ibaPDA Watchdog

Monitoring ibaPDA status by SIMATIC S7

Instructions manual

Issue 1.1

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The current version is available for download on our web site http://www.iba-ag.com.

Protection note

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Certification

The device is certified according to the European standards and directives. This device corresponds to the general safety and health requirements. Further international customary standards and directives have been observed.

Issue	Date	Revision – section / page	Author	Version SW
1.1	01/27/12	all	cv/rm	6.27.5

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1 About this instructions manual

This instructions manual describes the configuration of a watchdog connection between ibaPDA-V6 and SIMATIC S7.

1.1 Target group

This manual addresses in particular the qualified professionals who are familiar with handling electrical and electronic modules as well as communication and measurement technology. A person is regarded to as professional if he/she is capable of assessing safety and recognizing possible consequences and risks on the basis of his/her specialist training, knowledge and experience and knowledge of the standard regulations.

1.2 Basic knowledge

The following basic knowledge is required for a proper understanding of this manual and the performance of the actions described herein:

- ❑ Basic knowledge of dealing with ibaPDA
- ❑ Basic knowledge of dealing with SIMATIC S7 system / SIMATIC Manager

1.3 Designations

The following designations are used in this manual:

Action	Designations
Menu command	Menu „Logic diagram“
Call of menu command	„Step 1 – Step 2 – Step 3 – Step x” Example: Select menu „Logic diagram – Add – New logic diagram”
Keys	<Key name> Example: <Alt>; <F1>
Press keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Button name> Example: <OK>; <Cancel>
File names, Paths	„File name“, „Path” Example: „Test.doc“

1.4 Used symbols

If safety instructions or other notes are used in this manual, they mean:

⚠ DANGER

The non-observance of this safety information may result in an imminent risk of death or severe injury:

- ❑ By an electric shock!
- ❑ Due to the improper handling of software products which are coupled to input and output procedures with control function!

⚠ WARNING

The non-observance of this safety information may result in a potential risk of death or severe injury!

⚠ CAUTION

The non-observance of this safety information may result in a potential risk of injury or material damage!

Note

A note specifies special requirements or actions to be observed.

Important note

Note if some special features must be observed, for example exceptions from the rule.

Tip

Tip or example as a helpful note or insider tip to make the work a little bit easier.

Other documentation

Reference to additional documentation or further reading.

2 Introduction

By means of a watchdog you can monitor the function of an ibaPDA data acquisition system by another system and retrieve status information. The watchdog is a telegram which is generated and periodically sent over Ethernet TCP/IP or UDP by ibaPDA-V6.

If the ibaPDA system is working properly and the network connections are established then the monitoring system (in this case a SIMATIC S7) is receiving cyclically a telegram.

↗ For information about contents and structure of the telegram, refer to chapter 6.1.

3 Add the watchdog function in your S7

3.1 General blocks

In the S7 project 2 function blocks are needed, depending on the S7 family being used:

- ❑ For S7-300: FC500 and FC506. FC500 contains the call of AG_RECV function (FC506) and writes the received data into the DB50.
- ❑ For S7-400: FC501 and FC507. FC501 contains the call of AG_LRECV function (FC507) and writes the received data into the DB50.

To use this function, you can copy these function blocks (FC) and the data block (DB) into your own project by opening the sample project.

For your convenience a Variable Table is also included in the project.

3.2 Implementation

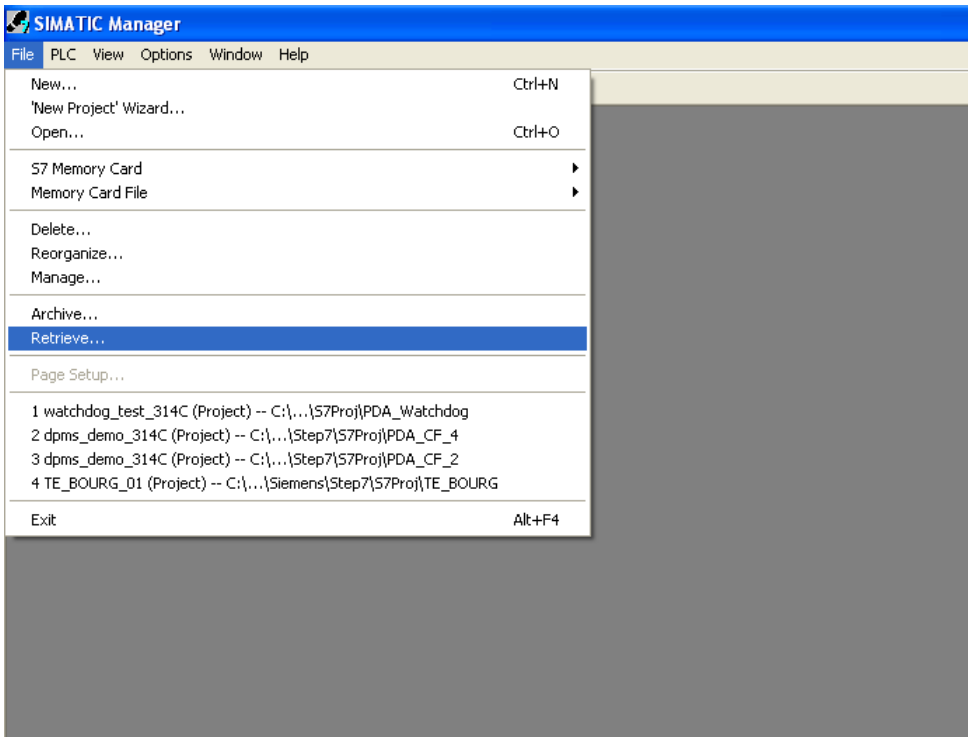
Note

The following descriptions refer to the implementation of the watchdog into an S7-300 system. The implementation into an S7-400 system follows the same method but using functions FC501 and FC507 instead of FC500 and FC506.

