Operation & Maintenance

Broce Broom

MK-1 Model Broce Transfer Sweeper

Serial Numbers: 500133 +

Broce Manufacturing Company, Inc.
1460 S. 2nd Ave.
Dodge City, KS 67801
(877) 227-8811   (620) 227-3012 fax
brocebroom.com
NOTICE: THIS VEHICLE DOES NOT CONFORM TO ALL SAFETY AND EMISSIONS STANDARDS APPLICABLE TO ON-ROAD VEHICLES IN THE UNITED STATES.

OPERATOR QUALIFICATIONS

Operation of this equipment shall be limited to competent and experienced persons. In addition, anyone who will operate or work around this equipment must use good common sense. In order to be qualified, he or she must also know and meet all other requirements, such as:

1. Some regulations specify that no one under the age of 16 may operate power machinery. It is your responsibility to know what these regulations are in your area or situation.

2. Current OSHA regulations state in part: "At the time of initial assignment and at least annually thereafter the employer shall instruct EVERY employee in the safe operation of servicing of all equipment with which the employee is or will be involved."

3. Unqualified persons are to STAY OUT of the work area.

4. A person who has not read and understood all operating and safety instructions is not qualified to operate the machinery.

FAILURE TO READ THIS MANUAL AND ITS SAFETY INSTRUCTIONS IS A MISUSE OF THE EQUIPMENT.

SIGN OFF SHEET

As a requirement of OSHA, it is necessary for the employer to train the employee in the safe operation and safety procedures with this equipment. We include this Sign Off Sheet for your convenience and personal recordkeeping.

<table>
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<tr>
<th>Date</th>
<th>Employer’s Signature</th>
<th>Employee’s Signature</th>
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BE A SAFE OPERATOR

BY THINKING-BEFORE ACTING
AND
BY READING YOUR OPERATORS MANUAL

(!) AVOID ACCIDENTS (!)

Most accidents, whether they occur in industry, on the farm, at home or on the highway, are caused by the failure of some individual to follow simple and fundamental safety rules or precautions. For this reason most accidents can be prevented by recognizing the real cause and doing something about it before the accident occurs.

Regardless of the care used in the design and construction of any type of equipment, there are many conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient operation.

A careful operator is the best insurance against an accident.

The complete observance of one simple rule would prevent many thousand serious injuries each year. That rule is: Never attempt to clean, oil, or adjust a machine while it is in motion!

(!) BEFORE OPERATING THIS MACHINE (!)

Read this manual completely. It contains information of safety and maintenance procedures which must be followed to insure years of trouble free service.

! Read and understand the following warning labels before operating this machine! If you do not understand these warnings, do not operate this machine!

!!! BE CAREFUL!!!

1. KEEP ALL SHIELDS IN PLACE.
2. STOP MACHINE TO REPAIR OR CLEAN.
3. KEEP HANDS, FEET AND CLOTHING AWAY FROM POWER DRIVEN PARTS.
4. KEEP OFF MACHINERY UNLESS A PLATFORM IS PROVIDED. DO NOT CRAWL ON EQUIPMENT.
5. WHEN EQUIPMENT BECOMES DISABLED, SHUT OFF POWER BEFORE ATTEMPTING REPAIRS.
6. CHECK FOR HYDRAULIC LEAKS WITH A PIECE OF PAPER AND NOT YOUR HANDS. HYDRAULIC OIL UNDER PRESSURE CAN CAUSE SERIOUS INJURY!

(!) WARNING (!) DO NOT ATTEMPT TO START ENGINE WITH TRANSMISSION CONTROL LEVER IN FORWARD OR REVERSE POSITION

While starting the engine, if the lever is not in the neutral position, the machine should not start. However, if the neutral safety switch failed, it could allow the machine to start in the forward or reverse position and the machine could move forward or backward before the operator is ready. This could cause injury to a bystander or damage the equipment. Do not operate the machine if the neutral safety is malfunctioning.

(!) WARNING (!) ROAD SPEED MUST BE GOVERNED BY GOOD JUDGMENT. DO NOT OVERSPEED
Although a high travel speed is not available with the MK-1, we caution all operators to use good judgment while operating this machine, especially on rough roads.

The MK-1 is hydrostatically driven. The Forward/Reverse directional control is achieved through the use of a control lever, located to the right of the operators’ seat. Move the lever forward to travel forward, moving the lever to the rear, shifts the travel to reverse. Rate of travel is governed by the distance the lever is moved and throttles position.

(!) IMPORTANT (!)

Familiarize yourself with the following controls before operating this machine.

1. Brake Pedal

2. Directional Control Lever

3. Locking Throttle

4. Ignition Switch

5. Safety Shutdown Switch

6. Preheat Button
7. Emergency Stop Button

8. Broom Float/Run

9. Broom Raise/Lower

10. Core Lock On/Off

11. Parking Brake On/Off

(!) WARNING (!)  
THE OPERATOR MUST INSURE THAT THE CONVEYOR IS CLEAR ON THE LEFT AND RIGHT, UP AND DOWN AREAS PRIOR TO OPERATING THE CONVEYOR JOYSTICK

12. Broom Rotate Speed Pot

13. Conveyor Speed Pot

14. Auger Off/Forward/Reverse Speed Pot

(!) WARNING (!)  
THE OPERATOR MUST INSURE THAT THE AUGER, CONVEYOR AND BRUSH ARE CLEAR OF OBSTRUCTIONS PRIOR TO OPERATION OF THE BROOM, CONVEYOR AND AUGER SPEED POT CONTROLS

15. Conveyor Left/Right and Up/Down Joy Stick
1. Before starting the engine, be sure the parking brake is set, the brake pedal is depressed and the lever is in neutral. If the machine is equipped with safety shut down, hold the button down while starting. If preheat is required, press and hold preheat momentarily prior to starting.
2. Turn the key switch to the start position (all the way to the right). Add fuel as necessary using the hand operated locking throttle near the operators’ right hand. Release the key switch when the engine starts.

3. Raise engine RPM to about half throttle. Release the parking brake. Slowly move the control lever in the desired direction. Engine speed may be adjusted to obtain desired travel speed.

4. Do not propel the machine with the parking brake on. Do not set the brake with the machine in motion. Damage to the brake/motor drive motor assembly could occur.
5. If the control lever is returned to center position while traveling, the machine will slow down rapidly. This is called “dynamic braking”. Using dynamic braking at low speeds is fine as long as the operator is ready to use the brake pedal if needed.
6. Do not reverse the direction of travel while the broom is in motion. This could damage the drive train and cause brush distortion and imbalance.
7. The core should be in the raised position and the core switch in the “LOCK” position before stopping the engine.

To stop the engine, turn the key back to the center position. The parking brake must be set prior to leaving the operators’ seat.

**OPERATION OF THE SWEEPING CORE**

All functions of the sweeping core are electric over hydraulic.

To adjust the core, the Core Lock Switch must be in the off position. Use the Raise/Lower Switch to adjust the core position. The Raise/Lower Switch must be in the float position to activate the float, and will disable the raise/lower function. The float position will allow the core to maintain the ideal contact with the road while allowing it to float over bumps or contours in the road surface.

**IMPORTANT**

If the Raise/Lower Switch is being used to maintain core position, the operator must maintain continuous adjustment on the core while the down pressure option is being used. This feature does not allow the core to float over contours in the road surface. Therefore the operator must constantly make these adjustments. Overuse of the positive down pressure feature will cause excessive wear and shorten the life of the broom. We recommend using float detent during all but the heaviest sweeping conditions.

**BROOM ROTATION**

The Variable Speed Brush is controlled by the Broom Rotate Speed Pot Control.

(!!) **CAUTION** (!)

(!) **IMPORTANT** (!)

If ambient temperature is below 40° F do not exceed 1500 RPM until hydraulic fluid has warmed up.
(!) WARNING (!)
THE OPERATOR MUST BE AWARE AT ALL TIMES OF ANY PEOPLE, VEHICLES, OR ANY OTHER OBJECTS WHICH MIGHT BE IN THE PATH OF FLYING DEBRIS FROM THE SWEEPER. THE SWEEPER CAN THROW SMALL ROCKS AND OTHER OBJECTS SEVERAL FEET. THIS DEBRIS CAN CAUSE SERIOUS INJURY TO PEOPLE AND DAMAGE TO PROPERTY. ALWAYS CHECK THAT THE AREA AROUND, AND IN FRONT OF THE BROOM CORE ARE FREE OF OBSTRUCTIONS BEFORE ACTIVATING THE CORE.

NO RIDERS
(!) WARNING (!)
UNDER NO CIRCUMSTANCES SHOULD PASSENGERS BE ALLOWED TO RIDE ON THIS MACHINE. THERE ARE NO SAFETY PROVISIONS ON THIS MACHINE FOR PASSENGERS. FAILURE TO HEED THIS WARNING COULD RESULT IN SERIOUS INJURY OR DEATH

MAINTENANCE

The manufacture has endeavored to build the MK-1 Transfer Sweeper as maintenance free as possible. The service points are easily accessible and are similar to those on many other types of construction equipment. This section will cover many of these points in some detail and will briefly mention those which should be standard on all equipment.

AIR CLEANER:

The air cleaner is one of the most important components of this machine. Due to the extremely dusty conditions in which this machine operates, the air cleaner must be maintained constantly. This machine is equipped with a dual element air cleaner.

Under average conditions, the air cleaner will need to be serviced daily.

Do not remove the safety element until you are ready to replace it! Do not attempt to clean the safety element. It is strictly a disposable type element. Clean the dirt from the inside of the canister and the end cover. Hold the element so that the opening is on tip, with your other hand, gently pat the side of the element to loosen the dirt. Do not tap the element against a hard surface as this can cause damage to the element itself. Air pressure may be used to clean dirt from the element, but the air pressure must be reduced to less than 30 PSI. Using an air nozzle, clean the element from the inside, moving the nozzle up and down in the direction of the pleats. Do not direct the air stream against the outside surface of the element, as it will force the dirt through the element fabric, resulting in damage.

(!) CAUTION (!)

When using compressed air, clear the area of bystanders, guard against flying chips, and wear personal protection equipment including eye protection.

The element may be cleaned by the following procedure:

If the element coated with oil or soot, wash in a solution of warm water and filter element cleaner (equal to R36571 Filter Element Cleaner). Let the element soak at least 15 minutes, then agitate gently to flush out dirt. Rinse element thoroughly from the inside with clean water. Use an element cleaning gun or a free running hose. Keep the pressure under 40 PSI to avoid damage to the element. Allow the element to dry completely before using. This usually takes from one to three days. Do not oven dry or use drying agents. Protect the element from freezing until dry.

The element must be inspected before it is reinstalled. Hold a bright light inside the element and check carefully for holes. Discard any element that shows the slightest hole. Be sure that the outer screen is not dented. Vibration will quickly wear a hole in the filter. Make sure the filter gasket is in good condition. If the gasket is damaged or missing, replace the element.
Seal the element in a plastic bag and store in a shipping container to protect against dust and damage.

AIR CONDITIONING:

The condenser, recirculating evaporator filter, and air intake filter must be kept clean. Change filters as required.

HYDRAULIC SYSTEM

The hydraulic system on this machine while sharing the same reservoir has three separate pumps to control all its functions. In order to simplify the description of this system, it will be separated into three parts.

HYDROSTATIC DRIVE

The hydrostatic drive system consists of a variable pump, pressure manifold, hoses and two fixed displacement wheel motors. Oil from the reservoir passes thru a 10 micron filter, with a bypass setting of 3 psi, to the dual manifold mounted on the left side of the machine, to the hydrostat inlet.

