HILMOT

A TREW Company

INCLINE / DECLINE
BELTED INTERMEDIATE SECTION - 1500 SERIES

INSTALLATION & MAINTENANCE MANUAL

11925 W Carmen Ave Milwaukee, WI 53225 **www.hilmot.com**

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SAFETY INSTRUCTIONS

This section is intended to help you operate the equipment safely and productively.

⚠ WARNING

You must read and understand these precautions completely before operating, setting up, running, or performing maintenance on the equipment. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

These safety precautions are to be used as a guide to supplement the following:

1. All other information pertaining to the equipment.
2. Local safety codes.
3. Plant and shop safety rules and codes.
4. Federal and state safety laws, regulations and codes.

Note: Emphasis is placed on the latest edition of the Occupational Safety and Health Standards, which is available from the Department of Labor, Washington, D.C. These standards (found in Part 1910, Title 29 of the Code of Federal Regulations) contain the current, general industry occupational safety and health regulations set forth by federal legislation. Also, some of the information contained in this section has been reprinted from ASME, B20.1--2000 by permission of The American Society of Mechanical Engineers. All rights reserved.

Installation Safety Precautions

The success of any safety program depends primarily on the attitudes and training of the maintenance and operating personnel. The very nature of their work makes it necessary that they develop a complete and firsthand knowledge of each piece of equipment that is within their care. This familiarity enables them to recognize the hazards resulting from improper usage.

Guards and Guarding

Where necessary for the protection of personnel from hazards, all exposed moving machinery parts that present a hazard to employees at work stations or operator's stations shall be mechanically or electrically guarded, or guarded by location or position.

Interfacing of Equipment -- When two or more pieces of equipment are interfaced, special attention shall be given to the interfaced area to insure the presence of adequate guarding and safety devices.

Guarding Exceptions -- Wherever conditions prevail that would require guarding under these standards, but such guarding would render the conveyor unusable, prominent warning means such as signs or warning lights shall be provided in the area or on the equipment in lieu of guarding.

Guarded by Location or Position -- Remoteness from frequent presence of public or employed personnel shall constitute guarding by location. Overhead conveyors, such as trolley conveyors and hanger suspended tray conveyors, for which guarding would render the conveyor unusable or would be impracticable, shall have prominent and legible warnings posted in the area or on the equipment, and, where feasible, lines shall be painted on the floor delineating the danger area.

When a conveyor passes over a walkway, roadway, or work station, it is considered guarded by location if all moving parts are at least 8 ft. (2.00 m) above the floor or walking surface or are otherwise located so that the employee cannot inadvertently come in contact with hazardous moving parts. Although overhead conveyors may be guarded by location, spill guard, pan guards, or equivalent shall be provided if the product may fall off the conveyor for any reason and endanger personnel.

Headroom

When conveyors are installed above exit passageways, aisles, or corridors, there shall be provided a minimum clearance of 6 ft. 8 in. (2.00 m) measured vertically from the floor or walking surface to the lowest part of the conveyor or guards. Where system function will

be impaired by providing the minimum clearance of 6 ft. 8 in. (2.00m) through an emergency exit, alternate passageways shall be provided. It is permissible to allow passage under conveyors with less than 6 ft. 8 in. (2.00m) clearance from the floor for other than emergency exits if a suitable warning indicates low headroom.

Controls

All electrical installations and wiring shall conform to the National Electrical Code (Article 670 or other applicable articles) as published by the National Fire Protection Association and as approved by the American National Standards Institute, Inc.

Control Stations

Control stations should be so arranged and located that the operation of the affected equipment is visible from them. Control stations shall be clearly marked or labeled to indicate the function controlled.

A conveyor which would cause injury when started shall not be started until employees in the area are alerted by a signal or by a designated person that the conveyor is about to start. When a conveyor that would cause injury when started and is automatically controlled or must be controlled from a remote location, an audible device shall be provided which can be clearly heard at all points along the conveyor where personnel may be present. The audible warning shall be actuated by the controller device starting the conveyor and shall continue for a required period of time before the conveyor starts. A flashing light or similar visual warning may be used in conjunction with, or in place of, the audible device if a visual warning is more effective. Where system function would be seriously hindered or adversely affected by the required time delay, or where the intent of the warning may be misinterpreted (i.e., a work area with many different conveyors and allied devices), a clear, concise, and legible warning sign shall be provided. The warning shall indicate that conveyors and allied equipment may be started at any time, that danger exists, and that personnel must keep clear. These warning signs shall be provided along the conveyor at areas not guarded by position or location.

Remotely and automatically controlled conveyors, and conveyors where operator stations are not manned or are beyond voice or visual contact from drive areas, loading areas, transfer points, and other potentially hazardous locations on the conveyor path not guarded by location, position, or guards, shall be furnished with emergency stop buttons, pull cords, limit switches, or similar emergency stop devices. All such emergency stop devices shall be easily identifiable in the immediate vicinity of such locations unless guarded by location, position, or guards. Where the design, function, and operation of such conveyor clearly is not hazardous to personnel, and emergency stop device is not required. The emergency stop device shall act directly on the control of the conveyor concerned and

shall not depend on the stopping of any other equipment. The emergency stop devices shall be installed so that they cannot be overridden from other locations.

Inactive and unused actuators, controllers, and wiring should be removed from control stations and panel boards, together with obsolete diagrams, indicators, control labels, and other material which may confuse the operator.

Safety Devices

All safety devices, including wiring of electrical safety devices, shall be arranged to operate such that a power failure or failure of the device itself will not result in a hazardous condition.

Emergency Stops and Restarts -- Conveyor controls shall be so arranged that, in case of emergency stop, manual reset or start at the location where the emergency stop was initiated, shall be required of the conveyor(s) and associated equipment to resume operation.

Before restarting a conveyor which has been stopped because of an emergency, an inspection of the conveyor shall be made and the cause of the stoppage determined. The starting device shall be locked or tagged out before any attempt is made to remove the cause of the stoppage, unless operation is necessary to determine the cause or to safely remove the stoppage. Refer to ANSI Z244.1--1982, American National Standard for Personnel Protection -- Lockout/Tagout of Energy Sources -- Minimum Safety Requirements, and OSHA Standard 29 CFR 1910.147, “The Control of Hazardous Energy (Lockout/Tagout).”

Operation Safety Precautions

Only a trained person shall be permitted to operate a conveyor. Training shall include instruction in operation under normal conditions and emergency situations.

Where safety is dependent upon stopping devices or starting devices or both, they shall be kept free of obstructions to permit ready access.

The area around loading and unloading points shall be kept clear of obstructions that could endanger personnel.

No person shall ride on a conveyor under any circumstances unless that person is specifically authorized by the owner or employer to do so. Under those circumstances, such employee shall only ride a conveyor which incorporates within its supporting structure, platforms or control stations specifically designed for carrying personnel.

Personnel working on or near a conveyor shall be instructed as to the location and operation of pertinent stopping devices.

A conveyor shall be used to transport only material it is designed to handle safely.

Under no circumstances shall the safety characteristics of the conveyor be altered if such alterations would endanger personnel.

Routine inspections and preventive and corrective maintenance programs shall be conducted to insure that all guards and safety features and devices are retained and function properly.

Personnel should be alerted to the potential hazard of entanglement in conveyors caused by items such as long hair, loose clothing, and jewelry.

Conveyors shall not be maintained or serviced while in operation unless proper maintenance or service requires the conveyor to be in motion. In which case, personnel shall be made aware of the hazards and how the task may be safely accomplished.

Maintenance Safety

Maintenance and service shall be performed only by qualified and trained personnel.

It is Important to establish a maintenance program to ensure that all conveyor components are maintained in a condition which does not constitute a hazard to personnel.

When a conveyor is stopped for maintenance or service, starting devices or powered accessories shall be locked or tagged out in accordance with a formalized procedure designed to protect all person or groups involved with the conveyor against an unexpected start. Personnel should be alerted to the hazard of stored energy, which may exist after the power source is locked out. Refer to ANSI Z244.1--1982, American National Standard for Personnel Protection -- Lockout/Tagout of Energy Sources -- Minimum Safety Requirements, and OSHA Standard 29 CFR 1910.147, “The Control of Hazardous Energy (Lockout/Tagout).”

Replace all safety devices and guards before starting equipment for normal operation.

Conveyors shall not be lubricated while in operation unless it is impractical to shut them down for lubrication. Only trained and qualified personnel who are aware of the hazards of the conveyor in motion shall be allowed to lubricate a conveyor that is operating.

Guards and safety devices shall be maintained in a serviceable and operational condition. Warning signs shall be maintained in a legible and operational condition. Examples of warning signs are shown later in this section.

It is the responsibility of the owner/user to add any additional protective components that may be needed whenever changes or variations are made to any of the equipment components or operational characteristics.

