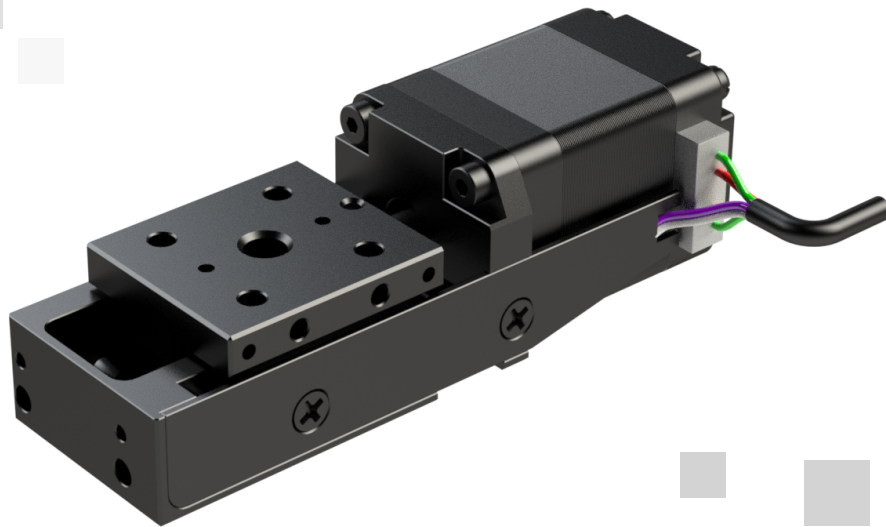


# VT-21

Series



## Translation Stage Reference Manual (Open and Closed Loop Versions)

# **VT-21S & L**

## **Linear Stage**

### **Reference Manual**

Rev 3.2

**MICRONIX USA, LLC**  
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## 1. Introduction

### 1.1 Product Description

The low-cost VT-21S & L linear stages excel in applications with very limited space due to its compact design. The stages utilize a 2-phase stepper motor and are equipped with two mechanical limit switches. A pre-loaded ball slide creates high stiffness and superior performance. The VT-21S & L are available with an optional linear encoder with 50nm resolution. The stages can be mounted in XY or XYZ configuration in a space saving arrangement. Versions capable of operation in vacuum ( $10^{-6}$  mbar) are available. The VT-21S & L are compatible with the MMC-200 controller.

#### Features:

- Travel range of 10mm (VT-21S) and 26mm (VT-21L)
- 50nm closed loop encoder resolution
- Load capacity up to 1kg
- Ball slide
- Integrated mechanical limit switches
- Vacuum versions available

### 1.2 Stepper Motor – (SM-001)

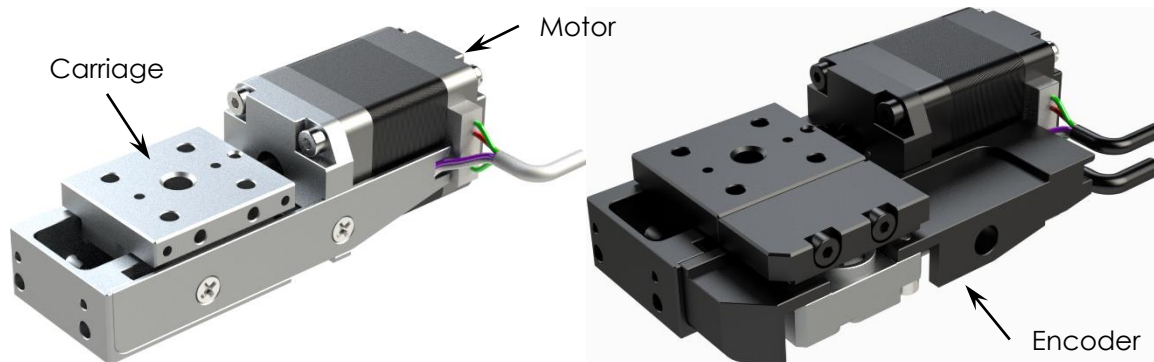


Figure 1-A. VT-21S, Open Loop Version (left), Closed Loop Version (right)

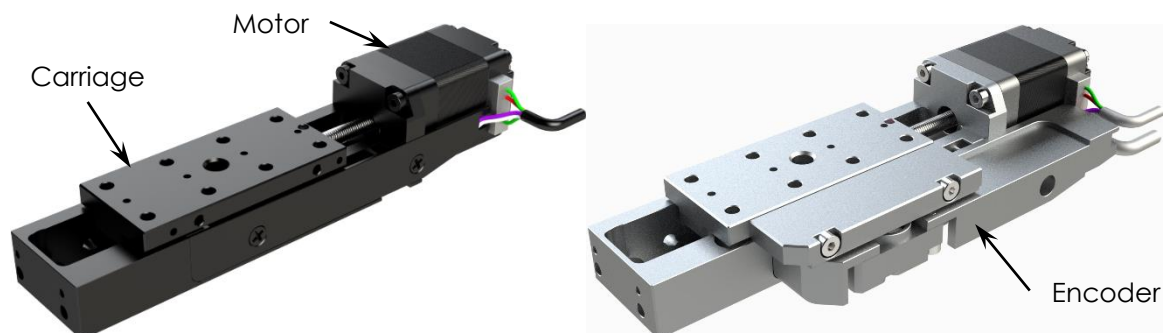


Figure 1-B. VT-21L, Open Loop Version (left), Closed Loop Version (right)

### 1.3 Recommended Controllers

The following controllers are available from MICRONIX USA:

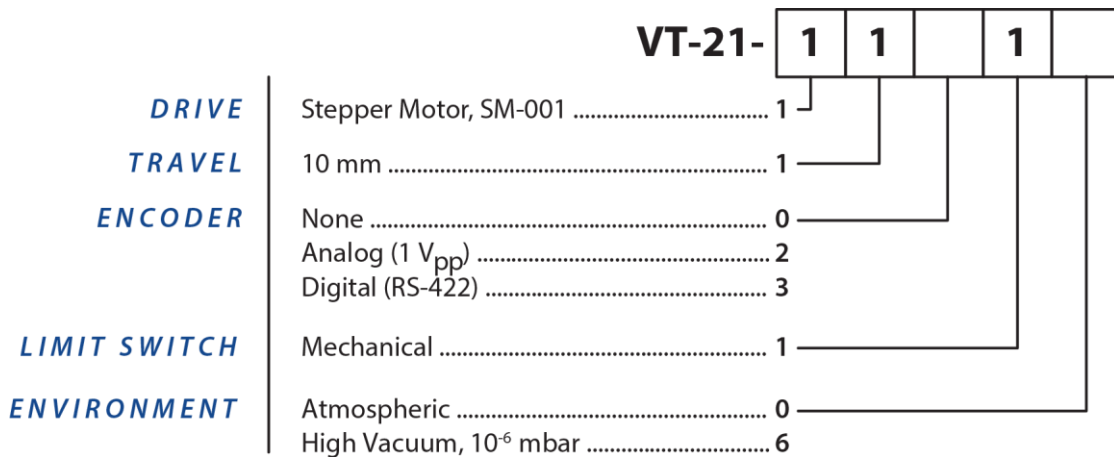
- MMC-200

### 1.4 Technical Data

See Datasheet.

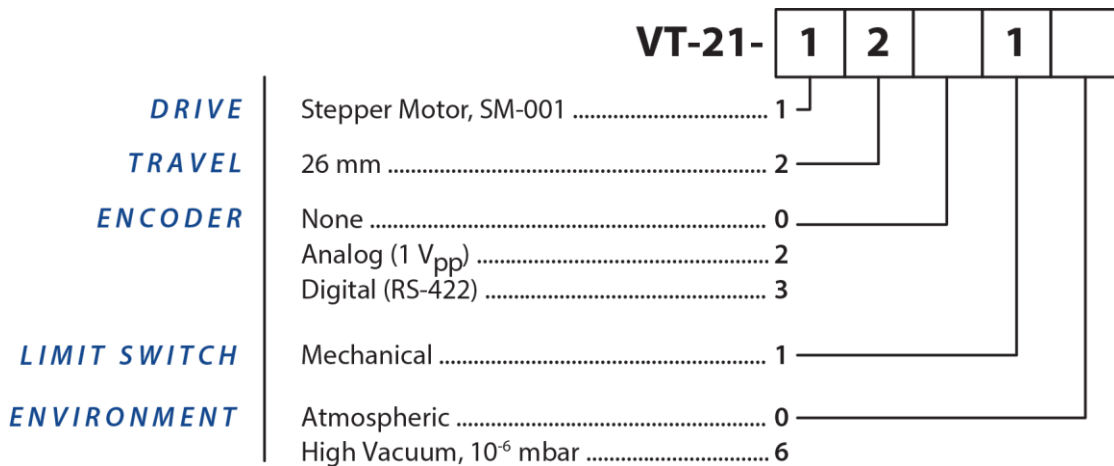
## 2. Model Configurations

### 2.1 VT-21S Order Numbers



Contact MICRONIX USA for custom version and stacking configurations.

### 2.2 VT-21L Order Numbers



Contact MICRONIX USA for custom version and stacking configurations.

### 3. Preparing to Install the VT-21S & L Stage

#### 3.1 Installation Preparation

When mounting the stage, it is important to consider the flatness of the mounting surface, as the stage will conform to the shape of that surface and affect the stage's performance and structural integrity. It is required to have a mounting surface with flatness less than the overall specified flatness of the base.

The stage is calibrated and guaranteed to be within specification at  $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$  unless otherwise specified. Be sure to use the stage under the following conditions:

- Mount to a clean surface which is free of debris, burrs or dings with a flatness to be less than the flatness of the base as specified on the product datasheet.
- An indoor atmosphere free of corrosive gases, excessive dust, and condensation.
- Temperature range of 5-40°C.
- Relative humidity between 20-80%.
- Locate away from water, heat, and electrical noise.

**Important:** Do not touch or manually turn the leadscrew, as this will contaminate the lubrication and jeopardize the longevity of the stage.

#### 3.2 Package Contents

If the product is damaged or there are missing components, contact MICRONIX USA immediately. Do not discard product packaging in case of return shipment.

**Package Should Contain:**

- VT-21 Linear Stage
- Reference Manual
- Any other previously agreed upon components such as a controller.

## 4. Installing the VT-21S & L Stage

Additional brackets and screws may be required for custom applications, see Section 6 for stacking configuration examples.

### 4.1 VT-21S 10mm Installation

#### 4.1.1 VT-21S Base Mounting

Base mounting pattern sample can be found in Section 5.3.1.

**Warning:** The stepper motor must be driven by a controller to reposition the carriage. Do not touch or manually turn the leadscrew, as this will contaminate the lubrication and jeopardize the longevity of the stage.

1. Align the stage to the mounting surface using two M1.5 dowel pins.
2. Secure the stage to the mounting surface using two M2.5 socket head cap screws at 0.35 Nm recommended torque.