STEERING CIRCUIT

The steering pumps is mounted on the rear on the hydrostatic drive pump and received its oil from the other side of the dual manifold. The return oil from the steering motor is returned to the case drain manifold.

LS Pump

Oil exits the tank through a 100 mesh screen to the inlet of the LS Pump. Pressured oil is sent to the PVG valve which controls all the fork functions of the sweeper. There are three proportional controls in the PVG valve, (1) Brush rotation, (2) Auger/slat rotation, and (3) Conveyor rotation. The controls for these functions are the potentiometers located on the left hand control console. The PVG valve also controls the lift/lower, float operation of the brush, and the lift/lower, swing functions of the conveyor. The lift/lower, float brush functions are controlled by toggle switches mounted on the control console, the joystick controls the lift/lower, swing of the belt conveyor.

Return oil from the PVG valve goes through a 10 micron return filter through a 100 mesh screen installed in the tank.

RADIATOR AND HEAT EXCHANGER

Due to the dusty conditions in which this machine operates, the heat exchanger and radiator must be cleaned every 4 to 8 hours of service, depending on sweeping conditions. If either becomes clogged with dirt, it will overload the cooling capacity of the other, causing both the engine and hydraulic system to operate at higher than acceptable temperatures. Use water or compressed air directed from the engine side of the radiator to remove dirt build up. The engine must be completely stopped while performing this maintenance. Inspect radiator and heat exchanger for dirt deposits and/or damage before resuming operation.

The case drain oil from the hydrostat pump, LS pump, wheel motors, slat conveyor drive motor and steering motor returns to the case drain manifold which in turns sends the oil to the oil cooler, then to left upper port on the reservoir thru a 100 mesh screen.

(!) CAUTION (!)

Do not attempt to clean the radiator or heat exchanger while the engine is running. If hands or equipment come in contact with the spinning fan blades, serious injury will result. Engine must be completely stopped.
LUBRICATION:

(!) IMPORTANT (!)

Lubricate frequently with a small amount of grease.

**Belt Conveyor**

There are 13 lubrication points on the conveyor.

**Slat Conveyor**

There are 6 lubrication points on the slat conveyor.

**Front Axle**

There are seven lubrication points on the front suspension. Use standard automotive type grease on each of these. While servicing these points, inspect all ball joints and rod ends for slack. If slack is found in any part of this suspension, including bolster pivot bushings, replace all worn parts.

**Air Cleaner**

The air cleaner may be the single most important component on a Broce Broom when it comes to service life. This machine operates in a cloud of dust for many hours of its life. If the air cleaner is not serviced properly this will reduce the engine life.

DAILY: A restriction indicator is installed on the outside of the air cleaner. This restrictor lets the operator know if the air cleaner element is dirty. Check and/or clean air intake element daily.

250 HOUR: Replace both service element and safety element every 250 hours or as needed.

(!) IMPORTANT (!)

Change the safety element every 250 hours.

**Engine**

Refer to the Engine Manufactures manual for recommendation and procedures.

**BRAKES:**

This machine is equipped with front wheel disc brakes and electrically operated parking brake. The operation of the brakes should be tested daily. Everyday, before this machine is to be operated, check the brake pedal “feel”. The pedal should be firm when depressed. If the pedal feels “spongy”, it probably means that there is air in one or more brake lines. If the brake pedal does not feel firm, the brakes must be serviced prior to operating this machine.

The master cylinder is located directly in front of the brake pedal. Remove the floor cover to gain access for servicing it. Check the fluid level periodically, especially if the brake lines show signs of leakage. If it becomes necessary to add or change the brake fluid, use a fluid with a DOT 3 rating.

Inspect brake lines every 50 hours for leaks and/or damage.

(!) CAUTION (!)

Do not allow this machine to be operated with faulty brakes. This will put the operator in extreme danger and could cause bodily injury and property damage.

**Fasteners**

Like all construction equipment, this machine requires periodic tightening of fasteners. During normal engine service intervals, check all nuts and bolts, clevis pins, and clamps.

**Frame, Gussets and Welds**

The frame on this machine was designed to withstand normal operating conditions, however under abusive type use, components and welds can fail. Periodically
check all frame welds and gussets for development of cracks.

**CORE DRIVE:**

The direct drive core is preset at the factory and does not need adjusting.

(!) **CAUTION (!)**

The MK-1 should not be towed. Towing could cause damage to the drive motors. A brake release tool is furnished with the machine. If the brake is mechanically released, towing very slowly for a short distance is allowed.

**Engine**

The normal engine operation and maintenance procedures are covered in a separate manual, which is furnished by the engine manufacture. Important: due to the dusty conditions that the Broce Boom operates in, it is recommended that the **engine fan inspection** and replacement be done every **300-400 hours**. The dusty environment the broom is operating in will result in erosion of the fan blades. The fan needs to be replaced when the blades deteriorate to the point that they do not provide enough air-movement or they become operationally unsafe. This fan blade erosion is considered to be normal wear on this type of equipment.

**Tires**

The tire manufacture recommends a tire pressure of **70 PSI**. This will provide the longest tire life. A lower pressure will provide a more comfortable ride, and make rough road conditions easier to negotiate.

**Storage**

When storing the Broce Broom outside, it is recommended that a light coating of oil is sprayed on the wire bristles of the broom core to retard rusting. This only applies to the optional wire cores.

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**Daily Inspection**

1. Visually inspect the entire machine for damage and fluid leaks.
2. Check all fluid levels; engine oil, radiator and hydraulic reservoir.
3. Check wheels and tires for excessive wear or damage; also check air pressure and lug nut tightness.
4. Check pre-cleaner bowl and air cleaner service indicator (service if indicated).
5. Check seat belt
6. Lights, windshield wipers, reverse alarm, etc., must be in operating condition.
7. Test brakes before operating this machine.
8. Core cover and material deflectors
9. Check auger, auger housing, slat conveyor, belt conveyor and conveyor rollers for asphalt buildup. All should be clean.
10. Check conveyor belt and slat conveyor chain for proper tension.

Any defects or damage found during this inspection must be repaired before operation.

**Broom Wafer Replacement**

There are many different techniques that may be used when rebuilding the broom core. The following instructions involve the techniques and equipment employed at Broce Manufacturing Co., Inc. These instructions are to be used as a guideline and are not designed to supersede any instructions offered by the broom wafer manufacturer.

The standard Broce Broom core uses 10” X 32” flat wafers and metal spacers.
Direct Drive Cores

1. With the core resting on or near the ground, remove the bolts securing the pillow block bearing to the core support frame.

2. Pull the core to the right side of the machine until you feel the splined hub come off the shaft. At this time, the core will be close to or touching the right support arm.

3. Angle the core toward the rear of the machine and slide it out from under the sweeper.

4. Clean the spindle from the lock ring out.

5. Loosen the set-screw and remove the lock ring and pillow block bearing.

6. Remove the spindle and install the Broce Core Service Ring in its place.

7. Remove the end cap from the drive end of the core.

8. Using a hoist or winch with a minimum capacity of 1,000 lbs., raise the core approximately 6 to 8 inches off the floor.

9. Using a pry bar or similar tool, start at the bottom of the core and work the wafers loose. Do not attempt to use a cutting torch to remove the wafer, as this could result in a fire.

10. Lower the core and remove the service ring. Reinstall the spindle. Loosen the four bolts securing the end cap until they are flush with the inside of the core end plate. This will leave approximately one inch of play in the end cap.

11. Using the Broce Core Service Stand, stand the core upright, with the end cap on the bottom. If this stand is not available, fabricate a similar device, which will securely hold the core in place. The stand is designed for use on a hard level surface. It may be easily transported using a small forklift and is ideal for storing a spare core.

12. Locate the service stand approximately one foot from a loading dock or other similar platform that will provide stability and will enable you to reach the top of the core.

13. Begin filling the core with a wafer, and then a spacer. Keep adding poly wafers and spacers in an alternate sequence until the core is filled. If there is not enough space left at the end for a spacer and wafer, finish out with a wafer to finish filling. When assembling a half poly and half wire core, or an all wire core, begin with a poly wafer and end the fill with a poly wafer. This will minimize unnecessary damage to the drive chain and will add stability to the wire wafers near the end of the core. When building a half-and-half core, the pattern should be; poly wafer, spacer, wire wafer, spacer and then repeat the sequence. If this pattern ends at the top with a wire wafer, substitute a poly wafer. Each wafer has a locking tab located on the inside of the crimp ring. This tab will lock the wafer against the core frame tubes to keep it from spinning on the core. To ensure proper core balance, rotate this tab 90° from the previous wafer. This will ensure even weight distribution on all four sides of the core.

14. Install the end cap using two ½” X 3” all thread bolts in two of the holes which are 180° apart. Slowly and evenly tighten these until the end cap is close enough to the core to install the standard mounting bolts. Start two of the standard
15. The core must now be tipped over onto the ground so that the core comes to rest laterally on the bristles. Clear an area fifteen feet in all directions of the core of personnel and property before tipping the core. Always tip the core by pushing it over. Once the core begins to fall, get away from it in case the stand falls off. Carelessness in this procedure could result in serious bodily injury and/or property damage.

16. With the core resting on the ground, slide the stand off of the spindle and tighten the end cap in the same fashion as before.

17. Using emery cloth or sandpaper, clean both spindles to remove any burs or tar which may interfere with sprocket or bearing installation.

18. Raise the core support frame and slide rebuilt core under the sweeper. The core will have to come in from an angle in order to be started over the motor mount. Once the core has been started onto the motor mount, swing the right side under the right support frame.

19. Lower the support frame slowly until the motor mount is centered in the core.

20. Using a back and forth twisting motion, pull the core onto the splined shaft.

21. Install the pillow block bearing on the right side of the core using the original mounting bolts.

22. Raise the core. Slide the core to the left as far as it will go.

23. Install the lock ring on the spindle securely. This lock ring is all that maintains core alignment.

If you have any questions regarding these procedures or would like to obtain the core service standard ring, please contact your nearest dealer or call us direct at (620) 227-8811, the part numbers are listed in the equipment options section of this manual.
Air Conditioner Preventive Maintenance

A well maintained A/C system would save on downtime and premature component failures.

**Weekly inspections or every 2 days in severe environments should include:**

1) Inspect compressor clutch drive belts (tightness, wear).
2) Inspect compressor-mounting brackets (bolts, alignment).
3) Inspect mounting hardware on evaporator unit and condensers.
4) Inspect air intake filter. Clean or replace filter.
5) Inspect evaporator and condenser coils. Clean using air pressure. *(DO NOT USE WATER OR PRESSURE WASHER).*
6) Inspect hose and wire harness for proper routing. Leaks and wear.

**Helpful Hints**

Make sure the evaporator intake area is not obstructed (i.e. toolboxes, clothing, lunch boxes, etc.)

Manual thermostat on our system, when rotated clockwise to the stop position will not allow A/C compressor clutch to cycle. The compressor will run continuously and the evaporator coil will not defrost.

REMEDY: Turn the manual thermostat knob clockwise to the stop position, and then turn the thermostat knob back counter clockwise ¼ turn.

Broce thanks you for purchasing our unit/s. It is our endeavor to provide you with a quality A/C unit with trouble-free service.
Troubleshooting the A/C System

Troubleshooting Chart

The following chart lists some of the common problems that plague A/C systems and refer them to the pressure readings on your test gauges. They are referred to as "low" or "high" due to the fact that different systems and conditions have different normal readings.

