HALF/PACK®

INCLUDING STANDARD, FREEDOM AND SIERRA

SERVICE MANUAL

ISSUED MARCH 2021

TP1HP-SM-0321

Environmental Solutions Group
201 W. Main Street, Ste 300
Chattanooga, TN 37408
Heil Customer Care: 866.275.4345

WARNING

IF INCORRECTLY USED, THIS EQUIPMENT CAN CAUSE SEVERE INJURY. THOSE WHO USE AND MAINTAIN THE EQUIPMENT SHOULD BE TRAINED IN ITS PROPER USE, WARNED OF ITS DANGERS, AND SHOULD READ AND FULLY UNDERSTAND THIS ENTIRE MANUAL BEFORE ATTEMPTING TO SET UP, OPERATE, ADJUST OR SERVICE THE EQUIPMENT. KEEP THIS MANUAL FOR FUTURE REFERENCE

IMPORTANT SAFETY NOTICE

Proper service and repair are important to the safe, reliable operation of Heil Co.'s products. Service procedures recommended by Heil are described in this service manual and are effective for performing service operations. Some of these service operations may require the use of tools or blocking devices specially designed for the purpose. Special tools should be used when and as recommended. It is important to note that some warnings against the use of specific methods that can damage the product or render it unsafe are stated in the service manual. It is also important to understand these warnings are not exhaustive. Heil could not possibly know, evaluate and advise the service trade of all conceivable ways in which service might be done or of the possible hazardous consequences of each method. Consequently, Heil has not undertaken any such broad evaluations. Accordingly, anyone who uses service procedures or tools which are not recommended by Heil must first satisfy himself thoroughly that neither his safety nor the product safety will be jeopardized by the method he selects.

"Heil Environmental, as manufacturer of the equipment that is covered by this manual, is providing a product to the user who has acknowledged to have superior knowledge of the conditions of the use to which the product will be put. Heil Environmental relies upon the user's superior knowledge in specifying any changes or modifications including, but not limited to, the inclusion or non inclusion of options that are required by the user and the Heil product, and for the particular application of the user relative to the Heil product."

HALF/PACK®
TABLE OF CONTENTS

HALF/PACK®
TABLE OF CONTENTS

HALF/PACK®
TABLE OF CONTENTS

HALF/PACK®
NOTES

Issued March 2021

Half/Pack®

INCLUDING STANDARD, FREEDOM AND SIERRA

SERVICE MANUAL

ISSUED MARCH 2021

TP1HP-SM-0321

HALF/PACK®
NOTES

SECTION 1
GENERAL INFORMATION

HALF/PACK®
General Information

INTRODUCTION

The following sections are a guide for maintenance and service of the Heil unit. The sections cover preventive maintenance, adjustment, and troubleshooting hints. Before performing maintenance, check the work area carefully to find all the hazards present and make sure all necessary safeguards or safety devices are used to protect all persons and equipment involved. In order to diagnose a problem quickly and effectively, a service person must be thoroughly familiar with the machine.

This section explains the system and its major components. Diagrams and schematics of the electrical and hydraulic systems are in the Service Manual Schematics section.

NOTICE

For CNG units, this Service Manual should be used in conjunction with any associated CNG System Manufacturer's Operation and Maintenance Manuals. Always read and understand all associated manuals alongside the Heil Parts and Service Manual and Heil Operation Manual before operating or servicing the unit.

IMPORTANT!

- Before starting any maintenance, study this section of the manual.
- Read all hazard warnings and decals on the unit.
- Clear the area of other persons before performing any maintenance.
- Know and understand safe use of all controls.
- It is your responsibility to understand and follow manufacturer’s instructions on equipment and care.

SERVICE/PARTS ASSISTANCE

Assistance in troubleshooting repair and service is available by contacting the authorized Heil Dealer in your area. Parts are available at your Heil Dealer or through Heil. Heil personnel are trained to give prompt, professional assistance.

ALWAYS give the unit serial number in all correspondence relating to the equipment.

See the back cover of this manual for Heil contact information.

RECOMMENDED SPARE PARTS		
PART NO.	**DESCRIPTION**	**QTY**
BODY AND TAILGATE ASSEMBLIES		
003-5142	BEARING, LOCK	2
022-3509	SEAL, TAILGATE	1
022-3924-001	SEAL, SUMP DOOR	1
019-1242	SPRING, 1” OD X 6”	4
014-2112	PAD, ARM STOP	2
003-4013	BEARING, ARM, SAE	2
003-5142	TAILGATE LOCK BUSHING	2
HYDRAULICS		
001-7138	CYLINDER W/SENSOR, CAN TILT, GEN 3	1
001-7139	CYLINDER WITHOUT SENSOR, CAN TILT, GEN 3	1
001-7141	CYLINDER WITHOUT SENSOR, CAN FORK, GEN 3	1
001-7142	CYLINDER W/SENSOR, CAN FORK, GEN 3	1
001-6966	CYLINDER, FORK, FULL TUCK	1
001-7057	CYLINDER, ARM, CUSHIONED, FEL	1
001-7179	CYLINDER, TOP DOOR	1
001-7149	CYLINDER, W/ IN CYLINDER PROX PORT, T/G RAISE	2
001-7148	CYLINDER, W/ IN CYLINDER PROX PORT, T/G LOCK	2
001-7158	CYLINDER, PACKER, DA TELESCOPIC, 28 YARD	2
001-7095	CYLINDER, PACKER, DA TELESCOPIC, 28 YARD	2
001-7189	CYLINDER, PACKER, DA TELESCOPIC, 32 YARD	2
001-6910	CYLINDER, PACKER, DA TELESCOPIC	2
001-7157	CYLINDER, PACKER, DA TELESCOPIC, 23 YARD	2
001-7096	CYLINDER, PACKER, DA TELESCOPIC, 23 YARD	2
001-6919	CYLINDER, PACKER, DA TELESCOPIC, 32 YARD	2
001-6920	CYLINDER, PACKER, DA TELESCOPIC, 28 YARD	2
001-7145	CYLINDER, ARM, W/ SENSOR (LOWRIDER)	2
001-7146	CYLINDER, ARM, W/O SENSOR (LOWRIDER)	2
001-7159	PACK/EJECT 189 STRK	2

001-6921	CYLINDER, PACKER, DA TELESCOPIC, 23 YARD	2
031-6444	ASSEMBLY, VALVE	1
031-6553	VALVE, TAILGATE	1
063-0145	TRANSDUCER, 3000 PSI PRESSURE	1
063-0146	SENSOR, TEMP	1
063-0151	MAGNETIC SENSOR	2
075-0896	STRAINER, SUCTION, 100 MESH	1
075-0578	STRAINER, SUCTION	1
075-0959-001	STRAINER, SUCTION, 100 MESH, 3" (IF EQUIPPED)	1
075-0953	FILTER, RETURN LINE	1
075-0712	FILTER, BREATHER	1
ELECTRICAL		
063-0122	SWITCH, PROXIMITY, 18 MM	1
063-0123	SWITCH, PROXIMITY, 30 MM	1
063-0141	SENSOR, CAN ARC	1
063-0151	SENSOR, MAGNETIC	4
108-8458	RELAY, POWER MODULE	1
263-1816	HARNESS, J1939 SENSOR PIGTAIL VARIOUS	1
CONTROLS		
108-8631	ELECTRIC JOYSTICK	1
108-8630	JOYSTICK, ELECTRIC, CS	1

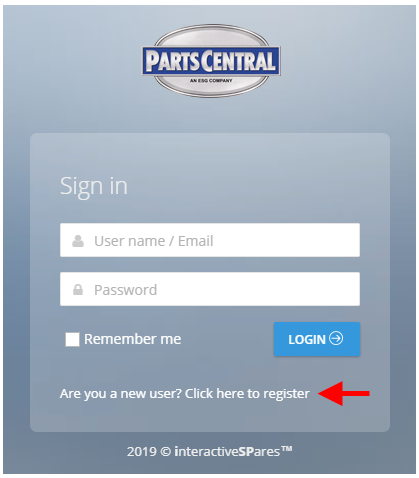
ELECTRONIC PARTS CATALOG (EPC)

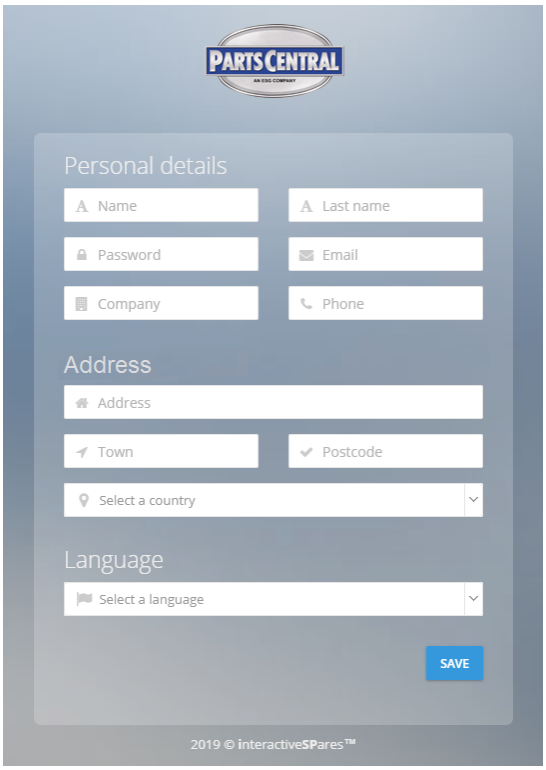
The Parts Central EPC includes electronic versions of the Heil Parts Manuals, specific to a Customer's truck configuration and options. After registering and logging in, the user can search by **Keyword(s) or Part Number** and/or **Heil Body Serial Number** to quickly identify a spare part or browse a custom parts catalog.

Note: This tool is currently for reference use only and the cart functionality is disabled. Please contact your local Heil Dealer for parts quoting and ordering.

Registration and Login

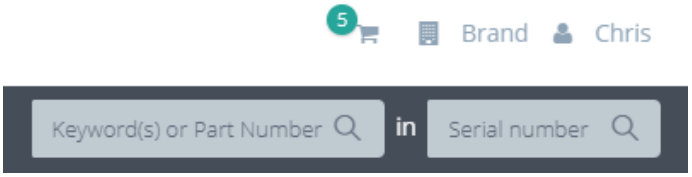
Register online to gain access: **https://epc.partscentral.com**. Upon registration, you will receive an email notification confirming registration. Within 24 hours, your registration will be approved and you can log in using the **login page**.





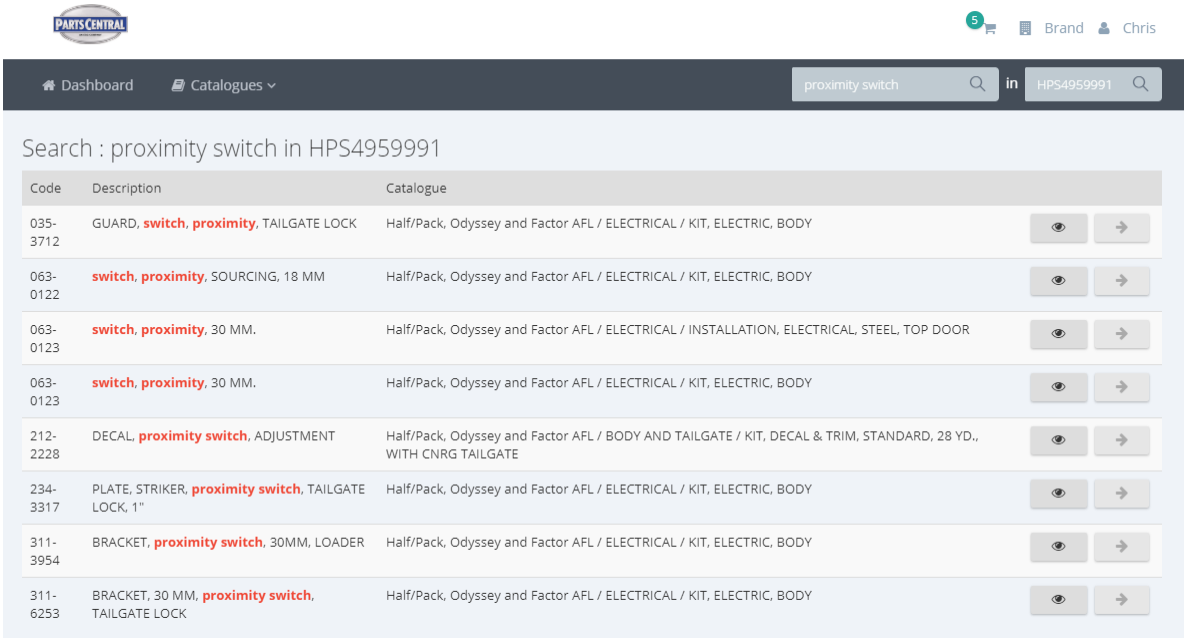
Search by Part Keyword(s) or Part Number in Body Serial Number

After login, you will land on the User Dashboard. At the top right of the Dashboard, there will be two search fields, as shown in the image below.



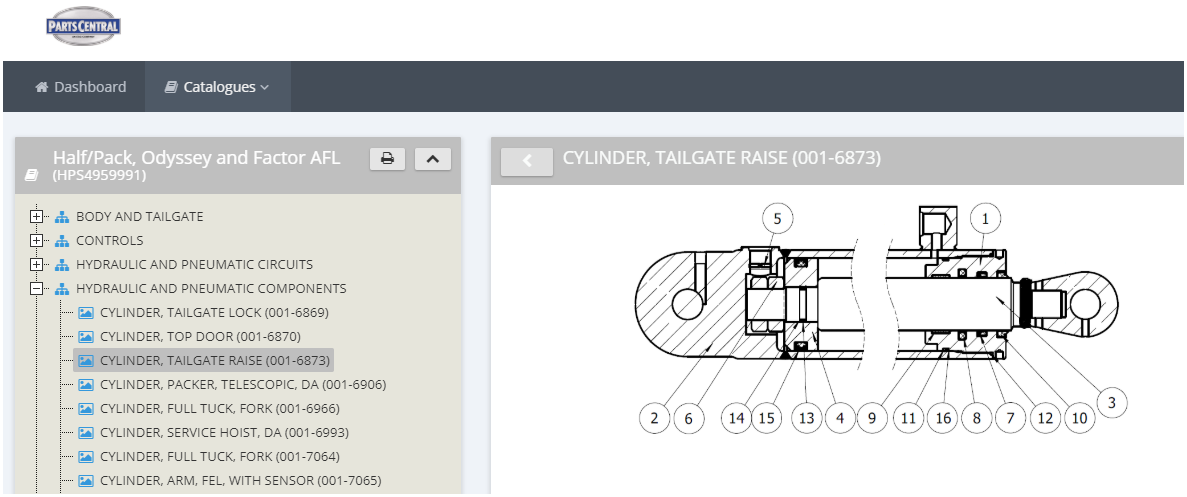
You can search by **Keyword(s) or Part Number** within a specific Heil Body **Serial Number**. For example, if you are looking for a **proximity switch** for Body Serial Number **HPS4959991**, you can enter this information into these two fields and the search results will include all parts within the **HPS4959991** body that contain the keywords **proximity** and **switch** within their part descriptions. See the image below.

From the search results list, you can select the right arrow icon to view the part within its associated assembly/kit, helping you identify the needed part. Alternatively, you can select the eye icon on the right to see part specifics (including any notes) and quickly add to cart (although this functionality is not yet turned on in the Parts Central EPC).

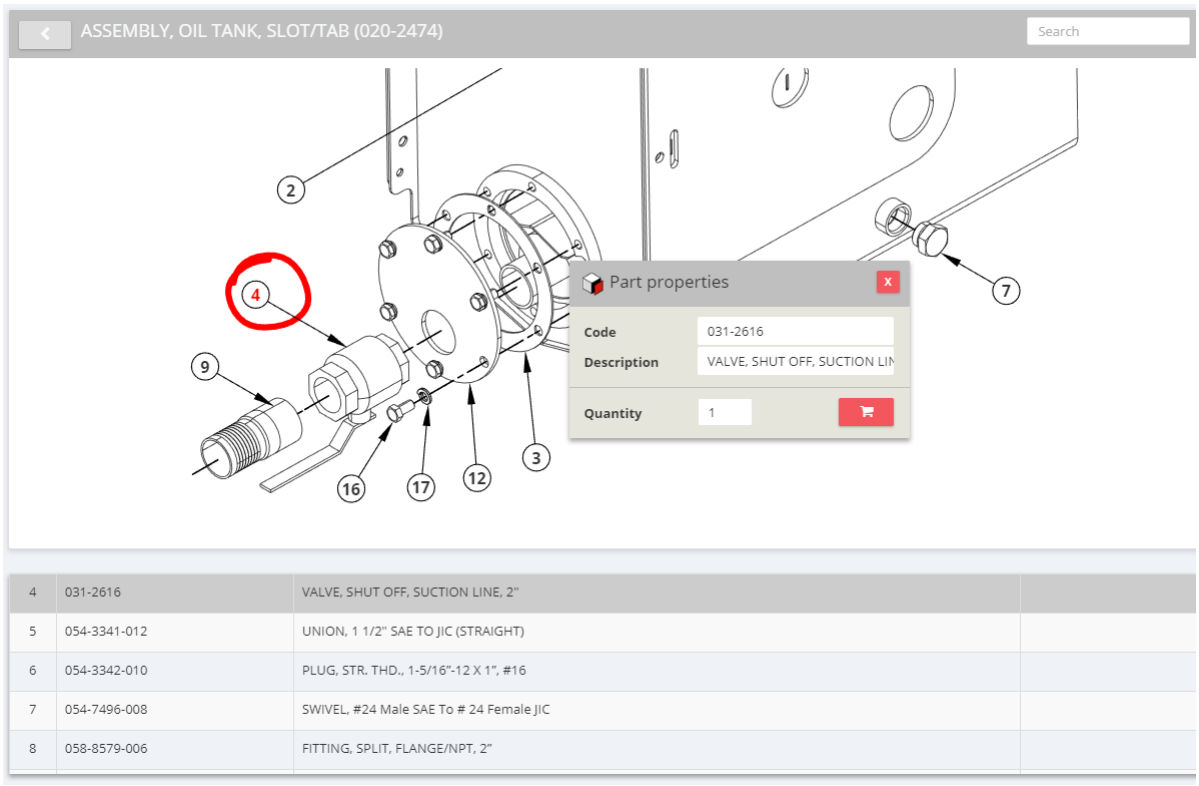


Search by Body Serial Number

If you want to view an entire parts catalog for a particular Heil unit, you can search by only the Heil Body **Serial Number**, leaving the **Keyword(s) / Part Number** field blank. The search result will then be the Body Serial Number-specific parts catalog with familiar catalog sections that you can browse. You can navigate through the catalog using the section/topic menu in the left panel and then adjust an assembly/kit illustration size in the right panel with the mouse center scroll wheel. Additionally in the right panel, you can drag the image when holding down the left mouse button. See the image below.



For each assembly/kit, you can click on the interactive part callout reference numbers to highlight the corresponding part in the parts list, or you can click on a parts list line item to highlight its position on the illustration. See the image below.



4	031-2616	VALVE, SHUT OFF, SUCTION LINE, 2"	
5	054-3341-012	UNION, 1 1/2" SAE TO JIC (STRAIGHT)	
6	054-3342-010	PLUG, STR. THD., 1-5/16"-12 X 1", #16	
7	054-7496-008	SWIVEL, #24 Male SAE To # 24 Female JIC	
8	058-8579-006	FITTING, SPLIT, FLANGE/NPT, 2"	

PRECAUTIONARY STATEMENTS

Listed below are the definitions for the various levels of hazards. It is important that the operators of this equipment and people who service units read and understand all warnings as they relate to this equipment operation.

- **DANGER** – indicates a hazardous situation, which if not avoided WILL result in DEATH or SERIOUS INJURY if you do not follow proper instructions.
- **WARNING** – indicates a hazardous situation, which if not avoided COULD result in DEATH OR SERIOUS INJURY if you do not follow proper instructions.
- **CAUTION** – indicates a hazardous situation, which if not avoided COULD result in MINOR to MODERATE INJURY if you do not follow proper instructions.
- **NOTICE** – addresses practices not related to personal injury, such as property damage or damage to the equipment.

The following warnings are generally in the Operator's Manual for each specific unit or are generic safety messages if an Operator's Manual does not have these safety messages. Other safety alert messages may be in other sections of the Parts and Service Manual or in an Operator's Manual. You must read and obey all safety alert messages in any manual produced by Heil to support your unit.

⚠ WARNING

Failure to follow all instructions and safety precautions in this manual, in the Service Manual, in other manufacturer's manuals and on the safety decals attached to the product could result in serious injury or death to operators or bystanders and/or damage to property. Do not operate this vehicle before you read and understand the Operation Manual, the Parts Service Manual for this unit, other applicable manufacturer's manuals and the safety decals on the product. Each operator of this unit must read and understand all directions in this manual before they first operate this vehicle. Keep this manual in the cab for new operators and to remind all operators about safe use.

⚠ WARNING

Never weld on a compressed natural gas vehicle unless the compressed natural gas fuel system has been purged with inert gas.

⚠ DANGER

Do not operate the unit or perform repair or maintenance procedures on the unit until you read and understand all of the instructions in this manual. Failure to do so can result in death or serious injury to operators or bystanders.

