



Imperial Electric®

A Kinetek Company®

Service Manual 520 Frame Synchronous ACPM



Guarantee and Limitation of Warranties

We guarantee that the apparatus manufactured by us will deliver its rated output as indicated on the nameplate, provided such apparatus is properly cared for, operated under normal conditions, and with competent supervision. We agree to correct by repair or replacement at our option and at our own expense, F.O.B. our factory (buyer to pay freight one way) any defects in apparatus, which may develop under normal and proper use within twelve months after date of shipment. Warranties are contingent upon inspection proving the claims and the buyer giving us immediate written notice of such defects, and provided further that during said period the apparatus is properly cared for, operated under normal conditions, and with competent supervision. The correction of such defects by repair or replacement by us shall constitute a fulfillment of all of our obligations to the buyer. When the apparatus or goods are sold by the original buyer, the maximum guarantee period shall be limited to twelve months from the date of shipment from our factory.

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No Liability for Consequential Damage

We are not liable for consequential damage in case of any failure to meet the conditions of our guarantee or the terms of our quotation or your purchase order.

Returns

Before returning material to our factory, authorization must be obtained from the factory or nearest district office or representative.

Warning and Disclaimer

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Receiving

Upon delivery, examine the machine and report any significant damage to the shipper and to Imperial Electric immediately. Verify that the motor nameplate data matches your order. A sample nameplate is shown below.

| AC MOTOR DATA | | | | | |
|-------------------------------|------|------------------|--|---------------|----|
| HP | 36.5 | F.L. RPM | 115 | | |
| S.F. | - | DUTY | 60 MIN | NEMA NOM.EFF. | |
| CODE | - | NEMA DES. | - | PF | |
| FR. | 525 | ENCL. | TENV | TYPE | P |
| AMB. | 40 | INSUL. CLASS | F | PHASE | 3 |
| Hz. | 19.1 | VOLTS | 460 | AMPS | 45 |
| Hz. | | VOLTS | | AMPS | |
| DR.END BRG. | | OPP.DR. END BRG. | | | |
| SERIAL NO. | | CAT. NO. | 525EAG037K700 | | |
| STARTS/HR. | | | | | |
| THE IMPERIAL ELECTRIC COMPANY | | |  | | |
| AKRON, OHIO | | MADE IN CHINA | | | |

Handling

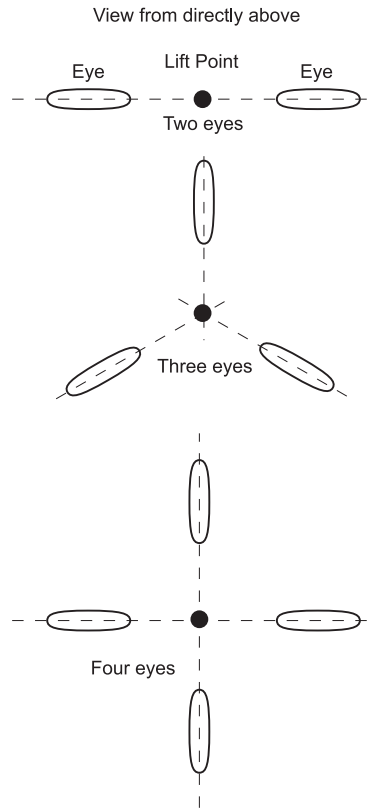
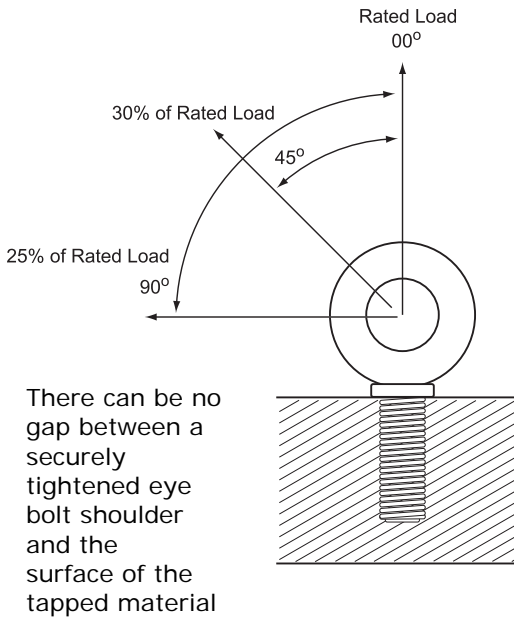
Machinery eye bolts are provided for lifting hoist machines. Before lifting it is important to be certain that you are aware of proper hoisting procedures, correct eye bolt alignment, and correct hoisting equipment for best practice.

- Inspect eye bolts and lifting equipment carefully.
- Never use a damaged or worn eye bolt.
- Never use a bent or elongated eye bolt.
- Never machine, grind, or cut an eye bolt.
- Check that threads on shank and receiving holes are clean.
- Never exceed load limits for equipment or eye bolt size.



When lifting, if the force on an eye bolt is other than in-line (00°), the working load must be adjusted downwards. Additionally, the force must be aligned with the long cross section of the eye. See the following illustrations and tables.

Hoisting Eye Bolts



| Eye Bolt In-Line Load | |
|-----------------------|--------------|
| Size, inches | Load, pounds |
| 1/2 | 2,600 |
| 5/8 | 5,200 |
| 3/4 | 7,200 |
| 7/8 | 10,600 |
| 1 | 13,300 |
| 1 1/4 | 21,000 |
| 1 1/2 | 24,000 |

Aligning an Eye Bolt

If it is necessary to rotate an eye bolt for proper alignment with the hoisting force, you can place a shim of the correct thickness between the eye bolt shoulder and the tapped surface. The table below lists the shim thickness required to change eye bolt rotation 90° for various eye bolt diameters. Different rotation requirements can be extrapolated.

