AC500 and AC Drives
PS553-DRIVES Library for AC500
PS553-DRIVES: AC500 Library Package

Overview of the Library

- Covers all major AC500 Communication networks for AC drives in industrial applications
- Standard speed and torque applications (Motion Control covered by PS552-MC)
- Pre-engineered function blocks and visualizations for control and diagnostics
- Fast and easy programming
- Flexible functionality
PS553-DRIVES: AC500 Library Package

Structure

- Overview AC Drives Fieldbus Configuration
- Configuration of AC Drives for AC500 Fieldbus Control
  - Workflow, Configuration Tools, Settings
- PS553-DRIVES Library
  - Update Package, Library details
  - Fieldbus independent blocks
  - Modbus RTU: Generic servers / ACSXXX
  - Modbus TCP
  - Control Blocks
  - Help and Documentation
  - Visualizations, Examples
- Benefits
PS553-DRIVES: AC500 Library Package

Structure

- Overview AC Drives Fieldbus Configuration
- Configuration of AC Drives for AC500 Fieldbus Control
  - Workflow, Configuration Tools, Settings
- PS553-DRIVES Library
  - Update Package, Library details
  - Fieldbus independent blocks
  - Modbus RTU: Generic servers / ACSXXX
  - Modbus TCP
  - Control Blocks
  - Help and Documentation
  - Visualizations, Examples
- Benefits
Overview AC Drives Fieldbus Configuration
Dedicated Drives

Libraries are released for the following drives:

Industrial:
- ACS800, ACS850, ACS880

Machinery:
- ACS310, ACS355, ACSM1

HVAC:
- ACH550, ACS550

Water:
- ACQ810
Overview AC Drives Fieldbus Configuration
Many different configurations possible

RS485  2wire Modbus RTU

EtherCAT

CANopen or PROFIBUS or PROFINET or Modbus TCP
## Overview AC Drives Fieldbus Configuration

Possible fieldbus connections 1 / 2

<table>
<thead>
<tr>
<th>Fieldbusses supported by AC500</th>
<th>AC500 communication module</th>
<th>ACS310</th>
<th>ACS350 ACS355</th>
<th>ACS850</th>
<th>ACQ810</th>
<th>ACM1</th>
<th>ACS880</th>
<th>ACS580 ACH580</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Modbus-RTU</strong></td>
<td>onboard or CM574-RS</td>
<td>FMBA-01</td>
<td>FRSA-00</td>
<td>FSCA-01</td>
<td>FSCA-01</td>
<td>FSCA-01</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Modbus-RTU embedded</strong></td>
<td>onboard or CM574-RS</td>
<td>embeded</td>
<td></td>
<td>embedded</td>
<td>embedded</td>
<td>-</td>
<td>embedded</td>
<td>embedded</td>
</tr>
<tr>
<td><strong>Modbus TCP</strong></td>
<td>onboard or CM577-ETH</td>
<td>FENA-01</td>
<td>FENA-11</td>
<td>FENA-11</td>
<td>FENA-11</td>
<td>FENA-11</td>
<td>FENA-11</td>
<td>FENA-11</td>
</tr>
<tr>
<td><strong>ProfiBus DP</strong></td>
<td>CM572-DP</td>
<td>-</td>
<td>FPBA-01</td>
<td>FPBA-01</td>
<td>FPBA-01</td>
<td>FPBA-01</td>
<td>FPBA-01</td>
<td>FPBA-01</td>
</tr>
<tr>
<td><strong>CANopen</strong></td>
<td>CM578-CN</td>
<td>FCAN-01</td>
<td>FCAN-01</td>
<td>-</td>
<td>FCAN-01</td>
<td>FCAN-01</td>
<td>FCAN-01</td>
<td>FCAN-01</td>
</tr>
<tr>
<td><strong>EtherCAT</strong></td>
<td>CM579-ETHCAT</td>
<td>FECA-01</td>
<td>FECA-01</td>
<td>-</td>
<td>FECA-01</td>
<td>FECA-01</td>
<td>FECA-01</td>
<td>FECA-01</td>
</tr>
</tbody>
</table>
Overview AC Drives Fieldbus Configuration
Possible fieldbus connections 2 / 2