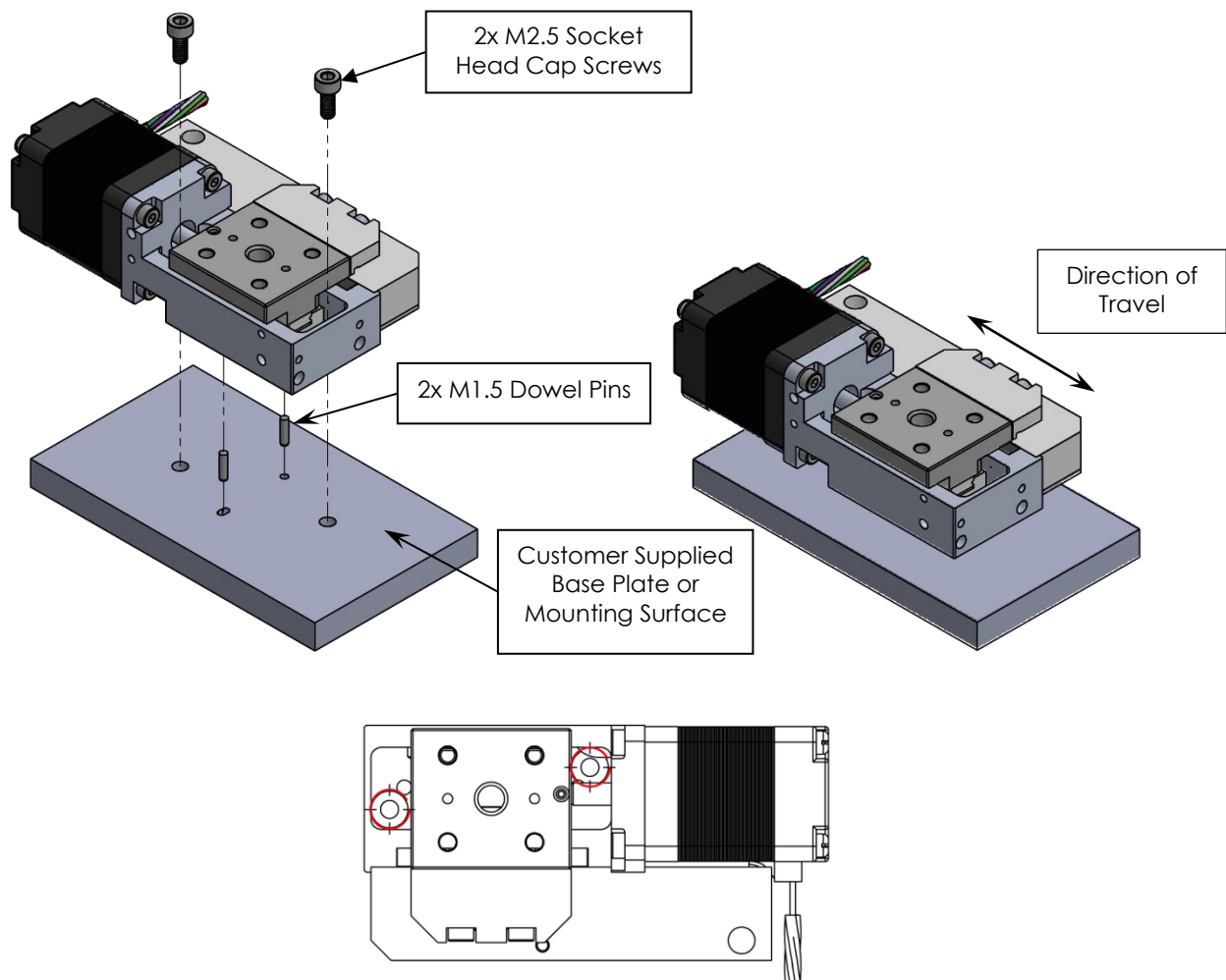


Figure 4-A. VT-21S Base Mounting Installation



#### 4.1.2 VT-21S Side Mounting

Side mounting pattern sample can be found in Section 5.3.2.

1. Align the stage to the mounting surface using at least two M1.5.
2. Secure the stage to the mounting surface using two M2.5 screws at 0.35 Nm recommended torque.

**Note:** It is important to not exceed a depth of 2.5 mm into the stage to avoid damage to the bearings.

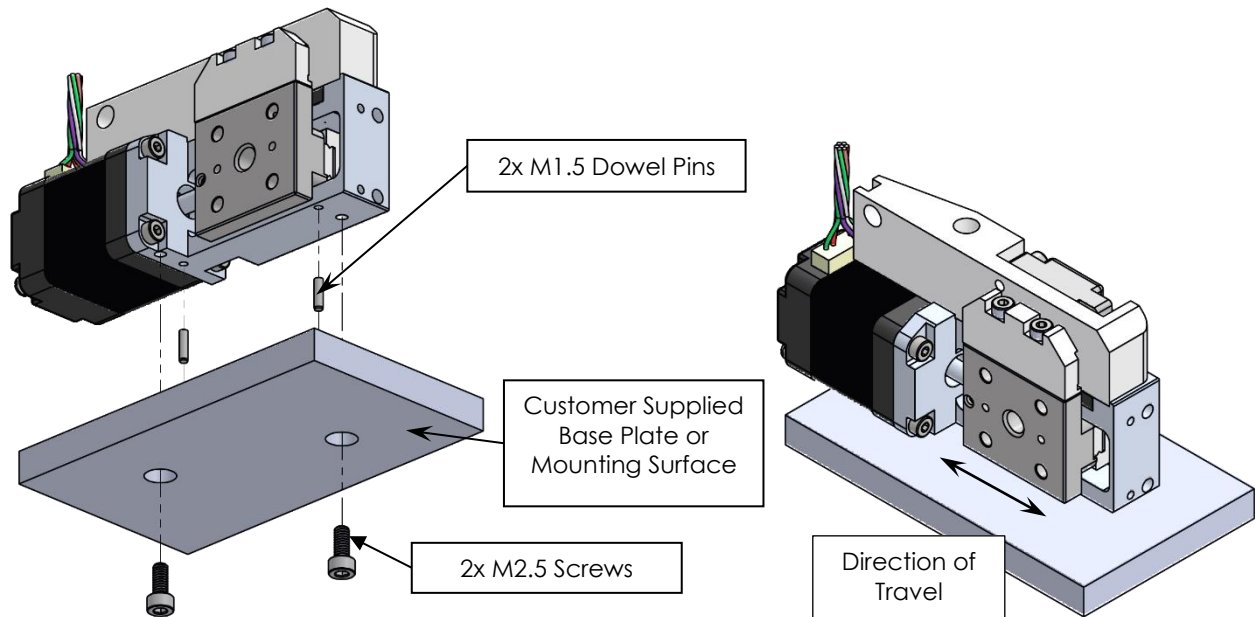


Figure 4-B. VT-21S Side Mounting Installation

### 4.1.3 VT-21S Front Mounting

Front mounting pattern sample can be found in Section 5.3.3.

1. Align the stage to the mounting surface using at least two M1.5 dowel pins.
2. Secure the stage to the mounting surface using two M2.5 Screws at 0.35 Nm recommended torque.

**Note:** It is important to not exceed a depth of 3mm into the stage to avoid damage to the bearings.

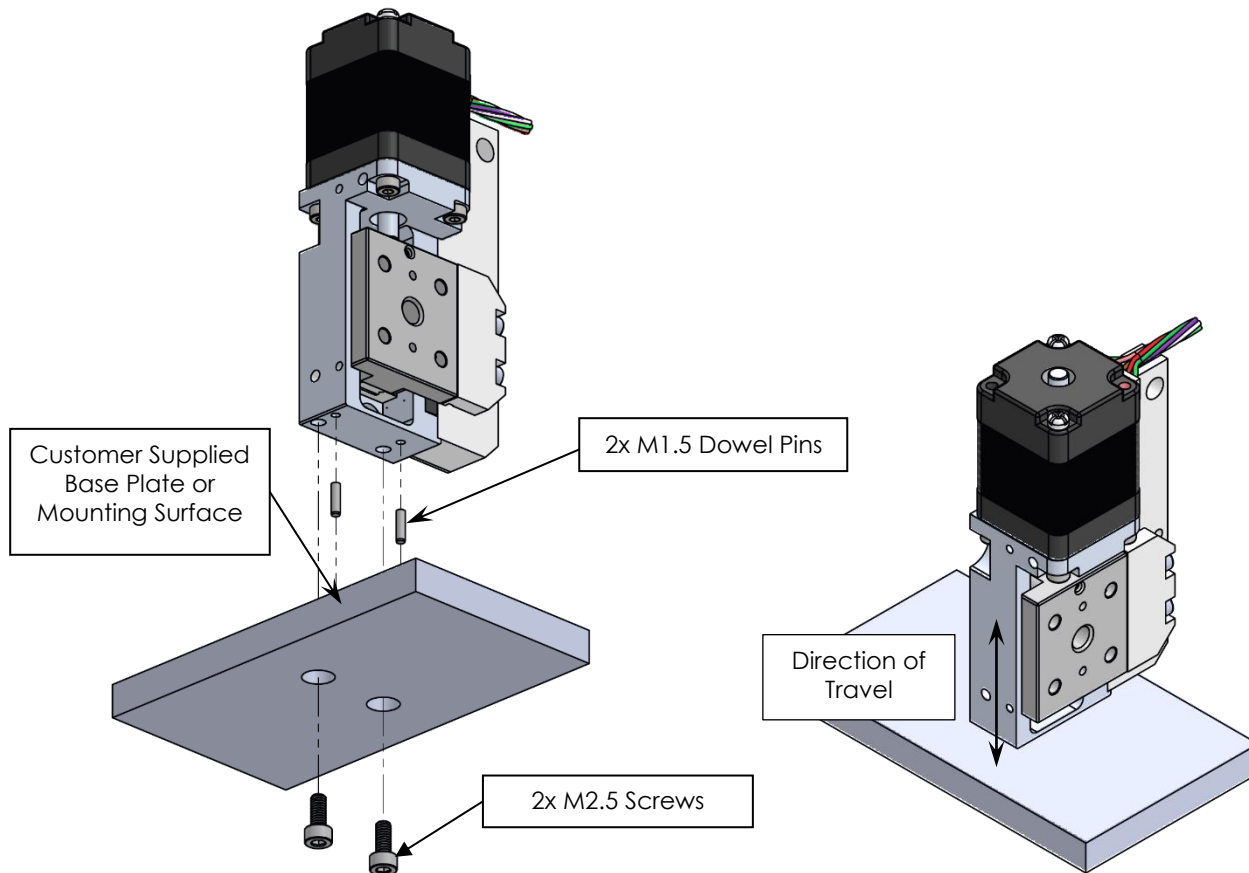


Figure 4-C. VT-21S Front Mounting Installation

## 4.2 VT-21L 26 mm Installation

### 4.2.1 VT-21L Base Mounting

**Warning:** The stepper motor must be driven by a controller to reposition the carriage. Do not touch or manually turn the leadscrew, as this will contaminate the lubrication and jeopardize the longevity of the stage.

Base mounting pattern sample can be found in Section 5.4.1.

1. Align the stage to the mounting surface using at least two M1.5 dowel pins.
2. Move the carriage to access the mounting holes. Secure the stage to the mounting surface using at least two M2.5 socket head cap screws at 0.35 Nm recommended torque.

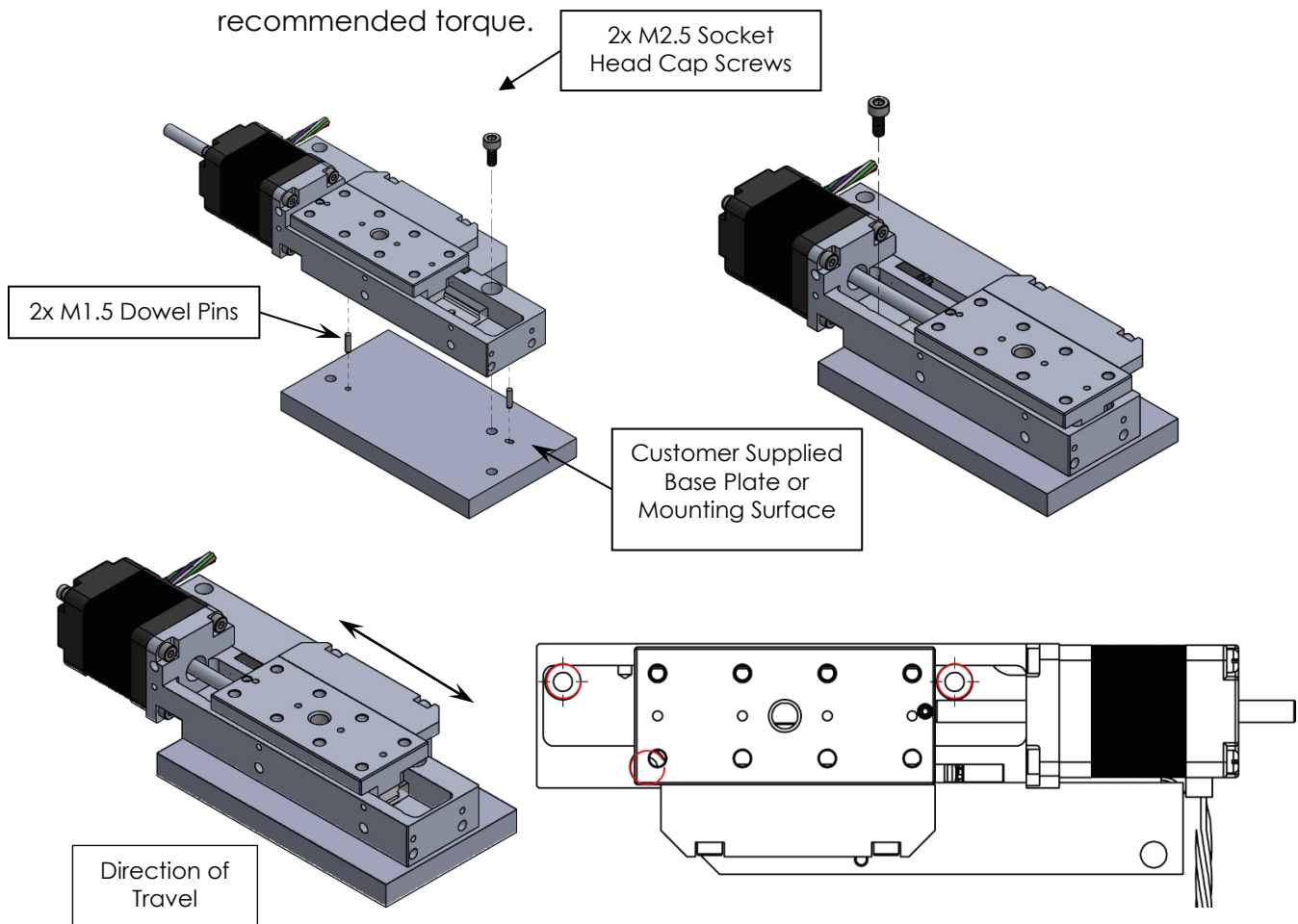


Figure 4-D. VT-21L Base Mounting Installation

#### 4.2.2 VT- 21L Side Mounting

Side mounting pattern sample can be found in Section 5.4.2.