Lockout / Tagout Procedure

Effective January 8, 1990, O.S.H.A. has designated the need for a 'positive, lockable' means to remove all energy sources from equipment prior to service or maintenance. The electrical power to your equipment can be locked out at the main disconnect switch, which is normally located on the electrical cabinet. When this is done, residual energy remains for some time in the capacitors associated with the electrical system. This residual energy is automatically depleted by features built into the equipment. After locking out the main disconnect switch, wait at least 60 seconds before beginning any maintenance procedures. This allows the residual energy to diminish. (If an equipment--mounted plate indicates that you should wait longer than 60 seconds, wait the recommended period of time before beginning any maintenance work.)

Whenever you need to perform maintenance on the equipment, or whenever you need to shut it down for any other reason, a lockout procedure must be followed. Your employer is required by O.S.H.A. to develop a written lockout/tagout procedure for this equipment. The following items should be considered in developing this procedure.

1. Notify everyone who normally operates, sets up, or performs maintenance on the equipment that it will be shut down.

2. Turn off all electric motors.

3. Turn off the main electrical disconnect switch.

4. Lock the main disconnect switch in the 'Off' position, and place a tag on the switch to indicate that work is being performed on the equipment.

5. If there is any auxiliary equipment associated with the equipment, make sure the main electrical disconnect switch is also turned off for each piece of auxiliary equipment. Then lock each disconnect switch in the 'Off' position, and tag each switch to indicate that work is being performed on the equipment.

6 Lock the air supply valves to make sure no air can be supplied to the equipment.

7 Verify that no sources of residual energy (capacitors, suspended equipment components, etc.) are present on the equipment or any piece of auxiliary equipment. If any such energy sources are located, make sure they are neutralized. If necessary, manually discharge air pressure and capacitor voltage from charged components. Also, block all suspended or spring loaded mechanical parts to prevent movement.

8 Verify that electrical power has been disconnected from the equipment, and from any auxiliary equipment, by trying to energize the equipment and any auxiliaries with the appropriate control switches. If any piece of equipment is found to be operational, locate the electrical circuit(s) supplying the power, and disconnect all such power sources. Then lock and tag these power sources.

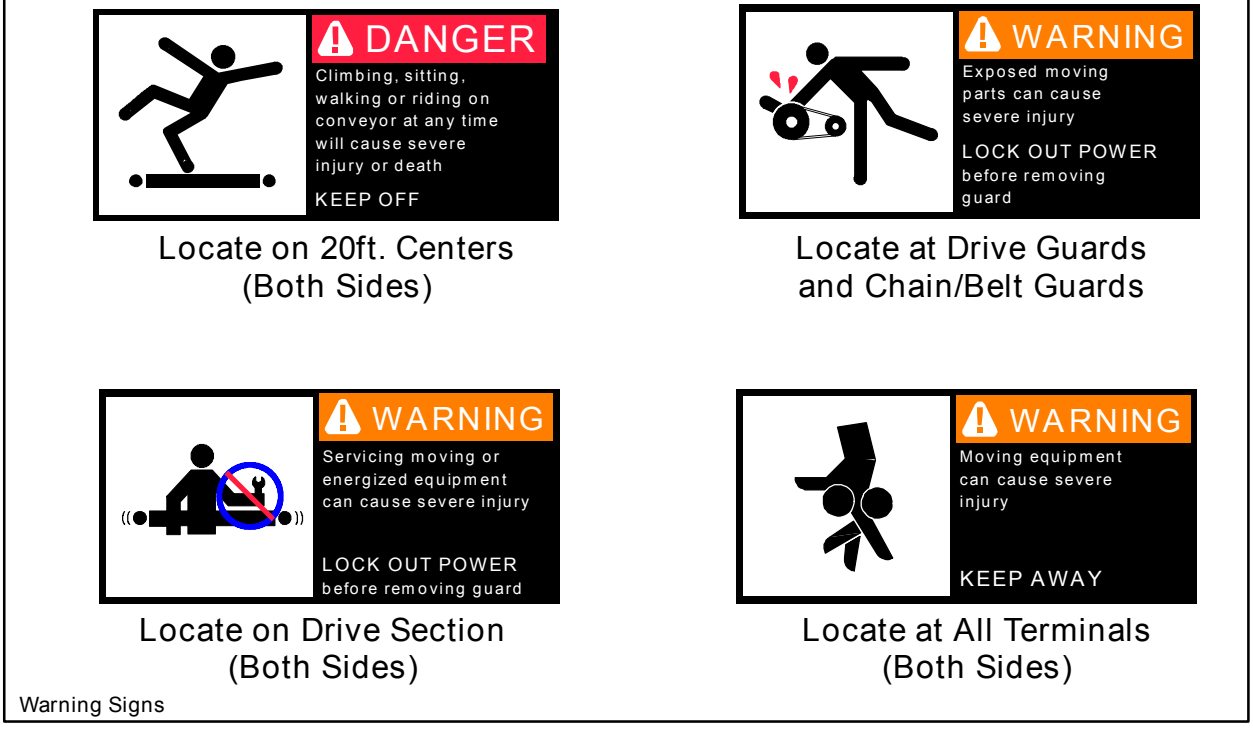
9 Make sure the air system pressure is 0 PSI.

10 Before you begin any work on the equipment or any auxiliary equipment, make sure that at least 60 seconds has elapsed since you turned off the main disconnect switch in step ‘ 3.’ (If an equipment--mounted plate indicates that you should wait longer than 60 seconds, wait the recommended period of time before beginning any maintenance work.)

11 Verify that any equipment which may have been added, and which is not covered by steps ‘1. ’ -- ‘10. ’ above, is considered for the lockout/tagout procedure.

12 After you have completed your work on the equipment,make sure all guards, gates and other safety related devices are in place and functioning properly.

13 When the equipment is completely ready to resume operation, remove your lock and tag from the main electrical disconnect switch. If someone else has placed a lock and/or tag on the main disconnect, do not remove the additional lock or tag. If there is no other lock or tag on the main disconnect, turn on the main disconnect switch and the electric motors, then perform the daily safety checks.

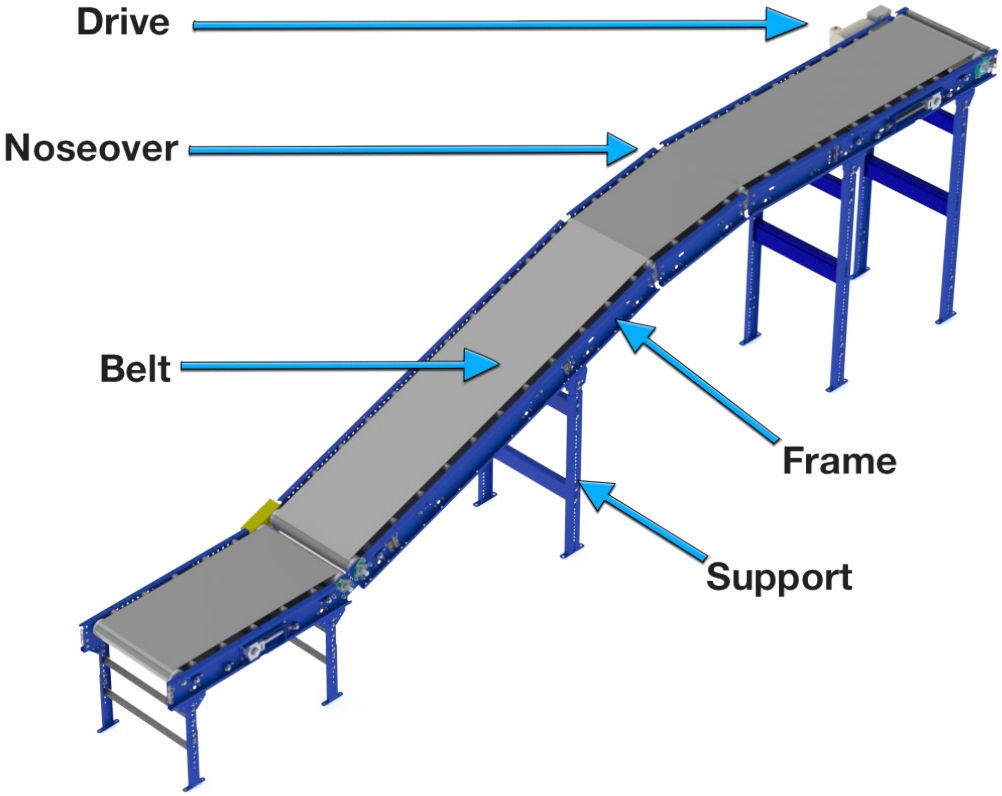


Warning Signs

Safety Signs

In an effort to reduce the possibility of injury to personnel working around conveying equipment, warning signs are placed at various points on the equipment to alert them of potential dangers. Please check the equipment and note all warning signs. Make certain your personnel are alerted to and obey these warnings. The following illustration shows typical signs that are attached to this equipment.

