DOVER FLEXO ELECTRONICS, INC.

INSTRUCTION MANUAL INSERT

Ethernet / IP Communications

STEADYWEB™ 6

DOC 801-2570

This document to be used
in conjunction with the
SW6 CONTROLLER
TECHNICAL REFERENCE OR
OPERATORS MANUAL

5 YEAR WARRANTY

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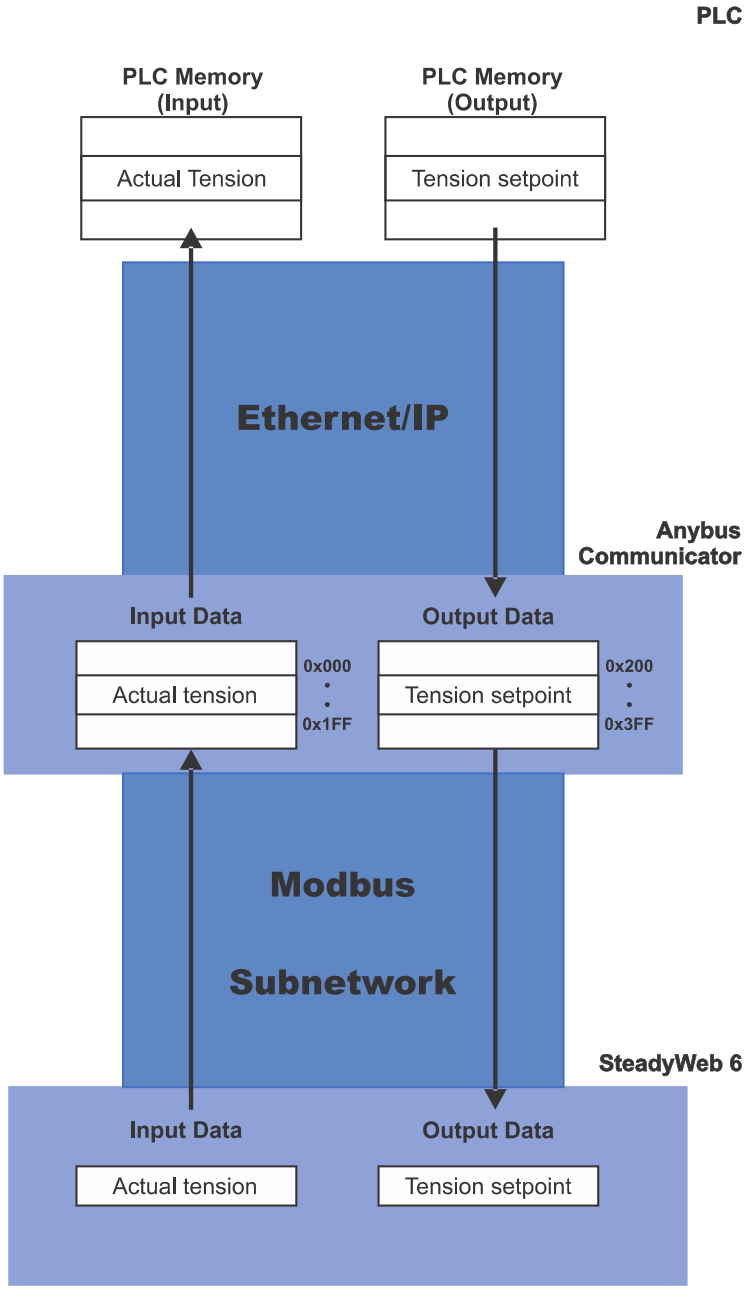
EtherNet/IP™ Communications for the SteadyWeb™ 6 Digital Tension Controller

Table of Contents

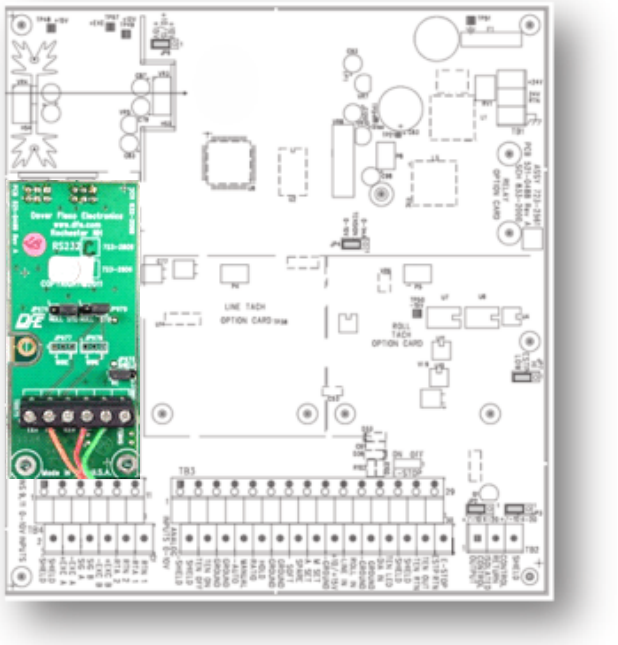
1. Overview:

The SteadyWeb6 (SW6) supports EtherNet/IP by utilizing a gateway called the Anybus Communicator. This gateway sits between the SteadyWeb6 Modbus interface and an EtherNet/IP-based network. A generic data exchange model is utilized to transfer data. The following shows a basic example of the data exchange between the SW6 and a PLC on the EtherNet/IP network.

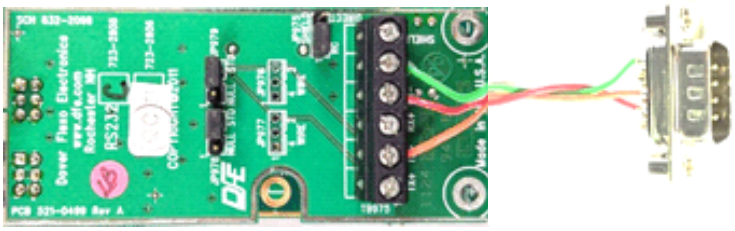


2. Physical Connection Requirements:

A RS232 Option Card, SW5/SW6, RoHS (P/N 723-2808) must be installed in the SW6 on the Control Board. If you ordered your SW6 from the factory with the option ”RS23” This board should already be installed.

