



# Operation Manual

## PRODUCT NAME

Ethernet ITV – Ethernet/IP™

## MODEL / Series / Product Number

ITVXXXX-SEN-XX-DUQ00833-XXXX

**SMC Corporation**

This page intentionally left blank

## Contents

1. Safety Instructions.....	- 3 -
2. About this Manual.....	- 8 -
2.1. Purpose.....	- 8 -
3. Terminology.....	- 9 -
4. Product Summary.....	- 10 -
5. How to Order.....	- 11 -
5.1. Accessories.....	- 11 -
6. Summary of Product Elements.....	- 12 -
7. Quick Start.....	- 13 -
7.1. Power Cable.....	- 13 -
7.2. Network Cable.....	- 13 -
7.3. IP Address.....	- 13 -
7.4. Setpoint.....	- 14 -
7.5. Login.....	- 14 -
7.6. Default Parameters.....	- 14 -
8. Installation and Wiring.....	- 15 -
8.1. Installation.....	- 15 -
8.2. Connecting Cables.....	- 16 -
9. Web Page Access.....	- 18 -
9.1. Initial Power-up.....	- 18 -
9.1.1. Connection and Power Up.....	- 18 -
9.2. Configuring the PC.....	- 19 -
9.3. Connecting to the ITV Web Page.....	- 23 -
10. Power Over Ethernet (POE).....	- 25 -
10.1. Configuring POE.....	- 25 -
10.2. Connecting ITVs for a POE Group.....	- 27 -
11. LED Indication and Settings.....	- 29 -
12. Web Pages Accessible Without Login.....	- 31 -
12.1. System Page.....	- 31 -
12.2. Diagnostics Page.....	- 32 -
12.3. IO Data Page.....	- 33 -
12.3.1. Status Flags.....	- 34 -
12.4. Version Page.....	- 35 -
12.5. ITV Status Page.....	- 36 -
12.6. Login Page.....	- 37 -
12.7. Contact Page.....	- 38 -
13. Web Pages Requiring Login.....	- 39 -
13.1. Regulator Configuration Page.....	- 40 -
13.2. Network Page.....	- 43 -
13.2.1. Device Name.....	- 43 -
13.2.2. IP Address.....	- 43 -
13.2.3. Netmask.....	- 44 -
13.2.4. Gateway Server.....	- 44 -

13.2.5.	Use DHCP .....	- 44 -
13.2.6.	DNS Server .....	- 44 -
13.2.7.	Enable POE.....	- 45 -
13.2.8.	Hold on Connection Loss .....	- 45 -
13.3.	Time Page .....	- 46 -
13.4.	Logout Page .....	- 47 -
14.	Counts and Pressure Units .....	- 48 -
14.1.	Count Value Sent TO ITV .....	- 48 -
14.2.	Count Value Received FROM ITV.....	- 49 -
15.	Rockwell PLC Configuration for use with Ethernet IP™ ITV .....	- 50 -
16.	LabVIEW Example .....	- 55 -
Appendix	.....	- 57 -
17.	Troubleshooting.....	- 57 -
17.1.	Problem: ITV Does Not Power Up .....	- 57 -
17.2.	Problem: ITV Does Not Operate .....	- 57 -
17.3.	Problem: Unable to Communicate with ITV.....	- 58 -
17.4.	Problem: ITV Web Page Pressure Value Differs from Master Calculated Value .....	- 59 -
17.5.	Problem: ITV Does Not Reach Set Pressure .....	- 59 -
18.	Recovering the IP Address of SMC Ethernet IP™ ITV Module .....	- 61 -
19.	Specifications.....	- 63 -
19.1.	General Specifications .....	- 63 -
19.2.	Initial Configuration Parameters .....	- 63 -

# 1. Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution", "Warning" or "Danger". They are all important notes for safety and must be followed in addition to International standards (ISO/IEC), and other safety regulations.

- \*1) ISO 4414: Pneumatic fluid power -- General rules relating to systems.
- ISO 4413: Hydraulic fluid power -- General rules relating to systems.
- IEC 60204-1: Safety of machinery -- Electrical equipment of machines. (Part 1: General requirements)
- ISO 10218-1992: Manipulating industrial robots -- Safety.
- Etc.

- |  |  |
|--|--|
|  <b>Caution :</b> | CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.   |
|  <b>Warning:</b>  | WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury. |
|  <b>Danger :</b>  | DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.     |

## Warning

### **1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

### **2. Only personnel with appropriate training should operate machinery and equipment.**

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

### **3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

### **4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

## **Caution**

### **The product is provided for use in manufacturing industries.**

The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries consult SMC beforehand and exchange specifications or a contract if necessary.  
If anything is unclear, contact your nearest sales branch.

## **Limited warranty and Disclaimer/Compliance Requirements**

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".

Read and accept them before using the product.

### **Limited warranty and Disclaimer**

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.\*1)  
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.  
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

\*1) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

### **Compliance Requirements**

When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).

## **Operator**

- ◆ This operation manual has been written for those who have knowledge of machinery and apparatus that use pneumatic equipment and have full knowledge of assembly, operation and maintenance of such equipment.
- ◆ Please read this operation manual carefully and understand it before assembling, operating or providing maintenance to the product.

## ■ Precautions

### **Warning**

- Do not disassemble, modify (including changing the printed circuit board) or repair.  
An injury or failure can result.
- **Do not operate the product outside of the specifications.**  
**Do not use for flammable or harmful fluids.**  
**Fire, malfunction, or damage to the product can result.**  
**Verify the specifications before use.**
- Do not operate in an atmosphere containing flammable or explosive gases.  
Fire or an explosion can result.  
This product is not designed to be explosion proof.
- If using the product in an interlocking circuit:
  - Provide a double interlocking system, for example a mechanical system.
  - Check the product regularly for proper operation.Otherwise malfunction can result, causing an accident.
- The following instructions must be followed during maintenance:
  - Turn off the power supply.
  - Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance.Otherwise an injury can result.

### **Caution**

- After maintenance is complete, perform appropriate functional inspections.  
Stop operation if the equipment does not function properly.  
Safety cannot be assured in the case of unexpected malfunction.
- Provide grounding to assure the safety and noise resistance of the Serial System.  
Individual grounding should be provided close to the product with a short cable.

## ■ NOTE

- Follow the instructions given below when designing, selecting and handling the product.
  - The instructions on design and selection (installation, wiring, environment, adjustment, operation, maintenance, etc.) described below must also be followed.
- **Product specifications**
  - When conformity to UL is necessary the SI unit must be used with a UL1310 Class2 power supply.
  - The SI unit is a  approved product only if they have a  mark on the body.
  - Use the specified voltage.  
Otherwise failure or malfunction can result.
  - Reserve a space for maintenance.  
Allow sufficient space for maintenance when designing the system.
  - Do not remove any nameplates or labels.  
This can lead to incorrect maintenance, or misreading of the operation manual, which could cause damage or malfunction to the product.  
It may also result in non-conformity to safety standards.
- **Product handling**
  - **Installation**
    - Do not drop, hit or apply excessive shock to the Ethernet ITV system.  
Otherwise damage to the product can result, causing malfunction.
    - Tighten to the specified tightening torque.  
If the tightening torque is exceeded the mounting screws may be broken.  
IP65 protection cannot be guaranteed if the screws are not tightened to the specified torque.
    - Never mount a product in a location that will be used as a foothold.  
The product may be damaged if excessive force is applied by stepping or climbing onto it.
  - **Wiring**
    - Avoid repeatedly bending or stretching the cables, or placing heavy load on them.  
Repetitive bending stress or tensile stress can cause breakage of the cable.
    - Wire correctly.  
Incorrect wiring can break the product.
    - Do not perform wiring while the power is on.  
Otherwise damage to the fieldbus system and/or I/O device can result, causing malfunction.
    - Do not route wires and cables together with power or high voltage cables.  
Otherwise the fieldbus system and/or I/O device can malfunction due to interference of noise and surge voltage from power and high voltage cables to the signal line.  
Route the wires (piping) of the fieldbus system and/or I/O device separately from power or high voltage cables.
    - Confirm proper insulation of wiring.  
Poor insulation (interference from another circuit, poor insulation between terminals, etc.) can lead to excess voltage or current being applied to the product, causing damage.
    - Take appropriate measures against noise, such as using a noise filter, when the fieldbus system is incorporated into equipment.  
Otherwise noise can cause malfunction.

## Environment

- Select the proper type of protection according to the operating environment.  
IP65 protection is achieved when the following conditions are met.
  - (1) The units are connected properly with fieldbus cable with M12 connector and power cable with M12 connector.
  - (2) Suitable mounting of each unit (if using the optional manifold mount).
  - (3) All unused connectors are closed with a properly installed seal cap.If using in an environment that is exposed to water splashes, please take measures such as using a cover.
- Do not use in a place where the product could be splashed by oil or chemicals.  
If the product is to be used in an environment containing oils or chemicals such as coolant or cleaning solvent, even for a short time, it may be adversely affected (damage, malfunction etc.).
- Do not use the product in an environment where corrosive gases or fluids could be splashed.  
Otherwise damage to the product and malfunction can result.
- Do not use in an area where surges are generated.  
If there is equipment which generates a large amount of surge (solenoid type lifter, high frequency induction furnace, motor, etc.) close to the fieldbus system, this may cause deterioration or breakage of the internal circuit of the fieldbus system. Avoid sources of surge generation and crossed lines.
- When a surge-generating load such as a relay or solenoid is driven directly, use a fieldbus system with a built-in surge absorbing element.  
Direct drive of a load generating surge voltage can damage the fieldbus system.
- The product is **NOT** immune to lightning strikes. Take measures against lightning strikes in the system.
- Prevent foreign matter such as remnant of wires from entering the fieldbus system to avoid failure and malfunction.
- Mount the product in a place that is not exposed to vibration or impact.  
Failure or malfunction can result.
- Do not expose the product to direct sunlight.  
If using in a location directly exposed to sunlight, shade the product from the sunlight. Failure or malfunction can result.
- Keep within the specified operating temperature range.  
Malfunction can result.
- Do not operate close to a heat source, or in a location exposed to radiant heat.  
Malfunction can result.

### Adjustment and Operation

- Perform settings suitable for the operating conditions.  
Incorrect setting can cause operation failure.
- Please refer to the PLC manufacturer's manual etc. for details of programming and addresses.  
For the PLC protocol and programming refer to the relevant manufacturer's documentation.

### Maintenance

- Turn off the power supply, stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance.  
There is a risk of unexpected malfunction.
- Perform regular maintenance and inspections.  
There is a risk of unexpected malfunction.
- After maintenance is complete, perform appropriate functional inspections.  
Stop operation if the equipment does not function properly.  
Otherwise safety is not assured due to an unexpected malfunction or incorrect operation.
- Do not use solvents such as benzene, thinner etc. to clean the unit.  
They could damage the surface of the body and erase the markings on the body. Use a soft cloth to remove stains. For heavy stains, use a cloth soaked with diluted neutral detergent and fully squeezed, then wipe up the stains again with a dry cloth.

## 2. About this Manual

### 2.1. Purpose

The purpose of this manual is to provide the user with necessary information to install, configure, and use the ITVXXXX-SEN-XX-DUQ00833-XXXX.

The ITV is typically operated under the control of a master device (usually a PLC). The ITV may also be operated under the control of a LabVIEW program. Finally, the ITV may also be operated using the built-in ITV web interface. The web interface is documented in this manual.

This manual provides information for ITV setup and configuration, examples of the web interface, a LabVIEW program, and a brief overview of the Rockwell RSLogix5000 software. Please see the manufacturer's documentation for detailed instructions on the setup and use of your Rockwell or other PLCs. Please see the LabVIEW documentation for more information on using LabVIEW.

### 3. Terminology

	Terms	Meaning
100	100BASE-TX	Standard LAN transmission line with communication speed of 100 Mbps.
A	Auto negotiation	The function that automatically optimizes the common communication parameters such as speed, duplex mode, and flow control between Ethernet devices.
B	Bus In / Bus Out	M12 Ethernet communication connectors located on top of the ITV.
C	Counts	The ITV controls and reports pressure or vacuum internally in <b>Counts</b> . The counts are used by hardware devices to control and measure the pressure or vacuum regulated by the ITV.
	Current consumption	The current necessary to operate each unit or device using a 24 volt power supply.
D	DHCP	DHCP (Dynamic Host Configuration Protocol) allows the ITV IP address to be set using an external DHCP server. DHCP may be used if desired, but is not required.
	Downstream	Relative to your ITV, a downstream device receives power and/or communication signals which originate <i>from</i> or are <i>passed through</i> your ITV.
	DLR	DLR (Device Level Ring) is supported by Rockwell PLCs for Ring networks. If your ITVs are configured using a ring topology, DLR provides redundancy if a problem (such as a line break or device failure) occurs within a Ring network. DLR allows communication and control of devices in the network to continue in the event of a single communication failure.
E	Electronic Data Sheet (EDS)	EDS is a file containing settable attribute information for a device (each parameter's object address, etc.). Used by Rockwell PLC RSLogix5000™ or Logix Designer™ software to permit faster, more consistent PLC setup.
	Ethernet/IP™ (EIP)	The specific Fieldbus (network) communication protocol used by the ITV to communicate with the PLC, and any other connected devices. EIP is a well-documented, standard communications protocol.
F	Fieldbus	The protocol that uses digital communication to exchange signals between field equipment (instruments and actuators).
	Full duplex	Communication system that can send and receive data at the same time bi-directionally (similar to standard telephone).
H	Half duplex	Communication system that sends and receives data in one direction at a time (similar to two-way radio).
	Host Address	The final (4 <sup>th</sup> ) octet of an IP Address.
I	IP address	A 32 bit digit sequence which is assigned to identify devices which are connected to the network. This address must be unique for each device to ensure proper operation of the network.
	IPxy	International Ingress Protection standard. xy indicates the level of protection from external objects (hands, steel balls, steel wire, dust, water, etc.) applied to the product.
M	MAC address	A unique number inherent to all devices which are connected to Ethernet.
	Master	The master is the device which controls the ITV. Typically a master is a PLC. It may also be a PC (using the ITV web pages or a LabVIEW program) or it may be another device capable of controlling the ITV.
P	PC	Personal Computer.
	PLC	Abbreviation for Programmable Logic Controller. A digital computer/controller used for automation of electromechanical processes.
	Power Cycle	A Power Cycle involves briefly removing power from the ITV and then restoring power.
S	Setpoint	The specified pressure or vacuum value which the ITV has been directed to maintain.
	Serial Interface (SI)	A communication interface between two digital systems that transmits data as a series of voltage pulses down a wire. Each pulse represents a single bit of data.
	SI unit	Abbreviation for Serial Interface unit. A unit connected to a device to communicate input and output data. The ITV connection to another device is a Serial Interface Unit (SI Unit).
	Subnet Address	The 3 <sup>rd</sup> octet of an IP Address. Also called Subnet.
T	Topology	Connection configuration of the network.
U	Upstream	Relative to your ITV, an upstream device provides power and/or communication signals to your ITV.

Figure 1 - Definitions and Terminology

## 4. Product Summary

The ITVXXXX-SEN-XX-DUQ00833-XXXX (ITV) is a pressure/vacuum regulator which is controlled by a serial interface. Pressure ITVs (ITVX010, ITVX030, and ITVX050) and Vacuum ITVs (ITV2090) regulate supplied pressure or vacuum to an output pressure or vacuum specified by the user.

The serial interface allows a user to configure, control, and monitor the ITV over an Ethernet communication link. The user can set the ITV pressure or vacuum and monitor the ITV operating status using the ITV web page or a PLC.

The connectors on the ITV are: one (1) 24 volt DC power supply connector (A-Coded M12 5-pin female connector) and two (2) Ethernet communications connectors (D-Coded M12 4-pin male connectors). (See [Connecting Cables \(Section 8.2\)](#) for cable pin information).

There are several options for the thread and port sizes. (For information on the various options, see [How to Order \(Section 5\)](#)).

### **Caution**

Be **SURE** you understand the location and function of these ports **BEFORE** connecting the ITV to an air or vacuum line. **VERIFY** that these lines are properly connected **BEFORE** enabling pneumatic pressure or vacuum and **BEFORE** powering the ITV.

## 5. How to Order

The part number describes the ITV as follows. Note: Not all variations of the “How to Order” part numbers are available. Check with your SMC sales person for availability.

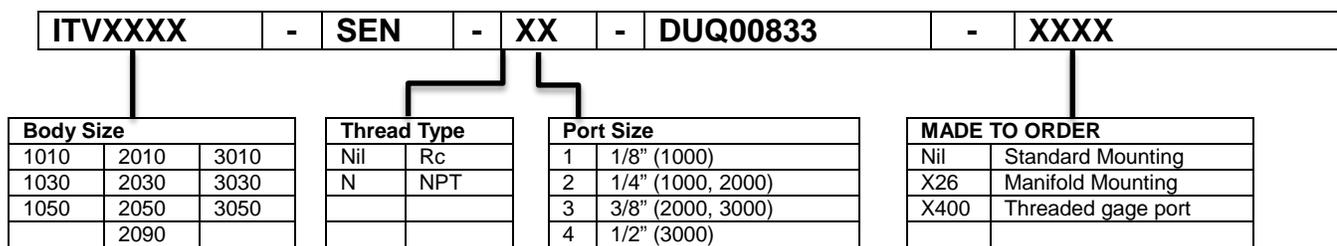


Figure 2 - ITV Part Number

- Note 1: Body Size 2090 is an -80 KPa vacuum ITV.  
All other Body Sizes are pressure ITVs (x010 – 0.1 MPa, x030 – 0.5 MPa, x050 – 0.9 MPa).
- Note 2: Port Size refers to the size of the supply, output, and exhaust ports for all body sizes. Body size 2090 **ONLY** supports 1/4" port size (Port Size 2).
- Note 3: Unless otherwise noted, this manual applies to all options. This document describes the standard Ethernet ITV connection and setup. The additional functionality of the X-Options is described on the SMC website and in the SMC product catalog. If further clarification is required, contact SMC for additional information on the X-Options.

### 5.1. Accessories

**Connector cables** (recommended – not included with ITV)

ITV unit connection	Description	Compatible cable		
		Part number	Len	Specifications
Fieldbus interface	Cables	EX9-AC010EN-PSRJ	1m	One end: molded M12 straight connector. Other end: RJ45 connector (Ethernet).
		EX9-AC020EN-PSRJ	2m	
		EX9-AC030EN-PSRJ	3m	
		EX9-AC050EN-PSRJ	5m	
		EX9-AC100EN-PSRJ	10m	
		PCA-1446566	5m	One end: molded M12 right angle connector. Other end: flying leads.
		EX9-AC005EN-M12M12	0.5m	Both ends: molded M12 straight connectors.
	EX9-AC050EN-M12M12	5m		
	Field wire-able Connector	PCA-1446553	--	Connector: M12 straight plug connector. Use with PCA-1446566 to make a cable of desired length.
Power supply	Cables	EX500-AP010-SE	1m	One end: molded M12 straight connector. Other end: flying leads.
		EX500-AP050-S	5m	
		EX500-AP010-A	1m	One end: molded M12 right angle connector. Other end: flying leads.
		EX500-AP050-A	5m	
	Cable with Speedcon connector	PCA-1401804	1.5m	One end: molded M12 straight connector. Other end: flying leads.
		PCA-1401805	3m	
	PCA-1401806	5m		

Figure 3 - Recommended Cables

Note: More options are available. Contact SMC for information on these options.

#### Seal cap

Seal caps are used to protect the M12 size connector openings. It is recommended that seal caps be used on all unused M12 connector openings. Use of seal caps is required for all unused connections for IP65 rating.

(One Ethernet and one Power seal cap are attached to the ITV when shipped from factory.)