⚠ DANGER

Make sure the unit is on firm, stable ground before you raise the body and clear the area of all unnecessary people. Do not prop a body unless it is on firm, stable ground. A unit not on firm, stable ground can roll when raising or propping the body. This can cause death or serious injury to you or bystanders.

⚠ DANGER

Always prop the tailgate when you leave it raised for maintenance, service or cleaning procedures. Any part of your body between the unit's body and the tailgate while you prop the tailgate or when the tailgate is propped is dangerous. Death or serious injury can occur if any part of your body is between the tailgate and the body if the tailgate suddenly closes.

⚠ DANGER

A tailgate in motion is dangerous. Serious injury or death can occur if a person is struck by a moving tailgate or becomes trapped between the tailgate and the body. Clear the area near the tailgate of all unnecessary people before you lower the tailgate.

⚠ DANGER

The packer and crusher panels are dangerous. They can cause death or serious injury if a person is inside the hopper. Make sure no one is inside the hopper before you begin a packer or crusher function. Put the unit in the Lock-Out/Tag-Out mode if it is necessary to enter the hopper area.

⚠ DANGER

Keep all parts of your body out from underneath the unit's body and away from the cylinders when raising or lowering the body. Serious injury or death will occur if the unit's body suddenly lowers and traps a part of your body.

⚠ DANGER

Do not raise a body that has refuse while you do maintenance or service procedures. Refuse in the body can make the unit unstable. Always unload refuse from the body before you raise it for maintenance or service procedures. Always use the body props when you raise the body for maintenance or service procedures.

⚠ DANGER

A full or partially full load of refuse is dangerous while you lower the body with inoperative controls. Refuse in the body can make the unit unstable and cause it to overturn. Serious injury or death can occur if the unit overturns due to instability caused by the loaded refuse. REMOVE the refuse before you block the body.

⚠ DANGER

Lifting equipment that does not have sufficient lifting capability is dangerous. Equipment can fail and cause death or serious injury to the operator or bystanders. Make sure the lifting equipment has sufficient lifting capability and clear ALL persons not involved with the procedure away from the area.

⚠ DANGER

The lifting equipment can fail. Serious injury or death can occur if the lifting equipment breaks and the body falls or the unit rolls over. Do not place your body or limbs between the unit's body and chassis while you remove the body-supporting timbers. Be attentive and prepared to move quickly away from the unit in the event there is an equipment failure.

⚠ DANGER

Contact of the unit with overhead electric lines is dangerous. Death or serious injury can occur. Make sure there is adequate overhead clearance before you raise the container. If the unit does make contact with overhead electric lines do not touch any metal in the cab. Stay in the unit until help arrives..

⚠ WARNING

Make sure the unit is in the Lock-Out/Tag-Out mode when you do maintenance or service procedures, or when you go in the hopper, climb in or on the body or on equipment. Equipment can be operated when the unit is not in the Lock-Out/Tag-Out mode. When the unit is not in the Lock-Out/Tag-Out mode, equipment operated while you do maintenance or service procedures, go in the hopper or climb in or on the body or on equipment can cause death or serious injury.

⚠ WARNING

Moving equipment can be dangerous to bystanders. Death or serious injury can occur if a person is in the wrong area or is not attentive to the operations. Clear the area of all unnecessary people before you operate the controls.

⚠ WARNING

Raising the body with the tailgate closed can damage the underride bumper. The under ride bumper can hit the ground when the tailgate is not fully raised before you raise the body. Death or serious injury can occur and also cause damage to the unit.

⚠ WARNING

Clear all people of the area before you lift a refuse container. Make sure the refuse is secure in the refuse container before you lift the container. Loose refuse can fall and cause death or serious injury.

⚠ WARNING

The hydraulic fluid can be under pressure and can spray while you open the connection. Hydraulic fluid can cause damage to your eyes, hands or skin. Wear protective eye glasses, gloves and other clothing as necessary to protect you from the hydraulic fluid.

⚠ WARNING

A unit that needs service or repair can malfunction and create a dangerous condition. A part failure during operation can cause death or serious injury to a person or damage to the unit. Repair or replace any failed or defective part immediately

⚠ WARNING

Improper dumping of the refuse can cause the unit to tip or rollover. Death or serious injury can occur if the unit rolls or tips over. Empty as much refuse as you can with the packer panel before you raise the body.

⚠ WARNING

Do not move the unit forward or backwards excessively fast (lurch) to dump the refuse load. Excessively fast movements with the body raised can make the body unstable and tip or roll the unit over. This can result in death or serious injury to the operator and damage the unit. Use only sufficient movement to loosen the load so that it will leave the body.

⚠ WARNING

Isopropyl alcohol is flammable and is harmful to eyes and skin. Keep isopropyl alcohol away from heat or open sources of ignition. Flush eyes and skin with water for 15 minutes after contact. Seek immediate medical help.

⚠ WARNING

A container that is not locked to the container lift mechanism is dangerous. The container can fall off the container lift mechanism and cause death or serious injury. Make sure you engage and lock the container latch bars before you lift the container.

⚠ WARNING

Grabbing a refuse container with too much pressure can damage the container. Pieces of the container can “fly” off the container and cause moderate or minor injury to a bystander. Use enough pressure with the grabber to raise the container with the lift arm and not damage the container.

NOTICE

Do not move the unit forward or backwards excessively fast (lurch) to dump the refuse load. Excessively fast movements with the body raised puts a very high load on the body raise cylinders and could damage one or both cylinders and make the body unstable unable to lower. Inspect the cylinders after you dump each load and replace if necessary.

NOTICE

Do not operate the unit or perform repair or maintenance procedures on the unit until you read and understand the instructions in this manual. Failure to do so can result in damage to the unit or other property. If you do not understand a procedure or instruction, tell the owner or the designated person immediately. Do not operate the unit if you do not understand all procedures and instructions in this manual. The owner or designated person can contact your Heil dealer or Heil for additional help. See the Operator’s Manual or Service Manual for contact information.

NOTICE

Grabbing a refuse container with too much pressure can damage the container. The container can become unusable. Use enough pressure with the grabber to raise the container with the lift arm and not damage the container.

NOTICE

Always use your employer's Lock-Out/Tag-Out procedures. If your employer does not have Lock-Out/Tag-Out procedures, use the procedures that follow. Contact your supervisor or ESG Technical Service if you have any questions about Lock-Out/Tag-Out procedures.

NOTICE

You can order Lock-Out/Tag-Out Tags through your Heil Dealer or through Heil.

LOCK-OUT/TAG-OUT PROCEDURES

NOTICE

Always use your employer's Lock-Out/Tag-Out procedures. If your employer does not have Lock-Out/Tag-Out procedures, use the procedures that follow. Contact your supervisor or Heil Technical Service if you have any questions about Lock-Out/Tag-Out procedures.

Watch the Service Shack Video online at **www.Heil.com/Heil-Service-Shack** by selecting **Lock-Out/Tag-Out**.

Put the unit in a Lock-Out/Tag-Out mode:

- BEFORE you enter the unit's body
- BEFORE you do maintenance, repair or cleaning procedures on the unit.

Figure 1. Lock-Out/Tag-Out (Do Not Operate) Tag

Follow These Steps:

1. LOWER the arms and forks FULLY DOWN to the ground or RAISE the arms FULLY UP against the arm stops.
2. APPLY the brakes. MAKE SURE the brakes do not let the unit move and they work properly.
3. Chock all wheels.
4. SET the tailgate props when you raise the tailgate for service, maintenance or cleaning.
5. SET the body props when you raise the body for service, maintenance or cleaning.
6. When there are in-cab controls, turn the ignition switch to ON then:
   a. Move the switches of the hydraulic controls. This relieves the pressure in the cylinders.
   b. Turn the ignition switch to OFF.
7. When there are no in-cab controls, move the outside control levers to relieve the pressure in the cylinders.
8. Put a LOCK-OUT/TAG-OUT Tag onto the steering wheel.
9. Remove the ignition key from the cab, lock the vehicle, and put the key in a secure location.
10. You can order Lock-Out/Tag-Out Tags (Part Number 212-1586) through your Heil Dealer or through Heil.

STORING REFUSE IN THE BODY

Heil does not recommend storing refuse in the body overnight. The different types of debris and corrosive elements usually collected can cause severe corrosion inside the body decreasing the life of your body. This corrosion can affect unloading and decrease the structural life of the body. In addition, storing refuse in the body overnight can increase the risk of fire.

MAINTENANCE/LUBRICATION INFORMATION

Before performing maintenance, check the work area carefully to find all the hazards present and make sure all safe guards or safety devices are in place to protect all persons and equipment involved.

GREASE LUBRICANT RECOMMENDATION

Use a grease gun. Before engaging grease gun, clean the fitting. Always pump enough grease to purge the joint of contaminated grease and wipe off the excess. Lubricate a unit as given on the lubrication decal on the unit and in the **Body Lubrication Guide** paragraph of this section.

Use grade NLG1000 grease or equivalent.

OIL LUBRICANT RECOMMENDATION

Use only non-detergent engine oil to lubricate all moveable mechanical parts not furnished with grease fittings. Apply sufficient oil to give good lubrication, but do not bathe parts in oil. Always wipe off excess oil.

HYDRAULIC OIL SPECIFICATIONS

Hydraulic fluid is one of the most important component in hydraulic system. It transmits power, provides lubrication and cooling function and has following features:

- High viscosity index
- Long service life
- Outstanding cold temperature flow properties
- Fast water separation
- Excellent anti-wear performance
- Long term oxidation stability
- Superior rust and corrosion protection
- Exceptional shear stability / filterability
- Excellent thermal and hydrolytic stability
- Anti-foam characteristics
- High performance of air release characteristics

Current Heil standard hydraulic oil is Shell Tellus S2 VX 32. Please see product TDS and MSDS for more detail information about it. We strongly recommend to use it on Heil products to get best system performance and oil service life.

The following oils can be used on Heil products if Heil standard hydraulic oil (Shell Tellus S2 VX 32) is not available. But system performance and/or oil service life may be compromised.

- Castrol Dual Range HV 32
- Chevron Rando HDZ 32
- Mobil DTE 10 Excel 32

COLD WEATHER WARMUP PROCEDURE

When ambient air temperature is cold (below 0 degrees F), it is necessary to warm up the unit's hydraulic oil before you start your daily route operation, check the oil level, or adjust hydraulic pressure settings. The hydraulic oil is sufficiently warmed when the temperature is between 120° and 160°F.

⚠ WARNING

Moving parts on the unit are dangerous. Serious injury or death can occur if a person is struck by the equipment. Clear all people from the area before you operate the unit.

Follow the steps below to warm up the hydraulic oil.

1. START the TRUCK and let the engine idle.
2. APPLY the PARKING BRAKE and make sure it holds.
3. ENGAGE the HYDRAULIC PUMP for approximately five minutes.
4. MAKE SURE the AREA IS CLEAR of all unnecessary people BEFORE you operate the controls.
5. OPERATE the PACKER EXTEND and PACKER RETRACT functions through ten (10) cycles while the engine idles. See the Operator's Manual for operation instructions.
6. Make sure the oil temperature on the site gauge is between 120° and 160°F. If not, repeat step 5.
7. Check for fluid leaks. Repair if necessary.
8. The unit is now ready to go on route.

BATTERY DISCONNECT SWITCH

The battery box is typically located on the streetside of the chassis frame near the front of the body, however it can be mounted at a different location on different chassis. Become familiar with the location of the battery box and battery disconnect switch on your unit.

1. You must turn the battery disconnect switch to the OFF position whenever the unit is shut off for any length of time – especially when the unit will be left unattended.
2. You must turn the battery disconnect switch to the ON position whenever you will use the unit.
3. You must check the position of the battery disconnect switch as part of the daily inspection.

NOTICE

Battery cables must be securely anchored and not rubbing other equipment. Cable insulation must be free of damage and abrasion. Inspect weekly.

NOTICE

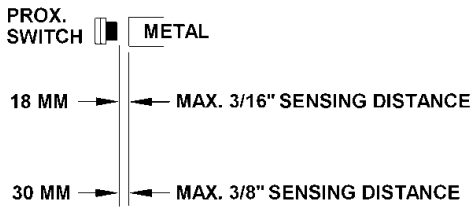
Always disconnect the battery before welding on the chassis or body.

PROXIMITY SWITCH TROUBLESHOOTING

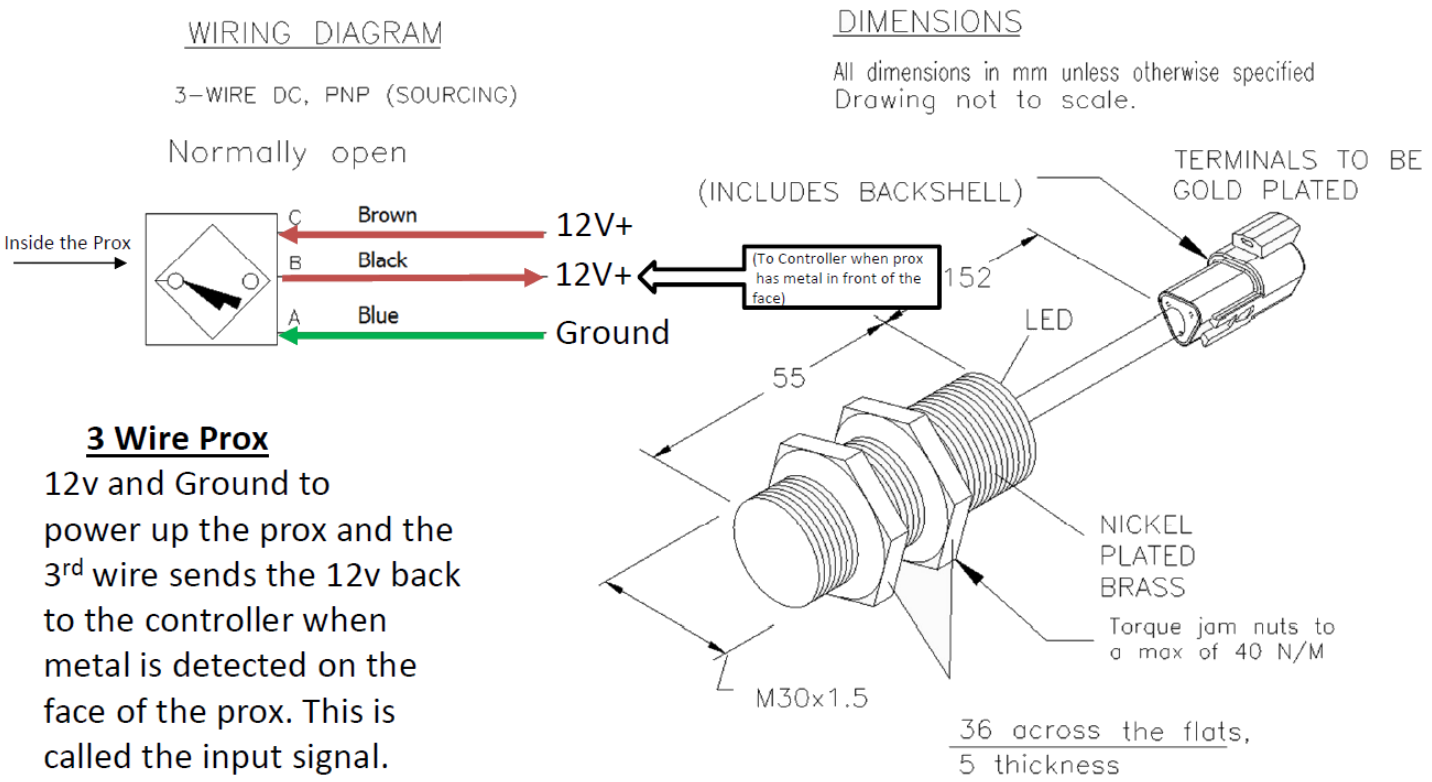
When one or more of a unit's functions do not operate properly and there are proximity switches in the circuits of the unit for these functions, refer to the following table as a guide to find the problem(s).

NOTICE

Heil proximity switches have a Light Emitting Diode (LED) on the switch to indicate that the switch is sensing metal. The light changes color when the switch senses metal. Green indicates the switch is ON. Yellow indicates the switch senses metal. Some proximity switches only have the yellow light.

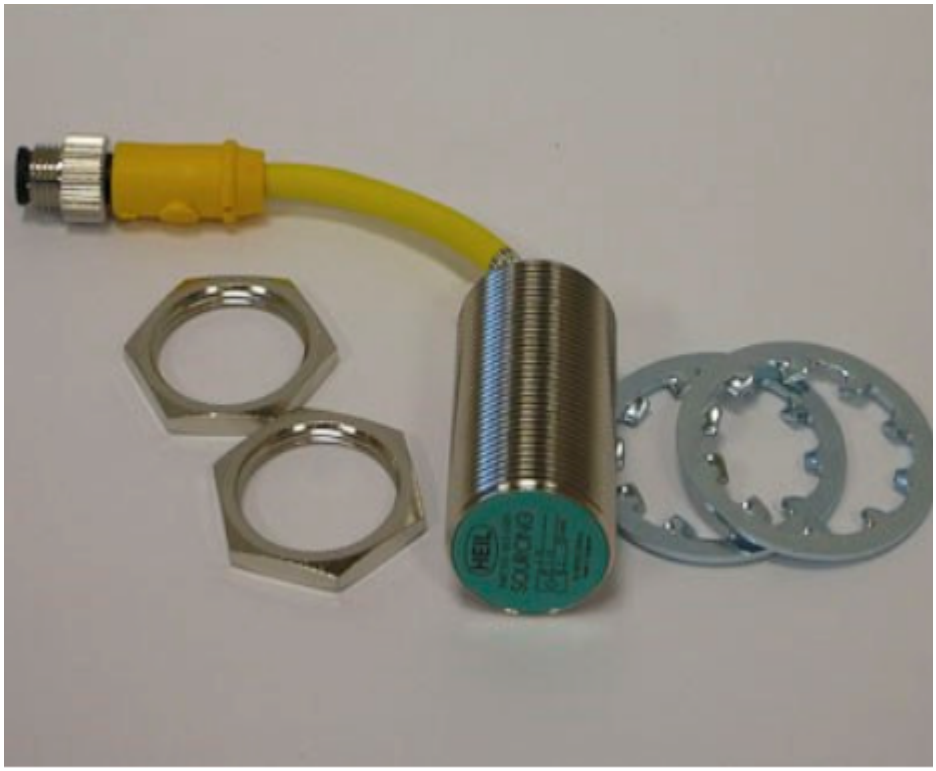
Proximity Switch Troubleshooting Table	
Probable Cause	Remedy
Loose or corroded electrical connections.	Replace the electrical connections.
Damaged Switch A. Cracked Ferrite core causing the fine internal wire to break. B. Cracked Ferrite core – but wire is not broken – the sensitivity of switch will increase which causes sensing distance to increase or switch work intermittently as the temperature changes.	• DO NOT strike switch to make it work. • DO NOT damage the switch when you adjust it. • DO NOT adjust switch too close to the metal it is sensing.
Voltage spikes from truck chassis electrical system will break down the internal electronics of the proximity switch.	1. Make sure the power source from the chassis manufacturer is clean. 2. The body electrical system is protected from voltage spikes.
Improper Sensing Range	Adjust proximity switches to sense metal as follows: 
If the controller input light stays on when a switch is unplugged (the signal wire is carrying +12V DC)	Check the proximity switch electrical circuits for the source of the problem.
If proximity switch LED light is NOT ON.	1. Check the fuse relay block (Half/Packs with IFM controllers). The fuse/relay box is located in the cab. Or Check the in-line fuses (Side Loaders with IFM controllers). The in-line fuses are located in the cab. 2. Unplug proximity switch. 3. Check the power wire (terminal C) for +12 VDC with a multi-meter. 4. Check ground signal with multi-meter for continuity to chassis ground. 5. Check the signal wire for continuity to appropriate controller input terminal. See Service Manual. 6. If all three (3) wires are good, replace the proximity switch.

PROXIMITY SWITCH TROUBLESHOOTING (CONTINUED)



3 Wire Prox

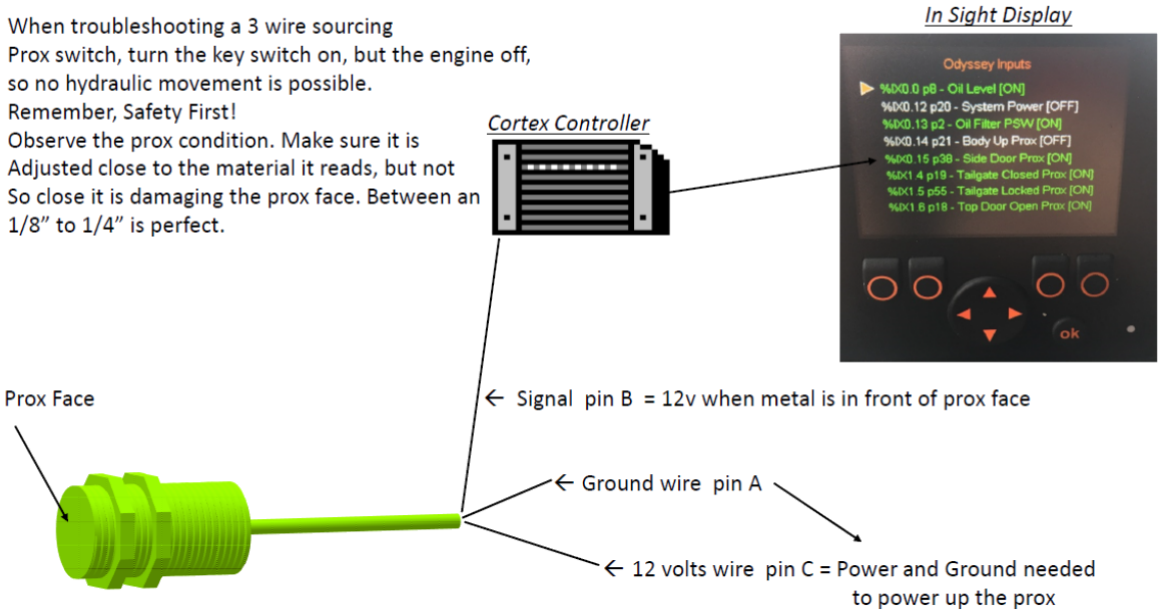
12v and Ground to power up the prox and the 3rd wire sends the 12v back to the controller when metal is detected on the face of the prox. This is called the input signal.