ACS Drives - AC500 overview fieldbus connectivity.xls

<table>
<thead>
<tr>
<th>Fieldbusses supported by AC500</th>
<th>AC500 communication module</th>
<th>ACS550</th>
<th>ACH550</th>
<th>ACS800</th>
<th>DCS800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus-RTU onboard or CM574-RS</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>RMB-01</td>
<td>RMB-01</td>
</tr>
<tr>
<td>Modbus-RTU onboard or CM574-RS</td>
<td>embedded</td>
<td>embedded</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Modbus TCP onboard or CM577-ETH</td>
<td>RETA-01 RETA-02</td>
<td>RETA-01</td>
<td>RETA-01</td>
<td>RETA-01</td>
<td>RETA-01</td>
</tr>
<tr>
<td>Profibus DP CM572-DP</td>
<td>RPBA-01</td>
<td>RPBA-01</td>
<td>RPBA-01</td>
<td>RMBA-01</td>
<td></td>
</tr>
<tr>
<td>ProfiNet IO CM579-PNIO</td>
<td>RETA-02</td>
<td>RETA-02</td>
<td>RETA-02</td>
<td>RETA-01</td>
<td></td>
</tr>
<tr>
<td>CANopen CM578-CN</td>
<td>RCAN-01</td>
<td>RCAN-01</td>
<td>RCAN-01</td>
<td>RCAN-01</td>
<td></td>
</tr>
<tr>
<td>EtherCAT CM579-ETHCAT</td>
<td>RECA-01</td>
<td>-</td>
<td>RECA-01</td>
<td>RECA-01</td>
<td></td>
</tr>
</tbody>
</table>
Overview AC Drives Fieldbus Configuration
Typical Configuration Modbus RTU
Overview AC Drives Fieldbus Configuration
Typical Configuration CANopen

CANopen

Control Builder Plus

ETHERNET or serial connection

AC500 PLC

• CANopen
Overview AC Drives Fieldbus Configuration Typical Configuration PROFIBUS

In CBP V2.3:
Automatic load of ACSDrivesBase library if DriveManager is used
Overview AC Drives Fieldbus Configuration
Typical Configuration PROFINET

In CBP V2.3:
Automatic load of ACSDrivesBase library if DriveManager is used
Overview AC Drives Fieldbus Configuration
Typical Configuration: Modbus TCP
Overview AC Drives Fieldbus Configuration
Typical Configuration Ethercat
PS553-DRIVES: AC500 Library Package

Structure

- Overview AC Drives Fieldbus Configuration
- Configuration of AC Drives for AC500 Fieldbus Control
  - Workflow, Configuration Tools, Settings
- PS553-DRIVES Library
  - Update Package, Library details
  - Fieldbus independent blocks
  - Modbus RTU: Generic servers / ACSXXX
  - Modbus TCP
  - Control Blocks
  - Help and Documentation
  - Visualizations, Examples
- Benefits
Configuration of AC Drives for AC500 Fieldbus Control Workflow - Steps to make a system run

1. Commissioning of drive
   - Panel or Drive Tool (Motor data, ID Run, local control)

2. Configuration of drive for fieldbus control
   - Panel or Drive Tool (activate fieldbus, node-number…)

3. Configuration of AC500 fieldbus
   - Control Builder Plus
     - (configure drive as slave, parameter mappings,..)

4. Create program to control the drive
   - function block programming
   - visualization
# Configuration of AC Drives for AC500 Fieldbus Control

## Tools and Drive Panels

<table>
<thead>
<tr>
<th>Drive Configuration Tools</th>
<th>ACS800</th>
<th>ACS310</th>
<th>ACS350</th>
<th>ACS550</th>
<th>ACH550</th>
<th>ACS850</th>
<th>ACQ810</th>
<th>ACSM1</th>
<th>ACS880</th>
<th>ACS580</th>
<th>ACH580</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive Window</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optical Link</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drive Window Light</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COM - Serial Link</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drive Studio</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COM - Serial Link</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drive Composer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USB Link via Panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drive control panels</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDP312R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACS-CP-x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACS-AP-I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drive Manager in Control Builder Plus</th>
<th>V2.1</th>
<th>ACS-CP-x</th>
<th>ACS-AP-I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profibus ProfiNet</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>*) only Profibus</td>
<td>X</td>
<td>X *)</td>
<td>X</td>
</tr>
</tbody>
</table>

© ABB
September 10, 2015
Slide 17
Configuration of AC Drives for AC500 Fieldbus Control
Drives Settings in Documentations

Fieldbus coupler manuals:
E.g. EN_FPBA01_UM_E.pdf

Quickstart Guides in
PS553-DRIVES package
Configuration of AC Drives for AC500 Fieldbus Control

Drives Settings in Documentations

AC500 Help – ACS Drives Libraries:

E.g. ACS_DRIVES_CTRL_STANDARD_GEN
Configuration of AC Drives for AC500 Fieldbus Control

Drives Settings in Documentations

AC500 Help – ACS Drives Libraries:

E.g. ACS_COM_MOD_RTU_ENHANCED
### Configuration of AC Drives for AC500 Fieldbus Control

Drives Setting Example ACS850 in fieldbus manual

The table below gives the recommended drive parameter settings.