Description	Part No.	Specification	
Seal cap	EX9-AWTS	For M12 connector socket: 10pcs.	Bus Port
Seal cap	P5033-88	For M12 connector socket: 1pcs.	Bus Port
Seal cap	UIUSP-A05-DUQ00833	Cap and Gasket for M12 Female Connector 1 pcs.	Power Port



Figure 4 - Seal Cap Part Numbers

## 6. Summary of Product Elements

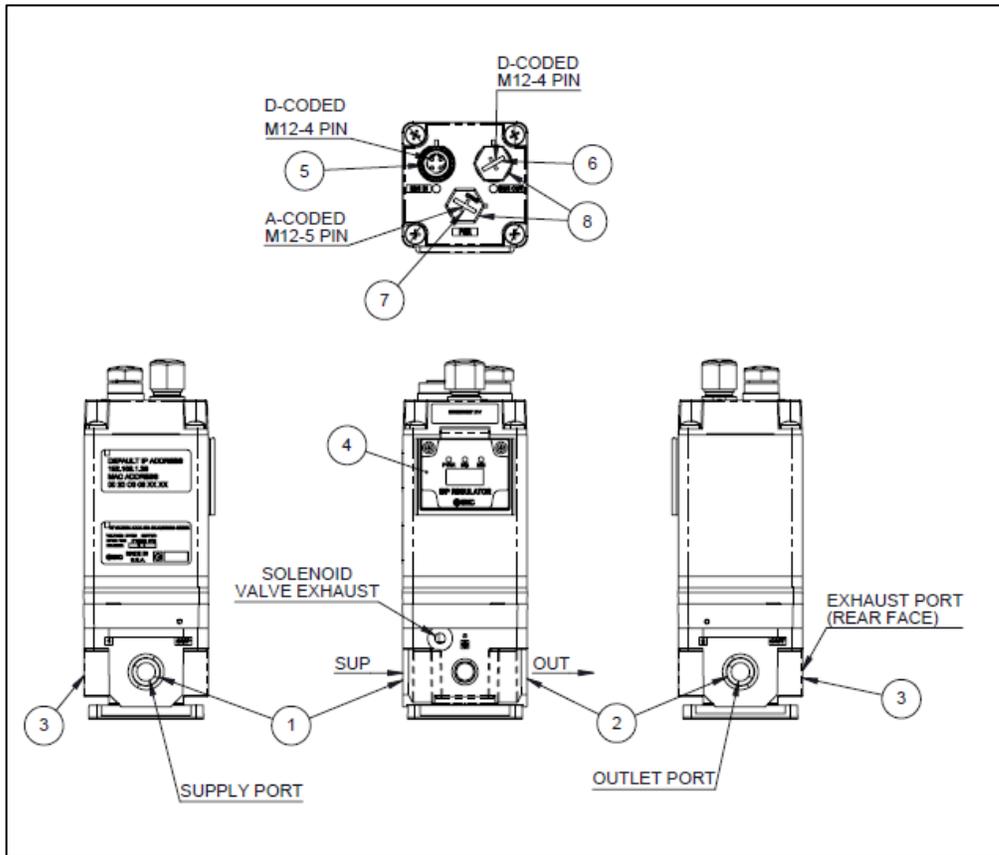


Figure 5 - ITV Drawing

No.	Element	Description
1	Supply Port Connection	Input Pressure Line Connection (X010, X030, X050) / Atmosphere Pressure (2090) * <sup>1</sup>
2	Outlet Port Connection	Output Pressure Line Connection (X010, X030, X050) / Application Vacuum Line Connection (2090) * <sup>1</sup>
3	Exhaust / Vacuum Port	Exhaust Port (X010, X030, X050) / Vacuum Line Connection (2090) * <sup>1</sup>
4	LED Display window	Network and operating status LEDs * <sup>2</sup>
5	Fieldbus interface connector (Bus In)	Ethernet connection (M12, 4-pin socket, D-coded) * <sup>3</sup>
6	Fieldbus interface connector (Bus Out)	Ethernet connection (M12, 4-pin socket, D-coded) * <sup>3</sup>
7	Power supply connector	24 Volt DC input power supply * <sup>3</sup>
8	Seal Cap (Accessory)	Seal cap for unused Fieldbus interface connector (Bus Out); Seal cap for unused power supply connector * <sup>3</sup>

\*1: X is 1, 2, or 3 and designates the body type for the ITV. (See [How to Order \(Section 5\)](#) for more information )

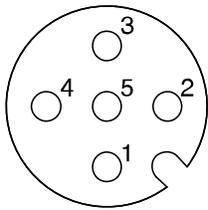
\*2: See [LED Indication and Settings \(Section 11\)](#) for the LED indication.

\*3: See [How to Order \(Section 5\)](#) for connecting cables and seal caps part numbers.

## 7. Quick Start

### 7.1. Power Cable

#### 7.1.1. Power supply connector layout - PWR: M12 5-pin Plug A-coded connector



No.	Designation	Description
1	24 VDC	Power (Brown Wire +24 VDC + terminal)
2	-	Do Not Connect
3	0 VDC	Common (Blue Wire – Common - terminal)
4	-	Do Not Connect
5	FG	Field Ground (Gray Wire – ground) – resistance to ground must be 100 ohms or less

Figure 6 - ITV Power Cable Pin Connections

(Note: The wire colors above are for a standard SMC power cable. Power cables from other sources may use different colors.) For Power Cable selection, see [Accessories \(Section 5.1\)](#).

### ⚠ Warning

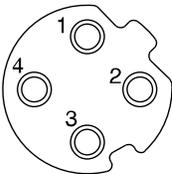
**ALL** pins on the M12 5-pin power connector **ARE** connected internally in the ITV. Only pins 1 and 3 are used for power. Pin 5 is used for field ground. The user **MUST** ensure that pins 2 and 4 are **NOT connected (OPEN)** in the power cable to prevent possible injury to personnel and possible hazardous operation of the ITV and controlled equipment.

Failure to ensure that **pins 2 and 4 are OPEN (NOT connected)** could cause abnormal ITV operation. Abnormal ITV operation could result in injury or death.

### 7.2. Network Cable

#### 7.2.1. Network Bus In and Bus Out: M12 4-pin socket D-coded connectors

Select the appropriate cables to mate with the communication connectors mounted on the ITV.



No.	Designation	Description
1	TD+	Transmit Data +
2	RD+	Receive Data +
3	TD-	Transmit Data -
4	RD-	Receive Data -

Figure 7 - ITV Ethernet Cable Pin Signals

Use a standard industrial Ethernet cable. For cable selection see [Accessories \(Section 5.1\)](#).

You may use either port (“Bus In” or “Bus Out”) for the Ethernet connection to the ITV **EXCEPT when using Power Over Ethernet (POE)**. POE **REQUIRES** that the input cable is connected to “**Bus In**” and the output cable is connected to “**Bus Out**”. (See [Power Over Ethernet \(POE\) \(Section 10\)](#) for more information.)

### 7.3. IP Address

The IP address is set to (192.168.1.20) at the factory. The IP address can be changed using the built in ITV web server. (See [Web Page Access \(Section 9\)](#)).

## 7.4. Setpoint

**Setpoint** is the requested value for the ITV's regulated pressure or vacuum output. An external master (typically a PLC) sends the setpoint value (in counts) to the ITV. During machine start up or troubleshooting, the ITV web page can be used to enter a setpoint value (see [Regulator Configuration Page \(Section 13.1\)](#)).

## 7.5. Login

ITV login is required to access many of the ITV web pages and features. The factory default login is Username: "**user**", Password: "**user**". The ITV login provides access to features that can be monitored during operation or modified to meet the application requirements. (See [Login Page \(Section 12.6\)](#) for more information).

## 7.6. Default Parameters

The default values of ITV settings are given below. The user can change these values as part of the ITV setup process.

- 7.6.1. Pressure Ranges. Pressure setpoints sent to the ITV are specified in counts. The range is 0 – 4095. 4095 corresponds to full range for the ITV. The actual pressure corresponding to 4095 counts depends on the ITV body type, is set by the factory, and cannot be changed.

Body Type	X010	X030	X050	2090
Pressure at 4095 Counts	100 KPa	500 KPa	900 KPa	-80 KPa

- 7.6.2. Swap PLC Data Bytes. By default, Swap PLC Data Bytes is **OFF** (unchecked). This setting is preserved across power cycles. To change this setting see [Regulator Configuration Page \(Section 13.1\)](#).
- 7.6.3. Pressure (Vacuum) setpoint is 0 upon system power up.
- 7.6.4. DHCP. By default, DHCP is **OFF** (unchecked). This setting is preserved across power cycles. To change this setting see [Network Page \(Section 13.2\)](#).
- 7.6.5. Power Over Ethernet (POE). By default POE is **OFF** (unchecked). The setting is preserved across power cycles. To change this setting see [Power Over Ethernet \(POE\) \(Section 10\)](#).
- 7.6.6. Hold on Connection Loss. By default Hold on Connection Loss is **OFF** (unchecked). Loss of data communication will cause the ITV to return to a pressure or vacuum of 0 counts. This setting is preserved across power cycles. To change this setting see [Network Page \(Section 13.2\)](#).
- 7.6.7. By default, the ITV web pages, [ITV Status Page \(Section 12.5\)](#) and [Regulator Configuration Page \(Section 13.1\)](#), display pressure and vacuum values in PSI.
- 7.6.8. The default factory IP address is 192.168.1.20.
- 7.6.9. The default factory MAC address is printed on the ITV label.
- 7.6.10. See [Specifications \(Section 19\)](#) for a summary of default ITV settings and ITV hardware specifications.

## 8. Installation and Wiring

### 8.1. Installation

1. For standard mounting, properly install pneumatic fittings in the threaded ports of the ITV base. For additional details see *SMC Best Pneumatics* version 5 (or later), volume 5, ITV Section Series ITV0000/1000/2000/3000. For information about SMC fittings see <http://www.smcusa.com/top-navigation/cad-models.aspx/87051>.
  - a. See [Figure 5 - ITV Drawing](#) for the description of fitting locations.
  - b. Torque the fittings as indicated:

Connection thread	1/8	1/4	3/8	1/2
Torque (N•m)	7 to 9	12 to 14	22 to 24	28 to 30

Figure 8 - Recommended proper connection torque: N•m

2. Install pneumatic tubing. When installing this tubing, be sure that the air pressure or vacuum source is **LOCKED OFF** at the closest shutoff valve before the ITV. There must be **NO AIR PRESSURE OR VACUUM** in the pneumatic line until all connections are complete.

### Caution

**DO NOT** enable air pressure or vacuum until **ALL** pneumatic lines in the circuit have been properly connected and the connections have been verified to be correct. Failure to follow this requirement can result in injury or equipment damage.

Be **SURE** you understand the location and function of the ports **BEFORE** connecting the ITV to an air or vacuum line. **VERIFY** that these lines are properly connected **BEFORE** enabling pneumatic pressure or vacuum and **BEFORE** powering the ITV.

## 8.2. Connecting Cables

### 8.2.1. Fieldbus interface connector layout

Select the appropriate cables to mate with the communication connectors mounted on the ITV.

#### Bus In and Bus Out: M12 4-pin socket D-coded connectors



No.	Designation	Description
1	TD+	Transmit Data +
2	RD+	Receive Data +
3	TD-	Transmit Data -
4	RD-	Receive Data -

Figure 9 - ITV Ethernet Cable Pin Signals

Connect one connector (“Bus In” or “Bus Out”) to the upstream device and connect the other connector (“Bus Out” or “Bus In”) to the downstream device. For cable selection see [Accessories \(Section 5.1\)](#).

If Power Over Ethernet (POE) is **NOT** in use, either communications port can be used for input or output. It is recommended that “Bus In” be used for the input (upstream) connection to the ITV and “Bus Out” be used for the output (downstream) connection from the ITV. It is also recommended that unused connectors be capped with a seal cap. For more information see [Accessories \(Section 5.1\)](#).

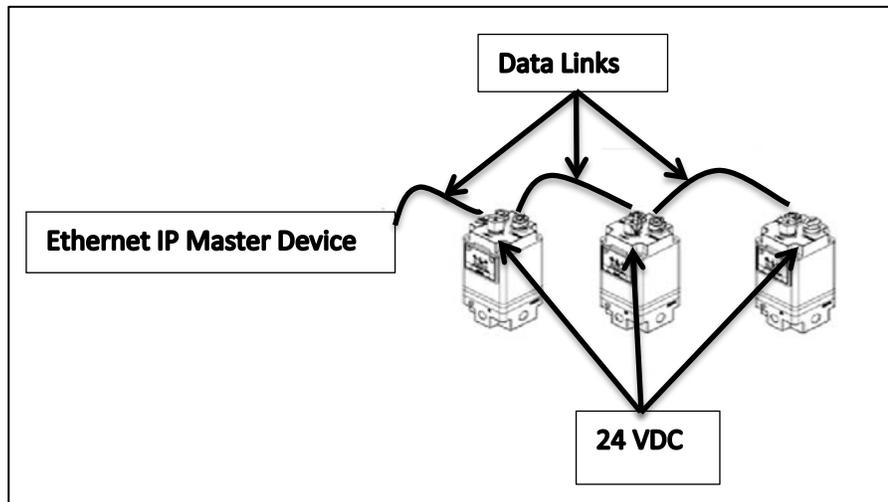


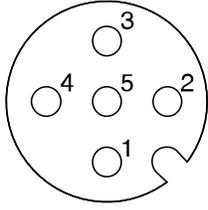
Figure 10 - Example (non-POE) ITV Data and Power Connections

### Caution

If using POE, **STRICTLY FOLLOW** the connections given in [Power Over Ethernet \(POE\) \(Section 10\)](#). Failure to follow the required connections could result in injury or equipment damage.

## 8.2.2. Power supply connector layout

### PWR: M12 5-pin Plug A-coded connector



No.	Designation	Description
1	24 VDC	Power (Brown Wire +24 VDC + terminal)
2	-	Do Not Connect
3	0 VDC	Common (Blue Wire – Common - terminal)
4	-	Do Not Connect
5	FG	Field Ground (Gray Wire – ground) – resistance to ground must be 100 ohms or less

Figure 11 - ITV Power Cable Pin Connections

(Note: The wire colors above are for a standard SMC power cable. Power cables from other sources may use different colors.) For Power Cable selection see [Accessories \(Section 5.1\)](#).

### Warning

**ALL** pins on the M12 5-pin power connector **ARE** connected internally in the ITV. Only pins 1 and 3 are used for power. Pin 5 is used for field ground. The user **MUST** ensure that pins 2 and 4 are **NOT** connected (**OPEN**) in the power cable to prevent possible injury to personnel and possible hazardous operation of the ITV and controlled equipment.

Failure to ensure that **pins 2 and 4 are OPEN (NOT connected)** could result in abnormal ITV operation. Abnormal ITV operation could result in injury or death.

## 9. Web Page Access

### 9.1. Initial Power-up

The ITV web page is the mechanism used to configure an ITV and prepare it for installation. The ITV web page may also be used to operate and control the ITV.

New ITVs come from the factory preconfigured with a unique MAC address which matches the MAC address printed on the label of the ITV. New ITVs have a preset static IP address of 192.168.1.20. Use this IP address initially to access the ITV web page.

Both MAC addresses and IP addresses must be unique on a network. The factory sets the same static IP address for *all* ITVs; therefore, the IP address *may need to be changed* as part of the setup process. The IP address change procedure is discussed in this section.

#### 9.1.1. Connection and Power Up

In order to initially access the ITV web page, you will need the following items (see [Connecting Cables \(Section 8.2\)](#) for more details):

- (1) One (1) power cable (with a 5-pin female M12 A-Coded connector).
- (2) One (1) Ethernet cable (with a 4-pin male M12 D-Coded connector on one end and a standard LAN Ethernet cable plugin connector (RJ45) on the other end).
- (3) A PC with a LAN port. The PC is either directly connected to the ITV using the Ethernet cable in item 2, or it may be connected to the ITV via a separate cable and switch.
- (4) Web browser installed on the PC. Internet Explorer (IE 9 or later), Chrome, or Firefox are supported.

Connect the Ethernet cable to the “Bus In” port of the ITV. Connect the LAN connector to your PC LAN port or switch.

Turn on the PC (and switch, if used).

Connect the power cable to a 24 VDC power supply and to the ITV (see [Power supply connector layout \(Section 8.2.2\)](#)).

Turn on the 24 VDC power supply.

The ITV should power up, the Power LED should be solid green, and the NS and MS LEDs should be flashing green. If this does not occur, turn off the 24 VDC power supply or disconnect the ITV power cable. Verify all connections. See [Troubleshooting \(Section 17\)](#) of this document for more information.

## 9.2. Configuring the PC

As noted, the IP address is initially set statically in the factory to 192.168.1.20. This is an address on subnet 1.

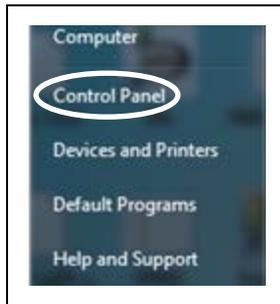
In order to access the ITV web page, the PC must also be configured to use subnet 1. The following steps (using Windows 7 – other versions of Windows may differ) describe how to set the PC to subnet 1. Note: If the PC is already configured to use subnet 1, you may skip this section.

This procedure assumes that you have appropriate access privileges on your PC. If not, please consult your PC Administrator.

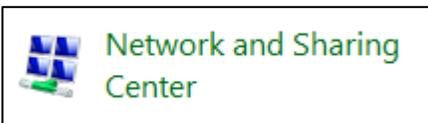
Bring up the Network and Sharing Center using the Control Panel from the Start menu:



First, select the **Start** button on your PC toolbar



Next, select **Control Panel** on the **Start Menu**



Finally select **Network and Sharing Center** on the **Control Panel** menu.

## Section 9.2 (Continued)

Your **Network and Sharing Center** will depict the specific network configuration for your PC and its network(s). As a result, your view may be somewhat different from the following window. If you have questions, please review the documentation for your PC. If you have additional questions, please consult your PC or Network Administrator for information and assistance.

