



OPERATION & MAINTENANCE MANUAL
FOR TIER 4 MODEL YEARS 2022 & UP

REV 12/06/22



**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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Bonnell Industries

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General Safety Information

1 DIMENSIONAL DATA

1.1 SPARTAN DIMENSION

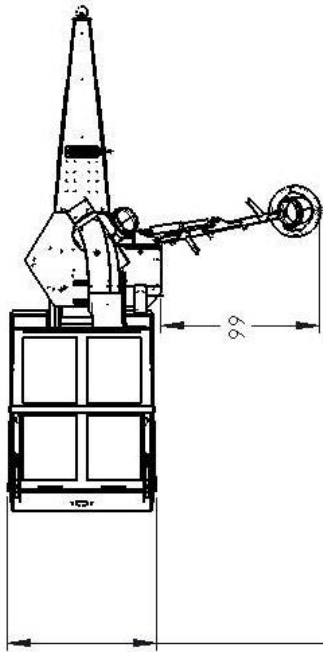
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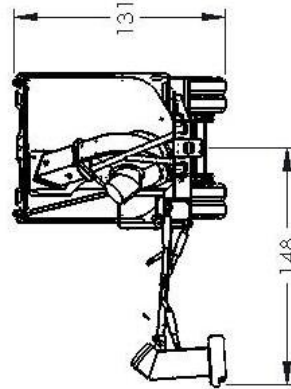
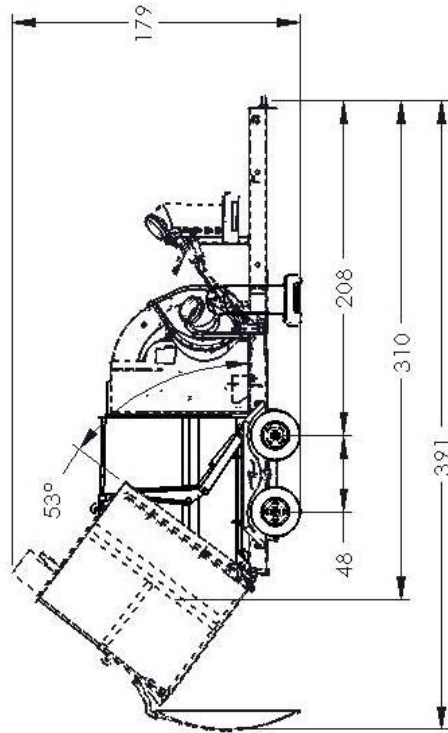
DIMENSIONAL DATA SHEET

ALL DIMENSIONS IN INCHES
EMPTY WEIGHT 10,500 LBS
GROSS AXLE RATING 24,000 LBS
APPROXIMATE TONGUE LOAD IS 1700 LBS
PAYLOAD 15,200 LBS

DENSITY OF COMPACTED LEAVES
IS APPROXIMATELY 400 LBS/CUBIC YARD
15 YARDS WILL WEIGH ABOUT 6,000 LBS
DENSITY WILL VARY!



93 (TOWING WIDTH WILL VARY
WITH THE ENGINE, BUT IS ABOUT 97")



General Safety Information

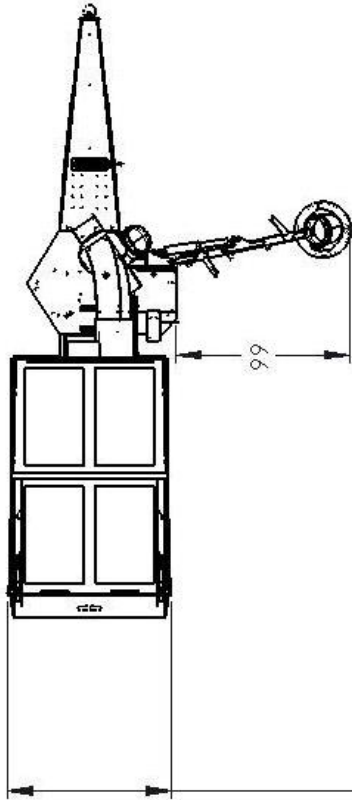
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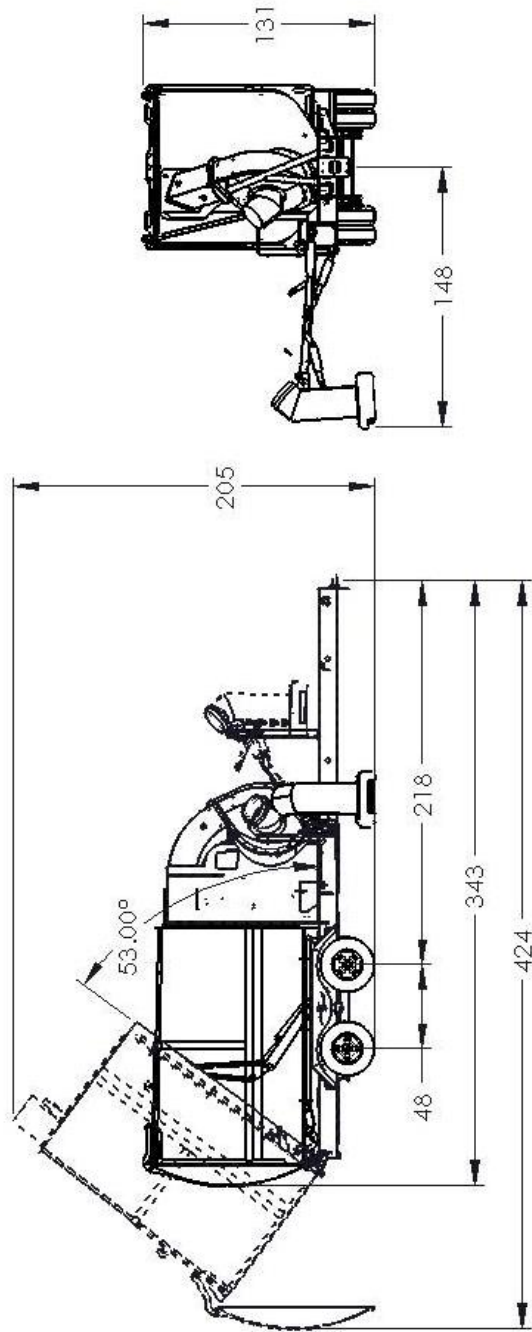
DIMENSIONAL DATA SHEET

ALL DIMENSIONS IN INCHES
 EMPTY WEIGHT 11,000 LBS
 GROSS AXLE RATING 24,000 LBS
 APPROXIMATE TONGUE LOAD IS 1800 LBS
 PAYLOAD 14,800 LBS

DENSITY OF COMPACTED LEAVES IS
 APPROXIMATELY 400 LBS/CUBIC YARD
 20 YARDS WILL WEIGH ABOUT 8,000 LBS
 DENSITY WILL VARY!



93 (TOW WIDTH VARIES WITH
 ENGINE, BUT IS AROUND 97")



General Safety Information

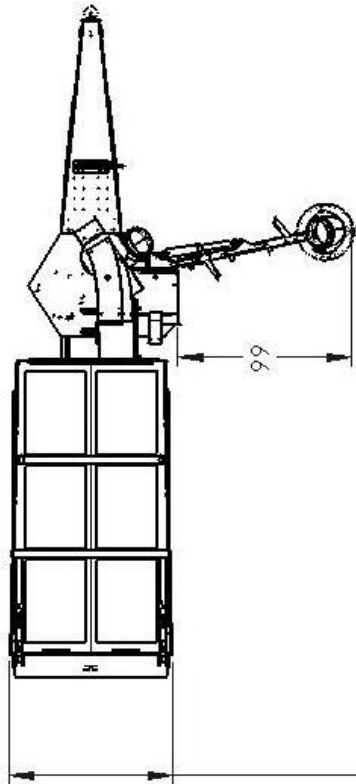
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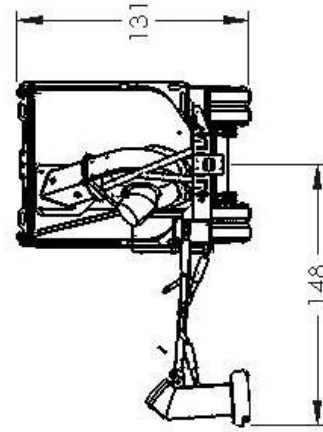
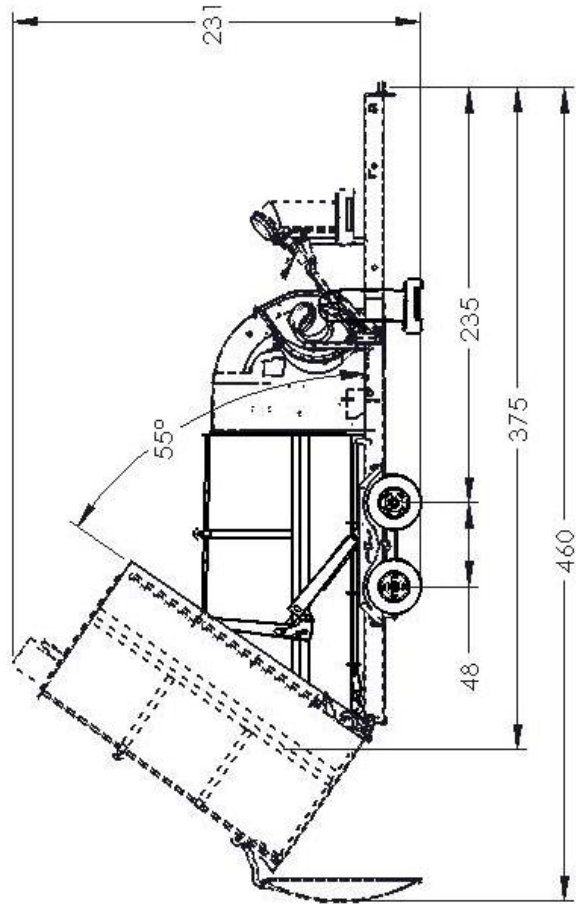
DIMENSIONAL DATA SHEET

ALL DIMENSIONS IN INCHES
 EMPTY WEIGHT 12,500 LBS
 GROSS AXLE RATING 24,000 LBS
 APPROXIMATE TONGUE LOAD IS 2000 LBS
 PAYLOAD 13,500 LBS

DENSITY OF COMPACTED LEAVES IS
 APPROXIMATELY 400 LBS/CUBIC YARD
 25 YARDS WILL WEIGH ABOUT 10,000 LBS
 DENSITY WILL VARY!



93 (TOW WIDTH VARIES WITH ENGINES, BUT IS ABOUT 97")



General Safety Information

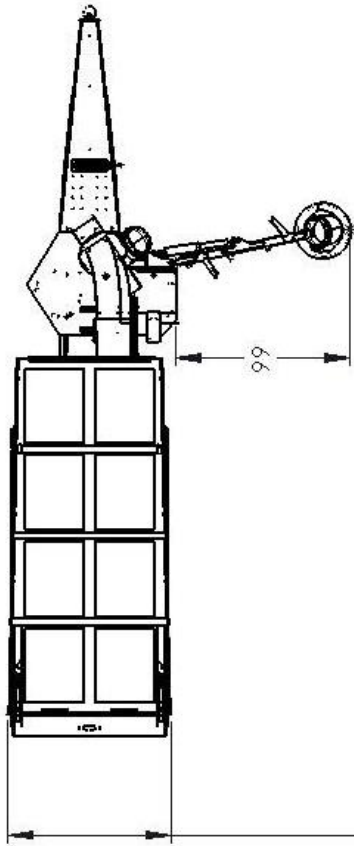
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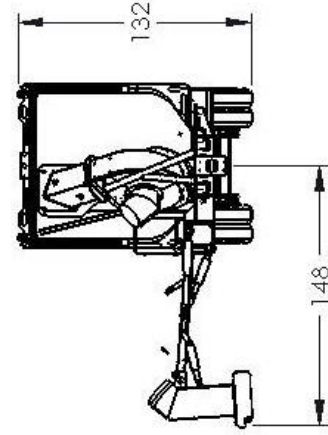
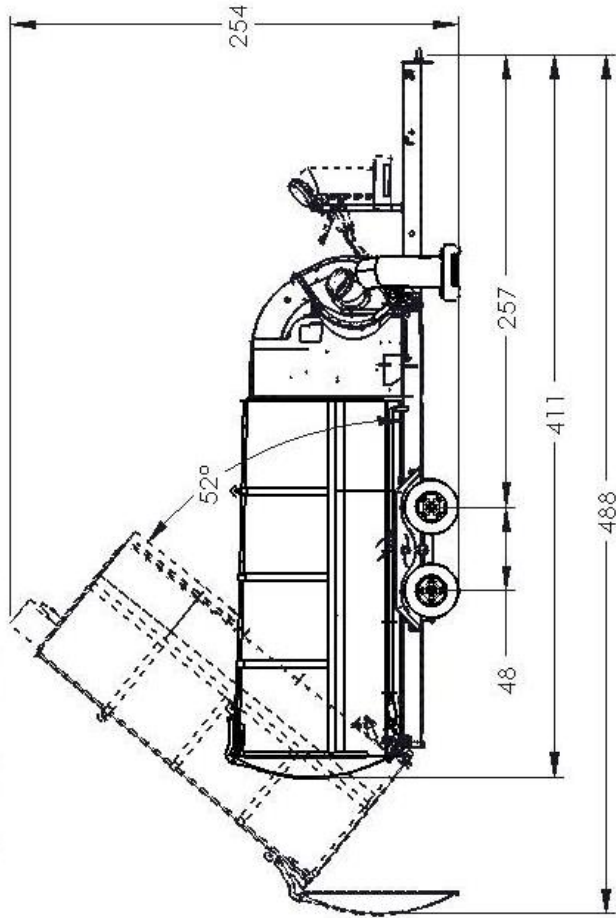
DIMENSIONAL DATA SHEET

ALL DIMENSIONS IN INCHES
 EMPTY WEIGHT 13,000 LBS
 GROSS AXLE RATING 24,000 LBS
 APPROXIMATE TONGUE LOAD IS 2000 LBS
 PAYLOAD 13,000 LBS

DENSITY OF COMPACTED LEAVES
 IS APPROXIMATELY 400 LBS/CUBIC YARD
 30 YARDS WILL WEIGH ABOUT 12,000 LBS
 DENSITY WILL VARY!

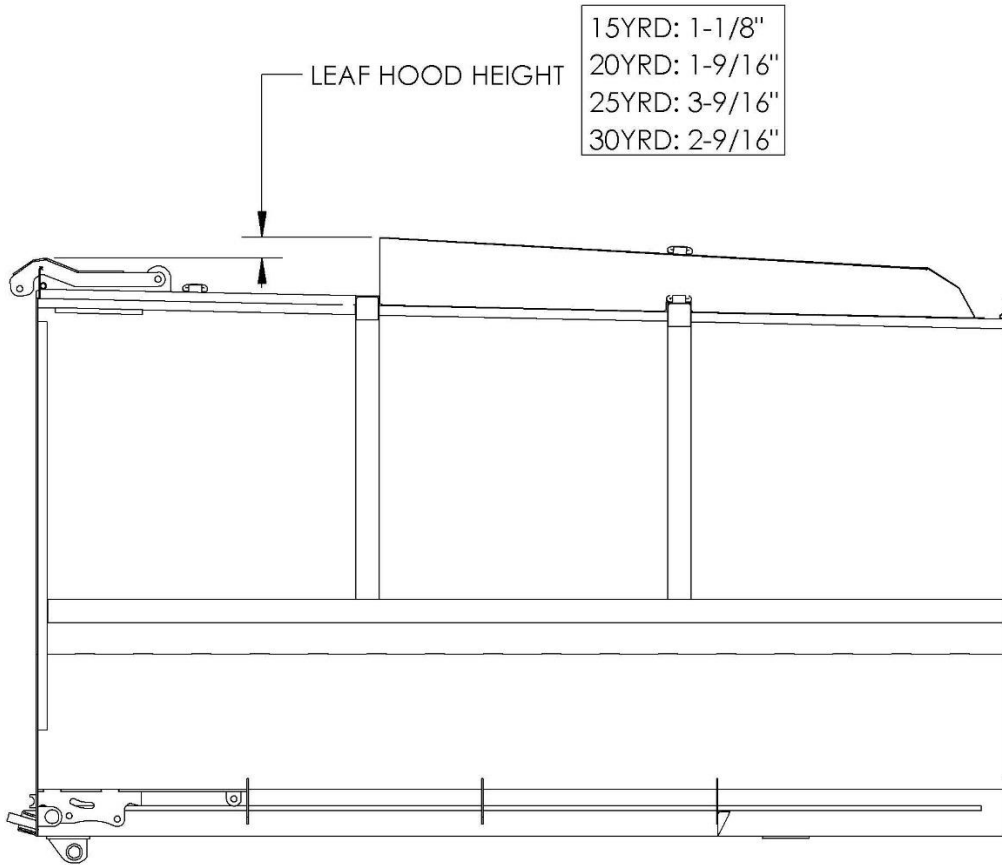


93 (TOWING WIDTH VARIES WITH ENGINE, BUT IS ABOUT 97")



General Safety Information

| | |
|-----------|-------------------------------|
| FILE NAME | SPARTAN HOOD HEIGHT REFERENCE |
| DWG NAME | SPARTAN HOOD HEIGHT REFERENCE |



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PHONE: 800-851-9664

General Safety Information

1.2 CAPACITIES & SPECIFICATIONS

| | |
|---|------------------------------------|
| Fuel Tank | 50 US Gallons |
| Hydraulic System (if equipped) | 18 US Gallons |
| Hydraulic Tank Only (if equipped) | 15 US Gallons |
| Wetting System (if equipped) | 100 US Gallons |
| Engine, Kubota V3800T174T4-15035 | 74 BHP @ 2600 RPM |
| TransFluid Coupler (if equipped) | 5-6 Quarts |
| Battery | 12 Volt, 1190 AMP, 950 CCA |
| Axles..... | 12000 LB each with Electric Brakes |
| Tires | ST325 80R16, Load Range E |
| Fan | 30 Dia. Std, 32" Dia. optional |

General Safety Information

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 at 800-851-9664 for a free copy. See the supplemental manuals section for applicable component manuals that pertain to this machine.

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. |

General Safety Information

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.

General Safety Information


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.


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:

General Safety Information

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. 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

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
equipped


|  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. | |

trailer is
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

General Safety Information

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 7.2.1.7 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 67. 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

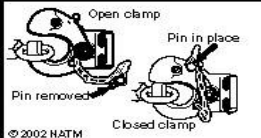
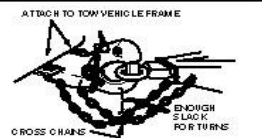
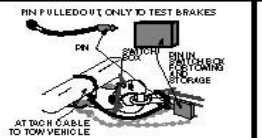
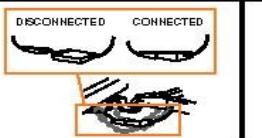

HAZARDS FROM MODIFYING YOUR TRAILER

Essential safety items can be damaged by altering your trailer. Before making any alteration to your trailer, contact your dealer or Bonnell Industries 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 at 800-851-9664 for free replacement labels.

On or near trailer tongue: DECAL: LV-1208

| ⚠ WARNING | ⚠ WARNING | ⚠ WARNING | ⚠ WARNING | ⚠ WARNING |
|--|--|--|---|--|
| <p>Uncoupling will cause trailer to come loose from tow vehicle.</p> <ol style="list-style-type: none"> 1. CHECK that pintle LOAD RATING is same or greater than ring LOAD RATING. 2. LOCK the clamp in place using a pin or lock. | <p>ALWAYS use safety chains. Chains hold trailer if connection fails. You must:</p> <ol style="list-style-type: none"> 1. CROSS chains underneath coupler. 2. ALLOW slack for trailer to turn. 3. ATTACH chain hooks securely to tow vehicle frame. | <p>Trailer can roll if it comes loose. Electric safety brake applies when cable pulls pin out of switch box.</p> <ol style="list-style-type: none"> 1. PULL hard to get pin out of switch box. 2. CHECK brake by PULLING TRAILER with tow vehicle. 3. ATTACH pin CABLE to tow vehicle so pin will be pulled out if trailer separates. 4. Promptly REPLACE pin in switch box. | <p>Lights can prevent trailer from being hit by other vehicles. You must:</p> <ol style="list-style-type: none"> 1. CONNECT trailer and tow vehicle electrical connectors. 2. CHECK all lights: tail lights, turn signal, and brake lights. 3. DO NOT TOW if lights are not working. | <p>Tire, wheel or lug nut failure can cause loss of control. Before towing, you must CHECK:</p> <ol style="list-style-type: none"> 1. Tire pressure and tread. 2. Tires and wheels for damage. 3. Lug nuts for tightness. <p>For new and remounted wheels, re-tighten lug nuts at the first 10, 25 and 50 miles of driving.</p> |
|  <p style="font-size: 0.8em;">© 2002 HATM</p> |  |  |  |  <p style="font-size: 0.8em; text-align: right;">UT0038</p> |

General Safety Information

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

↓ APPLY TO BELT GUARD ↓

| | |
|--|--|
| ! DANGER | |
| | ENTANGLEMENT HAZARD Serious injury or death will occur <ul style="list-style-type: none"> Shut down engine & disconnect safety interlock before removing hose or guards. |
| NOTICE | |
| <ul style="list-style-type: none"> 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 | |
| | ENTANGLEMENT HAZARD Serious injury or death will occur <ul style="list-style-type: none"> Shut down engine & disconnect safety interlock before removing hose or guards. |
| ! WARNING | |
| | PERSONAL INJURY HAZARD <ul style="list-style-type: none"> Head, Eye and Ear Protection required while operating this machine. |
| ! WARNING | |
| HEAVY IMPACT HAZARD | |
| Serious injury or death could occur <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> Chock wheels when servicing or parking machine. |

| | |
|---|--|
| Operation & Maintenance Manuals Inside | |
| | |

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

| | |
|---|--|
| ! WARNING | |
| COLLISION HAZARD | |
| Serious injury or death could occur <ul style="list-style-type: none"> Secure Pick-up nozzle for transport. | |
| ! WARNING | |
| SUCTION HAZARD | |
| Serious injury or death could occur HIGH VACUUM! KEEP CLEAR. | |

| | |
|------------------|--|
| ! DANGER | |
| | ENTANGLEMENT HAZARD Serious injury or death will occur <ul style="list-style-type: none"> Shut down engine & disconnect safety interlock before removing hose or guards. |
| ! WARNING | |
| | PERSONAL INJURY HAZARD <ul style="list-style-type: none"> Head, Eye and Ear Protection required while operating this machine. |
| ! WARNING | |
| | LOSS OF CONTROL HAZARD <ul style="list-style-type: none"> Chock wheels when servicing or parking machine. |

General Safety Information

| APPLY TO PREWET TANK (IF EQUIPPED) |

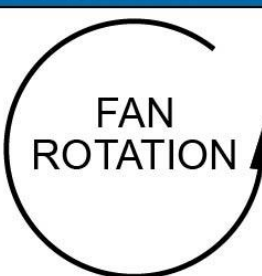
WATER ONLY
CAP. 100 GAL.

NOTICE

DRAIN WETTING SYSTEM PUMP & INLINE STRAINER TO PREVENT FREEZING.

| APPLY TO BLOWER HOUSING |

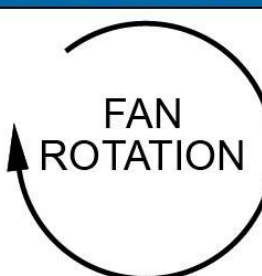
NOTICE



FAN ROTATION

| APPLY TO BLOWER HOUSING |

NOTICE



FAN ROTATION

| 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.

- Engine should be started and running at low idle speed, 1000 rpm or less.
- 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 intervals thereafter until the new plates are worn in.

Refer to clutch manual for proper adjustment procedures.

| 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 BOOM |

STOP

SAFETY LATCH MUST BE RELEASED BEFORE OPERATING BOOM, AND SECURED BEFORE TRANSPORTING OR SERVICING MACHINE.

| APPLY NEAR ENGINE CONTROLS |

WARNING



PERSONAL INJURY HAZARD

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

PRESTART CHECKLIST

| | |
|---|---|
| <ul style="list-style-type: none"> ✓ INSPECT TIRES ✓ ENGINE OIL & FUEL LEVELS ✓ CHECK ALL LIGHTS ✓ HYDRAULIC OIL LEVEL ✓ WATER LEVEL | <ul style="list-style-type: none"> ✓ INSPECT HOSE FOR WEAR ✓ PICK-UP HOSE SECURE ✓ CHECK BELT TENSION ✓ ALL GUARDS IN PLACE ✓ DISENGAGE CLUTCH |
|---|---|

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.

WARNING



FIRE HAZARD

- Keep engine and engine area free of leaf debris buildup.

- | APPLY TO PIVOT ARM |  
- | APPLY TO SPARTAN HOIST HINGES |  
- | APPLY NEAR IMPELLER BEARING ZERKS |  
- | APPLY TO FENDERS |  
- | APPLY TO FLUID COUPLER ZERK (IF EQUIPPED) | 

LV-1624_rev1 2.26.20 DECAL SET FOR TIER 4 TITAN & SPARTAN SERIES SHEET 2 OF 2

General Safety Information

[APPLY TO HYDRAULIC OIL TANK]

HYDRAULIC FLUID ONLY FILL LINE:

CAUTION

DO NOT OPERATE ENGINE WITH BALL VALVE CLOSED. CLOSE VALVE TO CHANGE HYDRAULIC FILTER.

ALWAYS WEAR SAFETY GLASSES AND PROTECTIVE GEAR

[FLASHERS]

CAUTION

READ & UNDERSTAND OPERATOR'S MANUAL BEFORE OPERATING MACHINE

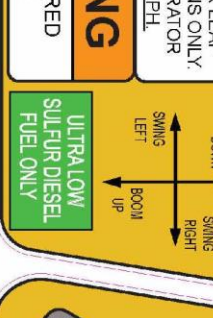
DANGER

OPERATOR'S SEAT FOR LEAF COLLECTION OPERATIONS ONLY. MAX SPEED WITH OPERATOR NOT TO EXCEED 5 MPH.

WARNING

SEAT BELT REQUIRED AT ALL TIMES

ULTRALOW SULFUR DIESEL FUEL ONLY



[FLASHERS]

CAUTION

READ & UNDERSTAND OPERATOR'S MANUAL BEFORE OPERATING MACHINE

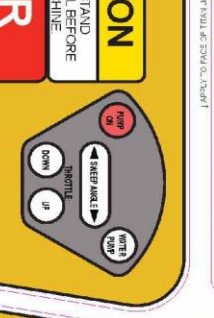
DANGER

OPERATOR'S SEAT FOR LEAF COLLECTION OPERATIONS ONLY. MAX SPEED WITH OPERATOR NOT TO EXCEED 5 MPH.

WARNING

SEAT BELT REQUIRED AT ALL TIMES

ULTRALOW SULFUR DIESEL FUEL ONLY



[APPLY TO FACE OF TITAN AND DISCHARGE CONTROLS, BOX 1]

DISCHARGE FLOAT

ON OFF

INDICATOR LIT WHEN FLOAT IS ON

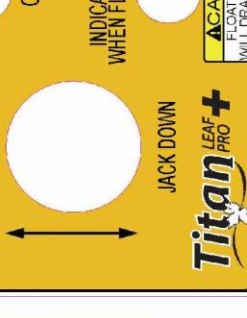
DISCHARGE UP DISCHARGE DOWN

JACK UP JACK DOWN

CAUTION

LEAF PRO PLUS

WILL DRAIN BATTERY



[APPLY TO FACE OF SPARTAN (SEE CONDITIONS)]

DANGER

OPERATOR'S SEAT FOR LEAF COLLECTION OPERATIONS ONLY. MAX SPEED WITH OPERATOR NOT TO EXCEED 5 MPH.

[APPLY TO FACE OF SPARTAN (SEE CONDITIONS)]

Titan LEAF PRO PLUS

Spartan LEAF PRO PLUS

Titan LEAF PRO PLUS

Spartan LEAF PRO PLUS

Titan LEAF PRO PLUS

Spartan LEAF PRO PLUS

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

21

General Safety Information

⚠ OPERATION OF BODY PROP

This machine is equipped with:
 1 Body Prop
 2 Body Props



TO USE BODY PROP(S):

1. Raise body to height where prop(s) can be swung upward into position. Place the hoist control valve in the neutral (hold) position.
2. Locate prop(s) (behind fender), and swing "up" to the support position.
3. Lower body slowly until prop(s) rests on prop receiver. Do not power hoist down. Place the hoist control valve in the neutral (hold) position.

TO STORE THE PROP(S):

4. Raise body to a height where the prop(s) will clear the prop receiver. Be sure the hoist control valve is in the neutral (hold) position.
5. Swing prop(s) down to transit position. Before lowering body be certain that the area is clear.

⚠ OPERATION OF BODY PROP

This machine is equipped with:
 1 Body Prop
 2 Body Props



TO USE BODY PROP(S):


1. Raise body to height where prop(s) can be swung upward into position. Place the hoist control valve in the neutral (hold) position.
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5. Swing prop(s) down to transit position. Before lowering body be certain that the area is clear.

**LUBRICATE HOIST EVERY 100 HRS.
3 PUMPS EACH LOCATION**

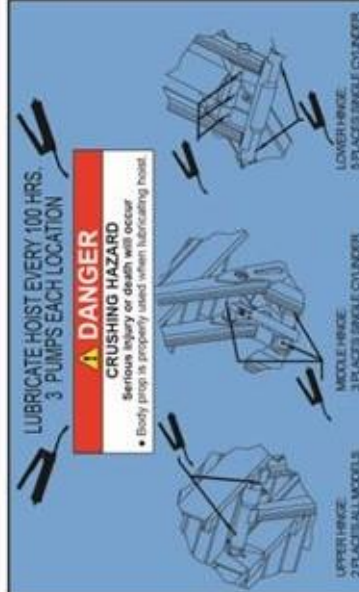
⚠ DANGER
CRUSHING HAZARD
 Serious injury or death will occur
 • Body prop is properly used when lubricating hoist.



UPPER HOIST: 2 PLACES DUAL CYLINDER
 MIDDLE HOIST: 3 PLACES SINGLE CYLINDER
 4 PLACES DUAL CYLINDER
 LOWER HOIST: 5 PLACES SINGLE CYLINDER
 6 PLACES DUAL CYLINDER

**LUBRICATE HOIST EVERY 100 HRS.
3 PUMPS EACH LOCATION**

⚠ DANGER
CRUSHING HAZARD
 Serious injury or death will occur
 • Body prop is properly used when lubricating hoist.



UPPER HOIST: 2 PLACES DUAL CYLINDER
 MIDDLE HOIST: 3 PLACES SINGLE CYLINDER
 4 PLACES DUAL CYLINDER
 LOWER HOIST: 5 PLACES SINGLE CYLINDER
 6 PLACES DUAL CYLINDER

SPARTAN^{lift}+

▲ TONGUE UP ○ ▲ TONGUE DOWN

▲ BODY UP ○ ▲ BODY DOWN

⚠ DANGER

- Do not operate or service hoist until you have read and understand the manual supplied with the hoist.
- Do not leave body raised or partly raised while vehicle is unattended or while performing maintenance or service under body unless body is propped to prevent accidental lowering.
- Do not attempt to raise a loaded body when vehicle is on unlevel ground.
- Operator must remain at controls during all operations.

CAP. 15 GAL.


LV-2093_REV6 9.26.16 DECAL SET FOR SPARTAN LEAF PRO SERIES

General Safety Information

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]

[APPLY DIRECTLY ABOVE YELLOW EMERGENCY SHUT OFF BUTTONS]

EMERGENCY ENGINE SHUT-OFF

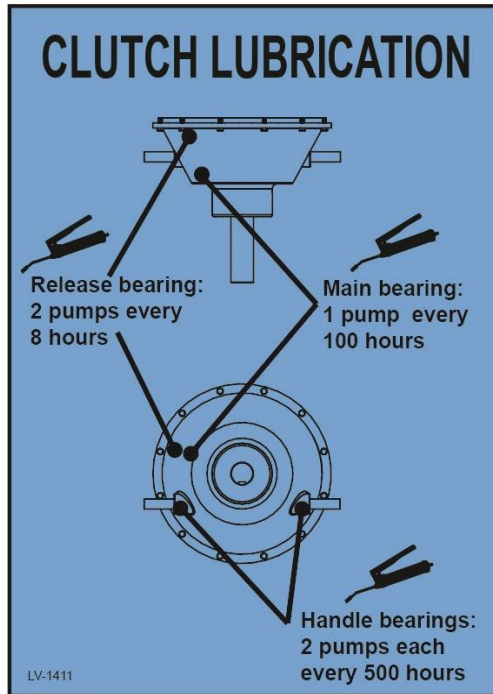
EMERGENCY ENGINE SHUT-OFF



USE 3 POINTS OF CONTACT

WHEN ENTERING OR EXITING VEHICLE





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

General Safety Information



WARNING




CRUSHING HAZARD

Serious injury or death can occur

- Stay clear while loading, unloading, raising, or lowering dump body.

BON-011375



DANGER



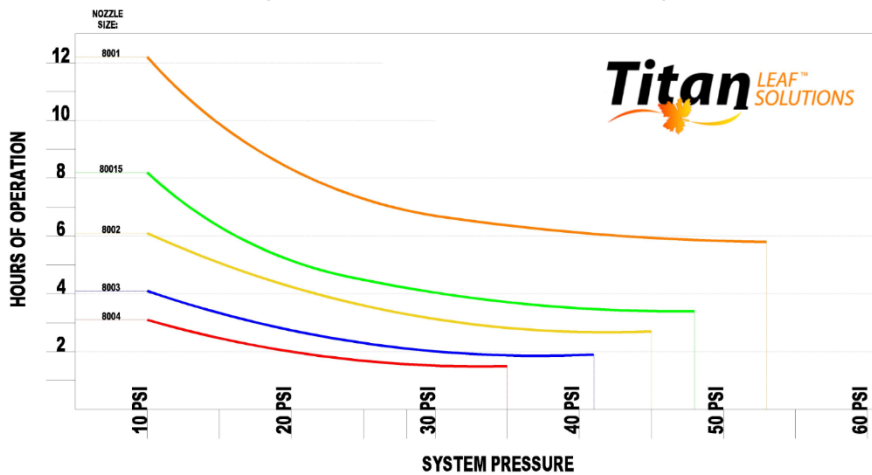
CRUSHING HAZARD

Serious injury or death will occur

- Stay clear of a raised dump body. If service work is required, make sure the body prop is properly used.
- Dump body must be empty when using body prop.
- Return the body prop to its storage position after service work is completed.
- Body must be completely lowered when unattended.

BON-011376

**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.**

LV-1386

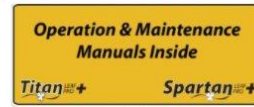
General Safety Information

SPARTAN DECALS.smg

LV-1208

| ▲ WARNING | ▲ WARNING | ▲ WARNING | ▲ WARNING | ▲ WARNING |
|--|--|--|--|--|
| <p>Unauthorized use could result in serious injury or death.</p> <ol style="list-style-type: none"> CHECK that the PICK-UP NOZZLE IS LOCKED IN POSITION. LOCK the chain or cable LATCHING MECHANISM.  | <p>Unauthorized use could result in serious injury or death.</p> <ol style="list-style-type: none"> Check that the PICK-UP NOZZLE IS LOCKED IN POSITION. LOCK the chain or cable LATCHING MECHANISM.  | <p>Unauthorized use could result in serious injury or death.</p> <ol style="list-style-type: none"> Check that the PICK-UP NOZZLE IS LOCKED IN POSITION. LOCK the chain or cable LATCHING MECHANISM.  | <p>Unauthorized use could result in serious injury or death.</p> <ol style="list-style-type: none"> Check that the PICK-UP NOZZLE IS LOCKED IN POSITION. LOCK the chain or cable LATCHING MECHANISM.  | <p>Unauthorized use could result in serious injury or death.</p> <ol style="list-style-type: none"> Check that the PICK-UP NOZZLE IS LOCKED IN POSITION. LOCK the chain or cable LATCHING MECHANISM.  |

DECAL SET: LV-1232



▲ 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.

DECAL SET: LV-1232



TT13169



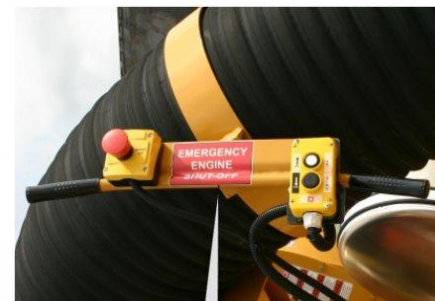
DECAL SET: LV-1624



DECAL SET: LV-2152



DECAL SET: LV-2152



EMERGENCY ENGINE SHUT-OFF

DECAL SET: LV-2152

General Safety Information

SPARTAN DECALS.smg

LV-1208



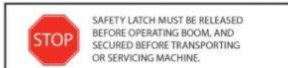
DECAL SET: LV-1232



DECAL SET: LV-2152



TT13169



DECAL SET: LV-1624

DECAL SET: LV-2152



DECAL SET: LV-1232

General Safety Information

SPARTAN DECALS.smg

! 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.

DECAL SET: LV-1232



| | | | | |
|--|---|---|---|---|
| <p>! WARNING</p> <p>Interlocking and safety devices do not make the machine safe from the operator. The operator must always use proper operation techniques.</p> <p>1. Do not operate the machine until you have read and understood the operator's manual.</p> <p>2. Do not operate the machine if you are under the influence of alcohol, drugs, or medication.</p> <p>3. Do not operate the machine if you are fatigued or otherwise impaired.</p> <p>4. Do not operate the machine if you are not properly trained and certified.</p> <p>5. Do not operate the machine if you are not wearing your seat belt.</p> <p>6. Do not operate the machine if you are not wearing your safety glasses.</p> <p>7. Do not operate the machine if you are not wearing your hard hat.</p> <p>8. Do not operate the machine if you are not wearing your ear protection.</p> <p>9. Do not operate the machine if you are not wearing your fall protection.</p> <p>10. Do not operate the machine if you are not wearing your fire extinguisher.</p> <p>11. Do not operate the machine if you are not wearing your first aid kit.</p> <p>12. Do not operate the machine if you are not wearing your fire blanket.</p> <p>13. Do not operate the machine if you are not wearing your fire extinguisher.</p> <p>14. Do not operate the machine if you are not wearing your first aid kit.</p> <p>15. Do not operate the machine if you are not wearing your fire blanket.</p> | <p>! WARNING</p> <p>Always use proper operation techniques. Do not operate the machine if you are under the influence of alcohol, drugs, or medication.</p> <p>1. Do not operate the machine until you have read and understood the operator's manual.</p> <p>2. Do not operate the machine if you are fatigued or otherwise impaired.</p> <p>3. Do not operate the machine if you are not properly trained and certified.</p> <p>4. Do not operate the machine if you are not wearing your seat belt.</p> <p>5. 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|--|---|---|---|---|

LV-1208

TT13169

DECAL SET: LV-1624

STOP SAFETY LATCH MUST BE RELEASED BEFORE OPERATING BOOM, AND SECURED BEFORE TRANSPORTING OR SERVICING MACHINE.

! 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.

DECAL SET: LV-2152



! 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.

DECAL SET: LV-2152

General Safety Information

SPARTAN DECALS.smg

DECAL SET: LV-1624

DANGER
DIESEL FUEL. FLAMMABLE. NO SMOKING.

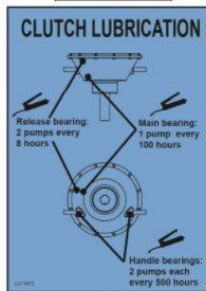
ULTRA LOW SULFUR DIESEL FUEL ONLY CAP. 50 GAL.

DANGER
EXPLOSION HAZARD. DO NOT WELD, CUT OR BURN ON OR NEAR FUEL TANK WITHOUT FIRST REMOVING AND COMPLETELY PURGING TANK.



DECAL SET: LV-1624

LV-1411



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 intervals thereafter until the new plates are worn in.
 Refer to clutch manual for proper adjustment procedures.

BJV-1660

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.

DECAL SET: LV-2152

EMERGENCY ENGINE SHUT-OFF

DECAL SET: LV-1624

NOTICE

FAN ROTATION

DANGER
ENTANGLEMENT 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
 • Check wheels when servicing or parking machine.

DECAL SET: LV-1232

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



General Safety Information

SPARTAN DECALS.smg



DECAL SET: LV-1624

NOTICE

FAN ROTATION

DANGER

ENTANGLEMENT 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.

DECAL SET: LV-1232

WEEKLY 2 PUMPS

FLUID COUPLER ZERK
 DECAL SET: LV-1624

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

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.

DECAL SET: LV-1624

EMERGENCY ENGINE SHUT-OFF

DECAL SET: LV-2152

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.

- Engine should be started and running at low idle speed, 1000 rpm or less.
- 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 end.

Set engine to idle speed before disengaging clutch.

DECAL SET: LV-1624

General Safety Information

SPARTAN DECALS.smg



⚠ DANGER

- Do not operate or service hoist until you have read and understand the manual supplied with the hoist.
- Do not leave body raised or partly raised while vehicle is unattended or while performing maintenance or service under body unless body is propped to prevent accidental lowering.
- Do not attempt to raise a loaded body when vehicle is on unlevel ground.
- Operator must remain at controls during all operations.

DECAL SET: LV-2093

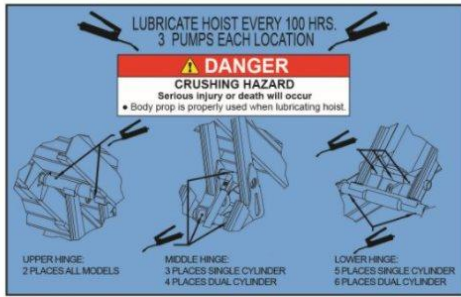


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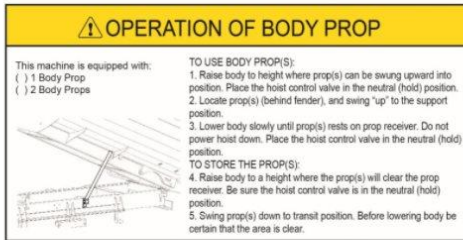


General Safety Information

SPARTAN DECALS.smg



DECAL SET: LV-2093



DECAL SET: LV-2093



BON-011376



DECAL SET: LV-1623



General Safety Information

SPARTAN DECALS.smg



TT13169

| | |
|--|--|
|  WARNING | |
|  | CRUSHING HAZARD Serious injury or death can occur |
| | <ul style="list-style-type: none">• Stay clear while loading, unloading, raising, or lowering dump body. |

BON-011375

BON-011375



General Safety Information



SPARTAN DECALS.smg



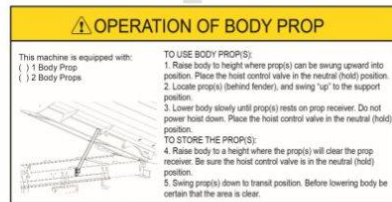
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LV-1277



DECAL SET: LV-2093

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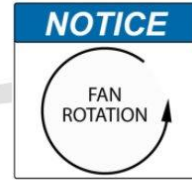


DECAL SET: LV-2093



General Safety Information

SPARTAN DECALS.smg



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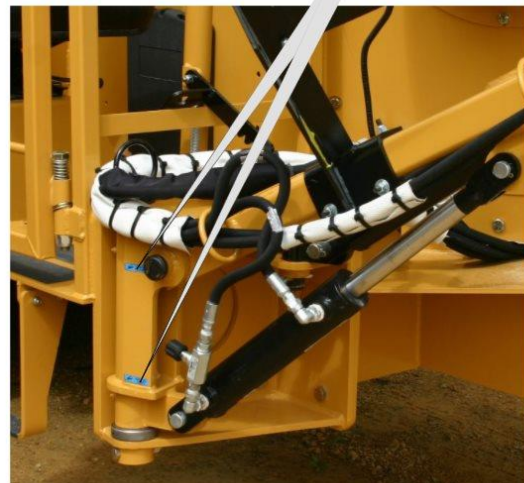


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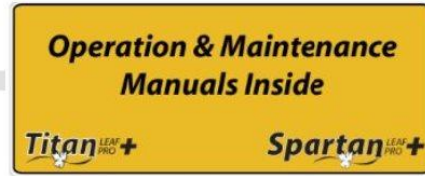


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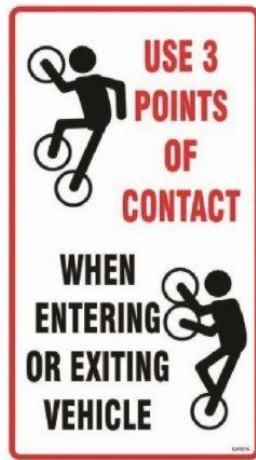


General Safety Information

SPARTAN DECALS.smg



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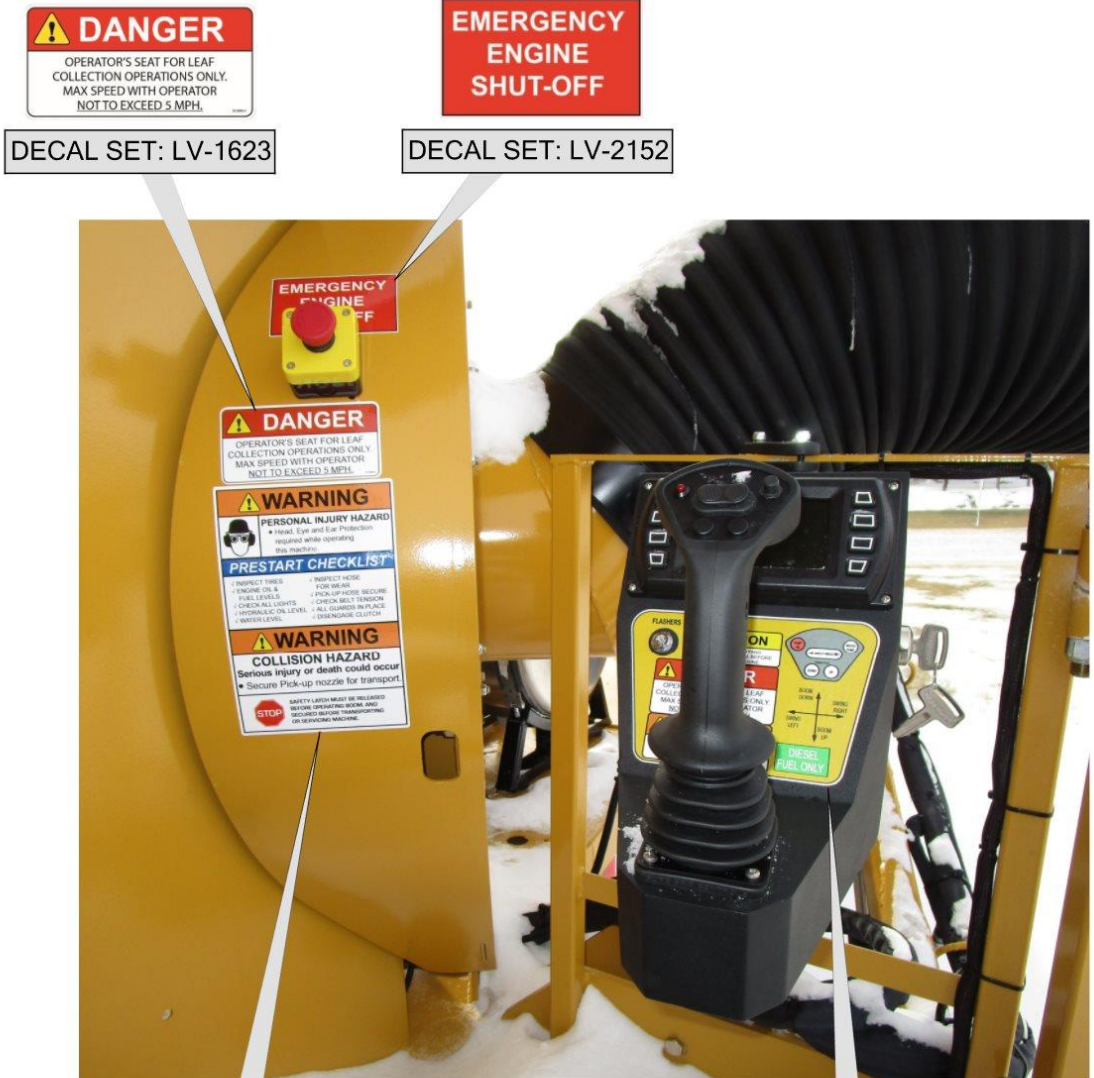
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General Safety Information

SPARTAN DECALS.smg

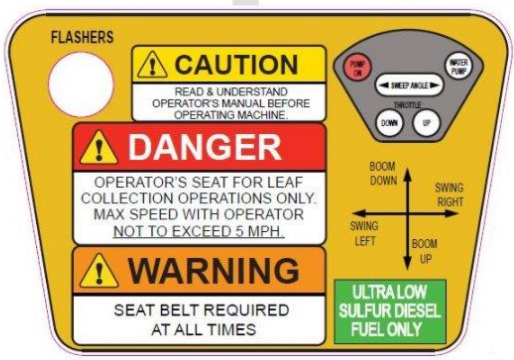


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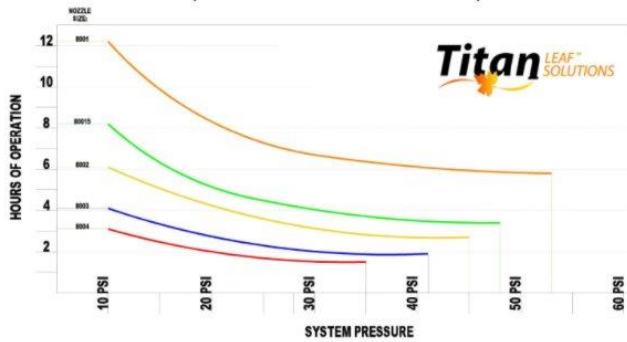
DECAL SET: LV-1623

General Safety Information

SPARTAN DECALS.smg

LV-1386

**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.

BON-011377

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.



General Safety Information

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.

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 to <http://www.safercar.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.safercar.gov>.

Call 1-800-851-9664 to reach Bonnell Industries.

2.4 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.

General Safety Information

- 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

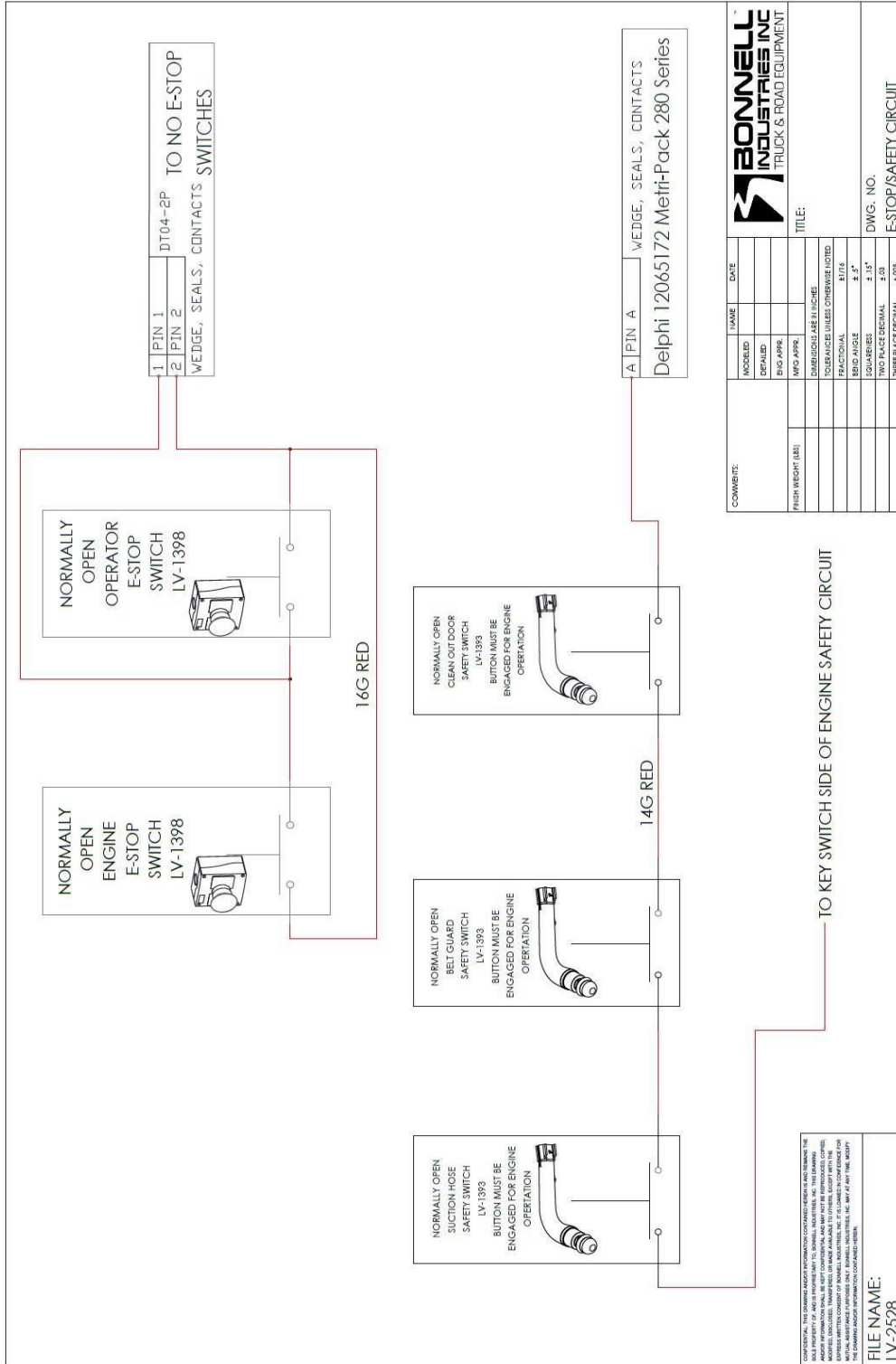
2.5 GENERAL SAFETY RELATED TO OPERATION OF VACUUM

- 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.**

General Safety Information

2.6 SAFETY DISCONNECT

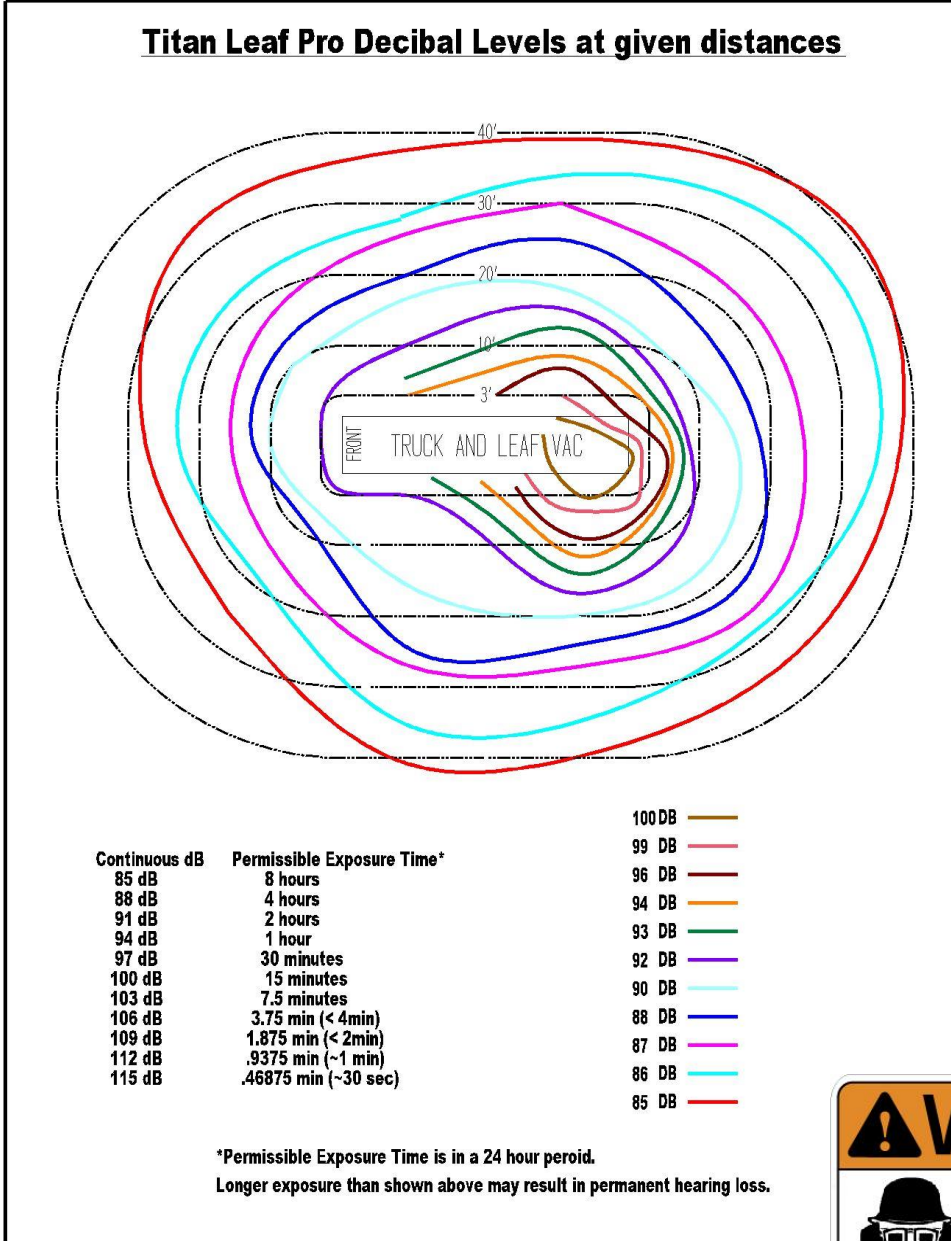
Your Leaf Machine is equipped with a safety disconnect device. **This disconnect device and all wiring is to be left operable and in place at all times, for the life of the machine.** This device is located on the hose connection to the blower housing. If your machine is equipped with a clean out door on the blower housing, an additional disconnect is located there. 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.



General Safety Information

2.7 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 the Spartan Leaf Pro Series with Kubota engines may vary from below.



Tire Safety Information

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".

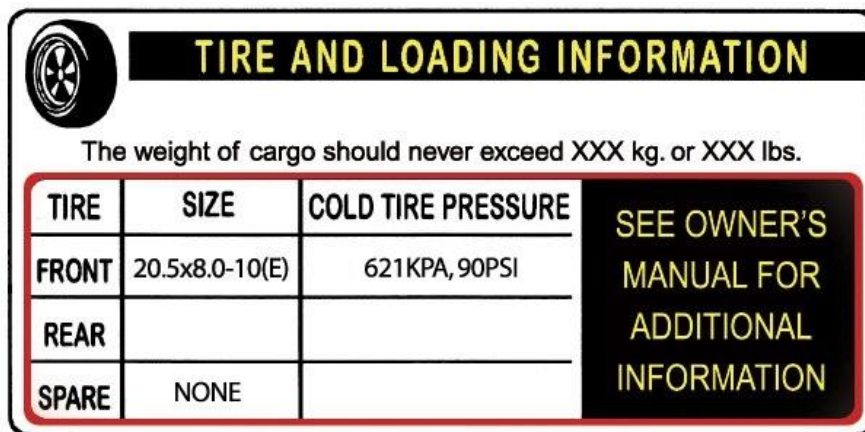
Section 2.2 contains "Steps for Determining Correct Load Limit – Tow Vehicle".

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:
 - Locating and understanding the load limit information, total load capacity, and cargo capacity.
 - 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.
 - Determining compatibility of tire and vehicle load capabilities.
 - Adverse safety consequences of overloading on handling and stopping on tires.

3.1 STEPS FOR DETERMINING CORRECT LOAD LIMIT – TRAILER



The placard features a tire icon in the top left corner. The title "TIRE AND LOADING INFORMATION" is displayed in yellow text on a black background. Below the title, a warning statement reads: "The weight of cargo should never exceed XXX kg. or XXX lbs." A table with three columns (TIRE, SIZE, COLD TIRE PRESSURE) and three rows (FRONT, REAR, SPARE) is provided. The "FRONT" row contains the values "20.5x8.0-10(E)" and "621KPA, 90PSI". The "REAR" and "SPARE" rows are empty. To the right of the table, a black box with yellow text says "SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION".

| TIRE | SIZE | COLD TIRE PRESSURE |
|-------|----------------|--------------------|
| FRONT | 20.5x8.0-10(E) | 621KPA, 90PSI |
| REAR | | |
| SPARE | NONE | |

Tire and Loading Information Placard – Figure 1-1

Trailers 10,000 Pounds GVWR or Less:

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.

