OPERATION & MAINTENANCE MANUAL
FOR MODEL YEARS 2022 & UP

REV 11/17/22

WHEN ORDERING PARTS, PLEASE REFER TO THE VIN NUMBER AND "TYPE OF VEHICLE" OF YOUR LEAF VACUUM.

RECORD THEM FROM THE VIN TAG ON THE FRONT DRIVER'S SIDE OF THE TRAILER:

LEAF VAC V.I.N. NO.: _____

TYPE OF VEHICLE.: _____

ENGINE MODEL NO.: _____

ENGINE SERIAL NO.: _____

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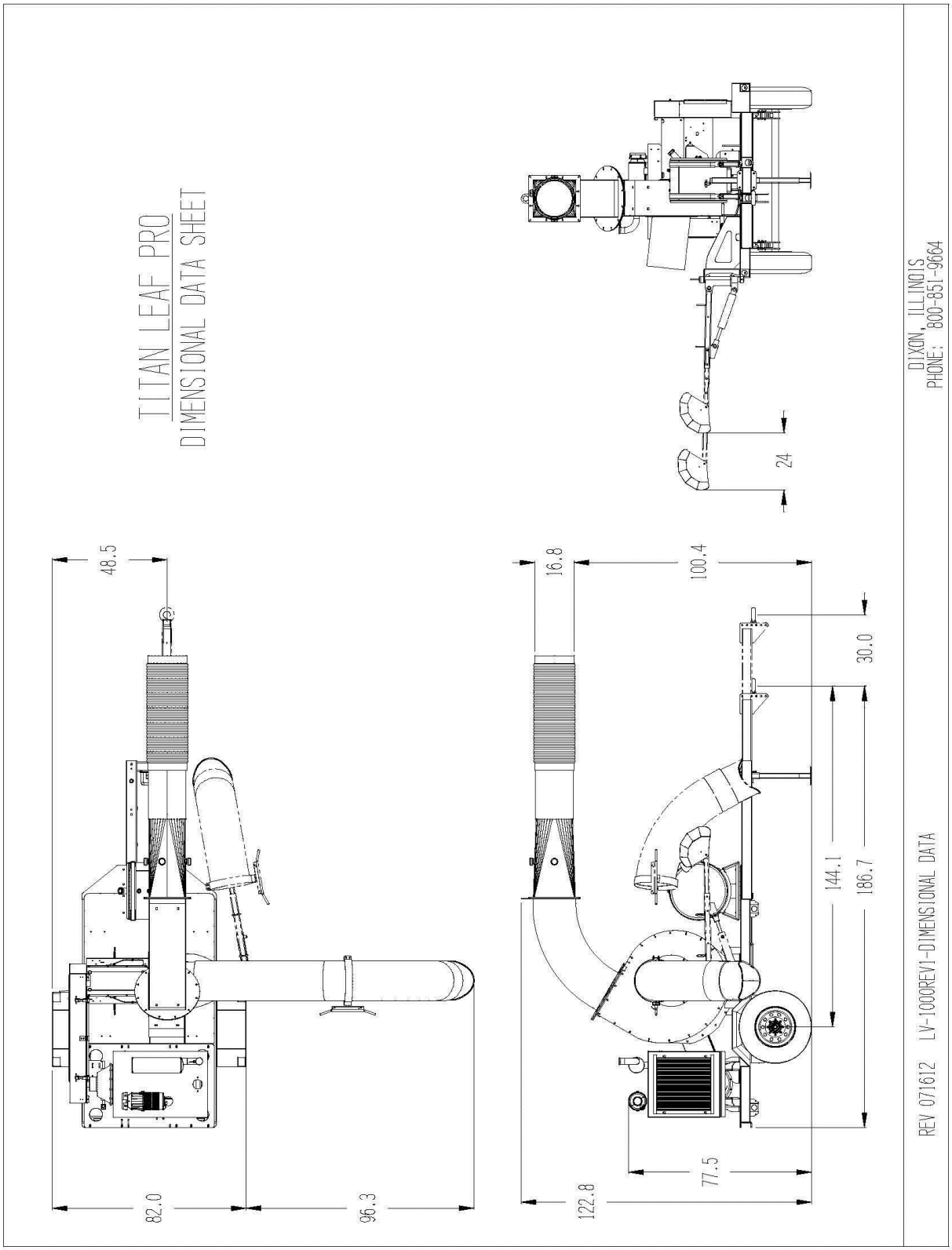
Manufactured, sold, and serviced by:

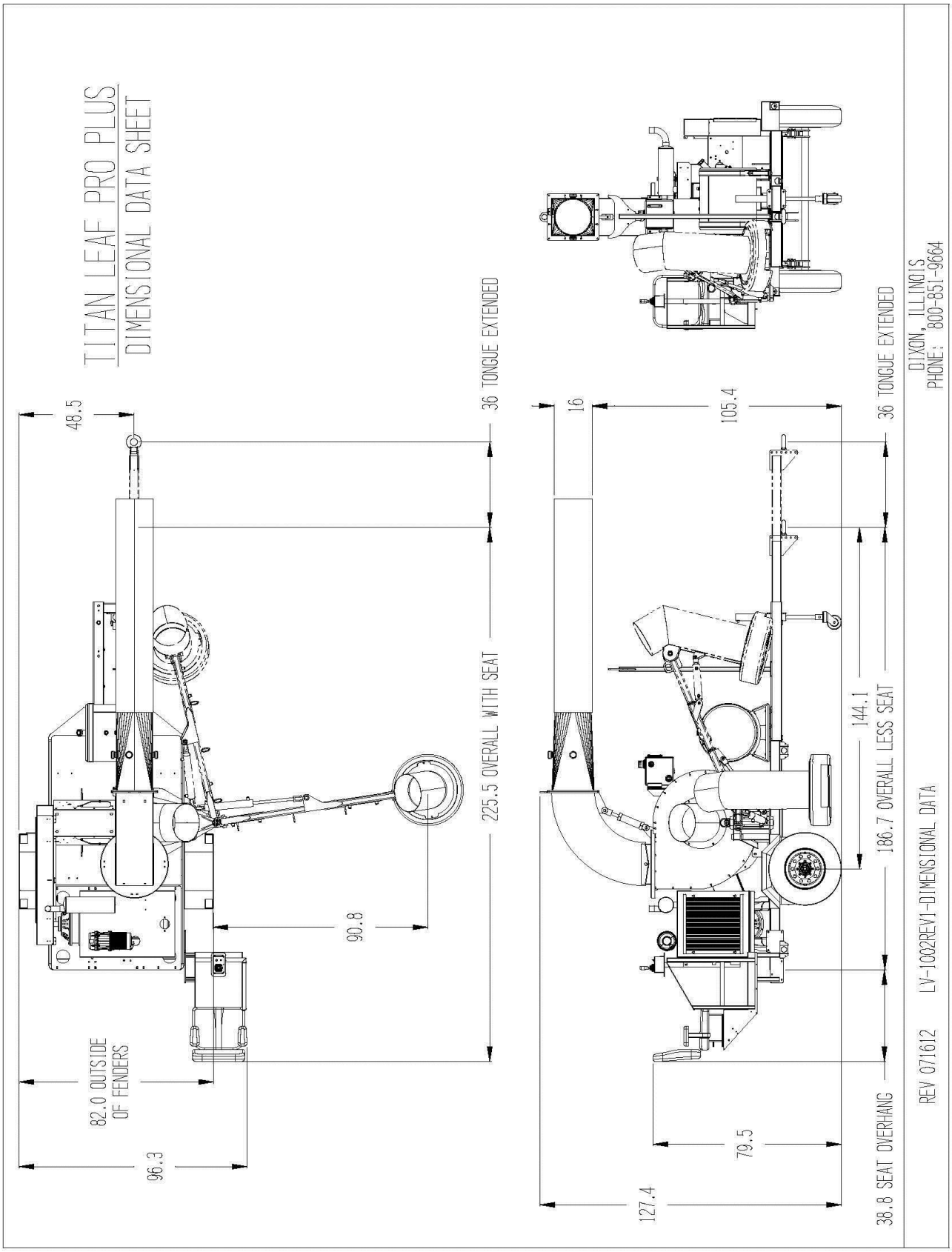
Bonnell Industries
1385 Franklin Grove Road
Dixon, IL 61021
800-851-9664
www.titanleafpro.com

1. DIMENSIONAL DATA

1.1. TITAN LEAF PRO DIMENSIONS



1.2. TITAN LEAF PRO PLUS DIMENSIONS



Dimensional Data

1.3. CAPACITIES & SPECIFICATIONS

Weight, total (may vary depending on optional equipment)	7000 LBS
Weight, tongue	940 LBS
Fuel Tank	50 US Gallons
Hydraulic System (if equipped)	10 US Gallons
Hydraulic Tank Only (if equipped)	7 US Gallons
Wetting System (if equipped)	100 US Gallons
Engine, Kubota V3800TI74T4	74 BHP @2600 RPM
Engine, John Deere 405HFC04	99 BHP @2400 RPM
TransFluid Coupler (if equipped)	5-6 Quarts
Battery	12 Volt, 1190 AMP, 950 CCA
Axle	7000 LB with Electric Brakes
Tires	8T23580R16, Load Range E
Engine Pulley	8.00” Diameter, 2-1/4” Shaft
30” Fan Driven Pulley, Kubota 74 HP	9.25” Diameter, 2-3/16” Shaft – 2,249 rpm
32” Fan Driven Pulley, Kubota 74 HP	9.75” Diameter, 2-3/16” Shaft – 2,133 rpm
30” Fan Driven Pulley, John Deere 99 HP	8.50” Diameter, 2-3/16” Shaft – 2,259 rpm
32” Fan Driven Pulley, John Deere 99 HP	9.00” Diameter, 2-3/16” Shaft – 2,133 rpm
Fan	30 Dia. Std, 32” Dia. optional
Engine to 30” Fan Speed Ratio	1:.94 (2600 Engine RPM = 2444 Fan RPM)
Engine to 32” Fan Speed Ratio	1:.89 (2600 Engine RPM = 2311 Fan RPM)
Belts	5VX1250 - 125" (Set of 5)

2. General Safety Information

2.1. Safety Alert Symbols and Signal Words

SPECIAL NOTE: **This manual contains information pertaining to both the chassis (trailer portion) of the leaf vacuum, as well as the equipment mounted on the chassis. Throughout this manual, the complete pull behind leaf vacuum will be referred to as a trailer, as this is how it is classified by federal law.** ***All rules and regulations pertaining to the operation of "regular trailers" also apply to this "leaf vacuum trailer"***.

ANOTHER SPECIAL NOTE: **An Owner's Manual that provides general trailer information cannot cover all of the specific details necessary for the proper combination of every trailer, tow vehicle and hitch. Therefore, you must read, understand and follow the instructions given by the tow vehicle and trailer hitch manufacturers, as well as the instructions in this manual.**

AND ONE MORE: **This trailer is 102" wide, which is within legal towing width for all US interstates and federally designated state highways. When operating on other roadways, consult local and state laws regarding legal towing width.**

Our trailers are built with components produced by various manufacturers. Some of these items have separate instruction manuals, and many are included in the supplemental manuals section. Where this manual indicates that you should read another manual, but you do not have that manual, call Bonnell Industries, Inc. at 800-851-9664 for a free copy. See page 83 for a list of supplemental manuals that may apply to this piece of equipment.

The safety information in this manual is denoted by the safety alert symbol: ⚠
The level of risk is indicated by the following signal words.

⚠ Danger
DANGER – Immediate hazards which WILL result in severe personal injury or death if the warning is ignored.
⚠ WARNING
WARNING – Hazards or unsafe practices which COULD result in severe personal injury or death if the warning is ignored.
⚠ Caution
CAUTION – Hazards or unsafe practices which could result in minor or moderate injury if the warning is ignored.
⚠ Notice
NOTICE – Practices that could result in damage to the trailer or other property.

2.2. PROPOSITION 65 WARNINGS

⚠ WARNING

Operating, servicing and maintaining a passenger vehicle or off-highway motor vehicle can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. To minimize exposure, avoid breathing exhaust, do not idle the engine except as necessary, service your vehicle in a well-ventilated area and wear gloves or wash your hands frequently when servicing your vehicle. For more information go to www.P65Warnings.ca.gov/passenger-vehicle.

⚠ WARNING

Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65warnings.ca.gov/diesel.

⚠ WARNING

Processing wood products can expose you to wood dust, a substance known to the State of California to cause cancer. Avoid inhaling wood dust or leaf debris or use a dust mask or other safeguards for personal protection. For more information go to www.P65Warnings.ca.gov/wood.

2.3. Major Hazards

Loss of control of the trailer or trailer/tow vehicle combination can result in death or serious injury. The most common causes for loss of control of the trailer are:

- Improper sizing the trailer for the tow vehicle, or vice versa.
- Excessive Speed: Driving too fast for the conditions.
- Failure to adjust driving behavior when towing a trailer.
- Improper or mis-coupling of the trailer to the hitch.
- Improper braking and steering under sway conditions.
- Not maintaining proper tire pressure.
- Not keeping lug nuts tight.

2.4. Improper Sizing of the Trailer to the Tow Vehicle.

Trailers that weigh too much for the towing vehicle can cause stability problems, which can lead to death or serious injury. Furthermore, the additional strain put on the engine and drive-train may lead to serious tow vehicle maintenance problems. For these reasons the maximum towing capacity of your towing vehicle should not be exceeded. The towing capacity of your tow vehicle, in terms of maximum Gross Trailer Weight (GTW) and maximum Gross Combined Weight Rating (GCWR) can be found in the tow vehicle Owner's Manual.

⚠ Danger

Use of a hitch with a load rating less than the load rating of the trailer can result in loss of control and may lead to death or serious injury.

Use of a tow vehicle with a towing capacity less than the load rating of the trailer can result in loss of control, and may lead to death or serious injury.

Be sure your hitch and tow vehicle are rated for the Gross Vehicle Weight Rating (GVWR) of your trailer.

Driving Too Fast

With ideal road conditions, the maximum recommended speed for safely towing a trailer is 60 mph. If you drive too fast, the trailer is more likely to sway, thus increasing the possibility for loss of control. Your tires may also overheat, thus increasing the possibility of a blowout.

⚠ Warning

Driving too fast for conditions can result in loss of control and cause death or serious injury.

Adjusting Driving Behavior to match Conditions

When towing a trailer, you will have decreased acceleration, increased stopping distance, and increased turning radius (which means you must make wider turns to keep from hitting curbs, vehicles, and anything else that is on the inside corner). Furthermore, the trailer will change the handling characteristics of your towing vehicle, making it more sensitive to steering inputs and more likely to be pushed around in windy conditions or when being passed by large vehicles. In addition, you will need a longer distance to pass, due to slower acceleration and increased length. With these caveats in mind:

Be alert for slippery conditions. You are more likely to be affected by slippery road surfaces when driving a tow vehicle with a trailer, than driving a tow vehicle without a trailer.
Anticipate the trailer "swaying." Swaying can be caused by excessive steering, wind gusts, roadway edges, or by the trailer reaction to the pressure wave created by passing trucks and busses.

General Safety Information

When encountering trailer sway take your foot off the gas, and steer as little as possible in order to stay on the road. Use small “trim-like” steering adjustments. Do not attempt to steer out of the sway; you’ll only make it worse. Also do not apply the tow vehicle brakes to correct trailer swaying. On the other hand, application of the trailer brakes alone will tend to straighten out the combination, especially when going downhill. Check rearview mirrors frequently to observe the trailer and traffic. Use lower gear when driving down steep or long grades. Use the engine and transmission as a brake. Do not ride the brakes, as they can overheat and become ineffective. Be aware of your trailer height, especially when approaching bridges, roofed areas and around trees.

TRAILER NOT PROPERLY COUPLED TO THE HITCH

It is critical that the trailer be securely coupled to the hitch ball, and that the safety chains and emergency break-away brake cable are correctly attached. Uncoupling may result in death or serious injury to you and to others.

⚠ WARNING

Proper selection and condition of the coupler and hitch are essential to safely towing your trailer. A loss of coupling may result in death or serious injury.

Be sure the hitch load rating is equal to or greater than the load rating of the coupler.

Be sure the hitch size matches the coupler size

Observe the hitch for wear, corrosion and cracks before coupling. Replace worn, corroded or cracked hitch components before coupling the trailer to the tow vehicle.

Be sure the hitch components are tight before coupling the trailer to the tow vehicle.

⚠ WARNING

An improperly coupled trailer can result in death or serious injury.

Do not move the trailer until:

The coupler is secured and locked to hitch;

The safety chains are secured to the tow vehicle; and

The trailer jack(s) are fully retracted.

Do not tow the trailer on the road until:

Tires and wheels are checked;

The trailer brakes are checked;

The breakaway switch is connected to the tow vehicle;

The load is secured to the trailer; and

The trailer lights are connected and checked.

General Safety Information

Proper Use of Safety Chains

⚠ WARNING

Improper rigging of the safety chains can result in loss of control of the trailer and tow vehicle, leading to death or serious injury, if the trailer uncouples from the tow vehicle.

Fasten chains to frame of tow vehicle. Do not fasten chains to any part of the hitch unless the hitch has holes or loops specifically for that purpose.

Cross chains underneath hitch and coupler with enough slack to permit turning and to hold tongue up, if the trailer comes loose.

If your trailer comes loose from the hitch for any reason, we have provided safety chains so that control of the trailer can still be maintained.

Proper Connection of Breakaway Brake

Your trailer is equipped with a breakaway brake system that can apply the brakes on your trailer if your trailer comes loose from the hitch ball for any reason. The breakaway brake system, including battery, must be in good condition and properly rigged to be effective.

⚠ WARNING

An ineffective or inoperative breakaway brake system can result in a runaway trailer, leading to death or serious injury if the coupler or hitch fails.

The breakaway cable must be connected to the tow vehicle, and NOT to any part of the hitch.

Before towing the trailer, test the function of the breakaway brake system. If the breakaway brake system is not working, do not tow the trailer. Have it serviced or repaired.

Matching Trailer and Hitch

⚠ Danger

Use of a hitch with a load rating less than the load rating of the trailer can result in loss of control and may lead to death or serious injury.

Use of a tow vehicle with a towing capacity less than the load rating of the trailer can result in loss of control, and may lead to death or serious injury.

Be sure your hitch and tow vehicle are rated for the Gross Vehicle Weight Rating (GVWR) of your trailer.

Worn Tires, Loose Wheels, and Lug Nuts

As with any vehicle, the trailer tires and wheels are important safety items. Therefore, it is essential to inspect the trailer tires before each tow.

If a tire has a bald spot, bulge, cut, cracks, or is showing any cords, replace the tire before towing. If a tire has uneven tread wear, take the trailer to a dealer service center for diagnosis. Uneven tread wear can be caused by tire imbalance, axle misalignment or incorrect inflation.

Tires with too little tread will not provide adequate frictional forces on wet roadways and can result in loss of control, leading to death or serious injury.

Improper tire pressure causes increased tire wear and may reduce trailer stability, which can result in a tire blowout or possible loss of control. Therefore, before each tow you must also check the tire pressure. Remember, the proper tire pressure is listed on the Certification / VIN label, normally mounted on front left side of the trailer, and should be checked when tires are cold. Allow 3 hours cool-down after driving as much as 1 mile at 40 mph before checking tire pressure.

⚠ WARNING

Improper tire pressure can result in a blowout and loss of control, which can lead to death or serious injury.

Be sure tires are inflated to pressure indicated on sidewall before towing trailer.

The tightness of the lug nuts is very important in keeping the wheels properly seated to the hub. Before each tow, check to make sure they are tight.

⚠ WARNING

Metal creep between the wheel rim and lug nuts will cause rim to loosen and could result in a wheel coming off, leading to death or serious injury.

Tighten lug nuts before each tow.

The proper tightness (torque) for lug nuts is listed in Section 7.2.1.8 in the “Inspection, Service, and Maintenance” chapter of this manual. Use a torque wrench to tighten the lug nuts, use the crisscross star pattern on page 57. If you do not have a torque wrench, use a lug wrench (from your tow vehicle) and tighten the nuts as much as you can. At the first opportunity, have a service garage or trailer dealer tighten the lug nuts to the proper torque.

⚠ WARNING

Lug nuts are prone to loosen after initial installation, which can lead to death or serious injury.

Check lug nuts for tightness on a new trailer or when wheel(s) have been remounted after the first 10, 25 and 50 miles of driving.

⚠ WARNING

Improper lug nut torque can cause a wheel separating from the trailer, leading to death or serious injury. Be sure lug nuts are tight before each tow.

INOPERABLE BRAKES, LIGHTS OR MIRRORS

Be sure that the electric brakes and all of the lights on your trailer are functioning properly before towing your trailer. Electric brakes and lights on a trailer are controlled via a connection to the tow vehicle, generally a multi-pin electrical connector. Check the trailer tail lights by turning on your tow vehicle headlights. Check the trailer brake lights by having someone step on the tow vehicle brake pedal while you look at trailer lights. Do the same thing to check the turn signal lights.

If your trailer has electric brakes, your tow vehicle will have an electric brake controller that sends power to the trailer brakes. Before towing the trailer on the road, you must operate the brake controller while trying to pull the trailer in order to confirm that the electric brakes operate. While towing the trailer at less than 5 mph, manually operate the electric brake controller in the tow vehicle cab. You should feel the operation of the trailer brakes.

General Safety Information

⚠ WARNING

Improper electrical connection between the tow vehicle and the trailer will result in inoperable lights and electric brakes, and can lead to collision.

Before each tow:

Check that the taillights, brake lights and turn signals work

Check that the electric brakes work by operating the brake controller inside the tow vehicle

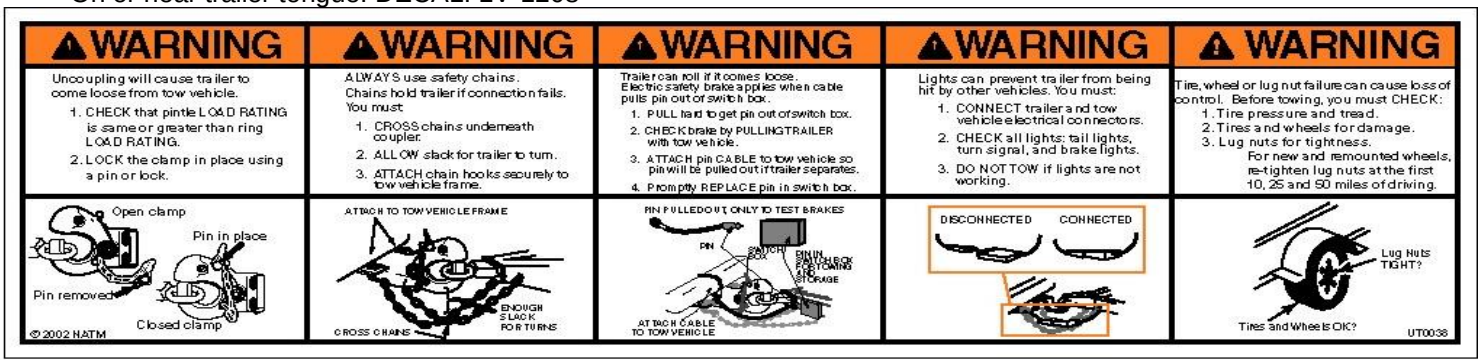
HAZARDS FROM MODIFYING YOUR TRAILER

Essential safety items can be damaged by altering your trailer. Before making any alteration to your trailer, contact your dealer or Bonnell Industries, Inc. at 800-851-9664 and describe the alteration you are contemplating. Alteration of the trailer structure or modification of mechanical, electrical, or other systems on your trailer must be performed only by qualified technicians who are familiar with the system installed on your trailer.

SAFETY WARNING LABELS ON YOUR TRAILER

Below are illustrations of the safety decals applied to your machine. Familiarize yourself with their locations & importance. To protect you and others against death or serious injury, all of the labels shown below must be on the trailer and must be legible. If any of these labels are missing or cannot be read, call Bonnell Industries, Inc. at 800-851-9664 for free replacement labels.

On or near trailer tongue: DECAL: LV-1208



LV-1232_REV5 9.26.16 DECAL SET FOR TITAN & SPARTAN SERIES SHEET 1 OF 2

↓ APPLY TO BELT GUARD ↓

DANGER

ENTAGLEMENT HAZARD
Serious injury or death will occur
- Shut down engine & disconnect safety interlock before removing hose or guards.

NOTICE
- New belt tension must be checked after first hour of operation and daily thereafter.
- Failure to do so will result in premature belt failure..

↓ APPLY TO BLOWER HOUSING, INLET SIDE ↓

DANGER

ENTAGLEMENT HAZARD
Serious injury or death will occur
- Shut down engine & disconnect safety interlock before removing hose or guards.

WARNING

PERSONAL INJURY HAZARD
- Head, Eye and Ear Protection required while operating this machine.

WARNING

HEAVY IMPACT HAZARD
Serious injury or death could occur
- Inspect fan and liners for wear or damage every 80 hours.
- Preform an inspection immediately if vibration occurs, or if large heavy debris is run through the machine.

WARNING

LOSS OF CONTROL HAZARD
- Chock wheels when servicing or parking machine.

Operation & Maintenance Manuals Inside

Titan LEAF PRO+ Spartan LEAF PRO+

↓ APPLY TO COLLECTION NOZZLE ↓ ↑ APPLY TO MANUAL BOX ↑

WARNING

COLLISION HAZARD
Serious injury or death could occur
- Secure Pick-up nozzle for transport.

WARNING

SUCTION HAZARD
Serious injury or death could occur

HIGH VACUUM!
KEEP CLEAR.

DANGER

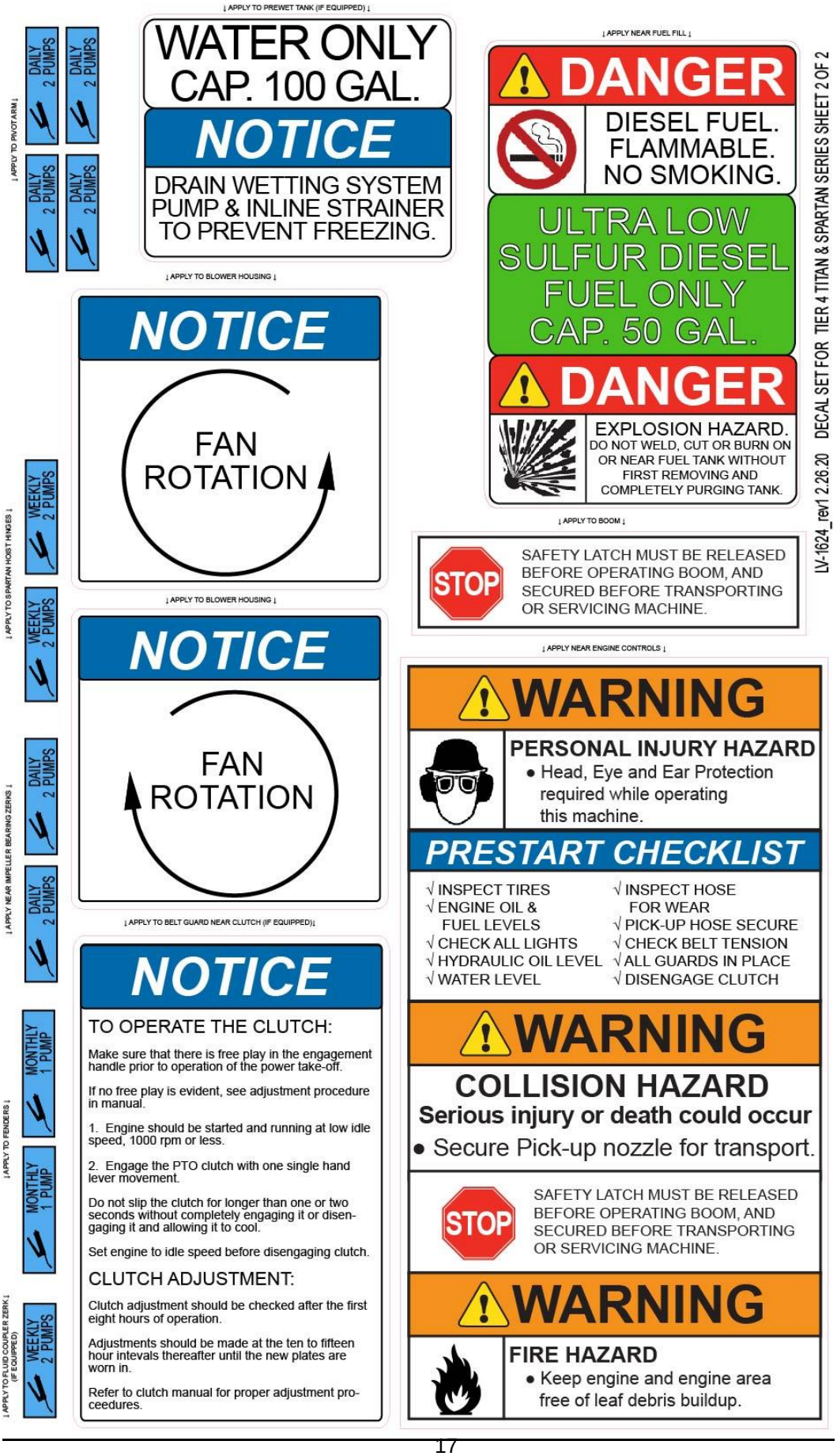
ENTAGLEMENT HAZARD
Serious injury or death will occur
- Shut down engine & disconnect safety interlock before removing hose or guards.

WARNING

PERSONAL INJURY HAZARD
- Head, Eye and Ear Protection required while operating this machine.

WARNING

LOSS OF CONTROL HAZARD
- Chock wheels when servicing or parking machine.


↓ APPLY TO PREWET TANK (IF EQUIPPED) ↓
WATER ONLY
CAP. 100 GAL.
NOTICE
DRAIN WETTING SYSTEM PUMP & INLINE STRAINER TO PREVENT FREEZING.
↓ APPLY NEAR FUEL FILL ↓
DANGER
DIESEL FUEL.
FLAMMABLE.
NO SMOKING.
ULTRA LOW SULFUR DIESEL FUEL ONLY
CAP. 50 GAL.
DANGER
EXPLOSION HAZARD.
DO NOT WELD, CUT OR BURN ON OR NEAR FUEL TANK WITHOUT FIRST REMOVING AND COMPLETELY PURGING TANK.
↓ APPLY TO PIVOT ARM ↓
DAILY 2 PUMPS
DAILY 2 PUMPS
DAILY 2 PUMPS
DAILY 2 PUMPS
↓ APPLY TO BLOWER HOUSING ↓
NOTICE
FAN ROTATION
↓ APPLY TO BOOM ↓
STOP
SAFETY LATCH MUST BE RELEASED BEFORE OPERATING BOOM, AND SECURED BEFORE TRANSPORTING OR SERVICING MACHINE.
LV-1624_rev1 2.26.20 DECAL SET FOR TIER 4 TITAN & SPARTAN SERIES SHEET 2 OF 2
↓ APPLY TO SPARTAN HOIST HINGES ↓
WEEKLY 2 PUMPS
WEEKLY 2 PUMPS
↓ APPLY TO BLOWER HOUSING ↓
NOTICE
FAN ROTATION
↓ APPLY NEAR IMPELLER BEARING ZERKS ↓
DAILY 2 PUMPS
DAILY 2 PUMPS
↓ APPLY NEAR ENGINE CONTROLS ↓
WARNING
PERSONAL INJURY HAZARD
• Head, Eye and Ear Protection required while operating this machine.
PRESTART CHECKLIST
√ INSPECT TIRES
√ ENGINE OIL & FUEL LEVELS
√ CHECK ALL LIGHTS
√ HYDRAULIC OIL LEVEL
√ WATER LEVEL
√ INSPECT HOSE FOR WEAR
√ PICK-UP HOSE SECURE
√ CHECK BELT TENSION
√ ALL GUARDS IN PLACE
√ DISENGAGE CLUTCH
↓ APPLY TO BELT GUARD NEAR CLUTCH (IF EQUIPPED)↓
NOTICE
TO OPERATE THE CLUTCH:
Make sure that there is free play in the engagement handle prior to operation of the power take-off.
If no free play is evident, see adjustment procedure in manual.
1. Engine should be started and running at low idle speed, 1000 rpm or less.
2. Engage the PTO clutch with one single hand lever movement.
Do not slip the clutch for longer than one or two seconds without completely engaging it or disengaging it and allowing it to cool.
Set engine to idle speed before disengaging clutch.
CLUTCH ADJUSTMENT:
Clutch adjustment should be checked after the first eight hours of operation.
Adjustments should be made at the ten to fifteen hour intevals thereafter until the new plates are worn in.
Refer to clutch manual for proper adjustment procedures.
↓ APPLY TO FENDERS ↓
MONTHLY 1 PUMP
MONTHLY 1 PUMP
WARNING
COLLISION HAZARD
Serious injury or death could occur
• Secure Pick-up nozzle for transport.
STOP
SAFETY LATCH MUST BE RELEASED BEFORE OPERATING BOOM, AND SECURED BEFORE TRANSPORTING OR SERVICING MACHINE.
↓ APPLY TO FLUID COUPLER ZERK ↓ (IF EQUIPPED)
WEEKLY 2 PUMPS
WARNING
FIRE HAZARD
• Keep engine and engine area free of leaf debris buildup.

LV-1623_REV0 03.25.19 TIER 4 TITAN & SPARTAN LEAF PRO PLUS

LV-2152_REV2, 9.26.16 DECAL SET FOR TITAN & SPARTAN LEAF PRO SERIES

↓ APPLY TO BOTH SIDES OF TONGUE, DIRECTLY IN FRONT OF CENTER MARKER LIGHT ↓

DANGER

FALL/CRUSH HAZARD

Serious injury or death could result from being crushed by moving machinery and revolving tires.

NO RIDERS!

- Only the machine operator shall occupy the machine when traveling or in operation.
- Do not stand, ride, or sit on machine.
- Keep clear when machine is in operation.
- Avoid driver and machine operator blind spots at all times.

DANGER

FALL/CRUSH HAZARD

Serious injury or death could result from being crushed by moving machinery and revolving tires.

NO RIDERS!

- Only the machine operator shall occupy the machine when traveling or in operation.
- Do not stand, ride, or sit on machine.
- Keep clear when machine is in operation.
- Avoid driver and machine operator blind spots at all times.

↓ APPLY DIRECTLY BELOW SEAT ↓

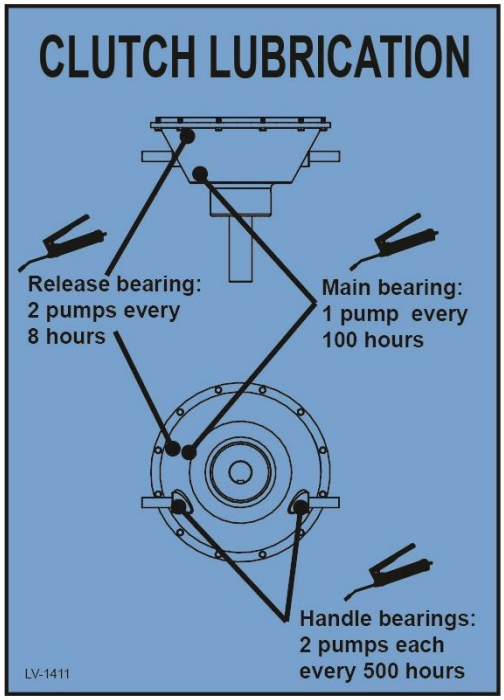
USE 3 POINTS OF CONTACT

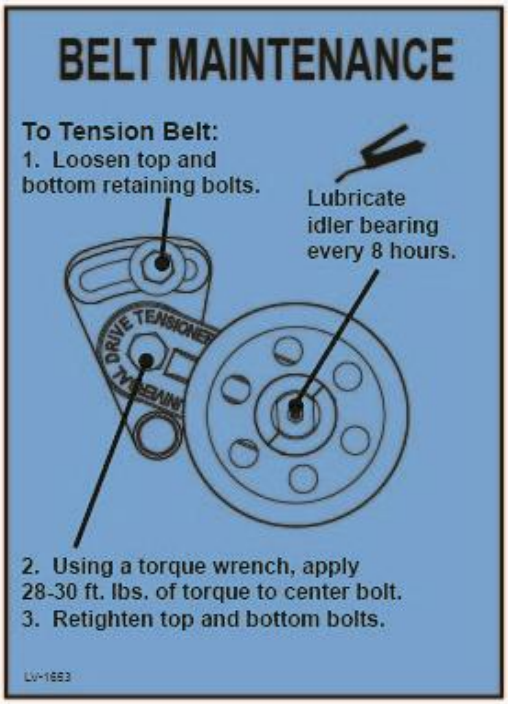
WHEN ENTERING OR EXITING VEHICLE

↓ APPLY DIRECTLY ABOVE YELLOW EMERGENCY SHUT OFF BUTTONS ↓

EMERGENCY ENGINE SHUT-OFF

EMERGENCY ENGINE SHUT-OFF





NOTICE

Bonnell Industries is not an authorized service center for engines, nor do we stock parts for these engines. Please refer to your engine manual, the yellow pages or internet to find your local authorized engine service center.

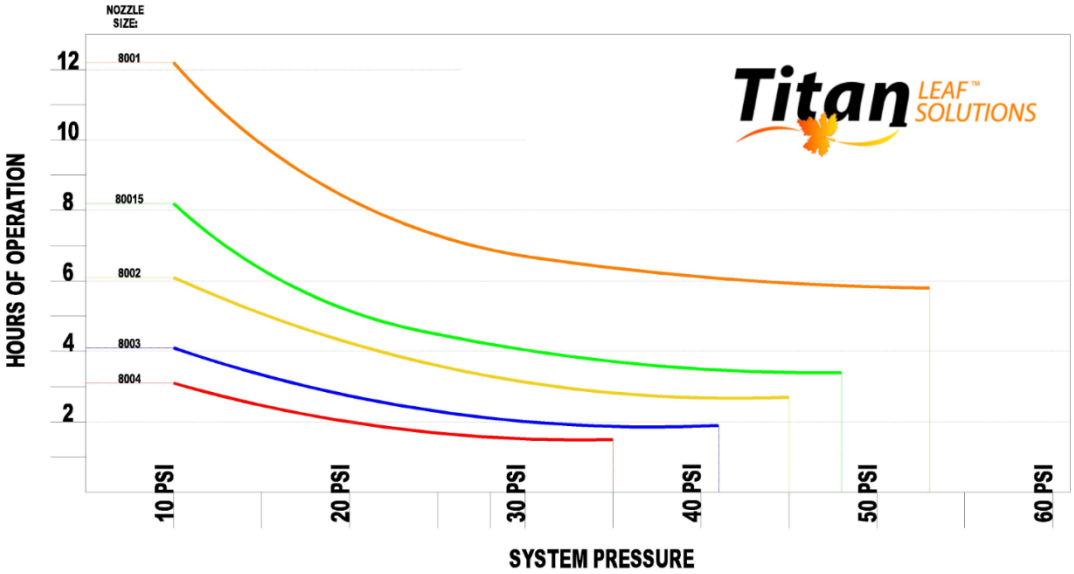
BJV-1660

⚠ CAUTION

- Read and understand Operator's Manual before operating unit. Free replacement manuals are available from Bonnell Industries.
- Keep all shields and guards in place and in good working condition. Keep hands, feet, and clothing away from all moving parts.
- Keep others away while operating or loading equipment. Do not allow children or untrained persons to operate or play on equipment.
- Stop vehicle, disengage power, stop engine, set parking brake and remove key before leaving vehicle. Make sure all movement has stopped before servicing machine.
- Failure to follow safety rules can result in serious injury or death.

BON-011377

DUST CONTROL SYSTEM RUN TIME CHART
HOURS OF OPERATION PER 100 GALLONS OF WATER
(GREEN NOZZLES INSTALLED AT FACTORY)

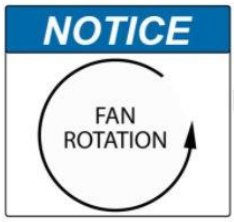


INSTRUCTIONS: ADJUST NEEDLE VALVE TO SYSTEM PRESSURE SHOWN TO OBTAIN APPROX. HOURS OF OPERATION LISTED AT LEFT.

DECAL: LV-1386

TITAN DECALS REV3.smg

DECAL SET: LV-1232



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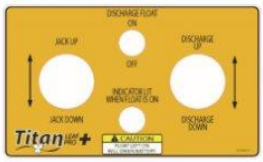


DECAL SET: LV-1623

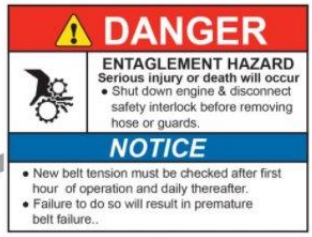
BON-011377

DECAL SET: LV-1232

DECAL SET: LV-1624

General Safety Information

TITAN DECALS REV3.smg



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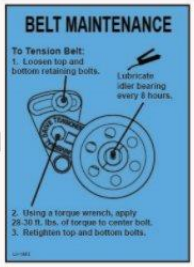
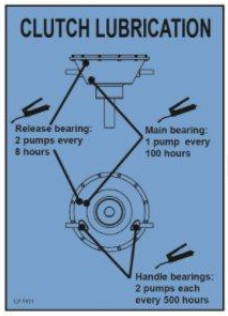
LV-1232



LV-1653



LV-1411

ONLY ADD IF GETTING
A MANUAL CLUTCH.

DECAL SET:
LV-1624

ONLY ADD IF GETTING
A MANUAL CLUTCH.

General Safety Information

TITAN DECALS REV3.smg

DECAL SET: LV-2152

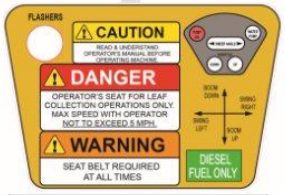
EMERGENCY ENGINE SHUT-OFF

DECAL SET: LV-2152

LV-1275

LV-1277

TT13169



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General Safety Information

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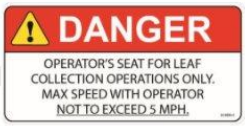

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General Safety Information

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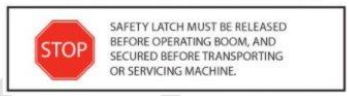

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DECAL SET: LV-1623

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TRAILER TOWING GUIDE

Driving a vehicle with a trailer in tow is vastly different from driving the same vehicle without a trailer in tow. Acceleration, maneuverability and braking are all diminished with a trailer in tow. It takes longer to get up to speed; you need more room to turn and pass, and more distance to stop when towing a trailer. You will need to spend time adjusting to the different feel and maneuverability of the tow vehicle with a loaded trailer. Because of the significant differences in all aspects of maneuverability when towing a trailer, the hazards and risks of injury are also much greater than when driving without a trailer. You are responsible for keeping your vehicle and trailer in control, and for all the damage that is caused if you lose control of your vehicle and trailer.

As you did when learning to drive an automobile, find an open area with little or no traffic for your first practice trailering. Of course, before you start towing the trailer, you must follow all of the instructions for inspection, testing, loading and coupling. Also, before you start towing, adjust the mirrors so you can see the trailer as well as the area to the rear of it.

Drive slowly at first, 5 mph or so, and turn the wheel to get the feel of how the tow vehicle and trailer combination responds. Next, make some right and left hand turns. Watch in your side mirrors to see how the trailer follows the tow vehicle. Turning with a trailer attached requires more room.

Stop the rig a few times from speeds no greater than 10 mph. If your trailer is equipped with brakes, try using different combinations of trailer/electric brake and tow vehicle brake. Note the effect that the trailer brakes have when they are the only brakes used. When properly adjusted, the trailer brakes will come on just before the tow vehicle brakes.

It will take practice to learn how to back up a tow vehicle with a trailer attached. Take it slow. Before backing up, get out of the tow vehicle and look behind the trailer to make sure that there are no obstacles. Some drivers place their hands at the bottom of the steering wheel, and while the tow vehicle is in reverse, “think” of the hands as being on the top of the wheel. When the hands move to the right (counter-clockwise, as you would do to turn the tow vehicle to the left when moving forward), the rear of the trailer moves to the right. Conversely, rotating the steering wheel clockwise with your hands at the bottom of the wheel will move the rear of the trailer to the left, while backing up. If you are towing a bumper hitch rig, be careful not to allow the trailer to turn too much, because it will hit the rear of the tow vehicle. To straighten the rig, either pull forward, or turn the steering wheel in the opposite direction.

REPORTING SAFETY DEFECTS

If you believe that your vehicle has a defect that could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Bonnell Industries, Inc. at 800-851-9664.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or Bonnell Industries.

To contact NHTSA, you may either call the Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153), go tohttp://www.safecar.gov; or write to: Administrator, NHTSA, 1200 New Jersey Ave. SE., Washington, DC 20590. You can also obtain other information about motor vehicle safety from http://www.safecar.gov.

Call Bonnell Industries, Inc. at 800-851-9664.

2.5. SAFE TRAILER TOWING GUIDELINES

- Before towing, check coupling, safety chain, safety brake, tires, wheels and lights.
- Check the lug nuts or bolts for tightness.
- Check coupler tightness after towing 50 miles.
- Adjust the brake controller to engage the trailer brakes before the tow vehicle brakes. Follow the instructions given with the brake controller manufacturer’s literature.
- Use your mirrors to verify that you have room to change lanes or pull into traffic.
- Use your turn signals well in advance.

- Allow plenty of stopping space for your trailer and tow vehicle.
- Do not drive so fast that the trailer begins to sway due to speed. Generally never drive faster than 60 m.p.h.
- Allow plenty of room for passing. A rule of thumb is that the passing distance with a trailer is 4 times the passing distance without a trailer.
- Shift your automatic transmission into a lower gear for city driving.
- Use lower gears for climbing and descending grades.
- Do not ride the brakes while descending grades, they may get so hot that they stop working. Then you will potentially have a runaway tow vehicle and trailer.
- To conserve fuel, don't use full throttle to climb a hill. Instead, build speed on the approach.
- Slow down for bumps in the road. Take your foot off the brake when crossing the bump.
- Do not brake while in a curve unless absolutely necessary. Instead, slow down before you enter the curve.
- Do not apply the tow vehicle brakes to correct extreme trailer swaying. Instead, lightly apply the trailer brakes with the hand controller.
- Make regular stops, about once each hour. Confirm that:
- The coupler is secure to the hitch and is locked,
- Electrical connectors are made,
- There is appropriate slack in the safety chains,
- There is appropriate slack in the breakaway switch pull pin cable,
- The tires are not visibly low on pressure

2.6. General Safety Related To Operation Of Vacuum

- Review safety items with all relevant personal at regular intervals.
- Ensure all operators are familiar with this manual before operating.
- Ensure your operation is in compliance with all applicable codes and regulations.
- Before operating machine, do a safety inspection. Refer to the pre-start checklist on page 4 for general procedures.
- Make sure all personal protective equipment is in order before leaving for the job site. Recommended equipment includes hard hat, safety goggles or ski mask, and ear protection.
- Have a fire extinguisher on hand at all times.
- Clean leaf debris from machine and engine screen after each load to prevent build-up of flammable material. A leaf blower works well for this. This can be done during truck change-over.
- Inspect work area before operating machine. Inspect for heavy debris, such as bricks, rocks, or glass bottles.
- Ensure all pedestrians and operators are clear of the vacuum area.
- Keep nozzle away from loose objects that may be near the collection area, and may get caught in the nozzle.
- Remove key and chock wheels when leaving machine unattended.
- **DO NOT** operate machine with guard, hose, or housing cover removed. Refer to safety disconnect section below for lock-out procedures.
- Prior to towing, inspect pintle, safety chains, lighting, running gear & trailer brakes.
- Secure pick-up nozzle for transport.
- When rotating hose per maintenance section, inspect fan for uneven wear, cracks, or looseness. Also check housing for large heavy debris & remove.
- With the exception of the operator's seat, no riders are allowed on the machine. Operator's seat is for leaf collection operations only. **Maximum speed with operator not to exceed 5 MPH.**

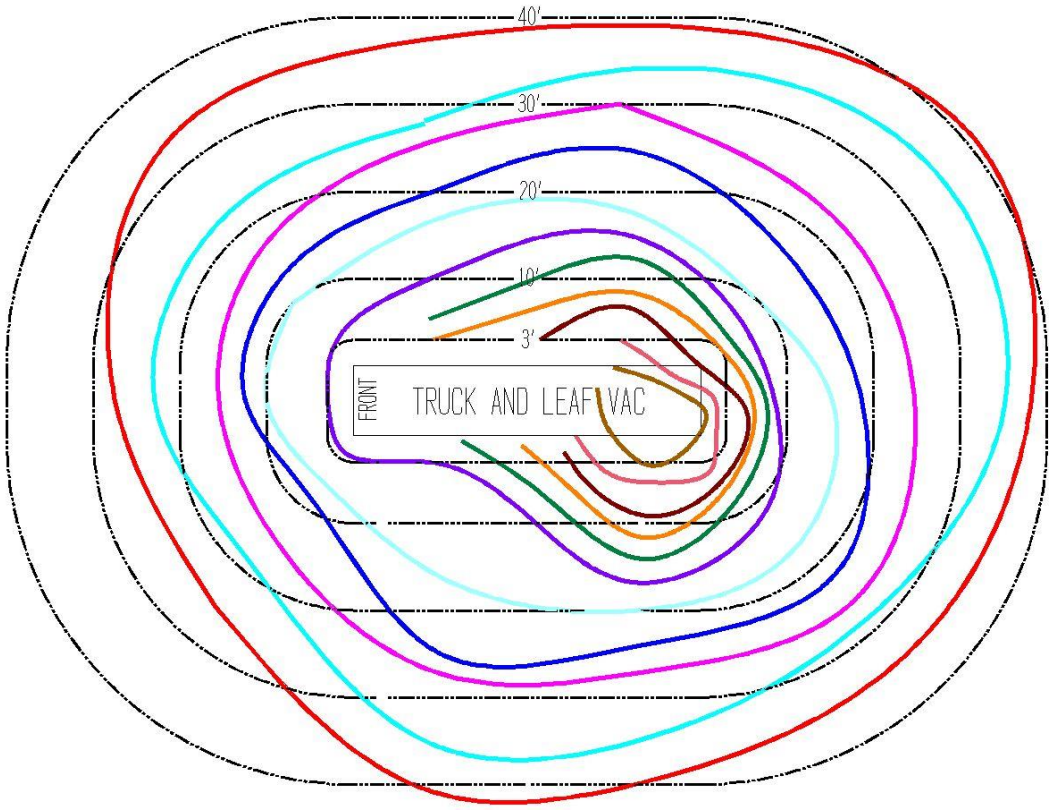
2.7. Safety Disconnect

Your Leaf Machine is equipped with two safety disconnect devices. **These disconnect devices and all wiring are to be left operable and in place at all times, for the life of the machine.** One is located on the belt guard, and the other is located on the hose connection to the blower housing. When performing any repair or maintenance work related to these areas, remove key from ignition, and disconnect the safety disconnect to the area needing service.

2.8. DECIBEL LEVELS

Below is an approximate decibel level chart showing sound levels at given positions around the machine. The purpose of this chart is to illustrate the approximate sound levels of the machine, and provide a guideline for hearing protection. ***To prevent hearing loss, ear protection is required when working on or around the leaf vacuum during operation.*** The Illustration below shows a Titan Leaf Pro Plus leaf vacuum with Kubota 99 HP engine. Decibel levels for other engines may vary from below.

Titan Leaf Pro Decibal Levels at given distances



Continuous dB	Permissible Exposure Time*
85 dB	8 hours
88 dB	4 hours
91 dB	2 hours
94 dB	1 hour
97 dB	30 minutes
100 dB	15 minutes
103 dB	7.5 minutes
106 dB	3.75 min (< 4min)
109 dB	1.875 min (< 2min)
112 dB	.9375 min (~1 min)
115 dB	.46875 min (~30 sec)

100 DB
99 DB
96 DB
94 DB
93 DB
92 DB
90 DB
88 DB
87 DB
86 DB
85 DB

*Permissible Exposure Time is in a 24 hour peroid.

Longer exposure than shown above may result in permanent hearing loss.

3. TIRE SAFETY INFORMATION

This portion of the User's Manual contains tire safety information as required by 49 CFR 575.6.

Section 2.1 contains "Steps for Determining Correct Load Limit - Trailer".

Section 2.2 contains "Steps for Determining Correct Load Limit – Tow Vehicle".

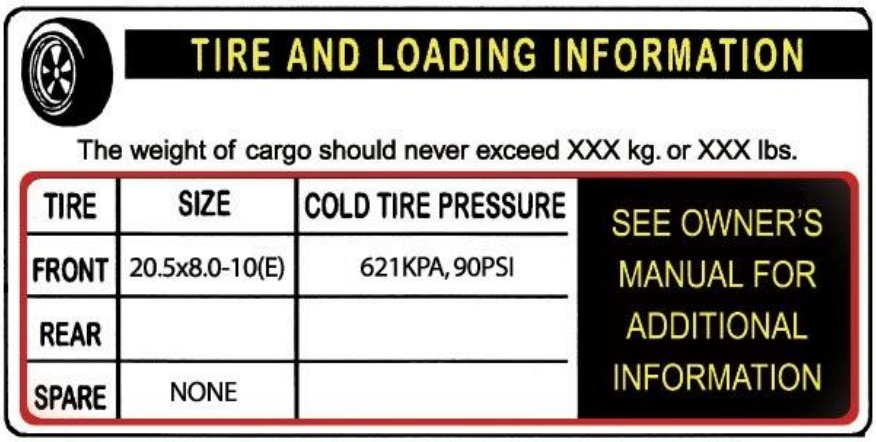
Section 2.3 contains a Glossary of Tire Terminology, including "cold inflation pressure", "maximum inflation pressure", "recommended inflation pressure", and other non-technical terms.

Section 2.4 contains information from the NHTSA brochure entitled "Tire Safety – Everything Rides On It". This brochure describes the following items;

- Tire labeling, including a description and explanation of each marking on the tires, and information about the DOT Tire Identification Number (TIN).
- Recommended tire inflation pressure, including a description and explanation of:
  A. Cold inflation pressure.
  B. Vehicle Placard and location on the vehicle.
  C. Adverse safety consequences of under inflation (including tire failure).
  D. Measuring and adjusting air pressure for proper inflation.
- Tire Care, including maintenance and safety practices.
- Vehicle load limits, including a description and explanation of the following items:
  A. Locating and understanding the load limit information, total load capacity, and cargo capacity.
  B. Calculating total and cargo capacities with varying seating configurations including quantitative examples showing / illustrating how the vehicles cargo and luggage capacity decreases as combined number and size of occupants' increases. This item is also discussed in Section 3.
  C. Determining compatibility of tire and vehicle load capabilities.
  D. Adverse safety consequences of overloading on handling and stopping on tires.

3.1. STEPS FOR DETERMINING CORRECT LOAD LIMIT – TRAILER

Trailers 10,000 Pounds GVWR or Less:



Tire and Loading Information Placard – Figure 1-1

1. Locate the statement, "The weight of cargo should never exceed XXX kg or XXX lbs.," on your vehicle's placard. See figure 1-1.
2. This figure equals the available amount of cargo and luggage load capacity.
3. Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage load capacity.

The trailer's placard refers to the Tire Information Placard attached adjacent to or near the trailer's VIN (Certification) label at the left front of the trailer.

3.2. GLOSSARY OF TIRE TERMINOLOGY

Accessory weight

The combined weight (in excess of those standard items which may be replaced) of automatic transmission, power steering, power brakes, power windows, power seats, radio and heater, to the extent that these items are available as factory-installed equipment (whether installed or not).

Bead: The part of the tire that is made of steel wires, wrapped or reinforced by ply cords and that is shaped to fit the rim.

Bead separation: This is the breakdown of the bond between components in the bead.

Bias ply tire: A pneumatic tire in which the ply cords that extend to the beads are laid at alternate angles substantially less than 90 degrees to the centerline of the tread.

Carcass: The tire structure, except tread and sidewall rubber which, when inflated, bears the load.

Chunking: The breaking away of pieces of the tread or sidewall.

Cold inflation pressure: The pressure in the tire before you drive.

Cord: The strands forming the plies in the tire.

Cord separation: The parting of cords from adjacent rubber compounds.

Cracking: Any parting within the tread, sidewall, or inner liner of the tire extending to cord material.

CT: A pneumatic tire with an inverted flange tire and rim system in which the rim is designed with rim flanges pointed radially inward and the tire is designed to fit on the underside of the rim in a manner that encloses the rim flanges inside the air cavity of the tire.

Curb weight: The weight of a motor vehicle with standard equipment including the maximum capacity of fuel, oil, and coolant, and, if so equipped, air conditioning and additional weight optional engine.

Extra load tire: A tire designed to operate at higher loads and at higher inflation pressures than the corresponding standard tire.

Groove: The space between two adjacent tread ribs.

Inner liner: The layer(s) forming the inside surface of a tubeless tire that contains the inflating medium within the tire.

Inner liner separation: The parting of the inner liner from cord material in the carcass.

Intended outboard sidewall: The sidewall that contains a white-wall, bears white lettering or bears manufacturer, brand, and/or model name molding that is higher or deeper than the same molding on the other sidewall of the tire or the outward facing sidewall of an asymmetrical tire that has a particular side that must always face outward when mounted on a vehicle.

Light truck (LT) tire: A tire designated by its manufacturer as primarily intended for use on lightweight trucks or multipurpose passenger vehicles.

Load rating: The maximum load that a tire is rated to carry for a given inflation pressure.

Maximum load rating: The load rating for a tire at the maximum permissible inflation pressure for that tire.

Maximum permissible inflation pressure: The maximum cold inflation pressure to which a tire may be inflated.

Maximum loaded vehicle weight: The sum of curb weight, accessory weight, vehicle capacity weight, and production options weight.

Measuring rim: The rim on which a tire is fitted for physical dimension requirements.

Non-pneumatic rim: A mechanical device which, when a non-pneumatic tire assembly incorporates a wheel, supports the tire, and attaches, either integrally or separably, to the wheel center member and upon which the tire is attached.

Non-pneumatic spare tire assembly: A non-pneumatic tire assembly intended for temporary use in place of one of the pneumatic tires and rims that are fitted to a passenger car in compliance with the requirements of this standard.

Non-pneumatic tire: A mechanical device which transmits, either directly or through a wheel or wheel center member, the vertical load and tractive forces from the roadway to the vehicle, generates the tractive forces that provide the directional control of the vehicle and does not rely on the containment of any gas or fluid for providing those functions.

Non-pneumatic tire assembly: A non-pneumatic tire, alone or in combination with a wheel or wheel center member, which can be mounted on a vehicle.

Normal occupant weight: This means 68 kilograms (150 lbs.) times the number of occupants specified in the second column of Table I of 49 CFR 571.110.

Occupant distribution: The distribution of occupants in a vehicle as specified in the third column of Table I of 49 CFR 571.110.

Open splice: Any parting at any junction of tread, sidewall, or inner liner that extends to cord material.

Outer diameter: The overall diameter of an inflated new tire.

Overall width: The linear distance between the exteriors of the sidewalls of an inflated tire, including elevations due to labeling, decorations, or protective bands or ribs.

Ply: A layer of rubber-coated parallel cords.

Ply separation: A parting of rubber compound between adjacent plies.

Pneumatic tire: A mechanical device made of rubber, chemicals, fabric and steel or other materials, that, when mounted on an automotive wheel, provides the traction and contains the gas or fluid that sustains the load.

Production options weight: The combined weight of those installed regular production options weighing over 2.3 kilograms (5 lbs.) in excess of those standard items which they replace, not previously considered in curb weight or accessory weight, including heavy duty brakes, ride levelers, roof rack, heavy duty battery, and special trim.

Radial ply tire: A pneumatic tire in which the ply cords that extend to the beads are laid at substantially 90 degrees to the centerline of the tread.

Recommended inflation pressure: This is the inflation pressure provided by the vehicle manufacturer on the Tire Information label and on the Certification / VIN tag.

Reinforced tire: A tire designed to operate at higher loads and at higher inflation pressures than the corresponding standard tire.

Rim: A metal support for a tire or a tire and tube assembly upon which the tire beads are seated.

Rim diameter: This means the nominal diameter of the bead seat.

Rim size designation: This means the rim diameter and width.

Rim type designation: This means the industry of manufacturer's designation for a rim by style or code.

Rim width: This means the nominal distance between rim flanges.

Section width: The linear distance between the exteriors of the sidewalls of an inflated tire, excluding elevations due to labeling, decoration, or protective bands.

Sidewall: That portion of a tire between the tread and bead.

Sidewall separation: The parting of the rubber compound from the cord material in the sidewall.

Special Trailer (ST) tire: The "ST" is an indication the tire is for trailer use only.

Test rim: The rim on which a tire is fitted for testing, and may be any rim listed as appropriate for use with that tire.

Tread: That portion of a tire that comes into contact with the road.

Tread rib: A tread section running circumferentially around a tire.

Tread separation: Pulling away of the tread from the tire carcass.

Tread wear indicators (TWI): The projections within the principal grooves designed to give a visual indication of the degrees of wear of the tread.

Vehicle capacity weight: The rated cargo and luggage load plus 68 kilograms (150 lbs.) times the vehicle's designated seating capacity.

Vehicle maximum load on the tire: The load on an individual tire that is determined by distributing to each axle its share of the maximum loaded vehicle weight and dividing by two.

Vehicle normal load on the tire: The load on an individual tire that is determined by distributing to each axle its share of the curb weight, accessory weight, and normal occupant weight (distributed in accordance with Table I of CRF 49 571.110) and dividing by 2.

Weather side: The surface area of the rim not covered by the inflated tire.

Wheel center member: In the case of a non-pneumatic tire assembly incorporating a wheel, a mechanical device which attaches, either integrally or separably, to the non-pneumatic rim and provides the connection between the non-pneumatic rim and the vehicle; or, in the case of a non-pneumatic tire assembly not incorporating a wheel, a mechanical device which attaches, either integrally or separably, to the non-pneumatic tire and provides the connection between tire and the vehicle.

Wheel-holding fixture: The fixture used to hold the wheel and tire assembly securely during testing.

3.3. Tire Safety - Everything Rides On It

The National Traffic Safety Administration (NHTSA) has published a brochure (DOT HS 809 361) that discusses all aspects of Tire Safety, as required by CFR 575.6. This brochure is reproduced in part below. It can be obtained and downloaded from NHTSA, free of charge, from the following web site:

http://www.nhtsa.dot.gov/cars/rules/TireSafety/ridesonit/tires_index.html

Studies of tire safety show that maintaining proper tire pressure, observing tire and vehicle load limits (not carrying more weight in your vehicle than your tires or vehicle can safely handle), avoiding road hazards, and inspecting tires for cuts, slashes, and other irregularities are the most important things you can do to avoid tire failure, such as tread separation or blowout and flat tires. These actions, along with other care and maintenance activities, can also:

- Improve vehicle handling
- Help protect you and others from avoidable breakdowns and accidents
- Improve fuel economy
- Increase the life of your tires.

This booklet presents a comprehensive overview of tire safety, including information on the following topics:
- Basic tire maintenance
- Uniform Tire Quality Grading System
- Fundamental characteristics of tires
- Tire safety tips.

Use this information to make tire safety a regular part of your vehicle maintenance routine. Recognize that the time you spend is minimal compared with the inconvenience and safety consequences of a flat tire or other tire failure.

SAFETY FIRST–BASIC TIRE MAINTENANCE

Properly maintained tires improve the steering, stopping, traction, and load-carrying capability of your vehicle. Underinflated tires and overloaded vehicles are a major cause of tire failure. Therefore, as mentioned above, to avoid flat tires and other types of tire failure, you should maintain proper tire pressure, observe tire and vehicle load limits, avoid road hazards, and regularly inspect your tires.

FINDING YOUR VEHICLE'S RECOMMENDED TIRE PRESSURE AND LOAD LIMITS

Tire information placards and vehicle certification labels contain information on tires and load limits. These labels indicate the vehicle manufacturer's information including:

- Recommended tire size
- Recommended tire inflation pressure
- Vehicle capacity weight (VCW–the maximum occupant and cargo weight a vehicle is designed to carry)
- Front and rear gross axle weight ratings (GAWR– the maximum weight the axle systems are designed to carry).

Both placards and certification labels are permanently attached to the trailer near the left front.

UNDERSTANDING TIRE PRESSURE AND LOAD LIMITS

Tire inflation pressure is the level of air in the tire that provides it with load-carrying capacity and affects the overall performance of the vehicle. The tire inflation pressure is a number that indicates the amount of air pressure– measured in pounds per square inch (psi)–a tire requires to be properly inflated. (You will also find this number on the vehicle information placard expressed in kilopascals (kPa), which is the metric measure used internationally.)
Manufacturers of passenger vehicles and light trucks determine this number based on the vehicle's design load limit, that is, the greatest amount of weight a vehicle can safely carry and the vehicle's tire size. The proper tire pressure for your vehicle is referred to as the "recommended cold inflation pressure." (As you will read below, it is difficult to obtain the recommended tire pressure if your tires are not cold.)
Because tires are designed to be used on more than one type of vehicle, tire manufacturers list the "maximum permissible inflation pressure" on the tire sidewall. This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

CHECKING TIRE PRESSURE

It is important to check your vehicle's tire pressure at least once a month for the following reasons:

- Most tires may naturally lose air over time.
- Tires can lose air suddenly if you drive over a pothole or other object or if you strike the curb when parking.
- With radial tires, it is usually not possible to determine under inflation by visual inspection.

For convenience, purchase a tire pressure gauge to keep in your vehicle. Gauges can be purchased at tire dealerships, auto supply stores, and other retail outlets.
The recommended tire inflation pressure that vehicle manufacturers provide reflects the proper psi when a tire is cold. The term cold does not relate to the outside temperature. Rather, a cold tire is one that has not been driven on for at least three hours. When you drive, your tires get warmer, causing the air pressure within them to increase. Therefore, to get an accurate tire pressure reading, you must measure tire pressure when the tires are cold or compensate for the extra pressure in warm tires.

STEPS FOR MAINTAINING PROPER TIRE PRESSURE

- Step 1: Locate the recommended tire pressure on the vehicle's tire information placard, certification label, or in the owner's manual.
- Step 2: Record the tire pressure of all tires.
- Step 3: If the tire pressure is too high in any of the tires, slowly release air by gently pressing on the tire valve stem with the edge of your tire gauge until you get to the correct pressure.
- Step 4: If the tire pressure is too low, note the difference between the measured tire pressure and the correct tire pressure. These "missing" pounds of pressure are what you will need to add.
- Step 5: At a service station, add the missing pounds of air pressure to each tire that is underinflated.
- Step 6: Check all the tires to make sure they have the same air pressure (except in cases in which the front and rear tires are supposed to have different amounts of pressure).

If you have been driving your vehicle and think that a tire is underinflated, fill it to the recommended cold inflation pressure indicated on your vehicle's tire information placard or certification label. While your tire may still be slightly underinflated due to the extra pounds of pressure in the warm tire, it is safer to drive with air pressure that is slightly lower than the vehicle manufacturer's recommended cold inflation pressure than to drive with a significantly underinflated tire. Since this is a temporary fix, don't forget to recheck and adjust the tire's pressure when you can obtain a cold reading.

TIRE SIZE

To maintain tire safety, purchase new tires that are the same size as the vehicle's original tires or another size recommended by the manufacturer. Look at the tire information placard, the owner's manual, or the sidewall of the tire you are replacing to find this information. If you have any doubt about the correct size to choose, consult with the tire dealer.

TIRE TREAD

The tire tread provides the gripping action and traction that prevent your vehicle from slipping or sliding, especially when the road is wet or icy. In general, tires are not safe and should be replaced when the tread is worn down to 1/16 of an inch. Tires have built-in tread wear indicators that let you know when it is time to replace your tires. These indicators are raised sections spaced intermittently in the bottom of the tread grooves. When they appear "even" with the outside of the tread, it is time to replace your tires. Another method for checking tread depth is to place a penny in the tread with Lincoln's head upside down and facing you. If you can see the top of Lincoln's head, you are ready for new tires.

TIRE BALANCE AND WHEEL ALIGNMENT

To avoid vibration or shaking of the vehicle when a tire rotates, the tire must be properly balanced. This balance is achieved by positioning weights on the wheel to counterbalance heavy spots on the wheel-and-tire

assembly. A wheel alignment adjusts the angles of the wheels so that they are positioned correctly relative to the vehicle's frame. This adjustment maximizes the life of your tires. These adjustments require special equipment and should be performed by a qualified technician.

TIRE REPAIR

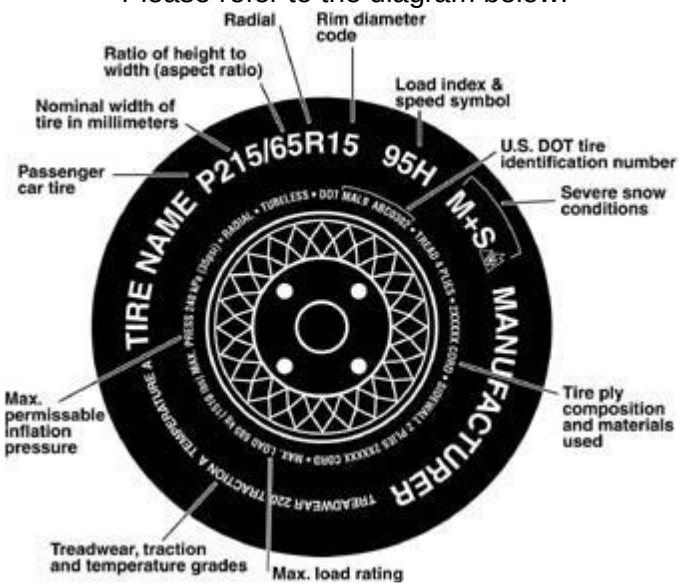
The proper repair of a punctured tire requires a plug for the hole and a patch for the area inside the tire that surrounds the puncture hole. Punctures through the tread can be repaired if they are not too large, but punctures to the sidewall should not be repaired. Tires must be removed from the rim to be properly inspected before being plugged and patched.

TIRE FUNDAMENTALS

Federal law requires tire manufacturers to place standardized information on the sidewall of all tires. This information identifies and describes the fundamental characteristics of the tire and also provides a tire identification number for safety standard certification and in case of a recall.

3.3.1.1. Information on Passenger Vehicle Tires

Please refer to the diagram below.



P
The "P" indicates the tire is for passenger vehicles.

Next number
This three-digit number gives the width in millimeters of the tire from sidewall edge to sidewall edge. In general, the larger the number, the wider the tire.

Next number
This two-digit number, known as the aspect ratio, gives the tire's ratio of height to width. Numbers of 70 or lower indicate a short sidewall for improved steering response and better overall handling on dry pavement.

R
The "R" stands for radial. Radial ply construction of tires has been the industry standard for the past 20 years.

Next number
This two-digit number is the wheel or rim diameter in inches. If you change your wheel size, you will have to purchase new tires to match the new wheel diameter.

Next number
This two- or three-digit number is the tire's load index. It is a measurement of how much weight each tire can support. You may find this information in your owner's manual. If not, contact a local tire dealer. Note: You may not find this information on all tires because it is not required by law.

M+S
The "M+S" or "M/S" indicates that the tire has some mud and snow capability. Most radial tires have these markings; hence, they have some mud and snow capability.

U.S. DOT Tire Identification Number
This begins with the letters "DOT" and indicates that the tire meets all federal standards. The next two numbers or letters are the plant code where it was manufactured, and the last four numbers represent the week and year the tire was built. For example, the numbers 3197 means the 31st week of 1997. The other numbers are marketing codes used at the manufacturer's discretion. This information is used to contact consumers if a tire defect requires a recall.

Tire Ply Composition and Materials Used
The number of plies indicates the number of layers of rubber-coated fabric in the tire. In general, the greater the number of plies, the more weight a tire can support. Tire manufacturers also must indicate the materials in the tire, which include steel, nylon, polyester, and others.

Maximum Load Rating
This number indicates the maximum load in kilograms and pounds that can be carried by the tire.

Maximum Permissible Inflation Pressure
This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

3.3.1.2. UTQGS Information

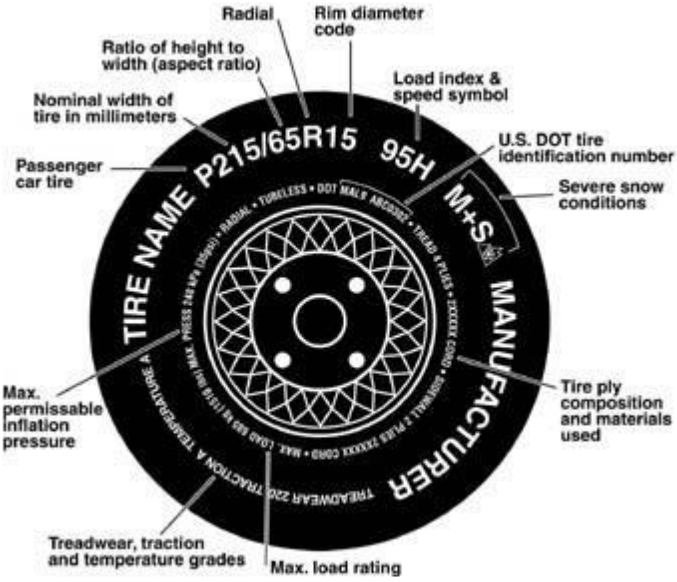
Tread wear Number
This number indicates the tire's wear rate. The higher the tread wear number is, the longer it should take for the tread to wear down. For example, a tire graded 400 should last twice as long as a tire graded 200.

Traction Letter
This letter indicates a tire's ability to stop on wet pavement. A higher graded tire should allow you to stop your car on wet roads in a shorter distance than a tire with a lower grade. Traction is graded from highest to lowest as "AA","A", "B", and "C".

Temperature Letter
This letter indicates a tire's resistance to heat. The temperature grade is for a tire that is inflated properly and not overloaded. Excessive speed, under inflation or excessive loading, either separately or in combination, can cause heat build-up and possible tire failure. From highest to lowest, a tire's resistance to heat is graded as "A", "B", or "C".

3.3.1.3. Additional Information on Light Truck Tires

Please refer to the following diagram.



Tires for light trucks have other markings besides those found on the sidewalls of passenger tires.

LT
The "LT" indicates the tire is for light trucks or trailers.

ST
An "ST" is an indication the tire is for trailer use only.

Max. Load Dual kg (lbs) at kPa (psi) Cold
This information indicates the maximum load and tire pressure when the tire is used as a dual, that is, when four tires are put on each rear axle (a total of six or more tires on the vehicle).

Max. Load Single kg (lbs) at kPa (psi) Cold
This information indicates the maximum load and tire pressure when the tire is used as a single.

Load Range
This information identifies the tire's load-carrying capabilities and its inflation limits.

TIRE SAFETY TIPS

Preventing T**ire Damage**

- Slow down if you have to go over a pothole or other object in the road.
- Do not run over curbs or other foreign objects in the roadway, and try not to strike the curb when parking.

Tire Safety Checklist

- Check tire pressure regularly (at least once a month), including the spare.
- Inspect tires for uneven wear patterns on the tread, cracks, foreign objects, or other signs of wear or trauma.
- Remove bits of glass and foreign objects wedged in the tread.
- Make sure your tire valves have valve caps.
- Check tire pressure before going on a long trip.
- Do not overload your vehicle. Check the Tire Information and Loading Placard or User's Manual for the maximum recommended load for the vehicle.

3.4. TIRE REGISTRATION

TIRE REGISTRATION

In accordance with Title 49 CFR 574.1, the following tire registration information must be filled out and returned to Bonnell Industries:

Company Name:_____

Contact: _____

Address: _____

City: _____

State: _____ Zip: _____

Model Number:_____

Serial Number: _____

TIN: DOT _____

SPARE TIN: _____

Date of Purchase:_____

The Tire Identification Number (TIN) can be found on the side wall of the tire.

The number begins with “DOT”, and ends with a four-number date code.

Please Complete Form and fax to:

815-284-8815

4. COUPLING TO THE TOW VEHICLE

Follow all of the safety precautions and instructions in this manual to ensure safety of persons, cargo, and satisfactory life of the trailer.