<table>
<thead>
<tr>
<th>Drive parameter</th>
<th>Setting for ACS850/ACQ810 drives</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.01 Fba enable</td>
<td>Enable</td>
<td>Enables communication between the drive and the fieldbus adapter module.</td>
</tr>
<tr>
<td>50.02 Comm loss func</td>
<td>Fault(2)</td>
<td>Enables fieldbus communication fault monitoring.</td>
</tr>
<tr>
<td>50.03 Comm loss t out</td>
<td>3.0 s(2)</td>
<td>Defines the fieldbus communication break supervision time.</td>
</tr>
<tr>
<td>50.04 Fb ref1 modesel</td>
<td>Speed</td>
<td>Selects the fieldbus reference 1 scaling.</td>
</tr>
<tr>
<td>51.01 FBA type</td>
<td>Ethernet(1)</td>
<td>Displays the type of the fieldbus adapter module.</td>
</tr>
<tr>
<td>51.02 FBA par2 (PROTOCOL/PROFILE)</td>
<td>10 (= PNIO Drive)</td>
<td>Selects the PROFINET IO protocol and the PROFIDrive profile.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drive parameter</th>
<th>Setting for ACS850/ACQ810 drives</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>51.03 FBA par3 (COMMIRATE)</td>
<td>0 (= Auto(2))</td>
<td>Ethernet communication rate is negotiated automatically by the device.</td>
</tr>
<tr>
<td>51.04 FBA par4 (I/O CONFIGURATION)</td>
<td>0 (= Static IP)</td>
<td>Configuration will be obtained from parameters 06...10 or from the PLC via the DCP protocol.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drive parameter</th>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>52.01 FBA data in1</td>
<td>4 (= SW 16bit(1))</td>
<td>Status word</td>
</tr>
<tr>
<td>52.02 FBA data in2</td>
<td>5 (= Act 1 16bit)</td>
<td>Actual value 1 (speed)</td>
</tr>
<tr>
<td>52.03 FBA data in3</td>
<td>122(2)</td>
<td>Power</td>
</tr>
<tr>
<td>52.05 FBA data in5</td>
<td>107(2)</td>
<td>DC bus voltage</td>
</tr>
<tr>
<td>53.01 FBA data out1</td>
<td>1 (= GW 16bit(1))</td>
<td>Control word</td>
</tr>
<tr>
<td>53.02 FBA data out2</td>
<td>2 (= Ref1 16bit)</td>
<td>Reference 1 (speed)</td>
</tr>
<tr>
<td>53.03 FBA data out3</td>
<td>2202(2)</td>
<td>Acceleration time</td>
</tr>
<tr>
<td>53.05 FBA data out5</td>
<td>2203(2)</td>
<td>Deceleration time</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drive parameter</th>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>51.27 FBA par refresh</td>
<td>Refresh</td>
<td>Validates the FENA-11 configuration parameter settings.</td>
</tr>
<tr>
<td>10.01 Ext1 start func</td>
<td>FB</td>
<td>Selects the fieldbus interface as the source of the start and stop commands for external control location 1.</td>
</tr>
<tr>
<td>21.01 Speed ref1.sel (ACS850)</td>
<td>FBA ref1</td>
<td>Selects the fieldbus reference 1 as the source for speed reference 1.</td>
</tr>
</tbody>
</table>

---

1) Read-only or automatically detected/set  
2) Example
Configuration of AC Drives for AC500 Fieldbus Control
Drives and AC500 Settings in examples and Quickstart guides
PS553-DRIVES: AC500 Library Package Structure

- Overview AC Drives Fieldbus Configuration
- Configuration of AC Drives for AC500 Fieldbus Control
  - Workflow, Configuration Tools, Settings
- PS553-DRIVES Library
  - Update Package, Library details
  - Fieldbus independent blocks
  - Modbus RTU: Generic servers / ACSXXX
  - Modbus TCP
  - Control Blocks
  - Help and Documentation
  - Visualizations, Examples
- Benefits
PS53-DRIVES: AC500 Library Package
Details of the Update Package

Included in Automation Builder 1.0 (CBP V2.3)

Libraries

Documentation in CoDeSys Help System

Examples & Docu Guides
PS553-DRIVES: AC500 Library Package
How to get the Update Package

1. Goto Automation Builder Homepage
   www.abb.com/automationbuilder

2. Scroll down to “Download…” section and select “Software”

3. Scroll or search for the “PS501-UPDA: PS553-DRIVES”
### PS533-DRIVES: AC500 Library Package

**Details of the Library**

All drives using “ABB Drives Profile”

<table>
<thead>
<tr>
<th>Scope: PS553-DRIVES</th>
<th>AC500-eCo</th>
<th>AC500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus RTU</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Modbus TCP</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>PROFIBUS</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>PROFINET</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CANopen</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>EtherCAT</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

- ACS310 ✓
- ACS355 ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓
- ACS550 ✓ ✓ ✓ ✓ ✓ ✓ ✓
- ACH550 ✓ ✓ ✓ ✓ ✓ ✓
- ACSM1 ✓ ✓ ✓ ✓ ✓ ✓ ✓
- ACS800 ✓ ✓ ✓ ✓ ✓ ✓ ✓
- ACQ810 ✓ ✓ ✓ ✓ ✓ ✓ ✓
- ACS850 ✓ ✓ ✓ ✓ ✓ ✓ ✓
- ACS880 ✓ ✓ ✓ ✓ ✓ ✓ ✓

✓ ✓ = Full CBP/Engineering Integration (Drives Manager)
PS553-DRIVES: AC500 Library Package
Details of the Library

One main Ctrl-block for standard use:

Additional blocks for simple Modbus handling:

Networks
Libraries
Function Blocks

- **Networks**
  - PROFINET
  - CANopen
  - EtherCAT

- **Libraries**
  - ACSDrivesBase_AC500_V20.lib
  - ACSDrivesComModRTU_AC500_V20.lib
  - ACSDrivesComModTCP_AC500_V22.lib

