

2.2.4 VitalSensors VS-3000 Sensor System - PLC-5 EtherNet/IP Setup

Connecting a VitalSensors VS-3000 Sensor to PLC-5 with EtherNet/IP

Objective: • Integrating a VS-3000 Sensor System with a PLC-5 PLC using EtherNet/IP

Equipment:	• PLC-5 PLC	EtherNet/IP interface
	• PLC-5 Instruction Manual	PC or laptop
	• RS/Logix 5/RSLinx	VS-3000 Sensor System

While every effort was made to verify the following information, no warranty of accuracy or usability is expressed or implied.

Overview:

The purpose of this document is to describe the configuration steps necessary to establish a communication path between the *VS-3000 Sensor System* and a PLC-5 unit. Your PLC-5 controller must be EtherNet/IP capable.

In the following example, the PLC-5 will establish a Class 1 connection and I/O data will be exchanged between the PLC-5 and the Modular Controller. The network parameters used in this example will almost certainly not apply to your application. Be sure to consult your network administrator when selecting appropriate values.

The *VS-3000 Sensor System* has the ability for two way communications (inputs and outputs) with a PLC-5 controller. Sensor measurement data can be sent real-time while tasks such as brand changes or system offsets can also set from the PLC-5.

Initial setup of VS-300SMS and VS-200SMS for EtherNet/IP

The setup of the *VS-300SMS* and *VS-200SMS* to enable EtherNet/IP fieldbus communications is straight forward.

1. An Ethernet cable connection should be made at the *VS-300SMS* or *VS-200SMS* controller to the plant network and PLC. The Ethernet connection is either on the side or the bottom part of the systems.
2. The IP Address for the Sensor Management Station must be changed to be in the same subnet as the PLC. The Sensor Management Station is set at the factory at 192.168.1.75 as default.

To change the IP address the *Advantec Enhanced Write Lock Filter* must be first disabled and then re-enabled after the change. This is performed via Remote Desktop Connection. Please see 2.1 *VS-3000 Sensor System User Guide* (Section 11.2)

3. Using MS Windows Remote Desktop Connection, maximize the *VS-3000 Dashboard* software desktop **Edit**>SMC Parameters. The number in the Fieldbus slot should be "4" EtherNet/IP. Please see the Figure: 1 below and the area circled. **NOTE:** If "4" is not entered, manually type in 4 and the software will re-start.