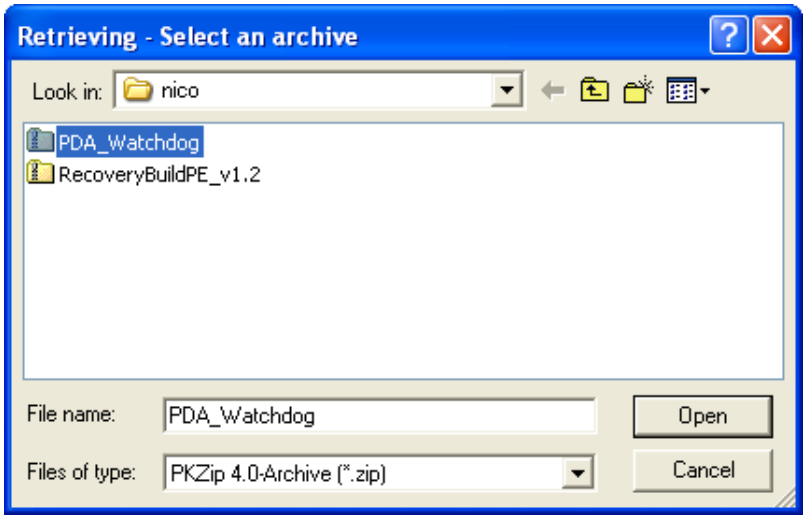
To implement these blocks into your S7 project, follow the steps explained below.

3.2.1 Open the sample project

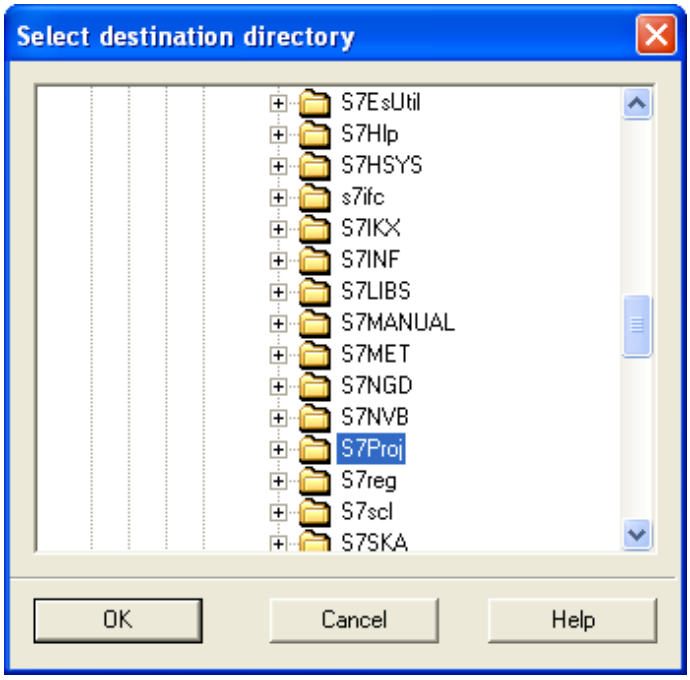
1. Open our sample project by clicking on menu “File --> Retrieve”.



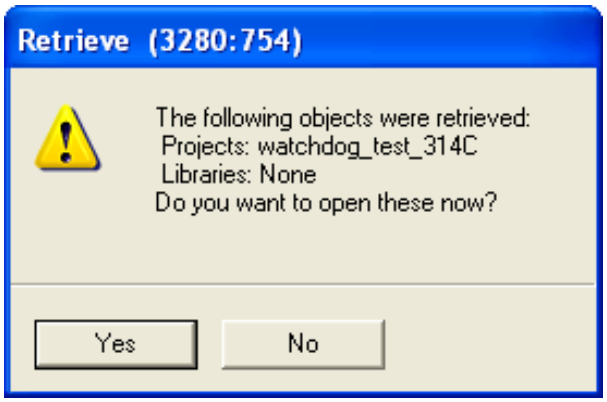
2. Browse to the directory of the zip file “PDA_watchdog_S7.zip” and retrieve the project.



