WIGGINS

# LIFT CO., INC.

## Wiggins Ebull training points: (Mechanic)

1. Decals, Warnings, Safety Procedures
2. Routine Maintenance Schedule
3. Daily Safety Check
4. Changing desiccant breather on hydraulic tank
5. Fill procedure for the cooling system
6. Air filter Inspection/Change on the battery boxes
7. Controls and Operation
    a. Master Electrical Switch
    b. Pedals and Joystick
    c. Control Panel and Primary Display Screen
    d. Low Main Battery - Reduced Power, Flashing Lights
    e. Charging Main Battery
8. Diagnostic Screens - Remove Screen Guard.
9. Charging 24V batteries
10. Adjustment of the parking brake caliper
11. Towing, releasing park brake
12. Lowering a load without power

**RECOGNIZE SAFETY INFORMATION:**

This is the **safety-alert symbol**. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury. Follow recommended precautions and safe operating practices.

**UNDERSTAND SIGNAL WORDS:**

A signal-word — DANGER, WARNING, or CAUTION — is used with the safety-alert symbol. DANGER identifies the most serious hazards.


Safety signs with signal word DANGER or WARNING are typically near specific hazards.


General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.


**HIGH VOLTAGE HAZARDS:**

Unique to a Battery Electric Vehicle is the hazard of high voltage components and wiring. ORANGE cables may have high voltage or high current exposure and should only be disconnected by trained and authorized mechanics. Any boxes inside the truck that are marked with the High Voltage Hazard type decals do not contain user serviceable or user repairable parts and must only opened by trained and authorized mechanics.



**FOLLOW SAFETY INSTRUCTIONS:**

Carefully read all safety messages in this manual and on your machine safety signs. Keep safety signs in good condition. Replace missing or damaged safety signs.

Learn how to operate the machine and how to use controls properly. Do not let anyone operate without proper training and instruction.

**WARNING:** Drugs and Alcohol will affect an operator's alertness and coordination. An operator should NEVER use drugs or alcohol while operating a forklift. An operator taking prescription or over-the-counter medication must consult a medical professional regarding any side affects of the medication that would hinder their ability to safely operate this equipment. NEVER allow anyone to operate this forklift when their alertness or coordination is impaired.

**WEAR PROTECTIVE CLOTHING -** Wear all protective gear and clothing issued to you or called for by job conditions.

- Wear close fitting clothing and safety equipment appropriate to the job.
- Wear a suitable hearing protective device such as earmuffs or earplugs to protect from objectionable or uncomfortable loud noises.
- When you drive connecting pins in or out, guard against injury from flying pieces of metal or debris; wear goggles or safety glasses.

You may also need: Hard Hat, Safety Shoes, Heavy Gloves, Reflective clothing, Wet Weather gear, Respirator or filter mask.

**KNOW THE EQUIPMENT:**

Study all safety and information decals on your forklift and in your operators' manual. Make sure all manufacturers' protective structures, guards, shields, screens, panels, and seat belts are in good repair, in place and fastened. NEVER modify or remove any safety components on your forklift. Know the pinch points and rotating parts on the forklift – awareness on YOUR part can prevent accidents.

**Know the following about your forklift:**

- How to operate all controls.
- The functions of all gauges, lights, and dials.
- The rated load capacity at different load positions.
- Directional Control with F-N-R switch.
- Braking and steering characteristics.
- Turning radius and clearances.
- How to Plug In Charge Cord
- How to Unplug Charge Cord

**SAFETY WHILE SERVICING:**

**Stop the machine. DO NOT service the machine if running or hot, or if the machine is in motion.**

***Any marked High Voltage component or any orange wire or connector is only to be touched or handled by authorized and fully trained personnel. During the warranty period, only Wiggins personnel or other authorized warranty service personnel are allowed to touch or exchange components. No field repairs will be performed on individual components and no high voltage components will be opened in the field.***

*Note: When making major repairs or complex adjustments, it is recommended that you consult your Wiggins Dealer and have the work carried out by trained personnel.*

**RECHARGE SAFELY - AVOID ELECTRIC SHOCK**

- Do not insert any objects or fingers into the charge port socket.
- Keep charge port door closed except when charging.
- Do not handle a damaged charge cable or plug.

**PREPARE FOR EMERGENCIES**

- Be prepared before a fire starts.
- Keep a first aid kit and fire extinguisher handy.
- Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.

**AVOID HIGH-PRESSURE FLUIDS**

- Escaping fluid under pressure can penetrate the skin causing serious injury.
- Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.
- Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.
- If an accident occurs, see a doctor immediately.

**HANDLE CHEMICAL PRODUCTS SAFELY**

Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with Wiggins Lift equipment may enclude such items as lubricants, coolants, paints, and adhesives.

A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.

Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and recommended equipments.

(See your Wiggins Lift Co., INC dealer for MSDS's on chemical products used with Wiggins Lift equipment.)

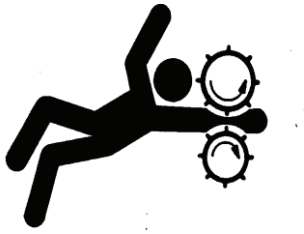
**WORK IN CLEAN AREA**

Before starting a job:

- Clean work area and machine.
- Make sure you have all necessary tools to do your job.
- Have the right parts on hand.
- Read all instructions thoroughly; do not attempt shortcuts.

**SERVICE MACHINES SAFELY**

Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing. or necklace when you work nearmachine tools or moving parts. If these items were to get caught, severe injury could result.



Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.

**ILLUMINATE WORK AREA SAFELY**

Illuminate your work area adequately and safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite anything flammable nearby.

**REPLACE SAFETY SIGNS**

Replace missing or damaged safety signs. Refer to the Decal Locations Page located in your Wiggins Manual.

**USE PROPER LIFTING EQUIPMENT**

Lifting heavy components incorrectly can cause severe injury or machine damage.

Follow recommended procedure for removal and installation of components in the manual.

**COOLING SYSTEM**

- **DO NOT** remove the radiator cap. Add coolant to overflow bottle only.
- **DO NOT** add coolant while the forklift is on or charging. **Pumps are on when Batteries are Charging.**
- When adding coolant, make sure coolant being added is compatible and will mix with existing coolant into overflow bottle.

**ELECTRICAL SYSTEM - "LV" Low Voltage**

**To prevent serious injury or death from exploding gases:**
**Do not work on LV batteries without proper instruction and training.**

**The 24v LV battery supply has two 12v batteries connected in series to achieve 24v. The OEM batteries are AGM, do not have liquid electrolyte, and do not produce gases. However, someone may have installed other batteries, so practice safe battery handling.**

Always wear protective clothing and eye protection when servicing. In case of electrolyte contact, rinse area with plenty of water and seek medical attention.

**Prevent LV Battery Explosions:**

**CAUTION:** Battery can explode.

- Before making adjustments or servicing the electrical system, disconnect the LV battery negative (-) cable first to prevent short circuits.
- Do not produce sparks with cable clamps when charging the LV battery or powering the machine on with a slave (jumper) battery.
- Keep sparks and flames away from batteries.
- Never check LV battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.
- Always remove grounded (-) battery clamp first and replace it last.

**ELECTRICAL SYSTEM - "HV" High Voltage**

**Do not work on HV batteries or Orange Cables - Contact OEM**

**Only trained and authorized personnel may remove or replace HV Batteries.**


**HYDRAULIC SYSTEM**

**High pressure fluid hazard.** To prevent serious injury or death:

**Relive pressure on system before repairing, adjusting or disconnecting.**

**Wear proper hand and eye protection when searching for leaks.**
**Keep all components in good care.**

- Ensure all hydraulic connections are tight.
- Relive all pressures before disconnecting hoses or lines. Escaping oil under pressure can cause serious injury.

- **NEVER** check for leaks with your hand. Leaks can be located by holding a piece of cardboard or wood (at least two feet long) with your hand at one end and passing the other end over the suspected area (wear eye protection). Look for discoloration of the cardboard or wood.
- Hydraulic fluid escaping through a pin hole sized opening can burn or puncture skin, resulting in wounds that could cause blood poisoning, infection, disability, gangrene, amputation, or death.
- NEVER adjust the pressure of the pump or valve.
- If injured by escaping fluid, no matter how small the wound is, see a doctor at once. A typical injection injury may be a small wound that does not look serious. However, severe infection or reaction can result if proper medical treatment is not administered immediately by a doctor who is familiar with injection injuries.

**WIGGINS LIFT CO - MAINTENANCE SCHEDULE**

**WIGGINS eBULL - NORMAL USE - ELECTRIC POWERTRAIN**
**SEE MANUAL FOR DETAILS**

| | DAILY | WEEKLY | EVERY 250 HOURS | EVERY 500 HOURS | 2000 HRS OR 5 YRS | 6000 HRS |
|---|---|---|---|---|---|---|
| TURN KEY ON, CHECK FOR STATE OF CHARGE | X | | | | | |
| SAFETY CHECK | X | | | | | |
| INSPECT FOR LEAKS | X | | | | | |
| CHECK HYDRAULIC FLUID LEVELS | X | | | | | |
| CHECK WARNINGS ON DISPLAY | X | | | | | |
| CHECK COOLANT LEVEL | X | | | | | |
| | | | | | | |
| OPERATIONAL CHECK | | X | | | | |
| LUBRICATE MAST AND AXLE GREASE FITTINGS | | X | | | | |
| LUBRICATE CHAIN | | X | | | | |
| LUBRICATE LINKAGES, PEDALS, HINGES | | X | | | | |
| INSPECT HOSE AND CHAIN ROLLERS | | X | | | | |
| INSPECT (ADJUST) WEAR PAD CLEARANCES | | X | | | | |
| INSPECT HYDRAULIC HOSES FOR RUBBING | | X | | | | |
| INSPECT WIRE HARNESSES AND CABLES FOR RUBBING | | X | | | | |
| CHECK TILT BACK ADJUSTMENT | | X | | | | |
| CHECK PNUEMATIC TIRE AIR PRESSURE | | X | | | | |
| CHECK MACHINE FOR RUST | | X | | | | |
| CHECK MACHINE FOR LOOSE NUTS AND BOLTS | | X | | | | |
| | | | | | | |
| INSPECT PARKING BRAKE PADS FOR WEAR | | | X | | | |
| CLEAN HYDRAULIC OIL FILTER MAGNETS | | | X | | | |
| CLEAN RADIATOR AND CHECK COOLANT HOSES | | | X | | | |
| CHECK DIFFERENTIAL FLUID LEVEL | | | X | | | |
| CHECK BATTERY CABLES FOR CORROSION | | | X | | | |
| CHECK ELECTRICAL CONNECTORS | | | X | | | |
| CHECK FAN BLADES | | | X | | | |
| CHECK TIRE WEAR | | | X | | | |
| CHECK WHEEL NUT TORQUE | | | X | | | |
| CHECK HV BATTERY MTG HARDWARE & BRKTS | | | X | | | |
| SAMPLE HYDRAULIC OIL, CHANGE WHEN REQUIRED | | | X | | | |
| | | | | | | |
| CHANGE HYDRAULIC OIL FILTER(S) | | | | X | | |
| CHANGE DIFFERENTIAL OIL | | | | X | | |
| REPACK STEER AXLE WHEEL BEARINGS | | | | X | | |
| | | | | | | |
| CHECK A/C SYSTEM FOR LEAKS OR DAMAGE | | | | | X | |
| | | | | | | |
| | | | | | | |
| CHANGE COOLANT | | | | | | X |
| CHECK EVAPORATOR FILTERS; CHANGE WHEN REQD | | X | **X** | **X** | **X** | X |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| **CIRCLE SERVICE INTERVAL, ABOVE.** | | | | | | |
| **WIGGINS YARD BULL SERIAL NUMBER:** | | | **MODEL NUMBER:** | | | |
| **RECORD ENGINE HOURS:** | | | | | | |
| **PERFORMED BY:** | | | | | | |
| **DATE:** | | | | | | |
| **PLEASE SEND COPY OF THIS REPORT TO WIGGINS LIFT CO. FOR OUR RECORDS** | | | | | | |

## Daily Safety Check

_____ 1. Check for broken, missing or damaged parts. Check for loose or missing fasteners.

_____ 2. Check that no safety switches have been bypassed and that no warning tags have been placed on the vehicle.

_____ 3. Check that warning decals, special instructions and operator's manuals are legible and stored in the proper location.

_____ 4. Check forks for rust, cracks or misalignment. Replace the forks IN SETS when the condition of the fork(s) is questionable. Replace with factory approved forks ONLY.

***IMPORTANT:*** *DO NOT use forks which have been repaired by welding.*

_____ 5. Check that the means to retain forks, if so equipped, are in place to prevent forks from changing position or coming off the carriage.

_____ 6. Check tires for cuts, bulges, tread depth and air pressure if pneumatic.

_____ 7. Check service and parking brakes for proper operation.

_____ 8. Keep radiator clean and free of dirt and other debris.

_____ 9. Check coolant bottle for proper level. Add coolant as required to reservoir bottle only.

_____ 10. Check the level of the hydraulic system. If necessary, fill to the required level with the proper type fluid.

_____ 11. Inspect hydraulic hoses and connections for wear or leaks. Repair or replace any damaged or worn hose with officially original accepted hydraulic hoses.