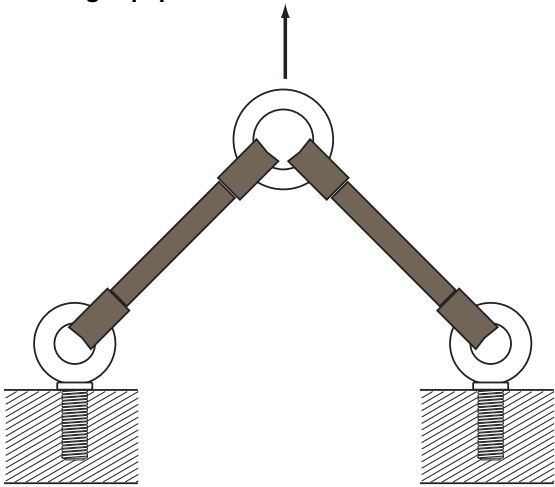
Shimming to Rotate Eye Bolt Alignment

| Bolt Size | Shim Thickness, inches |
|-----------|------------------------|
| 1/2 | 0.0192 |
| 5/8 | 0.0227 |
| 3/4 | 0.0250 |
| 7/8 | 0.0278 |
| 1 | 0.0312 |
| 1 1/4 | 0.0357 |
| 1 1/2 | 0.0417 |

Hoisting Equipment

Ensure that the hoist, ropes, tethers, and hardware are sufficient to hoist the machine weight with a good margin of safety.

Hoisting Equipment



- Use individual tethers for each eye bolt (or a tether assembly with centrally linked, individual tethers).
- Use spreader bars for balancing and to prevent damage
- Stand clear of the load.
- Lift with a steady, even pull – Do not jerk.

Storage

- Store in a warm, dry, clean location.
- Protect the motor from dust and dirt – particularly construction or cement dust which can penetrate the motor.

Extended Storage

The brake drum, sheave, and various other parts are protected with a rust inhibiting membrane before shipping. If the motor is stored beyond thirty days:

- Store in a dry, dirt free area.
- Periodically check the machine exterior for rust.
- If necessary, remove any rust with a fine abrasive paper.
- Do not allow oil or solvents to come in contact with the sheave grooves, brake linings, or brake drum.

Commissioning

Commissioning the machine includes a pre-installation inspection, machine positioning, and electrical connections. Adjustments, if required, are described in the Adjustment section of the manual.

Inspection

Inspect the machine carefully before installing, especially if it has been stored for thirty days or more.

- Using a soft cloth, thoroughly wipe down the machine. Check for and remove any rust, dirt, or oil from machine surfaces. Remove any rust, dirt, or oil from brake drum surfaces.
- Check for any evidence of condensation. If condensation has occurred, contact Imperial Electric for drying instructions before proceeding.
- Use a megohmmeter to confirm insulation resistance between the motor phases and the ground terminal. There should be a minimum of 100 megohms @ 500 VDC for 60 seconds.

Machine Positioning

1. Provide structural support consistent with loading on gearless machine feet or base pads.
2. Provide a level foundation with bolts well anchored and matched to motor base or base holes.
3. Carefully check brake settings and solenoid parameters. Refer to brake adjustment instructions for specific values.
4. Manually release the brakes and turn the drive sheave by hand to confirm smooth operation and no mechanical interference.

Electrical Connections

Electrical connections between the elevator controller and the machine must be made in accordance with local and national code requirements. Generally, AC connections, brake connections, and encoder connections are required to be through separate conduits.

Motor AC Connections

Incoming power to the controller and outgoing power to the motor must be in separate grounded conduits.

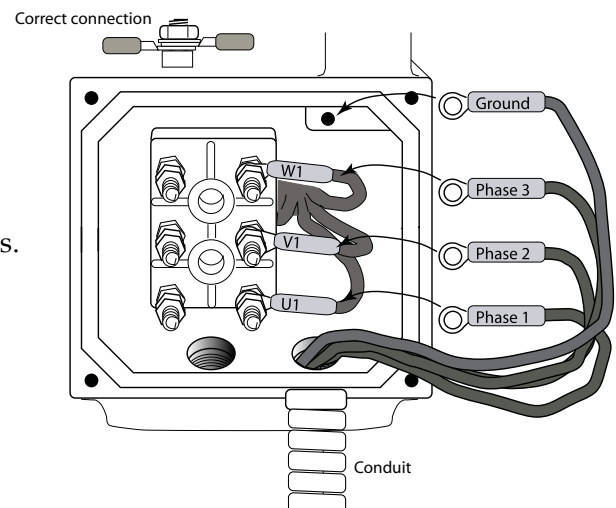


Verify power to the controller has been shut off at the main disconnect before proceeding with connections.

1. Refer to the power section drawing in the controller job prints.
2. Make connections as shown. Follow any special notes regarding wire sizes.
3. Follow grounding instructions in the controller job prints.

Phase Connections

| Phase Output | |
|--------------|--------------|
| U | Phase 1 |
| V | Phase 2 |
| W | Phase 3 |
| Ground | Green/Yellow |



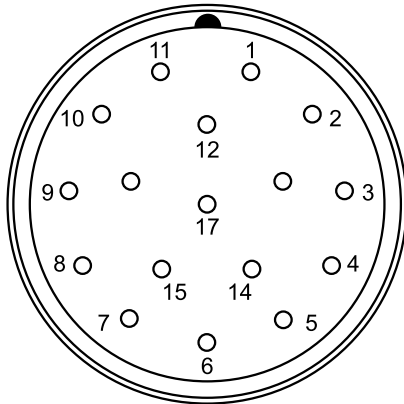


Encoder Connections

Encoder connections must be made with the power off to avoid equipment damage.