GENERAL DESCRIPTION



⚠ WARNING

Do not touch the belt while it is motion. Keep clothing and jewelry away from the conveyor. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

The Belt Conveyor is used for conveying product from one location to another. It is powered by a motor/ reducer combination that rotates a pulley, which in turn drives the belt. The pulley and motor/reducer typically are located on the discharge end of the conveyor, or in the middle underside of the conveyor.

The belt either rides on rollers or on a smooth sheet of steel called a slider pan.

INSTALLATION

This section contains instructions for installing the equipment and preparing it for operation. It is essential that the equipment be properly installed, and subsequently maintained, in order to obtain maximum productivity.

⚠ WARNING

The installer must be qualified and must comply with all applicable codes, ordinances, specifications, and/or other governing data related to the installation of the equipment. Read the installation section of this manual and resolve any questions you may have before attempting to move or install the equipment. Obey all safety precautions. Failure to follow these instructions may result in serious personal injury and/or equipment damage.

Receiving & Inspection

During the process of unloading the material, it is important to:

1. Be sure that the quantity of items received matches the count listed on the Bill of Lading. Once the Bill of Lading has been signed, the liability of any shortage is on the receiver.

2. Inspect each item for damage to the product, especially if there is any damage to the crate or container. Any obvious shortage or damage should be noted on the Bill of Lading before it is accepted.

Damage to the product that cannot be detected upon the initial receiving inspection must be reported to the carrier within 24 hours of the receipt of the product in order to qualify for a damage claim against the delivering carrier. It is the responsibility of the recipient to file claims for shipping shortages or damage whenever the freight charges are borne by that recipient.

Please notify the distributor or contact your Hilmot customer service representative whenever shipment shortage or damage occurs so that support services can be provided as well as track carrier performance. In the event that the shipment is refused, it is imperative that the distributor or your customer service representative be contacted immediately for return authorization approval to avoid demurrage costs.

If you need further assistance, please visit our website at www.versaconveyor.com or call our Customer Service Department at (740) 490--0300 Monday through Friday 8:00 am to 5:00 pm EST.

Layout Requirements

Conveyor layout drawings are typically used to determine the conveyor location and elevation based on the building grid. Layout drawings should be referenced in the installation preparations to determine the conveyor layout area and to make sure there are no physical obstructions to the conveyor. Special consideration should be given to drives (motor/reducer combinations), which extend beyond the conveyor layout area.

In addition, measurements should be taken along the conveyor layout to ensure that the support adjustment falls within the conveyor elevation requirements.

Installation Notes

Your conveyor has been shipped in major sub--assemblies to simplify and accelerate the installation process. Typically, the conveyor sub--assemblies consist of the following components:

Intermediate sections, drive units, curves, spurs, supports, and accessories.

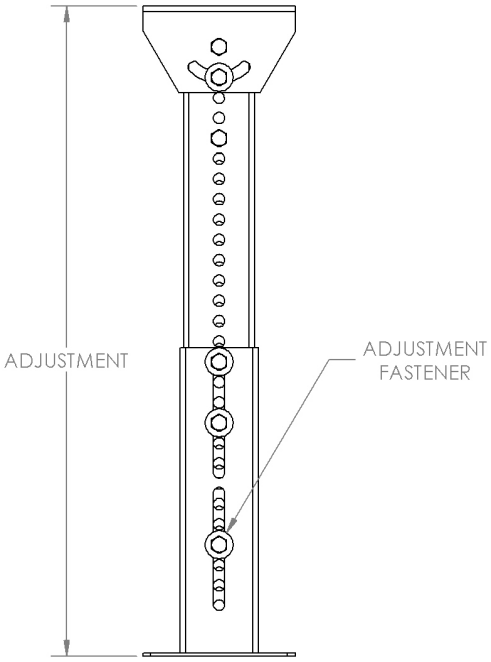
All installation should be done by a qualified installation specialist who understands conveyor and conveyor layout. Wiring and controls should always be the responsibility of experienced, licensed electricians. To ensure satisfactory performance, follow these instructions in the installation of every section of the conveyor:

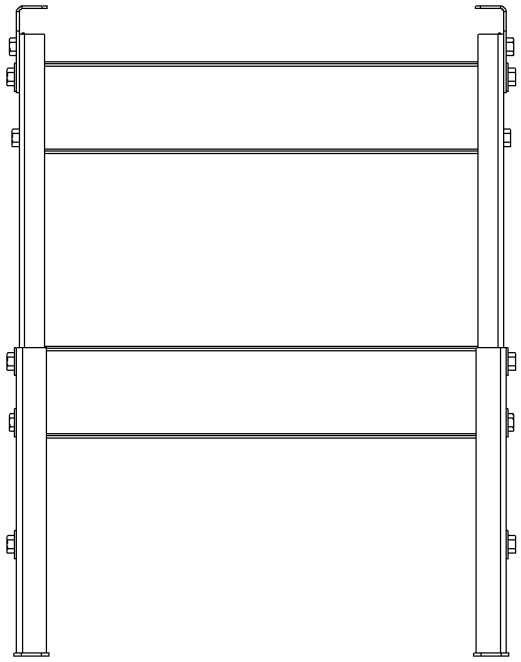
1. Mark a line on the floor to locate the centerline of the conveyor frame.
2. Preset frame supports to proper elevation, and attach the first frame section to its supports.
3. Position the conveyor according to the conveyor tag information provided. Each component is tagged with its respective identification and flow arrow.
4. Adjust the location of the conveyor using a plumb--bob to locate the center of the conveyor carrying surface relative to the centerline on the floor within a tolerance of (+/--)1/8".
5. Adjust the frame level within a tolerance of (+/--)1/16" for each conveyor section from the charge end to the discharge end.
6. Measure across both frame section diagonals to confirm that it is square within 1/16". (Refer to the squaring instructions in this section.)
7. Anchor section in place.
8. Add the next frame section, leaving a 1/8" gap at the bed joints for squaring. The gap provides clearance for adjusting and squaring the frame.
9. Check to make sure the section is square.
10. Adjust the frame level within a tolerance of (+/--)1/16" for each conveyor section from the charge end to the discharge end.
11. Anchor the section in place, attach an appropriate frame coupler, and repeat steps 8. through 11. for all additional sections.

Leveling

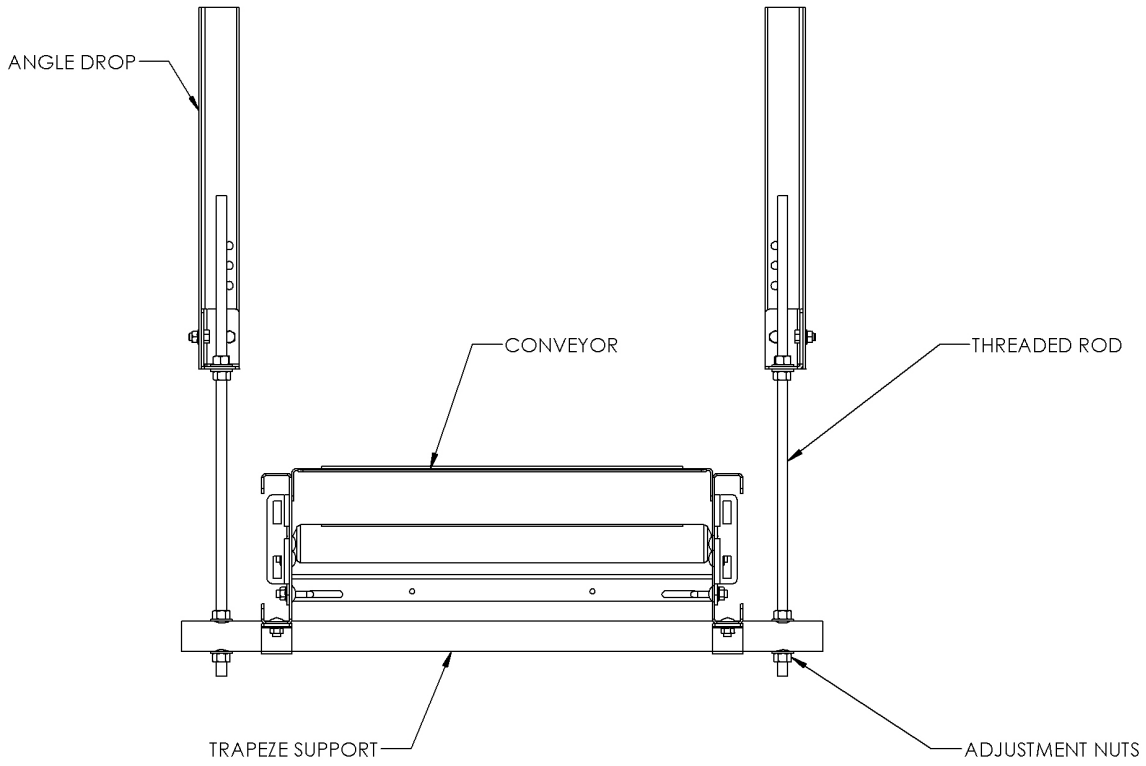
To level a conveying surface, a builder's level, laser level, transit, or other leveling device should be employed. Adjust the frame level within a tolerance of (+/--)1/16" for each conveyor section from the charge end to the discharge end.