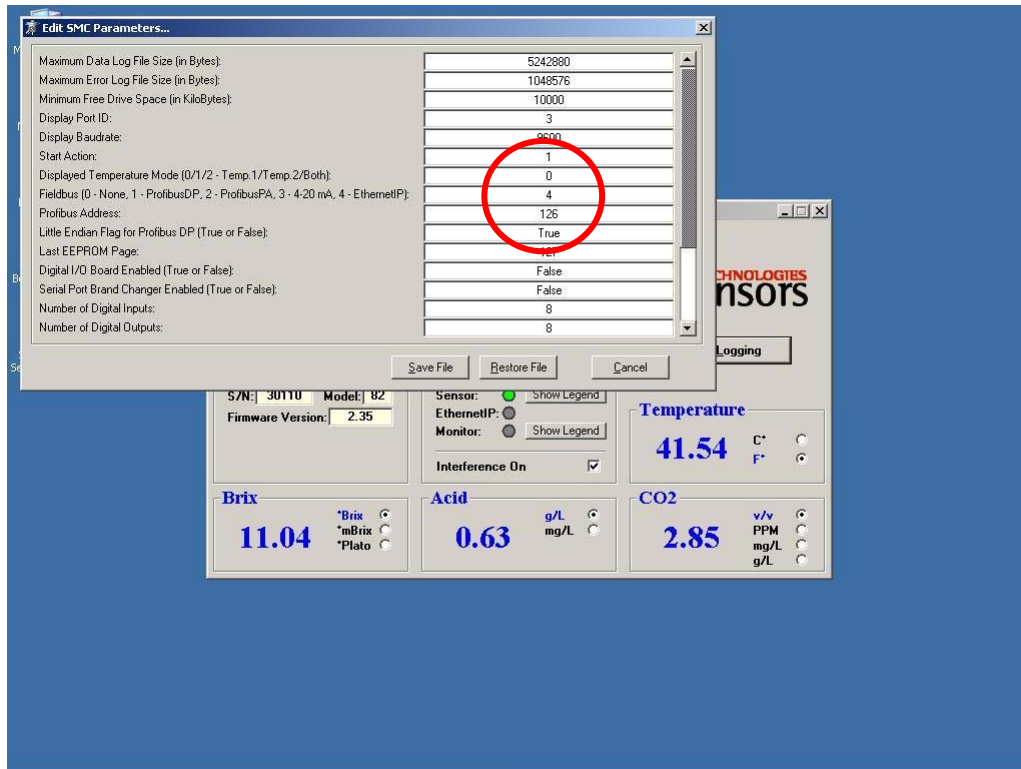


Figure: 1

4. In the *VS-3000 Dashboard* software desktop click on **Edit**>EtherNetIP. The following screen will be displayed. This is Figure: 3 below.
5. The IP address of the target PLC must also be entered as shown in Figure 3.
6. The input and output tag names (data file names) **must match** the tags set in the RSLogix 5 software.
7. The timeout parameters can also be changed on this screen.
8. Save any changes made.
9. In the *VS-3000 Dashboard* software desktop click on **Edit**>Data Update Rate. This screen allows for the setting on how fast the system sends data to the PLC over EtherNet/IP. The choices are: 100 to 10,000 msec. Please see Figure 4 below.
10. The offset in Writing and Reading Parameters allows for memory location offsets.

As a reminder, most of the settings in this section are set for you at the plant. Only site specific changes are generally made to *VS-3000 Dashboard* EtherNet/IP settings.

