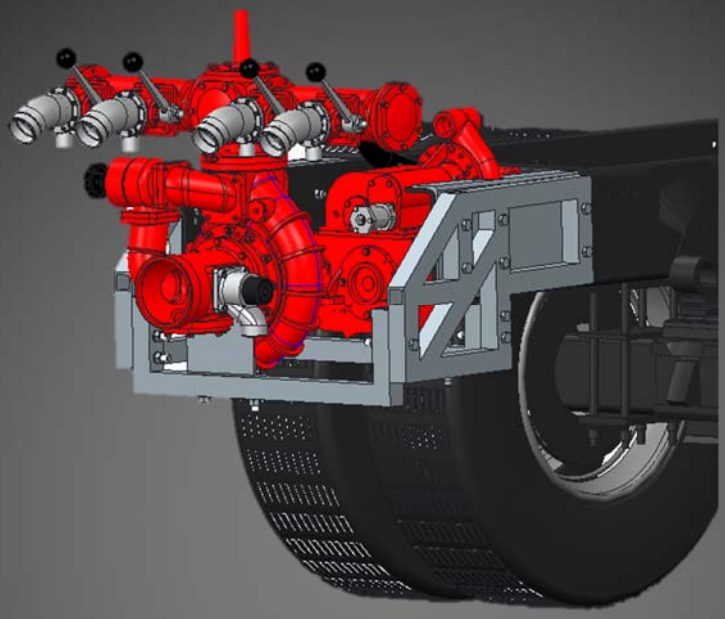


ASSEMBLY & INSTALLATION INSTRUCTIONS

LSRH

The installation instructions here within cover the best practice for safe installation, proper wiring, recommended pipe work, proper installation of safety devices, drive line design, chassis recommendations, required horse power, driveline layout, and instructions for the installer to make a complete risk assessment.

W.S. Darley & Company

1051 Palmer Street
Chippewa Falls, WI
54729

(715) 726-2650

KMD@Darley.com

6/25/2015

Version: 1 Revision: 0 Date of Release: 6/26/15

Table of Contents:

Definitions

!IMPORTANT!

In the case of this document, the LSRH General Instructions, **!IMPORTANT!** identifies a hazard that may cause premature wear, damage, or imminent failure to a component or series of components.

ATTENTION

In the case of this document, the LSRH General Instructions, **ATTENTION** along with the symbol of the triangle including an exclamation point ⚠ signifies a risk that may cause bodily harm, injury, or death.

Introduction

The LSRH Installation Manual contains important details regarding proper installation, driveline layout, installation of safety devices, intended wiring designations, special tools required for installation, proper selection of driveline components, measures to reduce noise, recommended horsepower, and advice on selecting a properly sized chassis. Prior to installing your LSRH it is critical that you read the information contained within the LSRH Installation Manual.

ATTENTION

Failure to read the LSRH Installation Manual prior to installing the LSRH pump may result in personal injury or death!

!IMPORTANT!

Failure to read the LSRH Installation Manual prior to installing the LSRH pump may result in premature failure to the pump, components, or Apparatus!

Initial Installation Instructions

Driveline Layout

Proper installation starts with designing a driveline layout. Drive line layouts often vary from one truck to the next. Chassis of the same make and model can be dimensionally different. This makes it important for every truck to be measured to ensure a proper lay out. The section below titled “Measuring Your Chassis” provides information on taking the proper chassis measurements.

Measuring Your Chassis (Reference Drawings DLD0722 or DLD0723 for visual guidance)

Start by measuring the exact chassis that the pump will be installed on. To measure the chassis layout you will need a plumb bob, digital protractor, wax pen or chalk, a straight edge and a measuring tape. The Digital protractor will be used to measure the angle of the transmission.

Note: The frame rail shall be considered the zero degree horizontal reference point.

Start by zeroing the digital protractor by placing it on the frame rail and pressing the zero or tare button. Next, find a machined surface on the transmission and measure the angle in which it is installed. Record the measurement. This measurement is referred to as the **VST**. Once you have measured the slope of the transmission angle, or **VST**, measure the slope of the output shaft on the PTO. Record the measurement. The engine transmission and PTO shaft are generally mounted at the same angle. When both the PTO shaft and engine transmission are mounted at the same angle, the PTO vertical offset and the VST are interchangeable. Next, measure the approximate distance from the PTO output shaft to the desired position of the pump’s input shaft (this will be an approximate distance as the pump is not yet mounted). Record the measurement. This is the approximate joint axle distance or approximate **JA**. Measure the distance from the top of the frame rail to the ground. Record your measurement. Then measure the distance from the center of the PTO output shaft to the ground. Record the measurement. Now measure the horizontal offset of the transmission, **HST**, with respect to the frame rail. With the aid of a plumb bob you can project the outermost edge of the frame rail to the ground. To do this, hold the string from the plumb bob tightly against the edge of the frame rail. Position the point of the plumb bob as near to the ground as possible without actually resting it on the ground. When the plumb bob stops moving score a line with the wax pen or chalk, repeat the process on a few spots along the frame rail. Next, you will use the plumb bob to indicate the center of the PTO output shaft. You can do this by holding the string of the plumb bob on the center of the PTO shaft. Once the plumb bob has stopped moving you can score a line directly below the point of the plumb bob’s tip. After you have projected a few points on the outside edge of the frame rail and the one point on the center of the PTO output shaft you can move the truck. When the truck has been moved take your strait edge and

position it over the marks which represent the outside edge of the frame rail. Using the measuring tape, measure the distance from the outside edge of the frame rail to the mark indicating the center of the PTO output shaft. Record the measurement. This measurement is your horizontal transmission offset, or **HST**.

Note: When recording the drive line angles indicate the direction by using a down arrow for angles that Slope downward and an up arrow for angles that are upward. A downward angle will start high towards the front of the truck and slope downwards towards the rear of the truck. An upward angle will start low towards the front of the truck and slope up as it approaches the rear of the truck.

Record Chassis Measurements Below

VST =_____

JA approximate =_____

HST =_____

Understanding Driveline Speed (PTO Application)

The maximum drive line speed is a very important variable in laying out a safe and reliable driveline. By using the equations shown in the following examples you can calculate the speed:

Example 1:

Maximum Engine Speed = 2100 RPM
PTO % Ratio = 1.3 %
Maximum Drive line speed = unknown

Maximum PTO Speed = (2100 RPM) x (1.3) = **2730 RPM**

Example 2:

Maximum Engine speed = 2100 RPM
Split shaft PTO Gear Ratio = 1:1.15 = 1.15 %
Over Drive Ratio = .6 %
Maximum speed at pump transmission input shaft in pump mode = Unknown
Maximum Driveline Speed in road mode = Unknown

Maximum speed at pump transmission input shaft in pump mode =

2100 RPM x 1.15 = 2,415 RPM

Maximum Driveline Speed in Road Mode =

(2100 RPM) = **3500 RPM**

(.60)

Record your engine and transmission information below and solve for your maximum drive line speed.

Maximum Engine Speed =_____

PTO % Ratio =_____

Over Drive Ratio =_____

Maximum Drive Line Speed =_____

Maximum Allowable Drive Shaft Length and Diameter

To determine the tube or shaft diameter and maximum spacing between U-joints you will need to know the maximum driveline speed. Based on the maximum driveline speed you can determine the best fit for your application. Using the table below, you can identify the maximum speed and determine the available solutions. It is recommended that you identify the most restricting variable in the layout and design around it. For example, if you need to run the drive shaft a long distance and the mounting position is fairly flexible, your best approach would be focusing in on a large diameter drive shaft which will allow you to span a long distance without adding additional drive shafts. Inversely, if the pumps mounting position is fairly restricted than you may want to use shorter drive shafts which will provide more variability in the position of the last drive yoke (i.e. 1 drive shaft allows for a recommended 3 degrees of variability, while 2 drive shafts allow for a recommended 6 degrees of variability). Keep in mind the simpler the drive line linkage, or the least amount of u-joints in a linkage, the more robust the linkage will be.

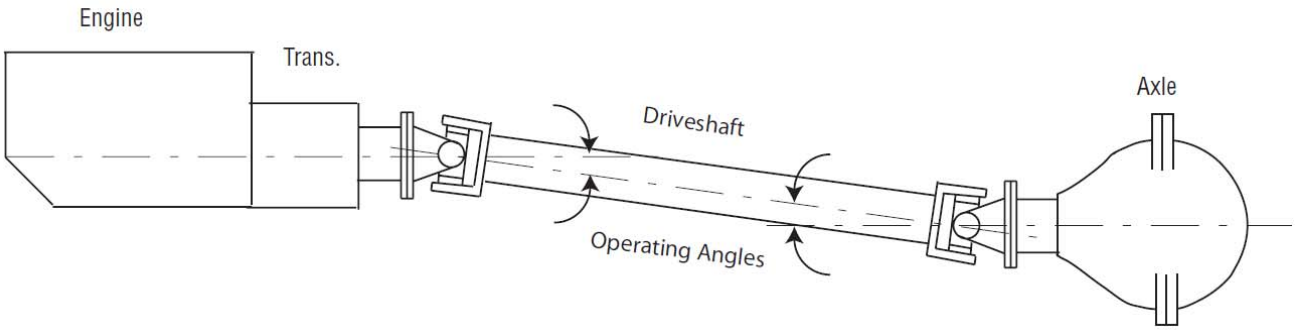
Maximum Safe Operating Speed

MAXIMUM OPERATING SPEED* BY TUBE SIZE, SOLID SHAFT SIZE, AND LENGTH *(For speeds over 6000 RPM, contact Spicer Universal Joint Division Engineering)											
TUBING	MAXIMUM INSTALLED LENGTH (IN INCHES) FOR GIVEN RPM										
Diameter & Wall Thickness	Centerline to Centerline of Joints for a Two Joint Assembly or Centerline of Joint to Centerline of Center Bearing for a Joint and Shaft										
W - Welded	RPM - Revolutions Per Minute										
S - Seamless	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000
1.750" x .065" W	82"	67"	58"	52"	-	-	-	-	-	-	-
1.250" x .095" S	64"	52"	45"	40"	37"	34"	32"	-	-	-	-
2.500" x .083" W	87"	70"	62"	55"	50"	45"	43"	41"	39"	37"	35"
3.000" x .083" W	-	-	85"	76"	70"	64"	60"	57"	54"	51"	49"
SOLID SHAFT DIAMETER											
.750"	42"	35"	30"	27"	25"	-	-	-	-	-	-
.812"	44"	36"	31"	28"	26"	-	-	-	-	-	-
.875"	46"	37"	32"	29"	27"	-	-	-	-	-	-
1.000"	49"	40"	35"	31"	28"	-	-	-	-	-	-
1.250"	55"	45"	39"	35"	32"	-	-	-	-	-	-

U-Joint Operating angles

A U-Joint operating angle is the angle that occurs at each end of a driveshaft within a linkage. As the center lines of two drive shafts intersect they form an angle which is called the operating angle. The image below depicts two operating angles, one on each end of the drive shaft.

Note: As additional shafts are added to the linkage the number of operating angles will increase.



Operating Angles in a Single Shaft Drive Line Linkage

A single shaft drive linkage has one driveshaft linking the PTO, Engine, or Lift box to the driven component. The image above shows a single drive shaft linkage. When designing a single drive shaft linkage there are three main rules to follow. The rules are listed below.

Rule Number 1:

Universal Joint Operating angles at each end of a driveshaft should always be at least 1 degree.

Rule Number 2:

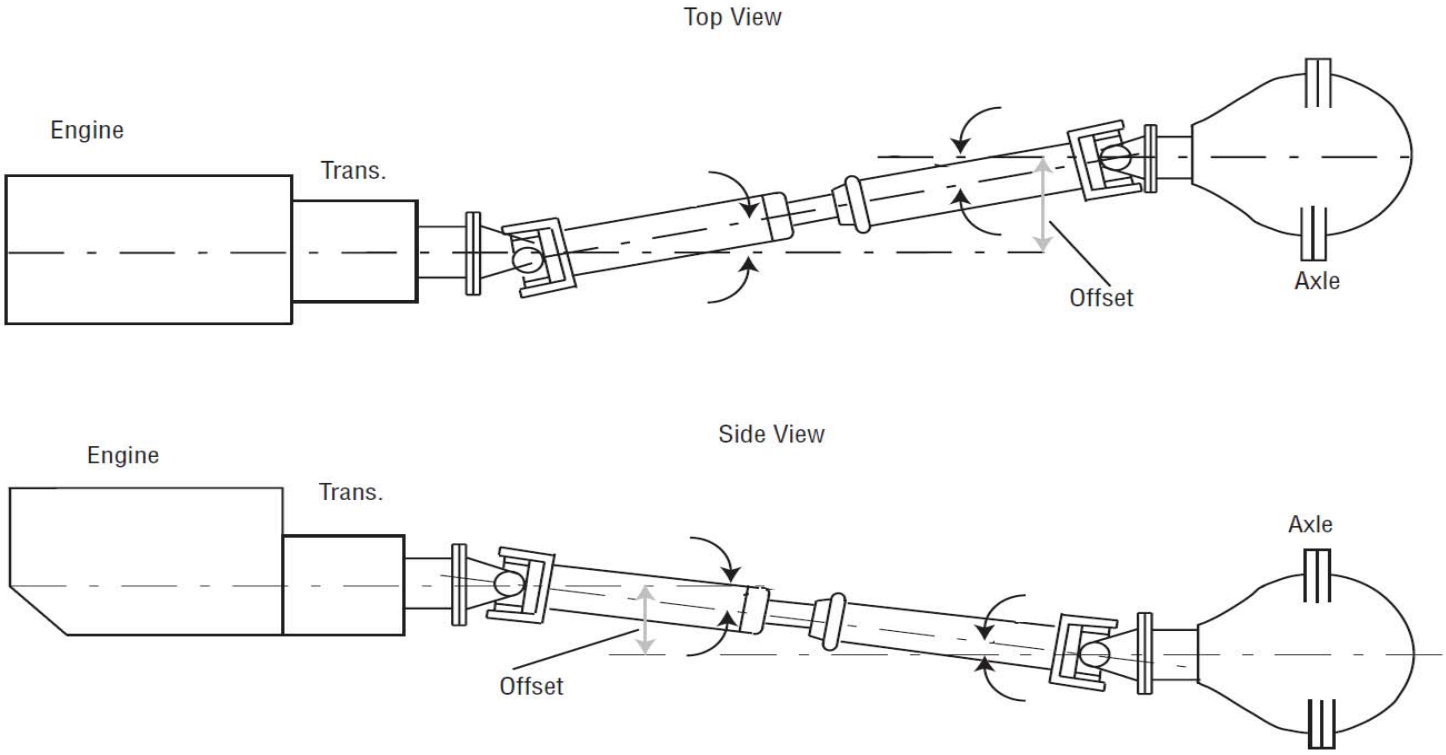
Universal joint operating angles on each end of a driveshaft should always be equal within 1 degree of each other (One Half degree for shafts in front of transfer case or auxiliary devices).

Rule Number 3:

For virtual vibration free performance, universal joint operating angles should not be larger than 3 degrees. If they are, make sure they do not exceed the maximum recommended angles listed in the section titled “Excessive Operating Angles, Worst Case Scenario”.

Rule Number 4:

Avoid compound driveline angles! A compound driveline angle occurs when a driveling linkage has both a horizontal & vertical offset. If compound driveline angles are required to mount the pump contact W.S. Darley & Co. by email at KMD@ Darley.com. The image shown below depicts a compound driveline angle.

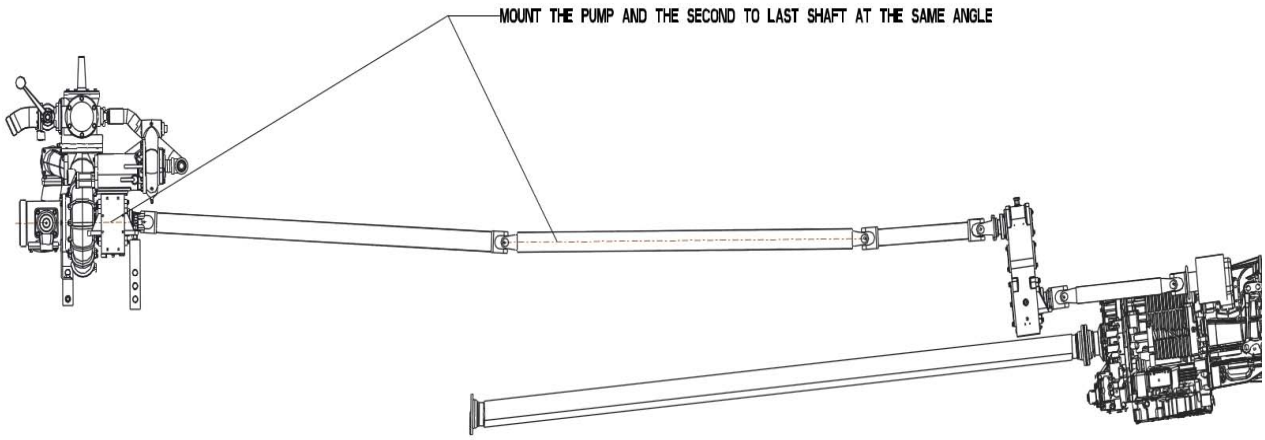


Operating Angles in a Multiple Shaft Driveline Linkage

In many applications the driveline linkage will require multiple drivelines. When multiple drivelines are used to link the driving mechanism to the pump the drive line profile and rules will vary from a single shaft driveline linkage. The rules listed below relate to a multiple driveline linkage.

Rule Number 1:

The driven mechanism or pump shall be mounted at the same angle as the second to last shaft. See image below.



Rule number 2:

Operating angles shall not exceed 3 degrees. In the event that this rule cannot be followed refer to the table in the section titled “Excessive Operating Angles, Worst Case Scenario” to determine the maximum safe operating angles with reference to the maximum driveline speed.

Rule number 3:

Operating angles at opposite ends of the same shaft shall be equal within a half degree.

Operating Angles When Using a Lift Box

A lift box is a device that allows for an offset distance from one u-joint to the next. Lift boxes can be helpful when designing around on obstruction in the path of a driveline linkage. When installing a lift box, the rules listed below shall be followed.

Note:

When analyzing a driveline with a lift box disregard the horizontal and vertical offset between the lift box yokes.

Rule number 1:

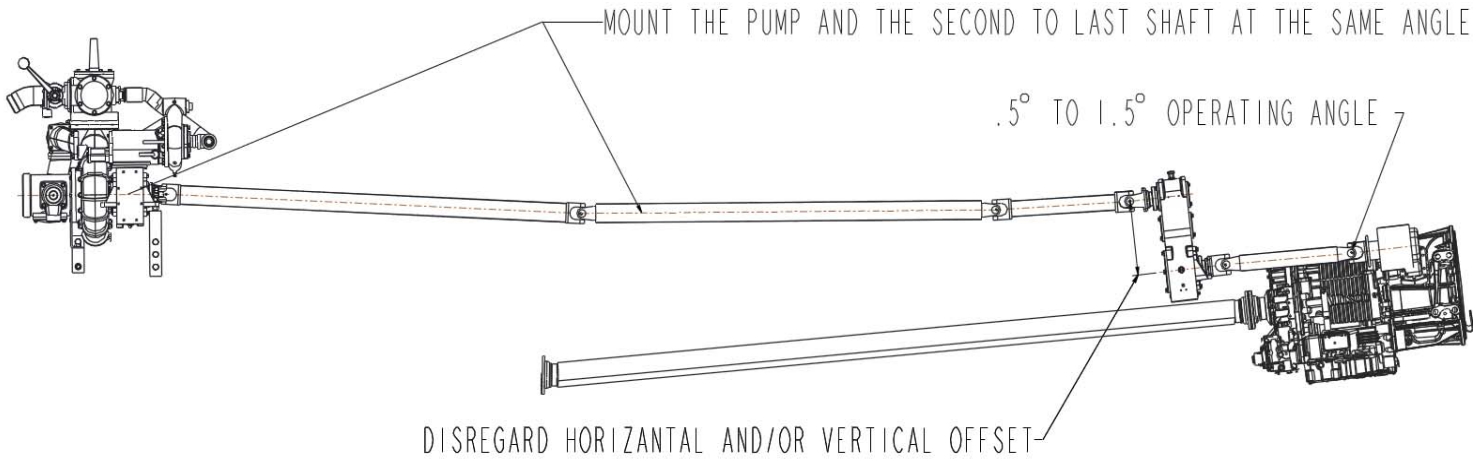
The lift box and the PTO coupled to the engine transmission shall be mounted at the same angle.

Rule Number 2:

There shall only be one shaft between the PTO and the drive shaft. If this is not possible with a specific application contact W.S. Darley & Co. for assistance.

Rule Number 3:

The U-Joints between the lift box and the PTO shall have an operating angle that ranges from .5 degrees to 1.5 degrees.



Excessive Operating Angles, Worst Case Scenario

Although a maximum recommended operating angle is 3 degrees, there are cases where larger angles are the only possible option. The table below list the maximum operating speed for a given drive shaft speed (RPM). The values listed are for extreme cases only and shall not be exceeded at any point. Keep in mind the drive line tube size and diameter will also be a limiting factor for maximum drive shaft speed.

Driveshaft RPM	Maximum Operating Angle	Interaxle	
		Parallel	Intersecting
5000	3.2°	-	-
4500	3.7°	-	-
4000	4.2°	3.8°	3.8°
3500	5.0°	4.4°	4.4°
3000	5.8°	5.1°	4.8°
2500	7.0°	6.0°	4.8°
2000	8.7°	6.0°	4.8°
1500	11.5°	6.0°	4.8°

Laying Out the Driveline:

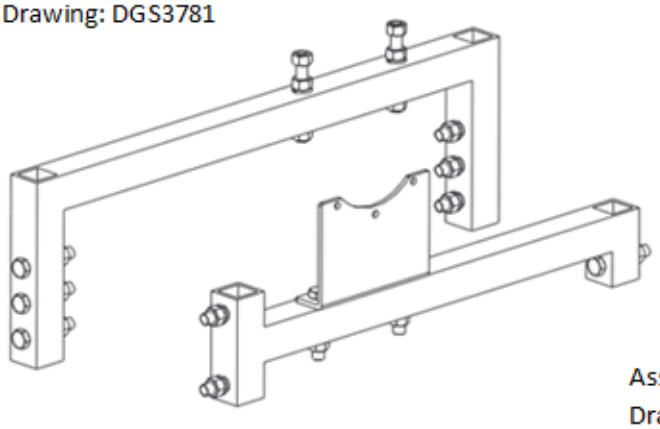
Following the rules outlined in previous sections, "**U-joint Operating angles**" and "**Maximum Allowable Drive Shaft Length and Diameter**", begin to layout your driveline. Use the measurements taken in the section titled "**Measuring Your Chassis**" to begin sketching the layout. Include the position of all known obstructions within the sketch. This will help ensure that the designed layout will fit on the truck when it comes time for installation. Next, begin to assign the drive line type such as tube or solid, along with the maximum driveshaft lengths. Remember to consider the maximum drive shaft speed when selecting your drive shafts. Once the desired drive shaft has been identified assign operating angles to the linkage. It is good practice to have an approximate location picked out for the pump. Having the approximate mounting location identified will improve your ability to visualize the driveline layout as you work through the operating angles. Once the layout is complete fill out the table on drawing DLD0722 or DLD0723 and email it to KMD@Darley.com. When the drawing has been received application approval will be granted or denied based on the data submitted in the table. When an application has been approved an email will be sent back including a Driveline layout approval Certificate. An example of the certificate is located in the "Drawings" section of the LSRH Installation and Assembly Instructions.

Mounting the Pump

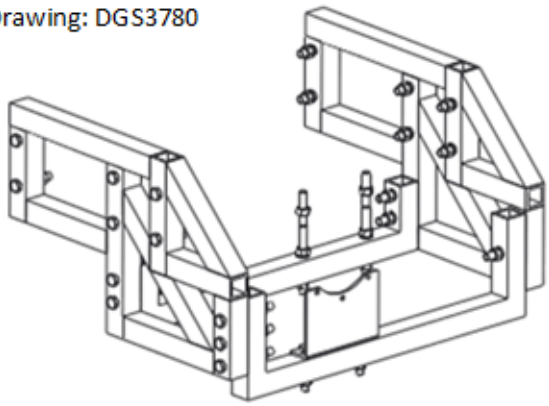
Mounting Kit

It is recommended that you order mounting kits with your pump. There are two types of mounting kits for the LSRH. The first kit, Darley part number KM01004, is designed for mounting the pump above or below the frame rail. The second kit, KM01003 is designed for a cantilever style mount for applications which require the pump to be overhung with respect to the rear of the frame rail. The images shown below list the drawing number which can be found in the drawing section of the LSRH Installation and Assembly Instruction Manual.

Assembly: KM01004
Drawing: DGS3781



Assembly: KM01003
Drawing: DGS3780

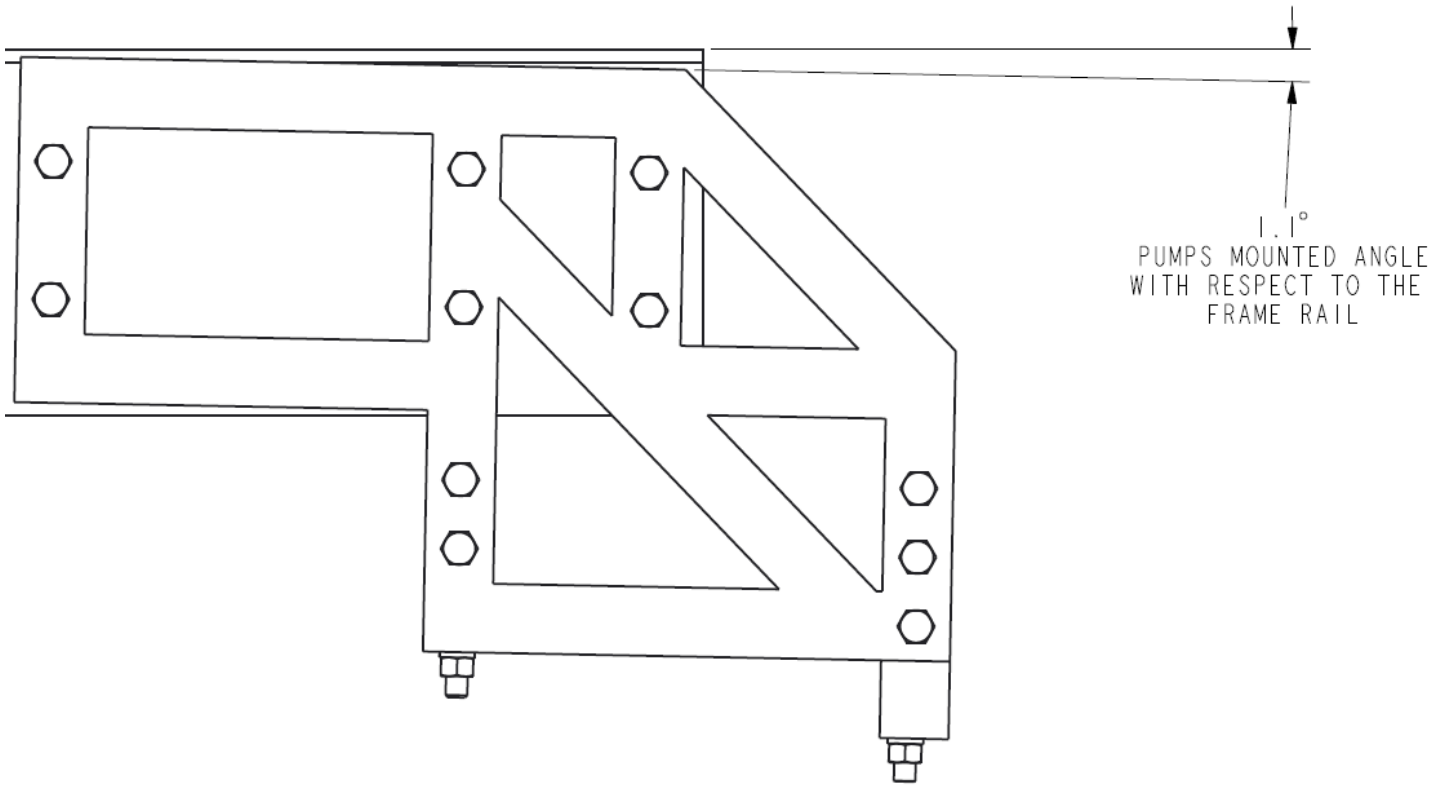


When laying out the mounting holes for the mounting kit, use the mounting kit to transfer punch the mounting holes to the frame rail. To transfer punch the holes, secure the mounting kit to the frame rail using clamps. The mounting kit shall be clamped to the frame at the pre-designed mounting angle, also referred to as the VSA. After the mounting kit is clamped in place, use a digital protractor to ensure the angle of the frame matches the VSA. Following verification transfer punch the mounting holes into the frame rail. Once the hole locations have been indicated drill them out using a 21 mm (13/16”) diameter drill. After the holes have

been drilled you can mount the mounting kit brackets/ sub-frame in place. When the mounting kit is securely fastened to the frame rail you can place the pump in the frame and secure it using the fasteners provided.

