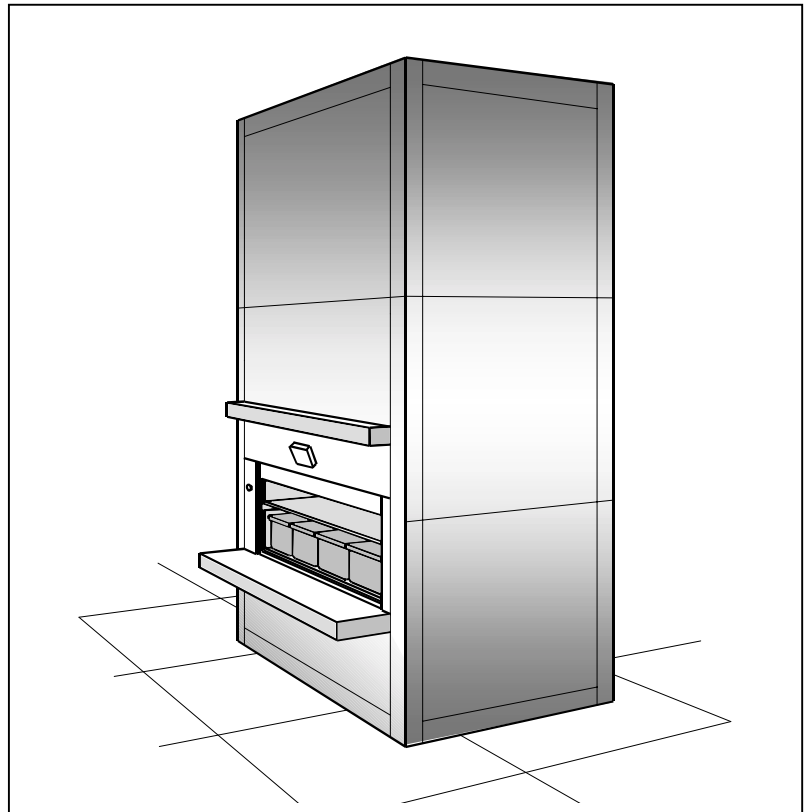

Series 2400 Vertical Carousel

Installation, Operation, and Maintenance Manual

These instructions are intended for use with all White Vertical Carousel models equipped with AC drives including:

MODEL	NOMINAL PAN DEPTH
2400	24.5 inches
1800	18.5 inches
1600	16.5 inches
1500	15.5 inches

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For assistance, contact our **Customer One Protection** technical support group at 1-800-571-8822 or cop@whitesystems.com

WHITE 
A PINNACLE AUTOMATION COMPANY

SERIES 2400 VERTICAL CAROUSEL

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

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PREFACE

Purpose of this manual

This is a guide for installing, operating, and maintaining the Series 2400 Vertical Carousel. The equipment owner should make a copy of this manual available to employees at installation and during safety, operation, and maintenance training. Afterwards, maintenance personnel should keep a copy on file for reference during maintenance, troubleshooting, or when ordering spare parts.

This manual does not cover major rebuilds and overhauls, or component level electronic repairs. Should you encounter any of these situations, please call our Customer One Protection technical support group at 1-800-571-8822.

How to use this manual

For reference purposes, we have divided this manual into separate subjects. Each subject appears in a numbered section following a bold, capitalized title. Key paragraphs within each section are numbered and have bold titles. The Table of Contents lists the numbered sections and paragraphs, forming an index for quick reference.

When possible, we have included illustrations to help explain procedures. Refer to the List of Figures to find specific illustrations. For cases where generic drawings cannot provide adequate detail, we will refer to specific drawings shipped with this manual.

Organization of this manual

1. **SAFETY:** This section is a list of statements and symbols the manual uses to warn about procedures that, if followed incorrectly, could cause personal injury or equipment damage.
2. **DESCRIPTION:** This section describes the components of the vertical carousel system, how the system operates, and the system's operating controls.
3. **INSTALLATION:** This section contains a list of tools, components, and procedures for the electrical and mechanical installation of the Series 2400 Vertical Carousel.
4. **ADJUSTMENTS AND SETUP:** This section is a general guideline for commissioning the Series 2400 Vertical Carousel.

5. **OPERATION:** This section contains rules for safe operation and procedures for starting and operating the vertical carousel system in manual and automatic mode.
6. **MAINTENANCE AND TROUBLESHOOTING:** This section contains rules for maintenance safety, a recommended maintenance schedule, procedures for inspecting, adjusting, and replacing components, and a guide for troubleshooting system problems.
7. **DESIGN DATA:** This section contains a list of Series 2400 Vertical Carousel specifications and optional equipment.

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1. SAFETY

White has designed the Series 2400 Vertical Carousel to meet OSHA, ANSI, and NEC standards for safety. We rely on you, our customers, to install, operate, and maintain the equipment to these standards. Always follow OSHA Lockout/Tagout procedure when inspecting or maintaining the carousel equipment.

1.1 WARNINGS



When serious injury or loss of life could result from failing to follow the proper procedure, this manual will use this symbol.

The warning symbol will be enclosed in a text box containing a bold text description of the safety issue and steps to avoid personal injury.


1.2 CAUTIONS




When a less serious injury, or equipment damage, could result from failing to follow the proper procedure, this manual will use this symbol.

A text description of the safety issue will accompany the warning symbol.

1.3 APPLICABLE WARNINGS AND CAUTIONS

 <p>DANGER</p>	<p>HAZARD OF ELECTRICAL SHOCK OR BURN. FAILURE TO FOLLOW SAFE ELECTRICAL PRACTICES CAN RESULT IN SERIOUS INJURY OR DEATH. BEFORE OPENING PANEL INSURE THAT ALL SOURCES OF POWER ARE TURNED OFF AND LOCKED OUT.</p>
---	---

 <p>DANGER</p>	<p>HAZARD OF ELECTRICAL SHOCK OR BURN. DO NOT STAND IN FRONT OF OPEN PANEL WHEN INITIALLY APPLYING POWER. CLOSE AND SECURE ALL ENCLOSURE DOORS BEFORE SWITCHING POWER ON AT THE DISCONNECT.</p>
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HAZARD OF ELECTRICAL SHOCK OR BURN. POTENTIALLY LETHAL VOLTAGES EXIST IN AC DRIVES FOR SEVERAL MINUTES AFTER POWER IS REMOVED. BEFORE SERVICING AN AC DRIVE, IN THE CONTROL ENCLOSURE, WAIT UNTIL THE DC BUS IS DISCHARGED AND THE BUS CHARGED LIGHT IS OUT.



POSSIBLE UNEXPECTED MACHINE OPERATION. BEFORE ATTEMPTING TO SERVICE OR ADJUST THE CAROUSEL MECHANISM, REMOVE ALL POWER TO THE CONTROL ENCLOSURE. INSTALL SAFETY LOCKOUT DEVICES TO ENSURE MECHANISM DOES NOT START UNEXPECTEDLY.



TO PREVENT THE SLINGS FROM SLIPPING OFF, FASTEN C-CLAMPS TO THE FORK ENDS AND TILT THE MAST BACKWARD BEFORE LIFTING THE SIDE.



TO AVOID DAMAGING THE CURVED TRACKS, BE SURE THAT ALL STABILIZING ARM ROLLERS ARE IN THEIR TRACKS AND THAT THE TRUNNION PLATES REMAIN LEVEL WHEN JOGGING THE CAROUSEL DRIVE.



PAN ROTATION INDICATES THAT THE FRONT TO BACK LOAD DISTRIBUTION EXCEEDS RECOMMENDED LIMITS AND IT IS NOT SAFE TO USE THE HAND CRANK.

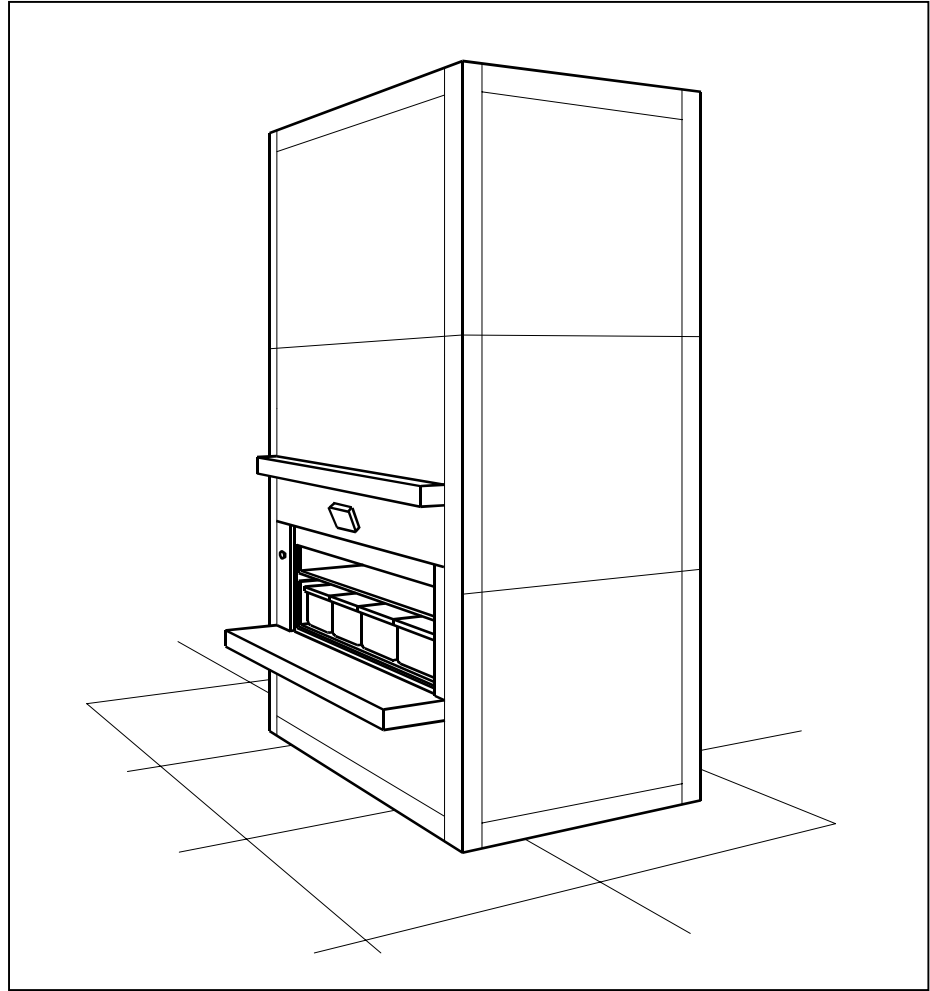


Figure 1. THE VERTICAL CAROUSEL

2. DESCRIPTION

2.1 GENERAL

White vertical carousels increase material storage density and retrieval efficiency by storing material in unused overhead space. Inside the carousel, movable carriers, called pans, rotate to bring stored material to the operator.

Personnel using White vertical carousels do not need to bend or lift because stored materials are delivered at waist height.

White vertical carousels can be part of many different storage system applications. They work as independent storage units when controlled by a local keyboard interface.

Multiple vertical carousels operate as integrated storage systems when they are networked with a host computer.

Batch pick systems, built by placing conveyors in front of vertical carousels, allow operators to pick from the carousels into totes or cartons placed on conveyors.

Tall carousels with multiple access windows combine storage and vertical lift functions when placed between floor levels.

Series 2400 Vertical Carousel features include:

- AC variable speed drive
- Carousel height is configurable to maximize use of overhead space
- Choice of pan size to maximize use of storage space
- Locking access doors
- Stainless steel work counter
- Front opening panel for maintenance access
- RS-232 computer interface port (optional)
- Automatic door operation (optional)
- Light bar (optional)
- Clean room rating down to Class 10 (optional)

2.2 OPERATING CONTROLS

2.2.1 Location of operating controls

2.2.1.1 EMERGENCY STOP BUTTONS

Three emergency stop buttons are provided at every door opening; one at each side of the opening, and one in the Carousel Interface Terminal.

2.2.1.2 CAROUSEL INTERFACE TERMINAL

The Carousel Interface Terminal is located above the door opening at the center of the unit. Up to four terminals can be accommodated on one carousel.

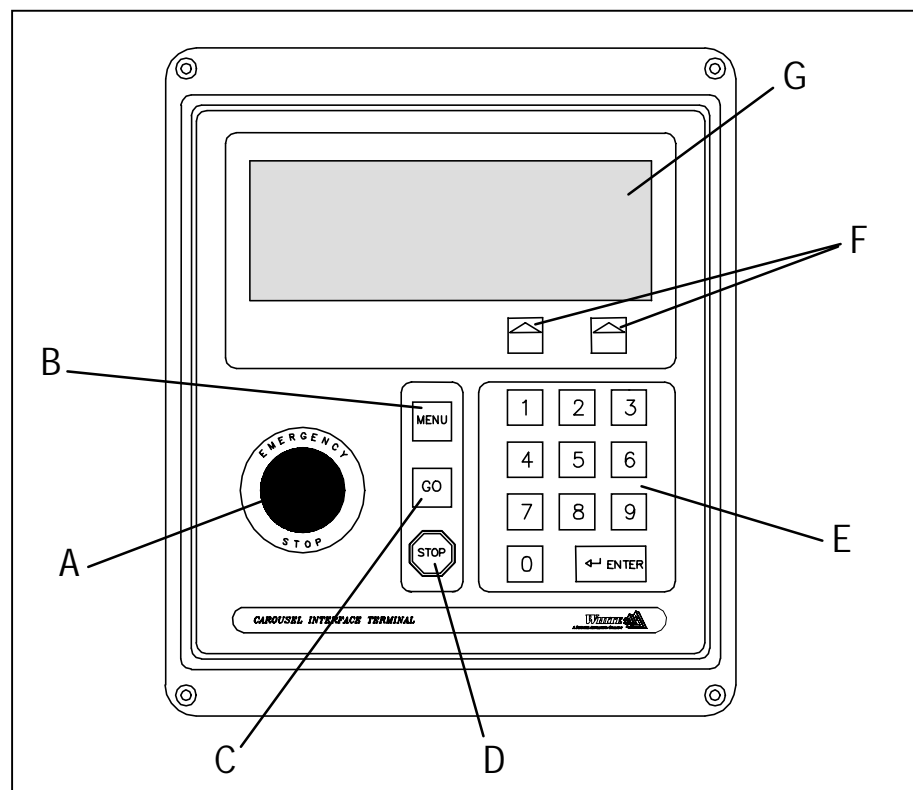


Figure 2. CONTROLS AND INDICATORS

2.2.2 Carousel Interface Terminal

The controls on the Carousel Interface Terminal have the following functions (see Figure 2).

- A. **EMERGENCY STOP:** Red mushroom pushbutton; stops and prevents pan rotation. This switch must be reset before carousel operation can resume.

PIEZOELECTRIC TONE ALARM (alternate): Audible signal indicates operational status of carousel.

- B. MENU: Tactile feel membrane switch; scrolls through menu screens to access carousel operation modes. The following modes are available: Startup, Host, Position, Jog, Home, Light bar Monitor, Fault, and Manual Door Control (optional).
- C. GO: Tactile feel membrane switch; starts carousel pan movement.
- D. STOP: Tactile feel membrane switch; stops carousel pan movement.
- E. NUMERIC KEYPAD: Tactile feel membrane switches; enter carousel setup parameters and destination pan locations.
- F. ARROW KEYS: Tactile feel membrane switches; enter menu selections.
- G. LCD DISPLAY: 4-line, 20-character alphanumeric display that shows carousel operation menus and status.

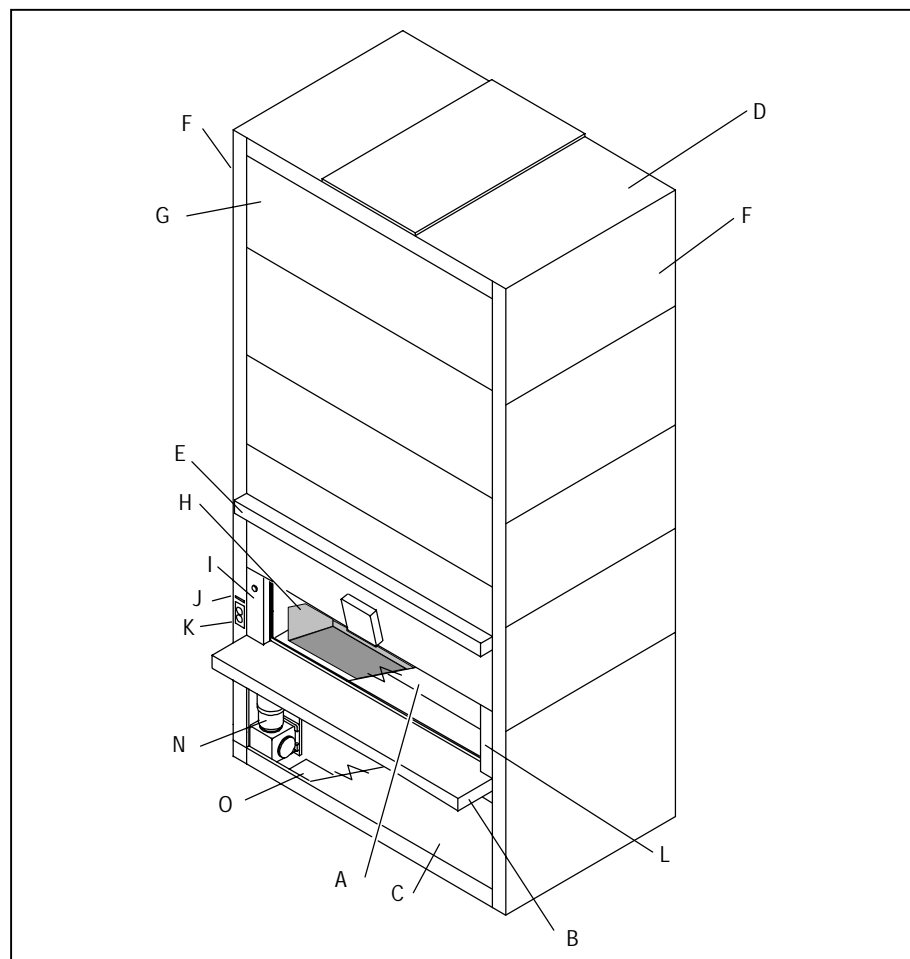


Figure 3. VERTICAL CAROUSEL ASSEMBLY

2.3 THEORY OF OPERATION

The Series 2400 Vertical Carousel consists of a set of horizontal pans that travel in a vertical closed-loop track inside a metal enclosure. Pans are accessed through a door at the front of the unit.

To operate the vertical carousel, an operator selects a numbered pan location. The machine moves the pan to the door opening. If the unit is equipped with a light bar, a light on the counter top will indicate the selected pan compartment. The operator then loads or unloads material from the pan. When the transaction is complete and the door opening is clear, the operator is free to select another pan location.

The machine consists of three subassemblies: enclosure, conveying mechanism, and controls.

2.3.1 Enclosure

The enclosure (see Figure 3) is made up of modular, bolt-together steel panels (F).

An opening at the front allows access to the pans (H). Two sliding doors (A) retract into the top and bottom of the opening. When the doors are open, pressing the upper or lower edges will stop pan rotation. When closed, the doors can be locked to secure the contents of the pans.

A stainless steel work counter (B) attaches below the opening.

A removable access panel (C) attaches to the front of the unit below the counter. The panel provides access to the drive assembly (N) and electrical enclosure (O) for maintenance and servicing.

A hinged supervisor's panel (I) and idle panel (L) open to allow access to cabling terminal blocks and drive motor.

Popular options include: fluorescent task lighting (E) over the work counter, RS-232 serial interface port (J) and courtesy outlet (K) on the left side of the opening, and a three-piece dust cover (D) that encloses the top of the unit.

2.3.2 Conveying mechanism

The conveying mechanism includes pans, trunnions, load chain, chain track, stabilizing track, and drive assembly (see Figure 4).

On single access carousels, each pan (P) has an open front. On double access carousels, the pans have an open front and back. The interior of the pan may be divided into compartments by horizontal shelves and vertical dividers to maximize use of storage space.

Cylindrical protrusions (Q) from each pan end, called trunnions, support the pans.

Scissor arms (R) connect the trunnions to load chains. Two scissor arms are required at each pan side.

The load chains (S) form a vertical loop at each side of the carousel. Each chain is made from a section of roller chain with extended attaching pins. The free ends of the scissor arms fit over the attaching pins to suspend the pans. Plastic rollers on the ends of the attaching pins guide the chain in the chain tracks.

The chain tracks (T) are load-bearing columns attached to the sides of the carousel enclosure. Idler sprockets (U) at the top and drive sprockets at the bottom (V) move the chain through the tracks to rotate the pans. The bottom sprockets are adjustable to compensate for chain stretch.

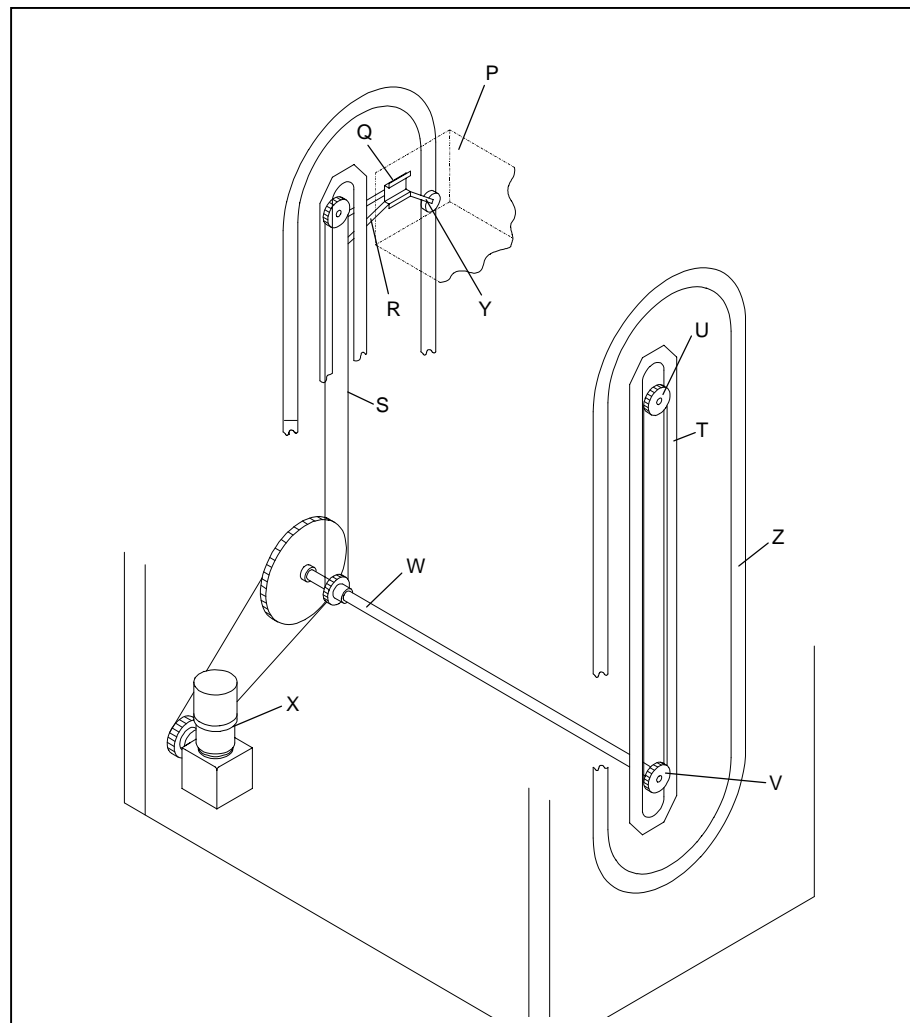


Figure 4. CONVEYING MECHANISM

A torque shaft (W) connects the left and right drive sprockets to the drive assembly.

The drive assembly (X) is made up of an AC gear motor with an integral brake. The vector duty motor operates on three-phase AC. The electric brake is spring set – solenoid release and has a manual override. Output from the reducer is coupled through sprockets and roller chain to the torque shaft. An emergency hand crank attaches to the motor shaft. It allows personnel to rotate the pans in the event of a power failure.

