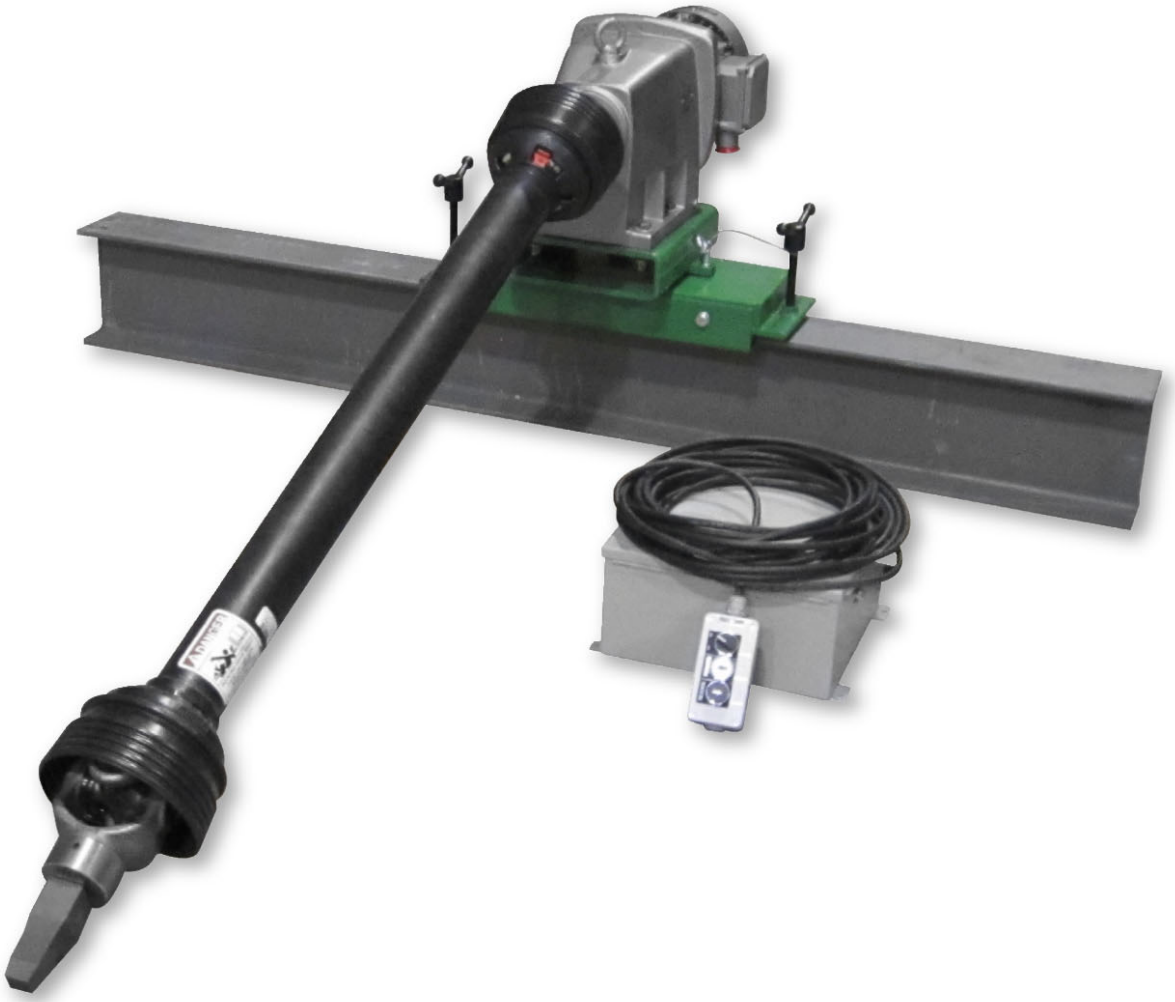
WORKMASTER®

WE FIND A WAY — OR MAKE ONE!

GO-E2 Gate Opener



OWNER / OPERATOR MANUAL

WORKMASTER disclaims any liability for injuries, death or damages arising directly or indirectly, from the use, operation, or application of this product not in accordance with the procedures, specifications and recommendations contained in this Owner/Operator's Manual. The user of this product is responsible to install, maintain and operate the product and parts or components manufactured or supplied by **WORKMASTER** in such a manner as to comply with all federal, state, and local rules, ordinances, regulations, and laws, including the Williams-Steiger Occupational Safety Act, and the American National Standards Institute Safety Code.

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SYMBOLS

The following symbols are found throughout this Owner/Operator's Manual to alert the reader to the relative danger that may result from non-observance.

This indicates a situation in which a hazard is imminent and will result in a high probability of serious injury or death.

This indicates a potentially hazardous situation, which could result in minor to moderate injury.

CAUTION

This indicates a potentially hazardous situation or unsafe practice which could result in product or property damaged.

IMPORTANT

This symbol indicates a general statement to assist the user in the operation or maintenance of the equipment.

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I. INTRODUCTION

Fast, safe, and economical unloading of covered hopper cars continues to be a problem at most unloading sites. One of the biggest contributors to this problem is the often time-consuming and difficult job of opening and closing bottom gates or doors of these hopper cars. Lading compaction, weather conditions, age, abuse or corrosive or gritty bulk materials can combine to prevent gate mechanisms from operating smoothly.

Regardless of cause, the costs associated with the problem are significant. Delays in emptying the cars means slow car turnaround, increased demurrage costs and interrupted production schedules. And, even more importantly, the chance of worker injury is high since at many unloading sites clumsy or dangerous makeshift or wrong tools are used during the "fight" to open a stubborn gate.

WORKMASTER has developed a line of Hopper Car Gate Openers and accessories which provides a safe, efficient, and economical solution to the problem of opening easy, medium, and hard-to-open hopper car gates.

There are pneumatic, electric, and manual units available producing 1,000 to 13,000 ft-lbs of torque to eliminate the need for "cheater" bars, sledgehammers, jacks, and other improper tools sometimes used on this difficult job.

This Owner/Operator's Manual details the installation, use, and maintenance of our **GO-E2** Electric Hopper Car Gate Opener. Experience has shown that the **GO-E2** Opener will open easy to moderately difficult car gates. However, that same experience demonstrates that total satisfaction in use depends on attention to detail in installing, using, and maintaining the Unit.

IMPORTANT

All persons involved in the installation, operation, and maintenance of this equipment should be thoroughly familiar with the contents of this manual.

The **GO-E2** Gate Opener consists of a heavy-duty, 5 Hp Gear Motor; a Telescoping Driveshaft (TDS), with universal joints on each end to enable the shaft to angle up to 20° off-center on either end; an electrical control package in a NEMA-4 watertight enclosure which contains a reversible starter, transformer and overload protection, and control with a 50'L cord. Also, included is a tapered Capstan Drive Fitting which is attached to the Driveshaft and a Capstan Swage to clean-out and square-up the Capstan sockets on car gate spindles.

The operating principle is simple. The **GO-E2** Opener uses the high-speed reversing action of an electric Gear Motor to provide an abrupt, forward-backward rocking (or twisting action) to jog stubborn gates loose.

When equipped with the Rolling Carriage option, the **GO-E2** Opener can be mounted to a steel W-Beam parallel to the track so the operator can roll the **GO-E2** Opener from gate to gate, and car to car. With the Rotating Platform option, the Opener can be swung 180° to open the gates of rail cars on parallel tracks.

For hazardous atmospheres, ask your **WORKMASTER** Dealer about special models.

II. OPERATION SAFETY

To prevent injury to yourself or others and/or damage to the equipment you should adhere to the following basic safety instructions:

GENERAL SAFETY INFORMATION

1. Carefully read all Owner-Operator Guides and Manuals, Service Manuals, and/or other instructions.

2. Always follow proper procedures and use proper tools and safety equipment.

3. Be sure to receive proper training.

4. Always use proper components in applications for which they are approved.

5. Be sure to assemble components properly.

6. Never use worn-out, defective, or damaged components.

7. Practice good housekeeping always and maintain good lighting around all equipment.

8. Hand tools, although commonly used, are specialized for jobs. Always use the right size and type of tool for the job being performed. Keep tools in proper working condition and discard any tools that are worn or used beyond their useful life.

GO-E2 OPENER SAFETY INFORMATION

1. If the **GO-E2** Gate Opener is to be inspected, lubricated, or serviced, the Gear Motor is to be locked-out electrically in such a manner that it cannot be restarted by anyone, however remote from the area.