Tire Information

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.

Tire Information

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.

Tire Information

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.

Tire Information

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.

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.)

Tire Information

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 Information

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.

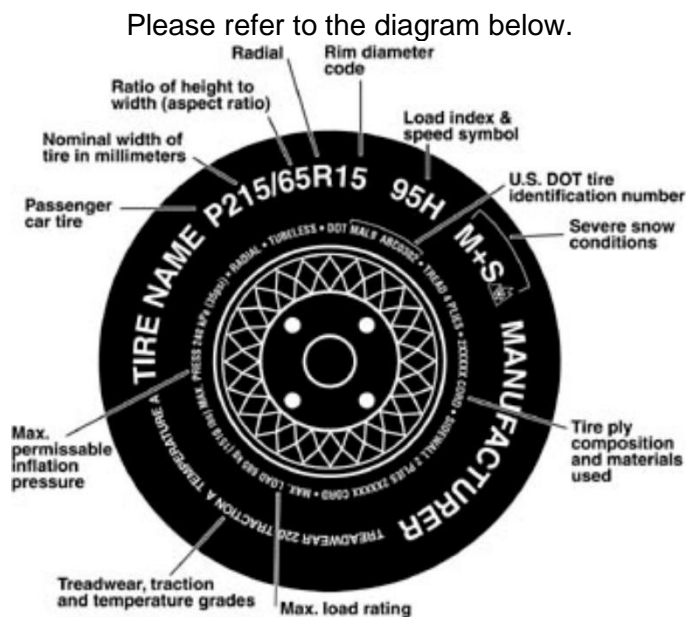
TIRE REPAIR

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



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.

Tire Information

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".

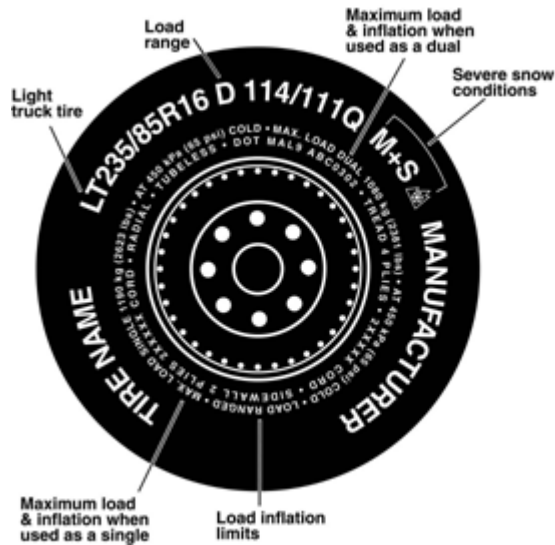
Temperature Letter

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.

Tire Information



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 Tire 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

Coupling to the Tow Vehicle

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.

Coupling to the Tow Vehicle

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.”

Coupling 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.

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 at 800-851-9664 for a free copy.

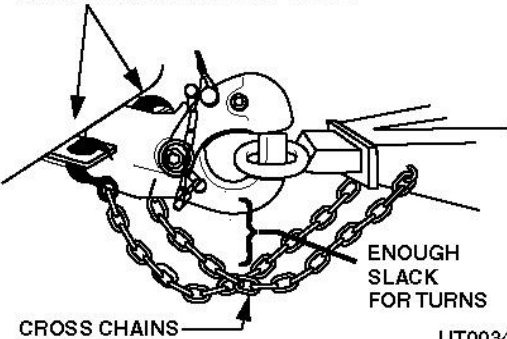
RIG THE SAFETY CHAINS

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.

Coupling to the Tow Vehicle

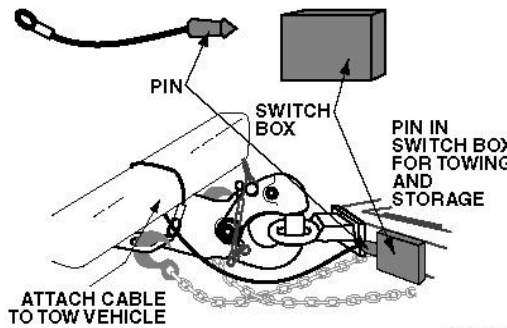
| | |
|---|---|
| <p>⚠ WARNING</p> <p>ALWAYS use safety chains. Chains hold trailer if connection fails. You must:</p> <ol style="list-style-type: none">1. CROSS chains underneath coupler.2. ALLOW slack for trailer to turn.3. ATTACH chain hooks securely to tow vehicle frame. <p>© 2002 NATM</p> | <p>ATTACH TO TOW VEHICLE FRAME</p>  <p>ENOUGH SLACK FOR TURNS</p> <p>CROSS CHAINS</p> <p>UT0034</p> |
|---|---|

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.

| | |
|---|--|
| <p>⚠ WARNING</p> <p>Trailer can roll if it comes loose. Electric safety brake applies when cable pulls pin out of switch box.</p> <ol style="list-style-type: none">1. PULL hard to get pin out of switch box.2. CHECK brake by PULLING TRAILER with tow vehicle.3. ATTACH pin CABLE to tow vehicle so pin will be pulled out if trailer separates.4. Promptly REPLACE pin in switch box. <p>© 2002 NATM</p> | <p>PIN PULLED OUT, ONLY TO TEST BRAKES</p>  <p>ATTACH CABLE TO TOW VEHICLE</p> <p>UT0035</p> |
|---|--|

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.

Coupling to the Tow Vehicle

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.

Coupling to the Tow Vehicle

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.

Checking the Trailer Before & During Each Tow

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 13 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 54 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 53 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 53 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

Breaking-In a New Trailer

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 7.2.1.7 page 67 on Proper Torquing 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 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 ensure 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 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.

General Operation Instructions

7 INSPECTION, SERVICE & MAINTENANCE

7.1 INSPECTION, SERVICE & MAINTENANCE SUMMARY CHARTS

| <p>7.1.1.1.1.1.1.1.1 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</p> | | |
|--|--|---------------------------------------|
| Item | Inspection / Service | Manual Section Reference |
| Breakaway Brakes > Electric | Check operation | Section 7.2.1.5 |
| Breakaway Battery | Fully charged, connections clean | Section 7.2.1.5.1.1 |
| Brakes, all types | Check operation | Section 6.3 |
| Shoes and Drums | Adjust | Section 6.2 & 7.2.1.4 |
| 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 & 7.2.1.7 |


General Operation Instructions

| 7.1.1.1.1.1.1.2 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 7.2.1.5.3 Section 7.2.1.5.2 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 |

| 7.1.1.1.1.1.1.3 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 7.2.1.6 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 |
| <p>Worn or broken suspension parts can cause loss of control and injury may result.</p> <p>Have trailer professionally inspected annually and after any impact.</p> |

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.

General Operation Instructions

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 at 800-851-9664 for a free copy.

General Operation Instructions

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 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.

7.2.1.5.1 BREAKAWAY BRAKE

7.2.1.5.1.1 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.

7.2.1.5.1.2 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.

7.2.1.5.2 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, Bonnell Industries at 800-851-9664 for a free copy.

General Operation Instructions

7.2.1.5.3 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.

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 buildup. If a trailer tire is under-inflated, even for a short period of time, the tire could suffer internal damage.

General Operation Instructions

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.

7.2.1.6 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.

General Operation Instructions

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).

7.2.1.7 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.

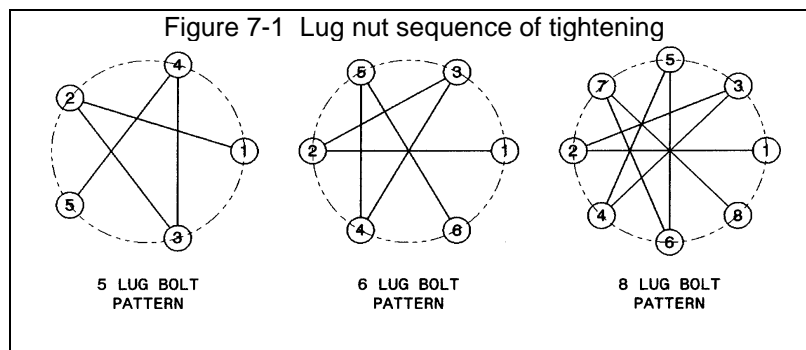
WARNING

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.



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

General Operation Instructions

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 owner's manual.

General Operation Instructions

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 | Separate Supplement |
| Running Gear | Separate Supplement |
| Hoist | Separate Supplement |
| NACD Clutch | Separate Supplement |
| Pro Plus PV450 Controller | Separate Supplement |

| | |
|---------------------------|------------------------|
| Split Taper Bushing | See Supplement Section |
| Trans fluid Coupler | See Supplement Section |
| Monarch Power Unit | See Supplement Section |
| Lighting System | See Supplement Section |
| Wetting System Pump | See Supplement Section |

General Operation Instructions

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.

Kubota 74 HP Engine:

| | | | | |
|-------------------------------|-------------|----------------------------|--|--|
| Oil Filter | HH1C0-32430 | | | |
| Fuel- Primary | 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.

General Operation Instructions

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.

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:

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

Weekly:

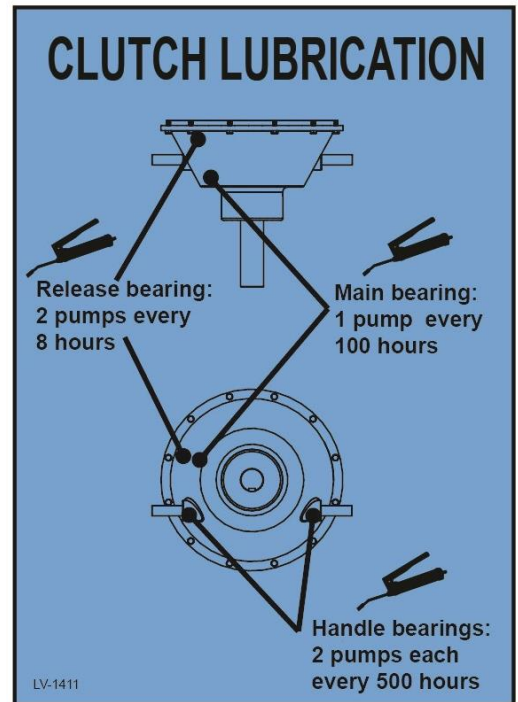
- Transfluid coupler output shaft bearing (if equipped), 2 pumps
- Hoist hinges, 2

Every 100 hours:

- Clutch main bearing (if equipped), 1 pump
- Hoist pivots, 3 pumps each location
- Hubs, 1 pump

Every 500 hours:

- Clutch handle bearing (if equipped), 2 pumps each



General Operation Instructions

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.**



HOIST

LUBRICATE HOIST EVERY 100 HRS.
3 PUMPS EACH LOCATION

⚠ DANGER
CRUSHING HAZARD
Serious injury or death will occur
• Body prop is properly used when lubricating hoist.

UPPER HINGE:
2 PLACES ALL MODELS

MIDDLE HINGE:
3 PLACES SINGLE CYLINDER
4 PLACES DUAL CYLINDER

LOWER HINGE:
5 PLACES SINGLE CYLINDER
6 PLACES DUAL CYLINDER

General Operation Instructions

FAN

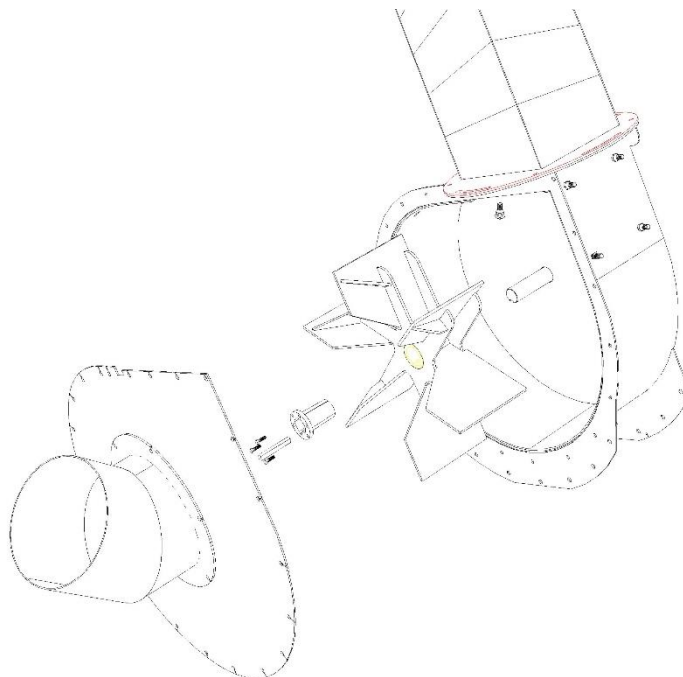
Your leaf machine is equipped with a 27" or 30" diameter balanced fan with AR400 impeller blades, mounted to the shaft with a split taper bushing. Inspect the fan regularly for cracks, deformations, and uneven wear. **DO NOT OPERATE THE MACHINE IF THE FAN IS OUT OF BALANCE.**

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:

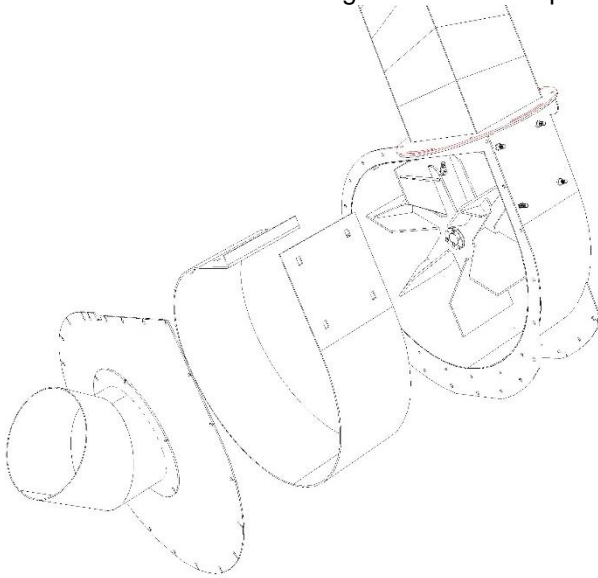
- Clean tapered cone surfaces of taper bushing & fan.
- **NOTE: DO NOT USE ANTISIEZE LUBRICANT ON TAPERED CONE SURFACES OR BOLT THREADS.**
- Slide fan onto shaft, with tapped hole side of fan bushing facing out. Install impeller on shaft as far as possible, with approx. $\frac{3}{8}$ " clearance to back wall.
- Slide split taper bushing onto shaft, insert key, position.
- Install $\frac{1}{2} \times 2\text{-}1/4$ grade 8 bolts into tapped holes in coupler.
- Use blue Loctite on bolts.
- Tighten in circular pattern to **82 ft-lbs.** for $\frac{1}{2}$ " 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 $\frac{1}{2}$ " bolts
- Start machine and run fan for several minutes at full RPM.
- Repeat torque procedure after shutting off machine.



General Operation Instructions

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 $\frac{1}{4}$ 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.

General Operation Instructions

OPERATING REAR DOOR PROP

Always use door prop when accessing body.

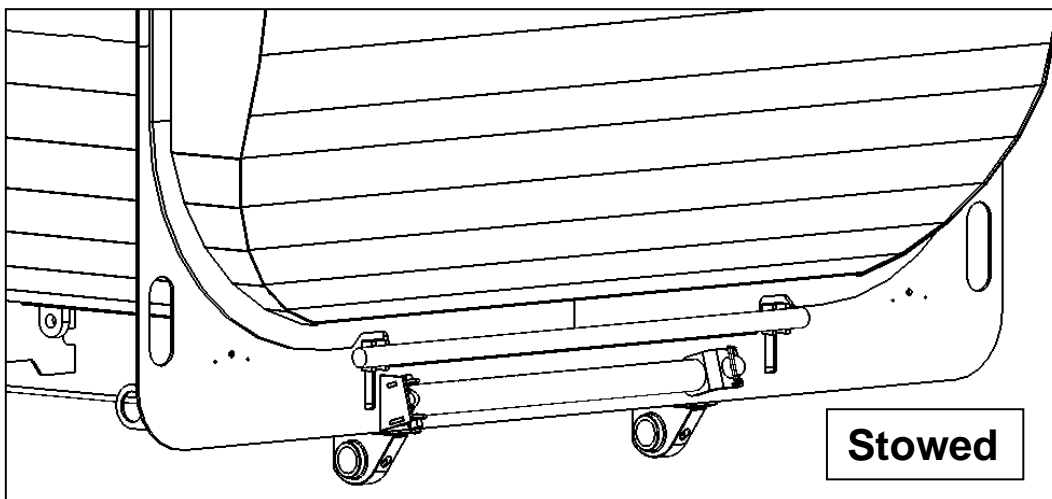
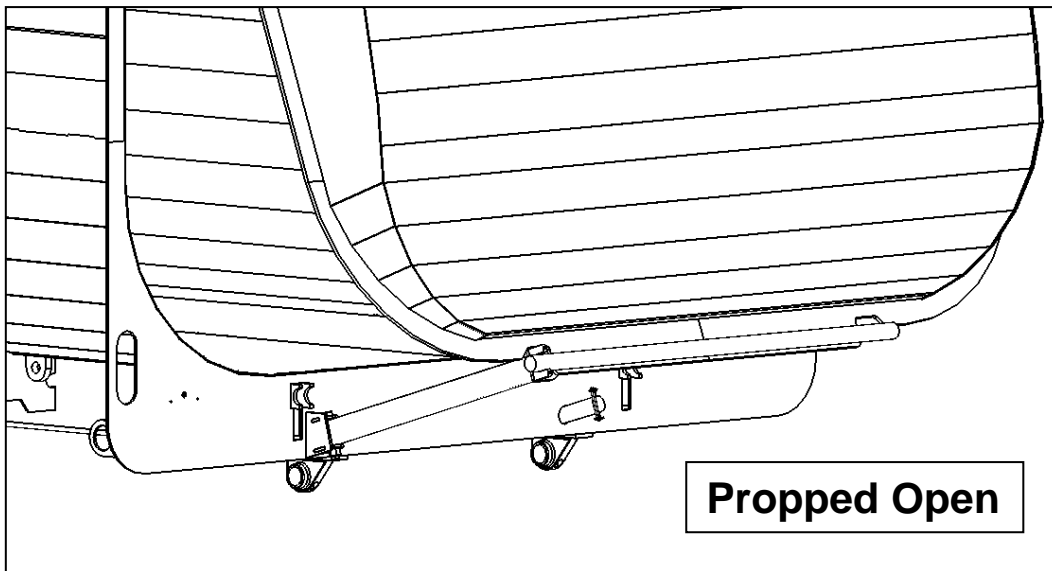
Caution

TO USE DOOR PROP:

- Raise body to height where rear door swings open on its own.
- Unpin the prop, swing it out, and insert into door cutout as shown.

TO STOW THE PROP:

- Push door open and remove prop from door cutout.
- Swing prop in and re-insert pin to keep the prop in place.

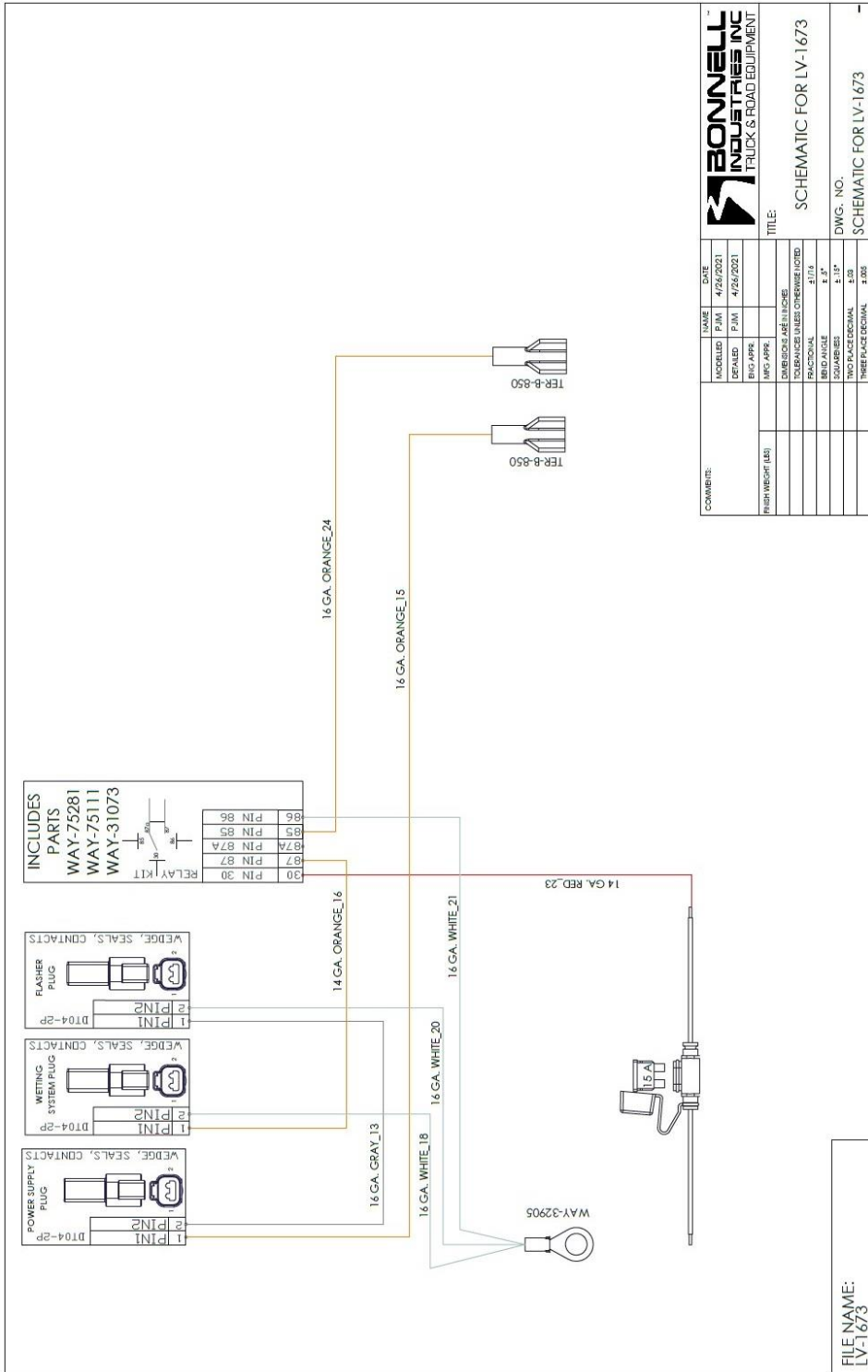


General Operation Instructions

7.4 ELECTRICAL SYSTEM WIRING DIAGRAMS

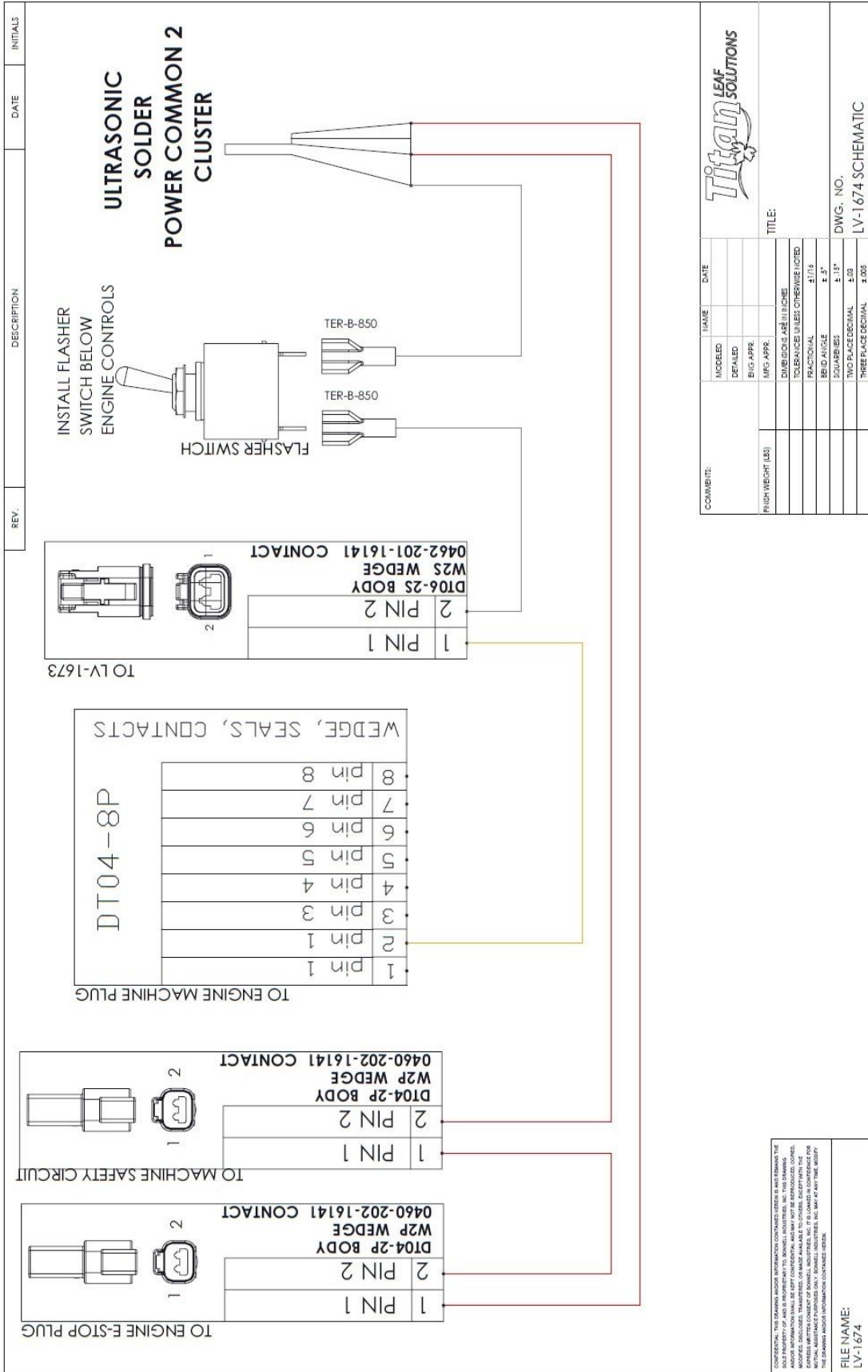
The following pages show a complete system electrical schematic. Following the complete schematic, diagrams with part numbers illustrate how the leaf vacuum electrical system is broken down into individual harness assemblies. Use this as a reference when ordering replacement harnesses.

MAIN CONTROL HARNESS SCHEMATIC (ELECTRIC POWER UNIT)



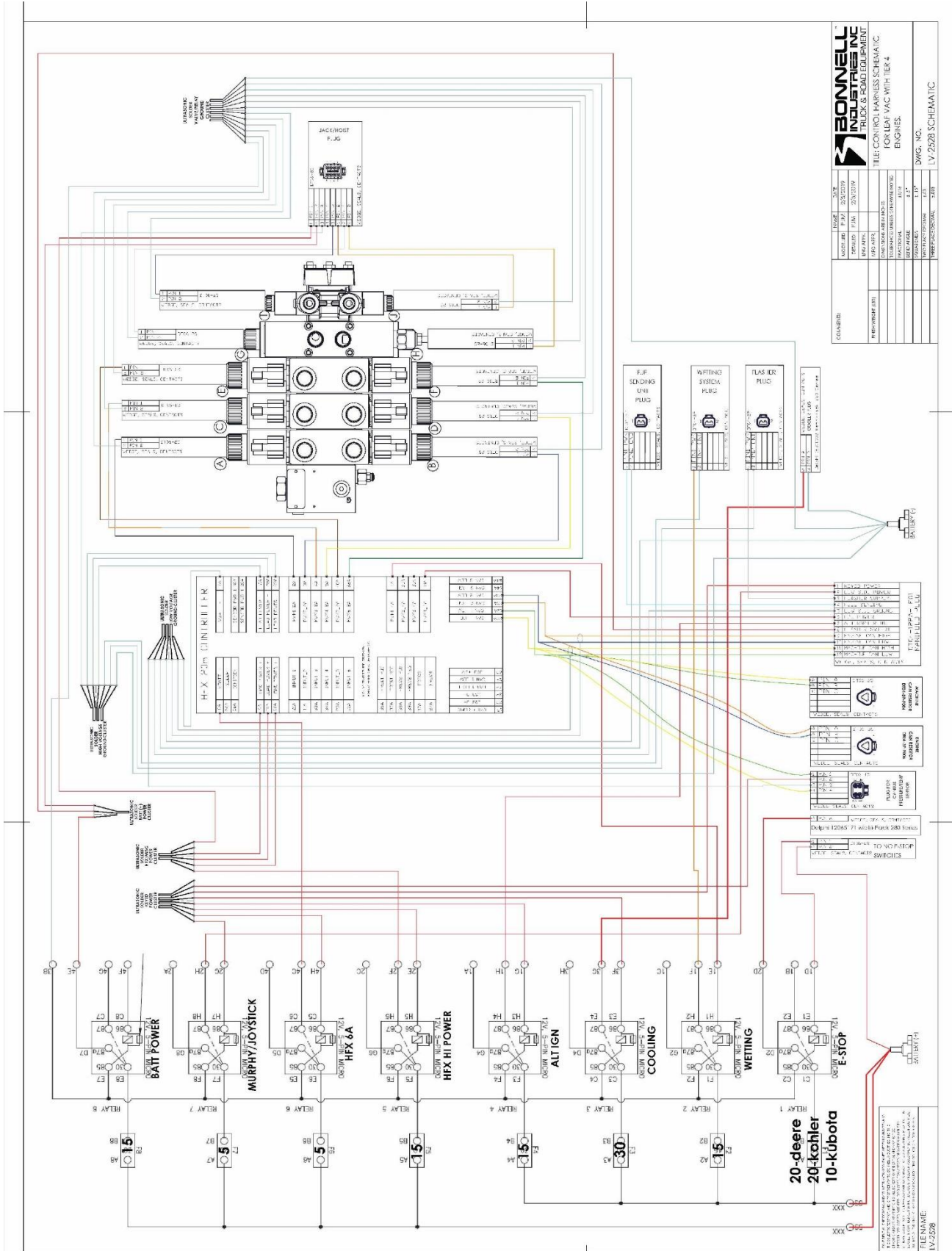
General Operation Instructions

AUXILIARY HARNESS SCHEMATIC (ELECTRIC POWER UNIT)



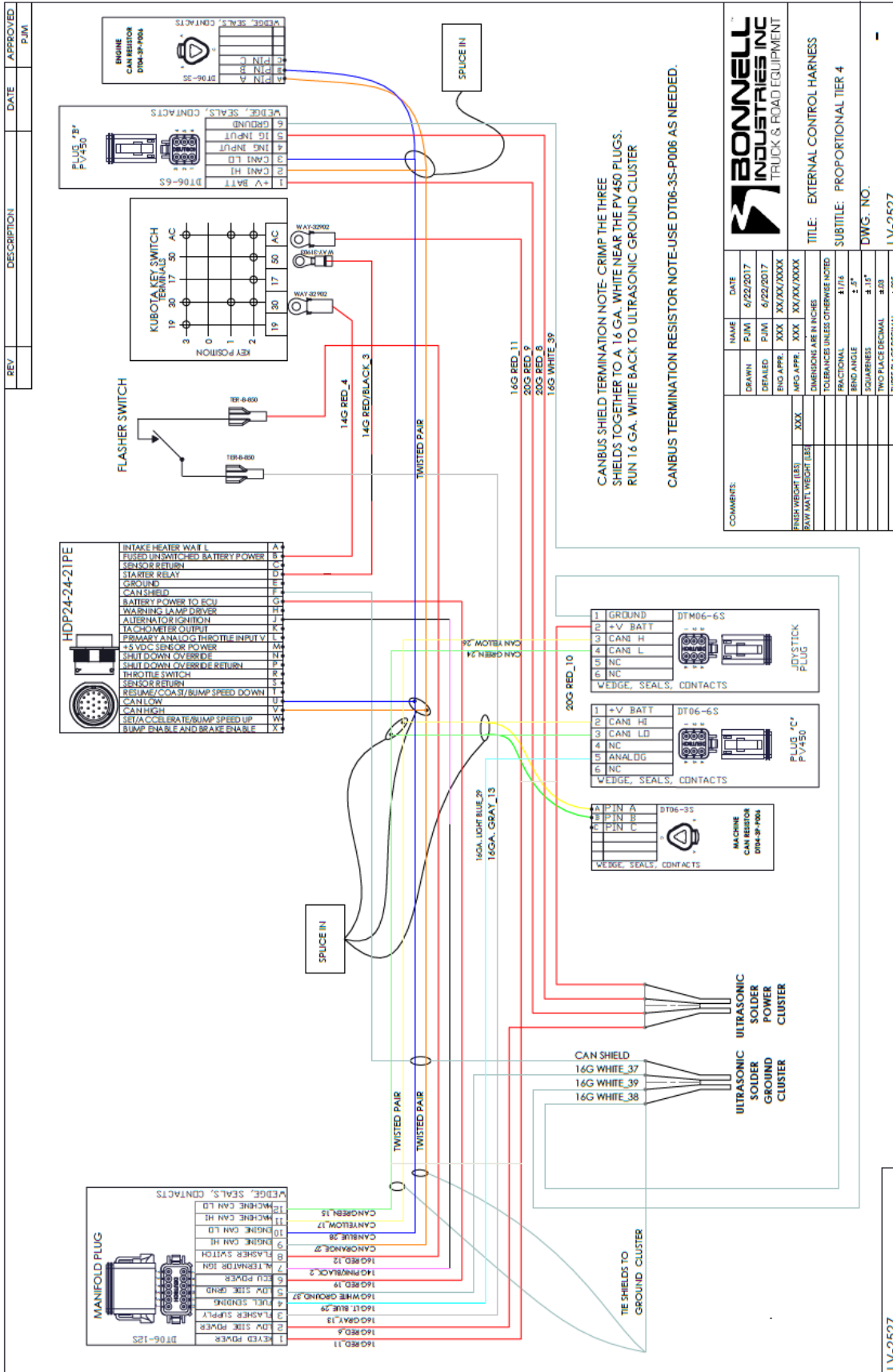
General Operation Instructions

PROPORTIONAL VALVE CONTROL HARNESS SCHEMATIC TIER 4



General Operation Instructions

EXTERNAL CONTROL HARNESS SCHEMATIC TIER 4



CANBUS SHIELD TERMINATION NOTE: CRIMP THE THREE SHIELDS TOGETHER TO A 16 GA. WHITE NEAR THE PV450 PLUGS. RUN 16 GA. WHITE BACK TO ULTRASONIC GROUND CLUSTER

CANBUS TERMINATION RESISTOR NOTE-USE DT06-3S-P006 AS NEEDED.

| REV | DESCRIPTION | DATE | APPROVED | PJM |
|-----|-------------|------|----------|-----|
| | | | | |

| NAME | DATE |
|------|------|
| | |

| DRAWN | PJM | DATE |
|-------|-----|------|
| | | |

| ENG APPR | XXX | XX/XX/XXXX |
|----------|-----|------------|
| | | |

| MFG APPR | XXX | XX/XX/XXXX |
|----------|-----|------------|
| | | |

| DIMENSIONS ARE IN INCHES | |
|--------------------------|--------|
| FRACTIONAL | 4.1/16 |
| DECIMAL | 2.5" |
| SQUARENESS | 4.15" |
| TWO PLACE DECIMAL | 4.03 |
| THREE PLACE DECIMAL | 4.005 |

| TITLE |
|--------------------------|
| EXTERNAL CONTROL HARNESS |

| SUBTITLE |
|---------------------|
| PROPORTIONAL TIER 4 |

| DWG. NO. |
|----------|
| LV-2527 |

General Operation Instructions

KUBOTA ENGINE ADAPTOR HARNESS

| | | | |
|------|-------------|------|----------|
| REV. | DESCRIPTION | DATE | INITIALS |
|------|-------------|------|----------|

NO GROUND NEEDED CONNECTED TO PIN 7 ON HDP26-24215N

NO CAN SHIELD CONNECTION AT D104-121A

| | |
|-----|-------|
| 1 | START |
| 2 | STOP |
| 3 | IDLE |
| 4 | RPM |
| 5 | STOP |
| 6 | START |
| 7 | STOP |
| 8 | IDLE |
| 9 | RPM |
| 10 | STOP |
| 11 | START |
| 12 | STOP |
| 13 | IDLE |
| 14 | RPM |
| 15 | STOP |
| 16 | START |
| 17 | STOP |
| 18 | IDLE |
| 19 | RPM |
| 20 | STOP |
| 21 | START |
| 22 | STOP |
| 23 | IDLE |
| 24 | RPM |
| 25 | STOP |
| 26 | START |
| 27 | STOP |
| 28 | IDLE |
| 29 | RPM |
| 30 | STOP |
| 31 | START |
| 32 | STOP |
| 33 | IDLE |
| 34 | RPM |
| 35 | STOP |
| 36 | START |
| 37 | STOP |
| 38 | IDLE |
| 39 | RPM |
| 40 | STOP |
| 41 | START |
| 42 | STOP |
| 43 | IDLE |
| 44 | RPM |
| 45 | STOP |
| 46 | START |
| 47 | STOP |
| 48 | IDLE |
| 49 | RPM |
| 50 | STOP |
| 51 | START |
| 52 | STOP |
| 53 | IDLE |
| 54 | RPM |
| 55 | STOP |
| 56 | START |
| 57 | STOP |
| 58 | IDLE |
| 59 | RPM |
| 60 | STOP |
| 61 | START |
| 62 | STOP |
| 63 | IDLE |
| 64 | RPM |
| 65 | STOP |
| 66 | START |
| 67 | STOP |
| 68 | IDLE |
| 69 | RPM |
| 70 | STOP |
| 71 | START |
| 72 | STOP |
| 73 | IDLE |
| 74 | RPM |
| 75 | STOP |
| 76 | START |
| 77 | STOP |
| 78 | IDLE |
| 79 | RPM |
| 80 | STOP |
| 81 | START |
| 82 | STOP |
| 83 | IDLE |
| 84 | RPM |
| 85 | STOP |
| 86 | START |
| 87 | STOP |
| 88 | IDLE |
| 89 | RPM |
| 90 | STOP |
| 91 | START |
| 92 | STOP |
| 93 | IDLE |
| 94 | RPM |
| 95 | STOP |
| 96 | START |
| 97 | STOP |
| 98 | IDLE |
| 99 | RPM |
| 100 | STOP |

NO GROUND NEEDED CONNECTED TO PIN 7 ON HDP26-24215N

NO CAN SHIELD CONNECTION AT D104-121A

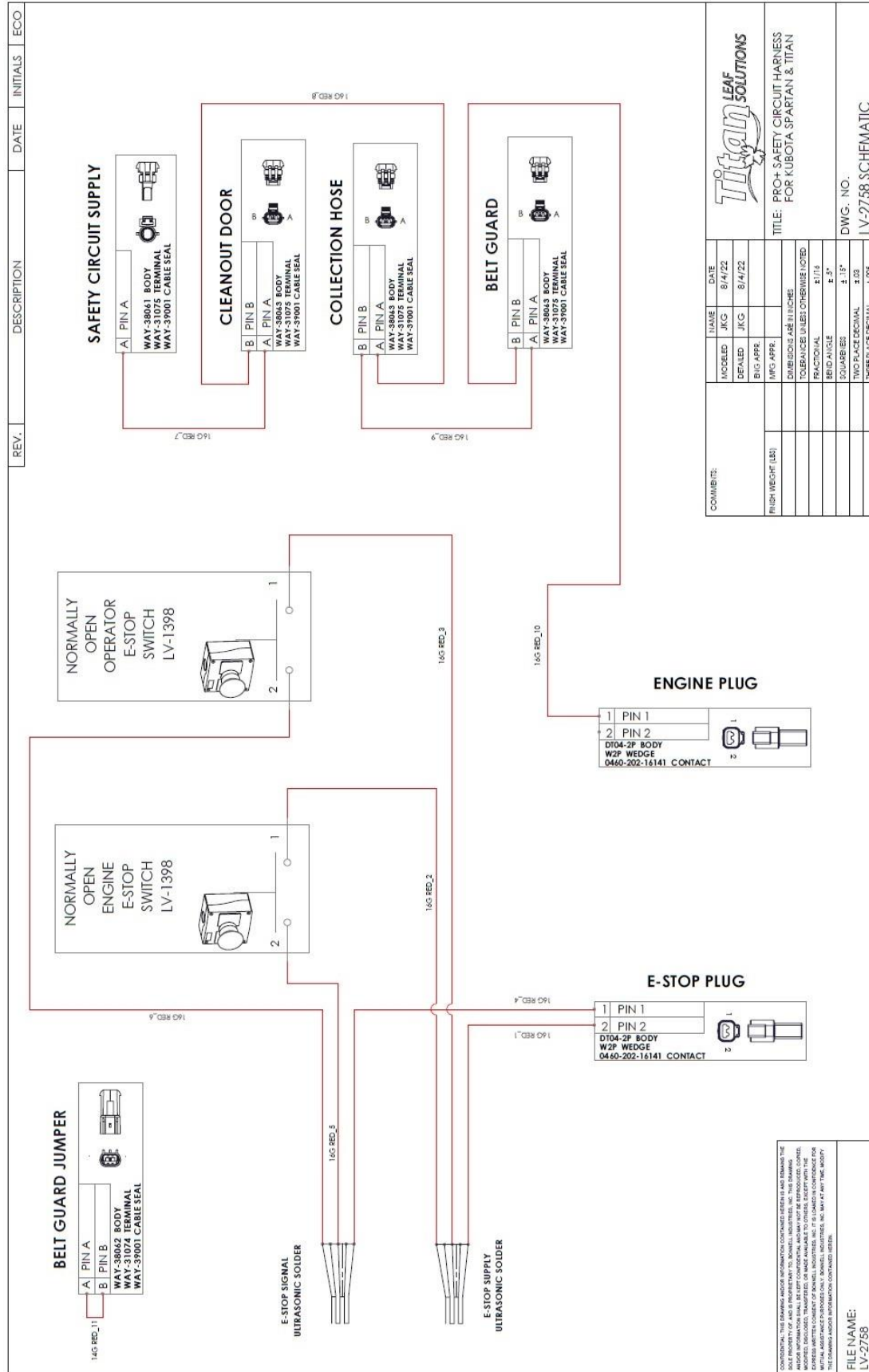
NOTES:

- HARNES\$ VENDOR TO ENSURE THAT ALL EMPTY CAVITIES ARE PROPERLY SEALED OFF.
- ALL WIRES APPROX. 8" LONG, GXL TYPE.
- HARNES\$ TO INCLUDE \$INGLE RUN BRAIDED LOOM (DT04 PLUG\$ \$IDE BY \$IDE).

| ITEM | QTY | PART NUMBER | DESCRIPTION | SIZE/LENGTH |
|---|------------|-------------|-------------|-------------|
| | | | | |
| TRUCK & ROAD EQUIPMENT | | | | |
| TITLE: ADAPTOR HARNESS, KUBOTA TIER 4 TO BONNELL ENGINE HARNESS | | | | |
| PART NUMBER | | DESCRIPTION | | SIZE/LENGTH |
| | 16C RED | 16C RED | 16C RED | |
| | 20C GREEN | 20C GREEN | 20C GREEN | |
| | 20C YELLOW | 20C YELLOW | 20C YELLOW | |
| | 16C RED | 16C RED | 16C RED | |
| PART NUMBER | | DESCRIPTION | | SIZE/LENGTH |
| DWG. NO. | | LY-2249 | | |

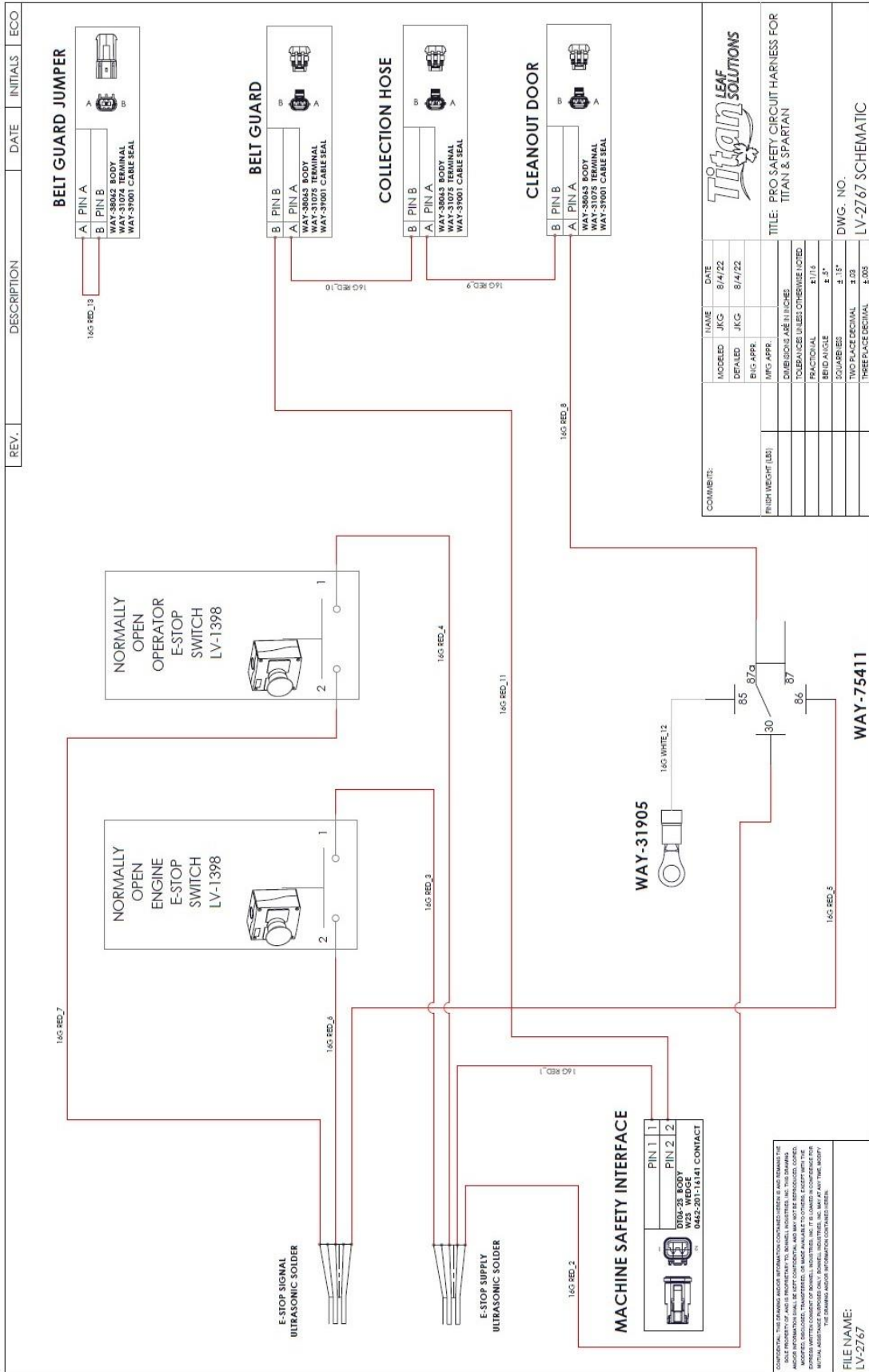
General Operation Instructions

SAFETY CIRCUIT HARNESS SCHEMATIC



General Operation Instructions

SAFETY CIRCUIT HARNESS SCHEMATIC (ELECTRIC POWER UNIT)



General Operation Instructions

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 |



LV-1398



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

IF WIRING THRU BACK SIDE
DRILL 1/2" HOLE.

TERMINAL BLOCK 1 & 2
NORMALLY CLOSED
(USE EITHER BLOCK)
-OLYMPIAN (ALL MODELS)

TERMINAL BLOCK 3
NORMALLY OPEN
-TITAN (ALL MODELS)
-SPARTAN (ALL MODELS)

FASTENING HARDWARE:
(OPPOSITE CORNERS ONLY)
6-32 X 1" MACHINE SCREW
6-32 NUT WITH STAR WASHER
(3/16" DRILL)

WAY-24594
STRAIGHT CORDGRIP

WAY-24612
Locknut



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:

- Drill 1/2 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.

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BONNELL INDUSTRIES INC
TRUCK & ROAD EQUIPMENT

DIXON, ILLINOIS
PHONE: 800-851-9664

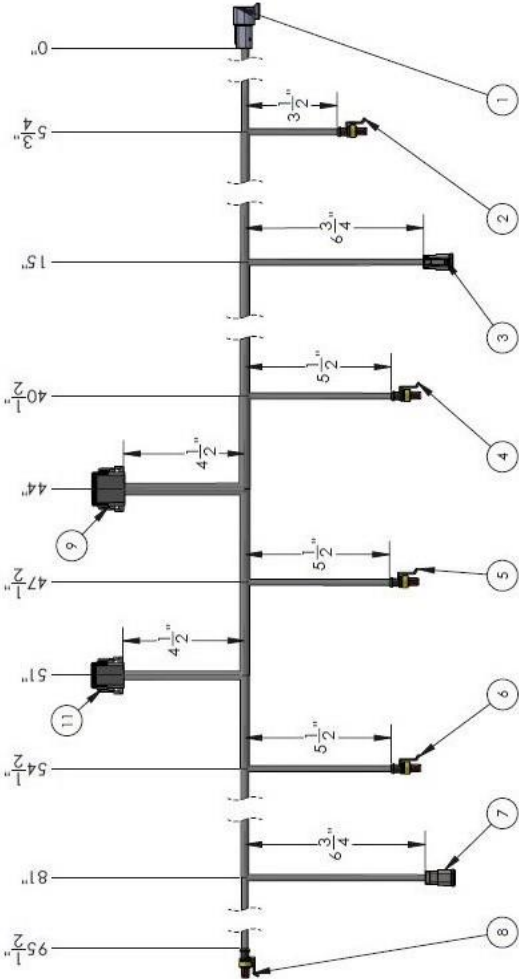
General Operation Instructions

LIGHTING HARNESS, BODY REAR UPPER

| REV. | DESCRIPTION | DATE | APPROVED |
|------|-------------|------|----------|
|------|-------------|------|----------|

NOTE- FOR ITEMS 1,2,3,6,7,8 : CRIMP ON THE PINS, BUT LEAVE PLUG HARDWARE LOOSE. THIS IS SO THE HARNESS CAN BE FISHED THRU SOME CONDUIT.

PLEASE SUPPLY ALL HARDWARE LISTED IN THE BILL OF MATERIAL. PLACE ALL LOOSE HARDWARE IN A SECURED BAG OR BOX.



| ITEM | QTY. | PartNo | COMPONENT REFERENCE | DESCRIPTION |
|------|------|------------------|---------------------------|--|
| 1 | 1 | D704-3P | SUPPLY PLUG | DEUTSCH PLUG |
| 2 | 1 | 282080-1 | RIGHT MARKER PLUG | 2 CONTACT PLUG FOR LIGHT/TECH/PERSON LIGHT |
| 3 | 1 | D706-2S | RIGHT FLASHER PLUG | SOCKET PLUG, 2 PIN |
| 4 | 1 | 282080-1 | RIGHT CENTER MARKER PLUG | 2 CONTACT PLUG FOR LIGHT/TECH/PERSON LIGHT |
| 5 | 1 | 282080-1 | CENTER MARKER PLUG | 2 CONTACT PLUG FOR LIGHT/TECH/PERSON LIGHT |
| 6 | 1 | 282080-1 | LEFT CENTER MARKER PLUG | 2 CONTACT PLUG FOR LIGHT/TECH/PERSON LIGHT |
| 7 | 1 | D706-2S | LEFT FLASHER PLUG | SOCKET PLUG, 2 PIN |
| 8 | 1 | 282080-1 | LEFT MARKER PLUG | 2 CONTACT PLUG FOR LIGHT/TECH/PERSON LIGHT |
| 9 | 1 | DT04-123A | MARKER-FLASHER BUSS PLUG | 12 X 4 PIN BUSS RECEPTICAL POLARITY |
| 10 | 1 | DT04-12PA-P026 | MARKER-FLASHER RECEPTICAL | 12 X 4 PIN BUSS RECEPTICAL |
| 11 | 1 | D706-083A | GROUND BUSS PLUG | DEUTSCH 8 PIN PLUG |
| 12 | 1 | DT04-08PA-A-P021 | GROUND BUSS RECEPTICAL | 8 PIN BUSS RECEPTICAL |
| 13 | 21 | 0462-201-16141 | | DEUTSCH CONTACT FOR DT08 CONNECTORS |
| 14 | 3 | 0460-202-16141 | | DEUTSCH PIN |
| 15 | 1 | W3P | | DEUTSCH WEDGE |
| 16 | 2 | W2S | | WEDGE LOCK |
| 17 | 3 | 114017 | | DEUTSCH SEALING PLUG |
| 18 | 1 | W8S | | DEUTSCH WEDGE LOCK FOR DT04-08 CONNECTORS |
| 19 | 1 | W12S | | DEUTSCH WEDGE LOCK FOR DT04-12 CONNECTORS |
| 20 | 10 | 183025-1 | | CONTACT PIN |
| 21 | 10 | 281934-2 | | WIRE SEAL |

| NAME | DATE |
|------------------------------------|------------|
| DRAWN PJM | 8/22/2016 |
| DETAILED PJM | 8/22/2016 |
| ENG APPR: XXX | XX/XX/XXXX |
| MFG APPR: XXX | XX/XX/XXXX |
| DIMENSIONS UNLESS OTHERWISE NOTED: | |
| FRACTIONAL | 2/16 |
| BEND ANGLE | 4.5° |
| SQUARENESS | 2.15° |
| TWO PLACE DECIMAL | ±.00 |
| THREE PLACE DECIMAL | ±.005 |

BONNELL INDUSTRIES INC
TRUCK & ROAD EQUIPMENT

TITLE: SPARTAN REAR UPPER HARNESS
SUBTITLE: ALL SPARTAN LEAF VACS
DWG. NO. 01
LV-2161

| CIRCUIT SUMMARY | | | |
|------------------------|---------|----------------------------|----------------------------|
| CONDUCTOR-WIRE ID | LENGTH | FROM | TO |
| 16 GA. GRAY_7 | 48 3/4" | LEFT FLASHER PLUG 1 | MARKER-FLASHER BUSS PLUG 1 |
| 16 GA. GRAY_8 | 41" | RIGHT FLASHER PLUG 1 | MARKER-FLASHER BUSS PLUG 2 |
| 16 GA. GRAY_9 | 49 1/4" | SUPPLY PLUG A | MARKER-FLASHER BUSS PLUG 3 |
| 16 GA. BROWN_1 | 57" | LEFT MARKER PLUG 1 | MARKER-FLASHER BUSS PLUG 4 |
| 16 GA. BROWN_2 | 21 1/2" | LEFT CENTER MARKER PLUG 1 | MARKER-FLASHER BUSS PLUG 5 |
| 16 GA. BROWN_3 | 14 1/2" | CENTER MARKER PLUG 1 | MARKER-FLASHER BUSS PLUG 6 |
| 16 GA. BROWN_4 | 14 1/2" | RIGHT CENTER MARKER PLUG 1 | MARKER-FLASHER BUSS PLUG 7 |
| 16 GA. BROWN_5 | 47 1/4" | RIGHT MARKER PLUG 1 | MARKER-FLASHER BUSS PLUG 8 |
| 16 GA. BROWN_6 | 49 1/4" | SUPPLY PLUG B | MARKER-FLASHER BUSS PLUG 9 |
| 16 GA. WHITE GROUND_12 | 50" | LEFT MARKER PLUG 2 | GROUND BUSS PLUG 1 |
| 16 GA. WHITE GROUND_10 | 41 3/4" | LEFT FLASHER PLUG 2 | GROUND BUSS PLUG 2 |
| 16 GA. WHITE GROUND_11 | 14 1/2" | LEFT CENTER MARKER PLUG 2 | GROUND BUSS PLUG 3 |
| 16 GA. WHITE GROUND_13 | 14 1/2" | CENTER MARKER PLUG 2 | GROUND BUSS PLUG 4 |
| 16 GA. WHITE GROUND_14 | 21 1/2" | RIGHT CENTER MARKER PLUG 2 | GROUND BUSS PLUG 5 |
| 16 GA. WHITE GROUND_15 | 48" | RIGHT FLASHER PLUG 2 | GROUND BUSS PLUG 6 |
| 16 GA. WHITE GROUND_16 | 54 1/4" | RIGHT MARKER PLUG 2 | GROUND BUSS PLUG 7 |
| 16 GA. WHITE GROUND_17 | 56 1/4" | SUPPLY PLUG C | GROUND BUSS PLUG 8 |

General Operation Instructions

LIGHTING HARNESS, BODY FRONT UPPER

| PART NO | DESCRIPTION | DIMENSION "A" | REV. | DESCRIPTION | DATE | APPROVED |
|---------|--|---------------|------|-------------|-----------|----------|
| LV-2162 | FRONT MARKER HARNESS FOR 15 YARD SPARTAN | 185" | A. | 82" WAS 80" | 4/18/2017 | SHJ |
| LV-2163 | FRONT MARKER HARNESS FOR 20 YARD SPARTAN | 218" | | | | |
| LV-2164 | FRONT MARKER HARNESS FOR 25 YARD SPARTAN | 250" | | | | |
| LV-2165 | FRONT MARKER HARNESS FOR 30 YARD SPARTAN | 286" | | | | |

NOTE 1 - PLEASE INSTALL PINS ONLY AND SHIP PLUG LOOSE FOR ITEM 2 & ITEM 3

NOTE 2 - PLEASE SHIP WITH ALL HARDWARE LISTED IN BILL OF MATERIAL. SHIP LOOSE ITEMS IN A HARWARE BAG.

| 12 | QTY. | PART NO | COMPONENT REFERENCE | DESCRIPTION |
|----|------|----------------|---------------------------------|--|
| 1 | 1 | 282080-1 | RIGHT FRONT MARKER LIGHT | 2 CONTACT PLUG FOR LIGHT/TECH/PETERSON LIGHT |
| 2 | 1 | 282080-1 | LEFT FRONT MARKER LIGHT | 2 CONTACT PLUG FOR LIGHT/TECH/PETERSON LIGHT |
| 3 | 1 | DT04-2P | SUPPLY PLUG | 2 PIN PLUG |
| 4 | 1 | DT06-6S | 6 PIN BUSS PLUG | DEUTSCH 6 PIN PLUG |
| 5 | 1 | DT04-6P-EP14 | 6 PIN BUSS RECEPTICAL 3/3 SPLIT | RECEPTICAL 6 WAY, (2) 3 PIN, BLACK |
| 6 | 4 | 183025-1 | | CONTACT PIN |
| 7 | 4 | 281934-2 | | WIRE SEAL |
| 8 | 6 | 0462-201-16141 | | DEUTSCH CONTACT FOR DT06 CONNECTORS |
| 9 | 1 | W6S | | DEUTSCH WEDGE LOCK FOR DT06-08 CONNECTORS |
| 10 | 2 | 0460-202-16141 | | DEUTSCH PIN |
| 11 | 1 | W2P | | LOCKING WEDGE FOR DT04-2P |