Stabilizer arms (Y) attached to the trunnions keep the pans correctly oriented throughout their travel. Nylon rollers at the ends of the arms ride in the stabilizer tracks.

The stabilizer tracks (Z) are oval tracks attached to the sides of the carousel enclosure. The bottom curved sections of track are adjustable to compensate for chain stretch.

2.3.3 Controls

The controls include a carousel interface terminal, sensors, electrical enclosure, programmable microprocessor control, motor drive, wire harness, and optional light bar.

2.3.3.1 CAROUSEL INTERFACE TERMINAL

An enclosure containing a membrane keypad with tactile feedback and a LCD display is mounted at the center of the carousel, above the door opening. The 20-character, 4-line display is backlit for increased visibility. All carousel setup parameters, operation commands, and status messages are available through a series of menu selections.

2.3.3.2 RS-232 SERIAL INTERFACE PORT (OPTIONAL)

This port allows a host computer to control pan motion and monitor system status. The female DB9 connector located at the left side of the door opening will accept asynchronous, point-to-point, ASCII communications up to 9600 baud.

2.3.3.3 SENSORS AND SWITCHES

The following devices will trigger an emergency stop and prevent pan rotation: emergency stop buttons, door limit switch (touch bar), lower access panel limit switch, supervisor's panel limit switch, door opening upper photo eye, door opening lower photo eye, and motor overload. During an emergency stop, the motor drive is isolated from power by the MC1 relay. After an emergency stop, the control will require a manual reset before normal operation of the carousel can resume.

An optical reference sensor and 128 pulse per revolution encoder provide signals to the microprocessor controller for pan movement. All devices operate at 12V DC.

2.3.3.4 ELECTRICAL ENCLOSURE

A NEMA 1 enclosure, located at the base of the carousel behind the lower access panel, houses the control system components (see Figure 5). A lockable power disconnect switch is located on the left side of the enclosure. Components located inside the enclosure include: programmable microprocessor controller, I/O boards, motor drive, power supply, fuses, and terminal blocks. The control package is rated for operation in ambient temperatures of 33° to 104°F.

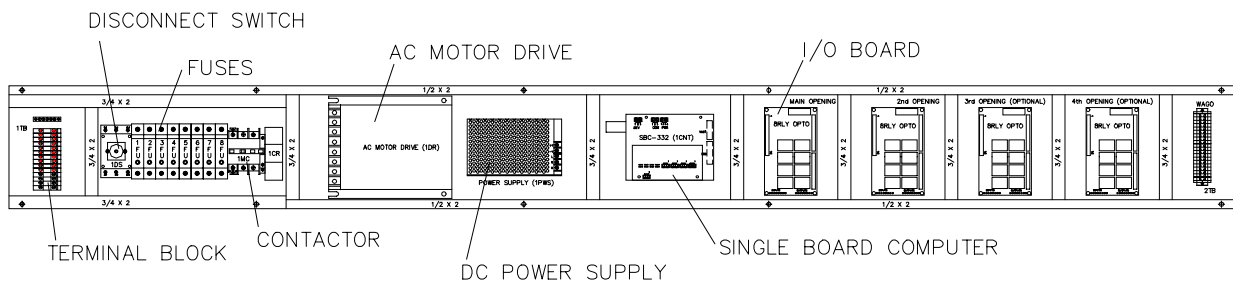


Figure 5. ELECTRICAL ENCLOSURE

2.3.3.5 PROGRAMMABLE MICROPROCESSOR CONTROLLER

The controller is based on a high performance, 32 bit, low power single board computer. Onboard memory consists of ROM, flash RAM, and battery backed RAM. Other features include onboard real time clock, and watchdog timer. The single board computer receives operator keypad inputs, sends LCD messages, monitors sensor inputs, controls pan movement, and communicates with the host computer. The unit supports up to four Carousel Interface Terminals.

2.3.3.6 MOTOR DRIVE

A modular, 230V AC motor drive, powers the AC gear motor. The drive uses an advanced sensorless flux-vector control system with 4-quadrant speed and torque control. It offers 250% starting torque, .2% speed regulation and 1.5 msec torque loop response. The drive

operates on 200 to 230V AC, three-phase power. It is capable of running on 120V single-phase power (derated output) in an emergency. A built-in RS-485 serial communications port can be used as a diagnostic tool to configure drive parameters, operate the drive, and measure system parameters.

2.3.3.7 WIRE HARNESS

The Carousel Interface Terminal, sensors, and switches for at door opening connect to two 8-port terminal blocks with twist-lock plugs. The terminal blocks, located behind the supervisor's panel and idle side panel, connect by cables and twist-lock plugs to the electrical enclosure.

2.3.3.8 LIGHT BAR (OPTIONAL)

Two styles of light bars are available. The first type illuminates a LED on the counter top to indicate the selected pick location. The second type is an intelligent device that uses an alphanumeric display and "task complete" button to show pick information.

3. INSTALLATION

The following instructions are intended for all carousel models. Special instructions for optional equipment are located in Section 7.

3.1 TOOLS AND EQUIPMENT

- (1) Open end wrench set
- (1) Box wrench set
- (1) Socket wrench set
- (1) Torque wrench, 50 foot-pound capacity
- (1) Hex key set
- (1) 1/4 and 3/8 inch flat blade screwdriver
- (2) 1/4 to 5/16 diameter tapered drift pins
- (2) Pry bars
- (2) Tape measure, 20 foot
- (1) Chalk line
- (2) Plumb bob
- (1) Torpedo level
- (1) Lift truck, 5000 pound capacity, 20 foot lifting height
- (2) Extension forks, 60 inch
- (8) C-clamps, 4 inch
- (2) Nylon eye and eye web slings, 6 foot
- (3) Dollies
- (1) Man lift
- (2) Extension ladders
- (1) Hammer drill and 1/2 inch carbide bit
- (1) Air compressor with blow gun
- (1) Soft face hammer

3.2 REFERENCE DRAWINGS

White provides the following drawings with the carousel equipment. Please refer to the specific drawings shipped with your system.

- Framing Layout
- Track Layout
- Wiring Diagram

3.3 RESOURCE PLANNING

White recommends a minimum installation crew size of three persons per carousel. As a basis for estimation, mechanical and electrical installation will require 50 to 60 man-hours per carousel.

3.4 INSTALLATION SITE

Make a site survey prior to start of installation. Check the site for undocumented obstructions or tight clearances that will interfere with moving or erecting the equipment.

Set up a staging area to uncrate the vertical carousel components. A typical shipping crate measures 73 inches wide, 48 inches high and

up to 25 feet long. Pans, front and rear panels are shipped on separate skids.

3.5 UNCRATING

3.5.1 Inspection

Before accepting shipment, you should check the crates for external damage. Open the crates and remove protective material from around the components. Check for damaged parts. Document any damage and have the receiving department issue a freight claim.

3.5.2 Itemized parts checklist

Parts will be crated as follows:

COMPONENT	LOCATION
Right side upright (idler)	Crate, top
Left side upright (drive)	Crate, bottom
Counter	Crate
Access panel	Crate
Tie rods	Crate
Front and rear panels	Skid
Access doors	Skid
Pans	Skid or box

Use the packing list located on crate number 1 to check that all components are present. If any parts are missing or damaged, notify White's Customer One Protection, technical support group at 1-800-571-8822.

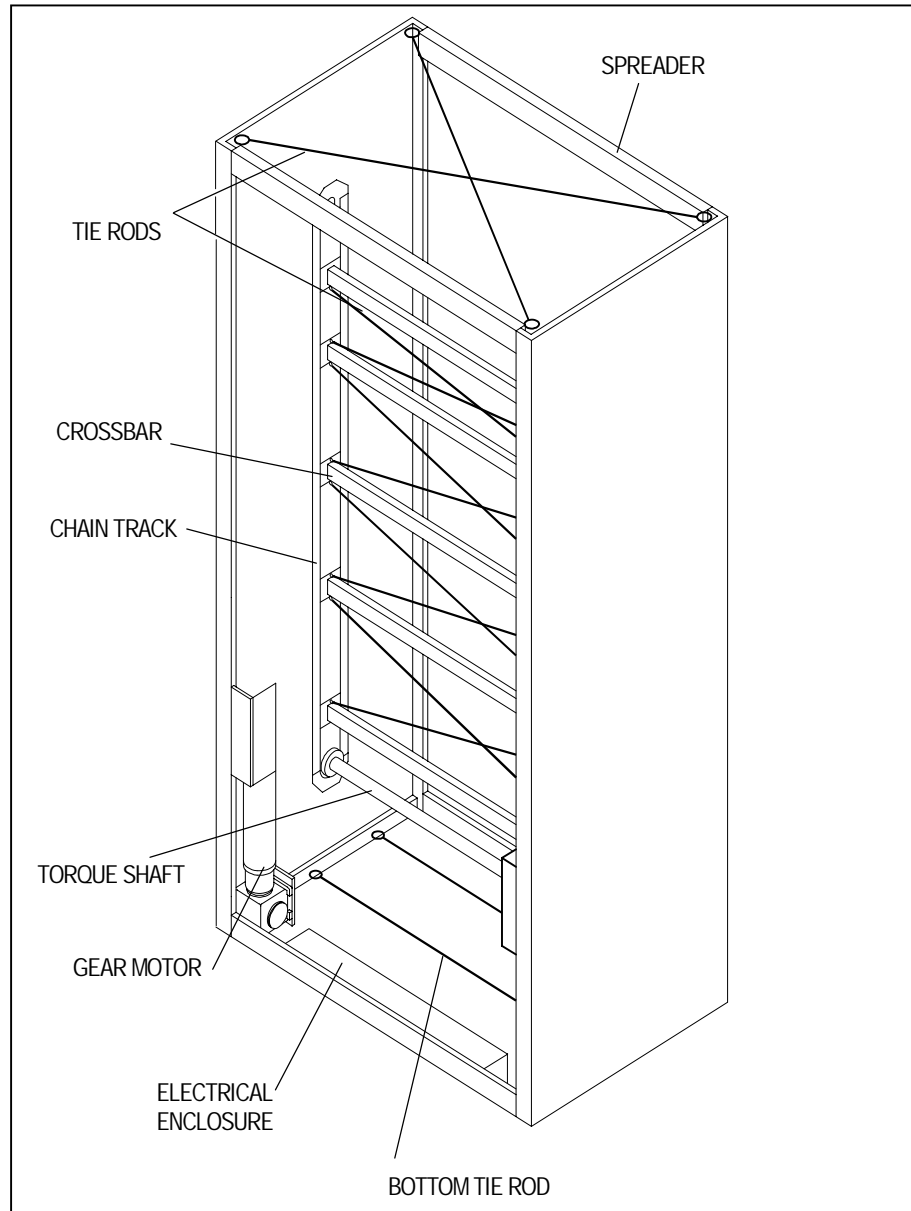


Figure 6. INTERNAL FRAMEWORK

3.6 ASSEMBLING THE CAROUSEL ENCLOSURE

3.6.1 Layout

Accurate alignment of the carousel sides is critical to the operation of the unit. The following layout procedure will assist in placing the sides parallel and square to each other.

1. Determine the model and width of the carousel you are installing and use the following chart to determine the footprint.

MODEL	PAN WIDTH	MACHINE WIDTH	MACHINE DEPTH	DIAGONAL MEASUREMENT
2400	130 inches	154-1/2 inches	67-3/4 inches	168-11/16 inches
2400	112 inches	136-1/2 inches	67-3/4 inches	152-3/8 inches
2400	106 inches	130-1/2 inches	67-3/4 inches	147-1/32 inches
2400	100 inches	124-1/2 inches	67-3/4 inches	141-3/4 inches
2400	95 inches	119-1/2 inches	67-3/4 inches	137-3/8 inches
2400	72 inches	96-1/2 inches	67-3/4 inches	117-29/32 inches
2400	60 inches	84-1/2 inches	67-3/4 inches	108-5/16 inches
1800	130 inches	154-1/2 inches	56-1/4 inches	164-7/16 inches
1800	112 inches	136-1/2 inches	56-1/4 inches	147-5/8 inches
1800	106 inches	130-1/2 inches	56-1/4 inches	142-3/32 inches
1800	100 inches	124-1/2 inches	56-1/4 inches	136-5/8 inches
1800	95 inches	119-1/2 inches	56-1/4 inches	132-1/16 inches
1800	72 inches	96-1/2 inches	56-1/4 inches	111-11/16 inches
1800	60 inches	84-1/2 inches	56-1/4 inches	101-1/2 inches
1600	130 inches	154-1/2 inches	56-1/4 inches	164-7/16 inches
1600	112 inches	136-1/2 inches	56-1/4 inches	147-5/8 inches
1600	106 inches	130-1/2 inches	56-1/4 inches	142-3/32 inches
1600	100 inches	124-1/2 inches	56-1/4 inches	136-5/8 inches
1600	95 inches	119-1/2 inches	56-1/4 inches	132-1/16 inches
1600	72 inches	96-1/2 inches	56-1/4 inches	111-11/16 inches
1600	60 inches	84-1/2 inches	56-1/4 inches	101-1/2 inches
1500	130 inches	154-1/2 inches	56-1/4 inches	164-7/16 inches
1500	112 inches	136-1/2 inches	56-1/4 inches	147-5/8 inches
1500	106 inches	130-1/2 inches	56-1/4 inches	142-3/32 inches
1500	100 inches	124-1/2 inches	56-1/4 inches	136-5/8 inches
1500	95 inches	119-1/2 inches	56-1/4 inches	132-1/16 inches
1500	72 inches	96-1/2 inches	56-1/4 inches	111-11/16 inches
1500	60 inches	84-1/2 inches	56-1/4 inches	101-1/2 inches

2. Refer to the building floor plan; snap a chalk line to represent the front edge of the carousel.
3. Snap a chalk line perpendicular to the first line to represent the rear edge of the unit.
4. Mark the position of the four corners of the unit. Check the dimensions using the diagonal measurements from the footprint chart.

5. Snap a chalk line through each set of marks to represent the sides of the carousel.

3.6.2 Uncratering the carousel sides

Vertical carousels are shipped with the right side assembly (idler side) at the top of the crate and the left side assembly (drive side) at the bottom of the crate. Both sides face up with the chain track exposed.

The drive side is the heaviest side and can weigh up to 3000 pounds. This section is the hardest to handle because its weight is concentrated in the lower front corner. Typically, the drive side is installed first.

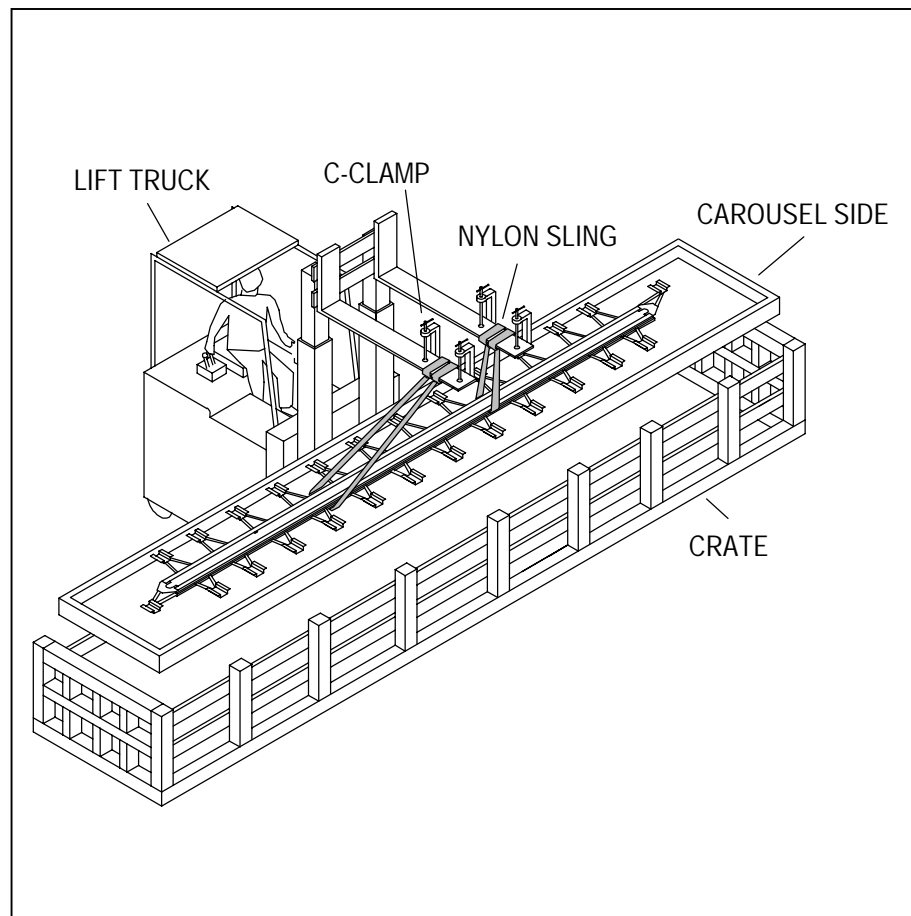


Figure 7. UNCRATING SIDES

1. Attach two slings, spaced 4 feet apart, at the center of the chain track (see Figure 7).
2. Position the forks of the lift truck above the slings. Slip the eyes of the slings over the forks.



TO PREVENT THE SLINGS FROM SLIPPING OFF, FASTEN C-CLAMPS TO THE FORK ENDS AND TILT THE MAST BACKWARD BEFORE LIFTING THE SIDE.

3. Lift the right side assembly out of the crate.
4. Move the side to the staging area and lower it onto two padded 4 x 4s. Position the 4 x 4s below the chain sprockets.
5. Remove the slings.
6. Attach a sling to the base frame of the left side.
7. Attach the second sling to the chain track at a point 4 to 5 feet away from the first sling.
8. Position the forks of the lift truck above the slings. Slip the eyes of the slings over the forks.

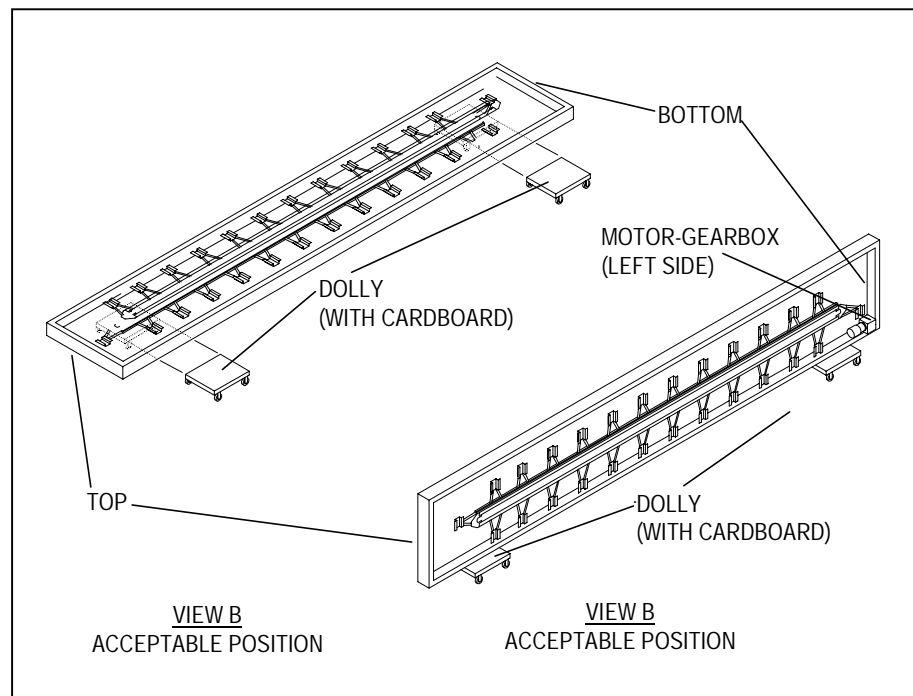


Figure 8. TRANSPORTING SIDES

9. Lift the left side assembly out of the crate.
10. Lower the side onto two padded dollies. Position the dollies below the chain sprockets (see Figure 8).

11. Disconnect the slings.

NOTE: If the carousel side must be moved through a narrow opening, tilt the side and place its edge on the dollies. White recommends using drywall dollies to brace the side as it is moved.

3.6.3 Placing the left carousel side

1. Move the left side assembly to the front of the chalked layout lines. Orient the side with the leveling feet on the right and the motor towards the front (see Figure 9).

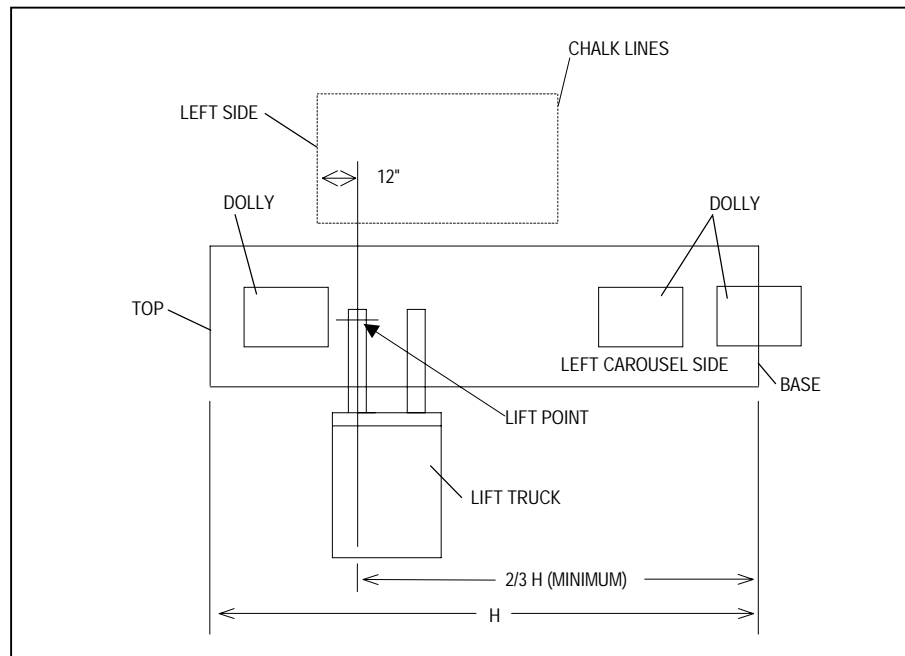


Figure 9. POSITIONING SIDE FOR LIFTING

2. Remove the four 3/8-16 hex head cap screws from each of the crossbar attachment points and save for later use.
3. Mark a lift point on the chain track 2/3 (minimum) of the distance from the leveling feet to the top of the side assembly.
4. Align the lift point with the chalked layout lines. Move the side to position the lift point approximately one foot to the right of the left side chalk line.
5. Attach a sling around the chain track at the lift point (see Figure 10).
6. Attach the sling to the left lift truck fork.

