HARDWARE MANUAL

Revision 4.03

TITAN-SVX-ETH

UNIVERSAL SERVO MOTOR CONTROLLER

First Edition, Jan 2018

Table of Contents

1. Introduction

The TITAN-SVX-ETH is an advanced universal single-axis closed loop servo driver-controller that supports various types of motors that are commonly used in the automation industry:

- 2 Phase Stepper Motor
- 3 Phase Brushless Rotary Servo Motor
- 3 Phase Brushless Linear Servo Motor
- DC Voice Coil Motor

In addition to the advanced servo motion control technology, the TITAN-SVX-ETH also has a number of advanced control technologies including force control, joystick control, dynamic gains, standalone programming, and many more. Additionally, TITAN-SVX-ETH enabled with various Servo 5.0 monitoring and analytics algorithm technology for the Industry 4.0 Smart Factory initiative and the Industrial Internet of Things.

1.1. Technical Features

- 100 Mbps Ethernet communication (ASCII over TCP/IP)
- USB 2.0 communication (Virtual Com Port)
- RS-485 communication using multi-drop network:
    - 115200 bps, 8N1
- Communication Protocol supported:
    - TITAN-ASCII
    - TITAN-ASCII with CRC
    - MODBUS-ASCII
    - MODBUS-RTU
- Standalone programmable using Arcus A-SCRIPT language with support of 3 multi-thread programs
- Closed Loop Driver Specifications:
    - 24-48 VDC
    - 8.0 Amp max peak current monitoring
- Multiple types of motor support:
    - 2 Phase Bipolar Stepper Motors
    - 3 Phase Brushless Rotary Servo Motors
    - 3 Phase Brushless Linear Servo Motors
    - DC Voice Coil Motors
- Configurable in following modes:
    - Pulse Mode - digital pulse control using pulse/dir or CW/CCW
    - Control Mode – internal motion profile generation with motion sequence control from internal standalone programming.
- Opto-isolated Digital IO:
    - 8 bits of digital inputs
    - 3 bits of digital outputs
- Analog input for speed and joystick control
    - 0-5V range 12 bit resolution
- A/B/Z differential encoder inputs with A/B/Z single ended encoder signal outputs
- UVW Hall sensor digital inputs
- Control Mode Features:
    - Homing routines using combination of Home/Limit/Z Index
    - Soft and Hard Limit Protection.
    - Over-current/Over-voltage/ Under voltage/Temperature/Position Error fault detection

2. Electrical and Thermal Specifications

Parameter	Min	Max	Units
Main Power Input[1]	+24	+48	V
	-	8	A
Digital Input Forward Diode Current	-	25	mA
Digital Output Collector Voltage	-	+24	V
Digital Output Sink Current	-	45	mA
Operating Temperature[2]	-20	+80	°C
Storage Temperature[2]	-55	+150	°C

Table 2.0

[1] The supply current should match the driver current setting.
[2] Based on component ratings.