A/C Troubleshooting Chart

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<th>SUCTION</th>
<th>DISCHARGE</th>
<th>POSSIBLE PROBLEM</th>
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<tr>
<td>LOW</td>
<td>HIGH</td>
<td>1. Restriction between the discharge of the compressor and inlet of receiver drier. Check condenser and condenser lines for a point of restriction that may create flashing. Condition indicated by an extreme differential in temperature at the point of restriction.</td>
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</tbody>
</table>
| LOW     | LOW       | 1. Possible restriction between drier and suction side of compressor.  
2. Low refrigerant charge _ bubbles in sight glass.  
3. Restriction at drier or expansion valve _ sight glass usually clear. |
| HIGH    | HIGH      | 1. Air in system.  
2. Overcharged system (oil or refrigerant).  
3. Condenser fan not working.  
4. Air flow restriction on condenser |
| HIGH    | LOW       | 1. Weak compressor _ indicated by accelerating the engine and watching the suction and discharge readings. Normally, suction moves lower and discharge side should rise.  
2. Expansion valve flooding or stuck open _ this would cause high and low sides to become less distinguishable. |

Attention

R-134a A/C Refrigerant
Factory Charge:
Kubota = 3.0 lb 2.0 oz (1.417 kg)  
John Deere = 3.0 lb 2.0 oz (1.417 kg)  
Caterpillar = 2.0 lb 12.0 oz (1.247 kg)  
Cummins = 2.0 lb 10.0 oz (1.191 kg)

Ester Oil Charge:
Compressor = 8.0 oz  
System = 4.0 oz
WIRING DIAGRAMS
Terminal Strip Identification

12v to Joystick (Red w/ White) 1 3A 28 12v from E-stop (Red w/ White)
12v to Circuit board P2-4 (Red w/ White) 2 3A 27 12v from E-stop (Bridge Strip)
12v Broom & Conveyor rotation solenoid P2-5 (Red w/ White) 3 3A 26 12v from E-stop (Bridge Strip)
12v Auger rotation & Broom up/down solenoid P2-6 (Red w/ White) 4 3A 25 12v from E-stop (Bridge Strip)
From Float switch (Orange) 5 3A 24 Core up/down solenoid P2-10 (Orange)
From Broom rotation dial (Purple) 6 3A 23 Broom rotation solenoid P2-14 (Purple)
From Conveyor rotation dial (Gray) 7 3A 22 Conveyor rotation solenoid P2-17 (Grey)
From Auger rotation dial (Pink) 8 3A 21 Auger rotation solenoid P2-20 (Pink)
12v From E-stop (Red) 9 3A 20 12v to core lock switch (Purple)
To Core lock solenoid (Purple) 10 19 12v from Core lock switch (Purple)
To Brake lock solenoid (Dr. Blue) 11 18 12v from Brake lock switch (Dr. Blue)
To Dash brake light (Blue w/ Yellow) 12 17 12v from Brake lock switch (Dr. Blue w/ Yellow)
Ground to Core & Brake lock solenoids (Black) 13 16 Ground for Core & Brake lock solenoids P1-8 (Black)
12v From E-stop (Red) 14 3A 15 12v to Parking brake switch (Red)

Circuit Board Connector Identification

CONNECTOR P1
1 12V Conveyor Solenoid Left/Right (Dr. Blue)
2 12V Conveyor Solenoid Left/Right (Lt. Blue)
3 12V Battery (Red)
4 12V Conveyor Solenoid Raise/Lower (White)
5 12V Conveyor Solenoid Raise/Lower (White w/ Red)
6 Ground (Black)
7 Solenoid ground (Black)
8 Brake and Core lock Ground (Black)
9 12V Conveyor Rotation And Broom Rotation Solenoid (Yellow)
10 12V Auger Rotation & Conveyor Raise/lower Solenoid (Green)
11 Varing Voltage for Core Up/Down/Float (Orange)
12 Varing Voltage for Broom Rotation (Purple)
13 Varing Voltage for Conveyor Rotation (Grey)
14 Varing Voltage for Auger Rotation (Pink)

CONNECTOR P2
1 12v from Conveyor joystick (right) (Dr. Blue)
2 12v from Conveyor joystick (left) (Lt. Blue)
3 12v Battery (Red w/ White)
4 12v from Conveyor joystick (left) (Lt. Blue)
5 12v from Terminal Strip 2-27 (Red w/ White)
6 12v from Terminal Strip 3-26 (Red w/ White)
7 12v from Conveyor joystick (lower) (White)
8 12v from Conveyor joystick (raise) (White w/ Red)
9 9V to Float switch (Black w/ Blue)
10 Varing Voltage from Broom Raise/Lower & Float switch (Orange)
11 6V to Float switch & Broom up/down switch (Black w/ Green)
12 8V to Broom Raise/Lower switch (Brown w/ White)
13 4.5V to Broom Raise/Lower switch (Brown w/ Green)
14 Varing Voltage from Broom Rotation switch (Purple)
15 8.6V to Broom Rotation switch (Blue w/ Yellow)
16 5.7V to Broom Rotation switch (Blue w/ White)
17 Varing Voltage from Conveyor Rotation switch (Gray)
18 8.6V to Conveyor Rotation switch (Green w/ Yellow)
19 5.7V to Conveyor Rotation switch (Green w/ Red)
20 Varing Voltage from Auger Rotation switch (Pink)
21 9V To Auger Rotation switch (Red w/ Yellow)
22 2.8V to Auger Rotation switch (Black w/ White)
MK-1 RVE Wiring

Bruce Broom Wiring Diagram
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<th>Function</th>
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<th>Pin Hirschman Connector</th>
<th>Normal Voltage</th>
<th>Operation Voltage</th>
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<tbody>
<tr>
<td><strong>Conveyor Pivot</strong></td>
<td>Dk Blue</td>
<td>2</td>
<td>0</td>
<td>12v right</td>
</tr>
<tr>
<td></td>
<td>Lt Blue</td>
<td>1</td>
<td>0</td>
<td>12v left</td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>(+)</td>
<td>grounded</td>
<td></td>
</tr>
<tr>
<td><strong>Conveyor Rotate</strong></td>
<td>Gray</td>
<td>2</td>
<td>5.7v</td>
<td>6 to 9v</td>
</tr>
<tr>
<td></td>
<td>Yellow</td>
<td>1</td>
<td>12v</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>(+)</td>
<td>grounded</td>
<td></td>
</tr>
<tr>
<td><strong>Broom Rotate</strong></td>
<td>Purple</td>
<td>2</td>
<td>5.7v</td>
<td>6 to 9v</td>
</tr>
<tr>
<td></td>
<td>Yellow/Red</td>
<td>1</td>
<td>12v</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>(+)</td>
<td>grounded</td>
<td></td>
</tr>
<tr>
<td><strong>Auger Rotation</strong></td>
<td>Pink</td>
<td>2</td>
<td>5.7v</td>
<td>2.8v forward 9.1v reverse</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>1</td>
<td>12v</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>(+)</td>
<td>grounded</td>
<td></td>
</tr>
<tr>
<td><strong>Conveyor Raise/Lower</strong></td>
<td>White</td>
<td>2</td>
<td>0</td>
<td>12v lower</td>
</tr>
<tr>
<td></td>
<td>White/Red</td>
<td>1</td>
<td>0</td>
<td>12v raise</td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>(+)</td>
<td>grounded</td>
<td></td>
</tr>
<tr>
<td><strong>Broom Raise/Lower</strong></td>
<td>Orange</td>
<td>2</td>
<td>6v</td>
<td>4.5v up</td>
</tr>
<tr>
<td></td>
<td>Brown</td>
<td>1</td>
<td>12v</td>
<td>8v down</td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>(+)</td>
<td>grounded</td>
<td>9v float</td>
</tr>
</tbody>
</table>
Stress Corrosion and Hydrogen Embrittlement

These closely related failures are similar in appearance and nature. They appear as cracks which initiate at the point of highest stress and tend to extend in an arc-like path parallel to the rolling grain of the material. Often, more than one crack will appear on a side plate.

This type of failure can be caused by operating in an acidic or caustic medium or atmosphere. Carbon steel and certain grades of stainless steel are subject to stress corrosion cracking when exposed to a corrosive environment. Also, exposure of carbon steel chain to moisture can lead to rusting and stress corrosion cracking.

The reactions of many chemical agents with metals liberate hydrogen, which attacks and weakens the metal grain structure. If stress corrosion failure occurs, check the installation to see if the chain is exposed to chemicals, gases, moisture, or other possible causes. If the chain has been cleaned with a detergent solution, the detergent could be at fault. For cleaning purposes, use only detergent-free fluids. Never use acids, such as in acid bath degreasing.

Fatigue Failure

Fatigue failures are a result of repeated cyclic loading beyond the chain’s endurance limit, or rated capacity. Extent of the overload and frequency of its occurrence are factors which determine when fatigue will occur. The overloading can be continuous or intermittent.

Continuous overloading may be caused by worn teeth or pocket buildup, imposing overloads with each cycle. Impulse overloads can be from motor overload torque, dynamic overloading due to sudden stops, or impact loading on conveyors.

Generally, a fatigue crack starts at the point of highest stress, which is the aperture of the pin or bushing plate. Repeated cyclic stresses cause the crack to extend approximately perpendicular to the pitch line of the chain until the plate breaks. Unlike a pure tension failure, there is no noticeable yielding (stretch) of the material.

When fatigue failure occurs, the application should be examined for continuous or impulse overloading conditions. Determine the cause of the overload and eliminate it if possible. (Be sure to check sprockets for worn teeth or pocket buildup.) If the cause cannot be eliminated, determine the extent of the overload and increase chain size (capacity) to accommodate the operating conditions.

Bushing fatigue is another type of fatigue failure. Such fatigue manifests itself as circumferential cracks near the bushing link plate or longitudinally along the length of the bushing. Both types of cracks may also appear in the same bushing. If bushing cracks are evident, do not try to repair the chain. Determine and correct the cause of the failure, then replace the entire chain.
Tension Failure

This type of failure occurs when the ultimate tensile strength of a chain is exceeded (when the chain is subjected to a one-time load greater than it can withstand). Normally, tension failure can be identified by fractured side plates showing a definite yield in the metal itself.

Pin fracture, either near the center of the pin or a pin shear failure between the side plates, can also be a result of tension failure. When a chain breaks because of shocks or overloads, all of its components are affected, even though the unbroken parts may appear sound. To avoid repetitive failures, the entire chain should be replaced.

Tension failures can result from any condition which creates improper engagement between links and sprockets, characterized by the chain riding up on the sprocket teeth.

In addition, dirt and foreign matter buildup in the sprocket tooth pockets will prevent proper seating of the chain, creating an overload condition between link and tooth. Sprockets should be checked periodically; if any foreign material has accumulated, it should be promptly removed.

Another variation of tension failure is cracked bushings. In applications contaminated by dirt or grit, abrasive material may penetrate the links. When it reaches the inside and outside bushing surfaces, this material literally grinds into the bushings during articulation, reducing their wall thickness and lowering chain tensile strength. Eventually the bushings crack under load.

Galling (Abnormal Wear)

Galling, or the tearing away of metal particles from the load-bearing surfaces, occurs as a result of inadequate lubrication or excessive operating speed. The mating surfaces of the pins and bushings actually weld together, then break away as the joints flex over the sprockets. Once started, galling accelerates rapidly and is highly destructive.

Galling can occur at high speed (within allowable speed limits) if lubrication is inadequate or misdirected. Check lubrication system to be sure that: a) proper type of lubricant is being used; b) lubricant flow is not obstructed; c) lubricant is penetrating chain joints.