_____ 12. Check condition and operation of seat belt and its mounts.

_____ 13. Keep steps, pedals and non-skid surfaces clean and free of grease, oil, dirt, snow or ice.

_____ 14. Make sure all doors, guards or covers are in place and secured properly.

_____ 15. Perform the Pre-Operation Check**.**

_____ 16. Perform all maintenance procedures as required**.** Check AutoLube grease level.

_____ 17. Make sure work lights, mirror, gauges and operator console are kept clean. Check that lights, horn, and wipers operate properly. Make sure electrical connections are clean and free of damage. Check **ORANGE** cables for nicks or wear.

_____ 18. Remove or secure any loose objects.

_____ 19. Survey the work area and notice any potential obstacles.

**COMPLETED BY:**_____ **SERIAL #:**_____

**O.K.:**_____**DATE:**_____ **HOURS:**_____

***Do not operate the Wiggins Yard eBull® if any of the Daily Safety Check procedures are faulty. If in doubt always contact the Dealer or Wiggins Lift Co.***

Wiggins eBull

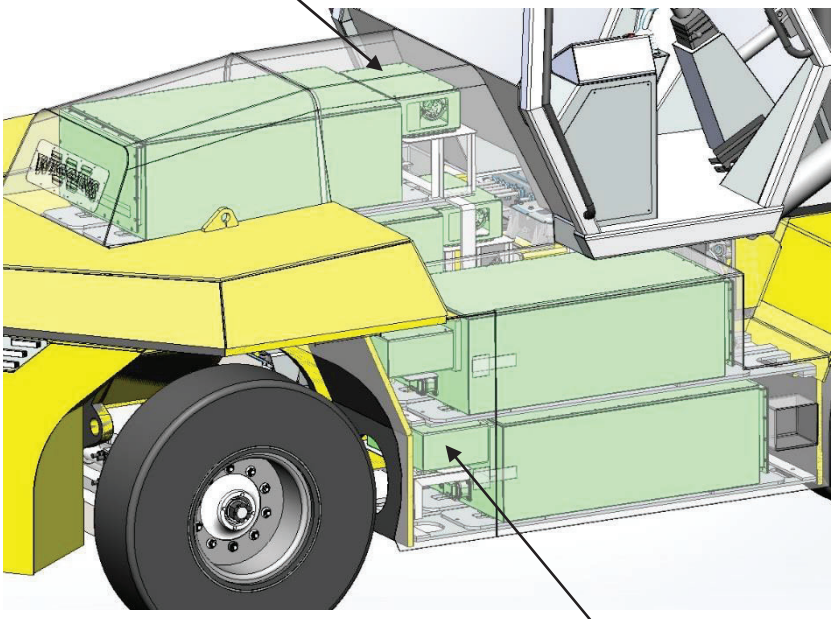
Coolant Fill and De-Aeration Procedure

1. Connect all hoses securely.
    a. Clear hose from Inverter Out to top of Reservoir, **leave ball valve open**.
    b. Clear hose from bottom of Reservoir to top of Radiator.
    c. Check that **hose barb** at Radiator cap is **plugged**.
    d. Check that radiator cap is tight and secure, will not leak air in or out.
2. Begin fill by adding coolant to Overflow Reservoir. Avoid introducing air bubbles by pouring too fast or splashing.
3. Watch coolant flow down clear tubing to Radiator until the hose up to Reservoir is full. About 3 gallons.
4. Watch clear hose from valve to Reservoir fill with coolant and reach same level as the coolant in the Reservoir.
5. Continue adding coolant to Reservoir until at least **1 inch above center line**.
6. With **return hose ball valve open, turn on key**, pumps at 1500 RPM (default setting).
7. Using IQAN Maintenance function, turn pumps up to 3000 RPM.
8. Watch clear hoses for air bubbles while running at 3000 RPM. After no bubbles for 5 minutes, turn off power.
9. **Connect vacuum device to cap on Reservoir. Connect hose from vacuum device to vent on reservoir.**
10. Activate vacuum while watching clear lines and vacuum gauge.
    a. Bubbles may appear in either or both clear lines.
    b. Run vacuum at –15 inches for 10 minutes or until bubbles stop for 5 minutes.
    c. Turn off vacuum, remove from filler neck on reservoir, and disconnect vacuum hose.
11. Add more coolant to Reservoir until level is above center line.
12. With valve open, turn on key, pumps at 1500 RPM (default setting). Watch for bubbles in clear hoses.
13. Close Inverter outlet vent ball valve and run vehicle with and without load for 1 hour, note TM4 Temp Factor.
14. With key on, raise console enough to open ball valve and observe any air bubble pass to the reservoir.
15. Close ball valve. Ready to operate.

## Maintenance Item Locations

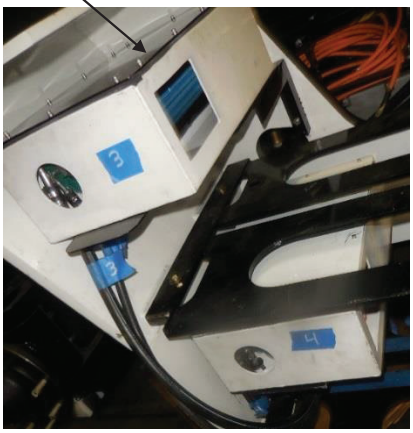
**If applicable**

**Evaporator Filter Locations**



**Evaporator Filter Locations**

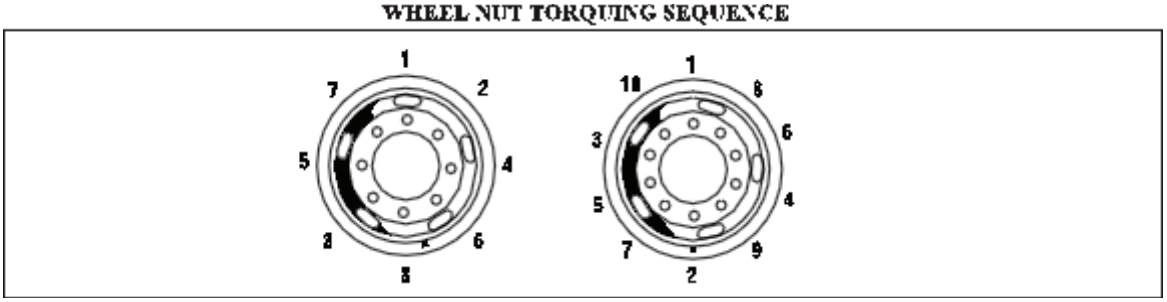
**Remove Evaporator cover to access Filter**



**HV Battery mounting hardware and brackets; Inspect quarterly for loose or broken bolts, cracks in welds, etc. Repair or replace as required.**

**Coolant should be changed generally every 30,000 miles. That would be around 6,000 hrs. In a stationary motor like a generator or forklift in this case**

**WHEEL NUT TORQUING SEQUENCE**




Torque values:

| | |
|---|---|
| ¾-16 | 450-500 Dry |
| | 320-384 Lubed |
| M22x1.5 | 480-575 Dry |
| | 450-500 Lubed |
| 1 1/8-16 | 750-900 Dry |

| | |
|---|---|
| PRC 7534 | ¾-16 |
| PRC 3805/3806 | ¾-16 – Typical but may vary |
| PRC 1756 | Most common M22x1.5, but Taylor has a ¾-16 option. |
| PRC 785 | M22x1.5 |
| JD1400 | ¾-16 |
| JD1600 | ¾-16 |

Most Wiggins Steer Axle use 1 1/8-16 Nuts

Lubed refers to a pressure bearing grease or anti-seize lubricants, not a light coat of oil. Threads should be lubricated, but it is important to keep the faces of the rim, washer or nut free from lubricant

For nuts used on hub-piloted wheels, apply two drops of oil to a point between the nuts and flanges and two drops to the last 2 or 3 threads at the end of each stud. Also, lightly lubricate the pilots on the hub to ease wheel installation and removal. Do not get lubricant on the mounting face of the drum or wheel.

**Fluid Sampling:**
Proper fluid sampling consists of the following procedure:

- The first sample data point must be from an unused, new fluid sample to establish initial levels for which subsequent used oil samples will be compared.
- Second sample data points of used oil samples should be taken at 250 hours.
- Subsequent draw of used oil samples should be at 250 hours and will continue until the fluid exceeds any of the limits.

**Extraction of Fluid Sample:**
To obtain a representative fluid sample, the following conditions must exist at the time the fluid sample is taken:

1. Hydraulic tank temperature above 60°C (140°F) (If hydraulic oil temperature is not available, coolant must be at operating temperature).
2. Direction Selector in Neutral.
3. Vehicle wheels chocked and vehicle brakes applied.
4. Before attaching collection bottle, allow a minimum of three fluid ounces (90ml) to purge into a container. This removes prior oil/debris trapped in valve and/or remote oil sample hose.
5. Once valve and/or remote oil sample hose has been purged, install collection bottle and fill approximately 3/4 full.
6. Discard the used materials properly. Do not reuse

**Fluid Analysis:**
Hydraulic component protection and fluid change intervals can be optimized by monitoring fluid viscosity and oxidation. Fluid degradation is monitored by testing for viscosity and Total Acid Number
(TAN•). Fluid Viscosity Limit +/- 25% Change From New Fluid

- Total Acid Number +3.0 Change From New Fluid

Since limits are referenced from an unused oil sample, when beginning fluid analysis or repurchasing bulk oil stock, i.e. 55 gallon drum and larger, collect a new, unused oil sample and submit for analysis. Viscosity and TAN values measured from unused sample create the baseline that future used oil sample will be measured against.

**Monitoring Contaminant Levels:**
The presence of contaminants in the hydraulic fluid is detrimental and indicates a fluid change is necessary. Contaminant limits:

- Contaminant Limit of Water - 0.2% Maximum
- Contaminant Limits of Glycol - No Trace Allowed
- Contaminant Limits of any fluid not approved – No Trace Allowed

**Monitoring Wear:**
Absolute maximum values are not applied to wear metals of a hydraulic system due to the many variables present that affect concentration limits. Wear metal analysis results must be evaluated using a trendline approach. A trendline approach plots the concentration level of each wear metal over a period of time. A line of best fit drawn through the plotted points is considered a trendline. A minimum of 4 data points for each wear metal is required to establish a trendline.

Concern should only occur when significant deviations in the established trendline are present. While trendline analysis on wear metals can prove informative and useful, a hydraulic component removal decision should not be based solely upon the analysis. The results should be used in conjunction with other inspection procedures such as a functional check, road test, oil tank/ internal filter inspection, or elevated particle counts. A removal based solely on wear metal analysis may result in an unnecessary teardown. Hydraulic component removal should occur only if the additional investigation warrants it.

If there is ever any doubt on the significance of any fluid analysis reports, or a need to react to a condition, assistance should be sought through a servicing outlet or Transmission Manufacturer's regional office.

The following part per million (PPM) values represent general guidelines which may be used for references as normal limits:

| | | |
|---|---|---|
| Iron | Fe | 125 PPM |
| Copper | Cu | 350 PPM |
| Silicon | Si | 20 PPM |
| Aluminum | Al | 15 PPM |
| Lead | Pb | 50 PPM |
| Chromium | Cr | 5 PPM |

## LUBRICATION and MAINTENANCE

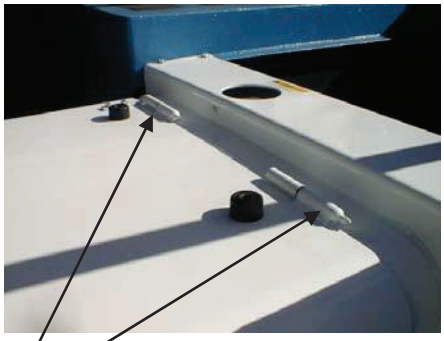
### Grease Recommendations:

Use grease based on the expected air temperature range during the service interval.

The following greases are preferred:

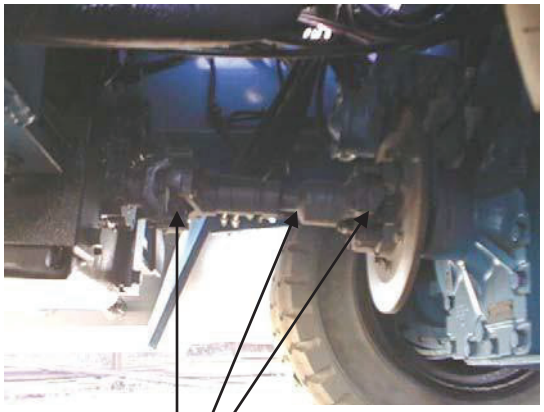
- SAE Multipurpose EP grease with a maximum of 5% molybdenum disulfide.
- For the ambient temperature range 14 F° to 122 F° (-10 C° to 50 C°) use SAE NLGI #2.
- For the ambient temperature range -4 F° to 86 F° (-20 C° to 30 C°) use SAE NLGI #1.
- For the ambient temperature range -22 F° to 50 F° (-30 C° to 10 C°) use SAE NLGI # 0.

