SuperTrak™

Modular Transport System
Operation and Maintenance Manual

Version: **V 1.3 (13.11.2020)**
Order no.: **MASUPERTRAK-ENG**

Translation of the original manual

1 General information

1.1 Manual history

Information:

B&R makes every effort to keep user's manuals as current as possible.
From a safety standpoint, however, the current version from the B&R website must be used (www.br-automation.com).

Version	Date	Comment
1.3	13.11.2020	Modifications: Frame of Reference added Left Coil Driver Board Left Coil Driver Board with a Power Supply Connected Right Coil Driver Board Encoder Brackets Coils Curved Segment (800 mm) added Curved Segment (500 mm), vertical added Straight Segment (RME), vertical added Notice about required line filter added Prerequisites Install the SuperTrak Transport System Segments with Custom Stands on a Custom Frame Install the SuperTrak Transport System in vertical Configuration Gateway Network Connections Pre-Start Inspection Pre-Power ON Checks Install a Power Supply Install an Electrical Interconnect Install the Shuttle V-Wheels Shuttle Magnetic Field Strength Measurement Locations
1.2	19.09.2019	Modifications: PPE Thermal hazards Label Gateway board power consumption Power supply Installation - Alignment / Adjustment SuperTrak transport system Lift a SuperTrak section Pre-start inspection Pre-power ON checks Inspect a shuttle (tolerance anti-static brush, wheels) Adjust encoder strip Flat weat strip Test section hardware added Test coil functionality added Test with TrackMaster added Environment conditions Hardware torque specifications added Data sheets of components added Adjust a Secondary Encoder Strip - Sequence corrected
1.1	06.02.2018	Start of revision history publication

Table 1: Manual history

1.2 SuperTrak transport system documentation package information

1.2.1 Documentation Package

B&R supplies the following documentation and software for the SuperTrak transport system:

- SuperTrak Modular Transport System Operation and Maintenance Manual
- TrackMaster software
- SuperTrak runtime system and libraries
- Spare parts list

1.2.2 Special Notations

This document uses five (5) levels of notation:

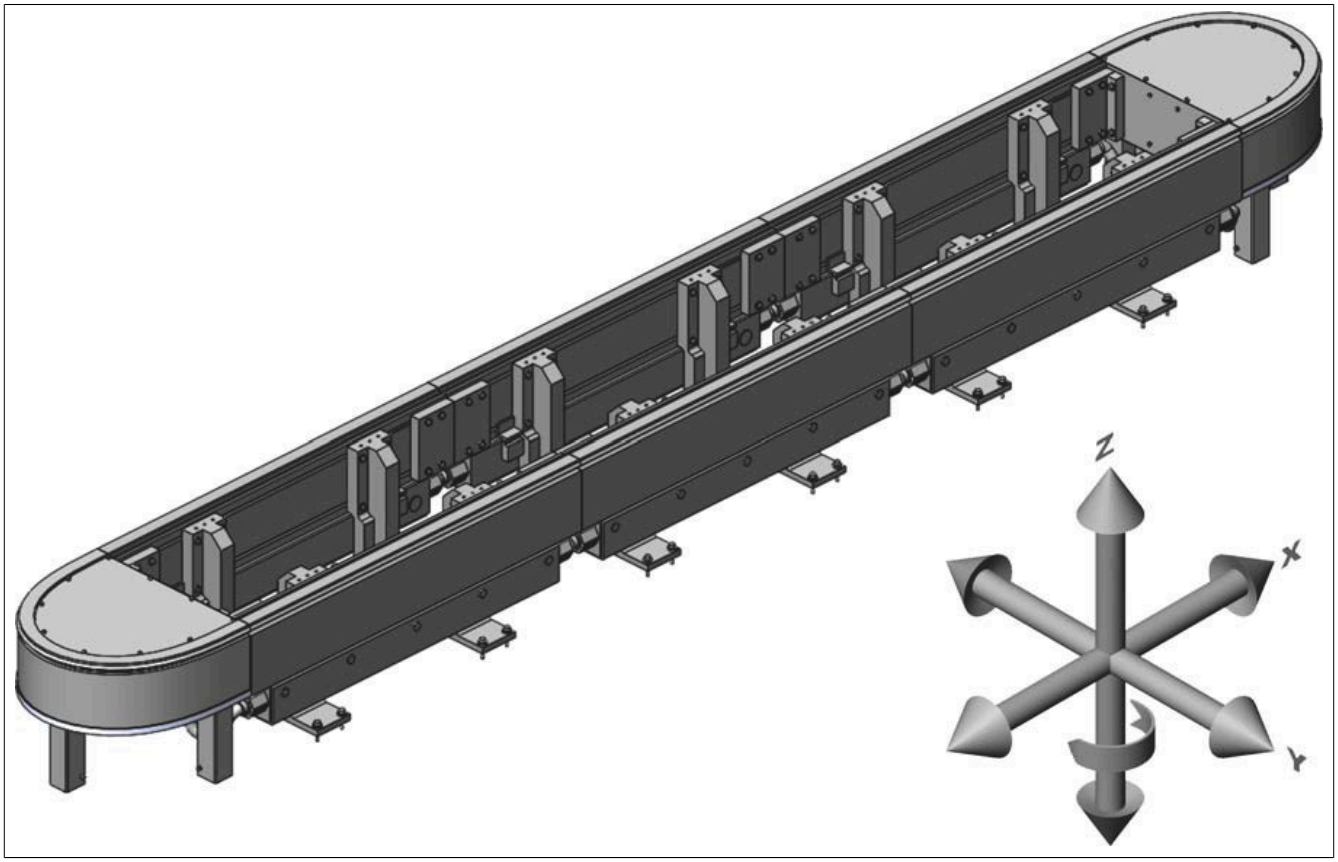
Danger	Warns that failure to comply results in death or serious injury.
Warning	Warns that failure to comply could result in death or serious injury.
Caution	Warns that failure to comply could result in minor or moderate injury.
Note	Warns that failure to comply may result in property damage.
Information	Provides additional information, emphasizes a point, or provides a tip.

1.2.3 Frame of Reference

Information:

- **The SuperTrak transport system image is for representational purposes only. It may not reflect the system you have installed.**
- **The direction of travel on each axis (positive or negative) varies based on configuration.**

This document describes tooling movement using the following frame of reference:



1.2.4 Referenced Terms

This section defines terms that are used throughout this document.

Term	Description
SuperTrak transport system	Represents the SuperTrak™ modular conveyor / SuperTrak™ GEN3 conveyor.
TrackMaster	Represents the TrackMaster™ software.
User	Represents all levels of SuperTrak transport system users. It includes operators, maintenance personnel, and technicians.
Operator	Represents a user with basic mechanical knowledge.
Maintenance Personnel	Represents a user with knowledge about routine cleaning, and lubrication procedures. They are expected to complete adjustments that are within validated ranges.
Technician	Represents a user that specializes in a discipline such as electrical, mechanical, or programming. They are expected to complete complex SuperTrak transport system procedures; such as, replacement procedures or adjustments that are outside of validated ranges.

For additional definitions see 13 "Glossary" on page 213.

2 Conditions of Acceptability for certification

Model Variations:

Certified models 1060387 or 1060391 are also represented as 8FZAM1.0A.A000-1 / SuperTrak Straight Segment. Models are further supplemented by EN standards as models 25220499.

Certified model 1060638 is also represented as 8FZAM2.0A.A000-1 / SuperTrak Curved Segment, 500 mm.

Certified model 125414648 is also represented as 8FZAM4.0A.A000-1 / SuperTrak Straight Segment, vertical.

Certified model 125420930 is also represented as 8FZAM5.0A.A000-1 / SuperTrak Curved Segment, vertical.

Certified model 25232698 is also represented as 8FZAM6.0A.A000-1 / SuperTrak Curved Segment, 800 mm.

Certified model 25270337 is also represented as 8FZAP0.00.0x00-1 ("x" identifies the DC cable length) / SuperTrak Motor Power Supply. Modes are further supplemented by EN standards as models 25195828, 25270354.

SuperTrak Segments

a) SuperTrak Segments are evaluated as an integrated component and intended to be a scalable interconnected system provided inline protection fuse(s) are installed on the Bus connection and power supply lines. End user / integrator shall recognize ampacity limits of the bus bar interconnect conductors per the National Electrical Code.
b) Models are to be powered by a certified SuperTrak Motor Power Supply / 8FZAP0.00.0x00-1.
c) Models are evaluated with an optional accessory cable “CONTROL PANEL TO E-TURN INTERCONNECT” Part# 25240470 1.2 m, Part# 125362696 2.0 m or Part# 25221246 6.5 m (6.5 m can be user adjustable length) or Part# 8FZAC0.00.Ax00 ("x" identifies the cable length).
d) The equipment is not evaluated for use in hazardous (classified) environments.
e) The equipment is not evaluated for use with flammable liquids or materials.
f) The equipment has been investigated for continuous operation at a maximum operating ambient temperature of 40°C at an altitude up to 2000 m and relative humidity levels from 5-90%, non-condensing.
g) The equipment has been evaluated for indoor use in pollution degree 2 environments.
h) The equipment is to be installed by qualified personal in accordance with local and national installation/wiring requirements.
i) The motor’s epoxy resin (potting) is not investigated for flammability (UL94).
j) Emergency Stop, disconnect devices for the SuperTrak system are provided via the mains supply to the SuperTrak Motor Power Supply. Integration and validation of system wide emergency stops are the responsibility of the end user/integrator.
k) Functional Safety requirements are the responsibility of the end user/integrator of this component.

SuperTrak Motor Power Supply

a) SuperTrak Power Supply is evaluated as an integrated component and intended to be a scalable interconnected system provided inline protection fuse(s) are installed on the Bus connection and power supply lines. End user / integrator shall recognize ampacity limits of the bus bar interconnect conductors per the National Electrical Code.
b) A suitable cable is to be provided for the plug/socket component (industrial twist lock) for connecting the mains supply. All permitted mounting orientations.
c) SuperTrak Motor Power Supply is for use only with SuperTrak Segments (8FZAM1.0A.A000-1, 8FZAM2.0A.A000-1, 8FZAM4.0A.A000-1, 8FZAM5.0A.A000-1, 8FZAM6.0A.A000-1).
d) SuperTrak Motor Power Supply is powered from an ATS SuperTrak Conveyor Control Panel / 25202161 or from other appropriate power source with certified (North American listed) overcurrent protection, 10A UL489 breaker, type CC fuses or Type J fuses.
e) The equipment is not evaluated for use in hazardous (classified) environments.
f) The equipment is not evaluated for use with flammable liquids or materials.

g) The equipment has been investigated for continuous operation at a maximum operating ambient temperature of 40°C at an altitude up to 2000 m and relative humidity levels from 5-90%, non-condensing.

h) The equipment has been evaluated for indoor use in pollution degree 2 environments.

i) The equipment is to be installed by qualified personal in accordance with local and national installation/wiring requirements.

j) Emergency Stop, disconnect devices for the SuperTrak system are provided via the mains supply to the SuperTrak Motor Power Supply. Integration and validation of system wide emergency stops are the responsibility of the end user/integrator.

k) Functional Safety requirements are the responsibility of the end user/integrator of this component.

3 Safety Information

This section provides the following important safety information:

Read this information thoroughly and completely before operating, or maintaining the SuperTrak transport system.

3.1 Training

SuperTrak transport system training packages are available on request.

3.2 General Safety Rules

Everyone:

- Learn how automated equipment works.
- Understand the potential dangers of automated equipment before operating it.
- Energy sources must be shutdown, locked out, and tagged out before preventive maintenance, adjustment, or service.
- Understand and be aware of potential energy sources that exist in the SuperTrak transport system after lockout and tagout (for example; the strong permanent magnets when shuttles are removed from the SuperTrak transport system).
- Long hair must be tied up and kept away from SuperTrak transport system devices to prevent entanglement.
- Do not wear loose clothing or dangling jewelry while operating or maintaining the equipment, to prevent entanglement.
- Wear the appropriate personal protective equipment (PPE) for each task.
- Stay away and do not touch any live electrical wires or circuits. Qualified technicians must wear PPE appropriate to the electrical hazard.
- Do not tamper, remove, or make safety controls ineffective.

Operators:

- Do not remove guarding, covers, or shields. Procedures that involve removing guarding, covers or shields must only be performed by a trained, qualified technician.
- Do not operate damaged equipment. Safety and protection features are impaired in damaged equipment. Turn OFF energy sources immediately. Do not use the automated equipment until a trained, qualified technician confirms it is safe to operate.

Technicians:

- Do not perform service work alone. Only attempt internal service or adjustments in the presence of a person capable of rendering first aid.
- Read the current SuperTrak™ GEN3 Modular Transport System Operation and Maintenance Manual before troubleshooting or servicing the equipment.
- Guarding, covers, or shields must not be removed, except for emergency or maintenance purposes.
- If guarding is removed, clearly communicate (for example, with signs or barriers) that the guarding is not functional.
- Guarding around moving devices that has been removed, must be replaced.
- Do not install substitute parts or make any product modifications that are not authorized by B&R because this may introduce new hazards.

- Use insulated tools when working with electrical equipment. Make sure qualified electrical technicians wear appropriate PPE when completing live electrical work according to the hazard assessment.
- Remove electrical power before changing fuses, or use approved fuse-pullers.
- Never use jumper wires or fuse substitutes to replace fuses.
- Replace the line fuses with fuses of the same voltage, current rating, and type. Do not use repaired fuses or short-circuited fuse holders.
- Be prepared to handle electrical fires by keeping dry powder or carbon dioxide extinguishers on hand at all times.
- Verify that all fittings and connections are tight once repair work is complete.
- Do not use compressed air to clean SuperTrak transport system devices. Use clean, lint-free cloths or a vacuum cleaner. Compressed air causes dirt and lubricants to become airborne and contaminate assembly products and tooling.

3.3 Personal Protective Equipment (PPE)

At a minimum, all users are recommended to wear the following personal protective equipment (PPE) when working with or around the SuperTrak transport system:

- Safety glasses that meet the specific standard requirements the local jurisdiction:
  - North America - ANSI Z87.1
  - Europe - EN 166 F
- Safety shoes that meet the specific standard requirements the local jurisdiction:
  - North America - ASTM F2413
  - Europe - EN ISO 20345 S1

3.4 Hazardous Energy

Any energy source that presents a risk of injury to a person working on equipment is considered a hazardous energy source. The SuperTrak transport system contains the following hazardous energy sources:

- Electrical
- Mechanical

To prevent accidental or unauthorized start-ups, always lockout and tagout hazardous energy before completing any service or maintenance procedures. Lockout and tagout procedures control hazardous energy supplies, making the SuperTrak transport system inoperable.

See 3.5 "Lockout and Tagout" on page 21.

Danger!

The incorrect behavior of transport systems can trigger unintended and dangerous shuttle movements!
Possible causes of this:

- **Incorrect installation or faults when handling components**
- **Incorrect or incomplete wiring of the transport system**
- **Defective components (segments, shuttles, position encoders, cables, etc.)**
- **Incorrect control (e.g. due to faulty software)**

Danger!

Shuttles can become detached from the guidance system at high speed during the movement and cause substantial damage to property and personal injury!
Possible causes of this:

- **Poor weight distribution of the product / product carrier on the shuttle**
- **Adverse ratio of distances from centers of gravity to magnetic forces**
- **Awkward geometry of the product / shuttle shelf**
- **Excessive weight of the transported product / shuttle shelf**
- **Excessive speed and/or acceleration of the shuttle**
- **Product moving on the shuttle (sloshing, rolling, slipping)**
- **Nonobservance of limitations regarding the mounting orientation of the transport system**
- **Incorrect configuration/behavior of the transport system**

3.4.1 Electrical

Warning!

Servicing an electrical panel that is still connected to its power source may cause injury or death. Unless directed otherwise, turn the main power supply OFF. Lockout and tagout before accessing and servicing the electrical panel. Only qualified electrical technicians should perform service on the electrical panel.

See 3.5 "Lockout and Tagout" on page 21.

The control panel for the SuperTrak transport system contains high voltages. Electrical hazards may be present from damaged or broken wires, open electrical boxes, or open control panels.

Do not turn ON power to the SuperTrak transport system until an electrical technician has corrected the situation.

See 6 "Controls and Connections" on page 80.

3.4.2 Mechanical

Warning!

Servicing mechanical components or devices while still connected to energy sources may cause injury. As required for access and service of the mechanical component, open the safety circuit or turn the main power supply OFF and lockout and tagout the main power supply. Only qualified technicians should access mechanical components or devices.

Understand and be aware of stored energy sources (for example; stored electrical energy, or strong magnetic field) that exist in the SuperTrak transport system after lockout and tagout.

See 3.5 "Lockout and Tagout" on page 21.

Caution!

- **The magnetic field generated by the SuperTrak transport system shuttles can be harmful to pacemaker wearers. Maintain a minimum distance of 31 cm (12 in.) between the shuttle and the implant location. The permanent magnets in the shuttles have a strong magnetic field. When the shuttles are installed on the SuperTrak transport system, the magnetic field around the shuttle is low. When a shuttle is removed from the SuperTrak transport system, the permanent magnets are exposed and the magnetic field is very strong.**
- **Always install a magnet cover plate on the shuttle magnet when a shuttle is removed from the SuperTrak transport system to reduce the magnetic field to a safe level.**
- **The magnetic field of the SuperTrak transport system may induce magnetic materials into motion, creating potential projectiles or pinch points. Various electronic equipment and magnetic data carriers can also be affected by magnetic fields.**

The SuperTrak transport system has mechanical hazards from moving tooling components or devices. Crushing, pinching, and impact injuries can result from devices actuated by potential or kinetic energy in the form of rotational, linear force or gravity.

In the event of a mechanical hazard, turn the main power supply OFF. Do not turn ON power to the SuperTrak transport system until a qualified technician has corrected the situation.

3.4.3 Thermal Hazards

> **Warning!**
>
> **Allow adequate time for hot surfaces to cool before commencing work. Wear the appropriate PPE when working on or near the thermal hazard. Use a non-contact thermometer to verify the temperature.**

> **Information:**
>
> **The lifespan of some SuperTrak components may be compromised when temperature-related TrackMaster configuration parameters are adjusted from the default value. For optimum lifespan of SuperTrak transport system component, do not increase the default value of the electronics temperature configuration parameter, and use caution when increasing the coil temperature configuration parameter:**
>
> - **Coil Temperature Limit (°C); default = 60, hard limit = 90.**
> - **Electronics Temperature Limit (°C); default = 60, hard limit = 70.**

The SuperTrak transport system may include thermal hazards if temperature-related TrackMaster configuration parameters are adjusted from the default value.

Thermal hazards include any excessively hot or cold point of contact. Thermal hazards can cause contact injuries to exposed skin, or create a fire hazard. Use shielding to avoid contact burns. Dissipate thermal to make sure the point of contact is at a moderate temperature before working near it.

See Access the TrackMaster Built-in Help to access the TrackMaster built-in help for more information about configuration parameters.

3.5 Lockout and Tagout

> **Danger!**
>
> **Understand and be aware of stored energy sources (for example; uninterrupted power supply (UPS) energy, or magnetism) that exist in the SuperTrak transport system after lockout and tagout.**
>
> **See 3.4 "Hazardous Energy" on page 19.**

> **Information:**
>
> **This lockout and tagout information is provided for reference only. Follow the lockout and tagout procedures listed below or use an applicable lockout tagout procedure that complies with local requirements.**

Lockout and tagout neutralizes all sources of SuperTrak transport system energy, making it inoperable and preventing accidental or unauthorized energizing of the SuperTrak transport system. Follow an approved lockout and tagout procedure before maintenance or service, or where unexpected SuperTrak transport system startup or the release of stored energy may cause injury.

3.5.1 Prerequisites

Locks

An acceptable lock should:

- Be provided by an employer. Ensure standardization (size, shape and color) and purchase from a reputable manufacturer.
- Be able to withstand heat, cold, and humidity.
- Be strong enough that it cannot be removed with heavy force.
- Not be a combination lock.
- Have only one (1) key and are not able to be opened using any other key.

Tags

A good tag should:

- Have a clear warning.
- Be easy to read (that is; legible and understandable).
- Have the identification mark of the person who applied it.
- Be secure enough to prevent accidental removal, and durable enough to withstand extreme temperatures, fumes, and caustic chemicals.
- Be secured with something similar to a nylon cable tie that is self-locking, can be attached by hand, can resist release with less than 23 kgs (50 lbs) of pressure, and cannot be reused.

3.5.2 Lockout and Tagout Locations

To lock out SuperTrak transport system hazardous energy, complete one of the following:

- Lockout and tagout the main power supply when SuperTrak transport system power must be OFF and SuperTrak transport system UPS power (if present) can be ON.
- Lockout and tagout the main power supply and the UPS power (if present) when SuperTrak transport system power and UPS power (if present) must be OFF.

See 7.3 "SuperTrak Transport System Power On Behavior" on page 94, and 7.4 "SuperTrak Transport System Power Off Behavior" on page 95.

3.6 Label Descriptions

Labels are applied throughout the SuperTrak transport system to warn users of possible or certain hazards. Read this section carefully and comply with the required actions, warnings or prohibitions.

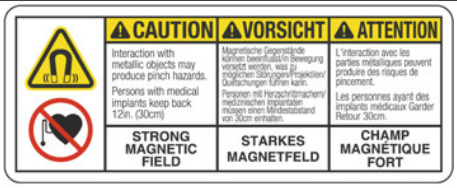
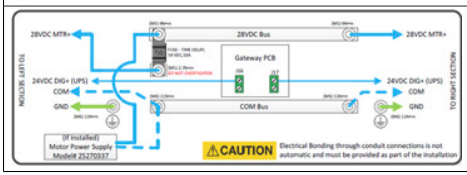
3.6.1 Marking Labels

Label	Label Name	Description
	Ground	This label is affixed next to grounded connections. The grounding conductor is the current path that enables protective devices, such as circuit breakers and fuses to operate when a fault occurs.

3.6.2 Mandatory Action Labels

Label	Label Name	Description
	Read and Understand the Manual	Users should read the Operation and Maintenance Manual before operating the SuperTrak transport system. Technicians should read and understand the Operation and Maintenance Manual before conducting any work or service in the referenced area. Personal injury may occur if the label warning is not observed.
	Mandatory Lockout and Tagout	Personal injury may occur if the label warning is not observed. See 3.5 "Lockout and Tagout" on page 21.

3.6.3 Other Labels

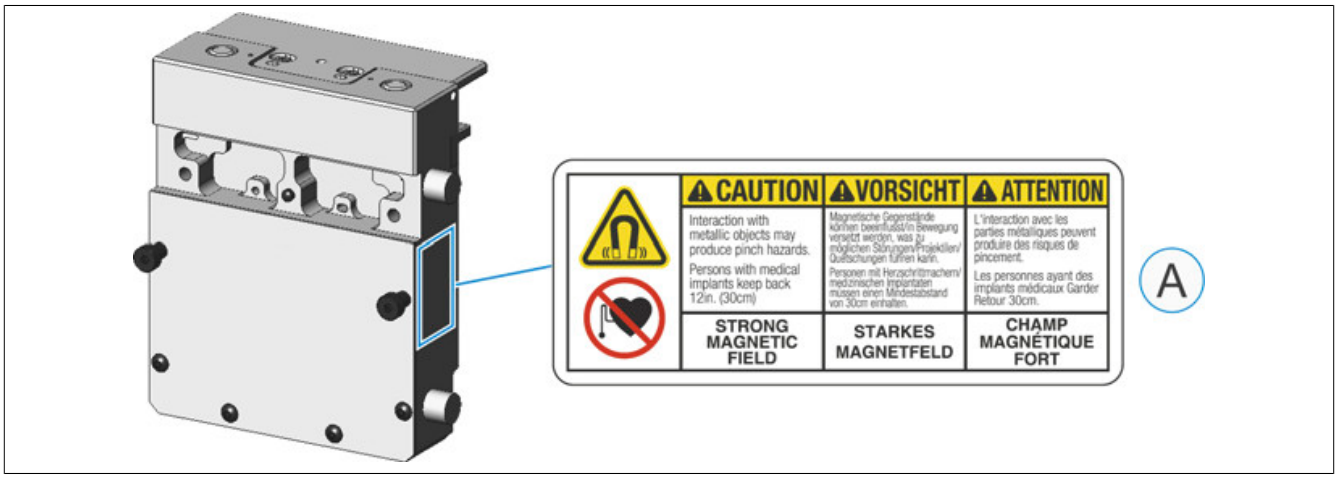
Label	Label Name	Description
	Warning - Hazardous Voltage	This label warns users of electrical energy. Only qualified electrical technicians should complete work in these areas. Disconnect power before opening the electrical cabinet working within. Close the electrical cabinet before turning the power ON.
	Caution - Strong Magnetic Field	This label warns users of a strong magnetic field. Interaction with metallic objects may produce pinch hazards. Persons with medical implants must keep back 31 cm (12 in.).
	Wiring pinout overview	This label provides wiring information for the straight segment and curvend segment.

3.7 Label Locations

This section describes the location of the safety labels on the SuperTrak transport system.

3.7.1 Shuttle Assembly Label

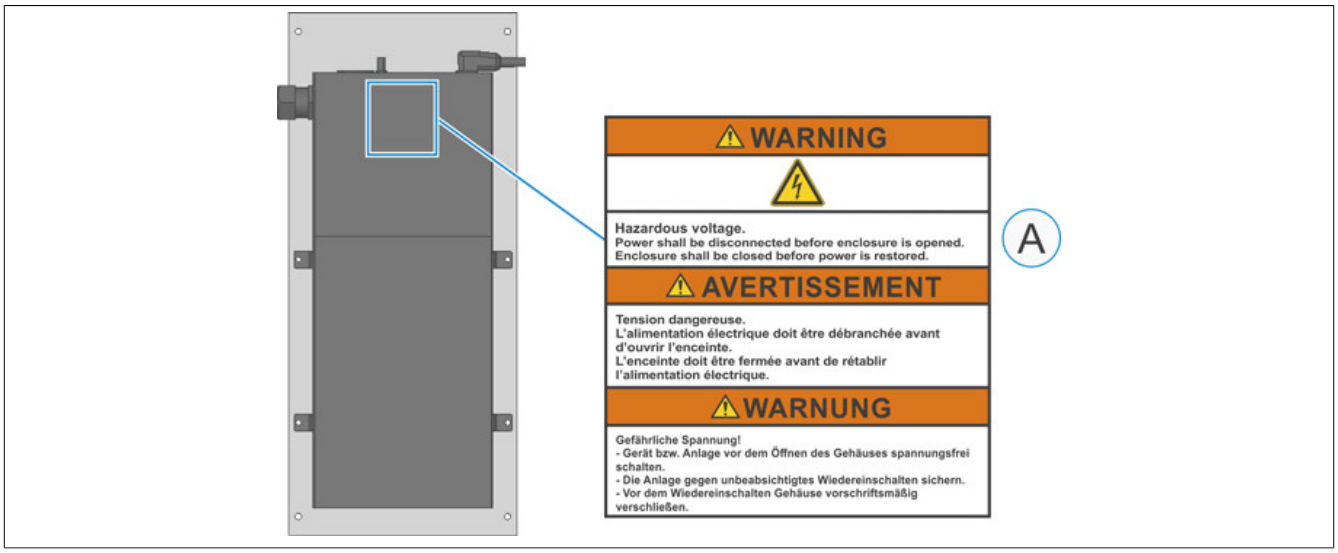
The shuttle assembly has the following label.



ID	Label	Location
A	Caution - Strong Magnetic Field See 3.6 "Label Descriptions" on page 22.	Side of each SuperTrak transport system shuttle assembly.

3.7.2 Power Supply Label

The power supply has the following label.



ID	Label	Location
A	Warning - Hazardous voltage See 3.6 "Label Descriptions" on page 22.	SuperTrak transport system power supply.

4 SuperTrak Transport System Overview

4.1 Features

The SuperTrak transport system is a high-speed shuttle transport system. It allows the direction, acceleration, speed, and position of each shuttle to be individually programmed. Integrated collision avoidance eliminates shuttle-to-shuttle contact and provides auto-queuing at process stations.

Some features of the SuperTrak transport system include:

- Fast indexing: maximum speed of 2.5 m/s (8.2 ft./s)
- Acceleration: 4 g for a 1 kg (2.2 lb) payload, 1 g for a 10 kg (22 lb) payload
- Precision shuttle control: stop repeatability of ±0.01 mm (0.00039 in.)
- High payload: each shuttle can hold up to 10 kg (up to 22 lb)[1)]
- Scalable: modular system provides design flexibility
- Low maintenance: has few moving parts

See 11 "Specifications" on page 189 for a complete list of SuperTrak transport system specifications.

Tutorial at www.br-automation.com see SuperTrak Transport System.

1) Higher payloads are possible.

4.2 SuperTrak Transport System Components

SuperTrak transport system components are configured, based on the required application. This illustration provides an example of one configuration. It describes the components that a typical SuperTrak transport system includes.

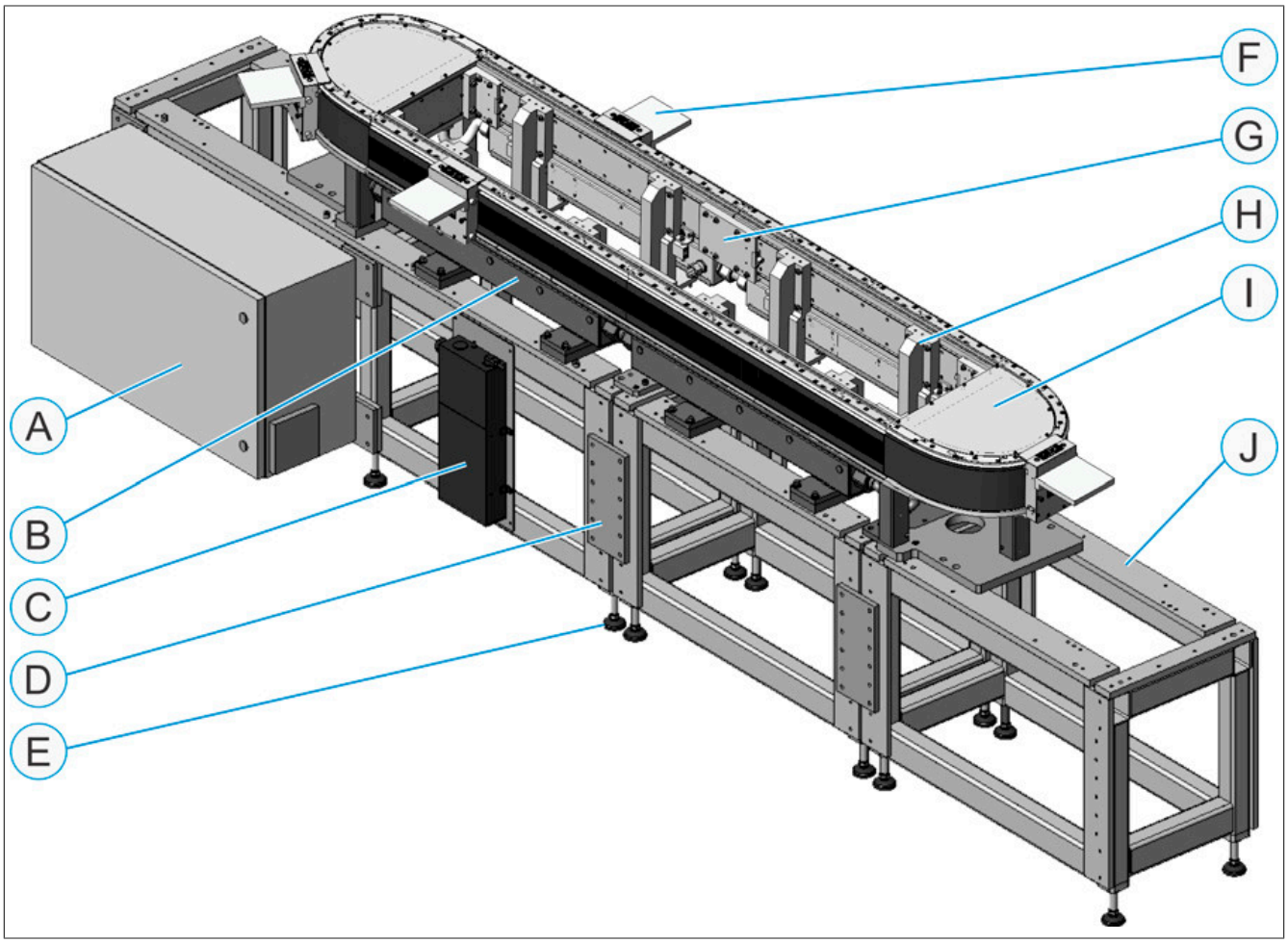


Figure 1: Overview SuperTrak transport system components

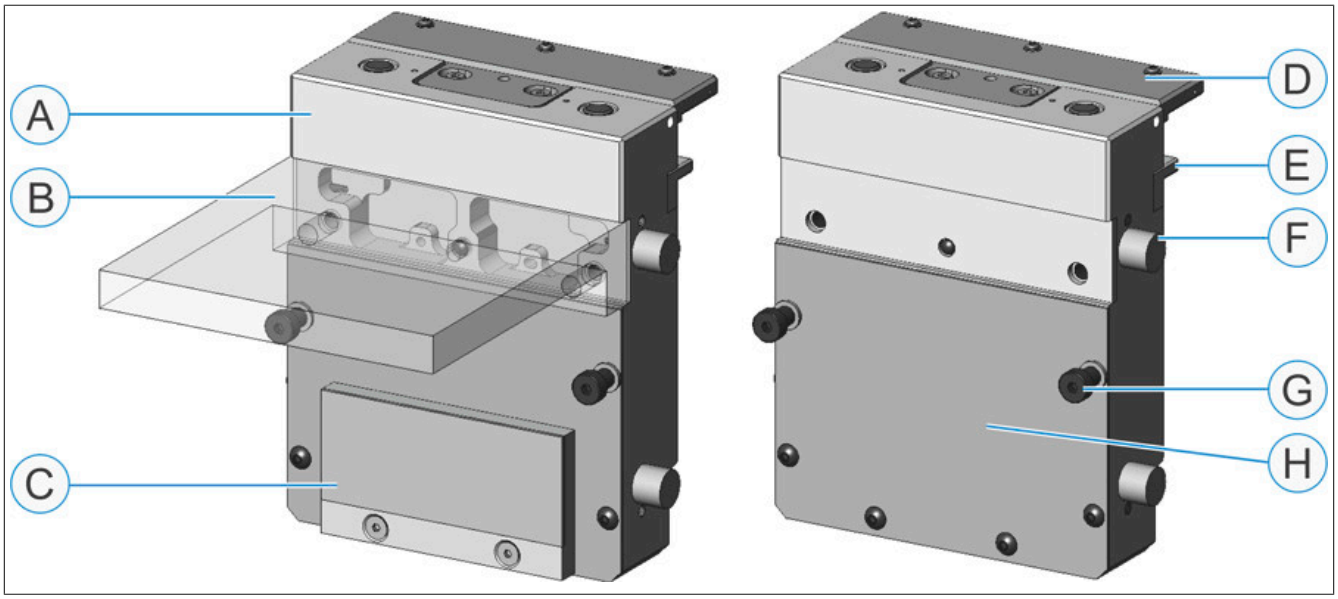
A	SuperTrak transport system control panel *Not included in standard scope of delivery.*	**F**	Shuttle See 4.2.1 "Shuttle" on page 27.
B	Straight segment See 4.2.2 "Straight Segment" on page 29.	**G**	Wedge adjust
C	SuperTrak transport system power supply See 4.2.4 "SuperTrak Transport System Motor Power Supply" on page 38.	**H**	Stand with height adjustment
D	Connection plate *Not included in standard scope of delivery.*	**I**	Curved segment See 4.2.3 "Curved Segment" on page 36.
E	Leveling foot *Not included in standard scope of delivery.*	**J**	Base frame *Not included in standard scope of delivery.*

4.2.1 Shuttle

The shuttle provides a transport platform for carrying production parts along a SuperTrak transport system. The shuttle shelf (not included) is customized for the customer product.

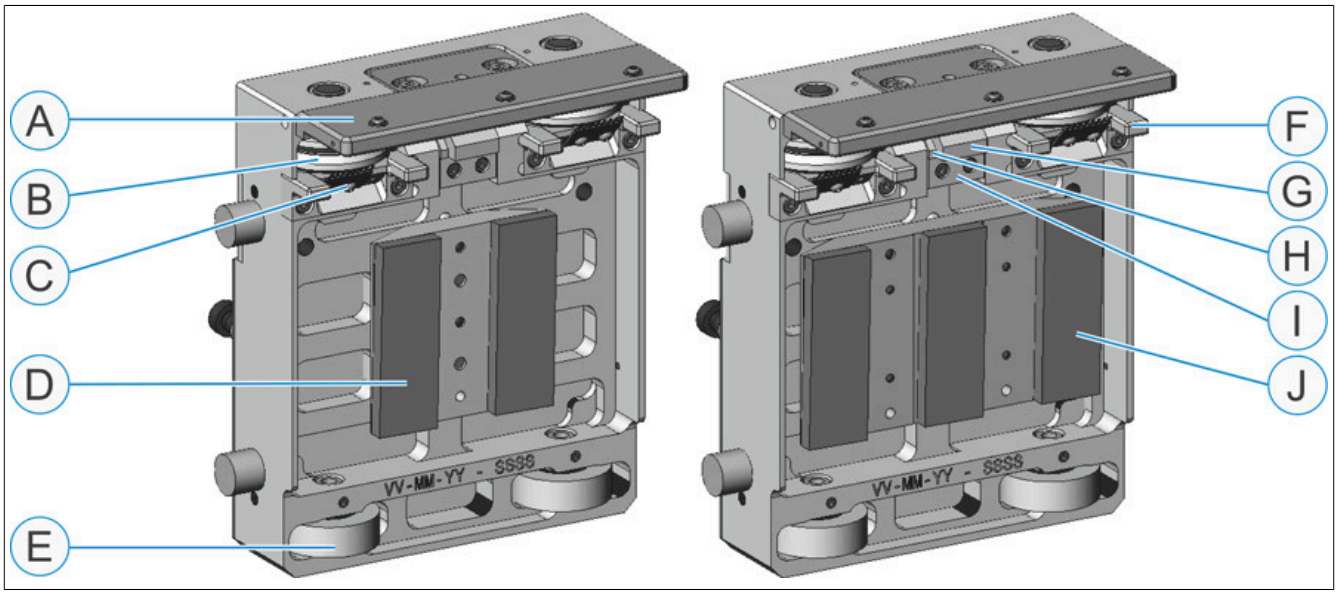
> **Caution!**
>
> **If the mounted shuttle shelf exceeds the complete width of the shuttle, then the bumpers are ineffective at collision of two shuttles. Make sure that in this case no damage can occur on the mounted shuttle shelf (for example by mounting additional bumpers at the shuttle shelf).**

4.2.1.1 Shuttle - Front View



ID	Assembly Name	Description
A	Shuttle base	The main body of the shuttle.
B	Shuttle shelf (not included)	Carries the customer product from station to station. The shuttle shelf is customer-specific. The illustration is provided for reference only.
C	IR tag (optional)	Provides a unique shuttle number for each shuttle for fixture tracking.
D	Encoder strip bracket	Contains the encoder strip.
E	Anti-tip block (1 of 2)	Protects the shuttle during unexpected impact and contains the anti-static brush.
F	Bumper	Provides cushion to the shuttle when shuttles are manually moved. Bumpers can be modified or extended to accommodate wider shuttle shelves.
G	Shoulder screws (1 of 2)	Provides shuttle mounting tool connection points, which are used during shuttle installation and removal.
H	Front cover plate	Provides access to the magnet unit screws.

4.2.1.2 Shuttle - Back View



ID	Assembly Name	Description
A	Encoder strip bracket	Contains the encoder strip.
B	V-wheel (1 of 2)	Travels on the upper v-rail of the straight segment.
C	Anti-static brush (1 of 2)	Dissipates static that is created during shuttle motion.
D	2-Magnet assembly	Supports the shuttle against the upper v-rail, and generates the forces needed to control shuttle motion. All shuttles on the SuperTrak transport system are either 2-magnet or 3-magnet.
E	Flat wheel (1 of 2)	Travels on the flat wear strip of the straight segment.
F	Anti-tip block (1 of 2)	Protects the shuttle during unexpected impact and and keeps the shuttle on the SuperTrak transport system when unplanned Z-axis forces are applied to the shuttle. It contains the anti-static brush.
G	Lubrication felt	Lubricates the upper v-rail of the straight segment and curved segment.
H	Lubrication holder	Contains the spring-loaded lubrication felt.
I	Lubrication locking block	Secures the lubrication holder.
J	3-Magnet assembly	Supports the shuttle against the upper v-rail, and generates the forces needed to control shuttle motion. All shuttles on the SuperTrak transport system are either 2-magnet or 3-magnet.

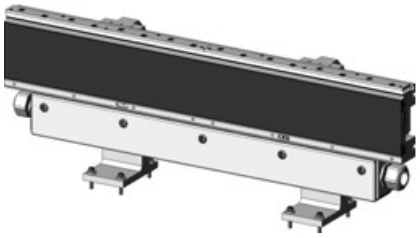
4.2.2 Straight Segment

Straight segments are connected in series to create a path for shuttle to travel on. Each straight segment upper v-rail is 1000 mm (39.4 in.) in length.

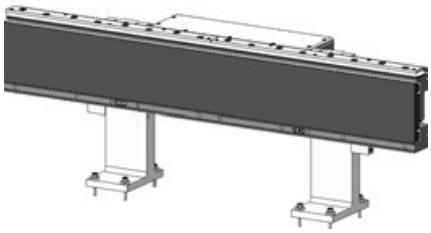
4.2.2.1 Straight Segment Electronics Options

Straight segments are available with the electronics panel at the front or rear:

- Front mounted electronics (FME)

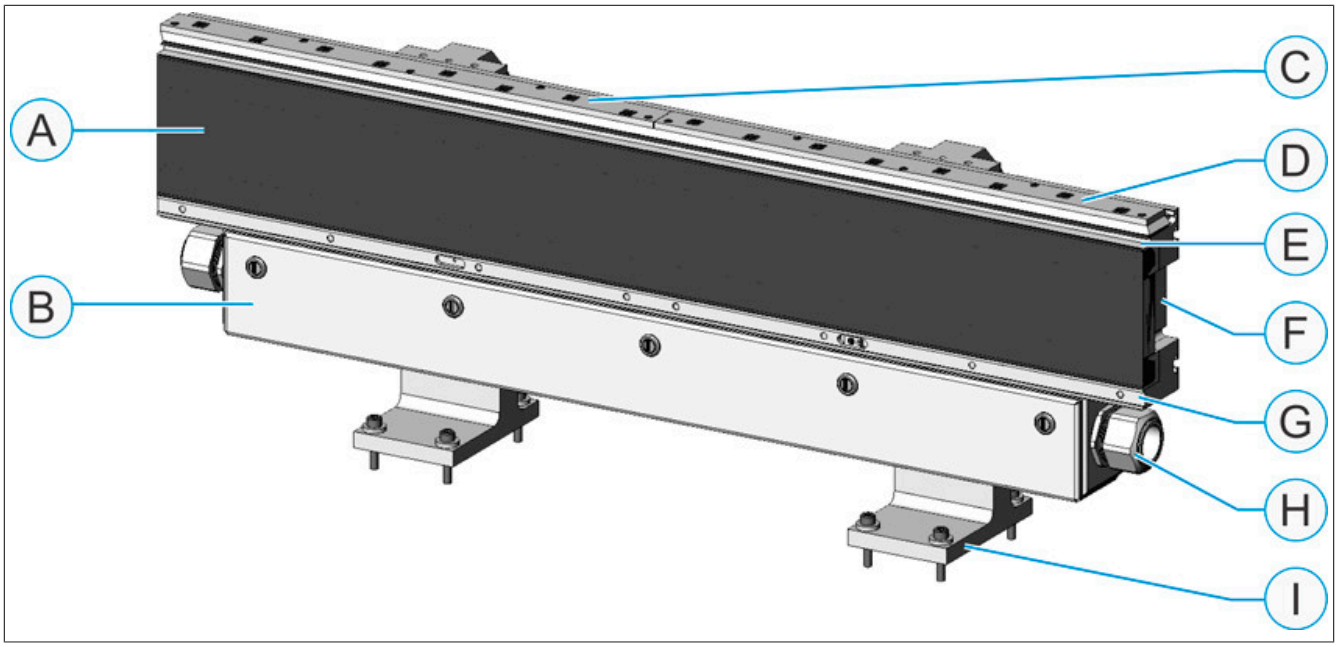


- Rear mounted electronics (RME)



See data sheets 12.1.1 "8FZAM1.0A.A000-1" on page 192 and 12.1.3 "8FZAM4.0A.A000-1" on page 195.

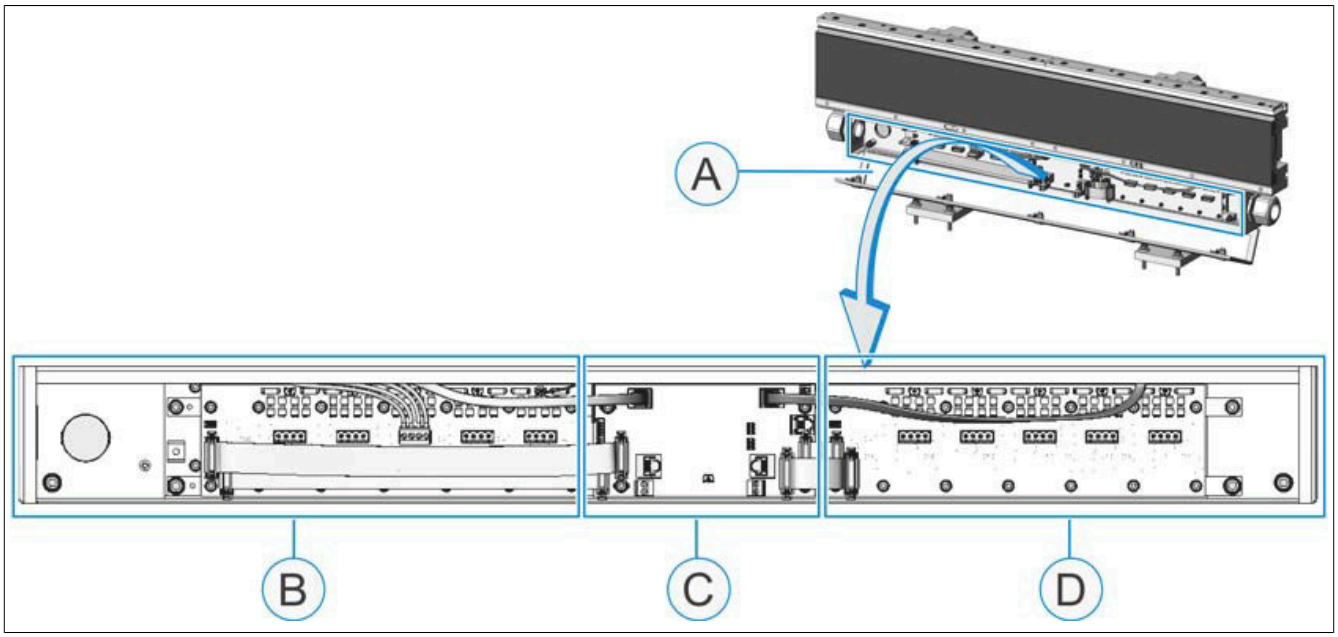
4.2.2.2 Straight Segment with the Electrical Door Closed



ID	Assembly Name	Description
A	Linear motor	Produces the electromagnetic force that propels the shuttles. The linear motor includes: • 20 potted coils • An iron core lamination assembly For information about coil numbering see "Coils" on page 34.
B	Electrical door (closed)	Encloses the electrical components. Straight segments are available with front mounted electronics (FME) as shown, or rear mounted electronics (RME).
C	Left encoder bracket	Measures the shuttle position using encoder read heads. See 4.2.3 "Curved Segment" on page 36 for information about encoder numbering.
D	Right encoder bracket	
E	Upper v-rail	Provides a track for the shuttle V-wheels to travel on.

ID	Assembly Name	Description
F	Track structure	Aluminum structure that forms the base of a track. All other track module components are mounted to the track structure.
G	Flat wear strip location	Provides a smooth surface for the shuttle flat wheels to travel on.
H	Electrical interconnect	Connector for conduit that contains the power and network cables.
I	Stand (1 of 2)	Mounts the segment to the SuperTrak transport system frame.

Straight Segment with the Electrical Door Open



ID	Assembly Name	Description
A	Electrical door (open)	Provides access to the straight segment circuit boards.
B	Left coil driver board	See 4.2.2.3 "Left Coil Driver Board" on page 30 or 4.2.2.4 "Left Coil Driver Board with a Power Supply Connected" on page 31.
C	Gateway board	See 4.2.2.5 "Gateway Board" on page 32.
D	Right coil driver board	See 4.2.2.6 "Right Coil Driver Board" on page 32.

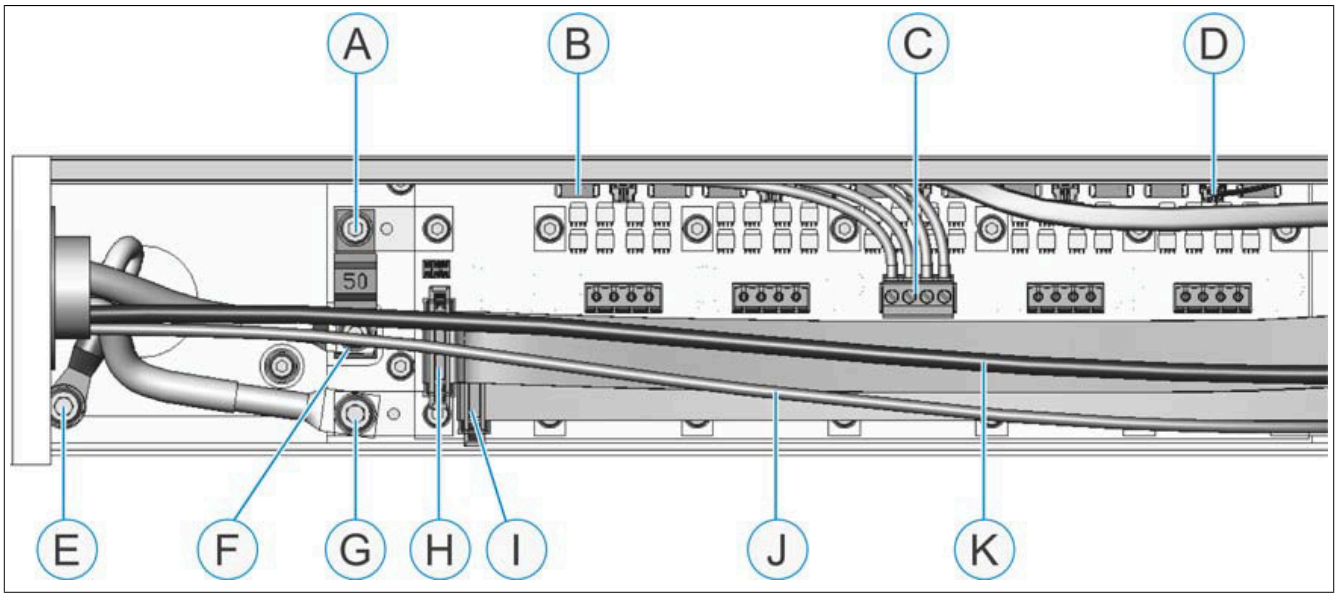
4.2.2.3 Left Coil Driver Board

Information:

If the SuperTrak transport system is realized with more than one safety circuit (different guard zones), remove the 28 VDC motor power connection from the zone boundaries.

Information:

The left coil driver board and the right coil driver board are the same. The connections to the boards are different, so they are referenced as the "left" or "right" coil driver board. The curved segment 800 mm also includes a "center" coil driver board.



A	Motor power connection for a power supply	**G**	Common connection
B	Coil fuse 15 A (1 of 10, 1x per coil)	**H**	Ribbon cable connection - connects to the top-left of the coil driver board
C	Coil connection (1 of 5, two coils per connection)	**I**	Ribbon cable connection - connects to the bottom-left of the coil driver board
D	Thermistor connector (1 of 5)	**J**	24 V digital power cable (battery backup)
E	Frame ground connection	**K**	Gateway network cable
F	28 V motor power connection		

4.2.2.4 Left Coil Driver Board with a Power Supply Connected

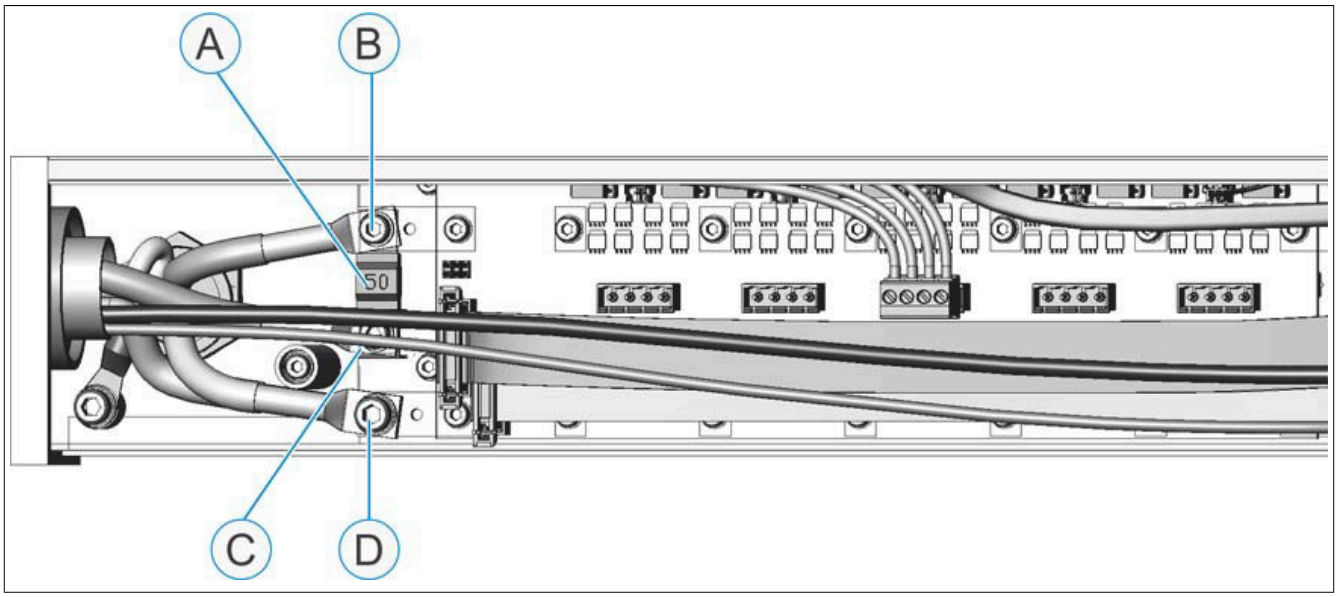
Information:

If the SuperTrak transport system is realized with more than one safety circuit (different guard zones), remove the 28 VDC motor power connection from the zone boundaries.

Information:

The left coil driver board and the right coil driver board are the same. The connections to the boards are different, so they are referenced as the "left" or "right" coil driver board. The curved segment 800 mm also includes a "center" coil driver board.

This drawing indicates the connections that are different on the left coil driver board when a power supply is connected.



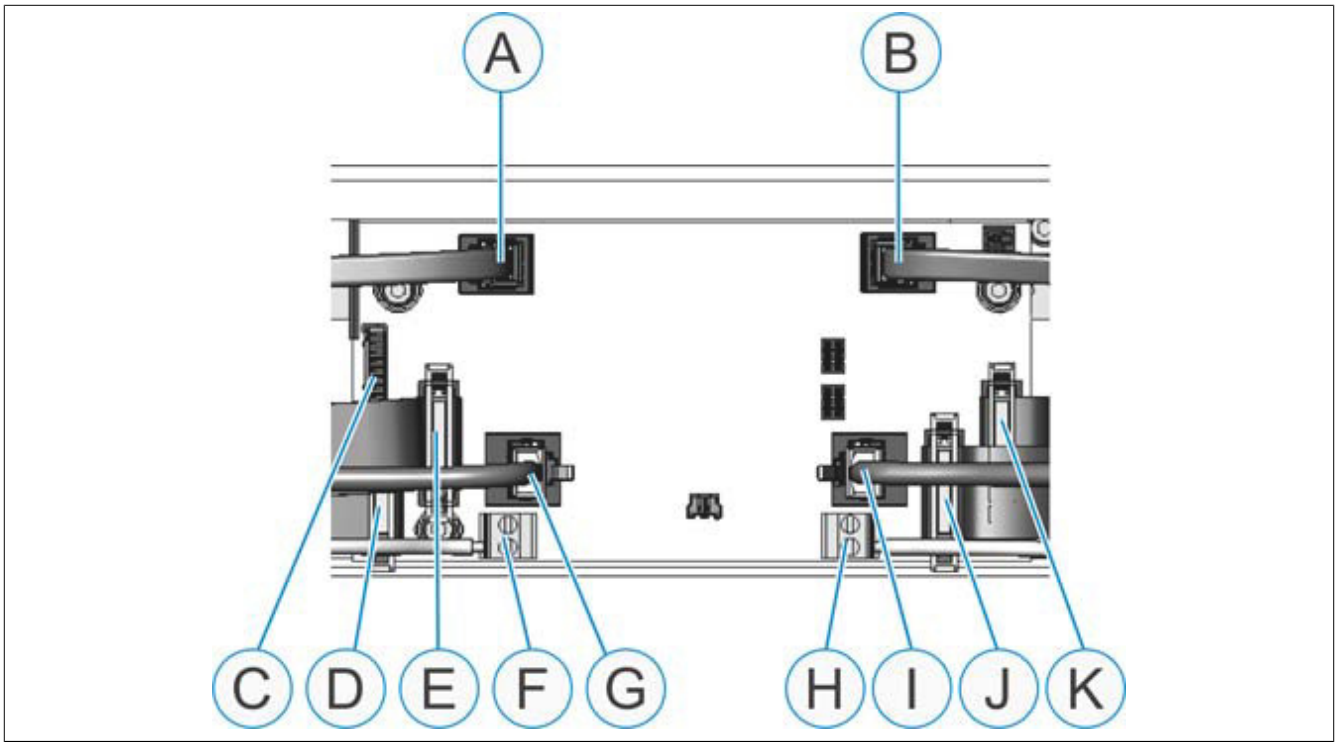
A	50 A fuse	**C**	Motor power connection
B	SuperTrak transport system power supply connection: 28 VDC	**D**	Common connection

See 8.1.5 "Install a SuperTrak Transport System Power Supply" on page 113.

4.2.2.5 Gateway Board

Information:

The 24 V power consumption of the gateway board for straight segments and curved segments is 6 W.

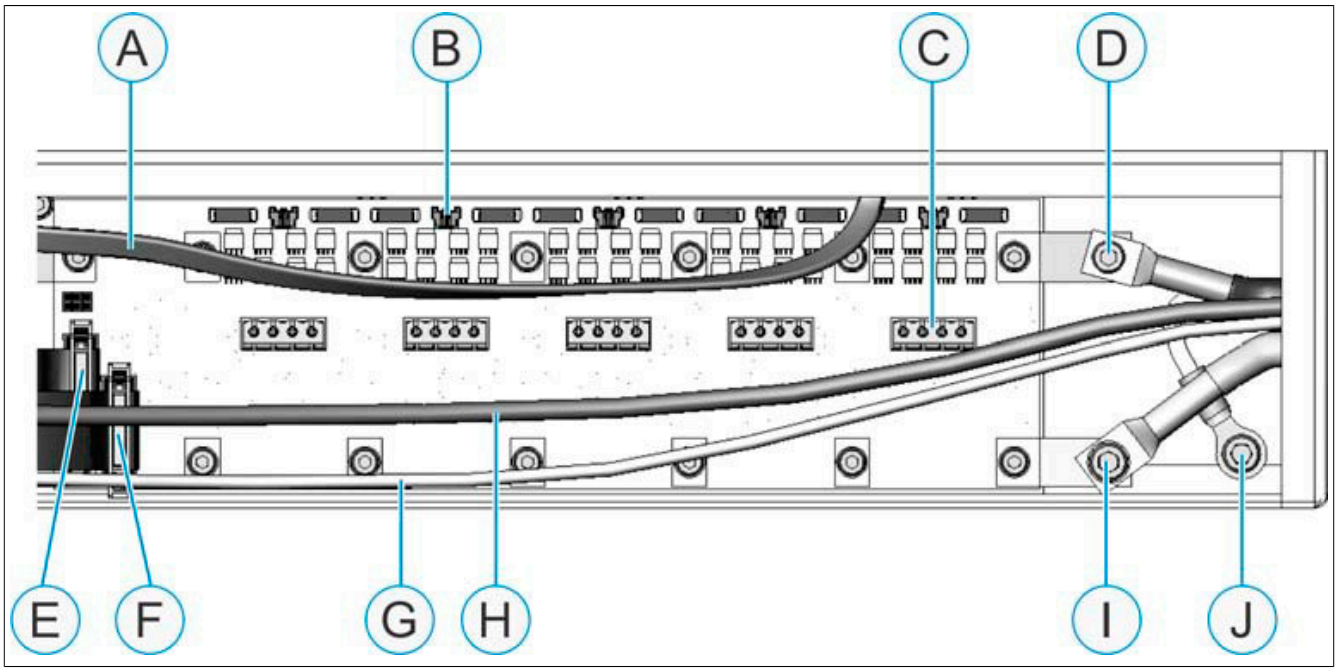


A	Left encoder cable port	**G**	Gateway network port
B	Right encoder cable port	**H**	24 V digital power connection (battery backup)
C	IR reader connection (optional)	**I**	Gateway network port
D	Ribbon cable connection - connects to the bottom-left of the coil driver board	**J**	Ribbon cable connection - connects to the bottom-right of the coil driver board
E	Ribbon cable connection - connects to the top-left of the coil driver board	**K**	Ribbon cable connection - connects to the top-right of the coil driver board
F	24 V digital power connection (battery backup)		

4.2.2.6 Right Coil Driver Board

Information:

The left coil driver board and the right coil driver board are the same. The connections to the boards are different, so they are referenced as the "left" or "right" coil driver board. The curved segment 800 mm also includes a "center" coil driver board.



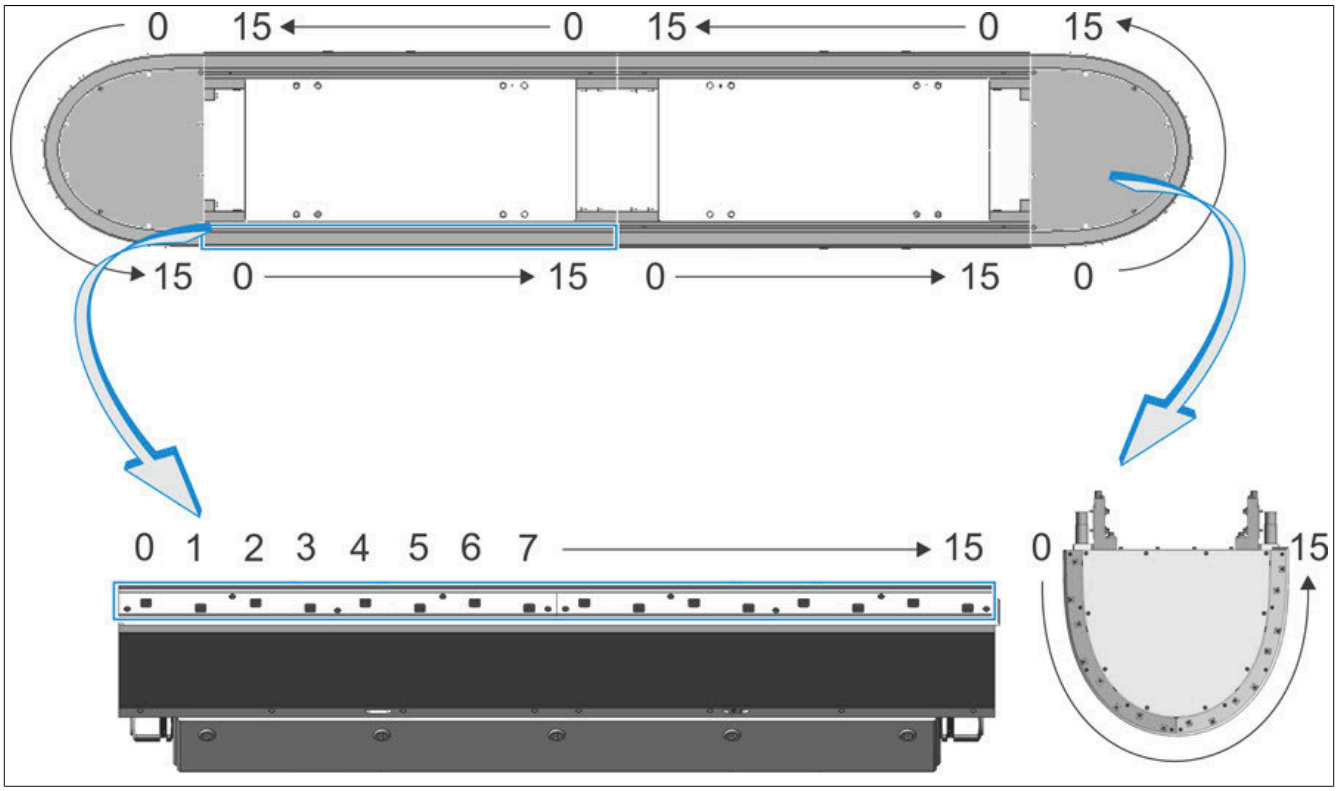
A	Right encoder cable	**F**	Ribbon cable connection - connects to the bottom-right of the coil driver board
B	Thermistor connector (1 of 5)	**G**	24 V digital power cable (battery backup)
C	Coil connection (1 of 5, two coils per connection)	**H**	Gateway network cable
D	28 V motor power connection	**I**	Common connection
E	Ribbon cable connection - connects to the top-right of the coil driver board	**J**	Frame ground connection

4.2.2.7 Encoder Brackets

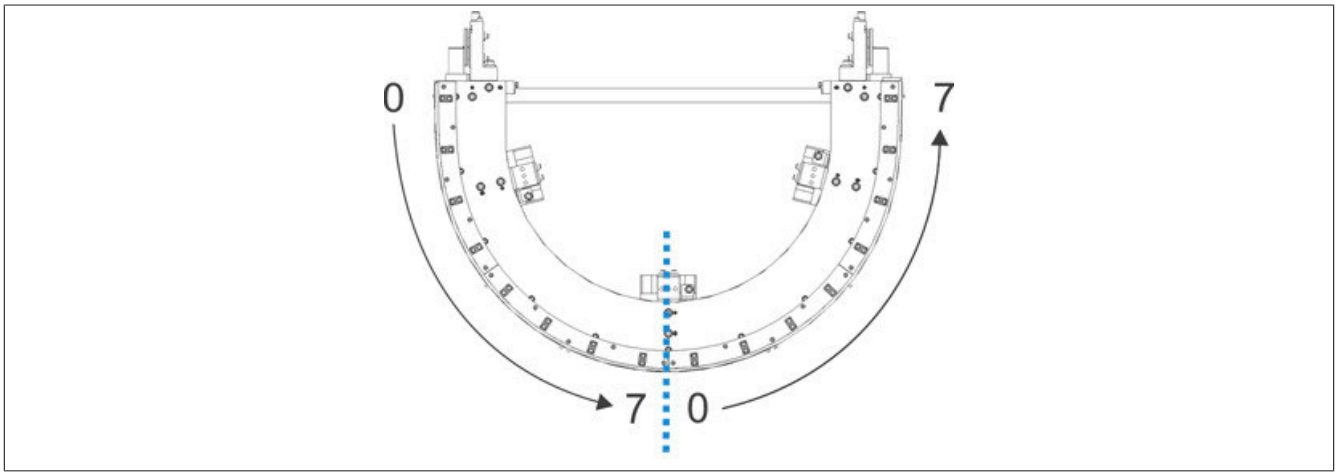
Encoder brackets measure the shuttle position using encoder read heads. Each straight segment and curved segment (500 mm) has two (2) encoder brackets: a left encoder bracket and a right encoder bracket. Every encoder bracket has eight (8) encoder read heads, which look like black squares on the top of the encoder bracket. The encoders are used for shuttle position feedback.

Encoder numbering begins at the left side of a left encoder bracket and ends at the right side of the right encoder bracket.

The following diagram illustrates how the encoders are numbered 0 to 15 from left to right, for each assembly:

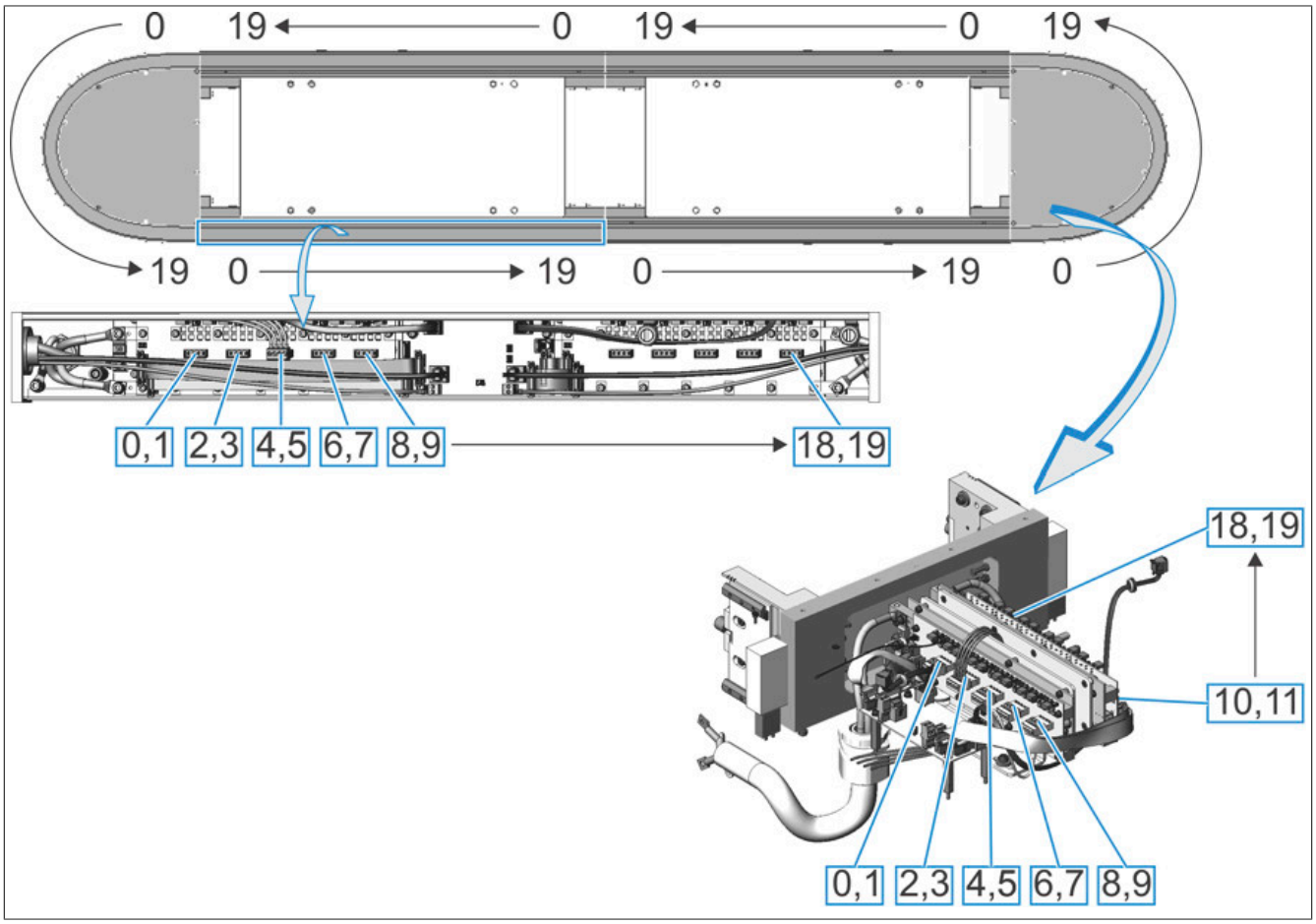


Each curved segment (800 mm) has four (4) encoder brackets: a left encoder bracket, two (2) center encoder brackets, and a right encoder bracket. The functionality is the same as described above except that the encoders are numbered 0 to 7 from left to right.

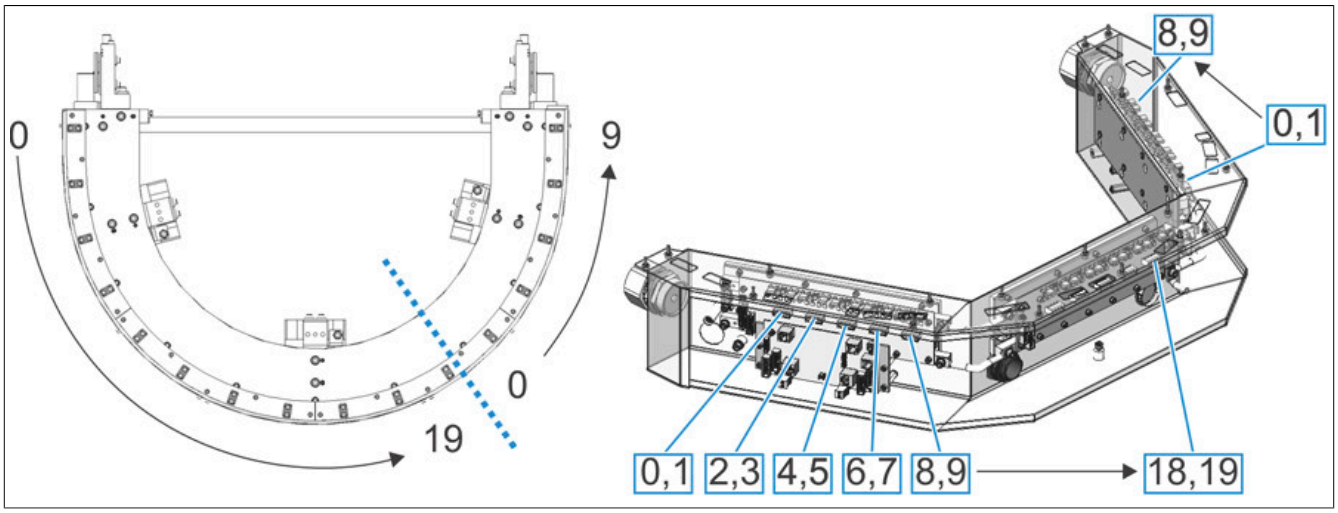


4.2.2.8 Coils

Each straight segment and each curved segment (500 mm) has twenty (20) coils. A coil pair is connected to each of the five (5) coil connections on the left coil driver board, and a coil pair is connected to each of the five (5) coil connections on the right coil driver board. The coils are numbered 0 to 19 from left to right.



Each curved segment (800 mm) has thirty (30) coils. The functionality is the same as described above except that the curved segment (800 mm) has three (3) coil driver boards. As shown, the coils are numbered 0 to 19, and then 0 to 9 from left to right.

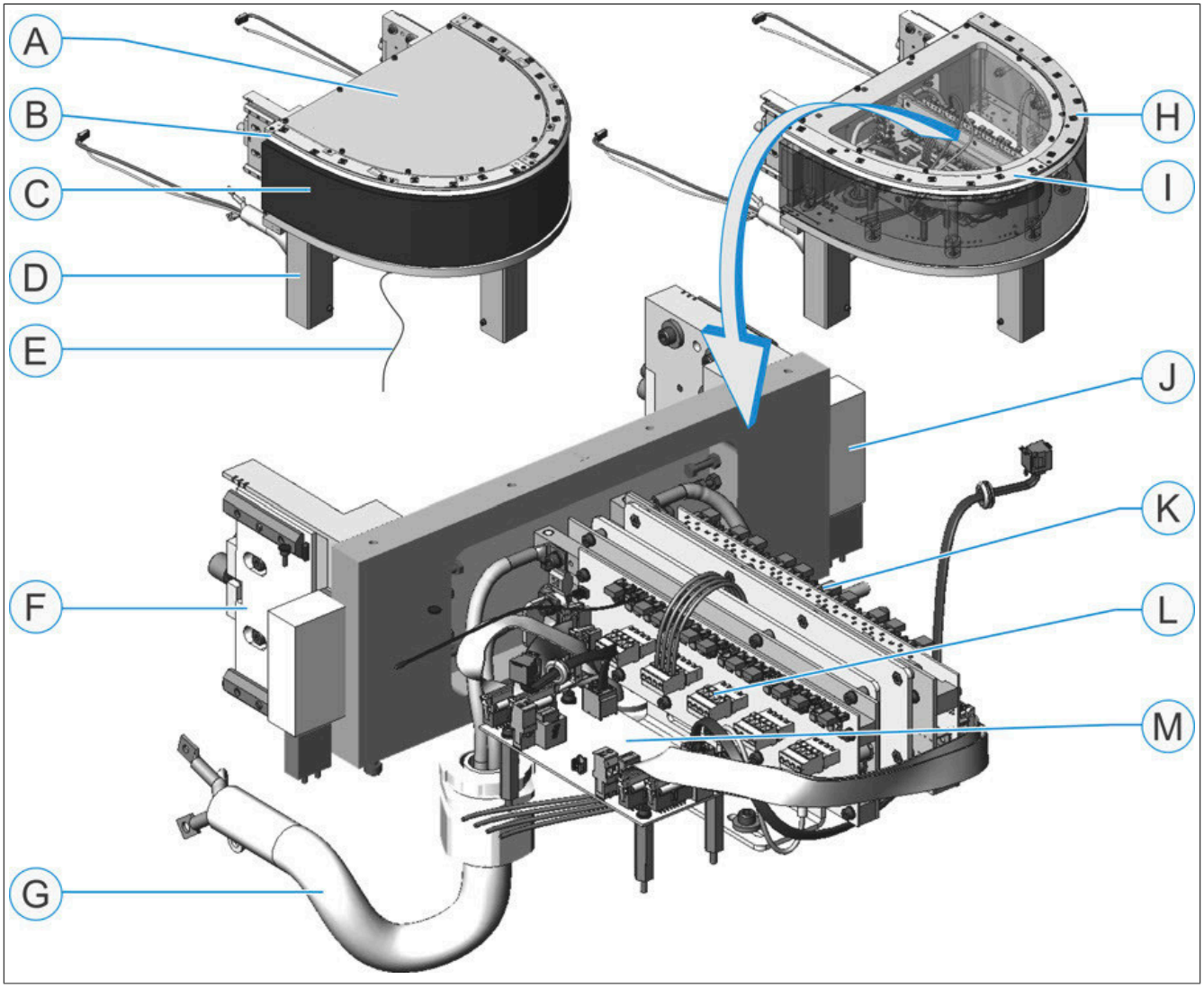

0
9
0
19
8,9
0,1
0,1
2,3
4,5
6,7
8,9
18,19

4.2.3 Curved Segment

An curved segment provides a 500 mm or 800 mm 180° turning radius for the shuttles to travel on. Each SuperTrak transport system has two. Each curved segment upper v-rail is 1030 mm (40.5 in.) in length.

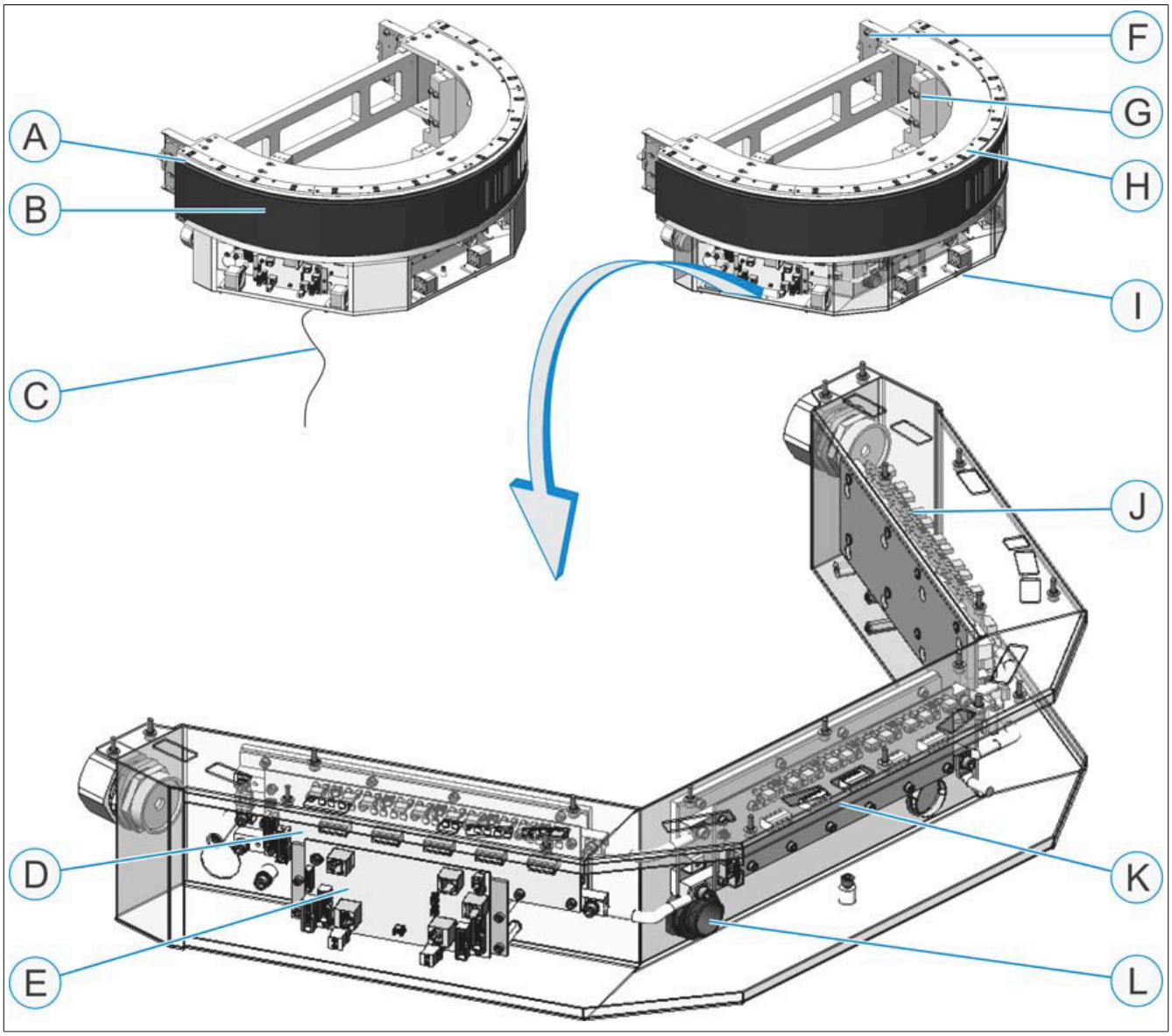
See data sheets 8FZAM2.0A.A000-1 and 8FZAM6.0A.A000-1.

4.2.3.1 Curved Segment, 500 mm



ID	Assembly Name	Description
A	Curved segment top cover	Provides access to the electronic boards.
B	Upper v-rail	Provides a track for the shuttle v-wheels to travel on. The upper v-rail of the curved segment is 1030 mm in length
C	Motor	Produces the electromagnetic force that propels the shuttles. The motor includes: • Potted coils • Iron core lamination assembly For information about coil numbering see "Coils" on page 34.
D	Stand (1 of 3)	Mounts the segment to the SuperTrak transport system frame.
E	Ground wire	Provides the single point earth ground for the SuperTrak transport system. Although each SuperTrak transport system has two curved segments, only one curved segment contains a single point earth ground wire. The single point earth ground wire is connected from the bottom plate of the curved segment to the main electrical panel.
F	Wedge adjust	Connects the curved segment to a straight segement.
G	Electrical interconnect	Houses the power and network cables.
H	Right encoder bracket	Measures the shuttle position using encoder read heads.
I	Left encoder bracket	
J	Magnetic shunt	An iron block.
K	Right coil driver board	See 4.2.2.6 "Right Coil Driver Board" on page 32.
L	Left coil driver board	See 4.2.2.3 "Left Coil Driver Board" on page 30 or 4.2.2.4 "Left Coil Driver Board with a Power Supply Connected" on page 31.
M	Gateway board	See 4.2.2.5 "Gateway Board" on page 32.

4.2.3.2 Curved segment, 800 mm



ID	Assembly Name	Description
A	Upper v-rail	Provides a track for the shuttle v-wheels to travel on. The upper v-rail of the curved segment is 1518.7 mm in length
B	Motor	Produces the electromagnetic force that propels the shuttles. The motor includes: • Potted coils • Iron core lamination assembly For information about coil numbering see 4.2.2.8 "Coils" on page 34.
C	Ground wire	Provides the single point earth ground for the SuperTrak transport system. Although each SuperTrak transport system has two curved segments, only one curved segment contains a single point earth ground wire. The single point earth ground wire is connected from the bottom plate of the curved segment to the main electrical panel.
D	Left coil driver board	See 4.2.2.3 "Left Coil Driver Board" on page 30.
E	Gateway board (1 of 2)	See 4.2.2.5 "Gateway Board" on page 32.
F	Wedge adjust, and a magnetic shunt	Connects the curved segment to a straight segement, and an iron core.
G	Adjustable stand (1 of 3)	Mounts the segment to the SuperTrak transport system frame.
H	Encoder bracket	Measures the shuttle position using encoder read heads.
I	Electrical door (1 of 3)	Encloses the electrical components.
J	Right coil driver board (2 of 2) and gateway board (2 of 2)	See 4.2.2.6 "Right Coil Driver Board" on page 32.
K	Right coil driver board (1 of 2)	See 4.2.2.6 "Right Coil Driver Board" on page 32 and Gateway Board.
L	Electrical interconnect	Houses the power and network cables.

4.2.4 SuperTrak Transport System Motor Power Supply

Warning!

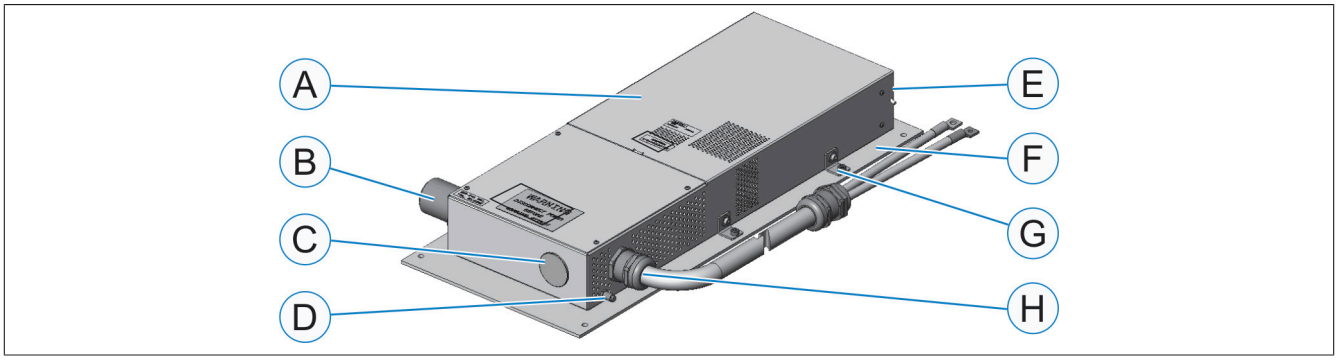
Servicing an electrical panel that is still connected to its power source may cause injury or death. Unless directed otherwise, turn the main power supply OFF. Lockout and tagout the main power supply before accessing and servicing the electrical panel. Only qualified electrical technicians should perform service on the electrical panel.
See 3.4 "Hazardous Energy" on page 19 and 3.5 "Lockout and Tagout" on page 21.

Information:

A line filter is required (for example, a Schaffner "FN 3256H-XX").

The SuperTrak transport system power supply is an AC to DC power supply that provides 28 VDC to the SuperTrak transport system for shuttle motion. Each SuperTrak transport system power supply is to be wired into a control panel.

The number of SuperTrak transport system power supplies varies depending on the demands of the specific SuperTrak transport system.



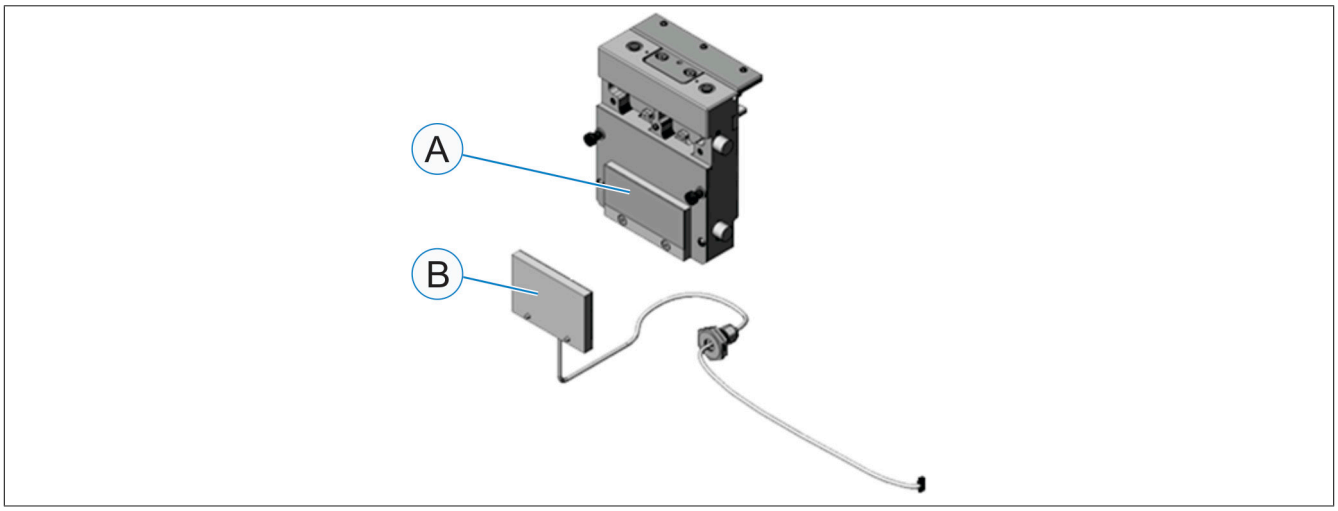
A	Power supply cabinet	**E**	Power supply filter
B	AC power input plug	**F**	Power supply mounting plate *Not included in standard scope of delivery.*
C	Alternate 28 VDC power output location	**G**	Power supply mounting brackets
D	Power supply OK signal	**H**	28 VDC power output location

4.2.5 IR Reader Assembly (Optional)

Caution!

The SuperTrak transport system IRID assembly contains an infrared emitting diode (IR LED) that is classified as eye safe. The following standards and classifications apply:

- **IEC/EN 60825-1 (2007-03), DIN EN 60825-1 (2008-05) “SAFETY OF LASER PRODUCTS - Part 1: equipment classification and requirements”, simplified method. This is classified as “Class 1”.**
- **IEC 62471 (2006), CIE S009 (2002) “Photobiological Safety of Lamps and Lamp Systems”. This is classified as “Exempt”.**
- **DIRECTIVE 2006/25/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5th April 2006 on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation) (19th individual directive within the meaning of article 16(1) of directive 89/391/EEC). This is classified as “Exempt”.**



A	IR tag (read-only)	**B**	IR reader

The infrared (IR) shuttle ID system is an optional SuperTrak transport system that allows for a customized shuttle ID to be assigned to each shuttle. The IR reader assembly includes an IR tag and IR reader (with cable). It provides the following benefits:

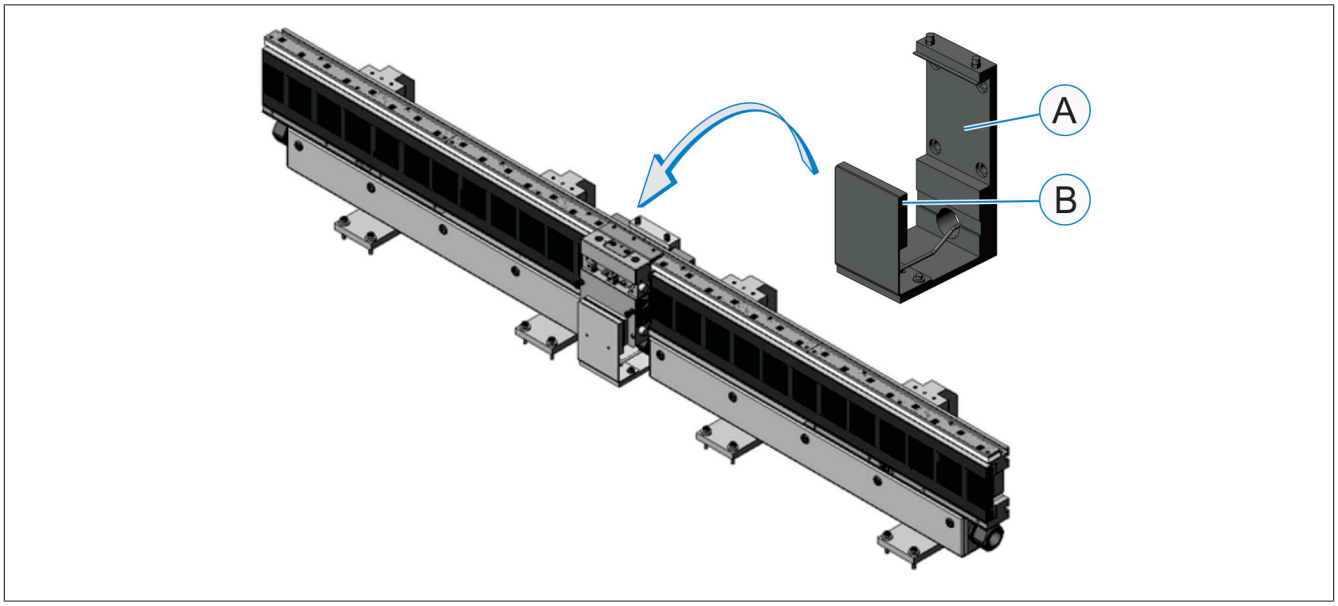
- Simplifies SuperTrak transport system recovery after a complete cold start.
- Provides data integrity when shuttles are manually removed.
- Provides tracking of individual shuttle fixtures.
- Shuttle IDs are read ‘on-the-fly’: shuttles do not stop at the IR reader assembly.
- It induces the necessary power into the tags for reading purposes. Batteries are not required.

Integration of the IRID reader assembly with the SuperTrak transport system is Plug-and-play. External PLC programming is not required.

See 4.2.6 "IR Reader Mount Assembly (Optional)" on page 40.

4.2.6 IR Reader Mount Assembly (Optional)

The infrared (IR) reader mount assembly is an optional assembly for mounting the IR reader assembly.