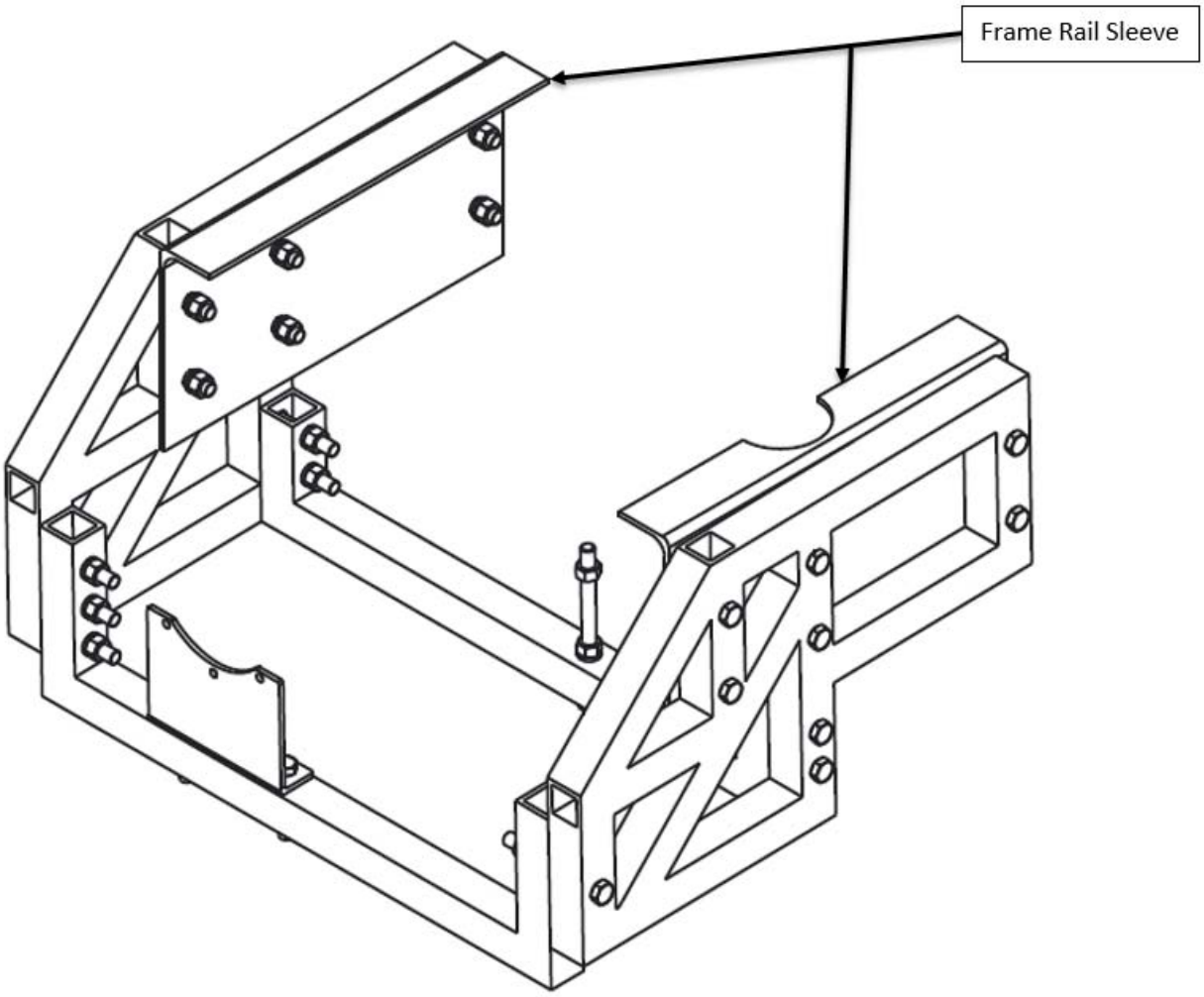
Note:

The mounting kit shall be mounted at the angle in which the pump shall sit when installed. Reference your drive line layout for the pumps mounted angle. (See image below)



Note:

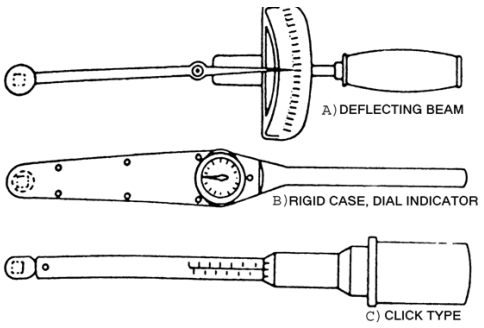
When using the cantilever styled mounting kit and the frame rail is notched or has a cut out, it is recommended that you use a frame rail sleeve to improve the rigidity of the frame rail and mounted pump (See image below). For maximum effectiveness the frame rail sleeve shall be welded to the mounting kit at the angle in which the pump is to be mounted.

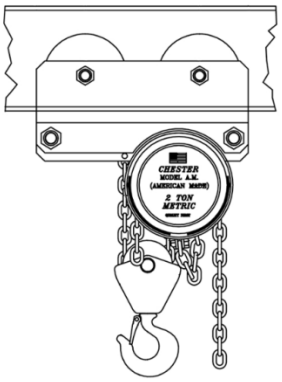


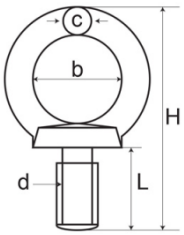
Instructions for Specialty Assembly Tools for Installation/ Assembly

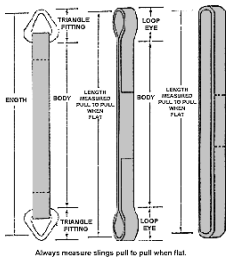
Assembly Tools

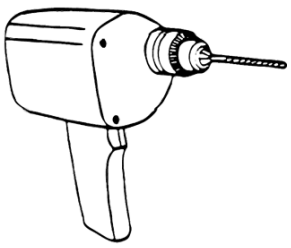
- Torque wrench
- Welding equipment (If frame rail sleeve is used)
- Lifting Device such as Hoist, Crane, or Fork lift
- Standard wrenches
- Lifting Eyes
- Lifting Straps
- Digital Angle Finder/ Angle Master
- Drill or Magnetic Drill











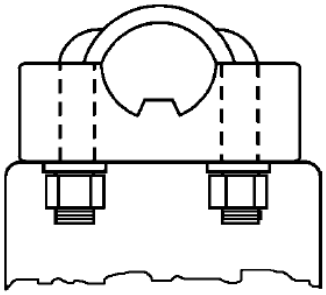
Assembly Tool Instructions

Torque Wrench

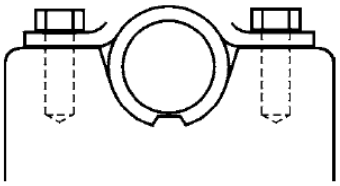
The pumps drive yoke shall be fastened to a torque of 150 LB-ft to 200 LB-ft.

The U-Joints bearing straps, U-Bolts, caps and bolts, and bearing plates shall be torqued to the manufactures recommendations. Consult the drive line component manufacturer to determine the recommended torque specifications.

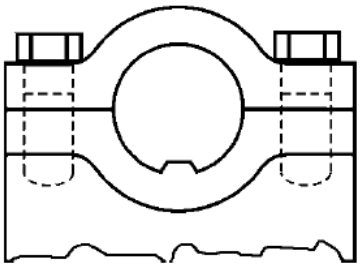
U-Bolt



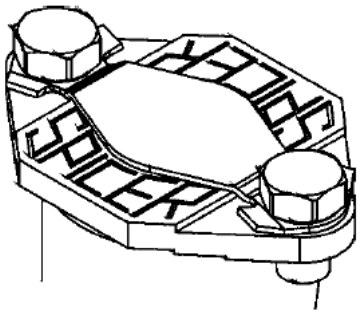
Bearing Strap



Cap & Bolt



Bearing Plate



For fasteners that don't have a specific torque spec listed, refer to the table below that outlines the fastener size and recommended torque specification.

USS /SAE GRADE 5 TORQUE VALUES		
DIAMETER & THREADS PER INCH	TORQUE WHEN DRY (N m)	TORQUE WHEN PLATED OR LUBRICATED (N m)
1/4 -20	10.8	8.5
1/4 -28	13.6	9.8
5/16 -18	23.0	17.6
5/16 -24	25.8	19.0
3/8 -16	40.7	31.2
3/8 - 24	47.5	33.9
7/16 - 14	67.8	47.5
7/16 -20	74.6	54.2
1/2 - 13	101.7	74.6
1/2 - 20	115.2	88.1
9/16 - 12	149.1	108.5
9/16 - 18	162.7	122.0
5/8 - 11	203.4	149.1
5/8 - 18	230.5	176.3
3/4 - 10	352.5	271.2
3/4 - 16	406.7	298.3
7/8 - 9	583.0	433.9
7/8 - 14	637.2	474.5
1 - 8	867.7	650.8
1 - 14	976.2	732.1

USS /SAE GRADE 8 TORQUE VALUES		
DIAMETER & THREADS PER INCH	TORQUE WHEN DRY (N m)	TORQUE WHEN PLATED OR LUBRICATED (N m)
1/4 -20	16.3	12.2
1/4 -28	19.0	13.6
5/16 -18	32.5	24.4
5/16 -24	36.6	27.1
3/8 -16	61.0	47.5
3/8 - 24	67.8	47.5
7/16 - 14	94.9	67.8
7/16 -20	108.5	81.3
1/2 - 13	149.1	108.5
1/2 - 20	162.7	122.0
9/16 - 12	203.4	149.1
9/16 - 18	230.5	176.3
5/8 - 11	284.7	216.9
5/8 - 18	325.4	244.0
3/4 - 10	515.2	379.6
3/4 - 16	569.4	420.3
7/8 - 9	813.5	610.1
7/8 - 14	908.4	677.9
1 - 8	1233.8	922.0
1 - 14	1382.9	1030.4

Welding Equipment

Adequate welding equipment may be required to weld the frame rail sleeve to the mounting kit. A certified welder shall perform all welding. All welds shall be ultimate strength.

Lifting Device

A lifting device with a minimum rated capacity of 1000 LBS is required to lift the pump assembly into place when the pump is being mounted.

Standard Wrench Set

A standard wrench set will be required to fasten mounting bolts and nuts. Similarly, standard wrenches will be required to perform any preventative maintenance or repairs.

Lifting Eyes

Lifting eyes can be used to pick the pump up without damaging the surface finish of the pump. When using lifting eyes ensure that you have sufficient thread engagement, sufficient thread engagement is 1.5 x the nominal diameter of the fastener.

Lifting Straps

Lifting straps will aid in hoisting or lifting the pump in the installation process. The lifting straps shall have a combined rating of no less than 1500 lbs.

Digital Angle Finder/ Angle Master

A digital angle finder or angle master will be used to measure the vertical slope of the driveline and pump. When using a digital protractor to measure vertical slope, the frame rail shall be considered zero degrees.

Drill or Magnetic Drill

A drill or magnetic drill will be needed to drill the mounting holes for the pumps mounting kit. A magnetic drill is recommended as it reduces the effort in drilling through the frame rail.

ATTENTION

OEM's shall consult with the chassis manufacturer prior to drilling holes in the frame rail

Instructions for the Installer to Make a Complete Risk Assessment for the Final Machine

Driveline Inspection as Installed

Upon completion of the pump and driveline a risk assessment must be made. Start by filling out a related Drive line drawing table, Reference drawing DLD0723 or drawing DLD0722. Using a digital protractor measure all of the driveline angles. With a tape measure, strait edge, and plumb bob measure all of the shaft lengths, and horizontal offsets. Record the measurements on the related drawing. When you have completed the table on the driveline layout drawing, E-mail the drawing to KMD@darley.com for review. Your driveline layout approval will be reviewed and a receipt of approval will be returned to the email address that the request was sent from. A sample of the Driveline layout approval receipt is included in the Drawings section of the LSRH Installation and Assembly Instructions.

Visual Inspection of Welds and Fasteners

A visual inspection of welds and fasteners shall be performed prior to operating the pump. When inspecting welds, look for uneven beads, excessive puddling, undersized welds, undercuts, overlaps, surface cracking, surface porosity, under fill, incomplete root penetration excessive root penetration, and burn through. If welds appear to be insufficient they shall be removed or repaired. When inspecting fasteners, look for metal shavings/ or strands around the fastening surface, deformed material on the fastening surface, fastener head engagement or nut/washer engagement beyond the external surface of the joint, cracks, and space between joints. If fasteners appear to be over-tightened, under-tightened, or fatigued they shall be removed and replaced. If an external surface of a joint appears to be distorted or damaged in any way the fastener shall be removed and the surface shall be inspected. In the event that a surface is found to be distorted or worn the surface shall be repaired or replaced to its original state.

Inspection of Guards

All shaft guards shall be intact and properly secured to the equipment. A visual inspection shall be performed to ensure that the guards are in place and properly secured to the equipment.

Performance Testing

Following the drive line approval and visual inspections the pump shall be tested to ensure that all performance points can be met. The guidelines laid out in EN-1028-2 shall be followed for all performance testing.

Data on Installation Site

Space Requirements for Operation and Maintenance

Operation

When operating the pump it is important to have adequate space to allow for safe operation. A general description of adequate space would be an environment in which the operator can freely move around the pump. This will require a clean area around the pump panel. The ideal setting for operating a pump has no obstructions, with the exception of discharge and suction lines, on the ground. Prior to starting the pump the operator shall survey the operation site to ensure the tripping hazards are reduced to the suction and discharge hose. This will allow the operator to move freely around the pump panel.

ATTENTION

Never get below the truck while the truck is running! Spinning drive shafts will snag loose clothing, hair, skin, tools, etc. Contact with a spinning drive shaft may result in personal injury or death.

Maintenance

When performing maintenance or repairs the truck and pump shall be turned off. The maintenance technician shall have the keys in his or her pocket to ensure that the truck is not turned back on. The area around and below the truck shall be clear of any obstructions, and the ground shall be swept clean. In the event that the pump is being installed, or removed, maintenance personnel shall also check to ensure there is a clear path for the pump to move into or out of the apparatus. This may require removing additional components from the apparatus.

Note: When preforming packing adjustments it is required that the engine is running at an idle. This will require extra caution. Make sure that you have a clear path around the packing gland prior to making adjustments.

ATTENTION

Never reach over or under rotating components when making packing adjustments or performing maintenance.

Note: If spinning components limit safe access to the packing gland, a remote packing cable can be purchased from W.S. Darley. To purchase a remote packing cable contact W.S. Darley by E-mail at sales@Darley.com .

Inspection Instructions before Starting Installation

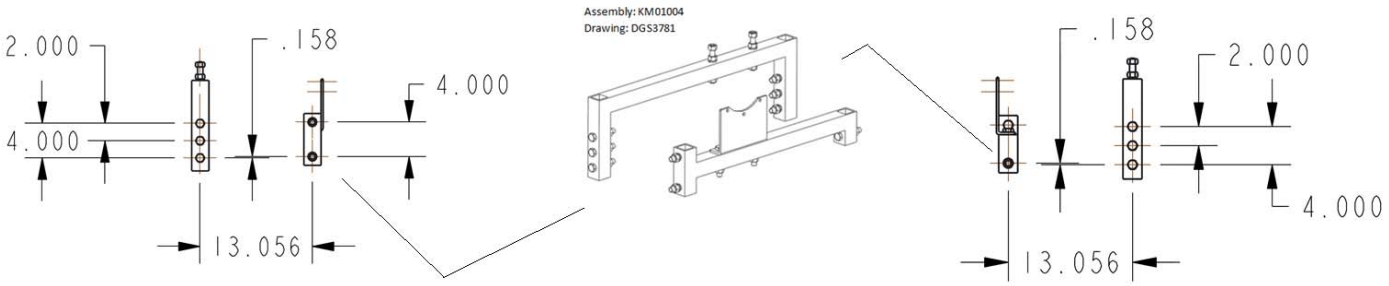
Prior to installation, you need to inspect the truck to ensure there are no obstructions restricting a safe and durable installation. To begin, inspect the area of the frame rail where the pump will be installed. It shall be cleared of any debris, metal chips, or metal shavings. Next, inspect the area where the pump is to be installed. Look for obstructions such as drive line components or cross members. In the even that a cross member is obstructing the desired installation site contact the chassis manufacture to seek approval to remove or relocate the cross member. Never remove or replace a cross member without receiving written approval from the chassis manufacturer. Once you have inspected the position in which the pump will be installed check the area where the driveline will be installed when coupled to the pump. There shall be no obstructions limiting the position of the pump or driveline.

ATTENTION

Never remove a cross member without receiving written approval from the chassis manufacturer.

Details of the Base

As every installation has its restrictions and limitations therefore the bases are designed to accommodate most scenarios. In the event that the standard bases do not accommodate for a specific installation please contact W.S. Darley & Co. by E-mail at KMD@Darley.com to discuss additional options. The images shown on the following page provide details on our above or below the frame rail mounting base and our cantilever styled mounting base. For additional information reference the drawing section of the manual. The cantilever style base is shown in drawing DGS3780 and the above or below the frame mount is shown in drawing DGS3781.

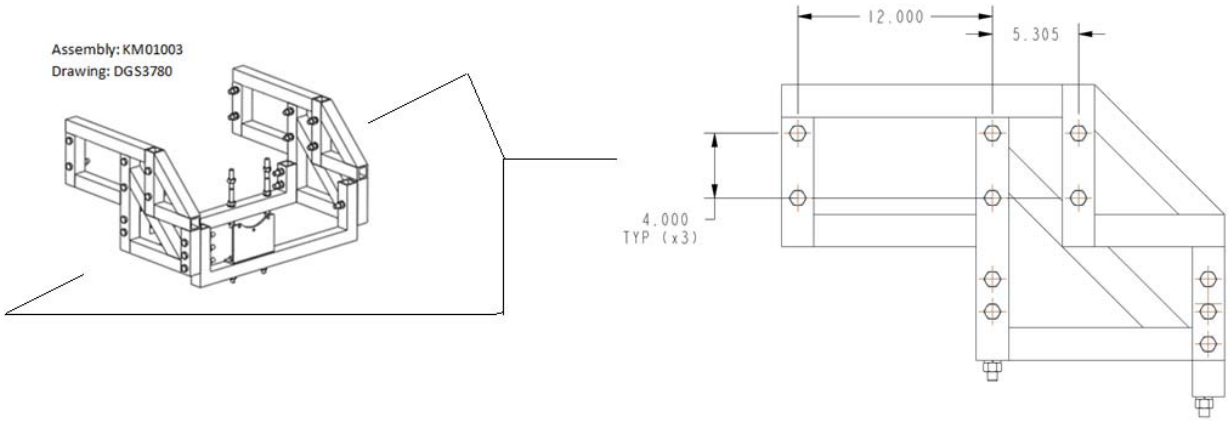


Drivers side Mounting Details

Passanger Side Mounting Details

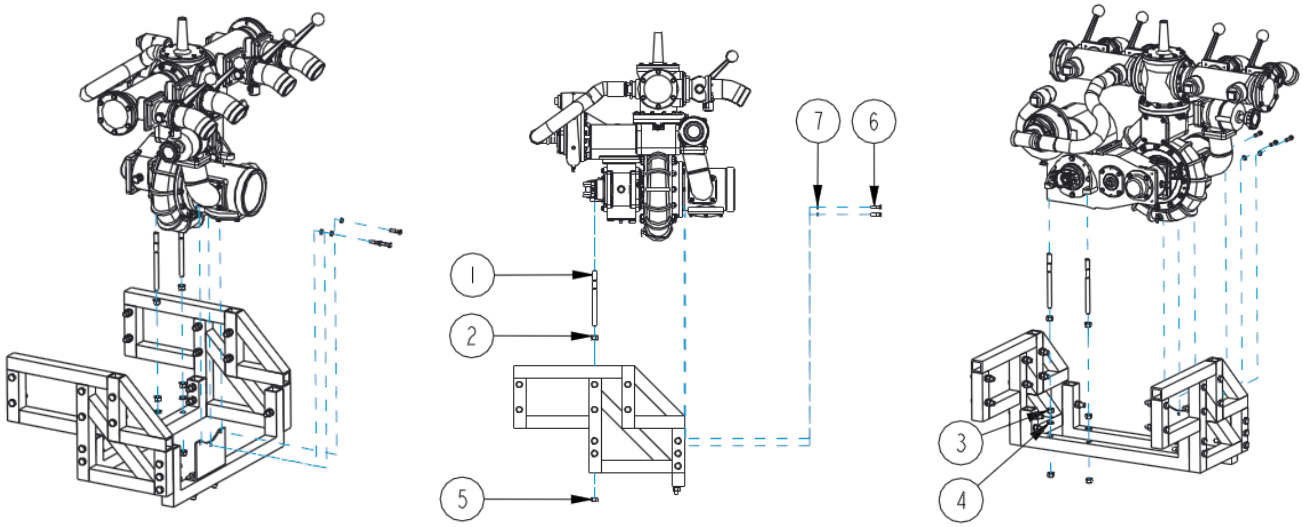
Note:

Mounting holes shall be drilled at an offset with respect to the top of the frame rail. The mounted position of the frame will dictate the mounted position of the pump.



Drivers Side and Passanger Side Mounting Details

Installation of the Pump Assembly



Note: The images and item numbers shown above are referenced in the following section.

To secure the pump to the base you must remove the three bottom most bolts (6) and lock washers (7) from the suction adapter. Once the bolts (6) and lock washers (7) have been removed screw the threaded rods (1) into the bearing cap mounting holes (Note: the bearing cap mounting holes are on the bearing cap that the pump transmission input shaft protrudes from). After the threaded rods (1) are in place secure them by screwing on the nut (2) until it is a half turn past snug against the mounting hole tabs on the bearing cap. Next, thread the leveling nuts (3) on to the threaded rods leaving a small gap (.25") between the jam nut (2) and the leveling nut (3). Place the locknut (4) onto the threaded rod and loosely secure it to the rod with tape or wax. Now lower the pump into place using an adequate lifting device and straps that have a combined lift rating of 1500 Lbs. Once the threaded rods (1) have been inserted into the clearance holes on the mounting frame you can remove the tape or wax securing the lock washer (4) to the threaded rod (1). With the lifting device and straps still supporting the pump, use the leveling nuts (3) to line up the holes on the suction adapter and the mounting kit. (Note: The pump shall be mounted at zero degrees with respect to the mounting kit, use an angle master to ensure it is mounted at 0 degrees (+/-) 1/4 degree.) When the pump is level and the suction adapter holes line up with the mounting holes on the suction side of the mounting kit, securely fasten the lock washer (7) and mounting bolt (6) to the mounting kit. When fasteners (6&7) have been secured check to make sure the pump's mounted angle with respect to the mounting kit is still 0 degrees. If the mounted angle has deviated from 0 degrees use the leveling nut to make minor adjustments. Now that the pump is mounted at zero degrees you can lock the threaded rod into place by threading the locking nut (5) onto the threaded rod (1). (Note: the process is the same on both the above or below the frame rail mounting kit or the cantilevered mounting kit.)

Alignment Requirements Including Flexible Couplings

The alignment requirements are covered in detail in the sub section titled “Operating Angles” which is contained within the “Initial Installation Instructions” section. This section outlines a few rules of thumb when dealing with alignment of driveline angles.

Rules of Thumb - Flexible Couplings

Rule Number 1:

Always consult the flexible coupling manufacture to ensure that the coupling selected can withstand the heat generated from the force at the designed operating angles.

Rule Number 2:

Always follow the recommended operating angles, or maximum allowable misalignment, for the flexible coupling being used.

Rule Number 3:

Contact W.S. Darley & Co. to seek application approval when using flexible couplings.

Rules of Thumb - Operating Angles in a Single Shaft Drive Line Linkage

A single shaft drive linkage has one driveshaft linking the PTO, Engine, or Lift box to the driven component. . When designing a single drive shaft linkage there are three main rules to follow. The rules are listed below.

Rule Number 1:

Universal Joint Operating angles at each end of a driveshaft should always be at least 1 degree.

Rule Number 2:

Universal joint operating angles on each end of a driveshaft should always be equal within 1 degree of each other (One Half degree for shafts in front of transfer case or auxiliary devices).

Rule Number 3:

For virtual vibration free performance, universal joint operating angles should not be larger than 3 degrees. If they are, make sure they do not exceed the maximum recommended angles listed in the section titled “Excessive Operating Angles, Worst Case Scenario”.

Rule Number 4:

Avoid compound driveline angles! If compound driveline angles are required to mount the pump contact W.S. Darley & Co. for driveline assistance.

Rules of Thumb - Operating Angles in a Multiple Shaft Driveline Linkage

In many applications the driveline linkage will require multiple drivelines. When multiple drivelines are used to link the driving mechanism to the pump the drive line profile and rules will vary from a single shaft driveline linkage. The rules listed below relate to a multiple driveline linkage.

Rule Number 1:

The driven mechanism or pump shall be mounted at the same angle as the second to last shaft.

Rule number 2:

Operating angles shall not exceed 3 degrees. In the event that this rule cannot be followed refer to the table in the section titled “Excessive Operating Angles, Worst Case Scenario” to determine the maximum safe operating angles with reference to the maximum driveline speed.

Rule number 3:

Operating angles at opposite ends of the same shaft shall be equal within a half degree.

Rules of Thumb - Operating Angles When Using a Lift Box

A lift box is a device that allows for an offset distance from one u-joint to the next. Lift boxes can be helpful when designing around on obstruction in the path of a driveline linkage. When installing a lift box, the rules listed on the following page shall be followed.

Rule number 1:

The lift box and the driving device (PTO or transmission) shall be mounted at the same angle as the transmission or PTO.

Rule Number 2:

There shall only be one shaft between the PTO and the drive shaft. If this is not possible with a specific application contact W.S. Darley & Co. for assistance.

Rule Number 3:

The U-Joints between the lift box and the PTO shall have an operating angle that ranges from .5 degrees to 1.5 degrees.

