



## Application Note

### **HFB Driver V 8.00**

connecting to a

**S7 PLC**

via

**Profibus FMS**

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Draft

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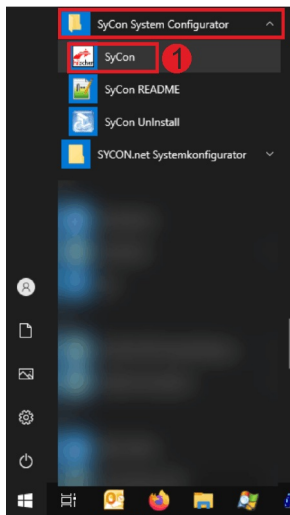
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## 1 Configuration of the CIF50-PB interface

When you receive a CIF50-PB card, this card is blank. That means it has no specific configuration but only the Profibus firmware is loaded. For the configuration of the project-specific settings like bus parameters, connections and FMS objects, the so-called SyCon software is required. SyCon requires a license from the company Hilscher. It is a customer related license, so it can be used on multiple systems of the license owner.

**Note:** In a second step the HFB OPC Server has to be configured with the so-called HFB Power Tool. Since the CIF50-PB card resp. the CIF device driver is not able to communicate with two programs at the same time, you have to make sure, that only one of the two programs (SyCon or HFB Power Tool) is active (at the same time). Otherwise especially the Online functions of the SyCon (Download, Live List, FMS Monitor etc.) and the HFB Power Tool will not work properly and can lead to a undetermined system state.

### 1.1 Starting SYCON



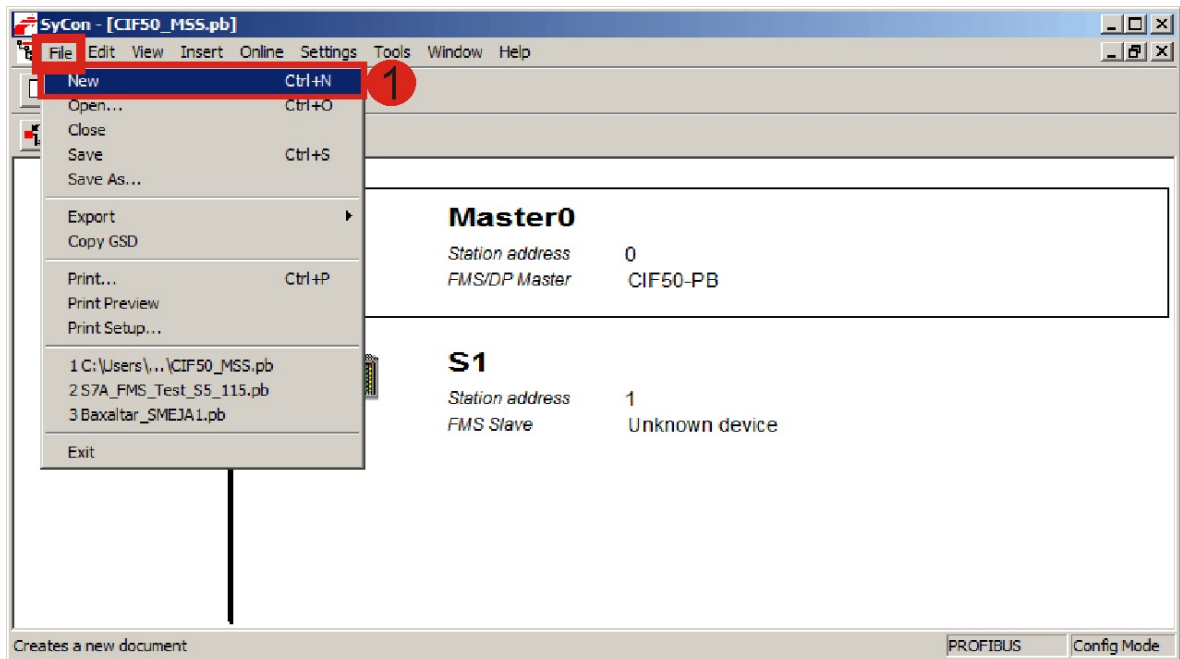
Picture 1: Start of SYCON via Windows Start Menu

1

***Start->All Programs->SyCon System Configuration->SyCon***



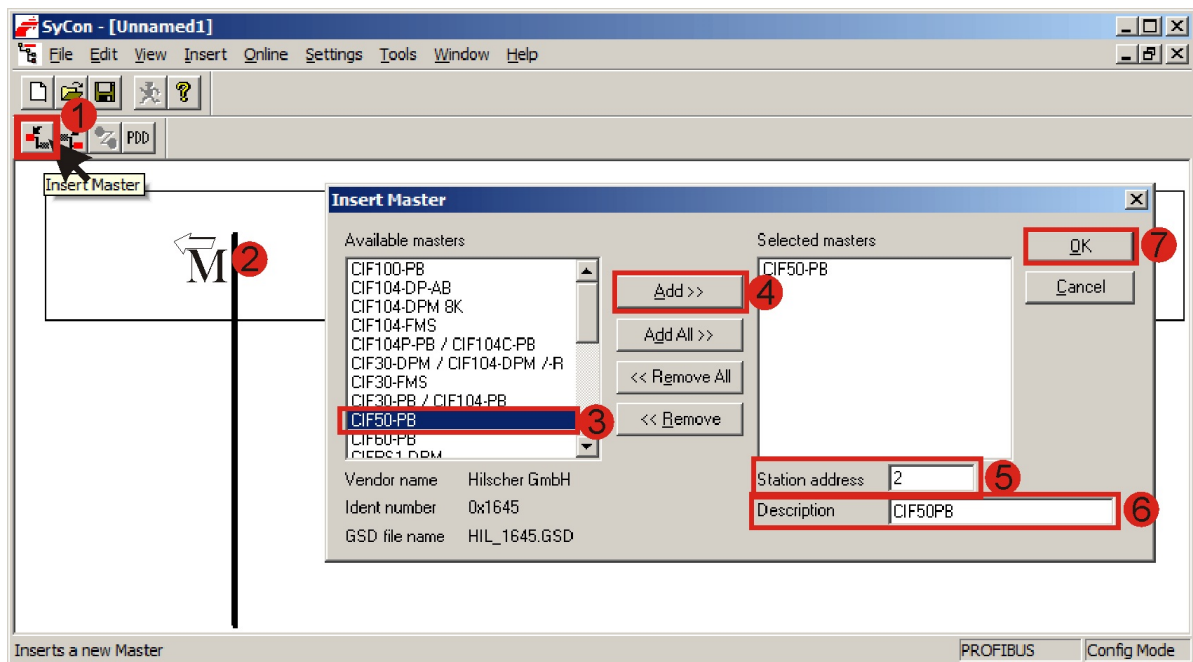
## 1.2 Create a new configuration



Picture 2: SYCON: Create new configuration

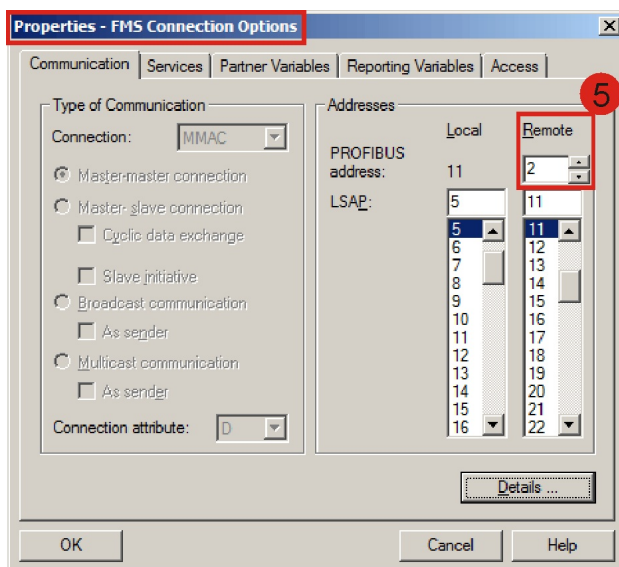
- 1 Select **File->New** from the Sycon application menu to create a new (blank) configuration.

### 1.3 Add a CIF50-PB as Profibus Master device to the new configuration

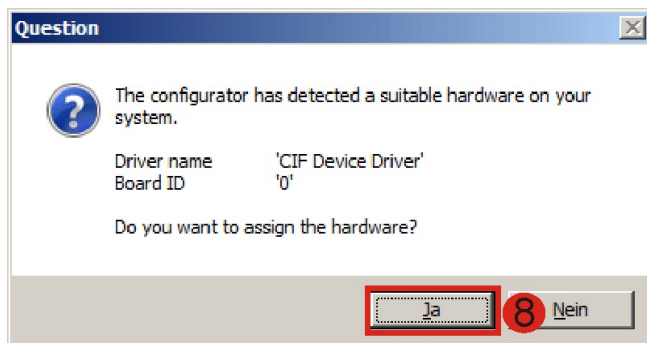


Picture 3: Insert a Master Device.

- 1 Klik the **Insert Master** Button.
- 2 Move the special M-Cursor to the top row of the configuration window and click left mouse button. The selection dialog with a list of the available master devices occurs.
- 3 Select CIF50-PB from the list of Available masters and...
- 4 ... click the Add button to move it to the Selected master list.
- 5 Set the Profibus station address for the CIF50-PB master. This address must be the same as specified in the field **Remote PROFIBUS address** of the communication reference in the Step7 NetPro software! See the following screen shot for an example:



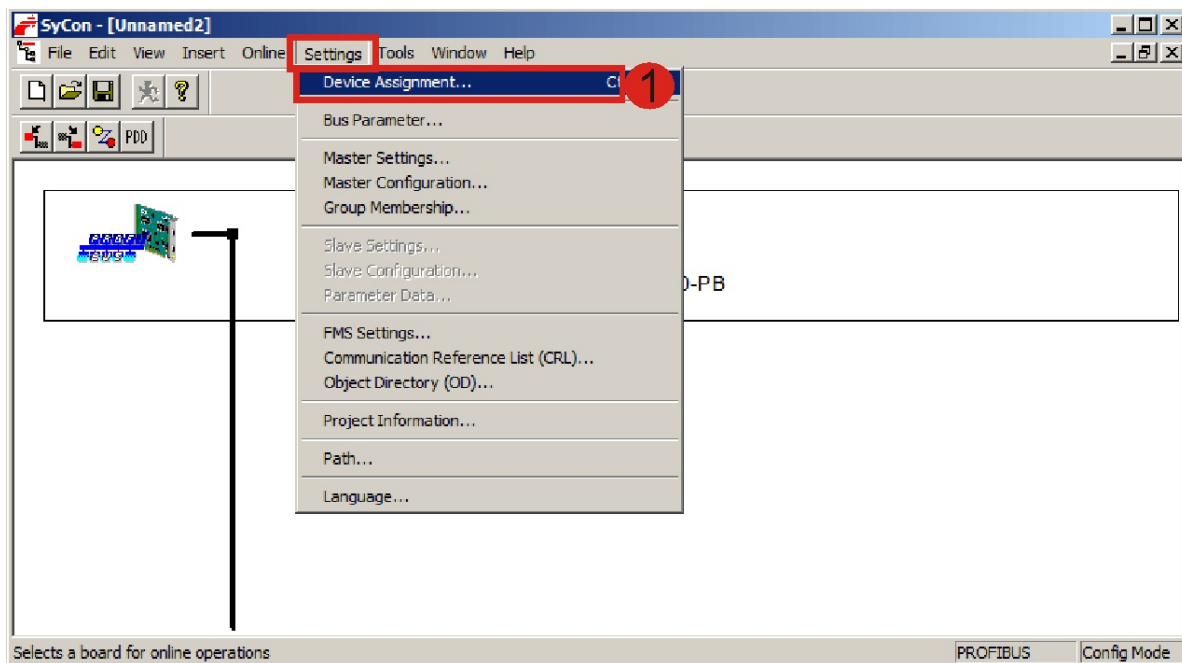
- 6 Give the Master CIF card a meaningful name. Note: Special characters like '-' (minus), '\_' (underline) or ' ' (space) are not allowed in the description text!
- 7 Click OK button to close the dialog and to add the CIF50-PB device to the configuration window.



Picture 4: Device Assignment Question Dialog Box.

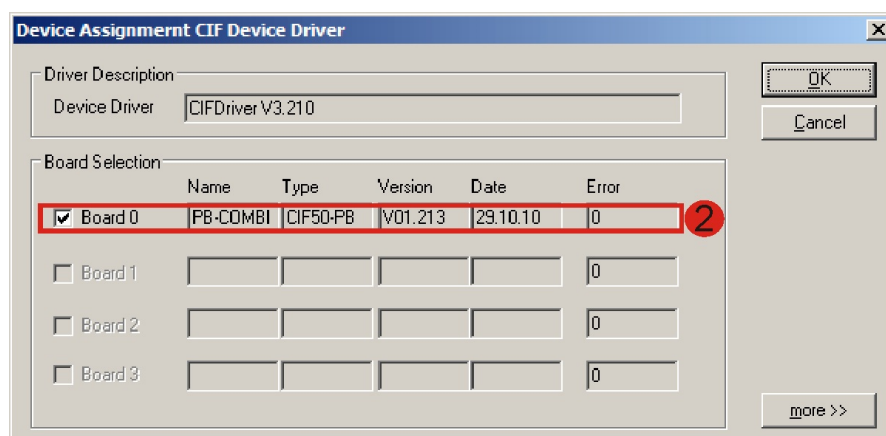
- 8 If a CIF50-PB card is installed in the system and this card isn't assigned to another (opened) SyCon configuration, this Question Dialog Box occurs. Click the **Yes** button to assign the CIF50-PB card to the Master device of your new configuration.

## 1.4 Check the Device Driver and Board assignment



Picture 5: Opening the Device Assignment dialog.

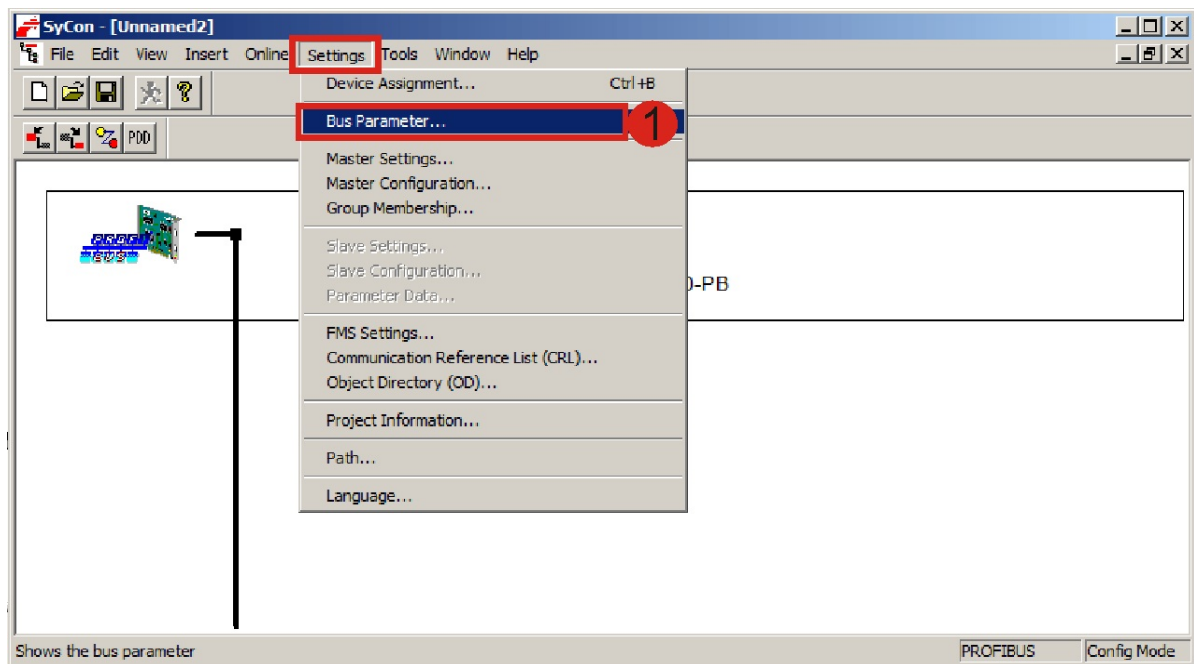
- 1 You can verify the current board assignment by selecting the menu item **Settings->Device Assignment...** from the Sycon application menu.