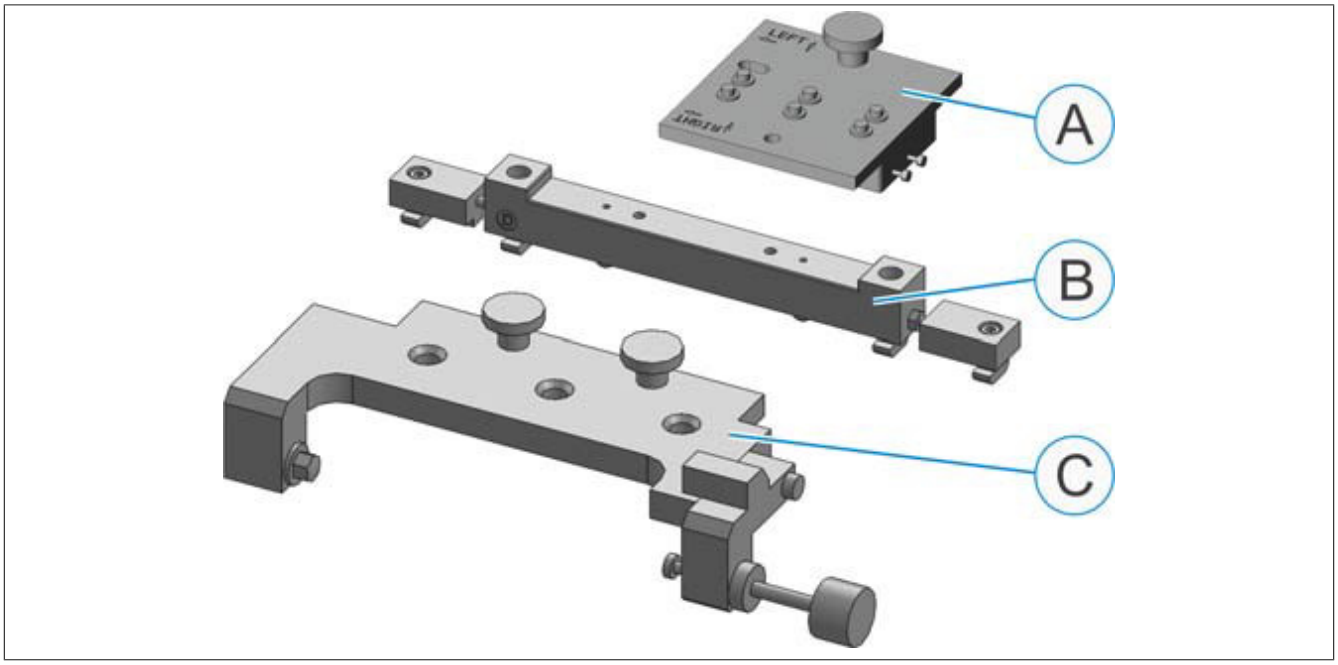


A	IR reader mount assembly	**B**	IR reader installation location

See 5.5 "Install an IR Reader Mount Assembly" on page 78.

4.2.7 Shuttle Setup Tools (Optional)

The shuttle setup tools are optional SuperTrak transport system tools that allow you to align and calibrate SuperTrak shuttle encoder strips.



A	Shuttle setup adjustable chip finder	**C**	Shuttle setup removable locate
B	Shuttle Setup Stationary mount		

5 Installation

5.1 Prerequisites

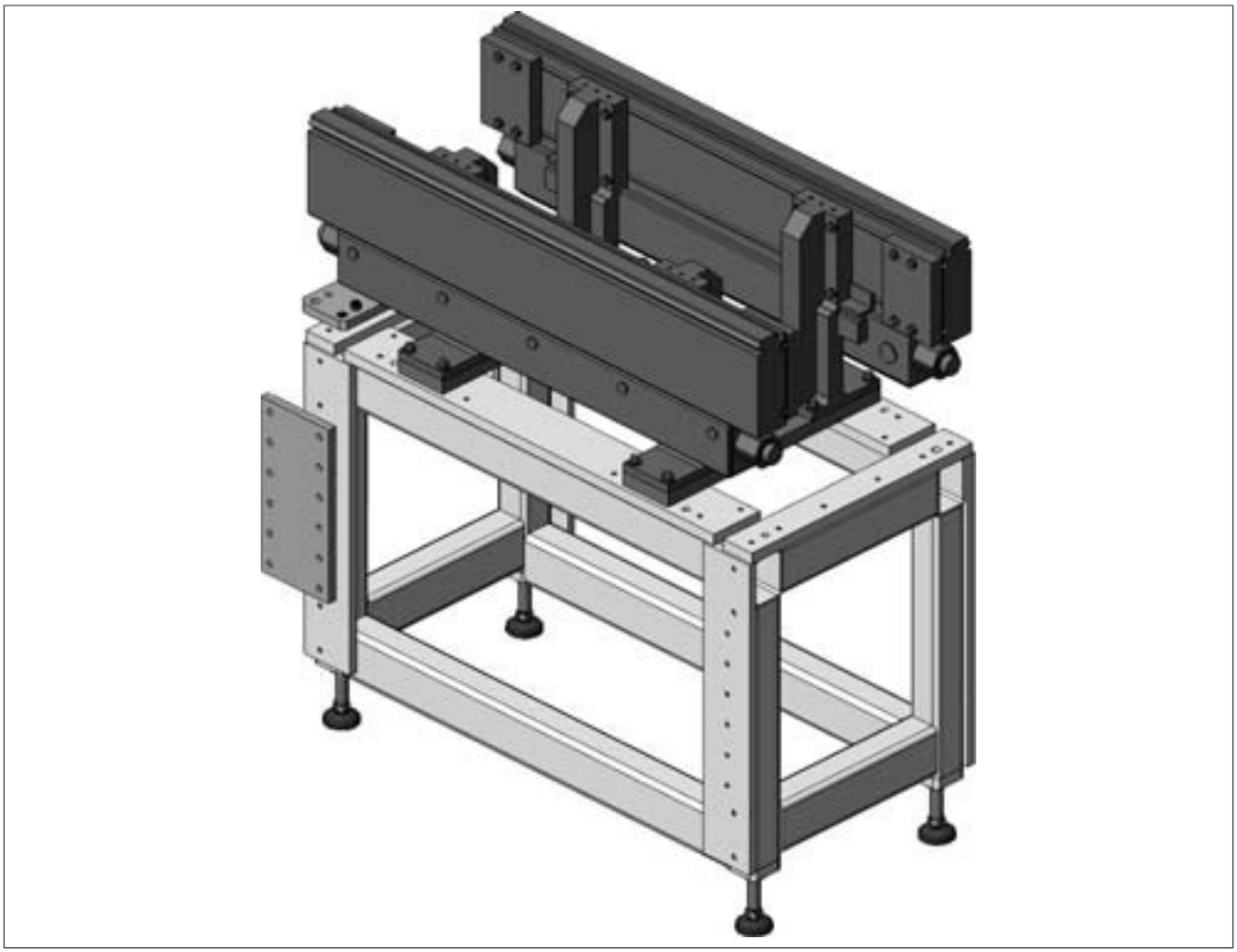
The following services and components are required to successfully install the SuperTrak transport system:

- A non-compressing installation surface (for example; a concrete floor)
- Critical Frame Considerations:
    1) The motor mounting surfaces must have flatness +/- 0.25 mm
    2) The frames must maintain a precise 1 meter pitch within +/- 0.075 mm
- TrackMaster software for easy startup or Automation Studio
- Computer with Windows and network connectivity
- Ethernet cable
- Tools:
    - 0.5 mm (0.02 in.) shims
    - Feeler gauges
    - Framing square
    - Mallet
    - Straight flat bar 38.5 cm (15.16 in.) long
    - Precision spirit level
    - Set of metric hex keys
    - Set of metric wrenches or spanners

5.1.1 Calculate the Installation Space

This section illustrates and provides measurements of the SuperTrak transport system segements that are available. Use the measurements to calculate the required installation space.

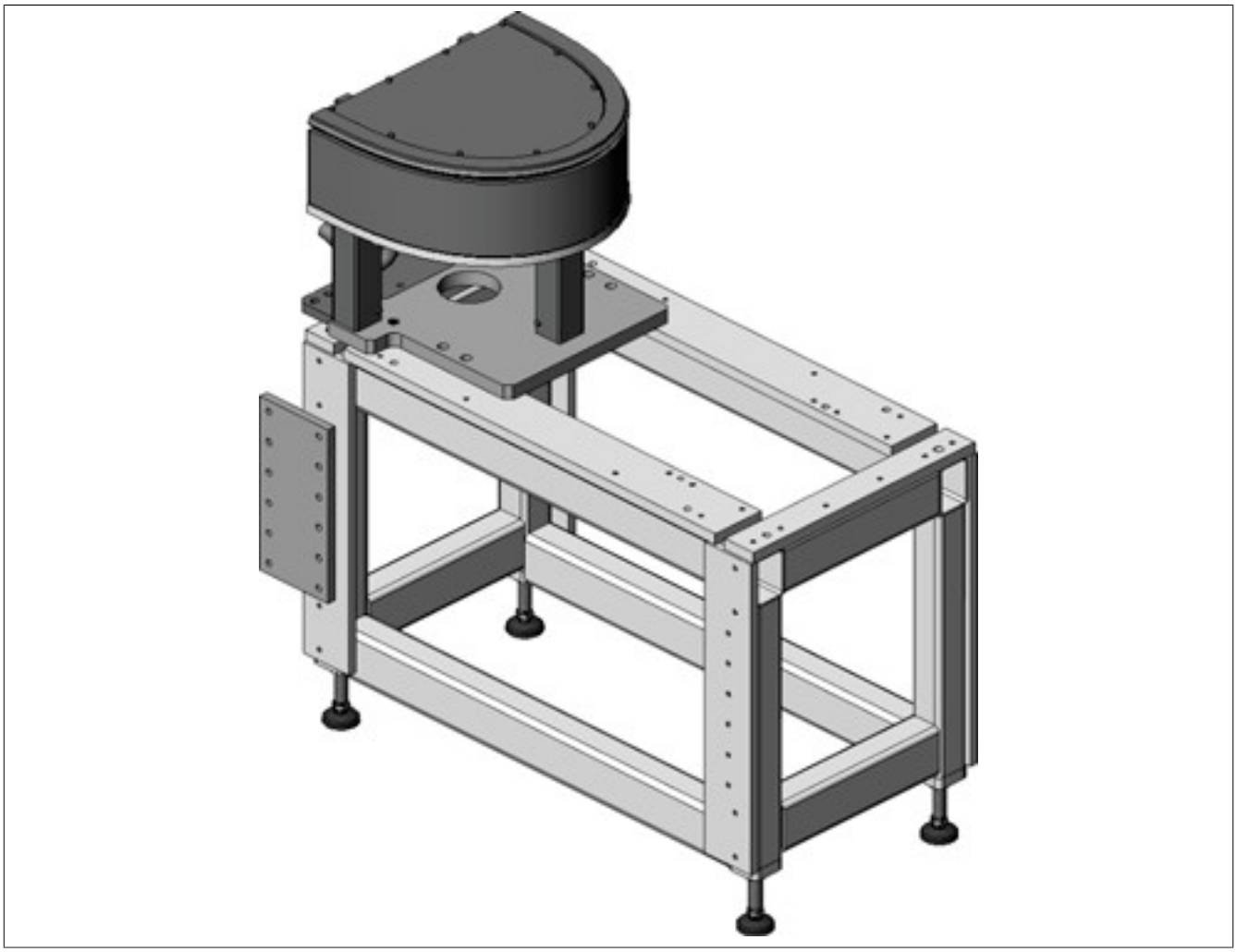
5.1.1.1 Straight Segment



Length	Width	Height	Weight
1000 mm	62 mm (150 mm with stands)	356.4 mm	51 kg

Table 2: Dimensions and weight of one segment without frame

5.1.1.2 Curved Segment



Length	Width	Height	Weight
390.8 mm (without shuttles, run length 1030 mm)	472 mm (without shuttles)	356.4 mm	65 kg

Table 3: Dimensions and weight of one segment without frame

5.2 Install the SuperTrak Transport System Segments

Information:

Make sure the installation is done on a non-compressing surface (for example; concrete), so the segments can be leveled and aligned correctly.

Information:

A SuperTrak transport system can contain a maximum of is sixty-two (62) segments: sixty (60) straight segments and two (2) curved segments. This is because the maximum number of gateways is 64. Each straight segment has one (1) gateway, each 500 mm curved segment has one (1) gateway, and each 800 mm curved segment has two (2) gateways.

Complete the procedures in this section in the order that they are written.

1. Calculate the space required to install the SuperTrak transport system, to verify that there is adequate space.
   See 5.1.1 "Calculate the Installation Space" on page 43.
2. Complete the following:
   See 5.2.1 "Install the SuperTrak Transport System Segments with Custom Stands on a Custom Frame" on page 46.
3. Install the SuperTrak transport system in an over/under configuration.
   See 5.2.2 "Install the SuperTrak Transport System in vertical Configuration" on page 56.
4. Install the required cable connections.
   See 6.3 "Connections" on page 81.
5. Verify that the upper v-rail is adequately lubricated.
   If required, add an additional 20 drops of lubricant to the shuttle lubrication felt, or manually wipe lubricant on the upper v-rail. Remove excess oil from the SuperTrak transport system that may have dripped from the upper v-rail.

5.2.1 Install the SuperTrak Transport System Segments with Custom Stands on a Custom Frame

Danger!

Always use appropriate lifting devices (for example, a fork-lift or crane) and use safe lifting practices and procedures when lifting a straight segment or curved segment.

See 5.2.3 "Lift a SuperTrak Transport System Segment" on page 63.

It is recommended that you obtain relevant information from your national Health and Safety Authority.

Note:

Make sure the frame is designed to hold the weight and force of the SuperTrak transport system segments.

Information:

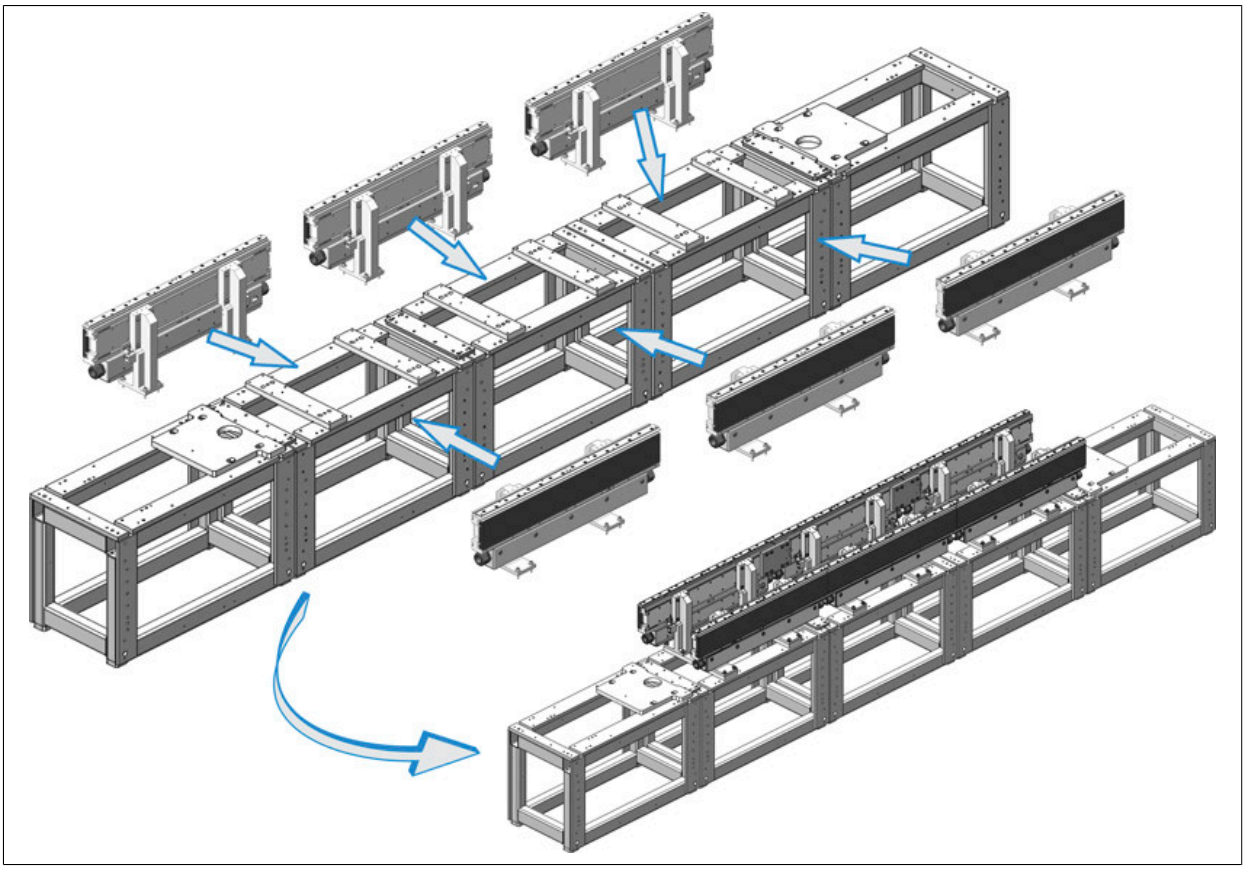
This procedure assumes that the Y-axis movement of the custom stands is ≤0.002 in. (≤0.05 mm) when the stands are parallel, the stands allow for Y-axis and Z-axis adjustment, and the stands include the correct hole pattern.

This procedure assumes that your frame includes the correct hole pattern on the top and sides of the frame.

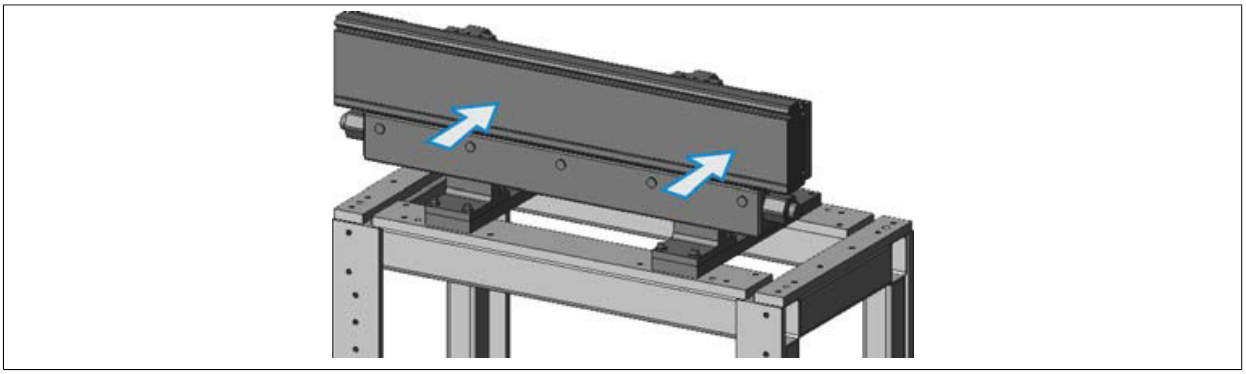
See the SuperTrak transport system B "Mechanical Drawings" on page 219 for additional information.

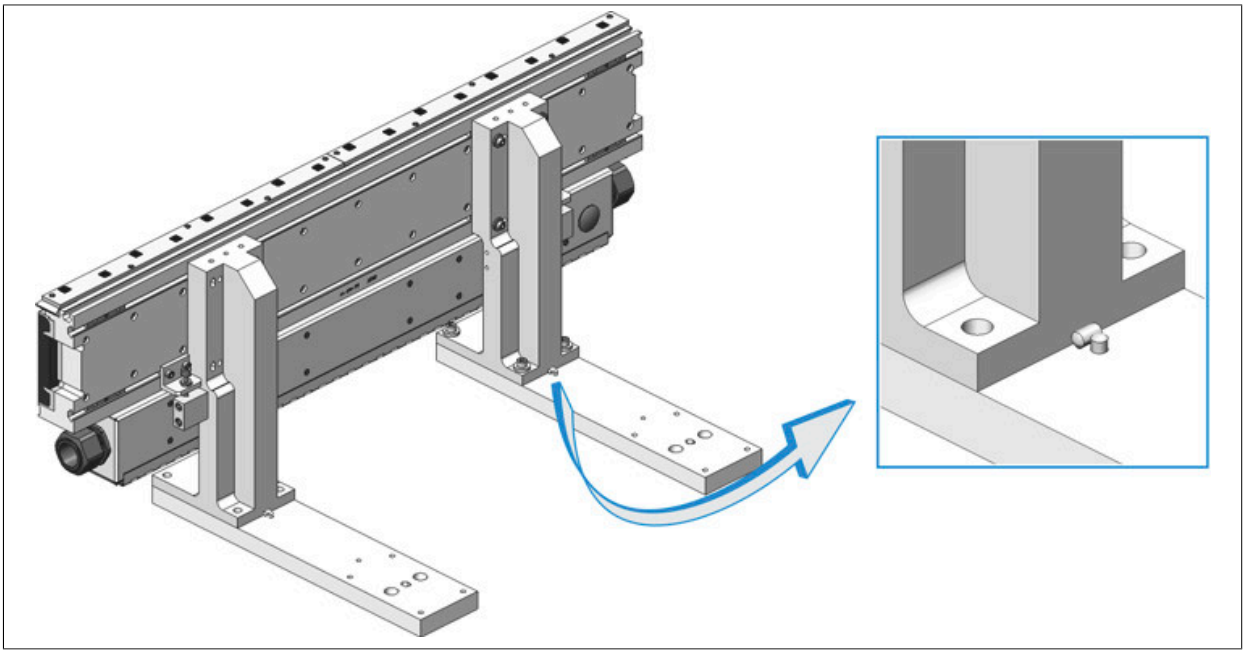
This section describes how to install SuperTrak transport system segments on custom stands and a custom frame. ATS stands and an ATS frame are shown for reference.

1) Inspect the frame to verify that it includes the correct features outlined in the SuperTrak tranport system B "Mechanical Drawings" on page 219.
2) Position the frame on a flat non-compressing surface.
3) If custom stands are used, install the stands on the straight segments and curved segments; otherwise, proceed to step 4:
    a) Inspect the stands to verify that they include the correct features outlined in the SuperTrak GEN3 Design Considerations document.
    This procedure assumes that the Y-axis movement of the custom stands is ≤0.002 in. (≤0.05 mm) when the stands are parallel, the stands allow for Y-axis and Z-axis adjustment, and the stands include the correct hole pattern.
    b) Lift the straight segment or curved segment. See 5.2.3 "Lift a SuperTrak Transport System Segment" on page 63.
    c) As required, attach the stands to the straight segment or curved segment.
4) Position all straight segments on the frame, with the electrical box facing out.

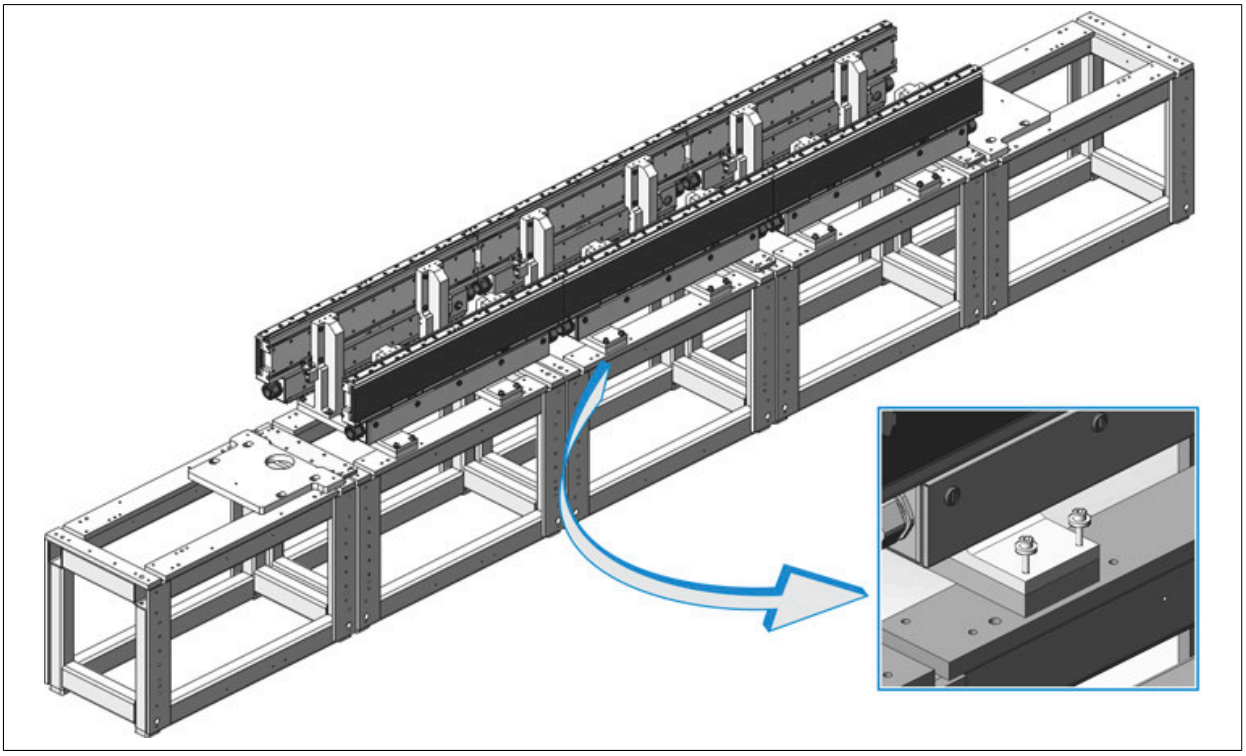


5) Push each straight section toward the center of the frame, so it is tight against the dowel pins in the frame.



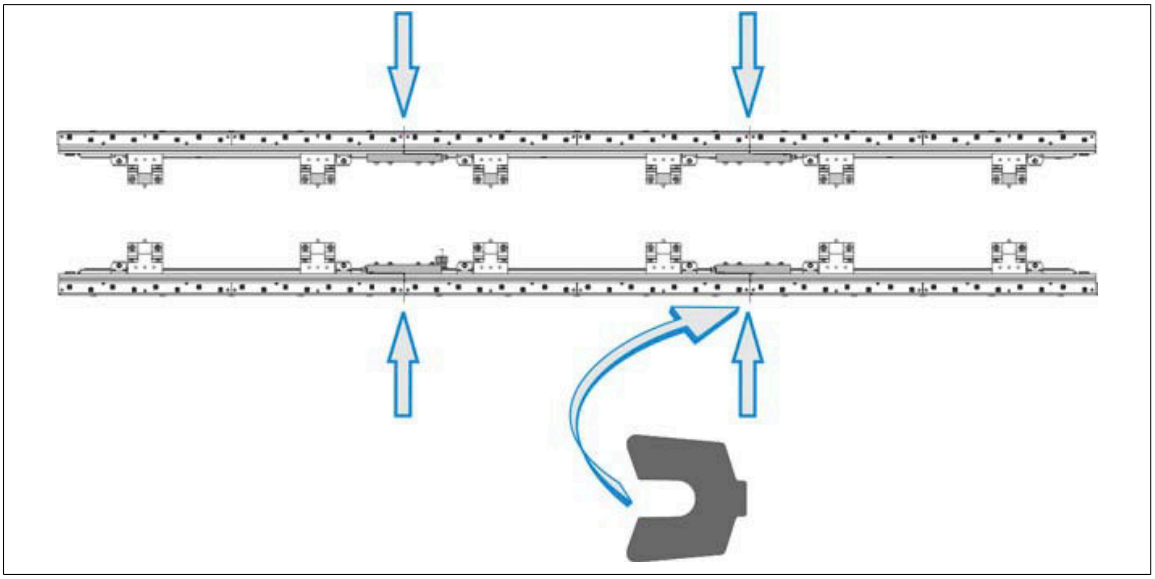


6) Loosely install four (4) screws into each stand base.
It is very important that the screws are centered in the screw holes as much as possible. This allows for adjustment when sections are connected together later.

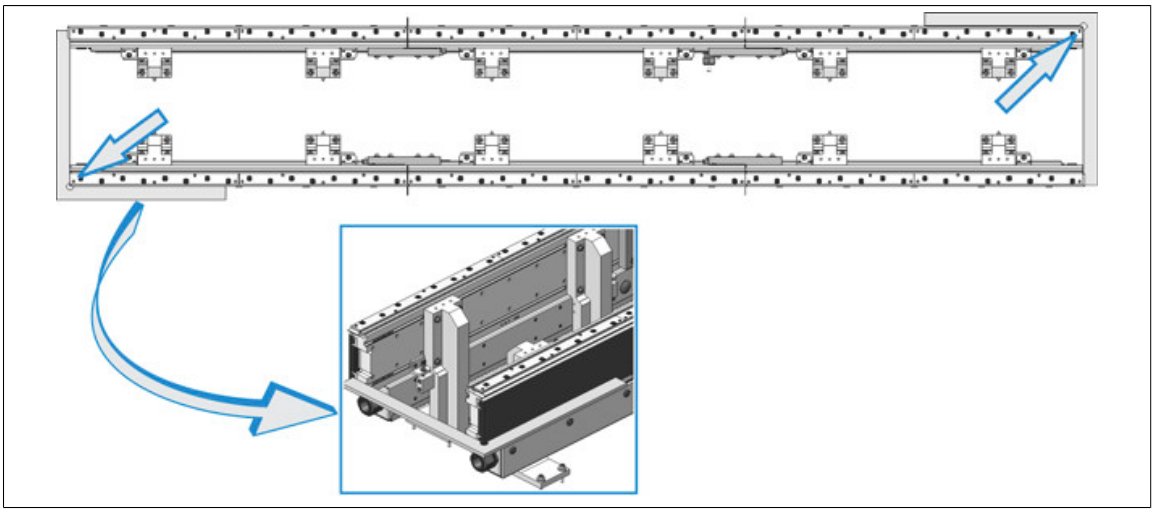


7) Adjust the position of the straight segments until:

° Use shims to verify that a 0.5 mm (0.02 in.) gap exists between all straight segments (between the track structure [or aluminum extrusion], not between the linear motors [or motor laminations]).

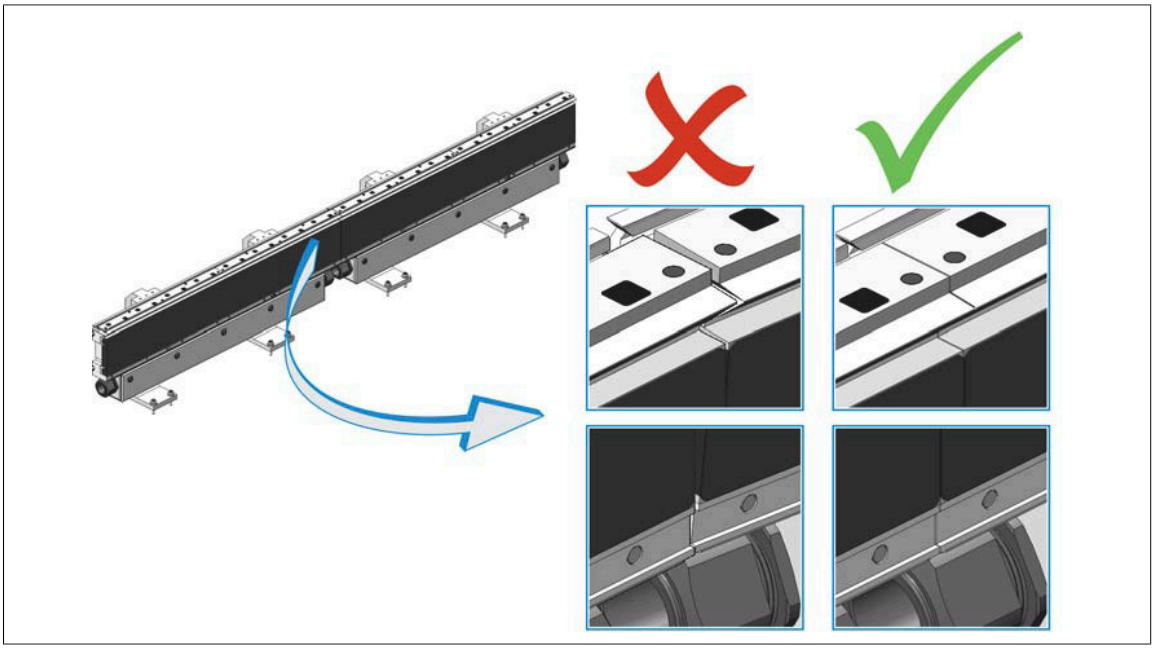


° The two (2) straight segments are reasonably square at each end.

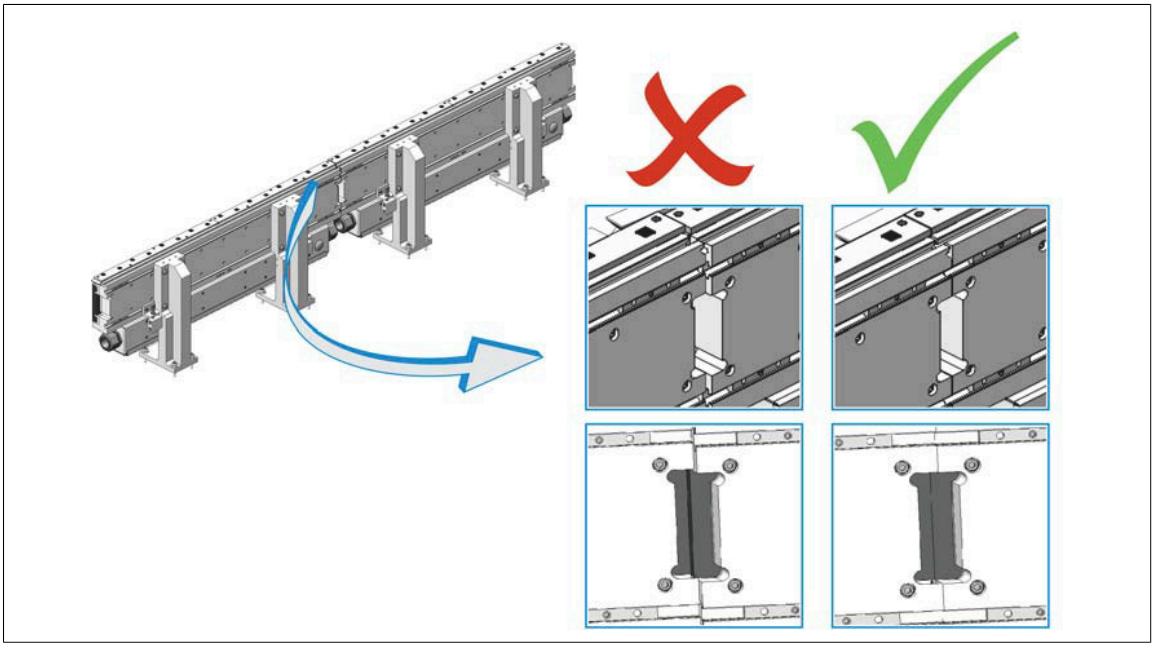


8) Verify that the following are aligned:

° Upper v-rails and flat wear strip pockets.

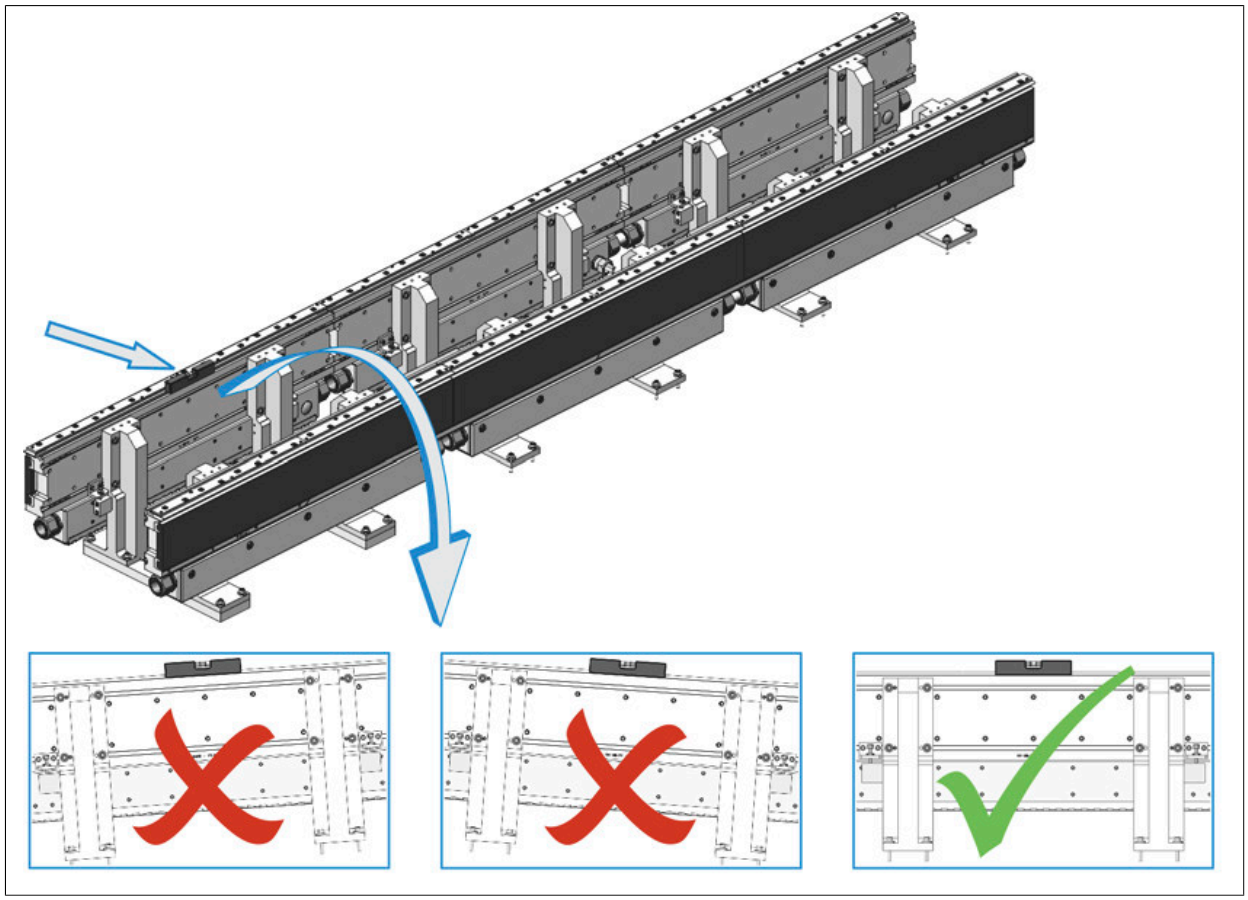


° Back of the laminations at all joints.

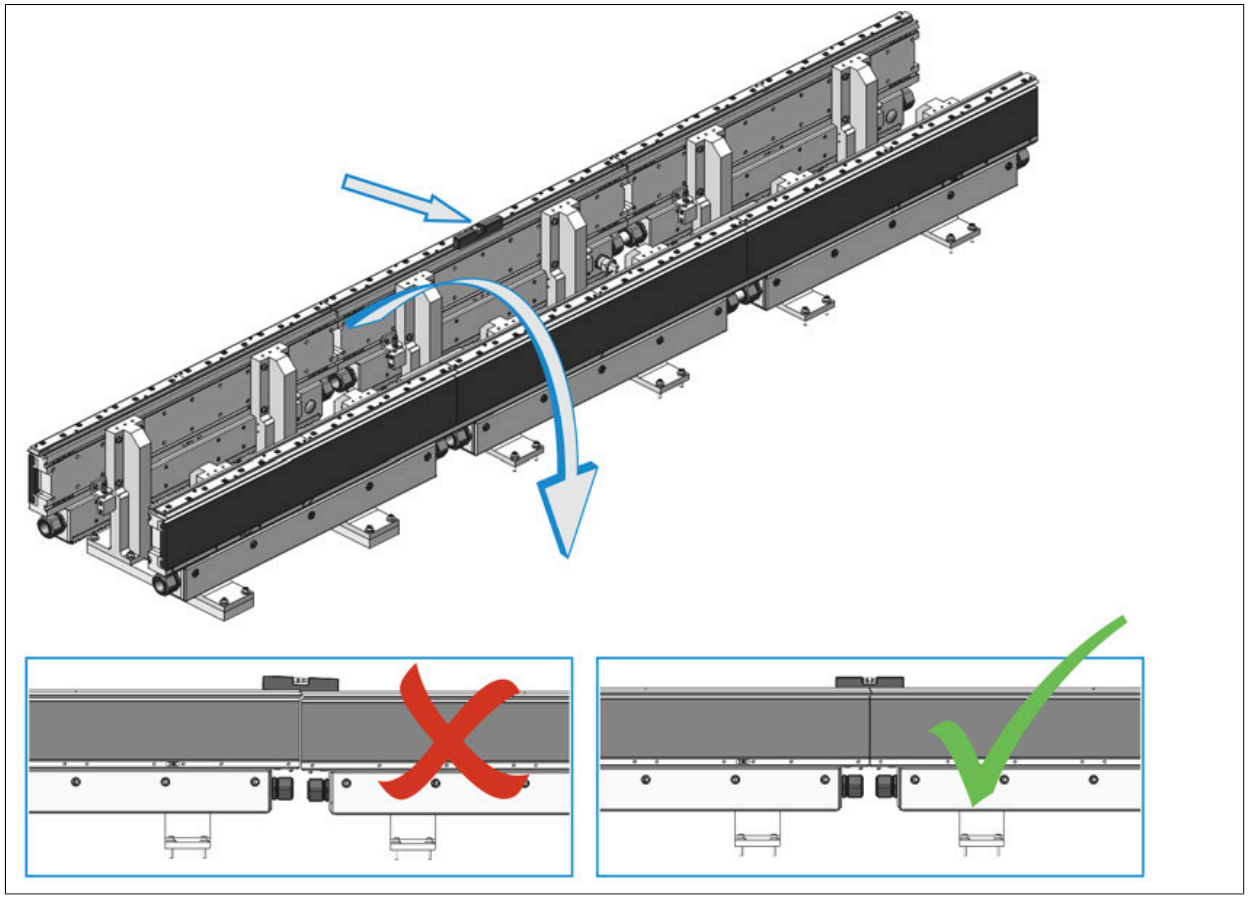


Fix any major misalignment before proceeding with fine alignment.

9) Level the first straight segment.
Place the precision level on the t-slot behind the encoder bracket of the straight segment when leveling.

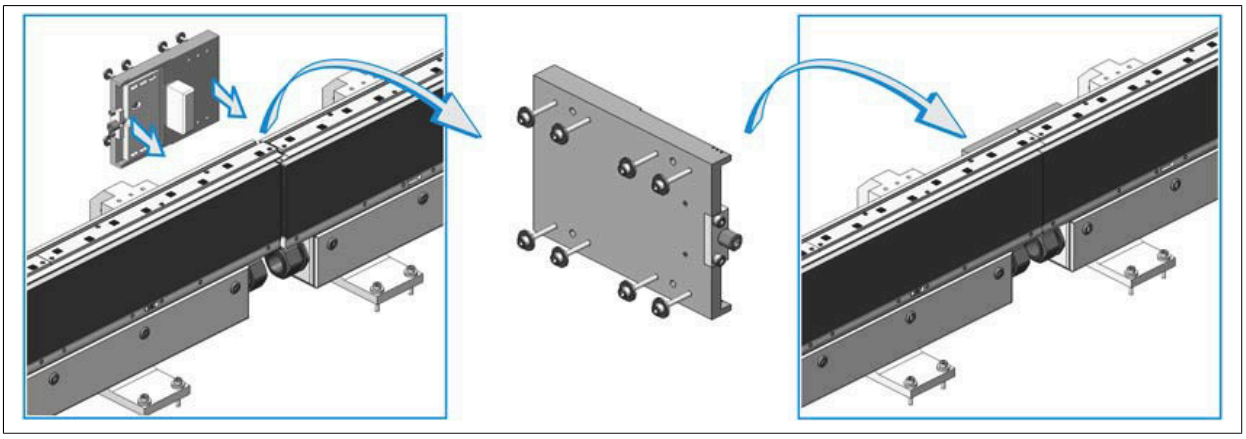


10) Level the second straight segment, and then adjust it vertically to align the upper v-rails with the first straight segment while keeping the segment level.



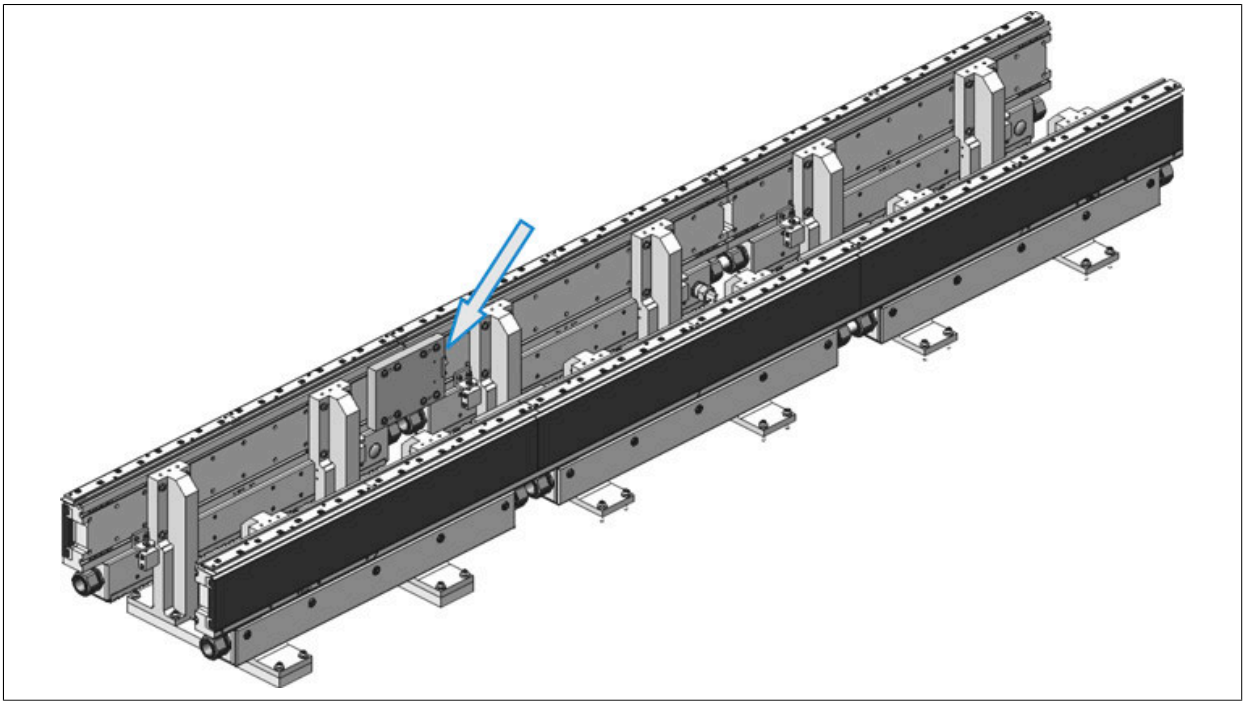
See 5.2.7 "Align the SuperTrak Transport System Segment Joints" on page 67 and 5.2.8 "Align the SuperTrak Transport System Segment Heights" on page 68.

11) Install a wedge adjust between the straight segments.



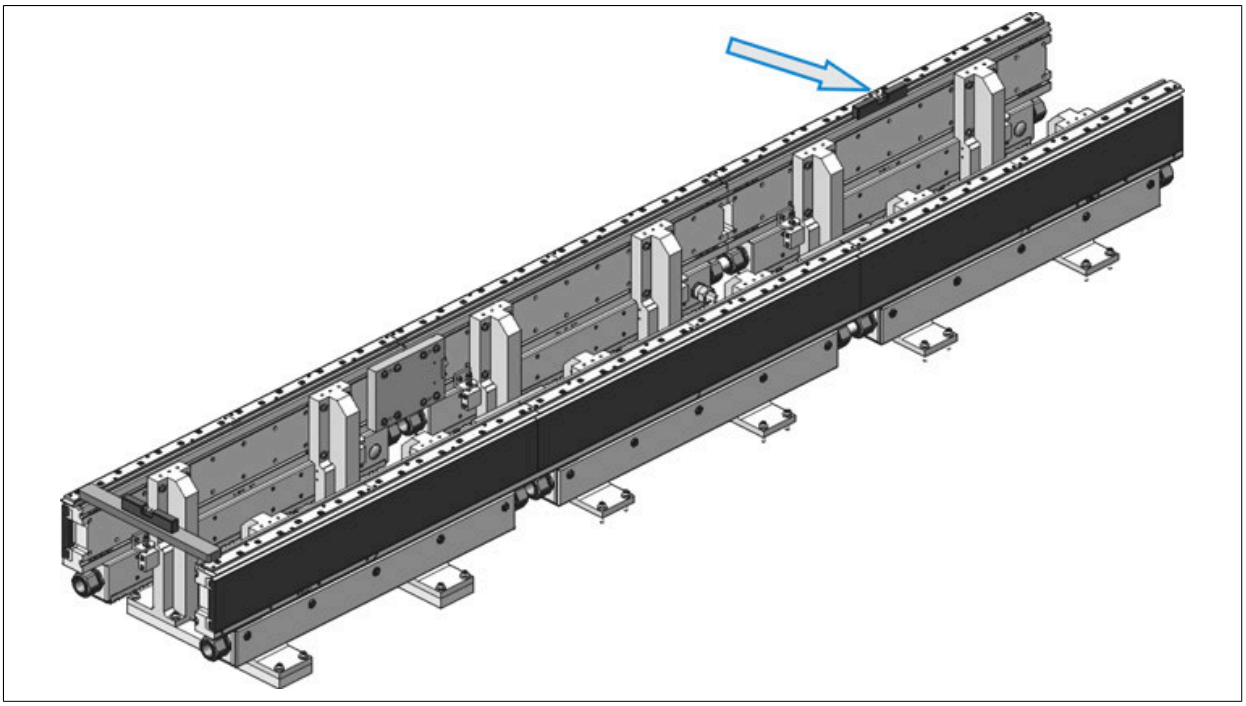
See 5.3 "Install a Wedge Adjust - Straight Segment" on page 69.

12) Adjust the wedge IN or OUT to align the upper v-rails. Only adjust when the wedge adjust screws are loose, and measure when the wedge adjust screws are tight.

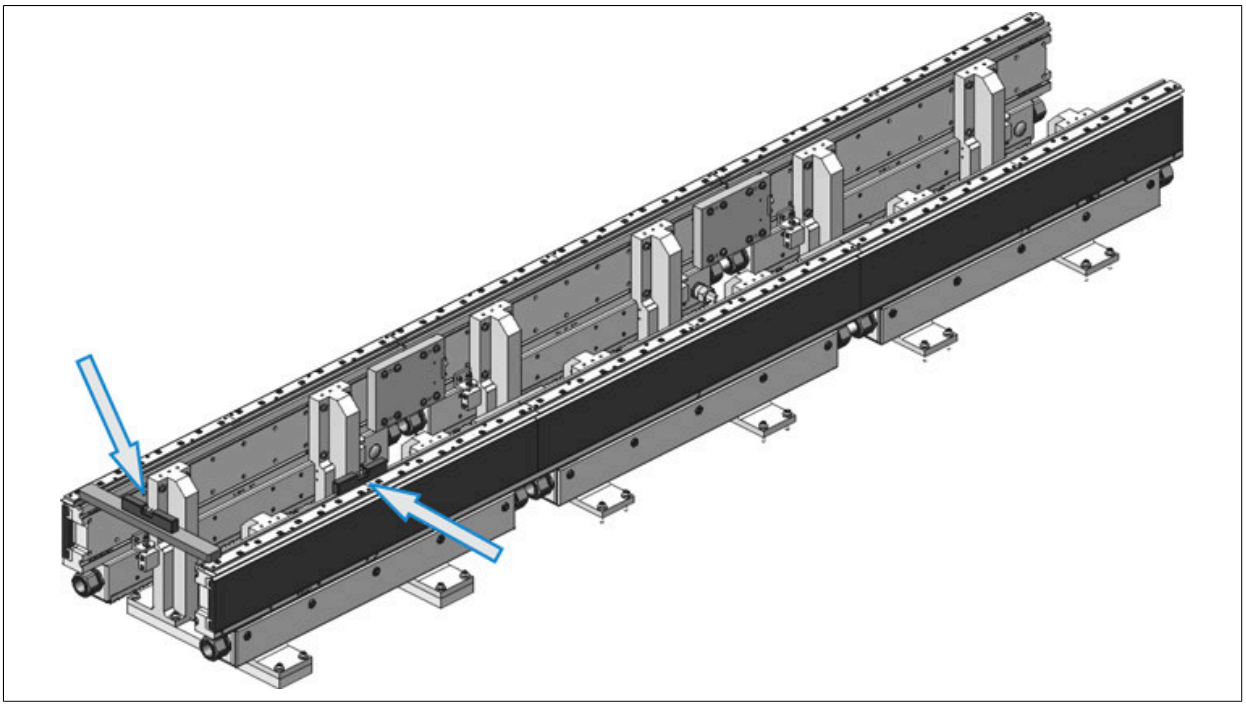


See 5.4 "Fine-Adjust the Upper V-Rail" on page 71.

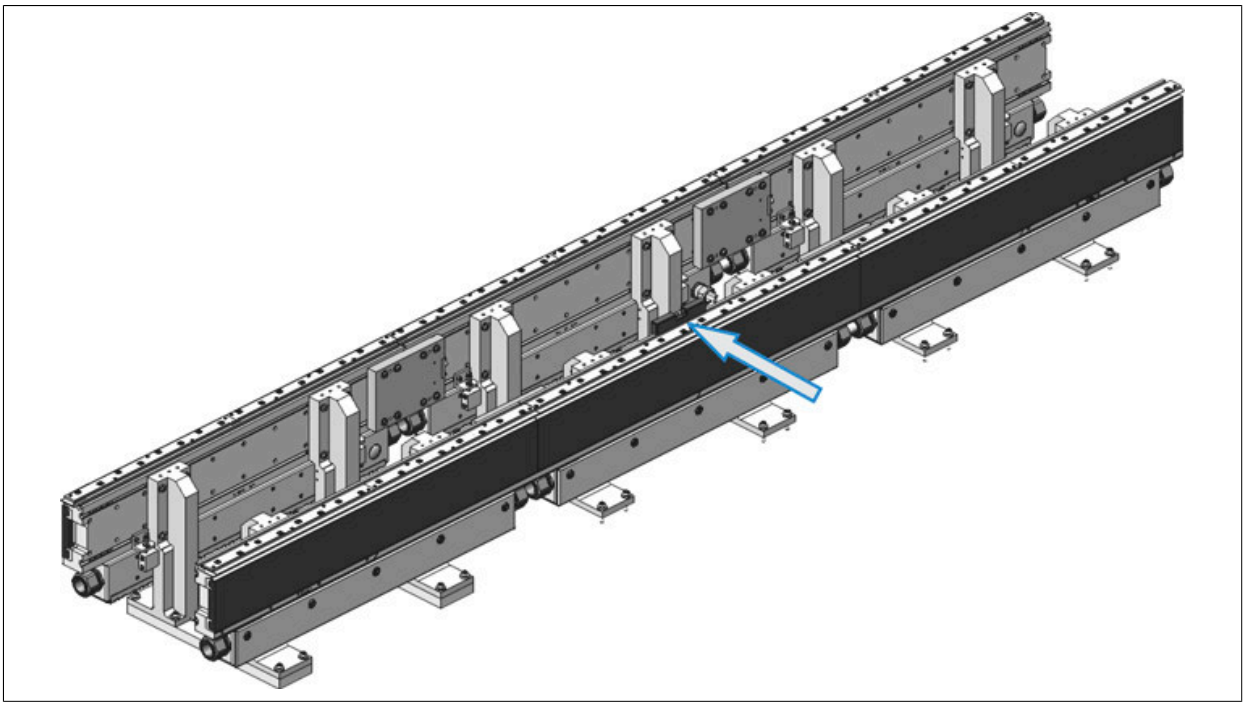
13) Repeat steps 10 to 12 for the remaining segments on the same side of the SuperTrak transport system.



14)Return to the first straight segment and lay a flat bar across it and the opposing straight segment. Make sure the flat bar rests on the t-slot and not the encoder brackets. Level this segment with the first segment.

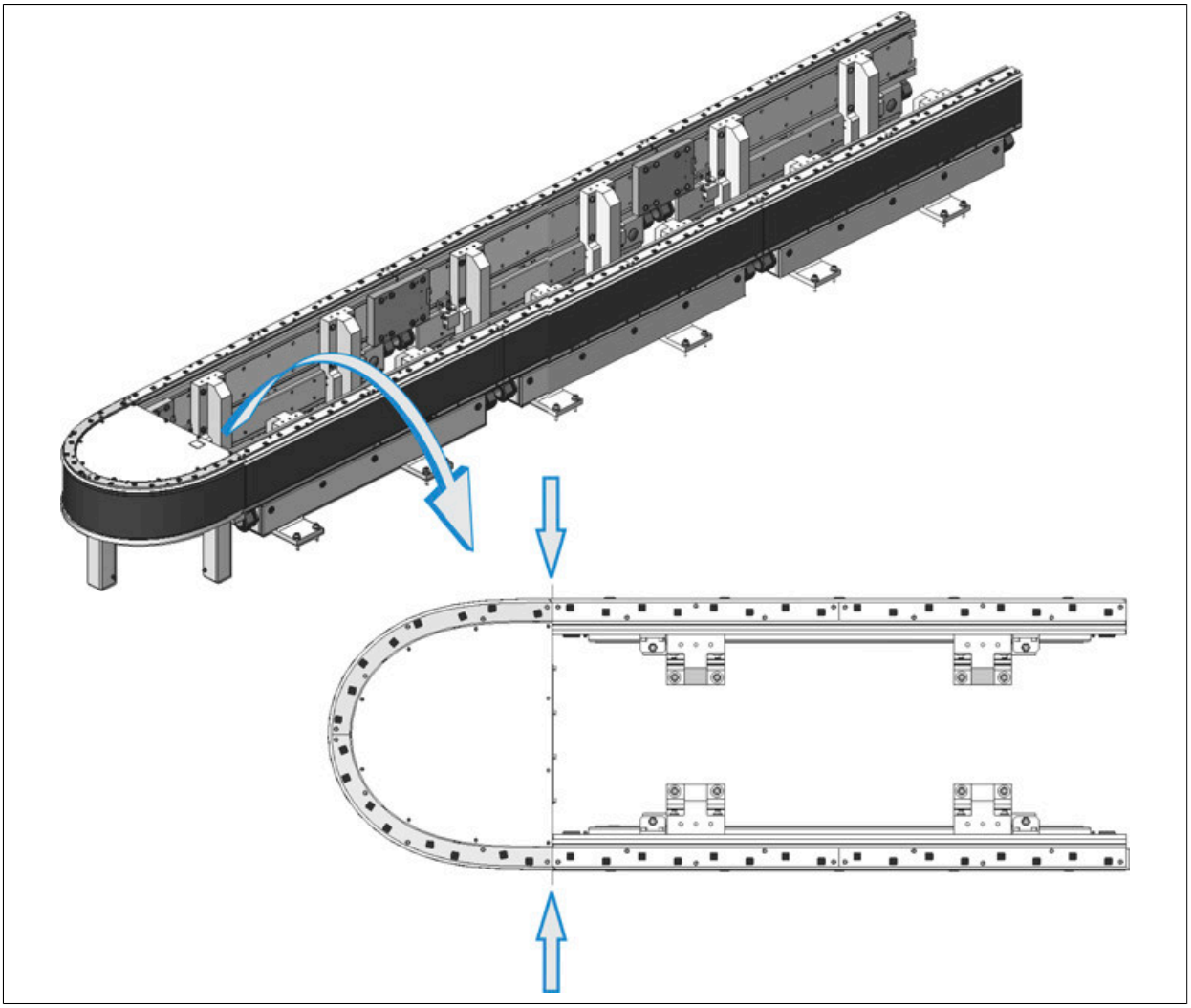


15)Repeat steps 10 to 12 for the remaining segments on the same side of the SuperTrak transport system.

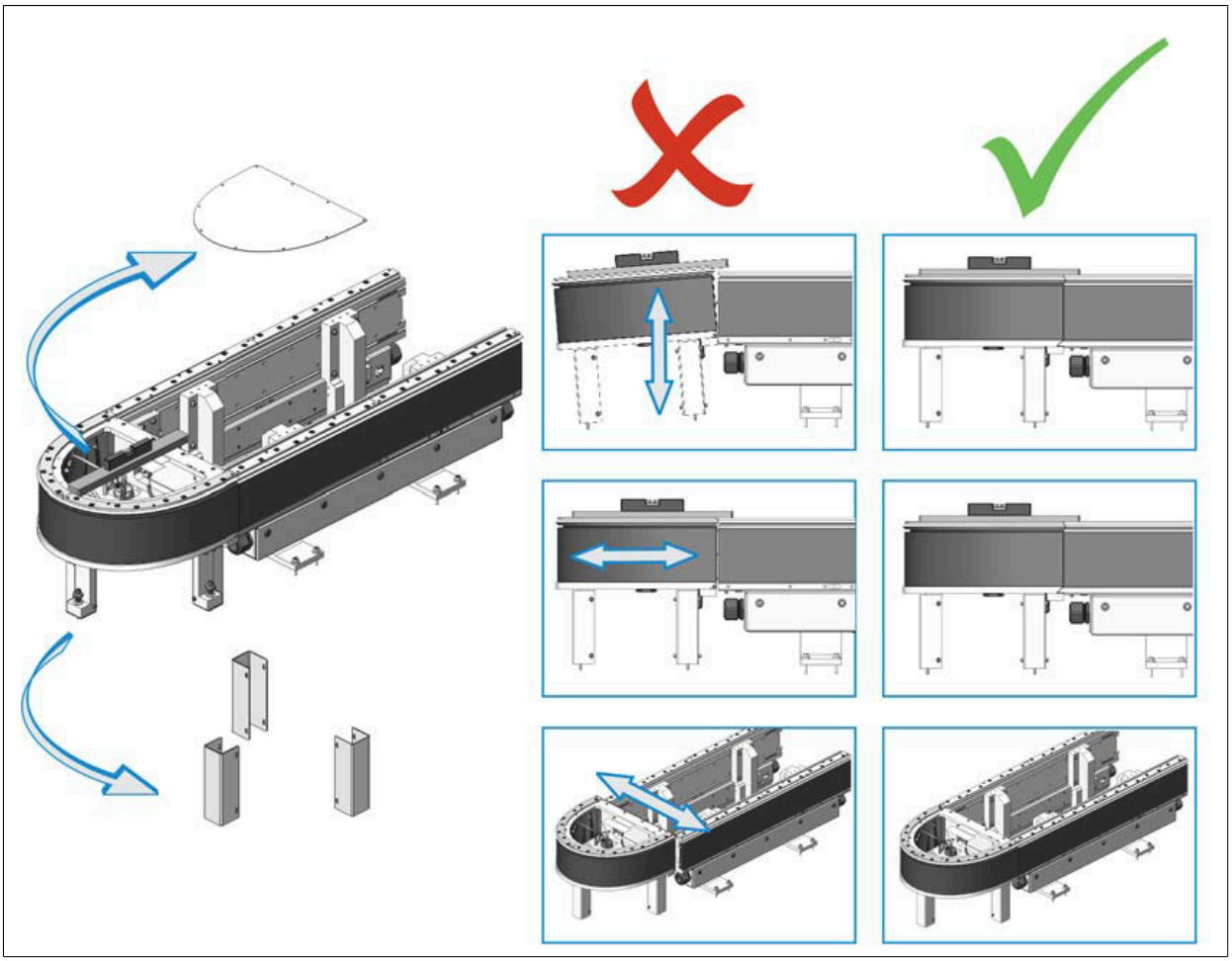


16)Install the first curved segment.

17)Use shims to verify that a a 0.5 mm (0.02 in.) gap exists between the curved segment and each of the two (2) abutting straight segments (between the track structure [or aluminum extrusion], not between the linear motors [or motor laminations]).

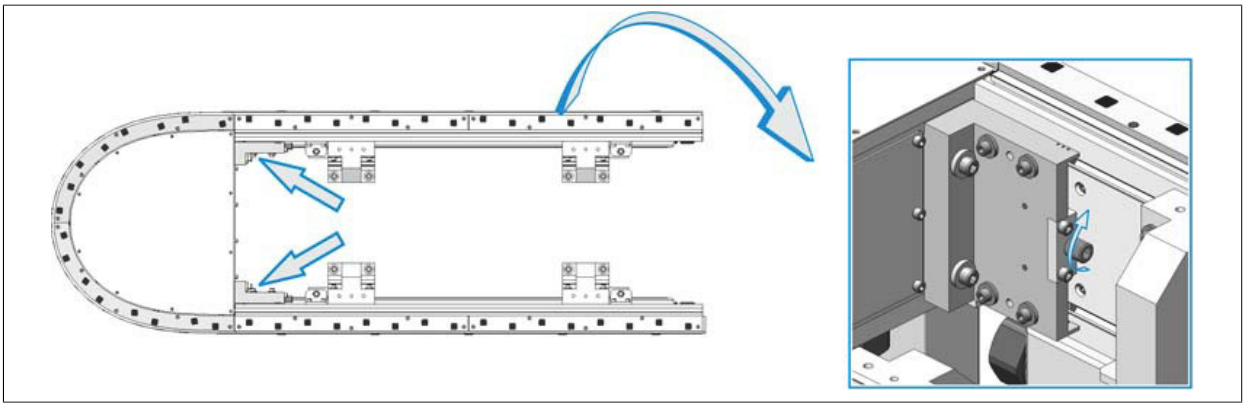


18)Remove the top cover from the curved segment, remove the covers from the curved segment stands, and then level the curved segment. Adjust the vertical, horizontal, and side-to-side positions until the upper v-rails align with the straight segments, and the curved segment is centered between the straight segments.



19)Tighten each of the three (3) curved segment stand screws to the custom frame.

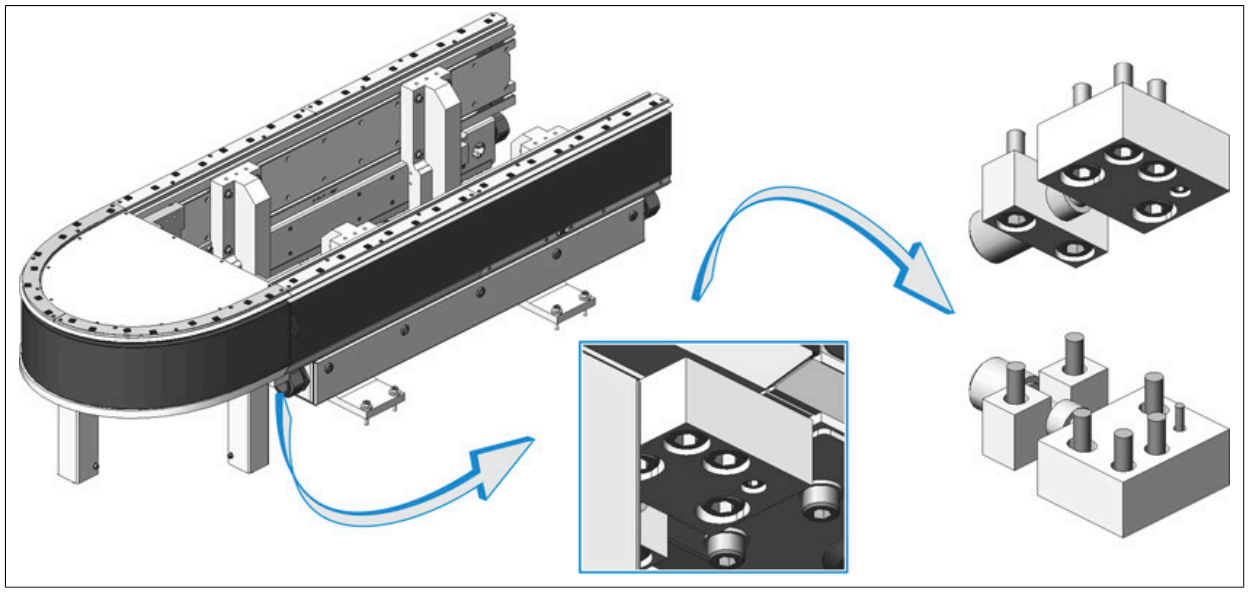
20)Install the wedge adjusts for the curved segment.



See 5.3 "Install a Wedge Adjust - Curved Segment" on page 69.

21)Align the upper v-rails by adjusting the wedge or adjusting the screws on the inside of the curved segment.
See 5.4 "Fine-Adjust the Upper V-Rail" on page 71.

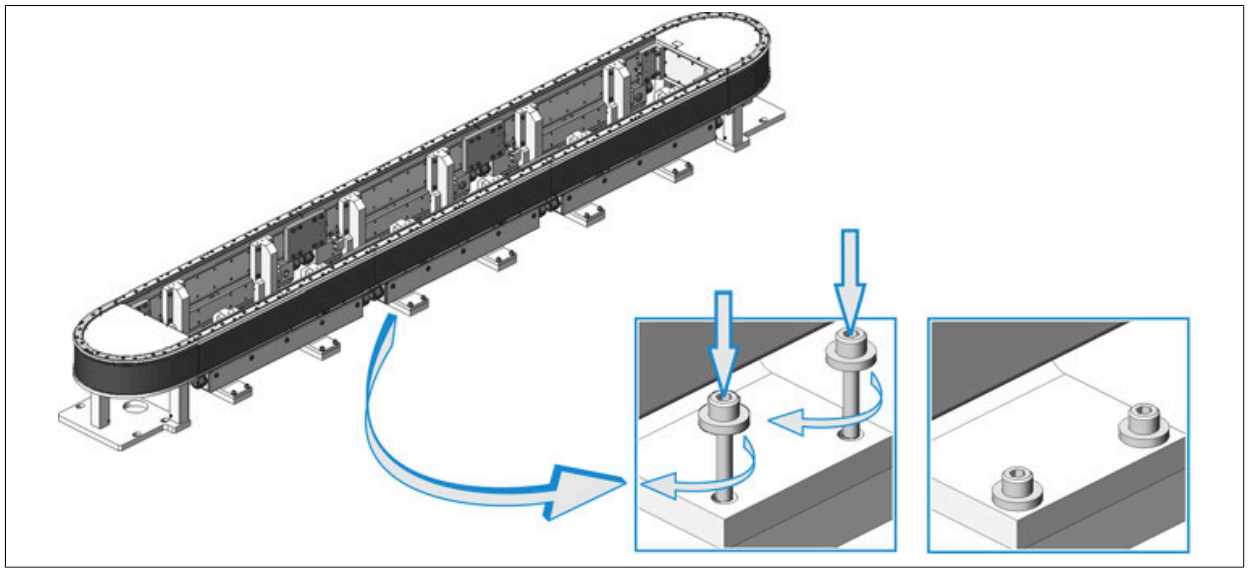
22)Align the lower flat rails with the adjustment features mounted below the curved segment´s plate.



See 8.2.18.3 "Align a Flat Wear Strip" on page 171.

23)Repeat steps 16 to 22 for the second curved segment.

24)Tighten the four (4) screws at the base of each straight segment stand.



25)Install the covers on the curved segment stands.

26)Install the top covers on the curved segments.

27)Install the lower flat wear strips.
See 8.2.18 "Replace a Flat Wear Strip" on page 170.

28)Install the shuttles.
See 8.2.2 "Install a SuperTrak Transport System Shuttle" on page 134.

29)If required, fine-adjust the upper v-rail.
See 5.4 "Fine-Adjust the Upper V-Rail" on page 71.

5.2.2 Install the SuperTrak Transport System in vertical Configuration

Danger!

Always use appropriate lifting devices (for example, a fork-lift or crane) and use safe lifting practices and procedures when lifting a straight segment or curved segment.

See 5.2.3 "Lift a SuperTrak Transport System Segment" on page 63.

It is recommended that you obtain relevant information from your national Health and Safety Authority.

Note:

Make sure the frame is designed to hold the weight and force of the SuperTrak transport system segments.

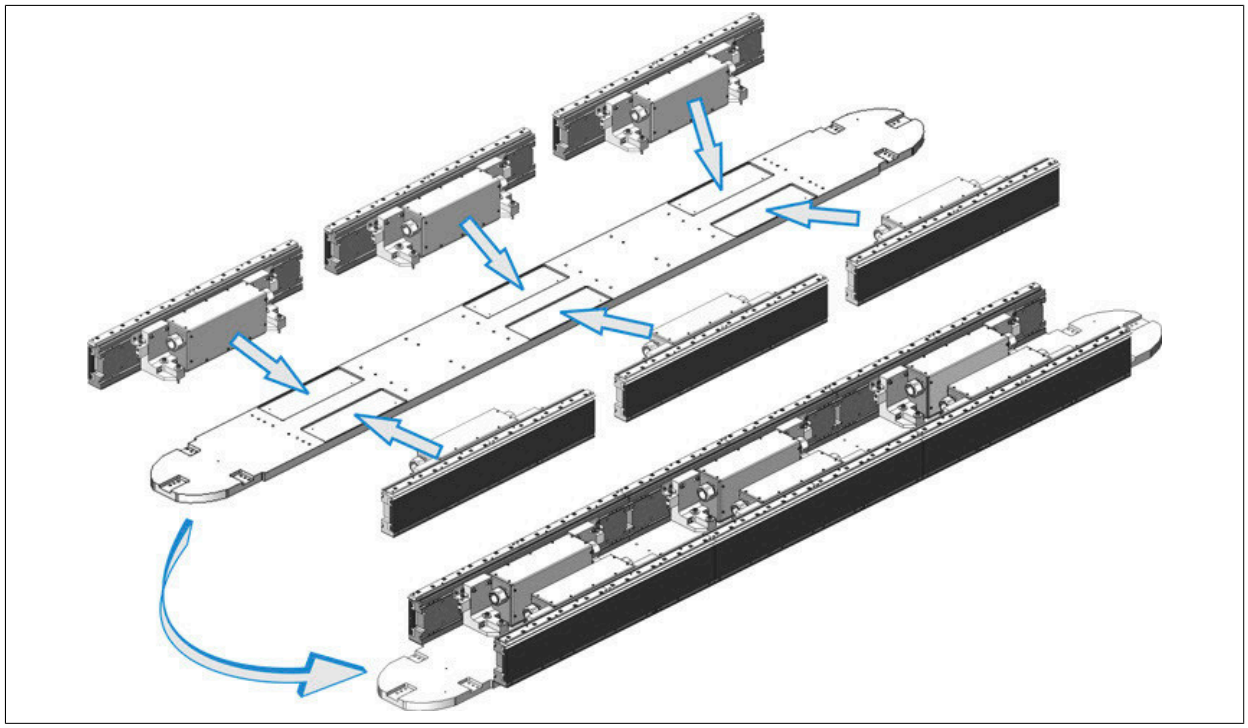
Information:

This procedure assumes that your frame includes the correct hole pattern on the top and sides of the frame.

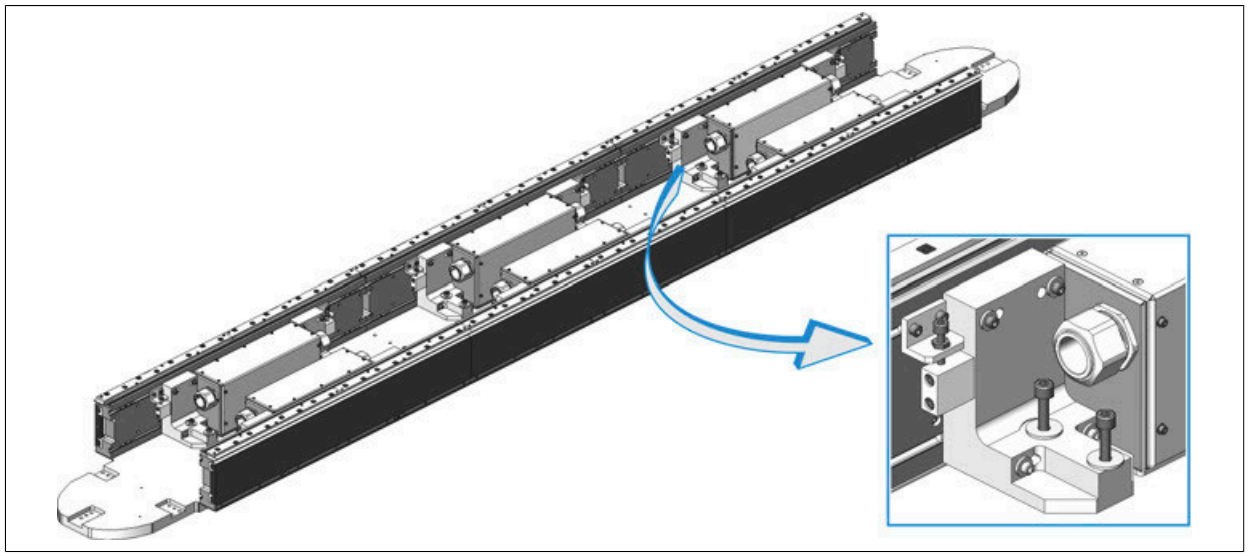
See the SuperTrak transport system B "Mechanical Drawings" on page 219 for additional information.

This section describes how to install SuperTrak transport system in vertical configuration.

1) Inspect the frame to verify that it includes the correct features outlined in the SuperTrak tranport system B "Mechanical Drawings" on page 219.
2) Position the base plate (not included in the scope of delivery) across two or more metal saw horses, with the slotted cut-outs facing up.
3) Mount all straight segments on the base plate, with the electrical box facing in.

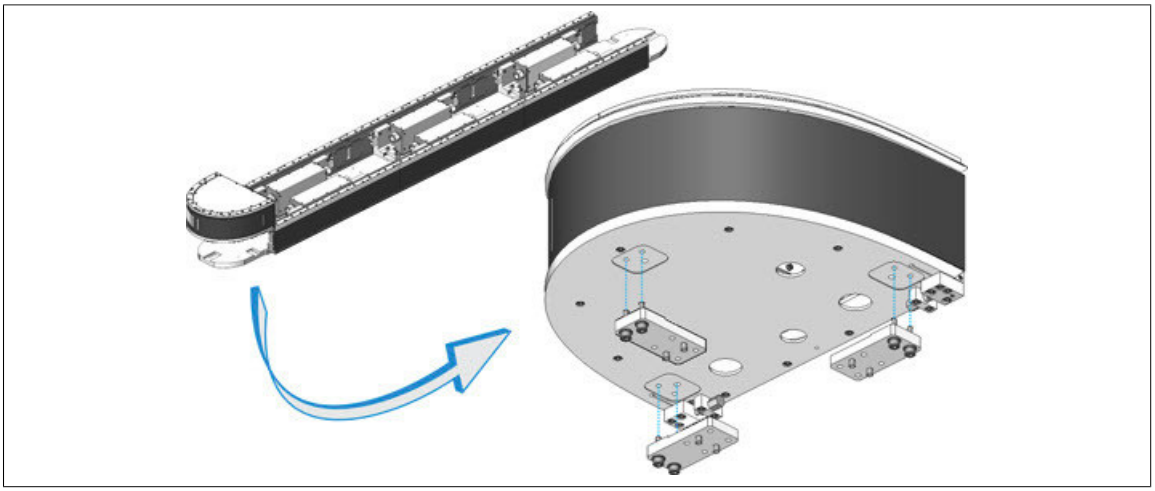


4) Loosely install four (4) screws into each straight segment stand base. It is very important that the screws are centered in the screw holes as much as possible. This allows for adjustment when segments are connected together later.

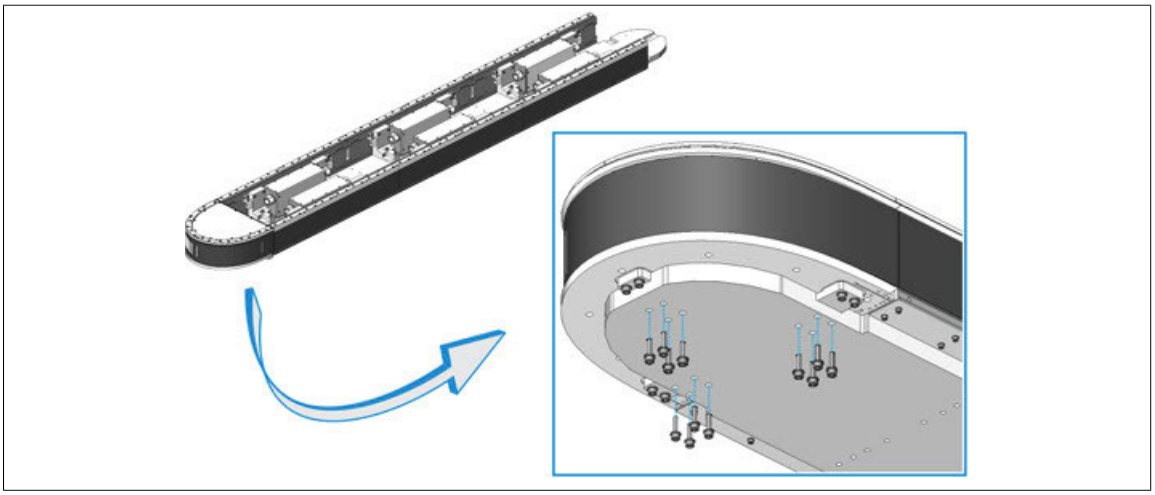


5) Install the two (2) curved segments.

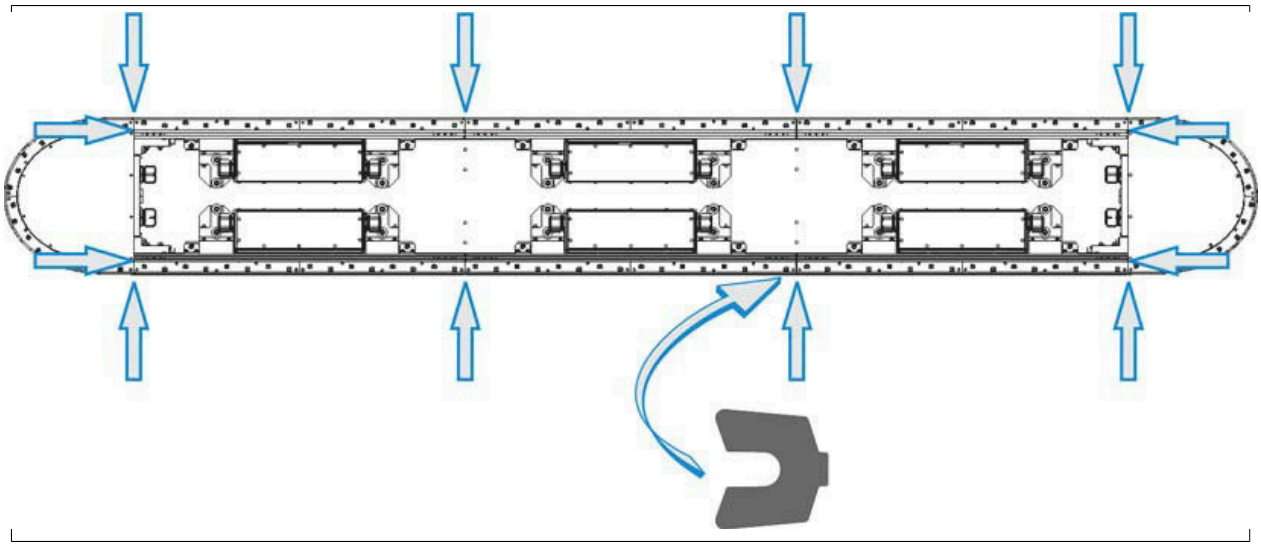
   a) Install three (3) mounting plates on the bottom of the curved segments with two (2) screws each.



   b) Align the mounting plates on the curved segment with the slots in the base plate, and then secure the curved segment to the base plate with twelve (12) screws.

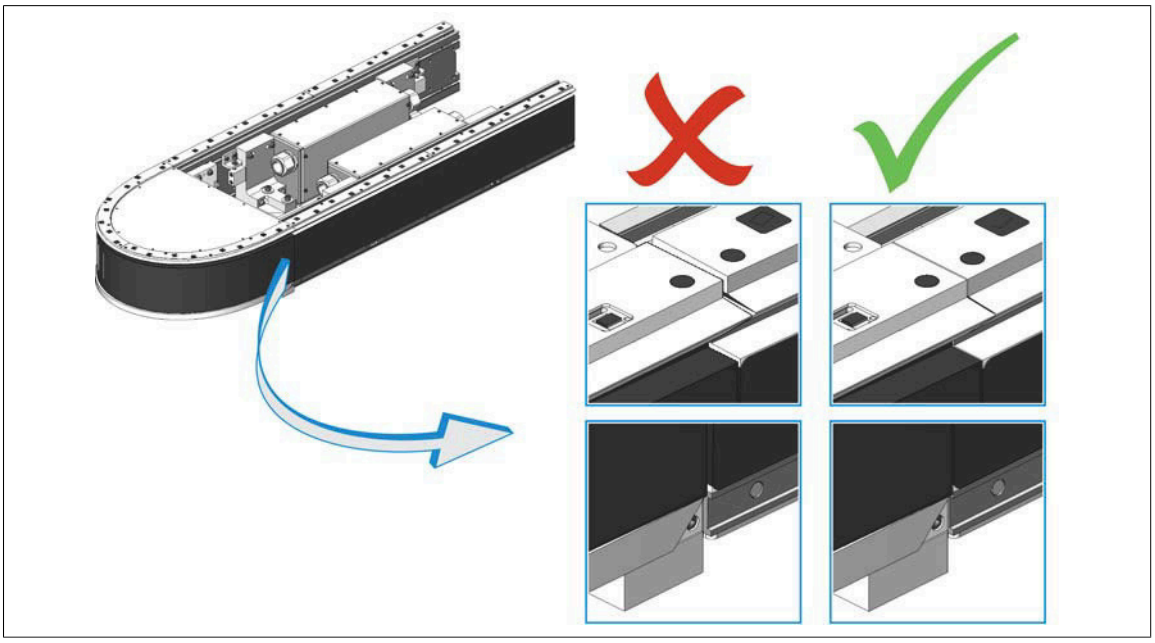


6) Adjust the position of all segments until a 0.5 mm (0.02 in.) gap exists between all segments (between the track structure [or aluminum extrusion], not between the linear motors [or motor laminations]).

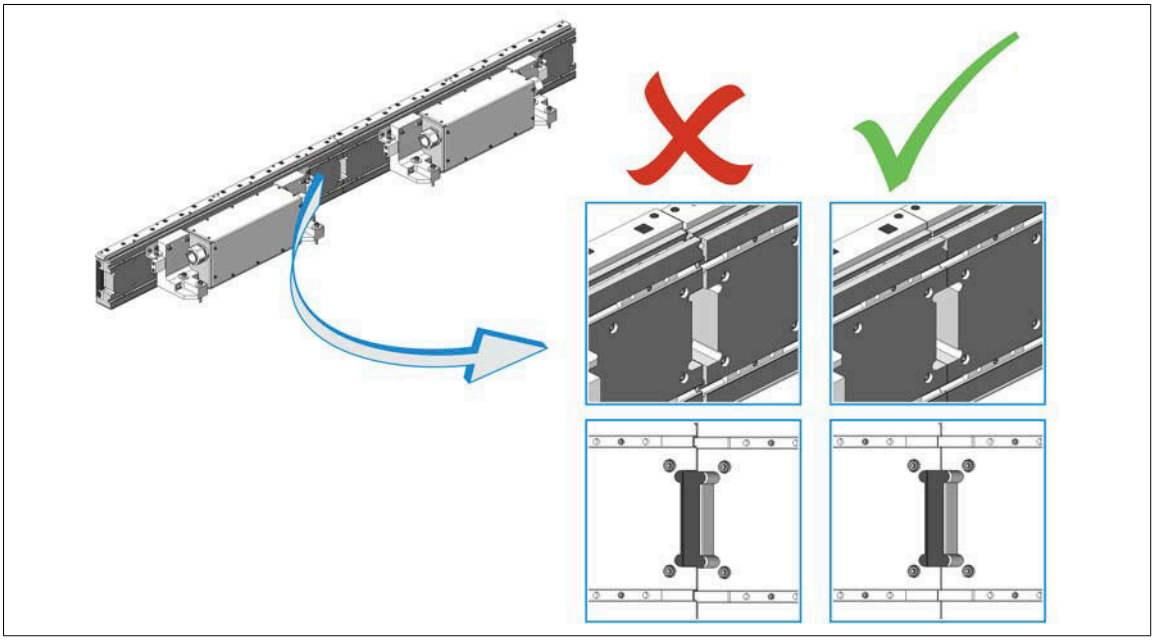


7) Verify that the following are aligned:

° Upper v-rails and flat wear strip pockets.

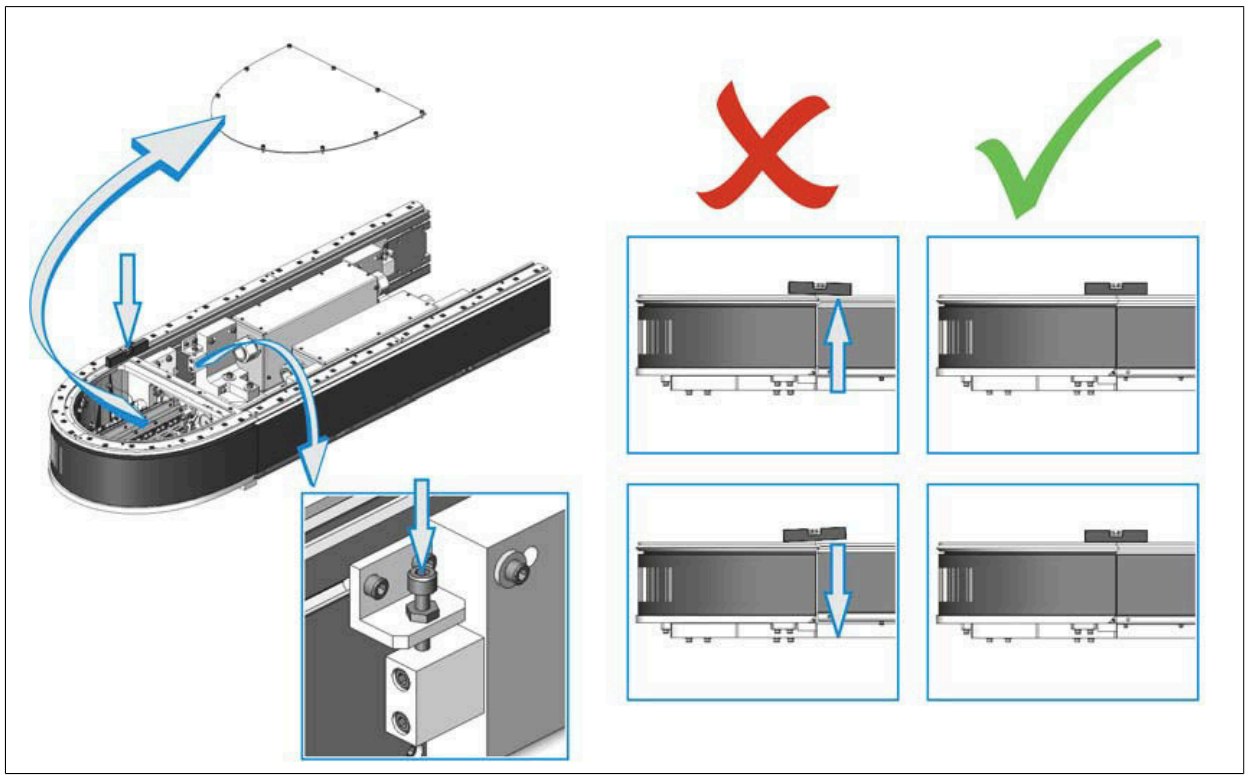


° Back of the laminations at all joints.

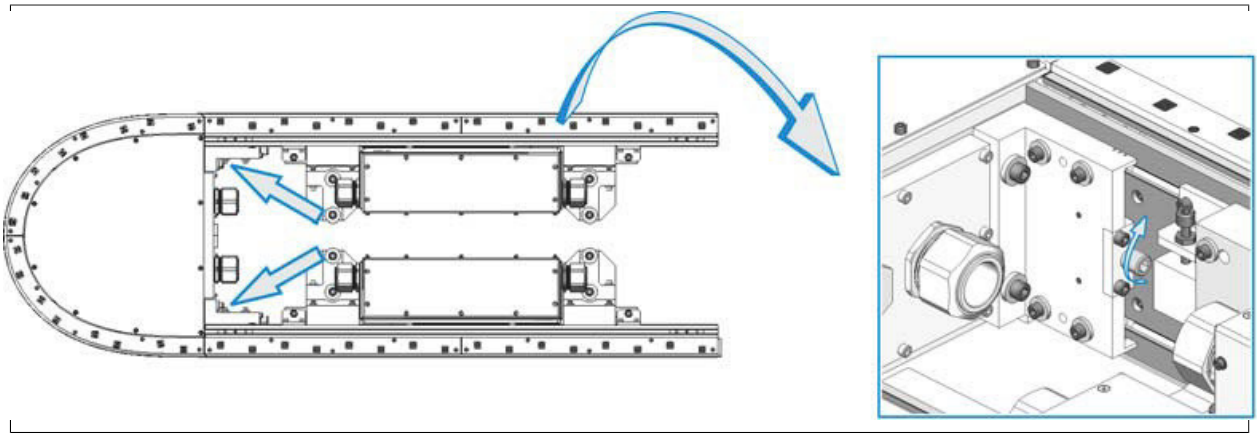


Fix any major misalignment before proceeding with fine alignment.

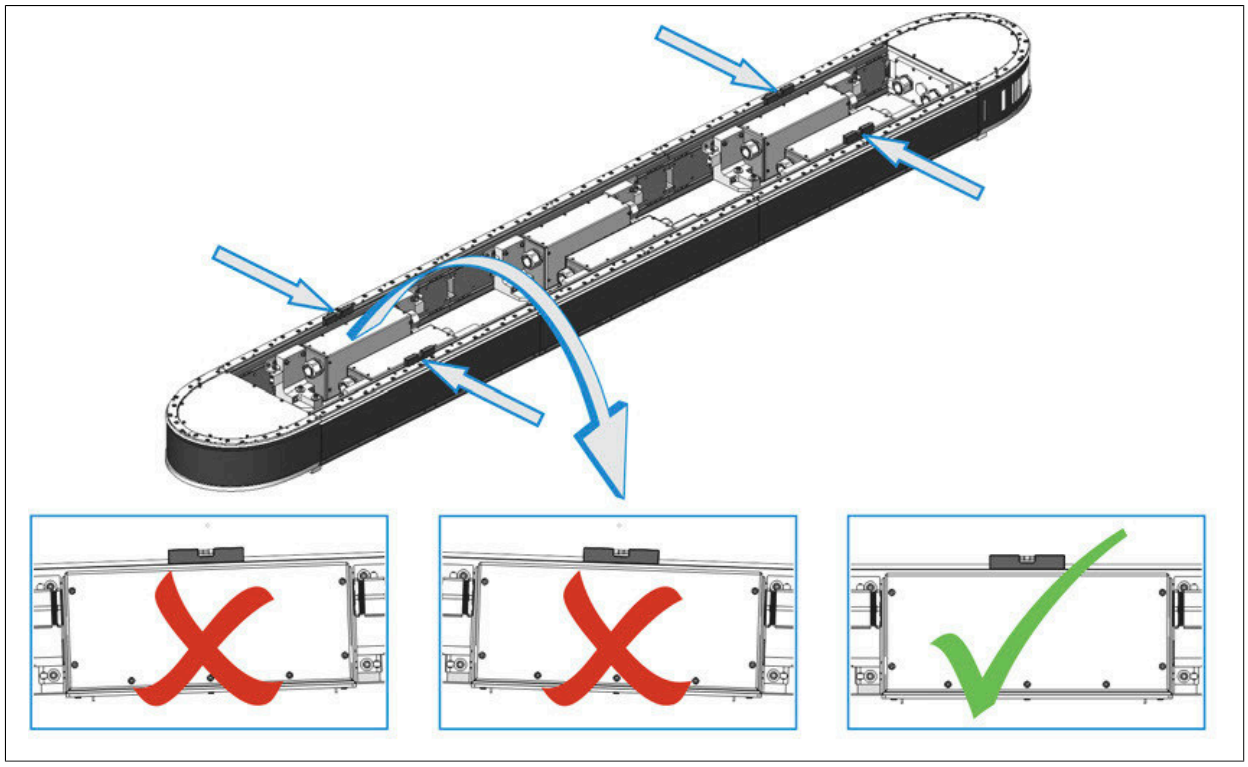
8) Remove the top cover from the curved segment, and level the curved segment. The height of the curved segment is fixed. Adjust the height of the straight segments to align with the curved segments by using the straight segment adjustment features.