4.1. USE AN ADEQUATE TOW VEHICLE AND HITCH

If the vehicle or hitch is not properly selected and matched to the Gross Vehicle Weight Rating (GVWR) of your trailer, you can cause an accident that could lead to death or serious injury. If you already have a tow vehicle, know your vehicle tow rating, and Gross Combination Weight Rating (GCWR) and make certain the trailer's rated capacity is less than or equal to the tow vehicle's rated towing capacity. If you already have (or plan to buy) a trailer, make certain that the tow rating of the tow vehicle is equal to or greater than the GVWR of the trailer, and that the GCWR will be within limits.

⚠ Danger

Use of a hitch with a load rating less than the load rating of the trailer can result in loss of control and may lead to death or serious injury.

Use of a tow vehicle with a towing capacity less than the load rating of the trailer can result in loss of control, and may lead to death or serious injury.

Be sure your hitch and tow vehicle are rated for the Gross Vehicle Weight Rating (GVWR) of your trailer.

4.2. CERTIFICATION / VIN TAG

The VIN tag is located on the driver's side, near the front of the trailer. The VIN Tag contains the following critical safety information for the use of your trailer:

MANUFACTURER: Name of trailer manufacturer

DATE OF MANUFACTURE: Month and year the trailer was manufactured.

GVWR: The Gross Vehicle Weight Rating is the maximum allowable gross weight of the trailer and its contents. The gross weight of the trailer includes the weight of the trailer and all of the items within it (such as cargo, water, food and other supplies).

GAWR: The Gross Axle Weight Rating is the maximum gross weight that an axle can support. It is the lowest of axle, wheel, or tire rating. Sometimes the tire or wheel rating is lower than the axle manufacturers rating, and will then determine GAWR.

The sum total of the GAWR for all trailer axles may be less than the GVWR for the trailer, because some of the trailer load is carried by the tow vehicle, rather than by the trailer axle(s). The total weight of the cargo and trailer must not exceed the GVWR, and the load on an axle must not exceed its GAWR.

TIRE SIZE: The tire size recommended for your trailer and load range.

PSIC: The "pounds per square inch- cold" is the tire pressure (Kilopascals / Pounds per Square Inch) measured when Cold.

CERTIFICATION STATEMENT: "This trailer meets all the Federal Motor Vehicle Safety Standards in effect on the date of manufacture shown above".

VIN: The Vehicle Identification Number.

VEHICLE TYPE: Generally the word “trailer” is used. However, after this you may put a Model #, or additional descriptor.

4.3. COUPLING AND UNCOUPLING THE TRAILER

A secure coupling (or fastening) of the trailer to the tow vehicle is essential. A loss of coupling may result in death or serious injury. Therefore, you must understand and follow all of the instructions for coupling.

The following parts are involved in making a secure coupling between the trailer and tow vehicle:

Coupling: That part of the trailer connecting mechanism by which the connection is actually made to the trailer hitch. This does not include any structural member, extension of the trailer frame, or brake controller.

Hitch: That part of the connecting mechanism including the ball support platform and ball and those components that extend and are attached to the towing vehicle, including bumpers intended to serve as hitches.)

Weight Distributing Hitch (or Equalizing Hitch): A mechanical device that connects the trailer to the towing vehicle and by means of leverage applied on both the trailer and towing vehicle structures, when properly adjusted, distributes the imposed vertical load at the hitch and coupling connection between structures of the towing vehicle and trailer.

Weight Carrying Hitch: A mechanical and/or structural device that connects the trailer to the towing vehicle and that does not employ features designed to redistribute the load imposed at the hitch and carrying connection.

Safety chains or cables: Chains or cables permanently attached to the trailer such that if the coupler connection comes loose, the safety chains or cables can keep the trailer attached to the tow vehicle. With properly rigged safety chains or cables, it is possible to keep the tongue of the trailer from digging into the road pavement, even if the coupler-to-hitch connection comes apart. Some states do not allow safety cables, e.g. Pennsylvania; therefore it may be wise to check with the State Police to see if your state has any restrictions on the use of safety cables, if your trailer is so equipped.

Trailer lighting (and braking) connector: A device that connects electrical power from the tow vehicle to the trailer. Electricity is used to turn on brake lights, running lights, and turn signals as required. In addition, if your trailer has a separate braking system, the electrical connector will also supply power to the trailer brakes from the tow vehicle.

Breakaway switch: If the trailer becomes de-coupled from the towing vehicle, the breakaway switch lanyard, attached independently to the tow vehicle hitch, will pull a pin in the emergency electrical break-away switch on the trailer. The breakaway switch is activated by a separate battery supply in the trailer such as to energize the trailer brakes independently of the towing vehicle. It is important to check the state of charge of the emergency break-away battery before each trip. Simply pull the pin out of the switch by hand and then try to pull the trailer. If you feel a significant drag force the brakes are activated. Be sure to re-insert the pin in the break-away switch. Also be sure to allow enough slack in the break-away brake lanyard such that the switch will only activate (pin pulls out) if the coupler connection comes loose. For additional details refer to Section 0

Jack: A device on the trailer that is used to raise and lower the trailer tongue. On larger trailers the jack is sometimes called the “landing gear.”

⚠ WARNING

An improperly coupled trailer can result in death or serious injury.
Do not move the trailer until:
The coupler is secured and locked to hitch;
The safety chains are secured to the tow vehicle; and
The trailer jack(s) are fully retracted.

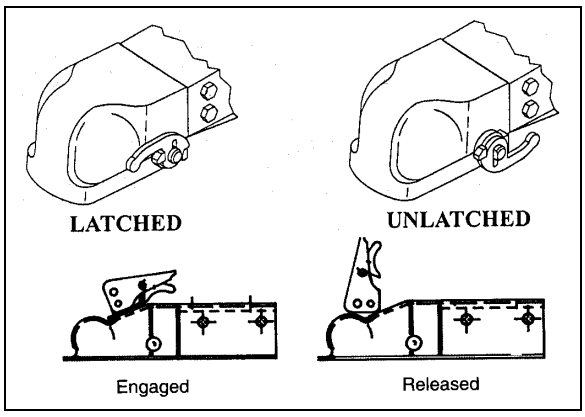
Do not tow the trailer on the road until:
Tires and wheels are checked;
The trailer brakes are checked;
The breakaway switch is connected to the tow vehicle;
The load is secured to the trailer; and
The trailer lights are connected and checked.

VARIOUS COUPLER DESIGNS

Trailers are produced with a variety of coupler devices. One of the sections below will pertain to your trailer. If the coupler on your trailer does not resemble one of the couplers shown in the figures, see the separate coupler instructions. If you do not have separate coupler instructions, call Bonnell Industries, Inc. at 800-851-9664 for a free copy.

TRAILER WITH BALL-HITCH COUPLER

A ball hitch coupler connects to a ball that is located on or under the rear bumper of tow vehicle. This system of coupling a trailer to a tow vehicle is sometimes referred to as “bumper pull.”



THE TOW VEHICLE, HITCH AND BALL MUST HAVE A RATED TOWING CAPACITY EQUAL TO OR GREATER THAN THE TRAILER GROSS VEHICLE WEIGHT RATING (GVWR).

IT IS ESSENTIAL THAT THE HITCH BALL BE OF THE SAME SIZE AS THE COUPLER.

The ball size and load rating (capacity) are marked on the ball; hitch capacity is marked on the hitch.

4.3.1.1. Before coupling the trailer to the tow vehicle

⚠ WARNING

Coupler-to-hitch mismatch can result in uncoupling, leading to death or serious injury.

Be sure the LOAD RATING of the hitch ball is equal or greater than the load rating of the coupler.

Be sure the SIZE of the hitch ball matches the size of the coupler.

Wipe the hitch ball clean and inspect it visually and by feel for flat spots, cracks and pits.

⚠ WARNING

A worn, cracked or corroded hitch ball can fail while towing, and may result in death or serious injury.

Before coupling trailer, inspect the hitch ball for wear, corrosion and cracks.

Replace worn or damaged hitch ball.

Rock the ball to make sure it is tight to the hitch, and visually check that the hitch ball nut is solid against the lock washer and hitch frame.

Wipe the inside and outside of the coupler clean and inspect it visually for cracks and deformations; feel the inside of the coupler for worn spots and pits.

Be sure the coupler is tight to the tongue of the trailer. All coupler fasteners must be visibly solid against the trailer frame.

⚠ WARNING

A loose hitch ball nut can result in uncoupling, leading to death or serious injury.

Be sure the hitch ball is tight to the hitch before coupling the trailer.

Raise the bottom surface of the coupler to be above the top of the hitch ball. Use the jack if one is provided; otherwise, use wood or concrete blocks to support the trailer tongue.
Prepare the coupler and hitch
Lubricate the hitch ball and the inside of the coupler with a thin layer of automotive bearing grease. If your trailer is equipped with a jack, raise the coupler above the ball height.

Open the coupler locking mechanism. Ball couplers have a locking mechanism with an internal moving piece (ball clamp) and an outside handle, wheel, or latch.

In the open position, the coupler is able to drop fully onto the hitch ball.
See the coupler instructions for details of placing the coupler in the “open” position.

Slowly back up the tow vehicle so that the hitch ball is near or aligned under the coupler, if the trailer jack has raised the coupler.

Couple the trailer to the tow vehicle
If your trailer does not have a jack, you will have to lift the coupler and place it over the ball.

If you have a jack, lower the trailer tongue until the coupler fully engages the hitch ball. If the coupler does not line up with the hitch ball, adjust the position of the tow vehicle.

Engage the coupler locking mechanism. In the engaged position, the locking mechanism securely holds the coupler to the hitch ball.

Insert a pin or lock through the hole in the locking mechanism.

Be sure the coupler is all the way on the hitch ball and the locking mechanism is engaged. A properly engaged locking mechanism will allow the coupler to raise the rear of the tow vehicle. Using the trailer jack, test to see that you can raise the rear of the tow vehicle by 1 inch, after the coupler is locked to the hitch.

If the coupler cannot be secured to the hitch ball, do not tow the trailer. Call Bonnell Industries, Inc. at 800-851-9664 or your dealer for assistance.

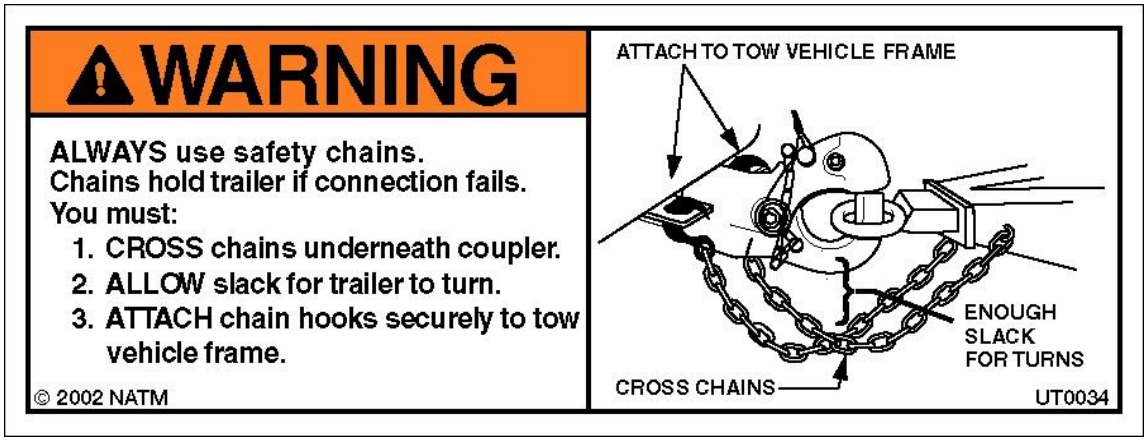
Lower the trailer so that its entire tongue weight is held by the hitch, and continue retracting the jack to its fully retraced position.

RIG THE SAFETY CHAINS

Visually inspect the safety chains and hooks for wear or damage. Replace worn or damaged safety chains and hooks before towing.

Rig the safety chains so that they:

- Criss-cross underneath the coupler so if the trailer uncouples, the safety chains can hold the tongue up above the road.
- Loop around a frame member of the tow vehicle or to holes provided in the hitch system (but, do **not** attach them to an interchangeable part of the hitch assembly)
- Attach hooks up from underneath the hole (do not just drop into hole); and
- Provide enough slack to permit tight turns, but not be close to the road surface to drag.

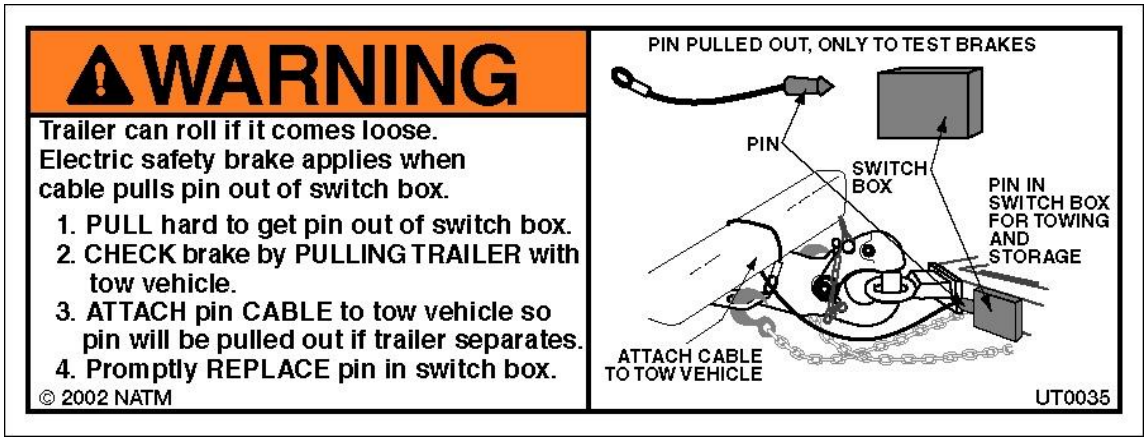


ATTACH AND TEST ELECTRIC BREAKAWAY BRAKE SYSTEM

If the coupler or hitch fails, a properly connected and working breakaway brake system will apply electric brakes on the trailer. The safety chains will keep the tow vehicle attached and as the brakes are applied at the trailer's axles, the trailer/tow vehicle combination will come to a controlled stop.

The breakaway brake system includes a battery, a switch with a pull-pin, and a lanyard. Read and follow the instructions here as well as the instructions that have been prepared by the breakaway brake manufacturer.

The breakaway brake system may be fitted with a "charging" capability that draws power from the tow vehicle. If the electrical system on your tow vehicle does not provide power to the breakaway brake battery, you must periodically charge the battery to keep the breakaway brake system in working order.



Connect the pull pin lanyard to the tow vehicle so that the pull pin will be pulled out before all of the slack in the safety chains is taken up (see Breakaway Brake System figure). Do **not** connect the pull pin cable to a safety chain or to the hitch ball or hitch ball assembly. This would keep the breakaway brake system from operating when it is needed.

To test the break-away brake battery, remove the pull pin from the switch and attempt to pull the trailer forward. You should feel the trailer resisting being towed, but the wheels will not necessarily be locked. If the brakes do not function, do not tow the trailer until brakes, or battery, are repaired.

Immediately replace the pull pin. The breakaway brake system battery discharges rapidly when the pull pin is removed.

⚠ WARNING

An ineffective breakaway brake system can result in a runaway trailer, leading to death or serious injury if the coupler or ball hitch fails.

Connect the breakaway cable to the tow vehicle; and NOT to the hitch, ball or support.

Before towing the trailer, test the function of the breakaway brake system. If the breakaway brake system is not working, do not tow the trailer. Have it serviced or repaired.

Do **not** tow the trailer with the breakaway brake system ON because the brakes will overheat which can result in permanent brake failure.

> **⚠ WARNING**
>
> Failure to replace the pull pin will prevent brakes from working, leading to loss of control, serious injury or death.

If you do not use your trailer for three or more months, or during winter months:

Store the battery indoors; and

- Charge the battery every three months.
- Replace the breakaway brake battery according to the intervals specified by battery manufacturer.
- Connect the electrical cables
- Connect the trailer lights to the tow vehicle's electrical system using the electrical connectors.
- Check all lights for proper operation.
    - Clearance and Running Lights (Turn on tow vehicle headlights).
    - Brake Lights (Step on tow vehicle brake pedal).
    - Turn Signals (Operate tow vehicle directional signal lever).

Check electric brakes for proper operation using brake controller mounted in the cab.

Your tow vehicle will have an electric brake controller that sends power to the trailer brakes. Before towing the trailer on the road, you must operate the brake controller while trying to pull the trailer in order to confirm that the electric brakes operate. While towing the trailer at less than 5 m.p.h., manually operate the electric brake controller in the tow vehicle cab. You should feel the operation of the trailer brakes.

> **⚠ WARNING**
>
> Improper electrical connection between the tow vehicle and the trailer will result in inoperable lights and electric brakes, and can lead to collision.
>
> Before each tow:
>
> Check that the taillights, brake lights and turn signals work
>
> Check that the electric brakes work by operating the brake controller inside the tow vehicle

Uncoupling the Ball Hitch Trailer with Tongue Jack
Follow these steps to uncouple your ball hitch trailer from the tow vehicle:

- Block trailer tires to prevent the trailer from rolling, before jacking the trailer up.
- Disconnect the electrical connector.
- Disconnect the breakaway brake switch lanyard.
- Disconnect the safety chains from the tow vehicle.
- Unlock the coupler and open it.
- Before extending jack, make certain the ground surface below the jack pad will support the tongue load.
- Rotate the jack handle (or crank) clockwise. This will slowly extend the jack and transfer the weight of the trailer tongue to the jack.

5. CHECKING THE TRAILER BEFORE AND DURING EACH TOW

5.1. PRE-TOW CHECKLIST

Before towing, double-check all of these items: See section 7.1, “Inspection, Service & Maintenance Summary Charts,” for more information.

Tires, wheels and lug nuts (see the Major Hazards section starting on page 10 of this manual)

- Tire Pressure. Inflate tire on trailer and tow vehicle to the pressure stated on the VIN / Certification label.
- Coupler secured and locked (see the “Coupling and Uncoupling the Trailer” section starting on page 42 of this manual)
- Safety chains properly rigged to tow vehicle, not to hitch or ball (see the “Coupling to the Tow Vehicle” chapter starting at Page 41 of this manual)
- Test of lights: Tail, Stop, and Turn Lights
- Test trailer brakes.
- Safety breakaway switch cable fastened to tow vehicle, not to safety chains (see the “Coupling to the Tow Vehicle” chapter starting at Page 41 of this manual)
- Fire extinguisher
- Flares and reflectors

5.2. MAKE REGULAR STOPS

After each 50 miles, or one hour of towing, stop and check the following items:

- Coupler secured
- Safety chains are fastened and not dragging

6. BREAKING-IN A NEW TRAILER

6.1. RETIGHTEN LUG NUTS AT FIRST 10, 25 & 50 MILES

Wheel lugs can shift and settle quickly after being first assembled, and must be checked after the **first** 10, 25 and 50 miles of driving. Failure to perform this check may result in a wheel coming loose from the trailer, causing a crash leading to death or serious injury.

⚠ WARNING

Lug nuts are prone to loosen after initial installation, which can lead to death or serious injury.

Check lug nuts for tightness on a new trailer or when wheel(s) have been remounted after the first 10, 25 and 50 miles of driving.

See Section 7.2.1.8 page 57 on Proper Tourqing Technique.

6.2. ADJUST BRAKE SHOES AT FIRST 200 MILES

Brake shoes and drums experience a rapid initial wear. The brakes must be adjusted after the first 200 miles of use, and each 3,000 miles thereafter. Some axles are fitted with a mechanism that will automatically adjust the brake shoes when the trailer is “hard braked” from a rearward direction. Read your axle and brake manual to see if your brakes adjust automatically. If you do not have the axle and brake manual, call Bonnell Industries, Inc. at 800-851-9664 for a free copy.

A hard stop is used to:

- Confirm that the brakes work;
- Confirm that the trailer brakes are properly synchronized with the tow vehicle brakes using the brake controller in the tow vehicle
- Adjust the brake shoes as necessary.
- For surge brakes check the Master cylinder reservoir for fluid.

If your trailer is not fitted with automatically adjusting brakes, the brakes will need to be manually adjusted. See section 7.2.1.4, “Manually Adjusting Brake Shoes,” for instructions.

6.3. SYNCHRONIZING THE BRAKE SYSTEMS

Trailer brakes are designed to work in synchronization with the brakes on the tow vehicle. When the tow vehicle and trailer braking systems are synchronized, both braking systems contribute to slowing, and the tongue of the trailer will neither dive nor rise sharply.

⚠ WARNING

If trailer and tow vehicle brakes do not work properly together, death or serious injury can occur.

Road test the brakes in a safe area at no more than 30 m.p.h. before each tow

To insure safe brake performance and synchronization, read and follow the axle/brake and the brake controller manufacturers’ instructions. If you do not have these instructions, call Bonnell Industries, Inc. at 800-851-9664 for a free copy.

TIRE PRESSURE

Check tire pressures on both the trailer and tow vehicle. Inflate to the maximum shown on the VIN / Certification Label.

7. INSPECTION, SERVICE & MAINTENANCE

7.1. INSPECTION, SERVICE & MAINTENANCE SUMMARY CHARTS

You must inspect, maintain and service your trailer regularly to insure safe and reliable operation. If you cannot or are unsure how to perform the items listed here, have your dealer do them. Note: In addition to this manual, also check the relevant component manufacturer's manual. Inspection and Service before Each Use

Item	Inspection / Service	Manual Section Reference
Breakaway Brakes > Electric	Check operation	Section 7.2.1.5
Breakaway Battery	Fully charged, connections clean	Section 7.2.1.5.A.(i)
Brakes, all types	Check operation	Section 6.3
Shoes and Drums	Adjust	Section 6.2 & 7.2.1.4
Coupler and Hitch Ball	Check for cracks, pits, and flats. Replace w/ball & coupler having trailer GVW Rating. Grease. Check locking device & replace.	Section 7.2.1.6
Safety Chain(s) & Hooks	Check for wear and damage	Sections 0
Tires	Check tire pressure when cold. Inflate as needed.	Sections 5.1 & 0
Wheels - Lug Nuts (Bolts) & Hub	Check for tightness Tighten. For new and remounted wheels, check torque after first 10, 25 & 50 miles of driving and after any impact	Section 5.1 Sections 6.1 & 7.2.1.8

Inspection and Service each 6 Months or 6,000 Miles		
Item	**Inspection / Service**	**Manual Section Reference**
Tires	Rotate @ 5,000 miles	Section 0
Brakes, electric > Magnets > Controller (in tow vehicle)	 Check wear and current draw Check power output (amperage) and modulation	 Section 7.2.1.5.C Section 7.2.1.5.B See Controller Mfr's Manual
Tires	Inspect tread and sidewalls thoroughly. Replace tire when treads are worn, when sidewall has a bulge, or sidewall is worn	Section 0 Section 0

Inspection and Service Each Year or 12,000 Miles		
Item	**Inspection / Service**	**Manual Section Reference**
Brakes, all types > Shoes and drums	Check for scoring and wear. Replace per manufacturer's specifications	Section 7.2.1.3 See Brake Mfr's Manual
Jack, Drop-leg	Grease gears at top	See Jack Mfr's Manual
Structure > Frame members > Welds	Inspect all frame members, bolts & rivets. Repair or replace damaged, worn or broken parts. Inspect all welds. Repair as needed	Section 0 Section 7.2.1.2
Wheels > Sealed Bearings (Hubs) > UNSEALED Bearings (Hubs) > Rims	Check and confirm free running. Replace if not (sealed bearings are not serviceable) Disassemble / inspect / assemble and repack. Replace promptly if immersed in water Inspect for cracks & dents. Replace as needed.	Section 0 Section 7.2.1.7 See Axle Mfr's Manual Section 0
Structure > Axle Attachment Bolts	 Check BY DEALER	 Section 0

7.2. Inspection and Service Instructions

Axle Bolts, Frame, Suspension, & Structure

⚠ WARNING

Worn or broken suspension parts can cause loss of control and injury may result.

Have trailer professionally inspected annually and after any impact.

To perform many of the inspection and maintenance activities, you must jack up the trailer. When jacking and using jack stands, place them so as to clear wiring, brake lines, and suspension parts (springs, torsion bars, etc.). Place jacks and jack stands directly under the side tube members of the trailer frame.

Refer to the axle manual for service information. Bonnell Industries does not service axles. Refer to your local axle dealer for service requirements.

⚠ WARNING

Never crawl under your trailer unless it is on firm and level ground and resting on properly placed and secured jack stands.

TRAILER STRUCTURE

Because the trailer floor receives the most abuse, it will most likely corrode before any other part of the structure.

7.2.1.1. Fasteners and Frame Members

Inspect all of the fasteners and structural frame members for bending and other damage, cracks, or failure. Repair or replace any damaged fastener and repair the frame member. If you have any questions about the condition or method of repair of fasteners or frame members, get the recommendation of, or have the repair done by, your dealer.

⚠ WARNING

Worn or broken suspension parts can cause loss of control and injury may result.

Have trailer professionally inspected annually and after any impact.

7.2.1.2. Welds

All welds can crack or fail when subjected to heavy loads or movement of cargo that was not properly tied to prevent movement. Any time that you know or suspect that the trailer has been subjected to heavy loads or movement of cargo, immediately inspect the welds and fasteners for damage. To prevent severe damage to your trailer, inspect all of the welds for cracks or failure at least once a year.

⚠ WARNING

Improper weld repair will lead to early failure of the trailer structure and can cause serious injury or death.

Do not repair cracked or broken welds unless you have the skills and equipment to make a proper repair. If not, have the welds repaired by your dealer.

TRAILER BRAKES

7.2.1.3. Brake Shoes and Drums

Properly functioning brake shoes and drums are essential to ensure safety. You must have your dealer inspect these components at least once per year, or each 12,000 miles.

The brake shoes must be adjusted after the first 200 miles of use, and each 3,000 miles thereafter. Most axles are fitted with a brake mechanism that will automatically adjust the brake shoes when the trailer is “hard braked” from a rearward direction. Read your axle and brake manual to see how to adjust your brakes. If you do not have this manual, call Bonnell Industries, Inc. at 800-851-9664 for a free copy.

7.2.1.4. Manually Adjusting Brake Shoes

Most braking systems are not automatically adjusted by hard stopping. These brakes require manual adjustment. The following steps apply to adjust most manually adjustable brakes. Read your axle and brake manual to see how to adjust your brakes. If you do not have this manual, call Bonnell Industries, Inc. at 800-851-9664 for a free copy.

Jack up the trailer and secure it on adequate capacity jack stands.
Be sure the wheel and brake drum rotate freely.
Remove the adjusting-hole cover from the adjusting slot on the bottom of the brake backing plate.
With a screwdriver or standard adjusting tool, rotate the star wheel of the adjuster assembly to expand the brake shoes. Adjust the brake shoes out until the pressure of the linings against the drum makes the wheel very difficult to turn. Note: Your trailer maybe equipped with drop spindle axles. See axle manual for your axle type. You will need a modified adjusting tool for adjusting the brakes in these axles. With drop spindle axles, a modified adjusting tool with about an 80 degree angle should be used.
Rotate the star wheel in the opposite direction until the wheel turns freely with a slight drag.
Replace the adjusting-hole cover.
Repeat the above procedure on all brakes.
Lower the trailer to the ground.

7.2.1.5. Brakes, Electric

Two different types of electric brakes may be present on the trailer: an emergency electric breakaway system, which acts only if the trailer comes loose from the hitch and the breakaway pin is pulled. The other brake is an electric braking system that acts whenever the brakes of the tow vehicle are applied.

7.2.1.5.A. Breakaway Brake

7.2.1.5.A.(i) Breakaway Battery

This battery supplies the power to operate the trailer brakes if the trailer uncouples from the tow vehicle. Be sure to check, maintain and replace the battery according to the battery manufacturer' instructions.

⚠ Caution

Extreme cold weather can degrade battery performance and cause brakes to not operate properly. Always check battery charge level before towing.

7.2.1.5.A.(ii) Breakaway Switch

This switch causes the breakaway battery to operate the electric brakes if the trailer uncouples from the tow vehicle.

The pull cable for the pull pin is connected to the tow vehicle, and the switch is connected to the trailer. To check for proper functioning of the switch, battery and brakes, you must pull the pin from the switch and confirm that the brakes apply to each wheel. You can do this by trying to pull the trailer with the tow vehicle, after pulling the pin. The trailer brakes may not lock, but you will notice that a greater force is needed to pull the trailer.

⚠ WARNING

If electric breakaway brakes do not operate when trailer is uncoupled from the tow vehicle, death or serious injury can occur.

Check emergency breakaway brake system BEFORE each tow.

7.2.1.5.B. Tow Vehicle Operated Electric Brakes

The electric brakes that operate in conjunction with the tow vehicle brakes must be "synchronized" so that braking is properly distributed to the tow vehicle brakes and the trailer brakes. For proper operation and synchronization, read and follow the axle/brake and the brake controller manufacturers' instructions. If you do not have these instructions, call Bonnell Industries, Inc. at 800-851-9664 for a free copy.

7.2.1.5.C. MAGNETS FOR ALL ELECTRIC BRAKES

To make certain an electrically-operated braking system will function properly, you must have your dealer inspect the magnets at least once a year, or each 12,000 miles. See the brake manual for wear and current inspection instructions.

TRAILER CONNECTION TO TOW VEHICLE

Inspect the towing pintle and safety chains periodically for wear, damage, cracks or missing parts. Replace as necessary.

7.2.1.6. Coupler and Ball (if equipped)

The coupler on the trailer connects to the ball attached to the hitch on the tow vehicle. The coupler, ball and hitch transfer the towing forces between the tow vehicle and the trailer. Before each tow, coat the ball with a thin layer of automotive bearing grease to reduce wear and ensure proper operation; and check the locking device that secures the coupler to the ball for proper operation.

See the coupler manufacturer's manual for other inspection and maintenance activities. If you do not have this manual, call Bonnell Industries, Inc. at 800-851-9664 for a free copy.

If you see or feel evidence of wear, such as flat spots, deformations, pitting or corrosion, on the ball or coupler, immediately have your dealer inspect them to determine the proper action to prevent possible failure of the ball and coupler system. All bent or broken coupler parts must be replaced before towing the trailer.

The coupler handle lever must be able to rotate freely and automatically snap into the latched position. Oil the pivot points, sliding surfaces, and spring ends with SAE 30W motor oil. Keep the ball pocket and latch mechanism clean. Dirt or contamination can prevent proper operation of the latching mechanism.

When replacing a ball, the load rating must match or exceed the GVWR of the trailer.

TRAILER JACK

HYDRAULIC:

The optional hydraulic trailer jack is equipped with a pilot operated check valve to eliminate bleed down of the hydraulic cylinder. NOTE: FOR ELECTRIC OVER HYDRAULIC SYSTEMS, THE ENGINE NEEDS TO BE RUNNING TO RAISE THE JACK.

MANUAL:

If a grease fitting is present, you must use a grease gun to lubricate the jack mechanism. Grease the gears in the top of hand-cranked jacks once a year, by removing the top of the jack and pumping or hand packing grease into the gears.

LIGHTS AND SIGNALS

Before each tow, check the trailer taillights, stoplights, turn signals and any clearance lights for proper operation.

⚠ WARNING

Improper operating taillights, stoplights and turn signals can cause collisions. Check all lights before each tow.

TIRES

Trailer tires may be worn out even though they still have plenty of tread left. This is because trailer tires have to carry a lot of weight all the time, even when not in use. It is actually better for the tire to be rolling down the road than to be idle. During use, the tire releases lubricants that are beneficial to tire life. Using the trailer tires often also helps prevent flat spots from developing.

The main cause of tire failure is improper inflation. Check the cold tire inflation pressures at least once a week for proper inflation levels. “Cold” means that the tires are at the same temperature as the surrounding air, such as when the vehicle has been parked overnight. Wheel and tire manufacturers recommend adjusting the air pressure to the trailer manufacturer’s recommended cold inflation pressure, in pounds per square inch (PSI) stated on the vehicle’s Federal Certification Label or Tire Placard when the trailer is loaded to its gross vehicle weight rating (GVWR). If the tires are inflated to less than the recommended inflation level or the GVWR of the trailer is exceeded, the load carrying capacity of the tire could be dramatically affected. If the tires are inflated more than the recommended inflation level, handling characteristics of the tow vehicle/trailer combination could be affected. Refer to the owner’s manual or talk to your dealer or vehicle manufacturer if you have any questions regarding proper inflation practices.

Tires can lose air over a period of time. In fact, tires can lose 1 to 3 PSI per month. This is because molecules of air, under pressure, weave their way from the inside of the tire, through the rubber, to the outside. A drop in tire pressure could cause the tire to become overloaded, leading to excessive heat build up. If a trailer tire is under-inflated, even for a short period of time, the tire could suffer internal damage.

High speed towing in hot conditions degrades trailer tires significantly. As heat builds up during driving, the tire’s internal structure starts to breakdown, compromising the strength of the tire. It is recommended to drive at moderate speeds.

Statistics indicate the average life of a trailer tire is about five years under normal use and maintenance conditions. After three years, replacing the trailer tires with new ones should be considered, even if the tires have adequate tread depth. Some experts claim that after five years, trailer tires are considered worn out and should be replaced, even if they have had minimal or no use. This is such a general statement that it may not apply in all cases. It is best to have your tires inspected by a tire supplier to determine if your tires need to be replaced.

If you are storing your trailer for an extended period, make sure the tires are fully inflated to the maximum rated pressure and that you store them in a cool, dry place, such as a garage. Use tire covers to protect the trailer tires from the harsh effects of the sun.

⚠ WARNING

Worn, damaged or under-inflated tires can cause loss of control, resulting in damage, serious injury and possibly death.

Inspect tires before each tow.

WHEEL RIMS

If the trailer has been struck, or impacted, on or near the wheels, or if the trailer has struck a curb, inspect the rims for damage (i.e. being out of round); and replace any damaged wheel. Inspect the wheels for damage every year, even if no obvious impact has occurred.

WHEELS, BEARINGS AND LUG NUTS

A loose, worn or damaged wheel bearing is the most common cause of brakes that grab.

To check your bearings, jack trailer and check wheels for side-to-side looseness. If the wheels are loose, or spin with a wobble, the bearings must be serviced or replaced.

Most trailer axles are built with sealed bearings that are not serviceable. Sealed bearings must be replaced as complete units.

7.2.1.7. Unsealed Bearings (Hubs)

If your trailer has unsealed axle bearings, they must be inspected and lubricated once a year or 12,000 miles to insure safe operation of your trailer.

If a trailer wheel bearing is immersed in water, it must be replaced.

If your trailer has not been used for an extended amount of time, have the bearings inspected and packed more frequently, at least every six months and prior to use.

Follow the steps below to disassemble and service the UNSEALED wheel bearings.

- After removing the grease cap, cotter pin, spindle nut and spindle washer (items 7-10 in “Exploded Wheel Bearing” figure), remove the hub and drum to inspect the bearings for wear and damage.
- Replace bearings that have flat spots on rollers, broken roller cages, rust or pitting. Always replace bearings and cups in sets. The inner and outer bearings are to be replaced at the same time.
- Replace seals that have nicks, tears or wear.
- Lubricate the bearings with a high quality EP-2 automotive wheel bearing grease.

Every time the wheel hub is removed and the bearings are reassembled, follow the steps below to check the wheel bearings for free running and adjust.

- Turn the hub slowly, by hand, while tightening the spindle nut, until you can no longer turn the hub by hand.
- Loosen the spindle nut just until you are able to turn it (the spindle nut) by hand. Do not turn the hub while the spindle nut is loose.
- Put a new cotter pin through the spindle nut and axle.
- Check the adjustments. Both the hub and the spindle nut should be able to move freely (the spindle nut motion will be limited by the cotter pin).

7.2.1.8. Lug Nuts (Bolts)

Being sure wheel mounting nuts (lug nuts) on trailer wheels are tight and properly torqued is an important responsibility that trailer owners and users need to be familiar with and practice. Inadequate and/or inappropriate wheel nut torque (tightness) is a major reason that lug nuts loosen in service. Loose lug nuts can rapidly lead to a wheel separation with potentially serious safety consequences.

Lug nuts are prone to loosen right after a wheel is mounted to a hub. When driving on a new or remounted wheel, check the lug nut tightness often during the first few hundred miles of the trailer's use, especially after the first 10, 25 and 50 miles of driving, before each tow, and at least twice per year thereafter.

⚠ WARNING

Lug nuts are prone to loosen after initial installation, which can lead to death or serious injury.

Check lug nuts for tightness on a new trailer or when wheel(s) have been remounted after the first 10, 25 and 50 miles of driving.

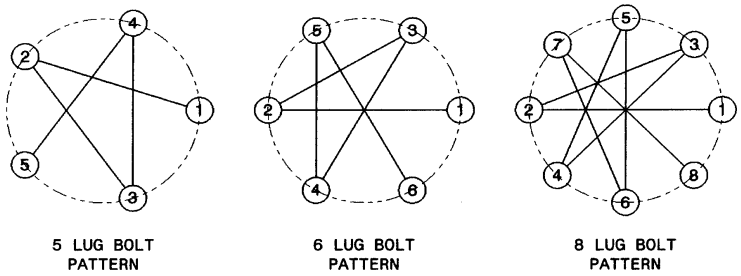
⚠ WARNING

Metal creep between the wheel rim and lug nuts will cause rim to loosen and could result in a wheel coming off, leading to death or serious injury.

Tighten lug nuts before each tow.

Tighten the lug nuts to the proper torque for the axle size on your trailer to prevent wheels from coming loose. Use a torque wrench to tighten the fasteners. The only way to be certain you have checked the torque or torqued the lug nuts to the proper torque is with a torque wrench. Four-way wrenches, ratchets, and similar tools can be useful for short-term emergency repairs, but are not appropriate tools for adequately checking lug nut torque. You must use a torque wrench to adequately indicate the torque that you are applying to the lug nut. If you do not have a torque wrench, tighten the fasteners with a lug wrench as much as you can, then have a service garage or dealer tighten the lug nuts to the proper torque. Over-tightening will result in breaking the studs or permanently deforming the mounting stud holes in the wheels.

Figure 7-1 Lug nut sequence of tightening



Keep a record of the date and approximate mileage when you check the lug nut torque. Note any lug nut that has lost torque. Investigate the reason(s) if the lug nut torque is not maintained after more than one re-torque application, because this indicates there is something wrong with the lug nuts, nut studs, wheels and/or hubs and should be corrected.

Contact your dealer or vehicle manufacturer immediately if you experience any persistent lug nut loosening or any other lug, wheel or axle problems.

In the event of a wheel separation incident, notify the vehicle manufacturer and dealer. Seek prompt professional assistance in assessing the trailer and its gear, and retain, but don't re-use involved lugs, wheels and studs. Don't repair or service the trailer yourself. Call a trained technician.

Torque lug nuts per axle owners manual.

7.3. Maintenance Guidelines Pertaining To Vacuum Equipment

Initial Servicing & Break-In

The leaf vacuum machine has been initially serviced at the factory and is ready to operate. Review engine manual for break-in procedures. Belt tension should be adjusted after first hour of operation. See fan belt section for instructions.

Your leaf machine is designed to pull approximately level. Adjust the pintle eye up or down as required to match the pull vehicle.

List Of Supplemental Manuals

Your manual packet includes supplemental manuals for some or all of the following components. Refer to these manuals for service & operation of these items:

Engine Service And Service Parts List

Refer to the engine manual for service information. Bonnell Industries does not service engines. Refer to your local engine dealer for service requirements.

Common engine service parts

Below is a helpful list of common engine service parts that may be necessary for engine maintenance on your machine.

Deere 99 HP Engine:

BELT:	R533591
FUEL FILTER:	RE551507
	RE551508
OIL FILTER:	RE504836
AIR FILTER:	CH09-16729
	ST09-16731

Kubota 74 HP Engine:

Oil Filter	HH1C0-32430
Fuel- Primeary	1K947-43172
Fuel Seperator	1J430-43060
Air Cleaner Inner	55231-26150
Air Cleaner Outer	59700-26112

V3800-CR-TE4 V3800-CR-TIE4	13.2 L (3.49 U.S.gals.)

IMPORTANT :

- **Engine oil should be API classification CJ-4.**
- Change the type of engine oil according to the ambient temperature.

Above 25°C (77°F)	SAE30 or SAE10W-30 SAE15W-40
-10°C to 25°C (14°F to 77°F)	SAE10W-30 or SAE15W-40
Below -10°C (14°F)	SAE10W-30

- When using oil of different brands from the previous one, be sure to drain all the previous oil before adding the new engine oil.
- On DPF-equipped engines, part of the fuel may get mixed with engine oil during the regenerating process. This may dilute the oil and increase its quantity. If the oil rises above the oil level gauge upper limit, it means the oil has been diluted too much, resulting in a trouble. In such case, immediately change the oil for new one.
  - If the interval of DPF regeneration becomes 5 hours or less, be sure to change the oil for new one.

CLUTCH OR FLUID COUPLER SERVICE

NACD Clutch: Refer to the clutch manual for service information. Bonnell Industries does not service clutches.

TransFluid Coupler: The transfluid coupler is filled from the factory with ISO 32 Oil. When put under extreme load, the oil in the coupler will heat up, and in some cases, the safety relief plug will melt, letting out the oil, and therefore stopping power transfer. **In this case, always replace plug with P/N 7018C**. **DO NOT USE STANDARD ALLEN HEAD PLUG.** Unit could overheat, and cause severe damage to engine, belts, or coupler.

When refilling oil (with coupler installed on engine), rotate inner housing until stamped “X” aligns in top vertical slot of outer housing. Fill inner housing with 5-6 quarts, until oil runs out of plug opening. Replace plug.
FOR ADDITIONAL INFORMATION, SEE PAGE **91**

LUBRICATION

Type of grease: It is recommended that lithium complex grease with a thickness rating of NLGI 2 and operating temperature of -20 – 200 deg. F. be used.

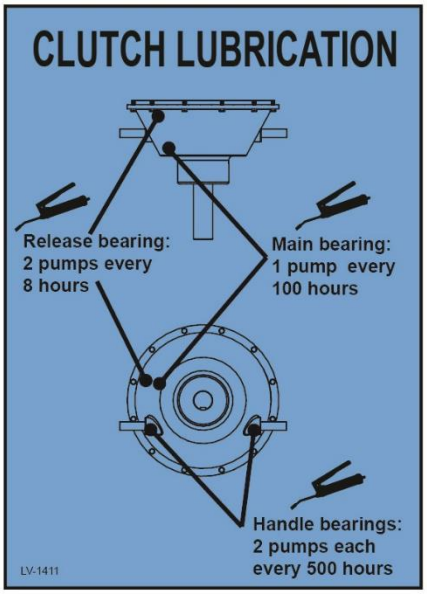
Daily:
- Impeller bearings, 2 pumps (2 places)
- Hose arm pivot 2 pumps each fitting (4 places)
- Clutch release bearing, 2 pumps

Weekly:
- Transfluid coupler output shaft bearing (if equipped), 2 pumps

Every 100 hours:
- Clutch main bearing (if equipped), 1 pump
- Hubs, 1 pump

Every 500 hours:
- Clutch handle bearing (if equipped), 2 pumps each

.



FAN BELT TENSION & ALIGNMENT

Your leaf vacuum is driven by a 5-strand 5xx belt system (2). To remove the blower fan belt, loosen the top hex bolt (3) on the belt tensioner (1) and slide idler pulley out of the way.

ALIGNMENT: See next section.

TENSION: Proper belt tension and alignment is critical to belt life. **To avoid severe belt slippage or failure, adjust belt tension after first hour of use.**

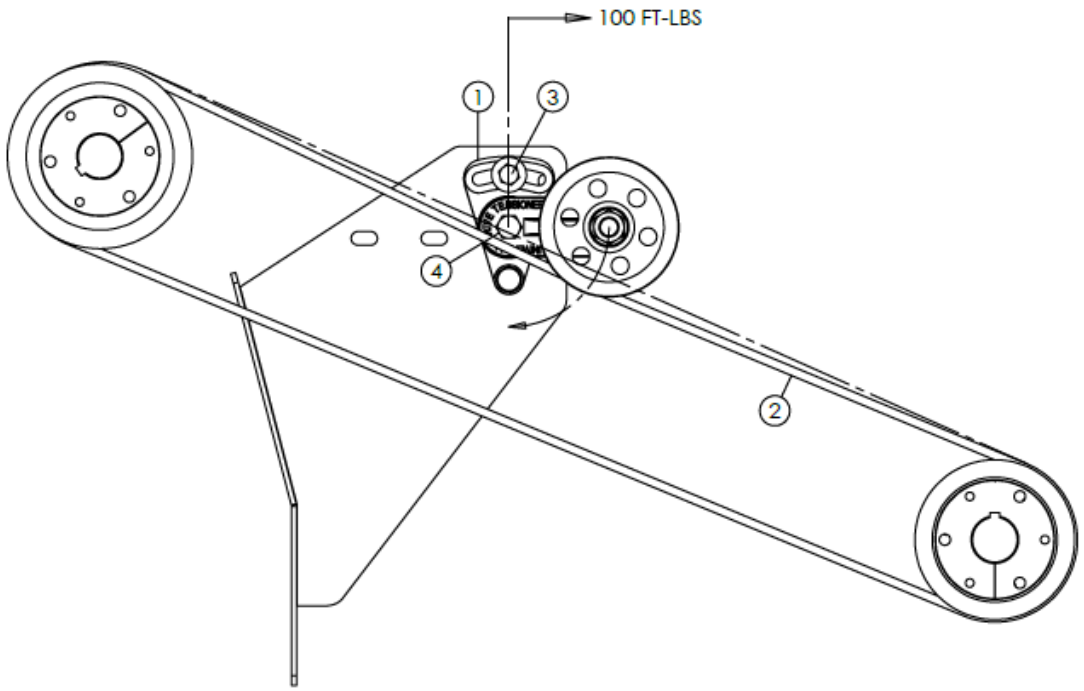
Belt tension should be set with a torque wrench. For a clutch operated belt system, correct belt tension is 3/4" of deflection with 70 pounds of force applied. Apply 100 ft-lbs of torque to the take-up pulley at the center mounting bolt (4). Tighten hex bolt (3) on top of belt tensioner to secure the backside belt pulley.

Less belt tension is required for a unit equipped with a trans fluid coupler, as power transfer to the belt from the engine is slower. Longer belt life can be expected with proper tension using a trans fluid coupler.

In general, the belt should be as loose as possible and still not slip under high loads. If the belt is too tight, premature bearing and belt failure are probable. If slippage is occurring, the belt should be tightened and realigned. **NOTE**: Over-tightening the belt will lead to premature belt failure and wear. **DO NOT OVER-TIGHTEN**.

Once proper tension is achieved, check to ensure the belt is properly aligned between the driver and driven pulleys. See Alignment Section for additional instructions.

FILE NAME	M1155
DWG NAME	M1155 (REV 08/24/22)



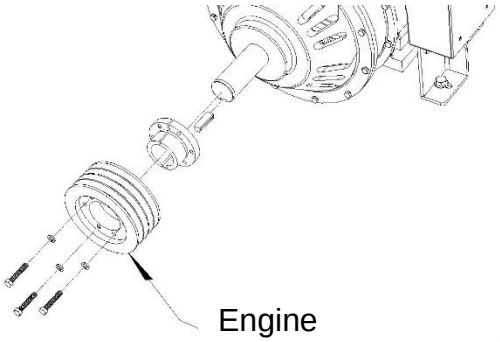
REF	DESCRIPTION
4	3/4-10 x 2 HEX BOLT
3	5/8-11 x 2-1/4 HEX BOLT
2	POWER BAND V-BELT (5 STRANDS)
1	BELT TENSIONER

BONNELL INDUSTRIES INC
TRUCK & ROAD EQUIPMENT
DIXON, ILLINOIS
PHONE: 800-851-9664

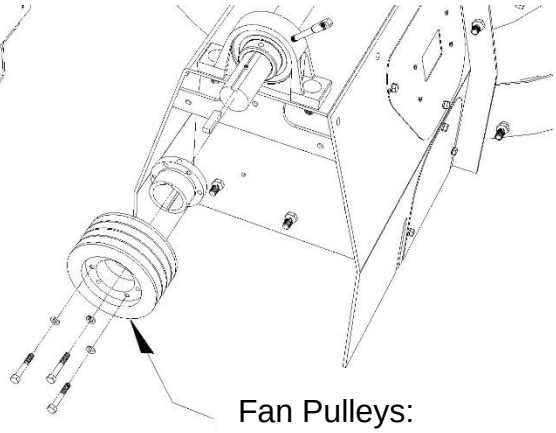
BELT SHEAVES & ALIGNMENT

Your leaf machine is equipped with QD Coupler style Quick Detachable bushings and sheaves.

NOTE: THE SHEAVES ARE NOT THE SAME SIZE. INSTALL CORRECTLY.



Engine Pulley: ∅8.00”



Fan Pulleys: Varies- see spec. sheet

REMOVAL:

- Loosen & remove the three bolts that hold the sheave in place.
- Reinsert the screws into the tapped holes on the sheave and tighten. This will free the sheave from the coupler.
- After the sheave is off, the coupler will slide off.

INSTALLATION & ALIGNMENT:

- Clean tapered cone surfaces of sheave & coupler.
- NOTE: DO NOT USE ANTISIEZE LUBRICANT ON TAPERED CONE SURFACES OR BOLT THREADS.
- Slide coupler into place, flange end first.
- Slide sheave into place, deep opening first, and install bolts with lock washers into tapped holes in coupler and hand tighten.
- Use a straight edge to align the sheaves. Straight edge should touch both edges of each sheave at the same time when properly aligned.
- Tighten bolts on both sheaves approx. one turn. Recheck alignment. If alignment is good, torque bolts.
-

Torque bolts as follows:

- Motor Drive and Fan Driven Pulleys, ½”” bolts – 720 in./lbs (60 ft./lbs)

If both edges of one sheave are touching the straight edge, and only one edge of the other sheave:
Engine end – adjust engine screw jack bolts to change engine sheave angle.
Fan end – loosen bearing bolts to change fan shaft sheave angle.

FOR ADDITIONAL INFORMATION, SEE PAGE 89

RADIATOR SCREEN

Your leaf machine is equipped with an auxiliary magnetic radiator screen. This screen assists in keeping the engine radiator clean and the engine cool during operation. This screen needs to be checked regularly for debris buildup. **Remove screen and clean off once every hour of operation.**

FAN

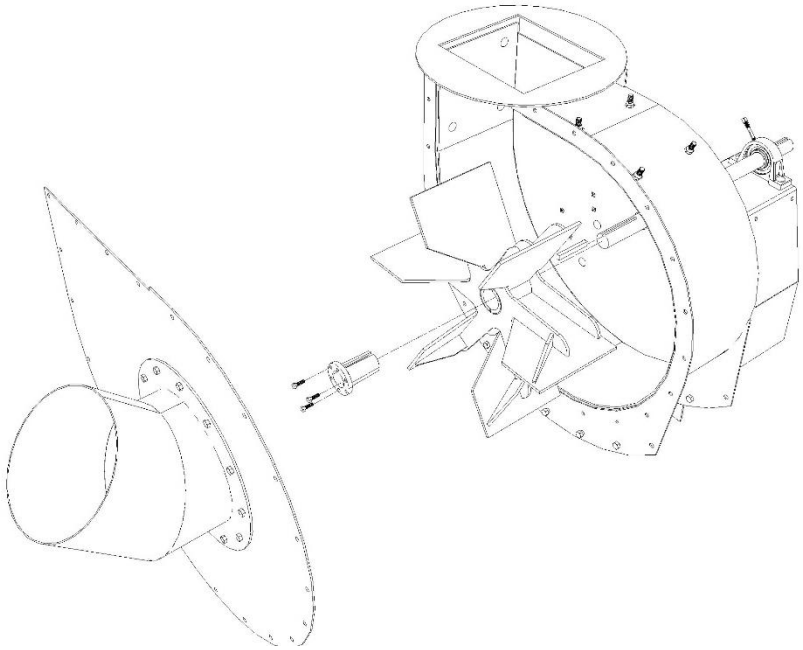
Your leaf machine is equipped with a 30” diameter (standard, 32” diameter optional) balanced fan with AR400 impeller blades, mounted to the shaft with a split taper bushing. Inspect the fan regularly for cracks, deformations, and uneven wear. DO NOT OPERATE THE MACHINE IF THE FAN IS OUT OF BALANCE.

REMOVAL:

- Disconnect safety interlock
- Remove suction hose
- Remove fan cover face plate on inlet side
- Loosen & remove the three bolts on the split taper bushing that hold the fan in place.
- Reinsert the screws into the two tapped holes on the bushing and tighten. This will free the fan from the bushing, and the bushing will slide out.
- Slide fan off of shaft.

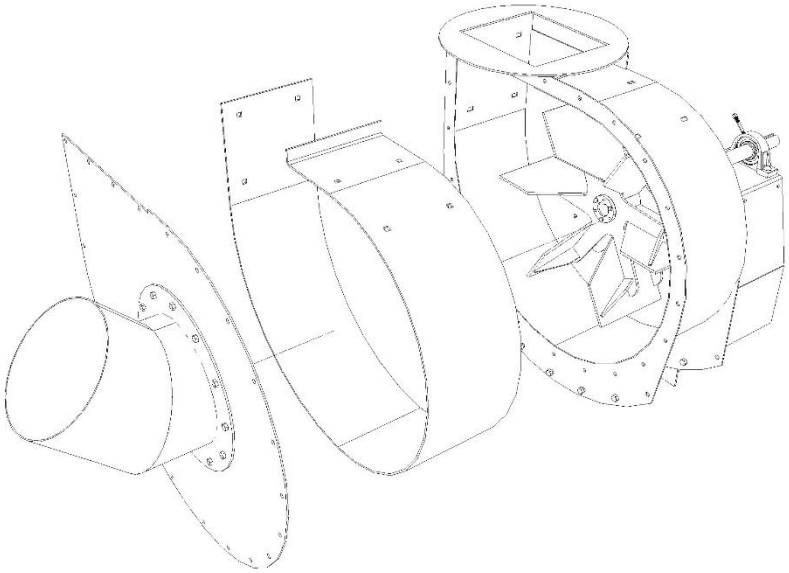
INSTALLATION:

- Clean tapered cone surfaces of taper bushing & fan.
- **NOTE: DO NOT USE ANTISIEZE LUBRICANT ON TAPERED CONE SURFACES OR BOLT THREADS.**
- Slide fan onto shaft, with tapped hole side of fan bushing facing out. Install impeller on shaft as far as possible, with approx..3/8” clearance to back wall.
- Slide split taper bushing onto shaft, insert key, position.
- Install 1/2x2-1/4 grade 8 bolts into tapped holes in coupler.
- Use blue Loctite on bolts.
- Tighten in circular pattern to **82 ft-lbs**. for ½” bolts
- Tap collet firmly or use air hammer in between bolts after each tightening.
- Do at least three circular tightening patterns until there is no rotation of the bolts at **82 ft-lbs**. for ½” bolts
- Start machine and run fan for several minutes at full RPM.
- Repeat torque procedure after shutting off machine.



BLOWER HOUSING LINER REMOVAL

To remove the liner from the housing for service or replacement:



- Disconnect safety interlock
- Remove suction hose
- Remove fan cover face plate on inlet side
- Loosen & remove the eight bolts that hold the liner in place.
- Puller liner out.

SUCTION HOSE

To increase the life of the suction hose, the hose should be loosened, removed, and rotated ¼ turn every 40 hours of operation. Inspect liner plate & fan for wear at this time.

HYDRAULIC SYSTEM (IF EQUIPPED)

FILTER: The hydraulic filter is equipped with an indicator gauge. Change filter accordingly.
OIL: The hydraulic oil should be changed annually. System capacity is approximately 10 gallons.

WETTING SYSTEM (IF EQUIPPED)

The wetting system is equipped with a 30 mesh strainer screen. Check the screen every 40 hours or as necessary, and clean as needed.

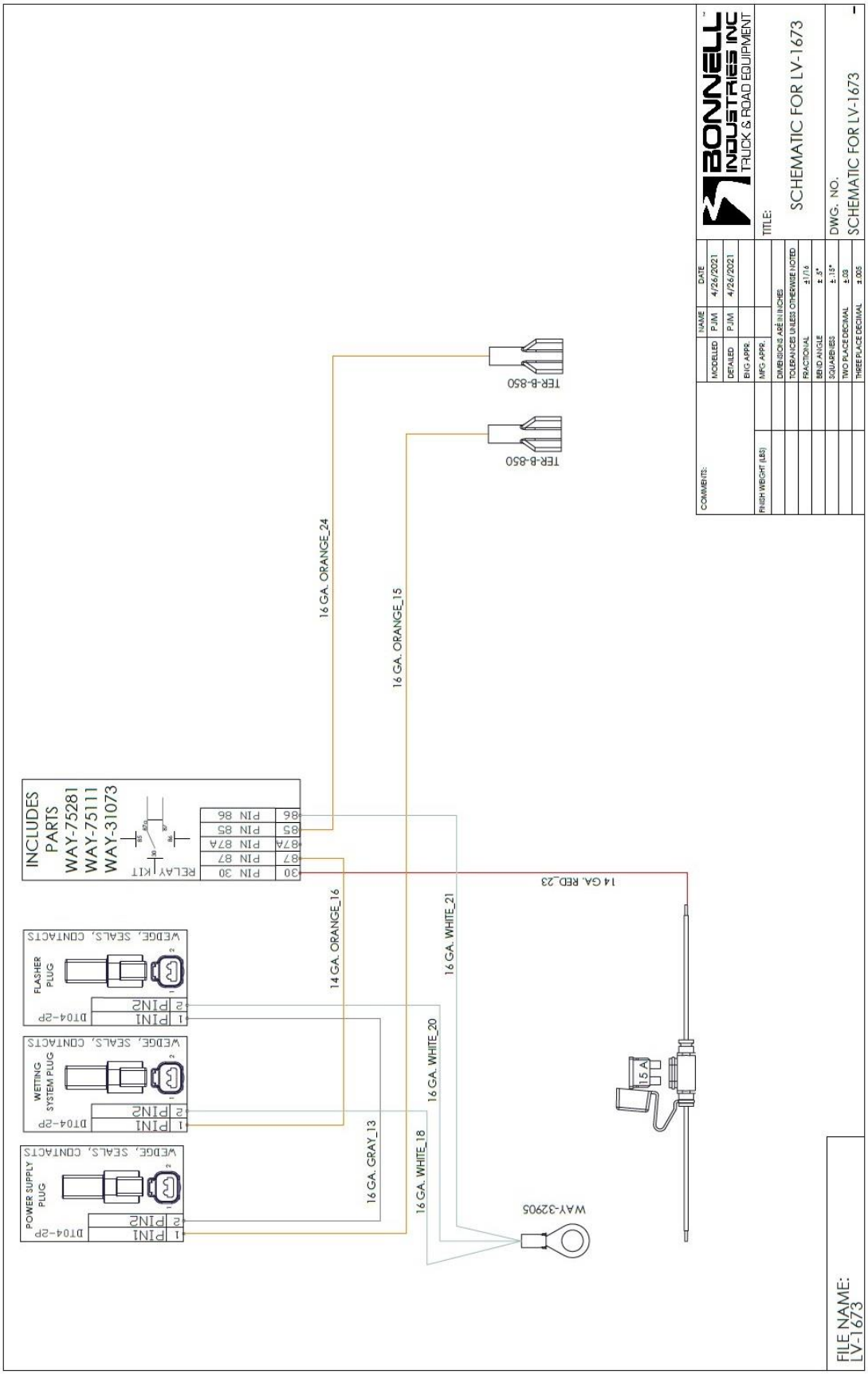
When the machine will be stored or parked in freezing temperatures, the pump and strainer need to be drained. To drain, shut off tank valve, and disconnect right hand pump fitting. Operate pump until line is empty. Shut off pump, and empty strainer canister.

7.4. ELECTRICAL SYSTEM

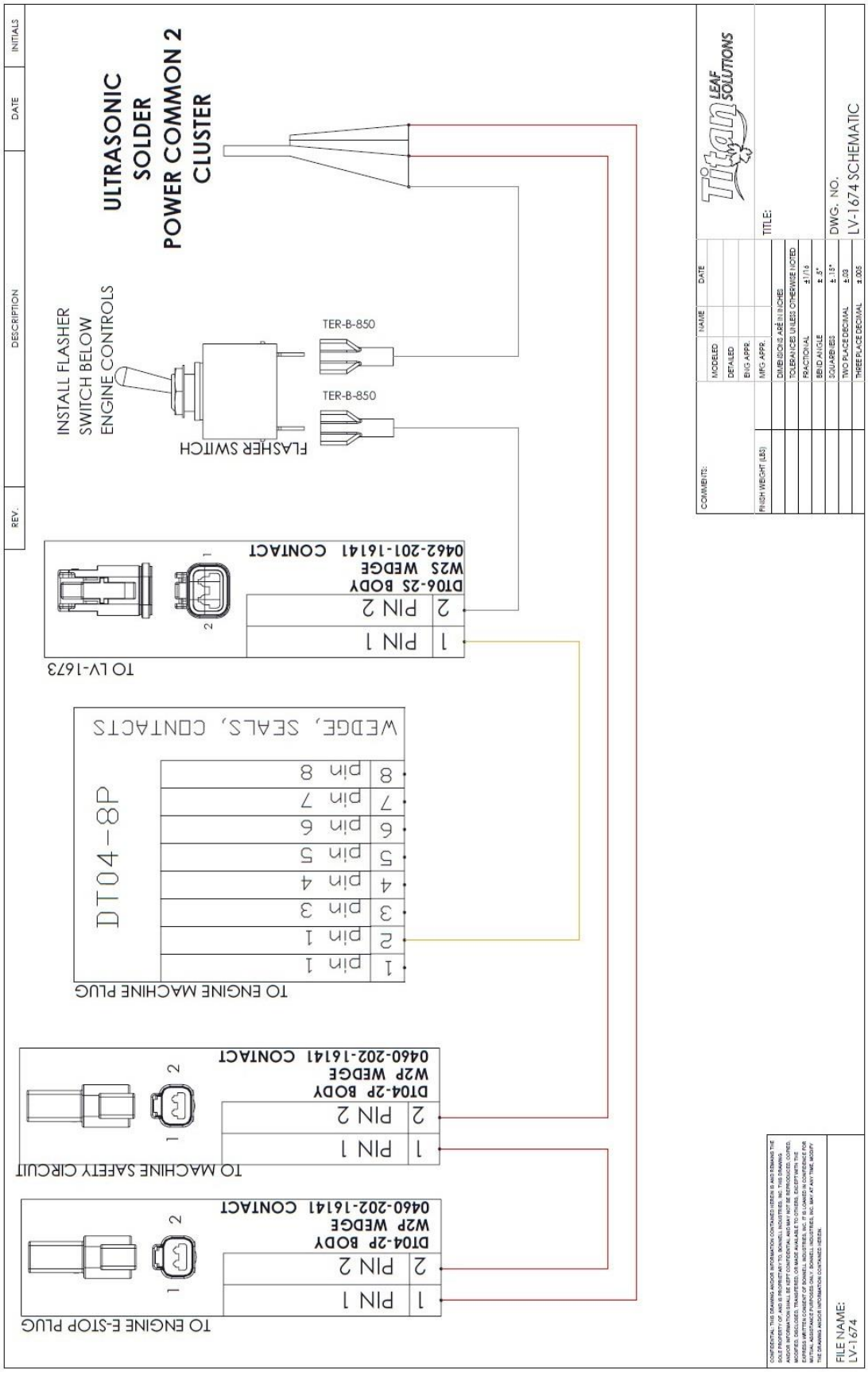
WIRING DIAGRAMS

The following pages show a complete system electrical schematic. Following the complete schematic, diagrams with part numbers illustrate how the leaf vacuum electrical system is broken down into individual harness assemblies. Use this as a reference when ordering replacement harnesses.

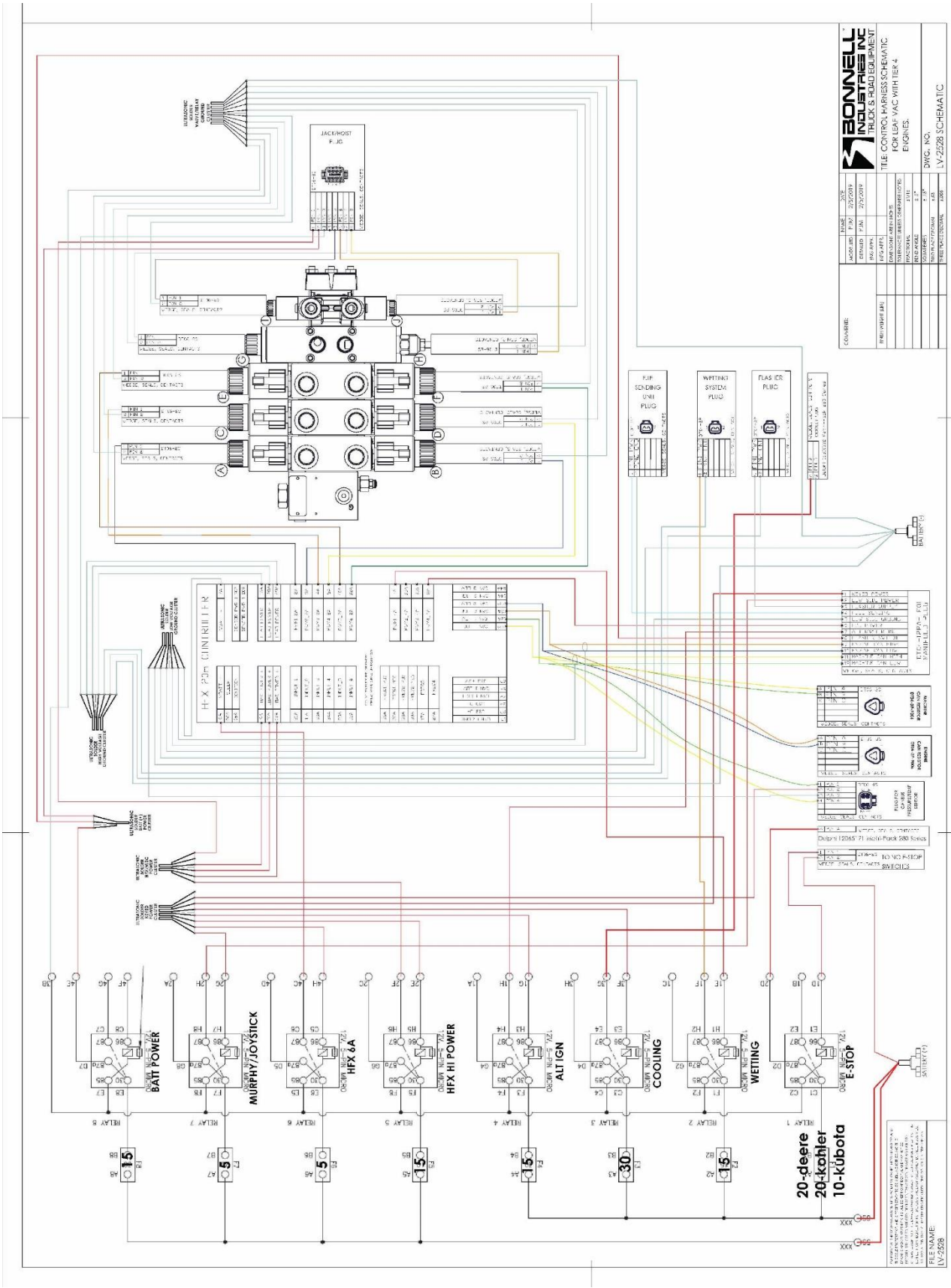
MAIN CONTROL HARNESS SCHEMATIC (ELECTRIC POWER UNIT)



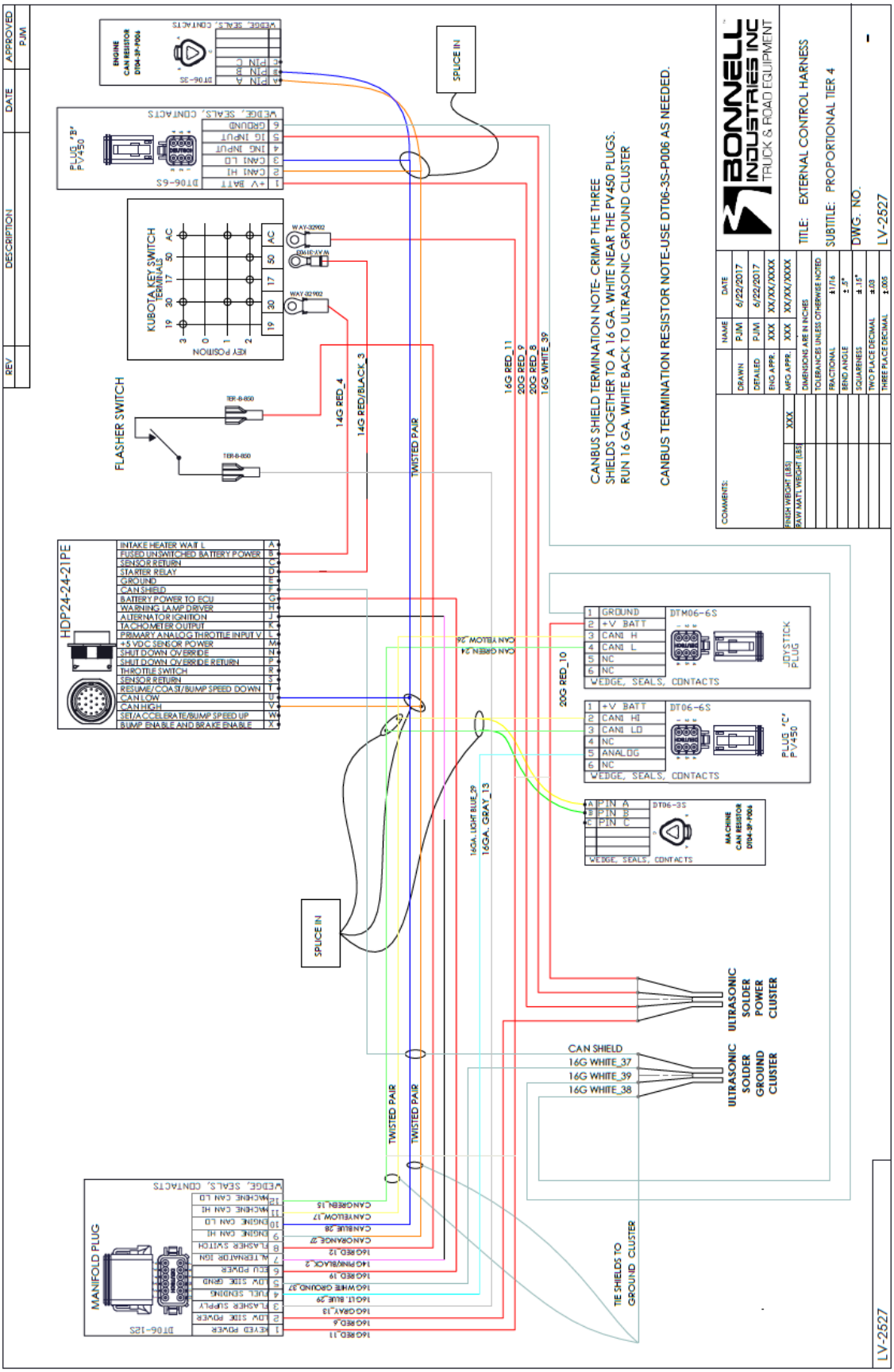
AUXILIARY HARNESS (ELECTRIC POWER UNIT)



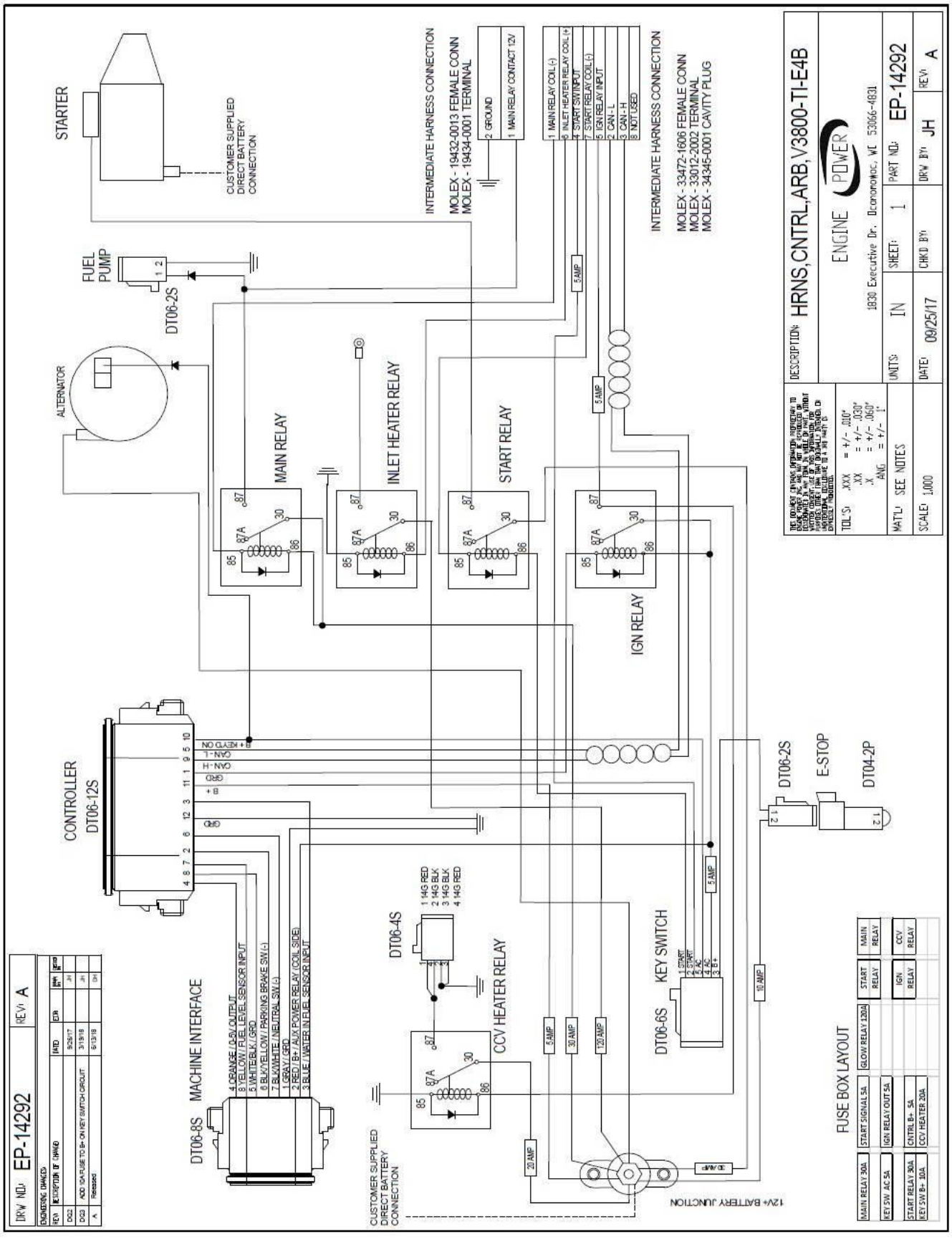
PROPORTIONAL VALVE CONTROL HARNESS SCHEMATIC TIER 4