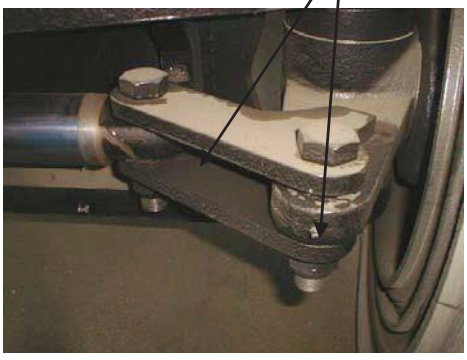
Contact Wiggins Lift Co., Inc. for more information (805) 485-7821.

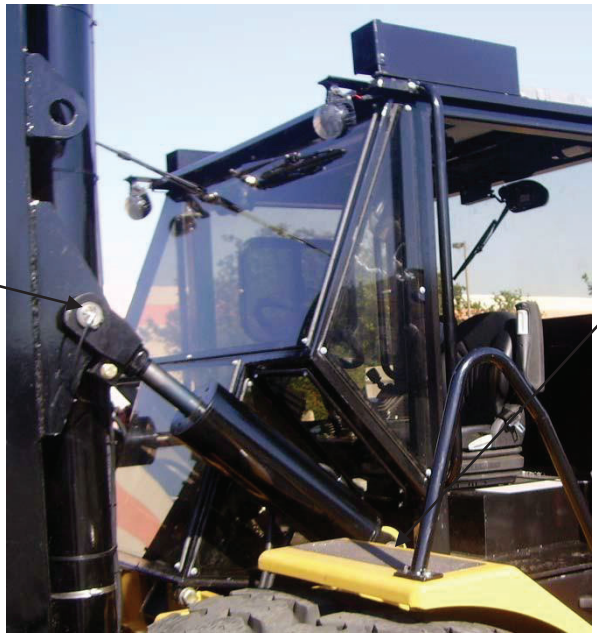
**All Hood and Door Hinge Points**

**Steer Axle Points**





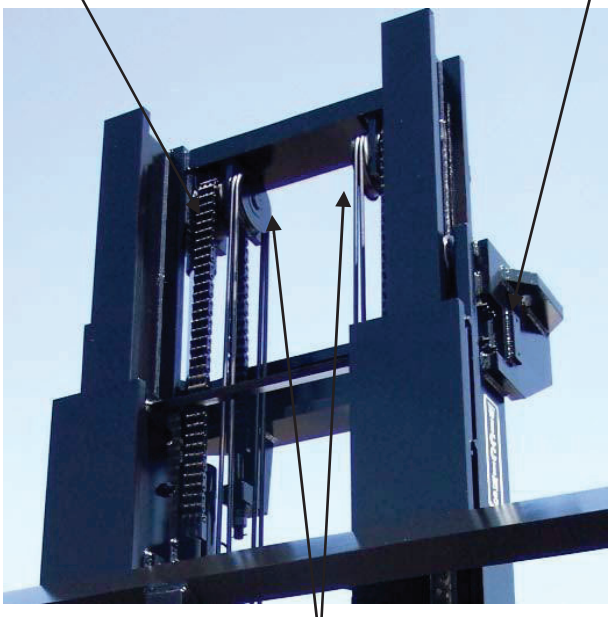
**Drive Line Points**

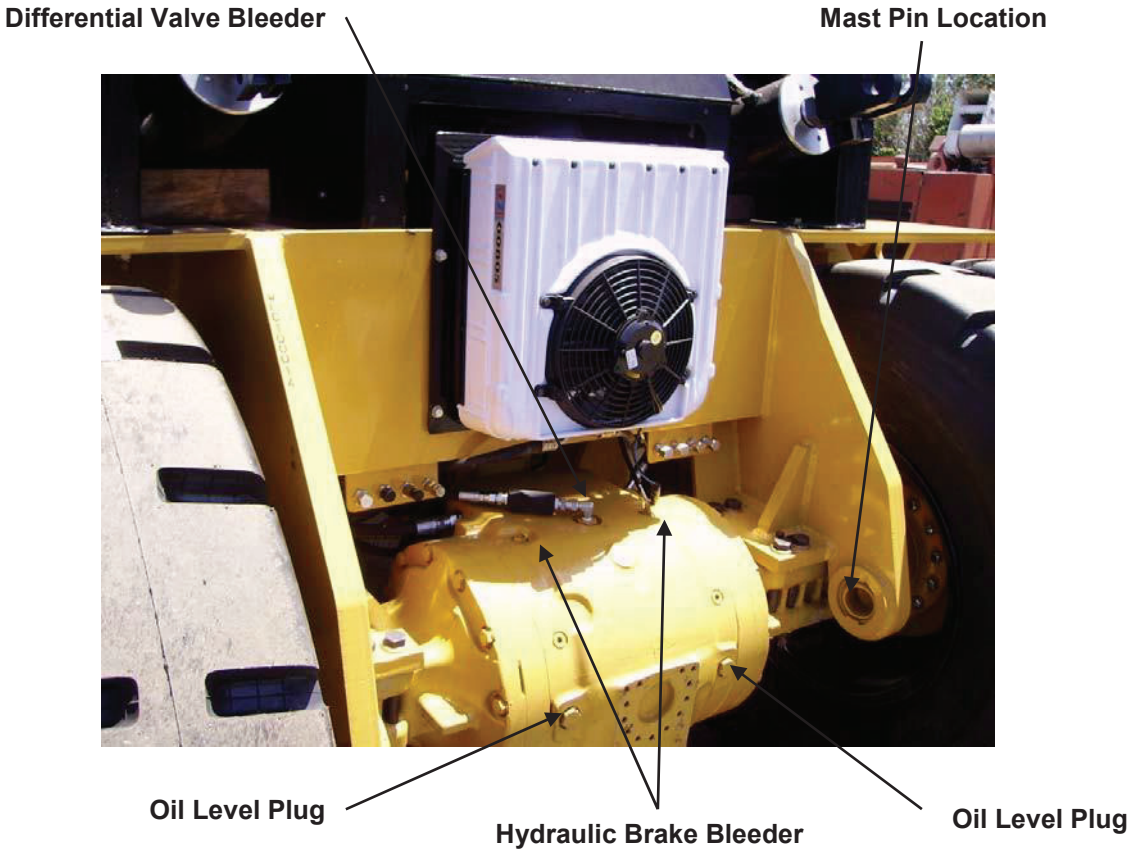



Carriage Roller Bearing Lube Points
(Inside Carriage Rail)

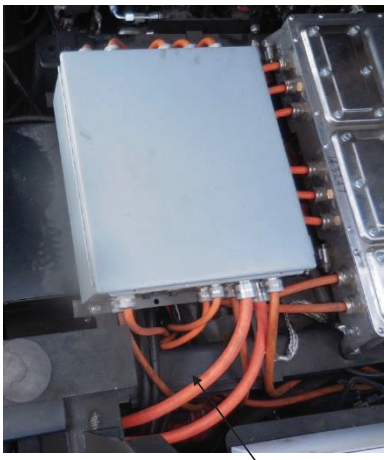

Mast Chain use Tefgel
(Wpn – 671864)

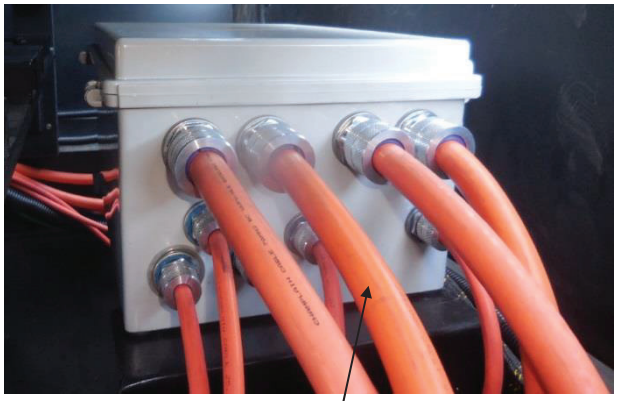
Mast roller bearings lube points



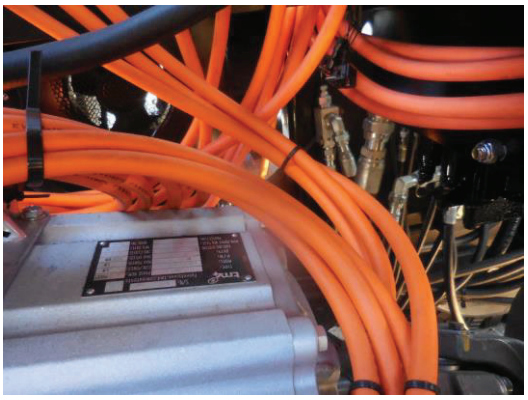



John Deere Axle Oil Level Check





**Inspect all High Voltage cables located throughout the forklift for damage, discoloration, cracks, cuts, or evidence of rubbing/abrasion. HV Cables are distingushed by their color orange.**



*** Hoses, Low Voltage Harness and High Voltage Cables should be thoroughly inspected a couple times a year unless something is found during the daily inspection.**

**DRIVE AXLE – Refer to the Drive Axle Manual**

**MAST**

For proper operation and extended life, your Wiggins Lift Mast should be inspected and serviced regularly as part of your normal lift truck maintenance schedule according to the following outlines and ANSI B56.1 procedures. The recommended intervals are for masts operating under normal conditions. If the mast is operating in severe conditions or corrosive atmospheres (including salt air), the inspections should be performed more frequently.

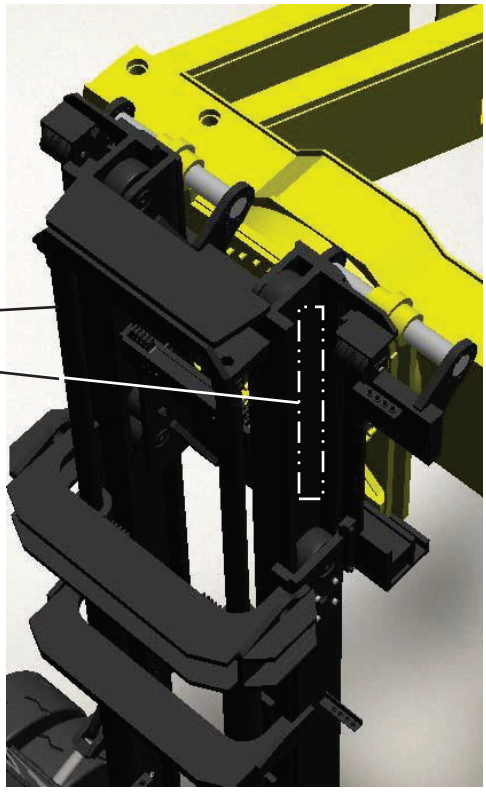
**WARNING:** Never work on the mast with a load on the forks or attachment, in the raised position without supports or while anyone is near the lift truck control handles per ANSI B56.1.

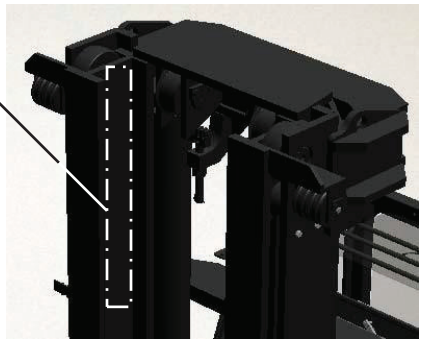
**Daily Inspection:**

1. Extend the carriage a few inches off the ground and make sure the mast chains are under equal tension. Refer to Chain Inspection Section.
2. Extend the mast to its fullest height to make sure the mast rails and carriage extend freely without binding.
3. While the mast is extended, inspect the upright rails for proper lubrication. Refer to Rail Lubrication Section (see Next Page).
4. Make sure the internal reeving hoses (if equipped) travel evenly in the hose guides. Adjust the hose ends if required. Tighten the fittings making sure they do not twist.

**Mast Lubrication:**

- Lubricate all grease fittings on the mast per Wiggins Maintenance Schedule. (Refer to “Lube and Grease Points” pages for locations and recommend grease).
- To lubricate Inner Mast Rail, fully extend mast. Apply Tefgel, (Wpn – 671864), to both outside webs of Inner Mast Sections.
- To Lubricate inside webs of inner rails, lower mast sections and apply to exposed inner mast rail.