General Layout Examples – LSRH

There are two Examples of driveline layouts shown in the "Drawings" section. The first drawing is a multiple driveshaft layout, drawing number DLD0722. The second drawing is a multiple driveshaft installation with a lift box, drawing number DLD0723. The drawings illustrate a typical layout for an LSRH. If further help is needed with driveline layout, etc., please contact us at KMD@Darley.com

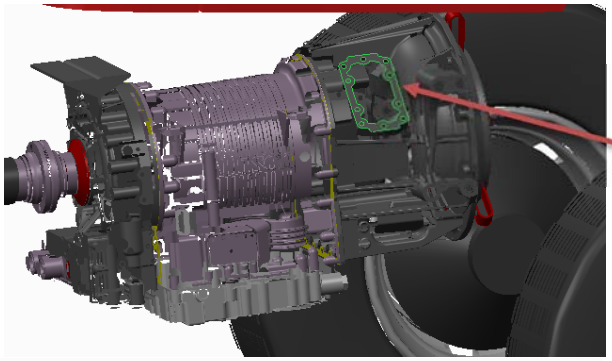
Assembly of Driver and Accessories

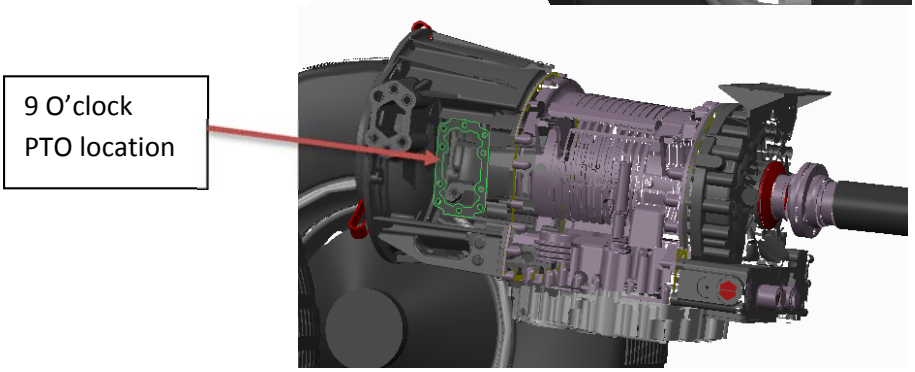
Assembly of Driver and Accessories

The driving device for the LSRH is most often a Power take off (PTO). When assembling a PTO it is critical that you follow the assembly instructions provided by the manufacturer. In general PTO's are mounted on to the engine transmission. The engine transmission will have at least one power take off location. In some cases the transmission will have multiple PTO locations. When this is the case, look for the best available location for your application. This can be determined by identifying a path that has the least amount of obstructions for the predesigned driveline.

When assembling drive line accessories such as U-Joints follow the torque specifications provided by the U-Joint Manufacturer. The same rule applies for center bearings. To properly install a center bearing refer to the guidelines provided by the center bearing manufacturer.

Note: The images shown below depict the available PTO mounting locations on a typical transmission. PTO mounting location availability is dependent on the transmission ordered with the chassis.



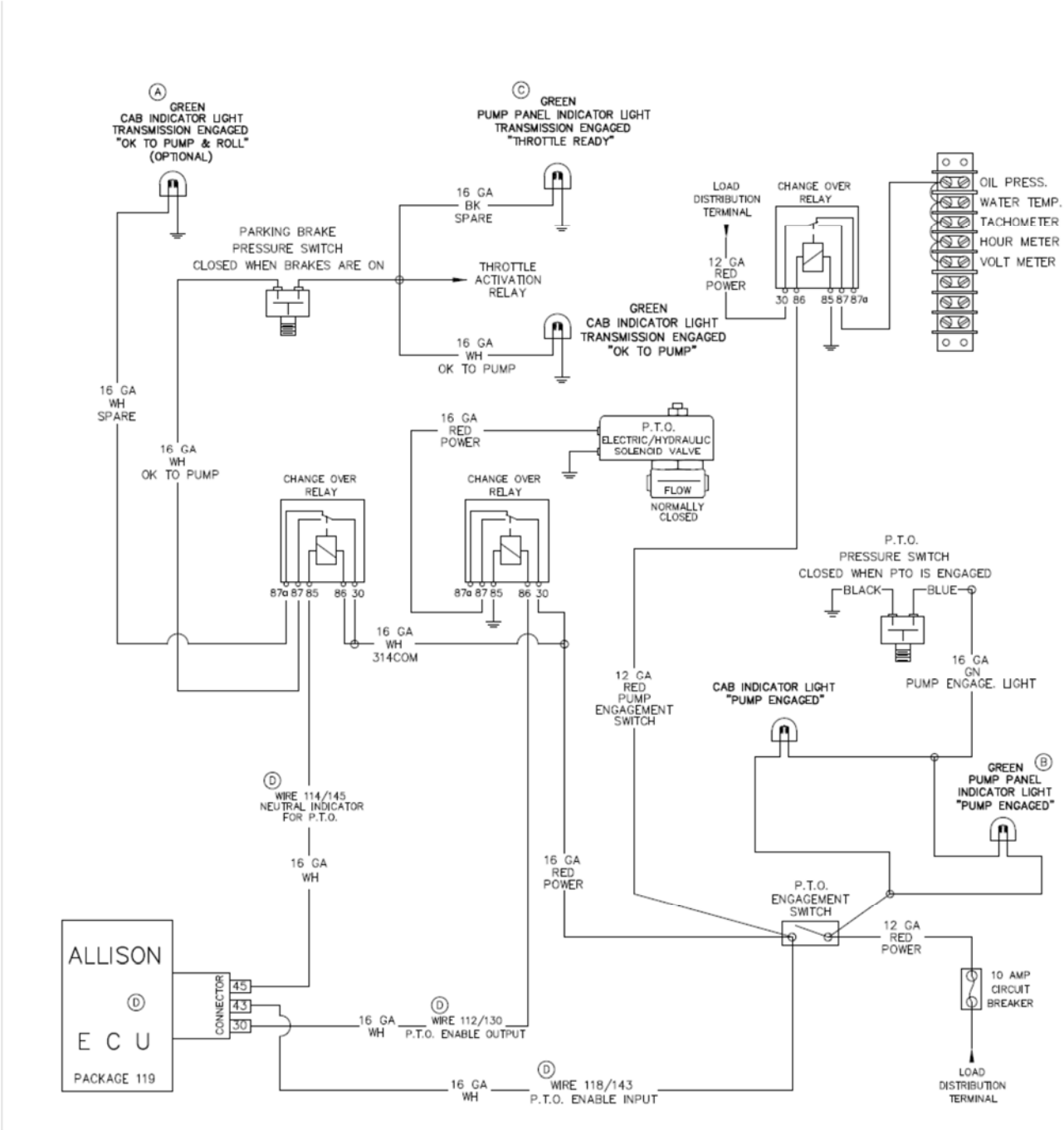


Note: Mounting locations vary from one transmission to the next. Consult the transmission or chassis manufacture to verify available mounting locations on the specific transmission in question.

Correct Installation of Safety Devices and Control Systems

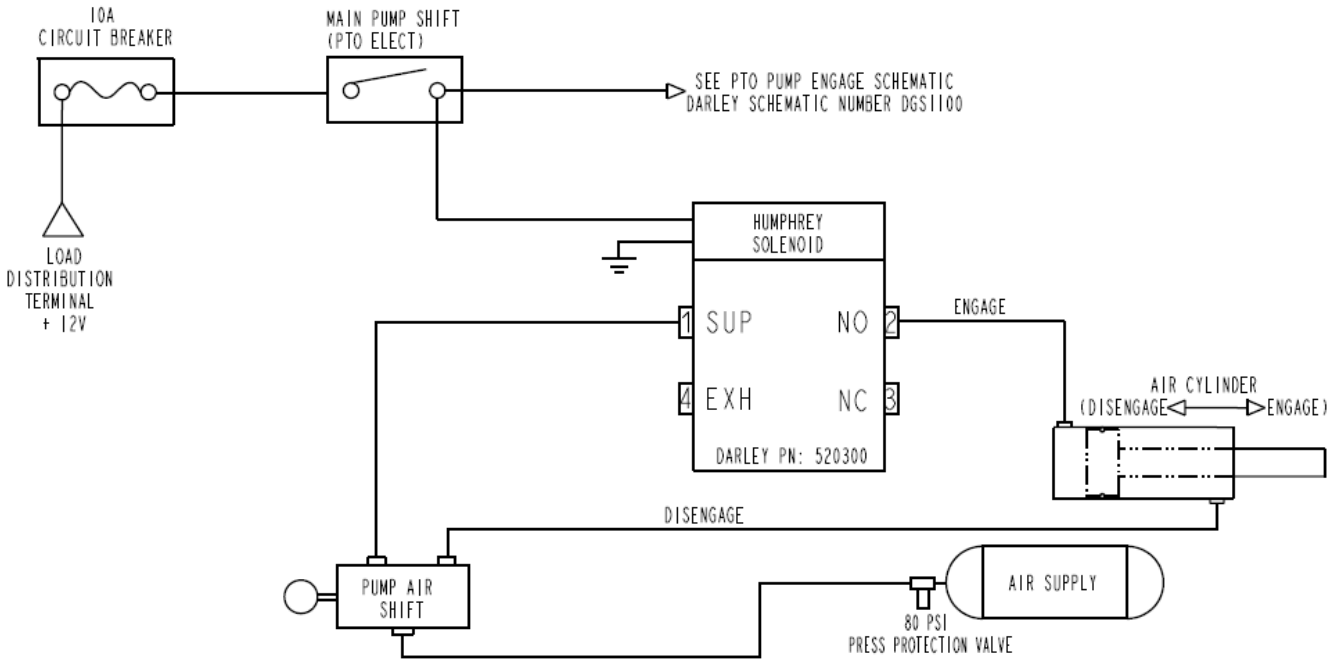
PTO Pump Interlock

When installing the electrical system on the truck you will need to incorporate a safety interlock circuit. A safety interlock circuit will allow the operator to know when the pump has been engaged and also when it is safe to engage the PTO. Drawing DGS1100 shows a wiring schematic for a safety interlock system when using an Allison World Transmission with a PTO driven pump. Please refer to the PTO pump engagement schematic below, or drawing number DGS1100 in the "Wiring" section for more detail.



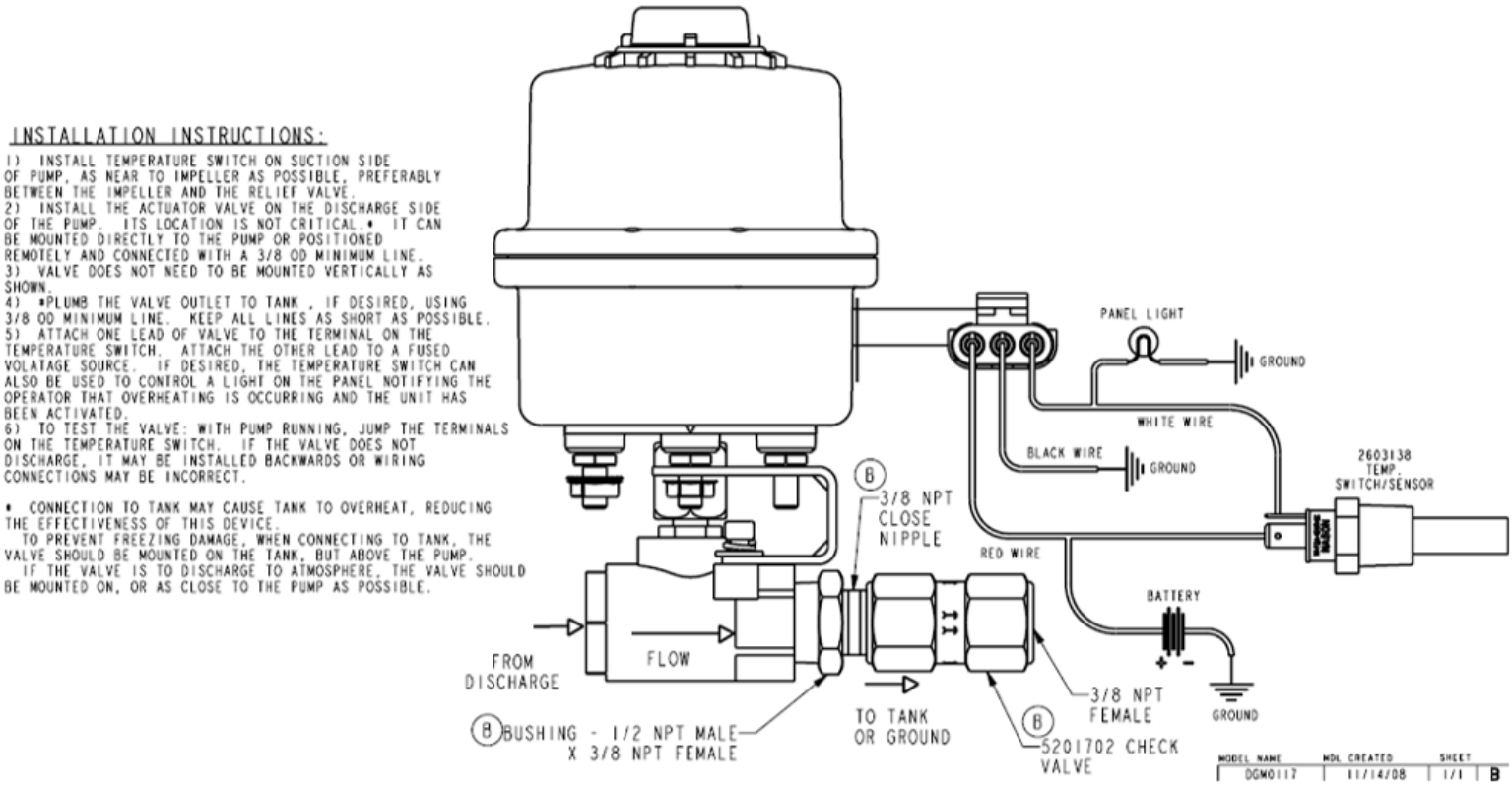
Auxiliary High Pressure Pump Interlock

When installing the electrical system on an apparatus that has an auxiliary high pressure pump you must incorporate a secondary pump interlock, the auxiliary high pressure pump interlock. The auxiliary high pressure pump interlock will eliminate the possibility of shifting the auxiliary high pressure pump into gear while the pump transmission is being driven. Drawing DGS3810 shows a wiring schematic and pneumatic layout for an auxiliary high pressure pump safety interlock system. Please refer to the auxiliary high pressure pump interlock schematic shown below, or drawing number DGS3810 in the "Wiring" section for more detail.



Thermal Relief Valve

The Thermal Relief valve can be installed by following the directions and schematics on drawing DGM0117. The drawing is shown below. The drawing is also in the "Drawings" section in the LSRH installation and assembly instructions manual.

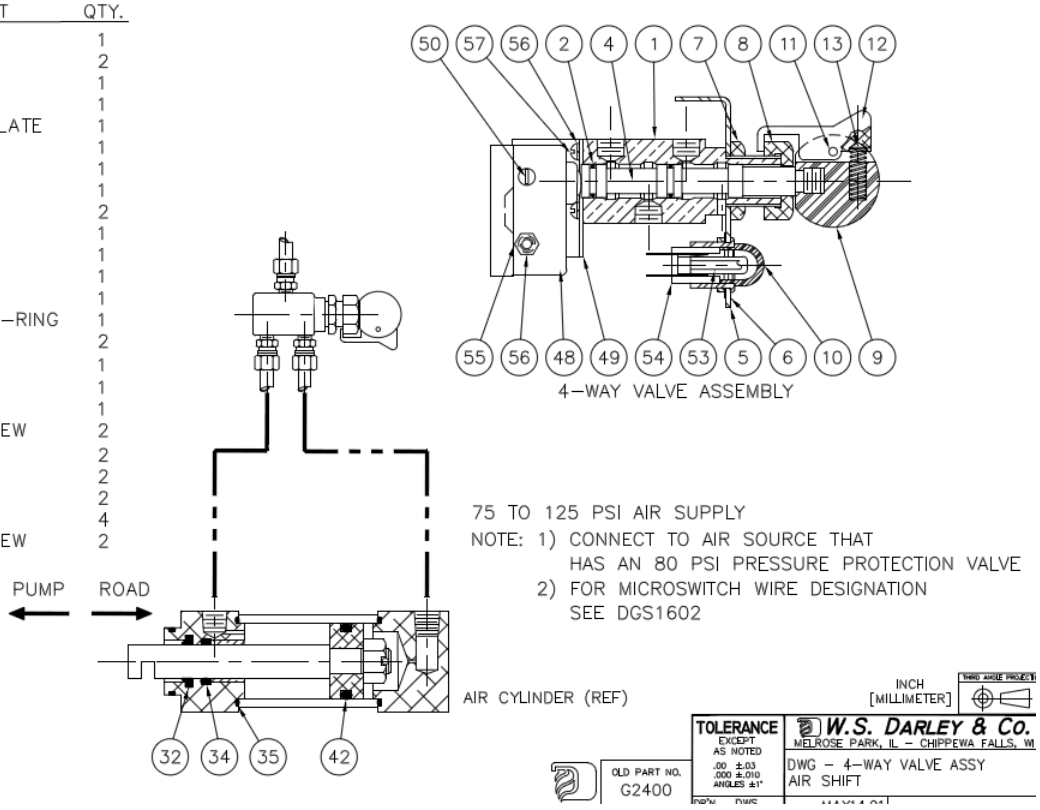


Correct Installation of Manual Controls and Operating Devices

Pneumatic Pump Shift – Auxiliary High Pressure Pump

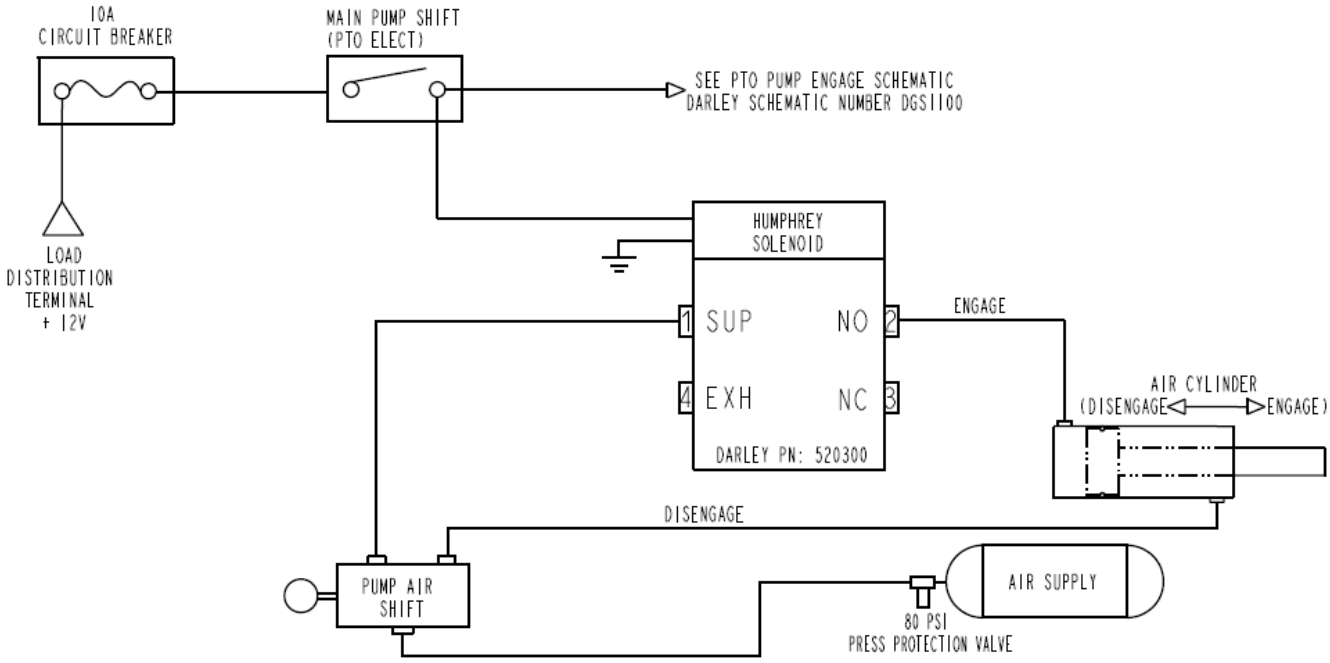
When installing the pneumatic pump shift valve for the auxiliary high pressure pump refer to drawing number DGC1000 which is shown below and found in the "drawing" section of the LSRH Installation and Assembly Instructions. The drawing illustrates the proper plumbing for the related air cylinder. To wire the micro switch, refer to the section titled "Electrical Connections and Connecting Cables" in the LSRH Installation and Assembly Instructions.

REP NO.	NAME OF PART	QTY.
1	VALVE BODY	1
2	O–RING SEAL	2
4	VALVE PLUG	1
5	MOUNTING PLATE	1
6	SHIFT CONTROL PLATE	1
7	PANEL NUT	1
8	STOP NUT	1
9	LATCH KNOB	1
10	LENSE – GREEN	2
11	LEVER LATCH PIN	1
12	LATCH LEVER	1
13	SPRING – LEE	1
32	WIPER RING	1
34	CYLINDER HEAD O–RING	1
35	CYLINDER O–RING	2
42	QUAD RING	1
48	MICROSWITCH	1
49	SWITCH BRACKET	1
50	RD HD MACH SCREW	2
53	LAMP	2
54	LAMP BASE	2
55	NUT	2
56	LOCKWASHER	4
57	RD HD MACH SCREW	2



Auxiliary High Pressure Pump Interlock

When installing the electrical system on an apparatus that has an auxiliary high pressure pump you must incorporate a secondary pump interlock, the auxiliary high pressure pump interlock. The auxiliary high pressure pump interlock will eliminate the possibility of shifting the auxiliary high pressure pump into gear while the pump transmission is being driven. Drawing DGS3810 shows a wiring schematic and pneumatic layout for an auxiliary high pressure pump safety interlock system. Please refer to the auxiliary high pressure pump interlock schematic shown below, or drawing number DGS3810 in the "Wiring" section for more detail.



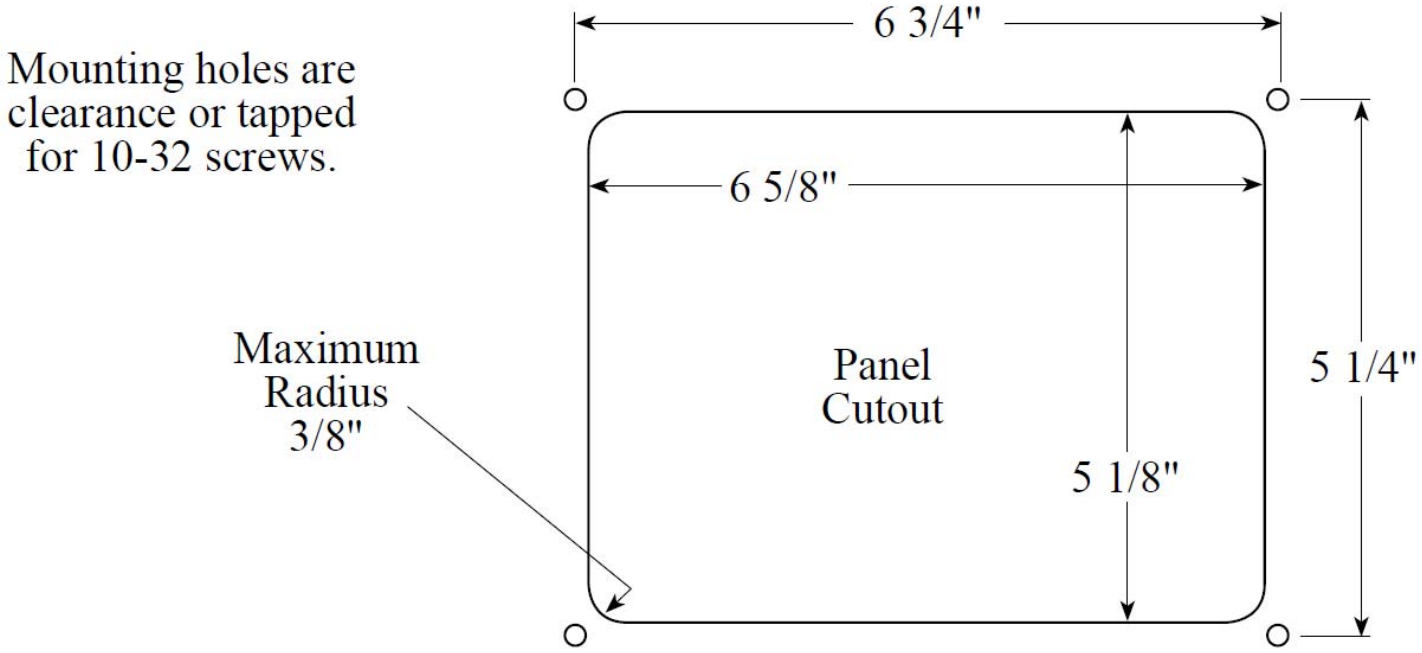
Discharge and Suction Valves

Discharge and suction valves, when ordered with the pump, will be installed at the factory. When valves are ordered after the pump has been delivered, the discharge or suction head and discharge or suction extensions will need to have a bolt pattern that matches the valve. If valves need to be retrofitted to your equipment or have bolt patterns that don't batch a series of adapters may be required. For more information regarding the installation of discharge valves contact W.S. Darley & Co. by E-mail at KMD@Darley.com.

Auto Governor

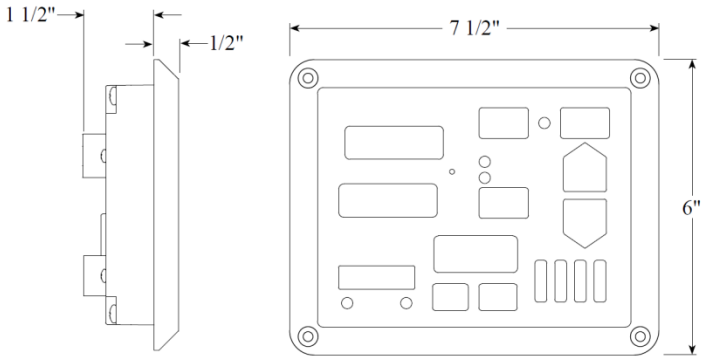
Control Module Installation

1. Measure and mark mounting locations for control module panel cutout and monitoring screw holes. Make sure there is clearance behind the panel for the module and cables before cutting holes. Refer to the figure below for layout and dimensions.



2. Cut out a 9 ¾ inch by 4 ¼ inch hole and drill four holes for mounting screws.
3. Place control module in position and secure with four screws (10- - 32 mounting hardware is recommended).
4. Connect cables at rear of the control module. (Refer to Wiring Section.)

   Note: The General panel dimensions are shown on the following page.



Pressure Sensor Installation

Two pressure sensors are mounted on the pump manifolds, one on the discharge and one on the intake. If there is a check valve on the discharge side of the pump, mount the discharge sensor before the check valve. T-fittings can be used to mount the pressure sensors.

Note: Install the pressure sensor upright so that water in the end of the pressure sensor is able to drain back into the pipe.

1. Screw the sensor into a 1/8 – 18 NPT hole.

Caution: Do not use the main body that houses the electronics to tighten the pressure sensor. Damage to the sensor may occur.

2. Tighten the sensor with a 7/8-inch wrench on the lower hex fitting.
3. Connect the pressure sensor cable from the control module to the pressure sensor. (Refer to Wiring Section)

Caution: Do not use the main body that houses the electronics to tighten the sensor. Damage to the sensor may occur.

Caution: The discharge and intake pressure sensors are the same size. Ensure the correct sensor is installed on the correct manifold. Refer to Table 1.

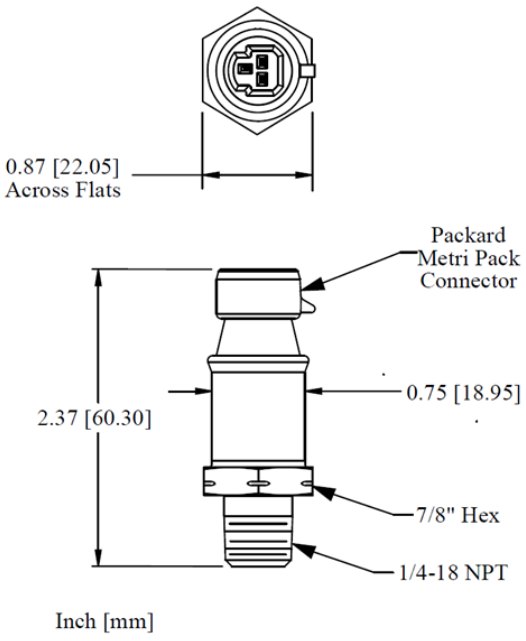


Table 1. Pressure Sensor Output Voltage

	0psi	100psi	150psi	200psi	250psi	300psi	600psi
Intake Sensor XE-IO3100PT2	0.604vdc	1.295vdc	1.640vdc	1.985vdc	2.331vdc	2.677vdc	4.75vdc
Discharge Sensor XE-FP4000PT1	0.5vdc	1.12vdc	1.56vdc	1.92vdc	2.27vdc	2.625vdc	4.75vdc

Buzzer Installation (optional)

Install the buzzer close to the control module so the audible warning is easily associated with the visual warning on the display.

