



Scalable PLC AC500

# AC500 CPU Diagnosis Basic module

# Diagnosis Contents



- Diagnosis System
- Local diagnosis at the CPU
- Local diagnosis at the modules
- Diagnosis in Control Builder Plus
- PS501 tools and status bar
- PS501 PLC-Browser
- Diagnosis by use of library SysInt\_AC500\_Vxx.LIB
- Diagnosis by use of library Diag\_AC500\_Vxx.LIB
- Extended diagnosis for fieldbus slaves

# Diagnosis Coming up

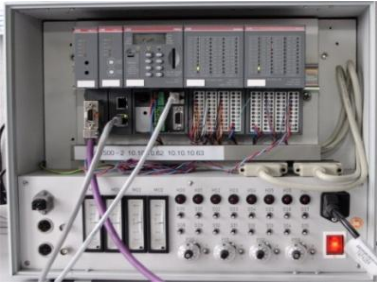


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# Diagnosis

## Diagnosis Sources and Tools

- PLC:
- LEDs
  - LCD display



### Control Builder Plus

AC500\_PM583\_ETH\_V

AC500

CPU\_parameters (CPL)

IO\_Bus (I/O-Bus)

A0523 (A0523)

A0523\_1 (A0523)

A1523 (A1523)

Interfaces (Interface):

- COM1\_Online\_A
- COM2\_Online\_A
- FBP\_Online\_Acc

Communication\_modu

- ETH PM5x1\_ETH\_C
- IP\_Settings (I)
- CM572\_DP
- CM572\_Mastx
- PDP22
- DC5C

REAL VALUES

SPEED ACT 749.95 rpm

SPEED ACT PERC 25.03 %

FREQUENCY 37.53 Hz

CURRENT 8.11 A

CURRENT PERC 5.2 %

TORQUE 28.65 N

DC-VOLTAGE 288.65 V

ENCODER 1 SPEED 747.97 rpm

ENCODER 1 POS 6.12799580 rev

ENCODER 2 SPEED 0.00 rpm

ENCODER 2 POS 0.00000000 rev

POS DNG DNG 234760.647 rev

POS DNG DNG 0.0000 rev

SPEED ESTIMATED 751.56 rpm

TEMP INVERTER 30.1 %

TEMP IC 30.1 %

INDUCTOR TEMP 20.2 C

INDUCTOR TEMP EST 20.2 C

USED SUPPLY VOLT 226.7 V

BRAKE RES LOAD 0.0 %

CPU USAGE 95 %

DIAGNOSTIC POWER 6.81 kW

RUN TIME COUNT 691.78 h

RUN TIME ECON 139.73 h

FAN ON TIME 1.845.88 h

MECH TIME CONST 6.000 s

VALUES

CTRL VALUES

### Programming tool CoDeSys

my\_new

name	value
r6	FALSE
r7	FALSE

# Diagnosis Summary

Diagnosis functions of PS501 are available offline or online and as Function Blocks

Diagnosis is used in following cases:

- Hardware configuration (fieldbus check)
- Program creation (compiler: syntax, semantic, variable mapping)
- Testing the logic without PLC (simulation mode and online functions)
- Testing the logic with PLC and commissioning on site
  - Setup/check for ETH-addresses
  - Wiring test, logic test
  - Trouble shooting: configuration errors, logic errors, PLC errors, wiring errors, sensor/actor errors, fieldbus /network errors...
  - Optimizing the cycle time for the task, check the file sizes in the memory
- Exploitation
  - Check of the firmware versions, check the PLC error buffer, check the project tree, check the project info and load
  - Check and trouble shooting: see commissioning

# Diagnosis

## Diagnosis System of AC500



- Up to 100 error messages are managed in a circular buffer LIFO
- Each message is provided with the time stamp and attribute:
  - Come
  - Gone
  - Acknowledgement
- The time stamp is generated by Real Time Clock (RTC) of the PLC
- If the RTC was not set or there is no battery in the PLC the time after power on is counted starting with:

01. Januar 1970, 00:00 AM

# Diagnosis

## Trouble Shooting: Error Indication



The trouble shooting can be done by use of:

- **Hardware**

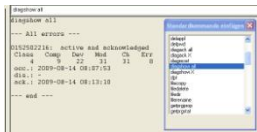
- The CPU's LED „ERR“ „ and CPU's display after pushing the „DIAG“ key
- LEDs at IO modules, communication modules, FieldbusPlugs

- **Engineering tools:**

- Error cause in plain text in Control Builder Plus
- Fieldbus and Ethernet diagnosis in Control Builder Plus
- A message in the status line of the CoDeSys project in online mode
- The command „diagshow all“ and further commands of PLC browser in online mode (Control Builder Plus and CoDeSys)

- **User program**

- FBs from ABB library SysInt\_AC500\_Vxx.lib integrated in user program
- FBs from ABB library Diag\_AC500\_Vxx.lib integrated in user program
- FBs from ABB library of the appropriate fieldbus integrated in user program



# Diagnosis

## Error Number

Each error message has a unique error number providing the following information:

- State (come, gone, acknowledged)
- Error class
- Faulty component
- Faulty device
- Faulty module
- Faulty channel
- Error identifier

### Error number

```
#152502216: 'x 1970-01-01 00:01:13 FK4 : ' None or empty battery
```



# Diagnosis

## The Error Classes

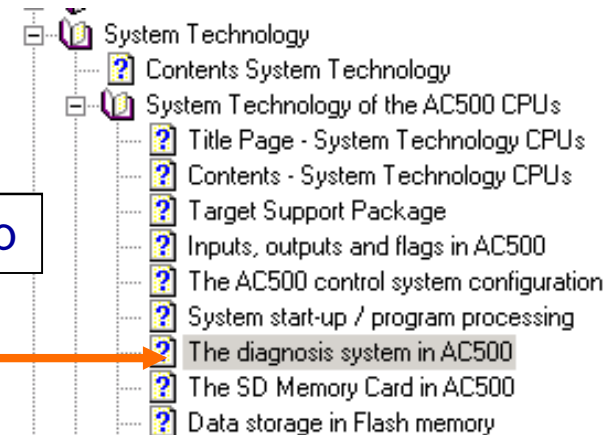
### Error class

#152502216: 'x 1970-01-01 00:01:13 FK4 : ' None or empty battery

### The error classes:

<b>E1</b>	<b>fatal</b>	the operating system is insecure: PLC is STOPPED
<b>E2</b>	<b>severe</b>	the program execution is insecure: PLC is STOPPED
<b>E3</b>	<b>light</b>	PLC behavior is defined by project configuration
<b>E4</b>	<b>warning</b>	PLC behavior is defined by project configuration

For more details see CoDeSys Help



# Diagnosis

## Error Lists: Example Battery Error

E1..E4	d1	d2	d3	d4	Identifier 000...063	AC500 display	<- displayed in 5)	
Class	Comp	Dev	Mod	Ch	Err	PS501 PLC browser		
Byte 6 Bit 6..7	-	Byte 3	Byte 4	Byte 5	Byte 6 Bit 0..5	FBP- diagnosis block		
Class	Inter- face	De- vice	Mod- ule	Chan- nel	Error identifier	Error message	Remedy	
	1)	2)	3)	4)				
<b>AC500 CPU errors</b>								
<b>Errors directly reported by the CPU</b>								
4	9	22	31	31	8	Missing or exhausted battery	Insert battery or set parameter "Check Battery" to "Off"	

For more details see CoDeSys Help

- System Technology
  - Contents System Technology
  - System Technology of the AC500 CPUs
    - Title Page - System Technology CPUs
    - Contents - System Technology CPUs
    - Target Support Package
    - Inputs, outputs and flags in AC500
    - The AC500 control system configuration
    - System start-up / program processing
    - The diagnosis system in AC500
    - The SD Memory Card in AC500
    - Data storage in Flash memory



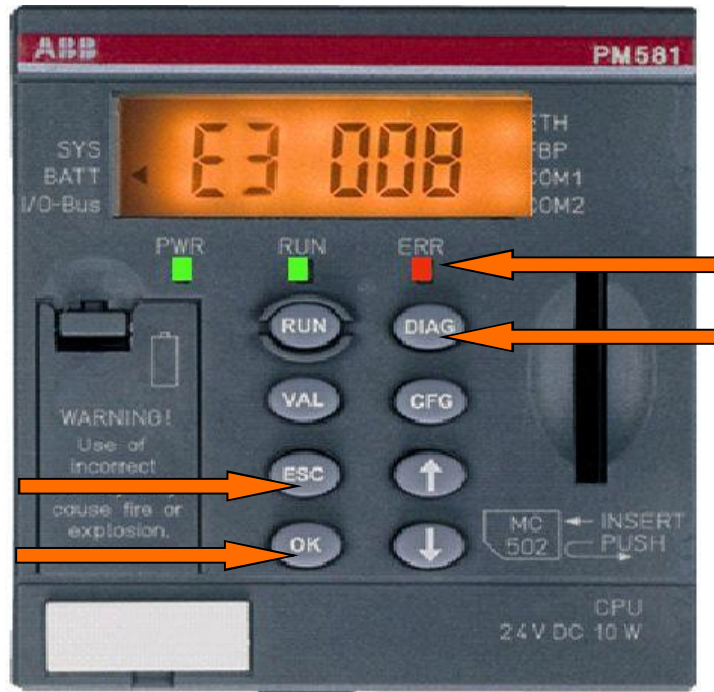
# Diagnosis Coming up



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# Diagnosis

## Local Diagnosis by Means of CPU's LCD Display



Errors are indicated by:

- The CPU's LED **ERR**
- The CPU's display:  
Error class / error number
- For each detail information push repeatedly the **DIAG** key:

detail information 1 = component

detail information 2 = device

detail information 3 = module

detail information 4 = channel

Exit display by pushing:

**ESC** without error acknowledgement or

**OK** with error acknowledgement

# Diagnosis

## Example: CPU display in case no battery/low battery voltage

Pushbutton	Display	Meaning
<DIAG>	E4 008	E4=Warning / Identifier = Empty/Not available
<DIAG>	d1 009	Detail information d1 = 009 -> Component=CPU
<DIAG>	d2 022	Detail information d2 = 022 -> Device=Battery
<DIAG>	d3 031	Detail information d3 = 031 -> Module=no specification
<DIAG>	d4 031	Detail information d4 = 031 -> Channel=no specification
<DIAG>	E4 008	E4=FK4 / Identifier = Empty/Not available
<ESC>	run/StoP	Diagnostic display is quit without error acknowledgement.
<DIAG>	E4 008	E4=FK4 / Identifier = Empty/Not available
<OK>	run/StoP	Diagnostic display is quit with error acknowledgement. If no further non-acknowledged errors exist, the LED "ERR" goes off.

**Note:** Diagnosis of AC500 PM55x and PM56x can only be shown by LED **ERR** at CPU

# Diagnosis Coming up



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# Diagnosis

## S500 I/O Modules: General



LED	Status	Color	LED = OFF	LED = ON	LED flashes
Inputs 00...31	digital input	yellow	Input = OFF	Input = ON (the input voltage is even displayed if the supply voltage is OFF).	--
UP	Process supply voltage 24 V DC via terminal	green	Process supply voltage is missing	Process supply voltage OK	--
CH-ERR1	Channel Error, error messages in groups (digital inputs combined into the groups 1, 2, 3, 4)	red	No error or process supply voltage is missing	Serious error within the corresponding group	Error on one channel of the corresponding group
CH-ERR2		red			
CH-ERR3		red			
CH-ERR4		red			
CH-ERR *)	Module Error	red	--	Internal error	--
*) All of the LEDs CH-ERR1 to CH-ERR4 light up together					

- Local diagnosis by means of LEDs on module
- Diagnosis over I/O-Bus or fieldbus
- Error description always to find in the documentation of the module

# Diagnosis

## Example AX521/AX522: LED Indication at Module



LED	Status	Color	LED = OFF	LED = ON	LED flashes
inputs 00...03 or 00...07	analog input	yellow	input is OFF	input is ON (brightness depends on the value of the analog signal)	--
outputs 00...03 or 00...07	analog output	yellow	output is OFF	output is ON (brightness depends on the value of the analog signal)	--
UP	process voltage 24 V DC via terminal	green	process voltage is missing	process voltage OK	--
CH-ERR2	Channel Error, error messages in groups (analog inputs or outputs combined into the groups 2 and 4)	red	no error or process voltage is missing	serious error within the corresponding group	error on one channel of the group
CH-ERR4		red			
CH-ERR *)	Module Error	red	--	internal error	--
*) Both LEDs (CH-ERR2 and CH-ERR4) light up together					



# Diagnosis

## Example AX521/AX522: Diagnosis (1)



E1..E4	d1	d2	d3	d4	Identifier 000..063	AC500 display	← Display in
Class	Comp	Dev	Mod	Ch	Err	PS501 PLC browser	
Byte 6 Bit 6..7	-	Byte 3	Byte 4	Byte 5	Byte 6 Bit 0..5	FBP diagnosis block	
Class	Inter- face	De- vice	Mod- ule	Chan- nel	Error identifier	Error message	Remedy
	1)	2)	3)	4)			
<b>Module error AX521 / AX522</b>							
3	14	1..7	31	31	19	Checksum error in the I/O module	Replace I/O module
	11 / 12	ADR	1..7				

Diagnosis evaluation for module and channel errors:

- S500 modules at I/O-Bus: AC500 display
- S500 modules connected via fieldbus : FBP diagnosis block (by means of Function Blocks)

# Diagnosis

## Example AX521/AX522: Diagnosis (2)



E1..E4	d1	d2	d3	d4	Identifier 000..063	AC500 display	← Display in
Class	Comp	Dev	Mod	Ch	Err	PS501 PLC browser	
Byte 6 Bit 6..7	-	Byte 3	Byte 4	Byte 5	Byte 6 Bit 0..5	FBP diagnosis block	
Class	Inter- face	De- vice	Mod- ule	Chan- nel	Error identifier	Error message	Remedy
	1)	2)	3)	4)			
<b>Channel error AX521 / AX522</b>							
4	14	1...7	1	0...3 0...7	48	Analog value overflow or broken wire at an analog input	Check input value or terminal
	11 / 12	ADR	1...7				
4	14	1...7	1	0...3 0...7	7	Analog value underflow at an analog input	Check input value
	11 / 12	ADR	1...7				
4	14	1...7	1	0...3 0...7	47	Short-circuit at an analog input	Check terminal
	11 / 12	ADR	1...7				
4	14	1...7	1	0...3 0...7	48	Analog value overflow at an analog output	Check output value
	11 / 12	ADR	1...7				
4	14	1...7	1	0...3 0...7	7	Analog value underflow at an analog output	Check output value
	11 / 12	ADR	1...7				

# Diagnosis

## CS31 Bus Module DC551-CS31: Local Diagnosis



LED	Status	Color	LED = OFF	LED = ON	LED flashes
PWR	System voltage	green	Missing internal system voltage or field bus supply is missing	Internal system voltage is OK	--
CS31	CS31 communication	green	No communication at the CS31 bus module	Communication at the CS31 bus OK	Diagnosis mode
S-ERR	Sum Error	red	No error or system voltage is missing	Internal error (storing can be parameterized)	--
I/O-Bus	Communication via the I/O-Bus	green	No expansion modules connected or data error	Expansion modules connected	Error I/O-Bus
Reserved	Not defined				
I0...I7	Digital inputs	yellow	Input = OFF	Input = ON (the input voltage is even displayed if the supply voltage is OFF)	
C8...C23	Digital inputs/outputs	yellow	Input/output = OFF	Input/output = ON (the input voltage is even displayed if the supply voltage is OFF)	
UP	Process supply voltage and initialization	green	Process voltage is missing	Process voltage OK	--
CH-ERR2	Channel Error, error messages in groups (digital inputs/outputs combined into the groups 2 to 4)	red	No error	Serious error within the corresponding group	Error on one channel of the corresponding group (e.g. short-circuit at an output)
CH-ERR3		red			
CH-ERR4		red			
CH-ERR *)	Module Error	red	No error or process voltage is missing	Internal error	--