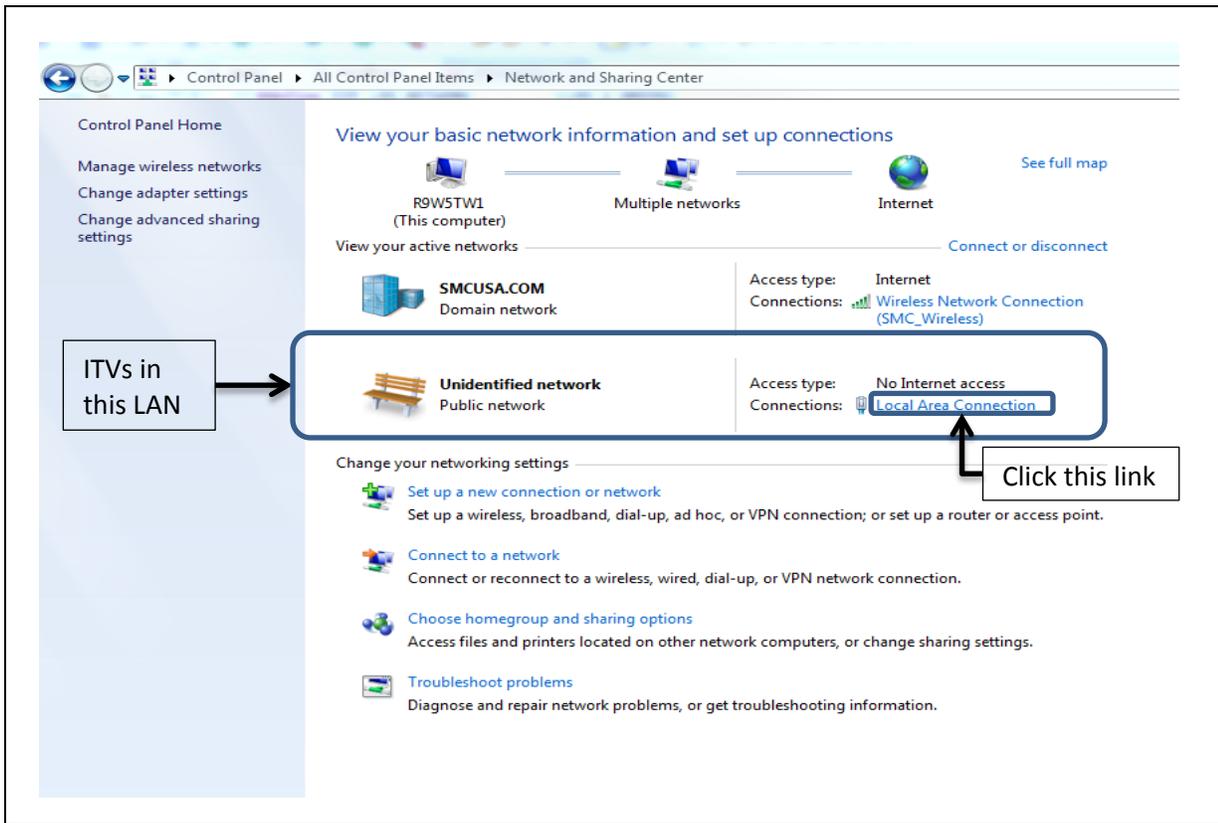


Figure 12 - Windows Network and Sharing Center

## Section 9.2 (Continued)

Press the “**Local Area Connection**” link (in [Figure 12 - Windows Network and Sharing Center](#)) and the **Local Area Connection Status** window will appear. Then press the “**Properties**” button and the **Local Area Connection Properties** window will appear:

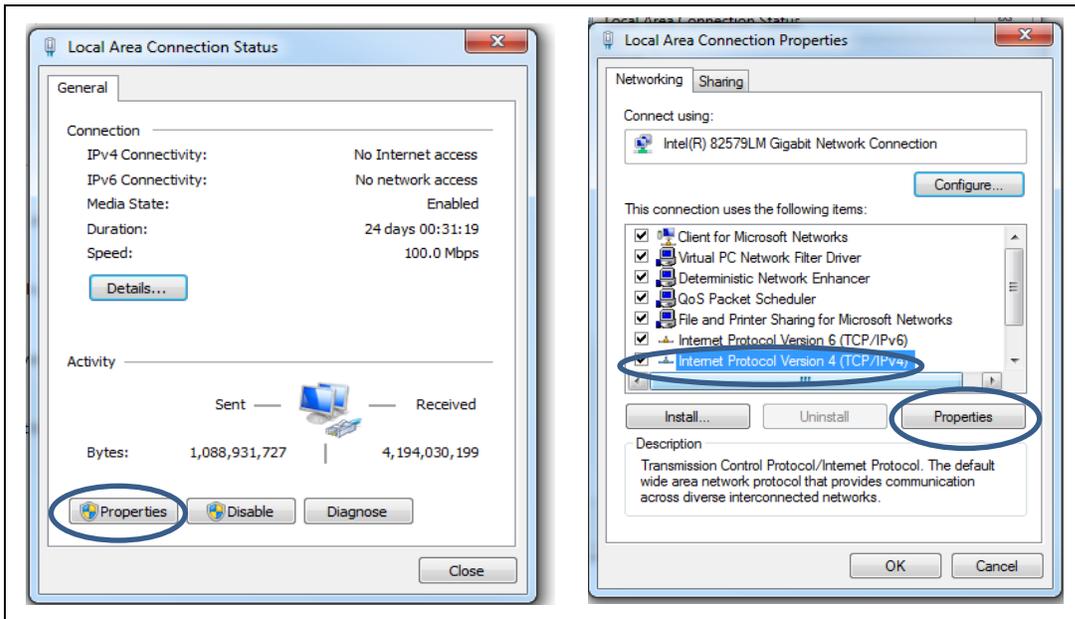


Figure 13 - Windows Local Area Connection and Local Area Connection Properties

Next select **Internet Protocol Version 4 (TCP/IPv4)** and press the **Properties** button. The **Internet Protocol Version 4 (TCP/IPv4) Properties** window will appear:

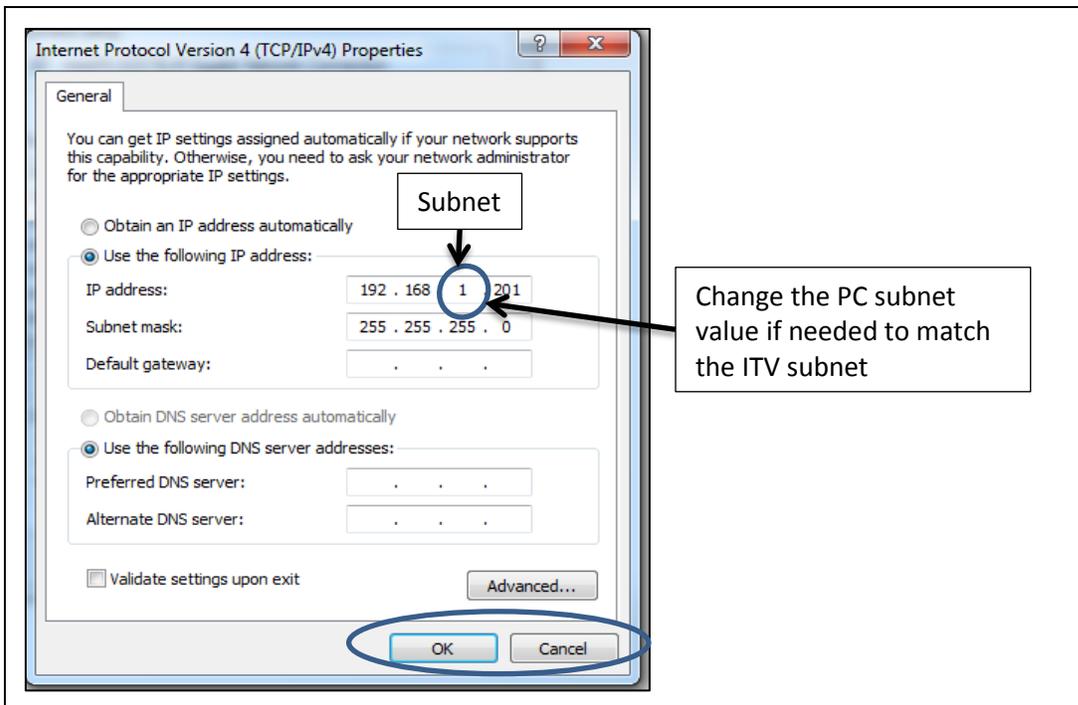


Figure 14 - Windows Internet Protocol - IPv4 – Properties

## Section 9.2 (Continued)

The **Subnet** field is circled ([Figure 14](#)). Verify that the PC Subnet value matches the Subnet in use on your ITV. Note: The PC and ITV **must** have different IP addresses.

***DO NOT MODIFY ANY OTHER FIELD IN THE IPv4 PROPERTIES WINDOW.***

If the Subnet field must be changed, **double click** the Subnet field entry (circled in [Figure 14](#)) and type the new value. Do **NOT** hit the keyboard “Enter” key. That has the effect of pressing the OK button, but does not give you the opportunity to review your Subnet change to ensure it is correct before you accept it.

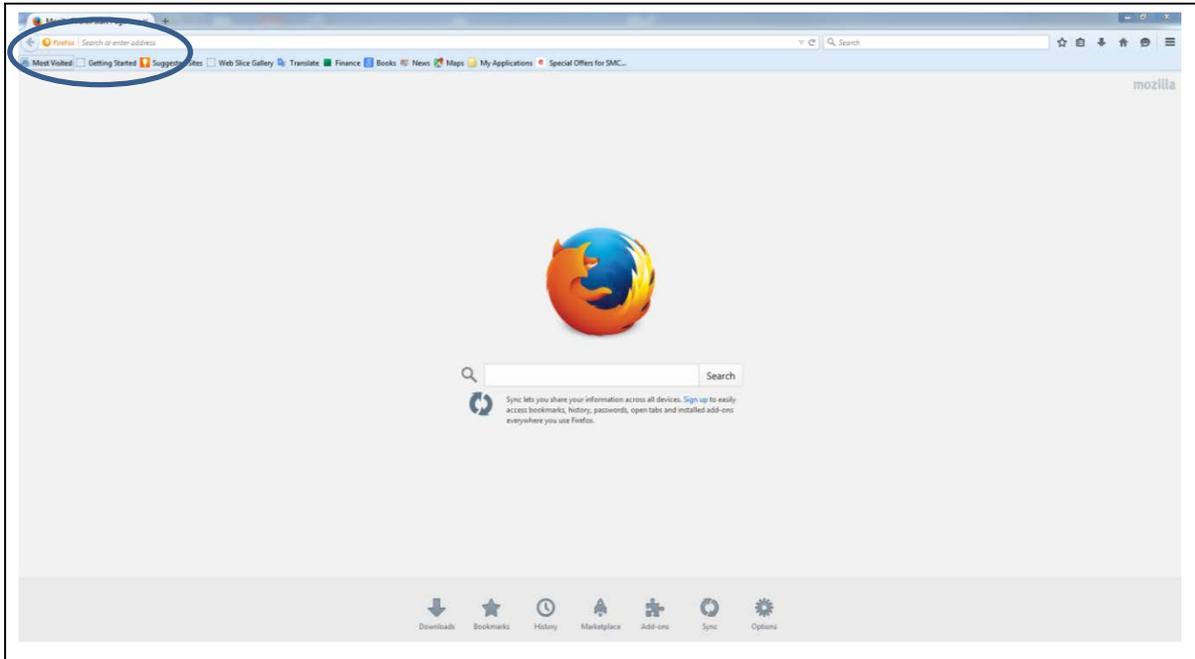
Verify that the **ONLY** change is the Subnet field. If **ANYTHING** other than the Subnet field has changed, restore the initial value **BEFORE** you press OK.

Once you have verified the values in the *IPv4 Properties* window, press the OK button to complete the PC subnet change. This will close the IPv4 Properties window.

Next, continue to [Connecting to the ITV Web Page \(Section 9.3\)](#).

### 9.3. Connecting to the ITV Web Page

After you have confirmed that the PC and ITV are on the same Subnet, launch your preferred browser. The following examples use Firefox. IE and Chrome are similar.



**Figure 15 - Firefox Browser Homepage**

In order to bring up the ITV web page, type the ITV IP address on the browser URL line. The “System Information” page should appear.

## Section 9.3 (Continued)

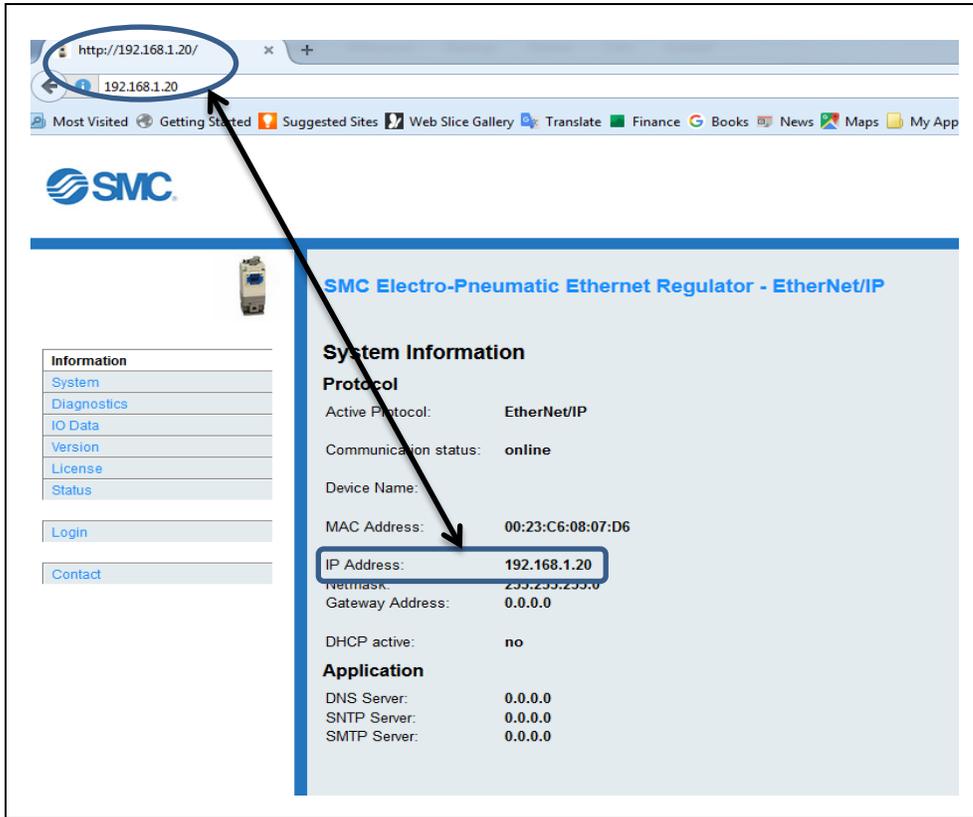


Figure 16 - ITV "System Information" Page with Factory Default IP Address

If the System Information page does **NOT** appear please see the following subsections of [Troubleshooting \(Section 17\)](#):

- [Problem: ITV Does Not Power Up \(Section 17.1\)](#)
- [Problem: ITV Does Not Operate \(Section 17.2\)](#)
- [Problem: Unable to Communicate with ITV \(Section 17.3\)](#)

If necessary, contact SMC Technical Support for assistance.

Note: To change the ITV IP address, follow the instructions in [IP Address \(Section 13.2.2\)](#).

## 10. Power Over Ethernet (POE)

The Power Over Ethernet (POE) feature is an *optional* way to power ITV units eliminating the need to run a power cable to all ITVs. When POE is enabled, power is provided to the ITV by the “**Bus In**” cable. The ITV factory *default* condition is **POE disabled**.

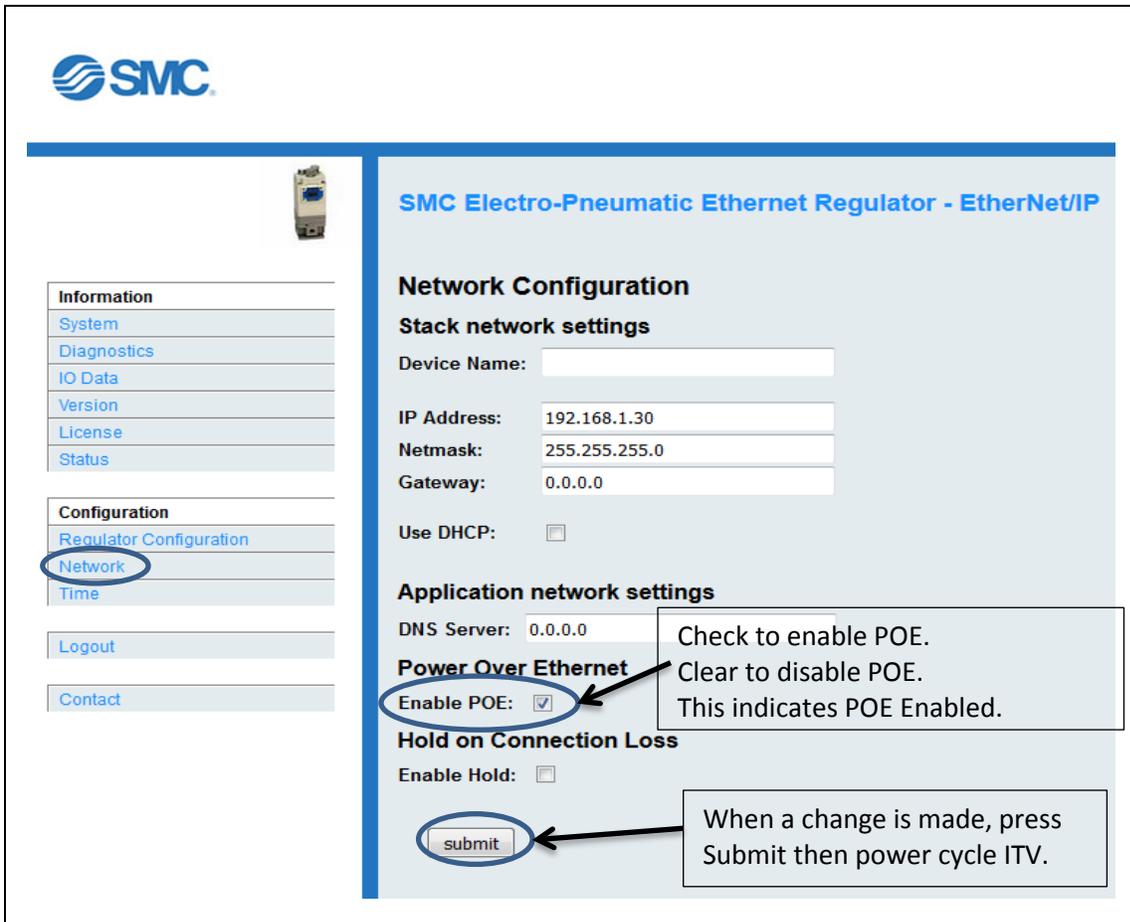
### Caution

By default, POE is **DISABLED**. Be sure that you **FULLY** understand this section **BEFORE** enabling POE on your ITV network. Improper use or configuration of POE can pose a safety hazard.

This Power Over Ethernet (POE) implementation is unique to the SMC ITV. Do **NOT** operate other devices using the ITV POE. Do **NOT** use POE from other devices to operate the ITV.

### 10.1. Configuring POE

POE is enabled or disabled using the “Enable POE” checkbox on the [Network Page \(Section 13.2\)](#). Login to the ITV (see [Login Page \(Section 12.6\)](#)) and press the “Network” menu item. The “Enable POE” check box is highlighted in the example below.



The screenshot shows the SMC Electro-Pneumatic Ethernet Regulator - EtherNet/IP configuration interface. On the left sidebar, the 'Network' menu item is circled. The main content area is titled 'Network Configuration' and includes sections for 'Stack network settings' (Device Name, IP Address: 192.168.1.30, Netmask: 255.255.255.0, Gateway: 0.0.0.0), 'Application network settings' (DNS Server: 0.0.0.0), and 'Power Over Ethernet'. The 'Enable POE' checkbox is checked and circled. A callout box points to this checkbox with the text: 'Check to enable POE. Clear to disable POE. This indicates POE Enabled.' Below this, the 'Hold on Connection Loss' section has an 'Enable Hold' checkbox. At the bottom, the 'submit' button is circled, and a callout box points to it with the text: 'When a change is made, press Submit then power cycle ITV.'

Figure 17 ITV in POE Mode

To change the POE state of an ITV, press “**Submit**” or the keyboard **Enter** key and then power cycle the ITV.

**NOTE: A power cycle will temporarily disrupt control of the ITV. It will disrupt the ITV’s control of air pressure / vacuum to the devices it regulates and it will temporarily disrupt communication and control of devices downstream of the power cycled ITV.**

Once the ITV has powered up, the “**Bus Out**” connection will be changed to the POE state indicated by the “Enable POE” checkbox: **enabled – 24 VDC on** (checked) or **disabled – 24 VDC off** (unchecked).

If POE is set during IP configuration, it is recommended that a mark be made on the ITV to indicate POE has been enabled. This will allow future verification of the ITV’s POE state for proper cable connections.

### **Warning**

When changing the POE state of an ITV, it is necessary to **POWER CYCLE** the ITV for the change to take effect. Changing the POE configuration **MUST** be done when the ITV can be **SAFELY POWER CYCLED**.

**NEVER** perform this action when equipment controlled by the ITV is in use. The power cycle will temporarily **DISRUPT THE AIR SUPPLY** to the equipment being controlled. Additionally, power cycling an ITV will temporarily interrupt Ethernet communication and control of other devices and/or equipment downstream of the ITV. This could result in abnormal operation of the downstream devices and/or equipment.

**ALL** equipment which may be affected by a power cycle **MUST** be in a safe state **BEFORE** the power cycle is started. The user **MUST** verify the safety of the system **BEFORE** power cycling any ITV.

**Failure to safely execute the power cycle could result in abnormal equipment operation. Abnormal equipment operation could result in injury or death.**

## 10.2. Connecting ITVs for a POE Group

The cable connections are critical for proper operation of POE. The following is an example of proper POE cable connections.

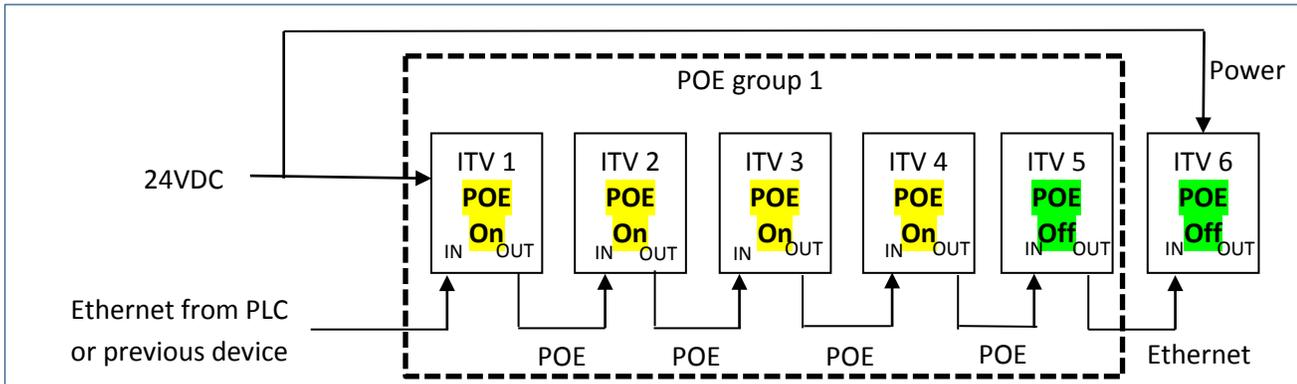


Figure 18 - ITV POE Group Ethernet Connections

The diagram illustrates the Ethernet communication and 24 VDC power cable connections required to support 6 ITVs when Power Over Ethernet (POE) is in use. The ITVs in the dashed box form a single POE group. Note that POE supports a *maximum* of five (5) ITVs in one POE group.