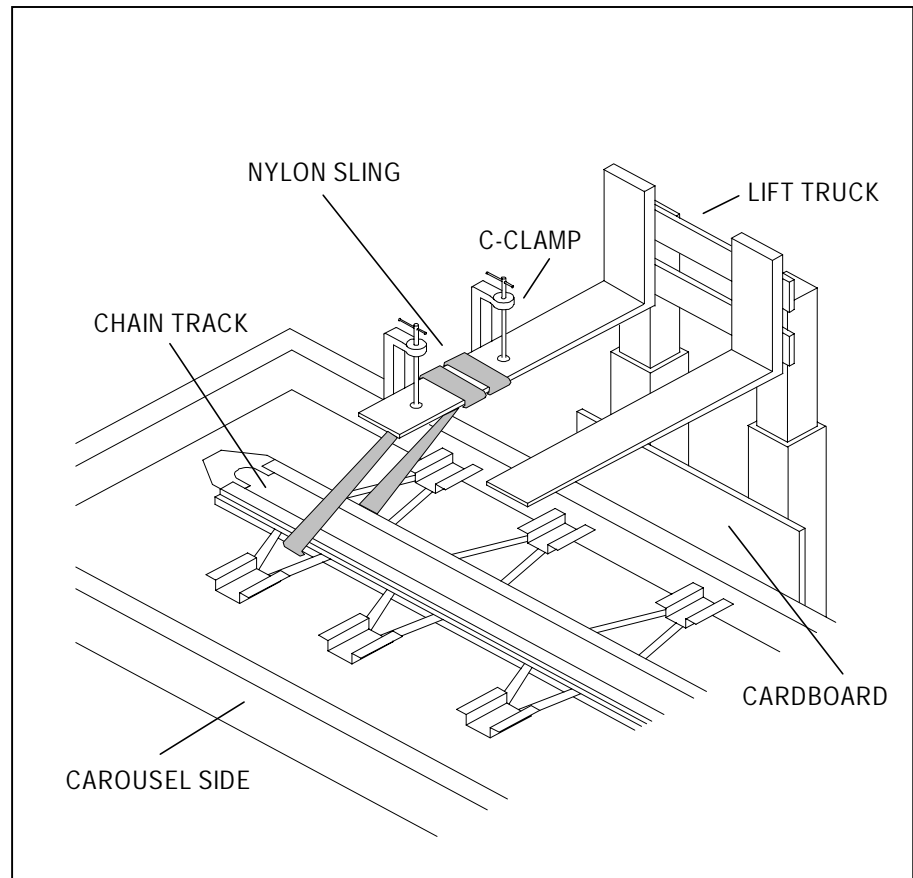


Figure 10. SLING ATTACHMENT FOR LIFTING

7. Check that the leveling pads are adjusted flush with the bottom of the sheet metal panels.
8. Place a third dolly below the leveling feet. Place a piece of cardboard between the mast of the lift truck and the carousel side.
9. Lift the carousel side until it is clear of the floor(see Figure 11).
10. Move the lift truck forward to position the side within the chalk lines (see Figure 12).
11. Lower the side and adjust its position to maintain alignment with the chalk lines.
12. Anchor the side with two concrete anchor bolts (see Section 3.6.12).
13. Temporarily brace the side to the building structure. Make all attachments to the upper portion of the chain track.

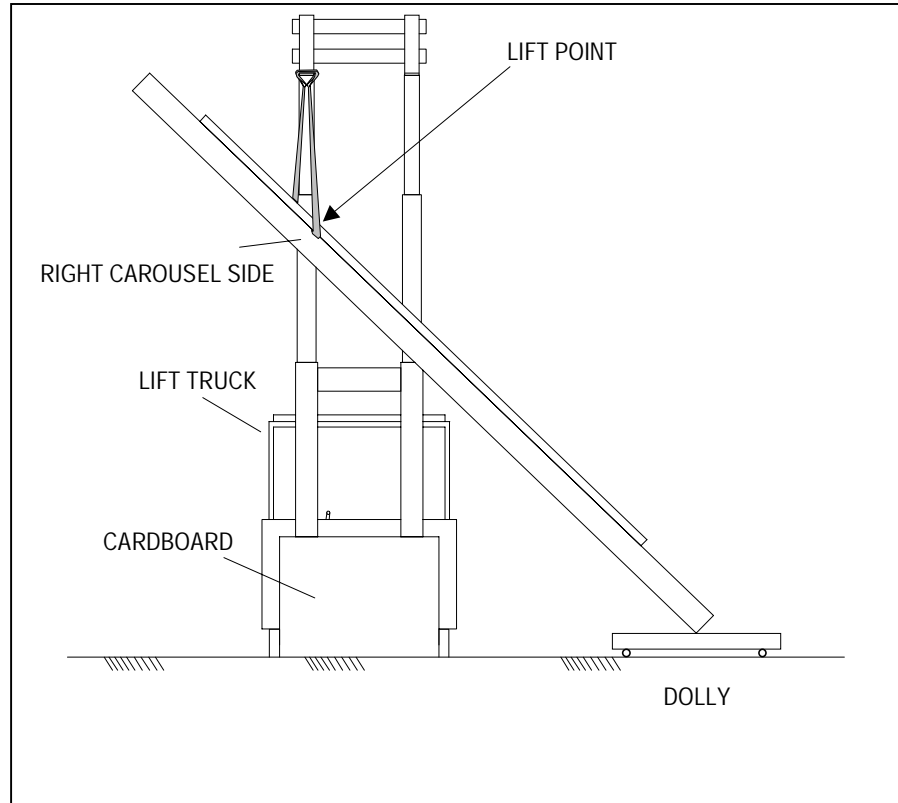


Figure 11. LIFTING THE SIDE

3.6.4 Placing the right carousel side

1. Move the right side assembly to the front of the chalked layout lines. Orient the side with the leveling feet on the left.
2. Remove the four 3/8-16 hex head cap screws from each of the crossbar attachment points and save for later use.
3. Mark a lift point on the chain track $\frac{2}{3}$ (minimum) of the distance from the leveling feet to the top of the side assembly.
4. Align the lift point with the chalked layout lines. Move the side to position the lift point approximately one foot to the left of the right side chalk line.
5. Attach a sling around the chain track at the lift point.
6. Attach the sling to the right lift truck fork.
7. Check that the leveling pads are adjusted flush with the bottom of the sheet metal panels.
8. Place a third dolly below the leveling feet. Place a piece of cardboard between the mast of the lift truck and the carousel side.

9. Lift the carousel side until it is clear of the floor.
10. Move the lift truck forward to position the side within the chalk lines.
11. Lower the side and adjust its position to maintain alignment with the chalk lines.
12. Use the lift truck to support the side until you install the crossbars.

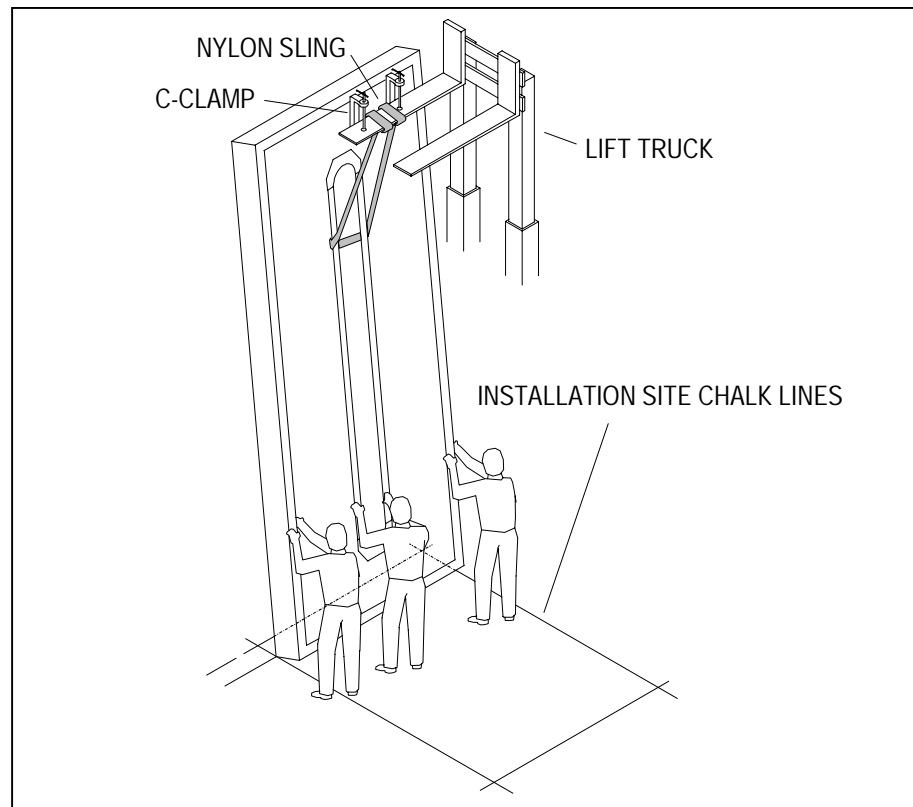


Figure 12. POSITIONING THE SIDE

3.6.5 Installing the crossbars

First, install the center crossbar. Next, add the lower crossbars sequentially towards the bottom. Finally, add the upper crossbars sequentially towards the top.

1. Hoist a crossbar into position. Use a drift pin to align the holes in the flanges with the threaded holes in the chain track (see Figure 13).
2. Secure with four 3/8-16 x 1 inch Grade 8 bolts, lock washers, and flat washers on each end. Do not tighten.
3. Repeat steps 1 and 2 at each attachment point.

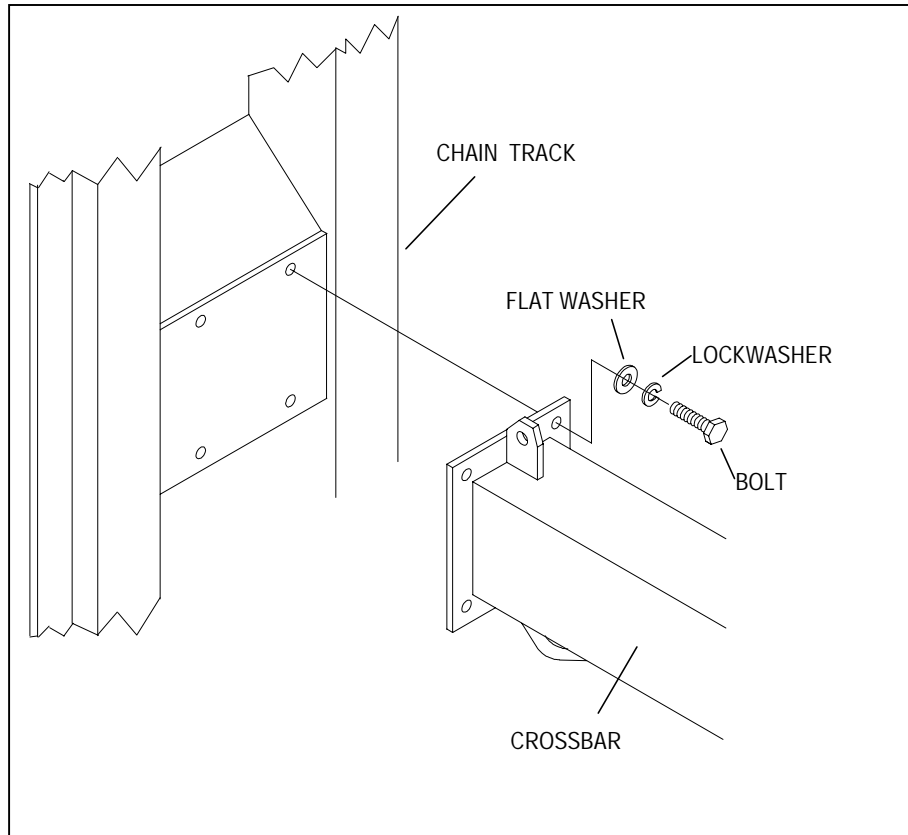


Figure 13. CROSSBAR ATTACHMENT

3.6.6 Installing the torque shaft

The torque shaft couples the left and right side drive sprockets. The position of sprockets must be synchronized to keep the pans level. Painted alignment marks on the chains, sprockets and torque shaft will be used to synchronize the left and right sides of the carousel.

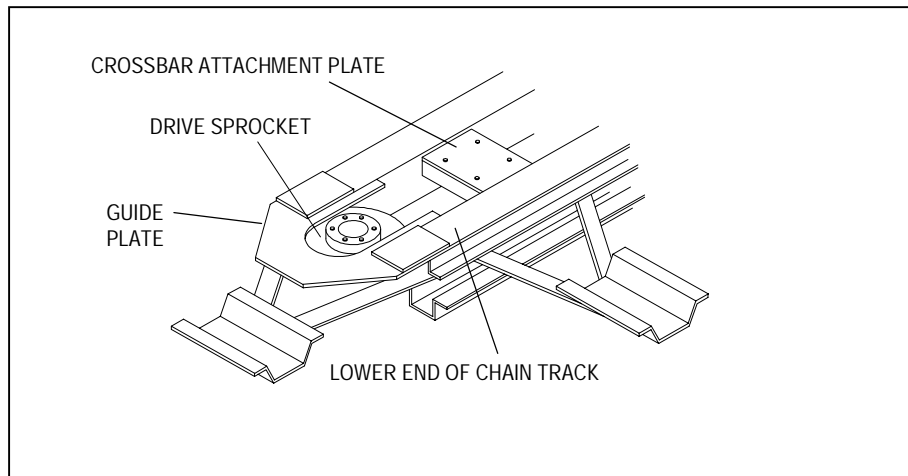


Figure 14. LOWER END OF CHAIN TRACK

1. Remove six 1/2-13 x 1-1/2 inch Grade 8 bolts from each drive sprocket. Set the hardware aside for later use (see Figure 14).
2. Remove eight flat head screws and star washers from each guide plate at the lower end of the chain tracks. Set the guide plates and hardware aside for later use.
3. Each side of the carousel has a trunnion plate marked with white paint. Locate the marked trunnion plates and move them to the bottom of the carousel.
4. Locate the painted links on the load chains next to the marked trunnion plates. Adjust the chains to align the painted links on the left and right drive sprockets (see Figure 15).
5. Lift the torque shaft into place between the drive sprockets.
6. Align the yellow paint mark on the left flange with the paint mark on the left sprocket. Use a drift pin to line up the holes in the flange with the threaded holes in the sprocket. Secure the shaft to the sprocket with six 1/2-13 x 1-1/2 inch Grade 8 bolts and lock washers. Do not tighten.
7. Align the yellow paint mark on the right flange with the paint mark on the right sprocket. Use a drift pin to line up the holes in the flange with the threaded holes in the sprocket. Secure the shaft to the sprocket with six 1/2-13 x 1-1/2 inch Grade 8 bolts and lock washers. Do not tighten.
8. Remove the shipping block supporting the large roller chain sprocket on the left side of the carousel. Tighten the torque shaft bolts to 60-70 foot-pounds.
9. Reinstall the guide plates to the lower ends of the chain tracks.

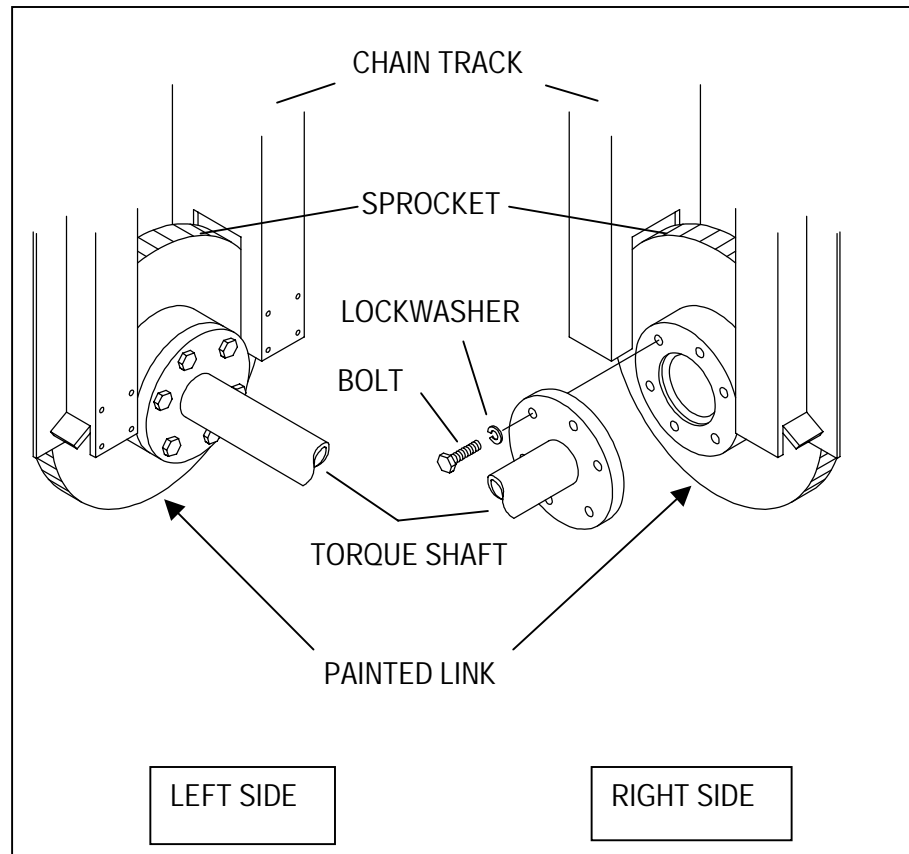


Figure 15. TORQUE SHAFT INSTALLATION

3.6.7 Installing the tie rods

Consult framing layout drawing to identify tie rod locations.

1. Remove the slings and temporary bracing from the carousel.
2. Attach the top pair of tie rods to the carousel sides with four 5/16-18 x 3 inch hex head bolts, flat washers, and elastic stop nuts.
3. Attach two tie rods between each pair of crossbars. Secure the ends of the rods to the bracket holes with four 5/16-18 x 1-3/4 inch hex head bolts, flat washers, and elastic stop nuts.
4. Attach a set of tie rods to the brackets in the four corners of the lower support frame with four 5/16-18 x 1-3/4 inch hex head bolts, flat washers, and elastic stop nuts.
5. Leave the tie rods slack.

3.6.8 Installing the spreaders

Four "L" shaped sheet metal spreaders connect the carousel sides at the upper and lower corners. The spreaders frame out the front and back openings for the skin panels (see Figure 16).

1. Lift the spreader into place at the top rear of the carousel.
2. Attach the spreader to the carousel sides by passing six 1/4-20 x 3/4 inch hex head bolts with flat washers through the flanges in the side panels and spreaders, and secure with six flat washers and 1/4-20 elastic stop nuts.
3. Repeat steps 1 and 2 for the top front and bottom rear spreaders.
4. The carousel control enclosure is attached to the lower front spreader. Attach the spreader to the carousel sides by passing six 1/4-20 x 3/4 inch hex head bolts with flat washers through the flanges in the side panels and spreaders, and secure with six flat washers and 1/4-20 elastic stop nuts.
5. Level the control enclosure by adjusting the slotted support legs at the back of the enclosure.

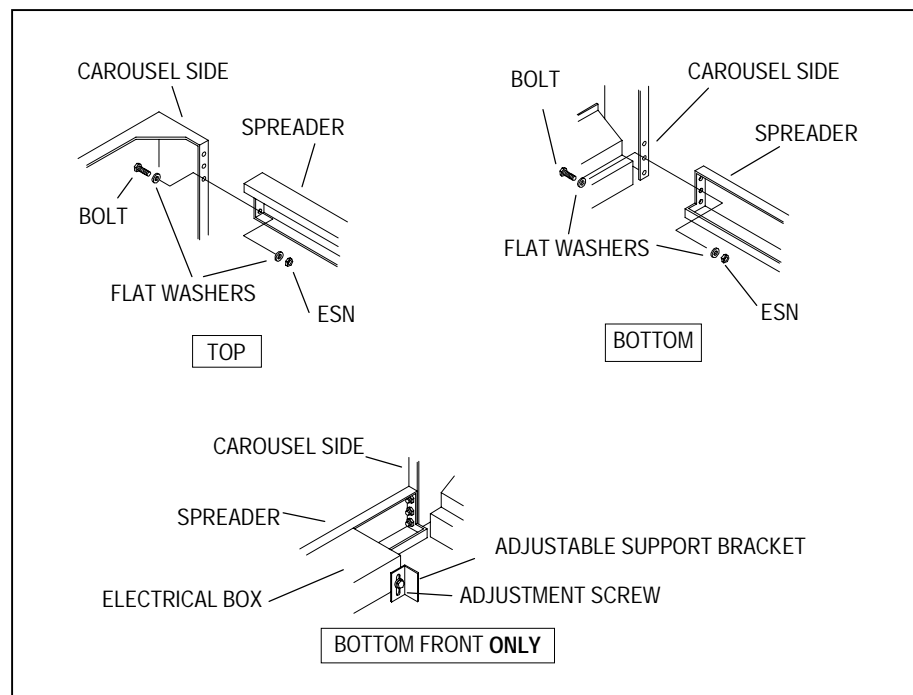


Figure 16. SPREADER INSTALLATION

3.6.9 Installing the skin panels

Consult framing layout drawing to identify panel locations.

1. Starting at the rear of the carousel, install the panels from bottom to top.
2. Attach the first panel to the carousel sides with 1/4-20 x 3/4 inch hex head bolts, elastic stop nuts and flat washers. Be sure to

install a flat washer under the bolt head and the lock nut. Do not tighten (see Figure 17).

3. Stack the next panel on top of the first panel and secure to the carousel sides.
4. Join the panels by inserting 1/4-20 x 3/4 inch hex head bolts and flat washers through the bolt holes in the top and bottom flanges. Secure with flat washers and elastic stop nuts. Do not tighten.
5. Repeat steps 1 through 4 until the back of the unit is enclosed.
6. At the front of the unit, install the first panel above the door opening.
7. Attach the panel to the carousel sides with 1/4-20 x 3/4 inch hex head bolts, elastic stop nuts and flat washers. Be sure to install a flat washer under the bolt head and the lock nut. Do not tighten.
8. Stack the next panel on top of the first panel and secure to the carousel sides.
9. Join the panels by inserting 1/4-20 x 3/4 inch hex head bolts and flat washers through the bolt holes in the top and bottom flanges. Secure with flat washers and elastic stop nuts. Do not tighten.
10. Repeat steps 7 through 9 until the front of the unit is enclosed.