3. Select the retrieve directory



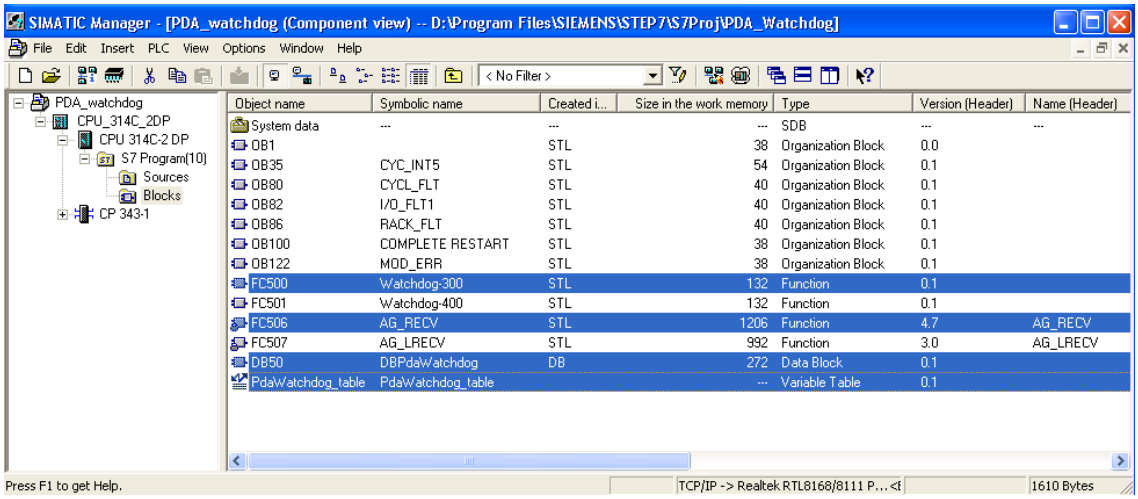
4. Open the retrieved project



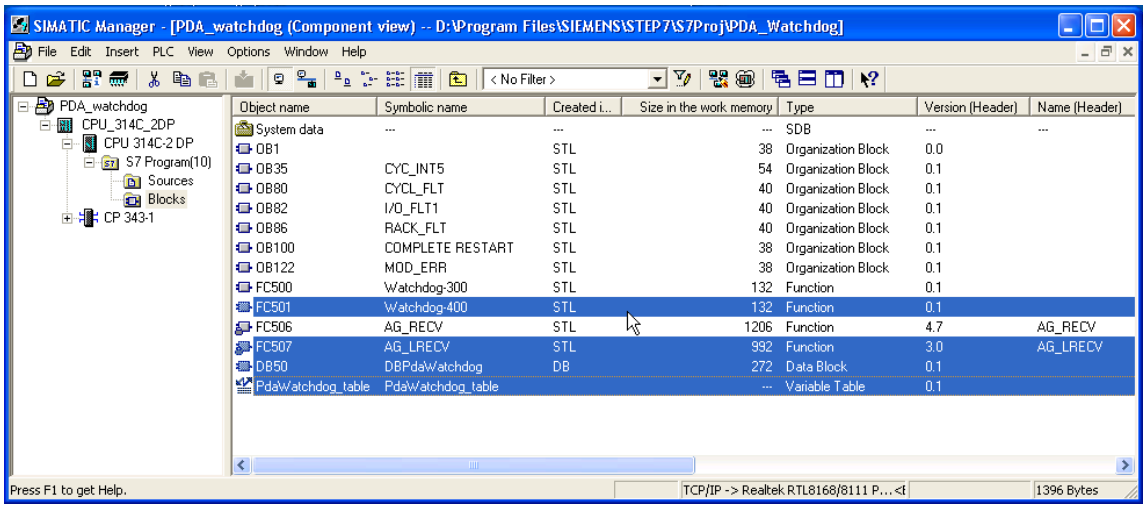
3.2.2 Transfer the function blocks and data block

1. Drag & drop the function blocks and data block from the “Watchdog” project into your project. Rename the DB, and respectively the function blocks if their numbers are already used in your project.

❑ For S7-300: FC500, FC506, DB50 and PdaWatchdog_table

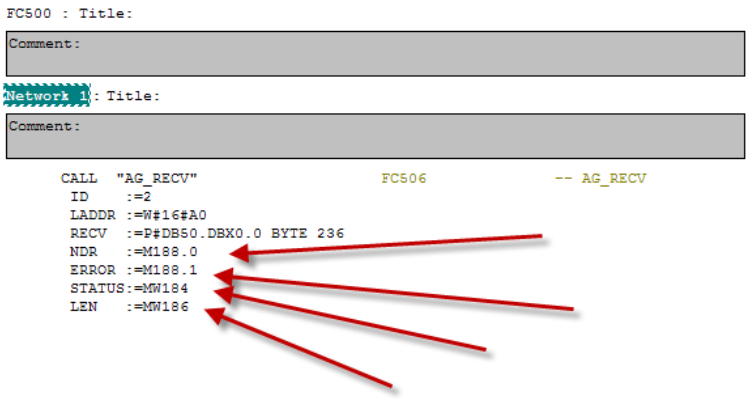


❑ For S7-400: FC501, FC507, DB50 and PdaWatchdog_table



2. To receive the watchdog in your project, call the function “Watchdog” in OB1 or in a time OB (e. g. OB35).

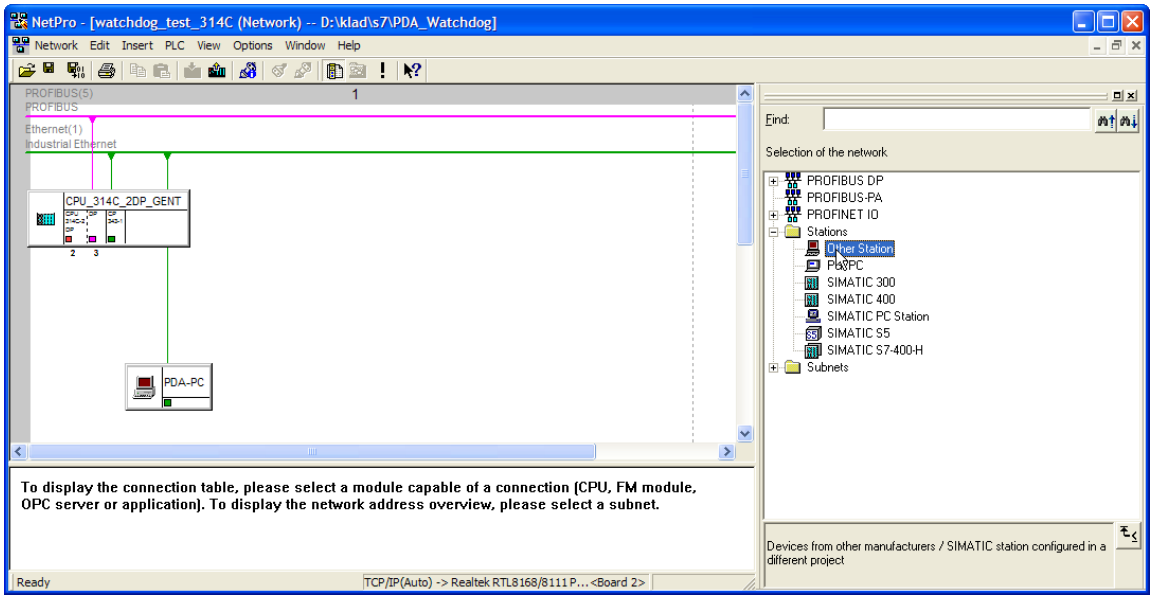
3. Check the used variables in FC500 (resp. FC501) to make sure that they are not already in use!



