

## **SE-330/SE-330AU/SE-330HV ETHERNET INTERFACE**

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**Revision 2**

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## 1. GENERAL

This document describes the Anybus Ethernet IT features supported by the SE-330/SE-330AU/SE-330HV. The Ethernet module supports the Modbus/TCP protocol and the IT functionality enables the module to work as a FTP Server, Telnet Server and HTTP Server. The module's file system can hold 1.4 Mbytes of data.

The IT features allow uploading custom web pages to access and display data. A default web page is included to demonstrate the IT functionality.

## 2. ETHERNET CONFIGURATION

### 2.1 CONFIGURATION SETTINGS

The Ethernet address can be set using the configuration switches or by using configuration software. The configuration switches allow setting the IP address from 192.168.0.1 to 192.168.0.254 with Subnet mask 255.255.255.0. If an IP address other than this range is required, use the configuration software.

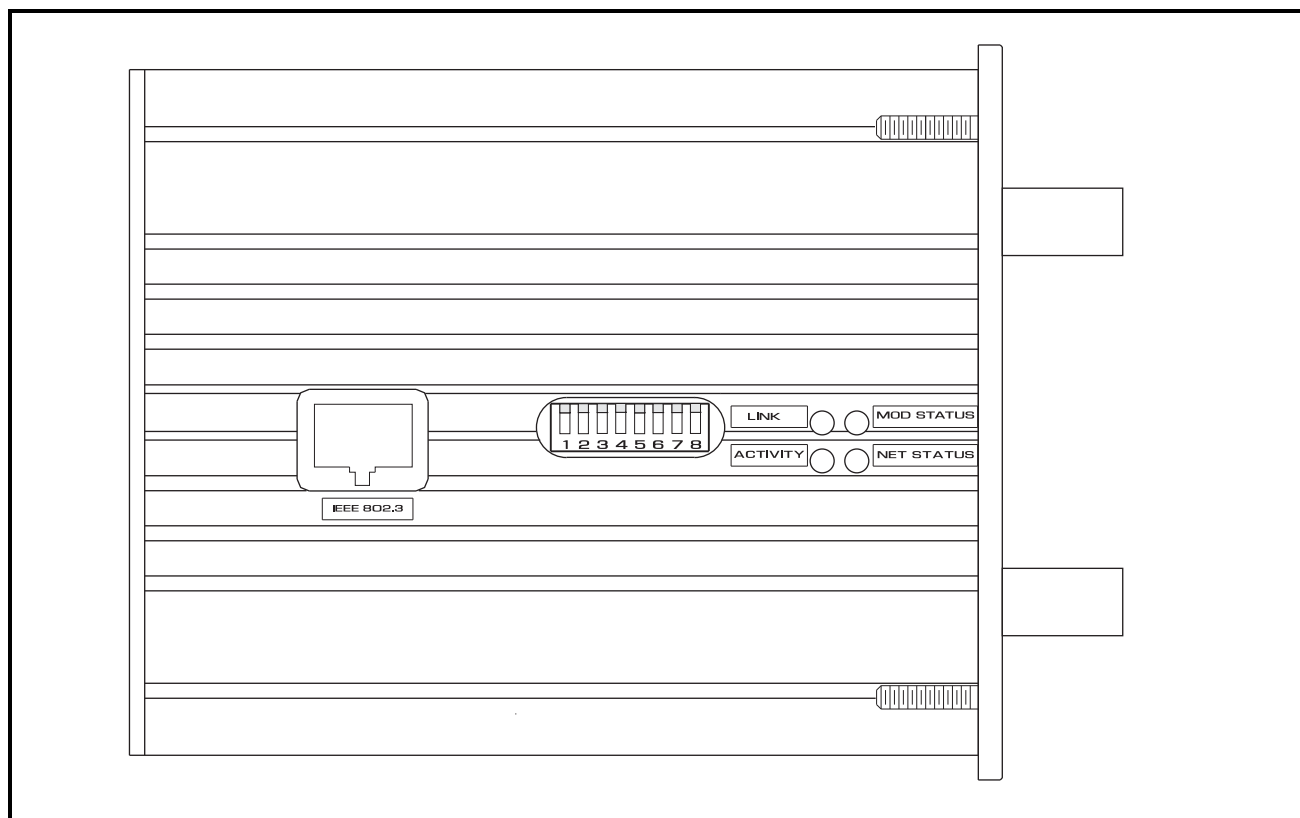


FIGURE 2.1 SE-330/SE-330AU/SE-330HV Top View Showing Ethernet Connection, Switches and LED's.

#### 2.1.1 CONFIGURATION SWITCHES

The configuration switch provides an easy way to configure the module for intranet use. The switch represents the binary value of the last byte in the IP address (n). Both 0 and 255 are reserved and cannot be used. The module will use the settings described below.

IP address: 192.168.0.n  
Subnet mask: 255.255.255.0  
Gateway address: 0.0.0.0 (No gateway set)

Subnet mask and Gateway address settings are fixed to the above values when using the configuration switches.