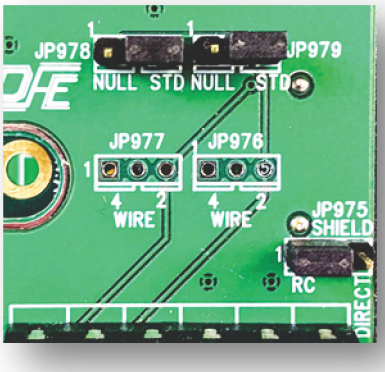


A serial connection between the RS232 option card and ’Anybus Communicator - EtherNet/IP’ Gateway must be established. One end of the connection shall be wired to the 723-2808 Option Card at the location of TB975. This connection should run to the ’Anybus Communicator - EtherNet/IP’ Subnet port located at the bottom of the device. A Male DB9 connector is used to make this connection.



723-2808 Option Card TB975	DB9 Male
TX-	3
RX-	2
GROUND	5

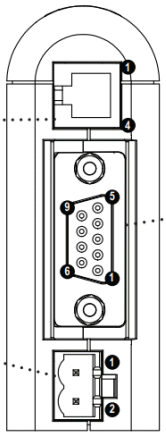
2. Physical Connection Requirements *continued…*



Bottom View

PC Connector:
1. GND
2. GND
3. RS232 Rx
4. RS232 Tx

Power:
1. +24 V DC
2. GND



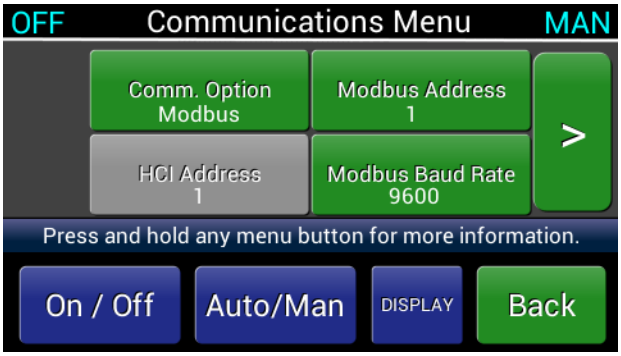
Subnetwork Connector

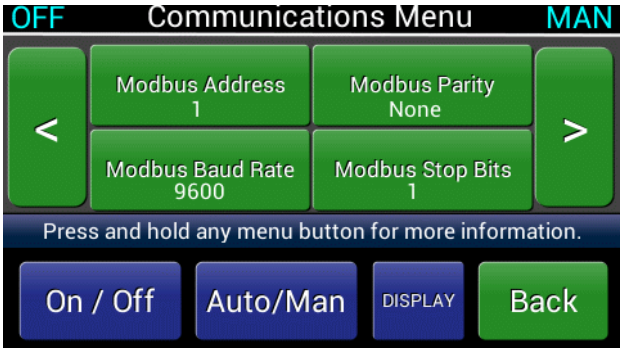
Pin no.	Description
1	+5V OUT
2	RS232 Rx
3	RS232 Tx
4	NC
5	Signal GND
6	RS422 Rx+
7	RS422 Rx-
8	RS485+ / RS422 Tx+
9	RS485- / RS422 Tx-

In addition to the electrical connections, the STD/NULL jumpers (JP978 and JP979) must be set. When using a connection specified above these jumpers should be left in the STD positions. (Pins 2 & 3) Verify the jumper positions on the 723-2808 Board installed on the SW6 are set correctly.

3. Communication Settings SW6

Once a Physical RS-232 connection is established between the SW6 and the Gateway the communication settings in the SW6 must be set correctly. Once these connection settings are established on the SW6 the device is ready to communicate with gateway.





Comm Option: **Modbus**
Modbus Address: **1**
Modbus Baud Rate: **9600**
Modbus Parity: **None**
Modbus Stop Bits: **1**

4. Gateway Configuration:

The gatewate configuration is extremely flexible. In this example a pre-loaded configuration is provided by DFE and pre-loaded on the gateway if the gateway was purchased through DFE. This configuration is called Standard Data SW6.cfg. The Gateway configuration can be re-loaded, modified, or altered to fit specific customer needs or to add commands and/or data requests not included in the 'Standard Data SW6' configuration. If you need to obtain the Standard Data SW6.cfg file please contact DFE.

To load a new configuration or view the current configuration of the gatewate a tool from HMS networks must be used called the 'Anybus Configuration Manager – Communicator' which can be downloaded from https://www.anybus.com. An independent serial connection must also be established with the gateway located at the bottom of the unit. This PC connection used for programing the device will connect with the Anybus Configuration Manage software. It is also strongly advised to read and understand the User Manual for the Anybus® Communicator™ for EtherNet/IP™ / Modbus-TCP

1. Essentials for a successful configuration:

Fieldbus Configuration:

Address mode	
ModbusTCP address mode	Enabled
Ethernet TCP/IP configuration	
TCP/IP Settings	Disabled
Fieldbus	
Fieldbus Type	EtherNet/IP & Modbus-TCP 2-Port
IO Sizes	
Exact IO match	Disabled
IO Sizes	Automatic
Online/Offline trigger	
EtherNet/IP Run/Idle Header	Disabled