2. Know the location and operation of all emergency controls and devices. Maintain clear, direct access to these controls and devices.

3. Frequently inspect these controls and devices, the Gear Motor, Driveshaft, and components to ensure proper working order and correct mounting and alignment.

4. Do not place hands, feet, or any part of the body, or clothing in any opening.

5. Maintain a safe distance from the Telescoping Driveshaft while it is operating.

6. Do not overload the **GO-E2** Opener or attempt to use it for other than its intended use.

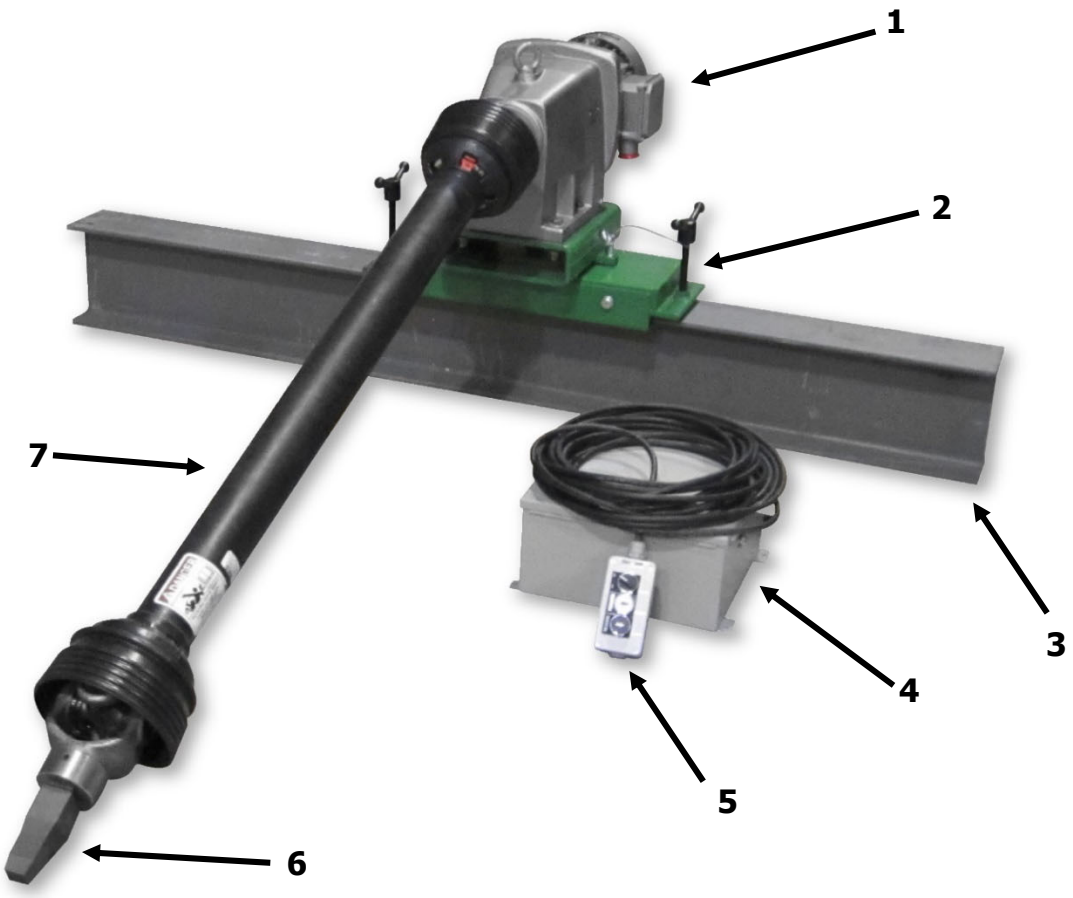
7. Perform a pre-start-up check before power is connected to ensure the equipment and area are safe for operations.

III. SPECIFICATIONS

To operate the **GO-E2** efficiently the user should be familiar with each of the Gate Opener's Components. See Figure 1 for component Layout and the following pages for item descriptions.

The **GO-E2** Gate Opener consists of a heavy-duty, 5 HP. Gear Motor; a Telescoping Driveshaft (TDS) with universal joints on each end to enable the TDS to angle up to 20° off-center on either end; an electrical Control Package in a NEMA-4 watertight enclosure which contains a reversible starter, transformer and overload protection, and a handheld, watertight, momentary contact, Forward/Reverse, Pushbutton Pendant w/ ON/OFF Control with 50' L cord. Also, included is a tapered Capstan Drive Fitting which is attached to the Driveshaft and a Capstan Swage to clean-out and square-up the capstan sockets on hopper car gate spindles.

Figure 1: Component Layout



1. GEAR MOTOR

The **GO-E2's** Gear Motor is an electrically powered unit with a cast iron housing that can be mounted to a stationary object or to our Rolling Carriage. The **GO-E2's** drive shaft slides onto the motor's keyed output drive.

2. ROTATING PLATFORM AND ROLLING CARRIAGE (RPRC)

The **GO-E2's RPRC** is used in conjunction with a customer supplied W-Beam (W8). The **RPRC** slides along the beam's flange to better align the drive shaft with the Railcars Capstan Socket. The **RPRC** also allows the operator to rotate the motor and drive shaft 360 degrees for storage purposes or for opening on both sides of the beam.

3. W-BEAM

We recommend a W8 Beam, if practical, to be mounted securely to the ground roughly 7 feet from the inside edge of the inner rail. Although not required to operate the **GO-E2** (the motor can be mounted to a permanent structure), the beam, in conjunction with the **RPRC** will maximize the Gate Opener's versatility.

4. ELECTRICAL CONTROL PACKAGE

The Electrical Control Package is wired for 480 V/3Ph/60Hz Operation. The Package is specifically designed for remote operation and control of electric motors in high voltage applications.

The Control Box features a NEMA-4 steel enclosure with continuous hinge and cover clamps. This provides watertight protection of electrical controls.

The Terminal Board, mounted inside the control box serves as the central station where power supply leads are connected.

The Reversing Magnetic Contactor, electrically and mechanically interlocked, reverses the motor by electrically reconnecting the motor windings.

The Overload Relays trips power off when the motor stalls, or when it experiences sustained overload or rapid cycling; the switch is manually reset inside the control box.

A 120V, 2 AMP fused circuit runs from the control box to the hand-held pendant control switch. This helps protect the operator by lowering the voltage in the pendant control switch.

A complete vinyl wiring diagram with adhesive backing, showing the motor circuit and the control circuit, is permanently attached inside the control box.

The diagram offers a convenient reference for connecting circuits or troubleshooting electrical problems.

5. PENDANT CONTROL

The Pendant Control is in a NEMA-4 (watertight) box and is operated by 2 momentary contact type pushbuttons. Wired to the Electrical Package with a 50ft cord, the Pendant Control allows the user to operate in both the clockwise and counterclockwise directions all while standing at a safe distance from the railcar.

The Pendant Control is also equipped with a 2-position ON/OFF switch to energize and de-energize the **GO-E2's** motor

6. DRIVE TIP

The Drive Tip is secured to the Telescoping Drive Shaft (TDS) with a heavy-duty set screw. The tapered end of the Drive Tip will firmly seat into the Railcar's Capstan Socket

REPLACEMENT DRIVE TIP PART # 33-10001

7. TELESCOPING DRIVE SHAFT (TDS)

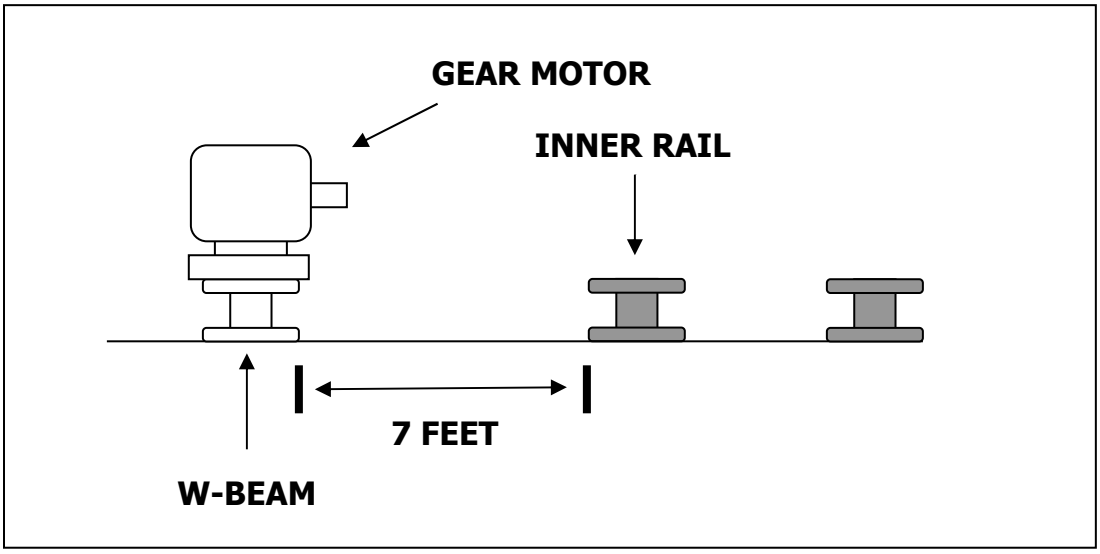
The TDS connects the Drive Tip to the Gear Motor. By extending and compressing the TDS allows the **GO-E2** to accommodate traveling Capstan Barrels. The U-Joint and Yoke design allows the Drive Tip to make full contact with the Capstan Barrel at all angles.