\*) All LEDs CH-ERR2 to CH-ERR4 light up together

# Diagnosis

## FBP Interface Module DC505-FBP (1)



LED	Status	Color	LED = OFF	LED = ON	LED flashes
PWR	System voltage (supply voltage 24 V DC via FBP)	green	Missing internal system voltage or field bus supply is missing	Internal system voltage is OK	--
FBP	FBP communication	green	Communication with the field bus plug does not work correctly	Communication with the field bus plug is OK	Diagnosis mode
S-ERR	Sum error	red	No error or system voltage is missing	Internal error (storing can be parameterized)	--
I/O-Bus	Communication via the I/O-Bus	green	No expansion modules connected or data error	Expansion modules connected	Device is initializing OR Error I/O-Bus
Reserved	not defined				

# Diagnosis

## FBP Interface Module DC505-FBP (2)



LED	Status	Color	LED = OFF	LED = ON	LED flashes
I0...I7	Digital inputs	yellow	Input = OFF	Input = ON (the input voltage is even displayed if the supply voltage is OFF).	
C8...C15	Digital inputs/outputs	yellow	Input/output = OFF	Input/output = ON (the input voltage is even displayed if the supply voltage is OFF).	
UP	Process supply voltage and initialization	green	Process voltage is missing	Process voltage OK	--
CH-ERR1	Channel Error, error messages in groups (digital inputs/outputs combined into the groups 1 and 2)	red	No error	Serious error within the corresponding group	Error on one channel of the corresponding group (e.g. short-circuit at an output)
CH-ERR2		red			
CH-ERR *)	Module Error	red	No error or process supply voltage is missing	Internal error	--
*) Both LEDs CH-ERR1 and CH-ERR2 light up together					

# Diagnosis

## FieldBusPlug FBP: Example PDP22



PROFIBUS status		Device status		Status / cause
LED green H1	LED red H2	LED green H3	LED red H4	
off	off	off	off	Power supply is missing
on	flashes			Possible errors: - No connection to the bus master, e.g. PROFIBUS is not operating - The PDP21/PDP22 has a slave address that is not configured in the bus master - Parameter length and slave address are correct but the I/O configuration of the slave does not meet the configuration sent by the bus master
flashes	on			The device parameters received from the bus master are formal incorrect, e.g. of other length
off	on			Connection to the bus master is interrupted longer than the timeout set by the bus master before interruption
<b>on</b>	<b>off</b>			Normal data exchange to the PROFIBUS DP master
		<b>on</b>	<b>off</b>	Normal data exchange to the terminal device
flashes	flashes	flashes	flashes	Plug is under self-test during power-up
		flashes	off	Plug is waiting for configuration data to be sent from the device (number of input/output bytes, number of parameter bytes, internal baud rate etc.)  Note: If no data has been sent by the terminal device within 3 s, the plug switches to the parallel mode.
		off	flashes	Error: can be remedied, e.g. connection to the terminal device is broken
		off	on	Error: cannot be remedied, e.g. incorrect check sum in the Flash. Exchange the plug.

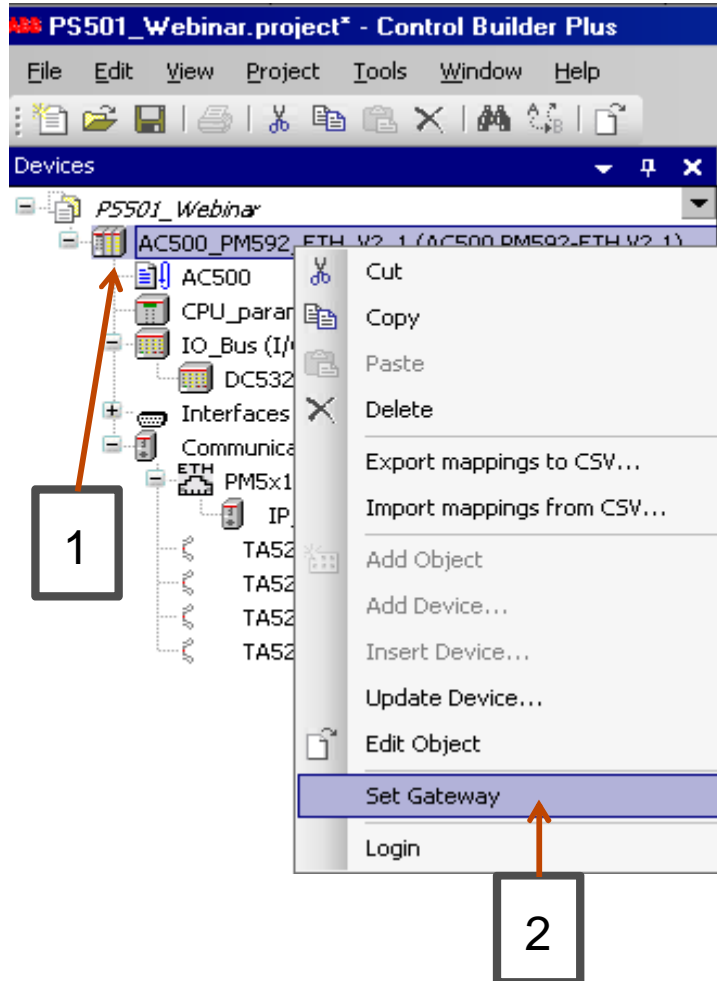
# Diagnosis Coming up



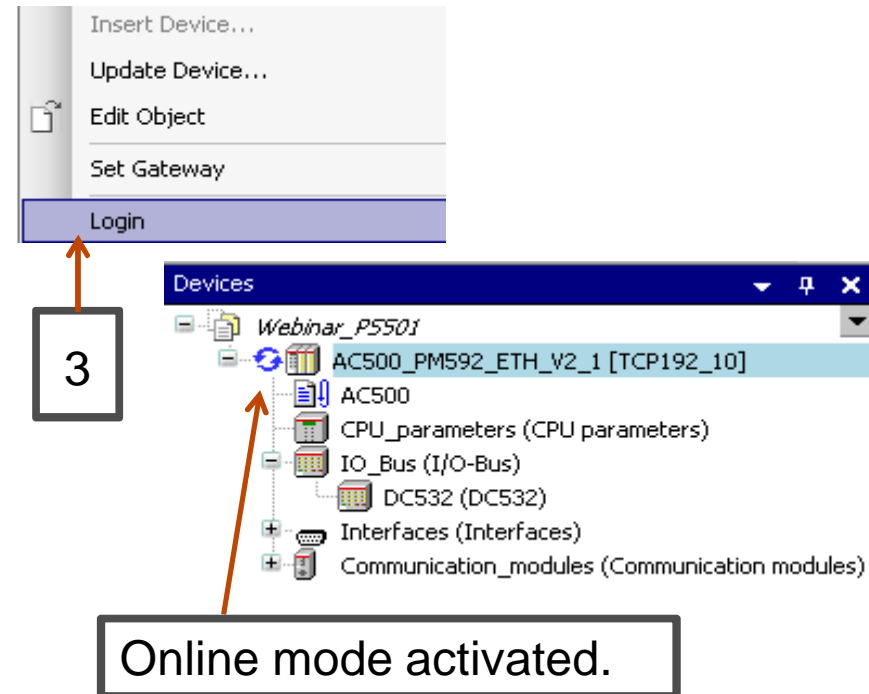
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# New features of PS501 Control Builder Plus

## New diagnosis features – Online access in CBP



- The Online diagnostics consists of a set of partly animated, mostly read only views.





# New features of PS501 Control Builder Plus

## New diagnosis features – Online Monitoring I/O in CBP

In Online mode, I/O component mapping tables are showing animated live values which are updated every second. No forcing available.

The screenshot displays the PS501 Control Builder Plus software interface. The 'Devices' tree on the left shows the project structure, with 'DC532 (DC532)' selected. The main window shows the 'DC532 I/O Mapping' tab, which contains a table of I/O channels. The 'Current Value' column is highlighted with a red box, indicating that the values are updated in real-time. A callout box with the text 'Online mode activated.' points to the 'DC532' component in the device tree.

Variable	Mapping	Channel	Address	Type	Current Value	Unit	Description
wDI_00_15		Inputs 0-15	%IW0	WORD	56832		Digital inputs...
		Bytes	%IB0				
byDI_00_07		Inputs 0-7	%IB0	BYTE	222		Digital inputs...
xDI_00		Input 0	%IX0.0	BOOL	FALSE		Input 0
xDI_01		Input 1	%IX0.1	BOOL	TRUE		Input 1
xDI_02		Input 2	%IX0.2	BOOL	TRUE		Input 2
xDI_03		Input 3	%IX0.3	BOOL	TRUE		Input 3
xDI_04		Input 4	%IX0.4	BOOL	TRUE		Input 4
xDI_05		Input 5	%IX0.5	BOOL	FALSE		Input 5
xDI_06		Input 6	%IX0.6	BOOL	TRUE		Input 6
xDI_07		Input 7	%IX0.7	BOOL	TRUE		Input 7
byDI_08_15		Inputs 8-15	%IB1	BYTE	0		Digital inputs...
		Inputs 16-31	%IW1				
		Inputs 16-31	%IW1	WORD	0		Digital In/Ou...
		Bytes	%IB2				
		Outputs 16-31	%QW0				
wDO_16_31		Outputs 16-31	%QW0	WORD	0		Digital In/Ou...
		Bytes	%QB0				
		Fast counter					

# New features of PS501 Control Builder Plus

## New diagnosis features – Online for CPU, I/O bus and CS31

Overview of the actual contents of the CPU diagnosis buffer

The screenshot shows the 'Webinar\_PS501\_project - Control Builder Plus' window. The 'Devices' tree on the left is expanded to show 'AC500\_PM592\_ETH\_V2\_1'. The main workspace is titled 'AC500\_PM592\_ETH\_V2\_1' and contains the 'CPU Diagnostics' section. This section has tabs for 'Start Page', 'IO\_Bus', 'DC532', and 'AC500\_PM592\_ETH\_V2\_1'. Below the tabs are buttons for 'Read Errors', 'Acknowledge', and 'Clear All Errors'. A table below these buttons displays the following data:

Index	State	Ack.	Class	Description	Online text	Time occ.	Time dis.	Time ack.	Comp	Dev	Mod	Ch	Err	Error number
0	Active	No	E4	Battery is missing or empty		1970-01-01 00:01:19	-	-	9	22	31	31	8	0152502216

A text box at the bottom right of the workspace contains the text: 'Online mode activated.'

# New features of PS501 Control Builder Plus

## New diagnosis features – Online/Show CPU statistics

The screenshot displays the 'Webinar\_PS501.project' window in 'Control Builder Plus'. The left sidebar shows a project tree with 'Webinar\_PS501' expanded to 'AC500\_PM592\_ETH\_V2\_1'. A box labeled '1' points to this tree. The main window has tabs for 'Start Page', 'IO\_Bus', 'DC532', and 'AC500\_PM592\_ETH\_V2\_1'. The 'Statistics' tab is active, showing 'CPU Diagnostics' and 'Version infos'. A box labeled '2' points to the 'Statistics' tab. The 'CPU Load' section shows 'Resource state: Run' and 'Battery state: 0%'. Below this is a table of CPU load statistics:

	Current	Min	Max	Avg
CPU Load:	10.00%	1.08%	88.79%	11.73%

The 'Date and time' section shows 'Current PLC Date and time: 1970-01-01 02:16:44'. The 'Application task statistics' section shows:

```
Number of Tasks: 1
Task 0: DefaultTask, ID: 15869472
Cycle count: 394207
Cycletime: 1 ms
Cycletime (min): 1 ms
Cycletime (max): 1 ms
Cycletime (avg): 1 ms
Status: RUN
Mode: CONTINUE
Priority: 10
Intervall: 10 ms
Event: NONE
Function pointer: 16#01F5D84C
Function index: 232
```

The 'I/O-Bus statistics' section shows:

```
--- I/O-Bus information ---
Baud rate [baud]: 1714286
Min. cycle time [us]: 600
Max. cycle time [us]: 50000
Last cycle time [us]: 733
--- I/O-Bus transmission quality ---
Total cycles: 9283162
Defective cycles/telegrams
```

	Total	Act. in series	Max. in series	Failure
Bus	0	0	0	
Module 1	0	0	0	NO

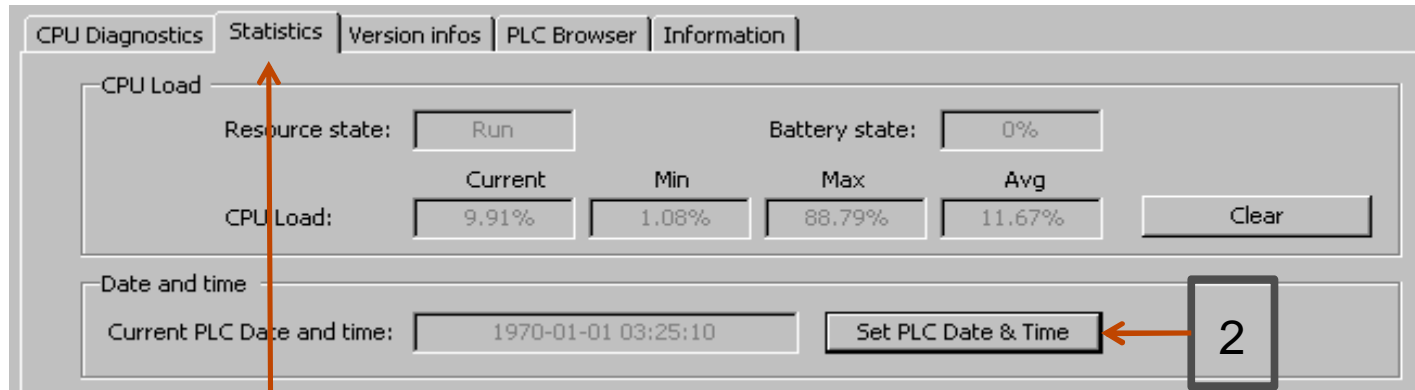
A box labeled 'Online mode activated.' points to the 'Statistics' tab. The 'Refresh' button is visible at the bottom of both the 'Application task statistics' and 'I/O-Bus statistics' sections.

- Actual resource run & battery load states are shown
- Information about the number of application tasks
- Information about the locally connected I/O Modules

# New features of PS501 Control Builder Plus

## New protocols and parameters – Clock Synchronization

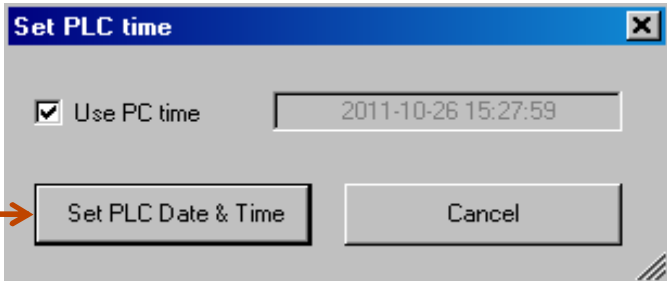
- Synchronize PLC RTC with PC clock



1

Online mode activated.

3



# New features of PS501 Control Builder Plus

## New diagnosis features – Online/Show Devices version info

Webinar\_PS501.project\* - Control Builder Plus

File Edit View Project Tools Window Help

Start Page IO\_Bus DC532 AC500\_PM592\_ETH\_V2\_1

Devices

Webinar\_PS501

AC500\_PM592\_ETH\_V2\_1

AC500

CPU\_parameters (CPU par)

IO\_Bus (I/O-Bus)

DC532 (DC532)

Interfaces (Interfaces)

Communication\_modules (C

CPU Diagnostics Statistics **Version infos** PLC Browser Information

PLC

```

AC500 PM592ETH(DISPLAY) : V2.3
AC500 PM592ETH(BOOT) : V2.0.6,2011-01-19 (Build:10249,09:01:58,Re1)
AC500 PM592ETH(FW) : V2.1.3,2011-07-26 (Build:11053)
    
```

Communication interfaces

No.	Name	Man. Date	Ser.No. Dev.No.	FW Version FW Name
Int. 1	PM5x1 Ethernet	n.a.	0000000051 n.a.	V1.3.2-STABLE LwIP - Lightweight IP Stack
Ext. 1	none	n.a.	n.a. n.a.	n.a. n.a.
Ext. 2	none	n.a.	n.a. n.a.	n.a. n.a.
Ext. 3	none	n.a.	n.a. n.a.	n.a. n.a.
Ext. 4	none	n.a.	n.a. n.a.	n.a. n.a.