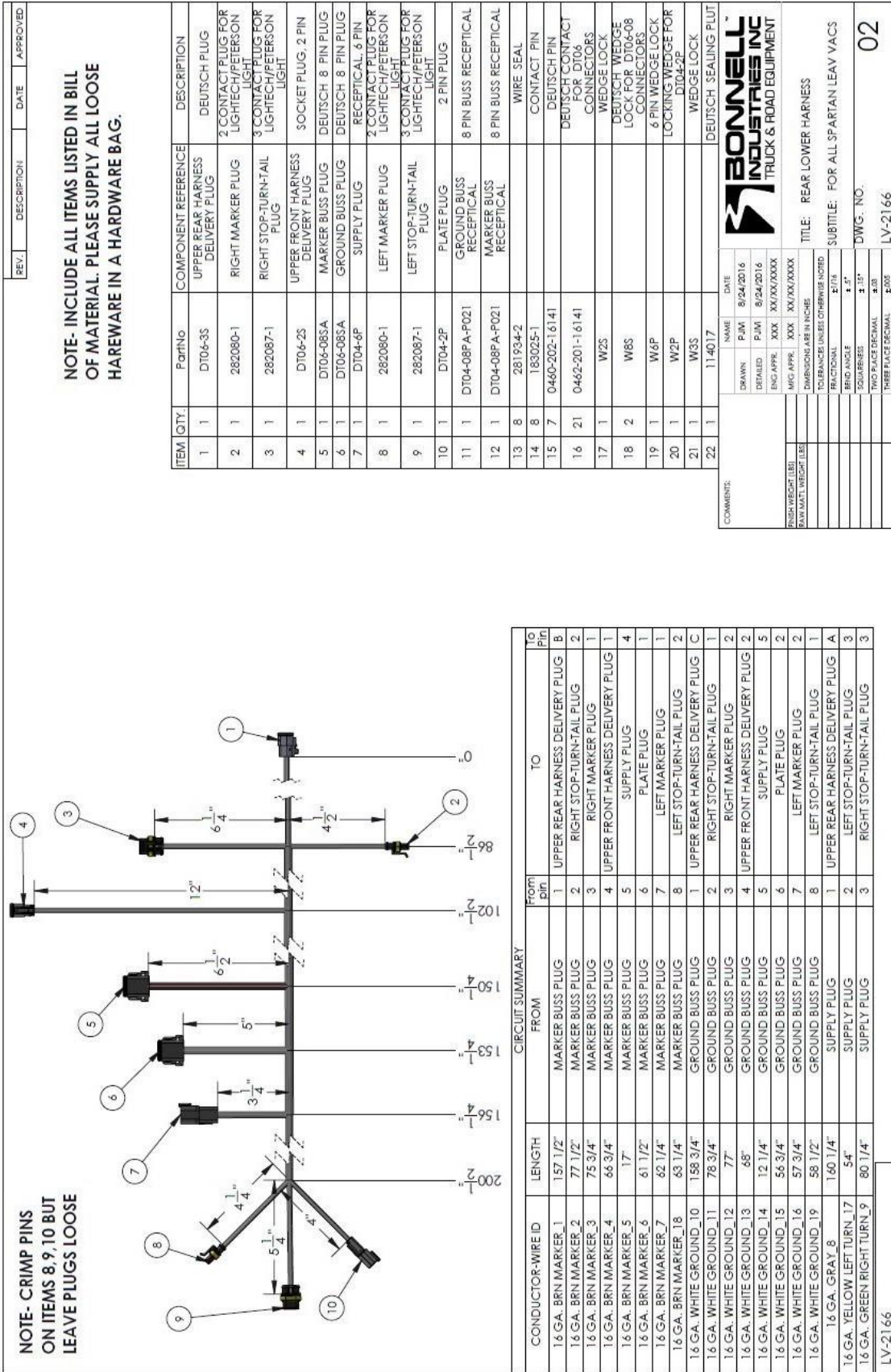
| NAME | DATE |
|-----------------------------------|-------------|
| DRAWN PJM | 8/23/2016 |
| DETAILED PJM | 8/23/2016 |
| ENG APPR. XXX | XXX/XX/XXXX |
| MFG APPR. XXX | XX/XX/XXXX |
| DIMENSIONS ARE IN INCHES | |
| TOLERANCES UNLESS OTHERWISE NOTED | |
| FRACTIONAL | 2/16 |
| DECIMAL | 0.125 |
| THREADS PER INCH | 2-32 |
| FINISH | 3.0 |
| THIRD ANGLE | 2-08 |
| THREE PLACE DECIMAL | 0.005 |

| CIRCUIT SUMMARY | | | |
|-----------------------|----------|-------------------|----------------------------|
| CONDUCTOR-WIRE ID | LENGTH | FROM pin | TO Pin |
| 16 GA. BROWN_1 | 5 1/4" | 6 PIN BUSS PLUG 1 | RIGHT FRONT MARKER LIGHT 1 |
| 16 GA. BROWN_2 | 82 3/4" | 6 PIN BUSS PLUG 2 | LEFT FRONT MARKER LIGHT 1 |
| 16 GA. WHITE GROUND_4 | 5 1/4" | 6 PIN BUSS PLUG 3 | RIGHT FRONT MARKER LIGHT 2 |
| 16 GA. WHITE GROUND_5 | 82 3/4" | 6 PIN BUSS PLUG 4 | LEFT FRONT MARKER LIGHT 2 |
| 16 GA. WHITE GROUND_6 | 252 1/2" | 6 PIN BUSS PLUG 5 | SUPPLY PLUG 2 |
| 16 GA. BROWN_3 | 252 1/2" | 6 PIN BUSS PLUG 6 | SUPPLY PLUG 1 |

| | |
|-----------------------------------|-----------|
| TITLE: FRONT UPPER MARKER HARNESS | |
| SUBTITLE: ALL SPARTAN LEAF VACS | |
| DWG. NO. | 02 |
| LV-2162 THRU LV-2165 | |

General Operation Instructions

LIGHTING HARNESS, BODY REAR LOWER



NOTE- INCLUDE ALL ITEMS LISTED IN BILL OF MATERIAL. PLEASE SUPPLY ALL LOOSE HARDWARE IN A HARDWARE BAG.

| ITEM | QTY. | PartNo | COMPONENT REFERENCE | DESCRIPTION |
|------|------|----------------|-----------------------------------|---|
| 1 | 1 | DT06-3S | UPPER REAR HARNESS DELIVERY PLUG | DEUTSCH PLUG |
| 2 | 1 | 282080-1 | RIGHT MARKER PLUG | 2 CONTACT PLUG FOR LIGHTCH/PETERSON LIGHT |
| 3 | 1 | 282087-1 | RIGHT STOP-TURN-TAIL PLUG | 3 CONTACT PLUG FOR LIGHTCH/PETERSON LIGHT |
| 4 | 1 | DT06-2S | UPPER FRONT HARNESS DELIVERY PLUG | SOCKET PLUG, 2 PIN |
| 5 | 1 | DT04-08SA | MARKER BUSS PLUG | DEUTSCH 8 PIN PLUG |
| 6 | 1 | DT04-08SA | GROUND BUSS PLUG | DEUTSCH 8 PIN PLUG |
| 7 | 1 | DT04-6P | SUPPLY PLUG | RECEPTICAL, 6 PIN |
| 8 | 1 | 282080-1 | LEFT MARKER PLUG | 2 CONTACT PLUG FOR LIGHTCH/PETERSON LIGHT |
| 9 | 1 | 282087-1 | LEFT STOP-TURN-TAIL PLUG | 3 CONTACT PLUG FOR LIGHTCH/PETERSON LIGHT |
| 10 | 1 | DT04-2P | PLATE PLUG | 2 PIN PLUG |
| 11 | 1 | DT04-08PA-P021 | GROUND BUSS RECEPTICAL | 8 PIN BUSS RECEPTICAL |
| 12 | 1 | DT04-08PA-P021 | MARKER BUSS RECEPTICAL | 8 PIN BUSS RECEPTICAL |
| 13 | 8 | 281934-2 | | WIRE SEAL |
| 14 | 8 | 183025-1 | | CONTACT PIN |
| 15 | 7 | 0462-202-16141 | | DEUTSCH PIN |
| 16 | 21 | 0462-201-16141 | | DEUTSCH CONTACT FOR DT06 CONNECTORS |
| 17 | 1 | W2S | | WEDGE LOCK |
| 18 | 2 | W8S | | DEUTSCH WEDGE LOCK FOR DT06-08 CONNECTORS |
| 19 | 1 | W6P | | 6 PIN WEDGE LOCK |
| 20 | 1 | W2P | | LOCKING WEDGE FOR DT04-2P |
| 21 | 1 | W3S | | WEDGE LOCK |
| 22 | 1 | 114017 | | DEUTSCH SEALING PLUG |

| | | | |
|-----------------------------------|--|------------|------------|
| DRAWN | | NAME | DATE |
| PJM | | PJM | 8/24/2016 |
| DETAILED | | PJM | 8/24/2016 |
| ENG APPR. | | XXX | XX/XX/XXXX |
| MFG APPR. | | XXX | XX/XX/XXXX |
| DIMENSIONS ARE IN INCHES | | | |
| TOLERANCES UNLESS OTHERWISE NOTED | | FRACTIONAL | 2/16 |
| HOLE POSITION | | ±.015 | |
| HOLE ANGLE | | ±.5° | |
| SQUARENESS | | ±.01 | |
| TWO PLACE DECIMAL | | ±.03 | |
| THREE PLACE DECIMAL | | ±.005 | |

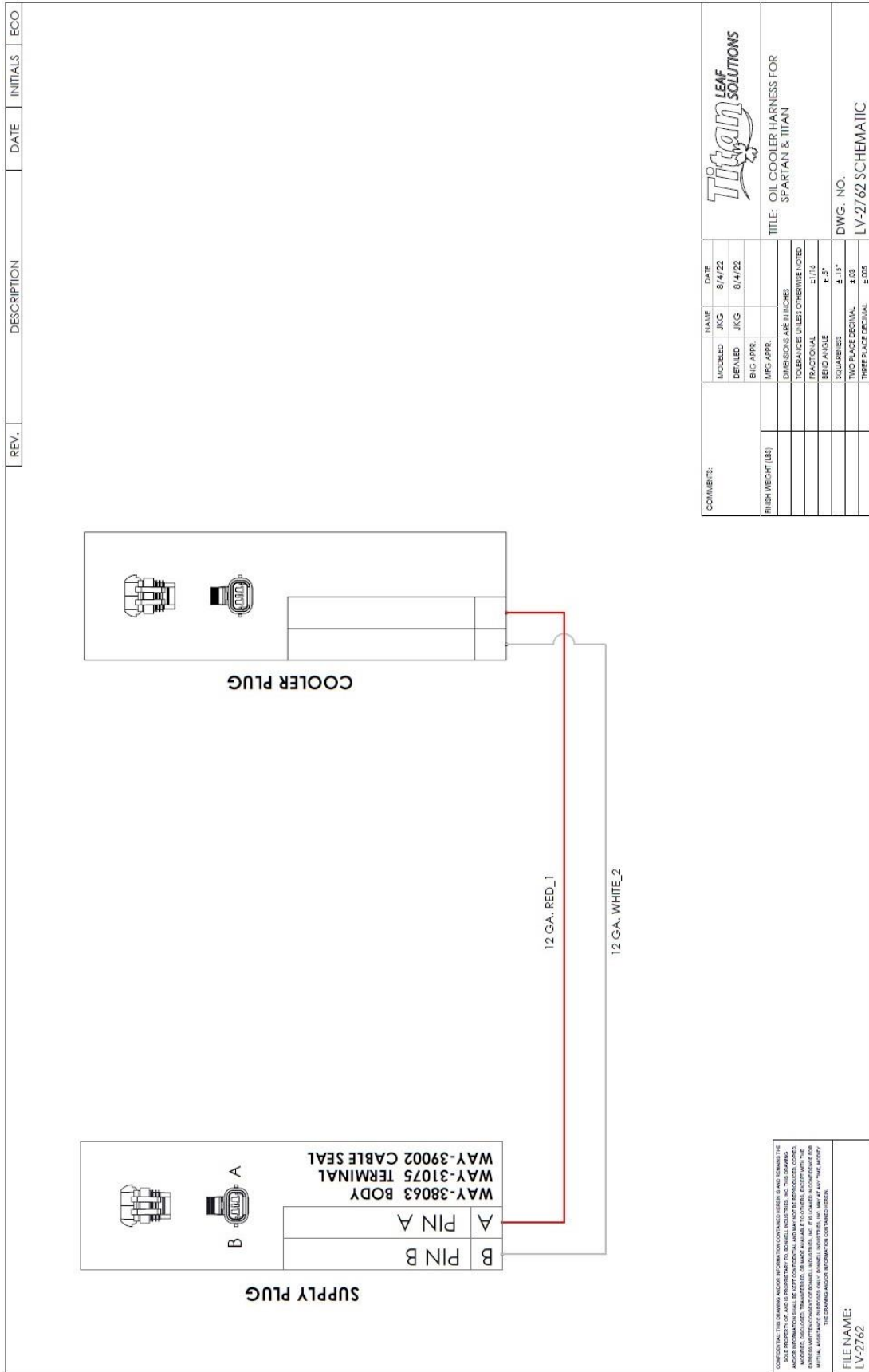
BONNELL INDUSTRIES INC
 TRUCK & ROAD EQUIPMENT

TITLE: REAR LOWER HARNESS
 SUBTITLE: FOR ALL SPARTAN LEAV VACS
 DWG. NO. **02**
 LV-2166

| CIRCUIT SUMMARY | | FROM | TO |
|----------------------------|----------|------|-------------------------------------|
| CONDUCTOR-WIRE ID | LENGTH | FROM | TO |
| 16 GA. BRN MARKER_1 | 157 1/2" | 1 | UPPER REAR HARNESS DELIVERY PLUG B |
| 16 GA. BRN MARKER_2 | 77 1/2" | 2 | RIGHT STOP-TURN-TAIL PLUG 2 |
| 16 GA. BRN MARKER_3 | 75 3/4" | 3 | RIGHT MARKER PLUG 1 |
| 16 GA. BRN MARKER_4 | 66 3/4" | 4 | UPPER FRONT HARNESS DELIVERY PLUG 1 |
| 16 GA. BRN MARKER_5 | 17" | 5 | SUPPLY PLUG 4 |
| 16 GA. BRN MARKER_6 | 61 1/2" | 6 | PLATE PLUG 1 |
| 16 GA. BRN MARKER_7 | 62 1/4" | 7 | LEFT MARKER PLUG 1 |
| 16 GA. BRN MARKER_18 | 63 1/4" | 8 | LEFT STOP-TURN-TAIL PLUG 2 |
| 16 GA. WHITE GROUND_10 | 158 3/4" | 1 | UPPER REAR HARNESS DELIVERY PLUG C |
| 16 GA. WHITE GROUND_11 | 78 3/4" | 2 | RIGHT STOP-TURN-TAIL PLUG 1 |
| 16 GA. WHITE GROUND_12 | 77" | 3 | RIGHT MARKER PLUG 2 |
| 16 GA. WHITE GROUND_13 | 68" | 4 | UPPER FRONT HARNESS DELIVERY PLUG 2 |
| 16 GA. WHITE GROUND_14 | 12 1/4" | 5 | SUPPLY PLUG 5 |
| 16 GA. WHITE GROUND_15 | 56 3/4" | 6 | PLATE PLUG 2 |
| 16 GA. WHITE GROUND_16 | 57 3/4" | 7 | LEFT MARKER PLUG 2 |
| 16 GA. WHITE GROUND_19 | 58 1/2" | 8 | LEFT STOP-TURN-TAIL PLUG 1 |
| 16 GA. GRAY_8 | 160 1/4" | 1 | UPPER REAR HARNESS DELIVERY PLUG A |
| 16 GA. YELLOW LEFT TURN_17 | 54" | 2 | LEFT STOP-TURN-TAIL PLUG 3 |
| 16 GA. GREEN RIGHT TURN_9 | 80 1/4" | 3 | RIGHT STOP-TURN-TAIL PLUG 3 |

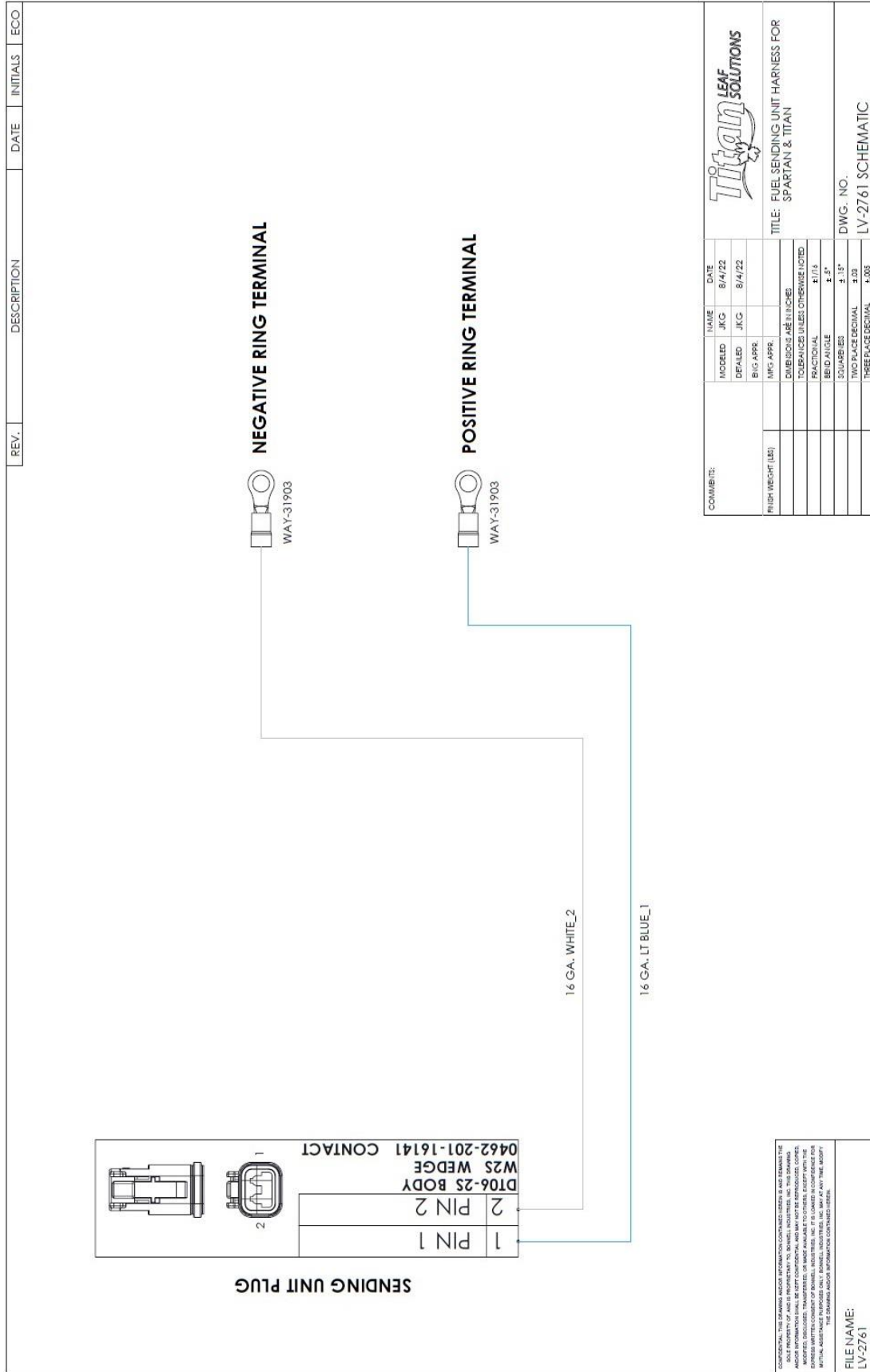
General Operation Instructions

OIL COOLER HARNESS



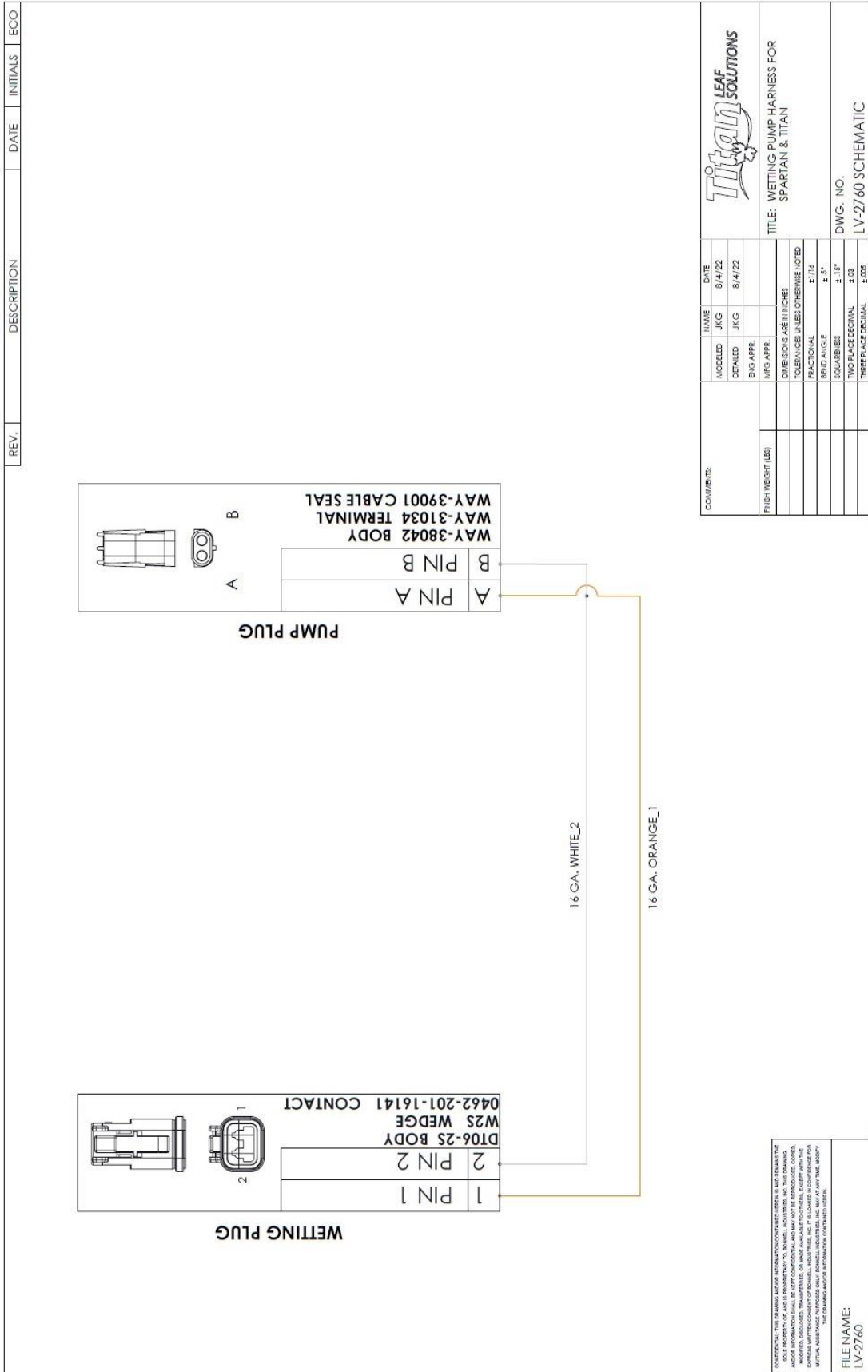
General Operation Instructions

FUEL SENDING UNIT HARNESS



General Operation Instructions

WETTING PUMP HARNESS



FILE NAME:
LV-2760

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| MODELED | J/K/G | J/K/G | 8/4/22 |
| DETAILED | J/K/G | J/K/G | 8/4/22 |
| BIG APPR. | | | |
| MFG APPR. | | | |
| DRIBBLES: ARE IN LINES: | | | |
| TOLERANCES UNLESS OTHERWISE NOTED: | | | |
| FRACTIONAL | | | # 1/16 |
| DECIMAL | | | # .5" |
| SQUARES | | | # .15" |
| TWO PLACE DECIMAL | | | # .03 |
| THREE PLACE DECIMAL | | | # .003 |

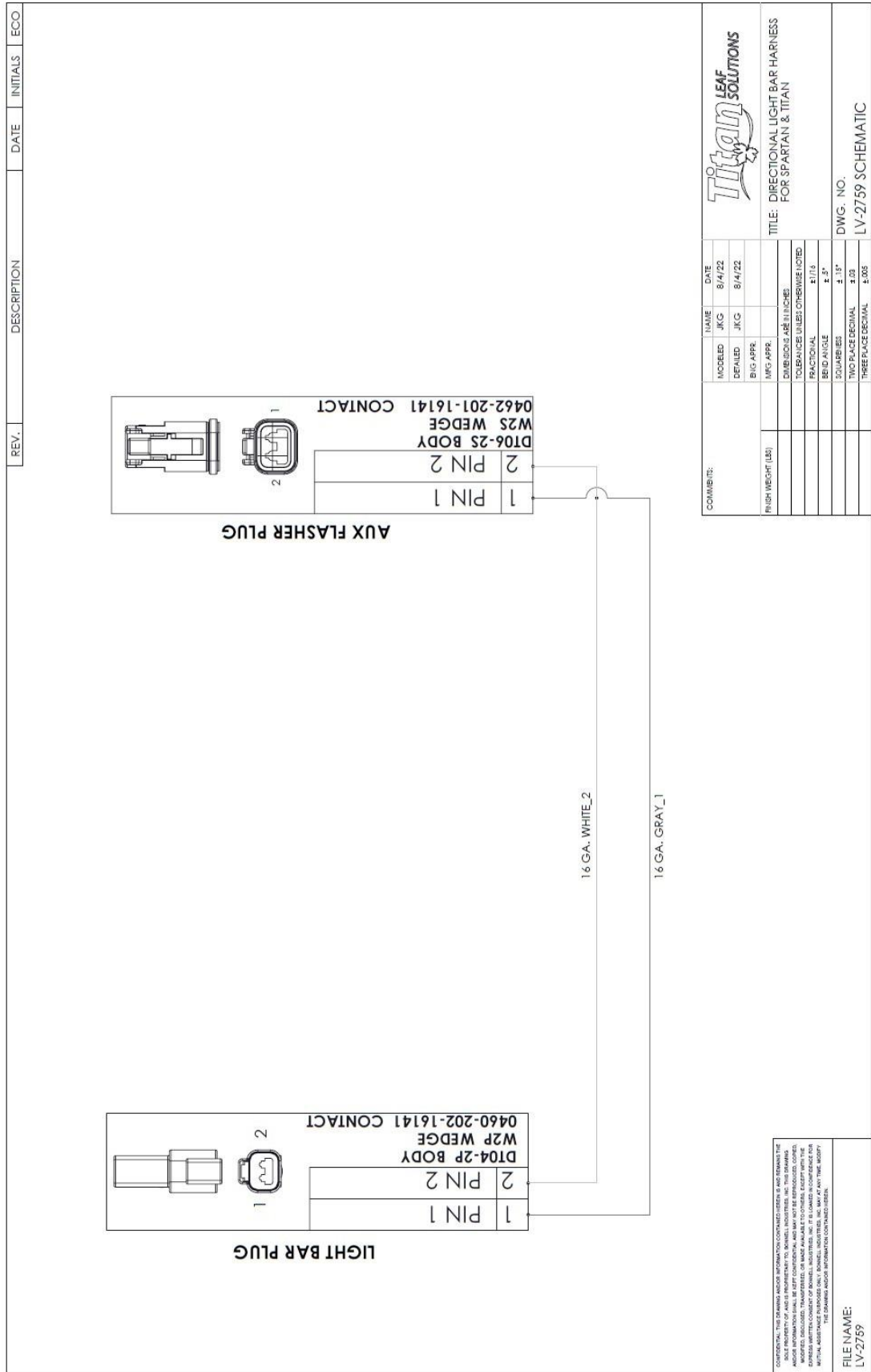
Titan LEAF SOLUTIONS

TITLE: WETTING PUMP HARNESS FOR SPARTAN & TITAN

DWG. NO.
LV-2760 SCHEMATIC

General Operation Instructions

DIRECTIONAL LIGHT BAR POWER HARNESS



General Operation Instructions

DIRECTIONAL LIGHT BAR EXTENSION HARNESS



General Operation Instructions

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

| PRESTART CHECKLIST | |
|-------------------------------|-----------------------|
| √ INSPECT TIRES | √ INSPECT HOSE |
| √ ENGINE OIL & FUEL LEVELS | FOR WEAR |
| √ CHECK ALL LIGHTS | √ PICK-UP HOSE SECURE |
| √ HYDRAULIC OIL LEVEL | √ CHECK BELT TENSION |
| √ WATER LEVEL | √ ALL GUARDS IN PLACE |
| | √ DISENGAGE CLUTCH |

8.2 CLUTCH ENGAGEMENT

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 intervals thereafter until the new plates are worn in.

Refer to clutch manual for proper adjustment procedures.

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 vibrations 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.

General Operation Instructions

EMERGENCY STOP SWITCH MOUNTING LOCATIONS

111617 SPARTAN EMERGENCY STOP LOCATIONS.smg



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)

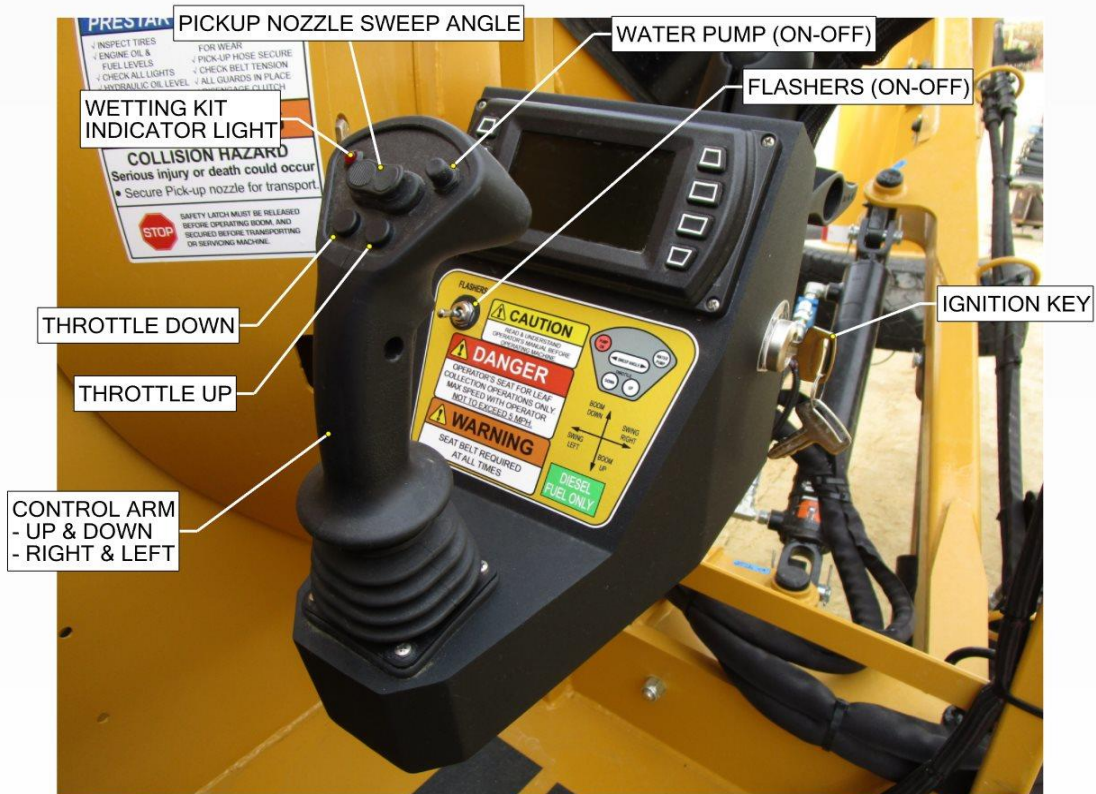
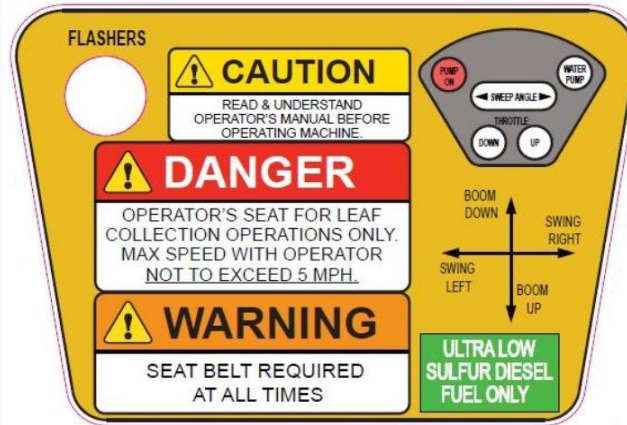
Sweep – Nozzle pivot

General Operation Instructions

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

OPERATOR JOYSTICK OPERATION

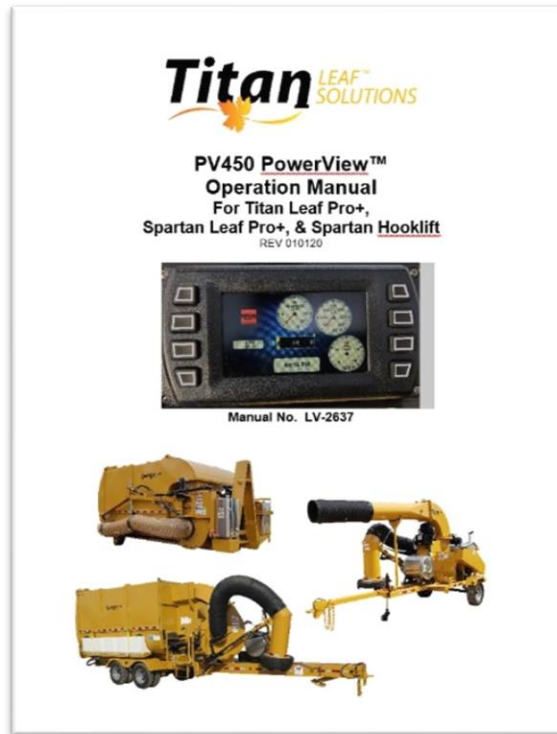
05/29/2018 SPARTAN AND TITAN OPERATOR JOYSTICK ASSEMBLY.smg



General Operation Instructions

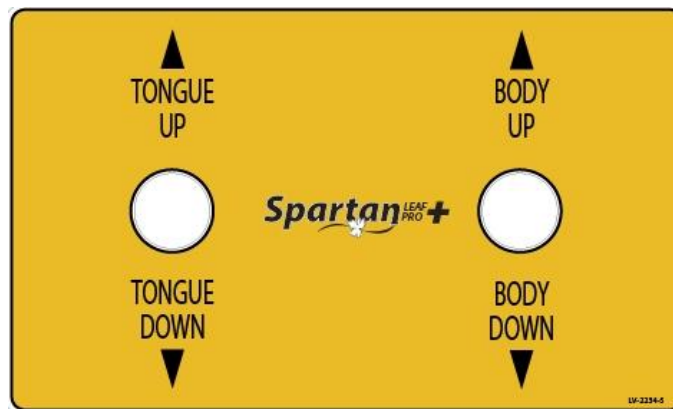
8.6 PV450 CONTROLLER ADJUSTMENTS

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 hydraulic valve doghouse, directly below the engine. NOTE: FOR ELECTRIC OVER HYDRAULIC SYSTEMS, THE ENGINE NEEDS TO BE RUNNING TO RAISE THE JACK. See illustration below.



General Operation Instructions

8.8 BODY HOIST OPERATION

The body hoist is operated by the control lever located on the hydraulic valve doghouse, directly below the engine. This hydraulic function is equipped with a sequence valve. When raising the body, the tailgate latch cylinders will release first prior to the main hoist cylinder. When lowering, the reverse is true. In some cases, the door may touch the ground when dumping. The body is equipped with a double hinge mechanism to prevent damage to the door when this occurs.

Danger

Crush, pinch, and overhead clearance hazard! Assure that all people and equipment are in the clear when raising the hoist! Also be aware of overhead obstructions such as power-lines. Failure to do so could result in severe injury or death.

WARNING

Engine must be at idle when dumping. Failure to follow this procedure may cause debris to exit the blower housing, and cause injury.

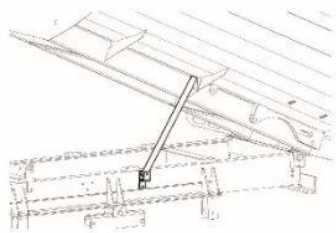
WARNING

Do not back up while dumping. Failure to follow this procedure may cause severe damage to the body or tailgate.

OPERATION OF BODY PROP

This machine is equipped with:

- () 1 Body Prop
- () 2 Body Props



TO USE BODY PROP(S):

1. Raise body to height where prop(s) can be swung upward into position. Place the hoist control valve in the neutral (hold) position.
2. Locate prop(s) (behind fender), and swing "up" to the support position.
3. Lower body slowly until prop(s) rests on prop receiver. Do not power hoist down. Place the hoist control valve in the neutral (hold) position.

TO STORE THE PROP(S):

4. Raise body to a height where the prop(s) will clear the prop receiver. Be sure the hoist control valve is in the neutral (hold) position.
5. Swing prop(s) down to transit position. Before lowering body be certain that the area is clear.

General Operation Instructions

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.



On-Off Switch - Shown On Proportional Joystick
(Location On Other Models May Vary)

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.

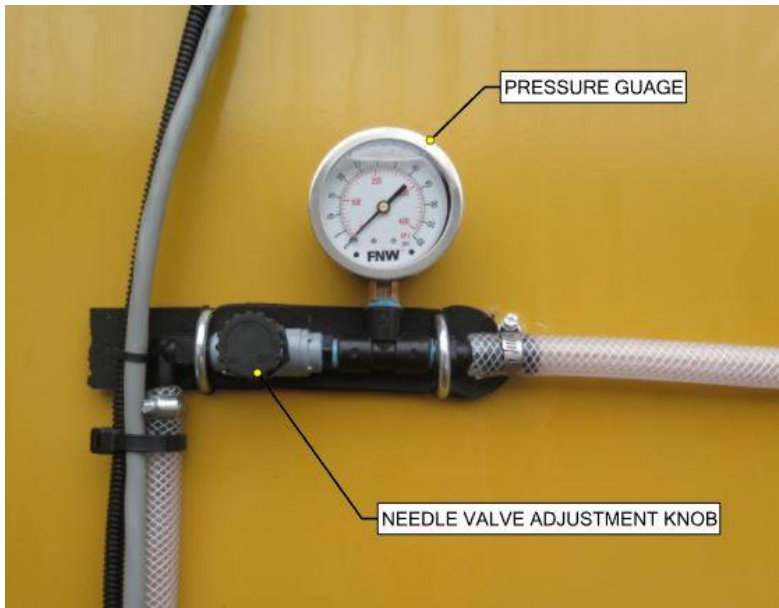
The amount of water being sprayed can be controlled to accommodate different conditions. Refer to the chart below. Machine is equipped with “green” 80015 nozzles. Nozzle sizes can be changed to increase flow, however this will reduce operation time of the dust control system before the tanks are depleted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

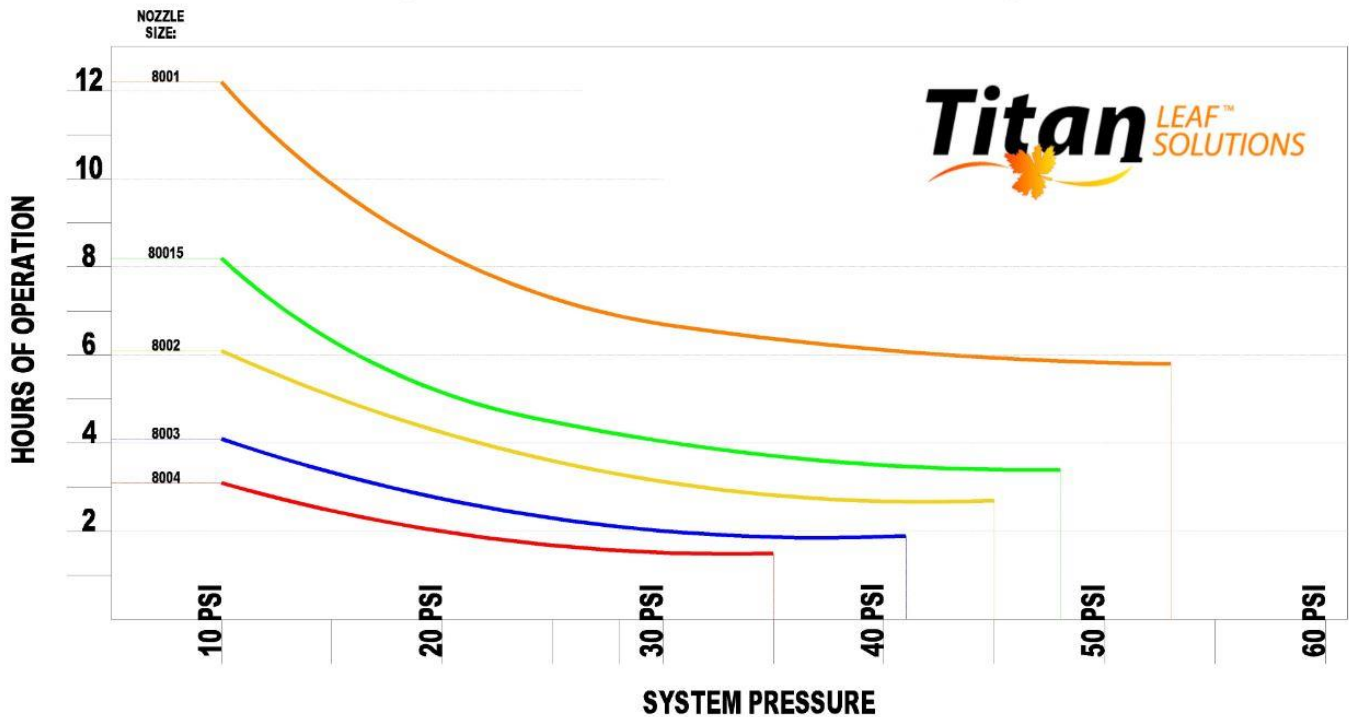
- A REDUCTION in line pressure will REDUCE the amount of water being applied, and INCREASE your run time before depleting the water supply.
- An INCREASE in line pressure will INCREASE the amount of water being applied, and REDUCE your run time before depleting the water supply.

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

General Operation Instructions



**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.**

9 SUPPLEMENTAL MANUALS

9.1 SPLIT TAPER BUSHING

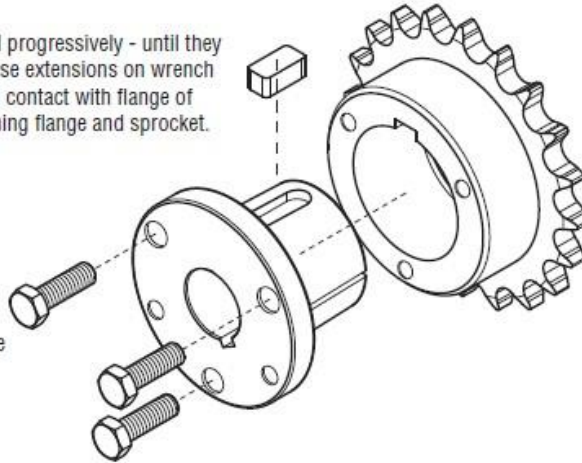


MST® Bushings
Instructions & Removal Instruction

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 free 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 |



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.)

9.2 TRANS FLUID COUPLER



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 SUDETTE 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

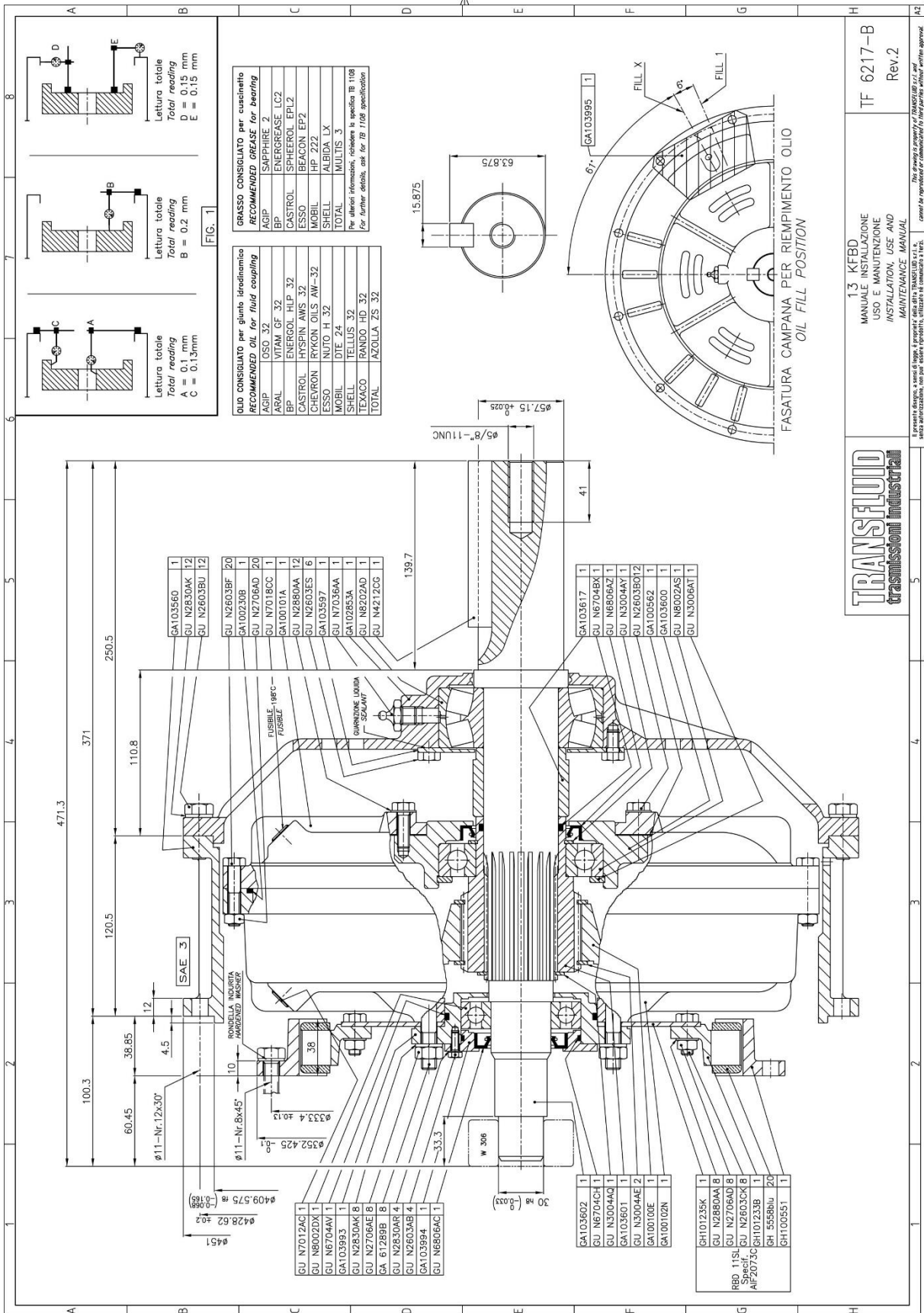
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Supplemental Manuals

| | | |
|---|---|---|
|  <p>trasmissioni industriali</p> | <p align="center">13 KFBD MANUALE INSTALLAZIONE, USO E MANUTENZIONE INSTALLATION, USE AND MAINTENANCE MANUAL</p> | <p align="center">TF 6217-A Rev. 0</p> |
| <p>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.</p> | | |
| <p><i>This manual contains instructions for installation, start up, working, and maintenance of KFBD fluid coupling.</i> 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. <i>We recall that, for spare parts order, it is important to provide, besides detail number and quantity, even:</i> TYPE - SPECIFICATION Nr. - SERIAL Nr. of KFBD that are stamped on identification metal plate.</p> | | |
| <p align="center">DESCRIZIONE</p> <p>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.</p> | <p align="center">DESCRIPTION</p> <p>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.</p> | |
| <p>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)</p> | | |
| <p>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)</p> | | |
| <p align="center">INSTALLAZIONE (vedere TF6217-B)</p> <ol style="list-style-type: none"> Montare l'anello di trascinamento del giunto elastico sul volano del motore. Montare il cuscinetto pilota, ingrassato a vita, sull'albero del KFBD. Montare la flangia SAE 3 sul coprivolano. 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. Così montato, si avra' l'apertura di drenaggio dell'olio in basso. Infine fissare il gruppo con le apposite viti sulla flangia esterna. 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. Riempimento grasso (vedere tabella grassi consigliati). Mediante l'apposito ingrassatore,, riempire la camera di lavoro del cuscinetto fino a far fuoriuscire il grasso attorno all'albero 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. Al primo avviamento, far girare il gruppo innestato, per almeno 10 minuti, con il motore alla meta' dei giri massimi. | <p align="center">INSTALLATION (see sheet.TF6217-B)</p> <ol style="list-style-type: none"> Mount elastic coupling driving ring, onto engine flywheel. Mount pilot bearing, greased for life, onto KFBD shaft. Mount SAE 3 flange onto flywheel housing. Install complete group paying attention at alignment between shaft and pilot bearing as well as alignment between rubber blocks and driving ring. <i>External housing must be orientated to get the oil fill opening at about 60° clockwise from vertical line, looking at the flywheel.</i> <i>In such a way, the oil drain opening will be downwards. Therefore tighten screws of external flange.</i> Fluid coupling oil filling (see recommended oil table). Remove cover. <i>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.).</i> <i>Therefore fit the plug using sealent on thread.</i> <i>Tightening torque is 30 Nm for 3/8" plug .Fit again the cover.</i> Grease filling (see recommended grease table). <i>Through the grease filler, fill grease untill it comes out around the shaft.</i> 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. At first start up, run the unit engaged and engine at half of max speed for not less than 10 minutes. | |

Supplemental Manuals



TRANSFLUID
 trasmissioni industriali

13 KFBD
 MANUALE INSTALLAZIONE
 USO E MANUTENZIONE
 INSTALLATION, USE AND
 MAINTENANCE MANUAL

TF 6217-B
 Rev.2

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Supplemental Manuals

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| <h2 style="margin: 0;">TRANSFLUID</h2> <p style="margin: 0;">trasmissioni industriali</p> | <p>13 KFBD</p> <p>MANUALE INSTALLAZIONE, USO E MANUTENZIONE</p> <p>INSTALLATION, USE AND MAINTENANCE MANUAL</p> | <p>TF 6217-C</p> <p>Rev. 0</p> |
|--|--|--|

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. |
| Perdita olio lato motore. | Carico radiale eccessivo. | Ridurre la tensione delle cinghie. |
| | 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. |
| Oil leakage at engine side. | Too high radial load. | Decrease belt tension. |
| | Taper plug. | Remount using thread sealant. |
| | O-ring. | Replace. |
| Oil leakage at output side. | Rotating seal. | Replace. Check shaft wear. |
| | Filling plug. | Remount using thread sealant. |
| | Fusible plug, whether installed. | Replace. |
| | O-ring. | Replace. |
| Noise. | Rotating seal. | Replace. Check shaft wear. |
| | Bearing failure. | Replace. |
| | Too much oil foam. | Check oil level and type. |
| | Elastic coupling wear. (Torsional vibration? high temperature? misalignment? 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. |

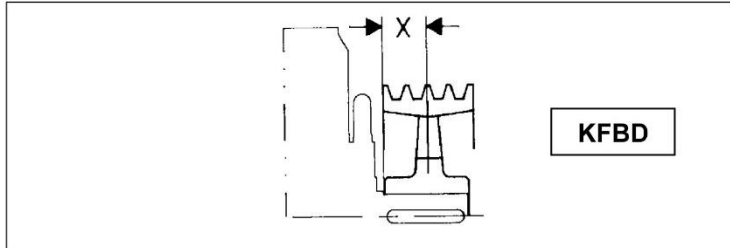
Supplemental Manuals

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 Ø |
|-----------------|------------------------------|-------------------------------------|
| 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 Ø |
|-----------------|------------------------------|-------------------------------------|
| 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 Ø |
|-----------------|------------------------------|-------------------------------------|
| 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 Ø |
|-----------------|------------------------------|-------------------------------------|
| 370 / 2000 | 150 / 28000 | 10 x 8V - 315 mm |
| | | 13 x SPC - 355 |
| 500 / 2000 | 177 / 29800 | 12 x 8V - 400 mm |
| | | 15 x SPC - 450 mm |

ASK TRANSFLUID FOR ANY APPLICATION DIFFERENT THAN ABOVE.

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).

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.

TF 6401-GB - rev. 0

- 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.

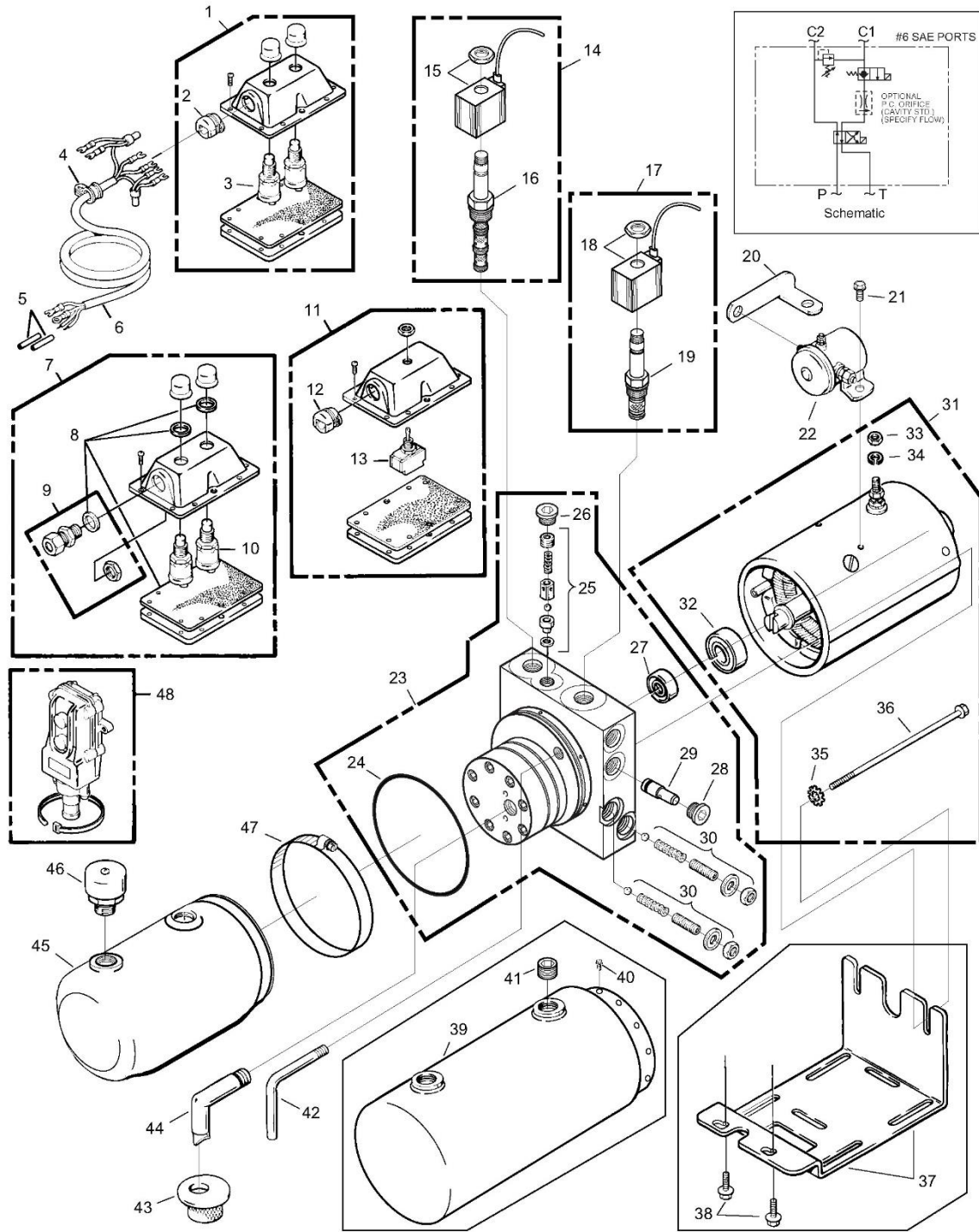
4) Conditions for requesting services under guarantee

- 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.

9.3 MONARCH POWER UNIT



Dyna-Jack® **M-3551**

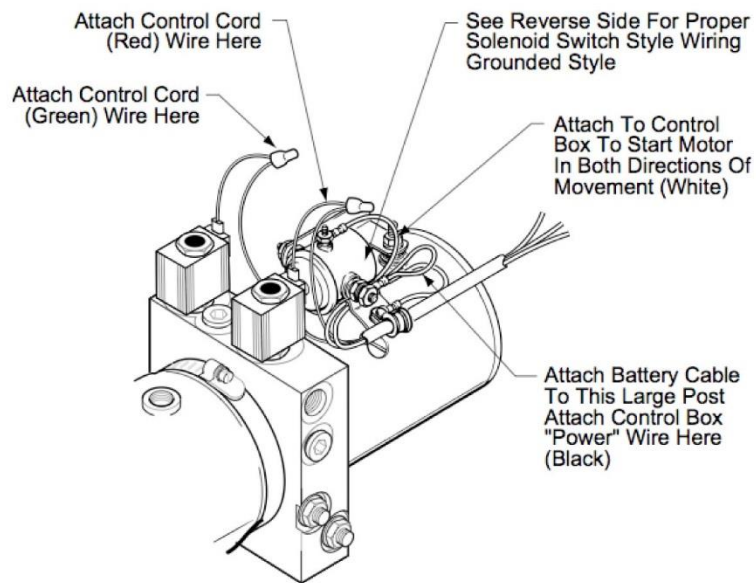


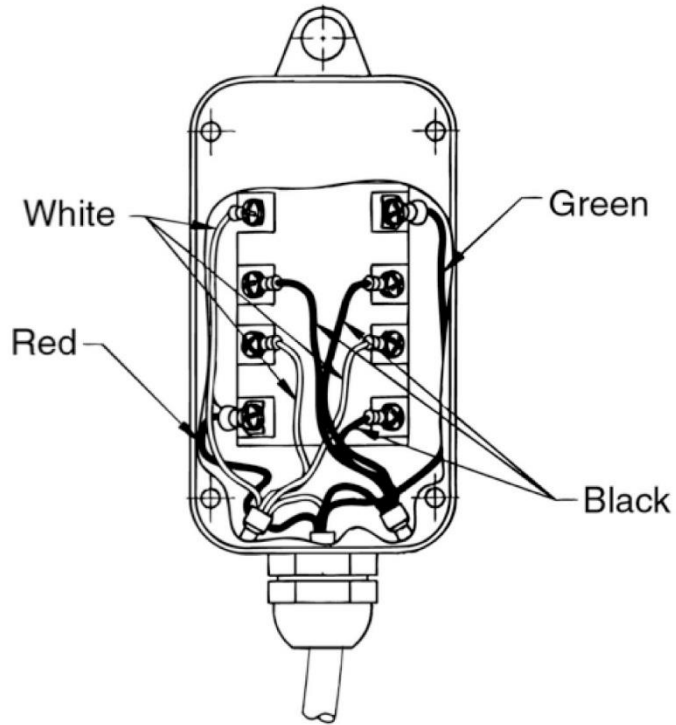
Supplemental Manuals

M-3551

| Ref. No. | Part No. | Description | No. Req. | Ref. No. | Part No. | Description | No. Req. |
|----------|----------|--|----------|----------|------------|--|----------|
| 1 | 03404 | BOX ASSEMBLY, Push Button | 1 | 24 | 02352 | • O-RING, Industrial (3-5/8 x 3-7/8 x 1/8) | 1 |
| 2 | 01418 | • STRAIN RELIEF, (Plastic) | 1 | 25 | 03624 | • PARTS KIT, Valve Assembly, poppet/ball check | 1 |
| 3 | 03345 | • SWITCH, Push Button, 3-Terminal | 2 | 26 | 03276 | • PLUG | 1 |
| 4 | 01076 | CLAMP, Cable | 1 | 27 | 02159 | • SEAL | 1 |
| 5 | 01412 | TERMINAL, Butt Connector | 2 | 28 | 03274 | • PLUG, #8 SAE | 1 |
| 6 | 03734 | Cord, Harness, 72" 16-4, valve grounded (push button) | 1 | 29 | 01723-x.xx | • VALVE, Press, comp. orifice (specify gpm for x.xx) | 1 |
| | 03351 | Cord, Harness, 72" 16-4, switches grounded (push button) | 1 | 30 | 07527 | • PARTS KIT, Relief Valve | 2 |
| | 03735 | Cord, Harness, 72" 16-4, valve grounded (toggle & rocker) | 1 | | | FOR FURTHER BREAKDOWN OF PUMP ASSEMBLY, SEE PUMP SECTION | |
| | 03490 | Cord, Harness, 72" 16-4, switches grounded (toggle & rocker) | 1 | 31 | 08111 | MOTOR, Electric, 12 VDC | 1 |
| 7 | 03453 | BOX ASSEMBLY, Push Button (weatherproof) | 1 | | 08112 | MOTOR, Electric, 12 VDC | 1 |
| 8 | 03690 | • PARTS KIT, Gasket, (weatherproof) | 1 | | 08120 | MOTOR, Electric, 24 VDC | 1 |
| 9 | 03691 | • PARTS KIT, Strain Relief, (weatherproof) | 1 | 32 | 02318 | • BEARING, Base, motor | 1 |
| 10 | 03369 | • SWITCH, Push Button, 3-Terminal (weatherproof) | 2 | 33 | 07625 | • NUT, Hex 5/16-24 | 1 |
| 11 | 03487 | BOX ASSEMBLY, (Toggle Switch) | 1 | 34 | 07781 | • WASHER, Lock 5/16" | 1 |
| 12 | 01418 | • STRAIN RELIEF, (plastic) | 1 | 35 | 07737 | • WASHER, Star 1/4" | 2 |
| 13 | 03394 | • SWITCH, Toggle | 1 | 36 | 07738 | • SCREW, Hex Head Cap 1/4-20 x 6-1/2" | 2 |
| 14 | 07132 | VALVE, 4 Way - 2 Position, (12V) | 1 | | | FOR FURTHER BREAKDOWN OF MOTOR, SEE MOTOR SECTION | |
| | 07361 | VALVE, 4 Way - 2 Position, (24V) | 1 | 37 | 02238 | BRACKET, Mounting | 1 |
| 15 | 00678 | • COIL, 10 VDC, grounded | 1 | 38 | 07889 | SCREW, Hex Head, thread forming 1/4-20 x 1-3/8" | 2 |
| | 07301 | • COIL, 18 VDC, grounded | 1 | 39 | 06042 | RESERVOIR, 6" x 9" , metal | 1 |
| 16 | 00455 | • CARTRIDGE, 4 Way - 2 Position | 1 | | 06044 | RESERVOIR, 6" x 13.5" | 1 |
| 17 | 00707 | VALVE, 2 Way - 2 Position, 12 VDC, grounded | 1 | 40 | 07703 | SCREW, Thread Forming 10-24 x 3/8" | 6 |
| | 07158 | VALVE, 2 Way - 2 Position, 24 VDC, grounded | 1 | 41 | 02349 | PLUG, 3/8" NPTF | 1 |
| 18 | 00678 | • COIL, 10 VDC, 2 Way - 2 Position, grounded | 1 | 42 | 01203 | TUBE, Return (1/8") | 1 |
| | 07301 | • COIL, 18 VDC, grounded | 1 | 43 | 01134 | SCREEN, Filter (suction) | 1 |
| 19 | 07193 | • CARTRIDGE, 2 Way - 2 Position, N.C. | 1 | 44 | 01209 | TUBE, Filter Suction 3/8 NPT 90 Deg. | 1 |
| 20 | 01349 | STRAP, Motor-Solenoid Connecting | 1 | 45 | 06102 | RESERVOIR, 4-1/2" Dia. x 8", Plastic | 1 |
| 21 | 07683 | SCREW, Round Head Machine 10-32 x 1/4" | 2 | | 06103 | RESERVOIR, 4-1/2" Dia. x 10", Plastic | 1 |
| 22 | 03427 | SWITCH, Solenoid, 12 VDC, 3-post grounded to can | 1 | | 06104 | RESERVOIR, 4-1/2" Dia. x 12", Plastic | 1 |
| | 03335 | SWITCH, Solenoid, 12 VDC 4-post isolated ground | 1 | 46 | 03866 | PLUG, Vent, 3/8" NPT | 1 |
| | 03467 | SWITCH, Solenoid, 24 VDC, 3 post, grounded to can | 1 | 47 | 07900 | CLAMP, Hose Worm Gear (in series) | 1 |
| | 03343 | SWITCH, Solenoid, 24 VDC, 3 post, insulated ground | 1 | 48 | 03240 | BOX ASSEMBLY, Push Button (weather proof) | 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 | | | | |

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 |

Supplemental Manuals

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



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 will 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 Accumulator 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

Supplemental Manuals

- 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.