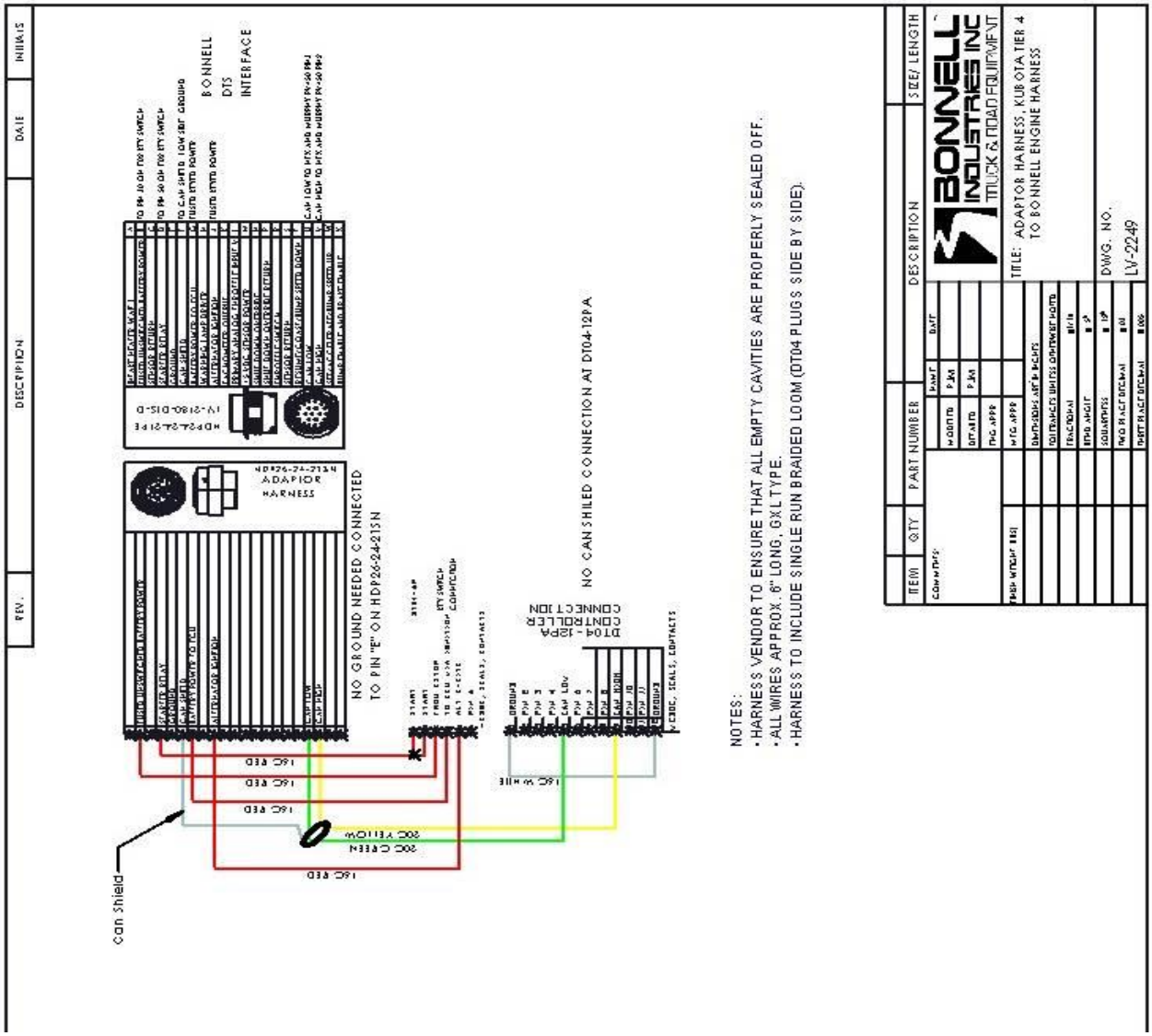
EXTERNAL CONTROL HARNESS SCHEMATIC TIER 4



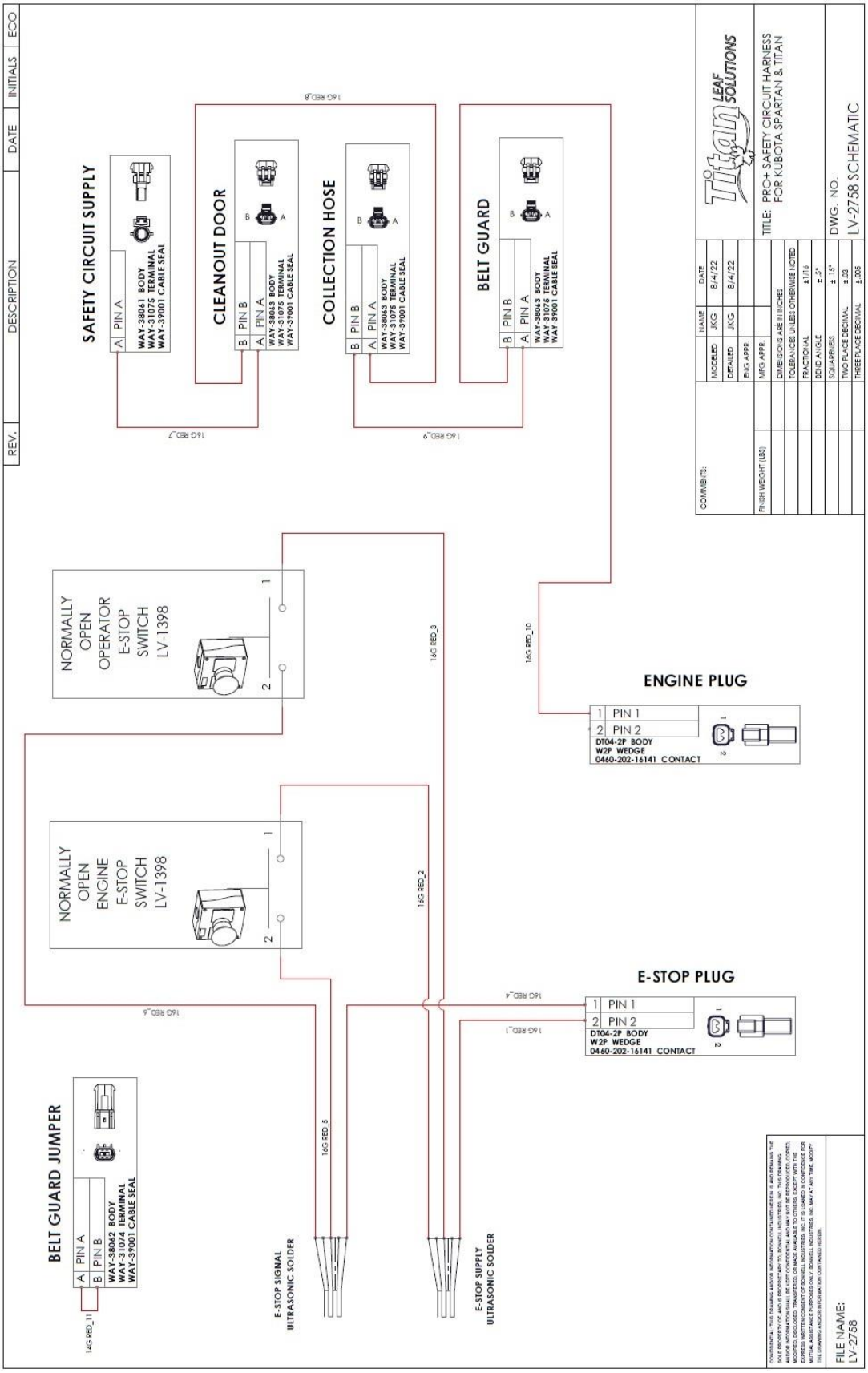
74 HP KUBOTA TIER 4 ENGINE SCHEMATIC



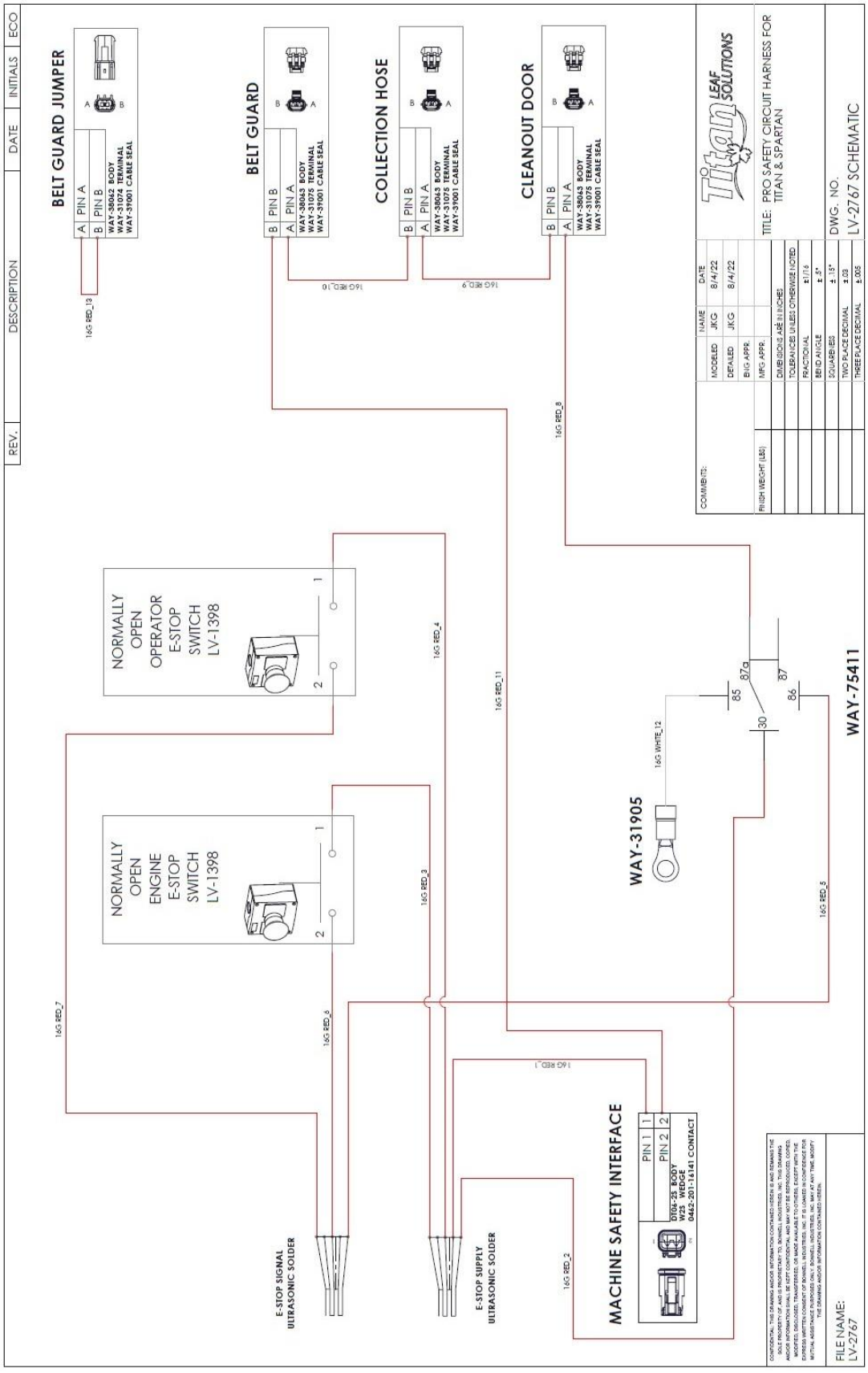
KUBOTA ENGINE ADAPTOR HARNESS



SAFETY CIRCUIT HARNESS SCHEMATIC

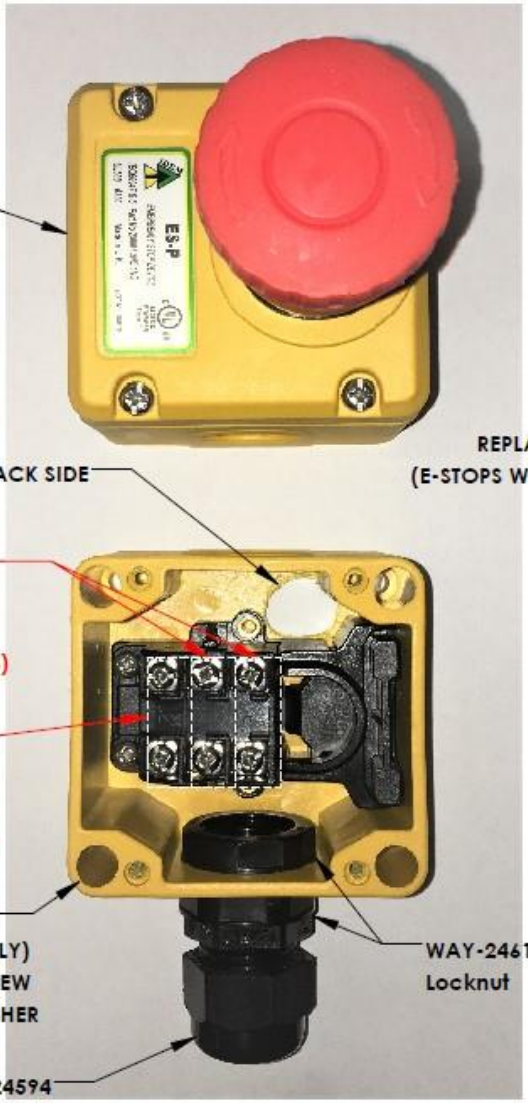


SAFETY CIRCUIT HARNESS SCHEMATIC (ELECTRIC POWER UNIT)



E-STOP WIRING ASSEMBLY

FILE NAME	LV-1398 WIRING ASSY	REV.	DESCRIPTION	DATE	INITIALS
DWG NAME	LV-1398 WIRING ASSY	-	ORIGINAL	11/30/2020	LAJ



REPLACE ONLY E-STOPS WITH GREY BASES
(E-STOPS WITH BLACK BASES DO NOT NEED REPLACED)

EXAMPLE ONLY: TERMINAL BLOCK 3
NORMALLY OPEN
-TITAN (ALL MODELS)
-SPARTAN (ALL MODELS)
(USE BLOCK 1 OR 2 FOR OLYMPIAN)

E-STOP INSTALLATION INSTRUCTIONS:

If wiring from the back:
- Drill1/2 hole as shown.

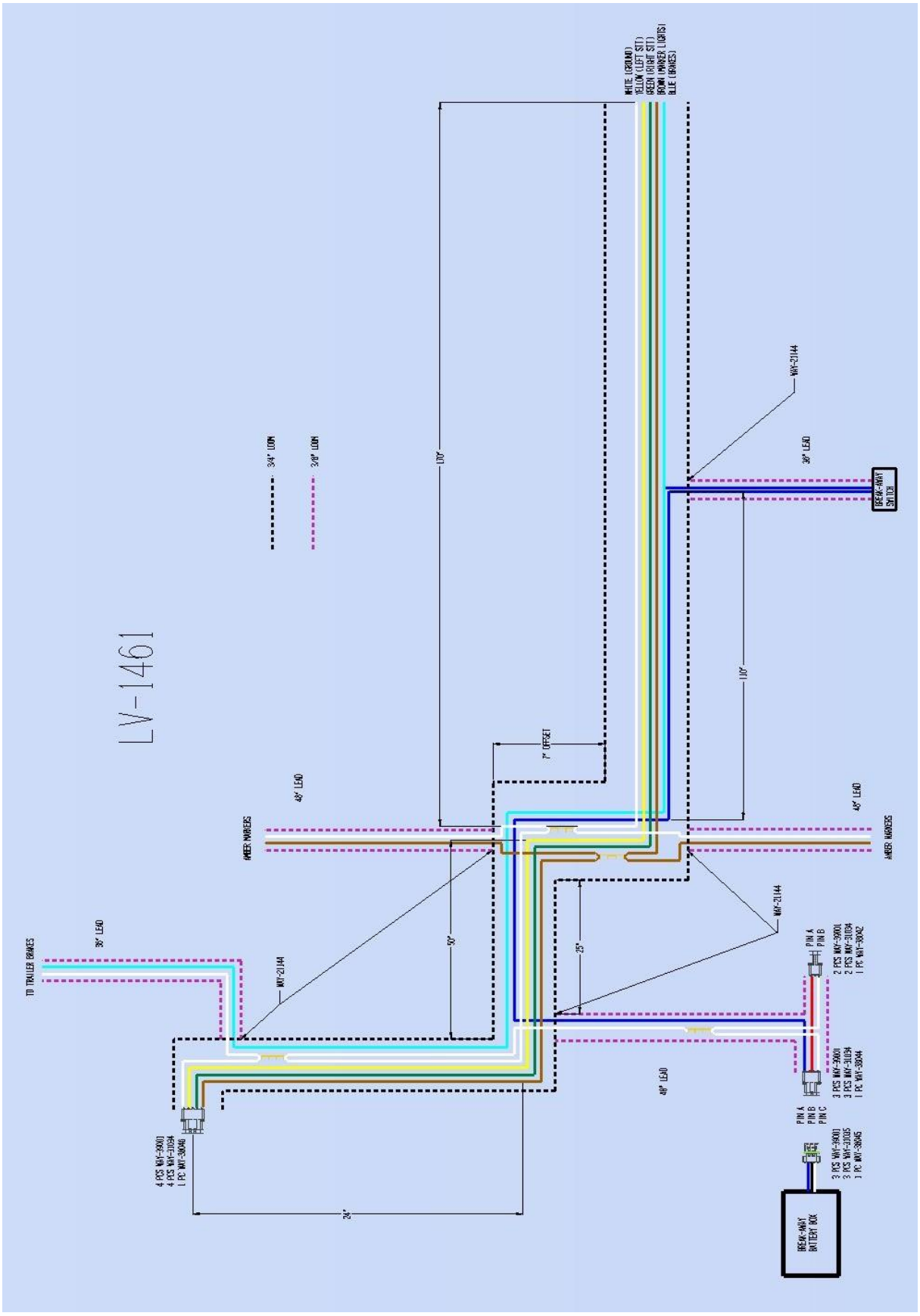
If wiring from side:
- Use knockout and install fittings as shown.

Fastening E-Stop to mounting surface:
- Transfer hole pattern (Opposite corners only)
- If field install - use one existing hole if possible.
- Drill 3/16" holes.
- Mount with 6-32 x 1" machine screws & nuts with star washers.

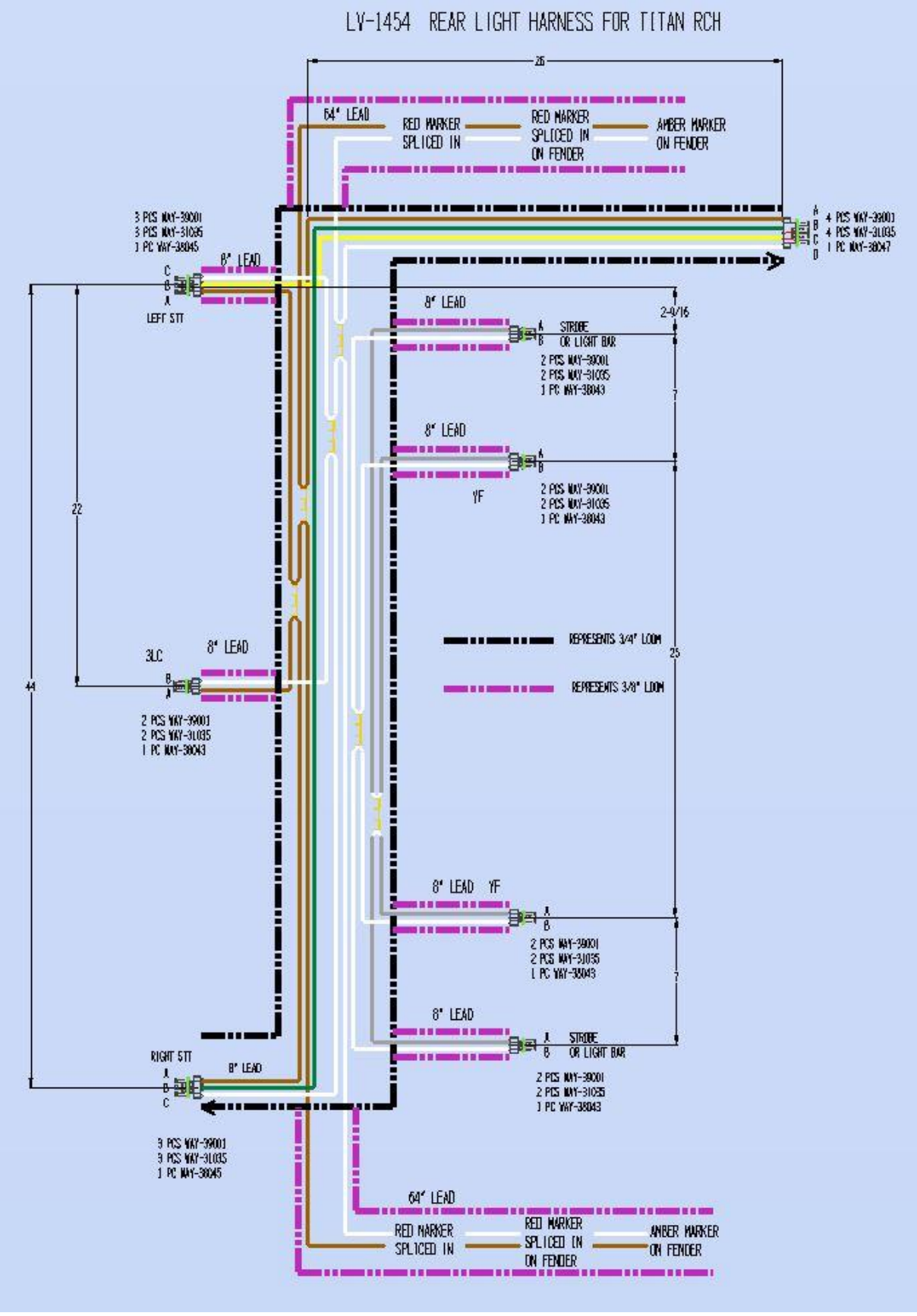
BONNELL INDUSTRIES INC
TRUCK & ROAD EQUIPMENT

DIXON, ILLINOIS
PHONE: 800-851-9664

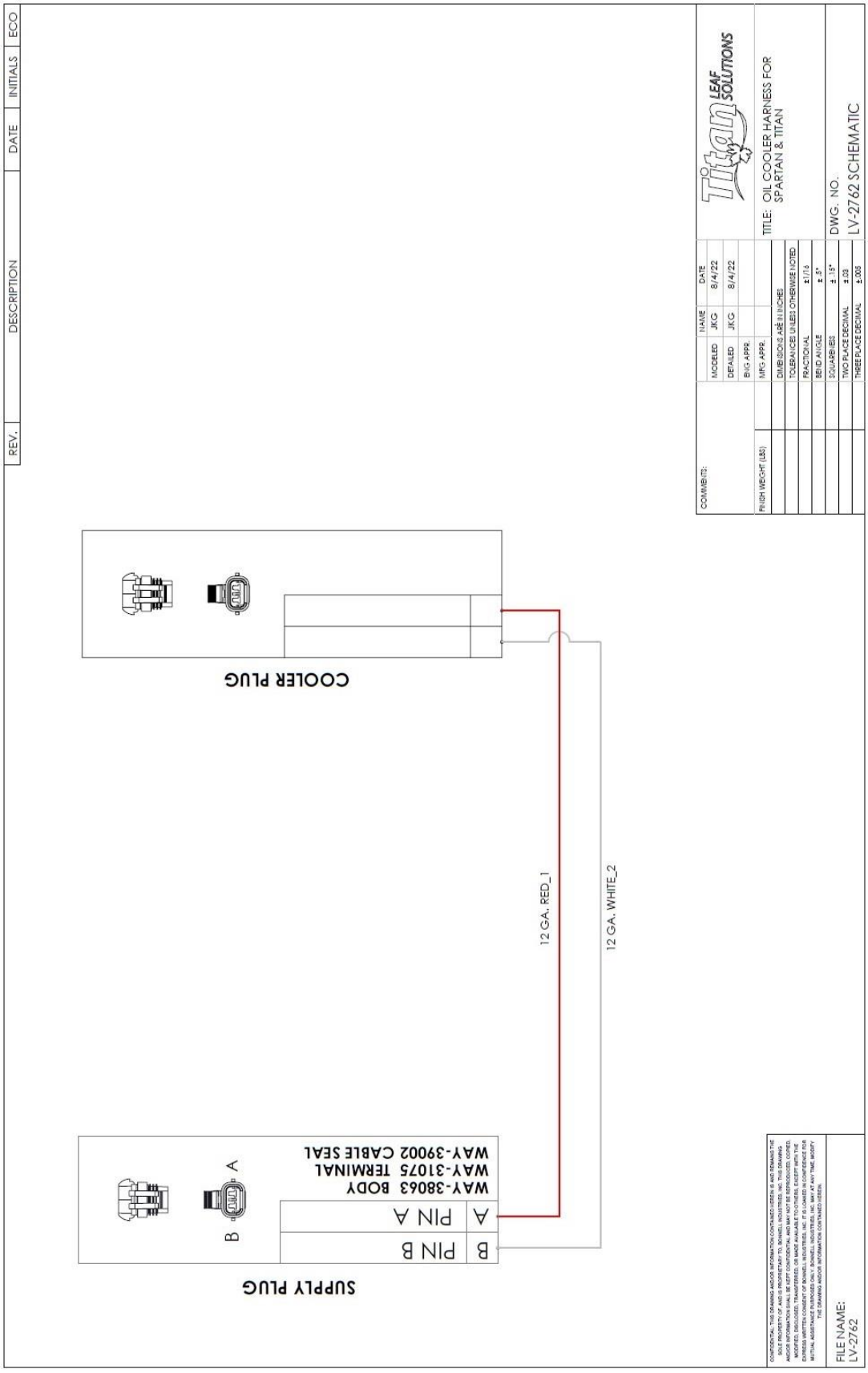
CHASSIS HARNESS, FRONT



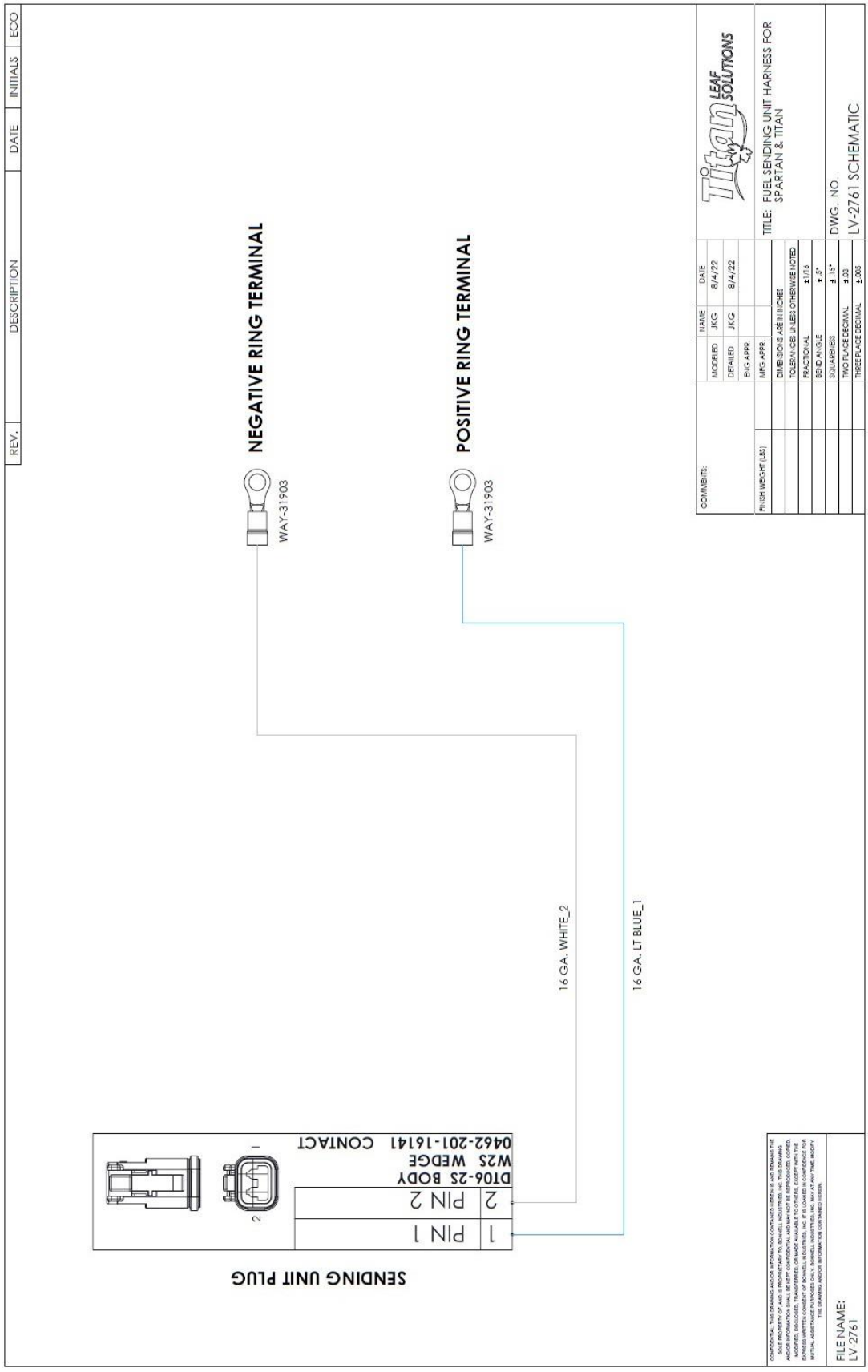
CHASSIS HARNESS, REAR



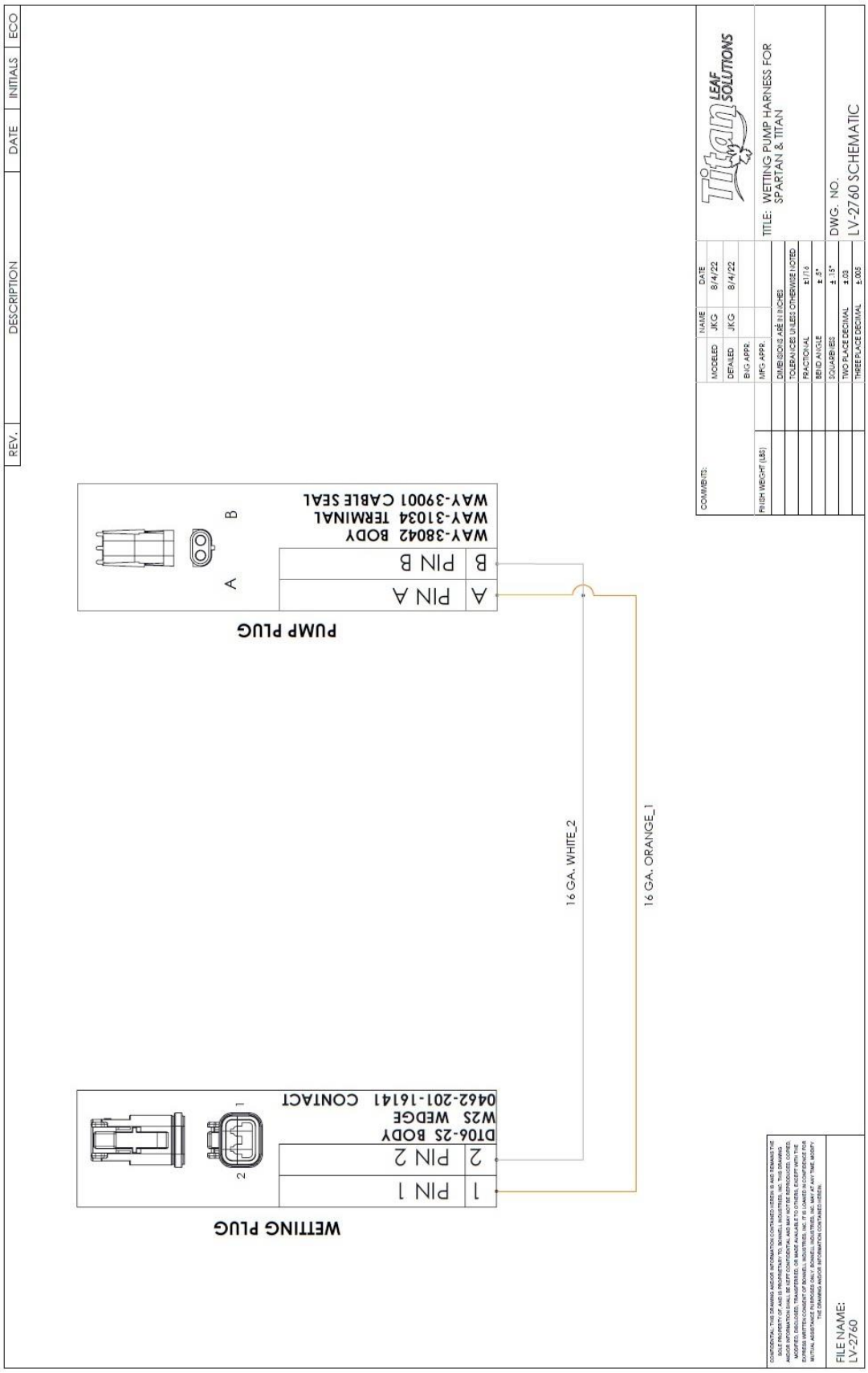
OIL COOLER HARNESS SCHEMATIC



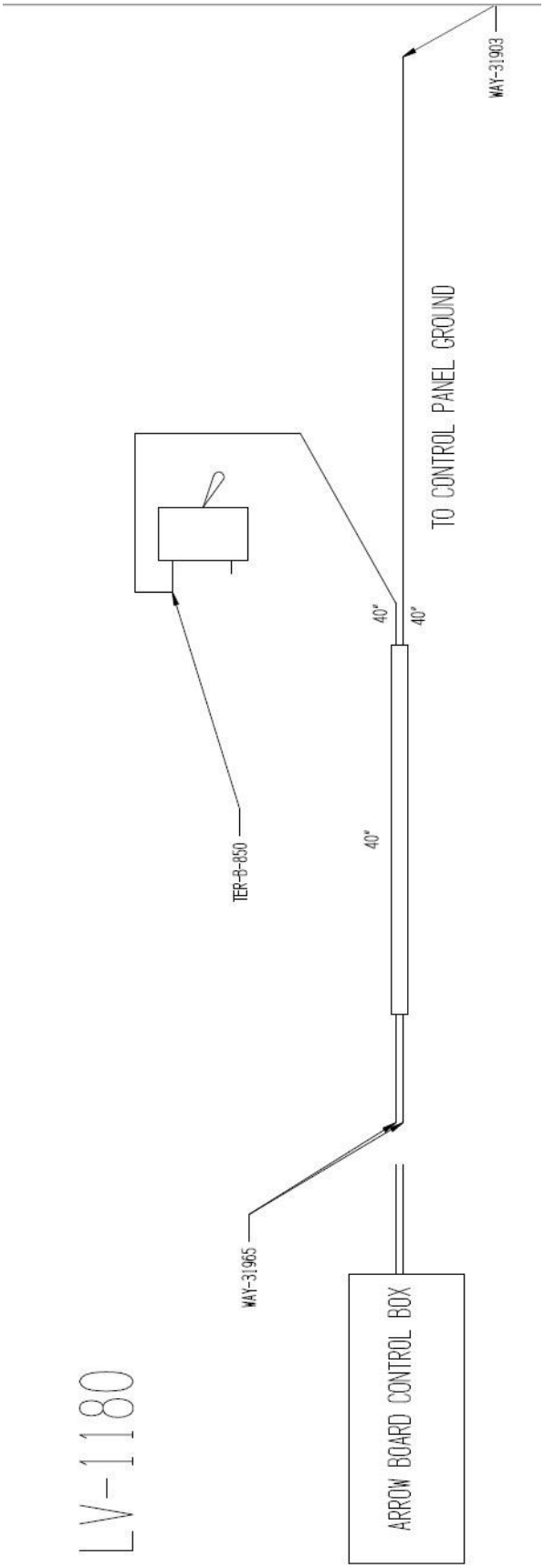
FUEL SENDING UNIT HARNESS SCHEMATIC



WETTING PUMP HARNESS SCHEMATIC



DIRECTIONAL LIGHT BAR HARNESS SCHEMATIC



8. General Operating Instructions

SPECIAL NOTE: **this section of the manual is intended as a supplement to your specific municipal or business guidelines in leaf collection, and is not intended to be a *"complete leaf collection guide"*. Training is the key to safe and proper operation of this equipment. Ensure your operation is in compliance with all applicable codes and regulations.**

8.1. Prestart Checklist

8.2. Clutch Engagement

8.3. Engine RPM

Adjust engine RPM to match working conditions. Generally, lower RPM is better for dryer and dusty conditions. However, engines will have greater vibrate at certain rpms that vary by engine. For example, the vibration of the engine may be higher at 2000 rpm than it is at 2200 rpm.
Never collect leaves while the engine is running in idle.

8.4. E-Stops

Emergency stop locations are shown below. Press the red button to stop the engine if an emergency situation arises. The emergency stop will kill the engine and disable all hydraulic and joystick functions. To reset the engine stop, twist the red button until it pops out. If the engine will not start, make sure all of the emergency stops are popped out.

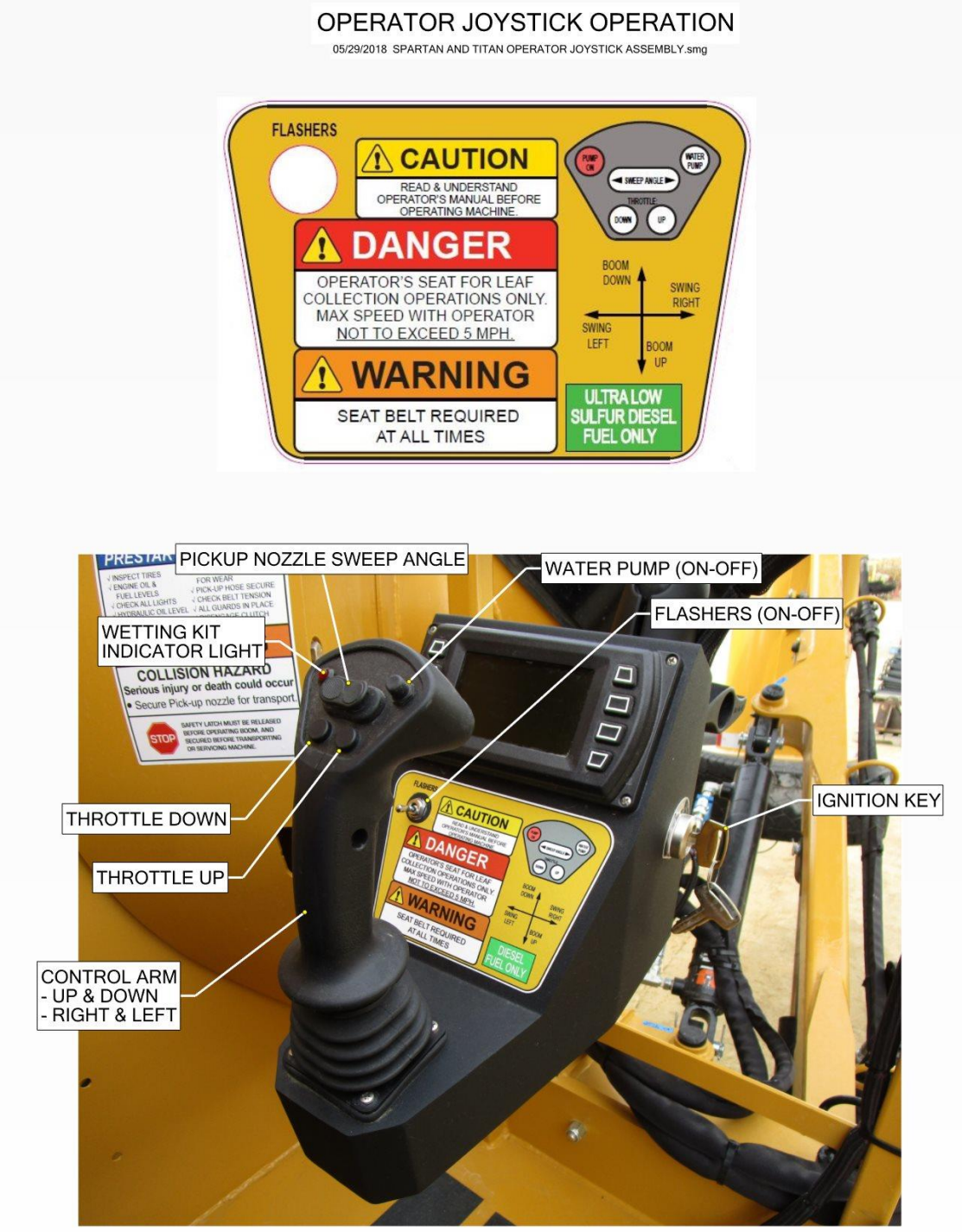
EMERGENCY STOP SWITCH MOUNTING LOCATION

083019 TITAN EMERGENCY STOP LOCATIONS

8.5. HYDRAULIC BOOM OPERATION (IF EQUIPPED)

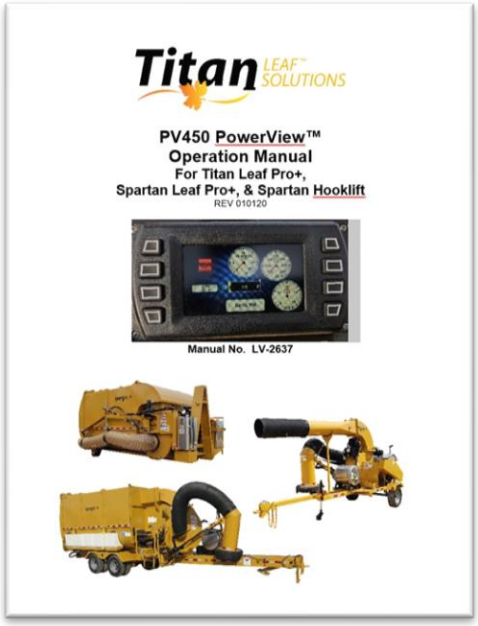
The hydraulic boom is fitted with three hydraulic cylinders:
Lift – Boom raise & lower
Swing – Boom in & out (left & right)
Sweep – Nozzle pivot

These controls will provide the range of motion needed to operate the machine on varying terrain and conditions.



8.6. PV450 CONTROLLER ADJUSTMENTS

Refer to supplemental controller manual part number LV-2637. Contact Bonnell Industries to obtain a copy.



8.7. HYDRAULIC JACK (IF EQUIPPED)

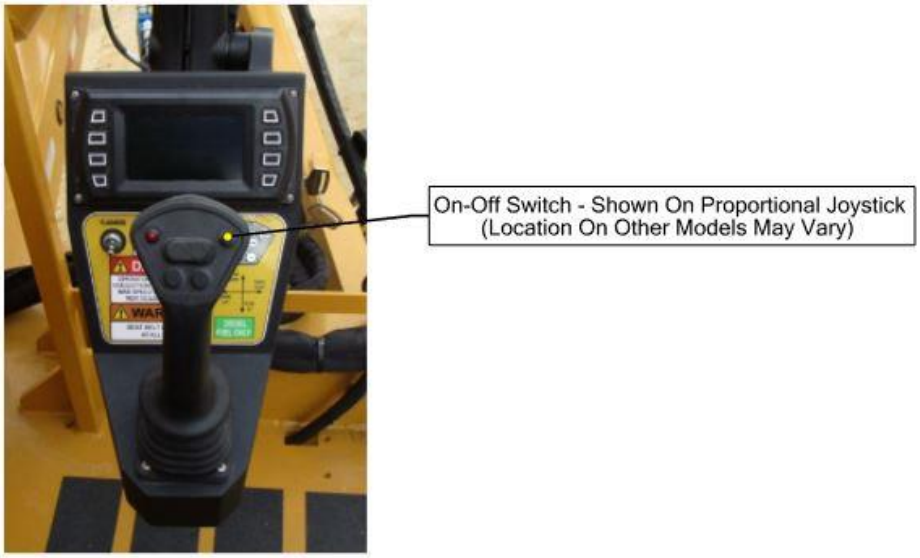
The hydraulic jack is operated by the control lever located on the bearing doghouse. NOTE: FOR ELECTRIC OVER HYDRAULIC SYSTEMS, THE ENGINE NEEDS TO BE RUNNING TO RAISE THE JACK.

8.8. DISCHARGE CHUTE CYLINDER (IF EQUIPPED)

The hydraulic discharge chute is operated by the control lever located on the bearing doghouse. NOTE: FOR ELECTRIC OVER HYDRAULIC SYSTEMS, THE ENGINE NEEDS TO BE RUNNING TO RAISE THE CHUTE. **During operations, it is recommended that the discharge cylinder toggle switch be left in the float position to accommodate variations in towing conditions.** NOTE: FLOAT LEFT ON WILL DRAIN BATTERY.

8.9. Dust Control System (If Equipped)

The dust control system is designed to reduce the amount of dust exiting the discharge nozzle. A simple on-off switch to operate the pump is located on or near the engine control center.



The dust control system consists of:

- 100 gallon water tank(s)
- Electric pump
- Pressure gauge and needle valve adjustment assembly (pictured below)
- 3 spray nozzles located in the discharge chute that apply water to the debris as it passes through.

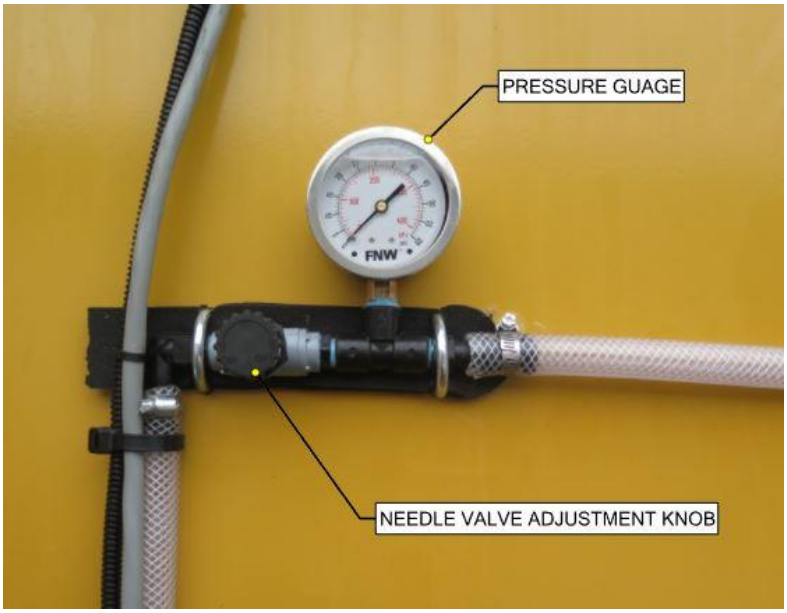
The amount of water being sprayed can be controlled to accommodate different conditions. Refer to the chart below. Machine is equipped with “green” 80015 nozzles. Nozzle sizes can be changed to increase flow, however this will reduce operation time of the dust control system before the tanks are depleted of water. Also

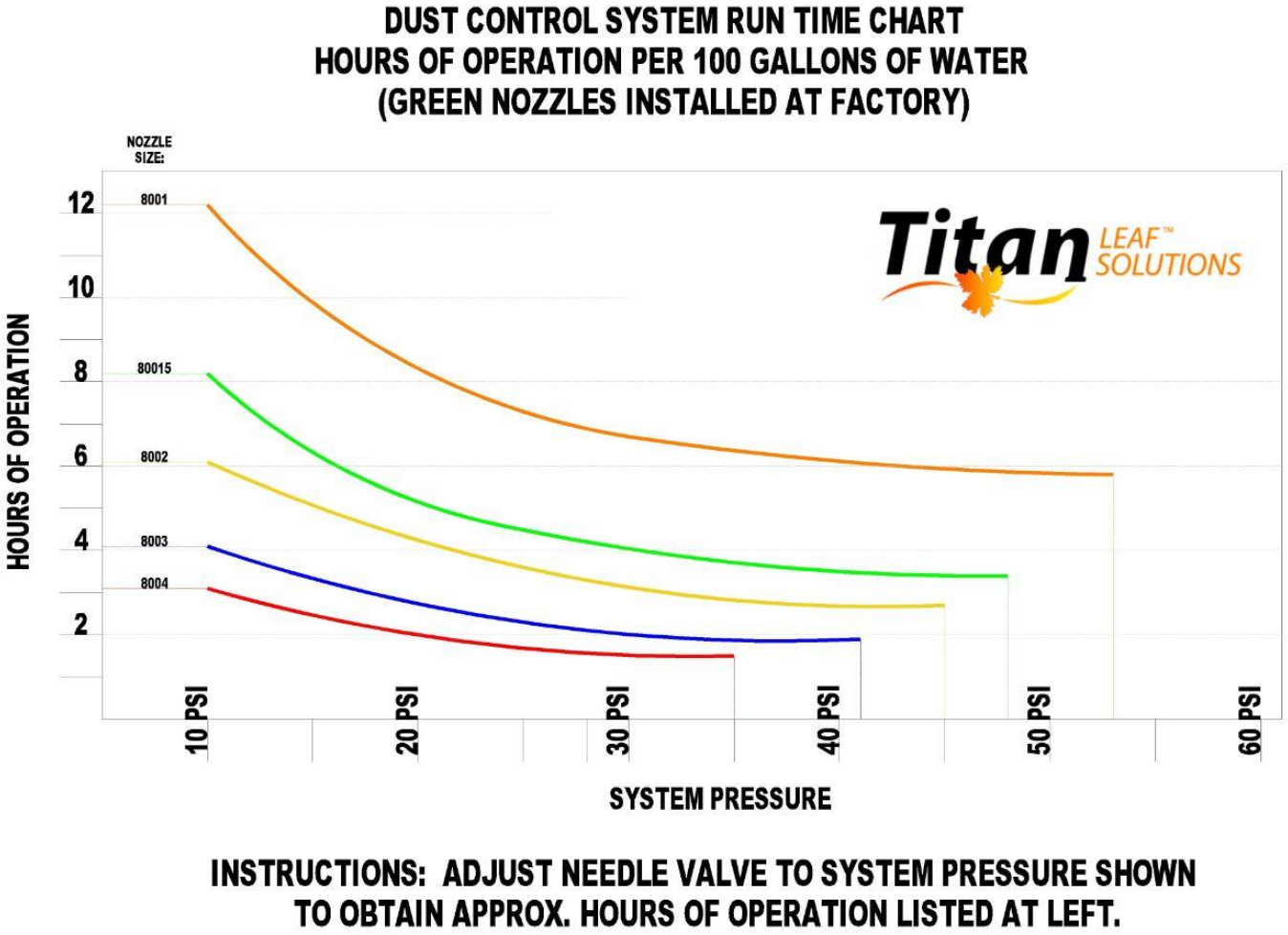
keep in mind that excessive water will increase the weight and wetness of the load, which may result in residual leaking from the containment box.

To change the amount of water being sprayed, adjust the pressure using the needle valve knob shown in the photo below:

- A REDUCTION in line pressure will REDUCE the amount of water being applied, and INCREASE your run time before depleting the water supply.
- An INCREASE in line pressure will INCREASE the amount of water being applied, and REDUCE your run time before depleting the water supply.

In very dusty conditions, a balance is necessary between lowering the dust level, but not necessarily eliminating it, based on available water refill stations.





8.10. Dual Tongue System (If Equipped)

The dual tongue system is designed for use where off-set operation is required, and consists of a rigid operation tongue, and a longer removable transport tongue.

When transporting, select the shortest possible length and pin in place. Mark this hole for future reference.

For operation mode, unpin the transport tongue, pull out fully, and drop to the lower tapered receiver tube. Caution: Transport tongue is heavy! Get help when moving tongue. Reinsert tongue fully and pin in place. Hook truck up to operation tongue.

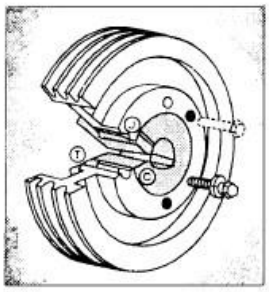
9. SUPPLEMENTAL MANUALS

9.1. QD & SPLIT TAPER BUSHINGS

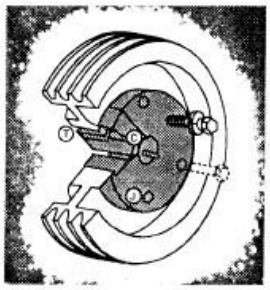
QD Bushing/Sheaves Installation

MASTERDRIVE®
POWER TRANSMISSION PRODUCTS

QD bushing sizes JA through N can be assembled in either of the two positions shown below. Sizes P through S should be assembled in position one. *Position One* is the conventional or standard mounting. *Position Two* (Reverse Mounting) may be necessary in some cases, such as mounting small sheaves with blind holes (not drilled through).



Position 1



Position 2

Bushing Size	Cap Screw Size-Thread	Foot Pounds Wrench Torque*
JA	10-24	3
SH-SDS-SD	1/4-20	6
SK	5/16-18	10
SF	3/8-16	20
E	1/2-13	40
F	9/16-12	50
J	5/8-11	90
M	3/4-10	150
N	7/8-9	200
P	1-8	300
W	1-1/8-7	400
S	1-1/4-7	500

*For Normal Applications. *For Severe* (Rock-crusher type) applications these values can be increased by a maximum of 50%
Caution: Excessive cap-screw torque can cause sheave and/or bushing breakage. The use of lubricants can cause sheave breakage.

Therefore,

DO NOT USE LUBRICANTS IN THIS INSTALLATION!

INSTALLATION:

1. Make sure the tapered-cone surface of the bushing and the mating bore of the sheave are free of all foreign substances, such as dirt, excess paint accumulations, metal chips, lubricants, etc.
2. For position one or two (whichever applies), line up the unthreaded holes (C) with the threaded holes (t) and insert cap screws with lock washers engaging only two or three threads. (*a)
3. With key in shaft keyway, slide the loosely-assembled unit onto shaft and position for good belt alignment. (*b, *c) **Use no lubricants or anti-seize compound on threads or tapered surfaces.**
4. Carefully tighten the capscrews alternately and progressively until the tapers are seated (at approximately half the recommended torque).
5. Check alignment and sheave runout (wobble) and correct as necessary.
6. Continue careful alternate and progressive tightening of the cap screws to the recommended torque values shown in the table. **Maximum torque should be achieved on each individual bolt only two times in the consecutive tightening.**

Note: When properly mounted, there will be a gap between the bushing flange and sheave after the screws are tightened.
Caution: Use of Lubricants and or excessive screw torque can cause breakage

7. Tighten the set screw, when available, to hold the key securely during installation and until cap screws are securely tightened.

REMOVAL

1. Loosen and remove all mounting cap screws.
2. Insert cap screws in all threaded jack screw holes (J).
3. Start with the screws furthest from the bushing saw slot and tighten all jack screws alternately and progressively. Keep turning the screws in small equal amounts until the tapered surfaces disengage.

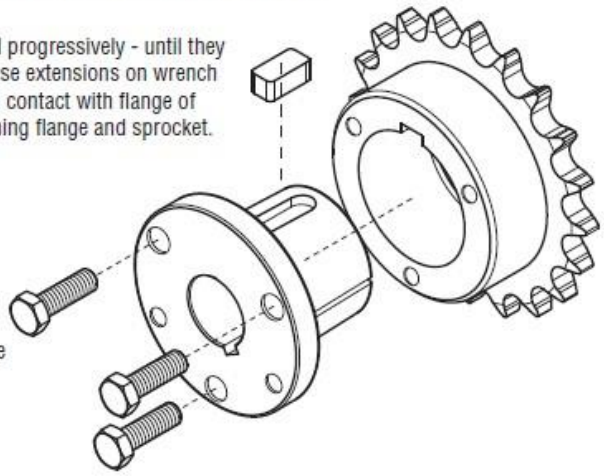
(*a) When mounting a sheave on M through W size bushing, position the threaded jack-apart hole (J) as far from the bushing saw as possible to reduce the possibility of bushing breakage.
(*b) When installing large or heavy parts in *Position One*, it may be easier to mount the key and bushing on the shaft first. Then place the sheave on the bushing and align the holes.
(*c) **Caution**: When mounting on a vertical shaft, provisions must be made, which will positively prevent the sheave and/or bushing from dropping during installation.

MST® Bushings
Instructions & Removal Instruction

The MST® bushings are easy to install and remove. They are split through the barrel and have a taper to provide a true clamp on the shaft. They are keyed to both the shaft and the hub to help during "blind" installations.

INSTALLATION

1. Be sure the tapered cone surfaces of the bushing and the inside of the driven product are clean and fee of anti-seize lubricants.
2. Place bushing in sprocket or other Martin MST® part.
3. Place cap screws loosely in pull-up holes. Bushing remains loose to assure sliding fit on shaft
4. With key on shaft, slide sprocket to desired position on shaft. Be sure heads of cap screws are accessible.
5. Align sprocket. Tighten screws alternately and progressively - until they are pulled up tight (see table below). Do not use extensions on wrench handles. Do not allow sprocket to be drawn in contact with flange of bushing. There should be a gap between bushing flange and sprocket. **CAUTION: THIS GAP MUST NOT BE CLOSED**



REMOVAL

1. Loosen and remove cap screws.
2. Insert cap screws in tapped removal holes.
3. Tighten inserted screws until sprocket is loose on shaft.
4. Remove sprocket from shaft.

WRENCH TORQUE VALUE FOR TIGHTENING BUSHING		
MST® Bushing Size	Size of Cap Screw	Wrench Torque in/lb
G	.25 × .625	95
H	.25 × .75	95
P	.313 × 1	192
Q	.375 × 1.25	348
R	.375 × 1.75	348
S	.5 × 2.25	840
U	.625 × 2.75	1680
W	.75 × 3	3000

CAUTION

WARNING: USE OF ANTI-SEIZE LUBRICANT ON TAPERED CONE SURFACE OR ON BOLT THREADS WHEN MOUNTING MAY RESULT IN DAMAGE TO SHEAVE AND SPROCKETS. THIS VOIDS ALL MANUFACTURER'S WARRANTIES

WARNING: Because of the possible danger to person(s) or property from accidents which may result from the improper use of products, it is important that correct procedures be followed: Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance and operation procedures must be observed. The instructions given above must be followed. Inspections should be made as necessary to assure safe operation under prevailing conditions. All rotating power transmission products when used in a drive are potentially dangerous and must be guarded by the user as required by applicable laws, regulations, standards, and good safety practice. (Refer to ANSI Standard B15.1.)

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9.2. TRANS FLUID COUPLER

TRANSFLUID

drive with us

TRANSFLUID
trasmissioni industriali

NORME D'INSTALLAZIONE E MANUTENZIONE

PRIMA DI MONTARE E METTERE IN FUNZIONE IL PRODOTTO, LEGGERE ATTENTAMENTE TUTTE LE ISTRUZIONI SULLA SICUREZZA ED IL FUNZIONAMENTO RIPORTATE NEL PRESENTE MANUALE.

SEGUIRE SEMPRE TUTTE LE AVVERTENZE ED ASSICURARSI CHE GLI OPERATORI PRESENTI IN PROSSIMITA' DELL'APPARECCHIATURA INDOSSINO TUTTI I DISPOSITIVI DI PROTEZIONE RICHIESTI PER LA SICUREZZA NELL' AMBIENTE DI LAVORO.

NON UTILIZZARE L'APPARECCHIATURA SE LE PRESENTI ISTRUZIONI NON DOVESSERO RISULTARE CHIARE, E CONTATTARE IMMEDIATAMENTE IL COSTRUTTORE O IL DISTRIBUTORE PER L'ASSISTENZA NECESSARIA.

IL PRODOTTO DEVE ESSERE PROTETTO DA UNA COPERTURA ADEGUATA PER EVITARE DANNI ALLE PERSONE.
LO SCHERMO DEVE SEMPRE PREVEDERE APERTURE ASSIALI E RADIALI PER LA VENTILAZIONE DEL GIUNTO.

SE FOSSE MONTATO IL TAPPO FUSIBILE, LE SUDDETTE APERTURE NON DEVONO ESSERE ORIENTATE VERSO GLI OPERATORI, PARTI CALDE O COLLEGAMENTI ELETTRICI.

INSTALLATION AND MAINTENANCE

BEFORE ASSEMBLING AND OPERATING THE PRODUCT, CAREFULLY READ ALL THE SAFETY AND OPERATING INSTRUCTIONS REPORTED IN THIS MANUAL.

ALWAYS FOLLOW ALL THE INSTRUCTIONS AND ASSURE THAT ALL THE OPERATORS STANDING BY THE MACHINERY ARE WEARING ALL THE PROTECTIVE EQUIPMENT NECESSARY FOR THE JOB TYPE AND APPLICATION BEING PERFORMED.

DO NOT USE THE MACHINERY IF YOU DO NOT UNDERSTAND THESE INSTRUCTIONS, AND IMMEDIATELY REFER TO THE MANUFACTURER OR THE CUSTOMER SERVICE DESK FOR ASSISTANCE.

THE PRODUCT MUST BE PROTECTED BY A CONVENIENT COVER GUARD TO AVOID PERSONAL INJURY TO PEOPLE.
AXIAL AND RADIAL VENTILATION OPENINGS SHOULD BE INCORPORATED IN THE GUARD FOR HEAT EXCHANGE.

IF THE PRODUCT IS FITTED WITH FUSIBLE PLUGS, THE SAID OPENINGS SHOULD NOT BE DIRECTED TOWARDS OPERATORS OR ANY HOT OR ELECTRICAL INSTALLATION.

GIUNTI IDRODINAMICI

FLUID COUPLINGS

13 KFBD

156 I - GB

TRANSFLUID trasmissioni industriali	13 KFBD MANUALE INSTALLAZIONE, USO E MANUTENZIONE *INSTALLATION, USE AND MAINTENANCE MANUAL*	TF 6217-A Rev. 0

Questo manuale contiene le istruzioni per l'installazione, l'avviamento, l'uso e la manutenzione del giunto idrodinamico tipo KFBD.
CONSIGLIAMO CHE I RESPONSABILI DELL'USO E DELLA MANUTENZIONE DEL KFBD, VENGANO DOTATI DEL PRESENTE MANUALE. IL NON RISPETTO DELLE REGOLE CITATE IN QUESTO MANUALE, PROVOCA IL DECADERE DELLA GARANZIA.
Ricordiamo che, per ordinare le parti di ricambio, e' importante specificare, oltre al numero di dettaglio e quantita' richiesta, anche:
TIPO - N° di SPECiFICA - N° di SERIE del KFBD, che si trovano stampigliati sulla targhetta di identificazione a bordo macchina.

This manual contains instructions for installation, start up, working, and maintenance of KFBD fluid coupling.
WE SUGGEST THAT ANY PERSON WHO IS RESPONSIBLE FOR USE AND/OR MAINTENANCE, SHOULD BE PROVIDED WITH THIS MANUAL. THE RESPECT OF RULES, CONTAINED IN THIS MANUAL, IS MANDATORY FOR WARRANTY VALIDITY.
We recall that, for spare parts order, it is important to provide, besides detail number and quantity, even:
TYPE - SPECIFICATION Nr. - SERIAL Nr. of KFBD that are stamped on identification metal plate.

DESCRIZIONE

Il KFBD e' un giunto idrodinamico la cui parte esterna, motrice, e' collegata al volano di un motore endotermico mediante un giunto elastico ed il cui albero di uscita e' supportato da un cuscinetto orientabile a rulli, lubrificato ad olio, alloggiati in una campana di supporto flangiata al coprivolano del motore. Un secondo cuscinetto, alloggiato nel volano, sostiene l'albero di uscita dal lato motore. Il KFBD e' adatto per applicazioni con puleggia od i linea.

DESCRIPTION

KFBD is a fluid coupling having the outer driving impeller connected to the internal combustion engine flywheel through an elastic coupling. The output shaft is supported by a spherical roller bearing, oil lubricated, fitted in a cover flanged to the engine flywheel housing. Another bearing, fitted into the flywheel, supports the output shaft at the engine side. The KFBD is suitable for pulley or in line applications.

Prima di iniziare il montaggio del KFBD sul motore, e' bene verificare che il volano rientri nelle tolleranze SAE. Questo e' importante soprattutto per il buon funzionamento del giunto elastico.(Vedere TF6217-B Fig.1)

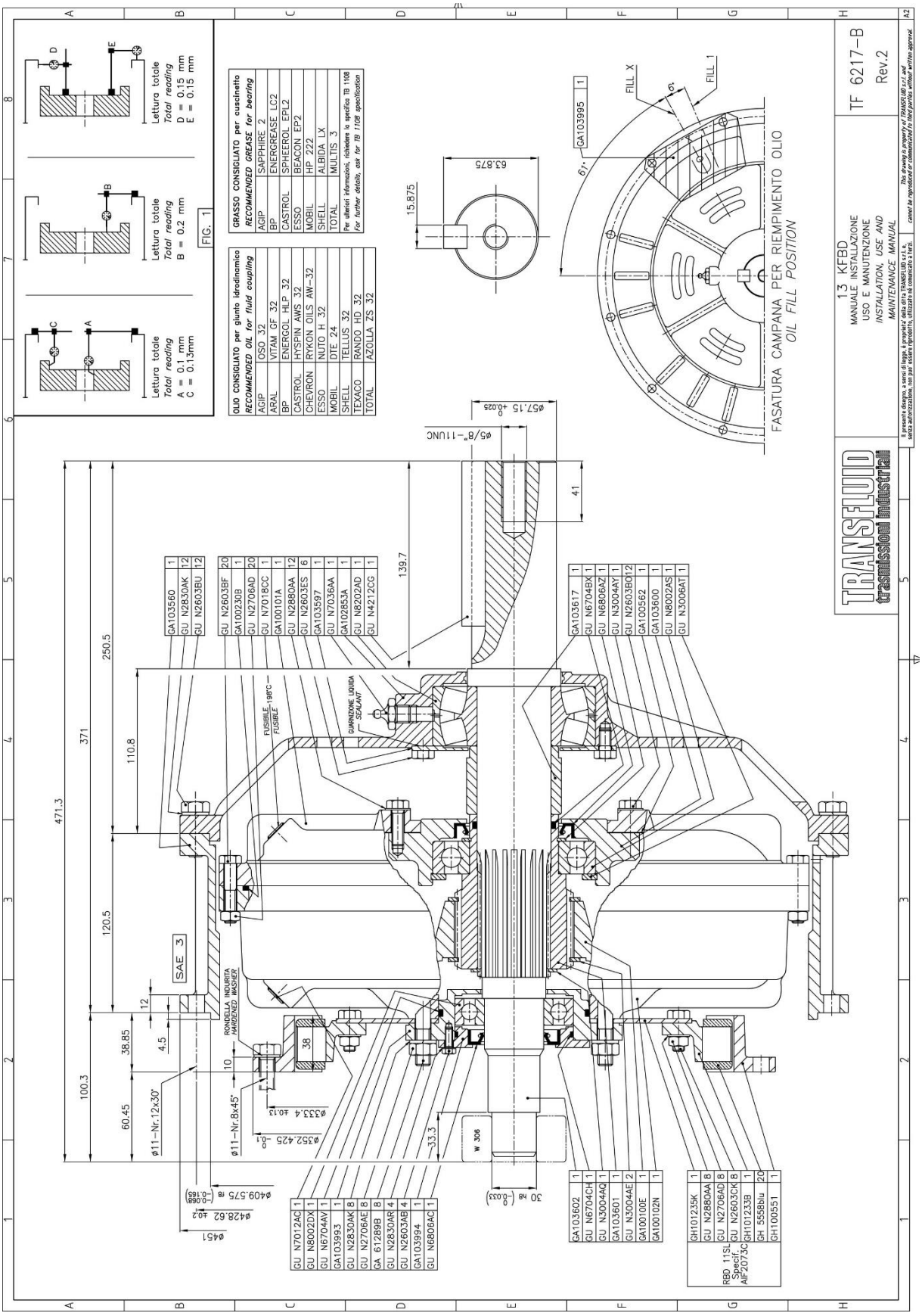
Before KFBD be mounted onto the engine, it is recommended to check that flywheel be within SAE tolerances. This is very important for elastic coupling good working.(see TF6217-B Fig.1)

INSTALLAZIONE (vedere TF6217-B)

1 Montare l'anello di trascinamento del giunto elastico sul volano del motore.
2 Montare il cuscinetto pilota, ingrassato a vita, sull'albero del KFBD.
3 Montare la flangia SAE 3 sul coprivolano.
4 Posizionare il gruppo completo, osservando con cura l'allineamento dell'albero nel cuscinetto pilota e dei blocchetti del giunto elastico con l'anello di trascinamento montato sul volano. La campana esterna deve essere orientata in modo da avere l'apertura per il riempimento dell'olio a circa 60° dalla verticale, in senso orario guardando il volano del motore. Cosi' montato, si avra' l'apertura di drenaggio dell'olio in basso. Infine fissare il gruppo con le apposite viti sulla flangia esterna.
5 Riempimento olio giunto (vedere tabella olii consigliati). Togliere il coperchio che protegge il tappo di carico . Ruotare il giunto sino a portare il tappo in corrispondenza del segno di riferimento X sulla verticale (X-1-2-3-4 dipende dall'applicazione). Togliere il tappo e riempire fino allo sbocco dal foro (13KFBD X=5,2 lt;), quindi chiudere utilizzando del sigillante sul filetto. La coppia di serraggio e' 30 Nm per tappo 3/8". Rimontare il coperchio di protezione.
6 Riempimento grasso (vedere tabella grassi consigliati). Mediante l'apposito ingrasatore,, riempire la camera di lavoro del cuscinetto fino a far fuoriuscire il grasso attorno all'albero
7 Dare alcuni colpi, con un martello non metallico, sull'estremita' dell'albero onde eliminare ogni eventuale tensione sui cuscinetti dovuta alla resistenza offerta dal cuscinetto pilota, quando esso viene montato forzato nella sede del volano.
8 Al primo avviamento, far girare il gruppo innestato, per almeno 10 minuti,con il motore alla meta' dei giri massimi.

INSTALLATION (see sheet.TF6217-B)

1 Mount elastic coupling driving ring, onto engine flywheel.
2 Mount pilot bearing, greased for life, onto KFBD shaft.
3 Mount SAE 3 flange onto flywheel housing.
4 Install complete group paying attention at alignement between shaft and pilot bearing as well as alignement between rubber blocks and driving ring.
External housing must be orientated to get the oil fill opening at about 60° clockwise from vertical line, looking at the flywheel.
In such a way, the oil drain opening will be downwards. Therefore tighten screws of external flange.
5 Fluid coupling oil filling (see recommended oil table). Remove cover.
Turn fluid coupling untill X mark be on vertical line (X-1-2-3-4 depends on application). Remove plug and fill untill oil overflows (13KFBD fill X=5,2 lt;).
Therefore fit the plug using sealent on thread.
Tightening torque is 30 Nm for 3/8" plug .Fit again the cover.
6 Grease filling (see recommended grease table).
Through the grease filler, fill grease untill it comes out around the shaft.
7 Rap the shaft on the end to relieve any preloading that may result due to the resistance of pilot bearing when being pressed into the flywheel.
8 At first start up, run the unit engaged and engine at half of max speed for not less than 10 minutes.


TRANSFLUID
transmissioni industriali
TF 6217-B
Rev.2
13 KFBD
MANUALE INSTALLAZIONE
USO E MANUTENZIONE
INSTALLATION, USE AND
MAINTENANCE MANUAL
FASATURA CAMPANA PER RIEMPIMENTO OLIO
OIL FILL POSITION
FIG. 1
GRASSO CONSIGLIATO per cuscinetto
RECOMMENDED GREASE for bearing
OLIO CONSIGLIATO per giunto idrodinamico
RECOMMENDED OIL for fluid coupling
SAE 3
FUSIBILE 98°C
FUSIBLE
GUARNIZIONE LIQUIDA
SEALANT
RONDELLA INDURITA
HARDENED WASHER
FILL X
FILL 1
Lettura totale
Total reading
A = 0.1 mm
C = 0.13mm
B = 0.2 mm
D = 0.15 mm
E = 0.15 mm

TRANSFLUID trasmissioni industriali	13 KFBD MANUALE INSTALLAZIONE, USO E MANUTENZIONE *INSTALLATION,USE AND MAINTENANCE MANUAL*	TF 6217-C Rev. 0

MANUTENZIONE

- Controllare, ogni 3 mesi, il livello dell'olio nel giunto. Cambiare l'olio ogni 4000 ore di funzionamento oppure una volta all'anno.
- Ingrassare il cuscinetto dell'albero di uscita ogni settimana.
- Controllare, periodicamente, lo stato dei blocchetti in gomma del giunto elastico.
- E' consigliabile, ogni 4000 ore di funzionamento, cambiare tutti gli anelli di tenuta rotante e controllare lo stato dei cuscinetti.
- Controllare, periodicamente, che la taratura del termostato,se installato, sia uguale al valore originariamente impostato (vedere certificato di collaudo e TF5941-O).
- Pulire periodicamente la sonda del termostato, se installato.

MAINTENANCE

- *Check, every 3 months, the fluid coupling oil level. Change oil every 4000 working hours or once a year, whichever occurs first.*
- *Grease output shaft bearing every week.*
- *Check, periodically, elastic coupling rubber blocks condition.*

- *It is advisable, every 4000 working hours, to change all rotating seals and to check bearings condition.*
- *Check, periodically, that temperature switch whether installed, set value be the same as originally adjusted (see test certificate and TF5941-O).*
- *Clean periodically the temperature switch bulb, whether installed.*

TABELLA INCONVENIENTI

SINTOMO	CAUSA	RIMEDIO
Scarse prestazioni.	Livello olio.	Controllare il livello (olio freddo) ed aggiungere se necessario. Controllare la macchina condotta. Controllare i giri del motore.
	Tipo olio.	Utilizzare olio indicato in tabella.
Surriscaldamento.	Scorrimento eccessivo.	Controllare il livello olio. Verificare l'installazione. Controllare i giri del motore.
	Scarsa ventilazione.	Pulire le aperture per la ventilazione.
	Cuscinetto non lubrificato.	Verificare il livello olio ed eventualmente aggiungere.
	Cuscinetto in uscita danneggiato.	Sostituire.
	Carico radiale eccessivo.	Ridurre la tensione delle cinghie.
Perdita olio lato motore.	Tappo conico.	Rimontare con sigillante per filetti.
	Anello OR.	Sostituire.
	Tenuta rotante.	Sostituire. Controllare l'usura sull'albero.
Perdita olio lato uscita.	Tappo conico.	Rimontare con sigillante per filetti.
	Tappo fusibile se installato.	Sostituire.
	Anelli OR.	Sostituire.
	Tenuta Rotante.	Sostituire. Controllare l'usura sull'albero.
Rumore.	Rottura cuscinetto.	Sostituire.
	Olio con troppa schiuma.	Controllare il livello ed il tipo di olio.
	Usura eccessiva giunto elastico (vibrazioni torsionali?, temperatura eccessiva?, disallineamento?, olio.).	Smontare e sostituire i blocchetti od il giunto elastico completo.
	Usura della dentatura tra albero uscita mozzo, girante interna.	Smontare e sostituire le parti usurate.
Intervento termostato.	Alta temperatura olio.	Vedere "surriscaldamento".
	Errata taratura termostato.	Vedere certificato di collaudo e TF 5941-O.

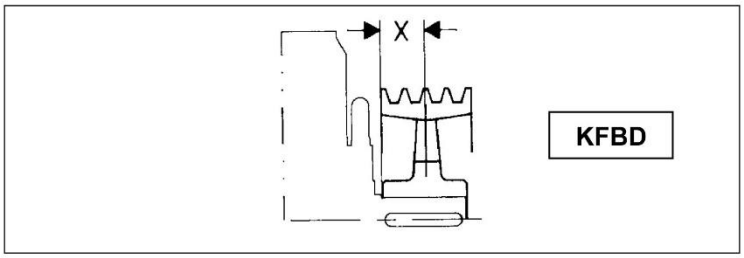
TROUBLE SHOOTING

SYMPTOM	*CAUSE*	*REMEDY*
Poor performances.	*Oil level.*	*Check level (cold oil) and add as necessary.* *Check driven machine.* *Check engine rpm.*
	Oil type.	*Use recommended oil (see table).*
Overheating.	*High slip.*	*Check oil level.* *Check installation.* *Check engine rpm.*
	Low ventilation.	*Clean ventilation openings.*
	No lubricated bearing.	*Check oil level . Add oil if required .*
	Damaged output bearing.	*Replace.*
	Too high radial load.	*Decrease belt tension.*
Oil leakage at engine side.	*Taper plug.*	*Remount using thread sealent.*
	O-ring.	*Replace.*
	Rotating seal.	*Replace. Check shaft wear.*
Oil leakage at output side.	*Filling plug.*	*Remount using thread sealent.*
	Fusible plug,whether installed.	*Replace.*
	O-ring.	*Replace.*
	Rotating seal.	*Replace. Check shaft wear.*
Noise.	*Bearing failure.*	*Replace.*
	Too much oil foam.	*Check oil level and type.*
	Elastic coupling wear. (Torsional vibration? high temperature? misalignement? oil ?).	*Dismantle and replace rubber blocks or complete elastic coupling.*
	Spline wear between output shafthub, inner impeller.	*Dismantle and replace worn components.*
Temperature switch intervention.	*High oil temperature.*	*See "overheating".*
	Wrong switch setting.	*See test certificate and TF 5941-O.*

TF6217-C REV.0 (MAN.13KFBD).DOC

TRANSFLUID trasmissioni industriali	KFBD PERMISSIBLE SIDE LOAD (N) AND SUGGESTED PULLEY TRANSMISSION	TF 6093-D Rev. 1

- Calculated bearings life over 10.000 hours.
- Engine speed over those listed, needs approval by Transfluid.
- Pulley diameter is the minimum permissible. (Over 35 m/s, dynamic balancing is recommended).
- Belts nr. is maximum permissible (about belt width: 8V > SPC > 5V).
- Timing belts must be approved by Transfluid.
- "X" distance is according to belts type & number.
- Side load includes 2.5 belt tensioning factor.
- Pilot bearing speed = 5% of max. input speed.