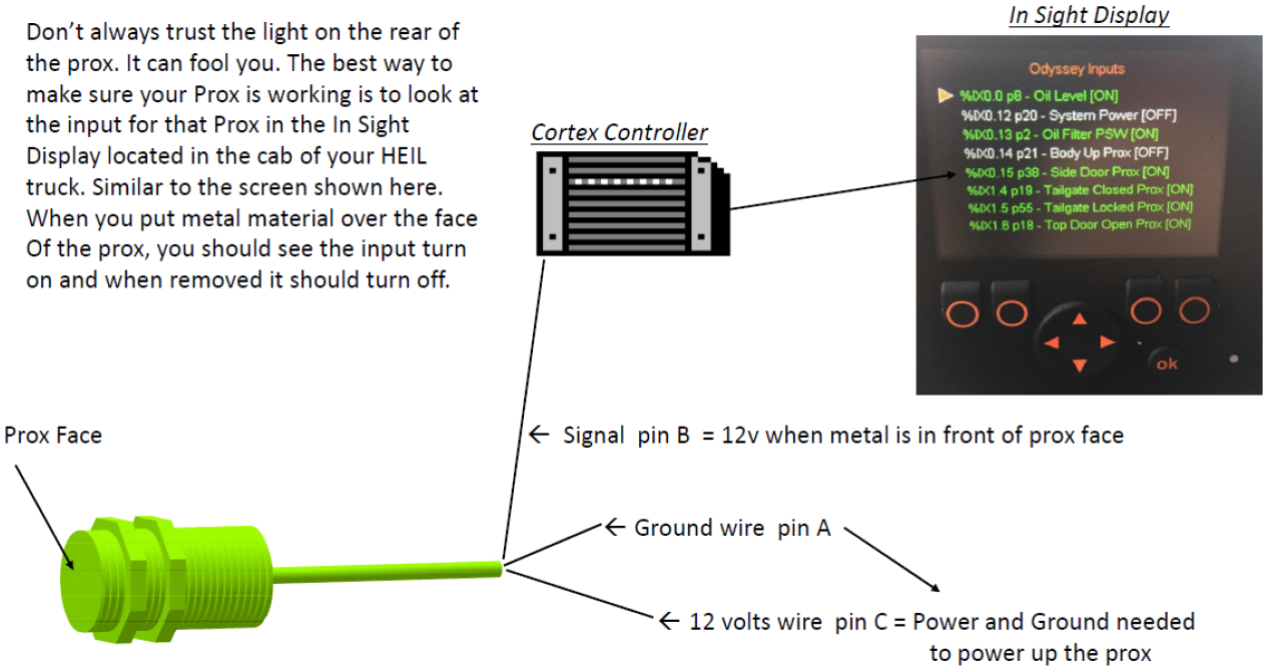
PROXIMITY SWITCH TROUBLESHOOTING (CONTINUED)

Testing Prox Switches Using Your Controller

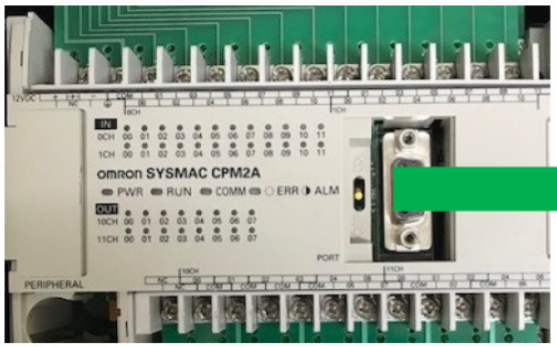
When troubleshooting a 3 wire sourcing Prox switch, turn the key switch on, but the engine off, so no hydraulic movement is possible. Remember, Safety First!
Observe the prox condition. Make sure it is Adjusted close to the material it reads, but not So close it is damaging the prox face. Between an 1/8" to 1/4" is perfect.

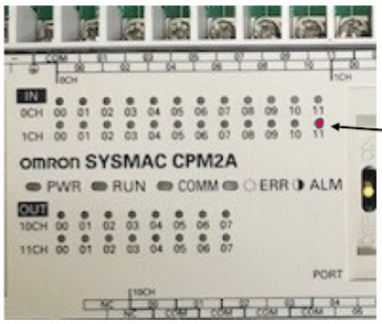


Don't always trust the light on the rear of the prox. It can fool you. The best way to make sure your Prox is working is to look at the input for that Prox in the In Sight Display located in the cab of your HEIL truck. Similar to the screen shown here. When you put metal material over the face Of the prox, you should see the input turn on and when removed it should turn off.



PROXIMITY SWITCH TROUBLESHOOTING (CONTINUED)

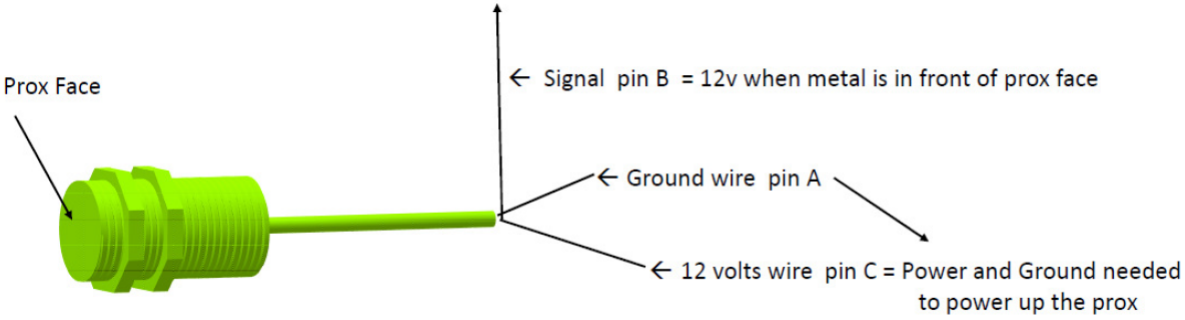




For Example

Input for side door prox switch Address 01.11

If older PLC controlled truck



DECALS ON THE UNIT

Make sure you can read all hazard and instruction decals. Clean decals if you cannot read the words. See for directions on cleaning decals.

Replace any decal that is damaged, missing, or is not readable.

When you replace a part that has a decal, make sure a new decal is installed on the new part. See the Parts and Service manual for a complete decal kit and individual decals. Order the decal kit or individual decals from your Heil Dealer or from Heil.

DECAL CARE

It is important that the decals are properly cleaned to make sure that they are readable and do not come off the unit. Use the following steps to clean the decals.

A. General Instructions

Following these instructions helps the decals adhere longer.

- Wash the decals with a blend of mild car wash detergent and clean water
- Rinse with clean water
- Let the vehicle air-dry or dry with a micro-fiber cloth
- Do not allow fuels to stay in contact with the decal for an extended period of time. Remove the fuel contamination as quickly as possible
- Do not use carnauba-based wax over the decals
- Do not use a mechanical brush while washing the decals.

B. Pressure Washer Precautions

Pressure washing can cause damage to decals. It can cause the edges of the decals to lift and peel the decal away from the unit. Over time, the decal can fade, crack or chip away.

Use pressure washing only when other cleaning methods are not effective. If you use a pressure washer, use the following precautions.

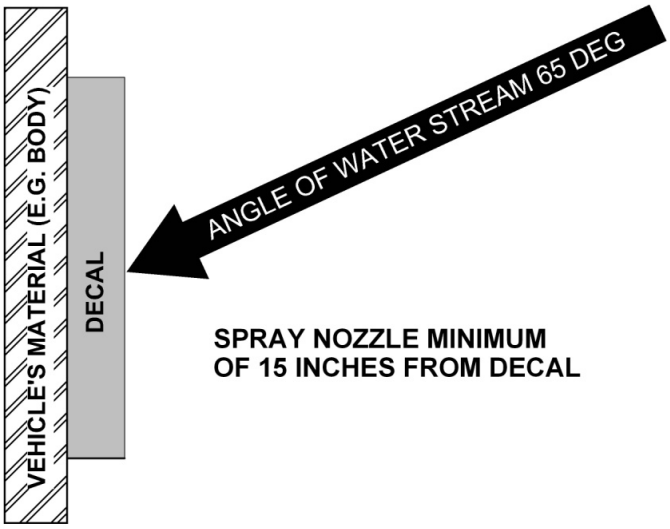
- Spray nozzle opening: 40° wide pattern
- Spray angle: 65° from vehicle’s body (do not use sharp angles – this can lift the decals from the unit)
- Distance of nozzle to decal: 38 cm minimum
- Water pressure: <= 5.5 MPa
- Length of time: not more than 30 sec.
- NEVER use a “turbo pressure nozzle”.

C. Remove Difficult Debris

When normal cleaning procedures do not remove difficult debris from the decals, try the following:

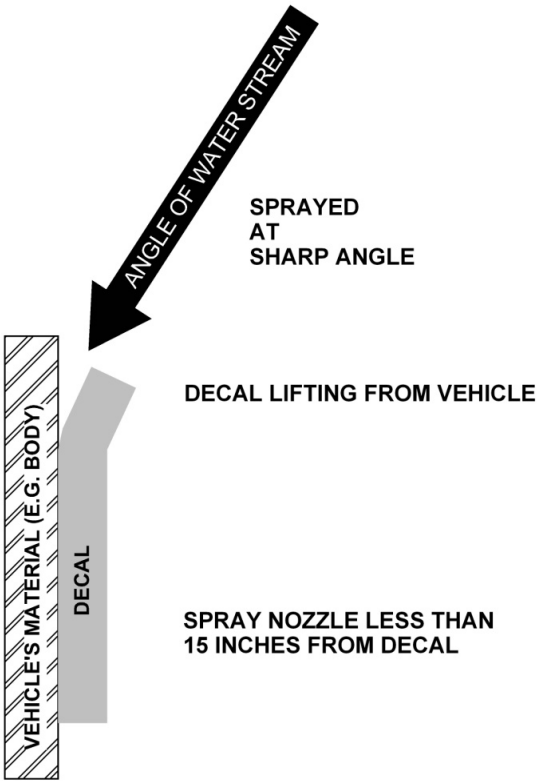
- Spot clean the decal with Isopropyl Alcohol and a micro-fiber cloth (rag)
- If these methods do not work on a problem area, call a Heil Dealer or Heil Customer Support.

DECAL CARE (CONTINUED)



RECOMMENDED TECHNIQUE

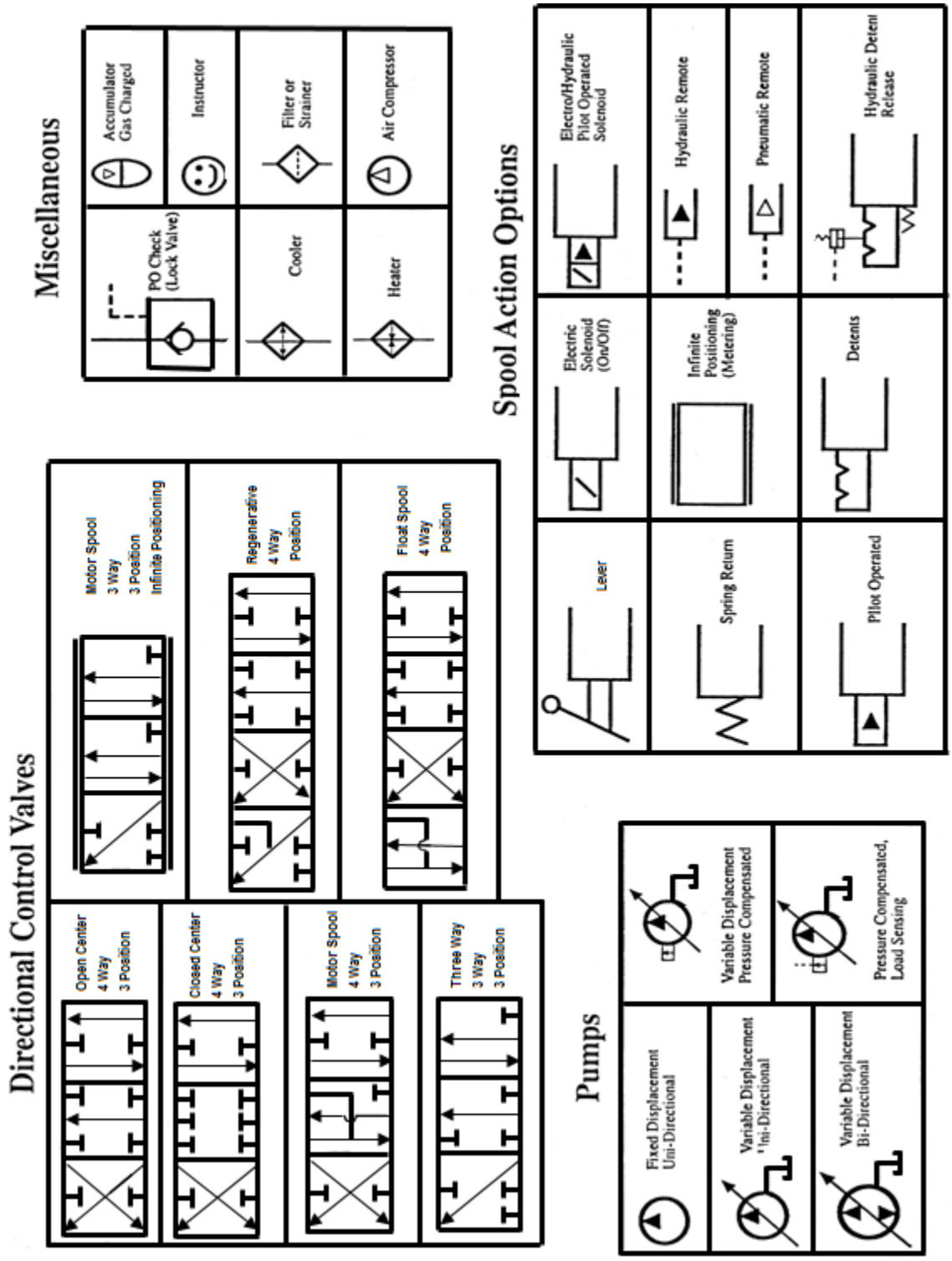
Figure 2. Recommended Technique



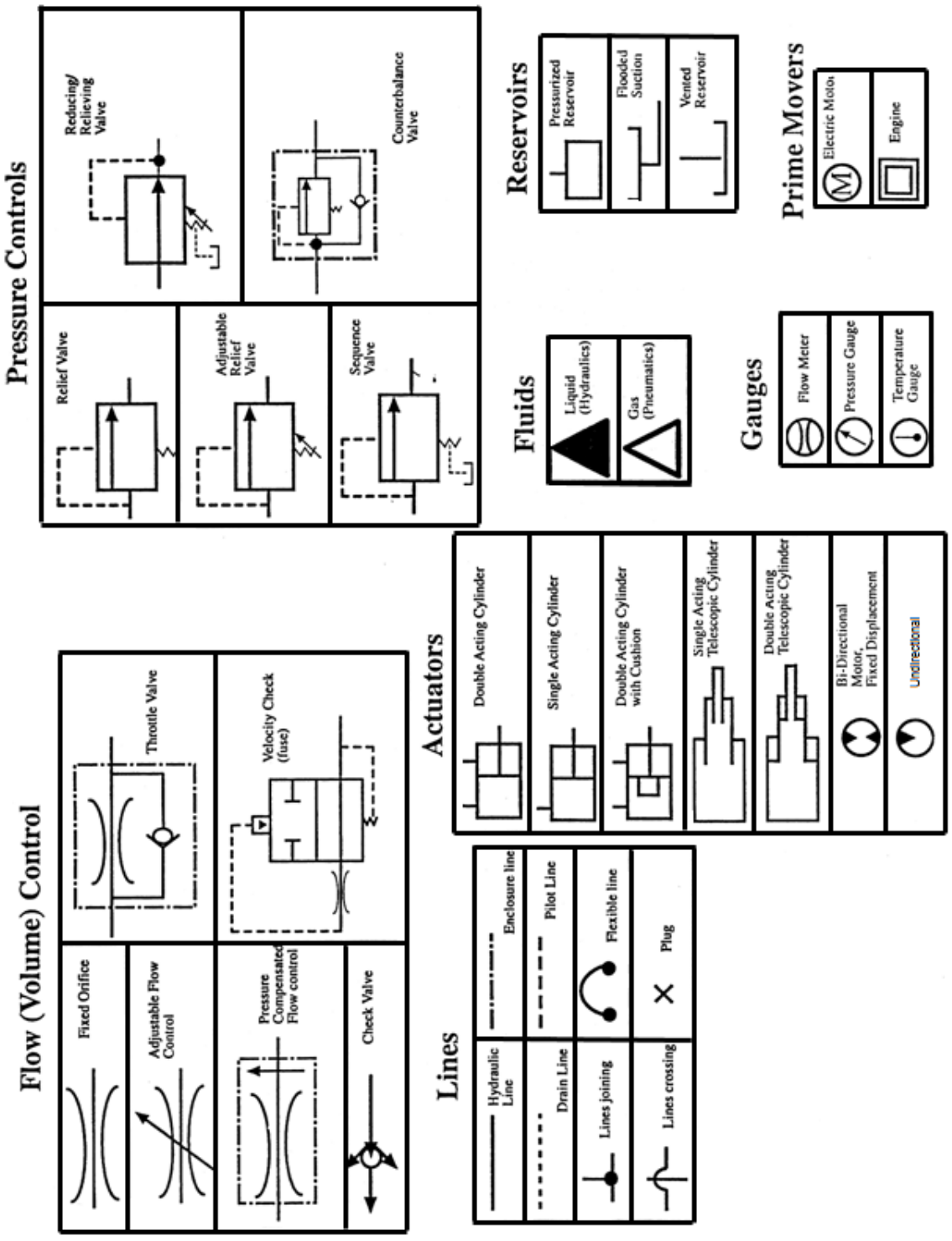
INCORRECT TECHNIQUE

Figure 3. Incorrect Technique

HYDRAULIC SYMBOLS

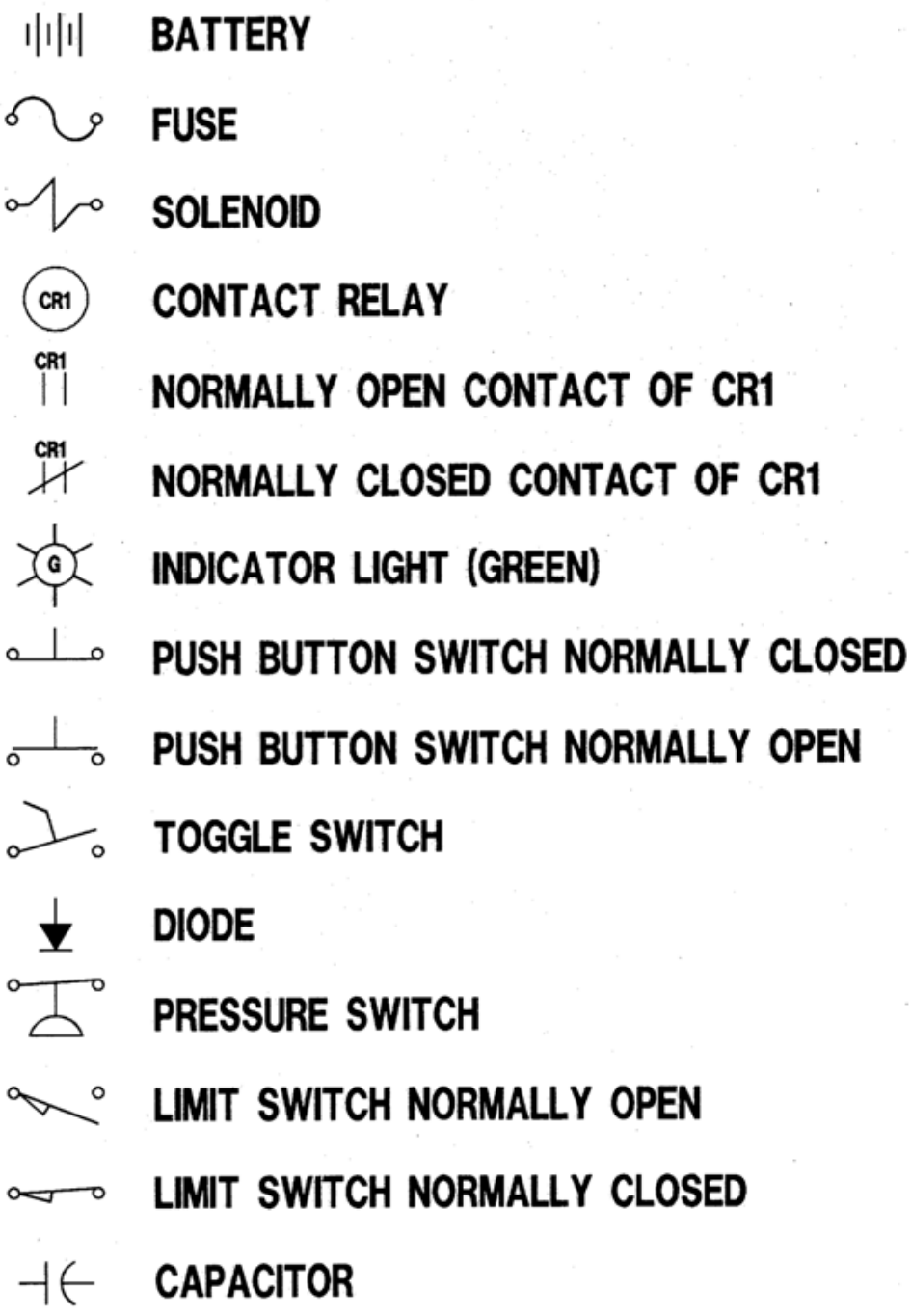


HYDRAULIC SYMBOLS (CONTINUED)



ELECTRICAL SYMBOLS

SYMBOL DEFINITIONS



SECTION 2
PUMP

PUMP INSPECTION

Important Inspection Tasks

- Check pressure fluid level in tank.
- Check cleanliness/condition of the hydraulic fluid.