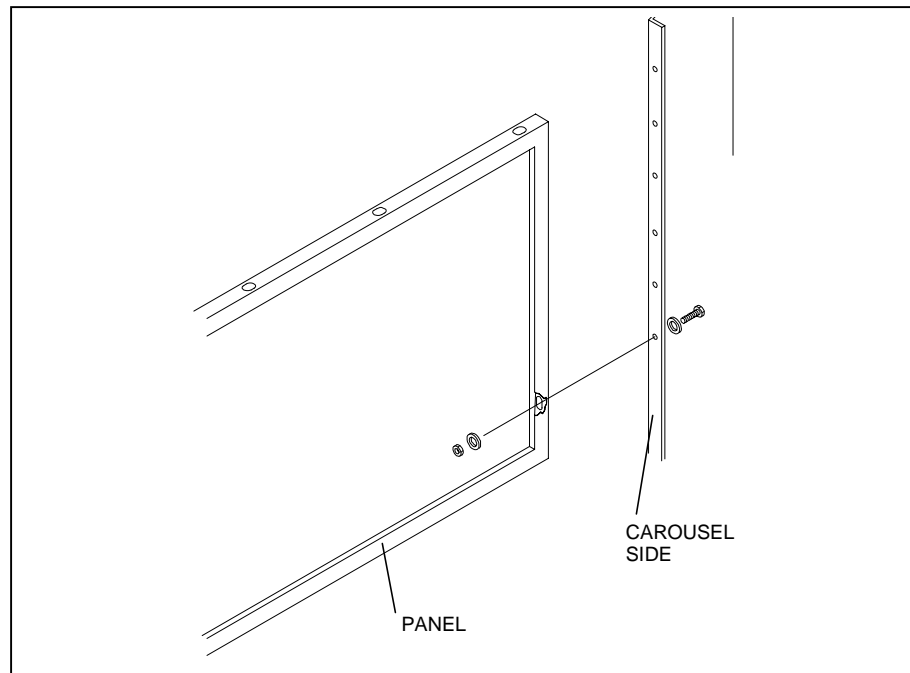


Figure 17. PANEL INSTALLATION

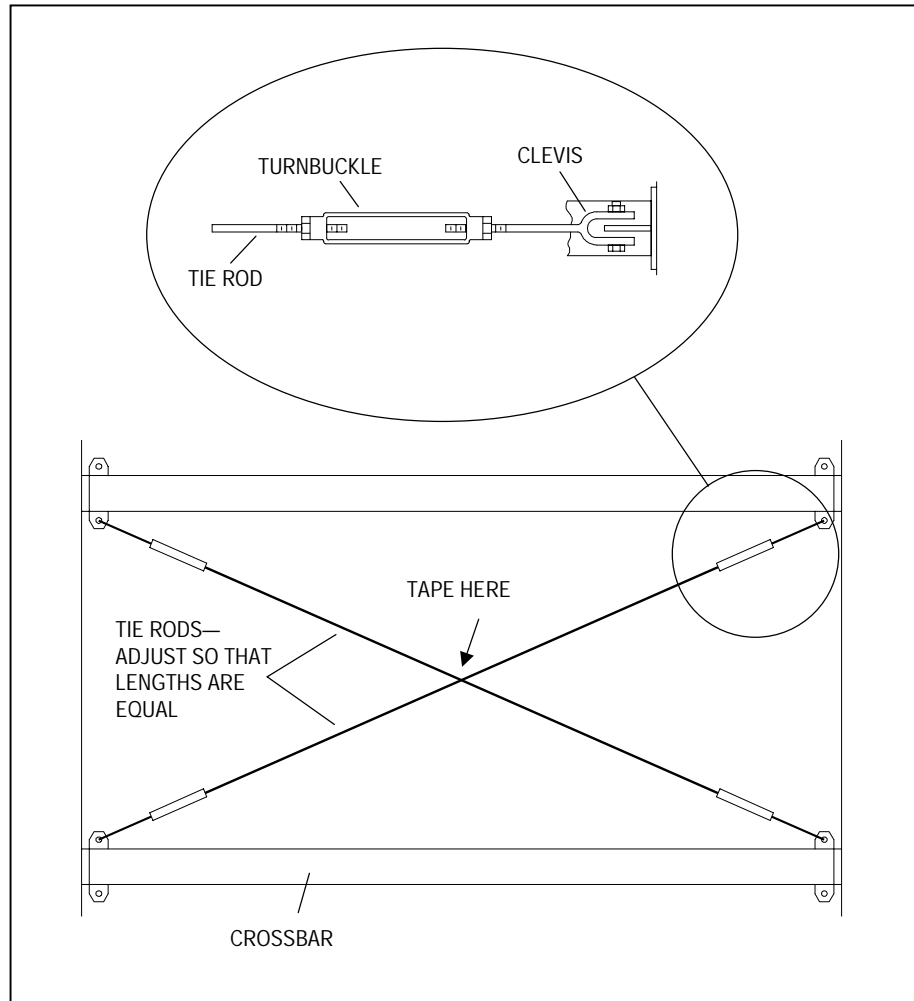


Figure 18. TIE ROD ADJUSTMENT

3.6.10 Adjusting the tie rods

1. Tighten the crossbar bolts to 50-60 foot-pounds.
2. Starting at the top pair of tie rods, remove slack from the rods using the turnbuckles, but do not tension (see Figure 18).
3. Measure the diagonals at the tie rod attachment points.
4. Adjust the tie rods to equalize the diagonal measurements.
5. Lock the turnbuckles with the jamb nuts.
6. Apply electrical tape to the intersection of the tie rods to prevent noise from vibration.
7. Repeat steps 1 through 6 for each pair of tie rods.
8. Tighten the skin panel bolts.

3.6.11 Leveling the carousel

1. Loosen the concrete anchors on the left side of the carousel.
2. Inside the unit, attach plumb bobs at the top of the left and right chain tracks. Use 5/16-inch nuts to space the strings away from the front surfaces of the chain tracks. Secure with C-clamps (see Figure 19).

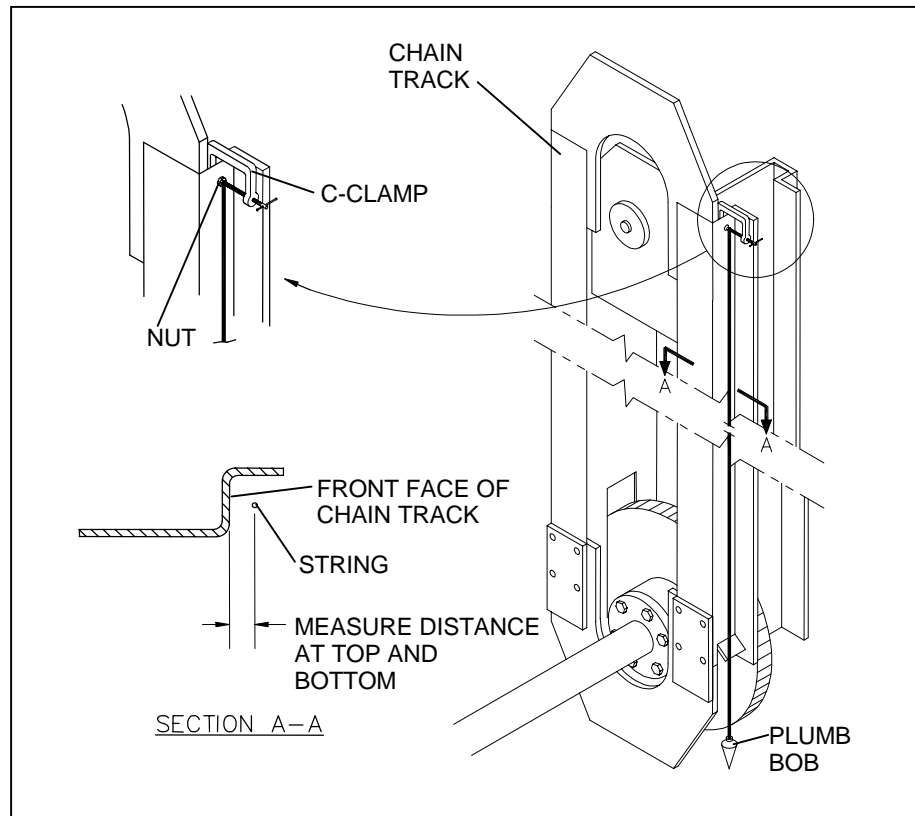


Figure 19. FRONT-TO-BACK LEVELING

3. Check the front-to-back alignment at each side. Measure the distance between the plumb bob string and the surface of the chain track at the top and bottom of the track.
4. Adjust each side independently. Lift the low corner with a pry bar and lower the leveling pad by turning it clockwise.
5. Recheck the alignment. Make all adjustments accurate to $\pm 1/16$ inch.
6. Check the side-to-side alignment of the carousel at the right chain track. Measure the distance between the plumb bob string and the left side surface of the chain track at the top and bottom of the track (see Figure 20).

7. Adjust the low side of the carousel by lifting the side with a pry bar and lowering the front and back leveling pads an equal number of turns.
8. Recheck side-to-side alignment and front-to-back alignment. Make all adjustments accurate to $\pm 1/16$ inch.
9. Adjust the two inner leveling pads on each side so that they contact the floor.

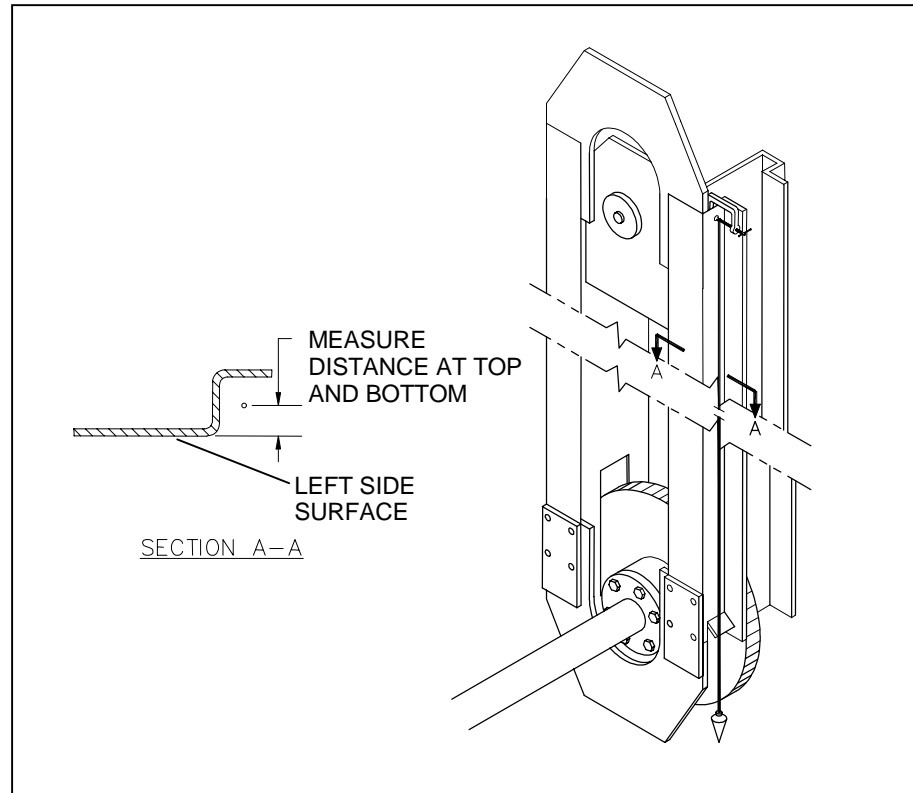


Figure 20. SIDE-TO-SIDE LEVELING

3.6.12 Anchoring the carousel

Each carousel side has two anchoring clips bolted to the inside of the frame at the front and back of the unit. The anchoring clips have clearance holes for 1/2 inch anchor studs (see Figure 21).

1. Fill the gap between the bottom frame tubes and the floor slab with shims or non-shrink grout.
2. Adjust the anchoring clips to contact the floor slab.
3. Using a 1/2 inch diameter bit, drill through the anchoring clips into the floor slab to a depth of 3 inches.

4. Blow the holes clean of dust fragments.
5. Insert an anchor into each hole.
6. Set the anchors with a soft face hammer.
7. Tighten the anchor nuts.

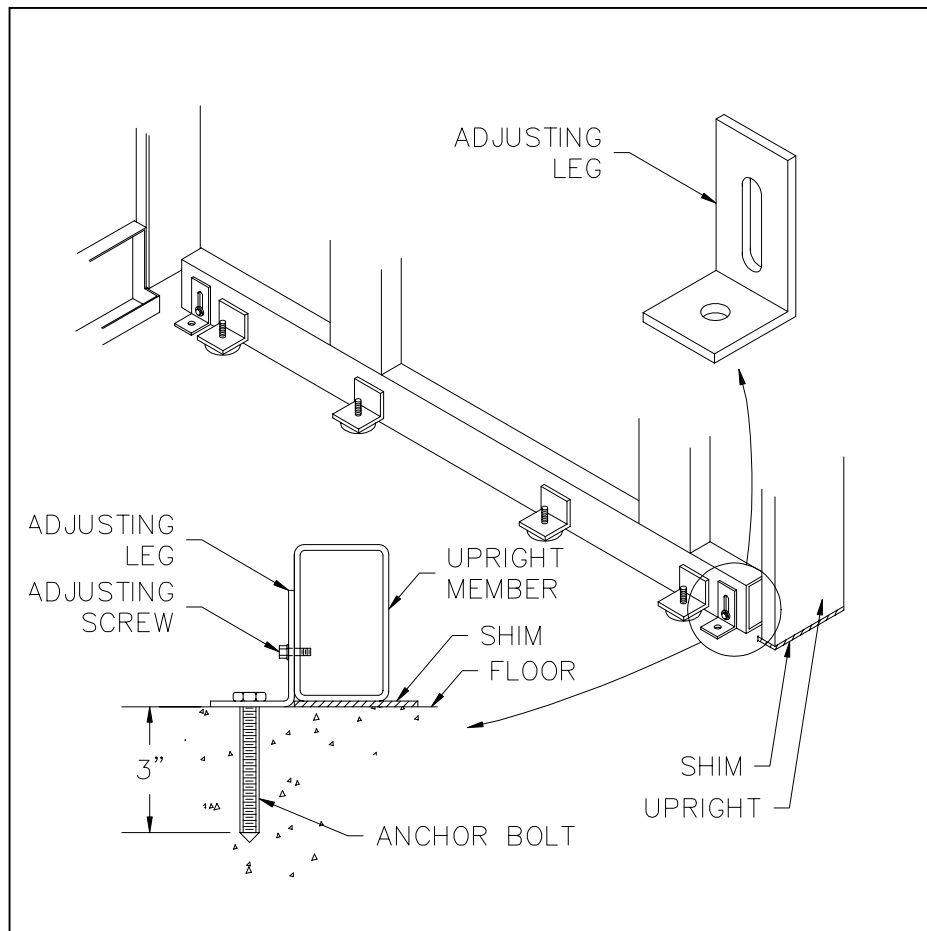


Figure 21. CAROUSEL ANCHORING

3.7 ELECTRO-MECHANICAL WIRING

Refer to the wiring diagram shipped with the carousel for the correct connections.

3.7.1 Control enclosure

1. Attach the signal cables from the control enclosure to the terminal blocks behind the supervisor's panel and the idle panel.
2. Check that the lockable disconnect switch is in the OFF position. Remove the enclosure cover.

3.7.2 Carousel Interface Terminal

To install the Carousel Interface Terminal on the panel above the door opening:

1. Mount the standoff bracket to the terminal using four 10-32 screws, washers, and elastic stop nuts.
2. Pass the cable through the opening in the panel.
3. Attach the enclosure to the panel using four 10-32 screws, washers, and elastic stop nuts.
4. Route the cable to the right side terminal block and connect to the port indicated on the wiring diagram. Secure the cable with tie wraps to prevent contact with moving parts of the carousel mechanism.

3.7.3 Task light

1. Remove the task light mounting hardware from the panel above the door opening.
2. Pass the power cable through the opening in the panel.
3. Attach the fluorescent light housing sections to the panel using the hardware removed in step 1.
4. Route the cable down the left side of the carousel to the control enclosure.
5. Connect the leads to terminals 11 and 12 on 1TB in the control enclosure.

3.7.4 Drive

1. Route the brake and motor cables from the drive junction box in the left side of the carousel to the control enclosure.
2. Connect the green ground wire to the ground bus (next to 1TB).
3. Connect the motor leads to 1TB in the control enclosure. Connect the brown lead to terminal 1, the orange lead to terminal 2, and the yellow lead to terminal 3.
4. Connect the brake leads to terminals 4 and 5 on 1TB in the control enclosure.

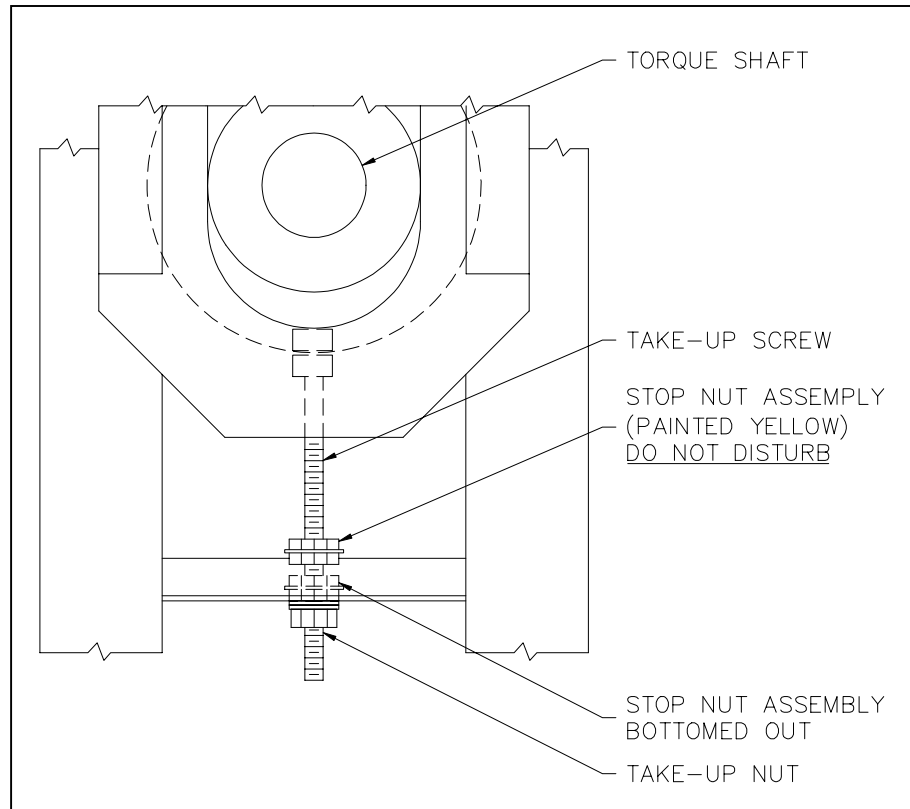


Figure 22. LOAD CHAIN ADJUSTMENT

4. ADJUSTMENTS AND SETUP

4.1 ADJUSTING CONVEYING MECHANISM

4.1.1 Adjusting the load chains

A take-up assembly, located at the bottom of each chain track, is used to pre-load the load chains. This adjustment prevents the chains from accumulating slack when the pans are installed and loaded.

1. Turn each take-up nut until the stop nut assembly bottoms out (see Figure 22).
2. Tighten the take-up nuts to 30 foot-pounds.
3. Check the position of the curved tracks by moving a trunnion assembly to the bottom of the drive sprockets. With the stabilizer wheel at the bottom of the track, the top of the trunnion plate should be level (see Figure 23).
4. If necessary, adjust the tracks by loosening the 3/8-16 attaching bolts. Move the tracks evenly to keep the gaps between the curved and straight sections equal at the front and back. Retighten the attaching bolts.

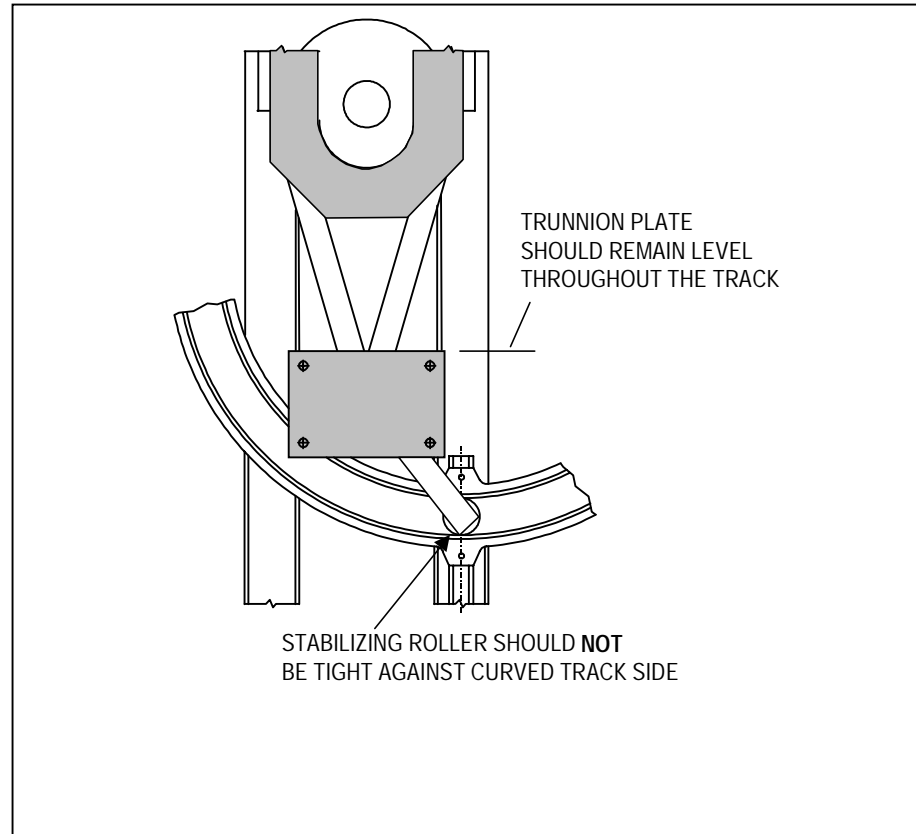


Figure 23. CURVED TRACK ADJUSTMENT

4.1.2 Adjusting the drive mechanism

1. Remove plugs A and B in the gear reducer (see Figure 24).
2. Check that the oil level reaches the bottom of the lower threaded hole. Add oil if necessary (see Section 6.4).
3. Install the vent plug in the top hole and the solid plug in the lower hole.
4. Remove the wooden shipping blocks from behind the motor and drive sprocket.
5. Loosen the four bolts (C) on the gear reducer mounting plate.
6. Release the brake and rotate the motor to equalize the drive chain.
7. Loosen the jam nut on jack bolt (D) and tighten the bolt until drive chain deflection is one inch or less. Tighten the jam nut and mounting plate bolts.

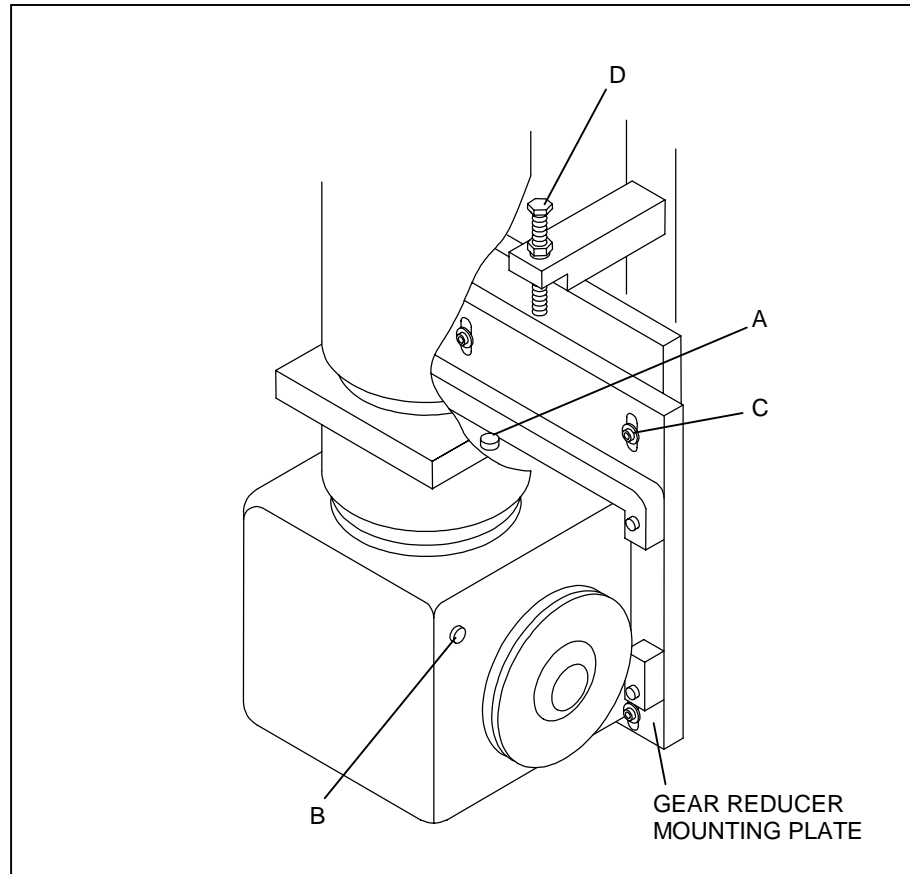


Figure 24. GEAR MOTOR ADJUSTMENTS

4.2 CONNECTING POWER

4.2.1 Power requirements


The vertical carousel requires a 200V to 230V AC, 60Hz, three-phase, 30A source supplied by the customer. The system shall be grounded in accordance with Article 250 of the National Electrical Code.

4.2.2 Courtesy outlets

The courtesy outlets require a 120V AC, 60Hz, single-phase, 20A source supplied by the customer. There is no overload protection provided inside the carousel.

4.2.3 Connecting power to the carousel


1. Check that disconnect switch 1DS in the electrical enclosure is in the OFF position.
2. Connect power to terminals 1L1, 3L2, and 5L3 of the switch.

 <p>DANGER</p>	<p>HAZARD OF ELECTRICAL SHOCK OR BURN. DO NOT STAND IN FRONT OF OPEN PANEL WHEN INITIALLY APPLYING POWER. CLOSE AND SECURE ALL ENCLOSURE DOORS BEFORE SWITCHING POWER ON AT THE DISCONNECT.</p>
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4.2.4 Powering the electrical enclosure

1. Check all field wiring and connectors before applying power to the enclosure.
2. Close the cover of the electrical enclosure.
3. Turn the disconnect switch to the ON position. The LCD display should light on the Carousel Interface Terminal, indicating the presence of power in the panel (see Section 5.3 for carousel operation and configuration).