**100 Hour Inspection**

After each 100 hours of lift truck operation, and in addition to the daily inspection:

1. Inspect and lubricate the full length of the chains with Tefgel. (Wiggins Part Number 671864 - TEFGEL PEN GEL LUBE)

**CAUTION:** The chains must be coated with a film of lubricant at all times.

**500 Hour Inspection**

After each 500 hours of lift truck operation, and in addition to the daily and 100 hour inspection:

1. Check for equal distances between the insides of the uprights (See Fig 1). If the distances are not equal, follow the applicable instructions described below:

Canted Mast Bearings – Typical for Extruded Rail (Shown in Fig 1)

a. Shim the load rollers on the uprights and carriage so that the total side clearance is no greater than .06 inches (1.5 mm) occurs at the tightest point throughout the travel of the member. Pry between the upright and load roller so that the opposite load roller is tight against the upright. (See Fig 1)

Straight Mast Bearing – Typical for Fabricated Rail (Shown in Fig 2 and 3)

b. Adjust set screws so the uprights and carriage distances are equal. Tighten locking nut to secure set screw. (See Fig 2 and 3)

2. Check the Chains for wear and stretch. Refer to Chain Inspection section

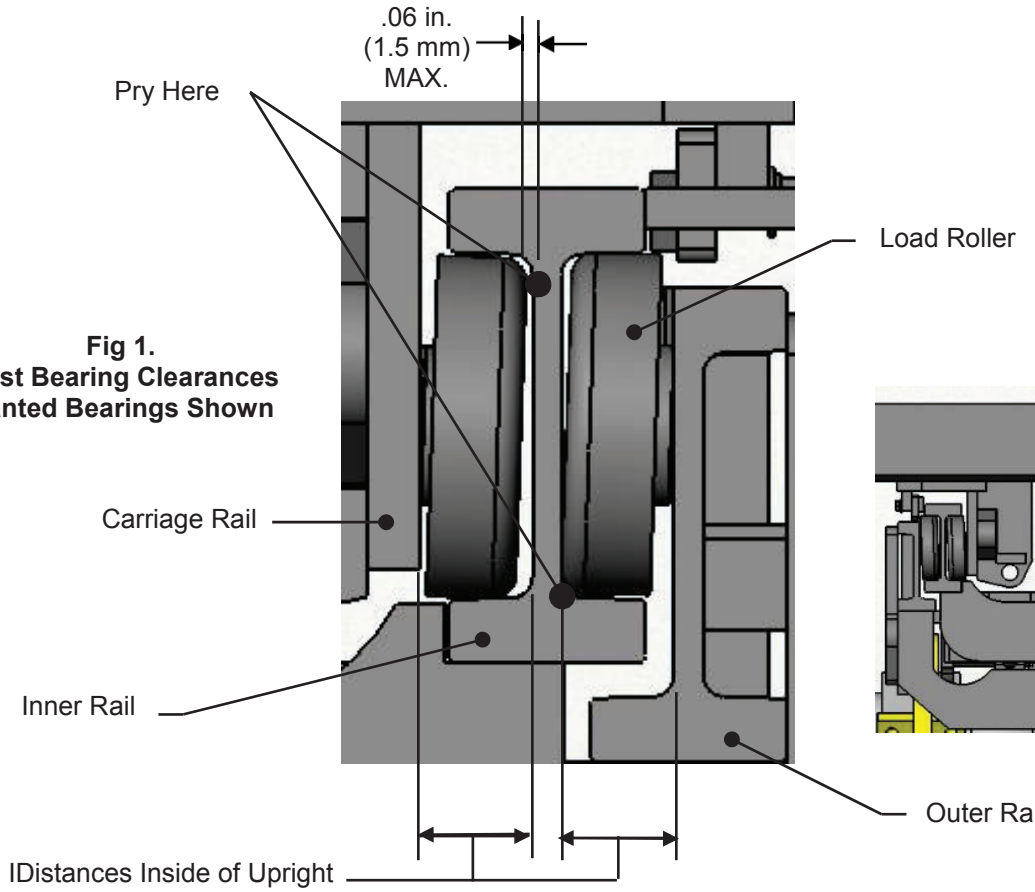



**Fig 1.**
**Mast Bearing Clearances**
**Canted Bearings Shown**

**Fig 1.**

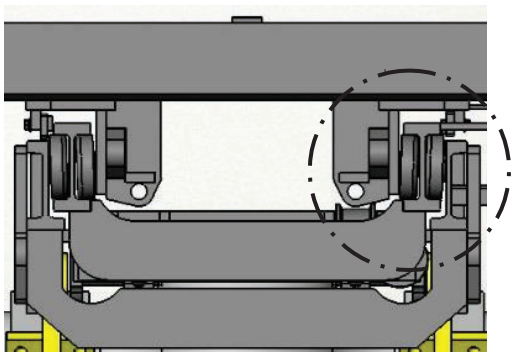
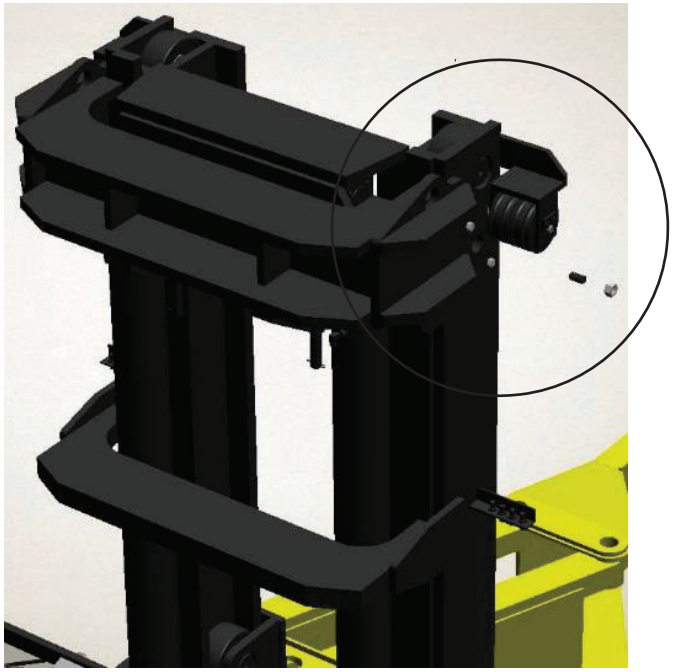


Fig 2.



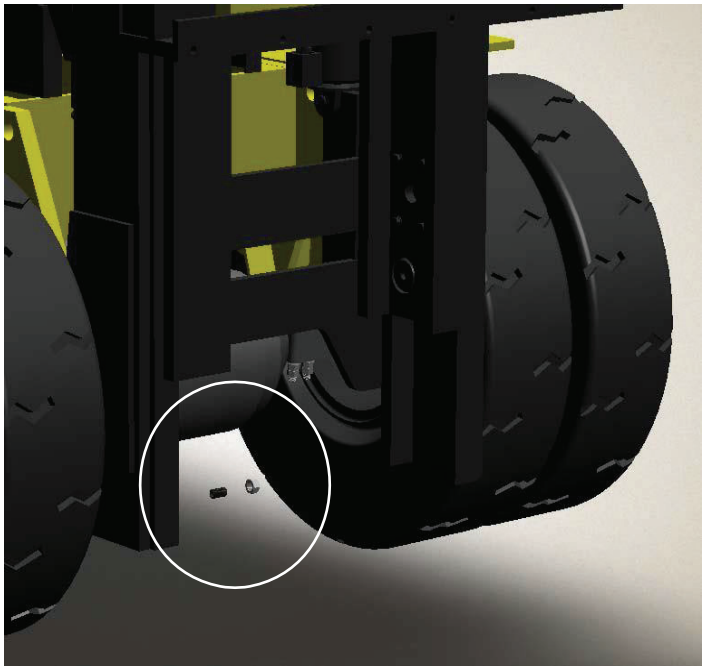
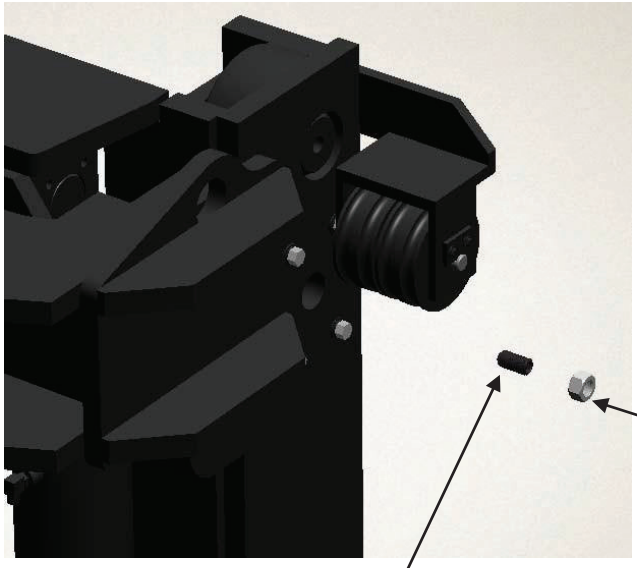
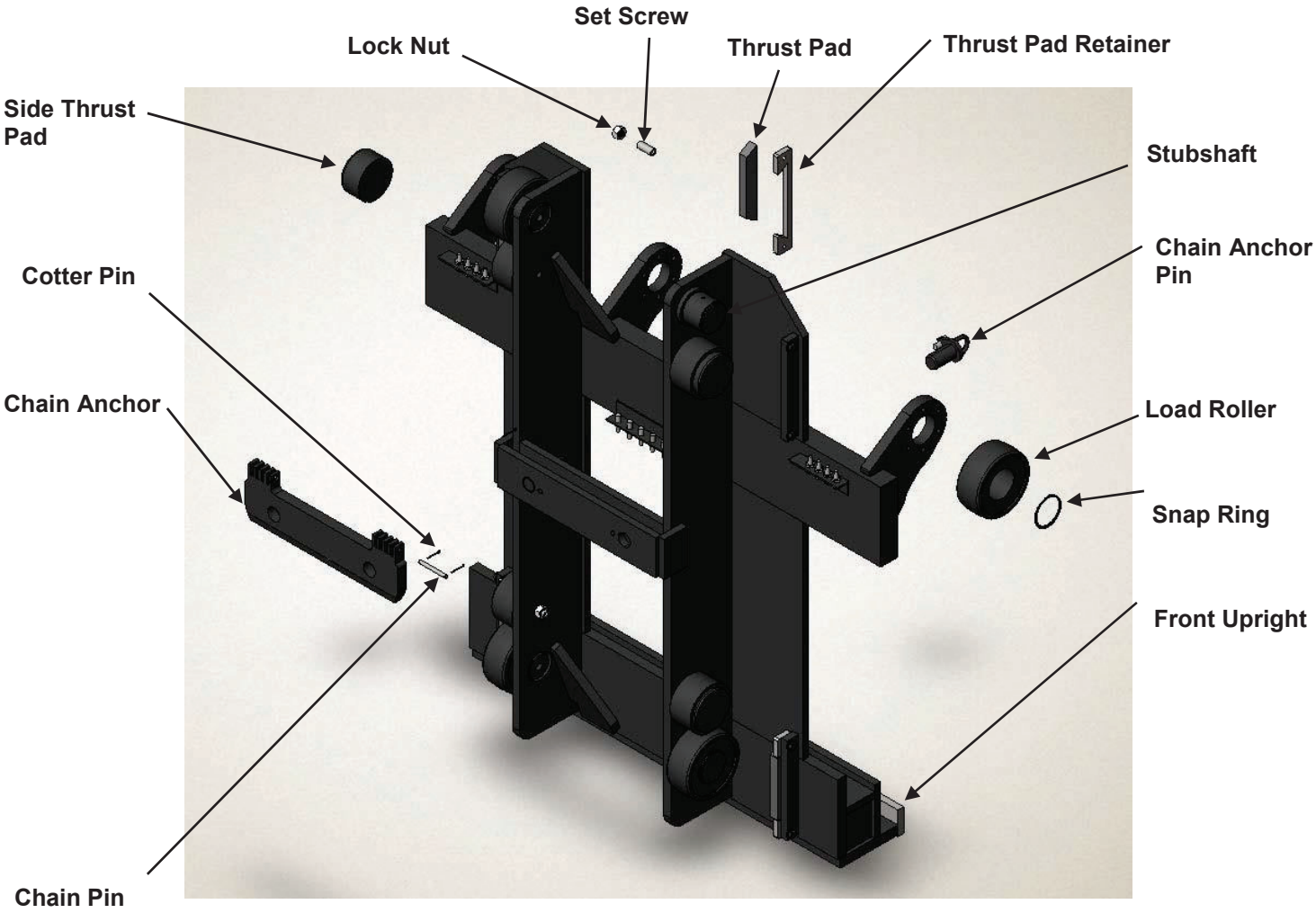


Fig 3.



**Carriage Inspection**

1. Inspect the rollers for excessive wear or damage. Rollers with visible flat spots or cracks should be replaced.
2. Lower Fork or Attachment to level ground and tilt the mast forward or back to release load on rollers. Inspect the roller bearings by turning the rollers on their shafts. Rollers with roughness or noticeable restrictions to turning should be replaced.
3. Inspect all welds between the carriage side plates and the carriage fork bars. If any welds are cracked, replace the carriage.
4. Inspect the roller stub shafts. If they are damaged or if there are cracks at the base of the stub shafts, the carriage must be replaced or repaired. Contact Wiggins Lift Co., Inc. for repair procedures.