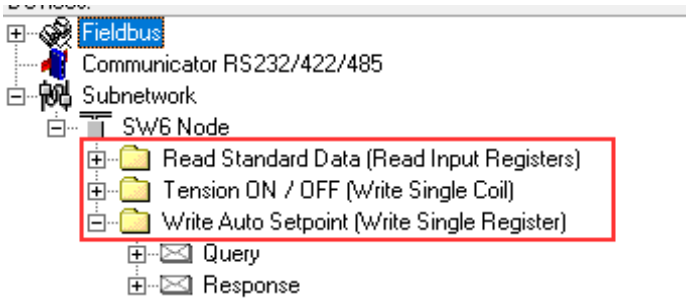
Subnet Configuration:

Communication	
Bitrate (bits/s)	9600
Data bits	8
Parity	None
Physical standard	RS232
Stop bits	1
Timing	
Message delimiter (10ms)	0

Node Configuration: *Slave Address: 1 (or set to the slave address in your SW6 menu settings)*

2. Example Transactions:

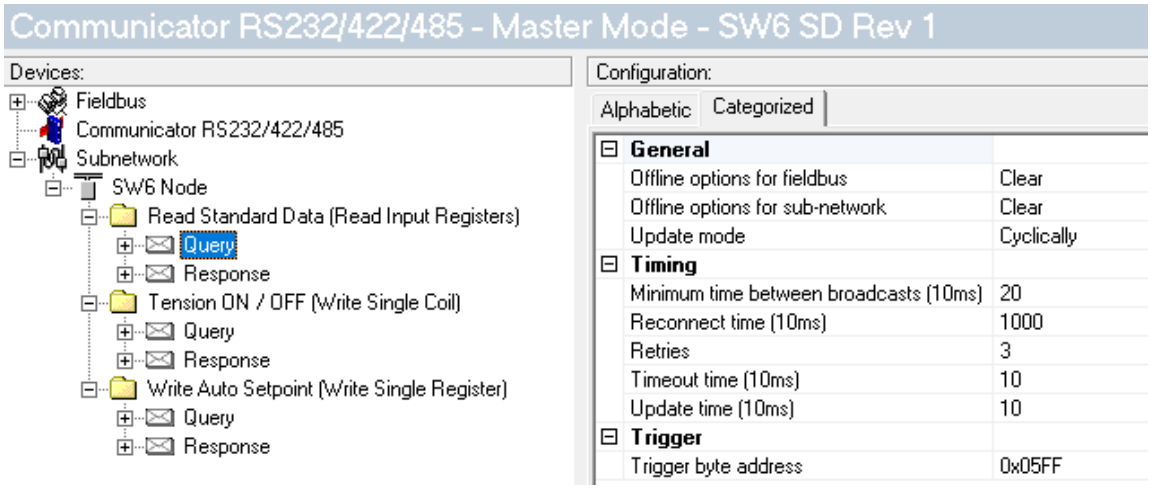
These transactions will setup the gateway to read a standard data packet and place that in memory of the gateway in the 'In Area' Location. Other transactions such as Tension ON/OFF and Write Auto Setpoint will allow us to turn the tension on and off and adjust a setpoint.



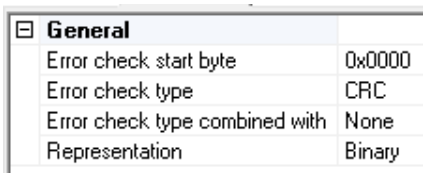
2. Example Transactions: continued...

1. Transaction: Read Standard Data (Read Input Registers)

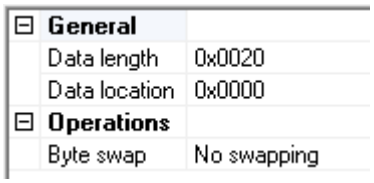
This transaction is setup as shown:



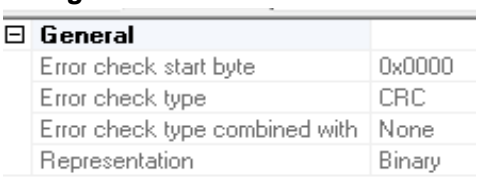
- **Query:**
  - ***Slave Address: 0x01***
  - ***Function: 0x04***
  - ***Starting Address: 0x0100***
  - ***Quantity of Input Registers: 0x0010***



  - ***Checksum:***
- ***Response:***
  - ***Slave Address: 0x01***
  - ***Function: 0x04***
  - ***Byte Count: 0x20***



  - ***Input Registers:***



  - ***Checksum:***

2. Example Transactions: continued...

Read Standard Data Transaction Summary:

This transaction sets the gateway to perform a polling update of the 'Standard Data' Modbus command. The Standard Data Command (04) is used to read a packet of 16 registers of data starting with register 256. The following data is procured and re stored into the 'In Area' of the Gateway device. Each register that is read from the SW6 takes up two bytes starting at 0x0000.

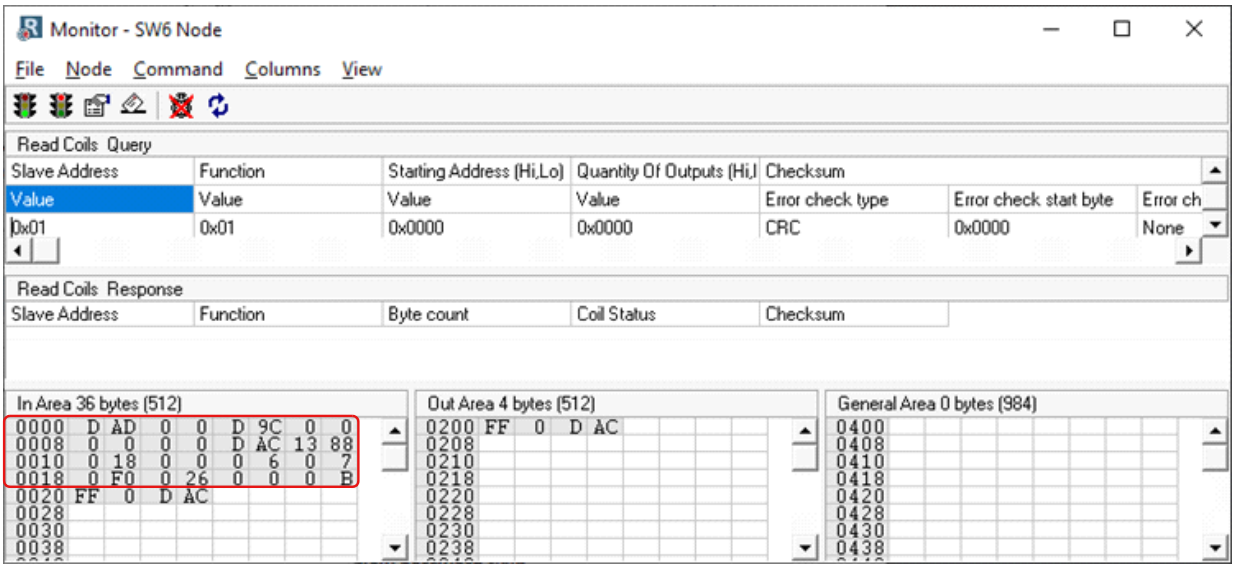
Data format:

'In Area' location	Status Register	Data Type
0x0000	Register 0	Tension Percent / RTA*
0x0002	Register 1	Tension Sign
0x0004	Register 2	Output Percent
0x0006	Register 3	Output Sign
0x0008	Register 4	Line Signal Percent
0x000A	Register 5	Diameter Percent
0x000C	Register 6	Auto Setpoint Percentage
0x000E	Register 7	Manual Setpoint Percent
0x0010	Register 8	Status Alarm Bits
0x0012	Register 9	Tension Units
0x0014	Register 10	Max Line Speed
0x0016	Register 11	Line Speed Units
0x0018	Register 12	Max Full Roll Diameter
0x001A	Register 13	Core Diameter
0x001C	Register 14	Diameter Units
0x001E	Register 15	Tension Range

* If Tension Source = Transducer: Register 0 = Transducer Tension Percent, Register 1 = Tension Sign
If Tension Source = RTA1: Register 0 = RTA1 Signal Percent, Register 1 = 0
If Tension Source = RTA2: Register 0 = RTA2 Signal Percent, Register 1 = 0

The format of each Data Type is documented in the OPTION INSERT RS232 / RS485 SERIAL INTERFACE STEADYWEB™ 6 documentation.

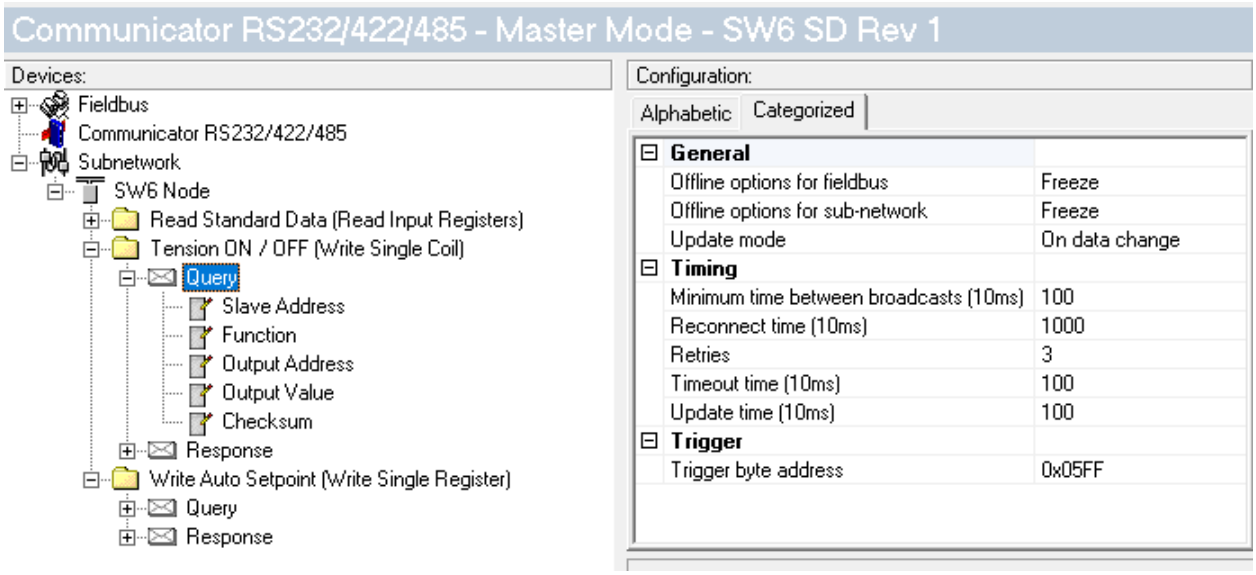
When running data can be viewed using the node monitor which is a tool within the Anybus Configuration Manager. Using this tool, we can see the standard data packet has arrived and was loaded into memory at the specified location.



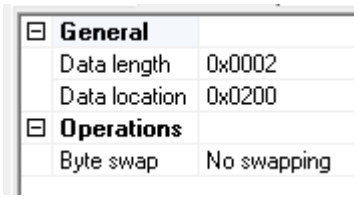
2. Example Transactions: continued...