4.3 FINAL ASSEMBLY

 <p>DANGER</p>	<p>POSSIBLE UNEXPECTED MACHINE OPERATION. BEFORE ATTEMPTING TO SERVICE OR ADJUST THE CAROUSEL MECHANISM, REMOVE ALL POWER TO THE CONTROL ENCLOSURE. INSTALL SAFETY LOCKOUT DEVICES TO ENSURE MECHANISM DOES NOT START UNEXPECTEDLY.</p>
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4.3.1 Installing the pans

Install pans at the front of the carousel through the lower access opening. Alternate the placement of pans at the front and back of the unit. Avoid an imbalance greater than four pans. Do not install the last four pans to leave clearance for the doors and counter.

1. Turn the disconnect switch to the ON position. Check that personnel are clear of the carousel.
2. Have a helper press down the lower access panel interlock switch. Use the Carousel Interface Terminal to jog a trunnion assembly into position. The trunnion plate should be at least two inches above the electrical box at the front of the carousel.



TO AVOID DAMAGING THE CURVED TRACKS, BE SURE THAT ALL STABILIZING ARM ROLLERS ARE IN THEIR TRACKS AND THAT THE TRUNNION PLATES REMAIN LEVEL WHEN JOGGING THE CAROUSEL DRIVE.

3. Lockout/Tagout power to the carousel.
4. Place two 2 x 4s across the bottom spreaders. Slide a pan over the 2 x 4s and align with the trunnion plates (see Figure 25).
5. Bolt the pan ends to the trunnion plates with five 5/16-18 x 1-1/2 inch hex socket head bolts, lock washers and flat washers on each side. Do not tighten.
6. Install lock nuts on the hex socket head bolts. Do not tighten.
7. Repeat steps 1 through 6 for the remaining pans. Do not install the last four pans until the doors and counter are in place.

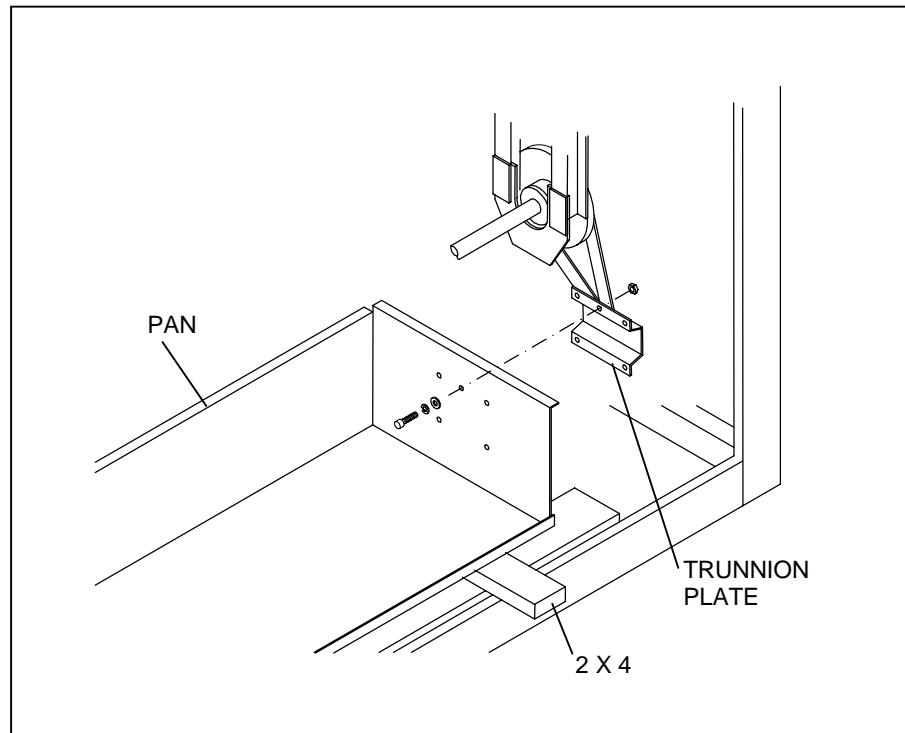


Figure 25. PAN INSTALLATION

4.3.2 Installing the counter

The position of the counter can be identified by three weld nuts on each carousel side below the door opening.

1. Lockout/Tagout power to the carousel.
2. Align the bolt holes in the counter with the weld nuts in the carousel sides (see Figure 26).
3. Bolt the counter to the carousel sides using six 5/16-18 x 1 inch hex head bolts and lock washers.

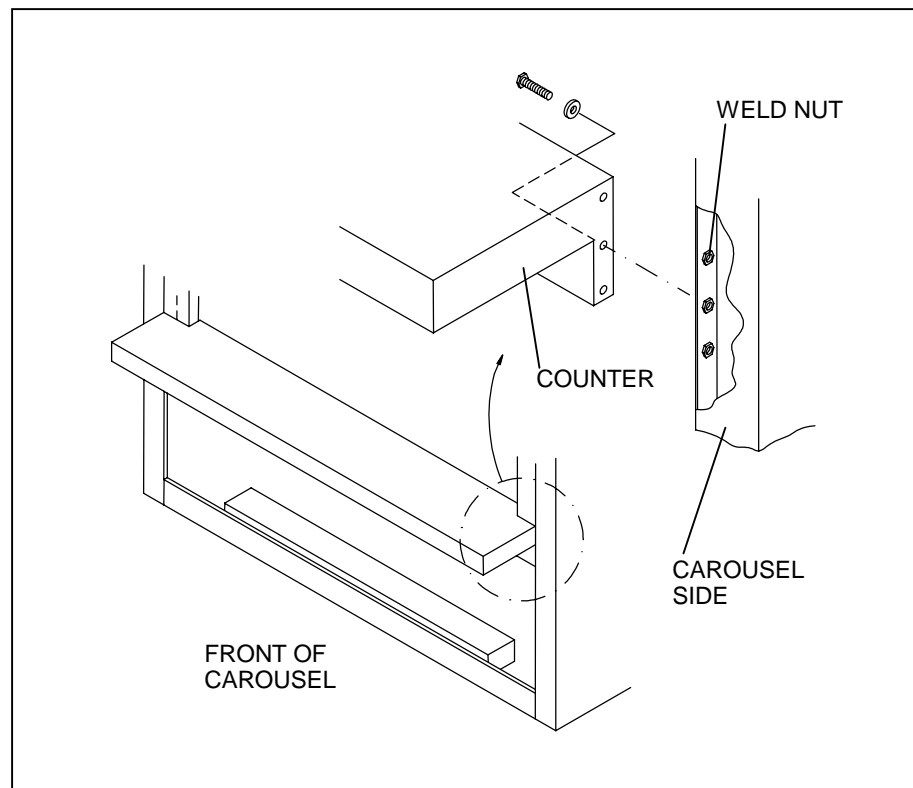


Figure 26. COUNTER INSTALLATION

4.3.3 Installing the doors

Two sliding doors close the pan access opening at the front of the carousel. The doors slide in a track attached to the side of the opening. Wire rope cables connect the upper and lower doors, causing them to move in unison. A latching mechanism in the upper door locks both doors in the closed position.

The door slide assemblies are installed at the factory. Angles with nylon glides slide in track channels attached to the carousel sides. The doors attach to the angles.

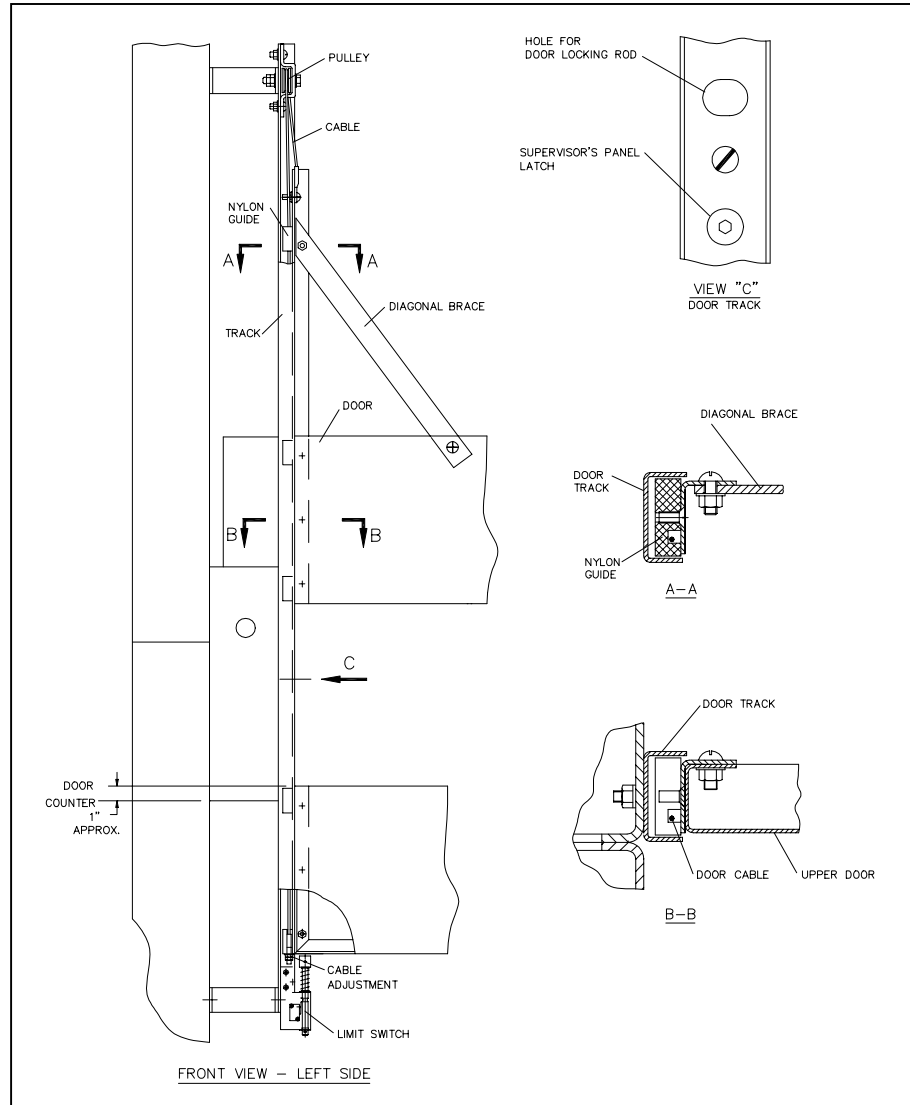


Figure 27. DOOR INSTALLATION

1. Lockout/Tagout power to the carousel.
2. Check that the upper door angles are seated in the track channels and that the cables are running in the pulley grooves (see Figure 27).
3. Push the upper door angles down until they stop moving.
4. Orient the upper door with the handle at the bottom. Lift the door into the opening.
5. Align the bolt holes in the back flanges of the door with the bolt holes in the angles.
6. Secure the door with six 10-32 x 1/2 inch round head screws, washers, and elastic stop nuts.

7. Attach the diagonal braces to the top of the door with two 10-32 x 1/2 inch round head screws, washers, and elastic stop nuts.
8. Check that the lower door angles are seated in the track channels.
9. Lift the lower door into the opening and rest it on the limit switches.
10. Align the bolt holes in the back flanges of the door with the bolt holes in the angles.
11. Secure the door with six 10-32 x 1/2 inch round head screws, washers, and elastic stop nuts.
12. Test the cable adjustment by closing the doors and turning the locking handle. If the lock rods do not align with the sockets in the door track, the cables must be readjusted.
13. Make all adjustments to the cable anchors in the bottom nylon glides of the lower door. If the top door moves too far down, shorten the cables. If the top door doesn't move down far enough, loosen the cables. Adjust both cables equally to keep the door edges parallel.
14. With the cables adjusted correctly, the locking mechanism should work smoothly and the doors should fit together tightly. When the doors are open, the lower door should extend approximately one inch above the top of the counter.
15. **For carousels equipped with 130-inch wide pans:** Thread the stabilizing cables diagonally between the pulleys at the top of the doors (see Figure 28). Anchor the free ends of the cables with 10-32 x 1/2 inch round head screws, washers, and elastic stop nuts. Set cable tension to allow the doors to move smooth and parallel.

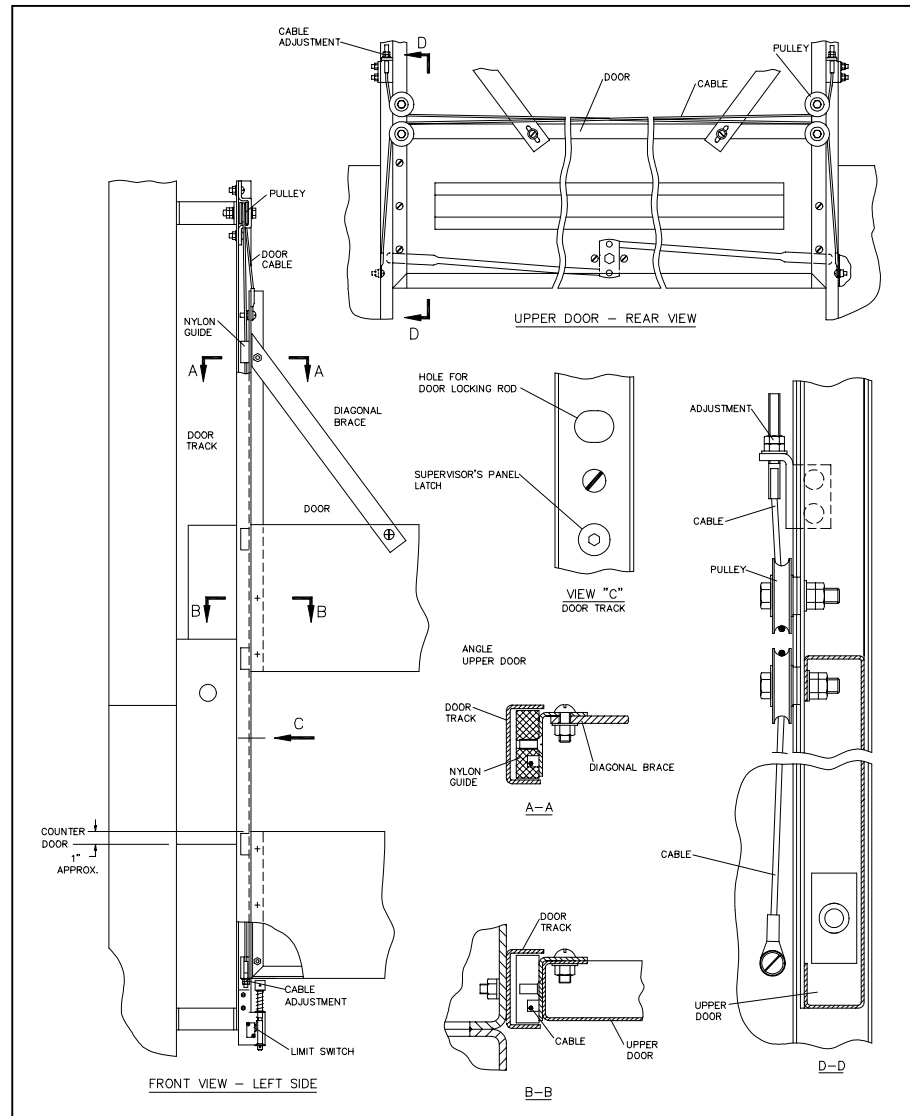


Figure 28. DOOR INSTALLATION (130-INCH WIDE PANS)

4.3.4 Installing the last four pans

Install the remaining pans as described in Section 4.3.1.

NOTE: If the pan height exceeds the height of the lower access opening, install the pans through the door opening.

4.3.5 Leveling the pans

1. Turn the disconnect switch to the ON position. Check that personnel are clear of the carousel.
2. Have a helper press down the lower access panel interlock switch. Use the Carousel Interface Terminal to jog a pan into the door opening.

3. Lockout/Tagout power to the carousel.
4. Check that all fastening bolts in the pan ends are loose.
5. Align the stabilizer rollers by pushing the front edge of the pan back and pulling it forward.
6. Place a torpedo level in the pan.
7. Slowly move the front edge down until the pan is level.
8. Tighten the bolts in the pan ends.
9. Check that the stabilizing rollers are aligned by rocking the pan front to back. If there is no play, repeat steps 4 through 8.
10. Move the pan to the lower access opening and tighten the jam nuts against the trunnion plates.
11. Apply self-adhesive pan numbers (see Figure 32 for numbering sequence).
12. Repeat steps 1 through 11 for each pan.

4.3.6 Installing the reference sensor reflector

1. Turn the disconnect switch to the ON position. Check that personnel are clear of the carousel.
2. Have a helper press down the lower access panel interlock switch. Use the Carousel Interface Terminal to jog a pan number 1 into the door opening.
3. Lockout/Tagout power to the carousel.
4. Locate the reference sensor on the left side of the carousel (see Figure 29).
5. Use a plumb bob to align the center of the reflector with the center of the sensor. Attach the reflector 2 inches above the bottom of pan number 1.

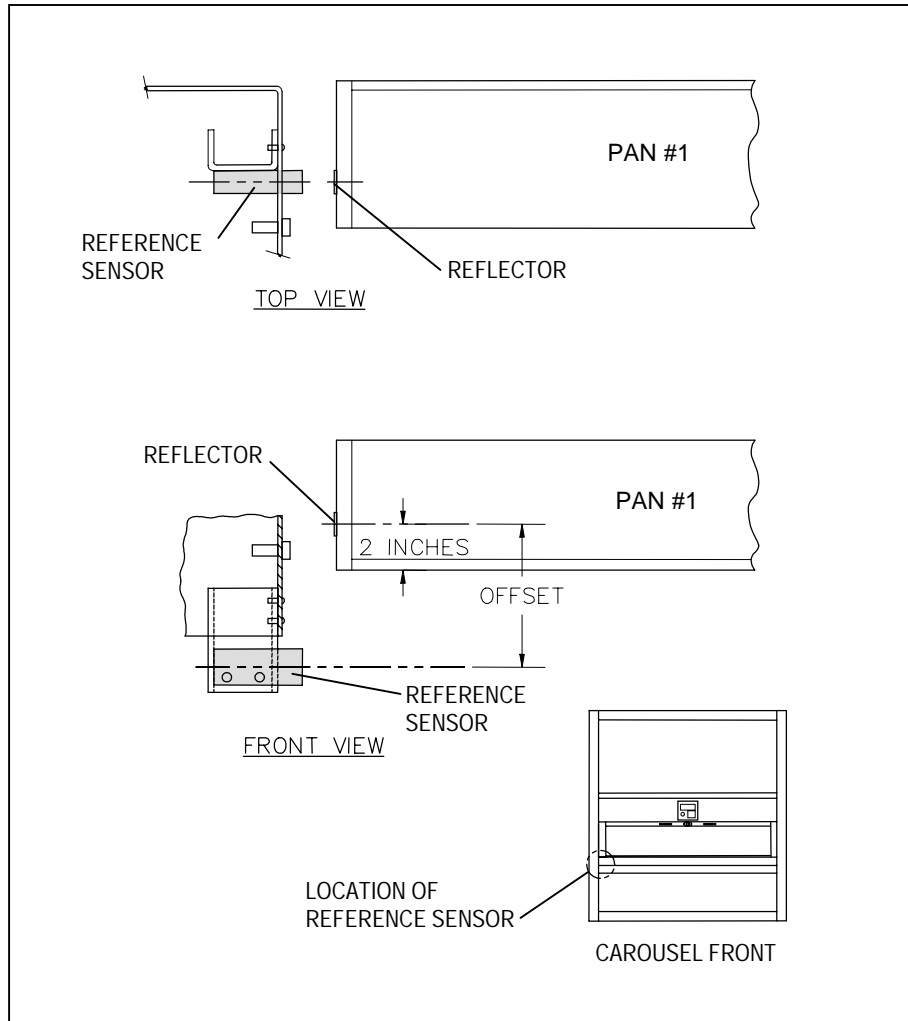


Figure 29. REFERENCE SENSOR INSTALLATION

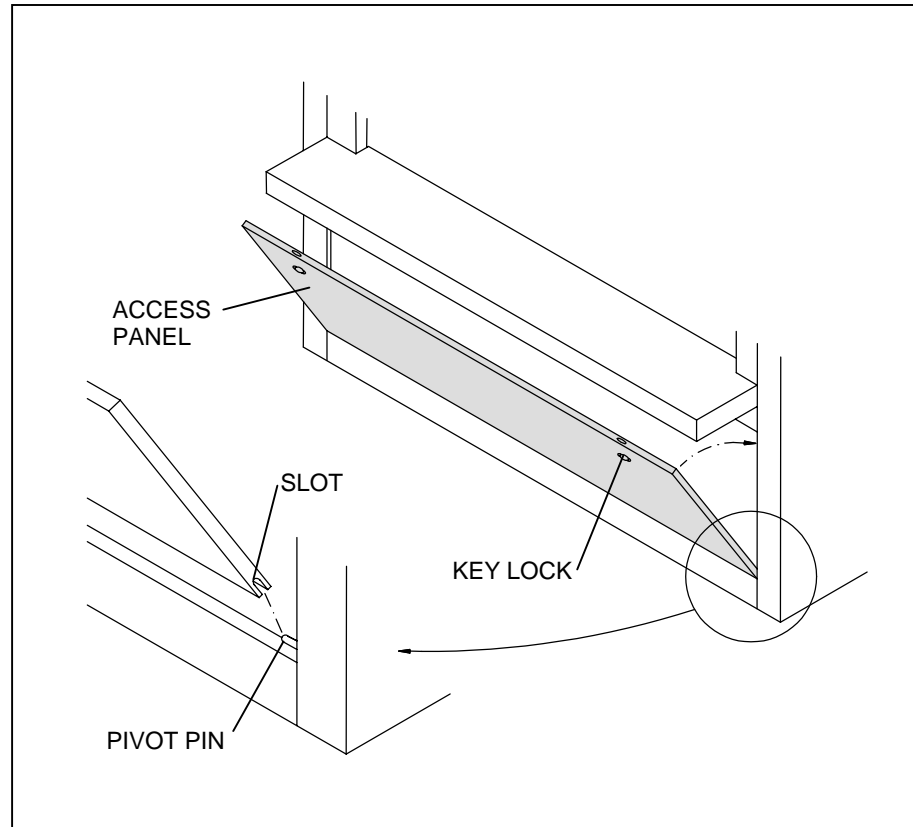


Figure 30. ACCESS PANEL INSTALLATION

4.3.7 Installing the lower access panel

1. Orient the panel with the key locks at the top (see Figure 30).
2. Hook the slots in the bottom of the panel over the studs at the bottom of the access opening.
3. Close the panel and turn the key locks to secure.

