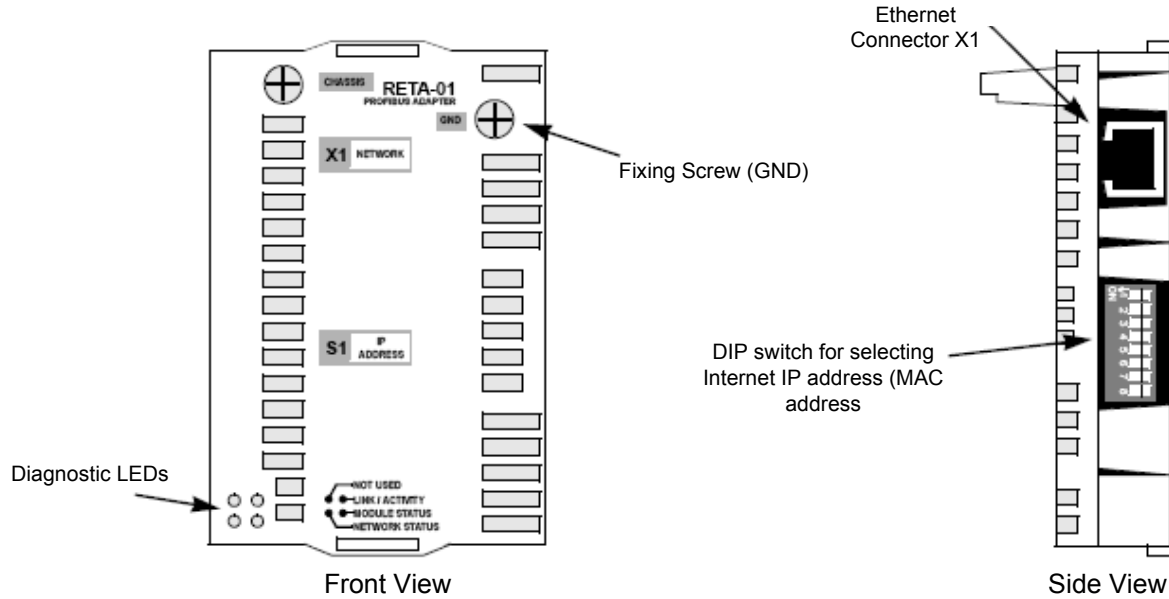


MODBUS TCP Fieldbus Quick Start Guide

The RETA-01 Adapter module is required to support Modbus/TCP network communications on the PS200. Implementation of the Modbus/TCP server in the RETA-01 module is done according to the Modbus/TCP Specification 1.0.

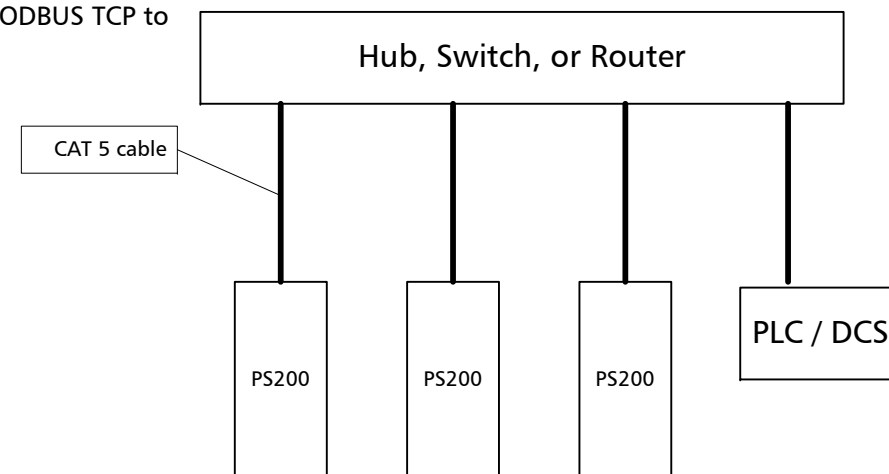


- 1 Install the RETA-01 fieldbus module in option slot 1 of the PS200. Be sure to use the fixing screws for proper ground bonding. Module power and signal connections are automatically made.