Picture 6: Device driver info and Board Selection dialog.

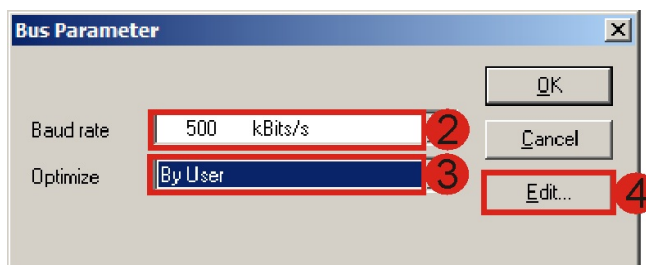
- 2 When the CIF50-PB board and the device driver software are installed correctly, the board should be displayed as Board 0 and should be assigned to the new configuration.

## 1.5 Set the Profibus Bus Parameters



Picture 7: Opening the Bus Parameter Dialog.

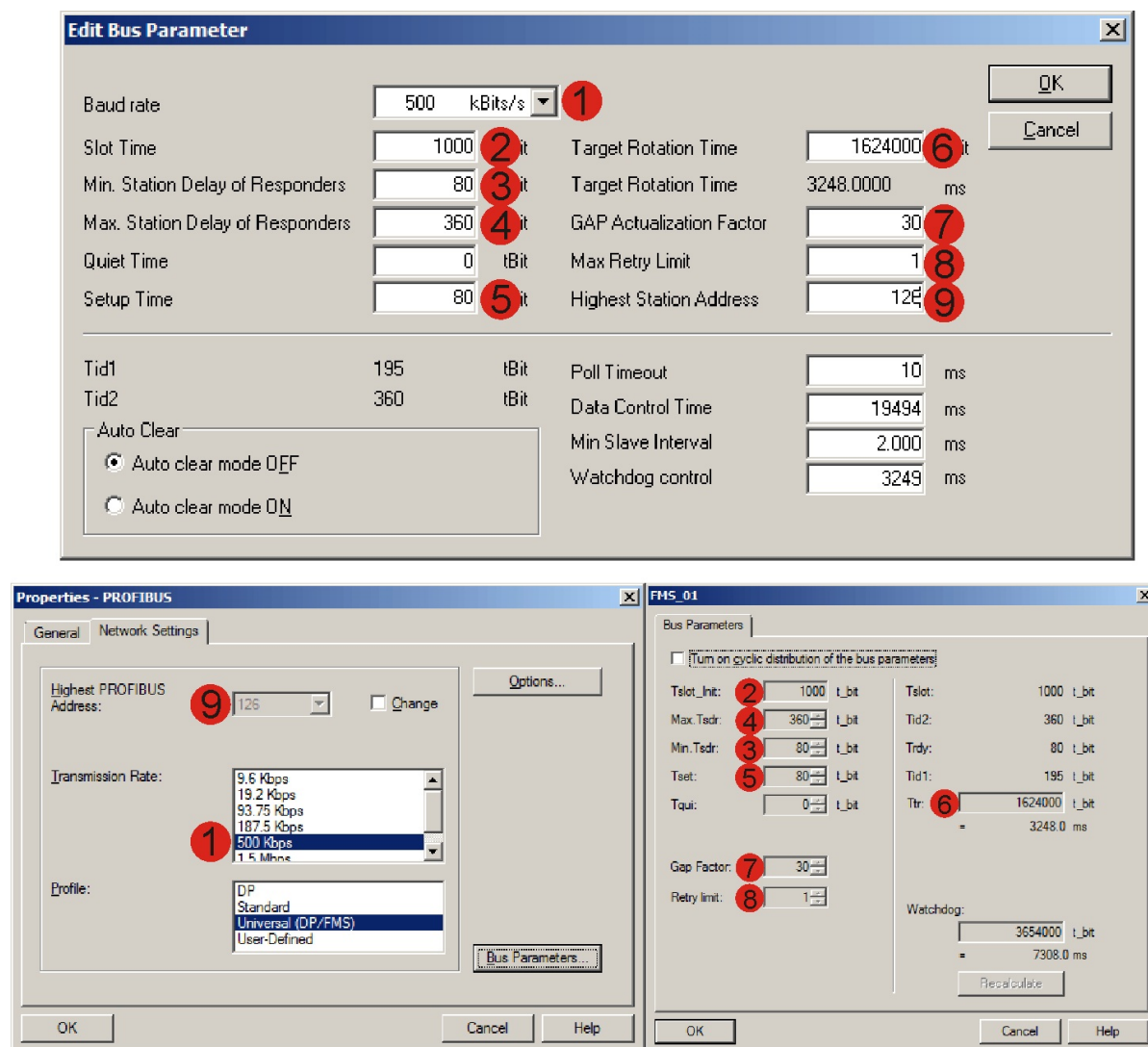
- 1 Select **Settings->Bus Parameters...** to open the **Bus Parameter** dialog.



Picture 8: Bus Parameter Base Dialog.

- 2 Select the proper baud rate in the **Baud rate** drop down list.
- 3 To be able to set individual Profibus bus parameters, you have to select **By User** in the **Optimize** drop down list. This selection enables the **Edit...** button.
- 4 Click the **Edit...** button to open the Profibus parameters dialog.

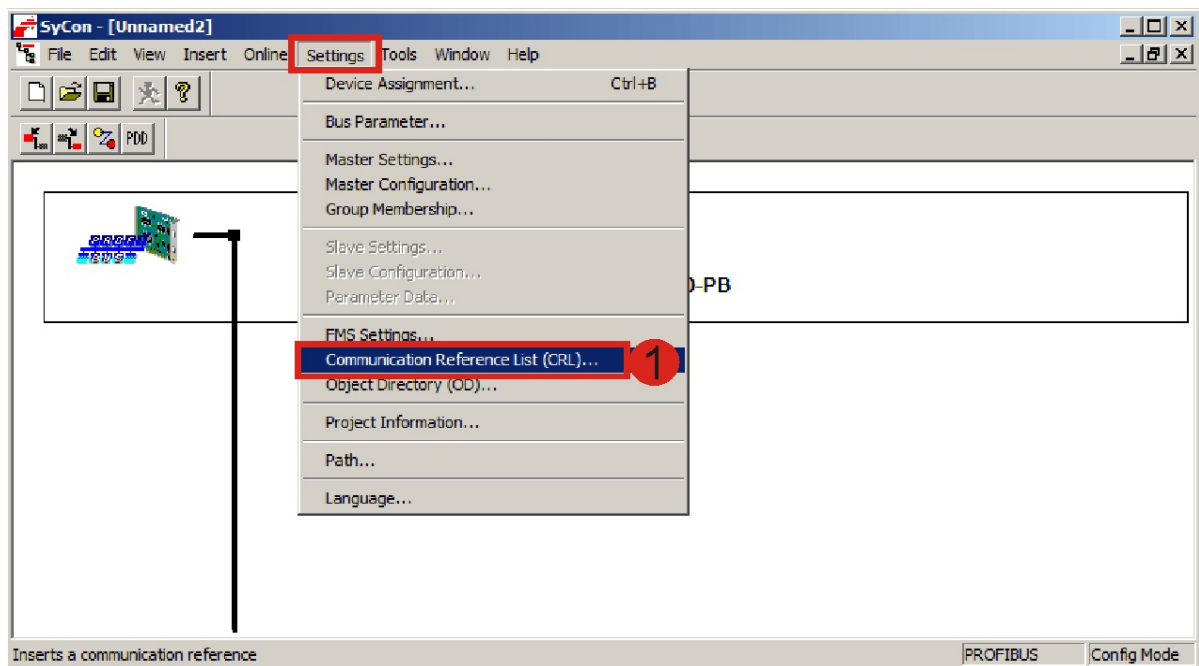
The following screen shots show the relation of the bus parameters between the CP343-5 Bus Parameter Dialog in Step7 and the SyCon Bus Parameter Dialog.



Picture 9: Relation between SyCon Bus Parameters and CP343-5 Bus parameters.

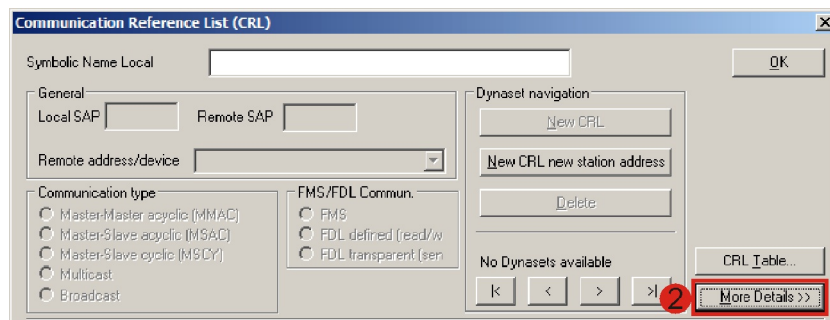
Make sure, that all parameters in the SyCon dialog are set to the same value as in the CP343-5 Bus Parameter dialog.

## 1.6 Create a Communication Reference



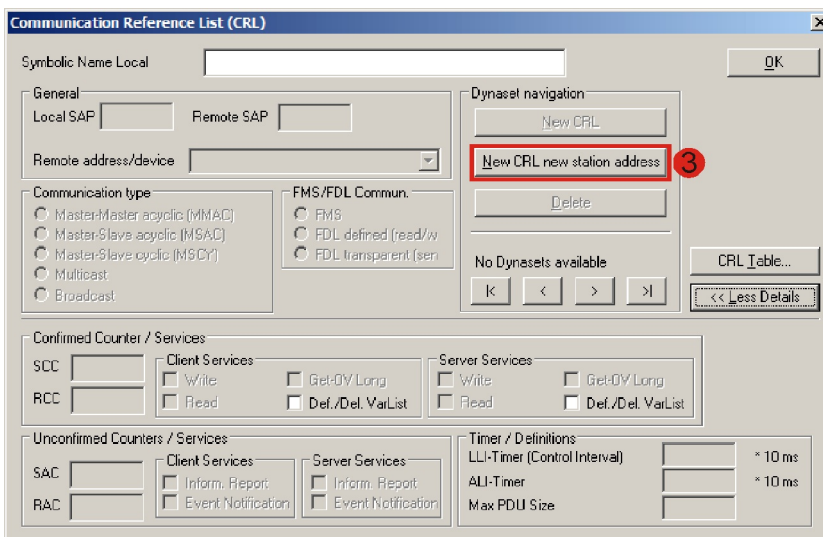
Picture 10: Opening the Communication Reference List dialog.

- 1 Select **Settings->Communication Reference List(CRL)....** to open the CRL dialog.



Picture 11: Expanding the Communication Reference List dialog.

- 2 Click the **More Details >>** button to expand the CRL dialog.

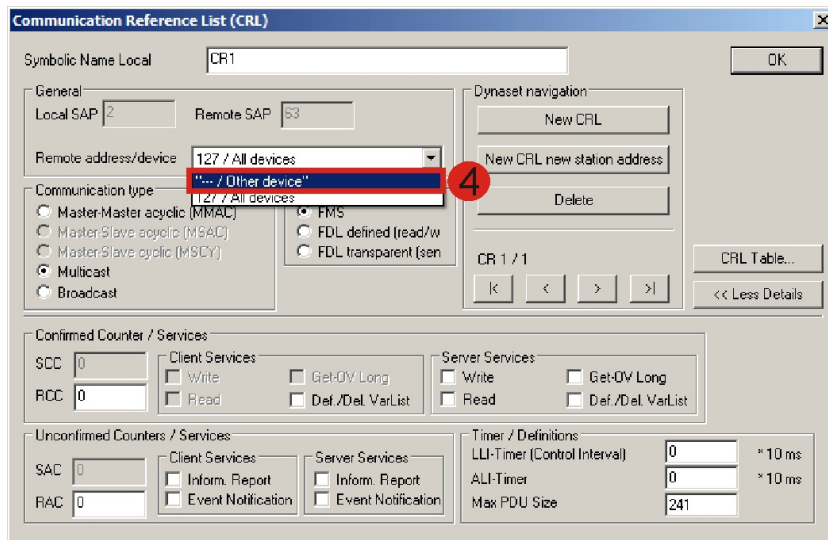


Picture 12: Creating a new communication reference and station.

- 3 To add a new Profibus device (e.g. a S5 PLC with CP5431), click the **New CRL new station**

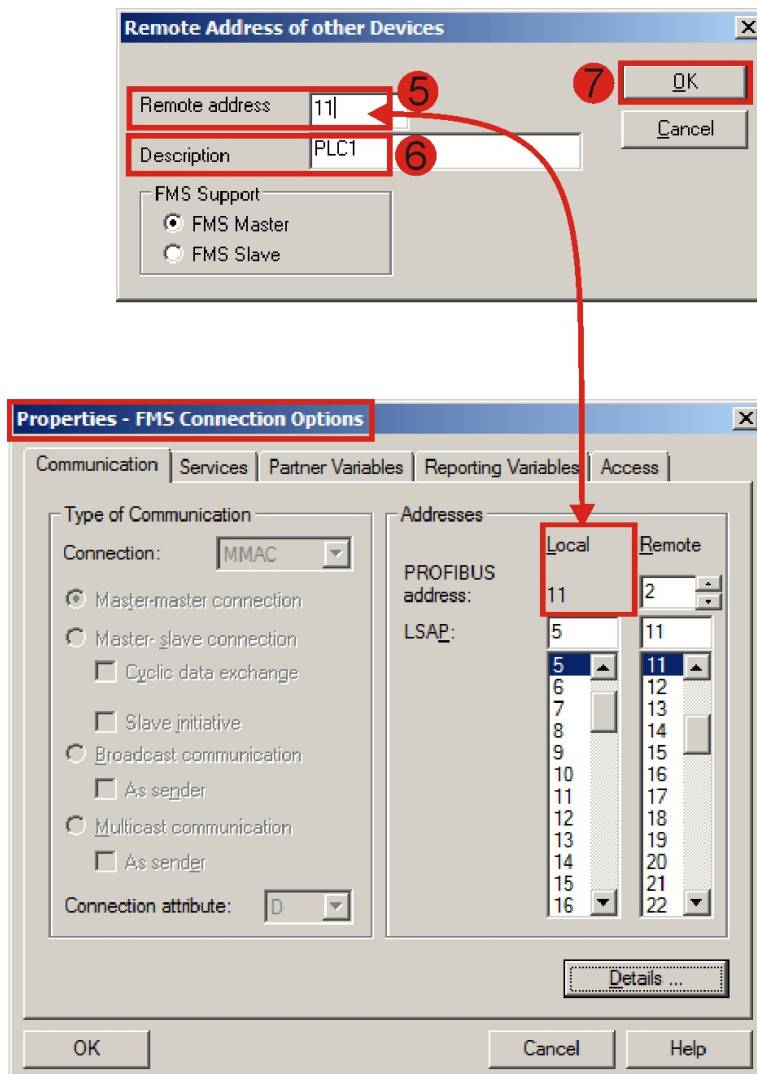


**address** button. The new device will automatically be added to the configuration window after the new communication reference is completely defined.



Picture 13: Comm. Ref. Device selection.