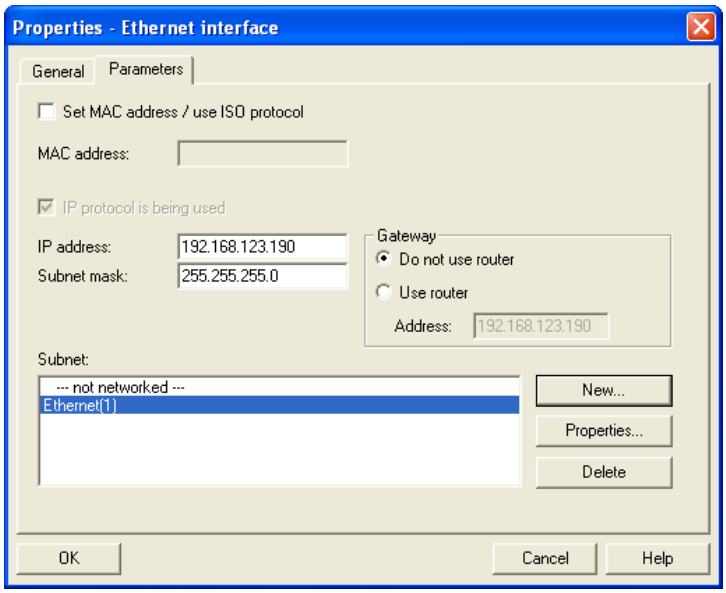
4. Check also the DB number if you previously renamed the DB.
The ID and LADDR are retrieved from the NetPro configuration (see next chapter).

3.2.3 Set up the TCP connection using NetPro

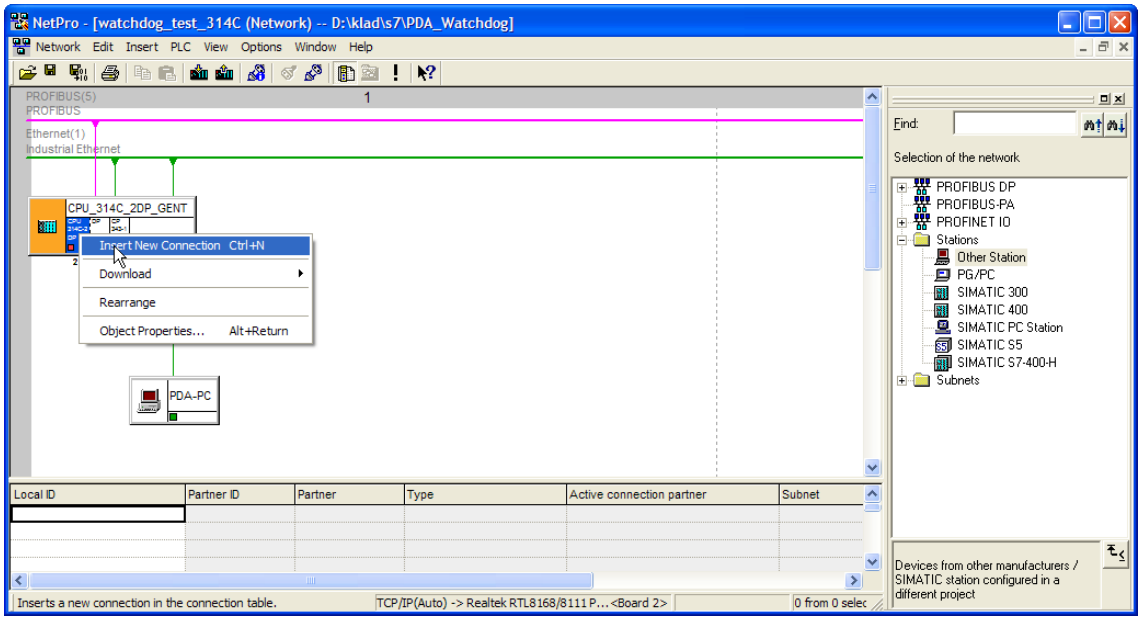
1. Create an “Other station” representing the ibaPDA server.



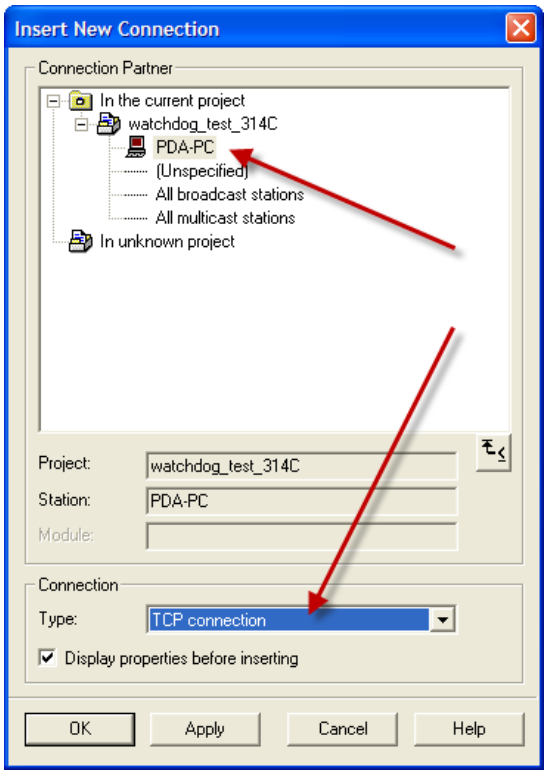
2. Rename the “Other station” to “PDA-PC” and assign it the existing S7 Ethernet connection.