The following rules **MUST** be followed for proper operation of POE:

- (1) Ethernet cable from the PLC or other device (source) must be connected to the “**Bus In**” on the first ITV in a POE group.
- (2) Ethernet cable between the ITV’s within the POE group must be connected between the “**Bus Out**” port of the **upstream** ITV and the “**Bus In**” port of the **downstream** ITV for **ALL** ITVs.

### **Caution**

**NEVER** connect “**Bus Out**” of an ITV which has POE Enabled to **ANYTHING** other than “**Bus In**” of another ITV. “**Bus Out**” of a POE Enabled ITV provides a 24 VDC power source for the next ITV. Failure to follow this precaution can result in injury or equipment damage.

- (3) A maximum of 5 ITV’s are allowed in each POE group.
- (4) The “**Bus Out**” port on the last ITV (**POE disabled**) in the group may be connected as the **communication source** to a downstream device.
- (5) The first ITV within a POE group **must** have a power connection to a 24 VDC power supply. The first ITV is the **ONLY** ITV in the group with a connection to the 24 VDC power supply.
- (6) Every ITV in the group (**EXCEPT THE FINAL ITV**) **MUST** have POE **ENABLED**. The **FINAL** ITV **MUST** have POE **DISABLED**. (see [Configuring POE \(Section 10.1\)](#))

### **Caution**

POE for the FINAL ITV in a POE group **must be** disabled for proper operation.

- (7) A power supply connection is **required** for the first ITV following a POE group.
- (8) Multiple POE groups can be used and the number of ITV’s in each POE group can vary as necessary (maximum of 5 ITVs per group).

## Warning

■ **NEVER** enable POE unless you understand the discussion above and have **verified** the ITVs are connected properly as indicated in the drawing. Injury or equipment damage can occur if POE is enabled and the ITVs are not connected properly.

■ Changing the POE state requires the ITV to be power cycled.

■ **During a power cycle, it is not possible to control the ITV.** This loss of control will disrupt the air pressure or vacuum regulated by the ITV. This loss of control could result in abnormal behavior of the equipment controlled by the ITV. **This abnormal behavior could cause injury or death.**

■ **During an ITV power cycle, downstream communication will be lost with other ITVs or other devices.** This loss of communication could result in abnormal behavior of the equipment controlled by those devices. **This abnormal behavior could cause injury or death.**

■ *Disabling POE on an ITV disconnects 24 VDC electrical power from the “Bus Out” connection. Any remaining ITV’s within the POE group will not operate. Unpowered ITVs cannot regulate equipment and cannot be controlled. This could cause abnormal equipment behavior resulting in injury or death.*

■ Always **DISABLE** POE on the final ITV of a POE Group.

- Failure to disable POE on the final ITV will result in 24 VDC power on the “Bus Out” port.
- If “Bus Out” of a POE enabled ITV is connected to a downstream device (other than “Bus In” of another, unpowered, ITV), abnormal behavior, device damage, equipment damage or **possible injury or death could occur.**

■ Only change POE state and power cycle an ITV when the ITV and **ALL** downstream devices are in a **VERIFIED SAFE STATE**. Loss of air pressure/vacuum, communication, power, and/or control of the ITV and downstream devices can pose risk of injury or damage.

## 11. LED Indication and Settings

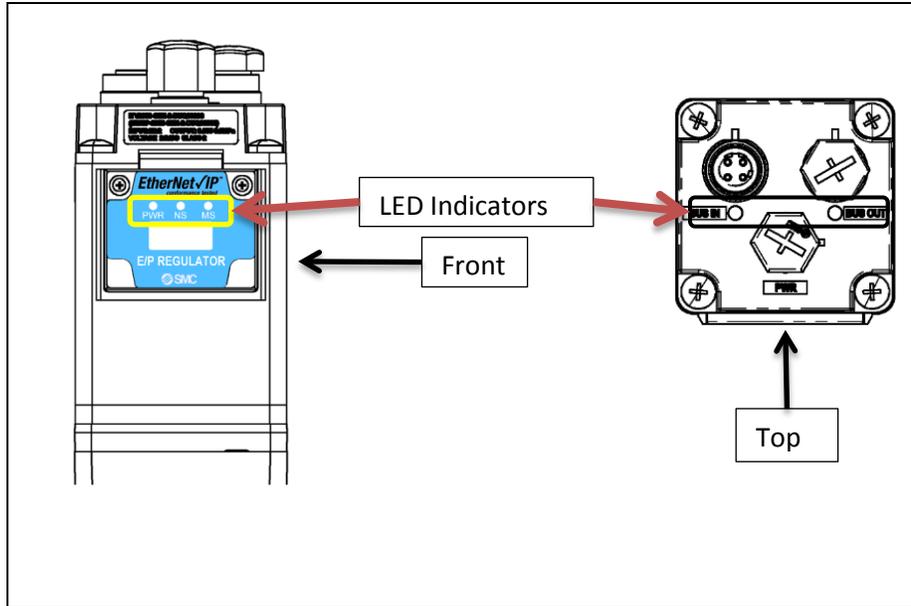


Figure 19 - ITV LED Placement

Front LED Indicators



PWR NS MS

LED	LED Status	Description
PWR	 Green ON	Load voltage for the ITV is supplied.
	 OFF	Load voltage for the ITV is not supplied or is outside the tolerance range (24 VDC $\pm$ 10%)
NS	 OFF	The ITV operating voltage is not supplied or the ITV is in DHCP mode with <b>NO</b> valid IP address set.
	 Green ON	Communication established.
	 Green flashing	Idle link.
	 Red flashing	Communication time out.
	 Red ON	IP address duplicated.
MS	 OFF	The ITV operating voltage is not supplied.
	 Green ON	Operating normally – communication in progress.
	 Green flashing	Operating normally – idle link.
	 Red flashing	Recoverable error – Possible low voltage.
	 Red ON	Unrecoverable error.

Figure 20 - ITV Front LED Indicator Status Key

Top LED Indicators



BUS IN BUS OUT

LED		LED Status	Description
Bus In / Bus Out		Off	Load voltage not supplied, terminal is not connected to another operating device, or terminal failed
Bus In / Bus Out		Green ON	Terminal is connected to another operating device
Bus In / Bus Out		Yellow Flashing	Intermittently blink yellow - data transfer in progress

**Figure 21 - ITV Top Bus Connection LED Indicator Status Key**

See [Troubleshooting \(Section 17\)](#) for information on dealing with problems indicated by these status LEDs.

## 12. Web Pages Accessible Without Login

Using a browser, the user can view various ITV settings.

### 12.1. System Page

Enter the IP address of the ITV into your internet browser as shown below.

The “System Information” page will open.

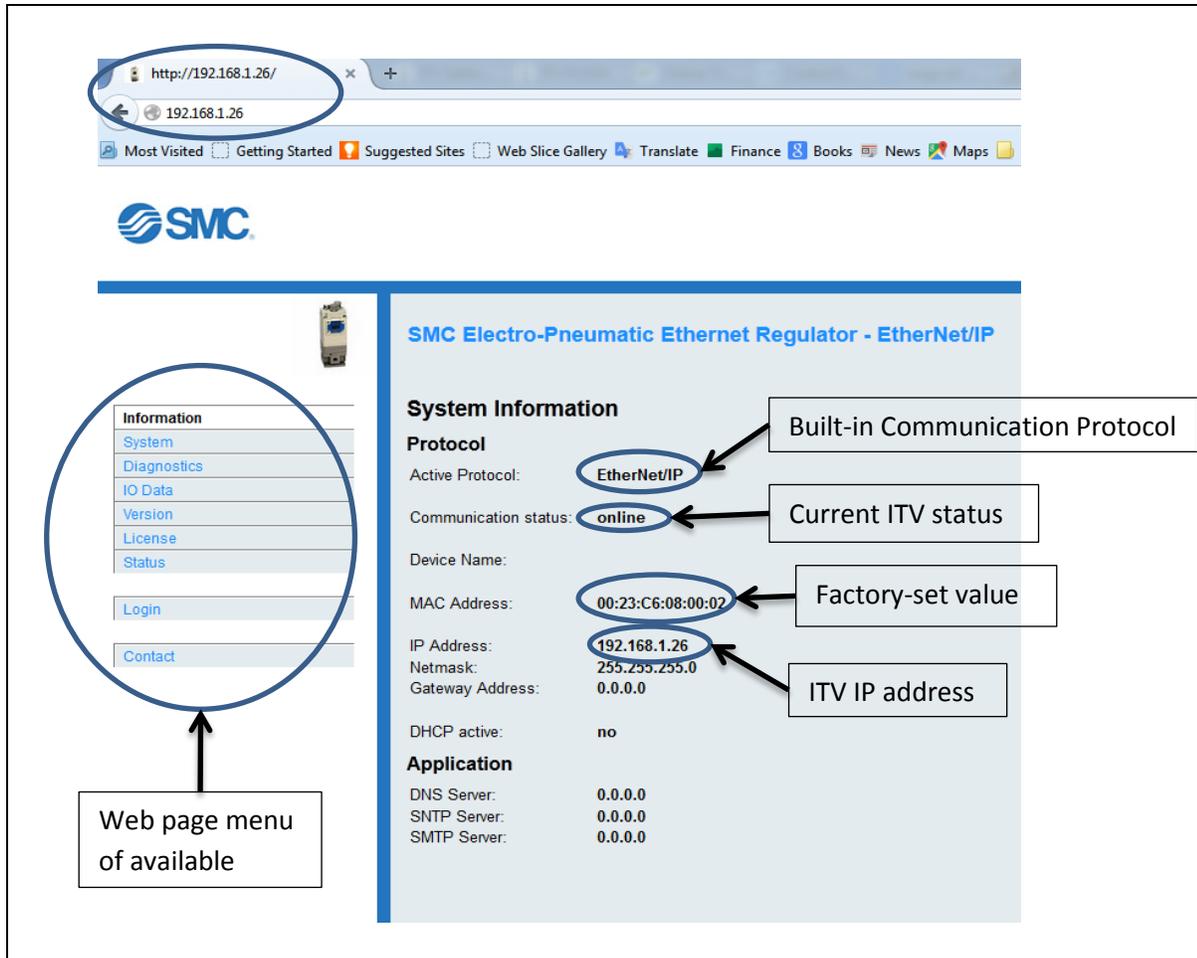


Figure 22 - ITV System Information web page

This page displays the current ITV communication settings.

Some of these settings can be changed by logging into the ITV. See the instructions on the [Network Page \(Section 13.2\)](#).

## 12.2. Diagnostics Page

Press “Diagnostics” to view the communication and connection status of the ITV.

This page provides an overview of the current communication status of the ITV and is helpful in analyzing network and communication issues.

The screenshot displays the SMC Electro-Pneumatic Ethernet Regulator - EtherNet/IP Diagnostics web page. The left sidebar contains navigation options: Information, Diagnostics (highlighted), I/O Data, Version, License, Status, Login, and Contact. The main content area is titled "Diagnostic Information" and is divided into several sections:

- Ethernet Port 1:** Inactive, Unknown Mbps, Unknown Duplex, Autonegotiation in progress.
- Ethernet Port 2:** Active, 100 Mbps, Full Duplex, Successfully negotiated speed and duplex.
- Ring Status:** Linear. Network Topology: Normal. Network Status: Normal. Ring Supervisor - MAC Address: 00:00:00:00:00:00. Ring Supervisor - IP Address: 0.0.0.0.
- ACD Status:** No conflict active. Last Conflict - Status: Last conflict detected in state INITIAL\_PROBING. Last Conflict - Remote MAC Address: 00:23:C6:08:04:E0.
- CIP Connection Statistics:** Active Explicit Msg Connections: 0, Explicit Msg Connections Supported: 20, Total Explicit Msg Connections Observed: 0, Active I/O Connections: 0, I/O Connections Supported: 10, Total I/O Connections Observed: 0, Conn Open Requests: 0, Open Request Errors: 0, Conn Close Requests: 0, Close Request Errors: 0, Conn Timeouts: 0.
- TCP Connection Statistics:** Active TCP Connections: 0, TCP Connections Supported: 10, Total TCP Connections Observed: 0.
- CIP Explicit Messaging Statistics:** Connected Messages Sent: 0, Connected Messages Received: 0, Unconnected Messages Sent: 0, Unconnected Messages Received: 0.
- CIP I/O Messaging Statistics:** Sent: 0, Received: 0, Inhibited: 0, Rejected: 0, Missed: 0, Total: 0. I/O Packet Capacity: 500, Theoretical reserve I/O Capacity: 500, Actual reserve I/O Capacity: 500.
- Exceptions:** (Section header with no data listed).

A callout box with an arrow pointing to the Ethernet Port 1 status contains the text: "Bus In NOT in use" and "Bus Out IN use".

Figure 23 - ITV Diagnostic Information web page

If you are experiencing communication problems, SMC support personnel may need information from this page to help resolve the problems.

### 12.3. IO Data Page

Press “IO Data” to view the pressure setpoint sent to the ITV, current ITV pressure and status information sent from the ITV to the master device (usually a PLC).

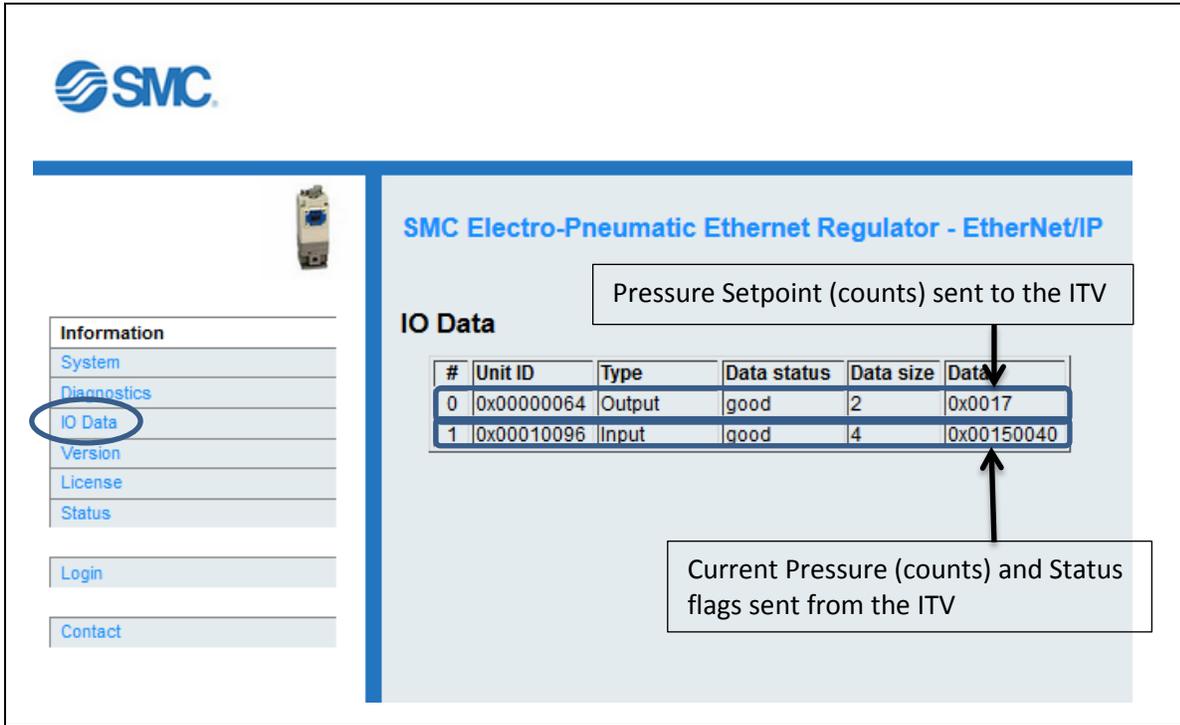


Figure 24 - ITV IO Data web page

The Data Status column indicates if data has been communicated on the bus after power up. “Bad” indicates that the data **has not** been written; “Good” indicates the data **has** been written.

**Row 0** is the most recent setpoint sent to the ITV. The requested pressure or vacuum setpoint value is in counts (here  $0x0017 = 23$ ).

**Row 1** is the current ITV pressure value and status flags sent from the ITV. The current pressure value is in counts (here  $0x0015 = 21$ ). The status flags indicate current ITV status (here  $0x0040$ ).

Counts are discussed in [Counts and Pressure Units \(Section 14\)](#) and status flags are discussed in [Status Flags \(Section 12.3.1\)](#).

### 12.3.1. Status Flags

**Status Flags** is a 16 bit value with 1 bit per status condition. If the bit is set (1) the condition is currently in effect. If the bit is clear (0), the condition is not in effect. (**Bits are numbered from right to left**).

Bit Order:  
Most Significant Bit . . . Least Significant Bit  
15 . . . 0

- bit 0 future use
- bit 1 future use
- bit 2 Pressure error – indicates pressure more than 20% outside 0 – 4095 count window
- bit 3 future use
- bit 4 future use
- bit 5 future use
- bit 6 always set to 1 – future use
- bit 7 future use
- bit 8 future use
- bit 9 future use
- bit 10 future use
- bit 11 future use
- bit 12 future use
- bit 13 future use
- bit 14 future use
- bit 15 future use

### 12.4. Version Page

Press "Version" to see the versions of the firmware of the ITV.

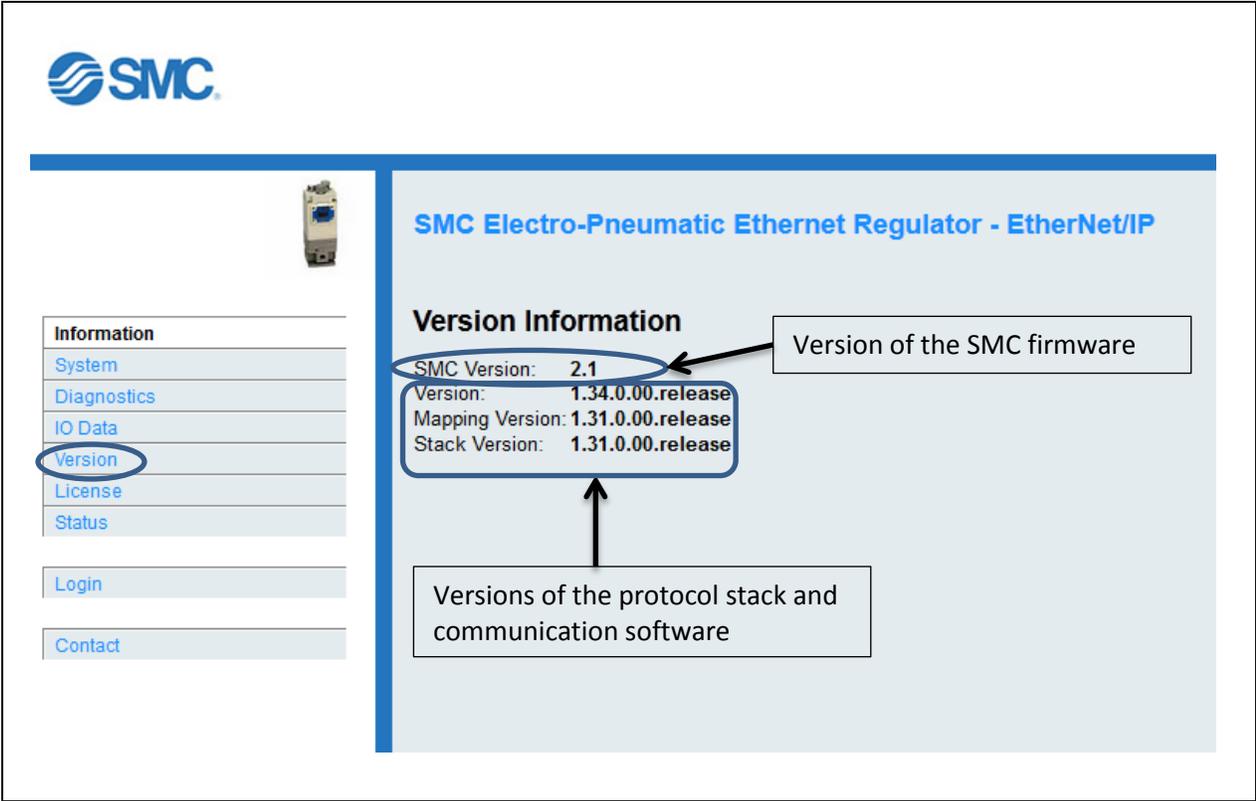


Figure 25 - ITV Version web page

Please make note of this information if contacting SMC for technical support.