- **Function Blocks**
  - **Communication**
    - Modbus
      - ACS_MOD_PRM_NUM_2000RT (FUN)
      - ACS_MOD_READ_N_PRM (FB)
      - ACS_MOD_WRITE_N_PRM (FB)
  - **Control**
    - ACS_Drives_CTRL_BASIC (FB)
    - ACS_Drives_CTRL_ENG (FB)
    - ACS_Drives_CTRL_STANDARD (FB)
    - ACS_Drives_CTRL_STANDARD_GEN (FB)
    - ACS_REF_SCALING (FB)
PS533-DRIVES: AC500 Library Package
Libraries: ACSDrivesBase_AC500_V20.lib

- Basic structures, constants
- Control blocks using ABB Drives Profile
- Read/Write Modbus blocks for both: RTU and TCP

for Modbus

Fieldbus independent
PS553-DRIVES: AC500 Library Package Structure

- Overview AC Drives Fieldbus Configuration
- Configuration of AC Drives for AC500 Fieldbus Control
  - Workflow, Configuration Tools, Settings
- PS553-DRIVES Library
  - Update Package, Library details
  - Fieldbus independent blocks
  - Modbus RTU: Generic servers / ACSXXX
  - Modbus TCP
  - Control Blocks
  - Help and Documentation
  - Visualizations, Examples
- Benefits
PS553-DRIVES: Fieldbus independent blocks

ACS_DRIVES_CTRL_STANDARD_GEN

[Diagram of state machine and control words]

StatusWord: SW

ControlWord: CW

© ABB
September 10, 2015
PS553-DRIVES: Fieldbus independent blocks
DCS_DRIVES_CTRL_GEN

The state machine for the ABB Drives communication profile is shown below.
PS553-DRIVES: Fieldbus independent blocks
ACS_DRIVES_CTRL_STANDARD_GEN

Status word + Control word to be configured as cyclic data on fieldbus

Functionblock

Global variable list

Fieldbus mapping
PS553-DRIVES: Fieldbus independent blocks
One drive control block for all AC500 networks
PS553-DRIVES: Fieldbus independent blocks
PROFINET Configuration
PS553-DRIVES: Fieldbus independent blocks

PROFINET Configuration
PS553-DRIVES: Fieldbus independent blocks
ACS_REF_SCALING
PS553-DRIVES: Fieldbus independent blocks
ACS_REF_SCALING

Scaling
Real <=> FB
PS553-DRIVES: AC500 Library Package

Structure

- Overview AC Drives Fieldbus Configuration
- Configuration of AC Drives for AC500 Fieldbus Control
  - Workflow, Configuration Tools, Settings
- PS553-DRIVES Library
  - Update Package, Library details
  - Fieldbus independent blocks
  - Modbus RTU: Generic servers / ACSXXX
  - Modbus TCP
  - Control Blocks
  - Help and Documentation
  - Visualizations, Examples
- Benefits
PS553-DRIVES: Modbus RTU
Library: ACSDrivesComModRTU_AC500_V20.lib

- Communication blocks for Modbus RTU for ACS drives
- Communication blocks for Modbus RTU for generic devices using same LineToken variable
PS553-DRIVES: Modbus RTU
Modbus RTU Configuration
Classic way using COM_MOD_MAST checking the end of the jobs to start the next one
PS533-DRIVES: Modbus RTU
ACS_COM_MOD_RTU_GEN

ACS_COM_MOD_RTU_GEN with Read and Write Blocks
ACS_COM_MOD_RTU_GEN_READ_N_PRM
ACS_COM_MOD_RTU_GEN_WRITE_N_PRM

Easy add new servers
or new Read / Write Jobs
PS553-DRIVES: Modbus RTU

ACS_COM_MOD_RTU

Principle of ACS_COM_MOD_RTU

FB_MAST

FB_READ_WORDS

ACS_COM_MOD_RTU_GEN_READ_N_PRM

TRUE
CH
PRIO
CH7
NRV
ADDR
DATA
SLAVE_DATA

FB_WRITE_WORDS

ACS_COM_MOD_RTU_GEN_WRITE_N_PRM

IF_CHANGES
EN
PRIO
CH7
NRV
ADDR
DATA
SLAVE_DATA

PS553-DRIVES: Modbus RTU
ACS_COM_MOD_RTU

For ABB Drives Profile (classic)!