Pinout and Wire Colors

| | |
|-----|---------------------------|
| Pin | Signal |
| 7 | Up (Power supply voltage) |
| 1 | Sensor Up |
| 10 | 0V |
| 4 | Sensor 0V |
| 11 | Inside Shield |
| 15 | A + |
| 16 | A - |
| 12 | B + |
| 13 | B - |
| 14 | DATA |
| 17 | DATA |
| 8 | CLOCK |
| 9 | CLOCK |



DO NOT USE VACANT PINS OR WIRES



The ECN 1313 is a hollow shaft encoder. It is installed in the machine before shipment. Pins on the encoder connector are male. If required, Imperial can provide an optional cable that is 12 meters (39.4 feet) long, part number 0850424.

| Criteria | Description |
|--|------------------|
| Data Interface | EnDat |
| Positions Per Revolution | 8192 (13 bit) |
| Incremental Signals | 1 Vpp |
| Line Count | 2048 |
| Power Supply | 5V, +/- 5% |
| Maximum Current Consumption without load | 150 mA |
| Maximum Cable Length | 150 m (492 feet) |

Should it be necessary to remove or replace the encoder, please refer to the instructions later in this document.

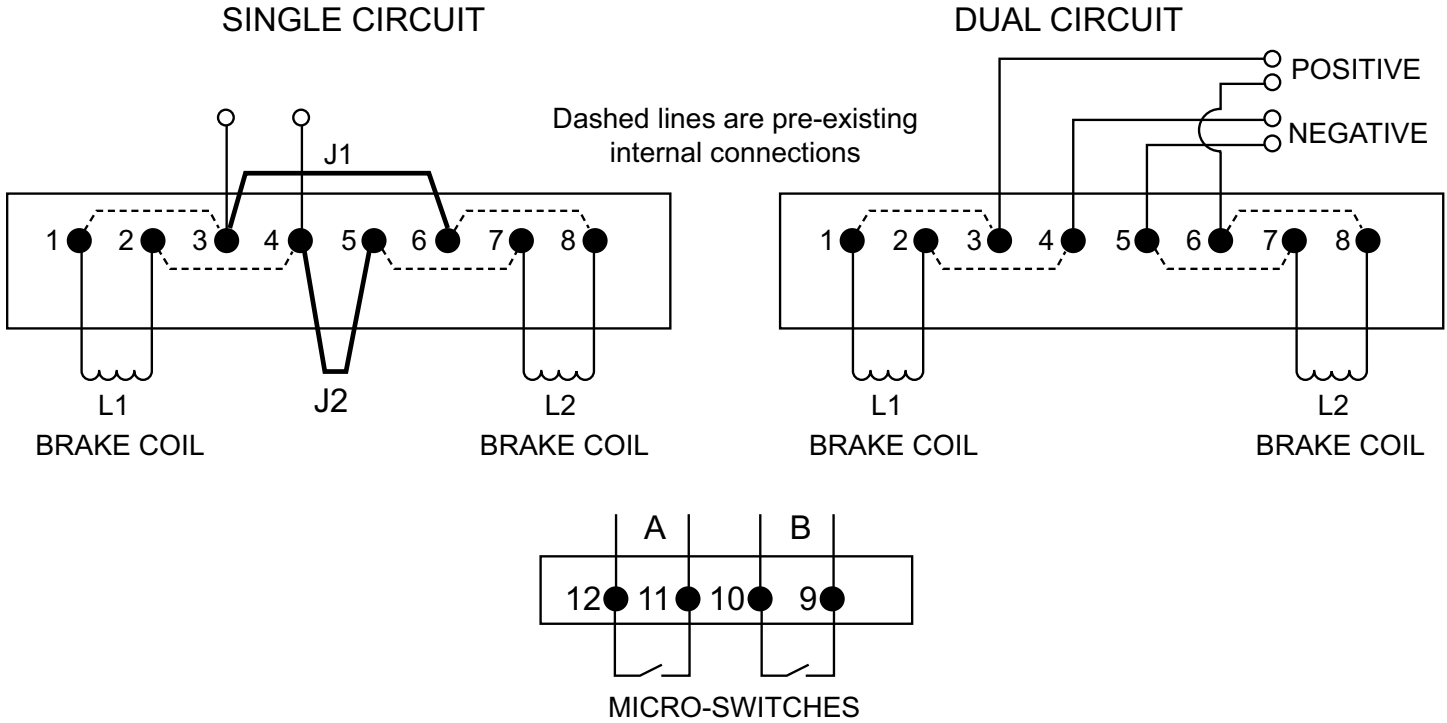
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Machine Brake Connections

520 series machines are provided with dual circuit, electrically released brakes. The brakes may be connected to operate independently (dual circuit) or to operate in unison (single circuit). A manual release handle is provided with the machine. After installation, it is recommended that the handle be removed and stored.

The brake and micro-switch connections are in the solenoid terminal box.

Brake and Micro-switch Connections



Brake Specifications

| Specification | 522 | 525 | 525LS |
|-----------------------------------|---|---|---|
| Pick Voltage | 93 VDC for 1 second maximum | 155 VDC for 1 second maximum | 200 VDC for 1 second maximum |
| Hold Voltage | 40 VDC | 53 VDC | 100 VDC |
| Coil Resistance (per coil) | Cold: 36 ohms (+/- 6%) Hot: 44 ohms (+/- 6%) | Cold: 29 ohms (+/- 6%) Hot: 38 ohms (+/- 6%) | Cold: 48 ohms (±3%) Hot: 59 ohms (±3%) |

Brake Maintenance & Troubleshooting

Elevator brakes, unlike vehicle brakes, are not designed to routinely bring the elevator to a stop. A properly adjusted elevator brake will drop onto the braking surface immediately after the car has stopped, preventing additional movement and helping to maintain position. Because they are not routinely pressing against a moving surface, elevator brake shoes wear very slowly.