Supplemental Manuals

| 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 | |
| 230 ACⓄ | BROWN (common) BLUE (neutral) GRN/YELL (ground) | (or heavier) [1 Mm ²] | |

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

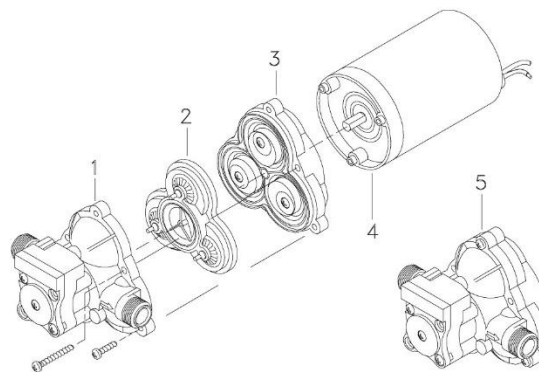
LEAKS FROM PUMP HEAD OR SWITCH:

- ✓ For loose screws at switch or pump head.
- ✓ Switch diaphragm ruptured or pinched
- ✓ For punctured diaphragm if fluid is present at bottom drain

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 number 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) |



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

Supplemental Manuals

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

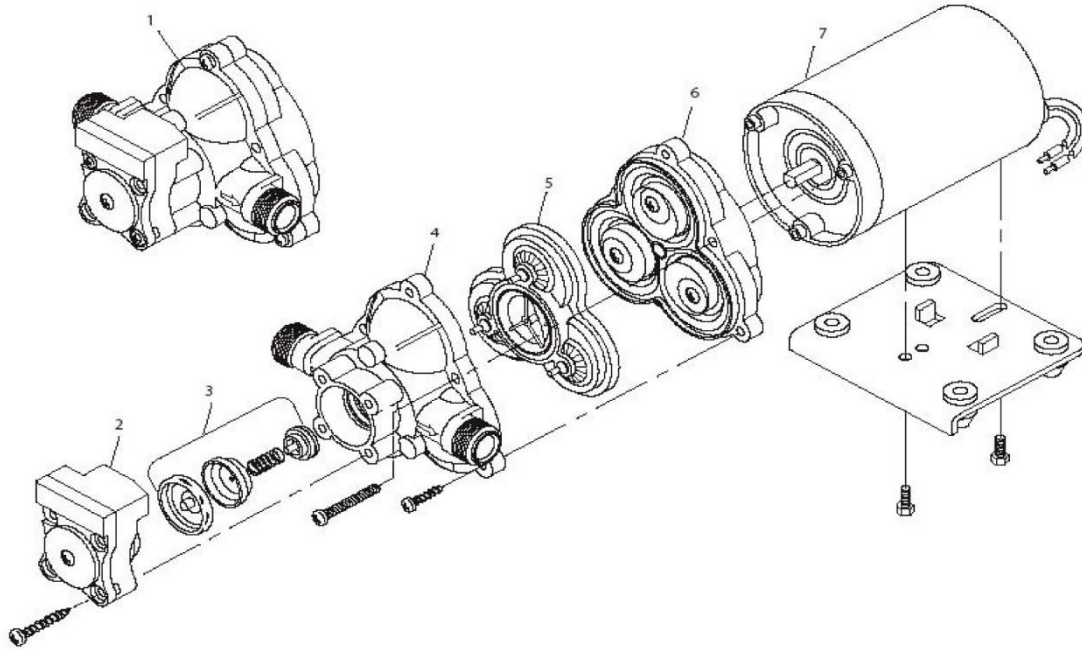
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Santa Ana, CA 92706-2100
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FAX (714) 554-4721
Shipping/UPS: 12650 Westminster Ave.
Garden Grove, CA 92843

SHURflo East
52748 Park Six Court
Elkhart, IN 46514-5427
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FAX (219) 264-2169
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United Kingdom
+44 1293 424000
FAX +44 1293 421880



2088 Replacement Kits



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

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Parts Breakdowns

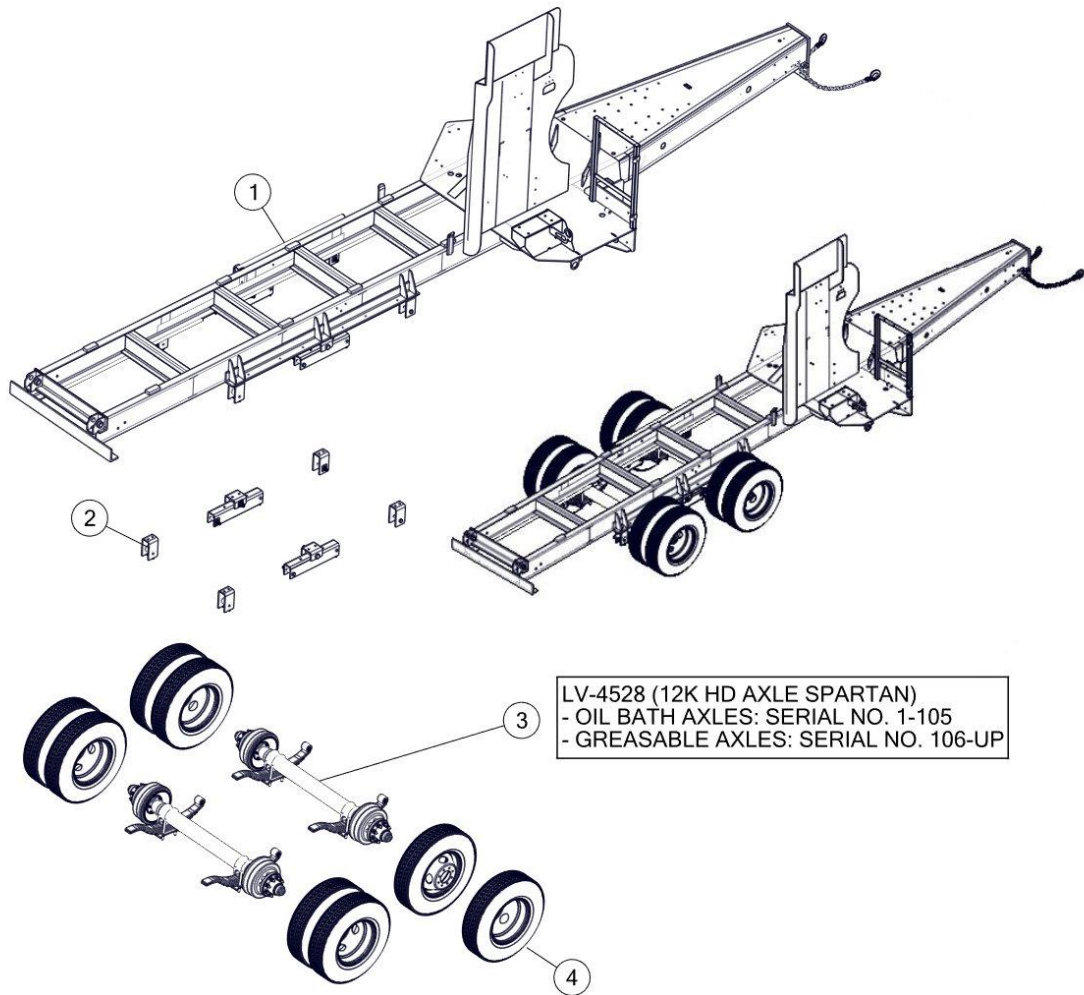
10 PART BREAKDOWNS

10.1 FRAME, AXLE HANGER KIT AND WHEEL ASSEMBLY

FRAME, AXLE HANGER KIT AND WHEEL ASSEMBLY SPARTAN LEAF VACUUM

032521 SPARTAN FRAME, AXLE HANGER KIT AND WHEEL ASSEMBLY - TIER 4.smg

ITEM 1: CHASSIS
 15 YARD - RIGHT HAND - NO SEAT - LV-2159
 15 YARD - RIGHT HAND - RIDE ON SEAT - LV-2135
 20 YARD - RIGHT HAND - NO SEAT - LV-2540
 20 YARD - RIGHT HAND - RIDE ON SEAT - LV-2136
 25 YARD - RIGHT HAND - NO SEAT - LV-2535
 25 YARD - RIGHT HAND - RIDE ON SEAT - LV-2545
 30 YARD - RIGHT HAND - NO SEAT - LV-2193
 30 YARD - RIGHT HAND - RIDE ON SEAT - LV-2100



LV-4528 (12K HD AXLE SPARTAN)
 - OIL BATH AXLES: SERIAL NO. 1-105
 - GREASABLE AXLES: SERIAL NO. 106-UP

| BOM ID | PartNo (config) | Description (config) |
|--------|-----------------|-------------------------|
| 1 | VARIABLES | SEE ABOVE |
| 2 | LV-2050 | SPARTAN AXLE HANGER KIT |
| 3 | LV-4528 | SEE ABOVE |
| 4 | LV-2051 | 16X6 865 DUAL WHEEL |

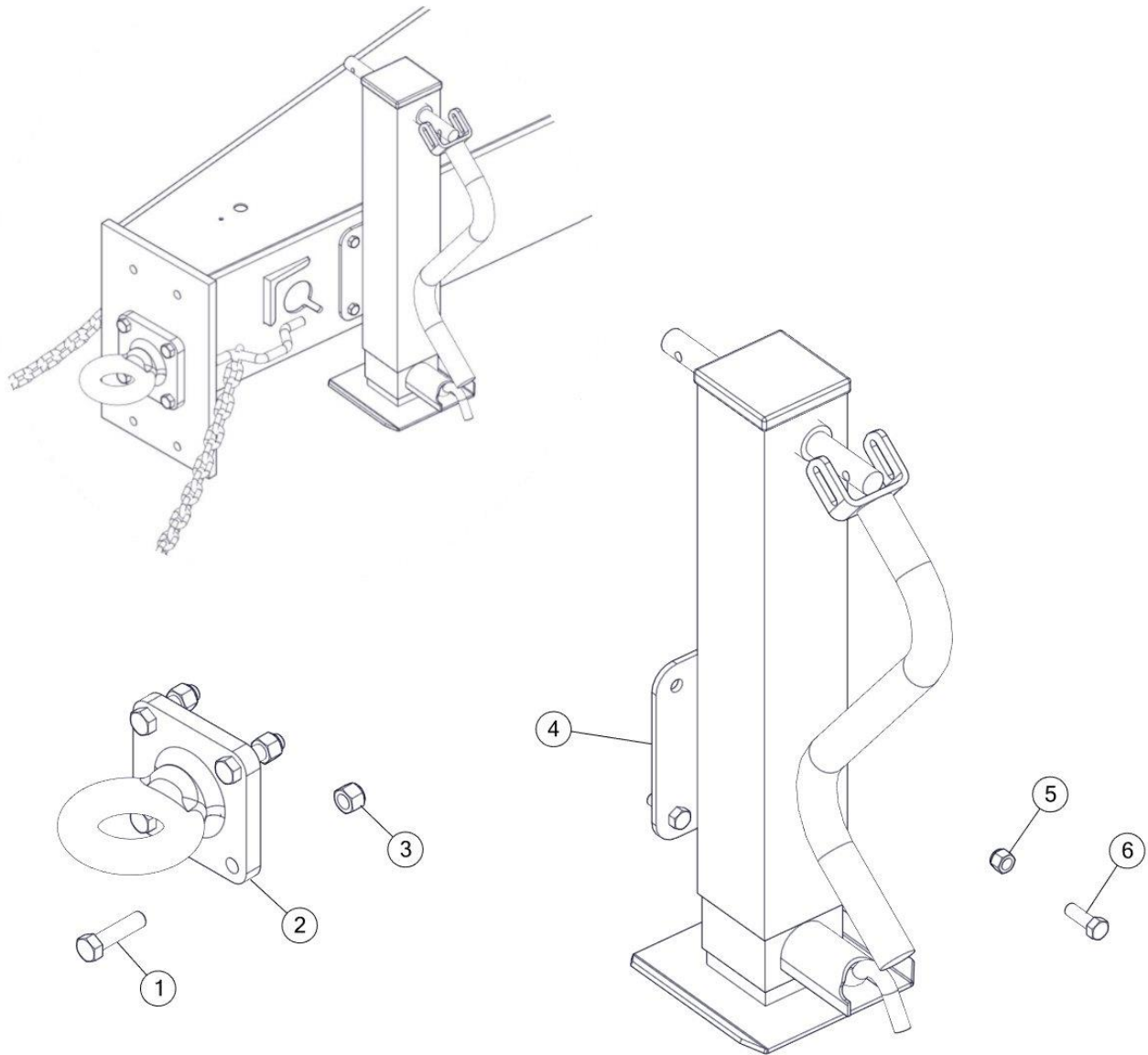
ADDITIONAL PARTS SOLD SEPARATELY:
 SAFETY PROP & PROP CUP: LV-2613 (EACH)
 BODY GUIDES: LV-2614 (EACH)
 REAR HINGES (15-20 YARD): LV-2615 (EACH)
 REAR HINGE (25-30 YARD): LV-2616

DOCUMENT 1.0

10.2 PINTLE EYE & MANUAL JACK ASSEMBLY

SPARTAN MANUAL TRAILER JACK ASSEMBLY

092616 SPARTAN MANUAL TRAILER JACK ASSEMBLY.smg



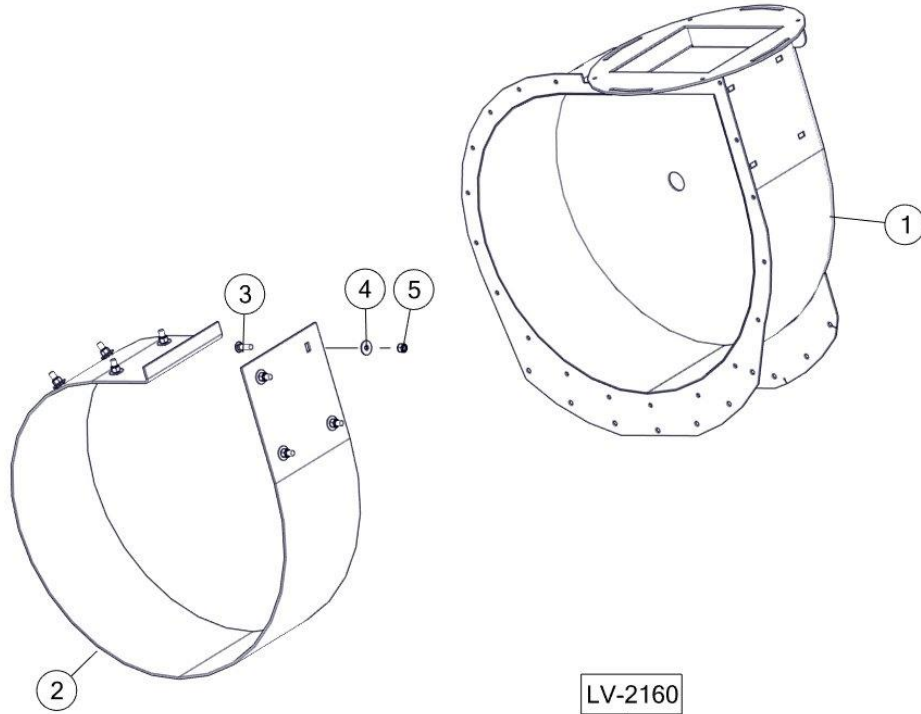
| BOM ID | PartNo (config) | Description (config) |
|--------|-----------------|----------------------------------|
| 1 | BON-000155 | 5/8-11 X 2-1/2" BOLT |
| 2 | HOL-DB-1250-15 | LUNETTE DRAW BAR, PINTLE EYE |
| 3 | BON-000322 | NYLON INSERT LOCKNUT, 5/8-11 UNC |
| 4 | LV-1521 | MANUAL HD JACK WELDMENT |
| 5 | BON-000321 | NYLON INSERT LOCKNUT, 1/2-13 UNC |
| 6 | BON-000107 | 1/2-13 x 1-1/2" BOLT |

DOCUMENT 1.1

10.3 BLOWER HOUSING LINER ASSEMBLY

BLOWER HOUSING LINER ASSEMBLY - SPARTAN LEAF VACUUM

092916 LV-2002REV1.SMG



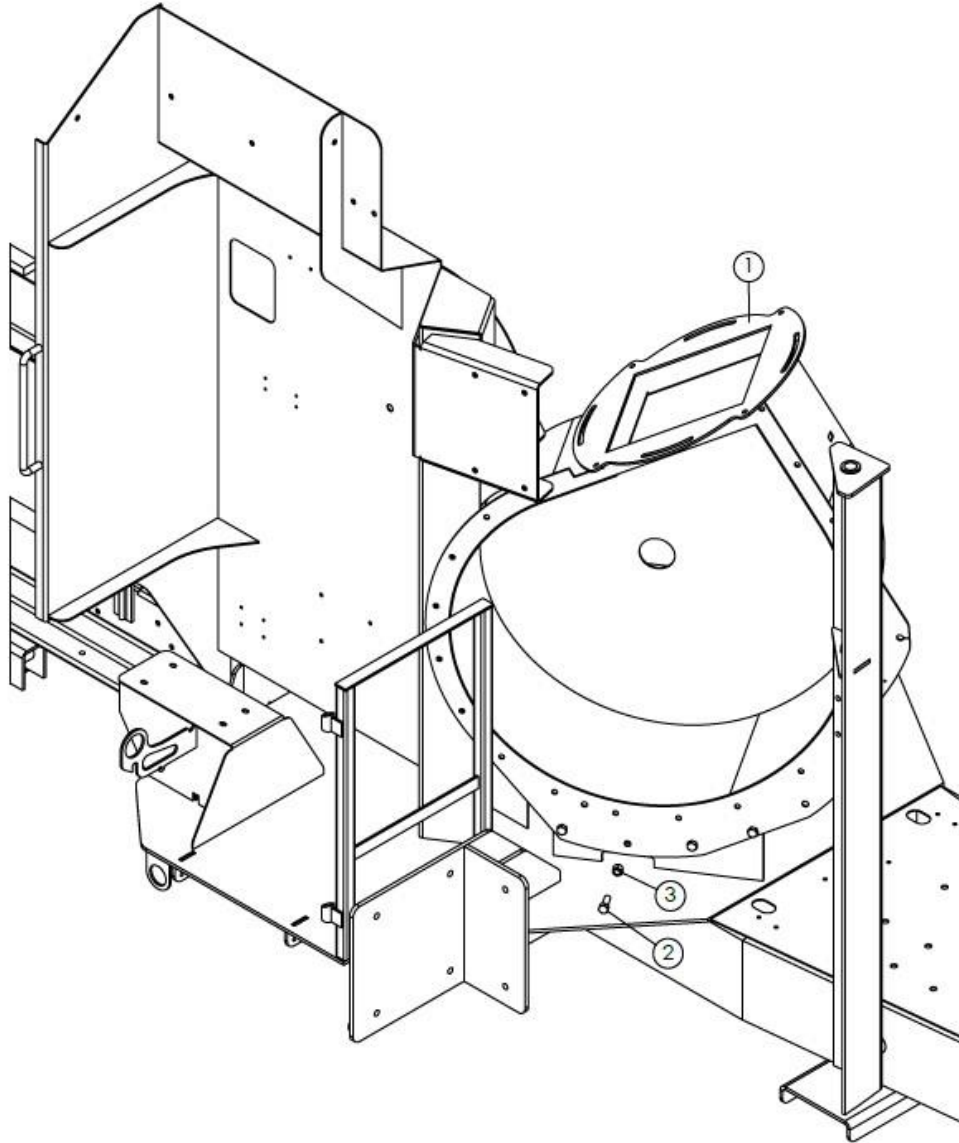
OVERHEAD BOOM BRACKET OPTION SHOWN

| BOM ID | PartNo (config) | Description (config) |
|--------|-----------------|--|
| 1 | LV-2022T4 | SPARTAN BLOWER HOUSING - RIGHT HAND PICKUP |
| 2 | LV-1026 | BLOWER HOUSING LINER |
| 3 | BON-000288 | 5/8-11 X 2" CARRIAGE BOLT |
| 4 | BON-000341 | FLAT WASHER, 5/8 |
| 5 | BON-000322 | 5/8-11 LOCK NUT |

10.4 INSTALL BLOWER HOUSING

| | |
|-----------|-------|
| FILE NAME | M1153 |
| DWG NAME | M1153 |

BLOWER HOUSING



| | | | |
|-----|------------|-----|------------------------------------|
| 3 | BON-000322 | 8 | 5/8-11 NYLON HEX LOCKNUT |
| 2 | BON-000152 | 8 | 5/8-11 x 1-3/4" HEX BOLT |
| 1 | LV-2022T4 | 1 | SPARTAN BLOWER HOUSING - RH PICKUP |
| REF | PART NO. | QTY | DESCRIPTION |

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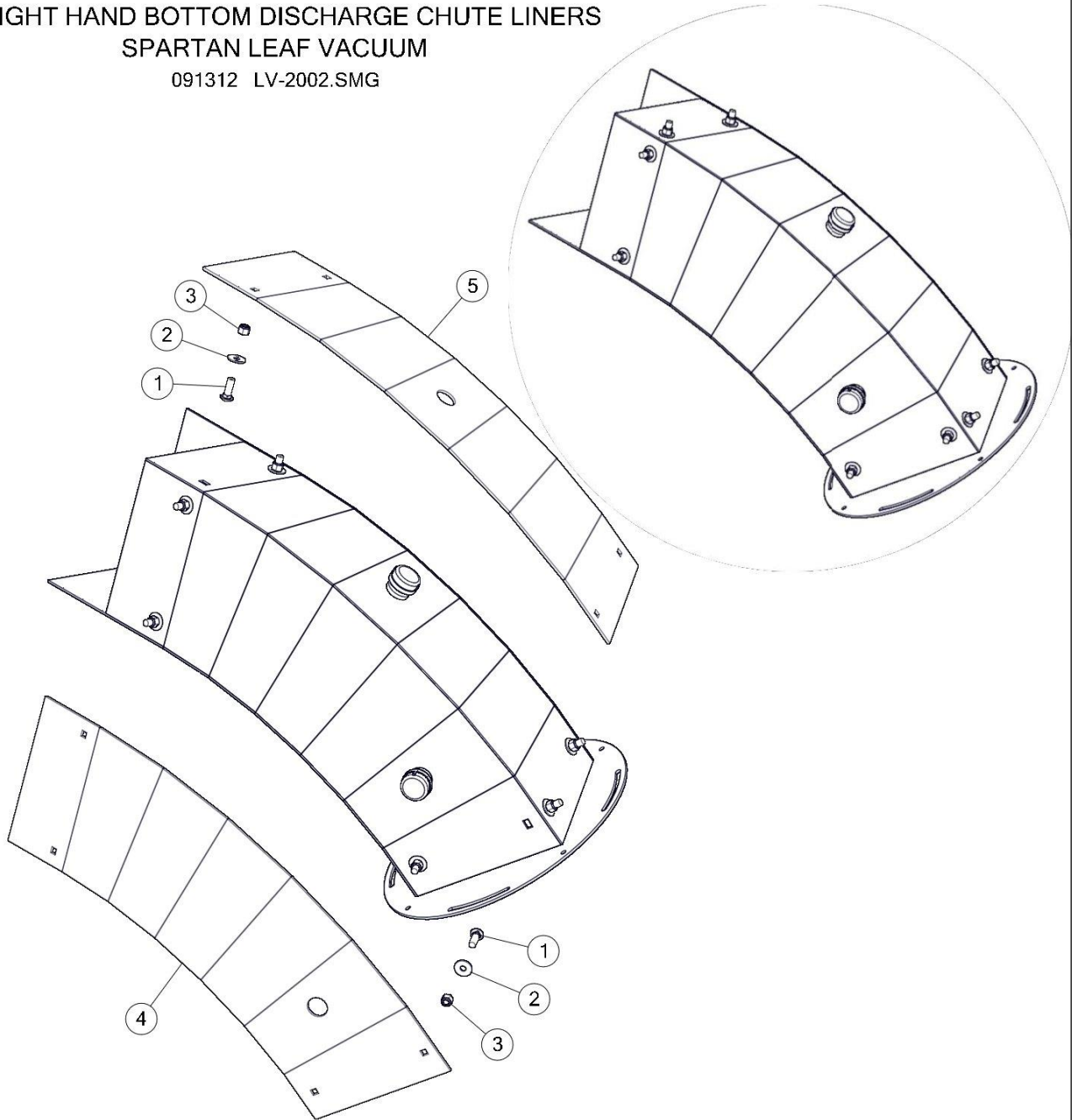
DIXON, ILLINOIS
PHONE: 800-851-9664

DOCUMENT 3.0

10.5 RIGHT HAND BOTTOM DISCHARGE CHUTE LINERS & HARDWARE

RIGHT HAND BOTTOM DISCHARGE CHUTE LINERS
SPARTAN LEAF VACUUM

091312 LV-2002.SMG



| BOM ID | Qty | PartNo (config) | Description (config) |
|--------|-----|-----------------|---|
| 1 | 8 | BON-000288 | 5/8-11 X 2" CARRIAGE BOLT |
| 2 | 8 | BON-000341 | FLAT WASHER, 5/8 |
| 3 | 8 | BON-000322 | NYLON INSERT LOCKNUT, 5/8-11 UNC |
| 4 | 1 | LV-2094 | BOLT ON LINER - RH BOTTOM DISCHARGE CHUTE |
| 5 | 1 | LV-2095 | BOLT ON LINER - RH BOTTOM DISCHARGE CHUTE |

10.6 RIGHT HAND BOTTOM DISCHARGE CHUTE

| | | |
|-----------|-------|--|
| FILE NAME | M1154 | RIGHT HAND BOTTOM DISCHARGE CHUTE |
| DWG NAME | M1154 | |

INSTALL CHAIN GUARD (CAPLUG-SW-15) AS NEEDED TO INSIDE OF THESE EDGES WITH 10-24X3/4 MACHINE SCREWS IN EXISTING HOLES.

| REF | PART NO. | QTY | DESCRIPTION |
|-----|--------------|-----|---------------------------|
| 5 | CAPLUG-SW-15 | 16 | CHAIN GUARD |
| 4 | BON-000321 | 12 | 1/2-13 NYLON HEX LOCKNUT |
| 3 | BON-000340 | 16 | 1/2" FLAT WASHER |
| 2 | BON-000107 | 12 | 1/2-13 x 1-1/2" HEX BOLT |
| 1 | LV-2026T4 | 1 | RH BOTTOM DISCHARGE CHUTE |

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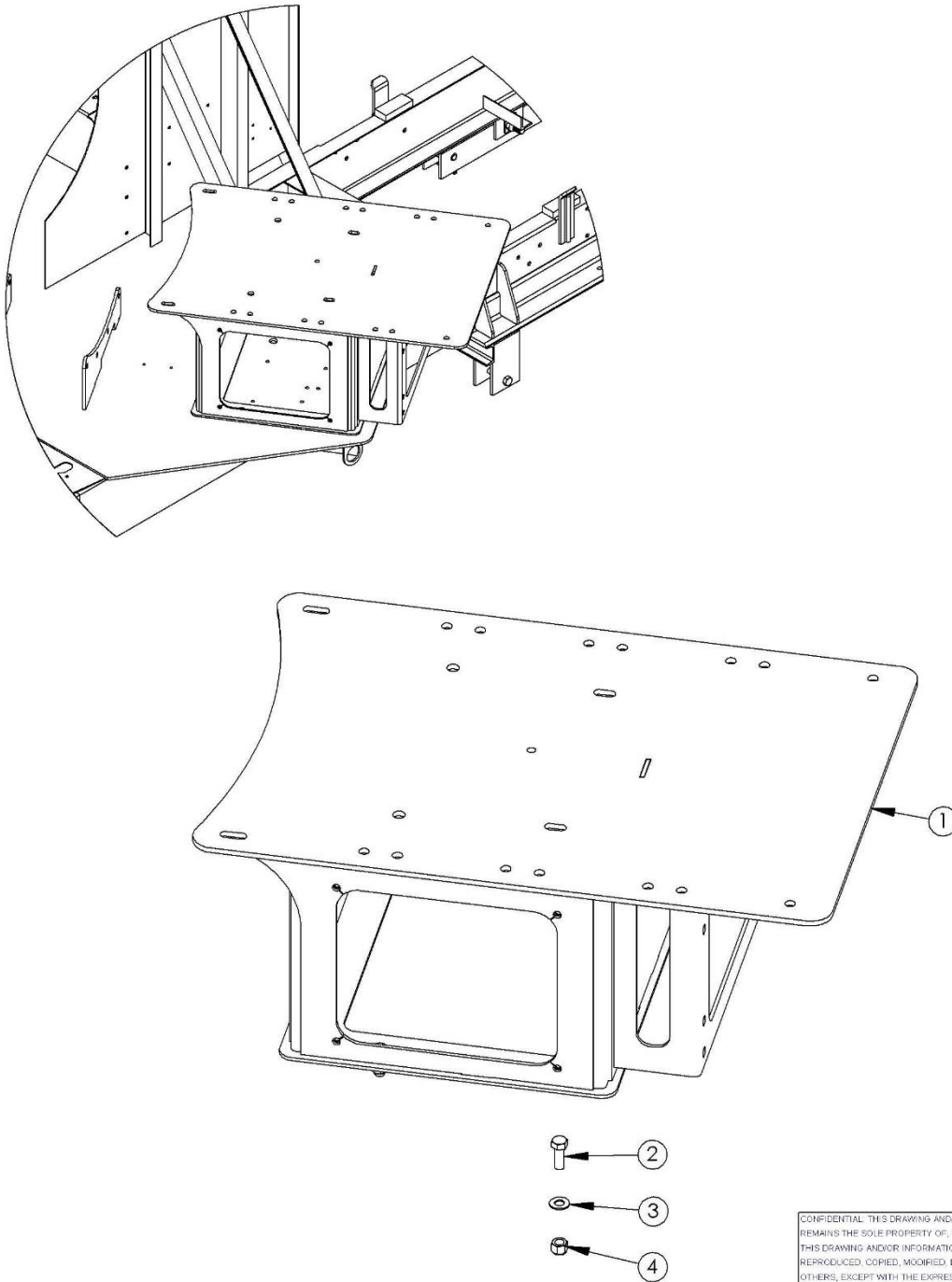
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PHONE: 800-851-9664

Parts Breakdowns

10.7 RIGHT HAND MOTOR MOUNT ASSEMBLY

| | | | | | |
|-----------|-------------|------|---------------------------------|-----------|----------|
| FILE NAME | LV-2032-EXP | REV. | DESCRIPTION | DATE | INITIALS |
| DWG NAME | LV-2032-EXP | - | RIGHT HAND MOTOR MOUNT ASSEMBLY | 4/15/2019 | LAJ |



| | | | |
|------|-----|----------------|-------------------------------|
| 4 | 4 | BON-000322 | 5/8-11 LOCKNUT |
| 3 | 4 | BON-000341SAEH | HARDENED SAE FLAT WASHER, 5/8 |
| 2 | 4 | BON-000152 | 5/8-11 X 1-3/4 BOLT |
| 1 | 1 | LV-2434 | RIGHT HAND MOTOR MOUNT |
| ITEM | QTY | PART NUMBER | DESCRIPTION |

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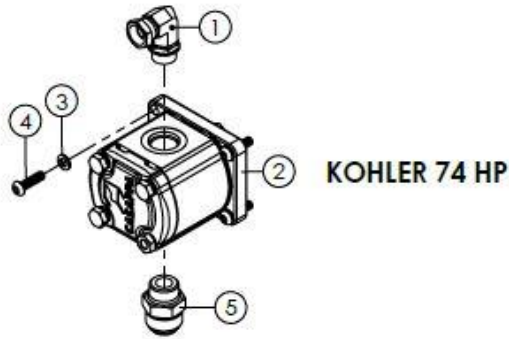
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Parts Breakdowns

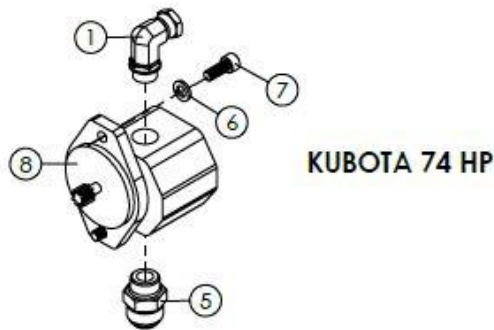
10.8 HYDRAULIC PUMP TO ENGINE ASSEMBLY

| | |
|-----------|-------|
| FILE NAME | M1173 |
| DWG NAME | M1173 |

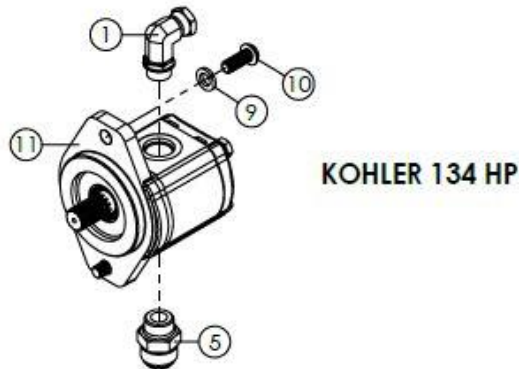
SPARTAN HYDRAULIC PUMPS



KOHLER 74 HP



KUBOTA 74 HP



KOHLER 134 HP

| | | | |
|-----|--------------|-----|---|
| 11 | LV-2496 | 1 | HYDRAULIC PUMP - 0.887 CI, CCW, SAE 13T SPLINE |
| 10 | LV-2409 | 2 | M12 x 1.75 x 30 MM BOLT |
| 9 | BON-000354 | 2 | 1/2 MED SPLIT LOCKWASHER ZP |
| 8 | LV-2029 | 1 | HYDRAULIC PUMP - 0.915 CI, CCW, 9T SPLINE |
| 7 | 96144A256 | 2 | M10 x 1.25 x 25 MM BOLT |
| 6 | BON-000353 | 2 | 7/16 MED SPLIT LOCKWASHER ZP |
| 5 | 848FSO 16X12 | 1 | MALE 37° x MALE ORB, 1-5/16-12 x 1-1/16 |
| 4 | LV-2408 | 4 | M8 x 1.25 x 30MM BOLT |
| 3 | BON-000351 | 4 | 5/16 MED SPLIT LOCKWASHER ZP |
| 2 | LV-2497 | 1 | HYDRAULIC PUMP - 0.887 CI, CCW, 1:8 TAPERED SHAFT |
| 1 | 60UB 10X08 | 1 | MALE ORB x 90° FEM PIPE SW 7/8-14 x 1/2 NPSM |
| REF | PART NO. | QTY | DESCRIPTION |

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DOCUMENT 9.0

10.9 MANUAL CLUTCH GREASE HOSE EXTENSION ASSEMBLY

MANUAL CLUTCH GREASE HOSE EXTENSION ASSEMBLY

11072018 MANUAL CLUTCH GREASE HOSE EXTENSION.smg

DECAL SET: LV-1233



BV2-002406 (GREASE EXTENSION HOSE)

BON-000411 (1/8" COUPLING)



LV-1411

BV2-001929 (CLAMP)

BON-000003 (1/4-20 X 3/4 BOLT)
BON-000318.5 (1/4-20 LOCK NUT)

DOCUMENT 9.1

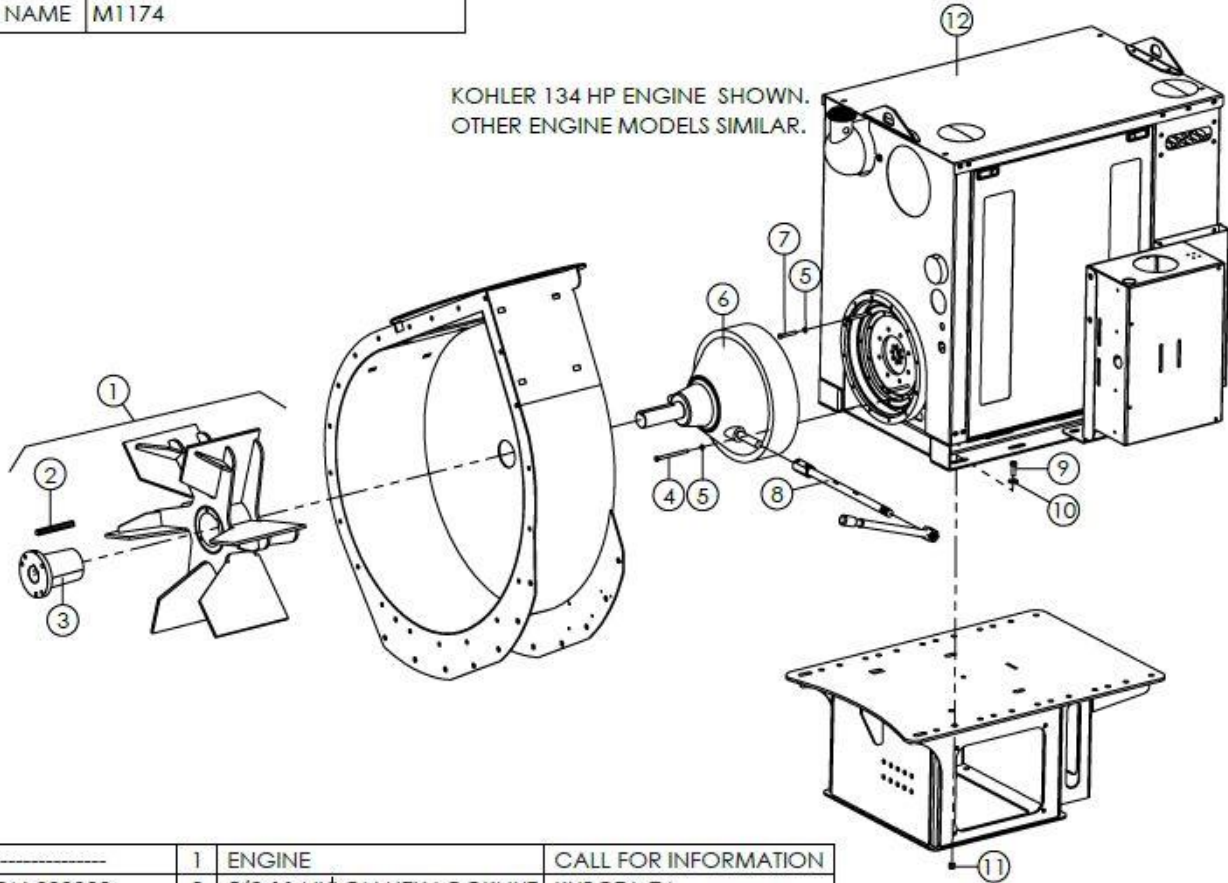
Parts Breakdowns

10.10 ENGINE MOUNTING, FLUID COUPLER AND FAN ASSEMBLY

| | |
|-----------|-------|
| FILE NAME | M1173 |
| DWG NAME | M1174 |

SPARTAN MECHANICAL CLUTCH & BLOWER FAN

KOHLER 134 HP ENGINE SHOWN.
OTHER ENGINE MODELS SIMILAR.



| | | | | |
|-----|---------------------|----------|-----------------------------|-------------------------------------|
| 12 | ----- | 1 | ENGINE | CALL FOR INFORMATION |
| 11 | BON-000322 | 8 | 5/8-11 NYLON HEX LOCKNUT | KUBOTA 74 |
| | BON-000321 | 16 12 | 1/2-13 NYLON HEX LOCKNUT | KOHLER 134 KOHLER 74 |
| 10 | BON-000341SAE | 8 | 5/8 SAE FLAT WASHER HT | KUBOTA 74 |
| | BON-000340SAEH | 16 12 | 1/2 SAE FLAT WASHER HT | KOHLER 134 KOHLER 74 |
| 9 | BON-000152 | 4 | 5/8-11 x 1-3/4 HEX BOLT GR8 | KUBOTA 74 |
| | BON-000107 | 8 6 | 1/2-13 x 1-1/2 HEX BOLT GR8 | KOHLER 134 KOHLER 74 |
| 8 | 305721AM LV-1339 | 1 | YOKE SHAFT EXTENSION | KOHLER 134 KOHLER 74 & KUBOTA 74 |
| | BON-000063 | | 3/8-16 x 2-1/2 HEX BOLT GR8 | KOHLER 134 |
| 7 | BON-000059 | 8 | 3/8-16 x 1-1/4 HEX BOLT GR8 | KUBOTA 74 |
| | BON-000063 | | 3/8-16 x 2-1/2 HEX BOLT GR8 | KOHLER 74 |
| 6 | LV-2474 | | | KOHLER 134 |
| | LV-1599 | 1 | O/C CLUTCH PTO, SAE #3 | KUBOTA 74 |
| | LV-2473 | | | KOHLER 74 |
| 5 | BON-000352 | 20 | 3/8 LOCKWASHER ZP | ALL |
| 4 | BON-000071 | | 3/8-16 x 5 HEX BOLT GR8 ZP | KOHLER 134 |
| | BON-000057 | 12 | 3/8-16 x 1 HEX BOLT GR8 ZP | KUBOTA 74 |
| | BON-000061 | | 3/8-16 x 2 HEX BOLT GR8 ZP | KOHLER 74 |
| 3 | LV-1607 | 1 | 2-1/4" SPLIT TAPER BUSHING | ALL |
| 2 | LV-1628 | 1 | STEP KEY | ALL |
| 1 | LV-1606 | 1 | 30" DIRECT DRIVE CCW FAN | KOHLER 134 |
| | LV-1631 | 1 | 27" DIRECT DRIVE CCW FAN | KOHLER 74 & KUBOTA 74 |
| REF | PART NO. | QTY | DESCRIPTION | ENGINE MODEL |

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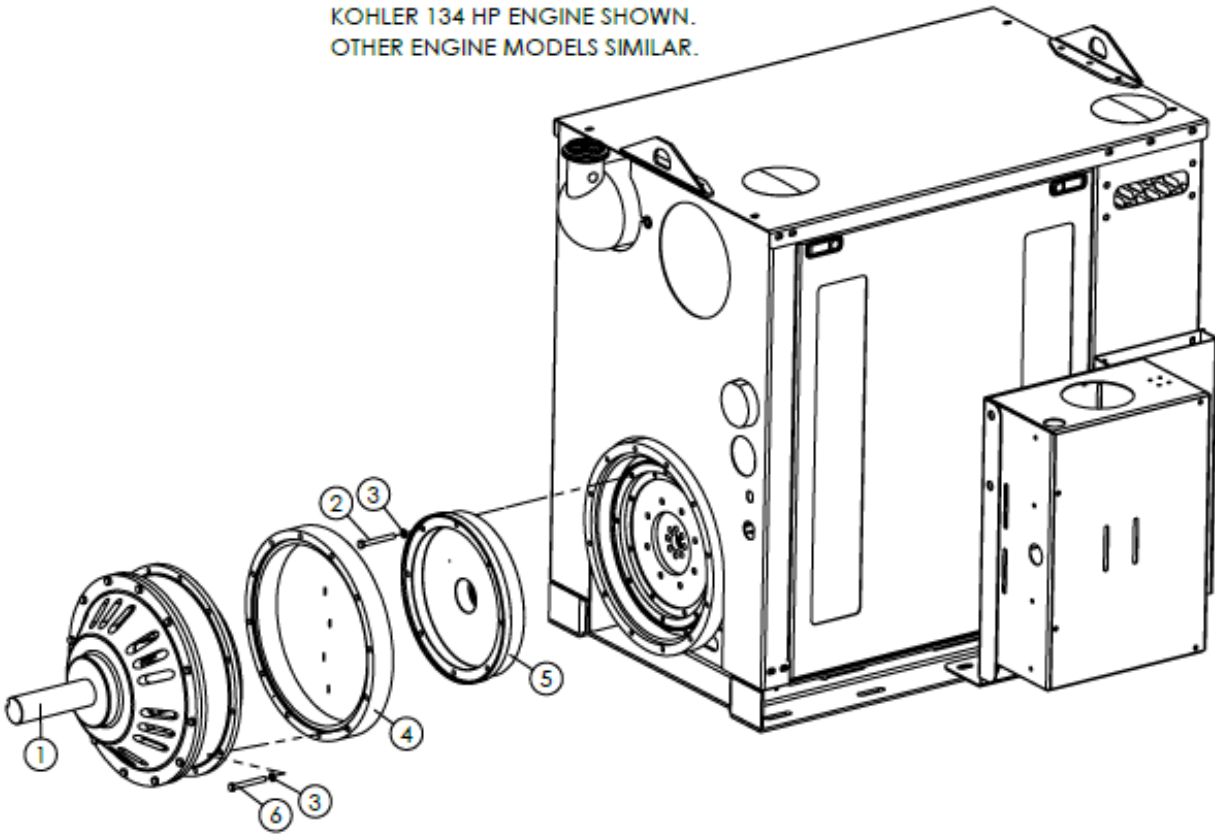
DIXON, ILLINOIS
PHONE: 800-851-9664

Parts Breakdowns

| | |
|-----------|-------|
| FILE NAME | M1175 |
| DWG NAME | M1175 |

SPARTAN FLUID COUPLER

KOHLER 134 HP ENGINE SHOWN.
OTHER ENGINE MODELS SIMILAR.



| REF | PART NO. | QTY | DESCRIPTION | ENGINE MODEL |
|-----|------------|-----|-----------------------------|------------------------|
| 6 | LV-2581 | 12 | 3/8-16 x 6 STUD | KOHLER 134 |
| | LV-2683 | | 3/8-16 x 4 STUD | KOHLER 74 |
| | BON-000058 | | 3/8-16 x 1-1/4 HEX BOLT GR8 | KUBOTA 74 |
| 5 | LV-2498 | 1 | FLYWHEEL ADAPTER | KOHLER 74 & KOHLER 134 |
| 4 | LV-2559 | 1 | HOUSING SPACER | KOHLER 74 & KOHLER 134 |
| 3 | BON-000352 | 20 | 3/8 LOCK WASHER ZP | ALL |
| | BON-000058 | | 3/8-16 x 1-1/4 HEX BOLT GR8 | KUBOTA 74 |
| 2 | BON-000066 | 8 | 3/8-16 x 3-1/4 HEX BOLT GR8 | KOHLER 74 & KOHLER 134 |
| | LV-1293 | | 1 | FLUID POWER TAKEOFF |

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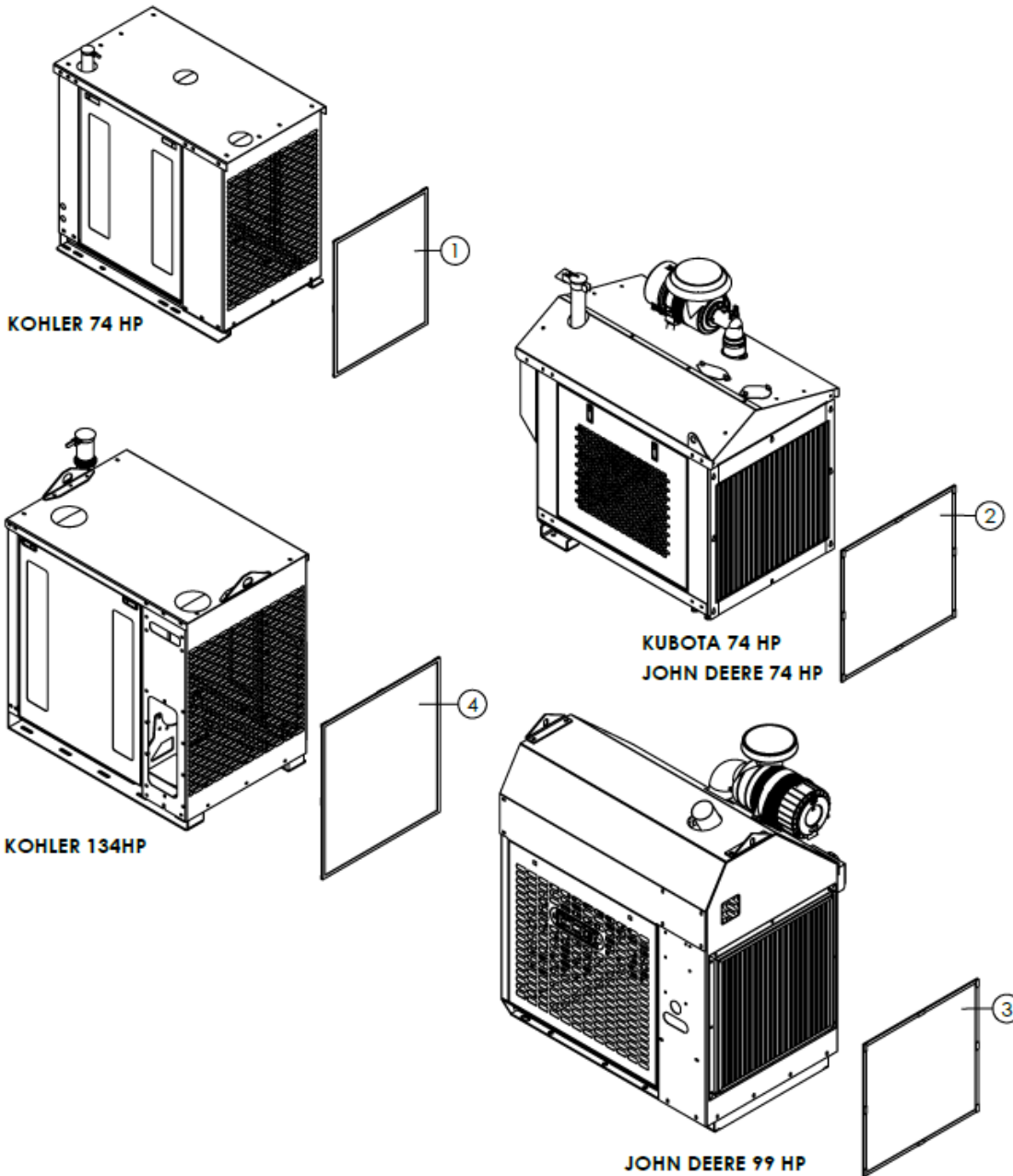
BONNELL
INDUSTRIES INC
TRUCK & ROAD EQUIPMENT

DIXON, ILLINOIS
PHONE: 800-851-9664

10.11 ENGINE SCREEN ASSEMBLIES

| | |
|-----------|-----------------------|
| FILE NAME | M1157 |
| DWG NAME | M1157 (Rev: 03/01/22) |

TIER IV ENGINE PREScreens



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| | | | |
|-----|----------|-----|---------------------------------------|
| 4 | LV-2453 | 1 | 29 x 33 MAGNETIC PRESscreen |
| 3 | LV-2454 | 1 | 28-3/16 x 28-3/16 MAGNETIC PRESscreen |
| 2 | LV-2455 | 1 | 28 x 28 MAGNETIC PRESscreen |
| 1 | LV-4535 | 1 | 29 x 23 MAGNETIC PRESscreen |
| REF | PART NO. | QTY | DESCRIPTION |

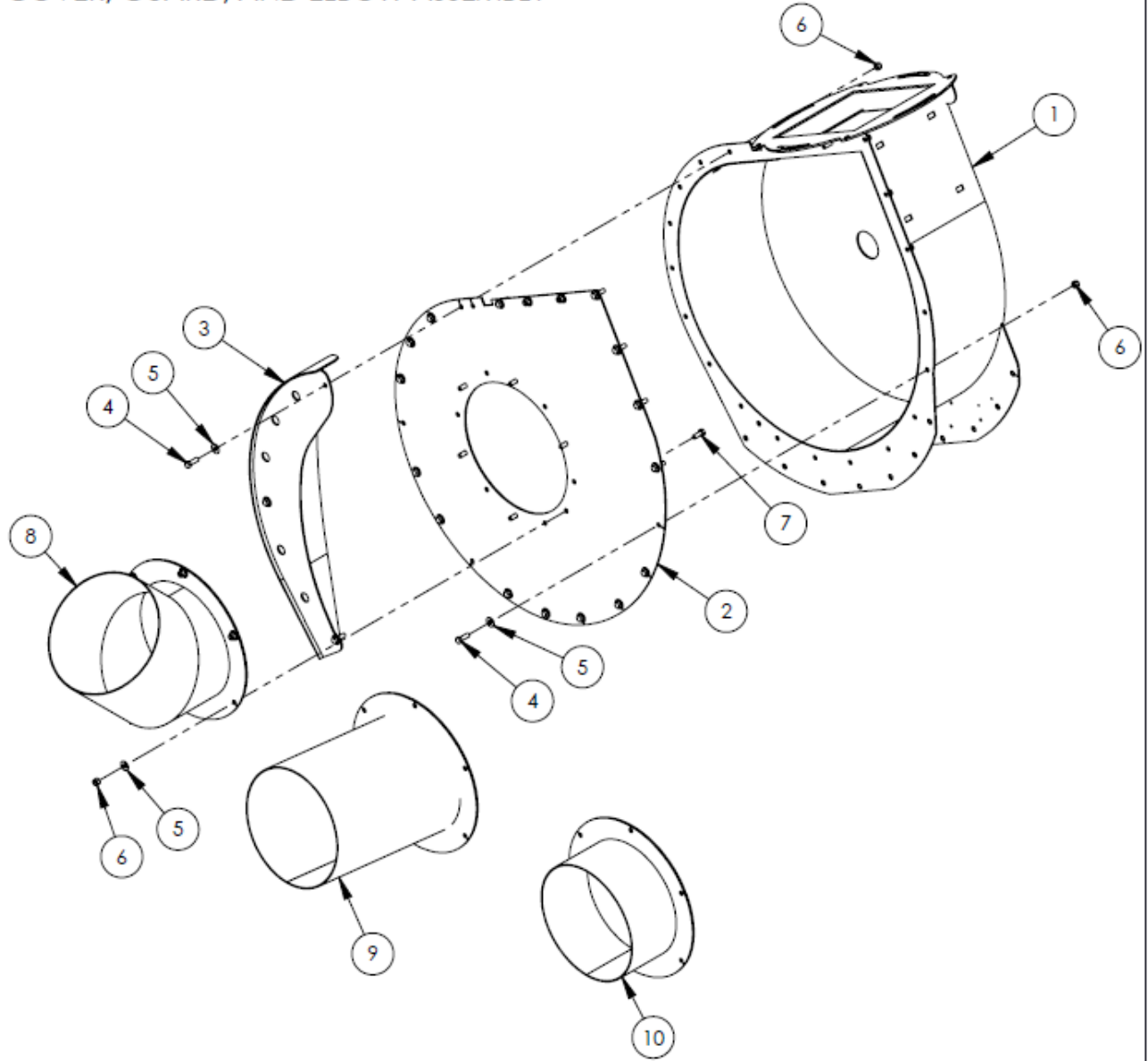
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 DIXON, ILLINOIS
 PHONE: 800-851-9664

Parts Breakdowns

10.12 COVER, GUARD AND ELBOW ASSEMBLY

| | | | | | |
|-----------|-------|------|-------------|-----------|----------|
| FILE NAME | M1483 | REV. | DESCRIPTION | DATE | INITIALS |
| DWG NAME | M1483 | - | ORIGINAL | 1/16/2023 | JWH |

COVER, GUARD, AND ELBOW ASSEMBLY



| | | | |
|------|-------------|-----|--|
| 10 | LV-1425 | 1 | HOSE ADAPTER - SHORT |
| 9 | LV-1346 | 1 | HOSE ADAPTER - 6 DEG INCLINE- MAN ARM |
| 8 | LV-1027 | 1 | HOSE ADAPTER - 135 DEG ELBOW - HYD ARM |
| 7 | BON-000106 | 6 | 1/2"-13 X 1-1/4" HHCS |
| 6 | BON-000321 | 27 | 1/2"-13 LOCKNUT, NYLON |
| 5 | BON-000340 | 27 | 1/2" FLAT WASHER |
| 4 | BON-000107 | 21 | 1/2"-13 X 1-1/2" HHCS |
| 3 | LV-2086 | 1 | SPARTAN DEBRIS DEFLECTOR |
| 2 | LV-1025 | 1 | BLOWER HOUSING COVER |
| 1 | LV-2022T4 | 1 | SPARTAN BLOWER HOUSING - RH PICKUP |
| ITEM | PART NUMBER | QTY | DESCRIPTION |

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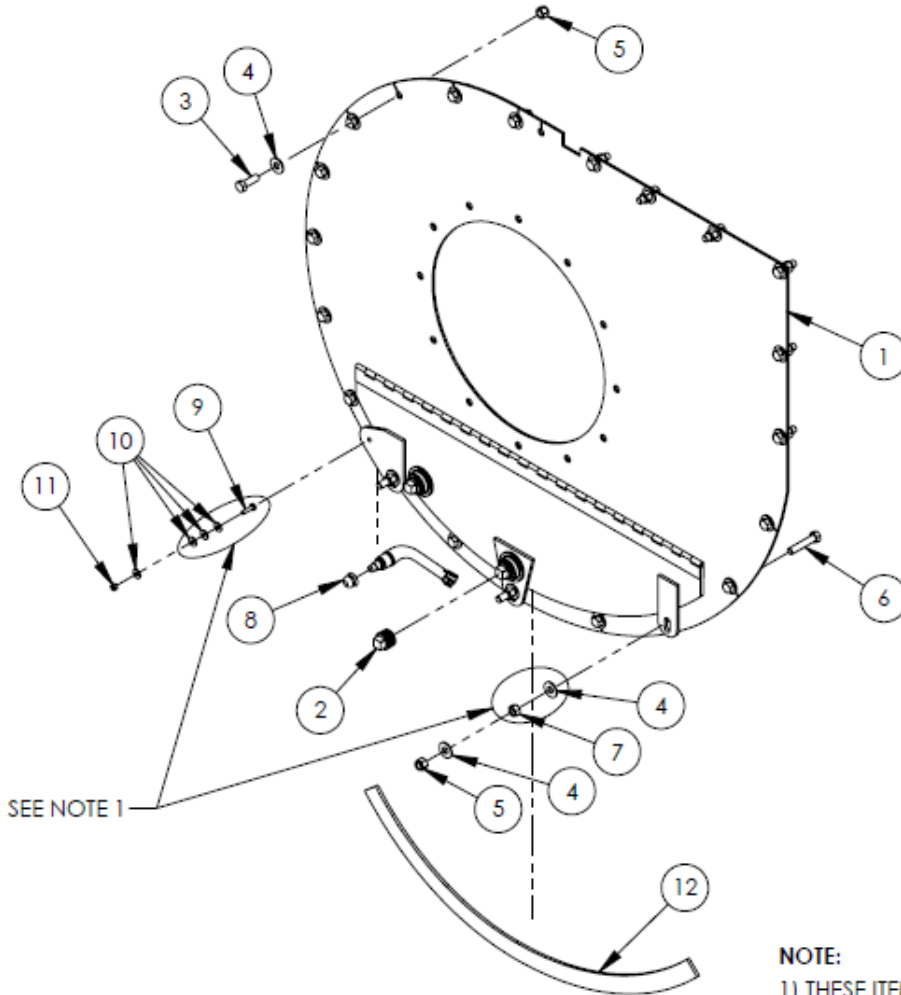
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PHONE: 800-851-9664

