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Profibus
FIOCON
Field Bus I/O Configurator

Application Description

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- to serve as instructions on configuring Profibus systems
- to assist in application of the firmware functions and function blocks

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1 General

The FIOCon Field Bus Configurator (**F**ield bus **IO Con**figurator) allows the two field bus systems Profibus-DP and DeviceNet to be configured via a serial interface.

After configuration download, it is possible to switch the FIOCon to Diagnostic mode. In Diagnostic mode, all status information of the connected devices can be observed. If a Profibus Slave is not operating correctly, this is displayed visually.

After configuration, you can print out detailed documentation of the field bus network, with the option of activating or deactivating the details.

2 System Requirements

In order to guarantee perfect FIOCon function, the following hardware an system requirements must be fulfilled:

- PC processor 486, Pentium or better
- WindowsNT 4.0
- at least 35 MB free hard disk space
- CD-ROM drive
- RAM: at least 16 MB
- Display mode 800 x 600 pixel or higher
- WindowsNT: Service Pack 3

3 Installation

Run file SETUP.EXE in order to install FIOCon. Follow the instructions provided by the installation routine.

4 Fundamental steps for Profibus configuration

4.1 Hardware

For the Profibus connection, a free COM port of your PC (COM 1 to max. COM4) must be connected to the DIAG port of the controller port (9-pin connectors). For this the INDRAMAT cabel IKS0106 (part number 260838) is recommended.

Furthermore it is possible to create a cable according to the Figure 4-1: RS 232C diagnosis cable.

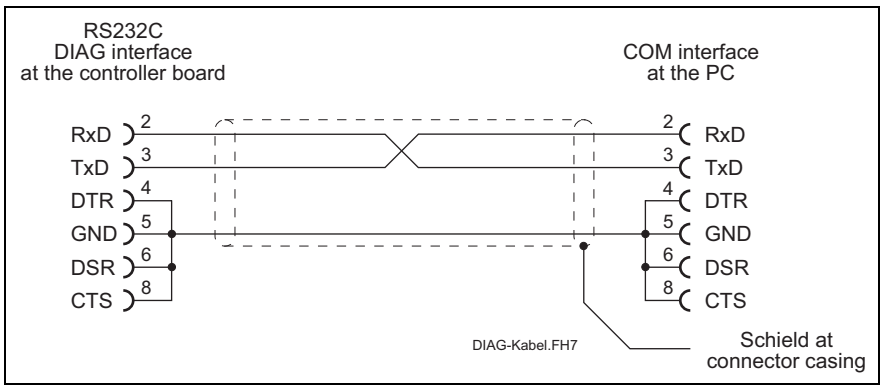


Figure 4-1: RS 232C diagnosis cable

4.2 Procedure

After launching the configurator, choose the **File/New** menu in order to create a new Profibus configuration. You have the choice between the two field buses Profibus and DeviceNet. Choose Profibus.

You can assign the name of the configuration file either with the **File/Save As** menu or when you quit FIOCON.

The FIOCon system configurator now supports configuration of a PROFIBUS-DP system. This generally requires the following steps:

- Inserting the Profibus Master.
- Inserting the Profibus Slaves.
- Parameterising the I/O modules.
- Setting the baud rate and the bus parameters.
- Selecting the serial port via which the Profibus interface communicates with the system configurator.
- Saving the configuration.
- Downloading the configuration to the selected device.
- Testing communication with the debugger.

5 GSD files

GSD files contain the properties of the various PROFIBUS devices. All existing GSD files, taken together, form the device database.

When the program is launched, the IO configurator automatically reads in all GSD files stored in the GSD directory (Figure 5-2: Directory structure of FIOCon). The device names are adopted in an internal list for instance. The device-specific data is read directly out from the GSD file during configuration.

If a device which is not yet shown in the list box is required, the corresponding GSD file can be copied to the GSD directory with menu **File/Copy GSD**. One other option is to copy the GSD file to the FIOCon GSD directory with Windows Explorer and then read the GSD files in the GSD directory in again with **Settings/Directory**.

The GSD file for a Profibus device is provided by the relevant device manufacturer.

The GSD files can be viewed with **Tools/GSD Viewer**.

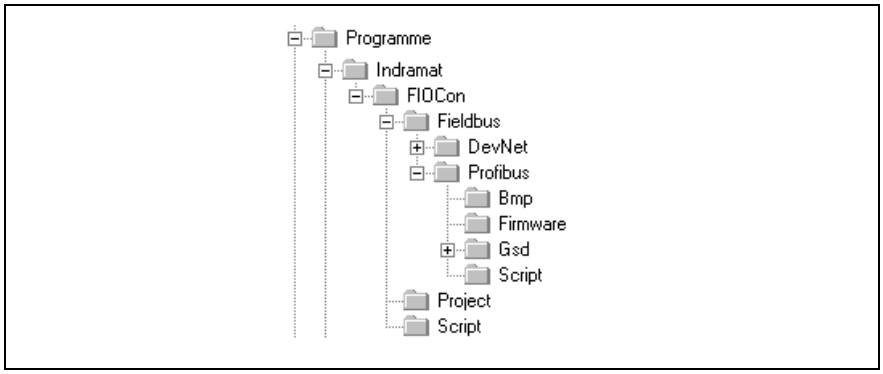


Figure 5-2: Directory structure of FIOCon

The GSD directory can be set. Use menu **Settings/Directory** in order to change the directory from the default directory to a different directory. All GSD files must be saved to this directory.

6 Profibus Master

6.1 Inserting the Master

A Master can be inserted in the configuration using menu **Insert/Master** or by clicking on the left-hand tool in the toolbar:

The mouse pointer changes shape automatically as soon as it is moved downwards out of the toolbar.

After you have clicked on the position at which the Master is to be inserted, a dialog box opens and you can choose the Master from this dialog box. The list at the left shows all Master devices available for selection and whose GSD files are stored in the GSD directory. You can also change the station address and enter a description of the Master.

Note: Even if more than one Master can be inserted in the configuration, the INDRAMAT PLC supports only one Mono-Master system.

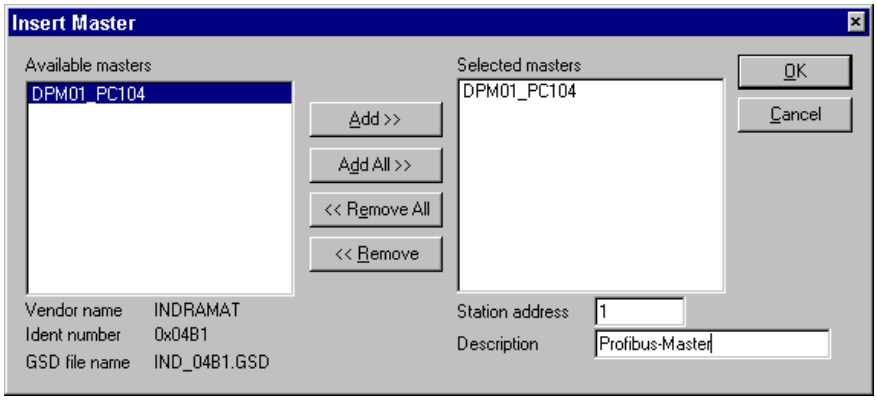


Figure 6-3: Insert Master dialog box

Figure 6-3 shows a DPM01_PC104 Profibus Master inserted with **station address 1** and description **Profibus DP Master**.

6.2 Configuring the Master

The master-specific configuration is performed with the dialog box shown in Figure 6-4: Master Configuration dialog box. Double-clicking on the icon of the Master to be configured opens this dialog box.

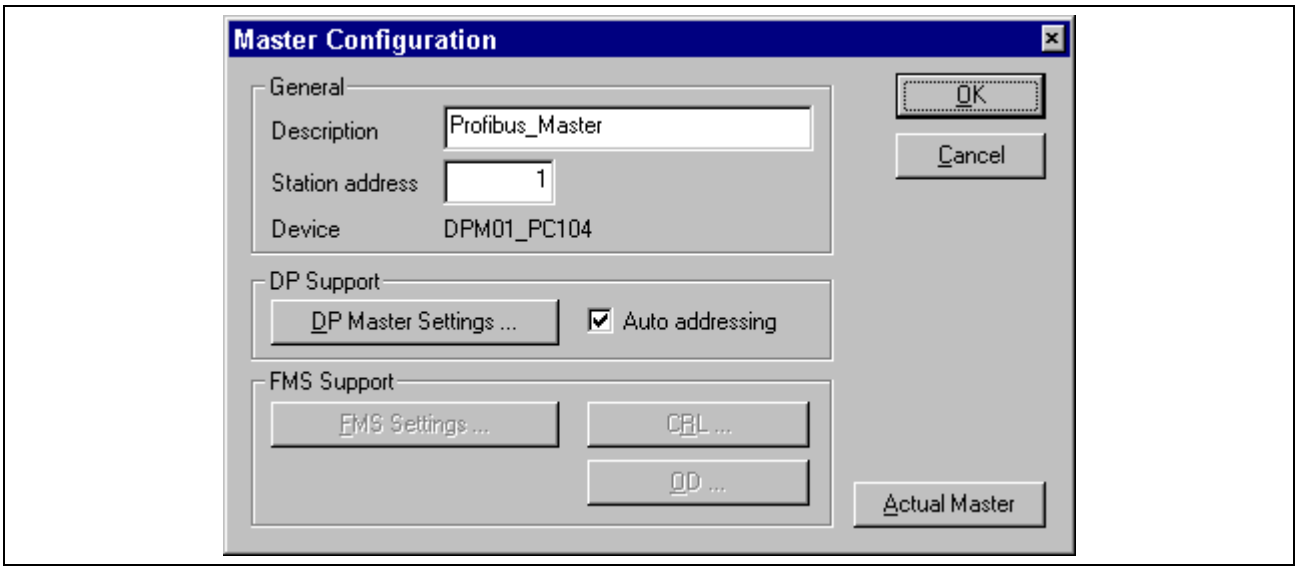


Figure 6-4: Master Configuration dialog box

You can make the following settings in this Master Configuration dialog box:

Station Address This assigns the Master station address. Each address may be assigned only once and must correspond to the address set on the corresponding bus user.

Description Entry of a symbolic description of the Master (no special characters may be used).

Actual Master The interface to which the configuration is to be loaded must be selected in order to perform the download. \he selected interface is referred to as 'actual Master'.

Auto Addressing Activation/deactivation of automatic address assignment by the Master.

DP Support The 'DP Master Settings...' button opens a new window in which you can make further Master settings (see Figure 9-20: Master Settings dialog box).

FMS Support Profibus FMS is not supported.

7 Profibus Slave

7.1 Inserting Slaves

PROFIBUS-DP Slaves can be inserted in the configuration using the **Insert/Slave** menu or by clicking on button

.

The mouse pointer automatically changes its shape as soon as it is moved downwards out of the toolbar.

After you have clicked on the position at which the Slave is to be inserted, a dialog box opens in which you can choose the Slave. You can also change the station address and enter a description of the Slave.

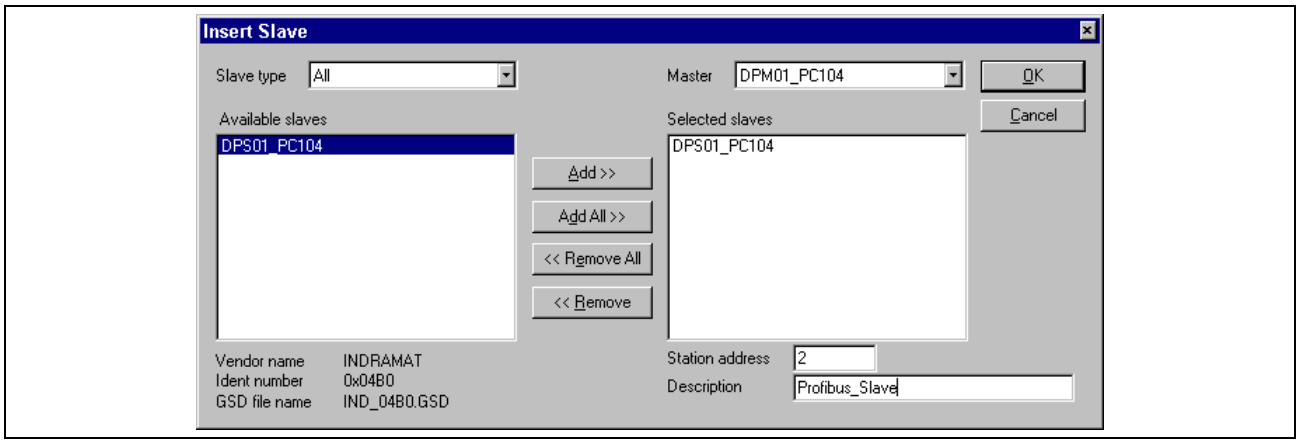


Figure 7-5: Insert Slave dialog box

The list at the left shows all Slave devices available for selection and whose GSD files are stored in the GSD directory.

Slave type You can use a filter in order to restrict the entries in the list box for the Slave family. You can choose the following types: All, General, I/O Slaves and Gateways.

Add This transfers the marked Slave to the right-hand column. Each new Slave added automatically increments the station address by 1. However, it can be overwritten in field **Station address**. By double-clicking on a Slave in the left-hand column, you can also transfer this Slave to the right-hand column.

Station address/Description This allows you to assign the selected Slave a station address and a description.

Master This is where the Slaves inserted in the right-hand column are assigned to the selected Master.

Further information on a Slave is displayed beneath the list box if the Slave is marked (by clicking on it with the mouse).

Note: It is permitted to select a Slave more than once. However, each Slave must have its own station address in order to allow unique differentiation on the bus.

7.2 Configuring the Slave

The Slave-specific configuration is performed with the following dialog box which is opened when you double-click on the corresponding Slave. This assigns the modules and their addresses in the Master's process image memory.