All conveyors are typically shipped with adjustable support feet. These supports negate grouting and/or shimming to provide a level conveying surface. If the support feet are not adjustable, shimming or grouting may be necessary to ensure a level conveying surface.





If the conveyor is being suspended from overhead structures, adjust the conveyor using the adjustment nuts on the Hanger Crossmember Support Rod (rod is supplied by others) to achieve a level conveying surface.



⚠ WARNING

When installing ceiling hanger rods in an existing building, it is the owner's responsibility to confirm that the structure loading and connection method is approved to by the appropriate authority to support the conveyor components and intended loads for conveyed materials and humanlive load (where applicable). Also, all methods of attachment must comply with federal, state, and local building codes. Failure to follow these instructions may result in serious personal injery and/or equipment damage.

Squaring the Conveyor

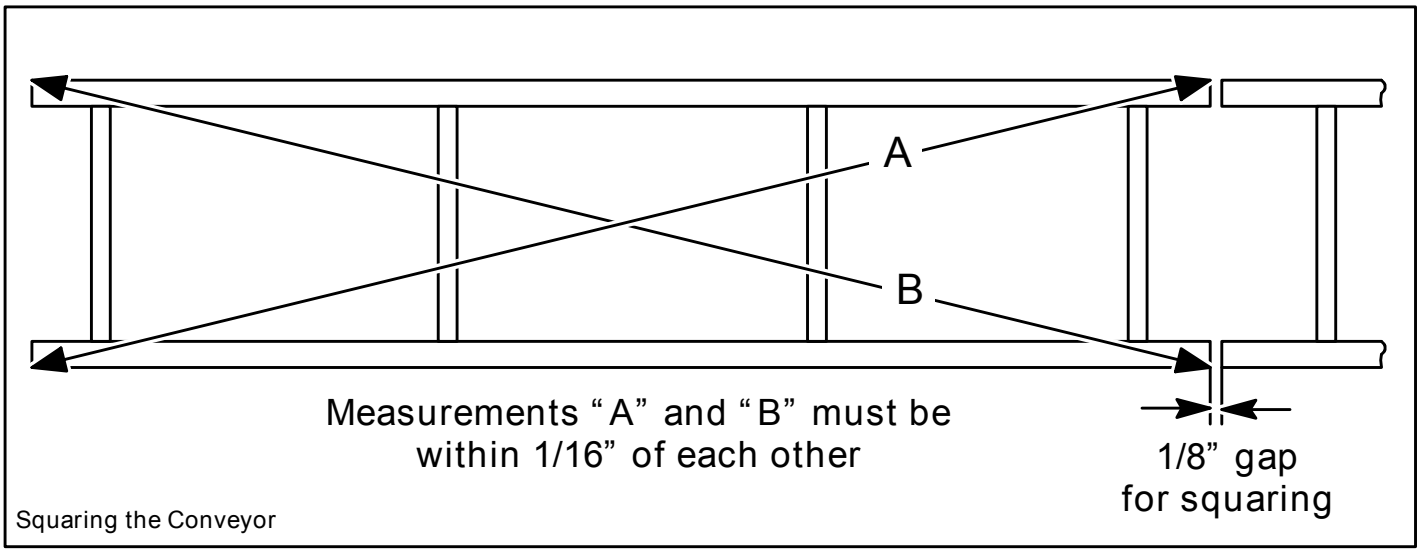
During shipment, sections will sometimes be knocked out of square. If this condition is not corrected before the section is installed in the conveyor line, operating problems can result. The procedure is the same for all types of conveyor. Be sure to check each section before installing.

1. Measure each section diagonally from corner to corner. These measurements should be within 1/16” of each other.

2. If the measurements are not within the tolerance, attach a suitable pulling device across the corners with the longest dimension.

3. Pull the corners until the measurements are within 1/16” of each other.

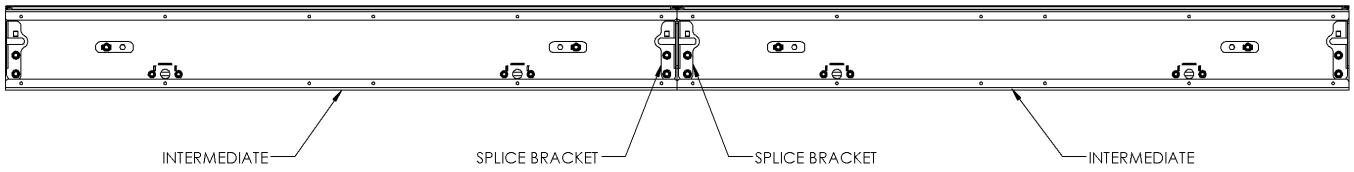
4. Remove the pulling device andmake sure the conveyor is still square. If not, repeat steps 1. -- 3. as necessary.



Squaring the Conveyor

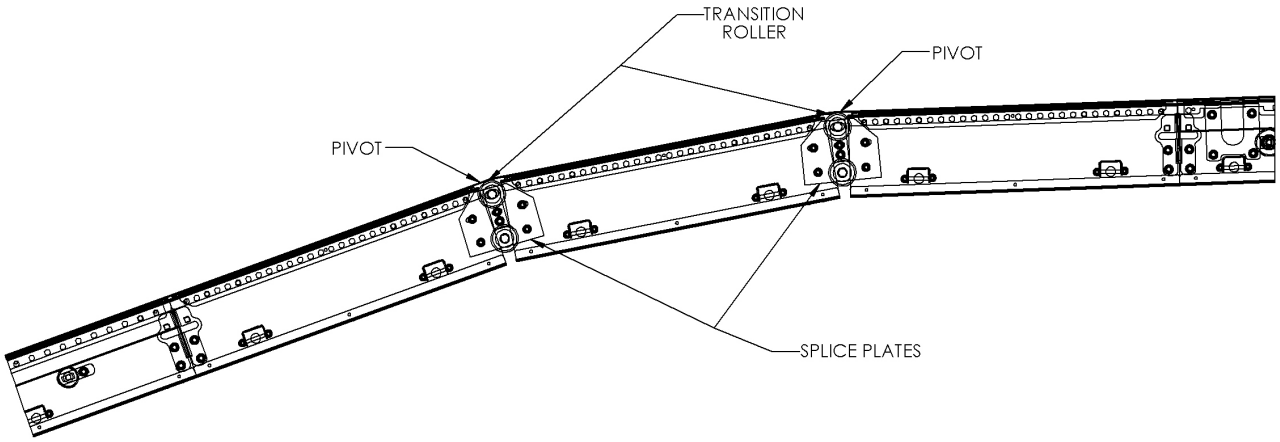
Frame Coupling

When the belt conveyor has been leveled and aligned to its final position, fasten the sections together using the couplers provided (see Belt Conveyor Couplings Illustration). The SpliceCoupler is used between Intermediate frames and atETI's. TheButtCoupler is used at ETT's and End Drives, as shown.



Noseover Installation

To achieve smooth transition of product over the noseover, the overall degree of incline or decline must be evenly divided between the pivot points that join the horizontal conveyor sections to the noseover sections. A gradual incline or decline is desired so the product ascends or descends without stopping or tumbling. This adjustment can be achieved by utilizing the four top fasteners on the unit. The slope per section of incline/decline should be no more than 18 degrees.



Conveyor Belt Installation

Conveyor Belt - *General*

For satisfactory conveying performance, the conveyor belt must run true and straight at all times. To accomplish this, the belt must be tracked to stay between the conveyor frames and maintain full contact with the pulleys and rollers of the unit. Typically, a new belt will require tracking adjustments during the break--in period. Tracking suggestions are listed later in this manual.

Conveyor Belt - *Tension*

Belt tension is controlled by screw type adjustments on the end pulleys (end drive) or the take--up pulley on center drive units. Be sure to adjust both sides evenly to insure proper tracking of the belt. Belt tension should be limited to the amount necessary for the drive to move the belt under full load. Too much tension on the belt may cause tracking problems, as well as considerable damage to the belt's fabric core, pulleys, bearings, and possibly the motor.