The optional buzzer provided requires a cutout hole of 1-1/8" (1.125"). Pin 7 on the 8-pin connector at the rear of the control module is used to connect the buzzer. Connect the ground side of the buzzer to pin 7. (Maximum current through pin 7 is 300 mA.) Refer to the Wiring section (Figure 5).

High-Idle Kit Installation

The high-idle is activated when +12 VDC is provided to pin 4 (High-Idle Active Input) of the 8-pin connector and to pin 3 (Interlock Input) of the 12 –pin connector. Refer to High-Idle Wiring schematic.

Note: It is important that the connection to the interlock input from the high-Idle circuit be isolated from the apparatus interlock wiring with the two diodes. The pump must NOT be engaged when using the high-idle function and the THROTTLE READY will be off.

Remote Governor Option –Installation

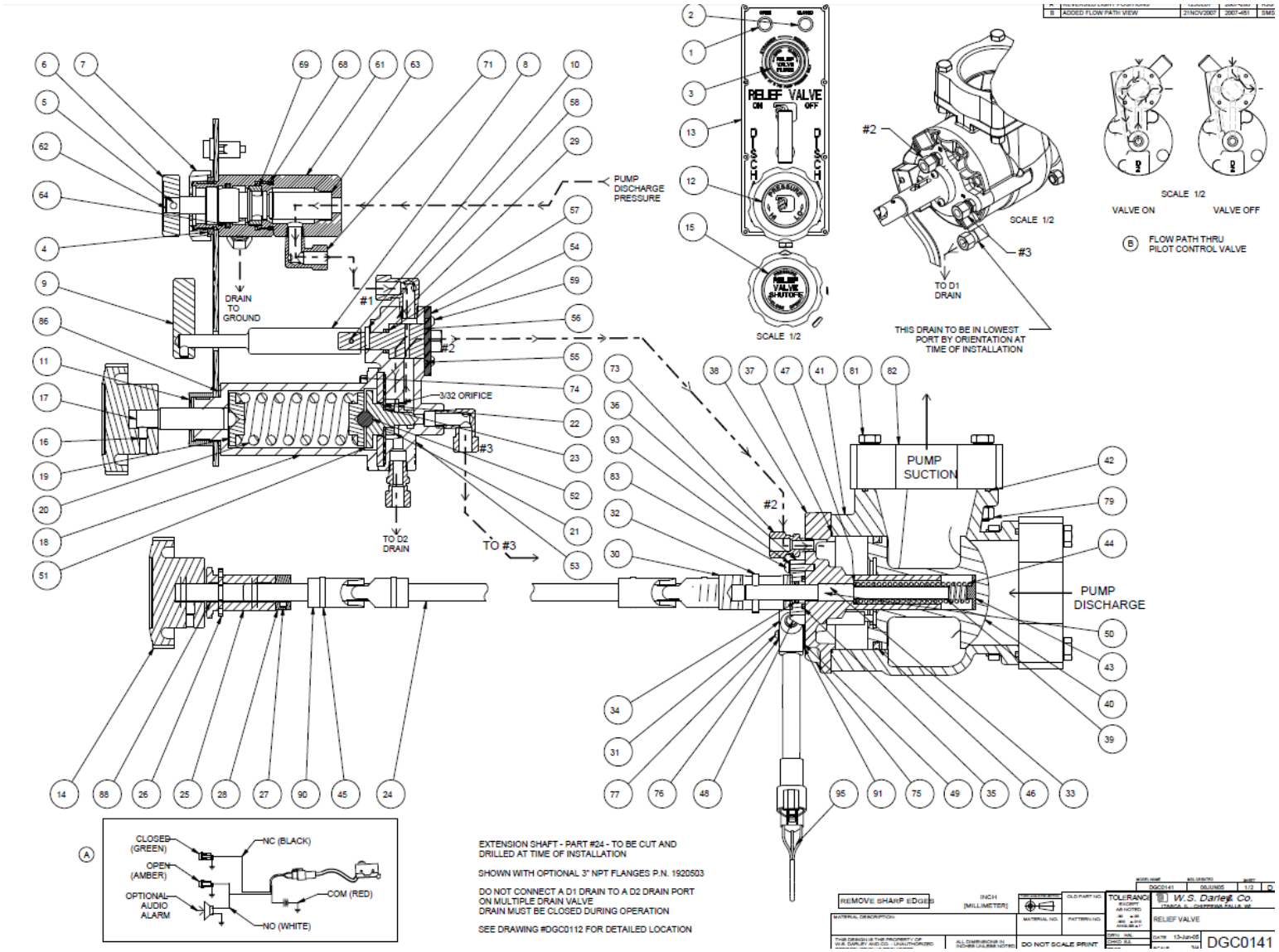
Refer to Install Control Module for dimensions. The remote governor is connected to power, the J1939 CAN Bus, and the FRC datalink. Refer to Wireing Section.

Note: Program code P303 SYS TYPE must be set to REMOTE in the remote governor program.

Correct Installation of the Pressure Relief Valve or Other Devices in Accordance With EN 1028-1 5.2.1.2.2

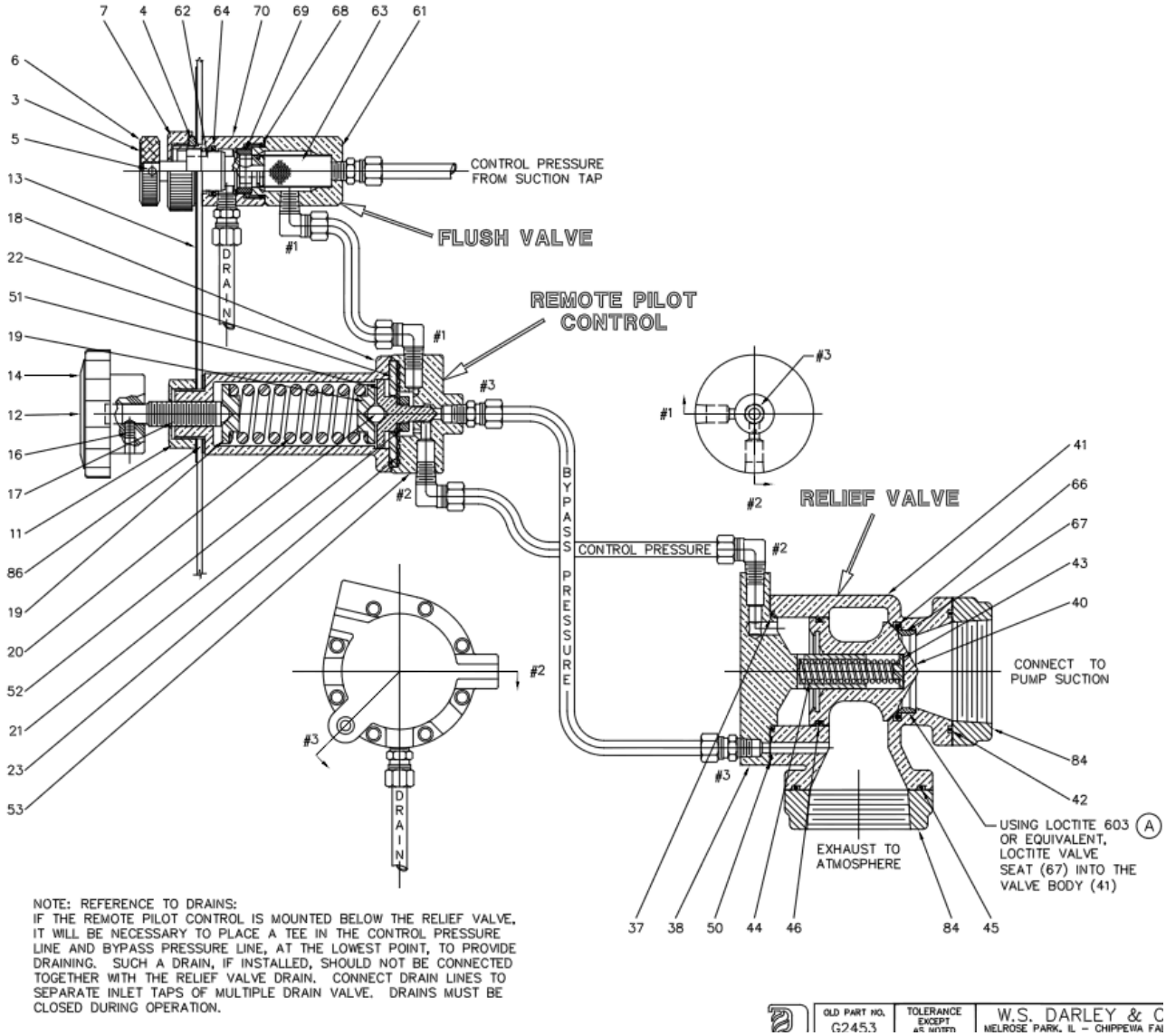
Pilot Operated Discharge Pressure Relief Valve

The discharge pressure relief valve shall be installed as illustrated in drawing DGC0141. Drawing DGC0141 can be found in the drawings section of the LSRH Installation and Assembly Instructions. Note: Drain D1 and D2 shown in drawing DGC0141 shall not be connected to the same drain port. Isolated drains are required.



Pilot Operated Suction Relief Valve

The pilot operated suction relief valve shall be installed as outline in drawing DGC0115. Drawing DGC0115 is located in the drawings section of the LSRH Installation and Assembly Instruction Manual.



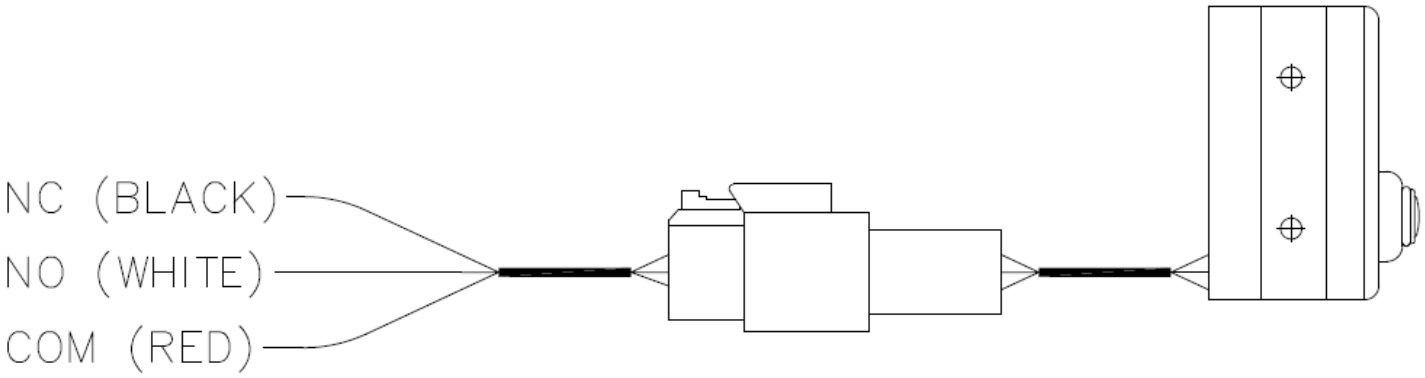
Spring Operated Suction Relief Valve

The spring operated suction relief valve can be mounted on the suction intake manifold. To mount the spring operated suction relief valve the suction intake manifold must have a mounting flange with a 3.25" Square bolt pattern with 7/16" – 14 threaded holes. Verify the bolt pattern. If the bolt pattern matches, install the spring operated suction relief valve & O-ring using (4) 1" long bolts with a 7/16" – 14 thread form. IF desired, the relief valve can be plumbed to the tank. .

Electrical Connections and Connecting Cables

Micro Switch Wiring

The image shown below displays the wire designation and color for the Darley Micro Switch. The micro switch will be included on the with the air shift actuator.



Auto Governor Wiring

The information available on the J1939 Databus varies depending on the particular engine type. The sensors (if any) that need to be installed will also vary depending on the engine.

12 Pin Connector/Cable

Pin	Wire Color	Description
1	Red	+12 VDC Supply Power
2	Black	Ground
3	White	Interlock Input (+12 VDC)
4	Red	J1939 CAN (+)
5	Black	J1939 CAN (–)
6	Red	+5 VDC Discharge Sensor
7	Black	Ground Discharge Sensor
8	White	Signal Discharge Sensor
9	Red	+5 VDC Intake Sensor
10	Black	Ground Intake Sensor
11	White	Signal Intake Sensor
12	Yellow	J1939 Shield

Note:
The Interlock Input pin 3 must be made for the governor to control the engine.

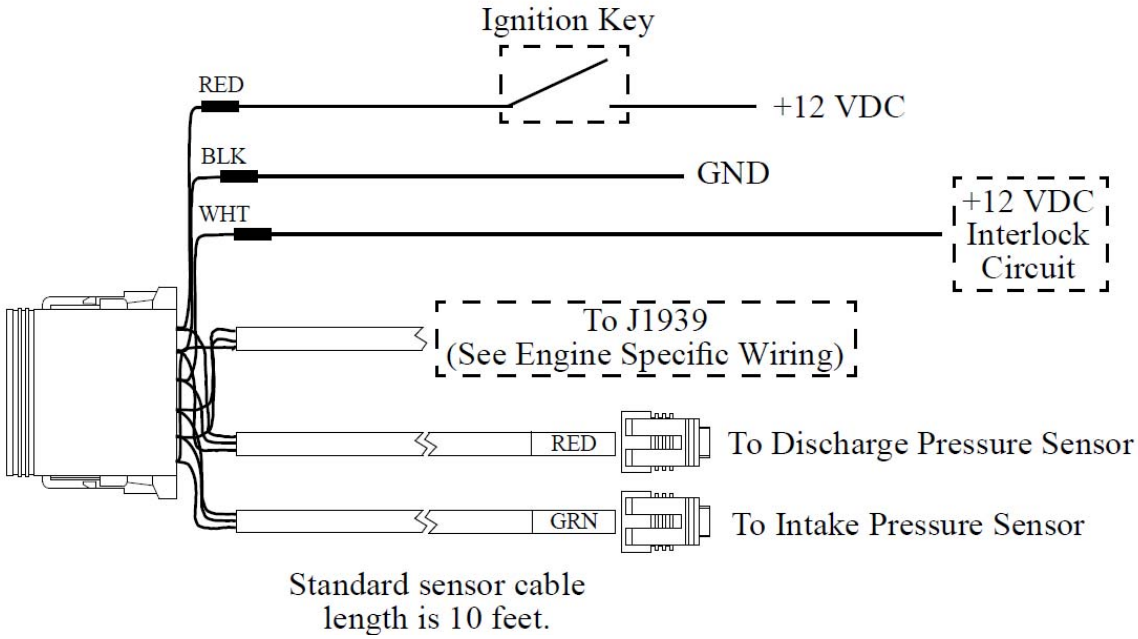


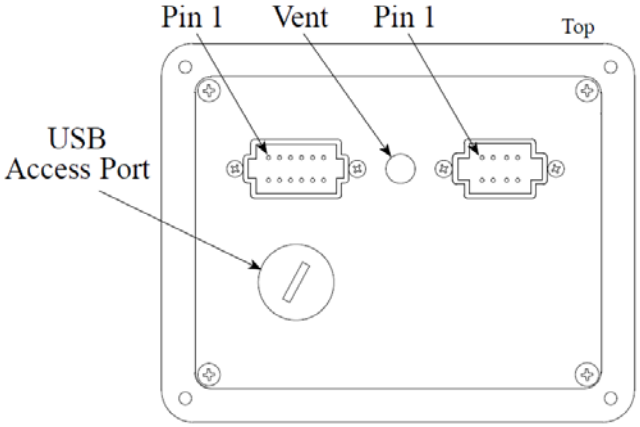
Figure 4

When a remote governor is installed ensure that the control module program code P303 is set to REMOTE. Refer to the figures below for wiring details.

12 and 8 Pin Connectors

Note:

An optional 6-pin connector is installed when external sensors are required.

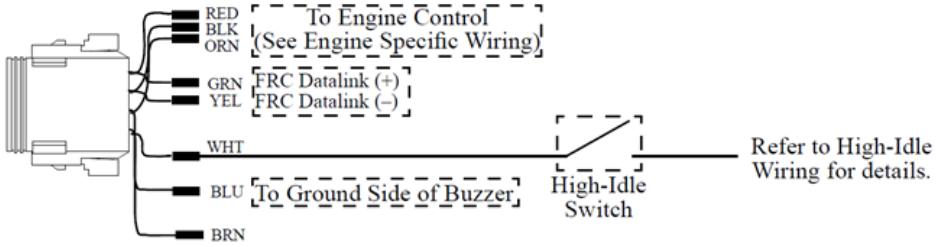


Rear View

8-Pin Connector/Cable

Pin	Wire Color	Description
1	Red	+5 VDC Reference From ECM
2	Black	ECM Ground
3	Orange	Engine Control Signal To ECM
4	White	High-Idle Active Input (+12 VDC)
5	Green	FRC Datalink (+)
6	Yellow	FRC Datalink (–)
7	Blue	Buzzer Ground (300 mA max)
8	Brown	Throttle Enable Signal Output

Note: Not all wires are used for all engines. Refer to the engine specific wiring diagram for interface connections.



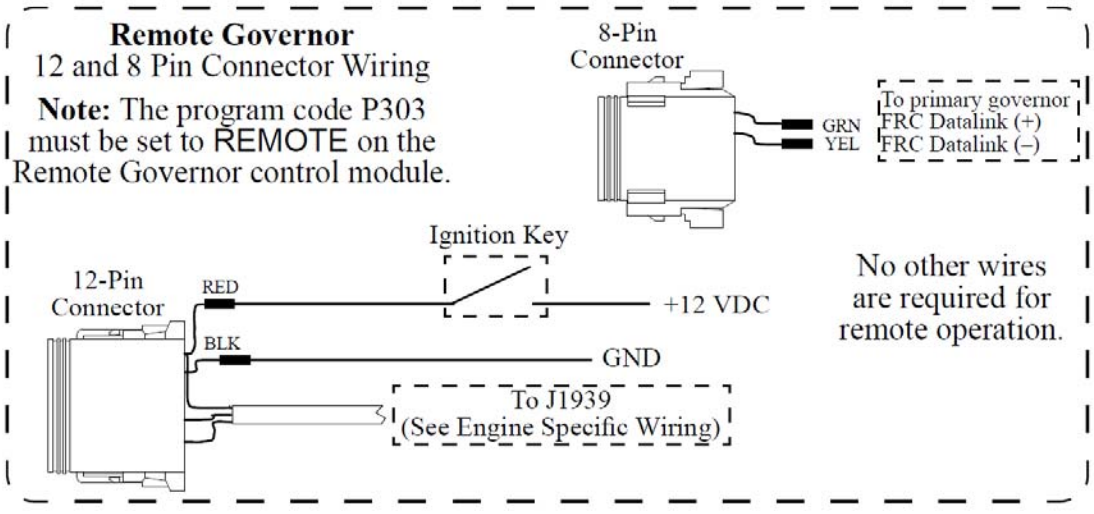
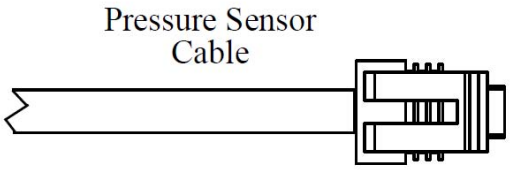


Figure 5

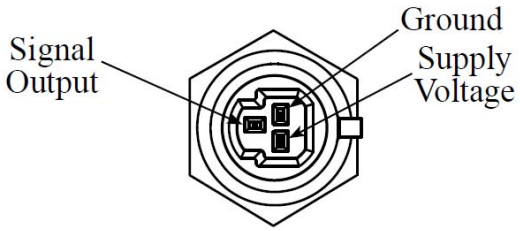
Pressure Sensor



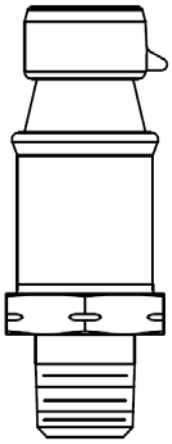
Pressure Sensor Cable 3-Pin Connector

Pin/Wire	Description
A/Black	Ground
B/Red	Supply Voltage
C/White	Signal

Pressure Sensor
Top View



Side View



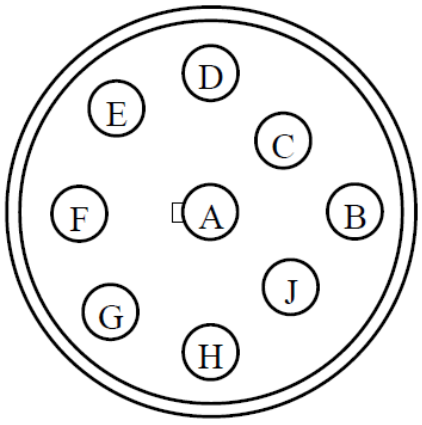
Caution: The discharge and intake pressure sensors are the same size. Ensure the correct sensor is installed on the correct manifold. Refer to Table 1.

Table 1. Pressure Sensor Output Voltage

	0psi	100psi	150psi	200psi	250psi	300psi	600psi
Intake Sensor XE-IO3100PT2	0.604vdc	1.295vdc	1.640vdc	1.985vdc	2.331vdc	2.677vdc	4.75vdc
Discharge Sensor XE-FP4000PT1	0.5vdc	1.12vdc	1.56vdc	1.92vdc	2.27vdc	2.625vdc	4.75vdc

Common OEM Diagnostic Connector

Typical 9-Pin Deutsch Diagnostic Connector.
Commonly found under the driver side dashboard.



Front View

9-Pin Connector

Pin	Description
A	Battery Ground
B	+12 VDC
C	J1939 CAN (+)
D	J1939 CAN (–)
E	J1939 Shield
F	J1587 DATA BUS (+)
G	J1587 DATA BUS (–)
H	Plug
J	Plug

Cummins Harness Connections – Governor Installation

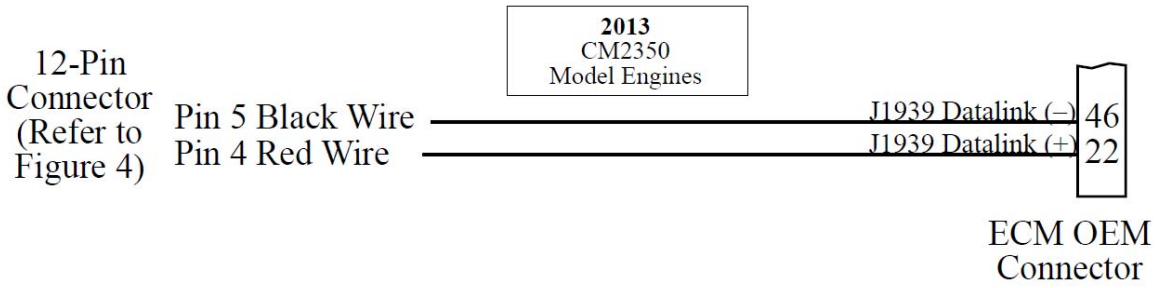
Interface Information

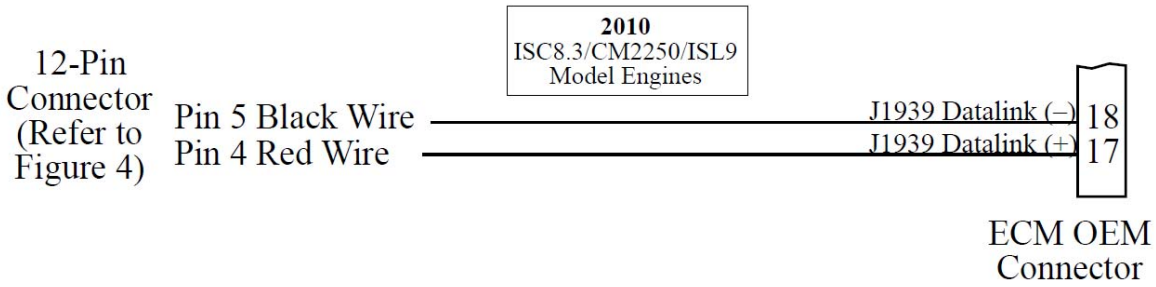
For use on 2004 or newer engines.

The governor is designed to control engine throttle directly over the SAE J1939 databus.

If the governor is being used on a COMMERCIAL CHASSIS with a Cummins Engine, ENSURE that the Cummins Engine EMERGENCY VEHICLE CALIBRATION is programmed in the engine ECM for the governor to work.

Note: Refer to the figure showing the TCA 12-Pin Connector on page six of section 7 Wiring for power and interlock wire connections.

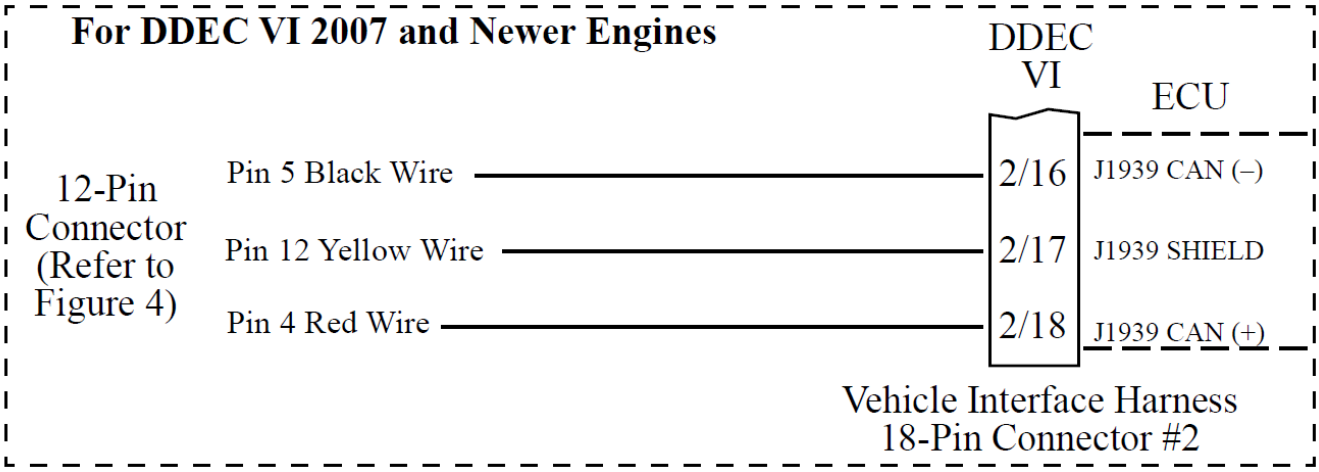


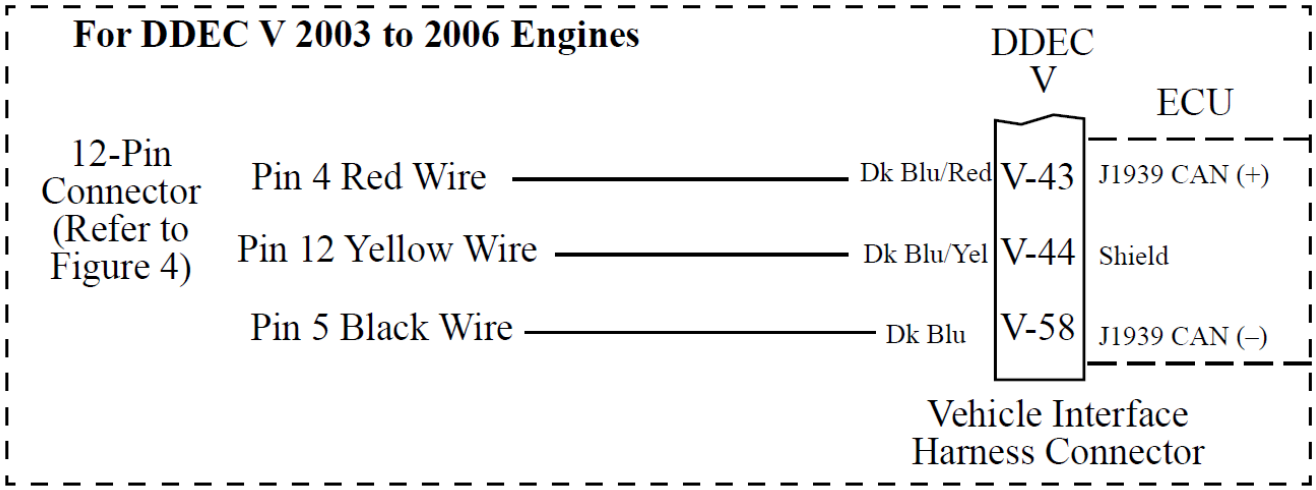


Detroit Diesel Harness Connections

Interface Information

Note: Refer to the figure showing the TCA 12-Pin Connector on page six of section 7 Wiring for power and interlock wire connections.