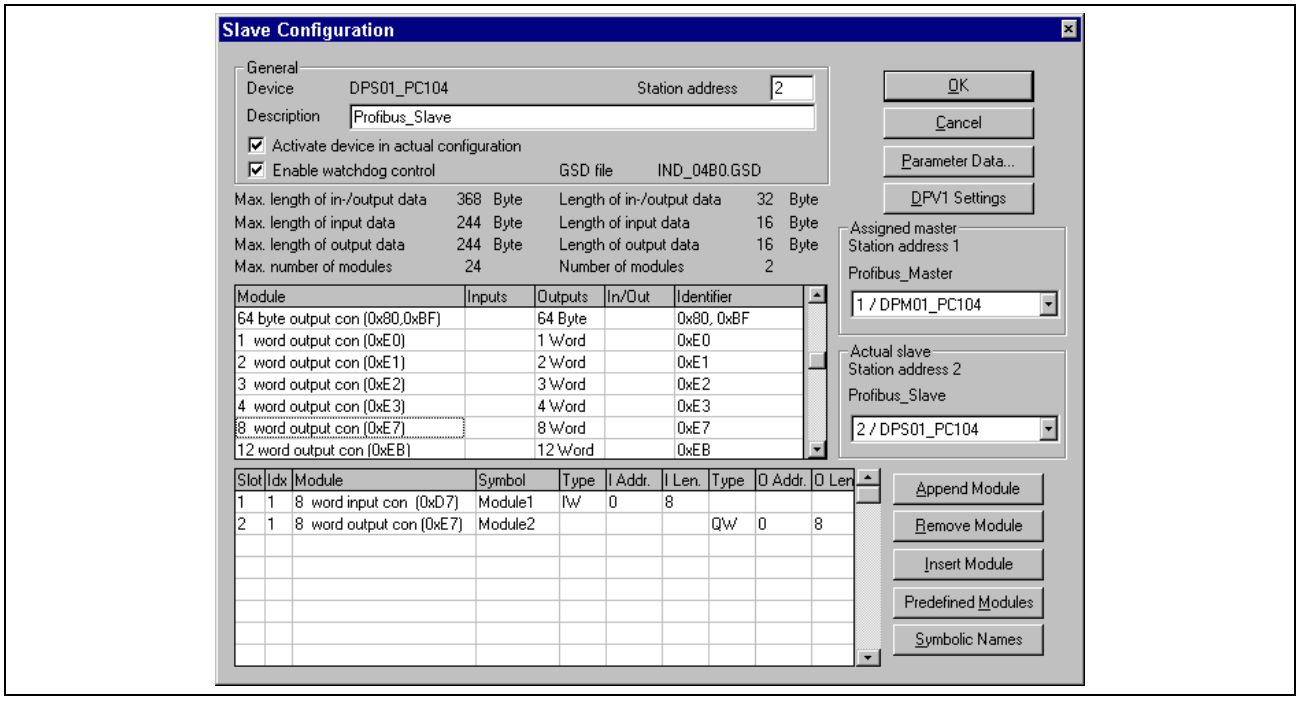


Figure 7-6: Slave Configuration dialog box

There are two types of Slave. A single Slave has a fixed data length whilst a modular Slave is configurable. A modular Slave can be understood as a combination of single Slaves with a common station address.

The upper list box shows all possible modules of the Slave. In the case of a single Slave, only one module is displayed and this is copied automatically to the configuration list at the bottom. In the case of a modular Slave, the user must choose the required modules and transfer these to the configuration list at the bottom either by double-clicking or using the **Append Module** button. Please ensure that the maximum values for the input and output data are not exceeded (you will see a warning if they are exceeded). The limit values are displayed above the list box.

If a module consists of several sub-modules, each sub-module is displayed in the configuration list at the bottom in a separate line. This is indicated by the number in the **Slot** column. The Index column displays a consecutive number for sub-modules.

You should proceed as follows in order to configure the modules (to select the modules) of a Slave:

- Insert all required modules from the list box at the top in the configuration list at the bottom. The order of the modules in the configuration list at the bottom is important and must correspond to the real physical order in the Slave.
- Assign the addresses of each module in the process image memory. The address is entered in column **Type** and **Addr** separately for inputs and outputs.

The I/O addresses can either by entered by the user or assigned automatically by FIOCon. In order to do this, activate or deactivate **Auto**

addressing in the **Master/Settings** menu. If Auto addressing is active, the addresses are assigned starting at 0 in ascending sequence. If Auto addressing is not active, address 0 is displayed in field **I Addr** resp. **O Addr** and must be overwritten by the user.

The addresses are byte addresses or word addressed depending on the **Addressing mode** which can be set in the **DP Master Settings**.

The DP Slaves use setting **Enable watchdog control** in order to detect communication errors with the assigned DP Master. If the DP Slave detects an interruption in existing communication beyond the response interval, the Slave automatically performs a reset and sets its outputs to a safe state.

Note: If watchdog control has been deactivated, it is possible that the outputs are not reset by the Slave even though communication with the Master is interrupted.

---

8 Data exchange between the devices

In order to display the connection between the Master and the Slaves, the actual Master resp. Slave must be selected with the right-hand mouse button by selecting "Choose as actual Master/Slave". A blue frame is drawn around the icon of the Master/Slave if it can be selected.

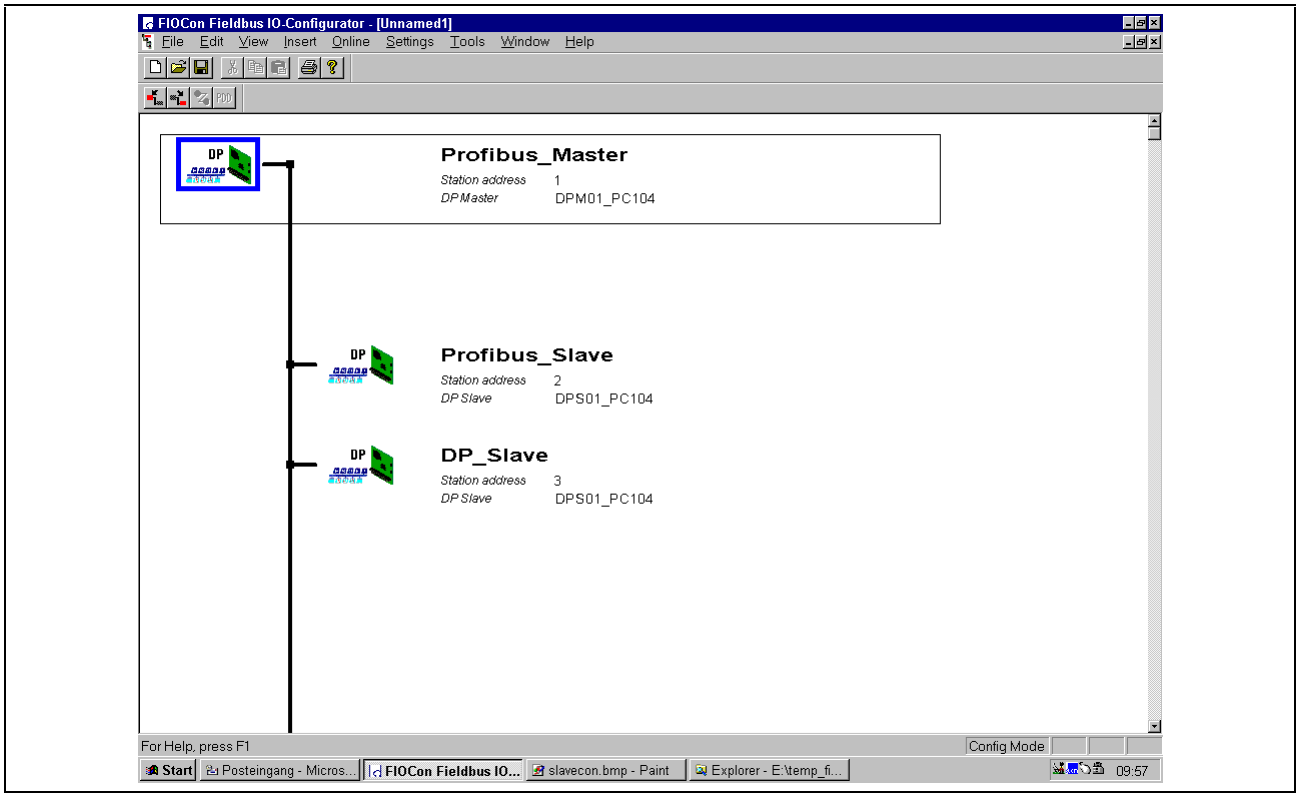


Figure 8-7: Bus configuration in FIOCon

The width of the bus line (symbolised bus cable) shows the connections of the current device.

A thick line means that the corresponding devices are connected by the configuration and a thin line means that there is no connection between the devices, i.e. there is no communication between them.

9 Menus

9.1 File

The sub-menus contained in this menu correspond to those from other Windows applications and are thus not described in greater detail.

Copy GSD

If a device which is not yet in the Master resp. Slave list box is required, the corresponding GSD file can be copied automatically to the GSD system directory with menu **File/Copy GSD**. A list box is displayed from which you can choose the required GSD file.

9.2 Edit

Delete line

This deletes the line at which the cursor is positioned after you answer yes to a prompt as to whether you really do wish to delete.

9.3 View

Device Table

Menu **View/Device Table** displays a list of all devices which have been inserted.

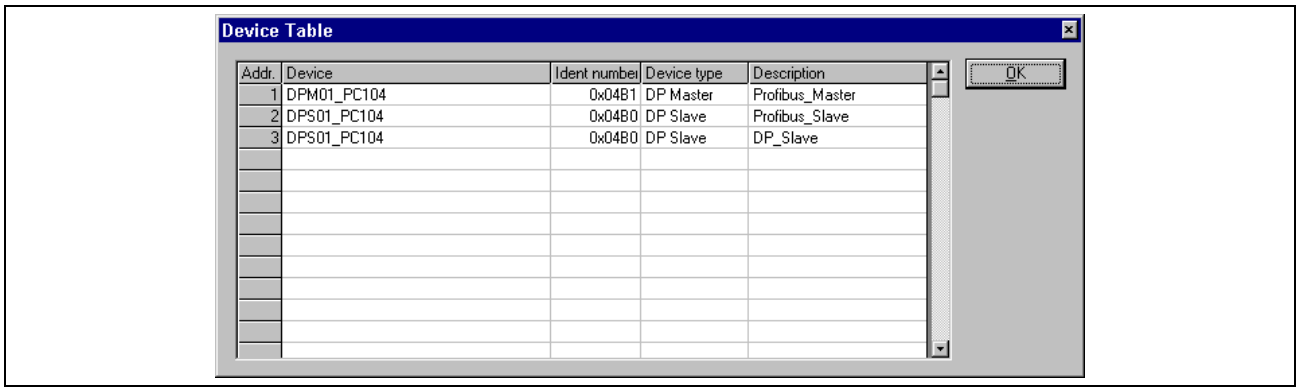


Figure 9-8: Device Table dialog box

Address table

A list of all addresses used in the process image memory is displayed with menu item **View/Address Table**.

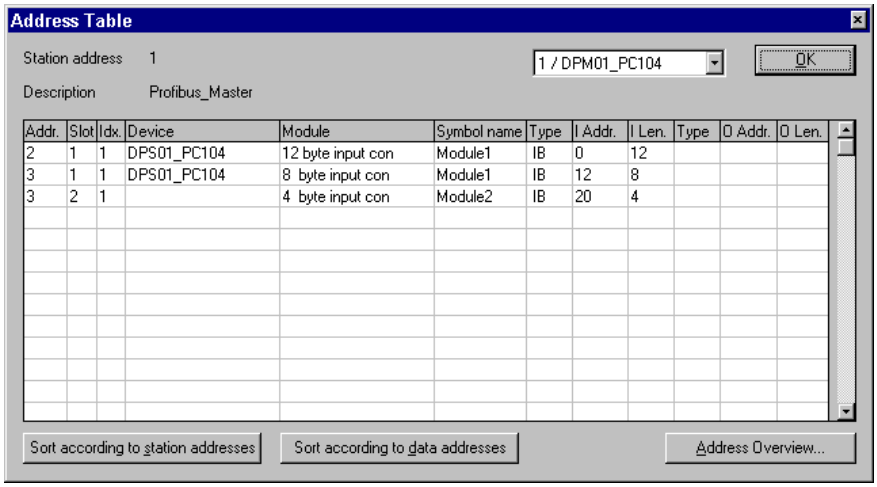


Figure 9-9: Address Table dialog box

It is possible to sort the addresses by station addresses or by data addresses.

The **Address Overview** button displays the assignment of the addresses in the input and output area.

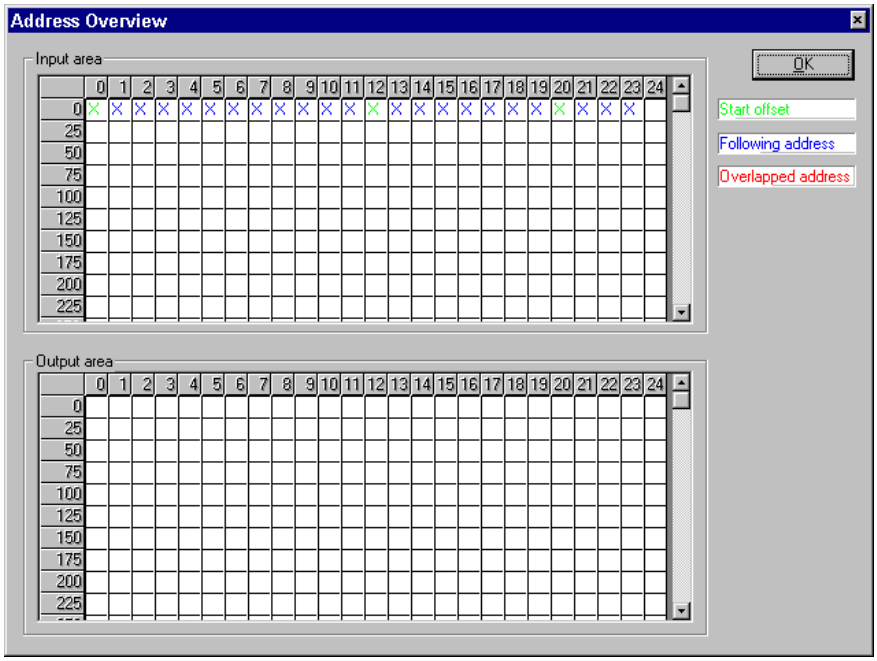


Figure 9-10: Address Overview dialog box

The "Auto addressing" setting in the DP Master Settings dialog box must be deactivated in order to allow the address areas to be shifted. In order to shift the address areas, click with the left mouse button on a cross and keep the mouse button pressed. The mouse button then change to an arrow. If you drag the arrow (with the mouse button pressed) to the required, new unoccupied position and release the mouse button, a prompt is displayed asking you whether you really do wish to make the change or not.