TABLE 2.1 CONFIGURATION SWITCH SETTINGS

| n   | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 |
|-----|----|----|----|----|----|----|----|----|
| 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| 1   | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  |
| .   | .  | .  | .  | .  | .  | .  | .  | .  |
| 255 | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |

1 = ON (Switch Down)  
0 = OFF (Switch Up)

**NOTE:** The node address associated with a Modbus device is not used. Device selection is done using only the IP address.

## 2.1.2 CONFIGURATION SOFTWARE

The IP address is set using the IPConfig330 program available at [www.littelfuse.com/protectionrelays](http://www.littelfuse.com/protectionrelays).

Set the address switches to 0. Connect the SE-330/SE-330AU/SE-330HV to an Ethernet network and run the IPConfig330 software. All module addresses for connected Anybus modules will be displayed. The MAC address is used to identify a specific SE-330/SE-330AU/SE-330HV.

### 2.1.2.1 TROUBLESHOOTING

If the SE-330 will not connect using the configuration switches try using IPConfig330 software. Set the configuration switches to address 0 and use IPConfig330 to view the connected units. Double click on the unit data to set the address. If the configuration switch address is used, IPConfig330 can be used to temporarily set a different IP address. On a subsequent power-on sequence, however, the IP address will revert to the configuration switch address.

## 2.2 LED INDICATION

The module contains four LED indicators.

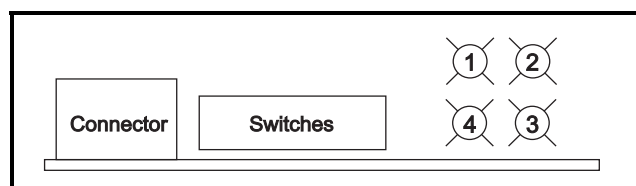


FIGURE 2.2 LED Indicators.

### LED 1 - Link

Indicates that the module is connected to an Ethernet network.

TABLE 2.2 LED 2 - MODULE STATUS

| STATE              | DESCRIPTION        |
|--------------------|--------------------|
| Steady Off         | No Power           |
| Steady Green       | Device Operational |
| Flashing Green     | Standby            |
| Flashing Red       | Minor Fault        |
| Steady Red         | Major Fault        |
| Flashing Green/Red | Self-Test          |

TABLE 2.3 LED 3 - NETWORK STATUS

| STATE              | DESCRIPTION               |
|--------------------|---------------------------|
| Steady Off         | No Power or No IP Address |
| Steady Green       | Connected                 |
| Flashing Green     | No Connections            |
| Flashing Red       | Connection Timeout        |
| Steady Red         | Duplicate IP              |
| Flashing Green/Red | Self-Test                 |

### LED 4 - Activity LED

Flashes green each time a packet is received or transmitted.

## 2.3 FILE SYSTEM

The module contains a file system to support IT functionality. The file system is a fixed-size storage area with a hierarchical directory structure. Any data, user, or application can be stored in files within the file system. Files can be grouped in directories for readability.

The file system features two security levels. Depending on security level, different users can have access to different files and directories. The application however, always has unrestricted access to the file system.

The file system is accessible via FTP, Telnet, HTTP, and from the application using mailbox commands.

The file system is case sensitive. This means that the file 'AnyBus.txt' is not identical to the file 'AnyBus.TXT'. Filenames can be a maximum of 48 characters long. Pathnames can be 256 characters in total, filename included.

### 3. ATTRIBUTE DEFINITIONS

The SE-330/SE-330AU/SE-330HV attribute table contains the attributes that are referenced in the following sections. Where bit descriptions are used, Bit 0 is the least significant bit of a byte or word value.