TRANSMITTABLE POWER CRITERIA: slip < 3%
f.c. oil temperature < 50 °C over ambient

13 (pilot brg: dia 30 mm – 33500 N)

Up to kW/rpm	Max "X" (mm) Max load (N)	Max belts nr Type - Min pulley ∅
90 / 2600	65 / 8300	7 x 5V - 200 mm

15 (pilot brg: dia 30 mm – 33500 N)

Up to kW/rpm	Max "X" (mm) Max load (N)	Max belts nr Type - Min pulley ∅
130 / 2400	92 / 13000	10 x 5 V - 200 mm

17-19 (pilot brg: dia 35 mm – 40500 N)

Up to kW/rpm	Max "X" (mm) Max load (N)	Max belts nr Type - Min pulley ∅
200 / 2200	110 / 22000	12 x 5 V - 200 mm 6 x 8V - 315 mm 7 x SPC - 315 mm
280 / 2200	130 / 22000	14 x 5 V - 280 mm 8 x 8V - 315 mm 9 x SPC - 315 mm

21-24 (pilot brg: dia 45 mm – 58500 N)

Up to kW/rpm	Max "X" (mm) Max load (N)	Max belts nr Type - Min pulley ∅
370 / 2000	150 / 28000 170 / 25000	10 x 8V - 315 mm 13 x SPC - 355
500 / 2000	177 / 29800 195 /26500	12 x 8V - 400 mm 15 x SPC - 450 mm

ASK TRANSFLUID FOR ANY APPLICATION DIFFERENT THAN ABOVE.

TRANSFLUID
trasmissioni industriali

GARANZIA BASE, TERMINI E CONDIZIONI
TF 6401-I - rev. 0

1) Premessa
TRANSFLUID garantisce che i propri prodotti, al momento della spedizione, sono conformi alle specifiche pubblicate nei propri cataloghi o documenti tecnici validi al momento della spedizione stessa e che sono esenti da difetti nei materiali e nella fabbricazione. Questi termini di garanzia sostituiscono tutte le altre garanzie, anche legali, espresse o implicite, comprese, a titolo esemplificativo e non esaustivo, le garanzie di commerciabilità e di idoneità ad un uso particolare (e qualsiasi garanzia implicita che sorga nel corso delle prestazioni, nel corso delle trattative o dell'uso commerciale). Fatti salvi i casi di dolo e colpa grave, in nessun caso TRANSFLUID sarà responsabile per danni diretti, indiretti, consequenziali, fortuiti od extracontrattuali basati su una richiesta d'indennizzo da parte del Compratore per violazione di garanzia, violazione di contratto, responsabilità oggettiva. In nessun caso il risarcimento da parte di TRANSFLUID potrà superare l'importo che il Compratore ha pagato per il prodotto fornito da TRANSFLUID.

2) Durata e limiti della garanzia

a) La durata della garanzia è pari a diciotto (18) mesi dalla messa in servizio del prodotto fornito da TRANSFLUID e comunque non oltre ventiquattro (24) mesi dalla data di spedizione del prodotto originale dallo stabilimento TRANSFLUID.

b) I prodotti, se inutilizzati e stoccati a lungo termine, devono essere immagazzinati e trattati in accordo alle linee guida redatte da TRANSFLUID per tipologia di prodotto che sono rese disponibili su richiesta.

c) La garanzia per le parti la cui usura o deterioramento è fortemente legata alle condizioni di impiego (tensionamento delle cinghie, condizioni ambientali, urti e sovraccarichi non previsti), alla sensibilità dell'operatore (utilizzo entro i limiti approvati), ad eventi esterni (inceppamenti della macchina condotta), non opera se tali parti sono state utilizzate (non sono nuove), o se non viene chiaramente dimostrato dal Compratore un eventuale difetto di fabbricazione riconducibile a TRANSFLUID.
Tipiche parti soggette ad usura o deteriorabili sono:
- filtri, tenute e guarnizioni
- molle, viti, tappi
- interruttori e fusibili
- materiali e superfici di attrito
- cinghie e catene
- lubrificanti in genere

d) L'installazione e la manutenzione dei prodotti TRANSFLUID deve essere eseguita in conformità a quanto indicato nel manuale di installazione, uso e manutenzione che viene sempre fornito a corredo di ogni prodotto.

e) In caso di fornitura di componenti sfusi/disassemblati, la garanzia copre solo ed esclusivamente eventuali difetti dei componenti stessi, relativamente al materiale o alle lavorazioni meccaniche effettuate da TRANSFLUID.

f) La garanzia decade nei casi in cui:
- il prodotto venga utilizzato oltre i limiti indicati nei cataloghi o manuali di installazione o in applicazioni non approvate da TRANSFLUID;
- la rottura derivi da abuso, negligenza, omessa o inadeguata manutenzione, mancato collegamento o controllo dei dispositivi di protezione o a seguito di incidenti;
- il prodotto venga modificato o disassemblato senza approvazione scritta di TRANSFLUID.

3) Prestazioni incluse/escluse nella garanzia

a) Eventuali prodotti o componenti i cui difetti, ad insindacabile giudizio di TRANSFLUID, sono coperti da garanzia, saranno riparati o sostituiti senza alcun addebito, salvo quanto stabilito ai punti successivi. Le parti sostituite saranno coperte dal residuo periodo della garanzia originale che resta in vigore sul prodotto inizialmente fornito (non decorrerà quindi un nuovo termine di garanzia).

BASIC GUARANTEE, TERMS AND CONDITIONS
TF 6401-GB - rev. 0

1) Preamble
TRANSFLUID guarantees that at the time of dispatch, its products comply with the specifications published in its catalogues or technical documents, which were valid at the time of dispatch, and that the products are free from defects in material and workmanship. These terms of guarantee substitute all other guarantees, including legal, expressed or implicit guarantees, including but not limited to, guarantees of saleability and suitability for a particular use (and any other implicit guarantee arising during the course of the services, negotiations or commercial use). Except in the event of serious negligence and fraud, under no circumstances will TRANSFLUID be held liable for direct, indirect, consequential, fortuitous or extra contractual damage based upon claims for compensation by the Buyer for violation of the guarantee, contract or objective responsibility. Under no circumstances can the compensation by TRANSFLUID exceed the amount paid by the Buyer for the product supplied by TRANSFLUID.

2) Duration and limits of the guarantee

a) The duration of the guarantee is equal to eighteen (18) months from the time the product supplied by TRANSFLUID is commissioned, and nonetheless, no more than twenty-four (24) months from the date of dispatch of the original product from TRANSFLUID's plant.

b) Product that are not used and stored for a long period must be kept and handled in keeping with the guidelines, which are available upon request, drawn up by TRANSFLUID according to product type.

c) The wear or tear of parts, which is particularly due to conditions of use (tension of the belts, environmental conditions, unforeseen knocks and overloading), or to the sensitivity of the operator (use within the approved limits) or to external circumstances (jamming of the machine), is not covered by the guarantee if these parts have been used (are not new), unless the Buyer can clearly prove the manufacturing defect, which is ascribable to TRANSFLUID.
Typical parts subject to wear or tear include:
- filters, seals and gaskets
- springs, screws, plugs
- switches and fuses
- material and friction surfaces
- belts and chains
- lubricants in general

d) Installation and maintenance of TRANSFLUID products must be carried out following the installation, use and maintenance manual, which is always supplied with each product.

e) With regard to the supply of loose/disassembled parts, the guarantee solely and exclusively covers faults of the components themselves, related to the material or mechanical workmanship carried out by TRANSFLUID.

f) The guarantee is no longer valid when:
- the product is used exceeding the limits stated in the catalogues or installation manuals, or in applications that are not approved by TRANSFLUID;
- breakage results from abuse, negligence, omission or inadequate maintenance, failed connection or control of the protection devices or as a result of accidents;
- the product is modified or disassembled without TRANSFLUID'S written approval.

3) Services included/excluded in the guarantee

a) In TRANSFLUID'S final decision, products or components, whose faults are covered by the guarantee, will be repaired or replaced at no extra cost, with the exception of the subsequent points. The replaced parts will be covered from the remaining period of the original guarantee, which stays in force for the product initially supplied (a new guarantee period will therefore not come into effect).

TRANSFLUID
trasmissioni industriali

TF 6401-I - rev. 0

b) Sono esclusi dalla garanzia, e pertanto restano a carico del Compratore, costi derivanti da:
- rimozione del prodotto TRANSFLUID dal macchinario in cui è inserito e relativa rimessa in servizio;
- adeguato imballaggio ed oneri derivanti da trasporti di andata e ritorno del materiale;
- ripristino di lubrificanti in genere, tubazioni, cofanature insonorizzanti, carter, ecc;
- qualsiasi altro costo non espressamente approvato per iscritto da TRANSFLUID.

c) Per le operazioni di smontaggio/reinstallazione/messa in servizio del prodotto, il Compratore potrà richiedere il supporto di un tecnico specializzato inviando un regolare ordine di acquisto. L'intervento sarà fatturato da TRANSFLUID applicando le correnti tariffe ASSIOT (Associazione Italiana costruttori organi di trasmissione, affiliata EUROTRANS).

d) TRANSFLUID non potrà essere ritenuta responsabile per mancati o minori profitti, costi per macchinari sostitutivi, fermi macchina, danni ad apparecchiature o proprietà causati da un eventuale malfunzionamento dei propri prodotti.

4) Modalità di richiesta di prestazioni in garanzia

a) Il Compratore, qualora intenda avvalersi della garanzia, dovrà informare TRANSFLUID per iscritto, entro 7 (sette) giorni dal momento in cui si è evidenziato un difetto, comunicando:
- descrizione del prodotto;
- numero di serie (ove previsto), numero di specifica o codice articolo;
- riferimento alla data ed al documento di acquisto o consegna;
- ragionevole prova che il difetto rientri nelle condizioni di garanzia completata da una descrizione dettagliata dell'anomalia o malfunzionamento ed eventualmente supportata da fotografie.

In caso di malfunzionamento occorso dopo la messa in servizio del prodotto, dovranno essere comunicati inoltre:
- tipo di applicazione;
- potenza e giri del motore (in caso di motore endotermico anche marca e modello);
- diametro, tipo, numero gole e posizione puleggia (se l'applicazione lo prevede);
- ore di funzionamento.

b) In base al prodotto coinvolto, al malfunzionamento segnalato, all'urgenza di intervento, TRANSFLUID indicherà se il prodotto stesso dovrà essere consegnato o spedito in porto franco ad un centro autorizzato o direttamente presso la propria sede.

c) Una volta ricevuto il prodotto, TRANSFLUID o il distributore autorizzato provvederanno ad una approfondita analisi;
se il prodotto sarà ritenuto coperto da garanzia:
- TRANSFLUID riparerà o sostituirà gratuitamente le parti necessarie al ripristino della piena e sicura funzionalità;

se il prodotto NON sarà ritenuto coperto da garanzia, TRANSFLUID:
- invierà un rapporto tecnico motivando la decisione;
- stilerà un preventivo di riparazione;
- solo dopo aver ottenuto l'ordine dal Compratore, procederà con la riparazione.

d) I prodotti riparati saranno restituiti al Compratore in porto assegnato, utilizzando lo stesso mezzo di trasporto con cui sono pervenuti (a meno che non sia diversamente specificato).

e) Qualora il Compratore decida di non accettare il preventivo di riparazione, dovrà comunicare per iscritto la propria decisione chiedendo esplicitamente la rottamazione o la restituzione delle parti che saranno spedite nello stato in cui si trovano.

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b) Excluded from the guarantee and remaining at the Buyer's expense are the costs resulting from:
- removal of the TRANSFLUID product from the machinery onto which it is fitted, and recommissioning;
- suitable packing and charges resulting from the return transport of the material;
- restoration of lubricants in general, piping, sound proof canopies, guards, etc.;
- all other costs not expressly approved in writing by TRANSFLUID.

c) The Buyer can request the support of a specialised technician to disassemble/re-install/recommission the product by sending a standard purchase order. TRANSFLUID will invoice the work, applying the current ASSIOT rates (Italian Association of Gears and Transmission Elements Manufacturers, a member of EUROTRANS).

d) TRANSFLUID cannot be held liable for lost or reduced profit, costs for replaced machinery, still machinery, damage to equipment or property caused by failure of its products.

4) Conditions for requesting services under guarantee

a) If the Buyer intends to take advantage of the guarantee, he must inform TRANSFLUID in writing within 7 (seven) days of discovering a fault, stating:
- product description;
- series number (where foreseen), specification number or article code;
- reference to the date and document of purchase or delivery;
- reasonable proof that the fault falls within the conditions of guarantee, together with a detailed description of the irregularity or failure and where possible, supported by photographs.

In the event of failure after commissioning the product, the following must also be communicated:
- type of application;
- power and engine rpm (stating also the make and model for endothermic engines);
- diameter, type, number of races and position of pulley (if foreseen by the application);
- hours of operation.

b) TRANSFLUID will indicate whether the product must be delivered or sent free port to an authorised centre or directly to its own plant depending on the product concerned, the failure indicated and the urgency of the intervention.

c) On receiving the product, TRANSFLUID or the authorised distributor will carry out a thorough analysis; if the product is deemed to be covered by the guarantee:
- TRANSFLUID will repair or replace the parts needed to restore full and safe working at no cost;

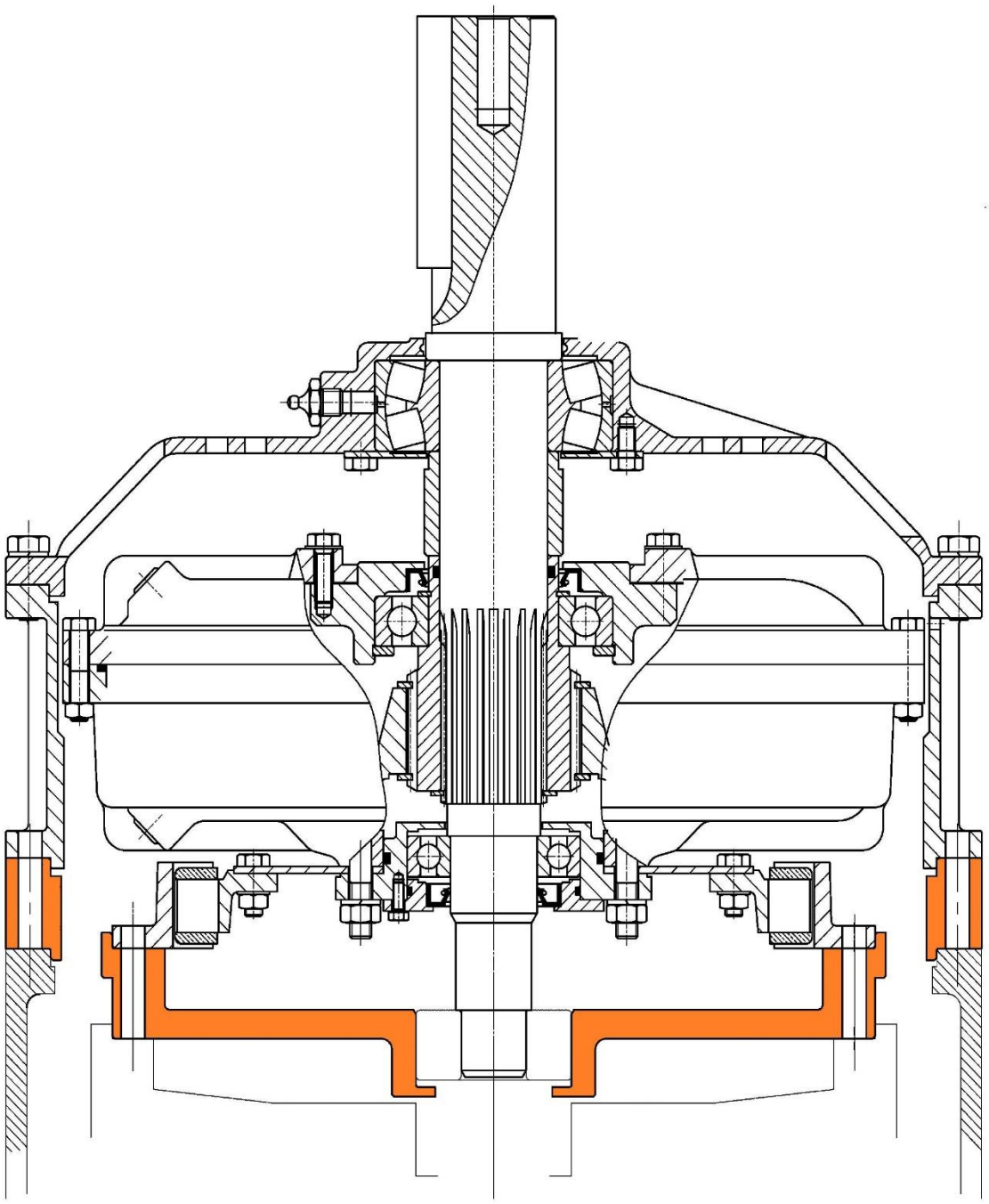
If the product is NOT deemed to be covered by the guarantee, TRANSFLUID:
- will send a technical report explaining its decision;
- will draw up an estimate for the repair;
- will carry out the repair upon receipt of the order from the Buyer.

d) The repaired products will be returned to the Buyer freight collect, by the same means of transport that was used for the arrival (unless stated otherwise).

e) Should the Buyer decide not to accept the estimate for the repair, he must communicate his decision in writing, explicitly asking for the parts to be scrapped or returned; the parts will be sent in their current state.

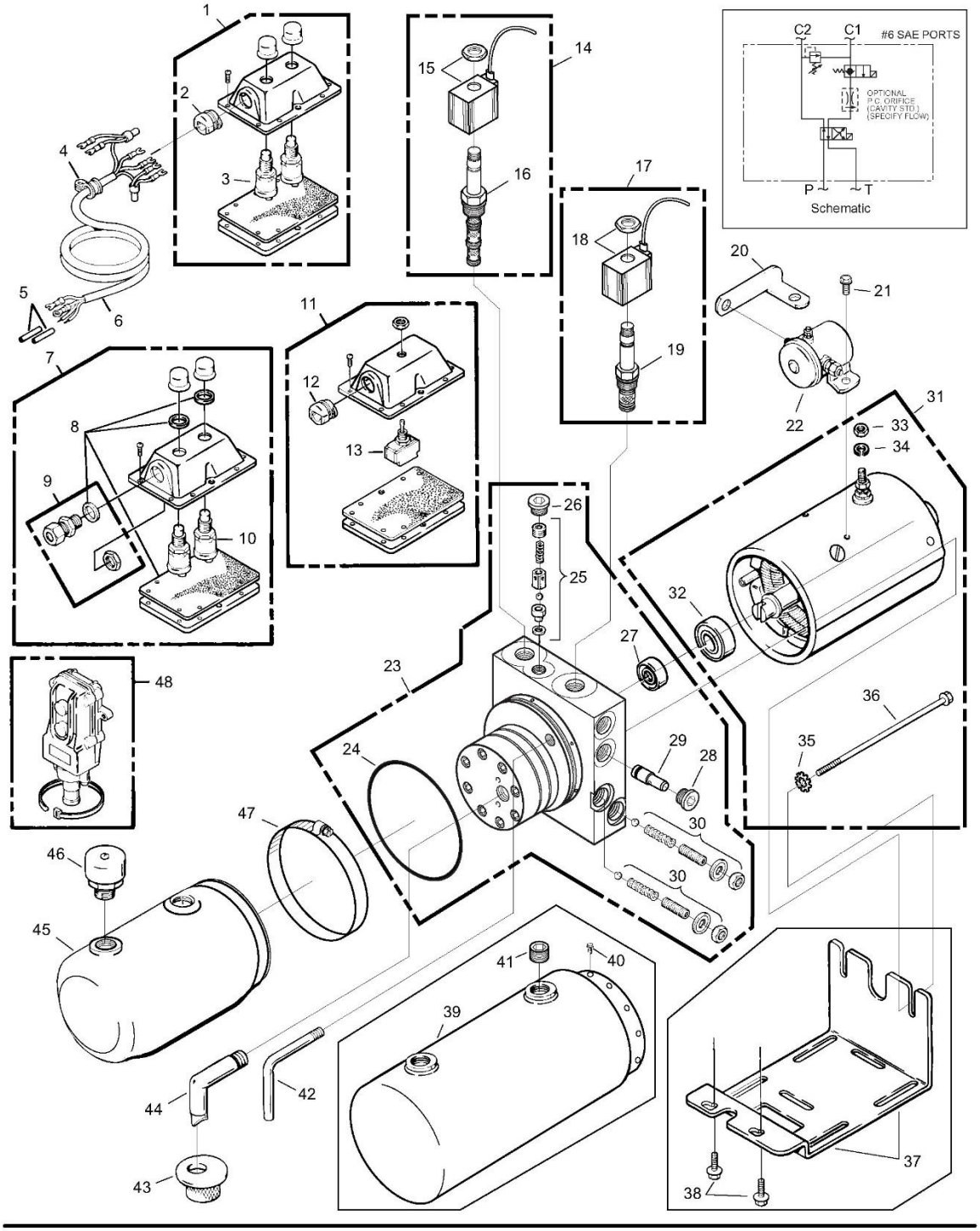
TRANSFLUID s.r.l. · Via G. Rossa, 4 · 20013 Gallarate (VA) Italy Tel. +39-0331 2842.1 · Fax +39-0331 2842911 · e-mail: info@transfluid.it · www.transfluid.eu
0806 - 156 I/GB

Fluid coupler for Kohler Engines



9.3. MONARCH POWER UNIT

Dyna-Jack® **M-3551**

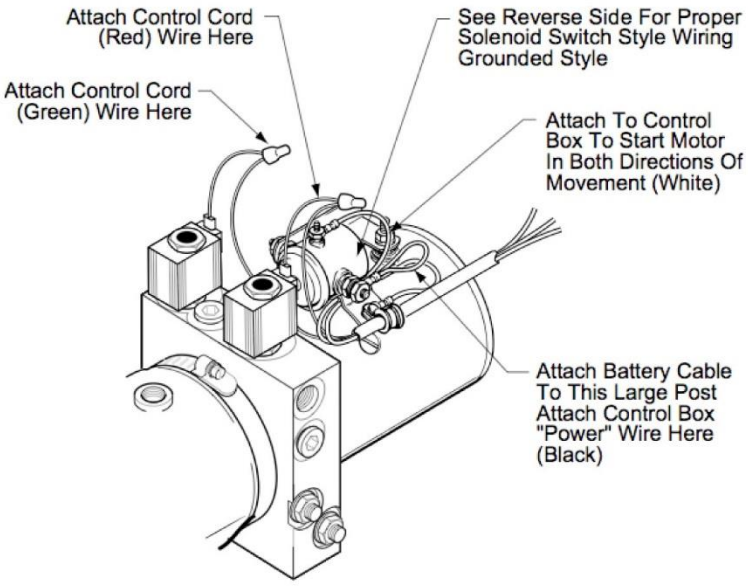


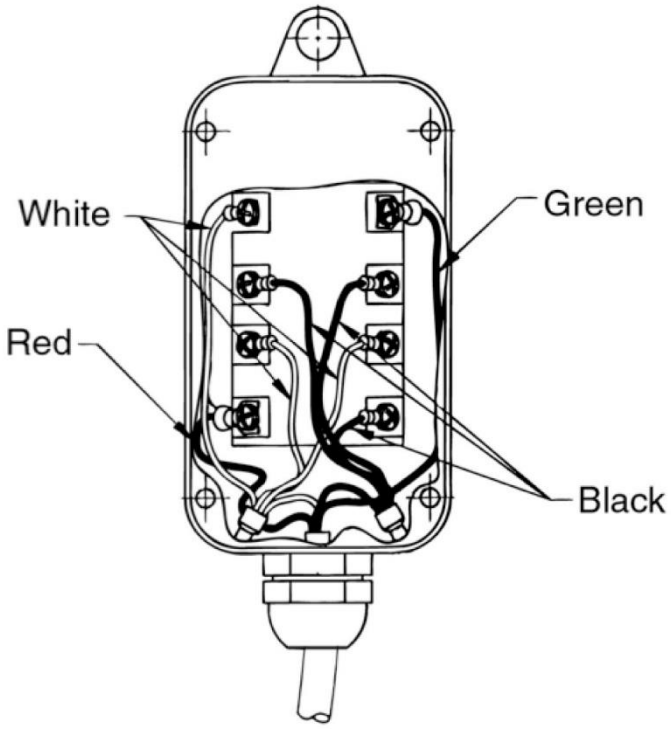
M-3551

Ref. No.	Part No.	Description	No. Req.
1	03404	BOX ASSEMBLY, Push Button	1
2	01418	• STRAIN RELIEF, (Plastic)	1
3	03345	• SWITCH, Push Button, 3-Terminal	2
4	01076	CLAMP, Cable	1
5	01412	TERMINAL, Butt Connector	2
6	03734	Cord, Harness, 72" 16-4, valve grounded (push button)	1
	03351	Cord, Harness, 72" 16-4, switches grounded (push button)	1
	03735	Cord, Harness, 72" 16-4, valve grounded (toggle & rocker)	1
	03490	Cord, Harness, 72" 16-4, switches grounded (toggle & rocker)	1
7	03453	BOX ASSEMBLY, Push Button (weatherproof)	1
8	03690	• PARTS KIT, Gasket, (weatherproof)	1
9	03691	• PARTS KIT, Strain Relief, (weatherproof)	1
10	03369	• SWITCH, Push Button, 3-Terminal (weatherproof)	2
11	03487	BOX ASSEMBLY, (Toggle Switch)	1
12	01418	• STRAIN RELIEF, (plastic)	1
13	03394	• SWITCH, Toggle	1
14	07132	VALVE, 4 Way - 2 Position, (12V)	1
	07361	VALVE, 4 Way - 2 Position, (24V)	1
15	00678	• COIL, 10 VDC, grounded	1
	07301	• COIL, 18 VDC, grounded	1
16	00455	• CARTRIDGE, 4 Way - 2 Position	1
17	00707	VALVE, 2 Way - 2 Position, 12 VDC, grounded	1
	07158	VALVE, 2 Way - 2 Position, 24 VDC, grounded	1
18	00678	• COIL, 10 VDC, 2 Way - 2 Position, grounded	1
	07301	• COIL, 18 VDC, grounded	1
19	07193	• CARTRIDGE, 2 Way - 2 Position, N.C.	1
20	01349	STRAP, Motor-Solenoid Connecting	1
21	07683	SCREW, Round Head Machine 10-32 x 1/4"	2
22	03427	SWITCH, Solenoid, 12 VDC, 3-post grounded to can	1
	03335	SWITCH, Solenoid, 12 VDC 4-post isolated ground	1
	03467	SWITCH, Solenoid, 24 VDC, 3 post, grounded to can	1
	03343	SWITCH, Solenoid, 24 VDC, 3 post, insulated ground	1
23	12037	PUMP ASSEMBLY, Gear Code 72, (#6 SAE Ports)	1
	12038	PUMP ASSEMBLY, Gear Code 62, (#6 SAE Ports)	1
	07461	PUMP ASSEMBLY, Gear Code 43, (#6 SAE Ports)	1
	07458	PUMP ASSEMBLY, Gear Code 42, (#6 SAE Ports)	1
	07464	PUMP ASSEMBLY, Gear Code 03, (#6 SAE Ports)	1

Ref. No.	Part No.	Description	No. Req.
24	02352	• O-RING, Industrial (3-5/8 x 3-7/8 x 1/8)	1
25	03624	• PARTS KIT, Valve Assembly, poppet/ball check	1
26	03276	• PLUG	1
27	02159	• SEAL	1
28	03274	• PLUG, #8 SAE	1
29	01723-x.xx	• VALVE, Press, comp. orifice (specify gpm for x.xx)	1
30	07527	• PARTS KIT, Relief Valve	2
		FOR FURTHER BREAKDOWN OF PUMP ASSEMBLY, SEE PUMP SECTION	
31	08111	MOTOR, Electric, 12 VDC	1
	08112	MOTOR, Electric, 12 VDC	1
	08120	MOTOR, Electric, 24 VDC	1
32	02318	• BEARING, Base, motor	1
33	07625	• NUT, Hex 5/16-24	1
34	07781	• WASHER, Lock 5/16"	1
35	07737	• WASHER, Star 1/4"	2
36	07738	• SCREW, Hex Head Cap 1/4-20 x 6-1/2"	2
		FOR FURTHER BREAKDOWN OF MOTOR, SEE MOTOR SECTION	
37	02238	BRACKET, Mounting	1
38	07889	SCREW, Hex Head, thread forming 1/4-20 x 1-3/8"	2
39	06042	RESERVOIR, 6" x 9' , metal	1
	06044	RESERVOIR, 6" x 13.5"	1
40	07703	SCREW, Thread Forming 10-24 x 3/8"	6
41	02349	PLUG, 3/8" NPTF	1
42	01203	TUBE, Return (1/8")	1
43	01134	SCREEN, Filter (suction)	1
44	01209	TUBE, Filter Suction 3/8 NPT 90 Deg.	1
45	06102	RESERVOIR, 4-1/2" Dia. x 8", Plastic	1
	06103	RESERVOIR, 4-1/2" Dia. x 10", Plastic	1
	06104	RESERVOIR, 4-1/2" Dia. x 12", Plastic	1
46	03866	PLUG, Vent, 3/8" NPT	1
47	07900	CLAMP, Hose Worm Gear (in series)	1
48	03240	BOX ASSEMBLY, Push Button (weather proof)	1

M-3551
(M-352 is Similar)





4 - Wire Cord (4 Way)
Terminal Connections
(M-352)(M-642)
(M-3551)(M-3552)

9.4. NORTH AMERICAN SIGNAL TRAFFIC ASSIST III

LED Traffic Assist™III (12/24VDC)

Installation and operating instructions for:
TA18LPS-A, TA36LP-A, TA36LP-A2
TA42LP-A, TA42LP-A2, TA52LP-A and TA52LP-A2

1. The package should contain the following:
   a. LED Traffic Assist™ III light bar with 25 feet of cable and 12 pin connector taped to end of cable;
   b. Control Head with 8 inches of cable;
   c. 2, 3, or 4 - "L" brackets (depending on model) for optional mounting
   d. Instruction sheet.
2. Attach the LED Traffic Assist Control Head to the dash using the bolts provided. Connect the red/black duplex wire to power (fused for a minimum of 5 Amps) and to a ground.
3. Install the LED Traffic Assist bar horizontally, with the curved side up (product label facing up and cable exiting the passenger side of the vehicle when installed in the rear of the vehicle), in one of the following two ways:
   a. Attach to any vertical surface using the ¼" x 20 - 5/8 inch long stainless steel hex bolts coming out the rear of the bar; or
   b. Mount the two "L" brackets on a horizontal surface and attach the Traffic Assist bar to the "L" brackets.
4. NOTE: For TA18LPS versions, 10' of interconnect cable connects the two 4-segment heads, each half is clearly marked as "LEFT" & "RIGHT" sides. When positioned correctly the power cable runs up the passenger side of the vehicle for rear mount. Unit comes pre-assembled unless otherwise noted.
5. Run the 12 conductor cable from the LED Traffic Assist™ to the control head. Be sure to leave the connector off until cable is completely installed in the vehicle.
6. Plug the individual wire pins into the 12 pin connector taped to the end of the cable according to the color coded diagram shown below and also the diagram shown on the back of the LED Traffic Assist Control Head.

#	COLOR	#	COLOR	#	COLOR	#	COLOR
4	PINK	3	RED	2	BROWN	1	BLACK
8	TAN	7	WHITE	6	GREEN	5	VIOLET
12	YELLOW	11	ORANGE	10	GRAY	9	BLUE

7. Assemble the two connectors together and verify everything is working properly.

OPERATING INSTRUCTIONS

(Use the following diagram for mode operation)

Various functions for either the 7 or 8 segment system.

BUTTON NAME	PRESS ONCE	PRESS TWICE	PRESS THREE TIMES
OFF	Turns system off	N/A	N/A
LEFT ARROW	Lights sequence from right to left until all are on and turn off in the same sequence	Lights sequence from right to left until all are on and then turn off all at once	Lights sequence from right to left until all are on, then the last flashes three times, then all turn off at once
CENTER ARROW	Lights sequence from center out until all are on and the turn off in the same sequence	All lights are quad flashing with the last flash on a delay	Three lights rapidly move from left to right, generating an attention gathering pattern
RIGHT ARROW	Lights sequence from left to right until all are on and turn off in the same sequence	Lights sequence from left to right until all are on and then turn off all at once	Lights sequence from left to right until all are on, then the last flashes three times, then all turn off at once
FAST / SLOW	Fast	Slow	Fast

* Custom Flash Patterns are available upon request. Please inquire at 1-877-246-6274 or sales@nasig.com.

LIMITED WARRANTY

North American Signal Company warrants that the LED Traffic Assist™III will be free of defects in material and workmanship for a period of 5 years from date of manufacture, under normal use and service. This warranty does not cover ordinary wear and tear, abuse, misuse, overloading, altered products, or damage caused by the purchaser connecting the unit to the wrong voltage or polarity. All products in need of repair must be returned to our factory freight prepaid. North American Signal Company reserves the right to determine in its sole discretion, whether to repair or replace a unit found to be defective under this LIMITED WARRANTY, and will then return the unit freight prepaid. THERE IS NO WARRANTY OF MERCHANTABILITY. THERE ARE NO WARRANTIES WHICH EXTEND THE DESCRIPTION HEREIN. THERE ARE NO WARRANTIES EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE, EXCEPT AS SET FORTH HEREIN.

In returning product, first try to determine if the controller and / or the Traffic Assist bar is not functioning. If only the bar is having problems, remove the end of the bar where the cable enters the unit and unplug the 12 pin connectors. Then detach the bar from its mounting and return this unit to the factory. If the controller is also not functioning, then detach the controller and bar and send them both to the factory.

North American Signal Company, 605 S. Wheeling Road, Wheeling, IL, 60090
Toll free: 877-246-6274, Fax: 847-537-8895, Email: sales@nasig.com, www.nasig.com

Revision 2.7, 1/1/2018

9.5. WETTING SYSTEM PUMP

SHURflo

2088 INDUSTRIAL SERIES PUMPS

Installation and Operation Manual

SHURflo offers various pumps models for different applications. The information outlined by this manual is general, and not specific to all 2088 series pumps. Be certain the pumps' materials will be compatible with the fluid being pumped. 2088 series pumps are intended for intermittent or continuous duty when the proper operating criteria is met. Product Data Sheets outlining specific thermal limits, load, flow curves, and other technical information for a particular model are available. If unsure of the chemical compatibility with a given elastomer or the motors intended design, please call SHURflo for assistance.

CAUTION: "Intermittent Duty" is defined as; operated and/or frequently started within a period of time that would cause the motor to reach its maximum thermal limits. Once the maximum thermal limit is obtained, the motor must be allowed to return to ambient temperature before resuming operation.

CAUTION: ***DO NOT*** use to pump flammable liquids. Never operate the pump in an explosive environment. Arcing from the motor brushes, switch or excessive heat from an improperly cycled motor may cause an explosion.

CAUTION: ***DO NOT*** assume fluid compatibility. If the fluid is improperly matched to the pumps' elastomers, a leak may occur. Pumps used to transfer hazardous or hot (max. temperature 170°F [76°C] viton only) chemicals must be in a vented area to guard against the possibility of injury due to harmful or explosive liquid/vapors.

CAUTION: ***DO NOT*** operate the pump at pressures which cause the motor to exceed the amperes rating indicated on the name plate. Various pump models are equipped with thermal breakers to interrupt operation due to excessive heat. Once the temperature of the motor is within proper limits it will automatically reset, and the pump ***will start operation without warning.***

CAUTION: To prevent electrical shock, disconnect power before initiating any work. In the case of pump failure, the motor housing and/or the pumped fluid may carry high voltage to components normally considered safe.

PRESSURE SWITCH OPERATION

The pressure switch reacts to outlet pressure, and interrupts power at the preset shut-off pressure indicated on the pump label. When outlet pressure drops below a predetermined limit (typically 15-20 psi.[1-1.4 bar] less than the shut-off pressure), the switch will close and the pump wil operate until the shut-off (high) pressure is achieved. The shut-off pressure is set to factory calibrated standards. See the motor label and Product Data Sheet for specific pump specifications.

CAUTION: Improper adjustment of the pressure switch, may cause severe overload or premature failure. Refer to SHURflo Service Bulletin #1031 for the adjustment procedure. Failures due to improper adjustment of the pressure switch will not be covered under the limited warranty.

If the plumbing is restrictive or the flow rate is very low, the pump may re-pressurize the outlet faster than the fluid is being released causing rapid cycling (ON/OFF within 2 seconds). If the pump is subjected to rapid cycling during normal operation, or for infrequent periods, damage may occur. Applications which exhibit rapid cycling should have restrictions in the outlet minimized. If not feasible considered a SHURflo Accumalator or a SHURflo "bypass" model pump.

BYPASS OPERATION

A bypass pump may be used for applications that normally induce frequent start/stop of the motor, and thereby create a potential for overheating. Models equipped with an internal bypass are designed to pump at high pressure while at low flow rates. Bypass models equipped with a switch may operate for several seconds even though the outlet side has been closed off. Contact SHURflo for information regarding bypass pumps.

MOUNTING

- The 2088 series pumps are self priming. Horizontal and vertical prime vary depending on the fluid viscosity and pump configuration. Refer to the pumps Product Data Sheet.
- The pump should be located in an area that is dry and provides adequate ventilation. If mounted within an enclosure, provisions to cool the motor may be necessary. Heat sinks which attach to the motor are available from SHURflo if increased heat dissipation is necessary.

CAUTION: ***DO NOT*** locate the motor near low temperature plastics or combustible materials. The surface temperature of the motor may exceed 250°F [120°C]. Refer to the pumps Product Data Sheet.

- The pump may be mounted in any position. However, if mounting the pump vertically the pump head should be in the down position so that in the event of a leak, fluid will not enter the motor.
- Secure the rubber feet with #8 hardware. ***DO NOT*** compress the feet, doing so will reduce their ability to isolate vibration/noise.

PLUMBING

- Flexible high pressure tubing compatible with the fluid should be used to connect the inlet/outlet ports. Tubing should be either $^3/_8$" or $^1/_2$" [10 or 13 mm] I.D., and at least 18 in. [46 cm] length is suggested to minimize stress on the fitting/ports and reduce noise. Allow for the shortest possible tubing route and avoid sharp bends that may kink over time.

NOTE: Restrictions on the inlet may cause vacuum levels to reach the fluid vapor pressure, causing cavitation, degassing, vapor lock and a loss in performance. Inlet pressure ***must*** not exceed 30 psi.[2.1 bar] maximum.

- **1/2" Male threaded models:** Are intended to be used with SHURflo Swivel Barb Fittings which seal with an internal taper when ***hand tightened***. Standard 1/2" NPT fittings may be used when tightened to a maximum torque of 3.7 ft\Lb (45 in\Lb) [5 Nm].

NOTE: SHURflo does not recommend the use of metal fittings or rigid pipe to plumb the inlet/outlet ports. Standard plastic male and female threaded fittings can be acquired at commercial plumbing supply stores. SHURflo also distributes Swivel Barb Fittings, and special fitting through it's dealers (Form #07-010-0011).

CAUTION: Sealers and Teflon tape may act as lubricant causing cracked housings or stripped threads due to over-tightening. Care should be used when applying sealers. Sealers may enter the pump inhibiting valve action, causing no prime or no shut-off. ***Failures due to foreign debris is not covered under warranty.***

- Installation of a 50 mesh strainer is recommended to prevent foreign debris from entering the pump.
- If a check valve is installed in the plumbing, it must have a cracking pressure of no more than 2 psi [.14 bar].

ELECTRICAL

CAUTION: Electrical wiring should be performed by a qualified electrician, in accordance with all local electrical codes.

- The pump should be on a dedicated (individual) circuit, controlled with a double pole switch (U.L./C-UL certified) rated at or above the fuse ampere indicated by the pump motor label. Depending on distance of the power source from the pump and ampere load on the circuit, wire may need to be heavier than indicated by the chart.

CAUTION: All 115 VAC and 230 VAC pump motors and systems, ***MUST*** be ground per local and state electrical codes.

- Improper duty cycle and/or rapid start & stop conditons may cause the internal thermal breaker (if equipped) to trip, or can result in premature motor failure due to excessive heat. Refer to the pumps Product Data Sheet.

- For the pump to meet U.L./C-UL requirements the circuit ***MUST be protected with a slow-blow fuse*** (U.L./C-UL certified) or equivalent circuit breaker as indicated on the motor label. Use an approved wire of the size specified or heavier.

VOLTAGE	WIRE LEADS	WIRE SIZE	FUSE RATING
12 DC	RED (positive +) BLACK (negative -)	#14 AWG [2.5 Mm^2] (or heavier)	SEE PUMP MOTOR LABEL
24 DC			
36 DC			
115 AC	BLACK (common) WHITE(neutral) GREEN (ground)	#16 AWG C-UL - TEW / UL 1015 (or heavier) [1 Mm^2]	
230 AC①	BROWN (common) BLUE (neutral) GRN/YELL (ground)		

① VDE requires a fuse (slow blow) or equivalent circuit breaker.

CAUTION: Circuit protection is dependent on the individual application requirements. Failure to provide proper overload / thermal devices may result in a motor failure, which will not be covered under warranty.

TROUBLESHOOTING

PUMP WILL NOT START:
- ✓ Fuse or breaker
- ✓ For correct voltage (±10%) and electrical connections
- ✓ Pressure switch operation and correct voltage at switch or motor wires (as equipped).
- ✓ Rectifier or motor for open or grounded circuit
- ✓ For locked drive assembly

WILL NOT PRIME: (No discharge/Motor runs)
- ✓ Out of product
- ✓ Strainer for debris
- ✓ Inlet tubing/plumbing for severe vacuum leak
- ✓ Inlet/Outlet tubing severely restricted (kinked)
- ✓ Debris in pump inlet/outlet valves
- ✓ Proper voltage with the pump operating (±10%)
- ✓ Pump housing for cracks

LEAKS FROM PUMP HEAD OR SWITCH:
- ✓ For loose screws at switch or pump head.
- ✓ Switch diaphragm ruptured or pinched
- ✓ For punctured diaphragm if fluid is present at bottom drain

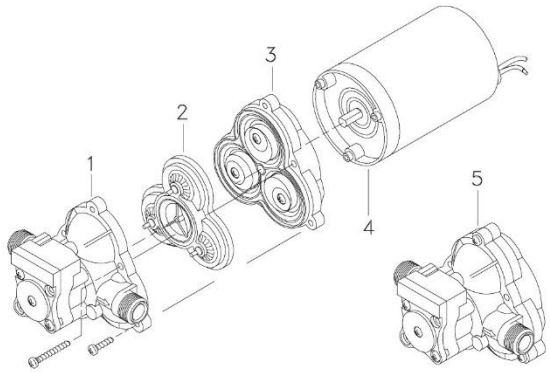
PUMP WILL NOT SHUT-OFF: (Pressure switch equipped)
- ✓ Output line closed and no leaks
- ✓ For air trapped in outlet line or pump head
- ✓ For correct voltage to pump(±10%)
- ✓ Inlet/Outlet valves for debris or swelling
- ✓ For loose drive assembly or pump head screws
- ✓ Pressure switch operation/adjustment incorrect refer to S/B #1031 for differential and pressure adjustment procedure

NOISY / ROUGH OPERATION:
- ✓ Mounting feet that are compressed to tight
- ✓ Does the mounting surface multiply noise (flexible)
- ✓ For loose pump head or drive screws
- ✓ Is the pump plumbed with rigid pipe causing noise to transmit

SERVICE KITS

Kits are readily available to repair standard 2088 series pumps. Repair kits include simple illustrated instructions allowing easy installation. To insure that the correct kit is received the model numbered and all name plate data must be included with the order. Contact a SHURflo distributor or SHURflo directly to order the necessary repair kit.

1	Switch / Check valve and Upper Housing Kit (Replaces all previous switch designs)
2	Valve plate assembly
3	Diaphragm / Drive assembly
4	Motor
5	Complete Pump Head assembly (includes parts # 1,2,3) (Replaces all previous switch designs)



RETURN POLICY

All Industrial pumps/products ***must*** be flushed of ***any*** chemical **(**ref. OSHA Section 1910.1200 (d)(e)(f)(g)(h)**)** and hazardous chemicals ***must*** be labeled/tagged before being *shipped to SHURflo for service or warranty consideration. SHURflo reserves the right to request a Material Safety Data Sheet from the returnee for any pump/product it deems necessary. SHURflo reserves the right to "disposition as scrap" pumps/products returned which contain unknown fluids. SHURflo reserves the right to charge the returnee for any and all costs incurred for chemical testing, and proper disposal of components containing unknown fluids. SHURflo request this in order to protect the environment and personnel from the hazards of handling unknown fluids.

LIMITED WARRANTY PROCEDURE

SHURflo warrants Industrial 2088 series pumps to be free from material and workmanship defects (under normal use and service) for a period of one (1) year from the date of manufacture. or (1) one year use with proof of purchase, not to exceed (2) two years in any event.

The limited warranty will not apply to pumps that were improperly installed, misapplied, or incompatible with fluids or components not manufactured by SHURflo. SHURflo will not warrant any pump which is damaged or modified outside the SHURflo factory.

All Industrial pumps/products ***must*** be flush of ***any*** chemicals before *shipping. All warranty considerations are governed by SHURflo's written Return Policy.

Returns are to be shipped postage prepaid to either service center; SHURflo Garden Grove, CA or Elkhart, IN. SHURflo shall not be liable for freight damage incurred during shipping. Package returns carefully.

Upon receiving a pump, it will be tested per SHURflo's test criteria. SHURflo's obligation under this warranty policy is limited to the repair or replacement of the unit. Pumps found not defective (under the terms of this limited warranty) are subject to charges to be paid by the returnee for the testing and packaging of "tested good" units.

No credit or labor allowances will be given to the returnee for pumps returned as defective. Warranty replacements will be shipped on a freight allowed basis. SHURflo reserves the right to choose the method of transportation.

This limited warranty is in lieu of all other warranties, expressed or implied, and no other person is authorized to give any other warranty or assume obligation or liability on SHURflo's behalf. SHURflo shall not be liable for any labor, damage or other expense, nor shall SHURflo be liable for any indirect, incidental or consequential damages of any kind incurred by the reason of the use or sale of any defective product or part. This limited warranty covers pumps distributed within the United States of America. Other world market areas should consult with the distributor for any deviation from this document.

* Carriers, including U.S.P.S., airlines, UPS, ground freight, etc., require specific identification of any hazardous materials being shipped. Check with your shipping company for specific instructions. Failure to do so may result in a substantial penalties.

★ ISO Certified Facility

SHURflo®
a WICOR Company

NSF COMPONENT

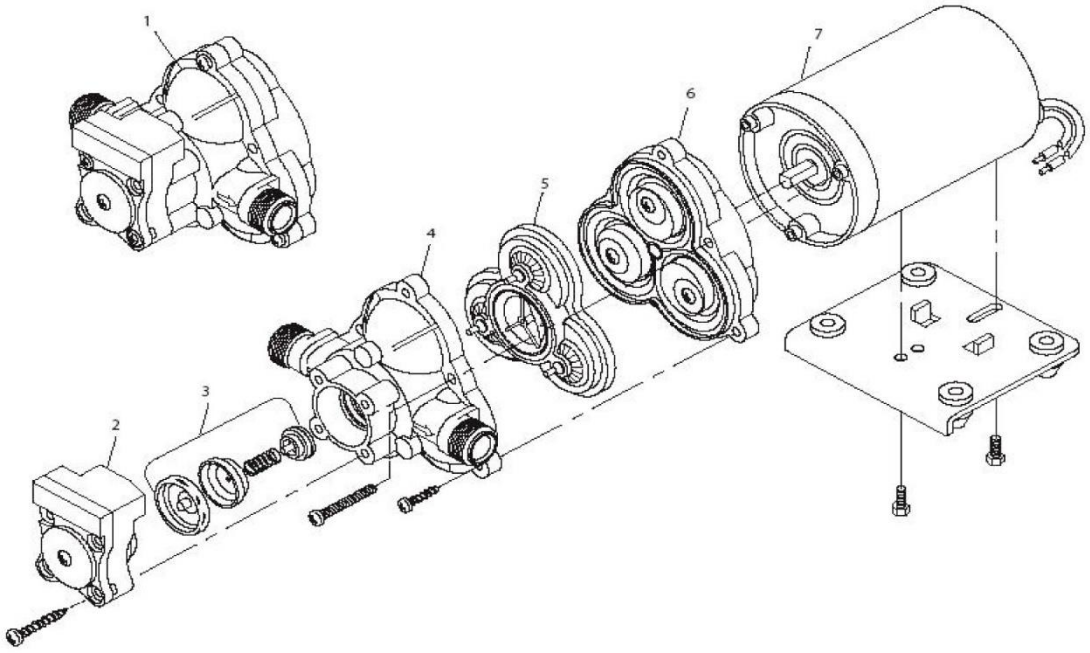
SHURflo reserves the right to update specifications, prices, or make substitutions.

SHURflo ★
12650 Westminster Ave.
Santa Ana, CA 92706-2100
(800) 854-3218 (714) 554-7709
FAX (714) 554-4721
Shipping/UPS: 12650 Westminster Ave.
Garden Grove, CA 92843

SHURflo East
52748 Park Six Court
Elkhart, IN 46514-5427
((800) 762-8094
(219) 262-0478
FAX (219) 264-2169

SHURflo Ltd.
Unit 5 Sterling Park
Gatwick Road, Crawley
West Sussex, RH10 2QT
United Kingdom
+44 1293 424000
FAX +44 1293 421880

2088 Replacement Kits



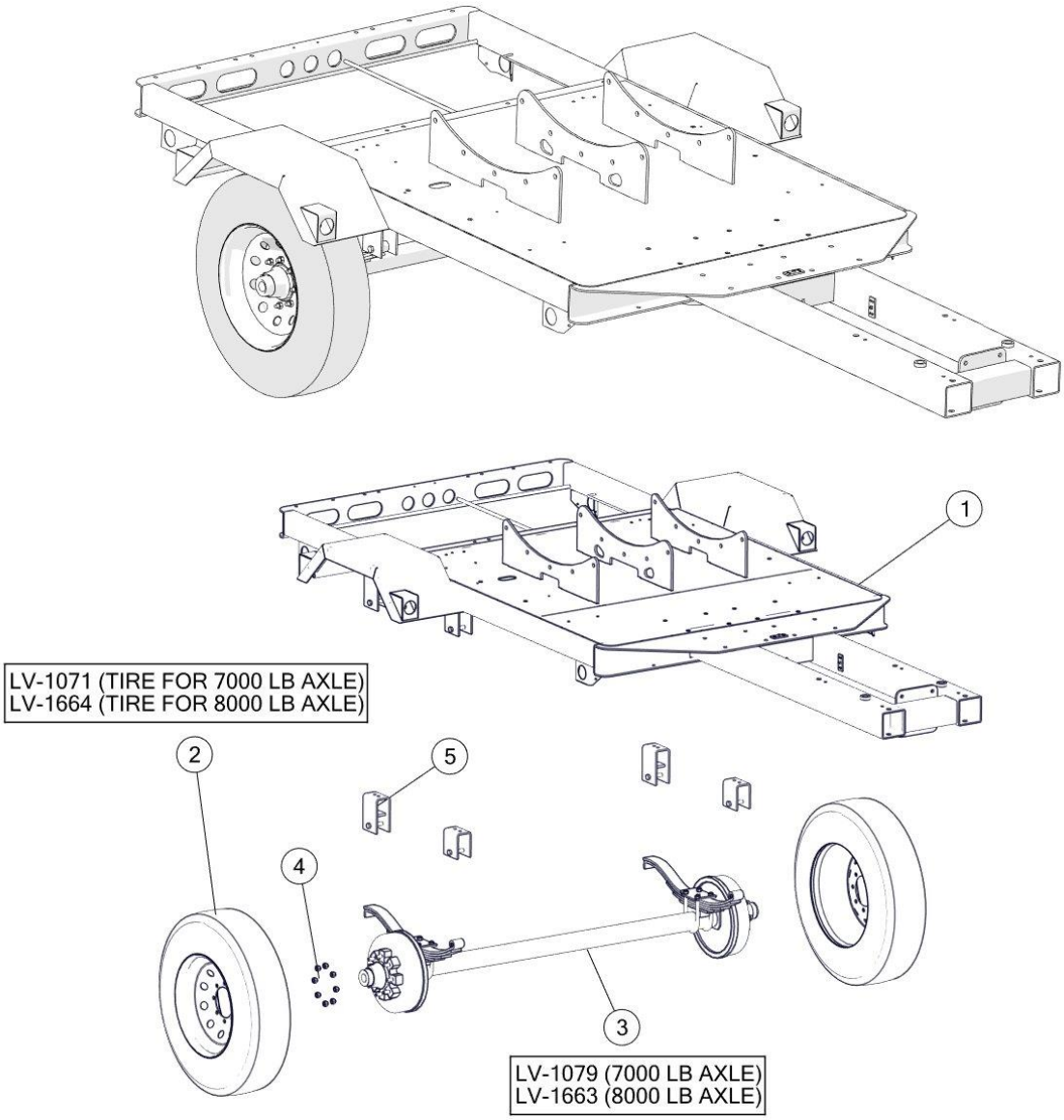
Model Number	1 Complete Pumphead Assembly	2 Switch Assembly	3 Check Valve Assembly	4 Upper Housing	5 Bypass/ Non Bypass Valve Assembly	6 Drive/Impeller Diaphragm Assembly	7 Motor
2088-514-500	N/A	N/A	N/A	94-238-00	94-232-00	94-238-03	11-226-07

10. PART BREAKDOWNS

10.1. AXLE AND TIRE TO CHASSIS ASSEMBLY

AXLE AND TIRES TO CHASSIS ASSEMBLY- TITAN

TITAN STEP 1 CONFIGURATIONS



BOM ID	Qty	PartNo (config)	Description (config)
1	1	LV-2485	TITAN CHASSIS WELDMENT
2	2	SEE ABOVE	TITAN TIRE AND RIM ASSEMBLY
3	1	SEE ABOVE	TITAN AXLE ASSEMBLY COMPLETE WITH LUG NUTS
4	16	BON-000297	1/2-20 TPI LUG NUT (7000 AXLE ONLY)
5	1	LV-1076	AXLE HANGER KIT. (SINGLE SLIPPER STYLE)

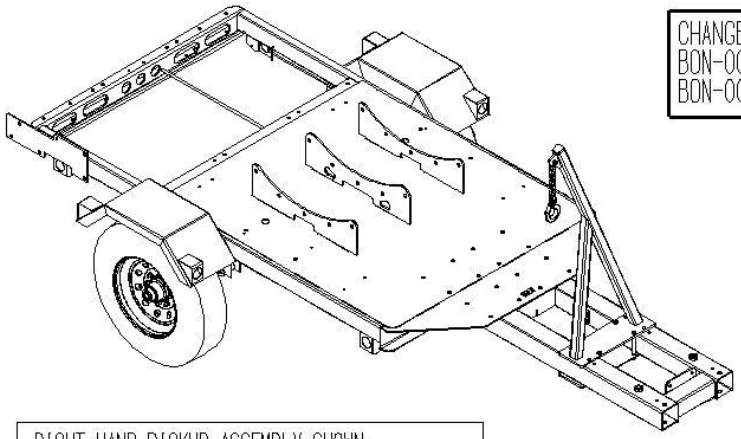
DOCUMENT 1.1

10.2. Hose Arm Support For Manual Arm with Overhead Boom & 3-Axis Hydraulic Arm With Fixed Discharge Snout

HOSE ARM SUPPORT ASSEMBLY - LEAF VAC

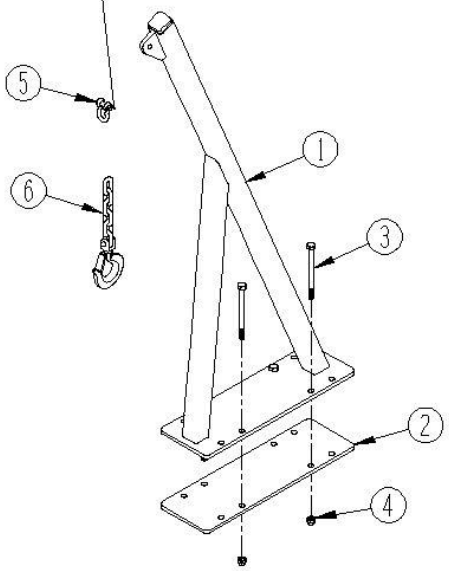
(LEAF VACUUMS WITH 3-AXIS HYDRAULIC ARM WITH A FIXED DISCHARGE SNOUT)

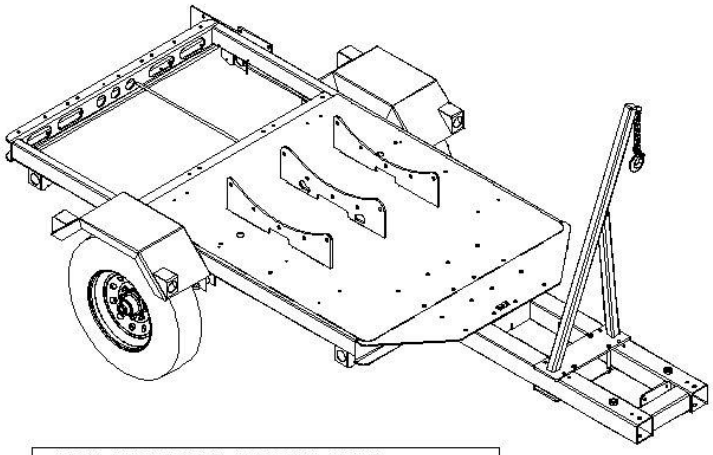
051820 LV-2025-EXP-STEPS



RIGHT HAND PICKUP ASSEMBLY SHOWN;
(FOR UNITS WITH FIXED DISCHARGE SNOUTS ONLY)

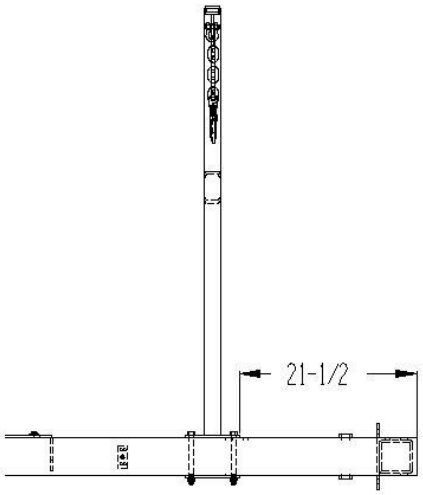
CHANGE OUT COTTER PIN WITH:
BON-000090 - 7/16-14TPI X 2-1/2" BOLT
BON-000320.5 - 7/16-14TPI LOCK NUT





LEFT HAND PICKUP ASSEMBLY SHOWN;
(FOR UNITS WITH FIXED DISCHARGE SNOUTS ONLY)

ITEM	QTY	PART #	DESCRIPTION
1	1	LV-2025	HOSE ARM SUPPORT WELDMENT
2	1	LV-2025-1	BOTTOM PLATE
3	4	BON-000121	1/2"-13TPI X 6" GRADE 8 BOLT
4	4	BON-000321	1/2"-13TPI HEX LOCK NUT NYLON INSERT
5	1	BON-000660.6	ROUND PIN ANCHOR SHACKLE 3/8" 1 TON
6	1	LV-2024	6 LINK HOSE ARM TIE UP CHAIN



THIS DIMENSION IS THE SAME FOR RIGHT AND LEFT HAND UNITS

BONNELL INDUSTRIES INC

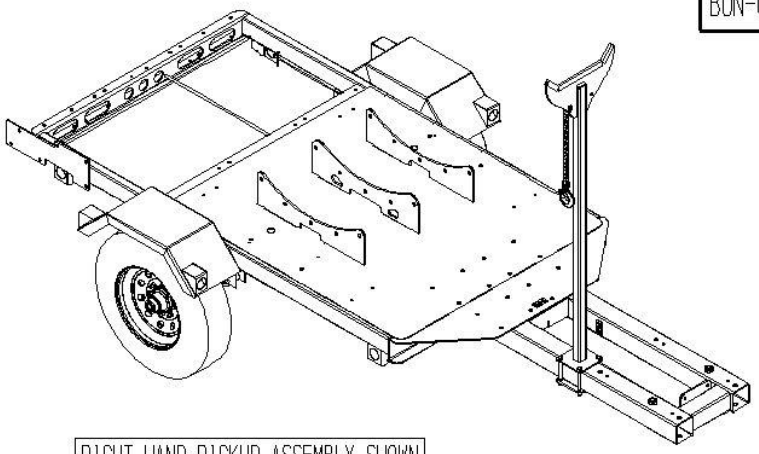
DIXON, ILLINOIS
PHONE: 800-851-9664

DOCUMENT 2.1

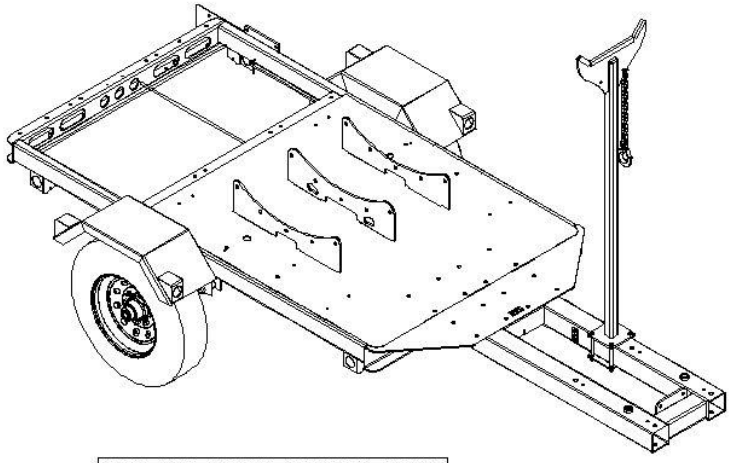
10.3. SNOUT SUPPORT FOR SWIVEL DISCHARGE

SWIVEL DISCHARGE TUBE ASSEMBLY - LEAF VAC

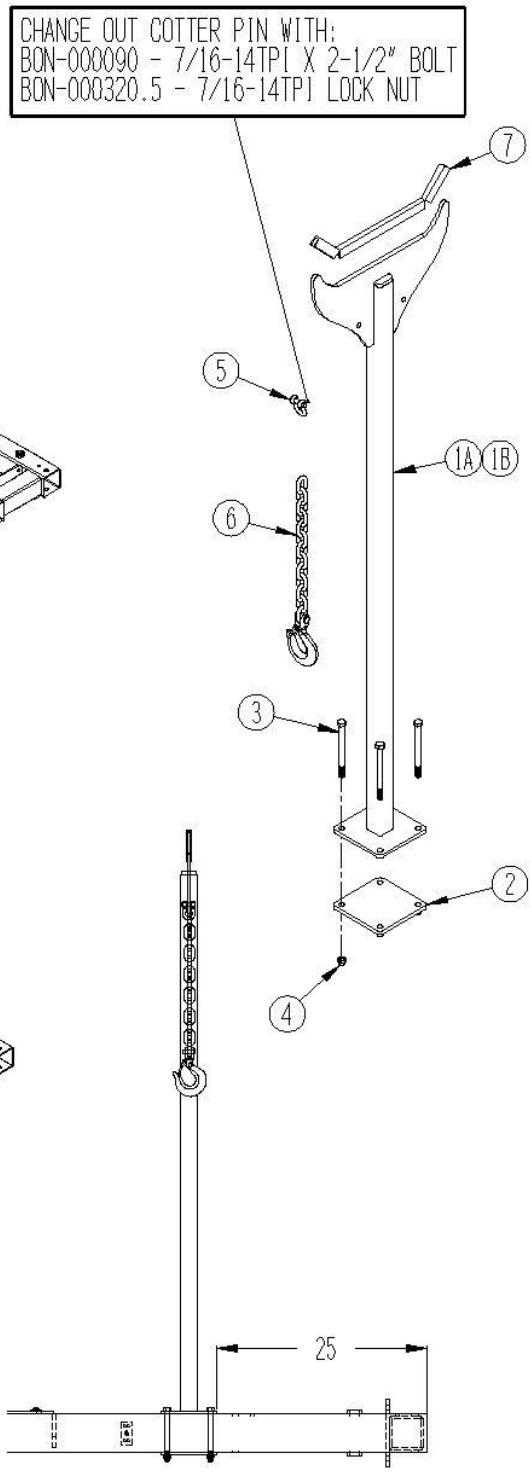
041521 LV-1016-EXP-STEPS



RIGHT HAND PICKUP ASSEMBLY SHOWN



LEFT HAND PICKUP ASSEMBLY SHOWN:



THIS DIMENSION IS THE SAME FOR RIGHT AND LEFT HAND UNITS

ITEM	QTY	PART #	DESCRIPTION
1A	AR	LV-1230	SNOUT SUPPORT - RIGHT HAND PICKUP
1B	AR	LV-1671	SNOUT SUPPORT - LEFT HAND PICKUP
2	1	LV-1231	BOTTOM PLATE
3	4	BON-000121	1/2"-13TPI X 6" GRADE 8 BOLT
4	4	BON-000321	1/2"-13TPI HEX LOCK NUT NYLON INSERT
5	1	BON-000660.6	ROUND PIN ANCHOR SHACKLE 3/8" 1 TON
6	1	LV-1086	SAFETY CHAIN, WITH FORGED SLIP HOOK
7	2FT	LV-1655	NEOPRENE RUBBER

BONNELL INDUSTRIES INC

DIXON, ILLINOIS
PHONE: 800-851-9664

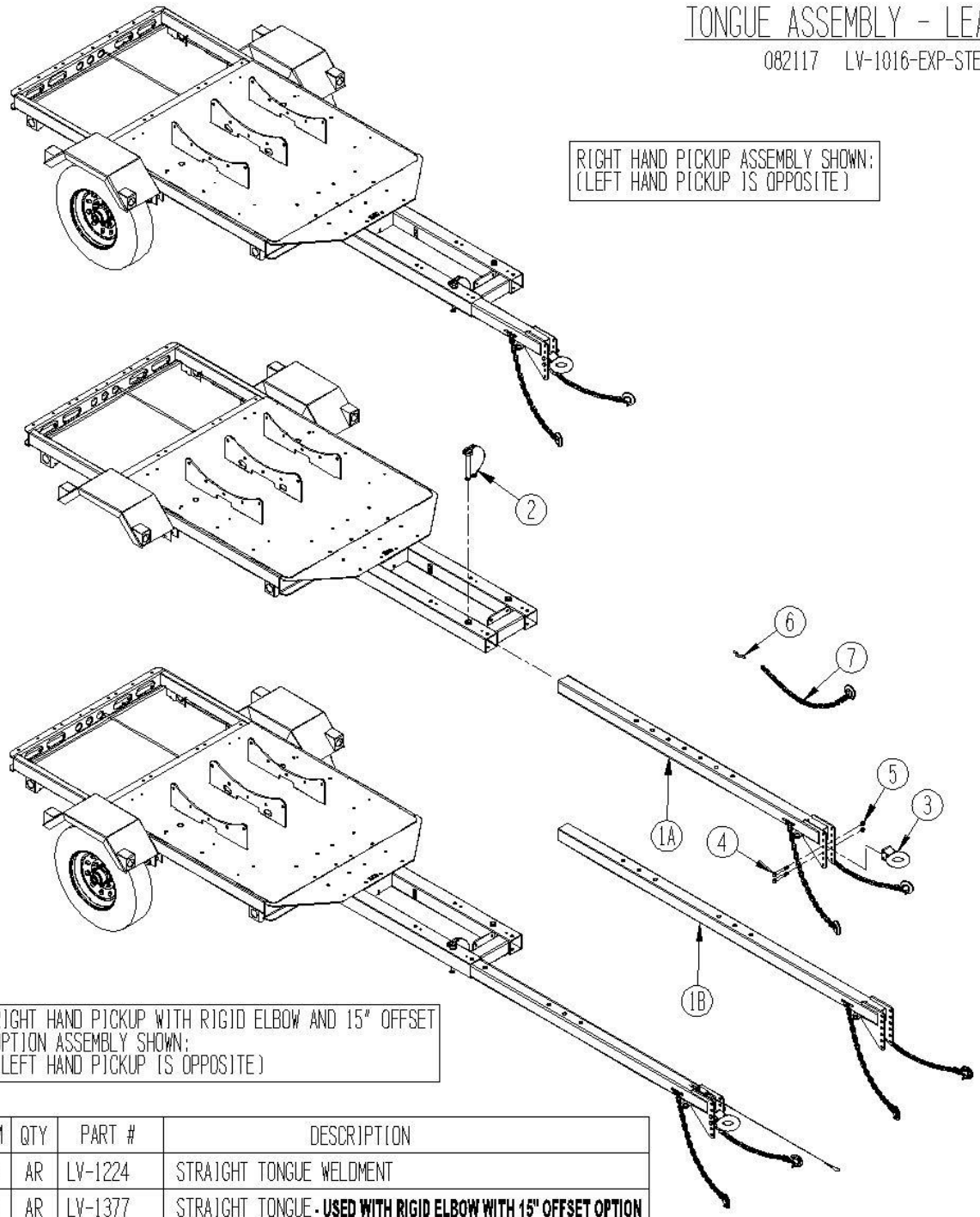
DOCUMENT 2.2

10.4. TONGUE ASSEMBLY

TONGUE ASSEMBLY - LEAF VAC

082117 LV-1016-EXP-STEPS

RIGHT HAND PICKUP ASSEMBLY SHOWN;
(LEFT HAND PICKUP IS OPPOSITE)



RIGHT HAND PICKUP WITH RIGID ELBOW AND 15" OFFSET OPTION ASSEMBLY SHOWN;
(LEFT HAND PICKUP IS OPPOSITE)

ITEM	QTY	PART #	DESCRIPTION
1A	AR	LV-1224	STRAIGHT TONGUE WELDMENT
1B	AR	LV-1377	STRAIGHT TONGUE - **USED WITH RIGID ELBOW WITH 15" OFFSET OPTION**
2	1	LV-1114	LEAF VAC HITCH PIN, WITH LANYARD
3	1	LV-1085	PINTLE EYE, 3" ID, 14,000 MAX CAPACITY
4	2	BON-000163	5/8"-11TPI X 5'' GRADE 8 BOLT
5	2	BON-000322	5/8"-11TPI HEX LOCK NUT NYLON INSERT
6	AR	LV-1087	SAFETY CHAIN CLIP, 7/16" BAR
7	AR	LV-1086	SAFETY CHAIN, 3/8" X 35" WITH FORGED SLIP HOOK

BONNELL INDUSTRIES INC

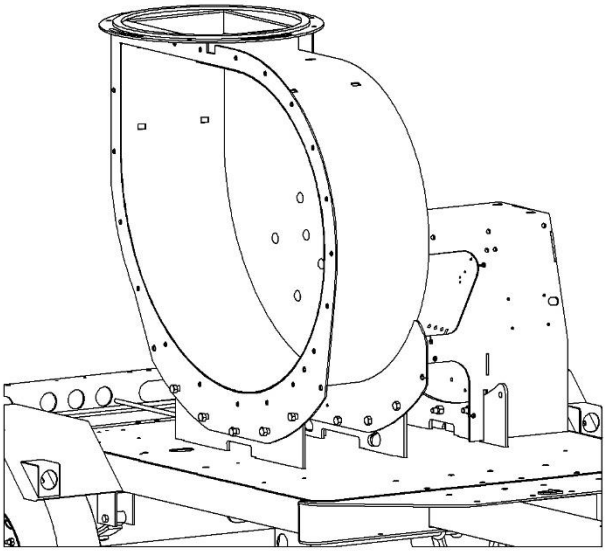
DIXON, ILLINOIS
PHONE: 800-851-9664

DOCUMENT 3.1

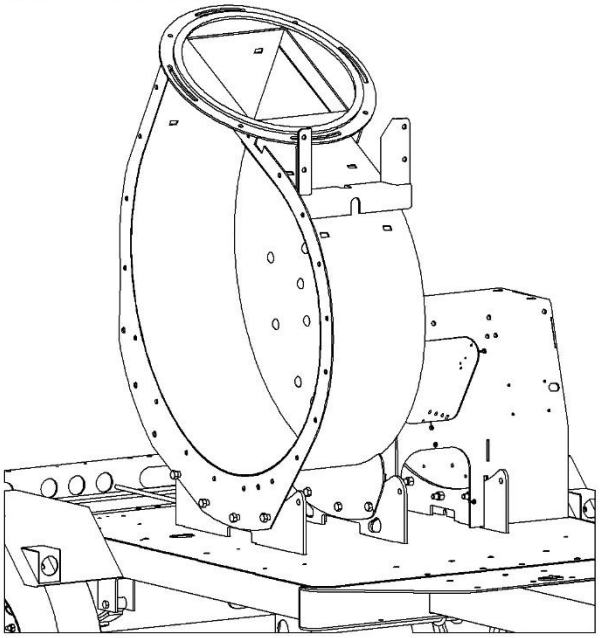
10.5. BLOWER HOUSING / DOG HOUSE / ARM BRACKETS – RIGHT HAND FIXED DISCHARGE

BLOWER HOUSING/DOG HOUSE/ARM BRACKETS
RIGHT HAND-FIXED DISCHARGE ORIENTATION SHEET

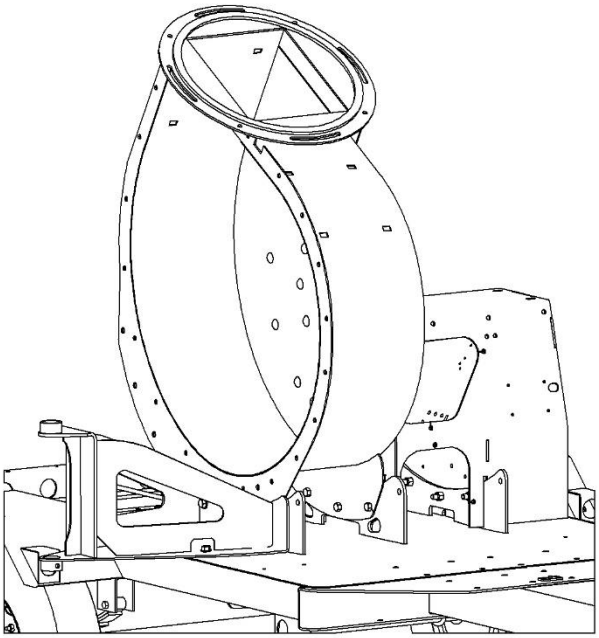
(TITAN STEP 4 CONFIGURATIONS.SLDDRW)