I/O-Bus modules

```

Module 1
Name DC532
Ident 1200
HW versions 000 000 000 000
SW versions 1.9.1 1.9.1 1.9.1 1.9.1
Min. cycle time [us]: 600
Module prm. (num./size): 6/ 7
Production data not available
Slots
type(def./prm.) format channels prm.(num./size) group log.num./offset
in / in X 16 0/ 0 0 0/ 0
inout / inout X 8 0/ 0 0 1/ 16
inout / inout X 8 0/ 0 0 2/ 24
????? / empty DW 2 0/ 0 1 3/ 24
????? / empty B 2 0/ 0 1 4/ 24
????? / empty DW 4 0/ 0 2 5/ 24
????? / empty B 2 0/ 0 2 6/ 24
    
```

flashdisk

FW Date: 110301b4

1

2

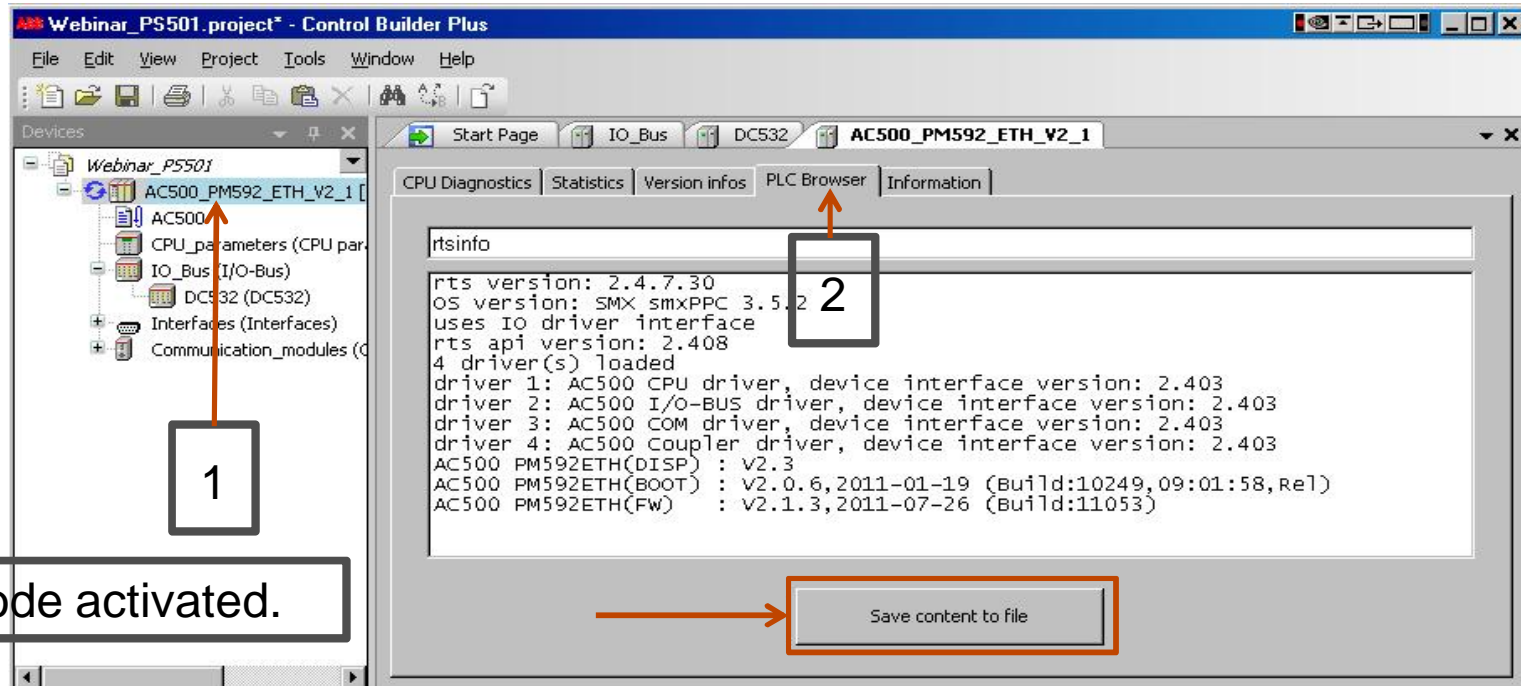
Online mode activated.

- CPU firmware versions, display, boot and FW
- All internal / external communication module firmware versions
- All versions figures of configured / mounted local I/O –modules

# New features of PS501 Control Builder Plus

## New diagnosis features – PLC Browser in CBP

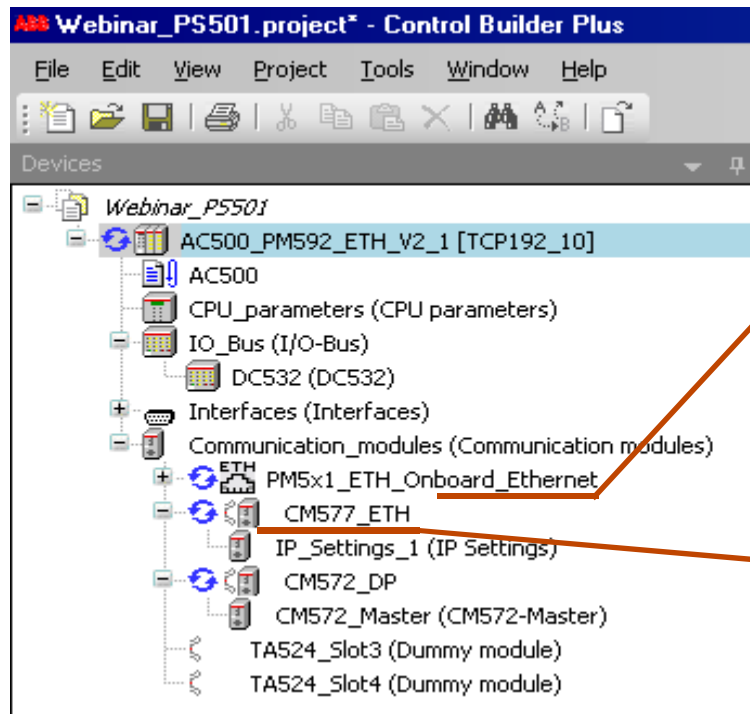
- All supported PLC Browser commands can be entered.
- Via “*Save content to file*” the contents of window can be saved to a text file.



# New features of PS501 Control Builder Plus

## New diagnosis features – Online for Onboard-ETH & CM577

- Diagnosis on internal and external ETH couplers



Onboard Ethernet Statistics		PM5x1-ETH - Onboard Ethernet Configuration	
Onboard Ethernet hardware driver statistics			
Invalid receive frame length errors	0		
Non octet errors	0		
Short frame errors	0		
Crc checksum errors	0		
Receive overruns	0		
Receive frame truncated errors	0		
Transmit heartbeat errors	0		
Late collisions detected	0		
Retransmission limit reached	0		
Carrier sense lost	0		
Transmitted bytes, throughput	433829	(4955/s)	
Received bytes, throughput	340892	(1961/s)	

Onboard Ethernet throttling statistics	
Receive throttling state	active
Receive throttling method	Bytes/packets per second
Receive bytes per second limit	400000
Receive packets per second limit	1000
Transmit throttling state	inactive, faulted
Transmit throttling method	Bytes/packets per second
Transmit bytes per second limit	400000
Transmit packets per second limit	1000
Current blocked receive side	7
Current blocked transmit side	0

Diagnostics for ext. Ethernet		CM577-ETH Configuration		Information	
Firmware Information		Parameter		Value	
CIF Stack task info		Task state		1	
Device Information		Error count		0	
OMB - Task Information		Last error		0	
OMB - Client		Socket status		15	
OMB - Server		Cyclic event count		3901	
OMB - IO					
TCP_UDP - Task Information					
TCP_UDP - Code Diag					
IP - Task Information					
IP - Ethernet Status					
IP - Ethernet Count					
IP - Packet Count					
IP- Code Diag					

Online mode activated.



# New features of PS501 Control Builder Plus

## New diagnosis features – Online for Profibus Master/Slaves

- Different diagnosis available for Profibus-DP Master / Slaves

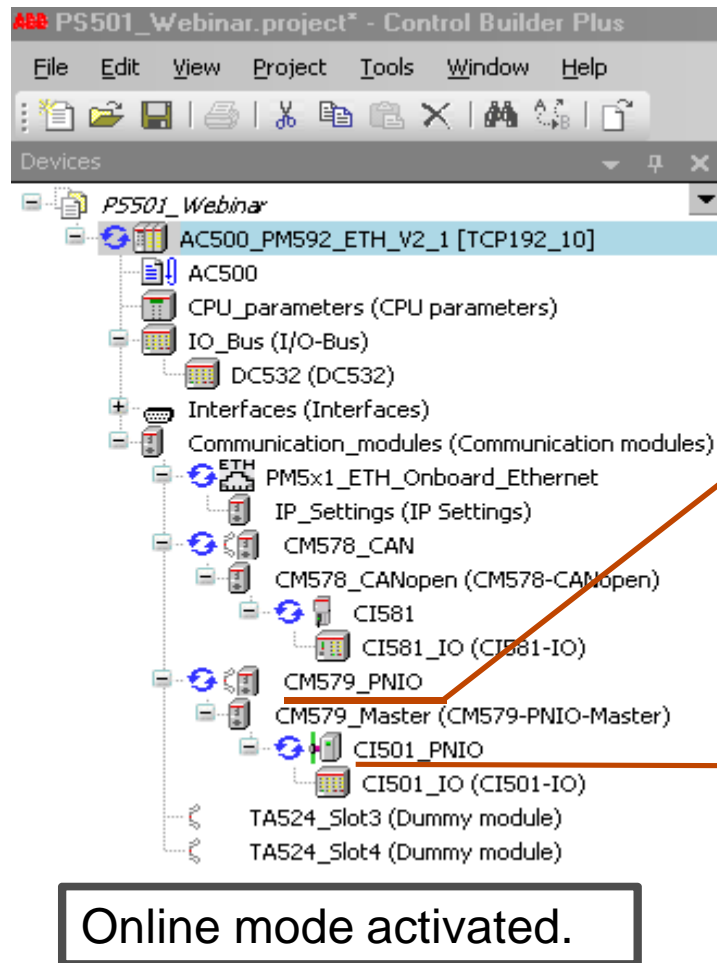
The screenshot displays the ABB Control Builder Plus interface. On the left, a tree view shows the project structure for 'Webinar\_PS501', including communication modules like 'CMS572\_DP' and 'CMS572\_Master (CMS572-Master)'. Two orange arrows point from the 'Master' and 'Slave' labels to the respective components in the tree. The main window shows the 'Diagnostics for Profibus' tab, with 'Station Diagnosis' selected. Below this, a grid of 127 status indicators (0-126) is shown. Indicator 2 is highlighted in green, indicating it is 'Active'. A legend at the bottom of the grid defines the colors: Not configured (white), Active (green), Diagnosis (yellow), Not found (cyan), and Error (red). Below the grid, the 'Station error' section shows 'Station address' as 0 and 'Error event' as 'No error'. A large text box at the bottom of the screenshot states 'Online mode activated.'



# New features of PS501 Control Builder Plus

## New diagnosis features – Online for Profinet Master/Slaves

- Different diagnosis available for Profinet Master / Slaves



Diagnostics for Profinet | CM579-PNIO Configuration | Information

List of Slaves

- Common status block
- Firmware identification
- NetX stack task info

Task	Name	Instance	Handle	Identifier	Version	Num...	Priority
0	RX_IDLE	0	8007CBF4	0	0.0	63	-1
1	RX_TIMER	0	8007BE54	0	0.0	1	-1
2	RX_SYSTEM	0	800892E0	10001	1.16	8	-1
3	DPM_COMO_SMBX	0	800927B8	2F0002	1.0	50	-1
4	DPM_COMO_RMBX	0	80092C60	2F0002	1.0	51	-1
5	TlrTimer	0	80093508	0	0.0	57	-1
6	T_PNIO_EDD	0	800945B0	E0001	1.0	17	-1
7	T_PNIO_ACP	0	80095658	110001	1.0	18	-1
8	T_PNIO_DCP	0	80096700	120001	1.0	19	-1
9	T_PNIO_MGT	0	800977A8	130001	1.0	20	-1
10	TCP_UDP	0	80098850	80000	2.1	21	-1
11	T_RPC	0	800998F8	2E0001	1.0	22	-1
12	T_PNIO_CMCTL	0	8009A9A0	A0001	1.0	23	-1
13	T_PNIO_APCTL	0	8009BA48	C0001	1.0	24	-1
14	T_PNIO_APCFG	0	8009CAFO	140001	1.0	25	-1

Diagnostics for Profinet slave | PROFINET slave | PNIO Configuration | Information

Profinet Slave node info

- Firmware identification

Node state

Node unknown  Node inactive  Node active  Node active with not acknowledged alarms  Node active with acknowledged alarms

Node data

Station name:  Diagnosis state:

Vendor ID:  Device ID:

IP-Address:  MAC Address:

Alarm data

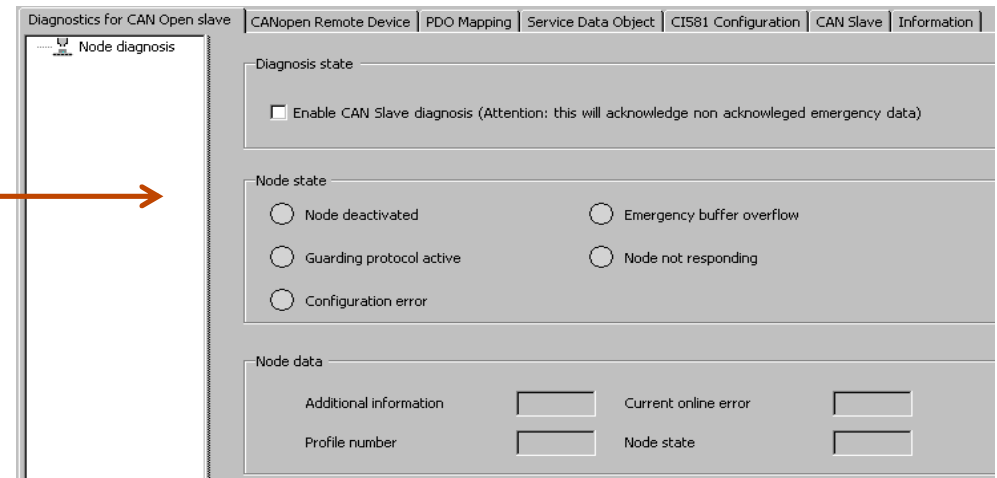
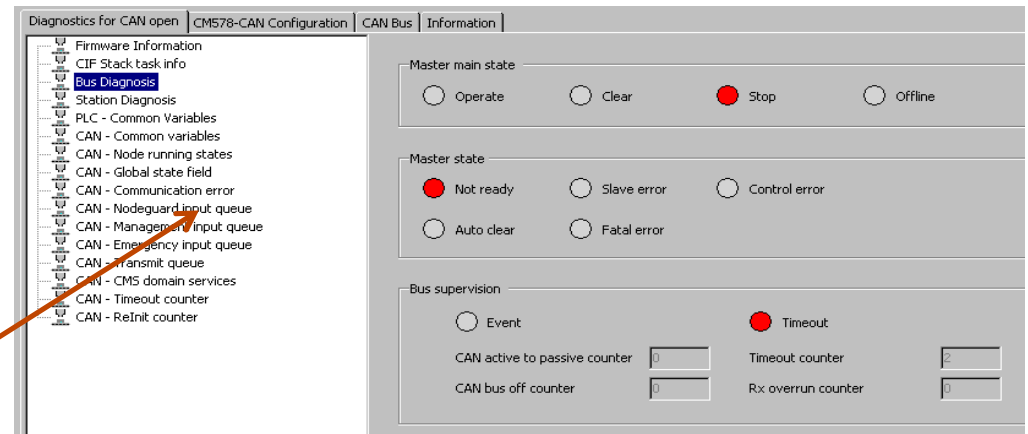
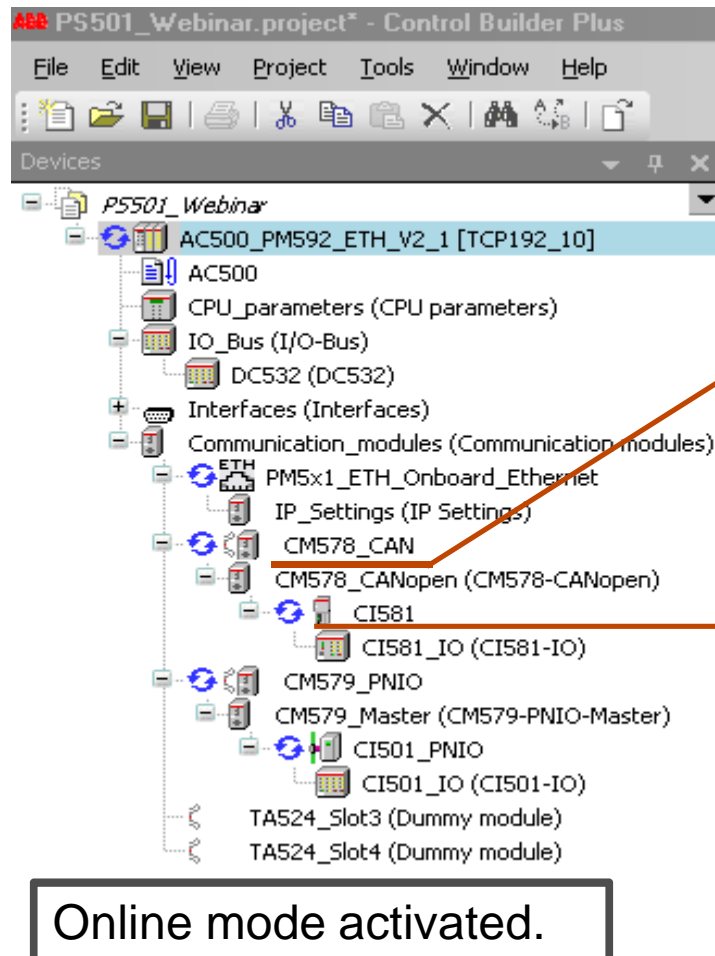
Time occ.	Time ack.	Slot	SubSlot	Module...	Submo...	Alarmp...	Alarm t...	Specifier

Online mode activated.