TABLE 3.1 SE-330/SE-330AU/SE-330HV ATTRIBUTE DEFINITIONS

| ATTRIBUTE NAME                 | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Trip Status<br>Pre-Trip Status | Bit string of fault bits<br>Bit 0, EF/GF: 1 = Earth/Ground Fault Trip<br>0 = No Trip<br>Bit 1, RF: 1 = Resistor Fault Trip<br>0 = No Trip<br>Bit 2, CAL: 1 = Calibration Error <sup>(1)</sup><br>0 = No Error<br>Bit 3, ADC: 1 = A/D Error <sup>(1)</sup><br>0 = No Error<br>Bit 4, GRV: 1 = Voltage Trip<br>0 = No Trip<br>Bit 5, EE: 1 = EEPROM Error<br>0 = No Error<br>Bit 6, SYS: 1 = Internal Fault<br>0 = No Internal Fault<br>(Will cause a EF/GF and RF trip)<br>Bit 7, RMT: 1 = Remote Trip<br>0 = No Trip<br>(Will cause a EF/GF and RF trip)                                                                                                                                                                                  |
| Pending Trips                  | Bit string of status bits<br>Bit 0, EF/GF: 1 = EF/GF Current > Set Point<br>0 = EF/GF Current < Set Point<br>Bit 1, RF: 1 = NER/NGR Resistance Exceeding Limits<br>0 = NER/NGR Resistance Within Limits<br>Bit 2, CAL: 1 = Calibration Error <sup>(1)</sup><br>0 = No Error<br>Bit 3, ADC: 1 = A/D Error <sup>(1)</sup><br>0 = No Error<br>Bit 4, GRV: 1 = Voltage Trip<br>0 = No Trip<br>Bit 5, EE: 1 = EEPROM Error<br>0 = No Error<br>Bit 6, CT Error: 1 = CT Open Detected <sup>(2)</sup><br>0 = No Error<br>Bit 7, CT Latch 1 = CT Error caused trip <sup>(2)</sup><br>0 = No Error<br><br><sup>(1)</sup> These bits do not activate the EF/GF indication relay.<br><sup>(2)</sup> These bits are only applicable to SE-330AU model. |
| Relay Status                   | Bit string indicating the state of output relays<br>Bit 1, K3: 1 = RF Indication Relay Energized<br>0 = Not Energized<br>Bit 2, K2: 1 = EF/GF Indication Relay Energized<br>0 = Not Energized<br>Bit 3, K1: 1 = Trip/Pulse Relay Energized<br>0 = Not Energized                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| ATTRIBUTE NAME           | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------|----------|---|--------|--------|---|--------|--------|---|--------|--------|---|--------|--------|---|--------|--------|---|--------|--------|---|-----|--------|---|-----|--------|---|-----|--------|---|-----|--------|----|------|--------|
| Switches                 | Bit string indicating the state of the configuration switches<br>Bit 0, S4:     1   = RF Latch<br>0   = RF Not Latched<br>Bit 1, S3:     1   = EF/GF Latched<br>0   = EF/GF Not Latched<br>Bit 2, S5:     1   = 20 k Sensor (200 k for SE-330HV)<br>0   = 100 k Sensor<br>Bit 3, S6:     1   = 50 Hz<br>0   = 60 Hz<br>Bit 4, S2:     1   = Fail Safe Trip-Relay Operation<br>0   = Non Fail Safe Operation<br>S2 is not used on SE-330AU<br>Bit 5, S1:     1   = Trip Configuration (K1)<br>0   = Pulsing Configuration (K1)<br>S1 is not used in SE-330AU or SE-330HV                                                                                                               |          |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
| Record x<br>(x = 0 to 9) | Up to 10 trip records are stored in a circular (ring) buffer (FIFO)<br>A trip record consists of the following:<br>Trip Status<br>Pre-trip Current<br>Pre-trip Voltage<br>Pre-trip Resistance Change<br>Record Head points to last trip record. See Sec. 4.1.                                                                                                                                                                                                                                                                                                                                                                                                                         |          |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
| Command                  | Specifies the command sent to the SE-330/SE-330AU/SE-330HV.<br>Modbus TCP:<br>Reset Command:           Transition from 0 to 256<br>Remote Trip:             Transition from 0 to 512<br>Clear Event Records:     Transition from 0 to 1024<br>Ethernet/IP:<br>Reset Command:           Transition from 0 to 1<br>Remote Trip:             Transition from 0 to 2<br>Clear Event Records:     Transition from 0 to 4                                                                                                                                                                                                                                                                   |          |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
| EF/GF Trip Time          | Positions on front-panel EF/GF Trip Time selector<br><table><tr><th>Position</th><th>SE-330/SE-330HV</th><th>SE-330AU</th></tr><tr><td>0</td><td>100 ms</td><td>100 ms</td></tr><tr><td>1</td><td>200 ms</td><td>120 ms</td></tr><tr><td>2</td><td>300 ms</td><td>140 ms</td></tr><tr><td>3</td><td>400 ms</td><td>160 ms</td></tr><tr><td>4</td><td>500 ms</td><td>180 ms</td></tr><tr><td>5</td><td>700 ms</td><td>200 ms</td></tr><tr><td>6</td><td>1 s</td><td>250 ms</td></tr><tr><td>7</td><td>2 s</td><td>300 ms</td></tr><tr><td>8</td><td>3 s</td><td>350 ms</td></tr><tr><td>9</td><td>5 s</td><td>400 ms</td></tr><tr><td>10</td><td>10 s</td><td>500 ms</td></tr></table> | Position | SE-330/SE-330HV | SE-330AU | 0 | 100 ms | 100 ms | 1 | 200 ms | 120 ms | 2 | 300 ms | 140 ms | 3 | 400 ms | 160 ms | 4 | 500 ms | 180 ms | 5 | 700 ms | 200 ms | 6 | 1 s | 250 ms | 7 | 2 s | 300 ms | 8 | 3 s | 350 ms | 9 | 5 s | 400 ms | 10 | 10 s | 500 ms |
| Position                 | SE-330/SE-330HV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | SE-330AU |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
| 0                        | 100 ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 100 ms   |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
| 1                        | 200 ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 120 ms   |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
| 2                        | 300 ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 140 ms   |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
| 3                        | 400 ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 160 ms   |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
| 4                        | 500 ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 180 ms   |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
| 5                        | 700 ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 200 ms   |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
| 6                        | 1 s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 250 ms   |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
| 7                        | 2 s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 300 ms   |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
| 8                        | 3 s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 350 ms   |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
| 9                        | 5 s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 400 ms   |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |
| 10                       | 10 s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 500 ms   |                 |          |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |        |        |   |     |        |   |     |        |   |     |        |   |     |        |    |      |        |