1. Align the stage to the mounting surface using at least two M1.5 dowel pins.
2. Secure the stage to the mounting surface using three M2.5 screws at 0.35 Nm recommended torque.

**Note:** It is important to not exceed a screw depth of 2.5 mm into the stage to avoid damage to the bearings.

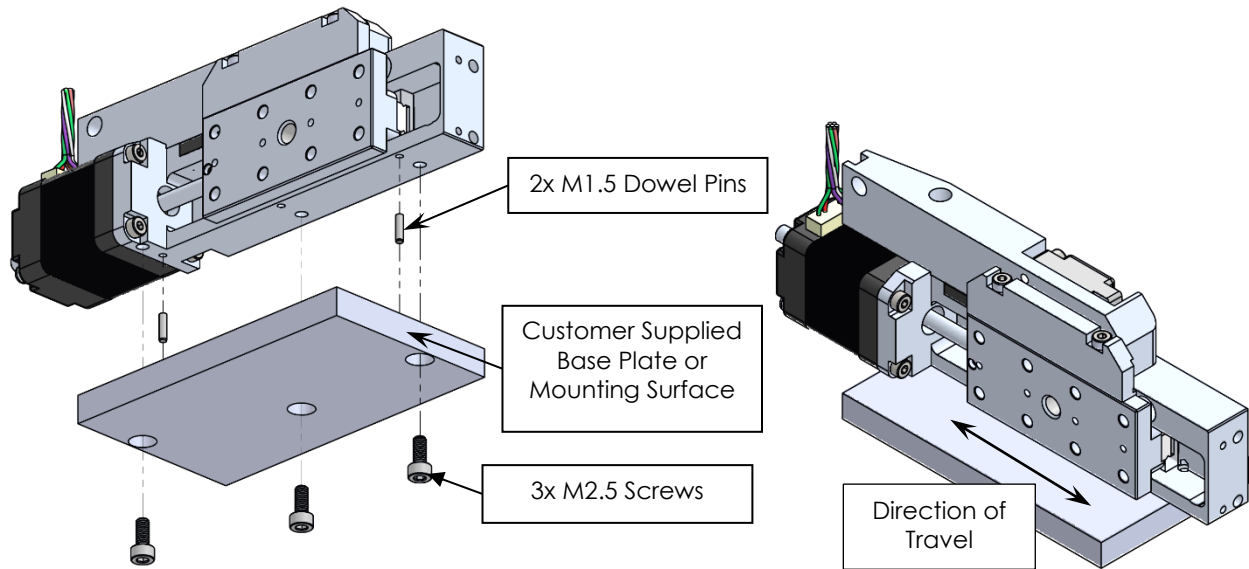


Figure 4-E. VT-21L, Side Mounting Installation

### 4.2.3 VT-21L Front Mounting

Front mounting pattern sample can be found in Section 5.4.3.

1. Align the stage to the mounting surface using at least two M1.5 x 6 mm dowel pins.
2. Secure the stage to the mounting surface using two M2.5 screws at 0.35 Nm recommended torque.

**Note:** It is important to not exceed a depth of 3 mm into the carriage to avoid damage to the bearings.

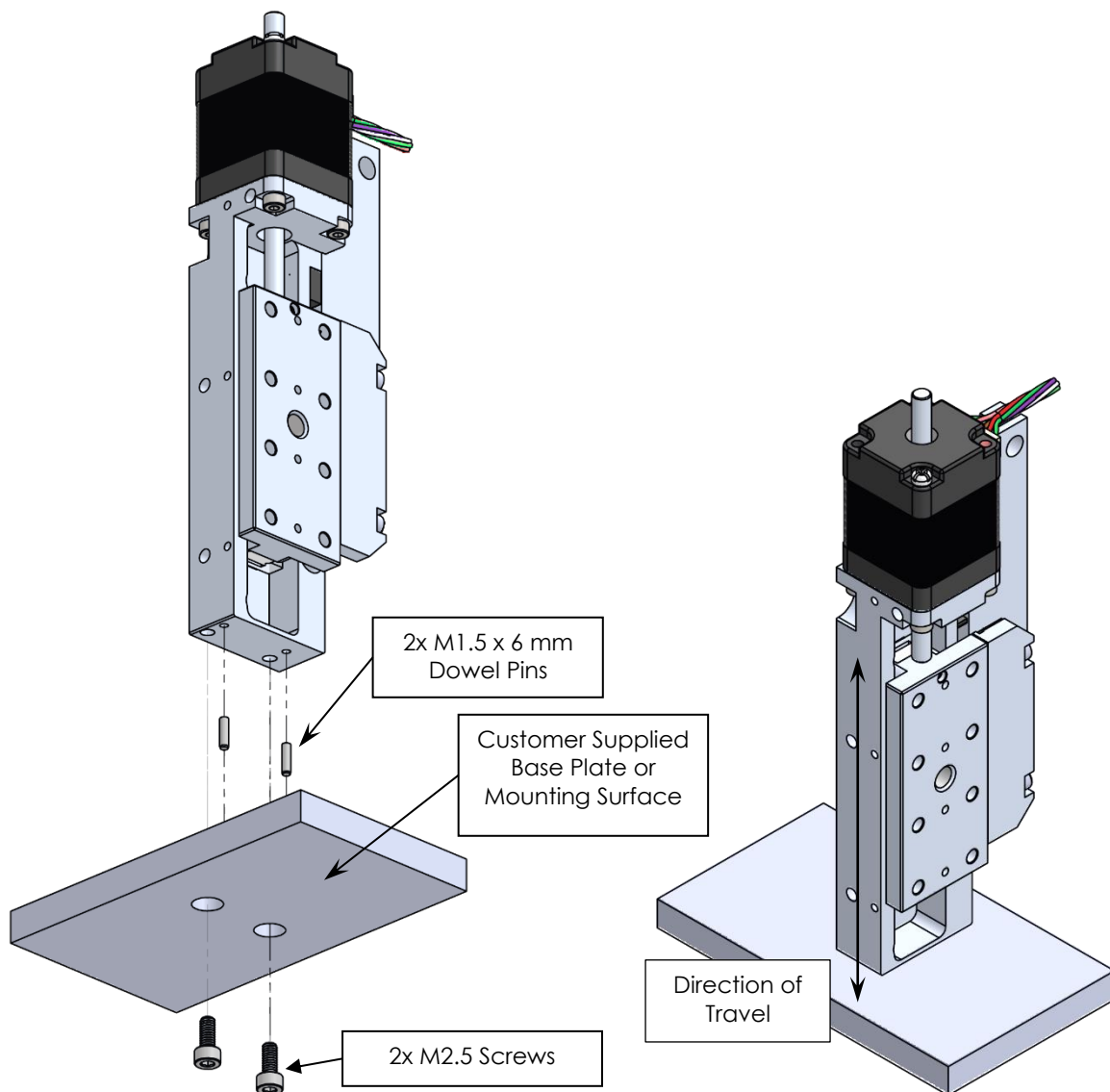


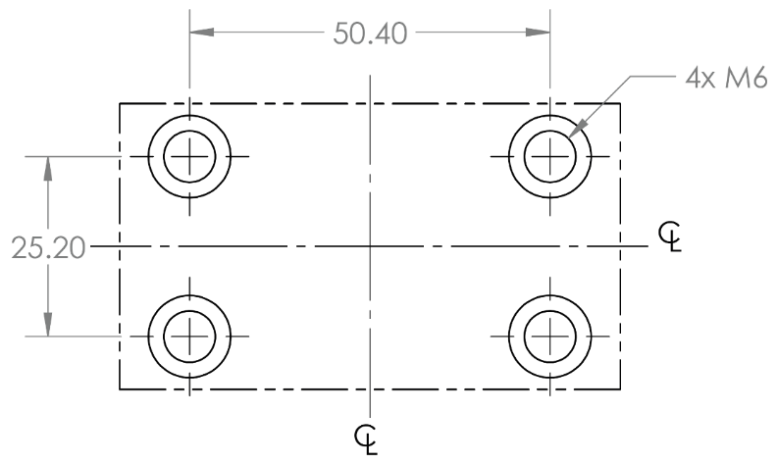
Figure 4-F. VT-21L, Front Mounting Installation

### 4.3 Optical Table Mounting

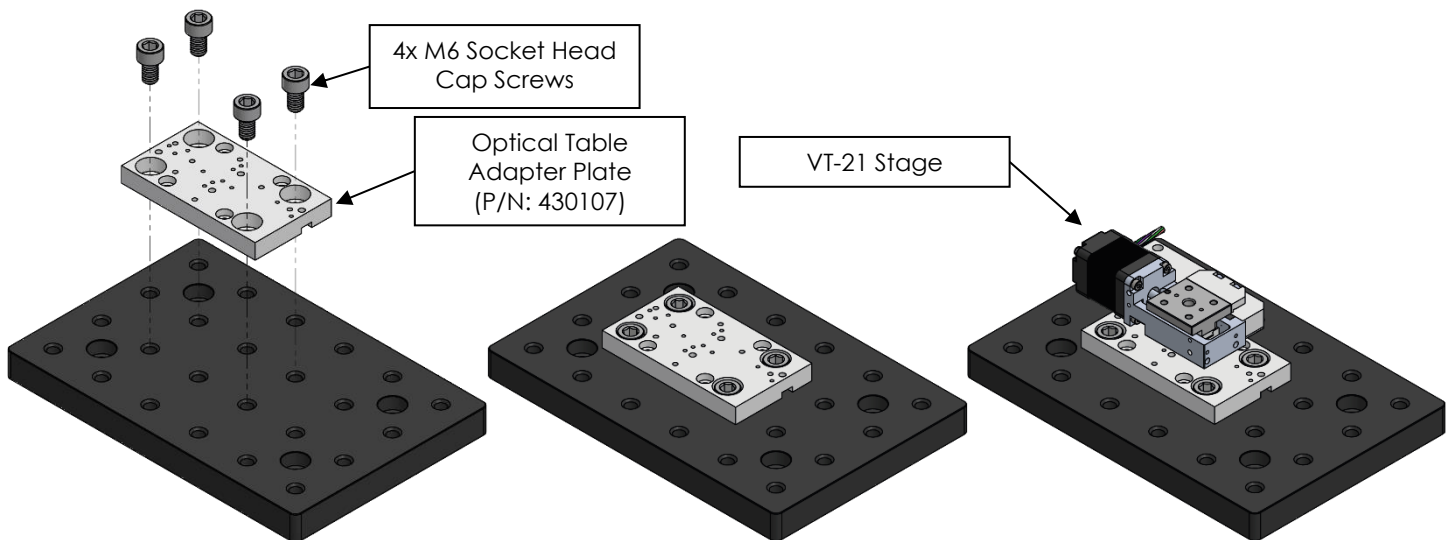
Optical table mounting requires an adapter plate (P/N: 430107) to attach the VT-21S or VT-21L stage to a metric or imperial optical table.

Optical table mounting pattern sample is shown below. To mount the stage to the adapter plate, follow the same mounting instructions as described in Sections 4.1, 4.2 depending on the mounting orientation.

**Note:** Ensure that all mounting screws are less than 8 mm in length to avoid damage to the stage, adapter plate, and/or optical table.