Parts Breakdowns

10.13 BLOWER HOUSING COVER WITH CLEAN OUT DOOR ASSEMBLY

| | | | | | |
|-----------|-------|------|-------------|-----------|----------|
| FILE NAME | M1489 | REV. | DESCRIPTION | DATE | INITIALS |
| DWG NAME | M1489 | - | ORIGINAL | 1/17/2023 | JWH |

BLOWER HOUSING WITH CLEAN OUT DOOR ASSEMBLY



NOTE:

- 1) THESE ITEMS TO BE INSTALLED BETWEEN THE HOUSING COVER AND THE CLEANOUT DOOR TABS
- 2) ITEM 12 ADHERES TO HOUSING COVER AND OVERLAPS CLEANOUT DOOR BY 1/4"

| | | | |
|------|--------------|-----|---------------------------------------|
| 12 | LV-1452 | 1 | 1/4"X1-1/2" RUBBER SEAL |
| 11 | BON-000318.5 | 1 | 1/4"-20 LOCKNUT, NYLON |
| 10 | BON-000336 | 4 | 1/4" FLAT WASHER |
| 9 | BON-000005 | 1 | 1/4"-20 X 1" HHCS |
| 8 | LV-1393 | 1 | PUSH BUTTON SAFETY ASSY |
| 7 | BON-000305 | 1 | 1/2"-13 HEX NUT |
| 6 | BON-000111FT | 3 | 1/2"-13 X 2-1/2" HHCS FULL THREAD |
| 5 | BON-000321 | 21 | 1/2"-13 LOCKNUT, NYLON |
| 4 | BON-000340 | 24 | 1/2" FLAT WASHER |
| 3 | BON-000107 | 18 | 1/2"-13 X 1-1/2" HHCS |
| 2 | BON-000590 | 2 | 1" SQ HD PLUG |
| 1 | LV-1423 | 1 | BLOWER HOUSING COVER W/ CLEANOUT DOOR |
| ITEM | PART NUMBER | QTY | DESCRIPTION |

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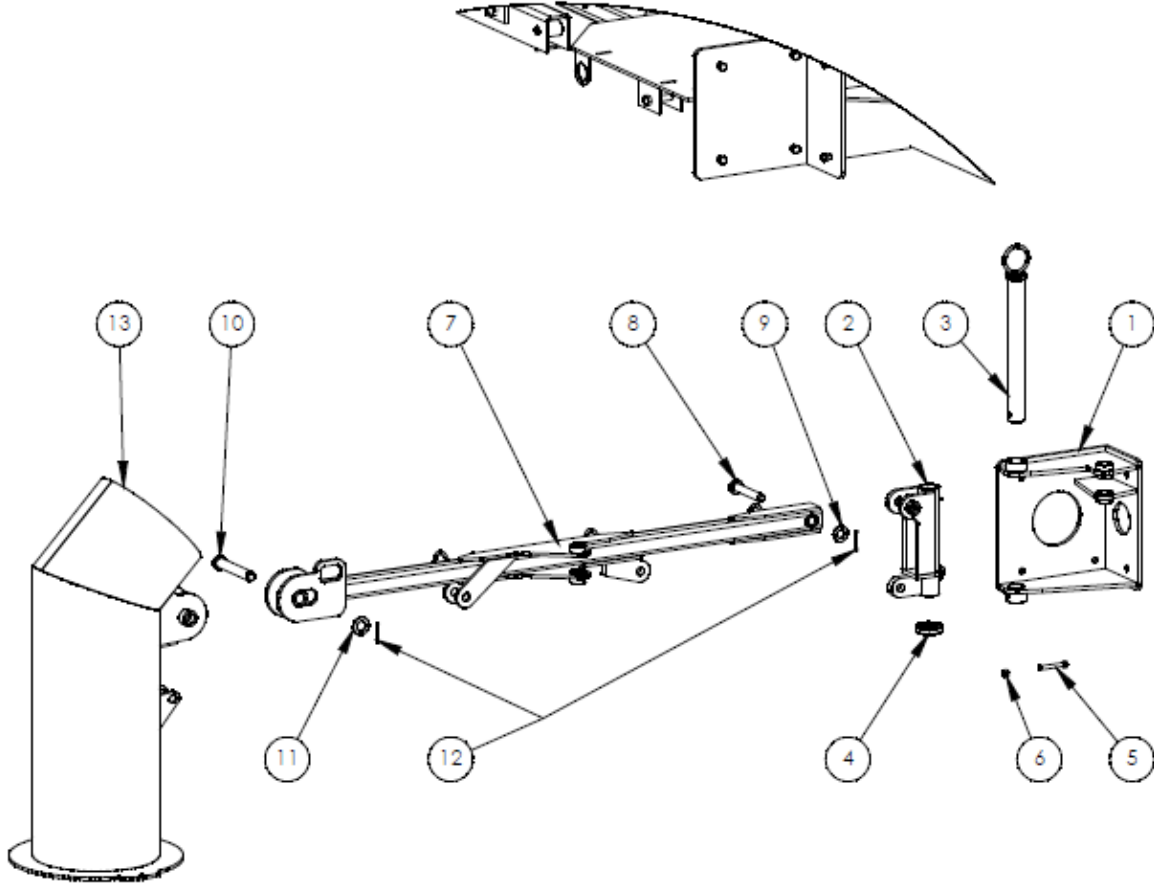
DOCUMENT 11.2

Parts Breakdowns

10.14 CONTROL ARM ASSEMBLY

| | | | | | | |
|-----------|-------|------|---|-------------|-----------|----------|
| FILE NAME | m1438 | REV. | | DESCRIPTION | DATE | INITIALS |
| DWG NAME | M1438 | | - | ORIGINAL | 11/2/2022 | EDG |

SPARTAN HYDRAULIC CONTROL ARM ASSEMBLY
BRACKET, ARM AND NOZZLE ASSEMBLY



| | | | |
|------|----------------|-----|--------------------------------------|
| 13 | LV-1355 | 1 | FIXED NOZZLE TUBE - LEAF VACUUM |
| 12 | BON-000602 | 2 | 1/4" X 2-1/2" ROLL PIN |
| 11 | BON-000346HD | 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-2354R | 1 | HOSE SUPPORT ARM - RIGHT HAND |
| 6 | BON-000321 | 1 | 1/2-13 NYLON LOCK 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-2350R | 1 | PIVOT BRACKET - RIGHT HAND - SPARTAN |
| ITEM | PART NUMBER | QTY | DESCRIPTION |

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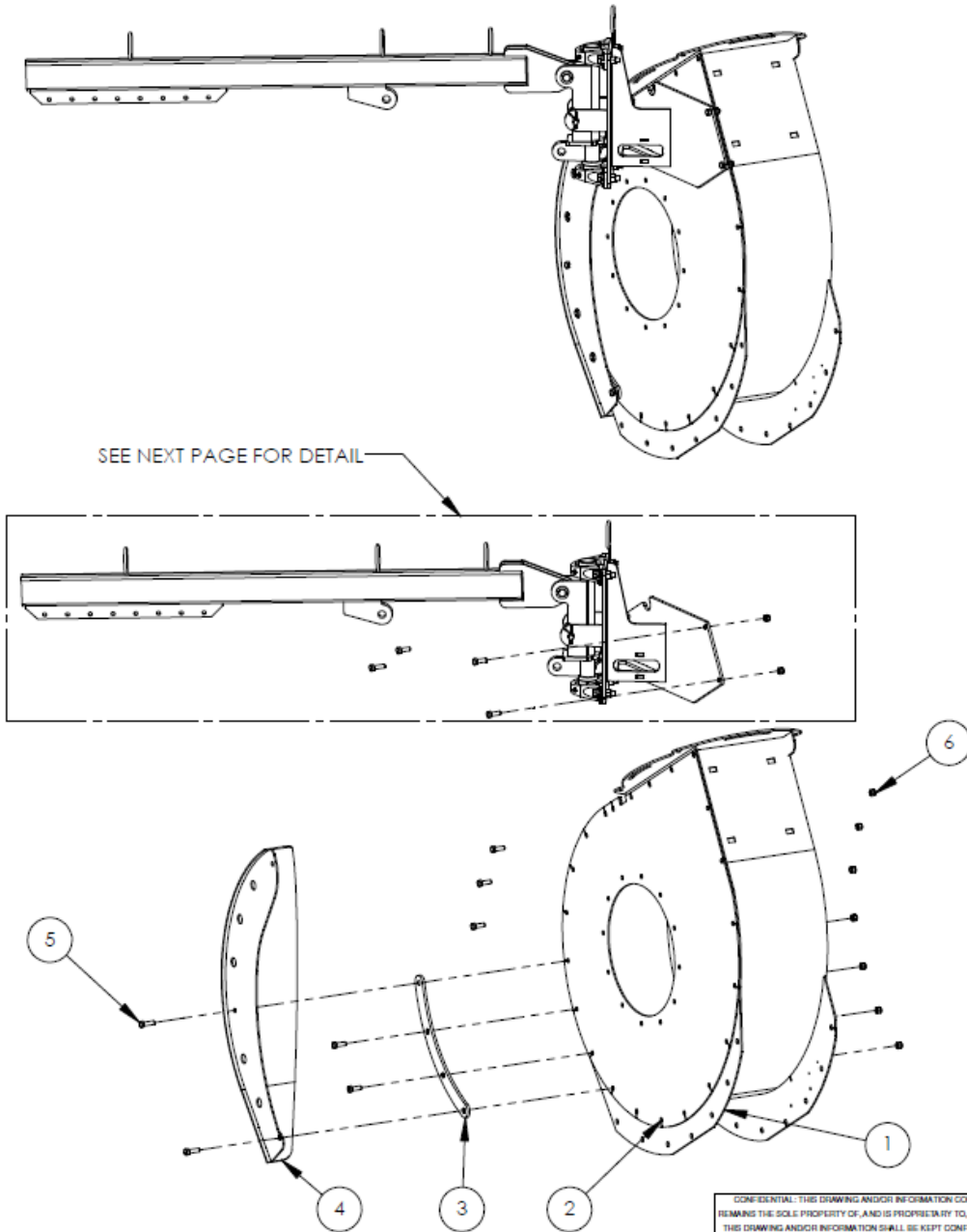


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Parts Breakdowns

10.15 OVERHEAD BOOM BRACKET, DEBRIS SHIELD SPACER AND SHIELD

| FILE NAME | SPRTN OVERHEAD BOOM ARM | REV. | DESCRIPTION | DATE | INITIALS |
|-----------|-------------------------|------|-------------|----------|----------|
| DWG NAME | SPRTN OVERHEAD BOOM | - | ORIGINAL | 2/9/2022 | EDG |



| 6 | 22 | BON-000321 | NUT, NYLON LOCKING, 1/2-13 |
|------|-----|-------------|------------------------------------|
| 5 | 22 | BON-000108 | HEX BOLT, 1/2-13 X 1-3/4" |
| 4 | 1 | LV-2086 | DEBRIS SHIELD |
| 3 | 1 | LV-1684 | DEBRIS SHIELD SPACER |
| 2 | 1 | LV-1025 | BLOWER HOUSING COVER |
| 1 | 1 | LV-2022 | BLOWER HOUSING - RIGHT HAND PICKUP |
| ITEM | QTY | PART NUMBER | DESCRIPTION |

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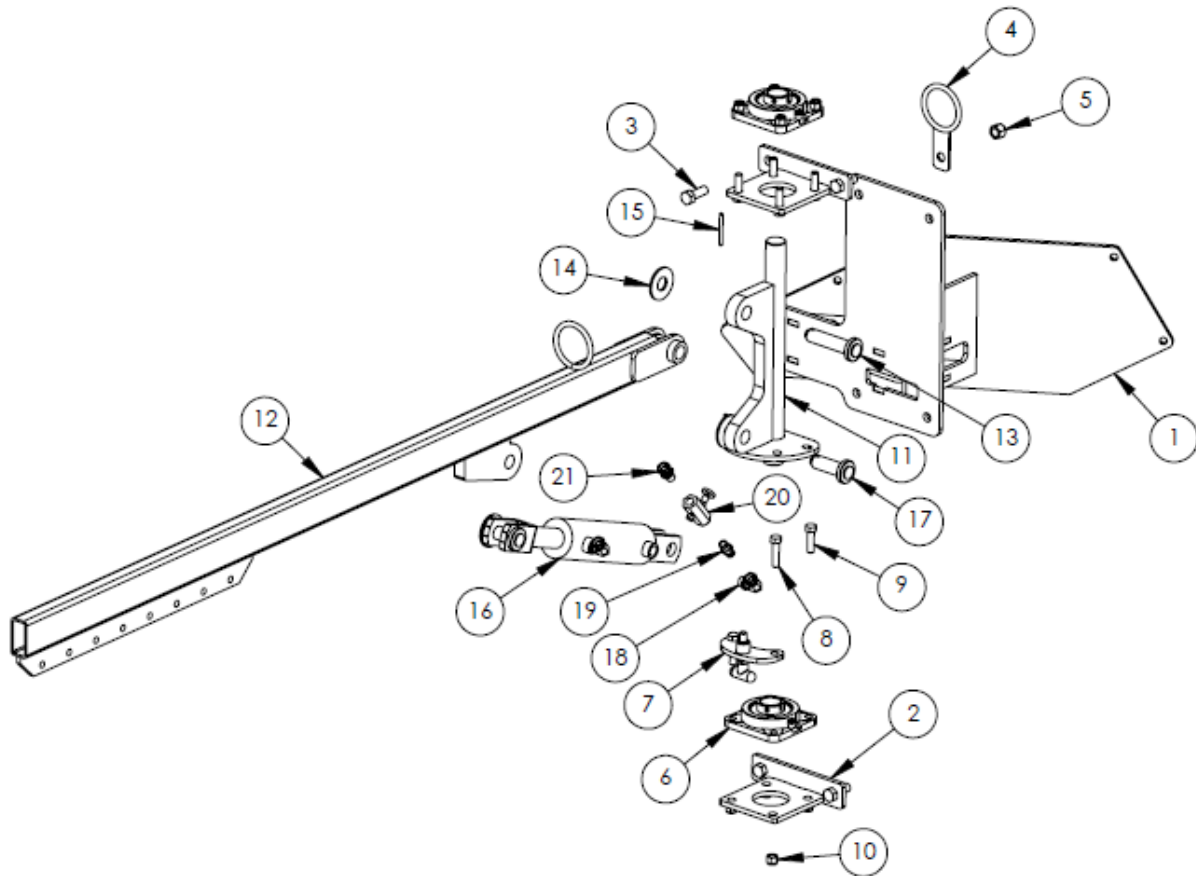
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DOCUMENT 12.2

Parts Breakdowns

10.16 OVERHEAD BOOM ARM & BRACKET

| FILE NAME | M1429 | REV. | DESCRIPTION | DATE | INITIALS |
|-----------|-------|------|-------------|-----------|----------|
| DWG NAME | M1429 | - | ORIGINAL | 9/22/2022 | JWH |



| | | | |
|------|-----|----------------|--|
| 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-1694 | MOUNT, OVERHEAD BOOM ARM |
| ITEM | QTY | PART NUMBER | DESCRIPTION |

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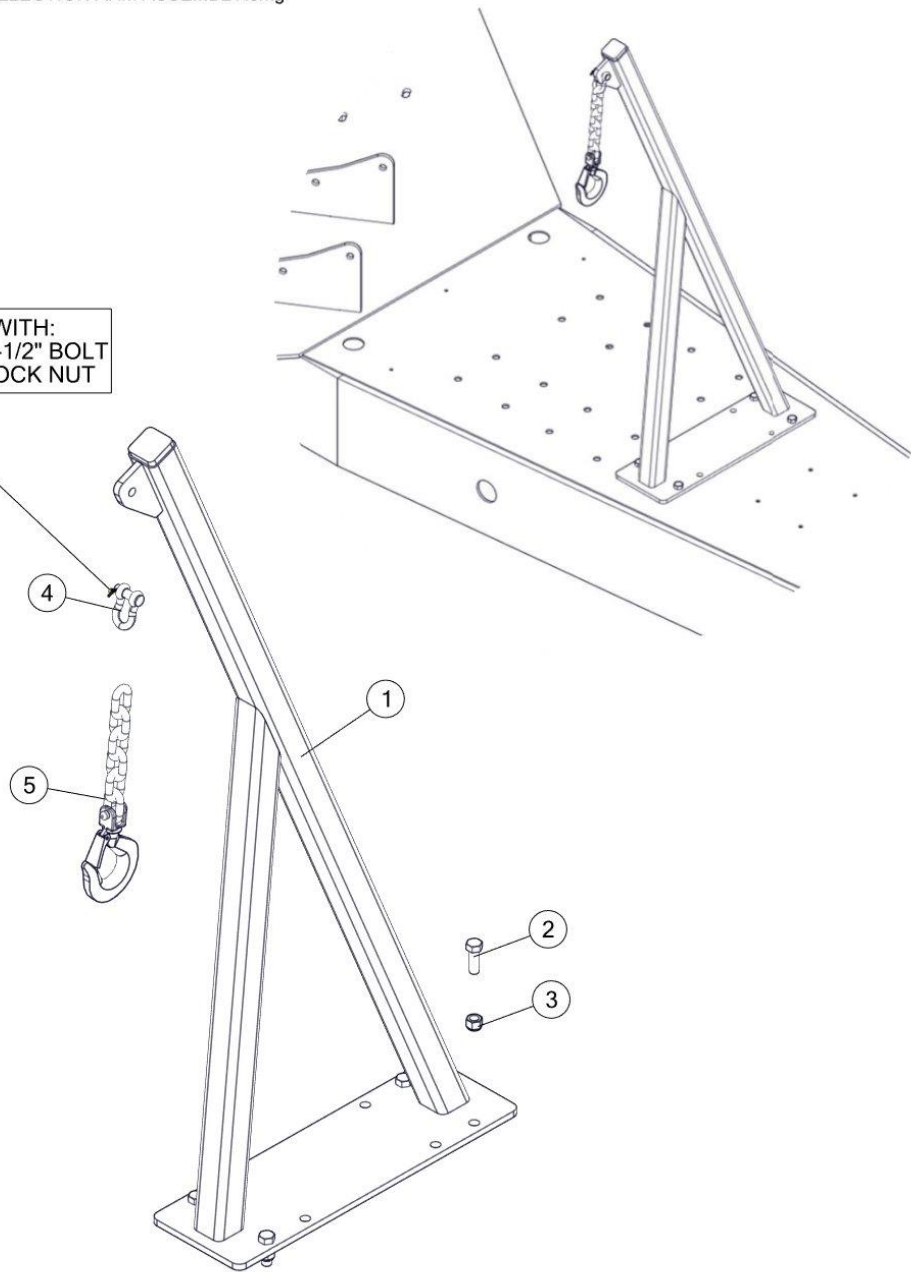
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PHONE: 800-851-9664

10.17 HOSE ARM SUPPORT ASSEMBLY

HOSE ARM SUPPORT ASSEMBLY

021618 SPARTAN HYDRAULIC COLLECTION ARM ASSEMBLY.smg

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

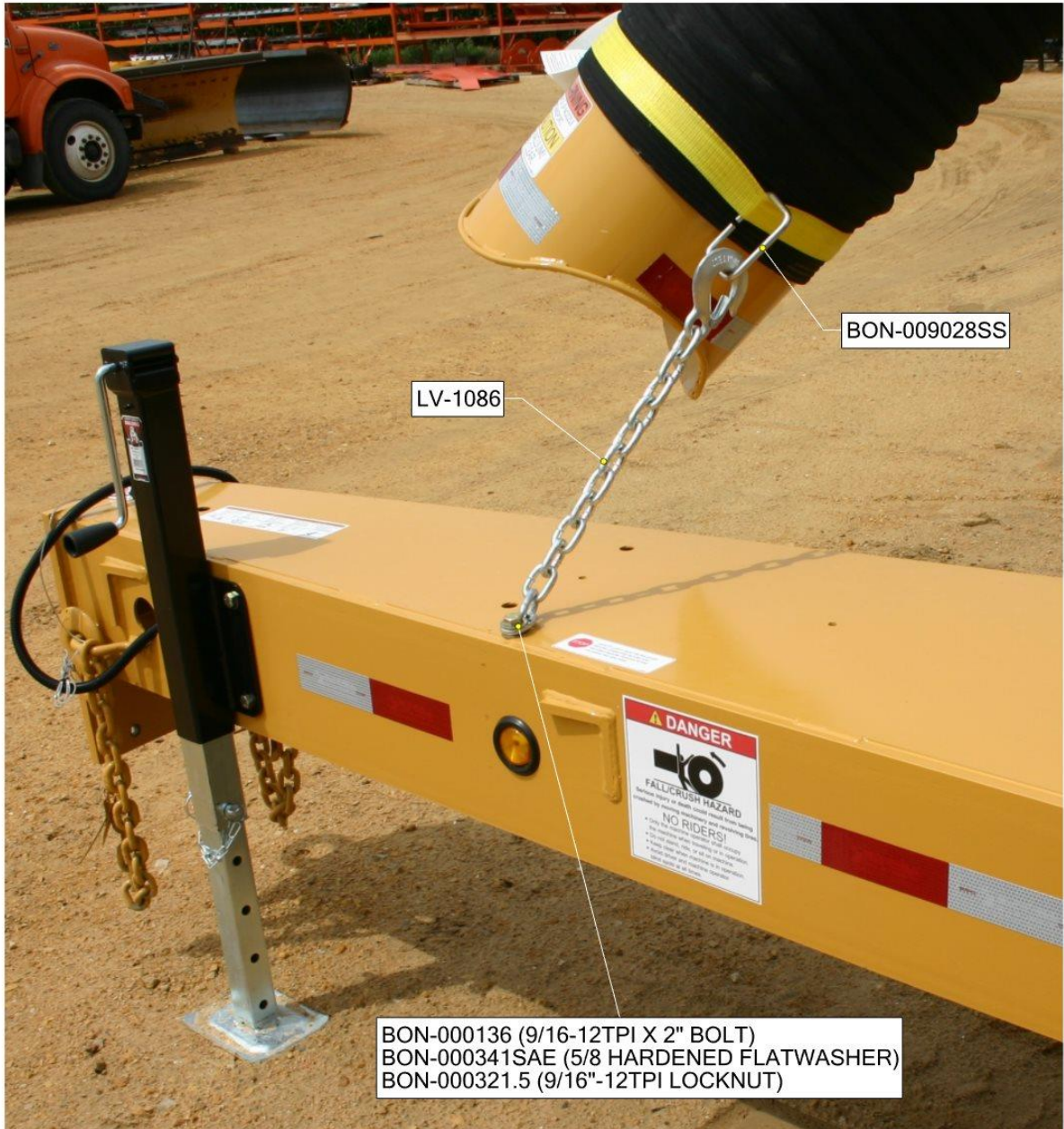


| BOM ID | PartNo (config) | Description (config) |
|--------|-----------------|---|
| 1 | LV-2025 | HOSE ARM SUPPORT WELDMENT |
| 2 | BON-000107 | 1/2-13 x 1-1/2" BOLT |
| 3 | BON-000321 | NYLON INSERT LOCKNUT, 1/2-13 UNC |
| 4 | BON-000660.6 | ROUND PIN ANCHOR SHACKLE 3/8" 1 TON RPAS S213 |
| 5 | LV-2024 | SPARTAN 6 LINK HOSE ARM TIE UP CHAIN |

10.18 **MANUAL UNDER CARRIAGE HOSE STOWING ASSEMBLY**

MANUAL UNDER CARRIAGE HOSE STOWING ASSEMBLY

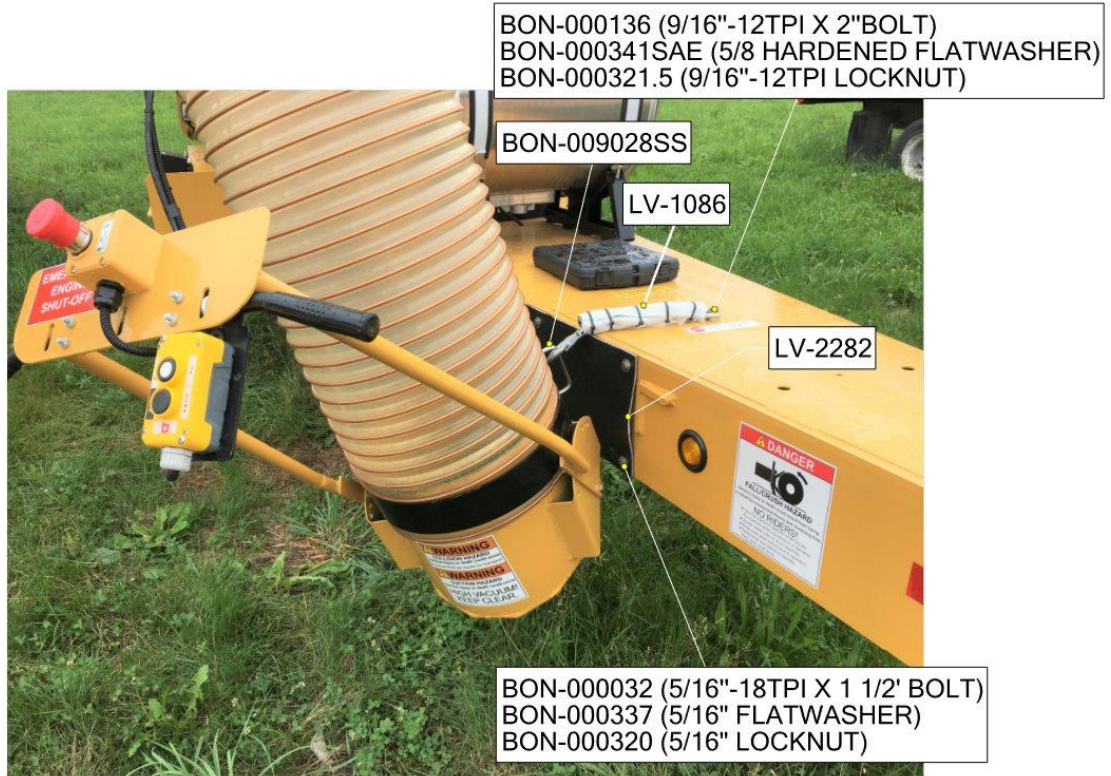
101816 SPARTAN MANUAL UNDER CARRIAGE HOSE STOWING ASSEMBLY.smg



10.19 OVERHEAD BOOM HOSE STOWING ASSEMBLY

OVERHEAD BOOM HOSE STOWING ASSEMBLY

070821 SPARTAN OVERHEAD BOOM HOSE STOWING ASSEMBLY REV1.SMG



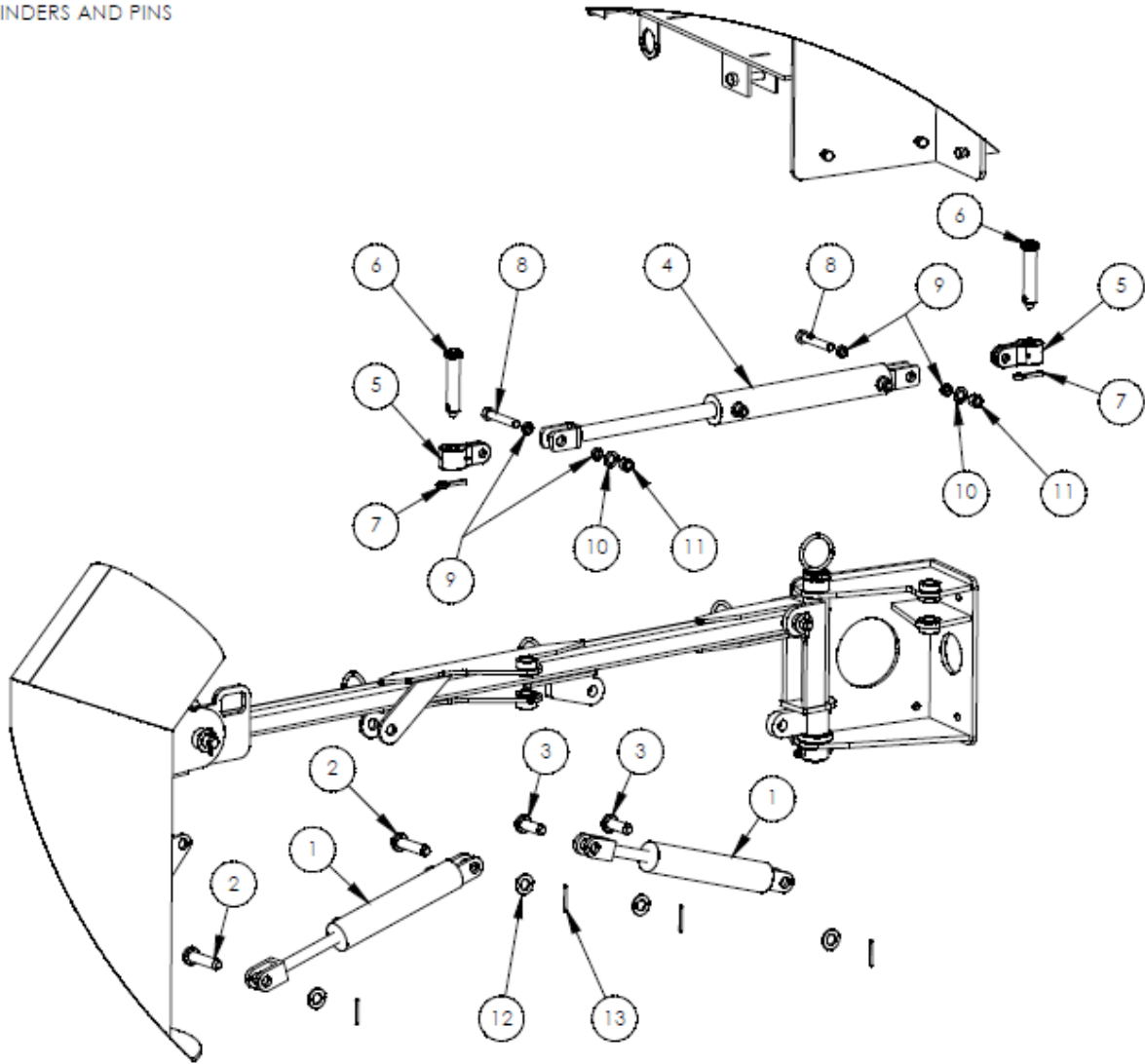
DOCUMENT 12.6

Parts Breakdowns

10.20 HYDRAULIC HOSE ARM CYLINDER ASSEMBLY

| FILE NAME | m1439 | REV. | DESCRIPTION | DATE | INITIALS |
|-----------|-------|------|-------------|-----------|----------|
| DWG NAME | M1439 | - | ORIGINAL | 11/2/2022 | EDG |

SPARTAN HYDRAULIC COLLECTION ARM CYLINDER ASSEMBLY
CYLINDERS AND PINS



| 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 CYLINDER |
| 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 |
| ITEM | PART NUMBER | QTY | DESCRIPTION |

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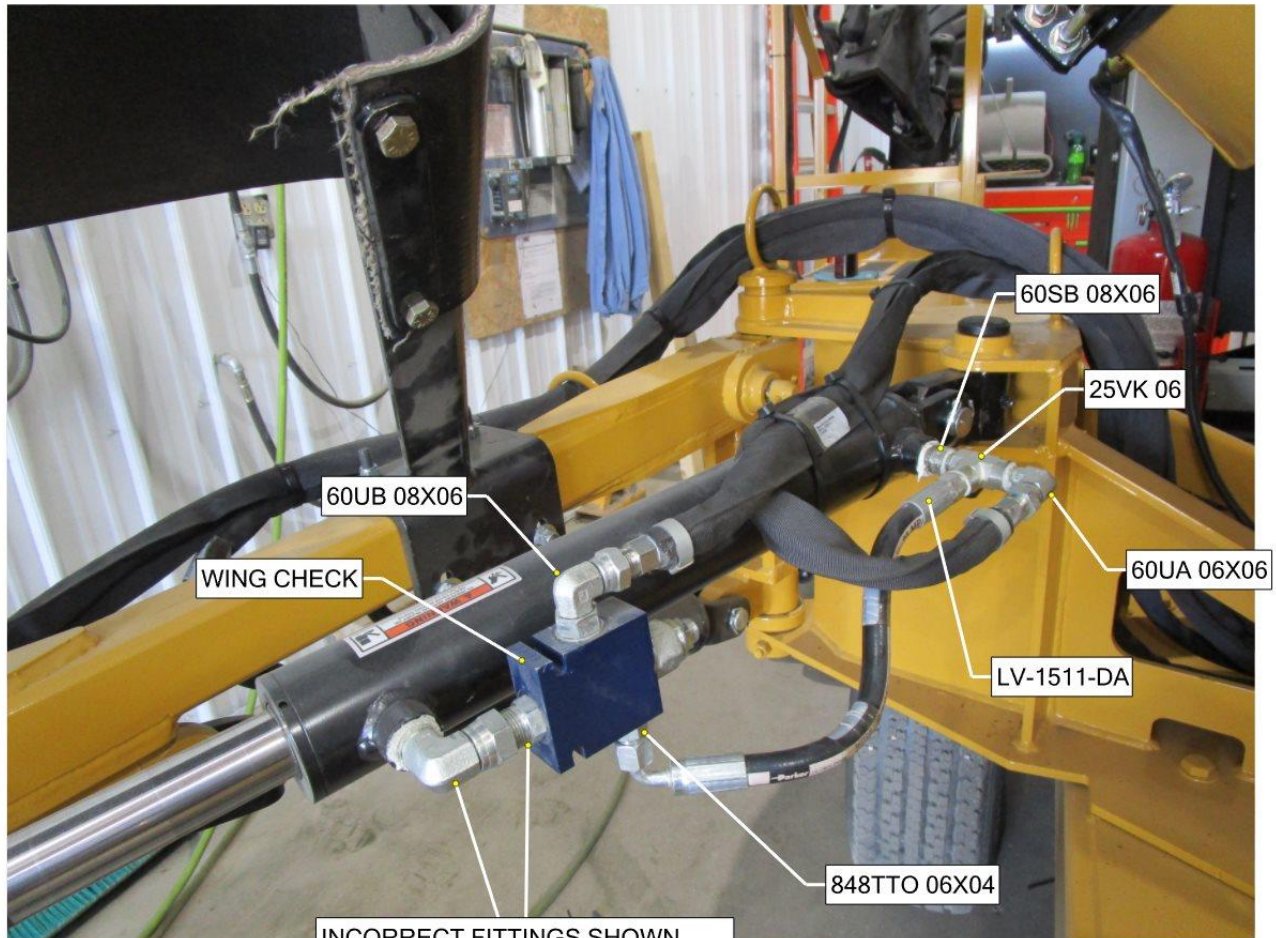
DOCUMENT 13.0

10.21 ARM CYLINDER COUNTER BALANCE ASSY – 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



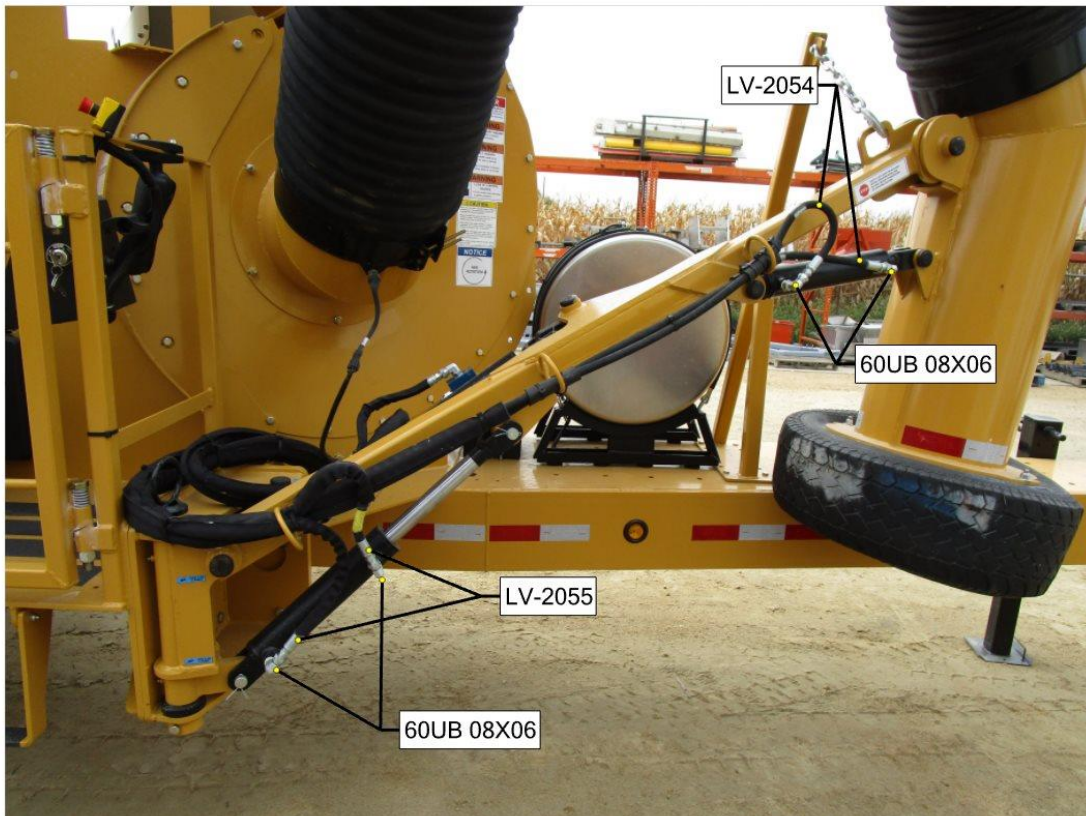
INCORRECT FITTINGS SHOWN
-USE FITTING: 6807-8-8 NWO
(SCREW INTO WING CHECK FIRST)

DOCUMENT 13.1

10.22 HYDRAULIC ARM HOSE & FITTINGS ASSY – PROPORTIONAL VALVE (NON WIRELESS & WIRELESS)

HYDRAULIC ARM HOSE ASSEMBLY
(PROPORTIONAL VALVE ASSEMBLY (NON WIRELESS & WIRELESS))

021021 SPARTAN PROPORTIONAL HYDRAULIC ARM HOSE ASSEMBLY REV1.smg



DOCUMENT 13.2

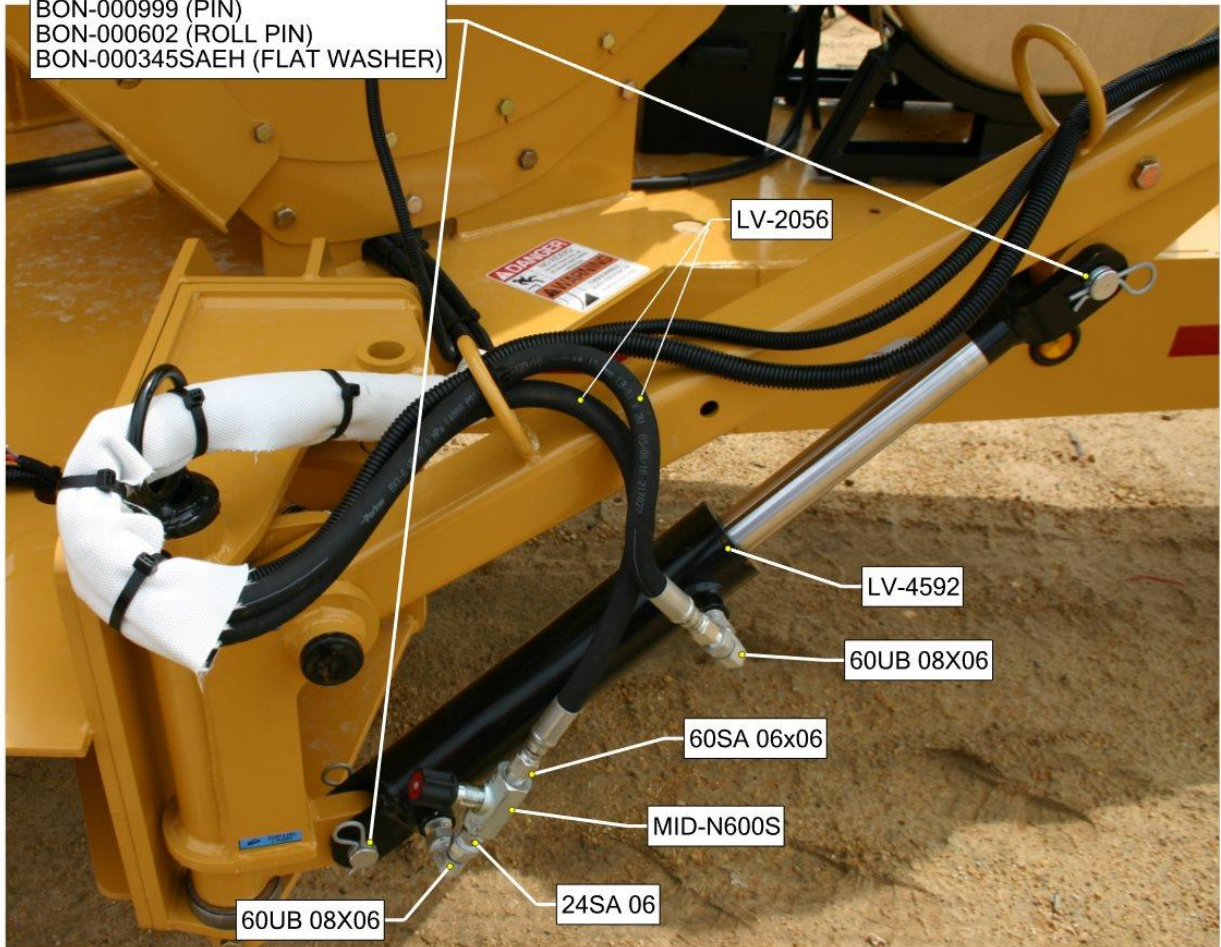
10.23 MANUAL UNDER CARRIAGE ARM CYLINDER ASSEMBLY

MANUAL UNDER CARRIAGE ARM CYLINDER ASSEMBLY

0210521 SPARTAN MANUAL UNDER CARRIAGE ARM CYLINDER ASSEMBLY REV1.smg



REPLACE CYLINDER PINS WITH:
BON-000999 (PIN)
BON-000602 (ROLL PIN)
BON-000345SAEH (FLAT WASHER)



DOCUMENT 13.3

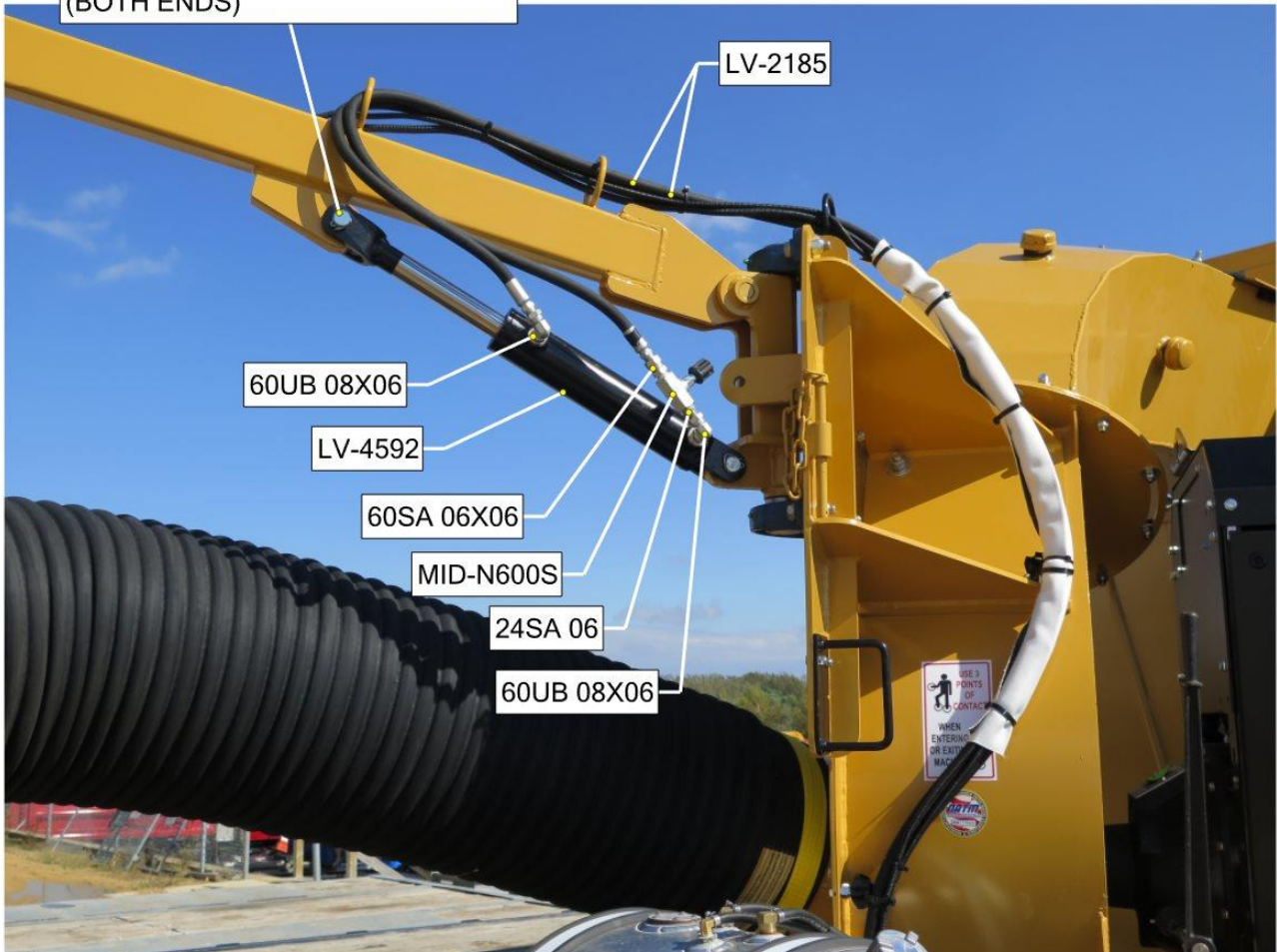
10.24 OVERHEAD BOOM CYLINDER AND HOSES FOR MANUAL ARM

SPARTAN - OVERHEAD BOOM CYLINDER AND HOSE ASSEMBLY

021121 SPARTAN OVERHEAD BOOM CYLINDER AND HOSE ASSEMBLY REV0.SMG



REPLACE CYLINDER PINS WITH:
BON-000999 (PIN)
BON-000602 (ROLL PIN)
BON-000345SAEH (FLAT WASHER)
(BOTH ENDS)



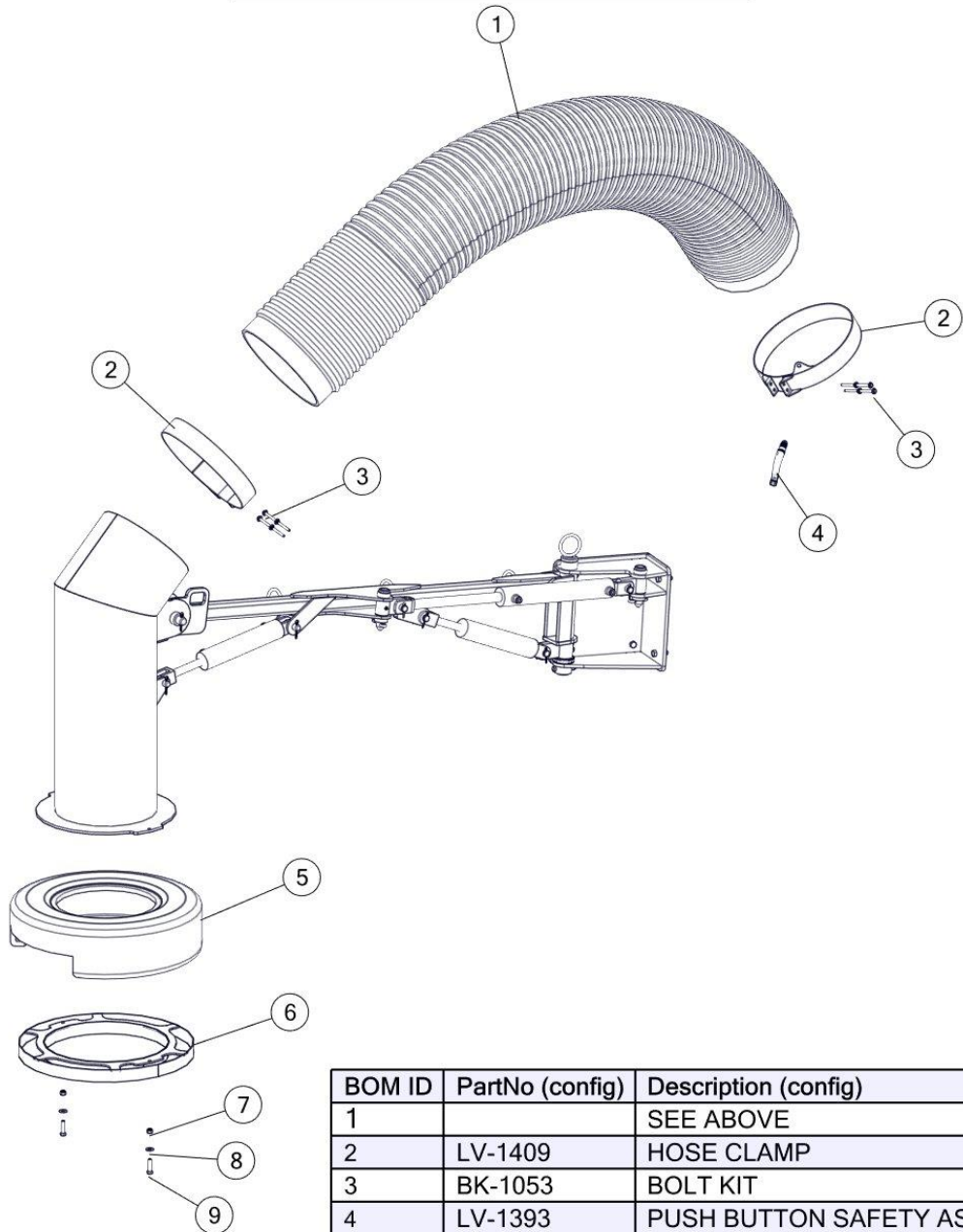
DOCUMENT 13.5

10.25 HOSE, TIRE NOZZLE, TUBE CLAMP AND SAFETY BRACKET ASSEMBLY

HOSE, TIRE NOZZLE, TUBE CLAMP AND SAFETY BRACKET ASSEMBLY

081219 SPARTAN HYDRAULIC COLLECTION ARM ASSEMBLY REV2.smg

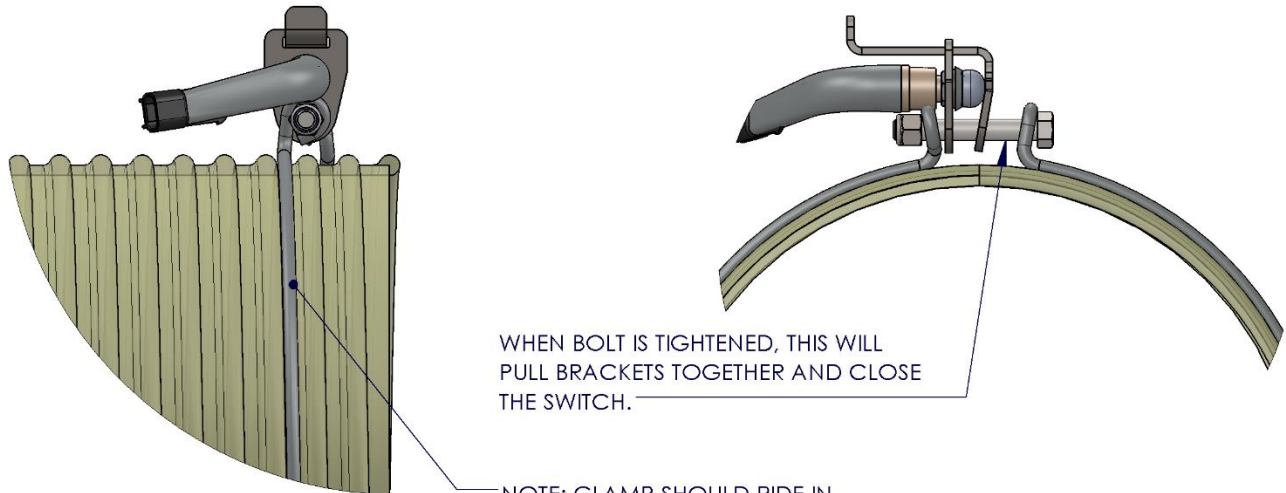
LV-1184 (16"X10' HEAVY DUTY RUBBER HOSE)
LV-1347 (16"X10' FLEX-THANE VHD HOSE)



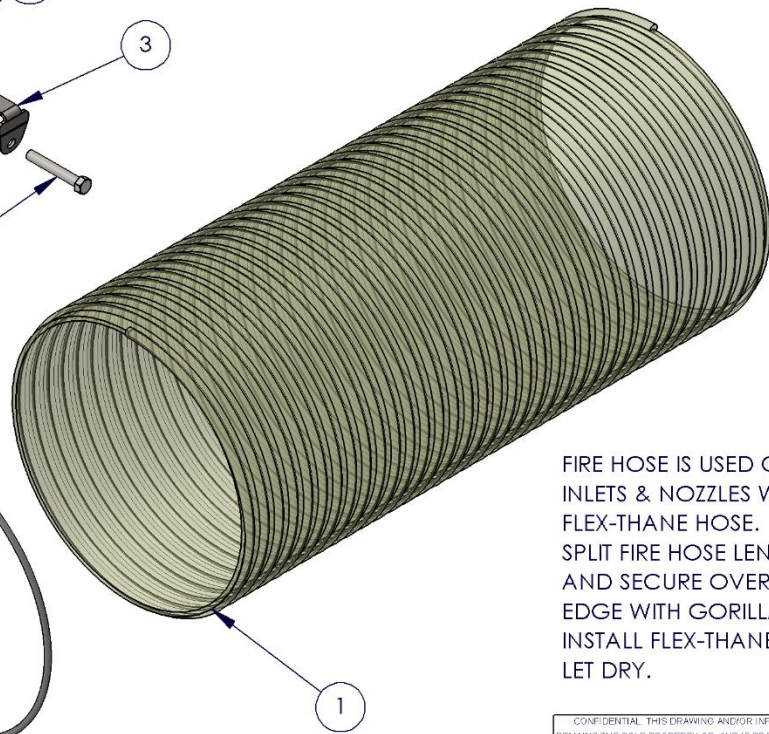
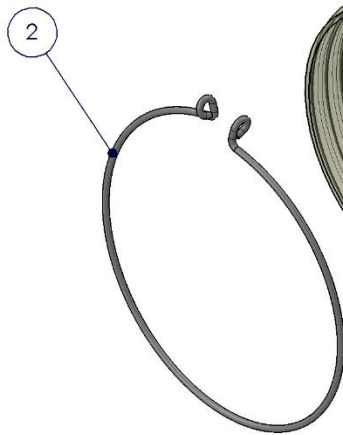
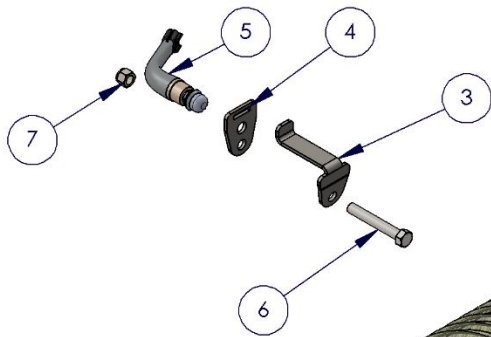
| BOM ID | PartNo (config) | Description (config) |
|--------|-----------------|----------------------------------|
| 1 | | SEE ABOVE |
| 2 | LV-1409 | HOSE CLAMP |
| 3 | BK-1053 | BOLT KIT |
| 4 | LV-1393 | PUSH BUTTON SAFETY ASSEMBLY |
| 5 | LV-1042 | TIRE NOZZLE |
| 6 | LV-1043 | TIRE RETAINER |
| 7 | BON-000321 | NYLON INSERT LOCKNUT, 1/2-13 UNC |
| 8 | BON-000340 | FLAT WASHER, 1/2 |
| 9 | BON-000111 | 1/2-13 x 2-1/2" BOLT |

Parts Breakdowns

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



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.