NOTICE

A check of the hydraulic fluid can be regarded only as a rough indicator for the fluid condition (milky/black appearance, gumming, sludge at the tank bottom, or smell of burnt oil).

- Check filter clogging indicators/difference pressure switches (when apparent) while system is in operation.
- Check persistent fluid temperature while system is in operation (usually <140 degrees F, maximum 176 degrees F).
- Check operation pressure levels and operation speeds.
- Check for external leaks.
- Check tubes and hoses for proper mounting and indications of rubbing.

NOTICE

Damaged tubes and hoses should be replaced immediately!

- Check visually the hydraulic accumulators.
- Check visually all electrical connections of motor, solenoids, sensors, and pressure switches.

PUMP MAINTENANCE

Important Inspection Tasks

Hydraulic Fluid

The service life of hydraulic fluids is highly dependent on the operation temperature and the conditions. The maximum operation temperature usually is 80°C, an increase of 10°C will reduce the service life by 50%.

NOTICE

Different kinds of pressure fluids should not be mixed as this might cause sludge or gumming. It is recommended to flush the system prior to any change of the fluid type and to contact the fluid manufacturer.

- The fluid should be drained while the system is warm. Used oil should be disposed professionally.
- Heavily aged or contaminated fluid can't be improved by simply adding fresh fluid.
- The hydraulic fluid has to be filled-in via the system filter or via a mobile filtration system. The absolute filter rating for this initial filtration must be at least as high as the rating of the system filter.
- Fluid samples have to taken and tested for contamination kind, size, and level with the results being documented.

PUMP MAINTENANCE (CONTINUED)

⚠ CAUTION

The complete hydraulic system has to be depressurized prior to any works at accumulators. No soldering, welding, or machining is allowed at hydraulic accumulators! Incompetent handling may cause severe accidents!

- Check the setting of system and control pressure.
- Any pressure re-adjustments should be documented, as this may be a sign of wear.
- When repeated readjustment of the pressure valve becomes necessary to achieve the specified setting, it indicates wear of the pressure valve.
- Check the tubes and hoses for external leaks.

NOTICE

It is most important that the system is completely depressurized prior to removal of fittings, hoses or other components. Leaks at joints sealed via soft-iron rings, O-rings or other contoured seals cannot be solved by simply re-tightening of the joint (observe the perm. torque) as the seal material has hardened or is otherwise damaged. Seals should always be replaced and not reused.

- Check the function of control and monitoring devices (pressure gauges and pressure switches).

PUMP REPAIR

Important Inspection Tasks

A. Troubleshooting

- A successful troubleshooting of hydraulic systems requires a detailed knowledge about the hydraulic system and understanding of the layout, operation, and ensemble acting of the individual components. All documentation required should be at hand. Understanding usually requires the ability to read hydraulic and electrical circuit plans.
- Suited test devices include a temperature gauge, pressure gauge, multimeter, stop watch, and rev. counter.

B. Repair

NOTICE

Minor repairs should only be undertaken by qualified personnel. Major repairs and overhauls should only be undertaken by the manufacturer.

- Cleanliness is mandatory when working on hydraulic systems! This is especially true with systems with an Axial Pumps. All surfaces where joints are to be separated should be cleaned prior to disassembly. All ports should be plugged to prevent contaminants to enter an open system.
- Defective devices should not be repaired on site because the tools and cleanliness required for professional repairs is not present. It is better to replace only the complete unit or at least sub-assemblies, which can be tested individually, on site. This way standstill periods and fluid losses are minimized as well as repairs are made more easily.
- It is important to take into account whether the malfunction of the repaired component may have caused malfunction of other components, for example by migrating debris or even fragments within the hydraulic system.
- After repair of the component, one should look for and solve the basic cause for this malfunction, for example unsuitable filtration level, elapsed preventive service maintenance.

SINGLE VANE PUMP WITH CONTROL MANIFOLD

Half/Pack

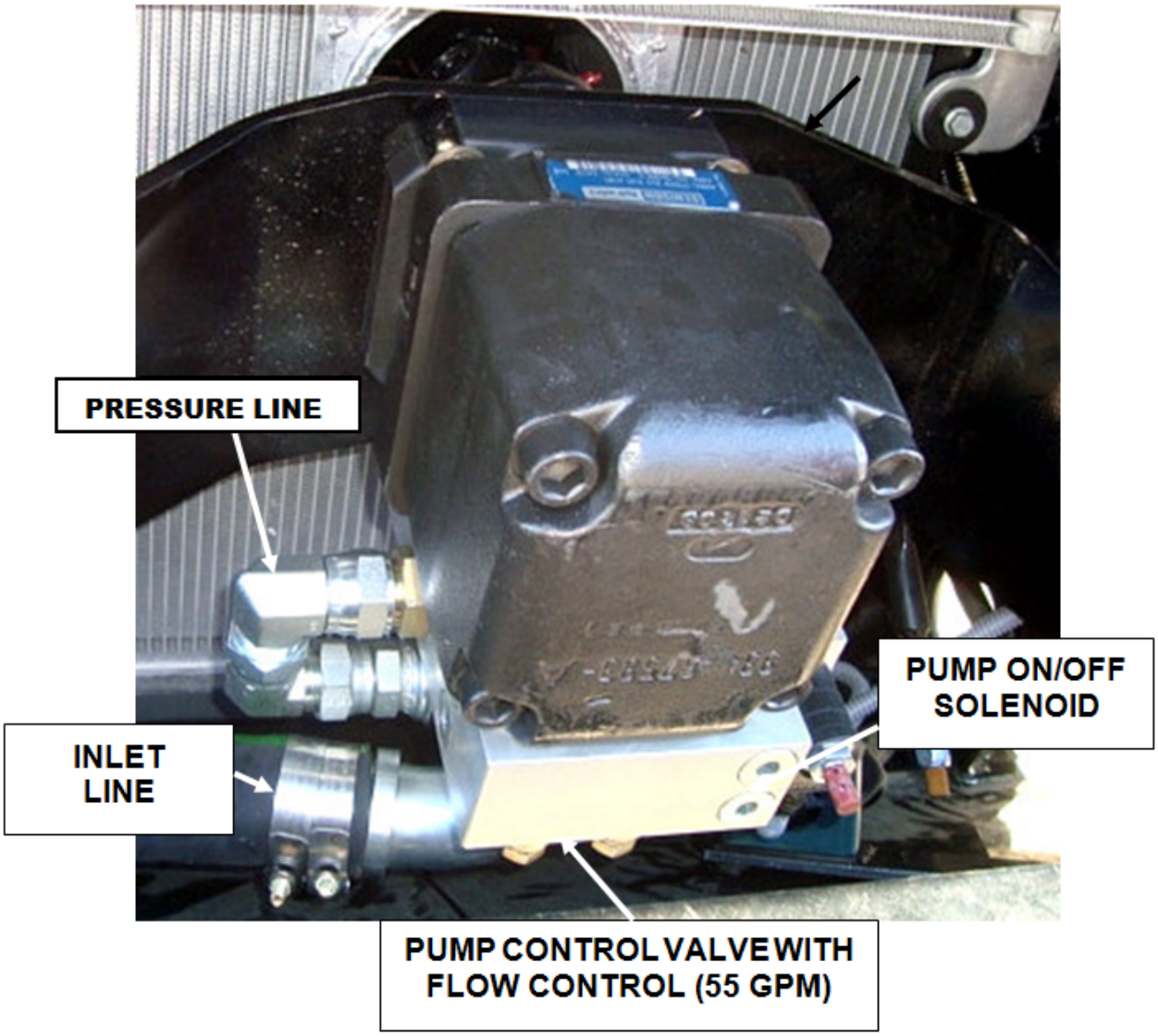


Figure 4.

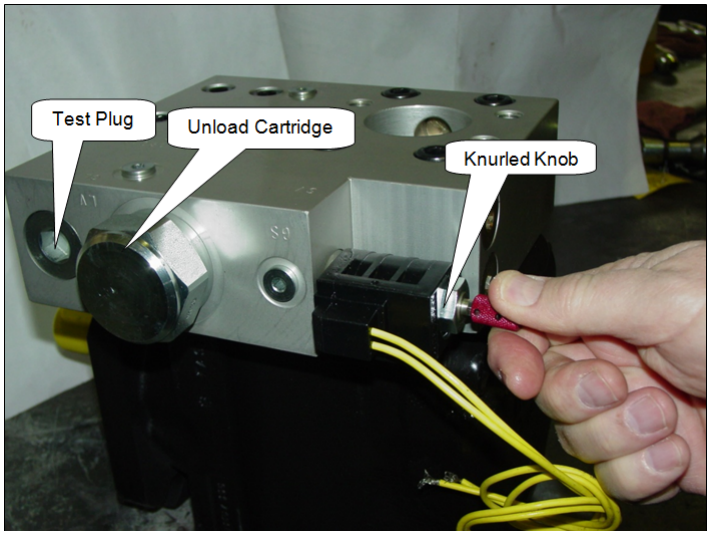
The single vane pump control valve is designed to limit the flow to 55 GPM. Excess flow is re-circulated to the inlet.

- The pump on/off valve must have power to turn the pump on
- When the pump solenoid is in the off mode, oil is allowed to circulate back to the inlet
- The maximum pump speed is controlled by the PLC.

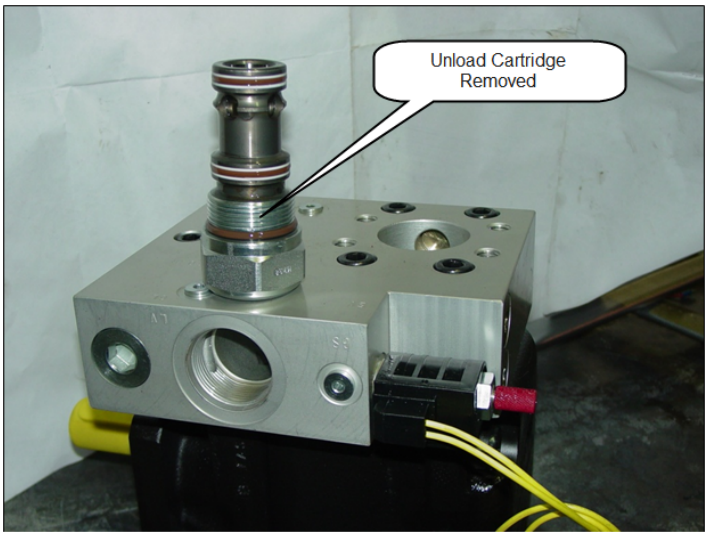
TROUBLESHOOTING PUMP 219-2303 WITH 031-6427

In 2007, Heil changed the pump control valve to a design that easily allows testing the pump and the pump control valve functions on the vehicle.

1. Hydraulic functions do not operate.
   - When pump should be on, verify there is at least 10 volts at the pump coil.
   - If 10 or more volts are present proceed to step 2.
   - If not, determine if the PLC program (if so equipped) is at fault or a wire is broken.
2. When pump should be on, pull red knurled knob on the end of the solenoid valve. (Figure below)
   - Does the system work now?
   - If so replace the coil
   - If not proceed to step 3

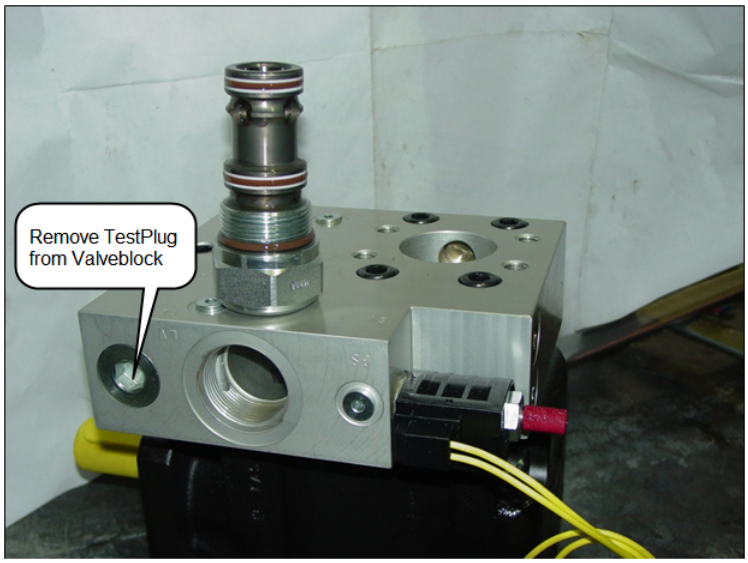


3. Remove the unloading cartridge. (Figure below) Temporarily set aside in a clean location.

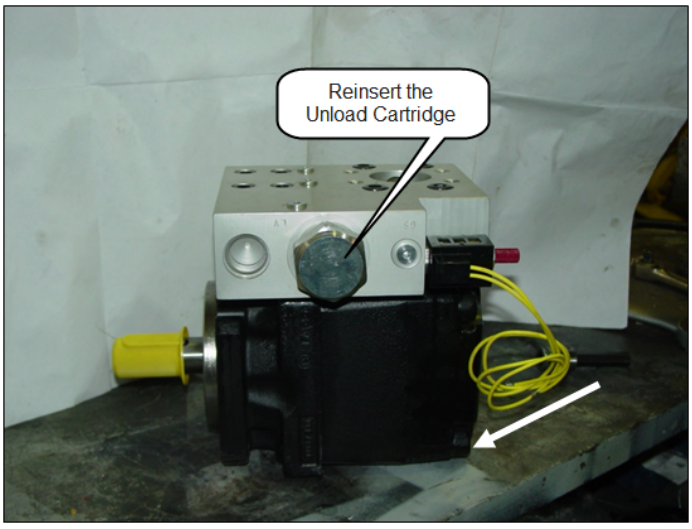


TROUBLESHOOT PUMP 219-2303 WITH 031-6427 (CONTINUED)

4. Remove test plug located in the side of the pump control valve. (Figure below)
5. Insert pug in the port where the unload cartridge was removed. There is a thread for it at the bottom of the cavity.



6. Reinsert the unload cartridge. (Figure below)



TROUBLESHOOT PUMP 219-2303 WITH 031-6427 (CONTINUED)

7. Start the truck and test all functions.
   - If the system now works correctly the problem is in the pump control valve.
   - If the system still does not function correctly the pump cartridge need to be replaced.
8. Remove the unload cartridge. Temporarily set aside in a clean location.
9. Remove the test plug and replace it in the side of the pump control valve.
10. Reinstall the unload cartridge.

Warning: Always remove the test plug before running the truck on routes to prevent hydraulic system failure.

SINGLE PUMP REPAIR PROCEDURES

Heil has upgraded many products to a high pressure vane pump. Although ratings vary, these pumps are generally rated for higher pressure and higher duty cycles than similar size gear pumps. Because of the design of a vane pump, it is generally not necessary to replace the entire pump. The pump cartridge contains all of the wear items in a vane pump. Replacing the cartridge provides the same performance as replacing the entire pump. Use the following procedures to field repair and inspect a Heil single vane pump. The procedure was performed on an Autocar chassis and can be used on other chassis. These instructions show complete tear down of the pump assembly. They can be used to replace a failed pump cartridge or failed pump shut-off valve. Before making adjustments, make sure the unit is in the LOCK-OUT position. LOCK-OUT position is defined as follows:

1. Engine stopped and ignition key removed.
2. Set the brakes and make sure they are holding.
3. Chock all wheels.
4. Insert a LOCK-OUT tag on the steering wheel.
5. Test the cartridge for damage by flow testing the pump before disassembly.

Required tools to replace the pump:	
Quantity	**Tool**
1	1 1/2 inch open end boxed end wrench
1	3/4 inch open end boxed end wrench
1	Wire cutters (Dikes)
1	1/2 inch drive ratchet
1	14mm 1/2 inch drive hex head socket
1	3/8 inch hex head wrench
1	5/32 inch hex head wrench
1	Torque wrench capable of producing 150 ft. lbs.

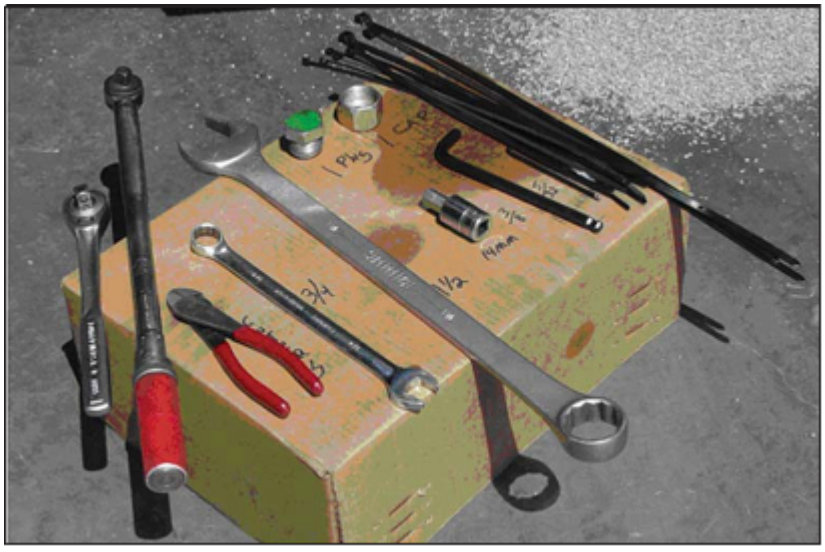


Figure 5. Tools Required

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

6. Remove the zip tie from the oil shut-off valve on the hydraulic oil tank.

Figure 6.

7. Turn the shut-off valve to the OFF position.

Figure 7.

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

8. Remove the grill from the chassis. The number of bolts for the grill varies with chassis brand.

Figure 8.

9. Cut the zip tie around the electrical wiring that controls the pump shut-off valve solenoid.

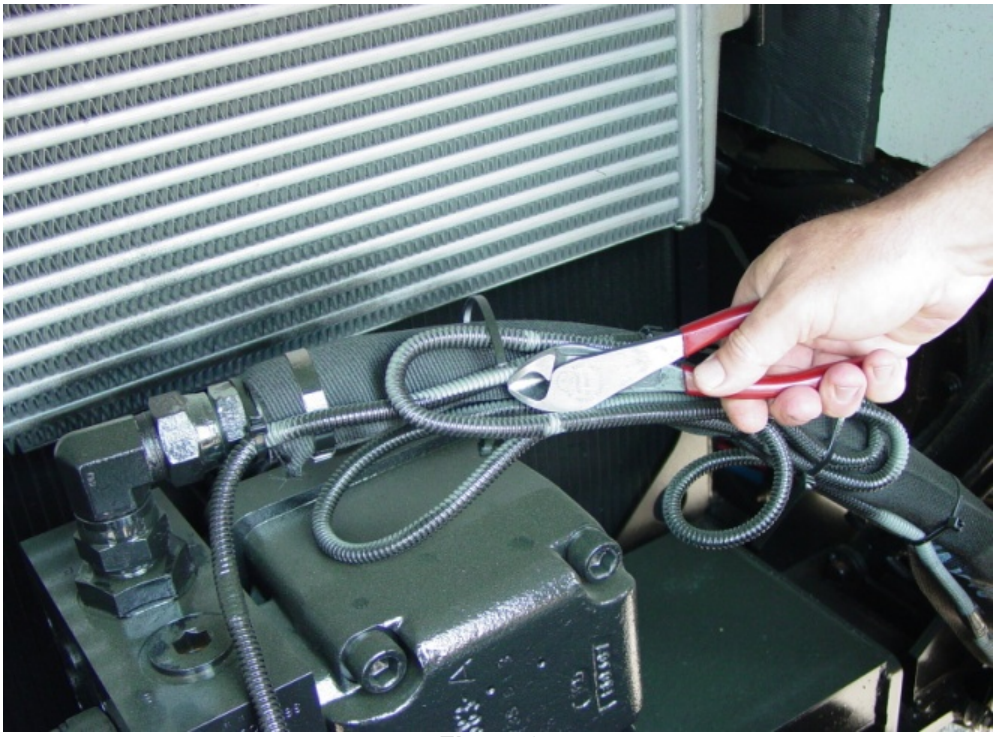


Figure 9.