3. Dimensions

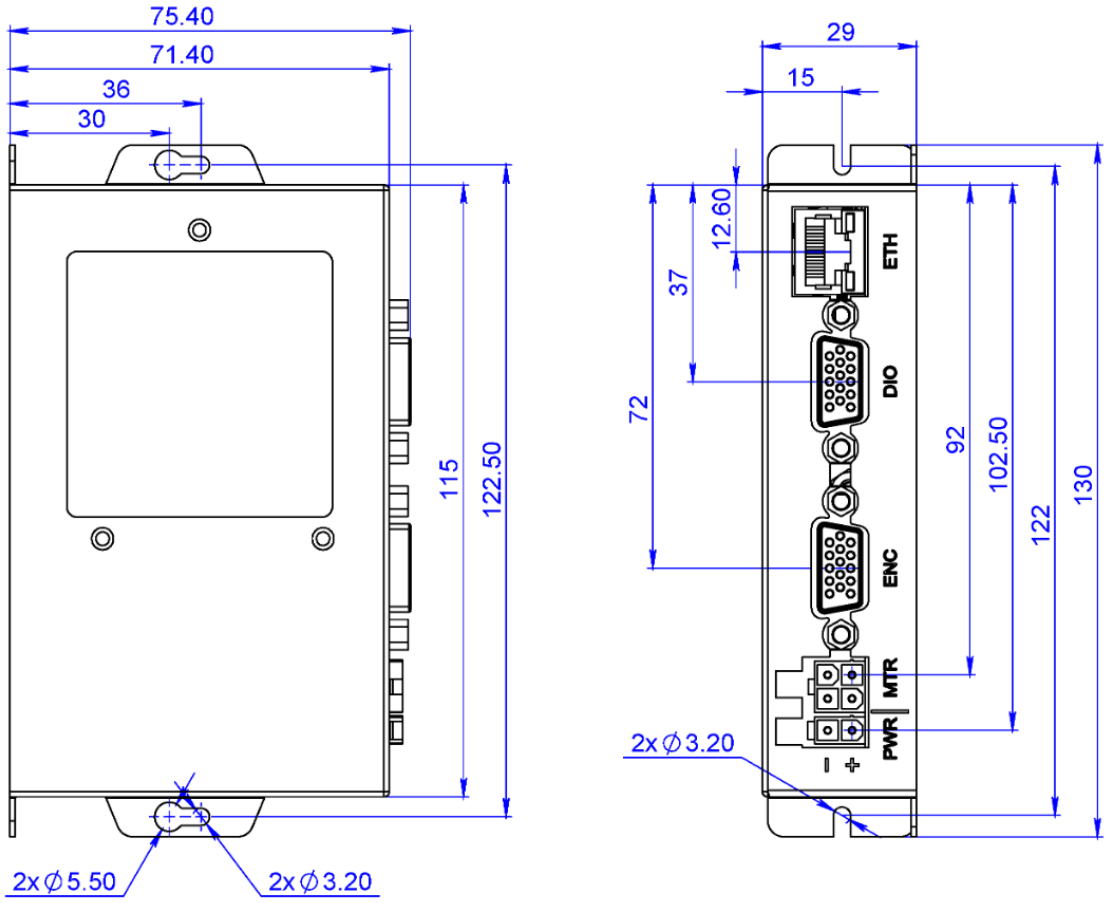

Figure 3.0

4. Connectivity

4.1. 2-Pin Power Connector

In order for the TITAN-SVX-ETH to operate, it must be supplied with +24VDC to +48VDC power supply. For typical operation, +24VDC power supply is recommended. For high speed applications, especially with the stepper motors, 48VDC power supply is recommended.

Power pins and communication port pin outs are shown below.

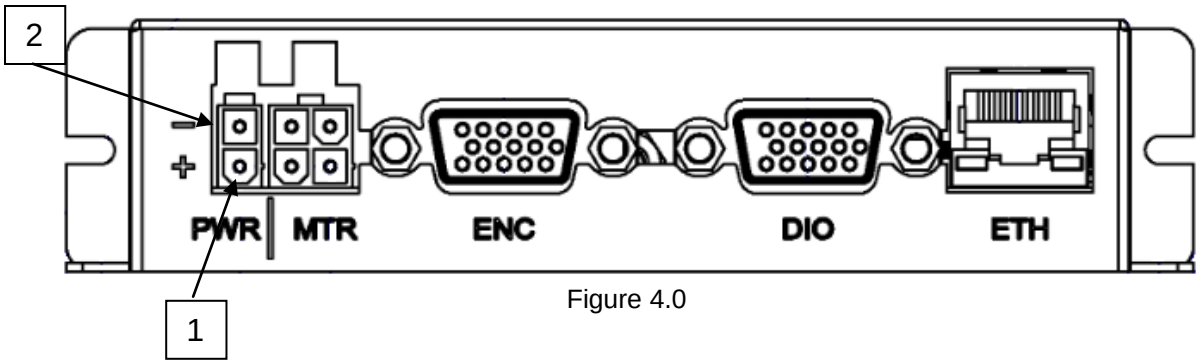

Figure 4.0

Pin #	Name	Description
1	V+	Power Input +24 to +48 VDC
2	G	Power Supply Ground

Table 4.0

Mating Connector Description: 2 pin Mini Fit Jr connector
Mating Connector Manufacturer: Molex
Mating Connector Manufacturer Part: †39-01-2025

† Other compatible connectors can be used.