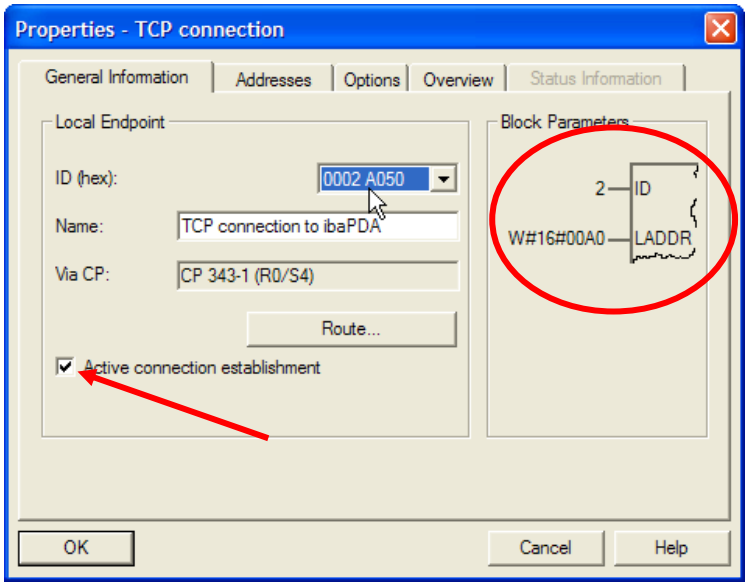
3. Once the PDA-PC has an IP address and is networked to the same subnet of the S7 CPU, you can add a new connection to the CPU. Click on the CPU itself to get access to the connections available at the CPU. By right clicking on a free line in the connection grid, you can add an extra connection.

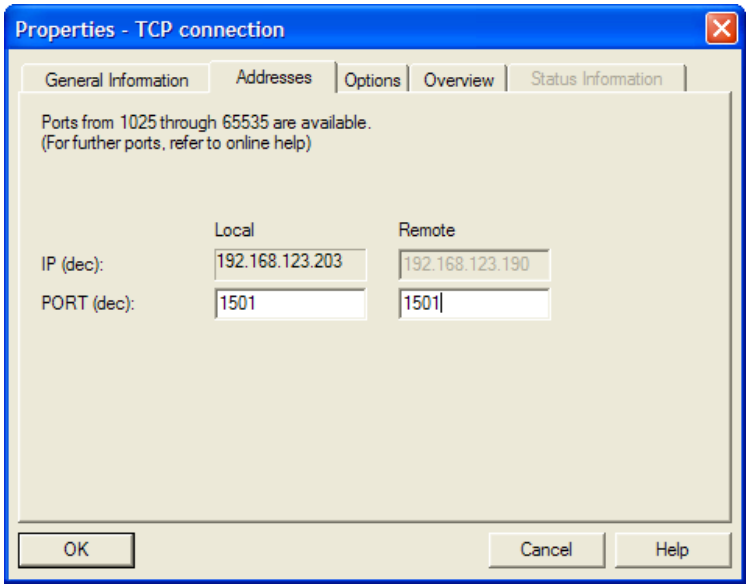


4. This new connection should be linked to the PDA-PC via Ethernet as configured in the screenshot below



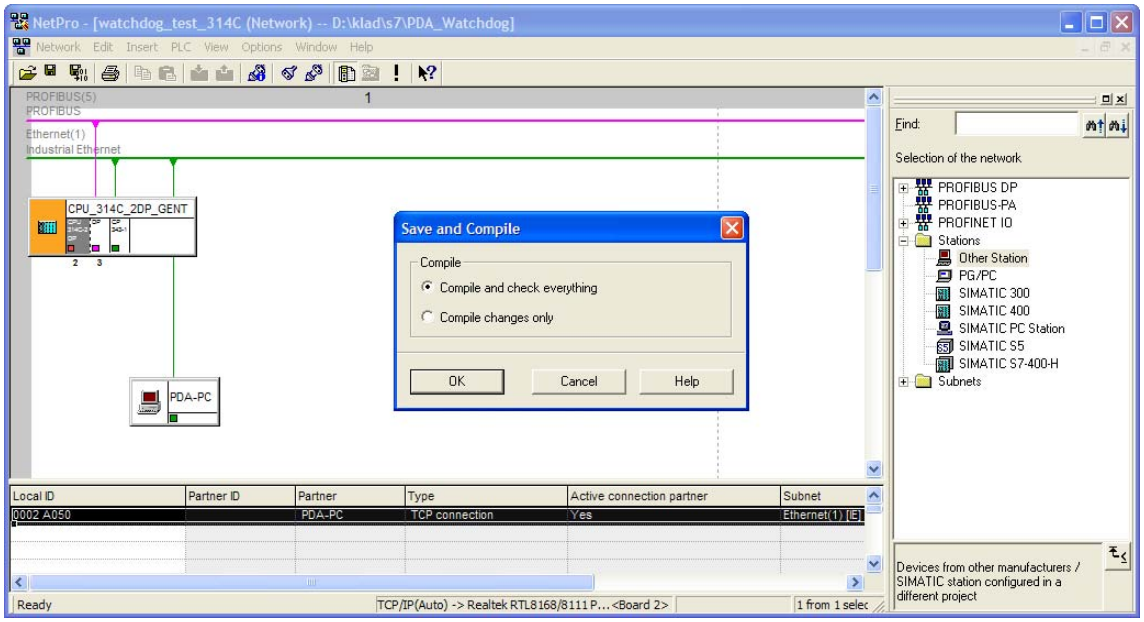
5. After the connection has been made, the properties of the created connection will pop-up. Here you can specify the port number and the name of this connection. In this example the port number 1501 is used. The block parameters you can see in this properties window are needed as input for the AG_RECV in FC500. Check again if the ID and LADDR indicated here, match with the values used in the AGC_RECV call in FC500.
Note, that the ibaPDA computer should be the passive partner if the S7 establishes the connection (see chapter 4).