2. Transaction: Tension ON/OFF (Write Single Coil)

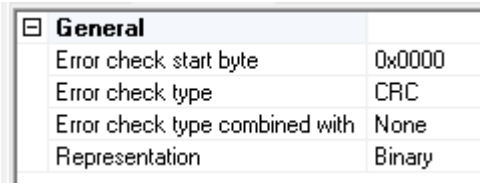
This transaction is setup as shown:



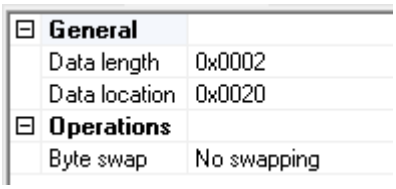
- ***Query:***
  - ***Slave Address: 0x01***
  - ***Function: 0x05***
  - ***Output Address: 0x000A***



  - ***Output Value:***



  - ***Checksum:***
- ***Response:***
  - ***Slave Address: 0x01***
  - ***Function: 0x05***
  - ***Output Address: 0x000a***



:

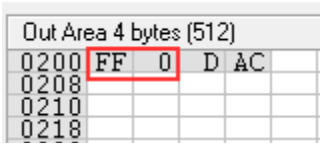
  - ***Output Value***
  - ***Checksum: N/A Default***

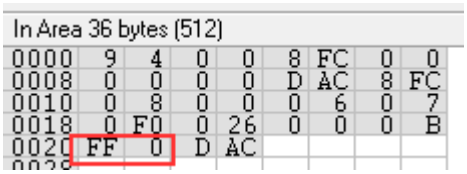
2. Example Transactions: continued...

2. Transaction: Tension ON/OFF (Write Single Coil) *continued...*

Tension On/Off Transaction Summary:

This transaction sets the gateway to reserve 2Bytes in the 'Out Area' of memory at the location of 0x200, which will be used to receive a value for the write coil command. By writing 0xFF00 to this location in memory a write coil command will be sent to the SW6 forcing the coil ON at Register 10 (Tension On/Off) thus forcing the tension ON. By writing 0x0000 to the same 0x200 location in memory the write single coil command will be sent to the SW6 forcing the Register 10 to OFF and thus forcing the tension OFF. You will notice this transaction is configured with an update mode set to "On data change" so a write coil command will only be sent when the data changes in the 0x200 location. This can be reconfigured if needed.

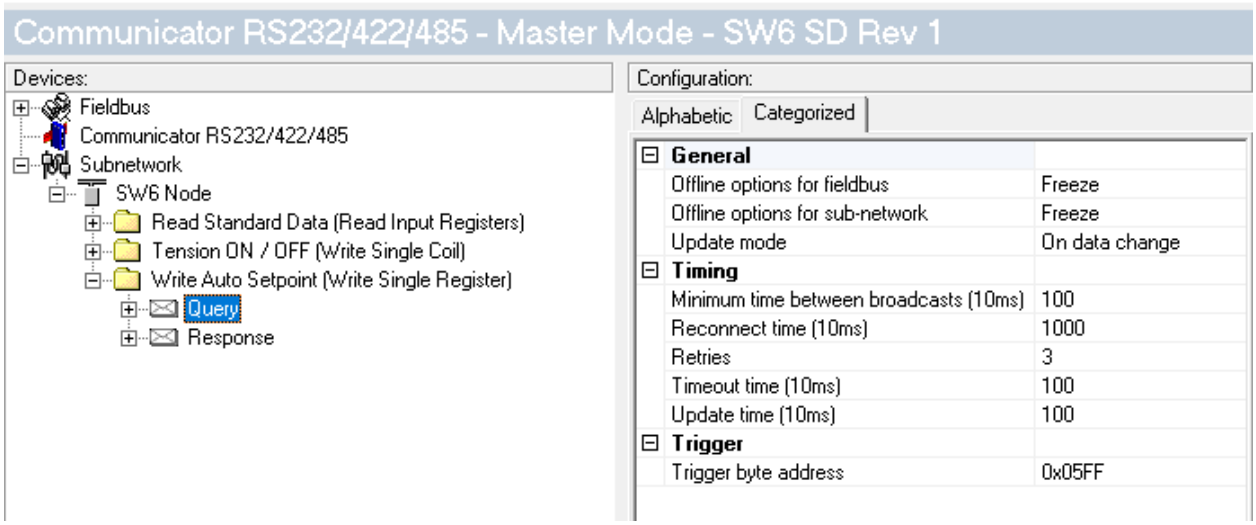




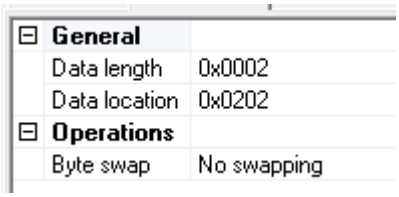
When sending the write coils command the response from the SW6 Modbus subnet is stored in the 'In Area' Data at the 0x0020 location. Reading this data can be used to verify if the command was accepted and acknowledged.

3. Transaction: Write Auto Setpoint (Write Single Register)

This transaction is setup as shown:



- ***Query:***
  - ***Slave Address: 0x01***
  - ***Function: 0x06***
  - ***Register Address: 0x0051***



2. Example Transactions: continued...

3. Transaction: Write Auto Setpoint (Write Single Register) *continued...*

- ***Register Value***

General	
Error check start byte	0x0000
Error check type	CRC
Error check type combined with	None
Representation	Binary

- ***Checksum***:

- ***Response:***
  - ***Slave Address: 0x01***
  - ***Function: 0x06***
  - ***Register Address: 0x0051***

General	
Data length	0x0002
Data location	0x0022
Operations	
Byte swap	No swapping

  - ***Register Value***
  - ***Checksum: N/A Default***

Write Auto Setpoint Transaction Summary:

This transaction sets the gateway to reserve 2Bytes in the 'Out Area' of memory at the location of 0x202, which will be used to receive a value for the Auto Setpoint Command. When data changes in this area of memory a Modbus command will be sent to the SW6 to modify the Auto Setpoint Register with the value that resides in 'Out Area' memory at location 0x202.

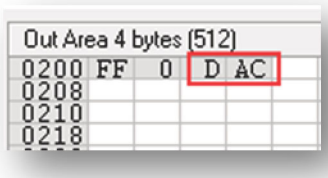
0 = 0.00%

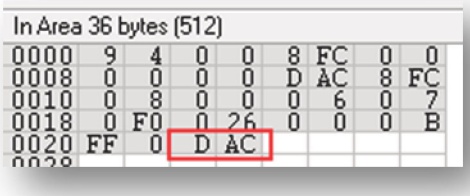
10000 = 100.00%

Example: A value of 5000 represents an Auto Setpoint of 50.00% the full range tension.