- 2 Connect the Ethernet cable (RJ-45 connector) to the RETA-01 module, connector X1. Standard CAT 5 UTP or STP cables can be used. Avoid parallel runs with power (e.g. motor) cables.
- 3 Power up the drive. The "MODULE STATUS" LED should be green. If the network cable is connected to an active network, the "LINK/ACTIVITY" LED should also be solid or blinking green. The "NETWORK STATUS" LED will be a steady green if the DCS/PLC has an Ethernet connection open against the drive.
- 4 Enter the proper pass code into the PS200 and go to parameter group 30. Be sure parameter 30.01 shows "FIELDBUS". Change parameter 30.03 to "CSA2.8 / 3.0". Set up parameter group 31 according to Table 1. NOTE: Once group 31 parameters are entered you must use parameter 31.27 to refresh the module or the new parameters will not take affect. Another way to refresh the module is to cycle power.

- 5 Set up PumpSmart for the type of process control required. Be sure to define all parameters being written to via MODBUS TCP to "FIELDBUS". Examples include:
 12.01 START / STOP
 12.11 SPEED OVERRIDE
 12.13 SPEED OVERRIDE REF
 16.01 SET 1 / SET 2 SELECT
 16.02 SETPOINT 1 SELECT
 16.03 SETPOINT 2 SELECT
 ETC.



See Page 2 for a MODBUS sample application.

Table 1

| Parameter Number | Parameter Name | Default Value | Required Value | Available Options | Comments |
|------------------|----------------|--------------------|----------------|--|---|
| 30.01 | FIELDBUS | NO | FIELDBUS | NO FIELDBUS ADVANT STD MODBUS CUSTOMIZED | |
| 30.03 | COMM PROFILE | CSA2.8/3.0 | CSA2.8/3.0 | CSA2.8/3.0 ABB DRIVES GENERIC | |
| 31.01 | MODULE TYPE | | RETA-01 | | No action is required. This parameter is automatically configured by the SP200 |
| 31.02 | COMM RATE | (0) Auto Negotiate | USER DEFINED | 0 = Auto Negotiate 1 = 100 Mbit/s, full duplex 2 = 100 Mbit/s, half duplex 3 = 10 Mbit/s, full duplex 4 = 10 Mbit/s, half duplex | |
| 31.03 | DHCP | (1) DHCP Enabled | USER DEFINED | 0 = DHCP Disabled 1 = DHCP Enabled | DHCP (Dynamic Host Configuration Protocol) can be used to automatically assign IP addresses, to deliver TCP/IP stack configuration parameters such as the subnet mask and default router, and to provide other configuration information. |
| 31.04 | IP ADDRESS 1 | 0 | USER DEFINED | 0 - 255 | Defined by the user's network. This is the MAC ID address for this drive. NOTE: Be sure all DIP switch settings are set at "0", or this address will be ignored. |
| 31.05 | IP ADDRESS 2 | 0 | USER DEFINED | 0 - 255 | |
| 31.06 | IP ADDRESS 3 | 0 | USER DEFINED | 0 - 255 | |
| 31.07 | IP ADDRESS 4 | 0 | USER DEFINED | 0 - 255 | |
| 31.08 | SUBNET MASK 1 | 0 | USER DEFINED | 0 - 255 | Defined by the user's network. Subnet masks are used for splitting networks into subgroups, or subnets. |
| 31.09 | SUBNET MASK 2 | 0 | USER DEFINED | 0 - 255 | |
| 31.10 | SUBNET MASK 3 | 0 | USER DEFINED | 0 - 255 | |
| 31.11 | SUBNET MASK 4 | 0 | USER DEFINED | 0 - 255 | |
| 31.12 | GW ADDRESS 1 | 0 | USER DEFINED | 0 - 255 | This is the Gateway address. Defined by the user's network. |
| 31.13 | GW ADDRESS 2 | 0 | USER DEFINED | 0 - 255 | |
| 31.14 | GW ADDRESS 3 | 0 | USER DEFINED | 0 - 255 | |
| 31.15 | GW ADDRESS 4 | 0 | USER DEFINED | 0 - 255 | |
| 31.16 | PROTOCOL | MODBUS TCP | MODBUS TCP | 0 = MODBUS TCP 1 = ETHERNET AC/DC 2 = ETHERNET IP / TRANSPARENT | The RETA-01 module can be used for any one of these three protocols. This Quick Start Guide deals with MODBUS TCP. |