IV. INSTALLATION

1. Position the **GO-E2**'s Gear Motor 7-feet from the inside edge of the inner rail. If you have purchased the Beam Mount Assembly (BMA), secure a W-Beam with at least a 6" width (W8 x 24) to the floor, 7-feet from the inside edge of the inner rail. See **Figure 1**.

2. If you did not purchase the BMA, attach the Gear Motor to a base with enough rigidity to prevent torsional or lateral vibratory flexure caused by dynamic loading. The mounting surface should be flat, and clean, so stresses are not induced during the mounting of the Gear Motor to its foundation.

Figure 2: Gear Motor Placement



3. The W-Beam should run parallel to the rails, along its entire length. The **GO-E2** will slide along this beam so the length is determined by your specific application.

The W-Beam must be secured to the floor/ground. If not properly bolted down the W-Beam and the GO-E2 could topple over.

4. Once the W-Beam is secured, slide the BMA onto the beam so that the beam's top flange fits into the t-slot on the bottom of the BMA.

5. Slide the carriage to a spot on the W-Beam where it will be convenient to mount the Gear Motor. Once in position, lock the carriage in place by turning the t-handle set screws clockwise.

6. Place the gear motor on top of the BMA and using the hardware supplied, bolt the gear motor to the BMA.

CAUTION

The **GO-E2** Opener's Gear Motor is designed to operate with the base mounted floor horizontal. Other special mountings require modifications to the lubrication system and seals. Consult your WORKMASTER Sales Representative on special mountings.

7. With the Gear Motor completely secured, loosen the BMA's t-handle set screws and slide the unit back and forth along the beam to verify ease of movement.

8. Check the Gear Motor nameplate to verify that the phase, hertz, and voltage agree with the available power source.

CAUTION

Although the control package includes overload protection, wiring the incorrect power supply could still damage the Gear Motor. Ratings cannot be exceeded.

It is the purchaser's responsibility to determine the applicable local, state, and national codes related to electrical wiring of this unit.

9. Wire the control package to the Gear Motor.

10. The **GO-E2** Opener's Gear Motor is lubricated before shipment. Before start-up (or prolonged storage), remove the seal from the breather/vent plug. The lubricant level should be checked with the **GO-E2** Opener mounted in its correct position. Lubricant should be added or removed to bring it to the correct level.

11. Test the Gear Motor by rotating the output shaft 360°.

12. Attach the motor-end yoke and Driveshaft assembly of the Telescoping Driveshaft to the Gear Motor; align the connection using the key/keyway provided on the Gear Motor, and firmly secure both set screws with a 3/16" Allen wrench.

13. Locate and mount the Electrical Control Box. The Control Console is housed in a NEMA-4 watertight steel enclosure with continuous hinge and cover clamps.

IMPORTANT

The Pushbutton Pendant Control Switch is supplied with 50' of 18/4 SOOW portable cordage as standard.

IMPORTANT

A wiring diagram showing the motor circuit and the control circuit is attached inside the Control Box.

Branch circuit conductors, disconnects, protection and grounding are the user's responsibility. Refer to Article 430 of the National Electrical Code.

V. OPENING CAR GATES

1. Using the Rolling Carriage, roll the **GO-E2** Opener along the W-Beam until you "rough spot" position the Gear Motor's output shaft with the hopper car gate.

2. Once in position use the T-Handle set screws to secure the Gear Motor and Rolling Carriage in place.

The Gear Motor must be securely fastened to its foundation, and the rolling carriage must be locked down before operating the **GO-E2** Opener.

3. Should the railcar's capstan barrel socket be completely worn, use our CAPSTAN RENEW ATTACHMENT, **PN: 80-10728**, which slips over the barrel and then pin-locks in place to provide a reusable, perfectly formed female square socket.

4. Disengage the Car Gate locking mechanism before attempting to open the gate.

CAUTION

Failure to disengage the Car Gate locking mechanism will cause damage to the Car Gate.

5. Using the Capstan Swage Tool (optional accessory **PN: 33-11120**), clean-out and square-up the Capstan Socket on the Car Gate so that the Capstan Drive Fitting on the GO-E2 Opener's Driveshaft can be properly and fully seated in the car's Capstan Socket when opening the gate.

6. Extend and adjust the Telescoping Driveshaft until the Capstan Drive Fitting on the yoke and tube assembly is firmly seated in the car's Capstan Socket.

7. Position yourself away from the Drive Shaft so that fingers, tools, or articles of clothing do not get caught during operation.

8. Press the "Forward" or "Reverse" momentary contact Pushbutton to open the gate. If the gate is stuck, alternately press the "Forward" and "Reverse" buttons to rock or jog the gate loose.

CAUTION

Do not hold either Pushbutton down for more than a few seconds. Prolonged hold-down of either button can cause the Gear Motor to overheat and stall.

9. Control the opening speed, and the travel of the gate so that it does not slam against the end of the gate track.

Release the Pushbutton the moment the gate reaches its fully opened position. Prolonged hold down can cause the Driveshaft to slip from the car's capstan and bounce uncontrollably along the ground.

10. If, after repeated attempts at "jogging" the Opener with the Pushbuttons, the car gate will not move, STOP using the **GO-E2** Opener and notify your supervisor.

Do not use other opening devices, (pry bars, multipliers, etc.) in a dangerous attempt to "help" the GO-E2 Opener.

11. Remove the Capstan Drive Fitting from the Capstan Socket, collapse the Telescoping Driveshaft, and secure the GO-E2 Opener for its next use.

IMPORTANT

Handle the Telescoping Driveshaft carefully. Repeated dropping or abuse will damage the bell-shaped guard which protects the universal joint.

VI. CLOSING CAR GATES

1. Using the Rolling Carriage, roll the **GO-E2** Opener along the W-Beam until you "rough spot" position the Gear Motor's output shaft with the hopper car gate.

The Gear Motor must be securely fastened to its foundation, and the rolling carriage must be locked down before operating the **GO-E2** Opener.

2. Using the Capstan Swage Tool (optional accessory **PN: 33-11120**), clean-out and square-up the Capstan Socket on the Car Gate so that the Capstan Drive Fitting on the **GO-E2** Opener's Driveshaft can be properly and fully seated in the car's Capstan Socket when closing the gate.

3. Disengage the Car Gate locking mechanism before attempting to close the gate.

CAUTION

Failure to disengage the Car Gate locking mechanism will cause damage to the Car Gate.

4. Extend and adjust the Telescoping Driveshaft until the Capstan Drive Fitting on the yoke and tube assembly is firmly seated in the car's Capstan Socket.

5. Press the "Forward" or "Reverse" momentary contact Pushbutton to close the gate. If the gate is stuck, alternately press the "Forward" and "Reverse" buttons to rock or jog the gate loose.

CAUTION

Do not hold either Pushbutton down for more than a few seconds. Prolonged hold-down of either button can cause the Gear Motor to overheat and stall.

6. Position yourself away from the Drive Shaft so that fingers, tools, or articles of clothing do not get caught during operation.

IMPORTANT

The **GO-E2** Opener will not close ice-bound gates or gates that are structurally damaged.