9) Install the wedge adjust for the curved segments. Place the precision level on the t-slot behind the encoder bracket of the straight segment when leveling.
See 5.3 "Install a Wedge Adjust - Curved Segment" on page 69.

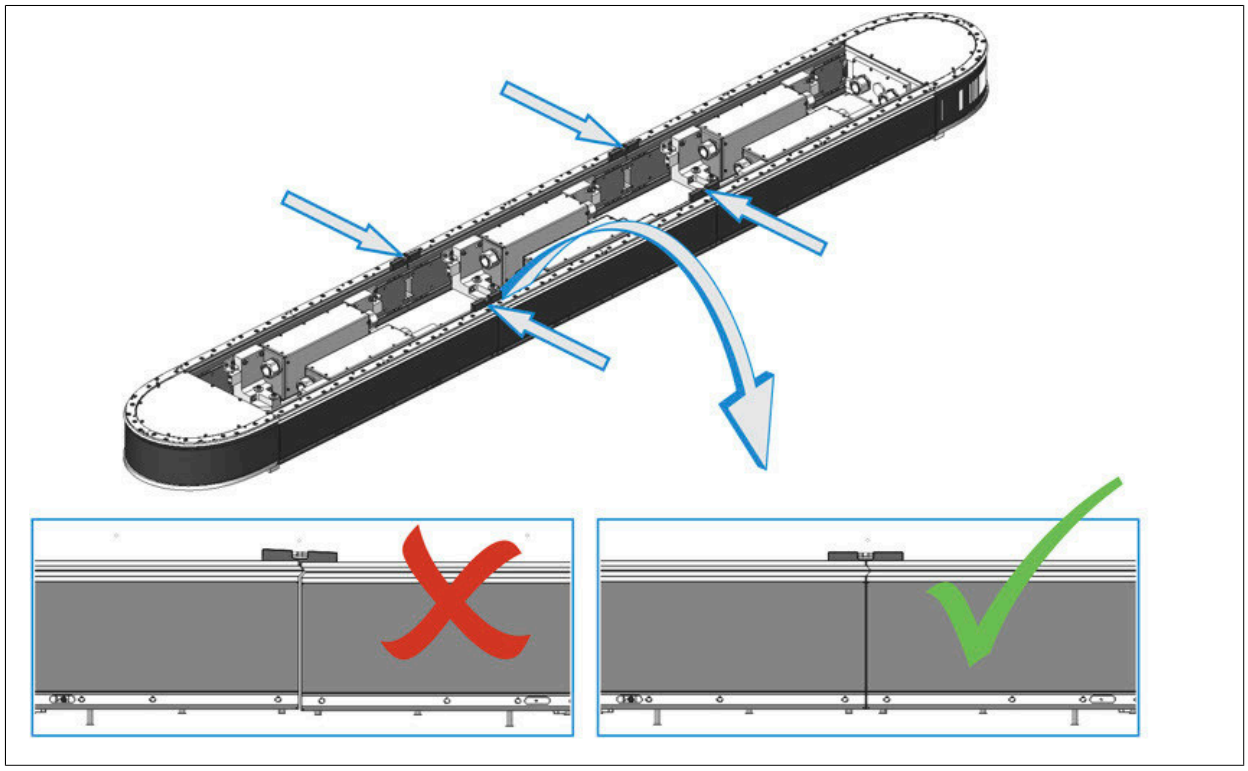


10) Level the straight segments next to the curved segments. Place the precision level on the t-slot behind the encoder bracket of the straight segment when leveling.



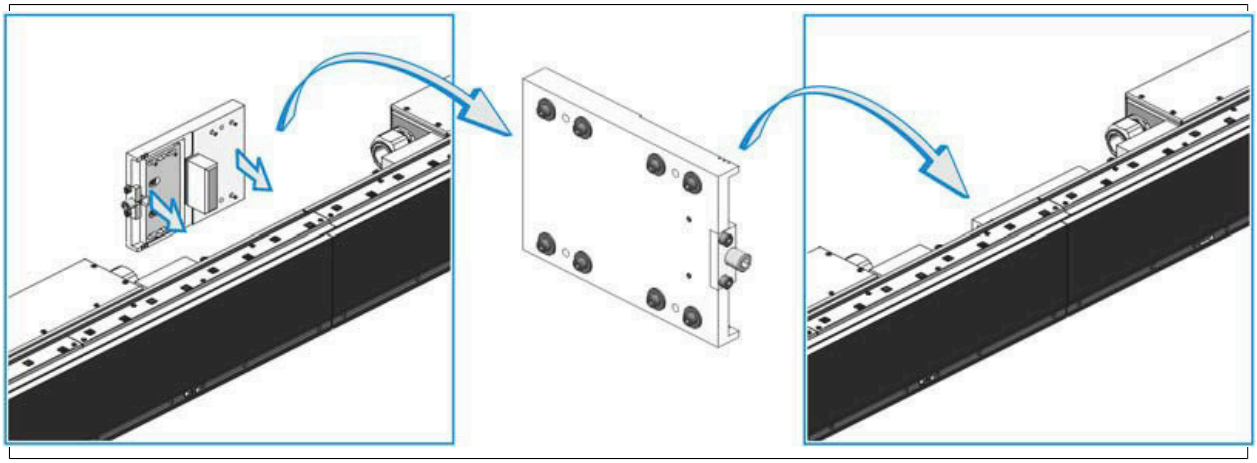
11) Level the straight segments in the middle of the track, and adjust them vertically to align the upper v-rails with the other straight segments.

See 5.2.7 "Align the SuperTrak Transport System Segment Joints" on page 67 and 5.2.8 "Align the SuperTrak Transport System Segment Heights" on page 68.

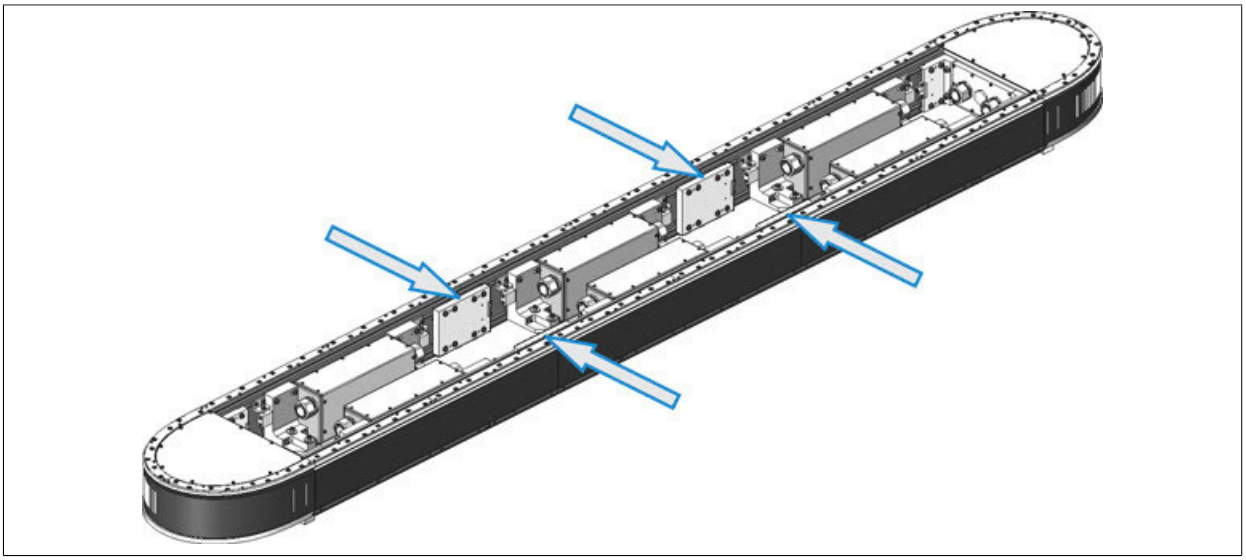


12) Install a wedge adjust between each of the straight segments.

See 5.3 "Install a Wedge Adjust - Straight Segment" on page 69.

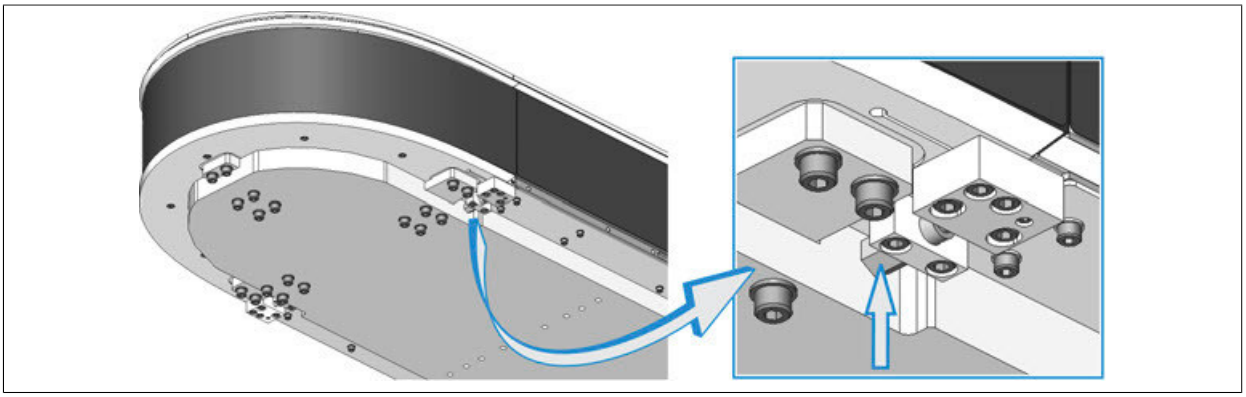


13) Adjust the wedges IN or OUT to align the upper v-rails. Only adjust when the wedge adjust screws are loose, and measure when the wedge adjust screws are tight.

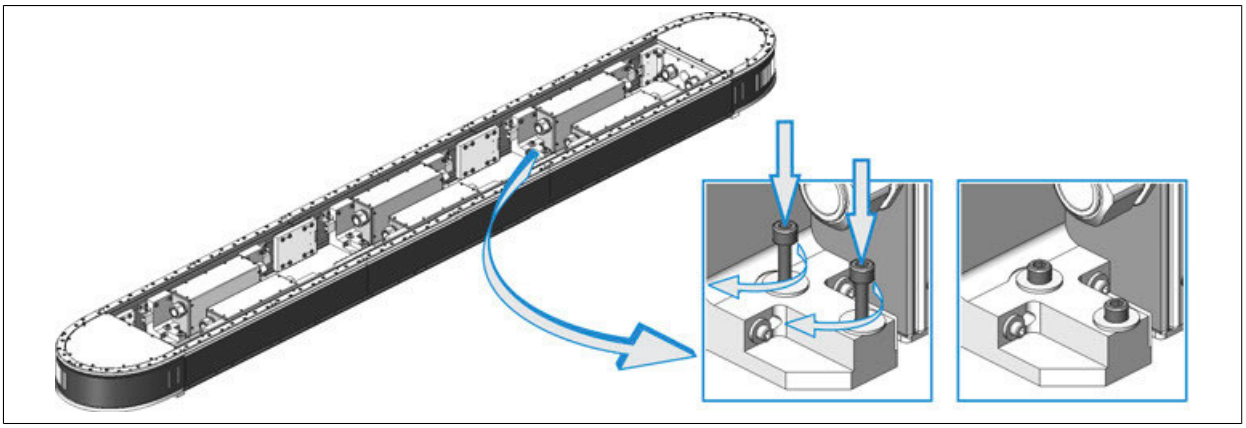


14) Align the upper v-rails by adjusting the wedge or adjusting the screws on the inside of the curved segment. See 5.4 "Fine-Adjust the Upper V-Rail" on page 71.

15) Align the lower flat rails with the adjustment features mounted below the curved segment. See 8.2.18.3 "Align a Flat Wear Strip" on page 171.



16) Tighten the four (4) screws in each straight segment stand base.



17)Install the lower flat wear strips.
See 8.2.18 "Replace a Flat Wear Strip" on page 170.

18)Lift the SuperTrak transport system into position.
Use correct lifting techniques with straps and a forklift.

19)Secure the base plate to the mounting frame.

20)Install the shuttles.
See 8.2.2 "Install a SuperTrak Transport System Shuttle" on page 134.

21)If required, fine-adjust the v-rails.
See 5.4 "Fine-Adjust the Upper V-Rail" on page 71.

5.2.3 Lift a SuperTrak Transport System Segment

> **Danger!**
>
> **Always use appropriate lifting devices (for example; a fork-lift or crane) and use safe lifting practices and procedures when lifting a straight segment or curved segment.**
>
> **B&R recommends that you obtain relevant information from your national Health and Safety Authority.**

Always use appropriate lifting devices and use safe lifting practices when moving a segment.

The following tools are required for this procedure:

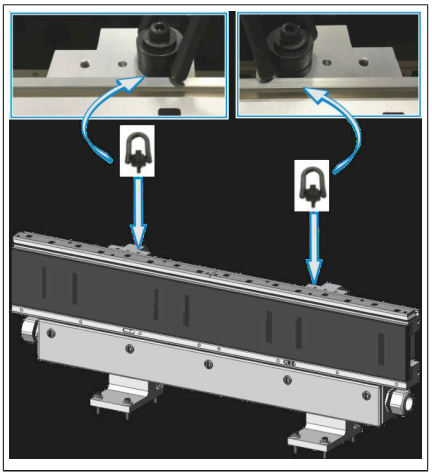
- Three (3) M8 rotating eye bolts

- Three (3) lifting straps, each with a minimum lifting capacity of 100 kg

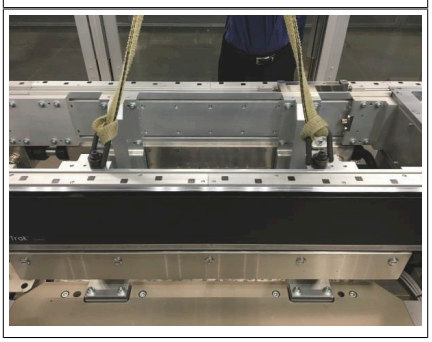
- Appropriate lifting device (for example; a fork-lift or crane)

Lift a Straight Segment

1. Thread an M8 rotating eye bolt into the inner-most hole of each of the two (2) stands.



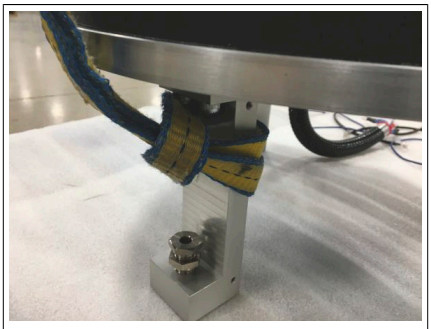
2. Attach each end of the lifting strap to an eye bolt.



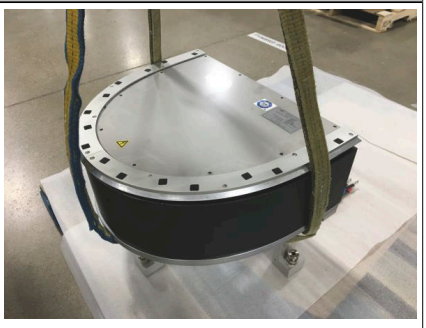
3. Use an appropriate lifting device, such as a fork-lift, to lift the straight segment by the middle of the lifting strap.
4. When the straight segment is in the required position, remove the lifting strap and two (2) eye bolts.

Lift a Curved Segment (500 mm)

1. Wrap a strap around each of the three (3) stands.

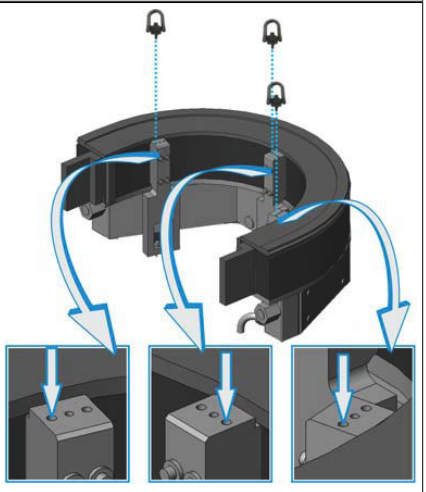


2. Use an appropriate lifting device, such as a fork-lift, to lift the curved segment up by the ends of the lifting straps.
3. When the curved segment is in the required position, remove the lifting straps.



Lift a Curved Segment (800 mm)

1. Thread one (1) M8 rotating eye bolt into the top of each of the three (3) stands.



2. Attach one (1) strap to each of the three (3) M8 rotating eye bolts.

3. Use an appropriate lifting device, such as a forklift, to lift the curved segment up by the ends of the lifting straps.
4. When the curved segment is in the required position, remove the lifting straps.

5.2.4 Install the First SuperTrak Transport System Segment

Danger!

Always use appropriate lifting devices (for example, a fork-lift or crane) and use safe lifting practices and procedures when lifting a straight segment or curved segment.

See Lift a SuperTrak Transport System Segment.

ATS recommends that you obtain relevant information from your national Health and Safety Authority.

Information:

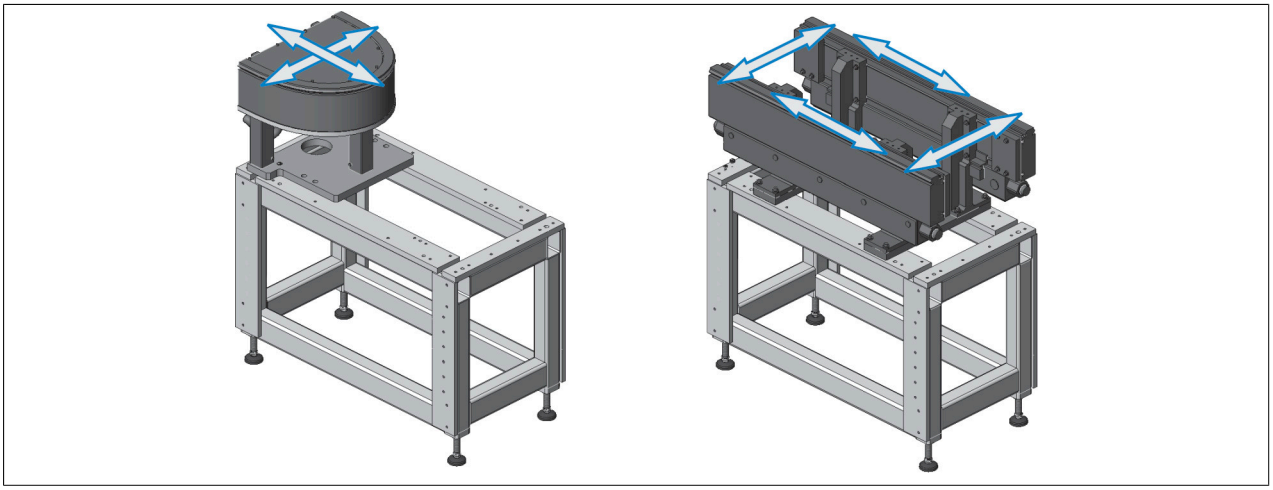
To prevent system damage, keep the system segments upright at all times.

Information:

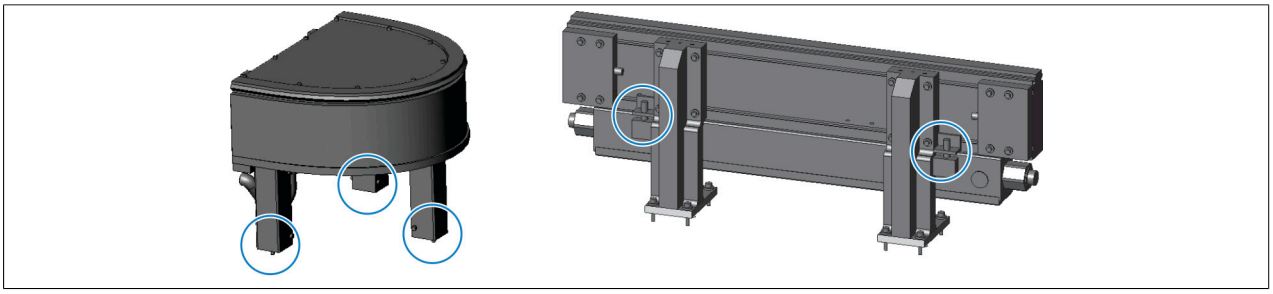
During installation, consider the size of the system. For large systems (>7 segments) install the middle straight segment first and work your way out to each curved segment. For small systems (<7 segments), installation can begin from the far left or right curved segment.

In this procedure, the term “assembly A” references an installed straight segement, curved segment, or group of segments.

1. Position assembly A in the installation location. Make sure the installation location has a non-compressing floor (for example; concrete), to correctly level and align assembly A.
2. Level the frame.
   See 5.2.5 "Level the Frame" on page 65.
3. Place a precision spirit level across the top of assembly A in the directions illustrated, to determine if additional adjustment is required.



If the assembly is not level, adjust the segments with the required leveling screw.



5.2.5 Level the Frame

To accommodate varying floor heights, level the frame precisely using a precision spirit.

5.2.6 Connect Two SuperTrak Transport System Segments Together

Danger!

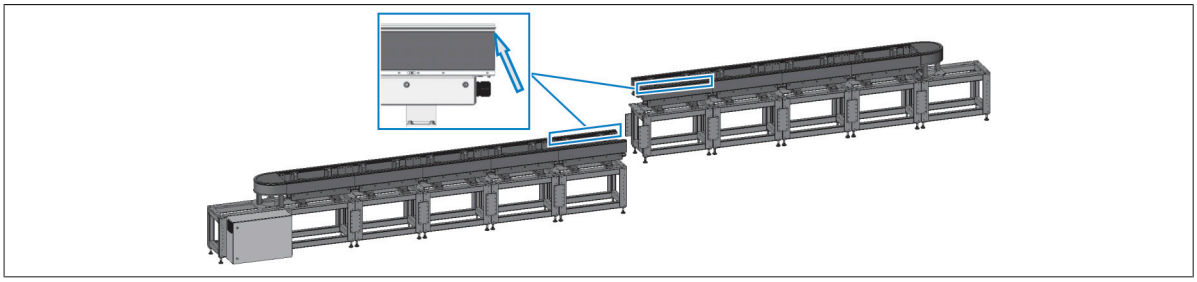
Always use appropriate lifting devices (for example, a fork-lift or crane) and use safe lifting practices and procedures when lifting a straight segment or curved segment.

See Lift a SuperTrak Transport System Segment.

ATS recommends that you obtain relevant information from your national Health and Safety Authority.

Information:

- **To prevent system damage, keep the system segments upright at all times.**
- **When two (2) large SuperTrak transport system assemblies are joined together, remove the upper v-rail from the connecting straight segments. The upper v-rail overhangs the edge of the segment; removal of the upper v-rail before the segment prevents upper v-rail and encoder bracket damage.**
  It is also recommended to install the interconnect before the segments are joined together, for ease of installation.



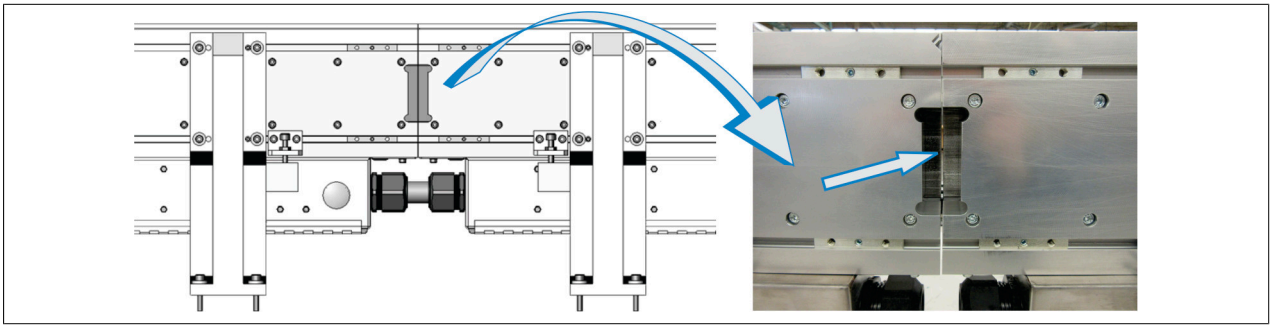
In this procedure, assembly A references an installed straight segment, curved segment, or group of segments. Assembly B is the straight segment, curved segment, or group of segments being installed next to assembly A.

1. Align the assembly B with the assembly A.
2. If required, adjust the height of assembly B.
3. Level assembly B.
   See 5.2.5 "Level the Frame" on page 65.
4. Loosely install eight (8) screws into the stand bases.
5. Use a 0.5 mm (0.020 in.) plastic shim to verify a 0.5 mm (0.020 in.) space exists between the aluminum surfaces of assembly A and assembly B.

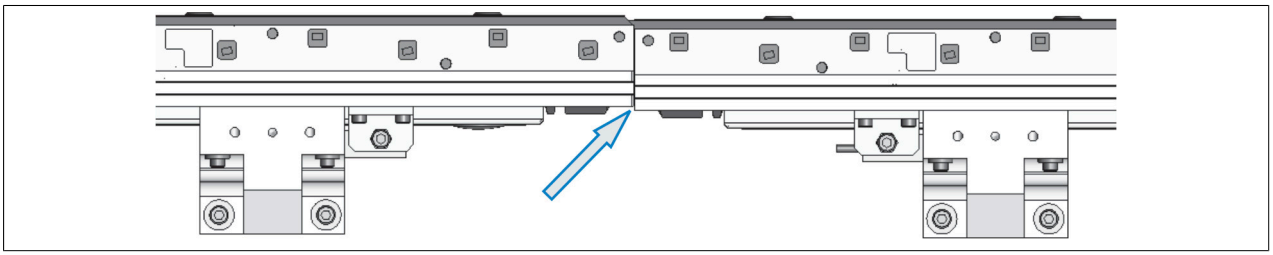
6. Tighten the eight (8) screws on the stands.

5.2.7 Align the SuperTrak Transport System Segment Joints

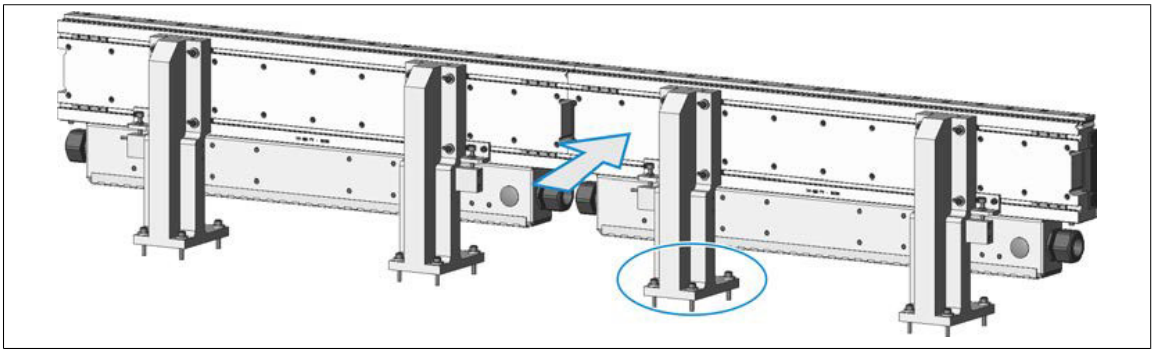
1. In the recess where the motor laminations meet, verify that the laminations align.



The image below provides a top view of two straight segments that are not aligned.



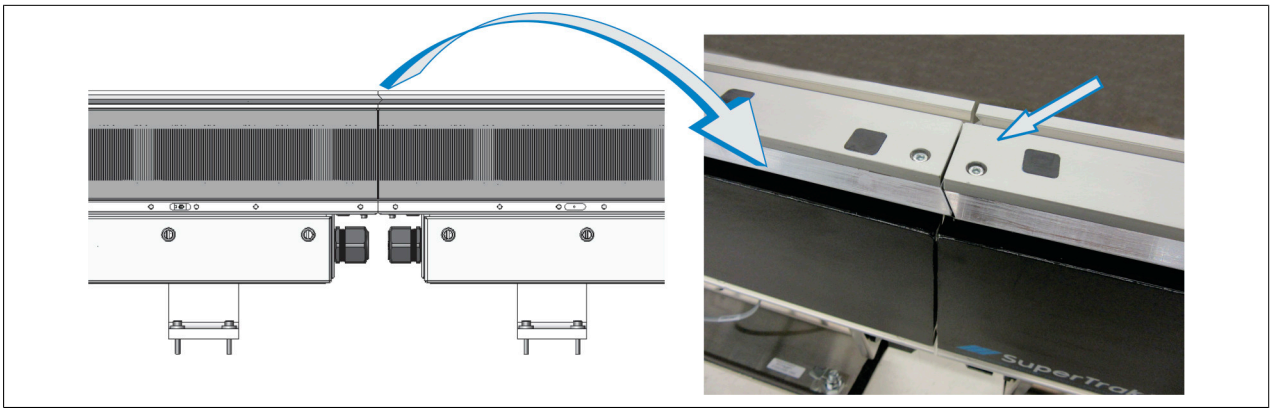
2. If the joints are not aligned:
    a) Loosen the four (4) screws on the base of the stand that requires adjustment.
    b) Gently slide the segment forward or back until the segments are aligned.



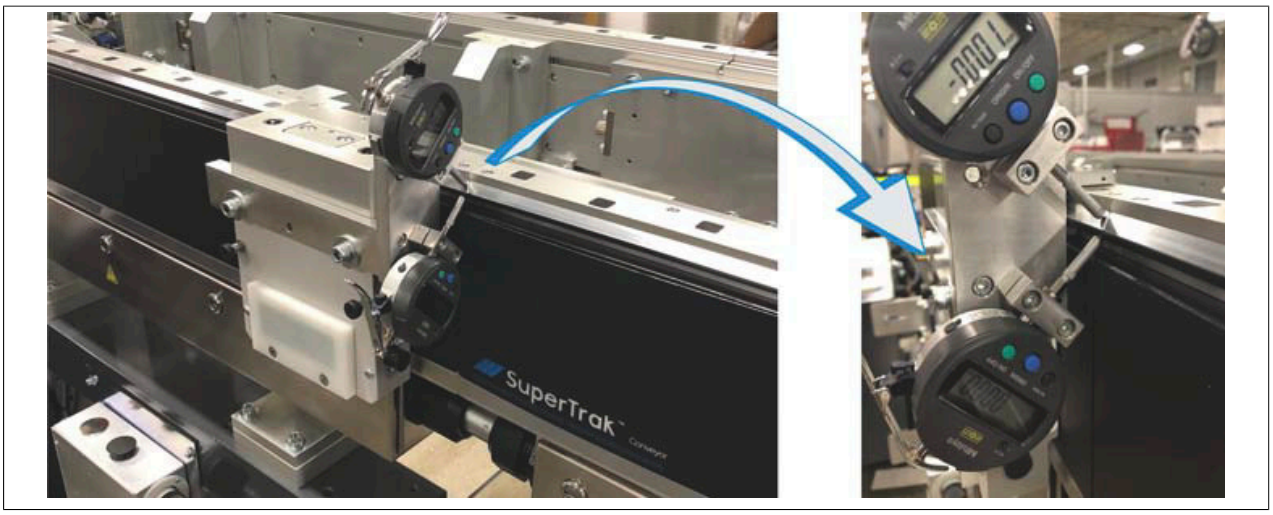
    c) Tighten the four (4) screws from step a.
    d) Repeat step 1.

5.2.8 Align the SuperTrak Transport System Segment Heights

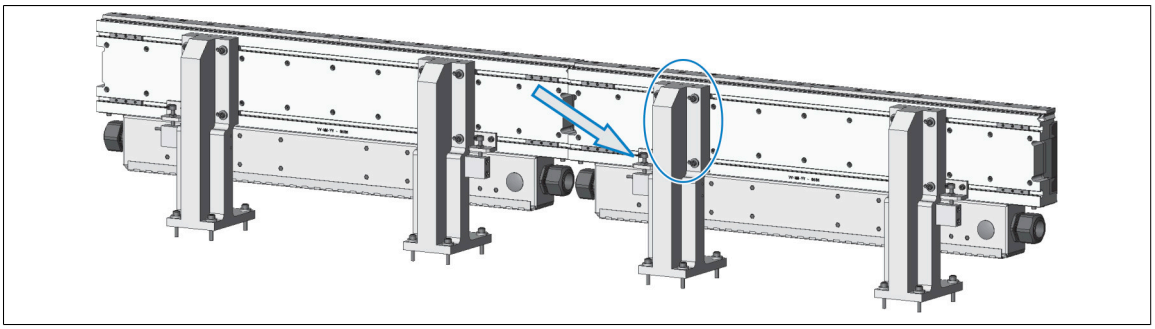
1. At the upper v-rail joint, measure the offset between the two (2) upper v-rails. If the offset exceeds ±0.07 mm (0.0027 in.), the SuperTrak transport system segments are not aligned.



The image below illustrates a possible validation process, where two (2) indicators are mounted to a shuttle to measure the offset between the two (2) upper v-rails.



2. If the height is not aligned:
   a) Loosen the four (4) screws on the top of the stand that requires adjustment.
   b) Adjust the height adjustment screw up or down until the height is aligned.



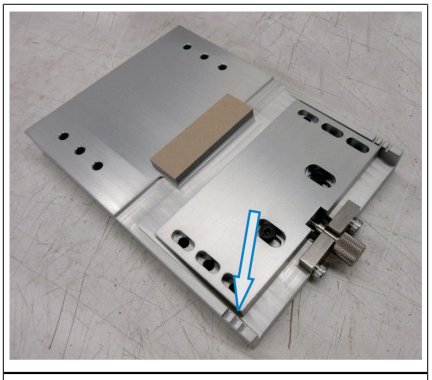
   c) Tighten the four (4) screws from step a.
   d) Repeat step 1.

5.3 Install a Wedge Adjust

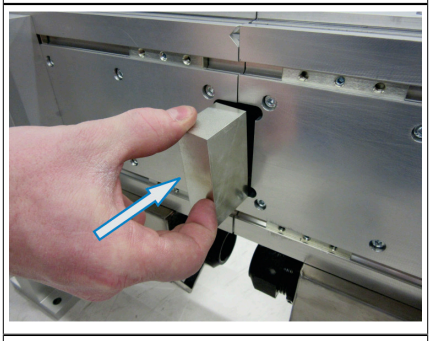
The wedge adjust compensates for excess tolerance between segments.

5.3.1 Install a Wedge Adjust - Straight Segment

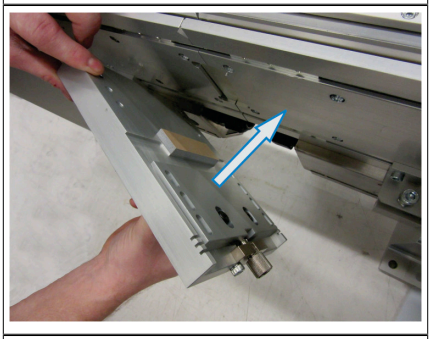
1. Verify that the edge of the wedge adjust plate aligns with the center notch on the side of the wedge adjust. If required, turn the adjustment knob to obtain the correct position. Make sure that the foam piece is adhered to the wedge adjust, as shown.



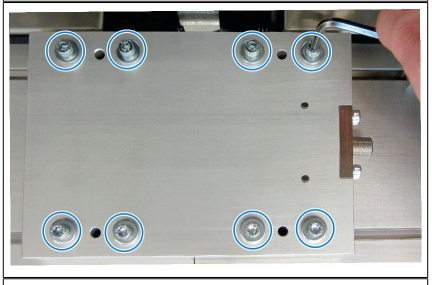
2. Place the magnetic shunt into the opening between the two (2) straight segments. Do not place any objects in the opening before the magnetic shunt is inserted. The magnetic shunt requires iron-to-iron contact with the motor core of each straight segment.



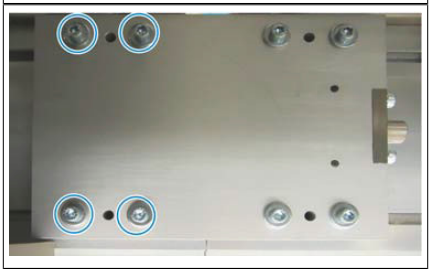
3. Align the wedge across two (2) straight segments. Make sure the wedge holes align with the holes on the t-bars in the assembly t-slot.



4. Loosely install eight (8) washers and eight (8) screws to install the wedge to the t-bars.

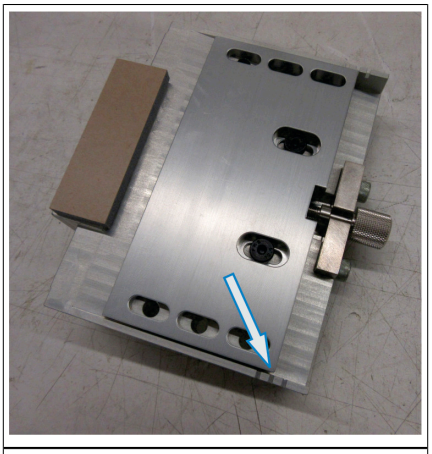


5. Tighten the four (4) screws on the nonadjustable side of the wedge.

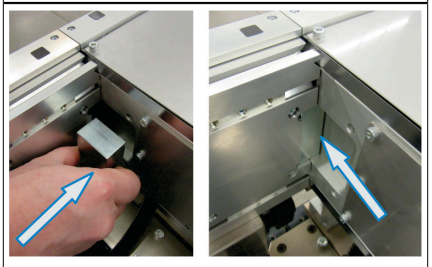


5.3.2 Install a Wedge Adjust - Curved Segment

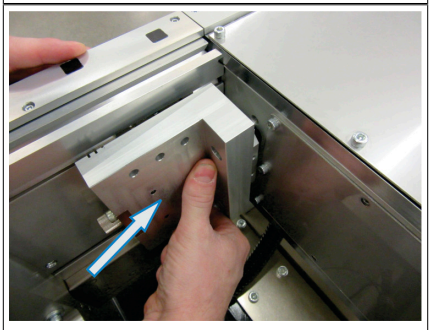
1. Verify that the edge of the wedge adjust plate aligns with the center notch on the side of the wedge adjust. If required, turn the adjustment knob to obtain the correct position. Also make sure that the foam piece is adhered to the wedge adjust as shown.



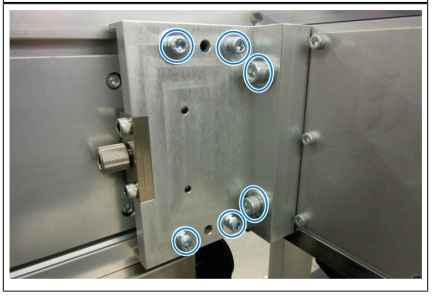
2. Place the magnetic shunt into the opening between the two (2) segments. Slide the magnetic shunt into the opening width-wise, and then push it sideways into location. Do not place any objects in the opening before the magnetic shunt is inserted. The magnetic shunt requires iron-to-iron contact with the motor core of both the straight segment and the curved segment.



3. Align the wedge adjust across the straight segment and a curved segment. The end of the wedge adjust slides into the opening that was used for the magnetic shunt installation.



4. Loosely install four (4) washers and four (4) screws on the straight segment side, and then install and tighten two (2) washers and two (2) screws on the curved segment side.
   Note that the screws installed on the curved segment are larger.



5.4 Fine-Adjust the Upper V-Rail

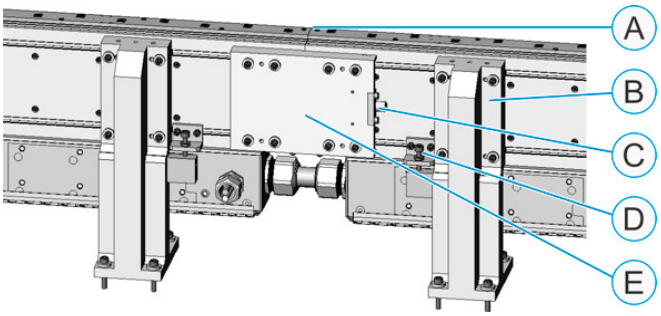
Information:

The maximum vertical tolerance at the upper v-rail joint is 70 µm.

Information:

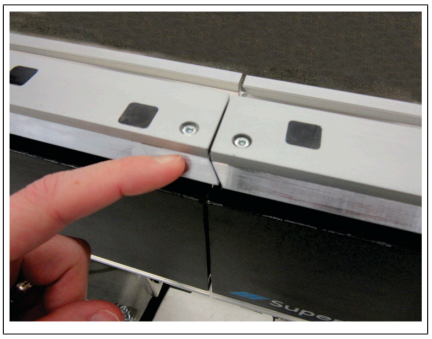
Upper v-rail alignment is an iterative process. Alternate between height and wedge adjustments until the upper v-rail is flush and the sound is consistent when a shuttle is pushed past the upper v-rail join.

Fine-adjust the upper v-rail if the shuttles make significant noise when traveling over the upper v-rails. This diagram indicates the location of the components that are referenced in this procedure.



A	Upper v-rail join
B	Stand
C	Wedge adjustment
D	Heigth adjustment
E	Wedge

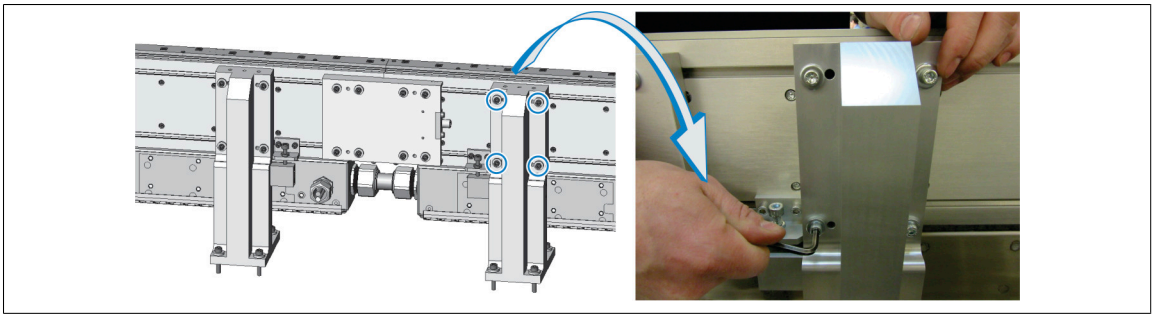
1. Verify that all stand and wedge screws are tight.
2. Complete one (1) of the following:
    - Run your finger over the upper v-rail joint.
    - Manually slide a shuttle across the upper v-rail joint in both directions while you watch and listen to the shuttle.



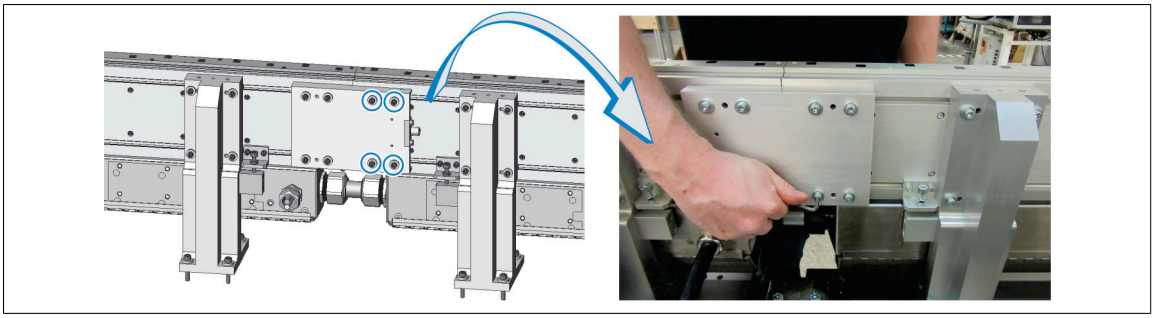
3. If you feel a ridge, or if the shuttle makes any knocking sounds as it rolls over the upper v-rail joint, proceed to step 4; otherwise, the procedure is complete.
4. Determine which segment is higher and by how much, and then complete one (1) of the following:
    - If the upper v-rail requires ±0.05 mm (±0.002 in.) adjustment, see 5.4.1 "Adjust the Upper V-Rail ±0.05 mm (±0.002 in.) - Straight Segment to Straight Segment" on page 72.
    - If the upper v-rail requires >±0.05 mm (>±0.002 in.) adjustment, see 5.4.3 "Specialized Upper V-Rail Adjustment - Straight Segment to Straight Segment" on page 76.

5.4.1 Adjust the Upper V-Rail ±0.05 mm (±0.002 in.) - Straight Segment to Straight Segment

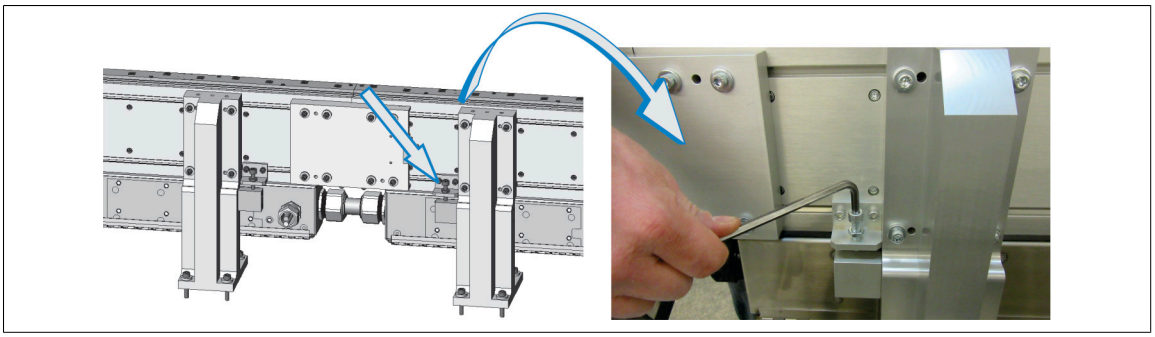
1. If vertical upper v-rail adjustment is required, complete the following steps on the side that requires adjustment:
   a) Loosen the four (4) screws at the top of the stand.



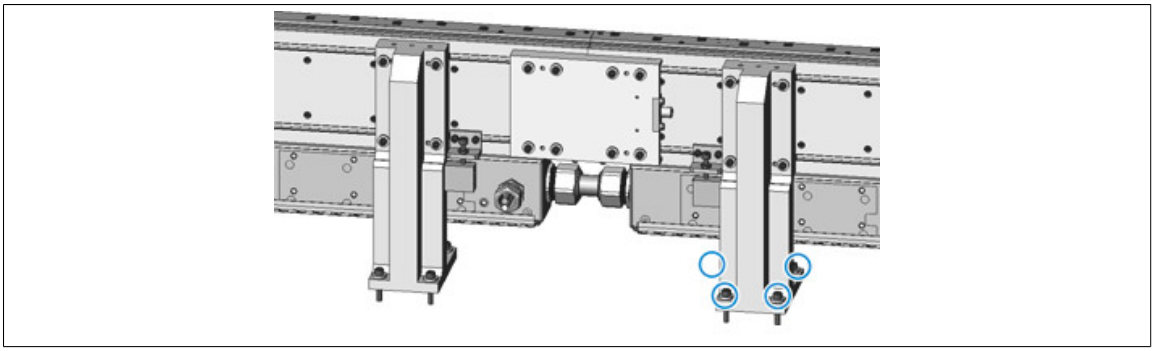
   b) Loosen the four (4) wedge screws.



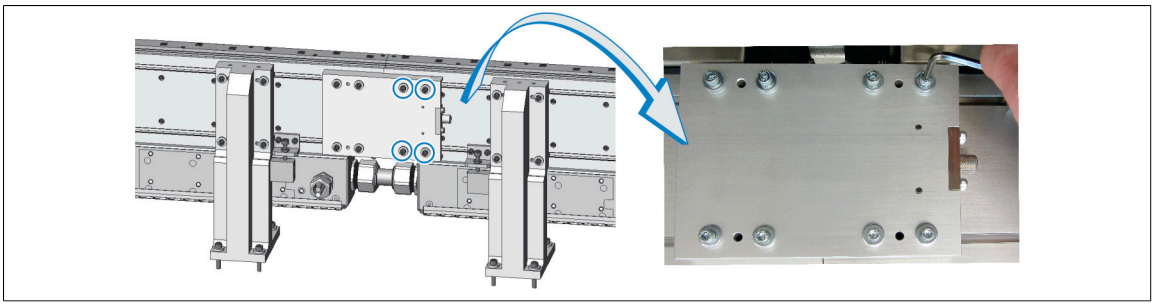
   c) Turn the height adjustment screw as required to adjust the upper v-rail height (up or down).



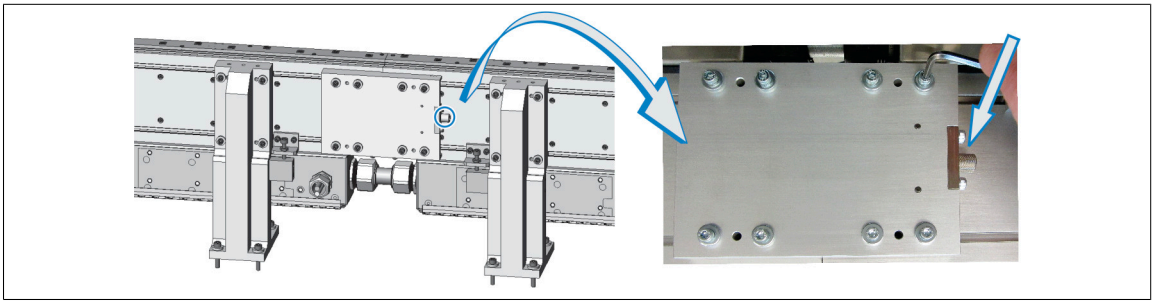
   d) Tighten the four (4) stand screws and four (4) wedge screws that were loosened in step a and b.
2. If horizontal (in or out) upper v-rail adjustment is required, complete the following steps on the side that requires adjustment:
   a) Loosen the four (4) screws at the bottom of the stand.



   b) Loosen the four (4) wedge screws.



c) Turn the wedge adjustment knob, as required, to adjust the upper v-rail in or out.

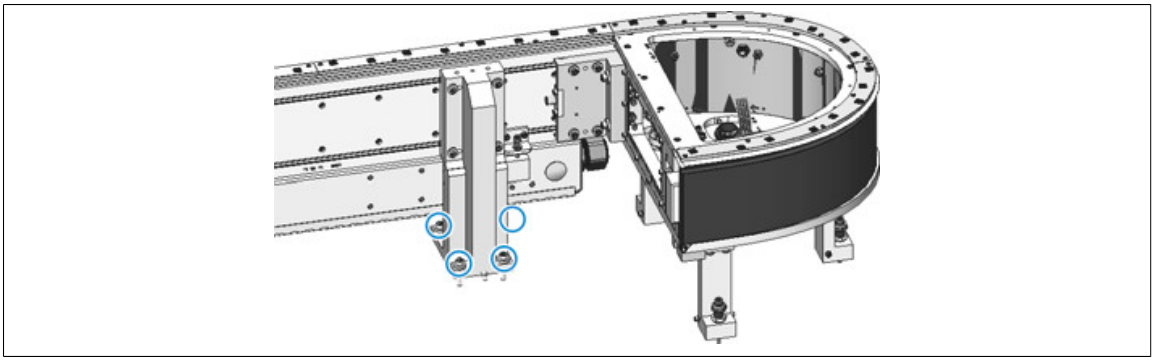


d) Tighten the four (4) wedge screws that were loosened in step a.

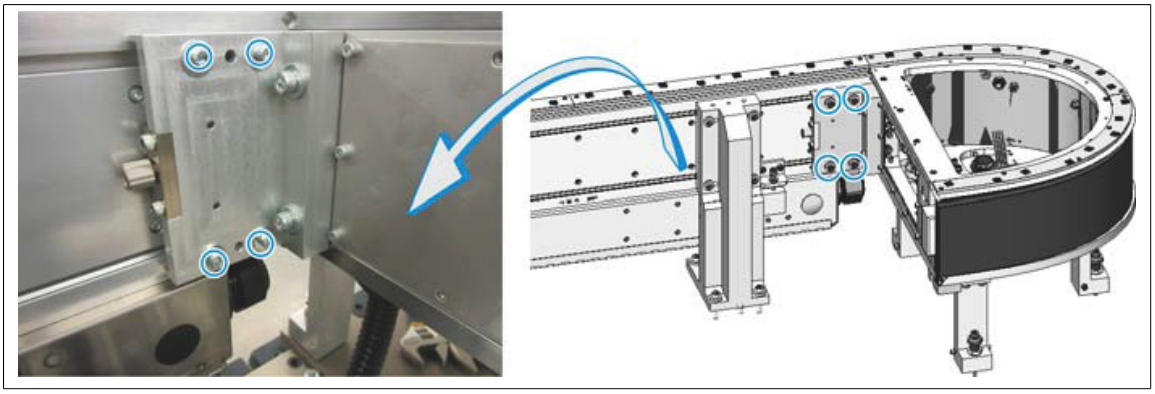
3. Repeat steps 2 to 4 of 5.4 "Fine-Adjust the Upper V-Rail" on page 71.

5.4.2 Adjust the Upper V-Rail ±0.05 mm (±0.002 in.) - Straight Segment to Curved Segment

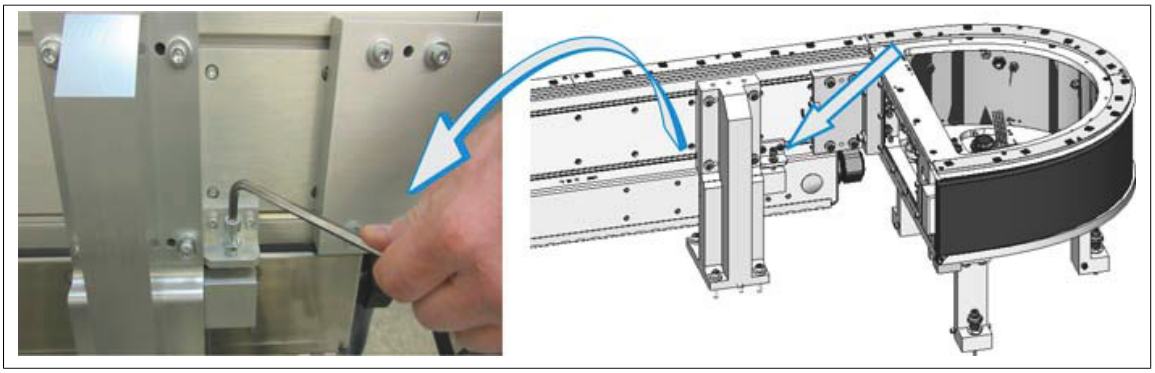
1. If vertical upper v-rail adjustment is required, complete the following steps on the side that requires adjustment:
   a) Loosen the four (4) screws at the bottom of the stand.



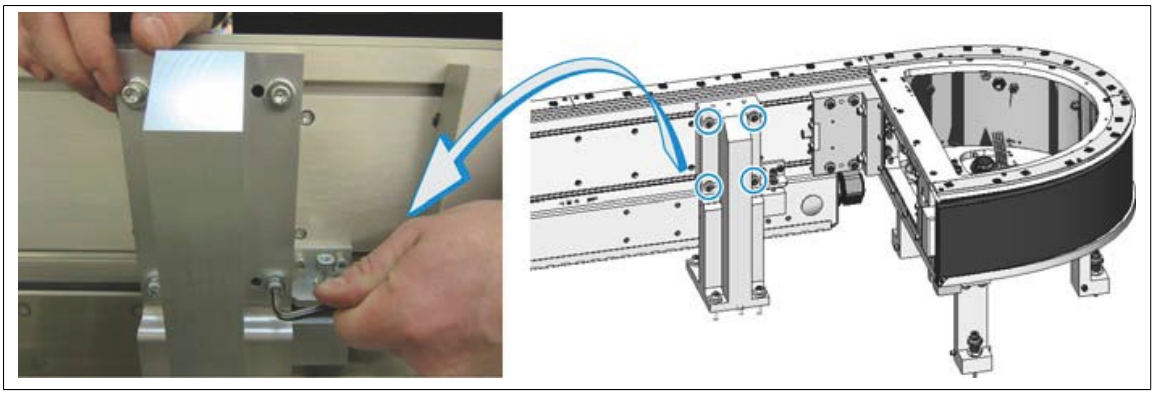
   b) Loosen the four (4) wedge screws.



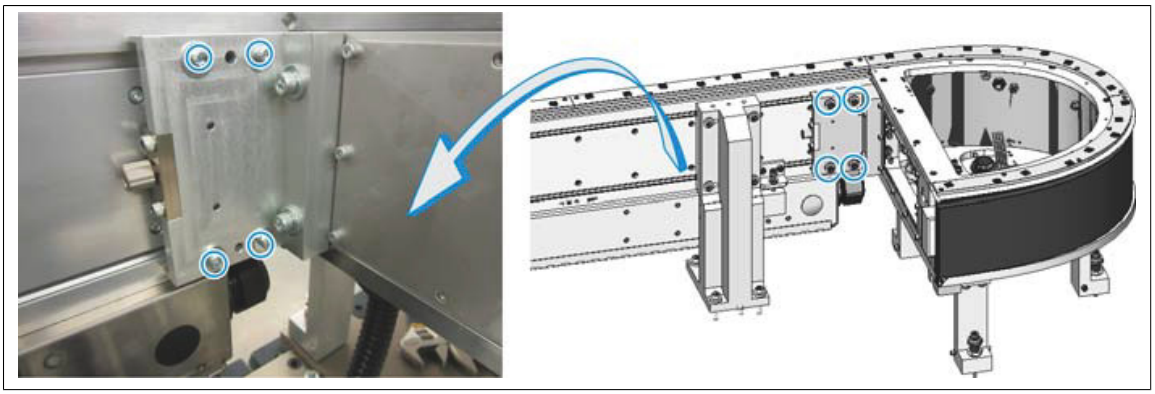
   c) Turn the height adjustment screw as required to adjust the upper v-rail height (up or down).



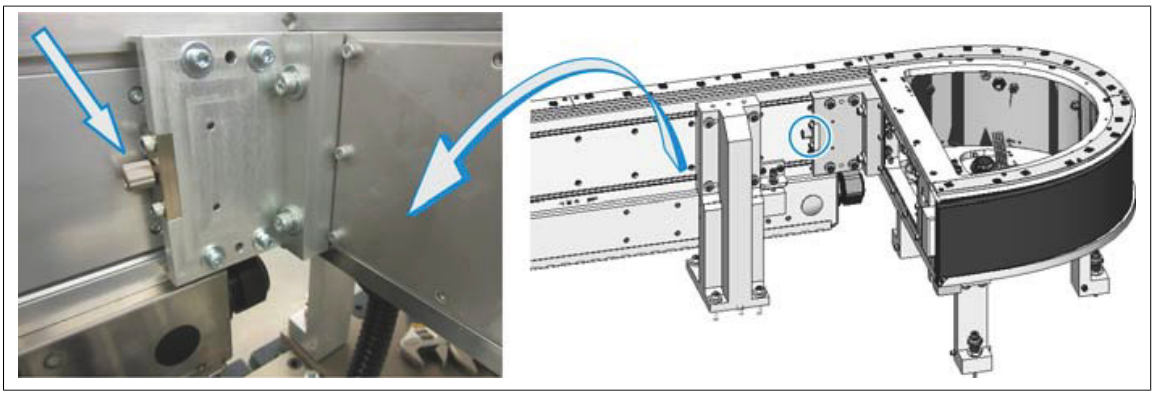
   d) Tighten the four (4) stand screws and four (4) wedge screws that were loosened in step a and b.
2. If horizontal (in or out) upper v-rail adjustment is required, complete the following steps on the side that requires adjustment:
   a) Loosen the four (4) stand screws. This allows the stand to shift rather than flex against the rigid stand.



   b) Loosen the four (4) wedge screws.



c) Turn the wedge adjustment knob, as required, to adjust the upper v-rail in or out.



d) Tighten the four stand screws and (4) wedge screws that were loosened in step a and b.

3. Repeat steps 2 to 4 of 5.4 "Fine-Adjust the Upper V-Rail" on page 71.

5.4.3 Specialized Upper V-Rail Adjustment - Straight Segment to Straight Segment

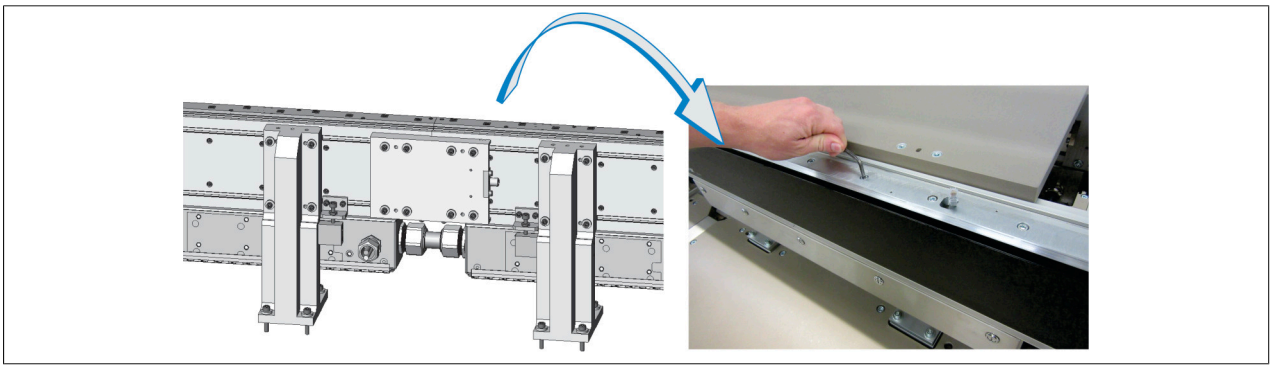
Information:

This is a specialized procedure that is not generally required.

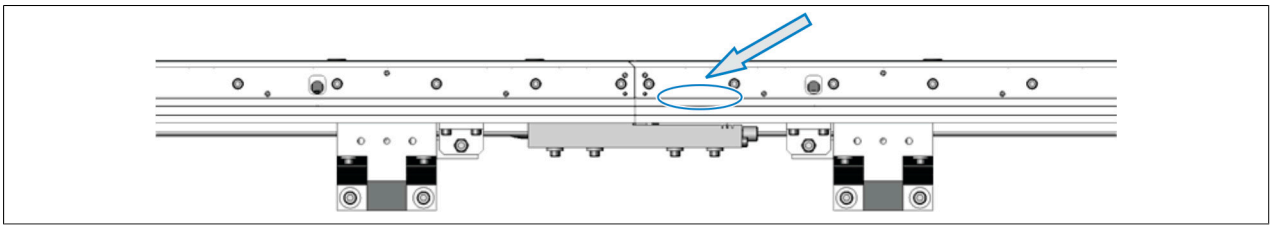
The most important alignment for shuttles to travel smoothly is the upper v-rail alignment. The second most important alignment is the lower flat rail alignment. Minor misalignment is acceptable because the wear strip straddles it. But if it is misaligned too much, the wear strip will flex and create an audible "clicking" sound. The third most important alignment is the laminations. If these are not aligned, a magnetic "bump" can occur as shuttles travel across it.

For all three alignments, the wedge adjust generally allows for alignment that is adequate enough.

1. Remove the encoder bracket.
   See 8.1.3 "Replace an Encoder Bracket" on page 107.
2. Loosen the upper v-rail screws.



3. At the end of the upper v-rail that requires adjustment, remove the 0.25 mm (0.01 in.) shim and replace it with a smaller or larger shim as required.
   For example, a shim would be placed in the area indicated if the right side required outward adjustment.



4. Re-install the encoder strip that was removed in step 1.
5. Repeat steps 2 to 4 of 5.4 "Fine-Adjust the Upper V-Rail" on page 71.

5.4.4 Specialized Upper V-Rail Adjustment - Straight Segment to Curved Segment

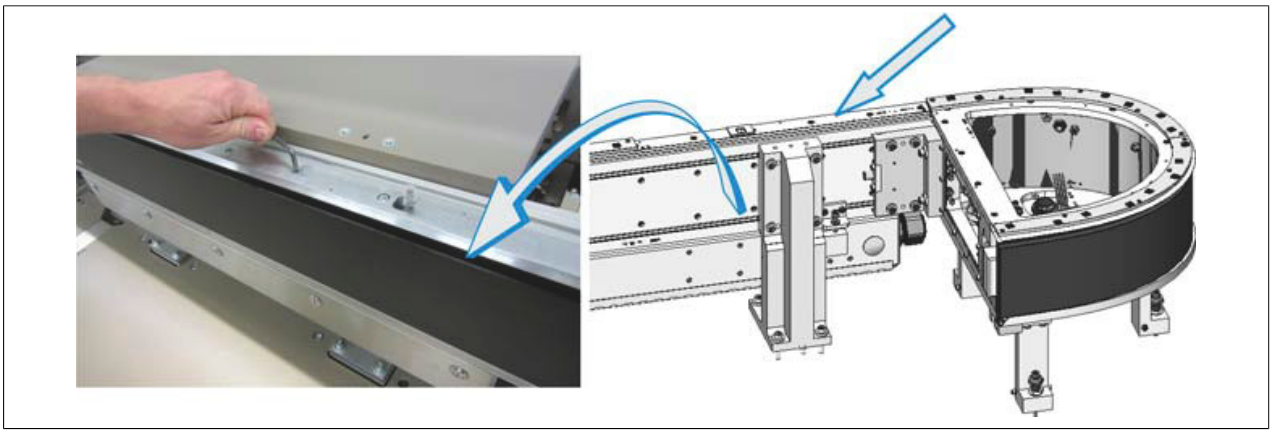
Information:

This is a specialized procedure that is not generally required.

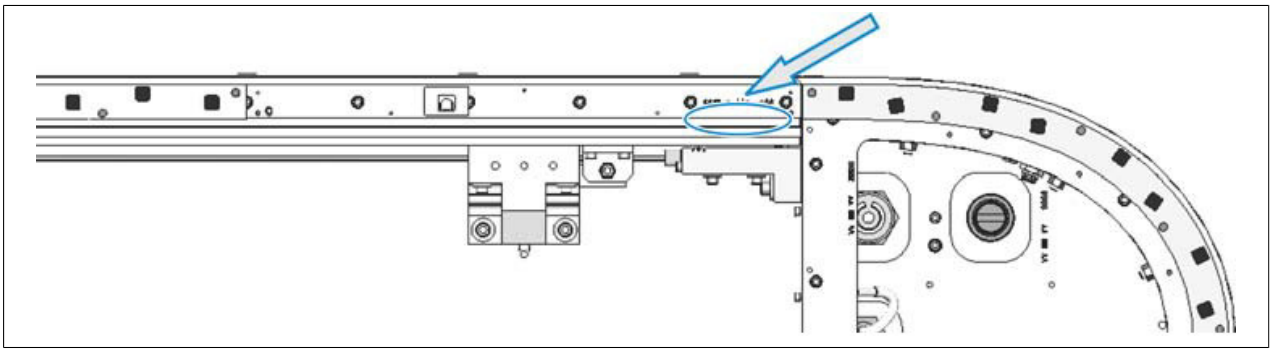
The most important alignment for shuttles to travel smoothly is the upper v-rail alignment. The second most important alignment is the lower flat rail alignment. Minor misalignment is acceptable because the wear strip straddles it, but if it is misaligned too much, the wear strip will flex and create an audible "clicking" sound. The third most important alignment is the laminations. If these are not aligned, a magnetic "bump" can occur as shuttles travel across it.

For all three alignments, the wedge adjust generally allows for alignment that is adequate enough.

1. Remove the encoder bracket.
   See 8.1.3 "Replace an Encoder Bracket" on page 107.
2. Loosen the upper v-rail screws.



3. At the end of the upper v-rail that requires adjustment, remove the 0.25 mm (0.01 in.) shim and replace it with a smaller or larger shim as required.
   For example, a shim would be placed in the area indicated if the right side required outward adjustment.



4. Re-install the encoder strip that was removed in step 1.
5. Repeat steps 2 to 4 of 5.4 "Fine-Adjust the Upper V-Rail" on page 71.

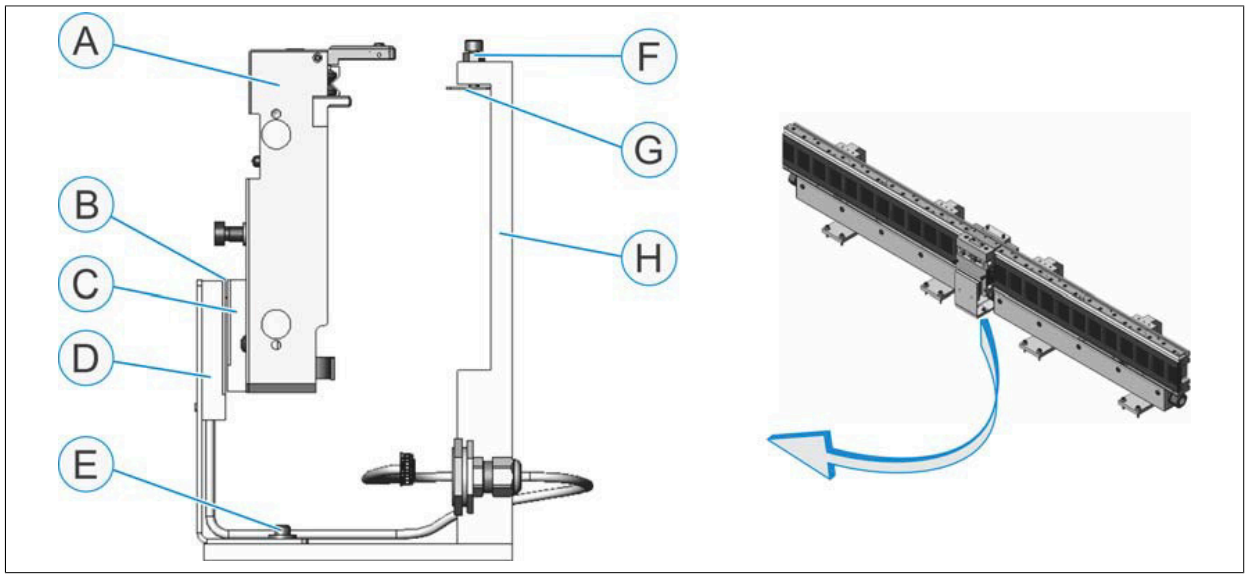
5.5 Install an IR Reader Mount Assembly

Information:

During this procedure, make sure the clamp plate (see "G" in the diagram below) is positioned between the clamp bolts and the joint plate when you slide the long side of the IR reader mount assembly under the joint of the two (2) adjacent straight segments. Failure to do so will result in joint plate damage.

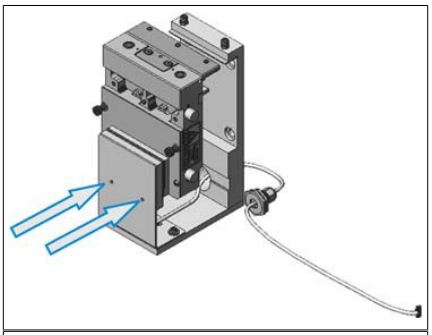
The IR reader mount assembly can be installed in one of the following locations:

- Custom location, if it meets the following criteria:
  - The air gap between the IR reader and IR tab is 1 mm (0.39 in.).
  - The IR reader is located in front of the SuperTrak transport system segment that it is plugged into.
  - There is no interference with a straight segment electrical door.
- Across the joint of two (2) adjacent straight segments. This installation location prevents interference with the electrical door of the straight segment.

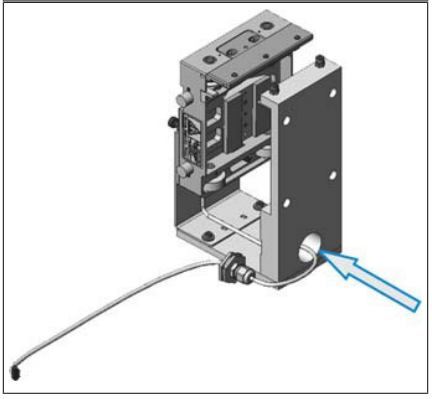


A	SuperTrak transport system shuttle	**E**	Air gap adjustment screw (with slotted hole)
B	1 mm (0.39 in.) air gap	**F**	Clamp plate bolt (1 of 2)
C	IR tag (read-only)	**G**	Clamp plate
D	IR reader	**H**	IR reader mount assembly

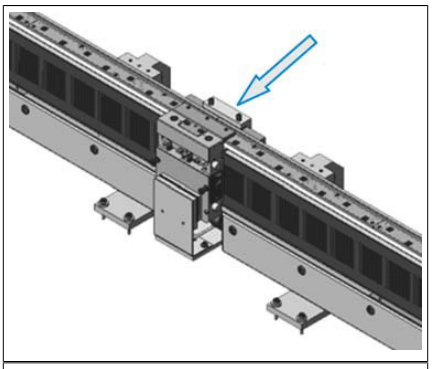
1. Secure the IR reader to the IR reader mount assembly with two (2) screws.



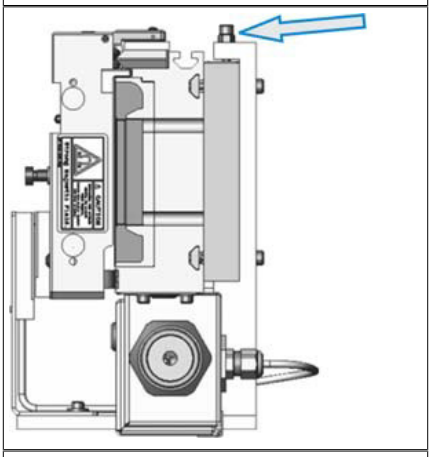
2. Route the IR reader cable through the IR reader mount assembly cable opening.



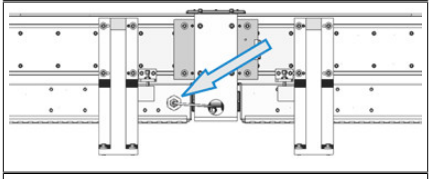
3. Slide the long side of the IR reader mount assembly under the joint of two (2) adjacent straight segments.
   To prevent joint plate damage, make sure the clamp plate is positioned between the clamp bolts and the joint plate.



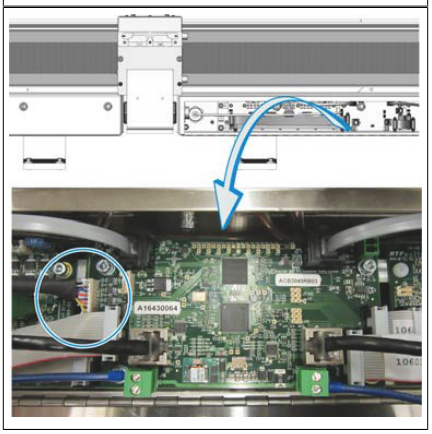
4. Tighten the two (2) clamp screws, to hold the IR reader mount in position.



5. Route the IR reader cable into the back of the straight segment electrical box, using the supplied knock-out reducer and strain relief connector.



6. Plug the IR reader cable into the IR reader connection on the gateway board. It must be connected to the gateway board of the assembly that the IR reader is mounted on.
   See 4.2.2.5 "Gateway Board" on page 32.



7. Slide a SuperTrak transport system shuttle in front of the IR reader.
8. Verify that a 1 mm (0,39 in.) gap exists between the IR tag on the SuperTrak transport system shuttle and the IR reader. If required, adjust the air gap adjustment screw to increase or decrease the gap.
9. Configure the IR reader.
   See 7.5.2 "Access the TrackMaster Built-in Help" on page 96.

6 Controls and Connections

6.1 TrackMaster Software

Information:

The lifespan of some SuperTrak components may be compromised when temperature-related TrackMaster configuration parameters are adjusted from the default value.

For optimum lifespan of SuperTrak conveyor component, do not increase the default value of the electronics temperature configuration parameter, and use caution when increasing the coil temperature configuration parameter:

- **Coil Temperature Limit (°C); default=60, hard limit=90.**
- **Electronics Temperature Limit (°C); default=60, hard limit=70.**

TrackMaster is a Windows™-based application that monitors, configures, and is used to troubleshoot the SuperTrak transport system.
See 7.5 "TrackMaster Procedures" on page 96.

6.2 Guarding

Danger!

Unguarded devices may cause injury or death. Do not start or operate the equipment with guard doors open. Lockout and tagout all energy sources before entering the guarding. Make sure that all guard panels are in place and guard doors are closed before operating the equipment. Make sure that the guarding is adequate due to the requirements of the application (e.g. transport of liquids). Never bypass a safety component.
See 3.4 "Hazardous Energy" on page 19 and 3.5 "Lockout and Tagout" on page 21.

Guarding is a protective housing that separates users from dangers; such as, moving devices. The guarding is comprised of a framework fitted with fixed guarding panels, and removable guarding panels.

The moving parts on machines must be shielded in such a way as to prevent unintentional access by personnel and injury due to flying parts. This type of protection can be achieved by using stable mechanical protective equipment such as protective covers, protective fences, protective gates.

6.2.1 Fixed Guard Panels

Fixed guard panels should not be removed.

6.2.2 Removable Guard Panels

Removable guard panels are available for maintenance and should only be opened by a qualified technician. A tool is required to unlock and remove a panel and to lock a panel in position. These panels are not usually equipped with a safety switch; therefore, the system should not be operated with any of these panels removed.

6.3 Connections

6.3.1 Ethernet Port Connection

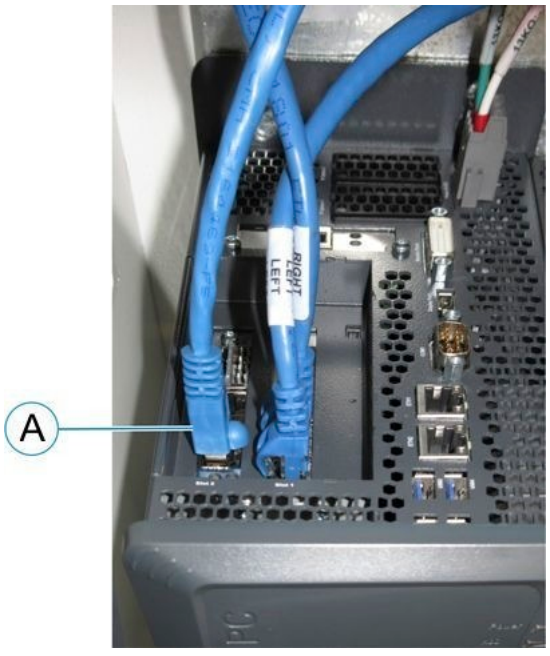
An Ethernet port (ETH1) is located on the Automation PC.

This connection provides Automation Studio and TrackMaster software communication. Any computer running Microsoft Windows (for example a laptop or HMI) can connect to ETH1 with an Ethernet cable.

ID	Connection Number	Connection Type	Description
A	ETH1	Ethernet	Provides Automation Studio and TrackMaster software communication.

6.3.2 Ethernet POWERLINK Connection

The Ethernet POWERLINK connection is on the Automation PC, as illustrated:



ID	Connection Number	Connection Type	Description
A	14K1 Slot 2	POWERLINK	Connects to I/Os, drives and other POWERLINK devices (30K3).

6.3.3 Gateway Network Connections

Note:

Turn OFF the 24 V gateway power, and turn OFF the controller before connecting the gateway network.

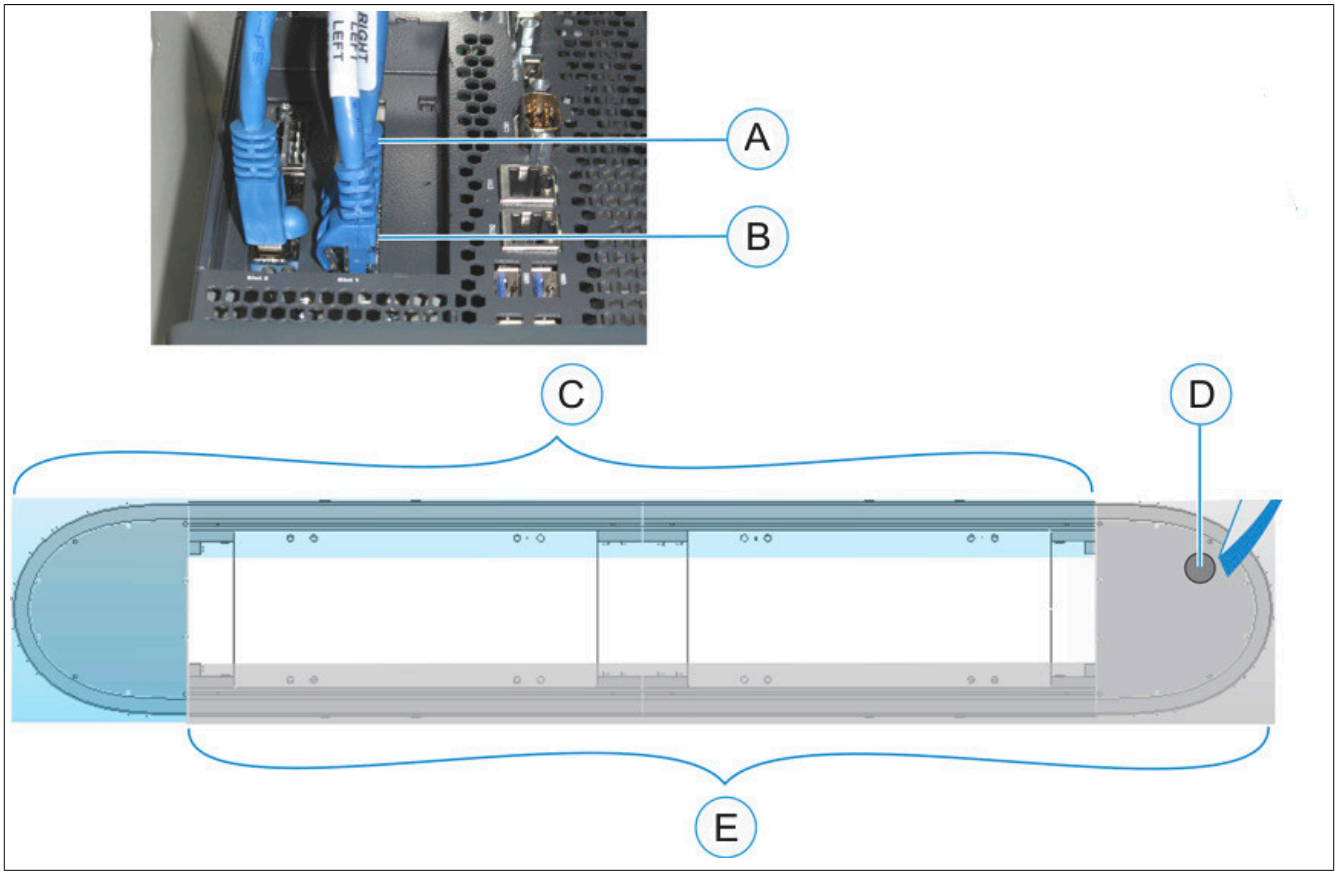
Information:

Although the gateway network connections are implemented using standard Ethernet cables, it is not an Ethernet network and can not be connected to Ethernet devices.

The gateway network connections use Ethernet cables to connect an array of gateway boards to the controller, as illustrated:

6.3.3.1 Left and Right Gateway Networks

The SuperTrak transport system is divided into two (2) networks: the left network, and the right network. Each network begins with a cable that needs to be routed through the control panel electrical interconnect to the controller.



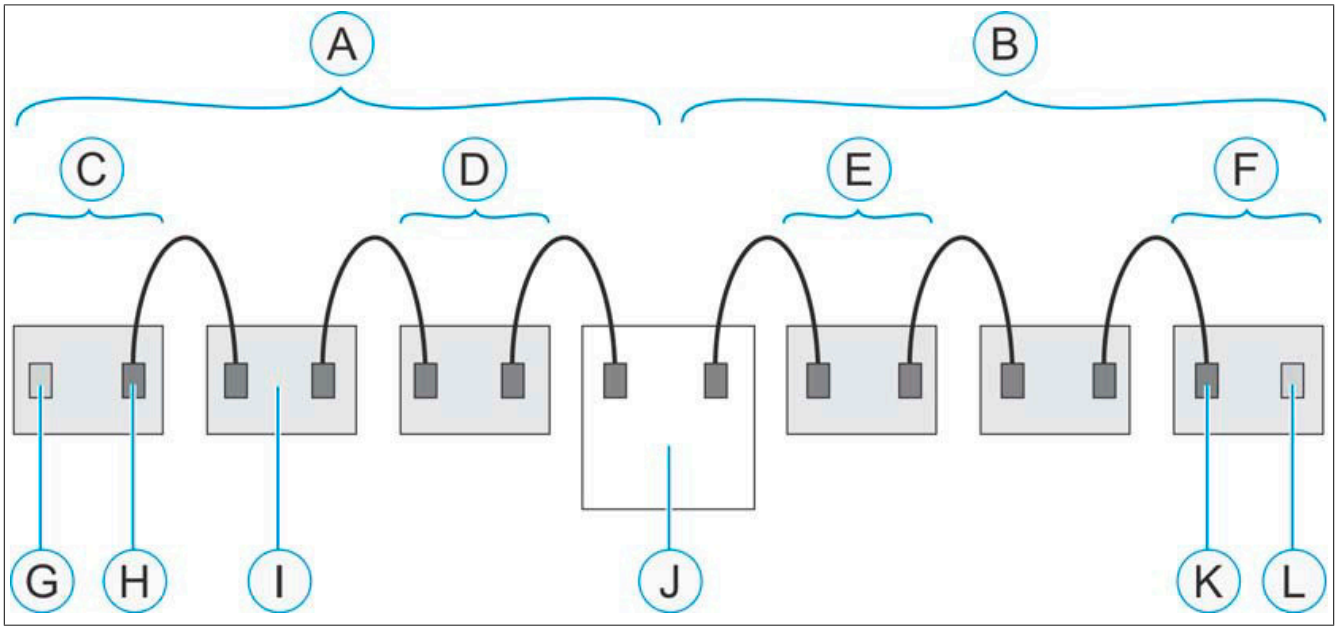
ID	Connection Type	Description
A	RJ45	Right gateway network cable
B	RJ45	Left gateway network cable
C	N/A	Right gateway network
D	N/A	Control panel electrical interconnect. Left and right gateway network cables should be routed to the SuperTrak transport system control panel through a flexible conduit.
E	N/A	Left gateway network

6.3.3.2 Gateway Board Connections

Note:

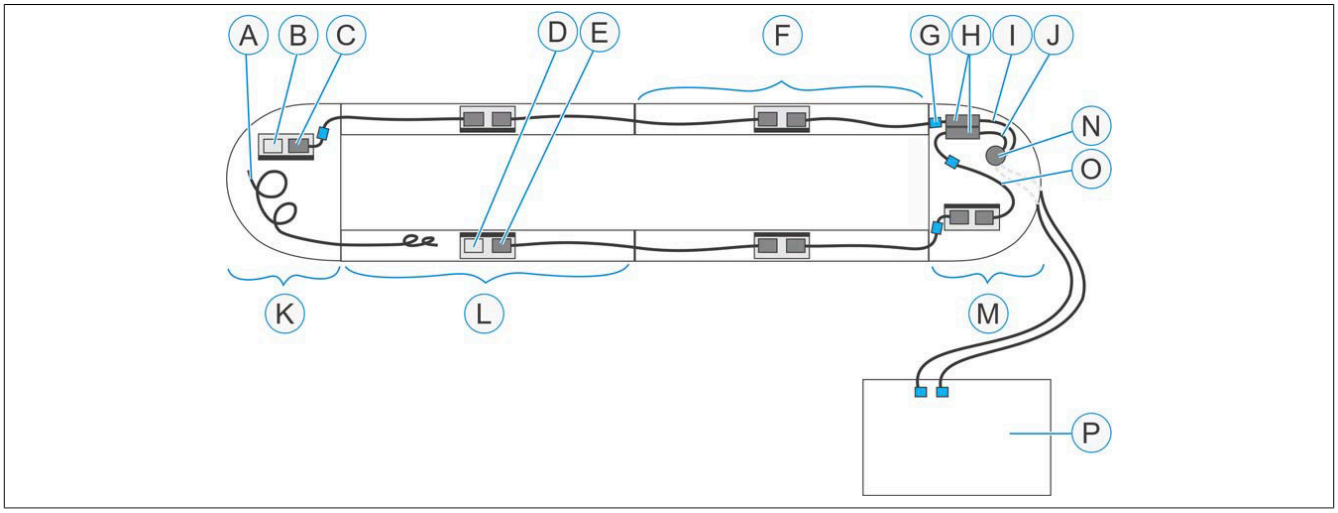
Gateway network cables should never cross one another.

As illustrated below, the left gateway connections connect to the controller upstream using the right network ports, and connect from the controller downstream using the left network ports. The right gateway connections are opposite; they connect to the controller upstream using the left network ports, and connect from the controller downstream using the right network ports.



ID	Connection Type	Description
A	N/A	Left gateway network
B	N/A	Right gateway network
C	N/A	Left tail section (farthest from the controller)
D	N/A	Left head section (closest to the controller)
E	N/A	Right head section (closest to the controller)
F	N/A	Right tail section (farthest from the controller)
G	RJ45	Left network port (not connected)
H	RJ45	Right network port (connected)
I	N/A	Gateway board (1 of 6)
J	N/A	Controller
K	RJ45	Left network port (connected)
L	RJ45	Right network port (not connected)

6.3.3.3 Straight Segment with Curved Segment (500 mm)

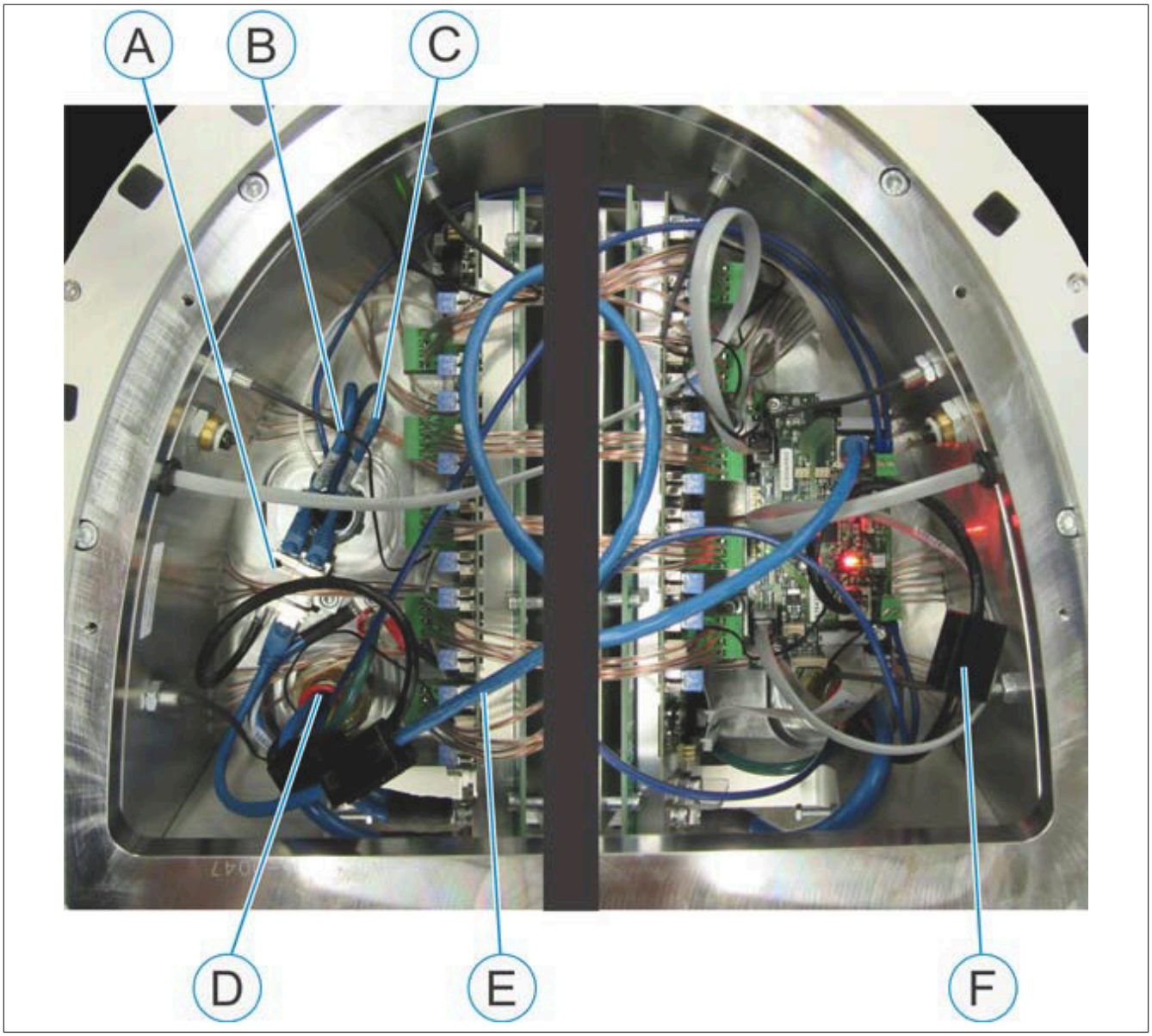


ID	Connection Type	Description
A	N/A	Ethernet cable - not connected
B	RJ45	Right network port (not connected)
C	RJ45	Left network port (connected)

ID	Connection Type	Description
D	RJ45	Left network port (not connected)
E	RJ45	Right network port (connected)
F	N/A	Right head section
G	N/A	Ferrite (1 of 6)
H	RJ45	F-F coupler
I	RJ45	Ethernet cable - right network cable from controller (connected)
J	RJ45	Ethernet cable - left network cable from controller (connected)
K	N/A	Right tail section
L	N/A	Left tail section
M	N/A	Left head section
N	N/A	Control panel electrical interconnect
O	N/A	Left network patch cable
P	N/A	SuperTrak transport system control panel

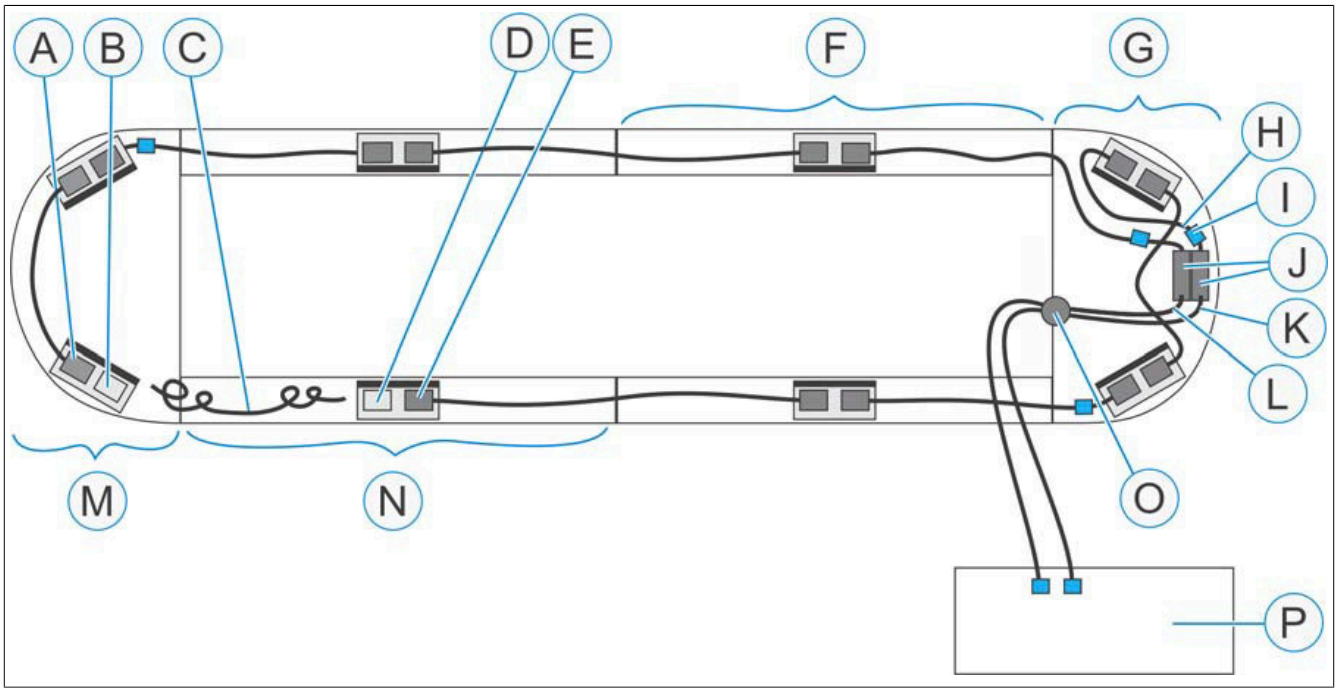
6.3.3.4 Sample Gateway Network Connections in a Curved Segment (500 mm)

The following image illustrates some of the gateway network connections. The black line is used to join two (2) images together.