The offset addresses can also be assigned using the Salve Configuration menu.

Overlapping addresses are marked by a red cross. This means that this address is used by more than one module.

You can display information showing what Slave is occupying the address by double-clicking on the corresponding cross. The "Byte information" dialog box is then opened.

Optimise Bus Layout

This sub-menu realigns the bus layout.

Status Bar

This serves to activate or deactivate the status bar at the bottom of the screen. This bar displays the status of communication.

9.4 Insert

The two sub-menus **Master...** resp. **Slaves...** are described in Sections 6.1 "Inserting the Master" resp. 7.1 "Inserting Slaves".

9.5 Online

This menu contains all functions which directly influence the PROFIBUS interface devices, e.g. DPM01_PC104 resp. DPS01_PC104.

Note: Note that these functions may cause an interruption in ongoing communication or that outputs may be switched.

Download

In order to be able to transfer the configuration to the interface module, the module itself resp. the device must be selected. Selectable controller boards include only DP Master or DP Slave interface modules. You can select the corresponding device using the right mouse button and menu item "Choose as actual Master/Slave". A blue frame is then drawn around the device.

If a device assignment has already been determined (refer to chapter 9.6) the Menu **Online/Download** transfers the configuration to the DP*01 device (DPM01_PC104 resp. DPS01_PC104). A warning is displayed indicating that communication on the PROFIBUS will be interrupted. You must confirm this warning. If the device assignment has not been determined, a window will be displayed in order to determine the device assignments now (refer to chapter 9.6).

The configuration is checked by the configurator before downloading. The most frequent cause of errors is overlapping of addresses in the process image. This can be checked by calling up the address table with menu item **View /Address Table**.

If you want the addresses to be assigned automatically in the process image, you must activate switch **Auto addressing** in the **Master Configuration** dialog box.

The configuration is transferred to the selected device and saved there in a buffered FLASH memory so that the configuration is still available if you switch the power supply off and back on again.

After downloading, the device performs an internal restart and starts communication if menu item **Automatic release of the communication by the device** has been set in menu **DP Master Settings**. Otherwise, communication must be started explicitly via the PLC program with the aid of the DP_Start function (see 12.2 Functions).

Debug Mode

Choose menu **Online/Start Debug Mode** in order to start Debug mode. The system configurator cyclically polls the status of bus communication on the device and the individual conditions of the devices.

Debug mode can be stopped with **Online/Stop Debug Mode**.

When the debugger has been started, the Configuration window changes to the Debug window. The devices and the lines between the devices are displayed in green or in red, dependent on network communication.

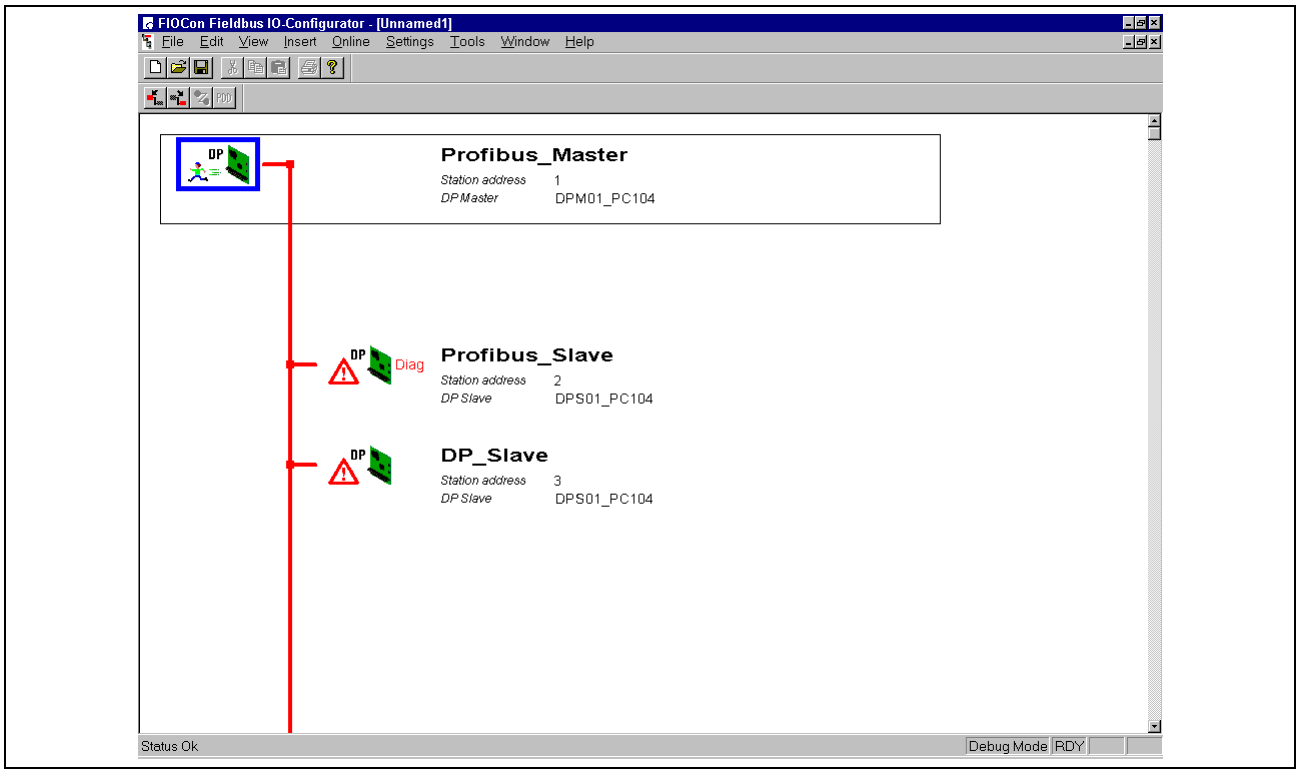


Figure 9-11: Debug Mode dialog box

If diagnostic information is pending for a specific device, **Diag** will be shown in red next to the device. You can retrieve further device-specific information by double-clicking on the corresponding device

Device Diagnosis

After you have started Debug mode, FIOCon requests the status of all devices from the Master. If a fault has occurred on a device, the bus line to the Slave is displayed in red. Otherwise, it is displayed in green. FIOCon also displays the text **Diag** if the device is signalling diagnostic information. This information is displayed more precisely if you double-click with the mouse on this device in Debug mode.

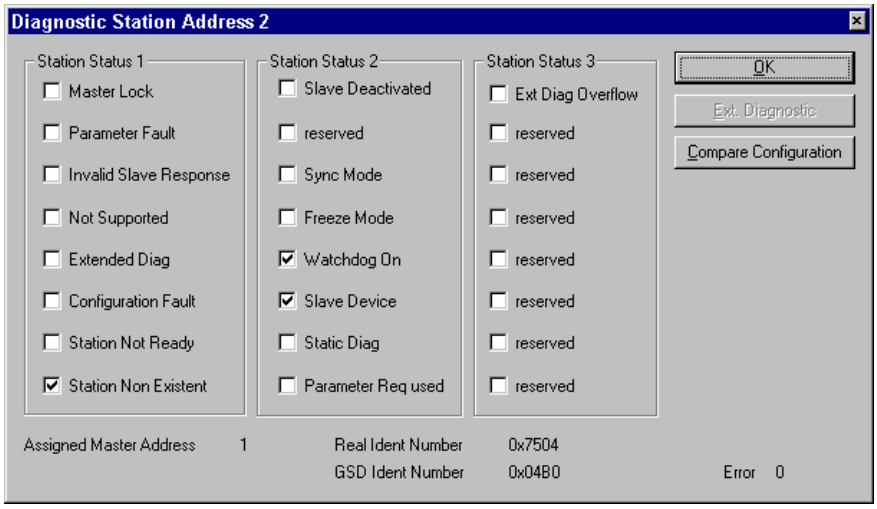


Figure 9-12: Device Diagnosis dialog box

The individual bits in Device Diagnosis have the following significance:

Access of other Masters: The Slave has been parameterised by another Master and is barred for access by the selected Master. Check whether there is another Master in the PROFIBUS network and then delete its connection to this Slave or disconnect this Master from the bus.

Parameter Error: This bit is set automatically by the Slave if the parameters issued to it by the Master are incorrect or incomplete. Each received parameter telegram is checked fully by the Slave. If the Slave detects an error or an invalid file, it signals this with a parameter error. The Slave also checks its identification number with the identification number which the Master transmits to it. If this error occurs, first compare the identification number determined with the GSD identification number in this window. If they are not the same, a Slave other than that entered in your configuration is being addressed under this station address. One other problem may be that more parameter data than the Slave supports has been entered with FIOCon. In this case, you should reduce the number of parameter data items.

Invalid Slave Response: This bit is set by the Master if the Master has received an invalid response from the Slave. This means that physical contact with the Slave has been established but the logical response is not being understood. This may happen, for instance, if a PROFIBUS-FMS Slave instead of a DP Slave is connected to the DP Master. This means that the Slave does not understand the DP telegram and returns it. It is then classified as an invalid response by the Master.

Function not supported This bit is set by the Slave if it is to perform a function which it does not support. More recent versions of Slaves normally support Sync and Freeze commands. This is stated in the GSD file and is read out from FIOCon and output to the Slave as a parameter telegram. If this error occurs, the GSD file contains at least one function not supported by the Slave. In this case, you should request the new GSD file from your device supplier.

Extended Diagnosis This bit is set if extended diagnostic data has been read out. Such data is optional and is normally used by a Slave to output manufacturer-specific diagnostic messages. The "Extended Diag." button displays the extended diagnostic data in hexadecimal notation, and you can read up on the significance of this data in the device manufacturer's manual.

Configuration Error During PROFIBUS-DP initialisation, the Slave compares its internal I/O configuration with the configuration of the Master. If the Slave detects a difference, it signals a configuration error. This means that the Master has an I/O configuration different to the Slave. First compare the individual modules of the Slave with the modules actually plugged in. Also note that the order of the modules must correspond. Certain Slaves require virtual

modules or a blank module at the start in order to achieve an even number of modules. This Slave-specific behaviour must be specified in the manufacturer's documentation since it cannot be taken from the GSD file. The last option is to read out the real configuration from the Slave using a PROFIBUS command with button "Compare Configuration". The configurations are displayed in hexadecimal notation in a window. Any differences are displayed by FIOCon.

Station not ready The Standard does not specify when or for what reason a Slave sets this bit. It means that the Slave is not ready to exchange data, which may attributable to various reasons. Generally, this error occurs in combination with another error.

Station Non Existent This bit is set automatically by the Master if the Slave does not respond on the bus. Possible causes of this may include an incorrect station address, baud rate or a fault on the bus cable.

Slave Deactivated This bit is set by the Master if parameterisation of the Slave identifies the Slave as inactive. This removes it from cyclic data communication.

Sync Mode This bit is set by the Slave if it has received a sync-control command.

Freeze Mode This bit is set by the Slave if it has received a freeze-control command.

Watchdog On This bit is set by the Slave if the watchdog timer is activated in order to monitor communication with the related Master.

Slave This bit is always set by the Slave.

Static Diag The Slave sets this bit in order to indicate to the Master that it is not ready for operation owing to a general fault. In this case, the Master should leave the bit set and request diagnostic data. The Standard does not describe with what event or at what instant the bit is set and it is thus not possible to provide further details.

Parameter Requested The Slave sets this bit in order to indicate to the Master that it requests new parameterisation. This bit remains pending for as long as parameterisation must be performed.

Ext Diag Overflow This bit is set if more extended diagnostic data is to be sent to the Master than would fit in a diagnostic telegram. For example, the Slave sets this bit if more diagnostic data is pending that can be entered in its buffer.

Firmware Download

Call menu **Online/Firmware Download** in order to perform a firmware download. A dialog box is displayed from which you can choose the new firmware. After you confirm, the new firmware is downloaded to the interface.

Firmware / Reset

Call menu **Online/Firmware Reset** in order to perform a Firmware reset.