7. Control the opening speed, and the travel of the gate so that it does not slam against the end of the gate track.

Release the Pushbutton the moment the gate reaches its fully closed position. Prolonged hold down can cause the Driveshaft to slip from the car's capstan and bounce uncontrollably along the ground.

8. If, after repeated attempts at "jogging" the Opener with the Pushbuttons, the car gate will not move, STOP using the **GO-E2** Opener and notify your supervisor.

Do not use other opening devices, (pry bars, multipliers, etc.) in a dangerous attempt to "help" the GO-E2 Opener.

9. Remove the Capstan Drive Fitting from the Capstan Socket, collapse the Telescoping Driveshaft, and secure the **GO-E2** Opener for its next use.

IMPORTANT

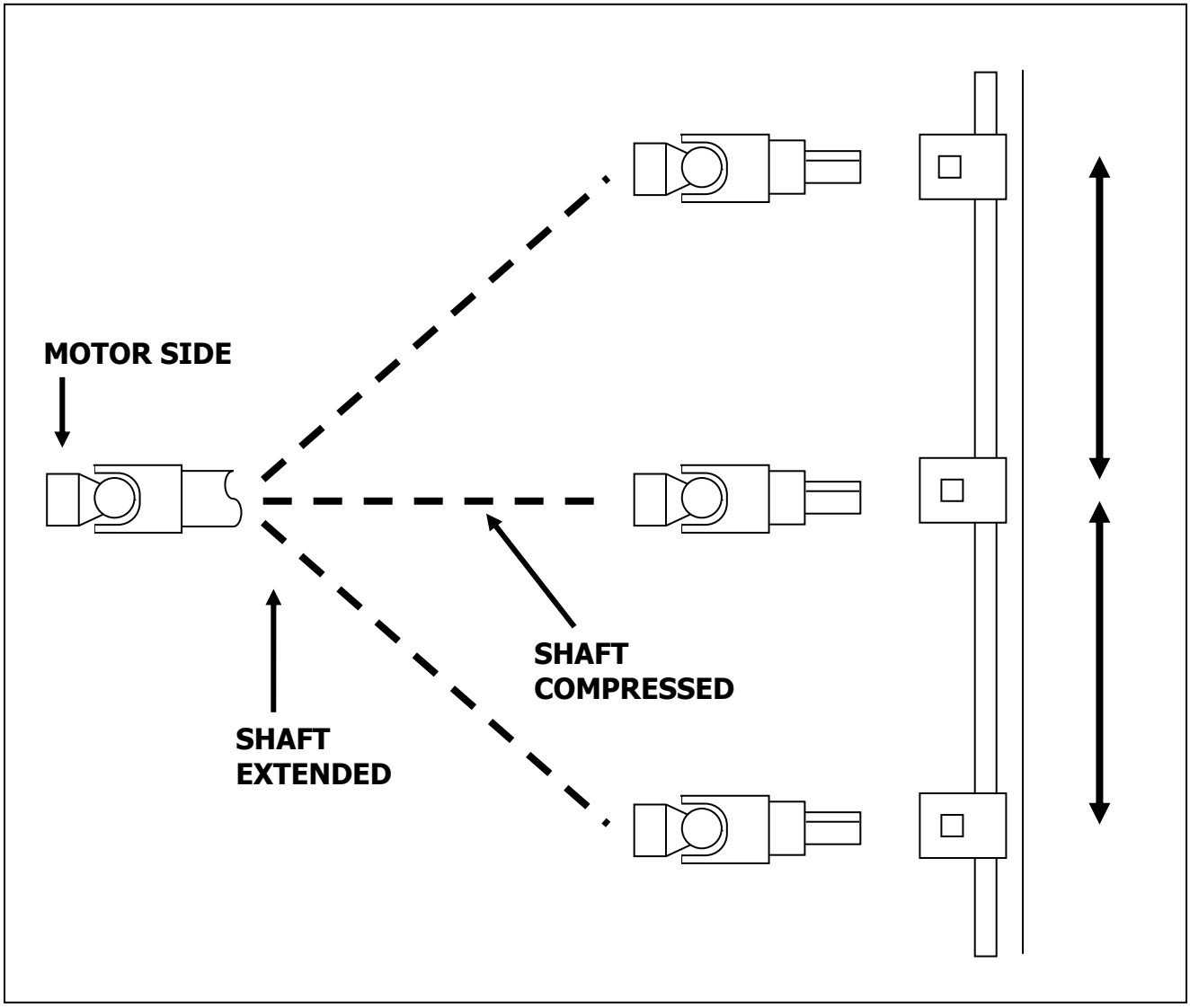
Handle the Telescoping Driveshaft carefully. Repeated dropping or abuse will damage the bell-shaped guard which protects the universal joint.

10. Engage Car Gate locking mechanism.

VII. TRAVELING CAPSTANS

The **GO-E2** Opener opens car slide gates with traveling capstans. The Driveshaft will extend and compress as the slide gate capstan moves along its length or travel. The Driveshaft's double yoke ensures that the drive fitting will maintain constant contact with the capstan. See **Figure 3** for traveling capstan depiction.

Figure 3: Traveling Capstan Diagram



VIII. MAINTAINING THE GO-E2 OPENER

Operating any equipment, including the **GO-E2** Opener, until it ceases to run can be very costly in terms of repairs and downtime. When the equipment finally breaks down, usually more expensive parts are worn out or broken. In addition, it seems that equipment always fails when it is most needed in production.

It is much wiser to develop a preventive maintenance program with an established schedule for inspecting and servicing the **GO-E2** Opener at regular intervals. The length of these intervals will be determined by specific operating conditions.

We urge you to adhere to the following maintenance schedule guidelines:

Maintenance of the **GO-E2** Gear Motor can be performed only when electrical system is locked out/tagged out.

Know and understand Lockout/Tagout Procedures as defined by American National Standards Institute (ANSI) z244.1-1992. American National Standard for Personnel Protection - Lockout/Tagout of Energy Sources - Minimum Safety Requirements, and Occupational Safety Health Administration (OSHA) Federal Register, Part IV, 29CFR Part 1910, Control of Hazardous Energy Source (Lockout/Tagout); Final Rule, and as amended.

IMPORTANT

Safety must be always considered a basic factor in machinery maintenance.

MOTOR UNIT

During maintenance and repair, inspect the fan guard and remove any accumulated debris from under it and from around the motor and gear. Motor bearings are greased during assembly. We suggest you inspect and maintain the Unit every six (6) months but at a minimum it must be done once-a-year due to the usually harsh environment in which the **GO-E2** Opener operates (temperature extremes, dirty, or moist location, etc).

CAUTION

Keep grease clean. Lubricate motors at standstill. Remove and replace drain plugs at standstill. Do not mix petroleum grease and silicone grease in motor bearings.

1. The Unit uses sealed bearings; should they need to be replaced, use bearings of equal quality with a consistency of grease suitable for class of insulation stamped on nameplate.

GEAR UNIT

The **GO-E2** Opener's gear unit should have the oil changed every 5,000 hours or 1 year. If synthetic lubricant is used, it should be changed every 10,000 hours, or 2 years. For adverse operating conditions, the interval should be shorter.

CAUTION

Do not mix synthetic and mineral base oils.

1. The **GO-E2** Opener should be checked periodically for increased noise, surface temperature, vibration, shaft movement and amperage draw.

Units with inspection covers should not be operated with the inspection cover removed.

2. The recommended lubricant for the **GO-E2** Opener's gears is: Typical Oil: SHELL Omala Oil 100, MOBIL 629.

IMPORTANT

Ambient temperatures below -20°F and above 140°F require special oil seals. Consult your **WORKMASTER** Dealer for these applications.

3. The oil reservoir holds approximately 1.5 quarts. Actual capacity should be established by opening the hex head plug from the oil level check port (lower left side of gear case) and adding oil to top-side oil fill port until oil runs out of the oil level check port.

4. Replace the hex head plug in the check port and tighten securely.

5. Replace the breather/vent plug in the oil fill port and tighten securely.

CAUTION

Use only a breather/vent type plug in the oil fill port.

STORAGE OF GEAR MOTOR

Units shipped are intended to be used within 30 - 60 days after receipt and presumed to be stored indoors in a heated building.