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

10.Disconnect the electrical wiring—the two-way Packard plug—that controls the pump shut-off valve solenoid.

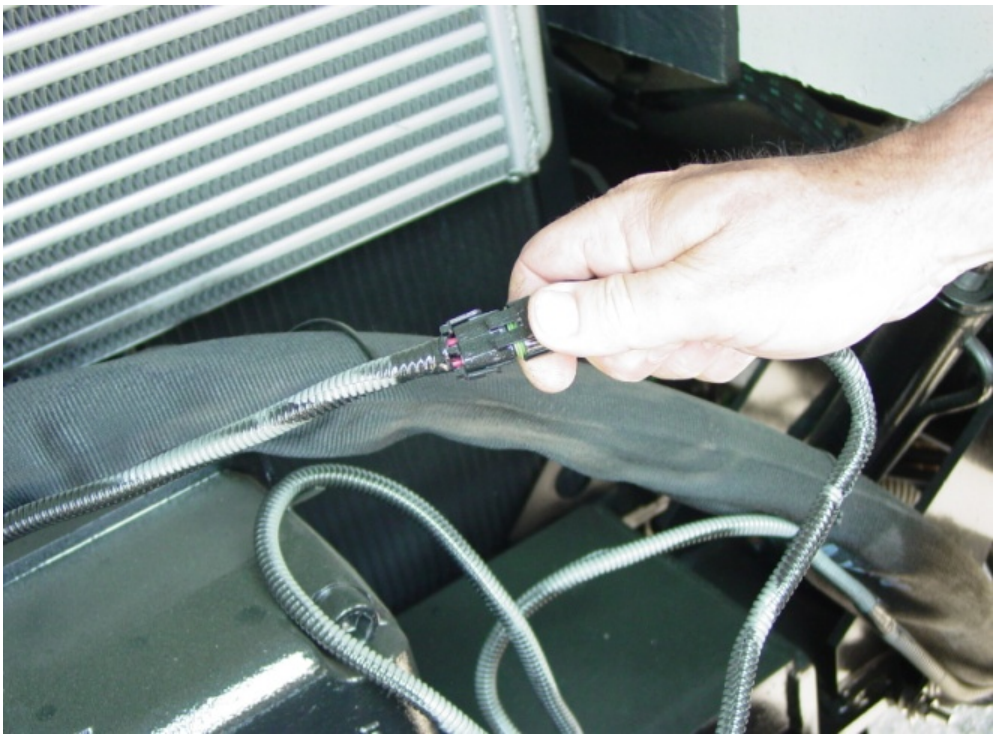


Figure 10.

11.Remove the one-inch hydraulic pressure hose.

Figure 11.

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

12.Remove the four suction line flange bolts.

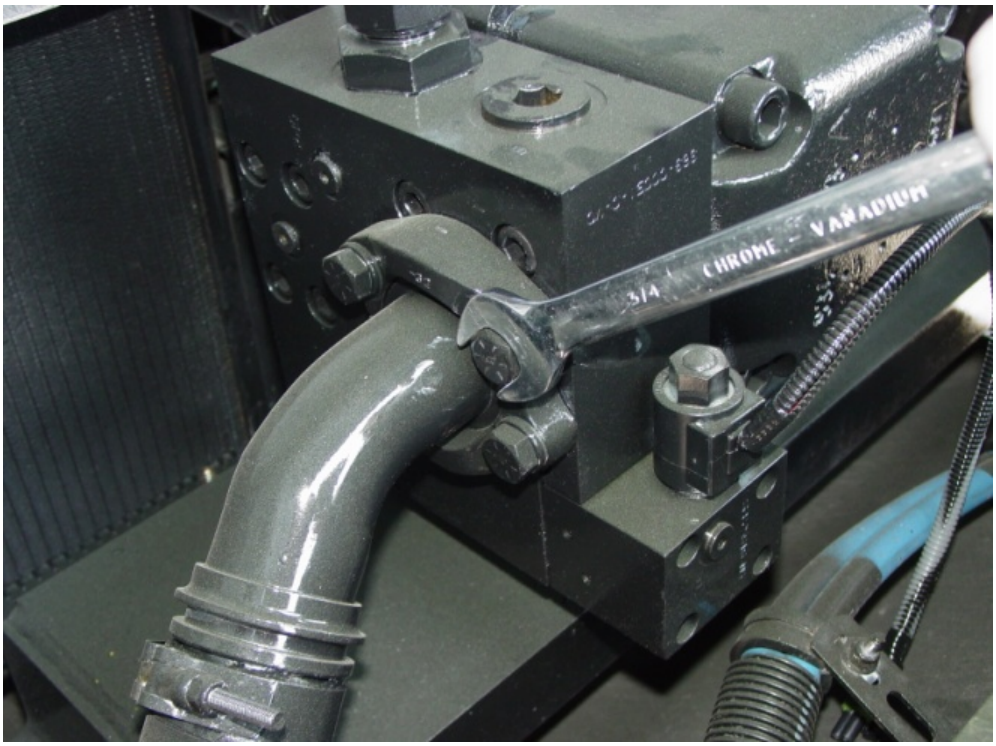


Figure 12.

13.Remove the eight bolts connecting the pump shut-off valve to the pump. There are four small bolts and four large bolts.

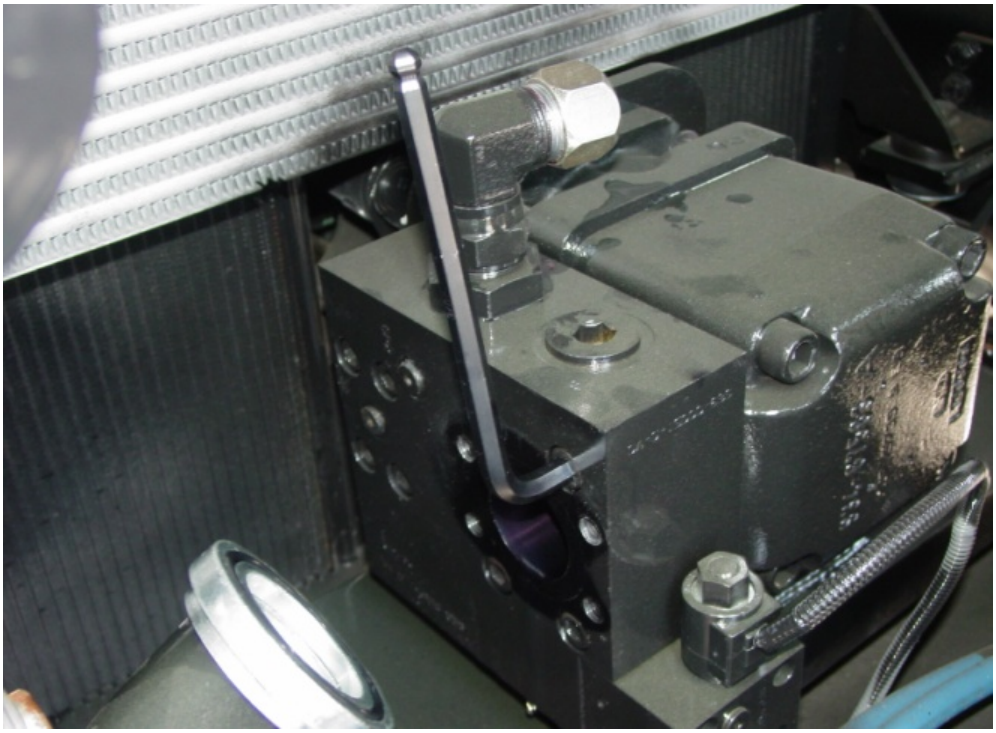


Figure 13.

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

14.Carefully, remove the shut-off valve from the pump.

Figure 14.

15.Remove the four pump housing connecting bolts.

Figure 15.

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

16.Carefully remove the pump case housing.

Figure 16.

17.Remove the pump cartridge by pulling it toward you. The fit might be tight.

Figure 17.

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

18. Inspect the pump shaft, splines, and bearings for wear and damage. Check for the following:

- Sheared or worn shaft splines
- Broken bearing.

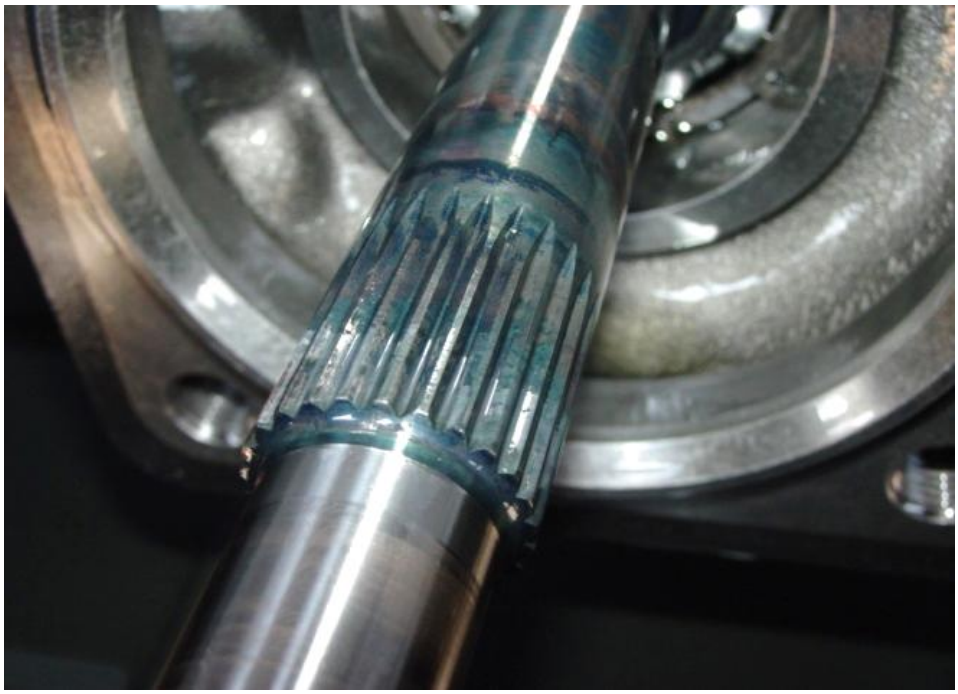


Figure 18.

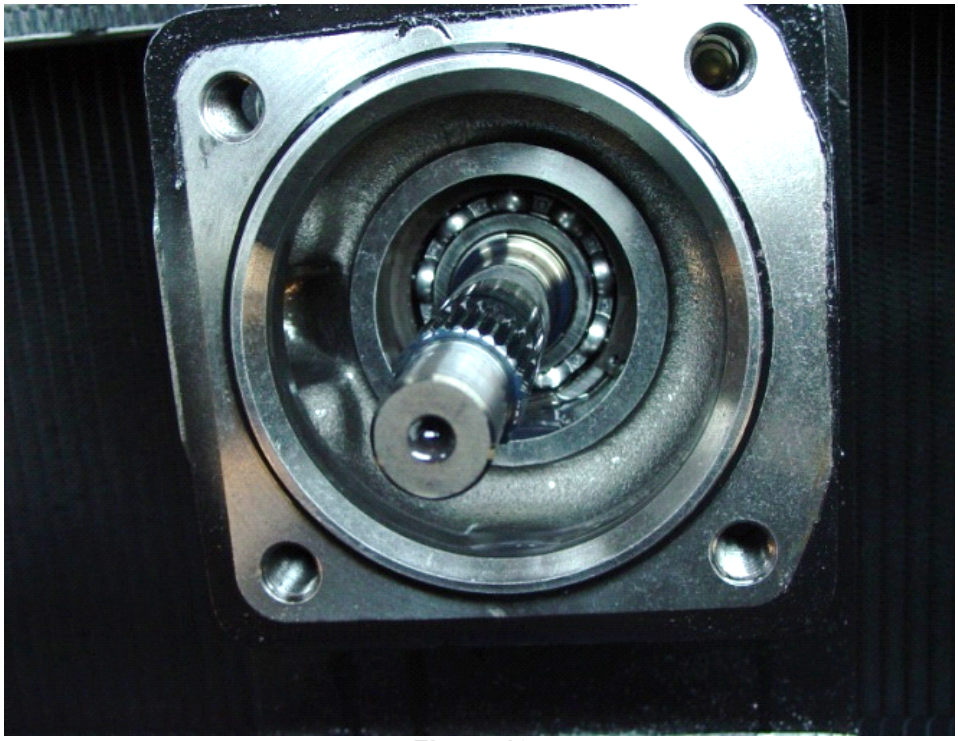


Figure 19.

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

19. Inspect the brass bushing on the pump cartridge for wear and damage.

Figure 20.

20. Check the outer housing O-ring for wear or damage such as nicks, fraying, or cuts. Replace the o-ring if it is damaged.

Figure 21.

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

21.Place the pump cartridge back on the pump shaft.

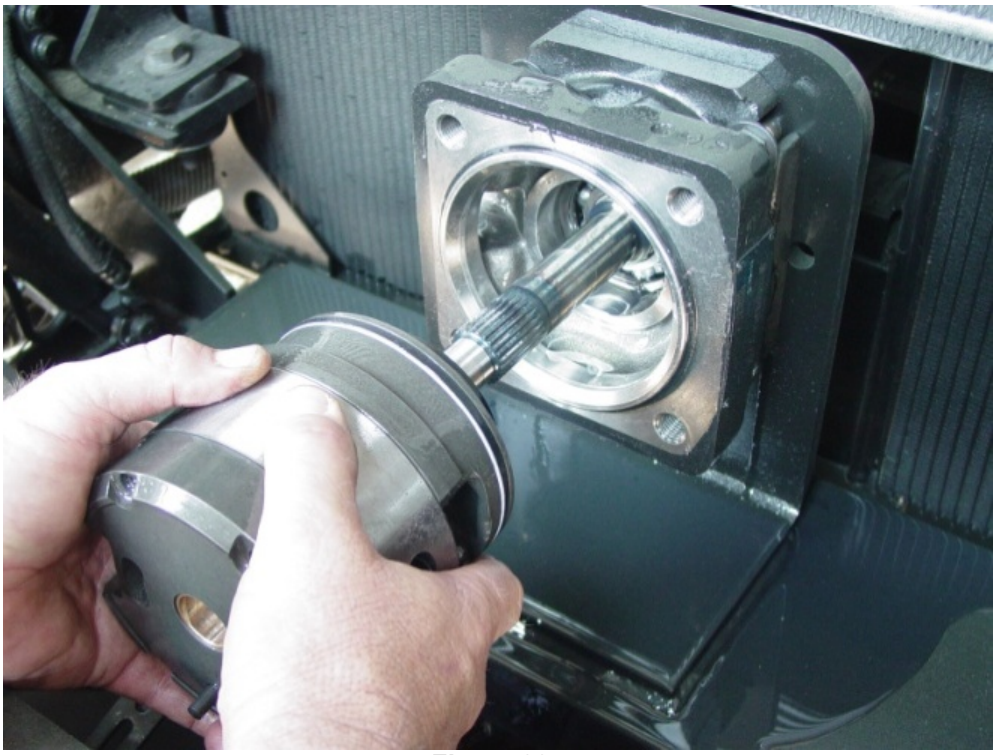


Figure 22.

22.Replace the outer pump housing and finger-tighten the four pump housing bolts.

Figure 23.

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

23. Tighten the four outer housing bolts to 138 ft. lbs.

Figure 24.

24. Install the new pump shut-off valve using the new bolts included with the new valve.

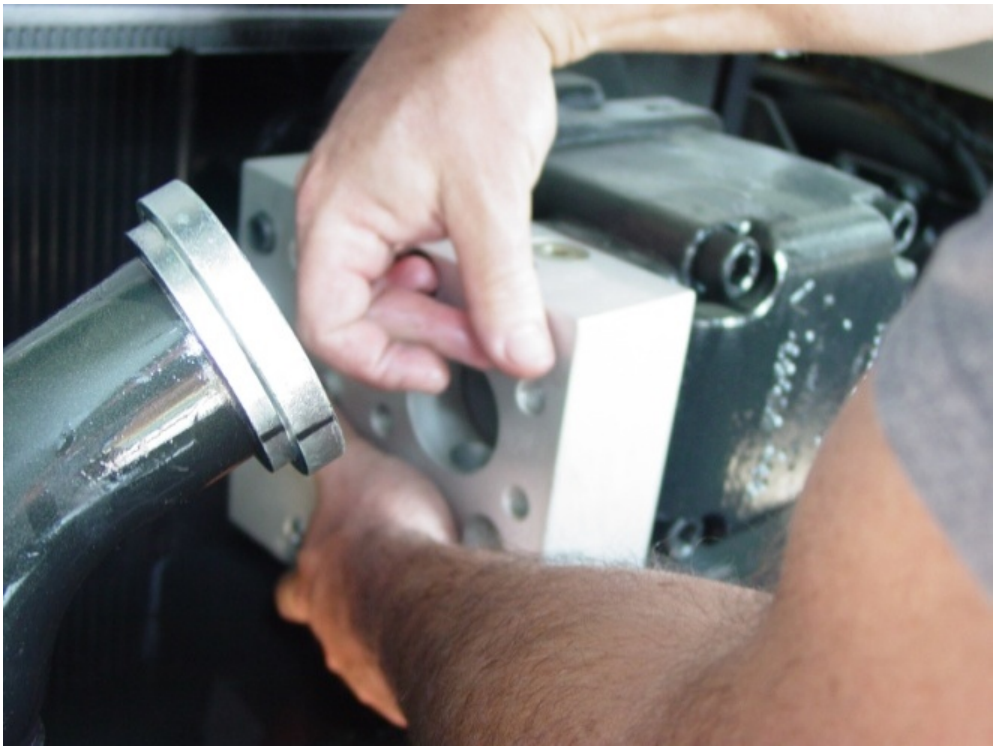


Figure 25.

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

25. Tighten the eight pump shut-off valve bolts as follows:

- Four small back bolts – 60 ft lb
- Four large front bolts – 92 ft lb

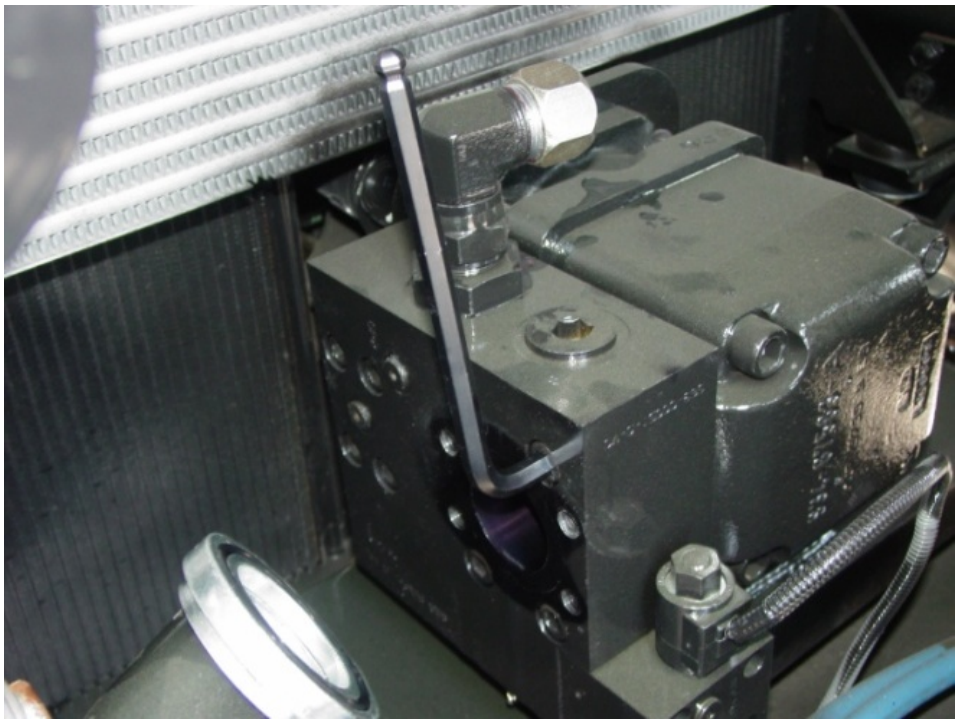


Figure 26.