| ATTRIBUTE NAME                                               | DESCRIPTION                                                                                  |                 |                    |                    |
|--------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------|--------------------|--------------------|
| EF/GF Level                                                  | Positions on front-panel EF/GF Trip Level selector                                           |                 |                    |                    |
|                                                              | Position                                                                                     | SE-330/SE-330HV | SE-330AU<br>EFCT-x | SE-330AU<br>CS30-x |
|                                                              | 0                                                                                            | 2% CT Rating    | 125 mA             | 0.75 A             |
|                                                              | 1                                                                                            | 4% CT Rating    | 250 mA             | 1.5 A              |
|                                                              | 2                                                                                            | 6% CT Rating    | 300 mA             | 1.8 A              |
|                                                              | 3                                                                                            | 8% CT Rating    | 400 mA             | 2.4 A              |
|                                                              | 4                                                                                            | 10% CT Rating   | 500 mA             | 3.0 A              |
|                                                              | 5                                                                                            | 15% CT Rating   | 750 mA             | 4.5 A              |
|                                                              | 6                                                                                            | 20% CT Rating   | 1 A                | 6.0 A              |
|                                                              | 7                                                                                            | 40% CT Rating   | 2 A                | 12.0 A             |
|                                                              | 8                                                                                            | 60% CT Rating   | 3 A                | 18.0 A             |
|                                                              | 9                                                                                            | 80% CT Rating   | 4 A                | 24.0 A             |
| 10                                                           | 100% CT Rating                                                                               | 5 A             | 30.0 A             |                    |
| Pulse Time<br>(Not Applicable to<br>SE-330HV or<br>SE-330AU) | Positions on front-panel Pulse Period selector                                               |                 |                    |                    |
|                                                              | 0 = 1.0 s                                                                                    |                 |                    |                    |
|                                                              | 1 = 1.2 s                                                                                    |                 |                    |                    |
|                                                              | 2 = 1.4 s                                                                                    |                 |                    |                    |
|                                                              | 3 = 1.6 s                                                                                    |                 |                    |                    |
|                                                              | 4 = 1.8 s                                                                                    |                 |                    |                    |
|                                                              | 5 = 2.0 s                                                                                    |                 |                    |                    |
|                                                              | 6 = 2.2 s                                                                                    |                 |                    |                    |
|                                                              | 7 = 2.4 s                                                                                    |                 |                    |                    |
|                                                              | 8 = 2.6 s                                                                                    |                 |                    |                    |
|                                                              | 9 = 2.8 s                                                                                    |                 |                    |                    |
|                                                              | 10 = 3.0 s                                                                                   |                 |                    |                    |
| NER/NGR Current<br>Pre-Trip Current                          | NER/NGR current reading in percent of CT Primary Rating                                      |                 |                    |                    |
| NER/NGR Voltage<br>Pre-Trip Voltage                          | NER/NGR voltage reading in percent of Vn trip level setting on the front panel               |                 |                    |                    |
| NER/NGR Change<br>Pre-Trip Change                            | Resistance deviation from calibrated setting.<br>Signed 16-bit value.                        |                 |                    |                    |
| Record Head                                                  | Pointer to the latest of 10 pre-trip records. 255 indicates no trips recorded. Range 0 to 9. |                 |                    |                    |
| Fault Reset                                                  | 0 to 1 transition causes a reset                                                             |                 |                    |                    |
| Remote Trip                                                  | 0 to 1 transition causes a remote trip                                                       |                 |                    |                    |

## 4. MODBUS/TCP PROTOCOL

The SE-330/SE-330AU/SE-330HV Ethernet module can handle up to 8 simultaneous connections. It supports all of the Modbus/TCP class 0 and class 1 and some of the class 2 commands.

Although word addressing (4xxxx) is recommended, both bit and word addressing is supported. A 16-bit word can be read as a single word using word addressing

and can also be read as bits by using bit addressing. The bit address is 16 times the word address. For example, a value at word address 34 has its most significant bit located at bit address 16x34 or 544. The use of the Modbus prefix 0, 1, 3, and 4 is a function of the master and may not be required. Check the master's documentation.