If you intend to store the **GO-E2** Opener under adverse conditions or for a long period of time, special storage precautions will be necessary:

1. Store in a sheltered area away from chemical vapors or steam.
2. Cover the Gear Motor.
3. Do not store it in sunlight or near high heat.
4. Remove plastic wick from breather.
5. Spray or wipe oil on exposed shafts and seals. Remove oil prior to start-up.
6. Rotate output shaft 360° every 2 - 3 weeks.

TELESCOPING DRIVESHAFT

Rotating shafts can be dangerous. You can snag clothes, skin, hair, hands, etc.

The basic function of a Driveshaft is to transmit power from one point to another in a smooth and continuous action. In the **GO-E2** Opener, the Driveshaft is designed to send torque through an angle from the Gear Motor to the railcar gate or door.

The Driveshaft must operate through changing relative angles between the Gear Motor and the hopper car. It must also be capable of changing length while transmitting torque. This means the Driveshaft must be able to expand, contract and change operating angles while the gate is being opened or closed. This is accomplished by U-joints which permit the Driveshaft to operate at varying angles.

The Telescoping Driveshaft (TDS) consists of two shielded yoke and tube assemblies with guards and U-joints. The outer yoke, tube and U-joint assembly also includes an end yoke with a 1-1/4" F. Square Drive to accept the Capstan Drive Fitting. The inner yoke, tube and U-joint assembly also includes an end yoke with a 1-7/8" F. bore with 1/2" x 1/4" keyway to accept the Gear Motor's output shaft.

Each U-joint allows the TDS to angle up to 20° off-center so that the Operator needs only to "rough spot" the **GO-E2** Opener in relation to the hopper car gate.

A combination of safe, careful handling and regular maintenance will greatly increase the likelihood of long, dependable service of the Telescoping Driveshaft.

We urge you to adhere to the following maintenance guidelines:

INSPECTING AND LUBRICATING THE DRIVESHAFT

To keep the **GO-E2** Opener operating smoothly and economically, the Driveshaft must be carefully inspected at regular intervals. Problems are caused by such things as loose end yokes, excessive radial (side-to-side, or up-and-down) looseness, and bent shaft tubing or bell guards.

1. Check the output and input yokes at both ends of the TDS for looseness.

2. Check the shaft for damage or bent tubing or guards. Make certain there is no build-up of foreign material on the shaft or at the U-joints. If found, it must be removed.

Among the most common causes of joint and slip problems is lack of proper lubrication. Regular lubrication flushes friction surfaces, removing abrasive contaminants in addition to reducing drag and heat build-up.

For normal use, use a good quality Lithium Soap base extreme pressure (EP) grease meeting National Lubricating Grease Institute (N.L.G.I.) Grades 1 or 2 specifications (Typical: SHELL Super Duty), can be used for both the U-joints and telescoping members.

IMPORTANT

There are access ports and Zerk-type grease fittings to simplify lubrication procedures.

IMPORTANT

Refer to Appendix C in this Guide for additional information on repairing the Telescoping Driveshaft (TDS).

1. The U-joints (each end of the TDS), protected by the bell-shaped guards, can be lubricated through the readily accessible Zerk-type grease fittings. Lubricate after every 4 - 8 hours of operation. Lubricate with 1 pump of grease.

2. With TDS compressed or extended, rotate inner and outer Driveshaft shields until lubrication access ports are aligned. When aligned, a Zerk-type fitting is exposed for lubrication. Lubricate after every 8 - 10 hours of operation. Lubricate with 4 - 6 pumps of grease.

3. Check that the end yoke attached to the Gear Motor output shaft is aligned (key/keyway) and firmly secure both 3/16" set screws.

SERVICING THE DRIVESHAFT

CAUTION

Replacement parts are not lubricated when shipped from the factory.

As shown in **Appendix C**, there are bearings, bearing retainers and shaft centralizers which will wear and require replacement. These parts should be inspected periodically. We suggest the TDS be disassembled and inspected every six (6) months but at a minimum, it must be done once-a-year.

DISASSEMBLY

With the driveshaft removed from the Gear Motor, the following procedure should be followed:

1. To remove the inner and outer Driveshaft shields, lay the driveline on a workbench or table. Insert a flat-tip screwdriver into the slot at the bottom of bell guard and push the retaining ring down and forward out of its groove toward the large opening of the bell.

2. Slide shield and guard off the U-joint and shaft.

3. Use a soft tap to the outside of the bearing assembly to loosen the snap ring. Tap bearing only hard enough to break assembly away from snap ring.

4. Remove snap ring from yoke. Turn U-joint over and remove the opposite snap ring.

5. Set the yoke in an arbor press with a piece of tube stock beneath it. Position the yoke with the lube fitting pointing up to prevent interference during disassembly. Place a solid plug on the upper bearing assembly and press it through to release the lower bearing assembly.

6. If the bearing assembly will not pull out by hand after pressing, tap the base of the lug near the bearing assembly to dislodge it.

7. To remove the opposite bearing assembly, turn the yoke over and straighten the cross in the open cross hole. Then carefully press on the end of the cross so the remaining bearing assembly moves straight out of the bearing Cross hole. If the cross or bearing assembly is cocked, the bearing assembly will score the walls of the cross hole and ruin the yoke.

8. Repeat this procedure on the remaining bearing assemblies to remove the cross from the yoke.

9. After removing the cross and bearings (both ends), inspect all yoke lugs cross hole surfaces for damage or raised metal. Raised metal can be removed with a rattail or half-round file and emery cloth. Check the yoke lug cross holes with a Go/No-Go Wear Gauge, and then use an alignment bar to inspect for damage by sliding through both cross holes simultaneously. The alignment bar will identify yoke lugs that have taken a set because of excessive torque. Raised metal or distorted lugs can cause premature cross and bearing problems.

10. Clean the cross holes of the inner and outer yoke ends used to attach the Gear Motor and Capstan Drive Fitting and inspect with an alignment bar (as described above). If after proper cleaning of the cross holes the alignment bar will not pass through simultaneously, the yoke lugs are distorted, and the yoke or yokes should be replaced.

Also inspect the inner yoke's 1-7/8" bore and the outer yoke's 1-1/4" square drive. Loose fitting or worn (inner yoke "out-of-round"; outer yoke "rounded corners") yokes can cause serious injury.

REASSEMBLY

1. Pack the four (4) grease cavities of the cross with high quality extreme pressure N.L.G.I. Grade 1 or 2 grease (eg, SHELL Super Duty). Also pack each bearing assembly approximately 1/4 full with this grease.

2. Position the cross in the yoke with its lube filling on the inboard side (toward Driveshaft)

3. Move one end of the cross to cause a trunnion to project through the cross hole beyond the outer machined face of the yoke lug. Place a bearing assembly over the trunnion diameter and align it to the cross hole. Using an arbor press, hold the trunnion in alignment with the cross hole and place a solid plug on the upper bearing assembly. Press the bearing assembly into the cross hole enough to install the snap ring.

4. Install the snap ring.

5. Repeat steps 3 and 4 to install the opposite bearing assembly. If the joint is stiff, strike the yoke ears with a ball peen hammer to seat the needle bearings.

CAUTION

Be sure snap rings are properly seated in grooves.

6. Repeat steps 2 - 5 at the opposite end of the Driveshaft if installing a second repair kit. Make sure to keep lube fittings at each end of the Driveshaft in line.

7. Replace the shield with bell guard by:

a. Sliding the shield retaining ring over the yoke hub.

b. Positioning bearing in groove of yoke hub.

c. Hanging guard vertically in vise or other support.

d. Inserting U-joint and shaft assembly into shield with guard. Position opening in retaining ring opposite the slot in the bell. With two screwdrivers push the retaining ring into the groove.

CAUTION

Make sure the retaining ring is completely seated in its groove.

8. Install the reassembled Driveshaft on the Gear Motor. Be sure the end yoke attached to the Gear Motor output shaft is aligned (key/keyway) and secure both 3/16" set screws.

CAUTION

Exact fit of all Driveshaft components is extremely important. The correct parts and clean mating surfaces are essential for safe operation and good repair.