26. Install the suction line flange to the pump shut-off valve and tighten the four bolts on the flange.

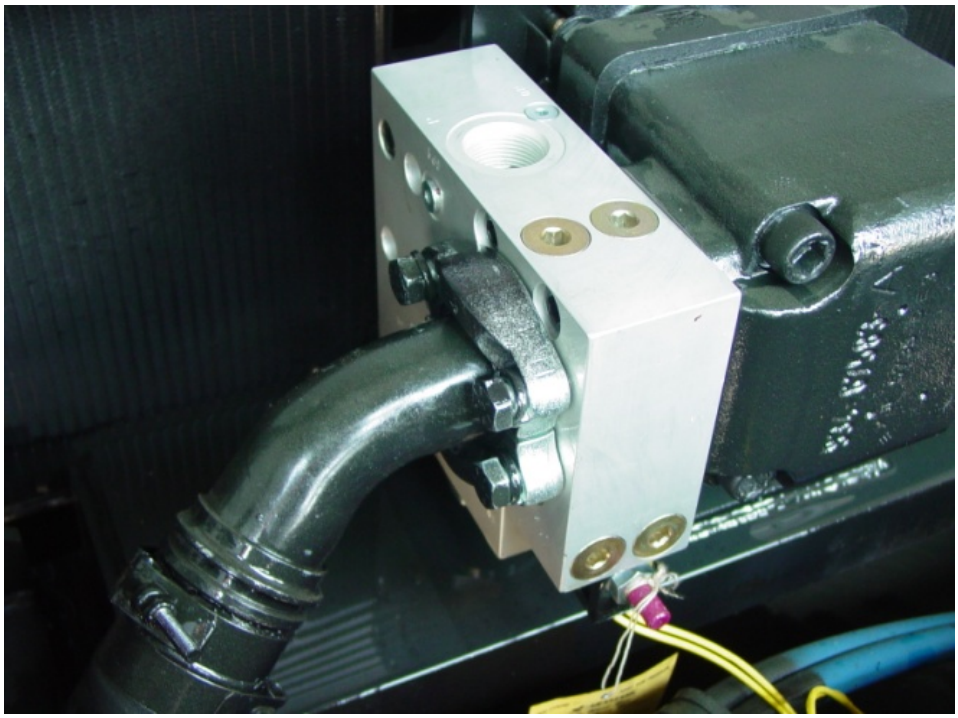


Figure 27.

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

27.Install one straight connector, 054-3341-10, to the **P Port** on the shut-off valve.

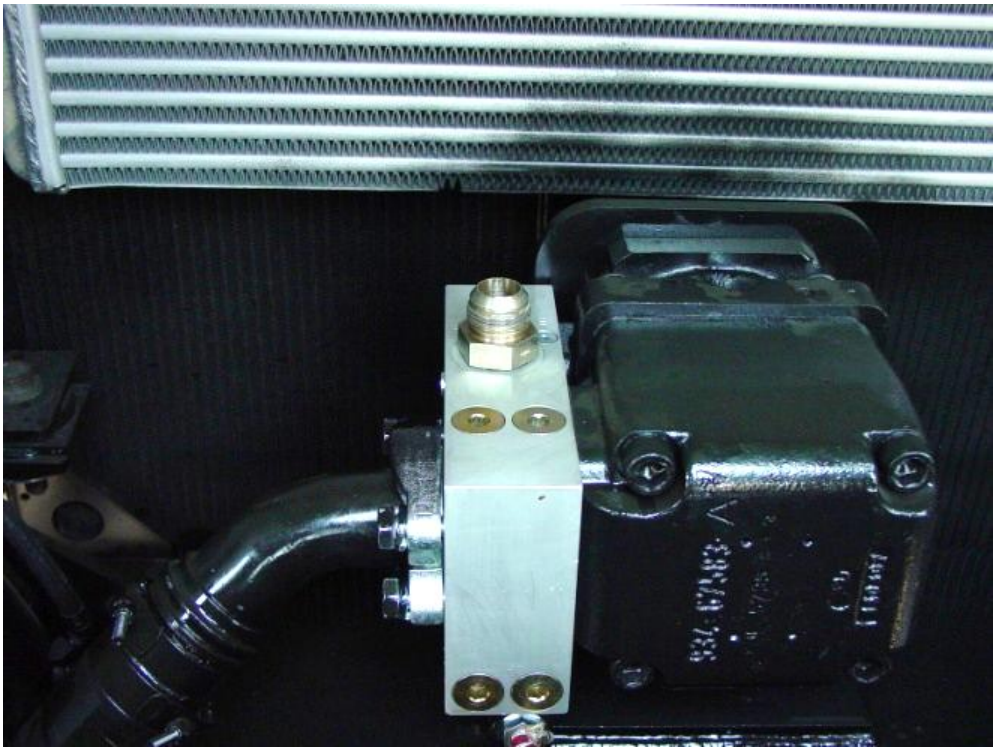


Figure 28.

28.Install one 90 degree elbow, 054-2988-10, on the straight connector.

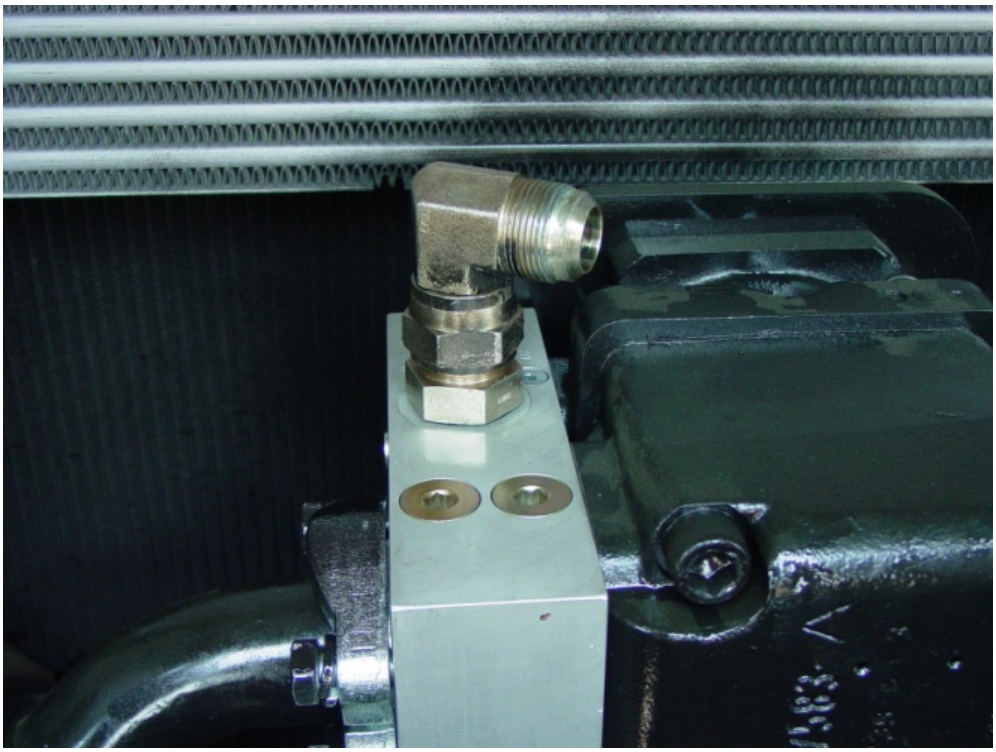


Figure 29.

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

29.Connect the one inch hydraulic pressure hose to the 90 degree elbow.

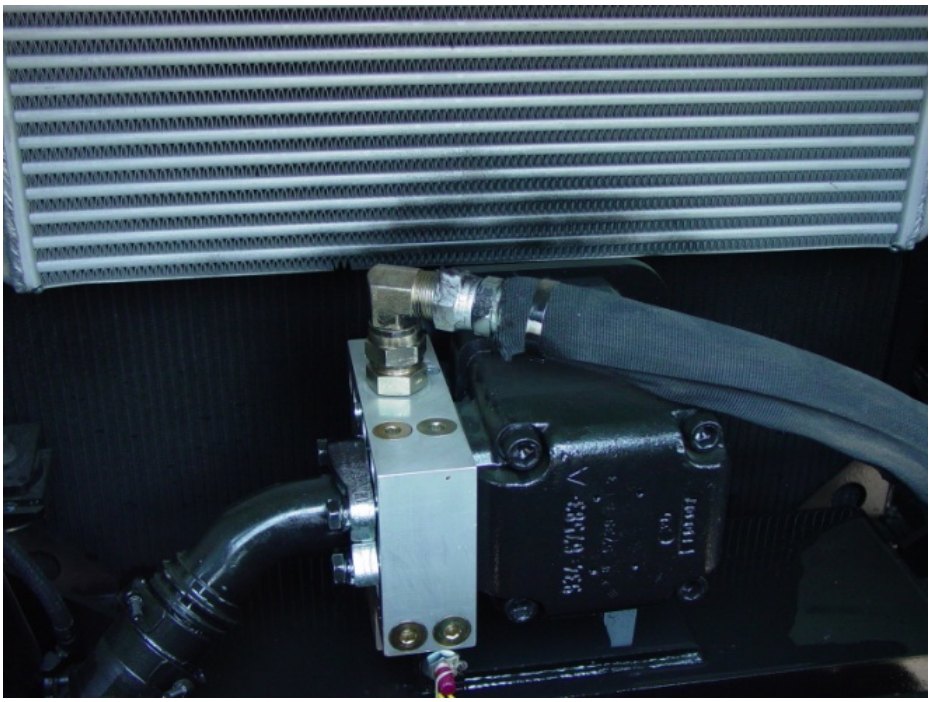


Figure 30.

30.Install the following two-way Packard connector to the two wires coming from the solenoid on the new shut-off valve:

- 1 ea – Two-way female connection
- 2 ea – Female terminal (18-20AWG)
- 2 ea – Cable seal (16-14 GA)

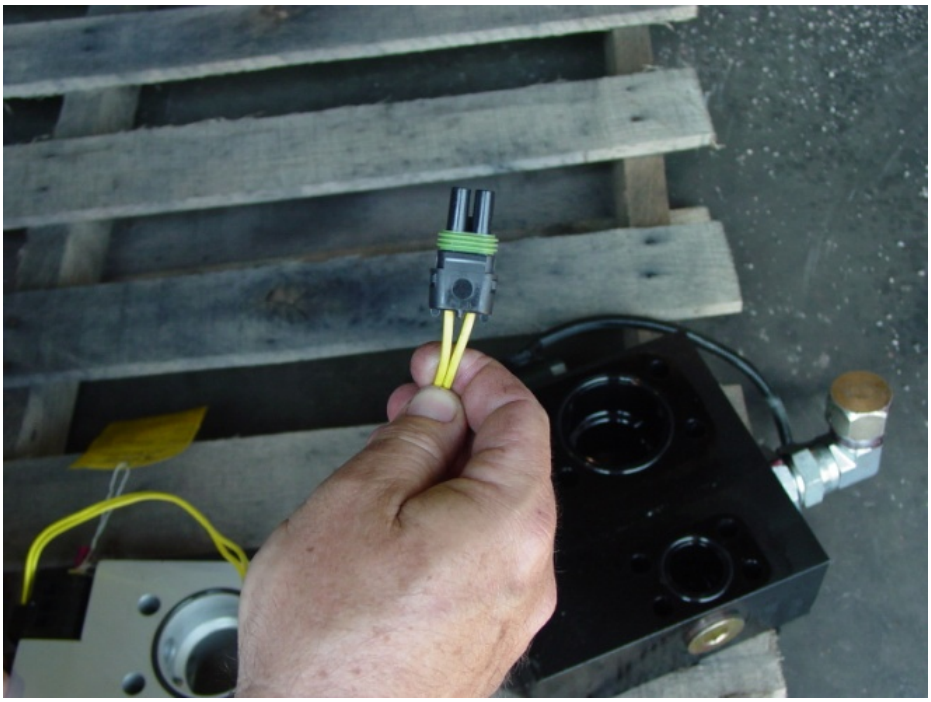


Figure 31.

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

31. Connect the new Packard connector to the original, matching Packard connector. Secure the excess wiring harness for the solenoid to the hydraulic pressure line with a zip tie.

Figure 32.

32. Attach the grill to the chassis.

Figure 33.

SINGLE PUMP REPAIR PROCEDURES (CONTINUED)

33.On the hydraulic oil pump, move the shut-off valve to the OPEN position and secure the valve with a zip tie.

Figure 34.

Figure 35.

TANDEM O.I.G.A.I. PUMP

Front Loaders, Rear Loaders, Recycle 2000, and Liberty

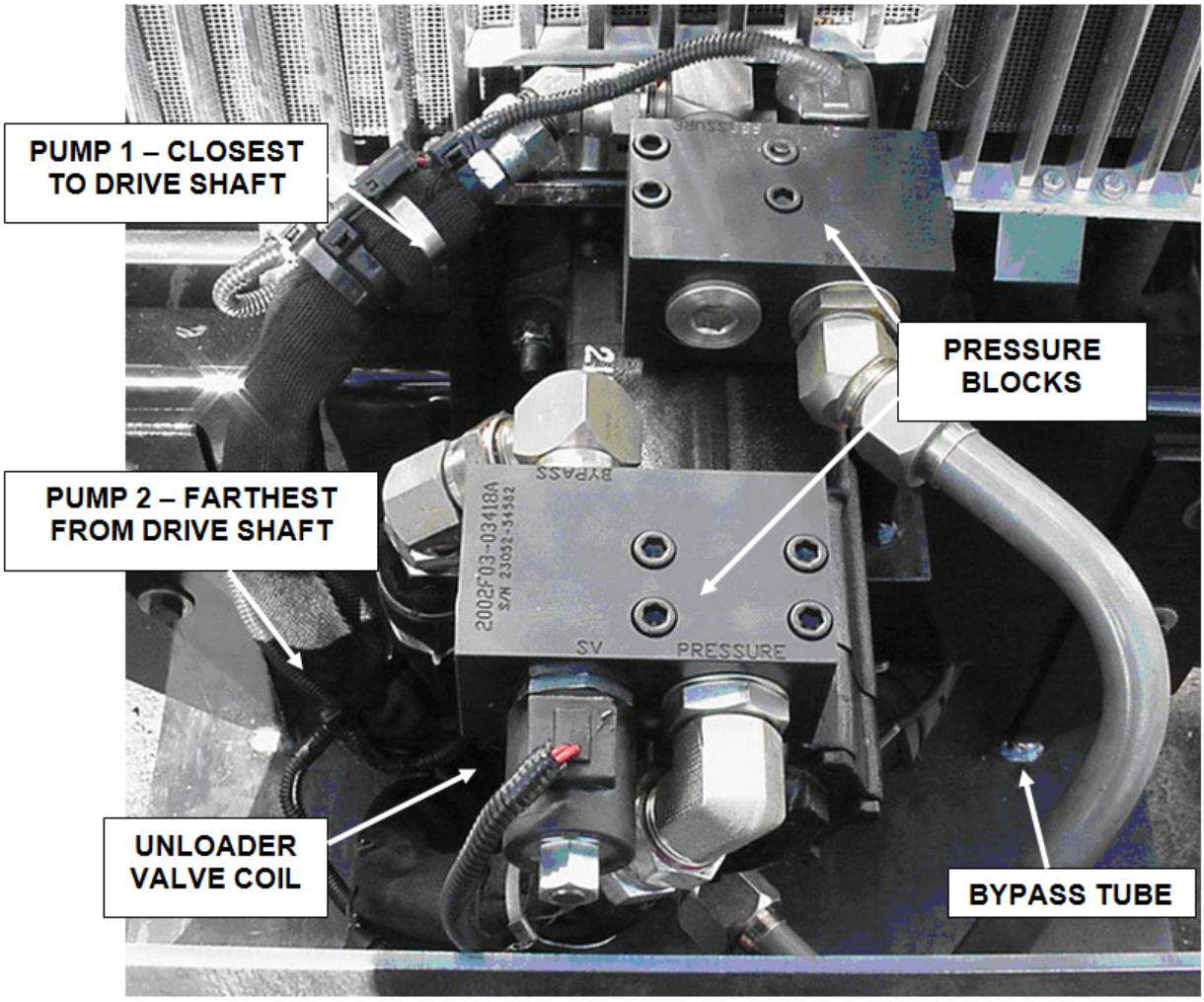


Figure 36. Tandem O.I.G.A.I. Pump

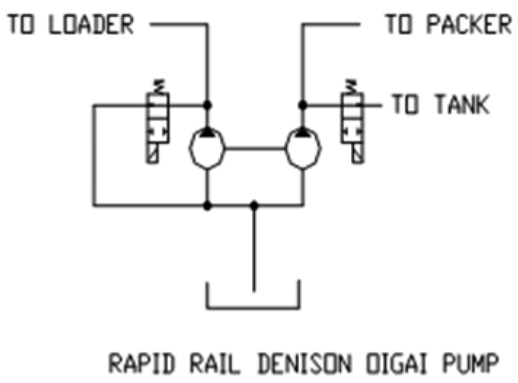


Figure 37.

This is the Hydraulic Controls Operate-In-Gear-At-Idle (OIGAI) System. The pump section (pump 1) closest to the input shaft operates the lift and shuts off first. The pump section (pump 2) farthest from the input shaft operates the packer and stays on at higher RPMs.

TANDEM VANE PUMP FRONT LOADER O.A.I. OPERATION

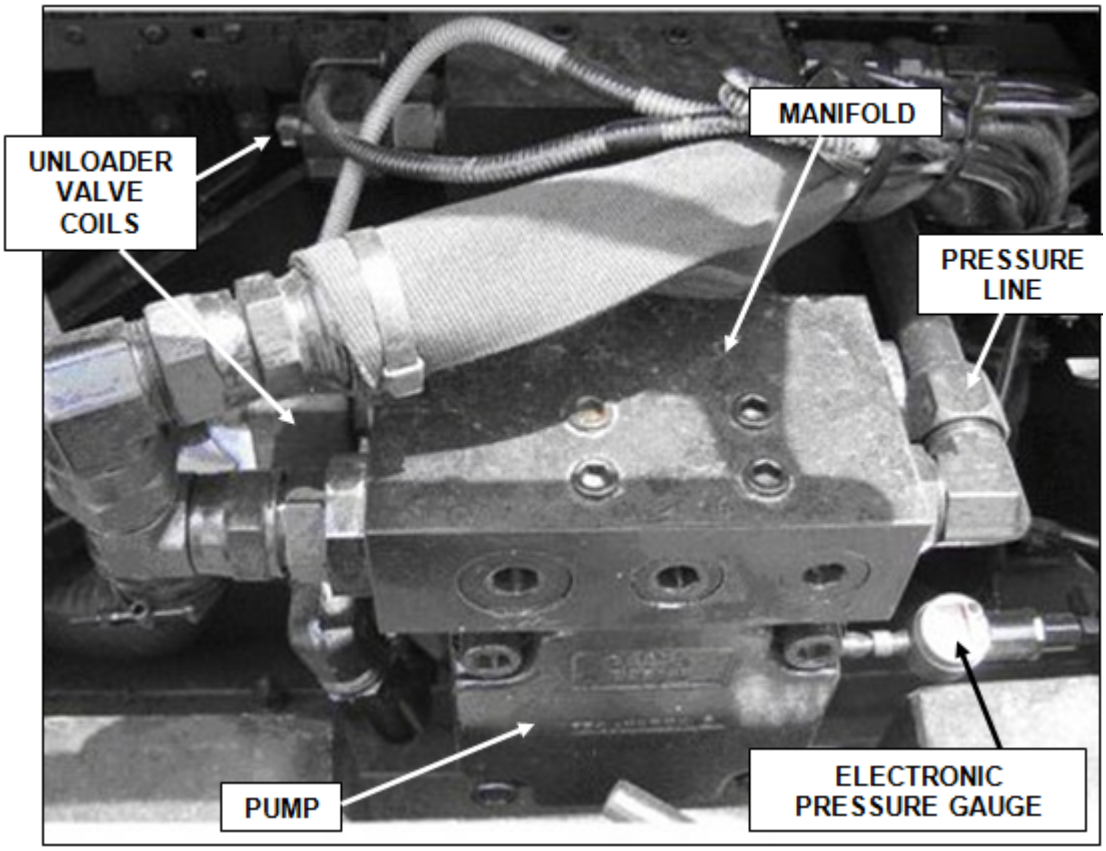
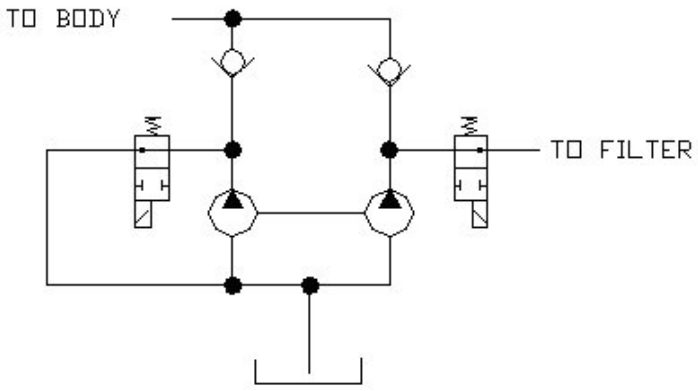


Figure 38.



The tandem pump with the pressure manifolds combines the flow of oil from both pumping sections to get normal cycle times for the packer and body functions at engine idle.

The pumping section closest to the pump input shaft (P1) shuts off first during higher RPMs. The pumping section farthest from the pump input shaft (P2) stays on longer during higher engine RPMs. The packer cycle time for units using this pump is fastest during engine idle up to 1050 RPM.

The separate pressure block manifolds contain two unloader valve and coil assemblies used to activate each respective pumping section and control the flow of oil directed to the hydraulic system.

HALF/PACK®
NOTES

SECTION 3
BODY AND TAILGATE

BODY NOMENCLATURE

The figure below shows the major components and their typical locations on the unit.