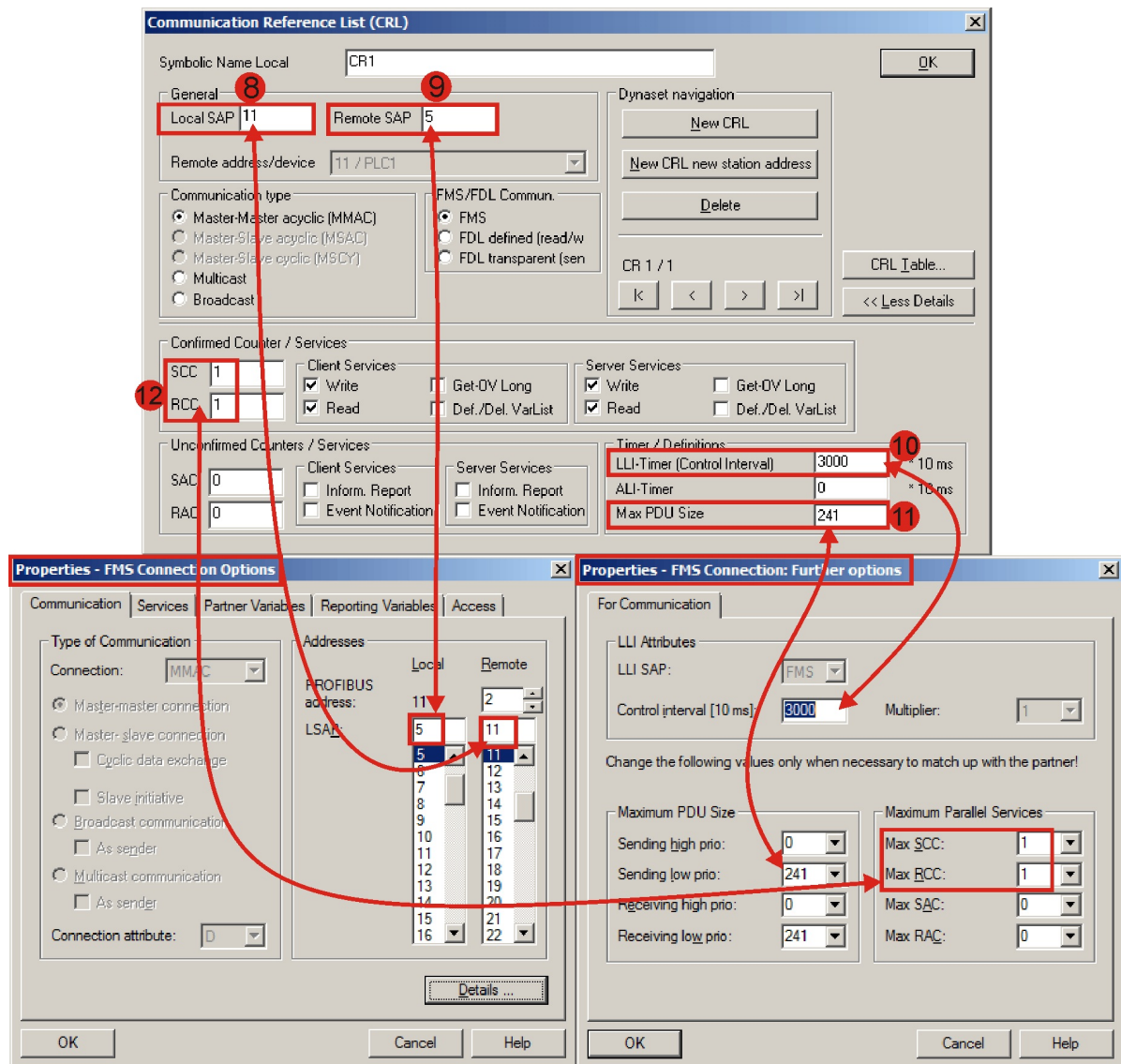
- 4 Select “--- / Other device” from the **Remote address/device** list.



Picture 14: Comm. Ref.: Remote address of new device.



- 5 Enter the Profibus station address of the new remote device. This address must correspond to the **Local PROFIBUS address** in the NetPro FMS Connection Options settings.
- 6 Enter a meaningful name for the new PLC device.
- 7 Click the OK button to close the dialog.



Picture 15: Relation of SAPs, LLI Timer and Max. PDU between NetPro FMS Connection Options and SyCon.

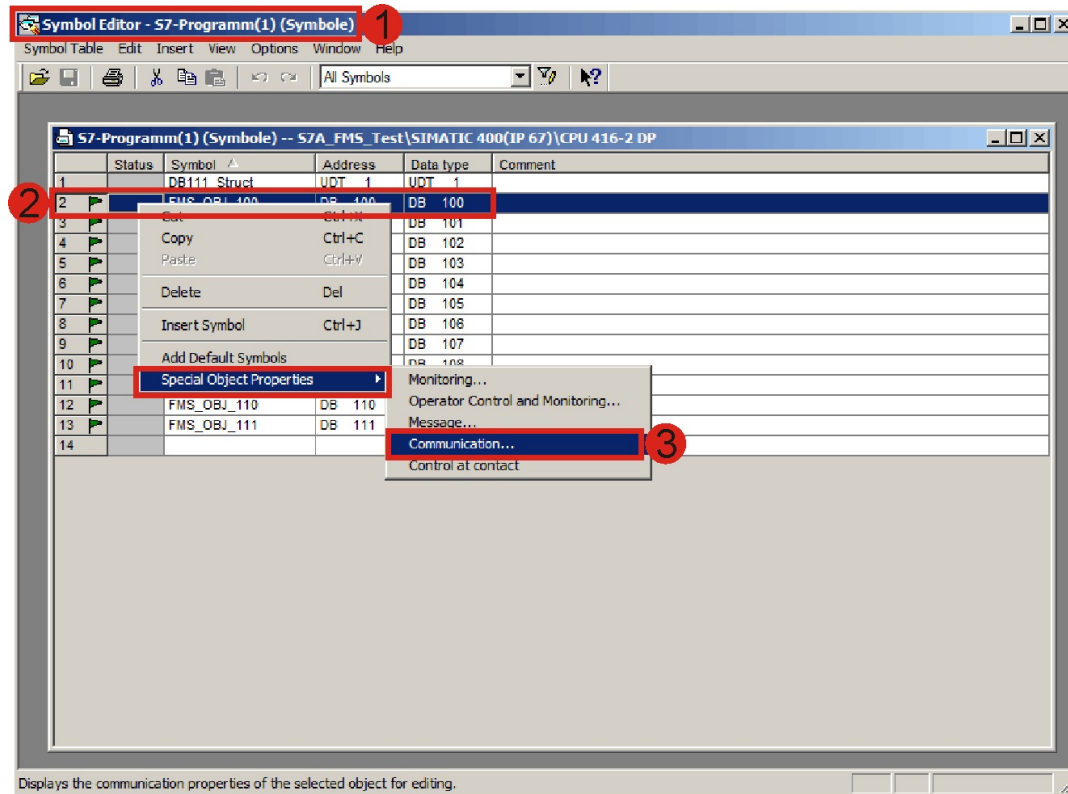
- 8 Enter the **Local SAP** value which corresponds to the **Remote LSAP** value in the NetPro.
- 9 Enter the **Remote SAP** value which corresponds to the **Local LSAP** value in the NetPro.
- 10 Enter the **LLI-Timer** value which corresponds to the **Monitoring interval** value in the NetPro.
- 11 Verify and if unequal enter the **Max. PDU Size** value which corresponds to the **Max. PDU length** value in the NetPro.

- 12 Enter the **SCC** and **RCC** values according to the **Max. SCC** and **Max. RCC** values in the NetPro.
- 13 Click the **OK** button to terminate the configuration of the communication reference.

## 1.7 Create an Object for test purposes

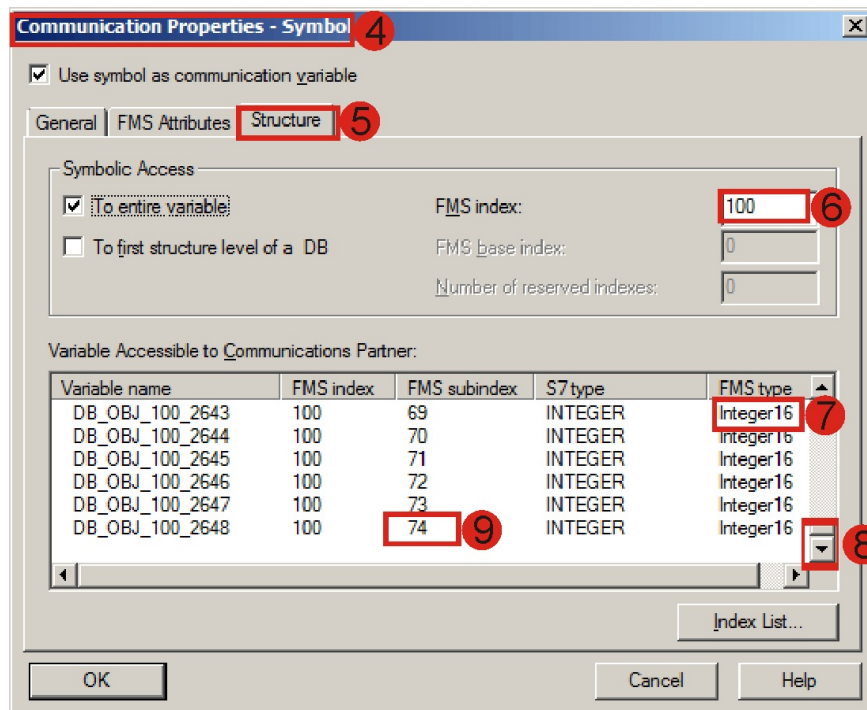
Basically it is not necessary to configure all of the FMS data objects which are configured in the remote stations (PLCs) but to test the communication between SyCon and the remote PLC it is necessary to configure at least one FMS object.

### 1.7.1 Pick one object from the list of configured objects in the PLC



Picture 16: Select a FMS Object in Step7 Symbol Editor

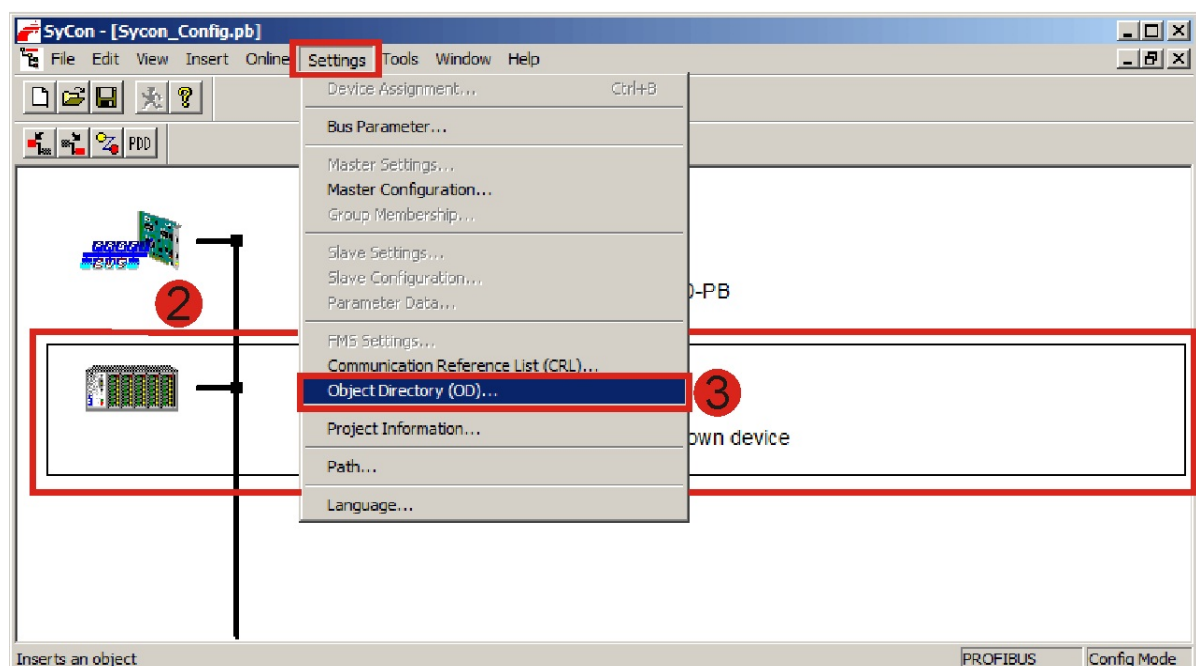
- ① Open the Step7 Symbol Editor.
- ② Select a symbol of a FMS object. Symbols of a FMS objects are marked with a green flag icon.
- ③ Open the context menu and select sub menu item **Special Object Properties->Communication**.



Picture 17: FMS Object definition in Step7 Symbol Editor

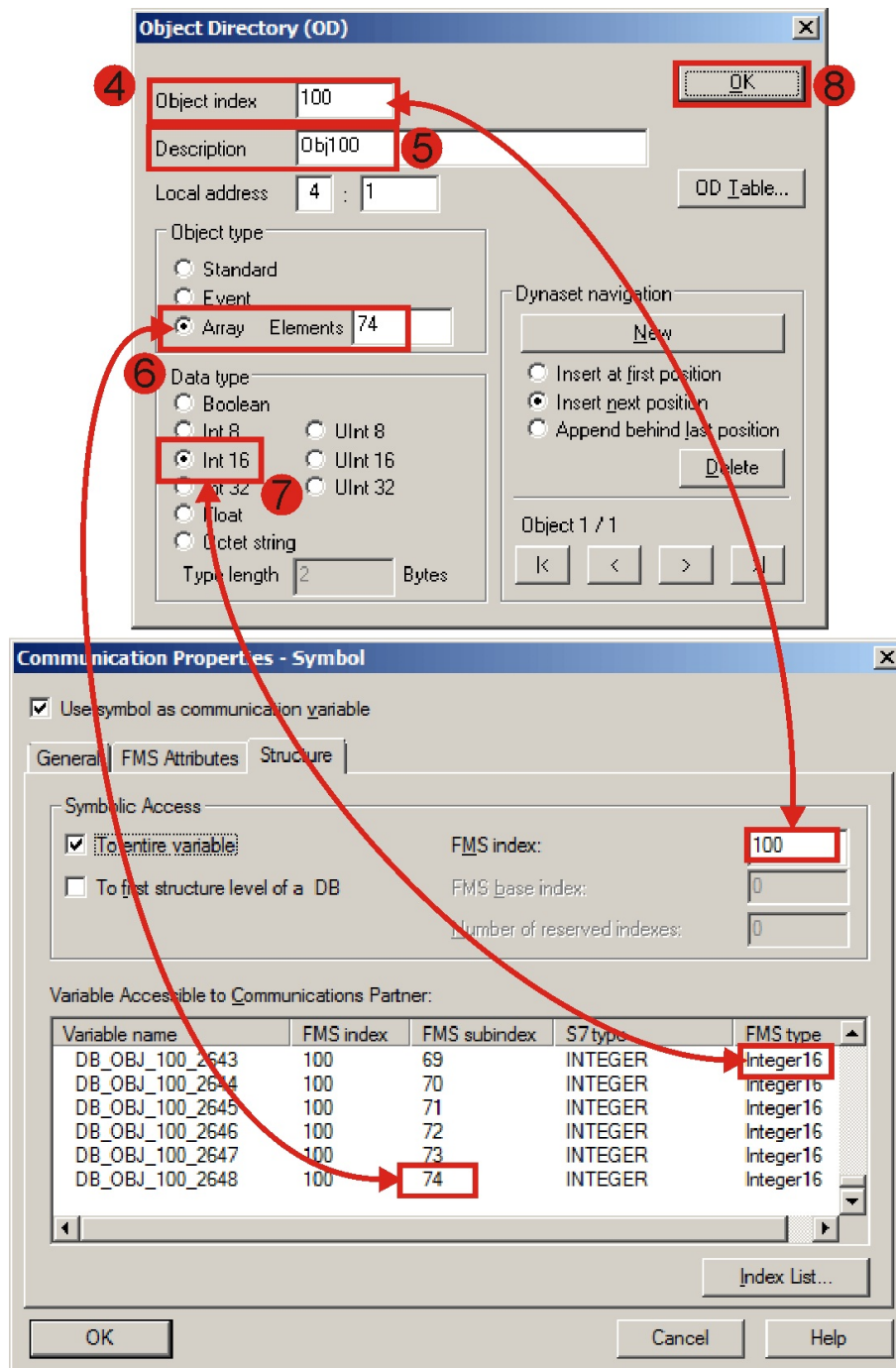
- 4 The Communication properties dialog shows all information about the FMS object.
- 5 Select the **Structure** tab. The field FMS index 6 shows the FMS object index, the column FMS type 7 shows the data type of the FMS object.
- 8 Scroll down to the bottom of the list to find out the size (highest sub index) of the FMS object.

### 1.7.2 Configure the FMS object in SyCon



Picture 18: Opening FMS Object Directory dialog in SYCON.