⚠ WARNING

Be sure to replace the drive guards after inspection or maintenance of the drive. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

Conveyor Belt -*Tracking*

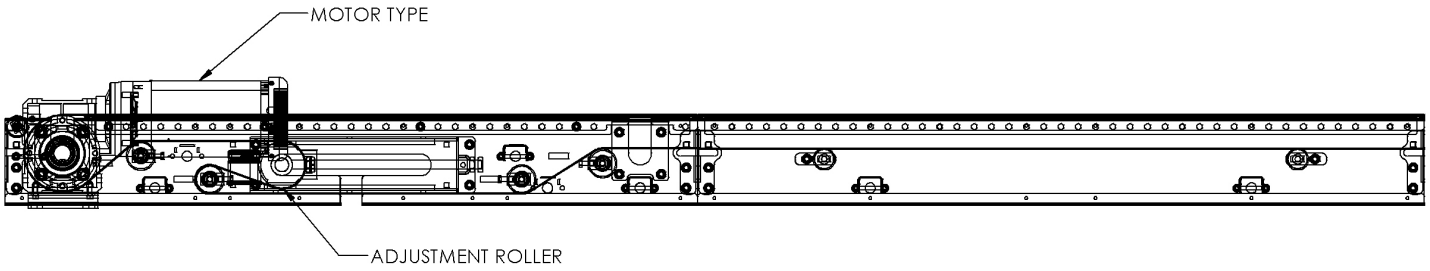
NOTE: A helpful guideline for belt tracking is that the belt always moves away from the side of the pulley where the most belt tension exists between the drive and tail pulleys (the high tension side).

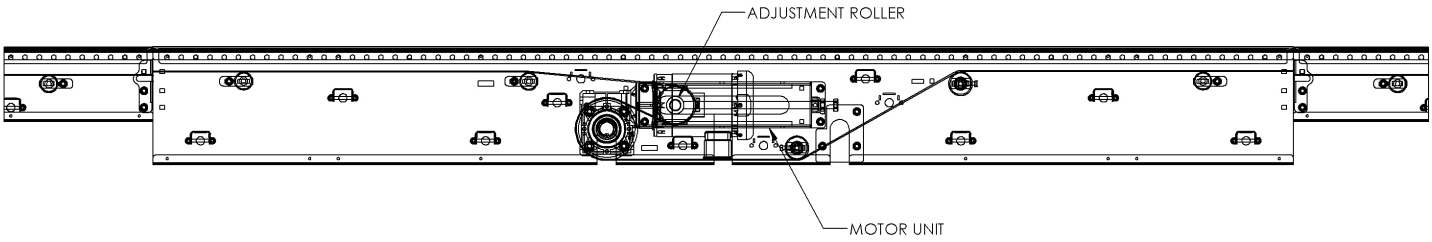
All pulleys, idlers, snub, and return rollers of the conveyor can be adjusted, as necessary, to align the shafts square with the frame. If any of these items are not square, the belt may never track properly. Begin the tracking process by following the steps listed below:

1. The conveyor frame must be installed square, level and plumb.
2. All pulleys, snub rollers & return rollers should be adjusted square with the frame.
3. Verify that the belt splice is square with the belt.
4. Run the conveyor belt in the intended direction.
5. Note any belt movement, especially the position of the belt as it travels around the pulleys.

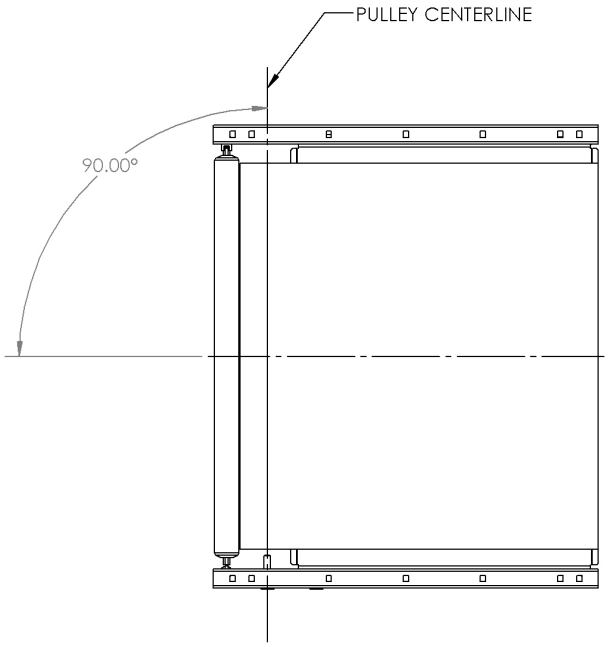
6 For end drive sections (see End Drive Illustration), adjust the return roller closest to the tail pulley. For center drive sections (see Center Drive Illustration), adjust the first roller the belt contacts. Make fractional adjustments to only one side of one pulley or roller at a time. Wait at least five belt revolutions after each adjustment to determine if the belt reacts properly. If the belt is riding to one side of a pulley or roller, adjust that side of the pulley or roller by fractionally decreasing the distance between the two pulleys (decreasing tension between belt and pulley or roller).

7 Repeat adjustments (step 6) until the belt is tracking on or near the center of the conveyor.

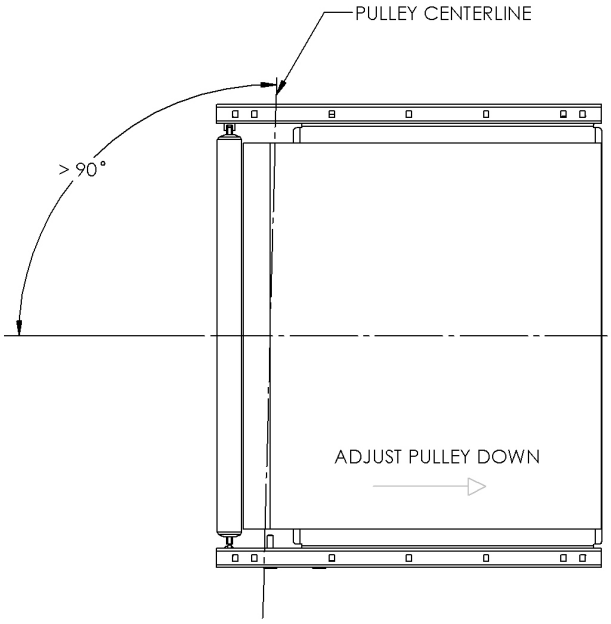




8 Check to make sure that the belt tension is adequate (see ConveyorBelt – Tension).



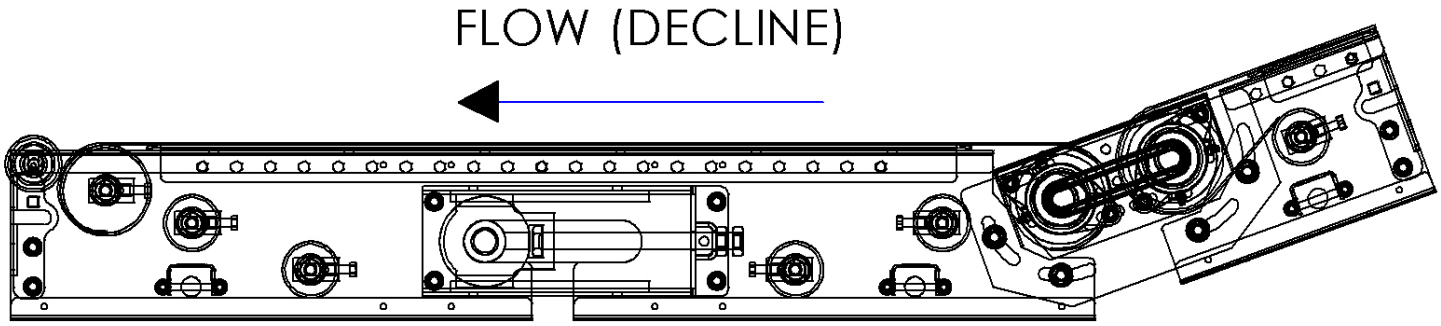
ALIGNED PULLEY



MISALIGNED PULLEY

Power Feeder Installation

The power feeder must be installed properly to attain smooth product flow. If the unit is being used as an Incline conveyor, the downstream pulley and the Power Feeder pulley must be in-line. If the unit is being used as a Decline conveyor, the upstream pulley must be elevated higher than the Power Feeder pulley, to allow a smooth transition onto the Power Feeder. Track the belt making small adjustments no greater than 1/8“ turn each.



Center Drive or Take--Up

Adjust the return roller that is nearest to the drive. An adjustment in the direction of belt travel will cause the belt to move away from the side adjusted. To track the belt exiting the unit, adjust the closest return roller after the belt leaves the drive unit.

Adjustment Intervals

There are no specific intervals between belt adjustments, but good preventive maintenance routines will generally uncover and correct belt problems before they cause belt damage.

Pop--Out Safety Rollers

Pop--Out Safety Rollers are idler rollers at the end of the End Terminal or End Drive modules. They are designed to serve as an idler gap roller for product to travel across when flowing. They also provide a safety feature for personnel and equipment. In the event something is trapped between the belt pulley and the pop--out safety roller, the roller will disengage itself from the bracket. Because of this, it is extremely important that there be no obstruction to prevent the roller from disengaging itself. This allows room for the object to be removed without damage to personnel or the equipment. Be sure to turn off and lockout the main disconnect before attempting to remove any trapped objects.