# New features of PS501 Control Builder Plus

## New diagnosis features – Online for Canopen Master/Slaves

- Different diagnosis available for CanOpen Master / Slaves



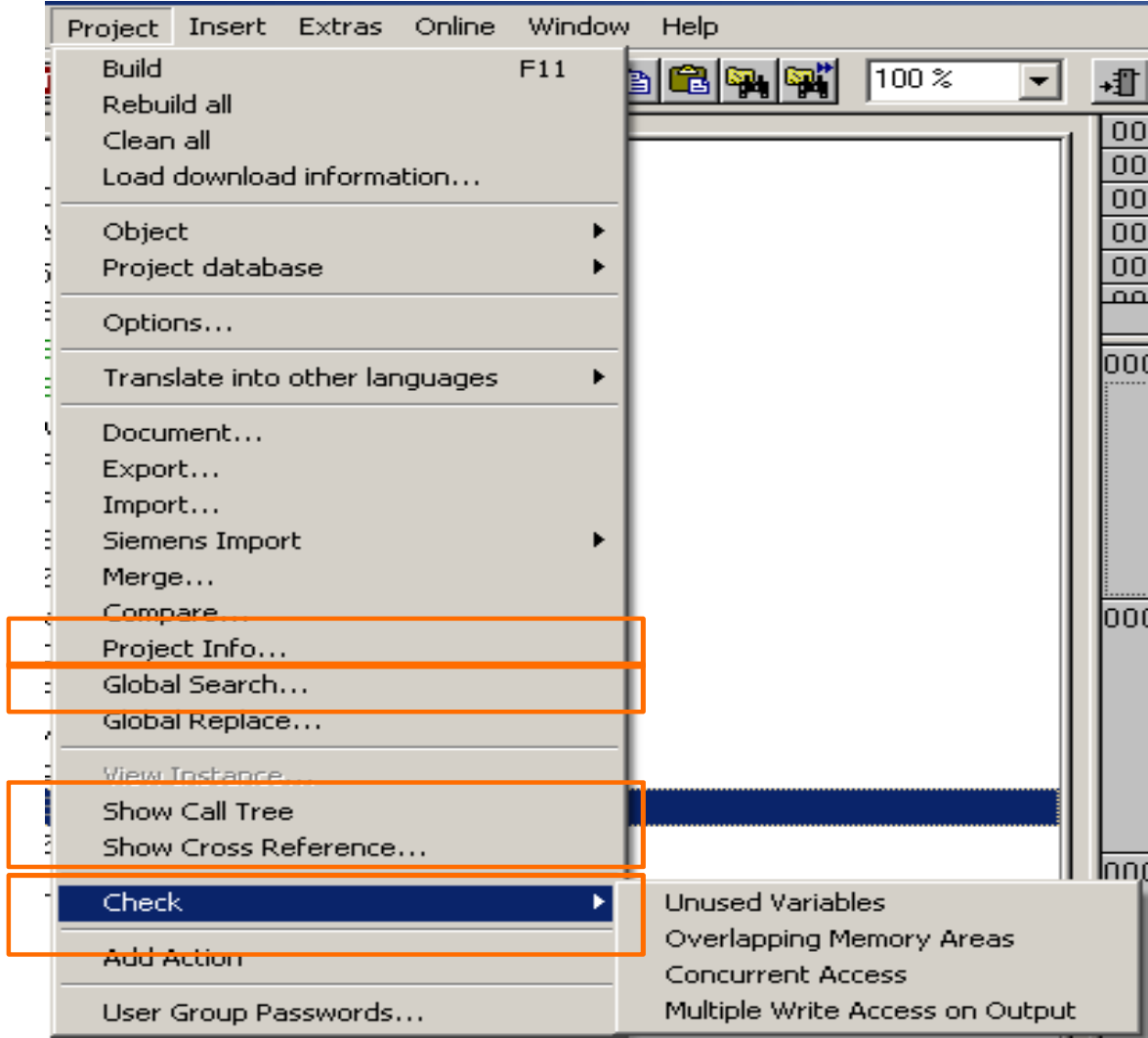
# Diagnosis Coming up



- Diagnosis System
- Local diagnosis at the CPU
- Local diagnosis at the modules
- Diagnosis in Control Builder Plus
- **PS501 tools and status bar**
- PS501 PLC-Browser
- Diagnosis by use of library SysInt\_AC500\_Vxx.LIB
- Diagnosis by use of library Diag\_AC500\_Vxx.LIB
- Extended diagnosis for fieldbus slaves

# Diagnosis

## Diagnosis tools in CoDeSys Project



# Diagnosis

## Diagnosis tools in CoDeSys Project

Login	Alt+F8
Logout	Ctrl+F8
Download	
Run	F5
Stop	Shift+F8
Reset	
Reset (cold)	
Reset (original)	
Toggle Breakpoint	F9
Breakpoint Dialog	
Step over	F10
Step in	F8
Single Cycle	Ctrl+F5
Write Values	Ctrl+F7
Force Values	F7
Release Force	Shift+F7
Write/Force-Dialog	Ctrl+Shift+F7
Show Call Stack...	
Display Flow Control	
Simulation Mode	
Communication Parameters...	
Sourcecode download	
Send marked text to RemoteControl Master (e.g. as parameter)	
Create boot project	
Write file to PLC	
Read file from PLC	
Show file information	

# Diagnosis

## Status Line in PS501: Connection and PLC status

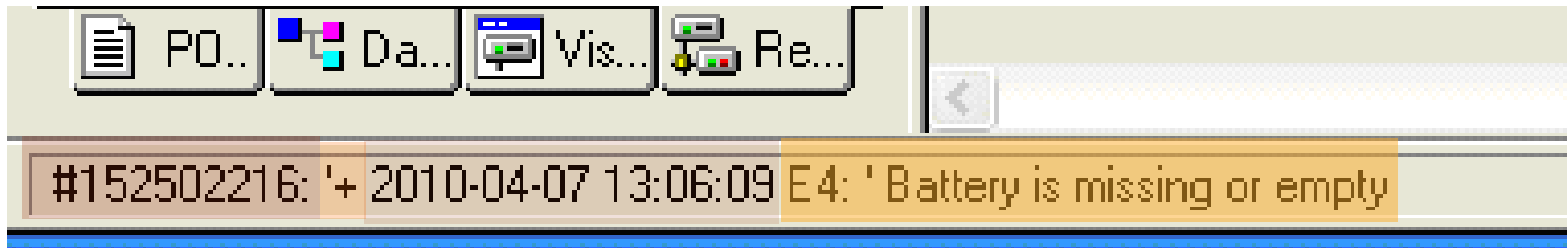
Visible in the right down corner of the screen.



Name of the communication profile

# Diagnosis

## Status Line in PS501: Example Battery Error



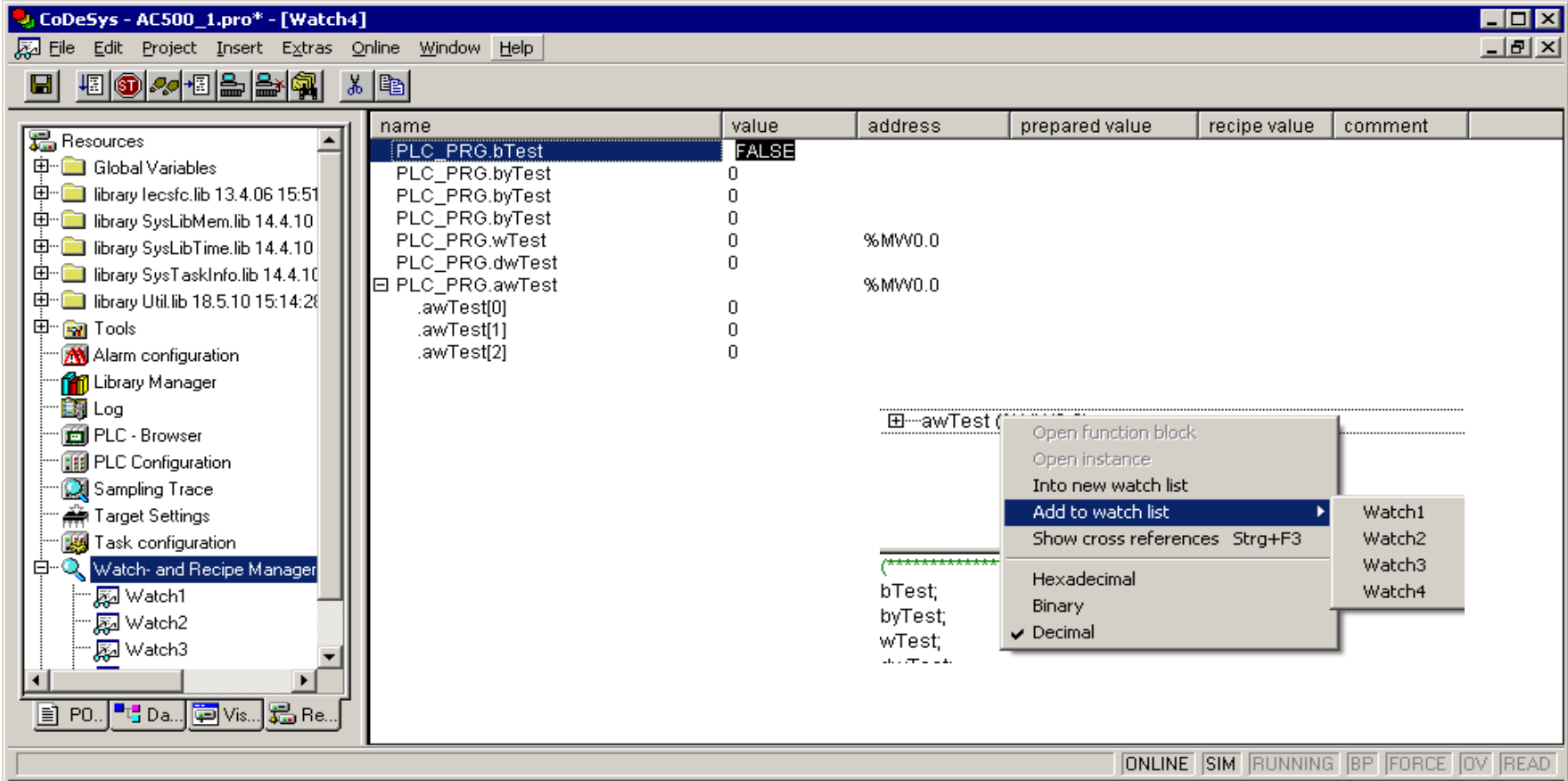
- Error number
- One of the attributes:
  - + come
  - gone
  - X acknowledgement
- Time stamp
- Error class and description

The error text is read from the file Errors.ini located in the directory  
..\Targets\ABB\_AC500 or ..\Targets\ABB\_AC500\AC500\_V12

# New features of PS501 Control Builder Plus

## New diagnosis features – Watch & Receipt Manager

- Due to activate the new features set the check in “Project/Options/Desktop/Tabular watch editor“
- The watch window displays the values in a table oriented view



The screenshot shows the CoDeSys software interface with the Watch and Recipe Manager window open. The window title is "CoDeSys - AC500\_1.pro\* - [Watch4]". The menu bar includes File, Edit, Project, Insert, Extras, Online, Window, and Help. The toolbar contains various icons for file operations and execution. The left sidebar shows a tree view of resources, including Global Variables, library files, Tools, Alarm configuration, Library Manager, Log, PLC - Browser, PLC Configuration, Sampling Trace, Target Settings, Task configuration, and Watch- and Recipe Manager. The main area displays a table of variables and their values:

name	value	address	prepared value	recipe value	comment
PLC_PRG.bTest	FALSE				
PLC_PRG.byTest	0				
PLC_PRG.byTest	0				
PLC_PRG.byTest	0				
PLC_PRG.wTest	0	%MW0.0			
PLC_PRG.dwTest	0				
PLC_PRG.awTest	0	%MW0.0			
.awTest[0]	0				
.awTest[1]	0				
.awTest[2]	0				

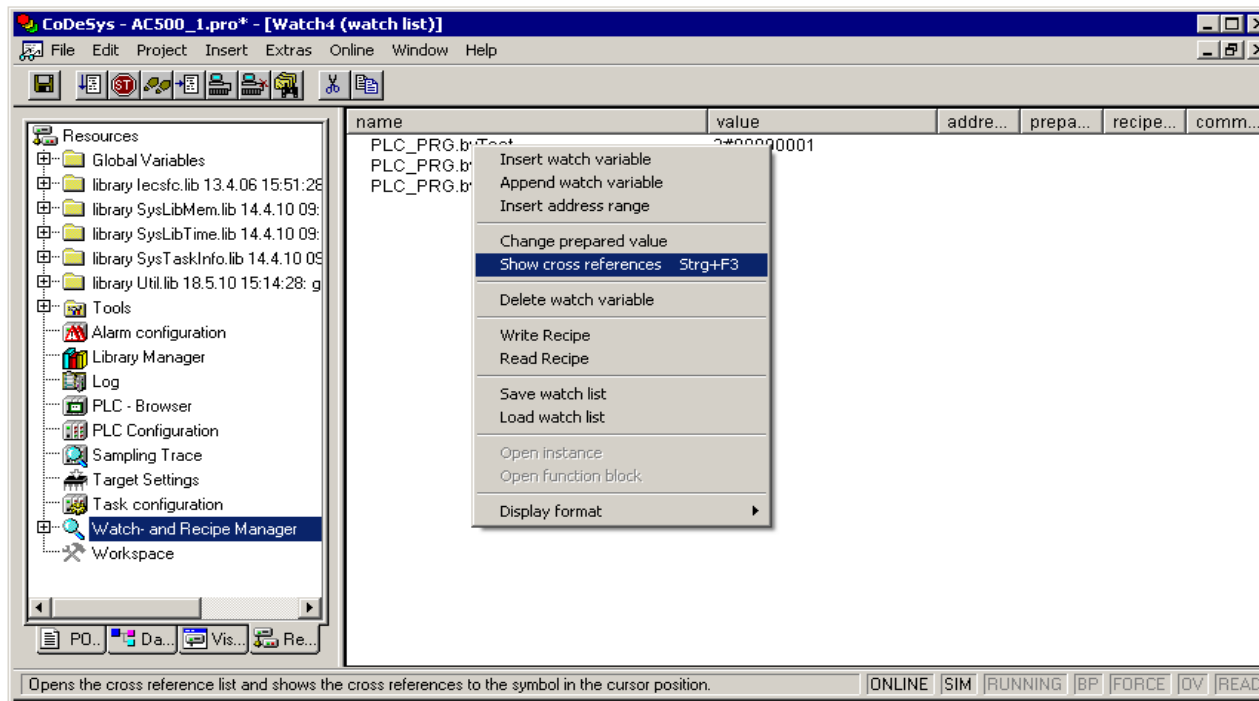
A context menu is open over the 'awTest' variable, showing options like 'Open function block', 'Open instance', 'Into new watch list', 'Add to watch list', 'Show cross references Strg+F3', 'Hexadecimal', 'Binary', and 'Decimal'. The 'Add to watch list' option is selected, and a sub-menu is open showing 'Watch1', 'Watch2', 'Watch3', and 'Watch4'.