4.2. 4-Pin Motor Connector

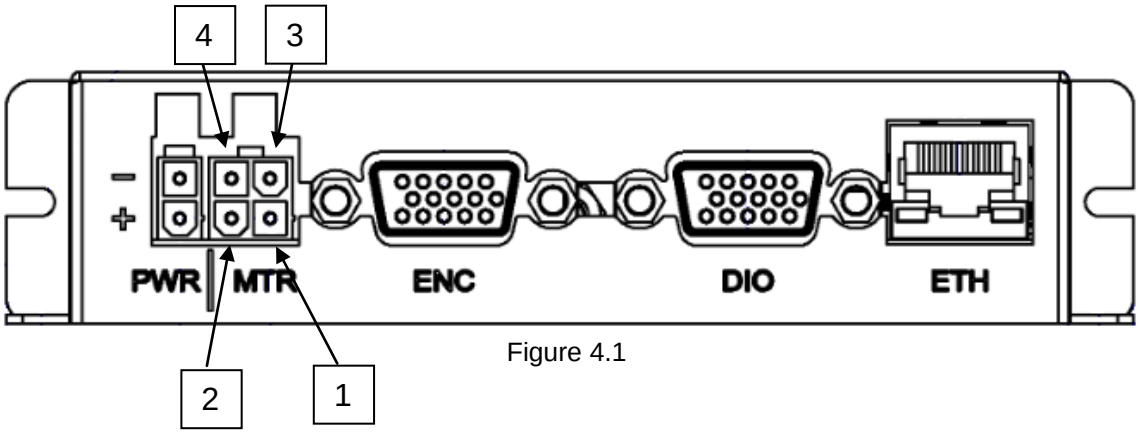

Figure 4.1

Depending on the type of motor, follow the motor connection as shown below.

3 Phase BLDC/PMSM Motor (Rotary and Linear)		
Pin #	**Name**	**Description**
1	V	Motor V
2	U	Motor U
3	W	Motor W
4	NC	No Connection

Voice Coil		
Pin #	**Name**	**Description**
1	+	Motor +
2	-	Motor -
3	NC	No Connection
4	NC	No Connection

2 Phase Bi-Polar Stepper Motor		
Pin #	**Name**	**Description**
1	A	Motor A
2	B	Motor B
3	/A	Motor /A
4	/B	Motor /B

Table 4.1

Mating Connector Description: 4 pin Mini Fit Jr connector
Mating Connector Manufacturer: Molex
Mating Connector Manufacturer Part: †39-01-2045

Important Note

Do **NOT** disconnect the motor wires or motor connector while the motor is enabled or when motor is moving.

Make sure to turn off the power to the controller or make sure that the motor is disabled when disconnecting the motor from the driver.

Plugging or unplugging the motor while the motor is enabled may damage the motor and/or the electronics.