⚠ WARNING

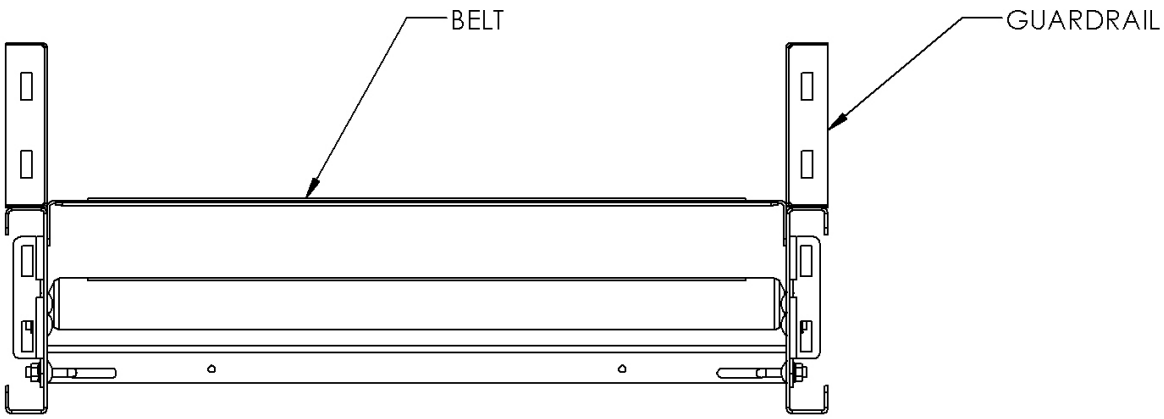
Before performing any maintenance or lubrication services, follow the lockout/tagout procedure in the Safety section to ensure that the equipment is safe to work on. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

Guard Rail

Guard rails must be installed to assure all conveyed products will stay on the conveyor. It is actually a safeguard device and must be carefully installed.

The rails are supported by a series of “L” shaped rail arm brackets and mounting brackets. (See Adjustable Guard Rail Picture)

Install the channel side guards to conform to the conveyor frame. Set the height by using a block of wood as a measuring gage. Be sure all lapp & joint offsets do not interfere with the product flow.



Conveyor Start-Up

Perform the following checks during conveyor start-up.

1. Make sure the unit has been properly installed according to the instructions in this section.
2. Make sure that no foreign objects were left inside or on the conveyor during installation.
3. Make sure all motors are rotating in the proper direction.
4. After starting, make sure all motors, reducers, and other moving parts are working properly.

⚠ WARNING

Do not attempt to set up, operate or perform maintenance on this equipment until you read, know and practice all of the safety instructions in this manual. Also, know and practice all safety rules set forth by your company. Failure to follow these instructions may result in serious personal injry and/or equipment damage.

Power Requirements

All electrical connections and wiring should be done by licensed, certified electricians who are familiar with local wiring and inspection codes.

Three phase and single phase motors and controls should be wired according to the wiring diagrams provided.

⚠ WARNING

Only qualified electricians should be allowed to connect or perform maintenance on the electrical system. All conveyor frames must be properly grounded per all applicable wiring code requirements. Failure to follow these instructions may result in serious personal injury and/or equipment damage.

Post Break-In Period

After approximately 40 hours of initial break-in, an inspection should be completed on all fasteners and set screws to confirm they are tightened properly. If loose fasteners or set screws are detected, they should be tightened at this time.

⚠ WARNING

Be sure to replace the guarding after inspection or maintenance of the drive belts. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

PREVENTATIVE MAINTENANCE

The satisfactory performance and reliability of this equipment is dependent upon a proficient preventive maintenance (PM) program with scheduled equipment inspections under normal operating conditions.

Accurate records of maintenance and repairs will help to identify problem areas and repetitive problem patterns. It is imperative that adequate records be kept in connection with the preventive maintenance program. These records should contain the date of inspection, inspection results, equipment services, repair history, part replacement history, and any other information that will help to make maintenance process more efficient and accurate. It is recommended that each conveyor have its own record. Properly kept, the conveyor record sheet will form a mechanical history of the equipment covered.

Preventive maintenance consists of regular service (lubrication, adjustments, cleaning, etc.). In addition, it consists of ”keeping your eyes, ears, and nose open.” Use your eyes to see potential component failure. Use your ears to listen for abnormal or louder than normal noises. Use your nose to smell a motor running abnormally warm in time to prevent its burnout. These sights, noises, and smells can be indicators of lack of lubrication, misalignment, or other potential trouble. Ignore them and you will be replacing a shaft, motor, or whatever does go out when a component is lacking proper preventive maintenance.

Only qualified maintenance specialists should maintain the mechanical, electrical and pneumatic portion of the conveyor.

⚠ WARNING

Before performing any maintenance or lubrication services, follow the lockout/tagout procedure in the Safety section to ensure that the equipment is safe to work on. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

Maintenance Precautions

⚠ WARNING

You must read and understand these precautions completely before operating, setting up, running, or performing maintenance on the equipment. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

1. When testing operating performance, do not start the equipment until all operations and maintenance personnel are notified and clear of the unit being tested.
2. Be certain that required safety guards are never removed without authorization.
3. Never run the equipment under production conditions without safety guards in place.
4. Do not make any equipment repairs, while the conveyor is running.
5. Keep hands, hair and clothing clear of any moving parts.
6. Never attempt to clear load jams, while equipment is running.
7. Always use appropriate tools when making repairs or adjustments.
8. Observe all warning labels and follow plant safety rules.
9. Make sure all connectors are secure and all wires are free from interference, obstruction, and any moving parts.

Cleaning and Inspection

Generally, there are many reasons for cleaning:

1. To allow heat to dissipate (motors and gearboxes).
2. To prevent wear on moving parts.
3. To prevent binding.
4. For proper operation.
5. Operating personnel will most likely treat clean equipment with more care.

Any prescribed cleaning schedule should be modified as experience is gained. A thorough inspection should be performed while cleaning problem areas.

The total value of inspection procedures is determined largely by the consistency and regularity of the schedule. A definite interval of inspection must be established and obeyed. This is usually easier to accomplish if a ”round robin” system of inspection is used. It is recommended that a general inspection that will ensure a thorough examination of each component and assembly contained in the system be done at least once for each thirty day period of operation. Results of these general inspections should be documented in the conveyor record of the unit inspected.

The probability of mechanical/electrical problems increase during periods of heavy usage, so an additional inspection immediately before and after a these periods is recommended.

Daily Inspection

Walk the entire length of conveyor system and observe the following:

1. With the conveyor running, listen for abnormal noises that could indicate:
    - Worn bearings in rollers, motors, reducers, etc.
    - O--Belt making contact due to misalignment or improper adjustment.
2. With the conveyor shut down, look for the following:
    - Strings or other foreign material wrapped around bearings, shafts, or rollers. Remove all foreign material immediately.
    - Shavings or belt dust under conveyor that would indicate misaligned or damaged components.
    - Oil leakage that would indicate faulty bearings or seals in rollers, motors, reducers, etc.
3. Check pneumatic regulators for proper setting and listen for air leaks.

Weekly Inspection

1. Visually inspect belts and rollers for wear, improper alignment, or buildup of foreign materials and repair/clean as required.
2. Visually inspect all motors.
3. Check pneumatic water traps and drain as required.
4. Inspect O--Belts for wear or damage. Repair or replace worn or damaged O--Belts.

Inspection Every 6 Months

1. Clean and lubricate all drive chains with SAE--10 to SAE--40 oil .
2. Check all set screws and tighten as necessary. These may work loose during normal operation.
3. Check all bolted connections and tighten as needed. Bolted connectors may work loose during normal operation.

Mechanical Components

Chains and Sprockets

Check the sprocket alignment periodically and correct any misalignment immediately. Wear on the inside of side bars, or on one side of a sprocket, is a definite indication of misalignment. Give reducers and gear motors (on indexing drives, or drives equipped with brakes) special attention to prevent drive sprocket mountings from becoming loose and shifting.

⚠ WARNING

Before performing any maintenance or lubrication services, follow the lockout/tagout procedure in the Safety section to ensure that the equipment is safe to work on. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

Normally, the drive section is shipped with the drive chain and guard installed. It is recommended that the chain guard be removed and the drive components checked for alignment and chain tension. Also check that all fasteners, keys and locking collars are in place and properly tightened.

It is a good practice to periodically clean and lubricate the chains. For correct chain tension, the deflection on the slack side should measure 2--3% of the sprocket center distance. Chains under too much tension are just as damaging to the conveyor as chains with too much slack.

⚠ WARNING

Be sure to replace the drive guarding after inspection or maintenance. Failure to follow this instruction may result in serious personal injury and/or equipment damage

Installing the Chain & Sprockets

Should it be necessary to install the sprockets and roller chain on the job site, use the following procedure.