Read cyclic:
- Status word,
- Actual Speed,
- Actual Value2

Configured Values in Modbus Reg 40007...
...Modbus Reg 40030

Write after changes:
- Control word,
- Reference Speed,
- Ref Value2
PS553-DRIVES: Modbus RTU
ACS3XX_COM_MOD_RTU

Still used for compatibility reasons
ACS_COM_MOD_RTU could also be used

Drive_Data

Read cyclic:
Status word,
Actual Speed,
Actual Value2

Configured Values in Modbus Reg 40004
... Modbus Reg 40012

Write after changes:
Control word,
Reference Speed,
Ref Value2

Drive_Data

READ_VALUES[1..9]
PS553-DRIVES: Modbus RTU
ACS_COM_MOD_RTU_ENHANCED

Read cyclic:
- Status word,
- Actual Speed,
- Actual Value2

Configured Values
in Modbus Reg 400054
... Modbus Reg 400065

Write after changes:
- Control word,
- Reference Speed,
- Ref Value2

Configured Values
in Modbus Reg 400004
... Modbus Reg 400015

For ABB DrivesProfile enhanced!
PS553-DRIVES: Modbus RTU
Additional Communication Function Blocks

ACS_MOD_READ_N_PRM
- Read any Parameter / Actual Value from the drive
- Cyclic reading at steady TRUE on EN

ACS_MOD_WRITE_N_PRM
- Write any Parameter to the drive
- One write job at rising edge on EN

Connect DRIVE_DATA variable to communication block e.g.
ACS_COM_MOD_RTU
PS53-DRIVES: Modbus RTU
Additional Communication Function Blocks

Read / Write 32 Bit long Parameters / Values from drive

- Use additional function to "ACS_MOD_PRM_NUM_32BIT" to calculate modbus address of 32 Bit parameters

- Concatenate high word and low word according to configured order in drive
Connect DRIVE_DATA variable to communication block e.g. ACS_COM_MOD_RTU
PS553-DRIVES: Modbus RTU

DCS_DRIVES_CTRL

Connect DRIVE_DATA variable to communication block e.g. ACS_COM_MOD_RTU
PS553-DRIVES: Modbus RTU
Main structure for Modbus RTU

AC500 / AC500-eCo as Modbus RTU master

ACS355
ACS880
CP635 - Panel

Modbus RTU (serial)
RS485
RTS control telegram

Comms: 9600
Parity: none
Data bits: 8
Stop bits: 1

© ABB
September 10, 2015  Slide 57
PS553-DRIVES: Modbus RTU
Modbus RTU Handling and Integration

- **LINE_TOKEN** variable (Structure)
  - Connect all drives and generic devices on the same line

- **DRIVE_DATA** variable (Structure)
  - Read cyclic: Statusword, Actual Speed, …
  - Write after changes: Controlword, Reference Speed, …
PS553-DRIVES: AC500 Library Package

Structure

- Overview AC Drives Fieldbus Configuration
- Configuration of AC Drives for AC500 Fieldbus Control
  - Workflow, Configuration Tools, Settings
- PS553-DRIVES Library
  - Update Package, Library details
  - Fieldbus independent blocks
  - Modbus RTU: Generic servers / ACSXXX
  - Modbus TCP
  - Control Blocks
  - Help and Documentation
  - Visualizations, Examples
- Benefits
PS553-DRIVES: Modbus TCP
Library: ACSDrivesComModTCP_AC500_V22.lib

- Communication blocks for Modbus TCP for ACS drives
PS53-DRIVES: Modbus TCP
Modbus TCP Configuration
## PS553-DRIVES: Modbus TCP

ACS_COM_MOD_TCP

### Read cyclic:
- Status word,
- Actual Speed,
- Actual Value2

### Write after changes:
- Control word,
- Reference Speed,
- Ref Value2

For ABB Drives Profile (classic)!

---

<table>
<thead>
<tr>
<th>FB_COM</th>
<th>ACS_COM_MOD_TCP</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRUE</td>
<td>D Busy</td>
</tr>
<tr>
<td>6 SLOT</td>
<td>ERR0</td>
</tr>
<tr>
<td>'192.168.0.12</td>
<td>SLAVE IP</td>
</tr>
<tr>
<td>ACS_DRIVE</td>
<td>Drive Type</td>
</tr>
<tr>
<td>Drive_Ref</td>
<td>Drive Data</td>
</tr>
</tbody>
</table>
### PS553-DRIVES: Modbus TCP
**ACS_COM_MOD_TCP_ENHANCED**

**Read cyclic:**
- Status word, Actual Speed, Actual Value2
- Configured Values in Modbus Reg 400054 ... Modbus Reg 400065

**Write after changes:**
- Control word, Reference Speed, Ref Value2
- Configured Values in Modbus Reg 400004 ... Modbus Reg 400015

<table>
<thead>
<tr>
<th>Drive_Data</th>
<th>READ_VALUES[1..12]</th>
<th>WRITE_VALUES[1..12]</th>
</tr>
</thead>
</table>

For ABB Drives Profile enhanced!
PS553-DRIVES: Modbus TCP
Modbus TCP Handling and Integration

- DRIVE_DATA variable (Structure)
  - Read cyclic: Statusword, + other e.g. Actual Speed
  - Write after changes: Controlword, + other e.g. Reference Speed

- Number of used ACS_COM_MOD_TCP_x must not exceed number of possible TCP sockets for specific PLC type!
- Check has to be made by user
PS553-DRIVES: AC500 Library Package Structure