Proper maintenance of the elevator brake includes regular inspection, lubrication, and adjustment when required.

Brake Inspection

Brakes must be inspected at regular intervals.

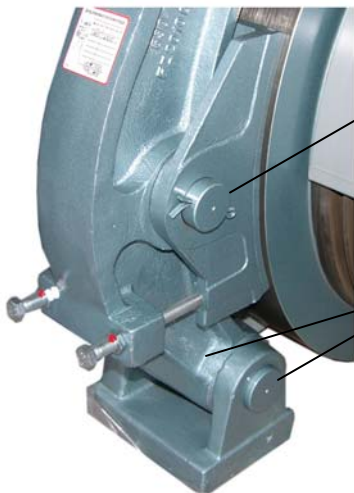
1. Wipe the machine and braking components down with a soft cloth.
2. Check that the brake shoes are resting evenly against the braking surface (at least 95% contact).
3. Note that pad thickness is constant across the arc of the shoe.
4. Check that no oil or solvents have contaminated the brake shoes or braking surface.
5. Check that there is no evidence of the brake dragging or dropping on a moving sheave.
6. With the elevator arranged so that it will not move, pick the brake and check that there is a continuous gap between the shoe and the braking surface of 0.004 to 0.005 inches.
7. Cycle the brake and observe that the micro-switches (pick switches) are secure and that the switches operate properly when the brake is picked.
8. Listen as the brake is operated. A certain amount of noise is expected as the brake opens and drops. Excessive noise indicates that lubrication and/or adjustment is required. Refer to Brake Troubleshooting.

Brake adjustments and proper clearances are critical to elevator and machine performance. **Damage caused by improper brake adjustment is not covered by warranty.**

Brake Lubrication

Although lubricants and solvents must never be allowed to contaminate brake shoes and braking surfaces, lubricating pivot points, solenoid components, and brake-applying bell washers or spring contact surfaces help the brake operate smoothly and quietly. **Lubricate solenoid components and brake-applying contact surfaces as a combined operation as they involve many of the same components.**

Brake Arm Assembly (minimum every three months)



Being careful not to allow any lubricant on the braking pad or surface, spray a two second burst of penetrating lubricant into the gap between the brake pad pivot shaft and the brake pad chassis (both sides).

Being careful not to allow any lubricant on the braking pad or surface, spray a two second burst of penetrating lubricant into the lubricating hole if present. If there is no lubricating hole, spray a three second burst of lubricant into the gap between the arm pivot shaft and the brake arm.

Brake Solenoid (minimum every 12 months)

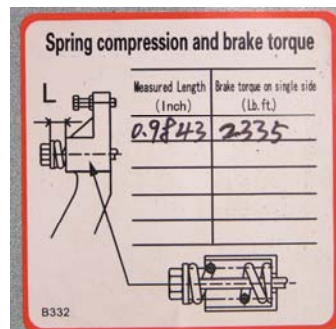


SKF LGHB 2 grease is the only recommended lubricant for this brake solenoid. The use of any other grease is the sole responsibility of the user and may void the warranty.

9. Bring the car to an appropriate position in the hoistway and arrange it so that it cannot move.
10. Remove all electrical power to controller, machine, and braking circuits.
11. Check that the label on the outside edge of each brake arm shows the load holding value for which the brake was factory torqued and the resulting measured distance from the face of the brake arm to the face of the spacer. This distance/torque has probably been changed if the brakes have been adjusted to hold 125% of fully loaded car weight. Measure the actual distance and record it on the label.

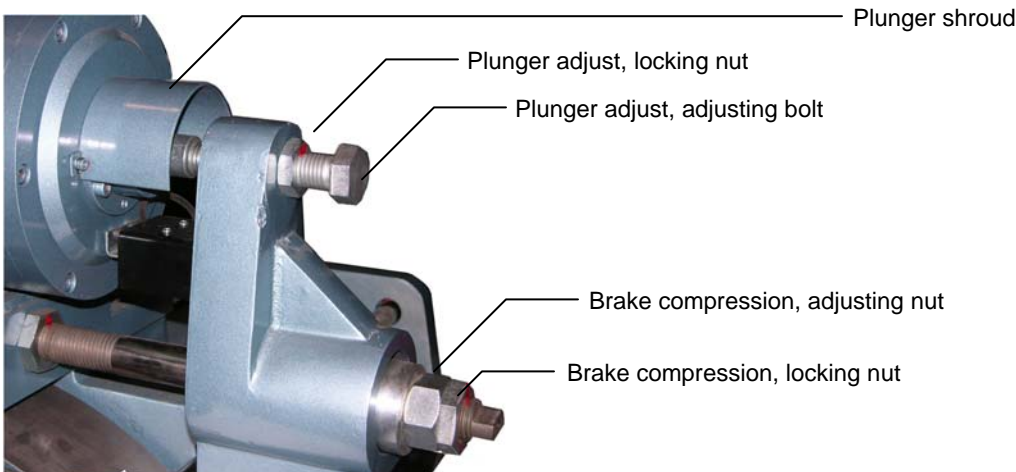


| Brake Torque / Per Side | |
|-------------------------|-------------------------------|
| 522 | 1250 Ft. lbs. Factory setting |
| 525 | 2335 Ft. lbs. Factory setting |
| 525LS | 3000 Ft. lbs. Factory setting |



12. See below. Use a wrench to hold the brake compression adjusting nut still while you back off the brake compression locking nut.
13. Remove the brake compression locking nut and back the brake compression adjusting nut off sufficiently to pivot the brake arm and clear some working room around the solenoid end.