Galling at speeds beyond allowable limits cannot be solved by lubrication changes. It can be prevented only by making necessary design changes to comply with speed limitations.

Importance of Lubrication

One of the most important, but overlooked, factors affecting chain life is proper lubrication. Besides minimizing metal-to-metal contact, lubrication provides cooling and impact damping at high speeds. It also reduces corrosion and carries away foreign matter, which is vital in abrasive environments.
Lubrication plays an important role for chain life because chain wear and its stretch results from friction in the area between pin and bushing. Proper lubrication is necessary to reduce metal to metal contact and interference at chain joints.

Method and amount of lubrication

<table>
<thead>
<tr>
<th>Type</th>
<th>Method</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Apply oil with a brush or spout can aiming at clearance between pins and roller links on the slack side of chain in operation.</td>
<td>periodically to keep chain joints from drying (generally about every 8 hours)</td>
</tr>
<tr>
<td></td>
<td>Drip lubrication Use simple casing and apply oil drops from a drip cup.</td>
<td>at a rate of 5 to 20 drops per minute for each strand of chain, the higher the speed the more the drops per minute.</td>
</tr>
<tr>
<td>B</td>
<td>Oil bath lubrication Chain runs through an oil reservoir kept in leak-proof casing.</td>
<td>too much oil kept in reservoir (if h dimension is too high) can generate heat in oil and deteriorate its quality, therefore oil level should be kept in such a way as to maintain h dimension to be about 6 to 12mm.</td>
</tr>
<tr>
<td></td>
<td>Slinger disc lubrication Oil disc mounted on lower sprocket picks up oil from the oil reservoir kept in leak-proof casing and splashes it on chain. Disc should run at rim speed of more than 200 meters per minute. If chain width exceeds 125mm, oil disc should be used on both sides of chain.</td>
<td>Oil level should be kept lower than chain lowest point to maintain h dimension to be about 12 to 25mm</td>
</tr>
<tr>
<td>C</td>
<td>Forced lubrication Oil pump is used to force continuous spray of oil after cooling to chain within a leak-proof casing. No. of spray oil holes should be N+1 if the number of chain strand is N.</td>
<td></td>
</tr>
</tbody>
</table>

In all types of lubrication, roller chain should be cleaned periodically using light oil or gasoline. In order to see if lubrication is performed satisfactorily, remove chain from drive and check its pin and bushing. If pin and bushing show flaking or being colored to red or dark brown, poor lubrication generally exists.
Chain Care & Trouble Shooting

Tips on Trouble Shooting Chain Life Expectancy

Chain life expectancy can be expressed as a maximum percent of elongation. When using up to 67-tooth sprockets, normal life expectancy is approximately 3% elongation. Thus, to avoid sudden tension failure, chain should be replaced when its length increases 0.36″ per foot on the average. When using sprockets with over 67 teeth, life expectancy is reduced in relationship to the following formula: permissible chain elongation = \( \frac{200}{N} \)

where \( N \) is the number of teeth in the larger sprocket.

Example \( \frac{200}{180} = 1.11\% \)

Normal Wear

Wear normally takes place in the pin and bushing load-bearing areas. As they wear, the chain gradually elongates. The rate of chain wear is greatly affected by lubrication. When properly lubricated, load-bearing surfaces of the pin and bushing will look shiny and smooth.

Excessive Wear

If the load-bearing surfaces show discoloration (brown-red oxide), lubrication is insufficient. Fretting corrosion has set in, and the abrasive oxide produced will greatly increase the wear rate. Among other causes of excessive wear are:

- Tight Chain—insufficient sag in the slack strand. Lessen idler tension or distance between sprockets until slack is 2% to 3% of the sprocket center-to-center distance.
- Excessive Slack—chain whips and creates noise. Adjust idlers or sprocket distances for proper slack.
- Worn or Misaligned Sprockets—can cause chain overloads and accelerate the wear rate. Replace sprockets when teeth show excessive wear or are hook-shaped.

Proper sprocket size is also important to minimize the wear rate. Use sprockets with a minimum of fifteen teeth for smoothest operation and longest life. The fewer teeth there are in a sprocket, the greater the wear rate because of the high angle of articulation.

Allied-Locke Industries Inc.

Call Toll Free (800) 435-7752
(U.S. and Canada)
(815) 288-7945
(U.S. and Canada)
Fax your inquiry (800) 462-3130 (United States)
www.alliedlocke.com
<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Causes</th>
<th>What To Do</th>
</tr>
</thead>
</table>
| Excessive noise                        | ■ Misalignment of sprocket  
■ Loose casings or bearings  
■ Too little or too much slack  
■ Chain and/or sprocket wear  
■ Inadequate lubrication or no lubrication  
■ Chain pitch size too large         | ■ Realign sprockets and shafts  
■ Tighten set-bolts  
■ Adjust center or idler take-up  
■ Replace chain and/or sprocket  
■ Lubricate properly  
■ Check chain drive recommendation    |
| Chain vibration                        | ■ Resonance to the vibration cycle of machine to be installed  
■ High load fluctuation              | ■ Change vibration cycle of chain or machine  
■ Use torque converter or fluid coupling |
| Wear on inside of link plate and one side of sprocket teeth | ■ Misalignment | ■ Realign sprockets and shafts |
| Chain climbs sprockets                 | ■ Excessive chain slack  
■ Heavy overload                      | ■ Adjust center or idler take-up  
■ Reduce load or install stronger chain |
| Broken pins, bushings or rollers       | ■ Chain speed too high for pitch and sprocket size  
■ Heavy shock or suddenly applied loads  
■ Material build-up in sprocket tooth pockets  
■ Inadequate lubrication  
■ Chain or sprocket corrosion         | ■ Use shorter pitch chain or install larger diameter sprockets  
■ Reduce shock load or install stronger chain  
■ Remove material build-up or install side gashed sprockets  
■ Lubricate properly  
■ Install anti-corrosive chain or sprockets |
| Chain clings to sprocket               | ■ Center distance too big or high load fluctuation  
■ Excessive chain slack              | ■ Adjust the center distance or install idler take-up  
■ Same as above                       |
| Chain gets stiff                       | ■ Misalignment  
■ Inadequate lubrication  
■ Corrosion  
■ Excessive load  
■ Material build-up in chain joint  
■ Peening of link plate edges        | ■ Realign sprockets and shafts  
■ Lubricate properly  
■ Replace with anti-corrosive chain  
■ Reduce load or replace with chain of suitable strength  
■ Shield drive from foreign matter  
■ Check for chain interference       |
| Breakage of link plate                 | ■ Subjected to shock load  
■ Vibration  
■ Moment of load inertia is too big   | ■ Reduce shock (e.g., install a shock absorber)  
■ Install a device to absorb vibration (e.g., tightening, idler wheel)  
■ Chain section should be checked (increase number of strands or select next larger size chain) |
Shaft & Mounting Surface Inspection
Shaft should be smooth, straight, & within commercial tolerances (Table 1). Remove burrs & align mounting surfaces within 2 degrees.

Assemble Adapter & Bearing
1) If the locknut is loose from the bearing, FIRST place locknut into bearing inner ring groove, THEN insert adapter into bearing bore until it rests against the locknut. Rotate locknut clockwise to engage adapter sleeve.

Pillow Blocks & Tapped Base Housings
NOTE: For Tapped Base (TB) housings drill mounting holes with 1/16” minimum bolt clearance to assist with proper installation.

2) During installation it is best practice to remove all of the weight from the bearing via slings or jacks. However, if it is difficult to remove all weight then insulate the dead weight on the bearing during installation does not exceed the values listed in Table 2.

3) Slide the unit into position onto the shaft. If the unit will not slip onto the shaft, turn locknut counter-clockwise to expand adapter sleeve.

4) Wearing gloves, rotate locknut clockwise, by hand, as tight as possible until adapter sleeve grips and does not spin on the shaft or move axially. If needed, tap on locknut outer diameter while rotating locknut to assist with this step. Scribe the line on the locknut above the adapter sleeve slot.

5) Lock bearing to shaft by rotating locknut, with a spanner wrench or brass bar & hammer, clockwise by amount shown in Table 3. NOTE: The use of air chisels is not recommended.

6) Center housing & mounting bolts over mounting holes & tighten bolts to proper torque (Table 4). Tighten locknut setscrew until 3/32” Allen key bends (25 in-lbs).

7) Repeat above steps for mounting 2nd housing. Do not tighten mounting bolts on 2nd housing until second bearing has been completely locked to the shaft. Bolts must fit freely between housing & mounting surface. If the mounting bolts do not fit freely, loosen mounting bolts on both housings & center both units. If the bolts still will not fit freely, remove one unit from the shaft, reposition housing, & reinstall.

WARNING
Because of the possible danger to person(s) or property from accidents which may result from the improper use of products, it is important that the correct procedure be followed. Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance, and operating procedures must be observed. The instructions in the instruction manuals must be followed. Inspections should be made as necessary to ensure safe operation under prevailing conditions. Proper guards and other suitable safety devices or procedures as may be desirable or as may be specified in safety codes should be provided, and are neither provided by Baldor Electric Company nor are the responsibility of Baldor Electric Company. This unit and its associated equipment must be installed, adjusted, and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and potential hazards involved. When risk to persons or property may be involved, a holding device or shear bars must be an integral part of the driven equipment.
**All Flange Housings**

**WARNING:** Special attention to the installation procedure for flange bearings is necessary to maintain the proper internal clearance & achieve maximum life. The installation of the first flange differs from the installation of the second flange.

(See step 1 Assemble Adapter & Bearing page 1)

2) During installation it is best practice to remove all of the weight from the bearing via slings or jacks. However, if it is difficult to remove all weight then insure the dead weight on the bearing during installation does not exceed the values listed in Table 2.

3) Slide the FIRST unit into position onto the shaft. If the bearing will not slip onto the shaft or more axially, turn locknut counter clockwise to expand adapter sleeve.

4) (Using gloves) rotate locknut clockwise by hand until it is tight & adapter sleeve grips & does not spin on the shaft. This is the starting point. Scribe a line on the locknut above the adapter sleeve slot.

(If needed, tap on locknut outer diameter while turning locknut to assist with this step.)

5) Lock bearing to shaft by rotating locknut, with a spanner wrench or brass bar & hammer, clockwise by amount shown in Table 2.

   NOTE: The use of air chisels is not recommended.

6) Tighten locknut setscrew until 3/32” Allen key bends (or 25 in-lbs). Tighten housing bolts to proper torque (Table 3).

7) Slide the SECOND flange onto the shaft and hand tighten as in step 4 but leave 1/16” minimum gap between the flange housing & the mounting surface. See picture to the right.

8) It is important to note that the 1/16” minimum gap between the flange housing and the mounting surface must be maintained while getting the bearing hand tight to the shaft. Wearing gloves, rotate the locknut clockwise, by hand, until adapter sleeve grips and does not spin or move axially on the shaft. If needed, tap on the locknut outer diameter while turning the locknut to assist with this step. At this point you should have difficulty in rotating the locknut by hand and you should not be able to move the bearing axially along the shaft by hand. If the bearing can be moved axially along the shaft by hand then continue rotating the nut gradually until it grips the shaft. Scribe a line on the locknut above the adapter sleeve slot.

9) Insert housing bolts & pull the housing flush with mounting surface by alternately tightening the bolts to the proper torque (Table 4).

10) Lock bearing to shaft by rotating locknut, with a spanner wrench or drift pin & hammer, clockwise by amount shown in Table 3. Tighten locknut setscrew until 3/32” Allen key bends (25 in-lbs).