A	F-F coupler	**D**	Control panel electrical interconnect
B	Ethernet cable - right network cable from controller (connected)	**E**	Left network patch cable
C	Ethernet cable - left network cable from controller (connected)	**F**	Ferrite (1 of 3 shown)

6.3.3.5 Straight Segment with Curved Segment (800 mm)



ID	Connection Type	Description
A	RJ45	Left network port (connected)
B	RJ45	Right network port (not connected)
C	N/A	Ethernet cable (not connected)
D	RJ45	Left network port (not connected)
E	RJ45	Right network port (connected)
F	N/A	Right head section
G	N/A	Left head section
H	N/A	Left network patch cable
I	N/A	Ferrite (1 of 6)
J	RJ45	F-F coupler
K	RJ45	Ethernet cable - left network cable from controller (connected)
L	RJ45	Ethernet cable - right network cable from controller (connected)
M	N/A	Right tail section
N	N/A	Left tail section
O	N/A	Control panel electrical interconnect
P	N/A	SuperTrak transport system control panel

7 Operating Procedures

7.1 Pre-Start Inspection

Information:

Before the SuperTrak transport system power is turned ON for the first time, complete the pre-power ON checks.

See 7.2 "Pre-Power ON Checks" on page 88.

In addition, complete one or more of the following to make sure the v-rails are adequately lubricated:

- **Make sure there is a shuttle for every 2 m of track.**
- **Add an additional 20 drops of lubricant to the shuttle lubrication felt.**
- **Manually wipe lubricant on the v-rails.**

Remove excess oil from the SuperTrak that may have dripped from the upper v-rail.

Information:

During startup, the SuperTrak transport system uses an identification process to locate unrecognized shuttles. There could be uncontrolled shuttle movement during this process. When all shuttles are located, the SuperTrak transport system switches to normal shuttle control.

For systems where minor shuttle collisions are acceptable, no action is required. Be aware that shuttles on straight segments have minimal or no movement during startup, whereas shuttles on curved segments may have significant movement.

For systems where shuttle collisions are not acceptable, use the TrackMaster before startup to determine which segments contain unrecognized shuttles, and then manually move those shuttles so the software can identify the shuttle position.

	Task	Complete
1.	Verify that all users have been properly trained and instructed in safety procedures and SuperTrak transport system operation.	
2.	Verify that the top and bottom rails are clean and that the shuttles have had the proper preventive maintenance.	
3.	Inspect around the SuperTrak transport system, to make sure there are no abnormal obstructions along the path that the shuttles travel.	
4.	Verify that all energy sources have locks and tags removed.	
5.	Verify that no one is working inside the guarding.	
6.	Verify that all guarding is correctly installed and operational.	
7.	Complete the pre-power ON check to confirm that shorts do not exist in the system. See 7.2 "Pre-Power ON Checks" on page 88.	
8.	Confirm that the segments are correctly aligned. Segment joints and heights should not exceed ±0.07 mm (0.003 in.). See 5.2.7 "Align the SuperTrak Transport System Segment Joints" on page 67 and 5.2.8 "Align the SuperTrak Transport System Segment Heights" on page 68.	
9.	Disconnect the black segment-to-segment Ethernet cable at the end of the right network going into the left network to avoid any errors during startups. See 6.3.3 "Gateway Network Connections" on page 82.	
10.	Confirm that the ETH1 port is used for TrackMaster to communicate with SuperTrak. See 6.3.1 "Ethernet Port Connection " on page 81.	
11.	Confirm that the right and left network cables are correctly connected. See see "Left and Right Gateway Networks" on page 82.	
12.	Open TrackMaster. The default IP address for the SuperTrak is 192.168.13.2. The computer must be connected to the ETH1 port on the controller computer. • Confirm the communication. • Confirm that faults and warnings do not exist. • Confirm that the latest controller software is installed (**Advanced** > **Firmware**)	
13.	Calibrate the encoders. See the TrackMaster built-in help for the calibration procedure.	
14.	Verify stable motion of a single SuperTrak shuttle: 1) Install a single SuperTrak shuttle on the SuperTrak transport system. 2) Confirm that the motor power supply is ON. On TrackMaster, check the Motor Power column on the **System Status/Control** screen. 3) Move the shuttle around the system at a high speed (2500 mm/sec). 4) Verify that no abnormal sounds or shuttle instability is detected.	
15.	Verify stable motion of all SuperTrak shuttles: 1) Turn the motor power OFF. On TrackMaster, check the **Motor Power** column on the **System Status/Control** screen. 2) Install all required SuperTrak shuttles on the SuperTrak transport system. 3) Verify that the number of shuttles on TrackMaster match the physical number of shuttles on the SuperTrak transport system. 4) Turn the motor power ON. 5) Move the shuttles around the system at high speed (2500 mm/sec). 6) Verify that no abnormal sounds or shuttle instability is detected.	

7.2 Pre-Power ON Checks

Information:

- **Before the SuperTrak transport system power is turned ON for the first time, complete the pre-power ON checks.**
- **If a straight segment or curved segment is added or removed, complete the pre-power ON checks.**
- **If a circuit board or power cable is replaced, complete the pre-power ON checks.**

Complete the pre-power ON check procedure before you turn the SuperTrak transport system power ON:

- After completing a new SuperTrak transport system installation.
- After a straight segment or curved segment is added or removed.
- After a circuit board is replaced.
- After a power cable is replaced.

Prerequisites

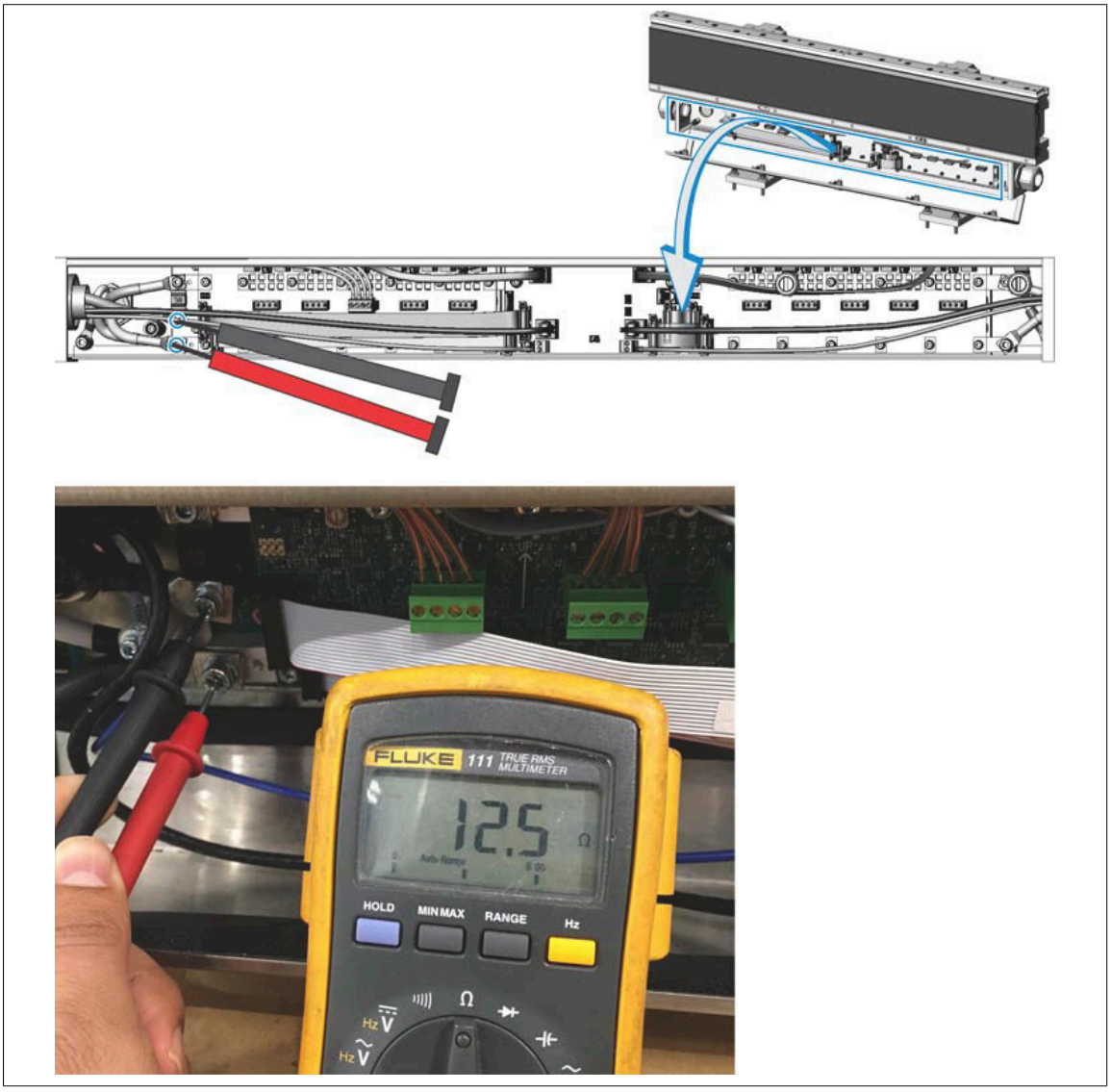
- Digital multimeter
- Set of metric hex keys

Procedure

1. Open the electrical door of a straight segment.
2. Set a digital multimeter to measure resistance.
3. Measure the resistance between the following:
    - Motor power connection and the common connection.
      See 7.2.1 "Measure the Resistance Between the Motor Power Connection and the Common Connection" on page 89.
    - Ground (frame) and the common connection.
      See 7.2.2 "Measure the Resistance Between the Ground (Frame) and the Common Connection" on page 90.
    - Common connection and the 24 V digital power connection.
      See 7.2.3 "Measure the Resistance Between the Common Connection and the 24 V Digital Power Connection" on page 92.
    - Motor power connection and the 24 V digital power connection.
      See 7.2.4 "Measure the Resistance Between the Motor Power Connection and the 24 V Digital Power Connection" on page 93.
4. If all step 3 resistance tests pass, it is safe to turn the SuperTrak transport system power ON.

7.2.1 Measure the Resistance Between the Motor Power Connection and the Common Connection

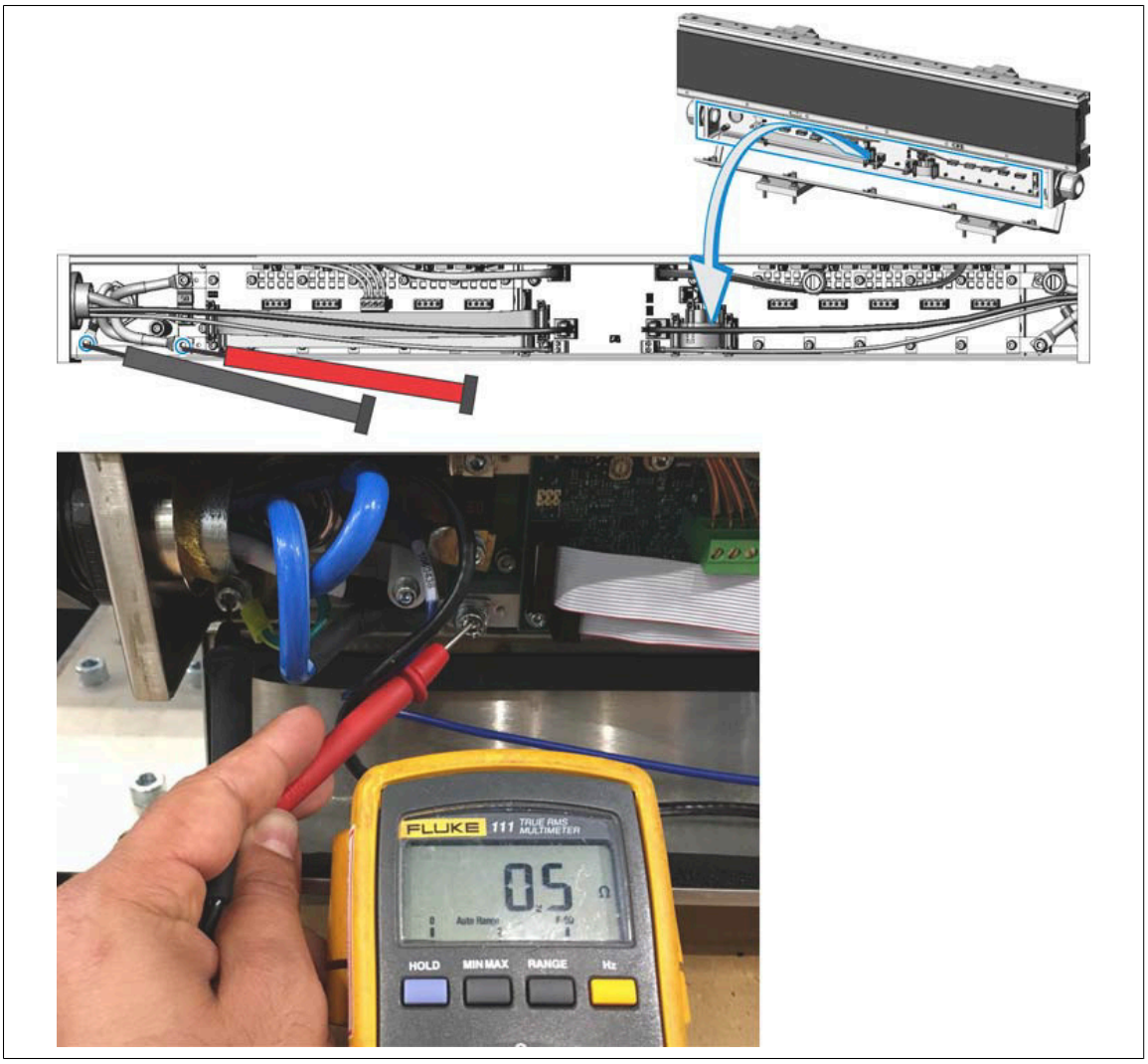
1. Test the resistance as shown below:



2. Look at the value displayed on the multimeter screen and determine if the resistance is acceptable:
   - Pass - The value is initially <10 Ω and then slowly rises to >10 Ω. This occurs because the capacitors are charging.
   - Fail - The value quickly settles at <5 Ω. This indicates that a short exists.
     See 10.2 "A short exists between the motor power connection and the common connection or ground (frame)." on page 180.

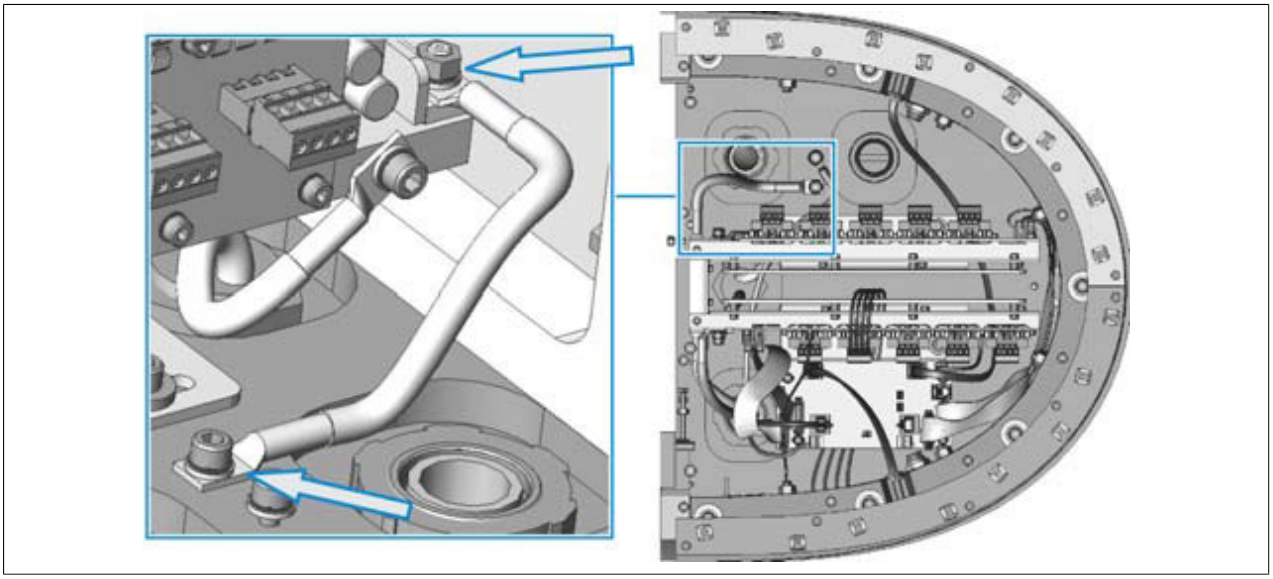
7.2.2 Measure the Resistance Between the Ground (Frame) and the Common Connection

1. Test the resistance as shown below:



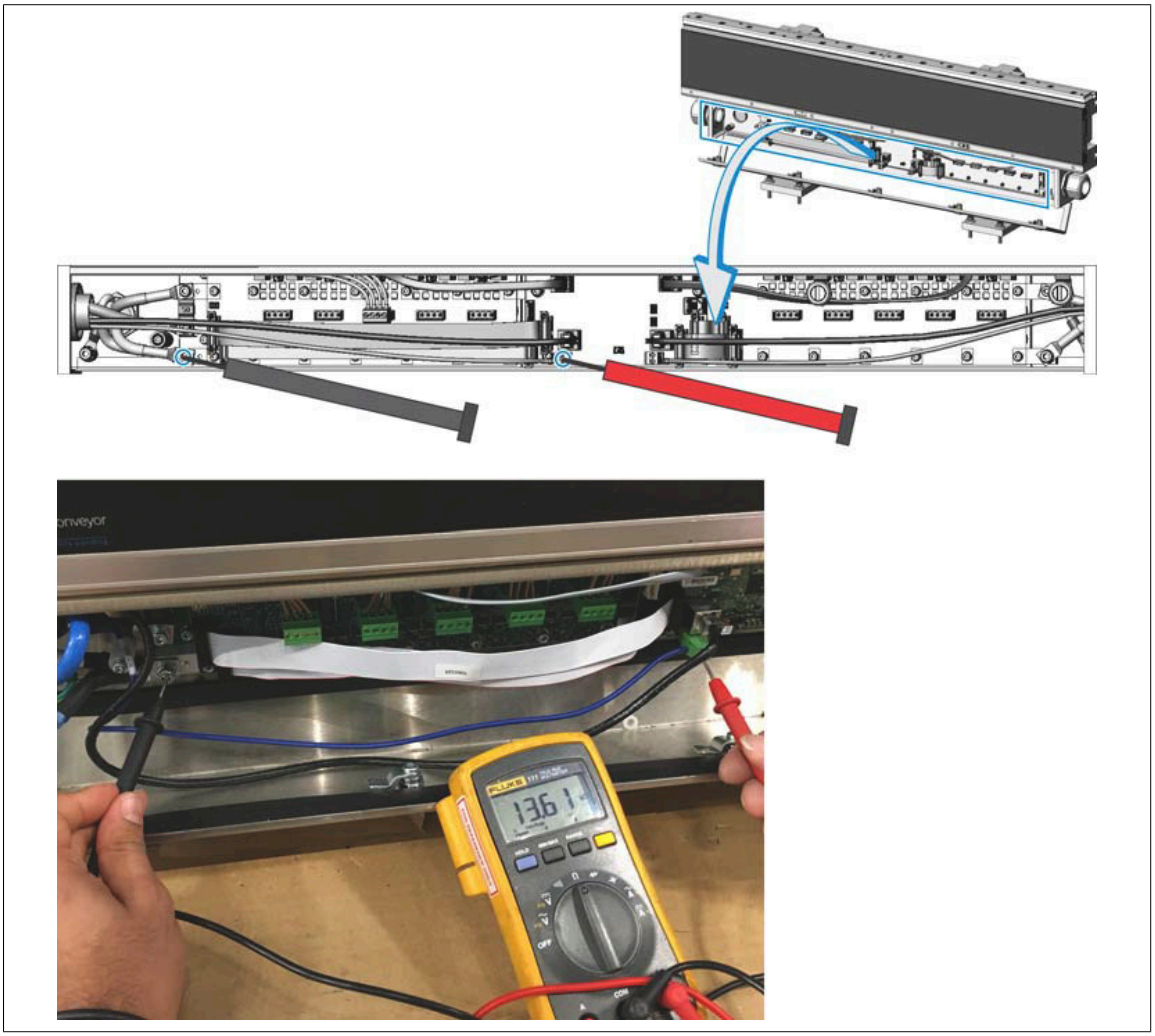
2. Look at the value displayed on the multimeter screen and determine if the resistance is acceptable:
    - Pass - The value is <1 Ω.
    - Fail - The value is >1 Ω.

3. Verify that the bonding jumper is correctly installed in the curved segment that contains the control panel electrical interconnect.



7.2.3 Measure the Resistance Between the Common Connection and the 24 V Digital Power Connection

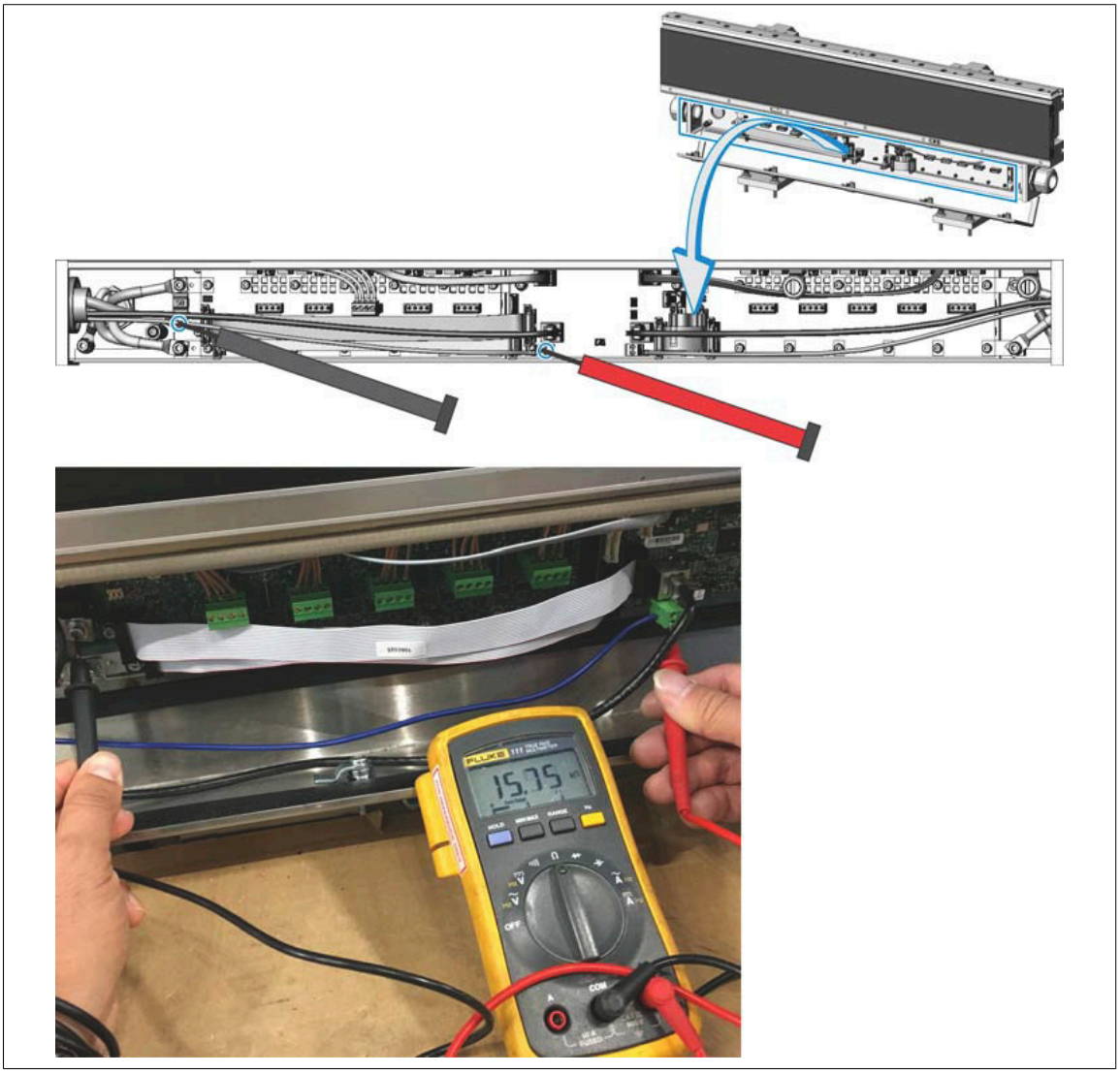
1. Test the resistance as shown below:



2. Look at the value displayed on the multimeter screen and determine if the resistance is acceptable:
    - Pass - The value is initially <500 Ω and then quickly rise to >1000 Ω. This occurs because the capacitors are charging.
    - Fail - The value quickly settles at <5 Ω. This indicates that a short exists.
      See 10.2 "A short exists between the 24 V digital power connection and the common connection or ground (frame)." on page 180.

7.2.4 Measure the Resistance Between the Motor Power Connection and the 24 V Digital Power Connection

1. Test the resistance as shown below:



2. Look at the value displayed on the multimeter screen and determine if the resistance is acceptable:
    - Pass - The value is >10 Ω.
    - Fail - The value is <10 Ω. This indicates that a short exists.
      See 10.2 "A short exists between the motor power connection and the 24 V digital power connection." on page 180.

7.3 SuperTrak Transport System Power On Behavior

Information:

The SuperTrak transport system is typically integrated with a larger automation system. This section describes the SuperTrak transport system power ON procedure and does not include any steps for the larger system.

Each track module has two (2) power connections:

- Motor power (28 VDC)
- Digital power (24 VDC)

Motor power must be switched off with the safety circuit, while digital power should remain on because digital power keeps the encoder feedback live, so that the SuperTrak transport system continues to monitor the shuttle positions.

The SuperTrak transport system 24 VDC digital power should be wired in such a way that it turns ON when the main power supply is ON. This provides power to the SuperTrak transport system controller, encoders, and other digital electronics in the motors. The SuperTrak Transport System 24 VDC digital power can be ON prior to the main power ON if the UPS (if present) has battery power remaining.

SuperTrak transport system motor power supplies must be switched ON by an appropriate safety system conforming to legal standards. This must only occur when the guard doors are closed and the system is in a safe state to start operation.

Warning!

To avoid rapid switching of the SuperTrak transport system motor power supplies, the machine safety circuit must be configured with a minimum 2 second delay after the fail safe output turns OFF before it turns back ON.

- If digital power is not lost, all shuttle locations and data are maintained. The system continues to work from where it left off.
- If digital power is lost and a cold start occurs, the software on the Automation PC determines if shuttle movements occur during startup.

7.4 SuperTrak Transport System Power Off Behavior

To stop the system, the PLC (if present) disables the SuperTrak transport system over the network at the appropriate time. This is typically triggered by a system **cycle stop** or **cycle end** button on the PLC-controlled operator interface. For example:

- The PLC (if present) can complete all current operations, move tooling clear, and then disable the SuperTrak transport system.
- The PLC (if present) can completely purge the line of parts, and then disable the SuperTrak transport system. When the system stops, the user turns the main power supply OFF.

When the PLC (if present) detects that the safety circuit is open (for example a guard door is open, or an emergency stop button is activated), it immediately drops the enable signal to the SuperTrak transport system. This causes shuttles to decelerate to a controlled stop. At the same time, the system safety circuit maintains the fail safe output to the SuperTrak transport system for a time delay OFF of 100-300 ms. The amount of time is configured based on shuttle speed and payload, to make sure that there is adequate time for the shuttles to stop. A 300 ms delay is adequate for a shuttle with high payload traveling at full speed.

The disable delay time is set in both the system safety circuit and in theTrackMaster software (see Section Parameters > Section Disable Delay Time). When the disable delay time is correctly configured, shuttles come to a controlled stop and avoid bumping on an abrupt cell power OFF. If a disable delay time is not configured (Section Disable Delay Time is set to zero [0]), the SuperTrak transport system shorts the coils to help decelerate the shuttles on cell power OFF, which minimizes how far the shuttles coast.

7.5 TrackMaster Procedures

Information:

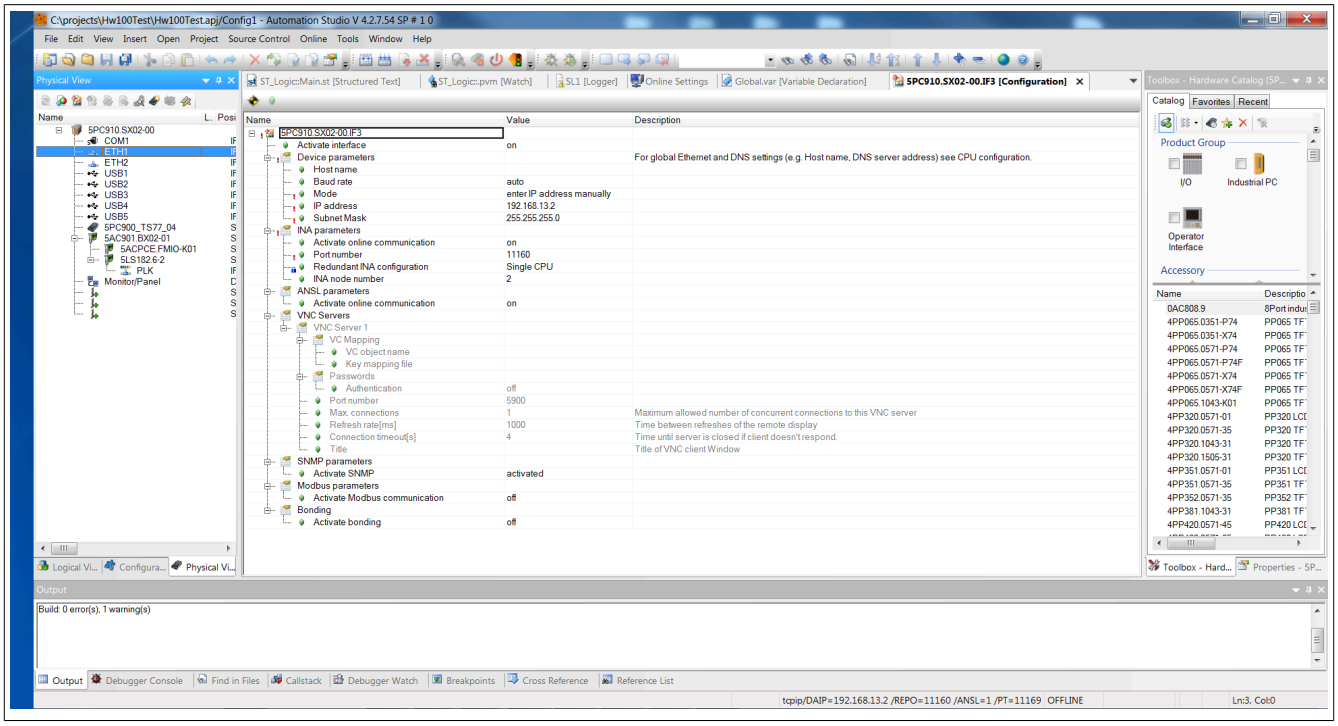
TrackMaster is not required to operate the SuperTrak transport system. However, it is useful for troubleshooting and configuring SuperTrak transport system and a first system start up.

TrackMaster is a Windows™-based application that monitors, configures, and is used to troubleshoot the SuperTrak transport system.

See the TrackMaster Built-in Help for additional information.

Information:

To get access to TrackMaster there must be configurated the IP adress 192.168.13.2 and subnet mask 255.255.255.0 in the Ethernet configuration of the Automation PC in Automation Studio. If there are further SuperTrak transport systems in network the particular IP address must be different.



7.5.1 Login to TrackMaster

For TrackMaster v2.99.0.106 and later, see Access Control in the TrackMaster built-in help for login instructions.

7.5.2 Access the TrackMaster Built-in Help

Information:

See the Quick Start section for initial SuperTrak transport system connection and configuration instructions.

1. Open TrackMaster.
2. Click **Help > Contents**.

7.6 Monitor the SuperTrak Transport System

It is important to be aware of the state of SuperTrak transport system during operation. When you are aware of how the SuperTrak transport system correctly works, it is easier to notice when a change occurs. Some things to notice include:

- Watch all devices for smooth operation. If a device does not seem to be operating correctly, stop the SuperTrak transport system and notify a service technician.
- Be aware of the speed at which the components function. If they appear to move slower than usual or are progressively getting slower, maintenance may be required.
- Watch for debris accumulation on the upper v-rail. This is an indication that the shuttles require immediate lubrication.
- Watch for debris accumulation on the lower rails. Wipe down the lower rails with a clean cloth dampened with isopropyl alcohol or equivalent.
- Watch for repeated faults and listen for shuttle noise. Inspect and repair the shuttle as required.
- Listen for knocking sounds as the shuttle travel over the upper v-rail joins. Knocking sounds are an indication that the upper v-rail requires adjustment.

8 Technician Procedures

8.1 Electrical Procedures

Danger!

Completing any maintenance procedures with the SuperTrak transport system electrically powered may result in serious injury or death. Lock out and tag out all electrical energy sources before part service or replacement.
See 3.4 "Hazardous Energy" on page 19, and 3.5 "Lockout and Tagout" on page 21.

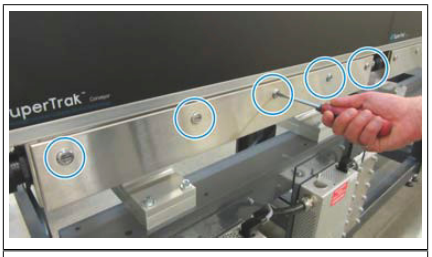
8.1.1 Replace a Coil Driver Board

Information:

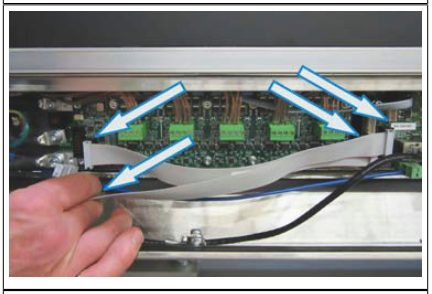
To prevent electrical board damage from electrostatic discharge (ESD), use an ESD wrist strap when working with the coil driver board. An ESD wrist strap prevents the buildup of static electricity.

8.1.1.1 Remove a Coil Driver Board - Straight Segment

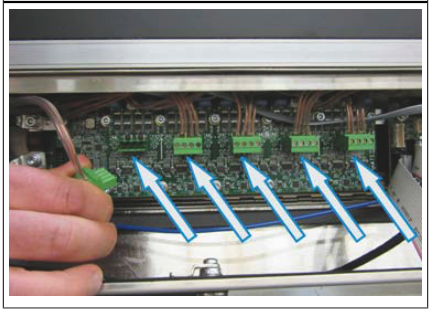
1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. Use a flat head screwdriver to unlock the five (5) locks, and then open the electrical door.



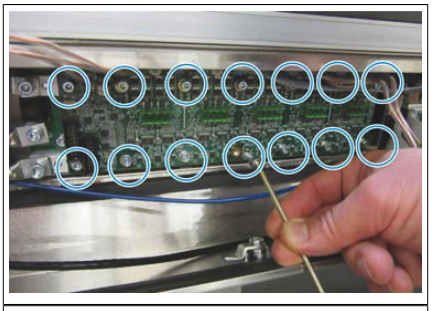
4. Unplug the two (2) ribbon cables. Pull each of the four (4) ribbon cable plugs straight out.



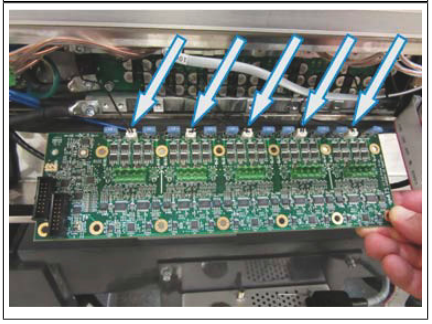
5. Unplug the five (5) coil plugs. Pull each coil plug straight out.



6. Remove the fourteen (14) screws that secure the coil driver board to the bus bar. Note that one (1) screw is nylon. This screw is located in the upper left corner of the coil driver board.

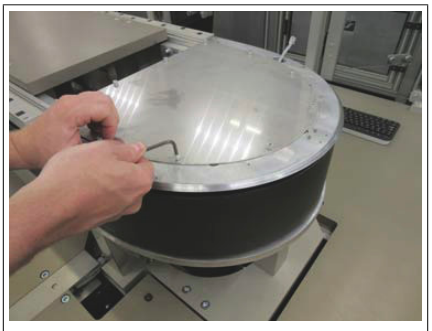


7. Pull the coil driver board straight down and out, and then disconnect the five (5) thermistor connections. Squeeze the tabs for each thermistor connector plug and then pull straight out.

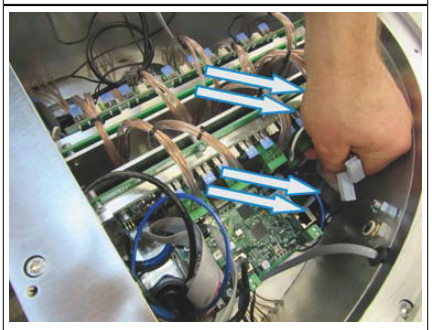


8.1.1.2 Remove a Coil Driver Board - Curved Segment (500 mm)

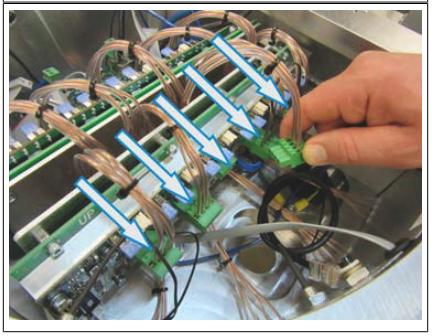
1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
See 3.5 "Lockout and Tagout" on page 21.
3. Remove ten (10) screws and ten (10) washers from the curved top cover, and then lift and remove the curved top cover.



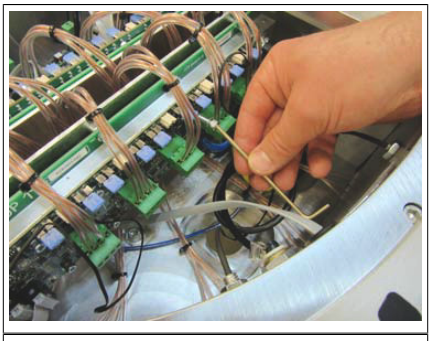
4. Unplug the two (2) ribbon cables. Pull each of the four (4) ribbon cable plugs straight out.



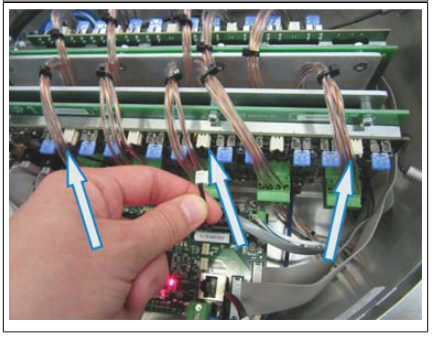
5. Unplug the five (5) coil plugs. Pull each coil plug straight out.



6. Remove the fourteen (14) screws that secure the board to the bus bar.



7. Disconnect the three (3) thermistor connections. Squeeze the tabs for each thermistor connector plug and then pull straight out.



8. Lean the coil driver board forward and lift straight up.

8.1.1.3 Remove a Coil Driver Board - Curved Segment (800 mm)

1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. Use a flat head screwdriver to remove the screws from the electrical door, and then set the electrical door aside.
4. Remove the gateway board.
   Complete steps 4 to 9 of 8.1.2.1 "Remove a Gateway Board - Straight Segment or Curved Segment (800 mm)" on page 102.
5. Remove the coil driver board.
   Complete steps 4 to 7 of 8.1.1.1 "Remove a Coil Driver Board - Straight Segment" on page 98.

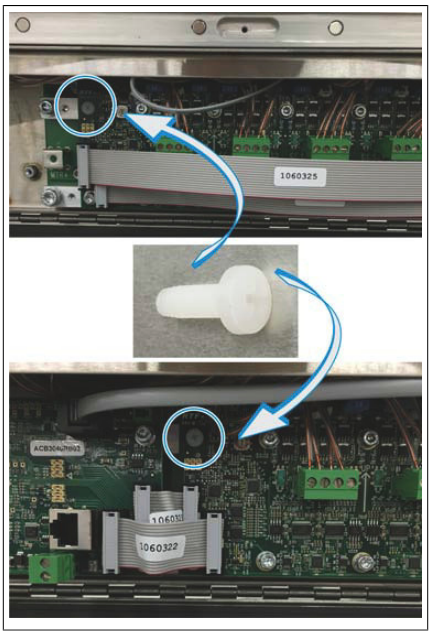
8.1.1.4 Install a Coil Driver Board - Straight Segment or Curved Segment (800 mm)

> **Information:**
>
> **During installation, do not pinch any wires behind the coil driver board when screws are installed. This can cause an electrical short.**

If required, reference 4.2.2.3 "Left Coil Driver Board" on page 30, and 4.2.2.4 "Left Coil Driver Board with a Power Supply Connected" on page 31 during this procedure.

1. Remove the old coil driver board.
   See 8.1.1.1 "Remove a Coil Driver Board - Straight Segment" on page 98.
2. Inspect the new coil driver board, to make sure it contains ten (10) 15 A fuses.
3. Connect the five (5) thermistor connections.
4. Align the coil driver board with the screw holes inside the straight segment.
   Make sure there are no wires behind the coil driver board.

5. Secure the coil driver board in position with fourteen (14) screws. Make sure that the screw in the upper-left corner of the coil driver board is nylon, and make sure the coil driver board wires are clear of the screws.

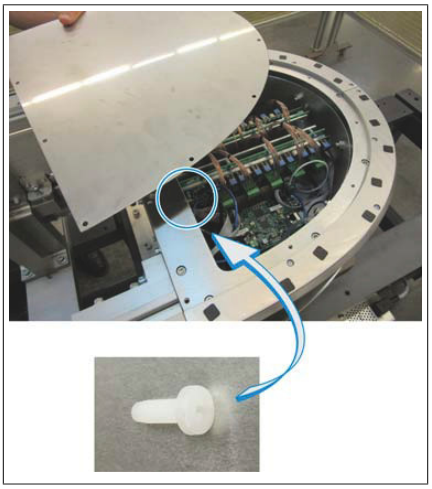


6. Connect the five (5) coil plugs.
7. Connect the two (2) ribbon cables.

8.1.1.5 Install a Coil Driver Board - Curved Segment (500 mm)

If required, reference 4.2.2.3 "Left Coil Driver Board" on page 30, and 4.2.2.4 "Left Coil Driver Board with a Power Supply Connected" on page 31 during this procedure.

1. Remove the old coil driver board.
   See 8.1.1.2 "Remove a Coil Driver Board - Curved Segment (500 mm)" on page 99.
2. Inspect the new coil driver board, to make sure it contains ten (10) 15 A fuses.
3. Align the coil driver board with the screw holes inside the curved segment.
4. Secure the coil driver board in position with fourteen (14) screws. Make sure that the screw in the upper left corner of the coil driver board is nylon.



5. Connect the five (5) coil plugs.
6. Connect the two (2) ribbon cables.
7. Connect the three (3) thermistor connections.

8.1.2 Replace a Gateway Board

Information:

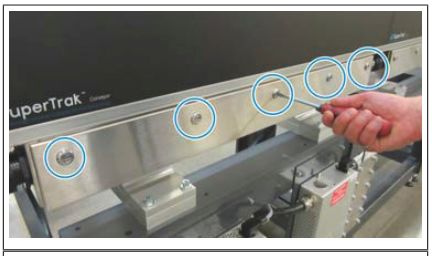
To prevent electrical board damage from electrostatic discharge (ESD), use an ESD wrist strap when working with the gateway board. An ESD wrist strap prevents the buildup of static electricity.

8.1.2.1 Remove a Gateway Board - Straight Segment or Curved Segment (800 mm)

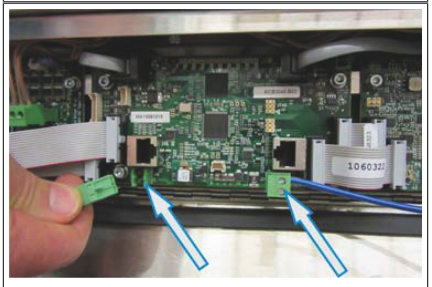
Information:

To prevent electrical board damage from electrostatic discharge (ESD), use an ESD wrist strap when working with the gateway board. An ESD wrist strap prevents the buildup of static electricity.

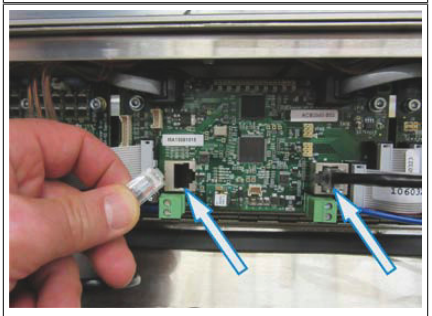
1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. Use a flat head screwdriver to unlock the five (5) locks, and then open the electrical door.



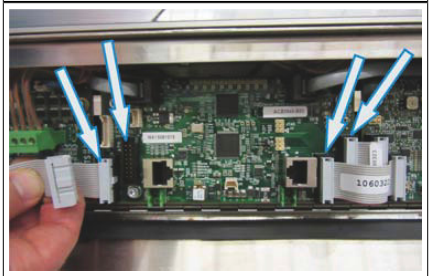
4. Unplug the two (2) 24 V digital power connections.



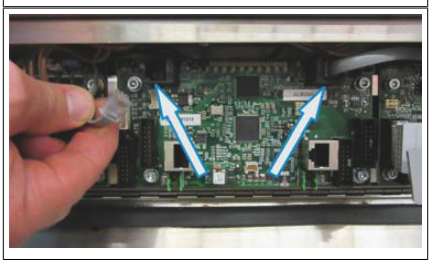
5. As required, unplug one (1) or two (2) motor network connection cables.



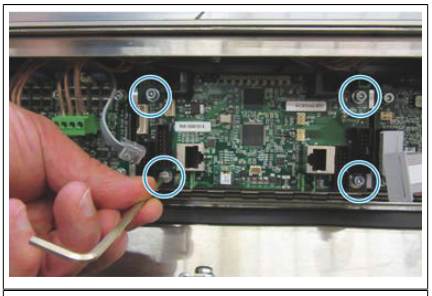
6. Unplug the four (4) ribbon cables.



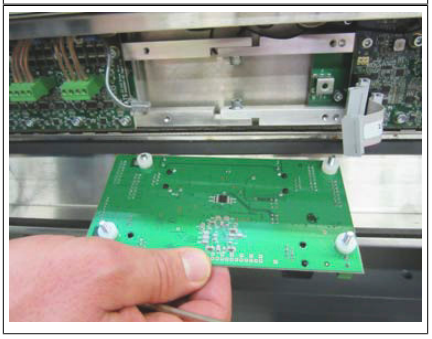
7. Disconnect the two (2) encoder cables (right and left).



8. Loosen, do not remove, all four (4) connection screws.



9. Remove the gateway board. As illustrated, verify that three (3) white plastic spacers are connected to each screw.



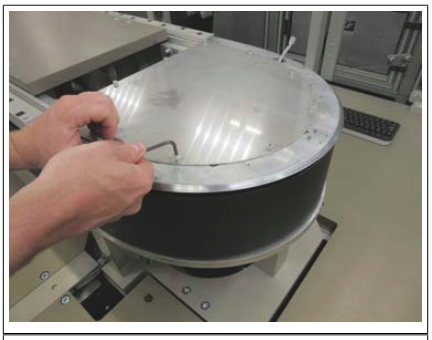
10. If the gateway board is being returned for repair, remove the hardware (screws, washers, and spacers), and make sure the gateway board is packaged in an ESD safe bag.

8.1.2.2 Remove a Gateway Board - Curved Segment (500 mm)

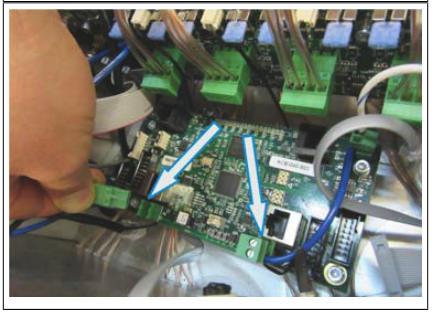
Information:

To prevent electrical board damage from electrostatic discharge (ESD), use an ESD wrist strap when working with the gateway board. An ESD wrist strap prevents the buildup of static electricity.

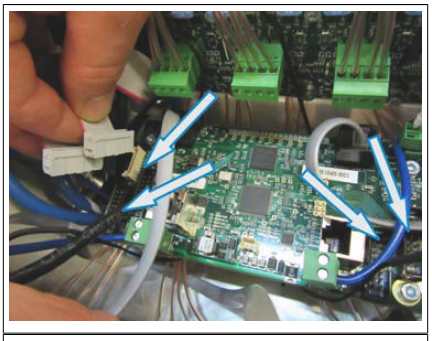
1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. Remove ten (10) screws and ten (10) washers from the curved top cover, and then lift and remove the curved top cover.



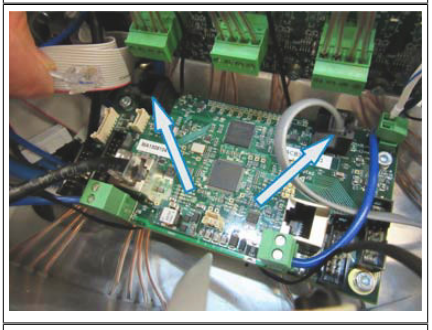
4. Disconnect the two (2) 24 V digital power connections.



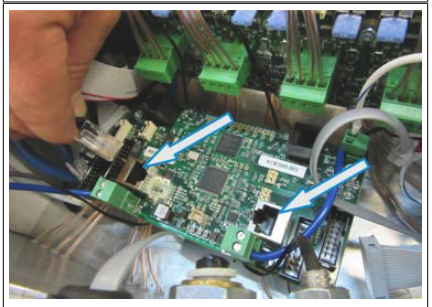
5. Unplug the four (4) ribbon cables.



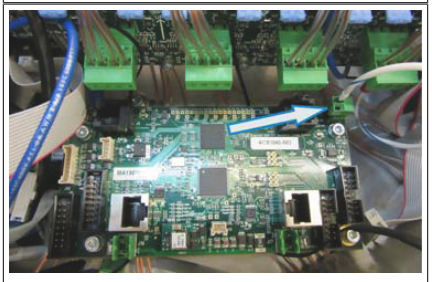
6. Unplug the two (2) encoder cables (right and left).



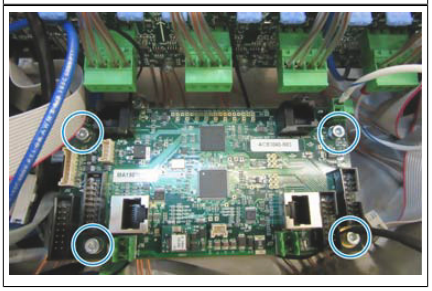
7. As required, unplug one (1) or two (2) motor network connection cables.



8. Disconnect the ground wire.



9. Remove the four (4) connection screws.



10. Remove the gateway board.
11. If the gateway board is being returned for repair, remove the hardware (screws, washers, and spacers), and make sure the gateway board is packaged in an ESD safe bag.

8.1.2.3 Install a Gateway Board - Straight Segment or Curved Segment (800 mm)

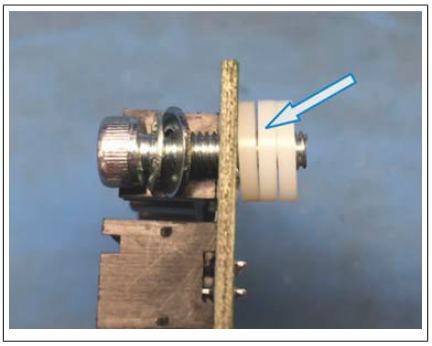
Information:

To prevent electrical board damage from electrostatic discharge (ESD), use an ESD wrist strap when working with the gateway board. An ESD wrist strap prevents the buildup of static electricity.

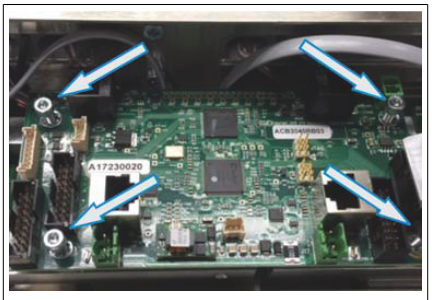
If required, reference 4.2.2.5 "Gateway Board" on page 32.

1. Remove the old gateway board.
   See 8.1.2.1 "Remove a Gateway Board - Straight Segment or Curved Segment (800 mm)" on page 102.

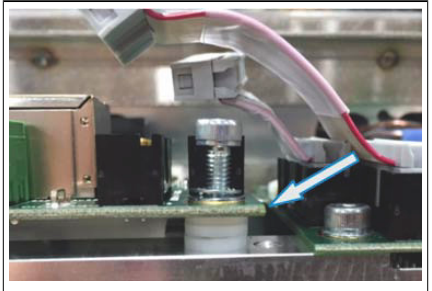
2. Preassemble the gateway board:
   a) Install a toothed washer on each of the four (4) screws.
   b) Install flat washer on each of the four (4) screws.
   c) Insert each of the four (4) screws through the gateway board.
   d) Install three (3) white plastic spacers on the end of each of the four (4) screws.
      Make sure the spacers are within a thread or two of the end of the screw.



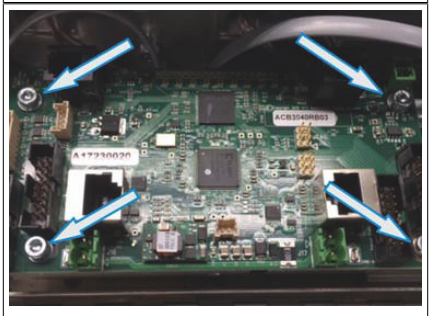
3. Align the screws in the gateway board with the threaded holes inside the straight segment.



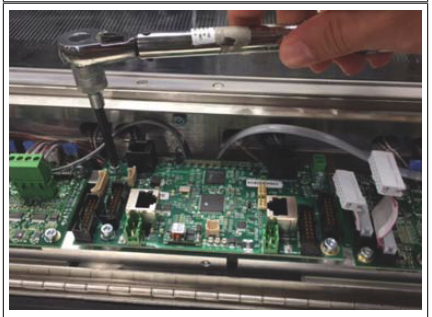
4. On each of the four (4) corners of the gateway board, verify that the gateway board sits flat on the white plastic spacers.



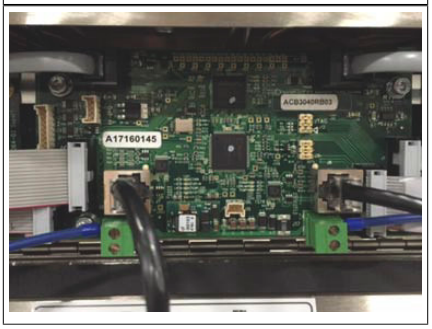
5. Secure the gateway board in position with four (4) screws. To prevent distortion of the gateway board, tighten one (1) screw at a time, working around the board in a clockwise direction.
   Depending on how the screws and white spacers bind, it may be necessary to tighten each screw a thread at a time.



6. Torque each of the four (4) screws to 18 lb-in (2 Nm).



7. Reconnect the cables to the gateway board:
   a) Connect the two (2) encoder cables (right and left).
   b) Connect the four (4) ribbon cables.
   c) As required, connect one (1) or two (2) motor network connection cables.
   d) Connect the two (2) 24 V digital power connections.



8. Close the electrical door, and then lock the five (5) locks with a flat head screwdriver.

8.1.2.4 Install a Gateway Board - Curved Segment (500 mm)

> **Information:**
>
> **To prevent electrical board damage from electrostatic discharge (ESD), use an ESD wrist strap when working with the gateway board. An ESD wrist strap prevents the buildup of static electricity.**

If required, reference 4.2.2.5 "Gateway Board" on page 32.

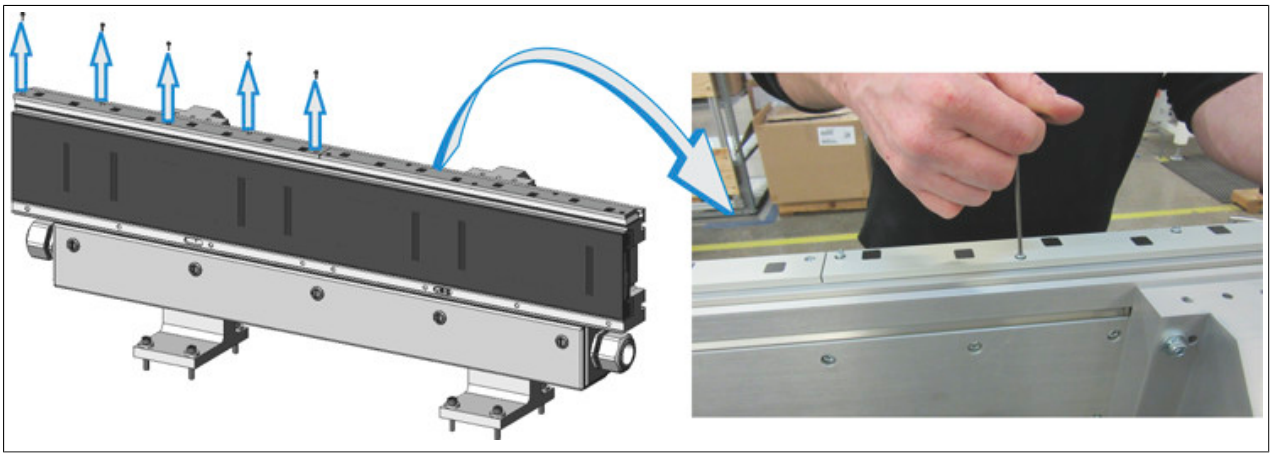
1. Remove the old gateway board.
   See 8.1.2.2 "Remove a Gateway Board - Curved Segment (500 mm)" on page 103.
2. Verify that the gateway board does not contain any white plastic spacers, and then align the gateway board with the screw holes inside the curved segment.
3. Secure the gateway board in position with four (4) screws.
4. Connect the ground wire.
5. As required, connect one (1) or two (2) motor network connection cables.
6. Connect the two (2) encoder cables (right and left).
7. Connect the four (4) ribbon cables.
8. Connect the two (2) 24V digital power connections.
9. Align the curved top cover in position.
10. Install ten (10) screws and ten (10) washers to secure the curved top cover in position.

8.1.3 Replace an Encoder Bracket

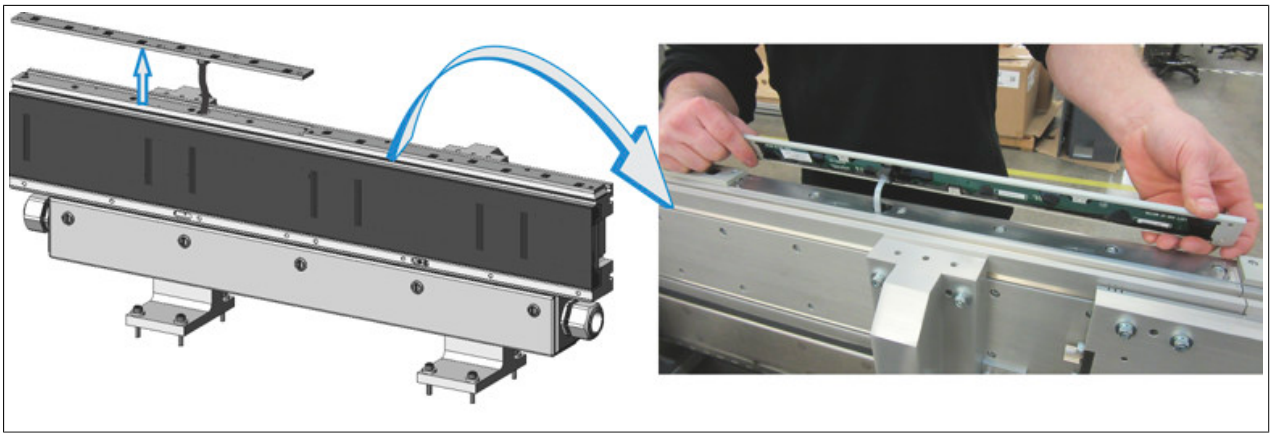
There are two (2) encoder brackets on each straight segment and on each curved segment. Replace the encoder bracket if a SuperTrak transport system fault indicates that replacement is required.

8.1.3.1 Remove an Encoder Bracket - Straight Segment

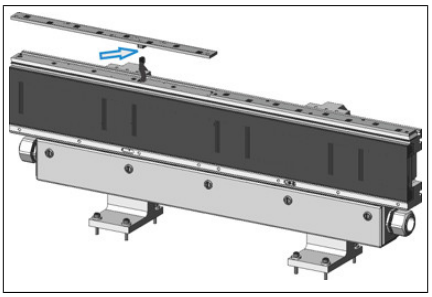
1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5.2 "Lockout and Tagout Locations" on page 22.
3. Remove the five (5) encoder bracket screw caps.
4. Remove the five (5) encoder bracket screws.



5. Lift the encoder bracket straight up, off the two locating dowels.



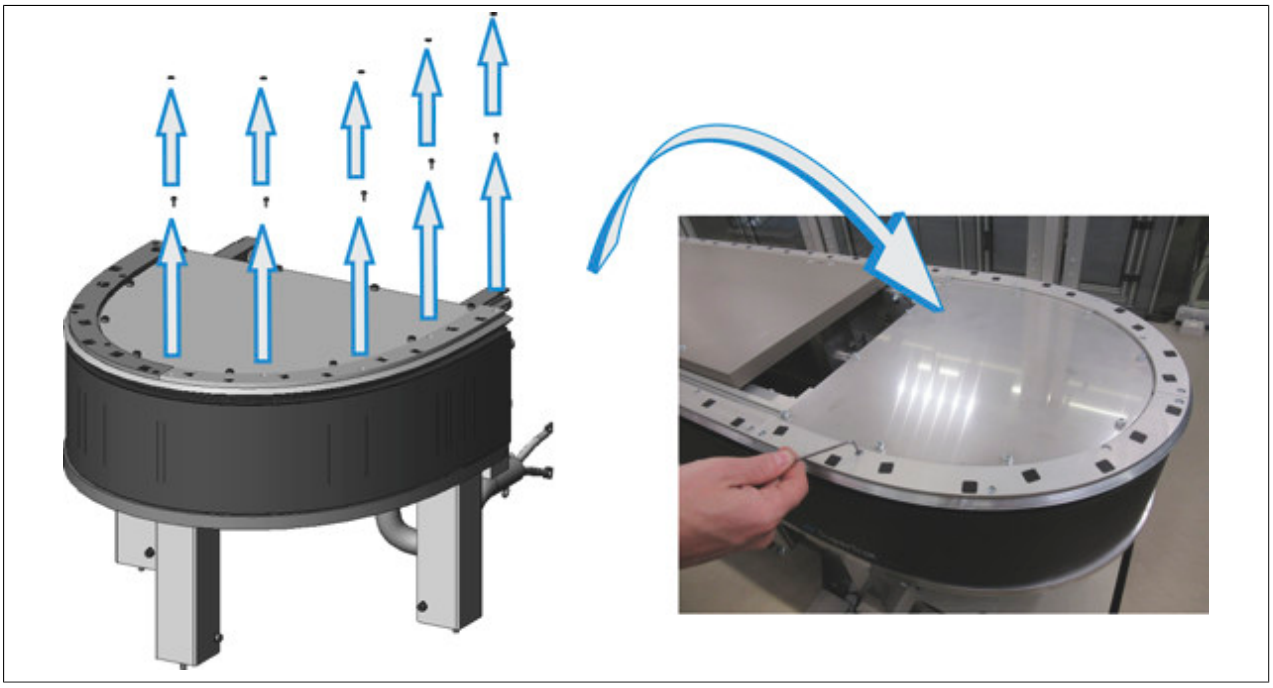
6. Disconnect the RJ11 plug from the encoder bracket connection.



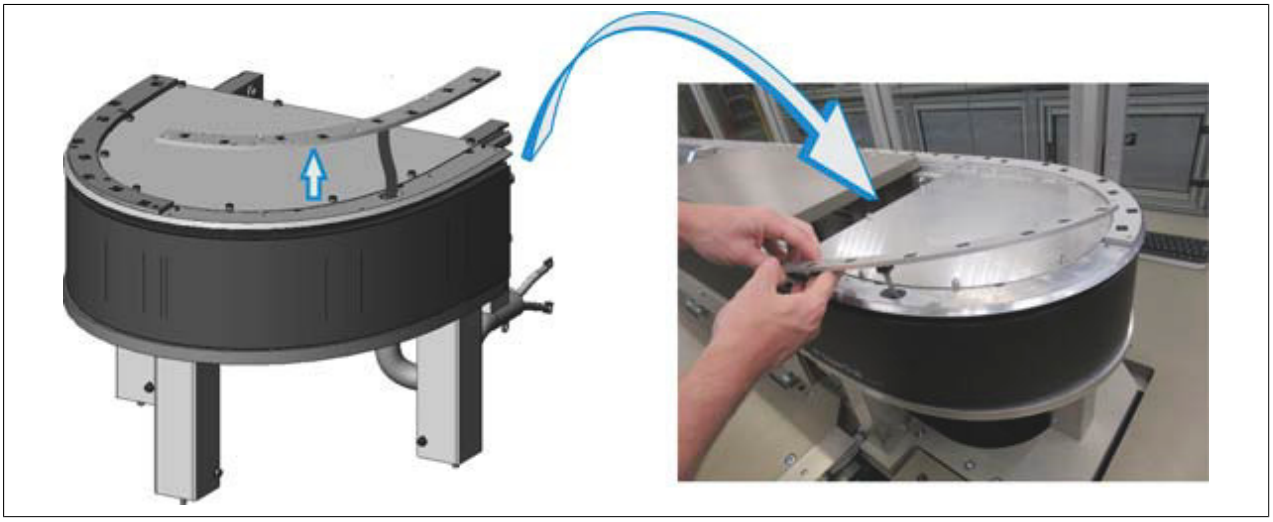
8.1.3.2 Remove an Encoder Bracket - Curved Segment

1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5.2 "Lockout and Tagout Locations" on page 22.
3. Remove the five (5) encoder bracket screw caps.

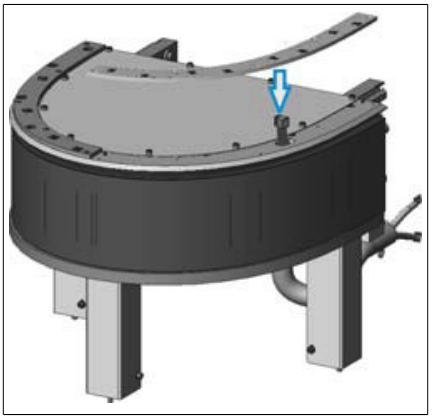
4. Remove the five (5) encoder bracket screws.



5. Lift the encoder bracket straight up, off the two locating dowels.



6. Disconnect the RJ11 plug from the encoder bracket connection..



8.1.3.3 Install an Encoder Bracket - Straight Segment

Power to the controller and gateways should OFF while installing encoders, and then turned ON before calibration.

1. If required, remove the old encoder bracket.
   8.1.3.1 "Remove an Encoder Bracket - Straight Segment " on page 107.
2. Connect the RJ11 plug to the new encoder bracket connection.

3. Align the encoder bracket with the locating dowels.
4. To prevent damage to the RJ11 connection, make sure it is aligned with the RJ11 opening.
5. Press the encoder bracket firmly down onto the locating dowels.
6. Secure the encoder bracket in position with five (5) screws.
7. Install an encoder bracket screw cap over each of the five (5) screws.
8. Remove locks and tags.
9. Turn the SuperTrak transport system power supply ON.
10. Calibrate the motor with the new encoder bracket.
    See the TrackMaster built-in help for the calibration procedure.
11. If the straight segment has a shuttle setup stationary mount installed, reference the encoder positions.
    See 8.2.16.5 "Reference the Encoder Position" on page 164.

8.1.3.4 Install an Encoder Bracket - Curved Segment

1. If required, remove the old encoder bracket.
   See 8.1.3.2 "Remove an Encoder Bracket - Curved Segment " on page 107.
2. Install the new encoder bracket. This procedure is the same as the straight segment procedure.
   See 8.1.3.3 "Install an Encoder Bracket - Straight Segment " on page 108.

8.1.4 Replace a Motor Thermistor

Information:

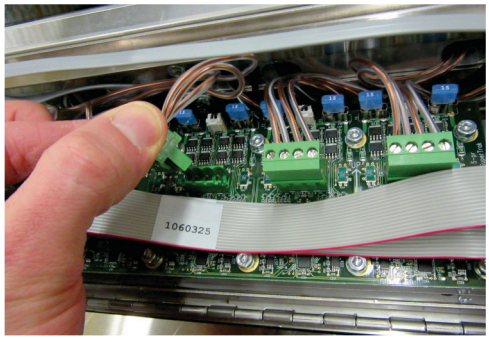
A thermistor replacement fault can be set to ignore in the TrackMaster software. This allows the SuperTrak transport system to continue to run in the immediate term, so that the thermistor can be changed at a convenient time.
See the TrackMaster built-in help for additional information.

Motor thermistors connections are made with the coil driver boards. Replace a motor thermistor if a SuperTrak transport system fault indicates that replacement is required.

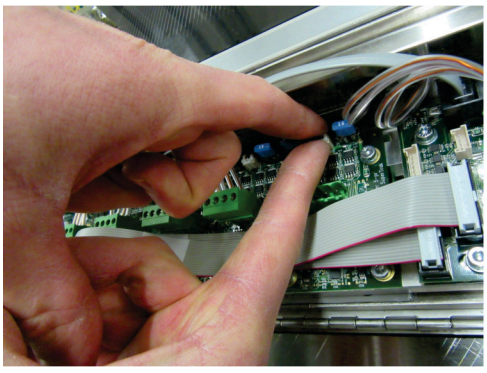
8.1.4.1 Replace a Thermistor - Straight Segment or Curved Segment (800 mm)

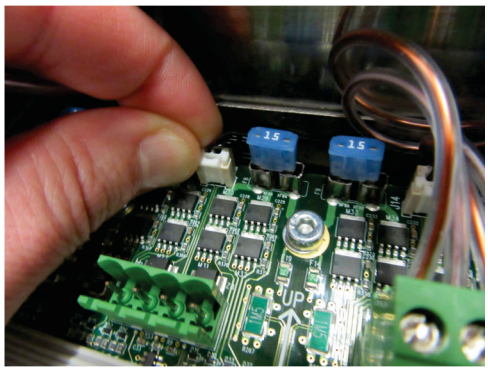
There are ten (10) thermistors in each straight segment: five (5) on the left coil driver board, and five (5) on the right coil driver board.

1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. Open the straight segment electrical door.
4. If access to the motor thermistor connection is blocked, disconnect the applicable coil connection.

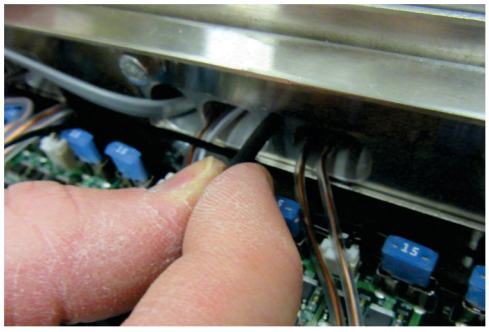


5. Unplug the thermistor connector from the coil driver board. To unplug the thermistor connector, use the index finger from each hand (left image), or your thumb and index finger (right image).

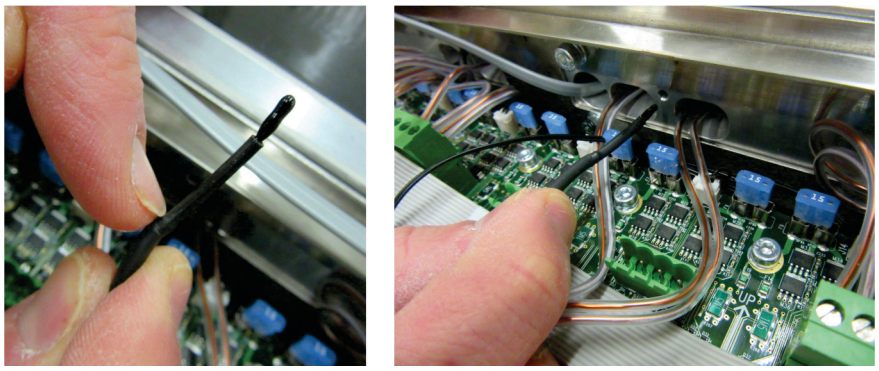




6. Pull the old thermistor wire straight out from the thermistor hole.



7. Slide the end of the new thermistor wire into the thermistor hole until you feel resistance. The thermistor tapers. During installation, the thick ridge creates a friction fit against the sides of the thermistor hole.

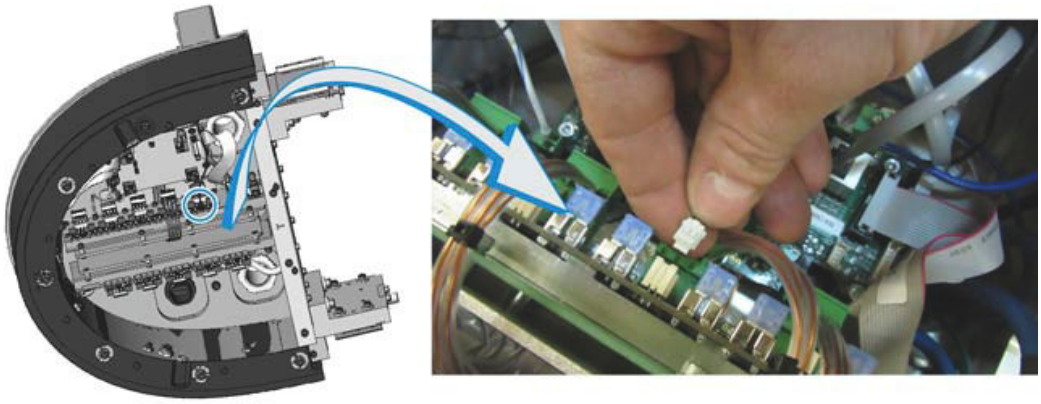


8. Plug the new thermistor connector into the electrical board.
9. Route the thermistor wire under the electrical board.
10. If required, connect any coil connections that were disconnected in step 4.

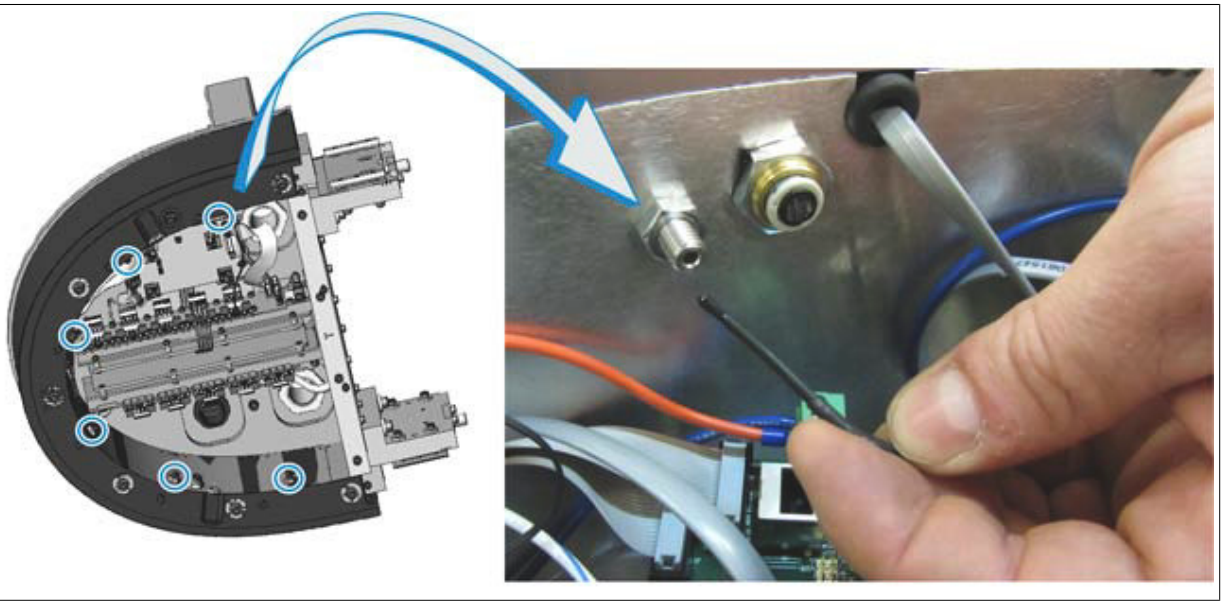
8.1.4.2 Replace a Thermistor - Curved Segment (500 mm)

There are six (6) thermistors in each curved segment.

1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. Remove the curved segment top cover.



4. Unplug the thermistor connector from the coil driver board.
5. Pull the old thermistor wire straight out from the thermistor hole.

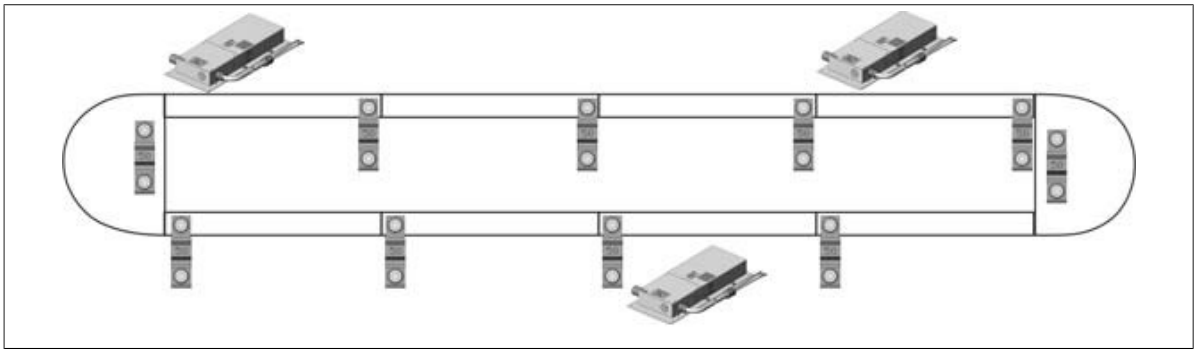


6. Slide the end of the new thermistor wire into the thermistor hole until you feel resistance. The thermistor tapers. During installation, the thick ridge creates a friction fit against the sides of the thermistor hole.
7. Plug the new thermistor connector into the electrical board.
8. Route the thermistor wire under the electrical board.

8.1.5 Install a SuperTrak Transport System Power Supply

Information:

- **Make sure the SuperTrak transport system power supply is wired correctly during installation. Incorrect wiring causes component damage.**
- **The length of the 28 VDC power cable (between the power supply and track segment) must be the same for all power supplies on the same system to obtain the correct voltage and power balancing.**
- **It is recommend to distribute the SuperTrak transport system power supplies as evenly as possible around the SuperTrak transport system. For example:**



If possible, install the SuperTrak transport system power supplies on the segments with the highest performance demands.

Information:

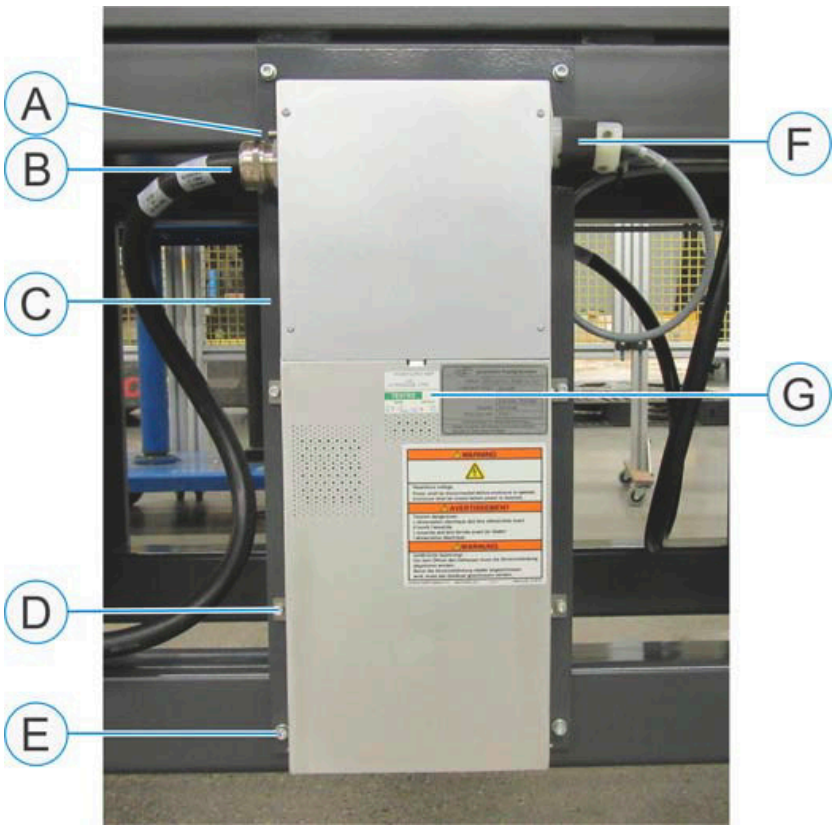
For a wiring overview, see the wiring pin-out overview label located on the electrical door of each straight segment and curved segment during this procedure.

See 3.6.3 "Other Labels" on page 23.

The number of SuperTrak transport system power supplies varies depending on the demands of the specific SuperTrak transport system.

This diagram describes the location of the components that are required to install the SuperTrak transport system power supply.

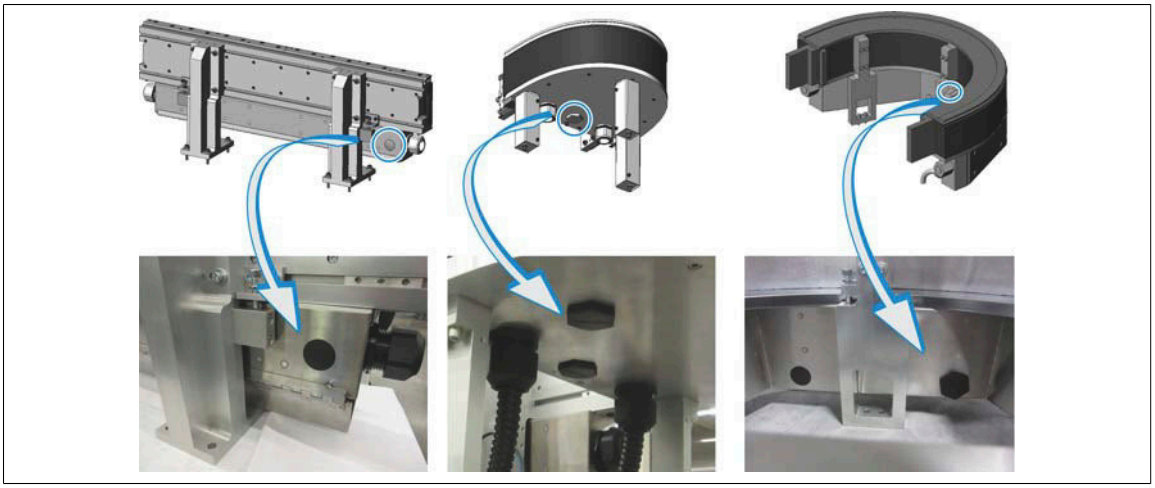
A	Power supply OK signal
B	28 VDC power output location
C	Mounting plate
D	Mounting bracket (1 of 4)
E	Mounting plate screw (1 of 4)
F	AC power input plug
G	Tested label



See 4.2.4 "SuperTrak Transport System Motor Power Supply" on page 38.

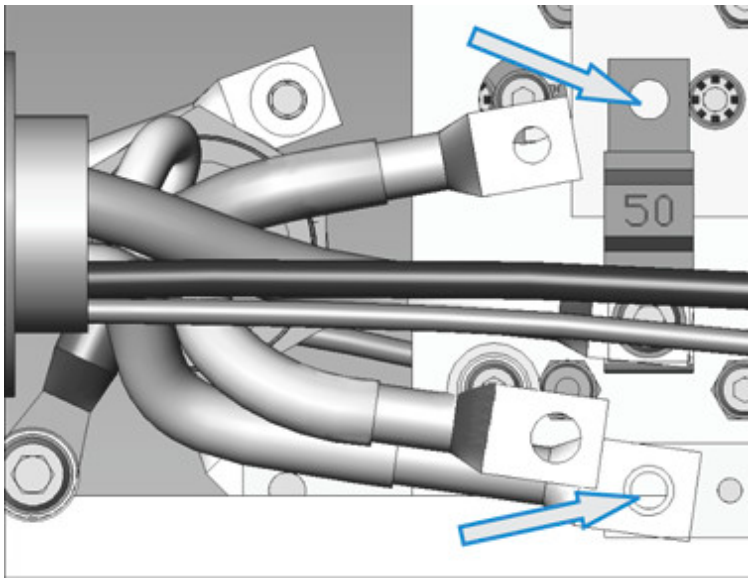
8.1.5.1 Replace or Install a New SuperTrak Transport System Power Supply

1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. If you are installing a new power supply, complete the following:
   a) Determine the SuperTrak transport system power supply installation location.
   b) Drill and tap four (4) holes that align with the mounting plate (not included in the scope of delivery) holes, into the frame.
   c) Secure the mounting plate to the frame with four (4) screws.
   d) As required, remove the black plug from the back of the straight segment or the bottom of the curved segment.

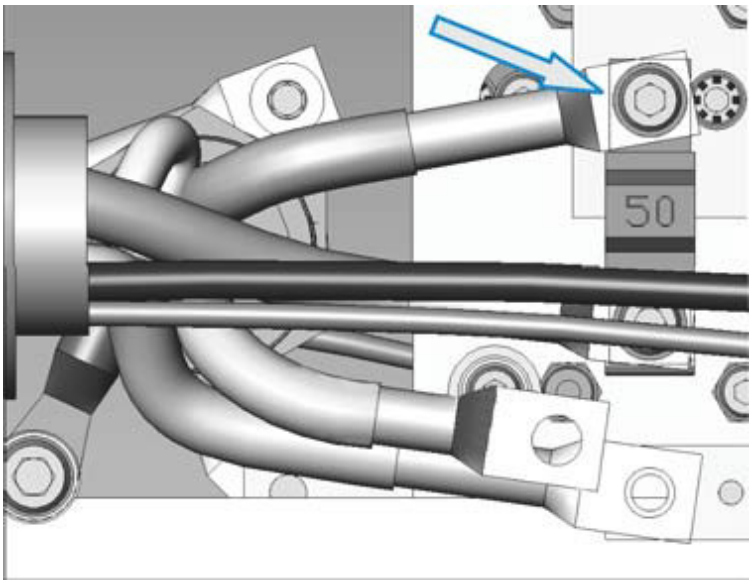


   e) Proceed to step 5.
4. If you are replacing an existing power supply:
   a) Remove the four (4) screws that secure it to the mounting plate.
   b) Disconnect the power supply wire connections from the SuperTrak Transport System (not from the power supply).
5. Secure the new SuperTrak transport system power supply to the mounting plate one (1) screw in each of the four (4) mounting brackets.
6. As required, complete one (1) of the following to access the left coil driver board:
   - Open the electrical door at the base of the straight segment.
   - Remove the curved segment top cover. It may also be helpful to remove the panel on the back of the curved segment.
7. Feed the 28 VDC power output cable through the plug opening (step 3d) and then tighten the connection.

8. Connect the SuperTrak power supply cables to the left coil driver board:
    a) Remove the screw from the top of the 50 A fuse, and the screw from the common connection wire.

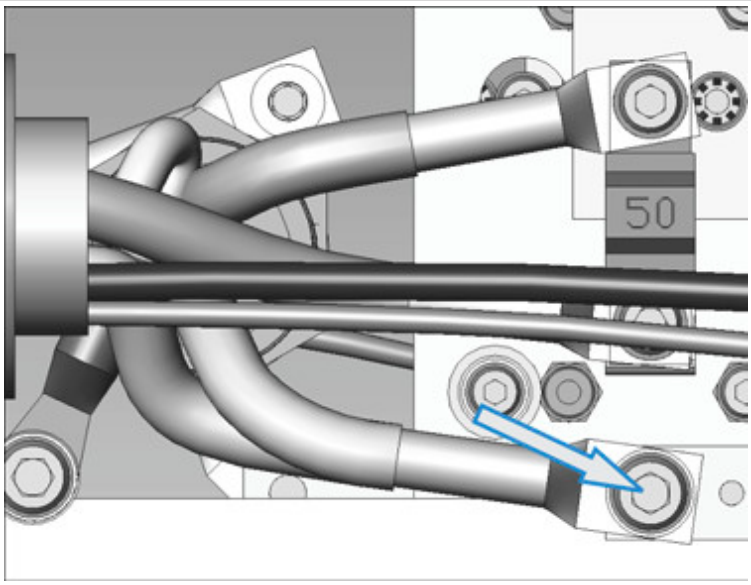


    b) Align the positive (+) 28 VDC motor power wire of the SuperTrak transport system power supply with the top of the 50 A fuse.
    c) Secure the wire and fuse in position with a lock nut, washer, and screw.

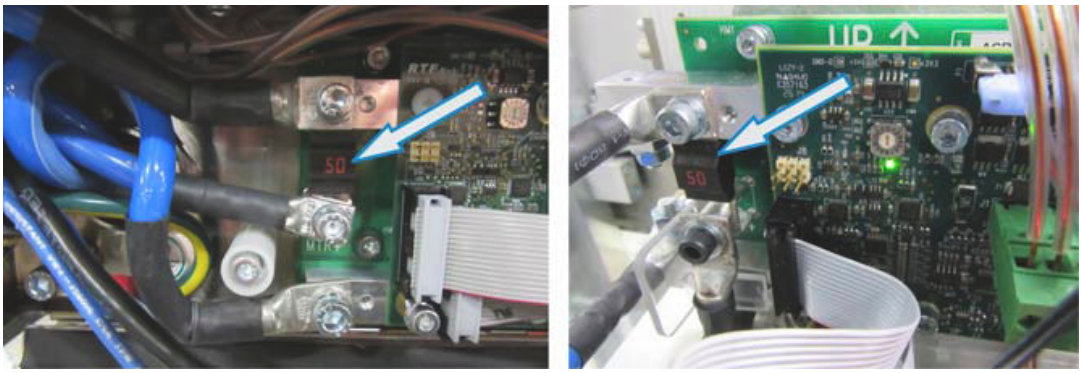


d) Align the negative (-) common wire from the left electrical interconnect, and the negative (-) common wire of the SuperTrak transport system power supply with the common connection.
These two (2) wires both have a white stripe on them.

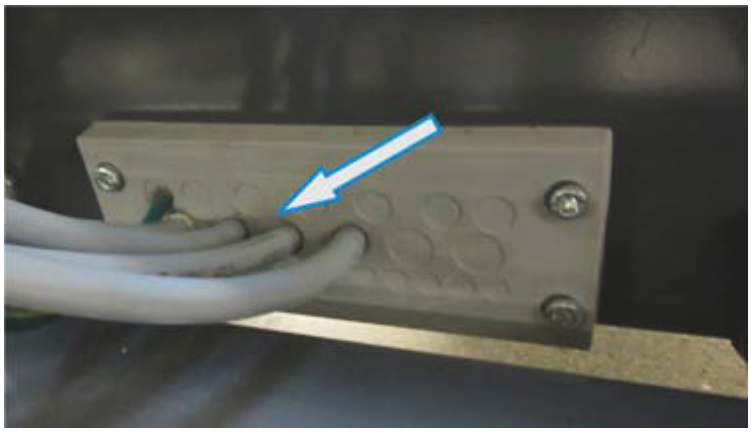
e) Repeat step 8c.



f) Verify that the wiring is the same as the 4.2.2.4 "Left Coil Driver Board with a Power Supply Connected" on page 31.



9. Feed the AC power input cable to a control panel, e.g.:



8.1.6 Replace the Main Motor Fuse

A 50 A fuse is installed on the left coil driver board when a power supply is installed for the motor. The 50 A fuse bridges the two (2) 28 V motor power connections. Fuse replacement may be required if a low motor voltage fault displays.

1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. Access the left coil driver board:
   - Open the electrical door at the base of the straight segment, or
   - Remove the curved segment top cover.
4. Remove a screw from each of the two (2) 28 V motor power connections.

5. Remove the 50 A fuse.
6. Align a new 50 A fuse with the two (2) 28 V motor power connections.

7. Install a screw through each of the two (2) 28 V motor power connections and into the 50 A fuse. Make sure each screw has a washer and lock nut as illustrated.

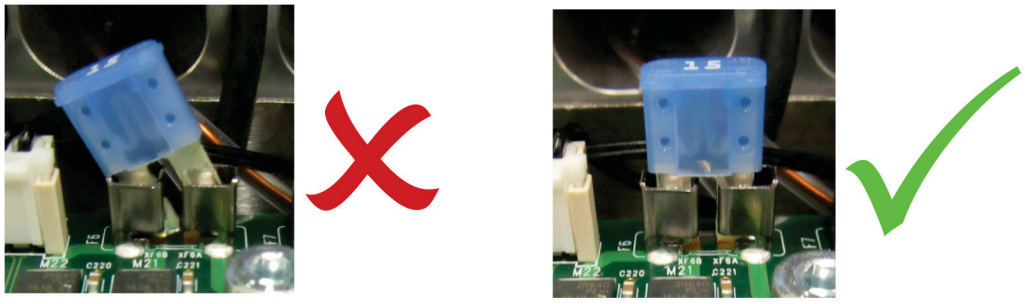
8.1.7 Replace a Coil Fuse

Information:

It is possible for the SuperTrak transport system to operate when a coil fuse is blown, however, the shuttle stop control is affected.