Navistar Harness Connections

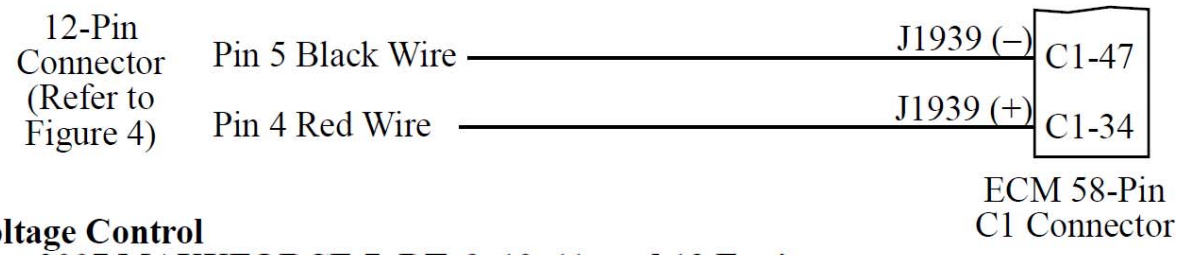
Interface Information

The ECM must be programmed for remote variable throttle operation.

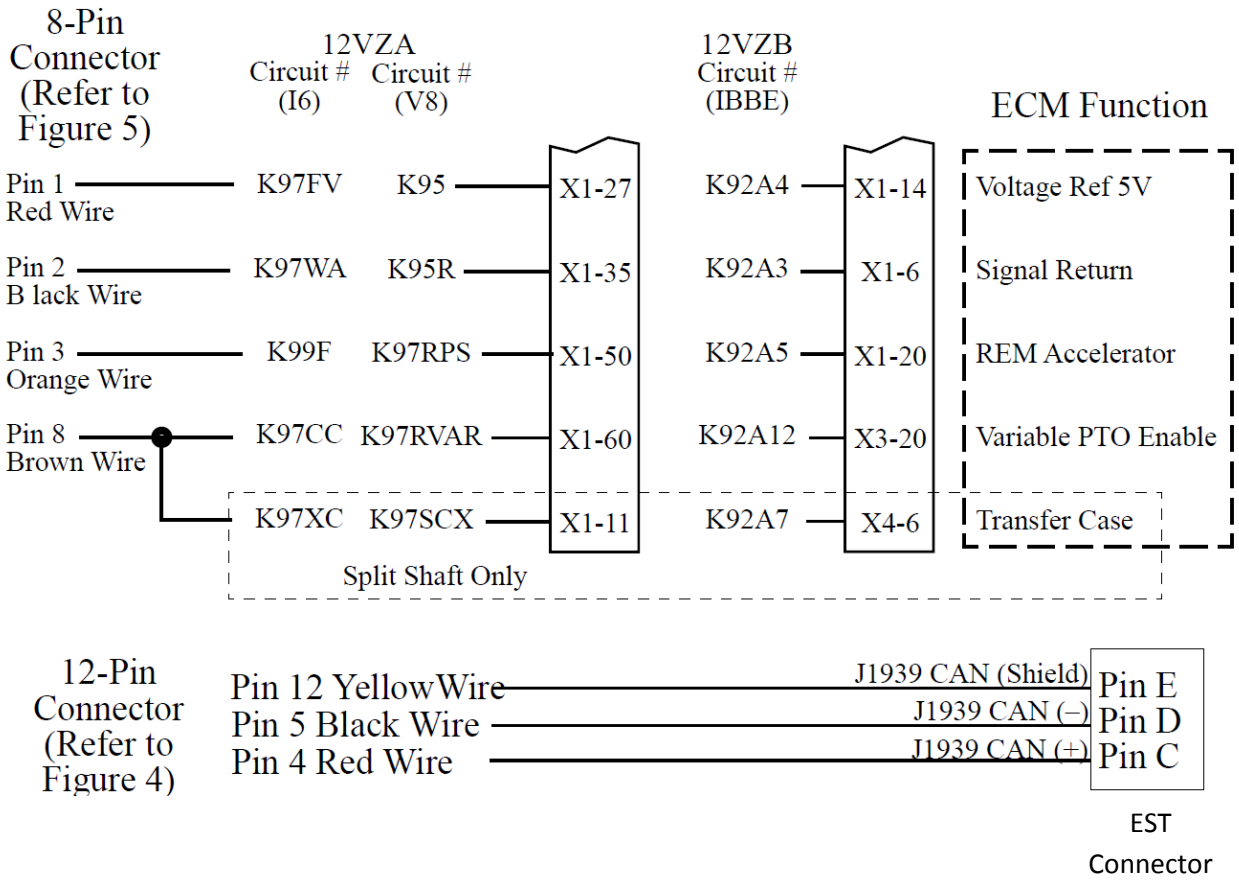
Note: Check the governor engine code to verify the program setting (for J1939 control use 4C and for voltage control use 4D). Wire accordingly or change the code.

Note: Refer to the figure showing the TCA 12-Pin Connector on page six of section 7 Wiring for power and interlock wire connections.

J1939 CAN Bus Control 12VXY
2010 and Newer MAXXFORCE 11 and 13 Engines



Voltage Control
Post 2007 MAXXFORCE 7, DT, 9, 10, 11, and 13 Engines



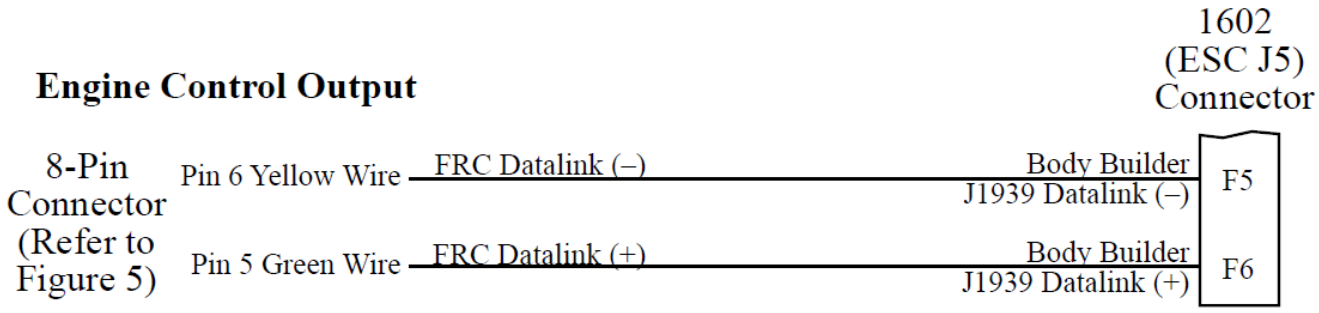
Navistar / International Chassis Harness Connections

Interface Information

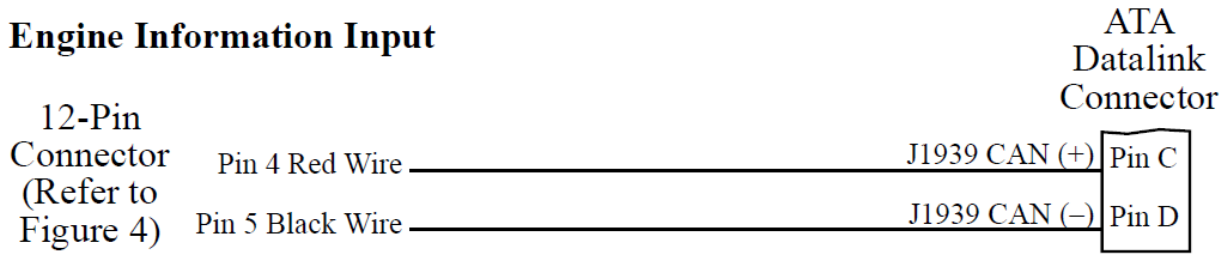
Note: This function is not available on custom chassis, refer to the figure in the Navistar Section

Vehicles must be equipped with an Electron System Controller (ESC) and have the Body Builder J1939 Datalink to the FRC Datalink for engine control as shown below.

Note: Refer to the figure showing the TCA 12-Pin Connector on page six of section 7 Wiring for power and interlock wire connections.



Note: The Body Builder J1939 Datalink is for engine control, the J1939 CAN Bus provides engine information to the governor.



Catepillar Harness Connections

Interface Information

The parameter settings for PTO Configuration is programmed to Remote Throttle or Remote Throttle with J1939 Speed Command.

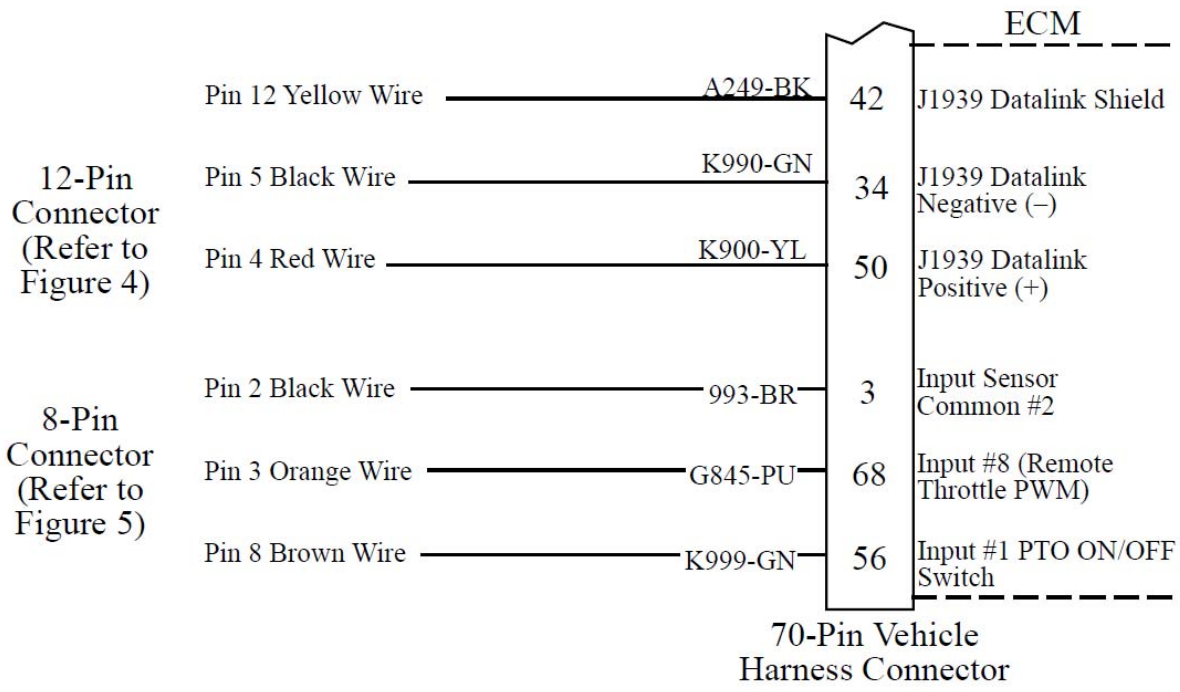
ECM software with a Personality Module release date of May08 for C7, C9, C13, C15 engines, will have the Remote Throttle with J1939 Speed Command setting available. This setting allows the engine speed to be controlled during PTO operations by a J1939 compliant device.

Refer to an authorized dealer to program one of these options.

C7, C9, C10, C11, C12, C13, C15 Engine Interface

Engines with 70-pin OEM connector.

Note: Refer to the figure showing the TCA 12-Pin Connector on page six of section 7 Wiring for power and interlock wire connections.



Ford Harness Connections

J1939 Interface Information

A J1939 CAN input is required to provide engine information to the governor. The ford vehicle CAN Bus information needs to be interpreted. A J1939 Translator Module with a harness to connect it to the ODB-II connector must be installed.

Note: the ODB-II connector and wiring is accessed under the dash.

There are two scenarios:

I. The J1939 translator Module and the ODB-II interconnecting harness (provided with the governor kit). A 2-pin connector is provided for the wires to governor.

II. The J1939 Translator Module is installed as part of the NFPA1901 compliant seat belt monitoring and VDR system.
The Translator Module/ODB-II/VDR harness is under the driver side dash. A T-cable (provided with the governor kit) needs to be installed at the 4-Pin connector that is between the harness and the VDR.

Stationary Elevated Idle Control (SEIC) Interface Information

Note: Access wires for SEIC are located in cabin, tagged and bundled above the parking brake pedal assembly behind the datalink connector.

SEIC is used in two modes: Stationary and split shaft. The governor provides a variable RPM control to the Ford Power Train Control Module (PCM) when all enabling conditions are met. Refer to Figure 14 Ford TCA106 PCM Wiring.

SEIC ENABLERS: Parking brake applied; Foot off of service brake; Vehicle in park; Foot off of accelerator pedal; Vehicle speed is 0 mph (stationary); Engine at a stable base idle speed

Note: Do not press the accelerator or service brake pedal when engaging the fire pump, this prevents the switch into SEIC (Stationary Elevated Idle Control)>

Install the J1939 Translator Module with the ODB-II Interconnecting Harness or Install the T-cable between 4-pin connectors.

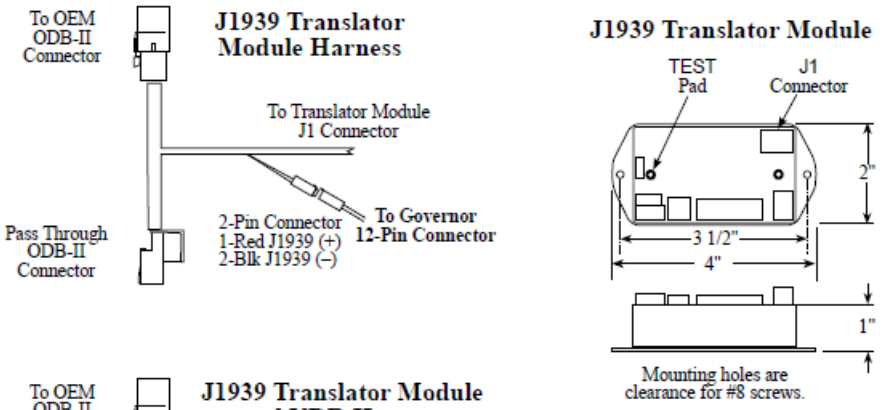
To install the J1939 Translator Module with ODB-II harness, read and follow the installation instructions provided with the Translator Module Kit.

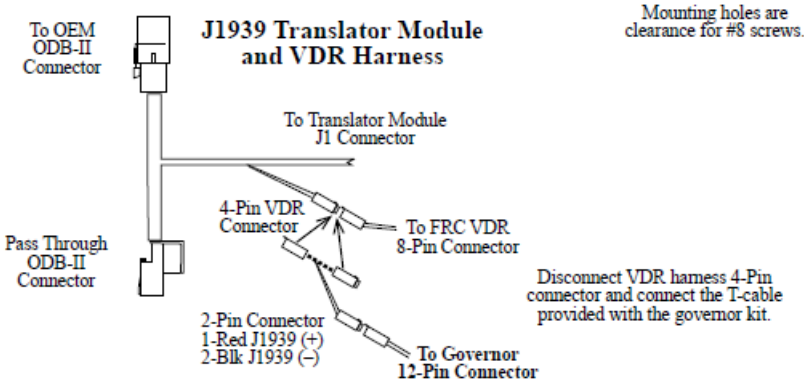
Note: The TEST pad on the module circuit board has to be held at ground when the harness connector is plugged into the J1 connector.

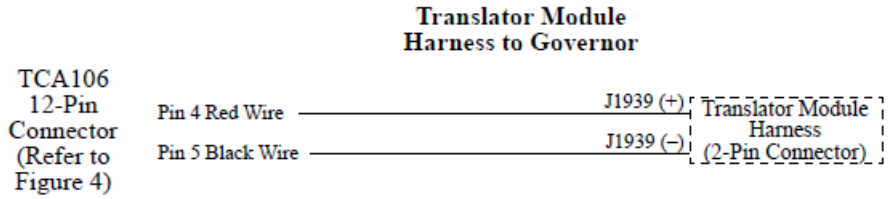
Install the J1939 Translator Module with the ODB-II Interconnecting Harness or Install the T-cable between 4-Pin connectors.

To install the J1939 Translator Module with ODB-II harness, read and follow the installation instructions provided with the Translator Module kit.

Note: The TEST pad on the module circuit board has to be held at ground when the harness connector is plugged into the J1 connector.





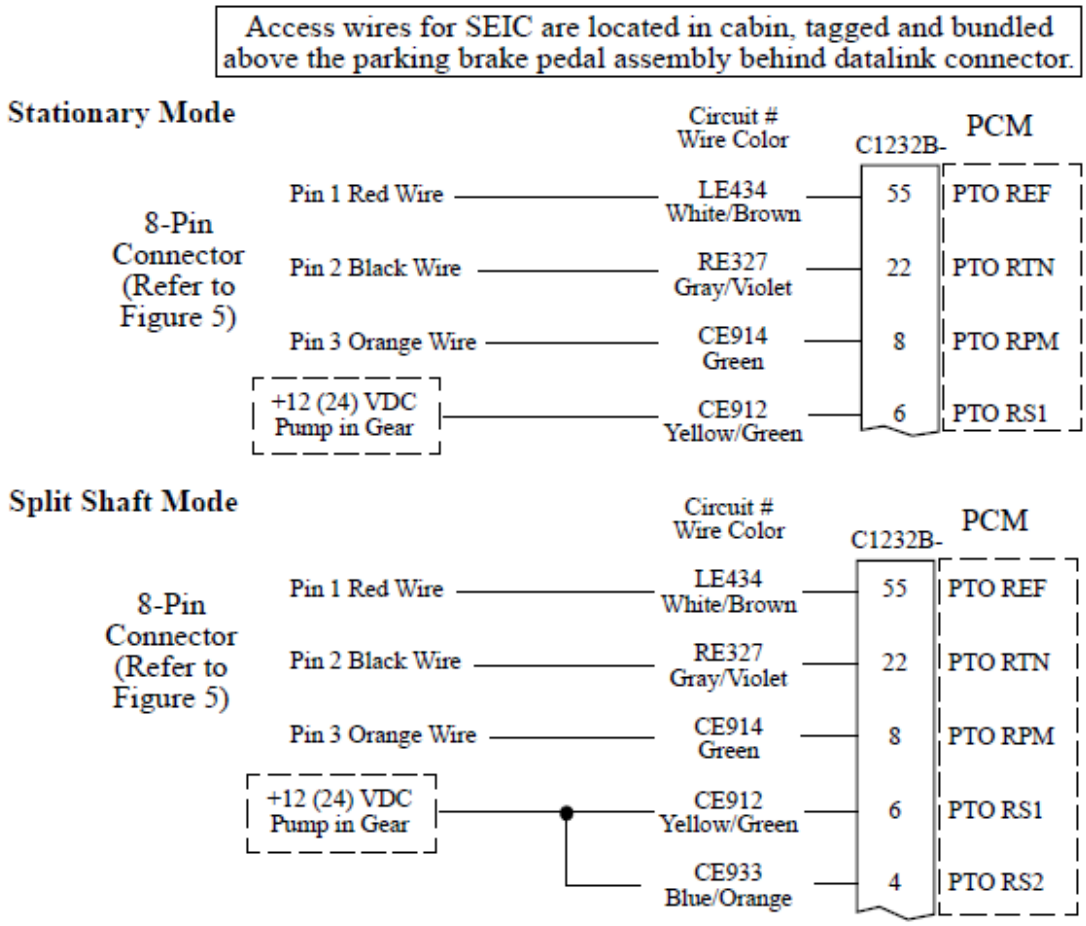


Note: Refer to the figure showing the TCA 12-Pin Connector on page six of section 7 Wiring for power and interlock wire connections.

2011 model F-250/350/450/550 – 6.7L Diesel Engine Stationary Elevated IDLE Control (SEIC)

Note: Do not press the accelerator or service brake pedal when engaging the fire pump, this prevents the switch into SEIC.

Note: Refer to the figure showing the TCA 12-Pin Connector on page six of section 7 Wiring for power and interlock wire connections.



Split Shaft Mode is activated by applying supply voltage to both the PTORS1 and the PTORS2 PCM circuits simultaneously.

1. Assure Engine is running and fully warmed-up.
2. Apply parking brake.
3. Transmission in neutral to disengage drive wheels.
4. **with foot OFF brake and accelerator,** Switch Split-Shaft PTO on.
5. **Without pressing the brake, shift transmission into drive.** If vehicle unexpectedly lurches or moves, immediately press brake pedal and shift transmission into park or neutral to secure vehicle.

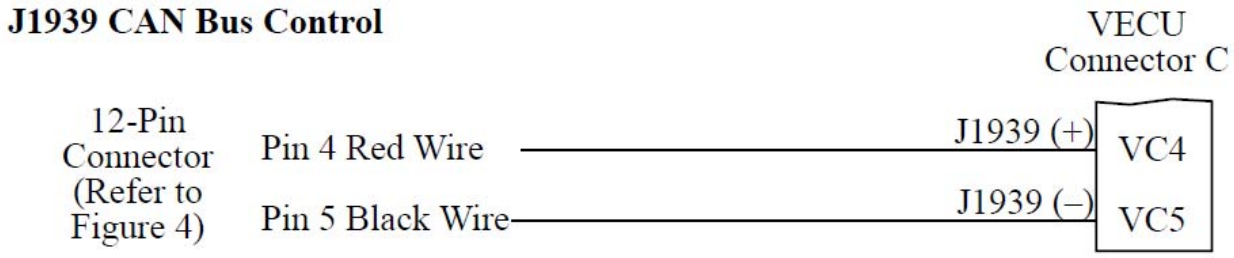
6. **Engage PTO load.**
   Once the system enablers are met voltage may be added to the SEIC system for activation. If power is applied prior to the enablers being met, a system error may occur, and the SEIC system will have to be reset.
   If an SEIC disabler occurs the engine requires a change-of-state, meaning the operator is required to turn off voltage to the PTO-Request circuit, and back on again to re-invoke SEIC and PTO operation.

Mack Harness Connections

Interface Information

For V-MACK IV 07 and newer, the governor is designed to control engine throttle directly over the SAE J1030 databus.

Note: Refer to the figure showing the TCA 12-Pin Connector on page six of section 7 Wiring for power and interlock wire connections.

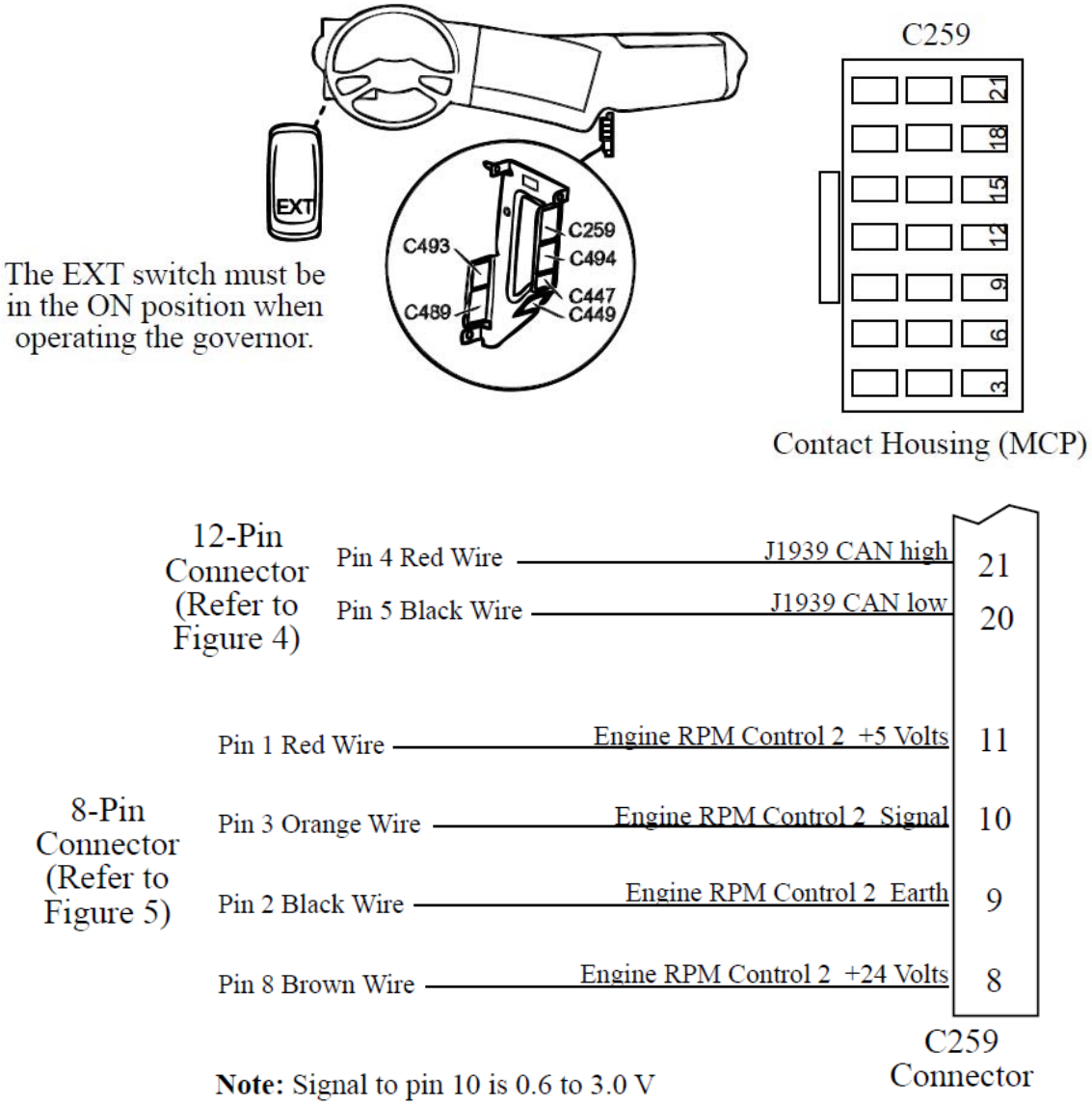


Scania Harness Connections

Interface Information

For uses on P, R, and T-series trucks equipped with bodywork control units (BWS). Connector C259 is available on all vehicles ordered with any of the bodywork options. It is located on the plate for the electrical bodywork interface for body builders. Connector C259 is white and has 21 pins. (February 2005 and newer.)

Note: Refer to the figure showing the TCA 12-Pin Connector on page six of section 7 Wiring for power and interlock wire connections.