11) Rotate the shaft by hand, no binding or excessive drag should be felt. If excessive drag is felt, loosen the second bearing & reinstall starting at step 8.

**Dismounting All Units**

1) Remove all weight from the bearing via slings or jacks & secure the shaft from rotation.

2) **LOOSEN THE HOUSING MOUNTING BOLTS & COMPLETELY REMOVE SETSCREW IN THE LOCKNUT.**

3) Rotate locknut counter clockwise with spanner wrench or drift pin & hammer until bearing is free.

**Lubrication:** (Use compatible Lithium base NGLI #2 grease & see Table 5)

The Dodge Grip-Tight bearing has been greased from the factory & is shaft ready. When re-lubricating slowly add grease until fresh grease is seen purging past the seal. In the higher speed ranges, excess grease may cause temporary bearing overheating. The amount of grease a bearing will take for a specific high speed application is best determined by experience. When establishing a re-lubrication schedule, note that a small amount of grease at frequent intervals is preferred to a large amount of grease at infrequent intervals. Lubrication recommendations are intended for standard products applied in general operating conditions. For modified products, high temperature applications, and other anomalous applications contact product engineering at 864-284-5700

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**Table 5 - Suggested Lubrication Intervals in Weeks**

<table>
<thead>
<tr>
<th>RPM</th>
<th>Hours Run Per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 250 RPM</td>
<td>8 12 12 10 7 5 4 3 3</td>
</tr>
<tr>
<td>251 to 500 RPM</td>
<td>16 12 7 5 4 2 2 1 1</td>
</tr>
<tr>
<td>501 to 750 RPM</td>
<td>24 10 5 3 2 1 1 1 1</td>
</tr>
<tr>
<td>751 to 1000 RPM</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>1001 to 1500 RPM</td>
<td>1</td>
</tr>
<tr>
<td>1501 to 2000 RPM</td>
<td>1</td>
</tr>
<tr>
<td>2001 to 2500 RPM</td>
<td>1</td>
</tr>
<tr>
<td>2500 to Max RPM</td>
<td>1</td>
</tr>
</tbody>
</table>
Parts Replacement Manual

For

HYDROIL™
TORQUE-ARM™
Speed Reducers
Taper Bushed
For Char-Lynn H, S, T and 2000 Series
6B Spline Motors

SIZES: HXT325A
HXT425A/HXT415A
HXT525B

WARNING: Because of the possible danger to persons(s) or property from accidents which may result from the improper use of products, it is important that correct procedures be followed: Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance and operation procedures must be observed. The instructions in the instruction manuals must be followed. Inspections should be made as necessary to assure safe operation under prevailing conditions. Proper guards and other suitable safety devices or procedures as may be desirable or as may be specified in safety codes should be provided, and are neither provided by Baldor Electric Company nor are the responsibility of Baldor Electric Company. This unit and its associated equipment must be installed, adjusted and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and the potential hazards involved. When risk to persons or property may be involved, a holding device must be an integral part of the driven equipment beyond the speed reducer output shaft.
REDUCER INSTALLATION

1. On sizes HXT3A, HXT4A, and HXT5B, replace the plastic plug that protects the threaded hole in the reducer housing with the eyebolt supplied with the reducer.

2. Determine the running position of the reducer (see Fig. 1). Note that the reducer is supplied with either 4 or 7 plugs; 4 around the sides for horizontal installations and 1 on each face for vertical installations. These plugs must be arranged relative to the running positions as follows:

   **Horizontal Installations**—Install the magnetic drain plug in the hole closest to the bottom of the reducer. Throw away the tape that covers the filler/ventilation plug in shipment and install plug in topmost hole. Of the 3 remaining plugs on the sides of the reducer, the lowest one is the minimum oil level plug.

   **Vertical Installations**—Install the magnetic drain plug in the hole closest to the bottom of the reducer. Throw away the tape that covers the filler/ventilation plug in shipment and install plug in topmost hole. Of the 3 remaining plugs on the sides of the reducer, the lowest one is the minimum oil level plug.


4. Install torque arm and adapter plates using the long reducer bolts. The bolts may be shifted to any of the holes on the input end of the reducer.

5. Install torque arm fulcrum on a rigid support so that the torque arm will be approximately at right angles to the center line through the driven shaft and the torque arm anchor screw.

CHAR-LYNN H, S, T AND 2000 SERIES
6B SPLINE MOTOR INSTALLATION

Consult the local Char-Lynn Motor dealer for hydraulic motor information.

REDUCER LUBRICATION

**CAUTION**

Unit is shipped without oil. Add proper amount of recommended lubricant before operating. Failure to observe these precautions could result in damage to, or destruction of, the equipment.

Use a high grade petroleum base, rust and oxidation inhibited (R & O) gear oil—see tables. Follow instructions on reducer nameplate, warning tags, and in the installation manual.

Under average industrial operating conditions, the lubricant should be changed every 2500 hours of operation or every 6 months, whichever occurs first. Drain reducer and flush with kerosene, clean magnetic drain plug and refill to proper level with new lubricant.

**CAUTION**

Too much oil will cause overheating and too little will result in gear failure. Check oil level regularly. Failure to observe these precautions could result in damage to or destruction of the equipment.

Under extreme operating conditions, such as rapid rise and fall of temperature, dust, dirt, chemical particles, chemical fumes, or oil sump temperatures above 200°F, the oil should be changed every 1 to 3 months depending on severity of conditions.
GUIDELINES FOR TORQUE-ARM REDUCER LONG-TERM STORAGE

During periods of long storage, or when waiting for delivery or installation of other equipment, special care should be taken to protect a gear reducer to have it ready to be in the best condition when placed into service.

By taking special precautions, problems such as seal leakage and reducer failure due to the lack of lubrication, improper lubrication quantity, or contamination can be avoided. The following precautions will protect gear reducers during periods of extended storage:

Preparation
1. Drain the oil from the unit. Add a vapor phase corrosion inhibiting oil (VCI-105 oil by Daubert Chemical Co.) in accordance with Table 3.
2. Seal the unit air tight. Replace the vent plug with a standard pipe plug and wire the vent to the unit.
3. Cover the shaft extension with a waxy rust preventative compound that will keep oxygen away from the bare metal (Non-Rust X-110 by Daubert Chemical Co.).
4. The instruction manuals and lubrication tags are paper and must be kept dry. Either remove these documents and store them inside or cover the unit with a durable waterproof cover which can keep moisture away.

See page 8 for lubricant viscosity classification equivalents.

Special lubricants may be required for food and drug industry applications where contact with the product being manufactured may occur. Consult a lubrication manufacturer’s representative for his recommendation.

When Placing the Reducer into Service
1. Assemble the vent plug into the proper hole.
2. Clean the shaft extensions with a suitable solvent.
3. Fill the unit to the proper oil level using a recommended lubricant. The VCI oil will not affect the new lubricant.
4. Follow the installation instructions provided in this manual.

Table 4 – Quantities of VCI #105 Oil

<table>
<thead>
<tr>
<th>Case Size</th>
<th>Quarts or Liters</th>
</tr>
</thead>
<tbody>
<tr>
<td>HXT3A</td>
<td>.1</td>
</tr>
<tr>
<td>HXT4A</td>
<td>.2</td>
</tr>
<tr>
<td>HXT5B</td>
<td>.3</td>
</tr>
</tbody>
</table>

VCI #105 & #10 are interchangeable.
VCI #105 is more readily available.

NOTE: Pour point of lubricant selected should be at least 10°F lower than expected minimum ambient starting temperature.

Minimum Oil Recommendations for Average Operating Conditions

Table 2 – Lubrication Recommendations – ISO Grades for Ambient Temperatures of 15º to 60º

<table>
<thead>
<tr>
<th>Output RPM</th>
<th>Reducer Size</th>
<th>ISO Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>301–400</td>
<td>HXT3A</td>
<td>S-10</td>
</tr>
<tr>
<td>201–300</td>
<td>HXT4A</td>
<td>S-20</td>
</tr>
<tr>
<td>151–200</td>
<td>HXT5A</td>
<td>S-30</td>
</tr>
<tr>
<td>126–150</td>
<td>HXT6A</td>
<td>S-40</td>
</tr>
<tr>
<td>101–125</td>
<td>HXT7A</td>
<td>S-50</td>
</tr>
<tr>
<td>81–100</td>
<td>HXT8A</td>
<td>S-60</td>
</tr>
<tr>
<td>61–80</td>
<td>HXT9A</td>
<td>S-70</td>
</tr>
<tr>
<td>41–60</td>
<td>HXT10A</td>
<td>S-80</td>
</tr>
<tr>
<td>11–40</td>
<td>HXT11A</td>
<td>S-90</td>
</tr>
</tbody>
</table>

Above 125ºF use Mobil SHC 634.
20ºF to -22ºF use Mobil SHC 627.
Below – 23ºF call application engineering.

Do not use oils containing slippery additives such as graphite or molybdenum disulphide in the reducer when backstop is used. These additives will destroy sprag action. Failure to observe these precautions could result in damage to, or destruction of, the equipment.

Table 3 – Lubrication Recommendations – ISO Grades for Ambient Temperatures of 50º to 125º

<table>
<thead>
<tr>
<th>Output RPM</th>
<th>Reducer Size</th>
<th>ISO Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>301–400</td>
<td>HXT3A</td>
<td>S-10</td>
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<tr>
<td>201–300</td>
<td>HXT4A</td>
<td>S-20</td>
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<td>151–200</td>
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<td>S-30</td>
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<td>126–150</td>
<td>HXT6A</td>
<td>S-40</td>
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<td>101–125</td>
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<td>61–80</td>
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<td>41–60</td>
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<tr>
<td>11–40</td>
<td>HXT11A</td>
<td>S-90</td>
</tr>
</tbody>
</table>

See page 8 for lubricant viscosity classification equivalents.

Special lubricants may be required for food and drug industry applications where contact with the product being manufactured may occur. Consult a lubrication manufacturer’s representative for his recommendation.

When Placing the Reducer into Service
1. Assemble the vent plug into the proper hole.
2. Clean the shaft extensions with a suitable solvent.
3. Fill the unit to the proper oil level using a recommended lubricant. The VCI oil will not affect the new lubricant.
4. Follow the installation instructions provided in this manual.

Table 4 – Quantities of VCI #105 Oil

<table>
<thead>
<tr>
<th>Case Size</th>
<th>Quarts or Liters</th>
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<tbody>
<tr>
<td>HXT3A</td>
<td>.1</td>
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<tr>
<td>HXT4A</td>
<td>.2</td>
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<tr>
<td>HXT5B</td>
<td>.3</td>
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</tbody>
</table>

VCI #105 & #10 are interchangeable.
VCI #105 is more readily available.