Example: A value of 0x0DAC represents an Auto Setpoint of 35.00% the full range tension.

When sending the write address command the response from the SW6 Modbus subnet is stored in the 'In Area' Data at the 0x0022 location. Reading this data can be used to verify if the command was accepted and acknowledged.



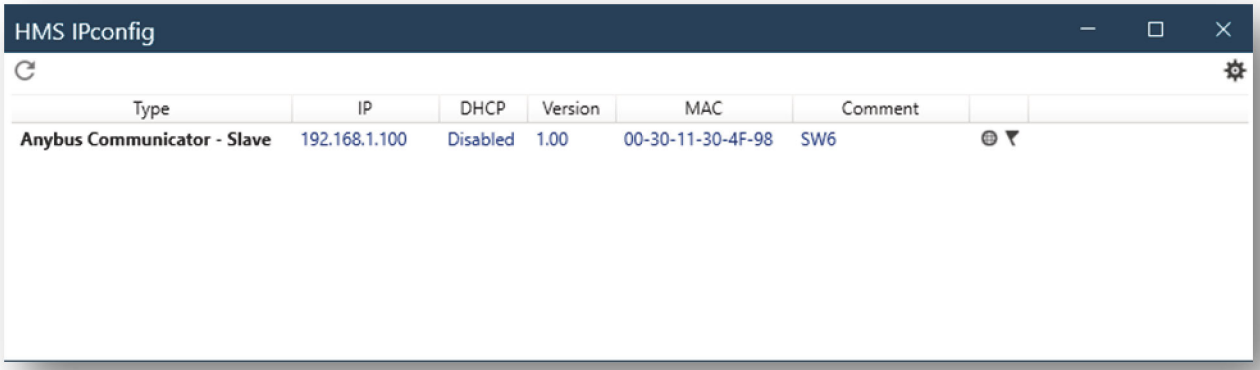


4. Gateway Configuration *continued...*

3. Configuring the IP address of the Gateway

The default IP is set to 192.168.1.100.
IP and DNS settings can be configured manually or dynamically using DHCP. To configure the gateway it is recommended to use the HMS Ipconfig tool.

1. Download HMS IPconfig from www.anybus.com/support.
2. Unpack the contents of the zip archive and run the installer program.
   When HMS IPconfig is started it will automatically scan for compatible and active HMS devices. To change the IP configuration for a device, click on the device in the list and edit the device configuration values. If more help is needed on this topic refer to the HMS Ipconfig User manual.



5 Testing out the Interface.

With the SteadyWeb6 and the Gateway powered and connected check to be sure that the subnet status light displays solid green to indicate there are no troubles with the Subnet interface.
If the subnet status light is red:

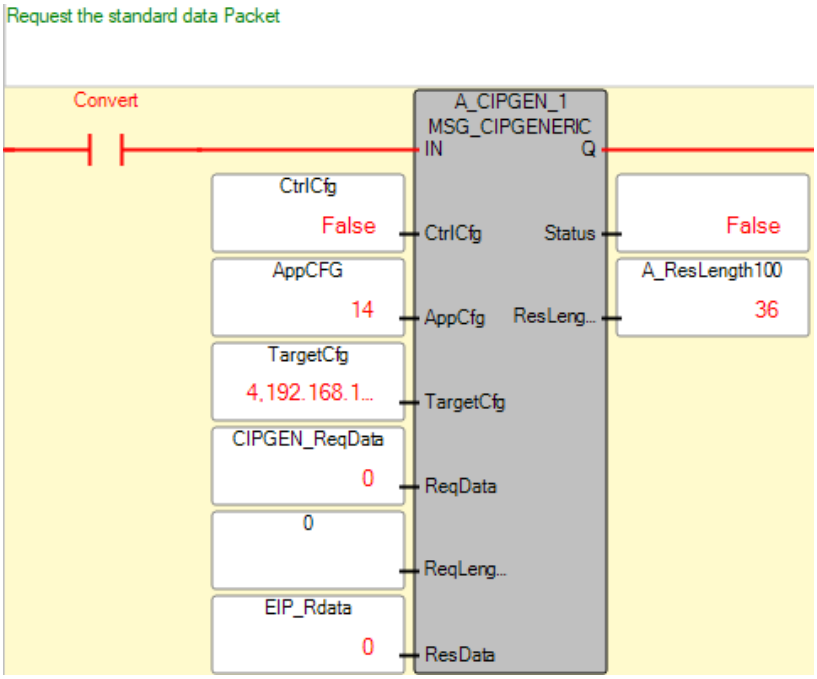
- Check the serial cable connections to the SW6
- Be sure a valid configuration is loaded to the gateway
- Be sure that the MODBUS configurations are set correctly in the SW6If the subnet Status is Green proceed to the EtherNet/IP Interface and attempt to communicate with the gateway.

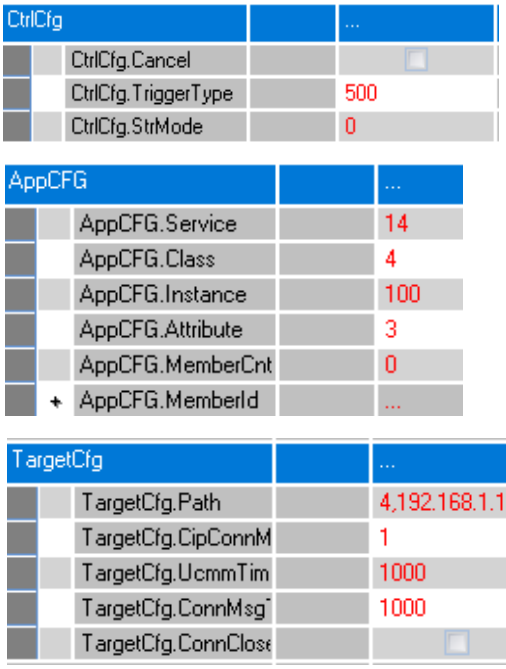
In this example we have utilized an Allen-Bradley Micro850 series PLC with a PV800 Graphics terminal to demonstrate the operation of displaying and setting tension. Reading Data

With a valid ethernet connection from the controller to the gateway established data can be read from the gateway at the pre-configured locations. A MSG_CIPGENERIC instruction block is configured to read the data in the ‘In Area’ of the gateway cyclically at a period of 500ms set in the CtrlCfg.TriggerType variable. The Class and Instance as well as other critical configurations parameters are found below. Keep in mind the IP Address much match your target gateway.