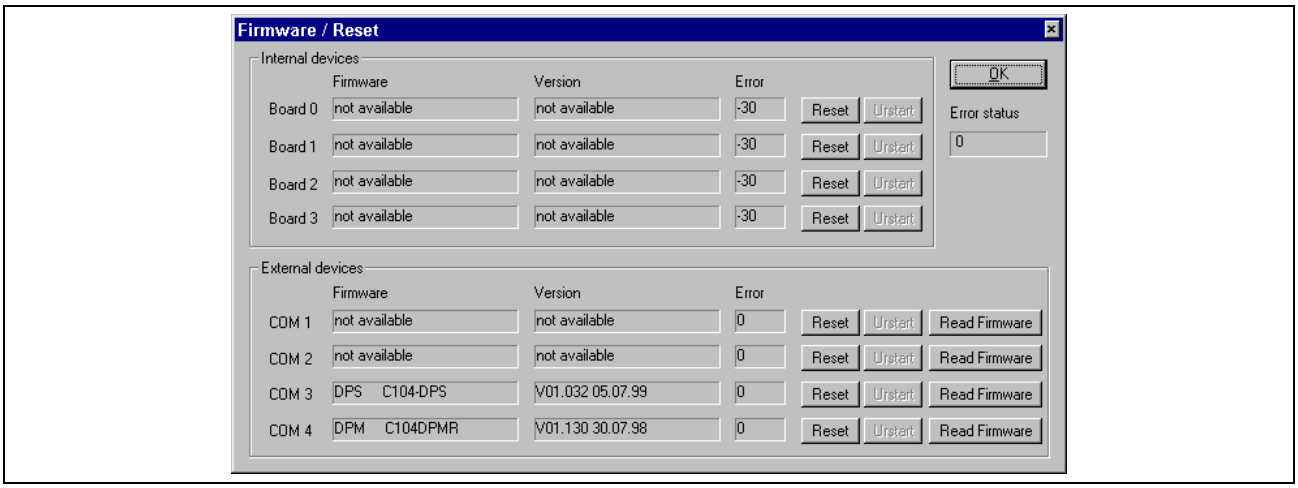


Figure 9-13: Firmware/Reset dialog box

Menu **Online/Firmware Reset** displays the name and the current version of the firmware.

Reset This button resets the device.

Read Firmware This button allows you to read out the firmware and its version via the serial COM port.

Extended Device Diagnosis

Menu item **Online/Extended Device Diagnosis** helps you to find bus and configuration errors if the menu functions of FIOCon can no longer help you.

This menu opens a list of diagnostic structures (see Figure 9-14: Select Task State dialog box) . These diagnostic structures contain online counters, statuses and parameters:

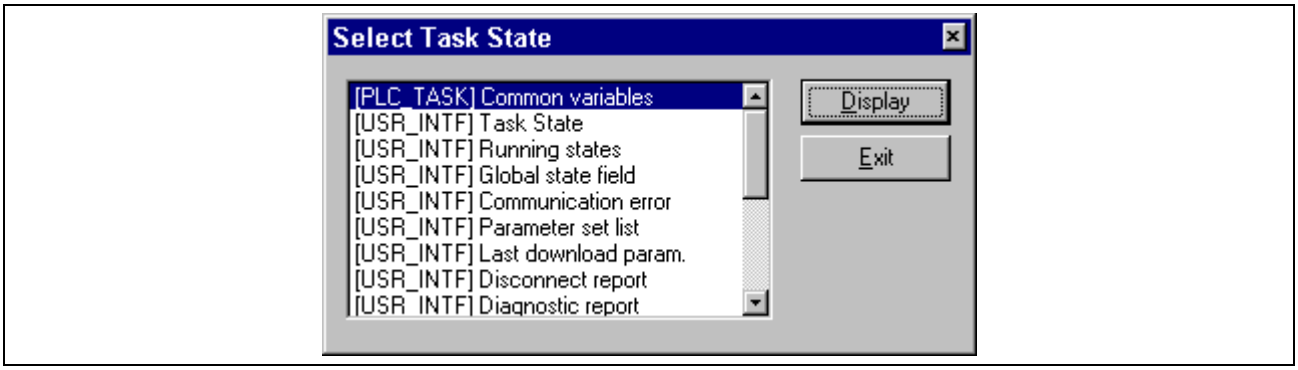


Figure 9-14: Select Task State dialog box

Global State field

Menu item **Online/Global State field** opens a display window cyclically displaying states in relation to the bus status and the connected devices.

The first row displays the main status of the Master. This may be state **OPERATE** or **STOP**.

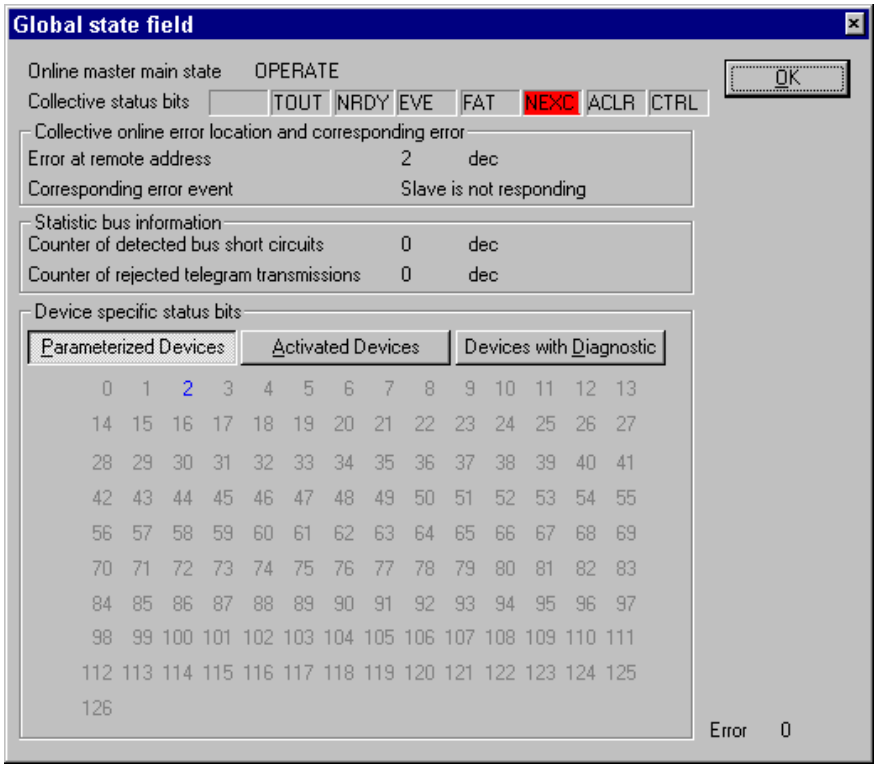


Figure 9-15: Global State Field dialog box

The next row displays individual bus errors. A pending error is indicated by a red field. The significance of the individual abbreviations is explained below:

TOUT TIMEOUT-ERROR: The Master has detected a transgression of the timeout time during which the PROFIBUS telegrams have not been able to be transmitted. This indicates short-circuits and faults on the PROFIBUS for instance interrupting communication with the Master. The number of interruptions is displayed in the statistical bus information. The bit is set if the first interruption has been detected and is no longer reset.

NRDY HOST-NOT-READY-NOTIFICATION: This indicates whether the application is ready or not. If the bit is set, the application is not ready to receive data.

EVE EVENT-ERROR: The Master has detected short-circuits on the PROFIBUS. The number of short-circuits is displayed in the statistical bus information. The bit is set when the first short-circuit has been detected and is no longer reset.

FAT FATAL-ERROR: No further communication is possible owing to a serious bus error.

NEXC NON-EXCHANGE-ERROR: At least one Slave is not in cyclic data exchange with the DP Master.

ACLR AUTO-CLEAR-ERROR: The Master has stopped communication and has reached the end state of Autoclear mode.

CTRL CONTROL-ERROR: A parameterisation error has occurred.

Other displays are as follows:

Errored Station and Error This indicates the address of the errored station and the pending error in plain text.

Statistical Bus Information This indicates the number of detected bus short-circuits and rejected telegrams.

Device-Specific Status Bits

These indicate the **Parameterised devices**, the **Active devices** or the **Devices with Diagnosis**, depending on the activated button. The relevant station address is displayed as a number in colour. A pending diagnostic message can be displayed by double-clicking on the station address.

This display is updated cyclically.

Live List

This menu provides you with an overview of all active devices on the PROFIBUS.

A green number indicates a Master and a blue number indicates a Slave, whereby the number indicates the station address. The significance of the other colours is specified in the list above the table.

The device type and device status of the station are displayed by clicking on a coloured number.

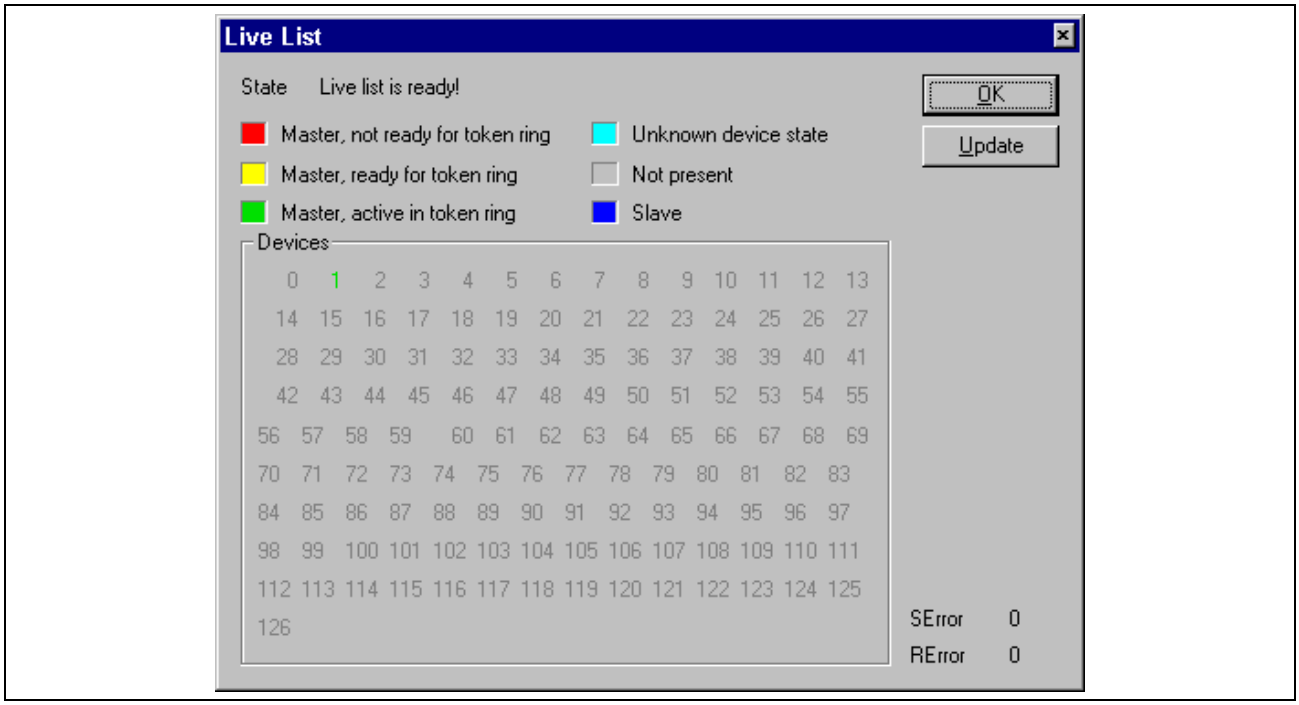


Figure 9-16: Live List dialog box

Update

The display is not updated automatically since this function would unnecessarily load the PROFIBUS network. The states are re-determined by clicking on button **Update**.

Set Slave Address

A station address of a Slave on the PROFIBUS can be changed with menu item **Online/Set Slave Address**.

Enter the new address in field **New Station Address** in order to do this. If no further change in the station address is to be allowed, mark field **No Further Change**. Additional parameters may be entered in hexadecimal notation in field **Slave Parameter**.

Device Information

Open menu item **Online/Device Information** in order to obtain further information on the selected device.

The date of manufacture, the device number and the serial number are read out from the device and displayed.

9.6 Settings

Device Assignment

The system configurator is able to configure up to 4 devices on the PROFIBUS network at the same time. The configurator must be told how (via the Dual-Port/ISA bus Memory or Serial/RS232C) and with what device it is to communicate so as to allow the online functions to be used. This is set in **Settings/Device Assignment**.

Note: Up to four devices connected to the COM ports 1 - 4 of the PC are supported at the same time. Communication via the Dual-Port Memory (ISA bus) in conjunction with an INDRAMAT control is not supported. Consequently, only the bottom section of the Device Assignment dialog box needs to be heeded for further settings.

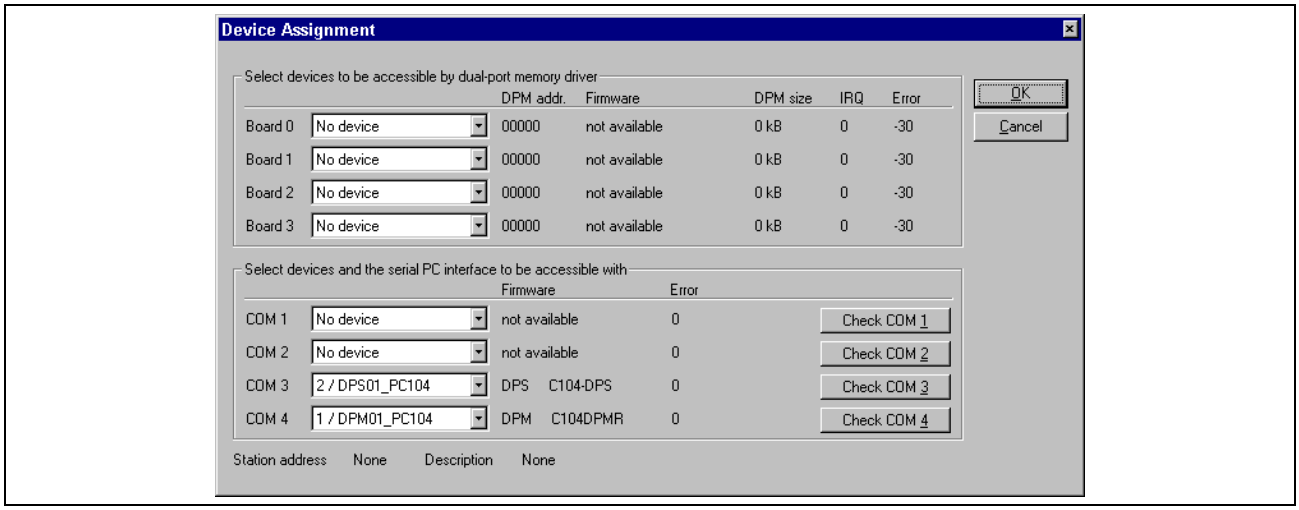


Figure 9-17: Device Assignment dialog box

The external connection to a device via the COM port can be tested with buttons **Check COM 1** to **Check COM 4**. If a device is connected, this is indicated by specifying the firmware. Otherwise, a timeout error is displayed, indicating that no device is connected.