4.3. Male DSUB15 (HD) Encoder/Hall Sensor Connector

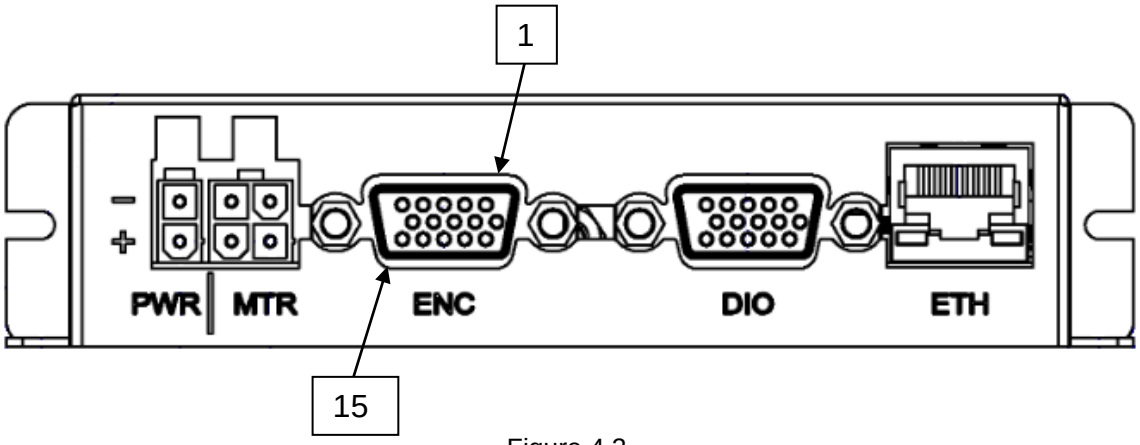

Figure 4.2

Pin #	In/Out	Name	Description
1	I	EA+	Differential Encoder A+ Signal Input
2	I	EA-	Differential Encoder A- Signal Input
3	I	EB+	Differential Encoder B+ Signal Input
4	I	EB-	Differential Encoder B- Signal Input
5	I	EZ+	Differential Encoder Z+ Signal Input
6	I	EZ-	Differential Encoder Z- Signal Input
7	O	+5V	+5V for Encoder and Hall Power
8	O	GND	GND for Encoder and Hall Power
9	O	A	Single Ended Encoder A Output
10	O	B	Single Ended Encoder B Output
11	O	Z	Single Ended Encoder Z Output
12	I	HU	Hall Sensor U Input
13	I	HV	Hall Sensor V Input
14	I	HW	Hall Sensor W Input
15	I	AI1	Analog Input 1

Table 4.2

Mating Connector Description: HD DSUB 15 Male Connector

4.3.1. Encoder Input Circuit

Both single ended and differential quadrature incremental encoder inputs are accepted.

The maximum encoder input frequency is 3MHz

See figure 4.3 for a circuit diagram of the encoder inputs.

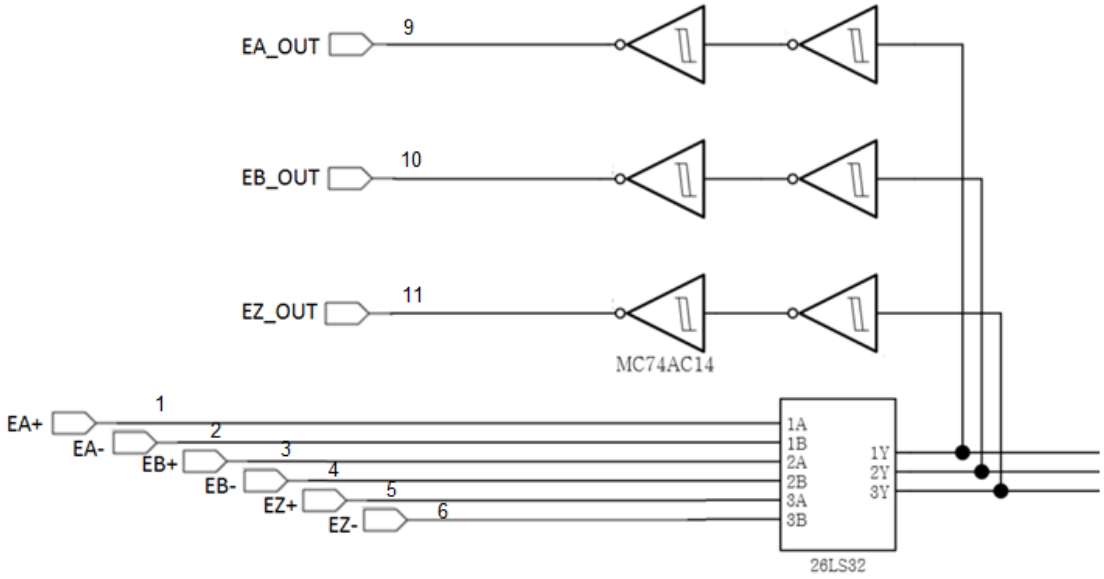

Figure 4.3

Notes:

- When using single-ended encoders, use the A-, B-, and Z- inputs.
- EA_OUT/EB_OUT/EZ_OUT signals are encoder output signals that are available for reading by external controller.

4.4. Male DSUB15 (HD) Motion I/O Connector

TITAN-SVX-ETH has 8 opto-isolated digital inputs and 3 opto-isolated digital outputs. Depending on the configuration as Pulse Mode or Control Mode, these digital signals have different functions.