- Overview AC Drives Fieldbus Configuration
- Configuration of AC Drives for AC500 Fieldbus Control
  - Workflow, Configuration Tools, Settings
- PS553-DRIVES Library
  - Update Package, Library details
  - Fieldbus independent blocks
  - Modbus RTU: Generic servers / ACSXXX
  - Modbus TCP
  - Control Blocks
  - Help and Documentation
  - Visualizations, Examples
- Benefits
PS553-DRIVES: Control Function Blocks
ACS_DRIVES_CTRL_ENG

- Engineering Block
- Pack Controlword, Unpack Statusword for own setting of bits

```
ACS_DRIVES_CTRL_ENG

OFF1
OFF2
OFF3
INHIBIT_OP
RAMP_OUT_ZERO
RAMP_HOLD
RAMP_IN_ZERO
RESET
...
CW_BIT15

Control Word (CW)

OFF1
OFF2
OFF3
INHIBIT_OP
RAMP_OUT_ZERO
RAMP_HOLD
RAMP_IN_ZERO
RESET
...
CW_BIT15

Status Word (SW)

RDY_ON
RDY_RUN
RDY_REF
TRIPPED
OFF2_STATE
OFF3_STATE
SWITCH_ON_INHIB
ALARM
...
SW_BIT15

FB_CTRL_ENGINEERING

TRUE

ACSB_DRIVES_CTRL_ENG

DONE

OFF1
RDY_ON

OFF2
RDY_RUN

OFF3
RDY_REF

INHIBIT_OP
TRIPPED

RAMP_OUT_ZERO
OFF2_STATE

RAMP_HOLD
OFF3_STATE

RAMP_IN_ZERO
SWITCH_ON_INHIB

RESET
ALARM

CW_BIT16
AT_SETPOINT

CW_BIT9
REMOTE

REMOTE_CMD
ABOVE_LIMIT

EXT_CTRL_LOC
EXT_CTRL_LOC_ACT

CW_BIT12
EXT_RUN_ENABLE

CW_BIT13
SW_BIT13

CW_BIT14
SW_BIT14

CW_BIT15
SW_BIT15

USE_CW
ACT_CVY

wControlword
CVY
ACT_VALUE1

iRefSpeed
REF_VALUE1
ACT_VALUE2

RefValue2
ACT_VALUE2

DriveRef
DRIVE_DATA

DRIVE_DATA variable
```
PS553-DRIVES: Control Function Blocks

ACS_DRIVES_CTRL_STANDARD

- Standard Control Block
- ABB Drives Profil Power-On Statemachine
- Reference and actual values in fieldbus equivalent (+/- 20.000, +/- 10.000)
ACS3XX_Drives_CTRL_BASIC

- Special Block for ACS310, ACS350, ACS355, ACS550, ACH550
- Includes Standard Control Block
- Reads scaling parameters from drive
- Reference and actual values in rpm or 0.1Hz
PS553-DRIVES: Control Function Blocks

DCS_DRIVES_CTRL

- Standard Control Block
- ABB Drives Profil Power-On Statemachine
- Reference and actual values in fieldbus equivalent (+/- 20,000, +/- 10,000)
Blocks which can be used only for special drives:

ACS3XX_COM_MOD_RTU &
ACS3XX_DRIVES_CTRL_BASIC

ACS310, ACS355, ACS550, ACH550

DCS_DRIVES_CTRL &
DCS_DRIVES_CTRL_GEN

DCS550, DCS800

ACS_COM_MOD_RTU_ENHANCED

drives using FSCA-01 (enhanced ABB profile)

ACS_COM_MOD_TCP_ENHANCED

drives using FENA-11 or FENA-21 (enhanced ABB profile)
PS553-DRIVES: AC500 Library Package

Structure

- Overview AC Drives Fieldbus Configuration
- Configuration of AC Drives for AC500 Fieldbus Control
  - Workflow, Configuration Tools, Settings
- PS553-DRIVES Library
  - Update Package, Library details
  - Fieldbus independent blocks
  - Modbus RTU: Generic servers / ACSXXX
  - Modbus TCP
  - Control Blocks
  - Help and Documentation
  - Visualizations, Examples
- Benefits
PS553-DRIVES: Help and Documentation

Help and Documentation

- Online help for Function Blocks form within CoDeSys
  Help\Contents\Target System\AC500/S500\ACS Drives Libraries

- Application and Quickstart Guides in examples folders
  PS553-DRIVES\Examples\PS553-DRIVES
  \ACSxxx_PM583_PB_PNIO_Ctrl_Std_Gen\Documentation
PS553-DRIVES: Help and Documentation
Wizard to select needed blocks – Help file

- Online Help of CoDeSys
  AC500/S500 – ACSDrives Libraries – Configuration and Selection Guide
Wizard to select needed blocks – Excel file