The assignment of the serial ports is now made with the **Device Assignment**. If a device has been assigned, it will then no longer appear in other list boxes. If a device which is already assigned is to be assigned differently, you must first choose **No device** before this device can be reassigned to a different port.

Bus Parameter

The baud rate is frequently the only parameter which needs to be set on a PROFIBUS-DP system (Mono-Master system).

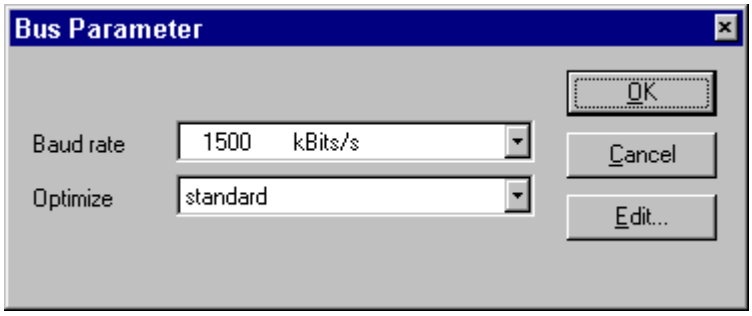


Figure 9-18: Bus Parameter dialog box

Die The baud rate must be set the same for all devices on the bus. Changing the baud rate means that all bus parameters are automatically recomputed. The system configurator checks whether the baud rate is supported by all devices configured, on the basis of the entries in the GSD files. If the system configurator detects at least one device which does not support the selected baud rate, an error message is displayed.

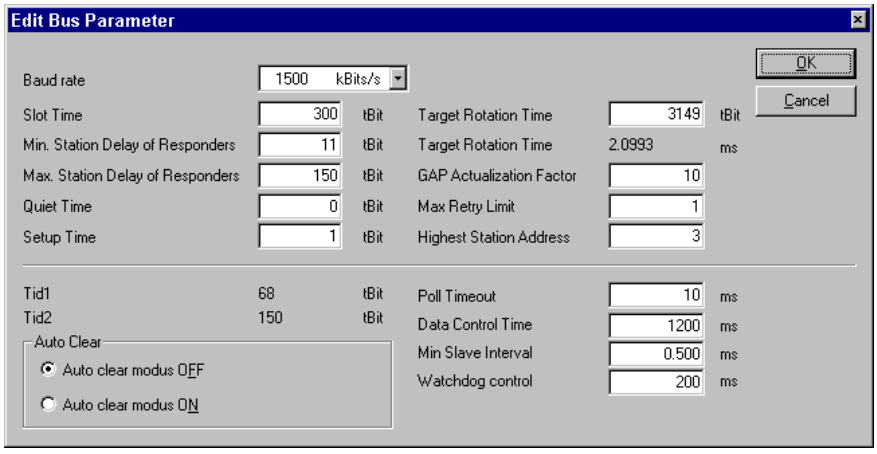


Figure 9-19: Edit Bus Parameter dialog box

The bus parameters can be viewed with menu **Settings/Bus Parameter** by clicking on the **Edit** button. Certain parameters can be changed. Field **Optimise** must be set to **User-defined** in order to able to set other parameters.

Note: Changing the bus parameters may result in communication disturbances.

Highest Station Address The highest address up to which a Master in a Multi-Master system searches for other Masters on the bus in order to pass on the token. On no account may this station address be lower than the Master-station address.

Poll Timeout The time after which the slaves set their outputs to zero in the case of an interruption in communication. If this time is selected too short with a low baud rate, it is possible that the Slaves set their outputs to zero. If this time is set too long, it is possible that the Slaves need too long to set the outputs to zero after an interruption in communication.

Auto Clear Mode The DP Master monitors data exchange with all Slaves. If no successful data transfer to **one** of the slaves can be achieved with **Auto Clear Mode** activated within the time entered in field **Poll Timeout**, the DP Master quits the data transfer phase and switches all outputs of **all** Slaves to safe operating state.

DP Master Settings

The DP Master can be set with menu **Settings/DP Master Settings**. The dialog box can also be opened by clicking with the right mouse button on the corresponding Master. The **DP Master Settings** dialog box can also be opened using the **Master Configuration** dialog box.

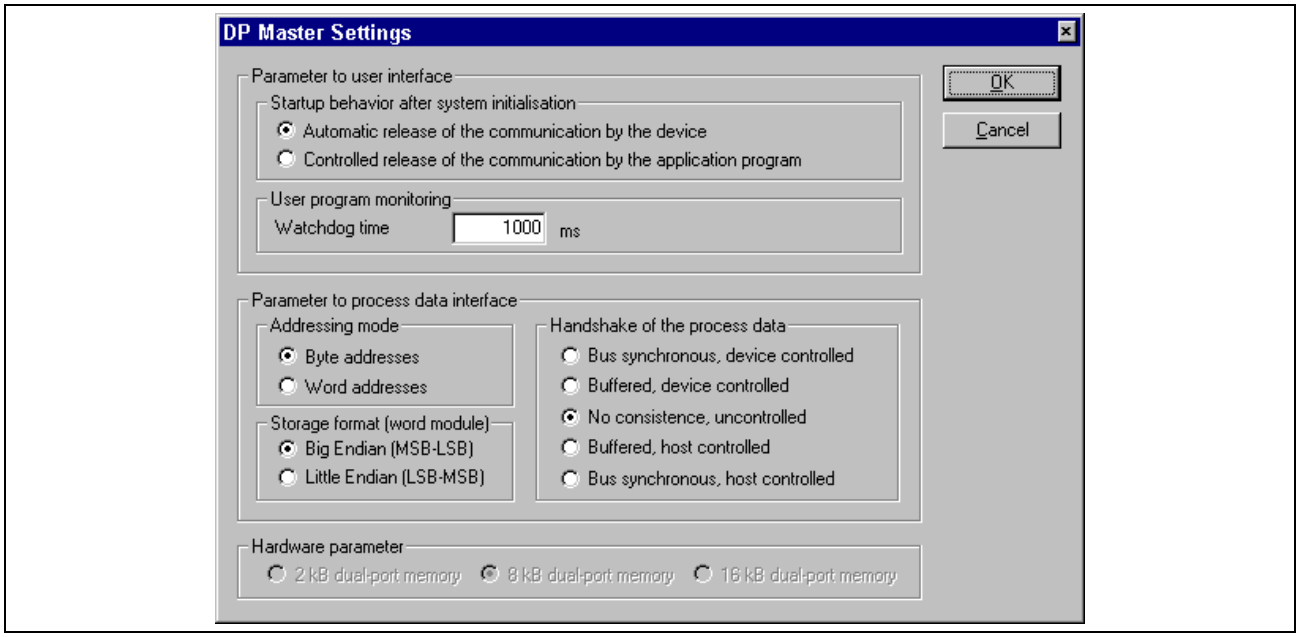


Figure 9-20: Master Settings dialog box

The DP Master Settings dialog box contains parameters which define the behaviour of the Master and the behaviour of the user interface. These settings apply only to Master interfaces and are also transferred when the configuration is downloaded.

Startup behaviour after system initialisation:

If **Automatic release of the communication by the device** is set, the Master device starts data exchange on the bus after the initialisation phase has been completed. If **Controlled release of the communication by the application program** is set, the application program must activate data exchange on the bus. The "DP_START" function is available for this purpose in the PLC programming GUI (see 11.2 Functions for further details).

User program monitoring:

The watchdog time defines how long the Master interface waits for triggering of the software watchdog by the PLC user program until it sets the outputs of the Slave devices to zero. This behaviour must be activated by the application program and does not start automatically.

Note: This is not a specific PROFIBUS function. One example of using this function is a SoftPLC.

Addressing mode

The addressing mode for the process data image defines how the addresses of the process data are interpreted. Addressing modes **Byte addresses** or **Word addresses** are possible. The addresses in the configuration of the users consequently define the start point of the data in the process image.

Byte addresses

The process image has a byte structure and each byte has its own address.

Word addresses

The process image has a word structure and each word has its own address.

The table below shows the different ways in which the various data types are stored in the byte or word-oriented process image:

Address in Byte mode	Address in Word mode	Offset address in the Dual-Port Memory	Data in the process image	Output on an I/O module
QB 0	QW 0	0	**0000 0000**	
QB 1		1	**0000 0000**	
QB 2	QW 1	2	**1110 0010**	QB2 / QW1 on a byte module: D7 D6 D5 D4 D3 D2 D1 D0 **1 1 1 0 0 0 1 0**
QB 3		3	**0000 0000**	
QB 4	QW 2	6	**1111 1111**	QW2 in data format *Little Endian*: D15D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0 **0 1 0 0 0 1 0 0 0 1 1 1 1 1 1 1**
QB 5		7	**0100 0100**	QW6 / QW2 in data format *Big Endian/Little Endian*: D15D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0 **1 1 1 1 1 1 1 1 0 1 0 0 0 1 0 0**

Figure 9-21: Comparison between Byte and Word addressing

Storage format

The storage format defines how the data words are stored in the process image. Big Endian/Little Endian or Little Endian/Big Endian can be selected for data type Word. This setting acts only on word modules. Setting Big Endian/Little Endian means that the high byte of the data word is stored at the low-order address in the image memory and the low byte is stored at the high-order address. Setting Little Endian/Big Endian stores the low byte at the low-order address and stores the high byte at the high-order address.

Handshake of the process data

In conjunction with INDRAMAT controls, this selection field is of no significance. Otherwise, it is used to set the handshake method of the process data for the Master. In conjunction with the Indramat PLC, only the two handshake methods **No consistence, uncontrolled** and **Bus synchronous, device controlled** are possible. The handshake method is set in the I/O editor of the PLC programming GUI. The designation "No consistence, uncontrolled" corresponds in the I/O editor of the PLC programming GUI to "Data consistency OFF" and "Bus synchronous, device controlled" corresponds to "Data consistency ON".

No consistence, uncontrolled: In this setting, the I/O data is exchanged between the PLC and the Dual-Port Memory (DPM) and between the DP Slave interface module and the DPM mutually independently and byte-serially. For example, this does not ensure that related input bytes from the same bus cycle are read out from the image memory (DPM) by the PLC.

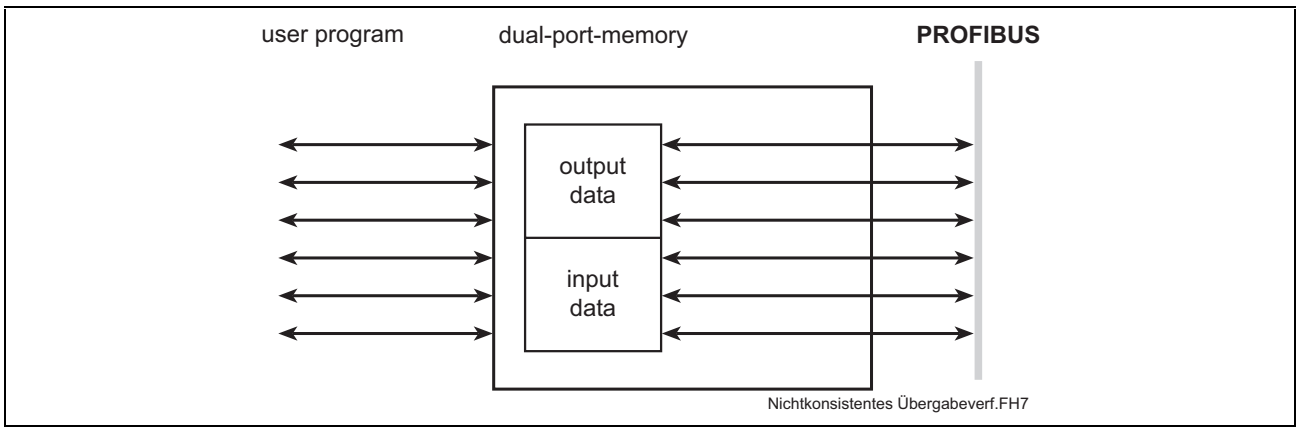


Figure 9-22: No consistence handshake method

Bus synchronous, device controlled: With this setting, the I/O data transferred cyclically from the bus is buffered (1) in an internal buffer. When the PLC has exchanged the image memory with the DPM (2), a flag is set, whereupon the interface exchanges the internal buffer with the DPM (3). During this time, data exchange between the bus and the internal buffer is stopped. After exchange, the interface sets a further flag, whereupon the PLC exchanges the image memory with the DPM (4).