Solenoid and Brake Arm Compression Adjustment Points

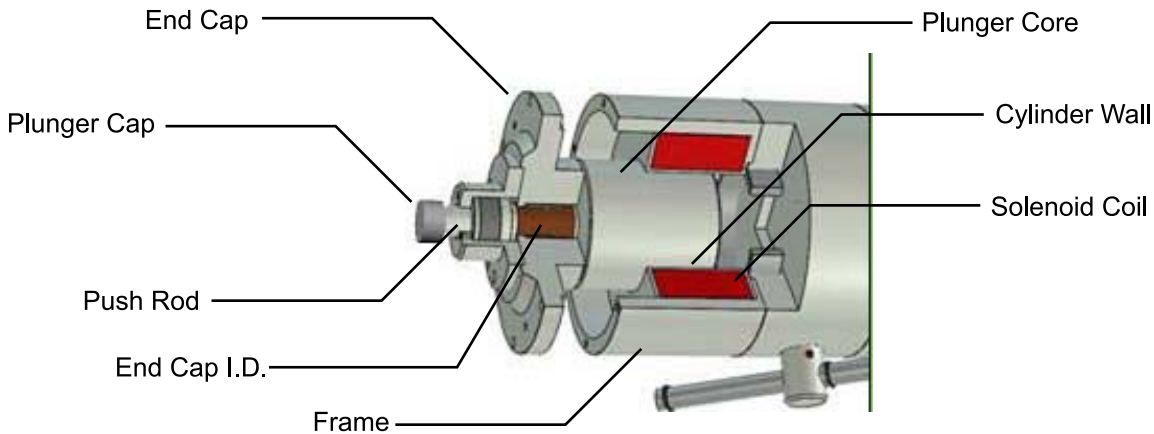


- Remove the plunger shroud. (See preceding illustration.)

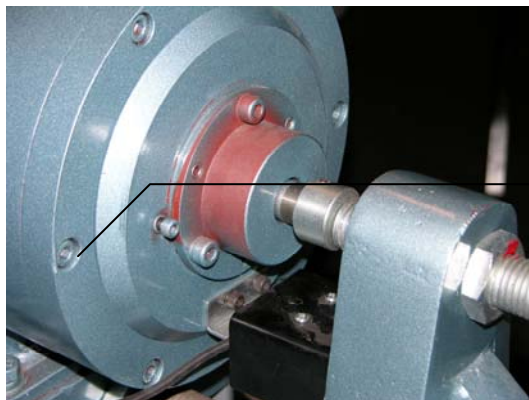


The brake solenoid has an independent coil in each end. During installation, the solenoid may be wired so that each brake arm can be operated independently or so that both brakes operate simultaneously.

Solenoid Components



- Loosen the set screw and remove the plunger cap from the push rod.
- Remove the six, 6mm Allen bolts that secure the end cap to the solenoid.



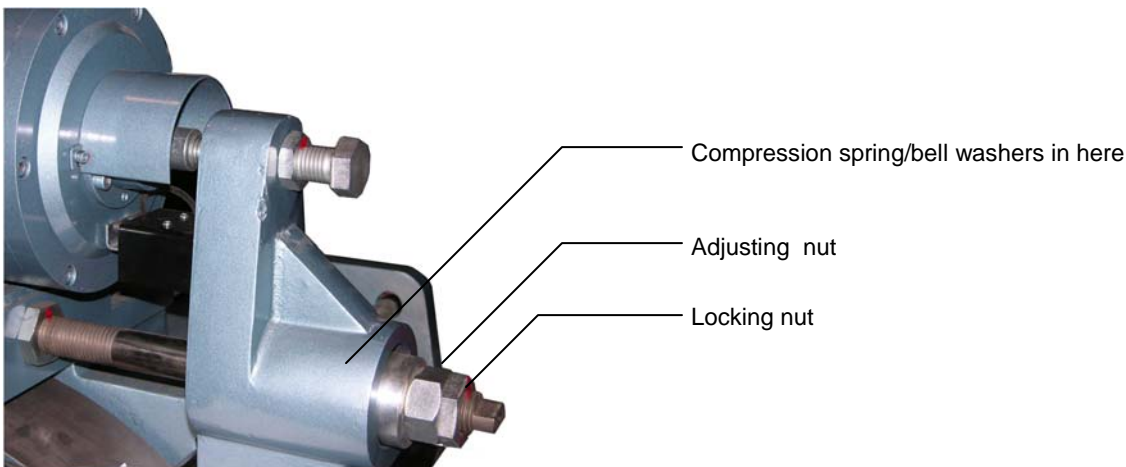
Bolts that secure end cap to solenoid

- Using a rubber mallet, tap the end cap away from the solenoid. It may be necessary to use a blunt chisel or drift at the inner edge of the end cap to separate it from the solenoid. Be careful not to damage the unit.
- Gently pull the end cap away, exposing the interior of the solenoid.
- Remove any dust and debris from the plunger core using fine emery cloth and solvent. The plunger core needs to be clean.
- Remove any dust and debris from the end cap I.D. (see components above) using fine emery cloth and solvent. The I.D. needs to be clean.
- Being very careful not to damage the solenoid coil, remove any dust and debris from the solenoid cylinder wall using fine emery cloth and just a little solvent. The cylinder wall needs to be clean.