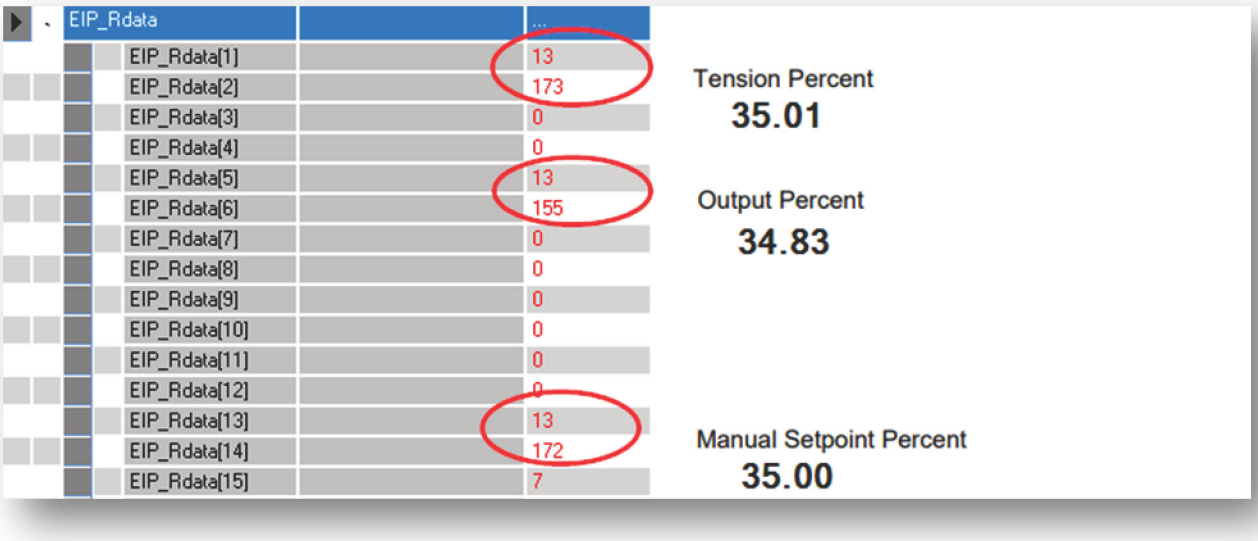
5. Testing out the Interface *continued...*

1. Reading Data





Successfully Generic Messaging should produce a resulting 36 Byte result which is stored to memory in the PLC. Below is a few critical locations for this example. Keep in mind if the gateway configuration is altered the data format may be different.



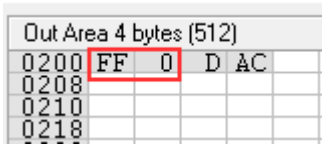
2. Writing Data

To write basic commands and data to the SW6 via the gatewate the MSG_CIPGENERIC instruction block is configured to write data to the 'Out Area' of the gateway. A command to set the SW6 Tension ON/OFF is presented below as an example.

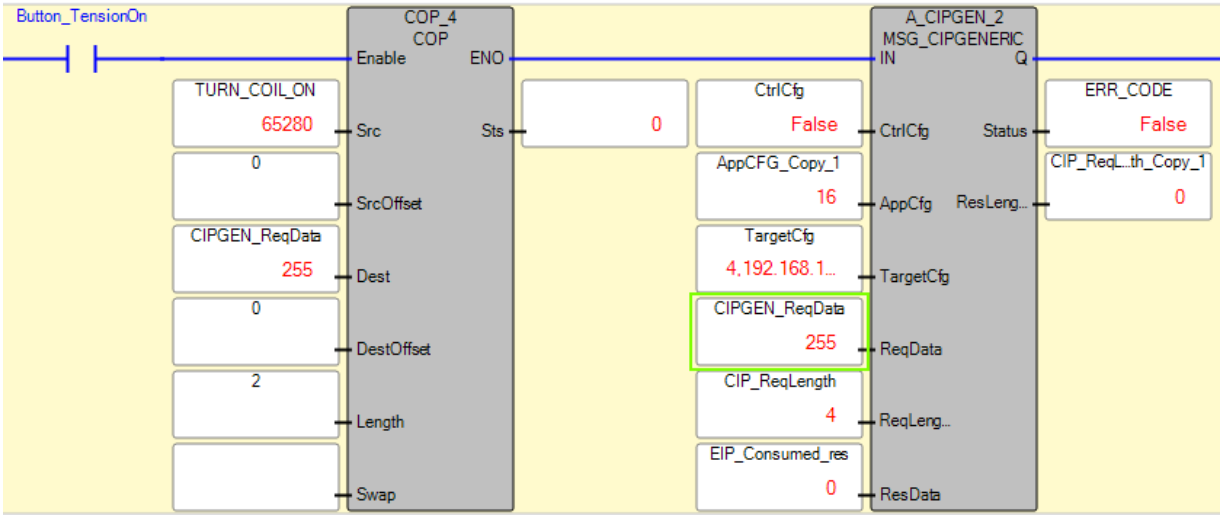
5. Testing out the Interface *continued...*