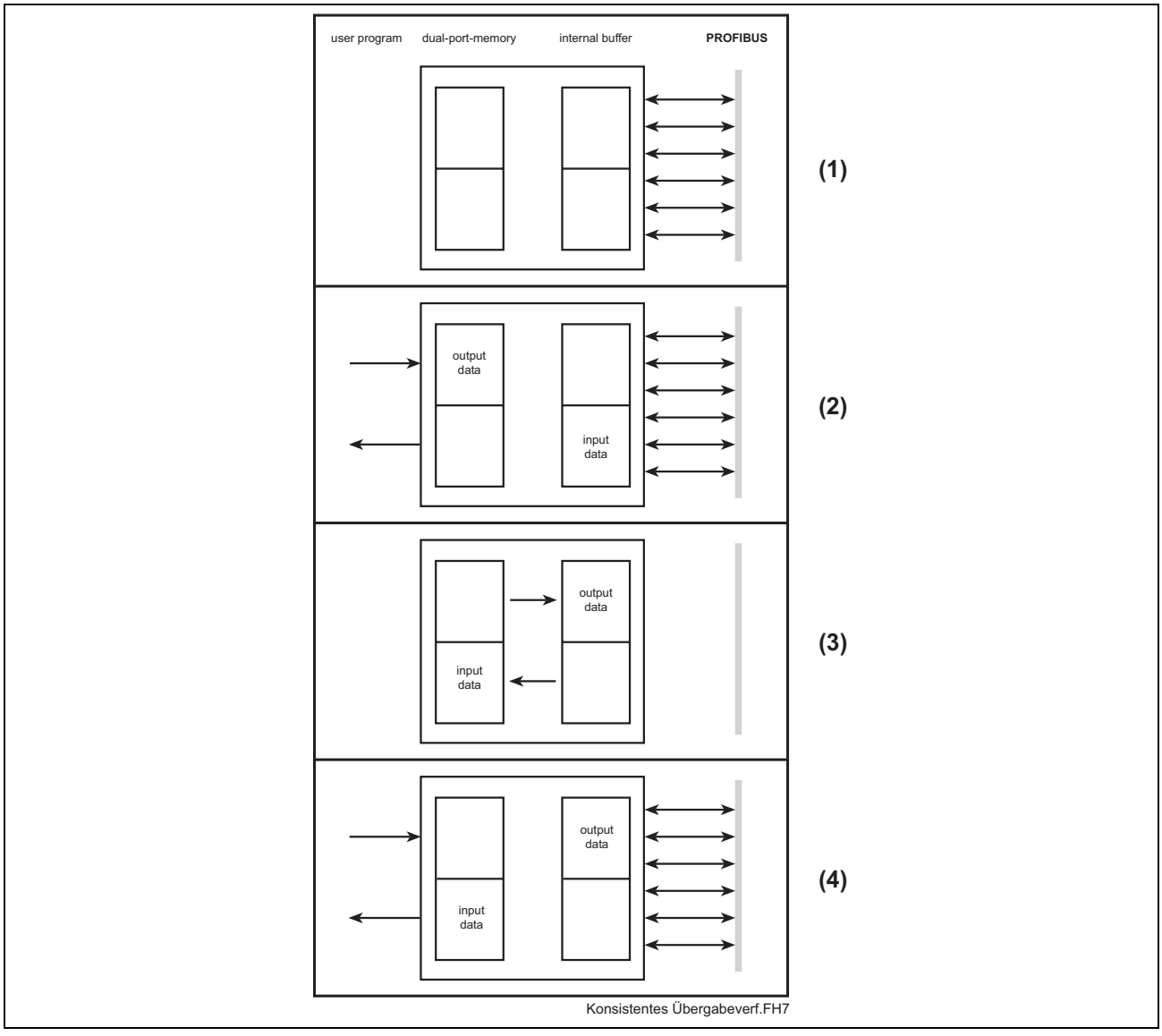


Figure 9-23: Consistent handshake method

Hardware parameter This parameter defines the size of the Dual-Port Memory of the hardware. The value increases or reduces the size of the permitted address range for the process data addresses. 8 Kbytes is set as the default for DPM01_PC104 resp. DPS01_PC104.

DP Slave Settings

The DP Slave Settings include parameters which define the behaviour of the device at its user interface. This menu item applies only to the Profibus DP Slave interface. If an attempt is made to call this menu item for other Slaves, a corresponding information box is displayed. The DP Slave settings are transferred to the Slave interface when the configuration is downloaded.

Note: After the configuration of a Slave has been changed and transferred, the configuration of the Master must be transferred again.

Menu "DP Slave Settings" is opened via **Settings/DP Slave Settings** after the Slave has been selected with the left mouse button.

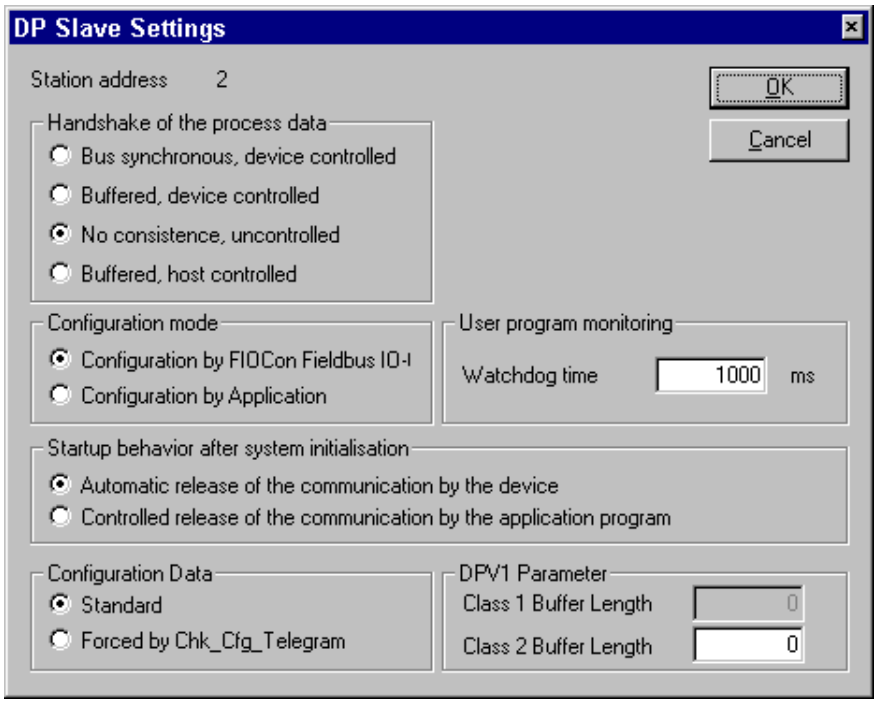


Figure 9-24: Slave Settings dialog box

User program monitoring

The watchdog time indicates how long the device waits for a user trigger until it resets all outputs to zero. This must be activated by the application in the PLC programming GUI.

Configuration mode

If the Slave device is to adopt the parameters from the configuration loaded by FIOCon to the device, mode **Configuration by FIOCon Fieldbus IO-I** must be selected. If the DP configuration is written online by an application into the Dual-Port Memory, mode **Configuration by Application** must be selected.

Handshake of the process data

In conjunction with INDRAMAT controls, this selection field is of no significance. Otherwise, it is used to set the handshake method of the process data for the Master. In conjunction with the Indramat PLC, only the two handshake methods **No consistence, uncontrolled** and **Bus synchronous, device controlled** are possible. The handshake method is set in the I/O editor of the PLC programming GUI. The designation "No consistence, uncontrolled" corresponds in the I/O editor of the PLC programming GUI to "Data consistency OFF" and "Bus synchronous, device controlled" corresponds to "Data consistency ON"

Startup behaviour after system initialisation

If **Automatic release of the communication by the device** is set, the Slave device starts data exchange on the bus after the initialisation phase has been completed. If **Controlled release of the communication by the application program** is set, the PLC application program must activate data exchange on the bus. Function "DP_START" is available for this purpose in the PLC programming GUI.

DP Slave Configuration

Double-clicking on the PROFIBUS-DP Slave device opens the Slave Configuration dialog box. The same happens if menu **Settings/DP Slave Configuration** is selected (see Section: 7.2 Configuring the Slave) .

Parameter Data

Parameter data can be edited in menu **Settings/Parameter Data**.

If default parameters are configured in the GSD file of the Slave, these default parameters are inserted automatically as soon as the menu is called a first time.

Some of the DP Slave devices require further parameter data in order, for instance, to change a measurement limit or a value range. This data is Slave-specific and its functionalities can thus not be explained at this point.

The device manufacturer defines the significance of the parameters. Please refer to the explanatory information in the device manufacturer's manual.

Figure 9-25: Parameter Data dialog box shows an example of possible parameter data of a Slave.

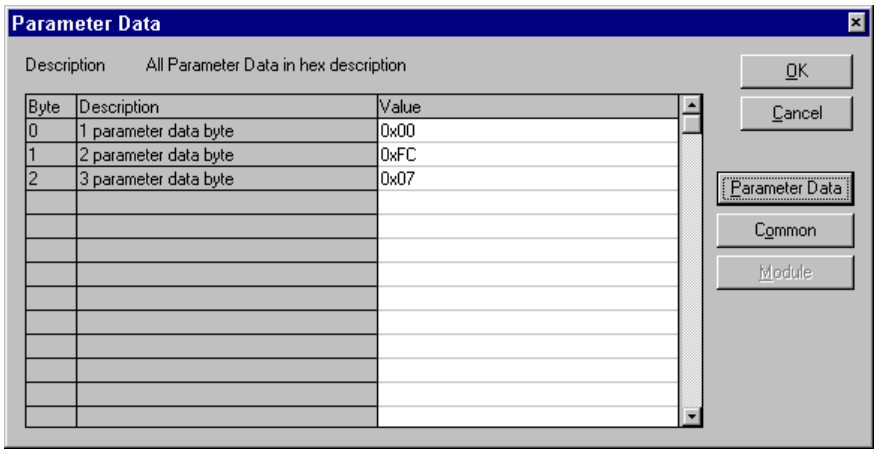


Figure 9-25: Parameter Data dialog box

A modular PROFIBUS-DP Slave station could require parameter data for one or more modules and for the Slave station itself (main station). There are three possibilities:

- Hex: These are all parameters of a Slave station
- Texts: Parameter data of the main station
- Module: Parameter data of one of the modules

After you select the Text button, the following dialog box with the text parameter data is shown. These parameters are for the main station.

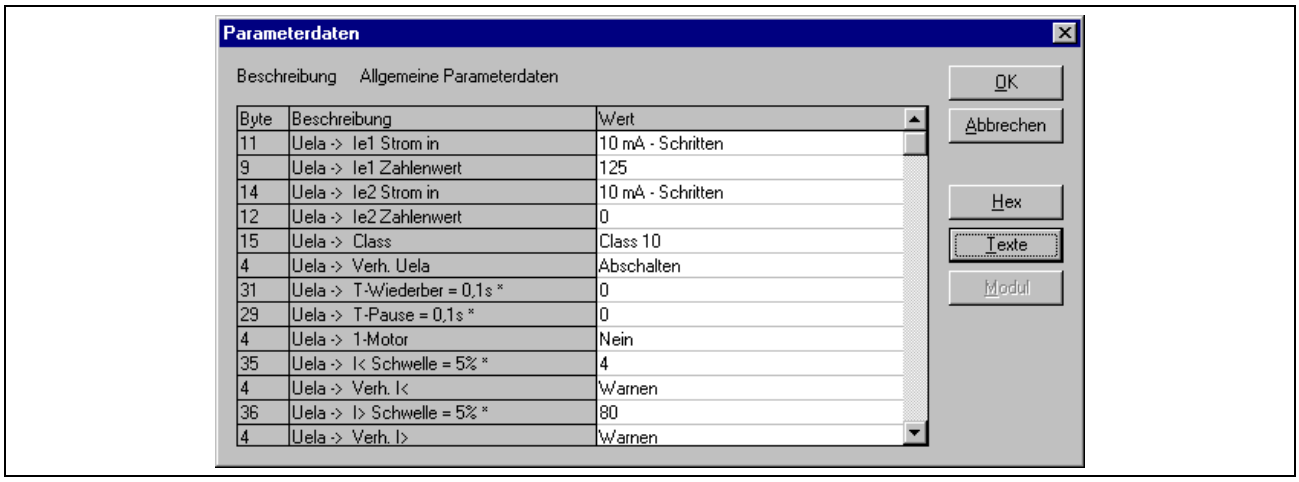


Figure 9-26: Parameter Data dialog box

By double-clicking on the parameter data, it is possible to edit the value.

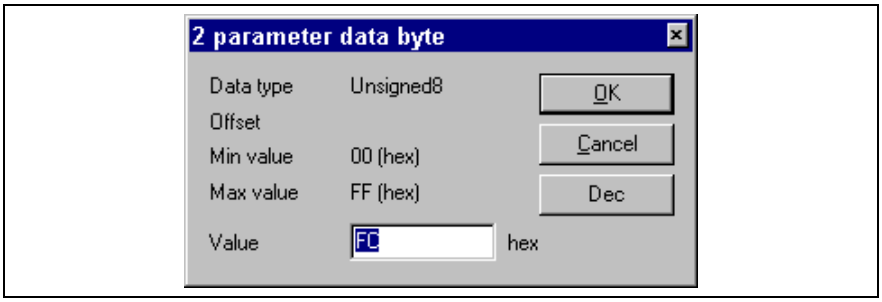


Figure 9-27: Dialog box for editing the parameter data

Project Information

Information on a project can be recorded in menu **Settings/Project Information**.

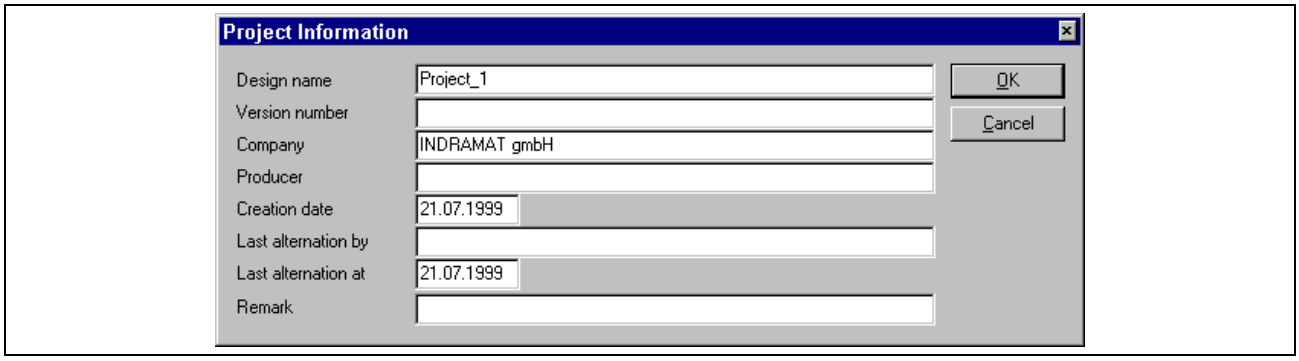


Figure 9-28: Project Information dialog box

Directory

The search path for GSD files is displayed if you select menu **Settings/Directory**.