**Carriage shown above is for a Tire Handler**
Additional Service, Safety and Maintenance information on NON-Wiggins attachments will be provided as a separate manual.

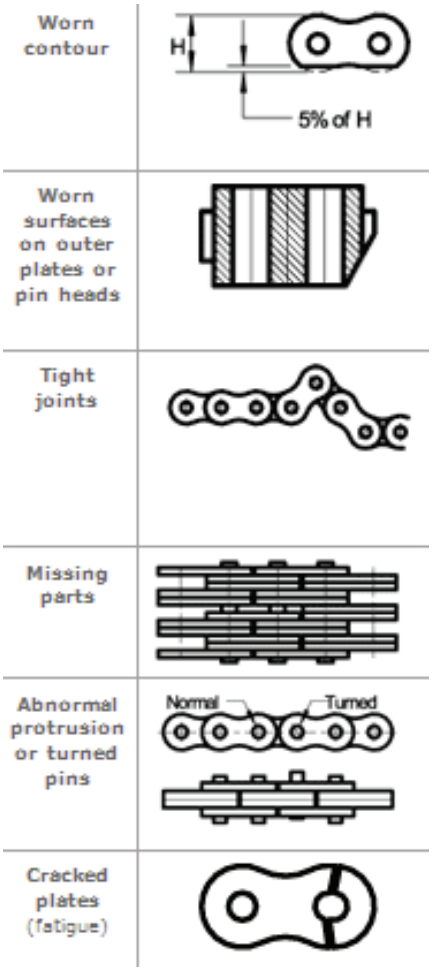
**Chains**

Inspection and Tension

Each pair of chains has been factory-lubricated using heat and pressure to force the lubricant thoroughly into the chain links. Avoid removal or contamination of this factory lubricant. **Do not wash, sand blast, etch, steam clean, or paint the chains on initial mast installation.** The chains must be adjusted with equal tension to ensure proper load distribution and mast operation. To determine equal tension, extend the unloaded mast to put the chains under tension. Press the center of a strand of chain with your thumb, then press at the same place on the other chain of the pair. Each chain in a pair should have equal “give”. If tension is not equal, adjust the chains as described in **Chain Adjustment**.

Inspect the chains. If inspection reveals that one strand of a pair of chains requires replacement, **both** strands of the pair should be replaced.

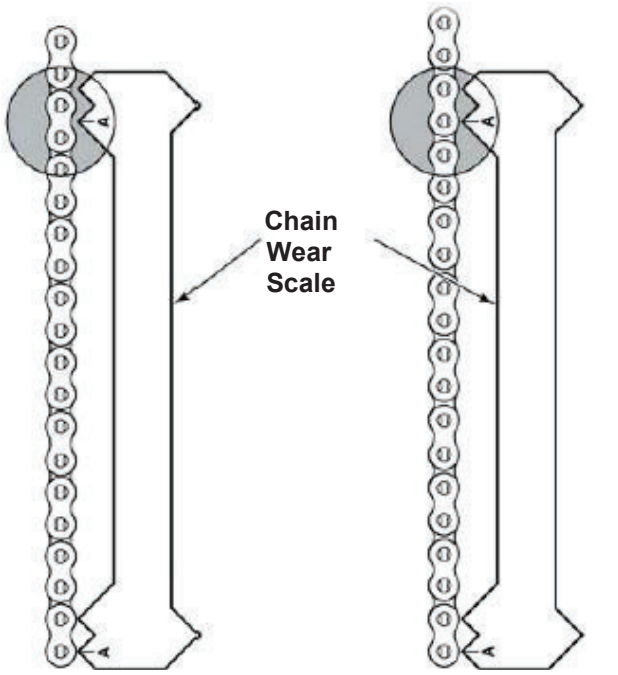
- Check for rust and corrosion.
- Check for cracked side plates. If you find cracked side plates, replace **both** strands of chain.
- Check for tight joints. If tight joints are caused by rust or corrosion, loosen them with SAE 40 wt. oil or penetrating oil. If they cannot be loosened, or if the tight joints are caused by bent pins or plates or worn contour, replace **both** strands of chain.
- Check for abnormal protrusion or turned pins. Replace **both** strands of chain.
- Check for chain side wear. If pins and outside plates show signs of wear, check for misalignment. If wear is excessive, replace **both** strands of chain.
- Check for work, broken or misaligned chain anchors. Replace or adjust as required.
- Lubricate the full length of the chains with Tefgel (WPN -671864)



**Measuring Chain Stretch**

Regular inspection and lubrication of the chains will increase their service lift and reduce down time.

If the chains stretch beyond the recommended about, they should be replaced in pairs. Chain stretch can be measured with the chain wear scale. Measure the chains according to the instructions printed on the chain wear scale. Measure the chains according to the instructions printed on the chain wear scale, without a load on the carriage.

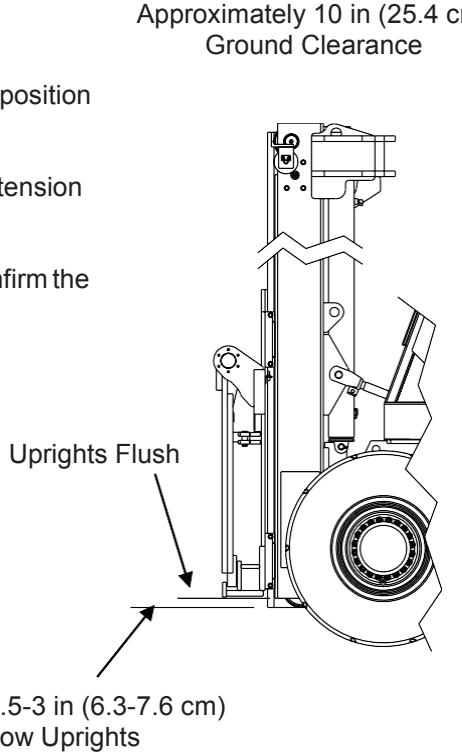



- To check the free lift chains, raise the carriage 1ft. (30 cm) off the ground to put tension on the chains.
- To check the main lift chains, raise the mast until the inner upright starts to extend putting tension on the chains.

**Main Lift Chain Adjustment**

The main lift chains should be adjusted so that when the unloaded mast is fully lowered, the uprights are positioned as shown.

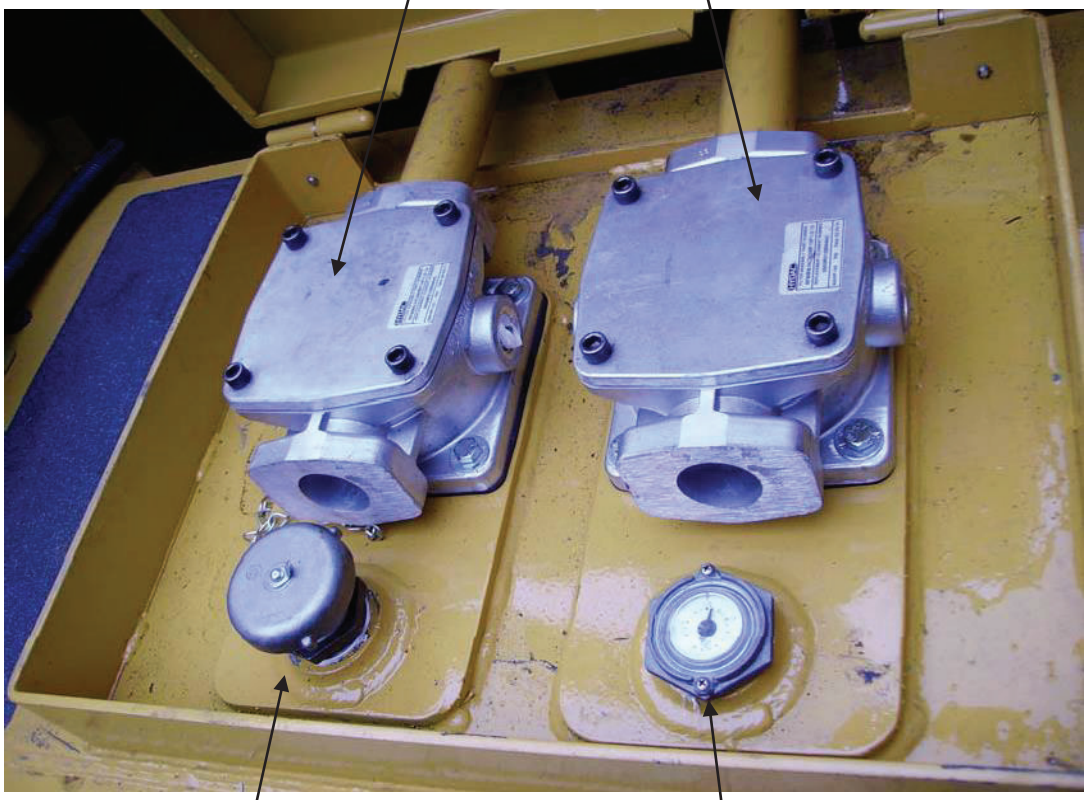
1. Adjust on chain to achieve the correct upright position when fully lowered.
2. Adjust the other chain to achieve equal chain tension Tighten the nuts together.
3. Raise and lower the mast several times to confirm the adjustments.



## HYDRAULIC SYSTEM

**Hydraulic Oil Filler**

- **Refer to the Wiggins Maintenance Schedule for Oil Filter replacement recommendation.**



**Hydraulic Oil Filler**

- **Refer to the Wiggins Maintenance Schedule for Oil Change recommendation.**

**Hydraulic Oil Gauge**

- **Check Hydraulic oil level Daily**

### Hydraulic Oil Recommendations

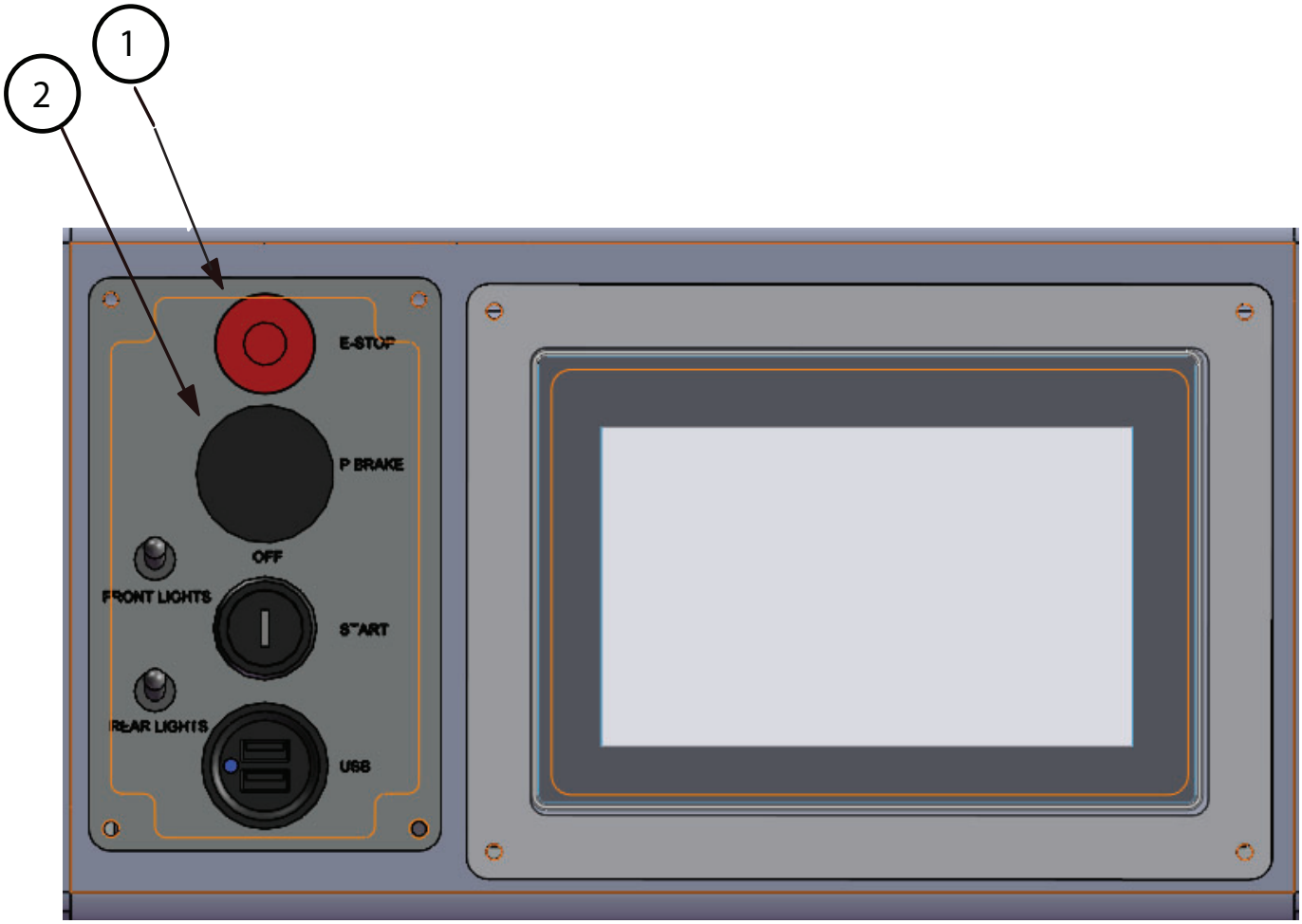
Wiggins Lift Co. Inc. recommends the use of mineral-based hydraulic oil containing anti-wear additives. Use oil viscosity based on the expected air temperature range during the period of oil change.
The following oils are preferred:

For the ambient temperature range is -25 F° to 104 F° (-32 C° to 40 C°) use Chevron synthetic All-Weather THF CPS226607 (SAE 10W)
For the ambient temperature range is 23 F° to 115 F° (-5 C° to 46 C°) use Chevron 1000 THF (SAE 30)

**Descriptions of Safety Features and Components:** The Wiggins Yard eBull® has safety features to protect the operator, nearby pedestrians, the loads being moved and the equipment itself. The operator must learn these features in order to safely operate this sophisticated and highly capable machine. Always wear your seatbelt!