<table>
<thead>
<tr>
<th>Package</th>
<th>MicroDrive</th>
<th>MODBUS TCP</th>
<th>ABB Drives</th>
<th>ABB Drives_ok</th>
<th>Scaling Block</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>PROFIBUS</td>
<td></td>
<td>ABB Drives</td>
<td>ABB Drives_CTRL_STANDARD_GEN</td>
<td>ACS_REF_SCALING</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CANopen/ EtherCAT</td>
<td>ACS_DriverBase_AC500_V20lb</td>
<td>ABB Drives</td>
<td>ABB Drives_CTRL_STANDARD_GEN</td>
<td>ACS_REF_SCALING</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>EtherCAT</td>
<td></td>
<td>ABB Drives</td>
<td>ABB Drives_CTRL_STANDARD_GEN</td>
<td>ACS_REF_SCALING</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>EtherCAT</td>
<td></td>
<td>ABB Drives</td>
<td>ABB Drives_CTRL_STANDARD_GEN</td>
<td>ACS_REF_SCALING</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>EtherCAT</td>
<td></td>
<td>ABB Drives</td>
<td>ABB Drives_CTRL_STANDARD_GEN</td>
<td>ACS_REF_SCALING</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>EtherCAT</td>
<td></td>
<td>ABB Drives</td>
<td>ABB Drives_CTRL_STANDARD_GEN</td>
<td>ACS_REF_SCALING</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>EtherCAT</td>
<td></td>
<td>ABB Drives</td>
<td>ABB Drives_CTRL_STANDARD_GEN</td>
<td>ACS_REF_SCALING</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>EtherCAT</td>
<td></td>
<td>ABB Drives</td>
<td>ABB Drives_CTRL_STANDARD_GEN</td>
<td>ACS_REF_SCALING</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>EtherCAT</td>
<td></td>
<td>ABB Drives</td>
<td>ABB Drives_CTRL_STANDARD_GEN</td>
<td>ACS_REF_SCALING</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>EtherCAT</td>
<td></td>
<td>ABB Drives</td>
<td>ABB Drives_CTRL_STANDARD_GEN</td>
<td>ACS_REF_SCALING</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>EtherCAT</td>
<td></td>
<td>ABB Drives</td>
<td>ABB Drives_CTRL_STANDARD_GEN</td>
<td>ACS_REF_SCALING</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>EtherCAT</td>
<td></td>
<td>ABB Drives</td>
<td>ABB Drives_CTRL_STANDARD_GEN</td>
<td>ACS_REF_SCALING</td>
<td></td>
</tr>
</tbody>
</table>
# Overview of Modbus data exchange with one block

## Modbus

<table>
<thead>
<tr>
<th>Modbus XXX</th>
<th>ABB Profile</th>
<th>AC5000 (3)</th>
<th>AC5300 (4)</th>
<th>ACH500 (7)</th>
<th>AC5800</th>
<th>AC5850</th>
<th>ACO5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RTU</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>classic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module</td>
<td><strong>FENA</strong></td>
<td><strong>FENA</strong></td>
<td><strong>FENA</strong></td>
<td><strong>FENA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function block</td>
<td><strong>ACS-3xx COM MOD RTU</strong></td>
<td><strong>ACS-3xx COM MOD RTU</strong></td>
<td><strong>ACS-3xx COM MOD RTU</strong></td>
<td><strong>ACS-3xx COM MOD RTU</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Values</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ModRegister - 40000</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mapping Par</td>
<td>53 10 53.17</td>
<td>53 10 53.17</td>
<td>53 10 53.17</td>
<td>53 10 53.17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>enhanced</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function block</td>
<td><strong>ACS-3xx COM MOD RTU</strong></td>
<td><strong>ACS-3xx COM MOD RTU</strong></td>
<td><strong>ACS-3xx COM MOD RTU</strong></td>
<td><strong>ACS-3xx COM MOD RTU</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Values</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ModRegister - 40000</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mapping Par</td>
<td>53 10 53.17</td>
<td>53 10 53.17</td>
<td>53 10 53.17</td>
<td>53 10 53.17</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **RTU**    |             |            |            |            |        |        |      |
| **classic**|             |            |            |            |        |        |      |
| Module     |             |            |            |            |        |        |      |
| Function block | **ACS-3xx COM MOD RTU** | **ACS-3xx COM MOD RTU** | **ACS-3xx COM MOD RTU** | **ACS-3xx COM MOD RTU** |        |        |      |
| Number of Values | 3 | 3 | 3 | 3 |        |        |      |
| ModRegister - 40000 | 1.3 | 1.3 | 1.3 | 1.3 |        |        |      |
| Mapping Par   | 53 10 53.17 | 53 10 53.17 | 53 10 53.17 | 53 10 53.17 |        |        |      |
| **enhanced** |             |            |            |            |        |        |      |
| Module     |             |            |            |            |        |        |      |
| Function block | **ACS-3xx COM MOD RTU** | **ACS-3xx COM MOD RTU** | **ACS-3xx COM MOD RTU** | **ACS-3xx COM MOD RTU** |        |        |      |
| Number of Values | 3 | 3 | 3 | 3 |        |        |      |
| ModRegister - 40000 | 1.3 | 1.3 | 1.3 | 1.3 |        |        |      |
| Mapping Par   | 53 10 53.17 | 53 10 53.17 | 53 10 53.17 | 53 10 53.17 |        |        |      |