## 12.5. ITV Status Page

Press “Status” to see the current ITV pressure or vacuum value, pressure units, and status of LEDs.

Note: The “ITV Status” page displays the current ITV pressure or vacuum value based on the indicated pressure units. The page automatically translates count values into the current pressure displayed.

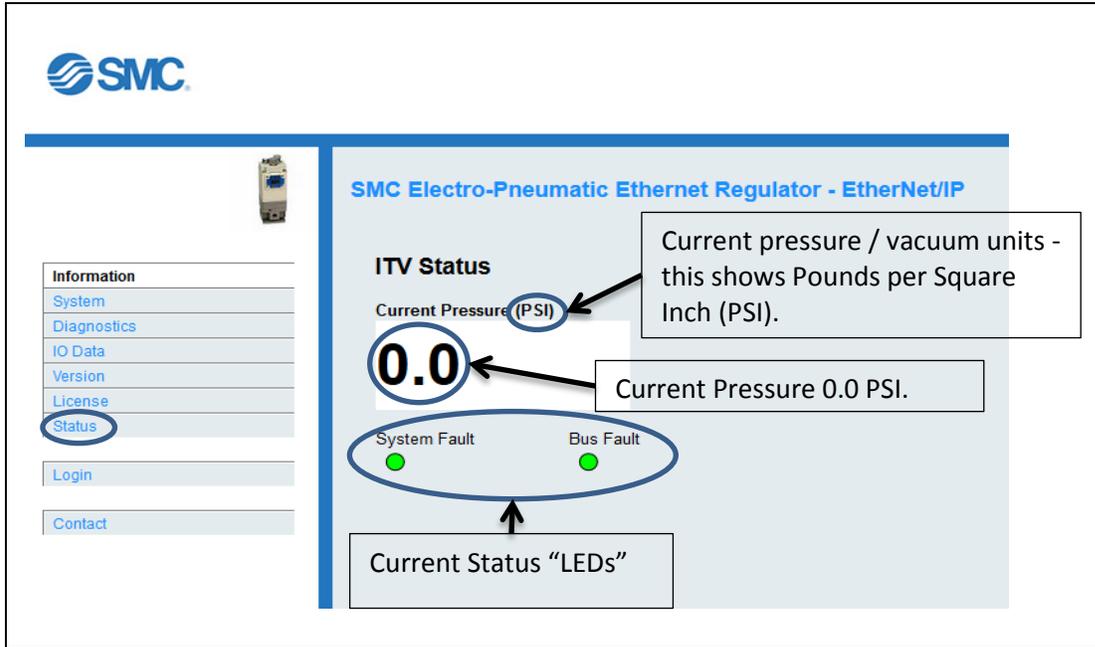


Figure 26 - ITV Status web page

Note: the LEDs **MAY NOT** reflect the actual current state of the ITV. There is a potential delay between the occurrence of an event (alarm condition or status) and the screen refresh rate. Also, if for any reason communication between the ITV and the web browser is disrupted, the display will indicate the last state of the ITV **BEFORE** communication was lost. The LEDs on the front of the ITV **DO** reflect the current state of the ITV (see [LED Indication and Settings \(Section 11\)](#)).

## 12.6. Login Page

Press “Login” and enter “user” as both the Username and the Password.

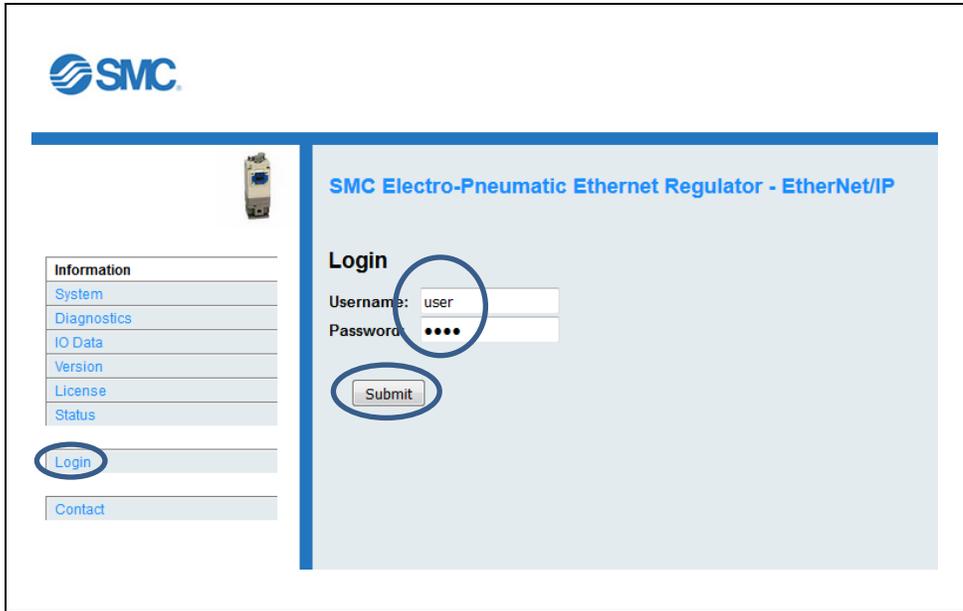


Figure 27 - ITV User Login

Login with user privileges allows the user to control the ITV.

This is a successful User login. Note that the Configuration web pages are now accessible.

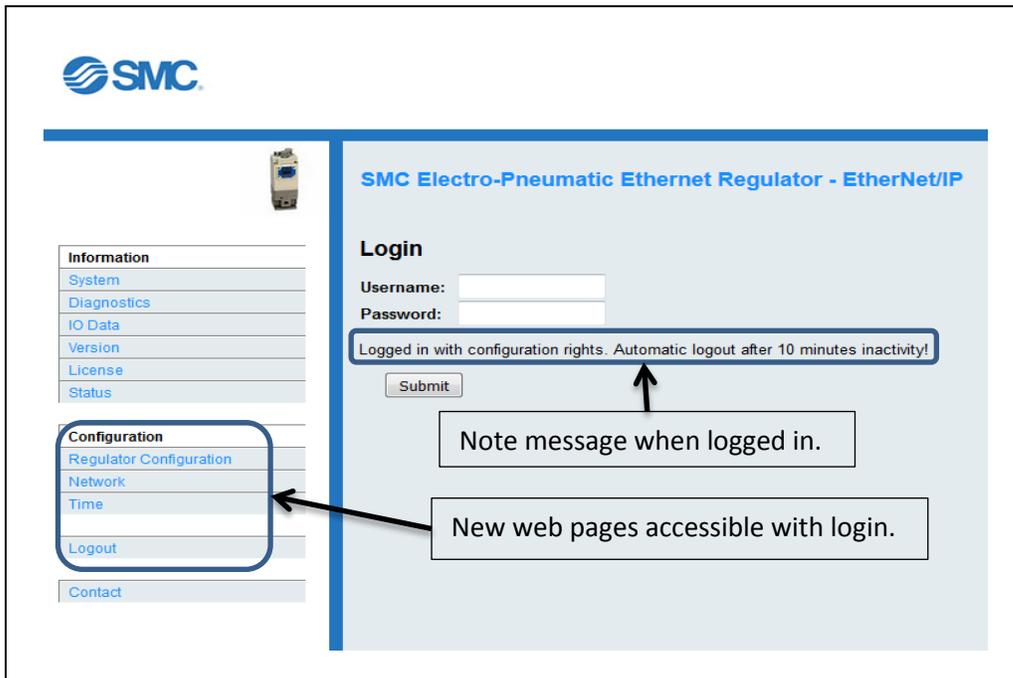


Figure 28 - ITV - Successful User Login

## 12.7. Contact Page

Press “Contact” to find the telephone numbers and email addresses for SMC Product Sales and Technical Support.

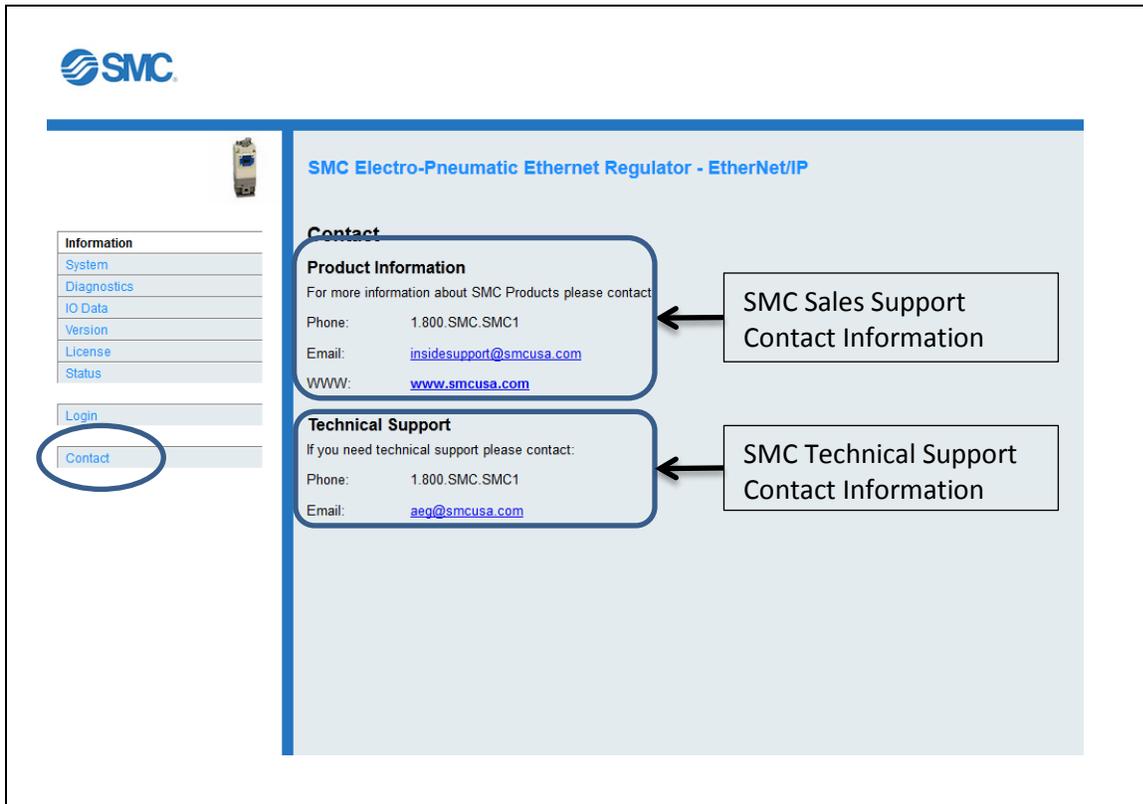


Figure 29 - ITV Support Contact Information Page

The “**Product Information**” contacts will connect you to the SMC sales team. Sales can help you order accessories for your ITV and other SMC products to support your application. Sales can also help you obtain documentation for your ITV.

The “**Technical Support**” contacts will connect you to the SMC technical support team. Tech support can help you resolve technical questions or problems with the operation and use of your ITV. Tech support can also help you deal with questions related to the initial setup of your ITV. (Also see [Web Page Access \(Section 9\)](#) for initial setup instructions.)

If you need to contact SMC, the contact information above is:

Sales Support:

Phone: 1-800-SMC-SMC1 (1-800-762-7621)  
Email: [insidesupport@smcusa.com](mailto:insidesupport@smcusa.com)  
Webpage: [www.smcusa.com](http://www.smcusa.com)

Technical Support:

Phone: 1-800-SMC-SMC1 (1-800-762-7621)  
Email: [aeg@smcusa.com](mailto:aeg@smcusa.com)

### 13. Web Pages Requiring Login

The following web pages are only accessible after a user has logged into the ITV. Upon logout, these pages will no longer be accessible.

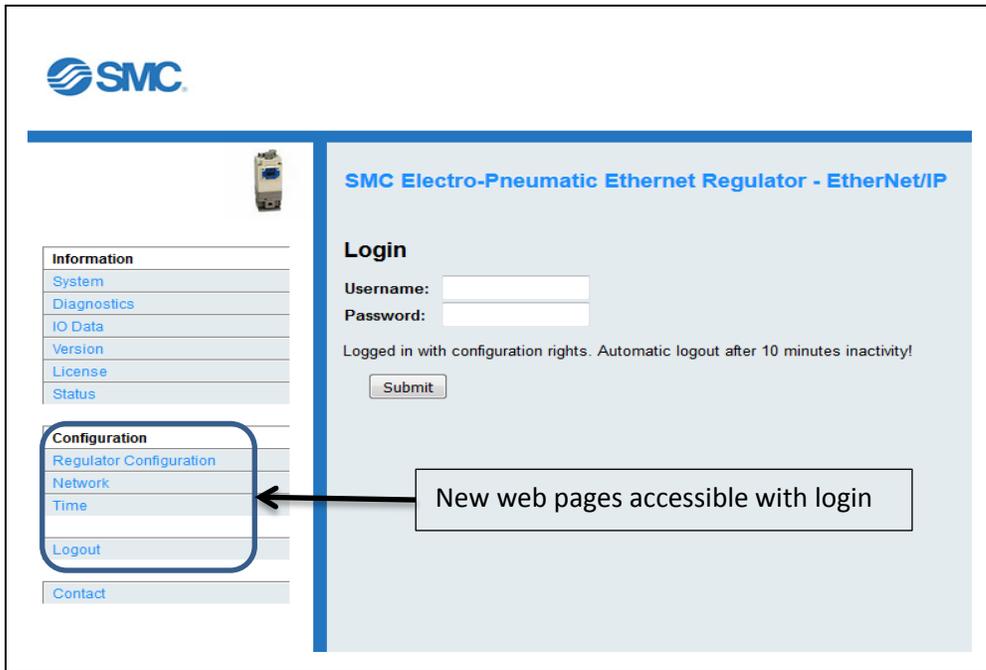


Figure 30 - Accessible Web Pages After Login

### 13.1. Regulator Configuration Page

Below is a view of the “Regulator Configuration” page.

The top of the page (“ITV Status” window) displays the current ITV pressure value and LED status indicators (the same as the [ITV Status Page \(Section 12.5\)](#)).

The bottom of the page (“ITV Configuration” window) allows the user to Override PLC Control, change pressure, change pressure units, and swap data bytes.

When the web page is initially launched, the set pressure value will match the current pressure value.

Note: The page automatically translates count values into the current pressure displayed.

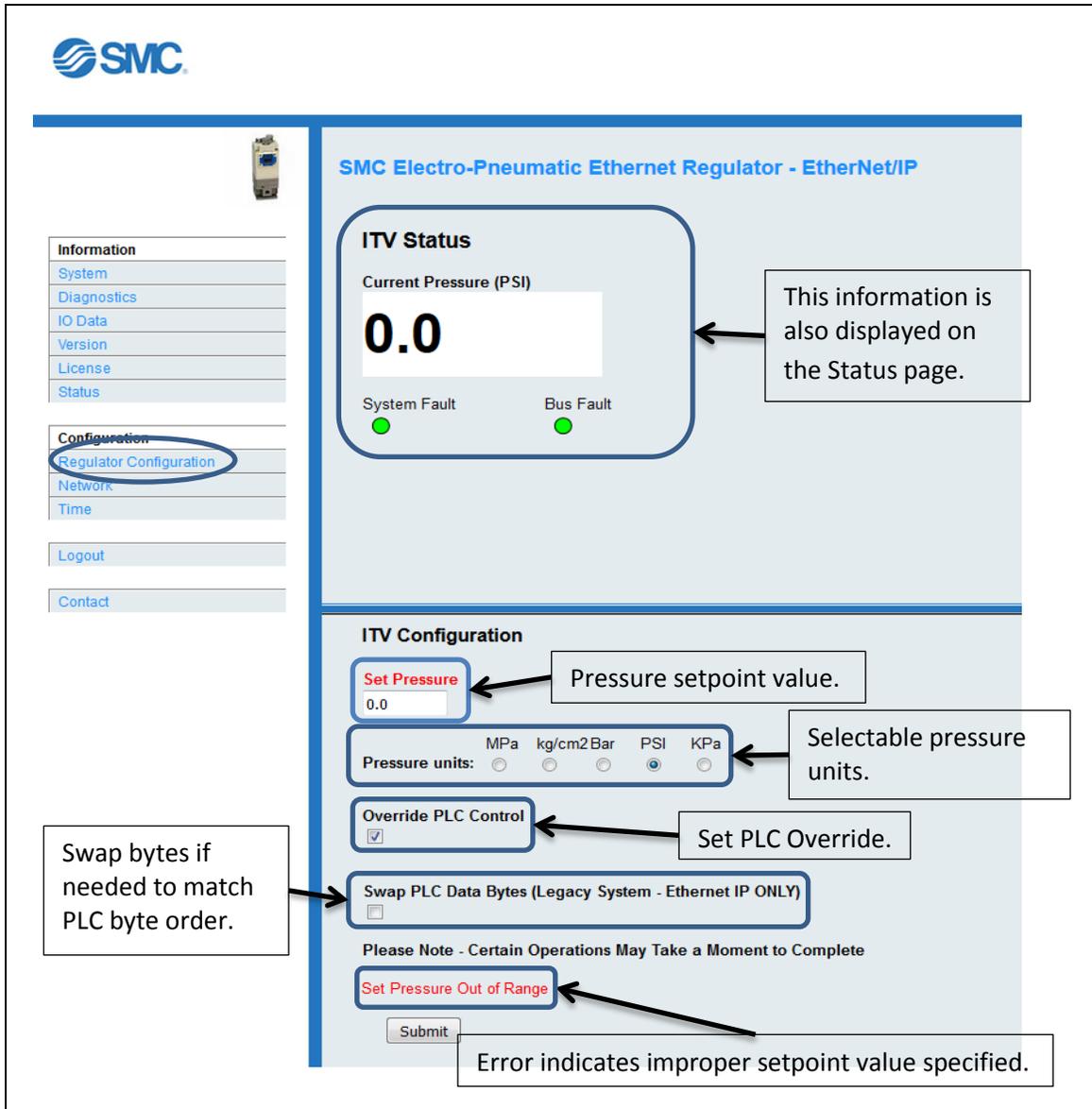


Figure 31 - ITV Regulator Configuration Page

The “ITV Configuration” window has the following user selectable controls:

1. **Override PLC Control:** This is a checkbox. If the checkbox is **OFF** (unchecked), the ITV is controlled externally (typically from a PLC). When the ITV is externally controlled, the user cannot set the ITV pressure or change the pressure units from the web page.

When the Override PLC Control checkbox is changed, press “**Submit**” or the keyboard **Enter** key for the change to take effect.

Changing ITV control from the master to the web page (checking the Override PLC Control checkbox) gives the user control of the ITV. There is **no pressure change** until the user enters a pressure setpoint in the Set Pressure window.

Changing ITV control from the web page to the master (clearing the Override PLC Control checkbox) gives the master device control of the ITV. There may be an **immediate pressure change** to the pressure setpoint sent from the master device.

**Note: Be sure that ITV controlled equipment is in a SAFE STATE when you change Override PLC Control. There may be an IMMEDIATE change in regulated pressure when control is returned to the master device. This pressure change may cause IMMEDIATE AND UNEXPECTED changes in the behavior of controlled equipment.**

**Note: Override PLC Control will remain in the same state when you exit this page.**

2. **Pressure Units:** This is a set of radio buttons indicating the current pressure unit. When Override PLC is set, the user can change the pressure unit.

When Pressure Units is changed, press “**Submit**” or the keyboard **Enter** key for the change to take effect.

The pressure value displayed in the “ITV Status” window and in the “Set Pressure” box will change to match the new Pressure Unit selection. **No pressure change will occur.**

3. **Set Pressure:** This is a data entry box in the ITV “Configuration” window. When Override PLC Control is set, the user can enter any legitimate setpoint value.