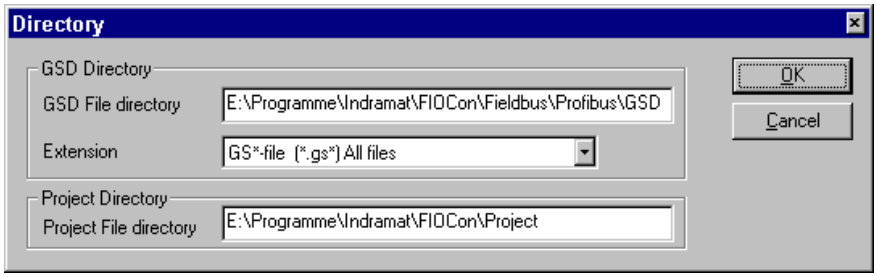


Figure 9-29: Directory dialog box

Select Language

Open menu **Settings/Select Language** in order to select the language.

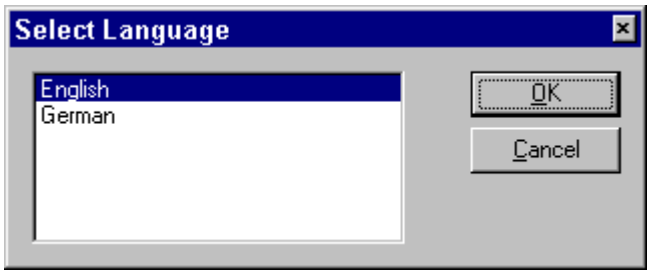


Figure 9-30: Select Language dialog box

The system configurator must be restarted after you change the language.

9.7 Tools

The GSD Viewer tool serves to display information of a selectable GSD file.

9.8 Window

The open windows can be arranged accordingly using the sub-menus.

9.9 Help

Help topics on FIOCon and information on FIOCon can be recalled with the sub-menus.

10 Error numbers

10.1 Serial driver errors

Figure 10-31: "Error numbers of serial drivers" lists the error numbers using the serial driver.

Error number	Description
-20	Driver: No COM handling found
-21	Driver: COM port already open
-22	Driver: Errored function call to the driver
-23	Driver: Internal driver error
-24	Driver: Unable to create read thread
-25	Driver: Unable to create read event
-26	Driver: Unable to create write event
-27	Driver: Unable to create timer event
-28	Driver: Error writing the data
-29	Driver: Incorrect COM status
-30	Driver: Setting COM status error
-31	Driver: Errored COM buffer setup
-32	Driver: Errored COM set timeout
-33	Driver: RX buffer overflow
-34	Driver: RX Buffer is full
-35	Driver: TX busy
-36	Driver: Error whilst closing driver
-40	User: COM port not open
-41	User: Invalid handling value
-42	User: Invalid COM number
-43	User: Parameter value invalid
-44	User: Parameter value zero
-45	User: Buffer pointer is zero
-46	User: Buffer is too small
-47	User: Setup error
-50	User: Sending message “Timeout error”
-51	User: Unable to send message
-52	User: Sending message “No device connected”
-53	User: Error sending message, message being received
-54	User: Telegram collision
-55	User: Telegram, no acknowledgement received
-56	User: Telegram, noise
-57	User: Telegram, data overflow
-58	User: Telegram, parity error
-59	User: Telegram, frame error
-60	User: Telegram, unknown error
-70	User: Timeout on reception of a message
-71	User: No message received

Figure 10-31: Error numbers of serial drivers

10.2 RCS error numbers

Figure 10-32 shows the list of error numbers of the RCS (Realtime Communication System), the operating system of the Profibus interface, returned in response messages. Command and response messages are used in communication between application software (e.g. the system configurator) and the Profibus interface. Download is specified as an example of communication.

Error number	Description
0	No error
4	Task not present
5	Task not initiated
6	MCL is barred
7	MCL rejected Transmit job owing to error
20	Database not planned
21	Database segment not configured or not present
22	Errored consecutive number of message when downloading
23	Received number of data items when downloading does not correspond to the number specified in command
24	Errored sequence ID when downloading
25	The checksum determined when downloading does not correspond to the checksum transferred in the command
26	Database write/read access
27	Download/upload resp. deletion not allowed with this planned database type
28	Status of the database segment indicates an error and thus allows no upload.
29	Access to the database segment requires the bootstrap loader. However, no bootstrap loader available
30	Trace buffer overflow
31	Trace buffer entry too long
37	No license or incorrect license. The corporate license of the system configurator allows only communication with devices containing the same license.
38	The database created by the system configurator and the database expected by the firmware are incompatible
39	DBM module missing
40	No further command free
41	Unknown command
42	Unknown command mode
43	Errored command parameter
44	Message length of command does not correspond to the parameters of the command
45	Only an MCL may transfer this command to the RCS
50	Currently processing FLASH
51	Error erasing the FLASH
52	Error writing to FLASH
53	FLASH not configured
54	FLASH timeout error
55	Access denied when erasing the FLASH

56	FLASH size does not correspond resp. FLASH memory inadequate
60	Errored structure type when accessing a task structure
61	Errored structure length when accessing a structure
62	Structure not present
70	No timer module present on the device
80	The transferred table handle is incorrect (table does not exist)
81	The data length does not correspond to the structure definition in this table
82	The data record with the transferred number does not exist
83	A non-existent name has been transferred
84	Table is full. No further data record may be entered
85	Other error from the DBM
90	The device information consisting of serial number, device number and date is already present
91	Invalid license code
92	License code already present
93	All memory locations for license codes are full

Figure 10-32: Error numbers RCS (response message)

11 Description of the Dual-Port Memory DPM

11.1 General

A **D**ual-**P**ort-**M**emory DPM with a size of 8 KByte is available on the Profibus Master's interface module for data exchange between the PLC and the Profibus interface. This DPM has the following structure:

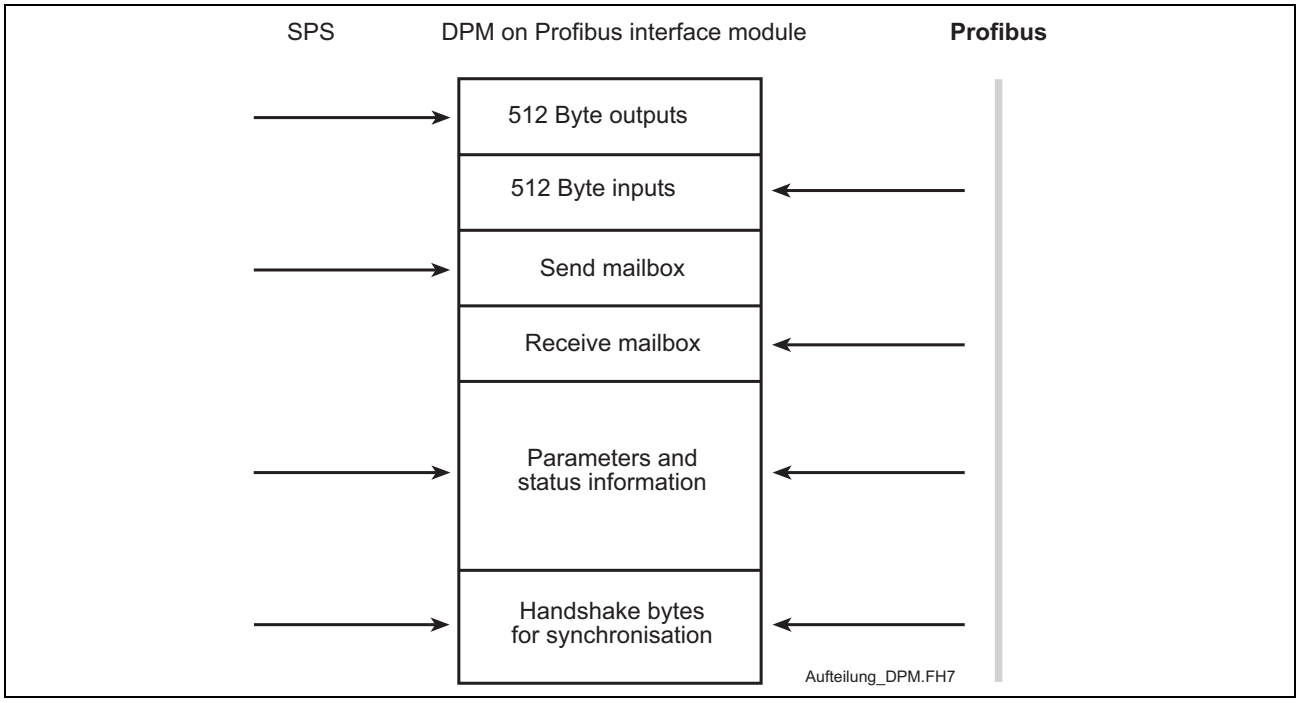


Figure 11-33: Overview of Dual-Port Memory

11.2 DPM memory map

The PLC programming GUI offers the option of accessing all memory areas of the DPM directly by absolute addressing. The corresponding variables must be entered in the VAR area of the declaration editor (example: variable AT %PB*.*). The addresses of the individual memory areas are specified in the tables which follow.

Address range (decimal)	Address range (hexadecimal)	Size	Designation
0 - 511	0000 - 01FF	512 bytes	SndPd Process output data PLC → Profibus
512 - 3583	0200 - 00DFF	3 KByte	Not used
3584 - 4095	0E00 - 0FFF	512 bytes	RecvPd Process input data Profibus → PLC
4096 - 7167	1000H - 1BFF	3KByte	Not used

Figure 11-34: Addresses of the DP Master input and output data

Address range (decimal)	Address range (hexadecimal)	Size	Designation
0 - 6143	0000 - 17FF	6 KByte	Not used
6144 - 6655	1800 -19FF	512 bytes	SndPd Process output data PLC → Profibus
6656 - 7167	1A00 -1BFF	512 bytes	RecvPd Process input data Profibus → PLC

Figure 11-35: Addresses of the DP Slave input and output data

Address range (hexadecimal)	Size	Designation
1C00H -1D1FH	288 bytes	DevMailbox[288] Message Buffer HOST → DEVICE
1D20H-1D23H	4 bytes	Date[4] Information Device
1D24H-1D27H	4 bytes	DeviceNumber[4]
1D28H-1D2BH	4 bytes	SerialNumber[4]
1D2CH-1D2FH	4 bytes	reserved[4]
1D30H-1D33H	4 bytes	PcOsName0[4] Information Driver
1D34H-1D37H	4 bytes	PcOsName1[4]
1D38H-1D3BH	4 bytes	PcOsName2[4]
1D3CH-1D3FH	4 bytes	OemIdentifier[4]
1D40H-1E5FH	288 bytes	HostMailbox[288] Message Buffer DEVICE → HOST
1E60H-1E6FH	16 bytes	FirmwareName[16] Information Firmware
1E70H-1E7FH	16 bytes	FirmwareVersion[16]
1E80H-1EBFH	64 bytes	Task1Parameter[64] Parameters of Task 1, 2
1EC0H-1EFFH	64 bytes	Task2Parameter[64]
1F00H-1F3FH	64 bytes	Task1State[64] States of Task 1, 2
1F40H-1F7FH	64 bytes	Task2State[64]
1F80H-1F87H	8 bytes	Task1Name[8] Information Task 1
1F88H	integer	Task1Version
1F8AH	byte	Task1State
1F8BH-1F8FH	bytes	reserved5
1F90H-1F97H	bytes	Task2Name[8] 8 Information Task 2
1F98H	integer	Task2Version
1F9AH	byte	Task2Condition
1F9BH-1F9FH	bytes	reserved5
1FA0H-1FA7H	8 bytes	Task3Name[8] Information Task 3

1FA8H	integer	Task3Version
1FAAH	byte	Task3Condition
1FABH-1FAFH	bytes	reserved5
1FB0H-1FB7H	8 bytes	Task4Name[8] Information Task 4
1FB8H	integer	Task4Version
1FBAH	byte	Task4Condition
1FBBH-1FBFH	bytes	reserved5
1FC0H-1FC7H	8 bytes	Task5Name[8] Information Task 5
1FC8H	integer	Task5Version
1FCAH	byte	Task5Condition
1FCBH-1FCFH	bytes	reserved5
1FD0H-1FD7H	bytes	Task6Name[8] 8 Information Task 6
1FD8H	integer	Task6Version
1FDAH	byte	Task6Condition
1FDBH-1FDFH	bytes	reserved5
1FE0H-1FE7H	8 bytes	Task7Name[8] Information Task 7
1FE8H	integer	Task7Version
1FEAH	byte	Task7Condition
1FEBH-1FEFH	bytes	reserved5
1FF0H	integer	RcsVersion Information Operating System
1FF2H	byte	RcsError
1FF3H	byte	HostWatchDog
1FF4H	byte	DevWatchDog
1FF5H	byte	SegmentCount
1FF7H	byte	DriverType
1FF8H	byte	DpmSize Informations of the Device
1FF9H	byte	DevType
1FFAH	byte	DevModel
1FFBH-7FDH	3 bytes	DevIdentifier[3]
1FFEH	byte	HostFlags Command and Acknowledge Location DEVICE → HOST
1FFFH	byte	DevFlags Command and Acknowledge Location HOST → DEVICE

Figure 11-36: Addresses DP Master/Slave

The memory areas have the following function:

SndPd: The process data to be transmitted is located in this area.

RecvPd: The process data received is located in this area.

DevMailbox: The data to be transmitted to the interface module is written into this memory area.

HostMailbox: The information transmitted by the interface module is located in this memory area in a defined message format.

HostWatchDog/DevWatchDog: These two memory areas allow mutual monitoring between the PLC user program (HOST) and the interface module (DEVICE). For this purpose, the interface module reads out the value of the DevWatchDog, increments it and writes the incremented value back to the HostWatchDog. When a value of 255 is reached, the value is not incremented to 0 but to 1. The process of incrementing and writing back is executed within 20 ms. The watchdog function is active only if the value in the DevWatchDog is not equal to 0. After initialisation of the interface module, the value 0 is located in the DevWatchDog area so that the watchdog function is deactivated. Thus, the user, through the PLC program, has the option of activating or deactivating this watchdog function.