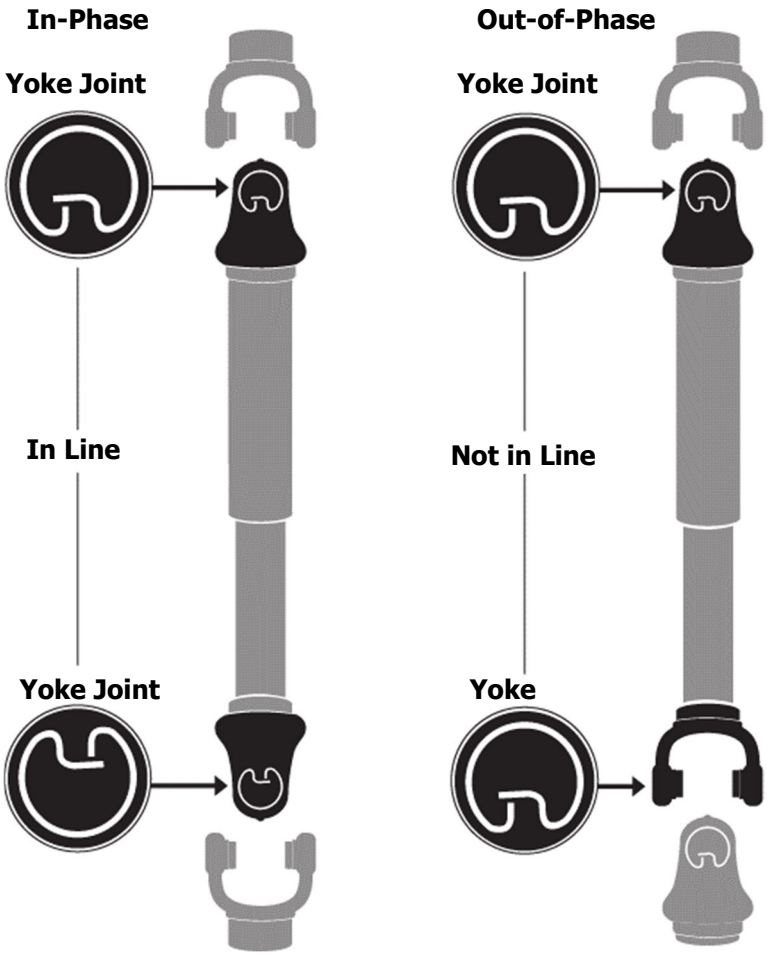
9. Apply more grease through the lube fittings until grease appears at all bearing seals.

IX. PHASING

When our **GO-E2** Telescoping Drive Shafts are assembled, the inner yoke and the outer yoke are put together in-line or "IN-PHASE". The proper orientation of one yoke to the other is called "PHASING". A Drive Shaft that is "IN-PHASE" and has the correct operating angles at the drive end of the shaft so as to not create torsional vibration. Drive Shafts that are NOT "in-phase" will vibrate and potentially "bind-up". This will destroy your Drive Shaft and potentially damage your Gear Motor. The easiest way to make sure your Drive Shaft is in the correct phase is to mark the tube and yoke before disassembling so that you can put it back together in its original orientation.

The inner shaft is square and the outer shaft, although circular on the exterior, has a female square interior. This allows the inner shaft to be inserted into the outer shaft in four separate orientations. Two of these orientations will be "out-of-phase", and two of these orientations will be "IN-PHASE". The two "IN-PHASE" orientations will have the two yoke joints in-line when assembled. See **Figure 4**. When replacing a Drive Shaft component make sure the Drive Shaft is reassembled "IN-PHASE" before operating.

Figure 4: Phase Diagram



X. ELECTRICAL CONTROL PACKAGE

The Electrical Control Package is wired for 230-460VAC/3P/6OHz operation. The electrical components are UL and CSA recognized. The Package is specifically designed for remote operation and control of electric motors in high voltage applications.

The Control Box features a NEMA-4 steel enclosure with continuous hinge and cover clamps. This provides watertight protection of electrical controls.

The Terminal Board, mounted inside the Control Box, serves as the central station where power supply leads are connected.

The Reversing Magnetic Contactor, electrically and mechanically interlocked, reverse the motor by electrically reconnecting the motor windings.

The Overload Relay trips power off when the motor stalls, or when it experiences sustained overload or rapid cycling; the switch is manually reset inside the Control Box.

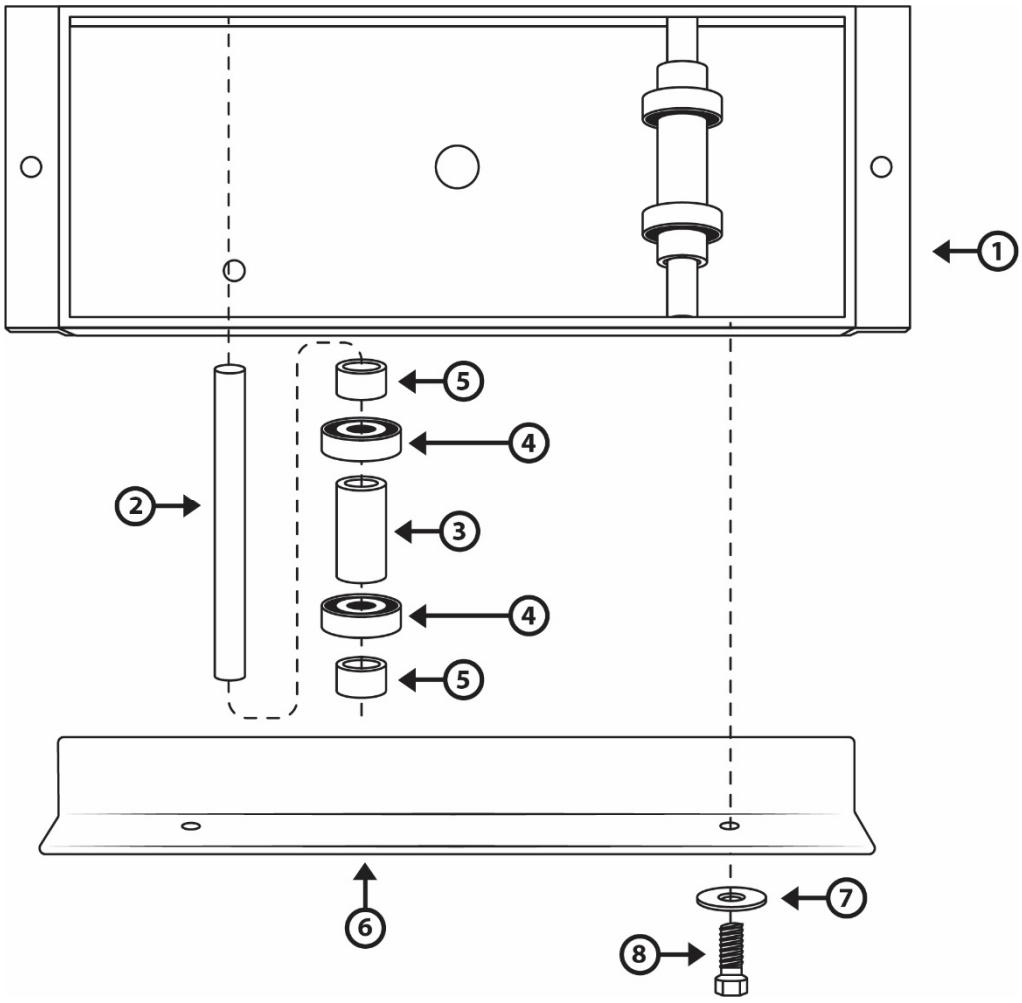
A 120VAC, 2 AMP fused control circuit runs from the Control Box to the hand-held Pendant Control Switch. This helps protect the Operator by lowering the voltage in the Pendant Control Switch.

A complete vinyl wiring diagram with adhesive backing, showing the motor circuit and the control circuit, is permanently attached inside the Control Box. The diagram offers a convenient reference for connecting circuits or troubleshooting electrical problems.

The Pendant Control Switch is in a NEMA-4 (watertight) Box on 50' of cord, operated by two (2) momentary contact type pushbuttons. This Pendant Control allows the Operator to stand away from the **GO-E2** during operation.