Table 1 – Oil Volumes

<table>
<thead>
<tr>
<th>Reducer Size</th>
<th>Volume of Oil Required to Fill Reducer to Oil Level Plug</th>
</tr>
</thead>
<tbody>
<tr>
<td>HXT315A †</td>
<td>Fluid (Approx) 48 1½ 1.42 24 2½ 3.79</td>
</tr>
<tr>
<td>HXT325A †</td>
<td>60 1½ 1.77 72 2½ 2.13</td>
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<tr>
<td>HXT515B †</td>
<td>104 3½ 3.08 128 4 3.79</td>
</tr>
<tr>
<td>HXT525B †</td>
<td>† Refer to Fig. 1 on page 2 for mounting positions.</td>
</tr>
</tbody>
</table>

↑ U.S. Measure: 1 quart = 32 fluid ounces = .94646 liters.
Note: If reducer position is to vary from those shown in Figure 1 either more or less oil may be required. Consult factory.
Note: The two-digit numbers are for reference only. Order parts by the six-digit numbers in the Parts List. Each six-digit number is a complete identification of the part or assembly.
<table>
<thead>
<tr>
<th>Reference</th>
<th>Name of Part</th>
<th>Req'd</th>
<th>HXT3A</th>
<th>Part No.</th>
<th>HXT4A</th>
<th>Part No.</th>
<th>HXT5B</th>
<th>Part No.</th>
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<th>Part No.</th>
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</tbody>
</table>

- Includes parts listed immediately below marked *.
- Housing assembly also includes a two-piece housing.
- Bushing assemblies include 2 bushings.
- Parts marked ** make up the assemblies under which they are listed.
- Not shown on drawing.
- See last paragraph under "ORDERING PARTS."
- Recommended spare parts.
- 5 Required for HXT5B, 4 required for HXT3A and HXT4A.
REPLACEMENT OF PARTS

A DODGE TORQUE-ARM Speed Reducer can be disassembled and reassembled by careful attention to the instructions following, using tools normally found in a maintenance department.

Cleanliness is very important to prevent the introduction of dirt into the bearings and other parts of the reducer. A tank of clean solvent, an arbor press, and equipment for heating bearings and gears should be available for shrinking these parts on shafts.

Our factory is prepared to repair reducers for customers who do not have proper facilities or who for any reason desire factory service.

The oil seals are of the rubbing type and considerable care should be used during disassembly and reassembly to avoid damage to the surface on which the seals rub.

The keyseat in the input shaft as well as any sharp edges on the output hub should be covered with tape or paper before disassembly or reassembly. Also be careful to remove any burrs or nicks on surfaces of the input shaft or output hub before disassembly or reassembly.

ORDERING PARTS:
When ordering parts for reducer, specify reducer size number, reducer serial number, part name, part number and quantity.

It is strongly recommended that when a pinion or gear is replaced, the mating gear or pinion be replaced also.

If the large gear on the output hub must be replaced, it is recommended that an output hub assembly with a gear assembled on the hub be ordered to secure undamaged surfaces on the output hub where the oil seals rub. However, if it is desired to use the old output hub, press the gear and bearing off and examine the rubbing surface under the oil seal carefully for possible scratching or other damage resulting from the pressing operation. To prevent oil leakage at the shaft oil seals the smooth surface of the output hub must not be damaged.

If any parts must be pressed from a shaft or from the output hub, this should be done before ordering parts to make sure that none of the bearings or other parts are damaged in removal. Do not press against outer race of any bearing.

Because old shaft oil seals may be damaged in disassembly it is advisable to order replacements for these parts.

If replacing a bearing or a shaft, it is advisable to order a set of shims for adjustment of bearings on the shaft assembly. If replacing a housing, a set of shims should be ordered for each shaft assembly because the adjustment of the bearings on each shaft assembly is affected.

REMOVING TAPER BUSHEd REDUCER FROM SHAFT:

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Failure to observe these precautions could result in bodily injury.</td>
</tr>
</tbody>
</table>

### WARNING

External loads may cause machine movement. Block machine before removing any drive train components. Failure to observe these precautions could result in bodily injury.

1. Remove bushing screws.
2. Place the screws in the threaded holes provided in the bushing flanges. Tighten the screws alternately and evenly until the bushings are free on the shaft. For ease of tightening screws make sure screw threads and threaded holes in bushing flanges are clean.
3. Remove the outside bushing, the reducer and then the inboard bushing.

DISASSEMBLY:
1. Remove all bolts from housing. Drive back hollow dowel pins on either side of housing. Remove back-up plates and snap rings on the output hub on taper-bushed reducers. Open housing evenly to prevent damage to parts inside.
2. Lift shaft, gear and bearing assemblies from housing.
3. Remove seals, seal carriers and bearing cups from housing.

REASSEMBLY:
2. Countershaft Assembly: Heat gear to 325° to 350°F and bearing cones to 270° to 290°F for shrinking onto shaft.
3. Input Shaft Assembly: Shaft and pinion are integral. Heat bearing cones to 270° to 290°F for shrinking onto shaft.
4. Drive the dowel pins back in position in the right-hand housing half.
5. Install countershaft cover in right-hand housing half. Place housing half on blocks to allow for protruding End of output hub. Install bearing cups in right-hand housing half making sure they are properly seated.
6. Mesh output hub gear and small countershaft gear together and set in place in housing. Set input shaft assembly in place in the housing. Make sure bearing rollers (cones) are properly seated in their cups. Set bearing cups for left-hand housing half in place on their rollers.
7. Clean housing flange surfaces on both halves, making sure not to nick or scratch flange face. Place a new bead of gasket eliminator on flange face and spread evenly over entire flange leaving no bare spots. Place other housing half into position and tap with a soft hammer (rawhide not lead hammer) until housing bolts can be used or draw housing halves together. Torque housing bolts per torque values listed below.
8. Place output hub seal carrier in position without slims and install two carrier screws diametrically opposed. Torque each screw to 25 lb.-ins. Rotate the output hub to roll in the bearings and then torque each screw once to 50 lb.-ins. **Do not retorque screws.** Again turn output hub to roll in the bearings. With a feeler or taper gage, measure the gap between the housing and the carrier, clockwise from and next to each screw. To determine the required shim thickness, take the average of the two feeler gage readings. Remove carrier and install the required shims. Note: Total shim thickness per carrier should not include more than .009” plastic shims and each plastic shim should be inserted between two metal shims. Place a \( \frac{1}{8} “ \) diameter bead of Dow Coming RTV732 sealant on the face around the I.D. of the end shim (sealant is to be between reducer housing and shim) and install carrier on reducer housing. Torque carrier bolts to value shown in Table 5. Output hub should have an axial end play of .001” to .003”.

9. Adjust the countershaft bearings using the same method as in step 8 above. The axial end play should be .001” to .003”.

10. Again using the same procedure as in step 8, adjust the input shaft bearings, except the axial end play should be .002” to .004”.

11. Apply sealant to the input shaft cover gasket and install input shaft cover in right-hand housing half. Install input and output seals. Extreme care should be used when installing seals to avoid damage due to contact with sharp edges on the input shaft or output hub. This danger of damage and consequent oil leakage can be decreased by covering all sharp edges with tape or paper prior to seal installation. Fill cavity between seal lips with grease. Seals should be pressed or tapped with a soft hammer evenly into place in the carrier applying pressure only on the outer edge of the seals. A slight oil leakage at the seals may be evident during initial running in but should disappear unless seals have been damaged.

12. Install bushing back-up plate and snap rings.

---

**Table 5 – Bolt Tightening Torque Values**

<table>
<thead>
<tr>
<th>Reducer Size</th>
<th>Housing Bolts (in.-lbs.)</th>
<th>Seal Carrier Bolts (in.-lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HXT309A</td>
<td>600</td>
<td>204</td>
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<tr>
<td>HXT315A</td>
<td>600</td>
<td>360</td>
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<tr>
<td>HXT325A</td>
<td>900</td>
<td>360</td>
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**Table 7 – Manufacturers’ Part Numbers For Replacement Countershaft Bearings**

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<th>Countershaft Bearing Input Side</th>
<th>Countershaft Bearing Adapter Side</th>
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<td>Timken Part No.</td>
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<td>HXT315A</td>
<td>402273</td>
<td>15102</td>
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<td>HXT325A</td>
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<td>15245</td>
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<tr>
<td>HXT415A</td>
<td>402000</td>
<td>M86649</td>
</tr>
<tr>
<td>HXT425A</td>
<td>403000</td>
<td>M86610</td>
</tr>
<tr>
<td>HXT515B</td>
<td>402203</td>
<td>2789</td>
</tr>
<tr>
<td>HXT525B</td>
<td>403027</td>
<td>2720</td>
</tr>
</tbody>
</table>

**Table 8 – Manufacturers’ Part Numbers For Replacement Input Shaft Bearings**

<table>
<thead>
<tr>
<th>TORQUE-ARM Reducer</th>
<th>Input Bearing Input Side</th>
<th>Input Bearing Adapter Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>DODGE Part No.</td>
<td>Timken Part No.</td>
</tr>
<tr>
<td>HXT315A</td>
<td>402204</td>
<td>LM48548A</td>
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<tr>
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<td>28579</td>
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<td>HXT525B</td>
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---
Viscosity Classification Equivalents

KINEMATIC VISCOSITIES

<table>
<thead>
<tr>
<th>cSt/40°C</th>
<th>cSt/100°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>70</td>
</tr>
<tr>
<td>1000</td>
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</tbody>
</table>

ISO VG

AGMA GRADES

SAE GRADES GEAR OILS

SAYBOLT VISCOSITIES

<table>
<thead>
<tr>
<th>SUS/100°F</th>
<th>1000</th>
<th>8000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>50</td>
<td>300</td>
</tr>
<tr>
<td>680</td>
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<td>5</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
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</tr>
</tbody>
</table>

Viscosities can be related horizontally only.
Viscosities based on 96 VI single grade oils.
ISO are specified at 40°C.
AGMA are specified at 40°C.
SAE 75W, 80W, 85W and 5W & 10W specified at low temperature. Equivalent viscosities for 100 and 210°F are shown.
SAE 90 to 250 and 20 to 50 specified at 100°C.
Il moto viene trasmesso dall'albero centrale dell'accoppiatore agli alberi laterali che comandano le pompe.
Il senso di rotazione delle uscite è contrario a quello dell'albero di entrata.
Il collegamento con le pompe viene effettuato a mezzo di manicotti scanalati.

**INSTALLAZIONE**

La posizione di lavoro dell'accoppiatore è quella indicata a catalogo. Per posizioni diverse interpellare il servizio tecnico Technodrive.

- **Staffaggio**
  
  Nel caso di collegamento diretto sulla campana coprivolano del motore diesel, l'accoppiatore deve essere staffato rigidamente allo stesso basamento a cui è staffato il motore. Nel caso di montaggio indipendente di un accoppiatore con frizione "BDS 145" o "BDS 290" occorre staffare, oltre che sui piani laterali dell'accoppiatore, anche sul due piani laterali della frizione. Per i modelli con frizione "BDS 2200" e "BDS 3300" occorre staffare sui piani laterali dell'accoppiatore e sul centraggio Ø 205 mm lato albero di entrata frizione.
  
  Montaggio pompe: l'accoppiatore viene fornito con i supporti pomma montati sulle prese. Qualora si dovesse smontare una presa pomma per sostituirla con altra, occorre fare attenzione che il nuovo supporto non carichi assialmente i cuscinetti (tra anello esterno del cuscinetto e supporto pomma deve esserci un gioco di 0,10 ÷ 0,20 mm).

I manicotti di collegamento delle pompe devono essere montati con i relativi anelli di ferma e con vite e rosetta di fissaggio in testa all'albero pomma, facendo attenzione che non vengano indotti carichi assiali sugli alberi a causa di errata posizione di un anello di ferma.

La tenuta olio è realizzata sul supporto pomma con anello OR o con guarnizione.

- L'accoppiatore viene fornito senza olio.
  
  Prima della messa in funzione procedere al riempimento sino al massimo indicato sull'asta di livello. Negli accoppiatori provvisti di impianto di raffreddamento occorre riferire il livello olio dopo aver avviato l'accoppiatore e riempito lo scambiatore e tubazioni.

  Nel caso di accoppiatori provvisti di impianto di raffreddamento assicurarsi che il senso di rotazione in entrata all'accoppiatore sia quello previsto per la pompa di circolazione dell'olio; in caso contrario invertire i collegamenti con la pompa.