22. Place the plunger core into the solenoid and feel the action of the plunger by manually pushing and pulling the push rod by hand. It should move freely. Repeat cleaning until it slides without resistance.
23. Lightly coat the surface of the plunger with SKF LGHB 2 grease.
24. Lightly coat the end cap I.D. with SKF LGHB 2 grease (where the plunger shaft passes through the end cap).
25. Slide the lubricated plunger assembly into the solenoid.
26. Reassemble the solenoid. Once the end cap is secured, manually exercise the plunger to see that it continues to move smoothly.
27. Replace the plunger cap. Move the brake arm back into position.
28. Tighten the brake arm compression adjustment nut until the distance from the face of the brake arm to the face of the spacer is the same as you recorded earlier.
29. Hold the adjustment nut to keep it from moving. Replace and tighten the locking nut.
30. Push the solenoid plunger in. Adjust the plunger adjusting bolt until it just touches the solenoid plunger cap.
31. Hold the adjusting bolt still and tighten the adjusting bolt locking nut.
32. Replace the solenoid shroud.
33. Repeat lubrication procedure for opposite end of solenoid. Test brake operation.

Brake-applying Bell Washers/Spring Contact Surfaces (minimum every 12 months)

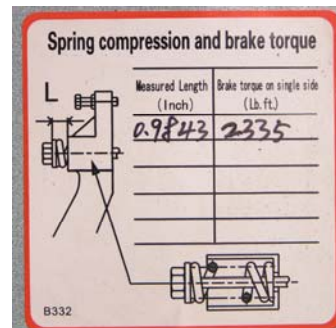
The brake compression spring or bell washer complement nest(s) in a cylinder that partially penetrates the brake arm. **Combine this task with lubricating solenoid components as they share procedures.**



1. Bring the car to an appropriate position in the hoistway and arrange it so that it cannot move.
2. Remove all electrical power to controller, machine, and braking circuits.
3. Check that the label on the outside edge of each brake arm shows the load holding value for which the brake was factory torqued and the resulting measured distance from the face of the brake arm to the face of the spacer. This distance/torque has probably been changed if the brakes have been adjusted to hold 125% of fully loaded car weight. Measure the actual distance and record it on the label.



| Brake Torque / Per Side | |
|-------------------------|-------------------------------|
| 522 | 1250 Ft. lbs. Factory setting |
| 525 | 2335 Ft. lbs. Factory setting |
| 525LS | 3000 Ft. lbs. Factory setting |



4. Use a wrench to hold the brake compression adjusting nut still while you back off the brake compression locking nut.
5. Remove the brake compression locking and adjusting nuts. Remove the spacer.
6. Position a long screwdriver to catch and maintain the order of the bell washers or the spring . See below.



7. Gently exercise the brake arm to help you remove the bell washers or spring. For washers, you may need to slip a tool in from the inside to dislodge them from the cylinder.

8. If bell washers are used, note their orientation. When they are replaced, they must be in exactly the same order and orientation. The washers are concave. The concave sides of washer pairs face each other so that the stack may be compressed and thus exert the pressure required to set the brake. A single washer may be used at the inside of the stack.



9. Let the brake arm open and examine the brake rod on which the spring or washers ride. Remove any debris or corrosion using fine emery cloth and solvent.
10. Lightly coat the brake rod with SKF LGHB 2 grease to minimize friction between rod and washers/spring.
11. Swing the brake arm back into position and replace the bell washers or spring and spacer.
12. Tighten the brake arm compression adjustment nut until the distance from the face of the brake arm to the face of the spacer is the same as you recorded earlier.
13. Hold the adjustment nut to keep it from moving. Replace and tighten the locking nut.
14. Repeat lubrication procedure for opposite brake arm. Test brake operation.

Troubleshooting a Noisy Brake

A certain amount of noise is normal. Maintenance personnel must use their own knowledge and expertise to determine whether noise is excessive or indicative of a problem.

Noise When Brake Drops

- Check the gap between shoe and drum when the brake is picked. Gap should be 0.004 to 0.005 inches.
- If the brakes are controlled through a brake module, pick and drop rates may be modulated through adjustments at the module or through controller software as directed in the controller manual. These adjustments may help with brake drop or pick noise.
- Binding between the brake solenoid plunger and the cylinder it rides in.

Noise When Brake Picks

- Binding between the brake solenoid plunger and the cylinder it rides in.
- See brake module information above.
- Gap inside the brake solenoid between the end cap shoulder and the plunger.
- Binding between the compression bell washers/spring and the brake rod as the brake arm opens.

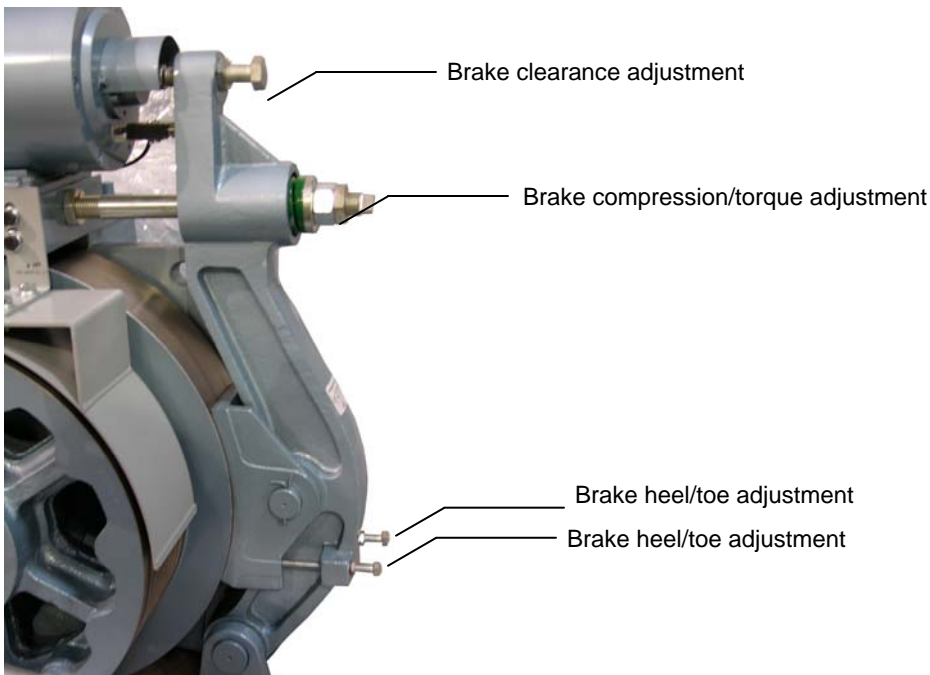
Brake Adjustment

Brake Application Adjustment



The manual release handle **MUST BE REMOVED** when adjusting brakes and during normal operation.