- 2 Before you open the Object Directory dialog you must select the remote station (PLC), because the FMS object are logically owned by the remote stations but not by the CIF50 card. So all object have to be configured in the context of its owner which is the PLC.
- 3 Select **Settings->Object Directory(OD)....** to open the object directory dialog.

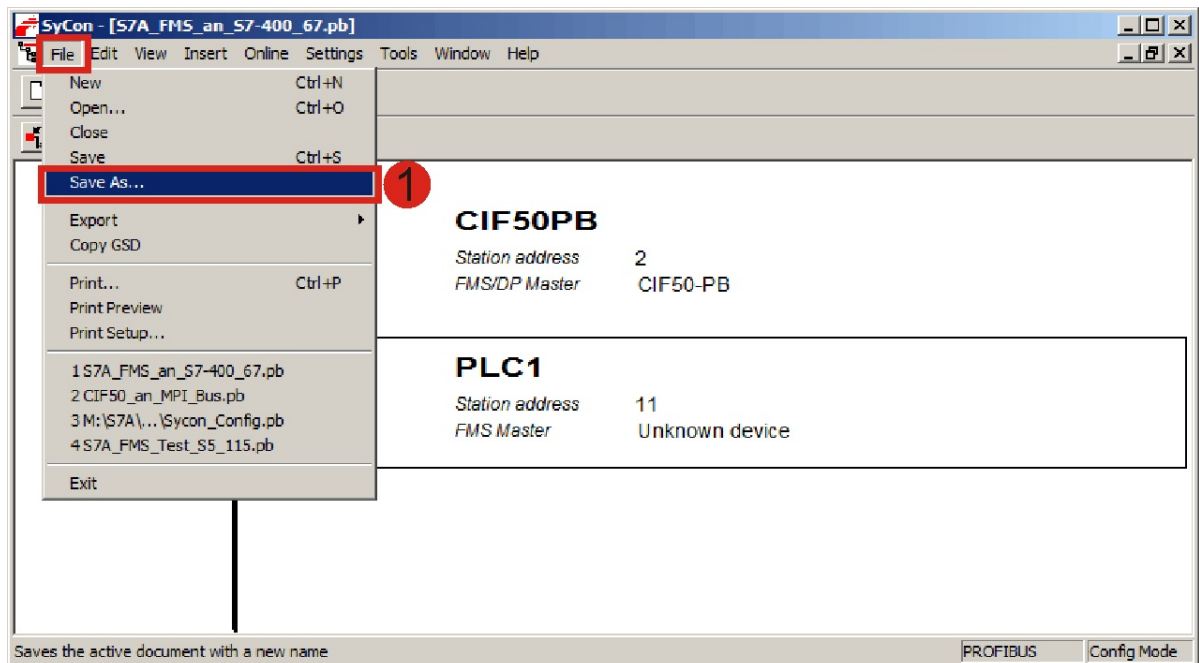


Picture 19: Relation of FMS Object parameters between SyCon and Step7 FMS Symbol.

- 4 Enter the **Object index** which corresponds to the **FMS Index** value of the object in the Step7 Symbol Editor Communication Properties dialog.
- 5 Enter a meaningful name for the object.
- 6 Select **Object type Array** and enter the array's number of elements which must correspond to the **FMS subindex** value on the bottom line of the variable list in Step7 Symbol Editor Communication Properties dialog.

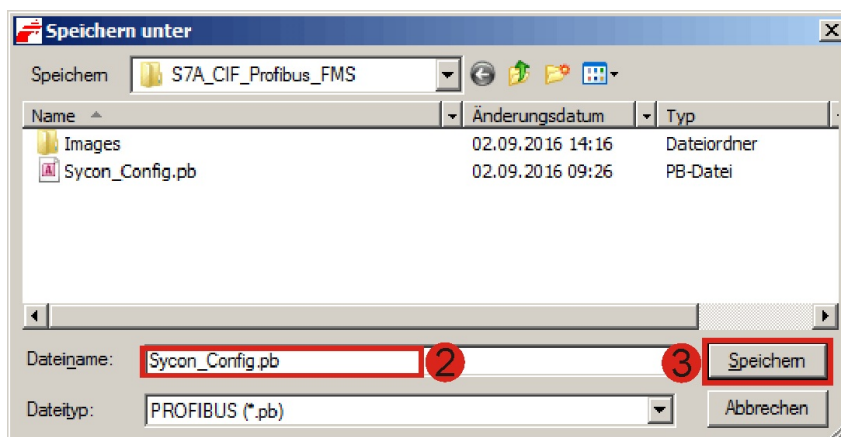
- 7 Set the data type, corresponding to the value in the **FMS type** column of the object variable list in Step7 Symbol Editor Communication Properties dialog.
- 8 Click the **OK** button to terminate the configuration of the object.

## 1.8 Save the configuration



Picture 20: Saving the configuration.

- 1 Select **File->Save As....** to open the File Save dialog.



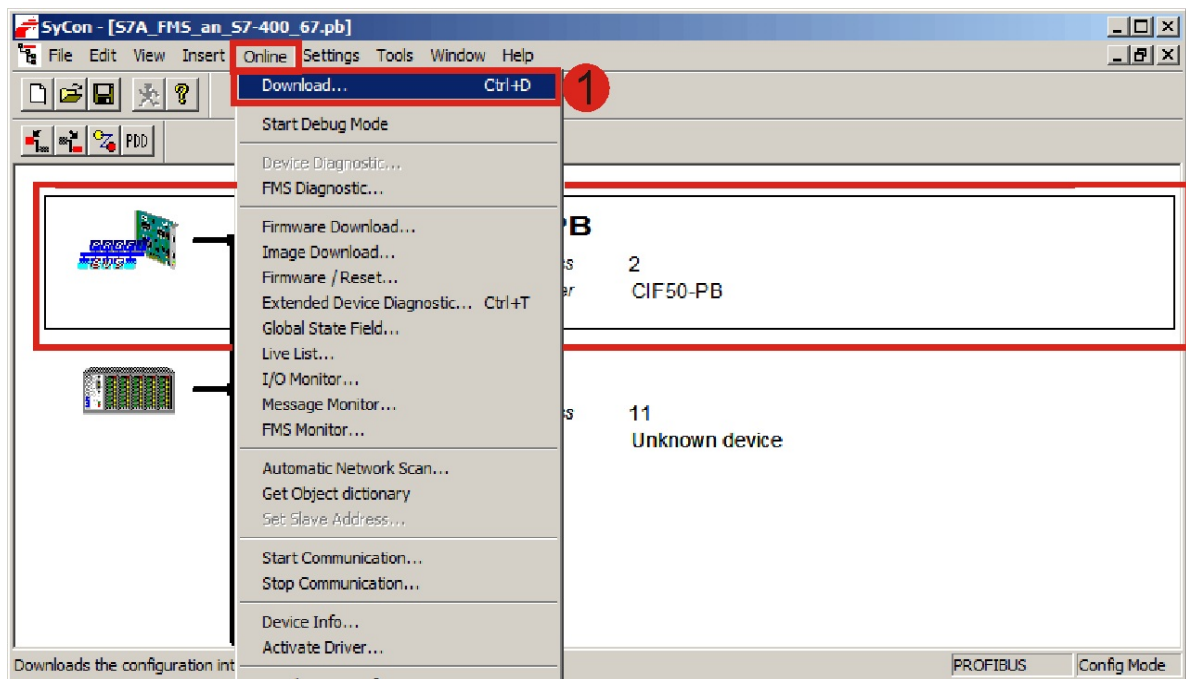
Picture 21: SyCon File save dialog.

- 2 Enter a meaningful name for the configuration file. File extension must be named to ".pb".
- 3 Click the **Save** button to store the configuration to the file.



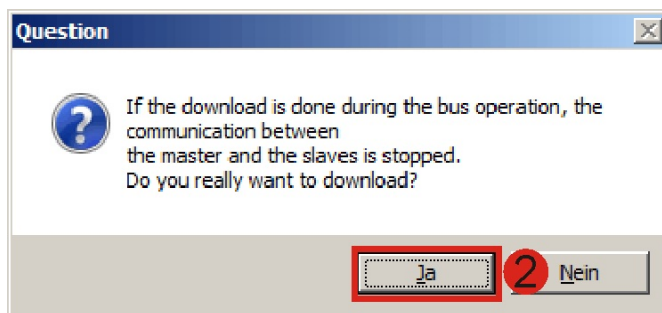
## 1.9 Download the configuration

Before the CIF50-PB card can work with the new configuration, the configuration has to be downloaded to the CIF50-PB card into a non-volatile (permanent) flash memory.



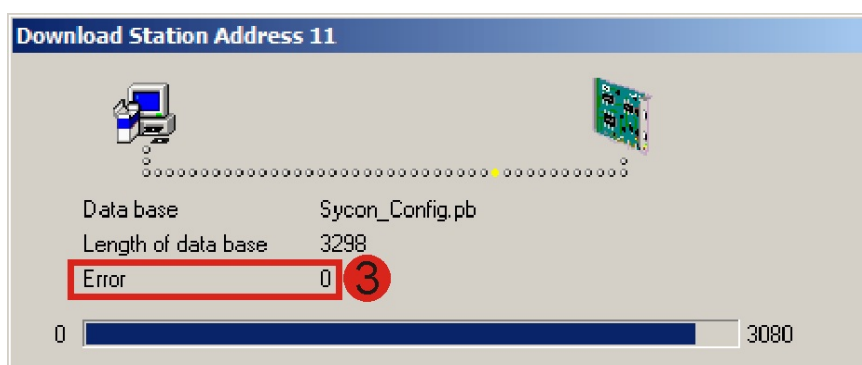
Picture 22: Downloading the configuration.

- 1 Select **Online->Download...** to open the Download dialog.



Picture 23: Download question.

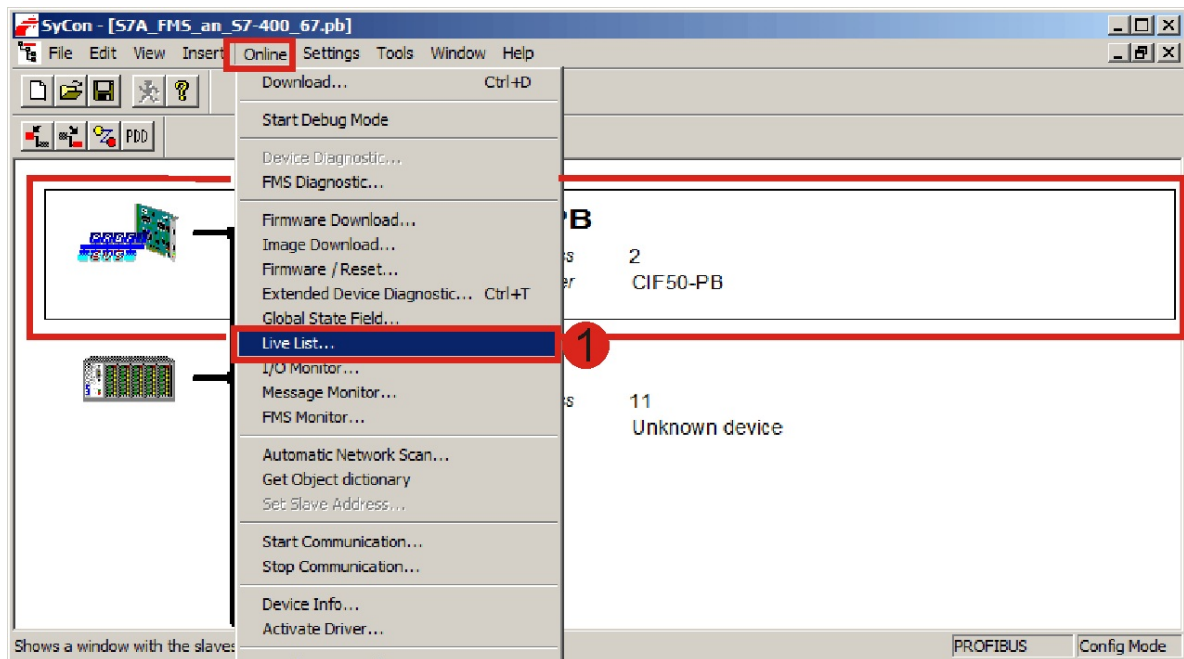
- 2 Click **Yes**.



Picture 24: Download in progress.

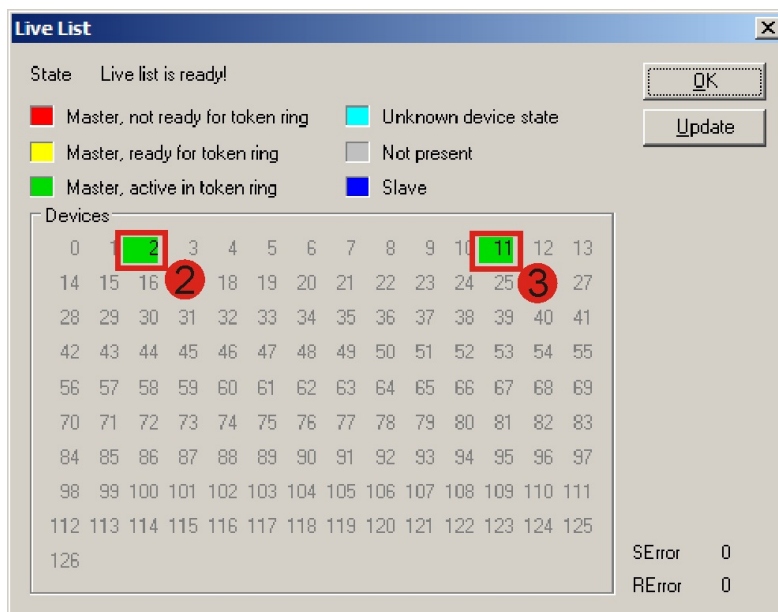
- 3 After the download is finished, the Error field should show error 0.

## 1.10 Check Live List of Profibus stations



Picture 25: Opening Live list.

1 Select **Online->Live List...** to open the Live List dialog.



Picture 26: The SyCon Live list.

Assumed that the Profibus parameters are set correctly, both devices are connected via Profibus cable and the PLC is switched on, the two configured devices 2 (2 the the PC station with the CIF50-PB card) and 11 (3 the PLC) must be displayed with green background color.