When the value of Set Pressure is changed, press “**Submit**” or the keyboard **Enter** key for the change to take effect.

If the setpoint value entered is legitimate, the ITV will regulate to this new pressure or vacuum value. The pressure displayed in the “ITV Status” window will change to the new value.

If the value is out of range, the ITV pressure will not change. The setpoint will change back to the previous value and the “Current Pressure” value will not change. The title of “**Set Pressure**” will be displayed in **RED**, and the error message “**Set Pressure Out of Range**” will also be displayed in **RED** immediately above the Submit button. [Figure 31 - ITV Regulator Configuration Page](#) shows an example.

Note: To change **BOTH pressure units AND the setpoint value**, pressure units **MUST** be changed first.

4. **Swap PLC Data Bytes:** This is a checkbox. When the checkbox is **OFF** (unchecked), the ITV does **not swap** bytes for data received from or sent to the master. When the checkbox is **ON** (checked), the ITV **swaps** the high and low bytes of data received from or sent to the master.

For example, if the value sent is 0x0278, the **unswapped** form of the value is 0x0278. The **swapped** form is 0x7802.

**Note: Changing the Swap PLC Data Bytes checkbox can change the setpoint used to regulate pressure by the ITV. The setpoint change can cause IMMEDIATE AND UNEXPECTED changes in the behavior of controlled equipment. Be sure that all**

**equipment regulated by the ITV is in a safe state and that all personnel are clear of that equipment before changing Swap PLC Data Bytes.**

Swap PLC Data Bytes does **NOT** affect the handling of status flags sent from the ITV to the master.

**It is NOT necessary to set Override PLC Control to change the state of Swap PLC Data Bytes.**

When the Swap PLC Data Bytes checkbox is changed, press “**Submit**” or the keyboard **Enter** key for the change to take effect. **Note: Swap PLC Data Bytes will remain in the same state when you exit this page and when you cycle power on the ITV.**

If the ITV “Current Pressure” does not match the pressure sent from the master device, verify that “Swap PLC Data Bytes” is set properly for the master device in use.

## **Warning**

***BEFORE*** changing the pressure used by the ITV, verify that all equipment affected is in a **safe state**. Be **sure** that **ALL PERSONNEL** are clear of **ALL EQUIPMENT** that may be affected by the pressure change. ***Unexpected changes in equipment motion or behavior can result in injury or death.***

When Override PLC is enabled (checked), entering a valid value into the “Set Pressure” field and pressing “**Submit**” or the keyboard **Enter** key will cause the ITV to change pressure. This will result in an **IMMEDIATE CHANGE** in regulated pressure. This change may cause an **immediate unexpected change in the behavior of equipment controlled by the ITV. This change could cause injury or death.**

When Override PLC is changed to the disabled state (cleared), control will return to the master device (typically a PLC). The current pressure will change to the setpoint value sent by the master device. This will result in an **IMMEDIATE CHANGE** in regulated pressure. This change may cause an **immediate unexpected change in the behavior of equipment controlled by the ITV. This change could cause injury or death.**

Changing the Swap PLC Data Bytes checkbox can immediately change the ITV regulated pressure. Be **sure** that **ALL PERSONNEL** are clear of **ALL EQUIPMENT** that may be affected by this pressure change. ***Unexpected changes in equipment motion or behavior can result in injury or death.***

## 13.2. Network Page

Press “Network” to view or change various network and operating parameters.

The screenshot shows the SMC Electro-Pneumatic Ethernet Regulator - EtherNet/IP configuration page. The left sidebar contains navigation links: Information (System, Diagnostics, IO Data, Version, License, Status), Configuration (Regulator Configuration, Network, Time), Logout, and Contact. The main content area is titled "SMC Electro-Pneumatic Ethernet Regulator - EtherNet/IP" and is divided into four sections:

- Stack network settings:** Includes fields for Device Name (optional), IP Address (192.168.1.26), Netmask (255.255.255.0), and Gateway (0.0.0.0). A checkbox for "Use DHCP" is present.
- Application network settings:** Includes a field for DNS Server (0.0.0.0).
- Power Over Ethernet:** Includes a checkbox for "Enable POE".
- Hold on Connection Loss:** Includes a checkbox for "Enable Hold".

Callout boxes provide additional information:

- Optional: Alphanumeric ITV name. Not used by Ethernet communication protocol.
- ITV IP address.
- Change with caution.
- If checked, “Bus Out” provides 24 VDC.
- If checked and Ethernet connection is lost, ITV maintains regulated pressure.

A "submit" button is located at the bottom of the configuration area.

Figure 32 - Network Configuration

The following sections describe the items that can be changed on the “Network Configuration” page. Multiple items can be changed at a time. When one or more items is modified, press “**Submit**” or the keyboard **Enter** key for the change to take effect.

Note for some changes to take effect, an ITV power cycle is required. **A power cycle will result in temporary loss of ITV control. A power cycle will also result in temporary loss of communication to all downstream devices connected to the ITV. This may result in a loss of the regulated air pressure or vacuum control and could result in unexpected dangerous behavior of controlled devices.**

### 13.2.1. Device Name

Device Name is optional. It may be left blank since it is not used by the Ethernet/IP™ protocol.

When Device Name is changed, press “**Submit**” or the keyboard **Enter** key and then power cycle the ITV to set the name. (Note: Pressure or vacuum control will be interrupted during a power cycle.)

### 13.2.2. IP Address

IP Address is used to communicate with the ITV. It **MUST** be unique on a network or subnet.

Note: Use the **SAME** Subnet for **ALL** ITVs for proper communication.

If you change the IP address, it is **STRONGLY RECOMMENDED** that you record the new IP address **before** you press “**Submit**” or the keyboard **Enter** key.

A new IP Address will take effect in the ITV **immediately** when you press “**Submit**” or the keyboard **Enter** key. Control of the ITV and communication between the ITV and the PC (or master device) will be lost. To reconnect the PC to the ITV web page, see [Web Page Access \(Section 9\)](#). The ITV IP address used in the master device (typically a PLC) must match the new ITV IP address.

### 13.2.3. Netmask

It is recommended that Netmask be left at the default value (255.255.255.0). Improperly configuring the Netmask can cause problems communicating with the ITV. The capability to communicate with the ITV may be lost. The ITV will need to be returned to SMC for repair.

### 13.2.4. Gateway Server

If the ITV is not connected to a Gateway Server, the Gateway Server should be left as 0.0.0.0. If another address is specified, the ITV will attempt to use the indicated Gateway Server to manage network communication. If no Gateway Server is present at the specified address, the capability to communicate with the ITV may be lost. The ITV will need to be returned to SMC for repair.

### 13.2.5. Use DHCP

Note: Use of DHCP (Dynamic Host Configuration Protocol) is not necessary since the initial IP address is statically set by the factory. The IP address can be changed to match the specific application network requirements. See [Initial Power-up \(Section 9.1\)](#).

When the Use DHCP checkbox is **OFF** (unchecked), the ITV is **NOT** in DHCP mode. The ITV will be in Static IP Address mode and the IP address of the ITV is the address programmed in the ITV (see [IP Address \(Section 13.2.2\)](#)).

When the Use DHCP checkbox is **ON** (checked), the ITV **is** in DHCP mode. **The ITV will have NO IP Address until a DHCP server sets the ITV IP address. An ITV with no IP address cannot be communicated with or controlled by either the master or the ITV webpage.**

When the Use DHCP checkbox is changed, press “**Submit**” or the keyboard **Enter** key to set the DHCP state. Note: When checking the Use DHCP checkbox (turning DHCP on), the web page will no longer be connected to the ITV. Also, the ITV may require a power cycle before the DHCP server will assign the ITV an IP address. (Note: Pressure or vacuum control will be interrupted during a power cycle.)

**Note: The DHCP checkbox setting is preserved across power cycles. In DHCP mode (checkbox is checked), the ITV IP address is NOT preserved across power cycles.**

If an ITV in DHCP mode needs to be changed to static IP Address mode, perform the following steps:

1. If the ITV has no IP address, use a DHCP server to assign an IP address. **Record the IP address.** Note the DHCP server **may** permit you to change the ITV from DHCP mode to static IP address mode.
2. Use the assigned IP address (from Step 1) and follow the instructions in [Web Page Access \(Section 9\)](#) and this subsection to turn DHCP mode OFF (uncheck the Use DHCP checkbox).

## Warning

Exercise care when activating DHCP mode. Enabling DHCP mode removes the IP address from the ITV. **The ITV cannot be controlled or communicated to until a DHCP server has assigned an IP address to the ITV. This loss of communication and control will result in the ITV holding its current pressure.**

### 13.2.6. DNS Server

If the ITV is not connected to a DNS (Domain Name System) Server, the DNS Server should be left as 0.0.0.0. If another address is specified, the ITV will attempt to use the indicated DNS Server to

manage network communication. If no DNS Server is present at the specified address, the capability to communicate with the ITV may be lost. The ITV will need to be returned to SMC for repair.

### 13.2.7. Enable POE

The “**Enable POE**” checkbox is used to control Power Over Ethernet. When the checkbox is **ON** (checked), POE is enabled. When the checkbox is **OFF** (unchecked), POE is disabled.

Follow the instructions in [Power Over Ethernet \(POE\) \(Section 10\)](#). If the instructions are not properly followed, changing the state of POE may result in undesired performance, abnormal equipment operation, or product damage.

When the POE checkbox is changed, press “**Submit**” or the keyboard **Enter** key, then power cycle the ITV to set the POE state. (Note: Pressure or vacuum control will be interrupted during a power cycle.)

### 13.2.8. Hold on Connection Loss

The “**Enable Hold**” checkbox is used to control ITV behavior in the event Ethernet communication is lost.

If Ethernet communication is lost with “**Enable Hold**” **ON** (checked) and the ITV is powered, the ITV will continue to regulate to the pressure setpoint.

If Ethernet communication is lost with “**Enable Hold**” **OFF** (unchecked) and the ITV is powered, the ITV will set the pressure setpoint to 0, the output pressure will be immediately exhausted, and the pressure will quickly drop to 0.

If **power is lost**, the ITV will stop regulating to the setpoint.

To change the state of “**Hold on Connection Loss**”, change the “**Enable Hold**” checkbox, press “**Submit**” or the keyboard **Enter** key and then power cycle the ITV. (Note: Pressure or vacuum control will be interrupted during a power cycle.)

## Warning

***Several setting changes in this section require an ITV power cycle. Only power cycle an ITV when all devices and equipment controlled by the ITV and all devices receiving communication through the ITV are in a verified safe state. Verify that all personnel are clear of all equipment which may be affected by power cycling an ITV.***

When an ITV is power cycled, communication to and control of the ITV is lost. When an ITV is power cycled, communication to and control of **ALL** devices downstream of the ITV is lost. Air pressure or vacuum regulation by the ITV is lost during a Power Cycle.

Loss of communication to and control of the ITV or downstream devices or loss of ITV air pressure or vacuum regulation could cause an **immediate unexpected change in the behavior of equipment controlled by the ITV or the downstream devices. This change could cause injury or death.**

### 13.3. Time Page

Press “Time” to set date and time.

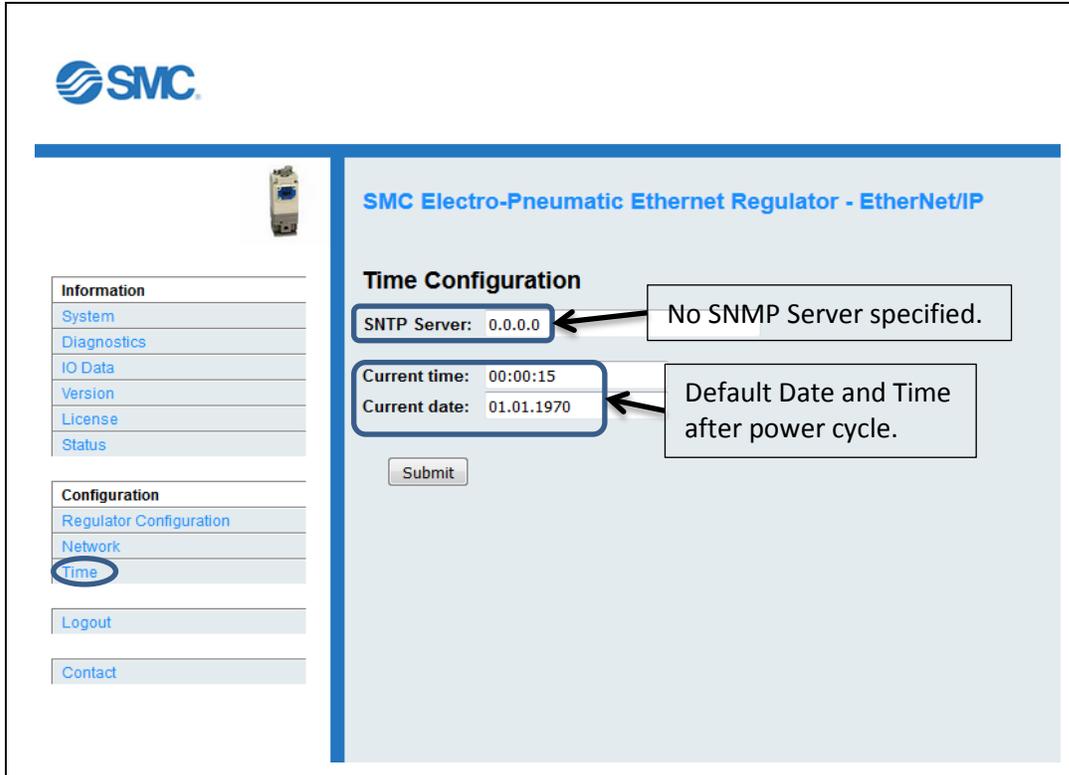


Figure 33 - ITV Time Page

Connection to a SNTP (Simple Network Time Protocol) Server is optional. The SNTP Server can communicate the date and time over the Ethernet connection to the ITV.

Setting the date and time is **not** required for normal ITV operation. If the date or time is changed, press “**Submit**” or the keyboard **Enter** key for the change to take effect.

Current time is entered as **hh:mm:ss** in 24-hour format. (To enter 8:30:25 PM, enter 20:30:25). Current date is entered as **dd.mm.yyyy**. (To enter November 23, 2015, enter 23.11.2015).

Note: the current date and time are reset each time the ITV is power cycled. The default date and time at restart are 01.01.1970 at 00:00:00 (January 1, 1970 at 12:00:00 Midnight).

### 13.4. Logout Page

Press “Logout” to log out of the Configuration web pages. Note: The ITV will **automatically** log out after 10 minutes of web page inactivity.

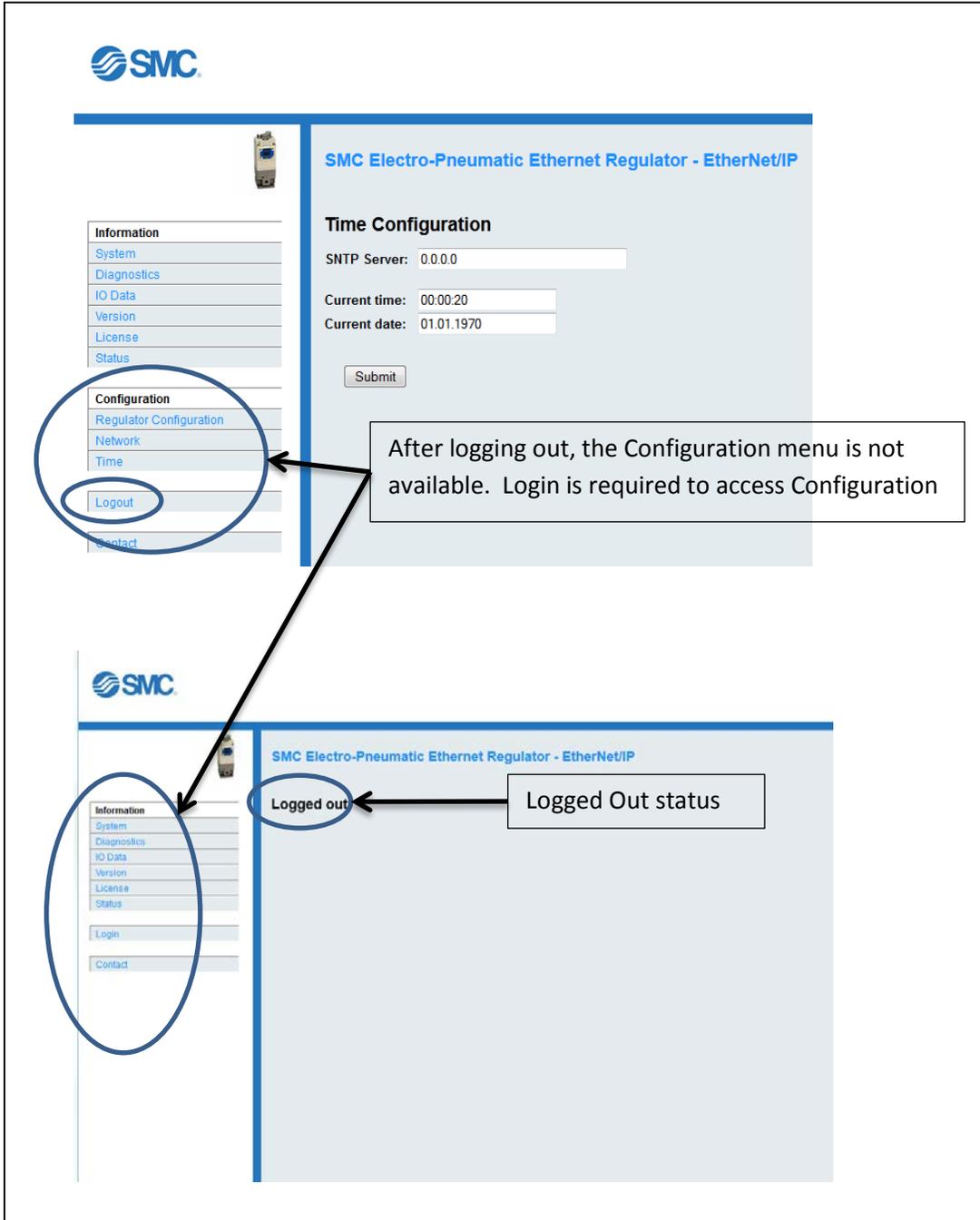


Figure 34 - ITV Logout Procedure

## 14. Counts and Pressure Units

See an introduction to the ITV **Setpoint** in [Quick Start \(Section 7\)](#).

Counts are used to control the ITV pressure. The master device must send counts to the ITV for the desired pressure. The ITV reports the current pressure value back to the master device in counts.

The count range is 0 to 4095 (12 bits). The count range is the same for all ITVs. The maximum pressure or vacuum corresponds to 4095 counts. For example, an X010 ITV body size has a pressure range from 0 to 0.1 MPa. The maximum pressure would correspond to 4095 counts.

The ITV web pages ([ITV Status Page \(Section 12.5\)](#) and [Regulator Configuration Page \(Section 13.1\)](#)) display pressure values. The pages automatically convert pressure values to counts.

### 14.1. Count Value Sent TO ITV

A 16-bit value must be sent to the ITV. The upper 4 bits must be 0. The lower 12 bits represent the count value. If a value greater than 4095 counts is sent to the ITV, the ITV will ignore the value (it is out of range) and will not change its current pressure or vacuum setpoint.

Counts sent to the ITV for a desired pressure or vacuum output must be scaled. Note: The count value sent between the master and the ITV is an integer value. **Round** the **calculated count** value to an **integer** if necessary.

The “Maximum Pressure Scaling Formula” for converting pressure to counts is:

$$\text{Counts} = \left( \frac{\text{desired pressure}}{\text{maximum pressure}} \right) \times 4095$$

The following table shows the **maximum pressure (or minimum vacuum)** values supported by the various ITV body types. These limits are determined by the hardware used to build the ITV and cannot be changed.

Pressure	MPa	kg/cm2	Bar	PSI	KPa
Body Type					
X010	0.1	1.02	1.0	14.504	100.0
X030	0.5	5.10	5.0	72.52	500.0
X050	0.9	9.18	9.0	130.536	900.0
2090 (Vacuum)	-0.08	-0.82	-0.8	-11.6032	-80.0

Figure 35 - ITV Body Type and Maximum Pressure

For example: The desired output pressure is 0.05 MPa for an X010 ITV. From the table the maximum pressure for this ITV body type is 0.1 MPa. Use the “Maximum Pressure Scaling Formula” to obtain the count value.

$$\text{Counts} = \left( \frac{0.05}{0.1} \right) \times 4095 = 2047.5 \cong 2048 = 0x0800$$

Note: Counts are passed in hexadecimal form (0x0800) between the ITV and the master.