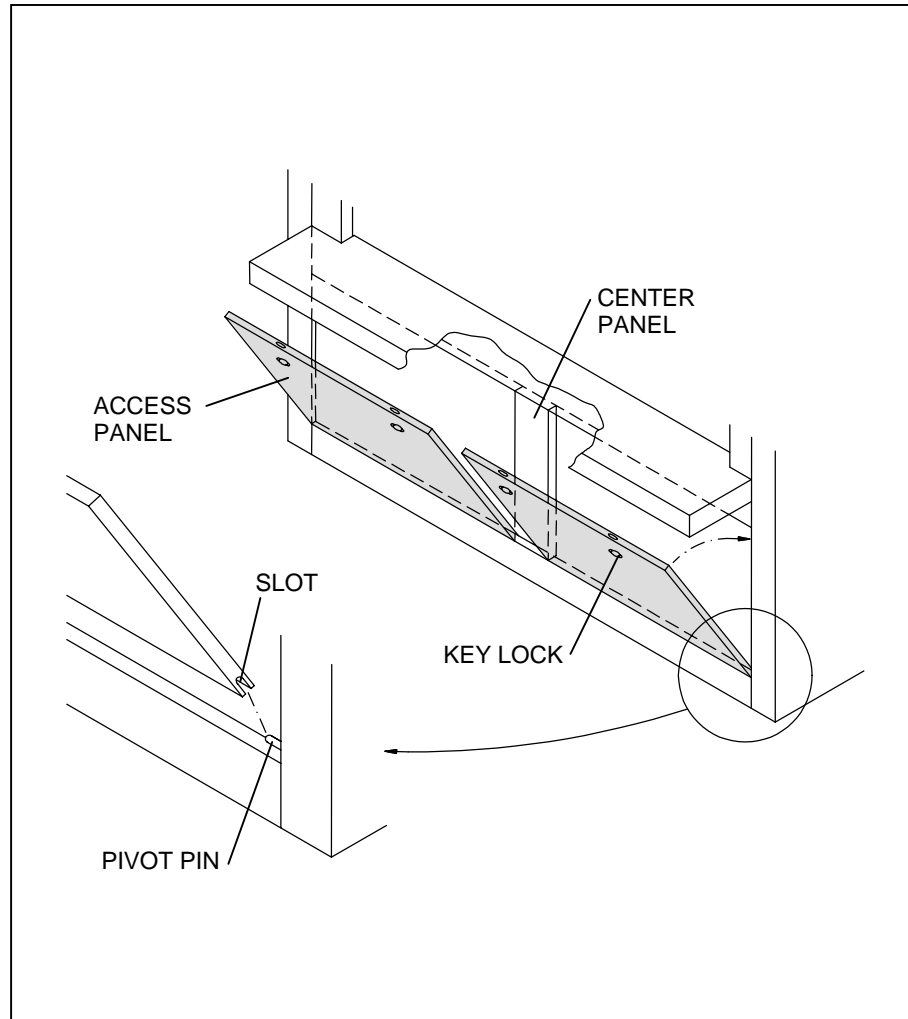


Figure 31. ACCESS PANEL INSTALLATION (130-INCH WIDE PANS)

4. **For carousels equipped with 130-inch wide pans:** Install the center panel in the access opening using four 10-32 screws, washers and elastic stop nuts. Repeat steps 1 through 3 for each of the removable panels (see Figure 31).

5. OPERATION

5.1 RULES FOR SAFE OPERATION

1. The Employer shall only permit trained personnel to operate the equipment.
2. Operators shall keep access areas open and free of obstructions.
3. Never climb, step, sit, ride or stand on the carousel pans.
4. Supervisors shall instruct personnel working on or near the equipment about the location and operation of safety and stopping devices.
5. The operator shall determine the cause of an emergency stop or system fault before restarting a carousel.
6. Personnel shall use the equipment to carry material it can handle safely. Never store oversize or overweight containers.
7. Only authorized personnel should try to correct a malfunction. The operator should immediately alert a supervisor if there is a problem with the carousel.
8. Equipment shall only be operated with all overload devices, guards and safety devices in place and operable.

5.2 LOADING THE CAROUSEL

5.2.1 Pan weight capacity

The maximum weight capacity of the carousel pans is indicated by the fifth digit of the carousel model number; A "6" indicates a 600 pound live load capacity, and an "8" indicates a 800 pound capacity.

5.2.2 Carousel weight capacity

The maximum weight capacity of the carousel is 25,000 pounds as listed on the serial number tag attached to the left side of the carousel.

5.2.3 Loading method

When loading the carousel use an alternating front to back sequence (see Figure 32). On carousels with 3HP drives, do not exceed a 1,800-pound imbalance between the front and back pans of carousel. On carousels with 5HP drives, the maximum imbalance is 3,000 pounds.

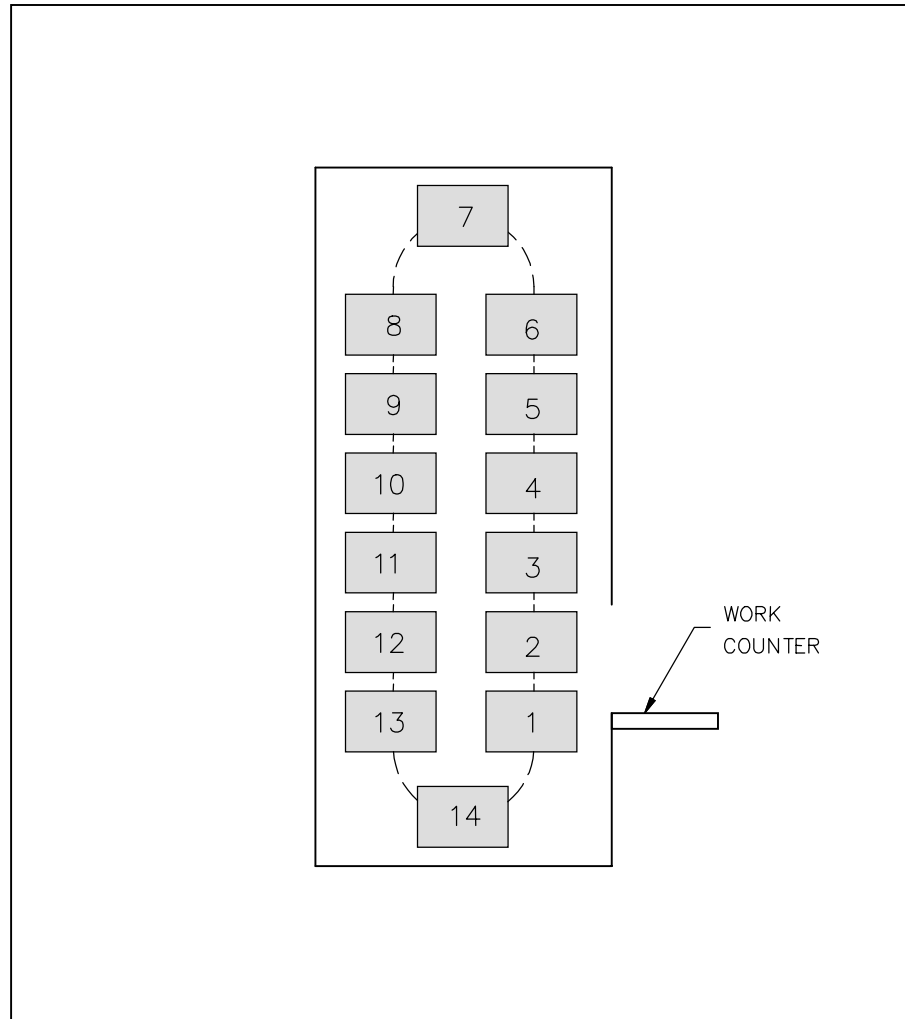


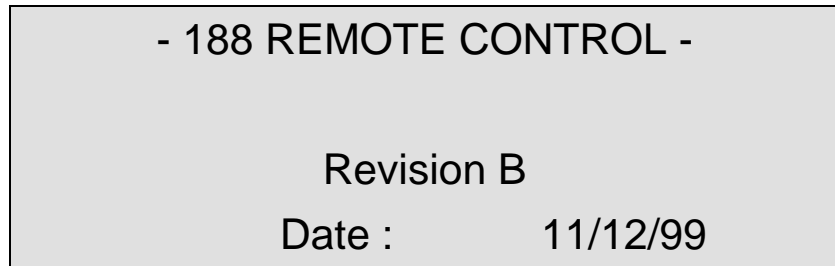
Figure 32. PAN LOADING

Load the pans in the following order: 1, 8, 7, 14, 13, 6, 5, 12, 11, 4, 3, 10, 9, and 2.

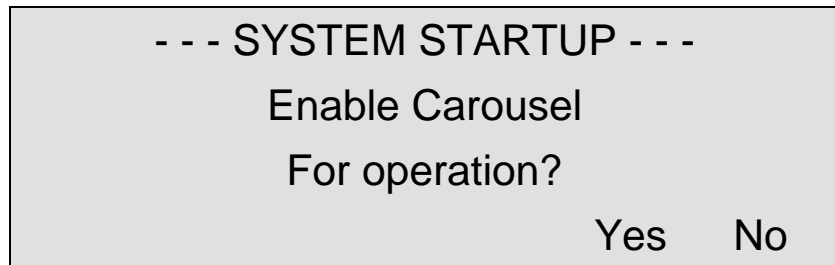
5.3 STARTING THE CAROUSEL

NOTE: The carousel must be configured by a White trained technician before it is put into service. If starting the carousel for the first time, only jog mode will be available until the configuration parameters in Section 5.6 are set.

1. Open the lower access panel and turn the disconnect switch (located on the top left side of the electrical enclosure) to the ON position.
2. Close and lock the access panel.
3. The Carousel Interface Terminal display will illuminate and the control will begin to initialize. The system initialization screen will display software version and control status:



4. If a safety condition is detected, the display will indicate the fault. Check and clear fault if necessary (see Section 5.5):
5. When all safety conditions are satisfied, the system startup screen will appear:



Select Yes using the arrow key. The control will pull in the MC1 relay enabling the drive.

When the carousel is enabled, the local control mode screen will appear:

```

- LOCAL CONTROL MODE -
  Press Menu button
    to advance
                                     Host
  
```

Select Host Computer Mode with the arrow key or use the **Menu** key to scroll through the operating mode menus.

5.4 OPERATING MODES

5.4.1 Host computer mode

The Host Computer screen shows the current pan position and the destination pan position for the next pick in the queue.

```

- HOST COMPUTER MODE -
  >>
  <<
  [Position]  [Destination]          Clr  Done
  
```

Return to Local Control Mode by selecting **Done** with the right arrow key.

5.4.2 Position carousel

The Position Carousel screen allows the operator to enter a destination pan number and shows the current pan position. The default carousel ID number is 1 for carousel controls that are not networked.

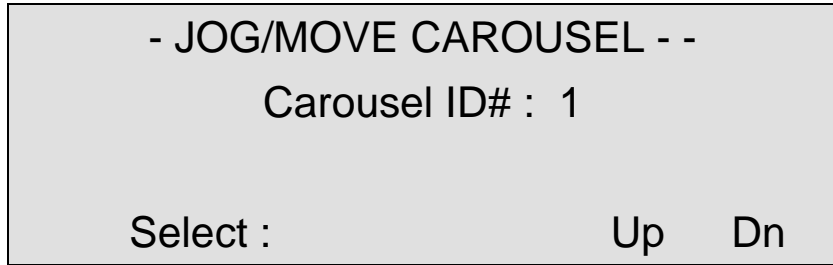
```

- POSITION CAROUSEL - -
  Carousel ID# : 1
  Target Pan# :
  [Position]                                     Clr
  
```

Enter a pan number and press **GO** to move the pan to the opening. Select **Clr** with the right arrow key to clear an entry. Press the **MENU** key to switch to a different operating mode.

5.4.3 Jog/move carousel

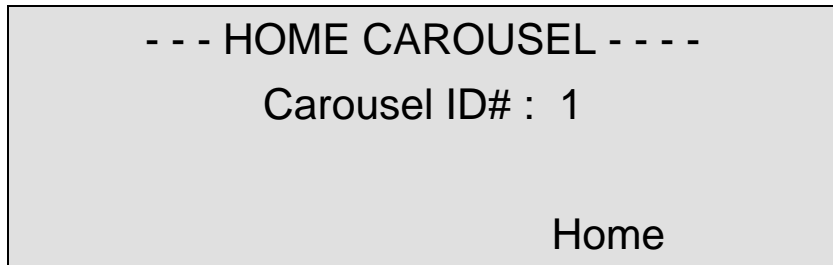
The Jog/Move Carousel screen allows the operator to jog the carousel pans up or down. The default carousel ID number is 1 for carousel controls that are not networked.



Select **Up** or **Dn** with the arrow keys and press the **GO** key to move the carousel pans. Press the **MENU** key to switch to a different operating mode.

5.4.4 Home carousel

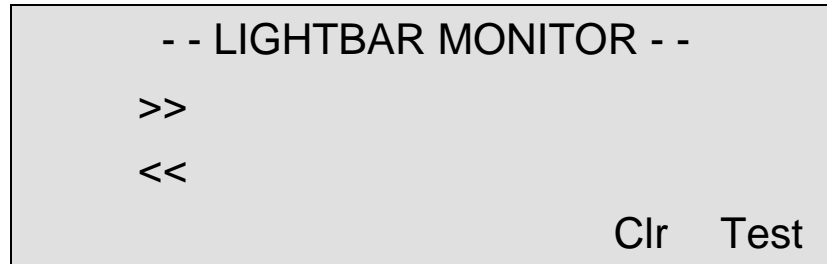
The Home Carousel screen allows the operator to initiate an automatic routine to synchronize the pan positions with the door opening. The default carousel ID number is 1 for carousel controls that are not networked.



Select **Home** with the left arrow key to initiate the routine. Press the **MENU** key to switch to a different operating mode.

5.4.5 Lightbar monitor (optional)

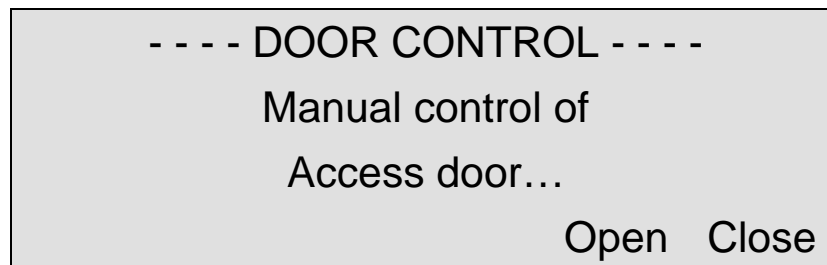
The Lightbar Monitor screen is a diagnostic tool that allows the operator to monitor communications between the host computer and the lightbar.



Select **Test** with the right arrow key to view the message stream. Press the **MENU** key to switch to a different operating mode.

5.4.6 Door control (optional)

The Door Control screen allows the operator to manually open and close the automatic doors.

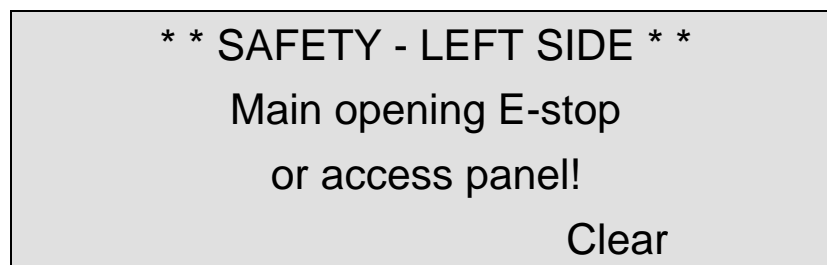


Select **Open** or **Close** with the arrow keys to actuate the doors. Press the **MENU** key to switch to a different operating mode.

5.5 FAULTS

5.5.1 Emergency stop fault

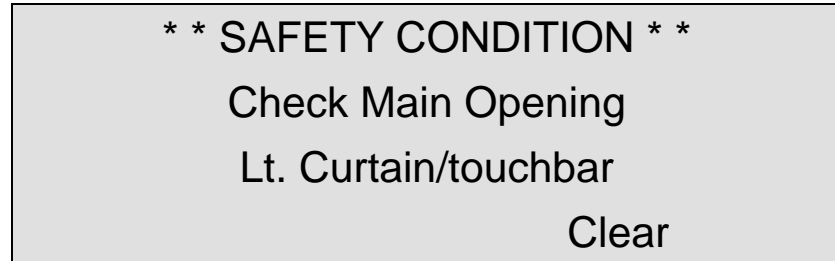
The Safety screens indicate that an Emergency Stop switch is activated or an access panel is open, preventing pan rotation.



Reset the indicated Emergency Stop switch or panel. Select **Clear** with the left arrow key to clear the screen.

5.5.2 Light curtain/touch bar fault

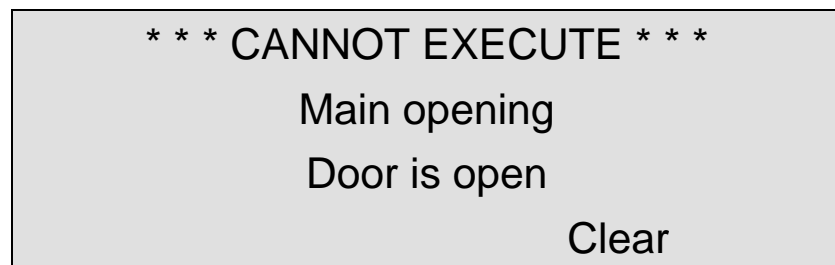
The Safety Condition screens indicate that the light curtain is interrupted or touch bar is activated at the door opening, preventing pan rotation.



Clear the indicated door opening. Select **Clear** with the left arrow key to clear the screen.

5.5.3 Execution fault

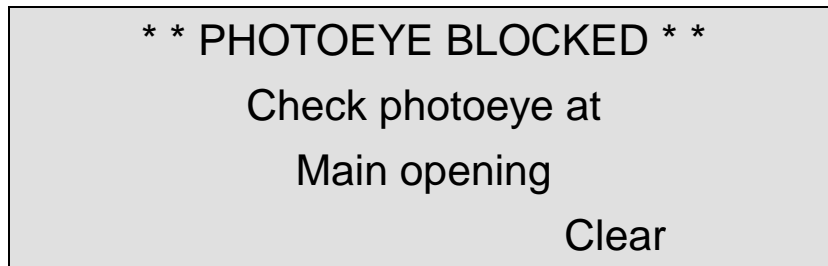
The Cannot Execute screens indicate that a move command cannot be acted on for one of the following reasons: the door is open (optional), the carousel is disabled because of a fault condition, or a previous move is in process.



Correct the indicated fault. Select **Clear** with the left arrow key to clear the screen.

5.5.4 Photo eye fault

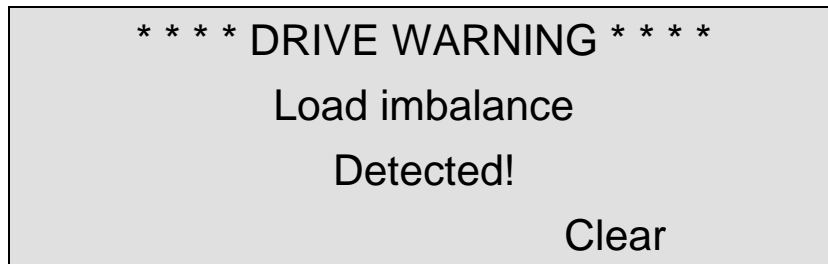
The Photoeye Blocked screen indicates that a photo eye beam is interrupted in the door opening, preventing pan rotation.



Clear the indicated photo eye. Select **Clear** with the left arrow key to clear the screen.

5.5.5 Imbalance fault

The Drive Warning screen indicates that an excessive load imbalance has caused the carousel drive to shut down.

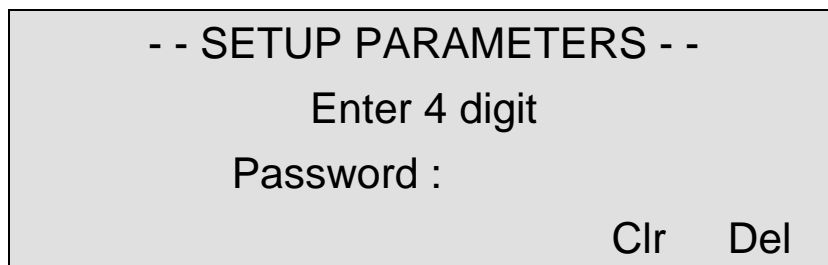


Select **Clear** with the left arrow key to clear the screen. Select Jog Mode and manually redistribute contents of pans to equalize load.

5.6 SETUP PARAMETERS

5.6.1 Password

Use the **MENU** key to select the Setup Parameters screen.



Enter the four-digit password to access and change system parameters.

5.6.2 Set parameters

The operator is prompted whether to restore default settings or enter new settings.

```

-- SETUP PARAMETERS --
Restore default
Settings?      No
                Yes  No
    
```

Select **Yes** or **No** with arrow keys. Default selection is **No**. Press **MENU** key to continue.

5.6.3 Checksums

The operator is prompted whether to use checksums.

```

-- SETUP PARAMETERS --
Message checksums
Required?     No
                Yes  No
    
```

Select **Yes** or **No** with arrow keys. Default selection is **No**. Press **MENU** key to continue.

5.6.4 Pulses per revolution

Enter the number of pulses per revolution for the carousel.

```

-- SETUP PARAMETERS --
Carousel ID# : 1
Pulses/Rev :
                Clr  Next
    
```

Select **Next** with the right arrow key to choose a different Carousel ID# (networked systems only). Select **Clr** with the left arrow key to clear Pulses/Rev and enter a new value. Press **MENU** key to continue.

5.6.5 Number of pans

Enter the number of pans in the carousel.

<p>- - SETUP PARAMETERS - -</p> <p>Carousel ID# : 1</p> <p>Number of Pans :</p> <p style="text-align: right;">Clr Next</p>
--

Select **Next** with the right arrow key to choose a different Carousel ID# (networked systems only). Select **Clr** with the left arrow key to clear Number of Pans and enter a new value. Press **MENU** key to continue.

5.6.6 Offset

Enter the offset distance from the reference sensor to the door opening in encoder pulses.

<p>- - SETUP PARAMETERS - -</p> <p>Carousel ID# : 1</p> <p>Pan#1 Offset :</p> <p style="text-align: right;">Clr Next</p>
--

Select **Next** with the right arrow key to choose a different Carousel ID# (networked systems only). Select **Clr** with the left arrow key to clear Pan#1 Offset and enter a new value. Press **MENU** key to continue.

5.6.7 Low speed

Enter distance for low speed ramp down in encoder pulses.

<p>- - SETUP PARAMETERS - -</p> <p>Carousel ID# : 1</p> <p>Lo spd pulses :</p> <p style="text-align: right;">Clr Next</p>

Select **Next** with the right arrow key to choose a different Carousel ID# (networked systems only). Select **Clr** with the left arrow key to clear Lo spd pulses and enter a new value. Press **MENU** key to continue.

5.6.8 Stop window

Enter door opening number at Carousel Interface Terminal.

-- SETUP PARAMETERS --

Carousel ID# : 1

Stop window :

Clr Next

Select **Next** with the right arrow key to choose a different Carousel ID# (networked systems only). Select **Clr** with the left arrow key to clear Stop window and enter a new value. Press **MENU** key to continue.

5.6.9 Set boards

Enter number of door openings.

-- SETUP PARAMETERS --

of 8Rly/Opto

I/O boards :

Change : (+) (-)

Select **(+)** with the left arrow key to increase number, **(-)** with the right arrow key to decrease number. Press **MENU** key to continue.

5.6.10 Baud rate

Enter baud rate for host communications.

```
  - - SETUP PARAMETERS - -  
    BAUD rate for host  
    communication :  
    Select :           (+)  (-)
```

Select **(+)** with the left arrow key to increase number, **(-)** with the right arrow key to decrease number. Press **MENU** key to continue.

5.6.11 Data bits

Enter number of data bits per character for host communications.

```
  - - SETUP PARAMETERS - -  
    # of data bits per  
    character?  
    Change :           (+)  (-)
```

Select **(+)** with the left arrow key to increase number, **(-)** with the right arrow key to decrease number. Press **MENU** key to continue.

5.6.12 Parity

Enter parity for host communications.

```
  - - SETUP PARAMETERS - -  
    Parity for host  
    communication :  
    Select :           (+)  (-)
```

Select **(+)** with the left arrow key to increase number, **(-)** with the right arrow key to decrease number. Press **MENU** key to continue.

5.6.13 Stop bits

Enter stop bits for host communications.

- - SETUP PARAMETERS - -		
Stop bits for host communication :		
Change :	(+)	(-)

Select **(+)** with the left arrow key to increase number, **(-)** with the right arrow key to decrease number. Press **MENU** key to continue.

5.6.14 Save settings

- - SETUP PARAMETERS - -		
Save to EEPROM		
Reboot?	No	
Reboot?	Yes	No

Select **Yes** or **No** with arrow keys. Default selection is **No**. Press **MENU** or **ENTER** key to continue.