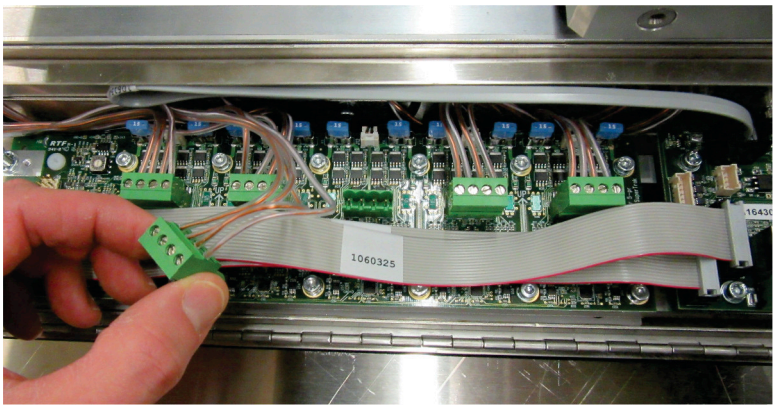
Each coil driver board has ten (10) 15 A fuses; there is a dedicated fuse for each coil. If a SuperTrak transport system fault indicates that fuse replacement is required, remove the fuse and test it. If the fuse is blown, replace it. If the fuse is not blown, verify that the fuse is seated correctly.

The images below indicate correct and incorrect fuse installation.

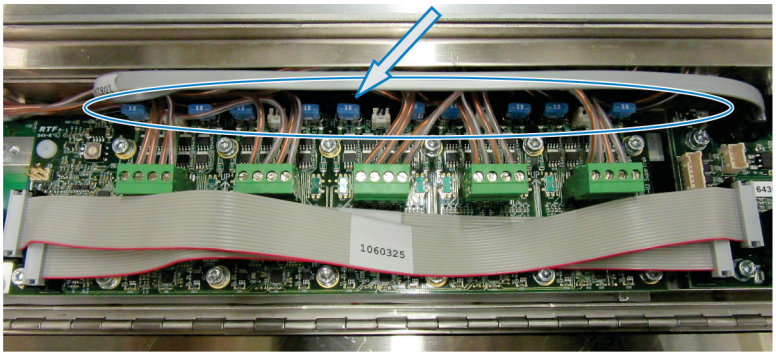


8.1.7.1 Replace a Coil Fuse - Straight Segment or Curved Segment (800 mm)

1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. Open the electrical door at the base of the straight segment.
4. If access to the fuse is blocked, disconnect the applicable coil connection.



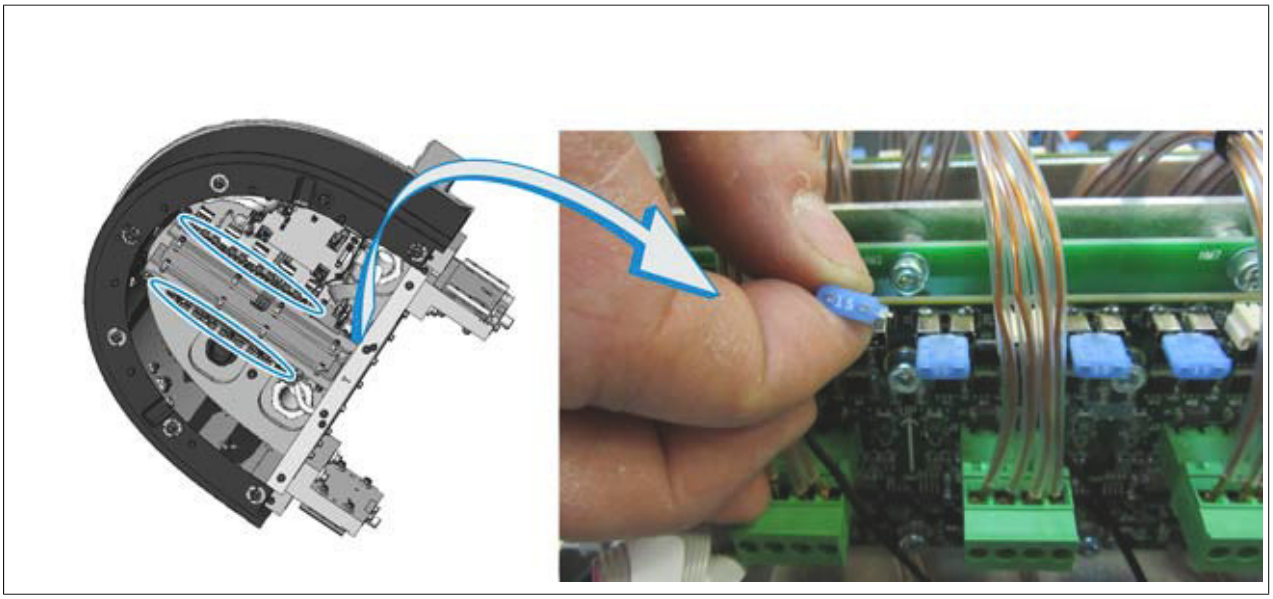
5. Pull the 15 A fuse straight out from the slot.



6. Install a new 15 A fuse straight into the fuse slot.
   Make sure the fuse is centered and seated correctly during installation.
7. If required, connect any coil connections that were disconnected in step 4.

8.1.7.2 Replace a Coil Fuse - Curved Segment (500 mm)

1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. Remove the curved segment top cover.
4. Pull the 15 A fuse straight out from the slot.



5. Install a new 15 A fuse straight into the fuse slot.
   Make sure the fuse is centered and seated correctly during installation.

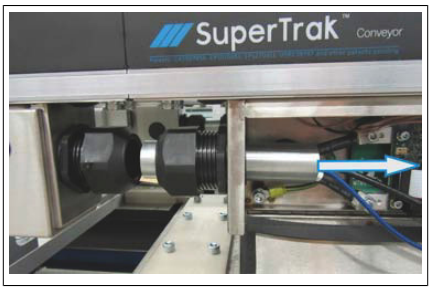
8.1.8 Install an Electrical Interconnect

> **Information:**
>
> **For a wiring overview, see the wiring pin-out overview label located on the electrical door of each straight segment and curved segment during this procedure.**
>
> **See 3.6.3 "Other Labels" on page 23.**

Use this procedure to install electrical interconnects during initial system installation, replace an existing electrical interconnect, or access wires within an electrical interconnect.

8.1.8.1 Remove an Electrical Interconnect - Straight Segment

1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. Open the electrical door of the two (2) adjacent straight segments.
4. Disconnect and remove all wires that run through the metal conduit.
5. Loosen the strain relief connectors on the side of the two (2) adjacent straight segments.
6. Slide the metal conduit out through the cable access hole.
   Slide the metal conduit to the right, so it exits through the left side of the electrical panel.

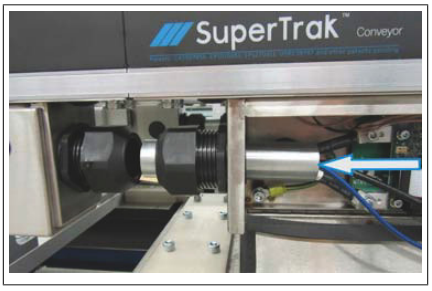


8.1.8.2 Remove an Electrical Interconnect - Curved Segment

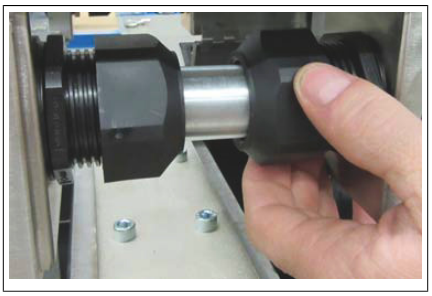
1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. Remove ten (10) screws and ten (10) washers from the curved top cover, and then lift and remove the curved top cover.
4. Open the electrical door of the adjacent straight segment. Use a flat head screwdriver to unlock the five (5) locks, and then open the electrical door.
5. Disconnect and remove all wires that run through the flexible conduit.
6. Loosen the strain relief connector on bottom of the curved segment and on the adjacent straight segement.
7. Remove the flexible conduit.

8.1.8.3 Install an Electrical Interconnect Between Two Straight Segments

1. If required, remove the existing electrical interconnect.
   See 8.1.8.1 "Remove an Electrical Interconnect - Straight Segment" on page 120.
2. Slide the metal conduit in through the cable access hole and the two (2) strain relief connectors.
   Always start the metal conduit from left side of the straight segment electrical panel.



3. With the metal conduit flush with the strain relief connectors, tighten the two (2) strain relief connectors.



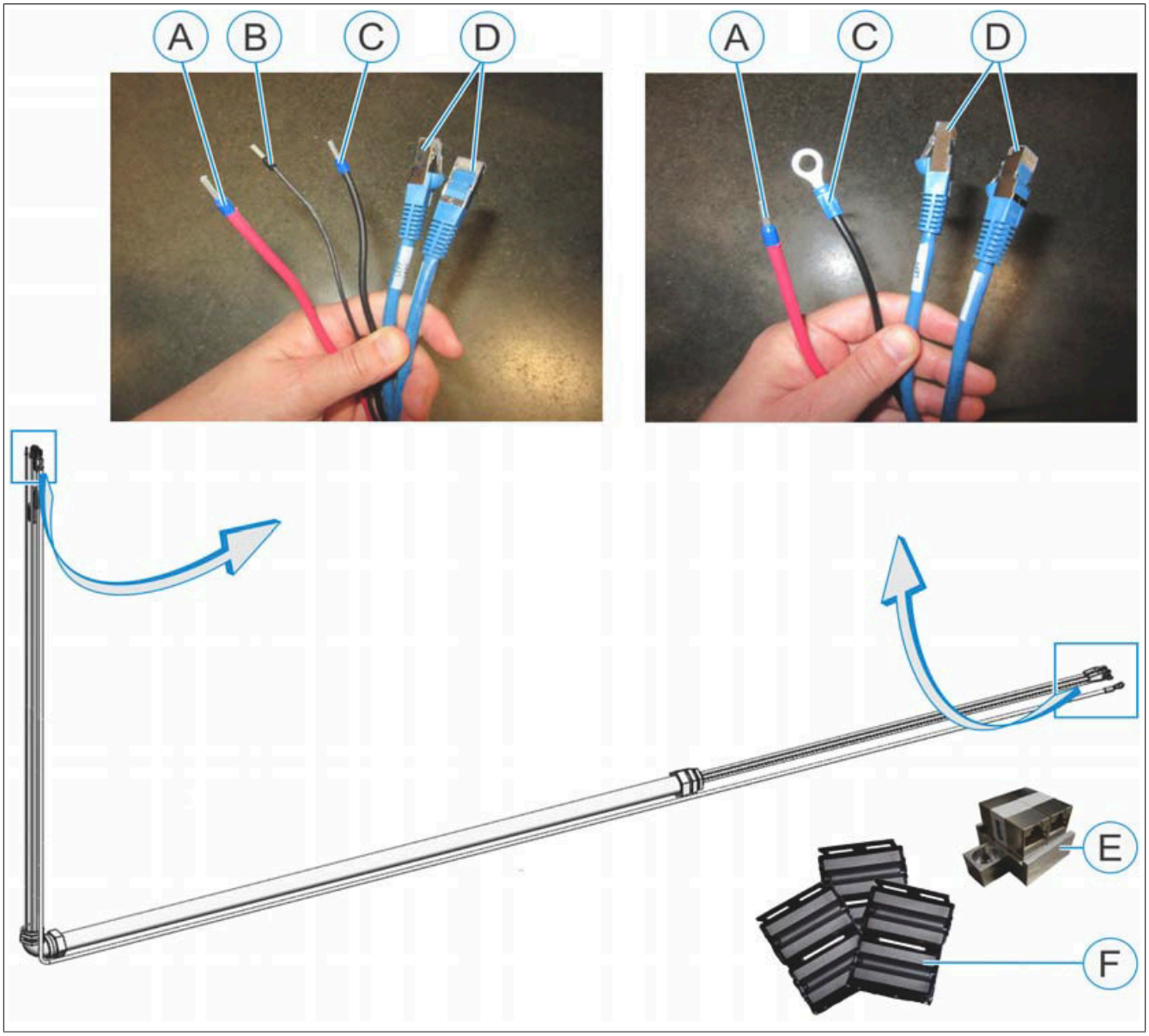
4. Feed the required wiring through the metal conduit and connect as required.
   For connection information see 4.2.2.3 "Left Coil Driver Board" on page 30, 4.2.2.5 "Gateway Board" on page 32 and 4.2.2.6 "Right Coil Driver Board" on page 32.

8.1.8.4 Install an Electrical Interconnect Between a Straight Segment and a Curved Segment

1. If required, remove the existing electrical interconnect.
   See 8.1.8.2 "Remove an Electrical Interconnect - Curved Segment" on page 120.
2. Carefully bend the flexible conduit, so that one end is in the straight segment strain relief connectors and the other end is in the curved segment strain relief connectors.
3. Tighten the two (2) strain relief connectors.
4. Feed the required wiring through the metal conduit and connect as required.
   For connection information see 4.2.2.3 "Left Coil Driver Board" on page 30, 4.2.2.5 "Gateway Board" on page 32, 4.2.2.6 "Right Coil Driver Board" on page 32, Curved Segment, 500 mm and Curved segment, 800 mm.

8.1.8.5 Install an Electrical Interconnect Between a Curved Segment and a SuperTrak Control Panel

The electrical interconnect has four (4) wires on one end and five (5) wires on the other, it also includes a left network patch cable (not shown), an F-F coupler, and three (3) ferrites.

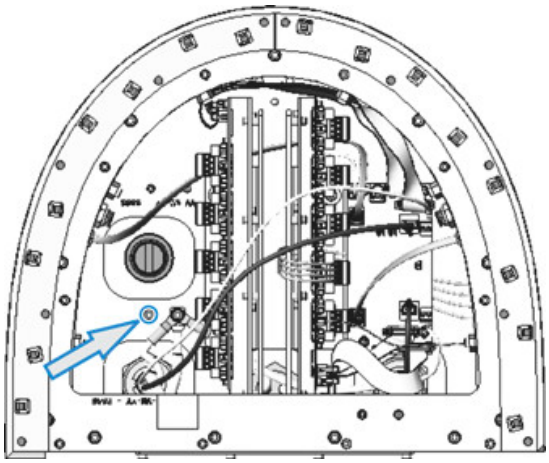
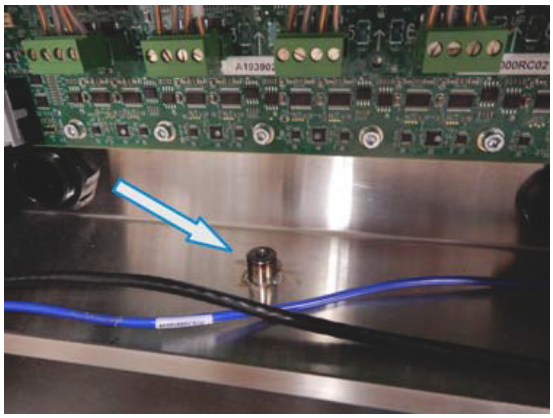


A	24 VDC digital power (red or blue)	**D**	Ethernet cables - left and right network cables (blue)
B	Digital shield cable (black)	**E**	F-F coupler
C	Common connection (black or white with blue stripe)	**F**	Ferrite (1 of 3)

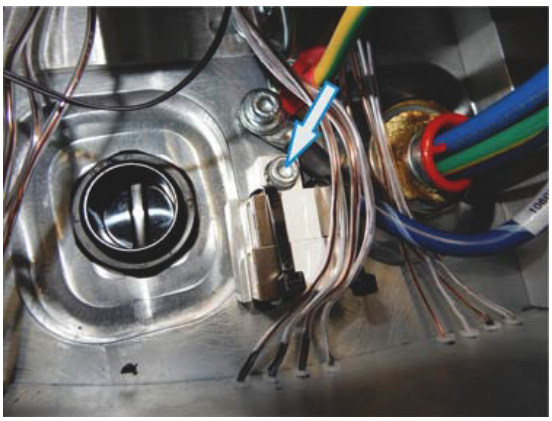
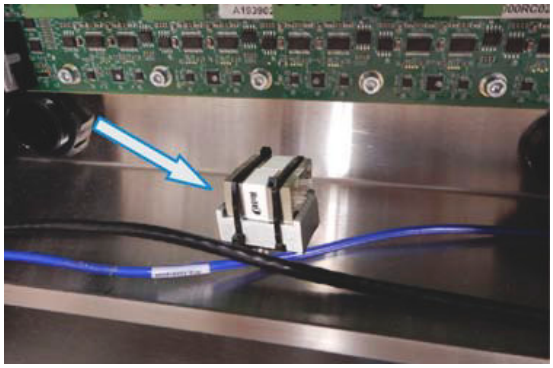
The procedure begins with connecting the end with four (4) wires to the curved segment.

1. Install the F-F coupler:

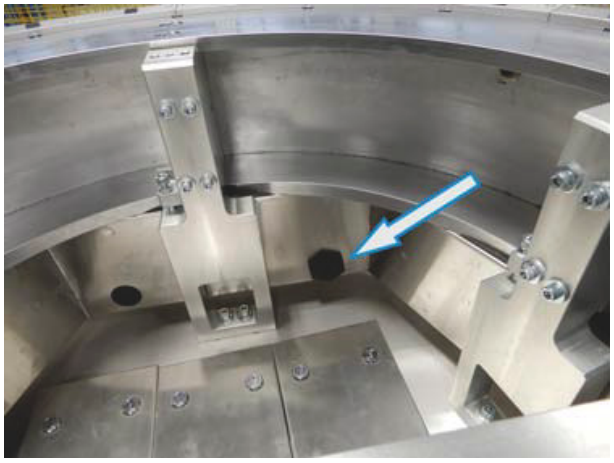
   a) As applicable, align the coupler with the mounting screw hole. Carefully lift the wires, so the F-F coupler fits below them:

500 mm curved segment	800 mm curved segment
Remove the top cover to access the mounting location. 	Remove the center electrical panel to access the mounting location. 

   b) As applicable, secure the F-F coupler in position using a screw:

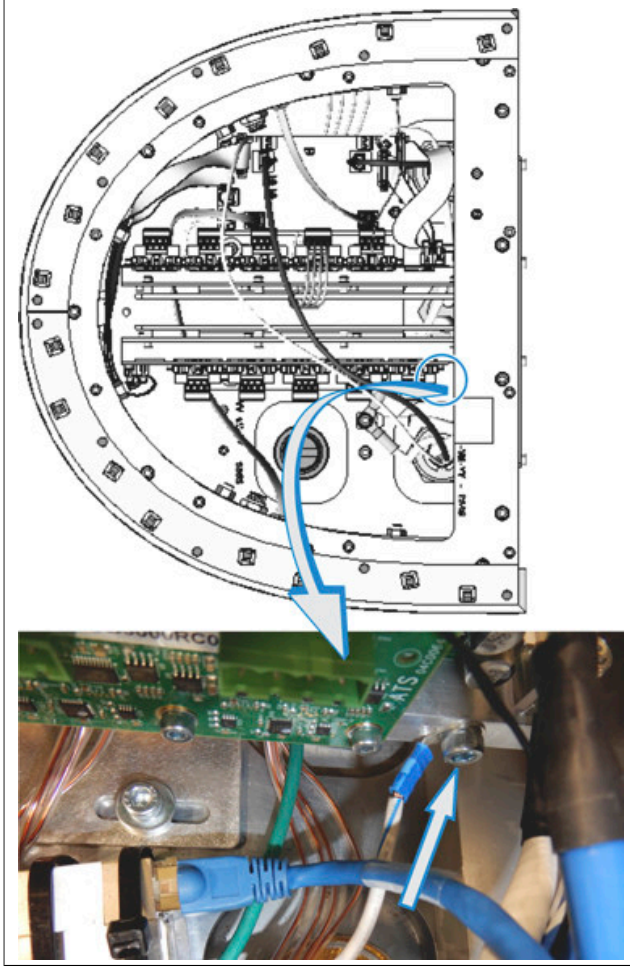
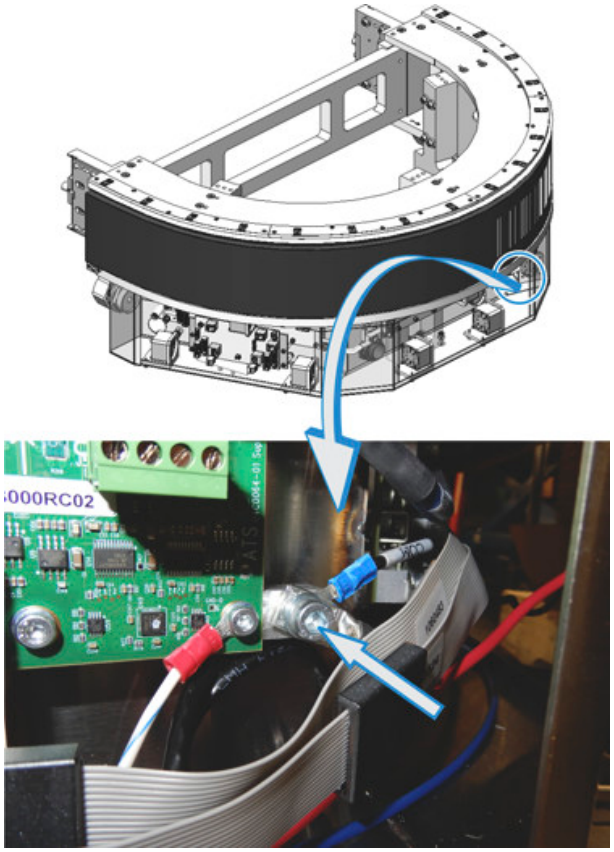
500 mm curved segment	800 mm curved segment
The F-F coupler installation is as shown. 	The F-F coupler installation is as shown. 

2. As applicable, remove the black wire plug from the curved segment:

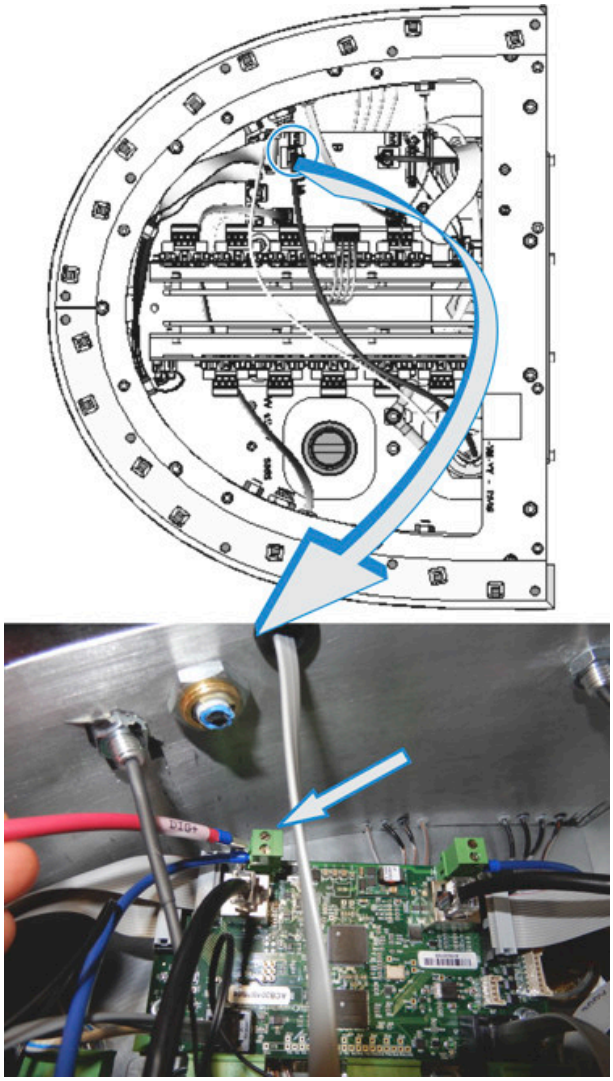
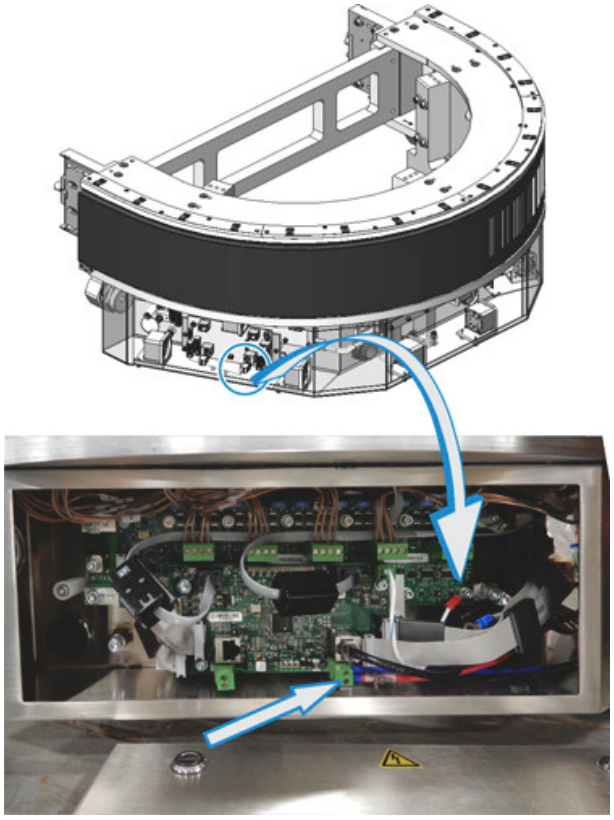
500 mm curved segment	800 mm curved segment
The wire plug is located at the bottom. 	The wire plug is located on the back (inside). 

3. Feed the four (4) cables of the interconnect cable through the plug opening on the curved segment.
4. Secure the threaded end of the interconnect cable in the plug opening of the curved segment using the supplied lock nut.

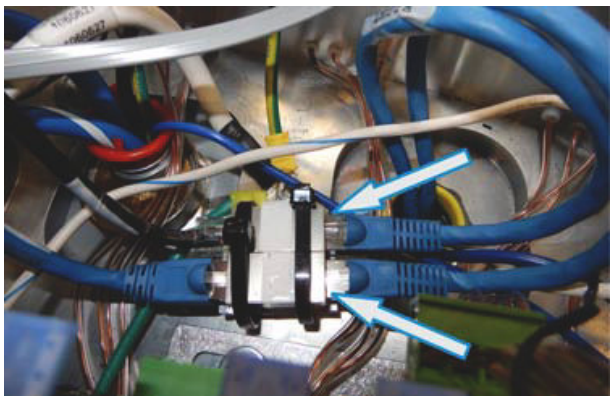
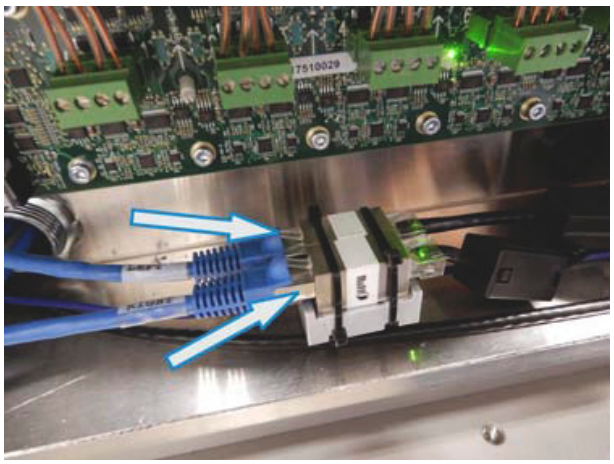
5. As applicable, connect the common connection wire (COM) to the curved segment. Remove the mounting screw, align the common connection wire with the screw hole, and then reinstall the mounting screw:

500 mm curved segment	800 mm curved segment
The connection is located near the bottom-right corner of the right coil driver board. 	The connection is located near the bottom-right corner of the right coil driver board that is in the center electrical panel. 

6. As applicable, connect the 24 VDC digital power wire (DIG+) to the J17 connector on the gateway board of the curved segment:

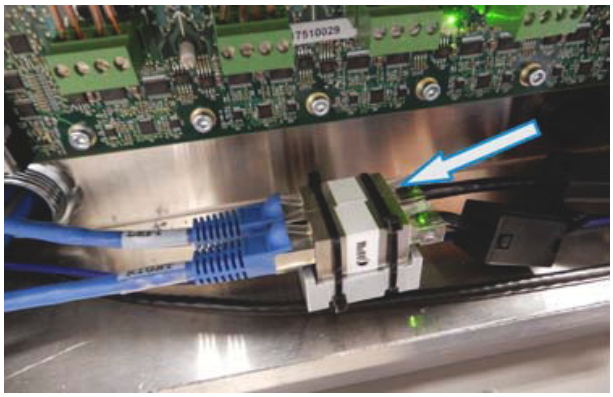
500 mm curved segment	800 mm curved segment
The connection is located on the gateway board inside the segment. 	The connection is located on the gateway board in the left electrical panel. 

7. As applicable, connect the two (2) Ethernet cables (left and right network cables) to the F-F coupler:

500 mm curved segment	800 mm curved segment
Connect the cables on the right side of the F-F coupler. 	Connect the cables to the left side of the F-F coupler. 

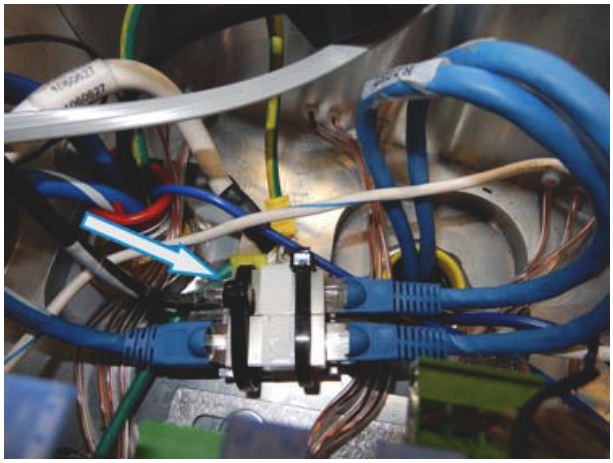
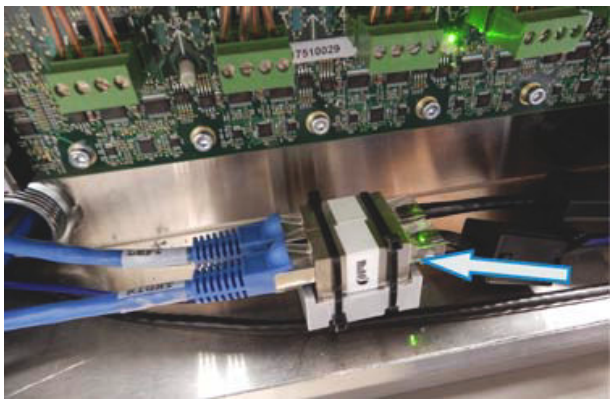
8. Install a ferrite onto the left network patch cable. Make sure the ferrite is within 10 cm (4 in.) of the connector.

9. As applicable, connect the left network patch cable to the F-F coupler:

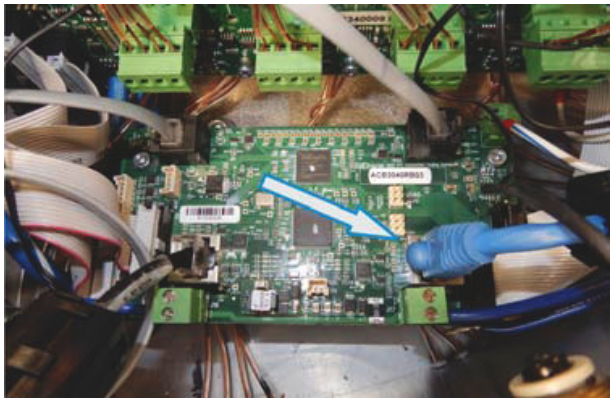
500 mm curved segment	800 mm curved segment
Connect the cable opposite from the left network cable. 	Connect the cable opposite from the left network cable. 

10. Verify that a ferrite exists on the end of each gateway network cable entering the curved segment from the adjoining straight segment. Make sure each ferrite is within 10 cm (4 in.) of the connector.

11. As applicable, connect the gateway network cable from the adjoining straight segment on the right to the F-F coupler:

500 mm curved segment	800 mm curved segment
Connect the cable opposite from the right network cable. 	Connect the cable opposite from the right network cable. 

12. As applicable, connect the other end of the left network patch cable:

500 mm curved segment	800 mm curved segment
Connect the cable to the gateway board within the 500 mm curved segment. 	Connect the cable to the gateway board in the right electrical enclosure within the 800 mm curved segment. 

13. Feed the five (5) cables of the interconnect cable through the plug opening at the back of the SuperTrak control panel.
14. Secure the end of the interconnect cable in the opening of the control panel using the supplied lock nut.
15. Install a ferrite on the end of the left and right network cables. Make sure each ferrite is within 10 cm (4 in.) of the connector.
16. Connect the other end of the left and right network cables to the controller in the SuperTrak control panel. See 6.3.3.1 "Left and Right Gateway Networks" on page 82.

8.2 Mechanical Procedures

Danger!

Always make sure the safety circuit is open (which turns OFF the SuperTrak transport system motor power) when completing any mechanical procedures.

See 3.4 "Hazardous Energy" on page 19.

Some equipment requires periodic adjustment to re-establish the accuracy and desired output of the SuperTrak transport system. B&R recommends replacing defective devices rather than repairing them. Only qualified technicians should perform maintenance tasks.

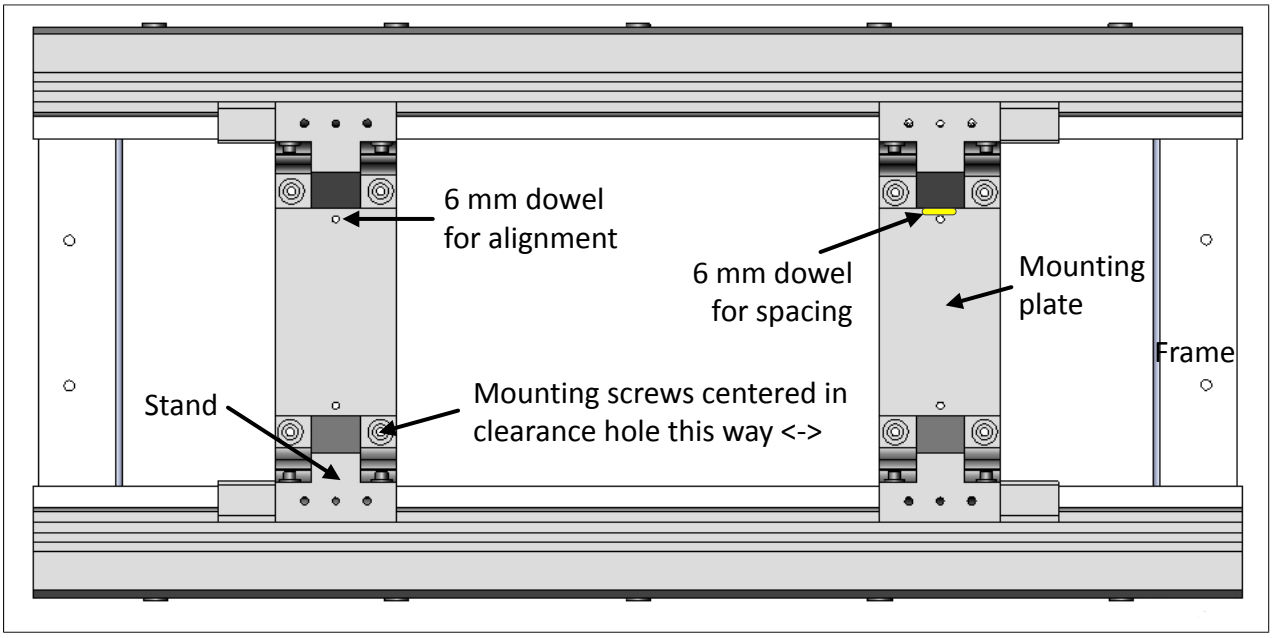
8.2.1 Motor Alignment - SuperTrak Transport System

8.2.1.1 Introduction

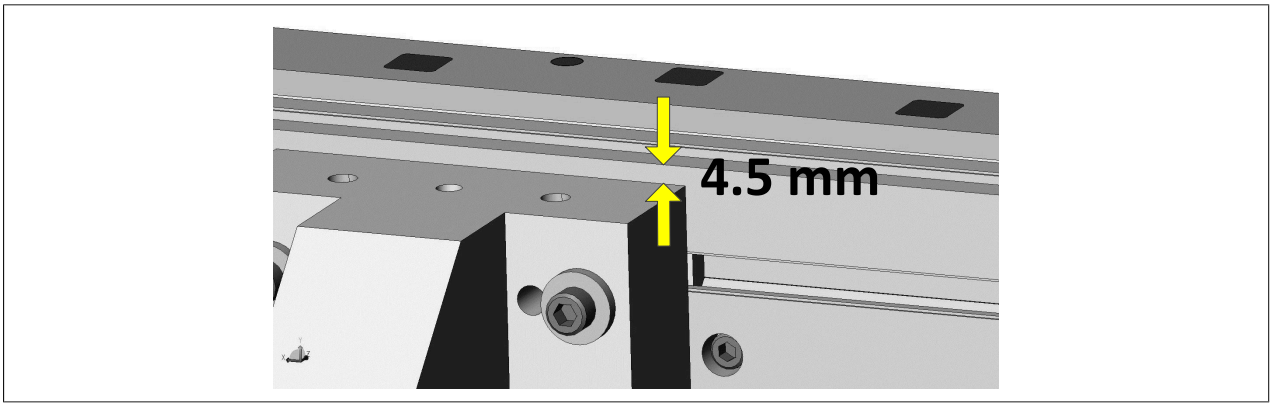
This section outlines the key steps to mount motors on a frame and then align the motor joints.

8.2.1.2 Step 1: Initial motor placement

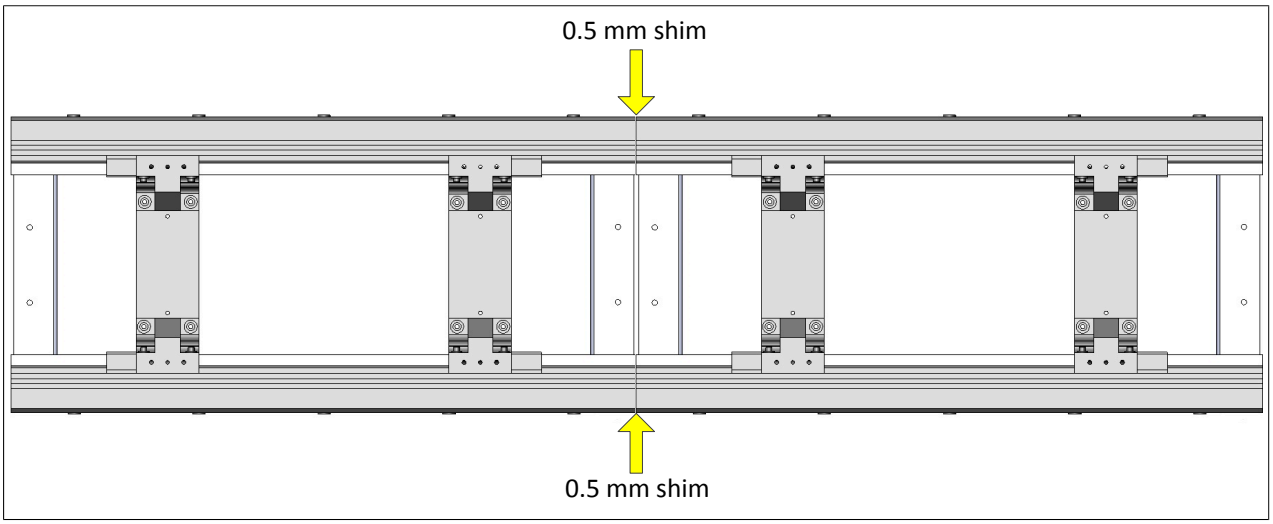
1. Place the first 2 straight motors on their mounting plates on the frames.
    - Align the stands to the 6 mm dowels spaced by a second 6 mm dowel placed horizontal
    - Align the mounting screws reasonably centered in the middle of their hole clearance
    - Lightly snug up the mounting screws to start
    - Adjust the frame feet to make the motors level at the desired system height



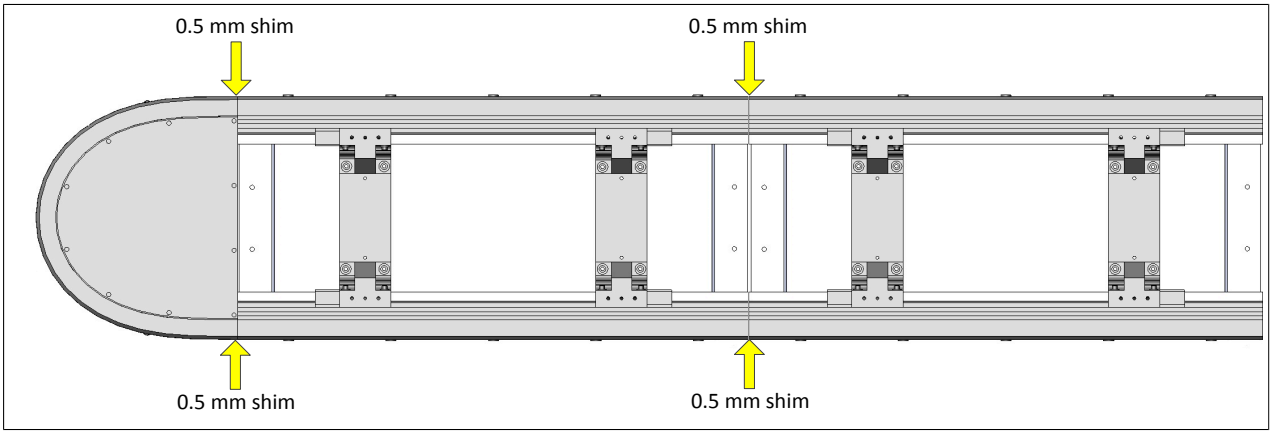
Aside: the vertical motor adjustment should start on nominal which is how they come from the factory which is the top of the stand 4.5 mm below the top of the aluminum motor structure. The stands should also be mounted square to the motor which is how they come from the factory.



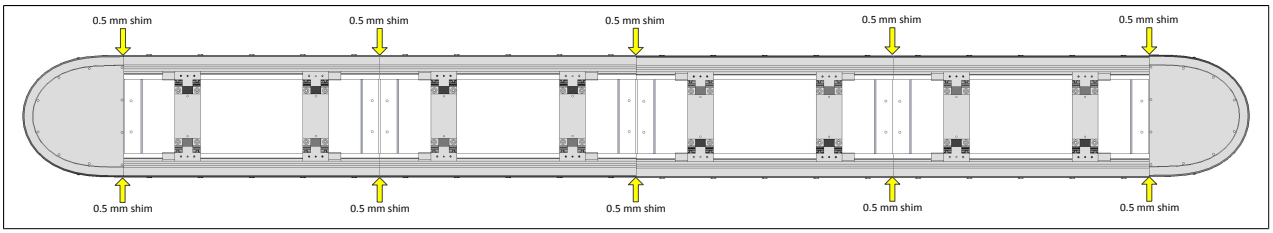
2. Mount neighbouring motors
    - Mount more motors to frames aligning the stands to the 6 mm dowels as per previous step
    - Level each motor pair and match the height by adjusting the frame feet
    - Adjoin the added motors maintaining a 0.5 mm gap between motors with plastic shims
    - Lightly snug up the stand mounting screws
    - Bolt the frames together with the connection plates (see 5.3 "Install a Wedge Adjust" on page 69)
    - This initial mounting gets the motors on nominal as a baseline. A fine adjustment will follow. So the alignment doesn't have to be perfect yet but everything should be reasonably close (within +/- 0. 25 mm). If alignments are far out, root cause needs to be investigated and fixed before moving on to fine alignment.



3. Mount Curved Segments
    - Mount the curved segment onto its frame plate
    - Level the curved segment and match the height by adjusting the frame feet
    - Adjoin the curved segment to the straight segment motors maintaining a 0.5 mm gap with plastic shims
    - Center the curved segment between the straight segment motors. Do not bias the curved segment to have a flush joint on one side and all stack-up tolerances on the other side. Center the curved segment to split the error.
    - Fine tune the curved segment height and levelness with the adjustments available in the 3 point stands. Tighten down the curved segment.

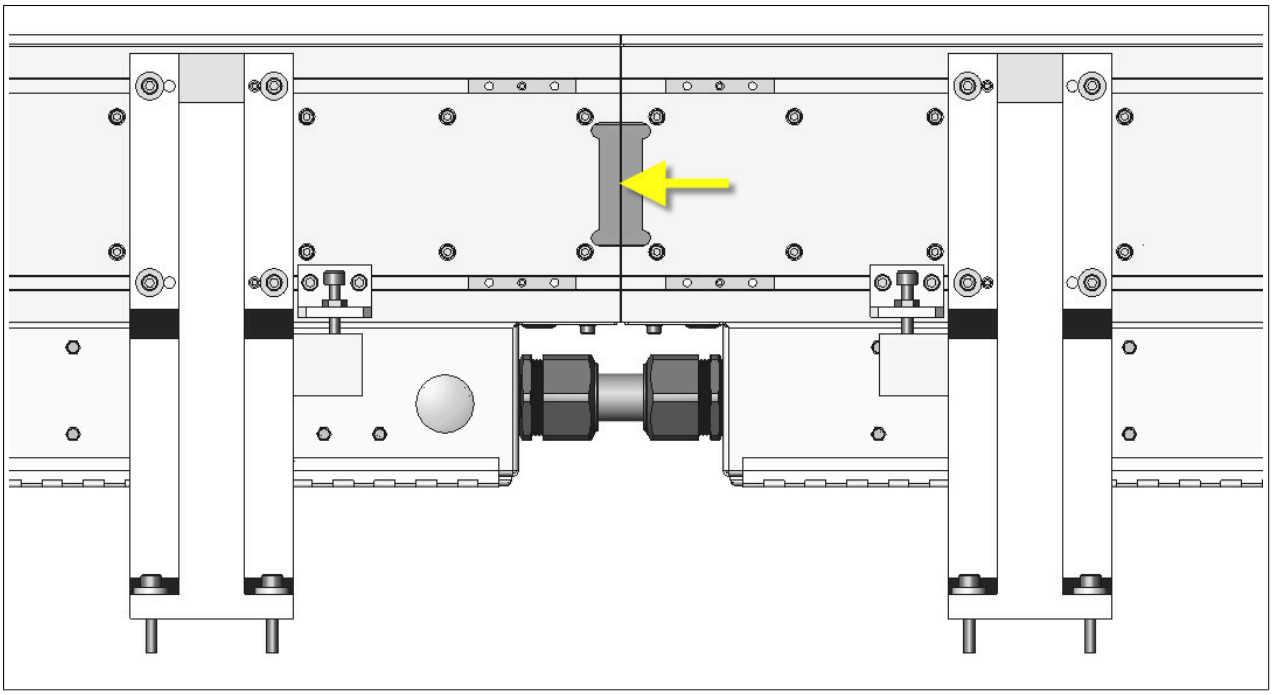


4. Mount remaining motors
    - It is preferable to mount as many motors as possible using the steps above verifying all alignments are reasonable (+/- 0.25 mm) prior to fine joint alignment. This ensures the entire system will go together properly.
    - Now the system is ready for fine adjustments

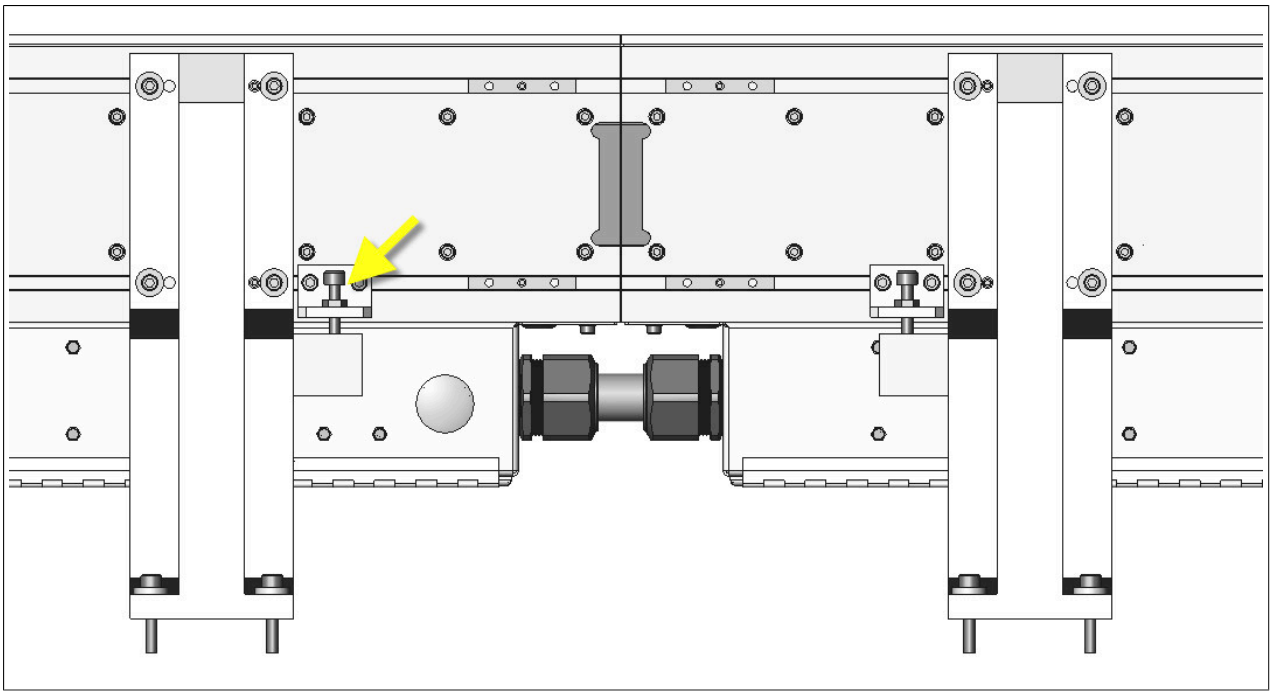


8.2.1.3 Step 2: Align and connect the joints

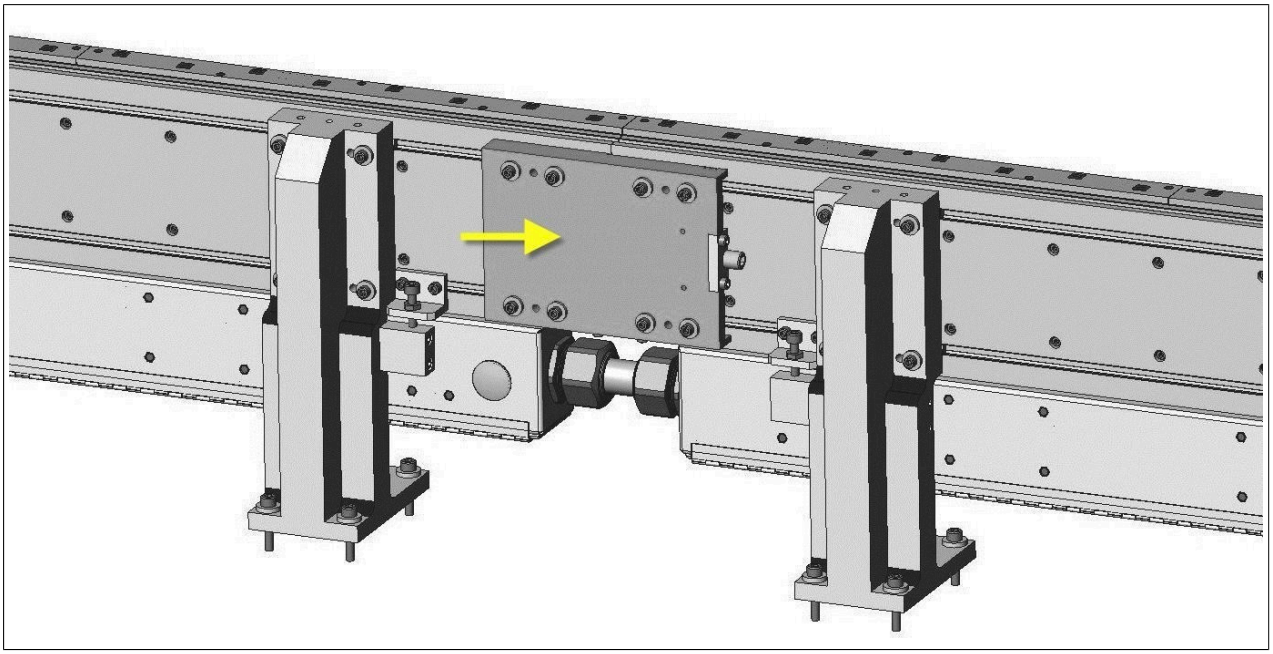
1. Align motors
    - Align the back of the motor laminations as shown by the arrow below. This is achieved by loosening the lower stand bolts and shifting a motor forward or backward. Once the backs of the adjoining lamination stacks are flush, the lower stand bolts are tightened.



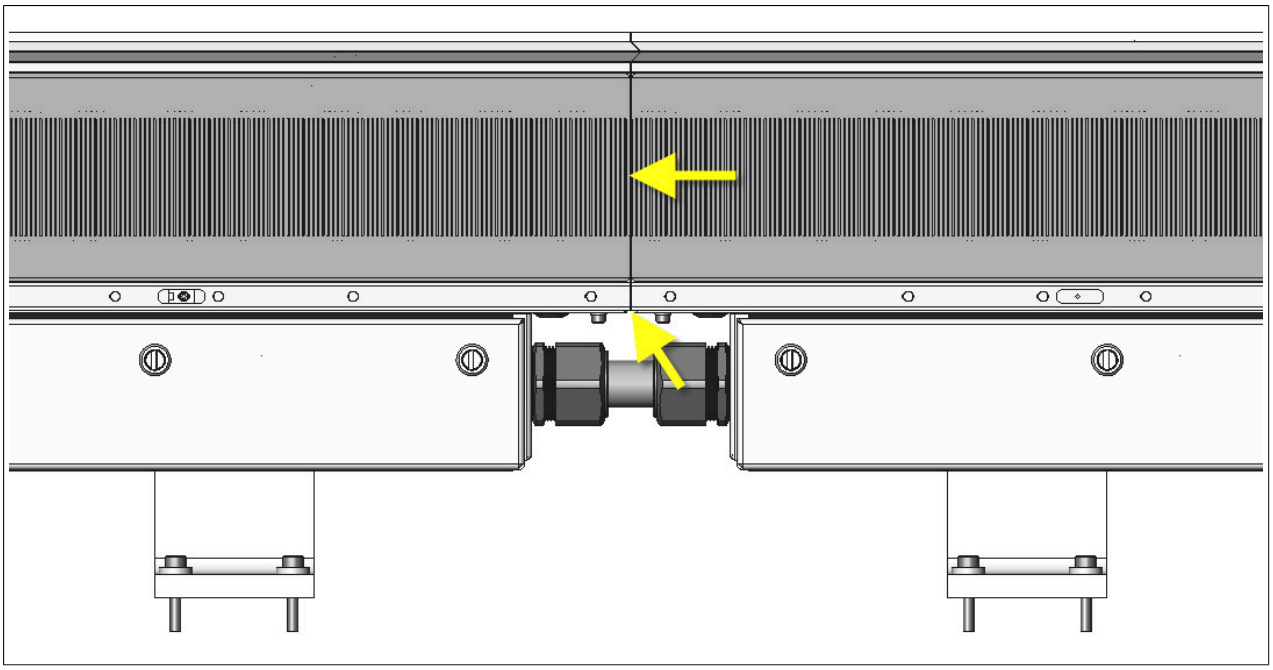
2. Vertical alignment
    - Fine adjust the vertical height of the v-rails by using one of the vertical adjustment screws shown below. The vertical stand screws get loosened when adjusting the height.



3. Install the shunt and the wedge block
    - Install the shunt block and the wedge block. The wedge gets adjusted to compensate for any stack up tolerances before tightening the screws so the back of the motors remain flush.

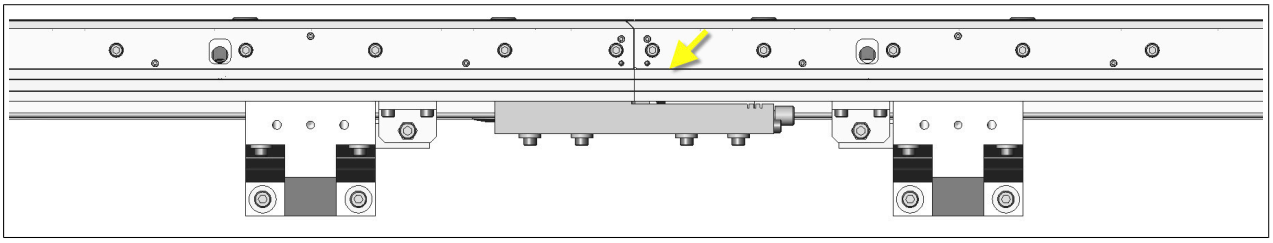


4. Check alignments on front of motor
    - The front motor faces should now be aligned. The flat rail joint surfaces below the motors should now be aligned. If this is not the case, the wedge has not been adjusted properly and needs to be re-adjusted.
    - Once aligned, install the lower flat wear strips

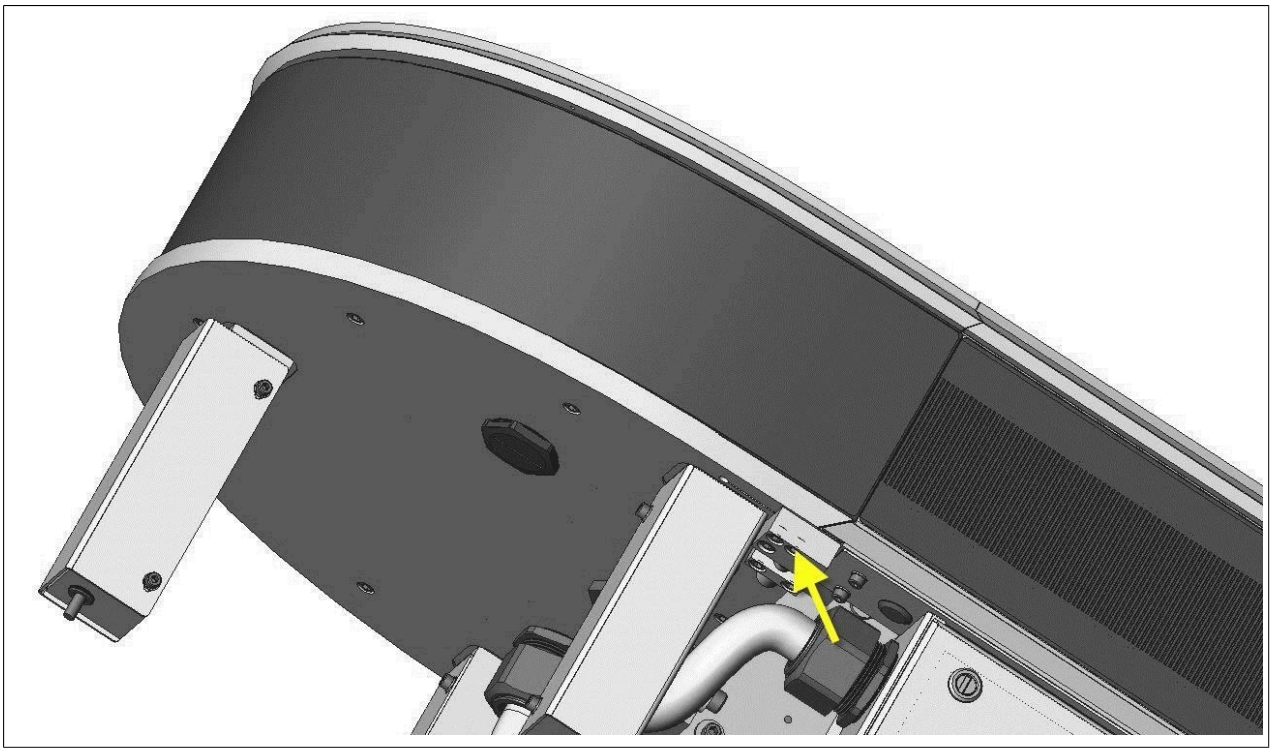


8.2.1.4 Step 3: V-Rail fine adjustments

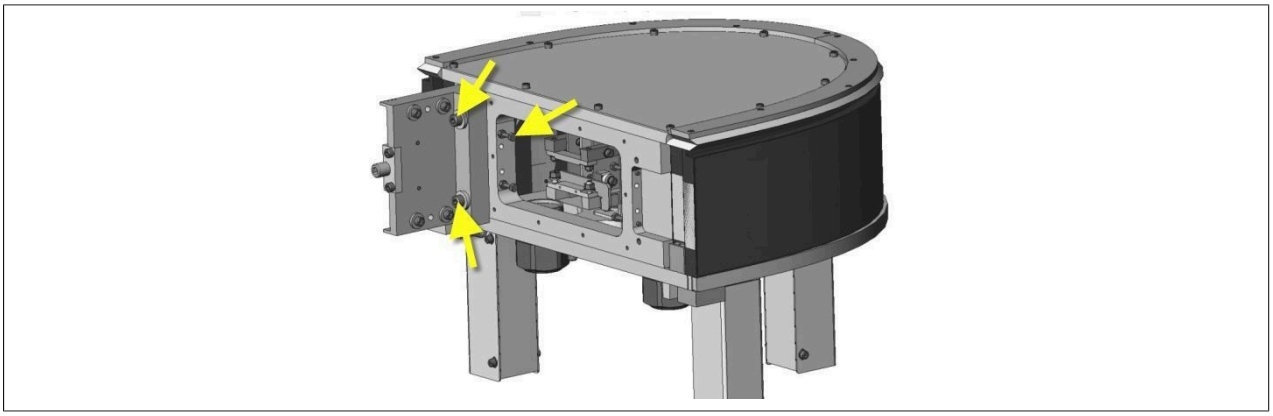
1. V-Rail Alignment
   The final step is to verify the v-rail alignment at joints (in/out) and fine adjust where required. V-rail alignment can be measured by running a straight edge along the top and bottom surfaces of the “V” crossing a joint. Alignment can also be felt with a finger or finger nail. It can also be useful to manually push a shuttle across a joint checking for knocking sounds. There are a few options for v-rail fine adjustment:
   - Some v-rail joints will already be aligned after finishing the previous procedures. The ongoing improvements to motors are making it more and more frequent that v-rails are aligned ok with no fine adjust required.
   - If the v-rail needs a small adjustment in the range of +/- 0.05 mm, the wedge can be used. Loosen the 4 screws on the wedge side, turn the wedge in or out and re-tighten. This small adjustment will not significantly impact motor alignment.
   - If the v-rail needs a larger adjustment than +/- 0.05 mm, then the v-rail needs to be loosened and shims installed behind the rail. The rail comes with 0.25 mm shims installed and these can be replaced to move the rail in or out. The image below shows a motor with the encoder bracket removed and the arrow is the location behind the rail that a shim can be installed if a large adjustment is needed.



1. Curved Segment - Additional fine adjustments
   The previous procedures apply to the curved segment with a few additions.
   The lower flat rail on the curved segment has a built in adjustment feature to align the flat rail which is shown below:



In addition to the previous adjustment options that will work, v-rail fine adjustment below +/-0.05 mm at the curved segment can also be achieved by loosening the two screws highlighted below and adjusting the hex bolt.



8.2.2 Install a SuperTrak Transport System Shuttle

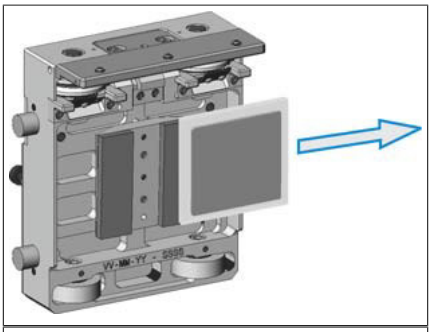
Caution!

- **The magnetic field generated by the shuttle magnets can be harmful to pacemaker wearers. Maintain a minimum distance of 31 cm (12 in.) between the shuttle and the implant location. The magnetic field may also induce magnetic materials into motion, creating potential projectiles or pinch points. Various electronic equipment and magnetic data carriers can also be affected by magnetic fields.**
- **Always install a magnet cover plate on the shuttle magnet when a shuttle is removed from the SuperTrak transport system to reduce the magnetic field to a safe level.**
- **Make sure the motor power is OFF when a shuttle is installed on the SuperTrak transport system. The external safety circuit must turn the failsafe output to the SuperTrak transport system control panel OFF when the guard doors are open, to disable the motor power.**

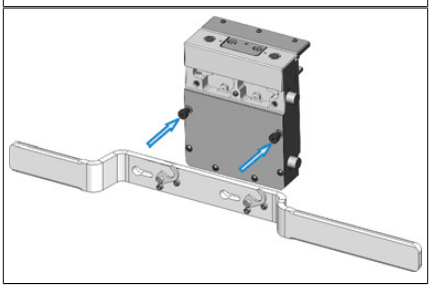
Information:

The magnetic attraction between the permanent magnets of the shuttle and the motor increases as the distance decreases. Prevent strong impact of the shuttle with the motor or damage can occur.

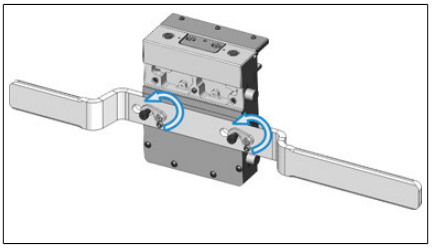
1. Open the safety circuit.
2. Slide the magnet cover plate off the shuttle magnet unit.



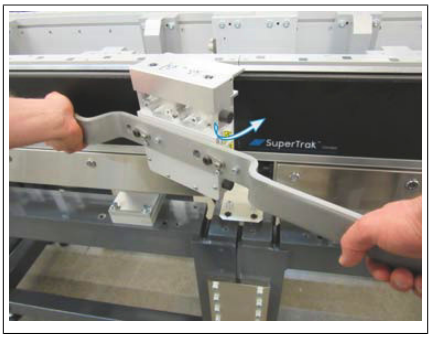
3. Install the shuttle mounting tool on the shuttle:
   a) Align the shuttle mounting tool holes with the shuttle shoulder screws and then position the tool against the front of the shuttle.



   b) Slide the shuttle mounting tool to the left, to locate the shaft of the two (2) shoulder screws into the tool slots.
   c) Rotate a locking finger over each of the two (2) shoulder screws.



4. Lift the shuttle using the handles of the shuttle mounting tool.
   Make sure the encoder strip bracket is positioned at the top of the shuttle.
5. Hold the shuttle mounting tool firmly. Rest the top left corner of the shuttle on the upper v-rail of the SuperTrak transport system, and then, align the anti-tip block of the shuttle with the slot below the upper v-rail.
   When the shuttle is positioned correctly, the shuttle encoder strip bracket is touching or almost touching the encoder bracket.



6. Hold the shuttle level. With the anti-tip block in the left slot, rotate the shuttle toward the motor until the anti-tip block on the right side moves into the slot below the upper v-rail.
   The magnetic attraction between the permanent magnets and the motor increases as the distance decreases. The shuttle removal tool provides leverage, to control the shuttle movement as the magnetic gap closes. Prevent strong impact of the shuttle with the motor or damage could occur.
7. Remove the shuttle mounting tool from the shuttle.
8. Verify that a 0,5 mm (0,02 in.) gap exists between the encoder strip bracket and the encoder bracket.
   See 8.2.10 "Adjust a Shuttle Shim" on page 148.

8.2.3 Remove a SuperTrak Transport System Shuttle

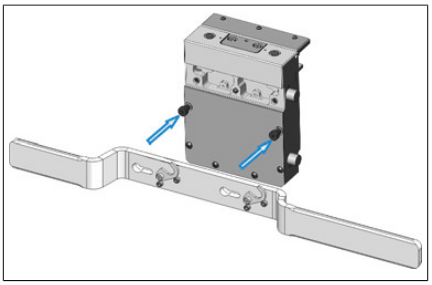
Caution!

- **The magnetic field generated by the shuttle magnets can be harmful to pacemaker wearers. Maintain a minimum distance of 31 cm (12 in.) between the shuttle and the implant location. The magnetic field may also induce magnetic materials into motion, creating potential projectiles or pinch points. Various electronic equipment and magnetic data carriers can also be affected by magnetic fields.**
- **Always install a magnet cover plate on the shuttle magnet when a shuttle is removed from the SuperTrak transport system to reduce the magnetic field to a safe level.**
- **Make sure the motor power is OFF when a shuttle is installed on the SuperTrak transport system. The external safety circuit must turn the failsafe output to the SuperTrak transport system control panel OFF when the guard doors are open, to disable the motor power.**

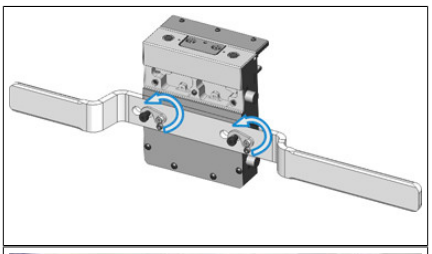
Information:

The magnetic attraction between the permanent magnets of the shuttle and the motor increases as the distance decreases. Prevent strong impact of the shuttle with the motor or damage can occur.

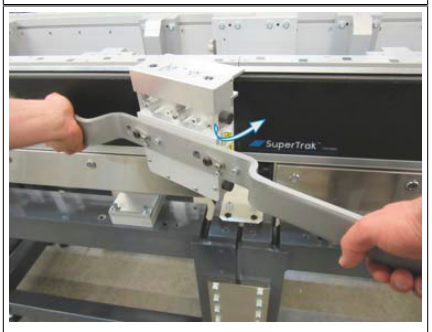
1. Open the safety circuit.
2. Install the shuttle mounting tool on the shuttle:
   a) Align the shuttle mounting tool holes with the shuttle shoulder screws and then position the tool against the front of the shuttle.



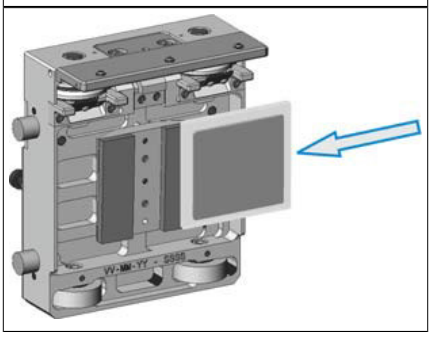
   b) Slide the shuttle mounting tool to the left, to locate the shaft of the two (2) shoulder screws into the tool slots.
   c) Rotate a locking finger over each of the two (2) shoulder screws.



3. Pry or tilt the shuttle away from the motor: firmly hold both shuttle mounting tool handles, and then pull the right handle while resisting with the left handle.
   At approximately 15 degrees the magnetic pull decreases and the shuttle can be removed from the motor.



4. Slide a magnet cover plate over the shuttle magnet assembly with the polycarbonate side of the magnet cover plate against the shuttle magnet.
   The magnet cover plate reduces the magnetic field produced by the magnet. The lexan creates a gap between the magnets and the steel plate. Hold the magnet cover plate in a manner that avoids fingers getting caught between the magnet cover plate and the magnets.



8.2.4 Inspect a SuperTrak Transport System Shuttle

Information:

Handle shuttles carefully to avoid damage to the shuttle components.

Inspect shuttles for wear on a regular basis and each time a shuttle is removed from the SuperTrak transport system. Inspect the shuttle:

Shuttle Component	Inspection	Resolution
Anti-static brush	Verify that the two (2) screws that secure the anti-static brush are tight.	Tighten any loose anti-static brush screws.
	The nominal length of a new anti-static brush is 4.05 mm (0.159 in.). When 0.5 mm (0.02 in.) of the anti-static brush is worn away, it will not make contact with the upper v-rail.	
	Visually inspect the anti-static brush. Make sure that at least 90% of the brushes remain. If more than 20% of the brushes are worn away, replace the anti-static brush.	Replace the anti-static brush. See 8.2.9 "Replace a Shuttle Anti-Static Brush" on page 147.
Bumpers	Verify that all bumpers are installed and compliant with the SuperTrak transport system application. If required, install or adjust the bumpers. See the main system mechanical drawings for compliance information. For example, the bumpers may require extensions.	Replace the shuttle bumper. See 8.2.5 "Replace a Shuttle Bumper" on page 139.
Encoder strip	Visually inspect the encoder strip and the encoder bracket for damage.	If required, replace the encoder bracket. See 8.2.13 "Replace a Shuttle Encoder Strip" on page 154.
Screws	Verify that all shuttle screws are secure. Make sure components do not have unexpected movement. The only components that should have movement are: v-wheels, spring- compliance of the lubrication Felt, anti-static bristles, and a small amount of vertical movement in the flat wheels (≤0.5 mm [≤0.02 in.]).	If required, tighten the screws.

Table 4: Inspect the shuttle

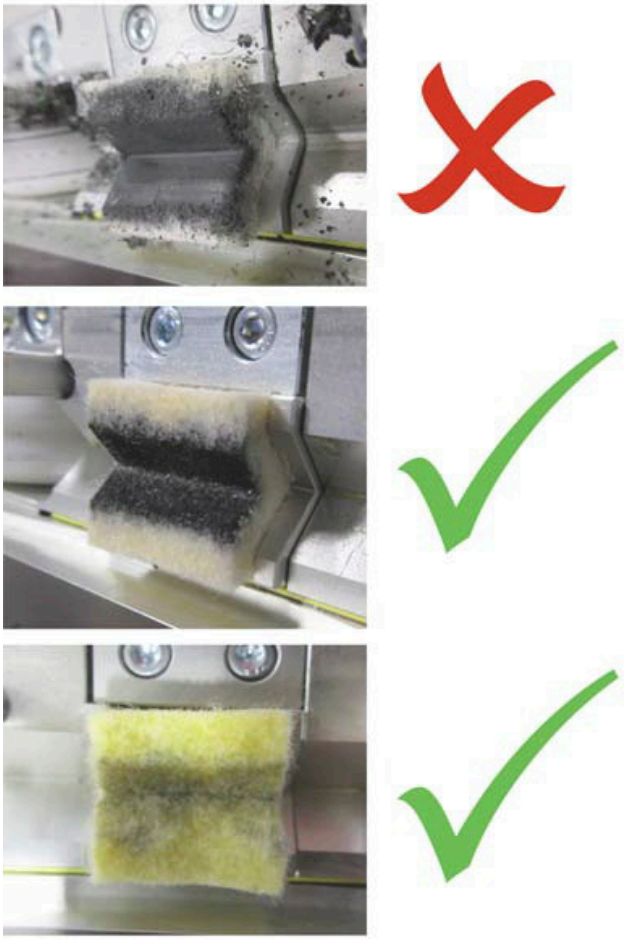
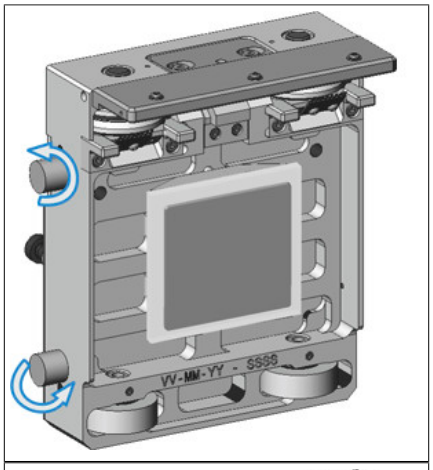
Shuttle Component	Inspection	Resolution
Lubrication felt	Visually inspect the lubrication felt. Make sure the felt is in good condition. 	If required, replace the lubrication felt. See 8.2.11 "Replace a Shuttle Lubrication Felt" on page 151.
	Verify that the lubrication felt contains lubricant. If debris accumulates on the upper v-rails, it is possible that all lubrication felts require lubricant.	Lubricate the lubrication felt. See 9.3 "Lubrication Procedures" on page 178.
	Test the lubrication felt spring compliance. Manually push the lubrication felt and then let go. The lubrication felt spring should spring back out and not jam.	If the lubrication felt spring jams, loosen the lubrication locking block screws, re-seat the lubrication locking block, and tighten the screws. If the lubrication felt spring does not spring back reliably, replace the lubrication felt spring. See 8.2.12 "Replace a Shuttle Spring " on page 153.
Magnet unit	Visually inspect the magnet unit for damage or wear (for example: cracks or flaking magnet plating).	Replace the shuttle magnet unit. See 8.2.8 "Replace a Shuttle Magnet Unit" on page 146.
	Visually inspect the magnet unit for dirt or debris.	Clean dirt and debris off of the magnet unit, using a clean, soft cloth. Wipe metal debris to a corner or edge of the magnet and then pull it off.
Wheels	• Check each flat wheel for vertical and horizontal movement. A small amount of vertical play (≤0.5 mm [≤0.02 in.]) in the flat wheels is normal and acceptable. If a flat wheel does not sit firmly in position, replace the flat wheel and make sure that the spacers are present. • Check each v-wheel for vertical movement. If the v-wheel does not sit firmly in position, tighten the screw at the top of the v-wheel.	See 8.2.6 "Replace the Shuttle Flat Wheels" on page 140.
	Turn each wheel to make sure it moves freely. Replace any wheels that do not move freely.	
	Visually inspect each flat wheel for wear or damage. Replace any badly damaged wheels. If a wheel has a groove worn into it, this may indicate that the flat wear strips, located on the straight segment or curved segment, are pitted. The flat wear strip may require replacement. Visually inspect v-wheels. If a wheel is damaged, make sure the upper v-rail is not damaged and that it is correctly aligned.	See 8.2.4 "Inspect a SuperTrak Transport System Shuttle " on page 137.

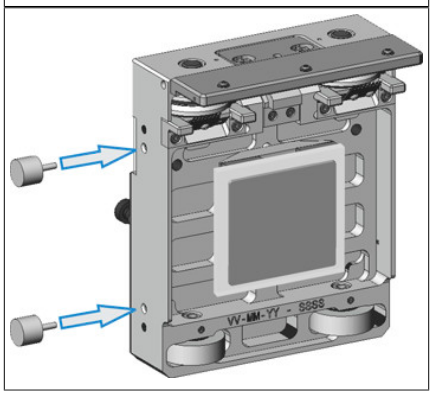
Table 4: Inspect the shuttle

8.2.5 Replace a Shuttle Bumper

1. Remove the shuttle from the SuperTrak transport system.
   See 8.2.3 "Remove a SuperTrak Transport System Shuttle " on page 136.
2. Turn the bumper counter-clockwise and remove the bumper.



3. Align the replacement bumper threads with the bumper spacer (if used) or with the bumper hole on the shuttle.



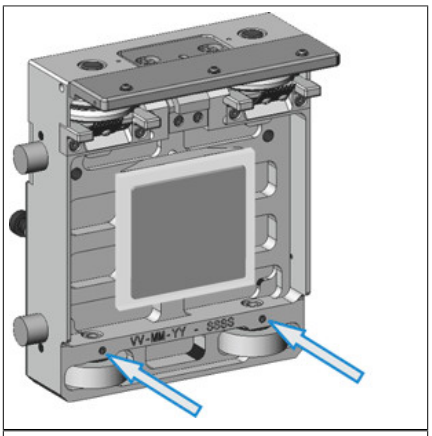
4. Turn the bumper clockwise until it is snug against the shuttle.

8.2.6 Replace the Shuttle Flat Wheels

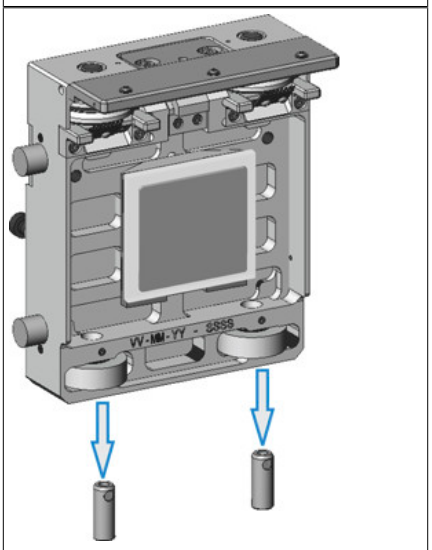
Inspect the flat wheels and spacers. Replace the flat wheels if they are worn (vertical play exceeds 0.5 mm [0.02 in.]) or damaged.

8.2.6.1 Remove the Shuttle Flat Wheels

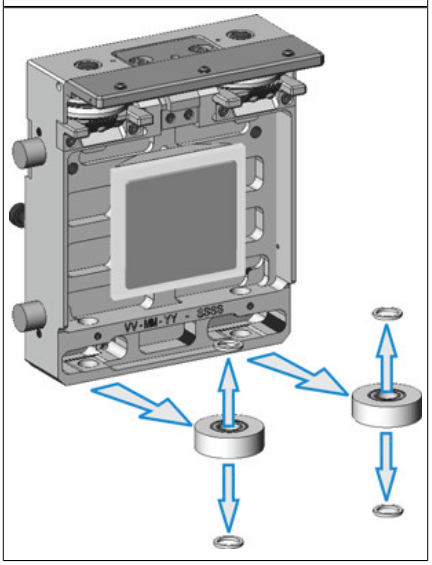
1. Remove the shuttle from the SuperTrak transport system.
   See 8.2.3 "Remove a SuperTrak Transport System Shuttle " on page 136.
2. Loosen the two (2) wheel set screws. For ease of disassembly, rest the shuttle on the shoulder screws or on the encoder strip bracket.



3. Attempt to manually push the shaft out. If snug, thread a dowel puller into the shaft and pull the shaft out. If the shaft does not come out, loosen the set screw more.
4. Repeat step 3 for the second shaft.

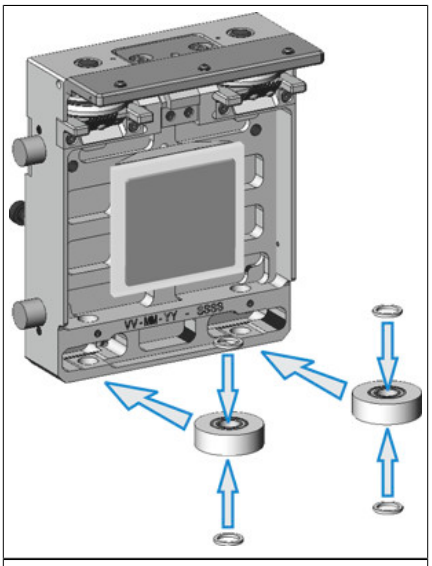


5. Remove the wheel bearing and two (2) spacers for each flat wheel.

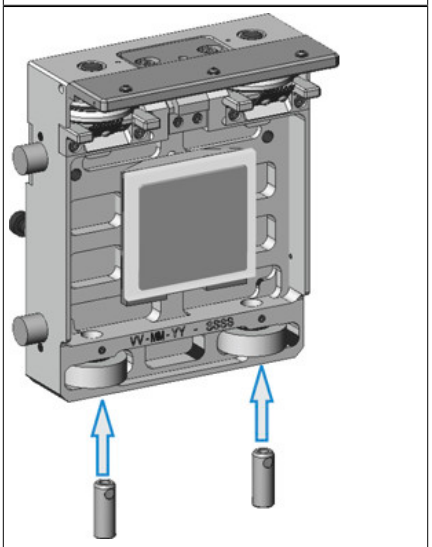


8.2.6.2 Install the Shuttle Flat Wheels

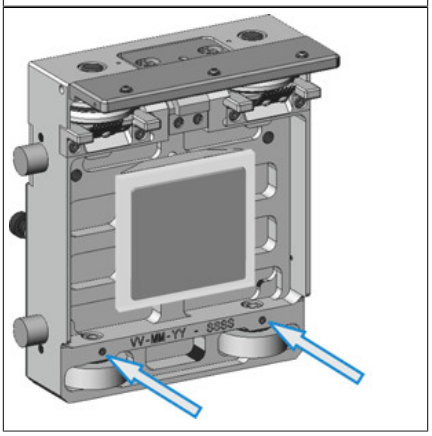
1. Hold a spacer on each side of the new wheel bearing and insert the flat wheel into the shuttle body. For ease of assembly, rest the shuttle on the shoulder screws or upside down on the encoder strip bracket.
2. Align the spacer and wheel bearing holes with the holes in the shuttle body.



3. Position a dowel over the shuttle body hole with the flat side of the shaft facing the set screw.
4. Attempt to manually push the shaft in. If tight, use a mallet to gently tap the shaft until the top of the shaft is flush with the shuttle body.
5. Repeat steps 1 to 4 for the second shuttle flat wheel.



6. Fully remove the set screws, to verify that the flat of the shaft is aligned with the set screw. If the set screw contacts the round of the shaft, it can score the shaft and make it difficult to remove the shaft later.
7. Install and tighten the two (2) wheel set screws.



8.2.7 Replace the Shuttle V-Wheels

Information:

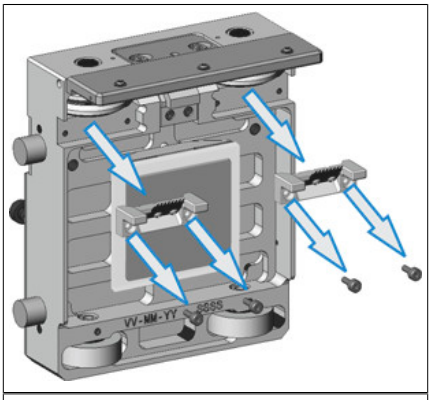
It is recommended to replace the shuttle v-wheels in pairs.

Inspect the v-wheels for gouges, pits, or wear. Replace if they are worn or damaged.

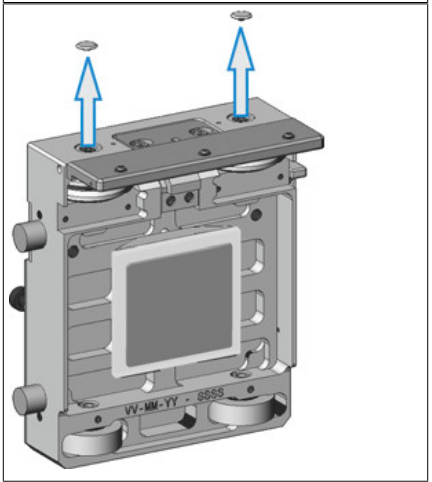
Shuttle v-wheel wear varies depending on the system application. It is recommended that you verify the accuracy of critical shuttle features over time, as required by the application. This allows you to compare the measurements to your process limits and recognize when replacement is necessary.

8.2.7.1 Remove the Shuttle V-Wheels

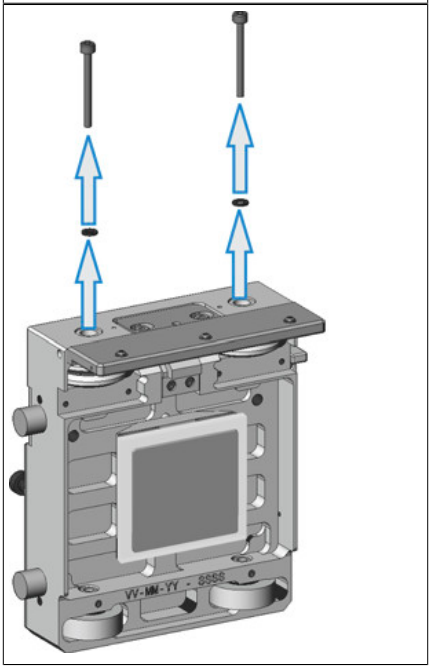
1. Remove the shuttle from the SuperTrak transport system.
   See 8.2.3 "Remove a SuperTrak Transport System Shuttle " on page 136.
2. Remove the two (2) screws that secure the anti-tip block in position.
3. Remove the anti-tip block.
4. Repeat steps 2 to 3 for the second anti-tip block.



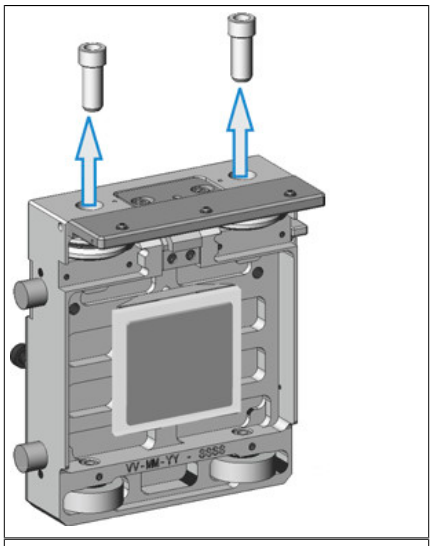
5. Remove the two (2) plastic caps on the top of the shuttle.
   For ease of disassembly, rest the shuttle on the shoulder screws or on the encoder strip bracket.



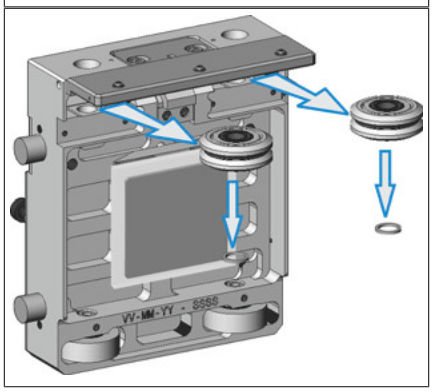
6. Remove the screw and washer that secures the v-wheel in position.
7. Repeat step 6 for the second v-wheel.



8. Attempt to manually pull the v-wheel shaft out. If snug, thread a dowel puller into the shaft and pull the shaft out.
9. Repeat step 8 for the second shaft.

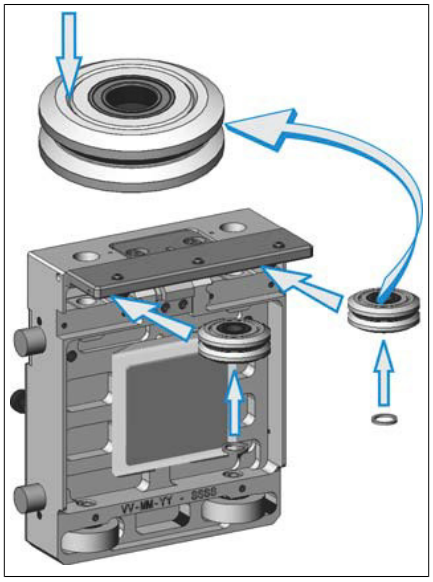


10. Remove the v-wheel and the spacer that is on the bottom of the v-wheel. Place the spacer in a safe location.

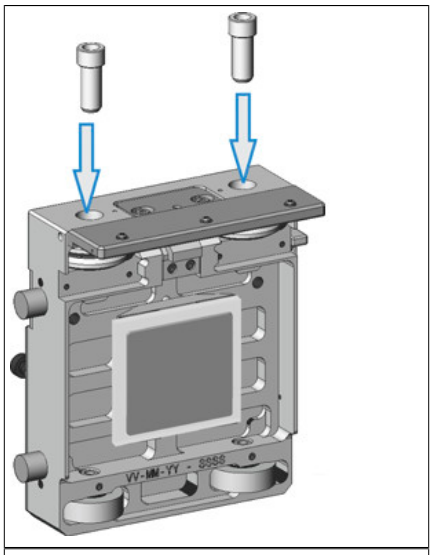


8.2.7.2 Install the Shuttle V-Wheels

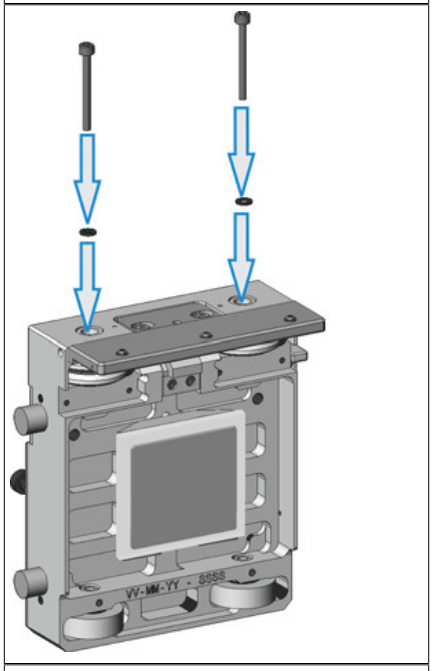
1. Hold the new v-wheel so that the side with the groove is facing up.
2. Hold a spacer on the bottom of the new v-wheel and insert them into the shuttle body.
   For ease of assembly, rest the shuttle on the shoulder screws or up-side down on the encoder strip bracket.
3. Align the spacer and v-wheel holes with the holes in the shuttle body.



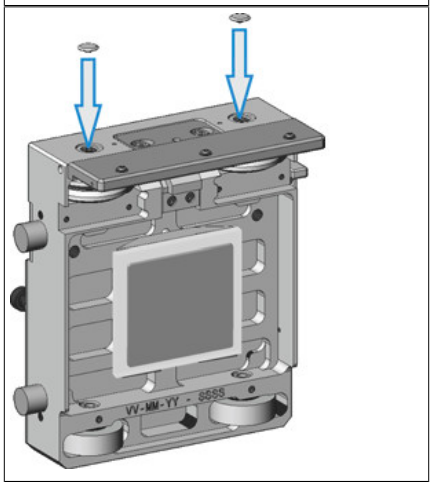
4. Manually insert the shaft through the v-wheel and spacer. If tight, use a mallet to gently tap the shaft until the top of the shaft is flush with the shuttle body.
5. Repeat steps 1 to 4 for the second v-wheel.



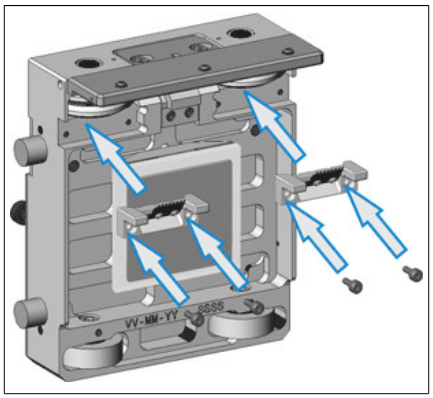
6. Install a washer and a screw into each of the two (2) v-wheel shafts, and then tighten.



7. Install a plastic cap over each of the two (2) screws.

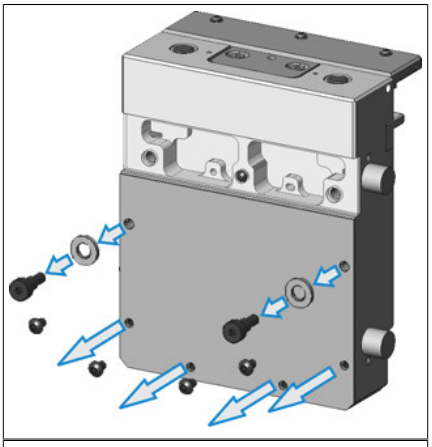


8. Position an anti-tip block in position, and then secure it in place with two (2) screws.
9. Repeat step 8 for the second anti-tip block.

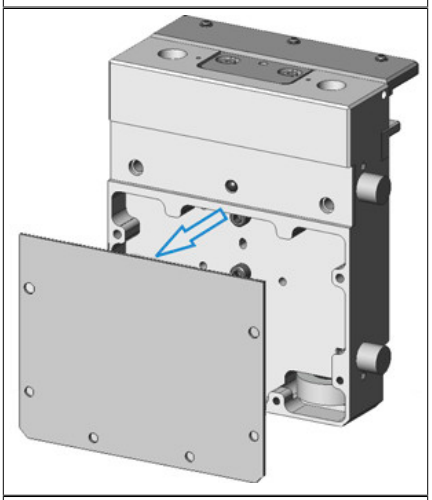


8.2.8 Replace a Shuttle Magnet Unit

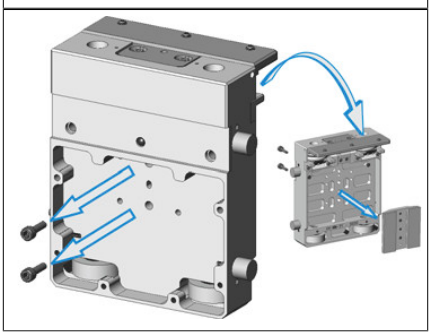
1. Remove the Shuttle from the SuperTrak transport system.
   See 8.2.3 "Remove a SuperTrak Transport System Shuttle " on page 136.
2. Remove the four (4) screws and two (2) shoulder bolts from the front cover plate.