**Horn and Motion Alarm:** The center of the steering wheel is a button for activating a horn to warn pedestrians and other equipment operators. Because electric motors are quiet, and difficult for pedestrians to hear in noisy work environments, a white noise device is activated whenever the directional control is in FWD and the truck is moving FWD. In addition, whenever the forklift truck is in REV, a beeping motion alarm will sound. This motion alarm will not sound when the transmission is in neutral. It has a switch that can be set at two levels. It is Wiggins factory pre-set at the recommended higher level.

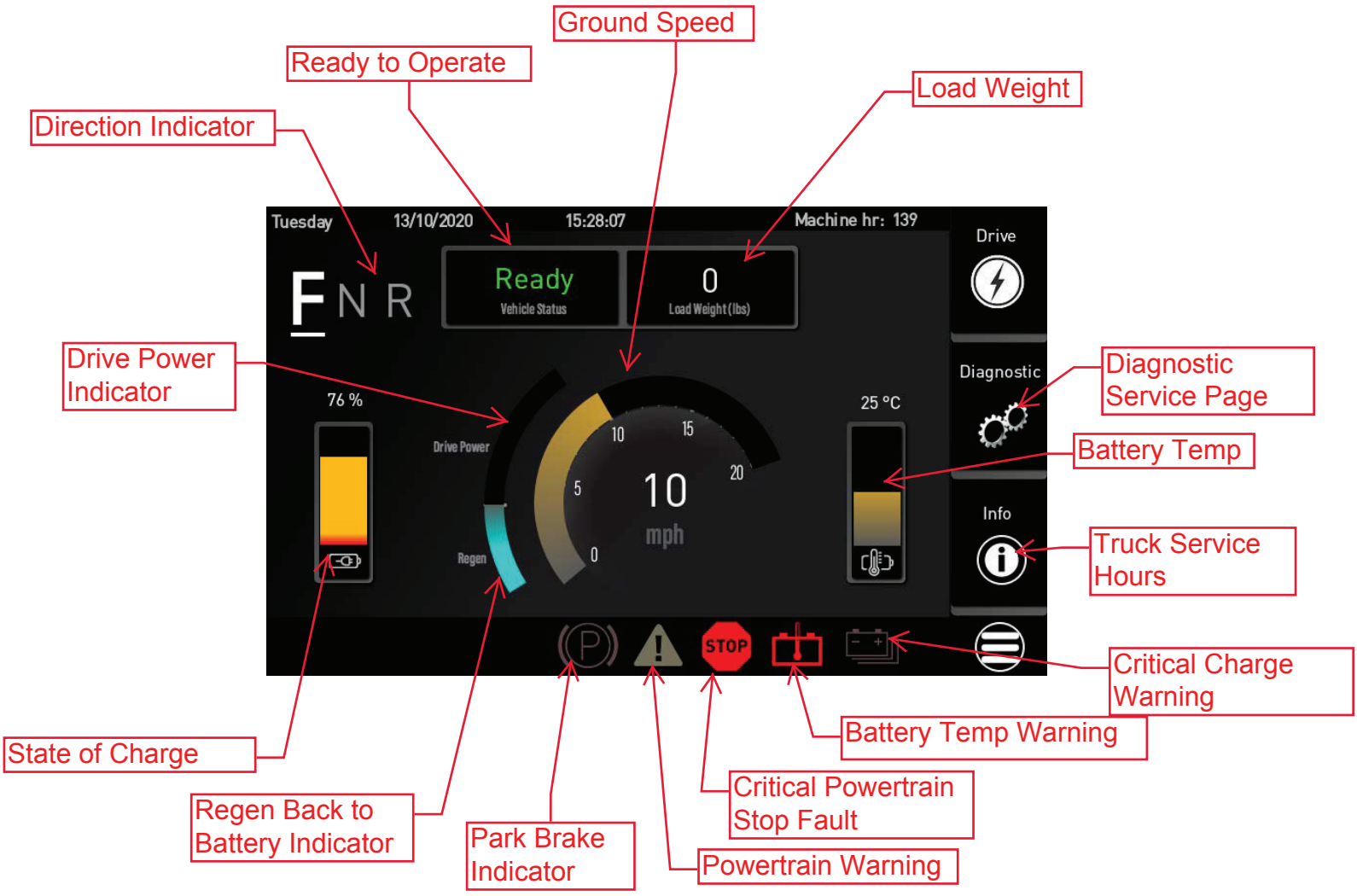
**Brakes and E-Stop:** There are two brakes: Service and Parking. The Service Brake is connected to the foot brake pedal and the amount of braking is controlled by the amount of foot pressure on the pedal. The Parking Brake is also the emergency brake. When this brake is activated, the truck comes to stop in a short distance. The red E-Stop **(#1)** button on the dash panel will stop the motors, which stops the hydraulic pump, and the Parking Brake will come on. If there is damage to the hydraulic system and the system loses pressure, the Parking Brake will come on. The Parking Brake switch **(#2)** on the dash panel will also turn on this brake. If the Parking Brake has been activated while the truck was in motion, the brake pads must be inspected by qualified personnel.



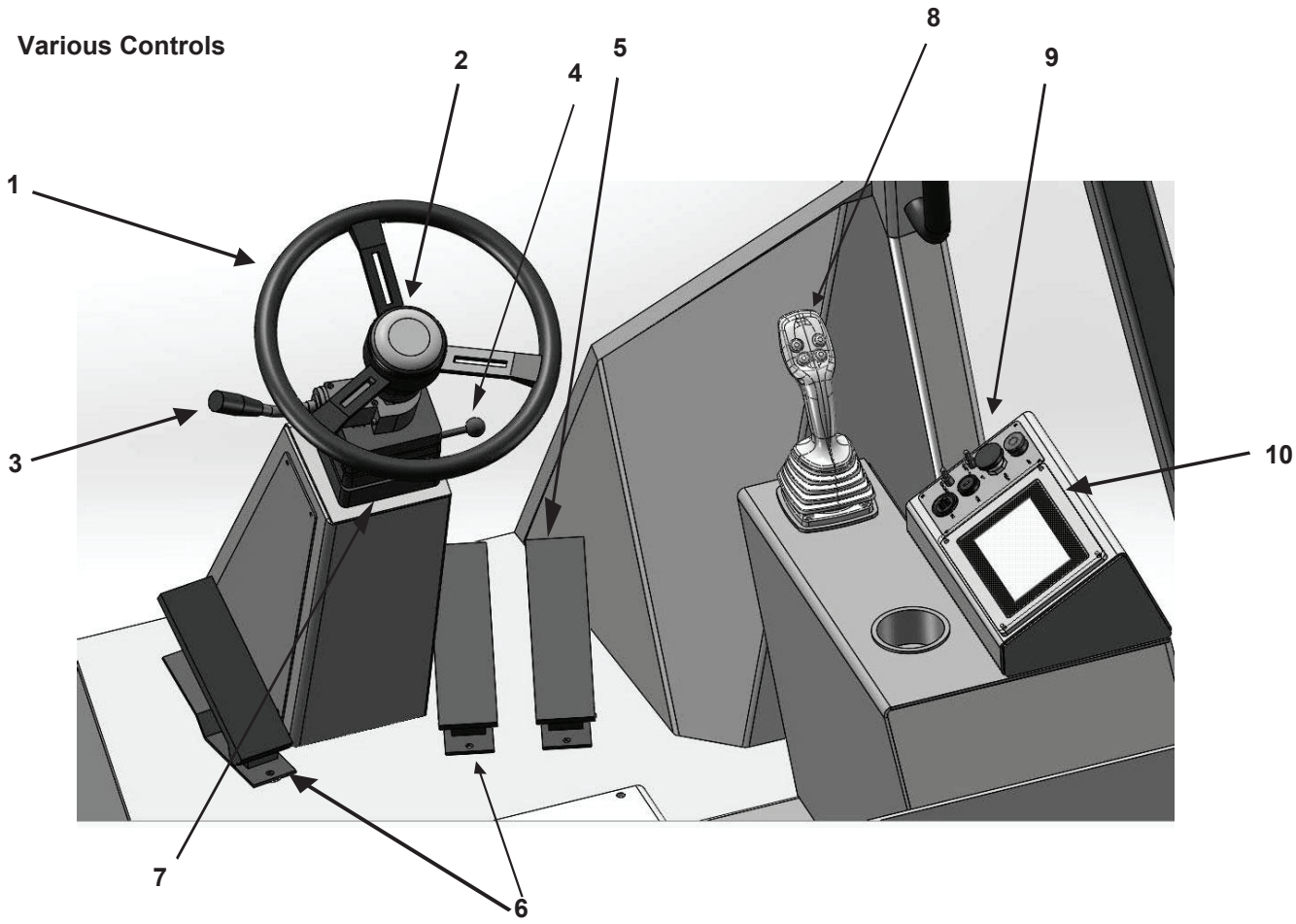
## Wiggins Information Center

### Introduction

The Wiggins Information Center with the state of the art IQAN™ System keeps the operator informed about powertrain performance and status. The Info Center will show an automatic reminder of daily checks as well as information for the Mechanic about required service intervals. The Info and Diagnostic screens can be used by a Service Technician to monitor and diagnose system performance and problems based on the information from the VCU (Vehicle Control Unit) about the HV Batteries and components. See SERVICE MANUAL.



Various Controls




1. **Steering Wheel**
   - Turn wheel left for left turn.
   - Turn wheel r ght for r ght turn.

2. **Horn Button**
   - Push to act vate.

3. **Shifter**
   - Center pos t on s Neutral.
   - Pull Up & Push forward for forward dr ve
   - Pull Up & Pull Back for reverse dr ve

4. **Signal Control Lever**
   - Push forward for eft Turn.
   - Pull back for R ght Turn,
   - Pull tab out for Hazard ghts.

5. **Accelerator Pedal**
   - Push to ncrease speed.

6. **Brake Pedal (2 pedals)**
   - Push to engage serv ce brake.

7. **Steering Column Adjustment**
   - Push button under steer ng wheel to adjust steer column angle.

8. **Joystick - Operation**
   - **Forward = Lower**
   - **Rearward = Lift**
   - **Right = Tilt Forward**
   - **Left = Tilt Back**

   **Push & Hold Left Button for LH Fork Position**
   - **Tilt Joystick to the Left = Move Left Fork Left**
   - **Tilt Joystick to the Right = Move Left Fork Right**

   **Push & Hold Right Button for RH Fork Position**
   - **Tilt Joystick to the Left = Move Right Fork Left**
   - **Tilt Joystick to the Right = Move Right Fork Right**

   **Pull & Hold Trigger Button for Side Shift**
   - **Tilt to the Left = Side Shift both forks to the Left**
   - **Tilt to the Right = Side Shift both forks to the Right**

9. **Switch Panel**

10. **IQAN Display**

**Foot Pedals**: The brake pedal and throttle pedal are on the floor to the right side of the steering column and perform the same as in an automobile. A second brake pedal is provided to the left side of the steering column for operators who prefer to drive two-footed. Either pedal applies the service brake.

**Steering**: The steering is hydraulic. On some short wheel base trucks, the hydraulic pressure may not be sufficient to move the steer tires past a certain point unless the truck is moving forward or reverse. This is normal. Even rolling just a few inches allows the steer tires to turn to their fullest extent.

**Drive:** The Directional Control is the F-N-R switch to the left side of the steering column behind the steering wheel. Moving the control forward allows the truck to move forward. Moving the control backwards toward the operator allows the truck to move backward. Care and patience while driving will allow the operator to maintain control of the load and the forklift and allow enough time so the operator can watch the tail swing and load clearances. Start moving slowly at first. Wiggins suggests driving at a reasonable speed when carrying a load. With exceptionally long or wide loads or high lifts, Wiggins recommends use of one or two spotters.

**Lift a Load:** Wiggins Yard eBulls® are designed for many different load handling configurations. For attempting to lift loads of uncertain weight and load center, Wiggins provides an indicator that can protect the equipment and the operator from an overload condition. Any attachments with ratings approved by Wiggins are listed on the Capacity and ID plate.