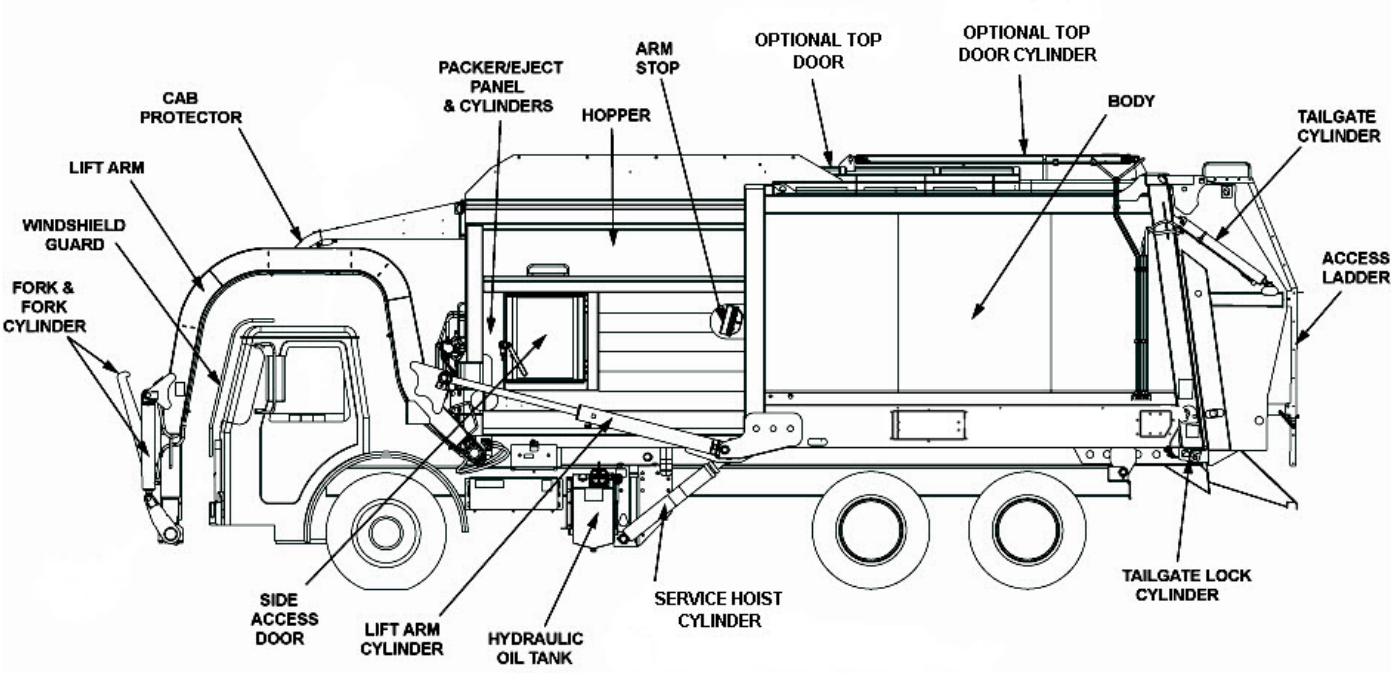


Figure 39. Body Nomenclature

TAILGATE NOMENCLATURE

The figure below shows the major tailgate components and their locations on the unit.

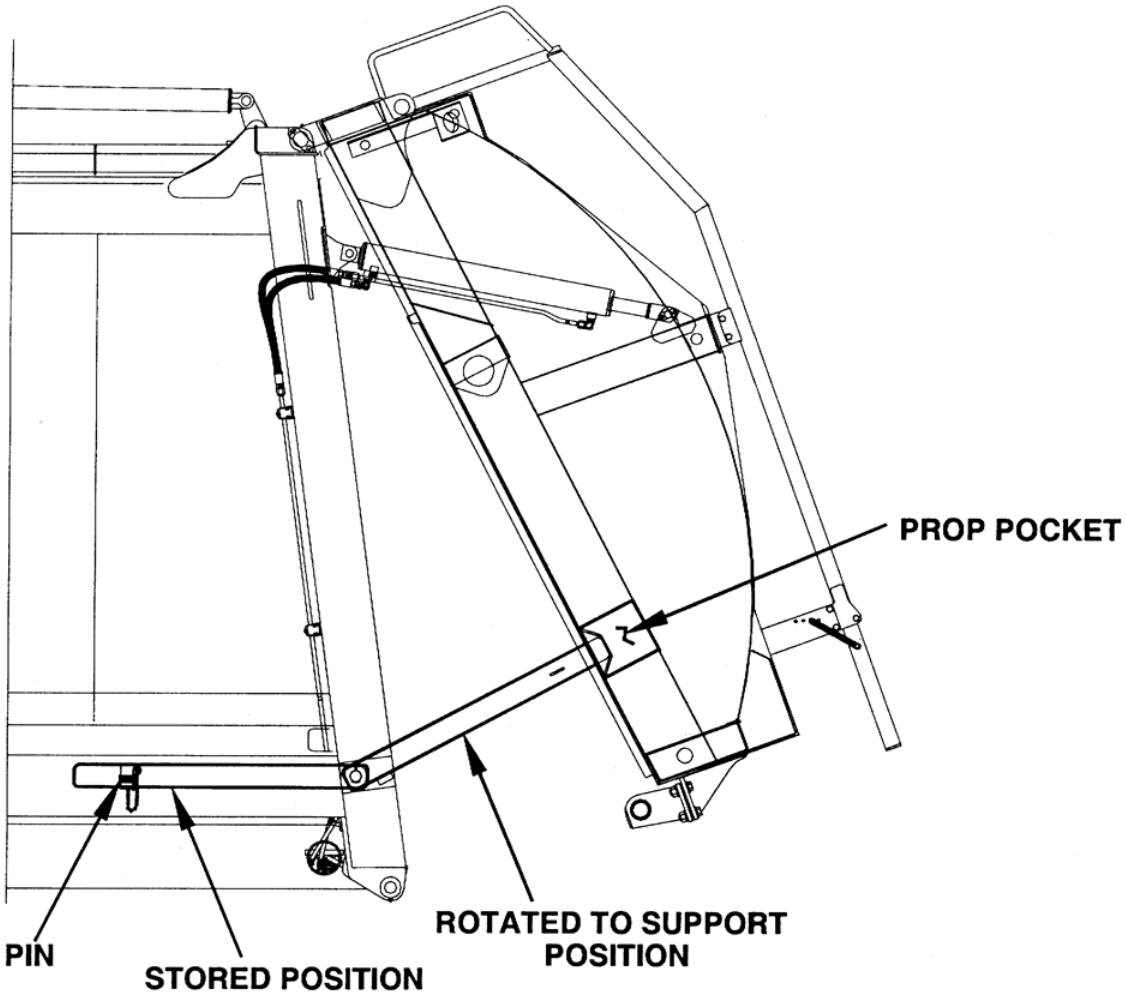


Figure 40. Tailgate Nomenclature

PROPPING THE BODY OF A SERVICE HOIST UNIT

Operators **MUST KNOW** how to **SAFELY** prop up the unit's body. You may need to prop the body up when you clean the inside of the body or for maintenance or repair procedures. Observe and obey the following DANGER and WARNING notices while you prop the body with the factory body props.

⚠ DANGER

Keep all parts of your body out from underneath the unit's body and away from the cylinders when raising or lowering the body. Serious injury or death will occur if the unit's body suddenly lowers and traps a part of your body.

⚠ DANGER

The unit may roll when you raise the body on unstable or uneven ground and cause serious injury or death to you or bystanders. Do not prop the body while the unit is on unstable or uneven ground. Clear the area of all people not necessary for this procedure and set the unit on stable and even ground before you start this procedure.

⚠ WARNING

Interconnected body props are installed on the unit. Both props MUST be used.

⚠ WARNING

Never drive the unit with the body propped.

NOTICE

Empty body of all refuse before using body props.

NOTICE

Units manufactured after April 2009 have the manual override valve. If you have not experienced problems with the service hoist, you may not need the override valve. If you have experienced problems with the service hoist, contact your Heil dealer or Heil.

PROPPING THE BODY OF A SERVICE HOIST UNIT (CONTINUED)

The factory-supplied body props are located on both sides under the body and forward of the rear wheels. Refer to the figure to the right and carefully follow the body propping procedures below.

☑ Follow These Steps to Raise the Body:

1. Empty body of all refuse.
2. Make sure that body is on firm, level ground with the Parking Brake engaged and holding and place chocks on the wheels.
3. CLOSE the manual override valve on the power unit – PUSH the knob IN and turn it CLOCKWISE.
4. Lock-Out/Tag-Out the unit.
5. Remove the bolts and springs from the chassis mounting brackets.

Figure 41. Removing Bolts and Springs from Chassis Mounting Brackets

6. If equipped with quick disconnects, uncouple prior to raising the body.
7. Make sure there is adequate slack in hoses that do not have disconnects. If there is not adequate slack in hoses that do not have disconnects, remove those hose clamps.
8. Observe and obey the DANGER labels for an elevated chassis.
9. PRESS and HOLD the UP button to RAISE the body.
10. RELEASE the UP button when the body is at the height you want.
11. Release the prop handles and LOWER the body props, then PRESS the DOWN button to lower the body onto the lugs.

PROPPING THE BODY OF A SERVICE HOIST UNIT (CONTINUED)

12. NEVER open the override valve when the body is elevated.
13. Perform the maintenance or service procedures.

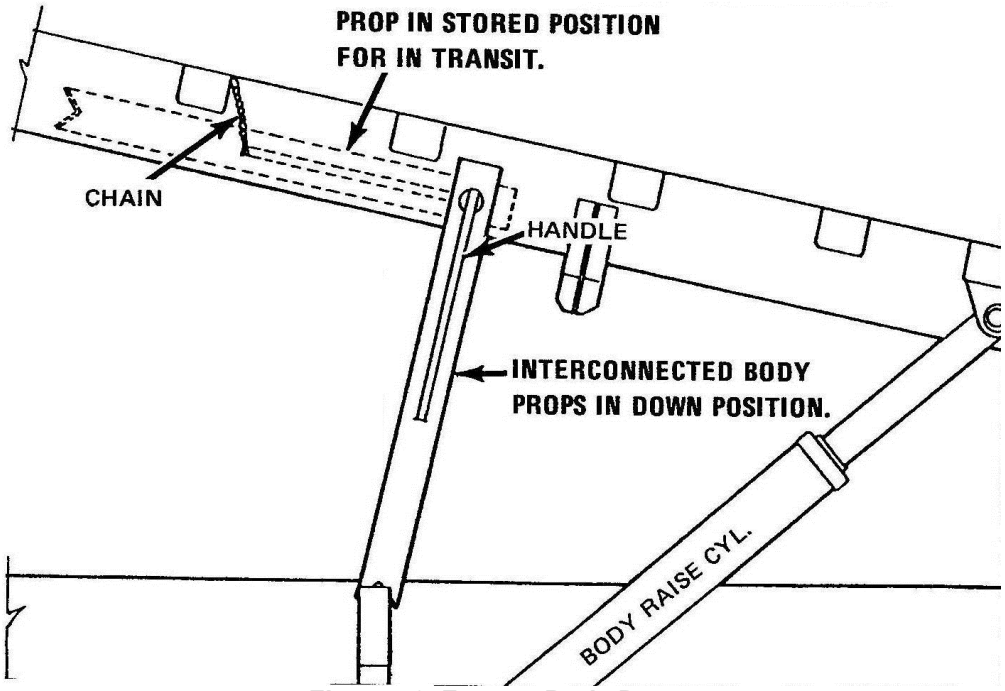


Figure 42. Factory Body Props

PROPPING THE BODY OF A SERVICE LIFT (SERVICEABLE EJECT) UNIT

Operators **MUST KNOW** how to **SAFELY** prop up the unit's body. You may need to prop the body up when you clean the inside of the body or for maintenance or repair procedures. Observe and obey the following DANGER and WARNING notices while you use a service lift to raise the body.

⚠ DANGER

Keep all parts of your body out from underneath the unit's body and away from the cylinders when raising or lowering the body. Serious injury or death will occur if the unit's body suddenly lowers and traps a part of your body.

⚠ DANGER

The unit may roll when you raise the body on unstable or uneven ground and cause serious injury or death to you or bystanders. Do not prop the body while the unit is on unstable or uneven ground. Clear the area of all people not necessary for this procedure and set the unit on stable and even ground before you start this procedure. Make sure all tire pressures are correct.

⚠ DANGER

All cranes, chains and cables used MUST be of adequate lift rating.

⚠ WARNING

Never drive the unit with the body propped.

NOTICE

Empty body of all refuse before raising the body with a service lift.

PROPPING THE BODY OF A SERVICE LIFT (SERVICEABLE EJECT) UNIT (CONTINUED)

The factory-supplied body props are located on both sides under the body and forward of the rear wheels. Refer to the figure to the right and carefully follow the body propping procedures below.

☑ Follow These Steps to Raise the Body:

1. Empty body of all refuse.
2. Make sure that body is on firm, level ground with the Parking Brake engaged and holding and place chocks on the wheels.
3. **Lock-Out/Tag-Out** 15 the unit.
4. Remove the bolts and springs from the chassis mounting brackets. See the figure below.

Figure 43. Removing Bolts and Springs from Chassis Mounting Brackets

5. Disconnect all wire harnesses, hydraulic hoses, and air lines that would prevent the body from raising or be damaged by the body raising.
6. Observe and obey the DANGER labels for an elevated chassis.
7. Connect a chain or cable sling with hooks from the front body chain hook lugs to an overhead crane, truck crane or other lifting device having adequate capacity to safely lift the body.

PROPPING THE BODY OF A SERVICE LIFT (SERVICEABLE EJECT) UNIT (CONTINUED)

8. Using the lifting device, slowly lift the body in a controlled manner high enough to lower the factory body props. See the figure below.

44. Front Body Chain Hook Lugs

9. RELEASE the prop handles and LOWER the body props. See the figure below.

Figure 45. Release and Lower Factory Body Props

PROPPING THE BODY OF A SERVICE LIFT (SERVICEABLE EJECT) UNIT (CONTINUED)

10. Using the lifting device, slowly lower the body in a controlled manner until the body is resting on the prop stands. See the figure below.

46. Release and Lower Factory Body Props

11. Perform the maintenance or service procedures.

☑ Follow These Steps to Lower the Body:

1. Observe and obey the DANGER labels for an elevated chassis.
2. Connect a chain or cable sling with hooks from the front body chain hook lugs to an overhead crane, truck crane or other lifting device having adequate capacity to safely lift the body.
3. Using the lifting device, slowly lift the body in a controlled manner high enough to raise (store) the factory body props.
4. Using the lifting device, slowly lower the body in a controlled manner until it is resting on the chassis frame.
5. With the body completely down and resting on the chassis, remove the cable or chain.
6. Reconnect all wire harnesses, hydraulic hoses, and air lines that were disconnected.
7. Install the bolts and springs to the chassis mounting brackets.

TAILGATE SUPPORT PROPS

Two support props are on the unit and must be used whenever the tailgate is opened for service or maintenance. Both props must be used.

⚠ DANGER

A tailgate in motion is dangerous. Serious injury or death may occur if a person is struck by a moving tailgate or becomes trapped between the tailgate and the body. Clear the area near the tailgate of all unnecessary people before you lower the tailgate.

⚠ CAUTION

Two props are installed on the unit. Both props must be used!

A. How to Use the Tailgate Props

1. Set unit on flat, stable ground, apply the parking brake, and chock the wheels.
2. Make sure the area around the tailgate is clear of all people.
3. **UNLOCK** the tailgate. Make sure the tailgate unlock flags are down (if equipped).
4. Use the tailgate raise lever or rocker switch in the cab (if equipped) and **RAISE** the tailgate enough to **RELEASE** and **ROTATE** the props so that you can **SECURE** each prop on its prop pin on each side of the tailgate.
5. **LOWER** the tailgate until you can **SECURE** each prop on its pin.
6. Turn **OFF** the engine and **REMOVE** the ignition key.
7. Put the unit in the **Lock-Out/Tag-Out** 15 mode.

B. How to Store the Tailgate Props

1. When you finish using the props, take the unit out of the Lock-Out/Tag-Out mode, insert the ignition key and start the engine.
2. **RAISE** the tailgate enough so that you can **REMOVE** each prop bar from its pin, then **ROTATE** each prop so that you can **PUT** the props in the **STORED** position.
3. **SECURE** each prop with a pin.
4. **LOWER** the tailgate until it is completely **CLOSED**.
5. **LOCK** the tailgate.

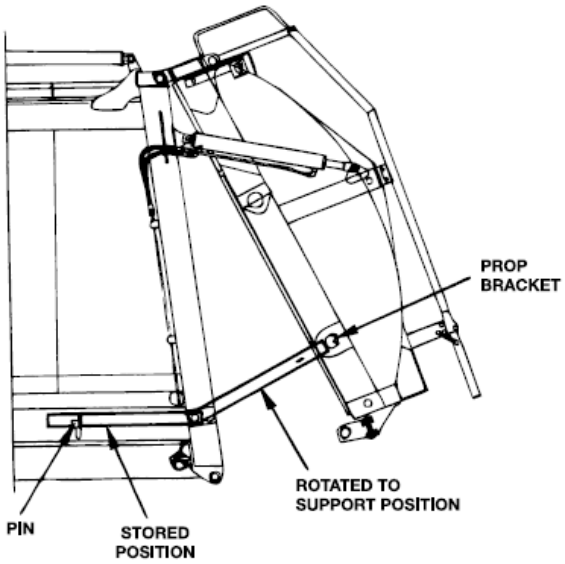


Figure 47. Tailgate Support Props

SIDE ACCESS DOOR

A hinged access door is located on the street side of the unit and provides access to the body area for cleanout purposes. Never enter the door unless the truck engine is stopped, the ignition key is removed, and the unit is in **Lock-Out/Tag-Out mode** 15. See the figure below.

⚠ WARNING

Make sure the unit is in the Lock-Out/Tag-Out mode when you do maintenance or service procedures, or when you go in the hopper, climb in or on the body or on equipment. Equipment can be operated when the unit is not in the Lock-Out/Tag-Out mode. When the unit is not in the Lock-Out/Tag-Out mode, equipment operated while you do maintenance or service procedures, go in the hopper or climb in or on the body or on equipment can cause serious injury or death.

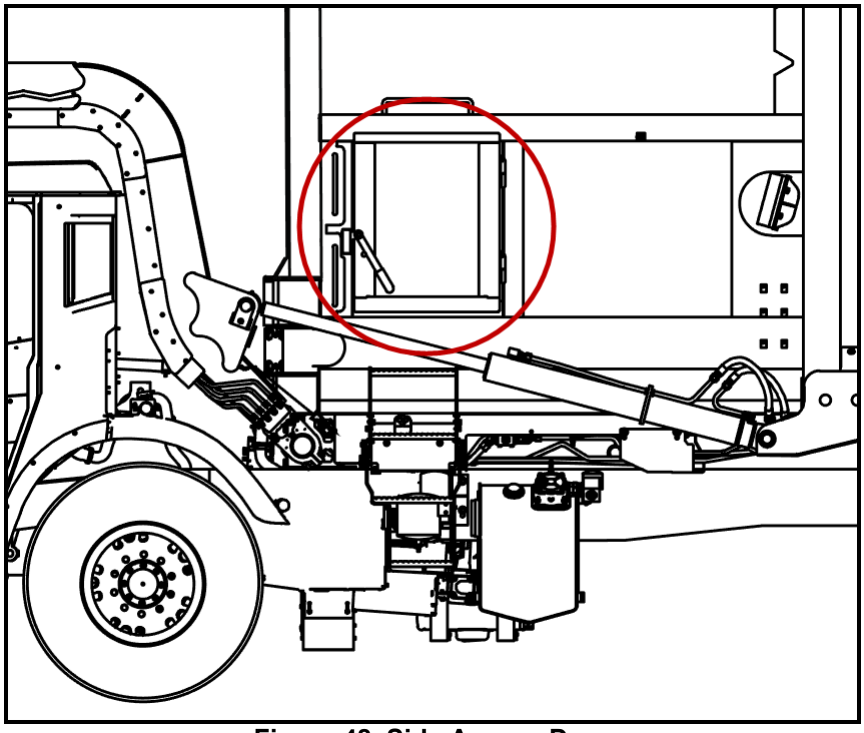


Figure 48. Side Access Door

SIDE ACCESS DOOR PROXIMITY SWITCH

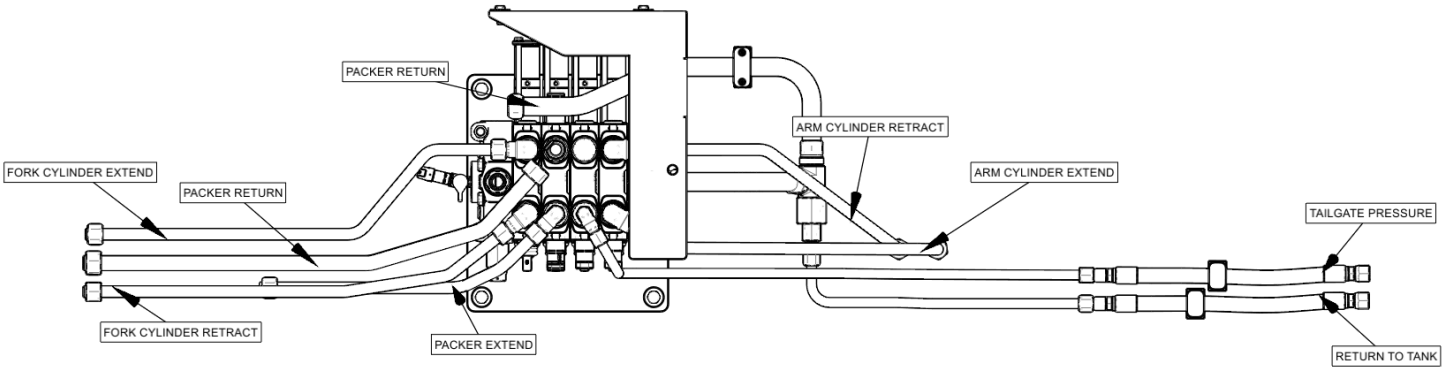
One 18mm sourcing or sinking proximity switch located by the side access door. This switch is adjusted properly when the sensing gap between switch and target is 1/8”. See the figure below.