3. Remove the front cover plate from the shuttle.



4. While supporting the magnet unit, remove the two (2) or four (4) magnet unit screws (as required).
5. Align the new magnet unit (2-magnet or 3-magnet, as required) with the shuttle dowel holes.
   The magnet unit can only be installed in one direction: it cannot be assembled upside down.



6. As required, secure the 2-magnet unit in position with two (2) screws, or the 3-magnet unit with four (4) screws.
7. Align the front cover plate with the shuttle.
8. Secure the front cover plate in position with four (4) screws and two (2) shoulder bolts.

8.2.9 Replace a Shuttle Anti-Static Brush

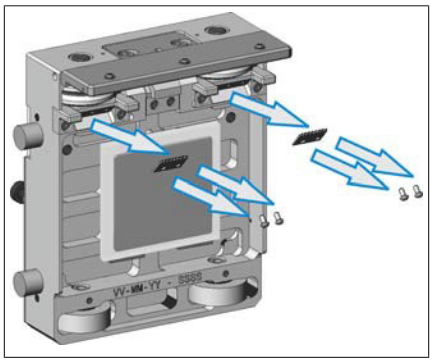
> **Information:**
>
> **The anti-static bristles can be bent out of shape if mishandled. Take care not to damage the anti-static bristles during this procedure.**

The nominal length of a new anti-static brush is 4.05 mm (0.159 in.). When 0.5 mm (0.02 in.) of the anti-static brush is worn away, it will not make contact with the upper v-rail.

Replace an anti-static brush if more than 20% of the brush bristles are worn away.

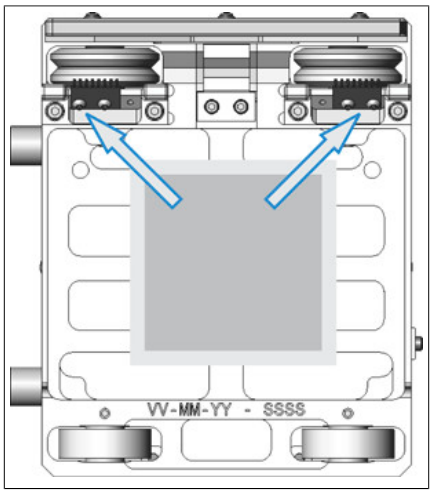
8.2.9.1 Remove an Anti-Static Brush

1. Remove the shuttle from the SuperTrak transport system.
   See 8.2.3 "Remove a SuperTrak Transport System Shuttle " on page 136.
2. Remove the two (2) screws that secure the anti-static brush in position.
3. Remove the anti-static brush.



8.2.9.2 Install an Anti-Static Brush

1. Align the new anti-static brush with the outer holes of the anti-tip block. Make sure the bristles of the anti-static brush face up, toward the v-wheel.
2. Install two (2) screws to secure the anti-static brush in position.

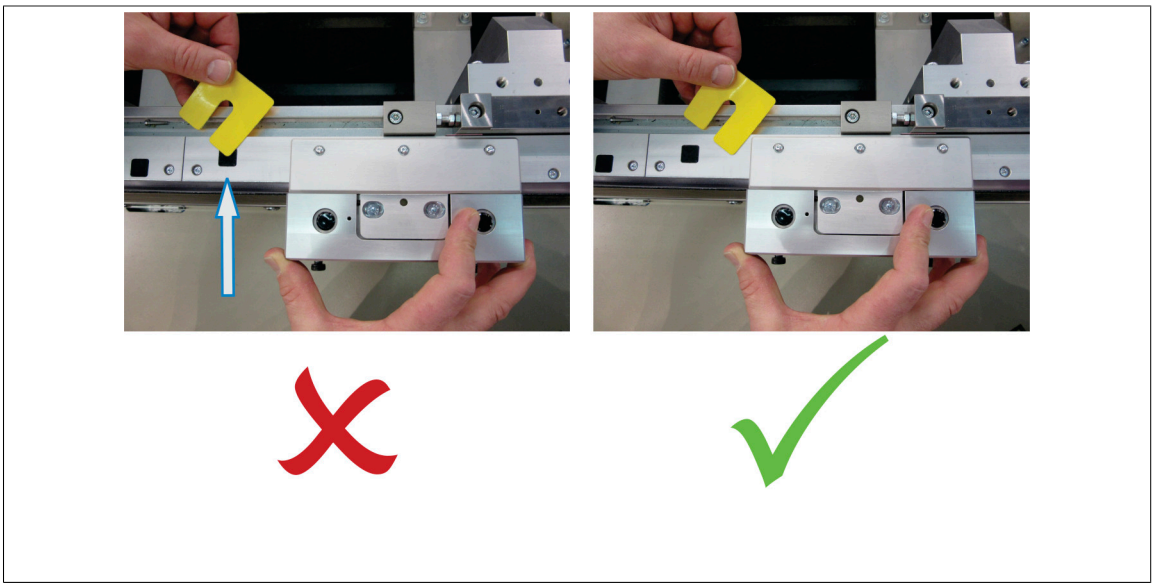


8.2.10 Adjust a Shuttle Shim

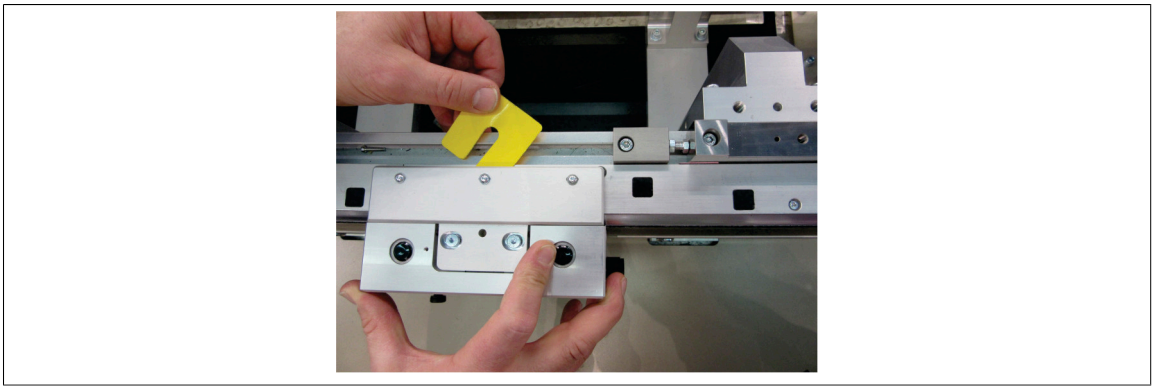
The shuttle shim is factory-set to obtain a 0.5 mm (0.02 in.) gap between the shuttle encoder bracket and the encoder bracket of preferably a straight segment. Adjust the shuttle shim if the gap is outside of the range of 0.5 mm (0.02 in.) +/- 0.3 mm (0.01 in.).

1. With the shuttle installed, measure the gap between the encoder strip bracket and the the encoder bracket of preferably a straight segment:

    a) Place a 0.5 mm (0.02 in.) plastic shim on the aluminum surface on the encoder bracket - do not place on an encoder.



    b) Slide the shuttle over the shim.



    c) Use different size shims to determine if the gap is greater or less than 0.5 mm (0.02 in.), and by how much.

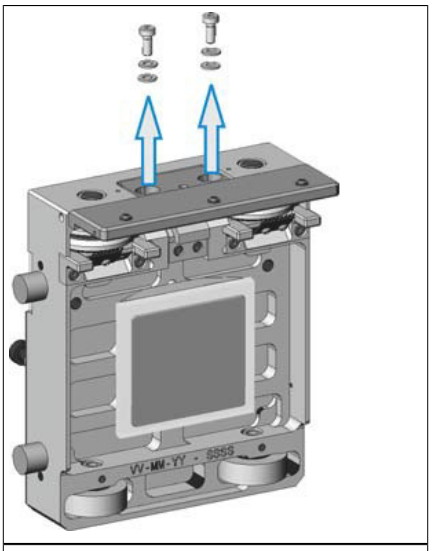
2. If the gap is greater than 0.5 mm (0.02 in.) +/- 0.3 mm (0.01 in.), verify that the shuttle shim is the problem (not the v-wheels or encoder strip):

    ° Make sure that the v-wheels are secure with no vertical play. If the v-wheels have vertical movement, tighten and then re-measure the encoder strip gap.

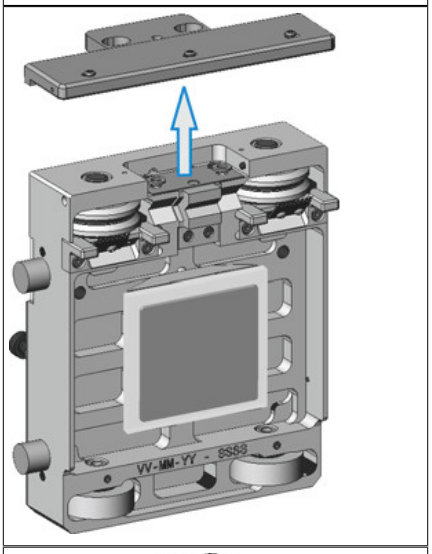
    ° Make sure that the encoder strip is secure and flush with the encoder bracket. If required, replace the encoder strip and then re-measure the encoder strip gap.
    See 8.2.13 "Replace a Shuttle Encoder Strip" on page 154.

3. Remove the two (2) outer set screws on the side of the shuttle.
4. Loosen the two (2) inner set screws on the side of the shuttle.

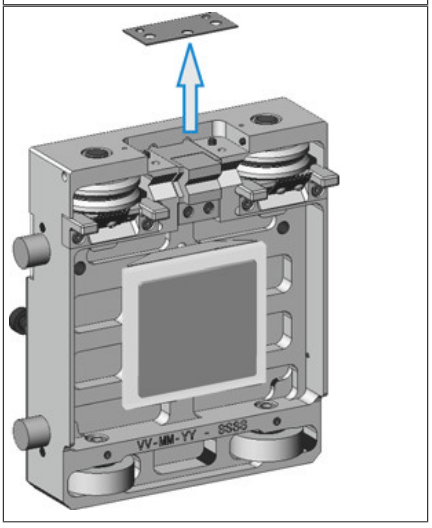
5. Remove the two (2) screws, two (2) lock washers, and two (2) flat washers that secure the encoder strip bracket in position.



6. Lift and remove the encoder strip bracket.



7. Lift and remove the shuttle shim.

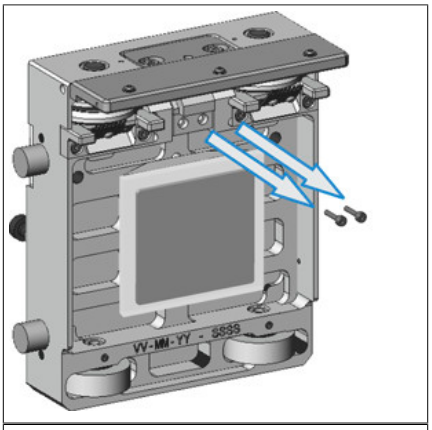


8. Measure the current combined shim thickness.
9. Use shims to adjust the gap to 0.5 mm (0.02 in.). Shims are available in a range of sizes.
10. Align the new shuttle shim with the shuttle dowels, and then place in position. The shim can only be installed one way.
11. Position the encoder strip bracket in position.
12. Secure the encoder strip bracket in position with one (1) flat washer, one (1) lock washer, and one (1) screw in each of the two (2) screw holes.

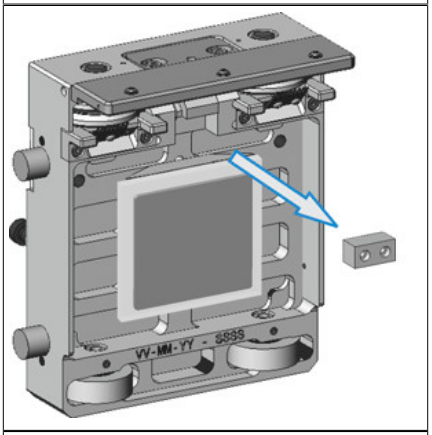
13. Repeat step 1.
14. Align the encoder strip bracket.
    See 8.2.16.6 "Adjust the Shuttle Encoder Bracket (Primary Encoder Strip)" on page 165.

8.2.11 Replace a Shuttle Lubrication Felt

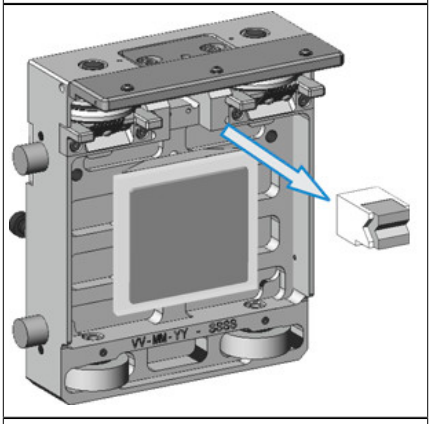
1. Remove the shuttle from the SuperTrak transport system.
   See 8.2.3 "Remove a SuperTrak Transport System Shuttle " on page 136.
2. Remove the two (2) lubrication locking block screws.



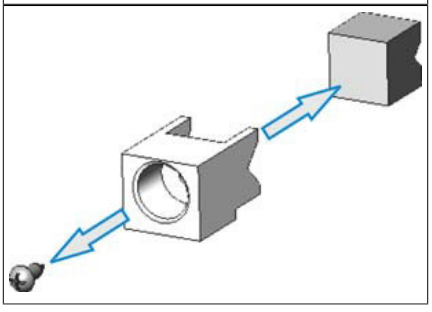
3. Remove the lubrication locking block.



4. Remove the lubrication holder.



5. Remove the screw from the back of the lubrication holder, and then remove the lubrication felt from the lubrication holder.

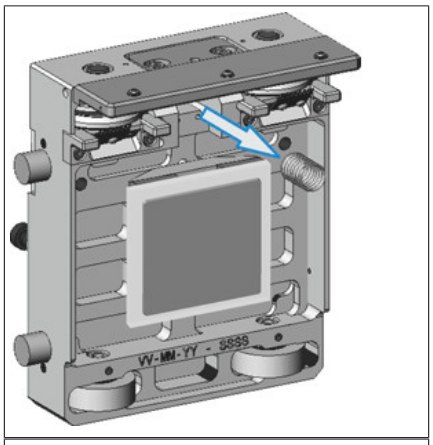


6. Position a new lubrication felt into the lubrication holder.
   Make sure the v-groove of the lubrication felt aligns with the v-groove of the lubrication holder.
7. Install one (1) screw in the back of the lubrication holder and into the lubrication felt.
8. Insert the lubrication holder into the shuttle.
   Make sure the v-groove of the lubrication Felt is horizontal with the shuttle v-wheels.
9. Install the lubrication locking block over the base of the lubrication holder.

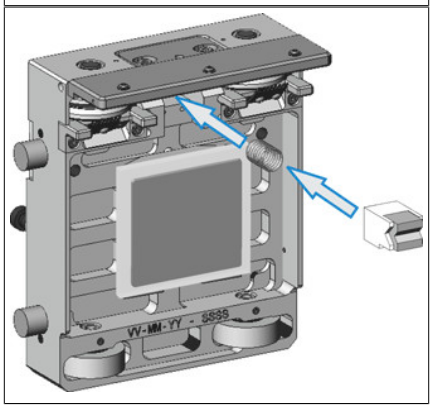
10. Secure the lubrication locking block in position with two (2) screws.
11. Lubricate the lubrication felt.
    See 9.3.1 "Lubricate the Shuttle Lubrication Felt" on page 178.

8.2.12 Replace a Shuttle Spring

1. Complete steps 1 to 4 of 8.2.11 "Replace a Shuttle Lubrication Felt" on page 151.
2. Remove the spring.



3. Position a new spring into the shuttle.
4. Complete steps 6 to 10 of 8.2.11 "Replace a Shuttle Lubrication Felt" on page 151.

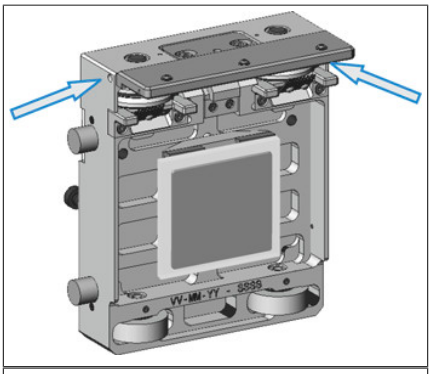


8.2.13 Replace a Shuttle Encoder Strip

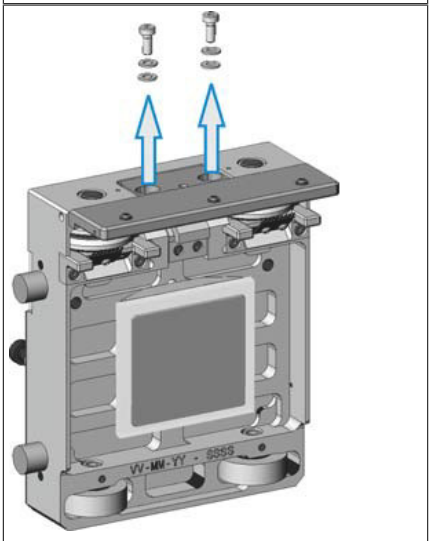
Note:

Shuttle encoder strips can be damaged by magnets. Never clean a shuttle encoder strip with a magnet.

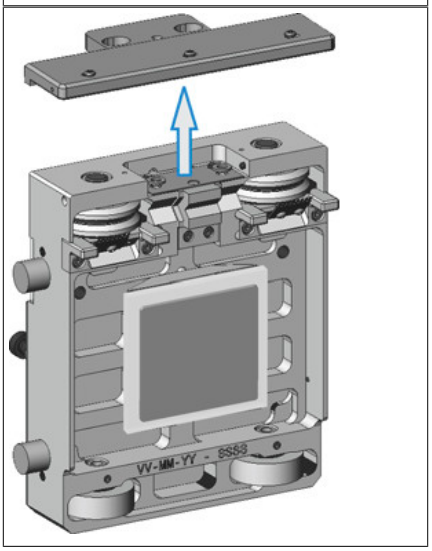
1. Remove the shuttle from the SuperTrak transport system.
   See 8.2.3 "Remove a SuperTrak Transport System Shuttle " on page 136.
2. Loosen the two (2) set screws on the side of the shuttle.
   There is one set screw on each side of the shuttle.



3. Remove the two (2) screws, two (2) lock washers, and two (2) flat washers that secure the encoder strip bracket in position.



4. Lift and remove the encoder strip bracket.



5. Obtain a replacement encoder bracket with a new encoder strip mounted. Order this part from B&R.
6. Align the encoder strip bracket that has a new encoder strip with the shuttle.
7. Secure the encoder strip bracket in position with two (2) screws, two (2) lock washers, and two (2) flat washers.
8. Align the encoder strip bracket.
   See 8.2.16 "Align a Shuttle Encoder Strip Bracket" on page 158.

9. Install the shuttle on the SuperTrak.
   See 8.2.2 "Install a SuperTrak Transport System Shuttle" on page 134.
10. Verify that a 0.5 mm (0.02 in.) +/- 0.3 mm (0.01 in.) gap exists between the encoder strip bracket and the encoder bracket. If the gap is less than 0.5 mm (0.02 in.) +/- 0.3 mm (0.01 in.), see 8.2.10 "Adjust a Shuttle Shim" on page 148.

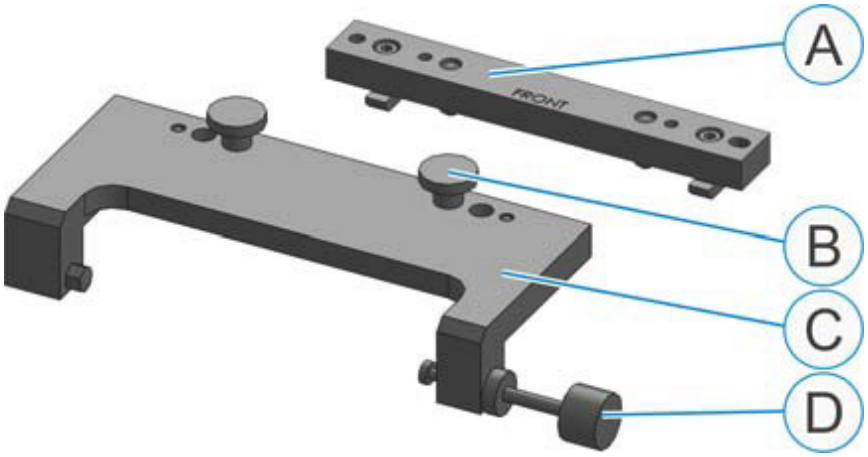
8.2.14 Install a Station Setup Fixture

Information:

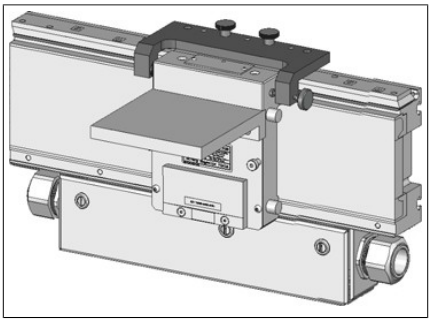
- **Improper use of a station setup fixture may cause damage to the shuttle or tools.**
- **Do not move or adjust a station setup fixture without the assistance of a trained technician.**
- **Remove all removable locating plates before operating the SuperTrak transport system.**

Install a station setup fixture when station tooling alignment verification is required.

A	Stationary mount
B	Top thumb screws
C	Removable locating plate
D	Side thumb screw



1. Position a shuttle below a station setup stationary mount.
2. Place the station setup removable locate over the shuttle.
3. Tighten the two (2) thumb screws to secure the station setup removable locate to the station setup stationary mount.
4. Lightly tighten the side thumb screw to lock the shuttle in position against the datum. The side thumb screw has an integrated slip clutch to prevent overtightening.



8.2.15 Remove a SuperTrak Transport System Station Setup Fixture

1. Loosen the side thumb screw.
2. Loosen the two (2) top thumb screws.
3. Lift the station setup removable locate straight up, to remove it from the shuttle.
4. As required, complete one of the following procedures:
    - Store the station setup removable locate in a safe place for future use.
    - Turn the station setup removable locate around, so the side thumb screw is on the inside of the SuperTrak transport system, and then tighten the two (2) top thumb screws to secure it in position for future use.

8.2.16 Align a Shuttle Encoder Strip Bracket

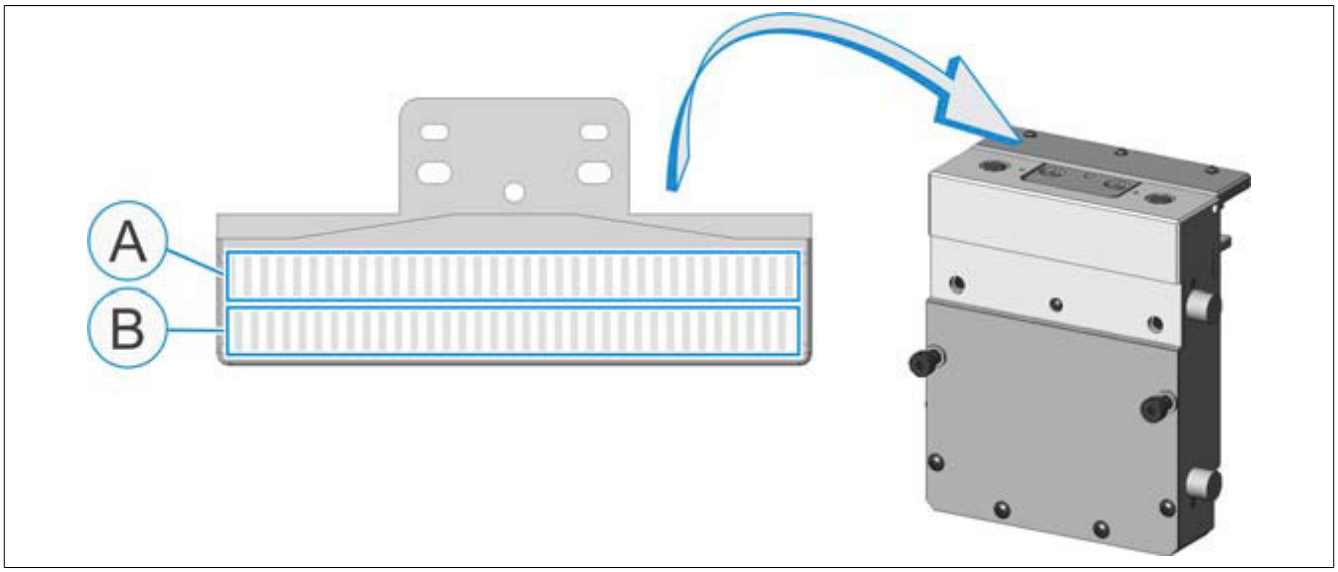
Note:

- **Improper use of a shuttle setup fixture may cause damage to the shuttles or tools.**
- **Do not move or adjust a shuttle setup fixture without the assistance of a trained technician.**
- **Remove all removable locating plates before operating the SuperTrak transport system.**

Information:

- **Encoder strip bracket alignment must be completed on a straight segment.**
- **Adjust shuttle encoder strips consistently to improve shuttle-to-shuttle repeatability.**

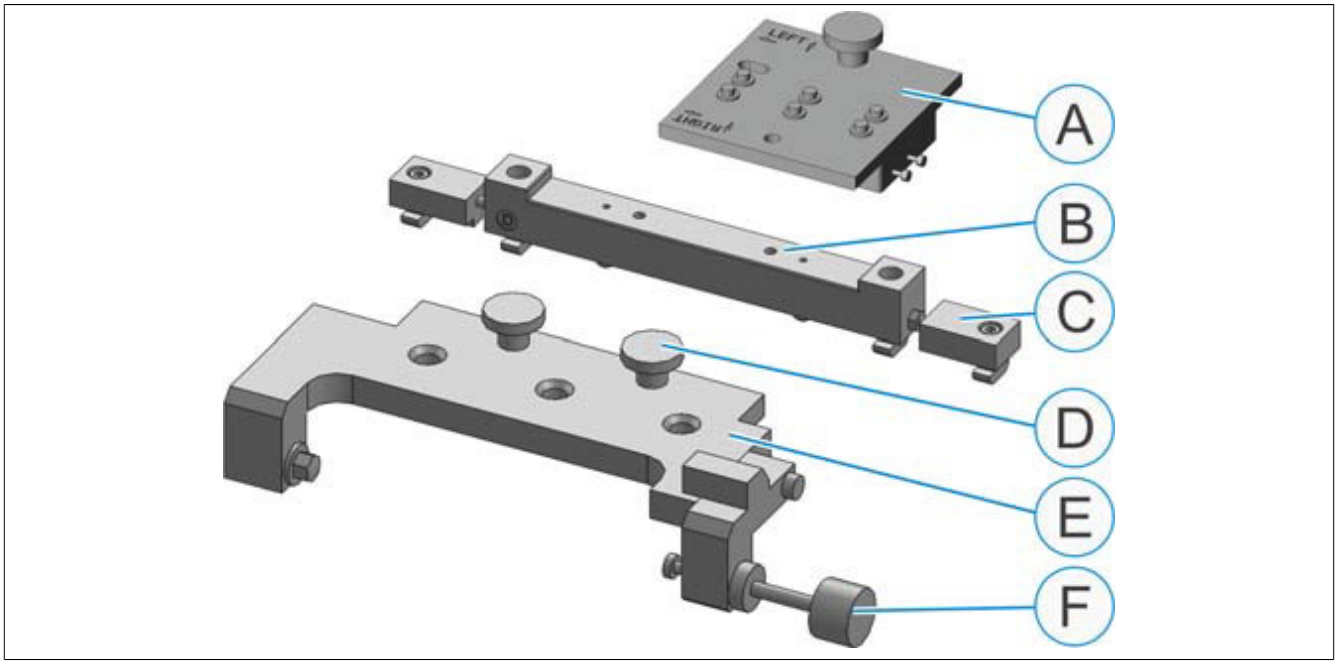
Each shuttle encoder bracket contains two (2) encoder strips: a primary encoder strip, and a secondary encoder strip. Each encoder strip is aligned differently. This procedure describes how to align both encoder strips; however, the secondary encoder strip is factory-aligned, and should not require adjustment.



A	Primary encoder strip	**B**	Secondary encoder strip

Align a shuttle encoder strip bracket if the encoder strip bracket is removed during maintenance, or if the shuttle position faults regularly occur on the curved segment.

The following diagram describes the setup tools that are used during this procedure.



A	Shuttle setup adjustable chip finder (chip finder)	**D**	Top thumb screw (1 of 2)
B	Shuttle setup stationary mount (stationary mount)	**E**	Shuttle setup removable locate (removable locate)
C	Adjust block (1 of 2)	**F**	Side thumb screw

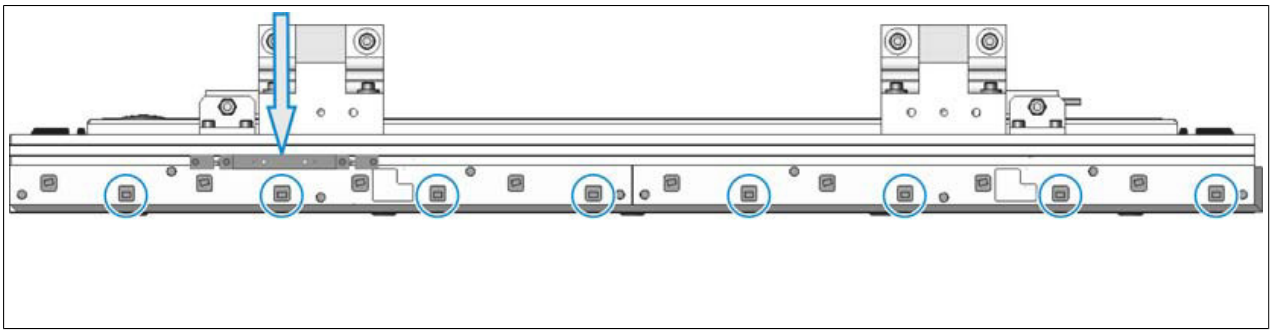
1. Install a shuttle setup stationary mount on a straight segment.
   See 8.2.16.1 "Install a Shuttle Setup Stationary Mount" on page 159.
2. Optionally, for systems that require tight tolerances, verify that the shuttle setup stationary mount is parallel with the upper v-rail.
   See 8.2.16.2 "Verify Shuttle Setup Stationary Mount Parallelism" on page 160.
3. Center the shuttle setup stationary mount with an encoder on the straight segment encoder bracket.
   See 8.2.16.3 "Center a Shuttle Setup Stationary Mount with an Encoder" on page 160.
4. Verify that the shuttle setup stationary mount is in the correct position.
   See 8.2.16.4 "Verify the Shuttle Setup Stationary Mount Position" on page 163.

At this point, the shuttle setup stationary mount is centered with an encoder on the straight segment.

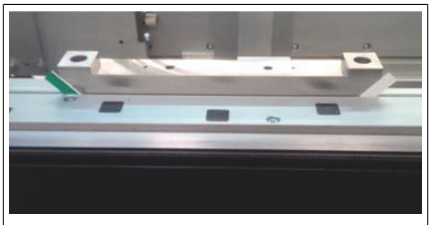
5. Determine the distance between two encoders.
   See 8.2.16.5 "Reference the Encoder Position" on page 164.
6. If required, center the encoder bracket with the center of the shuttle.
   See 8.2.16.6 "Adjust the Shuttle Encoder Bracket (Primary Encoder Strip)" on page 165.
7. If required, align the secondary encoder strip with the primary encoder strip.
   See 8.2.16.7 "Adjust a Secondary Encoder Strip" on page 166.

8.2.16.1 Install a Shuttle Setup Stationary Mount

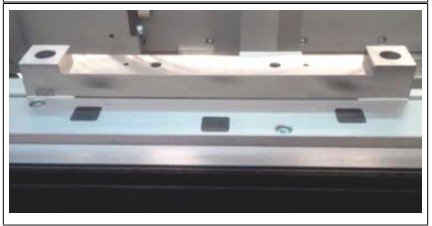
1. Position a stationary mount on a straight segment. Make sure the datum surface, which is etched with the a “D”, faces toward the encoders. Roughly center the stationary mount with an odd-numbered encoder. In the example below, all odd-numbered encoders are circled. The stationary mount is aligned with encoder 3 (the 4th encoder from the left).



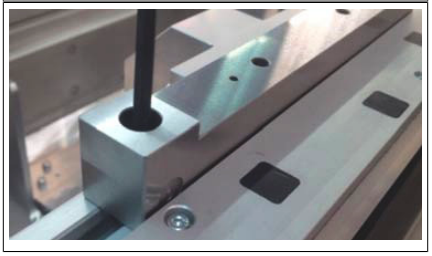
2. Install shims between the encoder bracket and the stationary mount, to bias the stationary mount to the back of the t-slot. In the example on the right, a green and white 0.729 mm (0.028 in.) shim is installed on the left, and a white 0.653 mm (0.025 in.) shim is installed on the right to bias the stationary mount to the back.



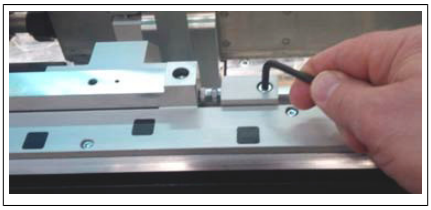
3. Lower the shims all the way down.



4. Snug the two (2) stationary mount screws. Make sure the t-nuts turn and lock into the t-slots.



5. Position an adjust block at the end of the stationary mount, and secure it in position with one (1) screw.
6. Repeat step 5 at the other end of the stationary mount.

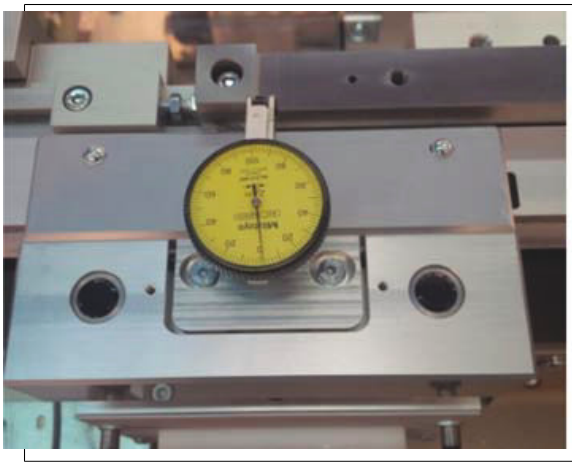


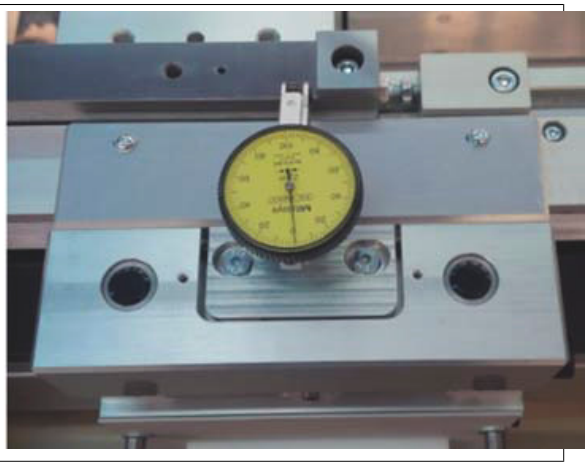
8.2.16.2 Verify Shuttle Setup Stationary Mount Parallelism

Information:

This procedure is optional. It is okay if the nominal for a particular system is slightly off from true nominal (for example; off by 10-20 µm). The important thing is that all shuttles on the SuperTrak system are adjusted to the same nominal.

1. Install a stationary mount.
   See 8.2.16.1 "Install a Shuttle Setup Stationary Mount" on page 159.
2. Mount a dial indicator on a shuttle, such that it contacts the datum face of the stationary mount. For example; mount a dial indicator to the top or side of a shuttle with a rigid clamp.
3. Note the dial indicator measurements as you slowly slide the shuttle, from left to right, along the stationary mount.
4. Based on the dial indicator results, complete one (1) of the following:
   - If the dial indicator measurements are the same on each side of the stationary mount, the face of the stationary mount is parallel with the upper v-rail. The procedure is complete.
     For example:



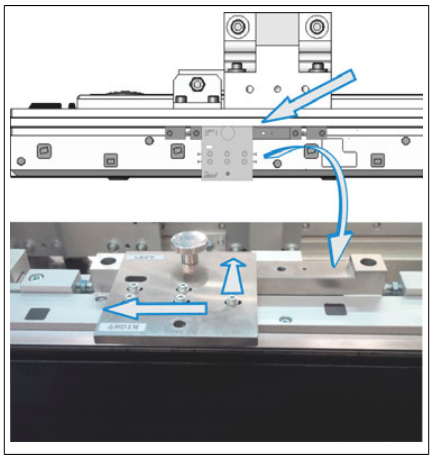


   - If the value on the dial indicator is different on each side of the shuttle setup stationary location, the face of the stationary mount is not parallel with the upper v-rail. Proceed to step 4.
5. Replace the shims, installed in step 1, with shims that are the correct size to improve parallelism.
6. Repeat steps 2 to 3.

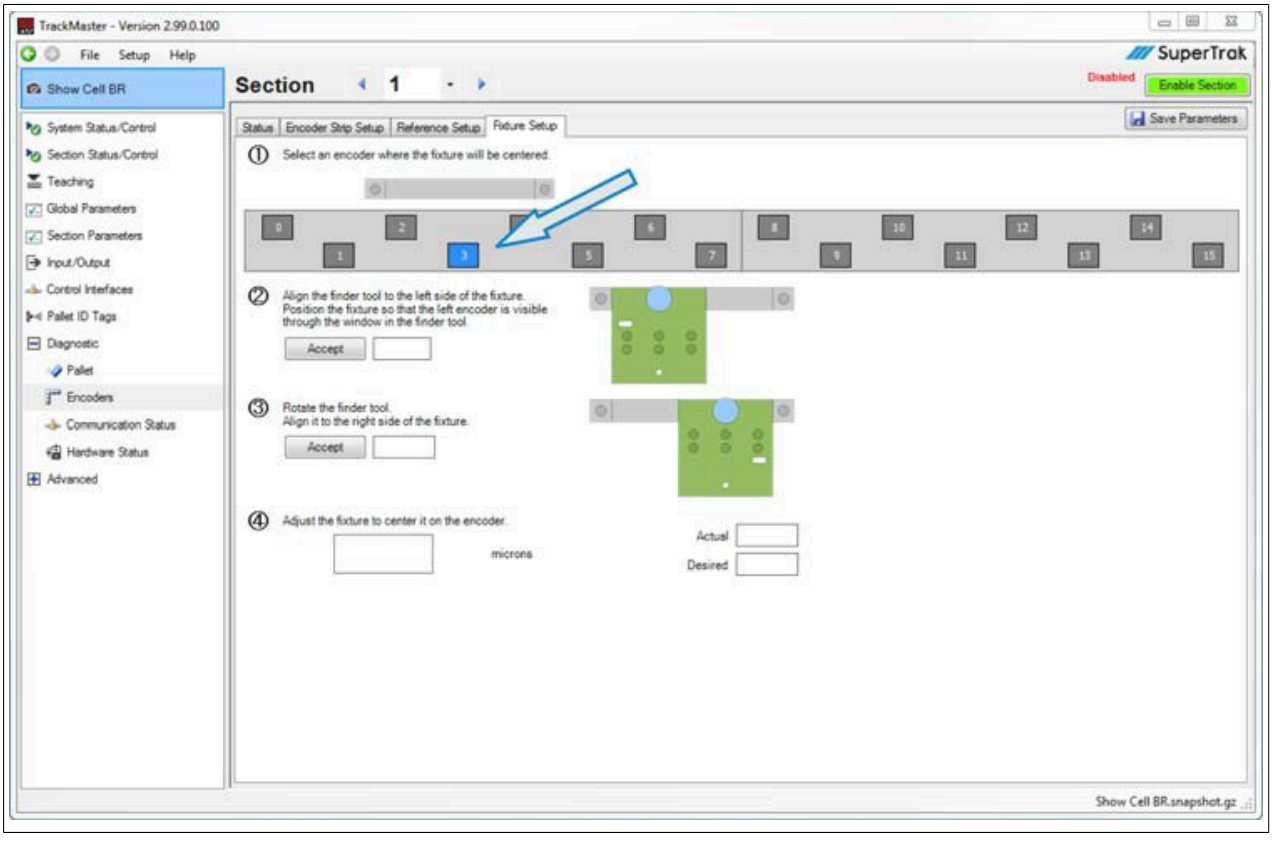
8.2.16.3 Center a Shuttle Setup Stationary Mount with an Encoder

1. If required, install a stationary mount.
   See 8.2.16.1 "Install a Shuttle Setup Stationary Mount" on page 159.

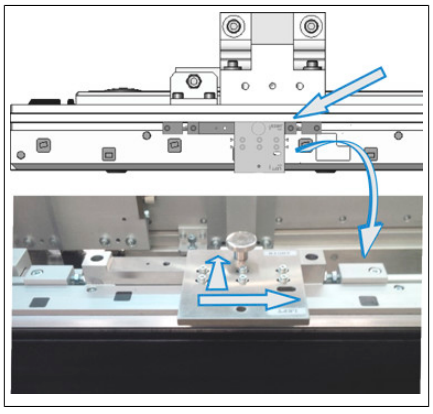
2. Install the chip finder on the left side of the stationary mount:
    a) Align the chip finder with the left side of the stationary mount.
    b) Loosely secure the chip finder in position using the thumb screw.
    c) Firmly hold the chip finder back and to the left (corner crowd), and then tighten the thumb screw.



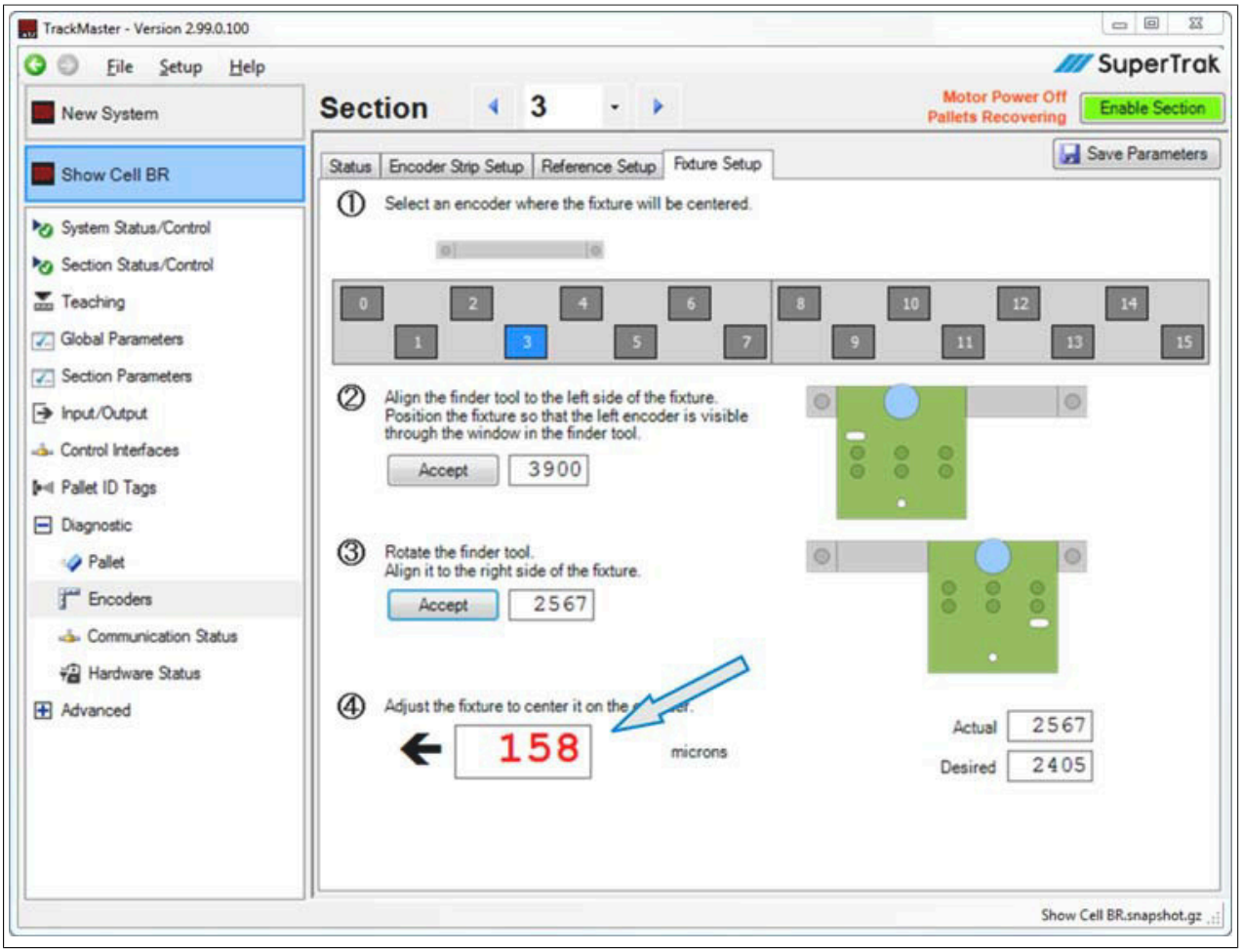
3. In the TrackMaster software, expand **Diagnostics**, and then click **Encoders**.
4. Click the **Fixture Setup** tab.
5. Click the encoder that the stationary mount is aligned with. For example; if the stationary mount was installed at encoder 3, “3” would be selected.



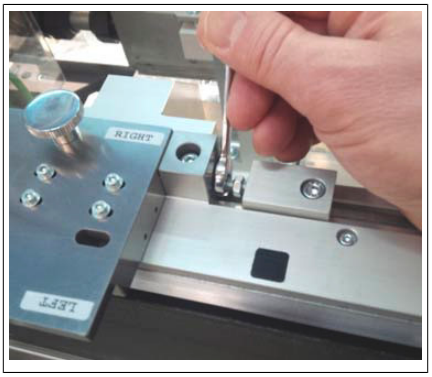
6. For step 2 on the TrackMaster screen, click **Accept**.
7. Remove the chip finder from the left side of the stationary mount and turn it 180°.
8. Install the chip finder on the right side of the stationary mount:
    a) Align the chip finder with the left side of the stationary mount.
    b) Loosely secure the chip finder in position using the thumb screw.
    c) Firmly hold the chip finder back and to the left, and then tighten the thumb screw.



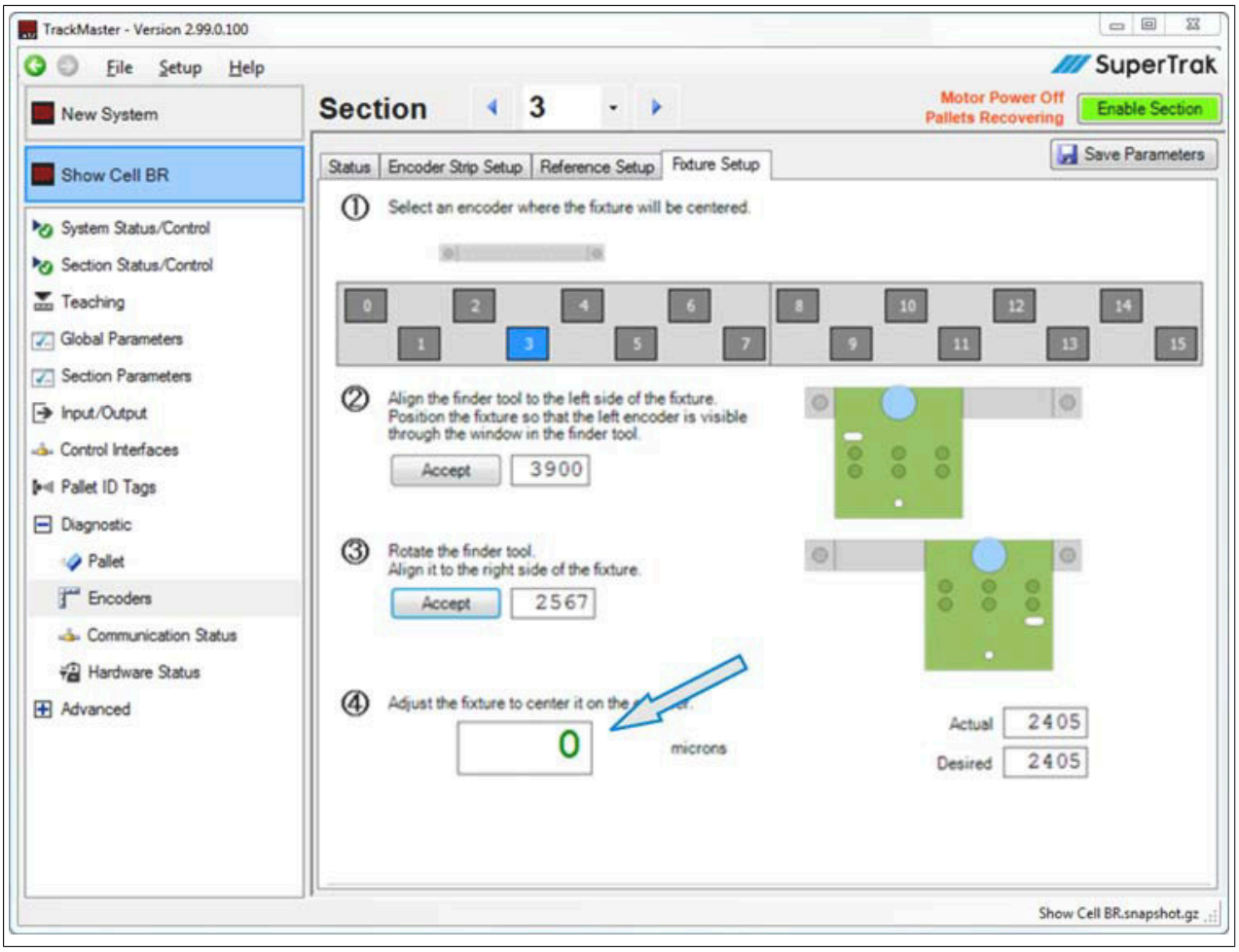
9. For step 3 on the TrackMaster screen, click **Accept**.
10. View the value displayed in step 4 on the TrackMaster screen to determine the direction and distance to adjust the shuttle setup station locate. For example; this screen indicates that the shuttle setup station locate must be adjusted to the left 158 microns.



11. As required, adjust the position of the shuttle setup station locate:
    a) Slightly loosen the two (2) stationary mount screws.
    b) Use a wrench to loosen the lock nut.
    c) Use a wrench to turn the hex head bolts as required to fine-adjust the position of the shuttle setup station locate.



12. Click the first **Accept** button again, to restart the process.
13. Repeat steps 3 to 12, until the shuttle setup station locate position is ±2 microns.
    In the example below, the shuttle setup station locate is precisely centered.

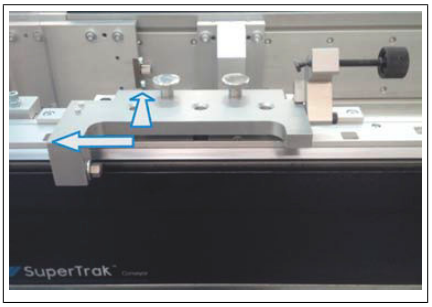


14. Tighten the two (2) stationary mount screws.
15. Snug the two (2) hex head bolts against the stationary mount.
16. Tighten the two (2) station locate lock nuts.
17. Loosen the adjust block screws, snug them up to each end of the stationary mount, and then tighten the screws.
18. Remove the chip finder from the stationary mount.

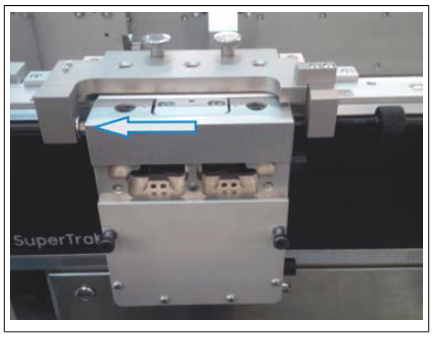
8.2.16.4 Verify the Shuttle Setup Stationary Mount Position

Complete this procedure to verify that the stationary mount is in the correct position. A shuttle with a correctly aligned encoder bracket (master or reference shuttle) is required for this procedure.

1. Install the shuttle setup removable locate:
    a) Align a removable locate with the stationary mount.
    b) Firmly hold the removable locate back and to the left, and then tighten the two (2) top thumb screws.

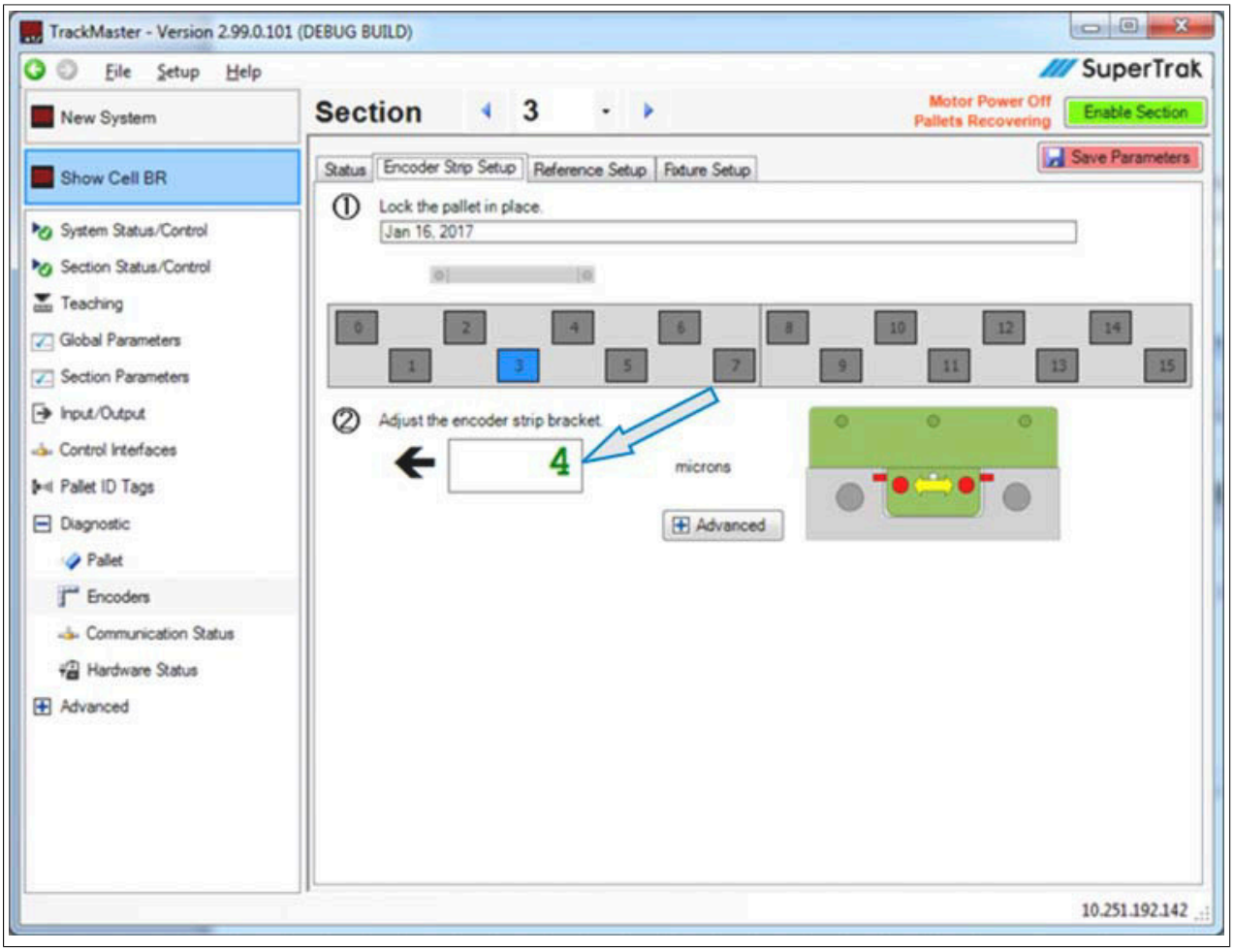


2. Lock a shuttle in position:



   a) Lift the side thumb screw up.
   b) Slowly position a shuttle with a correctly adjusted encoder bracket under the removable locate. This shuttle is the master (reference) shuttle . Do not force the shuttle against the datum of the removable locate because this could shift the tooling out of position.
   c) Lower the side thumb screw down.
   d) Hold the shuttle to the left, and then lightly tighten the side thumb screw to lock the shuttle in position against the datum. Shuttle setups can vary by ±5 microns if inconsistent pressure is applied. Use consistent pressure when locking a shuttle in position.

3. In the TrackMaster software, expand **Diagnostics**, and then click **Encoders**.
4. Click the **Encoder Strip Setup** tab.
5. View the value displayed in step 2 on the TrackMaster screen. If the stationary mount is good, the value should be within ±4 microns, like the example below.

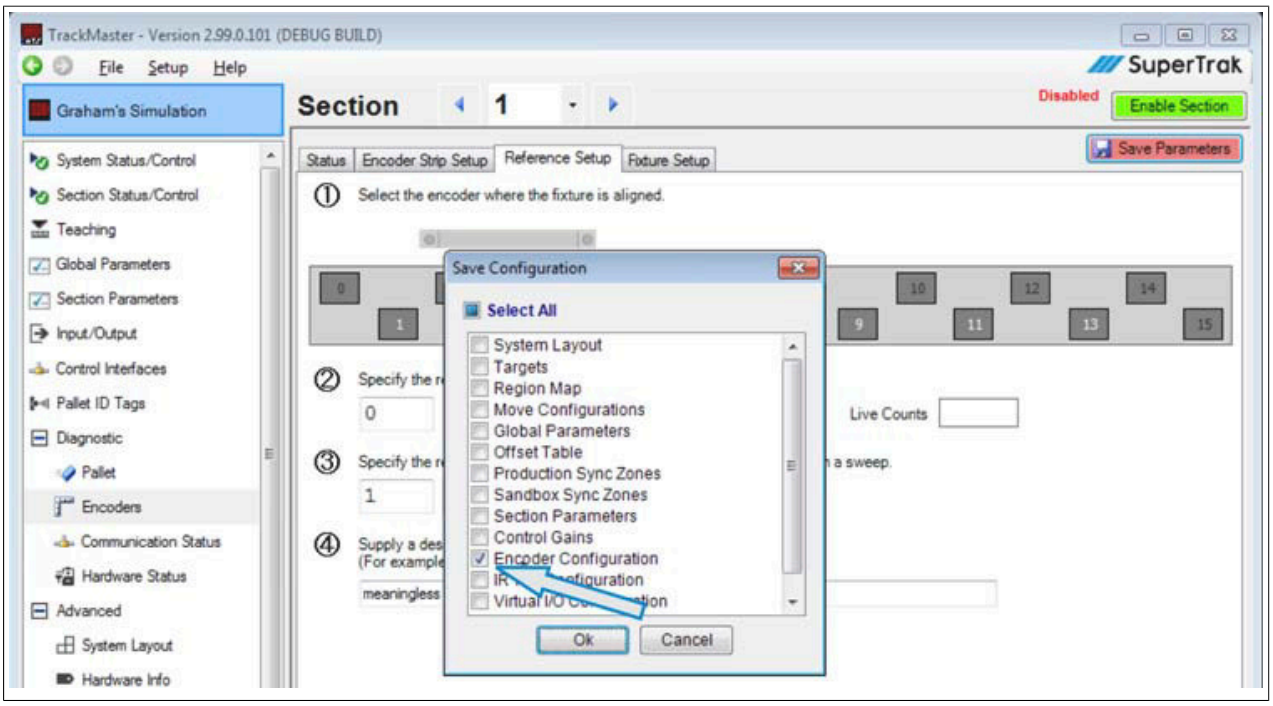


8.2.16.5 Reference the Encoder Position

Complete this procedure to measure the physical distance between two encoders on the straight segment encoder bracket. Redo this procedure if an encoder bracket is replaced on a straight segment that has a stationary mount installed.

1. Complete steps 1-4 of 8.2.16.4 "Verify the Shuttle Setup Stationary Mount Position" on page 163.
2. Click the **Reference Setup** tab.
3. Click the encoder that the stationary mount is aligned with.
4. Click **Capture Live Counts**. The primary reference values display.

5. Click **Begin Sweep**.
6. Remove the shuttle from the shuttle setup removable locate:
    a) Loosen the side thumb screw to release the shuttle.
    b) Raise the side thumb screw.
    c) Slide the shuttle to the right (~15 cm [~6 in.]). TrackMaster calculates and displays the secondary reference values.
7. Click **Save Parameters**, located in the top right of the screen. Encoder Configuration is selected by default on the Save Configuration dialog.



8. Click **OK**.
9. Note the following information for your records: your name, date, the shuttle number that was used for the procedure, and the removable locate number.

8.2.16.6 Adjust the Shuttle Encoder Bracket (Primary Encoder Strip)

> **Information:**
>
> **For optimal shuttle-to-shuttle repeatability, make sure all the shuttles on the SuperTrak transport system have the same encoder strip value in TrackMaster. It is more important for all shuttle encoder strips to be set the same, than for the encoders to be set 0.**

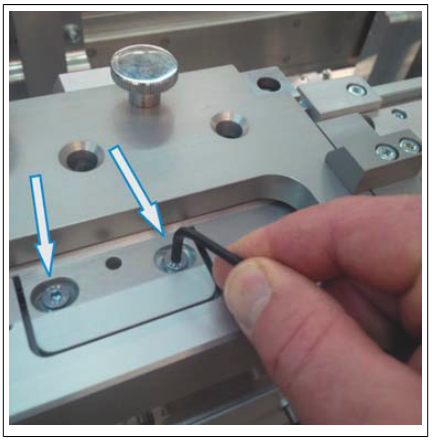
Adjust the shuttle encoder bracket (primary encoder strip) if:

- The shuttle encoder strip bracket is replaced.
- The shuttle encoder strip bracket height is adjusted.
- An alignment issue is identified with the shuttle (for example; the specific shuttle causes a lot of faults, or the plot data is bad when the encoder calibration verification procedure is completed).

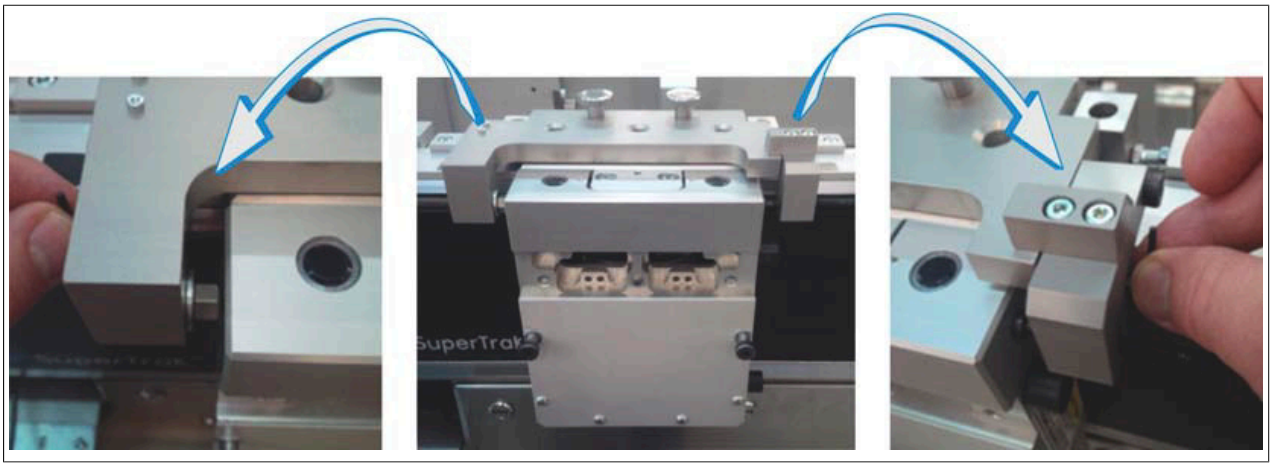
This procedure describes how to center the shuttle encoder bracket with the center of the shuttle.

1. Lock a shuttle in position.
2. In the TrackMaster software, expand Diagnostics, and then click Encoders.
3. Click the Encoder Strip Setup tab.
4. View the value below step 2 (Adjust the encoder strip bracket) on the TrackMaster screen, and then complete one (1) of the following:
    ° If the value is good (green), it will be within ±4 microns. The procedure is complete.
    ° If the value is not good (red), continue to step 5.

5. Slightly loosen the two (2) screws that secure the encoder strip bracket in position. Only loosen the screws enough to make a fine movement. Make sure the hex key is fully-engaged with the screw to avoid stripping the screw head.



6. On each side of the encoder bracket, insert a hex key into the hole and engage the recessed set screw.



7. Turn the hex key(s) the required amount in the required direction to correctly adjust the encoder bracket. Aim for a shuttle position that is within a few microns; the value on the TrackMaster screen should be green. It is helpful to loosen one set screw as you tighten the other. Do not overtighten these set screws, or the bracket may shift out of position.
8. Tighten the two (2) encoder bracket screws from step 5.
9. Verify that the shuttle position did not change (see step 4). If the value did change, repeat steps 4 to 8.

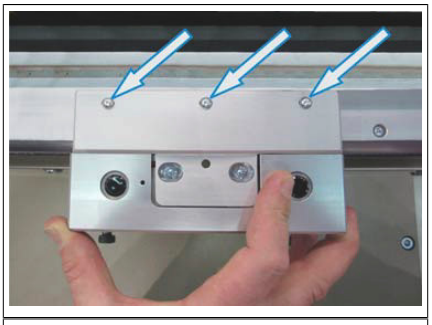
8.2.16.7 Adjust a Secondary Encoder Strip

> **Note:**
>
> **During this procedure, do not over-tighten the side screws because it can bend the secondary strip.**

This procedure describes how to align the secondary encoder strip with the primary encoder strip. Complete this procedure if a shuttle is causing faults, and the primary strip alignment has already been verified.

1. Verify that the primary encoder strip is aligned.
   See Adjust the Shuttle Encoder Bracket (Primary Encoder Strip).
2. Remove the shuttle from the shuttle setup removable locate:
   - Loosen the side thumb screw to release the shuttle.
   - Raise the side thumb screw.
   - Slide the shuttle to the right.

3. Loosen the three (3) screws on the edge of the shuttle encoder bracket. Only loosen the screws enough to make a fine movement. Make sure the hex key is fully-engaged with the screw to avoid stripping the screw head.



4. Install an M2.5 x10 mm screw into each side of the shuttle encoder bracket. Do not over-tighten the screws.

5. Install the shuttle below the removable locate. Slide the shuttle in position slowly. Make sure the shuttle does not bang against the datum of the removable locate because this could shift the tooling out of position.
6. On TrackMaster, click **+ Advanced**.
   If required, click **Diagnostic** > **Encoders**, and then click the **Encoder strip Setup** tab first.
7. View the value below step 3 (Make a coarse adjustment to the secondary strip) on the TrackMaster screen, and then complete one (1) of the following:
   - If the value is good (green), continue to step 9.
     This value may not be zero (0), especially if the strip was previously aligned correctly. The goal is to align the secondary strip close enough to enable the fine adjustment.
   - If the value is not good (red), continue to step 8.
8. As required, turn the side screws (from step 4) the required amount and in the required direction until the value is good (green). The secondary strip is pinched between the side screws. Do not over-adjust the screws because it could bend the secondary strip.
9. Click **Accept**.
10. Slide (sweep) the shuttle to the right, away from the removable locate:
    a) Loosen the side thumb screw to release the shuttle.
    b) Raise the side thumb screw.
    c) Slide the shuttle to the right (~15 cm [~6 in.]).
11. Repeat step 5.
12. View the fine adjustment value displayed in step 5 on the TrackMaster screen, and then complete one (1) of the following:
    - If the value is good (green), continue to step 13.
      Aim for a value close to zero (0).
    - If the value is not good (red), repeat step 8.
13. Tighten the three (3) screws from step 3.
14. Verify that the values are still good.
15. Click **Finish**.
16. Remove the two (2) screws from step 4.

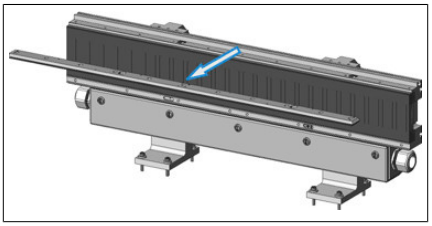
8.2.17 Replace an Upper V-Rail

Replace the upper v-rail if it becomes damaged.

8.2.17.1 Remove an Upper V-Rail - Straight Segment

1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. Remove the left and right encoder brackets.
   See 8.1.3.1 "Remove an Encoder Bracket - Straight Segment " on page 107.
4. Remove eleven (11) screws from the upper v-rail.

5. Note the position of the 0.25 mm (0.01 in.) shim, and then place the shim in a safe location.
6. Slide the upper v-rail out in the forward direction clear of the motor. The v-slots at the ends of the upper v-rail prevent it from being lifted straight up.

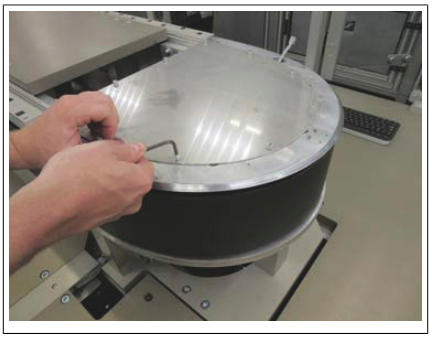


7. Clean the top of the straight segment with a soft cloth to remove any debris.

8.2.17.2 Remove an Upper V-Rail - Curved Segment

1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. Remove the upper v-rail from the two (2) adjacent straight segment.
   See 8.2.17.1 "Remove an Upper V-Rail - Straight Segment " on page 168.
4. Remove the left and right encoder brackets.
   See 8.1.3.1 "Remove an Encoder Bracket - Straight Segment " on page 107.

1. Remove the left and right encoder brackets from the curved segment.
   See 8.1.3.2 "Remove an Encoder Bracket - Curved Segment " on page 107.
2. Remove ten (10) screws and ten (10) washers from the curved segment top cover, and then lift and remove the top cover.

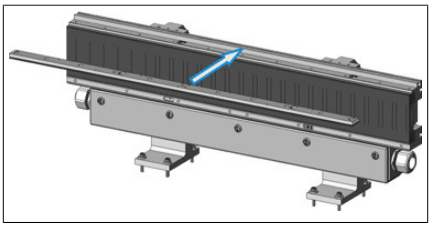


3. Remove eleven (11) screws from the top plate.

4. Lift the top plate straight up to remove it.
5. Clean the top of the curved segment with a soft cloth to remove any debris.

8.2.17.3 Install a Straight Segment Upper V-Rail

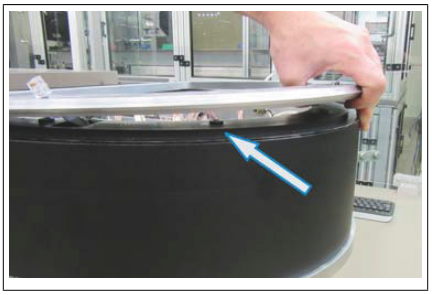
1. Hold the new upper v-rail horizontally,with the counter-bore side up.
2. Slide the new upper v-rail between the upper v-rails of the adjacent straight segments.



3. Equally divide the gap between the ends of the upper v-rail. The gap should be close to 0.5 mm (0.02 in.) on both sides.
4. Install the 0.25 mm (0.01 in.) shims. Restore them to the position you made note of during the removal procedure.
5. Install eleven (11) screws into the top of the upper v-rail, while keeping the back of the upper v-rail biased to the structure.
6. Reinstall the left and right encoder brackets.
See 8.1.3.3 "Install an Encoder Bracket - Straight Segment " on page 108.
7. Verify joint alignment on both ends and adjust if necessary.
See 5.4 "Fine-Adjust the Upper V-Rail" on page 71.
8. Calibrate the encoders.
See the TrackMaster built-in help for the calibration procedure.

8.2.17.4 Install a Curved Segment Upper V-Rail (500 mm)

1. Hold the new curved segment top plate horizontally with the counter-bore side up.
2. Position the top plate down onto the top of the curved segment.
The top plate must align with features in the top of the curved segment.
To prevent damage to the RJ11 connections, make sure the cables are aligned with the RJ11 openings in the top plate.



3. Install eleven (11) screws to secure the top plate in position.
4. Align the curved segment top cover in position.
5. Install ten (10) screws and ten (10) washers to secure the curved segment top cover in position.
6. Reinstall the left and right encoder brackets.
See 8.1.3.4 "Install an Encoder Bracket - Curved Segment " on page 109.
7. Verify joint alignment on both ends and adjust if necessary.
See 5.4 "Fine-Adjust the Upper V-Rail" on page 71.
8. Calibrate the encoders.
See the TrackMaster built-in help for the calibration procedure.

8.2.18 Replace a Flat Wear Strip

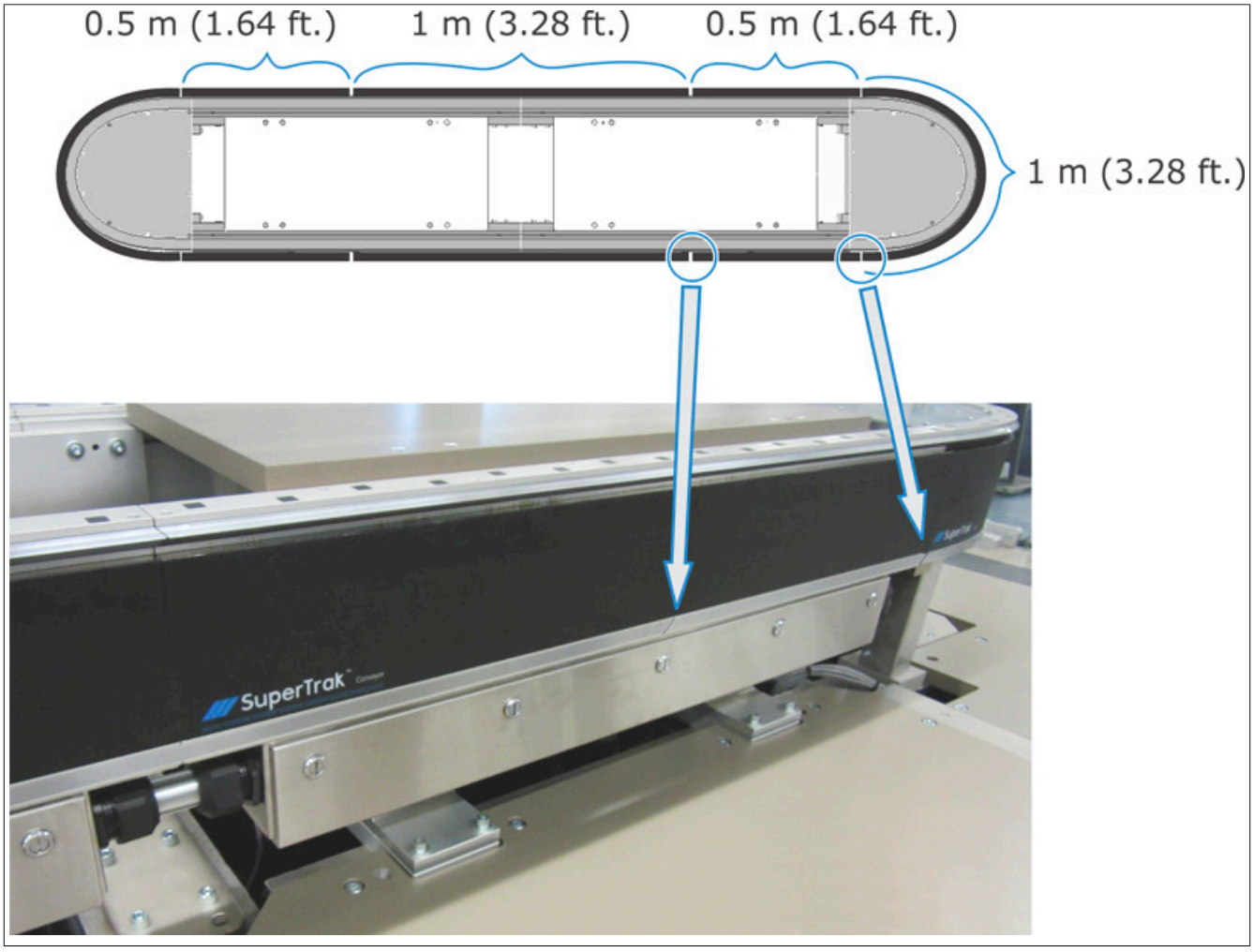
> **Information:**
>
> **The flat wear strip must be installed before shuttles move on the SuperTrak transport system. If a flat wear strip is not installed, shuttles will jam against the motors.**
>
> **The distance between flat wear strips must be 0.5 mm (0.02 in.).**

Replace a flat wear strip if it becomes damaged.

There are three flat wear strip lengths:

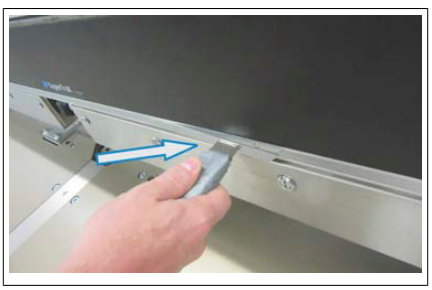
- 1.01 m (3.31 ft.) spans across two (2) straight segments.
- 0.52 m (1.70 ft.) spans across a straight segment and curved segment (500 mm).
- 0.545 m (1.70 ft.) spans across a straight segment and a curved segment (800 mm).

As illustrated, the flat wear strip bridges the join between each SuperTrak transport system segment:



8.2.18.1 Remove a Flat Wear Strip

1. Open the safety circuit.
2. Place a strong magnet on the front surface of one end of the wear strip.

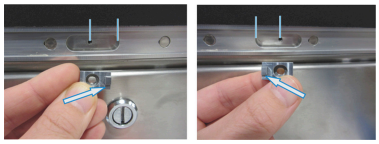


3. Holding onto the magnet, pull the wearstrip straight out of the channel. The flat wear strip is held in position with permanent magnets. Use the magnet to pull the flat wear strip away from the permanent magnets.

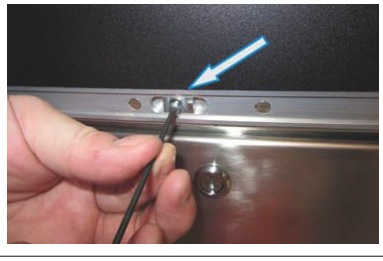
4. Remove any dirt or debris from the flat wear strip channel.
See 9.2 "Cleaning Procedures" on page 175.

8.2.18.2 Install a Flat Wear Strip

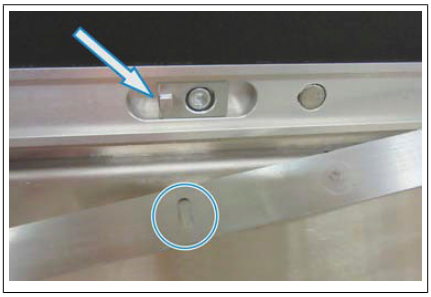
1. Verify that the flat wear strip is the correct length for the installation location.
2. Hold the flat wear strip next to the installation location and verify that a locator exists where the slot of the wear strip aligns with the SuperTrak transport system section.
3. If required, install a locator:
    a) Align the locator with the slot of the SuperTrak transport system section so that the tab faces the long opening. The screw hole is not centered in the slot, one side of the slot is longer than the other.



    b) Install a screw to secure the locator in position.



4. Align the flat wear strip slot with the locator tab.

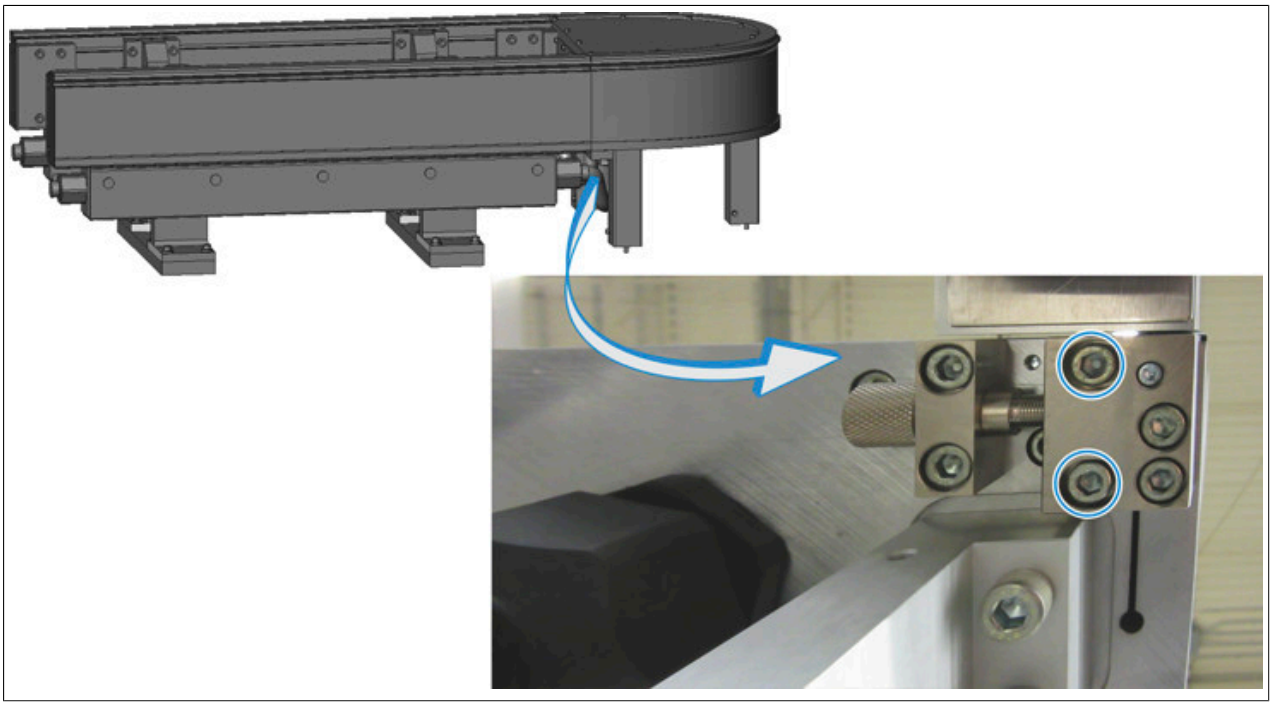


5. Release the flat wear strip. The channel magnets pull the flat wear strip into the channel.
6. If the flat wear strip does not sit flat in the channel, adjust the locator position:
    a) Loosen the locator screw.
    b) As required, slide the locator left or right.
    c) Tighten the locator screw.
7. If the flat wear strip join between a straight segment and a curved segment does not sit flat, see 8.2.18.3 "Align a Flat Wear Strip" on page 171.

8.2.18.3 Align a Flat Wear Strip

The flat wear strip is not removable on the curved segment. Adjustment tooling, located under the curved segment, provides in-and-out adjustment of the flat wear strip on the curved segment.

1. Loosen the two (2) screws that secure the flat wear strip adjustment tooling in position.



2. Turn the adjustment knob as required, until the flat wear strip on the curved segment aligns with the flat wear strip on the straight segment.
3. Tighten the two (2) screws from step 1.

8.2.19 Replace a Motor Cover Label

Each motor includes a protective motor cover label. This is the black label with the SuperTrak transport system logo in the bottom left corner. Replace the motor cover label if it becomes damaged.

8.2.19.1 Remove the Damaged Motor Cover Label

1. Turn the SuperTrak transport system power supply OFF.
2. Lock out and tag hazardous energy.
   See 3.5 "Lockout and Tagout" on page 21.
3. Peel off the old cover label.
4. Clean off any adhesive residue from the motor face.
   Use an adhesive residue cleaner (such as Goo Gone) to remove the adhesive residue, and then clean the motor with isopropyl alcohol or equivalent so the new cover label adheres correctly.

8.2.19.2 Install a new Motor Cover Label

1. Peel off the motor cover label backing.
2. Align the top of the motor cover label with the top edge of the motor.
3. Slowly tilt the motor cover label toward the motor until it is adhered to the motor.
4. Starting from the center of the motor cover label, run your hands over the label to remove any air pockets.
5. Trim away any portions of the motor cover label that extend past the edge of the motor.

9 Maintenance

Maintenance is an important part of the continued and proper operation of the SuperTrak transport system. Failure to perform maintenance as required voids the warranty. Maintain accurate and complete records regarding SuperTrak transport system maintenance and any completed service procedures.

Warranty excludes consumable items and wear parts, such as but not limited to fuses, filters, or lubricants, which by their nature require periodic replacement.

All technicians involved with maintaining the SuperTrak transport system must be qualified and must read and understand the SuperTrak transport system process and safety guidelines.

See 3 "Safety Information" on page 18.

This section provides the following SuperTrak transport system maintenance information:

9.1 Scheduled Maintenance

Note:

The scheduled maintenance tables in this section provide a recommended frequency for each maintenance task. Adjust the frequency according to your installation environment. For example; cleaning may need to be more or less frequent, depending on the environment.

This section provides SuperTrak transport system preventive maintenance tables.

9.1.1 SuperTrak Transport System Components

Component	Frequency	Task	Description
Flat wear strip	Weekly	Clean	• Clean off debris, using a clean, soft cloth dampened with isopropyl alcohol or equivalent.
Shuttles	Monthly	Inspect	• Inspect each shuttle for wear. See 8.2.4 "Inspect a SuperTrak Transport System Shuttle " on page 137.
	Monthly, or as determined for your application	Lubricate	• Add lubricant to the shuttle. See 9.3.1 "Lubricate the Shuttle Lubrication Felt" on page 178.
	Monthly	Clean	• Clean the shuttle body. Wipe off debris using a clean, soft, cloth. • Clean the magnet assembly. Wipe metal debris to a corner or edge of the magnet and then pull it off. • Clean the shuttle encoder strip. See 9.2.2 "Clean a Shuttle Encoder Strip" on page 175.
Power supply	Monthly	Inspect	• Inspect the air filter for dirt and debris. If required, replace the filter. See 9.2.4 "Replace a Power Supply Filter" on page 176.
Table and Supporting Structure	Weekly	Clean	• Clean off debris, using a clean, soft cloth.

9.2 Cleaning Procedures

9.2.1 Clean the SuperTrak transport system

> **Caution!**
>
> **After cleaning the SuperTrak transport system frame, clean up all spills and excess water immediately. Liquid on floors causes a slip hazard.**

> **Information:**
>
> **Never use razor blades, scrapers, squeegees, brushes or any other abrasive tools to clean the SuperTrak transport system frame. Use of these tools may cause damage.**

Remove Dust and Dirt

1. Wipe with a soft damp cloth to remove dust and dirt.
2. Wipe with a mild detergent on a soft cloth.
3. Wipe with a damp soft cloth to remove detergent.
4. Dry with a clean soft cloth or chamois.

Remove Wet Paint, or Grease

1. Wipe with a clean soft cloth dampened with isopropyl alcohol or equivalent.
2. Dry with a clean soft cloth or chamois.

9.2.2 Clean a Shuttle Encoder Strip

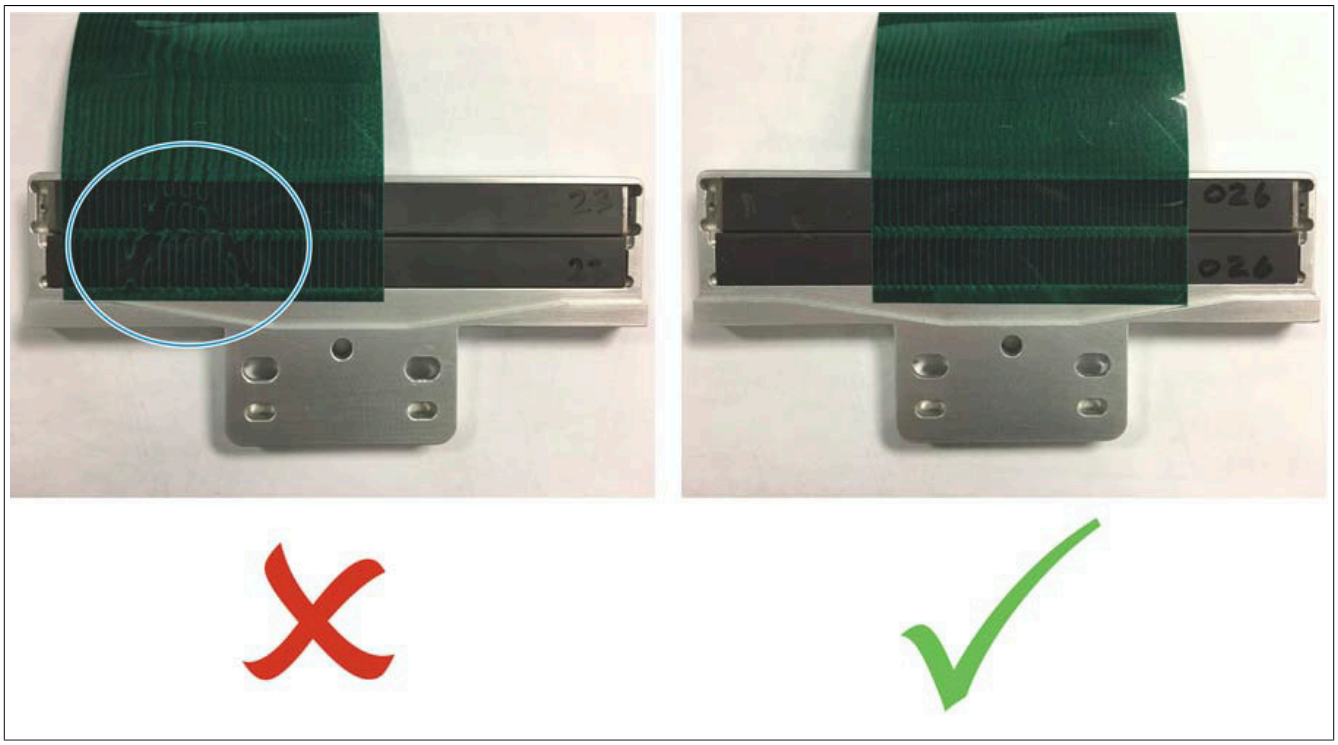
> **Note:**
>
> **Never use a magnet to clean the encoder strip. Contact with magnetic material will cause permanent damage to the magnetic encoder strip.**

1. Gently wipe the encoder strip with a soft, dry, clean cloth.
2. Inspect the encoder strip, to make sure it is not damaged.
   See 9.2.3 "Inspect an Encoder Strip" on page 175.

9.2.3 Inspect an Encoder Strip

Inspect the encoder strip with magnetic viewing film, to verify that the poles appear correctly.

The poles are vertical to the direction of movement but parallel to each other. If the poles appear damaged, replace the encoder strip.



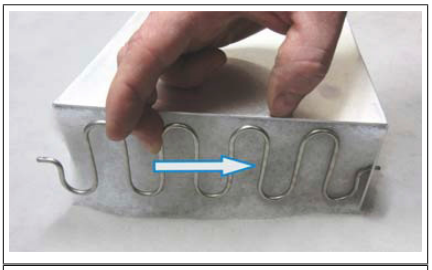
9.2.4 Replace a Power Supply Filter

> **Information:**
>
> **Be careful not to bend the power supply filter retention clip out of shape when removing it.**

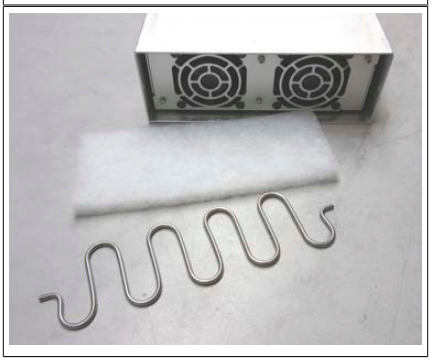
The power supply filter prevents particles from entering the power supply through the cooling fans. Particulate build-up on the power supply filter impedes air flow and may cause the power supply to overheat.

Power supply filter replacement frequency depends on the SuperTrak transport system environment. Regularly inspect the power supply filter and replace it when it is dirty.

1. Carefully compress one end of the filter retention clip until one end releases from the power supply cabinet tab.
2. Remove the filter retention clip.



3. Remove the old filter.
4. Clean away any excess grit or dirt in and around the power supply fans.
5. Position a new filter into the base of the power supply. The filter is not directional, so it can be positioned with either side facing either direction.



6. Place one end of the filter retention clip into the power supply cabinet tab, and then carefully compress the filter retention clip to secure the opposite end into the cabinet tab on the opposite side.

9.2.5 Replace a Straight Segment

Although both options are available, it is recommended that straight segments be repaired rather than replaced.

See 16 "Spare parts" on page 216.

9.2.6 Replace a Curved Segment

Although both options are available, it is recommended that curved segments be repaired rather than replaced.

See 16 "Spare parts" on page 216.

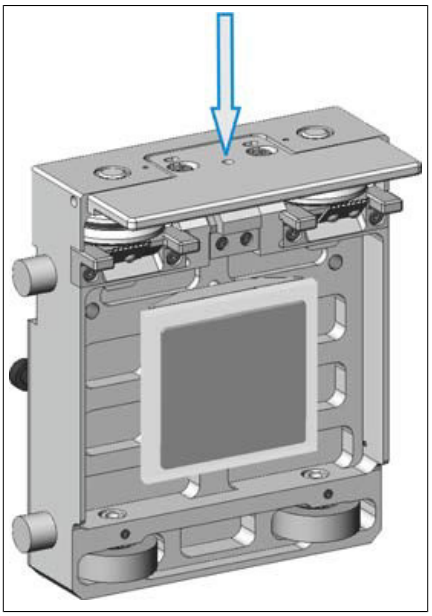
9.3 Lubrication Procedures

9.3.1 Lubricate the Shuttle Lubrication Felt

> **Note:**
>
> **Determine and maintain a lubrication schedule for your application, to ensure that the v-rails and shuttle lubrication felts do not run dry.**

> **Information:**
>
> **Use an oil lubricant with a viscosity similar to ISO grade 46, SAE grade 20. It is recommended to use a food grade NSF registered H1 machine oil for the broadest application range.**

The lubrication felt lubricates the upper v-rail.
Place five (5) to ten (10) drops of lubricant into the lubrication hole at the top of the shuttle.