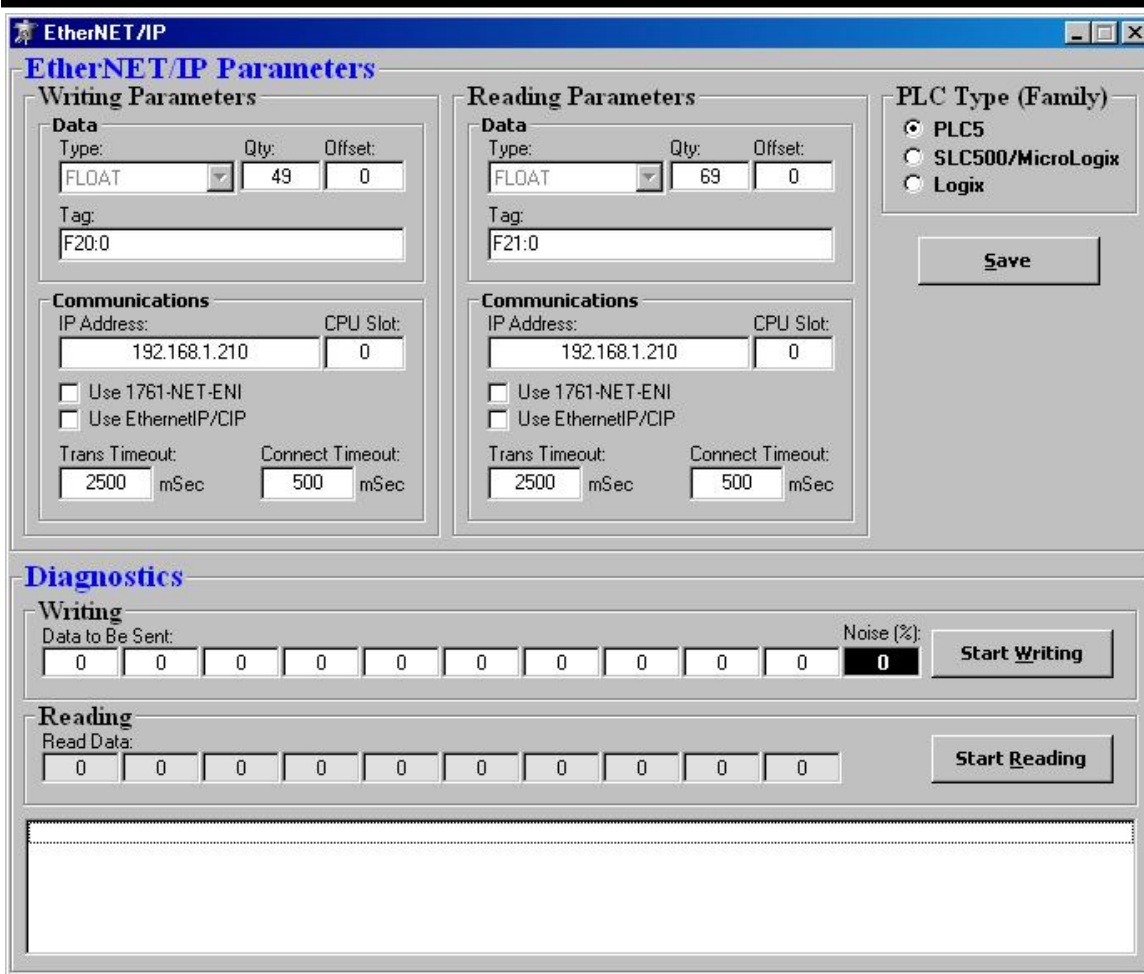


Figure: 3

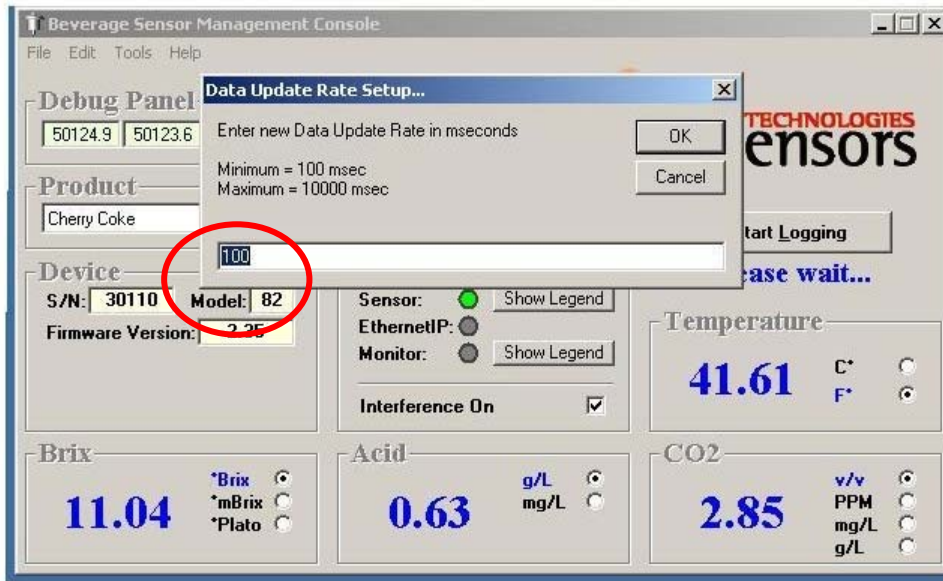


Figure: 4

PLC-5 CONFIGURATION

1. Run the RSLogix 5 program and create a new configuration.
2. Setup the IP address for the PLC if needed (see Figure 5)