**Park and Shutdown:** Select a flat and level area to stop the forklift in the charge yard. Lower the forks to the ground. Set the parking brake and turn the key to the off position. The official authorized person must always remove the starter key if the Wiggins Yard eBull® is left unattended. The key must be safely stored.

**Blue Lights Indicate Battery Level:** Blue LED lights on the machine indicate a low State of Charge when the key is on. The blue lights begin flashing slowly when the State of Charge is less than 20% and the operator should begin planning to return to the charge yard. The blue lights change to rapid flashing when below 10%. At the 5% level the machine performance also slows down to indicate to the operator it is time to plug in a charger cord. The most efficient charging rate is between 10% and 90%.

**Charging:** After the forklift is parked and shutdown in a designated parking spot within reach of an available charge station, and the key is off and removed, open the charge port door and insert the charge plug. Use the key card to activate the charge station. Verify that charging has started. Blue corner lights on the truck should flash. The Charge Station should indicate that charging has started after a short delay. Place the truck key and key card in a safe location.

**Complete Charge and Stow Charge Cable:** If DC charging on the large Fast Charger, follow the instructions on the screen to stop charging. Remove cable and stow aboard the Charge Station. If AC charging using the small Level 2 charge station, simply unplug the cord and stow aboard its charge station. Close charge port door.

**Controls -** The controls of the Wiggins Yard eBull® are conveniently located within easy reach of the operator.

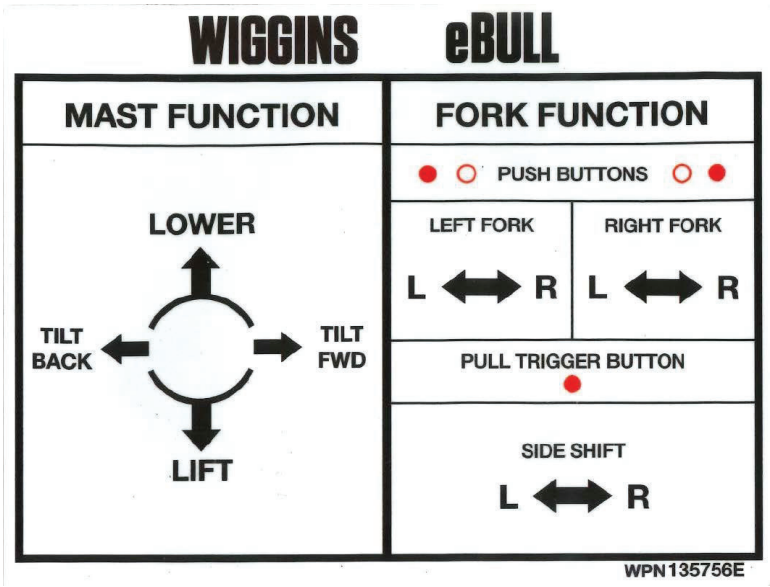
**Control Panel:** The parking brake switch is guarded from accidental activation. Push the parking brake button down to turn the parking brake off and the truck is free to move. Pull up, the parking brake is on. The key switch has two positions: Off and On.

**Hydraulic Controls:** The hydraulic controls are an electric joysitck with buttons, to select different functions. The response speed of any hydraulic function is directly related to the amount movement of the control. The operator should always begin activation of a control by moving the control a small amount until the function responds so the operator can be satisfied that the correct function and direction is happening as expected.

The joystick can be moved left and right, forward and back to control the mast lift and tilt. There are two buttons and one trigger for controlling the forks.

Pulling the joystick backwards raises the carriage. Pushing the joystick forward lowers the carriage. Pulling the joystick to the left toward the operator tilts the mast back toward the operator. Pushing the joystick to the right away from the operator tilts the mast forward away from the operator.

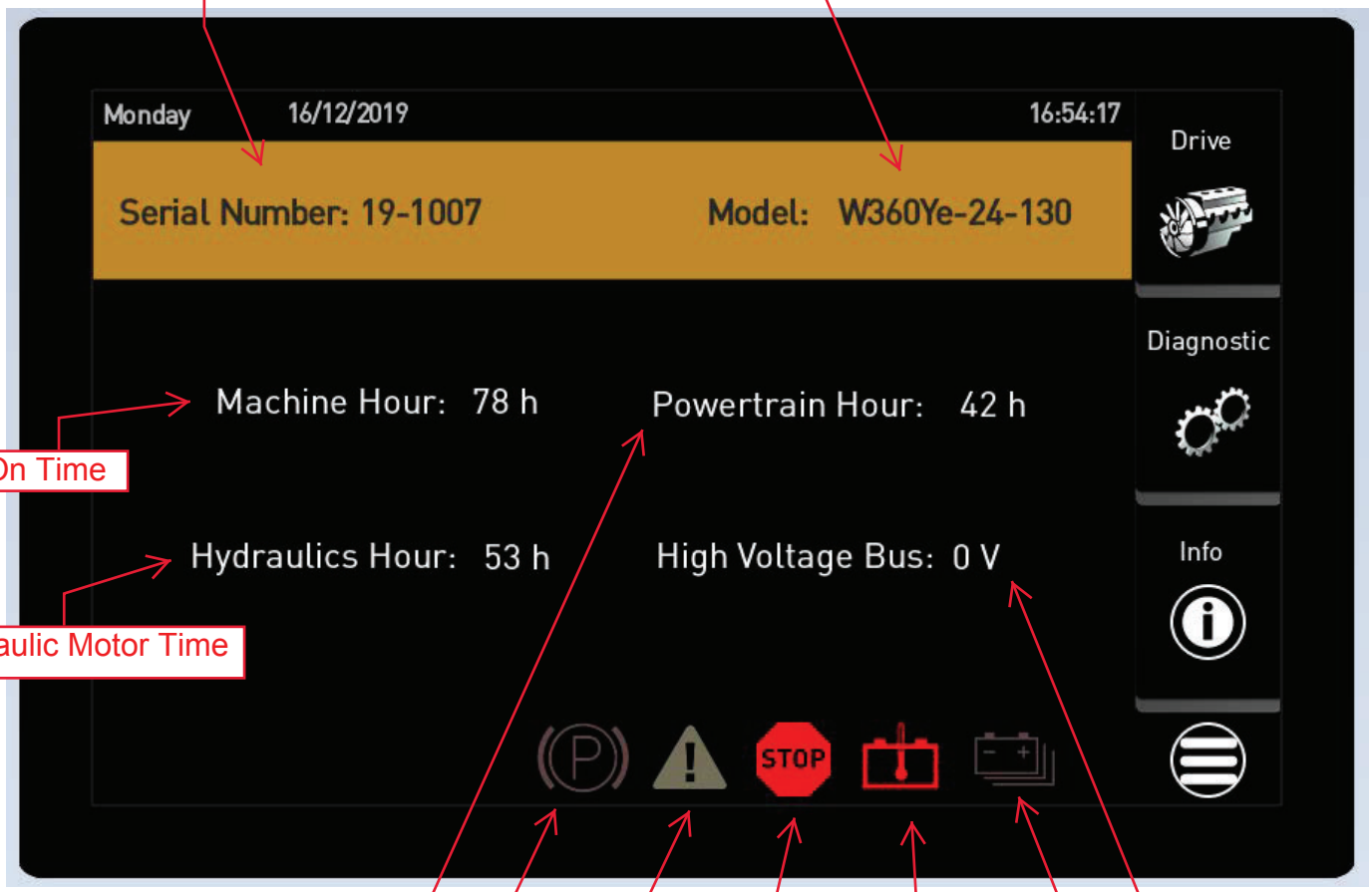
There are three functions for the forks: Left Fork Position, Right Fork Position and Side Shift. The Side Shift control moves the forks in the same direction at the same time and can be used with the rated load in place. Push and hold the **left** button while moving the joystick left and right to move the **left** fork left and right. Push and hold the **right** button while moving the joystick left and right to move the **right** fork left and right. Pull and hold the **trigger** under the joystick while moving the joystick left and right to move both forks and the load left and right for **side shift**.



**Info Page:**

Displays Truck Serial Number, Truck Model, Machine Hours, Powertrain Hours, Hydraulics Hours, High Voltage Bus Value.

Select "Info" to display Information Page.