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| | | | |
|------|-------------|-----|----------------------------------|
| 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 ASSEMBLY |
| 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 |
| ITEM | PART NUMBER | QTY | DESCRIPTION |

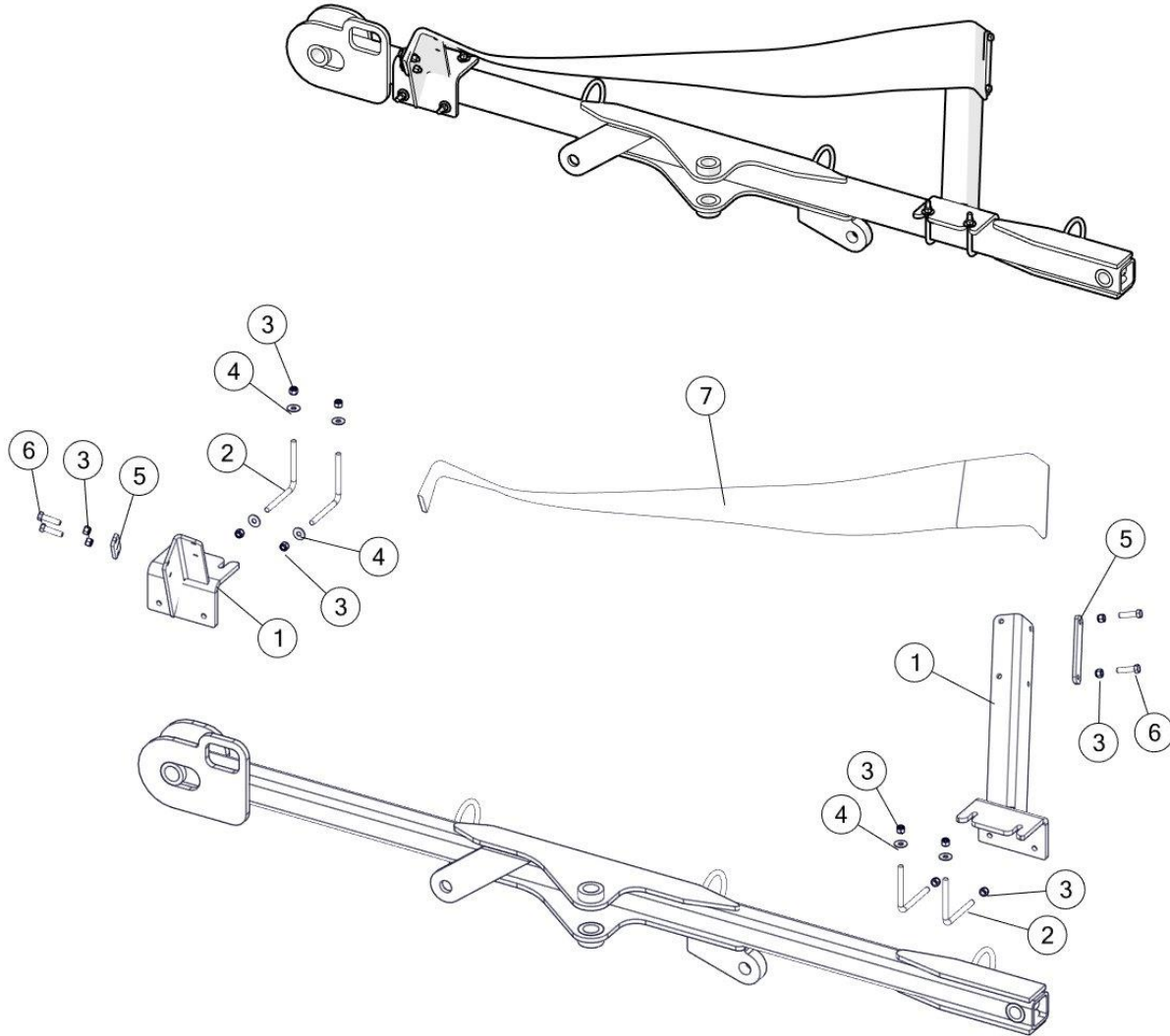


DIXON, ILLINOIS
PHONE: 800-851-9664

10.26 SUCTION HOSE HAMMOCK SUPPORT ASSEMBLY

SUCTION HOSE HAMMOCK SUPPORT ASSEMBLY

052418 LV-1370-EXP_REV1.smg



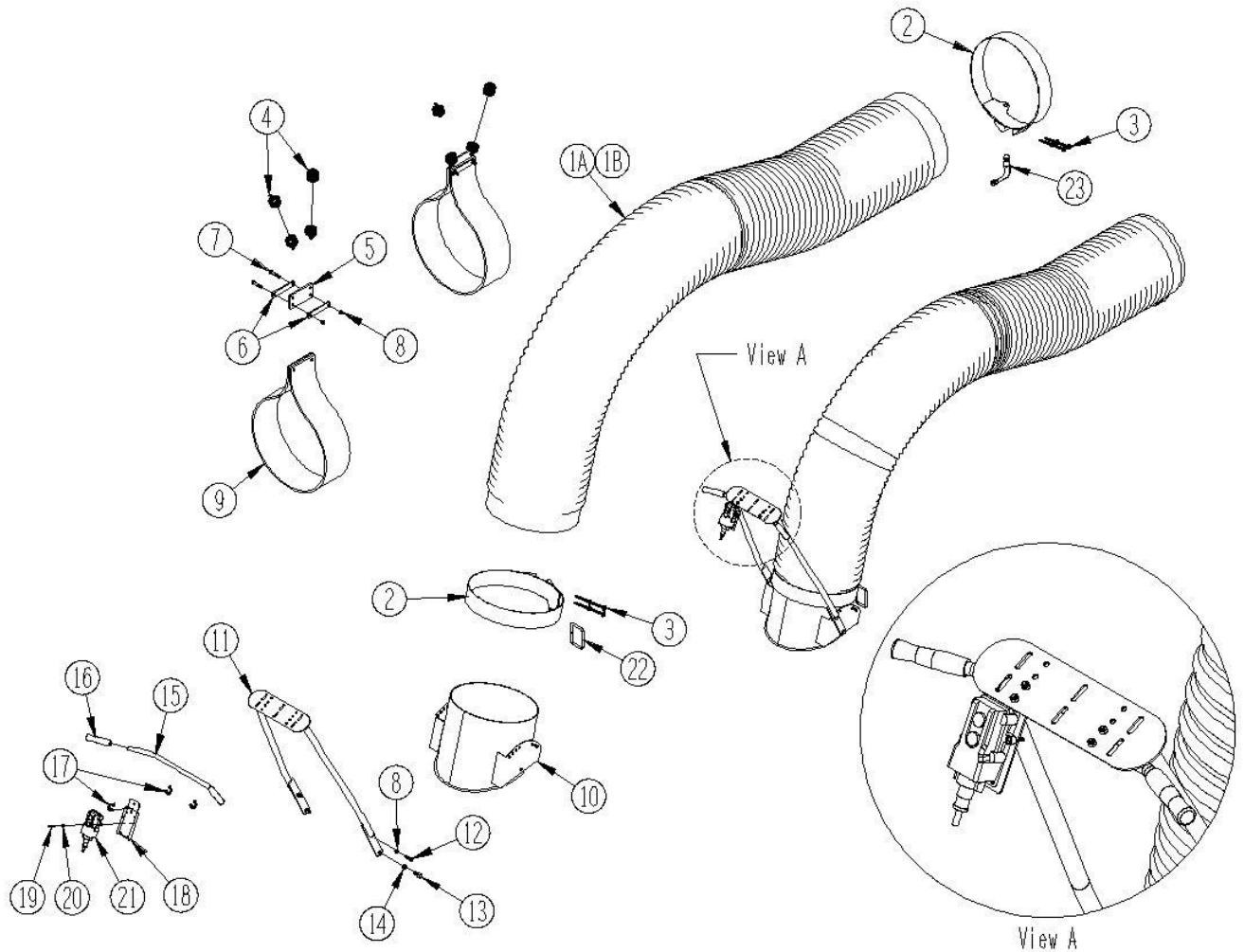
| BOM ID | PartNo (config) | Description (config) |
|--------|-----------------|------------------------------------|
| 1 | LV-1370 | SUCTION HOSE SUPPORT BRACKET |
| 2 | LV-1372 | L BOLT |
| 3 | BON-000319 | NYLON INSERT LOCKNUT, 3/8-16 UNC |
| 4 | BON-000338 | FLAT WASHER, 3/8 |
| 5 | LV-1313 | OUTER CLAMP STRIP FOR RUBBER STRAP |
| 6 | BON-000059 | 3/8-16 X 1-1/2" BOLT |
| 7 | LV-1371 | SUCTION HOSE HAMMOCK SUPPORT |

DOCUMENT 13.7

Parts Breakdowns

SPRINGS, STRAPS, HOSE PICKUP NOZZLE AND HANDLE ASSEMBLY - OVERHEAD BOOM LEAF VAC

111017 LV-2160 SPARTAN OVERHEAD BOOM HOSE ASSEMBLY



| ITEM | QTY | PART # | DESCRIPTION | ITEM | QTY | PART # | DESCRIPTION |
|------|-----|------------|--|------|-----|--------------|--|
| 1A | AR | LV-1184 | 16"X10' HEAVY DUTY RUBBER SUCTION HOSE | 12 | 2 | BDN-000058 | 3/8"-16TPI X 1 1/4" GRADE 8 BOLT |
| 1B | AR | LV-1347 | 16"X10' FLEX-THANE VHD SUCTION HOSE | 13 | 2 | BDN-000106 | 1/2"-13TPI X 1 1/4" GRADE 8 BOLT |
| 2 | 2 | LV-1409 | TUBE CLAMP | 14 | 2 | BDN-000321 | 1/2"-13TPI HEX LOCK NUT NYLON INSERT |
| 3 | 1 | BK-1053 | TUBE CLAMP BOLT KIT | 15 | 1 | LV-1216-1 | HOSE HANDLE |
| 4 | 4 | LV-1438 | HOSE SUPPORT SPRING | 16 | 2 | LV-1219 | HAND GRIPS |
| 5 | 2 | LV-1440 | INNER CLAMP STRIP | 17 | 3 | 3043T11 | ZINK PLATED STEEL U-BOLT |
| 6 | 4 | LV-1313 | OUTER CLAMP STRIP | 18 | 1 | LV-1429 | CONTROL BRACKET |
| 7 | 4 | BON-000061 | 3/8"-16TPI X 2" GRADE 8 BOLT | 19 | 2 | | 10-24 X 1-1/4" MACHINE SCREW |
| 8 | 6 | BON-000319 | 3/8"-16TPI HEX LOCK NUT NYLON INSERT | 20 | 2 | | 10-24 NUT WITH STAR WASHER |
| 9 | 2 | LV-1439 | RUBBER HOSE STRAP | 21 | AR | MON-03240 | POWER UP/POWER DOWN CONTROLLER W/ SHORT CORD |
| 10 | 1 | LV-1427 | HOSE PICKUP NOZZEL | 22 | 1 | BON-009028SS | DOOR HANDLE, STAINLESS STEEL |
| 11 | 1 | LV-1428 | ADJUSTABLE PICK UP HANDLE WELDMENT | 23 | 1 | LV-1393 | PUSH BUTTON SAFETY ASSEMBLY |



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PHONE: 800-851-9664

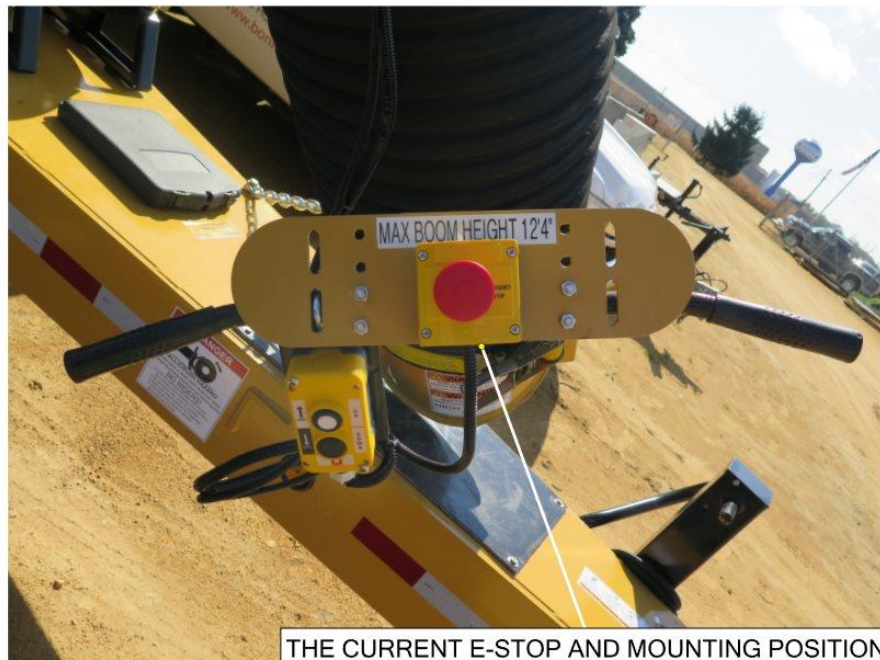
28

DOCUMENT 13.12

10.27 OVERHEAD BOOM SPRING, LABEL, AND E-STOP PLACEMENT

OVERHEAD BOOM SPRING, LABEL AND E-STOP PLACEMENT

SPARTAN OVERHEAD BOOM SPRING, LABEL & E-STOP PLACEMENT.SMG



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

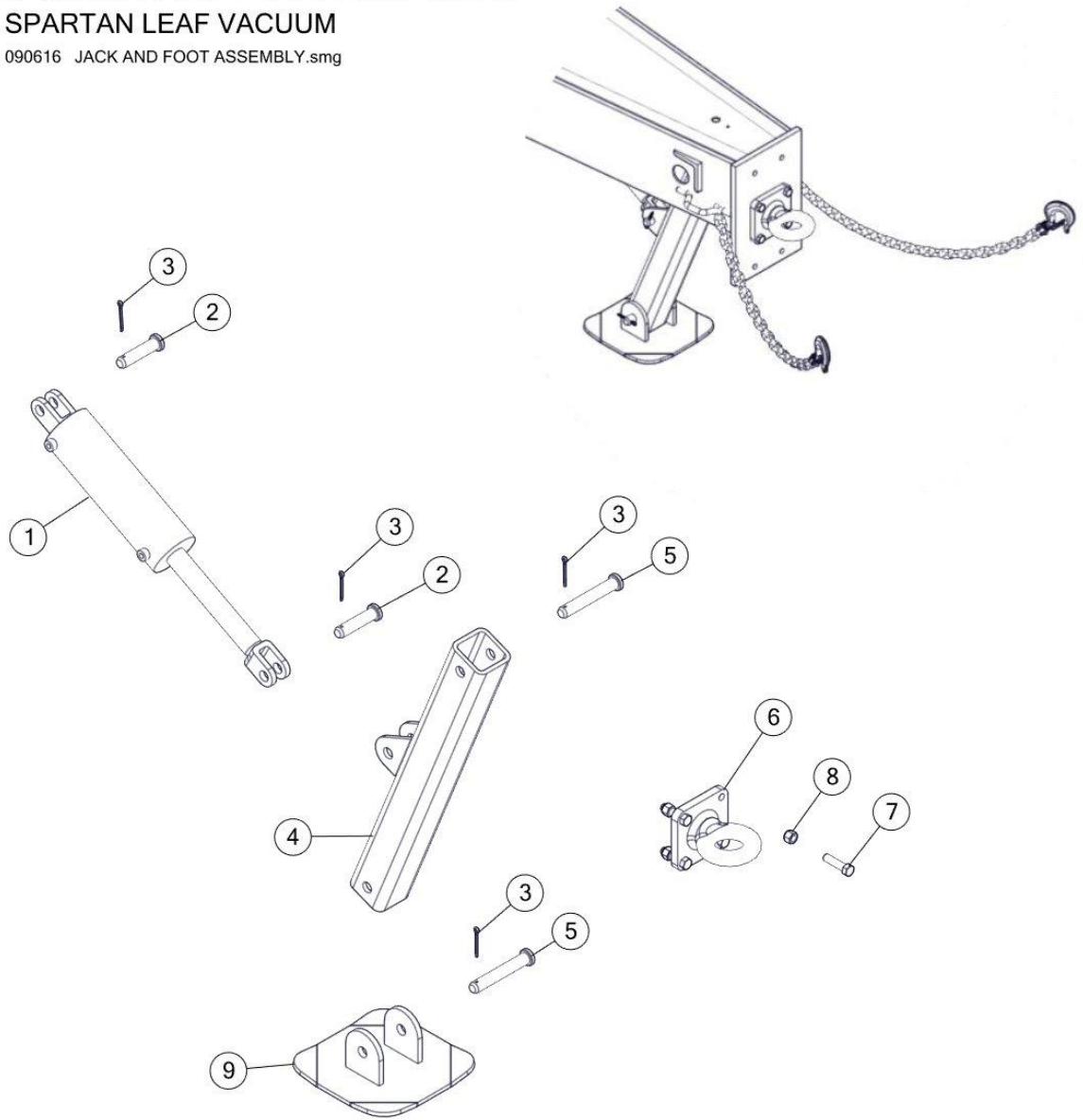
DOCUMENT 13.13

10.28 PINTLE EYE, JACK AND FOOT ASSEMBLY

PINTLE EYE, JACK AND FOOT ASSEMBLY

SPARTAN LEAF VACUUM

090616 JACK AND FOOT ASSEMBLY.smg

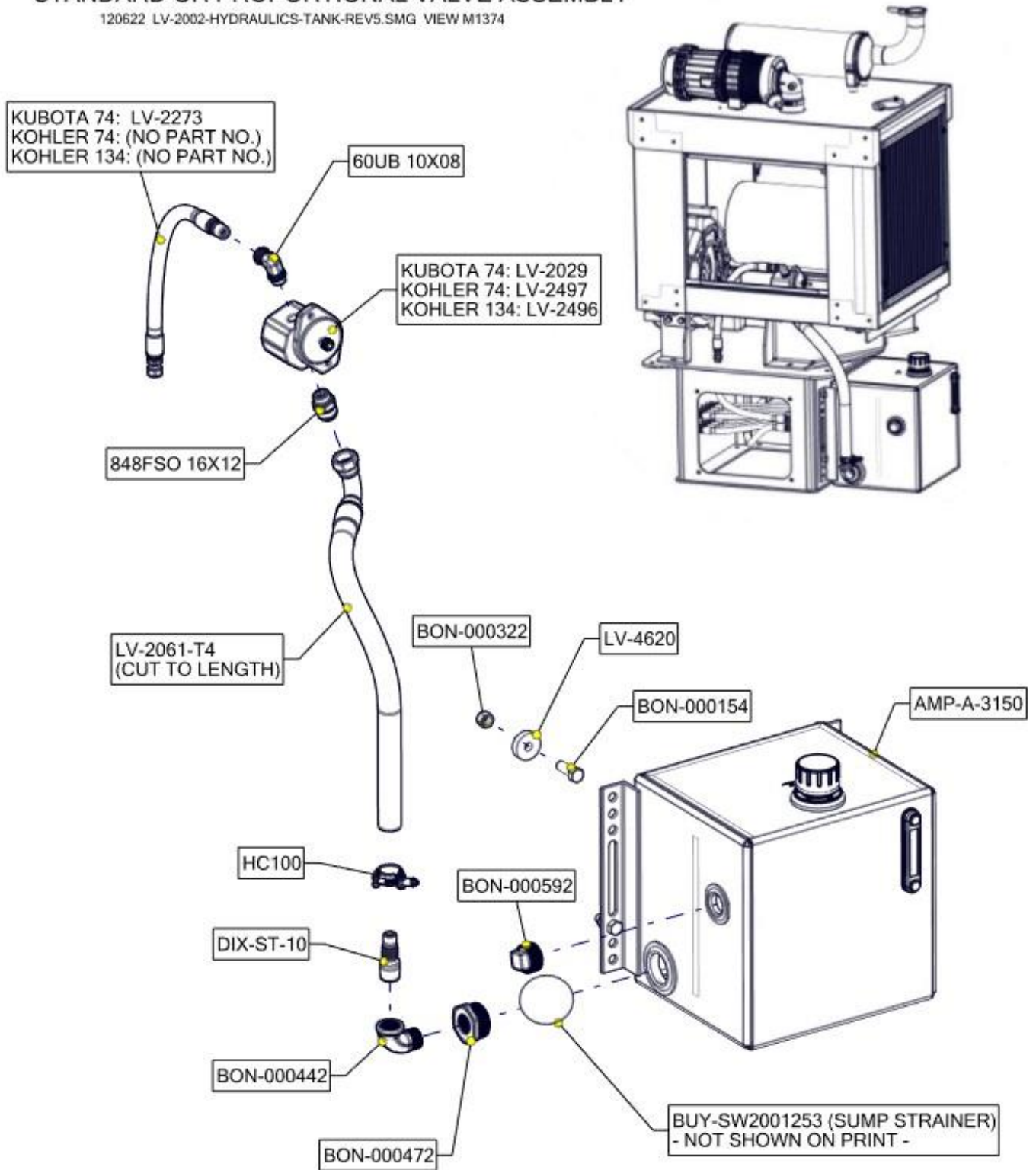


| BOM ID | PartNo (config) | Description (config) |
|--------|-----------------|---|
| 1 | BON-003606N | HYD CYLINDER, 4X10 DA, NITRIDED ROD |
| 2 | BON-000991 | PIN, 1" DIA. x 4-1/4 LG 3-5/8" WORKING LENGTH |
| 3 | BON-000385 | COTTER PIN 1/4 X 2 |
| 4 | LV-2101 | JACK STAND TUBE |
| 5 | BON-000994 | PIN, 1"x6-3/8" LG 5-3/4" WORKING LENGTH |
| 6 | HOL-DB-1250-15 | LUNETTE DRAW BAR, PINTLE EYE |
| 7 | BON-000155 | 5/8-11 X 2-1/2" BOLT |
| 8 | BON-000322 | NYLON INSERT LOCKNUT, 5/8-11 UNC |
| 9 | LV-2102 | JACK STAND FOOT |

10.29 HYDRAULIC TANK FITTINGS AND HOSE ASSY – STANDARD & PROPORTIONAL

HYDRAULIC TANK FITTINGS AND HOSE ASSEMBLY
STANDARD OR PROPORTIONAL VALVE ASSEMBLY

120622 LV-2002-HYDRAULICS-TANK-REV5.SMG VIEW M1374



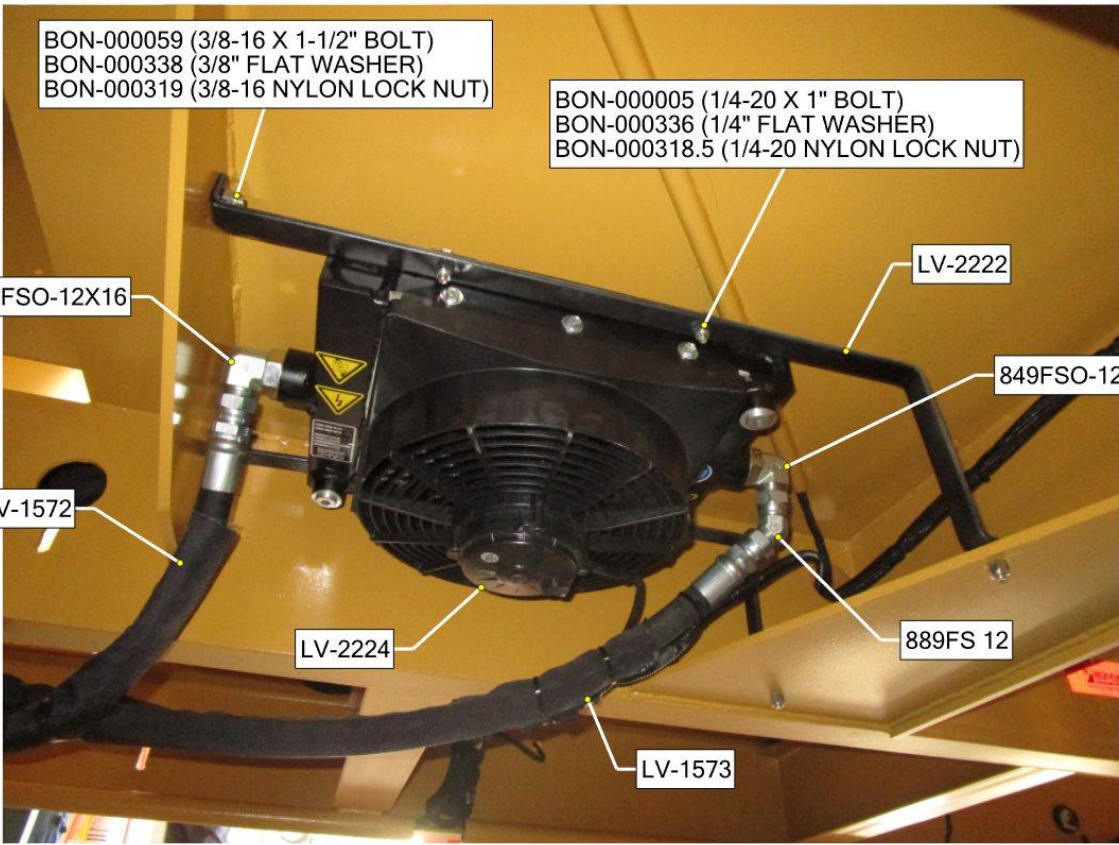
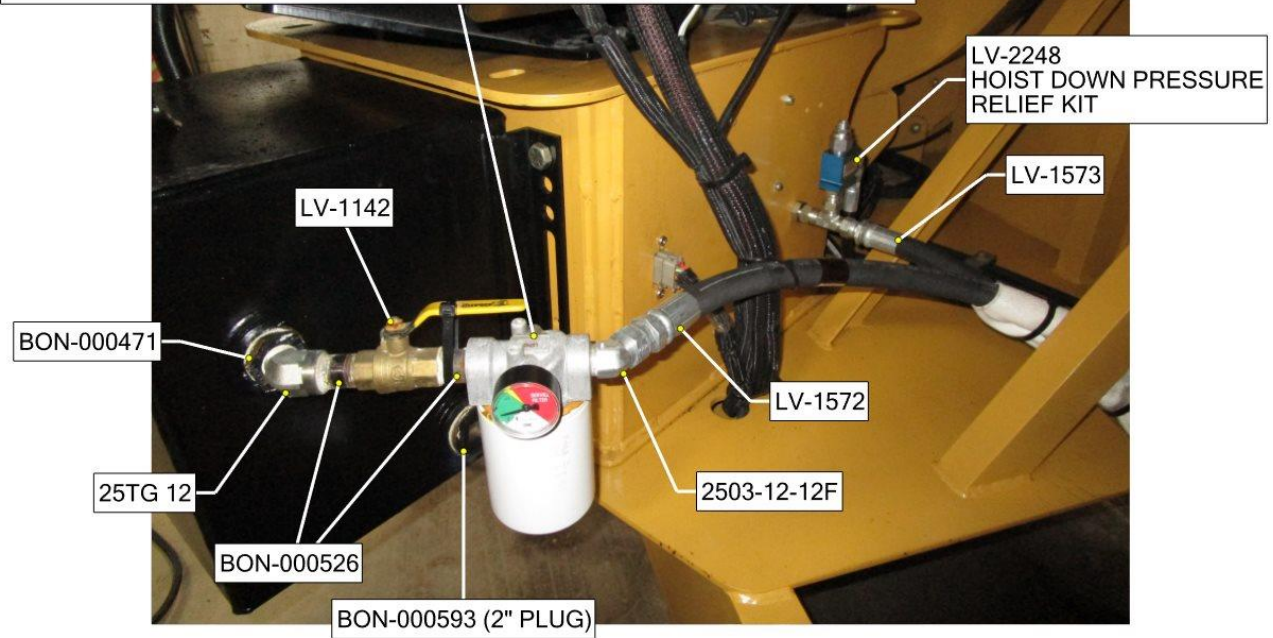
DOCUMENT 15.0

10.30HYDRAULIC TANK FITTINGS, HOSES & COOLER ASSEMBLY – PROPORTIONAL

HYDRAULIC TANK FITTINGS, HOSES & OIL COOLER ASSEMBLY - PROPORTIONAL VALVE

031219 SPARTAN PROPORTIONAL OIL COOLER.smg

ARROWS POINT TOWARDS THE TANK!!
 LV-1137 - HYDRAULIC FILTER ASSEMBLY (INCLUDES: FILTER, HEAD & GUAGE)
 LV-1138 - LENZ FILTER ONLY
 LV-1139 - LENZ FILTER HEAD ONLY
 MID-CI-20-L - FILTER RESTRICTION GUAGE ONLY



DOCUMENT 15.1

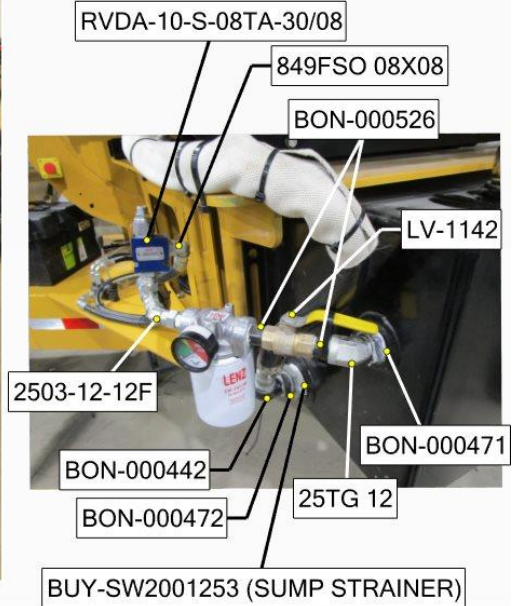
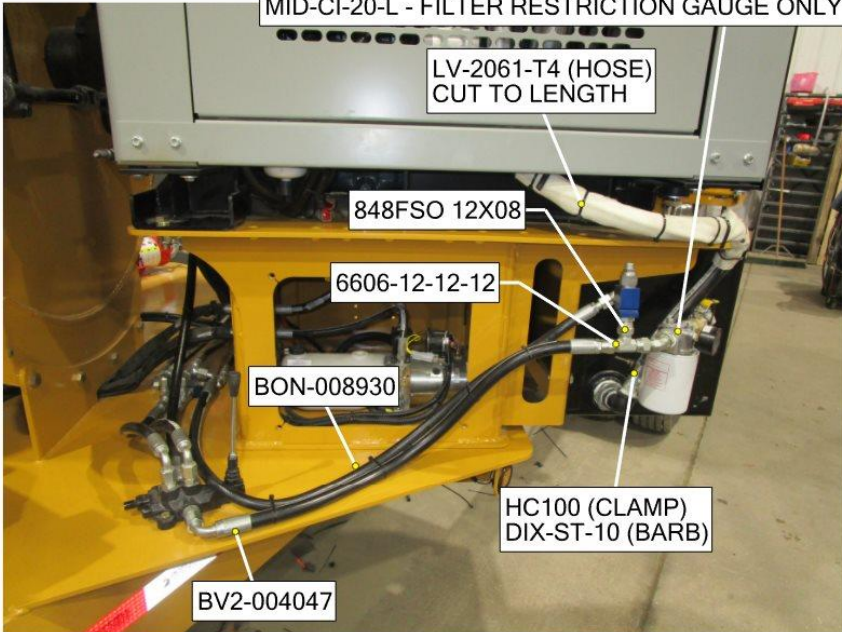
Parts Breakdowns

10.31 SINGLE FUNCTION MANUAL VALVE WITH HYDRAULIC TAILGATE LATCH

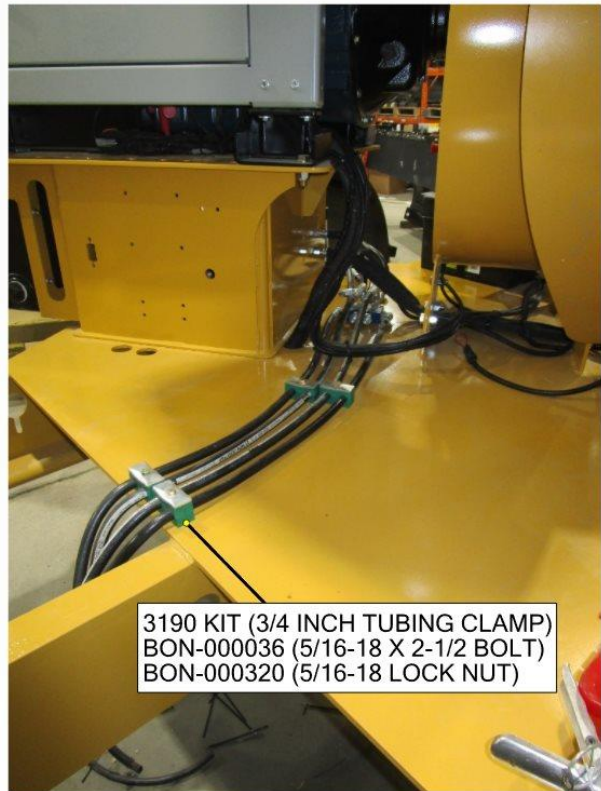
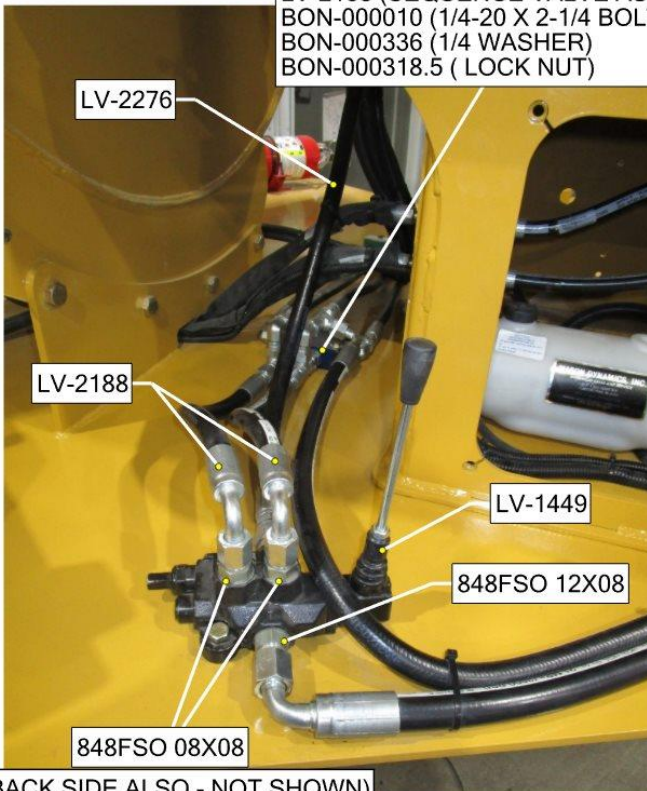
SINGLE FUNCTION MANUAL 4-WAY HYDRAULIC VALVE WITH HYDRAULIC TAILGATE LATCH

032221 SPARTAN SINGLE FUNTION MANUAL VALVE WITH HYDRAULIC TAILGATE LATCH REV2.smg

ARROWS POINT TOWARDS THE TANK !!
 LV-1137 - HYDRAULIC FILTER ASSEMBLY (INCLUDES: FILTER, HEAD & GUAGE)
 LV-1138 - LENZ FILTER ONLY
 LV-1139 - LENZ FILTER HEAD ONLY
 MID-CI-20-L - FILTER RESTRICTION GAUGE ONLY



LV-2158 (SEQUENCE VALVE ASS'Y)
 BON-000010 (1/4-20 X 2-1/4 BOLT)
 BON-000336 (1/4 WASHER)
 BON-000318.5 (LOCK NUT)

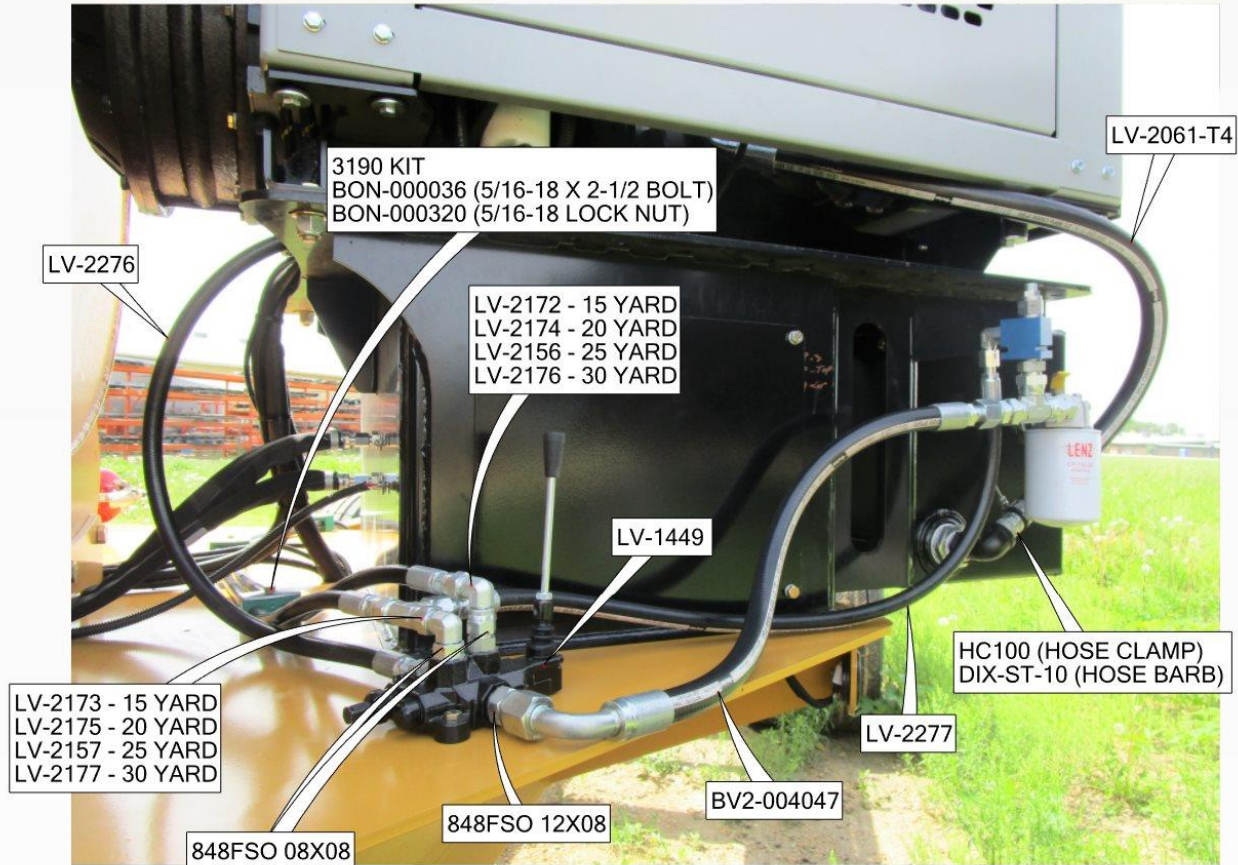


DOCUMENT 15.2

10.32 SINGLE FUNCTION MANUAL VALVE WITH MANUAL TAILGATE LATCH

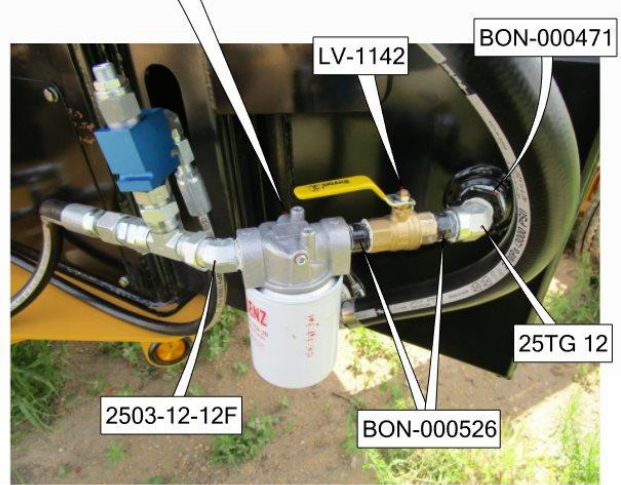
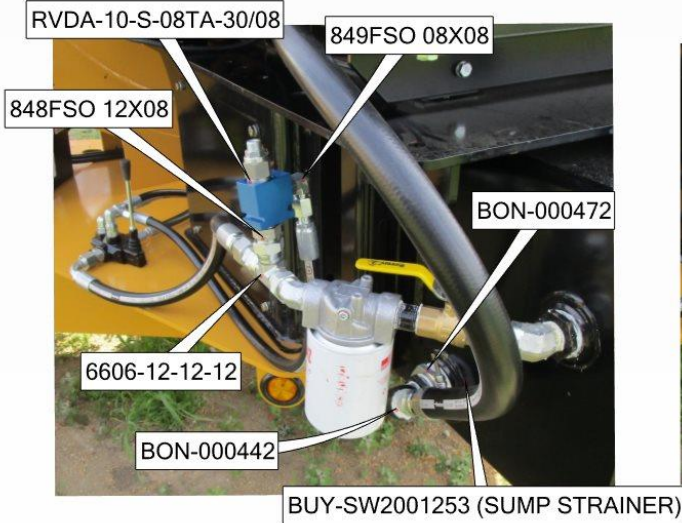
SINGLE FUNCTION MANUAL 4-WAY HYDRAULIC VALVE WITH MANUAL TAILGATE LATCH

SPARTAN SINGLE FUNCTION MANUAL VALVE WITH MANUAL TAILGATE LATCH REV1.smg



(BACK SIDE ALSO - NOT SHOWN)

ARROWS POINT TOWARDS THE TANK !!
LV-1137 - HYDRAULIC FILTER ASSEMBLY (INCLUDES: FILTER, HEAD & GAUGE)
LV-1138 - LENZ FILTER ONLY
LV-1139 - LENZ FILTER HEAD ONLY
MID-CI-20-L - FILTER RESTRICTION GAUGE ONLY

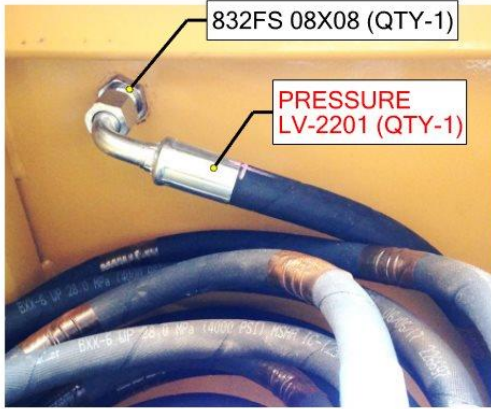


DOCUMENT 15.3

10.33 PROPORTIONAL VALVE ASSEMBLY - REX

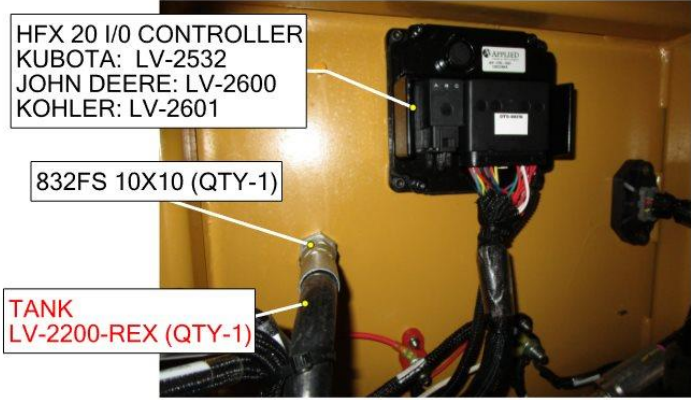
SPARTAN PRO + PROPORTIONAL VALVE - REX - TIER IV

041219 SPARTAN HYDRAULIC BOX AND TANK FOR NEW DTS VALVE REV3.smg



832FS 08X08 (QTY-1)

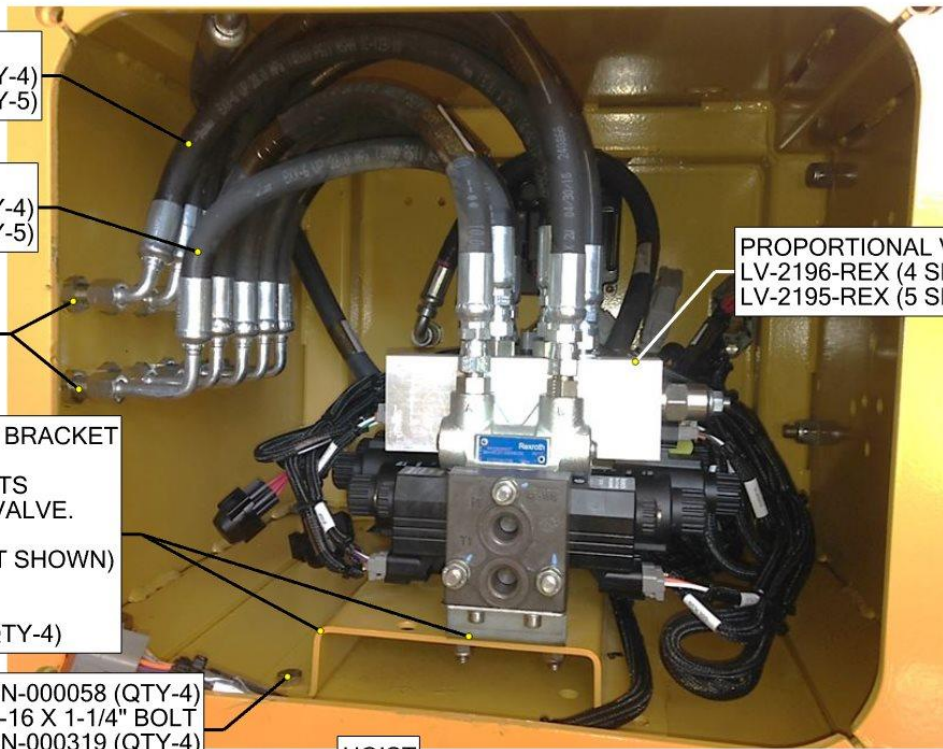
PRESSURE
LV-2201 (QTY-1)



HFX 20 I/O CONTROLLER
KUBOTA: LV-2532
JOHN DEERE: LV-2600
KOHLER: LV-2601

832FS 10X10 (QTY-1)

TANK
LV-2200-REX (QTY-1)



LV-2199
(4 SECTION: QTY-4)
(5 SECTION: QTY-5)

LV-2198
(4 SECTION: QTY-4)
(5 SECTION: QTY-5)

832FS 06X06
(4 SECTION: QTY-8)
(5 SECTION: QTY-10)

PROPORTIONAL VALVE
LV-2196-REX (4 SECTION)
LV-2195-REX (5 SECTION)

LV-2197-REX (QTY-1) - BRACKET
(NOT SHOWN)
- REMOVE "Z" BRACKETS
ADD SPACER UNDER VALVE.
LV-2482 (QTY-6)
(3 ON EACH END - NOT SHOWN)
M6-1.0X40MM (QTY-4)
M6 WASHERS
M6 LOCK WASHERS (QTY-4)

BON-000058 (QTY-4)
3/8-16 X 1-1/4" BOLT
BON-000319 (QTY-4)
3/8-16 LOCK NUT

HOIST

TANK
LV-2200-REX (QTY-1)

832FS 10X10 (QTY-1)

SWEEP IN & OUT

BOOM UP & DOWN

BOOM SWING
LEFT & RIGHT

JACK

848FSO 06X08
(4 SECTION: QTY-8)
(5 SECTION: QTY-8)

848FSO 06X06

848FSO 08X08

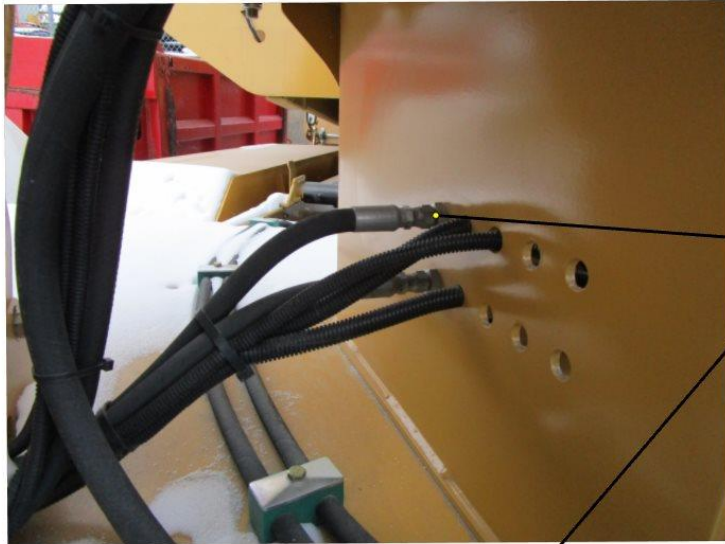
849FSO 08X08

PRESSURE
LV-2201 (QTY-1)

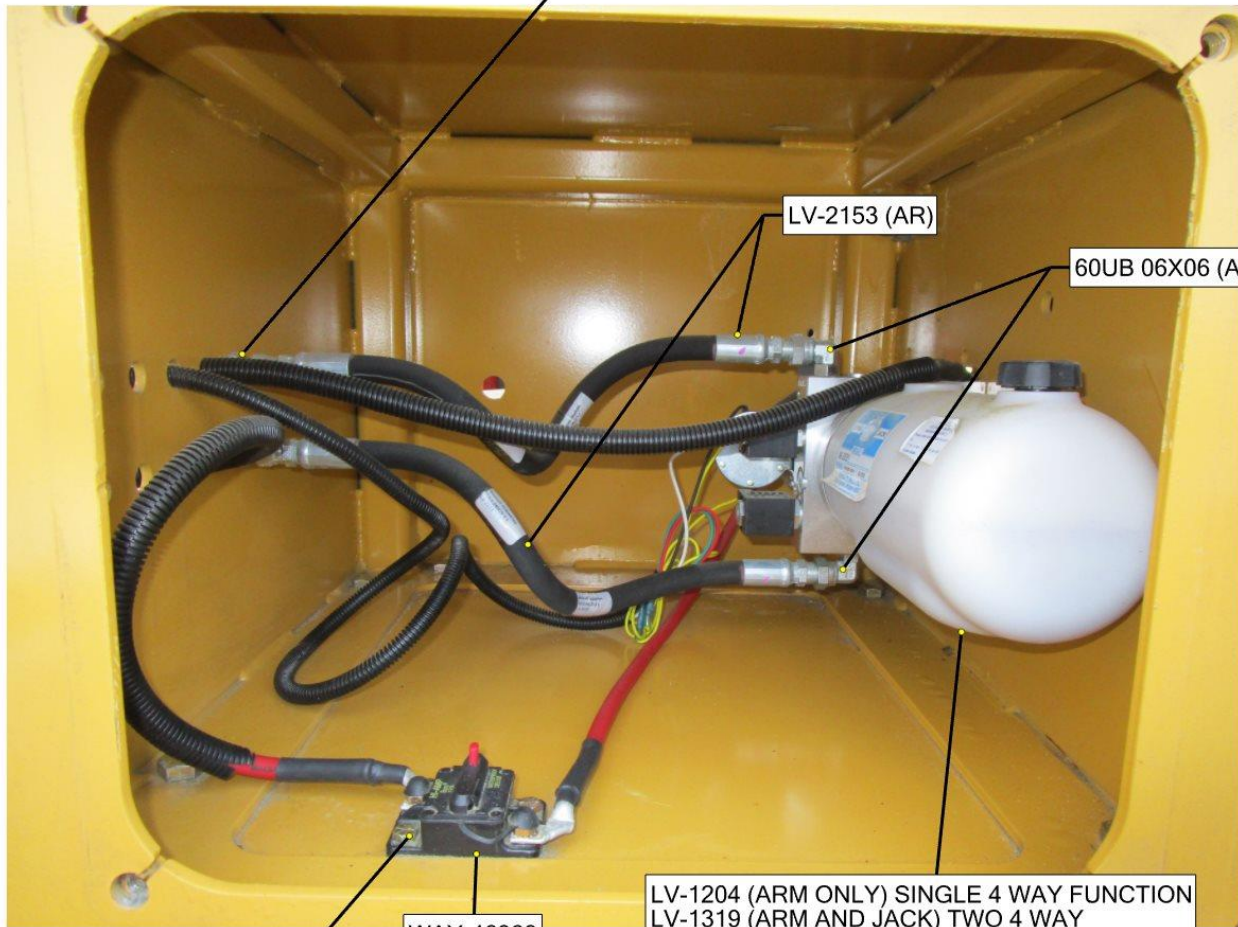
5 SECTION ASSEMBLY SHOWN ABOVE AS EXAMPLE

10.34 ELECTRIC POWER UNIT - SINGLE AND DUAL FUNCTION ASSEMBLIES
ELECTRIC POWER UNIT, PUSH BUTTON - SPARTAN LEAF VACUUM

122817 SPARTAN ELECTRIC POWER UNIT ASSEMBLY.smg



832FS 06X06 (AR)



LV-2153 (AR)

60UB 06X06 (AR)

WAY-46989

LV-1204 (ARM ONLY) SINGLE 4 WAY FUNCTION
 LV-1319 (ARM AND JACK) TWO 4 WAY

MOUNTING HARDWARE (NOT SHOWN)
 BON-000057 (QTY-2) 3/8-16 X 1" BOLT
 BON-000352 (QTY-2) 3/8 LOCK WASHER

BON-000007 (QTY-2) 1/4-20 X 1-1/2 BOLT
 BON-000318.5 (QTY-2) 1/4-20 LOCKNUT

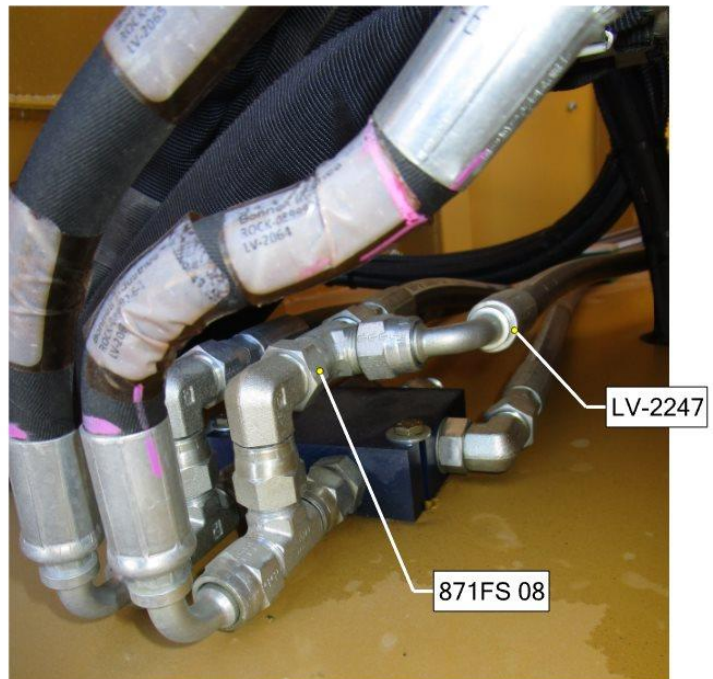
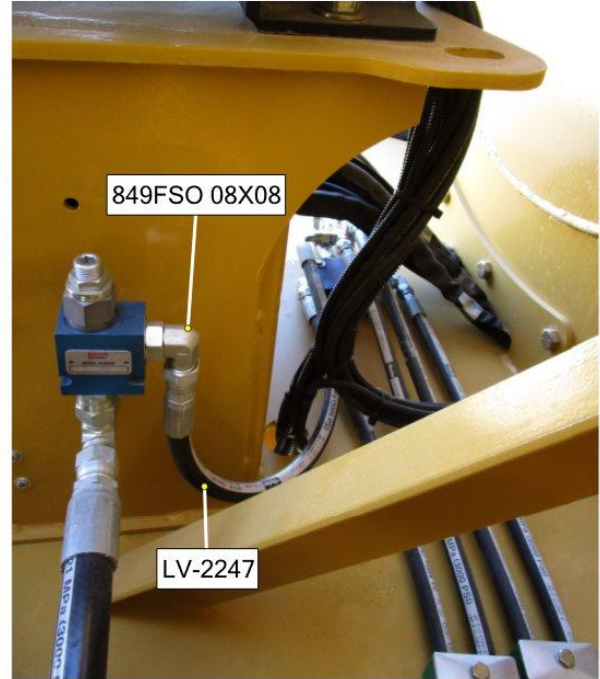
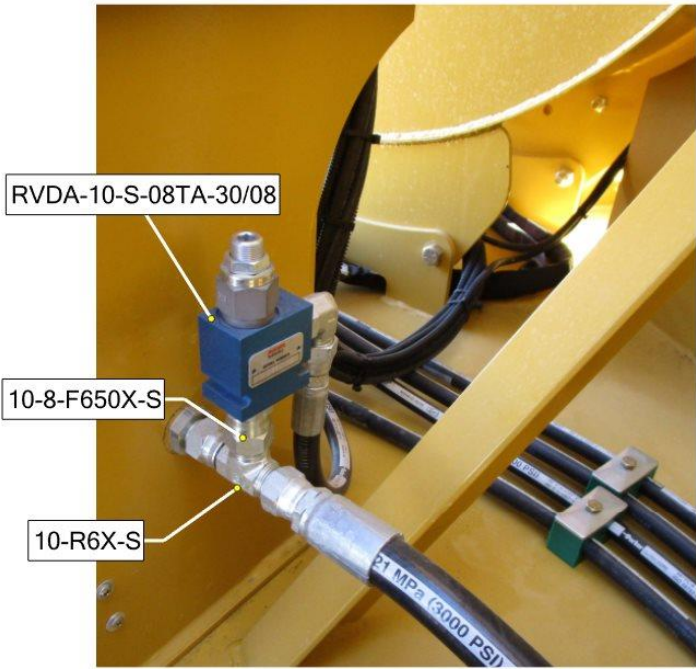
DOCUMENT 16.1

10.35 HOIST DOWN PRESSURE RELIEF KIT

SPARTAN HOIST DOWN PRESSURE RELIEF KIT

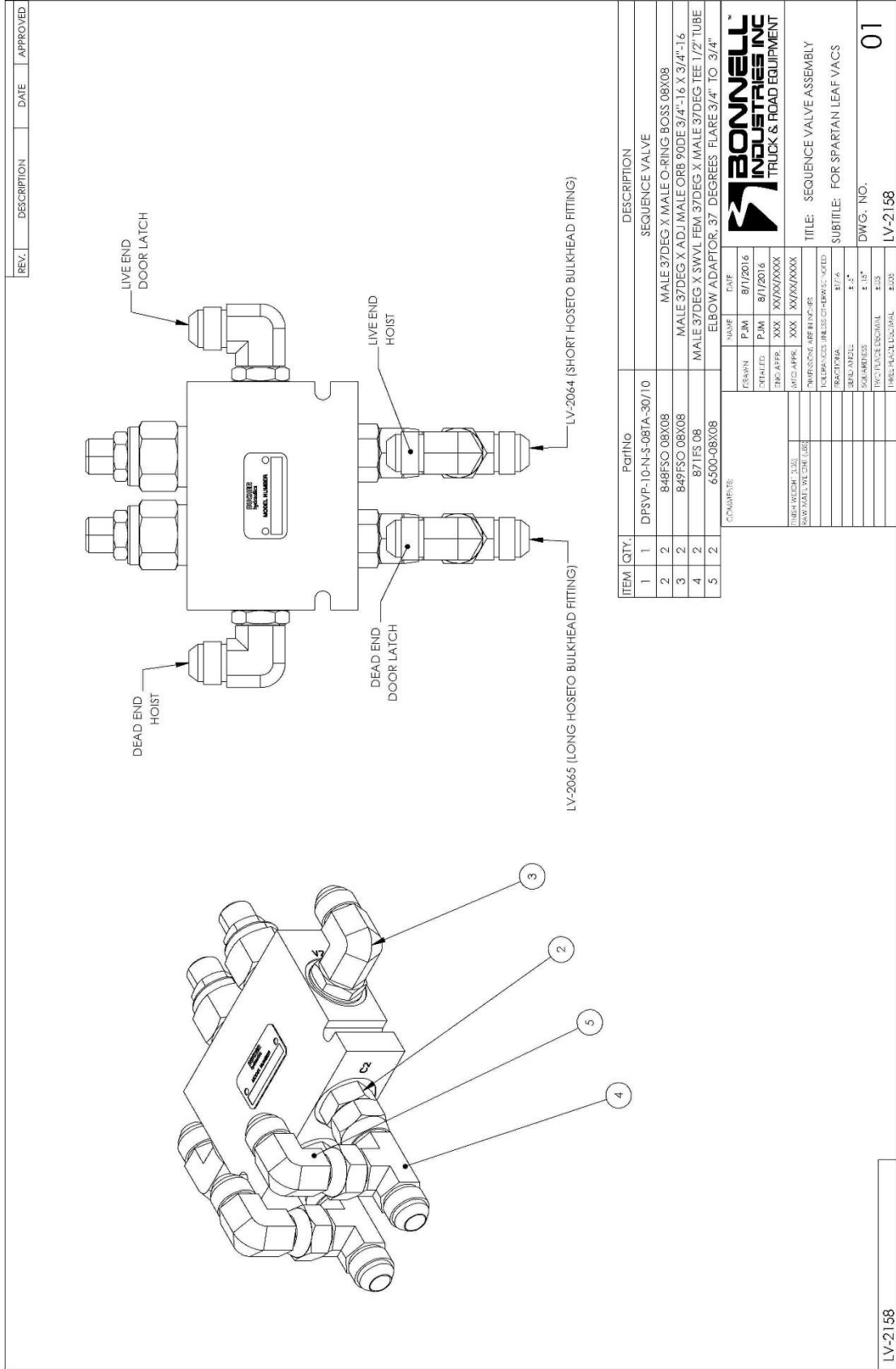
030819 SPARTAN HOIST DOWN PRESSURE RELIEF KIT.smg

COMPLETE HOIST DOWN PRESSURE RELIEF KIT: LV-2248



DOCUMENT 17.0

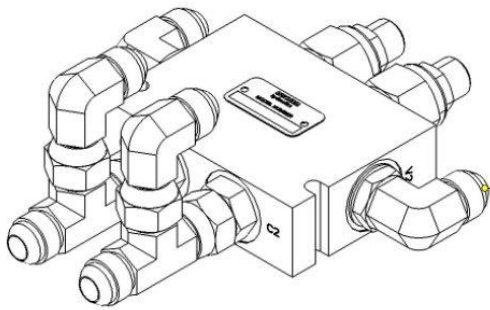
10.36 SEQUENCE VALVE ASSEMBLY



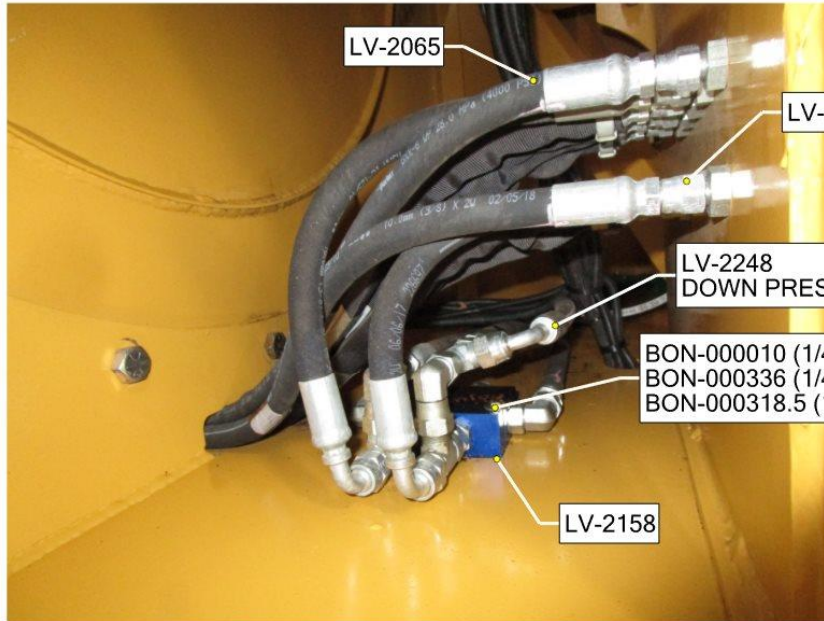
10.37HYDRAULIC DOOR AND HOIST FRONT FITTINGS AND HOSE ASSEMBLY

HYDRAULIC DOOR AND HOIST FRONT FITTINGS AND HOSE ASSEMBLY

031219 SPARTAN HYDRAULIC DOOR AND HOIST FRONT FITTINGS AND HOSE ASSEMBLY.SMG



LV-2158 (COMPLETE ASSEMBLY)