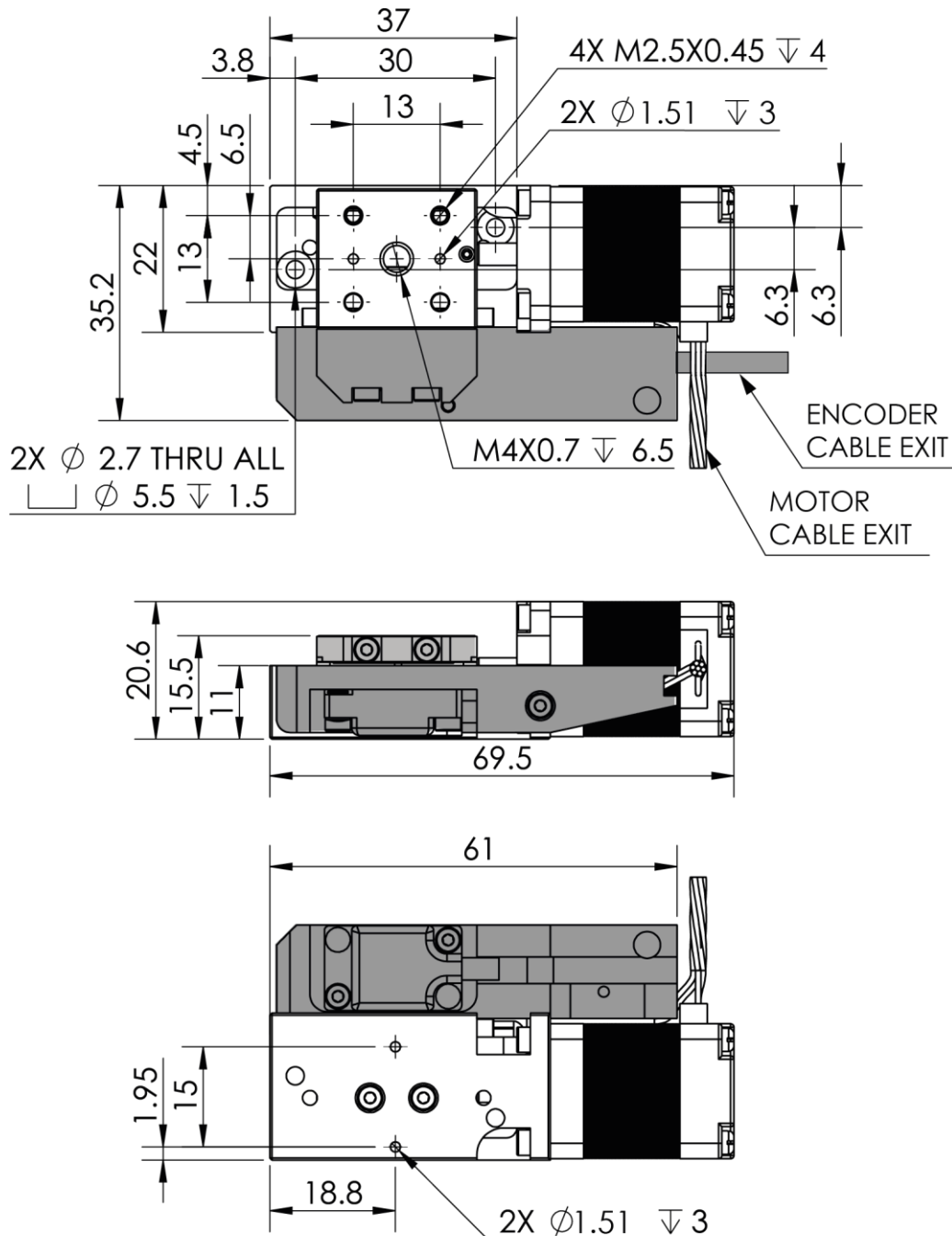
**Figure 4-G. VT-21, Adapter Plate (P/N: 430107) Mounting Pattern for Optical Table**



**Figure 4-H. VT-21, Optical Table Mounting Example**

5. Dimensions

5.1 VT-21S, 10mm



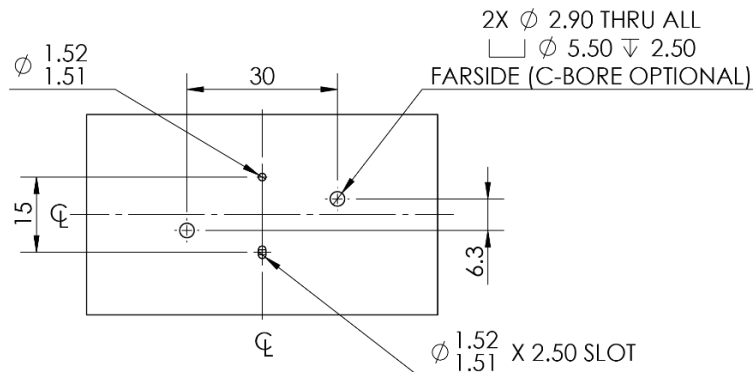
\* grey parts for closed loop version only  
 \* all dimensions are in millimeters



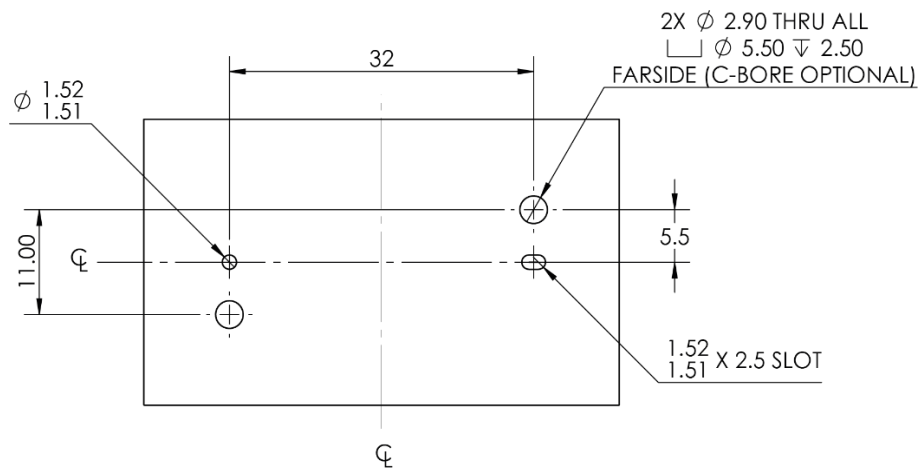


### 5.3 VT-21S Mounting Patterns

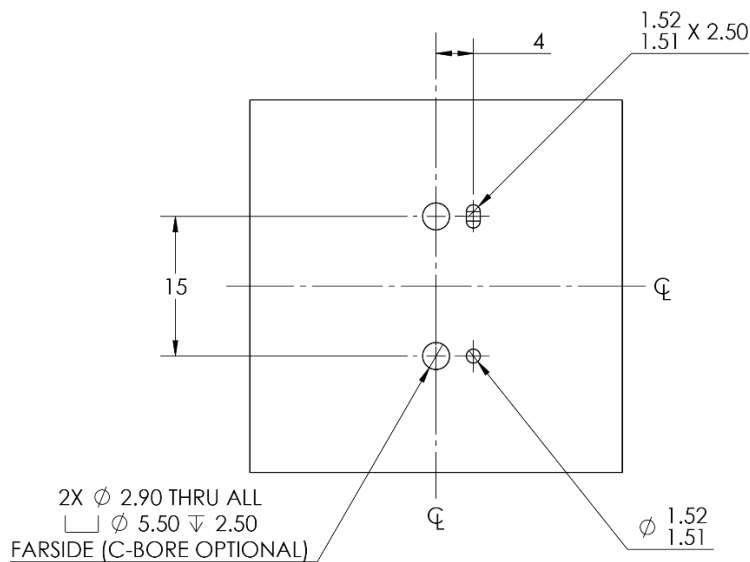
#### 5.3.1 General Mounting Pattern



#### 5.3.2 Side Mounting Pattern

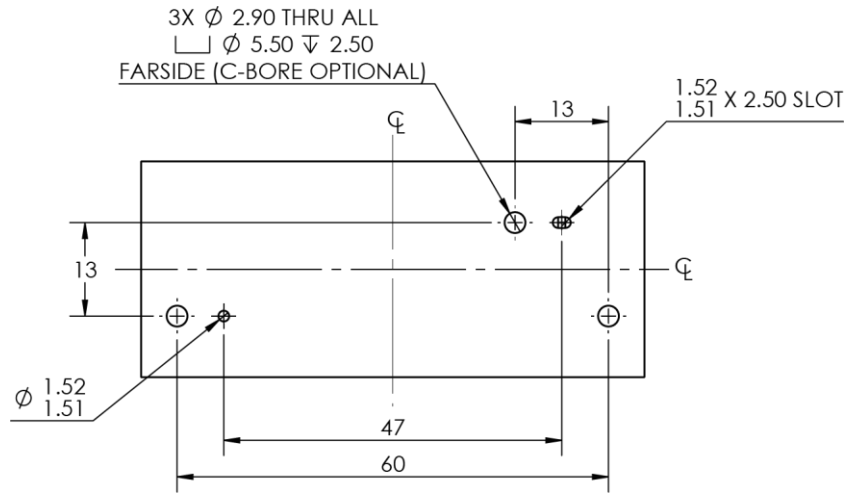


#### 5.3.3 Front Mounting Pattern

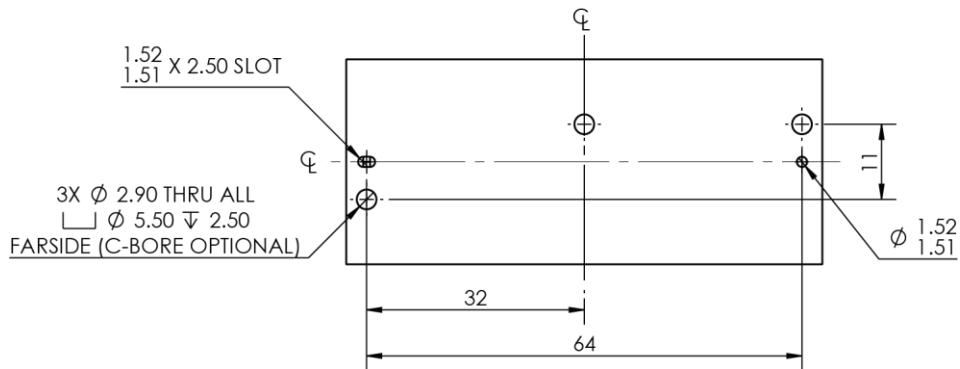


## 5.4 VT-21L Mounting Patterns

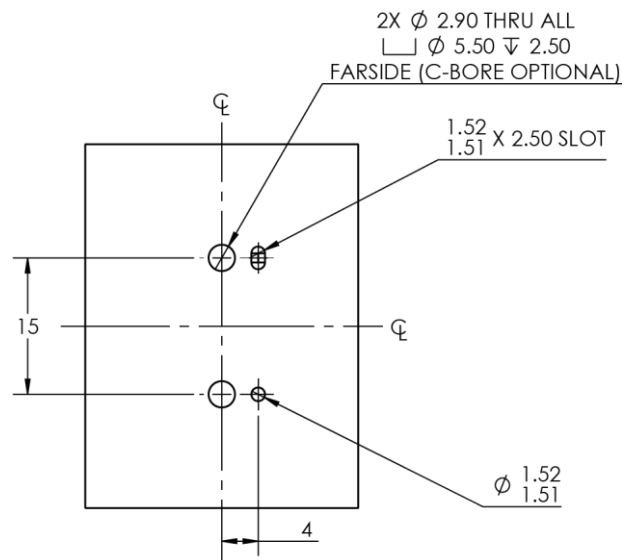
### 5.4.1 General Mounting Pattern



### 5.4.2 Side Mounting Pattern



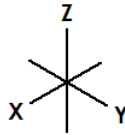
### 5.4.3 Front Mounting Pattern



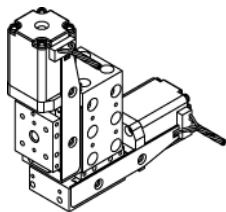
## 6. Stacking Configurations

### 6.1 Configuration Examples

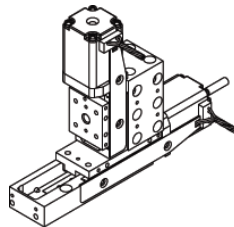
- Additional configurations available upon request
- Note: Stacking compatibility for all length configurations.
- Positioning according to:



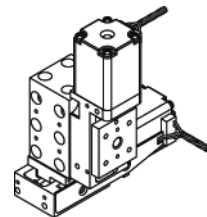
**Using Adapter Block (P/N: 430141)**



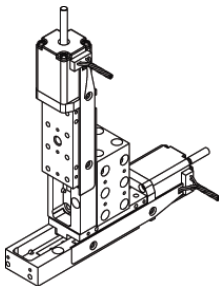
X-Z 10x10 mm



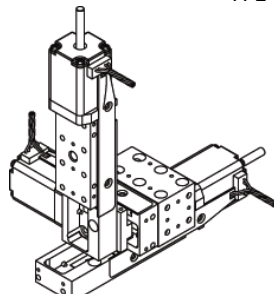
X-Z 26x10 mm



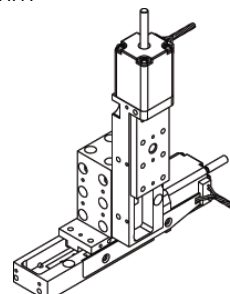
X-Z 10x10 mm



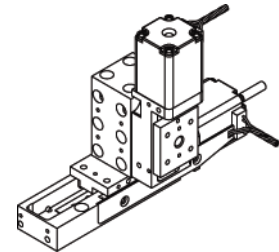
X-Z 26x26 mm



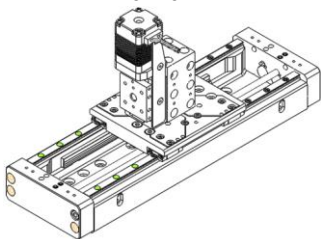
X-Y-Z 26x26x26 mm



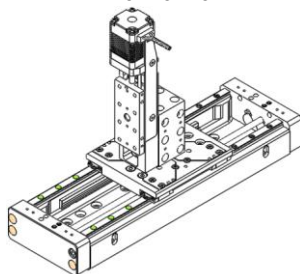
X-Z 26x26 mm



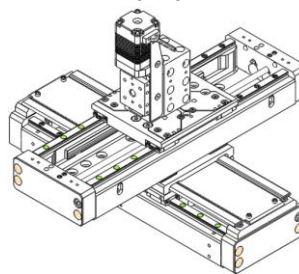
X-Z 26x10 mm



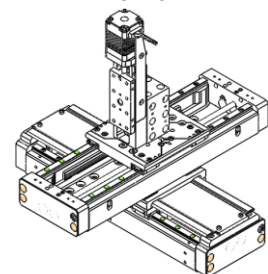
X-Z 100x10mm  
[with PPS-60 Linear Stage]



X-Z 100x26mm  
[with PPS-60 Linear Stage]

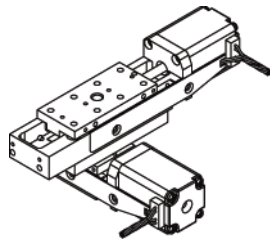


X-Y-Z 100x100x10mm  
[with PPS-60 Linear Stages]

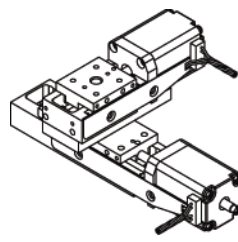


X-Y-Z 100x100x26  
[with PPS-60 Linear Stages]

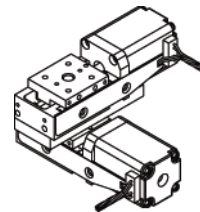
### Using: Adapter Plate (P/N: 430169)



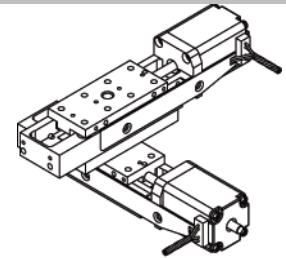
X-Y 10x26 mm



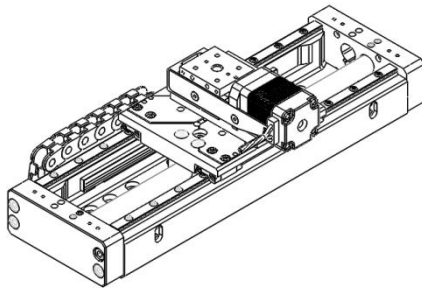
X-Y 26x10 mm



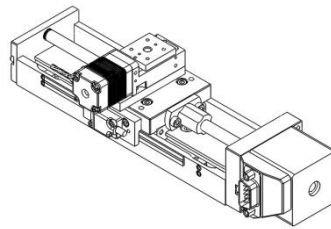
X-Y 10x10mm



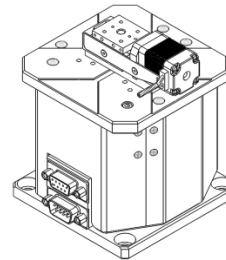
X-Y 26x26 mm



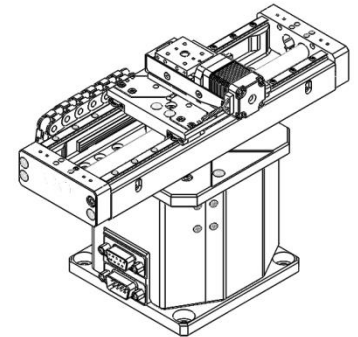
X-Y 100x10mm  
[with PPS-60 Linear Stage]



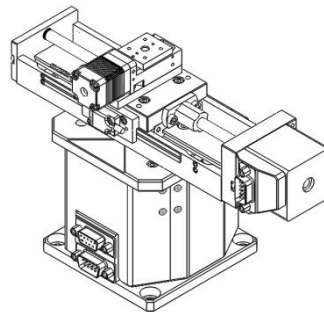
X-Y 10x100mm  
[with VT-50 Linear Stage]



Y-Z 10x35mm  
[with PZS-90  
Elevation Stage]

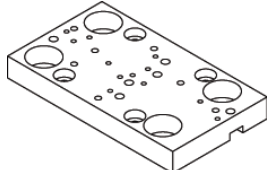
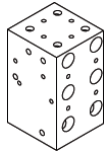
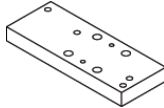


X-Y-Z 100x10x35mm  
[with PPS-60 Linear Stage  
& PZS-90 Elevation Stage]



X-Y-Z 10x100x35mm  
[with VT-50 Linear Stage  
& PZS-90 Elevation Stage]

## 6.2 Accessories

430107 Adapter Base Plate, Table	430141 Adapter Block	430169 Adapter Plate, XY, Base
		
<p>Used for mounting to an optical table with 1" or 25mm square hole patterns</p>	<p>Used in X-Y or X-Z configurations</p>	<p>Used for X-Y configurations, attaches carriage to base</p>

## 7. Connecting the VT-21S & L Stage

### 7.1 Atmospheric Environments

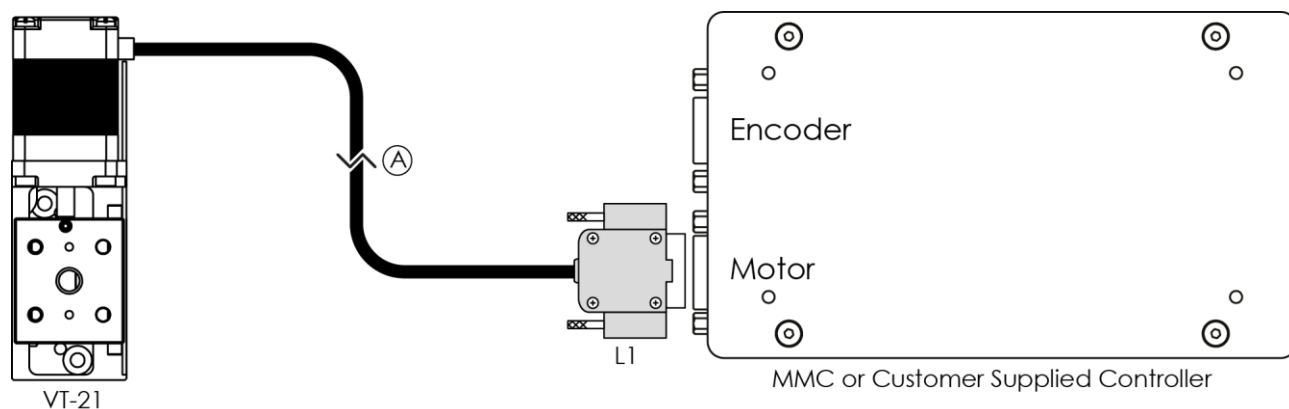
For controller information refer to the appropriate MMC controller manual.

#### 7.1.1 Open Loop, Atmospheric Wiring Diagram

Connecting the VT-21 in an open loop only requires that the motor cable be connected to a compatible controller. No other cables or components are required.

##### Cable Descriptions:

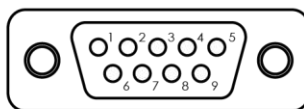
- A. Motor Cable (Male Dsub9 Pin, 1m Black Sleeved Cable)



**Figure 7-A. VT-21, Open Loop, Atmospheric Wiring Diagram**

#### 7.1.1.1 Open Loop Atmospheric Pinout

	Pinout for VT-21-11010/12010		Cable A
	Description:	Color	DE-9P L1
Motor A	Motor Phase A+	Green	1
	Motor Phase A-	Green & White	2
	Motor Phase B+	Red & White	3
	Motor Phase B-	Red	4
	Limit Ground	Brown	5
	Limit Switch-	White	6
	Limit Switch+	Violet	7
	Shield	-	Casing



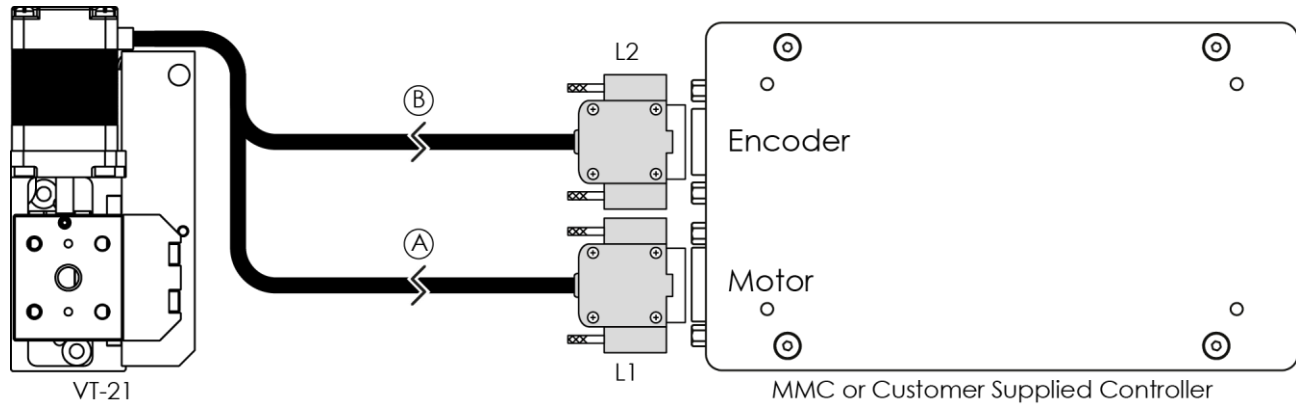
Male Dsub9 Connector (DE-9P) - Front View

**7.1.2 Closed Loop (Encoder), Atmospheric Wiring Diagram**

Using the VT-21 stage with an encoder requires a closed loop compatible controller that recognizes the proper type of encoder feedback. Connect the stage as shown below. See 7.1.2.1 & 7.1.2.2 for analog and digital pinouts respectively.

**Cable Descriptions:**

- A. Motor Cable (Male Dsub9 Pin, 1m Black Sleeved Cable)
- B. Encoder Cable (Female Dsub9 Pin Module, 1m PVC Black Cable)

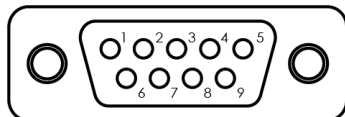


**Figure 7-B. VT-21 Closed Loop Version, Atmospheric Wiring Diagram**

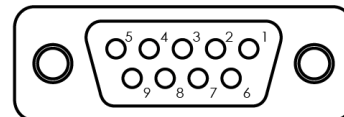
**7.1.2.1 Analog Encoder Atmospheric Pinout**

Pinout for VT-21-11210/12210		Cable A DE-9P
Description:	Color	L1
Motor Phase A+	Green	1
Motor Phase A-	Green & White	2
Motor Phase B+	Red & White	3
Motor Phase B-	Red	4
Limit Ground	Brown	5
Limit Switch-	White	6
Limit Switch+	Violet	7
Shield	-	Casing

Pinout for VT-21-11210/12210		Cable B DE-9S
Description:	Color	L2
Cos+	Brown	1
Sin+	Blue	2
Index+	Violet	3
GND	Grey	4
+5V	White (Grey TP)	5
Cos-	White (Brown TP)	6
Sin-	White (Blue TP)	7
Index-	White (Violet TP)	8
Shield	-	Casing



**Male** Dsub9 Connector (DE-9P) - Front View



**Female** Dsub9 Connector (DE-9S) - Front View

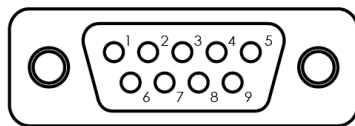
7.1.2.2 Digital Encoder Atmospheric Pinout

Pinout for VT-21-11310/12310		Cable A Dsub9M
Description:	Color	L1
Motor Phase A+	Green	1
Motor Phase A-	Green & White	2
Motor Phase B+	Red & White	3
Motor Phase B-	Red	4
Ground	Brown	5
Limit Switch-	White	6
Limit Switch+	Violet	7
Shield	-	Casing

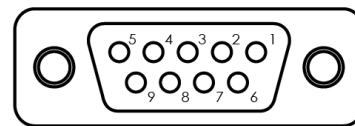
Motor  
A

Pinout for VT-21-11310/12310		Cable B Dsub9F
Description:	Color	L2
A+	Brown	1
B+	Blue	2
Index+	Violet	3
GND	Grey	4
+5V	White (Grey TP)	5
A-	White (Brown TP)	6
B-	White (Blue TP)	7
Index-	White (Violet TP)	8
Shield	-	Casing

Encoder  
B & C



**Dsub9M** - Front View  
9 Pin Male Connector



**Dsub9F** - Front View  
9 Pin Female Connector

## 7.2 Vacuum Environments

### 7.2.1 Handling and Preparation

When handling the stage for vacuum environments, take the necessary precautions, such as wearing clean latex gloves, clean room, clothing, etc. Avoid any contaminants. Maximum bake-out temperature is 100°C. MICRONIX USA optionally supplies the stage with vacuum compatible connectors, see chart below.