6. MAINTENANCE AND TROUBLESHOOTING

6.1 MAINTENANCE SAFETY

1. Equipment owners should set up a maintenance program to keep the carousel equipment in a safe condition.
2. Only qualified, trained personnel shall perform maintenance on the carousel equipment.
3. Maintenance personnel shall conduct routine inspections, preventive and corrective maintenance, to be sure all safety devices function properly. Maintenance personnel shall keep all warning labels in legible condition.
4. Personnel shall not perform maintenance such as adjustments or lubrication on the carousel equipment when it is in operation.
5. When maintenance personnel stop the carousel equipment for servicing, they must lock out all power to the machine in accordance with the OSHA Lockout/Tagout procedure.
6. Any hazardous conditions discovered during periodic inspections shall be corrected before the carousel equipment is returned to normal operation.
7. Maintenance personnel shall replace and check that all safety devices, access panels, and guards are in working order before starting the equipment for normal operation.

6.2 MAINTENANCE SCHEDULE

MAINTENANCE OPERATION	FREQUENCY	REF
SYSTEM SAFETY		
Inspect all safety stop devices	Every six months or after performing maintenance	-
Check that all warning labels are legible	Every six months	-
LUBRICATION		
Check oil level in gear reducer	Before operating for first time	6.4.1
Replace oil in gear reducer	One year or 2500 hours of operation	6.4.2
Roller chain	One year	6.4.3
Idler and drive sprocket bearings	One year	6.4.4
Stabilizing track	One year	6.4.5
Trunnion pivot points	One year	6.4.6
INSPECTION		
Hardware	Start up	6.3.1
Drive chain	Six months	6.3.2
Drive sprockets	Six months	6.3.3
Load chain	Six months	6.3.4
Load chain wheels	Six months	6.3.5
Stabilizing arm wheels	Six months	6.3.6
Scissor arms	Six months	6.3.7
Pans	Six months	6.3.8
Curve tracks	Six months	6.3.9
Photo eyes	Six months	6.3.10

 DANGER	<p>POSSIBLE UNEXPECTED MACHINE OPERATION. BEFORE ATTEMPTING TO SERVICE OR ADJUST THE CAROUSEL MECHANISM, REMOVE ALL POWER TO THE CONTROL ENCLOSURE. INSTALL SAFETY LOCKOUT DEVICES TO ENSURE MECHANISM DOES NOT START UNEXPECTEDLY.</p>
--	--

6.3 CAROUSEL INSPECTION

6.3.1 Hardware

Before putting a carousel into service for the first time, or after overhauling, check the pan mounting hardware, load chain take-up assemblies and drive chain take-up assembly for loose bolts and missing hardware.

6.3.2 Checking drive chain

The roller chain connecting the speed reducer sprocket to the drive sprocket is tensioned during installation. As the chain wears, excessive chain stretch will cause errors in carousel pan positioning. When the drive chain deflects more than one inch, chain tension must be readjusted (see Section 4.1.2).

6.3.3 Checking drive sprockets

Examine the drive sprocket teeth for wear. Check for broken, worn, or chipped teeth that indicate a misalignment or problem with the load chain.

6.3.4 Checking load chain

Examine the load chain for correct tension. If slack is seen at the drive sprockets, readjust preload (see Section 4.1.1). The chain should appear slightly wet with lubricant. A reddish-brown color on the chain surfaces indicates that the chain was not adequately lubricated.

6.3.5 Checking load chain wheels

Examine the nylon wheels for flat spots or unusual wear. Cracked or broken wheels will seize without affecting the overall motion of the carousel. Loose load chains or overloaded pans can damage the wheels.

6.3.6 Checking stabilizing arm wheels

Examine the nylon wheels for cracks or flat spots. Misaligned stabilizer tracks or loose load chains can damage the wheels.

6.3.7 Checking scissors arms

Examine the trunnion assemblies for bent scissor arms, indicating a jam or other mechanical problem. Check the pivot bushings and chain pins for excessive wear, indicating overloaded pans.

6.3.8 Checking pans and shelves

Examine the pan dividers and shelves for loose hardware. Check for bent shelves or pans that are not level.

6.3.9 Checking the stabilizing track

Examine the stabilizing tracks for cracked or bent rails, especially at the end sections. Incorrectly tensioned load chains or incorrectly adjusted curved tracks can damage the inside and outside rails.

6.3.10 Checking photo eyes

Check the LED on each photo eye (hold a reflector in front of the reference sensor). If a LED is not lit, examine the lens for excessive dust buildup. Wipe lens and reflector with a clean soft cloth and a mild detergent solution. Do not use solvents. If the LED does not light after cleaning, adjust alignment and sensitivity setting. If the sensor continues to malfunction, see Section 6.4.7.

6.4 CAROUSEL MAINTENANCE

6.4.1 Checking reducer oil level

The carousel drive reducer is filled with oil prior to shipment. Check the oil level prior to putting the unit into operation (see Section 4.1.2).

6.4.2 Replacing oil in reducer

Replace the oil every twelve months or 2500 operating hours. Refill with Sitter Oil Co. Valvata J460 or equivalent.

6.4.3 Lubricating roller chain

Use a lithium EP-2 grease or equivalent.

6.4.4 Lubricating idler and drive sprocket bearings

All bearings are prelubricated with a No. 2 consistency lithium base grease. When relubricating, use a lithium EP-2 grease or equivalent.

6.4.5 Lubricating stabilizing track

Use a lithium EP-2 grease or equivalent.

6.4.6 Lubricating trunnion pivot points

Use a lithium EP-2 grease or equivalent.

6.4.7 Replacing sensors and cables

Each sensor has a twist-lock connector. Unplug the connector to replace a sensor without disturbing the cable. If a cable requires replacement, route the new cable exactly as the old one, replacing all cable ties. Check the new cable for clearance with surrounding components.



DANGER

HAZARD OF ELECTRICAL SHOCK OR BURN. FAILURE TO FOLLOW SAFE ELECTRICAL PRACTICES CAN RESULT IN SERIOUS INJURY OR DEATH. BEFORE OPENING PANEL INSURE THAT ALL SOURCES OF POWER ARE TURNED OFF AND LOCKED OUT.



DANGER

HAZARD OF ELECTRICAL SHOCK OR BURN. POTENTIALLY LETHAL VOLTAGES EXIST IN AC DRIVES FOR SEVERAL MINUTES AFTER POWER IS REMOVED. BEFORE SERVICING AN AC DRIVE, IN THE CONTROL ENCLOSURE, WAIT UNTIL THE DC BUS IS DISCHARGED AND THE BUS CHARGED LIGHT IS OUT.

6.5 TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Disconnect switch ON, no Carousel Interface Terminal light	No power to panel	Check input power
	Line fuses open	Check fuses, find fault, replace fuses
	Power supply fuses open	Check fuses, find fault, replace fuses
	Terminal cable connector loose	Check connector at terminal block behind idle panel
Cannot enable carousel for operation	EMERGENCY STOP button pressed	Reset EMERGENCY STOP button, press Clear arrow key
	Door opening photo eye blocked	Clear sensor, press Clear arrow key
	Touch bar activated	Clear door opening, press Clear arrow key
	Access panel open	Close panel, press Clear arrow key
	Light curtain blocked (optional)	Clear door opening, press Clear arrow key
Pans will not move	Control fault	Clear fault, press Clear arrow key
	Drive fuses open	Check fuses, find fault, replace fuses
	Drive malfunction	Replace drive
	Brake shaft key sheared	Replace key
	Brake failure	Adjust or replace brake
	Drive chain failure	Replace chain, see Section 4.1.2
	Speed reducer failure	Replace reducer
Carousel will not home	Reference photo eye malfunction	Check photo eye, adjust or replace, see Section 6.3.10
	Drive malfunction	Replace drive
	Encoder malfunction	Check and replace encoder
Pan position error	Pan# 1 offset set incorrectly	Change offset, see Section 5.6.6
	Chain stretch	Adjust load chain preload, see Section 4.1.1
	Encoder malfunction	Check and replace encoder
	Pan not level	Level pan, see Section 4.3.5
	Brake failure	Adjust or replace brake
Brake chatters, smells burnt	Insufficient voltage	Check input power
	Pressure plate not releasing	Adjust or replace brake
	Control relay failure	Replace CR1 relay
Broken nylon wheel	Excessive load in pan	Reduce load
	Pan binding in transition	Adjust load chain preload, see Section 4.1.1
Bent scissor arm	Interference between pans	Clear interference, replace arm
	Obstruction between arm and track	Clear obstruction, replace arm
Door lock inoperable	Binding lock rod	Open-up socket hole in tracks
	Loose set screw in handle	Apply Loctite, tighten setscrew
Doors open unevenly	Broken cable	Remove door, replace cable

7. DESIGN DATA

7.1 SPECIFICATIONS

7.1.1 Performance

Vertical Carousel Performance Characteristics	
Maximum pan speed	40 feet/minute
Horsepower	3 and 5
Maximum imbalance	1,800 pounds @ 3HP and 3,000 pounds @ 5HP
Maximum pan capacity	600 and 800 pounds
Pan depth (inches)	24.5, 18.5, 16.5, 15.5
Pan width (inches)	130, 112, 106, 100, 95, 72, 60
Pan pitch (inches)	22.5, 21.0, 19.5, 18.0, 16.5, 15.0, 13.5, 12.0, 10.5

7.1.2 Load chain safety factor

Two #120 chains support the pans. They have a static safety factor of 6:1.

7.1.3 Bearings

All ball bearings have a B10 life of 25,000 hours, and are a sealed, heavy-duty design.

7.1.4 Footprint

- The depth of model 2400 is 67.75 inches.
- The depth of models 1800, 1600, and 1500 is 56.25 inches.
- Carousel width is equal to the pan width + 24.5 inches.

7.1.5 Height

The overall height of the carousel ranges from 8 feet to 36 feet.

7.1.6 Power requirements

Standard power requirements are 200V to 230V AC, 60Hz, three-phase, 30A. As an option, the carousel can use 400V to 460V AC, 60Hz, three-phase, 15A.

7.1.7 Environmental considerations

The I/E is capable of operating in a temperature range of 33°F to 104°F with a relative humidity of 5-95% (without condensation).

7.1.8 Sound level

The I/E sound levels are less than 80_{db} (A scale, slow response) at a distance of 5 feet.

7.1.9 Service life

The I/E is designed with the appropriate safety factors to ensure the unit is capable of functioning in a 7-24-365 environment.

7.2 OPTIONAL EQUIPMENT

7.2.1 Dust cover

The dust cover consists of three identical sheet metal panels that enclose the top of the carousel.

7.2.1.1 INSTALLATION

1. Orient the panels with reinforcing flanges down (see Figure 33).
2. Place the two end panels.
3. Place the center panel so that it overlaps the side panels.
4. Secure with #10 x 3/4 self-drilling screws.

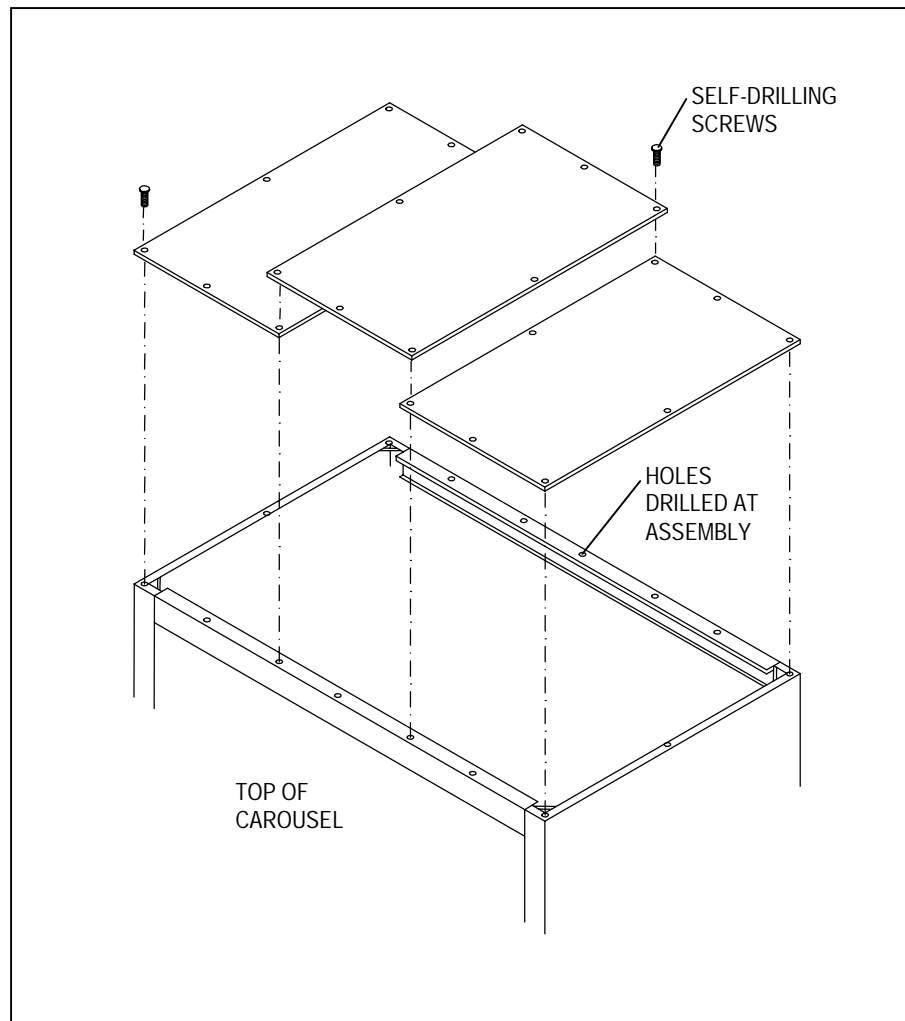


Figure 33. DUST COVER INSTALLATION

7.2.2 Hand crank
7.2.2.1 INSTALLATION

1. Depress the **EMERGENCY STOP** push button on the supervisor's panel.
2. Remove the lower access door to provide access to the brake lever.
3. Remove the 1-inch channel from the crank mounting bracket.
4. Place the crank bracket on the corner of the counter (see Figure 34).
5. Insert the 1-inch channel between the counter flange and thumbscrews.
6. Tighten thumbscrews to clamp to counter flange.
7. Install brake release rod by inserting it through the hole in the clip on the mounting bracket and through the hole on the brake lever.
8. Install hairpin clip to end of release rod.
9. Test the pan load distribution by pulling the brake release rod to the brake OFF position. **If the pans start to rotate, immediately engage the brake by pushing the rod to the brake ON position.** Do not use the hand crank. Remove the crank mounting hardware.



PAN ROTATION INDICATES THAT THE FRONT TO BACK LOAD DISTRIBUTION EXCEEDS RECOMMENDED LIMITS AND IT IS NOT SAFE TO USE THE HAND CRANK.

If no pan movement is observed, continue to step 10.

10. Open the supervisor's panel by turning the latch release with a hex key. The latch release is located in the left door channel.
11. Place the end of the right angle gear drive on the squared end of the motor shaft.
12. Place the hand crank tube through the socket on the mounting bracket. Align the top of the crank assembly with the top of the right angle drive. Tighten thumbscrews to secure.

13. Loosen the front collar of the right angle drive and insert the crank shaft. Slide the collar back to the face of the right angle drive and lock in place.

7.2.2.2 OPERATION

1. Pull the brake release rod.
2. Turn crank handle. Ten rotations will provide approximately 2 1/2 inches of pan travel.
3. Engage brake after turning crank.
4. Remove hand crank and close access panels before resuming normal carousel operation.

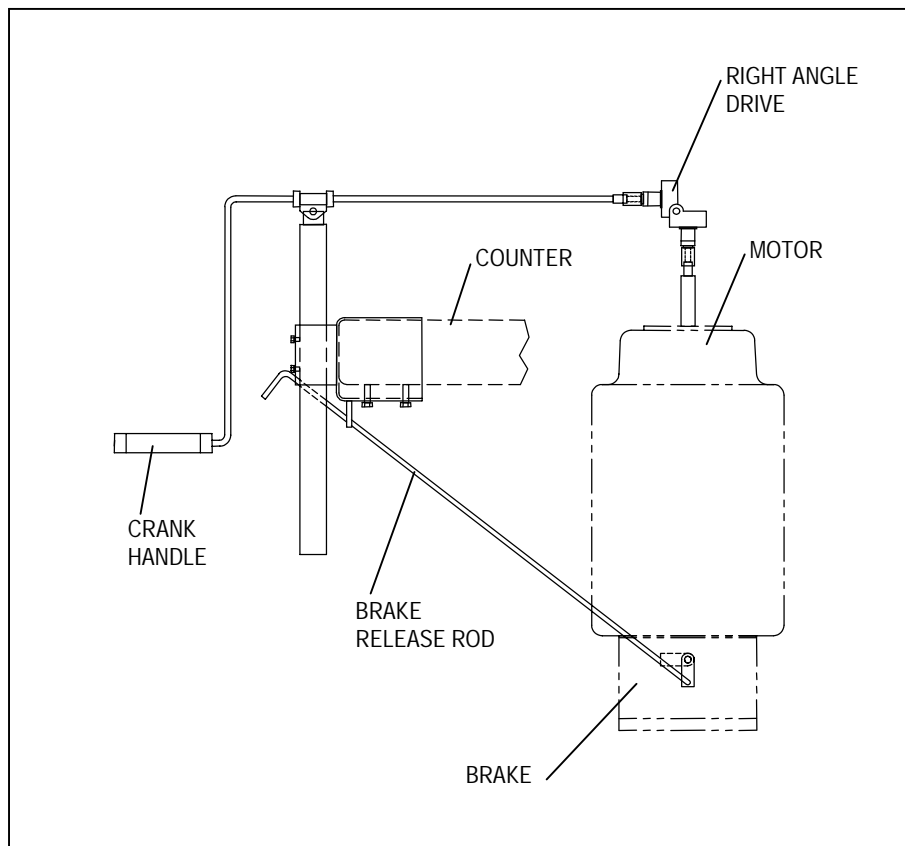


Figure 34. HAND CRANK INSTALLATION

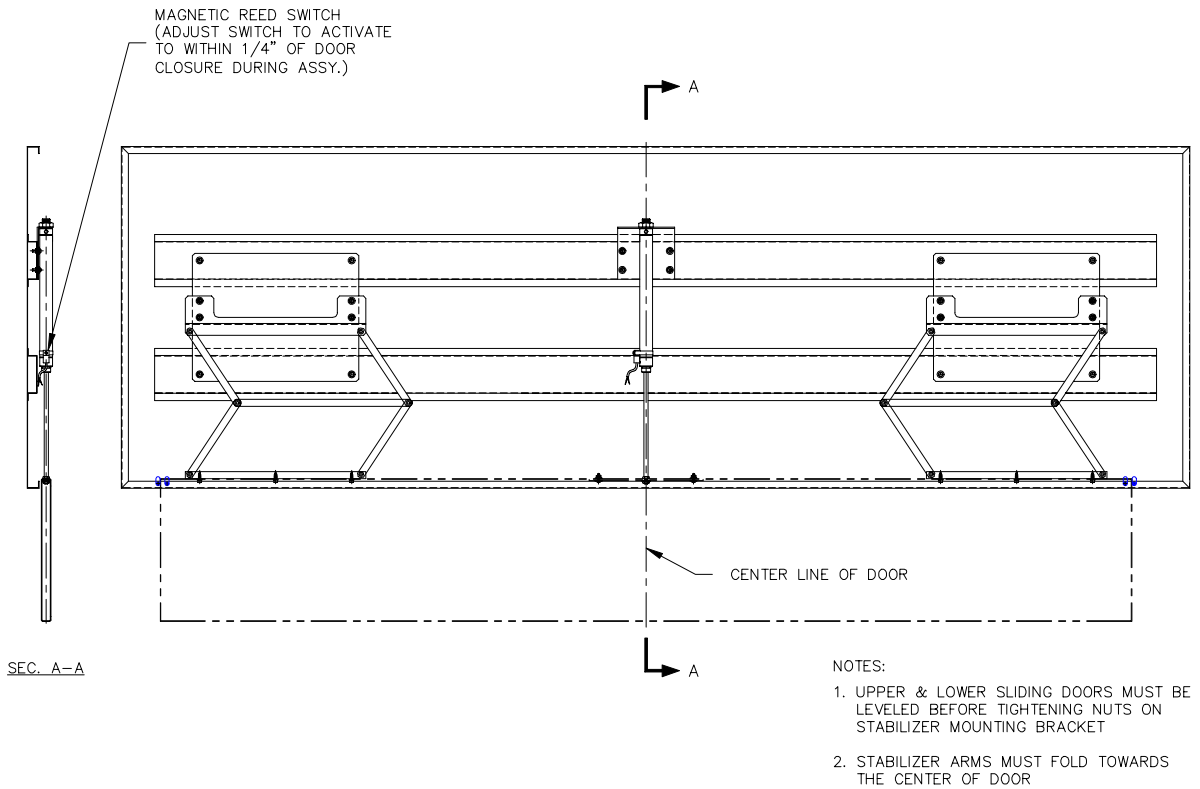


Figure 35. PNEUMATIC DOOR ASSEMBLY

7.2.3 Clean room options

7.2.3.1 AUTOMATIC ACCESS DOORS

Automatic doors maintain clean room integrity when used on carousels with multiple openings. A computer control allows only one open door during a transaction. When the transaction is complete and personnel are clear, the door closes automatically.

The doors are actuated by a pneumatic cylinder attached to the upper door (see Figure 35). A double-acting pneumatic valve, connected to the carousel controller, directs air to the cylinder. A reed switch mounted on the cylinder signals the controller when the doors are closed.

Carousels equipped with automatic doors use a light curtain to protect personnel from potential pinch points (see Figure 36). The light curtain system scans the door opening with infrared light beams. When a beam is interrupted, the system prevents door closure and pan rotation.

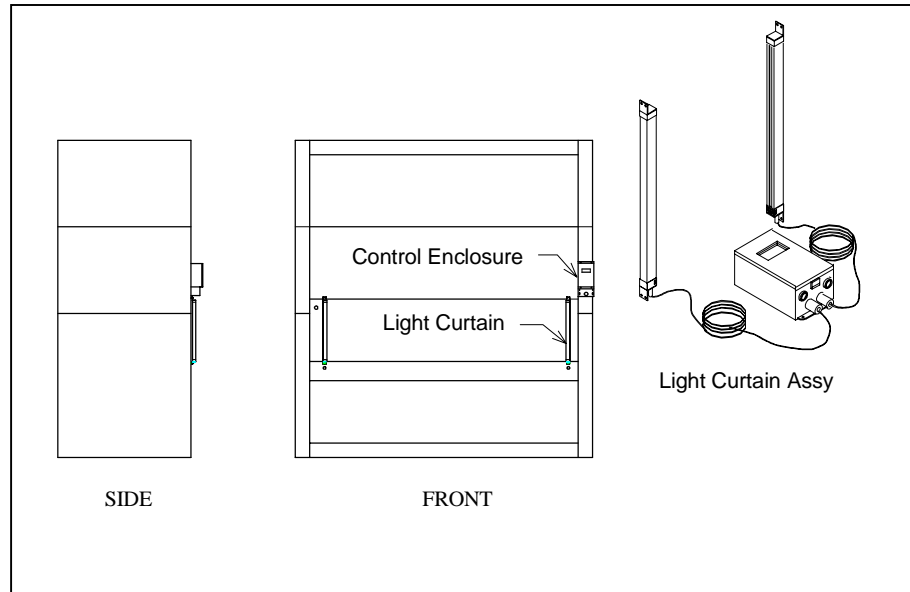


Figure 36. LIGHT CURTAIN INSTALLATION

7.2.3.2 INTERNAL SIDE ENCLOSURE

To isolate areas where particulate is generated, both drive and idler sides of the carousel have internal baffle plates (see Figure 37). The baffles cover all but a 2-inch slot for trunnion stud movement. When the inside of the machine is pressurized, any particulate generated behind the baffles becomes trapped in the filtration system at the bottom of the unit. Clean air exhausts from the machine through ports located at the sides of the carousel.