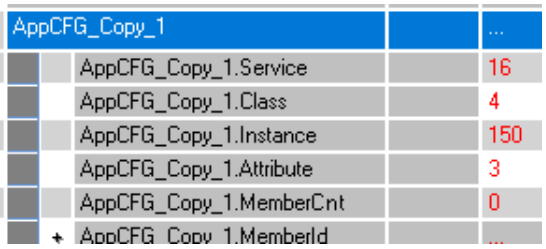
2. Writing Data *continued...*

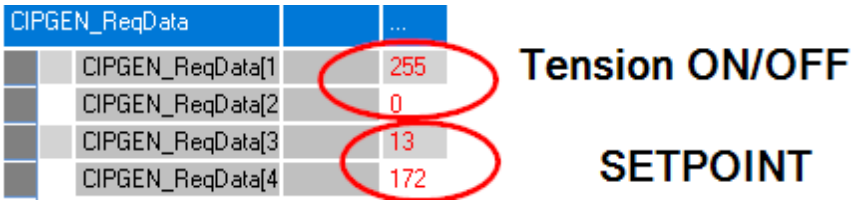
As described above we have configured the gateway to send a write Coil command to transition the tension ON when we write 0xFF00 to the location 0x200 in the ‘out Area’ of the gateway.



Below are the configurations of the MSG_CIPGENERIC instruction. We are also utilizing a COP instruction block to modify a portion of the memory we wish to modify. The Class and Instance as well as other critical configurations parameters are found below. Keep in mind the IP Address much match your target gateway. Similar COP instructions can be utilized to copy in Setpoint Data to the memory and then sent with a MSG_CIPGENERIC instruction.



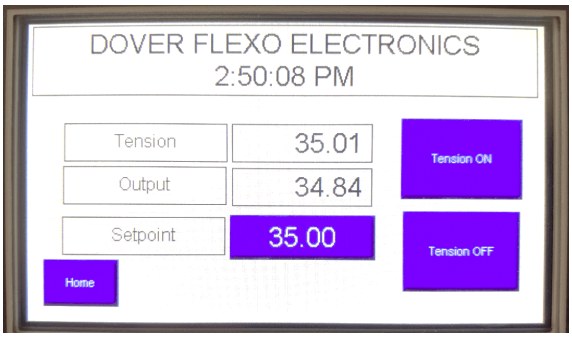




5. Testing out the Interface *continued...*

2. Writing Data *continued...*

Below is the GUI for the basic example shown next to the SW6 which is responding to commands and sending back live tension data to the gateway and ultimately the PLC. This is a simple example intended to demonstrate the architecture and some basic configuration parameters for an EIP connected communications infrastructure.



Implementation and Flexibility: The basic example provided provides the guidelines and roadmap for an EIP connected interface to the SW6. If more commands are needed or required by the system designer they can be added to the configuration on the gateway. In theory, any SW6 supported MODBUS command could be implemented to satisfy the designers needs.

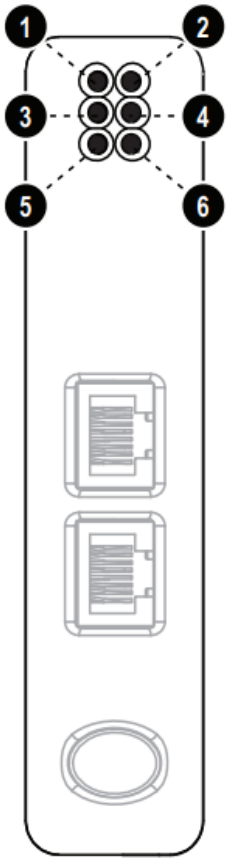
Limitations: The EIP interface via the gateway is ultimately limited in operation by primary 2 factors:

- The SW6 Modbus Interface – Only command which are supported by the Serial MODBUS interface will be able to accessed through the gateway, thus the Option Insert Manual for the RS232 / RS485 SERIAL INTERFACE SW6 serves as a great guild for remote command capability.
- Gateway Data Size Input Output Restrictions – Input data and output data are each limited to 512 Bytes. This serves as ample space but should be considered when determining the operational configuration for the gateway, especially if more than one Node is present on the subnetwork.

Practical Use for SteadyWeb6 EIP Interface:

- Recipe control at the PLC level
- System Monitoring of Actual Tension for Inspection or Quality Assurance
- Improved Plant Connectivity

APPENDIX:



LED Indicators

LED	Indication	Description
1 (Module Status)	Off Green Flashing Green Flashing Red Red Flashing Green/Red	No power Controlled by a scanner in run state Not configured, or scanner in idle state Minor fault (recoverable) Major fault (unrecoverable) Self-test in progress
2 (Network Status)	Off Green Flashing Green Red Flashing Red Flashing Green/Red	No IP address, or no power Online, one or more EtherNet/IP connections established Online, no connections established Duplicate IP address detected. Fatal error. One or more connections timed out Self-test in progress
3 (Link)	Off Green	No link Connected to an Ethernet network
4 (Activity)	Off Flashing Green	No Ethernet activity Activity, receiving/transmitting Ethernet packets
5 (Subnet Status)	Flashing green Green Red	Running, but one or more transaction errors Running Transaction error/timeout or subnet stopped
6 (Device Status)	Off Alternating red/green Green Flashing green Red Flashing red	Power off Invalid or missing configuration Initializing Running Bootloader mode Note the flash sequence pattern and contact HMS support

References:

TECHNICAL REFERENCE MANUAL Digital Tension Controller STEADYWEB™ 6
https://dfe.com/pdfs/con_sw6-tech-ref-man-r2.pdf
OPTION INSERT RS232 / RS485 SERIAL INTERFACE STEADYWEB™ 6
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User Manual Anybus® Communicator™ for EtherNet/IP™ / Modbus-TCP (2-port version)
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User manual HMS IPconfig
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Micro800 Programmable Controllers: Getting Started with CIP Client Messaging
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NOTES

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