1. Place the sprockets on the shafts with tooth side of the sprockets closest to the bearing.
2. Align the sprockets with a straightedge and tighten the set screws in the sprocket on the drive shaft, making sure the drive key is in the keyway.
3. Check the sprocket alignment with a straightedge again for accuracy and tighten the set screws in the sprocket on the reducer shaft, making sure the drive key is in the keyway.
4. Place the chain on the sprockets and attach the master link.
5. Adjust the motor/reducer mounting to insure proper chain tension.

Note: When aligning sprockets, make sure the ends of the chain pins and link plates do not contact any objects and that link plates do not rub on side of sprocket teeth. Either condition will cause premature wear and damage to the chain. Also, the key may need to be staked or peened carefully with a hammer in order to fit tightly in the keyway (see the Staking Diagram).

Replacing the Chain

⚠ WARNING

Before performing any maintenance or lubrication services, follow the lockout/tagout procedure in the Safety section to ensure that the equipment is safe to work on. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

1. Relieve the tension on the old chain by loosening the motor/reducer mounting bolts and jack screws.
2. Disconnect the master link and remove the old chain.
3. Check the sprockets for wear and alignment.
4. Place the new proper size chain on the sprockets and attach a new master link.
5. Adjust the motor/reducer mounting to insure proper chain tension.

Timing Belts and Pulleys

Check timing belt pulley alignment periodically and correct any misalignment immediately. Wear on one or both sides of belt are a definite indication of mis-alignment. Give reducers and gear motors (on indexing drives, or drives equipped with brakes) special attention to prevent drive pulley mountings from becoming loose and shifting.

Normally, the drive section is shipped with the drive belt and guard installed. It is recommended that the belt guard be removed and the drive components checked for alignment and belt tension. Also check that all fasteners, keys and locking collars are in place and properly tightened.

It is a good practice to periodically clean the belts and check belt tension. Belts that are too tight can be very harmful to the conveyor. For correct belt tension, the deflection on the slack side should measure 1/64” per inch of belt span(our standard length between pulley centers is about 20”, therefore the belt deflection with 4 lbs. of force is about 1/4”.

⚠ WARNING

Be sure to replace the drive guarding after inspection or maintenance. Failure to follow this instruction may result in serious personal injury and/or equipment damage

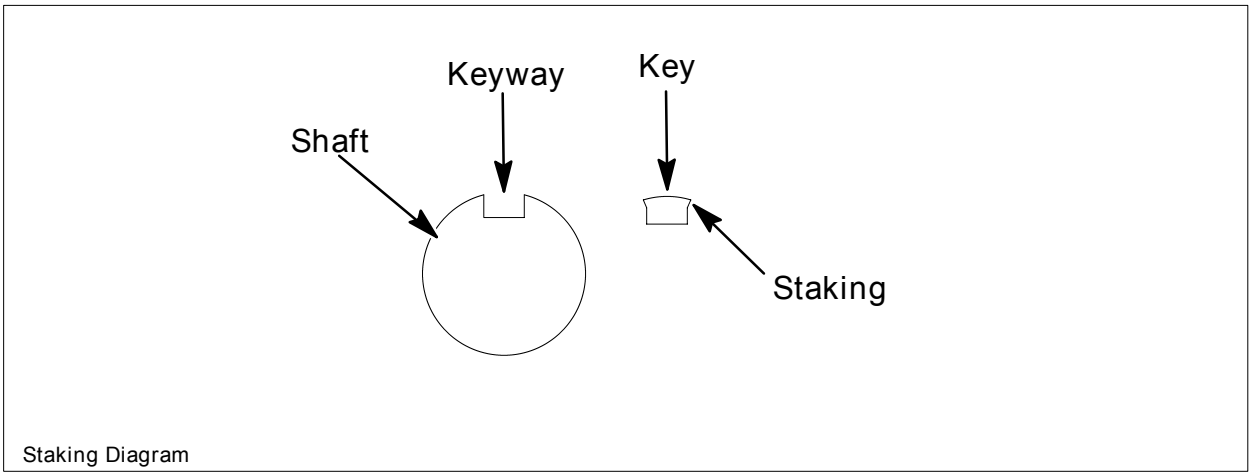
Should it be necessary to install the timing belt on the job site, use the following procedure.

1. Place the pulleys on the shafts with hub side of the pulleys away from the bearing.
2. Align the pulleys with a straightedge and tighten set screws in the pulley on the drive shaft, making sure the drive key is in the keyway.
3. Check the pulley alignment with a straightedge again for accuracy and tighten the set screws in the pulley on the reducer shaft, making sure the drive key is in the keyway.
4. Install the belt on the pulleys and seat the cogs in the pulleys.
5. Adjust the motor/reducer mounting to insure proper belt tension.

Note: When aligning pulleys, make sure the belt edges do not come in contact with the frame or any other structures that may cause rapid wear to the belt. Also, the key may need to be staked or peened carefully with a hammer in order to fit tightly in the keyway (see the Staking Diagram).

Timing Belt Replacement

1. Relieve tension on the old belt by loosening motor/reducer mounting bolts and jack screws.
2. Remove the old belt.
3. Check the pulley for wear and alignment.
4. Install the new proper size belt on the pulleys and seat the cogs in the pulleys.
5. Adjust the motor/reducer mounting to insure proper belt tension.



Staking Diagram

Belt Maintenance

Most conveyor belting will perform satisfactorily if three basic rules are observed:

1. Keep belt properly tracked.
2. Prevent anything from dragging on belt.
3. Keep the belt and conveyor free of foreign material build--up.

All belting goes through a break--in period during which more frequent tracking adjustments are expected. To prevent damage to the belt from rubbing or roll--over, tracking adjustments must be made when the belt begins to wander from its normal track. Do not wait until it begins to rub before correcting. Tracking instructions are given later in this section.

Anything that drags on the belt will destroy it. Prevent this type of damage. If a belt should be damaged by having the edge drag, clip all loose strings and frayed edges to keep them from becoming caught or tangled in rotating parts of the conveyor.

If any part of the conveyor is damaged, make sure that edges or corners do not contact the belt. Make repairs to damaged equipment as soon as possible.

Belt Tension Requirements

Power to the drive belt is transmitted from the friction surface of the drive pulley to the friction surface of the belt. The tighter the belt grips the pulley, the tighter the tension will be. The tighter the belt tension, the greater the power transmitted. Conversely, if belt tension is low, slippage may result.

It should be remembered that the belt should not be tighter than the minimum tension required to drive the belt without slippage.

⚠ WARNING

Before performing any maintenance or lubrication services, follow the lockout/tagout procedure in the Safety section to ensure that the equipment is safe to work on. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

Note: The motor must be running in order to adjust the tension on the center drives; however, power is turned off and Locked--Out/Tagged--Out for most other maintenance/repair operations.

With the motor running, adjust the tension on the center drives using the single take--up screw on the unit. Adjust the screw until the compression spring has a compression of 9 inches. Periodically check the spring length to maintain this 9” spring compression rate.

On end drives, the take--ups should be adjusted evenly to ensure proper centering of the belt on the pulley. Following the steps for belt adjustment will help center the belt when the proper tension is obtained.

CAUTION

Excessive tension on the belt will cause tracking problems, as well as considerable damage to the belt’s fabric core, pulleys, bearings, and possibly cause overload to the motor. Failure to follow this instruction may result in equipment damage.

Belt tension must be adjusted to meet operating conditions because many factors affect belt tension. Atmospheric conditions can affect belt tension. High humidity causes stretching and dry air causes shrinkage; therefore, belt tension should be checked corresponding to wet and dry seasonal changes, and daily when belts are new.

⚠ WARNING

Be sure to replace the drive guarding after inspection or maintenance. Failure to follow this instruction may result in serious personal injury and/or equipment damage

Belts always move away from the side of the pulley with the most tension (the high tension side).

If a belt suddenly leaves its established track, there is a good chance that something foreign has gotten under it or on the drive pulley. A build-up along one side will cause the belt to be curved or longer on one side than the other. A build--up on a head or drive pulley will usually cause the belt to creep toward the build-up in the same way that a belt reacts to a crowned pulley. Bear in mind that the belt could creep away from the build--up if speeds are high, tension is low, or friction on the drive pulley is low.

For that reason, both ends of the drive pulley must be inspected if a build-up is suspected. Belt tension is often changed by a build-up also. And finally, if a belt runs over a build-up for a long period, it will take a set and tend to run off the opposite way when the conveyor is finally cleaned. Changes in bed friction cause changes in belt tension, and this can cause changes in tracking. In short, keep the belts and their associated components clean.

Adjustment Intervals

There are no specific intervals between belt adjustments, but good preventive maintenance routines

Replacing Rollers

1. Turn off and Lockout/Tagout all power to the conveyor.
2. Loosen the tension on the carrier belt and remove it.
3. Use a tool to push in the spring loaded axle on the roller to free one end of the axle from the frame of the conveyor.
4. Carefully disengage the opposite end of the roller from the frame and remove. Make sure the axle is not pinched on the frame causing damage during removal.
5. Insert the axle of the replacement roller through the hole on the conveyor frame.
6. Use tool to compress the spring loaded axle on the roller and lower the roller into its proper position.
7. Release the spring loaded axle and make sure it fully engages in the hole in the frame.
8. Install the and properly tension the carrier belt as described in Section 3, “Conveyor Belt Tension”.