Table 2

| Bit | Name | Description |
|------|----------------|---|
| 0 | Reserved | |
| 1 | Reserved | |
| 2 | Reserved | |
| 3 | Start/Stop | 0 = Stop 1 = Start |
| 4 | Reserved | |
| 5 | Ref Select | 0 = Reference 1 1 = reference 2 |
| 6 | Reserved | |
| 7 | Reserved | |
| 8 | Reset Fault | 0 → 1 |
| 9-12 | Reserved | |
| 13 | Speed Override | 0 = Speed Override Disabled 1 = Speed Override Enabled |

Control Word

Table 3

| Bit | Name | Description |
|-----|-------------|--|
| 0 | Ready | 0 = Initializing, or initialization error 1 = Ready to start |
| 1 | Enabled | 0 = Coast to stop 1 = Stop per profile (defined in parameter 13.02) |
| 2 | Reserved | |
| 3 | Running | 0 = Stopped 1 = Running with selected setpoint |
| 4 | Reserved | |
| 5 | Remote | 0 = Drive in Local Mode 1 = Drive in Remote Mode |
| 6 | Reserved | |
| 7 | At Setpoint | 0 = Actual not at setpoint 1 = Actual at setpoint |
| 8 | Faulted | 0 = No active faults 1 = A fault is active |
| 9 | Warning | 0 = No active warning 1 = A warning is active |
| 10 | Limit | 0 = Drive is not at limit 1 = Drive is at a limit |

Status Word

Example Application

In this application we will be setting the drive up for pressure control with a pressure range of 0–100 PSIG, and want to make available to the DCS values for actual pressure, SmartFlow, motor speed, motor power, and energy savings. We want to be able to send a set-point reference, start/stop, and reset the drive the drive if necessary. The process requires that we occasionally change the specific gravity as well. Our DCS Ethernet address is 192.100.66.108, and a Subnet of 255.255.255.0.

First, note that the five values; actual pressure, SmartFlow, motor speed, motor power, and energy savings are not in parameter numerical order. MODBUS does not support polling a group of parameters where some parameters in that group do not exist. In that case you will receive an exception code 02 error. You can request individual reads for each of these parameters, or using Group 92 you can assign these parameters to open read registers within the first 12 MODBUS registers (40005-40006, 40010-40012).

Start/Stop and Reset are accomplished by writing to the appropriate bits in the control word 40001. We write the set-point reference to register 40002

Specific gravity (SG RATE) is parameter 29.15. We still want to manage all parameters within the first 12 MODBUS registers so we need to assign this to an open write register (40007-40009). This is done in Group 90.