Counts can also be determined by using the “Scale Factor Table Formula”:

$$\mathbf{Counts = desired\ pressure \times scale\ factor}$$

The following table shows the scale factors for the ITV body types and pressure units

Pressure	MPa	kg/cm2	Bar	PSI	KPa
Body Type					
X010	40950.0	4014.70	4095.0	282.33	40.95
X030	8190.0	802.94	819.0	56.46	8.19
X050	4550.0	446.07	455.0	31.37	4.55
2090 (Vacuum)	-51187.5	-4993.90	-5118.75	-352.92	-51.18

**Figure 36 - ITV Scale Factors**

For example: The desired output pressure is 10 PSI for an X030 ITV. From the table, the scale factor for this body type is 56.46. Use the “Scale Factor” formula to obtain the count value.

$$\mathbf{Counts = 10 \times 56.46 = 564.6 \cong 565 = 0x0235}$$

The calculated count value must be rounded if necessary and converted to hexadecimal.

## 14.2. Count Value Received FROM ITV

A 16-bit value is received from the ITV. The upper 4 bits are 0. The lower 12 bits represent the count value. The count value indicates the current pressure output of the ITV. The count value can be converted to pressure units using the following formulas:

“Maximum Pressure Scaling Formula” (using [Figure 35 - ITV Body Type and Maximum Pressure](#)):

$$\mathbf{Reported\ Pressure = \left( \frac{counts \times maximum\ pressure}{4095} \right)}$$

“Scale Factor Table Formula” (using [Figure 36 - ITV Scale Factors](#)):

$$\mathbf{Reported\ Pressure = \frac{counts}{scale\ factor}}$$

## 15. Rockwell PLC Configuration for use with Ethernet IP™ ITV

### Configure the PLC for use with the ITV using RSLogix5000™ or Logix Designer™ (version 20 or higher)

When connecting the ITV, using RSLogix5000™ or Logix Designer™ software by Rockwell Automation, refer to Rockwell Automation manuals for detailed operation.

#### 1. Example of configuring with EDS file

Select [EDS Hardware Installation Tool] from the [Tools] menu.

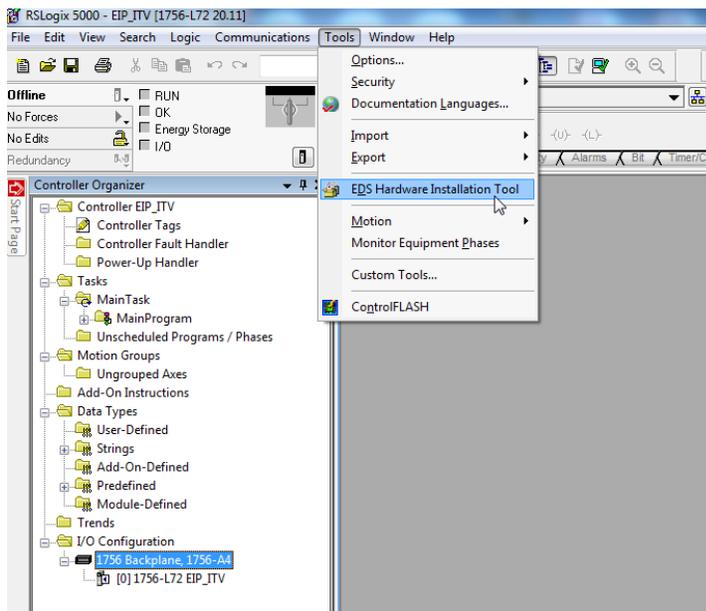


Figure 37 - EDS Hardware Installation Tool

Select [Register an EDS file(s)] from the [Options] menu. Then select [Next].

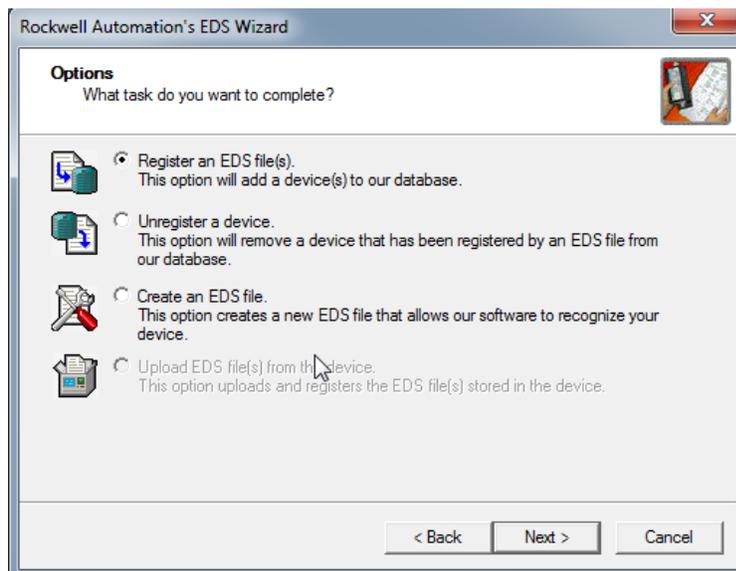
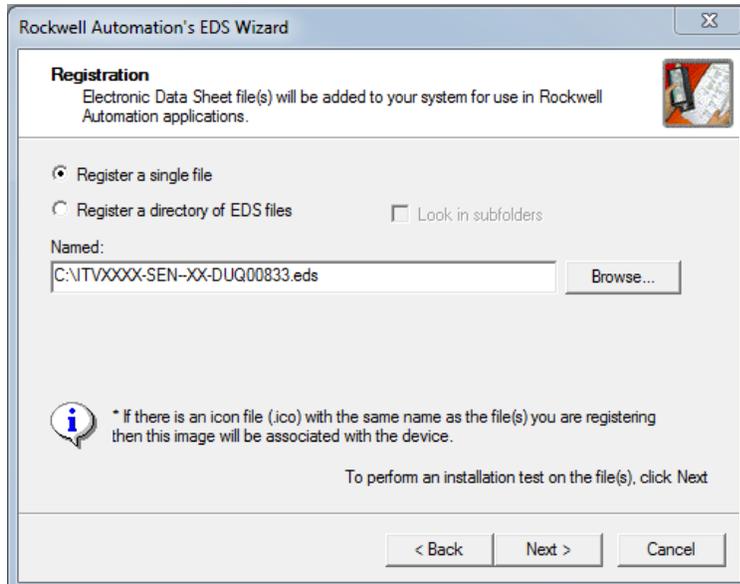


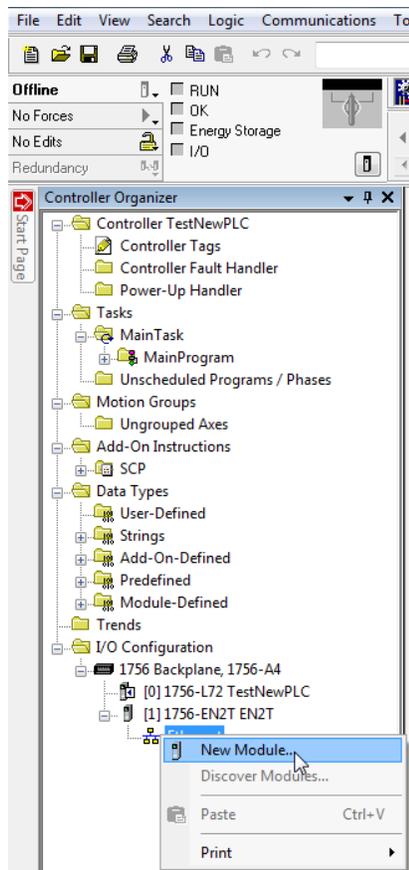
Figure 38 - EDS Options Menu

Select the EDS file to be installed and select [Next].



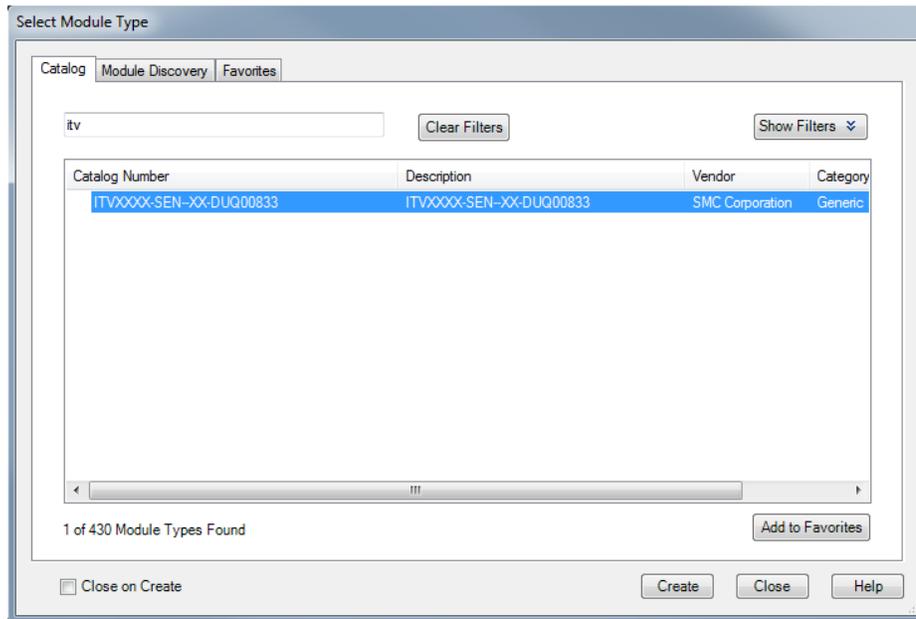
**Figure 39 - Select EDS File to Install**

Right click on the selection [Ethernet] in the [I/O Configuration] folder and select [New Module].



**Figure 40 - New Module Selection**

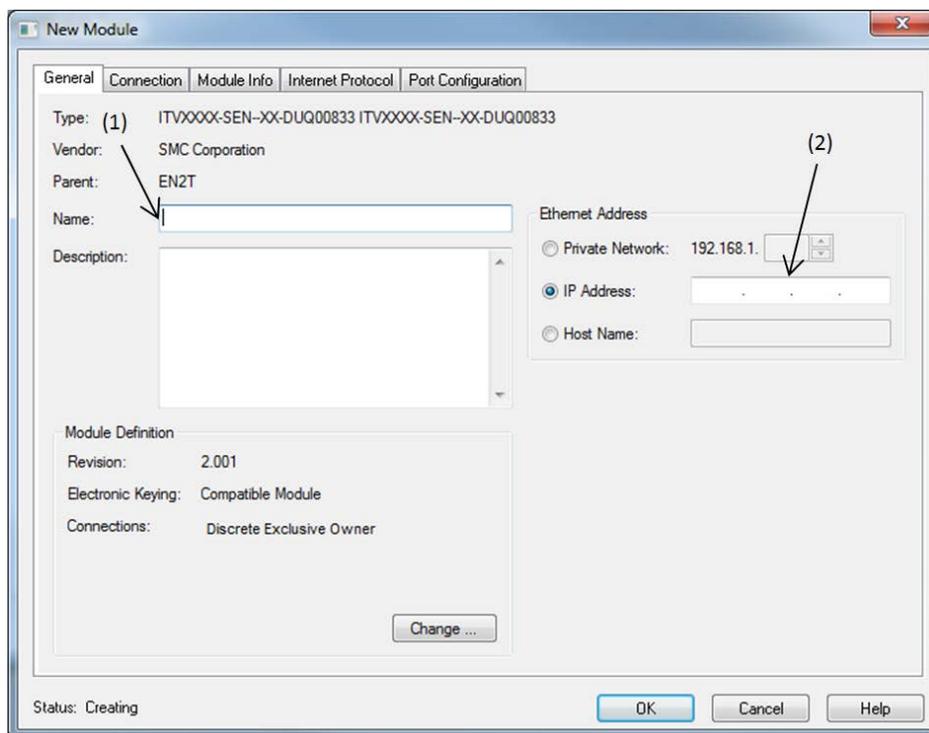
The [Select Module Type] screen is displayed. Select [ITVXXXX-SEN-XX-DUQ0083] and select [Create].



**Figure 41 - Select Module Type Screen**

When the [New Module] screen is displayed, input the information below.

- (1) Name: Enter the required unit name.
- (2) IP Address: The IP address setting for the unit.



**Figure 42 - New Module Screen**

## 2. Example of setting using the Generic Ethernet Module

- Right-click on the selection [Ethernet] in the [I/O Configuration] folder, and select [New Module].
- The [Select Module Type] screen is displayed. Select [Generic Ethernet Module] and select [Create]

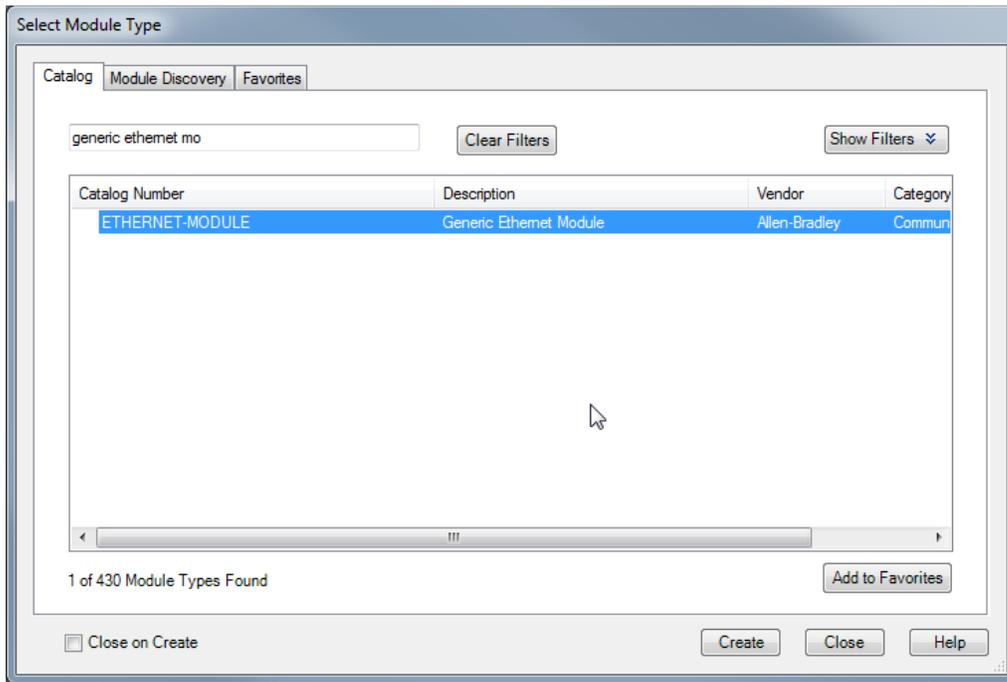


Figure 43 - Select (Register) Module Type

•The [Module Properties] screen is displayed, to perform setup.

- (1) Name: Enter the required unit name.
- (2) Select the data format of Comm: Connection Parameters.
- (3) IP Address: Enter the IP address setting for the SI unit.
- (4) Assembly Instance: Perform setting as shown below.

Description	Decimal	
	"Data-INT"	"Data-SINT"
Common Format	"Data-INT"	"Data-SINT"
Input	150	150
Output	100	100
Configuration	1	1

- (5) Size: Perform setting as shown below.

Description	Decimal	
	"Data-INT"	"Data-SINT"
Common Format	"Data-INT"	"Data-SINT"
Input	2	4
Output	1	2
Configuration	0	0

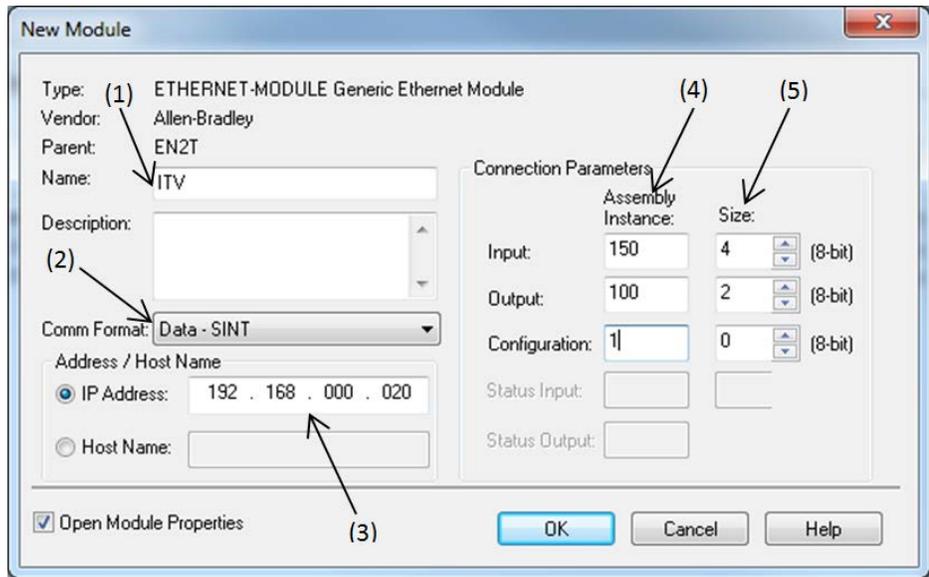


Figure 44 - Module Properties

## 16. LabVIEW Example

It is possible to control the ITV with a LabVIEW program.

The following is a simple example of a LabVIEW front panel and its associated block diagram. The program can send a pressure or vacuum setpoint value to the ITV and will read the ITV pressure and status.