Connector Description	Connector Material	Contacts	Backshell
High Vacuum Glass- filled Dyathilate D-Subminiature	DAP	T2 Female Crimps, Gold Pins (Accuglass P/N: 111652)	Nickle-plated Zinc Backshell Strain Relief
Ultra High Vacuum D-Subminiature	PEEK	T1 Female Crimps, Gold Pins (Accuglass P/N: 100180)	PEEK UHV Strain Relief

Environment	Open Loop	Closed Loop
High Vacuum ( $10^{-6}$ mbar)	9 Pin Female DAP	15 Pin Female DAP
Ultra-High Vacuum ( $10^{-9}$ mbar)	9 Pin Female PEEK	15/25 Pin Female PEEK

Connecting the VT-21 in an open loop requires the use of a feed through connector at the vacuum chamber wall.

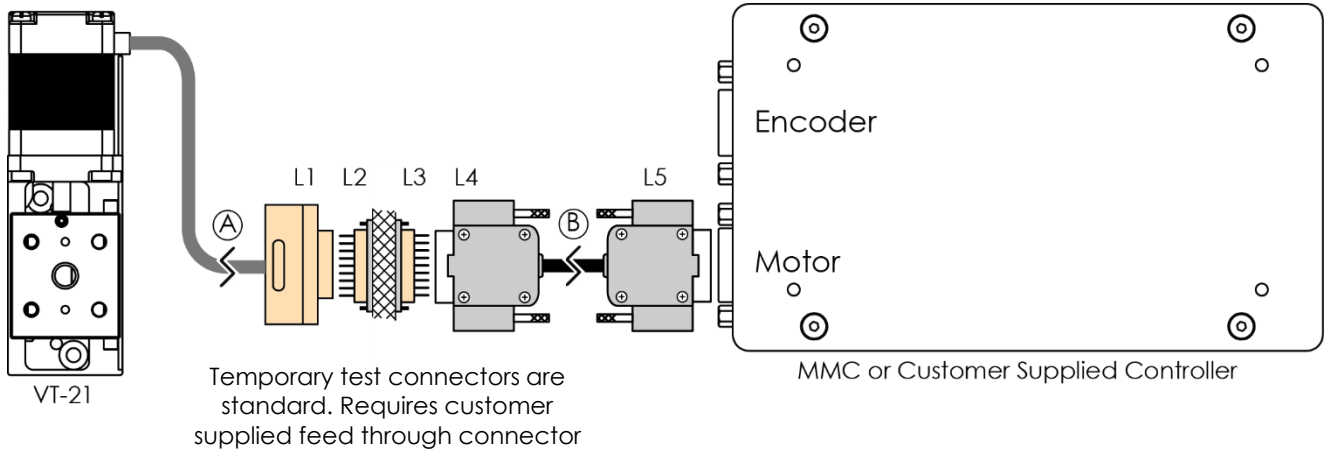
The vacuum compatible VT-21 will be supplied with wiring for a straight through feed through not a cross over gender changer. MICRONIX USA supplies test connectors that simulate the vacuum feed through to allow for functionality testing prior to installation in a vacuum chamber, see the Appendix section A.1.1 for feedthrough pins.



7.2.2 Open loop, Vacuum Wiring Diagram

**Cable Descriptions:**

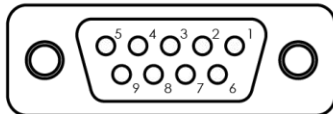
- A. Motor Cable (Female Dsub9 Pin PEEK or DAP, 1.5m Silver Braided Cable)
- B. Atmospheric Motor Cable (Female Dsub9 Pin to Male Dsub9 Pin, 1.5m PVC Black Cable)



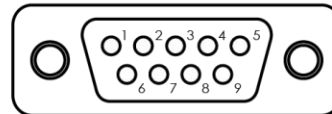
**Figure 7-C. VT-21, Open Loop, Vacuum Wiring Diagram**

7.2.2.1 Open loop, Vacuum Pinout

Pinout for VT-21-11016/12016		Cable A			Cable B			
		DE-9S	DE-9P	DE-9P	DE-9S	DE-9P		
Motor	Description:	Color	L1	L2	L3	Color	L4	L5
	Motor Phase A+	Green	5	5	1	Brown/White (Brown TP)	1	1
	Motor Phase A-	Green & White	4	4	2	Green/White (Green TP)	2	2
	Motor Phase B+	Red & White	3	3	3	Violet/White (Violet TP)	3	3
	Motor Phase B-	Red	2	2	4	Grey/White (Grey TP)	4	4
	Limit Ground	Brown	1	1	5	Black	5	5
	Limit Switch-	White	9	9	6	Blue	6	6
	Limit Switch+	Violet	8	8	7	White (Blue TP)	7	7
	Shield	-	6	6	9	-	9	Casing



Female Dsub9 Connector (DE-9S) - Front View



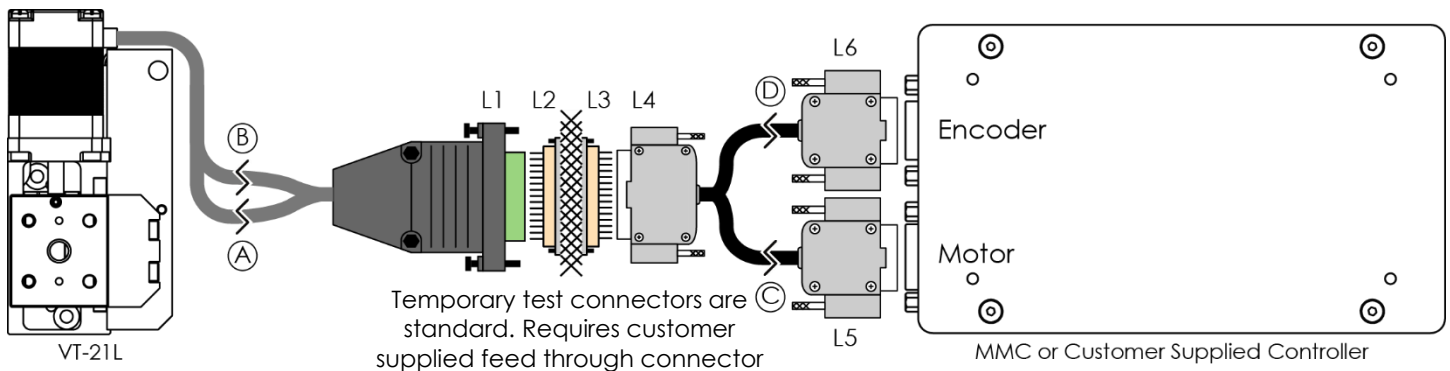
Male Dsub9 Connector (DE-9P) - Front View

**7.2.3 Closed Loop (Encoder), Vacuum Wiring Diagram**

For details regarding the pin-out, see the 7.2.3.1 & 7.2.3.1 for Analog and Digital respectively.

**Cable Descriptions:**

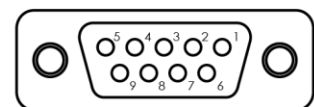
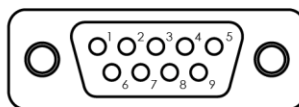
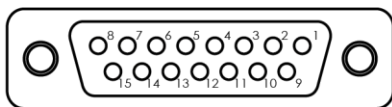
- A. Motor Vacuum Cable (Female Dsub 15 Pin DAP, 1.5m Silver Braided Cable)
- B. Encoder Vacuum Cable (Female Dsub 15 Pin DAP, 1.5m Silver Braided Cable)
- C. Motor Breakout Cable (Female Dsub 15 Pin to Male Dsub 9 Pin, 1.5m PVC Black Cable)
- D. Encoder Breakout Cable (Female Dsub 15 Pin to Female Dsub 9 Pin, 1.5m PVC Black Cable)



**Figure 7-D. VT-21, Closed Loop, Vacuum Wiring Diagram**

**7.2.3.1 Analog Encoder Vacuum Pinout**

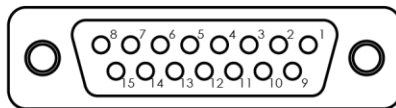
Pinout for VT-21-11216/12216		Cables A&B			Feedthrough			Cable C			Cable D
		DA-15S	DA-15S	DA-15P	DA-15P	DA-15S	DE-9P	DE-9S	DA-15S	DE-9P	DE-9S
<b>Motor A&amp;C</b>	<b>Description:</b>	<b>Color</b>	<b>L1</b>	<b>L2</b>	<b>L3</b>	<b>Color</b>	<b>L4</b>	<b>L5</b>	<b>L6</b>		
	Motor Phase A+	Green	1	1	8	Brown/White (Brown TP)	8	1	-		
	Motor Phase A-	Green/White	9	9	15	Green/White (Green TP)	15	2	-		
	Motor Phase B+	Red/White	2	2	7	Violet/White (Violet TP)	7	3	-		
	Motor Phase B-	Red	10	10	14	Grey/White (Grey TP)	14	4	-		
	Ground	Brown	12	12	12	Black	12	5	-		
	Limit Switch-	White	3	3	6	Blue	6	6	-		
	Limit Switch+	Violet	11	11	13	White (Blue TP)	13	7	-		
<b>Encoder B&amp;D</b>	Sin-	White (Blue TP)	8	8	1	White (Blue TP)	1	-	7		
	Cos+	Brown	7	7	2	Brown	2	-	1		
	Index+	Violet	6	6	3	Violet	3	-	3		
	+5V	White (Grey TP)	5	5	4	White (Grey TP)	4	-	5		
	Sin+	Blue	15	15	9	Blue	9	-	2		
	Cos-	White (Brown TP)	14	14	10	White (Brown TP)	10	-	6		
	Index-	White (Violet TP)	13	13	11	White (Violet TP)	11	-	8		
	Ground	Grey	12	12	12	Grey	12	-	4		
	Shield	-	4	4	5	-	4	-	Casing		



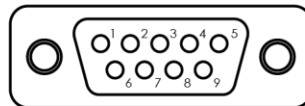
**Female Dsub15 Connector (DA-15S) - Front View    Male Dsub9 Connector (DE-9P) - Front View    Female Dsub9 Connector (DE-9S) - Front View**

7.2.3.1 Digital Encoder Vacuum Pinout

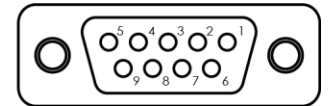
Pinout for VT-21-11316/12316		Cables A&B			Feedthrough		Cable C		Cable D
		Dsub15F	Dsub15M		Dsub15M		Dsub15F	Dsub9M	Dsub9F
Description: Color		L1	L2	L3	Color	L4	L5	L6	
<i>Motor A&amp;C</i>	Motor Phase A+ Green	1	1	8	Brown/White (Brown TP)	8	1	-	
	Motor Phase A- Green/White	9	9	15	Green/White (Green TP)	15	2	-	
	Motor Phase B+ Red/White	2	2	7	Violet/White (Violet TP)	7	3	-	
	Motor Phase B- Red	10	10	14	Grey/White (Grey TP)	14	4	-	
	Ground Brown	12	12	12	Black	12	5	-	
	Limit Switch- White	3	3	6	Blue	6	6	-	
	Limit Switch+ Violet	11	11	13	White (Blue TP)	13	7	-	
<i>Encoder B&amp;D</i>	A+ Brown	7	7	2	Brown	2	-	1	
	B+ Blue	15	15	9	Blue	9	-	2	
	Index+ Violet	6	6	3	Violet	3	-	3	
	GND Grey	12	12	12	Grey	12	-	4	
	+5V White (Grey TP)	5	5	4	White (Grey TP)	4	-	5	
	A- White (Brown TP)	14	14	10	White (Brown TP)	10	-	6	
	B- White (Blue TP)	8	8	1	White (Blue TP)	1	-	7	
	Index- White (Violet TP)	13	13	11	White (Violet TP)	11	-	8	
	Shield -	4	4	5	-	5	-	Casing	



Dsub15F - Front View  
15 Pin Female Connector



Dsub9M - Front View  
9 Pin Male Connector



Dsub9F - Front View  
9 Pin Female Connector

## 8. Supplementary Information

### 8.1 Maintenance

- The VT-21 series of linear stages utilizes a maintenance free design. Do not modify the stage or perform any maintenance unless specifically instructed to do so by MICRONIX USA personnel. If the stage is not performing up to the original specifications, please contact MICRONIX USA.
- The VT-21 linear stage is a precision mechanical device and should be handled with care. Do not drop or mishandle the stage.
- Keep hands clear of all moving parts while the stage is in motion to avoid personal injury.
- Do not touch the leadscrew, as this will contaminate the lubrication and jeopardize the longevity of the stage.
- **Caution: Do not manually rotate the leadscrew.** The leadscrew does not rotate in this stage. Using pliers or other tools to attempt to rotate the leadscrew may cause permanent damage to the stage.
- Follow the *Safe Operating Environment* requirements and use proper cable management to ensure a clean and safe operating environment.
- Properly wire the feedback to the controller before powering on the stage. Failure to do so can result in damage to the stage.