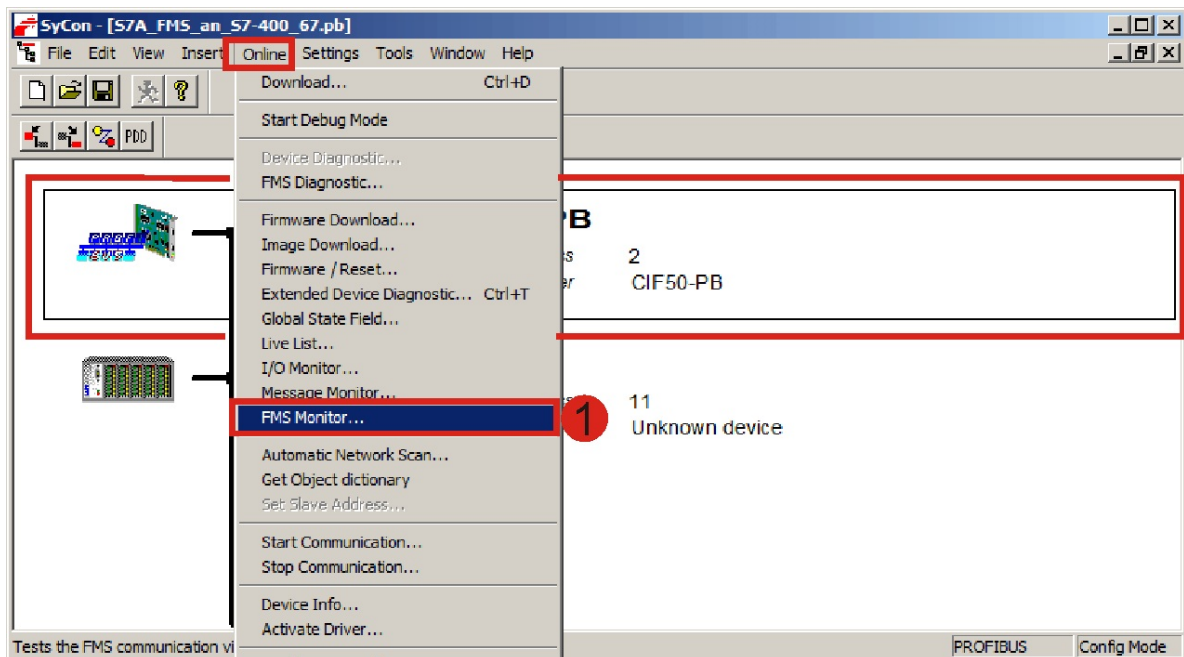
If only the PC station is marked green, you should check

1. The Profibus parameters on both sides
2. The Profibus cable (especially the termination).
3. Run/Stop state of the S7-CP343-5



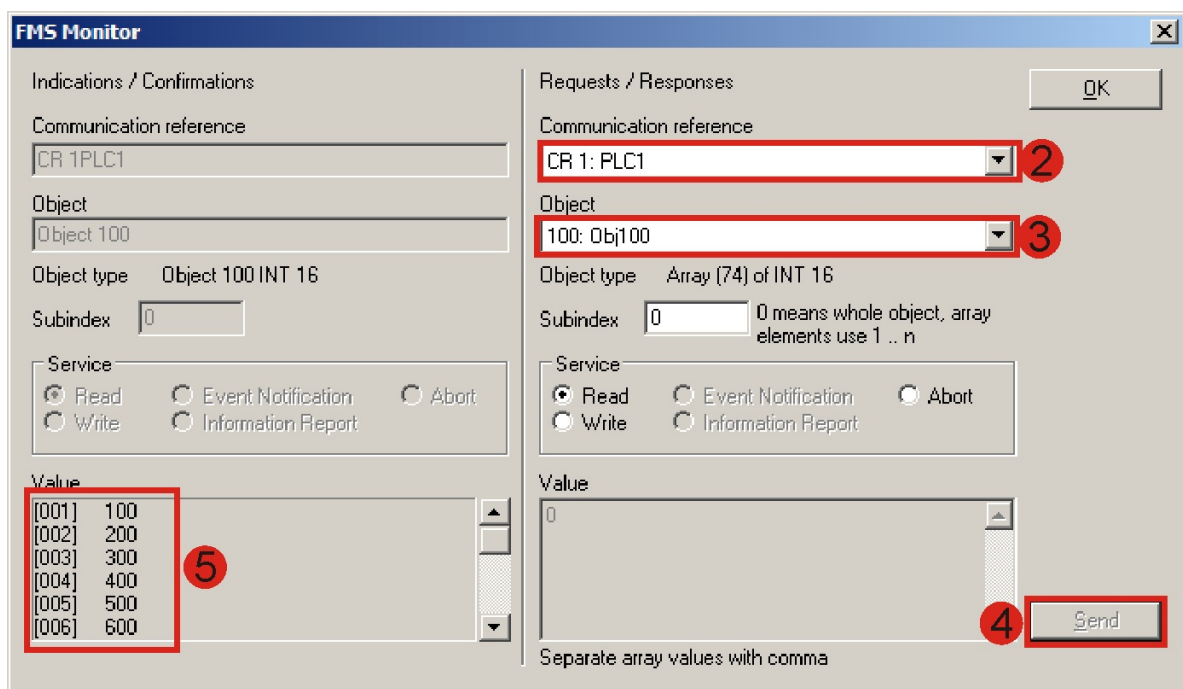
## 1.11 Check FMS connection

To verify if the FMS communication reference is configured properly you can try to read the FMS object which was previously configured in step 1.7.2.



Picture 27: Opening the FMS Monitor.

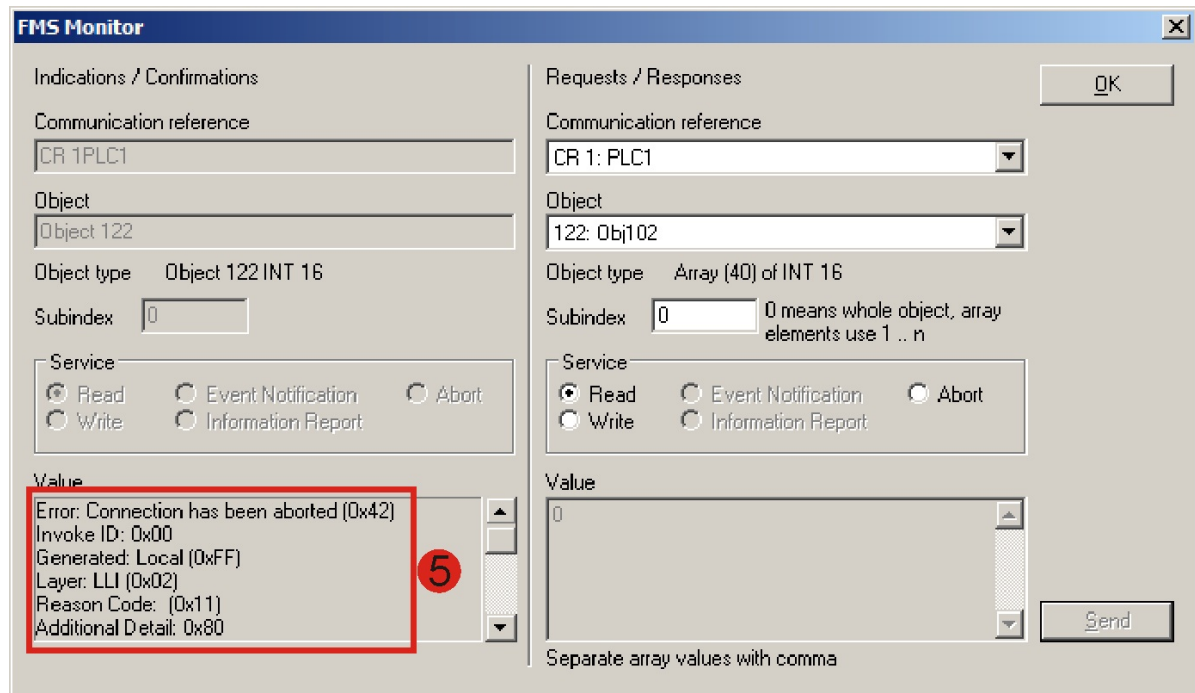
- 1 Select **Online->FMS Monitor...** to open the FMS Monitor dialog.



Picture 28: The FMS Monitor which shows object's data values.

- 2 Select the communication reference (CR) to the PLC. If only one CR is configured, this CR is already selected.
- 3 Select the FMS object you want to read from the PLC. If only one object is configured, this object is already selected.

- 4 Click the **Send** button. The CIF50-PB card then tries to open the connection via the selected communication reference. If the connection can be established, the program reads the object data from the PLC.
- 5 If the object could be read successfully, all data values of the object are listed in the Value list. If the connection could not be established or the object couldn't be read, the Value list shows detailed error information. The following screen shot shows such an error message:



Picture 29: The FMS Monitor which shows connection error.

The variety of possible errors is very high and we can't describe all these errors and reasons for it here in this manual. You can find a description of these errors in the Hilscher **Protocol interface manual for Profibus FMS** which you can download via the following link:  
[www.incosol.de/WP\\_Downloads/Hilscher\\_PIM\\_Profibus\\_FMS\\_EN.pdf](http://www.incosol.de/WP_Downloads/Hilscher_PIM_Profibus_FMS_EN.pdf)

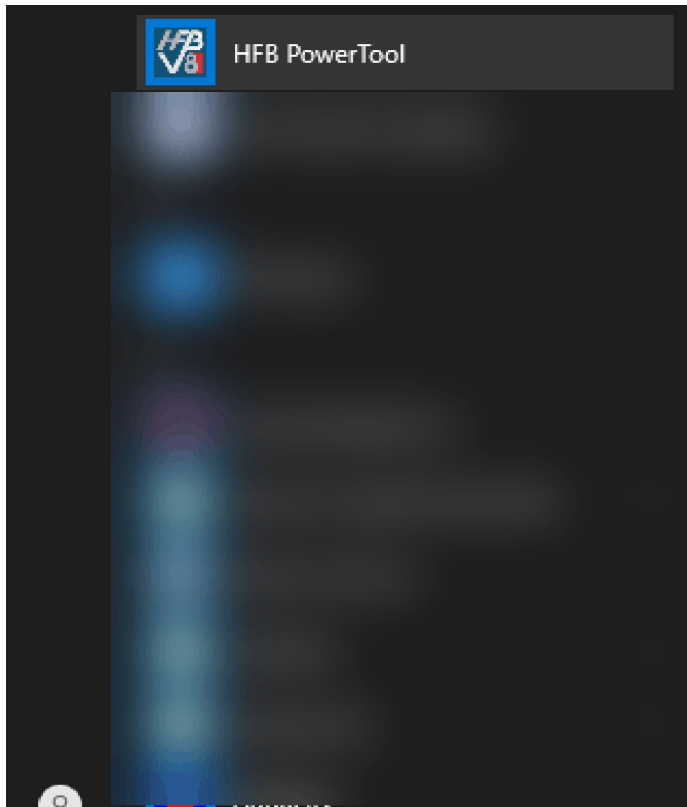
See chapter **3.2 General Error Messages** (page 14 and following) for details about errors and its reasons.

If you have successfully passed all the steps up to this point you can save the SyCon configuration, close the SyCon software and continue with the next main step, the configuration of the HFB Driver / OPC Server.

As mentioned at the beginning of the chapter, it is mandatory to close the SyCon software before the HFB software is started and vice versa. The HFB process HFBDRV.EXE may not be started together with the SYCON.EXE process. Please be aware of this circumstance!

## 2 Configuration via HFB Power Tool

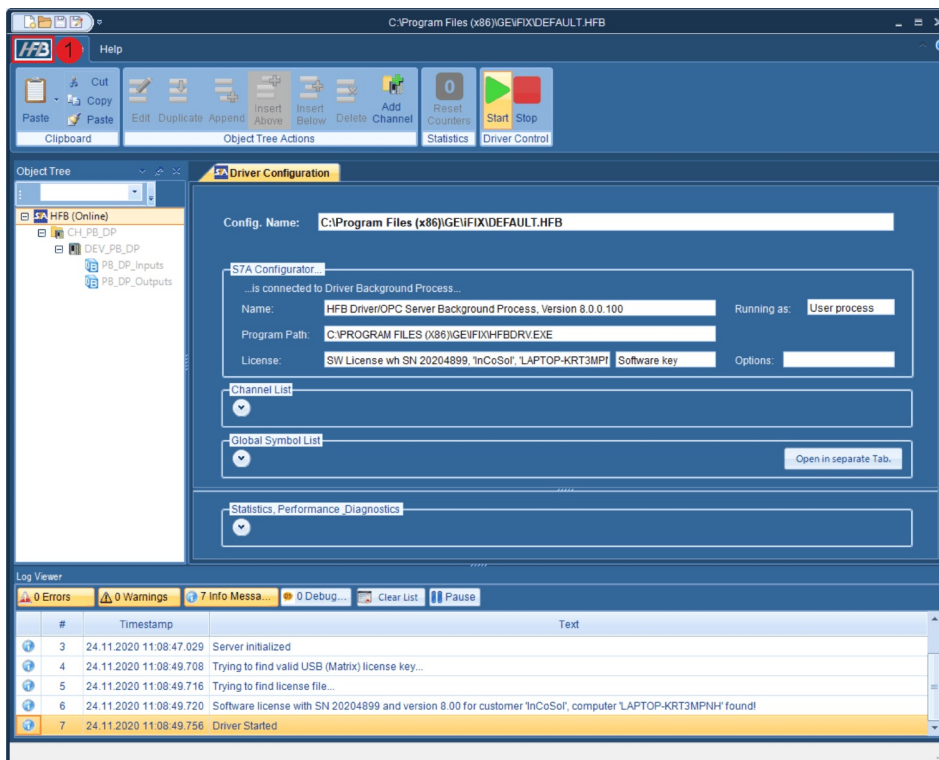
### 2.1 Start the HFB Power Tool



Picture 30: Starting HFB Power Tool via Windows Start Menu

- 1 You can start the HFB Power Tool via Windows Start Menu.

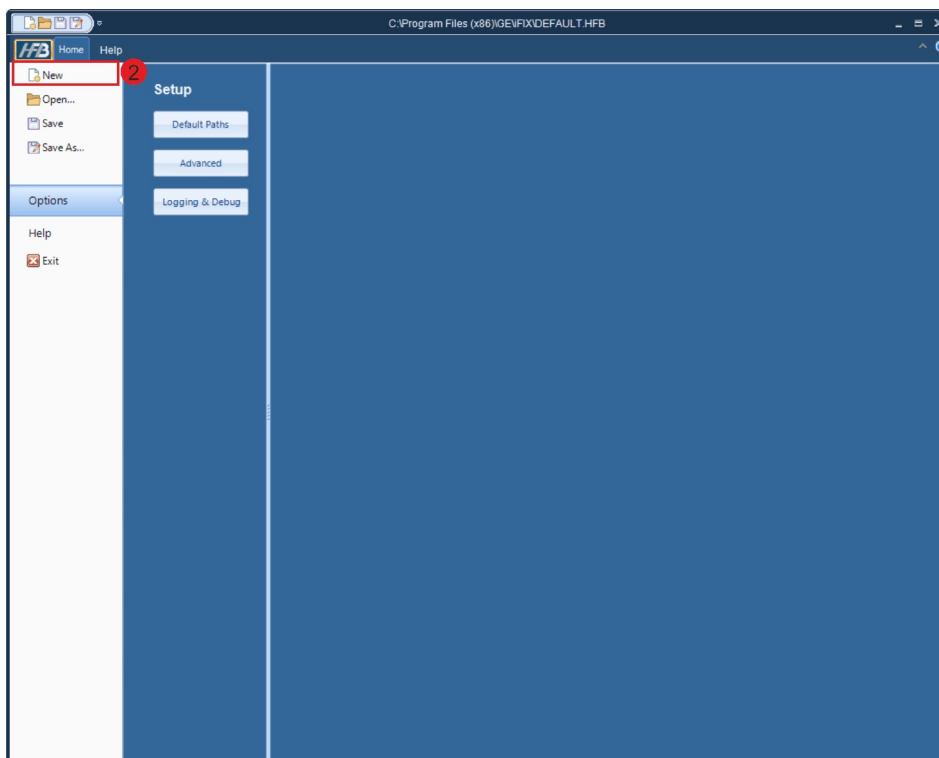
## 2.2 Create a new configuration



Picture 31: Opening the program's backstage menu

1

Click on the HFB Program Icon to open the application (backstage) menu.

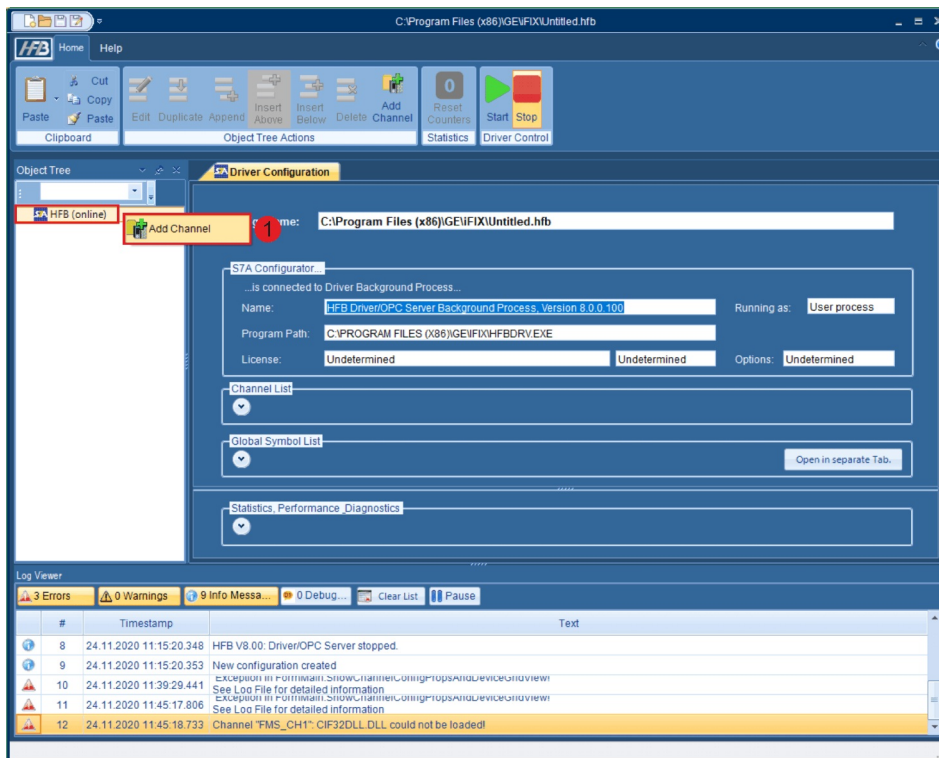


Picture 32: Creating a new (blank) configuration.