TABLE 4.1 FUNCTION CODES

| FUNCTION CODE | FUNCTION NAME            | CLASS | AFFECTS AREA | ADDRESSING METHOD | MODBUS GROUP |
|---------------|--------------------------|-------|--------------|-------------------|--------------|
| 1             | Read coils               | 1     | IN/OUT       | Bit               | 0xxxx        |
| 2             | Read input discretes     | 1     | IN/OUT       | Bit               | 1xxxx        |
| 3             | Read multiple registers  | 0     | IN/OUT       | Word              | 4xxxx        |
| 4             | Read input registers     | 1     | IN/OUT       | Word              | 3xxxx        |
| 5             | Write coil               | 1     | OUT          | Bit               | 0xxxx        |
| 6             | Write single register    | 1     | OUT          | Word              | 4xxxx        |
| 7 *           | Read exception status    | 1     | -            | -                 | -            |
| 15            | Force multiple coil      | 2     | OUT          | Bit               | 0xxxx        |
| 16            | Force multiple registers | 0     | OUT          | Word              | 4xxxx        |
| 22            | Mask write register      | 2     | OUT          | Word              | -            |
| 23            | Read/Write registers     | 2     | IN/OUT       | Word              | -            |

- \* Exception Code 01: Illegal Function  
Exception Code 02: Illegal Data Address  
Exception Code 03: Illegal Data Value

#### 4.1 MODBUS/TCP MEMORY ADDRESSING

The IN area contains data that can be read using Function Codes 1, 2, 3, 4, and 23. It is not possible to write to the IN area.

The data is available in 16-bit format and starts at memory address 160 (Modbus 40081)

TABLE 4.2 IN AREA: 16-BIT FORMAT

| BYTE MEMORY ADDRESS<br>(Modbus Address) | ATTRIBUTE                      |
|-----------------------------------------|--------------------------------|
| 160 (40081)                             | Revision                       |
| 162 (40082)                             | Trip Status                    |
| 164 (40083)                             | Pending Trips                  |
| 166 (40084)                             | EF/GF Time                     |
| 168 (40085)                             | EF/GF Level                    |
| 170 (40086)                             | Pulse Time <sup>(2)</sup>      |
| 172 (40087)                             | NER/NGR Current                |
| 174 (40088)                             | NER/NGR Voltage                |
| 176 (40089)                             | NER/NGR Change <sup>(1)</sup>  |
| 178 (40090)                             | Relay Status                   |
| 180 (40091)                             | Switches                       |
| 182 (40092)                             | Record Head <sup>(3)</sup>     |
| Record 0                                |                                |
| 184 (40093)                             | Pre-Trip Status                |
| 186 (40094)                             | Pre-Trip Current               |
| 188 (40095)                             | Pre-Trip Voltage               |
| 190 (40096)                             | Pre-Trip Change <sup>(1)</sup> |
| Record 1                                |                                |
| 192 (40097)                             | Pre-Trip Status                |
| 194 (40098)                             | Pre-Trip Current               |
| 196 (40099)                             | Pre-Trip Voltage               |
| 198 (40100)                             | Pre-Trip Change <sup>(1)</sup> |
| Record 2                                |                                |
| 200 (40101)                             | Pre-Trip Status                |
| 202 (40102)                             | Pre-Trip Current               |
| 204 (40103)                             | Pre-Trip Voltage               |
| 206 (40104)                             | Pre-Trip Change <sup>(1)</sup> |
| Record 3                                |                                |
| 208 (40105)                             | Pre-Trip Status                |
| 210 (40106)                             | Pre-Trip Current               |
| 212 (40107)                             | Pre-Trip Voltage               |
| 214 (40108)                             | Pre-Trip Change <sup>(1)</sup> |
| Record 4                                |                                |
| 216 (40109)                             | Pre-Trip Status                |
| 218 (40110)                             | Pre-Trip Current               |
| 220 (40111)                             | Pre-Trip Voltage               |
| 222 (40112)                             | Pre-Trip Change <sup>(1)</sup> |
| Record 5                                |                                |
| 224 (40113)                             | Pre-Trip Status                |
| 226 (40114)                             | Pre-Trip Current               |
| 228 (40115)                             | Pre-Trip Voltage               |
| 230 (40116)                             | Pre-Trip Change <sup>(1)</sup> |

TABLE 4.2 IN AREA: 16-BIT FORMAT

| BYTE MEMORY ADDRESS<br>(Modbus Address) | ATTRIBUTE                      |
|-----------------------------------------|--------------------------------|
| Record 6                                |                                |
| 232 (40117)                             | Pre-Trip Status                |
| 234 (40118)                             | Pre-Trip Current               |
| 236 (40119)                             | Pre-Trip Voltage               |
| 238 (40120)                             | Pre-Trip Change <sup>(1)</sup> |
| Record 7                                |                                |
| 240 (40121)                             | Pre-Trip Status                |
| 242 (40122)                             | Pre-Trip Current               |
| 244 (40123)                             | Pre-Trip Voltage               |
| 246 (40124)                             | Pre-Trip Change <sup>(1)</sup> |
| Record 8                                |                                |
| 248 (40125)                             | Pre-Trip Status                |
| 250 (40126)                             | Pre-Trip Current               |
| 252 (40127)                             | Pre-Trip Voltage               |
| 254 (40128)                             | Pre-Trip Change <sup>(1)</sup> |
| Record 9                                |                                |
| 256 (40129)                             | Pre-Trip Status                |
| 258 (40130)                             | Pre-Trip Current               |
| 260 (40131)                             | Pre-Trip Voltage               |
| 264 (40132)                             | Pre-Trip Change <sup>(1)</sup> |