### 8.2 Units and Conventions

All measurements in this document are in the metric system of units.

Metric Unit	English Unit
1 millimeter	0.0394 inches
1 micron	0.0000394 inches
1 Newton	0.2248 lbs
1 Newton-meter	8.85 in-lbs

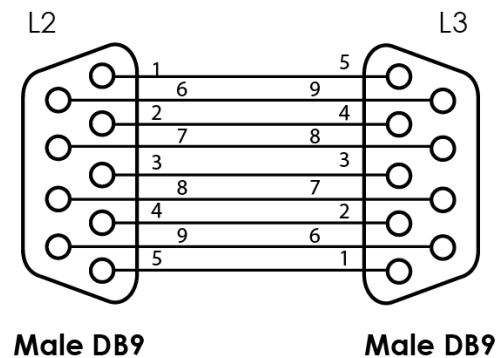
A. Appendix

A.1 Stepper Motor Operating Specifications

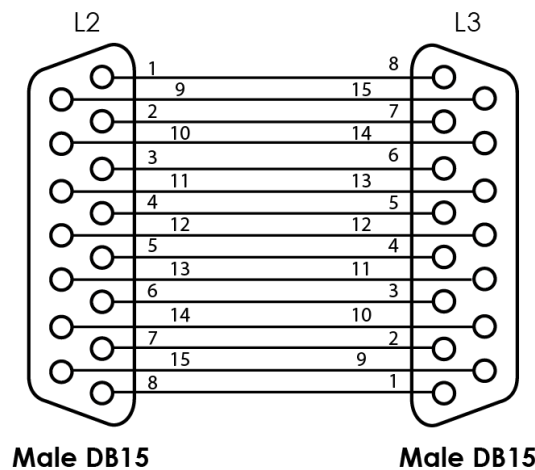
Motor Type	2 Phase Bipolar
Phase Current	0.24 A max.
Step Angle	1.8 °
Steps	200
Coil-Resistance	20.4 Ohms
Coil-Inductance	5 mH
Pitch	0.5 mm/rev
Resolution/Full step	2.5 μm

A.1.1 Feedthrough

**Straight Through 9-Pin Feed-through**



**Straight Through 15-Pin Feed-through**



## A.2 Limit Switches

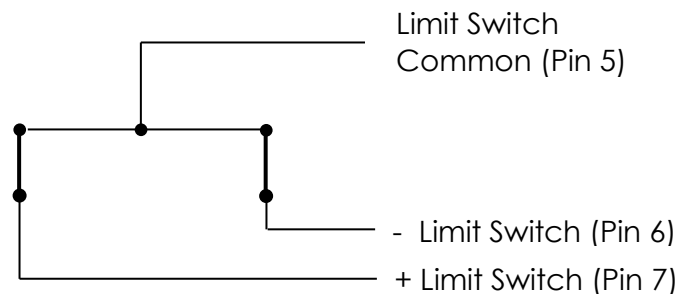
The limit switches are normally closed (when not activated) and should be connected to a compatible controller that recognizes these settings. Failure to properly set up the limit switches in the controller can result in physical damage to the switches themselves. A hard stop is designed into the VT-21 body which will prevent the carriage from running away should the limit switches fail.

The limit switches are factory calibrated to ensure advertised travel length and cannot be adjusted by the customer. For custom travel lengths, please contact MICRONIX USA.

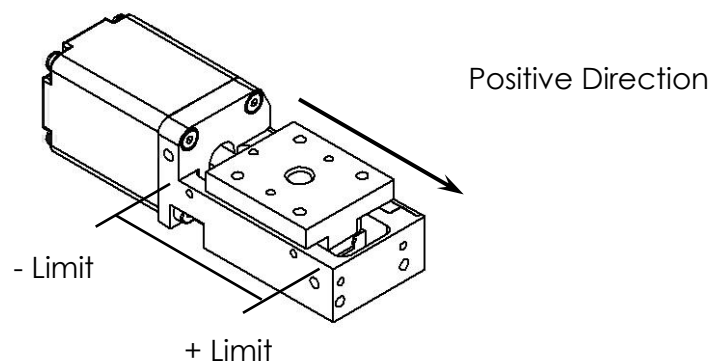
### A.2.1 Mechanical Limit Switches Operating Specifications

Contact Rating	100 mA @ 30 V
Contact Type	Normally Closed
Operating Temperature	-25 to +70 °C

### A.2.2 Limit Switch Schematic



#### 8.2.1.1 Direction of Motion



VT-21 Shown in center position

### A.3 Using an Analog Encoder

#### A.3.1 Encoder Overview

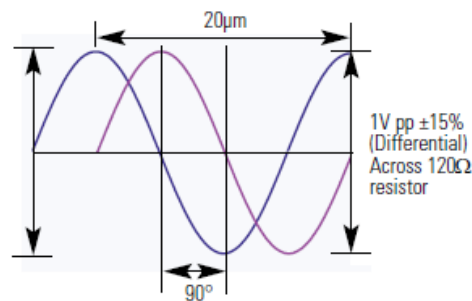
The VT-21 with Analog Encoder will need to be paired with an appropriate controller. The MMC-200 has an Analog option. The VT-21 with an analog encoder will be supplied with a 9-pin connector that incorporates these encoder signals.

Pin	Description
1	Cos+
2	Sin+
3	Index +
4	Ground
5	+5V
6	Cos-
7	Sin-
8	Index -
9	Not in Use

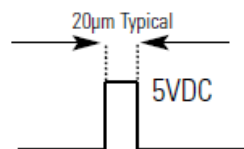
#### A.3.2 Encoder Operating and Electrical Specifications

Power Supply	5VDC $\pm$ 5% @ 330mA (60mA for sensor)
Operating Temperature	0 to 70°C
Humidity	10 - 90% RH non-condensing

#### A.3.3 Analog Output (Pins 1,2,6, and 7)



#### A.3.4 Index Window



#### A.3.5 Resolution

All closed loop stages are supplied with 20µm scales. The interpolation is done in the MMC-200 to a higher resolution as specified in the order. With an analog encoder the MMC-200 has an achievable resolution of 50nm.

## A.4 Using the Digital Encoder

### A.4.1 Encoder Overview

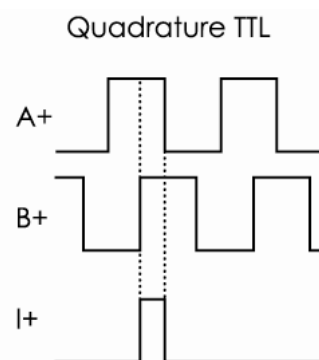
The VT-21 with Digital Encoder will need to be paired with an appropriate controller. The MMC-200 has a Digital option. The VT-21 with an digital encoder will be supplied with a 9-pin connector that incorporates these encoder signals.

Pin	Description
1	A+
2	B+
3	Index +
4	Ground
5	+5V
6	A-
7	B-
8	Index -
9	Not in Use

### A.4.2 Operating and Electrical Specifications

Power Supply	5VDC $\pm$ 5% @ 330mA (30mA for sensor)
Operating Temperature	0 to 70°C
Humidity	10 - 90% RH non-condensing

### A.4.3 Output Signals



**\*Note:** The index pulse may be aligned with A- or B- at some interpolation values.

### A.4.4 Resolution

All closed loop stages are supplied with 20 $\mu$ m scales. The digital encoder module interpolates to a higher resolution as specified in the order. With a digital encoder an MMC controller has an achievable resolution of 50nm.



## A.5 Legacy Wiring

The following wiring can be referenced if the VT-21 product was purchased before the year 2020. Please contact MICRONIX for more information.

### A.5.1 Legacy Low Cost and MicroE Encoder Pinout

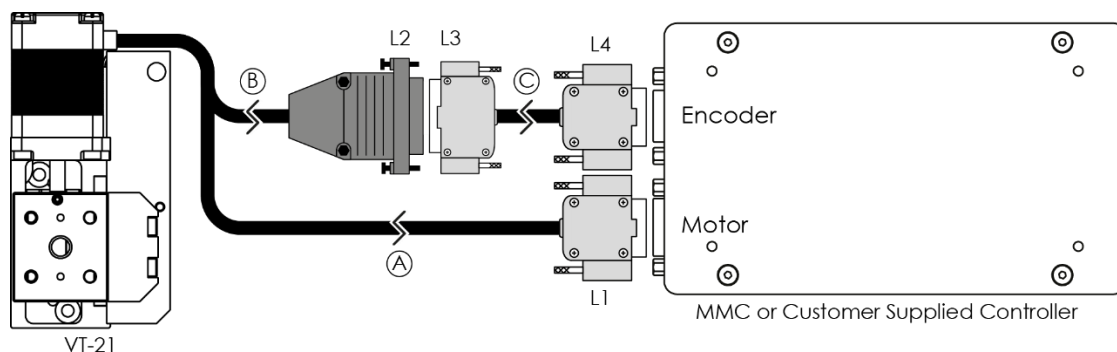
**Note:** For vacuum prepared wiring, blue may be substituted for green/white, and black for red/white

Pin	Function	Low Cost Digital	Analog
1	A+/Cos+	Brown	Brown
2	B+/Sin+	Grey	Yellow
3	Index+	Violet	Violet
4	GND	Black & Inside shield	Black & Inside shield
5	+5V	Red	Red
6	A-/Cos-	Orange	Orange
7	B-/Sin-	White	Green
8	Index-	Blue	Blue
9	N/A	N/A	N/A
Shield	GND	Outside Shield	Outside Shield

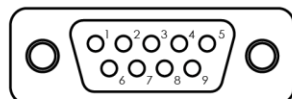
**A.5.2 Legacy Digital Encoder, Atmospheric Wiring Diagram**

**Cable Descriptions:**

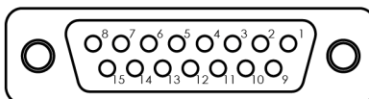
- A. Motor Cable (Male Dsub9 Pin to Male Dsub9 Pin, 1m Black Sleeved Cable)
- B. Encoder Cable (Male Dsub15 Pin Module, 0.5m PVC Black Cable)
- C. Encode Module Adapter Cable (Female Dsub 15 Pin to Female Dsub 9 Pin, 0.5m PVC Black Cable)



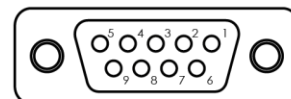
	Cable A			Interpolator			Cable C		
	Pinout for VT-21-11310/12310			Pinout for VT-21-11310/12310			Pinout for VT-21-11310/12310		
	Description:	Color	L1	Description:	Color	L2	L3	L4	
Motor A	Motor Phase A+	Green	1	A+	Brown	14	14	1	
	Motor Phase A-	Green & White	2	B+	Blue	13	13	2	
	Motor Phase B+	Red & White	3	Index+	Violet	12	12	3	
	Motor Phase B-	Red	4	GND	Grey	2	2	4	
	Ground	Brown	5	+5V	White (Grey TP)	7	7	5	
	Limit Switch-	White	6	A-	White (Brown TP)	6	6	6	
	Limit Switch+	Violet	7	B-	White (Blue TP)	5	5	7	
	Shield	-	Casing	Index-	White (Violet TP)	4	4	8	
				Shield	-	Casing	Casing	Casing	Casing