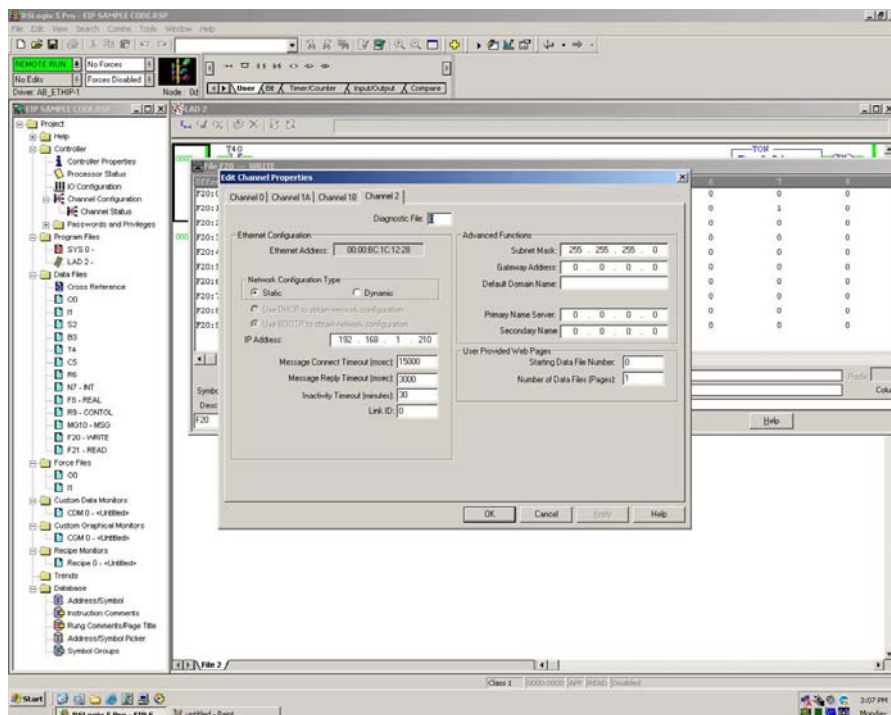


Figure 5

The user must setup data files for reading and writing to the PLC. We recommend that the user setup two data files, one for reading and one for writing. We have shown F20 for writing (from sensor to PLC) and F21 (from PLC to sensor) each with 100 word locations. The user can create data files (PLC in program mode) by right clicking on data files in the left pane. See figure 6 below.

RSLogix 5 must be in the “Offline” mode to create new data files.