<sup>(1)</sup> Signed value

<sup>(2)</sup> Not applicable to SE-330HV or SE-330AU

<sup>(3)</sup> Points to last trip record. Counts 0 to 9 and repeats.

#### OUT AREA

The out area is used to send a remote trip or remote reset command. These commands are sent to the first byte of the OUT area using function code 6. The out area is located at byte address 2048, or Modbus word address 41025.

To perform a reset in Modbus word format, the command register at 41025 must transition from 0 to 256.

To issue a remote trip, the command register must transition from 0 to 512.

To issue a clear event records, the command register must transition from 0 to 1024.

#### 5. ETHERNET/IP OBJECTS

The module supports the following vendor specific objects:

TABLE 5.1 SE-330/SE-330AU/SE-330HV OBJECTS

| CLASS | ATTRIBUTE         |
|-------|-------------------|
| 0x04  | Assembly          |
| 0xB0  | Input Parameters  |
| 0xB1  | Output Parameters |

## 5.1 ASSEMBLY OBJECT

### Assembly Class (4), Instance (0) Attributes

| ATTRIBUTE NUMBER | ATTRIBUTE NAME | SERVICES             | DESCRIPTION             | DEFAULT, MINIMUM, MAXIMUM | DATA TYPE |
|------------------|----------------|----------------------|-------------------------|---------------------------|-----------|
| 1<br>0x01        | Revision       | Get_Attribute_Single | Revision of this object | 1, 1, 1                   | UINT      |

### Assembly Class (4), Instance (100), Attribute (3) – Input 1 (9 Bytes)

| BYTE | BIT7                                                                             | BIT6           | BIT5         | BIT4          | BIT3      | BIT2      | BIT1      | BIT0         |
|------|----------------------------------------------------------------------------------|----------------|--------------|---------------|-----------|-----------|-----------|--------------|
| 0    | Remote Trip                                                                      | Internal Error | EEPROM Error | NER/NGR Volts | ADC Error | CAL Error | RF Trip   | EF/GF Trip   |
| 1    |                                                                                  |                |              |               |           |           | RF Detect | EF/GF Detect |
| 2    | EF/GF Trip Time Selector (Position 0 to 10)                                      |                |              |               |           |           |           |              |
| 3    | EF/GF Trip Level Selector (Position 0 to 10)                                     |                |              |               |           |           |           |              |
| 4    | Pulse Period Selector (Position 0 to 10), Not Applicable to SE-330HV or SE-330AU |                |              |               |           |           |           |              |
| 5    | NER/NGR Current (% of CT Rating)                                                 |                |              |               |           |           |           |              |
| 6    | NER/NGR Voltage (% of Setting)                                                   |                |              |               |           |           |           |              |
| 7    | Delta Ohms (Low) (ohms)                                                          |                |              |               |           |           |           |              |
| 8    | Delta Ohms (High) (ohms)                                                         |                |              |               |           |           |           |              |

### Assembly Class (4), Instance (101), Attribute (3) – Input 2 (2 Bytes)

| BYTE | BIT7        | BIT6           | BIT5         | BIT4          | BIT3      | BIT2      | BIT1      | BIT0         |
|------|-------------|----------------|--------------|---------------|-----------|-----------|-----------|--------------|
| 0    | Remote Trip | Internal Error | EEPROM Error | NER/NGR Volts | ADC Error | CAL Error | RF Trip   | EF/GF Trip   |
| 1    |             |                |              |               |           |           | RF Detect | EF/GF Detect |