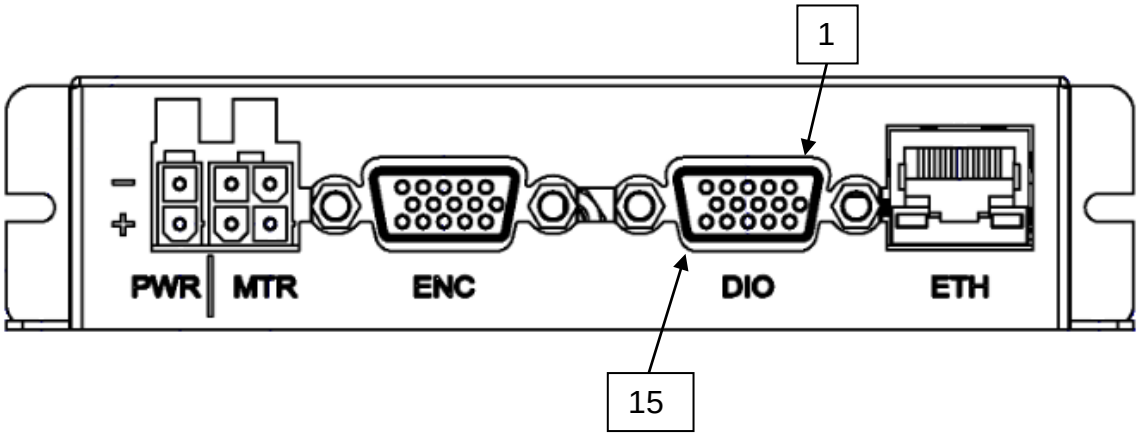

Figure 4.4

Pin #	In/Out	Pulse Mode	Control Mode	Description
1	I	PUL+	DI1+	Pulse Input+ / Digital Input 1+
2	I	PUL-	DI1-	Pulse Input- / Digital Input 1-
3	I	DIR+	DI2+	Dir Input+ / Digital Input 2+
4	I	DIR-	DI2-	Dir Input- / Digital Input 2-
5	I	ENA	DI3	Enable Input / Digital Input 3
6	I	CLR	DI4	Clear Fault Input / Digital Input 4
7	I	RST	DI5	Reset Position Input / Digital Input 5
8	I	DI6	+LIM	Digital Input 6 / + Limit Input
9	I	DI7	HOME	Digital Input 7 / Home Input
10	I	DI8	-LIM	Digital Input 8 / - Limit Input
11	I	DI_COM	DI_COM	Opto-isolated Digital Input Common
12	O	ALM	DO1	Alarm Output / Digital Output 1
13	O	DO2	DO2	Digital Output 2/ Digital Output 2
14	O	INPOS	DO3	In Position Output / Digital Output 3
15	O	DO_COM	DO_COM	Opto-isolated Digital Output Common

Table 4.3

Mating Connector Description: HD DSUB 15 Male Connector

4.4.1. Pulse / Direction (CW/CCW) Inputs

In Pulse Mode, TITAN-SVX-ETH supports both one-clock (Pulse/Dir) or two-clock (CW/CCW) inputs for target position input.

In Controller Mode operation, the corresponding Pulse/Dir inputs can be used as general purpose input. In Control Mode, the Pulse/CW input is referenced as DI1 and the Dir/CCW input referenced as DI2.

One-clock uses Pulse signal as the amount of movement and Dir signal as the direction of the movement.

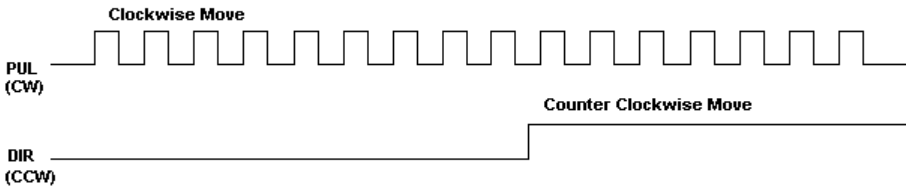

Figure 4.5

Two-clock uses CW as clockwise movement and CCW as counter clockwise movement.