Wiggins Unit Serial Number

Wiggins Unit Model Number

Key On Time

Hydraulic Motor Time

Drive Motor Time

Park Brake Indicator

Powertrain Warning

Critical Powertrain Stop Fault

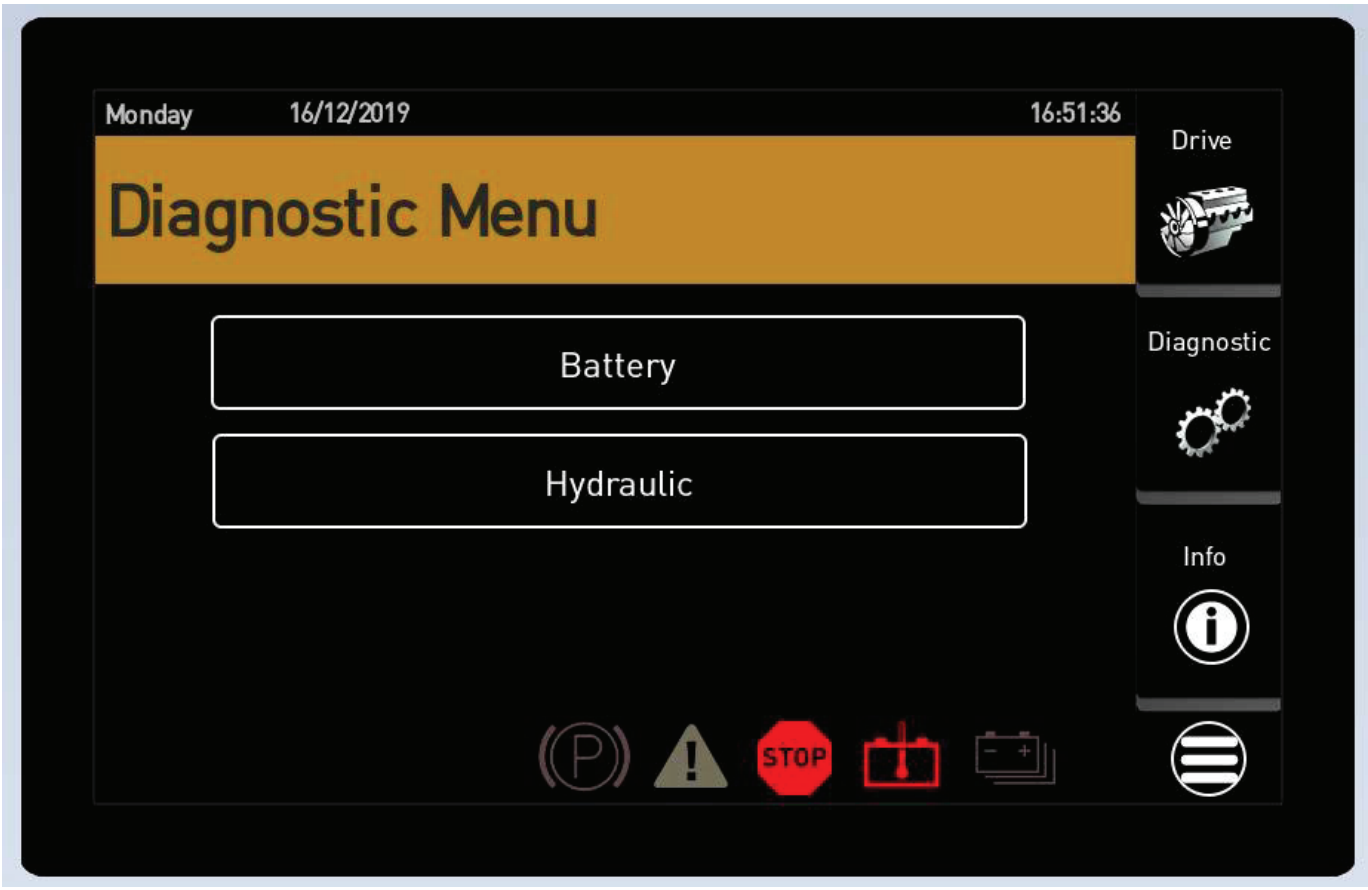
Battery Temp Warning

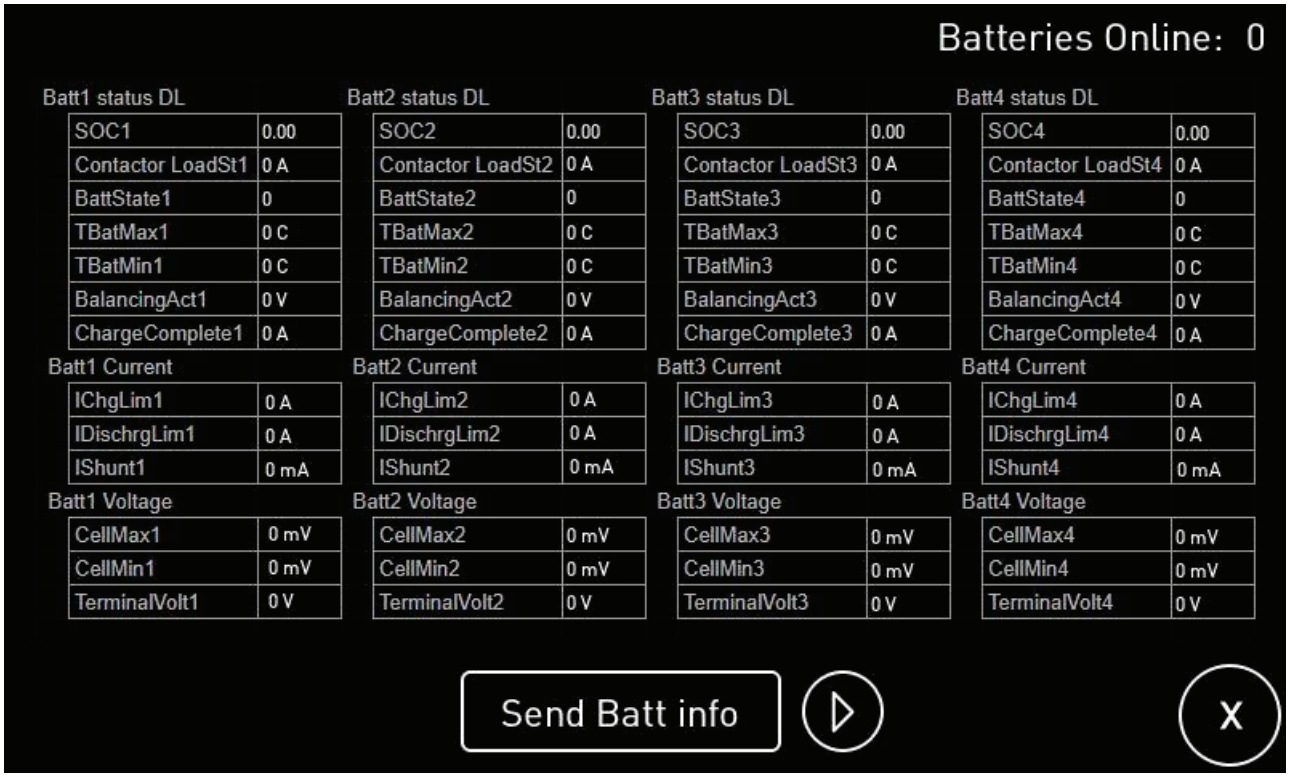
Battery Voltage

Battery System Warning

**Diagnostic Deatails Page:**

Only trained and authorized mechanics can safely work on the Battery, High Voltage Bus, and Hydraulic System.



1.  Each time the truck is parked and not used for a day or two, the **Master Switch** must be turned off.  If left on, the **24V battery pair** will drain in a few days.
2.  If the 24V battery is drained and needs to be charged, an external charger must be compatible with AGM batteries connected as 24V.
3.  Connect the correct charger as follows:
3.1  The Master Switch should be turned to the off position to prevent accidental operation.
3.2  Open the side door, see the positive battery terminal and the bracket bolt as shown in the photo, below left.
3.3  Connect the red/positive clamp to the positive battery terminal as shown in the photo, below right.
3.4  Connect the black/negative clamp to the bracket bolt as shown in the photo, below right.
3.5  Plug in and turn on charger.  Verify proper operation.
4.  After a few hours, check battery voltage and condition.
5.  Unplug charger, disconnect terminal clamps, and make sure the Master Switch is off.

**TOWING A DISABLED VEHICLE:**

If the truck no longer moves under its own power, it may be towed out of the way with the procedure described here. It is critical to safety that the load and the forklift be under control at all times, and be prevented from unexpected movement.

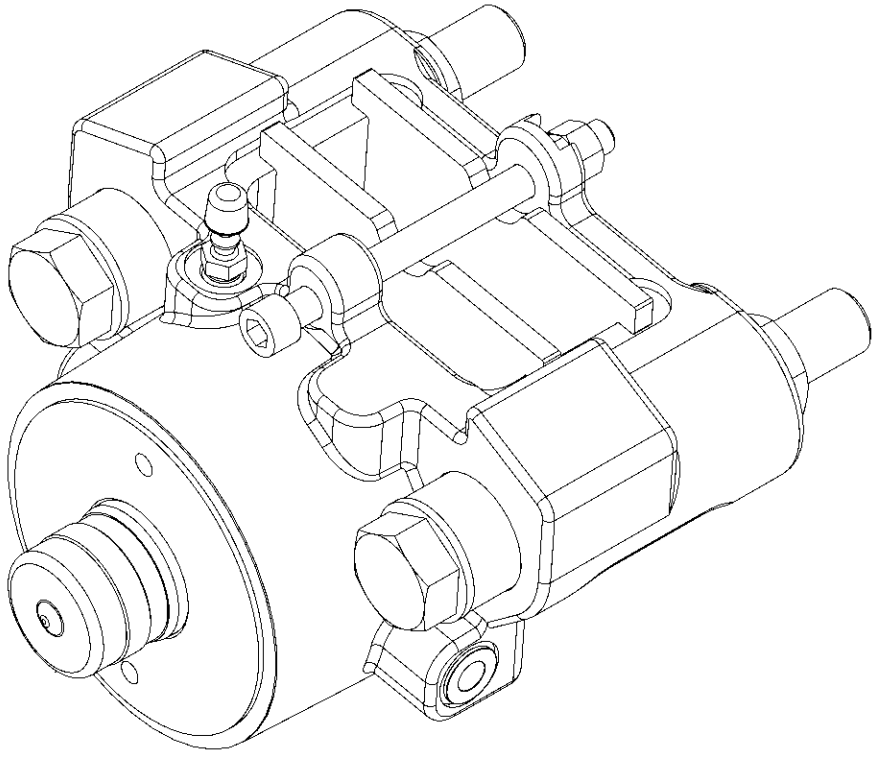
The load should be carefully lowered and removed from the forks or attachment by another forklift of the same or greater capacity. If no hydraulic or electrical power is available, the load may be lowered to the ground by trained and authorized mechanics.

If no hydraulic or electrical power is available aboard the truck, the steering and service brakes will not function and the park brake will not release. The park brake spring will apply the park brake by default. Care must be taken to maintain control of the machine. In order to move the truck, the park brake must be safely released while the wheels are chocked or the truck is secured by strap or chain to a fixed strong point or to another vehicle. See Service Manual for instructions to open the park brake calipers.

**TOW SPEED MUST BE LESS THAN 2 MPH.**

If there is 24V electrical power available, then release the park brake using the switch on the operator console. If it does not release, then there is not enough pressure in the brake accumulator.

Straps may be used around the lower carriage bar at the front or around the rear counterweight tub.

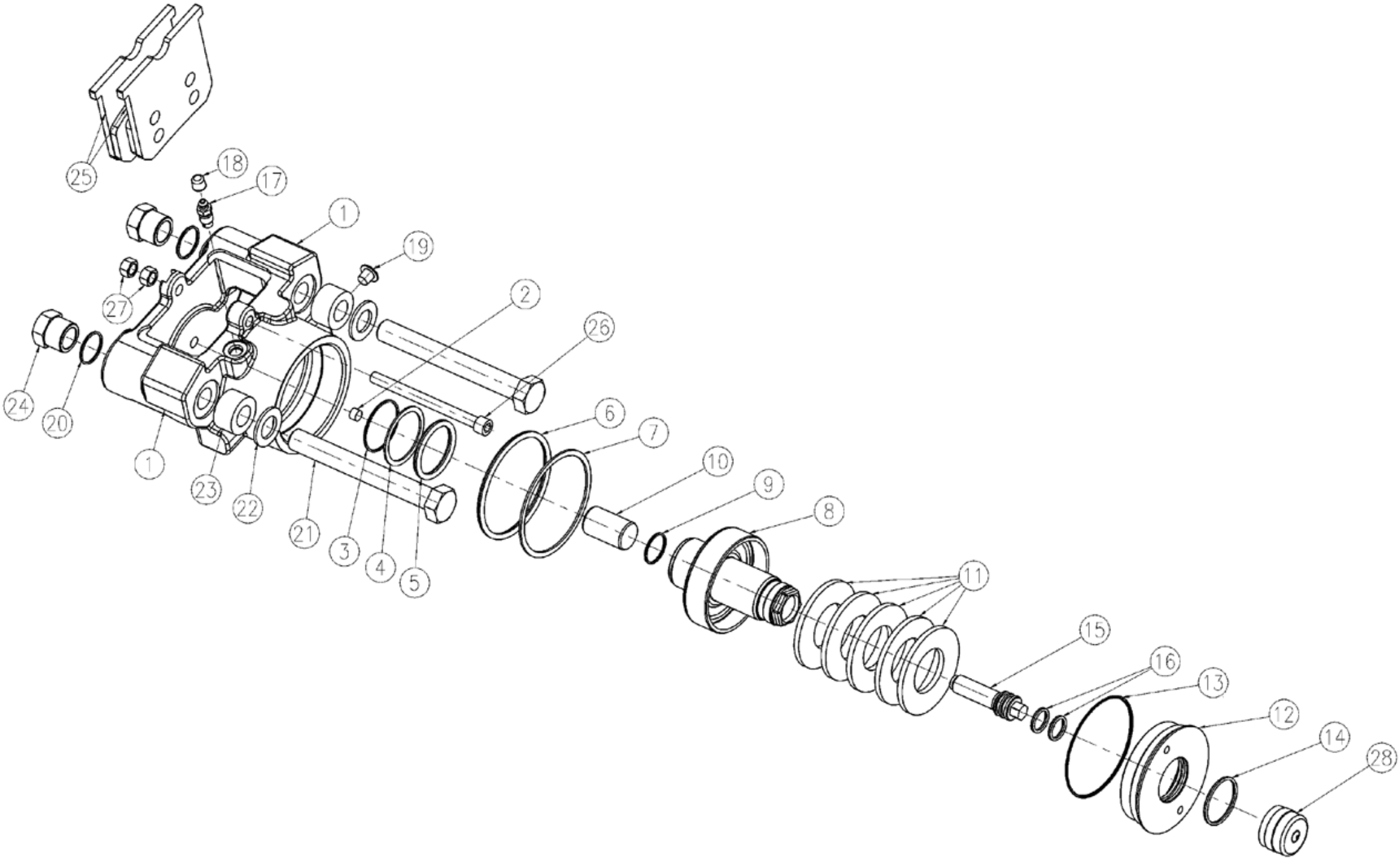


**11.0 ADJUSTMENT**

11.1 Apply hydraulic pressure to the brake.

11.2 Set running clearance between the disc and lining surface by removing the cap (28), and doing the following: Rotate the adjusting screw (15) until the brake is clamped onto the disc. Loosen the outer hex nut (27) and rotate socket head cap screw (26) until it makes contact with the bump stop on the mounting bracket, then back it off ¼ turn (.016" or .41mm). Hold the socket head cap screw (26) in place while tightening the outer hex nut (27) against the inner hex nut (27) to 30-35 ft-lbs (40.7-47.5 N-m). Finally, back off adjusting screw (15) ½ turn (.028" or 0.71mm).
Replace cap (28).

11.3 Re-adjust the brake when running clearance reaches a total of 0.111 inch (2.82 mm).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**6.0 PARTS LIST**

| ITEM NO. | PART NO. | DESCRIPTION | QTY. |
|---|---|---|---|
| | 304-7196 | KIT – PARTS | 1 |
| 1 | + | TORQUE PLATE | 1 |
| 2 | + | MAGNET | 1 |
| 3 | * | SEAL - ORING | 1 |
| 4 | * | BACK-UP RING | 1 |
| 5 | * | SEAL - ORING | 1 |
| 6 | * | SEAL - ORING | 1 |
| 7 | * | BACK-UP RING | 1 |
| 8 | * | PISTON | 1 |
| 9 | * | SEAL - ORING | 1 |
| 10 | * | PISTON & MAGNET ASSEMBLY | 1 |
| 11 | * | SPRING-DISC | 5 |
| 12 | | CAP - THREADED | 1 |
| 13 | * | SEAL O-RING | 1 |
| 14 | * | SEAL O-RING | 1 |
| 15 | * | SCREW - ADJUSTMENT | 1 |
| 16 | * | SEAL O-RING | 2 |
| 17 | | BLEEDER | 1 |
| 18 | | PLUG | 1 |
| 19 | + | CAP – PLUG | 1 |
| 20 | * | SEAL O-RING | 2 |
| 21 | * | BOLT-HEX 3/4-10 X 6.0 | 2 |
| 22 | * | WASHER-FLAT | 2 |
| 23 | * | SPRING – URETHANE | 2 |
| 24 | * | JAMNUT/SLEEVE (3/4-10) | 2 |
| 25 | * | LINING,CARRIER ASSY | 2 |
| 26 | * | SHCS 3/8-16 x 4.5” | 1 |
| 27 | * | NUT-HEX 3/8-16 | 2 |
| 28 | | CAP | 1 |