  Assicurarsi che la temperatura dell'olio non superi, in esercizio, i 105° C.

  Qualora tale valore venga superato occorre prevedere un raffreddamento più efficace dell'accoppiatore.

  L'albero di entrata degli accoppiatori, sia in versione "B" che in versione "BDS", non accetta carichi radiali o assiali, è quindi sconsigliato l'azionamento con puleggia.

  Gli accoppiatori con frizione "BDS" devono essere azionati tramite un giunto che non induca sforzi radiali o assiali sull'albero.

  Il montaggio del semigiunto sull'albero della frizione deve essere effettuato a caldo.

  Il semigiunto deve avere una lunghezza utile del foro superiore a quella dell'albero e deve essere fissato assialmente con vite e rondella in testa all'albero.

  Curare l'allineamento nel collegamento all'albero di entrata della frizione.

- Per il montaggio degli accoppiatori con frizione "BD" procedere come segue:
  
  a) la frizione viene fornita in posizione innestata e con leva di comando smontata; non disinnestare sino a quando non si è ultimato il montaggio sul motore.
  
  b) Posizionare il cuscinetto pilota sull'alloggiamento del volano. Il cuscinetto pilota deve essere a doppio schermo ingrassato a vita.
  
  Il cuscinetto pilota è di solito montato con interferenza sull'alloggiamento volano e con gioco sull'albero frizione. Qualora non ci fosse interferenza sull'alloggiamento volano occorre bloccare il cuscinetto con "loctite" (o simile) sull'albero esterno per evitare lo sfalcamento.
  
  c) Posizionare la corona dentata sul centraggio del volano e stringere le viti di fissaggio.
  
  d) Posizionare il gruppo accoppiatore sul motore facendo attenzione ad inserire i denti del disco frizione nelle cave della corona dentata senza danneggiarli e ad infilare il cuscinetto pilota con l'estremità dell'albero facendo scorrere la frizione verso il motore sino a quanto possibile.
  
  e) Montare le viti di fissaggio della campana serrandole gradualmente a croce.
  
  f) Posizionare la leva di comando e disinnestare la frizione verificando che le uscite dell'accoppiatore ruotino liberamente.

**USO**

Accoppiatori con frizione "BD" o "BDS"

La frizione deve essere innestata unicamente con il motore al minimo o comunque non al disopra dei 1000 giri/1'.

L'innesto deve essere effettuato velocemente. Non fermarsi con la leva in posizione intermedia.

Le stesse norme valgono per il disinnesto.
MANUTENZIONE

- Usare olio per ingranaggi con additivi EP, indice di viscosità minimo 95.
  Il tipo di olio può essere selezionato, in funzione della temperatura ambiente, sulla tabella A.
- Effettuare il primo cambio olio dopo 50 ore di funzionamento; i successivi ogni 1000 ore di funzionamento (in ogni caso non oltre i 12 mesi).
- Controllare periodicamente il livello olio.
- Assicurarsi che la temperatura dell’olio non superi, in esercizio, i 105°C.
- Per la lubrificazione delle frizioni usare grasso al litio di consistenza NLGI-2. I punti di lubrificazione, con riferimento alle figure 5-6-7, sono i seguenti:
  a) albero di comando (A25, Fig. 5): ingrassare ogni 300 ore.
  b) Collare di comando (A11, Fig. 5): ingrassare ogni 300 ore sulle frizioni “BD 145”, “BD 290”, “BDS 145”, “BDS 290”.
  c) Levette di comando (A43) (solo su “BD 2200”, “BD 3300”, “BDS 2200”, “BDS 3300”): ingrassare ogni 600 ore.
  d) Cuscinetti in entrata per “BDS 2200”, “BDS 3300”, (C12, Fig. 7): ingrassare ogni 100 ore; l’ingrassatore è sull’esterno della campana (C11, Fig. 7).
- Regolazione della frizione (accoppiatori “AM... BD...”, “AM... BDS...”).
  La regolazione della frizione è fondamentale per ottenere una durata soddisfacente della slessa ed è responsabilità dell’operatore verificare periodicamente.

RICAMBI

Per ordinare i ricambi specificare il tipo di accoppiatore, il rapporto, il numero di serie, il numero di riferimento dell’esploso e la quantità.

GENERAL INFORMATION

- The motion is transmitted by the pump drive central shaft to the lateral shafts which operate the pumps.
- The rotation direction of the outputs is opposite to that of the input shaft.
- Coupling with the pumps is done by means of splined sleeves.

INSTALLATION

- The working position of the pump drive is as shown on the catalogue. For a different position call upon Technodrive technical service.
- Mounting on a bracket system:
  In case of direct connection to the flywheel housing of the diesel engine, the pump drive must be firmly mounted with a bracket system to the base to which the engine is also bracketed.
  When a pump drive is independently mounted with a clutch “BDS 145” or “BDS 290” it is necessary to fit bracket supports on the pump drive sides and also on the clutch sides.
  For the models with clutch “BDS 2200” and “BDS 3300” bracketing should be done onto the lateral pump drive surfaces and on the match diam. 205 mm on the input side of the clutch.
- Pump assembly:
  The pump drive is supplied with the pump supports already assembled onto the pump drive outputs.
  If a pump support must be dismantled for replacement, particular attention should be given to the new support as it must not axially load the bearings (there must be a clearance of 0.10 + 0.20 mm between the bearing external ring and the pump support).
  The connecting sleeves of the pumps must be assembled with their retaining rings, or with the fixing screw and washer, on the pump shaft top; check that axial loads are not produced on the shafts caused by incorrect positioning of a retaining ring.
  The oil sealing is guaranteed on the pump holder by an O-ring or a gasket.
- The pump drive is supplied without oil.
  Before start up, fill it up to the maximum level indicated by the oil dipstick.
  For the pump drives equipped with a cooling system, check the oil level again after the pump drive has been started and the exchanger and pipings have been filled.
  For the pump drives equipped with a cooling system, check that the rotation direction at the pump drive input is as expected for the oil circulating pump; if not, invert the wirings to the pump.
  Ensure that the oil temperature, when operating, is no higher than 105°C.
  If the temperature is higher, select a more efficient cooling system for the pump drive.
- The input shaft of the pump drive, both versions “B” and “BDS”, will not bear radial or axial loads. For this reason the pulley drive should not be used.
- The pump drive with clutch “BDS” must be driven by a coupling not producing radial or axial load on the shaft.
The coupling flange is to be heated when being mounted on the clutch shaft.

The useful length of the coupling flange hole must be bigger than the useful length of the clutch shaft; the coupling flange must be axially fixed by a screw and a washer on the shaft top.

Carefully align when connecting to the input shaft of the clutch.

For the assembly of the pump drives with "BD" clutch proceed as follows:

a) The clutch is supplied in engaged position and the operating lever is not mounted on; do not disengage until the assembly to the engine is finished.

b) Place the pilot bearing on the engine flywheel bore. The pilot bearing must be double screen type and greased for life-time.

The pilot bearing is usually mounted with interference on the flywheel housing and clearance on the clutch shaft.

If there is no interference on the flywheel housing, the bearing should be blocked with "loctite" sealant (or similar product) on the external ring to prevent it slipping off.

c) Place the crown wheel on the flywheel centering and tighten the fixing screws.

d) Place the pump drive set on the engine, paying attention when inserting the teeth of the clutch disk in the crown wheel slots, without damaging them, and when inserting the pilot bearing with the shaft making the clutch slip towards the engine as much as possible.

e) Fit the fixing screws of the housing and gradually cross-tighten them.

f) Place into right position the operating lever and disengage the clutch by checking that the pump drive outputs rotate freely.

- Pump drives with clutch "BD" or "BDS".

The clutch must be engaged only with the engine idling or, however, not more than 1000 rpm.

The engagement must be quickly effected.

Do not hesitate with the operating lever in an intermediate position.

The same recommendations must be applied for disengagement.

MAINTENANCE

- The pump drives are supplied without oil.

  Before their start up fill them up to the maximum level indicated by the oil dipstick.

  Use oil for gears with EP additives, minimum viscosity index 95.

  Oil type can be chosen, depending on the ambient temperature, on Table A.

  Effect the first oil replacement after 50 working hours; next ones each 1000 working hours (or, at the longest, every 12 months).

  Periodically check the oil level.

- Ensure that the oil temperature, when working, is not higher than 105°C.

- For clutches lubrication use lithium grease with consistency NLGI-2.

Lubrication points, referred to Fig. 5-6-7, are the following:

a) Cross shaft (A25, Fig. 5): lubricate each 300 hours.

b) Drive sleeve (A1 1, Fig.5): lubricate each 300 hours on clutches "BD 145", "BD 290", "BDS 145", "BDS 290". On these clutches the grease nipple (A11) is placed on the drive sleeve (A10) and is possible to be accessed only by taking the inspection cover (A19) off.

On clutches "BD 2200", "BD 3300", "BDS 2200", "BDS 3300": the grease nipple (A11) is located on the outside of the housing (A16) and greasing is required each 100 working hours.

c) Control levers (A43) (only on "BD 2200", "BD 3300", "BDS 2200", "BDS 3300"): the grease nipple (A11) is located on the outside of the housing (C11, Fig. 7).

d) Input shaft bearings for "BDS 2200", "BDS 3300", (C12, Fig. 7): lubricate each 100 working hours; the grease nipple is on the outside of the housing (C11, Fig. 7).

Clutch adjustment (pump drives "AM...BD...", "AM...BDS...").

A correct adjustment of the clutch is of fundamental importance to obtain a satisfactory duration of the same and it is the responsibility of the operator to check it periodically.

The clutch adjustment (or checking) must only be effected with the engine stopped.

Referring to Fig. 1, Fig. 5:

take the inspection cover (A19) off and, with the clutch engaged, measure the distance A (Fig. 1) using a thickness gauge.

If such a distance is more than 1.3 mm it is necessary to adjust the clutch, by resetting distance A to 0.5 ± 0.7 mm in the following way: disengage the clutch by pressing the lever (A13) opposite to the engine, using a screwdriver move back the pin (A36), rotate the adjusting device (A34) clockwise, strikng it with a hammer and a soft metal rod, for a number of lock grooves sufficient to reset the correct adjustment of the clutch.

SPARE PARTS

When ordering spare parts specify pump drive model, ratio, serial number, reference number indicated on the exploded view and desired quantity.

GENERALITES

- Le mouvement est transmis par l'arbre central de la boîte aux arbres latéraux qui commandent les pompes.

- Le sens de rotation des sorties est opposé à celui de l'arbre d'entrée.

- Le raccordement avec les pompes est réalisé au moyen des manchons cannelés.

INSTALLATION

- La position de travail de la boîte est celle indiquée dans le catalogue.

  Pour des positions autres s'adresser au Service Technique TECHNO DRIVE.
- **Bridage**
  Dans le cas d'accouplement direct sur la cloche couvre-volant du moteur diesel, la boîte doit être bridée solidement au même soubassement que le moteur.
  Dans le cas de montage indépendant d'une boîte avec embrayage type "BDS 145" - "BDS 290", il faut brider non seulement sur les plans latéraux de la boîte mais aussi sur les plans latéraux de l'embrayage.
  Pour les modèles avec embrayage type "BDS 2200" et "BDS 3300", il faut brider sur les plans latéraux de la boîte et sur le centrage Ø 205mm du coté de l'arbre d'entrée de l'embrayage.