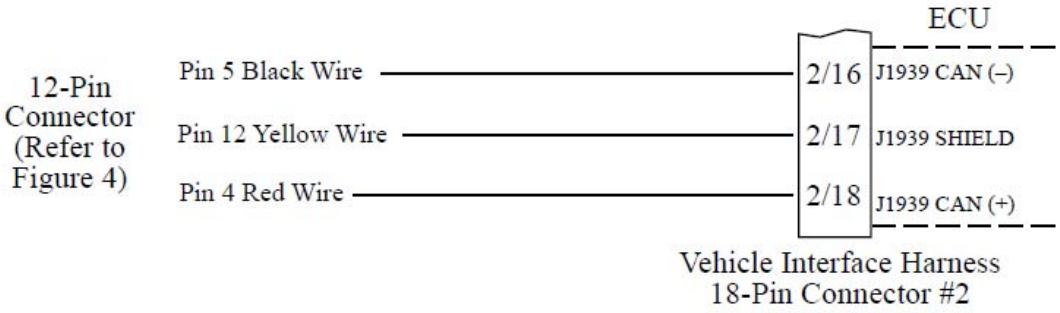


Mercedes Harness Connections

Interface Information

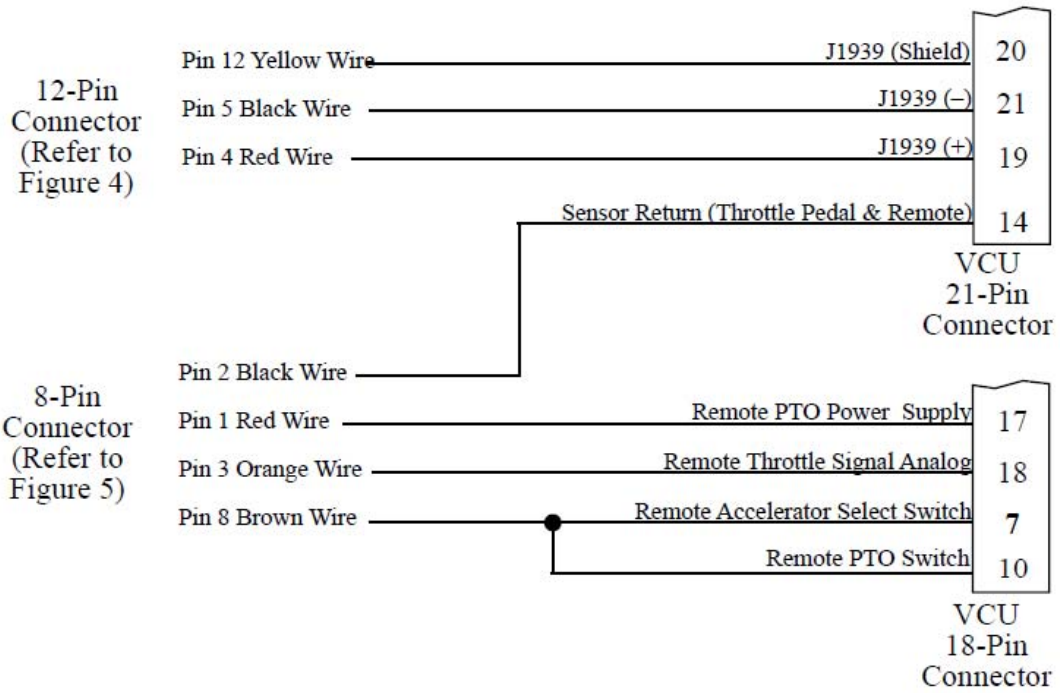
Note: Refer to the figure showing the TCA 12-Pin Connector on page six of section 7 Wiring for power and interlock wire connections.

For DDEC VI 2007 and Newer Engines

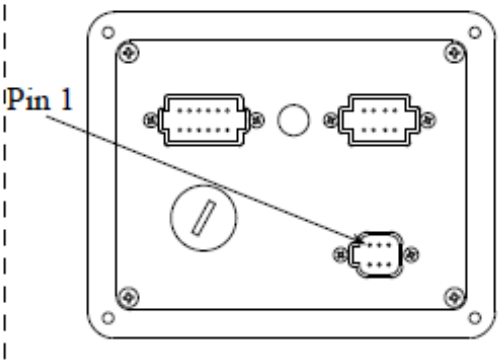


For 2006 and Older Engines

Note: The VSG Throttle Override parameter has to be enabled (set to 1).



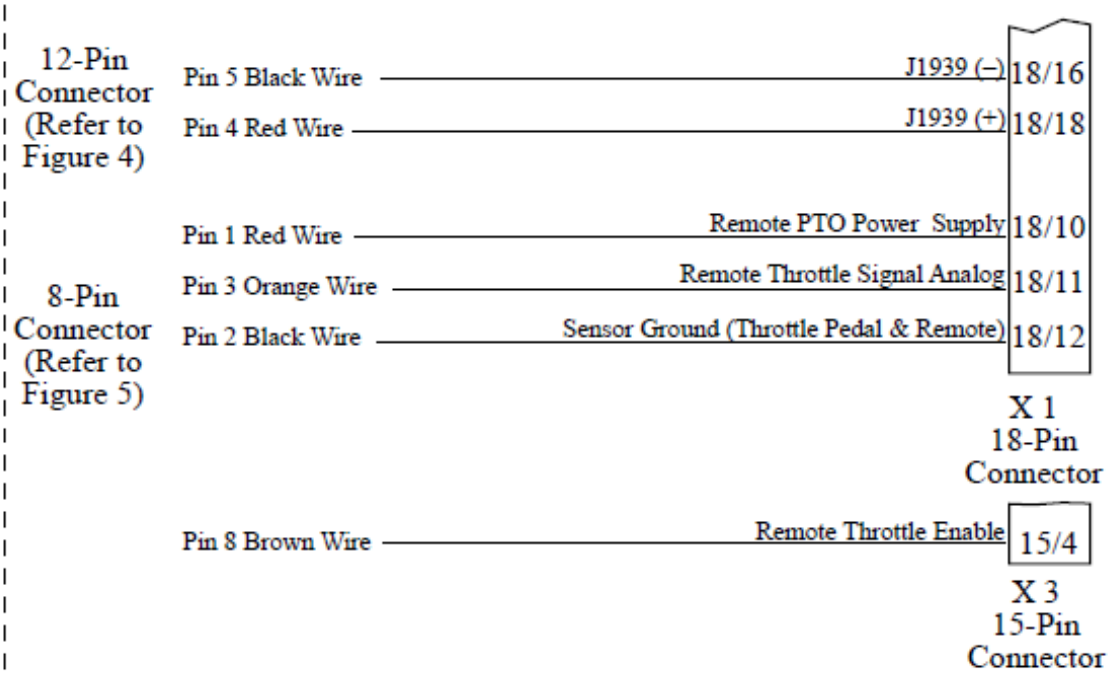
ACTROS Wiring



6-Pin Optional Connector/Cable

Pin	Wire Color	Description
1	Blue	RPM Signal (TTL or Alternator Pulse Input)
2	Orange	Oil Sensor Signal
3	*Red*	*Engine Coolant Temp Sensor Signal*
4	*Black*	*Transmission Temp Sensor Signal*
5	*White*	*Foot Pedal Signal Input*
6	*Green*	*Check Engine LED Input*

Note: The optional 6-Pin Connector is for inputs that are not available on J1939

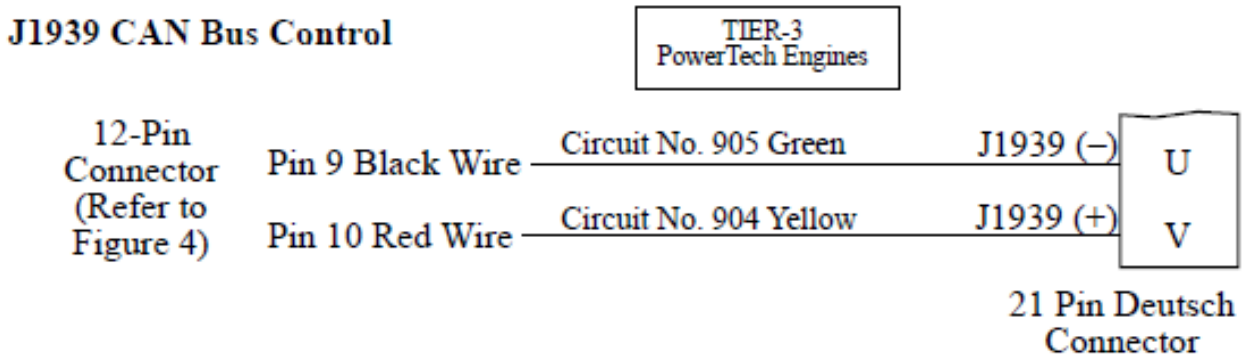


John Deere Harness Connections

Interface Information

CAN Controller will request a torque by means of TSC1. This option is disabled by default and is selectable in the Trim Options page for this application. Source address 57 should be programmed.

Note: Refer to the figure showing the TCA 12-Pin Connector on page six of section 7 Wiring for power and interlock wire connections.

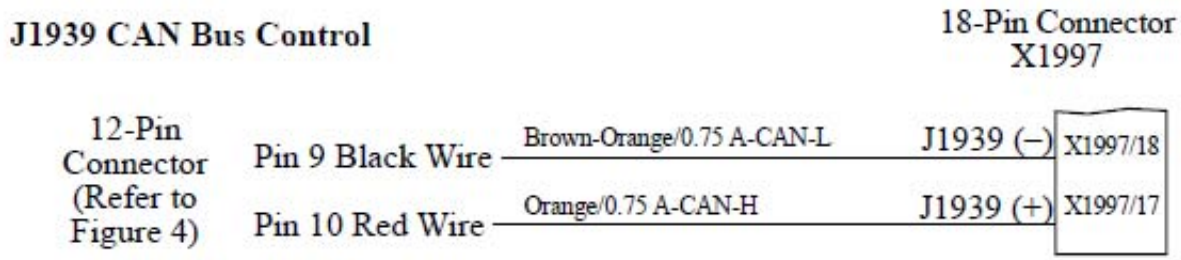


MAN Harness Connections

Interface Information

Parameters for various functions can be set on the KSM using MAN-cats II. The KSM can accept the engine speed request from the Governor on the A-CAN

Note: Refer to the figure showing the TCA 12-Pin Connector on page six of section 7 Wiring for power and interlock wire connections.



High-Idle Wiring

The governor includes a high-idle function. to activate the high-idle provide +12 VDC to pin 4 (high-Idle Active Input) of the 8 pin connector and to pin 3 (Interlock Input) of the 12-pin connector. The high-Idle connection to pin 3 must be isolated from the interlock circuit using two diodes (see schematic).

Note: It is important that the connection to the interlock input from the High-Idle circuit be isolated from the apparatus interlock wiring with the two diodes. Refer to the wiring diagram. The pump must NOT be engaged when using the high idle function.

The high-idle is set to 1000 RPM at the factory. (This value varies depending on the specific engine.) To adjust this setting refer to High-Idle in the Operation Section.

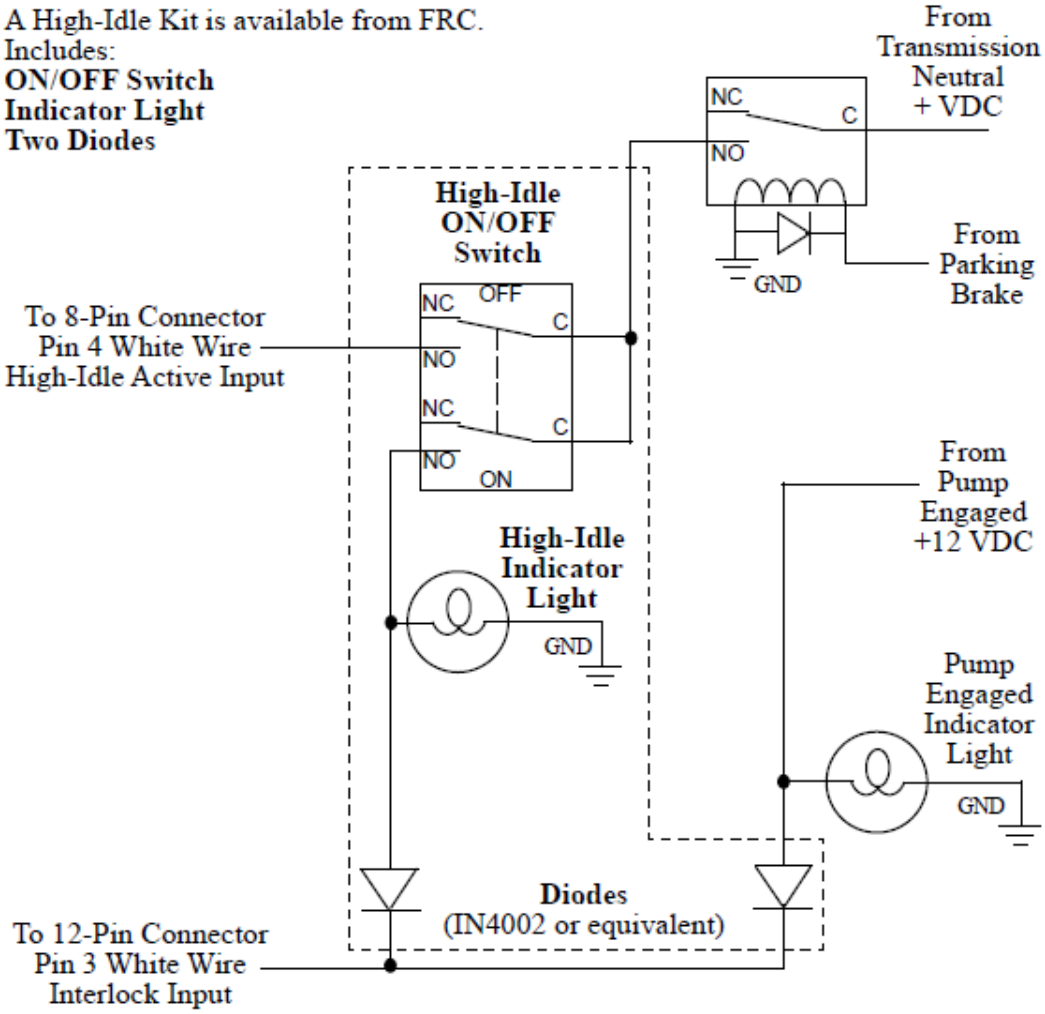


Figure 14

Fly Back Diode Information

It is good engineering practice to include a flyback diode when switching an inductive load (solenoid coil, relay coil, electric motor winding, etc.). It is recommended that a flyback diode be installed on inductive devices that share a common power source/ ground with FRC governor.

Typical circuit showing a flyback diode installed across an inductive load.

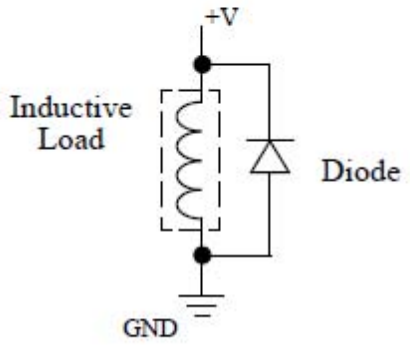
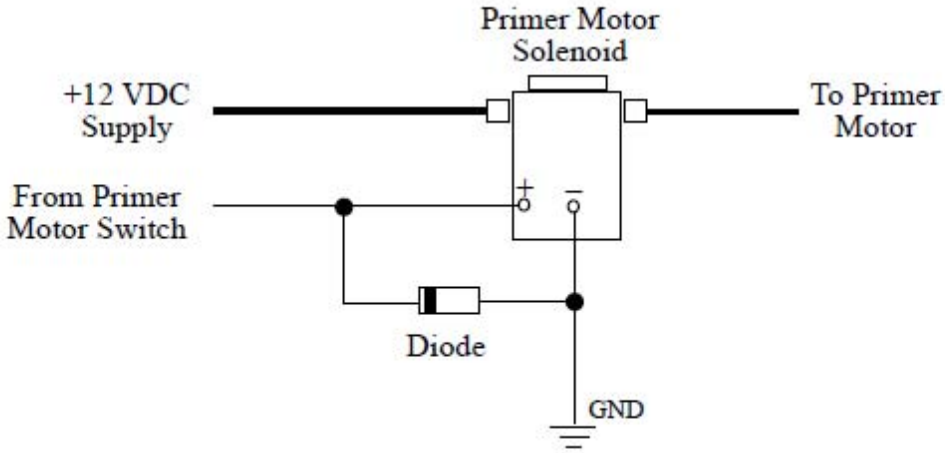


Diagram showing a flyback diode connected on a typical pump primer motor solenoid.



Pipework

General Description of Pipe Work:

Suction Inlet Pipe Work:

The suction inlet consists of a suction head (Cast Iron or Brass) and a swept T or suction Nipple. The suction inlet nipple can be ordered with threaded or weld connections. The suction T can be ordered with Victaulic connections. Threaded adapters are available for various thread to thread connections. For a list of available suction connections please contact Sales@Darley.com

Discharge Outlet Pipe Work:

The pump discharge plumbing consists of a discharge head with check valve, discharge extensions, ball valves, and discharge nipples. The ball valves can be omitted and replaced with blank flanges. For a list of available threaded adapters please contact W.S. Darley and company by email at Sales@Darley.com

Permitted Forces and Moments on Inlet and Outlet Branches:

The maximum allowable force/moment on the inlet pipework connection is 453.6 kgf (1000lbf).

The maximum allowable force/moment on the outlet pipework connection is 453.6 kgf (1000lbf).

Reduction of Noise

Driveline Noise

When laying out the driveline it is critical that the guidelines described in the “U-Joint Operating Angles Section” and “Excessive Operating Angles, Worst Case scenario” are followed. Excessive U-joint operating angles can cause increased noise and premature failure.

Gear Box Noise

If a gear box is wore out or not properly maintained it may cause excessive noise. When an unusual noise is coming from the gear box refer to the table titled “Remedies using a product related check list” in the “LSRH General Instructions” manual.

Recommended Chassis Size

Things to Consider When Selecting a Chassis:

When selecting a chassis there are many variables to consider. Things such as obstructions to intended driveline linkages, available PTO locations, and the gross vehicle weight all come into play. This section will describe the recommended GVWR based on the pump weight and size of water tank. If further information on appropriate chassis size is required please contact W.S. Darley at KMD@darley.com.

LSRH Chassis with 1135 Liter tank (300 US Gallons):

For a chassis that is being used for a fire apparatus vehicle with a LSRH and an 1135 liter water tank, the chassis shall have a GVWR no less than 8,845 kg (19,500 lbs.).

Chassis Size for an LSRH and an 1893 liter water tank (500 US Gallons):

For a chassis that is being used for a fire apparatus vehicle with a LSRH and a 1893 liter water tank, the chassis shall have a GVWR no less than 9980 kg (22,000 lbs.).

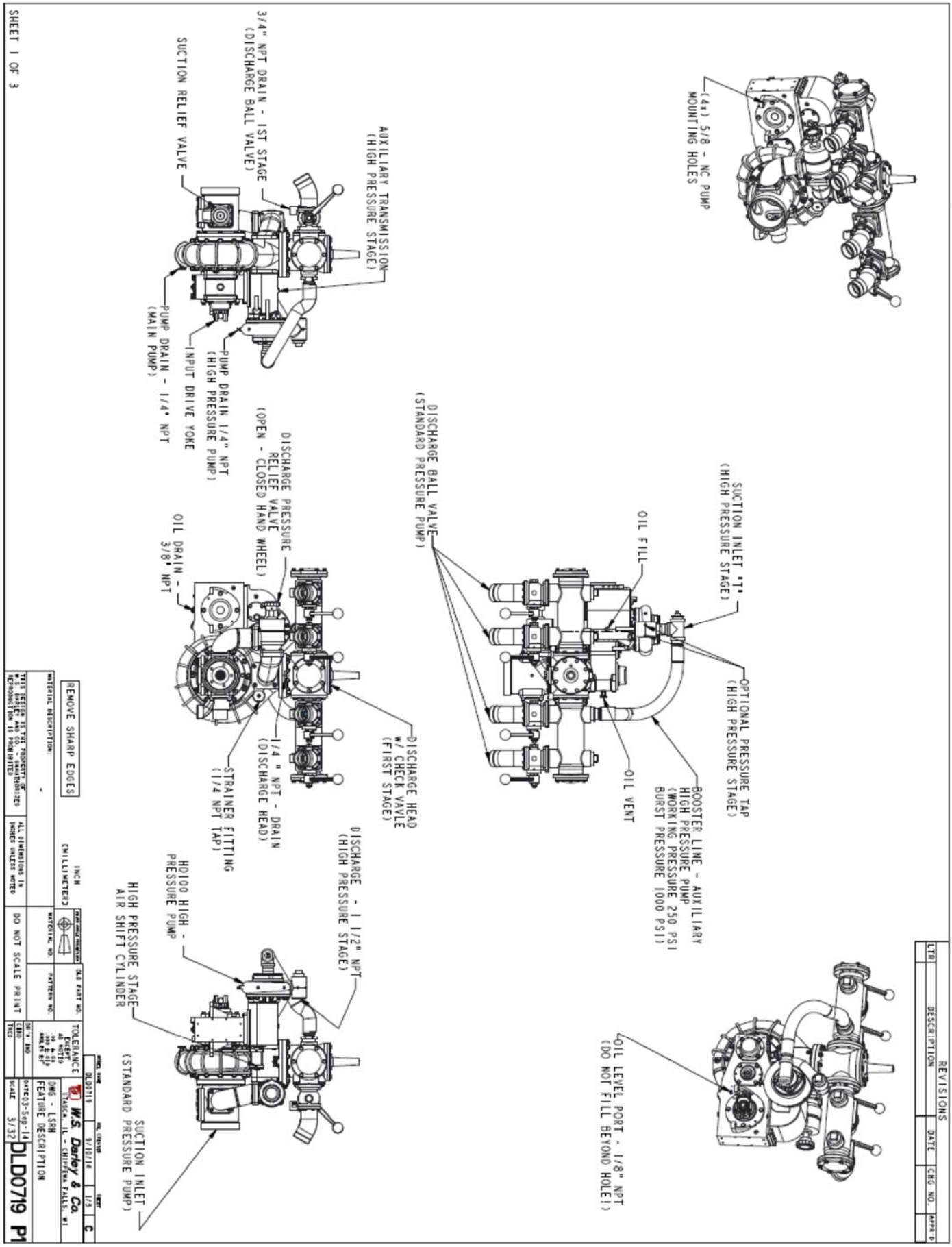
Recommended Horse power for Performance Rating

Horse Power Required:

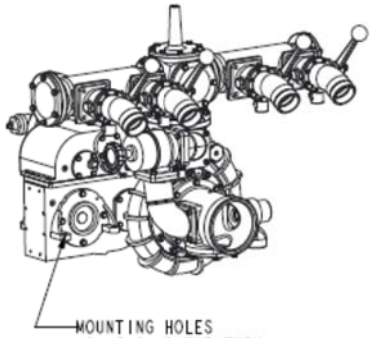
For the LSRH to satisfy the EN1028-1FPN 40-250 performance requirement along with the EN1028-1-FPN 10 – 4000 requirement a minimum available horse power of 137 (+/- 5%) is required.

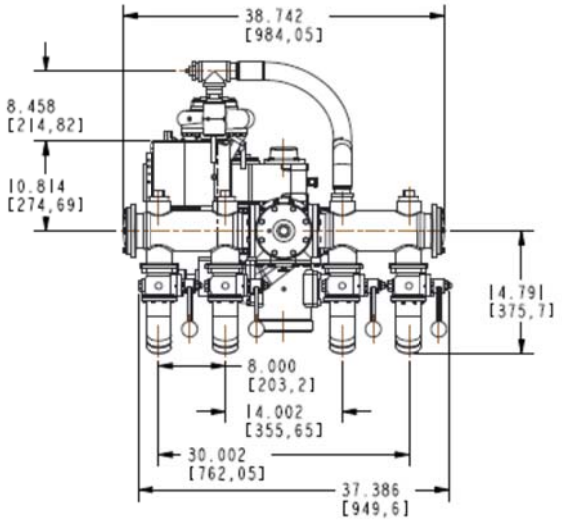
Drawings

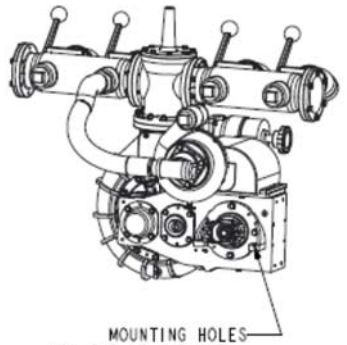

CERTIFICATE Of APPROVAL
OEM Truck CO.
The truck serial number listed below has a designed driveline layout that is approved by W.S. Darley & Co.
TRUCK SN: 64646465464
PRESENTED BY: Kyle M. Darley
ON THIS DAY: May 29, 2015

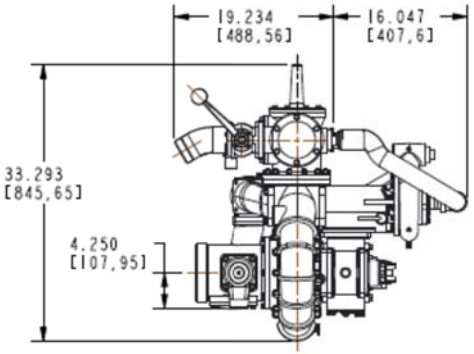

(4x) 5/8 - NC PUMP MOUNTING HOLES
AUXILIARY TRANSMISSION (HIGH PRESSURE STAGE)
3/4" NPT DRAIN - IST STAGE (DISCHARGE BALL VALVE)
SUCTION RELIEF VALVE
PUMP DRAIN - 1/4" NPT (MAIN PUMP)
INPUT DRIVE YOKE
PUMP DRAIN 1/4" NPT (HIGH PRESSURE PUMP)
DISCHARGE PRESSURE RELIEF VALVE (OPEN - CLOSED HAND WHEEL)
OIL DRAIN - 3/8" NPT
1/4 " NPT - DRAIN (DISCHARGE HEAD)
STRAINER FITTING (1/4 NPT TAP)
DISCHARGE HEAD W/ CHECK VAVLE (FIRST STAGE)
DISCHARGE BALL VALVE (STANDARD PRESSURE PUMP)
SUCTION INLET "1" (HIGH PRESSURE STAGE)
OIL FILL
OIL VENT
OPTIONAL PRESSURE TAP (HIGH PRESSURE STAGE)
BOOSTER LINE - AUXILIARY HIGH PRESSURE PUMP (WORKING PRESSURE 250 PSI BURST PRESSURE 1000 PSI)
OIL LEVEL PORT - 1/8" NPT (DO NOT FILL BEYOND HOLE!)
DISCHARGE - 1 1/2" NPT (HIGH PRESSURE STAGE)
HD100 HIGH - PRESSURE PUMP
HIGH PRESSURE STAGE AIR SHIFT CYLINDER
SUCTION INLET (STANDARD PRESSURE PUMP)
REVISIONS
LTR
DESCRIPTION
DATE
ENG NO.
APPR'D
REMOVE SHARP EDGES
INCH [MILLIMETER]
DO NOT SCALE PRINT
TOLERANCE
W.S. Darley & Co.
ITASCA, IL - CHIPPEWA FALLS, WI
DWG - LSRH FEATURE DESCRIPTION
DATE 03-Sep-14
SCALE 3/32
DLD0719 P1
SHEET 1 OF 3

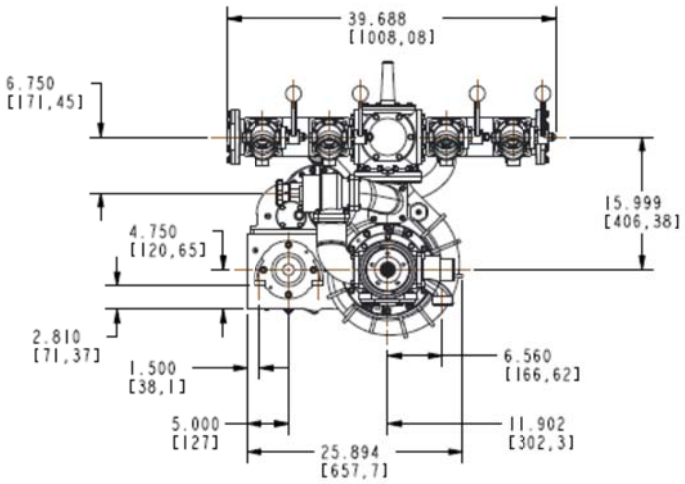
REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D