# New features of PS501 Control Builder Plus

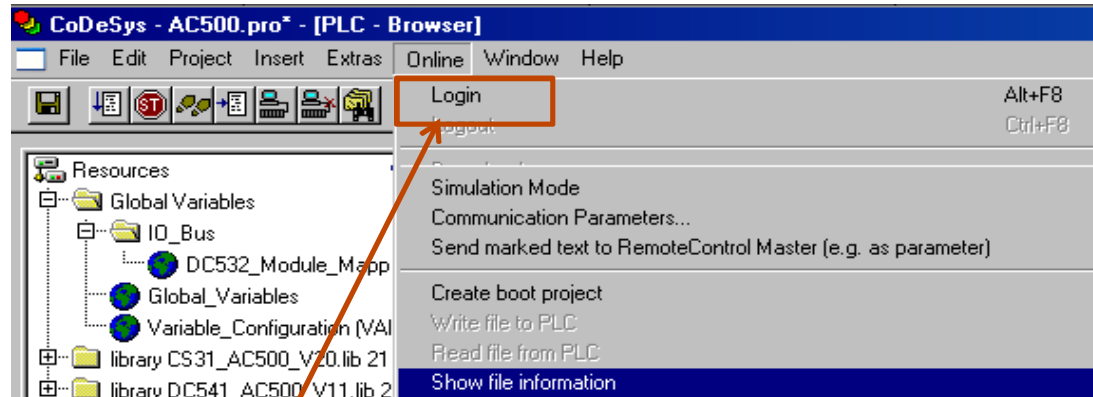
## New diagnosis features – Cross references functions

- The cross reference list is extended with:
  - Open cross reference list from the watch window and list from language editor
  - Including the visualization to the cross reference list
  - Including arrays, structures and addresses



# New features of PS501 Control Builder Plus

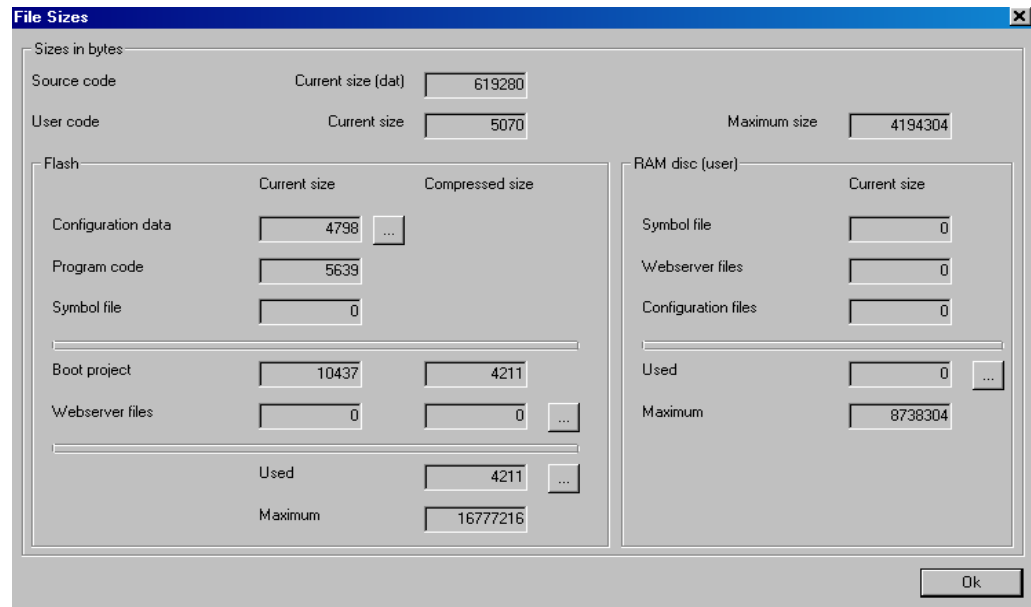
## New diagnosis features – Online/Show file information



- Display sizes of programs & Visualization

1

2



# Diagnosis Coming up

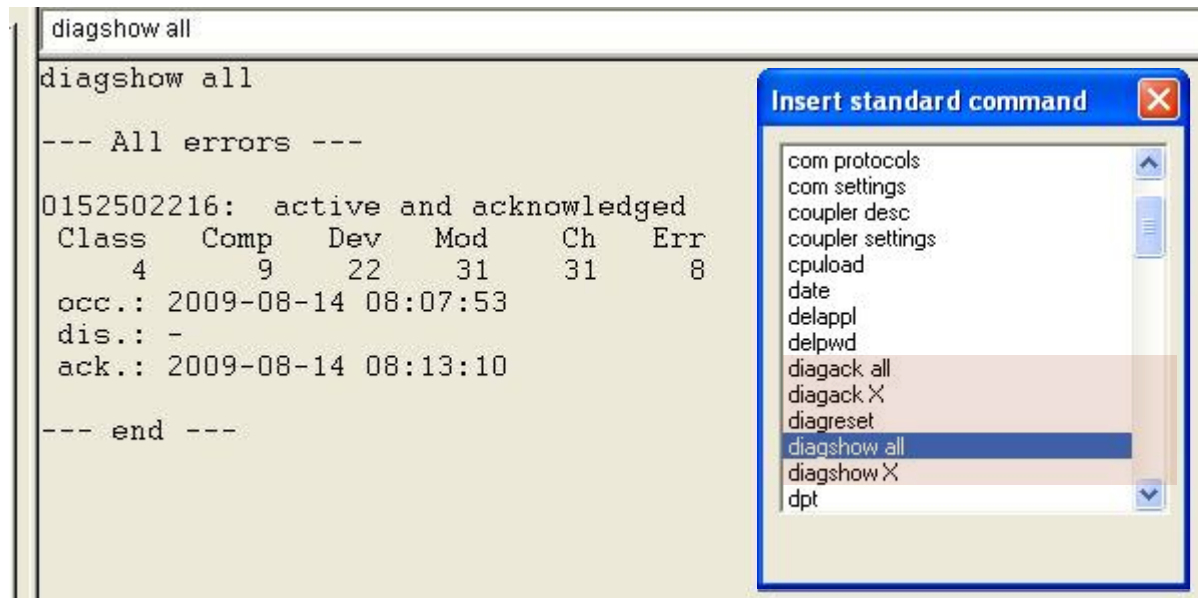


- Diagnosis System
- Local diagnosis at the CPU
- Local diagnosis at the modules
- Diagnosis in Control Builder Plus
- PS501 tools and status bar
- **PS501 PLC-Browser**
- Diagnosis by use of library SysInt\_AC500\_Vxx.LIB
- Diagnosis by use of library Diag\_AC500\_Vxx.LIB
- Extended diagnosis for fieldbus slaves

# Diagnosis

## PLC- Browser: Commands for Diagnosis

1. Login into PLC
2. Click at “Resources“/“PLC-Browser“
3. Click at “...“ button and select a command
4. Press <Enter> key



```
diagshow all
diagshow all
--- All errors ---
0152502216: active and acknowledged
Class  Comp   Dev   Mod   Ch   Err
   4     9    22    31   31    8
occ.: 2009-08-14 08:07:53
dis.: -
ack.: 2009-08-14 08:13:10
--- end ---
```

The screenshot shows a terminal window with the command 'diagshow all' entered and its output. The output includes a table of error details for a specific device. An 'Insert standard command' dialog box is open on the right, listing various commands, with 'diagshow all' selected.

diagshow all: Shows all errors

diagshow X: Shows all errors of the class X (with X= 1...4)

diagack all: Acknowledges all errors (except errors that have to be quit exclusively)

diagack X: Acknowledges all errors of the class X (with X= 1...4)

diagreset: Resets the diagnosis system (clears error buffer)


# Diagnosis

## PLC- Browser: Example Battery Error (1)

Error number

Error appearance

```
diagshow all
diagshow all
--- All errors ---
0152502216: active not acknowledged
Class   Comp   Dev   Mod   Ch   Err
   4     9    22   31   31   8
occ.: 2010-04-07 13:06:09
dis.: -
ack.: -
--- end ---
```

E1..E4	d1	d2	d3	d4	Identifier 000...063	AC500 display 
Class	Comp	Dev	Mod	Ch	Err	PS501 PLC browser

# Diagnosis

## PLC- Browser: Example Battery Error (2)

**Error acknowledge**

```
diagack all
diagack all
All errors quit - except explicit ack
```

**Error acknowledged**

```
diagshow all
diagshow all
--- All errors ---
0152502216: active and acknowledged
Class  Comp  Dev  Mod  Ch  Err
   4    9   22   31   31   8
occ.: 2010-04-07 13:06:09
dis.: -
ack.: 2010-04-07 13:10:15
--- end ---
```

**Error vanished**

```
diagshow all
diagshow all
--- All errors ---
0152502216: inactive and acknowledged
Class  Comp  Dev  Mod  Ch  Err
   4    9   22   31   31   8
occ.: 2010-04-07 13:06:09
dis.: 2010-04-07 13:11:35
ack.: 2010-04-07 13:10:15
--- end ---
```

Insert standard command

- coupler desc
- coupler settings
- cpupload
- date
- delappl
- delpwd
- diagack all
- diagack X
- diagreset
- diagshow all
- diagshow X
- dpt
- filecopy
- filedelete

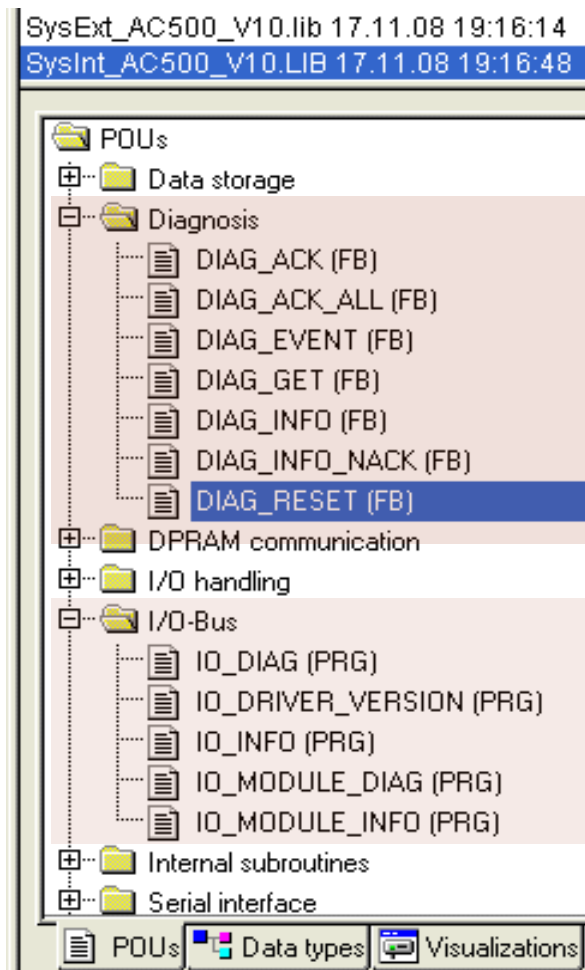
# Diagnosis Coming up



- Diagnosis System
- Local diagnosis at the CPU
- Local diagnosis at the modules
- Diagnosis in Control Builder Plus
- PS501 tools and status bar
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- **Diagnosis by use of library SysInt\_AC500\_Vxx.LIB**
- Diagnosis by use of library Diag\_AC500\_Vxx.LIB
- Extended diagnosis for fieldbus slaves

# Diagnosis

## Library SysInt\_AC500\_Vxx.LIB



### POUs Diagnosis

- Represent PLC- Browser commands in the PLC program and more  
Example:  
DIAG\_RESET: Reset of the error buffer by means of external signal
- DIAG\_EVENT for creating user defined error indication at CPU display
- Read the description before use!

### POUs I/O-Bus

- I/O-Bus and module diagnosis
- Further information



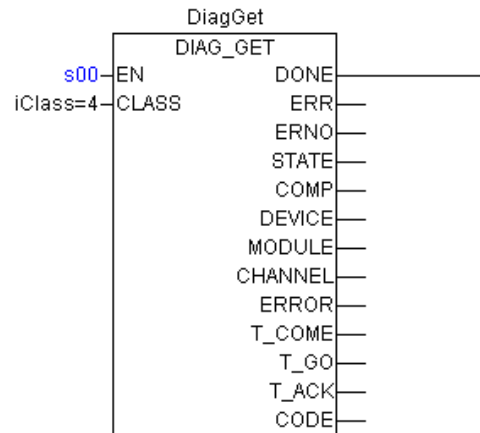
# Diagnosis

## Example Battery Error

```

0002 | ▢--DiagGet
0003 |   ..EN = TRUE
0004 |   ..CLASS = 4
0005 |   ..DONE = FALSE
0006 |   ..ERR = FALSE
0007 |   ..ERNO = 0
0008 |   ..STATE = 2
0009 |   ..COMP = 9
0010 |   ..DEVICE = 22
0011 |   ..MODULE = 31
0012 |   ..CHANNEL = 31
0013 |   ..ERROR = 8
0014 |   ..T_COME = DT#2010-04-07-13:32:13
0015 |   ..T_GO = DT#1970-01-01-00:00
0016 |   ..T_ACK = DT#1970-01-01-00:00
0017 |   ..CODE = 957808584
0018 |   iClass = 4
0019 |

```



```

diagshow all

diagshow all

--- All errors ---

0152502216: active not acknowledged
Class   Comp   Dev   Mod   Ch   Err
      4     9    22   31   31    8
occ.: 2010-04-07 13:32:13
dis.: -
ack.: -

--- end ---

```

### Function Block **DIAG\_GET**:

- 0-1 edge on EN input reads the oldest not read error
- The next 0-1 edge on EN reads the next one

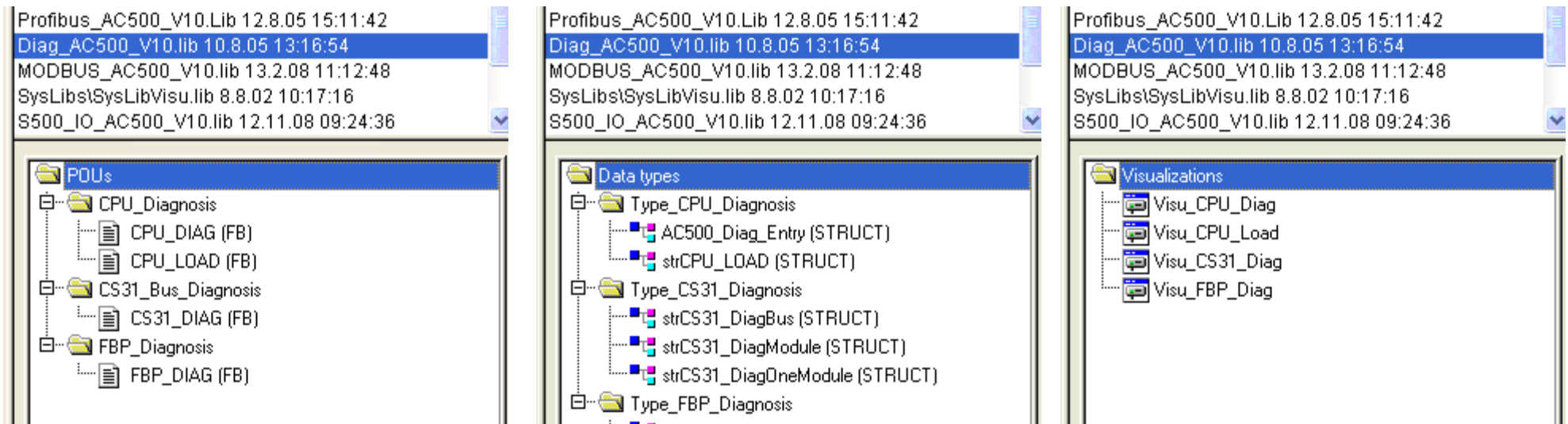
# Diagnosis Coming up



- Diagnosis System
- Local diagnosis at the CPU
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- Diagnosis in Control Builder Plus
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- Extended diagnosis for fieldbus slaves