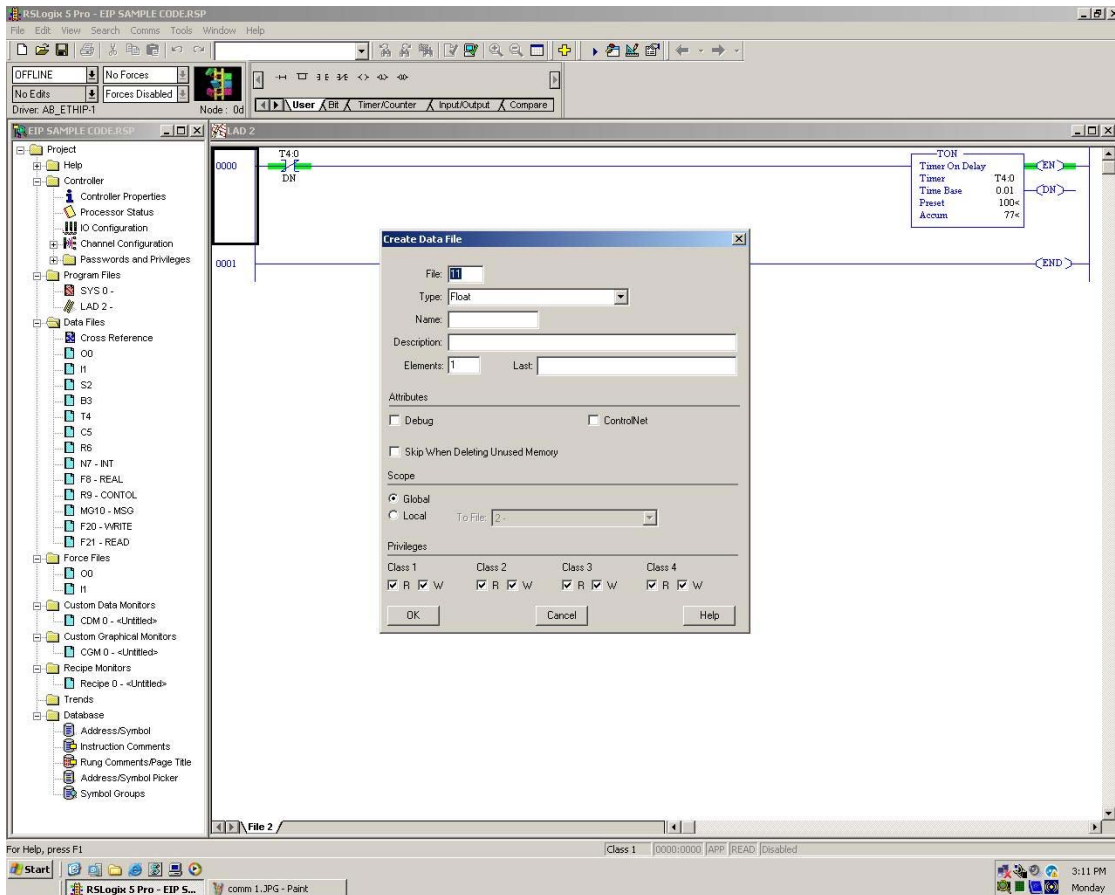


Figure 6

- Download the configuration to the PLC.

Working With Inputs and Outputs

VS-3000 Sensor Systems have the ability to generate data for up to three concentrations and temperature real-time. Depending on the type of sensor the sensor channels are as follows:

- VS-3000BSMA: Beverage, Soft Drink and Juice Monitor

Channel 1 = Brix
Channel 2 = Acid
Channel 3 = CO₂

- VS-3000BSMA: Beer Monitor

Channel 1 = Ethanol
Channel 2 = Brix/Plato
Channel 3 = CO₂

NOTE: If only 1 or 2 ingredient measurements were purchased, only those concentrations will be measured and sent over EtherNet/IP. The channel numbers do not change regardless of the number of parameters being measured.

Figure 7 shown below depicts the inputs and outputs of a VS-3000 BSMA Beverage, Soft Drink and Juice Monitor. The specific gravity and original gravity positions are for use with the VS-3000 Beer Monitor. The input settings represent all the important settings for the sensor. They include:

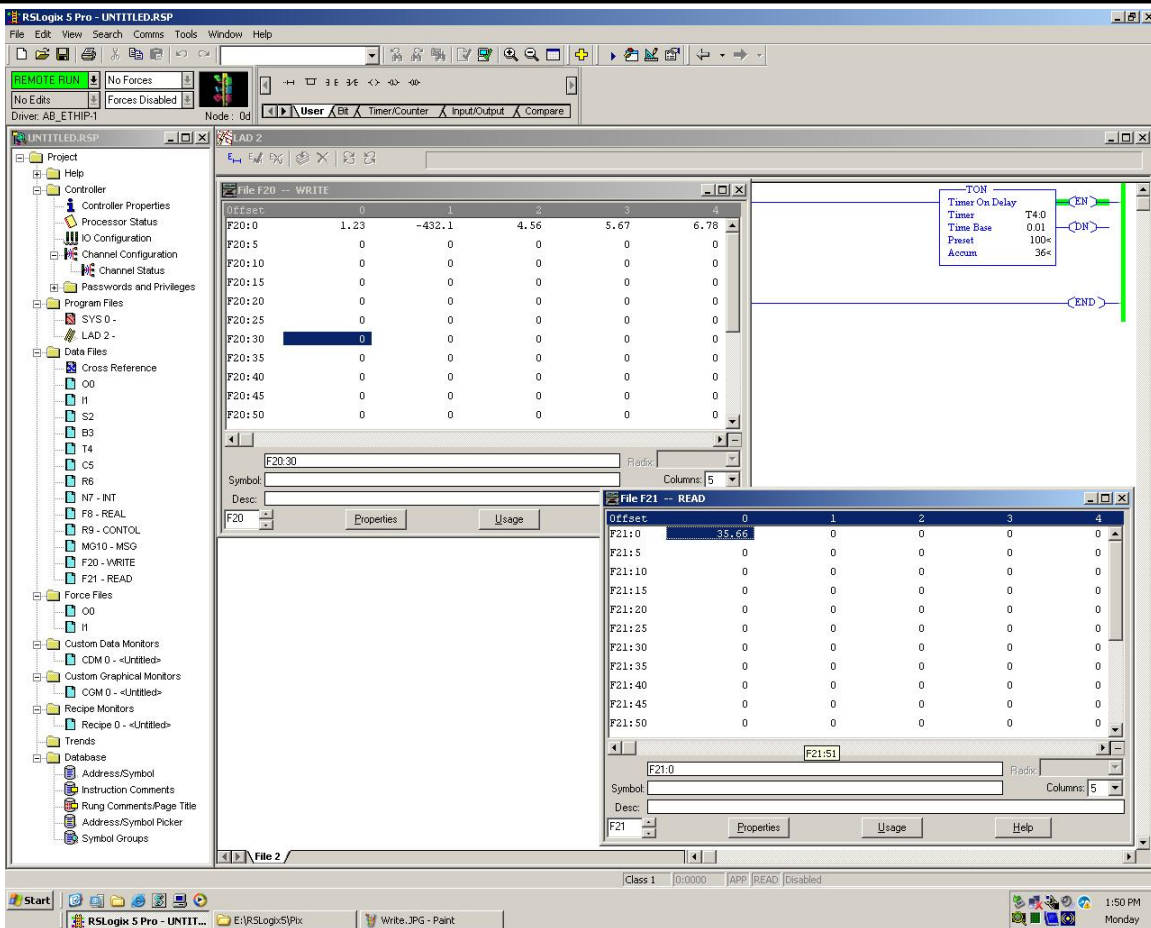


Figure 7

Inputs Description:

- Concentrations
- Temperature
- Alarm Code
- Current Product ID – “Product 1” is the default unless product brands have been implemented in the VS-300SMS or VS-200SMS
- FG = Field Gain by channel
- FO = Field Offset by channel
- PG = Product Gain by channel
- PO = Product Offset by channel

Output Description:

The implementation of outputs requires careful attention due to the fact that a mistake can change all sensor settings. In order to send outputs to the sensor the following process must be followed.

- The specific number required must be set in the “Data Outputs”
- Global Read Enable must be set to “1” from “0” (only “1” enables the function)
- The specific task Read Enable must be set to “1” from “0” (only “1” enables the function)

Example: Changing Product or Brands on the VS-300SMS or VS-200SMS

1. Set New Product ID: “number of Product”
2. Set Global Read Enable to: 1 (only “1” enables the function)
3. Set New Product ID Read Enable to: 1 (only “1” enables the function)
4. The VS-300SMS or VS-200SMS will send the changes to the “Data Inputs” for verification
5. Once the data is verified and received in “Data Inputs” it is a good practice to return all “Data Output” settings back to “0”.

Output Description – Special Cases:

- Line Stop enabled puts system on hold until reset to “0”
- CIP in Progress enabled puts system on hold until reset to “0”
- **Flow control**: The data from the sensor can be controlled by toggling bits 68 (in this case F21) and the Global Read Enable. The if bit 68 is “one”, the data from the sensor will be stopped.

VS-3000 Sensor EtherNet/IP PLC Inputs (from Sensor to PLC)		
ID	Floating Point (Real) Values	Type
0	<i>Reserved</i>	D Y N A M I C
1	Ch. 1 Concentration (<i>if active</i>)	
2	Ch. 2 Concentration (<i>if active</i>)	
3	Ch. 3 Concentration (<i>if active</i>)	
4	Detector Temperature	
5	Fluid Temperature	
6	Error (<i>Alarm</i>)	
7	Specific Gravity (<i>if active</i>)	
8	Original Extract (<i>if active</i>)	
9	<i>Reserved</i>	S T A T I C
10	Current Product ID (<i>Number</i>)	
11	Ch. 1 Field Gain (<i>if active</i>)	
12	Ch. 1 Field Offset (<i>if active</i>)	
13	Ch. 1 Product Gain (<i>if active</i>)	
14	Ch. 1 Product Offset (<i>if active</i>)	
15	Ch. 2 Field Gain (<i>if active</i>)	
16	Ch. 2 Field Offset (<i>if active</i>)	
17	Ch. 2 Product Gain (<i>if active</i>)	
18	Ch. 2 Product Offset (<i>if active</i>)	
19	Ch. 3 Field Gain (<i>if active</i>)	
20	Ch. 3 Field Offset (<i>if active</i>)	
21	Ch. 3 Product Gain (<i>if active</i>)	
22	Ch. 3 Product Offset (<i>if active</i>)	
23	Detector Temperature Field Gain	
24	Detector Temperature Field Offset	
25	Fluid Temperature Field Gain	
26	Fluid Temperature Field Offset	
27	Fast Average for Reference	
28	Fast Average for Active 2	
29	Fast Average for Active 1	
30	Fast Average for Active 3	
31	Long Average for Reference	
32	Long Average for Active 1	
33	Long Average for Active 2	
34	Long Average for Active 3	
35	Current Product Long ID (<i>High Number</i>)	
36	Current Product Long ID (<i>Low Number</i>)	
37	Ch. 1 Low Spec. Limit	
38	Ch. 1 High Spec. Limit	
39	Ch. 1 Low Control Limit	
40	Ch. 1 High Control Limit	
41	Ch. 2 Low Spec. Limit	
42	Ch. 2 High Spec. Limit	
43	Ch. 2 Low Control Limit	
44	Ch. 2 High Control Limit	
45	Ch. 3 Low Spec. Limit	
46	Ch. 3 High Spec. Limit	
47	Ch. 3 Low Control Limit	
48	Ch. 3 High Control Limit	