Below are tables for Groups 30 & 31, 90, and 92 showing how these Groups would be set up for this application.

| Parameter Number | Parameter Name | Required Value |
|------------------|----------------|----------------|
| 30.01 | FIELD BUS | FIELD BUS |
| 30.03 | COMM PROFILE | CSA2.8 / 3.0 |
| 31.01 | MODULE TYPE | ETHERNET TCP |
| 31.02 | COMM RATE | 0 |
| 31.03 | DHCP | 1 |
| 31.04 | IP ADDRESS 1 | 192 |
| 31.05 | IP ADDRESS 2 | 100 |
| 31.06 | IP ADDRESS 3 | 66 |
| 31.07 | IP ADDRESS 4 | 109 |
| 31.08 | SUBNET MASK 1 | 255 |
| 31.09 | SUBNET MASK 2 | 255 |
| 31.10 | SUBNET MASK 3 | 255 |
| 31.11 | SUBNET MASK 4 | 0 |
| 31.12 | GW ADDRESS 1 | 0 |
| 31.13 | GW ADDRESS 2 | 0 |
| 31.14 | GW ADDRESS 3 | 0 |
| 31.15 | GW ADDRESS 4 | 0 |
| 31.16 | PROTOCOL | 0 |

REMEMBER –
After setting values in groups 30 and 31 you **MUST** use parameter 31.27 to refresh the Fieldbus module.

| Parameter Number | Parameter Name | Required Value | Parameter | MODBUS Register |
|------------------|----------------|----------------|-----------|-----------------|
| 90.01 | MAIN DS REF2 | 2915 | SG RATE | 40003 |

| Parameter Number | Parameter Name | Required Value | Parameter | MODBUS Register |
|------------------|----------------|----------------|----------------|-----------------|
| 92.02 | MAIN DS ACT1 | 204 | Press Actual | 40005 |
| 92.03 | MAIN DS ACT2 | 219 | SMARTFLOW | 40006 |
| 92.04 | AUX DS ACT3 | 102 | MOTOR SPEED | 40010 |
| 92.05 | AUX DS ACT4 | 106 | MOTOR POWER | 40011 |
| 92.06 | AUX DS ACT5 | 212 | Energy Savings | 40012 |

For this example application as a Pressure controller set the drive up according to TAB “2A – Single Pump Process” as found in the “PumpSmart Control Solutions PS200 v5 Configuration & Operation Guide”. In addition to this set up make the following parameter changes in order to facilitate Fieldbus control.

| Parameter | Parameter Name | Set To Value | Comment |
|-----------|------------------|--------------|--|
| 12.01 | Start/Stop | FIELD BUS | Enables the drive to be start/stopped from the DCS. Also see “DI1P,2P – FB” when using a local momentary start/stop pushbutton for start/stop in addition to Fieldbus. |
| 16.02 | SET-POINT SELECT | FIELD BUS | Enables the drive to look to the DCS for its reference (set-point). Note: 16.03 and 16.04 must still be set up with the set-point engineering units. |

How the DCS will read/write the register values.

| MODBUS Register | Parameter Name | Read/Write | Comment | Example |
|-----------------|--------------------|------------|--|--|
| 40001 | Control Word | Write | See the control Word table for detail. | (BIN) 000001000 will start the drive. (DEC 8) |
| 40002 | Pressure Set-point | Write | Scale value accordingly using 0 to 20,000 counts where 20,000 equals the value entered in parameter 16.03. | Assuming a set-point scale of 0-100 PSIG, to set a set-point value of 20 PSIG send a decimal value of 4,000. |
| 40003 | SG RATE | Write | Scale value accordingly with an implied decimal value of two. Scaled 100:1. | To set a SG Rate value of 1.2 you will enter a decimal value of 120. |
| 40004 | Status Word | Read | See the Status Word table for detail. | With the following BIN value we know the drive is Ready, Enabled, and is running with a Set-Point. 0000001011 (Decimal 11) |
| 40005 | Actual Pressure | Read | Scaled 1:1 | An Actual Pressure value of 16.8 PSIG will read 17. |
| 40006 | SmartFlow | Read | Scale value accordingly with an implied decimal value of one. Scaled 10:1 | If the value of SmartFlow is 200 GPM you will read 2000. |
| 40007 | Not Used | Write | | |
| 40008 | Not Used | Write | | |
| 40009 | Not Used | Write | | |
| 40010 | Motor Speed | Read | Scale value accordingly using 0 to 20,000 counts, where 20,000 counts equals the Max Spd (14.01) | If the maximum permitted speed is 1750 and the pump is rotating at 600 RPM, we would expect to see a value of 6,856. |
| 40011 | Motor Power | Read | Scale value accordingly with an implied decimal value of one. Scaled 10:1. Read as a % of the motors Normal Power (11.08). | If the drive calculates the motor power at 25% of the motor's Normal Power (11.08), the value read by the DCS is 250. |
| 40012 | Energy Savings | Read | Scaled 1:1 | If the energy savings is \$500.35 the read value will be 500. |