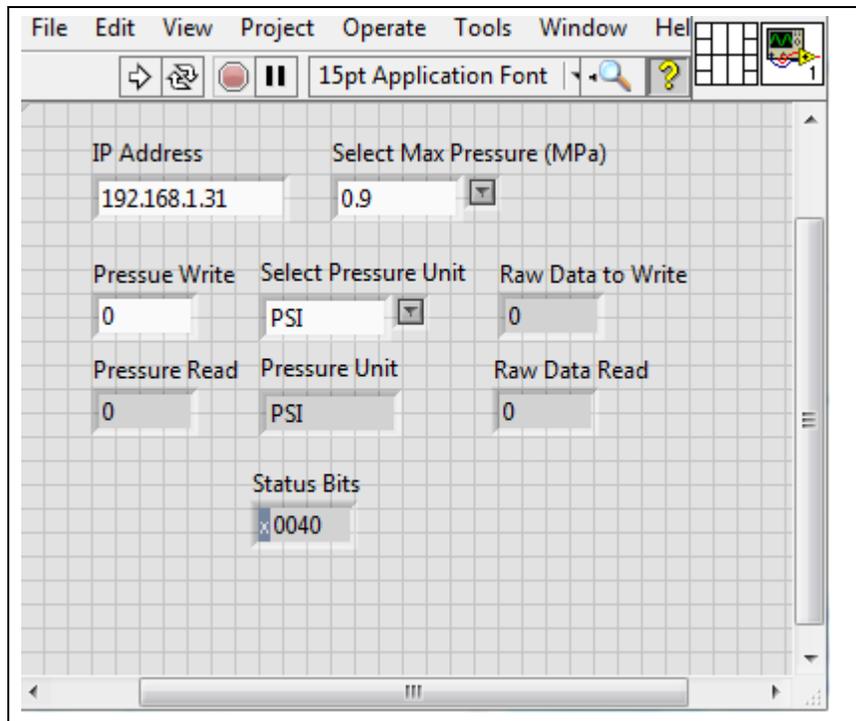


Figure 45 - Sample LabVIEW Front Panel

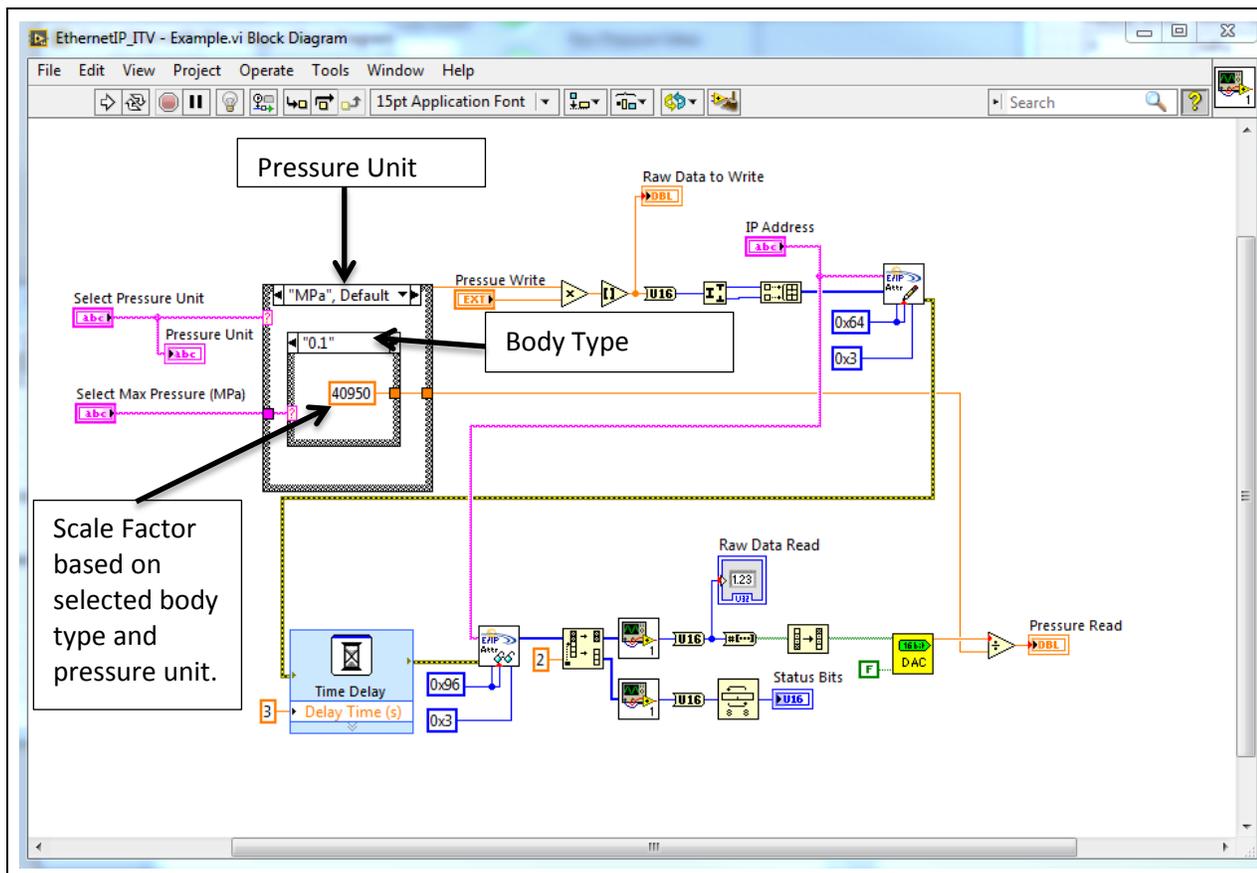


Figure 46 - Sample LabVIEW Block Diagram

This is the Block Diagram which implements the Front Panel from [Figure 45](#).

The nested Case Structures in the Block Diagram are used to implement pressure unit selection (outer structure) and body type selection (inner structure). The scale factor in the inner case structure (40950) is taken from [Figure 36 - ITV Scale Factors](#). It is the scale factor used for the particular pressure units and body type shown on the Front Panel ([Figure 45](#)). In the case of this example, this is the scale factor for an X010 ITV using MPa pressure units.

# Appendix

## 17. Troubleshooting

This is a brief set of troubleshooting tools for the SMC Ethernet ITV. The intent of this section is to provide steps that a user can follow to diagnose and correct common issues. This set is by no means exhaustive. Refer to the [LED Indication and Settings \(Section 11\)](#) for LED state information.

### 17.1. Problem: ITV Does Not Power Up

#### 17.1.1. Symptom: All 3 Front LEDs and both top cover LEDs are not lit

##### 17.1.1.1. Possible Cause: Power Supply Problem or Incorrect Power Connection

1. Check power supply. Be sure it is providing 24 VDC  $\pm$  10%. Check the output voltage provided by the power supply using a calibrated voltage meter.
2. Check the power cable. Ensure the cable conforms to the requirements of [Power supply connector layout \(Section 8.2.2\)](#). Be sure 24 VDC is available at the ITV connector on the cable pins indicated in the power cable pin-out ([Figure 11 - ITV Power Cable Pin Connections](#)). Ensure the power cable is securely connected to the ITV. Be sure there are no breaks or cuts in the power cable.
3. If the ITV is being powered using POE, be sure that the requirements of [Power Over Ethernet \(POE\) \(Section 10\)](#) are met. In particular, ensure that the upstream ITV has POE enabled and that the Ethernet cable is properly connected to the upstream ITV "Bus Out" connector and the "Bus In" connector of the ITV that doesn't power up.
4. If POE is being used to power the ITV that is not powering up, connect a 24 VDC power supply with a properly configured power cable to the power connector of the ITV. If the ITV powers up, verify POE setting and communication cable from the upstream ITV. (Note: For normal operation, **do not** operate ITV with the power cable and POE enabled on the upstream ITV (see [Power Over Ethernet \(POE\) \(Section 10\)](#)).
5. If the problem persists, contact SMC Technical Support (see [Contact Page \(Section 12.7\)](#)).

### 17.2. Problem: ITV Does Not Operate

#### 17.2.1. Symptom: One of the front LEDs is Red

##### 17.2.1.1. Possible Cause: Power LED is Green and NS and/or MS LEDs are solid Red

1. Solid Red **NS LED** indicates a **duplicate** IP address has been detected. The ITV displaying the red NS LED has the same IP address as another device on the network. See [IP Address \(Section 13.2.2\)](#).
2. Solid Red **MS LED** indicates an **unrecoverable error**. Power cycle the ITV.
3. If the problem persists, contact SMC Technical Support (see [Contact Page \(Section 12.7\)](#)).

### 17.2.1.2. Possible Cause: Power LED is Green and NS and/or MS LEDs are flashing Red

1. Flashing Red **NS LED** indicates loss of communication with the master device. Check the LED on top of the ITV (Bus Connector LED).
  - 1.1. If the **Bus Connector LED is OFF**, the physical connection with the master device has been lost. Verify the communication cable connections. Verify that the master device is operating.
  - 1.2. If the **Bus Connector LED is GREEN**, the physical connection is operational. The master device has stopped responding to the ITV. Verify the state of the master device.
2. Flashing Red **MS LED** indicates a possible low voltage condition. The voltage is high enough for the ITV to power up but may not be high enough for the ITV to operate properly. Verify the ITV power is within specification. (See power specifications in [Figure 50 - ITV Device Specifications](#)).
3. If the problem persists, contact SMC Technical Support (see [Contact Page \(Section 12.7\)](#)).

## 17.3. Problem: Unable to Communicate with ITV

### 17.3.1. Symptom: LEDs are Green

ITV does not respond to commands. Power LED is green, NS flashing green, the LED on top of the ITV for the incoming signal is green

#### 17.3.1.1. Possible Cause: Incorrect IP address

1. Verify that the master device is using the correct IP address for the ITV.
2. If the ITV IP Address is unknown, use the procedure in [Recovering the IP Address of SMC ITV Module \(Section 18\)](#) to attempt to determine the IP address of the ITV. Use that IP address to communicate with the ITV.
3. If the problem persists, contact SMC Technical Support for assistance (see [Contact Page \(Section 12.7\)](#)).

### 17.3.2. Symptom: NS LED OFF 1+ Minutes After Power Cycle

ITV does not respond to commands. Power LED is green, NS OFF 1+ minutes after power cycle, LED on top of the ITV for the incoming signal is green

#### 17.3.2.1. Possible Cause: ITV is in DHCP Mode

1. Verify the ITV is in DHCP mode. Power cycle the ITV. Just after the power cycle, verify NS LED is flashing green. If the **NS LED** turns **off** after about one minute, the ITV is in **DHCP** mode. Follow the instructions in [Use DHCP \(Section 13.2.5\)](#) to connect to the ITV.
2. If the problem persists, contact SMC Technical Support for assistance (see ).

### 17.3.3. Symptom: Power is green; LED on top of the ITV for the incoming signal is off.

Note: It is **normal** for a connector LED to be **OFF** if there is no physical connection to another device.

#### 17.3.3.1. Possible Cause: Connector Not Connected or Not Powered

1. If a communication cable is not connected to the connector associated with the LED, the LED will be off. If this connection is not required, putting a seal cap on the connector is recommended.

2. The cable is not connected to another operating device. Verify the communication cable is properly connected between the other device and the ITV. Also, verify the other device is operational.
3. If the problem persists, contact SMC Technical Support for assistance (see [Contact Page \(Section 12.7\)](#)).

#### **17.4. Problem: ITV Web Page Pressure Value Differs from Master Calculated Value**

Note: The master device reported pressure is calculated from the pressure count value received by the master from the ITV.

##### **17.4.1. Possible Cause: ITV and Master Pressure Units Differ**

The selected pressure unit **displayed on the ITV web page** is **different** from the pressure unit used to **calculate** the pressure value from the counts sent to the **master device**.

1. Confirm the pressure unit displayed on the ITV web page matches the pressure unit used to calculate the pressure value from the counts sent to the master. See [ITV Status Page \(Section 12.5\)](#) or [Regulator Configuration Page \(Section 13.1\)](#). Also refer to the conversions in [Counts and Pressure Units \(Section 14\)](#).

##### **17.4.2. Possible Cause: Incorrect Count Calculation**

1. Verify the correct formula for calculating pressure is used for determining pressure value. (See the conversions in [Counts and Pressure Units \(Section 14\)](#)).

##### **17.4.3. Possible Cause: Pressure Change in Progress**

1. If the master requested a pressure value change and the ITV has not settled to the new pressure value, the web page may display a different pressure value than the calculated value. Check the pressure value once the ITV has settled to the new pressure value.

##### **17.4.4. Possible Cause: ITV and PLC Use Different Byte Order for Data Transfer**

1. Confirm the setting of the “Swap PLC Data Bytes” checkbox on the [Regulator Configuration Page \(Section 13.1\)](#). Verify the setting matches the master device. The “Swap PLC Data Bytes” checkbox can be changed to see if this corrects the problem.
2. If there is still a problem, contact SMC Technical Support for assistance. See [Contact Page \(Section 12.7\)](#).

#### **17.5. Problem: ITV Does Not Reach Set Pressure**

##### **17.5.1. Symptom: ITV “Buzzes” When Directed to Set a Pressure**

###### **17.5.1.1. Possible Cause: Inadequate Supply Pressure**

1. Verify that supply pressure is at least set at Minimum Pressure (**Set pressure + 0.1 MPa** - or **Set Pressure – 13.3 kPa** for **ITV2090** Vacuum ITVs) - see [Figure 50 - ITV Device Specifications](#)).
2. If the problem persists, contact SMC Technical Support for assistance. See [Contact Page \(Section 12.7\)](#).

## 17.5.2. Symptom: ITV Makes “Hissing” Sound when Operated at Pressure

### 17.5.2.1. Possible Cause: Air or Vacuum Leak

1. Verify that fittings are properly installed in the correct ports. See [Summary of Product Elements \(Section 6\)](#) and [Figure 8 - Recommended proper connection torque: N•m](#).
2. Verify that air lines are properly installed.
3. Verify that the air lines are not cut or punctured.
4. Verify that air is not being unexpectedly exhausted from the ITV exhaust port.
5. If the problem persists, contact SMC Technical Support for assistance. See [Contact Page \(Section 12.7\)](#).

This is **not** an exhaustive troubleshooting guide. SMC Technical Support may request that you check additional things, depending on the problem experienced.

## 18. Recovering the IP Address of SMC Ethernet IP™ ITV Module

Note: ITVs have a factory preconfigured static IP address (192.168.1.20). Use this procedure when the current IP address of an ITV is unknown.

### 18.1. Step 1

Be sure Wireshark is installed on your PC. You may download and install a free copy of Wireshark using the following link: <http://www.wireshark.org/download.html>.

Follow all installation instructions.

### 18.2. Step 2

Launch the Wireshark network protocol analyzer. Note: Your actual Wireshark display depends on the version of Wireshark you are using.

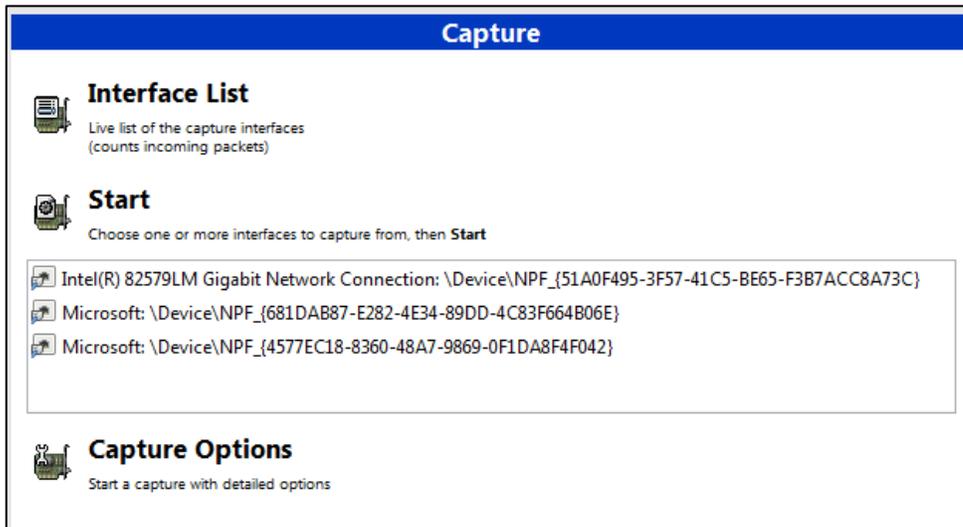


Figure 47 - Wireshark Launch Window

### 18.3. Step 3

If there are multiple Ethernet drivers in your PC, select the appropriate driver by double clicking it. The following blank window will pop up.

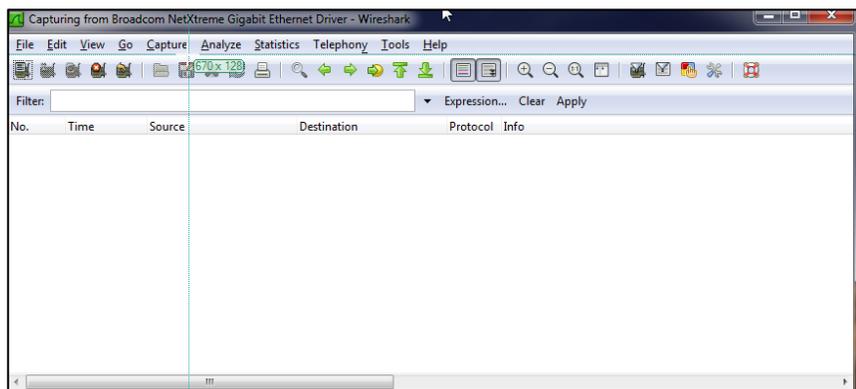


Figure 48 - Wireshark Initial Interface Capture Window

## 18.4. Step 4

Connect the ITV to your PC. Cycle the ITV power. The ITV will issue ARP messages (indicated in the **Protocol** column).

ARP messages will appear in the Wireshark window. Stop the Wireshark scan when an ARP has occurred (Note: The user can stop the scan by pressing the “Capture” tab then pressing the “Stop” command or by entering Ctrl+E on the keyboard).

Look in the **Source** column in a row that has an ARP. If the MAC address of the ITV has not been changed, the Source entry for the ITV should start with “SmcCorpo\_” (or “smc\_”). The remaining data in the **Source** column will match the last three fields of the ITV MAC address (Note: the MAC address is located on the ITV label). If the MAC address of the ITV was changed the full MAC address may appear in the **Source** column.

Once the row for the ITV has been determined, move to the **Info** column for the ITV IP address.

Note: It may be easier to review the ARP messages by clicking the **Protocol** column header. This will cause Wireshark to sort the messages by protocol.

In the example below, the MAC address of the device appears as smc\_08.00.08. It may also appear as 00.23.C6.08.00.08. A MAC address starting with 00.23.C6 is registered to SMC. Look for the device whose last 3 fields under **Source** match the last 3 fields of the MAC address of the ITV you are seeking. The ITV IP address is shown in the **Info** column.

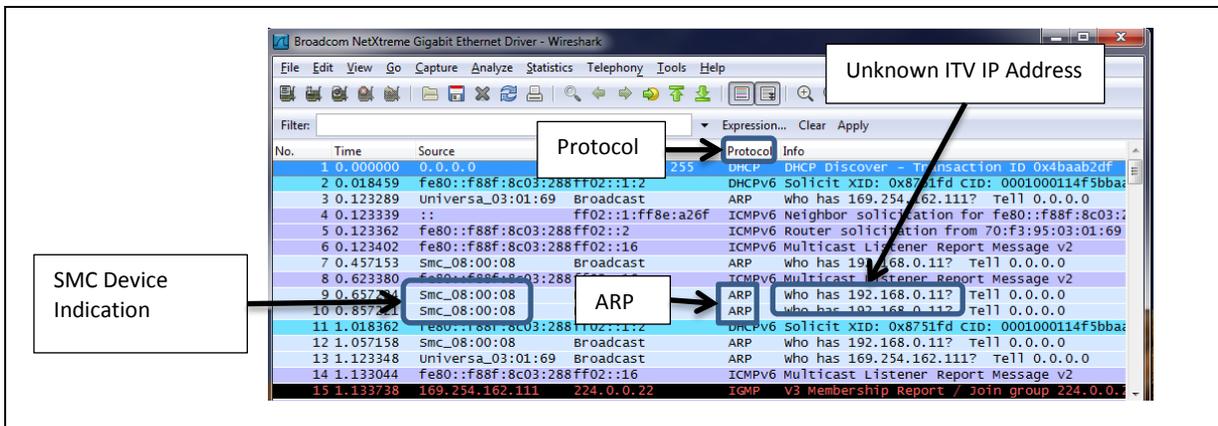


Figure 49 - Wireshark IP Message Display

Note: Using your Internet browser and the IP address of the ITV, the user can now access the webpage of the ITV. See [Web Page Access \(Section 9\)](#). Please be sure to record the IP address of the ITV.

## 19. Specifications

### 19.1. General Specifications

Model	ITV1010	ITV1030	ITV1050	
	ITV2010	ITV2030	ITV2050	ITV2090
	ITV3010	ITV3030	ITV3050	
Minimum supply pressure	Set pressure + 0.1 MPa			Set pressure -13.3 kPa
Maximum supply pressure	0.2 MPa	1.0 MPa	1.0 MPa	-101 kPa
Set pressure range	0.005~0.1 MPa	0.005~0.5 MPa	0.005~0.9 MPa	-1.3~-80 kPa
Power supply	Voltage	24 VDC ± 10%		
	Current Consumption	0.12 A or less		
Linearity	± 1% F.S. or less			
Hysteresis	0.5% F.S. or less			
Repeatability	±0.5% F.S. or less			
Sensitivity	0.2% F.S. or less			
Temperature characteristics	±0.12% F.S. /°C or less			
Operating temperature	0 to 50°C (No condensation)			
Standards	Contact SMC			
Enclosure	IP65 equivalent			

Figure 50 - ITV Device Specifications

Please see the SMC Best Pneumatics catalog, Volume 5 ITV section, for additional information on how the ITV functions. The catalog is the source of information for ITV working principles, operating range parameters, accessories, and other information useful for the operation and maintenance of your ITV.

For ITV weight and enclosure measurement information, please see the ITV design drawing.

### 19.2. Initial Configuration Parameters

Model	ITV1010	ITV1030	ITV1050	
	ITV2010	ITV2030	ITV2050	ITV2090
	ITV3010	ITV3030	ITV3050	
IP Address	192.168.1.20 static address			
Power Over Ethernet (POE)	Off			
DHCP Mode	Off			
Configuration Login ID	"user"			
Configuration Login Password	"user"			
Hold Pressure on Connection Loss	Off			
PLC Data Byte Swap	Off			

Figure 51 - ITV Initial Configuration

Revision History			
Revision	Description	Date	Author(s)
0	Initial release for EthernetIP™ ITV.	07/14/2016	T. Zabel

## **SMC Corporation of America**

10100 SMC Boulevard

Noblesville, IN 46060

Phone: 1-800-SMC-SMC1 (1-800-762-7621)

URL: [www.smcusa.com](http://www.smcusa.com)

---