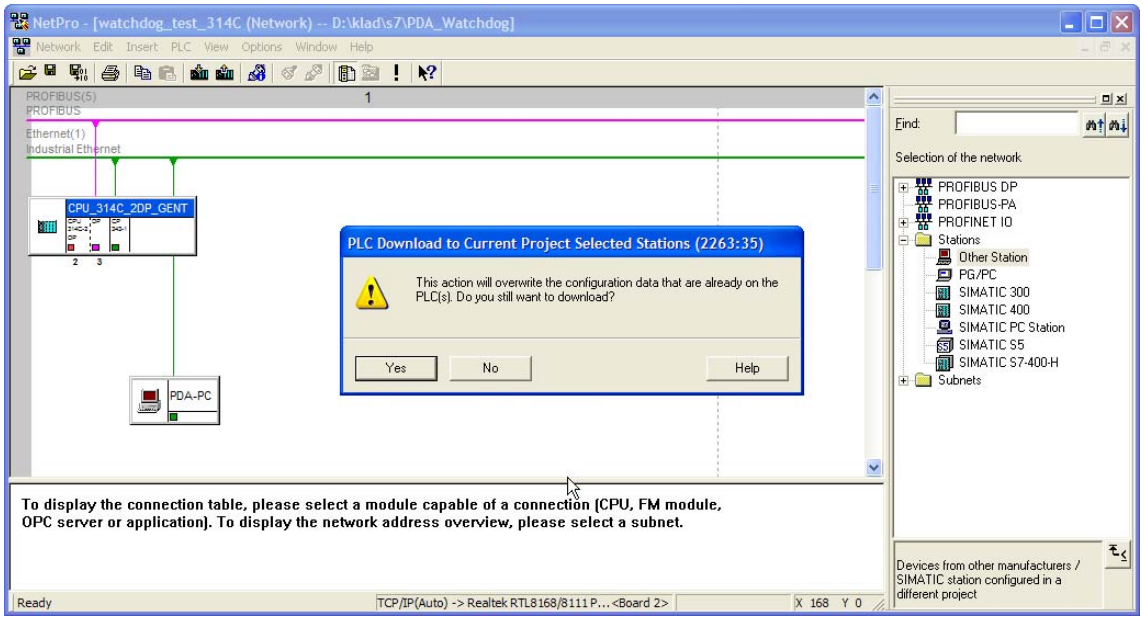


6. After all the settings are inserted, press OK.

7. Now you need to compile the NetPro configuration. This can be done by clicking on the floppy drive icon with numbers in the toolbar on top (3rd icon from left).



8. When the compilation finished without any errors, the configuration needs to be downloaded into the PLC. Click on the CPU of the PLC and afterwards click on the PLC icon where the arrow is pointing towards the PLC. Follow all the steps and reboot the PLC when asked for.



4 Set up the ibaPDA watchdog on the ibaPDA Server

You also need to configure ibaPDA to send the watchdog towards the S7.

1. The configuration panel of the watchdog can be found in the branch “General” of the module tree of the I/O Manager, “Watchdog” tab. Here you can enable the watchdog and define the watchdog send cycle and the watchdog port. In this example the watchdog port was set to 1501.

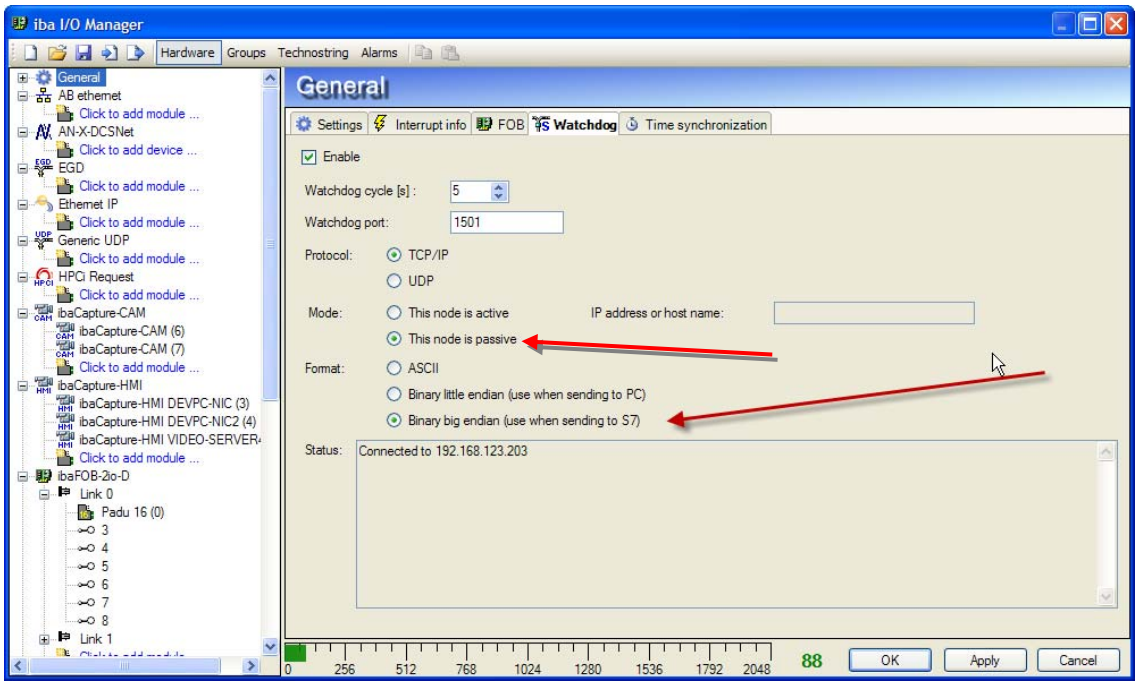
2. Afterwards the protocol, mode and format can be selected. Select the passive mode together with the binary format.