Troubleshooting Guidelines

The LED Indicators on the RETA-01 module can assist with troubleshooting communications between the drive and DCS.

| Name | Colour | Function |
|---------------|------------|---|
| Link/Activity | (not used) | Link/Activity |
| | Green | Flashing green - Module is receiving/transmitting on Ethernet Steady green - Module has detected link Off - Module cannot detect link |
| | Red/ Green | Flashing red - <i>EtherNet/IP</i> : One or more connections timed out; <i>Modbus/TCP</i> : No message has been received within configured time Steady red - Duplicate IP address Flashing green - Waiting for connections Steady green - <i>EtherNet/IP</i> : At least one EtherNet/IP connection is open against the module (even to the Message router); <i>Modbus/TCP</i> : At least one Modbus/TCP connection is open against the module |
| Module Status | Red/ Green | Flashing red - Minor fault (e.g. communication with application lost but recoverable) Steady red - Major fault (e.g. bad flash, failed memory test, non-recoverable communication problem with host) Steady green - Normal operation |

Unable to establish communications between the drive and the DCS (PLC).

Be sure the Module is located in Slot 1 of the PS200.

Check the MAC addressing between the DCS and the drive, specifically the IP and Subnet Mask. If Gateway addressing is used be sure it is correct for the network.

Be sure the Comm Rate and DHCP values are correct for the network. Setting these to “0” and “1” respectively causes the module to automatically determine these two attributes.

Be sure that parameter 31.01 states ETHERNET TCP, as this indicates the module is recognized by the drive. If not, check that parameters 30.01 and 30.03 are set for FIELD BUS and CSA2.8/3.0 respectively.

Be sure that you have Refreshed the Fieldbus module anytime after you change parameters in Groups 30 & 31. This is done by initiating a Refresh at parameter 31.27. It is not necessary to Refresh after changing parameter Groups 90 and 92.

Verify the Ethernet cable is OK.

Be sure the DIP switches are in the off position if not using them to set the MAC addressing. Only one switch being in the “on” position will cause the module to look to the DIP switches for the complete MAC address.

“COMM FLT FUNC” Error

Disable the COMM FAULT FUNC (24.19) if you do not want to see a communications loss fault when switching from remote to local. Set up 16.10 for type of local control desired. However, doing so disables any communication loss indication via the keypad display.

Getting errors.

The RETA-01 module supports the following MODBUS codes and exception codes.

| Function code | Name | Description | Modbus class |
|---------------|---------------------------|--|--------------|
| 03 | Read holding registers | Reads the binary contents of the holding registers (4X references) in the slave. | 0 |
| 06 | Preset single register | Presets a value into a single holding register (4X reference). | 1 |
| 16 (10h) | Preset multiple registers | Presets values into a sequence of holding registers (4X references). | 0 |
| 23 (17h) | Read/Write registers | Performs a combination of one read and one write operation in a single Modbus transaction. The function first reads a group of 4XXXX registers and then writes new contents to another group of 4XXXX registers. | 2 |

| Exception code | Name | Description |
|----------------|----------------------|---|
| 01 | Illegal function | Unsupported command |
| 02 | Illegal data address | Address does not exist or is read/write-protected |
| 03 | Illegal data value | Value is outside minimum and maximum limits. Parameter is read-only |