- **Montage de pompes:**
  La boîte est fournie avec les supports de pompe montés sur les prises.
  En cas de nécessité de démontage d'une prise de pompe pour la remplacer par une autre, il faut faire attention à ce que le nouveau support ne charge pas les roulements en direction axiale (entre la bague externe du roulement et le support de la pompe, il doit y avoir un jeu de 0,10 + 0,20mm).
  Les manchons de raccordement des pompes doivent être montés avec leurs bagues d'arrêt ou avec vis et rondelles de fixation en tête de l'arbre de pompe, en faisant attention à ce qu'il n'y ait pas création de charges axiales sur les arbes provoquées par la position erronée d'une bague d'arrêt.
  La tenue de l'huile est réalisée sur le support de la pompe à l'aide d'un joint torique ou d'une garniture.
  La boîte est livrée sans huile.
  Avant la mise en service, procéder au remplissage de l'huile jusqu'au niveau maximum indiqué sur la jauge.
  Pour les boîtes équipées de système de refroidissement, il faut révéler le niveau de l'huile après avoir fait démarrer la boîte et rempli l'échangeur et les conduites.
  - Dans le cas de boîtes équipées de systèmes de refroidissement, s'assurer que le sens de rotation à l'entrée de la boîte soit le même que celui prévu pour la pompe de circulation d'huile; dans le cas contraire inverser les raccordements de la pompe.
  S'assurer que la température en exercice ne dépasse pas les 105°C.
  Si cette limite devait être dépassée, il faut prévoir un système de refroidissement plus efficace de la boîte.
  - L'arbre d’entrée des boîtes dans la version "B" tout comme dans la version "BDS" n'accepte pas de charges radiales ou axiales.
  L’entraînement au moyen de poulies est donc déconseillé.
  - Les boîtes avec embrayage "BDS" doivent être actionnées au moyen d'un accouplement qui ne provoque pas de forces radiales ou axiales sur l'arbre.
  Le montage du demi-accouplement sur l'arbre de l'embrayage doit être effectué à chaud.
  Le demi-accouplement doit avoir une longueur d'alignement supérieure à celle de l'arbre et il doit être fixé axialement en tête de l'arbre et à l'aide d'une vis et d'une rondelle.
  Veiller à l'alignement lors du raccordement à l'arbre d'entrée de l'embrayage.
  - Pour le montage des boîtes avec embrayage "BD" procéder comme suit:
    a) L'embrayage est livré dans la position embrayée avec le levier de commande démonté, ne pas débrayer tant que le montage sur le moteur n'est pas terminé.
    b) Positionner le roulement pilote sur l'emplacement du volant. Le roulement pilote doit avoir deux déflecteurs et doit être graissé à vie (type 2RS).
    Le roulement pilote est généralement monté avec interférence sur le siège du volant et avec du jeu sur l'arbre de l'embrayage.
    Dans le cas d'absence d'interférence sur le siège du volant, il faut bloquer le roulement au moyen de locitex (ou similaire) sur la bague externe pour éviter sa sortie.
    c) Positionner la couronne d'entrée sur le centrage du volant et serrer les vis de fixation.
    d) Positionner le groupe embrayage sur le moteur en faisant attention de ne pas endommager les dents du disque d'embrayage lors de leur introduction dans les rainures de la couronne dentée et d'enfiler le roulement pilote avec l'extrémité de l'arbre en faisant coulisser l'embrayage en direction du moteur tant que cela est possible.
    e) Monter les vis de fixation de la cloche en les serrant graduellement en croix.
    f) Positionner le levier de commande et se mettre en position débrayée pour vérifier que les sorties de la boîte tournent librement.

**EMPLOI**

- **Boîtes avec embrayages type "BD" ou "BDS"**
  N'embrayer que si le moteur tourne au minimum ou ne dépasse pas les 1000 tours/minute.
  L'embrayage doit être effectué rapidement et fermement.
  Ne pas s'arrêter avec le levier en position intermédiaire.
  Les mêmes règles sont valables pour le débrayage.

**ENTRETIEN**

- Les boîtes sont livrées sans huile.
  Avant la mise en service, procéder au remplissage de l'huile jusqu'au niveau maximum indiqué sur la jauge.
  - Utiliser de l'huile pour engrenages avec additifs EP, indice de viscosité minimum 95.
  Pour la sélection du type d'huile en fonction de la température ambiante, consulter le tableau A.
  - Effectuer la première vidange après 50 heures de fonctionnement et les vidanges suivantes toutes les 1000 heures de fonctionnement (dans tous les cas ne jamais laisser passer plus de 12 mois).
  - Effectuer un contrôle périodique du niveau d'huile.
  - S'assurer que la température de l'huile en exercice ne dépasse pas les 105°C.
  - Pour la lubrification des embrayages, utiliser de la graisse au lithium de consistance NL-Gl-2.
  Les parties à lubriﬁer indiquées sur les figures 5-6-7 sont les suivantes:
  Arbre de commande (A25, fig.5), graisser toutes les 300 heures.
  Pour les embrayages "BD 145" - "BD 290" - "BDS 145" - "BDS 290", le graisseur (A11) est positionné sur le collier de commande (A10) et l'on peut y accéder qu'en retirant le couvercle d'inspection (A19), et le graisseur est raccomodé toutes les 300 heures. Pour les embrayages "BD 2200" - "BD 3300" - "BDS 2200" - "BDS 3300", le graisseur est positionné sur la partie externe de la cloche (A16) et le
graissage est recommandé toutes les 100 heures.

- Levier de commande (A43) sur "BD 2200" - "BD 3300" - "BDS 2200" - "BDS 3300" (uniquement) graisser toutes les 600 heures.

Roulement en entrée pour "BDS 2200" - "BDS 3300" (C1, fig. 7) graisser toutes les 100 heures; le graisseur est situé sur la partie externe de la cloche (C11 fig. 7).

- Réglage de l'embrayage (boîte "AM...BD", "AM...BDS...").

Un réglage correct de l'embrayage est fondamental pour une durée de vie satisfaisante de ce dernier.

L'opérateur est responsable de son contrôle périodique.

Le réglage de l'embrayage (ou son contrôle) ne peut être effectué que si le moteur est à l'arrêt. Référence fig. 1 et fig. 5:

- retirer le couvercle d'inspection (A19), embrayer et mesurer à l'aide d'un jeu de câbles la distance A (fig. 1).

Si cette distance dépasse 1,3 mm, il faut régler l'embrayage en abaissant la valeur de A à 0,5-0,7 mm, en procédant comme suit:

- débrayer en poussant le levier (A13) dans la direction opposée du moteur,
- faire reculer le pivot (A36) au moyen d'un tournevis,
- faire tourner le dispositif de réglage (A34) dans le sens de aiguilles d'une montre, en utilisant un marteau et une tige en métal tendre, la rotation doit être d'un nombre de crans suffisants pour obtenir le réglage correct de l'embrayage.

**PÉCES DÉTACHÉES**

Pour les commandes de pièces détachées, veuillez spécifier la type de la boîte, le rapport, le numéro de série, le numéro de rep. de l'éclaté ainsi que la quantité.

---

**OLIO - OIL - HUILE**

<table>
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<tr>
<th>Température ambiante</th>
<th>-20°C/+5°C</th>
<th>+5°C/+40°C</th>
<th>-30°C/+65°C</th>
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<tbody>
<tr>
<td>Viscosité</td>
<td>ISO 3448</td>
<td>VG 100</td>
<td>VG 150</td>
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<tr>
<td>Viscosity</td>
<td>IV min</td>
<td>95</td>
<td>95</td>
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<td>BLASIA 150</td>
<td>BLASIA 220</td>
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<td>BP MACH</td>
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<td>SPARTAN EP 150</td>
<td>C. OIL LG 150</td>
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<td>I.P.</td>
<td>MELLANA 100</td>
<td>MELLANA 150</td>
<td>TELESIA OIL 150</td>
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<td>SHELL</td>
<td>OMALA OIL 100</td>
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<td>TOTAL</td>
<td>CARTER EP 100N</td>
<td>CARTER EP 150</td>
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**Tab. A**

---

**Fig. 1**
Accoppiatori a 2 prese  
Double pump drives  
Boites 2 sorties

Accoppiatori a 3 prese  
Triple pump drives  
Boites 3 sorties

Fig. 2

Fig. 3
Accoppiatore a 4 prese
Four pump drive
Boite 4 sorties

Accoppiatori con frizione
Clutch driven pump drives
Boites de repartition avec embrayage
Accoppiatori con frizione “BDS 145”, “BDS 290”.
Clutch driven pump drives, “BDS 145” and “BDS 290” versions.
Boites de repartition avec embrayage “BDS 145”, “BDS 290”.

Gruppo albero di entrata: valido per “BDS 2200” e “BDS 3300”
Input shaft assembly: valid for “BDS 2200” and “BDS 3300”
Groupe arbre d’entrée pour les modeles “BDS 2200” et “BDS 3300”
This procedure to be used only under emergency or service situations such as, moving a disabled vehicle to a safe location.

1. Shut off engine and block wheels to prevent vehicle from rolling.
2. Remove Rubber Dust Plug in rear Drive Motors (Fig 1)
3. Install Brake Release Tool in Drive Motor (Fig 2)
4. Tighten 12mm nut to release brakes (Fig 3)
5. Brake Release Tool must be removed for safe normal operation
6. Reinstall Rubber Dust Plug

**WARNING**

Vehicle will roll freely with Brake Release Tool installed. Vehicle braking ability will be greatly reduced or disabled. Serious injury or death can occur.
BROCE MK-1 MODEL TRANSFER SWEEPER

EXTERNAL DIMENSIONS

FRONT AXLE  CG  REAR AXLE

5,910 LBS.  10,260 LBS. TOTAL  4,350 LBS.

WEIGHTS
(EMPTY WATER TANKS, NO OPERATOR)
**MK1 FLUID CAPACITIES**

<table>
<thead>
<tr>
<th>Component</th>
<th>Fluid Type</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Hydraulic Tank</td>
<td>DYNA-PLEX 21C Cursa Hydraulic Oil</td>
<td>57 Gal.</td>
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<tr>
<td></td>
<td>Multifunctional Medium</td>
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<tr>
<td>Fuel</td>
<td>#2 Diesel</td>
<td>29 Gal.</td>
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<tr>
<td>Radiator</td>
<td>Ethylene Glycol 50/50 Mix</td>
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<tr>
<td>Engine Crankcase</td>
<td>API Classification CE or CD</td>
<td>10 Qts.</td>
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<tr>
<td></td>
<td>CCMC Specification D4 or D5</td>
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</tr>
<tr>
<td>Dual Pump Drive</td>
<td>85/140 Gear Lube</td>
<td>2 Qts.</td>
</tr>
<tr>
<td>Dodge Speed Reducer</td>
<td>Hydra 1000 ISO #32</td>
<td>2 Qts. *</td>
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<tr>
<td>Air Conditioner</td>
<td>R134A</td>
<td>2 LB. 12 OZ.</td>
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<tr>
<td></td>
<td>Ester Oil Compressor System</td>
<td>8 OZ.</td>
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<tr>
<td></td>
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<td>4 Oz.</td>
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* 2Qts is approximate. Fill to the level of the level plug
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<th>QTY</th>
<th>REMARKS</th>
<th>Initial (Hours)</th>
<th>Thereafter (Hours)</th>
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<td>Steering Cylinder Mount</td>
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<td>Knuckle</td>
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<td>Core/Brush Bearing</td>
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<td>Conveyor Pivots</td>
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<td>Dodge Grip-Tight Bearings</td>
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<td>Core Hanger Pivot</td>
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<tr>
<td>Conveyor Support Bearings</td>
<td>2</td>
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