10 Troubleshooting

This section provides the following SuperTrak transport system troubleshooting procedures for qualified technicians:

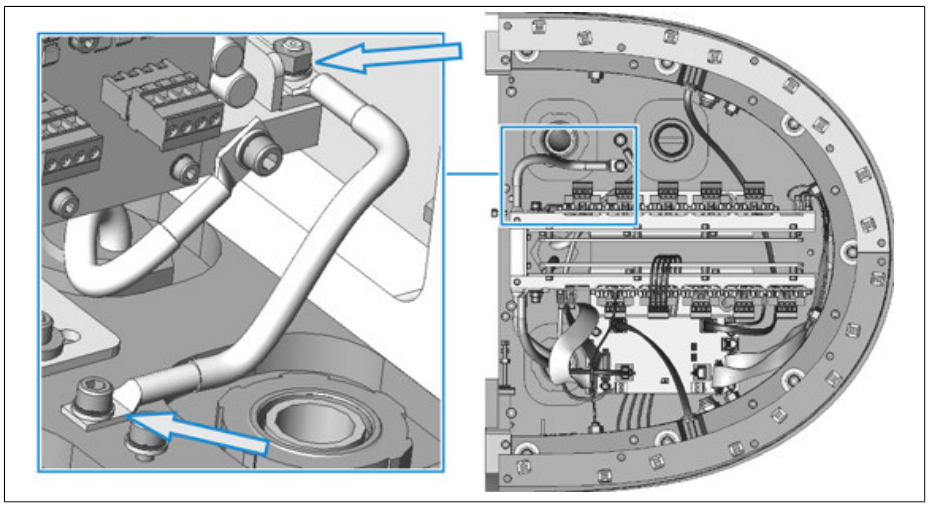
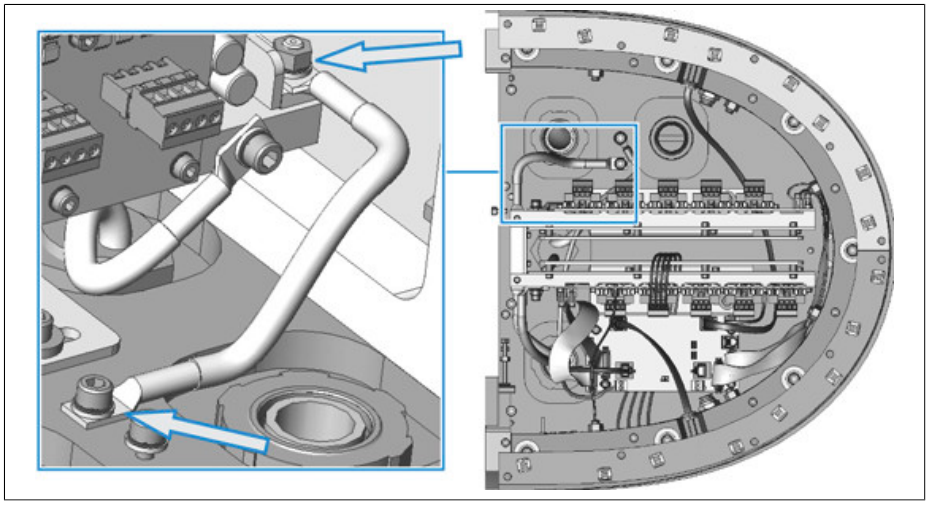
Read and understand the SuperTrak transport system process and safety guidelines before starting any troubleshooting procedures.

See 3 "Safety Information" on page 18.

10.1 Communication Faults

Fault	Resolution
The configuration software is unable to connect to the controller.	• Attempt to retrieve diagnostic information using the following website: http://controller_IP_address/sdm The IP address of the controller is required for this procedure. • Check the controller LEDs. See 10.6.1 "Controller Indicator Lights" on page 186.
A fault message indicates that a communication problem exists.	1. Read the fault message, and reference the integrated TrackMaster built-in help for are solution. See 7.5.2 "Access the TrackMaster Built-in Help" on page 96. 2. Verify that all associated electronic components have power (for example confirm power by looking at the component indicator lights). 3. Turn off power to the controller and gateway boards (24 V digital power). 4. Verify that all associated cables are correctly connected. Make sure the cable connections are correct to the components, and that the connectors are seated correctly at both ends. See Connections. 5. Turn the power ON.

10.2 Pre-Power On Faults

Fault	Resolution
A short exists between the motor power connection and the common connection or ground (frame).	Determine if the short exists between a motor power connection and a common connection or between a motor power connection and ground (frame): 1. Disconnect and isolate one (1) end of the common bonding jumper located in the curved segment that contains the electrical interconnect.  2. Use a multimeter to measure the resistance between the motor power connection and the common connection. If the value displayed on the multimeter screen is OL, the short exists between the motor power connection and ground (frame). If the value displayed on the multimeter screen is <5 Ω, the short exists between the motor power connection and the common connection.
	Isolate the short: 1. Disconnect a motor power connection at each end of the system. This divides the system in half electrically. 2. Use a multimeter to measure the resistance of each half of the system. The half of the system with a measurement of <5 Ω is the half containing the short. 3. Disconnect a motor power connection in the middle of the isolated half of the system. 4. Repeat step 2. 5. Locate the connection between the motor power connection and the common connection or ground (frame).
A short exists between the 24 V digital power connection and the common connection or ground (frame).	Determine if the short exists between a 24 V digital power connection and a common connection or between a 24 V digital power connection and ground (frame): 1. Disconnect and isolate one (1) end of the common bonding jumper located in the curved segment that contains the electrical interconnect.  2. Use a multimeter to measure the resistance between the 24 V digital power connection and the common connection. If the value displayed on the multimeter screen is OL, a short exists between the 24 V digital power connection and the ground (frame). If the value displayed on the multimeter screen is <1000 Ω, the short exists between the 24 V digital power connection and the common connection.
	Isolate the short:

Fault	Resolution
	1. Disconnect a 24 V digital power connection at each end of the system. This divides the system in half electrically. 2. Use a multimeter to measure the resistance of each half of the system. The half of the system with a measurement of <1000 Ω is the half containing the short. 3. Disconnect a 24 V digital power connection in the middle of the isolated half of the system. 4. Repeat step 2. 5. Locate the connection between the 24 V digital power connection and common connection or ground (frame).
A short exists between the motor power connection and the 24 V digital power connection.	Isolate the short: 1. Disconnect a 24 V digital power connection at each end of the system. This divides the system in half electrically. 2. Use a multimeter to measure the resistance of each half of the system. The half of the system with a measurement of <10 Ω is the half containing the short. 3. Disconnect a 24 V digital power connection in the middle of the isolated half of the system. 4. Repeat step 2. 5. Locate the connection between the motor power connection and the 24 V digital power connection.

10.3 Power Faults

Fault	Resolution
Motor supply voltage	• Make sure the motor power is ON before attempting to enable the SuperTrak transport system. This is typically a PLC programming error. • Verify that the breakers in the SuperTrak transport system control panel are ON. • Verify that all power supplies are functioning correctly, and that all power wiring is installed correctly and securely. • Check the 50 A main motor fuse(s) and replace if necessary. See 8.1.6 "Replace the Main Motor Fuse" on page 117.
Motor I2T	• Check for a mechanical interference with the shuttle. The fault indicates the location. • Verify that shuttle performance limits (such as shuttle acceleration, duty cycle, or payload) are not exceeded. Reduce if required. The fault indicates the location. • Check the shuttle stability. Watch the shuttle during operation for abnormal oscillation. Contact maintenance to verify shuttle tuning. • Replace the coil driver board, if no other solution resolves the issue. See 8.1.1 "Replace a Coil Driver Board" on page 98.
Excessive current loop error	• Verify that the coil is correctly connected to the coil driver board (green connectors). • Test the coil resistance. It should be low (less than 1 ohm) but not a short-circuit (less than 0.3 ohm). • If the resistance test fails, a problem may exist with the coil. Replace the coil (replacing a coil cannot be done in the field). If the resistance test passes, a problem may exist with the coil driver board. See 8.1.1 "Replace a Coil Driver Board" on page 98.
Coil driver(s) shut down error	• Verify that the power supplies are functioning correctly. • A problem may exist with the coil driver board. See 8.1.1 "Replace a Coil Driver Board" on page 98.

10.4 Shuttle Faults

Fault	Resolution
Shuttle following error	• Check for mechanical or other interference with the shuttle (for example, a jammed part). The fault indicates the location. • Inspect the shuttle. See 8.2.4 "Inspect a SuperTrak Transport System Shuttle " on page 137. • Verify that a coil fuse is not blown. If a shuttle travels across a coil with a blown fuse, shuttle momentum is usually adequate to allow acceptable control. However, if the shuttle attempts to stop in the vicinity of this coil, it will have poor control, which will trigger a following error. See 8.1.7 "Replace a Coil Fuse" on page 118. • Check for a damaged upper v-rail, flat wear strip, or motor cover label.
Shuttle lost position	• Check the encoder strip, to make sure that it is not damaged. See 8.2.4 "Inspect a SuperTrak Transport System Shuttle " on page 137. • Check encoder calibration. See the TrackMaster built-in help for the calibration procedure. • Verify the encoder functionality. View the TrackMaster Encoder screen, to make sure the encoders are functioning.

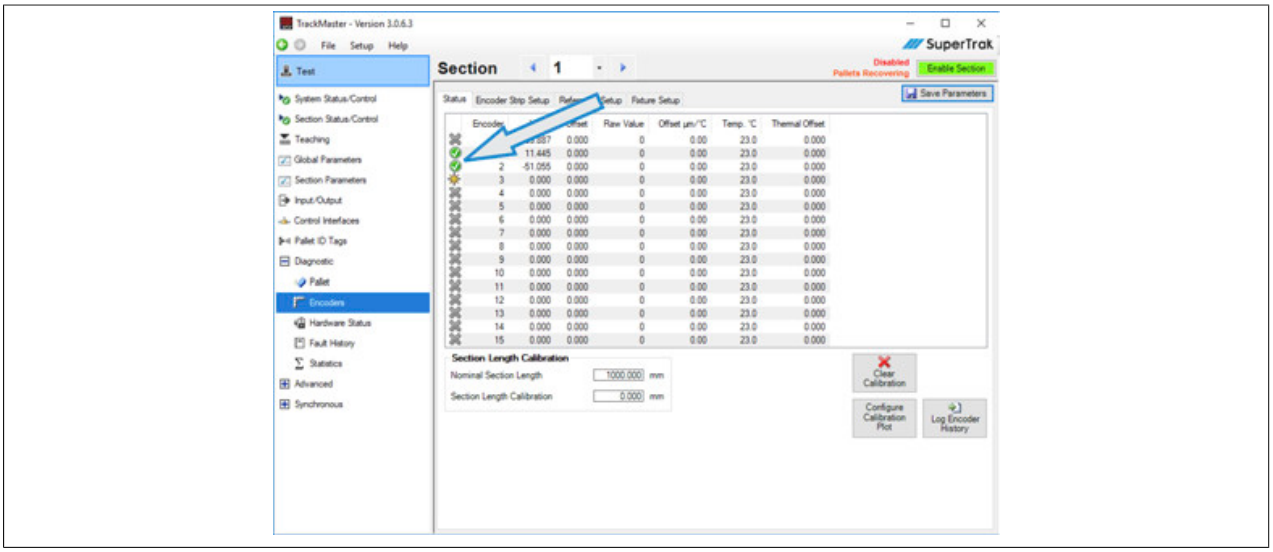
10.5 Test Straight Segment or Curved Segment Hardware

> ### Information:
>
> **TrackMaster software is required for most of the straight segment or curved segment hardware testing procedures.**

This section describes how to test the functionality of straight segment or curved segment hardware components.

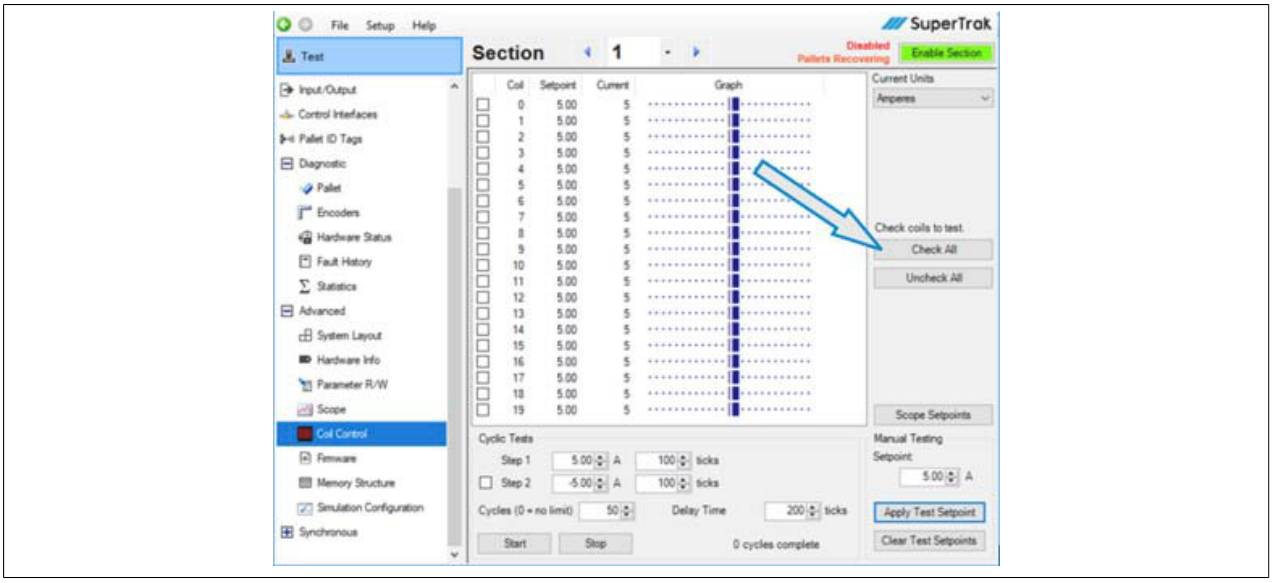
10.5.1 Test Encoder Functionality

1. Open TrackMaster.
2. In the left pane, click **Diagnostic** > **Encoders**.
3. If required, click the **Status** tab.
4. At the top of the screen, click ◄ or ► to select the required "Section" to test.
5. By hand, slowly move a shuttle across the section you selected in step 3. As you move the shuttle, watch the grey Xs on the left side of the screen. The Xs, beginning with "Encoder" 0 or 15 depending on the direction the shuttle is moving, should change to a yellow star and then to a green checkmark. As the shuttle continues to travel across the section the green checkmark may or may not change back to a yellow star and then back to a grey X. The encoders pass if all the grey Xs sequentially change to a green checkmark.



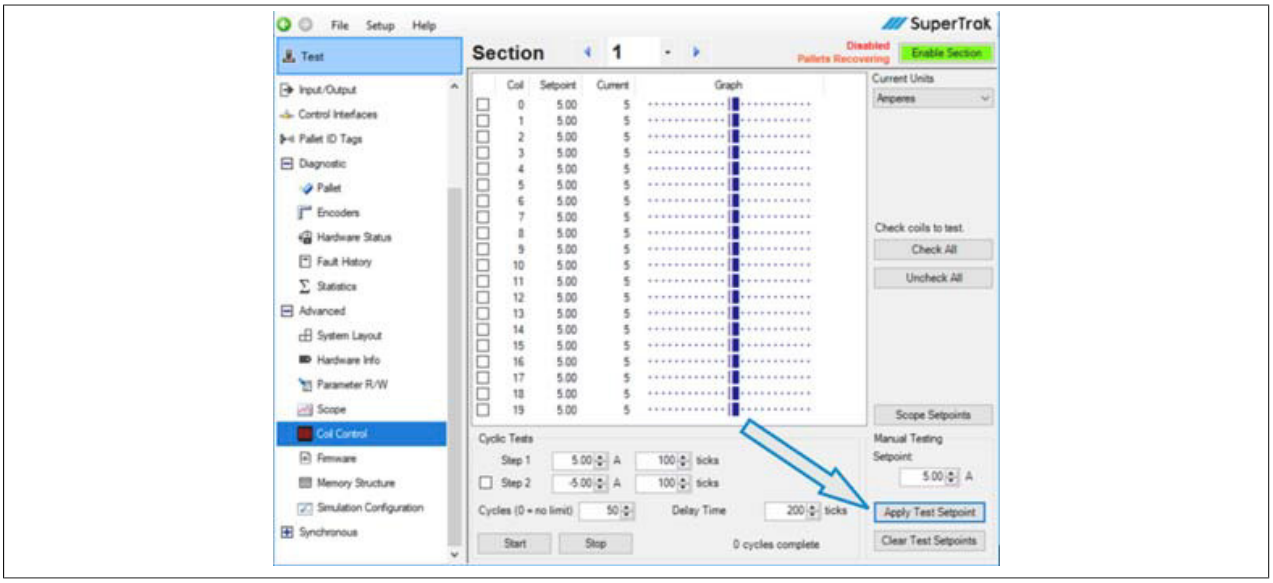
10.5.2 Test the Coil Functionality

1. Remove all shuttles from the straight segement or curved segment to be tested.
2. Turn the SuperTrak power supply power ON. This is generally done by turning the system power ON when the safety circuit is closed.
3. Open TrackMaster.
4. In the left pane, click **Advanced** > **Coil Control**.
5. Click **Check All**.

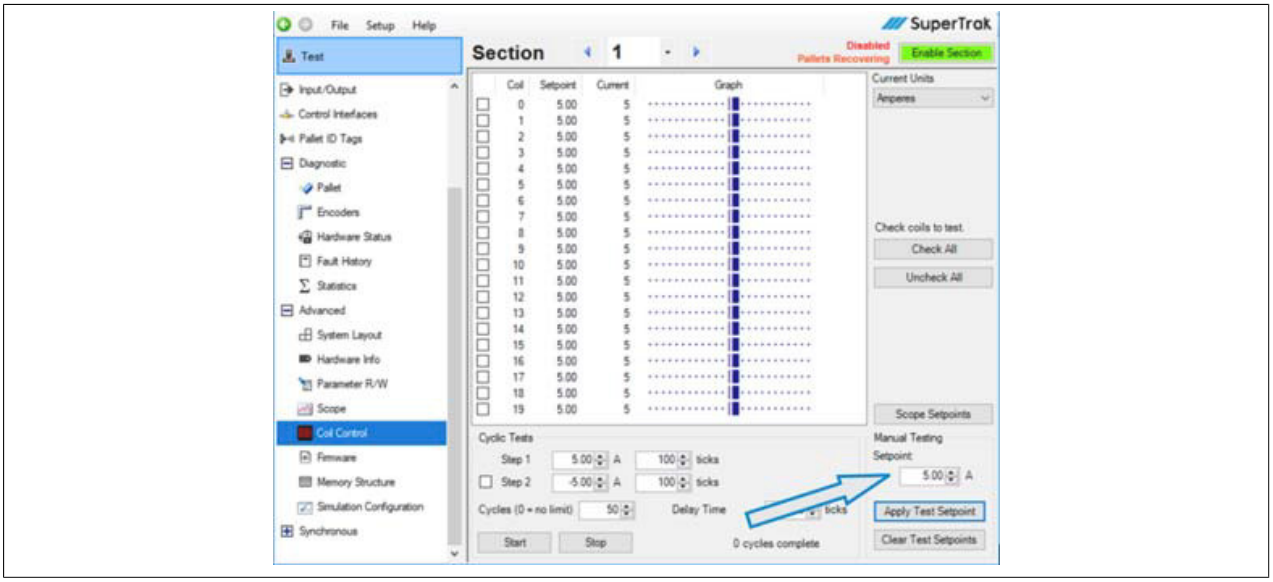


6. Verify that the section is disabled and that there are no active faults or warnings. The top right of the screen displays "Disabled" when faults or warnings exist. If required, open the "Section Status/Control" screen to clear any faults or warnings.

7. Verify that the "Setpoint" is set to 5.00 A.
8. Click **Apply Test Setpoint**. To pass, each "Coil" should display a "Current" of 5.00 ±0.5.



9. Click **Clear Test Setpoints**.
10. Enter a value of -5.00 into the "Setpoint" field.



11. Click **Apply Test Setpoint**. To pass, each "Coil" should display a "Current" of -5.00 ±0.5. This verifies that the current control works in both directions.
12. Click **Clear Test Setpoints**.

10.5.3 Reversed Polarity Coil Test

If a coil is connected backward it will have reversed polarity. This is the method to test for reversed polarity in a coil:

Manually Test with TrackMaster

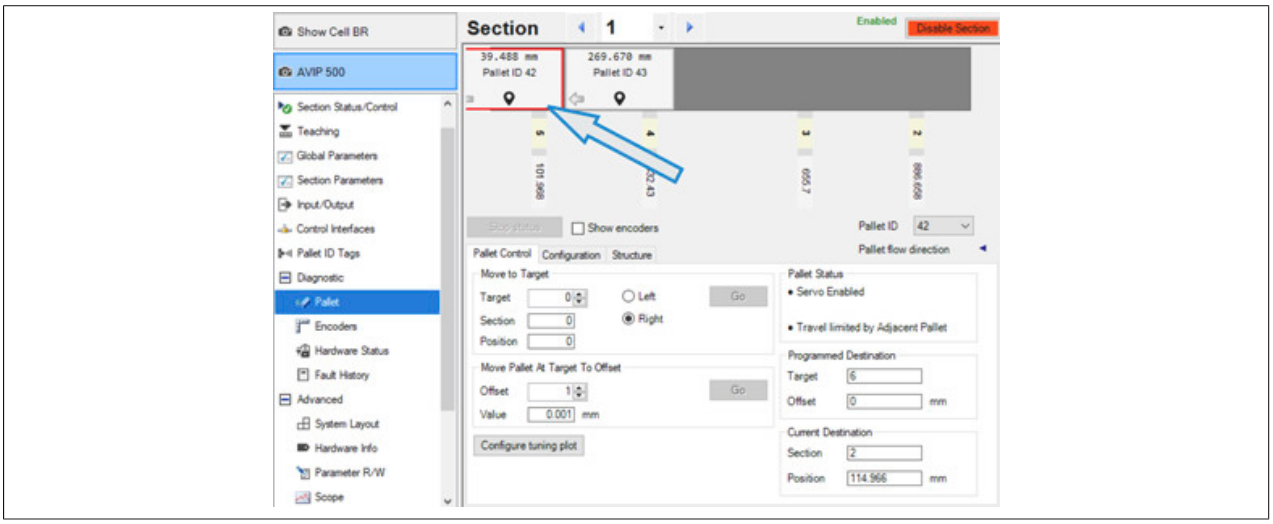
> **Information:**
>
> **Before starting this test, manually block any system tooling that could interfere with shuttle motion. Failure to do so, could result in system damage.**

During this test, a shuttle is manually commanded across the straight segment or curved segment being tested and across the segment on either side of the straight segment or curved segment being tested.

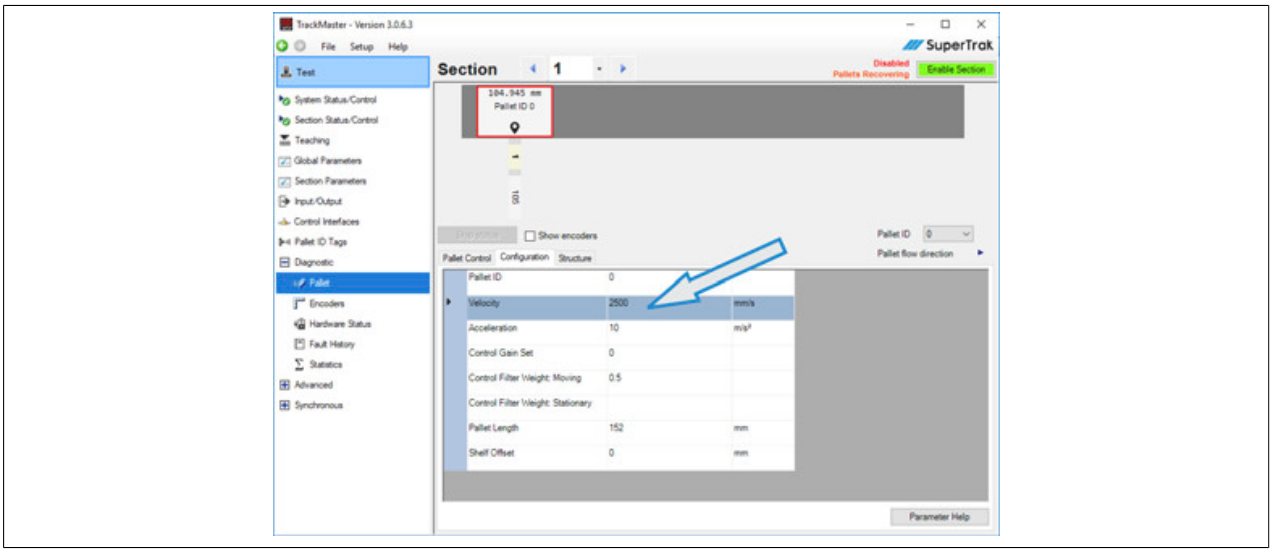
1. Prepare the system and SuperTrak shuttles:

a) Verify that no system tooling can interfere with shuttle motion. If required, block the system tooling out of the way.
b) Remove all shuttles from the straight segment or curved segment to be tested and the segments on each side of it.
c) Position a shuttle directly on the right or left side of the segment to be tested.

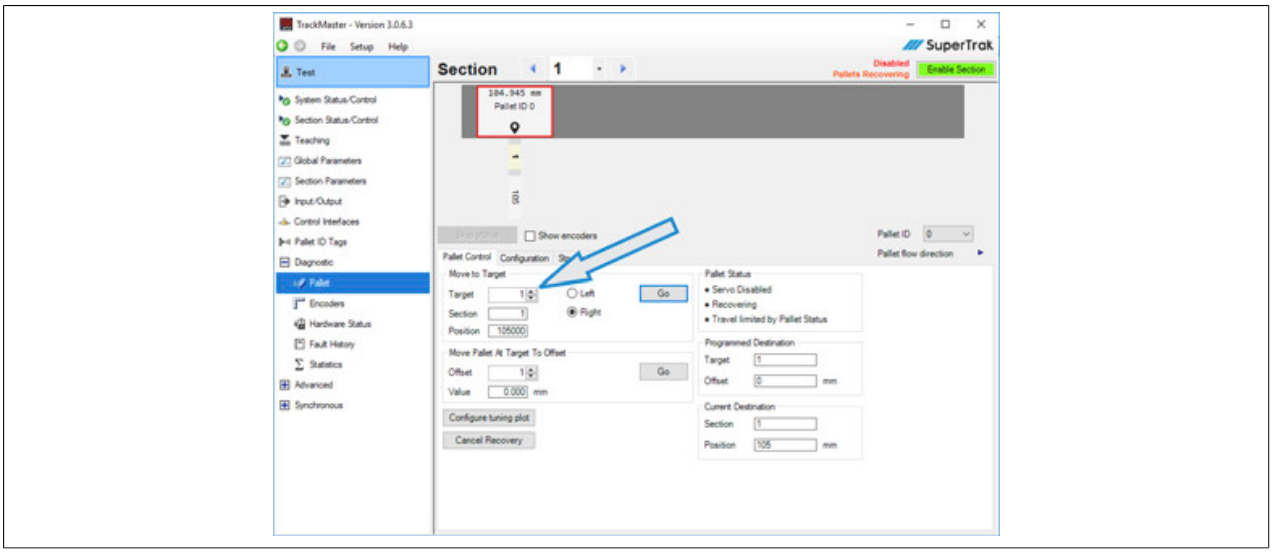
2. Open TrackMaster.
3. In the left pane, click **Diagnostic** > **Pallet**.
4. At the top of the screen, click ◄ or ► to select the "Section" that contains the shuttle to use for the test. The selected shuttle graphic has a red outline.



5. Click the **Configuration** tab.
6. Note the value of the "Velocity" parameter, so that you can change the value back to this after the test.



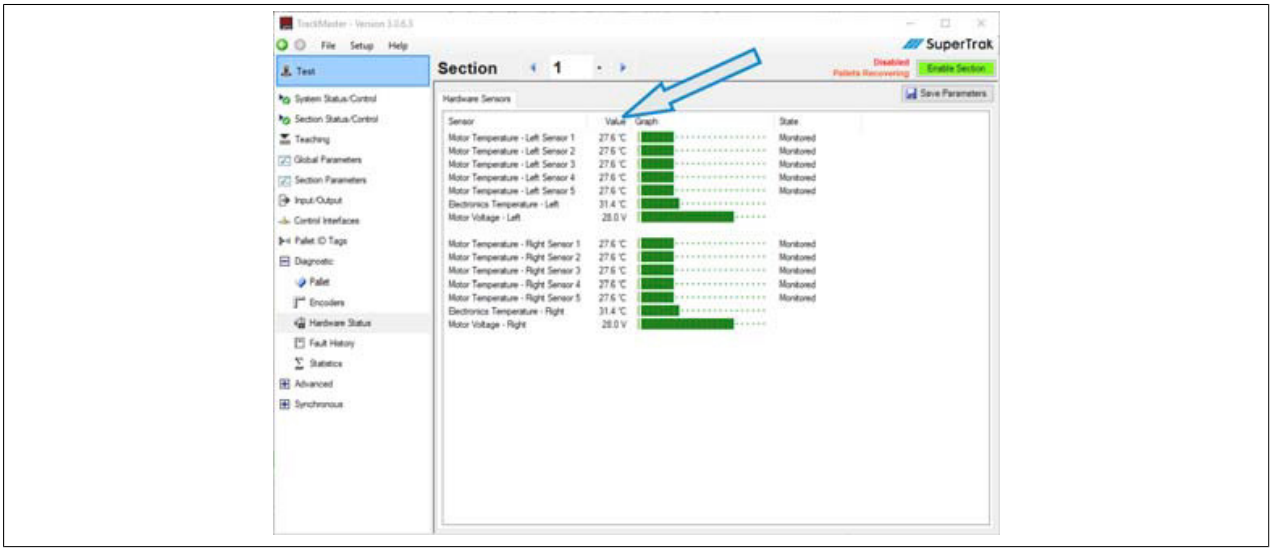
7. Set the "Velocity" parameter to 50 mm/s.
8. Click the **Pallet Control** tab.
9. Under "Move to Target", select a "Target" that is past the segment to be tested and in the direction that will cause the shuttle to travel over the segment to be tested.



10. Select the correct shuttle direction (**Left** or **Right**), and then click **Go**.
11. With the SuperTrak power supply power ON, click **Diagnostic** > **Pallet**, and then click **Enable Section** for the segment being tested and the segments on each side of it. Do not enable power to any other segments because this may cause all the SuperTrak shuttles to move around the system.
12. In the left pane, click **System Status/Control**, and then click **Disable Zone**. The segment passes if the shuttle fully travels over the segment without producing an "Excessive Follow Error" fault.
13. Click the **Configuration** tab.
14. Set the "Velocity" parameter value to the value noted in step 6.

10.5.4 Test the Status of the Hardware

1. Open TrackMaster.
2. In the left pane, click **Diagnostic** > **Hardware Status**.
3. Verify that the "State" of all motor temperature sensors is set to "Monitored".
4. Verify that the "Value" for:
    - Motor temperature sensors are reasonable. This value varies depending on the state of the system. Note that each straight segment and curved segment has two (2) coil driver boards, and each coil driver board has five (5) thermistor connections. A straight segment has ten (10) thermistors, so it uses all the connections on the coil driver boards. A curved segment has six (6) thermistors, so it only uses three (3) connections. It is normal for thermistors 2 and 4 to be ignored for curved segments because the software sets these to "Ignored" by default.
    - Electronics temperatures are within a reasonable range (25-50°C [77- 122°F]).
    - Motor voltages are representative of the current SuperTrak power supply power state (ON or OFF), and are within a reasonable range (27-29 V).



10.5.5 Test the Rail System

1. Inspect both the flat and upper v-rail for any damage or debris build-up.
2. Inspect the flat rail, to verify that the wear strip is correctly seated in the groove of the track structure.
3. Slowly, manually move a shuttle fully across a straight segement or curved segment. As you move the shuttle, feel for any resistance in shuttle motion.
4. Verify that the alignment of the upper v-rail is correct between every straight segment and between the straight segments and curved segements.
5. Verify that the alignment of the flat rail is correct between every straight segment and between the straight segments and curved segments.

10.5.6 Test a Magnetic Shunt

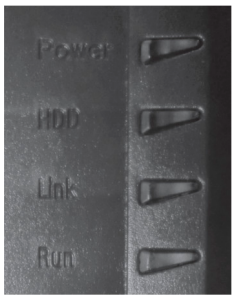
1. Manually move a shuttle over straight segment and curved segment joints. Feel for an excessive amount of resistance (magnetic bump).
2. If necessary repeat this in several locations to obtain a baseline of what the magnetic bump should feel like.

10.6 Diagnostic Lights

This section provides information about the indicator lights on the SuperTrak transport system hardware.

10.6.1 Controller Indicator Lights

The controller has four (4) indicator lights: Power, HDD, Link, and Run.



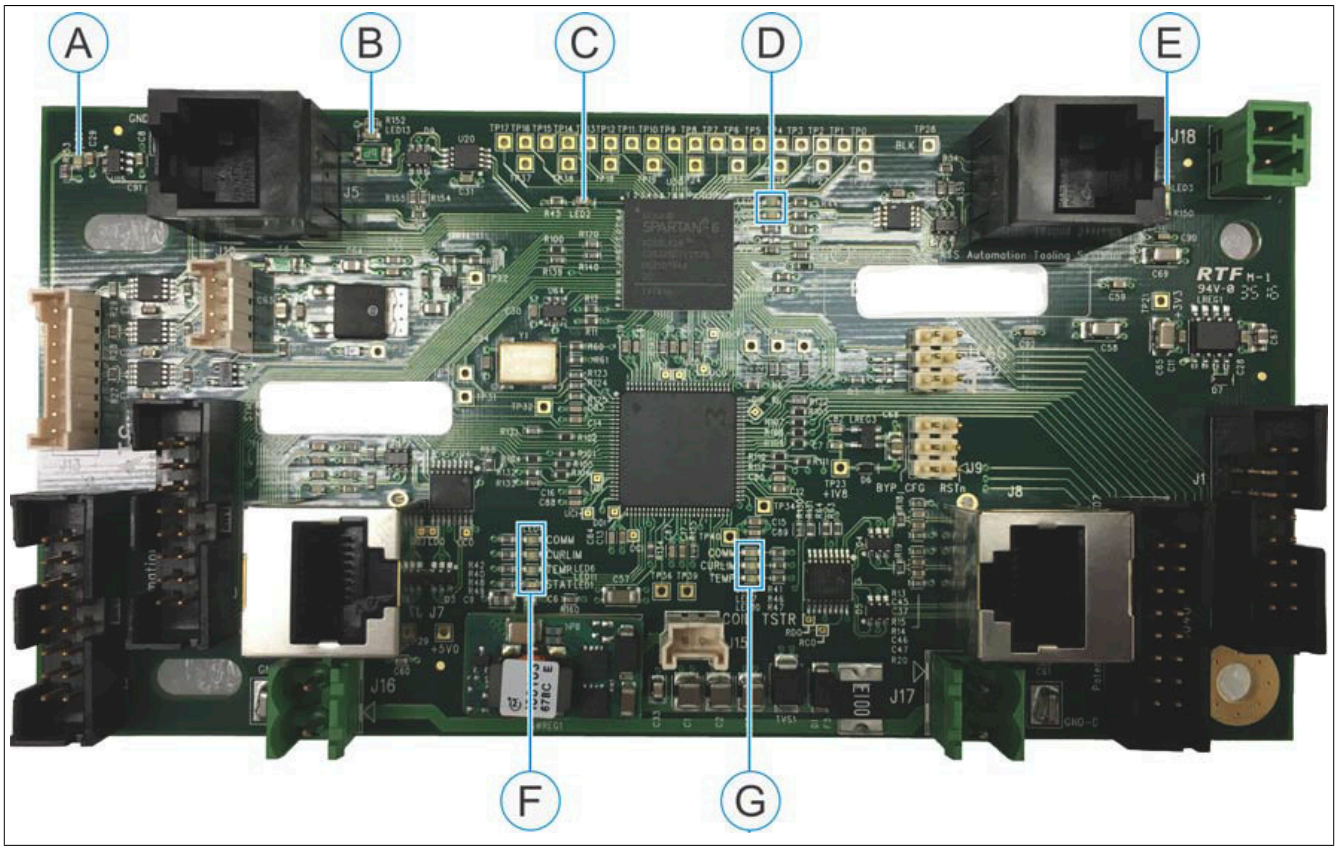
The following table summarizes the indicator light behavior.
See the *B&R APC910 User's Manual* for additional information.

Indicator	Color	Light State	Normal	A Problem May Exist
Power	Green	Solid	✓	
		Blinking		A controller hardware problem exists. Contact your vendor for assistance.
	Red	Solid		The controller power is OFF. Press the power button to turn it ON.
		Blinking		A controller hardware problem exists. Contact your vendor for assistance.
	Red/ Green	Blinking		
HDD	Yellow	Occasional Blink	✓	
Link	Yellow	Solid	Normal when an SDL display is connected.	
		Blinking		SDL display power was interrupted. Check the cables.
		Off	Normal when an SDL display is not connect-ed.	
Run	Green	Solid	✓	
		Blinking	✓	The controller startup sequence is not yet complete. Wait several minutes.
	Red	Solid		A controller software problem exists. Contact your vendor for assistance.
		Blinking		

10.6.2 Gateway Board (8FZSB0.00.0200-1) Indicator Lights

> **Information:**
>
> **The gateway board image may not reflect the latest version of the gateway board.**

The gateway board has thirteen (13) indicator lights.



ID	LED#	Color	Light State	Normal	A Problem May Exist
F	1 (STAT) [1]	Green	ON	✓	
			Blinking very slow		The network is not configured.
			Blinking slow		The FPGA is not configured.
			Blinking fast		The FPGA is ready but inactive.
			OFF		Power is OFF.
C	2	Green	Any	N/A	A software diagnostic LED. This indicator is for development purposes only.
E	3	Red	ON		Power is disabled due to excessive current draw, a short-circuit exists in the encoder board or in the encoder board cable.
			OFF	✓	
F and G	4 (COMM) [2] and 5 (COMM) [2]	Orange or Blue	ON		Gateway board communication does not exist with the controller.
			Blinking fast		The coil current set points are not received.
			OFF	✓	
F and G	6 (CURLIM) [3] and 7 (CURLIM) [3]	Red	Blinking fast	✓ (normal if the motor power is OFF)	The coil driver board is deactivated.
			OFF	✓	
D	8	Red	Any	N/A	Software diagnostic LEDs. These indicators are for development purposes only.
D	9	Yellow			
G	10 (TEMP) [4]	Yellow	ON	✓	The gateway board is the last in the network.
			OFF	✓	The gateway board is not the last in the network.
F	11 (TEMP) [4]	Yellow	ON	✓	The gateway board is configured on the left network.
			OFF	✓	The gateway board is configured on the right network.
B	13	Red	ON		Power is disabled due to excessive current draw, A short-circuit exists in the encoder board or in the encoder board cable.
			OFF	✓	
A	14	Red	ON		Power to the IR reader is disabled because of excessive current draw. A short-circuit may exist in the IR reader or in the IR reader cable.
			OFF	✓	

1) STAT stands for status.
2) COMM stands for communication.
3) CURLIM stands for current limit. Note that the text does not correlate to the LED function.
4) TEMP stands for temperature. Note that the text may not correlate to the LED function. Gateway boards that were manufactured before mid-2016 and have not received a CPLD firmware update use the yellow LEDs as follows:

- ON = defective thermistor detected
- blinking fast = the operating temperature limit is exceeded
- OFF = the motor temperature is within operating range

10.6.3 Coil Driver Board (8FZSB0.00.0100-1) Indicator Lights

The coil drive board has two (2) indicator lights: one green, and one red.

Indicator Light	Light State	Normal	A Problem May Exist
Green	ON	✓ (power is ON)	
	OFF		The power is OFF.
Red	ON		The A/D CPLD is not programmed. Contact your vendor for assistance.
	OFF	✓	

11 Specifications

This section provides SuperTrak transport system specifications. Information in this section is for general reference and is subject to change without notice.

11.1 Performance

The SuperTrak transport system is designed to meet the following optimal performance:

Performance Description	Value
Maximum speed	2.5 m/s (8.2 ft./s)
Acceleration [3]	1 g with 10 kg (22 lb) payload 4 g with 1 kg (2.2 lb) payload
Payload	Up to 10 kg (up to 22 lb) per shuttle[1]
Stop repeatability - straight segment	±0.01 mm (0.00039 in.)
Stop repeatability - curved segment	±0.025 mm (0.001 in.)
Number of supported shuttles	As many as can physically fit on the track length
Process on curve	Yes, with a 50% derating on acceleration and velocity derating from 2.5 m/sec with 3.5 kg payload down to 1 m/sec with 10 kg payload
Shuttle options	Standard configuration with 2 or 3 magnet array options
Collision avoidance	Built in
Power consumption	10 W/segment, 150-275 W/shuttle[2]
Servo update rate	800 µs typical

1) Higher payloads are possible.
2) Power consumption varies depending on the aggressiveness of the application: it may be less with less demanding requirements or more with more demanding requirements.
3) Note duty cycle can become limited by maximum motor temperature limits.

11.2 Environment Conditions

State	Specification	Straight Segment or Curved Segment Value	SuperTrak Transport Systemt Power Supply Value
Operation	Temperature (ambient)	5°C (41°F) to 55°C (131°F)	-20°C (-4°F) min. to 71°C (159.8°F)
	Humidity (relative)	5% to 85% non-condensing	20% to 90%
Storage	Temperature (ambient)	-25°C (-13°F) to 55°C (131°F)	-20°C (-4°F) min. to 75°C (167°F)
	Humidity (relative)	5 to 95% non-condensing	20 to 90%
Transport	Temperature (ambient)	-25°C (-13°F) to 70°C (158°F)	-20°C (-4°F) min. to 75°C (167°F)
	Humidity (relative)	Max. 95% at 40°C (104°F)	20% to 90%

11.3 Environmental Limits

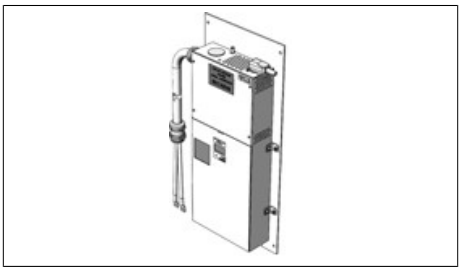
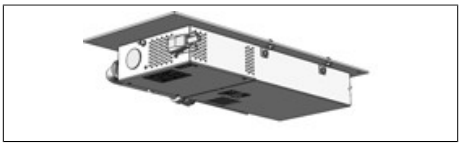
Specification	SuperTrak Transport System Power Supply Value
Mains configuration	1 phase x 200-240 VAC 50/60 Hz Grounding: TN
Degree of contamination	Pollution degree 2 environments
Over-voltage capacity	II
IP protection	IP20
NEMA protection	NEMA type 1
Maximum installation altitude	2000 m (6561.6 ft.)

11.4 Weight

Component weight

Component	Wert
Shuttle, 2 magnets	2,02 kg (2.2 kg including magnet cover plate)
Shuttle, 3 magnets	2.4 kg (2.7 kg including magnet cover plate)
Shuttle, 2 magnets with IR identification	2.1 kg (2.3 kg including magnet cover plate)
Shuttle, 3 magnets with IR identification	2.5 kg (2.8 kg including magnet cover plate)
Power supply without mounting plate	9 kg
Straight segment, horizontal	51 kg
Straight segment, vertical	52 kg
Curved segment, 500 mm	65 kg
Curved segment, 800 mm	109,8 kg
Curved segment, vertical	64 kg

11.5 Installation Requirements

Component	Specification	Value
SuperTrak transport system power supply	Input rating	1 phase x 200-240 VAC 50/60 Hz
	Output rating	28 VDC 47 A continuous 70 A peak
	Fuses/circuit breaker	10 A UL489 breaker Type CC fuses, or type J fuses
	Terminal connection cross-section	Connect as per local requirements for 10 A
	Permitted mounting orientations	Power supply filter down • Vertical with the air filter down.  • Horizontal with the access panel facing down.  • Any orientation if mounted inside a sufficient enclosure with adequate cooling.
Straight segment	Input rating	28 VDC 100 A peak
	Output rating	Force of up to 150 N/shuttle
	Fuses/circuit breaker	50 A fuses
	Terminal connection cross-section	16 mm² cables terminated with a wire lug
	Permitted mounting orientations	Horizontal upright, or vertical
Curved segment (500 mm)	Input rating	28 VDC 100 A peak
	Output rating	Force of up to 150 N/shuttle
	Fuses/circuit breaker	50 A fuses
	Terminal connection cross-section	16 mm² cables terminated with a wire lug
	Permitted mounting orientations	Horizontal upright, or vertical
Curved segment (800 mm)	Input rating	28 VDC 150 A peak
	Output rating	Force of up to 150 N/shuttle
	Fuses/circuit breaker	50 A fuses
	Terminal connection cross-section	16 mm² cables terminated with a wire lug
	Permitted mounting orientations	Horizontal upright

11.6 Electrical Services

It is strongly recommended to provide an UPS with following specifications:

Service	Specification	Value
UPS	Line voltage	24 VDC
	Current rating	15 A

11.7 Electromagnetic Compatibility (EMC) Requirements for High-Frequency Emissions

The following table provides the high-frequency emissions in accordance with EN 61000-6-4:

Emission	Test Accordance	Class	Emission
Conducted emissions	IEC 55011	Class A Group 2	150 kHz - 30 MHz
Radiated emissions	IEC 55011	Class A Group 2	150 kHz - 1000 MHz

11.8 Electromagnetic Compatibility (EMC) Requirements for Immunity to Disturbances

The following table provides high-frequency disturbance limits in accordance with EN 61000-6-2:

Disturbance Type	Test Accordance	Description	Limit Requirement	PC[1)]
Electrostatic discharge	EN 61000-4-2	Contact discharge to powder-coated and bare metal housing parts.	4 kV	B
		Discharge through the air to plastic housing parts.	8 kV	B
Electrostatic fields	EN 61000-4-3	Housing, completely wired.	10 V/m, 51 MHz, 144 MHz, 222 MHz, 431 MHz, 2.4 GHz Radiated field as produced by portable radios modulation.	A
Burst	EN 61000-4-4	AC mains	±2kV, 1 min, direct coupling.	B
		I/O ports	N/A	B
Surge	EN 61000-4-5	Power connection	±2 kV, CM (L-Gnd), ±1 kV, DM (L-L), N/A on I/O Ports	B
Highfrequency conducted disturbances	EN 61000-4-6	Power connection	0.15 - 250 MHz, 10 Vrms, 80% amplitude modulation at 1 kHz	A
		I/O ports	N/A	-

1) Performance criteria (PC) descriptions are as follows:

- A
  The system will continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by Automation Tooling Systems when the system is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified, then either of these may be derived from the product description and documentation and by what the user may reasonably expect from the system if used as intended. Preprogrammed move of shuttles showing speeding up, sudden stop in predetermined position, short moves back-and-forth and speeding up again, are simulated to show all possible scenarios of the shuttle moves. No stopping of shuttles, no errors on the control screen, and no alarms are allowed during the application of the test voltage.
- B
  After the test, the system will continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by Automation Tooling Systems, when the system is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test. If the minimum performance level (of the permissible performance loss) is not specified by Automation Tooling Systems, then either of these may be derived from the product description and documentation and by what the user may reasonably expect from the system if used as intended.

12 Data sheets

12.1 SuperTrak segments

12.1.1 8FZAM1.0A.A000-1

12.1.1.1 General information

The straight segment with front mounted electronics (FME) generates and regulates the electromagnetic field for the shuttles.

Features

- Bevels on the upper v-rail overlap at SuperTrak conveyor section transitions to provide a smooth, low-vibration transport surface for shuttles.
- Includes:
  - Encoders for contact-free position tracking of shuttles.
  - Eight (8) slots for mounting brackets, cable ducts, and other tooling.
  - Two (2) stands for stable mounting on a base frame and smooth height adjustment.
  - Accessible electronics with door.
- Requires minimal maintenance (weekly cleaning of the flat wear strip).

12.1.1.2 Order data

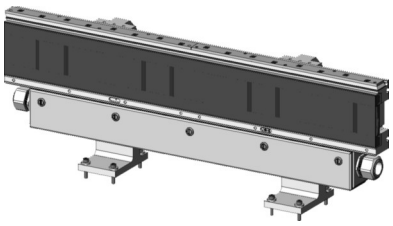
Order number	Short description	Figure
	Segments	
8FZAM1.0A.A000-1	SuperTrak straight segment, length 1000 mm, horizontal	
	Optional accessories	
	Accessories	
8FZAM0.00.A000-1	SuperTrak shuttle IR reader with mount assembly	
8FZAMS0.00.A000-1	SuperTrak Shuttle Setup Tool Kit	

Table 5: 8FZAM1.0A.A000-1 - Order data

12.1.1.3 Technical data

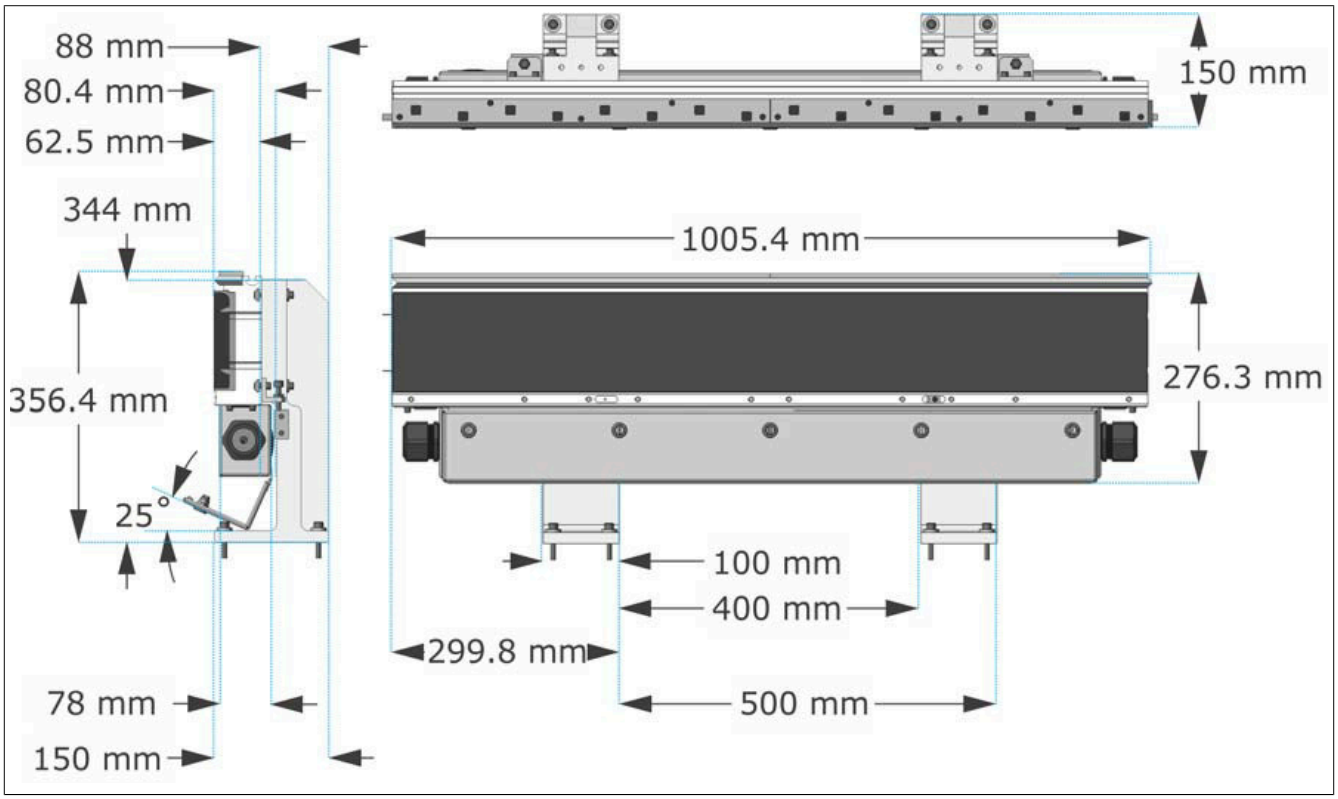
Order number	8FZAM1.0A.A000-1
General information	
Certifications	
CE	Yes
24 VDC power supply	
Current consumption	250 mA
28 VDC output	
Peak current	100 A
Operating conditions	
Degree of protection per EN 60529	IP20
Ambient conditions	
Temperature	
Operation	
Nominal	5 to 25°C
Maximum	40°C

Table 6: 8FZAM1.0A.A000-1 - Technical data

Order number	8FZAM1.0A.A000-1
Relative humidity	
Operation	5 to 90%, non-condensing
Mechanical properties	
Material	Anodized aluminum, stainless steel, polyamide (PA), polycarbonate (PC), epoxy resin
Dimensions	
Width	1000 mm
Height	356.4 mm
Depth	62 mm
Acceleration force of motor	120 N (Shuttle, 2 magnets) 160 N (Shuttle, 3 magnets)
Weight	51 kg

Table 6: 8FZAM1.0A.A000-1 - Technical data

12.1.1.4 Dimension diagram



12.1.2 8FZAM2.0A.A000-1

12.1.2.1 General information

The curved segment with TS (tall stands) generates and regulates the electromagnetic field for the shuttles.

- Bevels on the upper v-rail overlap at SuperTrak conveyor section transitions to provide a smooth, low-vibration transport surface for shuttles.
- Includes:
  - Encoders for contact-free position tracking of shuttles.
  - Slot for power supply cable access.
  - Three (3) stands for stable mounting on a base frame and smooth height adjustment
  - Accessible electronic box by removing a cover.
- Requires minimal maintenance (weekly cleaning of the flat wear strip).

12.1.2.2 Order data

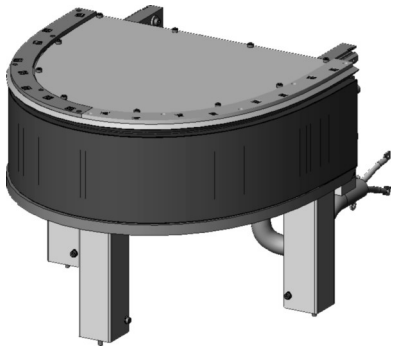
Order number	Short description	Figure
	Segments	
8FZAM2.0A.A000-1	SuperTrak 180° curved segment, length 1030 mm, horizontal	

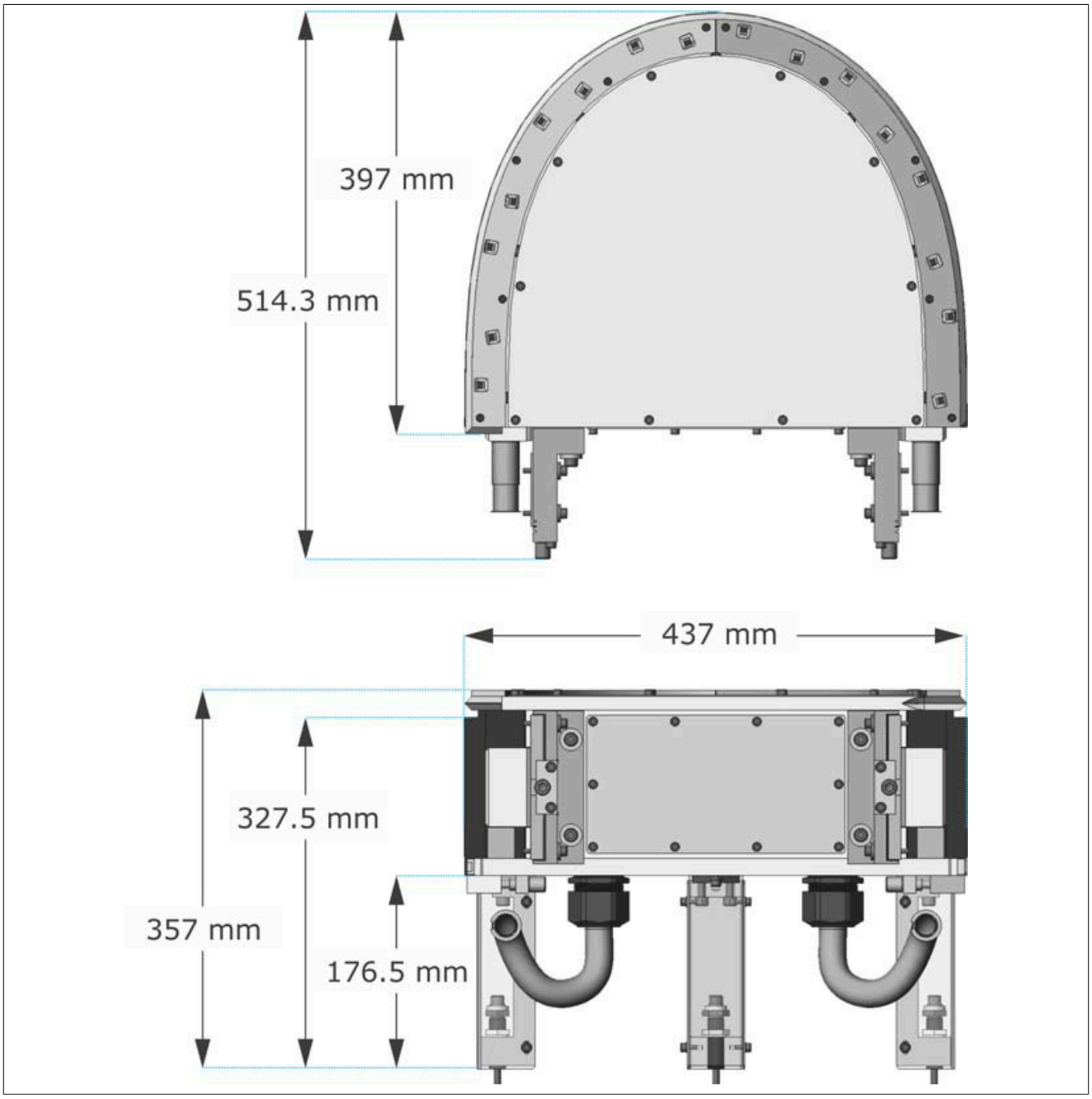
Table 7: 8FZAM2.0A.A000-1 - Order data

12.1.2.3 Technical data

Order number	8FZAM2.0A.A000-1
General information	
Certifications	
CE	Yes
24 VDC power supply	
Current consumption	250 mA
28 VDC output	
Peak current	100 A
Operating conditions	
Degree of protection per EN 60529	IP20
Ambient conditions	
Temperature	
Operation	
Nominal	5 to 25°C
Maximum	40°C
Relative humidity	
Operation	5 to 90%, non-condensing
Mechanical properties	
Material	Anodized aluminum, stainless steel, polyamide (PA), polycarbonate (PC), epoxy resin
Dimensions	
Width	390.8 mm
Height	356.4 mm
Depth	472 mm
Acceleration force of motor	~ 60 N (Shuttle, 2 magnets) ~ 80 N (Shuttle, 3 magnets)
Weight	65 kg

Table 8: 8FZAM2.0A.A000-1 - Technical data

12.1.2.4 Dimension diagram



12.1.3 8FZAM4.0A.A000-1

12.1.3.1 General information

The straight segment with rear mounted electronics (RME) generates and regulates the electromagnetic field for the shuttles.

- Bevels on the upper v-rail overlap at SuperTrak conveyor section transitions to provide a smooth, low-vibration transport surface for shuttles.
- Access to the electronics from the front is not required, since the electronics are mounted in the rear.
- Includes:
    - Encoders for contact-free position tracking of shuttles.
    - Eight (8) slots for mounting brackets, cable ducts, and other tooling.
    - Two (2) stands for stable mounting on a base frame and smooth height adjustment.
    - Rear mounted electronics, to allow for a horizontal or vertical (also known as over/under) installation.

- Requires minimal maintenance (weekly cleaning of the flat wear strip).

12.1.3.2 Order data

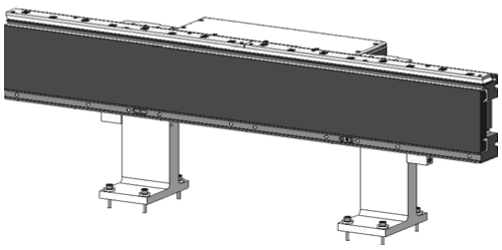
Order number	Short description	Figure
	Segments	
8FZAM4.0A.A000-1	SuperTrak straight segment, length 1000 mm, vertical	

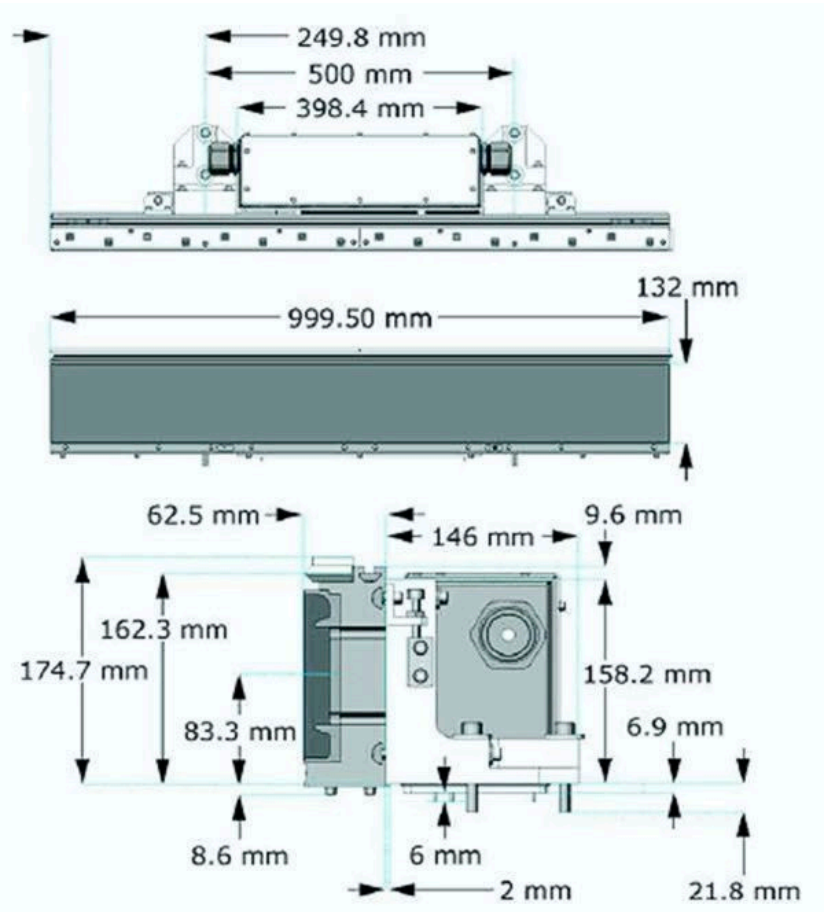
Table 9: 8FZAM4.0A.A000-1 - Order data

12.1.3.3 Technical data

Order number	8FZAM4.0A.A000-1
24 VDC power supply	
Current consumption	250 mA
28 VDC output	
Peak current	100 A
Operating conditions	
Degree of protection per EN 60529	IP20
Ambient conditions	
Temperature	
Operation	
Nominal	5 to 25°C
Maximum	40°C
Relative humidity	
Operation	5 to 90%, non-condensing
Mechanical properties	
Material	Anodized aluminum, stainless steel, polyamide (PA), polycarbonate (PC), epoxy resin
Dimensions	
Width	999.5 mm
Height	174.7 mm
Depth	208.5 mm
Acceleration force of motor	120 N (Shuttle, 2 magnets) 160 N (Shuttle, 3 magnets)
Weight	52 kg

Table 10: 8FZAM4.0A.A000-1 - Technical data

12.1.3.4 Dimension diagram



12.1.4 8FZAM5.0A.A000-1

12.1.4.1 General information

The curved segment, vertical with LS (low stands) generates and regulates the electromagnetic field for the shuttles.

- Bevels on the upper v-rail overlap at SuperTrak conveyor section transitions to provide a smooth, low-vibration transport surface for shuttles.
- Mountable in an upright, or vertical over/under orientation.
- Includes:
  - Encoders for contact-free position tracking of shuttles.
  - Slot for power supply cable access.
  - Three (3) stands for stable mounting on a base frame and smooth height adjustment
  - Accessible electronic box by removing a cover.
- Requires minimal maintenance (weekly cleaning of the flat wear strip).

12.1.4.2 Order data

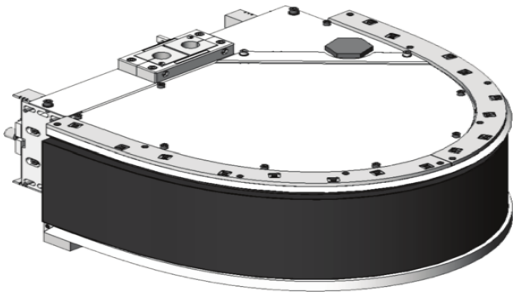
Order number	Short description	Figure
	Segments	
8FZAM5.0A.A000-1	SuperTrak 180° curved segment, length 1030 mm, vertical	

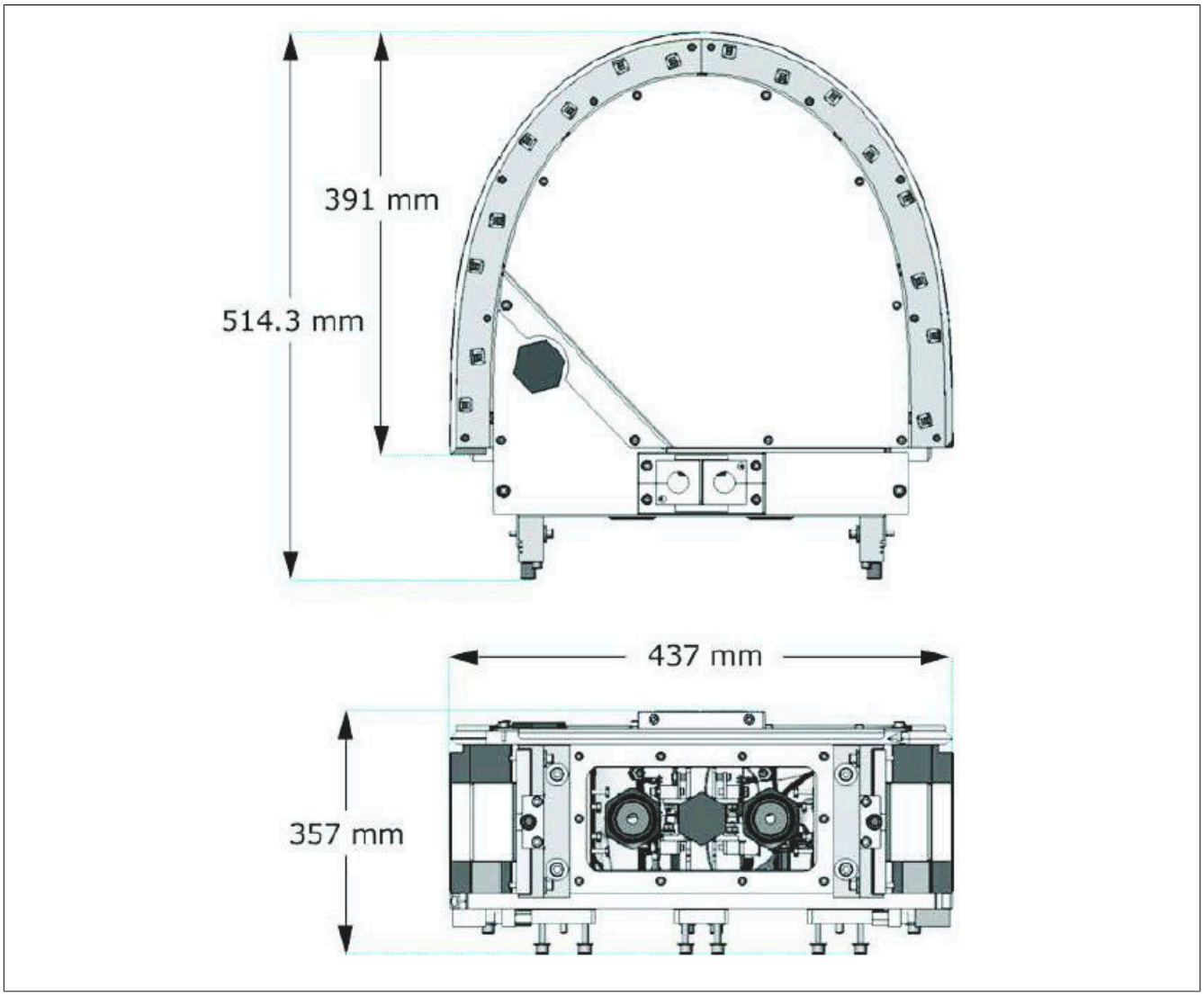
Table 11: 8FZAM5.0A.A000-1 - Order data

12.1.4.3 Technical data

Order number	8FZAM5.0A.A000-1
24 VDC power supply	
Current consumption	250 mA
28 VDC output	
Peak current	100 A
Operating conditions	
Degree of protection per EN 60529	IP20
Ambient conditions	
Temperature	
Operation	
Nominal	5 to 25°C
Maximum	40°C
Relative humidity	
Operation	5 to 90%, non-condensing
Mechanical properties	
Material	Anodized aluminum, stainless steel, polyamide (PA), polycarbonate (PC), epoxy resin
Dimensions	
Width	437 mm
Height	357 mm
Depth	514.3 mm
Acceleration force of motor	~ 60 N (Shuttle, 2 magnets) ~ 80 N (Shuttle, 3 magnets)
Weight	64 kg

Table 12: 8FZAM5.0A.A000-1 - Technical data

12.1.4.4 Dimension diagram



12.1.5 8FZAM6.0A.A000-1

12.1.5.1 General information

The curved segment generates and regulates the electromagnetic field for the shuttles.

- Bevels on the upper v-rail overlap at SuperTrak conveyor section transitions to provide a smooth, low-vibration transport surface for shuttles.
- Includes:
  - Encoders for contact-free position tracking of shuttles.
  - Slot for power supply cable access.
  - Three (3) stands for stable mounting on a base frame and smooth height adjustment
  - Accessible electronic box by removing a cover.
- Requires minimal maintenance (weekly cleaning of the flat wear strip).

12.1.5.2 Order data

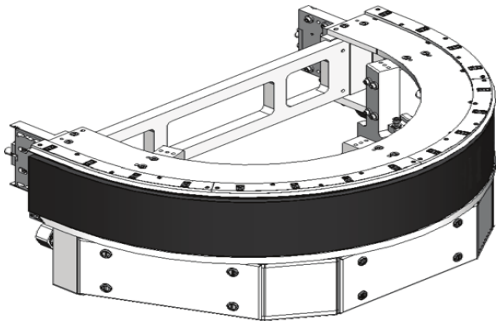
Order number	Short description	Figure
	Segments	
8FZAM6.0A.A000-1	SuperTrak 180° curved segment, length 1545 mm, horizontal	

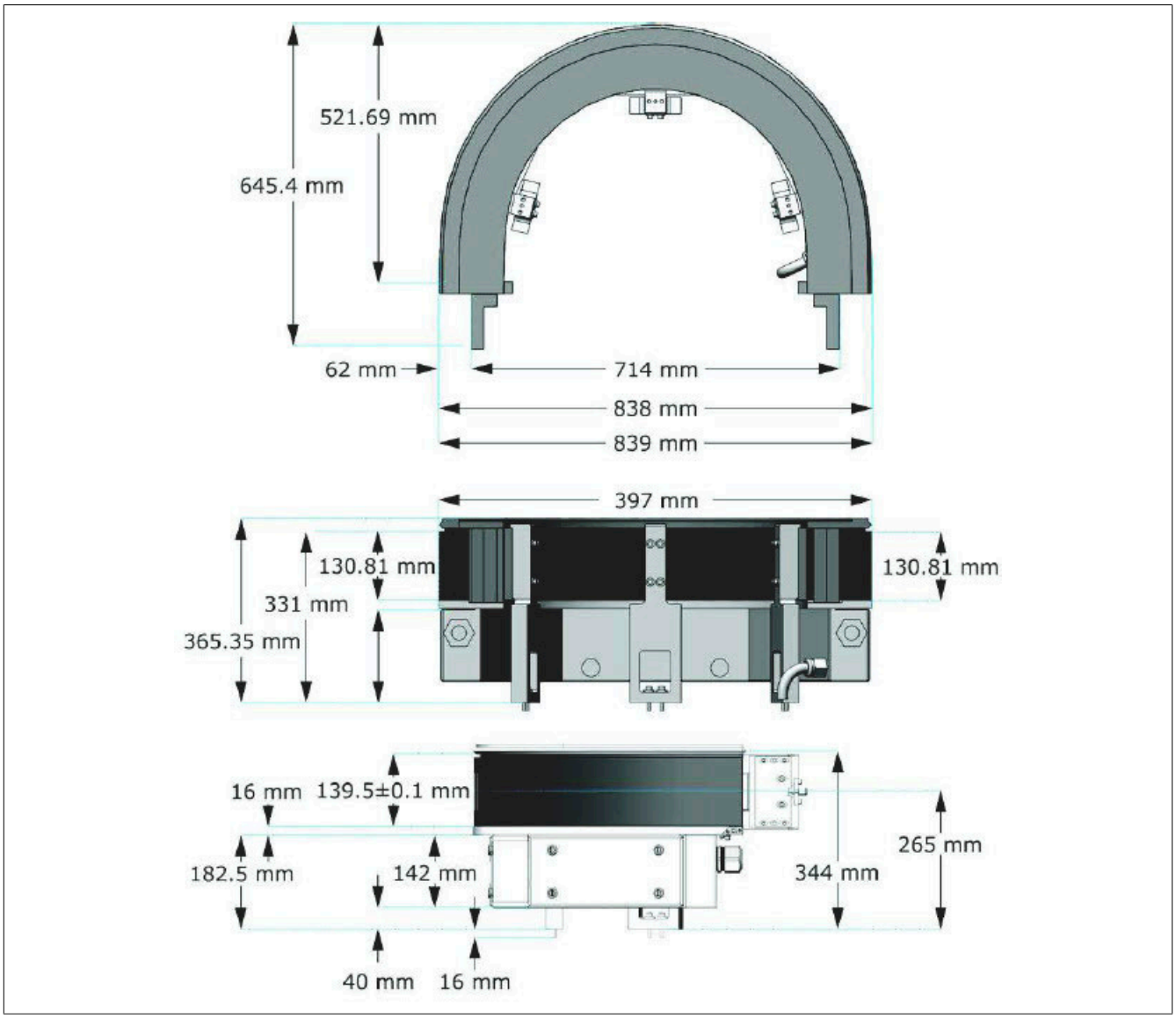
Table 13: 8FZAM6.0A.A000-1 - Order data

12.1.5.3 Technical data

Order number	8FZAM6.0A.A000-1
24 VDC power supply	
Current consumption	500 mA
28 VDC output	
Peak current	150 A
Operating conditions	
Degree of protection per EN 60529	IP20
Ambient conditions	
Temperature	
Operation	
Nominal	5 to 25°C
Maximum	40°C
Relative humidity	
Operation	5 to 90%, non-condensing
Mechanical properties	
Material	Anodized aluminum, stainless steel, polyamide (PA), polycarbonate (PC), epoxy resin
Dimensions	
Width	839 mm
Height	365.35 mm
Depth	645.4 mm
Acceleration force of motor	~ 60 N (Shuttle, 2 magnets) ~ 80 N (Shuttle, 3 magnets)
Weight	109.8 kg

Table 14: 8FZAM6.0A.A000-1 - Technical data

12.1.5.4 Dimension diagram



12.2 SuperTrak shuttles

12.2.1 8FZAS1.2A.A000-1, 8FZAS1.3A.A000-1, 8FZAS1.2A.A100-1, 8FZAS1.3A.A100-1

12.2.1.1 General information

- Variable load is centered by the v-wheels.
- Available in four (4) options:
    - 2-magnet shuttle without an IR tag.
    - 3-magnet shuttle without an IR tag.
    - 2-magnet shuttle with an IR tag.
    - 3-magnet shuttle with an IR tag.
- Requires minimal maintenance (felt lubrication, monthly inspection, and cleaning)

12.2.1.2 Order data

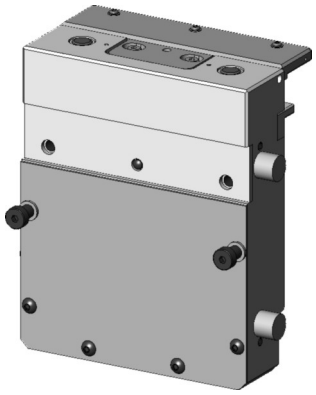
Order number	Short description	Figure
	Shuttles	
8FZAS1.2A.A000-1	2-magnet shuttle without an IR tag.	
8FZAS1.3A.A000-1	3-magnet shuttle without an IR tag.	
8FZAS1.2A.A100-1	2-magnet shuttle with an IR tag.	
8FZAS1.3A.A100-1	3-magnet shuttle with an IR tag.	
	Optional accessories	
	Accessories	
8FZAS0.00.0200-1	SuperTrak Shuttle IR tag	
8FZAS0.00.0300-1	SuperTrak Shuttle IR reader	
8FZSE0.00.0100-1	SuperTrak Magnetic encoder strip viewing film (pack of 5 pieces)	

Table 15: 8FZAS1.2A.A000-1, 8FZAS1.3A.A000-1, 8FZAS1.2A.A100-1, 8FZAS1.3A.A100-1 - Order data

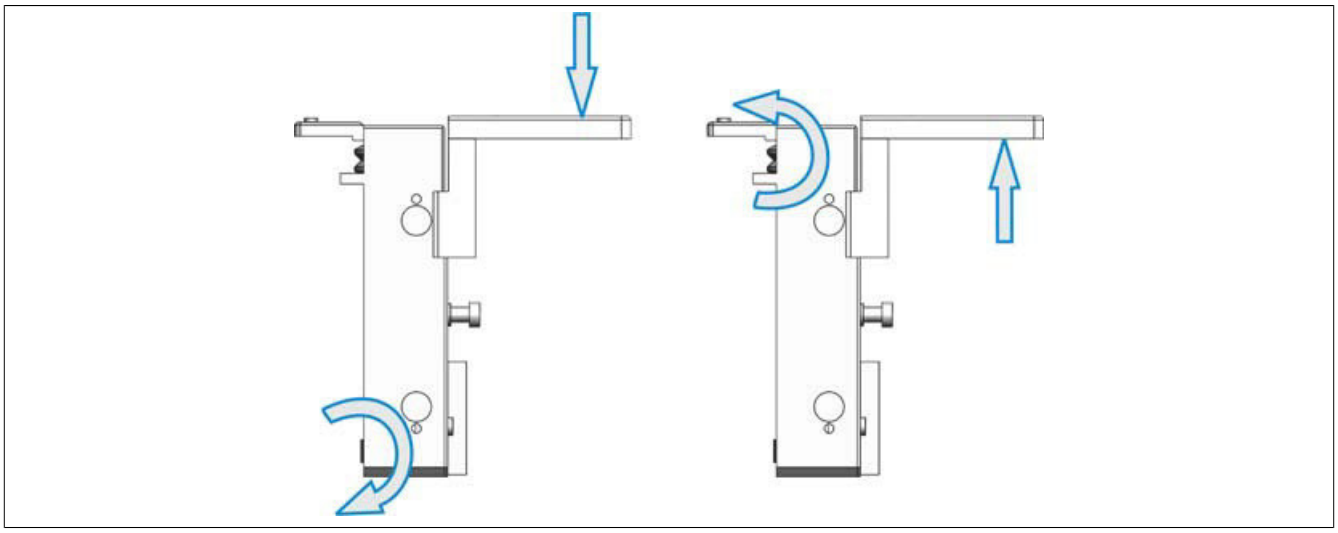
12.2.1.3 Technical data

Order number	8FZAS1.2A.A000-1	8FZAS1.3A.A000-1	8FZAS1.2A.A100-1	8FZAS1.3A.A100-1
Electrical properties				
Power consumption [1]	Max. 275 W			
Magnetic field strength	2.2 to 268 Gs	3 to 1400 Gs	2.2 to 268 Gs	3 to 1400 Gs
Magnetic force	860 N (straight segment) 430 N (curved segment, 500 mm) 590 N (curved segment, 800 mm)	1290 N (straight segment) 645 N (curved segment, 500 mm) 775 N (curved segment, 800 mm)	860 N (straight segment) 430 N (curved segment, 500 mm) 590 N (curved segment, 800 mm)	1290 N (straight segment) 645 N (curved segment, 500 mm) 775 N (curved segment, 800 mm)
Mechanical properties				
Dimensions				
Width	152 mm			
Height	189.23 mm			
Depth	46 mm			
Acceleration force of motor [2]	120 N (straight segment) ~ 60 N (curved segment)	160 N (straight segment) ~ 80 N (curved segment)	120 N (straight segment) ~ 60 N (curved segment)	160 N (straight segment) ~ 80 N (curved segment)
Acceleration [2]	Max. 40 m/s² (1 kg load) Max. 10 m/s² (10 kg load)	Max. 40 m/s² (1 kg load) Max. 10 m/s² (10 kg load)		
Velocity [2]	Max. 2.5 m/s			
Unsupported torque perpendicular to shuttle movement [3]	30 Nm	50 Nm	30 Nm	50 Nm
Repeat accuracy [2]	Straight segment X - axis: ±0.01 mm (±0.00039 in.) Y - axis: ±0.015 mm (±0.00059 in.) Z - axis: ±0.025 mm (±0.00098 in.) Curved segment (X - , Y - , Z - axis): ±0.025 mm (±0.00098 in.)			
Weight	2 kg (with magnet cover plate: 2.2 kg)	2.4 kg (with magnet cover plate: 2.7 kg)	2.1 kg (with magnet cover plate: 2.3 kg)	2.5 kg (with magnet cover plate: 2.8 kg)

Table 16: 8FZAS1.2A.A000-1, 8FZAS1.3A.A000-1, 8FZAS1.2A.A100-1, 8FZAS1.3A.A100-1 - Technical data

1) Typical.
2) Values depend on the application.
3) Includes process force, product mount mass and product mass.

The rotation point for the moment load is calculated from the flat wheels for downward forces (left), and from the v-wheels for upward forces (right).



12.2.1.4 Dimension diagram

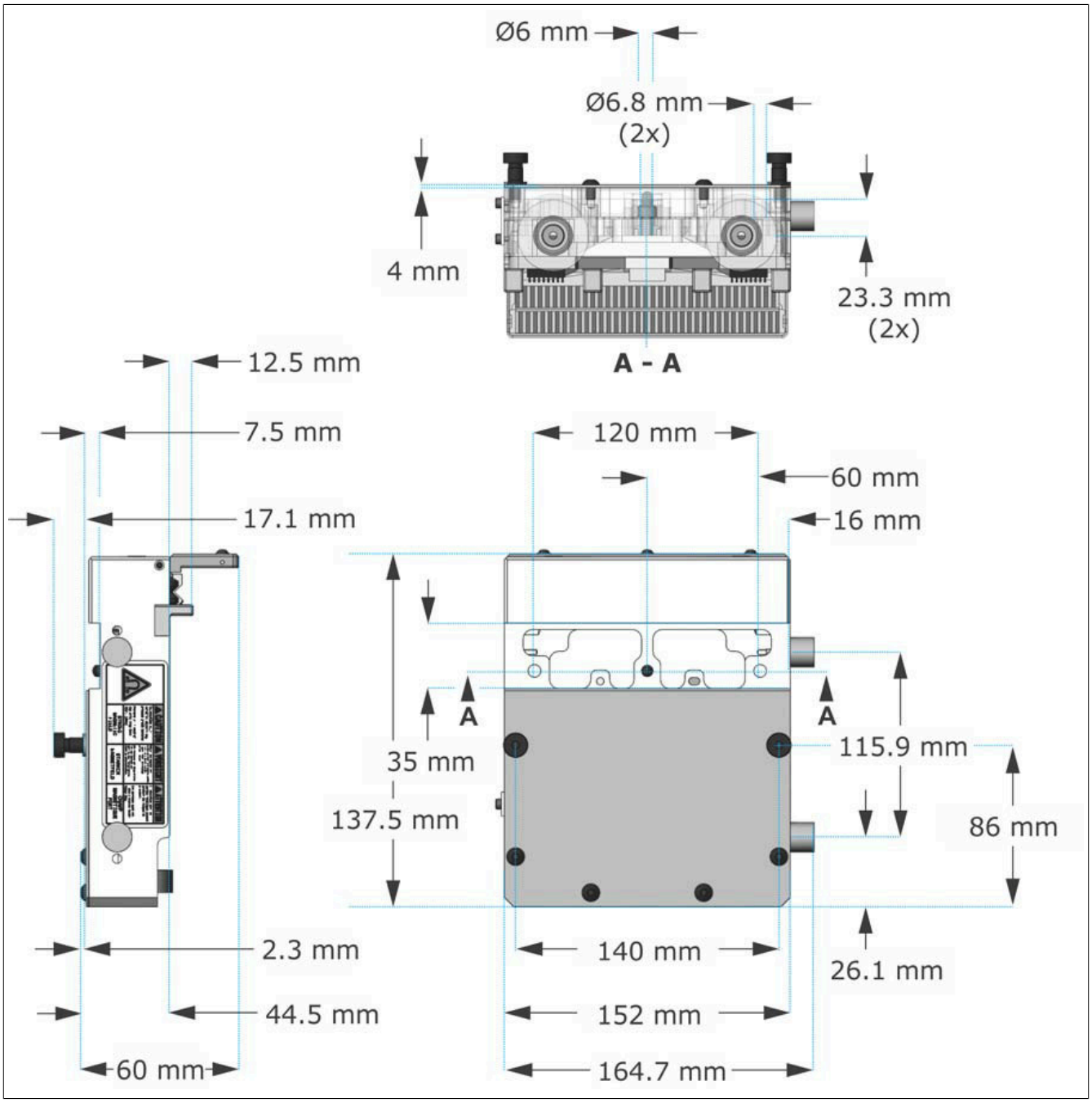
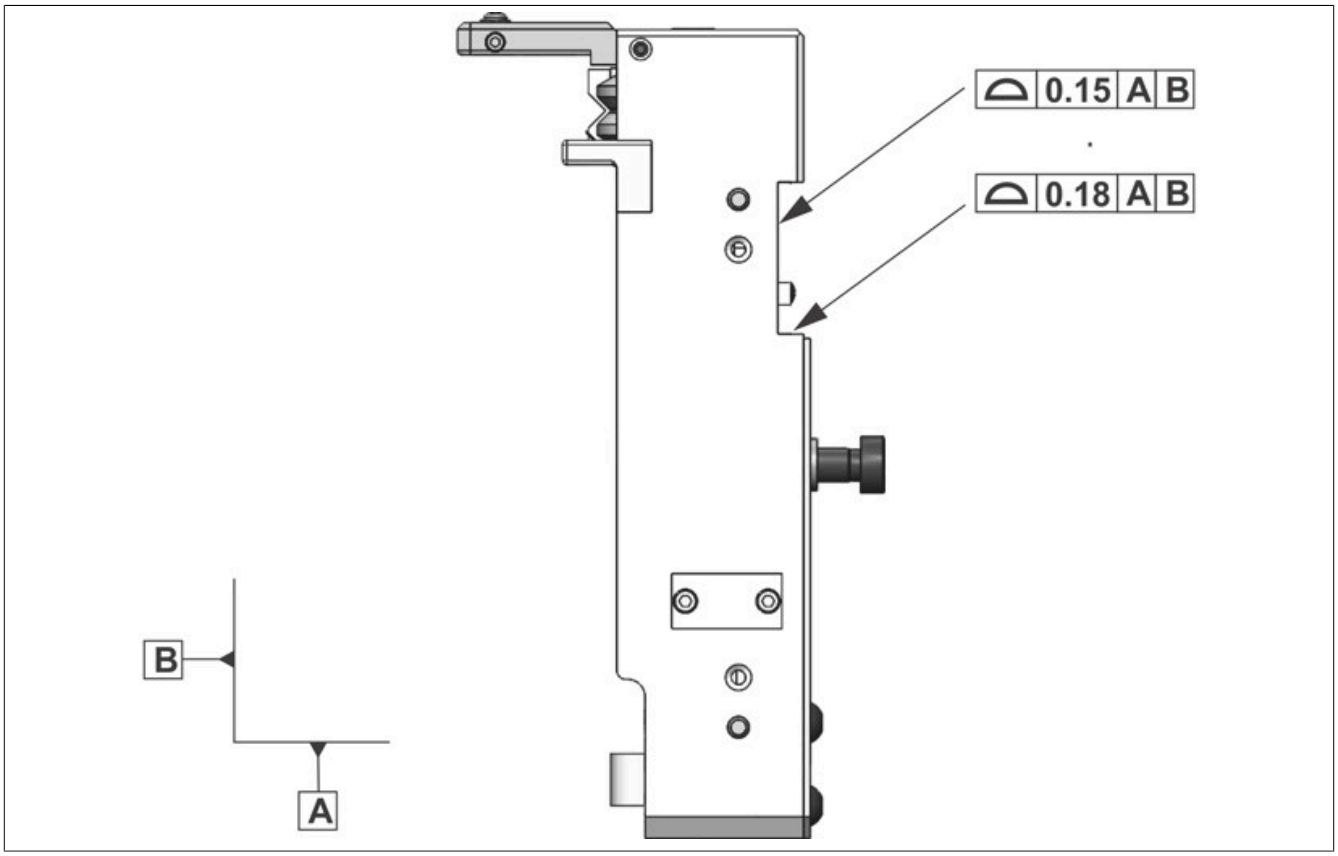
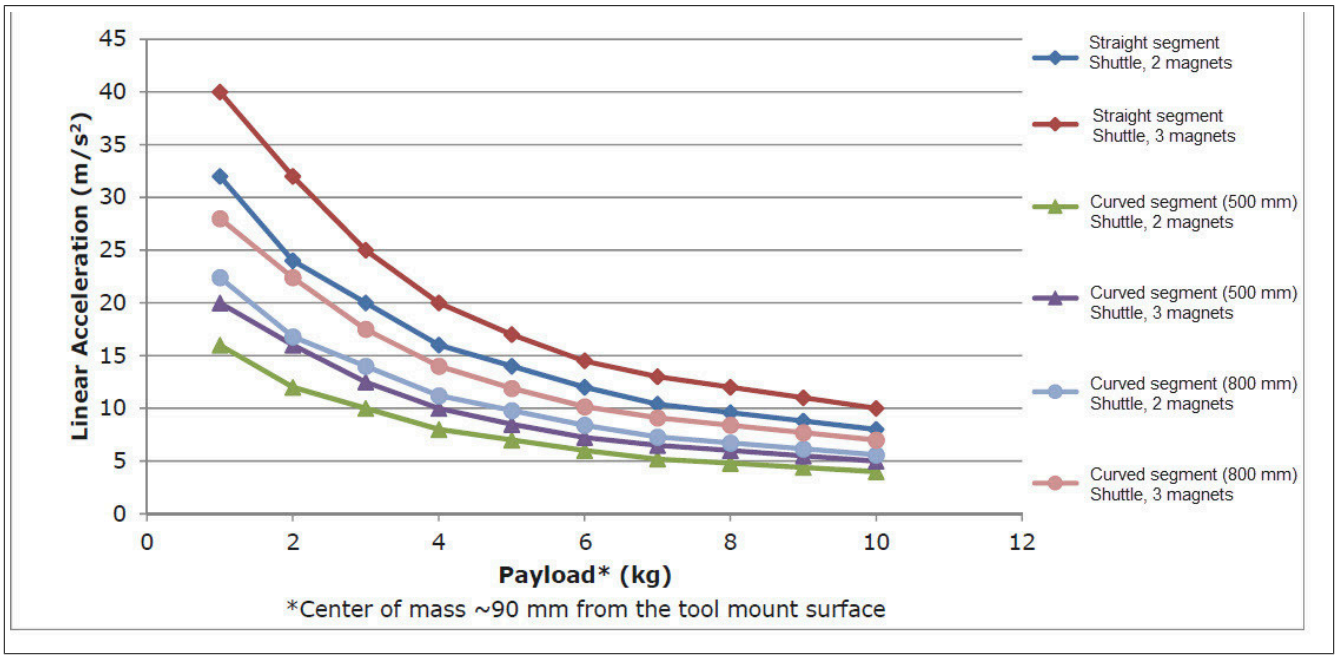


Figure 2: 8FZAS1.2A.A000-1, 8FZAS1.3A.A000-1, 8FZAS1.2A.A100-1, 8FZAS1.3A.A100-1 - Dimension diagram

12.2.1.5 Shuttle Shelf Mounting Surface Tolerances



12.2.1.6 Shuttle Linear Acceleration Vs. Payload

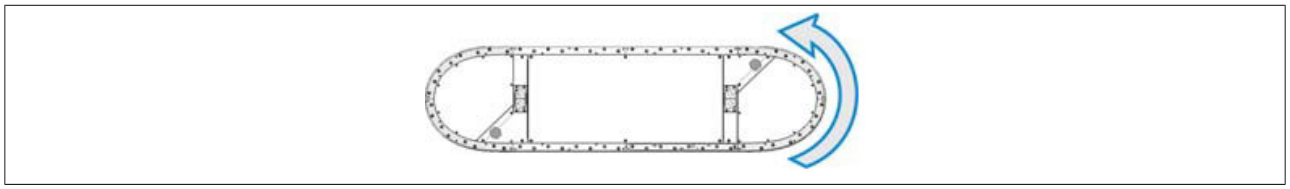


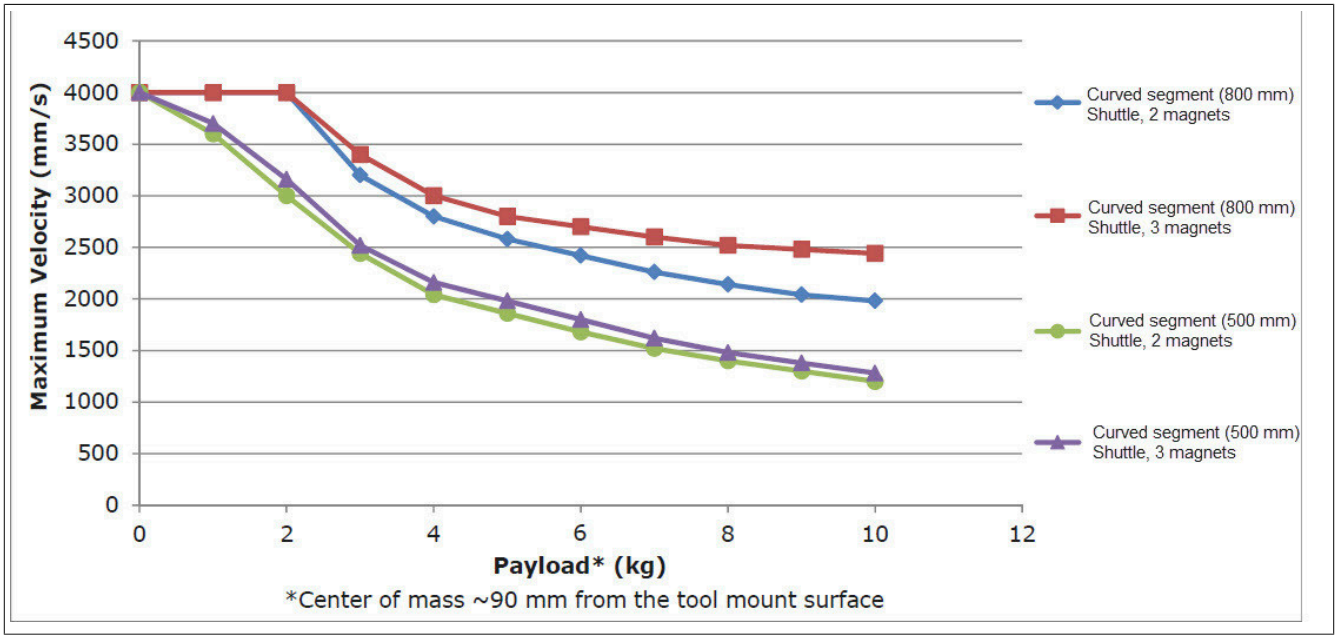
*CoM = Centric load in relation to the direction of movement

12.2.1.7 Shuttle Maximum Velocity Vs. Payload on a Curved Segment

Information:

On a curved segment in a vertically mounted system (vertical configuration) the maximum velocity for a 3-magnet shuttle with a 4 kg payload with CoM ~90 mm is 2.5 m/s.