2

Select the menu item **New** to create a new (blank) configuration.

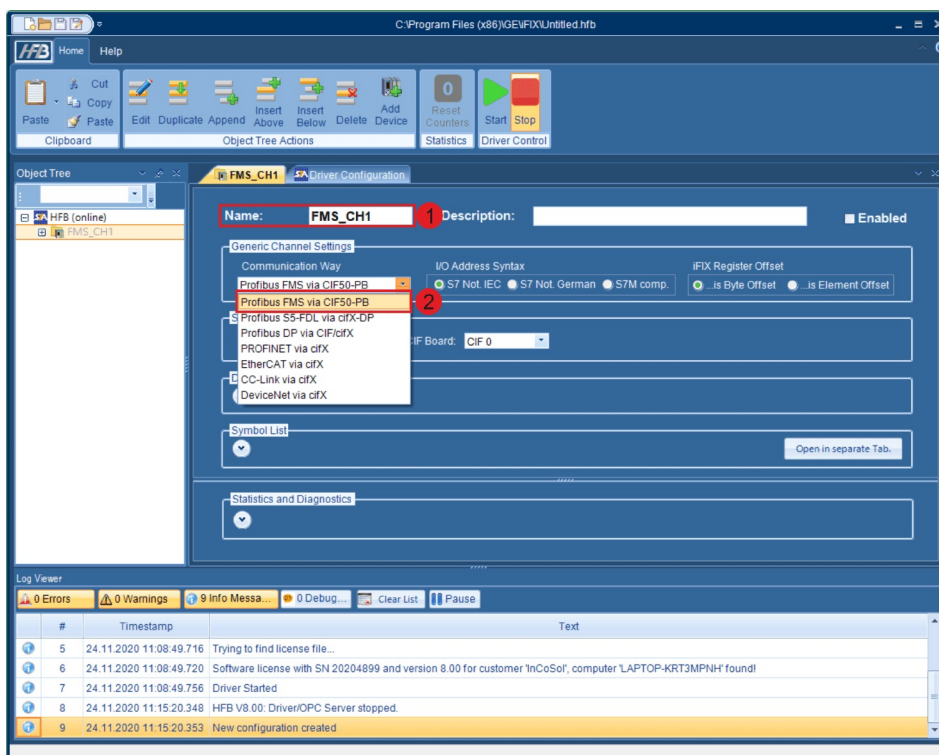
## 2.3 Create a new channel



Picture 33: Creating a new channel

- 1 Select the root item HFB (Online) in the Object Tree View, open the context menu via right mouse click and select **Add Channel** from the context menu to create a new channel object.

## 2.4 Configure the new channel

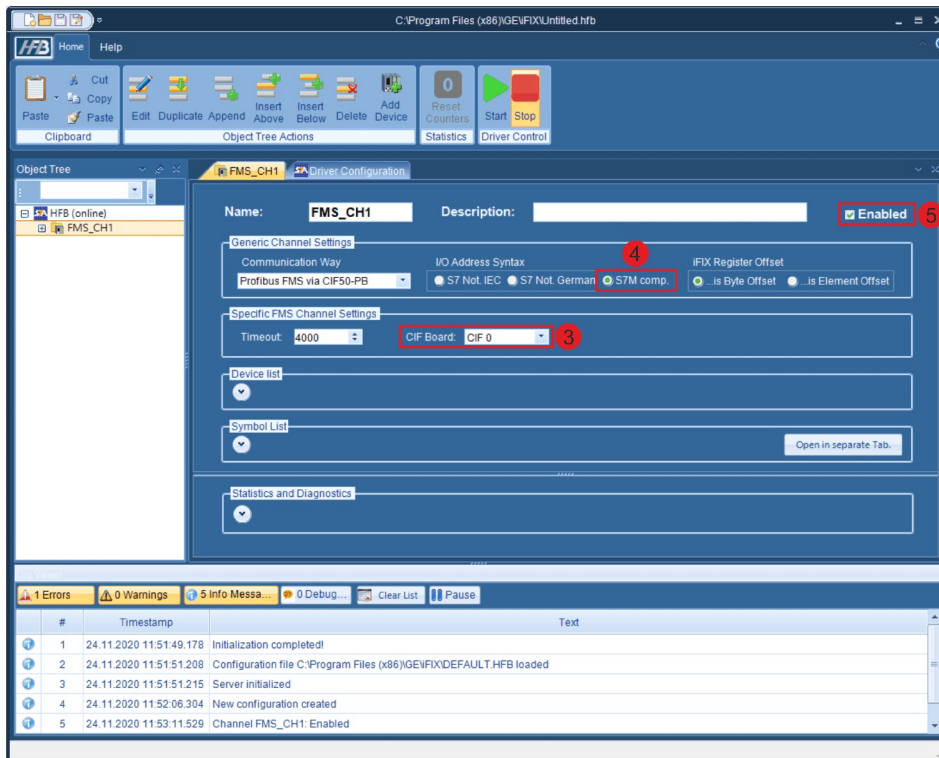


Picture 34: Configuring the new channel, part 1.

- 1 Give the channel an unique name. This name must not be used for another channel!

- 2 Since the new channel not yet has a specific communication way, you have to select the proper communication way **Profibus FMS via CIF50-PB** from the **Communication Way** drop down list. The program then automatically loads the specific dialog for the selected communication way.

#### 2.4.1 Configure the specific channel parameters

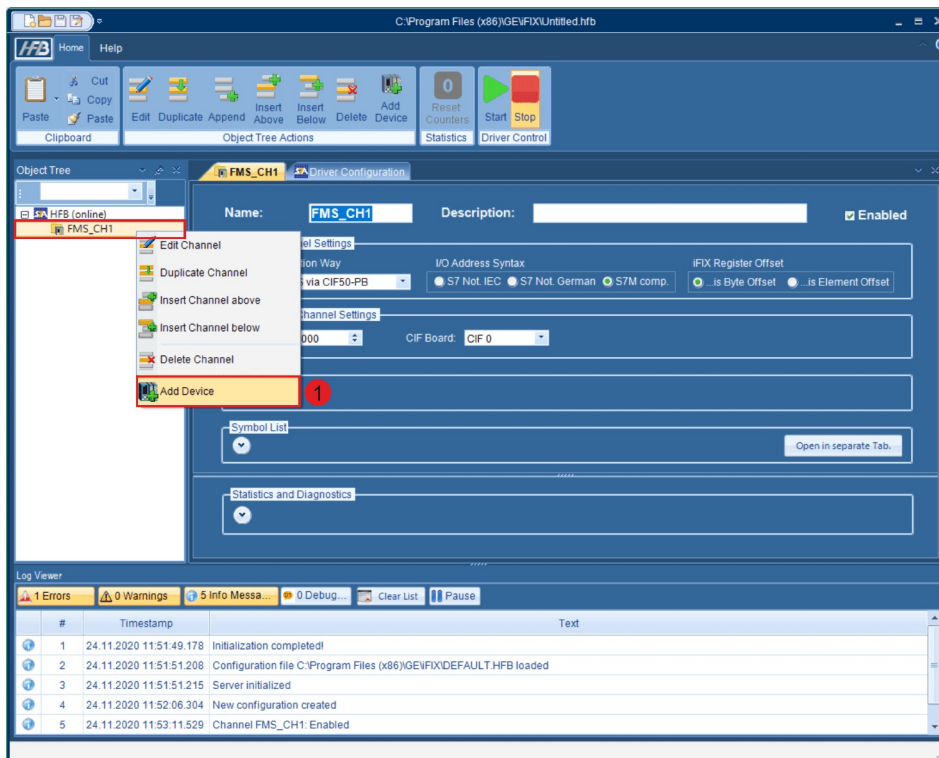


Picture 35: Configuring the specific channel parameters.

- 3 Select the entry **CIF 0** from the **CIF Board** drop down list.
- 4 Click the radio button **S7M comp** in the **I/O Address Syntax** group. This setting is very important because it controls the syntax of the iFIX I/O address resp. the OPC Item ID.
- 5 Enable the channel.



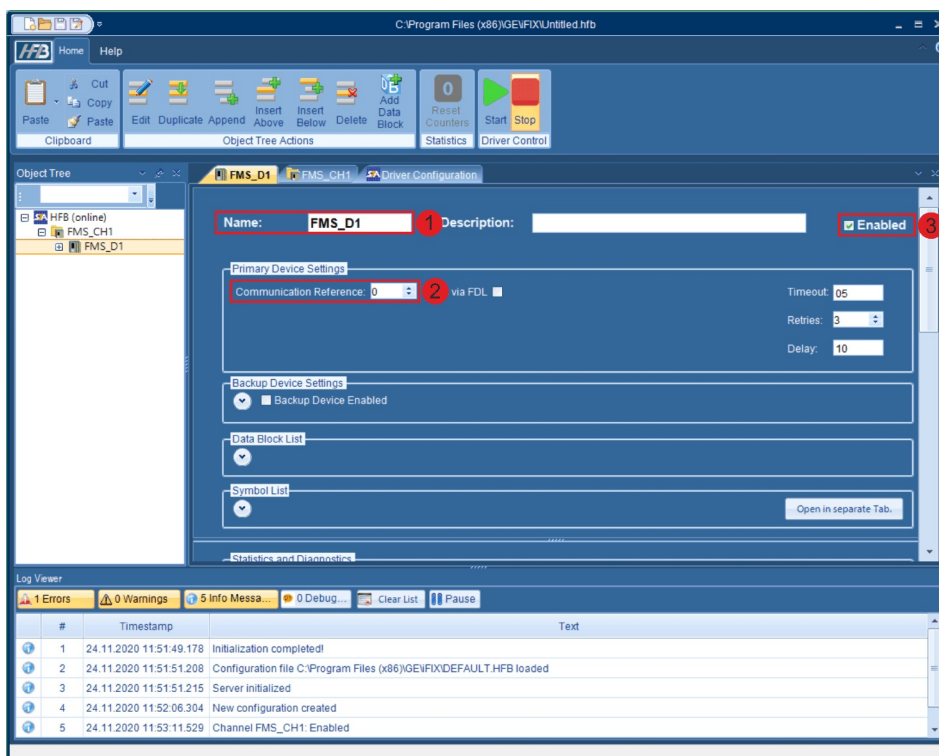
## 2.5 Create a new device



Picture 36: Creating a new device

- 1 Select the previously created channel in the Object Tree View, open the context menu via right mouse click and select **Add Device** from the context menu to create a new device object.

## 2.6 Configure the new device

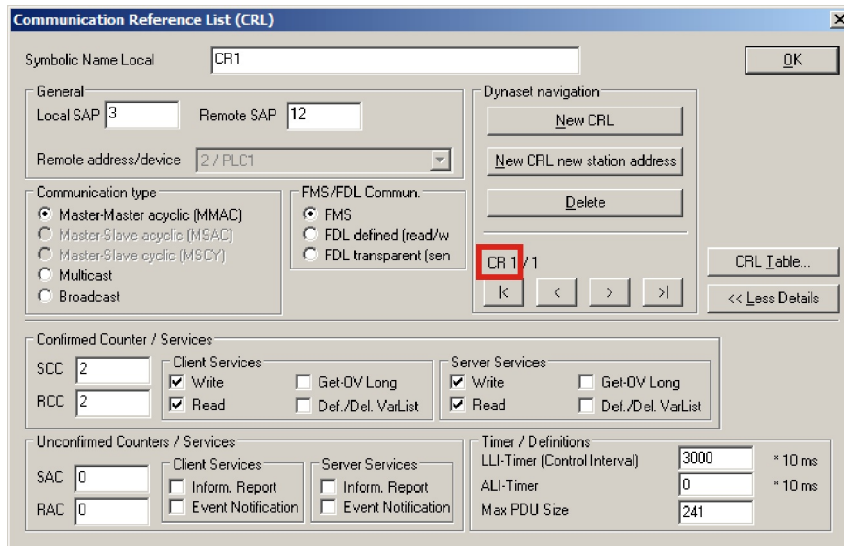


Picture 37: Configuring the specific device parameters.

- 1 Give the device an unique name. This name must not be used for another device!

**Note! The device name will later on be used as part of an iFIX I/O address or an OPC item id.**

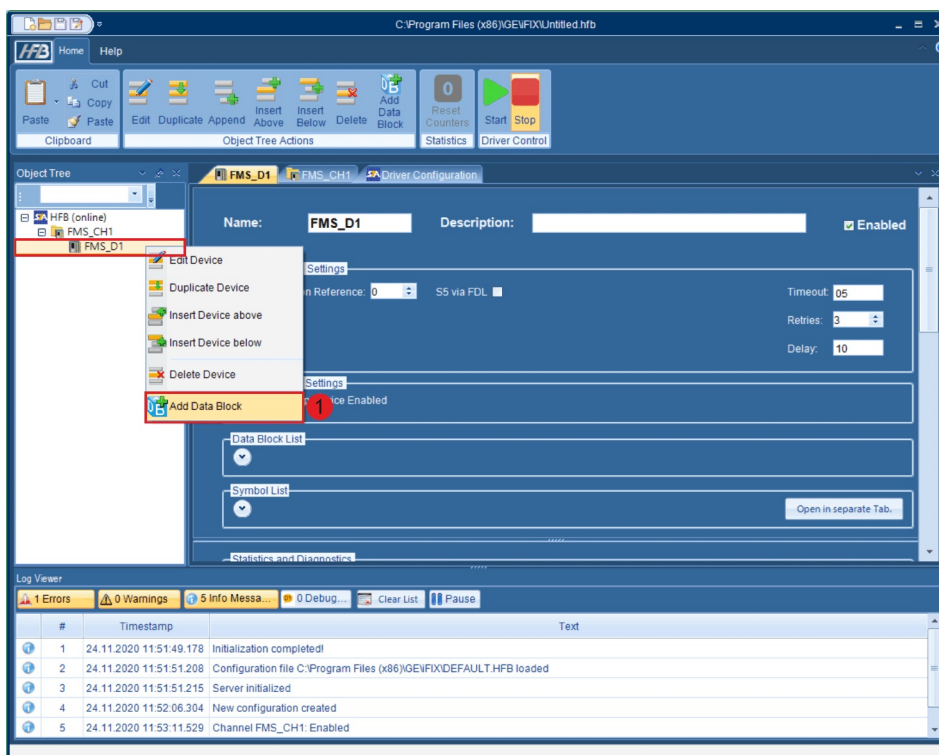
- 2 Enter the FMS communication reference index. This index corresponds to the communication reference (CR) number which is automatically generated by the SyCon software when a new CR is created (see chapter 1.6). You can determine this index as shown in the following screen shot of the **SyCon Communication Reference List** dialog:



Picture 38: Determine the Communication Reference Index

- 3 Enable the device.