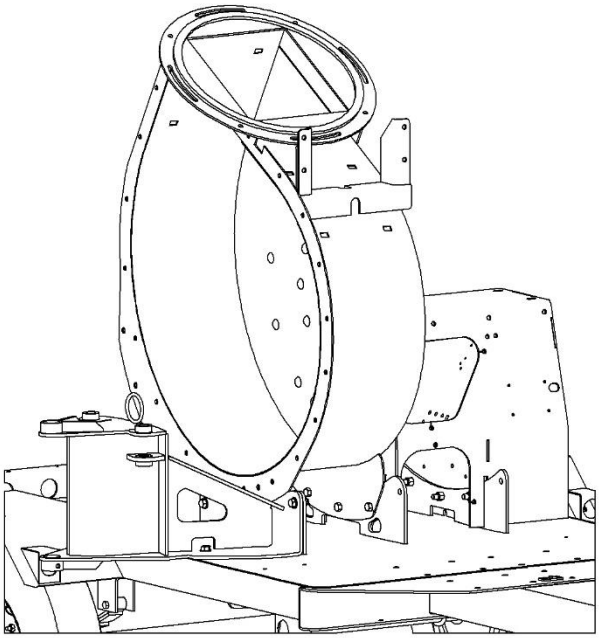
RIGHT HAND-FIXED DISCHARGE-MANUAL ARM-OVERHEAD BOOM 4.1.1



RIGHT HAND-FIXED DISCHARGE-HYDRAULIC ARM-OVERHEAD BOOM 4.1.2



RIGHT HAND-FIXED DISCHARGE-MANUAL ARM-UNDERSLUNG BOOM 4.1.3



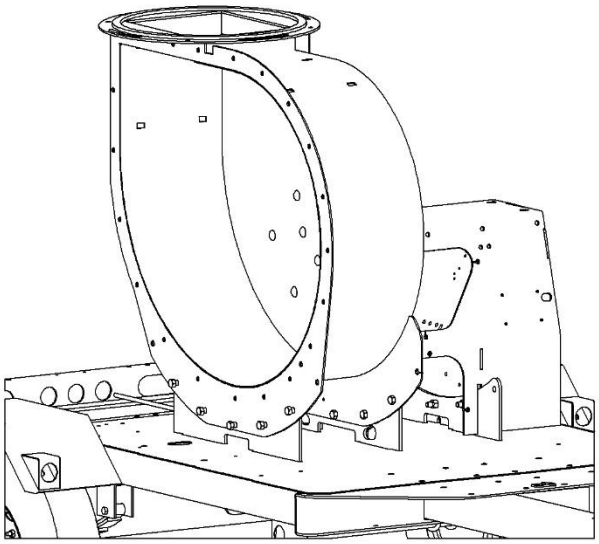
RIGHT HAND-FIXED DISCHARGE-HYDRAULIC ARM-UNDERSLUNG BOOM 4.1.4

DOCUMENT 4.1

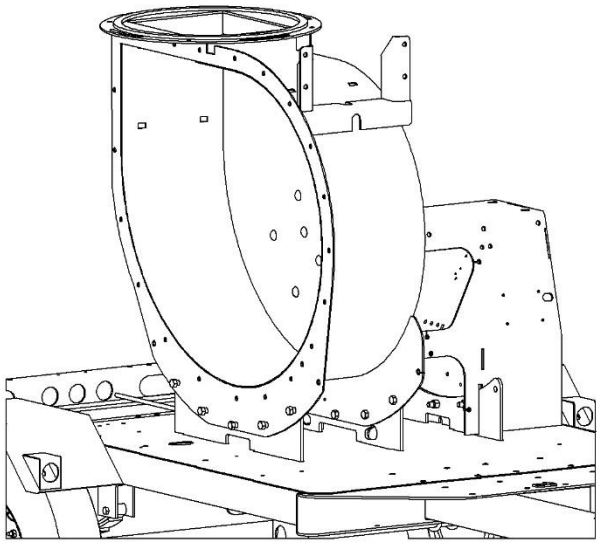
10.6. BLOWER HOUSING / DOG HOUSE / ARM BRACKETS – RIGHT HAND SWIVEL DISCHARGE

BLOWER HOUSING/DOG HOUSE/ARM BRACKETS
RIGHT HAND-SWIVEL DISCHARGE ORIENTATION SHEET

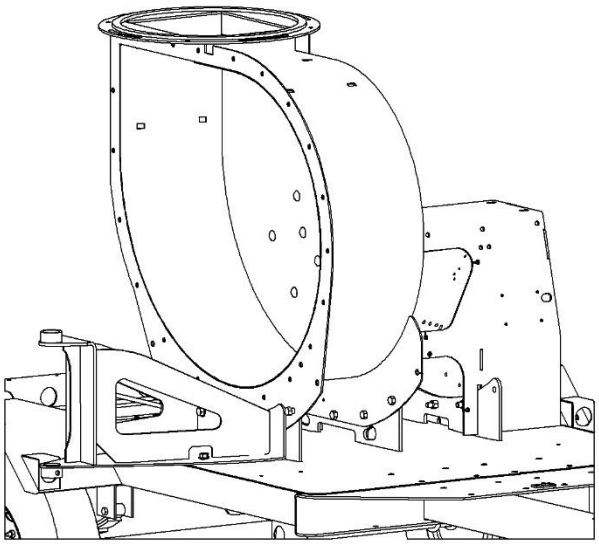
(TITAN STEP 4 CONFIGURATIONS.SLDDRW)



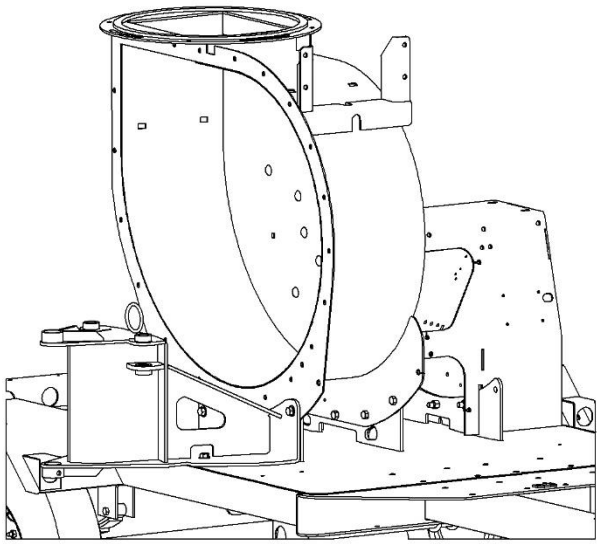
RIGHT HAND-SWIVEL DISCHARGE-MANUAL ARM-OVERHEAD BOOM 4.2.1



RIGHT HAND-SWIVEL DISCHARGE-HYDRAULIC ARM-OVERHEAD BOOM 4.2.2



RIGHT HAND-SWIVEL DISCHARGE-MANUAL ARM-UNDERSLUNG BOOM 4.2.3



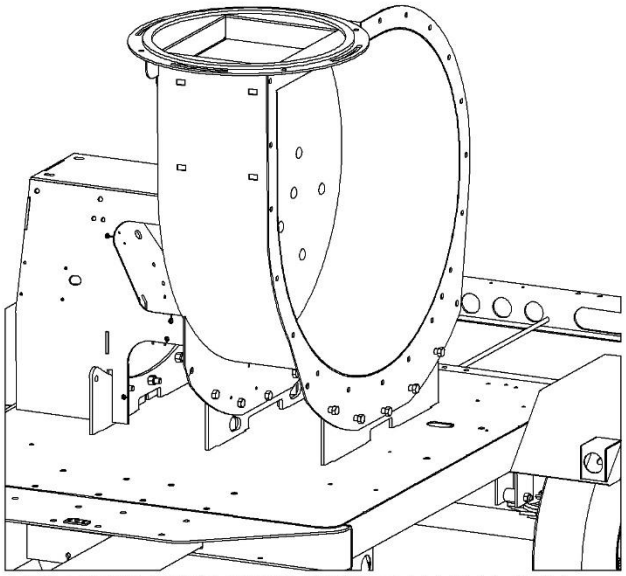
RIGHT HAND-SWIVEL DISCHARGE-HYDRAULIC ARM-UNDERSLUNG BOOM 4.2.4

DOCUMENT 4.2

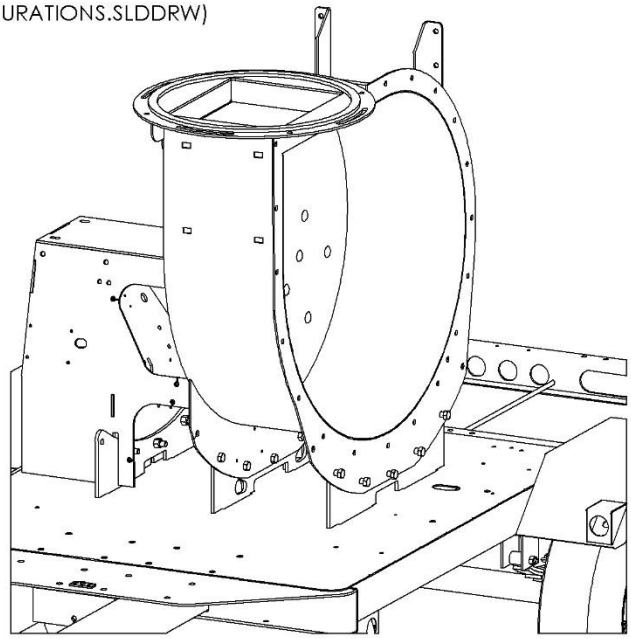
10.7. BLOWER HOUSING / DOG HOUSE / ARM BRACKETS – LEFT HAND FIXED DISCHARGE

BLOWER HOUSING/DOG HOUSE/ARM BRACKETS
LEFT HAND-FIXED DISCHARGE ORIENTATION SHEET

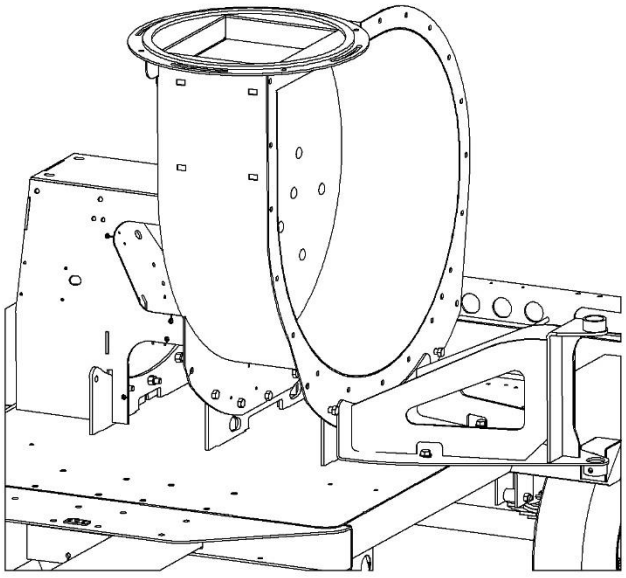
(TITAN STEP 4 CONFIGURATIONS.SLDDRW)



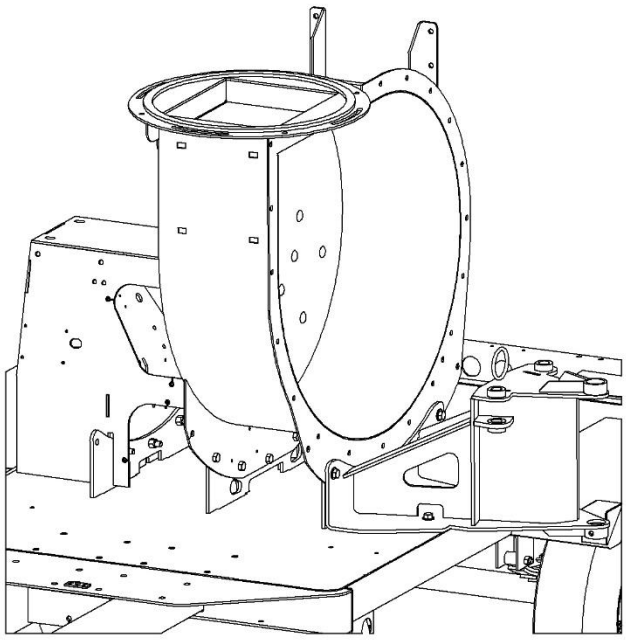
LEFT HAND-FIXED DISCHARGE-MANUAL ARM-OVERHEAD BOOM 4.3.1



LEFT HAND-FIXED DISCHARGE-HYDRAULIC ARM-OVERHEAD BOOM 4.3.2



LEFT HAND-FIXED DISCHARGE-MANUAL ARM-UNDERSLUNG BOOM 4.3.3

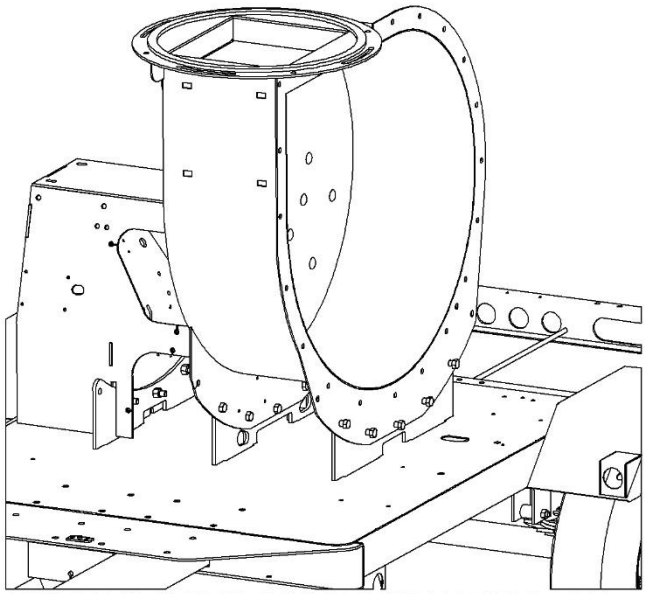


LEFT HAND-FIXED DISCHARGE-HYDRAULIC ARM-UNDERSLUNG BOOM 4.3.4

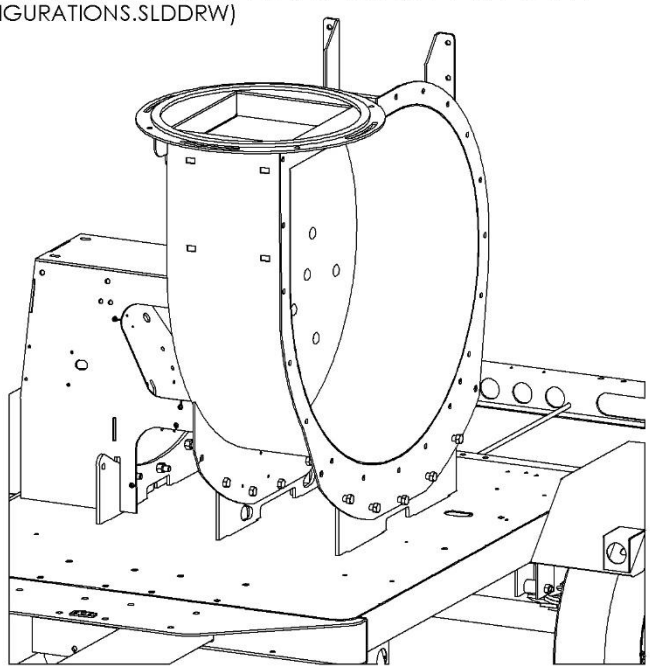
DOCUMENT 4.3

10.8. BLOWER HOUSING / DOG HOUSE / ARM BRACKETS – LEFT HAND SWIVEL DISCHARGE

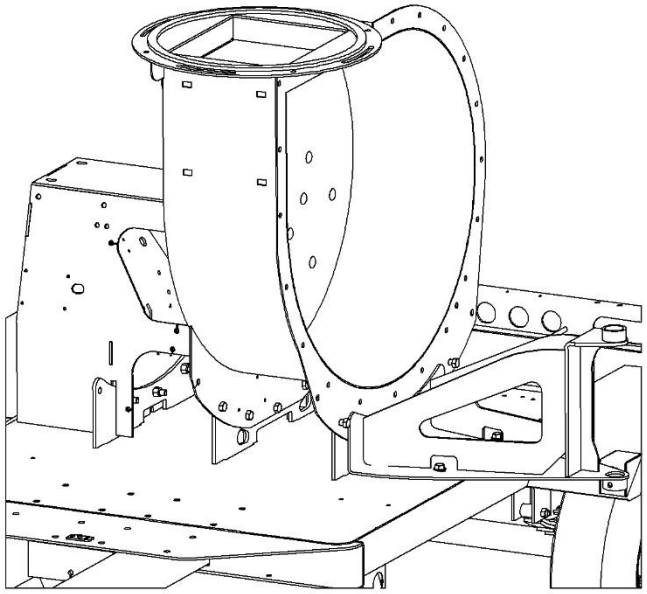
BLOWER HOUSING/DOG HOUSE/ARM BRACKETS
LEFT HAND-SWIVEL DISCHARGE ORIENTATION SHEET
(TITAN STEP 4 CONFIGURATIONS.SLDDRW)



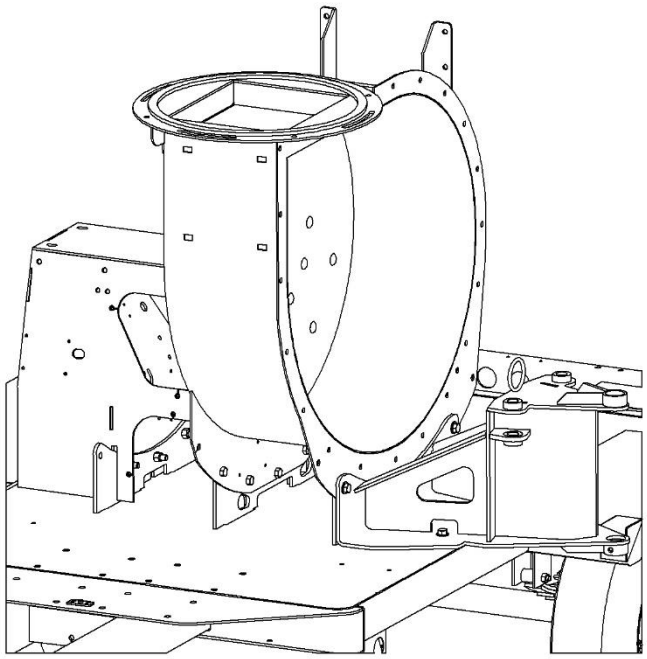
LEFT HAND-SWIVEL DISCHARGE-MANUAL ARM-OVERHEAD BOOM 4.4.1



LEFT HAND-SWIVEL DISCHARGE-HYDRAULIC ARM-OVERHEAD BOOM 4.4.2



LEFT HAND-SWIVEL DISCHARGE-MANUAL ARM-UNDERSLUNG BOOM 4.4.3



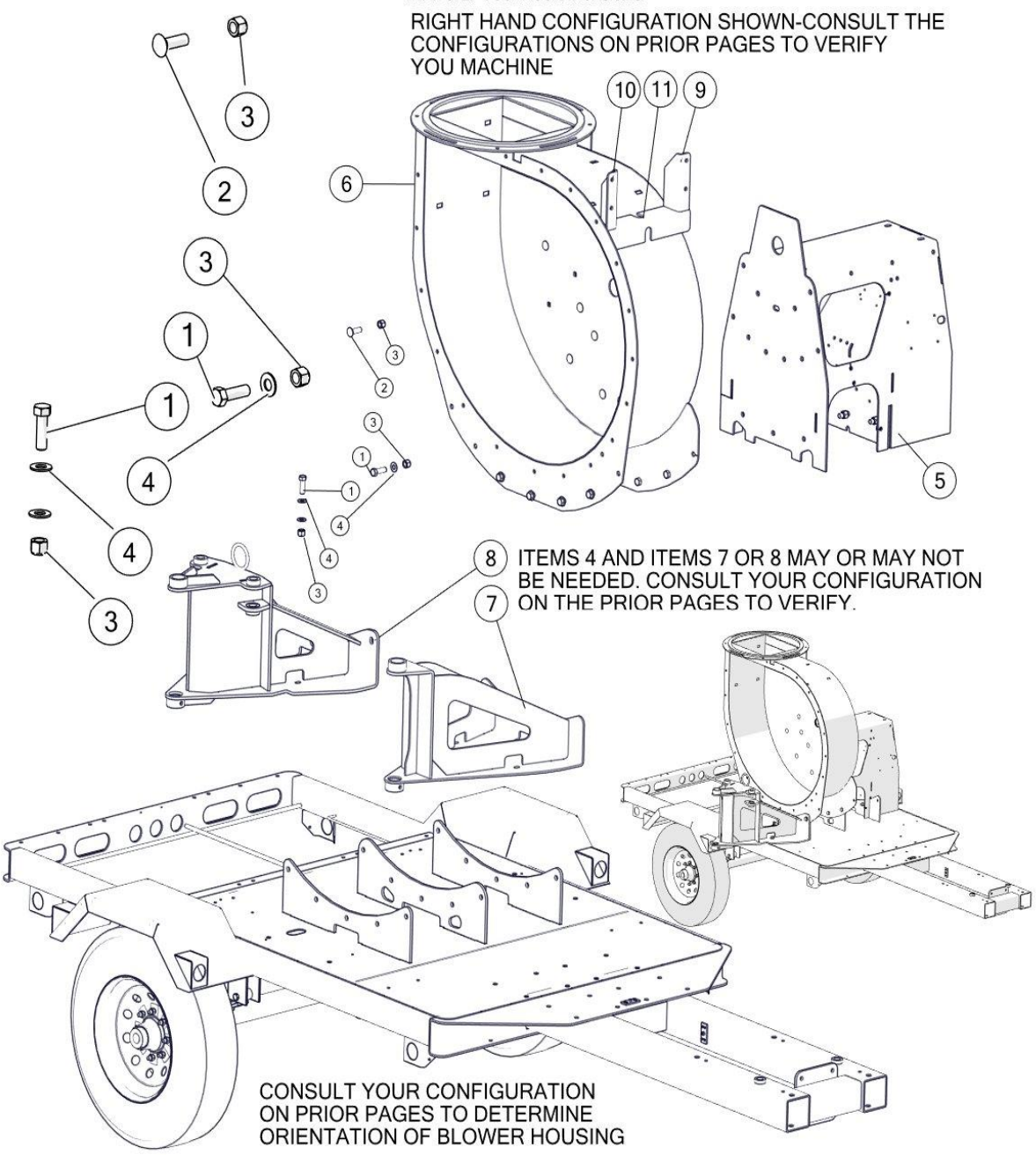
LEFT HAND-SWIVEL DISCHARGE-HYDRAULIC ARM-UNDERSLUNG BOOM 4.4.4

DOCUMENT 4.4

10.9. Blower Housing / Dog House / Control Arm Bracket Parts Breakdown

BLOWER HOUSING/DOG HOUSE/CONTROL ARM BRACKET TITAN LEAF VAC

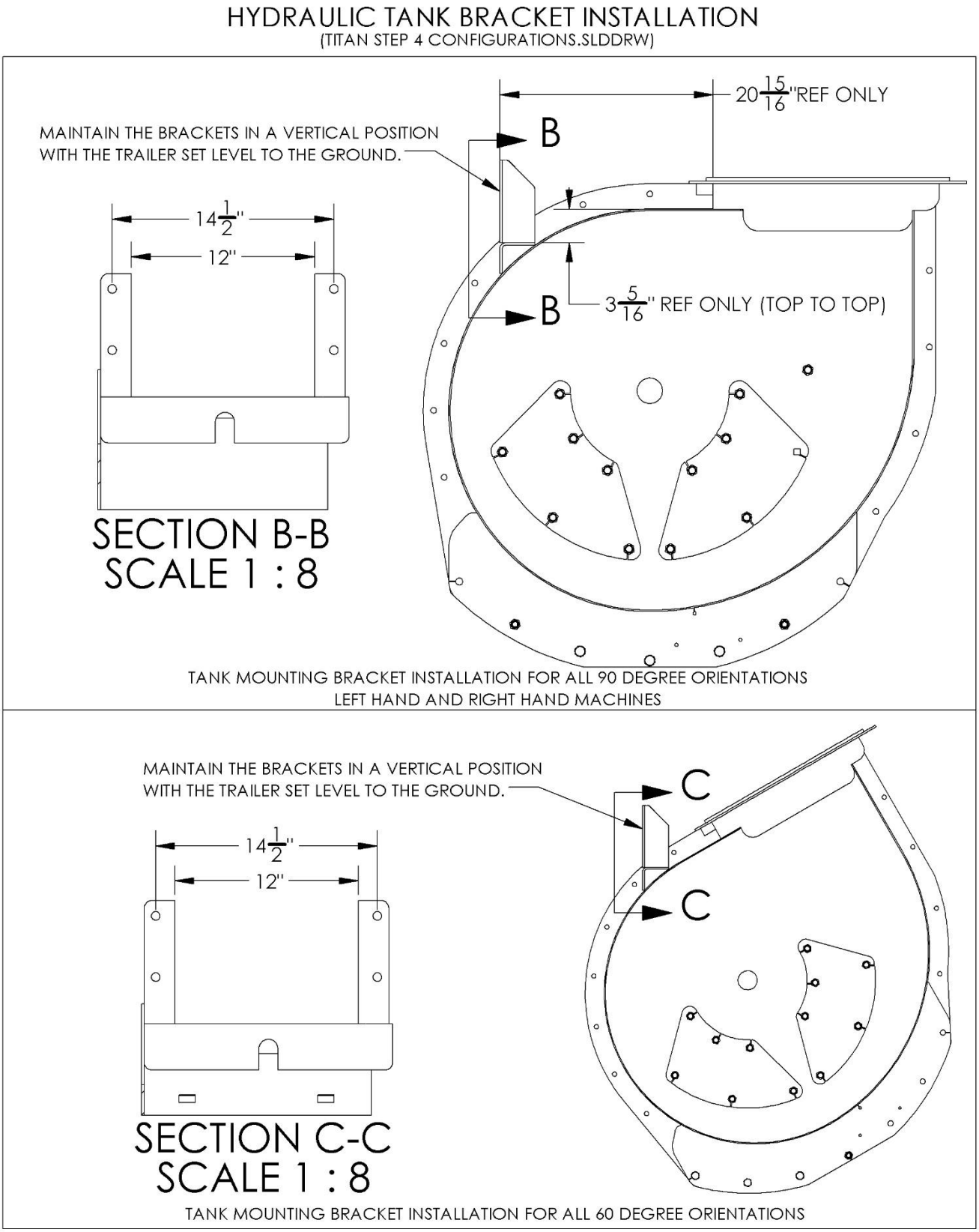
TITAN STEP 4 CONFIGURATIONS.SMG



BOM ID	QTY-	PartNo (config)	Description (config)
1	AS REQ'D	BON-000153	5/8-11 X 2" BOLT
2	12	BON-000288	5/8-11 X 2" CARRIAGE BOLT
3	AS REQ'D	BON-000322	NYLON INSERT LOCKNUT, 5/8-11 UNC
4	AS REQ'D	BON-000341SAEH	FLATWASHER,5/8" SAE; HARDENED
5	1	LV-1010-TIER IV	BEARING BOX (DOG HOUSE)
6	1	LV-1024	TITAN BLOWER HOUSING
7	AS REQ'D	LV-1029	TITAN LEAF PRO UNDERSLUNG ARM BRACKET
8	AS REQ'D	LV-1257	PIVOT BRACKET
9	AS REQ'D	LV-1058	TANK MOUNTING BRACKET, RIGHT HAND
10	AS REQ'D	LV-1057	TANK MOUNTING BRACKET, LEFT HAND
11	AS REQ'D	LV-1059	TANK MOUNTING BRACKET, BASE

DOCUMENT 4.5

10.10. HYDRAULIC TANK BRACKET INSTALLATION

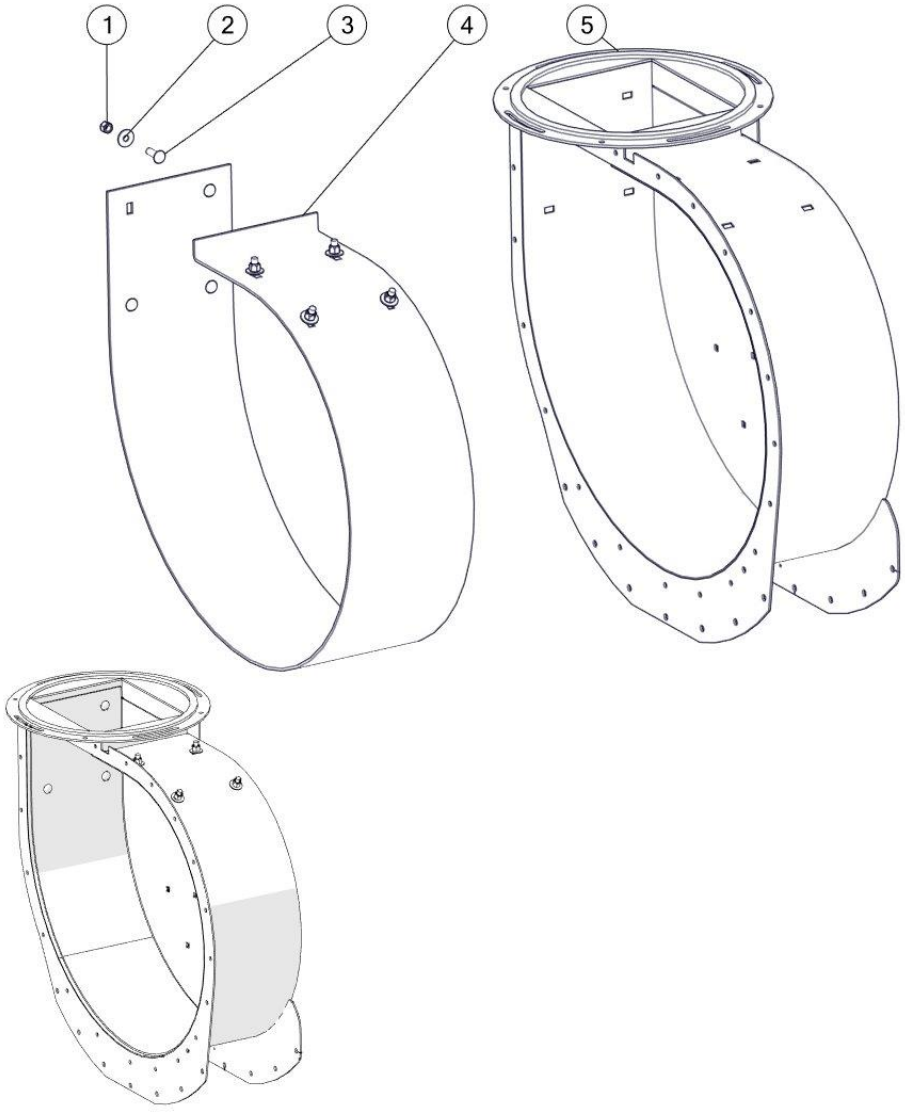


DOCUMENT 4.6

10.11. Blower Housing Liner Assembly And Optional Manual Overhead Boom Bracket

BLOWER HOUSING LINER ASSEMBLY

TITAN STEP 5 CONFIGURATIONS.SMG



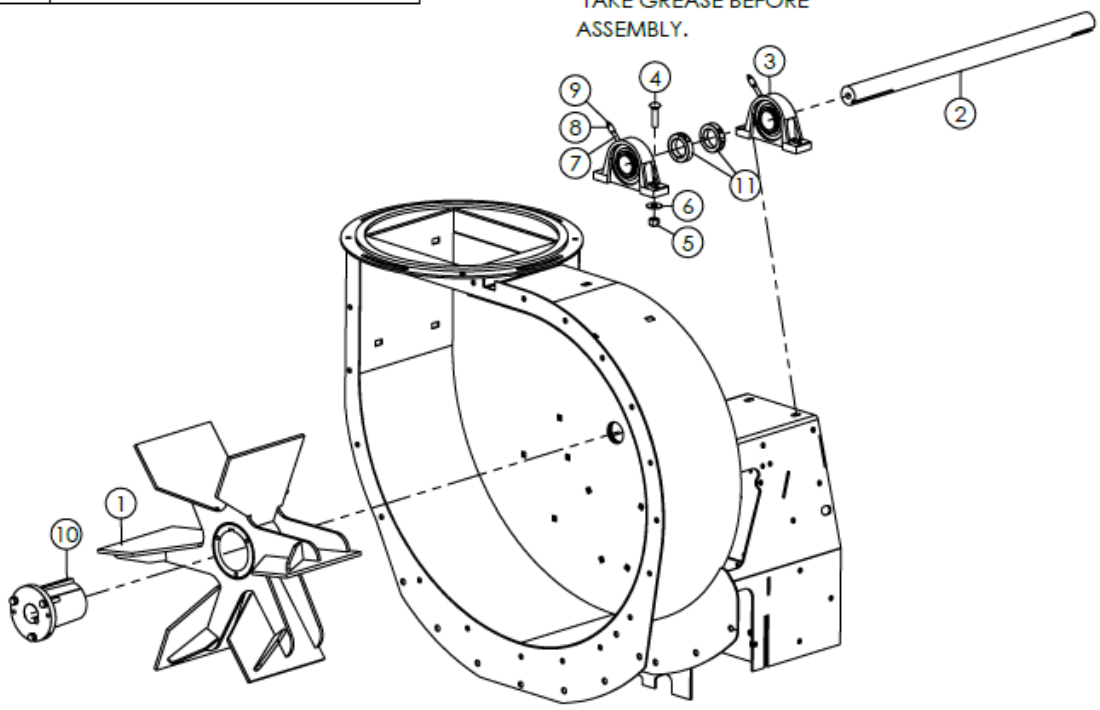
BOM ID	Qty	PartNo (config)	Description (config)
1	8	BON-000322	NYLON INSERT LOCKNUT, 5/8-11 UNC
2	8	BON-000341	FLAT WASHER, 5/8
3	8	BON-000288	5/8-11 X 2" CARRIAGE BOLT
4	1	LV-1026	BLOWER HOUSING LINER
5	1	LV-1024	TITAN BLOWER HOUSING

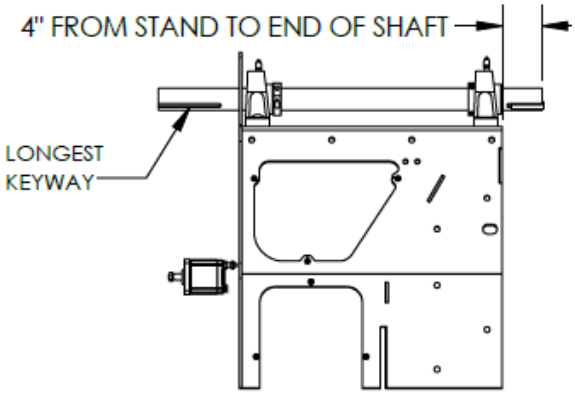
DOCUMENT 5.1

10.12. Fan Shaft, Bearings, and Fan Assembly

FILE NAME	M1152
DWG NAME	M1152 REV: 05/27/20

NOTE: MAKE SURE BEARINGS TAKE GREASE BEFORE ASSEMBLY.





ITEM	PART NO.	QTY	DESCRIPTION
11	LV-1352	2	2-3/16" TWO PIECE CLAMP-ON SHAFT COLLAR
10	LV-1633	1	2-3/16 SPLIT TAPER FAN BUSHING
9	BON-000652	2	1/8 NPT GREASE FITTING, STRAIGHT
8	BON-000411	2	1/8 BLACK STEEL COUPLING
7	BON-000488	2	1/8 x 2" PIPE NIPPLE
6	BON-000341SAE	4	5/8 FLAT WASHER HT
5	BON-000322	4	5/8-11 NYLON HEX LOCKNUT
4	BON-000289	4	5/8-11 x 2-1/2 CARRIAGE BOLT GR 5
3	LV-1092	2	2-3/16" PILLOW BLOCK BEARING
2	LV-1046	1	IMPELLAR SHAFT
1	LV-1630	1	32" BELT DRIVE FAN CW & 2-3/16" COLLET
1	LV-1629	1	30" BELT DRIVE FAN CW & 2-3/16" COLLET

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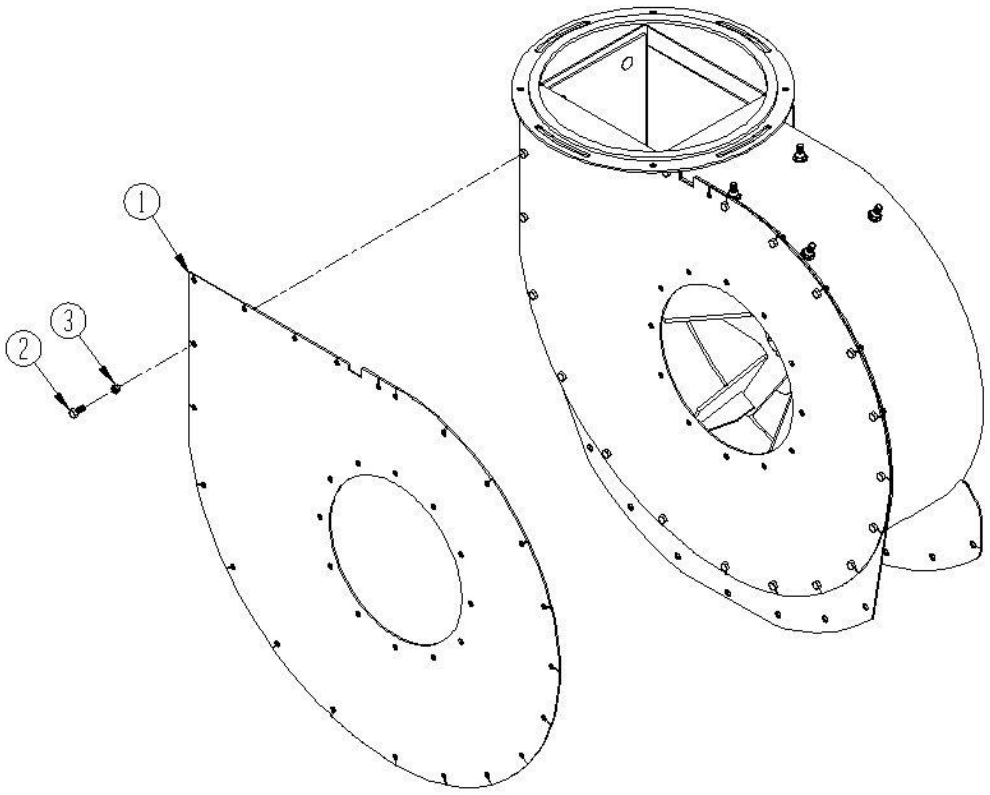
10.13. BLOWER HOUSING COVER ASSEMBLY

BLOWER HOUSING COVER ASSEMBLY - LEAF VAC

111710 LV-1010-EXP-STEPS-RH



ITEM	QTY	PART #	DESCRIPTION
1	1	LV-1025	BLOWER HOUSING COVER
2	21	BON-000106	1/2"-13TPI X 1 1/4" GRADE 8 BOLT
3	21	BON-000321	1/2"-13TPI HEX LOCK NUT NYLON INSERT

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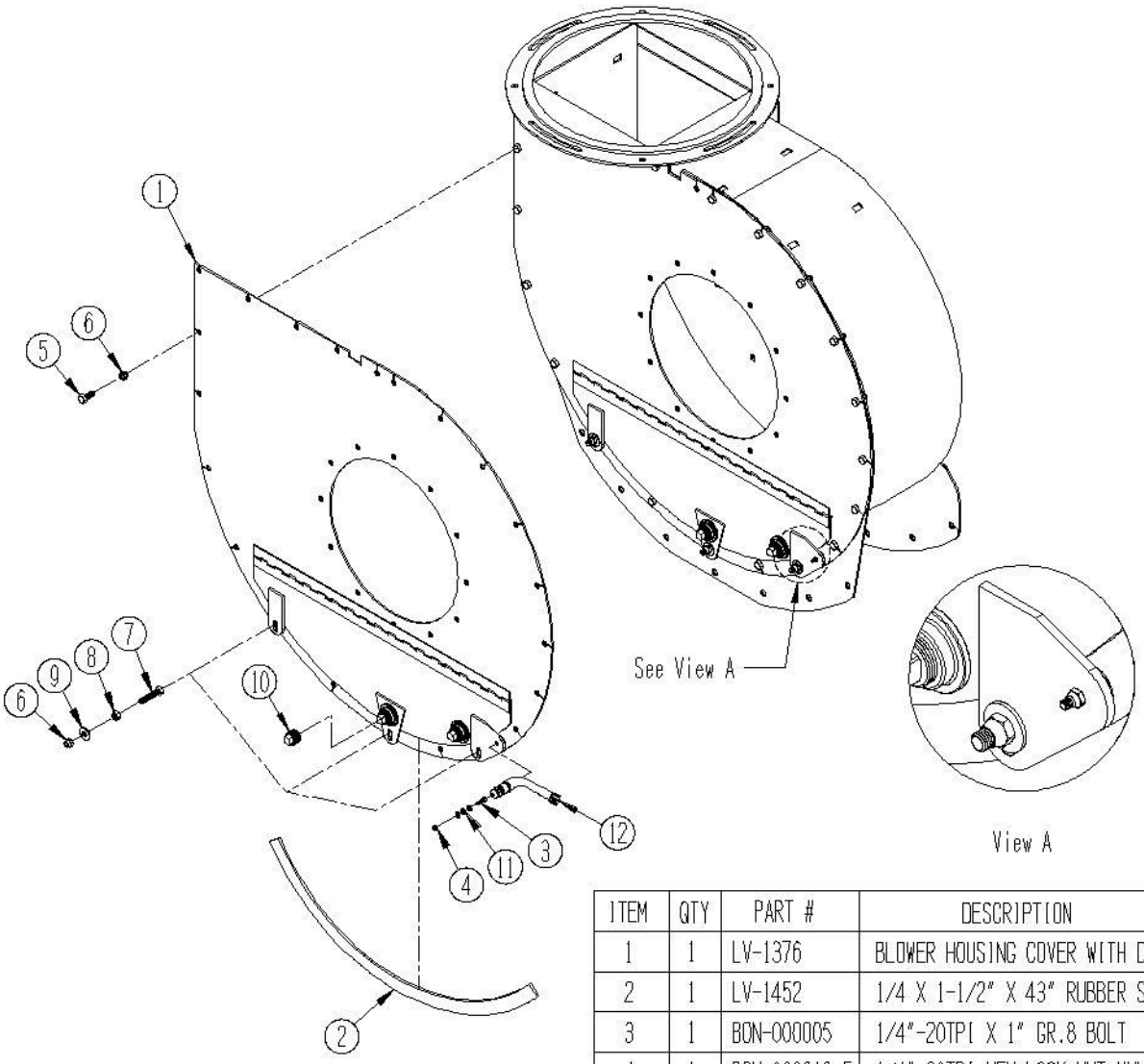
PHONE: 800-851-9664

DOCUMENT 7.1

10.14. BLOWER HOUSING COVER WITH DOOR ASSEMBLY

BLOWER HOUSING COVER WITH DOOR ASSEMBLY - LEAF VAC

111416 LV-1376-EXP



ITEM	QTY	PART #	DESCRIPTION
1	1	LV-1376	BLOWER HOUSING COVER WITH DOOR
2	1	LV-1452	1/4 X 1-1/2" X 43" RUBBER SEAL
3	1	BON-000005	1/4"-20TPI X 1" GR.8 BOLT
4	1	BON-000318.5	1/4"-20TPI HEX LOCK NUT NYLON INSERT
5	18	BON-000106	1/2"-13TPI X 1 1/4" GRADE 8 BOLT
6	21	BON-000321	1/2"-13TPI HEX LOCK NUT NYLON INSERT
7	3	BON-000111FT	1/2"-13TPI X 2-1/2" BOLT
8	3	BON-000305	1/2"-13TPI HEX NUT
9	3	BON-000340	1/2" FLATWASHER
10		BON-000590	PLUG 1 SQ HD 1" SQUARE HEAD PLUG
11	3	BON-000336	FLAT WASHER 1/4"
12	1	LV-1393	BUSH BUTTON SAFETY ASSEMBLY

NOTE:
ITEM 8 FITS BETWEEN THE HINGED CLEAN OUT DOOR AND HOUSING COVER

GLUE ITEM 12 TO THE HOUSING COVER IT OVERLAPS THE HINGED DOOR BY 1/4"

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DOCUMENT 7.2

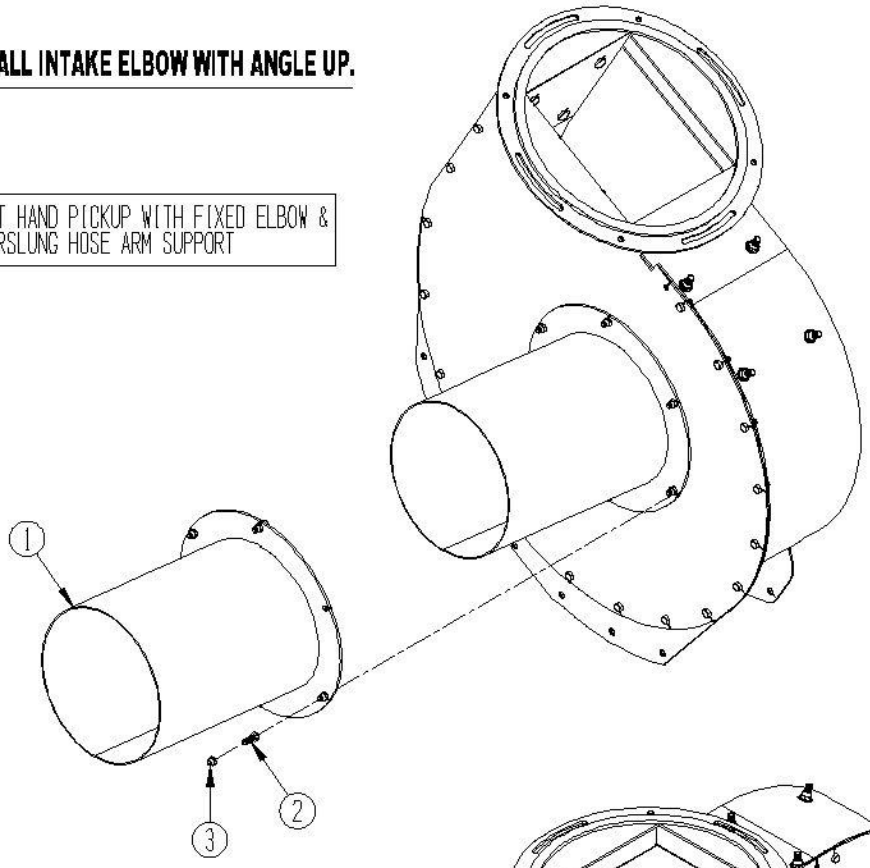
10.15. INTAKE ELBOW - UNDERSLUNG MANUAL HOSE ARM SUPPORT

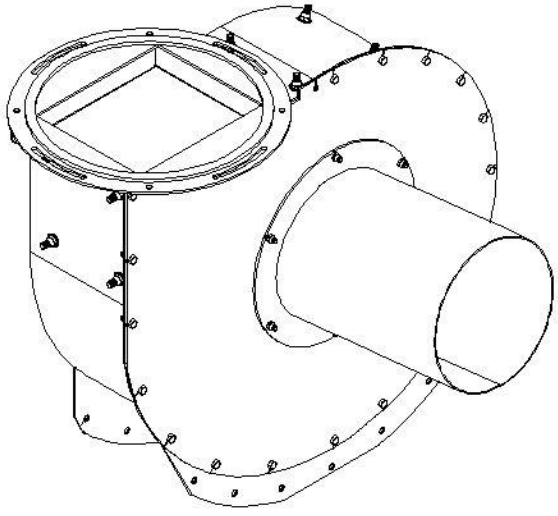
INTAKE ELBOW - UNDERSLUNG MANUAL HOSE ARM SUPPORT

072916 LV-1010-EXP-STEPS-1000-RH

NOTE: INSTALL INTAKE ELBOW WITH ANGLE UP.

RIGHT HAND PICKUP WITH FIXED ELBOW & UNDERSLUNG HOSE ARM SUPPORT





RIGHT HAND PICKUP WITH SWIVEL ELBOW & UNDERSLUNG HOSE ARM SUPPORT
&
LEFT HAND PICKUP WITH FIXED OR SWIVEL ELBOW & UNDERSLUNG HOSE ARM SUPPORT

ITEM	QTY	PART #	DESCRIPTION
1	1	LV-1346	HOSE ADAPTOR - 6 DEG. INCLINE
2	6	BON-000106	1/2"-13TPI X 1 1/4" GRADE 8 BOLT
3	6	BON-000321	1/2"-13TPI HEX LOCK NUT NYLON INSERT

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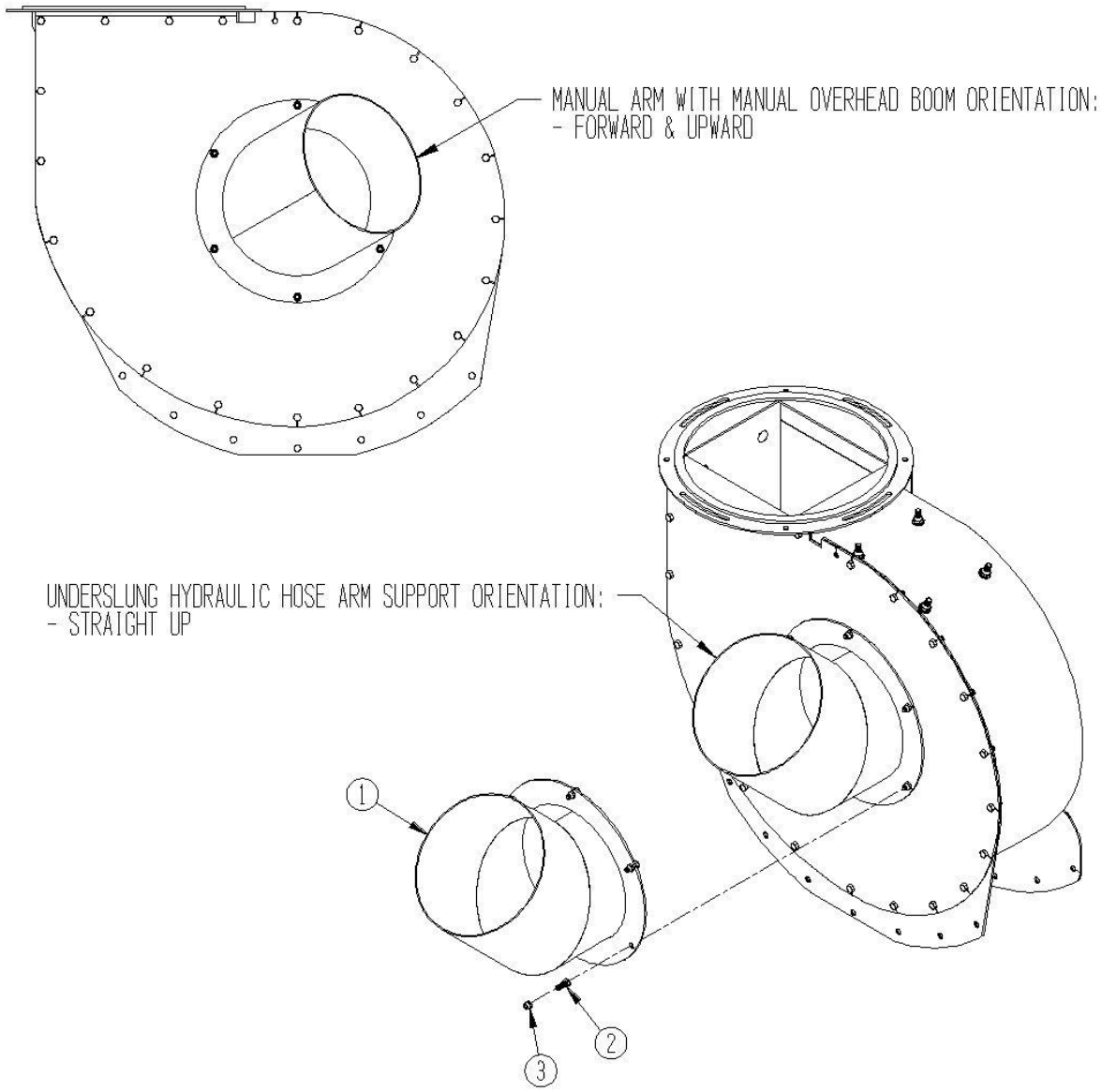
DOCUMENT 8.1

10.16. Intake Elbow – Manual Arm with Overhead Boom & Underslung Hydraulic Hose Support Assembly

INTAKE ELBOW

(FOR MANUAL ARM WITH MANUAL OVERHEAD BOOM & UNDERSLUNG HYDRAULIC HOSE ARM SUPPORT)

010820 LV-1010-EXP-STEPS-RH



ITEM	QTY	PART #	DESCRIPTION
1	1	LV-1027	HOSE ADAPTOR - 135 DEG. ELBOW
2	6	BON-000106	1/2"-13TPI X 1 1/4" GRADE 8 BOLT
3	6	BON-000321	1/2"-13TPI HEX LOCK NUT NYLON INSERT

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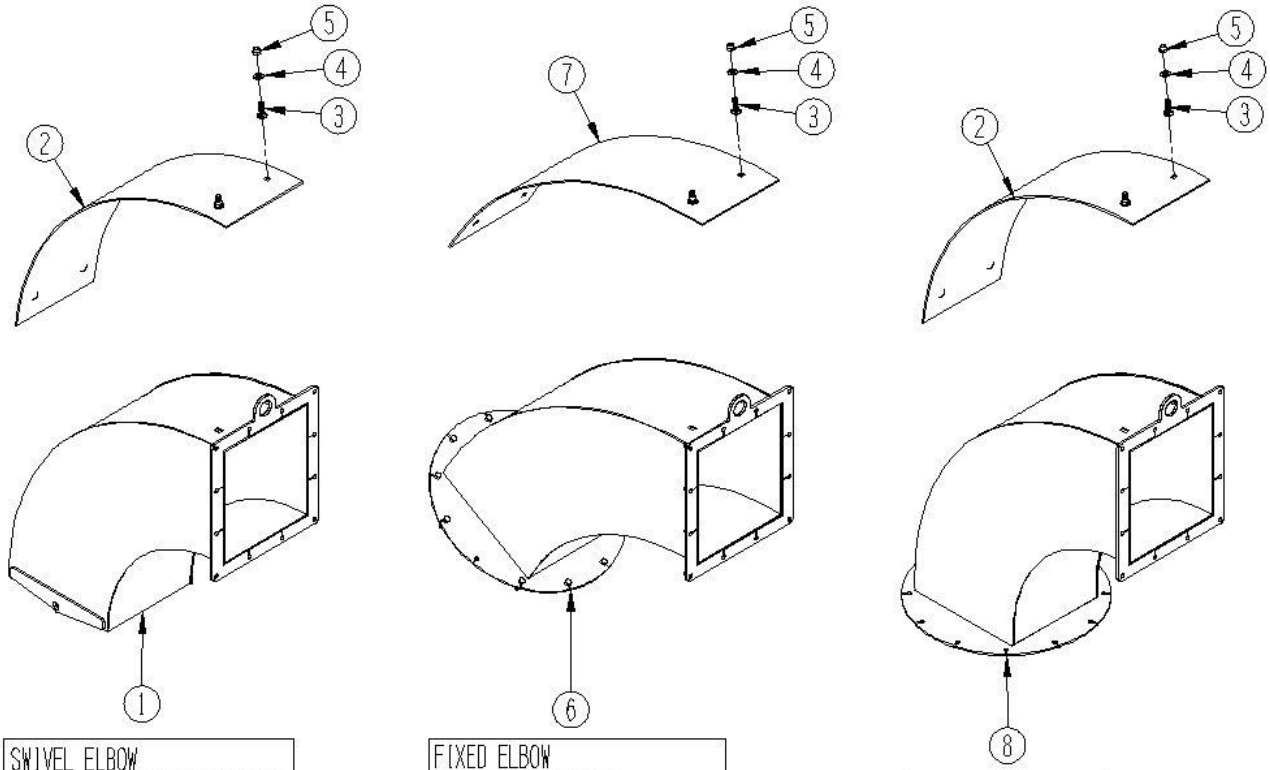
DOCUMENT 8.3

10.17. LINER IN DISCHARGE ELBOW ASSEMBLY

LINER IN DISCHARGE ELBOW ASSEMBLY - LEAF VAC

090712 LV-1010-EXP-STEPS-RH



ITEM	QTY	PART #	DESCRIPTION
1	AR	LV-1055	SWIVEL ELBOW
2	AR	LV-1185	INNER LINING - 90 DEGREE ELBOW
3	4	BON-000288	5/8"-11TPI X 2"CARRIAGE BOLT, GRADE 5
4	4	BON-000341	5/8" FLATWASHER, ZN
5	4	BON-000322	5/8"-11TPI HEX LOCK NUT NYLON INSERT
6	AR	LV-1177	FIXED ELBOW 60 DEGREES
7	AR	LV-1186	INNER LINING - 60 DEGREE ELBOW
8	AR	LV-1342	FIXED ELBOW 90 DEGREES
9	AR	LV-1375	RIGHT HAND 15" RIGID OFFSET ELBOW - 90 DEG.

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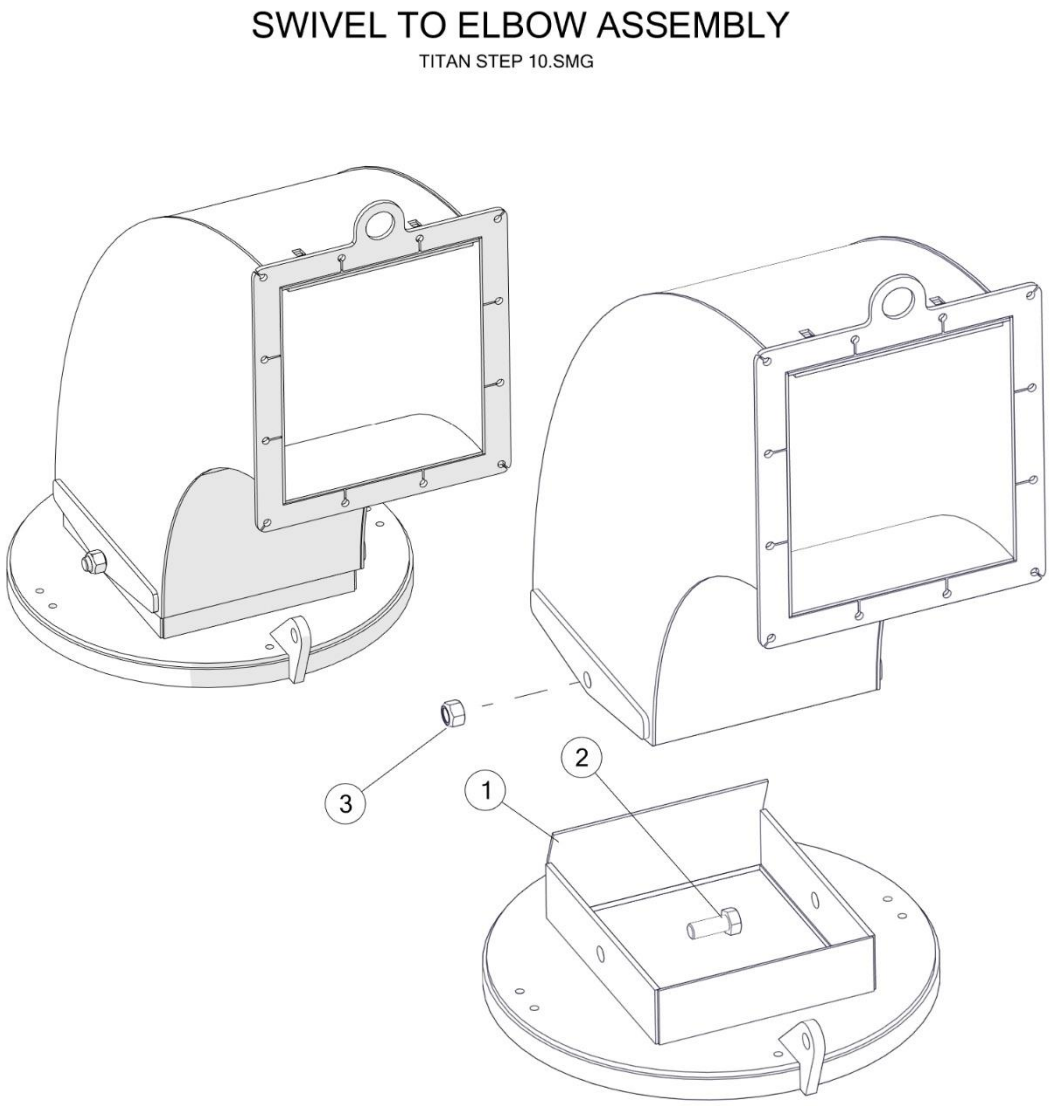
DOCUMENT 9.1

10.18. SWIVEL TO ELBOW ASSEMBLY



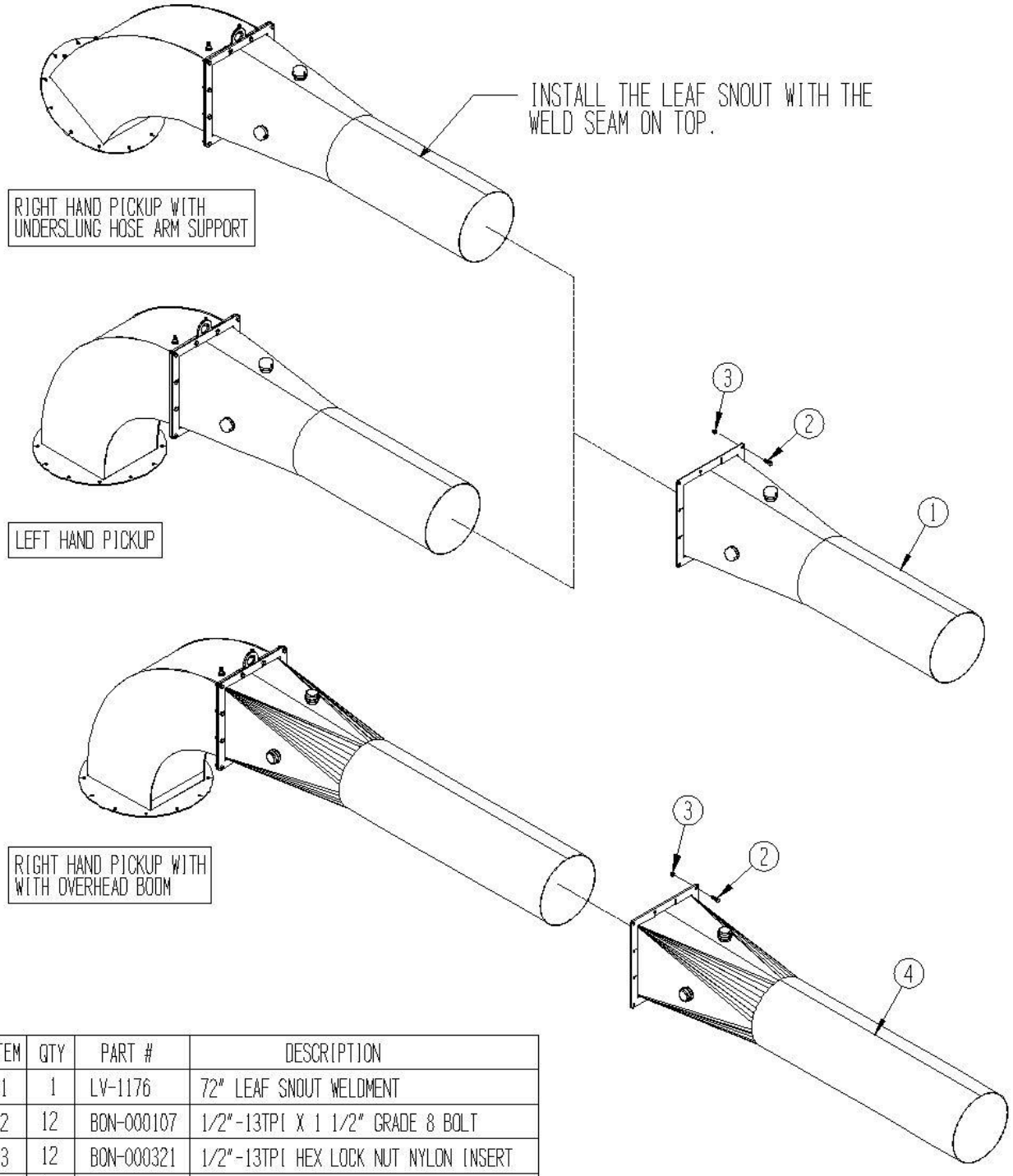
BOM ID	Qty	PartNo (config)	Description (config)
1	1	LV-1115	SWIVEL ADAPTOR - LEAF VAC
2	2	BON-000232	1-8 X 2-1/2" BOLT
3	2	BON-000310.3	NYLON INSERT LOCKNUT, 1-8 UNC

DOCUMENT 10.1

10.19. SNOUT TO FIXED ELBOW ASSEMBLY

SNOUT TO FIXED ELBOW ASSEMBLY - LEAF VAC

08/22/17 LV-1010-EXP-STEPS-1000-RH



ITEM	QTY	PART #	DESCRIPTION
1	1	LV-1176	72" LEAF SNOUT WELDMENT
2	12	BON-000107	1/2"-13TPI X 1 1/2" GRADE 8 BOLT
3	12	BON-000321	1/2"-13TPI HEX LOCK NUT NYLON INSERT
4	1	LV-1328	92" LEAF SNOUT WELDMENT

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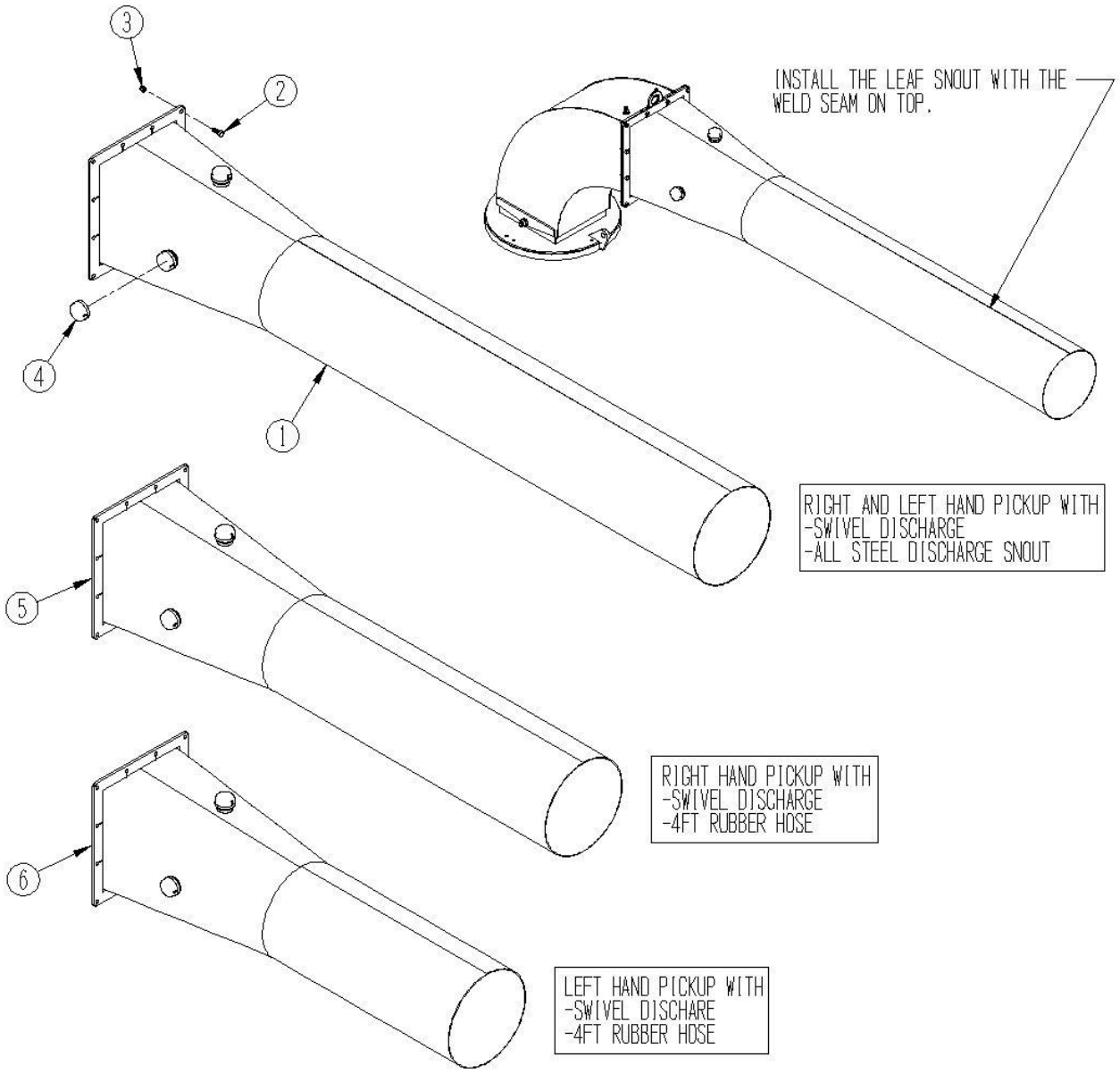
DOCUMENT 11.1

10.20. SNOUT TO SWIVEL ELBOW ASSEMBLY

SWIVEL DISCHARGE SNOUT TO ELBOW ASSEMBLY - LEAF VAC

031319 LV-1010-EXP-STEPS-RH



ITEM	QTY	PART #	DESCRIPTION
1	AR	LV-1056	LEAF SNOUT WELDMENT - 123-1/2" LONG (CAPS INCLUDED)
2	12	BON-000107	1/2"-13TPI X 1 1/2" GRADE 8 BOLT
3	12	BON-000321	1/2"-13TPI HEX LOCK NUT NYLON INSERT
4	3	BON-000584	PIPE FITTING, 2" CAP
5	AR	LV-1328	92" LEAF SNOUT WELDMENT
6	AR	LV-1176	72" LEAF SNOUT WELDMENT

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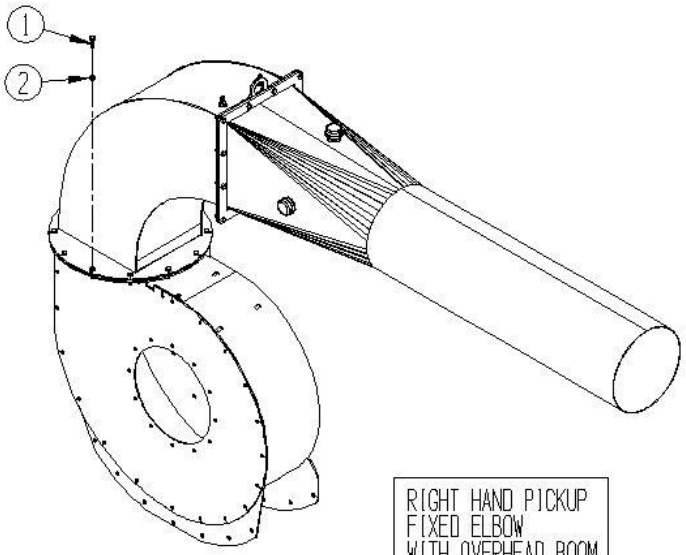
DOCUMENT 11.2

10.21. Fixed Discharge To Blower Assembly

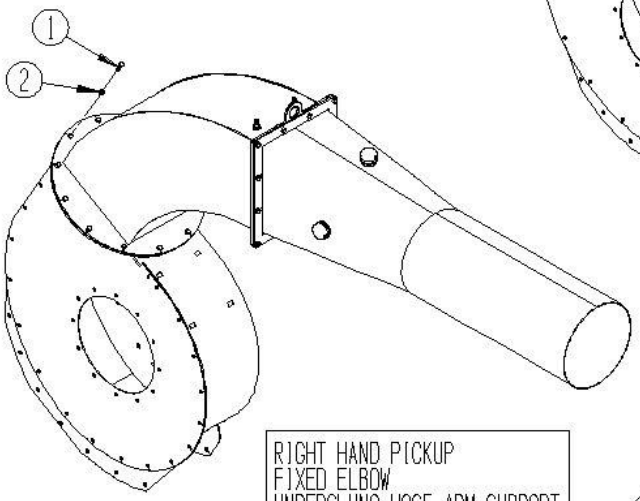
INSTALL DISCHARGE ASSEMBLY TO BLOWER - LEAF VAC

092112 LV-1010-EXP-STEPS-1000-RH

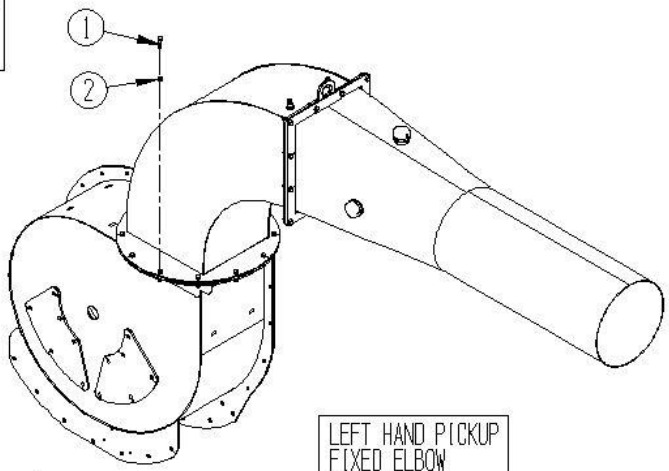
USE FLAT WASHERS
BON-000340 AT SLOTS
ON BLOWER HOUSING FLANGE,
TYP. 8 PLACES.