# Diagnosis

## Library Diag\_AC500\_Vxx.LIB

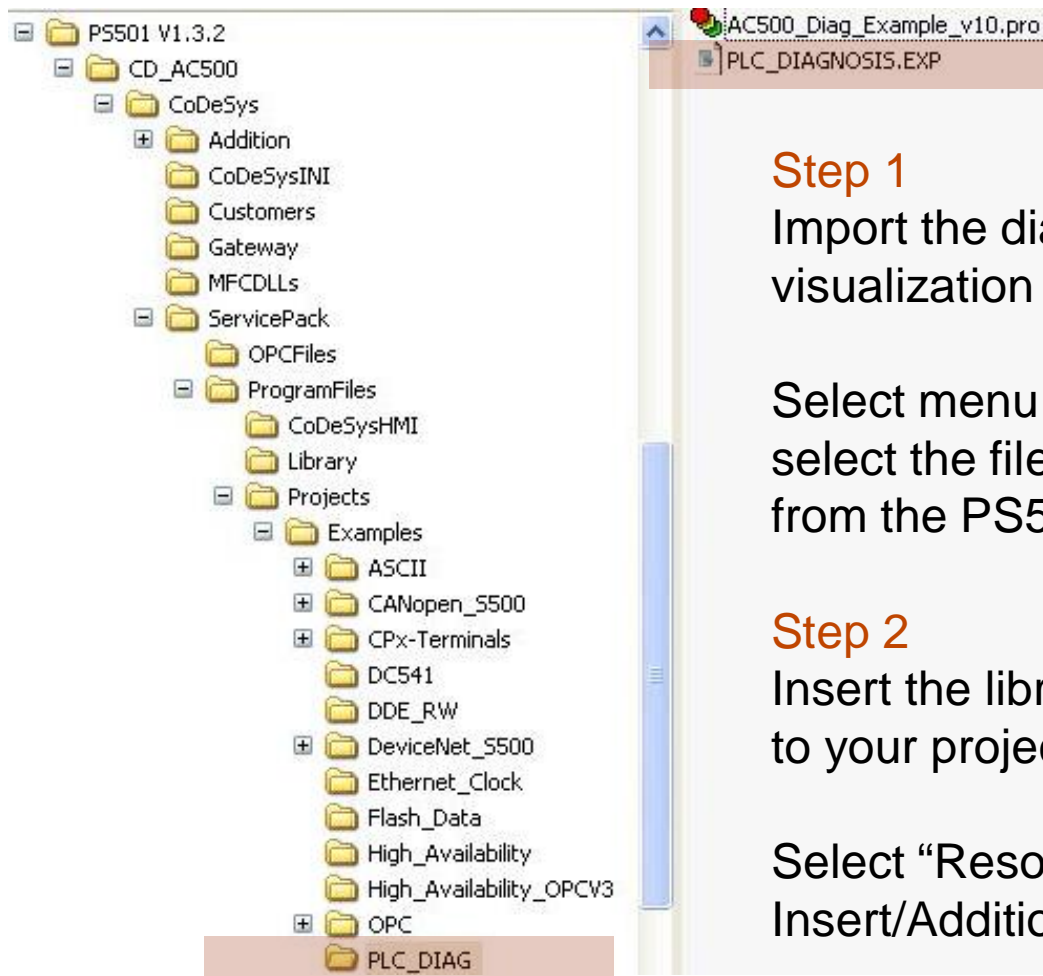


The library enables a direct access to following diagnosis with integrated visualisation:

- Reading the AC500 diagnosis buffer and CPU capacity utilization
- Diagnosis of the communication modules
- Diagnosis of S500 I/O modules mounted at I/O-Bus (central extension)
- Diagnosis of S500 I/O modules at CS31-Bus (decentral extension)
- Diagnosis of the FBP slave interface

# Diagnosis

## Import of the Prepared Diagnosis into a User Program (1)



### Step 1

Import the diagnosis program and visualization into your project:

Select menu item “Project/Import“ and select the file PLC\_DIAGNOSIS.EXP from the PS501 installation CD

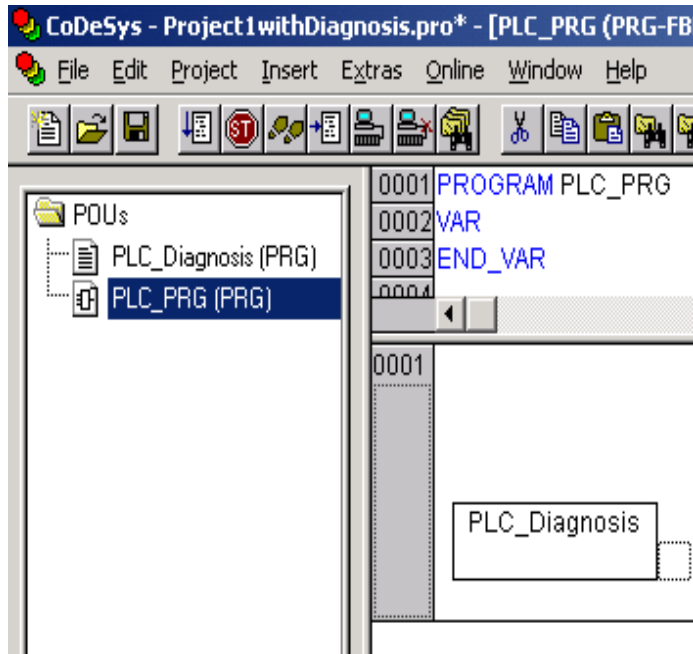
### Step 2

Insert the library DIAG\_AC500\_Vxx.LIB to your project:

Select “Resources/Library Manager/ Insert/Additional library...”

# Diagnosis

## Import of the Prepared Diagnosis into a User Program (2)

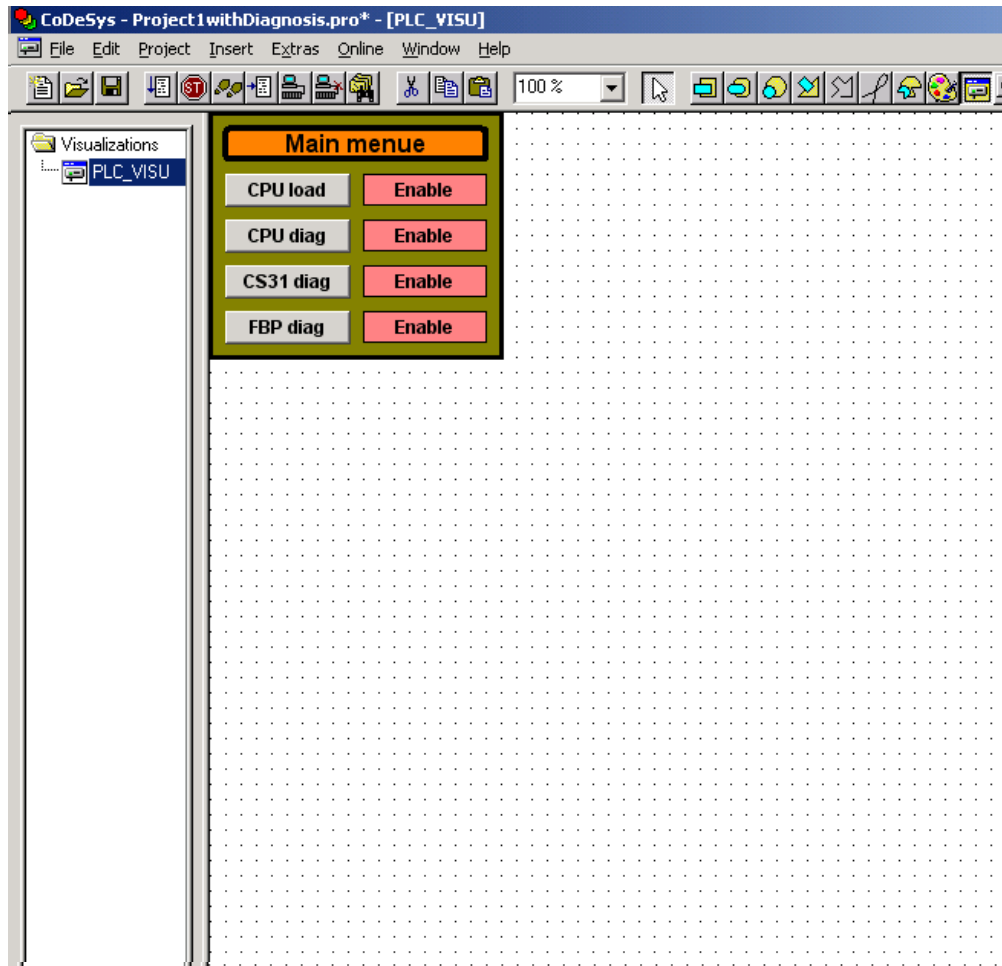


### Step 3

The program PLC\_Diagnosis has to be called in the task (here PLC\_PRG)

# Diagnosis

## Import of the Prepared Diagnosis into a User Program (3)



### Step 4

In the tab “Visualizations” there is a POU PLC\_VISU

Use this start screen to enable and switch to 4 different diagnosis screens as:

- CPU load
- CPU diag
- CS31 diag
- FBP diag

Use for each diagnosis a template from the library

# Diagnosis Visualization Template CPU Load

The screenshot shows the CoDeSys interface with a library manager on the left and a visualization template on the right. The library manager lists various system libraries, with 'Diag\_AC500\_V10.lib 10.8.06' selected. The visualization template, titled 'Auslastung / CPU load', includes a 'Simulation' button, an 'Enable' button, and a 'HEAP check' button. It also features a table for monitoring CPU load metrics and five horizontal bar charts showing the current load percentage.

**Library Manager:**

- standard.lib 4.10.05 12:14:41
- lecsfc.lib 13.4.06 16:51:28
- Util.lib 1.6.07 10:40:58
- SysLibTime.lib 18.7.05 09:39
- SysExt\_AC500\_V10.lib\*17.11
- SysInt\_AC500\_V10.lib\*17.11
- BusDiag.lib 27.8.04 15:06:10
- Diag\_AC500\_V10.lib 10.8.06**
- SysTaskInfo.lib 18.7.05 09:39
- SysLibMem.lib 18.7.05 09:39
- SYSLIBCALLBACK.LIB 18.7.05 09:39

**Visualization Template: Auslastung / CPU load**

Buttons: Simulation, Enable, HEAP check, Reset

Counter:	%S	Reset	HEAP check
Current [%]:	Average [%]:	Minimum [%]:	Maximum [%]:
%S	%S	%S	%S

Five horizontal bar charts showing CPU load percentage from 0 to 100. The bars are colored green, blue, yellow, and red, with the fifth bar being black. The current load is approximately 50% for all bars.

# Diagnosis

## Visualization Template CPU Diagnosis (1)

Project IwithDiagnosis.pro\* - [Library Manager]

Project Insert Extras Online Window Help

standard.lib 4.10.05 12:14:41 Parameters:  
 lecscf.lib 13.4.06 16:51:28  
 Util.lib 1.6.07 10:40:58  
 SysLibTime.lib 18.7.05 09:39  
 SysExt\_AC500\_V10.lib\*17.11  
 SysInt\_AC500\_V10.lib\*17.11  
 BusDiag.lib 27.8.04 15:06:10  
 Diag\_AC500\_V10.lib 10.8.09  
 SysTaskInfo.lib 18.7.05 09:39  
 SysLibMem.lib 18.7.05 09:39  
 SYSLIBCALLBACK.LIB 18.7.

Visualizations

- Visu\_CPU\_Diag
- Visu\_CPU\_Load
- Visu\_CS31\_Diag
- Visu\_FBP\_Diag

Enable	No.	Come / gekommen	Gone / gegangen	Acknowledge / quittiert	Error number
Ack / Quit	%s	%s	%s	%s	%s
	%<ERROR>				
Ack / Quit	%s	%s	%s	%s	%s
	%<ERROR>				
	%s	%s	%s	%s	%s
	%<ERROR>				
	%s	%s	%s	%s	%s
	%<ERROR>				
	%s	%s	%s	%s	%s
	%<ERROR>				
	%s	%s	%s	%s	%s
	%<ERROR>				

Newest

Oldest

ACK all    ACK E1    ACK E2    ACK E3    ACK E4    Simulation

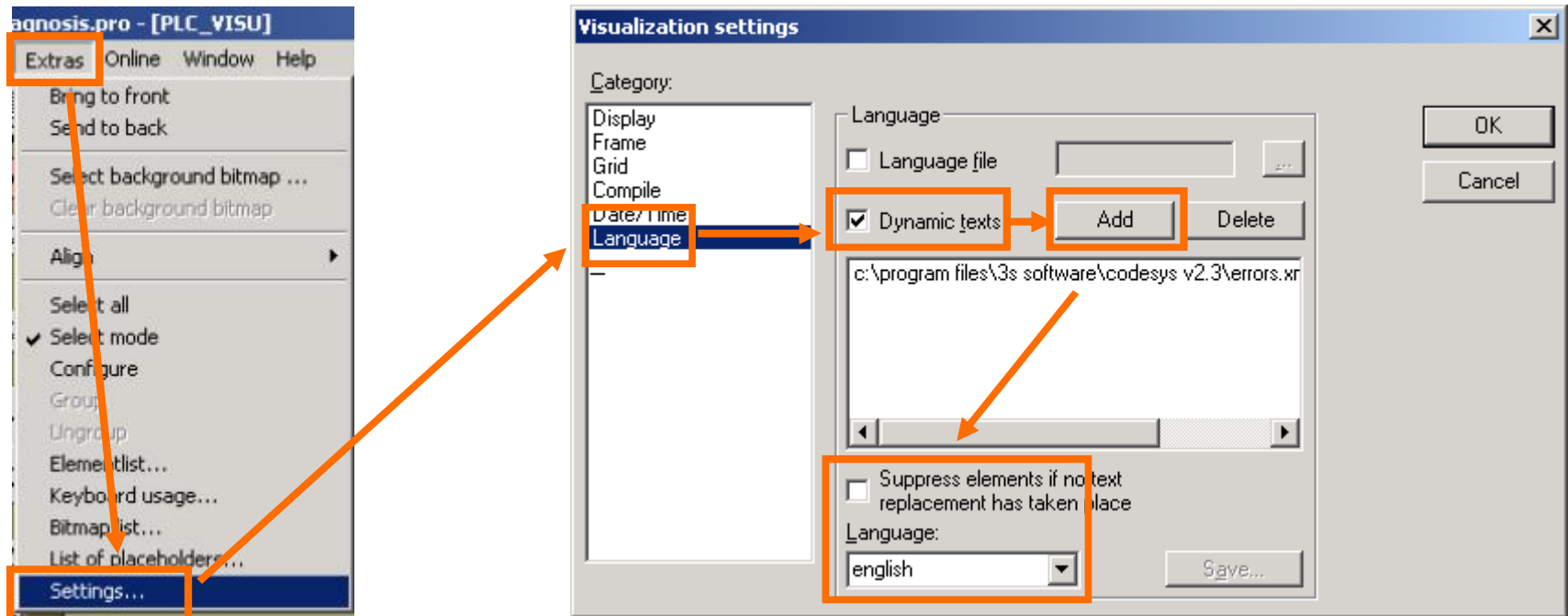




# Diagnosis

## Visualization Template CPU Diagnosis (2)

- Define the message language by click at the template and selecting “Extras/Settings...”
- Select the path of **Errors.xml** for dynamic texts as of C:\Program Files\3S Software\CoDeSys V2.3\Errors.xml



# Diagnosis Visualization Template CS31-Bus

CoDeSys - Project1withDiagnosis.pro\* - [Library Manager]

File Edit Project Insert Extras Online Window Help

standard.lib 4.10.05 12:14:41  
 lecsfc.lib 13.4.06 16:51:28  
 Util.lib 1.6.07 10:40:58  
 SysLibTime.lib 18.7.05 09:33  
 SysExt\_AC500\_V10.lib\*17.11  
 SysInt\_AC500\_V10.lib\*17.11  
 BusDiag.lib 27.8.04 15:06:10  
 Diag\_AC500\_V10.lib 10.8.05  
 SysTaskInfo.lib 18.7.05 09:33  
 SysLibMem.lib 18.7.05 09:33  
 SYSLIBCALLBACK.LIB 18.7.05 09:33

Parameters:

Simulation **CS31 - Bus diagnosis** Enable

Module	Address	Type	Err Count	State	Module	Address	Type	Err Count	State
1	%s	%s	%s	%s	17	%s	%s	%s	%s
2	%s	%s	%s	%s	18	%s	%s	%s	%s
3	%s	%s	%s	%s	19	%s	%s	%s	%s
4	%s	%s	%s	%s	20	%s	%s	%s	%s
5	%s	%s	%s	%s	21	%s	%s	%s	%s
6	%s	%s	%s	%s	22	%s	%s	%s	%s
7	%s	%s	%s	%s	23	%s	%s	%s	%s
8	%s	%s	%s	%s	24	%s	%s	%s	%s
9	%s	%s	%s	%s	25	%s	%s	%s	%s
10	%s	%s	%s	%s	26	%s	%s	%s	%s
11	%s	%s	%s	%s	27	%s	%s	%s	%s
12	%s	%s	%s	%s	28	%s	%s	%s	%s
13	%s	%s	%s	%s	29	%s	%s	%s	%s
14	%s	%s	%s	%s	30	%s	%s	%s	%s
15	%s	%s	%s	%s	31	%s	%s	%s	%s
16	%s	%s	%s	%s					

Maximum number modules on bus :	%s	CS31 bus state :	%s
Actual number modules on bus :	%s	State diagnosis :	%s
CS31 cycle count :	%s	CS31 error count :	%s

# Diagnosis Visualization Template FBP Slave Interface

The screenshot shows the CoDeSys software interface. The top menu bar includes File, Edit, Project, Insert, Extras, Online, Window, and Help. The left sidebar shows a tree view of resources, including Global Variables, library folders (Diag, lecscf, SysLib, SysTa, Util), Tools, Alarm configuration, Library Manager, Log, PLC configuration, Sampling, Target Settings, Task configuration, Watch, and Workspace. The main window displays a list of libraries with 'Diag\_AC500\_V10.lib' selected. Below this, a 'Parameters' dialog box is open, showing configuration options for FBP diagnosis.