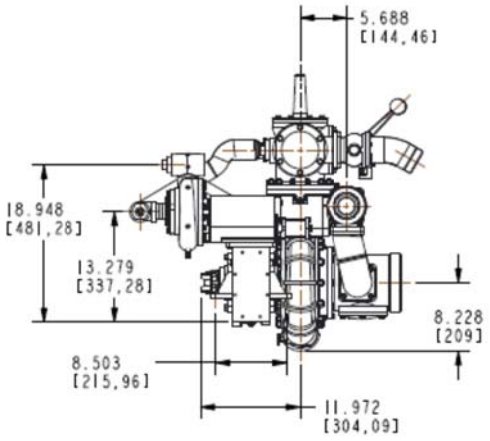






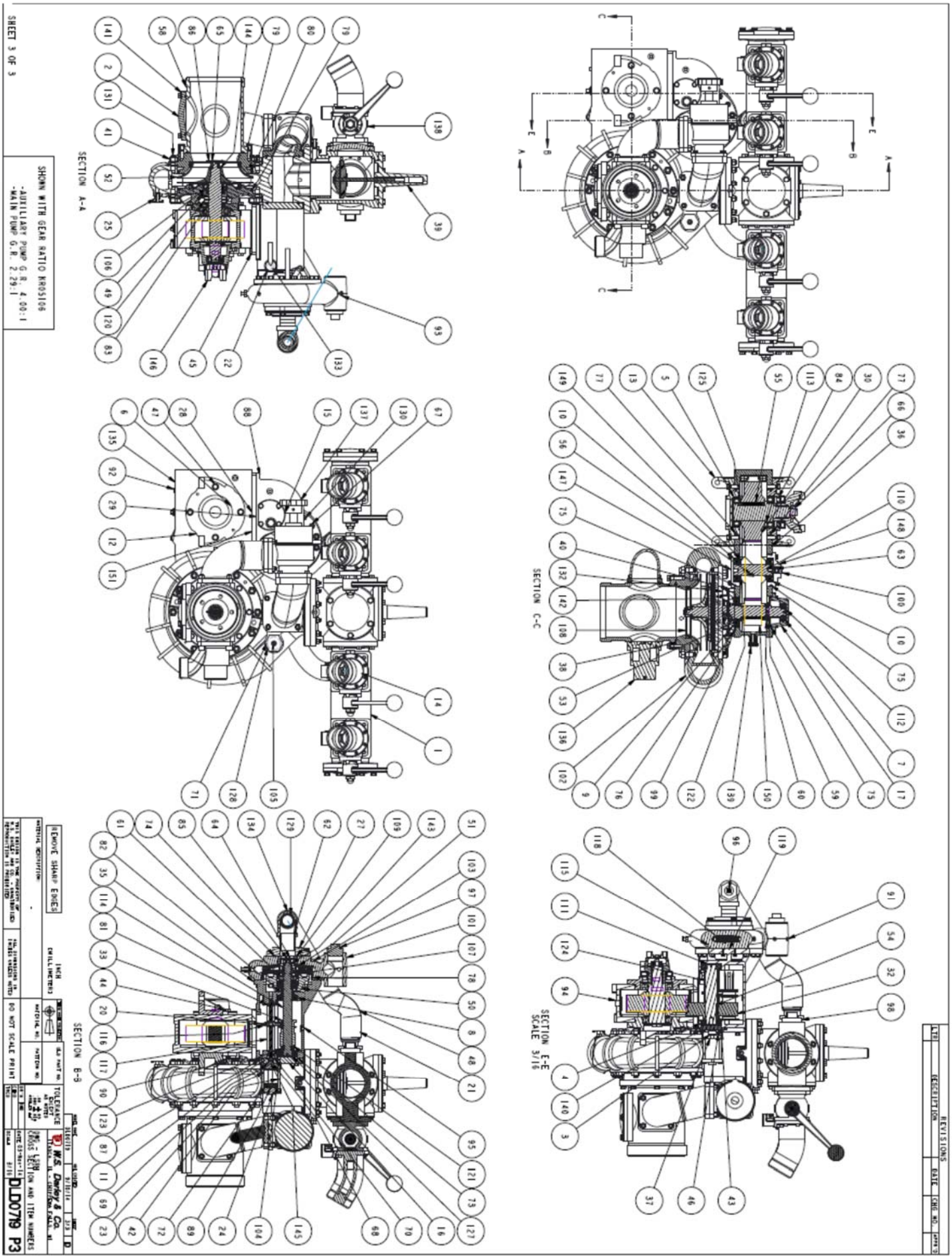






				MODEL NAME: DLD0719	DGL CREATED: 9/10/14	SHEET: 2/3 C
REMOVE SHARP EDGES	INCH [MILLIMETER]		OLD PART NO.	TOLERANCE EXCEPT AS NOTED .00 ± .03 .000 ± .010 ANGLES ± 1°	W.S. Darley & Co. [TASCA, IL - CHIPPEWA FALLS, WI]	
MATERIAL DESCRIPTION: -		MATERIAL NO.	PATTERN NO.		DWG - LSRH DIMENSIONAL	
THIS DESIGN IS THE PROPERTY OF W. S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED	ALL DIMENSIONS IN INCHES UNLESS NOTED	DO NOT SCALE PRINT		DR'N BMD CHK'D TRCD	DATE 10-Sep-14 SCALE 3/32	DLD0719 P2

SHEET 2 OF 3


SHEET 3 OF 3
SHOWN WITH GEAR RATIO NR0S106
-AUXILIARY PUMP G.R. 4.00:1
-MAIN PUMP G.R. 2.29:1
SECTION A-A
SECTION C-C
SECTION B-B
SECTION E-E
SCALE 3/16
REMOVE SHARP EDGES
DO NOT SCALE PRINT
DLD0779 P3
REVISIONS

MEASUREMENT DESCRIPTION	ABBREVIATION	VALUE & DIRECTION (+/-)
VERTICAL SLOPE TRANSMISSION/ PTO	VST	
VERT. SLOPE SHAFT 1	VS1	
VERT. SLOPE SHAFT 2	VS2	
VERT. SLOPE SHAFT 3	VS3	
VERT. SLOPE SHAFT 4	VS4	
VERT. SLOPE SHAFT 5	VS5	
VERT. SLOPEREAR AXLE OR PTO MOUNTED PUMP	VSA	
HORIZ. SLOPE TRANSMISSION	HST	
OFFSET JOINT 1	OS1	
OFFSET JOINT 2	OS2	
OFFSET JOINT 3	OS3	
OFFSET JOINT 4	OS4	
OFFSET JOINT 5	OS5	
OFFSET JOINT 6	OS6	
HORIZ. SLOPE REAR AXLE OR PTO MOUNTED PUMP	HSA	
SHAFT LENGTH 1	S1	
SHAFT LENGTH 2	S2	
SHAFT LENGTH 3	S3	
SHAFT LENGTH 4	S4	
SHAFT LENGTH 5	S5	
DISTANCE JOINT - AXLE	JA	
WHEEL BASE	WB	
SPRING COMPRESSION	SC	
MAX RPM	-	
PTO - ENGINE % INDICATE HIGH, LO, REV	PTO %	
PUMP GEAR RATIO	PUMP G.R.	
ENGINE MAKE & MODEL	-	
TRANSMISSION MAKE & MODEL	-	

NOTE:
1. The positions "right," "left," "front," and "rear," are always based on a view looking from behind the rear axle toward the engine/ transmission.

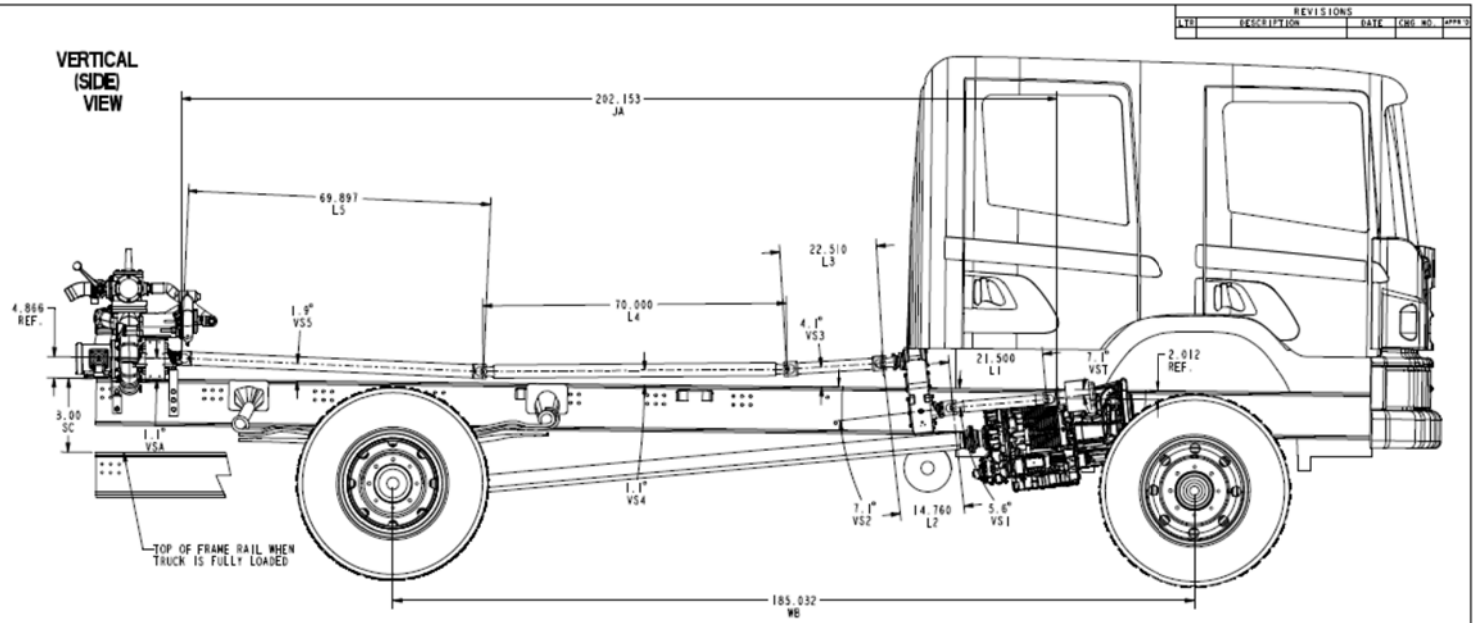
2. The sign of the vertical slope of components is determined by:
- Positive (+) if front of component (looking toward engine) is higher than the rear
- Negative (-) if front is lower than the rear

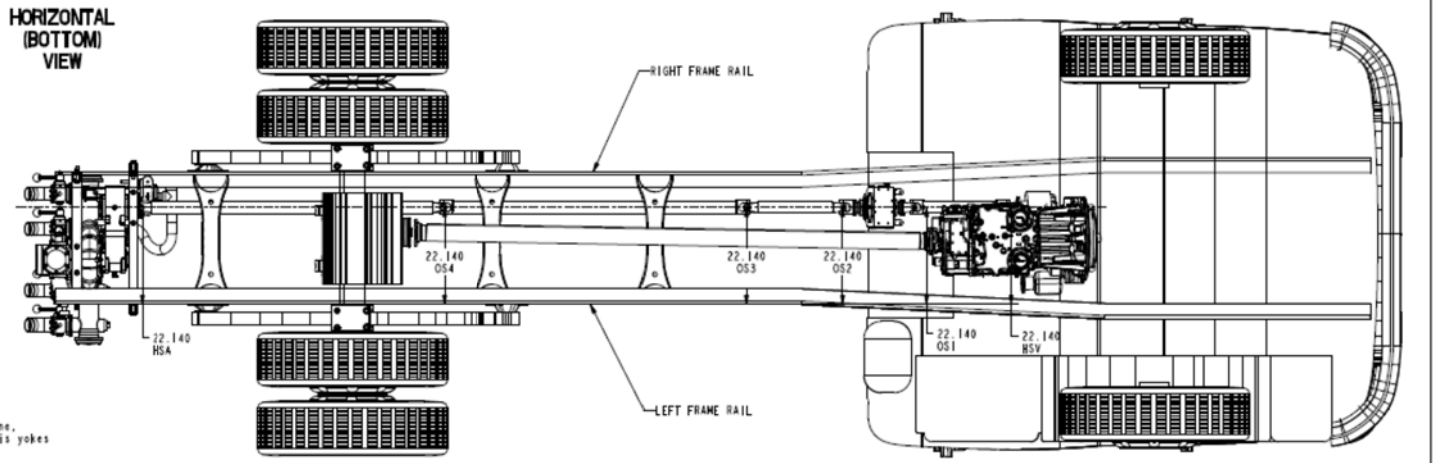
3. The signs of the horizontal slope of components is determined by:
- Positive (+) if the end nearest the engine (looking toward engine) is closer to the left frame rail
- Negative (-) if end nearest engine is closer to right frame rail

4. Yokes on a properly assembled shaft are parallel, or in the same plane, (when looking down the shaft, the yokes are "in-line"). For this analysis yokes are assumed to be "In-Phase".

5. Vertical Shaft Slope VS3 should be recorded when chassis is in it's nominal loaded condition. If chassis is not loaded, record VS3 angle in unloaded position AND estimated spring compression SC when chassis is in it's nominal loaded position.

6. THE LIFT BOX SHALL BE TREATED AS A DRIVE SHAFT. THE HORIZANTAL AND VERTICAL OFF SET WHICH IS CAUSED BY THE OFFSET POSITION OF THE INPUT AND OUT PUT SHAFT SHALL BE IGNORED.





REVISIONS

LTR	DESCRIPTION	DATE	CHG NO.	APPR'D

REMOVE SHARP EDGES | INCH [MILLIMETERS] | DLD PART NO. | TOLERANCE EXCEPT AS NOTED

MATERIAL DESCRIPTION: LSHH MOUNTED ON A SCANIA CHASSIS | MATERIAL NO. | PATTERN NO.

THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - CANTON (OH) REPRODUCTION IS PROHIBITED | ALL DIMENSIONS IN [INCHES UNLESS NOTED] | DO NOT SCALE PRINT

W.S. Darley & Co.
TRUCK DIVISION - SPECIAL APPARATUS

DRIVELINE DATA
LSHH WITH LIFT BOX

DATE 04-Feb-11 | SCALE 1/100 | DLD0722

MEASUREMENT DESCRIPTION	ABBREVIATION	VALUE & DIRECTION (+/-)
VERTICAL SLOPE TRANSMISSION/ PTO	VST	
VERT. SLOPE SHAFT 1	VS1	
VERT. SLOPE SHAFT 2	VS2	
VERT. SLOPE SHAFT 3	VS3	
VERT. SLOPE SHAFT 4	VS4	
VERT. SLOPE SHAFT 5	VS5	
VERT. SLOPEREAR AXLE OR PTO MOUNTED PUMP	VSA	
HORIZ. SLOPE TRANSMISSION	HST	
OFFSET JOINT 1	OS1	
OFFSET JOINT 2	OS2	
OFFSET JOINT 3	OS3	
OFFSET JOINT 4	OS4	
OFFSET JOINT 5	OS5	
OFFSET JOINT 6	OS6	
HORIZ. SLOPE REAR AXLE OR PTO MOUNTED PUMP	HSA	
SHAFT LENGTH 1	S1	
SHAFT LENGTH 2	S2	
SHAFT LENGTH 3	S3	
SHAFT LENGTH 4	S4	
SHAFT LENGTH 5	S5	
DISTANCE JOINT - AXLE	JA	
WHEEL BASE	WB	
SPRING COMPRESSION	SC	
MAX RPM	-	
PTO - ENGINE % INDICATE HIGH, LO, REV	PTO %	
PUMP GEAR RATIO	PUMP G.R.	
ENGINE MAKE & MODEL	-	
TRANSMISSION MAKE & MODEL	-	

NOTE:

1. The positions "right," "left," "front," and "rear," are always based on a view looking from behind the rear axle toward the engine/ transmission.

2. The sign of the vertical slope of components is determined by:
- Positive (+) if front of component (looking toward engine) is higher than the rear
- Negative (-) if front is lower than the rear

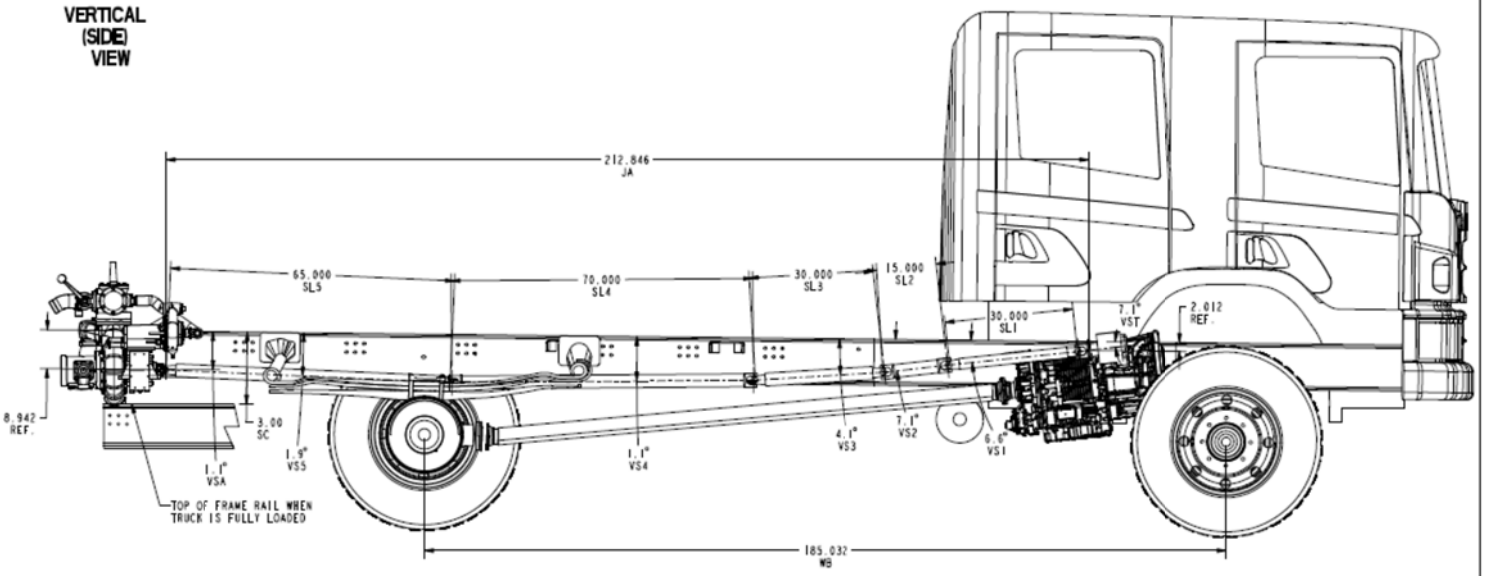
3. The slope of the horizontal slope of components is determined by:
- Positive (+) if the end nearest the engine (looking toward engine) is closer to the left frame rail
- Negative (-) if end nearest engine is closer to right frame rail

4. Yokes on a properly assembled shaft are parallel, or in the same plane, (when looking down the shaft, the yokes are "in-line"). For this analysis yokes are assumed to be "In-Phase".

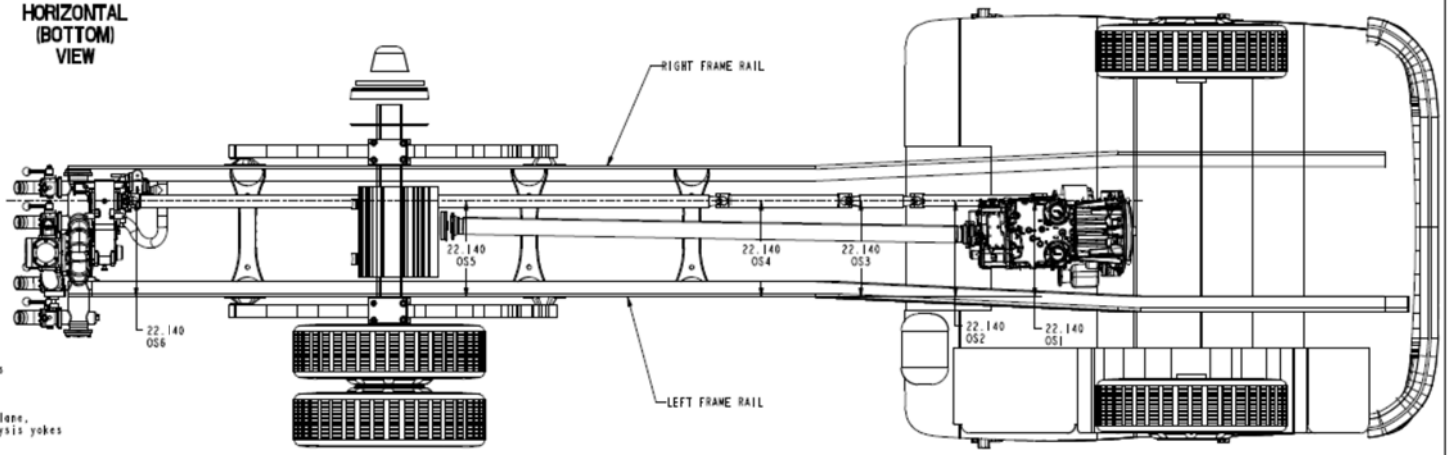
5. Vertical Shaft Slope VS3 should be recorded when chassis is in it's nominal loaded condition. If chassis is not loaded, record VS3 angle in unloaded position AND estimated spring compression SC when chassis is in it's nominal loaded position.

6. THE LIFT BOX SHALL BE TREATED AS A DRIVE SHAFT. THE HORIZANTAL AND VERTICAL OFF SET WHICH IS CAUSED BY THE OFFSET POSITION OF THE INPUT AND OUT PUT SHAFT SHALL BE IGNORED.

VERTICAL (SIDE) VIEW



HORIZONTAL (BOTTOM) VIEW



REVISIONS

LTR	DESCRIPTION	DATE	CHG NO.	APPR'D

REMOVE SHARP EDGES | INCH (MILLIMETERS)

MATERIAL DESCRIPTION: LSRH MOUNTED ON A SCANIA CHASSIS

MATERIAL NO. | PATTERN NO. | OLD PART NO.

TOLERANCE EXCEPT AS NOTED

W.S. Darley & Co. TRANSM. DIV. — SOUTH HOLLAND, ILL. U.S.A.

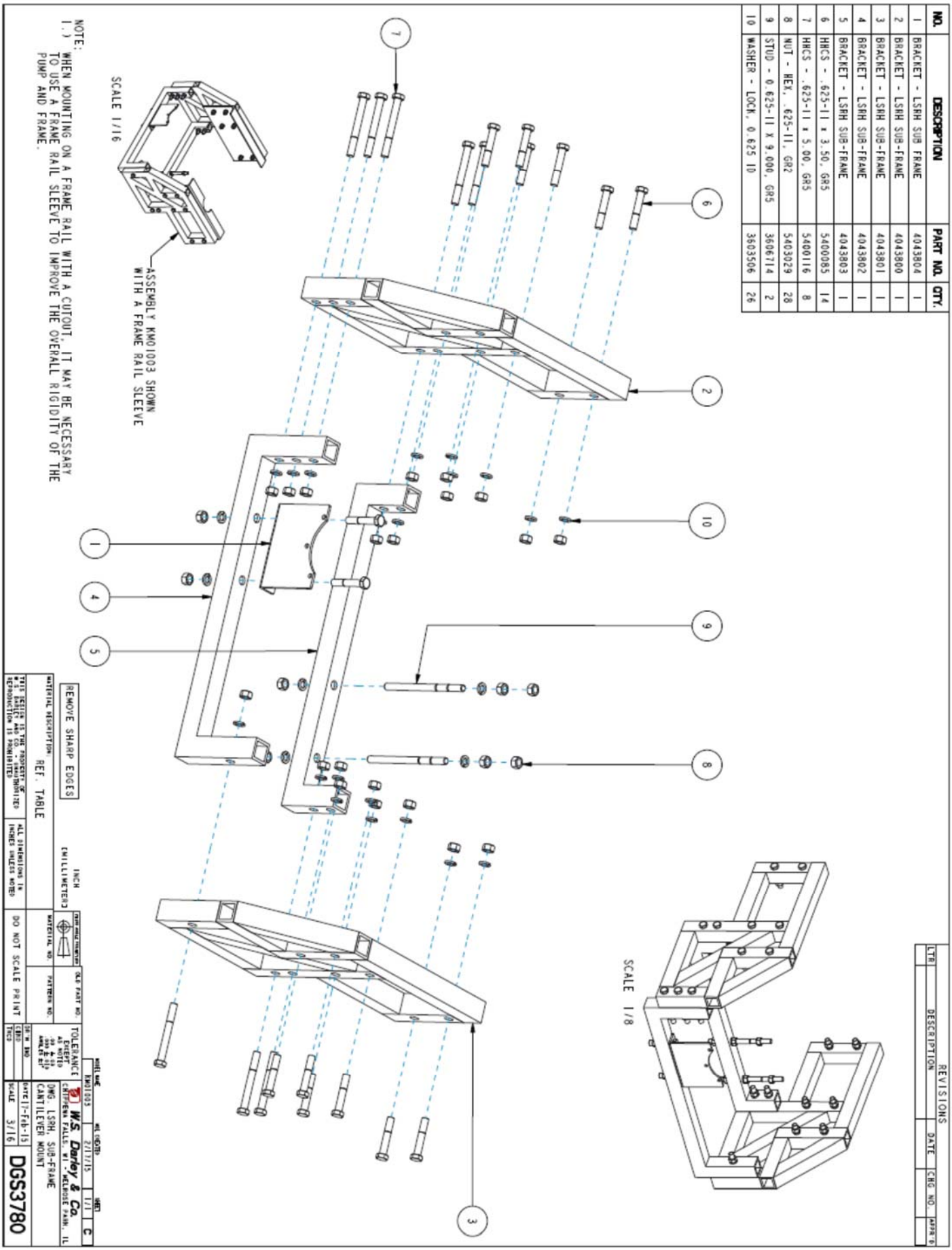
DRIVELINE DATA LSRH WITH LIFT BOX

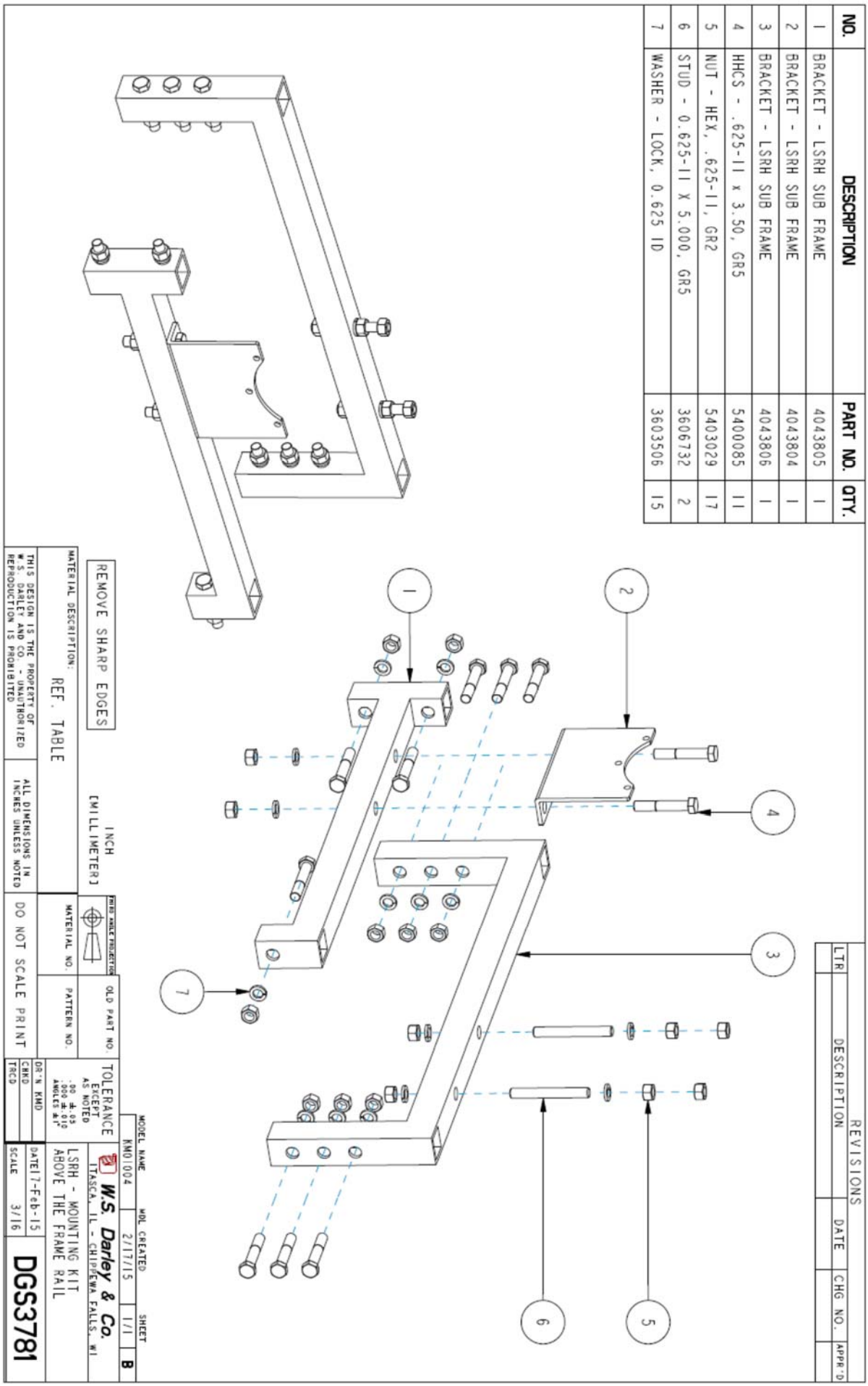
DRN. BW | DATE 04-Feb-15 | CHKD | SCALE 1/100