RIGHT HAND PICKUP
FIXED ELBOW
WITH OVERHEAD BOOM
ASS'Y SHOWN



RIGHT HAND PICKUP
FIXED ELBOW
UNDERSLUNG HOSE ARM SUPPORT
ASS'Y SHOWN



LEFT HAND PICKUP
FIXED ELBOW
ASS'Y SHOWN

ITEM	QTY	PART #	DESCRIPTION
1	12	BON-000108	1/2"-13TPI X 1 3/4" GRADE 8 BOLT
2	12	BON-000321	1/2"-13TPI HEX LOCK NUT NYLON INSERT
3	8	BON-000340	1/2" FLAT WASHER

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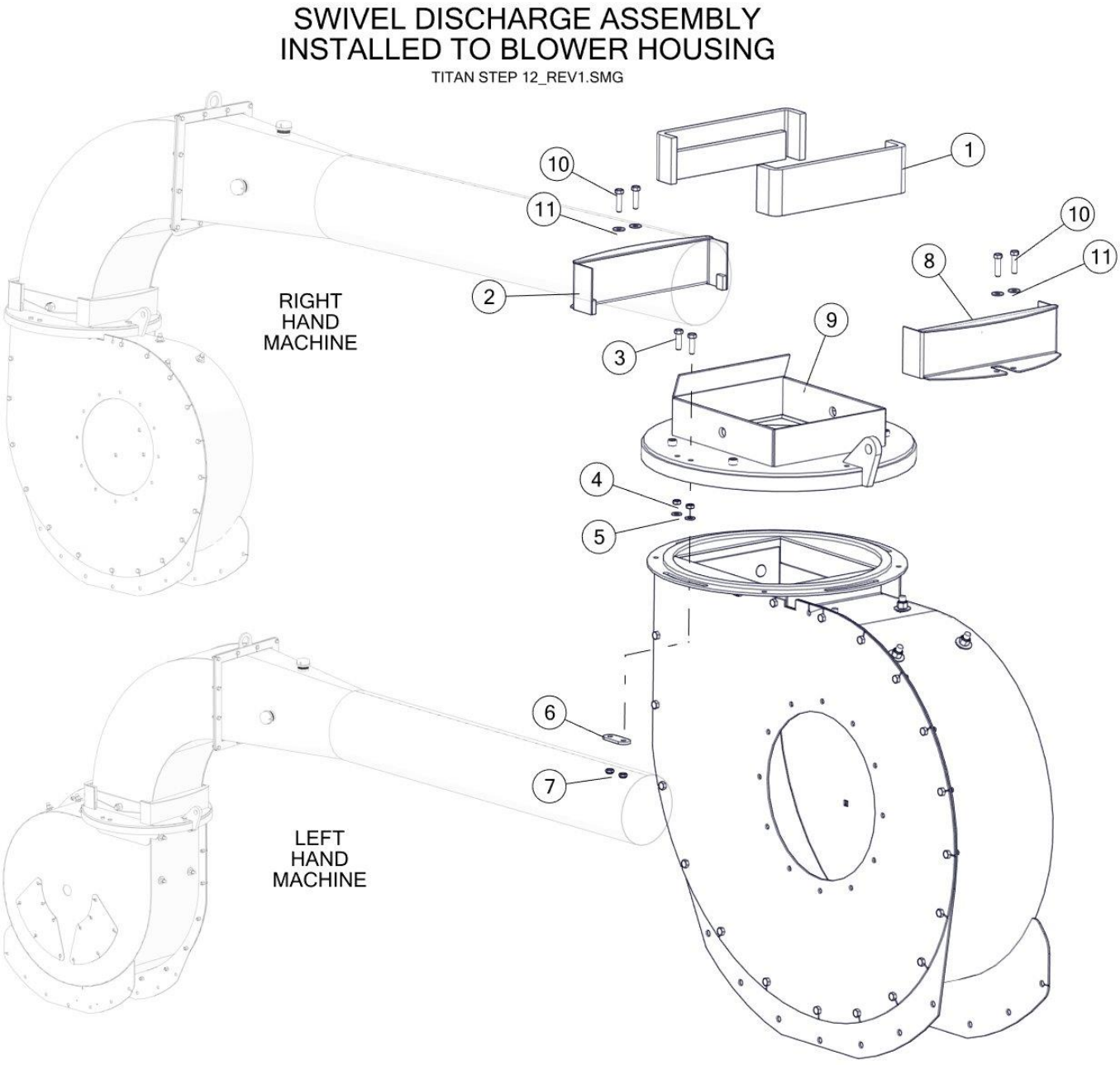
DOCUMENT 12.1

10.22. Swivel Discharge Assembly Installed To Blower Housing



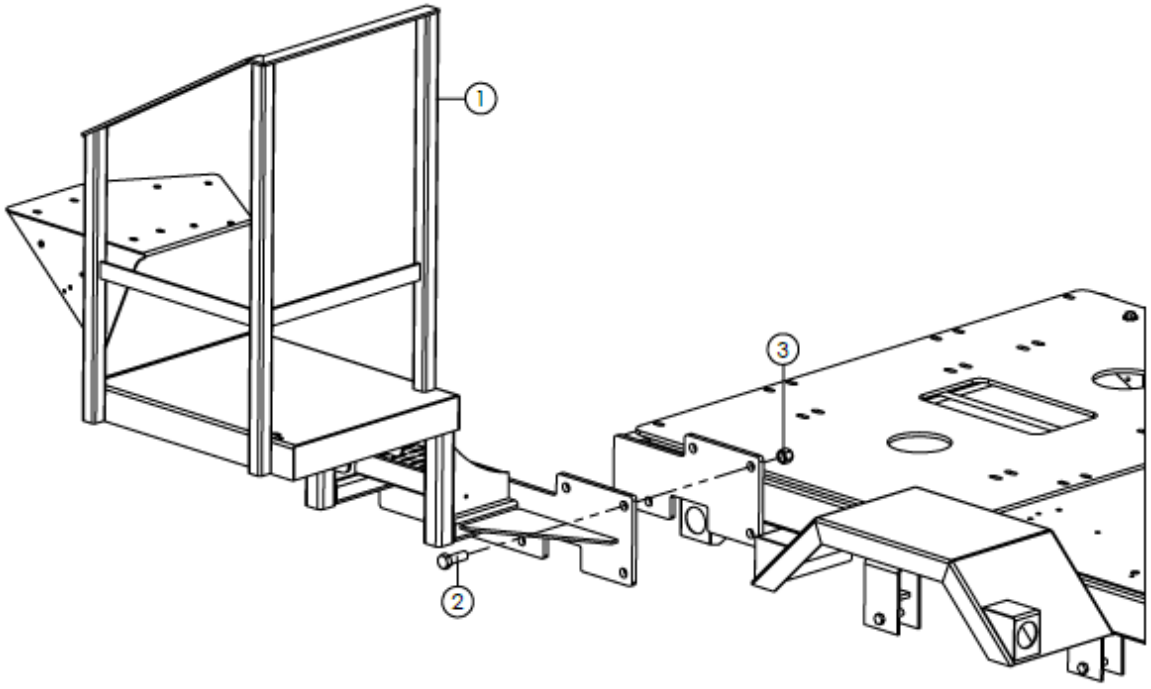
BOM ID	PartNo (config)	Description (config)
1	LV-1543	NEOPRENE/EPDM/SBR FOAM - BLACK
2	LV-1542	REAR SNOUT CAP - TITAN
3	BON-000108	1/2-13 x 1-3/4" BOLT
4	BV2-001647	NUT,1/2 -13 HEX JAM ZP
5	BON-000340SAEH	FLATWASHER,1/2" SAE; HARDENED
6	LV-1256	SWIVEL ADAPTOR RETAINER - LEAF VAC
7	BON-000333.6	NYLON INSERT JAM LOCKNUT, 1/2-13 UNC
8	LV-1541	FRONT SNOUT CAP - TITAN
9	LV-1115	SWIVEL ADAPTOR - LEAF VAC
10	BON-000109	1/2-13 x 2" BOLT
11	BON-000340	FLAT WASHER, 1/2

DOCUMENT 12.2

10.23. Seat Weldment for Pro Plus – Electric Valve Only

FILE NAME	M1156
DWG NAME	M1156 Rev 10/19/21

TITAN OPERATOR PLATFORM
LEFT HAND & RIGHT HAND PICKUP



OPERATOR PLATFORM WITH 1/2" MOUNTING HARDWARE

REF	PART NO.	QTY	DESCRIPTION
3	BON-000321	8	1/2-13 NYLON HEX LOCKNUT
2	BON-000107	8	1/2-13 x 1-1/2" HEX BOLT
1	LV-2430R	1	TITAN OPERATOR PLATFORM

OPERATOR PLATFORM WITH 3/4" MOUNTING HARDWARE

REF	PART NO.	QTY	DESCRIPTION
3	BON-000323	4	3/4-10 NYLON HEX LOCKNUT
2	BON-000183	4	3/4-10 x 2-1/4" HEX BOLT GR8
1	LV-2568L	1	TITAN OPERATOR PLATFORM, LH PICKUP
1	LV-2568R	1	TITAN OPERATOR PLATFORM, RH PICKUP

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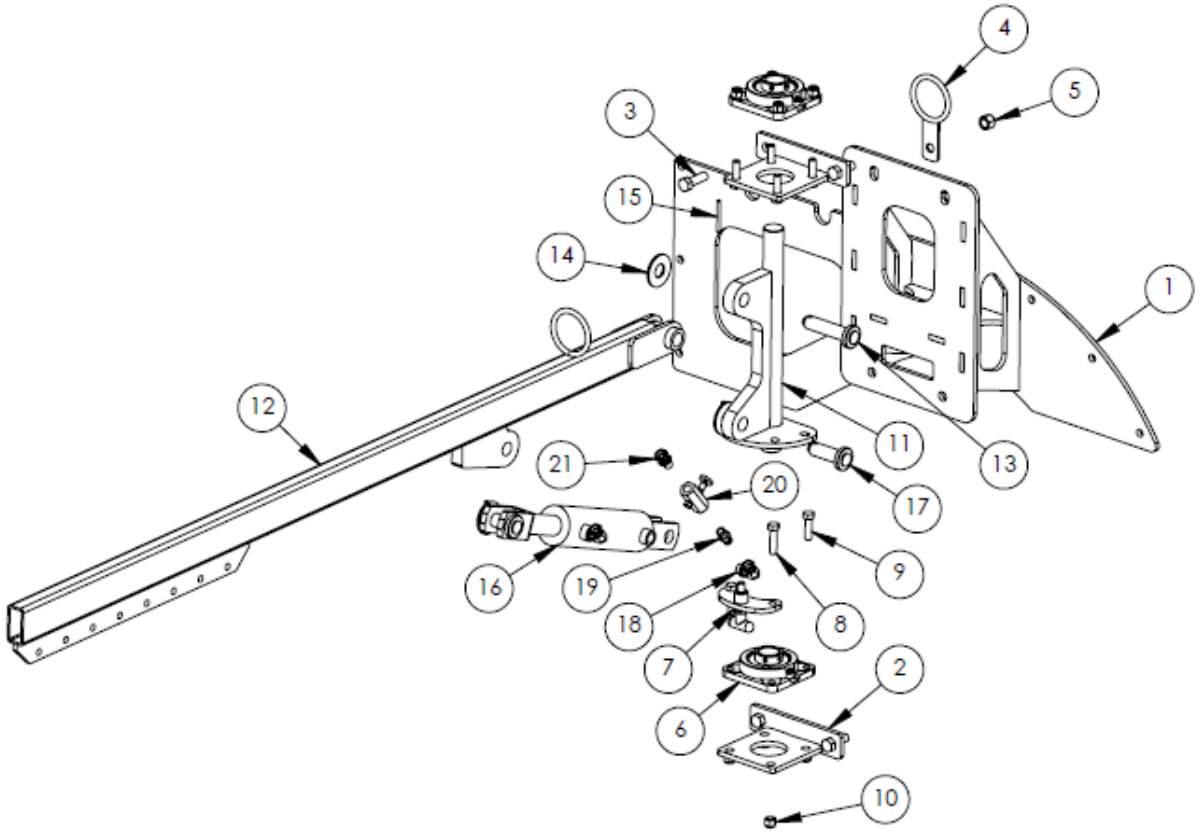
Optional Overhead Boom Bracket Control Arm Assembly

FILE NAME	M1430	REV.	DESCRIPTION	DATE	INITIALS
DWG NAME	M1430	-	ORIGINAL	9/22/2022	JWH



ITEM	QTY	PART NUMBER	DESCRIPTION
21	1	60SA 06X06	MALE PIPE X FEMALE PIPE SWIVEL STRAIGHT
20	1	MID-N600S	VALVE, FLOW CONTROL
19	1	24SA 06	MALE PIPE TO MALE PIPE STRAIGHT
18	2	60UB 08X06	MALE ORB X 90DEG FEMALE PIPE SWIVEL
17	2	BON-000999	PIN, 1" X 3"
16	1	LV-4594	CYLINDER, HYDRAULIC DUAL ACT 2-1/2" X 6"
15	3	BON-000602	PIN, ROLL 1/4" X 2-1/2"
14	3	BON-000345SAEH	1" WASHER, HARDENED
13	1	BON-000991	PIN, 1" X 4-1/4"
12	1	LV-4444	ARM, HOSE SUPPORT BOOM
11	1	LV-4469	TUBE, TORQUE
10	8	BON-000321	1/2-13 LOCKNUT, NYLON
9	6	BON-000108	1/2"-13 X 1-3/4" HHCS
8	2	BON-000109	1/2"-13 X 2" HHCS
7	1	LV-4467	LOCK, TORQUE TUBE
6	2	BV2-001005	BEARING, 4-BOLT FLANGE, 1-1/2" BORE
5	4	BON-000322	5/8"-11 LOCKNUT, NYLON
4	1	LV-2178	RING, HYDRAULIC HOSE
3	4	BON-000152	5/8"-11 X 1-3/4" HHCS
2	2	LV-4468	MOUNT, BEARING SUPPORT
1	1	LV-1698	MOUNT, OVERHEAD BOOM ARM

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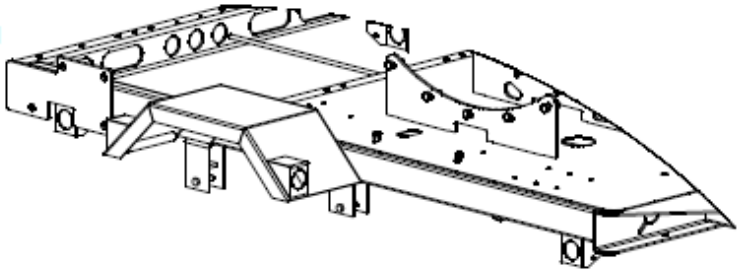
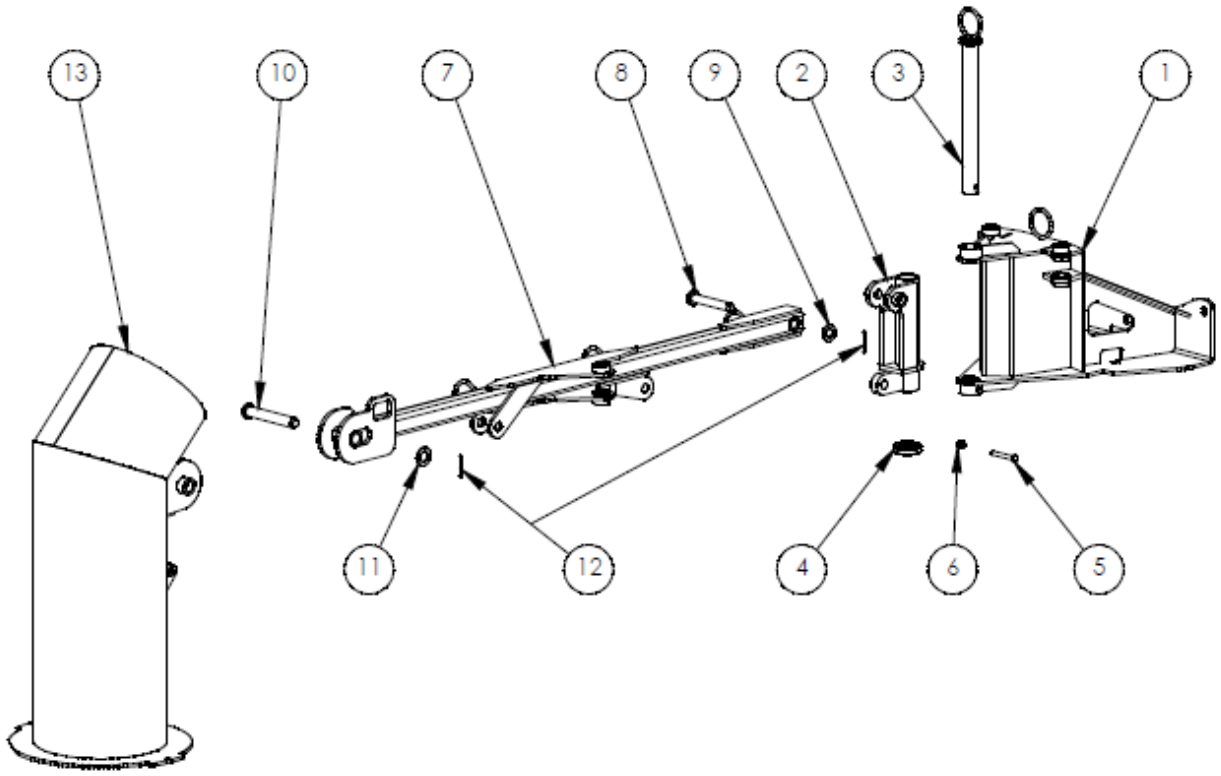
10.24. Hydraulic Control Arm Assembly

FILE NAME	M1440	REV.	DESCRIPTION	DATE	INITIALS
DWG NAME	M1440	-	ORIGINAL	11/2/2022	EDG

TITAN HYDRAULIC COLLECTION ARM ASSEMBLY BRACKET
ARM AND NOZZLE ASSEMBLY

RIGHT HAND PICKUP VERSION SHOWN
SEE B.O.M. FOR LEFT HAND PARTS





13	LV-1355	1	FIXED NOZZLE TUBE - LEAF VACUUM
12	BON-000602	2	1/4" X 2-1/2" ROLL PIN
11	BON-000345HD	1	1-1/8" FLAT WASHER, HIGH STRENGTH
10	BON-001000	1	PIN, 1-1/4" DIA, 7-1/8" WL
9	BON-000345SAEH	1	1" FLAT WASHER, SAE HARDENED
8	BON-000994	1	PIN, 1" DIA, 5-3/4" WL
7	LV-2354L	1	HOSE SUPPORT ARM - LEFT HAND
7	LV-2354R	1	HOSE SUPPORT ARM - RIGHT HAND (SHOWN)
6	BON-000321	1	1/2-13 NYLOK NUT
5	BON-000115	1	1/2-13 X 3-1/2" GRADE 8 BOLT
4	LV-1254	1	THRUST BEARING
3	LV-1253	1	HOSE ARM PIN - LEAF VACUUM
2	LV-1036	1	TORQUE TUBE
1	LV-2340	1	PIVOT BRACKET - LEFT & RIGHT HAND - TITAN

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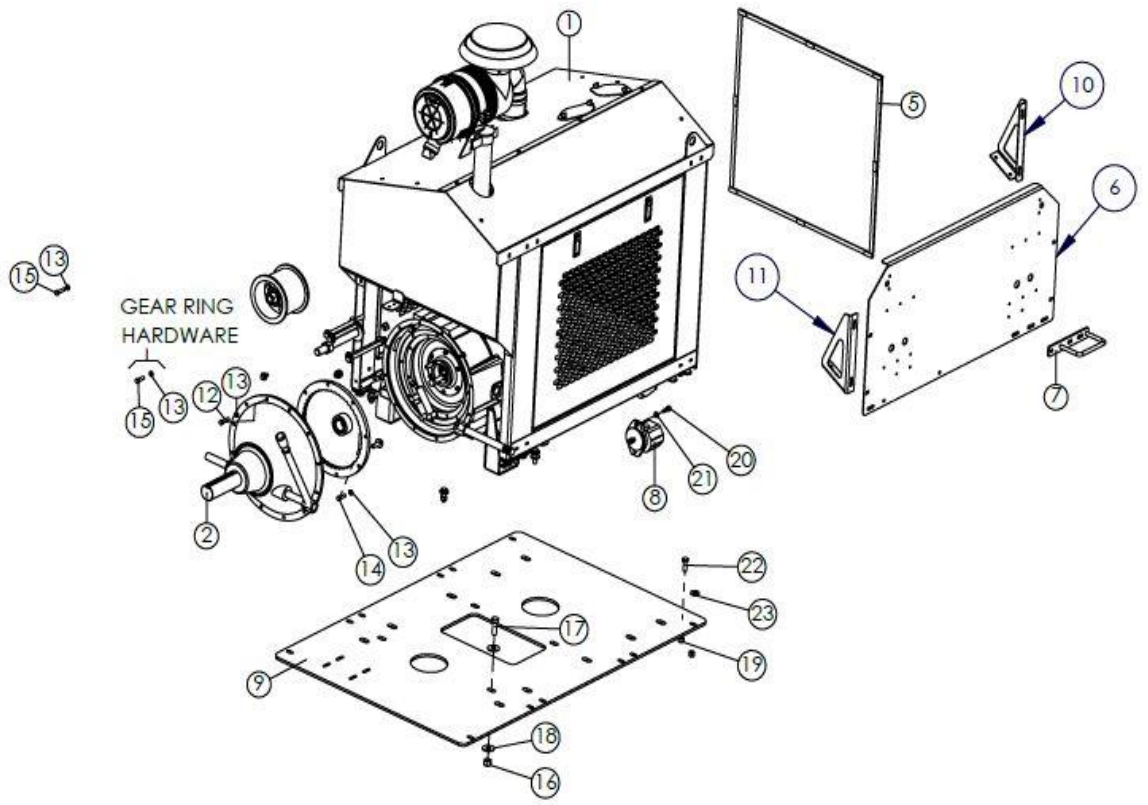
10.25. Suction Hose Hammock Support Assembly

10.26. INSTALL KUBOTA ENGINE 74HP ON CHASSIS ASSEMBLY

FILE NAME	M1147
DWG NAME	M1147 Rev: 10/16/19

KUBOTA 74 HP TIER IV ENGINE



REF	PART NO.	QTY	DESCRIPTION
23	BON-000340	-	1/2 FLAT WASHER ZP
22	BON-000107	-	1/2-13 x 1-1/2 HEX BOLT ZP
21	BON-000353	-	7/16 MED SPLIT LOCKWASHER ZP
20	96144A256	-	M10 x 1.25 x 25 MM BOLT
19	BON-000321	-	1/2-13 NYLON HEX LOCKNUT
18	BON-000341SAEH	-	5/8 SAE HARDENED FLAT WASHER
17	BON-000153	-	5/8-11 x 2 HEX BOLT GR8 ZP
16	BON-000322	-	5/8-11 NYLON HEX LOCKNUT
15	BON-000058	-	3/8-16 x 1-1/4 HEX BOLT GR8
14	BON-000059	-	3/8-16 x 1-1/2 HEX BOLT GR8
13	BON-000352	-	3/8 MED SPLIT LOCKWASHER ZP
12	BON-000057	-	3/8-16 x 1 HEX BOLT GR8
11	LV-2751	1	KUBOTA ARROWBOARD SUPPORT LH
10	LV-2750	1	KUBOTA ARROWBOARD SUPPORT RH
9	LV-2483L	1	ENGINE MOUNTING PLATE, LH PICKUP
9	LV-2483	1	ENGINE MOUNTING PLATE, RH PICKUP
8	LV-2029	1	HYDRAULIC PUMP - 0.915 IN³, CCW , 9T SPLINE
7	LV-1562	1	BOLT-ON HANDLE
6	LV-2457	1	LIGHTBOARD - KUBOTA 74, KOHLER 74 & 134
5	LV-2455	1	28 x 28 MAGNETIC PRESCREEN
4			
3	LV-1089	1	13KFBD FLUID POWER TAKE-OFF
2	LV-1599	1	NACD OVER-CENTER CLUTCH PTO, SAE #3 HOUSING/11.5
1	CALL FOR QUOTE	1	ENGINE - KUBOTA 74 HP

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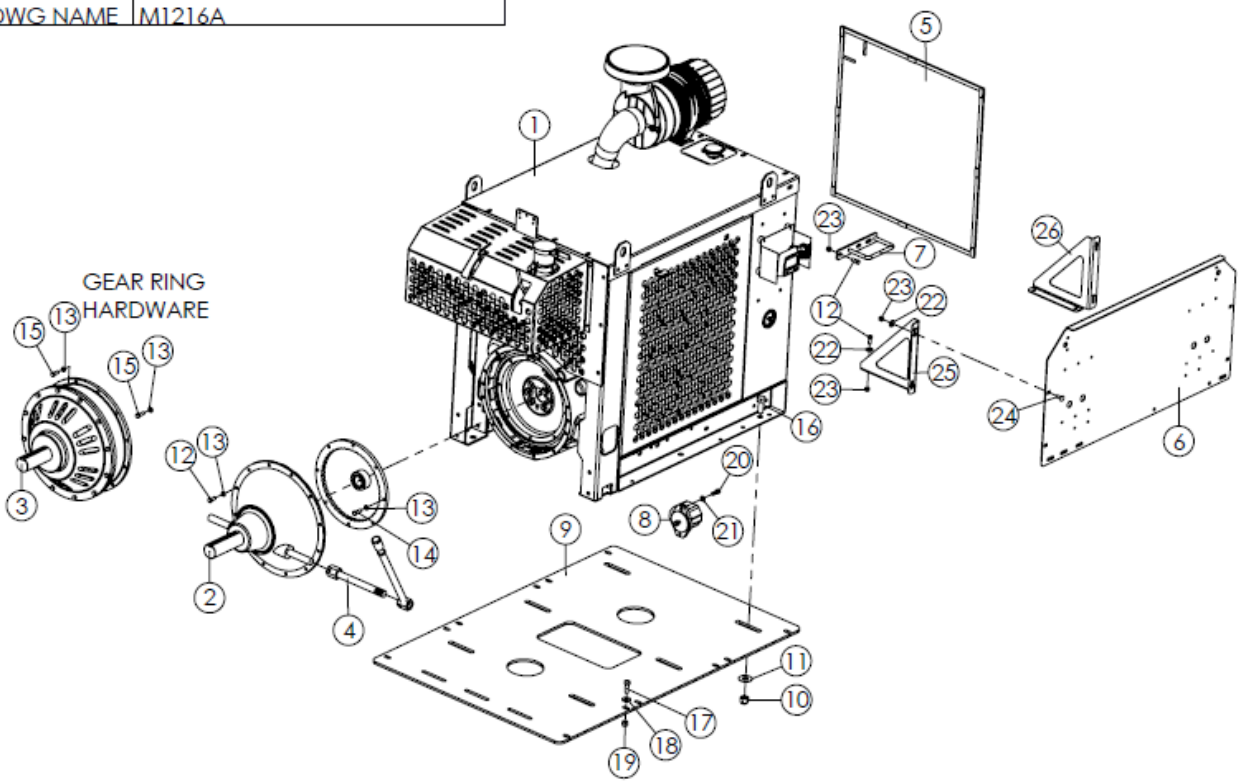
10.27. Install John Deere 74HP Engine on Chassis Assembly

FILE NAME	M1216
DWG NAME	M1216A

JOHN DEERE 74 HP TIER IV ENGINE



REF	PART NO.	QTY	DESCRIPTION
26	LV-2458R	1	BRACE-KOHLER 134HP LIGHT BOARD, RH
25	LV-2458L	1	BRACE-KOHLER 134HP LIGHT BOARD, LH
24	BON-000285.3	6	3/8-16 x 1 CARRIAGE BOLT
23	BON-000319	13	3/8-16 NYLON HEX LOCKNUT
22	BON-000338	11	3/8 STANDARD FLAT WASHER
21	BON-000353	2	7/16 MED SPLIT LOCKWASHER ZP
20	91290A520	2	M10 x 1.50 x 25 MM BOLT
19	BON-000321	12	1/2-13 NYLON HEX LOCKNUT
18	BON-000340SAEH	12	1/2 SAE HARDENED FLAT WASHER
17	BON-000107	12	1/2-13 x 1-1/2 HEX BOLT ZP
16	BON-000182	6	3/4-10 x 2 HEX BOLT GR8
15	BON-000058	24	3/8-16 x 1-1/4 HEX BOLT GR8
14	BON-000059	8	3/8-16 x 1-1/2 HEX BOLT GR8
13	BON-000352	20	3/8 MED SPLIT LOCKWASHER ZP
12	BON-000057	19	3/8-16 x 1 HEX BOLT GR8
11	BON-000342	6	3/4 STANDARD FLAT WASHER ZP
10	BON-000323	6	3/4-10 NYLON HEX LOCKNUT
9	LV-2697	1	ENGINE MOUNTING PLATE, RH PICKUP, AT
8	LV-2029	1	HYDRAULIC PUMP - 0.915 CI, CCW, 9T SPLINE
7	LV-1562	1	BOLT-ON HANDLE (optional)
6	LV-2457	1	BOARD-LIGHT (optional)
5	LV-2455	1	28 x 28 MAGNETIC PRESCREEN (optional)
4	LV-1339	1	EXTENSION ARM WELDMENT (optional)
3	LV-1089	1	13KFBD FLUID POWER TAKE-OFF
2	LV-1599	1	NACD OVER-CENTER CLUTCH PTO, SAE #3 HOUSING/11.5
1	CALL FOR QUOTE	1	ENGINE - DEERE 74 HP TIER IV

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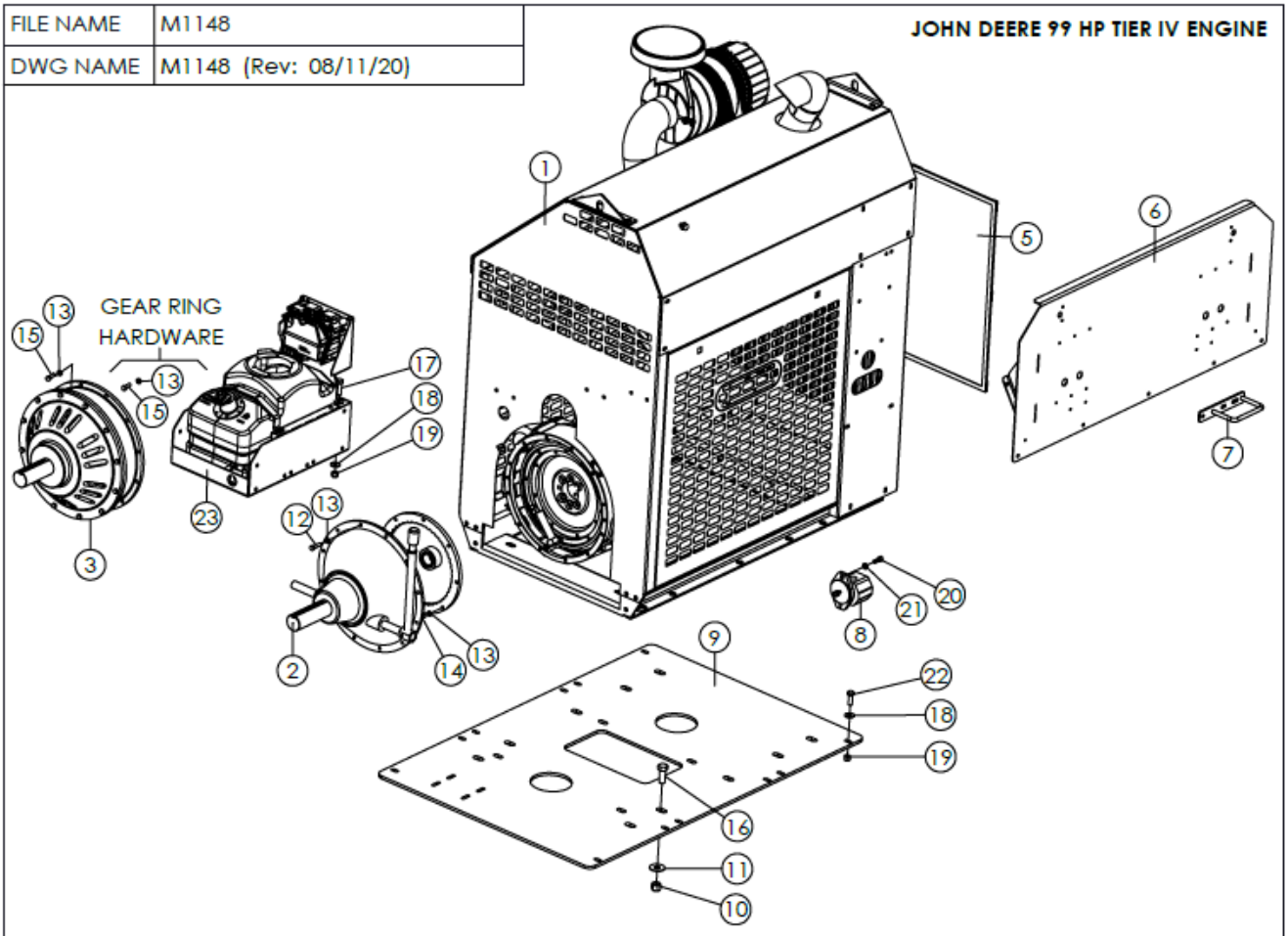
10.28. INSTALL JOHN DEERE 99HP ENGINE ON CHASSIS ASSEMBLY

FILE NAME	M1148
DWG NAME	M1148 (Rev: 08/11/20)



REF	PART NO.	QTY	DESCRIPTION
23	LV-2553	1	DEF TANK HOUSING
22	BON-000107	-	1/2-13 x 1-1/2 HEX BOLT ZP
21	BON-000353	-	7/16 MED SPLIT LOCKWASHER ZP
20	91290A520	-	M10 x 1.50 x 25MM BOLT
19	BON-000321	-	1/2-13 NYLON HEX LOCKNUT
18	BON-000340SAEH	-	1/2 SAE HARDENED FLAT WASHER
17	BON-000108	-	1/2-13 x 1-3/4 HEX BOLT GR8 ZP
16	BON-000183	-	5/8-11 x 2 HEX BOLT GR8
15	BON-000058	-	3/8-16 x 1-1/4 HEX BOLT GR8
14	BON-000059	-	3/8-16 x 1-1/2 HEX BOLT GR8
13	BON-000352	-	3/8 MED SPLIT LOCKWASHER ZP
12	BON-000057	-	3/8-16 x 1 HEX BOLT GR8
11	BON-000342	-	5/8 FLAT WASHER ZP
10	BON-000323	-	5/8-11 NYLON HEX LOCKNUT
9	LV-2483	1	ENGINE MOUNTING PLATE
8	LV-2029	1	HYDRAULIC PUMP - 0.915 IN³, CCW , 9T SPLINE
7	LV-1562	1	BOLT-ON HANDLE
6	LV-2456	1	LIGHT BOARD - DEERE 99 HP
5	LV-2455	1	28 x 28 MAGNETIC PRESCREEN
4			
3	LV-1089	1	13KFBD FLUID POWER TAKE-OFF
2	LV-1599	1	NACD OVER-CENTER CLUTCH PTO, SAE #3 HOUSING/11.5
1	CALL FOR QUOTE	1	ENGINE - DEERE 99 HP TIER IV w/DEF TANK

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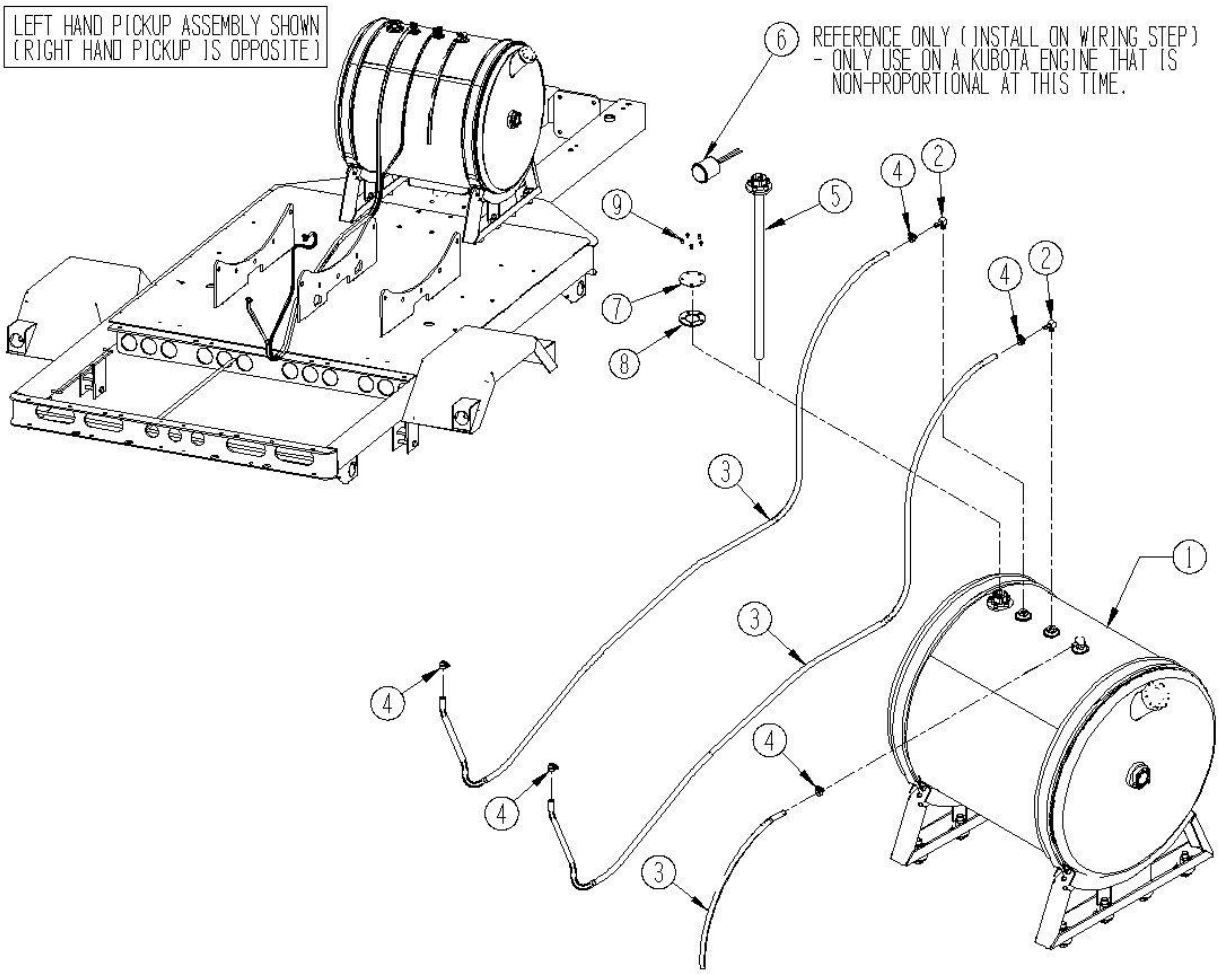
10.29. Fuel Tank Assembly For Kubota Engines

FUEL TANK ASSEMBLY - FOR KUBOTA ENGINES - LEAF VACUUM

061319 LV-1263-EXP-KABOTA-STEPS-REV2



INSTALLATION NOTES:
RIGHT HAND PICKUP - FUEL CAP GOES ON THE LEFT SIDE.
LEFT HAND PICKUP - FUEL CAP GOES ON THE RIGHT SIDE.

50 GALLON FUEL TANK / LEFT HAND PICKUP PARTS EXPLOSION SHOWN

ITEM	QTY	PART #	DESCRIPTION
1	1	LV-1263	FUEL TANK ASSEMBLY, 50 GALLON
2	2	LV-1161	1/4" NPTF MALE ELBOW X 5/16" SAE 30R7 HOSE BARB, BRASS
3	30FT	LV-1159	FUEL LINE, 5/16 IN. ID, SAE 30R7
4	5	VEL-022204	HOSE CLAMP, SAE 4 7/32-5/8
5	AR	LV-1281	FUEL TANK SENDING UNIT
6	AR	LV-1068	FUEL TANK REMOTE FUEL GAUGE (SEE NOTE)
7	1	LV-1326	SENDING UNIT PORT COVER PLATE
8	1	LV-1373	SENDING UNIT GASKET
9	1	LV-1374	SENDING UNIT COVER SCREWS (5 PACK)

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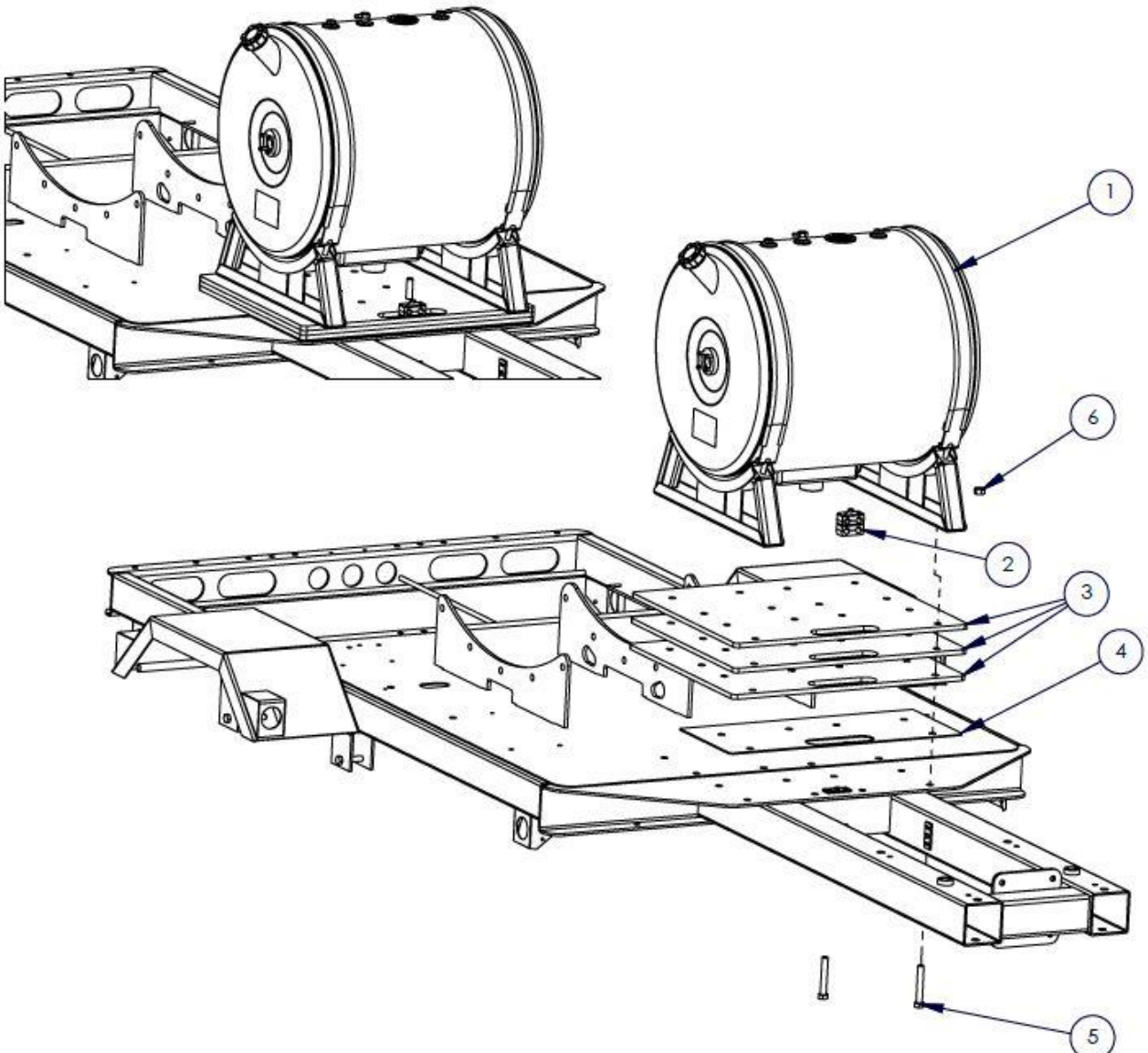
PHONE: 800-851-9664
DOCUMENT 19.1

10.30. Fuel Tank Ballast Plates for John Deere 99 Engine

FILE NAME	JD BALLAST ASSY
DWG NAME	JD BALLAST

FUEL TANK BALLAST PLATES FOR JOHN DEERE 99 HP ENGINE



ITEM	QTY	PART NUMBER	DESCRIPTION
6	16	BON-000307	5/8" - 11TPI HEX NUT GRADE 5 NUT
5	16	BON-000161	5/8"-11TPI X 4" LONG GRADE 8 BOLT
4	1	LV-1659	10 GA. BALLAST PLATE
3	3	LV-1660	1/2" BALLAST PLATE
2	2	3190 KIT	3/4 INCH TUBING CLAMP
1	1	LV-1263	FUEL TANK ASSEMBLY

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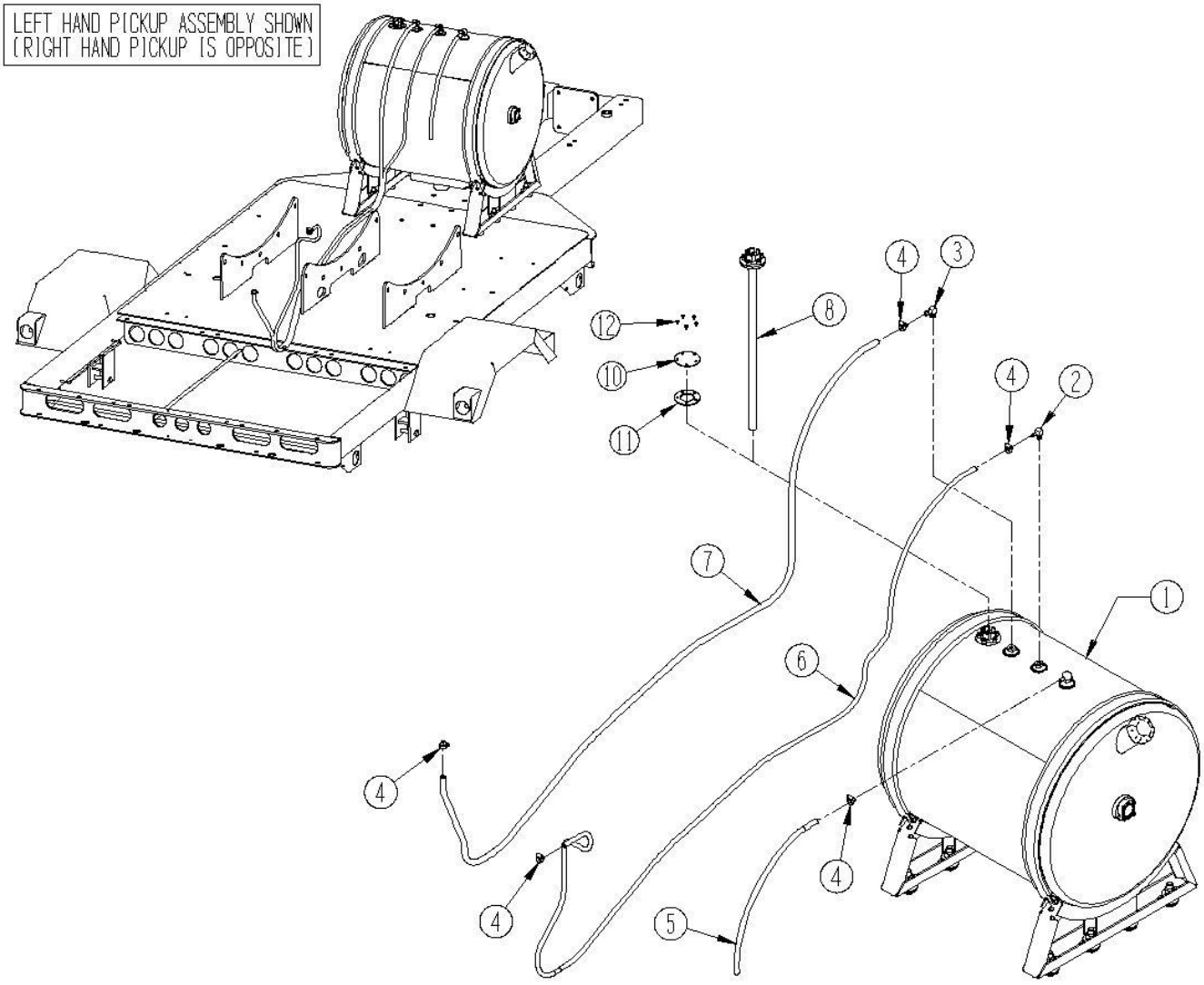
10.31. Fuel Tank Assembly For John Deere & Kohler Engines

FUEL TANK ASSEMBLY - FOR JOHN DEERE & KOHLER ENGINES - LEAF VACUUM

040319 LV-1263-EXP-JOHN DEERE-STEPS-REV1

LEFT HAND PICKUP ASSEMBLY SHOWN
(RIGHT HAND PICKUP IS OPPOSITE)



50 GALLON FUEL TANK / LEFT HAND PICKUP PARTS EXPLOSION SHOWN

INSTALLATION NOTES:
RIGHT HAND PICKUP - FUEL CAP GOES ON THE LEFT SIDE.
LEFT HAND PICKUP - FUEL CAP GOES ON THE RIGHT SIDE.

ITEM	QTY	PART #	DESCRIPTION
1		LV-1263	FUEL TANK ASSEMBLY, 50 GALLON
2	1	LV-1441	1/4" NPTF MALE PIPE X 1/4" ID HOSE BARB 90 DEG. ELBOW, BRASS
3	1	LV-1442	1/4" NPTF MALE PIPE X 3/8" ID HOSE BARB 90 DEG. ELBOW, BRASS
4	5	VEL-022204	HOSE CLAMP, SAE 4 7/32-5/8
5	AR	LV-1159	FUEL LINE, 5/16 IN. ID, SAE 30R7
6	AR	LV-1443	FUEL LINE, 1/4 IN. ID, SAE 30R7
7	AR	LV-1444	FUEL LINE, 3/8 IN. ID, SAE 30R7
8	AR	LV-1281	FUEL TANK SENDING UNIT
10	1	LV-1326	SENDING UNIT PORT COVER PLATE
11	1	LV-1373	SENDING UNIT GASKET
12	1	LV-1374	SENDING UNIT COVER SCREWS (5 PACK)

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DOCUMENT 19.2

10.32. Manual Overhead Boom Hose Arm Cylinder And Fittings

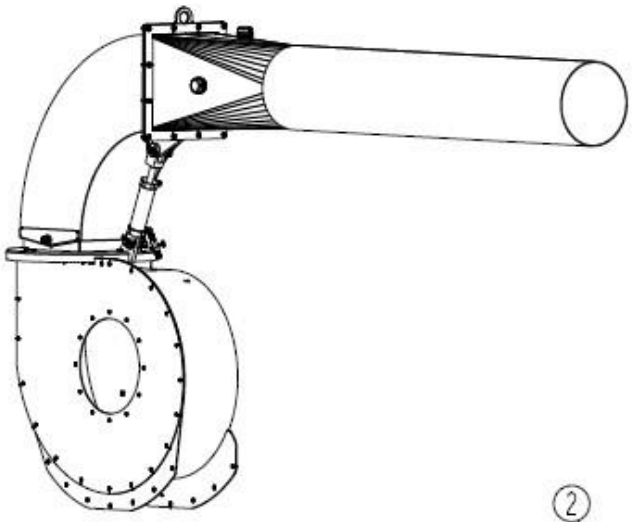
TITAN - OVERHEAD BOOM CYLINDER AND HOSE ASSEMBLY

012521 TITAN OVERHEAD BOOM CYLINDER AND HOSE ASSEMBLY REV1 .SMG

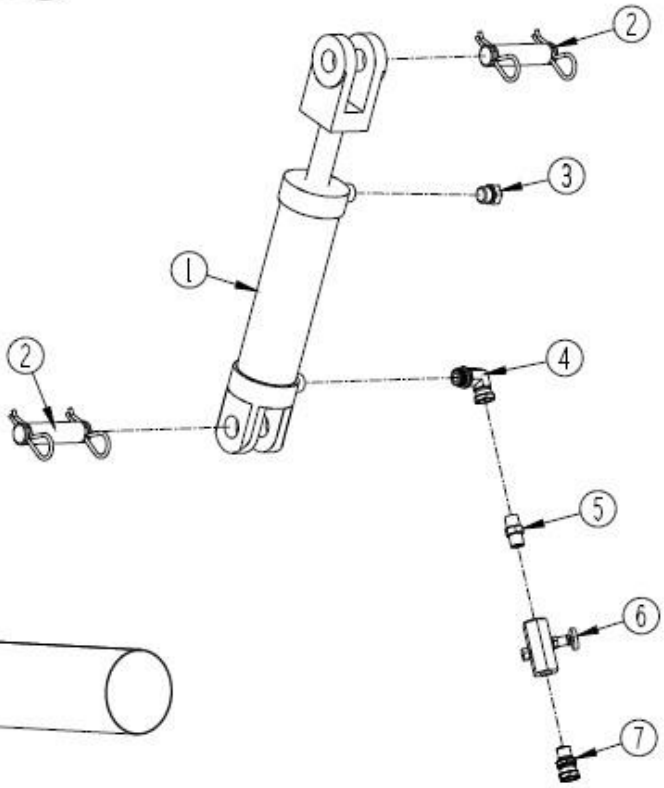
10.33. Swivel Elbow Hydraulic Cylinder & Fittings Assembly

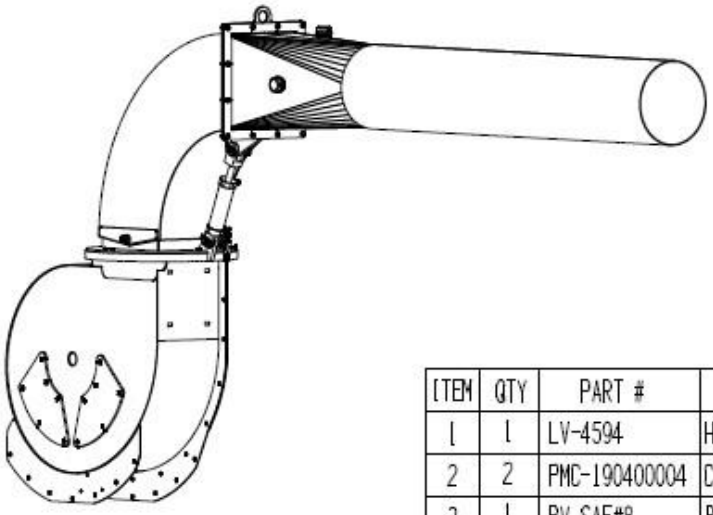
SWIVEL ELBOW HYDRAULIC CYLINDER AND FITTINGS ASSEMBLY - LEAF VAC

021121 LV-1056-EXP-STEPS



RIGHT HAND PICKUP ASSEMBLY





LEFT HAND PICKUP ASSEMBLY

ITEM	QTY	PART #	DESCRIPTION
1	1	LV-4594	HYDRAULIC CYLINDER (INCLUDES PINS - ITEM 2)
2	2	PMC-190400004	CLEVIS PIN
3	1	BV-SAE#8	BREATHER CAP 1/2" PIPE THREAD
4	1	6OUB 08X06	MALE ORB X 90DEG FMALE PIPE SW 3/4-16TPI TO 3/8 NPT
5	1	24SA 06	MALE PIPE TO MALE PIPE 3/8 NPT X 3/8 MNPT
6	1	MID-N600S	FLOW CONTROL 3/8 ADJUSTABLE
7	1	6OSA 06X06	MALE PIPE X FEMALE PIPE SWIVEL 3/8 NPTF TO 3/8 NPSM

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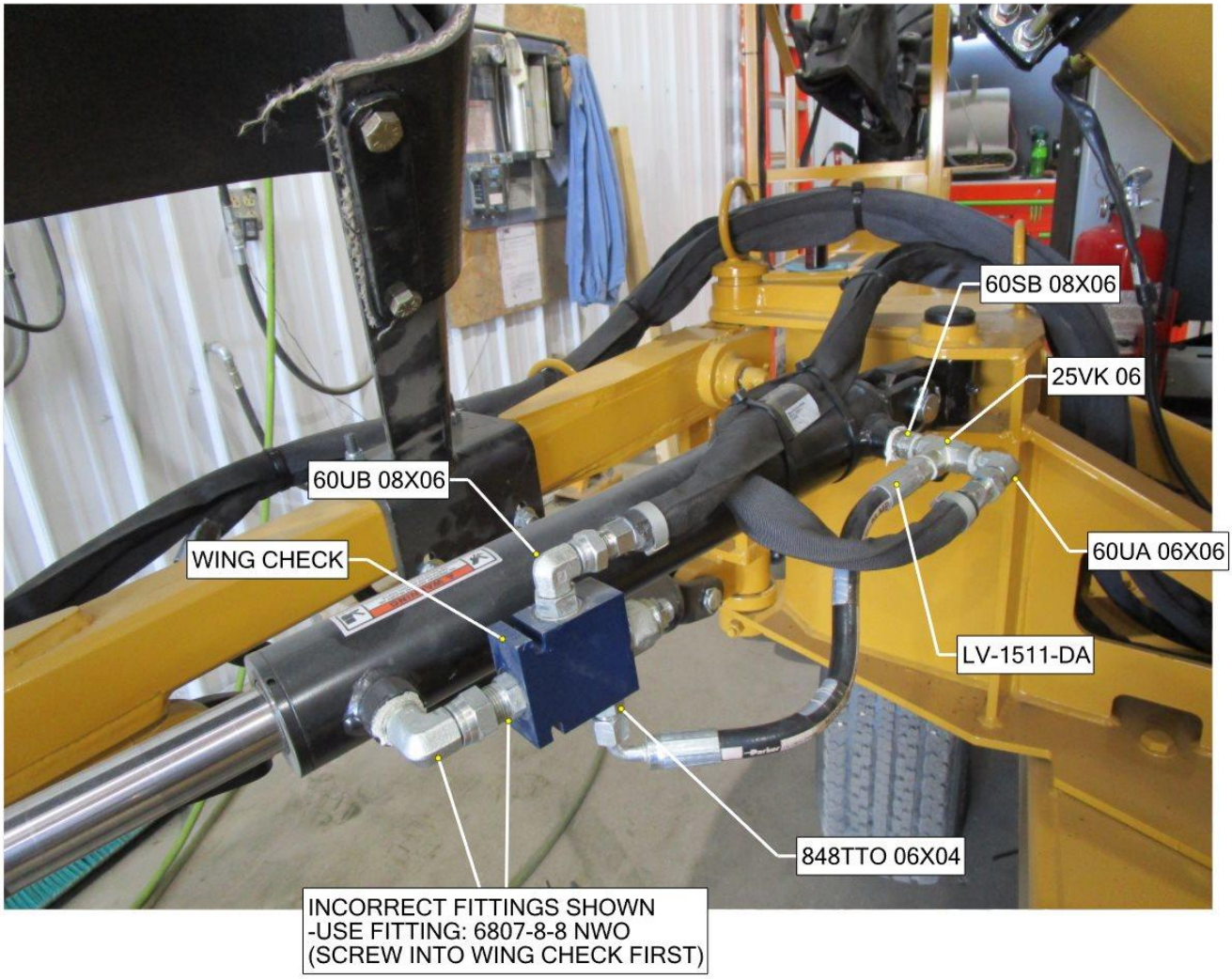
DOCUMENT 20.3

Arm Cylinder Counter Balance Ass'y (Proportional Valve – Non Wireless & Wireless)

WING CHECK ASSEMBLY

(USE WITH PROPORTIONAL VALVE ONLY - NON WIRELESS & WIRELESS)

021221 SPARTAN PROPORTIONAL HYDRAULIC ARM WING CHECK ASSEMBLY REV1.smg

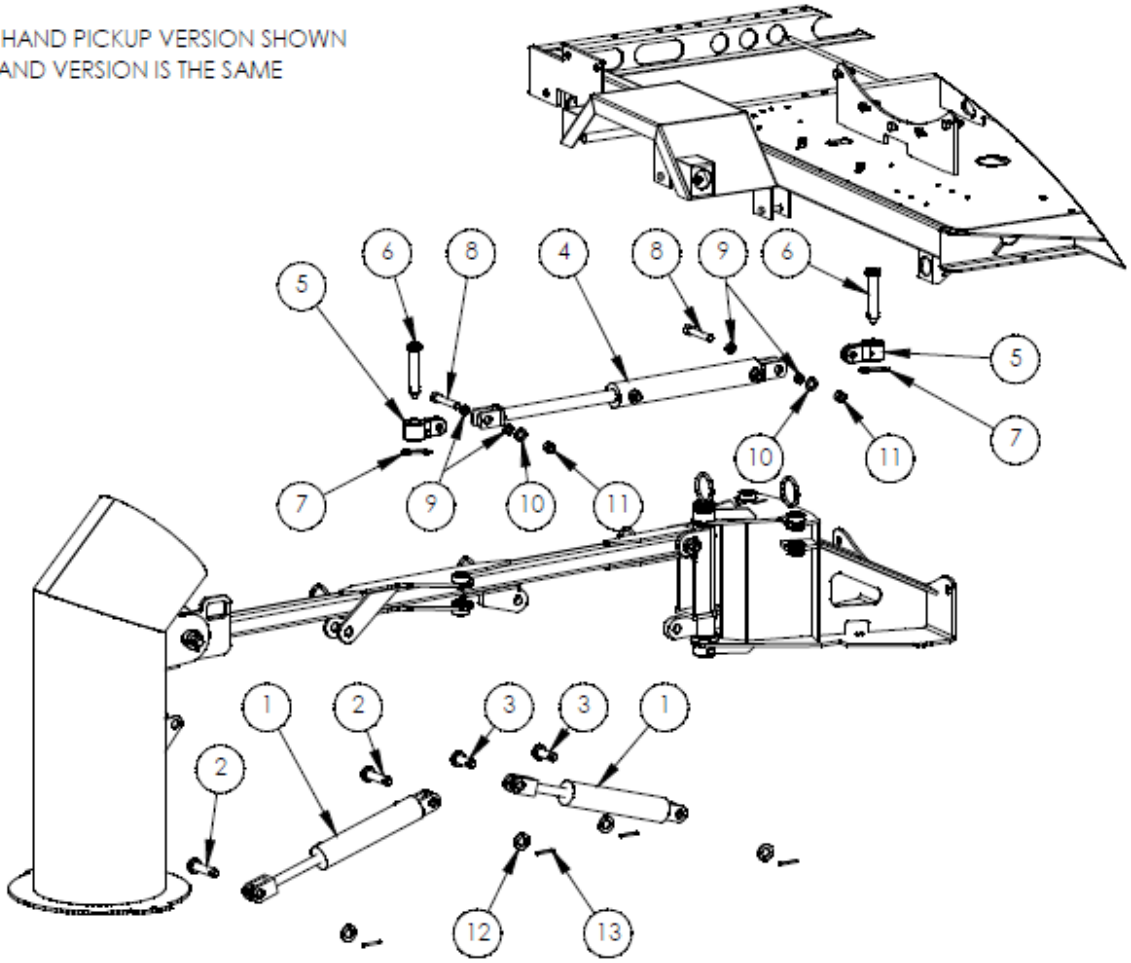


10.34. Hydraulic Hose Arm Cylinder Assembly

FILE NAME	M1441	REV.	DESCRIPTION	DATE	INITIALS
DWG NAME	M1441	-	ORIGINAL	11/2/2022	EDG

TITAN HYDRAULIC COLLECTION ARM CYLINDER ASSEMBLY
CYLINDERS AND PINS

RIGHT HAND PICKUP VERSION SHOWN
LEFT HAND VERSION IS THE SAME



13	BON-000602	4	1/4" X 2-1/2" ROLL PIN
12	BON-000345SAEH	4	1" FLAT WASHER, SAE HARDENED
11	BON-000323	2	3/4-10 NYLON LOCK NUT
10	BON-000343.1	2	3/4" FLAT WASHER
9	SS 12-1608	4	SPLIT SLEEVE BUSHING
8	BON-000191	2	3/4-10 X 4-1/2" GRADE 8 BOLT
7	BON-000292.1	2	1/2" CLINCH PIN
6	BON-000292.3	2	PIN, 1-1/4" DIA, 4-3/4" WL
5	BON-007126	2	CYLINDER PIVOT EAR
4	LV-4593	1	LEAF VAC CYLIDER
3	BON-000999	2	PIN, 1" DIA, 2-3/8" WL
2	BON-000991	2	PIN, 1" DIA, 3-5/8" WL
1	LV-4592	2	LEAF VAC CYLINDER

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10.35. HYDRAULIC ARM FITTINGS ASS'Y (PROPORTIONAL VALVE – NON WIRELESS & WIRELESS)

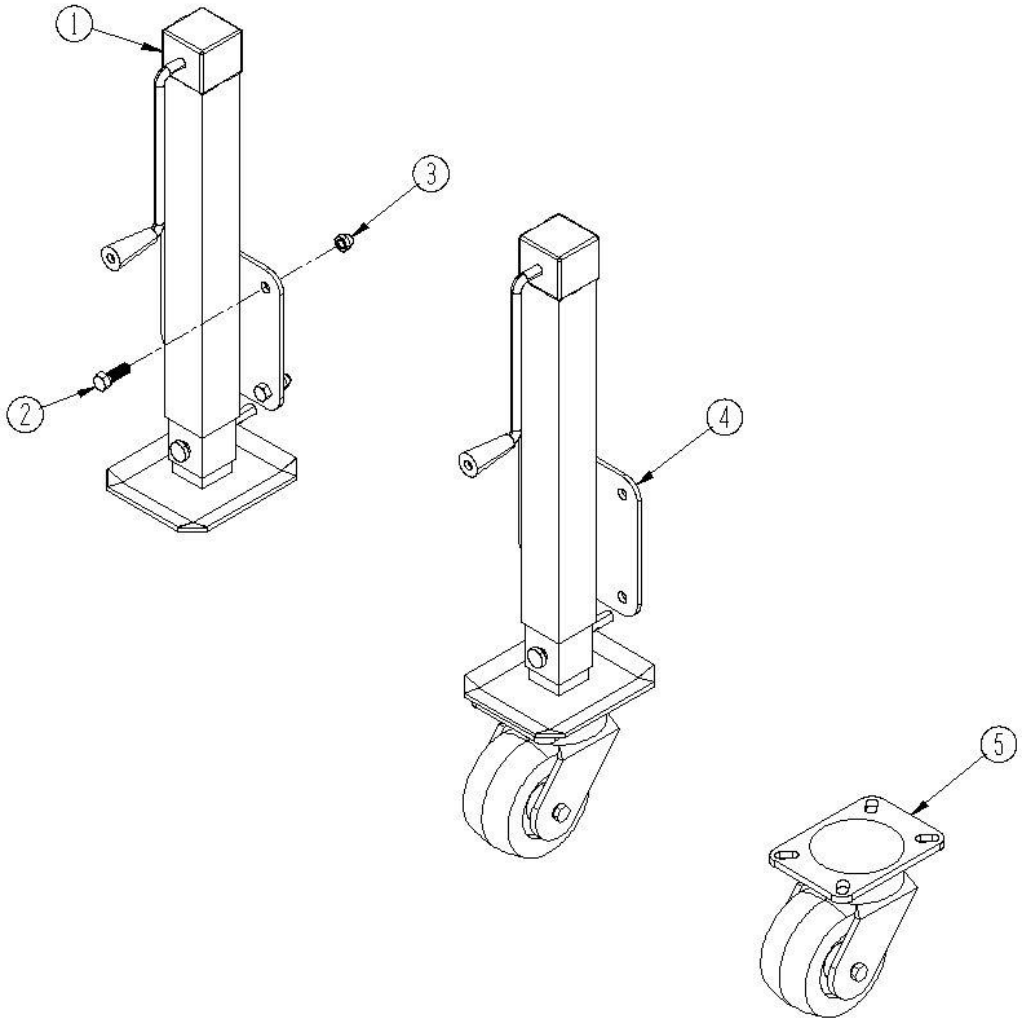
HYDRAULIC ARM FITTINGS ASSEMBLY
(PROPORTIONAL VALVE - NON WIRELESS & WIRELESS)

021021 TITAN HYDRAULIC ARM FITTINGS & HOSE ASSEMBLY REV1.smg

10.36. MANUAL TRAILER JACK ASSEMBLY

MANUAL TRAILER JACK ASSEMBY - LEAF VACUUM

012511 LV-1236-EXP-STEPS



ITEM	QTY	PART #	DESCRIPTION
1	1	LV-1303	MANUAL JACK WELDMENT
2	4	BON-000107	1/2"-13TPI X 1 1/2" GRADE 8 BOLT
3	4	BON-000321	1/2"-13TPI HEX LOCK NUT NYLON INSERT
4		LV-1308	MANUAL JACK WITH CASTER
5		LV-1190	SWIVEL CASTER, 3000 LB, 6" DIAMETER

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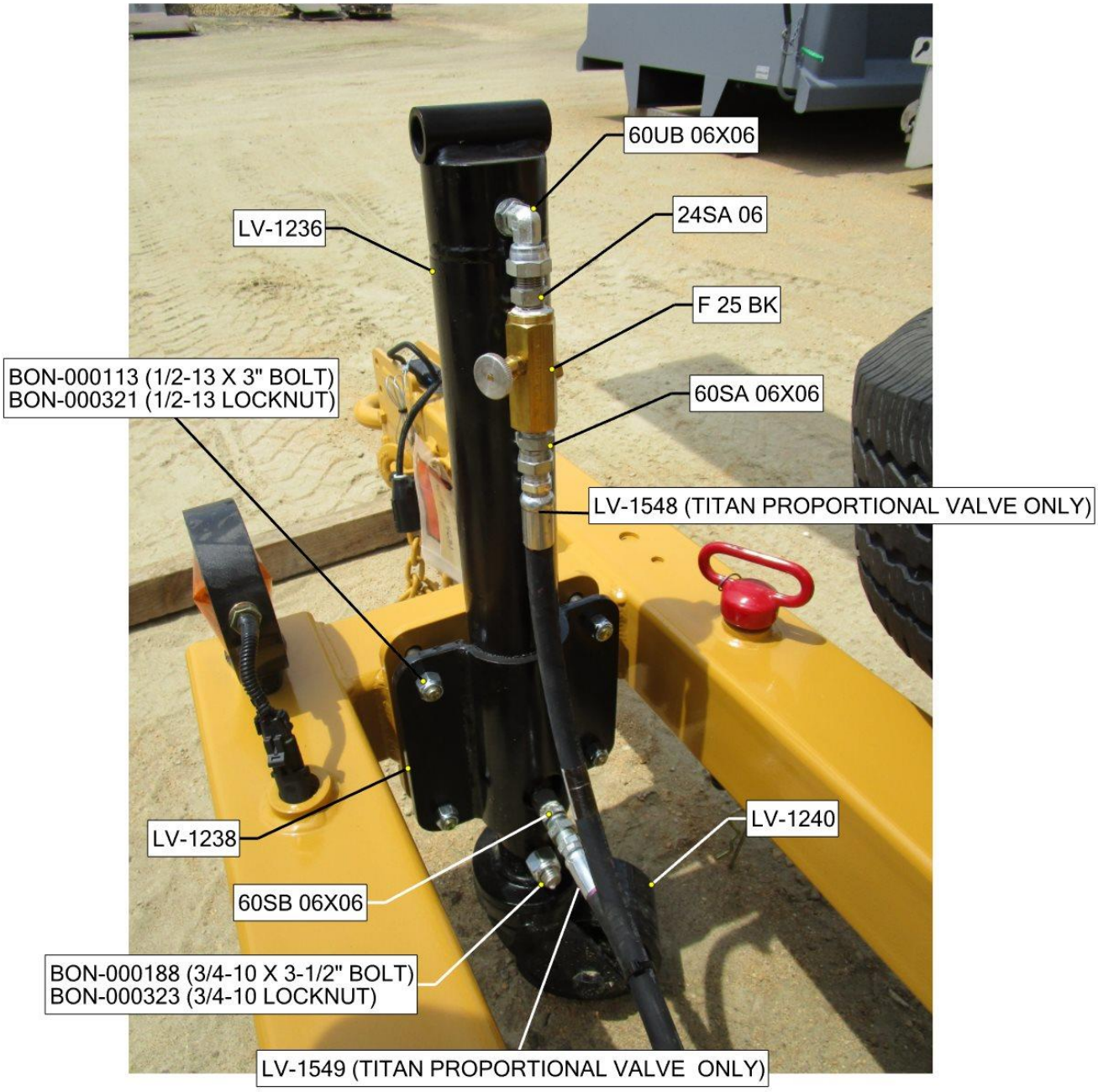
DOCUMENT 21.1

10.37. Hydraulic Trailer Jack Assembly (Use When The Duel Check Is Part Of The Valve Or When Using An Electric Power Unit)

HYDRAULIC JACK ASSEMBLY

(WHEN DUAL CHECK IS PART OF VALVE OR USING AND ELECTRIC POWER UNIT)

032521 LV-1236-DUAL CHEK PART OF VALVE



OLD STYLE ASSEMBLY SHOWN (PRINT NEEDS UPDATED):

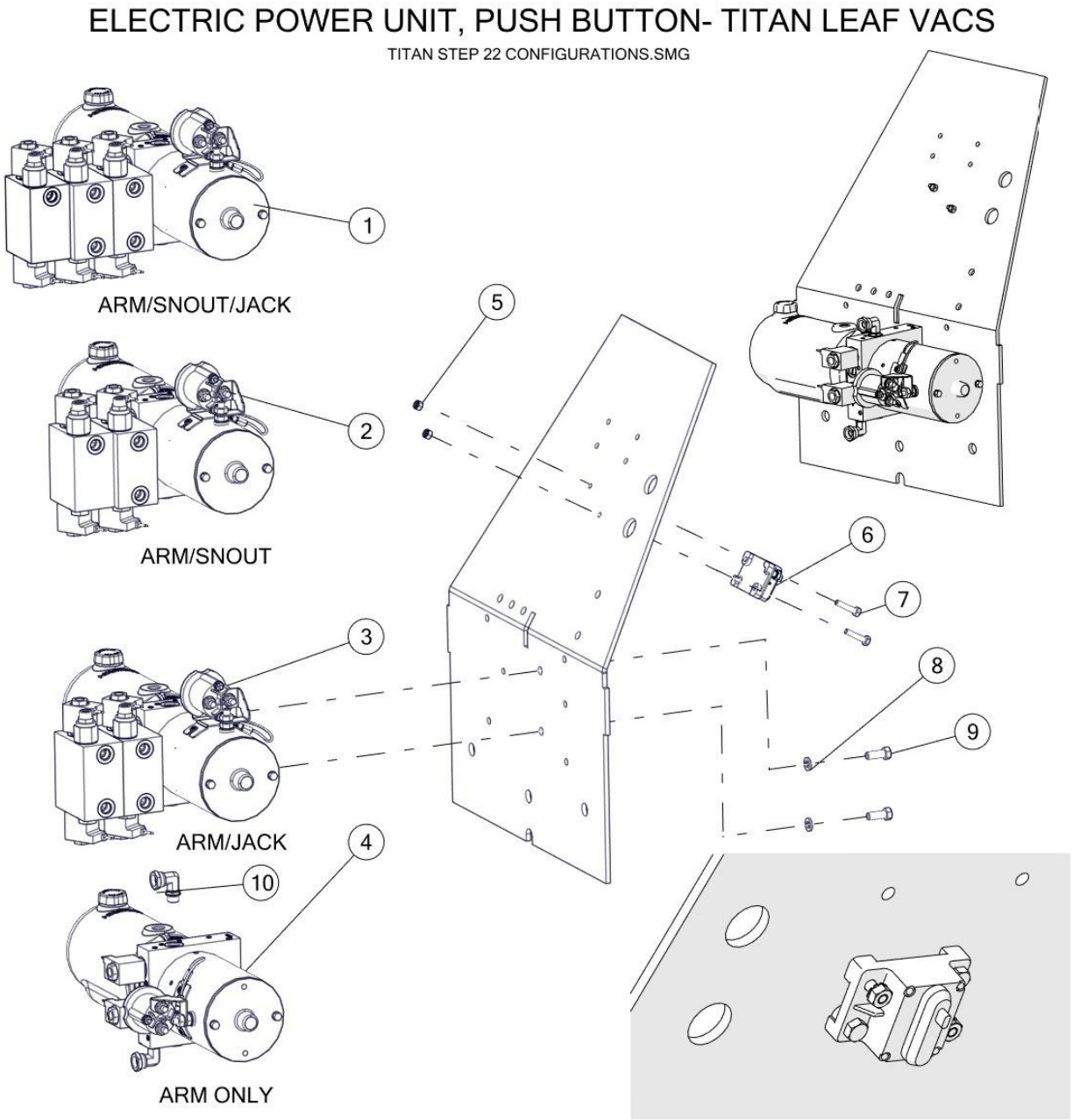
NEW STYLE CHANGES:
LV-1236 WILL INCLUDES A WELD-ON PLATE.
LV-1238 WILL NO LONGER BE NEEDED.

60UB 06X06 WILL BE REPLACED BY 60UB 08X06.

60SB 06X06 WILL BE REPLACED BY 60SB 08X06.