### Assembly Class (4), Instance (102), Attribute (3) – Input 3 (51 Bytes)

| BYTE | BIT7                             | BIT6           | BIT5         | BIT4          | BIT3      | BIT2      | BIT1    | BIT0       |
|------|----------------------------------|----------------|--------------|---------------|-----------|-----------|---------|------------|
| 0    | Record Head                      |                |              |               |           |           |         |            |
| 1    | Remote Trip                      | Internal Error | EEPROM Error | NER/NGR Volts | ADC Error | CAL Error | RF Trip | EF/GF Trip |
| 2    | NER/NGR Current (% of CT Rating) |                |              |               |           |           |         |            |
| 3    | NER/NGR Voltage (% of Setting)   |                |              |               |           |           |         |            |
| 4    | Delta Ohms (Low) (ohms)          |                |              |               |           |           |         |            |
| 5    | Delta Ohms (High) (ohms)         |                |              |               |           |           |         |            |
| 6    | Remote Trip                      | Internal Error | EEPROM Error | NER/NGR Volts | ADC Error | CAL Error | RF Trip | EF/GF Trip |
| 7    | NER/NGR Current (% of CT Rating) |                |              |               |           |           |         |            |
| 8    | NER/NGR Voltage (% of Setting)   |                |              |               |           |           |         |            |
| 9    | Delta Ohms (Low) (ohms)          |                |              |               |           |           |         |            |
| 10   | Delta Ohms (High) (ohms)         |                |              |               |           |           |         |            |
| 11   | Remote Trip                      | Internal Error | EEPROM Error | NER/NGR Volts | ADC Error | CAL Error | RF Trip | EF/GF Trip |
| 12   | NER/NGR Current (% of CT Rating) |                |              |               |           |           |         |            |
| 13   | NER/NGR Voltage (% of Setting)   |                |              |               |           |           |         |            |
| 14   | Delta Ohms (Low) (ohms)          |                |              |               |           |           |         |            |
| 15   | Delta Ohms (High) (ohms)         |                |              |               |           |           |         |            |
| 16   | Remote Trip                      | Internal Error | EEPROM Error | NER/NGR Volts | ADC Error | CAL Error | RF Trip | EF/GF Trip |
| 17   | NER/NGR Current (% of CT Rating) |                |              |               |           |           |         |            |
| 18   | NER/NGR Voltage (% of Setting)   |                |              |               |           |           |         |            |
| 19   | Delta Ohms (Low) (ohms)          |                |              |               |           |           |         |            |
| 20   | Delta Ohms (High) (ohms)         |                |              |               |           |           |         |            |

**Assembly Class (4), Instance (102), Attribute (3) – Input 3 (51 Bytes) (Continued)**

| BYTE | BIT7                             | BIT6           | BIT5         | BIT4          | BIT3      | BIT2      | BIT1    | BIT0       |
|------|----------------------------------|----------------|--------------|---------------|-----------|-----------|---------|------------|
| 21   | Remote Trip                      | Internal Error | EEPROM Error | NER/NGR Volts | ADC Error | CAL Error | RF Trip | EF/GF Trip |
| 22   | NER/NGR Current (% of CT Rating) |                |              |               |           |           |         |            |
| 23   | NER/NGR Voltage (% of Setting)   |                |              |               |           |           |         |            |
| 24   | Delta Ohms (Low) (ohms)          |                |              |               |           |           |         |            |
| 25   | Delta Ohms (High) (ohms)         |                |              |               |           |           |         |            |
| 26   | Remote Trip                      | Internal Error | EEPROM Error | NER/NGR Volts | ADC Error | CAL Error | RF Trip | EF/GF Trip |
| 27   | NER/NGR Current (% of CT Rating) |                |              |               |           |           |         |            |
| 28   | NER/NGR Voltage (% of Setting)   |                |              |               |           |           |         |            |
| 29   | Delta Ohms (Low) (ohms)          |                |              |               |           |           |         |            |
| 30   | Delta Ohms (High) (ohms)         |                |              |               |           |           |         |            |
| 31   | Remote Trip                      | Internal Error | EEPROM Error | NER/NGR Volts | ADC Error | CAL Error | RF Trip | EF/GF Trip |
| 32   | NER/NGR Current (% of CT Rating) |                |              |               |           |           |         |            |
| 33   | NER/NGR Voltage (% of Setting)   |                |              |               |           |           |         |            |
| 34   | Delta Ohms (Low) (ohms)          |                |              |               |           |           |         |            |
| 35   | Delta Ohms (High) (ohms)         |                |              |               |           |           |         |            |
| 36   | Remote Trip                      | Internal Error | EEPROM Error | NER/NGR Volts | ADC Error | CAL Error | RF Trip | EF/GF Trip |
| 37   | NER/NGR Current (% of CT Rating) |                |              |               |           |           |         |            |
| 38   | NER/NGR Voltage (% of Setting)   |                |              |               |           |           |         |            |
| 39   | Delta Ohms (Low) (ohms)          |                |              |               |           |           |         |            |
| 40   | Delta Ohms (High) (ohms)         |                |              |               |           |           |         |            |
| 41   | Remote Trip                      | Internal Error | EEPROM Error | NER/NGR Volts | ADC Error | CAL Error | RF Trip | EF/GF Trip |
| 42   | NER/NGR Current (% of CT Rating) |                |              |               |           |           |         |            |
| 43   | NER/NGR Voltage (% of Setting)   |                |              |               |           |           |         |            |
| 44   | Delta Ohms (Low) (ohms)          |                |              |               |           |           |         |            |
| 45   | Delta Ohms (High) (ohms)         |                |              |               |           |           |         |            |
| 46   | Remote Trip                      | Internal Error | EEPROM Error | NER/NGR Volts | ADC Error | CAL Error | RF Trip | EF/GF Trip |
| 47   | NER/NGR Current (% of CT Rating) |                |              |               |           |           |         |            |
| 48   | NER/NGR Voltage (% of Setting)   |                |              |               |           |           |         |            |
| 49   | Delta Ohms (Low) (ohms)          |                |              |               |           |           |         |            |
| 50   | Delta Ohms (High) (ohms)         |                |              |               |           |           |         |            |