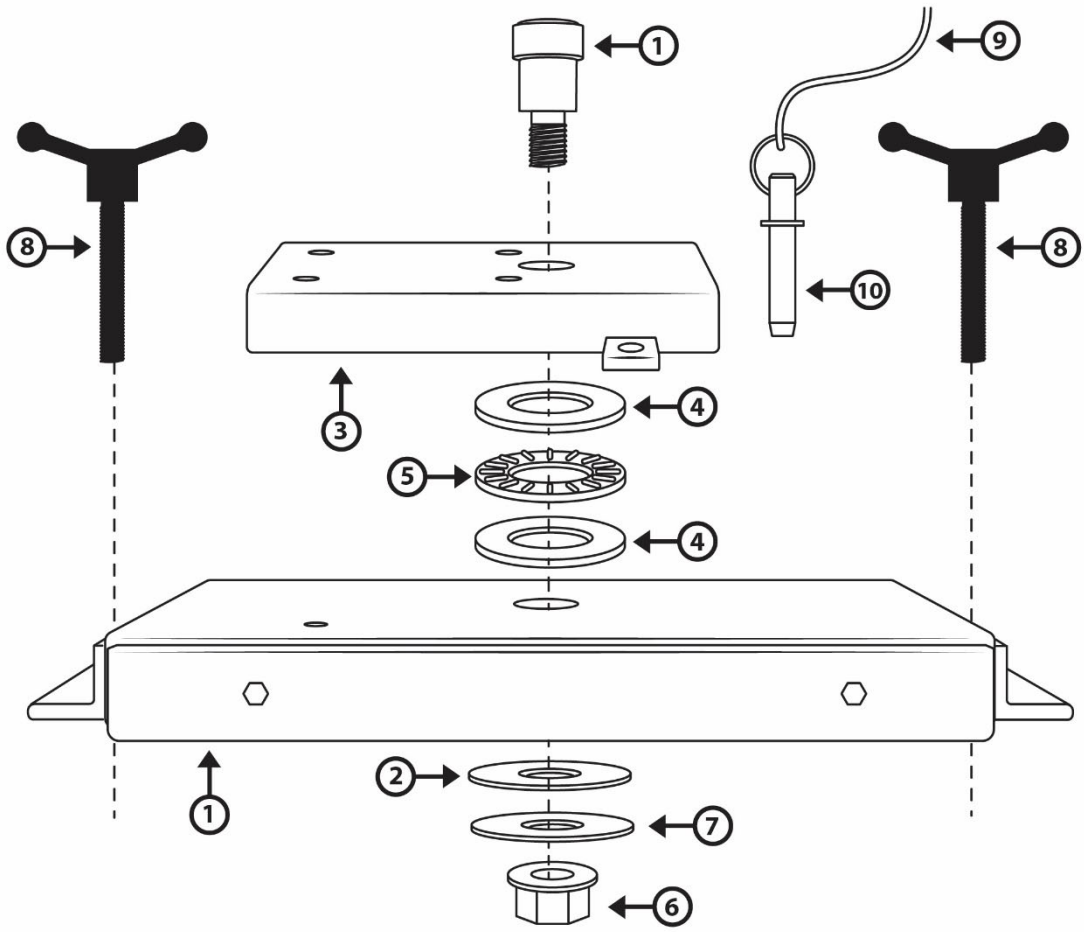
APPENDIX A: BEAM MOUNT ASSEMBLY

Assembly Part # 33-40000



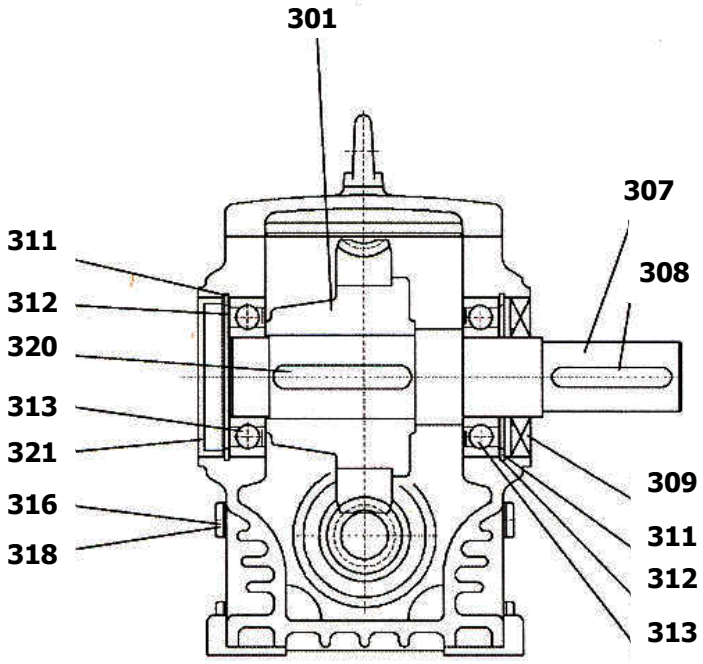
Item #	Part #	Description	Qty per Assembly
1	33-40100-A	RC Main Frame	1
2	33-40100-B	Shaft	2
3	33-40100-C	Spacer	2
4	32-20013	Bearing	4
5	32-20016	Collar	4
6	33-40100-D	RC Side Plate	2
7	75-90500	Washer	4
8	75-10504	Bolt	4

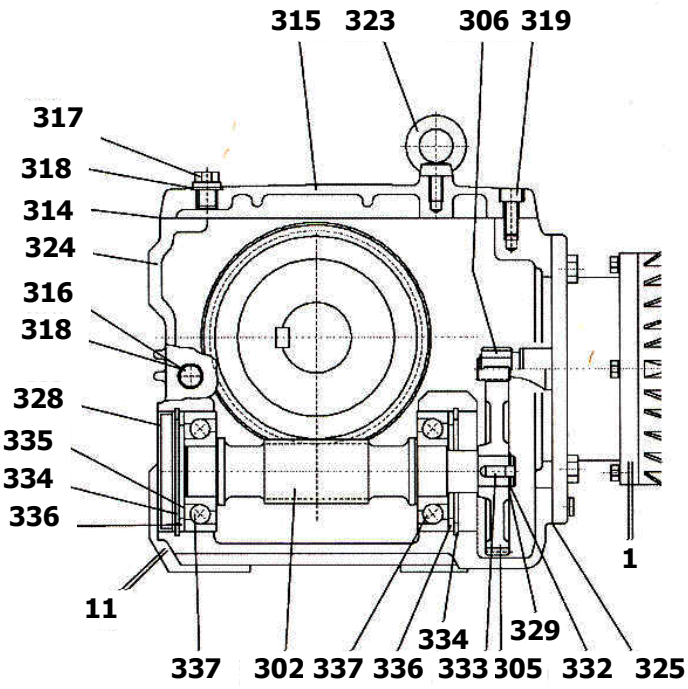
Rotating Platform



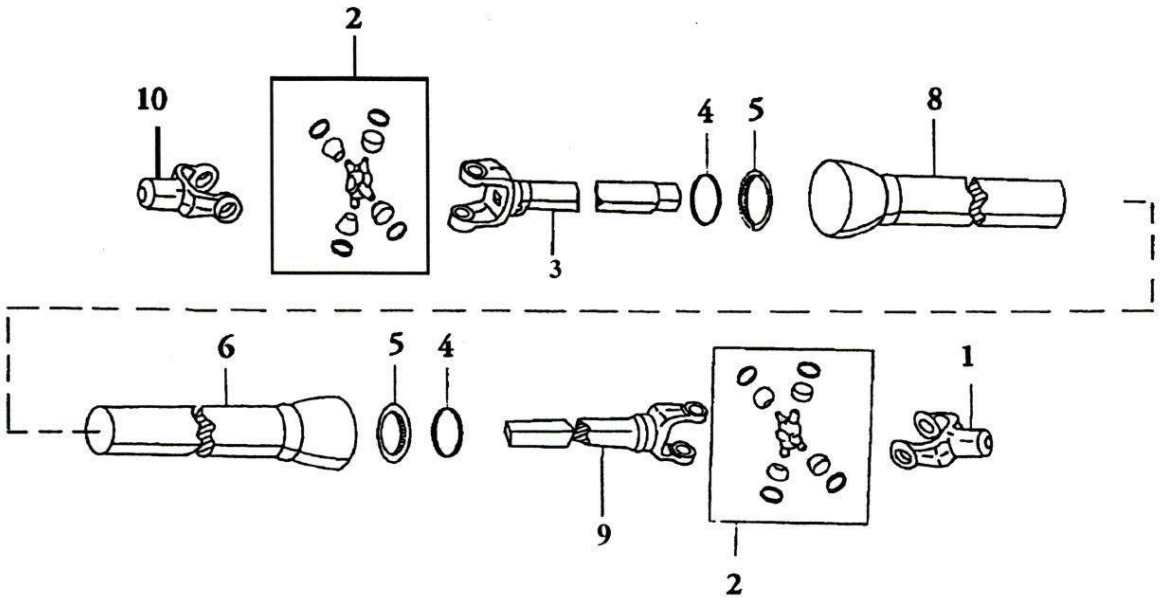
Item #	Part #	Description	Qty per Assembly
1	32-20011	Shoulder Bolt	1
2	75-81000	Flat Washer	1
3	33-40200	Rotating Platform	1
4	32-20017	Bearing Race	2
5	32-20014	Bearing	1
6	75-52800	Stop Nut	1
7	75-80800	Washer	1
8	32-20018	Handle	2
9	33-20022	Lanyard	1
10	32-20010	Pin	1