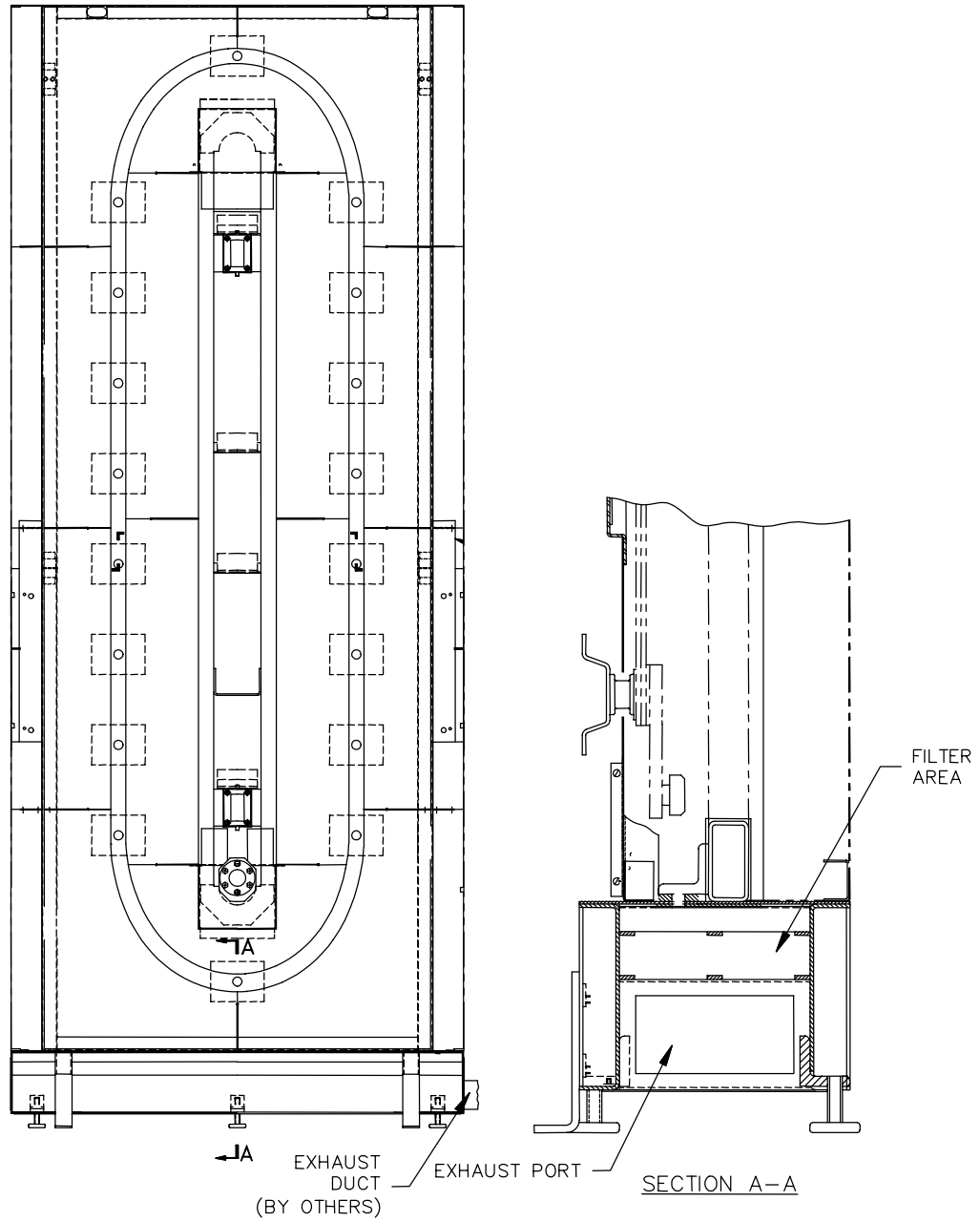


Figure 37. CLEAN ROOM AIR BAFFLE SYSTEM

7.2.3.3 AIR FLOW & PRESSURE REGULATING SYSTEM

Louvers with adjustable blades are installed at the bottom of the carousel to control internal air pressure and divert airflow (see Figure 38). A louver adjustment mechanism, mounted at the front of the carousel, allows regulation of airflow and internal pressure.

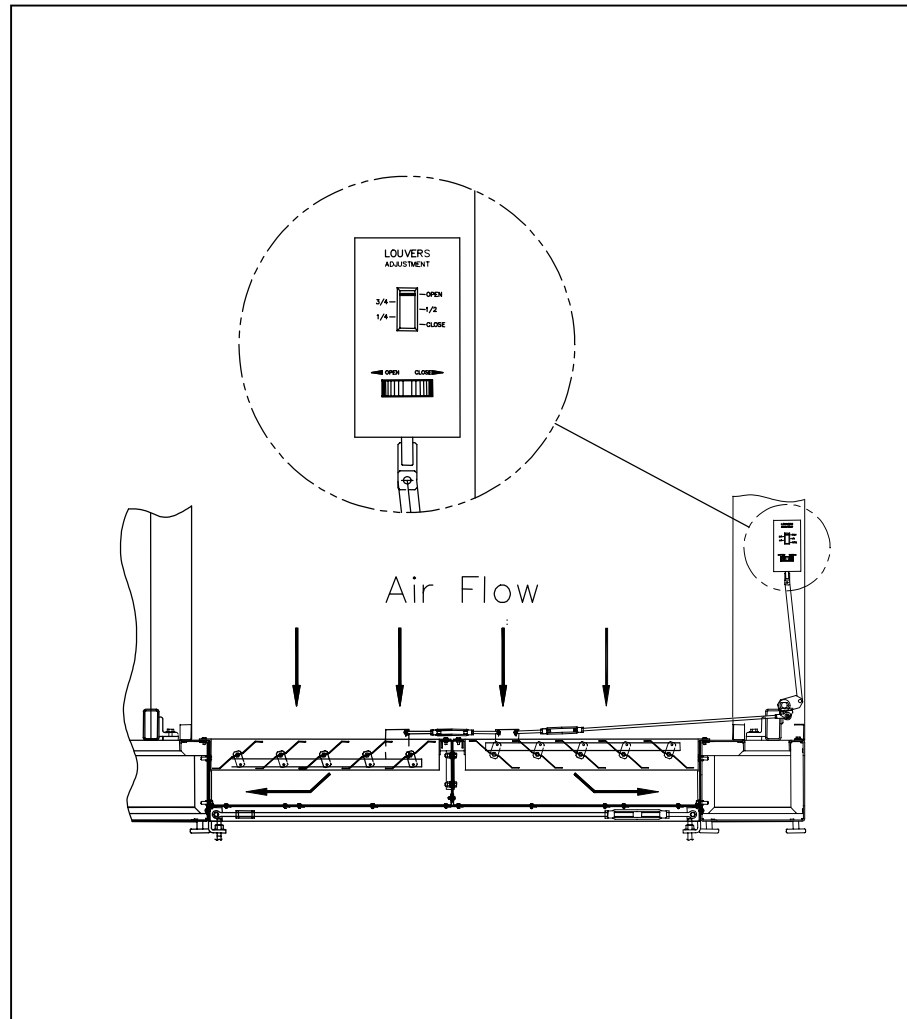


Figure 38. CLEAN ROOM LOUVER SYSTEM

7.2.4 RS-232 interface port operation and message format

7.2.4.1 OPERATION

The carousel must be in Host Computer Mode to respond to transmissions from the RS-232 port. If the carousel control is in Local Control Mode, it can receive information, but cannot rotate the pans.

There are two modes of operation: host-directed picks and message database picks. Host-directed picks are "real time" transactions directed by the host computer. Message database picks are directed to any door opening on the carousel and stored in the message database.

On carousels with multiple door openings, the operator must check the pan number to see if a pan has stopped for his/her pick. To eliminate operator confusion, White recommends the use of light bars on multiple opening carousels. Light bars automatically indicate the active opening and correct pick location.

7.2.4.2 MESSAGE FORMAT

The Series 2400 carousel control equipped with an RS-232 interface port will accept synchronous point-to-point communications (up to 9600 baud) from a host computer. The transmission must be half duplex, ASCII. The carousel control ignores "line feeds" and "nulls" in order to be compatible with most half duplex protocols. The number of data bits per character, stop bits, parity, and baud rate is configurable at the carousel control.

Communications are originated by the host. The carousel control will echo each character back to the host, followed by a carriage return. If the carousel control receives a character out of context or an invalid command, it will send back an ASCII question mark (?) followed by a carriage return. The host must handle lowercase alpha characters and strings in order to "interpret" data from the carousel control.

7.2.4.3 ASCII COMMANDS

FUNCTION	ASCII COMPUTER KEYBOARD INPUT	CHARACTER STRING (HEX)
PAN LEVEL	a	61
PAN POSITION	b	62
QUANTITY	c	63
PART NUMBER	d	64
CLEAR	e	65
STORE*	f	66
RECALL	g	67
MESSAGE**	h	68
MEMORY**	i	69
JOG INCREMENTAL VALUE	j	6A
ON	k	6B
GET CURRENT LOCATION	l	6C
OPEN DOOR	m	6D
CLOSE DOOR	n	6E
SET	o	6F
INCREMENTAL DOWN	p	70
INCREMENTAL UP	q	71
STOP	r	72
GO	s	73
SEND STATUS	t	74
GET RS232 BUFFER	u	75
GET WINDOW BUFFER	v	76
WINDOW	w	77
START TRANSACTION	x	78
END TRANSACTION***	y	79
INITIALIZE PORT****	z	7A
CFILE MONITOR MODE	mj	

- * Store in the "MESSAGE DATABASE".
- ** This function requests a memory dump of the specified database.
- *** 'y' input allows transfer from host to local control mode.
- **** 'z' forces the RS-232 port to a known condition by doing the following:
clearing port, changing to a normal operate or pick mode, clearing
buffers, preparing the buffer area, defining window 0 as the default
value.

7.2.4.4 SEND STATUS

The host can request a Status message. The message will contain a string of 23 characters: "zeros" for NO, or "ones" for YES. The status can be determined from the following sequence.

STATUS MESSAGE SEQUENCE	
1: UNIT READY	13: NOT USED
2: PORT LOCK OUT	14: FINAL DESTINATION DISPLAYED
3: SAFETY STOP OCCURRED	15: WINDOW AT REAR OF MACHINE
4: RS232 PORT "ON"	16: FRONT DOOR OPEN
5: CONTROL SET TO "HOST MODE"	17: REAR DOOR OPEN
6: PICK MODE ENABLED	18: FRONT DOOR TRANSACTION IN PROGRESS
7: NOT USED	19: REAR DOOR TRANSACTION IN PROGRESS
8: MACHINE RUNNING	20: FRONT DOOR LIGHT BEAM ACTIVATED
9: TASK IN PROGRESS	21: REAR DOOR LIGHT BEAM ACTIVATED
10: MEM DBASE SORT	22: FRONT DOOR TOUCH BAR ACTIVATED
11: NOT USED	23: REAR DOOR TOUCH BAR ACTIVATED
12: MSG DBASE SORT	\$4: END OF MESSAGE

NOTE: Status characters 10 through 23 represent status at the default window. If you need status of an auxiliary window you must first send ('w and 1, 2, or 3), then request status ('t).

7.2.4.5 ENTERING COMMANDS FOR HOST DIRECTED PICKS

1. Enter SEND STATUS ('t) command. If status message indicates that the port is OFF, enter an ON ('k) command before the GO command.
2. Enter INITIALIZE PORT ('z) command to send all picks to main window "0".
3. Enter WINDOW ('w and 1, 2, or 3) command if required.
4. Enter PAN LEVEL ('a and up to three numeric characters) command.
5. Enter PAN POSITION ('b and up to two numeric characters) command if required.
6. Enter GO ('s) command.

7.2.4.6 ENTERING COMMANDS FOR MESSAGE DATABASE PICKS

1. Enter INITIALIZE PORT ('z) command to send all picks to main window "0".
2. Enter WINDOW ('w and 1, 2, or 3) command if required.

3. Enter PAN LEVEL ('a and up to three numeric characters) command.
4. Enter PAN POSITION ('b and up to two numeric characters) command if required.
5. Enter STORE ('f) command.

7.2.4.7 ENTERING JOG COMMANDS

The host can jog the machine an incremental amount by sending a ('p) for jog down and a ('q) for jog up. The machine will move the distance defined in the jog incremental buffer. The quantity in the jog incremental buffer can be changed using the following procedure:

Enter QUANTITY ('c and up to four numeric characters) command.

Enter JOG INCREMENTAL VALUE ('j) to store input in the jog incremental buffer

7.2.4.8 RETRIEVING INFORMATION

The MEMORY ('i) command requests the information in the message database. The control responds as follows:

An 'A followed by a carriage return, is transmitted to the host. This indicates that the database for the window is an AMK type.

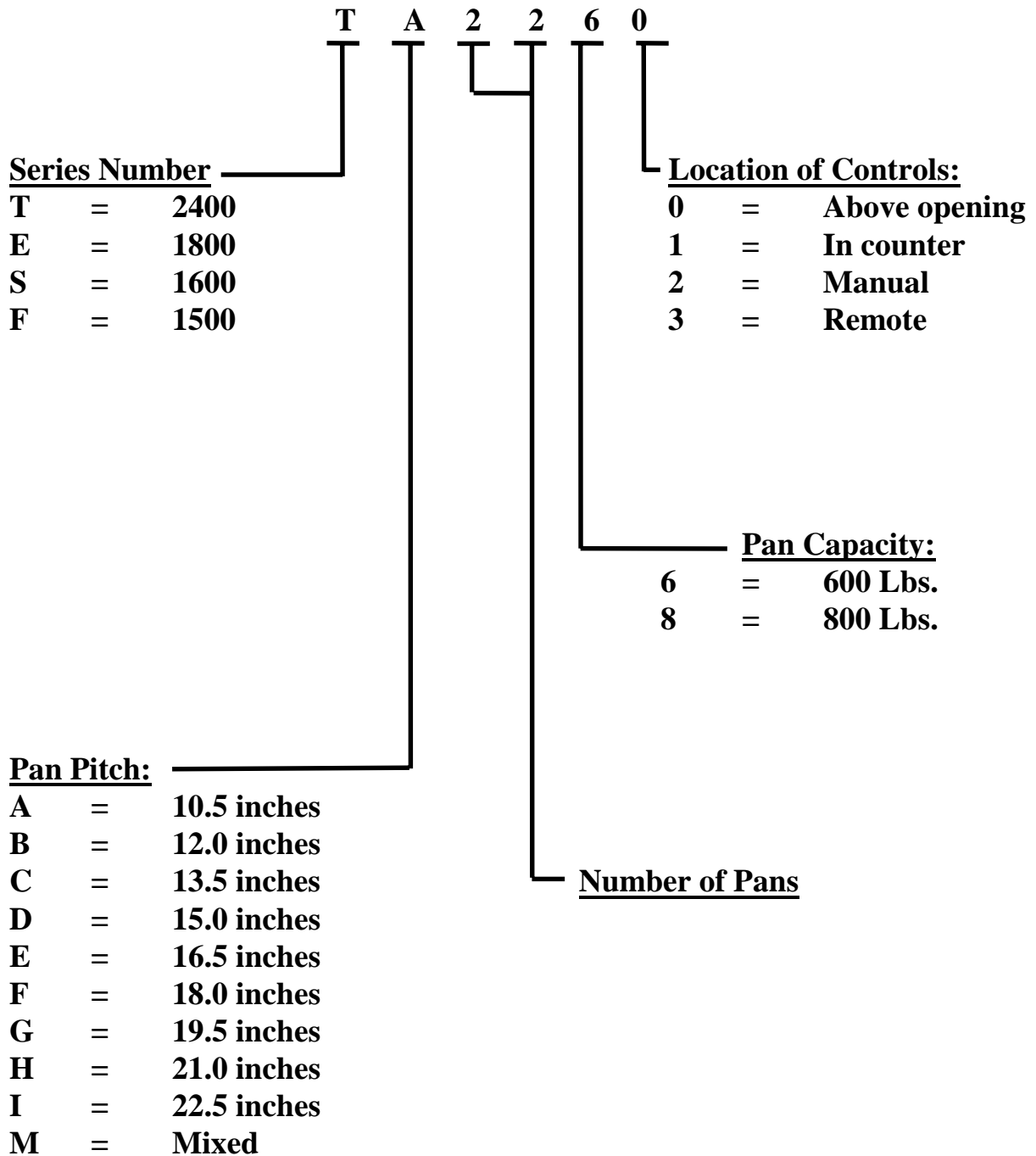
Then the requested database is transmitted to the host. A seven-character field, followed by carriage return, is transmitted for each item in the database. The first three characters are the pan level, the fourth character is a space, the fifth and sixth characters are the pan position, and the last character is a space.

The transmission is then terminated with a character \$4 (EOT) followed by a carriage return.

The GET RS232 BUFFER ('u) command and the GET WINDOW BUFFER ('v) commands request the information in the RS232 buffer and the window buffer respectively. The control responds with a 24-character field followed by a carriage return. Then the transmission is terminated with a character \$4 (EOT) followed by a carriage return. The first three characters are the pan level, the fourth character is a space, the fifth and sixth characters are the pan position, the seventh character is a space, and the last twelve characters are the part numbers.

8. APPENDIX

8.1 MODEL NUMBER



8.2 WARRANTY

White Systems warrants that the system and equipment manufactured by White, when used for ordinary purposes for which such equipment is designed, shall be free of defects in workmanship and material for a period of one (1) year from the date of shipment, based on a one shift per day operation. During the warranty period and upon proof of claim by Customer, White will replace F.O.B. White factory, or repair, excluding installation, any part proving defective in material or workmanship, subject to the following conditions: (a) Customer shall return defective equipment and components to White upon request. (b) This warranty applies only to system equipment properly used and maintained and does not apply to any equipment which has been subjected to misuse, neglect or accident, or which has been installed, operated, repaired, altered or modified other than in accordance with instructions or written authorization by White. (c) This warranty does not apply to any equipment, control components or software not manufactured by White, and Customer's sole warranty with respect to such items shall be that of the manufacturer, if any.

Customer's remedies and White's obligations in connection with any claim made under this warranty shall be limited to repair or, at White's option, replacement of the equipment or part thereof which is found to be defective. Labor performed at the worksite with regard to such claims is not included in this warranty. Customer shall be responsible for the normal maintenance and repair of the Equipment and shall perform the same in accordance with generally accepted maintenance procedures or such other procedures as are set forth in maintenance and repair manuals provided by White to Customer. White shall not be responsible for and shall not be obligated to pay or to reimburse Customer for (a) any materials furnished by third parties for use in connection with the Equipment if the same was undertaken or furnished without mutual prior written consent or (c) any loss of damage arising from improper operation or maintenance of the equipment or from ordinary wear and tear.

White Systems, Inc.
30 Boright Avenue
Kenilworth, New Jersey 07033

8.3 RETURNED GOODS

White Systems Inc. policy requires a Return Authorization Number or "RAN" for all goods returned. This Return Authorization Number **MUST** be prominently displayed on the outside of **ALL** packages returned, on all related paperwork, and referenced in any telephone conversations with WHITE personnel. Packages which do not display the Return Authorization Number will be refused by WHITE and returned to sender.

TO OBTAIN A RETURN AUTHORIZATION NUMBER:

WHITE Customer One Protection personnel will assign the Return Authorization Number during the normal work week, Monday through Friday, between the hours of 8:30 a.m. and 5:00 p.m. (Eastern Standard Time) at : **800-571-8822**.

THE FOLLOWING INFORMATION MUST BE PROVIDED TO OBTAIN THE RETURN AUTHORIZATION NUMBER:

- Name of caller and contact telephone number
- Ship to and Bill to information - contact person
- Customer Purchase Order number
- Part description of malfunction
- Complete description of malfunction
- Detailed return reason
- Part application, i.e., required for carousel
- Serial number of system and individual components

COMPONENTS COVERED UNDER A MAINTENANCE AGREEMENT:

White Systems, Inc. will ship a replacement for any defective component covered under warranty or Maintenance Agreement. The caller, after providing the above listed information, will be instructed to return the defective component(s) to WHITE. Upon receipt of the component, a full credit will be issued subject to the note below. The customer Purchase Order is issued to cover replacement cost only in the event the defective component is not returned.

NOTE: All repairs necessary to restore the component to its original appearance, i.e., remove paint, decals, repair scratches or dents, customer alterations, including but not limited to replacement of components are not covered under warranty. Customer will be billed for such restorative repairs at the prevailing rates.¹

COMPONENTS UNDER WARRANTY:

White Systems, Inc. will repair or replace, if necessary, and ship within ten (10) working days of receipt of defective goods. WHITE will repair the component(s) to a functional state. No aesthetic repairs will take place unless specified by the customer.

WHITE will absorb surface shipping charges on warranty replacement and repaired parts shipped by WHITE. The customer is responsible for any expedited shipping charges, as well as the freight on the return of the defective component.

¹ Irreparable components will not be replaced without prior customer approval.

8.4 RECOMMENDED SPARE PARTS

Mechanical Components

Part No.	Description	Qty
76000PT	Door Cable Assemblies	2
76047PT	Latch, w/Lock & Handle	1
76046PT	Nut - Actuator Lock	1

Trunnion Arm Assemblies

70750PT	Model 2400 Arm (without roller)	4
70751PT	Model 2400 Arm Assembly	4
78200PT	Model 1800, 1600, 1500 (without stabilizing roller)	4
78201PT	Model 1800, 1600, 1500 Arm Assembly	4
70332PT	Roller Solid 1.75" Dia.	2
76071PT	Washer Nylon	2
00132PT	Washer 7/16"	2
02358PT	Retaining Ring	2
70161PT	Roller 2" Dia.	2
02356PT	Retaining Ring	2
00133MPT	Washer	2
70071PT	Bearing, Flanged, Top Sprocket	1

Curved Track

722601PT	Model 2400 +	1
78141PT	Model 1800, 1600, 1500 +	1

Drive Components

41648	Encoder, 12 pulse, 19mm Bore	1
41955	Gear Motor with Brake, 3HP	1
37686	Gear Motor with Brake, 5HP	1

Control System

Part No.	Description	Qty
38488	Photo Eye Receiver 52266 (Banner)	2
38489	Photo Eye Receiver 52267 (Banner)	2
7870	Reference Sensor (A-B)	1
38490	Photo Eye Emitter 37989 (Banner)	2
40960	Cable Assembly J-Block 50 ft	1
40960	Multiport Hirschmann Block (Hirschmann)	1
40807	Overlay with Membrane Keypad	1
40808	Display, LCD 4x20	1
38920	Cable Assy, 18"	1
41644	Piezo Panel, Tone Alarm	1
39637	Peripheral, Bus 4 Serial	1
20394	Relay, 4PDT, 12VDC	1
30527	Fuse, Buss LP-CC-30, 30A, 600V	5
54253	Fuse, Time Delay, 10A, FNQ-10	5
38258	Board Computer, 4K, E2P, 256K RAM	1
38259	Opto Isolated, 8 Input, 8 Relay	1
39322	Board, Encoder, Interface, A2B2	1
40695	Power Supply, +5V, +12V, 60 Watt	1
40806	Carousel Interface Assembly	1
40894	Cable, Encoder to SBC-332	1
40918	Cable, SBC-332 to DC Power Supply	1
40919	Cable, Ref Sensor to SBC-332	1
40965	Cable Assembly, 50 ft (Hirschmann)	1
54257	Fuse, Time Delay, 20A, FNQ-20	5
40692	Disconnect Switch, 32A, 3 Pole	1
41317	Contact, 12V, 100-C30ZQ10 (A-B)	1
40694	Drive, 3HP, 230V AC, Semipower	1
41460	Drive, 5HP, 230V AC, Semipower	1
42406	Light Curtain Emitter	1
42407	Light Curtain Receiver	1
42408	Light Curtain Control Box	1