Note

The passive mode is the server mode of the ibaPDA watchdog. With this mode selected, different systems can connect to the ibaPDA watchdog. If the active mode is selected, ibaPDA can only connect to one server.

The binary format is suggested because this way the TCP/IP or UDP message always has the same length of 236 bytes. If the ASCII mode is used the length is variable.

3. Since ibaPDA V6.27.5 a new setting has been introduced to support the big-endian byte order in the S7. Select this option as indicated by the red arrow below.
   Note that ibaPDA is the passive partner because S7 is actively establishing the connection.



5 Compile and load your S7

1. Compile and load your S7 and check online the status of the AG_RECV in FC500 or AG_LRECV in FC501 respectively.
2. In your S7 project check the DB50.msgCounter to verify if the ibaPDA system is sending data. The DB50.msgCounter should increment every time ibaPDA sends new data with the cycle time specified as “Watchdog cycle” in the “Watchdog” tab of the ibaPDA I/O Manager. Once the DB50.msgCounter is alive the other data in the DB50 is valid.

↗ For details about the contents of DB50, see chapter 6.2.

6 Appendix

6.1 Structure of the ibaPDA watchdog telegram (binary)

Byte offset	Data type	Contents								Remark	
0	int32									Message counter is incremented after each message	Message
1											
2											
3											
4	int32									Version number (currently =1)	
5											
6											
7											
8	int32									Measurement status =1: PDA is measuring	General
9											
10											
11											
12	char	7	6	5	4	3	2	1	0	Bit 0 = 1: Everything is OK Bit 1 = 1: There are disabled signals	
13	char									Reserved	
14	char									Reserved	
15	char									Reserved	
16	int32								MSB	Connection status to ibaCapture-CAM servers connections 1 to 32 1 bit per connection; bit = 1: connection ok	Capture-CAM
17											
18											
19									LSB		
20	int32								MSB	Connection status to ibaCapture-CAM servers connections 33 to 64	
…											
24	int32								MSB	Connection status to ibaCapture-HMI servers connections 1 to 32 1 bit per connection; bit = 1: connection ok	Capture-HMI
25											
26											
27									LSB		
28	int32								MSB	Connection status to ibaCapture-HMI servers connections 33 to 64	
…											
32	short									Status QDR data store	QDR data store
33											
34	short									Current directory	
35											
36	int32									Free disk space in MB	
37											
38											
39											
40	char									Reserved	
41	char									Reserved	
42	char									Reserved	
43	char									Reserved	
44	short									Status normal data store	1st normal data store
45											
46	short									Current directory	
47											
48	int32									Free disk space in MB	
49											
50											
51											
52	char									Reserved	
53	char									Reserved	
54	char									Reserved	
55	char									Reserved	
56											2nd data store
…											
67											
68											3rd data store
…											
79											
80											more data stores
…											

The binary watchdog telegram contains the following information:

- Status of measurement
  - 0 = PDA is not measuring
  - 1 = PDA is measuring
- Connection status of ibaCapture-CAM servers
  (2 x 32 bits, 1 bit per connection)
  - True = Connection OK
  - False = No connection
- Connection status of ibaCapture-HMI servers
  (2 x 32 bits, 1 bit per connection)
  - True = Connection OK
  - False = No connection
- Status QDR data store
  - 0 = Inactive
  - 1 = Not synchronized
  - 2 = Synchronized
- Current directory
  - 0 = PDA is writing to the base directory
  - 1 = PDA is writing to the backup directory
- Free space on the hard disk in MB
- Status (normal) data store(s) 1, 2, ...n
  - 0 = Inactive
  - 1 = Waiting for trigger
  - 2 = Recording
  - 3 = Post-trigger
- Current directory
  - 0 = PDA is writing to the base directory
  - 1 = PDA is writing to the backup directory
- Free space on the hard disk in MB

6.2 Structure of DB50

This DB contains all the separate information fields which are included in the watchdog message. In the comment of each address line of the DB, you can find additional information about the received signals.

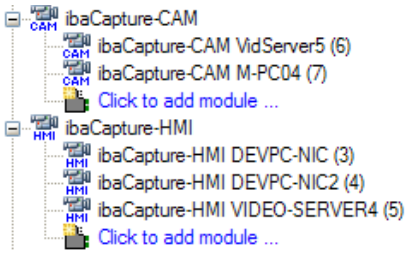
Address	Name	Type	Initial val	Comment
0.0		STRUCT		
+0.0	msgCounter	DWORD	DW#16#0	Message counter is incremented after each message
+4.0	msgVersion	DWORD	DW#16#0	Version number
+8.0	isMeasuring	DWORD	DW#16#0	=1 : Pda is measuring
+12.0	allOK	BOOL	FALSE	everything is OK (measuring and no disabled signals)
+12.1	disabledSignals	BOOL	FALSE	there are disabled signals
+12.2	reservedBit2	BOOL	FALSE	
+12.3	reservedBit3	BOOL	FALSE	
+12.4	reservedBit4	BOOL	FALSE	
+12.5	reservedBit5	BOOL	FALSE	
+12.6	reservedBit6	BOOL	FALSE	
+12.7	reservedBit7	BOOL	FALSE	
+13.0	reserved1	BYTE	B#16#0	reserved
+14.0	reserved2	BYTE	B#16#0	
+15.0	reserved3	BYTE	B#16#0	
+16.0	captureCamStatus	ARRAY[1..2]		Bit per connection to ibaCapture-CAM server
*4.0		DWORD		
+24.0	captureHmiStatus	ARRAY[1..2]		Bit per connection to ibaCapture-HMI server
*4.0		DWORD		
+32.0	qdrInfo	STRUCT		information about QDR datastore
+0.0	status	WORD	W#16#0	0=inactive, 1=not synchronized, 2=synchronized
+2.0	directory	WORD	W#16#0	0=base directory is used, 1=backup directory is used
+4.0	freeSpace	DWORD	DW#16#0	free space on harddisk in MB
+8.0	reserved	ARRAY[1..4]		reserved
*1.0		BYTE		
=12.0		END_STRUCT		
+44.0	datastoreInfo	ARRAY[1..16]		information about datastores
*0.0		STRUCT		
+0.0	status	WORD	W#16#0	0=inactive, 1=waiting for trigger, 2=recording, 3=post trigger
+2.0	directory	WORD	W#16#0	0=base directory is used, 1=backup directory is used
+4.0	freeSpace	DWORD	DW#16#0	free space on harddisk in MB
+8.0	reserved	ARRAY[1..4]		reserved
*1.0		BYTE		
=12.0		END_STRUCT		
=236.0		END_STRUCT		