Regardless of single or dual circuit, each brake arm is independently factory set to hold the maximum load the machine is designed to lift. In the field, each brake must be set to hold at least 125% of the rated load.



1. Position the elevator safely. (It may slide during brake adjustment.) Place it on machine room inspection.
2. Push the brake solenoid plungers in manually. (They may not move much, if at all.)
3. Adjust the gap between the plunger and the adjusting bolt on each side until they are just touching.
4. Load the car to 125% of rated load.
5. Pick one brake. Adjust the brake that did not pick to hold 125% of rated load using the brake compression/torque adjustment. Drop the brake.
6. Pick the adjusted brake. Adjust the brake that did not pick to hold 125% of rated load using the brake compression/torque adjustment. Drop the brake.
7. Pick the brake and check that there is an even gap of 0.004 to 0.005 of an inch between the brake pad and the braking surface across the arc of contact. If not, adjust the plunger bolt for proper lift and the heel-to-toe to even the gap if needed.

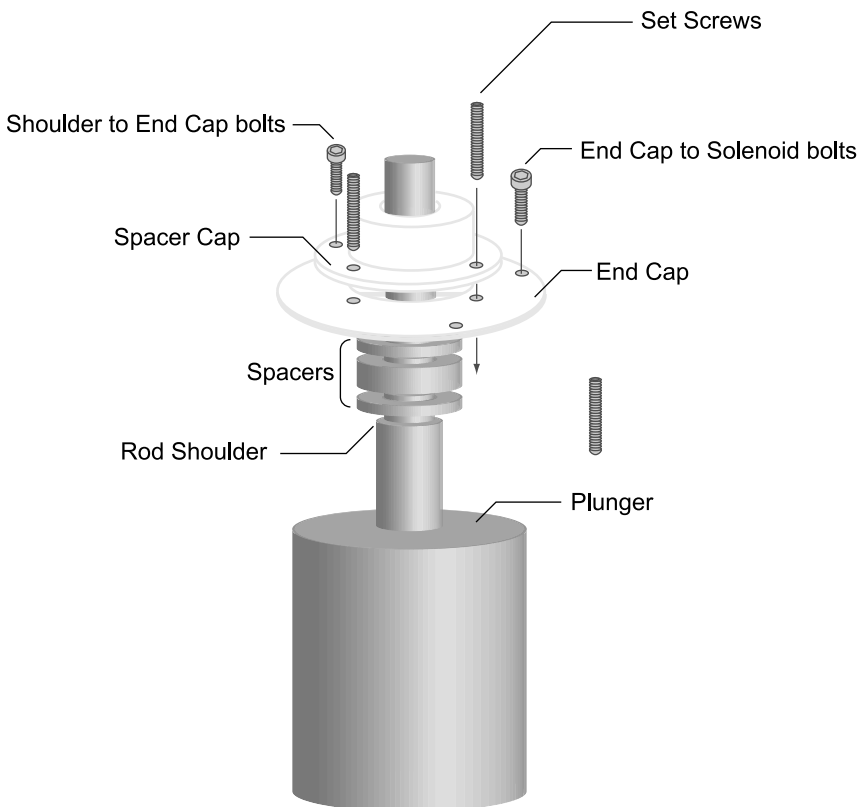


- Drop the brakes. Set the heel-to-toe adjustment so that there is a gap of 0.004 to 0.005 on an inch between the brake and the adjusting bolts.
- Ensure they continue to hold 125% of rated load.
- Check that all brake adjustments are locked down.



Brake Solenoid Internal Stroke Adjustment

Sometimes, the source of a noisy brake can be attributed to a worn rod shoulder in the internal stroke of the brake solenoid. As the shoulder wears and the middle, neoprene, spacer flattens, the plunger stroke gets longer until it contacts the end cap resulting in a “clacking” sound when the brake picks. There are set screws on the spacer cap at each end of the brake solenoid that can be adjusted to restore the gap between the plunger and the end cap.

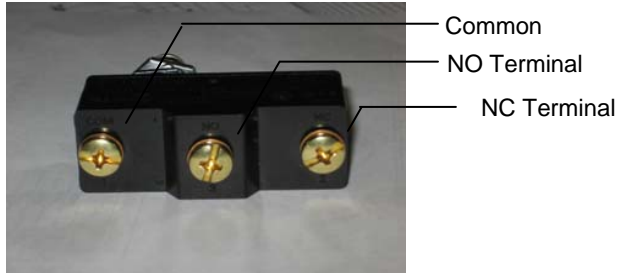
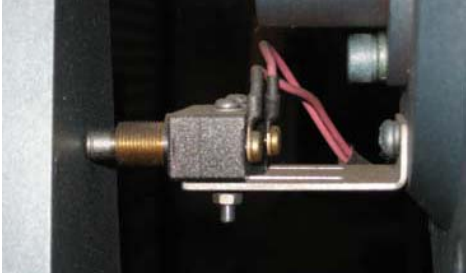


If the set screws are adjusted inward, they contact the top spacer, or the plunger (model dependent) creating a gap between the spacer cap and the plunger and effectively shortening the plunger stroke.