VS-3000 Sensor EtherNet/IP PLC Outputs (from PLC to Sensor)	
ID	Description
0	Global Read Enable (1 - Enable, Else - Disable)
1	New Product ID Read Enable (1 - Enable, Else - Disable)
2	New Product ID (Number)
3	Line Stop Read Enable (1 - Enable, Else - Disable)
4	Line Stop (1 - Stopped, Else - Activated)
5	CIP Read Enable (1 - Enable, Else - Disable)
6	CIP (1 - In Progress, Else - Normal)
7	1-st Concentration Channel Field Gain Read Enable (1 - Enable, Else - Disable)
8	1-st Concentration Channel Field Gain (if applicable)
9	1-st Concentration Channel Field Offset Read Enable (1 - Enable, Else - Disable)
10	1-st Concentration Channel Field Offset (if applicable)
11	1-st Concentration Channel Product Gain Read Enable (1 - Enable, Else - Disable)
12	1-st Concentration Channel Product Gain (if applicable)
13	1-st Concentration Channel Product Offset Read Enable (1 - Enable, Else - Disable)
14	1-st Concentration Channel Product Offset (if applicable)
15	2-nd Concentration Channel Field Gain Read Enable (1 - Enable, Else - Disable)
16	2-nd Concentration Channel Field Gain (if applicable)
17	2-nd Concentration Channel Field Offset Read Enable (1 - Enable, Else - Disable)
18	2-nd Concentration Channel Field Offset (if applicable)
19	2-nd Concentration Channel Product Gain Read Enable (1 - Enable, Else - Disable)
20	2-nd Concentration Channel Product Gain (if applicable)
21	2-nd Concentration Channel Product Offset Read Enable (1 - Enable, Else - Disable)
22	2-nd Concentration Channel Product Offset (if applicable)
23	3-rd Concentration Channel Field Gain Read Enable (1 - Enable, Else - Disable)
24	3-rd Concentration Channel Field Gain (if applicable)
25	3-rd Concentration Channel Field Offset Read Enable (1 - Enable, Else - Disable)
26	3-rd Concentration Channel Field Offset (if applicable)
27	3-rd Concentration Channel Product Gain Read Enable (1 - Enable, Else - Disable)
28	3-rd Concentration Channel Product Gain (if applicable)
29	3-rd Concentration Channel Product Offset Read Enable (1 - Enable, Else - Disable)
30	3-rd Concentration Channel Product Offset (if applicable)
31	Detector Temperature Field Gain Read Enable (1 - Enable, Else - Disable)
32	Detector Temperature Field Gain
33	Detector Temperature Field Offset Read Enable (1 - Enable, Else - Disable)
34	Detector Temperature Field Offset
35	Fluid Temperature Field Gain Read Enable (1 - Enable, Else - Disable)
36	Fluid Temperature Field Gain
37	Fluid Temperature Field Offset Read Enable (1 - Enable, Else - Disable)
38	Fluid Temperature Field Offset
39	Set Point / Target Read Enable (1 - Enable, Else - Disable)
40	Set Point / Target
41	1-st Concentration Channel Lab Read Enable (1 - Enable, Else - Disable)
42	1-st Concentration Channel Lab
43	2-nd Concentration Channel Lab Read Enable (1 - Enable, Else - Disable)
44	2-st Concentration Channel Lab
45	3-rd Concentration Channel Lab Read Enable (1 - Enable, Else - Disable)
46	3-st Concentration Channel Lab
47	Fast Average for Reference Read Enable (1 - Enable, Else - Disable)
48	Fast Average for Reference
49	Fast Average for Active 1 Read Enable (1 - Enable, Else - Disable)
50	Fast Average for Active 1
51	Fast Average for Active 2 Read Enable (1 - Enable, Else - Disable)
52	Fast Average for Active 2
53	Fast Average for Active 3 Read Enable (1 - Enable, Else - Disable)
54	Fast Average for Active 3
55	Long Average for Reference Read Enable (1 - Enable, Else - Disable)
56	Long Average for Reference
57	Long Average for Active 1 Read Enable (1 - Enable, Else - Disable)
58	Long Average for Active 1
59	Long Average for Active 2 Read Enable (1 - Enable, Else - Disable)
60	Long Average for Active 2
61	Long Average for Active 3 Read Enable (1 - Enable, Else - Disable)
62	Long Average for Active 3
63	New Product Long ID Read Enable (1 - Enable, Else - Disable)
64	New Product Long ID (High Portion)
65	New Product Long ID (Low Portion)
66	Reserved
67	Set "Zero" Enable (1 - True, Else - False)
68	Data Flow Enable (1 - False, Else - True)