DO NOT SCALE PRINT

DLD0723 | 1/1 | D

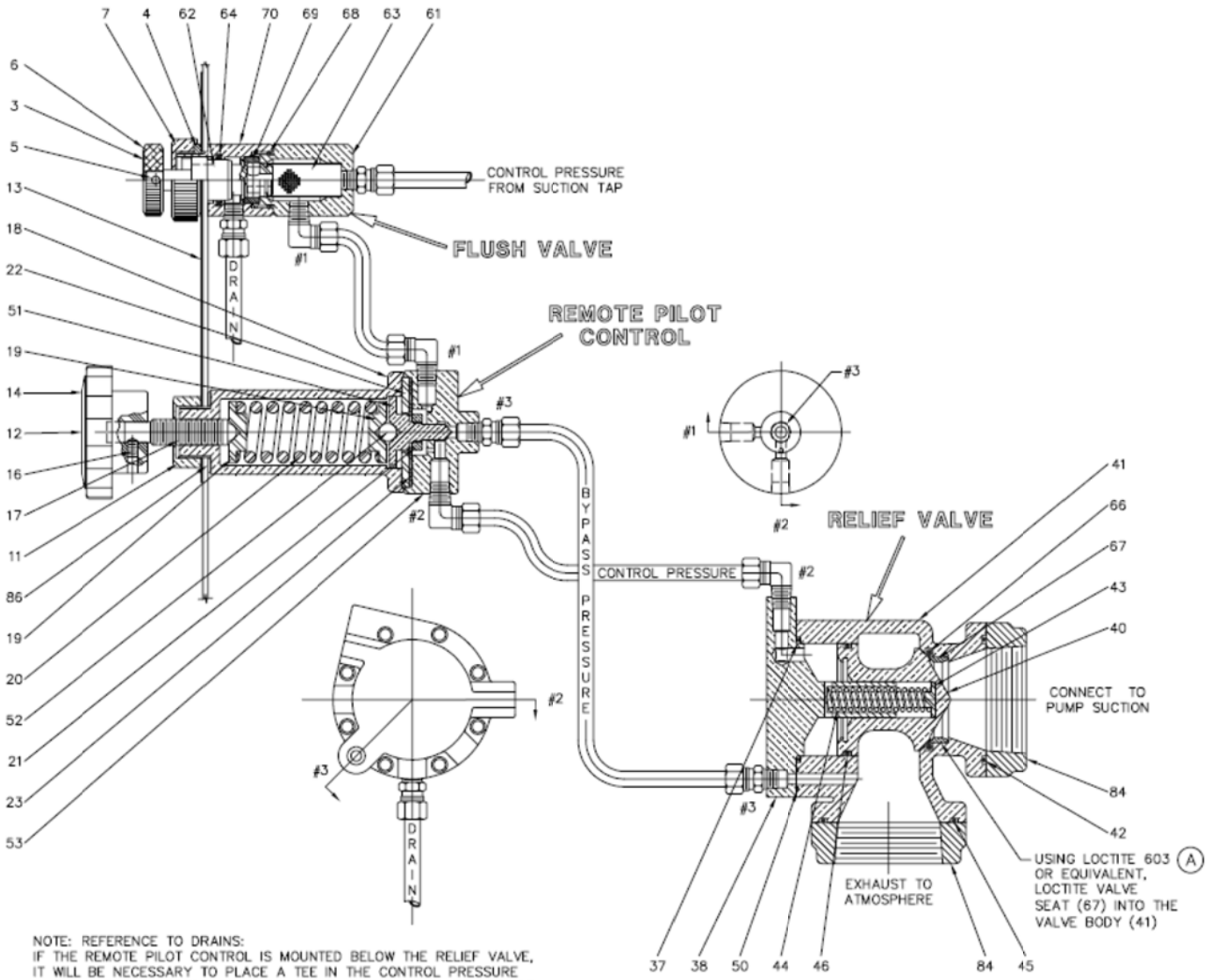
FINAL DIMENSIONS ARE INCHES UNLESS NOTED


NO. DESCRIPTION PART NO. QTY.
1 BRACKET - LSRH SUB FRAME 4043804 1
2 BRACKET - LSRH SUB-FRAME 4043800 1
3 BRACKET - LSRH SUB-FRAME 4043801 1
4 BRACKET - LSRH SUB-FRAME 4043802 1
5 BRACKET - LSRH SUB-FRAME 4043803 1
6 HHCS - .625-11 x 3.50, GR5 5400085 14
7 HHCS - .625-11 x 5.00, GR5 5400116 8
8 NUT - HEX, .625-11, GR2 5403029 28
9 STUD - 0.625-11 X 9.000, GR5 3606714 2
10 WASHER - LOCK, 0.625 ID 3603506 26
NOTE:
1.) WHEN MOUNTING ON A FRAME RAIL WITH A CUTOUT, IT MAY BE NECESSARY TO USE A FRAME RAIL SLEEVE TO IMPROVE THE OVERALL RIGIDITY OF THE PUMP AND FRAME.
SCALE 1/16
ASSEMBLY KM01003 SHOWN WITH A FRAME RAIL SLEEVE
SCALE 1/8
REVISIONS
LTR DESCRIPTION DATE CHG NO APPR'D
REMOVE SHARP EDGES
INCH [MILLIMETER]
MATERIAL DESCRIPTION REF. TABLE
OLD PART NO.
PATTERN NO.
MATERIAL NO.
ALL DIMENSIONS IN INCHES UNLESS NOTED
DO NOT SCALE PRINT
TOLERANCE EXCEPT AS NOTED .XXX ± .010 ANGLE ±1°
THE DESIGN IS THE PROPERTY OF W.S. DARLEY & CO. AND IS NOT TO BE REPRODUCED OR COPIED IN ANY FORM WITHOUT THEIR PERMISSION
W.S. Darley & Co.
CHICAGO (FOREST PARK), ILLINOIS
MODEL NAME KM01003
WGT (LBS) NETTO 217.15
SHEET 1/1
SIZE C
DWG. LSRH, SUB-FRAME CANTILEVER MOUNT
DRAWN DATE 17-Feb-15
CHKD
ENGR
SCALE 3/16
DGS3780



NO.	DESCRIPTION	PART NO.	QTY.
1	BRACKET - LSRH SUB FRAME	4043805	1
2	BRACKET - LSRH SUB FRAME	4043804	1
3	BRACKET - LSRH SUB FRAME	4043806	1
4	HHCS - .625-11 x 3.50, GR5	5400085	11
5	NUT - HEX, .625-11, GR2	5403029	17
6	STUD - 0.625-11 X 5.000, GR5	3606732	2
7	WASHER - LOCK, 0.625 ID	3603506	15

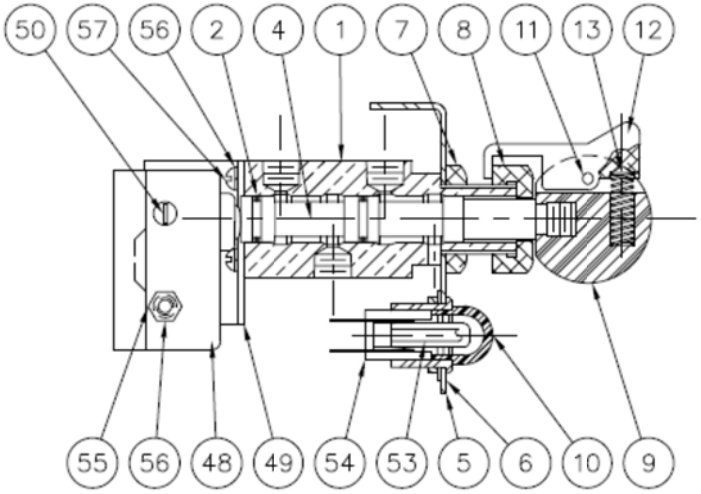
REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D
A	ADDED LOCTITING NOTE	4NOV2002	2002-175	TED



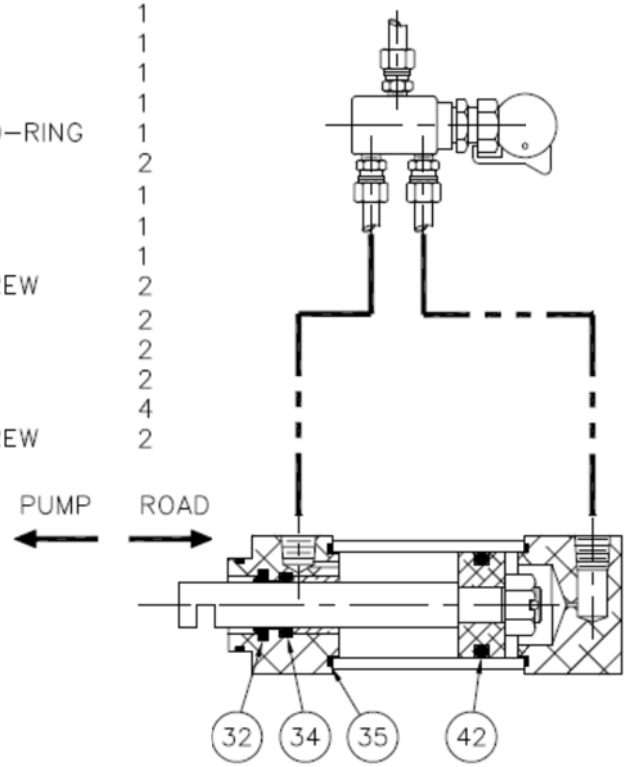
NOTE: REFERENCE TO DRAINS:
IF THE REMOTE PILOT CONTROL IS MOUNTED BELOW THE RELIEF VALVE, IT WILL BE NECESSARY TO PLACE A TEE IN THE CONTROL PRESSURE LINE AND BYPASS PRESSURE LINE, AT THE LOWEST POINT, TO PROVIDE DRAINING. SUCH A DRAIN, IF INSTALLED, SHOULD NOT BE CONNECTED TOGETHER WITH THE RELIEF VALVE DRAIN. CONNECT DRAIN LINES TO SEPARATE INLET TAPS OF MULTIPLE DRAIN VALVE. DRAINS MUST BE CLOSED DURING OPERATION.

	OLD PART NO. G2453	TOLERANCE EXCEPT AS NOTED FRAC DIM ±.01 .00 ±.01 .000 ±.005 ANGLES ±1°	W.S. DARLEY & CO. MELROSE PARK, IL – CHIPPEWA FALLS, WI	
MATERIAL DESCRIPTION: –	MATERIAL NO. –	PATTERN NO. –	DWG – SUCTION RELIEF VALVE –	
THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. – UNAUTHORIZED REPRODUCTION IS PROHIBITED	ALL DIMENSIONS IN INCHES UNLESS NOTED	DO NOT SCALE PRINT	DRN S. LEE CHKD TRCD	DATE DEC17,91 SCALE 1/2 DGC0115

REP NO.	NAME OF PART	QTY.
1	VALVE BODY	1
2	O–RING SEAL	2
4	VALVE PLUG	1
5	MOUNTING PLATE	1
6	SHIFT CONTROL PLATE	1
7	PANEL NUT	1
8	STOP NUT	1
9	LATCH KNOB	1
10	LENSE – GREEN	2
11	LEVER LATCH PIN	1
12	LATCH LEVER	1
13	SPRING – LEE	1
32	WIPER RING	1
34	CYLINDER HEAD O–RING	1
35	CYLINDER O–RING	2
42	QUAD RING	1
48	MICROSWITCH	1
49	SWITCH BRACKET	1
50	RD HD MACH SCREW	2
53	LAMP	2
54	LAMP BASE	2
55	NUT	2
56	LOCKWASHER	4
57	RD HD MACH SCREW	2



4–WAY VALVE ASSEMBLY



AIR CYLINDER (REF)

75 TO 125 PSI AIR SUPPLY

NOTE: 1) CONNECT TO AIR SOURCE THAT HAS AN 80 PSI PRESSURE PROTECTION VALVE

2) FOR MICROSWITCH WIRE DESIGNATION SEE DGS1602

INCH [MILLIMETER]

THIRD ANGLE PROJECTION

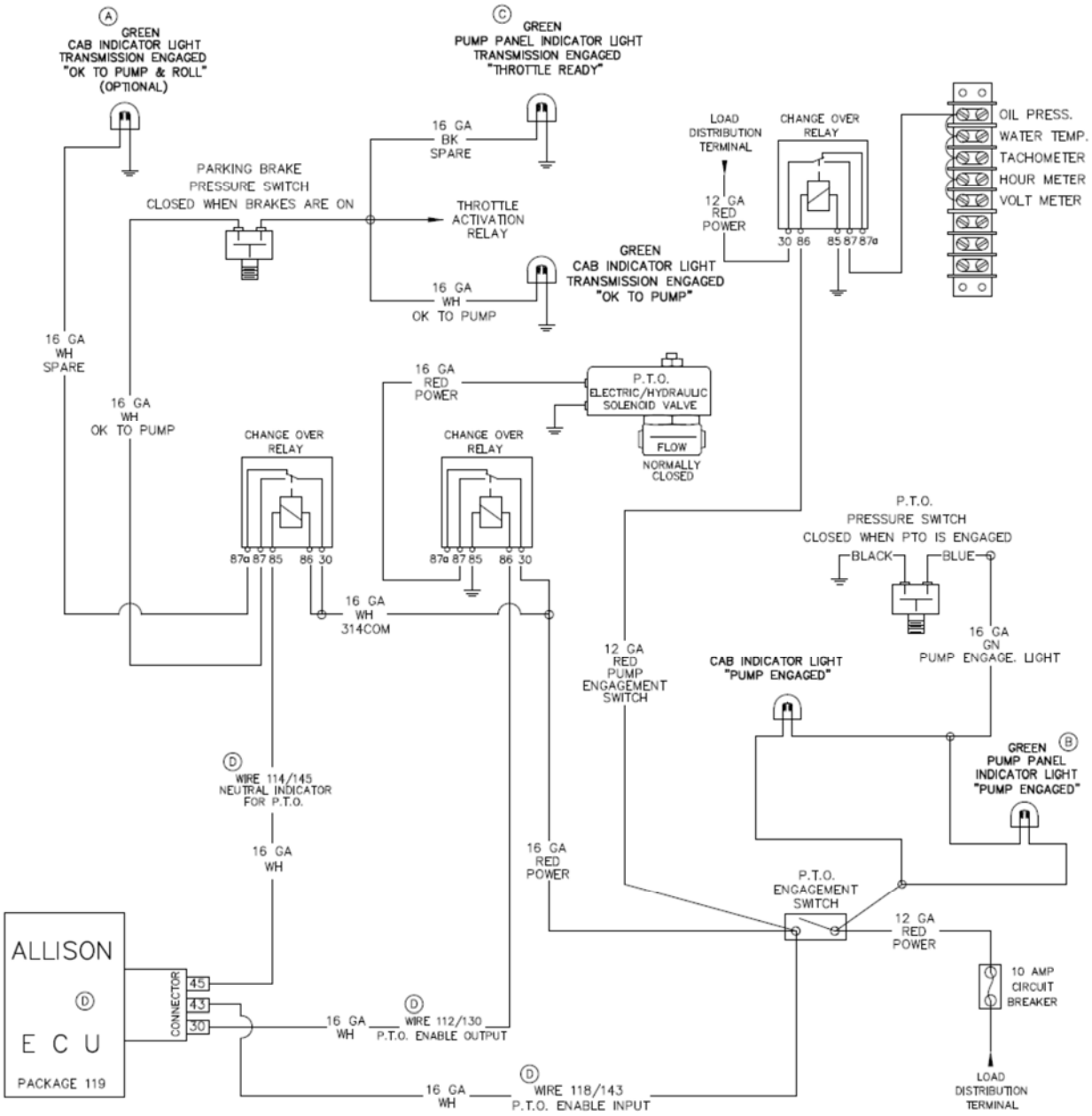
TOLERANCE EXCEPT AS NOTED .00 ±.03 .000 ±.010 ANGLES ±1°	W.S. DARLEY & Co. MELROSE PARK, IL – CHIPPEWA FALLS, WI		
OLD PART NO. G2400	DWG – 4–WAY VALVE ASSY AIR SHIFT		
DR'N DWS / CHKD / TRCD	DATE MAY14,91	SCALE 1/1	DGC1000

THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. – UNAUTHORIZED REPRODUCTION IS PROHIBITED

ALL DIMENSIONS IN INCHES UNLESS NOTED

DO NOT SCALE PRINT

REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D
A	WAS: RED, PUMP PANEL "DANGER DO NOT OPEN THROTTLE"	20JAN00	00–11	DLW
B	ADDED LIGHT	20JAN00	00–11	DLW
C	WAS: GREEN, "WARNING: DO NOT OPEN THROTTLE UNLESS LIGHT IS ON"	20JAN00	00–11	DLW
D	ADDED NEWEST WIRE DESIGNATION #'s: 145, 143, 130; ADDED ALLISON E C U CONNECTOR #'s: 45, 43, 30;	6/23/08	2008–166	RJG

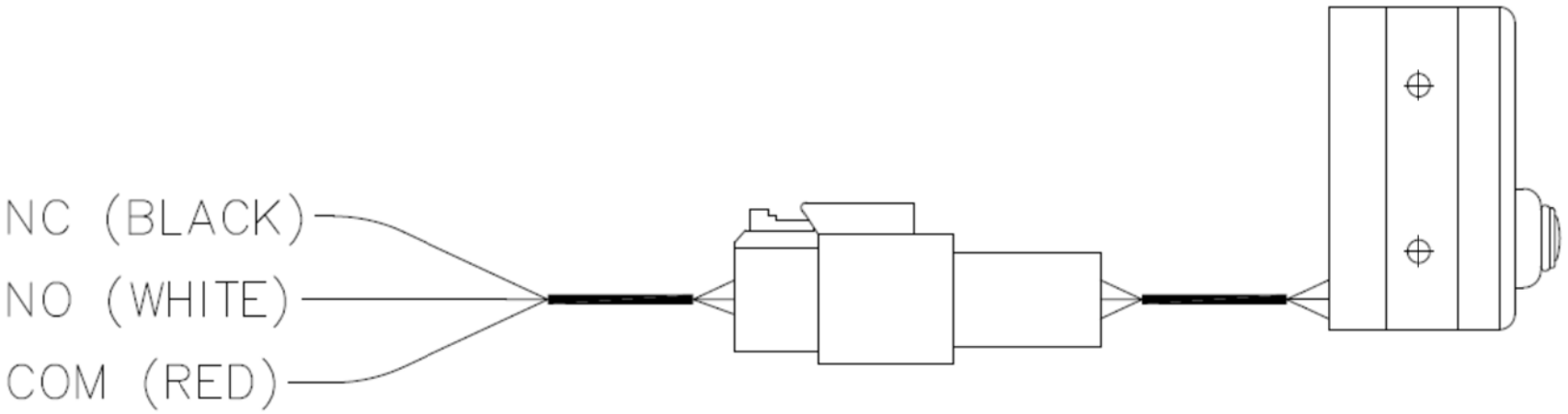


ELECTRICAL SCHEMATIC
ALLISON WORLD TRANS.
PTO/PUMP ENGAGEMENT

W.S. Darley & Co.
APPARATUS DIVISION
920 KURTH ROAD
CHIPPEWA FALLS, WISCONSIN 54729
1-715-726-2645

DWG BY SCHULTZ	SCALE SIZE A, 1:2	REV D
DATE 8–29–96	JOB NO.	DWG. NO. DGS1100

REVISIONS				
LTR	DESCRIPTION	DATE	CHG NO.	APPR'D



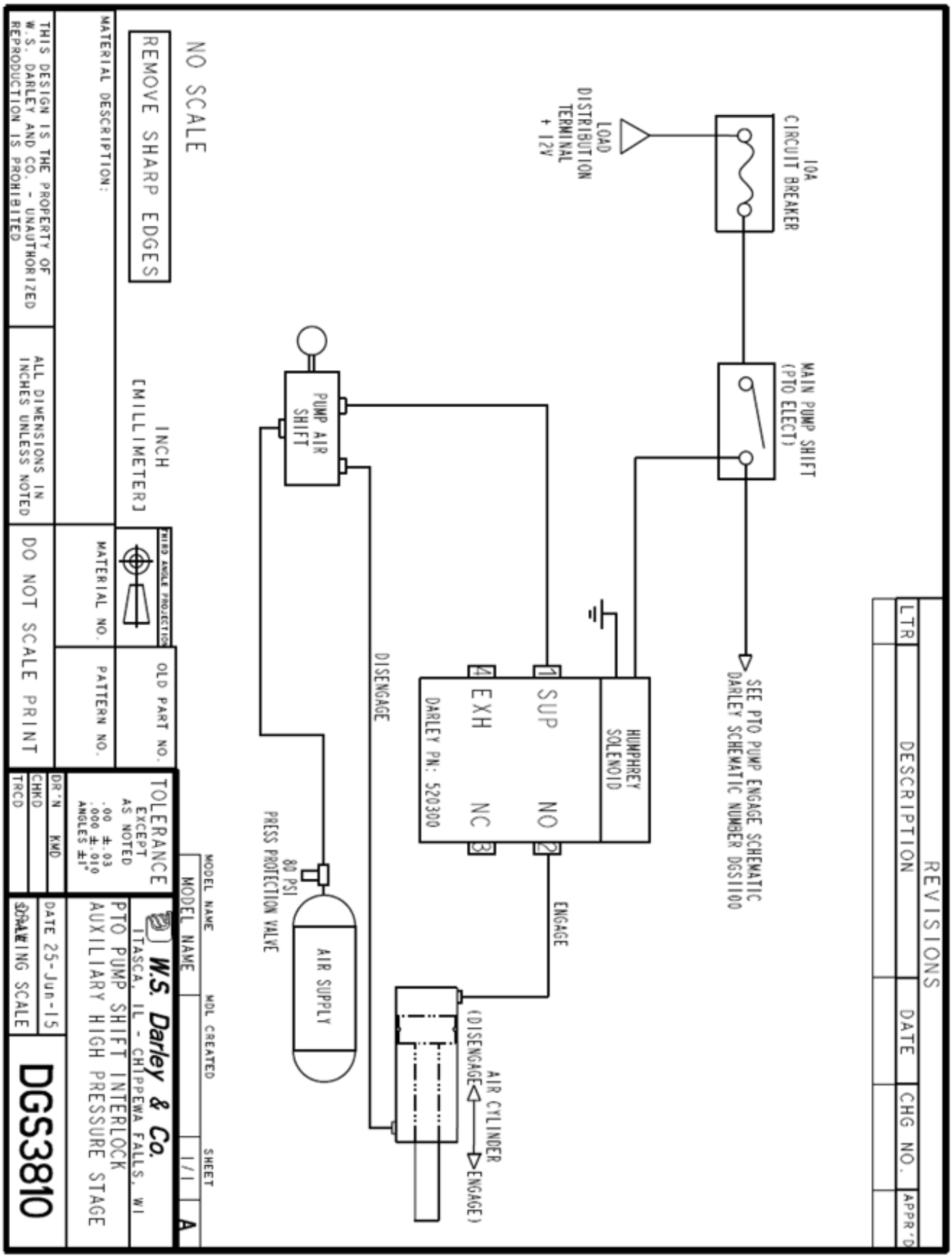
REMOVE SHARP EDGES

INCH
[MILLIMETER]

THIRD ANGLE PROJECTION

MATERIAL DESCRIPTION: –	MATERIAL NO. –	OLD PART NO. –	TOLERANCE EXCEPT AS NOTED .00 ±.03 .000 ±.010 ANGLES ±1°	W.S. DARLEY & CO. MELROSE PARK, IL – CHIPPEWA FALLS, WI
		PATTERN NO. –		DWG – MICROSWITCH, WIRE DESIGNATION
THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. – UNAUTHORIZED REPRODUCTION IS PROHIBITED	ALL DIMENSIONS IN INCHES UNLESS NOTED	DO NOT SCALE PRINT	DR'N JSS CHKD CKE TRCD	DATE 7/2/02 SCALE 1/1

DGSI602


REVISIONS
LTR
DESCRIPTION
DATE
CHG NO.
APPR'D
10A CIRCUIT BREAKER
LOAD DISTRIBUTION TERMINAL + 12V
MAIN PUMP SHIFT (PTO ELECT)
SEE PTO PUMP ENGAGE SCHEMATIC DARLEY SCHEMATIC NUMBER DGS1100
HUMPHREY SOLENOID
SUP
NO
EXH
NC
DARLEY PN: 520300
PUMP AIR SHIFT
DISENGAGE
ENGAGE
AIR CYLINDER
(DISENGAGE)
(ENGAGE)
80 PSI
PRESS PROTECTION VALVE
AIR SUPPLY
NO SCALE
REMOVE SHARP EDGES
INCH
[MILLIMETER]
THIRD ANGLE PROJECTION
OLD PART NO.
MATERIAL NO.
PATTERN NO.
MATERIAL DESCRIPTION:
ALL DIMENSIONS IN INCHES UNLESS NOTED
DO NOT SCALE PRINT
THIS DESIGN IS THE PROPERTY OF W.S. DARLEY AND CO. - UNAUTHORIZED REPRODUCTION IS PROHIBITED
TOLERANCE EXCEPT AS NOTED .00 ±.03 .000 ±.010 ANGLES ±1°
DR'N KMD
CHKD
TRCD
MODEL NAME
MDL CREATED
SHEET 1/1
A
W.S. Darley & Co.
ITASCA, IL - CHIPPEWA FALLS, WI
PTO PUMP SHIFT INTERLOCK
AUXILIARY HIGH PRESSURE STAGE
DATE 25-Jun-15
SCALE
DRAWING SCALE
DGS3810