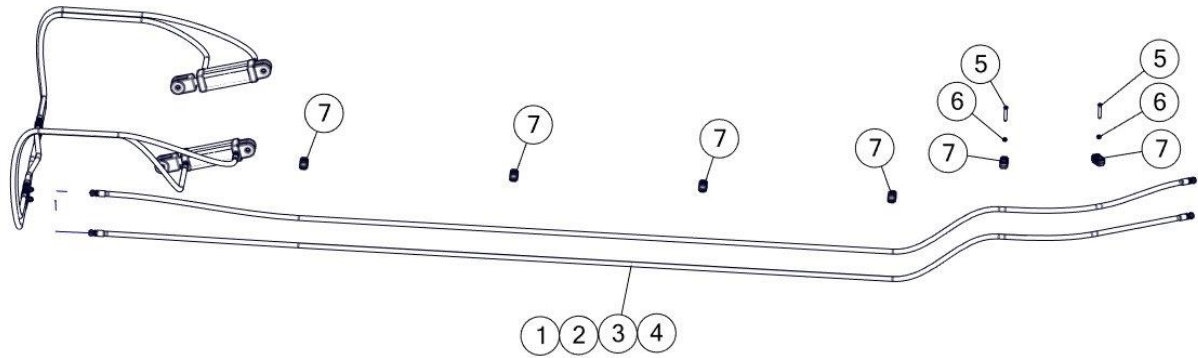


DOCUMENT 17.2

10.38 HYDRAULIC DOOR MIDDLE FITTINGS AND HOSE ASSEMBLY

HYDRAULIC DOOR MIDDLE FITTINGS AND HOSE ASSEMBLY
SPARTAN LEAF VACUUM

093014 LV-2002-HYDRAULICS-REAR DOOR-REV1.SMG



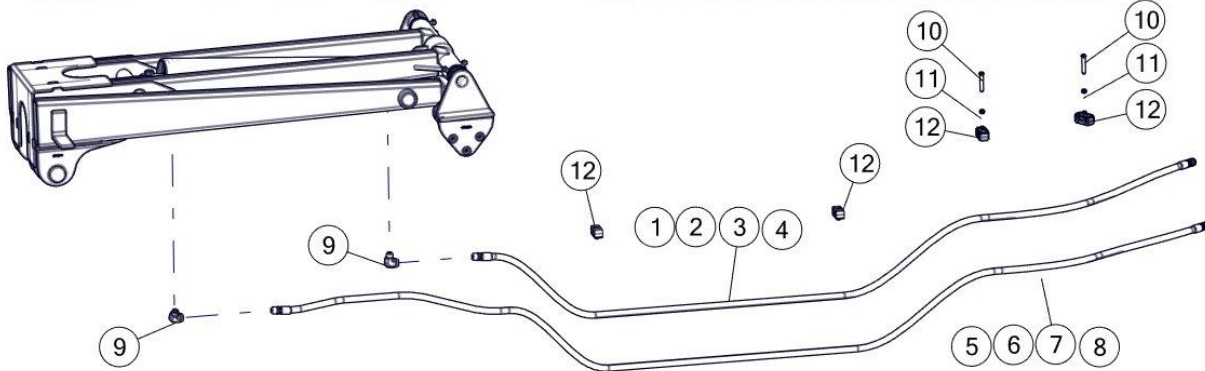
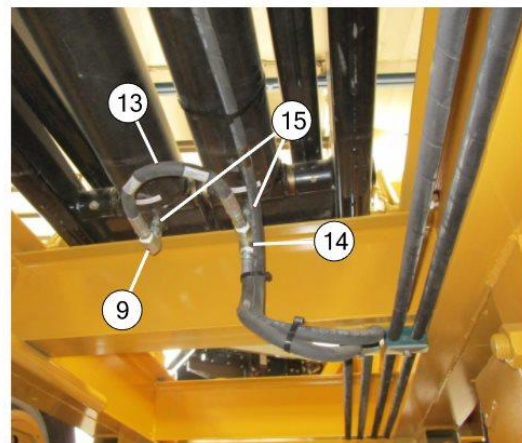
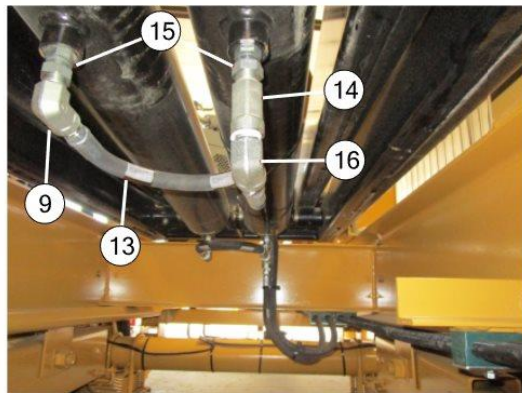
| ITEM | QTY. | PART NO. | DESCRIPTION |
|------|------|------------|-----------------------------------|
| 1 | 2 | LV-2071 | 15 YARD SPARTAN - HYD. HOSE |
| 2 | 2 | LV-2072 | 20 YARD SPARTAN - HYD. HOSE |
| 3 | 2 | LV-2073 | 25 YARD SPARTAN - HYD. HOSE |
| 4 | 2 | LV-2074 | 30 YARD SPARTAN - HYD. HOSE |
| 5 | 2 | BON-000036 | 5/16-18 X 2-1/2" BOLT |
| 6 | 2 | BON-000320 | NYLON INSERT LOCKNUT, 5/16-18 UNC |
| 7 | AR | 3190 KIT | HOSE CLAMP FOR TWO 3/8" HYD. HOSE |

DOCUMENT 18.0

10.39 HYDRAULIC HOIST BACK FITTINGS AND HOSE ASSEMBLY

HYDRAULIC HOIST BACK FITTINGS AND HOSE ASSEMBLY

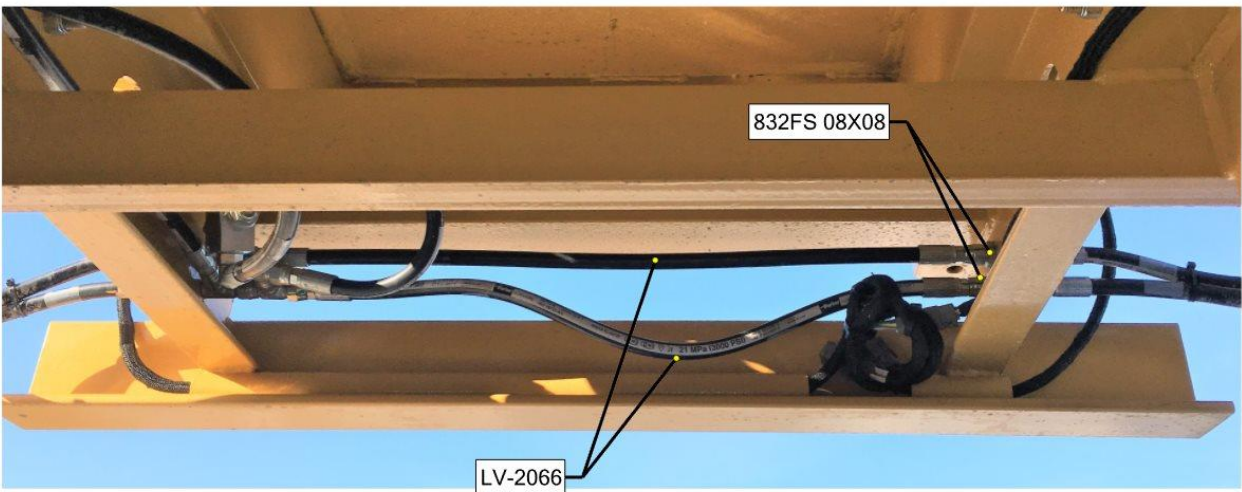
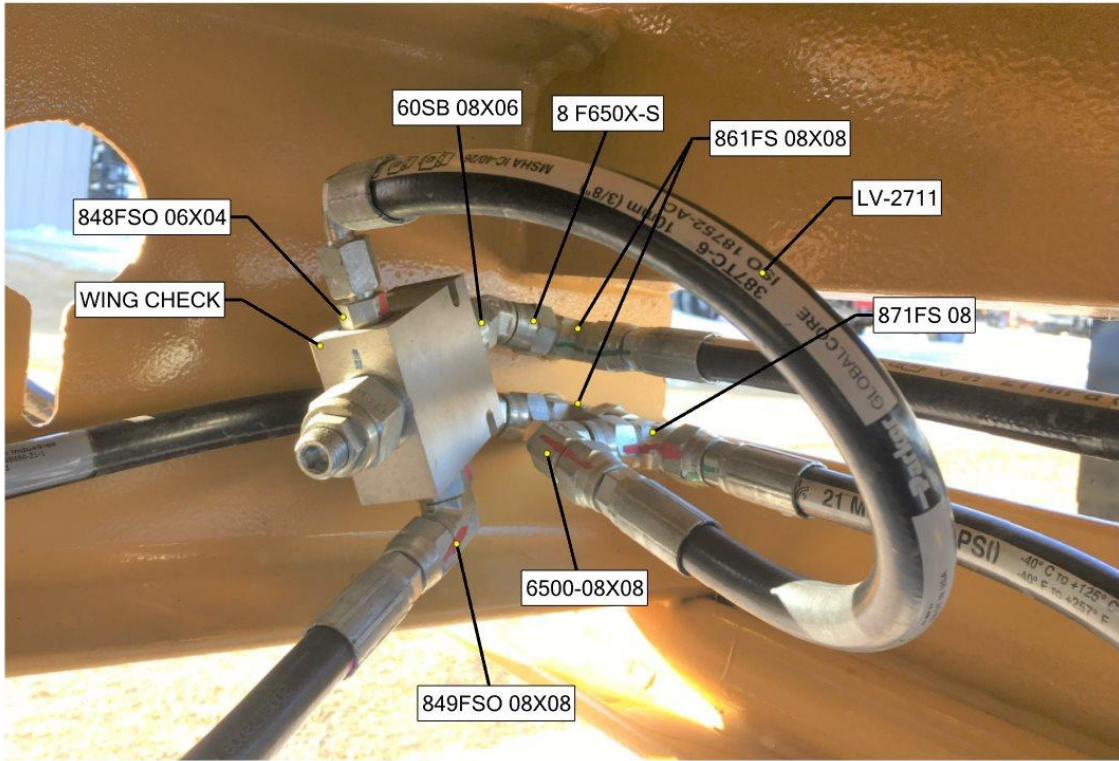
030421 LV-2002-HYDRAULICS-HOIST-REV2.SMG



| ITEM | QTY. | PART NO. | DESCRIPTION |
|------|------|------------|---|
| 1 | 1 | LV-2079 | 15 YARD SPARTAN - SEQ VALVE TO HOIST, SHORT HOSE |
| 2 | 1 | LV-2080 | 20 YARD SPARTAN - SEQ VALVE TO HOIST, SHORT HOSE |
| 3 | 1 | LV-2081 | 25 YARD SPARTAN - SEQ VALVE TO HOIST, SHORT HOSE |
| 4 | 1 | LV-2082 | 30 YARD SPARTAN - SEQ VALVE TO HOIST, SHORT HOSE |
| 5 | 1 | LV-2075 | 15 YARD SPARTAN - SEQ VALVE TO HOIST, LONG HOSE |
| 6 | 1 | LV-2076 | 20 YARD SPARTAN - SEQ VALVE TO HOIST, LONG HOSE |
| 7 | 1 | LV-2082 | 25 YARD SPARTAN - SEQ VALVE TO HOIST, LONG HOSE |
| 8 | 1 | LV-2078 | 30 YARD SPARTAN - SEQ VALVE TO HOIST, LONG HOSE |
| 9 | AR | 25UG 08 | 1/2" 90 DEG STREET ELBOW |
| 10 | 2 | BON-000036 | 5/16-18 X 2-1/2" BOLT |
| 11 | 2 | BON-000320 | NYLON INSERT LOCKNUT, 5/16-18 UNC |
| 12 | 4 | 3190 KIT | HOSE CLAMP FOR TWO 3/8" HYD HOSE |
| 13 | AR | LV-2147 | HOIST CYLINDER LOOP HOSE |
| 14 | AR | 25VK 08 | MALE PIPE X FEM PIPE X FEM PIP TEE 1/2" NPTF |
| 15 | AR | 60SB 08X08 | MALE ORB X FEMALE PIPE SWIVEL 3/4-16TPI TO 1/2 NPSM |
| 16 | AR | 60UA 08X08 | MALE PIPE X 90DEG FEMALE SWIVL 1/2 NPTF TO 1/2 NPSM |

10.40 HYDRAULIC DOOR FITTINGS AND HOSE ASSEMBLY

HYDRAULIC DOOR CYLINDER FITTINGS AND HOSE ASSEMBLY
SPARTAN LEAF VACUUM
011221 LV-2002-HYDRAULICSREV1.SMG



10.41 HYDRAULIC DOOR CYLINDER FITTINGS AND HOSE ASSEMBLY

HYDRAULIC DOOR CYLINDER FITTINGS AND HOSE ASSEMBLY
SPARTAN LEAF VACUUM
021121 LV-2002-HYDRAULICSREV2.SMG



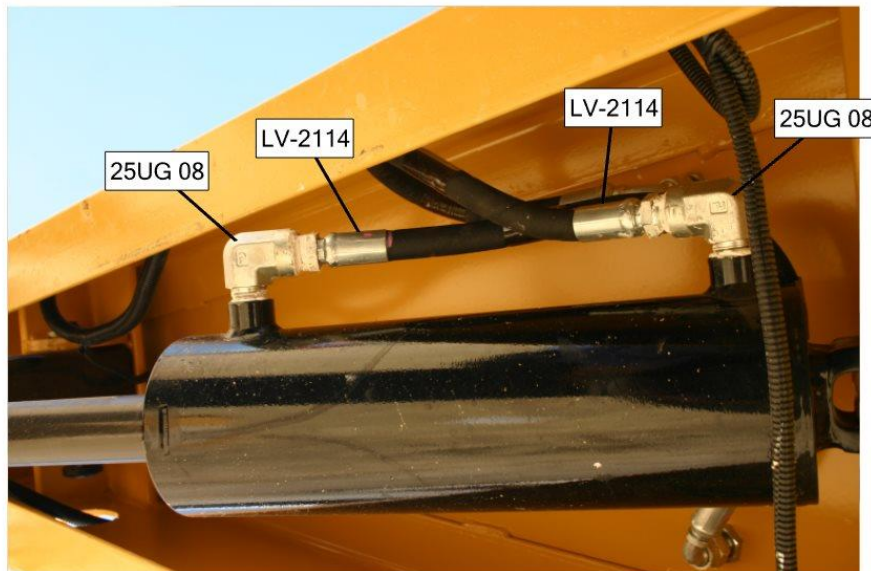
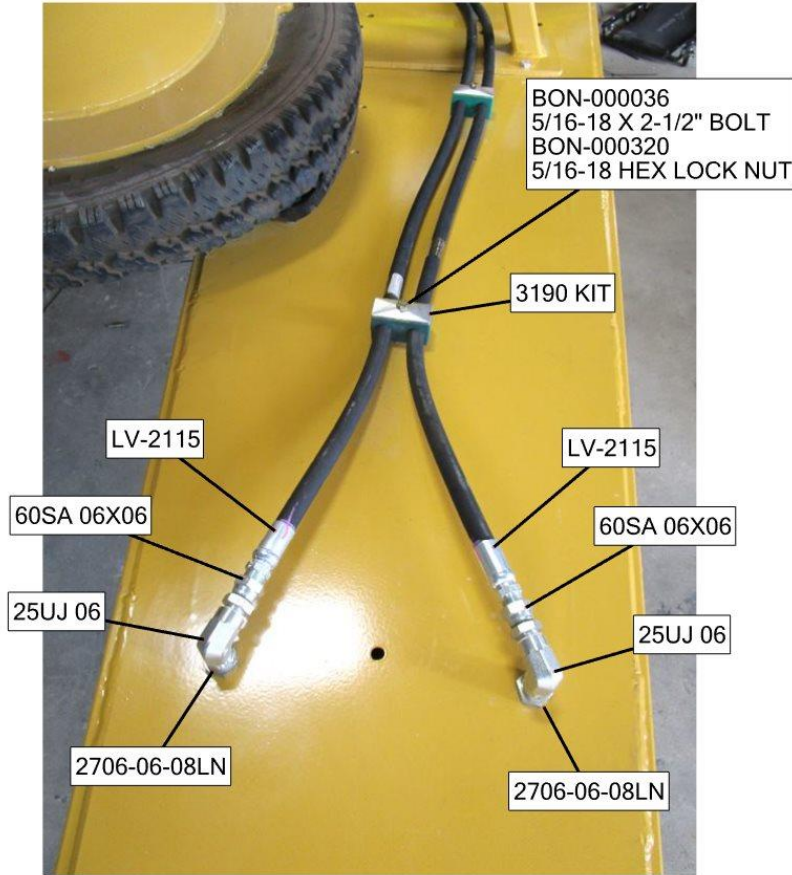
| BOM | QTY. | PART NO. | DESCRIPTION: |
|-----|------|------------|---|
| 1 | 2 | LV-2112 | REAR DOOR LATCH CYLINDER HOSE - SHORT |
| 2 | 2 | LV-2113 | REAR DOOR LATCH CYLINDER HOSE - LONG |
| 3 | 4 | 60UB 08X08 | MALE ORB X 90DEG FEMALE PIPE SW 3/4-16TPI TO 1/2 NPSM |

10.42 HYDRAULIC JACK FITTINGS & HOSES

HYDRAULIC JACK FITTINGS AND HOSES

(ASSEMBLY WHEN DUEL CHECK IS PART OF THE VALVE OR WHEN USING AN ELECTRIC POWER UNIT)

011119 SPARTAN HYDRAULIC JACK HOSES AND FITTINGS ASSEMBLY.smg

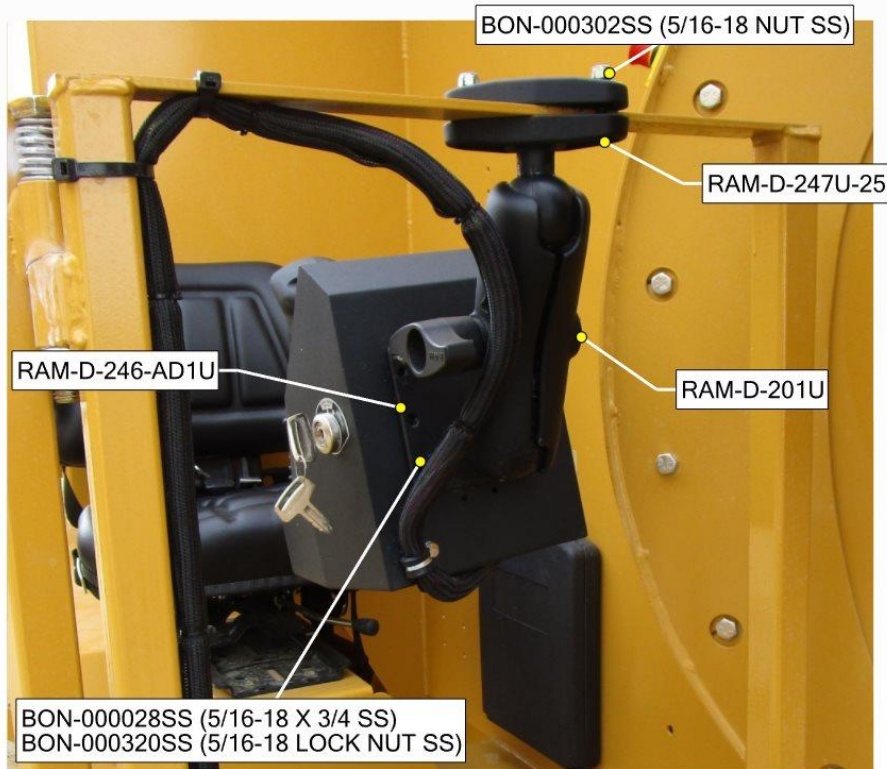
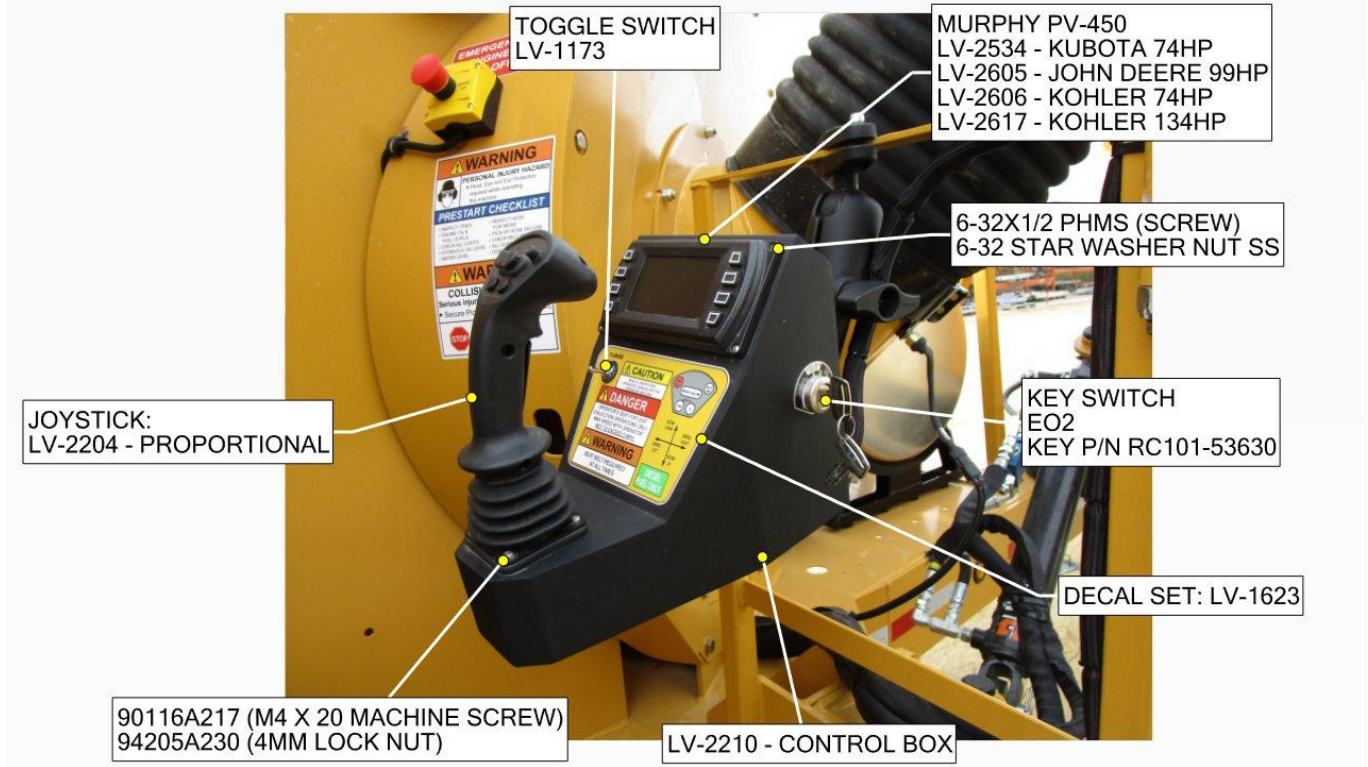


DOCUMENT 18.3

10.43 JOYSTICK MOUNTING ASSEMBLY

OPERATOR JOYSTICK ASSEMBLY

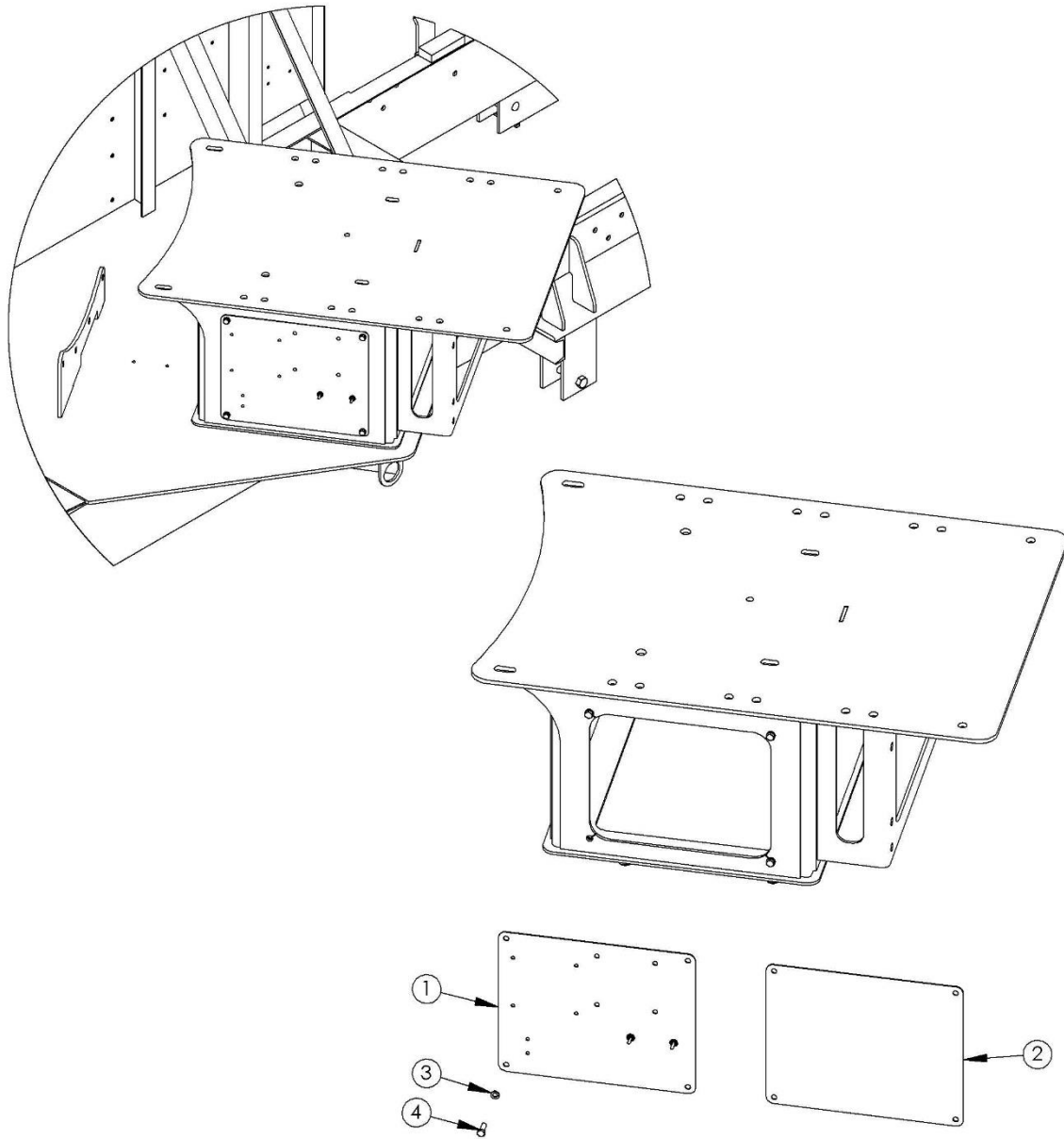
12/21/2021 SPARTAN AND TITAN OPERATOR JOYSTICK ASSEMBLY.smg



Parts Breakdowns

10.44 MOTOR MOUNT COVER AND CONTROL BOX ASSEMBLY

| | | | | | |
|-----------|-------------|------|--|-----------|----------|
| FILE NAME | LV-2546-EXP | REV. | DESCRIPTION | DATE | INITIALS |
| DWG NAME | LV-2546-EXP | - | MOTOR MOUNT COVER AND CONTROL ASSEMBLY | 4/15/2019 | LAJ |



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| | | | |
|------|-----|-------------|-----------------------|
| 4 | 4 | BON-000057 | 3/8-16 X 1" BOLT |
| 3 | 4 | BON-000352 | LOCK WASHER, 3/8 |
| 2 | AR | LV-2151 | BOLT ON COVER |
| 1 | AR | LV-2546 | CONTROL PANEL, TIER 4 |
| ITEM | QTY | PART NUMBER | DESCRIPTION |


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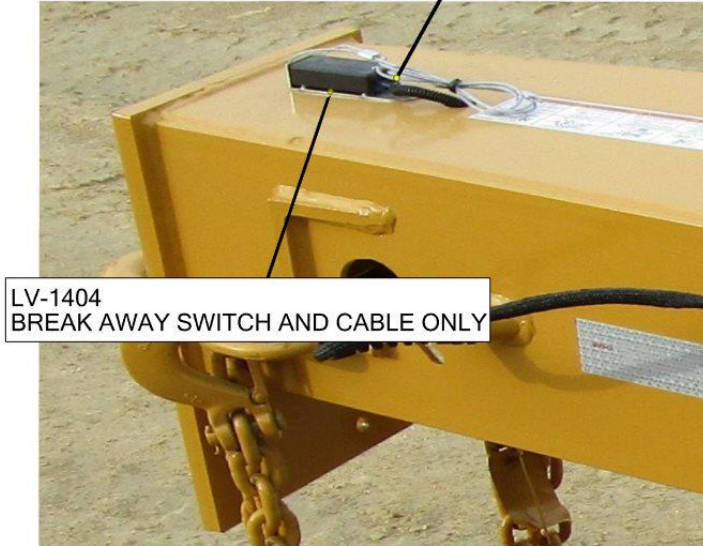
DOCUMENT 19.8

10.45 BATTERY AND BREAK AWAY KIT ASSEMBLY

SPARTAN BATTERY BOX AND BREAK AWAY SWITCH ASSEMBLY

020420 SPARTAN BATTERY BOX AND BREAK AWAY KIT REV2.smg

BON-000003 (1/4-20 X 3/4 BOLT)
BON-000318.5 (1/4-20 LOCK NUT)



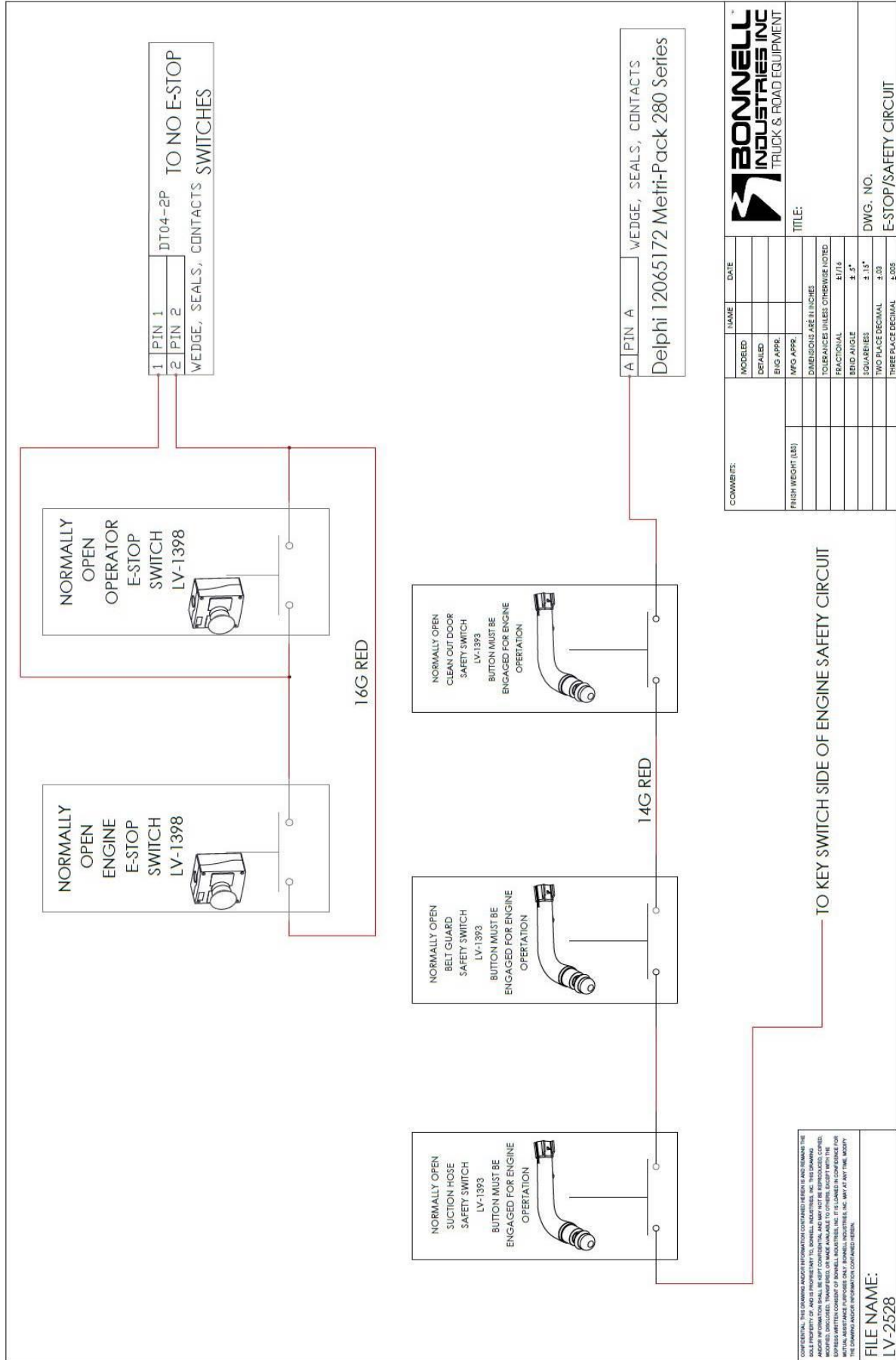
LV-1404
BREAK AWAY SWITCH AND CABLE ONLY



LV-1144 (BATTERY - 12 VOLT)
LV-1145 (BATTERY BOX)

BON-000005 (1/4-20 X 1" BOLT) (QTY-2)
BON-000336 (1/4 FLAT WASHER) (QTY-4)
BON-000318.5 (1/4-20 LOCK NUT) (QTY-2)

10.46 E-STOP AND SAFETY HARNESS



| COMMENTS: | | NAME | DATE |
|-----------------------------------|--|--------|------|
| MODELED | | | |
| DETAILED | | | |
| BWG APPR. | | | |
| MFG APPR. | | | |
| FINISH WEIGHT (LBS) | | | |
| DIMENSIONS ARE IN INCHES | | | |
| TOLERANCES UNLESS OTHERWISE NOTED | | | |
| FRACTIONAL | | ± .010 | |
| DECIMAL | | ± .005 | |
| SQUARES | | ± .15" | |
| TWO PLACE DECIMAL | | ± .00 | |
| THREE PLACE DECIMAL | | ± .000 | |

TITLE:
DWG. NO. E-STOP/SAFETY CIRCUIT

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FILE NAME:
LV-2528

10.47 EMERGENCY STOP SWITCH MOUNTED TO BLOWER HOUSING

EMERGENCY STOP SWITCH MOUNTED TO BLOWER HOUSING GUARD

121520 SPARTAN EMERGENCY STOP LOCATIONS REV1.smg

THE CURRENT E-STOP MODEL 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



10.48 EMERGENCY STOP SWITCH MOUNTED TO ENGINE

EMERGENCY STOP SWITCH MOUNTED TO ENGINE

121520 SPARTAN EMERGENCY STOP LOCATIONS.smg

EMERGENCY STOP SWITCH REQUIRED ON ALL SPARTAN ENGINES.



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:

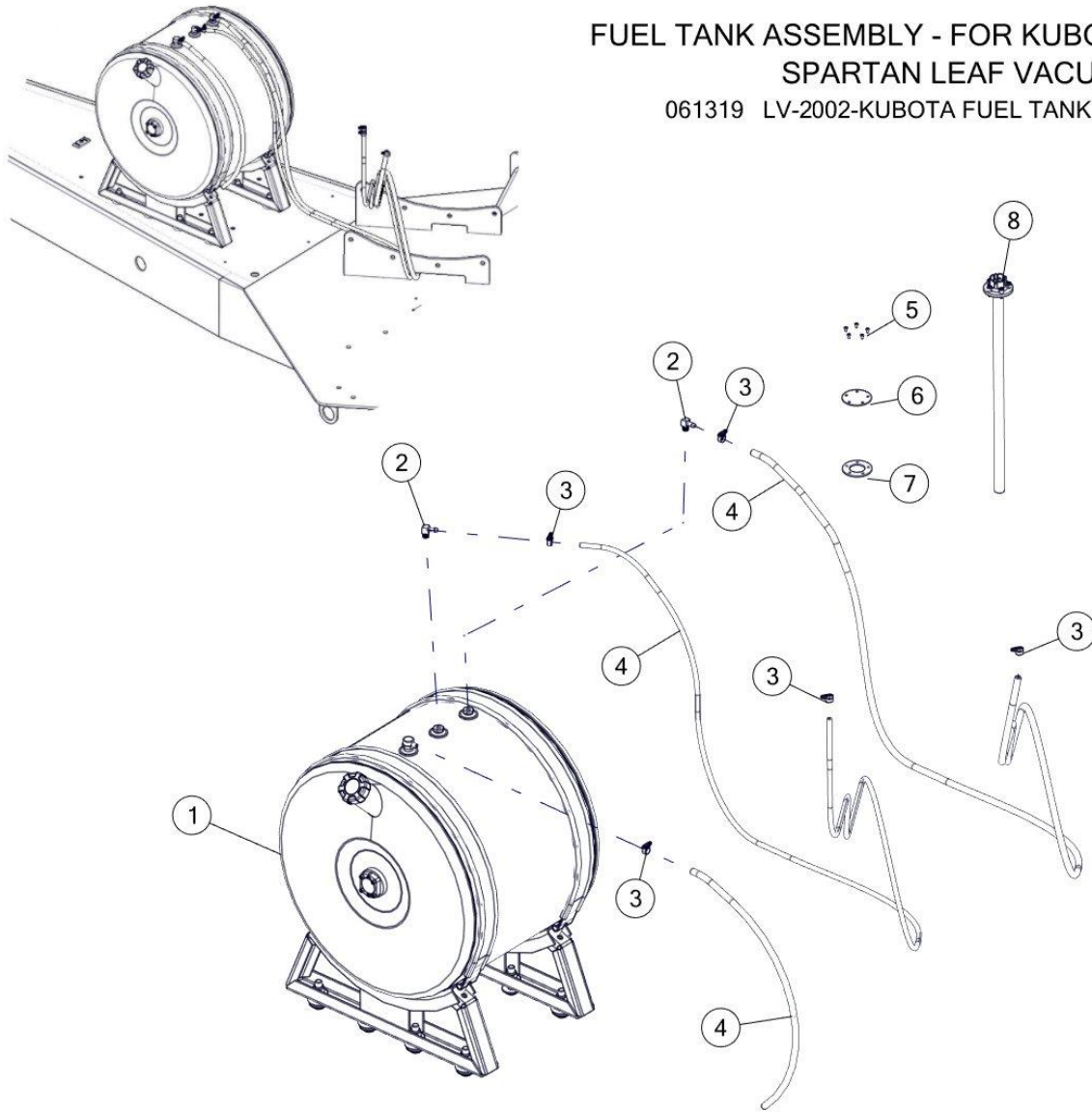
- (2) 6-32 X 1" MACHINE SCREW
- (2) 6-32 NUT WITH STAR WASHER
- (1) WAY-24594 - CORD GRIP
- (2) WAY-24612 - NYLON LOCKNUT



10.49 FUEL TANK ASSEMBLY – FOR KUBOTA ENGINES

FUEL TANK ASSEMBLY - FOR KUBOTA ENGINES
SPARTAN LEAF VACUUM

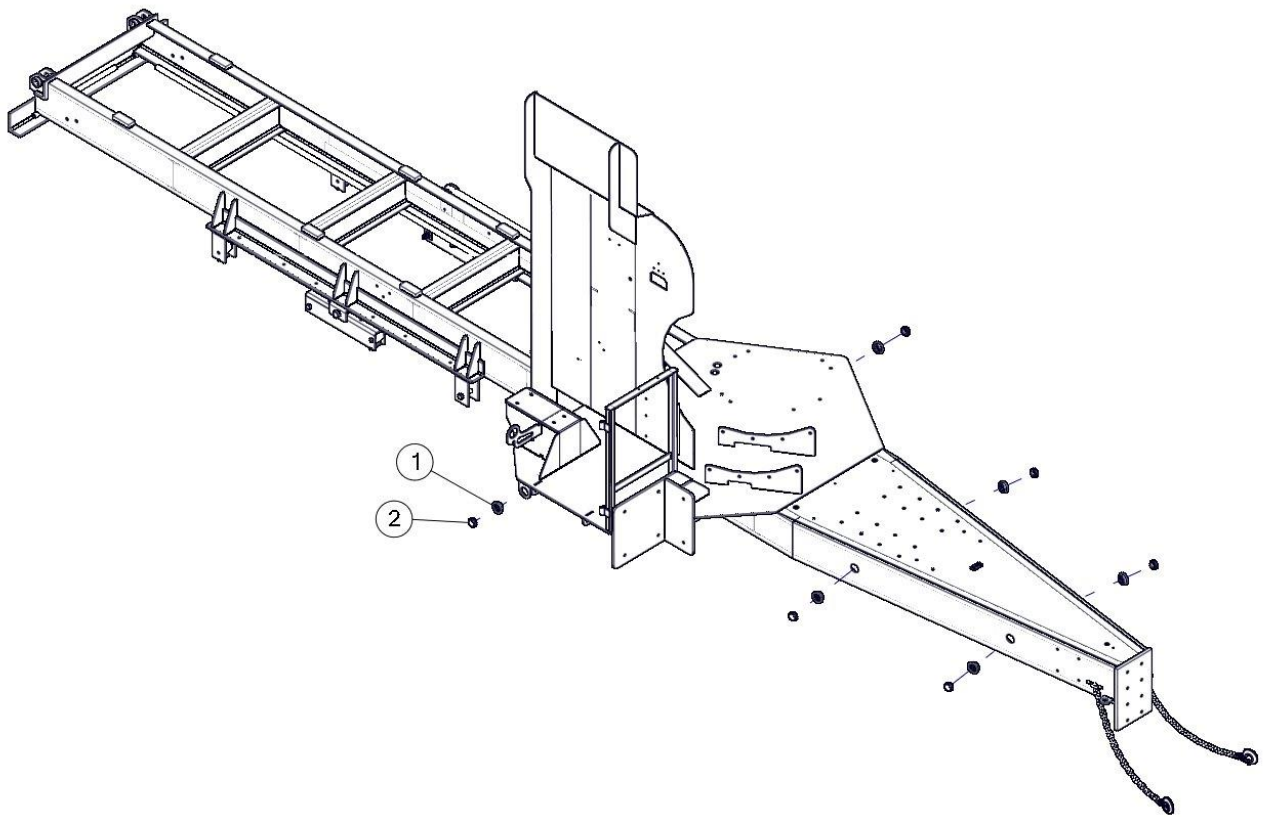
061319 LV-2002-KUBOTA FUEL TANK ASSEMBLY REV1



| BOM ID | Qty | PartNo (config) | Description (config) |
|--------|-----|-----------------|--|
| 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 | 5 | VEL-022204 | HOSE CLAMP, SAE 4 7/32-5/8 |
| 4 | 1 | LV-1159 | FUEL LINE, 5/16 IN. ID, SAE 30R7 |
| 5 | 1 | LV-1374 | SENDING UNIT COVER SCREWS (5 PACK) |
| 6 | 1 | LV-1326 | SENDING UNIT PORT COVER PLATE |
| 7 | 1 | LV-1373 | SENDING UNIT GASKET |
| 8 | 1 | LV-1281 | FUEL TANK SENDING UNIT FOR REMOTE FUEL GAUGE |

10.50 SPARTAN FRAME LIGHT ASSEMBLY

SPARTAN FRAME LIGHTS ASSEMBLY
 SPARTAN LEAF VACUUM
 121311 LV-2002.SMG



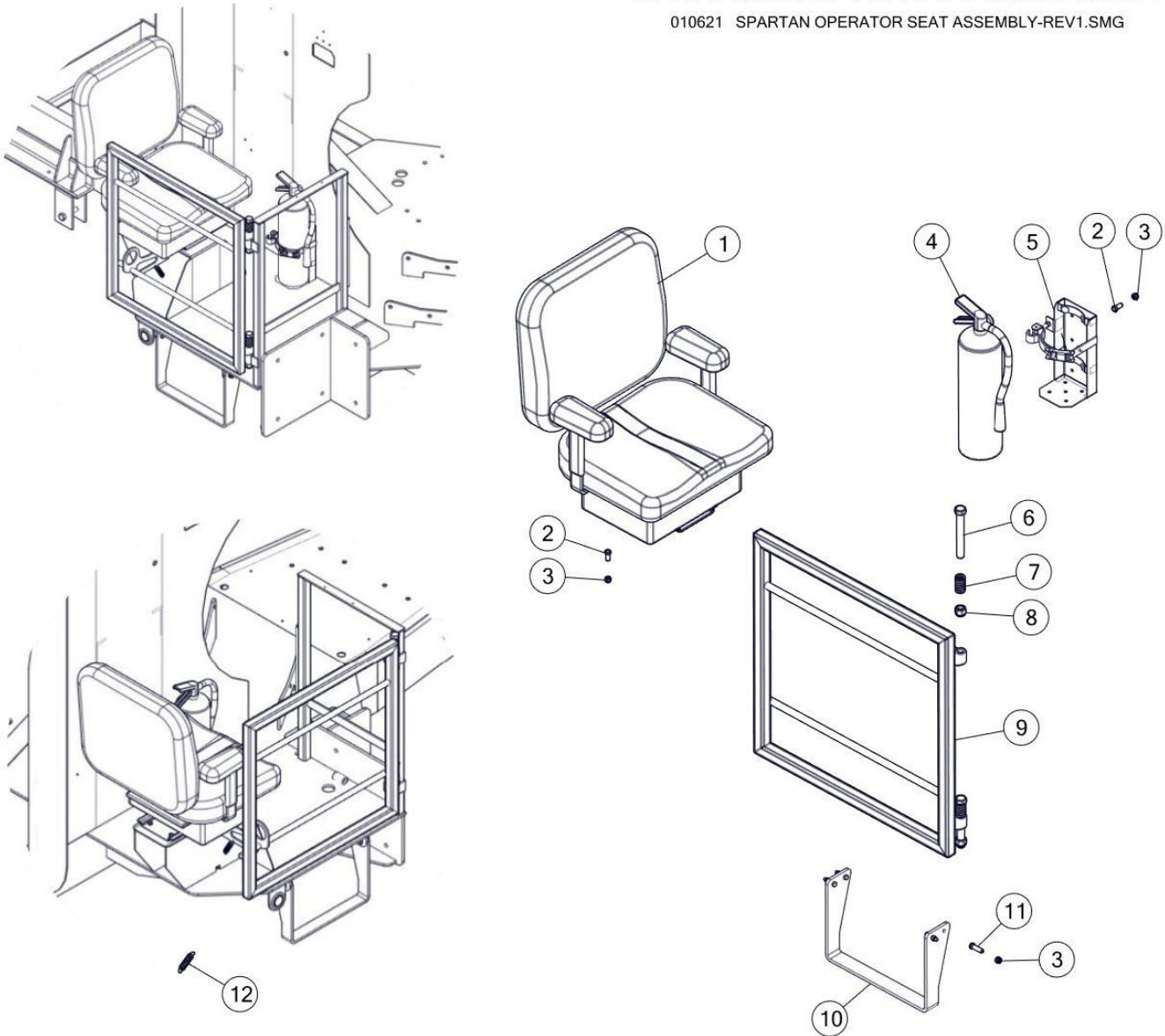
| BOM ID | Qty | PartNo (config) | Description (config) |
|--------|-----|-----------------|-------------------------------------|
| 1 | 6 | PM-146-18 | GROMMET, 2" CLEARANCE/MARKER |
| 2 | 6 | PM-M194A | LED CLEARANCE LITE 2" AMBER 3 DIODE |

DOCUMENT 21.0

10.51 SEAT, FIRE EXTINGUISHER AND GATE ASSEMBLY

OPERATOR SEAT AREA ASSEMBLY

010621 SPARTAN OPERATOR SEAT ASSEMBLY-REV1.SMG

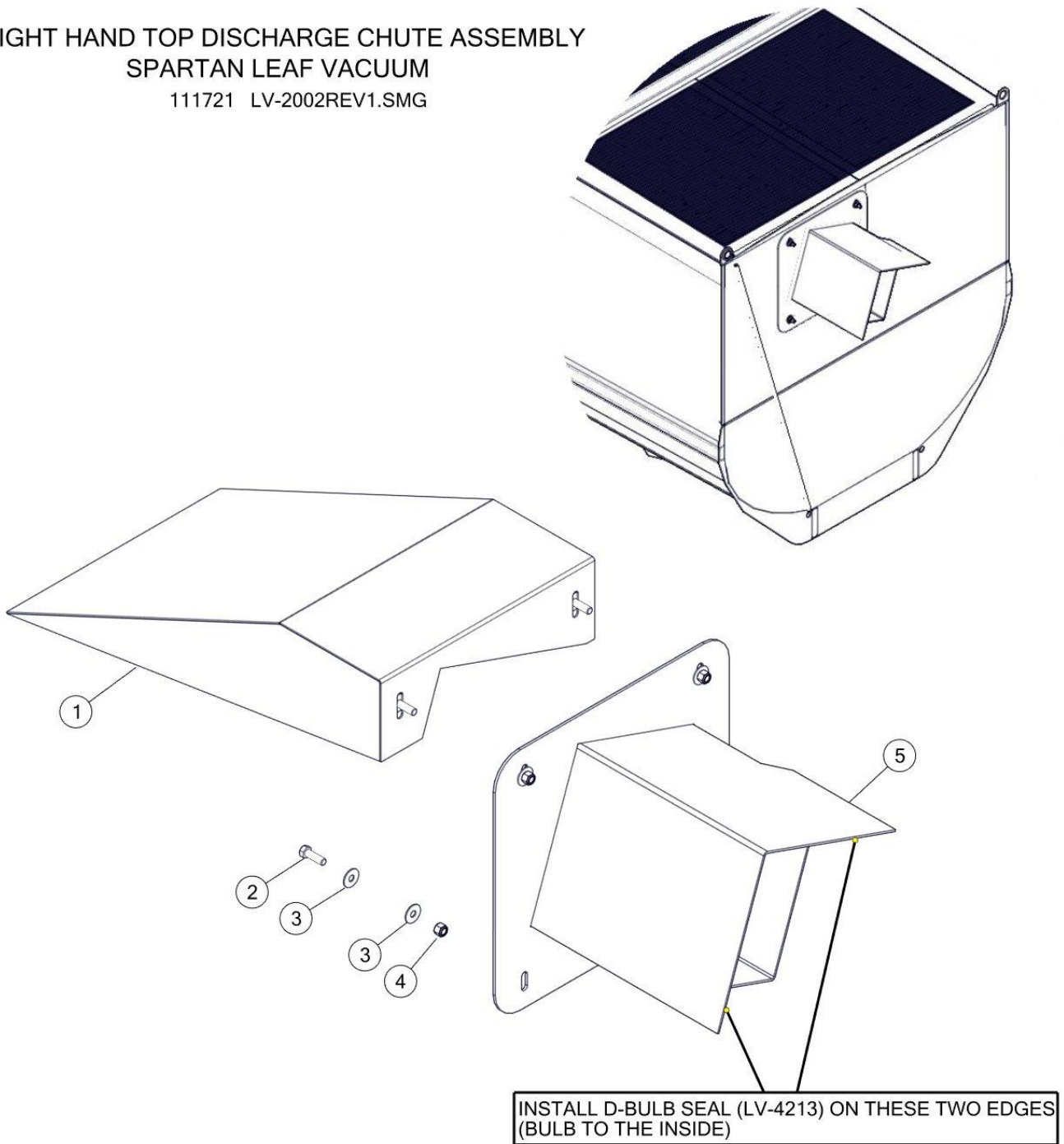


SEAT BELT: LV-1636 (NOT SHOWN)

| BOM ID | Qty | PartNo (config) | Description (config) |
|--------|-----|-----------------|-------------------------------|
| 1 | 1 | LV-1140 | OPERATOR SEAT |
| 2 | 7 | BON-000057 | 3/8-16 X 1" BOLT |
| 3 | 11 | BON-000319 | 3/8-16" LOCK NUT |
| 4 | 1 | LV-1259 | FIRE EXTINGUISHER - 10# ABC |
| 5 | 1 | LV-4585 | 10# FIRE EXTINGUISHER BRACKET |
| 6 | 2 | BON-000195 | 3/4-10 X 6-1/2" BOLT |
| 7 | 2 | LC-135M-1-S | SPRING |
| 8 | 2 | BON-000323 | 3/4-10" LOCK NUT |
| 9 | 1 | LV-2031 | RIGHT HAND HINGED HAND RAIL |
| 10 | 1 | LV-2053 | BOLT ON STEP |
| 11 | 4 | BON-000059 | 3/8-16 X 1-1/2" BOLT |
| 12 | 1 | BON-002209 | SPRING |

10.52 RIGHT HAND TOP DISCHARGE CHUTE ASSEMBLY

RIGHT HAND TOP DISCHARGE CHUTE ASSEMBLY
 SPARTAN LEAF VACUUM
 111721 LV-2002REV1.SMG



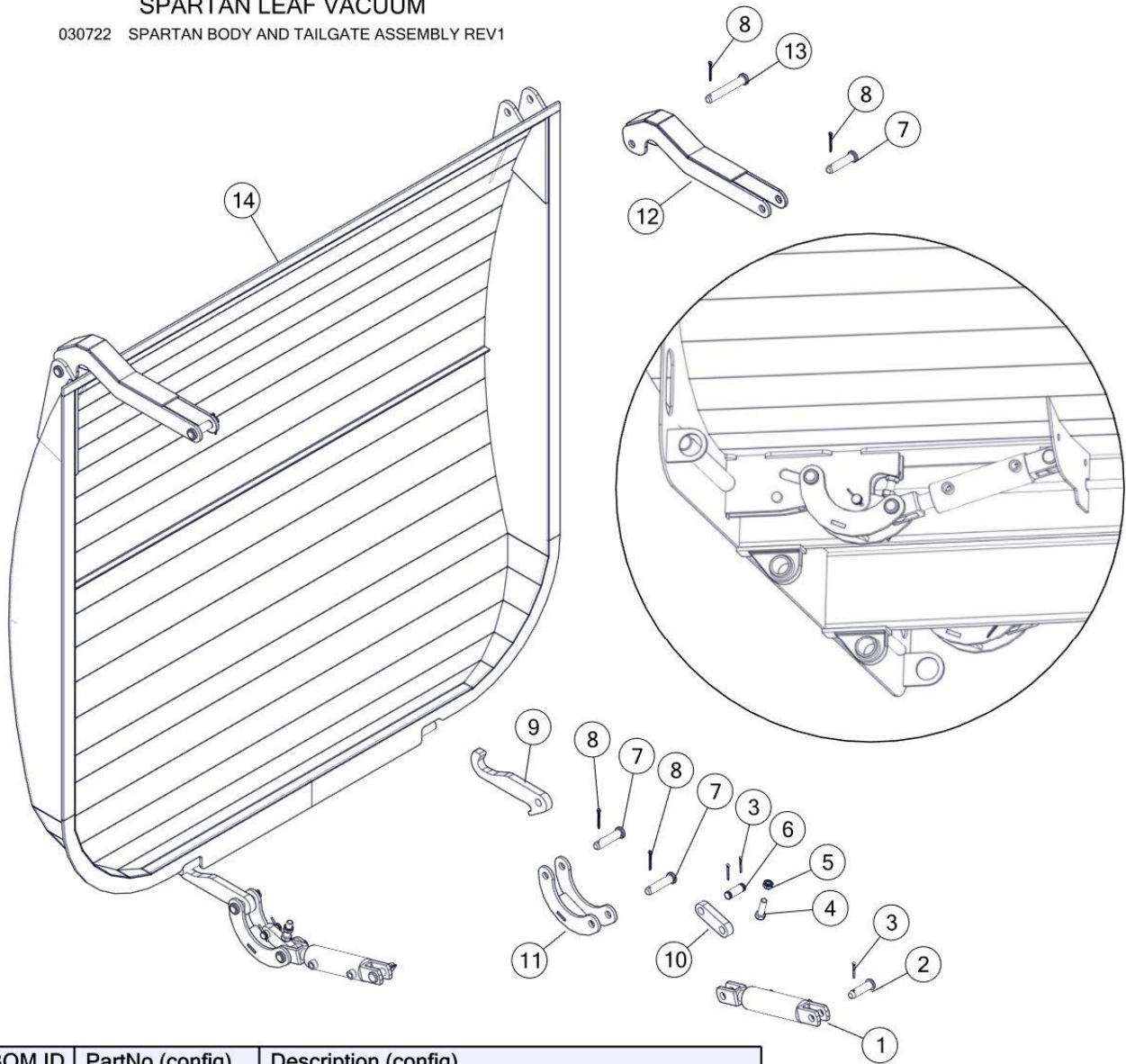
| BOM ID | PartNo (config) | Description (config) |
|--------|-----------------|------------------------|
| 1 | LV-2012 | AIR BAFFLE |
| 2 | BON-000153 | 5/8-11 X 2" BOLT |
| 3 | BON-000341 | FLAT WASHER, 5/8 |
| 4 | BON-000322 | 5/8-11 LOCK NUT |
| 5 | LV-2027 | RH TOP DISCHARGE CHUTE |