BON-000113 (3" BOLT) (QTY-4) WILL BE REPLACED BY BON-000108 (1-3/4" BOLT)(QTY-4)

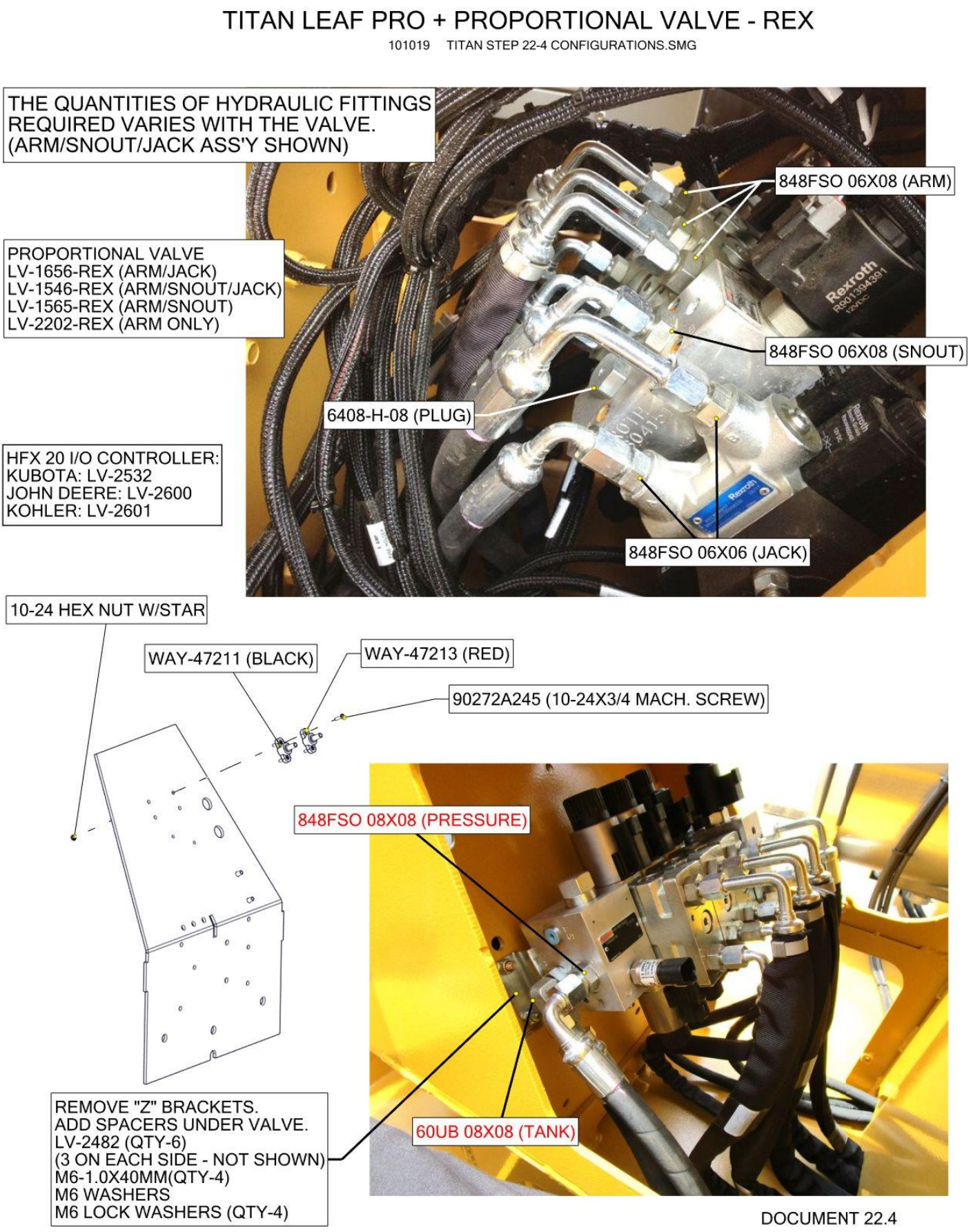
10.38. ELECTRIC POWER UNIT PUSH BUTTON ASSEMBLIES



BOM ID	Qty	PartNo (config)	Description (config)
1	1	LV-1321	POWER UNIT, TWO 4 WAY, ONE 3 WAY
2	1	LV-1331	POWER UNIT, ONE 4 WAY, ONE 3 WAY
3	1	LV-1319	POWER UNIT, TWO 4 WAY
4	1	LV-1204	POWER UNIT, SINGLE 4 WAY FUNCTION
5	2	BON-000318.5	NYLON INSERT LOCKNUT, 1/4-20 UNC
6	1	WAY-46989	CIRCUIT BREAKER, 150 AMP
7	2	BON-000006	1/4-20 x 1-1/4" BOLT
8	2	BON-000352	LOCK WASHER, 3/8
9	2	BON-000057	3/8-16 X 1" BOLT
10	2	60UB 06X06	3/8 MALE ORB X 3/8 90DEG FMALE PIPE

DOCUMENT 22.2

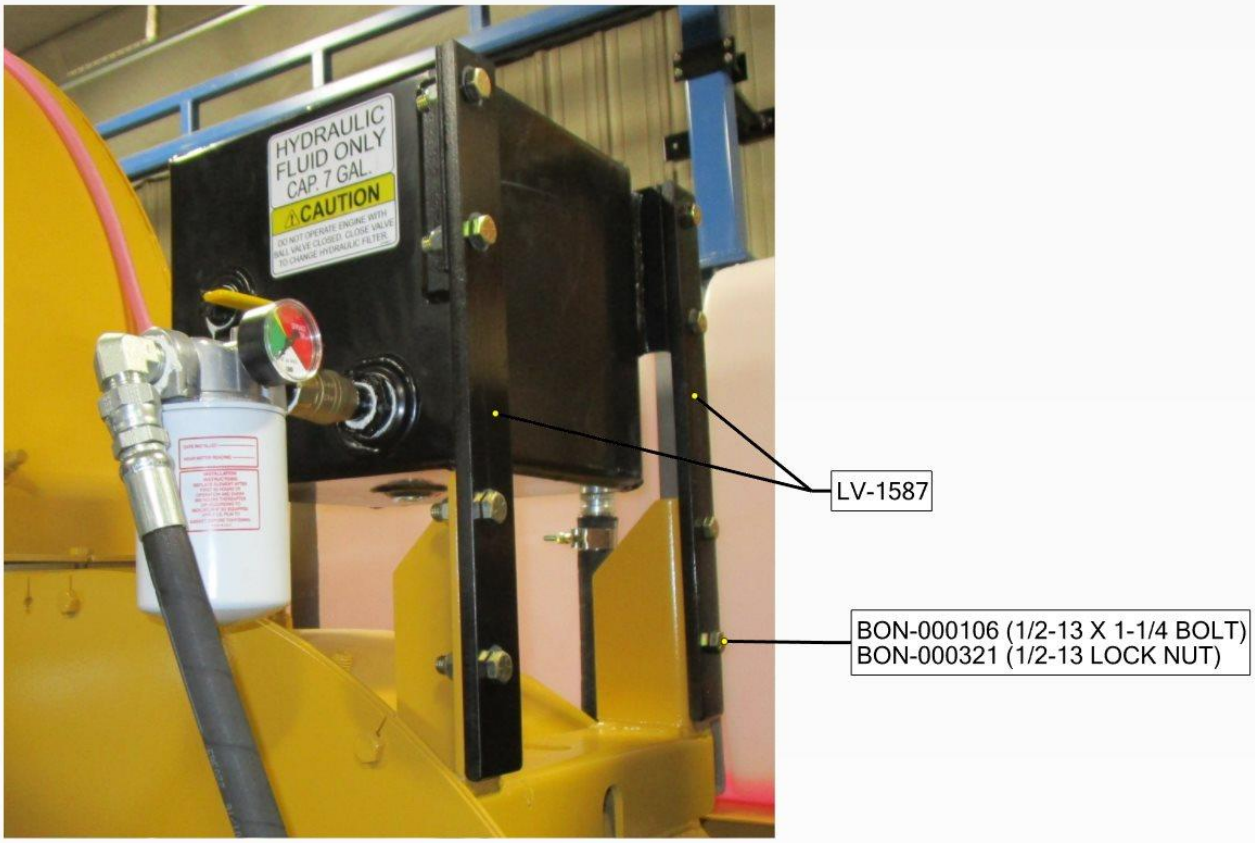
10.39. PROPORTIONAL VALVE ASSEMBLY – REX



10.40. Hydraulic Tank Bracket Extensions (Left Hand Pickup – John Deere Only)

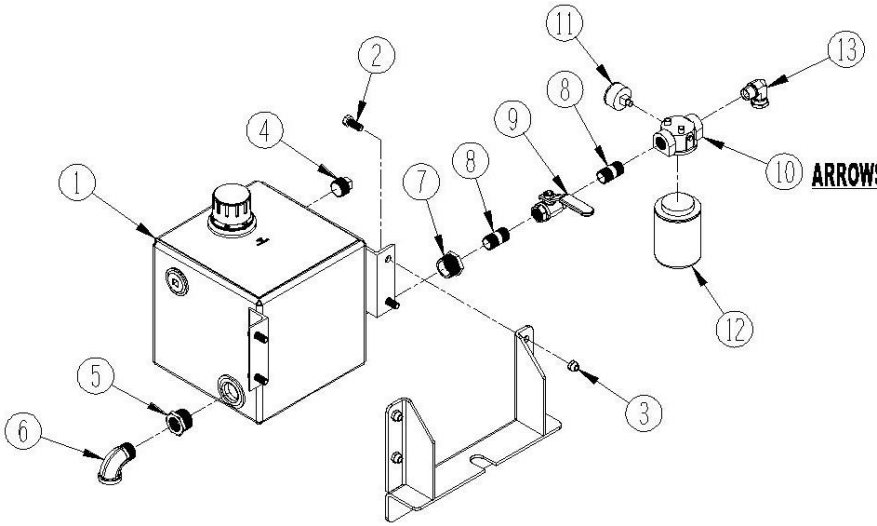
HYDRAULIC TANK BRACKET EXTENSION - LEFT HAND PICKUP - JOHN DEERE ENGINE ONLY

TITAN HYDRAULIC TANK BRACKET - LEFT HAND PICKUP - DEERE ENGINE.smg

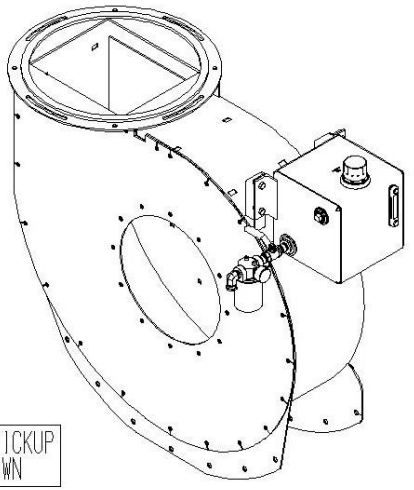


HYDRAULIC TANK ASSEMBLY - STANDARD AND PROPORTIONAL VALVE

120718 LV-1108-EXP-STEPS

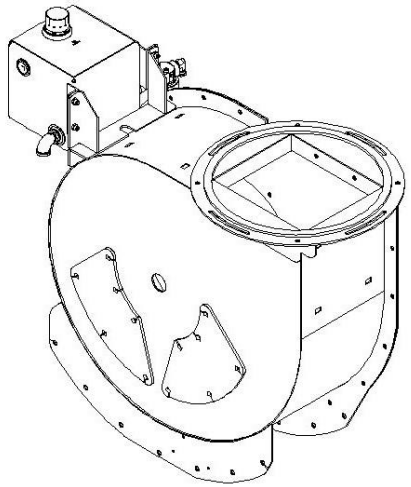


ARROWS POINT TOWARD THE TANK



RIGHT HAND PICKUP ASSEMBLY SHOWN

ITEM	QTY	PART #	DESCRIPTION
1	1	LV-1108	HYDRAULIC TANK, 7 GALLON
2	4	BON-000106	1/2"-13TPI X 1 1/4" GRADE 8 BOLT
3	4	BON-000321	1/2"-13TPI HEX LOCK NUT NYLON INSERT
4	1	BON-000590	PIPE FITTING, 1" SQUARE HEAD PLUG
5	1	BON-000472	PIPE FITTING, 1-1/4X1 BLACK HEX BUSHING
6	1	BON-000442	PIPE FITTINGS,1" 90 DEGREE STREET ELS
7	1	BON-000471	PIPE FITTING, 1-1/4X3/4 BLACK HEX BUSHING
8	2	BON-000526	PIPE FITTING, NIPPLE 3/4X2 NIPPLE
9	1	LV-1142	3/4" BALL VALVE
10-12	1	LV-1137	HYDRAULIC FILTER ASSEMBLY WITH GAUGE
10		LV-1139	LENZ FILTER HEAD ONLY
11		MID-C1-20-L	FILTER RESTRICTION GAUGE
12		LV-1138	LENZ FILTER ONLY
13	1	6OUA 12X12	MALE PIPE X 90DEG FEMALE SWIVL 3/4 NPTF TO 3/4 NPSM

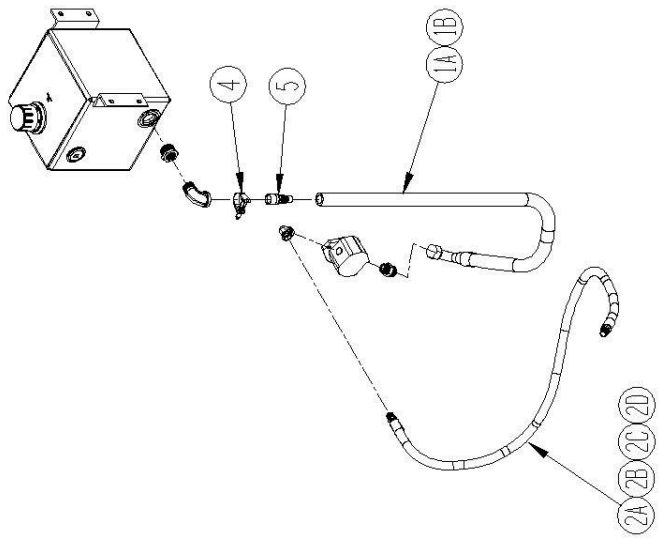


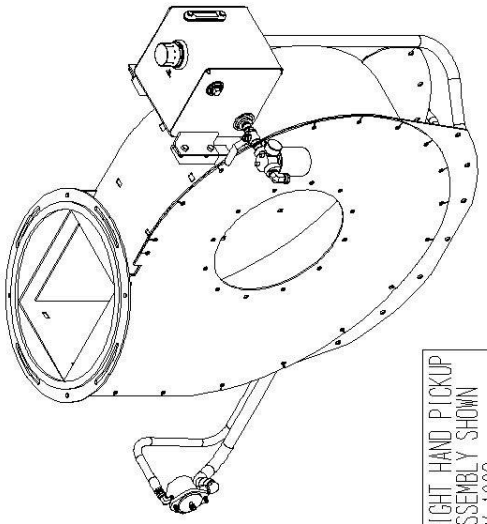
LEFT HAND PICKUP ASSEMBLY SHOWN

10.42. HYDRAULIC TANK HOSE ASS'Y (STANDARD / PROPORTIONAL VALVE)

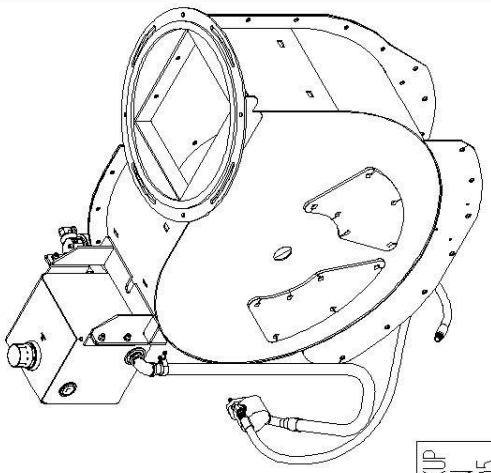
HYDRAULIC TANK HOSE ASSEMBLY - STANDARD AND PROPORTIONAL VALVE

022018 LV-1108-EXP-STEPS





RIGHT HAND PICKUP
ASSEMBLY SHOWN
LV-1002



LEFT HAND PICKUP
ASSEMBLY SHOWN
LV-1003 LV-1005

ITEM	QTY	PART #	DESCRIPTION
1A	AR	LV-1207	STANDARD AND PROPORTIONAL VALVE - HYD. HOSE, SUCTION LINE (R.H. PICK UP) 130" LONG
1B	AR	LV-1100	STANDARD AND PROPORTIONAL VALVE - HYD. HOSE, SUCTION LINE (L.H. PICK UP) 50" LONG
2A	AR	LV-1209	STANDARD VALVE - HYD. HOSE, PUMP TO VALVE (R.H. PICK UP) 105" LONG
2B	AR	LV-1101	STANDARD VALVE - HYD. HOSE, PUMP TO VALVE (L.H. PICKUP) 53" LONG
2C	AR	LV-1552	PROPORTIONAL VALVE - HYD. HOSE, PUMP TO VALVE (R.H. PICKUP) - 90° FITTING NOT SHOWN
2D	AR	LV-1553	PROPORTIONAL VALVE - HYD. HOSE, PUMP TO VALVE (L.H. PICKUP) - 90° FITTING NOT SHOWN
4	1	HC100	HOSE CLAMP
5	1	DIX-ST-10	HOSE BARB

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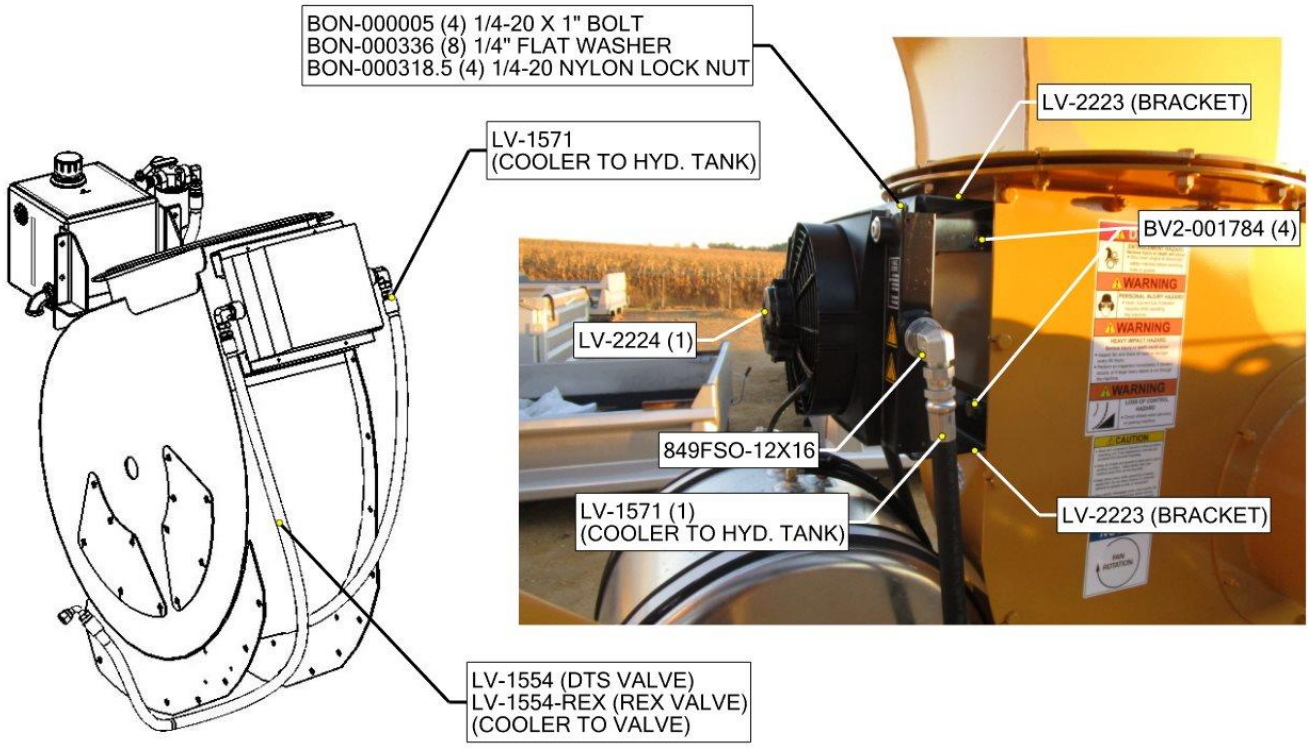
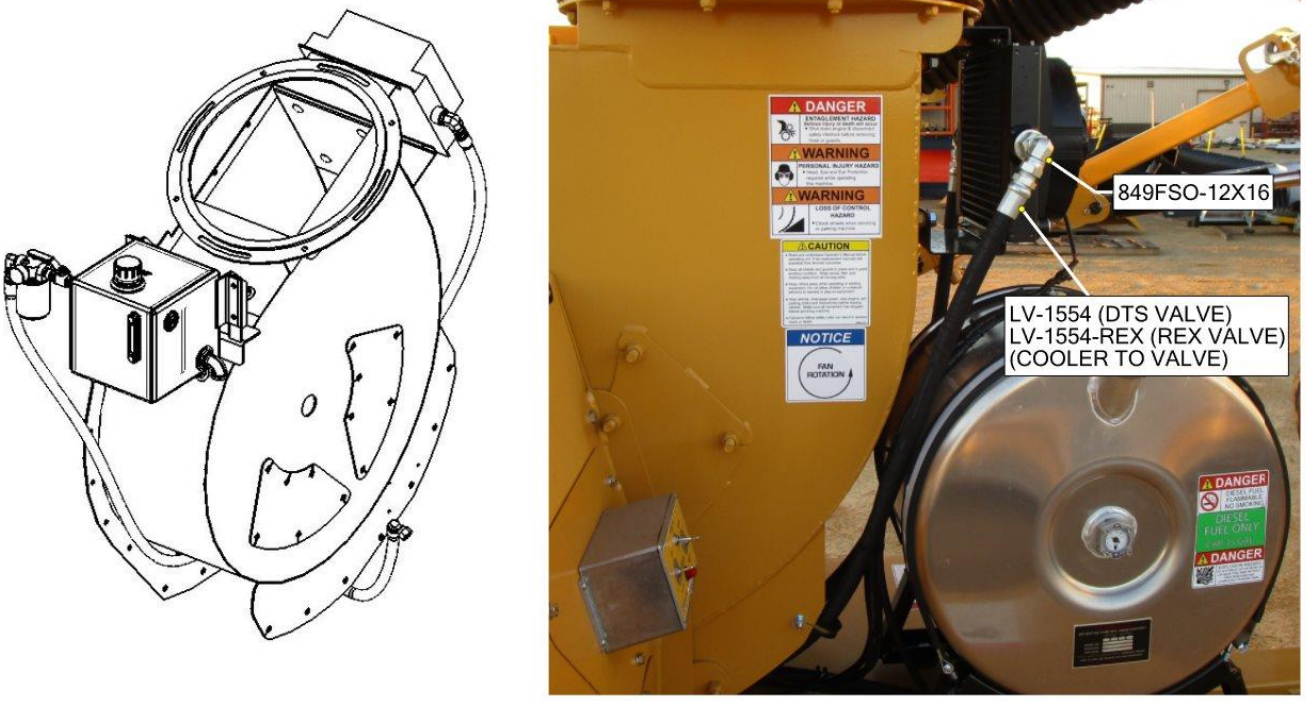
DOCUMENT 23.6

10.43. HYD OIL COOLER FITTINGS, HOSES & ASSEMBLY FIXED DISCHARGE

HYDRAULIC TANK FITTINGS, HOSES & OIL COOLER ASSEMBLY - PROPORTIONAL VALVE
- RIGHT HAND AND LEFT HAND "FIXED DISCHARGE" ASSEMBLY
- LEFT HAND PICKUP WITH "FRONT SWIVEL DISCHARGE" ASSEMBLY

080618 TITAN PROPORTIONAL OIL COOLER.smg

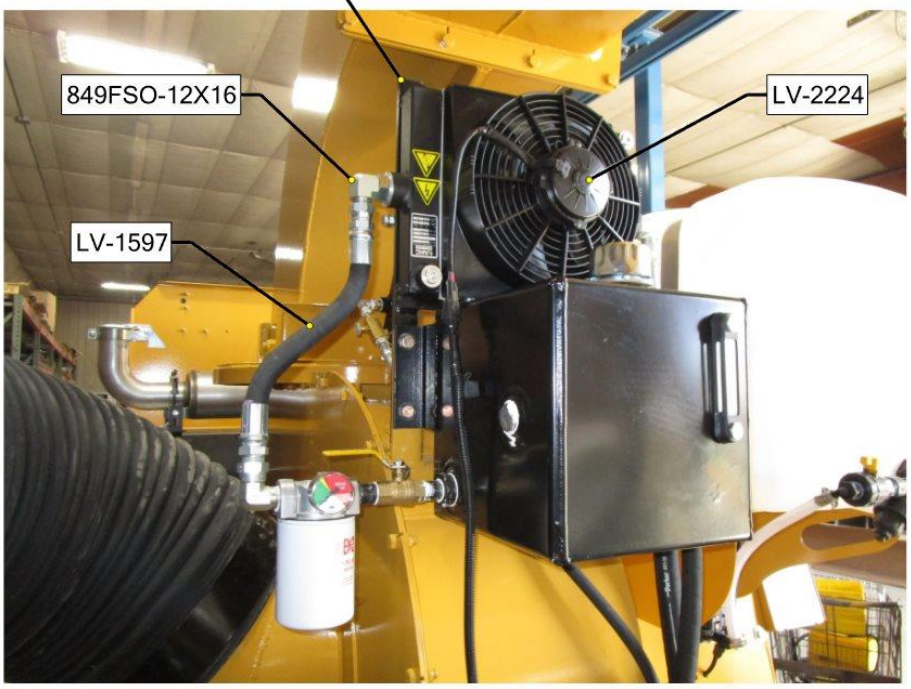


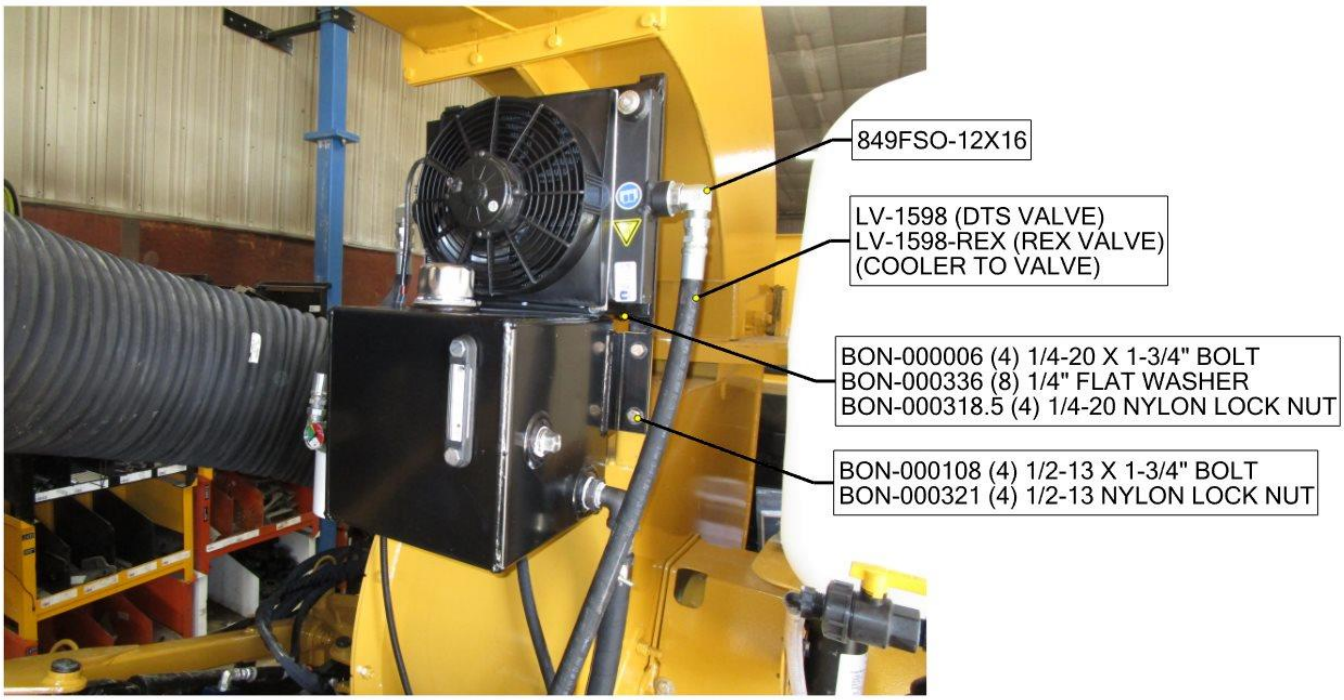


10.44. HYD OIL COOLER FITTINGS, HOSES & ASSEMBLY(RH PICKUP WITH SWIVEL SNOUT)

HYDRAULIC TANK FITTINGS, HOSES & OIL COOLER ASSEMBLY - PROPORTIONAL VALVE - RIGHT HAND PICKUP WITH FRONT SWIVEL DISCHARGE ASSEMBLY

080618 TITAN PROPORTIONAL OIL COOLER.smg





10.45. Manual Arm Hydraulic Hose Ass'y – Right Hand Overhead Boom

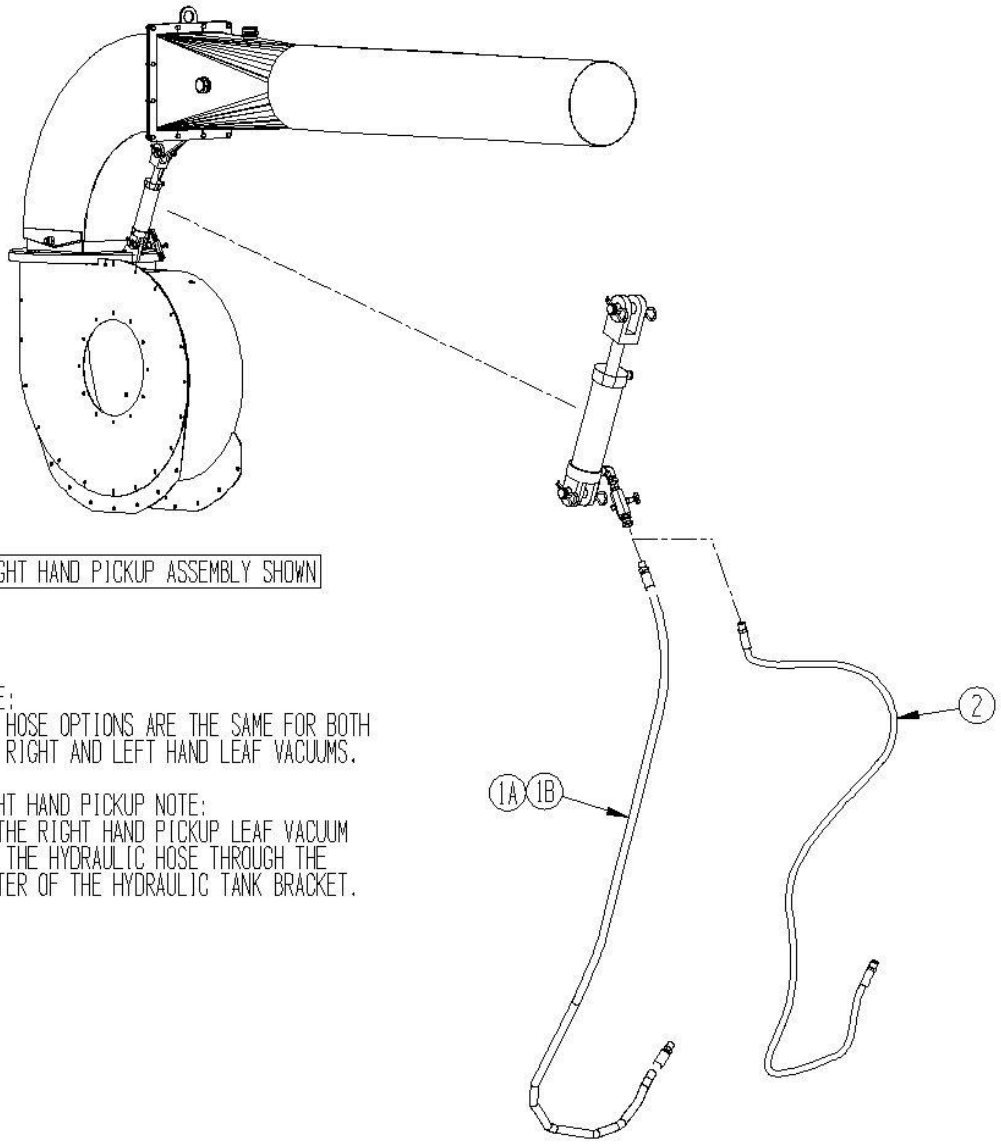
TITAN - OVERHEAD BOOM CYLINDER AND HOSE ASSEMBLY

060120 TITAN OVERHEAD BOOM CYLINDER AND HOSE ASSEMBLY.SMG

10.46. Swivel Elbow Hydraulic Cylinder Hose Assembly

SWIVEL ELBOW HYD. CYLINDER HOSE ASS'Y - STANDARD AND PROPORTIONAL VALVE

060717 LV-1056-EXP-STEPS



RIGHT HAND PICKUP ASSEMBLY SHOWN

NOTE:
THE HOSE OPTIONS ARE THE SAME FOR BOTH THE RIGHT AND LEFT HAND LEAF VACUUMS.

RIGHT HAND PICKUP NOTE:
ON THE RIGHT HAND PICKUP LEAF VACUUM RUN THE HYDRAULIC HOSE THROUGH THE CENTER OF THE HYDRAULIC TANK BRACKET.

ITEM	QTY	PART #	DESCRIPTION
1A	AR	LV-1105	STANDARD VALVE - 3/8 HYDRAULIC HOSE, (STANDARD)
1B	AR	LV-1550	PROPORTIONAL VALVE - 3/8 HYDRAULIC HOSE, (90° SHORT FITTING NOT SHOWN)
2	AR	LV-1369	1/4 HYDRAULIC HOSE, 102" LONG, FOR USE WITH ELECTRIC POWER UNIT. (THIS HOSE IS A LITTLE LONGER BECAUSE IT CAN BE USED WITH AN OVERHEAD BOOM)

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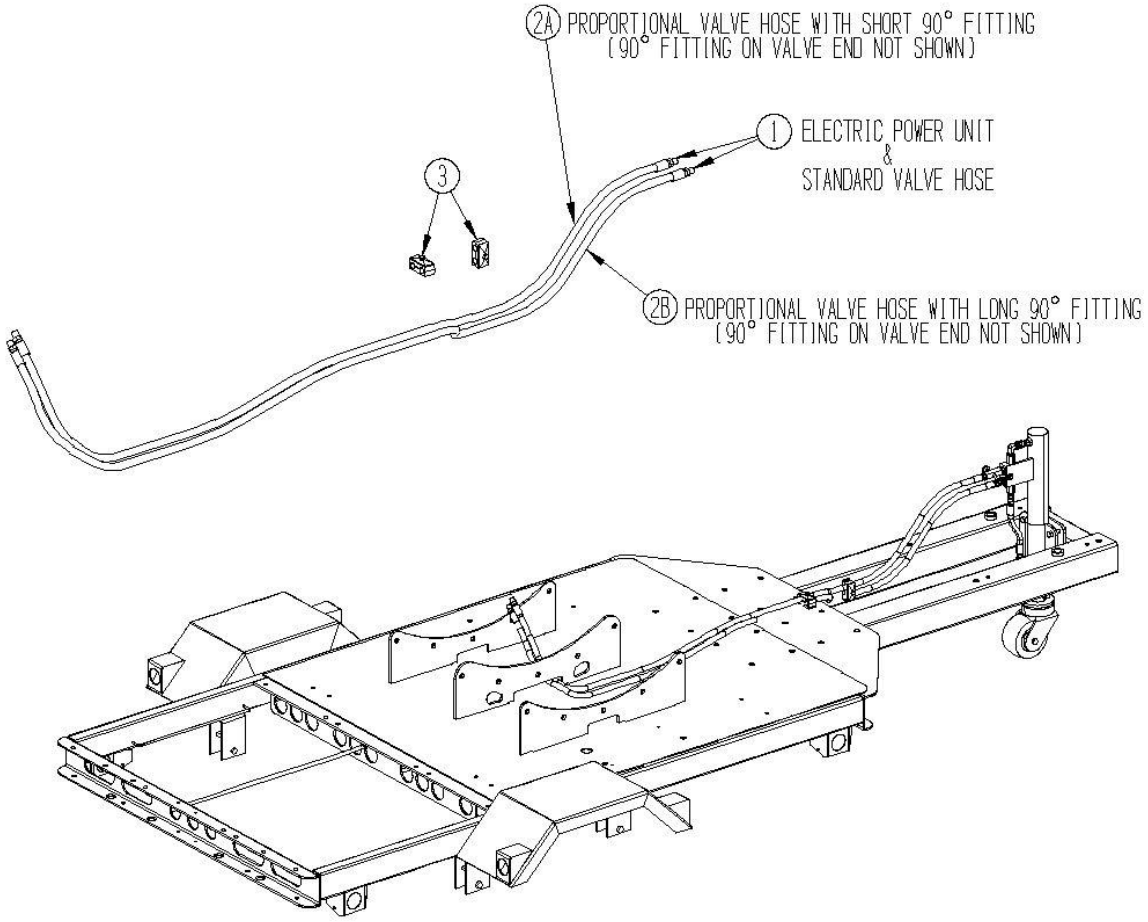
DOCUMENT 23.3

10.47. HYDRAULIC TRAILER JACK HOSE ASSEMBLY

HYDRAULIC TRAILER JACK HOSE ASS'Y

ELECTRIC POWER UNITS / STANDARD VALVES / PROPORTIONAL VALVE

8/03/18 LV-1236-DUAL CHECK-EXP



NOTE: RIGHT HAND PICKUP SHOWN
RUN HOSES ON OPPOSITE TONGUE FOR LEFT HAND PICKUP

ITEM	QTY	PART #	DESCRIPTION
1	AR	LV-1249	STANDARD VALVE - HYDRAULIC HOSE FOR JACK
2A	AR	LV-1548	PROPORTIONAL VALVE- HYDRAULIC HOSE FOR JACK, 90DEG SHORT FITTING
2B	AR	LV-1549	PROPORTIONAL - HYDRAULIC HOSE FOR JACK, 90DEG LONG FITTING
3	2	3190 KIT	3/4 INCH TUBING CLAMP, DOUBLE TUBE WITH TOP CLAMP, BOLT, NO BASE PLATE

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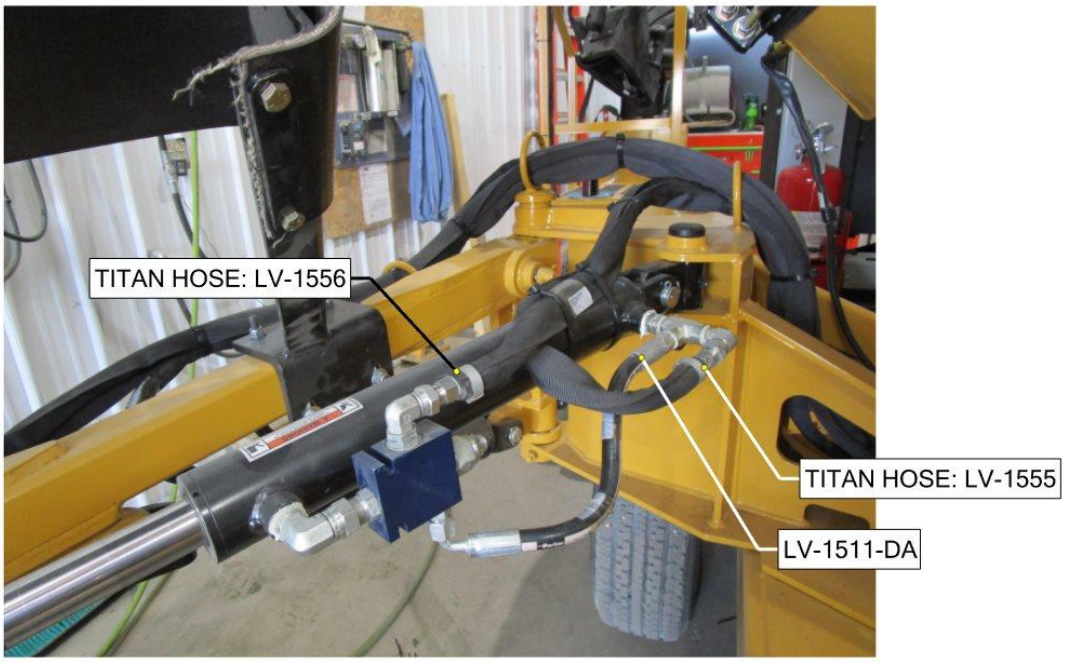
DIXON, ILLINOIS
PHONE: 800-851-9664

DOCUMENT 23.4

10.48. HYDRAULIC ARM HYDRAULIC HOSE ASSEMBLY (PROPORTIONAL VALVE)

HYDRAULIC ARM HOSES
(PROPORTIONAL VALVE - NON WIRELESS & WIRELESS)

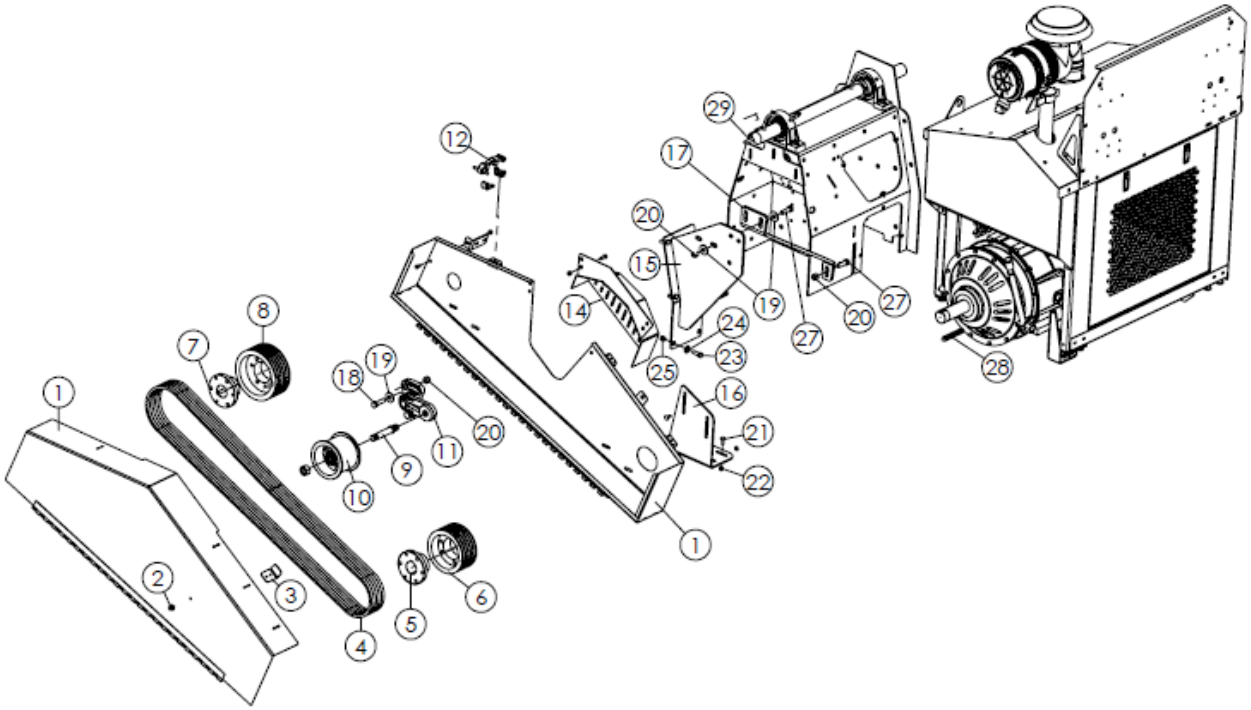
080519 TITAN HYDRAULIC ARM FITTINGS & HOSE ASSEMBLY.smg



10.49. Belt Guard And Belt Assembly

FILE NAME	M1151
DWG NAME	M1151B

TITAN BELT DRIVE
RIGHT HAND PICKUP



REF	PART NO.	QTY	DESCRIPTION
29		1	KEY - 1/2 SQ x 3-1/4"
28	LV-1628	1	STEP KEY FOR S2 COLLET
27	BON-000153	-	5/8-11 x 2 HEX BOLT GR8 ZP
26	BON-000057SS	-	3/8-16 x 1 HEX BOLT SS
25	BON-000321	-	1/2-13 NYLON HEX LOCKNUT
24	BON-000340	-	1/2 FLAT WASHER ZP
23	BON-000107	-	1/2-13 x 1 1/2 HEX BOLT GR8 ZP
22	BON-000319	-	3/8-16 NYLON HEX LOCKNUT
21	BON-000279	-	3/8-16 x 1 CARRIAGE BOLT
20	BON-000322	-	5/8-11 NYLON HEX LOCKNUT
19	BON-000341	-	5/8 FLAT WASHER ZP
18	BON-000154	-	5/8-11 x 2-1/4 HEX BOLT GR8 ZP
17	LV-2550	1	TITAN TIER IV DIAGONAL BRACE
16	LV-2417L	1	BRACKET - TITAN LOWER BELT GUARD MOUNT, LT
15	LV-2476	1	TITAN BELT TENSIONER BRACKET
14	LV-2480	1	BELT GUARD REAR COVER - RH -TIER IV TITAN
13	H2C-150	1	SPLIT COLLAR - 1.50 x 2.50 x 0.50
12	ORR-H-5800	3	RUBBER LATCH ASS'Y
11	LV-2491	1	ASSY - TITAN BELT TENSIONER
10	LV-1661	1	IDLER - 7" OD x 1" ID, WITH SEALED ROLLER BEARINGS
9	LV-1662	1	MACHINED SHOULDER STUD & NUT - 1", IS1665
8		1	SEE DRIVEN PULLEY CHART
7	LV-1272	1	BUSHING E 2-3/16
6	LV-1270	1	ENGINE SHEAVE - 8.00"
5	LV-1273	1	QD ENGINE SHEAVE BUSHING E 2-1/4
4	LV-2424	1	5VX1250 COGGED WEDGE BELT - 125" POWERBAND
3	LV-1015-11	1	BOLT-ON SAFETY STOP BRACKET
2	9377K63	-	NEOPRENE RUBBER BUMPER
1	LV-2486	1	TITAN TIER IV BELT GUARD, RH PICKUP

ITEM #8 - DRIVEN PULLEY		
MODEL	30" DIA FAN	32" DIA FAN
KOHLER 74 HP	LV-1271 (9.25")	LV-1278 (9.75")
KUBOTA 74 HP	LV-1271 (9.25")	LV-1278 (9.75")
DEERE 99 HP	LV-1279 (8.50")	LV-1280 (9.00")

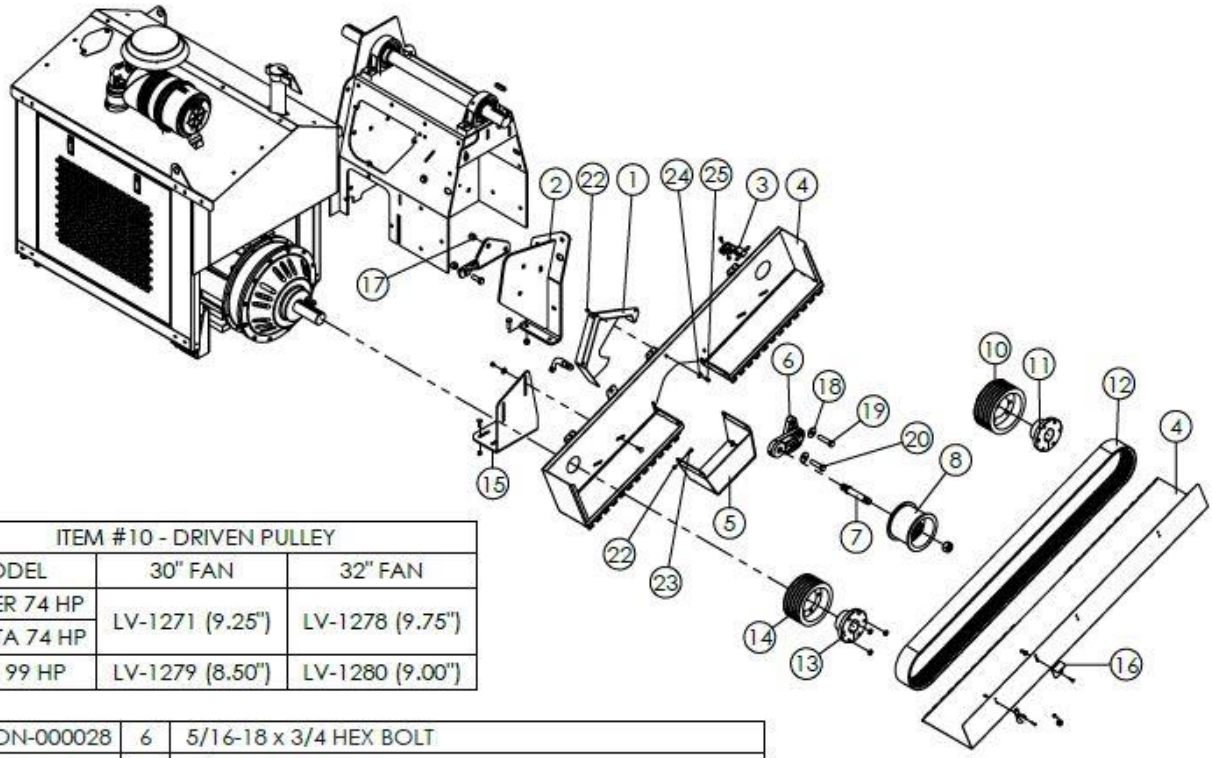
Titan LEAF SOLUTIONS

DIXON, ILLINOIS
PHONE: 800-851-9664

FILE NAME	M1180
DWG NAME	M1180A-PG1 (Rev 10/29/19)

TITAN BELT DRIVE

LEFT HAND PICKUP



ITEM #10 - DRIVEN PULLEY		
MODEL	30" FAN	32" FAN
KOHLER 74 HP	LV-1271 (9.25")	LV-1278 (9.75")
KUBOTA 74 HP		
DEERE 99 HP	LV-1279 (8.50")	LV-1280 (9.00")

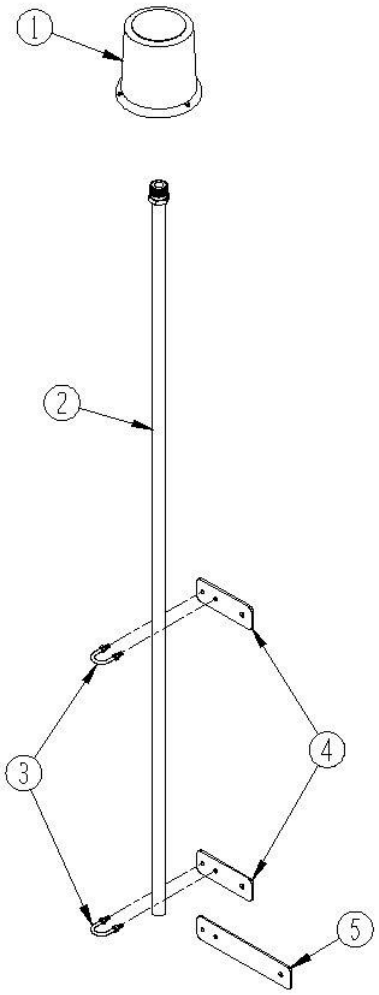
REF	PART NO.	QTY	DESCRIPTION
25	BON-000028	6	5/16-18 x 3/4 HEX BOLT
24	BON-000337	3	5/16 FLAT WASHER
23	BON-000030	4	5/16-18 x 1 HEX BOLT
22	BON-000320	10	5/16-18 NYLON HEX LOCKNUT
21			
20	BON-000155	1	5/8-11 x 2-1/2 HEX BOLT
19	BON-000156	1	5/8-11 x 2-3/4 HEX BOLT
18	BON-000341	2	5/8 FLAT WASHER
17	BON-000322	3	5/8-11 NYLON HEX LOCKNUT
16	LV-1015-11	1	BOLT-ON SAFETY STOP BRACKET
15	LV-2417R	1	BRACKET - TITAN LOWER BELT GUARD MOUNT, RH
14	LV-1270	1	ENGINE SHEAVE - 8.00"
13	LV-1273	1	QD ENGINE SHEAVE BUSHING E 2-1/4
12	LV-2424	1	5VX1250 COGGED WEDGE BELT - 125" POWERBAND
11	LV-1272	1	BUSHING E 2-3/16
10	----------	1	SEE DRIVEN PULLEY CHART
9			
8	LV-1661	1	IDLER - 7" OD x 1" ID, WITH SEALED ROLLER BEARINGS
7	LV-1662	1	MACHINED SHOULDER STUD & NUT - 1", IS1665
6	LV-2491	1	TITAN BELT TENSIONER ASS'Y
5	LV-2576	1	TITAN BELT GUARD, LH LOWER
4	LV-2578	1	TITAN BELT GUARD, LH
3	ORR-H-5800	3	RUBBER LATCH ASS'Y
2	LV-2571	1	TITAN PULLEY ARM, LH
1	LV-2577	1	TITAN INNER BELT GUARD, LH

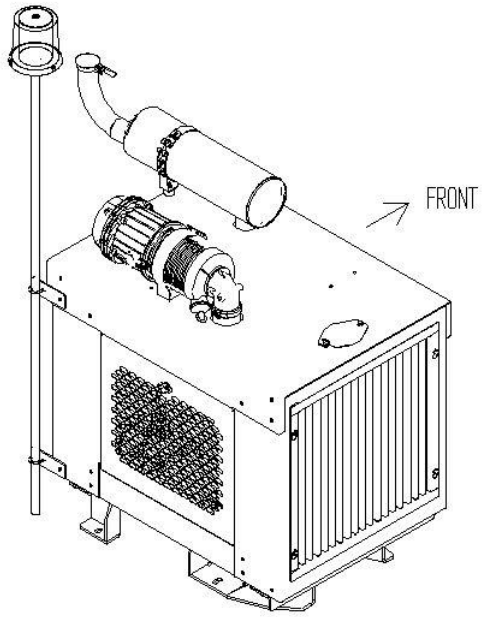
BONNELL INDUSTRIES INC
TRUCK & ROAD EQUIPMENT
DIXON, ILLINOIS
PHONE: 800-851-9664

10.50. Strobe Light Assembly For Kubota And John Deere Engines

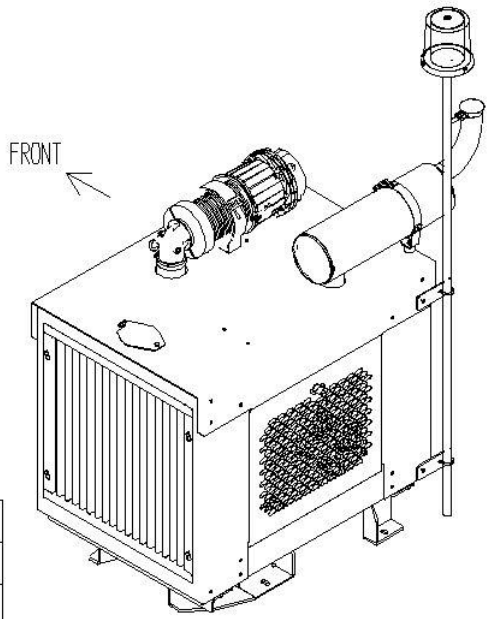
KUBOTA AND JOHN DEERE ENGINE STORBE LIGHT ASSEMBLY - LEAF VAC

021822 LV-1080-EXP-STROBE-STEPS





RIGHT HAND PICKUP



LEFT HAND PICKUP

ITEM	QTY	PART #	DESCRIPTION
1	1	FED-200TC-A	STROBE LIGHT,LED PULSATOR AMBER BEACON, AMBER
2	1	LV-1306	STROBE LIGHT TUBE FIXTURE
3	2	3043T15	ZINK PLATED STEEL U-BOLT
4	AR	LV-1350	STROBE LIGHT BRACKET - SHORT
5	AR	LV-1658	STROBE LIGHT BRACKET - LONG

BONNELL INDUSTRIES INC

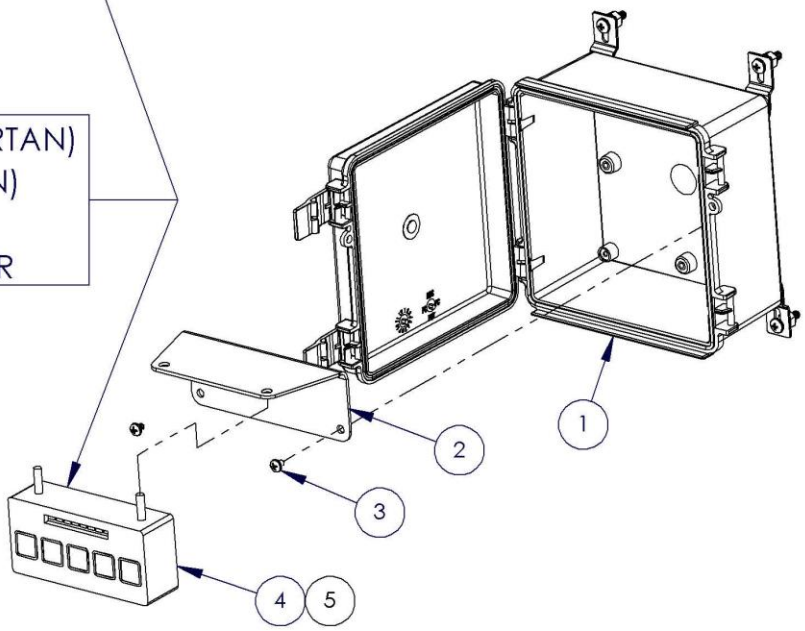
DIXON, ILLINOIS
PHONE: 800-851-9664

DOCUMENT 25.1

10.51. Directional Arrow Board & Engine Screen Assembly: Kubota Engines

FILE NAME	LV-2620 WITH CONTROLLER
DWG NAME	LV-2620 LIGHTBAR CONTROLLER

LV-2621 LIGHTBAR KIT (SPARTAN)
LV-2622 LIGHTBAR KIT (TITAN)
INCLUDES:
HARNESS AND CONTROLLER



ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	LV-2620	ENCLOSURE, 6" X 6" X 3.5"
2	1	LV-2623	CONTROLLER BRACKET
3	2	LV-2625	SCREW, M4 X.7MM PITCH X 5MM LONG
4	AR	LV-2621	SPARTAN - LOW PROFILE LED, TOUCH PAD CONTROLLER
5	AR	LV-2622	TITAN - LOW PROFILE LED, TOUCH PAD CONTROLLER

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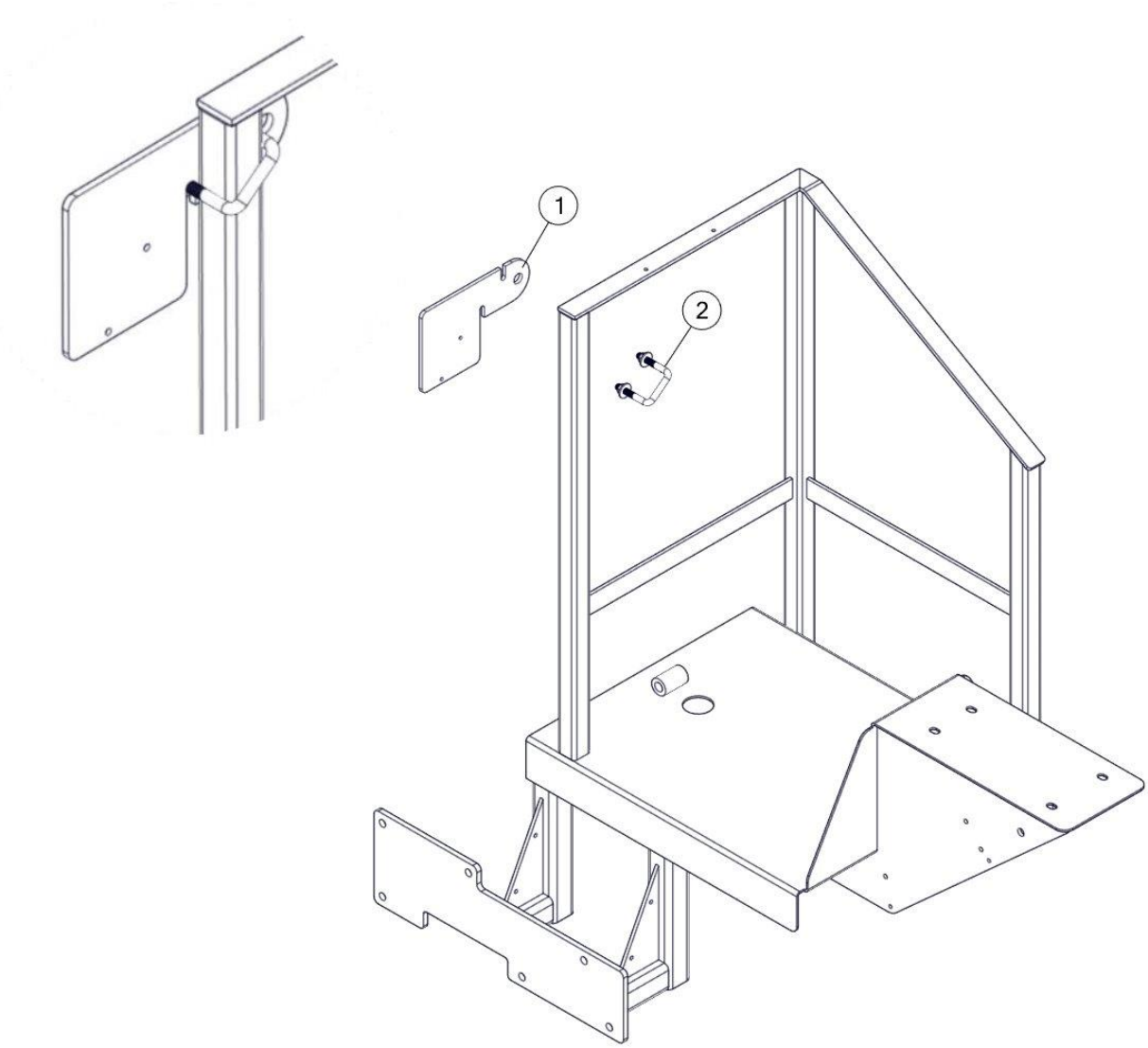
DIXON, ILLINOIS
PHONE: 800-851-9664

10.52. KUBOTA AND JOHN DEERE THROTTLE AND EMERGENCY STOP ASSEMBLY

KUBOTA AND JOHN DEERE ENGINE THROTTLE AND EMERGENCY STOP ASSEMBLY

082917 LV-1378-EXP.smg

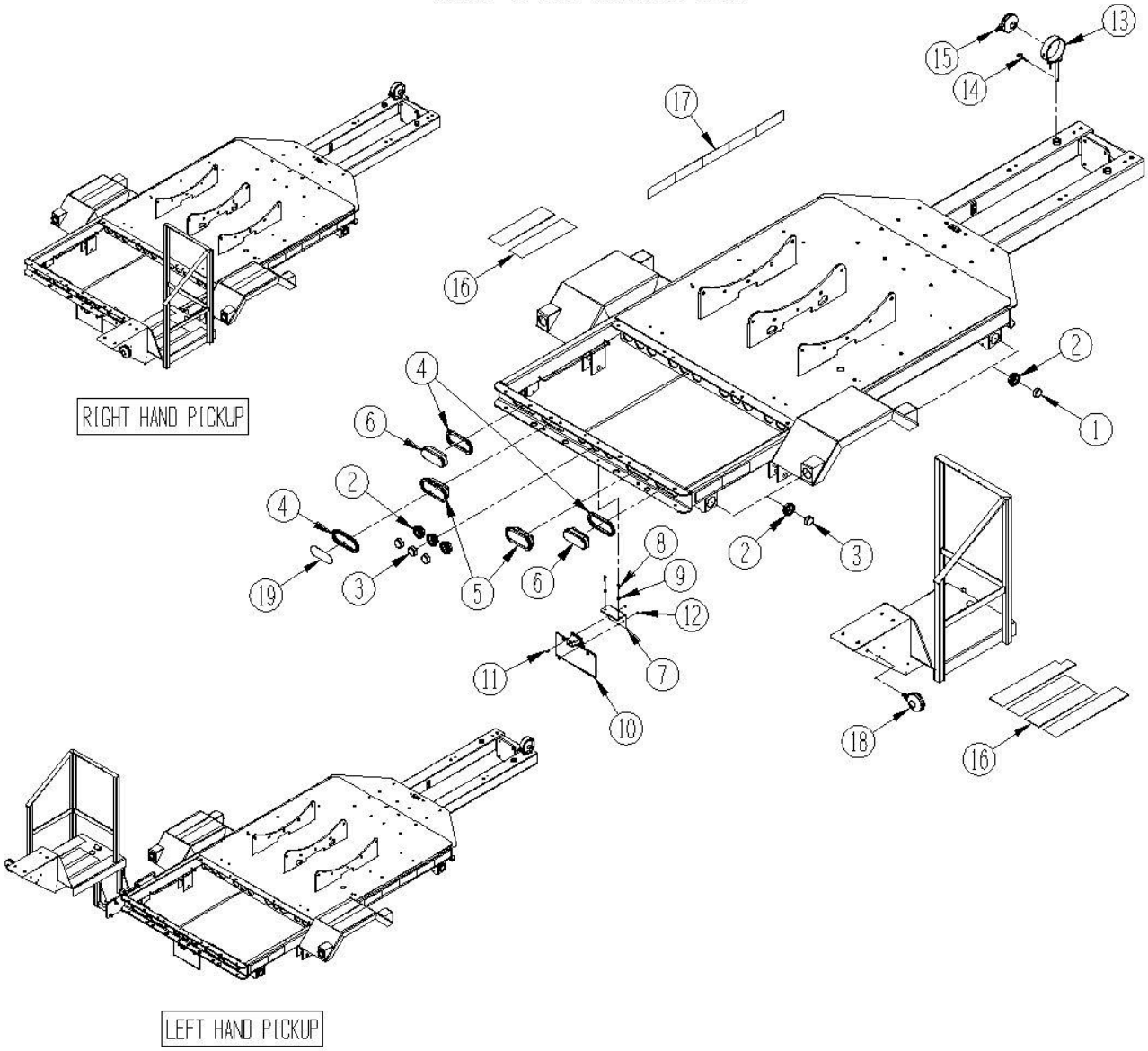


RIGHT HAND SEAT ASSEMBLY SHOWN
(LEFT HAND OPPOSITE)

BOM ID	PartNo (config)	Description (config)
1	LV-1378	THROTTLE AND EMERGENCY STOP BRACKET
2	LV-1379	U-BOLT CLAMP

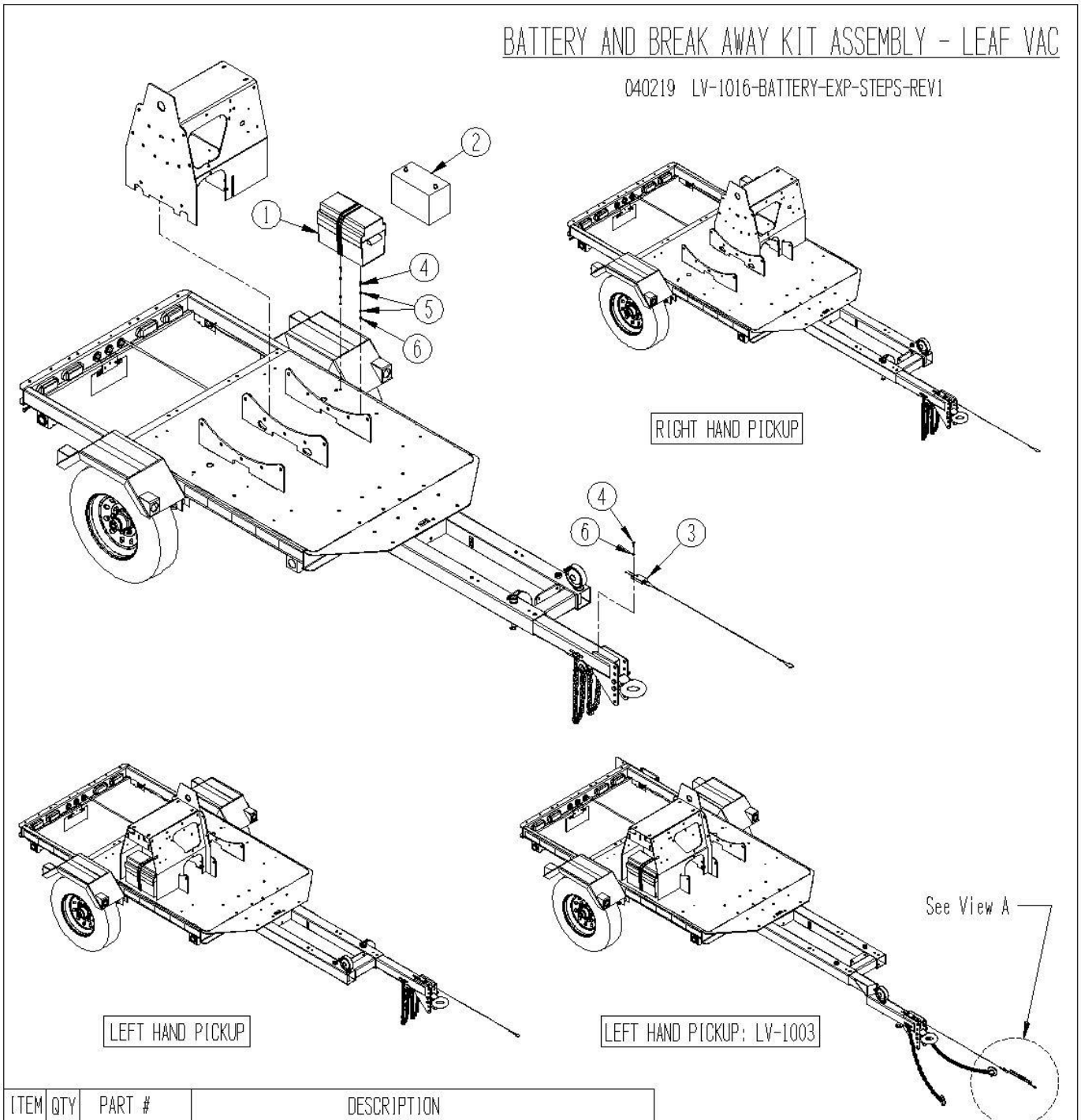
DOCUMENT 25.5

10.53. LIGHTS, CONSPICUITY TAPE, ANTI SLIP TAPE ASSEMBLY



ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	4	PM-M194A	LED CLEARANCE LITE 2" AMBER, 3 DIODE, W/O GROMMET	11	2		10-24 X 1/2 MACHINE SCREW
2	11	PM-146-18	GROMMET, 2" CLEARANCE/MARKER	12	2		10-24 HEX NUT WITH STAR WASHER
3	7	PM-M194R	LED CLEARANCE LITE 2" RED W/O GROMMET	13	1	LV-1223	REMOVABLE TONGUE LIGHT BRACKET
4	AR	PM-B421-18	GROMMET, OBLONG FOR 60 SERIESBULK	14	1	BON-000401	HAIR PIN .148'' WIRE (X 3")
5	AR	ECCO-3920A	LED OVAL WARNING LAMP 12 VOLT, WITH GROMMET	15	1	PM-313AA	DOUBLE FACE AMBER / AMBER PARK & TURN SIGNAL
6	2	PM-M820R-10	LED S.T.T LIGHT OVAL RED W/O GROMMET	16	AR	ORR-M-7004	4" ANTI-SLIP SAFETY TAPE
7	1	LV-1210	LICENSE PLATE BRACKET	17	10	TT13169	CONSPICUITY TAPE, RED/WHITE
8	2	BON-000005	1/4"-20TPI X 1" LONG GR.8 BOLT	18	AR	PM-313-2RA	DOUBLE FACE RED / AMBER PARK & TURN SIGNAL
9	2	BON-000318.5	1/4"-20TPI HEX LOCK NUT LOCKNUT	19	AR	LV-1214	LIGHT HOLE FILLER PLATE
10	1	NAP-12250304	LICENSE PLATE LIGHT AND BRKT. OS IN SR	DOCUMENT 26.1			

10.54. Battery And Break Away Switch Assembly



ITEM	QTY	PART #	DESCRIPTION
1	1	LV-1145	BATTERY BOX FOR LEAF VAC (COMES WITH TIE DOWN STRAP)
2	1	LV-1144	BATTERY FOR LEAF VAC (12VOLT)
3	1	LV-1404	BREAK AWAY SWITCH AND CABLE ONLY
4	3	BON-000005	1/4"-20TPI X 1" LONG GR.8 BOLT
5	4	BON-000336	FLAT WASHER 1/4"
6	3	BON-000318.5	1/4"-20TPI HEX LOCK NUT LOCKNUT
7	AR	LV-1212	EXTENSION CABLE FOR BREAK AWAY KIT

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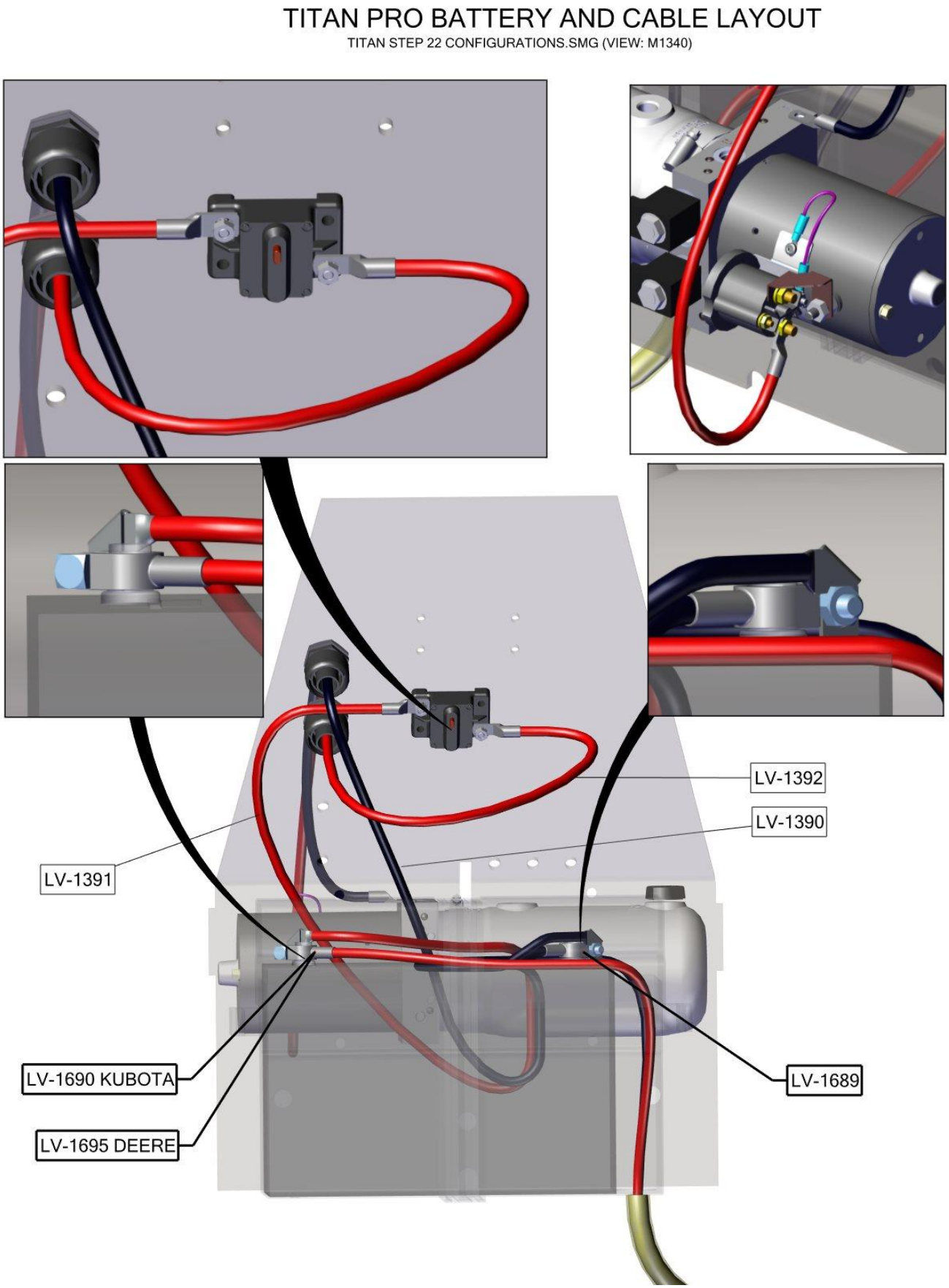
DOCUMENT 27.1