**Assembly Class (4), Instance (150), Attribute (3) – Output 1 (1 Byte)**

| BYTE | BIT7 | BIT6 | BIT5 | BIT4 | BIT3 | BIT2                | BIT1        | BIT0        |
|------|------|------|------|------|------|---------------------|-------------|-------------|
| 0    |      |      |      |      |      | Clear Event Records | Remote Trip | Fault Reset |

## 5.2 INPUT PARAMETER OBJECT

### Input Parameter Class (0xB0), Instance (0) Attributes

| ATTRIBUTE NUMBER | ATTRIBUTE NAME | SERVICES | DESCRIPTION             | DEFAULT, MINIMUM, MAXIMUM | DATA TYPE |
|------------------|----------------|----------|-------------------------|---------------------------|-----------|
| 1                | Revision       | Get      | Revision of this object | 1, 1, 1                   | UINT      |

### Input Parameter Class (0xB0), Instance (1) Attributes

All attributes in this instance are read-only and support the Get\_Attribute\_Single service using Explicit Messaging.

| ATTRIBUTE NUMBER | ATTRIBUTE NAME            | SERVICES | DESCRIPTION                       | DEFAULT, MINIMUM, MAXIMUM | DATA TYPE |
|------------------|---------------------------|----------|-----------------------------------|---------------------------|-----------|
| 1                | Revision                  | Get      | SE-330 Revision                   | 0, 0, 255                 | USINT     |
| 2                | Trip Status               | Get      | Bits defines trips                | 0, 0, 255                 | USINT     |
| 3                | Pending Trips             | Get      | Bits define pending trips         | 0, 0, 3                   | USINT     |
| 4                | EF/GF Time                | Get      | Detent position                   | 0, 0, 10                  | USINT     |
| 5                | EF/GF Level               | Get      | Detent position                   | 0, 0, 10                  | USINT     |
| 6                | Pulse Time <sup>(1)</sup> | Get      | Detent position                   | 0, 0, 10                  | USINT     |
| 7                | NER/NGR Current           | Get      | Percent of CT rating              | 0, 0, 255                 | USINT     |
| 8                | NER/NGR Voltage           | Get      | Percent of V <sub>N</sub> setting | 0, 0, 255                 | USINT     |
| 9                | NER/NGR Change            | Get      | Deviation from calibrated value   | 0, -32k, +32k             | INT       |
| 10               | Relay Status              | Get      | Bits indicate output relay state  | 0, 0, 15                  | BYTE      |
| 11               | Switches                  | Get      | Front panel switch state          | 0, 0, 255                 | BYTE      |
| 12               | Record Head               | Get      | 0 to 9 or 255                     | 0, 0, 255                 | USINT     |
| 13               | Pre-Trip Status           | Get      | Trip status for last record       | 0, 0, 255                 | BYTE      |
| 14               | Pre-Trip Current          | Get      | Percent of CT rating              | 0, 0, 255                 | USINT     |
| 15               | Pre-Trip Voltage          | Get      | Percent of V <sub>N</sub> setting | 0, 0, 255                 | USINT     |
| 16               | Pre-Trip Change           | Get      | Deviation from calibrated value   | 0, -32k, +32k             | INT       |

<sup>(1)</sup> Not applicable to SE-330HV or SE-330AU

## 5.3 PARAMETER OUTPUT OBJECT

This object allows parameters to be written to the SE-330/SE-330AU/SE-330HV

### Class (0xB1), Instance (0) Attributes

| ATTRIBUTE NUMBER | ATTRIBUTE NAME | SERVICES          | DESCRIPTION             | DEFAULT, MINIMUM, MAXIMUM | DATA TYPE |
|------------------|----------------|-------------------|-------------------------|---------------------------|-----------|
| 1                | Revision       | Get_Attribute_All | Revision of this object | 1, 1, 1                   | USINT     |

### Class (0xB1), Instance (1) Attributes

| ATTRIBUTE NUMBER | ATTRIBUTE NAME | SERVICES | DESCRIPTION                                                                                                                                                                                                                     | DEFAULT, MINIMUM, MAXIMUM | DATA TYPE |
|------------------|----------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------|
| 1                | Command        | Get/Set  | Sends reset or remote trip command.<br>0 = No action (IDLE)<br>1 = Transition from 0 to 1 causes a trip reset.<br>2 = Transition from 0 to 2 causes a remote trip.<br>4 = Transition from 0 to 4 causes event records to clear. | 0, 0, 2                   | USINT     |