10.53 DISCHARGE DOOR AND HYDRAULIC LATCH ASSEMBLY

DISCHARGE DOOR AND LATCH ASSEMBLY

SPARTAN LEAF VACUUM

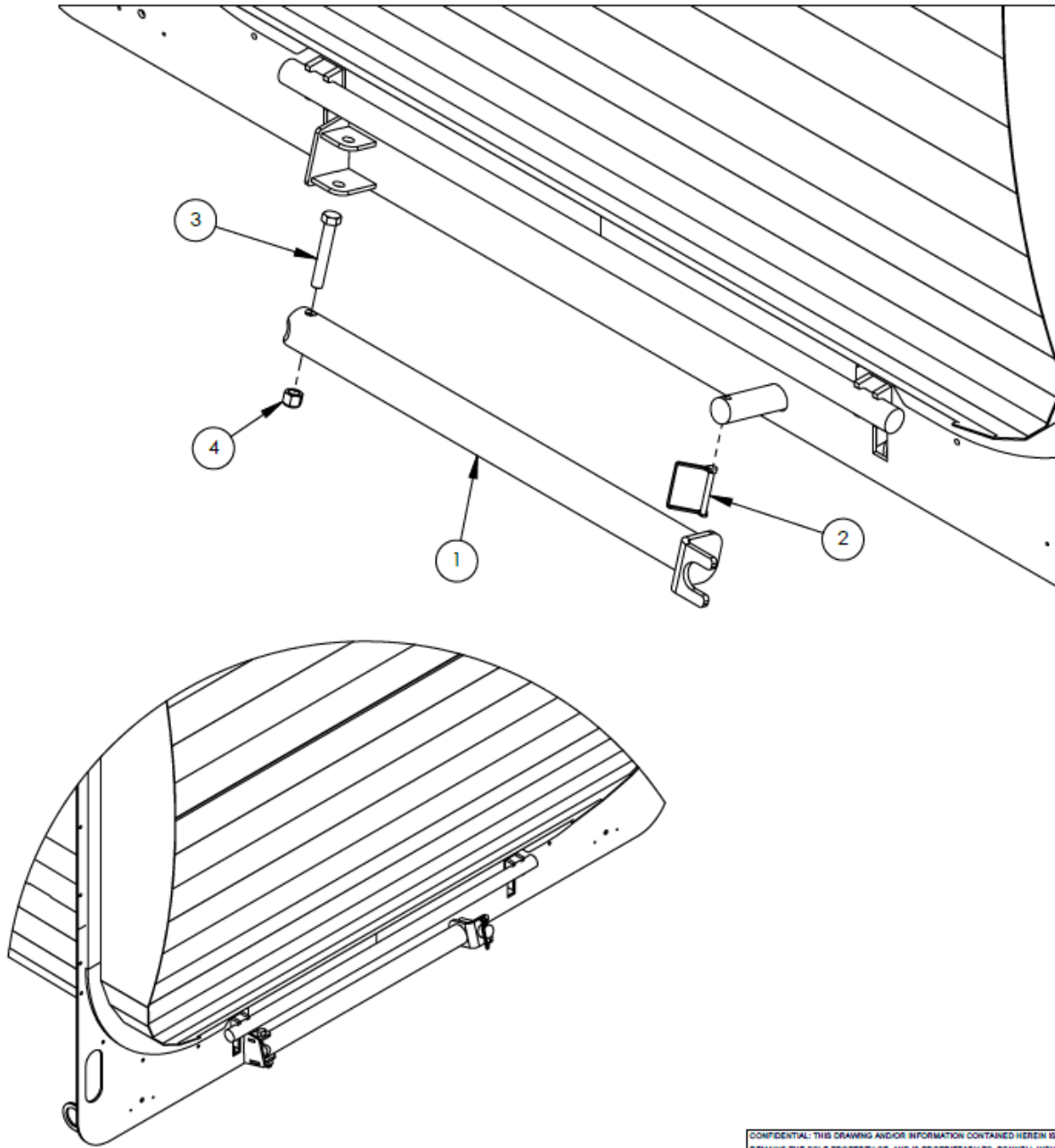
030722 SPARTAN BODY AND TAILGATE ASSEMBLY REV1



| BOM ID | PartNo (config) | Description (config) |
|--------|-----------------|---|
| 1 | LV-4594 | CYLINDER, 2-1/2" BORE X 6" STROKE |
| 2 | WES-93079K | PIN 1 X 3-1/2 |
| 3 | BON-000383 | COTTER PIN 3/16 X 2 |
| 4 | BON-000184 | 3/4-10 X 2-1/2" BOLT |
| 5 | BON-000333.3 | 3/4-10 HEX JAM NUT |
| 6 | PMC-190400005 | CLEVIS PIN, 1" X 2-1/8" WORKING LENGTH |
| 7 | BON-000991 | PIN, 1" DIA. x 4-1/4 LG 3-5/8" WORKING LENGTH |
| 8 | BON-000385 | COTTER PIN 1/4 X 2 |
| 9 | LV-2107 | SPARTAN DOOR LATCH |
| 10 | LV-2013 | SPARTAN FRONT LATCH PIVOT |
| 11 | LV-2108 | SPARTAN LATCH WELDMENT |
| 12 | LV-2110 | SPARTAN LATCH WELDMENT |
| 13 | BON-000995 | PIN, 1"x6-3/8" LG 5-3/4" WORKING LENGTH |
| 14 | LV-2103 | HYDRAULIC LATCH |

10.54 REAR DOOR PROP

| | |
|-----------|-------------------|
| FILE NAME | SPARTAN DOOR PROP |
| DWG NAME | BREAKDOWN |



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| | | | |
|------|-----|-------------|-----------------------------|
| 4 | 1 | BON-000322 | 5/8"-11 LOCKNUT, NYLON |
| 3 | 1 | BON-000161 | 5/8"-11 X 4" GR. 8 HEX BOLT |
| 2 | 1 | BUY-66053 | SNAPPER PIN, 5/16" X 2-3/4" |
| 1 | 1 | LV-3041 | DOOR PROP |
| ITEM | QTY | PART NUMBER | DESCRIPTION |

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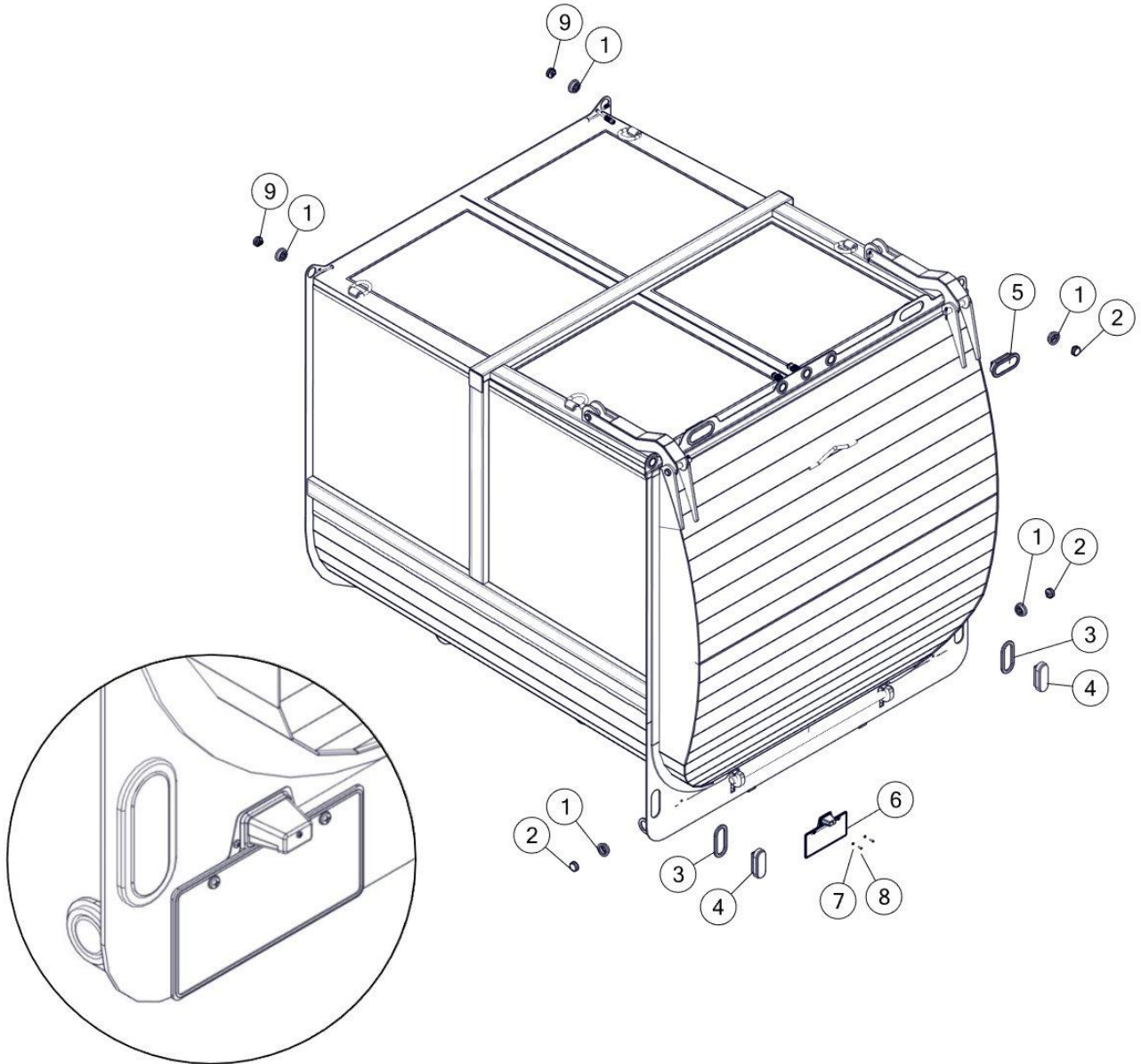
DIXON, ILLINOIS
 PHONE: 800-851-9664

10.55 SPARTAN BODY LIGHTS ASSEMBLY

SPARTAN BODY LIGHTS ASSEMBLY

SPARTAN LEAF VACUUM

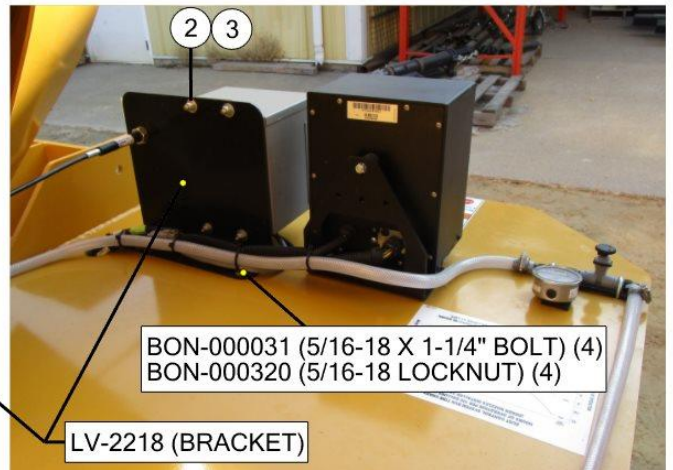
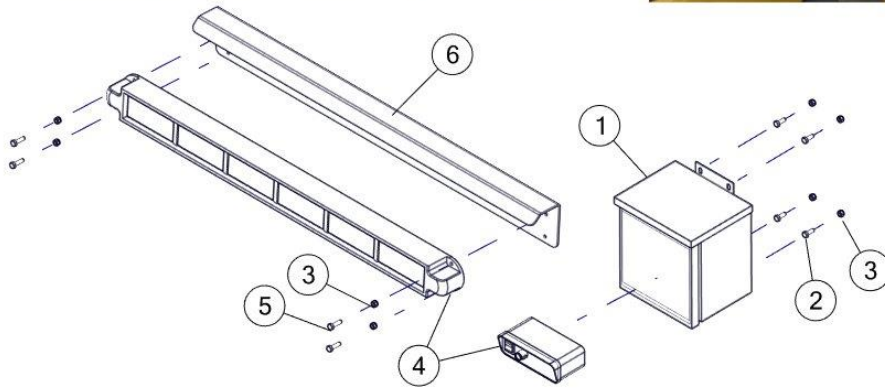
110717 SPARTAN BODY LIGHTS ASSEMBLY.SMG



| BOM ID | PartNo (config) | Description (config) |
|--------|-----------------|---|
| 1 | PM-146-18 | GROMMET, 2" CLEARANCE/MARKER |
| 2 | PM-M194R | LED CLEARANCE LITE 2" RED |
| 3 | PM-B421-18 | GROMMET, OBLONG FOR 60 SERIES |
| 4 | PM-M820R-10 | OVAL LED 10 DIODE LUMENX STT LIGHT |
| 5 | ECCO-3920A | LED OVAL WARNING LAMP 12 VOLT ONLY AMBER 10 |
| 6 | NAP-12250304 | LICENCE PLATE BRACKET |
| 7 | | 10-24 HEX NUT WITH STAR WASHER |
| 8 | | 10-24 X3/4" MACHINE SCREW |
| 9 | PM-M194A | LED CLEARANCE LITE 2" AMBER 3 DIODE |

10.56 TRAFFIC ADVISOR LIGHT ASSEMBLY

TRAFFIC ADVISOR LIGHT ASSEMBLY
SPARTAN LEAF VACUUM
122117 LV-2002.SMG



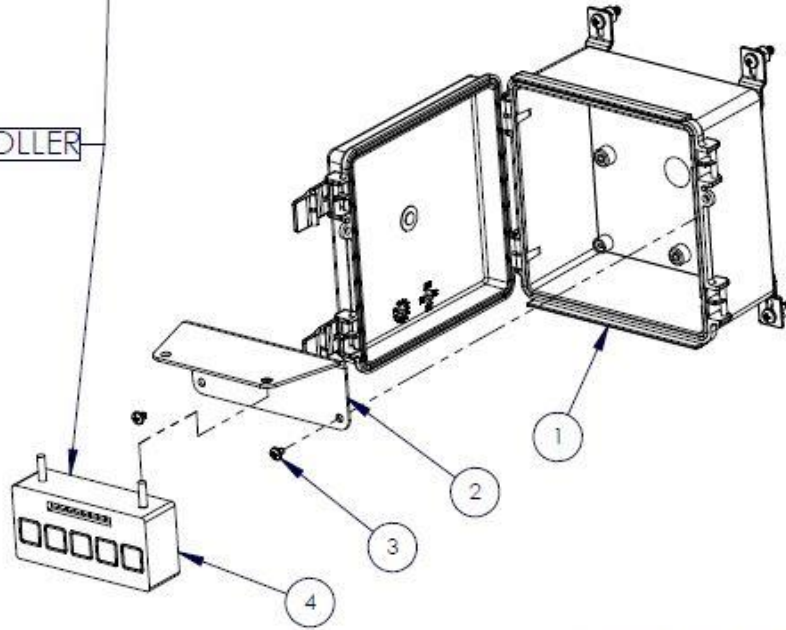
| BOM ID | Qty | PartNo (config) | Description (config) |
|--------|-----|-----------------|---|
| 1 | 1 | 6C717 | ELECTRICAL ENCLOSURE |
| 2 | 4 | BON-000003 | 1/4-20 x 3/4" BOLT |
| 3 | 8 | BON-000318.5 | 1/4-20 LOCK NUT |
| 4 | 1 | LV-2092 | TRAFFIC ADVISOR, LED, 6 LITE, WITH CONTROLLER |
| 5 | 4 | BON-000005 | 1/4-20 x 1" BOLT |
| 6 | 1 | LV-2048 | TRAFFIC ADVISOR BRACKET |

Parts Breakdowns

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



LV-2621 CONTROLLER



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| 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 | 1 | LV-2621 | LOW PROFILE LED, TOUCH PAD CONTROLLER |
| ITEM | QTY | PART NUMBER | DESCRIPTION |

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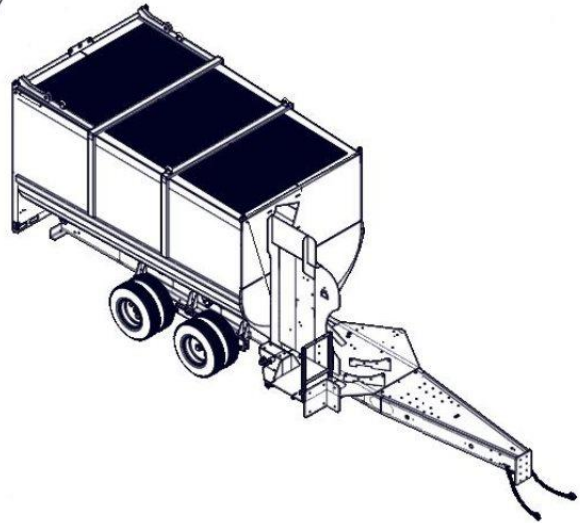
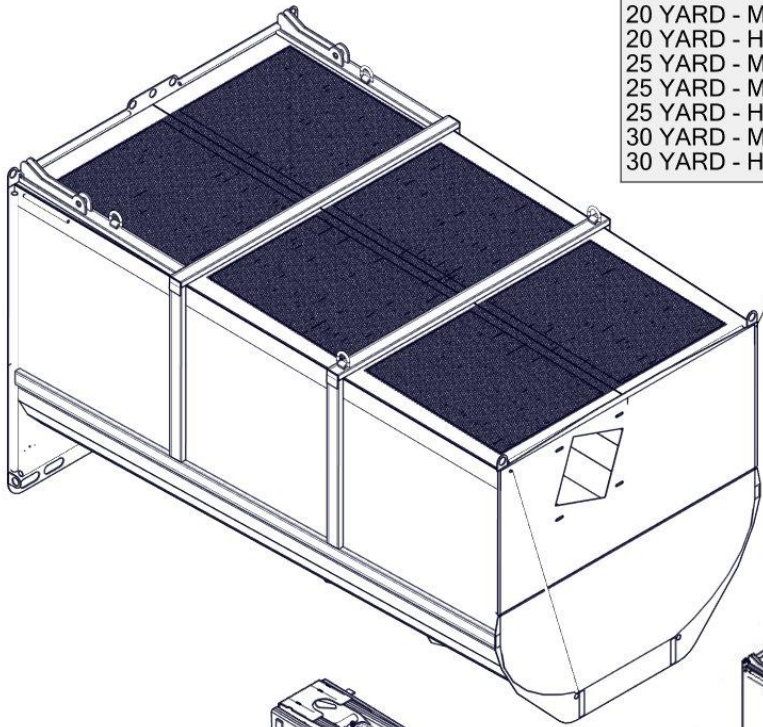
DIXON, ILLINOIS
 PHONE: 800-851-9664

10.57 HOIST AND BODY ASSEMBLY

HOIST AND BODY ASSEMBLY
SPARTAN LEAF VACUUM

111119 SPARTAN BODY AND HOIST TIER 4.SMG

ITEM 1: (BODY)
 15 YARD - MANUAL LATCH - LV-2216
 15 YARD - HYDRAULIC LATCH - LV-2215
 20 YARD - MANUAL LATCH - LV-2633
 20 YARD - HYDRAULIC LATCH - LV-2220
 25 YARD - MANUAL LATCH - LV-2275
 25 YARD - MANUAL LATCH - NO TOP SCREENS - LV-2285
 25 YARD - HYDRAULIC LATCH - LV-2255
 30 YARD - MANUAL LATCH - LV-2634
 30 YARD - HYDRAULIC LATCH - LV-2230



ITEM 2: (HOIST - COMPLETE ASS'Y)
 INCLUDES:
 FRAME W/CYLINDER, UPPER & LOWER PIVOTS,
 SAFETY PROP, PROP CUP, REAR HINGE & BODY GUIDES
 15 YARD - CS620T BONNELL
 20 YARD - CS620T BONNELL
 25 YARD - CS5530 BONNELL
 30 YARD - CS6630 BONNELL

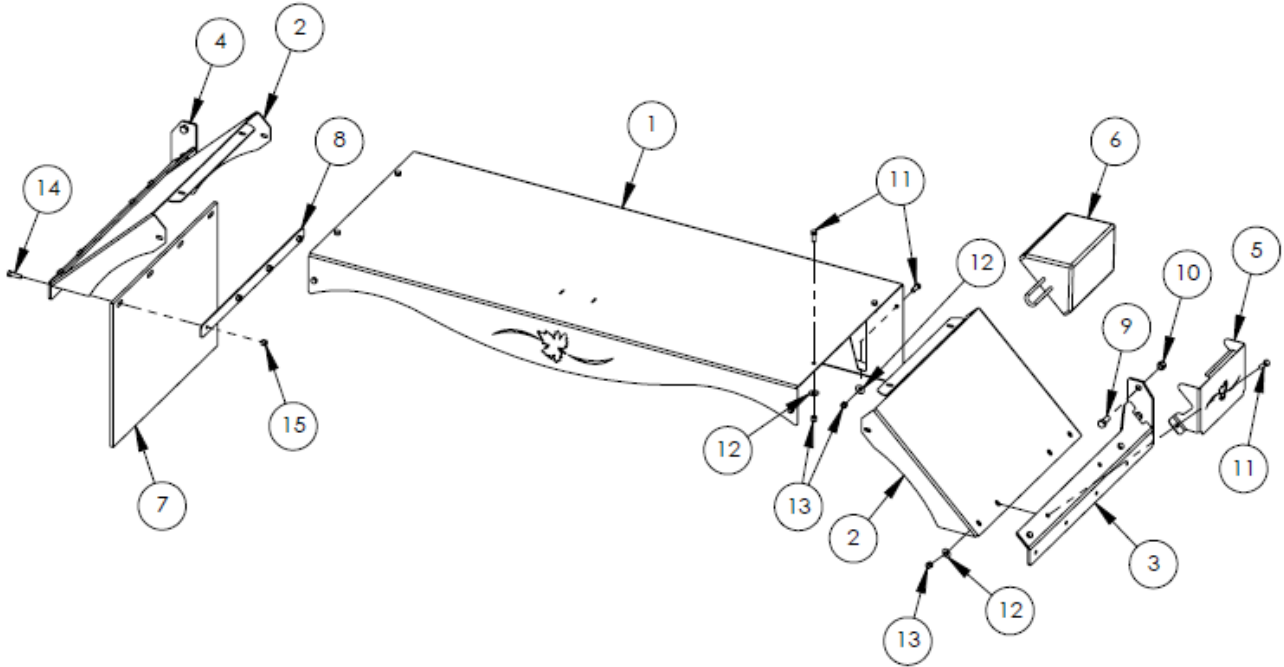
| BOM ID | PartNo (config) | Description (config) |
|--------|-----------------|----------------------|
| 1 | VARIABLES | SEE ABOVE |
| 2 | VARIABLES | SEE ABOVE |
| 3 | BON-000108 | 1/2-13 x 1-3/4" BOLT |
| 4 | BON-000321 | 1/2-13 LOCK NUT |
| 5 | LV-2020-23 | BODY PROP SPACER |

ADDITIONAL PARTS SOLD SEPARATELY:
 SAFETY PROP & PROP CUP: LV-2613
 BODY GUIDES: LV-2614
 REAR HINGES (15-20 YARD): LV-2615 (EACH)
 REAR HINGE (25-30 YARD): LV-2616

Parts Breakdowns

10.58 FENDER AND WHEEL CHOCK ASSEMBLY

| | | | | | |
|-----------|-------|------|-------------|-----------|----------|
| FILE NAME | M1477 | REV. | DESCRIPTION | DATE | INITIALS |
| DWG NAME | M1477 | - | ORIGINAL | 1/16/2023 | JWH |



| | | | |
|------|--------------|-----|--------------------------------|
| 15 | BON-000320 | 4 | 5/16"-18 LOCK NUT, NYLON |
| 14 | BON-000031 | 4 | 5/16"-18 X 1-1/4" HHCS |
| 13 | BON-000319 | 16 | 3/8"-16 LOCK NUT, NYLON |
| 12 | BON-000338 | 16 | 3/8" FLAT WASHER |
| 11 | BON-000058 | 16 | 3/8"-16 X 1-1/4" HHCS |
| 10 | BON-000321 | 4 | 1/2"-13 LOCK NUT, NYLON |
| 9 | BON-000107 | 4 | 1/2"-13 X 1-1/2" HHCS |
| 8 | BON-008755SS | 1 | MOUNTING BRACKET, MUDFLAP |
| 7 | LV-2267 | 1 | MUDFLAP, TITAN LEAF SOLUTIONS |
| 6 | BUY-WC1085H | 1 | WHEEL CHOCK |
| 5 | LV-4478 | 1 | WHEEL CHOCK HOLDER |
| 4 | LV-4477L | 1 | MOUNTING BRACKET, FENDER LEFT |
| 3 | LV-4477R | 1 | MOUNTING BRACKET, FENDER RIGHT |
| 2 | LV-4476 | 2 | FENDER, SIDE |
| 1 | LV-4475 | 1 | FENDER, TOP |
| ITEM | PART NUMBER | QTY | DESCRIPTION |

NOTE:
QUANTITIES ARE FOR ONE FENDER

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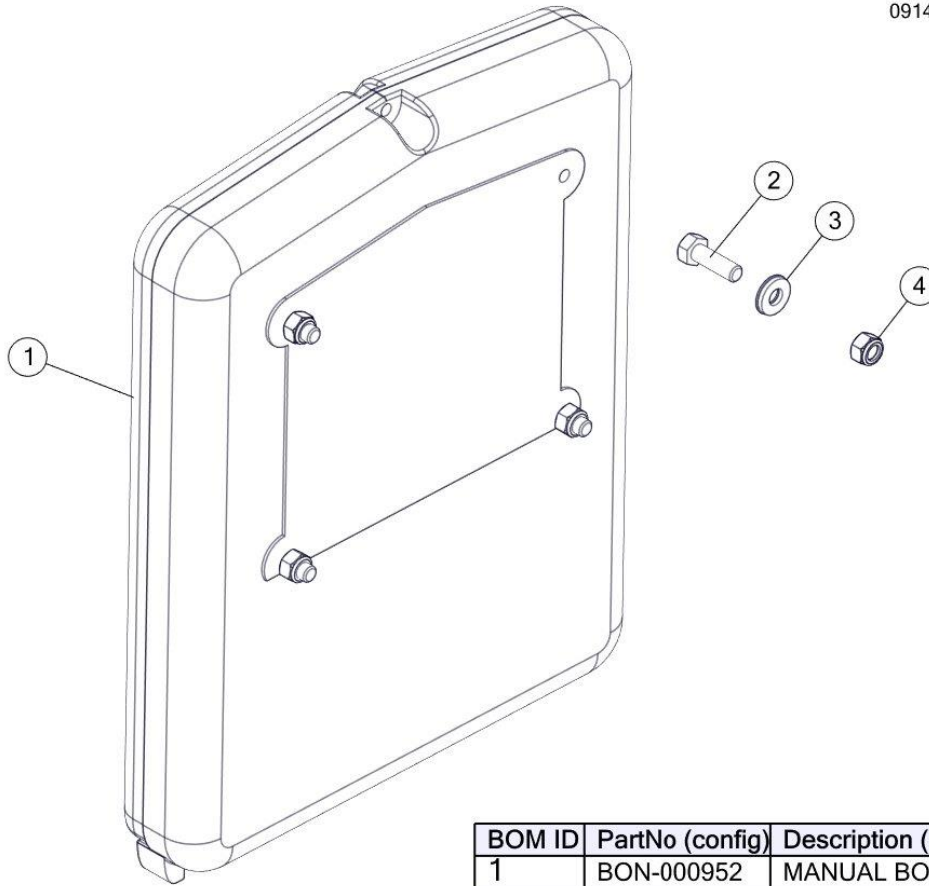
DIXON, ILLINOIS
PHONE: 800-851-9664

DOCUMENT 31.0

10.59 MANUAL BOX ASSEMBLY

MANUAL BOX ASSEMBLY

091416 BON-000952.smg



| BOM ID | PartNo (config) | Description (config) |
|--------|-----------------|-----------------------------------|
| 1 | BON-000952 | MANUAL BOX, LARGE |
| 2 | BON-000030 | 5/16-18 X 1" BOLT |
| 3 | BON-008939 | 5/16 BONDED FLATWASHER |
| 4 | BON-000320 | NYLON INSERT LOCKNUT, 5/16-18 UNC |



NO RIDE ON SEAT MOUNTING LOCATION



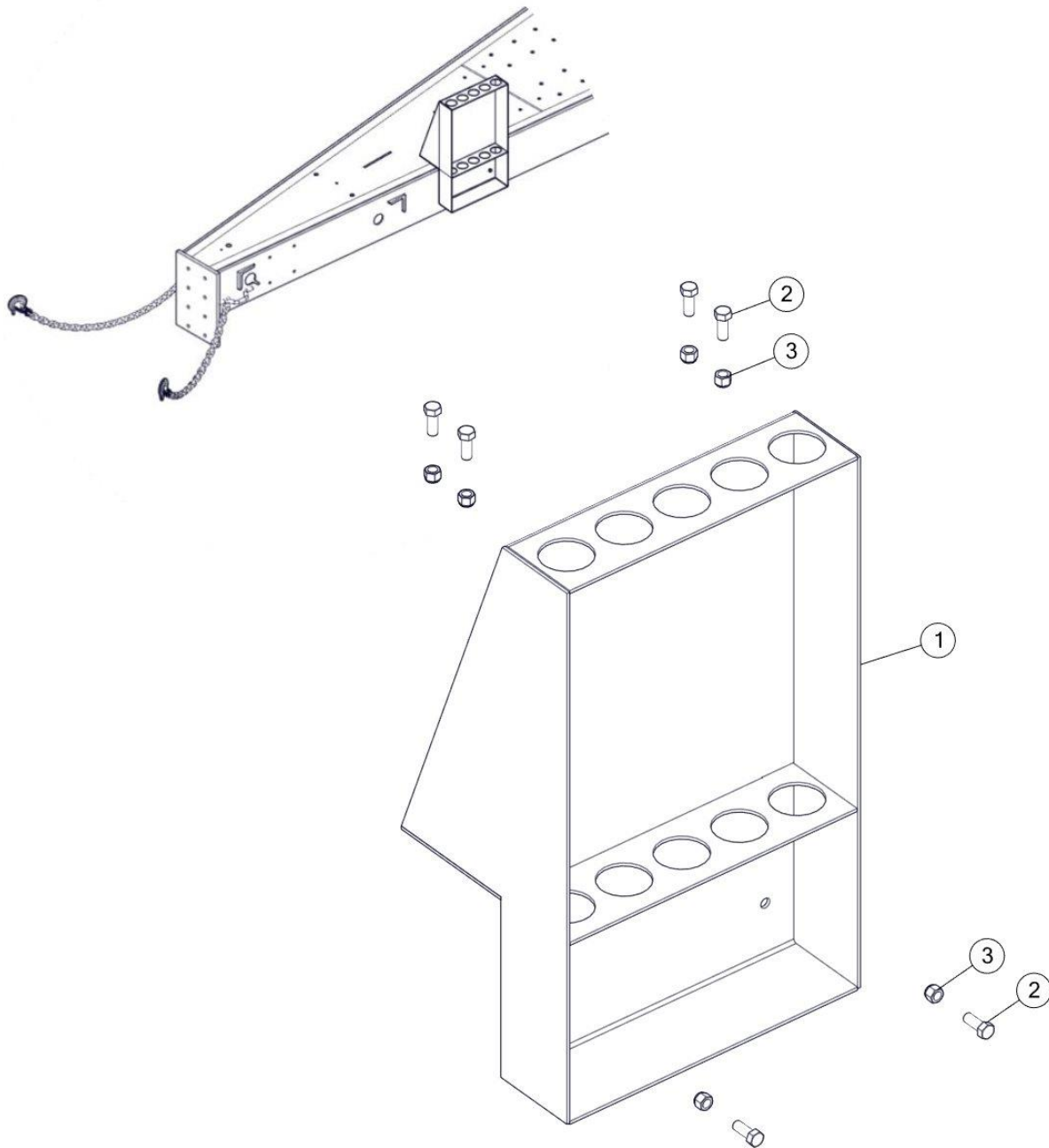
RIDE ON SEAT MOUNTING LOCATION

DOCUMENT 32.0

10.60RAKE HOLDER ASSEMBLY

RAKE HOLDER ASSEMBLY

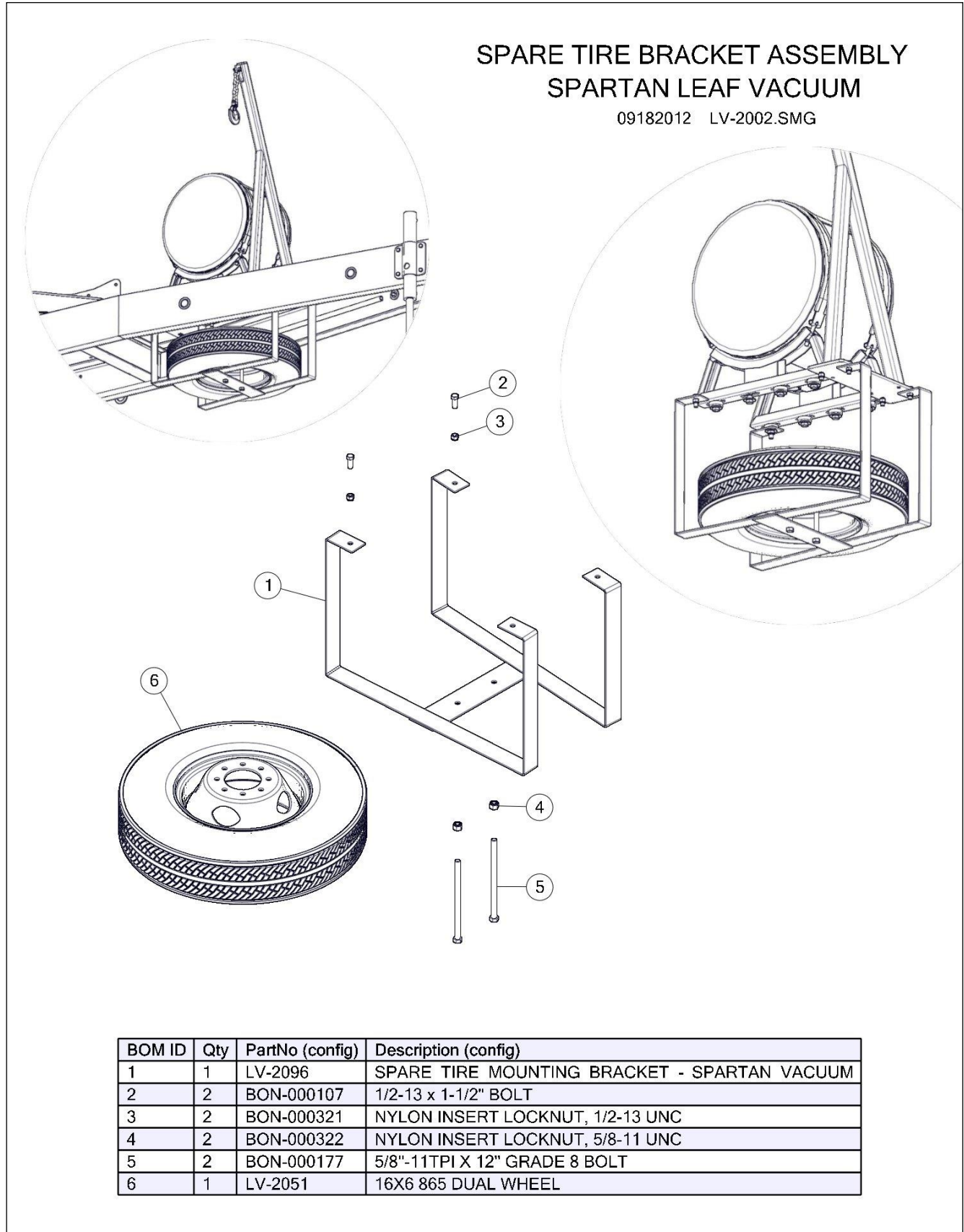
110116 SPARTAN RAKE HOLDER ASSEMBLY.smg



| BOM ID | PartNo (config) | Description (config) |
|--------|-----------------|----------------------------------|
| 1 | LV-1324 | RAKE HOLDER - EDGE MOUNT |
| 2 | BON-000057 | 3/8-16 X 1" BOLT |
| 3 | BON-000319 | NYLON INSERT LOCKNUT, 3/8-16 UNC |

DOCUMENT 33.0

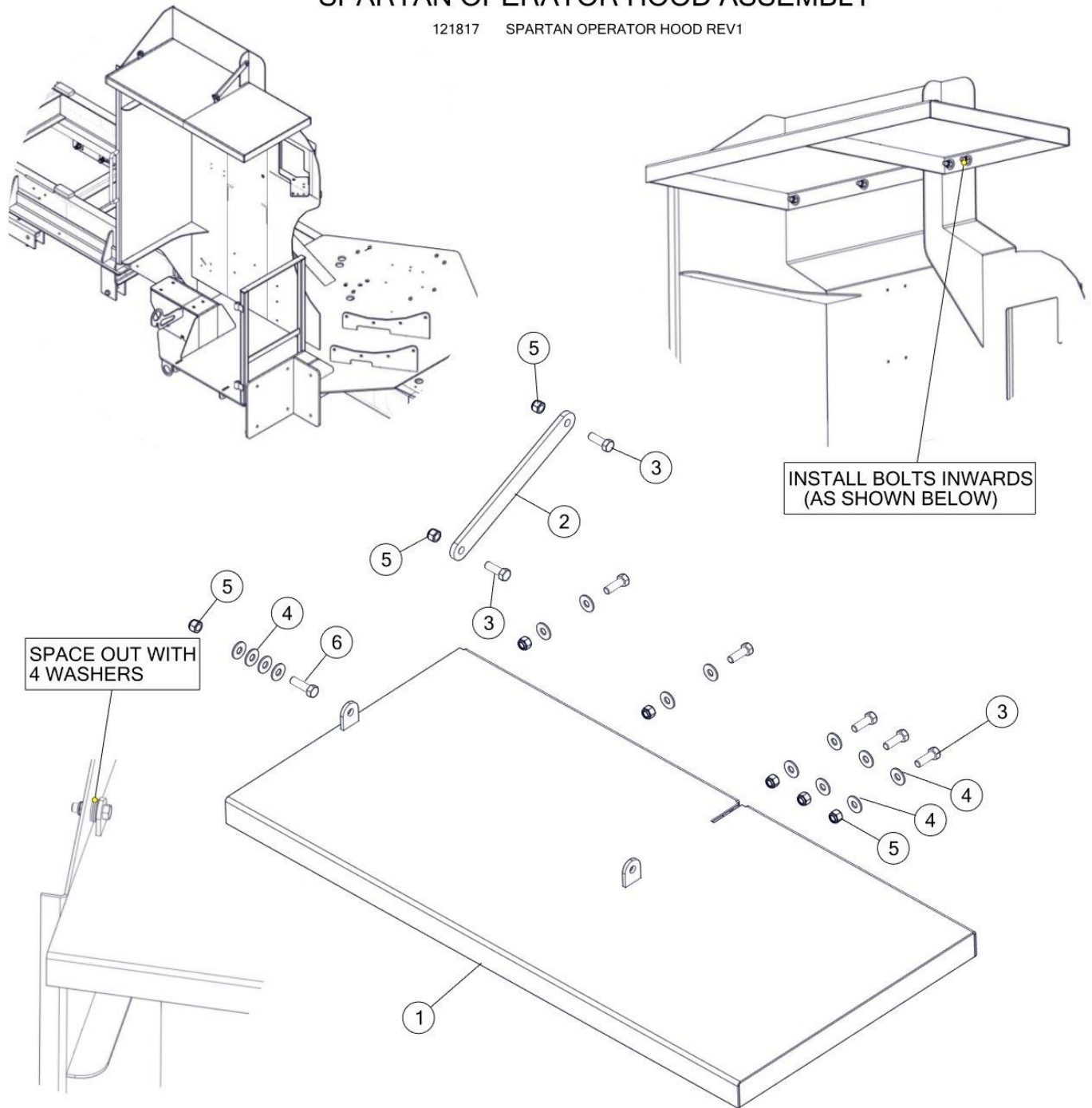
10.61 SPARE TIRE BRACKET ASSEMBLY



10.62 SPARTAN OPERATOR HOOD ASSEMBLY

SPARTAN OPERATOR HOOD ASSEMBLY

121817 SPARTAN OPERATOR HOOD REV1



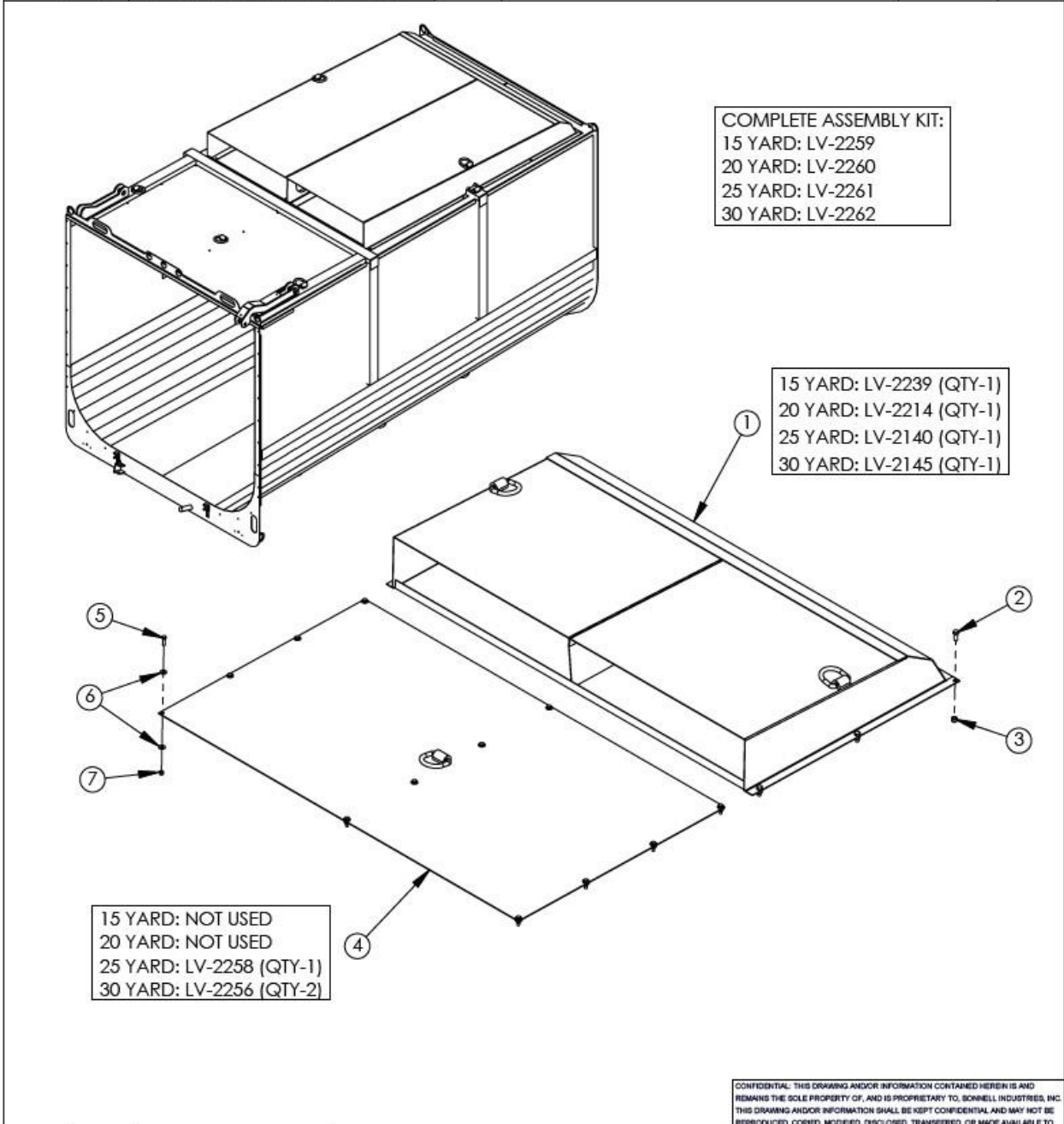
| BOM ID | PartNo (config) | Description (config) |
|--------|-----------------|----------------------------------|
| 1 | LV-2190 | SPARTAN OPERATOR HOOD |
| 2 | LV-2191 | LINK - SPARTAN OPERATOR HOOD |
| 3 | BON-000107 | 1/2-13 x 1-1/2" BOLT |
| 4 | BON-000340 | FLAT WASHER, 1/2 |
| 5 | BON-000321 | NYLON INSERT LOCKNUT, 1/2-13 UNC |
| 6 | BON-000108 | 1/2-13 x 1-3/4" BOLT |

DOCUMENT 34.0

Parts Breakdowns

10.63 LEAF HOOD ASSEMBLY

| | | | | | |
|-----------|----------------------------|------|-----------------------|-----------|----------|
| FILE NAME | SPARTAN LEAF HOOD ASSEMBLY | REV. | DESCRIPTION | DATE | INITIALS |
| DWG NAME | SPARTAN LEAF HOOD ASSEMBLY | - | ORIGINAL / ECO 20-005 | 1/31/2020 | LAJ |



| | | | |
|------|-----|-------------|--------------------------------------|
| 7 | AR | BON-000319 | 3/8"-16TPI HEX LOCK NUT NYLON INSERT |
| 6 | AR | BON-000338 | FLATWASHER,3/8" ZP |
| 5 | AR | BON-000058 | 3/8"-16TPI X 1 1/4" GRADE 8 BOLT |
| 4 | AR | SEE ABOVE | SCREEN COVER |
| 3 | AR | BON-000321 | 1/2"-13TPI HEX LOCK NUT NYLON INSERT |
| 2 | AR | BON-000106 | 1/2"-13TPI X 1 1/4" GRADE 8 BOLT |
| 1 | 1 | SEE ABOVE | LEAF HOOD |
| ITEM | QTY | PART NUMBER | DESCRIPTION |

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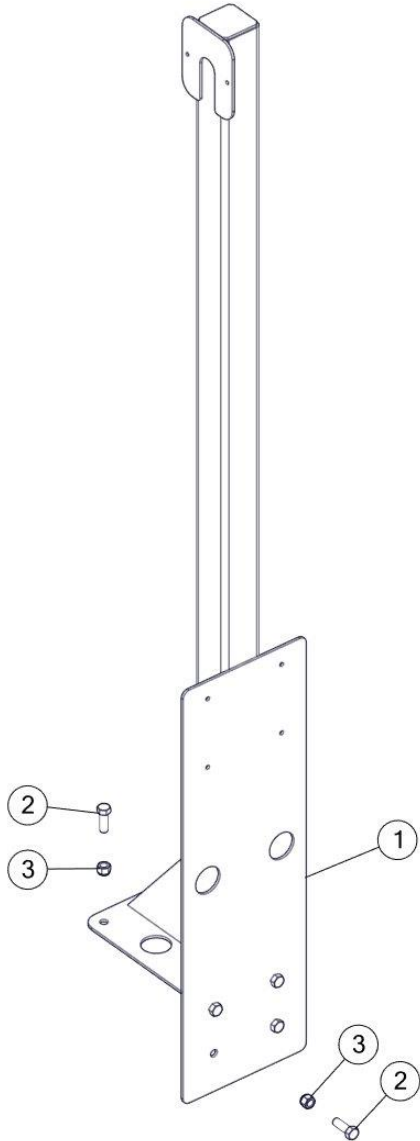
DIXON, ILLINOIS
 PHONE: 800-851-9664

DOCUMENT 35.0

10.64 BRACKET FOR WIRELESS BASE UNIT AND MURPHY POWER VIEW

BRACKET FOR WIRELESS BASE UNIT AND MURPHY POWER VIEW

120216 SPARTAN WIRELESS BRACKET.smg



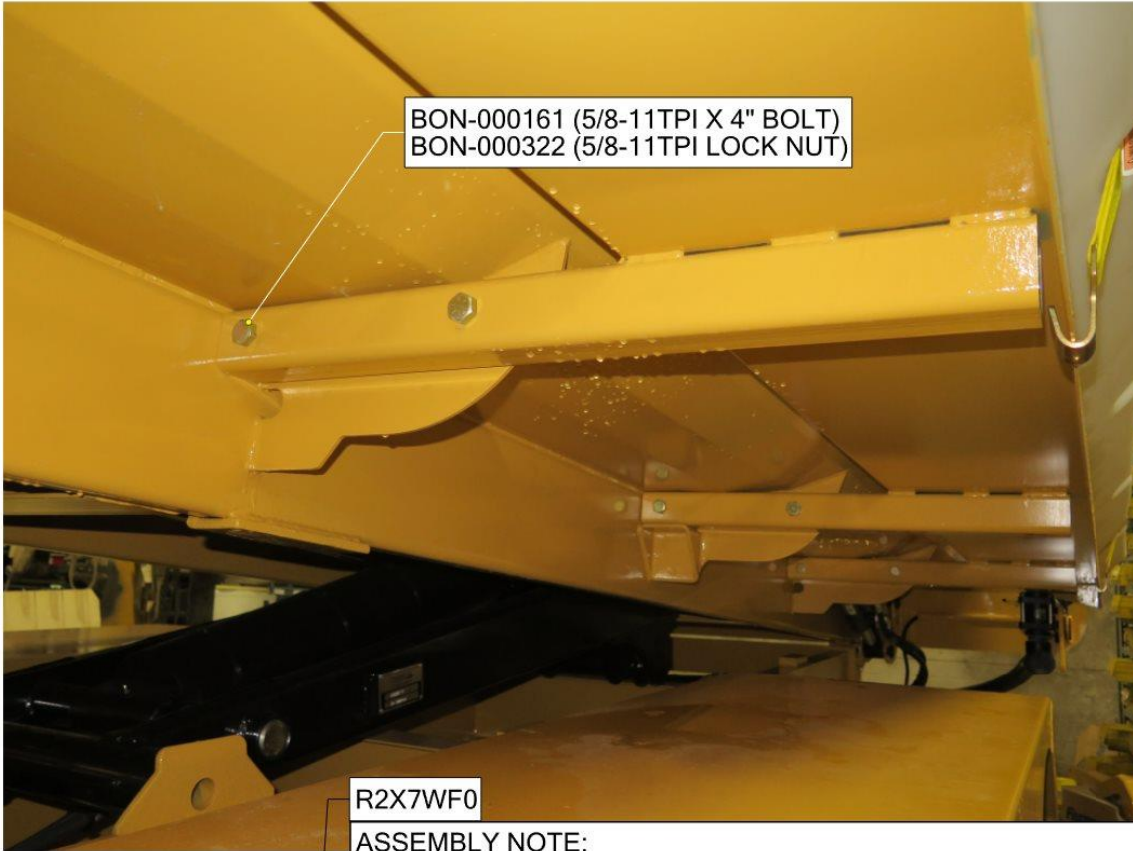
| BOM ID | Qty | PartNo (config) | Description (config) |
|--------|-----|-----------------|--|
| 1 | 1 | LV-2226 | BRACKET FOR WIRELESS BASE UNIT AND MURPHY POWER VIEW |
| 2 | 7 | BON-000107 | 1/2-13 x 1-1/2" BOLT |
| 3 | 7 | BON-000321 | NYLON INSERT LOCKNUT, 1/2-13 UNC |

DOCUMENT 37.0

10.65 DUST CONTROL TANK AND MOUNTING BRACKET ASSEMBLY

DUST CONTROL TANK AND MOUNTING BRACKET ASSEMBLY

101019 SPARTAN DUST CONTROL ASSEMBLY.smg



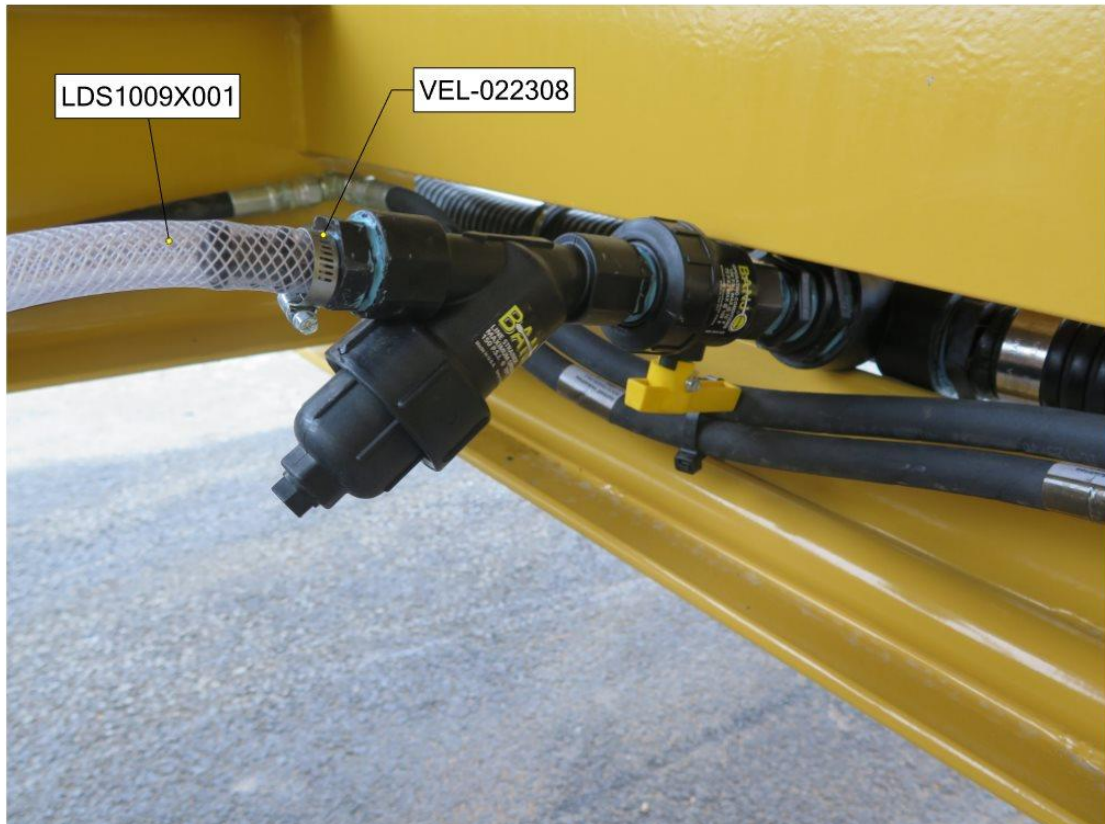
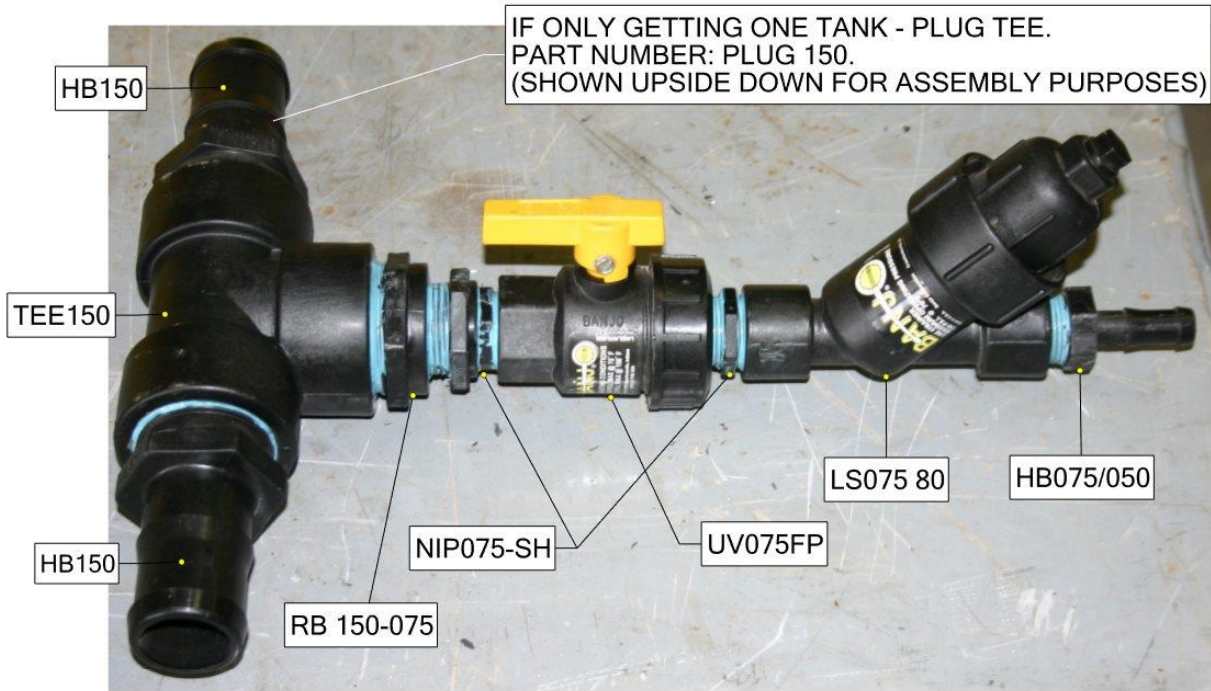
ASSEMBLY NOTE:
BEFORE TIGHTENING STRAPS, SANDWICH TWO RUBBER PADS
AT BOTH THE TOP FRONT AND TOP BACK CORNERS OF THE TANK.
PART NUMBER: BON-000703.3 (CUT 3/8X6X18" LONG)



10.66 DUST CONTROL BALL VALVE ASSEMBLY

DUST CONTROL BALL VALVE ASSEMBLY

90617 SPARTAN DUST CONTROL ASSEMBLY.smg



DOCUMENT 38.1

10.67 DUST CONTROL RIGHT AND LEFT TANK FITTING ASSEMBLIES

DUST CONTROL RIGHT AND LEFT TANK FITTING ASSEMBLIES

110216 SPARTAN DUST CONTROL ASSEMBLY.smg

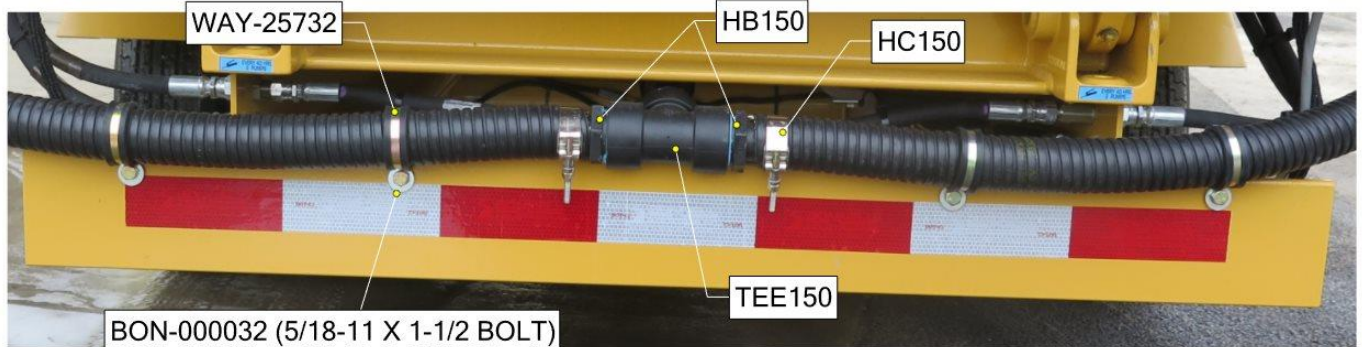


DOCUMENT 38.2

10.68 DUST CONTROL REAR HOSE MOUNTING ASSEMBLY

DUST CONTROL REAR HOSE MOUNTING ASSEMBLY

110216 SPARTAN DUST CONTROL ASSEMBLY.smg



10.69 DUST CONTROL BOTTOM HOSE ROUTING ASSEMBLY

DUST CONTROL BOTTOM HOSE ROUTING ASSEMBLY

110216 SPARTAN DUST CONTROL ASSEMBLY.smg



10.70DUST CONTROL PUMP AND PRESSURE ASSEMBLY

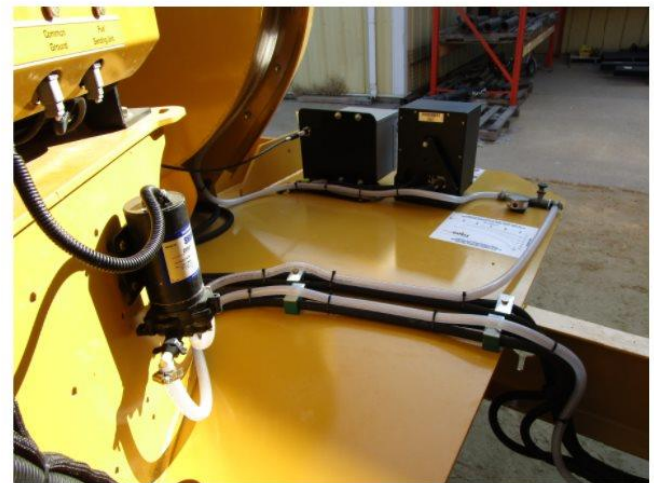
DUST CONTROL PUMP AND PRESSURE GAUGE ASSEMBLY

122117 SPARTAN DUST CONTROL ASSEMBLY.smg

BON-000006 (1/4-20 X 1-1/4" BOLT)
BON-000318.5 (1/4-20 LOCK NUT)



3043T15 (U-BOLT)
BON-000318.5 (1/4-20 LOCK NUT)

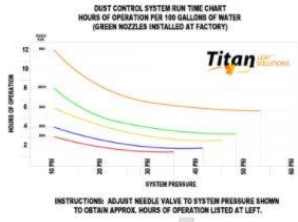


DOCUMENT 38.5

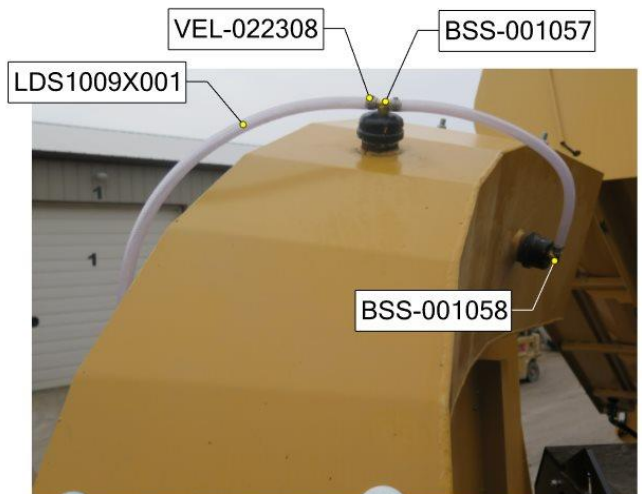
10.71 DUST CONTROL SPRAY NOZZLE ASSEMBLY

DUST CONTROL SPRAY NOZZLE ASSEMBLY

110216 SPARTAN DUST CONTROL ASSEMBLY.smg



LV-1386



DOCUMENT 38.6

Warranty

11 NOTES

12 WARRANTY



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 