By using the Variable Table, the values in the DB50 can be displayed online. The example below shows a watchdog message sent by an ibaPDA system, running with 2 active data stores, 2 ibaCapture-CAM servers connected and 3 ibaCapture-HMI servers connected.

	Address	Symbol	Display format	Status value	Modify
1	DB50.DBD 0	"DBPdaWatchdog".msgCounter	DEC	L#14842	
2	DB50.DBD 4	"DBPdaWatchdog".msgVersion	DEC	L#1	
3	DB50.DBD 8	"DBPdaWatchdog".isMeasuring	DEC	L#1	
4	DB50.DBX 12.0	"DBPdaWatchdog".allOK	BOOL	true	
5	DB50.DBX 12.1	"DBPdaWatchdog".disabledSignals	BOOL	false	
6	DB50.DBX 12.2	"DBPdaWatchdog".reservedBit2	BOOL	false	
7	DB50.DBX 12.3	"DBPdaWatchdog".reservedBit3	BOOL	false	
8	DB50.DBX 12.4	"DBPdaWatchdog".reservedBit4	BOOL	false	
9	DB50.DBX 12.5	"DBPdaWatchdog".reservedBit5	BOOL	false	
10	DB50.DBX 12.6	"DBPdaWatchdog".reservedBit6	BOOL	false	
11	DB50.DBX 12.7	"DBPdaWatchdog".reservedBit7	BOOL	false	
12	DB50.DBD 16	"DBPdaWatchdog".captureCamStatus[1]	BIN	2#0000_0000_0000_0000_0000_0000_0000_0011	
13	DB50.DBD 20	"DBPdaWatchdog".captureCamStatus[2]	BIN	2#0000_0000_0000_0000_0000_0000_0000_0000	
14	DB50.DBD 24	"DBPdaWatchdog".captureHmiStatus[1]	BIN	2#0000_0000_0000_0000_0000_0000_0000_0111	
15	DB50.DBD 28	"DBPdaWatchdog".captureHmiStatus[2]	BIN	2#0000_0000_0000_0000_0000_0000_0000_0000	
16	DB50.DBW 32	"DBPdaWatchdog".qdrInfo.status	DEC	0	
17	DB50.DBW 34	"DBPdaWatchdog".qdrInfo.directory	DEC	0	
18	DB50.DBD 36	"DBPdaWatchdog".qdrInfo.freeSpace	DEC	L#0	
19	DB50.DBD 40		DEC	L#0	
20	DB50.DBW 44	"DBPdaWatchdog".datastoreInfo[1].status	DEC	2	
21	DB50.DBW 46	"DBPdaWatchdog".datastoreInfo[1].directory	DEC	0	
22	DB50.DBD 48	"DBPdaWatchdog".datastoreInfo[1].freeSpace	DEC	L#6857	
23	DB50.DBD 52		DEC	L#0	
24	DB50.DBW 56	"DBPdaWatchdog".datastoreInfo[2].status	DEC	2	
25	DB50.DBW 58	"DBPdaWatchdog".datastoreInfo[2].directory	DEC	0	
26	DB50.DBD 60	"DBPdaWatchdog".datastoreInfo[2].freeSpace	DEC	L#854	
27	DB50.DBD 64		DEC	L#0	
28	DB50.DBW 68	"DBPdaWatchdog".datastoreInfo[3].status	DEC	0	
29	DB50.DBW 70	"DBPdaWatchdog".datastoreInfo[3].directory	DEC	0	
30	DB50.DBD 72	"DBPdaWatchdog".datastoreInfo[3].freeSpace	DEC	L#0	
31	DB50.DBD 76		DEC	L#0	
32	DB50.DBW 80	"DBPdaWatchdog".datastoreInfo[4].status	DEC	0	
33	DB50.DBW 82	"DBPdaWatchdog".datastoreInfo[4].directory	DEC	0	
34	DB50.DBD 84	"DBPdaWatchdog".datastoreInfo[4].freeSpace	DEC	L#0	
35	DB50.DBD 88		DEC	L#0	
36	DB50.DBW 92	"DBPdaWatchdog".datastoreInfo[5].status	DEC	0	
37	DB50.DBW 94	"DBPdaWatchdog".datastoreInfo[5].directory	DEC	0	
38	DB50.DBD 96	"DBPdaWatchdog".datastoreInfo[5].freeSpace	DEC	L#0	

Note

The order of the ibaCapture-CAM and ibaCapture-HMI servers is the order as defined in the I/O manager.



7 Support and Contact

Support

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Note

If you require support, specify the serial number (iba-S/N) of the product.

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