⚠ WARNING

Before performing any maintenance or lubrication services, follow the lockout/tagout procedure in the Safety section to ensure that the equipment is safe to work on. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

Lubrication

Check the following maintenance items immediately after start--up, during initial run--in, at 100 hours, and thereafter at 500 hour intervals under average conditions. Under adverse conditions, more frequent maintenance checks should be performed.

Speed Reducers

Standard speed reducers are sealed and maintenance free. They incorporate a pressure compensating chamber, which eliminates the lengthy preparation normally required to put a reducer into service and prevents atmospheric contamination. These reducers are properly filled at the factory with sufficient lubrication for all mounting positions. The lubricant is Mobil SHC--634, a synthesized hydrocarbon formulated for extremely long life. Refer to the manufacturers instructions for more information.

⚠ WARNING

Before performing any maintenance or lubrication services, follow the lockout/tagout procedure in the Safety section to ensure that the equipment is safe to work on. Failure to follow this instruction may result in serious personal injury and/or equipment damage.

Chains and Sprockets

To keep drive chains in good operating condition, the following procedures are recommended.

1. Use a Commercial Grade non--corrosive solvent to flush away foreign materials such as metal particles, dirt, or rust before lubricating.

2. Chains should be lubricated with SAE 10 to SAE 40 viscosity oil to prevent galling and seizing of the contact surfaces. Oils formulated for chain lubrication will retard oil throwing.

3. Lubricate all sprocket contact surfaces.

All lubricant should be applied to the inside of the chain so that centrifugal force will help work the oil into the pin joints instead of throwing it off. A thin lubricant will penetrate into the chain joints. Lubrication with an oil cup, spout can or brush is adequate.

⚠ WARNING

Be sure to replace the drive guarding after inspection or maintenance. Failure to follow this instruction may result in serious personal injury and/or equipment damage

In an atmosphere that contains abrasive particles, it is better not to have conventional lubricants on the surface of the chain that collect or retain abrasive particles. Use dry lubricants such as molybdenum disulfide or deflocculated colloidal graphite in a volatile carrier.

Motors and Carrier Rollers

All motors and carrier rollers are equipped with sealed bearings. No additional lubrication is required.

SUPPORT

When troubleshooting equipment problems, it is essential to completely understand how the system functions during normal operation. Thoroughly review the operational description, the circuit drawings, and the electrical diagrams sent with your equipment. Once the system operation is understood, it is usually best to start at the problem, and then work back to the source.

Procedures are discussed at length in the following pages; however, there are certain guidelines that should be followed for all troubleshooting problems.

1. Locate the problem.
2. Listen and observe.
3. Identify problem as electrical, mechanical, or pneumatic.
4. Determine symptoms through observations.
5. Think and act with caution and clear thinking.
6. List short and long term solutions.
7. Select a solution or possible solutions.
8. Implement and document one solution at a time.

Symptom	Probable Cause	Corrective Action
Motor will not start or it is slow to start.	No line voltage.	Check emergency stops and reset. Check fuses and wiring for open circuit. Replace fuses or repair wiring as necessary. Check thermal overload protection device and reset as necessary. Check limit switches, starter and relays for defective contacts or mechanical fault. Replace as necessary. Check for supply voltage at source and correct fault as necessary. Check control circuit voltage and correct fault as necessary.
	Low line voltage.	Check for proper supply voltage and proper motor wiring. Correct as necessary.
	Conveyor overloaded or jammed.	Remove load from conveyor and reset. Check for foreign material in chain or sprockets and remove. Check chain tension and correct as necessary.
	Defective motor.	Verify proper wiring, voltage and overload. Correct as necessary. Replace motor with spare.

Symptom	Probable Cause	Corrective Action
Motor repeatedly stalls.	Defective wiring or electrical components.	Check electrical circuits and panels for loose or defective wiring. Correct as necessary. Check for loose or defective relays, switches, etc. Correct as necessary.
Motor runs excessively hot (over 130 ºF).	Overload.	Check for sluggish or seized bearings, or obstructions. Check all rollers for free rotation.
	Lack of lubrication in reducer.	Replace reducer with spare and clean motor as necessary.
	Ventilating holes in motor obstructed or excessive dust in motor.	Clean ventilating holes or replace motor as necessary.
	Defective bearing in motor or reducer.	Replace motor or reducer with spare.
Motor emits excessive noise, hum, or vibration.	Lack of lubrication in reducer.	Replace reducer with spare.
	Worn or damaged motor or reducer.	Replace motor or reducer with spare.
	Defective bearing.	Replace motor or reducer with spare.
	Loose mounting.	Check motor and reducer for loose mounting hardware.
Oil leakage from reducer.	Worn or damaged bearing or seals or cracked housing.	Replace reducer with spare.
	Loose drain plug.	Tighten or replace plug.

Symptom	Probable Cause	Corrective Action
Belt slipping on drive pulley.	Insufficient belt tension (new belt stretch).	Adjust take-up, while running under normally loaded condition, until slippage on pulley is overcome and return belt sag is approximately 2% of length between return rollers.
	Seized pulley(s).	Check pulley bearings and replace as necessary.
	Pulleys or rollers causing belt drag.	Check pulleys and rollers for seized or sluggish performance and replace as necessary.
	Conveyor is overloaded.	Check conveyor capacity and correct as necessary.
Excessive belt stretch.	Excessive belt tension.	Relieve belt tension by adjusting take-up until return belt sag is approximately 2% of return length between rollers.
Severe wear on underside of belt.	Belt slipping on drive pulley.	Adjust take-up, while running under normally loaded condition, until slippage on pulley is overcome and return belt sag is approximately 2% of return length between rollers.
	Seized or misaligned pulleys or rollers.	Check alignment, bearing condition and replace as necessary.
Excessive edge wear.	Belt tracking problem.	See belt tracking procedure.
	Belt splice is not square.	Remove belt lacing, trim belt square and re-lace.

Symptom	Probable Cause	Corrective Action
Belt runs off at head or tail pulley.	Belt tracking problem.	See belt tracking procedure.
	Conveyor loading or load distribution problem.	If side loading, move loading location several feet from end of conveyor. If load is concentrated on one side, redistribute upstream to correct problem.
Section of belt runs to one side continually.	Belt splice is not square.	Remove belt lacing, trim belt square and re-lace.
	Excessive belt camber.	Replace belt.
	Conveyor section not square.	See squaring procedure in installation section.
Belt moves erratically.	Intermittent roller or bearing drag.	Check and replace any rollers and/or bearings that are not free rotating.
	Excessive belt tension.	Relieve belt tension by adjusting take-up to approximately 2% of return length between rollers.
	Conveyor is overloaded.	Check conveyor capacity and correct as necessary.
Belt lacing pulls out or wears out prematurely.	Wrong lacing size.	Replace lacing with correct size.
	Excessive belt tension.	Relieve belt tension by adjusting take-up to approximately 2% of return length between rollers.
	Foreign obstruction.	Locate and clear obstruction.
	Conveyor is overloaded.	Check conveyor capacity and correct as necessary.

Symptom	Probable Cause	Corrective Action
Belt has pulsing movement.	Too much slack in drive chain.	Adjust drive chain tension per "Drive chain and sprocket" section.
	Excessive belt tension.	Relieve belt tension by adjusting take-up to approximately 2% of return length between rollers.
	Conveyor is overloaded.	Check conveyor capacity and correct as necessary.
Conveyor does not start or stop quickly enough. There is a delay between signal and function.	Clutch unit is not engaging properly.	Adjust clutch unit as instructed in manufacturer manual provided.
Excessive chain wear.	Chain is too tight or too loose.	Reposition the reducer or adjust the chain tensioner (if provided) for proper tension per instructions in Maintenance & Lubrication section.
	Sprockets are misaligned.	Re-align with straight edge across the face of both sprockets.
	One sprocket is loose.	Locate, align and tighten loose sprocket.
	Insufficient lubrication.	Lubricate as instructed (Maint. & Lube).
Excessive noise.	Refer to Probable Causes for Excessive wear listed above.	See Corrective Action for Excessive wear listed above.
	Dirty chain.	Remove & clean chain in solvent; clean sprockets, replace chain & lubricate as instructed.
	Chain is rubbing guard.	Check for obstruction and adjust as necessary.

Symptom	Probable Cause	Corrective Action
Chain is pulsing.	Insufficient tension.	Adjust as instructed.
	Conveyor/Drive overload.	Inspect conveyor for obstructions and correct as necessary.
Broken chain.	Frozen pulley or sprocket shaft.	Inspect source of problem and correct as necessary.

Support

If you need further assistance:

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