Male Dsub9 Connector (DE-9P) - Front View



Female Dsub15 Connector (DA-15S) - Front View



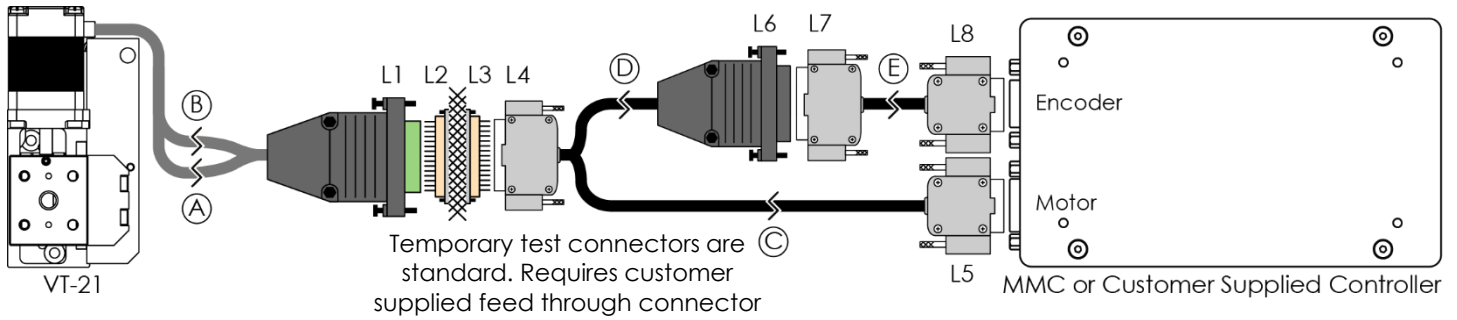
Female Dsub9 Connector (DE-9S) - Front View

**Figure A-A. Legacy Digital Encoder Wiring Diagram**

**A.5.3 Legacy Digital Encoder, High Vacuum Wiring Diagram**

**Cable Descriptions:**

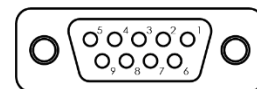
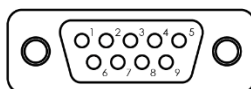
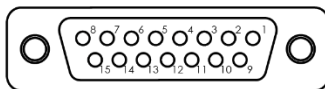
- A. Motor Vacuum Cable (Female Dsub 15 Pin DAP, 1.5m Silver Braided Cable)
- B. Encoder Vacuum Cable (Female Dsub 15 Pin DAP, 1.5m Silver Braided Cable)
- C. Motor Breakout Cable (Female Dsub 15 Pin to Male Dsub 9 Pin, 1.5m PVC Black Cable)
- D. Encoder Module Breakout Cable (Female Dsub 15 Pin to Interpolator Module, 1m PVC Black Cable)
- E. Encoder Module Adapter Cable (Female Dsub 15 Pin to Female Dsub 9 Pin, 0.5m PVC Black Cable)



**Figure A-B. VT-21, Digital Encoder, Vacuum Wiring Diagram**

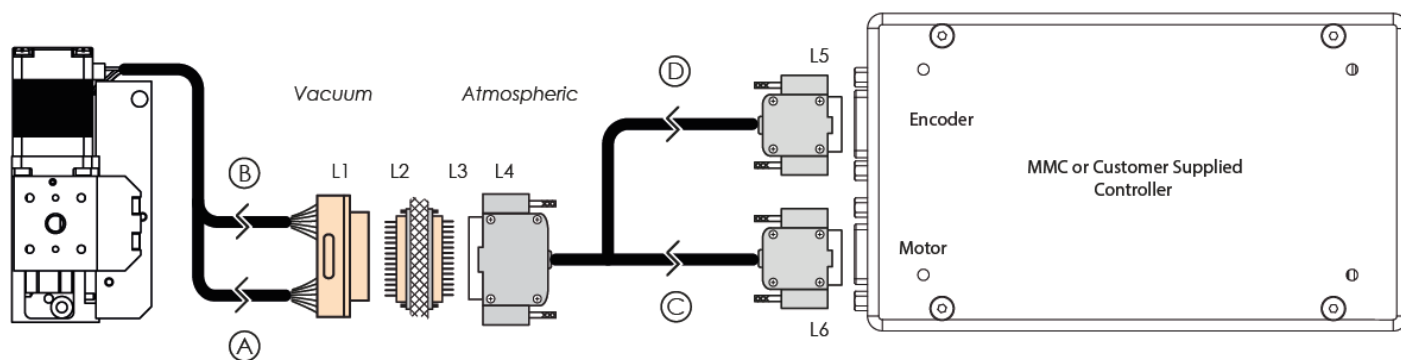
Pinout for VT-21-11316/12316		Cables A&B Feedthrough			Cable C		
Description:	Color	DA-15S L1	DA-15P L2	DA-15P L3	DA-15S L4	DE-9P L5	
Motor Phase A+	Green	1	1	8	Brown/White (Brown TP)	8	1
Motor Phase A-	Green/White	9	9	15	Green/White (Green TP)	15	2
Motor Phase B+	Red/White	2	2	7	Violet/White (Violet TP)	7	3
Motor Phase B-	Red	10	10	14	Grey/White (Grey TP)	14	4
Ground	Brown	12	12	12	Black	12	5
Limit Switch-	White	3	3	6	Blue	6	6
Limit Switch+	Violet	11	11	13	White (Blue TP)	13	7
Sin-	White (Blue TP)	8	8	1	White (Blue TP)	1	To Interpolator L6 (Cable D)
Cos+	Brown	7	7	2	Brown	2	
Index+	Violet	6	6	3	Violet	3	
+5V	White (Grey TP)	5	5	4	White (Grey TP)	4	
Sin+	Blue	15	15	9	Blue	9	
Cos-	White (Brown TP)	14	14	10	White (Brown TP)	10	
Index-	White (Violet TP)	13	13	11	White (Violet TP)	11	
Ground	Grey	12	12	12	Grey	12	
Shield	-	4	4	5	-	4	

Pinout for VT-21-11316/12316		Interpolator		Cable E	
Description:	Color	DA-15P L6	DA-15S L7	DE-9S L8	
A+	Brown	14	14	1	
B+	Blue	13	13	2	
Index+	Violet	12	12	3	
GND	Grey	2	2	4	
+5V	White (Grey TP)	7	7	5	
A-	White (Brown TP)	6	6	6	
B-	White (Blue TP)	5	5	7	
Index-	White (Violet TP)	4	4	8	
Shield	-	Casing	Casing	Casing	



Female Dsub15 Connector (DA-15S) - Front View Male Dsub9 Connector (DE-9P) - Front View Female Dsub9 Connector (DE-9S) - Front View

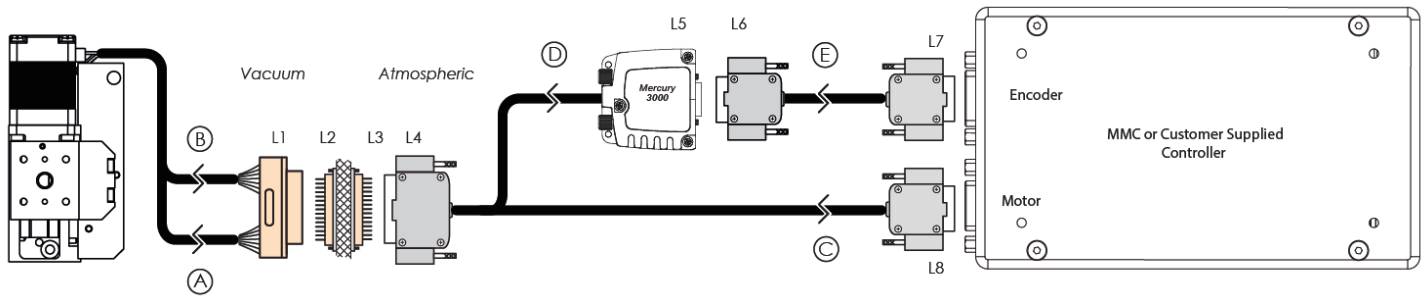
A.5.4 Legacy HV Analog, MicroE Encoder Wiring Diagram



Description	Color	L1	L2	L3	L4	L5	L6
Motor Phase A+	Green	1	1	8	8 (Brwn & Brwn Wht TP)		
Motor Phase B+	Red & White	2	2	7	7 (Violet & Violet Wht TP)		
Limit Switch	White	3	3	6	6 (Blue)		
Enc Shield	Shield	4	4	5	5 (Shield)	Casing	
+5V	Red	5	5	4	4 (Red)	5	
Index+	Violet	6	6	3	3 (Violet)	3	
Cos+	Brown	7	7	2	2 (Brown)	1	
Sin-	Green	8	8	1	1 (White – Yellow TP)	7	
Motor Phase A-	Green & White	9	9	15	15 (Grn & Grn Wht TP)		2
Motor Phase B-	Red	10	10	14	14 (Yllw & Yllw Wht TP)		4
Limit Switch +	Violet	11	11	13	13 (White – Blue TP)		7
Ground	Brown Black	12	12	12	12 (Black/Black TP)	4	5
Index-	Blue	13	13	11	11 (White – Violet TP)	8	
Cos-	Orange	14	14	10	10 (White – Brown TP)	6	
Sin+	Yellow	15	15	9	9 (Yellow)	2	

-Encoder
  -Motor

A.5.5 Legacy HV Digital, MicroE Encoder Wiring Diagram

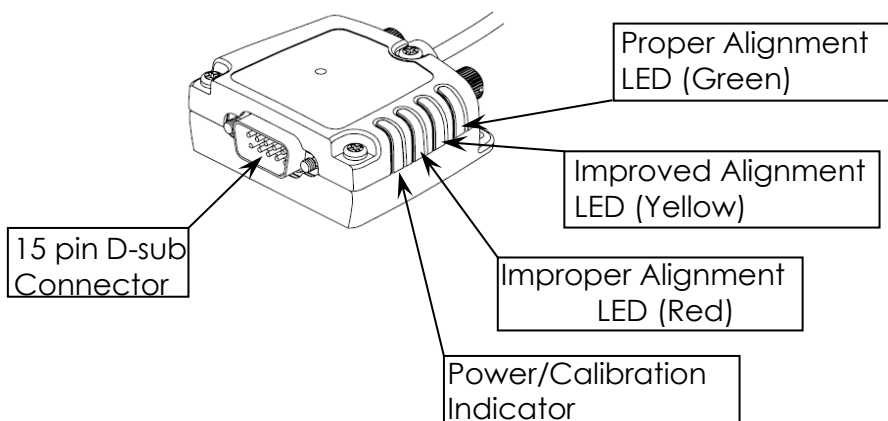


Description	Color	L1	L2	L3	L4	L8
Motor Phase A+	Green	1	1	8	8 (Brwn & Brwn Wht TP)	1
Motor Phase B+	Red & White	2	2	7	7 (Violet & Violet Wht TP)	3
Limit Switch -	White	3	3	6	6 (Blue)	6
Enc Shield	Shield	4	4	5	5 (Shield)	
+5V	Red	5	5	4	4 (Red)	
Index+	Violet	6	6	3	3 (Violet)	
Cos+	Brown	7	7	2	2 (Brown)	
Sin-	Green	8	8	1	1 (White – Yellow TP)	
Motor Phase A-	Green & White	9	9	15	15 (Grn & Grn Wht TP)	2
Motor Phase B-	Red	10	10	14	14 (Yllw & Yllw Wht TP)	4
Limit Switch +	Violet	11	11	13	13 (White – Blue TP)	7
Ground	Black Brown	12	12	12	12 (Black/Black TP)	5
Index-	Blue	13	13	11	11 (White – Violet TP)	
Cos-	Orange	14	14	10	10 (White – Brown TP)	
Sin+	Yellow	15	15	9	9 (Yellow)	

-Encoder
  -Motor

**Note:** For the pinout of cable E, refer to the appropriate MMC manual.

**A.5.6 Legacy Encoder Module Overview**



**A.5.7 Legacy Encoder Module Pinout**

Pin	Description	Pin	Description
1	Reserved	9	B-
2	Transmit**	10	B+
3	Receive	11	Alarm**
4	A-	12	+5V
5	A+	13	Ground
6	Reserved	14	Index +
7	Reserved	15	Index -
8	Reserved		

\*Note: Proprietary pins reserved for manufacturer programming, not required to be connected to controller

**A.5.8 Legacy Encoder Module Operating and Electrical Specifications**

<b>Power Supply</b>	5VDC $\pm$ 5% @ 330mA (30mA for sensor)
<b>Operating Temperature</b>	0 to 70°C
<b>Humidity</b>	10 - 90% RH non-condensing