Alternatively, new spacers may be ordered from Imperial Electric or a thin “shim” washer may be inserted between the existing spacers. Refer to the instructions on lubricating internal solenoid components for disassembly/assembly instructions.

Brake Micro-switch Adjustment

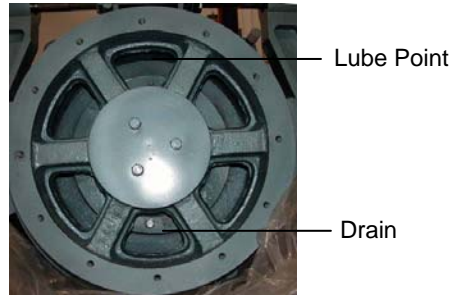
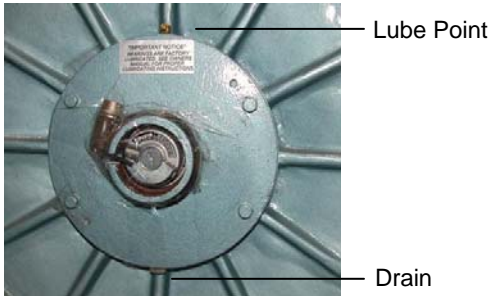
A Brake micro-switch (pick switch) is mounted on a bracket at each side of the brake solenoid. Adjustments are made by loosening the hex nut and sliding the switch into the proper position so that it is activated by the opening and closing of the brake arm. The switch is pre-wired at the factory using the Normally Open (NO) terminals. The connection can be changed to Normally Closed by disconnecting the lead on the NO terminal and connecting it to the NC terminal.



Machine Lubrication (6 month or 3000 hour intervals)



SKF LGEP 2 grease is the only recommended bearing lubricant for this motor. The use of any other grease is the sole responsibility of the user and may void the warranty. Damage due to improper bearing lubrication is not covered under warranty.



Sheave and encoder end bearings are pre-lubricated at the factory but require periodic lubrication.

Quantity per Bearing

| Frame 522 & 525 Location | Quantity | Type | Interval |
|--------------------------|------------------|------------|------------------------|
| Encoder End Bearing | 0.50 oz (15.3 g) | SKF LGEP 2 | 6 months or 3000 hours |
| Sheave End Bearing | 1.77 oz (55 g) | SKF LGEP 2 | 6 months or 3000 hours |

1. Remove the motor from service. Clean the grease fitting and drain plug.
2. Using a 17mm socket, remove the drain plug.
3. Lubricate the top fitting with SKF LGEP2 grease quantity indicated above.



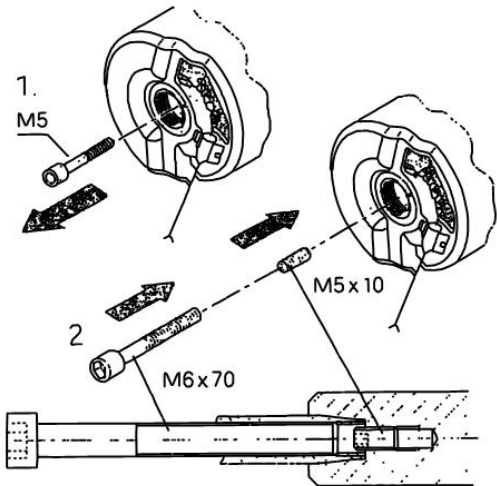
Do not overfill bearing reservoir by pumping grease until it comes out the drain. This will cause permanent bearing damage. Use only the recommended amount of lubricant.

4. Replace the drain plug.
5. Clean lubrication and drain points.

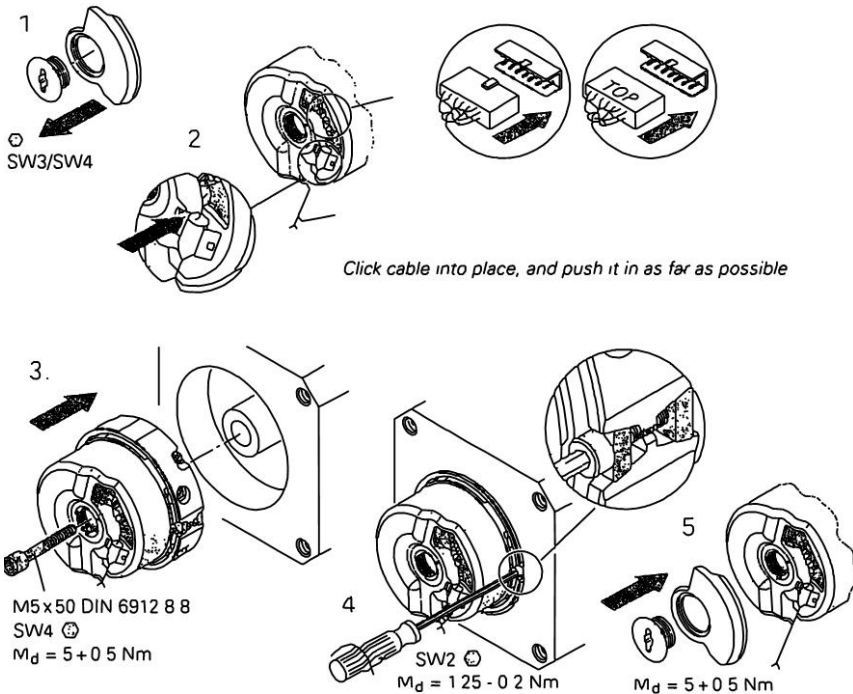
Encoder

Follow these instructions if the ECN 1313 encoder must be replaced.

Pressing the encoder out:



Installing new encoder:



Disassembly in reverse order

520 Frame Synchronous ACPM