10.55. Titan Pro Battery And Cable Layout

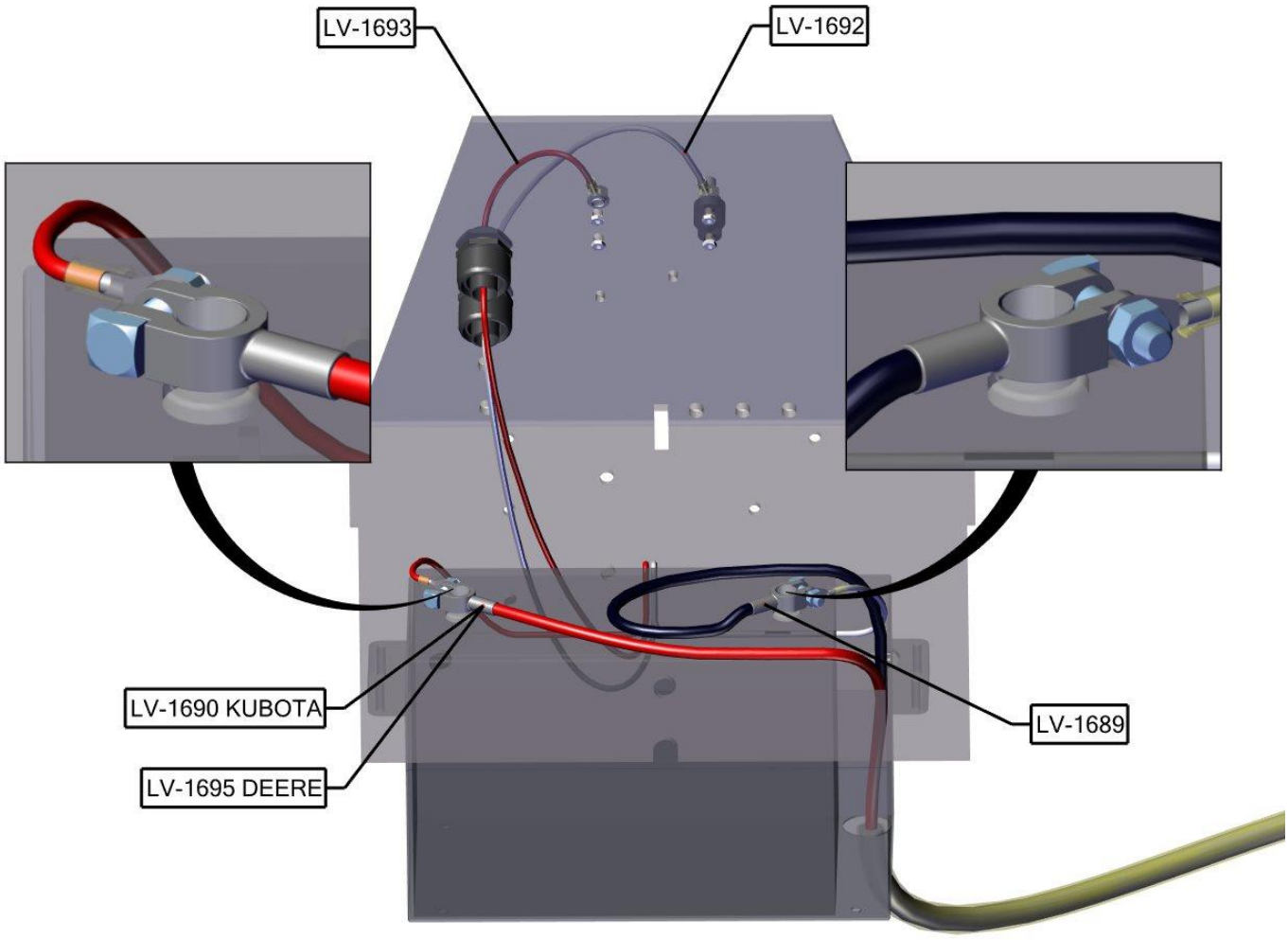


10.56. TITAN PRO + BATTERY CONNECTIONS

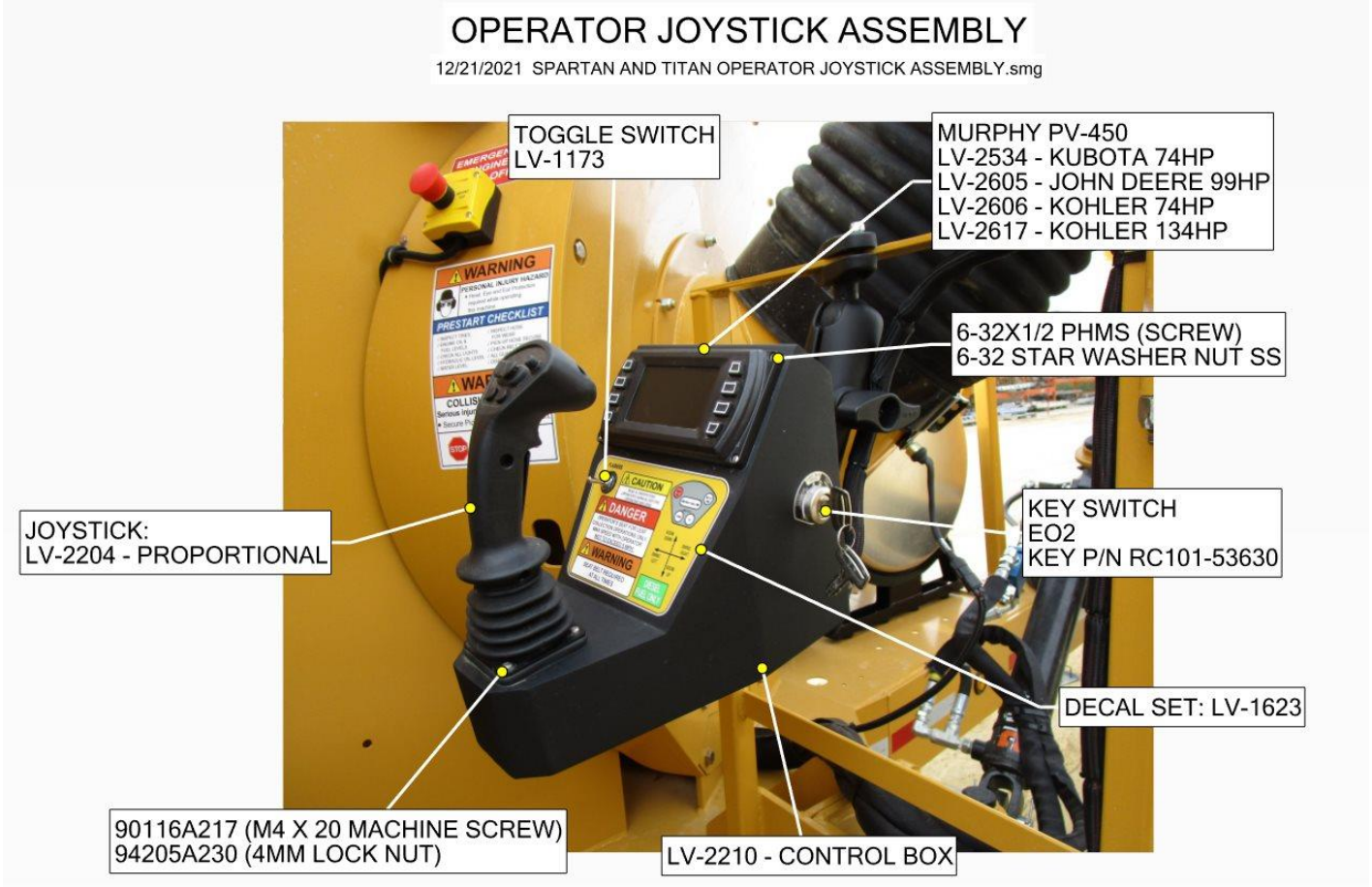
TITAN PRO + BATTERY CONNECTIONS

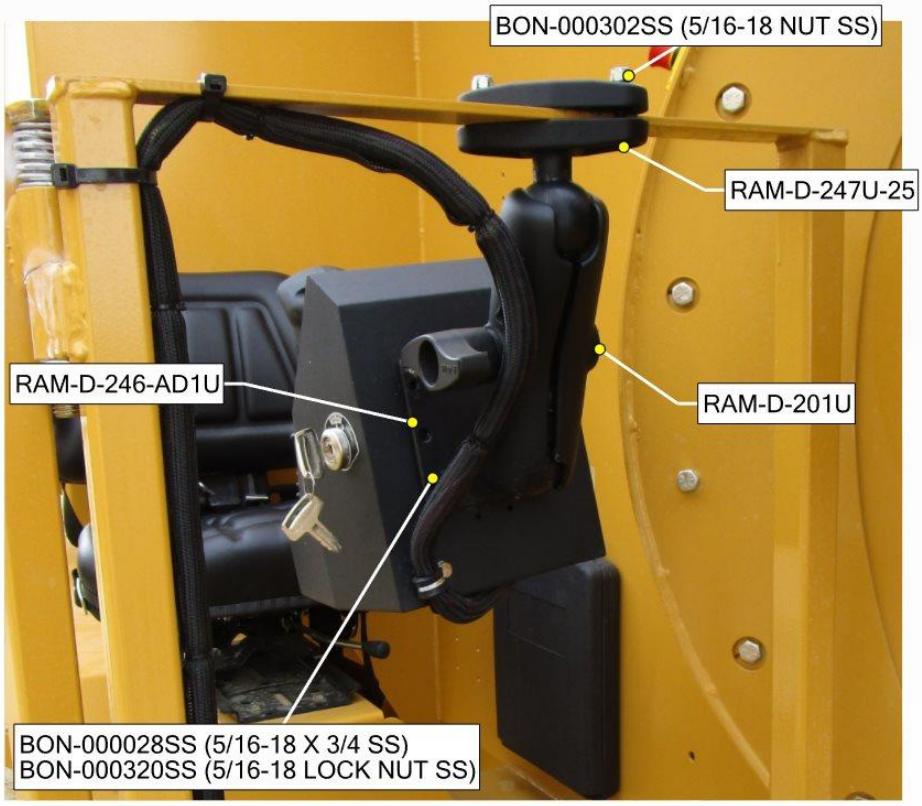
TITAN STEP 22-4 CONFIGURATIONS.SMG (VIEW: M1341)

BOM ID	Qty	Name	Desc1
1	1	LV-1689	NEGATIVE BATTERY CABLE
2	1	LV-1690	POSITIVE BATTERY CABLE KUBOTA
3	1	LV-1695	POSITIVE BATTERY CABLE DEERE
4	1	LV-1691	AUX POSITIVE CABLE TO KUBOTA
5	1	LV-1693	POSITIVE LEAD TO FUSE PANEL
6	1	LV-1692	GROUND LEAD TO JUNCTION BLOCK



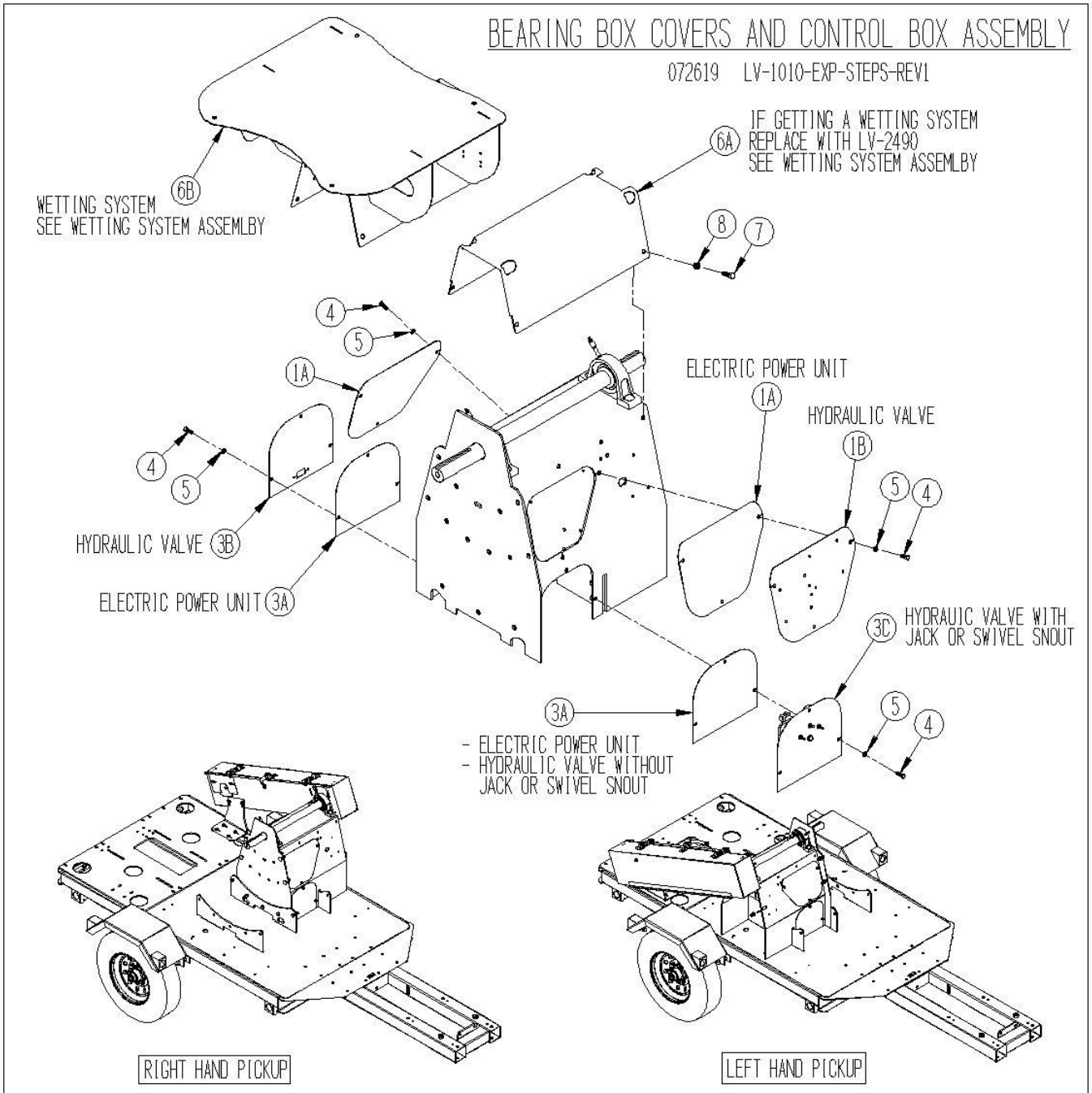
10.57. JOYSTICK ASSEMBLY – PROPORTIONAL VALVE





TITAN DOCUMENT 28.2

10.58. Bearing Box Covers And Cap Assembly



ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1A	AR	LV-1012	BEARING BOX TOP COVER	6A	1	LV-1011	BEARING BOX CAP
1B	AR	LV-1621	BEARING BOX TOP COVER W/ HFX & FUSE BOX HOLES	6B		LV-2490	BEARING BOX CAP FOR WETTING SYSTEM
3A	AR	LV-1013	BEARING BOX BOTTOM COVER	7	4	BDN-000107	1/2-13 X 1-1/2" BOLT
3B	AR	LV-1447	BOTTOM COVER WITH PLUG CUT HOLE	8	4	BDN-000321	1/2-13 LOCK NUT
3C	AR	LV-1622	CONTROL BOX ASSY- HYD JACK / RAISE & LOWER SNOUT				
4	12	BDN-000057	3/8"-16TPI X 1" GRADE 8 BOLT				
5	12	BDN-000352	3/8 LOCK WASHER				

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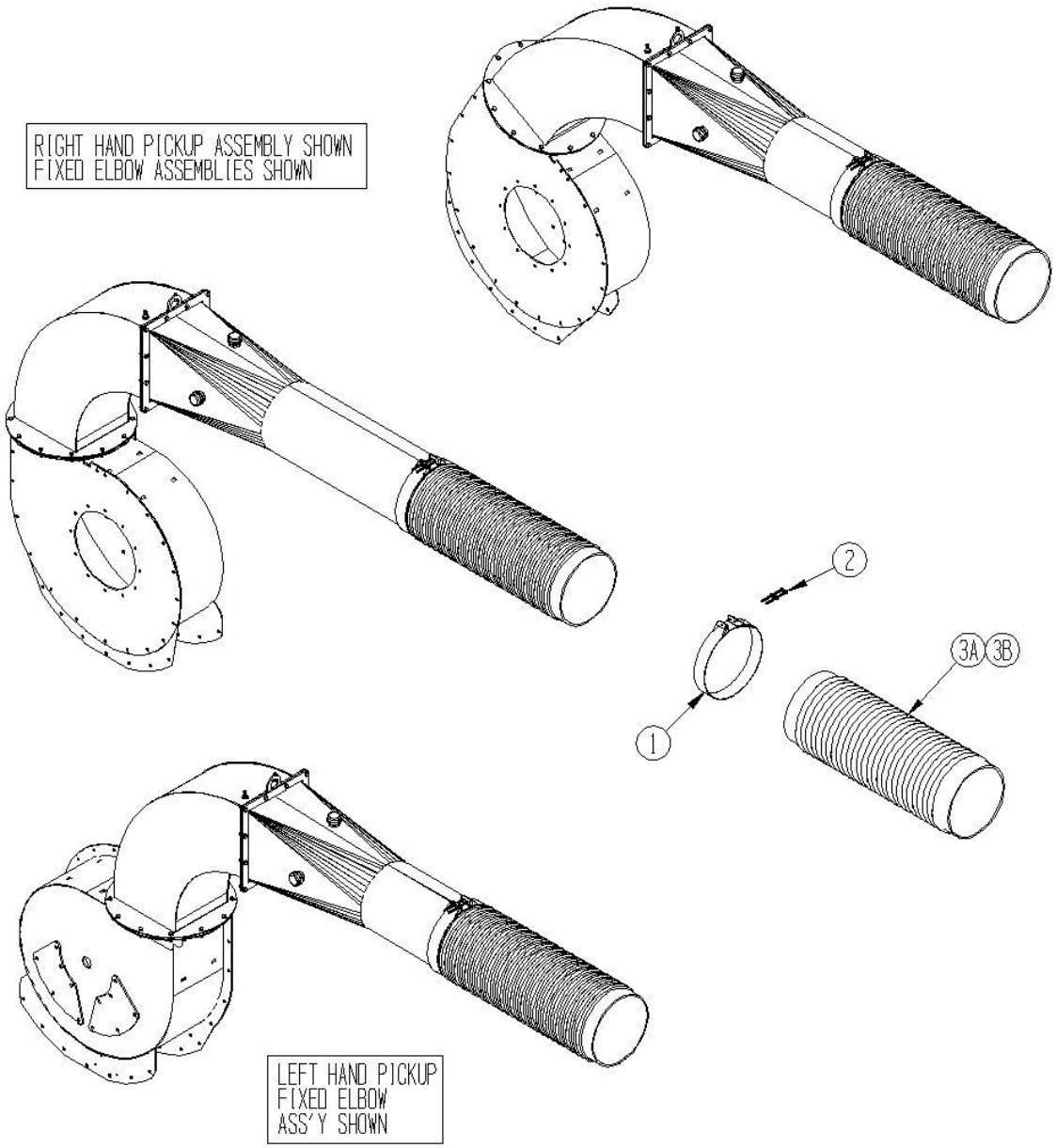
10.59. Fixed Elbow Discharge Hose & Hose Clamp Assembly

FIXED ELBOW DISCHARGE HOSE & HOSE CLAMP ASSEMBLY

081717 LV-1010-EXP-STEPS-1000-RH



ITEM	QTY	PART #	DESCRIPTION
1	1	LV-1409	TUBE CLAMP
2	1	BK-1053	TUBE CLAMP BOLT KIT
3A	AR	LV-1178	16"X4' RUBBER HOSE
3B	AR	LV-1519	16"X4' FLEX-THANE VHD CLEAR HOSE

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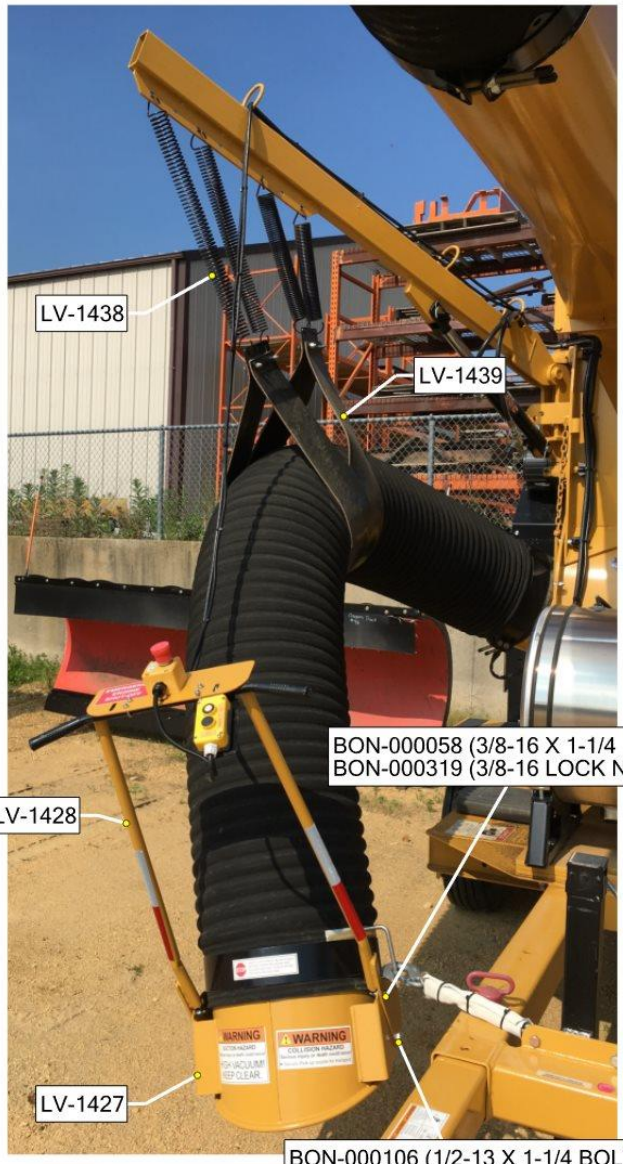
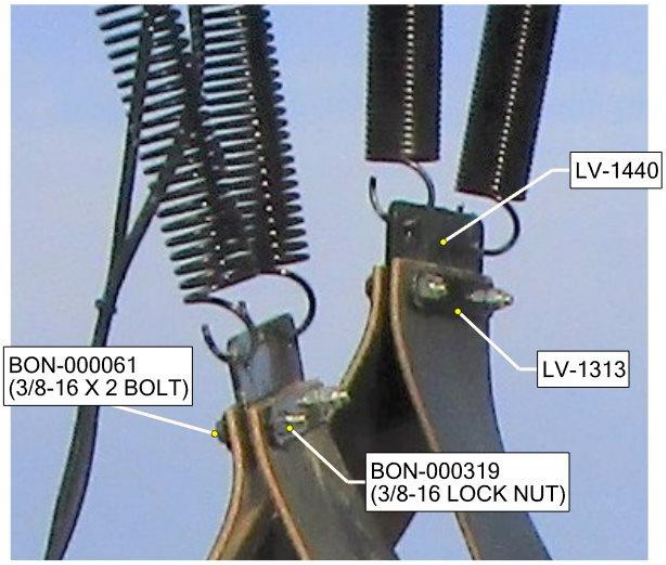
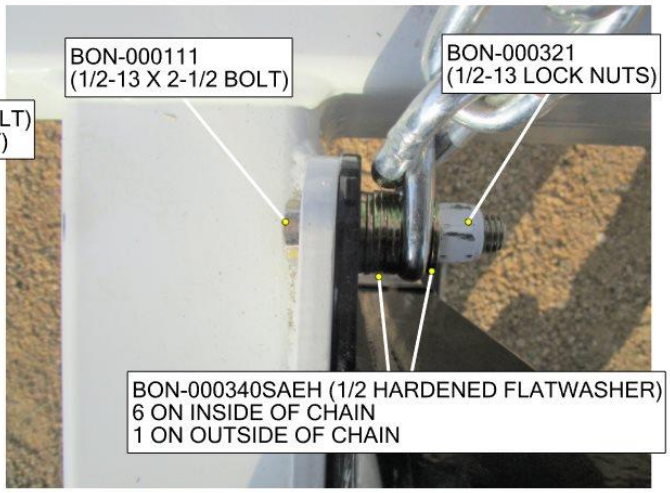
10.60. Overhead Boom Springs, Straps, Hose Pickup Nozzle and Handle Assembly

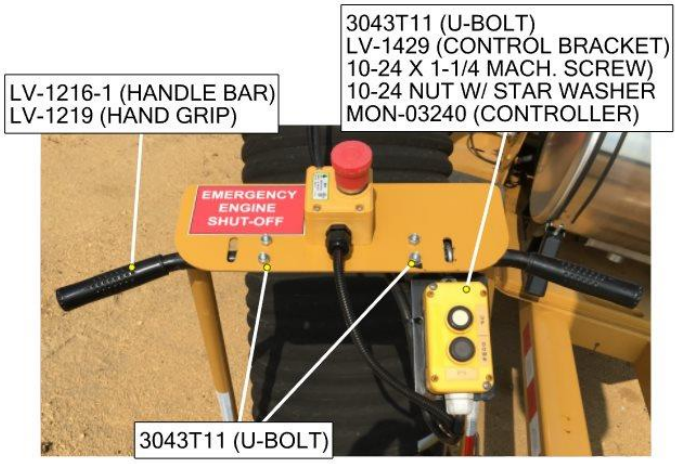
TITAN OVERHEAD BOOM ASSEMBLY

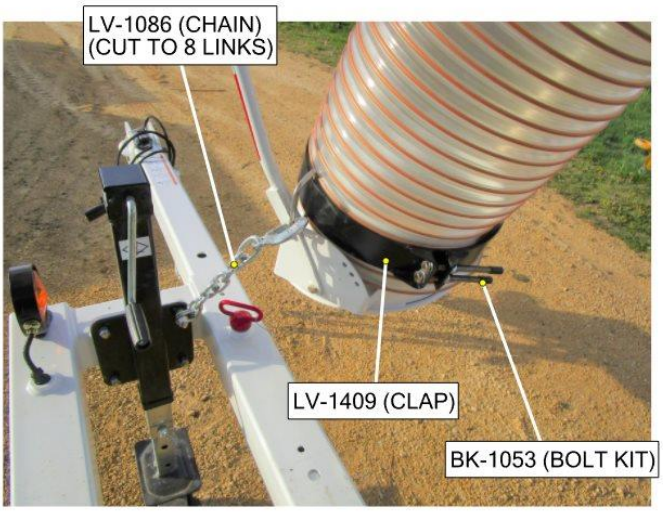
061021 TITAN OVERHEAD BOOM ASSEMBLY.SMG











10.61. Overhead Boom Arm Stop Assembly

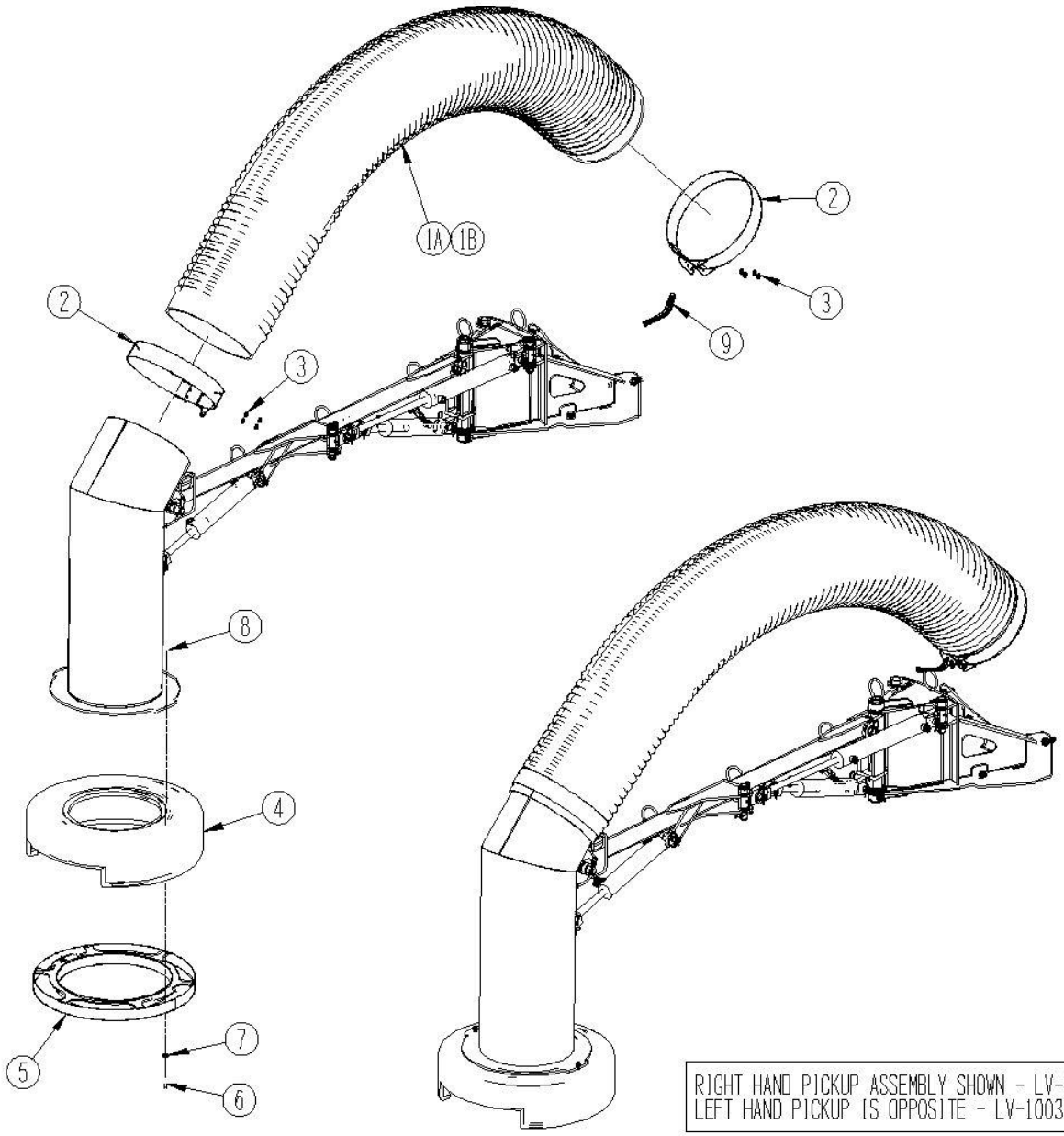
TITAN OVERHEAD BOOM ASSEMBLY

060220 TITAN OVERHEAD BOOM ASSEMBLY.SMG

10.62. NOZZLE, SUCTION HOSE AND SAFETY BRACKET ASSEMBLY

TIRE NOZZLE, TUBE CLAMP AND SAFETY BRACKET ASSEMBLY - LEAF VAC

082417 LV-1044REV2-EXP-STEPS



RIGHT HAND PICKUP ASSEMBLY SHOWN - LV-1002
LEFT HAND PICKUP IS OPPOSITE - LV-1003 LV-1005

ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1A	AR	LV-1184	16"X10' HEAVY DUTY RUBBER SUCTION HOSE	5	1	LV-1043	TIRE RETAINER
1B	AR	LV-1347	16"X10' FLEX-THANE VHD SUCTION HOSE	6	2	BON-000111	1/2"-13TPI X 2-1/2" GRADE 8 BOLT
2	2	LV-1409	TUBE CLAMP	7	2	BON-000340	1/2" FLATWASHER
3	2	BK-1053	TUBE CLAMP BOLT KIT	8	2	BON-000321	1/2"-13TPI HEX LOCK NUT NYLON INSERT
4	1	LV-1042	TIRE NOZZLE	9	1	LV-1393	PUSH BUTTON SAFETY ASSEMLBY

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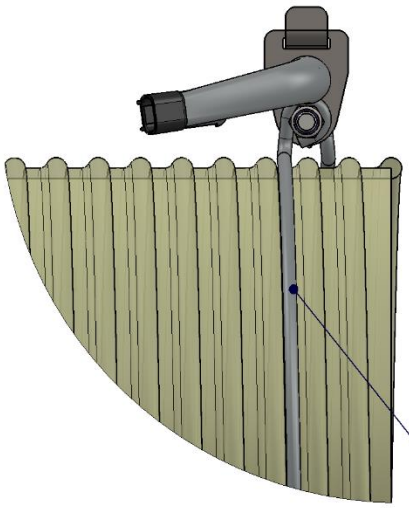
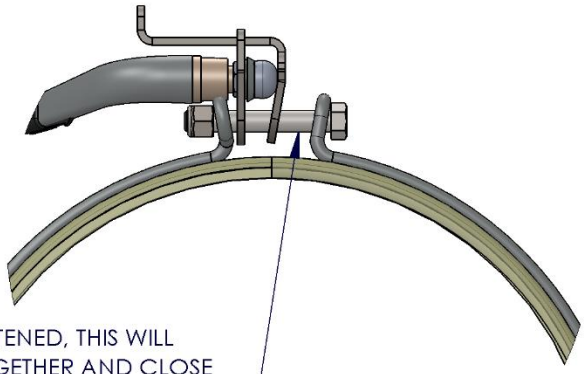
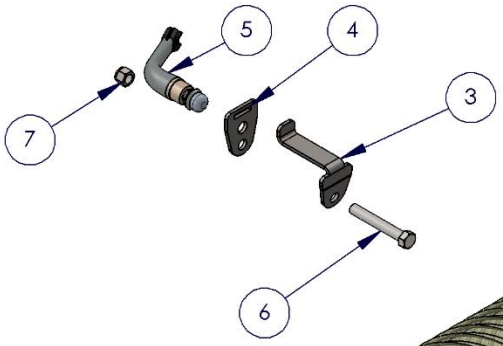
FILE NAME	M1451	REV.	DESCRIPTION	DATE	INITIALS
DWG NAME	FLEX-THANE CLAMP AND SWITCH	-	ORIGINAL	11/16/2022	EDG

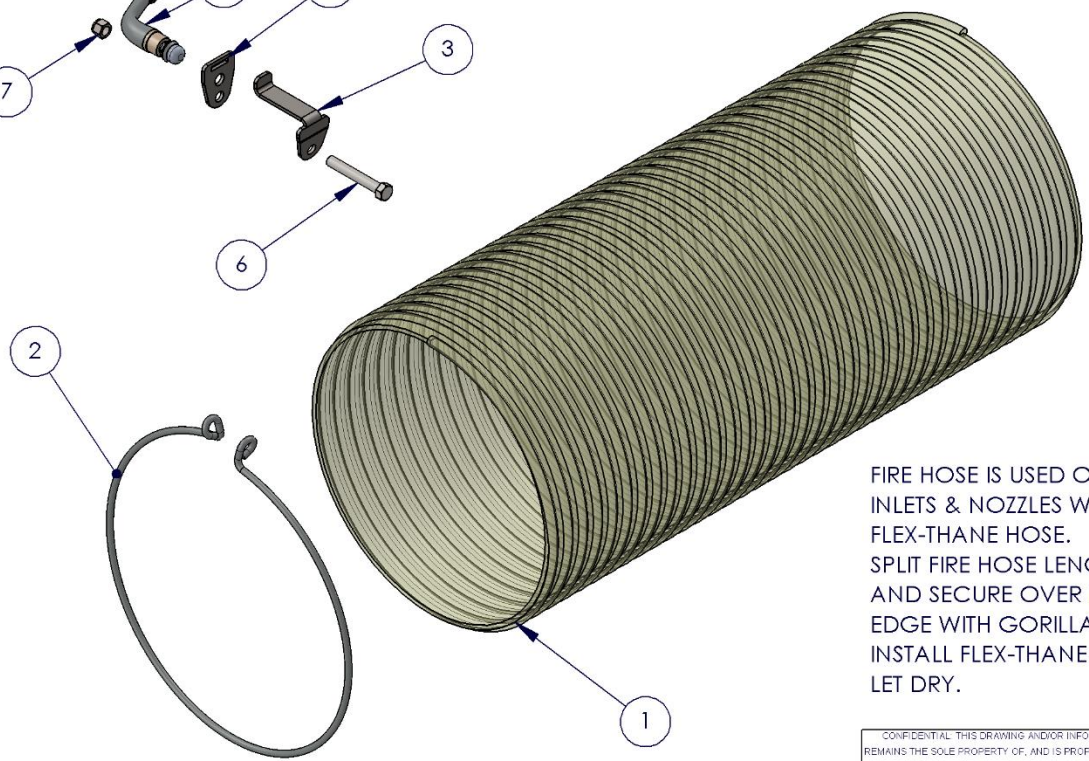




WHEN BOLT IS TIGHTENED, THIS WILL PULL BRACKETS TOGETHER AND CLOSE THE SWITCH.

NOTE: CLAMP SHOULD RIDE IN THE GROOVE OF THE HOSE AS SHOWN





FIRE HOSE IS USED ON ALL INLETS & NOZZLES WITH FLEX-THANE HOSE.
SPLIT FIRE HOSE LENGTH WISE AND SECURE OVER INLET/NOZZLE EDGE WITH GORILLA TYPE GLUE.
INSTALL FLEX-THANE HOSE AND LET DRY.

ITEM	PART NUMBER	QTY	DESCRIPTION
7	BON-000321	1	1/2-13 NYLOK NUT
6	BON-000115	1	1/2-13 X 3-1/2" GRADE 8 HEX BOLT
5	LV-1393	1	SAFETY SWITCH ASSSEMBLY
4	LV-2768	1	BRACKET - SAFETY SWITCH
3	LV-2769	1	BRACKET - SAFETY SWITCH
2	LV-1687	1	CLAMP RING - FLEX-THANE HOSE
1	LV-1347	1	16" X 10' FLEX-THANE HOSE

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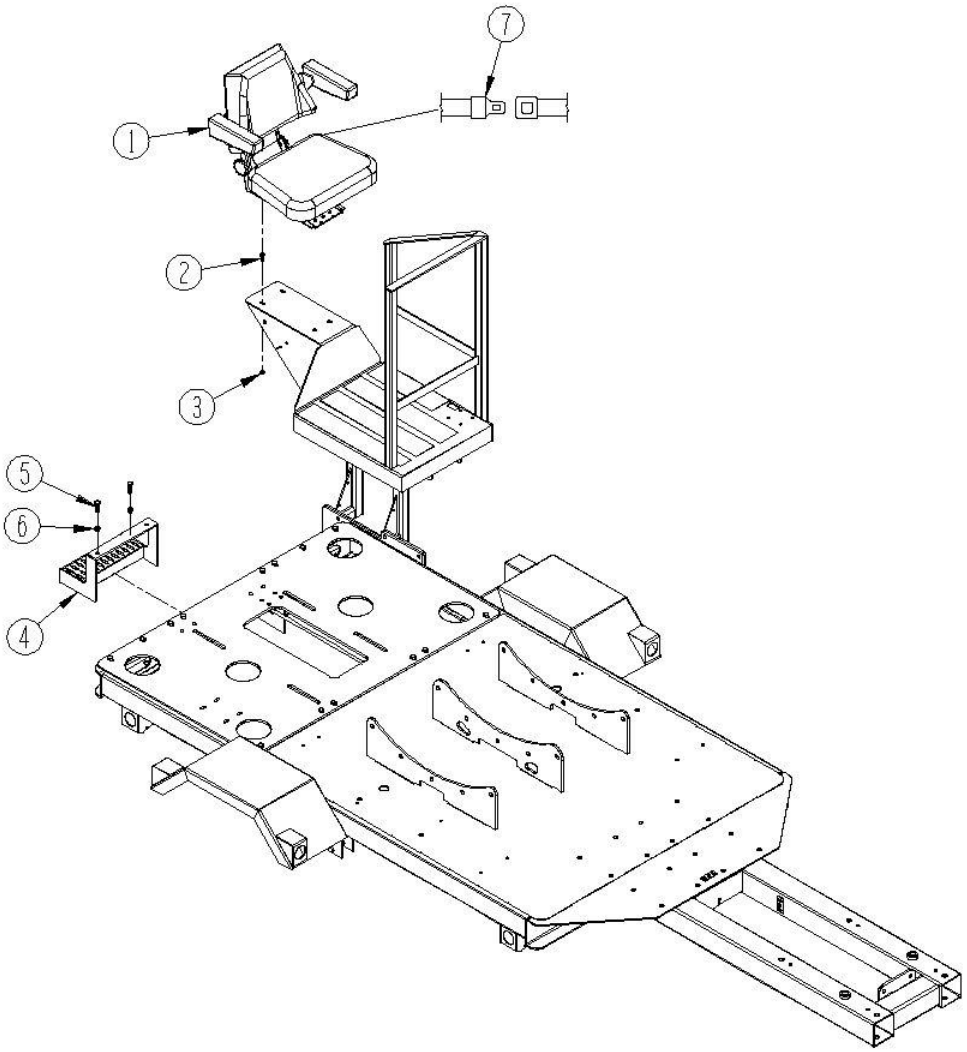
10.63. SEAT ASSEMBLY

SEAT ASSEMBLY - LEAF VAC

040319 LV-1030-EXP-STEPS-SEAT WELDMENT-REV1



ITEM	QTY	PART #	DESCRIPTION
1	1	LV-1140	SEAT FOR LEAF VAC
2	4	BON-000057	3/8"-16TPI X 1" GRADE 8 BOLT
3	4	BON-000319	3/8"-16TPI HEX LOCK NUT NYLON INSERT
4	1	LV-1149	BOTTOM STEP WELDMENT
5	2	BON-000107	1/2"-13TPI X 1 1/2" GRADE 8 BOLT
6	2	BON-000321	1/2"-13TPI HEX LOCK NUT NYLON INSERT
7	1	LV-1636	SEAT BELT

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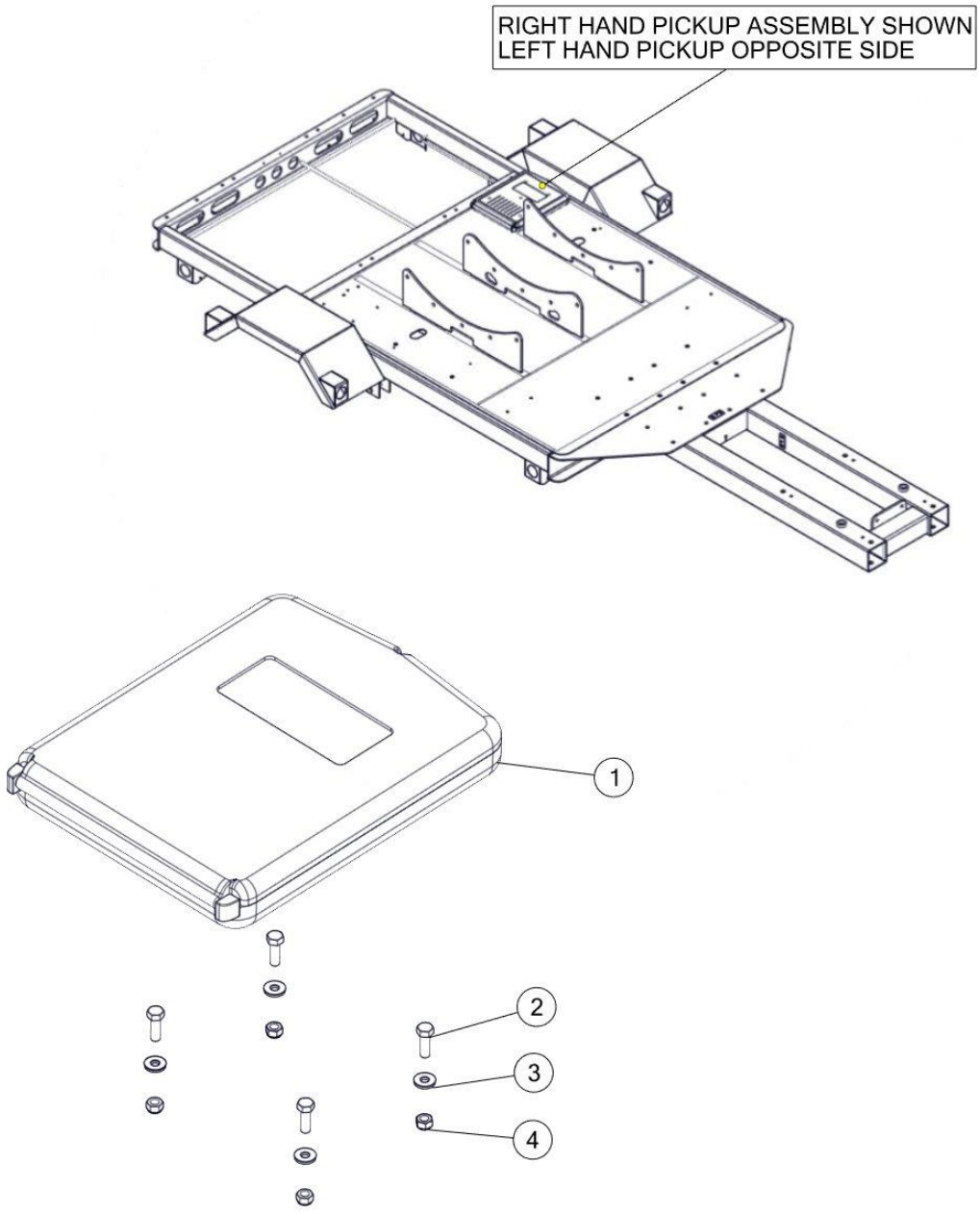
10.64. MANUAL BOX ASSEMBLY

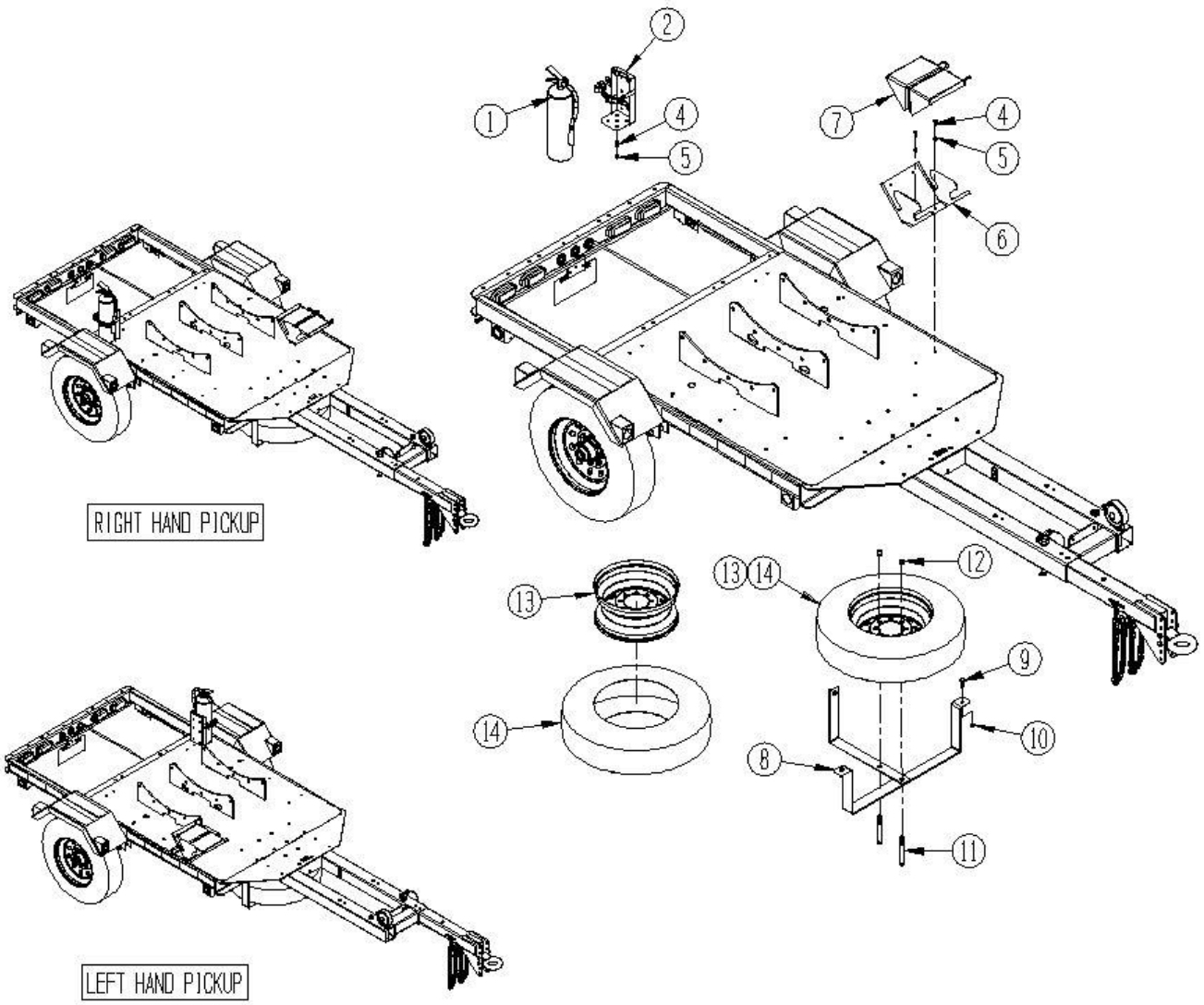
MANUAL BOX ASSEMBLY

103118 BON-000952 TITAN ASSEMBLY



BOM ID	PartNo (config)	Description (config)
1	BON-000952	MANUAL BOX, LARGE
2	BON-000031	5/16-18 X 1-1/4" BOLT
3	BON-008939	5/16 BONDED FLATWASHER
4	BON-000320	NYLON INSERT LOCKNUT, 5/16-18 UNC

10.65. Chock Holder, Spare Tire & Fire Extinguisher Assembly



ITEM	QTY	PART #	DESCRIPTION	ITEM	QTY	PART #	DESCRIPTION
1	1	LV-1259	FIRE EXTINGUISHER - 10# ABC	9	3	BON-000107	1/2"-13TPI X 1 1/2" GRADE 8 BOLT
2	1	LV-4585	10# FIRE EXTINGUISHER BRACKET	10	3	BON-000321	1/2"-13TPI HEX LOCK NUT NYLON INSERT
				11	2	BON-000166	5/8"-11TPI X 6 1/2" GRADE 8 BOLT
4	6	BON-000057	3/8"-16TPI X 1" GRADE 8 BOLT	12	2	BON-000322	5/8"-11TPI HEX LOCK NUT NYLON INSERT
5	6	BON-000319	3/8"-16TPI HEX LOCK NUT NYLON INSERT	13		LV-1073	RIM ONLY
6	1	LV-1340	DOUBLE WHEEL CHOCK HOLDER	14		LV-1072	TIRE ONLY
7	2	BUY-WC1085H	HEAVY-DUTY RUBBER WHEEL CHOCK WITH HANDLE	13&14	1	LV-1071	TIRE & RIM ASSEMBLY
8	1	LV-1251	SPARE TIRE MTG BRACKET				

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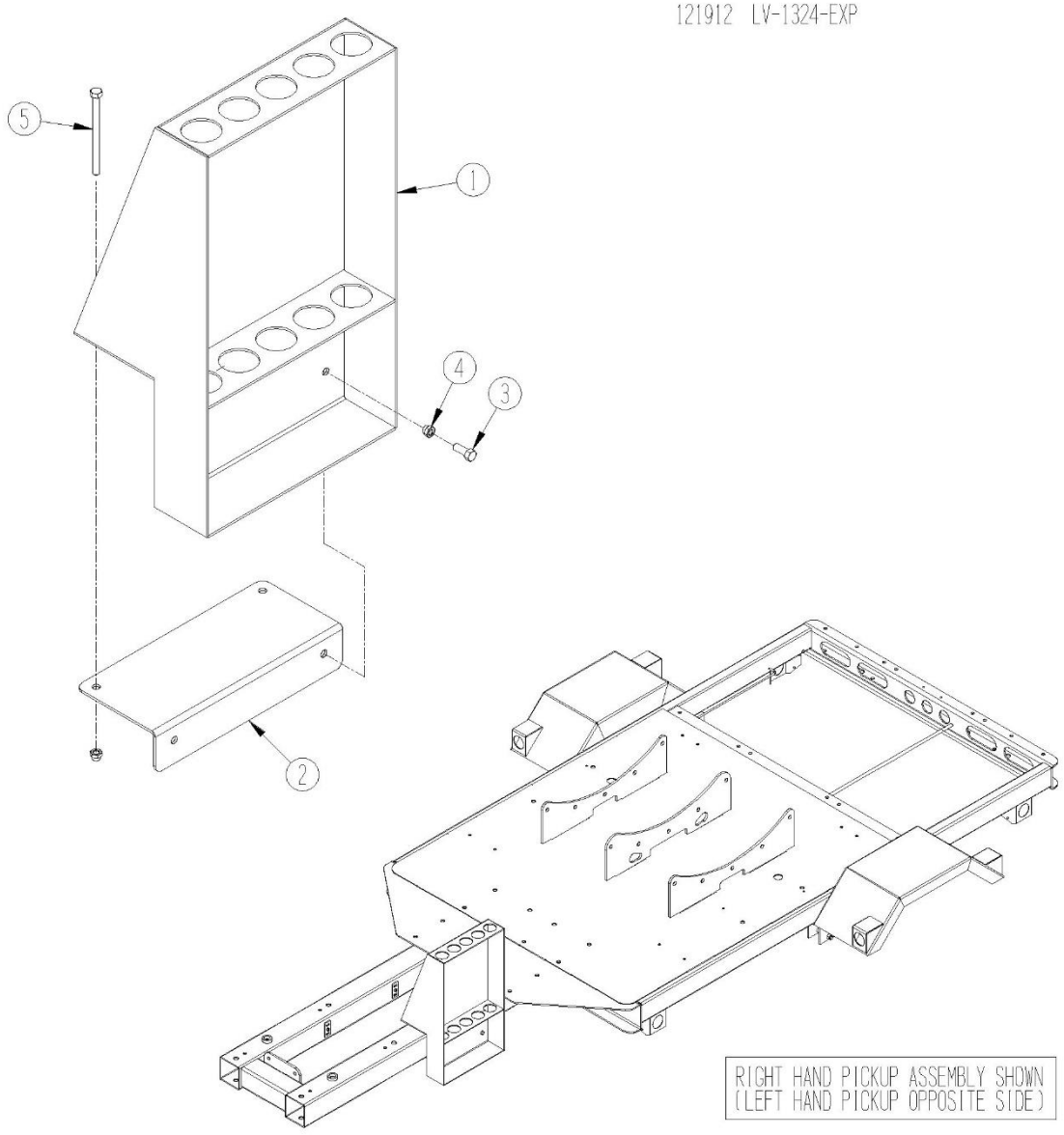
10.66. RAKE HOLDER ASSEMBLY

RAKE HOLDER ASSEMBLY - LEAF VAC

121912 LV-1324-EXP



RIGHT HAND PICKUP ASSEMBLY SHOWN
(LEFT HAND PICKUP OPPOSITE SIDE)

ITEM	QTY	PART #	DESCRIPTION
1	1	LV-1324	RAKE HOLDER - EDGE MOUNT
2	1	LV-1018	MOUNTING BRACKET
3	2	BON-000057	3/8"-16TPI X 1" GR.8 BOLT
4	4	BON-000319	3/8"-16TPI HEX LOCK NUT NYLON INSERT
5	2	BON-000072	3/8"-16TPI X 5 1/2" GR.8 BOLT

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10.67. Emergency Stop Switch Mounted To Pick-up Handle Assembly

EMERGENCY STOP SWITCH MOUNTED TO PICKUP HANDLE

121520 TITAN OVERHEAD BOOM EMERGENCY STOP LOCATION.smg

THE CURRENT E-STOP IS NOT SHOWN
THE PART NUMBERS BELOW ARE CORRECT

(1) LV-1398 - EMERGENCY STOP SWITCH

MOUNTING HARDWARE & WIRE FITTINGS:
(2) 6-32 X 1" MACHINE SCREW
(2) 6-32 NUT WITH STAR WASHER
(1) WAY-24594 - CORD GRIP
(2) WAY-24612 - NYLON LOCKNUT

10.68. Emergency Stop Switch Mounted To Ride On Seat

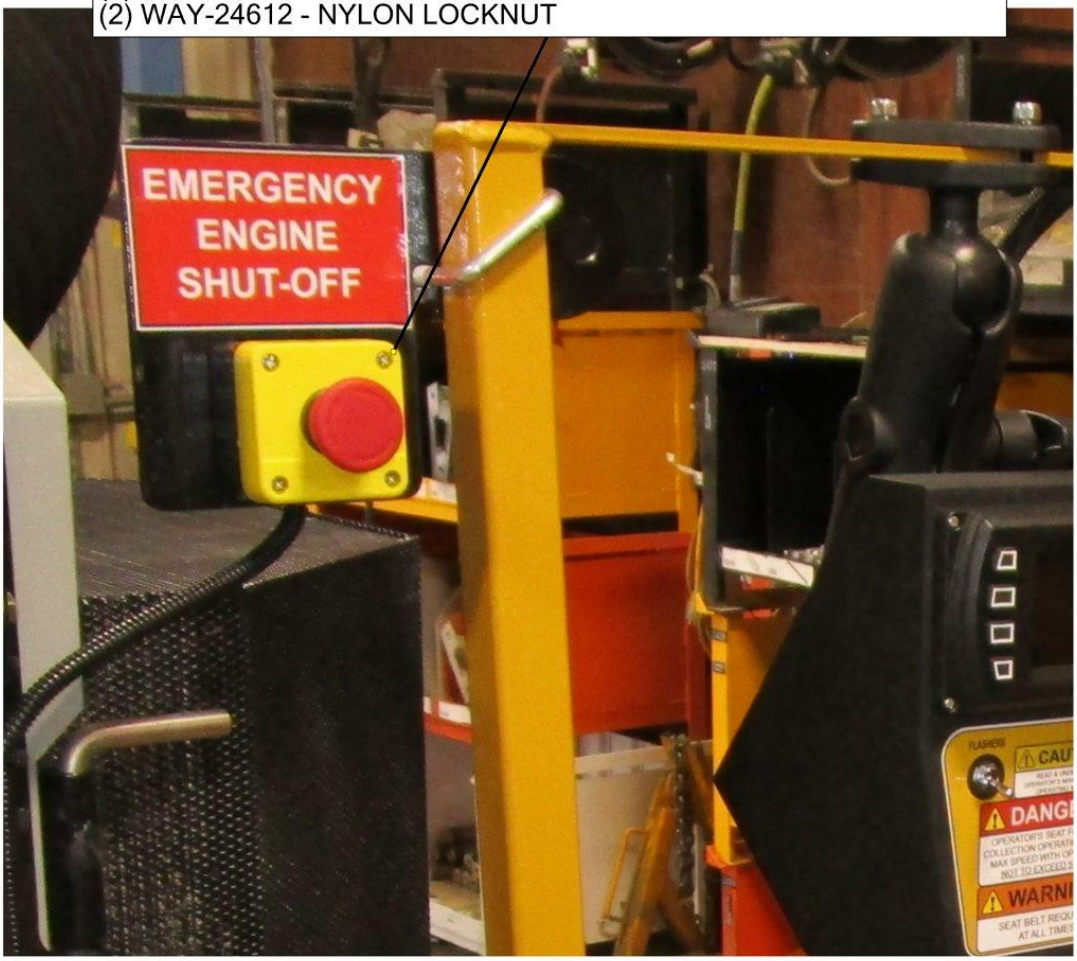
EMERGENCY STOP SWITCH MOUNTED TO RIDE ON SEAT

121520 TITAN EMERGENCY STOP LOCATIONS

THE CURRENT E-STOP AND MOUNTING POSITION IS NOT SHOWN
THE PART NUMBERS BELOW ARE CORRECT

(1) LV-1398 - EMERGENCY STOP SWITCH

MOUNTING HARDWARE & WIRE FITTINGS:
(2) 6-32 X 1" MACHINE SCREW
(2) 6-32 NUT WITH STAR WASHER
(1) WAY-24594 - CORD GRIP
(2) WAY-24612 - NYLON LOCKNUT



10.69. Emergency Stop Switch Mounted To Engine

EMERGENCY STOP SWITCH MOUNTED TO ENGINE

121520 TITAN EMERGENCY STOP LOCATIONS

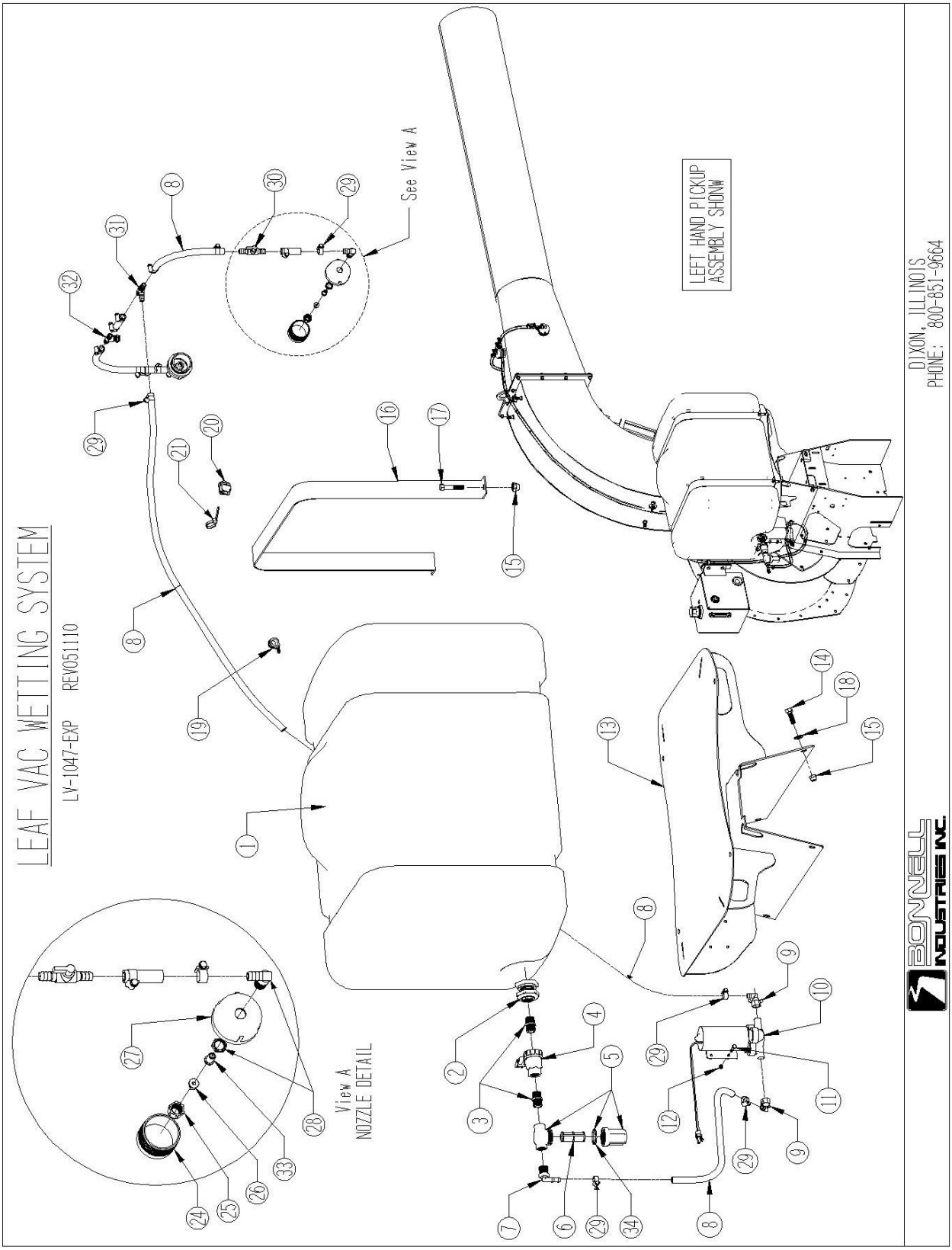
BOTH THE MANUAL CLUTCH AND FLUID COUPLERS GET E-STOPS

THE CURRENT E-STOP IS NOT SHOWN
THE PART NUMBERS BELOW ARE CORRECT

(1) LV-1398 - EMERGENCY STOP SWITCH

MOUNTING HARDWARE & WIRE FITTINGS:
(2) 6-32 X 1" MACHINE SCREW
(2) 6-32 NUT WITH STAR WASHER
(1) WAY-24594 - CORD GRIP
(2) WAY-24612 - NYLON LOCKNUT

10.70. WETTING SYSTEM ASSEMBLY

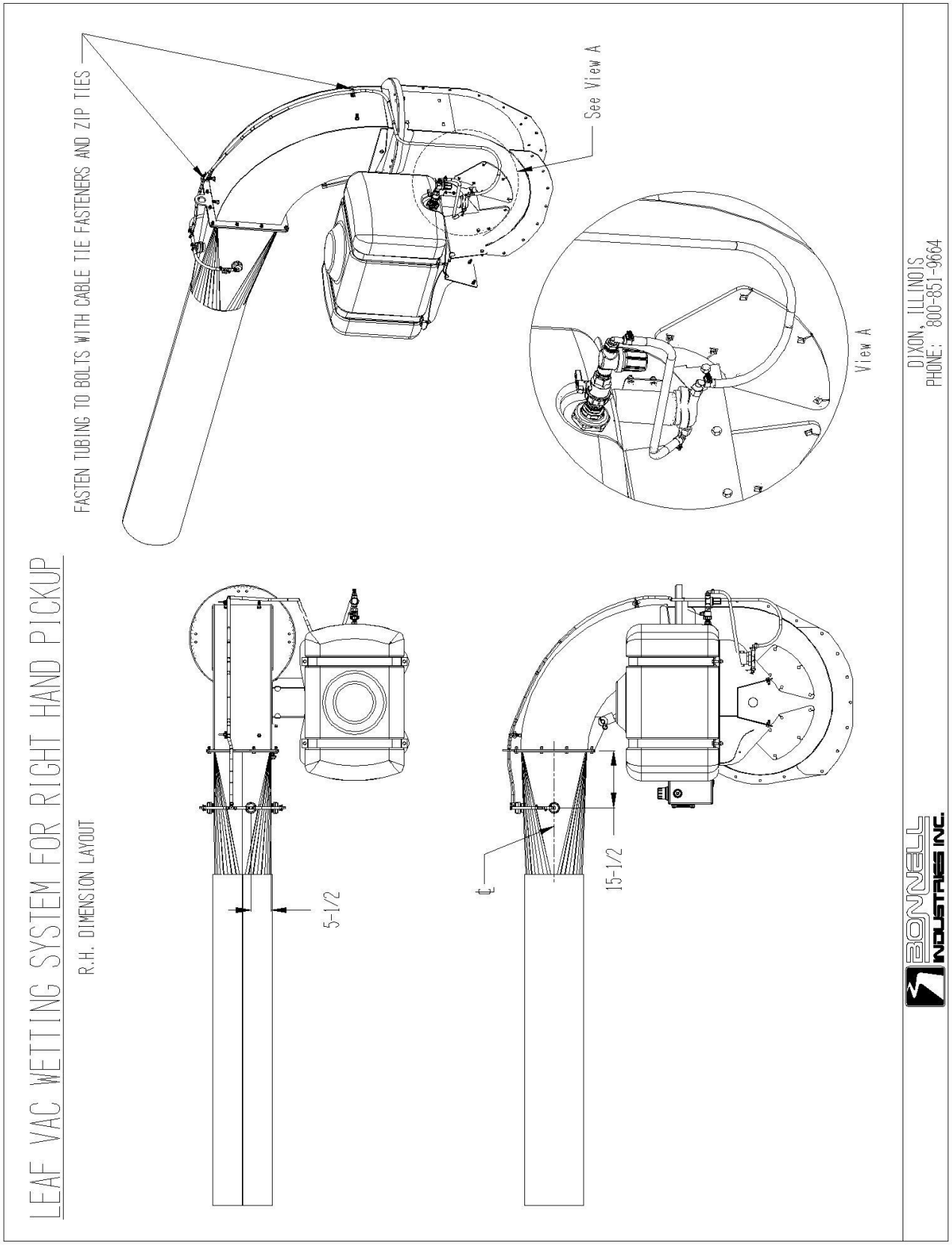


10.71. WETTING SYSTEM PARTS BREAKDOWNS

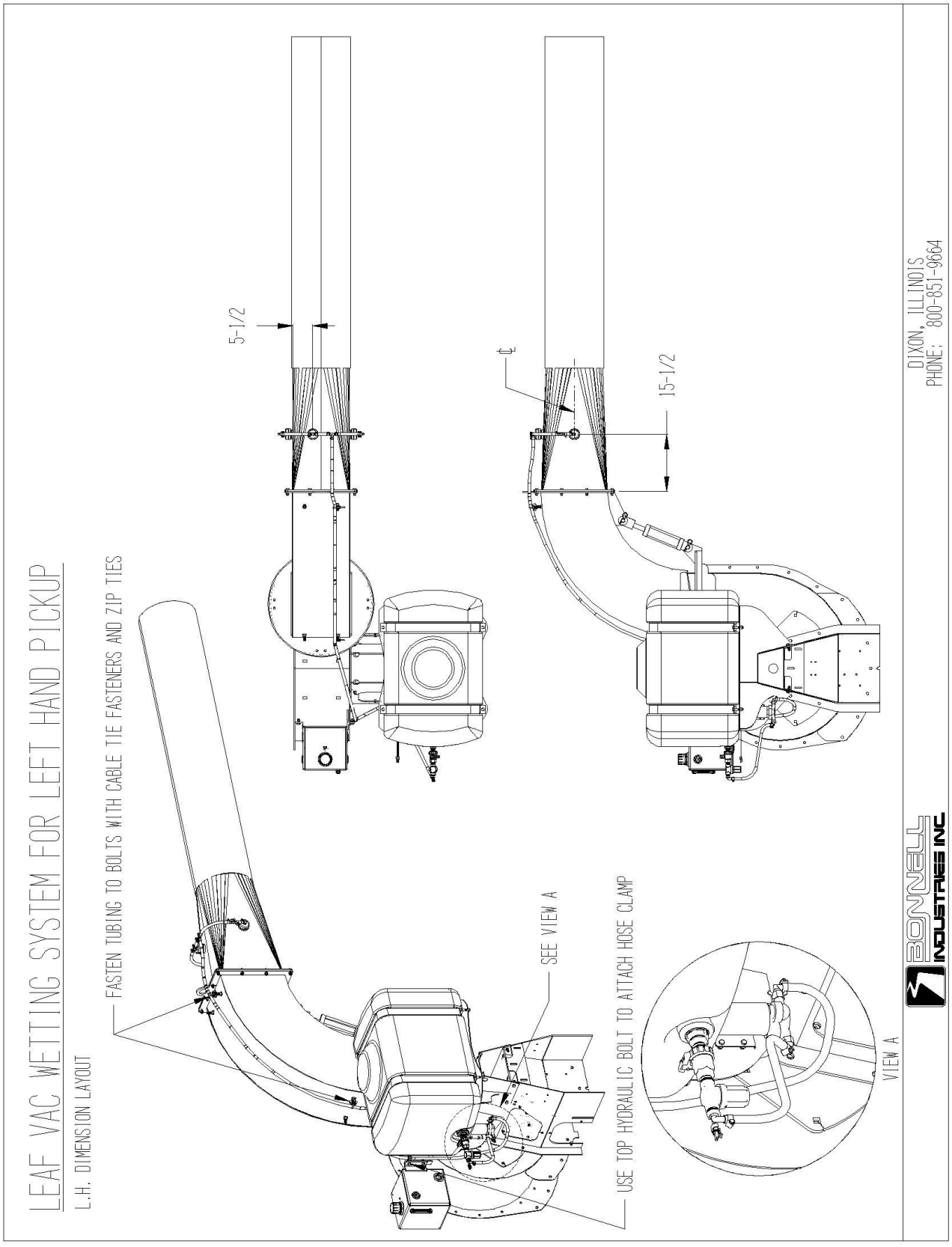
LEAF VAC WETTING SYSTEM

ITEM #	PART #	QTY.	DESCRIPTION
1-32	LV-1047	1	COMPLETE WETTING SYSTEM, 100 GALLON
1	LV-1048	1	100 GAL. TANK
2	TF075	1	3/4" TANK FITTING
3	LDS1026X001	2	3/4" CLOSE NIPPLE, POLY
4	LDS1042X001	1	3/4" BALL VALVE
5	BSS-001127	1	LINE STRAINER
6	LV-1244	1	30 MESH STRAINER SCREEN
7	HB-075/050-90	1	3/4" MALE THREAD X 1/2" HOSE SHANK 90
8	LDS1009X001	17 FT	HOSE, 1/2" ID NYLON BRAIDED
9	LDS1070X001	2	ELBOW AT PUMP
10	LDS8003X002	1	PUMP,12VOLT,45 PSI, 3 TO 5 GPM
11	BON-000007	4	1/4"-20 X 1-1/2 HEX BOLT
12	BON-000318.5	4	1/4" HEX LOCK NUT
13	LV-2490	1	TANK MOUNTING PLATFORM WELDMENT
14	BON-000107	8	1/2"-13 X 1-1/2 HEX BOLT
15	BON-000321	8	1/2" HEX LOCK NUT
16	LV-1053	1 PR	TANK HOLD DOWN BRACKET KIT
17	BON-000111	4	1/2"-13TPI X 2-1/2" LONG GR.8 GRADE 8 BOLT
18	BON-000340	4	1/2" FLAT WASHER
19	WAY-25712	1	CABLE CLAMP, 3/4"
20	WAY-21298	2	CABLE TIE FASTENER; 5/8 STUD
21	WAY-21047	2	CABLE TIE H.D. 15-1/4 INCH LONG
24	LV-1051	3	SPRAY NOZZLE MOUNTING NIPPLE
25	BSS-001056	3	NOZZLE NUT
26	LDS1072X001	3	SPRAY NOZZLE
27	LV-1050	3	SPRAY NOZZLE MOUNTING CAP
28	BSS-001057	2	1/2" BRASS MOUNTING TEE
29	VEL-022308	14	HOSE CLAMP
30	LV-1049	2	PVC 2-WAY BALL VALVE, 1/2"
31	LDS1065X001	1	1/2" HOSE BARB TEE
32	BSS-001058	1	1/2" BRASS MOUNTING ELBOW
33	LDS1079X001	3	50 MESH NOZZLE STRAINER

10.72. WETTING SYSTEM DETAIL – RIGHT HAND PICKUP



10.73. WETTING SYSTEM DETAIL – LEFT HAND PICKUP



11. NOTES

12. WARRANTY

Titan LEAF SOLUTIONS

WARRANTY

Issued: January 1, 2010

Bonnell Industries, Inc. warrants to the original purchaser that if any part of the product proves to be defective in workmanship or material within one year of the date of original installation and is returned to us freight prepaid within 30 days after such defect is discovered and notification thereof is provided Bonnell, we will either replace or repair the defective part (our option). This warranty does not apply to damage resulting from neglect, misuse, accident or improper installation or maintenance. Charges for field service, labor, or other expenses not previously authorized and approved in writing by Bonnell Industries, Inc. will not be accepted. This warranty is exclusive and in lieu of all other warranties whether expressed or implied. Bonnell Industries, Inc. neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with this warranty, and will not be liable for consequential damages. This warranty applies only to products made and/or supplied by Bonnell Industries, Inc. and does not apply to other products not made or supplied by us and to which our products may be attached, such as trucks. We accept no responsibility for damages to such other products, even if our product is alleged to have contributed to the damage of the other product.

Engines, drive line components, hydraulic, electrical, or other components furnished by other manufacturers and used with our products are warranted by that manufacturer and not by Bonnell Industries, Inc. the manufacturer's own warranty will apply to these parts. Hydraulic or electrical components are not to be disassembled without the express written permission of Bonnell Industries, Inc.

All defective parts returned from an end user must include the unit model, serial number, date installed, and dealer from whom purchased.

Bonnell Industries, Inc. reserves the right to make changes or improvements to its products without incurring any liability or obligation and without being required to make corresponding changes or improvements to products manufactured or sold prior to those changes or improvements.

The Bonnell Industries, Inc. Warranty Policy is subject to change without notice.

Product Information

When ordering parts, please refer to the information below.

INSTALLATION DATE:

This product was manufactured by Bonnell Industries, Inc.,

located at 1385 Franklin Grove Rd.,

in the city of Dixon, Illinois, U.S.A.

MADE IN THE USA