APPENDIX B: MOTOR PARTS LIST



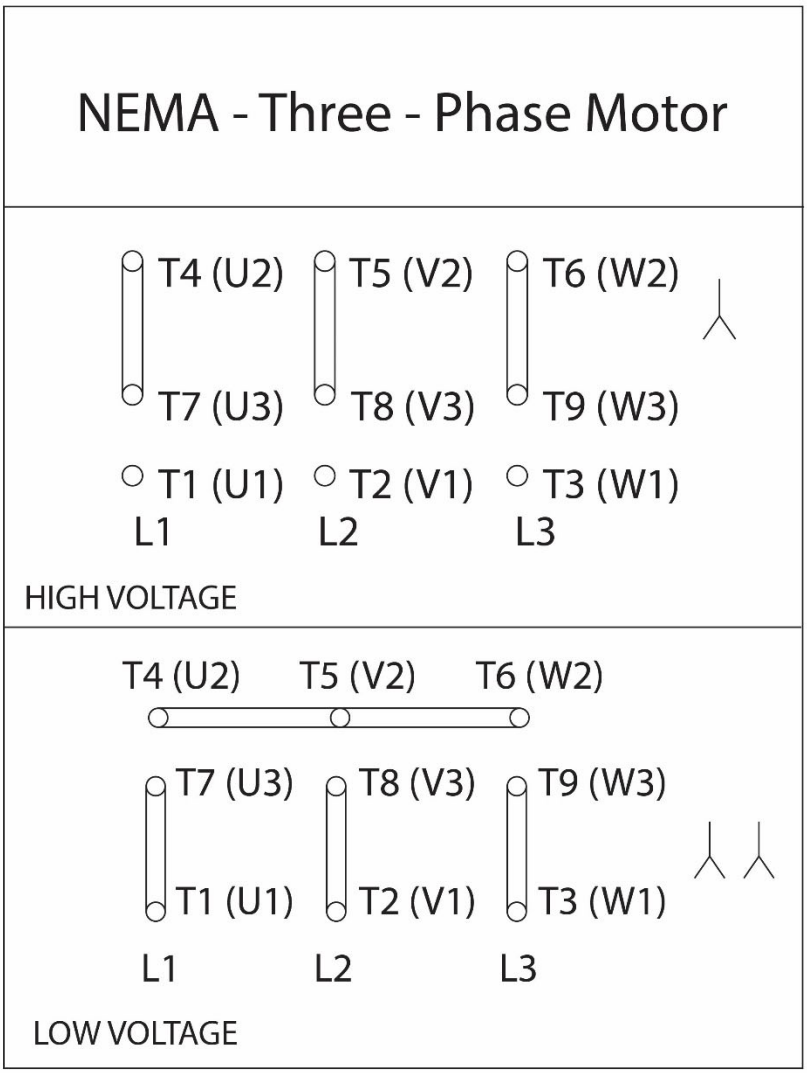


APPENDIX C: DRIVE SHAFT EXPLODED VIEW

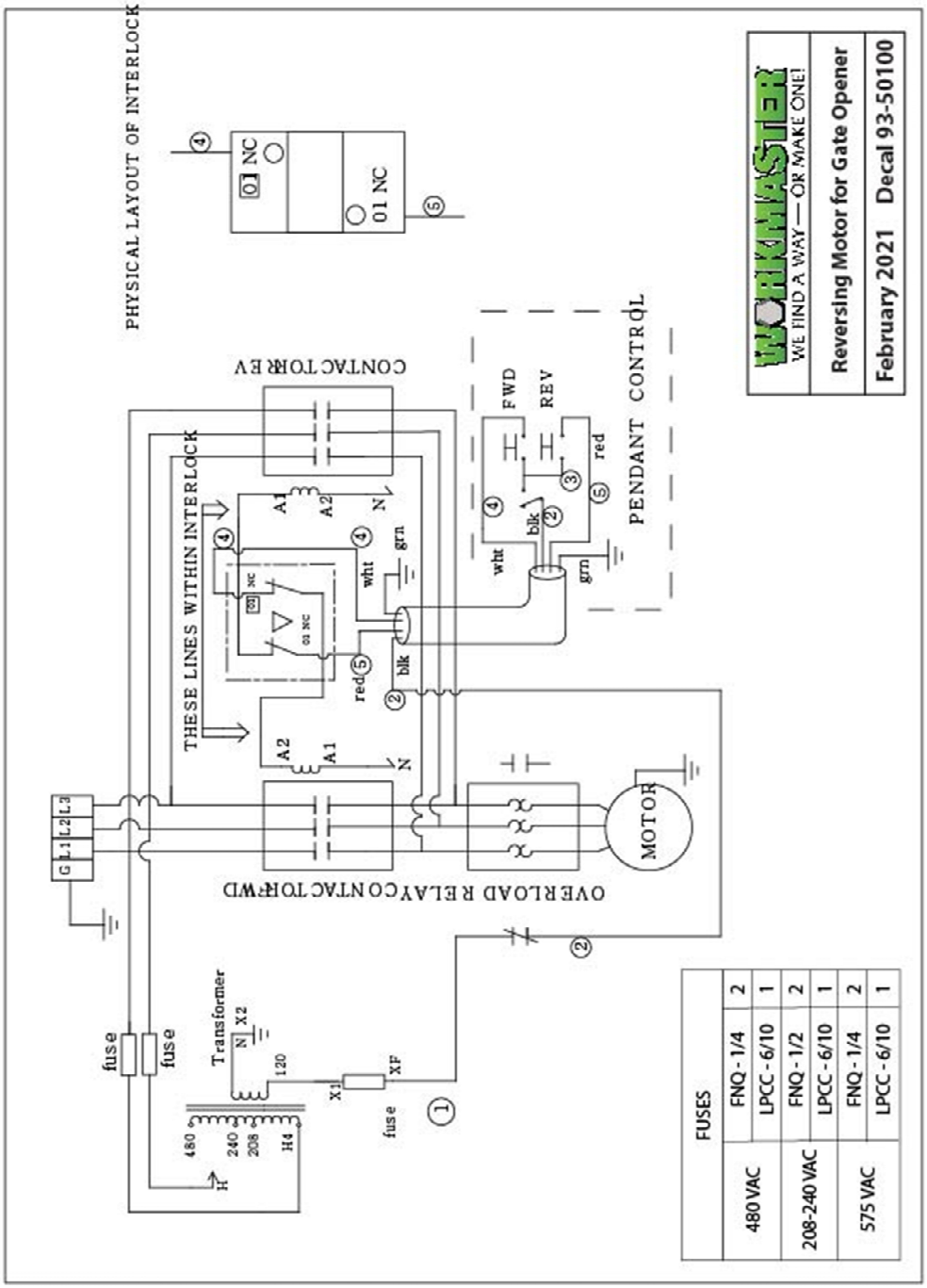


REF	PART No.	QTY	DESCRIPTION
1	33-40258	1	Inner Yoke (Motor side) 1-7/8" w/keyway
2	33-40251	2	U-Joint Cross & Bearing Kit
3	33-40252	1	Outer Yoke & Sleeve Assembly (Based on Dimensions)
4/5	31-90012	1	Bearing and Retainer Kit (Inc Qty 2 Bearings & 2 Retainers)
6/8	31-90011	1	Inner/Outer Shield w/Guard
9	33-40255	1	Inner Yoke & Shaft Assembly
10	33-40250	1	Outer Yoke (car side) 1-1/4" F. Sq. Dr.
NS		1	Safety Label – Outer
NS		1	Safety Label – Inner
NS	33-40225		Complete Driveshaft Assembly 48" Compressed x 80.5" Extended

APPENDIX D: WIRING DIA. GEAR MOTOR



APPENDIX E: WIRING DIA. MOTOR STARTER



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