SegmentCount: Number of memory segments still available for accommodating buffered messages. This value is entered by the interface module.

HostFlags/DevFlags: Monitoring data exchange between the host and the interface module. The interface module writes the HostFlags; the host reads out only the HostFlags. The host writes the DevFlags; the interface module reads out the DevFlags.

12 Firmware functions and function blocks

12.1 Firmware data types

The following data types are available:

- Status information of the Profibus: DPGLOBAL
- Status bits of a Profibus Slave: DPSLDIAG

Status information of the Profibus DPGLOBAL

Firmware data type DPGLOBAL is a BOOLEAN array indicating the status bits of the Profibus. The array consists of the following elements:

CTRL: Control Error: Parameterisation error

ACLR: Autoclear Error: Master has stopped communication with all Slaves.

NEXC: Non Exchange Error: At least one Slave has not reached data exchange status. No process data is being exchanged.

FAT: Fatal Error: No further bus communication is possible owing to a serious bus error (resp. bus short-circuit).

EVE: Event Error: The Master has detected bus short-circuits. The number of short-circuits is stored in variable "bus_error_cnt". This bit is not automatically reset.

NRDY: Host Not Ready Notification: User program is responding that is not ready.

TOUT: Timeout Error: The Master has detected a timeout owing to rejected telegrams. This bit is not automatically reset.

Slave status bits DPSLDIAG

Firmware data type DPSLDIAG is an array indicating the status bits of a Profibus Slave. The array consists of the following elements:

stannous: DP Slave not responding

StaNotRd: DP Slave not ready

CfgFault: DP Slave incorrectly parameterised

ExtDiag: DP Slave signalling extended diagnosis

NotSupp: DP Slave signalling invalid command

InvSlRes: Invalid DP Slave response

PrmFault: Last parameter telegram errored

MastLock: DP Slave parameterised by another Master

PrmReq: DP Slave not yet parameterised

StatDiag: DP Slave diagnosis present

S2_D2: Reserved

WDOn: Watchdog of DP Slave activated

FreezeMd: Freeze command active

SyncMd: Sync command active

S2_D6: Reserved

Deactivated: DP Slave not planned

S3_D0: Reserved

S3_D1: Reserved

S3_D2: Reserved
S3_D3: Reserved
S3_D4: Reserved
S3_D5: Reserved
S3_D6: Reserved
ExtDiag0: Data area overflow extended diagnosis
MastAdd: Address of the parameterising DP Master
IdentNr: Identification number of the DP Slave

12.2 Functions

The following functions are available:

- Bus communication start: DP_START
- Bus communication stop: DP_STOP
- Status information on Profibus process data exchange: DP_EXCHG

Bus communication start DP_START

This function switches the Profibus to OPERATE mode and starts communication between the Master and the Slaves.

Note: The FIOCon field bus IO configurator allows the start-up behaviour of the Profibus after system initialisation to be set. If "Automatic release of the communication by the device" is set, bus communication is started automatically after each PLC program download (CTRL-F9) resp. after each download of the configuration by the FIOCon. Setting "Controlled release of the communication by the application program" means that bus communication must be started explicitly with block DP_START. (See Page 9-12 DP and Page 9-14 DP for further details)

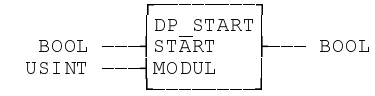
The slot number of the PC104 Profibus interface is applied to input MODUL. If the input changes to START TRUE, bus communication is started. The function result changes to TRUE if start is successful.

Error variables

If an illegal value (0 or ≥5) is applied to input MODUL, the error variables are set as follows::

ErrorFlg: TRUE
ErrorNo: 1
ErrorType: -244

If an incorrect slot number is specified or if no Profibus interface is present, the ErrorNo is set to 235; the other error variables are set as specified above.




```
START  (BOOL):    Activation of OPERATE mode
MODUL (USINT):    Module number (slot number of the Profibus PC104
                  interface)
```

Bus communication stop DP_STOP

This function switches the Profibus to STOP mode and stops communication between the Master and the Slaves.

The slot number of the PC104 Profibus interface is applied to input MODUL. If the input changes to STOP TRUE, bus communication is stopped. The function result changes to TRUE on successful execution of the function.

Error variables

If an illegal value (0 or ≥5) is applied to input MODUL, the error variables are set as follows:

ErrorFlg: TRUE

ErrorNo: 1

ErrorType: -243

If an incorrect slot number is specified or if no Profibus interface is present, the ErrorNo is set to 235; the other error variables are set as specified above.


```
STOP  (BOOL):     Activate STOP mode
MODUL (USINT):    Module number (slot number of the Profibus PC104
                  interface)
```

Status information on process data exchange DP_EXCHG

This function supplies the status information on Profibus process data exchange. If data exchange is active, the function result is TRUE.

Error variables

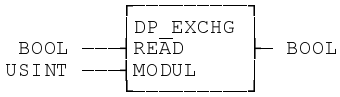
If an illegal value (0 or ≥5) is applied to input MODUL, the error variables are set as follows:

ErrorFlg: TRUE

ErrorNo: 1

ErrorType: -245

If an incorrect slot number is specified or if no Profibus interface is present, the ErrorNo is set to 235; the other error variables are set as specified above.




```
READ   (BOOL):    Read status
MODUL (USINT):    Module number (slot number of the Profibus PC104
                  interface)
```

12.3 Function blocks

The following function blocks are available:

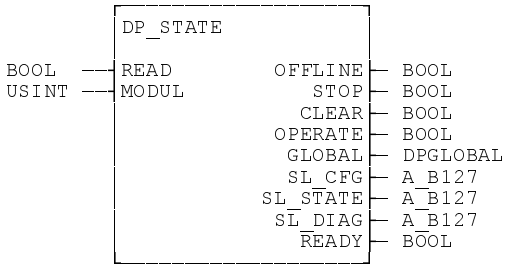
- Status information of the Profibus Master: DP_STATE
- Single diagnosis of a Profibus Slave: DP_SLDIAG

Status information of the Profibus Master DP_STATE

This function block supplies the status information of the Profibus DP Master if the Boolean input READ is set to TRUE. Moreover, the slot number of the PC104 Profibus interface must be specified at input MODUL.

The outputs contain the following information:

OFFLINE:	The Profibus is in OFFLINE operating state
STOP:	The Profibus is in STOP operating state
CLEAR:	The Profibus is in CLEAR operating state
OPERATE:	The Profibus is in OPERATE operating state
GLOBAL:	Global status information of the Profibus
SL_CFG:	List of Slaves configured
SL_STATE:	List of active Slaves
SL_DIAG:	List of the Slaves with pending diagnosis (the entries are cleared when Slave single diagnosis is polled; see 11.3: Single diagnosis of a Profibus slave DP_SLDIAG)
READY:	Function block is being processed




```
READ (BOOL):          Read status
MODUL (USINT):        PC104 slot number of the Profibus interface
OFFLINE (BOOL):       OFFLINE operating state
STOP (BOOL):          STOP operating state
CLEAR (BOOL):         CLEAR operating state
OPERATE (BOOL):       OPERATE operating state
GLOBAL (DPGLOBAL):    Global status bits
SL_CFG (A_B127):      Table of configured Slaves
SL_STATE (A_B127):    Table of active Slaves
SL_DIAG (A_B127):     Table of Slaves with diagnosis
READY (BOOL):         Function block is being processed
```

Error variables

If an illegal value (0 or ≥5) is applied to input MODUL, the error variables are set as follows:

ErrorFlg:	TRUE
ErrorNo:	1
ErrorType:	-242

If an incorrect slot number is specified or if no Profibus interface is present, the ErrorNo is set to 235; the other error variables are set as specified above.

Single diagnosis of a Profibus Slave DP_SLDIAG

The diagnostic information of a DP Slave consists of standard diagnostic information and (if present) user-specified diagnostic information. This

function block supplies the standard diagnosis of the Slave addressed via input SLV_ADR at output DIAG. The user-specific diagnostic information is provided at output EX_DIAG, whereby the length (in bytes) of this information is specified at output EX_LEN.

Note: In order not to unnecessarily load the bus, diagnosis should be requested only if the function block DP_STATE has set the corresponding bit in the diagnosis field (see Section 12.4: Program example). This bit is reset again in the Diagnosis field when diagnosis is read.

Moreover, this function block must be implemented only in controls with DP Master configuration.

Error variables

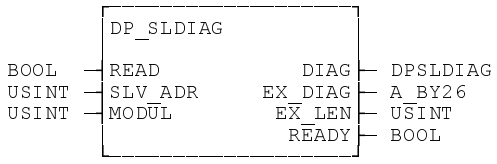
If an illegal value (0 or ≥5) is applied to input MODUL, the error variables are set as follows:

ErrorFlg: TRUE

ErrorNo: 1

ErrorType: -239

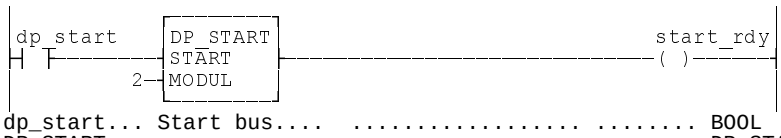
If an incorrect slot number is specified or if no Profibus interface is present, the ErrorNo is set to 235; the other error variables are set as specified above.



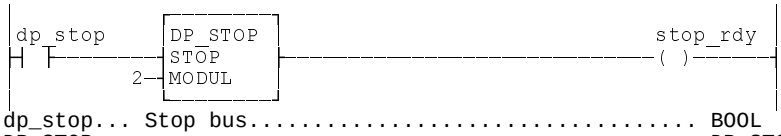

```
READ     (BOOL):     Read diagnosis
SLV_ADR (USINT):     Slave address
MODUL   (USINT):     PC104 slot number of the Profibus interface
DIAG (DPSLDIAG):     Diagnosis of the addressed Slave
EX_DIAG A_BY26):     Extended diagnostic data
EX_LEN  (USINT):     Length of the extended diagnostic data
READY    (BOOL):     Function block is being processed
```

12.4 Program example

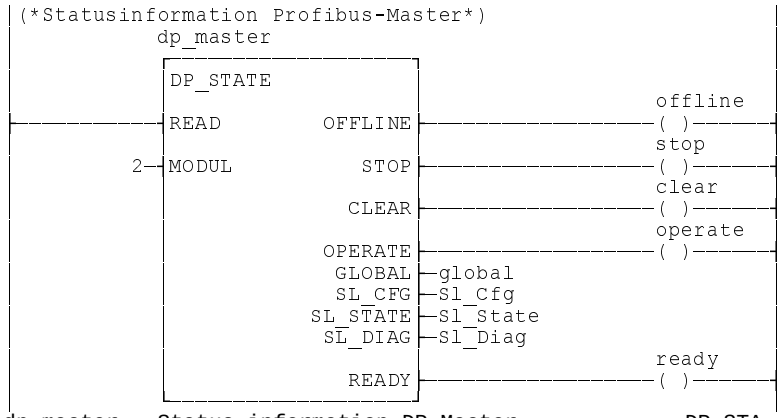
In this program example, the single diagnosis of the Slave is read with address 15. The PC104 Profibus interface is located at slot 2. The bus can be started via variable dp_start and can be stopped again via variable dp_stop. If the Master detects a diagnosis of the Slave, bit Sl_Diag[15] is set. The status bits of diagnosis set in field diag15 can then be read via variable read_diag. Bit SL_Diag[15] is reset again when the diagnosis is read.



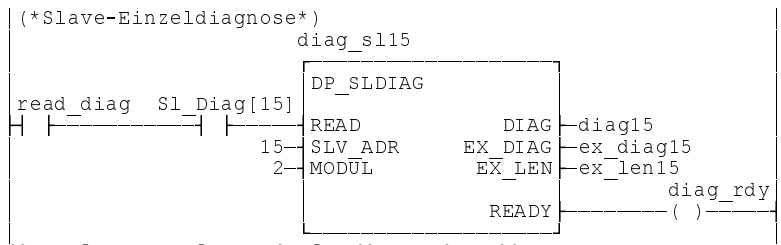

```
dp_start... Start bus....  ................. ........ BOOL
DP_START... ................................ ........ DP_START
start_rdy.. Bus started..................... ........ BOOL
2.......... PC104 slot number of the Profibus DP....... USINT
```




```
dp_stop... Stop bus.................................... BOOL
DP_STOP... ............................................ DP_STOP
stop_rdy.. Bus stopped ................................ BOOL
2......... PC104 slot number of the Profibus DP....... USINT
```




```
dp_master.. Status information DP Master............ DP_STA
offline.... OFFLINE operating state................. BOOL
2.......... PC104 slot number of the Profibus DP.... USINT
stop....... STOP operating state.................... BOOL
clear...... CLEAR operating state................... BOOL
operate.... OPERATE operating state................. BOOL
global..... Global status bits...................... DPGLOB
Sl_Cfg..... List of configured Slaves............... A_B127
Sl_State... List of active Slaves................... A_B127
Sl_Diag.... List of Slaves with diagnosis........... A_B127
ready...... ........................................ BOOL
```




```
diag_sl15.... Slave single diagnosis address 15....... DP_SLDIAG
read_diag.... Read diagnosis.......................... BOOL
Sl_Diag[15].. Diagnosis has been detected on Slave 15. BOOL
diag15....... Status bits of diagnosis................ DPSLDIAG
15........... Address of the Slave to be diagnosed.... ANY_IN
ex_diag15.... Extended diagnostic data address 15..... A_BY26
2............ PC104 slot number of the Profibus DP.... USINT
ex_len15..... Length of the extended diagnostic data.. USINT
diag_rdy..... Diagnosis has been read................. BOOL
```

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