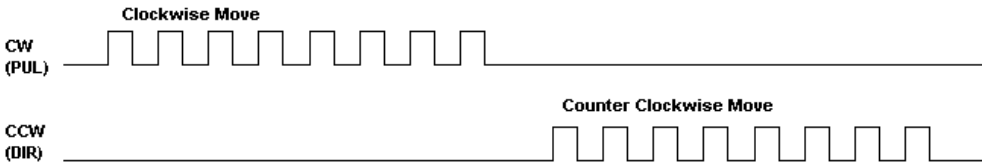

Figure 4.6

Depending on the direction polarity setting, actual direction of the stepper motor rotation can be configured for the application. Maximum pulse rate support is 1M pulses/second.

Pulse/Dir (CW/CCW) inputs are opto-isolated differential inputs with 270Ω resistor as shown in figure 4.7. Maximum source current for the diode is 25mA.

Important Note: If voltage across is greater than 5V, make sure to add current limiting resistor to limit the current to 50mA across the diode. Figure 4.7 shows the detailed schematic of the opto-isolated pulse and direction inputs.

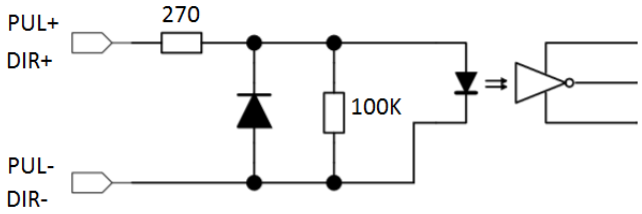

Figure 4.7

4.4.2. Digital Outputs

In Pulse Mode, three digital outputs are designated as INPOS, ALARM outputs. Third digital output is general purpose output.

In Control Mode, three digital outputs are available for general purpose use.

Figure 4.8 shows an example circuit of the digital outputs for TITAN-SVX-ETH

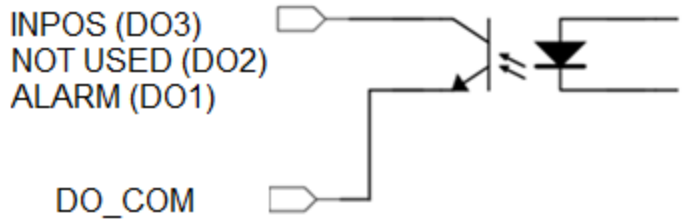

Figure 4.8

The DO_COM must be connected in order for the digital outputs to operate.

4.4.3 Digital Inputs

In Pulse Mode, the following digital inputs are available: Enable, Reset, and Clear. Three other digital inputs are general purpose inputs.

In Control Mode, the following digital inputs are available: +Limit, Home, and -Limit. Remaining 3 digital inputs are available for general purpose use. Note that in Control Mode, limit inputs can be disabled and these limit inputs can be used as general purpose inputs.

Figure 4.9 shows the detailed schematic of the opto-isolated digital inputs available on the TITAN-SVX-ETH.

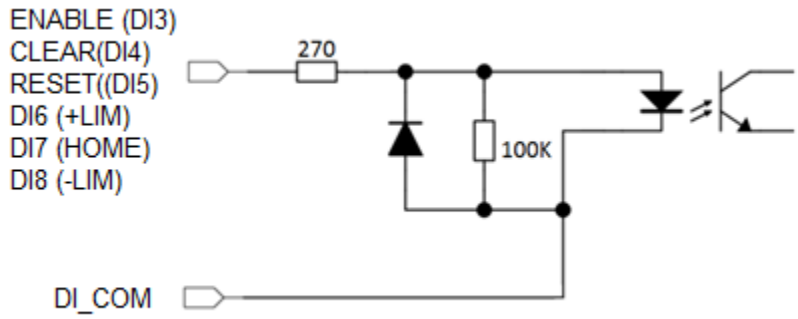

Figure 4.9

The DI_COM must be connected in order for the digital inputs to operate

4.5. 3-Pin Communication Connection

TITAN-SVX-ETH supports serial RS-485 communication.