## TCP

<table>
<thead>
<tr>
<th>Modbus XXX</th>
<th>ABB Profile</th>
<th>AC5000 (3)</th>
<th>AC5300 (4)</th>
<th>ACH500 (7)</th>
<th>AC5800</th>
<th>AC5850</th>
<th>ACO5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>classic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module</td>
<td><strong>FENA</strong></td>
<td><strong>FENA</strong></td>
<td><strong>FENA</strong></td>
<td><strong>FENA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function block</td>
<td><strong>ACS-3xx COM MOD TCP</strong></td>
<td><strong>ACS-3xx COM MOD TCP</strong></td>
<td><strong>ACS-3xx COM MOD TCP</strong></td>
<td><strong>ACS-3xx COM MOD TCP</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Values</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ModRegister - 40000</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mapping Par</td>
<td>53 10 53.17</td>
<td>53 10 53.17</td>
<td>53 10 53.17</td>
<td>53 10 53.17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>enhanced</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function block</td>
<td><strong>ACS-3xx COM MOD TCP enhanced</strong></td>
<td><strong>ACS-3xx COM MOD TCP enhanced</strong></td>
<td><strong>ACS-3xx COM MOD TCP enhanced</strong></td>
<td><strong>ACS-3xx COM MOD TCP enhanced</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Values</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ModRegister - 40000</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mapping Par</td>
<td>53 10 53.17</td>
<td>53 10 53.17</td>
<td>53 10 53.17</td>
<td>53 10 53.17</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PS553-DRIVES: AC500 Library Package

Structure

- Overview AC Drives Fieldbus Configuration
- Configuration of AC Drives for AC500 Fieldbus Control
  - Workflow, Configuration Tools, Settings
- PS553-DRIVES Library
  - Update Package, Library details
  - Fieldbus independent blocks
  - Modbus RTU: Generic servers / ACSXXX
  - Modbus TCP
  - Control Blocks
  - Help and Documentation
  - Visualizations, Examples
- Benefits
PS553-DRIVES: Visualizations
Visualization for all Blocks Available
PS553-DRIVES: Visualizations
General Creation of a Visualization Element

Actual Speed: %s

Regular Element Configuration (#2)

Category:
Shape
Text
Text variables
Line width
Colors
Color variables
Motion absolute
Motion relative

Variables:
Invisible:
Input disable:
Change color:
Text display: ActSpeed

Input assistant
Watch Expressions
- PPO_05_4_PKw_10_PZD_Module_Mapping
  - ActSpeed (WORD)
  - ControlWord (WORD)
  - n1 PKw (mV/WORD)
PS553-DRIVES: Examples
Example Classic Control
PS553-DRIVES: Examples
Example Classic Control with Scaling Function
PS553-DRIVES: Examples
Example project Modbus RTU ACS355
PS553-DRIVES: AC500 Library Package
Structure

- Overview AC Drives Fieldbus Configuration
- Configuration of AC Drives for AC500 Fieldbus Control
  - Workflow, Configuration Tools, Settings
- PS553-DRIVES Library
  - Update Package, Library details
  - Fieldbus independent blocks
  - Modbus RTU: Generic servers / ACSXXX
  - Modbus TCP
  - Control Blocks
  - Help and Documentation
  - Visualizations, Examples

- Benefits
PS553-DRIVES: AC500 Library - Market Trend: Solution selling

- Applications: Industrial Speed control applications
  - Pumping, blending, dosing in food & beverage or chemical; fan and compressors / compressors and fans in HVAC
  - Material handling: in production machines
  - Conveying: In assembly or packing lines
  - Packaging: bag forming filling, sealing, wrapping machines

- Main Segments:
  - Water & Waste Water
  - Building Automation
  - Food & beverage
  - Assembly line OEMs
  - Packaging machines OEM
PS553-DRIVES: AC500 Library
Advantage of AC500 Drives library

- Multiple drives can be connected to one PLC in a simple way via different networks
- One function block for many different drives and busses ensures similar handling
- Modbus RTU: additional support blocks for easy integration
  - Lower in cost, Standard Modbus interface available in CPU and some Drives
- Simple to use
PS553-DRIVES: AC500 Library

Benefit of the Solution

- System approach with ABB components
- e.g. Drives Manager integration for Profibus and Profinet in CBP
- Lower risk of implementation: Pretested blocks, example application
- Save time: Up and running quickly.
- Many different ABB Drives and networks usable in same simple way
PS553-DRIVES: AC500 Library

Benefit of the AC500 platform

- One programming tool
- CPU w. onboard Ethernet f. integration to different networks
- Webserver for web visualization
- Scalability of the PLC: One single PLC platform with scaleable performance for all application types
PS553-DRIVES: AC500 Library
Benefit of the AC500 platform

- One engineering tool based on the CODESYS environment
- One access point
  - One project archive
  - Drive interface libraries
- Well adapted user interface
- Complies with the IEC 61131-3 programming standard
PS553-DRIVES: “Move a Motor in Minutes” (M³)
Simple integration of major networks and ABB drives

- Modbus for General communications
- Profibus for plant communications
- CANopen for Machine communications
- Profinet for industrial networking
- EtherCAT for Motion networking
Power and productivity for a better world™