VS-3000 EtherNet/IP Error Codes:

The VS-300 Sensor Management Station (SMS) has the ability to output alarms to a PLC via EtherNet/IP when certain conditions arise during a product run. Alarms are output using numbers (the last value output over EtherNet/IP). Codes are displayed on the VS-300 Sensor Management Console software as well as over Fieldbus. Each code corresponds to a specific condition. See **Table 1**.

“Output codes” are sent in the order stated in **Table 1**. Lower “output code” numbers have priority if multiple error conditions are present. If two error conditions exist and the lower number code is disabled, the higher “output code” will be displayed and the lower code ignored.

00	No Errors (good operational state)
01	Sensor Disconnected
02	Sensor Occluded (possibly empty pipe)
03	Fieldbus serial port error (requires a re-boot)
04	Invalid Product Id
05	Sensor Ch. 1 - spec Low limit violated
06	Sensor Ch. 2 - spec Low limit violated
07	Sensor Ch. 3 - spec Low limit violated
08	Sensor Ch. 1 - spec High limit violated
09	Sensor Ch. 2 - spec High limit violated
10	Sensor Ch. 3 - spec High limit violated
11	Sensor Ch. 1 - control Low limit violated
12	Sensor Ch. 2 - control Low limit violated
13	Sensor Ch. 3 - control Low limit violated
14	Sensor Ch. 1 - control High limit violated
15	Sensor Ch. 2 - control High limit violated
16	Sensor Ch. 3 - control High limit violated

Table: 1

Reference: Other Supported PLC's

The following PLCs are supported. This list may change as processors are added, but all processors within a family (PLC5, SLC500, Logix) should be compatible.

- Remote ControlLogix CPU via ControlNet bridge
- Remote ControlLogix CPU via DH+ bridge
- MicroLogix 1100
- ControlLogix Gateway to PLC5 via DH+
- ControlLogix Gateway to SLC5/04 via DH+
- PLC5 E-Series
- PLC5 enhanced processors with 1785-ENET (Ethernet Side Car)
- SLC5/05
- ControlLogix family with 1756-ENET/ENBT module
- GuardLogix family with 1756-ENET/ENBT module
- FlexLogix family with 1756-ENET/ENBT module
- PLC-5 with Ethernet port
- SoftLogix5
- SoftLogix5800
- SLC500 via channel 0 with 1761-NET-ENI Module
- MicroLogix via channel 0 with 1761-NET-ENI Module
- PLC5 processors via channel 0 with 1761-NET-ENI Module