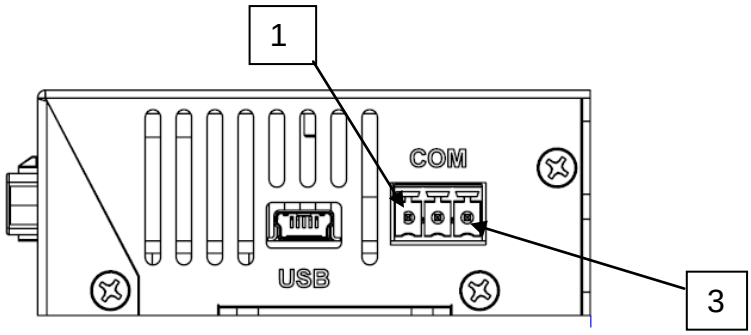

Figure 4.10

Pin #	Name	Description
1	485+	Positive RS485 Signal
2	485-	Negative RS485 Signal
3	GND	Ground

Table 4.4

4.6 USB Communication Connection

TITAN-SVX-ETH supports USB 2.0 communication.

Mini-B connector USB communication cable is used to communicate with a master such as PC.

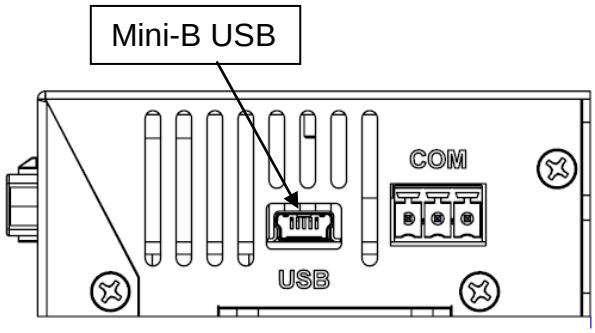

Figure 4.11

5. Communication

5.1 Ethernet Communication

TITAN-SVX-ETH uses 100Mbps Ethernet ASCII communication over TCP/IP

5.1.1. Ethernet Settings

The default IP address/socket settings can be found below

IP: 192.168.1.100
Port: 5000

To begin communication with a factory default device, configure the PC control panel with the following settings:

IP = 192.168.1.nnn
Subnet Mask = 255.255.255.0

Note that the host IP address of the PC should differ from the IP address of the TITAN-SVX-ETH.

5.2. Serial Communication

The TITAN-SVX-ETH communicates over an RS-485 interface.

5.2.1. Communication Port Settings

The TITAN-SVX-ETH has communication port settings as shown in Table 5.0.

Parameter	Setting
Baud Rate	115,200
Byte Size	8 bits
Parity	None
Flow Control	None
Stop Bit	1

Table 5.0

5.2.2. Communicating from PC

Use the TITAN-SVX-ETH Windows User Interface available for download from the Arcus TITAN website.

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USB to RS-485 converter will be required to communicate from PC to the TITAN-SVX-ETH.

5.2.3. RS-485 Communication Issues

RS-485 communication issues can arise due to noise on the RS-485 bus. The following techniques can be used to help reduce noise issues:

Daisy Chaining
For a multi-drop RS-485 network, be sure that the network uses daisy-chain wiring.

Number of Nodes
The maximum number of nodes recommended is 32. Increasing beyond this number will require special attention

Twisted Pair Wiring
To reduce noise, it is recommended to use twisted pair wiring for the 485+ and 485- lines. This technique will help cancel out electromagnetic interference.

Termination
For an RS-485 network, it may be required that a 120 Ohm resistor is placed in between the 485+ and 485- signals, at the beginning and end of the bus. A terminal resistor will help eliminate electrical reflections on the RS-485 network.

Note that on short communication buses, or buses with a small number of nodes, termination resistors may not be needed. Inclusion of terminal resistors when they are not needed may mask the main signal entirely.

5.3. USB Communication

The TITAN-SVX-ETH uses USB 2.0 Virtual Communication.

5.3.1. Virtual Communication Settings

The TITAN-SVX-ETH uses same communication port settings as the serial communication setting as shown in Table 5.0.

Parameter	Setting
Baud Rate	115,200
Byte Size	8 bits
Parity	None
Flow Control	None
Stop Bit	1

Table 5.1

5.4. Windows GUI

The TITAN-SVX-ETH comes with a Windows GUI program to setup, configure, test, program, compile, download, and debug the controller. The Windows GUI will perform all communication via RS-485. See TITAN-SVX-ETH Software Users Manual for more details.

Contact Information

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