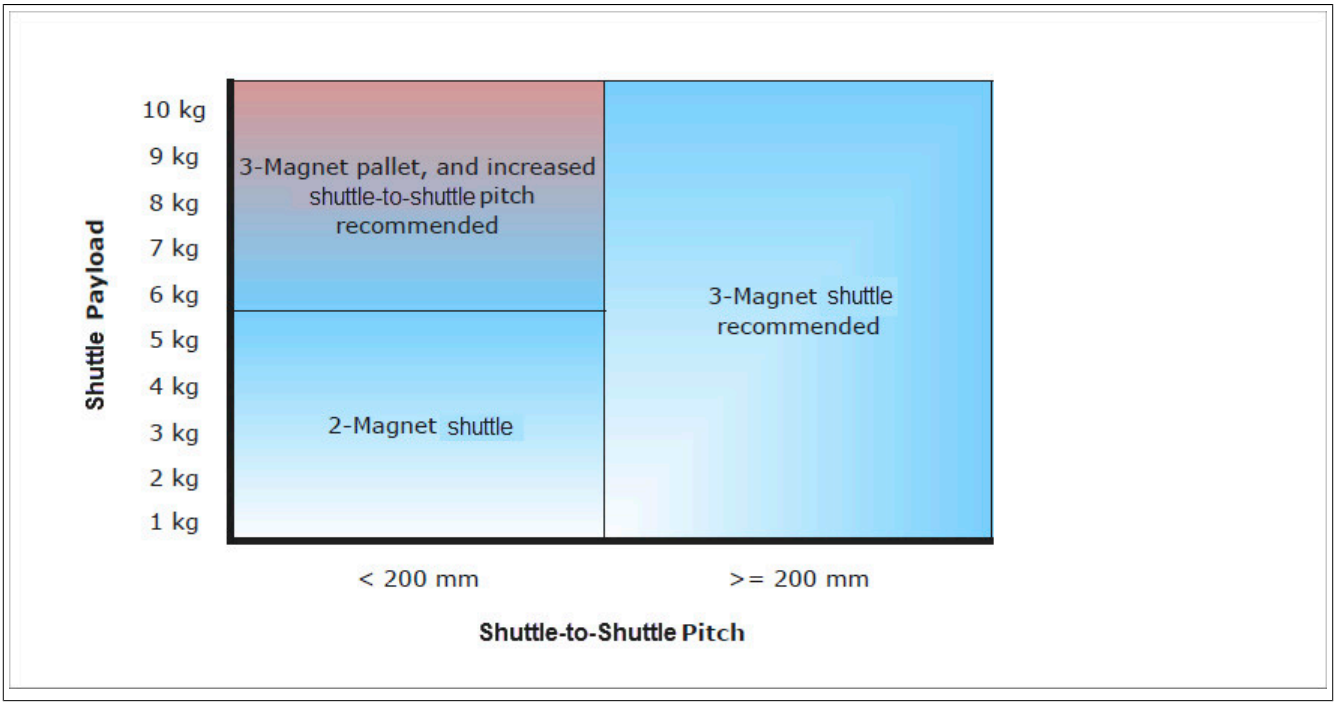


*CoM = Centric load in relation to the direction of movement

12.2.1.8 Shuttle Magnet Recommendations

Information:

The maximum performance for the curved segment in a vertically mounted system (vertical configuration) is 4 kg and 2 m/s.



12.2.1.9 Shuttle Motion at a Constant Velocity

Information:

A 3* standard deviation for following error is provided to show the ± positioning tolerance of the pallet 99.7% of the time.

Component [1]	Constant velocity	Laser interferometer (± µm)	SuperTrak encoders (± µm)
Shuttle, 2 magnets	20	31	23
	50	38	28
	100	48	32
	200	40	28
	500	69	25
	1000	63	35
Shuttle, 3 magnets	20	31	24
	50	35	27
	100	51	35
	200	49	35
	500	75	28
	1000	58	32

1) Calculations for shuttle motion predictability are based on the following test:

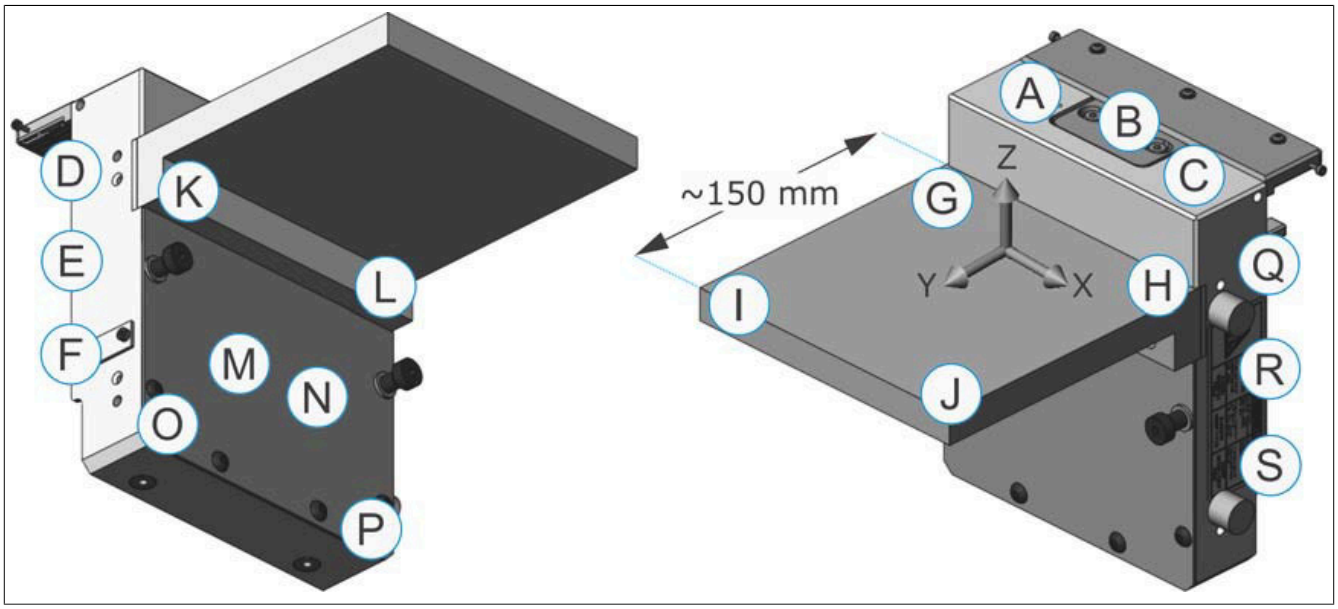
- A shuttle is programmed to travel between the two targets at various constant velocities (see “Constant velocity”).
- The shuttle motion is measured two different ways:
  - SuperTrak encoders using the TrackMaster built-in Scope feature
  - External laser interferometer
- A target is placed at the 0 mm and 1000 mm position on a straight segment.

2) The laser interferometer and SuperTrak encoder results vary from segment-to-segment due to manufacturing tolerances.

The following settings and hardware versions were used during this test:

- Control gains: P=8, I=0.4, D=4, FF=5, Moving Filter=0.5, Stationary Filter=0.5
- Coil driver version: ACB3000-C02
- Controller firmware version: 3.0.10.0 using the updated March 2019 force table.

12.2.1.10 Shuttle Magnetic Field Strength Measurement Locations



12.2.1.11 Shuttle, 2 Magnets Magnetic Measurement Values

All measurements in the following table are in Gauss units.

The magnetic field strength measurement locations see "Shuttle Magnetic Field Strength Measurement Locations" on page 208 and description of X, Y, Z see "Frame of Reference" on page 15.

	Shuttle, 2 magnets enabled at a standstill			Shuttle, 2 magnets at peak force[1)]		
Location	**X**	**Y**	**Z**	**X**	**Y**	**Z**
A	14	10	10	117	157	149
B	3	3.5	2.5	15	17	36
C	14	10	10	117	157	149
D	8	8	23	180	249	221
E	17	3	21	140	268	171
F	13	15	32	180	200	155
G	13	11	6	55	60	30
H	13	11	6	55	60	30
I	2.8	2.7	2.5	2.8	2.7	7
J	2.8	2.7	2.5	2.8	2.7	7
K	10	10	10	45	40	51
L	10	10	10	45	40	51
M	19	12	45	45	69	115
N	19	12	45	45	69	115
O	9	13	10	25	43	23
P	9	13	10	25	43	23
Q	8	8	23	180	249	221
R	17	3	21	140	268	171
S	13	15	32	180	200	155

1) Peak force measurements are captured when the coils are at maximum current. This electromagnetic field is a momentary field that could exist during acceleration at the maximum rate for a given payload.

12.2.1.12 Shuttle, 3 Magnets Magnetic Measurement Values

All measurements in the following table are in Gauss units.

The magnetic field strength measurement locations see "Shuttle Magnetic Field Strength Measurement Locations" on page 208 and description of X, Y, Z see "Frame of Reference" on page 15.

	Shuttle, 3 magnets enabled at a standstill			Shuttle, 3 magnets at peak force[1)]		
Location	**X**	**Y**	**Z**	**X**	**Y**	**Z**
A	75	94	62	110	101	85
B	18	19	29	23	19	31
C	75	94	62	110	101	85
D	116	70	180	1210	270	606
E	250	38	280	1400	450	1135
F	64	65	90	260	96	100
G	40	50	19	43	53	246
H	40	50	19	43	53	246
I	5	4.5	5	5	4.5	6

	Shuttle, 3 magnets enabled at a standstill			Shuttle, 3 magnets at peak force[1]		
Location	**X**	**Y**	**Z**	**X**	**Y**	**Z**
J	5	4.5	5	5	4.5	6
K	90	90	128	90	112	157
L	90	90	128	90	112	157
M	124	31	120	134	31	140
N	124	31	120	134	31	140
O	22	38	3	22	39	4
P	22	38	3	22	39	4
Q	116	70	180	1210	270	606
R	250	38	280	1400	450	1135
S	64	65	90	260	96	100

1) Peak force measurements are captured when the coils are at maximum current. This electromagnetic field is a momentary field that could exist during acceleration at the maximum rate for a given payload.

12.3 SuperTrak power supply

12.3.1 8FZAP0.00.0100-1, 8FZAP0.00.0200-1

12.3.1.1 General information

The motor power supply supplies straight and curved segments.

12.3.1.2 Order data

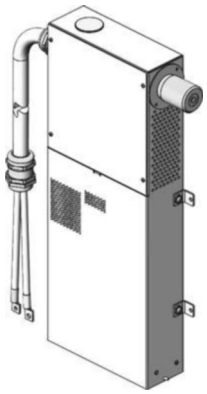
Order number	Short description	Figure
	Power supply	
8FZAP0.00.0100-1	SuperTrak motor power supply 1.5 m	
8FZAP0.00.0200-1	SuperTrak motor power supply 8 m	
8FZAP0.00.0300-1	SuperTrak motor power supply 5 m	

Table 17: 8FZAP0.00.0100-1, 8FZAP0.00.0200-1, 8FZAP0.00.0300-1 - Order data

12.3.1.3 Technical data

Order number	8FZAP0.00.0100-1	8FZAP0.00.0200-1	8FZAP0.00.0300-1
General information			
Certifications			
CE	Yes	-	
Mains connection			
Mains input voltage	1x 200 to 240 VAC ±10%		
Frequency	50 / 60 Hz ±4%		
Power output			
Output power	Max. 1500 W		
Output			
Output voltage	28 VDC		
Operating conditions			
Permissible mounting orientations			
Hanging vertically	Yes (filter element on bottom)		
Horizontal, face up	No		
Standing horizontally	No		
Installation elevation above sea level			
Nominal	0 to 500 m		
Maximum	2000 m		
Pollution degree per EN 61800-5-1	2 (non-conductive pollution)		
Overvoltage category per EN 61800-5-1	II		
Degree of protection per EN 60529	IP20		

Table 18: 8FZAP0.00.0100-1, 8FZAP0.00.0200-1, 8FZAP0.00.0300-1 - Technical data

Order number	8FZAP0.00.0100-1	8FZAP0.00.0200-1	8FZAP0.00.0300-1
Ambient conditions			
Temperature			
Operation			
Nominal		-20 to 71°C	
Maximum		71°C	
Storage		-20 to 75°C	
Transport		-20 to 75°C	
Relative humidity			
Operation		20 to 90%	
Storage		20 to 90%	
Transport		20 to 90%	
Mechanical properties			
Dimensions [1]			
Width		229 mm	
Height		490 mm	
Depth		66 mm	
Weight [2]		6.3 kg	

Table 18: 8FZAP0.00.0100-1, 8FZAP0.00.0200-1, 8FZAP0.00.0300-1 - Technical data

1) Without mounting plate and attachment cable.
2) Without mounting plate.

12.3.1.4 Dimension diagram

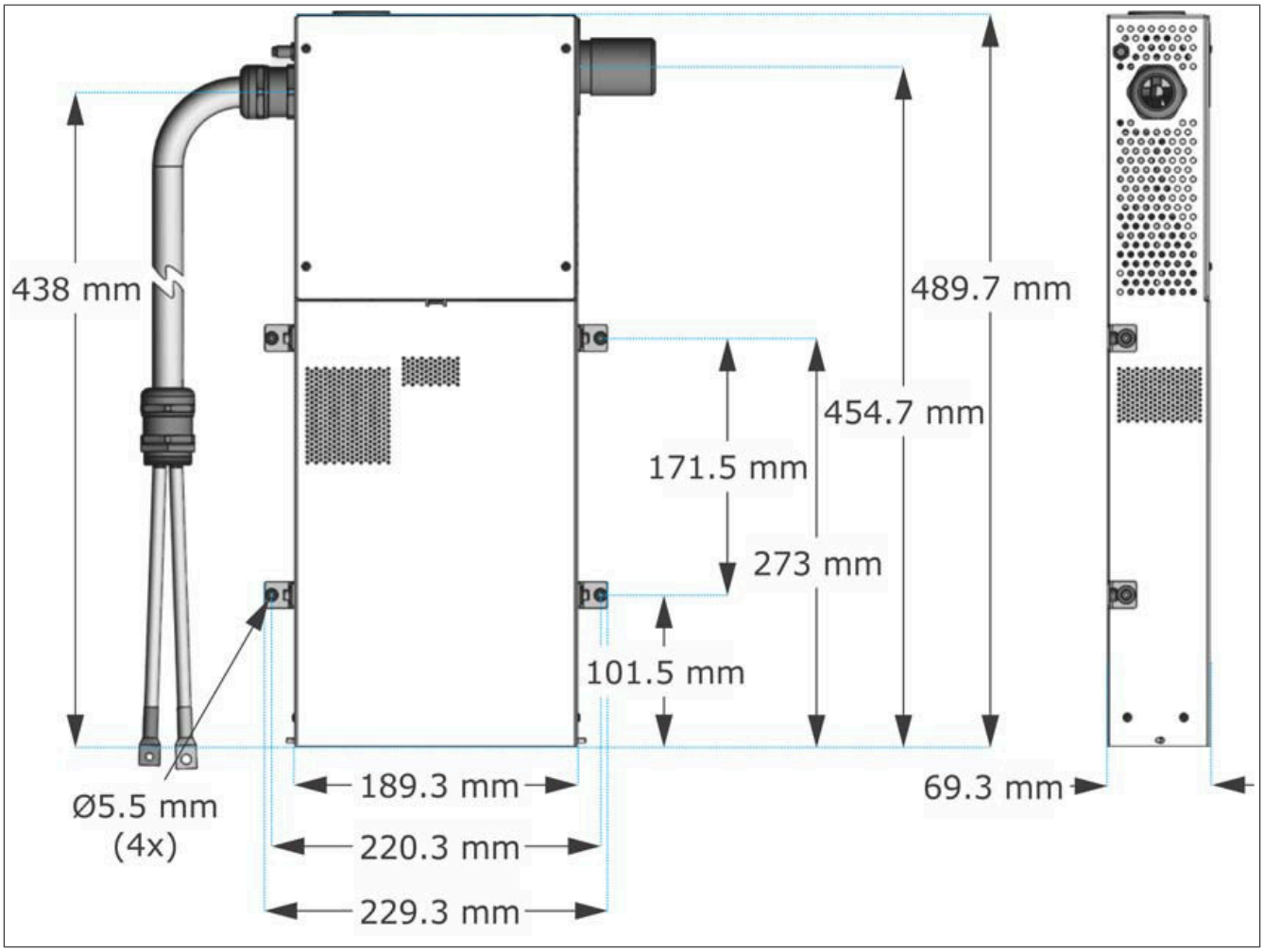


Figure 3: Dimension diagram for 8FZAP0.00.0100-1, 8FZAP0.00.0200-1, 8FZAP0.00.0300-1

12.4 SuperTrak IR Reader Mount Assembly

12.4.1 8FZAM0.00.A000-1

12.4.1.1 General information

The infrared (IR) components are optional. The IR reader mount assembly allows for easy installation of the IR reader on a SuperTrak conveyor. The IR tags assign a customized shuttle ID to each shuttle, and the IR reader tracks shuttle positions.

- Simplifies SuperTrak conveyor recovery after a complete cold start.
- Provides data integrity when shuttles are manually removed.
- Provides tracking of individual shuttles.
- Allows shuttle IDs to be read "on-the-fly": Shuttles do not stop at the IR reader assembly.
- Batteries are not required. The assembly induces the necessary power into the tags for reading purposes.
- External PLC programming is not required. Integration of the IR reader assembly with the SuperTrak conveyor is plug-and-play.

12.4.1.2 Order data

Order number	Short description	Figure
	Accessories	
8FZAM0.00.A000-1	SuperTrak shuttle IR reader with mount assembly	

Table 19: 8FZAM0.00.A000-1 - Order data

12.4.1.3 Technical data

Order number	8FZAM0.00.A000-1
Mechanical properties	
Weight	2.4 kg

Table 20: 8FZAM0.00.A000-1 - Technical data

12.4.1.4 Dimension diagram

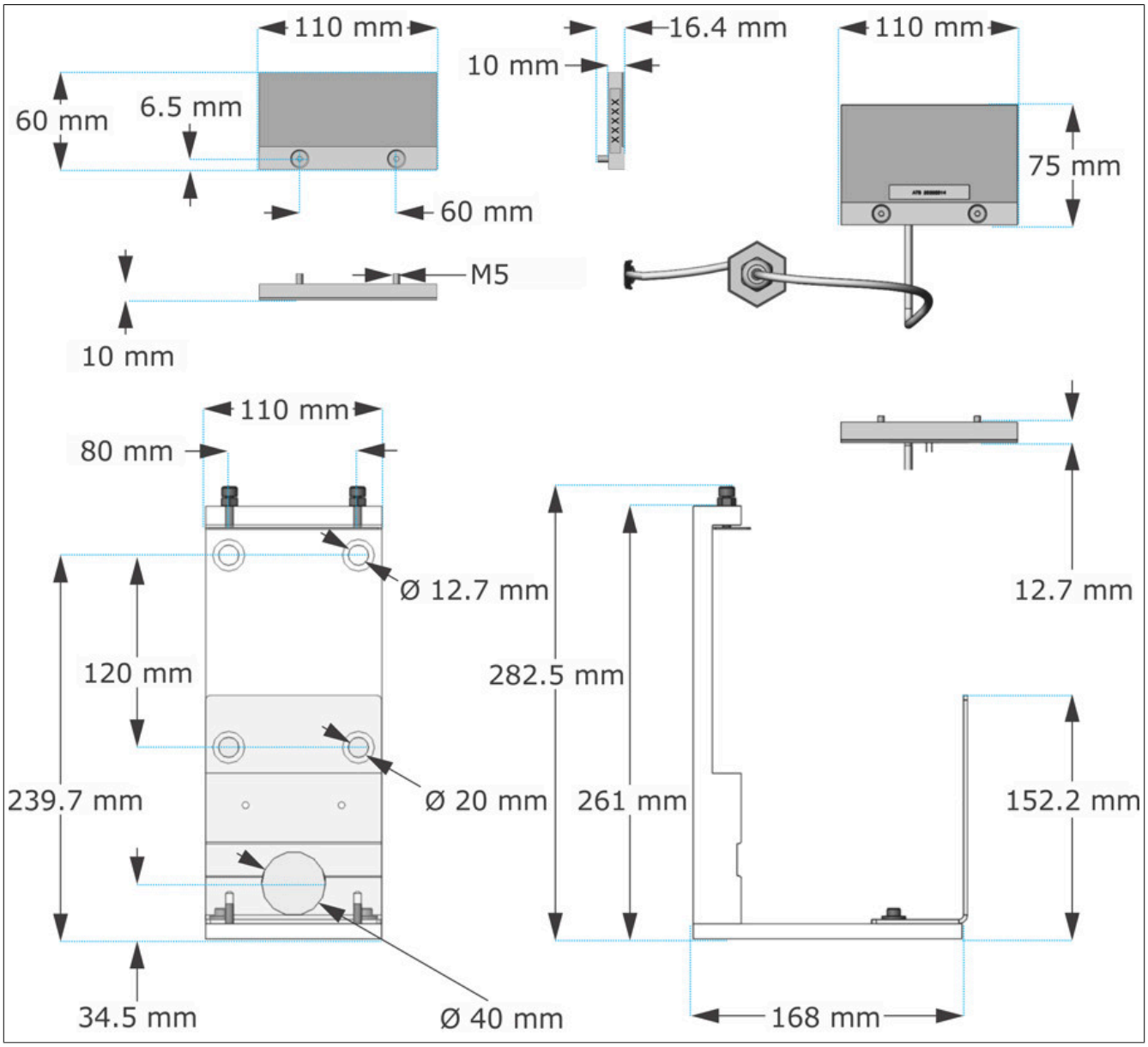


Figure 4: 8FZAM0.00.A000-1 (with 8FZAS0.00.0200-1, 8FZA30.00.0200-1) - Dimension diagram

13 Glossary

This section contains an list of terms and acronyms that may be used in this document.

Term	Definition
Cell	Two (2) or more stations that are grouped together. Typically, a cell can function independently of other cells. In some cases, cells are connected by a global emergency stop.
Component	Typically, the smallest and most detailed level of the SuperTrak transport system. For example a single piece of tooling, a sensor, or a cylinder.
Control interface	A protocol that provides isolated bi-directional communication from the SuperTrak transport system controller to local cell controllers. This protocol is executed over one of the supported fieldbus network.
Cycle	The complete sequence of steps that a device performs to complete a task.
Cycle time	The time a device takes to complete a sequence of operations once.
Device	Two (2) or more components that are grouped together to complete a single function. A device can be controlled by software to move through a sequence of steps. For example a transport system, or lift tooling.
Disable	Prevent a device from operating through software or by removing power.
Disconnect	To interrupt or terminate a connection.
Enable	Allow a device to operate through software or by connecting power.
Encoder	A position sensor that continuously monitors shuttle positions.
Gateway network	An proprietary network, implemented using standard Ethernet cables, however, it is not Ethernet and should not be connected to Ethernet devices. It connects an array of gateway boards to the controller.
GEN3	Third generation.
Guarding	A protective barrier surrounding automated equipment to prevent access to moving devices and to guard users from potentially hazardous conditions.
Home position	A reference point, often called the zero position, from which automated equipment begins its sequence of operation.
Homing	The process of moving equipment to the home (zero) position.
ISO	International Organization for Standardization ISO is an international organization composed of national standards bodies from over 75 countries.
Lockout	The placement of a locking device (such as a padlock) on an energy isolating device, in accordance with an established procedure, to make sure that the energy isolating device and the equipment being controlled cannot be operated until the locking device is removed. Used in combination with tagout.
Master shuttle (pallet)	A SuperTrak shuttle that is stored in a safe place and is only installed on the SuperTrak to verify nominal settings.
Motor assembly	References the hardware that powers the SuperTrak transport system. The motor is mounted in an extruded outer frame that protects and encloses all the working elements of a section. It assembly incorporates the magnetic laminations, coils, drive electronics and controller for a track segment.
Shuttle (Pallet)	A movable base on which parts can be placed. A shuttle can be partitioned to hold more than one part.
PCB	Printed circuit board Mechanically supports and electrically connects electronic components using conductive tracks, pads and other features etched from copper sheets laminated onto a non-conductive substrate.
PLC	Programmable Logic Controller An electronic processor that contains the programmable code for controlling system operation, device operating sequences, fault recovery, and data processing.
Reference shuttle (pallet)	A SuperTrak shuttle that is installed on the SuperTrak transport system and is used as a reference. It can be a specific production shuttle, or a few different shuttles can be sampled and the shuttle in the middle of the range can be used.
Station	Two (2) or more devices that work together to complete a task. For example a shuttle stop on a transport system and all the devices responsible for working on the contents of the shuttle.
System	References the automation machine that the SuperTrak transport system is integrated with.
Tagout	The placement of a durable tag on an energy isolating device, in accordance with established procedure, to identify the person who placed a lock on the device. Equipment being controlled by the energy isolating device must not be operated until the lock and tag have been removed. Used in combination with lockout.
Target	A location on the SuperTrak transport system that can be set as a shuttle destination. A SuperTrak transport system can have up to 255 configured targets, each located anywhere on the system.
Teach point	Also called a Tpoint or taught point. The value of a specific location that a device is programmed to move to.
Track section	A 1 m (3.28 ft.) long piece of transport system track that can be joined with other segments of transport system to produce a length of SuperTrak transport system. The segments typically share a common power supply or multiple power supplies, and communicate with each other over a high speed data network.
TrackMaster	Software that provides configuration, programming, diagnostics and control over a supervisory data network. TrackMaster communicates over Ethernet. TrackMaster is not required to operate SuperTrak transport system. However, it is useful for troubleshooting and configuring the device.
UPS	Uninterruptible power supply or uninterruptible power source An electrical device that provides electrical power to a device when the main source of electrical power is turned OFF.

14 Standards and certifications

14.1 Applicable European directives

- 2014/35/ - Low Voltage Directive (LVD)
- 2014/30/EU - Electromagnetic Compatibility
- 2006/42/EC - Machinery Directive

14.2 Applicable standards

Standard	Description
EN 60204-1:2006 +A1:2009	Electrical Equipment of Machines • Part 1: General Requirements
EN ISO 12100:2012	Basic Concepts, general Principles for Design - Risk Assessment and Risk Reduction
EN 619:2002 +A1:2010	Continous handling equipment and systems - Safety and EMC requirements for equipment for mechanical handling of unit loads
EN ISO 13849-1:2015	Safety Related Parts of Control Systems • Part 1: General Principles for Design
EN 61000-6-2:2005	Electromagnetic Compatibility - Generic Standards - Immunity for Industrial Environments
EN 61000-6-4:2007 +A1:2011	Electromagnetic Compatibility - Generic Standards - Emission for Industrial Environments

15 Hardware Torque Specifications

The following table provides the hardware torque specifications to use during the installation of the SuperTrak transport system.

Location Description	Size	Type	Finish	Class	DIN	Qty per	Torque (Nm)
Top connection plate	M10-1.5x40	SHCS	Zinc Plated	12.9	912	8	80
Side connection plate	M10-1.5x40	SHCS	Zinc Plated	12.9	912	12	80
Straight segment mount plate	M10-1.5x40	SHCS	Zinc Plated	12.9	912	4	80
Curved segment mount plate	M10-1.5x40	SHCS	Zinc Plated	12.9	912	4	80
	M10	O/S Washer	Zinc Plated		7349	4	
Straight segment stand to mount	M8-1.25x40	SHCS	Zinc Plated	12.9	912	8	40
	M8	O/S Washer	Zinc Plated		7349	8	
Straight segment stand to Motor	M6-1.0x45	SHCS	Zinc Plated	12.9	912	8	16
	M6	O/S Washer	Zinc Plated		7349	8	
Curved segment stand	M8-1.25x75	SHCS	Zinc Plated	12.9	912	3	40
	M8	Lock Washer	Zinc Plated		127	3	
Joint plate	M6-1.0x35	SHCS	Zinc Plated	12.9	912	8	16
	M6	Fender Washer	Zinc Plated		9021	8	
Power supply mount	M5-0.8x16	SHCS	Zinc Plated	12.9	912	4	10
	M5	Flat Washer	Zinc Plated		125	4	
	M5	Lock Washer	Zinc Plated		127	4	
Curved Segment top cover	M5-0.8x10	SHCS	Zinc Plated	12.9	912	10	10
Straight encoder	M3-0.5x8	SHCS	Zinc Plated	12.9	912	10	2
Upper v-rail	M6-1.0x14	SHCS	Zinc Plated	12.9	912	11	16
Interconnect 24 VDC motor and cable	M5-0.8x14	SHCS	Zinc Plated	12.9	912	2	9
	M5	Int. Tooth Washer	Zinc Plated		6797	2	
	M5	Flat Washer	Zinc Plated		125	2	
Interconnect com cable	M6-1.0x14	SHCS	Zinc Plated	12.9	912	2	11
	M6	Int. Tooth Washer	Zinc Plated		6797	2	
	M6	Flat Washer	Zinc Plated		125	2	
Interconnect to cabinet ground	M6-1.0x14	SHCS	Zinc Plated	12.9	912	2	11
	M6	Int. Tooth Washer	Zinc Plated		6797	2	
	M6	Flat Washer	Zinc Plated		125	2	
50 A fuse to coil driver PCB	M5-0.8x8	SHCS	Zinc Plated	12.9	912	1	2.7
	M5	Int. Tooth Washer	Zinc Plated		6797	1	
	M5	Flat Washer	Zinc Plated		125	1	
Coil driver board to bus bar	M4-0.7x12	SHCS	Zinc Plated	12.9	912	13	2
	M4	Int. Tooth Washer	Zinc Plated		6797	13	
	M4-0.7x12	Phillips head nylon screw	None		7985	1	
Gateway board to bus bar	M4-0.7x16	SHCS	Zinc Plated	12.9	912	4	2
	M4	Int. Tooth Washer	Zinc Plated		6797	4	
Shuttle - front cover	M5-0.8x8	BHSCS	Zinc Plated	10.9	7380	4	5.8
Shuttle - shoulder screw	SS 8MMX10MM	Shoulder Screw - 8MM DIA, 10MM LONG, M6X1.0 Thread	Black oxide	12.9	7379	2	10
Shuttle - 2-magnet	M6-1.0x20	SHCS	Zinc Plated	12.9	912	2	16
Shuttle - 3-magnet	M4-0.7x20	SHCS	Zinc Plated	12.9	912	4	4.5
Shuttle - anti-tip blocks	M4-0.7x10	SHCS	Zinc Plated	12.9	912	4	4.5
Shuttle - encoder strip	M5-0.8x12	LSHCS	Zinc Plated	8.8	7984	2	5.4
Shuttle - anti-static brush	M3-0.5x6	BHSCS	Zinc Plated	10.9	7380	4	1.3
Shuttle - lubricator	M3-0.5x14	SHCS	Zinc Plated	12.9	912	2	2
Wear strip locator	M3-0.5x8	SHCS	Zinc Plated	12.9	912	1	2

16 Spare parts

B&R Order Code	Description	Rec. Qty[1]	Replacement Frequency[2]	Critical[3]
Shuttle Spare Parts				
8FZSS0.00.0100-1	SuperTrak Anti-static brush - pack of 10 pieces	1+ (10 pc.)	Medium	Yes
8FZSS0.00.0200-1	SuperTrak Anti-tip block	10	Low	No
8FZAS0.00.0100-1	SuperTrak Flat wheel & bearing sub-assembly	10 (individual wheels, not sets)	Medium	No
8FZSS0.00.0300-1	SuperTrak Lubrication felt	5	Medium	No
8FZASE.00.0100-1	SuperTrak Shuttle encoder strip	5	Low	No
8FZAS0.00.0200-1	SuperTrak Shuttle IR tag	1 (if used)	Low	No
8FZAS0.00.0300-1	SuperTrak Shuttle IR reader	1	Very low	Yes
8FZAS0.20.0400-1	SuperTrak Shuttle magnet unit - 2 magnets	5 (if used)	Low	No
8FZAS0.30.0500-1	SuperTrak Shuttle magnet unit - 3 magnets	5 (if used)	Low	No
8FZAS0.00.0600-1	SuperTrak V-wheel & bearing sub-assembly	10 (individual wheels, not sets)	Medium	No
8FZAMS.00.A000-1	SuperTrak Shuttle Setup Tool Kit	0	Very low	No
Cabling and Wiring Spare Parts				
8FZSCE.00.0100-1	SuperTrak Encoder cable	1	Very low	Yes
8FZSCN.00.0100-1	SuperTrak Ethernet network cable	2	Very low	Yes
8FZSCR.00.0100-1	SuperTrak Ribbon cable - Curved segment lefthand top & bottom	1	Very low	Yes
8FZSCR.00.0200-1	SuperTrak Ribbon cable - Curved segment righthand top	1	Very low	Yes
8FZSCR.00.0300-1	SuperTrak Ribbon cable straight segment lefthand & curved segment righthand bottom	1	Very low	Yes
8FZSCR.00.0400-1	SuperTrak Ribbon cable straight segment lefthand top	1	Very low	Yes
8FZSCR.00.0500-1	SuperTrak Ribbon cable straight segment righthand bottom	1	Very low	Yes
8FZSCR.00.0600-1	SuperTrak Ribbon cable straight segment righthand top	1	Very low	Yes
8FZSCR.00.0700-1	SuperTrak Ribbon cable - curved segment (800 mm)	1	Very low	Yes
8FZSCR.00.0800-1	SuperTrak Ribbon cable - straight, driver (465 mm long) (Only applicable for straight segments with RME)	1	Very low	Yes
8FZSCR.00.0900-1	SuperTrak Ribbon cable - straight, driver (227 mm long) (Only applicable for straight segments with RME)	1	Very low	Yes
Circuit Board Spare Parts				
8FZSB0.00.0100-1	SuperTrak Coil driver board	2+	Low	Yes
8FZSB0.00.0200-1	SuperTrak Gateway board	1+	Low	Yes
Encoder Spare Parts				
8FZAE0.00.0100-1	SuperTrak Curved segment lefthand encoder assembly	1	Low	Yes
8FZAE0.00.0200-1	SuperTrak Curved segment righthand encoder assembly	1	Low	Yes
8FZSE0.00.0100-1	SuperTrak Magnetic encoder strip viewing film (pack of 5 pieces)	1	Very low	No
8FZAE0.00.0300-1	SuperTrak straight segment magnetic encoder assembly	3	Low	Yes
Rail Spare Parts				
8FZSG0.00.0100-1	SuperTrak Wear strip – curved segment, transition	1	Low	Yes
8FZSG0.00.0200-1	SuperTrak Wear strip 1000 mm	1	Low	Yes
8FZSG0.00.0300-1	SuperTrak Wear strip locater	2	Low	Yes
8FZSMM.00.0400-1	SuperTrak Straight segment v-rail 999.5 mm	0	Very low	Yes
Miscellaneous Spare Parts				
8FZSBM.00.0100-1	SuperTrak Coil driver fuse - pack of 10 pieces	1 (10 pc.)	Very low	Yes
8FZSC0.00.0100-1	SuperTrak Digital power cable	0	Very low	Yes
8FZSMM.00.0100-1	SuperTrak Curved segment motor cover	1	Low	No
8FZSCM.00.0100-1	SuperTrak Curved segment motor ground cable	0	Very low	No
8FZSCM.00.0200-1	SuperTrak Frame ground cable - curved segment	0	Very low	No
8FZSCM.00.0300-1	SuperTrak Frame ground cable - straight segment	0	Very low	Yes
8FZSCM.00.0400-1	SuperTrak Gateway board ground cable	0	Very low	No
8FZSMM.00.0200-1	SuperTrak Interconnect tube	0	Very low	Yes
8FZSCM.00.0500-1	SuperTrak Motor common cable	0	Very low	Yes
8FZSCM.00.0600-1	SuperTrak Motor common cable - curved segment	0	Very low	Yes
8FZSCM.00.0700-1	SuperTrak Motor positive cable	0	Very low	Yes
8FZSCM.00.0800-1	SuperTrak Motor positive cable - curve	0	Very low	Yes
8FZAP0.00.0100-1	SuperTrak Motor Power Supply	1+	Low	Yes
8FZSS0.00.0400-1	SuperTrak Shuttle mounting tool	0	Very low	No
8FZSMM.00.0500-1	SuperTrak Plastic hole plugs; size 15 (pack of 10)	0	Very low	No

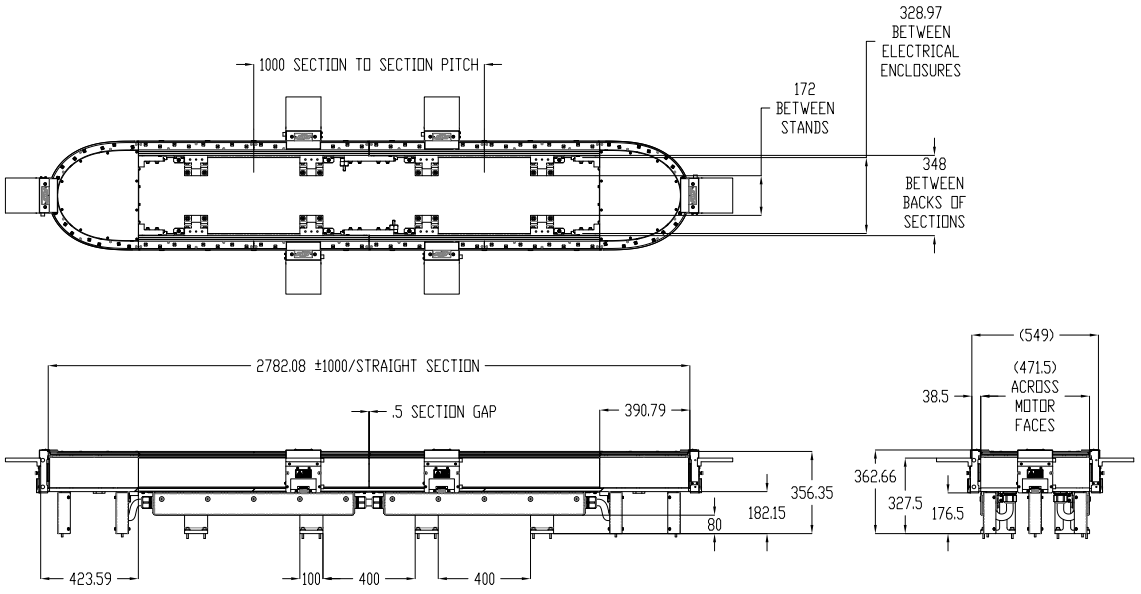
B&R Order Code	Description	Rec. Qty[1)]	Replacement Frequency[2)]	Critical[3)]
Shuttle Spare Parts				
8FZSPM.00.0100-1	SuperTrak Power supply 50A fuse - pack of 5 pieces	1+ (5 pc.)	Very low	Yes
8FZSPM.00.0200-1	SuperTrak Power supply exhaust filter - pack of 10 pieces	1+ (10 pc.)	High	Yes
8FZSMM.00.0300-1	SuperTrak Straight segment motor cover	2	Low	No
8FZSM0.00.0100-1	SuperTrak Thermistor	0	Very low	No

1) This is the recommended on-hand quantity for a base assembly. Increase quantities, as required, for larger SuperTrak transport systems.
2) Replacement frequency definitions:
   - High - Replace at regular intervals.
   - Medium - Replace occasionally.
   - Low - Replace rarely.
   - Very Low - Replacement is not generally required.
3) Critical to the SuperTrak transport system function definitions:
   - Yes - The SuperTrak conveyor will not run without this component.
   - No - The SuperTrak conveyor will run without this component.

Appendix A Unit Conversions

To Convert	Into	Multiply By
psi	kPa	6.8948
psi	bar	0.068947
psi	inHg	2.03602
kPa	psi	0.145038
kPa	bar	0.01
kPa	inHg	0.295301
bar	psi	14.503773773
bar	KPa	100.0
bar	inHg	29.5301
inHg	psi	0.491154
inHg	kPa	3.38638816
inHg	bar	0.03386388158
Gs	mT	0.1
cm	in.	0.3937
in.	cm	2.54
m	ft	3.2808
ft	m	0.3048

Appendix B Mechanical Drawings



Appendix C SuperTrak Transport System Design Considerations

These documents provide design considerations when incorporating the SuperTrak transport system into a machine or system. They cover features, options, things to watch out for and important general information for new users. The following topics are covered:

- Shuttle
- Straight segment
- Curved segment
- Motor Power Supply

To have details added to the package or for further information, see

www.br-automation.com

Other references:

- Files listed here are distributed in the SuperTrak customer design package.
- .EASM and .EPRT files enable the measure tool and the ability to hide in a CAD viewer.
- E-drawing configurations are saved in separate .STEP files for non-SolidWorks users.
- If multiple versions are present, a change is in progress so select the relevant version for the system.

C.1 Shuttle Design Considerations

Shuttle Design Considerations 1

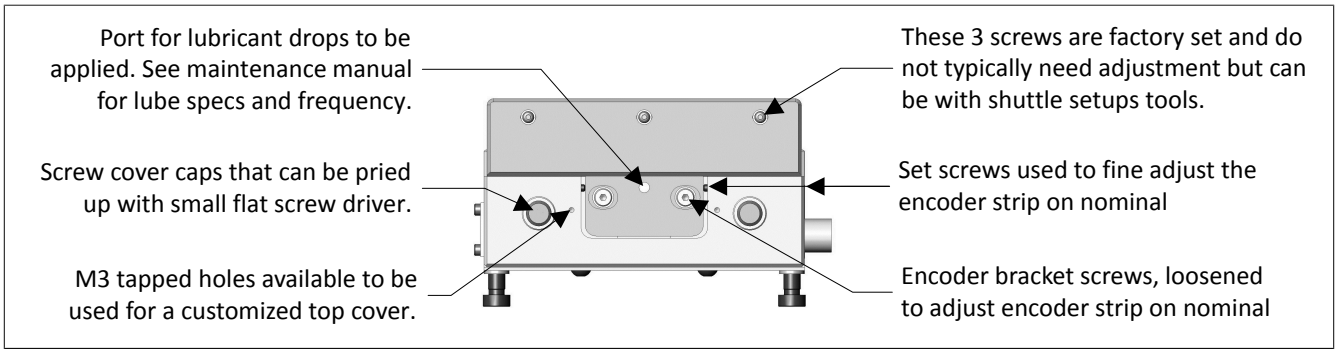


Figure 5: Shuttle Design Considerations 1

Shuttle Design Considerations 2

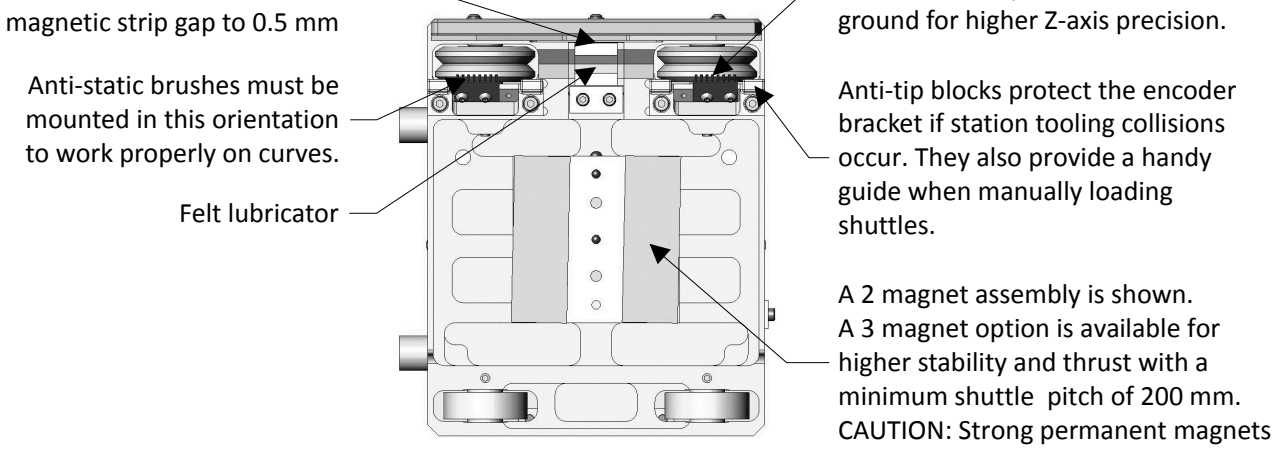


Figure 6: Shuttle Design Considerations 2

Shuttle Design Considerations 3

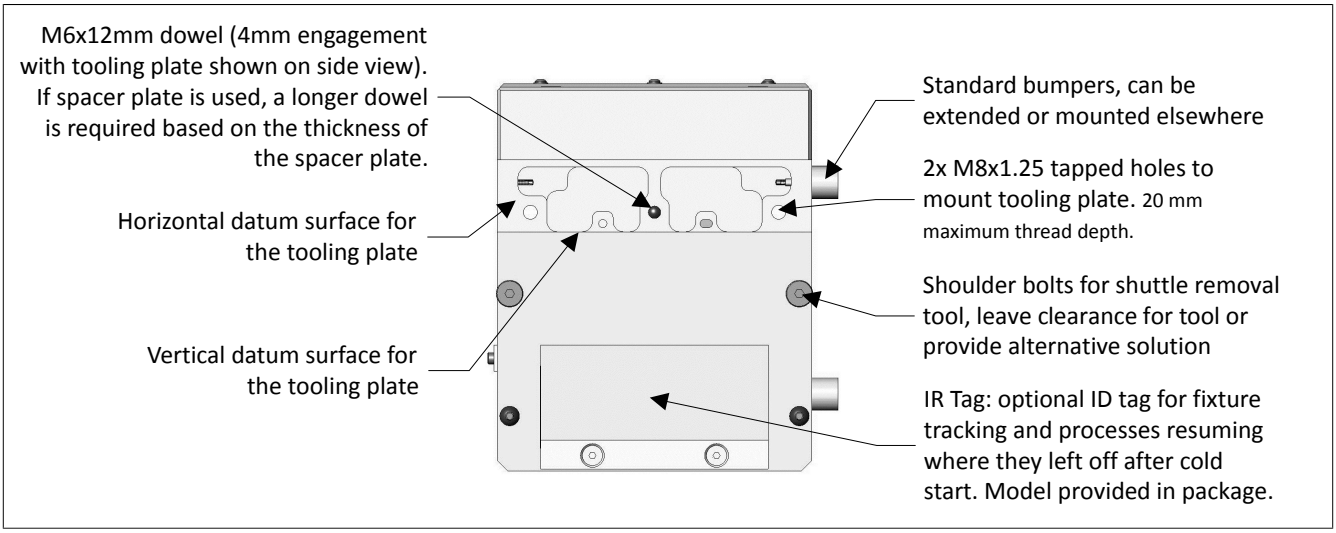


Figure 7: Shuttle Design Considerations 3

Minimum Pitch Scenarios	Base shuttle	Standard bumper	Gap	Pitch
Standard bumper & typical gap	152 mm	13 mm	5 mm	170 mm
Standard bumper & smallest gap	152 mm	13 mm	2 mm	167 mm
No bumper & typical gap	152 mm	0 mm	5 mm	157 mm
No bumper & smallest gap	152 mm	0 mm	2 mm	154 mm
Shuttle with 3 vs 2 magnets	152 mm	13 mm	5 mm	200 mm

Table 21: Dimensions

Shuttle Design Considerations 4

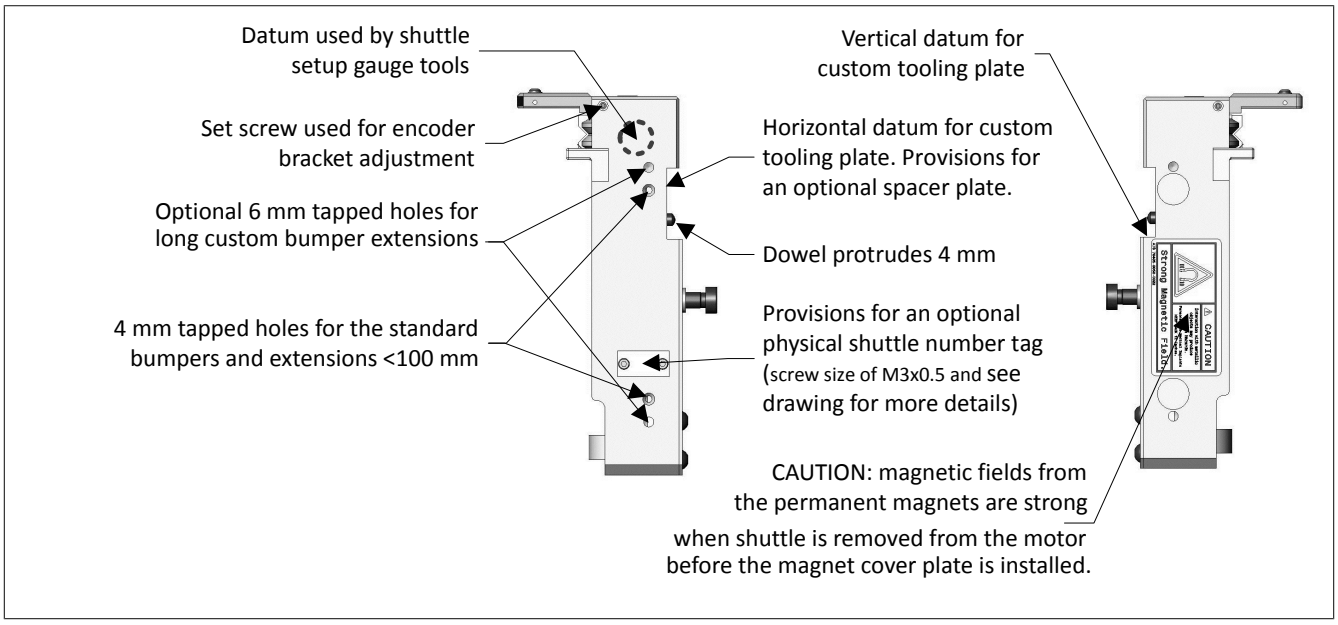


Figure 8: Shuttle Design Considerations 4

Other references:

- Operation & Maintenance Manual
- Shuttle models, IR Tag model
- Shuttle tooling interface reference design
- Shuttle tooling plate mount spacer reference design
- Shuttle physical number tag drawing

C.2 Straight Segment Design Considerations

Straight Segment Design Considerations 1

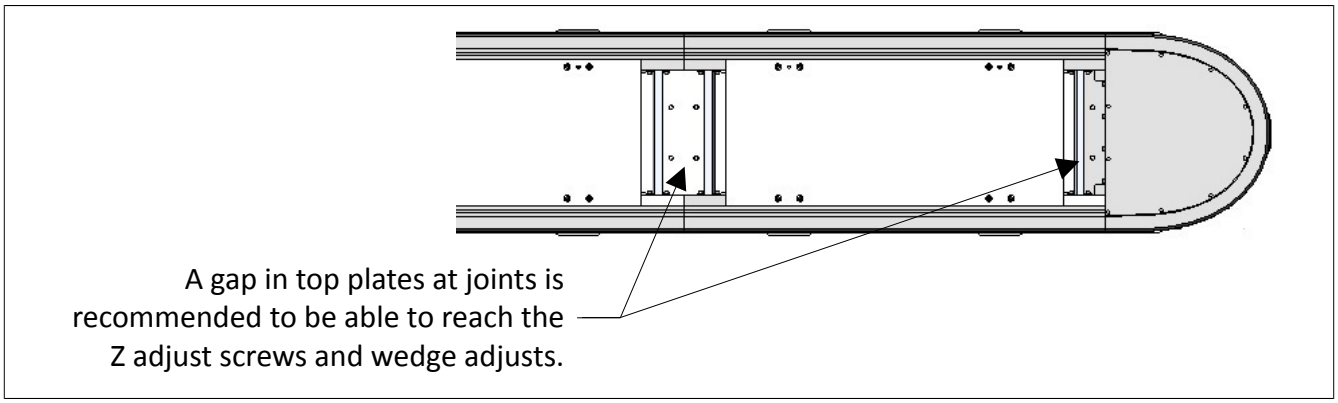


Figure 9: Straight Segment Design Considerations 1

Straight Segment Design Considerations 2

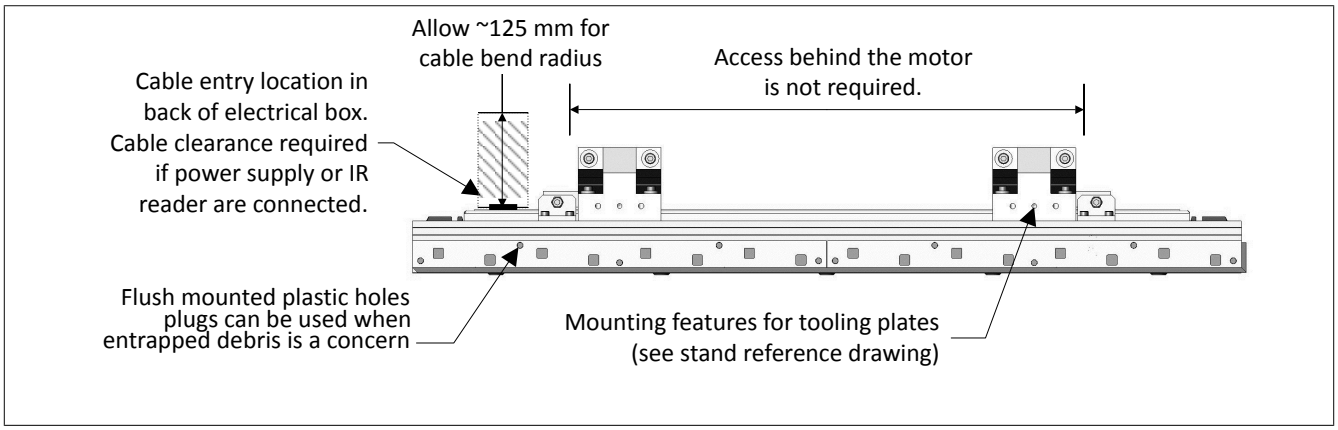


Figure 10: Straight Segment Design Considerations 2

Straight Segment Design Considerations 3

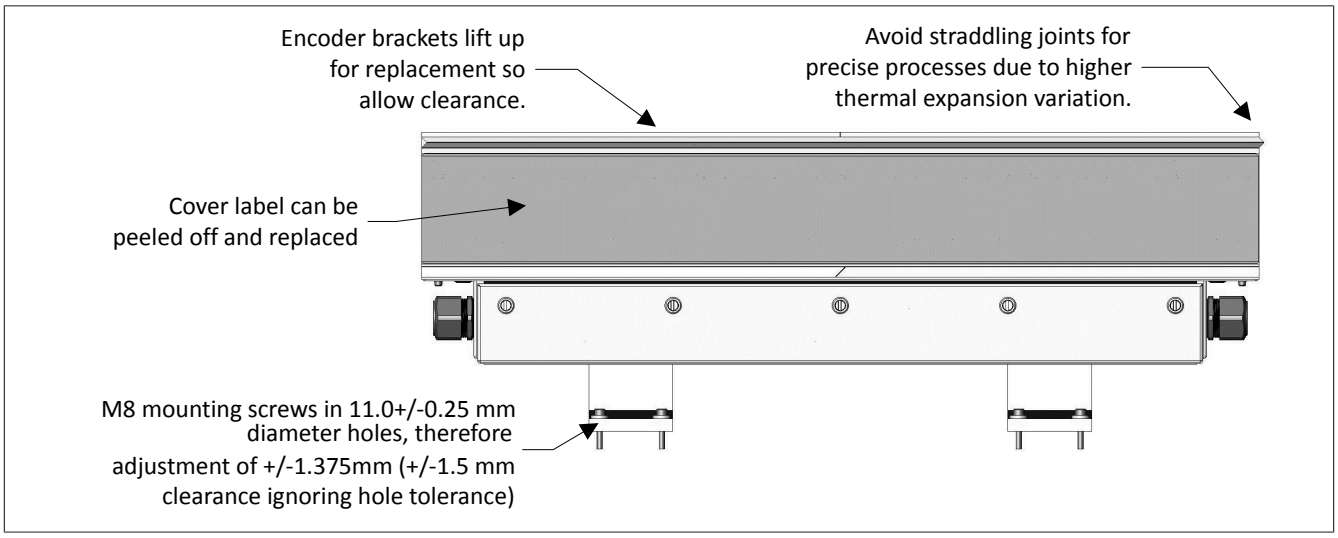


Figure 11: Straight Segment Design Considerations 3

Straight Segment Design Considerations 4

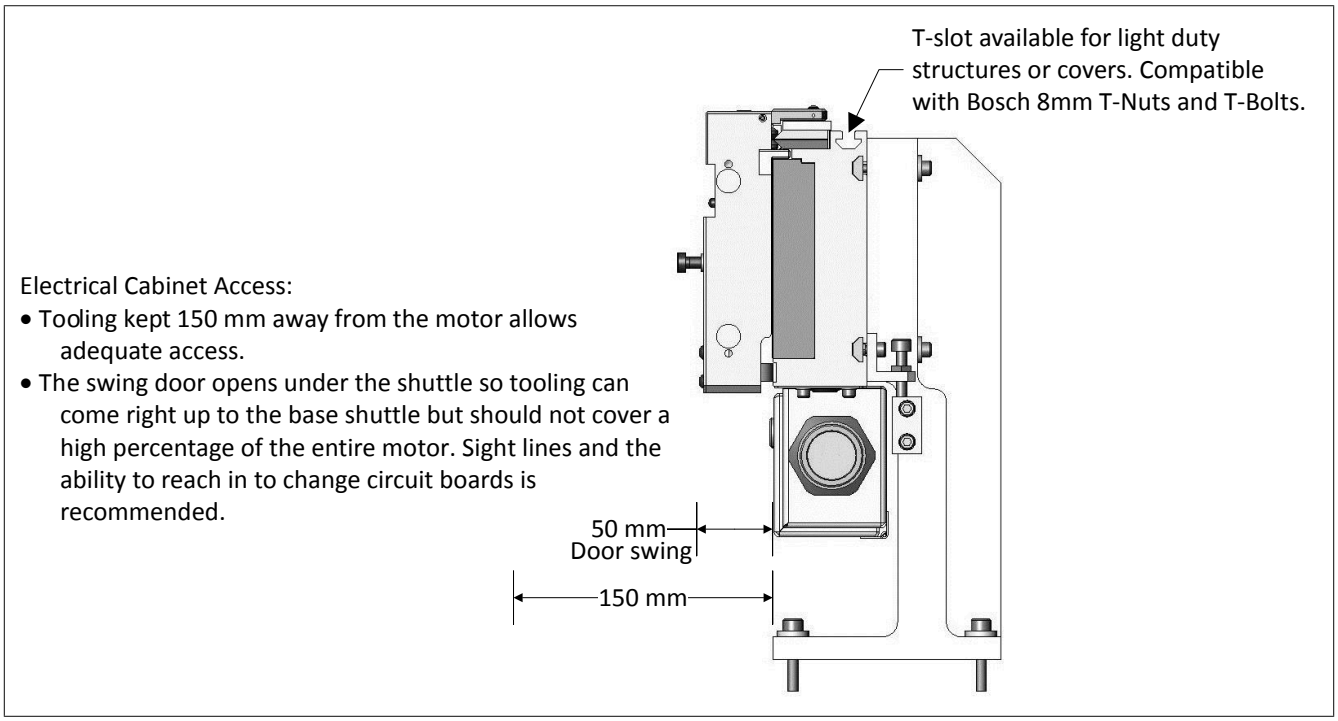


Figure 12: Straight Segment Design Considerations 4

Straight Segment Design Considerations 5

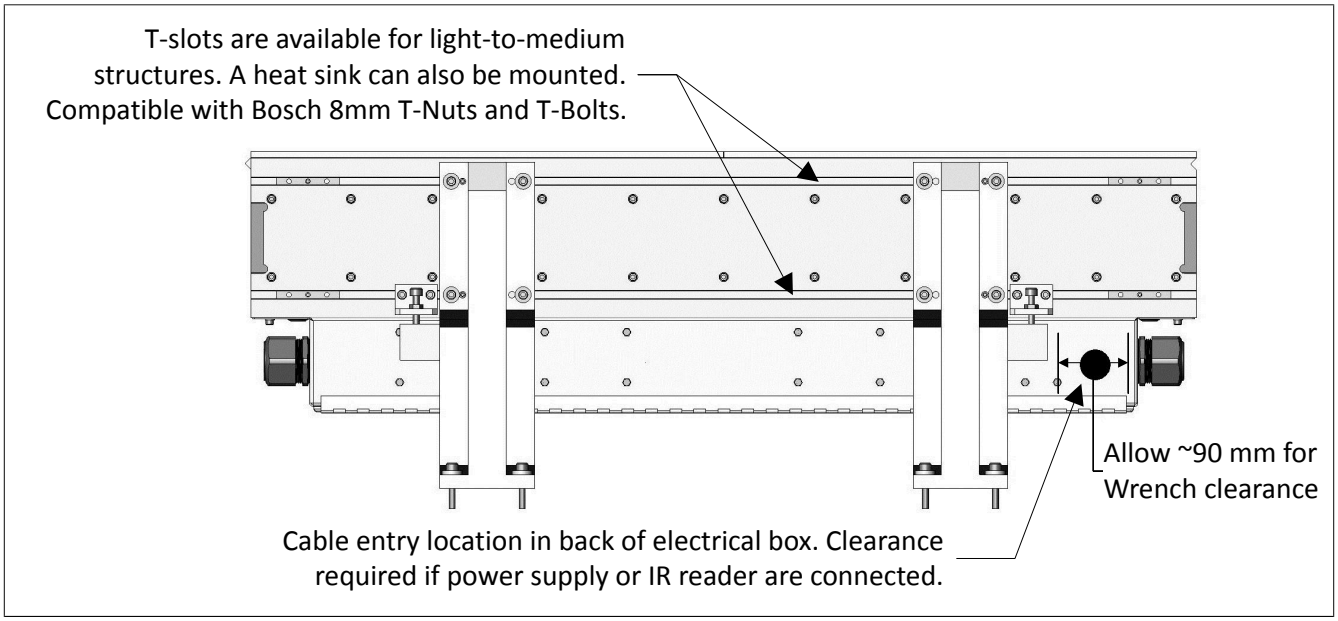


Figure 13: Straight Segment Design Considerations 5

Critical Frame Considerations

1. The motor mounting surfaces must have flatness +/- 0.25 mm
2. The frames must maintain a precise 1 meter pitch within +/- 0.075 mm

Other references

- Operation & Maintenance Manual
- Power Supply models
- Power Supply mount drawing

C.3 Curved Segment Design Considerations

Curved Segment Design Considerations 1

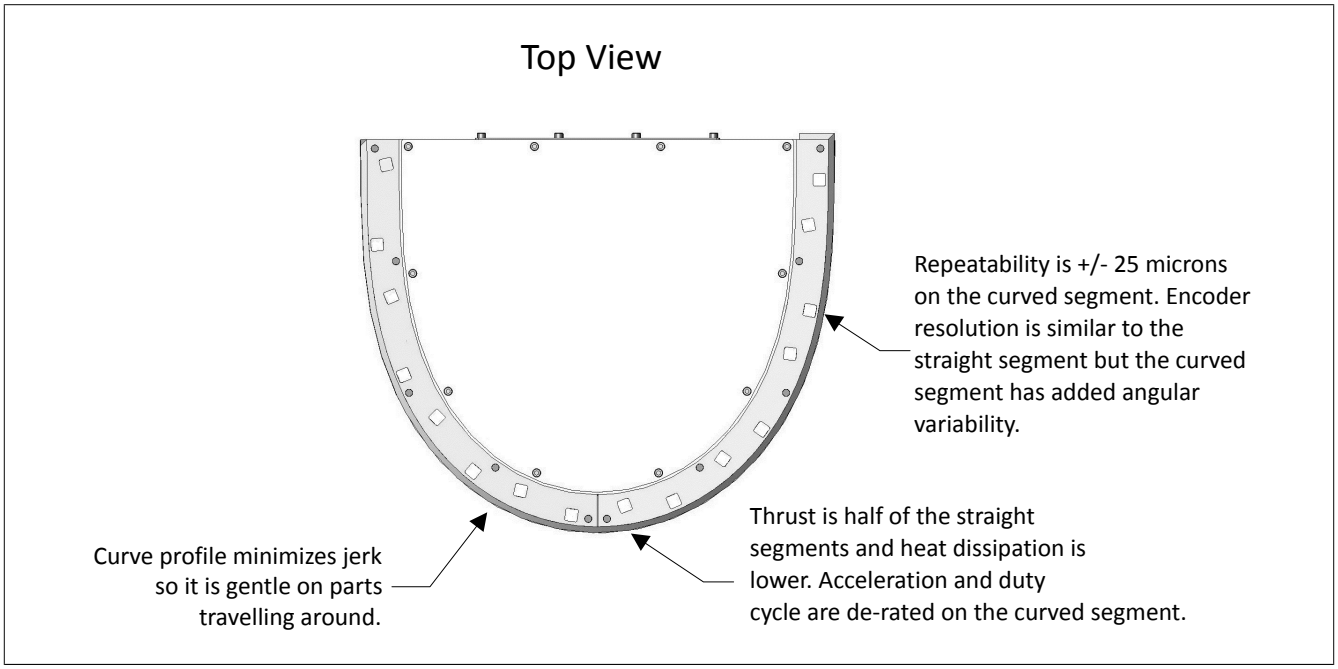


Figure 14: Curved Segment Design Considerations 1

Curved Segment Design Considerations 2

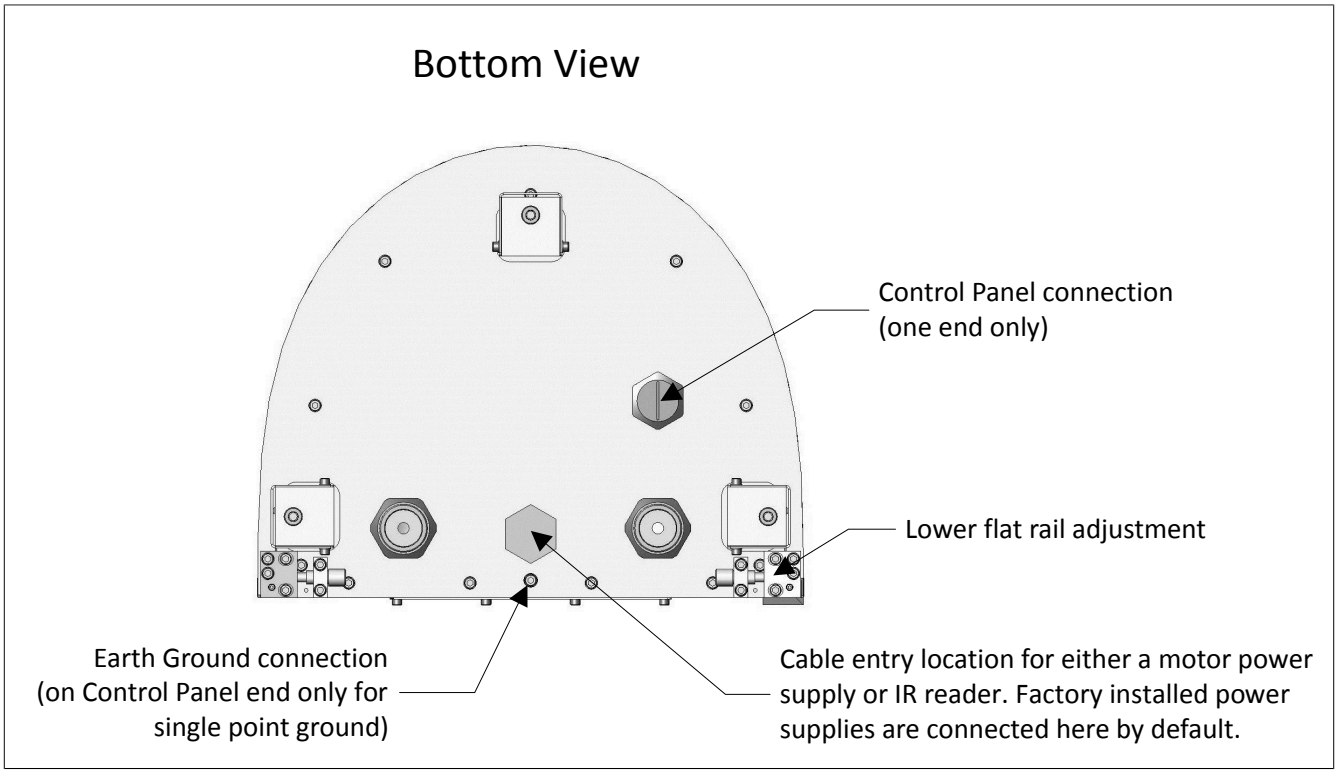


Figure 15: Curved Segment Design Considerations 2

Curved Segment Design Considerations 3

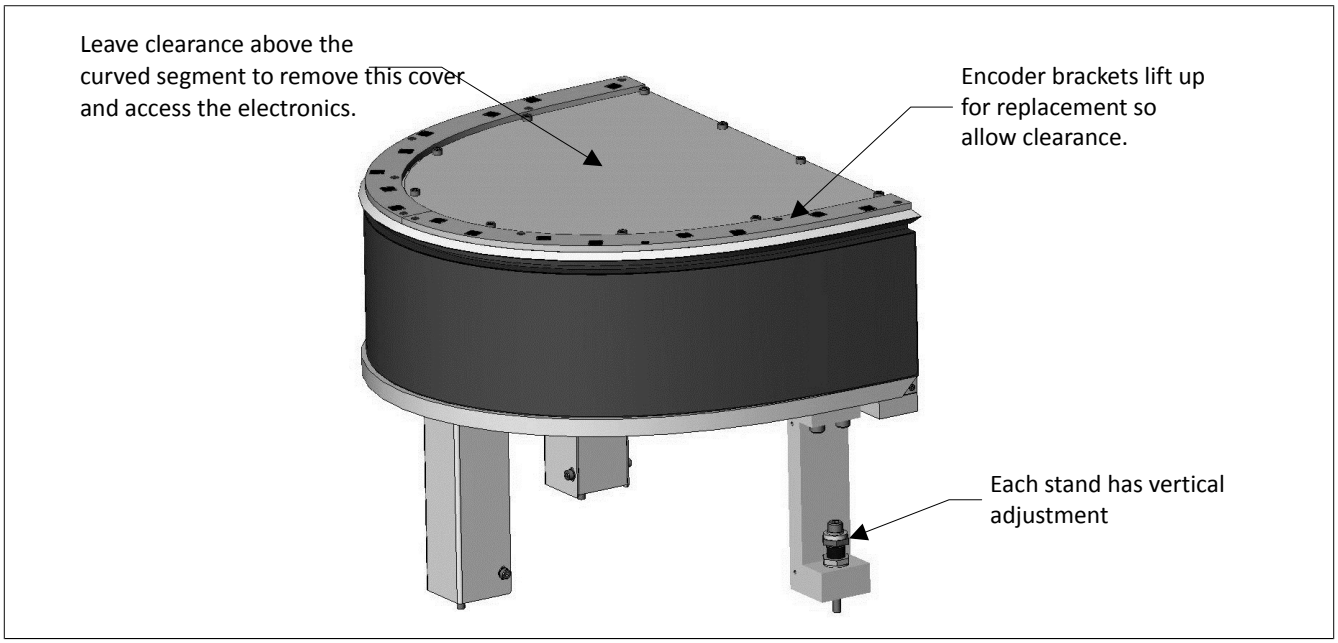


Figure 16: Curved Segment Design Considerations 3

Other references:

- Operation & Maintenance Manual
- 180 Deg. Curved Segment models

C.4 Motor Power Supply Considerations

Motor Power Supply Considerations 1

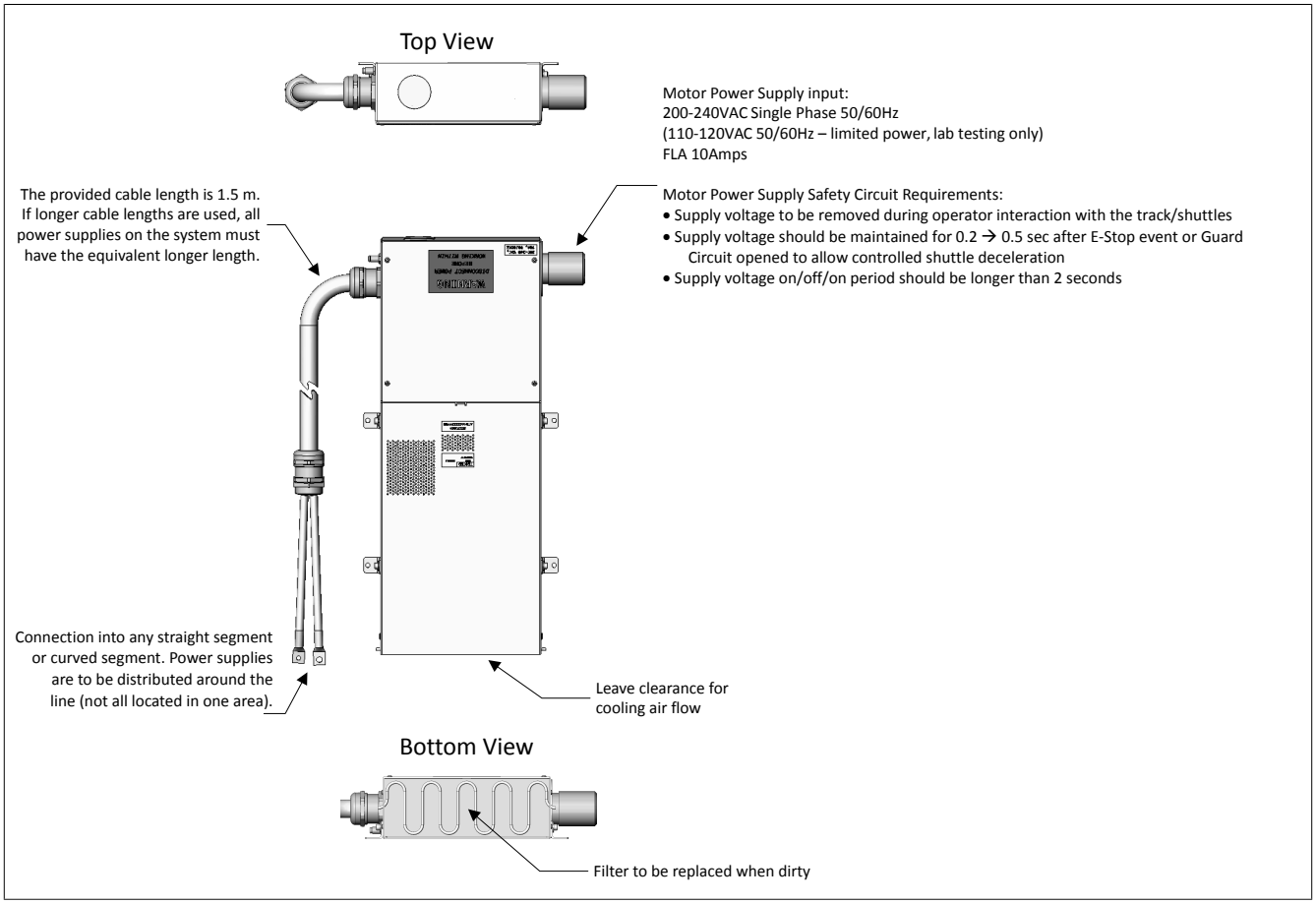


Figure 17: Motor Power Supply Considerations 1

Motor Power Supply Considerations 2

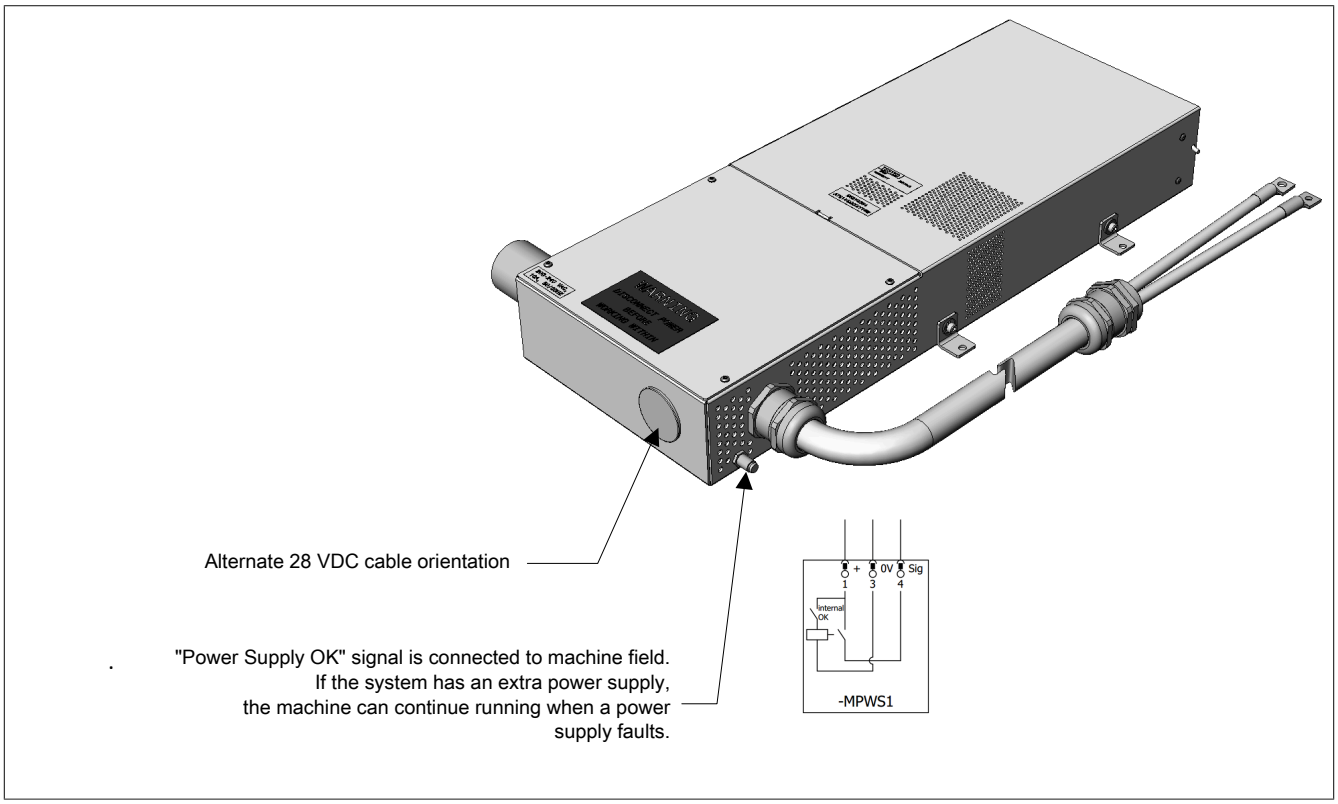
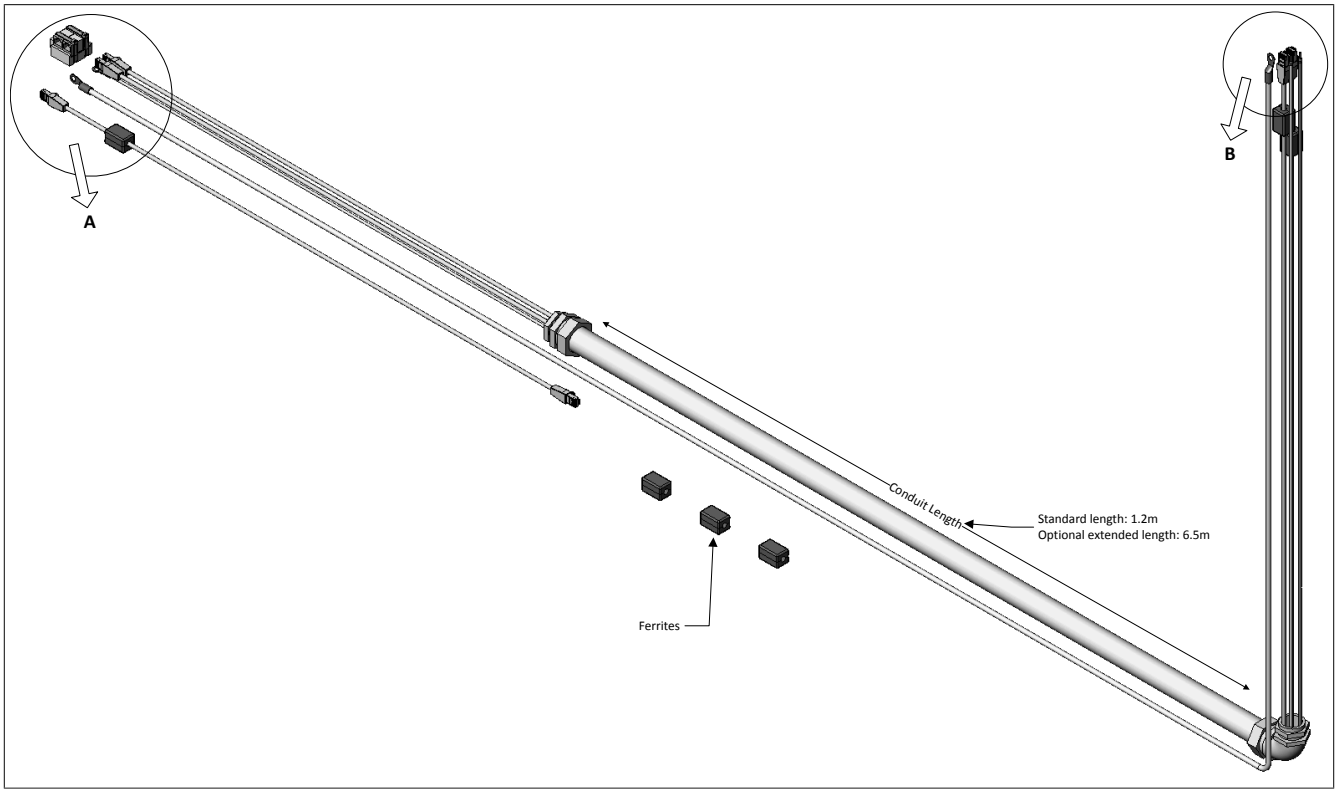


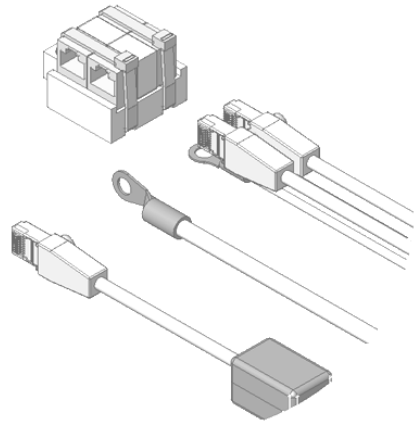
Figure 18: Motor Power Supply Considerations 2

Other references:

- Operation & Maintenance Manual
- Power Supply models
- Power Supply mount drawing

C.5 Control Panel to Curve Interconnect

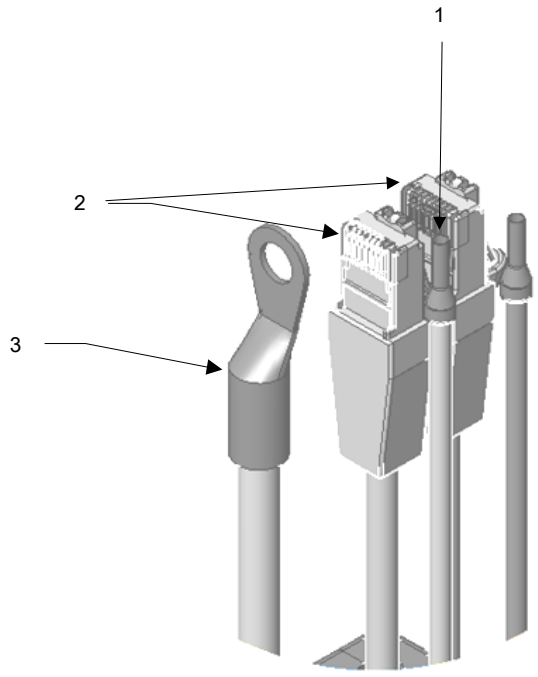




Curved Segment Connection & Components

Refer to Operation & Maintenance Manual for Installation instructions

Figure 19: **A**



Control Panel Connections

Figure 20: **B**

1

24 VDC and COM wires – Provides power to motor electronics and encoders. This should come from the same power source that provides power to the SuperTrak controller.

Requirements:

- 250 mA per segment
- Recommend that this is UPS power to maintain controller power and encoder positions during power outages.

2

Qty 2: CAT6 Patch Cables: These connect to SuperTrak interface card

- Standard length: 3 m
- Optional Extended length: 7.6 m

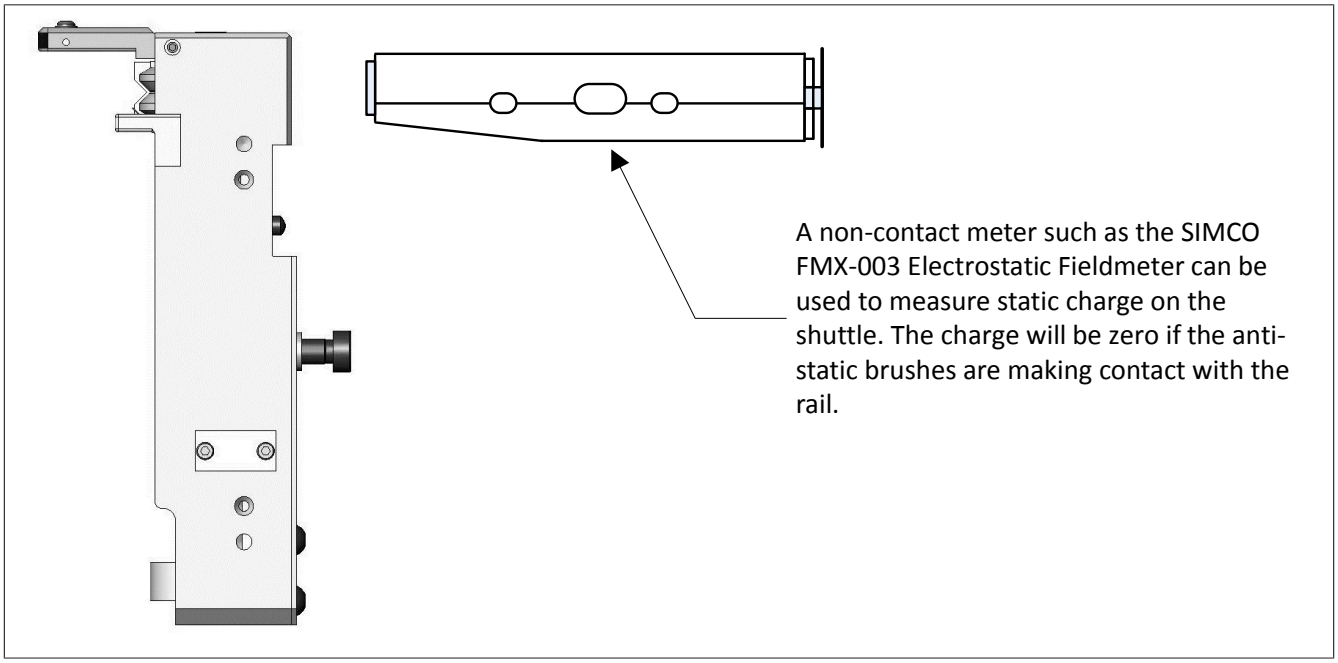
3

GND – Connect to control panel GND

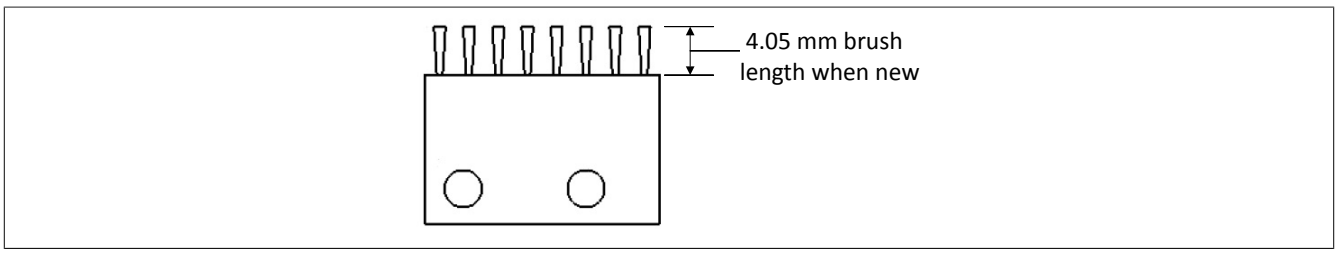
Appendix D Shuttle Static Charge Considerations

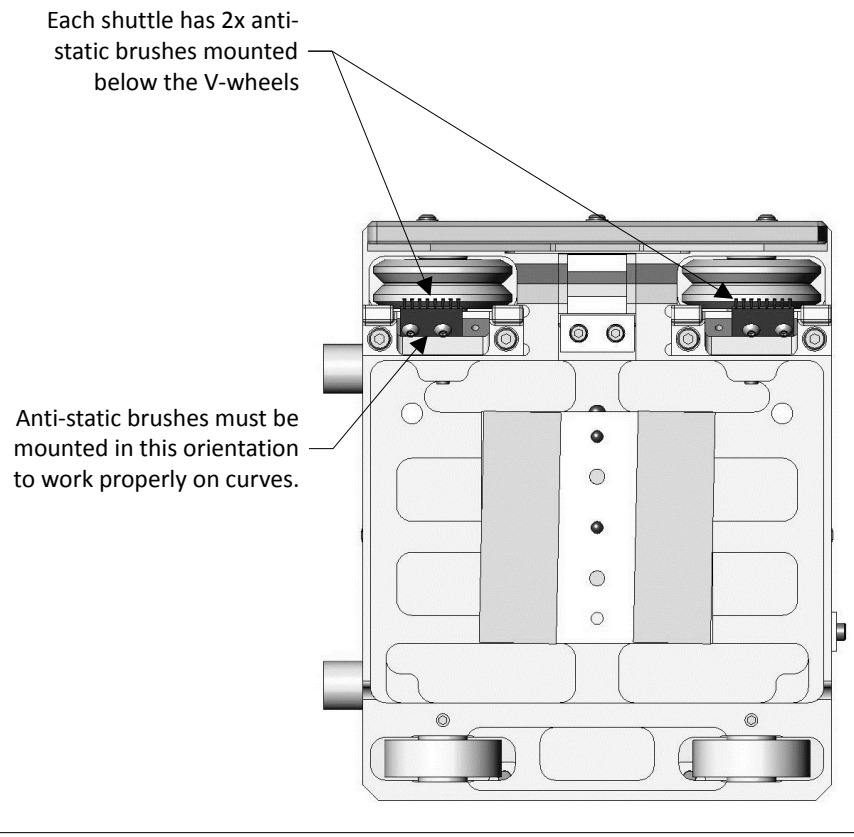
Each shuttle comes with anti-static brushes installed to keep the shuttles discharged. There are 2x anti-static brushes on each shuttle for redundancy in case one gets damaged. The anti-static brushes discharge to both the straight segments and the curve segements so they work at all times.

The bristles of the anti-static brushes are stainless steel that will wear down over time. When bristles are long enough to make contact with the rail, the charge on the shuttles will be kept at 0V. Once they no longer make contact, there will be some charge accumulating on the shuttle. If the gap between the brushes and the rail gets large enough, higher charges up to 1 kV have been measured on the shuttles and the brushes must be replaced. Anti-static brushes should be inspected and replaced as part of the preventative maintenance schedule. A minimum annual replacement schedule is recommended. A alternate option to visual inspection is to measure the accumulated static charge on the shuttles with a field meter.



Constant, complete discharge occurs when the stainless steel bristles make contact with the rail. This occurs with brush length >3.5 mm. For constant discharge, replace the brushes when <3.5 mm.





Other references:

- Operation & Maintenance Manual
- Shuttle models

Appendix E Conditions of Acceptability for certification

Model Variations:

Certified models SuperTrak GEN3 Track Module Assy / 1060387 or 1060391 are also represented as 8FZA-M1.0A.A000-1 / SuperTrak Straight Segment. Models are further supplemented by EN standards as models 25220499.

Certified model SuperTrak GEN3 E-Turn Track Module Assy / 1060638 is also represented as 8FZAM2.0A.A000-1 / SuperTrak Curved Segment.

Certified model SuperTrak Motor Power Supply 25270337 is also represented as 8FZAP0.00.0100-1 / SuperTrak Motor Power Supply. Modes are further supplemented by EN standards as models 25195828, 25270354.

Track Module Assembly & E-Turn Track Module Assembly

a) Models are evaluated as an integrated component and intended to be a scalable interconnected system provided inline protection fuse(s) are installed on the Bus connection and power supply lines. End user / integrator shall recognize ampacity limits of the bus bar interconnect conductors per the National Electrical Code.
b) Models are to be powered by a certified SuperTrak Motor Power Supply Assy / 25270337.
c) Models are evaluated with an optional accessory cable “CONTROL PANEL TO E-TURN INTERCONNECT” Part# 25240470 1.2 m, Part# 125362696 2.0 m or Part# 25221246 6.5 m (6.5 m can be user adjustable length).
d) The equipment is not evaluated for use in hazardous (classified) environments.
e) The equipment is not evaluated for use with flammable liquids or materials.
f) The equipment has been investigated for continuous operation at a maximum operating ambient temperature of 40°C at an altitude up to 2000 m and relative humidity levels from 5-90%, non-condensing.
g) The equipment has been evaluated for indoor use in pollution degree 2 environments.
h) The equipment is to be installed by qualified personal in accordance with local and national installation/wiring requirements.
i) The motor’s epoxy resin (potting) is not investigated for flammability (UL94).
j) Emergency Stop, disconnect devices for the SuperTrak system are provided via the mains supply to the SuperTrak Motor Power Supply. Integration and validation of system wide emergency stops are the responsibility of the end user/integrator.
k) Functional Safety requirements are the responsibility of the end user/integrator of this component.

SuperTrak Motor Power Supply

a) SuperTrak Power Supply is evaluated as an integrated component and intended to be a scalable interconnected system provided inline protection fuse(s) are installed on the Bus connection and power supply lines. End user / integrator shall recognize ampacity limits of the bus bar interconnect conductors per the National Electrical Code.
b) A suitable cable is to be provided for the plug/socket component (industrial twist lock) for connecting the mains supply.
c) SuperTrak Motor Power Supply is for use only with a SuperTrak Track Module Assy (1060387 or 1060391) & SuperTrak Track E-Turn Module Assy (1060638).
d) SuperTrak Motor Power Supply is powered from an ATS SuperTrak Conveyor Control Panel / 25202161 or from other appropriate power source with certified (North American listed) overcurrent protection, 10A UL489 breaker, type CC fuses or Type J fuses.
e) The equipment is not evaluated for use in hazardous (classified) environments.
f) The equipment is not evaluated for use with flammable liquids or materials.
g) The equipment has been investigated for continuous operation at a maximum operating ambient temperature of 40°C at an altitude up to 2000 m and relative humidity levels from 5-90%, non-condensing. Orientation is filter element down.

h) The equipment has been evaluated for indoor use in pollution degree 2 environments.

i) The equipment is to be installed by qualified personal in accordance with local and national installation/wiring requirements.

j) Emergency Stop, disconnect devices for the SuperTrak system are provided via the mains supply to the SuperTrak Motor Power Supply. Integration and validation of system wide emergency stops are the responsibility of the end user/integrator.

k) Functional Safety requirements are the responsibility of the end user/integrator of this component.