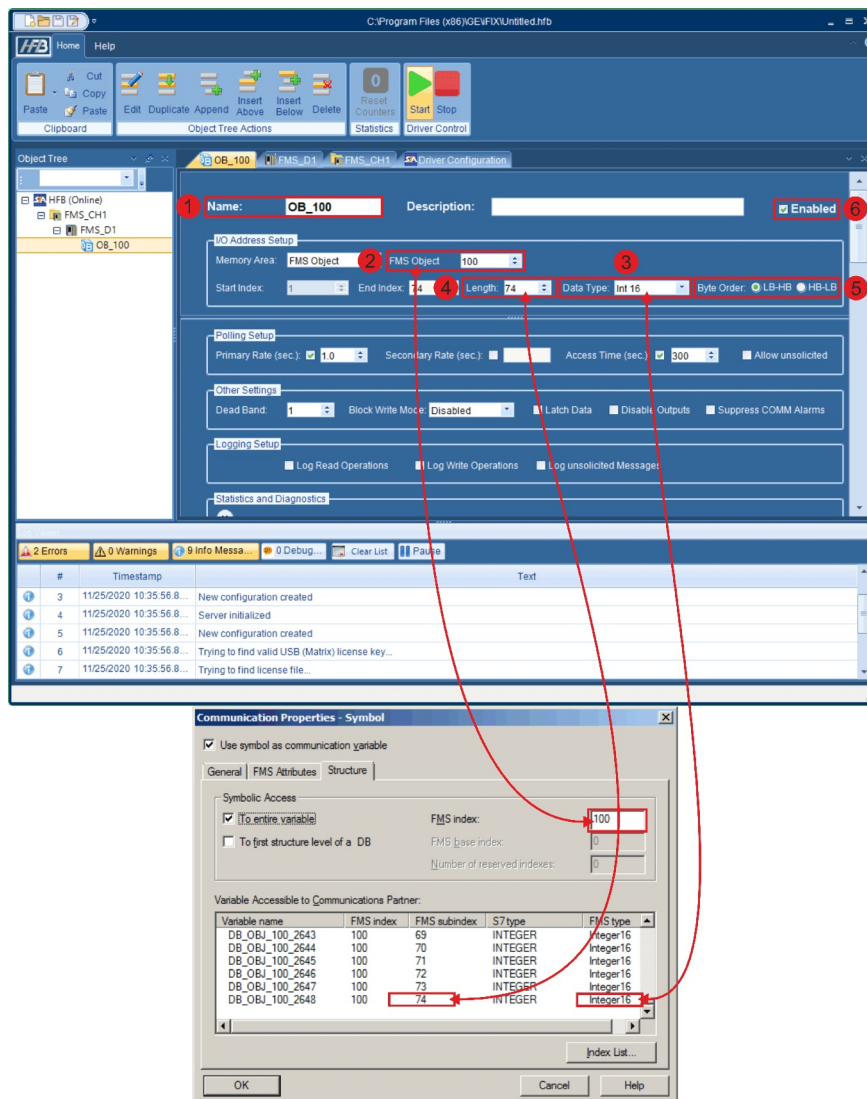
## 2.7 Create a new data block



Picture 39: Creating a new data block



## 2.8 Configure the new data block



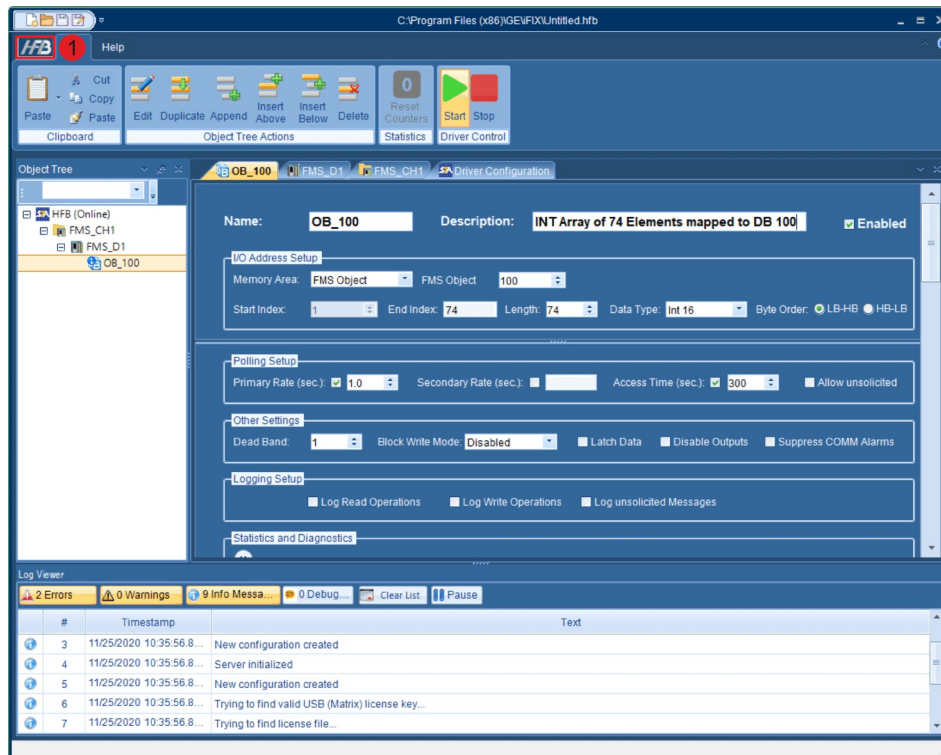
Picture 40: Relation of parameter between data block and Step7 FMS Variable

- 1 Give the data block an unique name. This name must not be used for another data block!
- 2 Enter the object index according to the **FMS index** value in the Step7 Symbol Editor Communication Properties dialog.
- 3 Set the data type, corresponding to the value in the **FMS type** column of the object variable list in Step7 Symbol Editor Communication Properties dialog.
- 4 Enter the **Length** (number of array elements) of the FMS object which must correspond to the **FMS subindex** value on the bottom line of the variable list in Step7 Symbol Editor Communication Properties dialog.
- 5 Set the **Byte Order** to **LB-HB**. This is the proper setting for a S7 FMS connection. Connection to other PLCs than S7 might require opposite byte order setting.
- 6 Enable the data block.

Now a minimum configuration is completed. Of course you can add additional channels, devices and data blocks as required for your application.

All parameters for channel, device and data block which are not described in this documentation can be left at their default values. The only parameters which may have to be adapted are the polling parameters (primary rate, secondary rate and access time) of the data block.

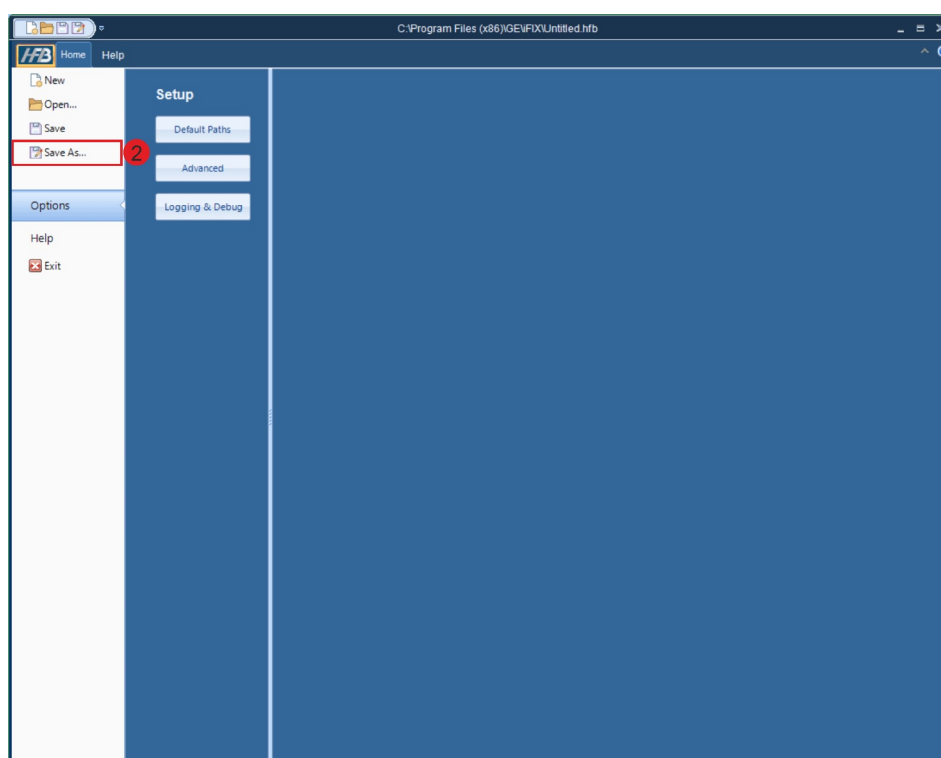
## 2.9 Save the new configuration



Picture 41: Opening the program's backstage menu

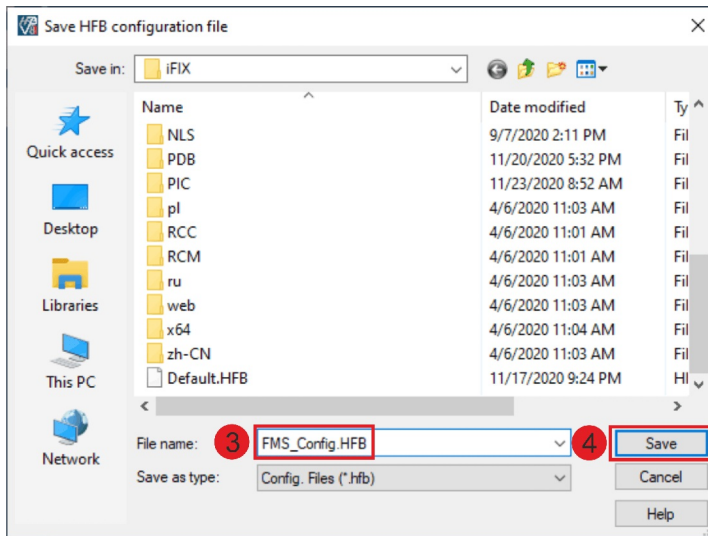
1

Click the HFB Program Icon to reach the application (backstage) menu.



Picture 42: Saving the new configuration

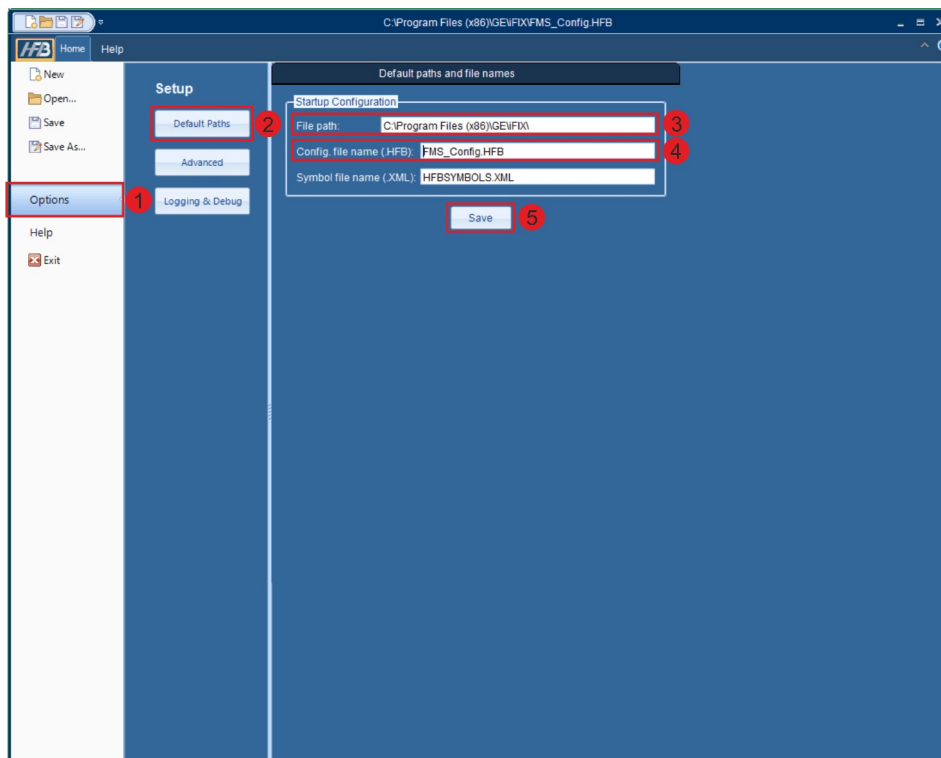
- 2 Select the menu item **Save As...** to open the File Save dialog.



Picture 43: Configuration file save dialog

- 3 Select a folder and enter a valid file name. The name must have the extension .HFB.
- 4 Click the Save button to finally save the configuration to disk.

## 2.10 Set the new configuration as default/startup configuration

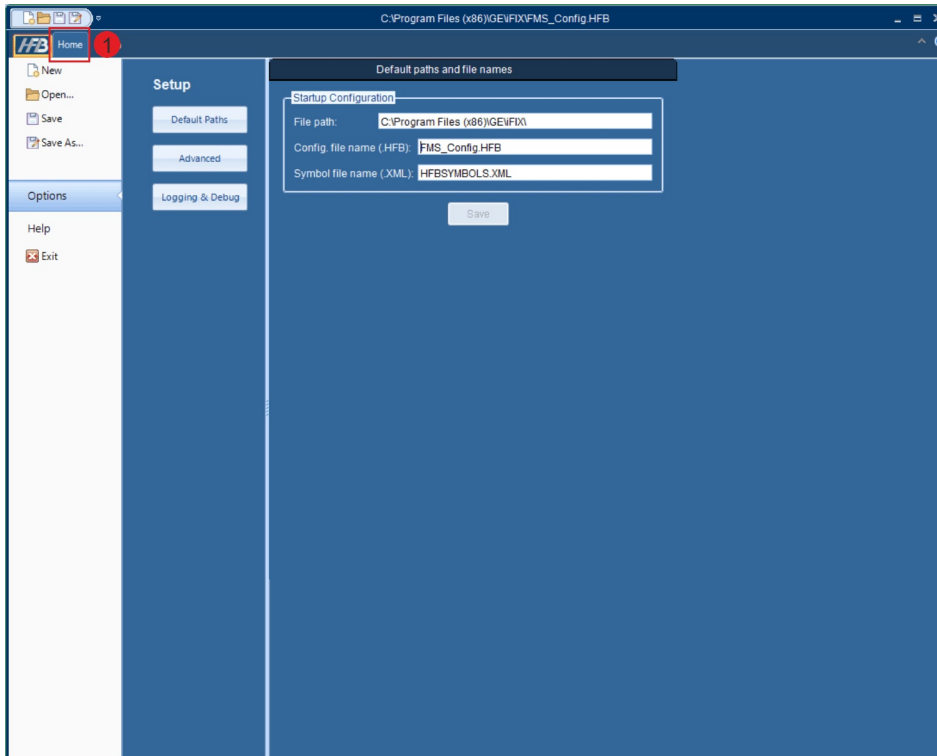


Picture 44: Setting default configuration path and file

- 1 Open the application (backstage) menu and select the menu item **Options**.
- 2 Click the **Default Paths** button to open the Default paths and filenames dialog.
- 3 Enter the complete path of the previously saved configuration file.

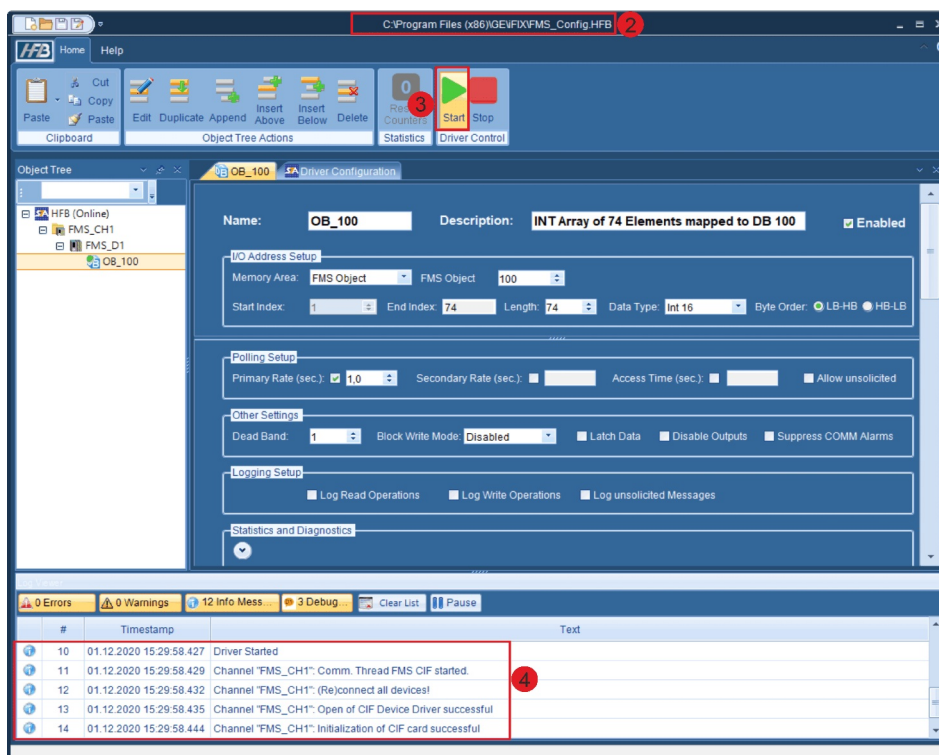
- 4 Enter the name of the previously saved configuration file.
- 5 Click the **Save** button to store the modified values permanently.