**Parameters:**

Simulation **FBP diagnosis** Enable

Slave address : %s  
 Selected baudrate [bit/sec] : %s  
 Protocol type : %s

Init requests sent : %s  
 Total telegrams received : %s  
 Defective telegrams received : %s  
 Unknown telegrams received: %s  
 Checksum errors received : %s  
 Receipt timeouts : %s  
 Telegrams sent : %s

Module	DI	DO	AI	AO
1	%s	%s	%s	%s
2	%s	%s	%s	%s
3	%s	%s	%s	%s
4	%s	%s	%s	%s
5	%s	%s	%s	%s
6	%s	%s	%s	%s
7	%s	%s	%s	%s
8	%s	%s	%s	%s

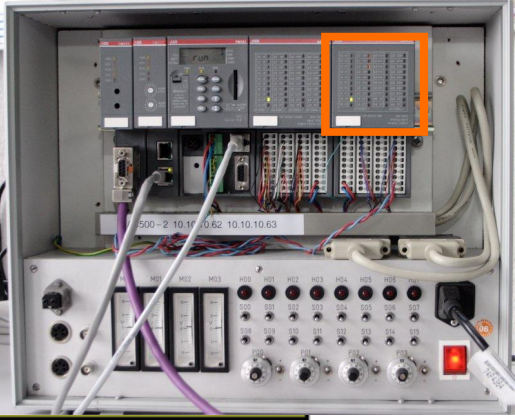




# Diagnosis

## AX522 at I/O-Bus (1)

Enable	No.	Come / gekommen	Gone / gegangen	Acknowledge / quittiert	Error number
Ack / Quit	0	DT#2010-04-08-08:12:54	DT#1970-01-01-00:00	DT#2010-04-08-08:13:37	234881031
		E4: I/O-Bus , Mod. 2, 1, 4		Measurement underflow at the I/O module	
Ack / Quit	0	DT#2010-04-08-08:12:54	DT#1970-01-01-00:00	DT#2010-04-08-08:13:37	234881031
		E4: I/O-Bus , Mod. 2, 1, 4		Measurement underflow at the I/O module	
		0	DT#1970-01-01-00:00	DT#1970-01-01-00:00	DT#1970-01-01-00:00
		No entry		error 0	
		0	DT#1970-01-01-00:00	DT#1970-01-01-00:00	DT#1970-01-01-00:00
		No entry		error 0	
		0	DT#1970-01-01-00:00	DT#1970-01-01-00:00	DT#1970-01-01-00:00
		No entry		error 0	
		0	DT#1970-01-01-00:00	DT#1970-01-01-00:00	DT#1970-01-01-00:00
		No entry		error 0	
		0	DT#1970-01-01-00:00	DT#1970-01-01-00:00	DT#1970-01-01-00:00
		No entry		error 0	



The photograph shows the internal components of the AX522 I/O module. An orange box highlights a specific component on the board, which is the I/O module 2 mentioned in the error message. The board is populated with various electronic components, including integrated circuits, resistors, and connectors. A label at the bottom of the board reads '500-2 10.10 0.82 10.10.10.63'.

Warning from I/O-Bus module 2 (second module right to the CPU) type 1 (1 = analog input), channel 4

Error cause: Broken wire at input channel 4 (configured as 4.. 20 mA)

# Diagnosis

## AX522 at I/O-Bus (2)

```
diagshow all
diagshow all
--- All errors ---
0234881031: active and acknowledged
Class   Comp   Dev   Mod   Ch   Err
      4     14     2     1     4     7
occ.: 2010-04-08 08:12:54
dis.: -
ack.: 2010-04-08 08:13:37
--- end ---
```

Error indication also by means of:

- CPU LCD display
- PLC browser
- Status line of PS501



```
PO... Dat... Visu... Res...
#234881031: 'x 2010-04-08 08:13:37 E4: I/O-Bus , Mod. 2, 1, 4 ' Measurement underflow at the I/O module
```

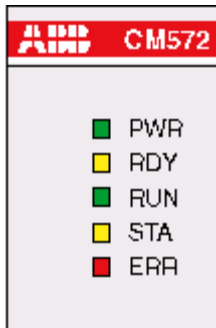
# Diagnosis Coming up



- Diagnosis System
- Local diagnosis at the CPU
- Local diagnosis at the modules
- Diagnosis in Control Builder Plus
- PS501 tools and status bar
- PS501 PLC-Browser
- Diagnosis by use of library SysInt\_AC500\_Vxx.LIB
- Diagnosis by use of library Diag\_AC500\_Vxx.LIB
- **Extended diagnosis for fieldbus slaves**

# Diagnosis

## Fieldbus Diagnosis by means of LEDs of a Communication Module



LED	Color	Status	Meaning
PWR	green	ON (light)	Voltage is present
		OFF (dark)	Voltage is missing
RDY	yellow	ON	Coupler is ready
		flashes cyclic	Bootstrap Loader is active
		flashes non-cyclic	Hardware or system error
		OFF	Defective hardware
RUN	green	ON	Communication is running
		flashes cyclic	Ready for communication
		flashes non-cyclic	Parameterization error
		OFF	No communication
STA	yellow	ON	DP master: Transmits data or token on the network
		OFF	DP master: no token
ERR	red	ON	PROFIBUS error
		OFF	No error

### Example

Indication: Connection error between the PROFIBUS DP Master and Slave 2



# Diagnosis

## Fieldbus Diagnosis by means of the Diagnosis System

Enable	No.	Come / gekommen	Gone / gegangen	Acknowledge / quittiert	Error number
Ack / Quit	0	DT#2010-04-08-08:17:53	DT#1970-01-01-00:00	DT#1970-01-01-00:00	167835713
E4: Ext.2 CM572 PROFIBUS , Slave 2 error 167835713					
Ack / Quit	0	DT#2010-04-08-08:17:53	DT#1970-01-01-00:00	DT#1970-01-01-00:00	167835713
E4: Ext.2 CM572 PROFIBUS , Slave 2 error 167835713					
	0	DT#1970-01-01-00:00	DT#1970-01-01-00:00	DT#1970-01-01-00:00	0
No entry error 0					
	0	DT#1970-01-01-00:00	DT#1970-01-01-00:00	DT#1970-01-01-00:00	0
No entry error 0					
	0	DT#1970-01-01-00:00	DT#1970-01-01-00:00	DT#1970-01-01-00:00	0
No entry error 0					
	0	DT#1970-01-01-00:00	DT#1970-01-01-00:00	DT#1970-01-01-00:00	0
No entry error 0					

Indication by means of:

- CPU display
- Visualization
- Status line
- PLC- Browser



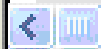
diagshow all

diagshow all

--- All errors ---

```
0167835713: active not acknowledged
Class  Comp  Dev  Mod  Ch  Err
   4     2    2   31   1   1
occ.: 2010-04-08 08:17:53
dis.: -
ack.: -
```

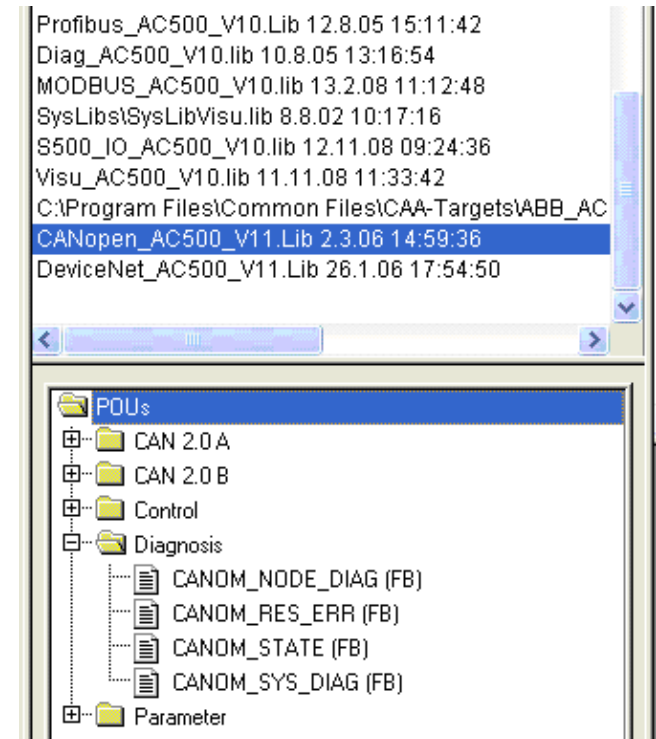
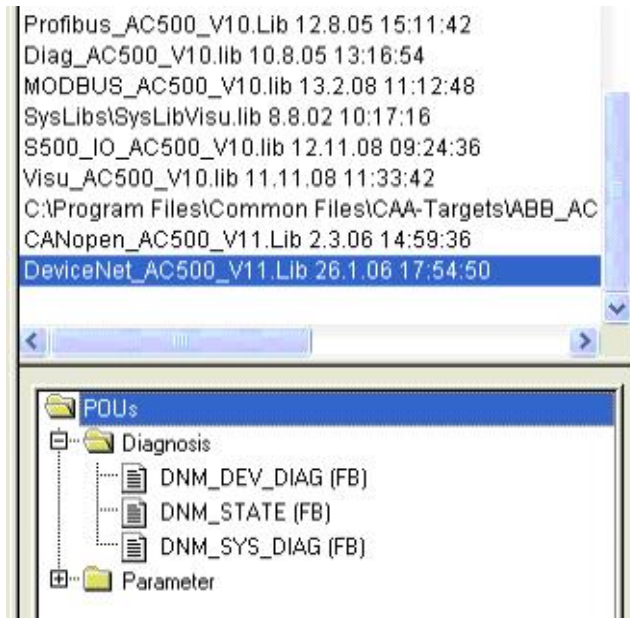
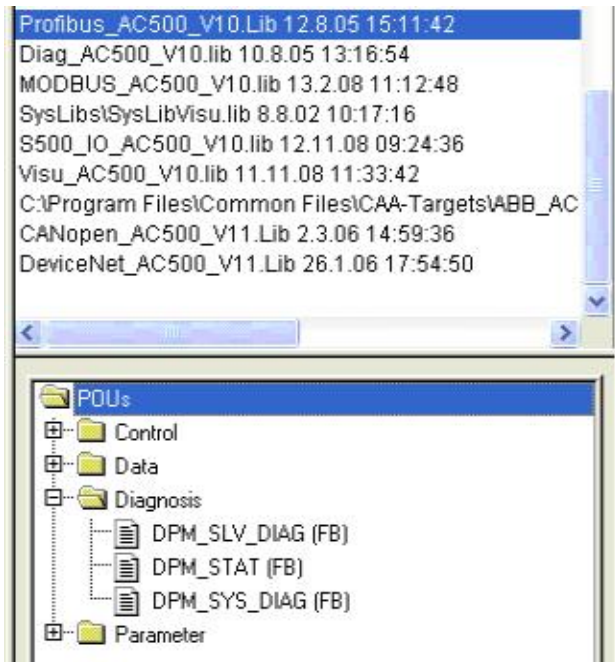
--- end ---



Runtime error #167835713 (+ 2010-04-08 08:17:53 E4: Ext.2 CM572 PROFIBUS , Slave 2 )

# Diagnosis

## Extended Diagnosis by Means of Function Blocks

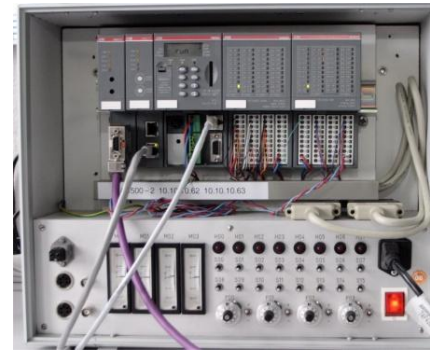


For more details see the Function Blocks in the appropriate fieldbus library

# Diagnosis

## Example: PROFIBUS DP Communication Error to Slave 2

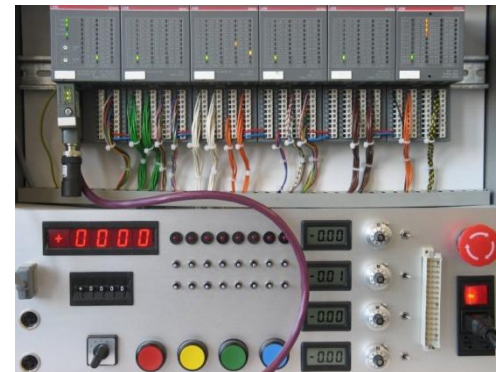
```
0001  ▢ Diag_SL2
0002  |   .Access =
0003  |   ▢ .psCouplerTel = <001f2ff0>
0004  |   |   bEnOld = TRUE
0005  |   |   .bySlaveAdr = 2
0006  |   |   .wError = 0
0007  |   |   .byStep = 0
0008  |   |   .i = 239
0009  |   |   EN = TRUE
0010  |   |   SLOT = 2
0011  |   |   SLV = 2
0012  |   |   DONE = TRUE
0013  |   |   ERR = FALSE
0014  |   |   ERNO = 0
0015  |   ▢ .STAT_1
0016  |   |   .NON_EXISTENT = TRUE
0017  |   |   .NOT_READY = FALSE
0018  |   |   .CFG_FAULT = FALSE
0019  |   |   .EXT_DIAG = FALSE
0020  |   |   .NOT_SUPPORTED = FALSE
0021  |   |   .INVALID_RESPONSE = FALSE
0001  |
0001  |   Diag_SL2
0001  |   |   DPM_SLV_DIAG
0001  |   |   DONE
0001  |   |   ERR
0001  |   |   ERNO
0001  |   |   STAT_1
0001  |   |   STAT_2
0001  |   |   STAT_3
0001  |   |   MSTR
0001  |   |   EXT_DIAG_LEN
0001  |   |   EXT_DIAG_DAT
```