## 2.11 Online check of the new configuration



Picture 45: From backstage view to configuration view

- 1 Click the Home tab to go back to the configuration view



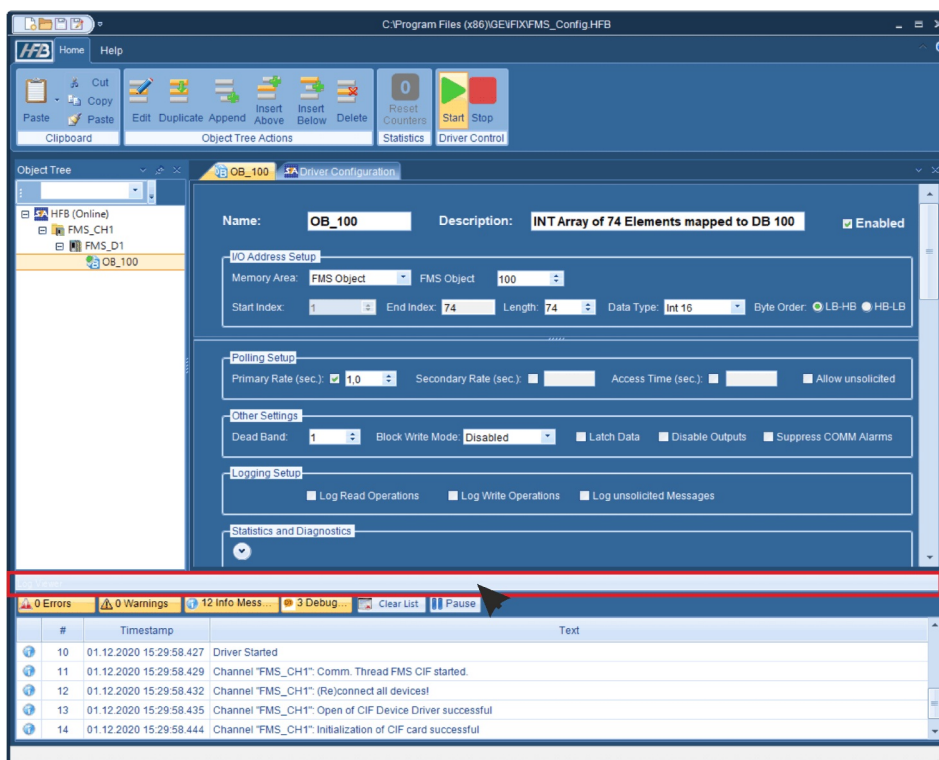
Picture 46: Message sequence in Log Viewer window

- 2 Check the program header for the correct configuration file path and name which you have entered as default/startup configuration.
- 3 If the driver is not yet started, click the **Start** button to start it.
- 4 Check the messages in the Log Viewer window. For the previously configured channel and device the following sequence of messages should appear:

```
Channel <Your channel name>: Comm. Thread FMS CIF started!
Channel <Your channel name>: (Re)connect all devices!
Channel <Your channel name>: Open of CIF Device Driver successful
Channel <Your channel name>: Initialization of CIF card successful.
```

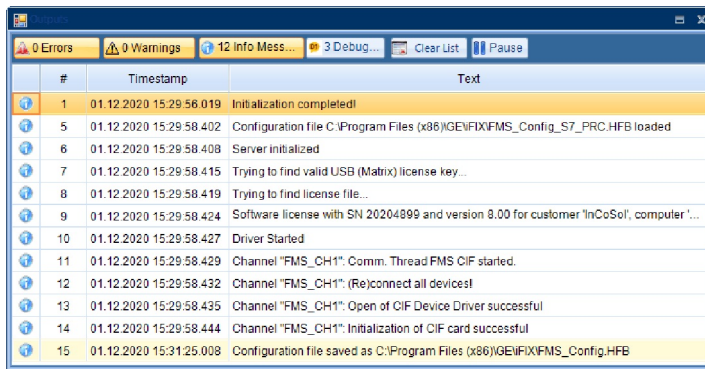
If some of these messages are not shown but instead error messages then you should verify all channel, device and data block parameters, you have configured before. If the problem should persist please contact our support team at [support@incosol.de](mailto:support@incosol.de) and send us a screen shot of the Log Viewer Window for further analysis.

Hint: For a better presentation of the messages in the Log Viewer window you can drag this window out of the HFB Power Tool's program frame. Afterwards you can resize the separated window in height and width to display a larger amount of messages.



Picture 47: Dragging the Log Viewer window

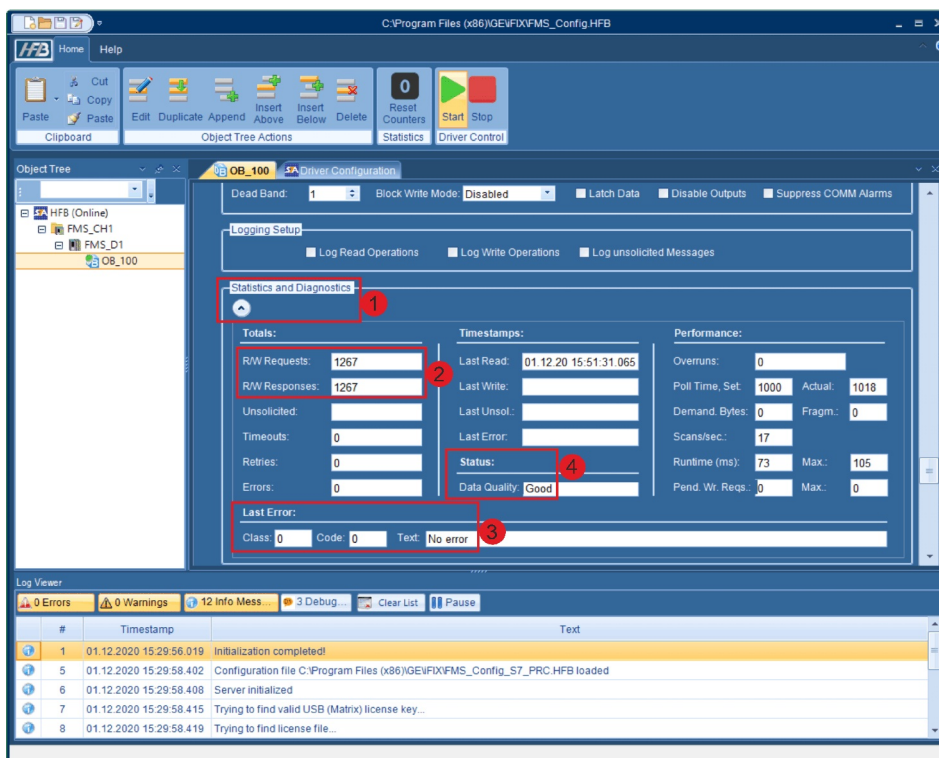
To drag the window click into the header line of the Log Viewer window, keep the left mouse button pressed and drag the window to the desired area of the desk top. Now you can resize the separated window by pulling it with the mouse cursor at any edge or corner of the window.



#	Timestamp	Text
1	01.12.2020 15:29:56.019	Initialization completed!
5	01.12.2020 15:29:58.402	Configuration file C:\Program Files (x86)\GEV\FIX\FMS_Config_S7_PRC.HFB loaded
6	01.12.2020 15:29:58.408	Server initialized
7	01.12.2020 15:29:58.415	Trying to find valid USB (Matrix) license key...
8	01.12.2020 15:29:58.419	Trying to find license file...
9	01.12.2020 15:29:58.424	Software license with SN 20204899 and version 8.00 for customer 'InCoSol', computer '...
10	01.12.2020 15:29:58.427	Driver Started
11	01.12.2020 15:29:58.429	Channel "FMS_CH1": Comm. Thread FMS CIF started.
12	01.12.2020 15:29:58.432	Channel "FMS_CH1": (Re)connect all devices!
13	01.12.2020 15:29:58.435	Channel "FMS_CH1": Open of CIP Device Driver successful
14	01.12.2020 15:29:58.444	Channel "FMS_CH1": Initialization of CIP card successful
15	01.12.2020 15:31:25.008	Configuration file saved as C:\Program Files (x86)\GEV\FIX\FMS_Config.HFB

Picture 48: Separated Log Viewer Window

## 2.12 Check the communication state of a particular data block



The screenshot shows the HFB Driver Configuration window with the 'Statistics and Diagnostics' section expanded for data block OB\_100. The section displays various counters and performance metrics. Red circles 1, 2, 3, and 4 highlight specific areas: 1 points to the expand button, 2 points to the R/W Requests and R/W Responses counters, 3 points to the Last Error field, and 4 points to the Status field.

Totals:		Timestamps:		Performance:	
R/W Requests:	1267	Last Read:	01.12.20 15:51:31.065	Overruns:	0
R/W Responses:	1267	Last Write:		Poll Time, Set:	1000
Unsolicted:		Last Unsol:		Actual:	1018
Timeouts:	0	Last Error:		Demand, Bytes:	0
Retries:	0	Status:	Good	Frags:	0
Errors:	0	Data Quality:	Good	Scans/sec:	17
Last Error:				Runtime (ms):	73
Class:	0			Max:	105
Code:	0			Pend. Wr. Regs:	0
Text:	No error			Max:	0

Picture 49: Data block statistics

- 1 Click the expand button in the data block's **Statistics and Diagnostics** Group to expand the dialog. The expanded dialog now shows numerous data fields with counter values, timestamps and other values which give you a detailed view of the runtime behaviour of the data block.
- 2 When the data block or the FMS object is polled properly, the counter fields **R/W Requests** and **R/W Responses** should increase in the rate specified by the Primary Rate field.
- 3 The **Last Error Class**, **Code** and **Text** field should show **0** resp. **No Error**.



### 3 Configuration of the Clients (iFIX or OPC)

The Item ID and iFIX I/O Address must follow the following structure:

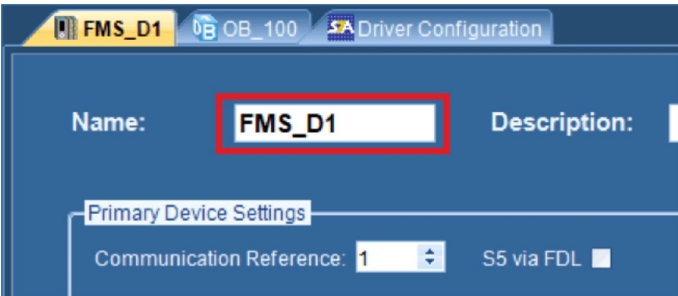
For a digital address:

<Device Name>:OB.<FMS Object>.< Index>.<Bit Number>

For an analog address

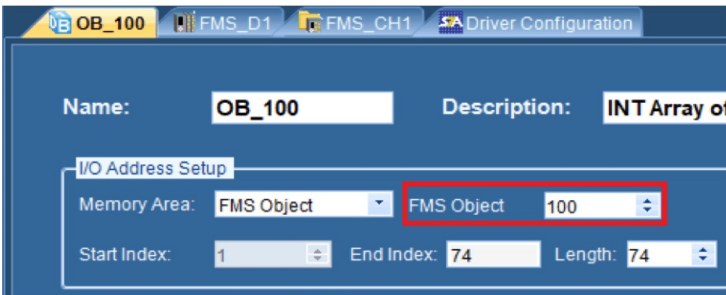
<Device Name>:OB.<FMS Object>.< Index>|<Option>

<Device Name> Is the name of the HFB device as specified in chapter 2.6. A FMS communication reference to a specific PLC is specified by this device name.



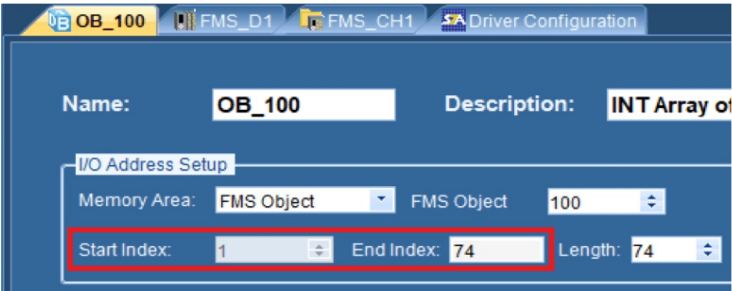
Picture 50: Device name is part of the I/O address

<FMS Object> Is the number of the FMS object. A data block must be created in the HFB configuration for this object number.



Picture 51: FMS Object number is part of the I/O address

<Index> Specifies a single data item within the FMS object. Minimum index is 1 (start index of HFB data block) and the maximum index is the end index or the length of the HFB data block.



Picture 52: FMS Index is part of the I/O address

<Option> are valid for analog addresses of particular data types. The following table shows all possible options:

Option	allowed data types	Description
LBYT	Int16	Converts the lower 8 bits of a signed 16 bit value to a signed 8 bit value
	UInt16	Converts the lower 8 bits of an unsigned 16 bit value to an unsigned 8 bit value
HBYT	Int16	Converts the upper 8 bits of a signed 16 bit signed value to a signed 8 bit value
	UInt16	Converts the upper 8 bits of an unsigned 16 bit value to an unsigned 8 bit value
LWRD	Int16	Converts the lower 8 bits of a (signed or unsigned) 16 bit value (signed or unsigned) to an unsigned 8 bit value
HWRD	Int16	Converts the upper 8 bits of a (signed or unsigned) 16 bit value to an unsigned 8 bit value
FWRD	Int16	Converts a 16 bit signed value to an unsigned 16 bit value
FDIN*	Int16	Converts * two consecutive 16 bit values to a signed 32 bit value
FDWR*	Int16	Converts * two consecutive 16 bit values to an unsigned 32 bit value
FREA*	Int16	Converts two consecutive 16 bit values to a 32 bit floating point (real) value
* )The block write mode of the respective data blocks has to be set to "Auto" when values with these options must be written.		

Table 1: Possible signal conditioning options

<Bit Number> For an analog data item of an integer data type (Int8, UInt8, Int16 and UInt16) a single bit can be addressed by extending an analog I/O address with the bit number between 0 and 15.

### 3.1 Examples of OPC Item IDs

Item ID	Data Type	Value	Timestamp	Quality	Update C...
FMS_D1:OB.100.1	Short	-100	16:04:35:385	Good	2
FMS_D1:OB.100.1 FWRD	Word	65436	16:04:35:385	Good	2
FMS_D1:OB.100.1 LBYT	Short	-100	16:04:35:385	Good	2
FMS_D1:OB.100.1 HBYT	Short	-1	16:04:35:385	Good	2
FMS_D1:OB.100.1 LWRD	Word	156	16:07:00:823	Good	1
FMS_D1:OB.100.1 HWRD	Short	255	16:07:08:998	Good	1
FMS_D1:OB.100.1 FDIN	Long	-6553600	16:07:26:355	Good	1
FMS_D1:OB.100.1.0	Boolean	0	16:07:40:681	Good	1
FMS_D1:OB.100.1.1	Boolean	0	16:07:48:840	Good	1
FMS_D1:OB.100.1.2	Boolean	1	16:07:54:965	Good	1
FMS_D1:OB.100.1.3	Boolean	1	16:08:04:139	Good	1
FMS_D1:OB.100.1.4	Boolean	1	16:08:08:226	Good	1
FMS_D1:OB.100.1.5	Boolean	0	16:08:12:313	Good	1
FMS_D1:OB.100.1.6	Boolean	0	16:08:18:447	Good	1
FMS_D1:OB.100.1.7	Boolean	1	16:08:26:623	Good	1
FMS_D1:OB.100.1.8	Boolean	1	16:08:30:714	Good	1
FMS_D1:OB.100.1.15	Boolean	1	16:08:35:834	Good	1

Picture 53: Example of OPC Items