### Configuration:

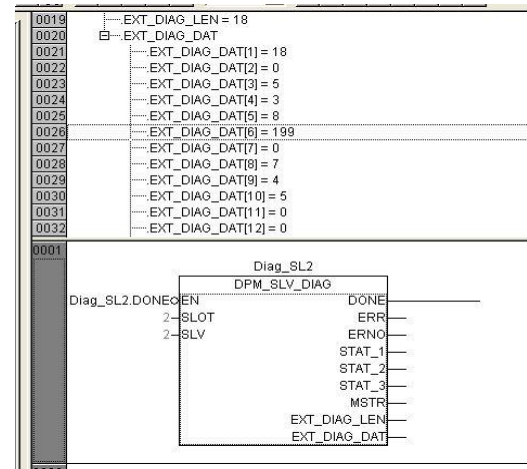
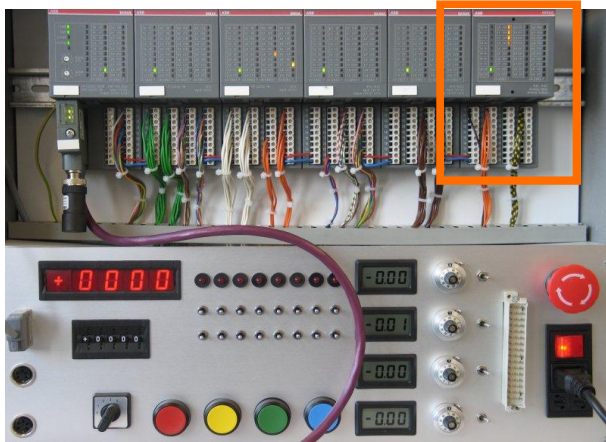
Master: CM572 mounted in slot 2

Slave: Dezentral extension with DC505 and PDP22. Address 2



# Diagnosis

## Example: AX522 Module Error of the Slave 2



Error **is not** indicated by means of :

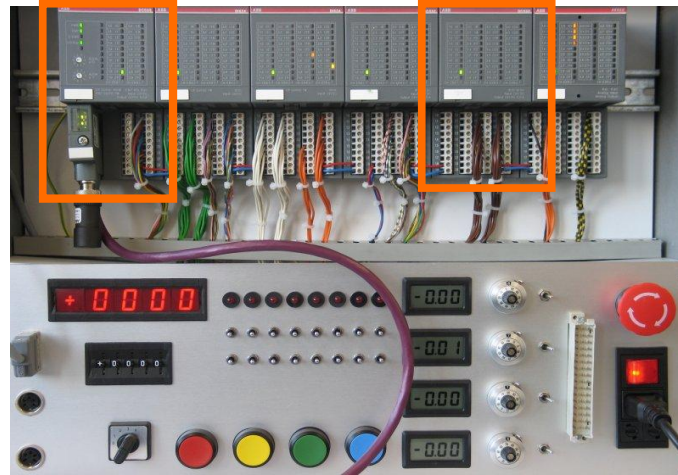
- CPU display
- Visualization
- Status line
- PLC- Browser

Error **is indicated** by means of:

- Local LEDs by decentral extension
- Diagnosis FBs from fieldbus library

# Diagnosis

## Local diagnosis by means of LEDs



DC505-FBP:

- LED **S-ERR** on
- LED **I/O-Bus** flashing

AX522:

- LED **CH-ERR4** flashing
- Error in group 1 (slot 0)

Error cause: Broken wire at input channel 4 (configured as 4.. 20 mA)

# Diagnosis

## AX522: Broken wire at an Input Channel

E1..E4	d1	d2	d3	d4	Identifier 000..063	AC500 display	← Display in
Class	Comp	Dev	Mod	Ch	Err	PS501 PLC browser	
Byte 6 Bit 6..7	-	Byte 3	Byte 4	Byte 5	Byte 6 Bit 0..5	FBP diagnosis block	
Class	Inter- face	De- vice	Mod- ule	Chan- nel	Error identifier	Error message	Remedy
	1)	2)	3)	4)			
<b>Channel error AX521 / AX522</b>							
4	14	1...7	1	0...3 0...7	48	Analog value overflow or broken wire at an analog input	Check input value or terminal
	11 / 12	ADR	1...7				
4	14	1...7	1	0...3 0...7	7	Analog value underflow at an analog input	Check input value
	11 / 12	ADR	1...7				
4	14	1...7	1	0...3 0...7	47	Short-circuit at an analog input	Check terminal
	11 / 12	ADR	1...7				
4	14	1...7	1	0...3 0...7	48	Analog value overflow at an analog output	Check output value
	11 / 12	ADR	1...7				
4	14	1...7	1	0...3 0...7	7	Analog value underflow at an analog output	Check output value
	11 / 12	ADR	1...7				

FBP diagnosis block has to be analyzed

# Diagnosis

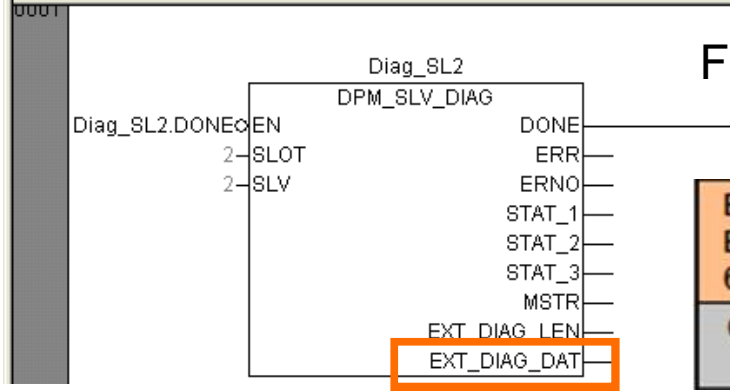
## Function Block DPM\_SLV\_DIAG: AX522 of Slave 2 (1)

```

0016  STAT_2
0017  STAT_3
0018  MSTR = 1
0019  EXT_DIAG_LEN = 18
0020  EXT_DIAG_DAT
0021  .EXT_DIAG_DAT[1] = 18
0022  .EXT_DIAG_DAT[2] = 0
0023  .EXT_DIAG_DAT[3] = 5
0024  .EXT_DIAG_DAT[4] = 1
0025  .EXT_DIAG_DAT[5] = 4
0026  .EXT_DIAG_DAT[6] = 199
0027  .EXT_DIAG_DAT[7] = 0
0028  .EXT_DIAG_DAT[8] = 7
0029  .EXT_DIAG_DAT[9] = 4
0030  .EXT_DIAG_DAT[10] = 5
0031  .EXT_DIAG_DAT[11] = 0
0032  .EXT_DIAG_DAT[12] = 0
0033  .EXT_DIAG_DAT[13] = 0
0034  .EXT_DIAG_DAT[14] = 0
0035  .EXT_DIAG_DAT[15] = 0
0036  .EXT_DIAG_DAT[16] = 0
0001
    
```

- .....EXT\_DIAG\_DAT[1] = 18      Fixed value for DC505
- .....EXT\_DIAG\_DAT[2] = 0      Communication with DC505 OK
- .....EXT\_DIAG\_DAT[3] = 5      The fifth module right to DC505
- .....EXT\_DIAG\_DAT[4] = 1      Module type; 1 = analog input
- .....EXT\_DIAG\_DAT[5] = 4      Channel 4

Use the slave description to evaluate the diagnosis block!



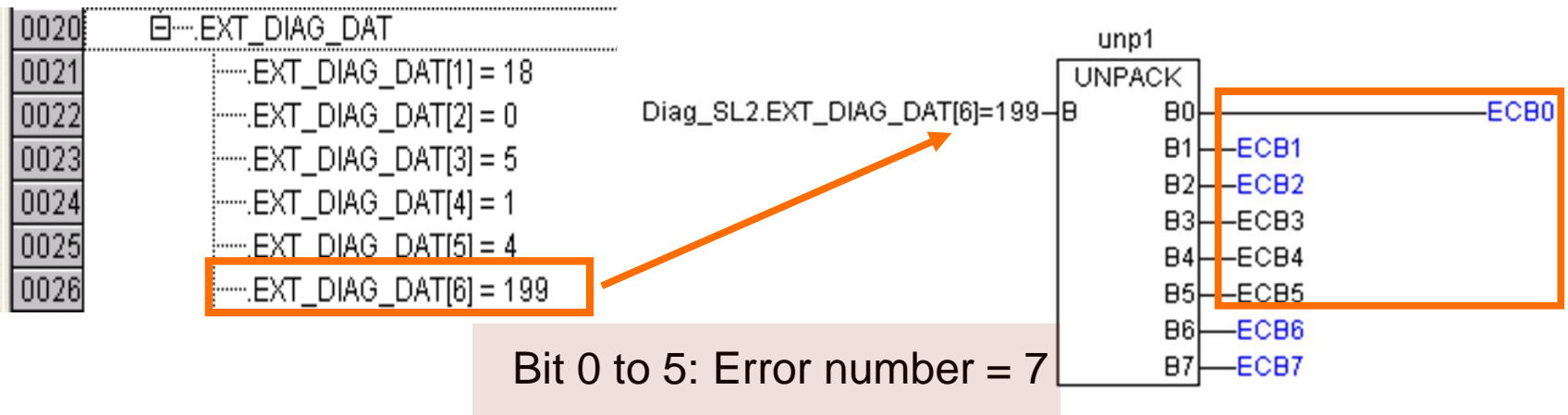
For decentral extension use the **DC505-FBP** description for the diagnosis bytes

Byte 6 Bit 6..7	-	Byte 3	Byte 4	Byte 5	Byte 6 Bit 0..5	FBP diagnosis block
Class	Inter-face	De-vice	Mod-ule	Chan-nel	Error identifier	



# Diagnosis

## Function Block DPM\_SLV\_DIAG: AX522 of the Slave 2 (2)



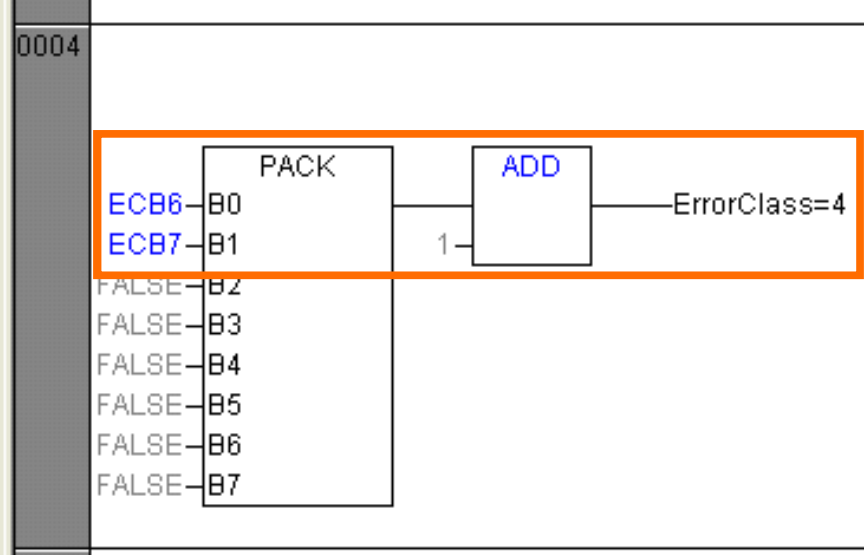
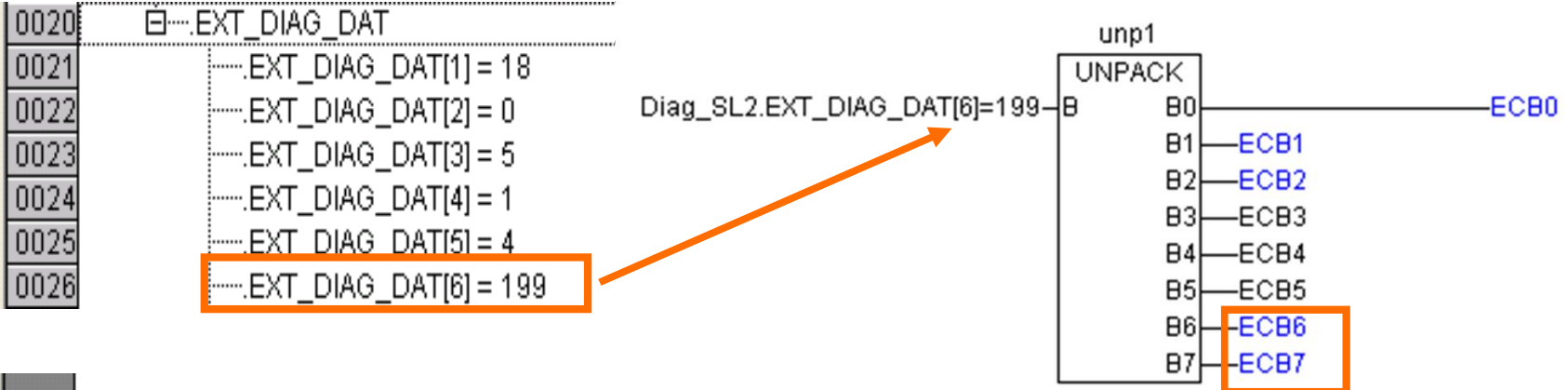
For decentral extension use the **module** description to find the error cause by means of error number!

Byte 6 Bit 6..7	-	Byte 3	Byte 4	Byte 5	Byte 6 Bit 0..5	FBP diagnosis block	← Display in	
Class	Inter- face	De- vice	Mod- ule	Chan- nel	Error identifier	Error message		Remedy
4	14 11 / 12	1...7 ADR	1 1...7	0...3 0...7	7	Analog value underflow at an analog input		Check input value



# Diagnosis

## Function Block DPM\_SLV\_DIAG: AX522 of the Slave 2 (3)



Bit 6 and bit 7 + 1: Error class

# Diagnosis

## Cross-References to Documentation (1)

The screenshot shows a help system interface. At the top, there is a navigation bar with 'Previous' and 'Next' buttons, and a series of question mark icons representing a breadcrumb trail. Below this, the main content area displays the title '5 The diagnosis system in the AC500' and a 'Contents' section with a list of links. To the right, a tree view shows the hierarchy of the help system, with 'The diagnosis system in AC500' highlighted. An orange arrow points from a text box at the bottom left to this highlighted item.

**5 The diagnosis system in the AC500**

**Contents**

- [5.1 Summary of diagnosis possibilities](#)
- [5.1.1 Structure of the diagnosis system](#)
- [5.1.2 Diagnosis directly at the PLC by means of "ERR" LED, keypad and display](#)
- [5.1.3 Plain-text display of error messages in the Control Builder status line during online mode](#)
- [5.1.4 Diagnosis using the PLC browser commands of the Control Builder](#)
- [5.1.5 Diagnosis with help of the user program](#)
- [5.2 Organization and structure of error numbers](#)
- [5.2.1 Error classes](#)
- [5.2.2 Error identifiers](#)
- [5.2.3 Possible error numbers](#)
- [5.2.4 Error list](#)
- [5.2.5 Coupler errors](#)
- [5.3 Diagnosis blocks for the AC500](#)
- [5.4 AC500-specific PLC browser commands](#)

**System Technology**

- Contents System Technology
- System Technology of the AC500 CPUs
  - Title Page - System Technology CPUs
  - Contents - System Technology CPUs
  - Target Support Package
  - Inputs, outputs and flags in AC500
  - The AC500 control system configuration
  - System start-up / program processing
  - The diagnosis system in AC500**
  - The SD Memory Card in AC500
  - Data storage in Flash memory

**For more details see CoDeSys Help**

# Diagnosis

## Cross-References to Documentation (2)

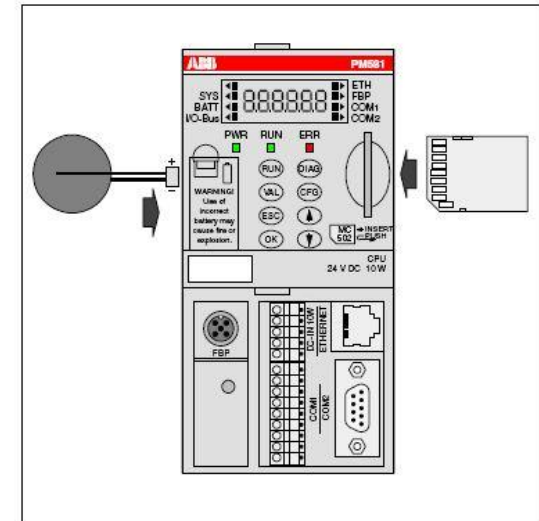
1. CoDeSys Help\Target System\AC500 / S500\  
System Technology\System Technology of the AC500  
CPUs\The diagnosis system in the AC500
2. CoDeSys Help\Target System\AC500 / S500\  
Function Block Libraries AC500

Systembeschreibung

**AC500**

Skalierbare SPS  
für individuelle  
Automatisierung

Systemtechnik  
der CPUs



Power and productivity  
for a better world™