NOTICE

Side door must be closed and latched prior to adjustment of the side door proximity switch.

Figure 49. Side Door Proximity Switch

BODY VALVE FUNCTIONS



SUMP DOORS

A sump with a door is located on both sides of the front head of the unit. The sump area may be cleaned out by opening the door and using the sump tool.

Doors should be closed at all times except when cleaning out. See the figure below.

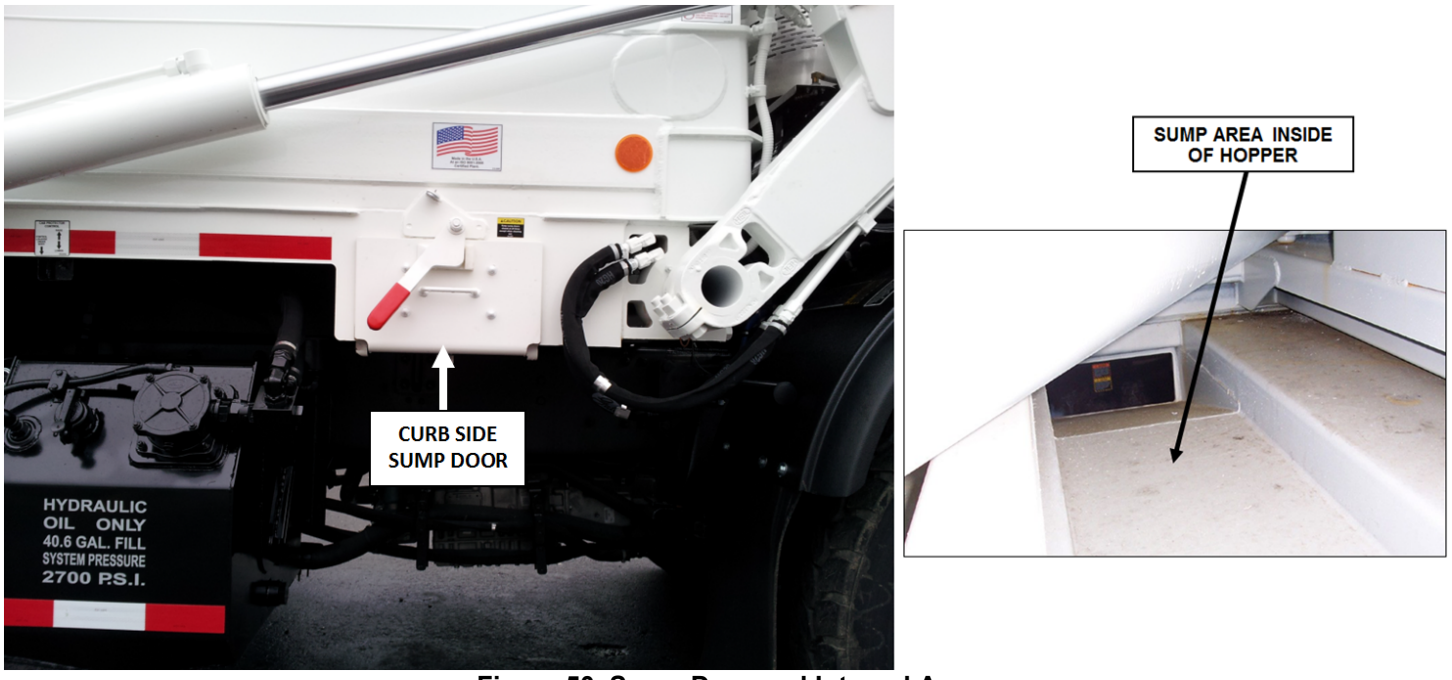


Figure 50. Sump Door and Internal Area

INSTRUCTIONS OF INSPECTION FOR OVER-PACKING

Use the instructions that follow and perform the inspections necessary and any necessary actions due to damage to the unit from over-packing.

Note: These instructions are for the Freedom body only.

A. Prepare the Unit for Inspection of Cracks

1. Before performing the inspections, you must set up the unit.
2. Clear the area around the unit of all unnecessary people and equipment.
3. Start the engine and let the hydraulic oil warm up to at least 100° F. Monitor the temperature sight gauge for the

temperature of the hydraulic oil. When the unit is in a cold-weather climate and the ambient air temperature is below 0° F, follow the procedures in the Operator's and Service for **Cold Weather Warm-Up Procedure** 17.

⚠ DANGER

A tailgate in motion is dangerous. Serious injury or death can occur if a person is struck by a moving tailgate or becomes trapped between the tailgate and the body. Clear the area near the tailgate of all unnecessary people before you lower the tailgate.

⚠ DANGER

Always prop the tailgate when you must leave it raised for maintenance, service, or cleaning procedures. Placing any part of your body between the unit's body and the tailgate at any time, including while you prop the tailgate or when the tailgate is propped, is dangerous. Serious injury or death can occur if any part of your body is between the tailgate and the body if the tailgate suddenly closes.

4. After the hydraulic oil is warm, MOVE the TAILGATE LOCK/UNLOCK switch to the UNLOCK position.
5. MOVE the TAILGATE RAISE/LOWER switch to the RAISE position and RAISE the tailgate sufficiently to use the tailgate props.
6. SET the tailgate props.

⚠ DANGER

Make sure no one is in the hopper and body before you operate the packer. Serious injury or death can occur if a person is in the hopper or body while the packer moves. Make sure there is no equipment in the hopper and body. Equipment in the hopper or body can damage the unit when the packer moves.

7. Make sure the packer is in the fully RETRACTED position. If it is not, PRESS the PACKER RETRACT button and fully RETRACT the PACKER.
8. Turn the engine OFF.
9. After you set up the unit, you must put the unit in a Lock-Out/Tag-Out mode.

B. Lock-Out/Tag-Out

Put the unit in a Lock-Out/Tag-Out condition. See Service Manual Section 1 for Lock-Out/Tag-Out information.

NOTICE

If your employer or company has Lock-Out/Tag-Out procedures that are different from the following procedures, use your employer's or company's procedures. If your employer or company does not have Lock-Out/Tag-Out procedures, use the procedures that follow. Contact your supervisor if you have any questions about Lock-Out/Tag-Out procedures. If your supervisor has any questions, that person can contact ESG Technical Service.

INSTRUCTIONS OF INSPECTION FOR OVER-PACKING (CONTINUED)

C. Over-Packing Inspections

1. Thoroughly clean the inside and outside of the body before you inspect the unit for cracks.
2. Inspect for cracks in the metal of the unit as shown in the following illustrations. (The red dots indicate the inspection points.) Check both sides of the body.
   a. For Point 1, check inside of body where the Packer track meets front hopper head.
   b. For Points 2 and 3, check underneath the body:
      (1) For Point 2, check the top edge of cross shaft lug attachment to floor sheet
      (2) For Point 3, check the longmember to front subframe crossmember corner.
   c. For Points 4 and 5, check:
      (1) For Point 4, check the lower joint at which the three bolsters shown meet
      (2) For Point 5, check around the boss for the pin to attach the arm cylinder.
   d. For Point 6, check the upper joint at which the three bolsters shown meet.
   e. For Point 7, check the body side at the center of the body and the bend in the body side sheet.
   f. For Point 8, check the end of the bolster on the body side.
   g. For Point 9, with the tailgate open, check the back surface of the rear body bolster.
   h. For Point 10, check the body roof sheet in the corner. See the figure on the next page.

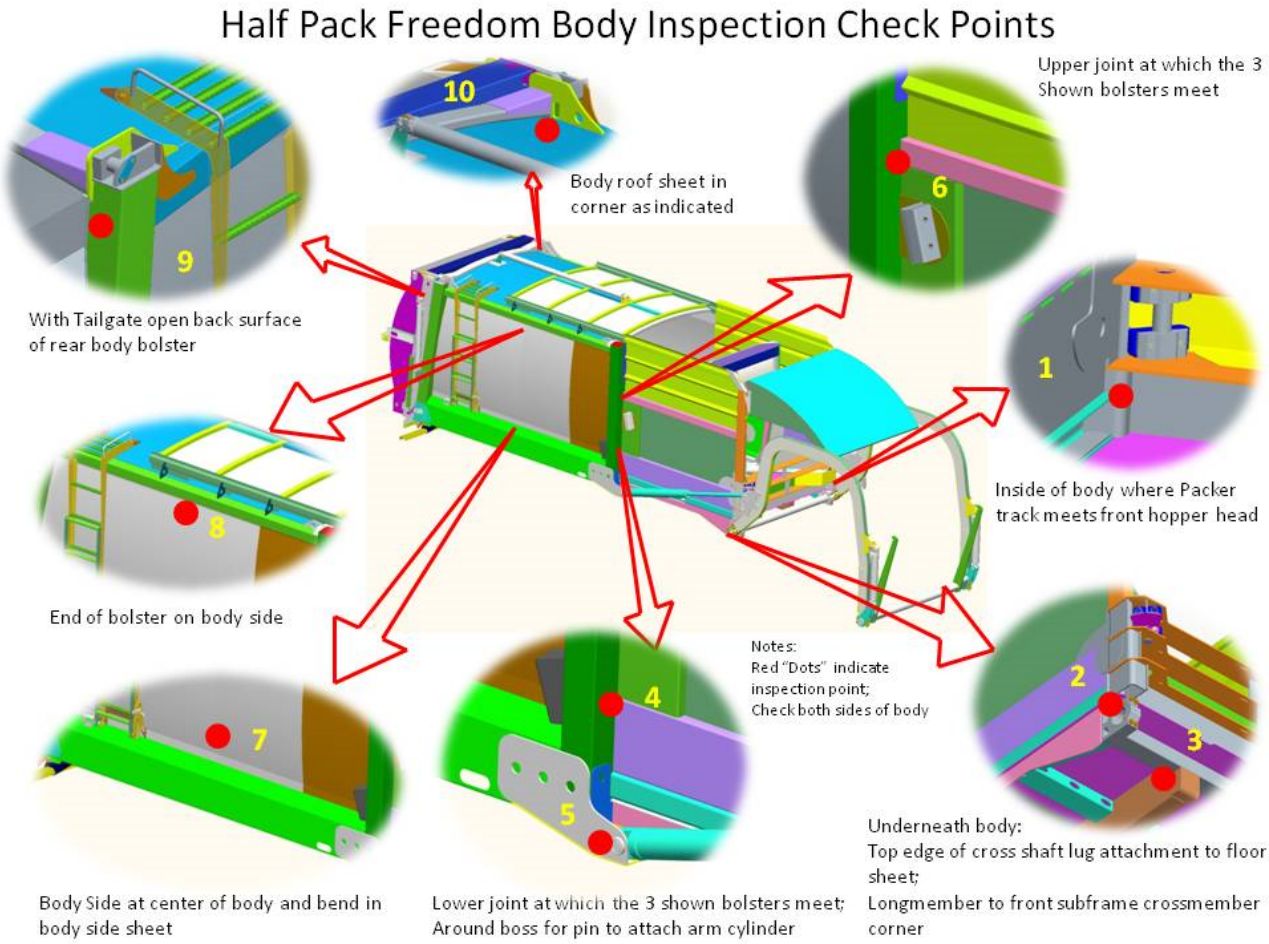


Figure 51. Front Loaders Body Inspection Check Points

INSTRUCTIONS OF INSPECTION FOR OVER-PACKING (CONTINUED)

C. Over-Packing Inspections (Continued)

3. If cracks are visible, contact your Heil dealer or Heil for recommended countermeasures. Continued operation of a vehicle with cracks can lead to detrimental damage to the structure that may or may not be repairable.
4. If consistent over-packing is suspected, do the following.
   (a) Inspect for cracks in the metal of the body as given above on a monthly (200 hours) basis.
   (b) Give additional operator training on proper allowable payloads.
   (c) Recalibrate the HOPS.
   (d) Confirm proper pressure settings in the body. Refer to Paragraph A.
5. If no metals cracks are found, keep the unit in the Lock-Out/Tag-Out mode and go to Paragraph 4.

WELDING AND ELECTRONIC DEVICES / ELECTRICAL LUBRICANTS

Before welding on any unit with electronic devices like the Cortex Controller™ and proximity switches, complete the following procedures.

⚠ WARNING

Never weld on a compressed natural gas vehicle unless the compressed natural gas fuel system has been purged with inert gas. See Service Manual Section 1.

- Disconnect all battery connections.
- Place welding ground as close as possible to the area that is being repaired.
- Disconnect the Cortex Controller.
- If welding within 24 inches of a proximity switch, remove the switch from the unit.

NOTICE

Failure to follow these procedures may cause damage to the devices. The damage comes from the inability of the devices to withstand the amperage, open circuit voltage and magnetic flux a welder can produce.

Electrical Anti-Corrosion Lubricant

It is very important that all packard connectors are properly lubricated. The following compounds, by brand name or functional equivalents, are approved for use.

- Truck-Lite Corrosion Preventive Compound
- GB ox-gard, anti-oxidant compound
- Burndy Penetrox A electrical joint compound.

These lubricants may be obtained at an electrical supply store.

HALF/PACK®
NOTES

SECTION 4
MAINTENANCE AND ADJUSTMENT

BODY DAILY CHECKLIST

Make sure you perform a daily check of the unit. Refer to the Operator's Manual for the Daily Checklist. Many checks in the Daily Checklist are maintenance related, such as checking tire pressures and hoses for wear and damage.

DAILY CHECKLIST MAINTENANCE ITEMS	
Item	Required Action
Low air pressure in tires	Inflate the tire to the correct air pressure given on the tire.
Worn tire	Replace when the wear is greater than allowed by law or before the tread is no longer visible.
Damaged tire	Replace immediately BEFORE going on route.
Hydraulic pump leaks	Determine the cause of the leak and repair immediately.
Damaged hydraulic pump	Repair or replace IMMEDIATELY.
Loose or missing hardware for the hydraulic pump	Tighten loose hardware. Replace missing hardware immediately.
Damaged decal or decal not readable	Replace decal immediately.
Low level of hydraulic oil	Fill the hydraulic oil tank immediately.
Worn or damaged hoses	Replace immediately.
Leaks at cylinders, hoses or fittings	Tighten loose connection.
Loose or missing hardware	Tighten loose connections. Replace missing hardware.
Worn fiber guards	Replace hoses/fittings as necessary. Install new fiber guard on new hoses.
Worn or damaged tailgate lock components	Replace worn or damaged components.
Loose or missing tailgate lock hardware	Tighten loose hardware. Replace missing hardware.
Damaged tailgate seal	Replace seal.
Body structure has loose or missing hardware	Tighten loose hardware. Replace missing hardware.
Body structure has cracked weld joints	Repair immediately.
Body mounting brackets have loose hardware, damaged hardware or cracked welds	Tighten loose hardware. Replace missing hardware. Repair cracked welds.
Air regulator	90 PSI, typically located at front of body.
Operation	Operate All Functions to make sure all functions work correctly.

BODY PREVENTIVE MAINTENANCE CHART

Preventive maintenance must be performed to ensure the safe and reliable operation of your unit. Use the chart below as a guideline for when essential items should checked and serviced. Severe use or adverse conditions may require more frequent maintenance.

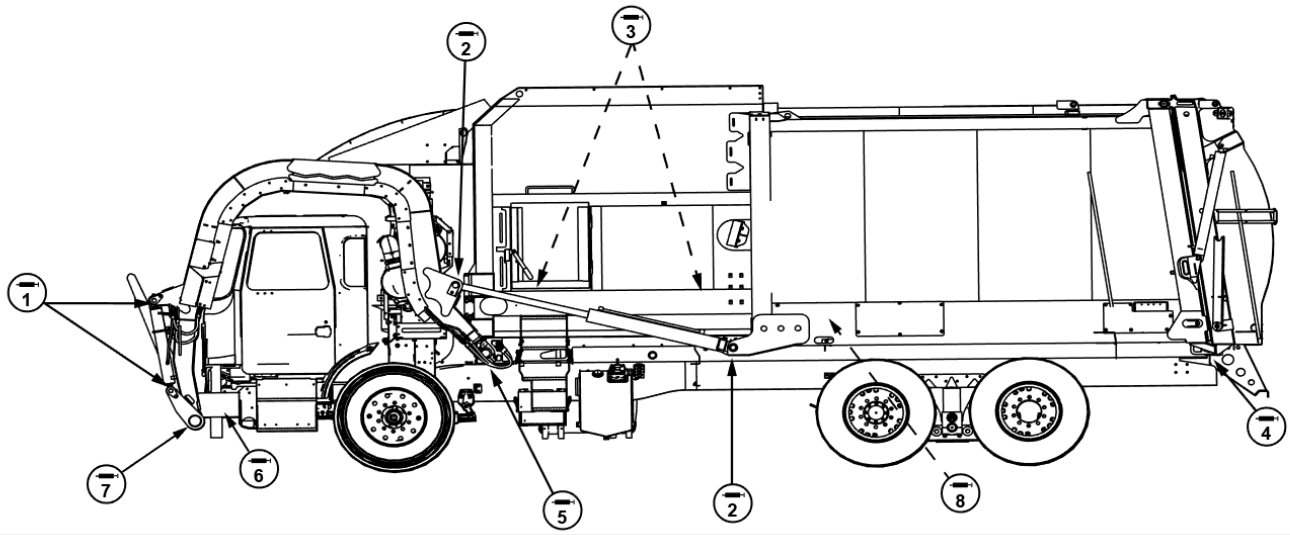
BODY PREVENTIVE MAINTENANCE CHART						
	*HOURS OF OPERATION					
COMPONENT/SYSTEM	**8**	**40**	**200**	**1000**	**2000**	**CHECK/SERVICE**
Hydraulic System	☑					Check oil level – add if necessary
		☑				Check cylinders, pump, hoses, tubes, fittings, and adapters for leaks. Check hoses for cracks, crushes, and cover blisters. Repair or replace if necessary with genuine Heil parts. Any replacement hose should be the same size and pressure rating as listed on the original OEM hose.
		☑				Check Control valve seals for leaks. Repair or replace if necessary.
				☑		Replace filter(s) after first 30 days of operation, then every 6 months or 1000 hours of operation OR when filter bypass light is ON.
				☑		Replace tank breather filter every time you replace filter element.
					☑	Drain, flush, and refill. Change filter element(s). Change oil when oil sample shows to change oil.
	When the hydraulic oil analysis shows the oil has expired					Drain, flush, and refill the hydraulic oil. Change filter element.
Electrical, Battery Cables	☑					Check for proper operation.
		☑				Check battery cables from battery to starter for loose cables, rubbing or damage and abrasions to cables. Replace if necessary.
Operator Controls	☑					
Front Mount Pump or Power Take-Off (PTO)		☑				Check seals for leaks and operation. Replace if necessary
		☑				Check drive line for smooth operation. Replace as necessary.
		☑				Check set screws for tightness. Tighten as necessary.
		☑				Make sure keys are in place. Replace if necessary.
			☑			For greaseable PTO's (non-wet spline), remove the pump's bolt flange about 2 inches from the PTO and apply grease to female pilot of PTO pump flange. Failure to lubricate

BODY PREVENTIVE MAINTENANCE CHART						
*HOURS OF OPERATION						
COMPONENT/SYSTEM	**8**	**40**	**200**	**1000**	**2000**	**CHECK/SERVICE**
						female pilot of PTO as given may cause damage to the pump shaft. Greasing is NOT required on wet spline PTO's such as the Chelsea 890/897 series.
Grease Fittings		☑				Lubricate as shown on **Body Lubrication Decal** 75.
Body Undercoating					☑	Inspect body undercoating and repair as necessary.
Fork Bearing Block Bolts			☑			Each of the four fork bearing block bolt torques should be 460 Ft-Lbs.
Tailgate Seal Integrity	☑					
Packer/Ejector Cylinder Preventive Maintenance	☑	☑	☑			See **Packer/Ejector Cylinder Preventive Maintenance.** 76
Packer/Ejector Panel Bolt-in Cylinder Mount Bolts			☑			Check for tightness. Bolt torques should be 192 Ft-Lbs. (lubricated threads)
* Daily = 8 hrs. Weekly = 40 hrs. Monthly = 200 hrs. 6 Months = 1000 hrs. Yearly = 2000 hrs.						

BODY LUBRICATION GUIDE

Clean fittings before applying grease and always pump enough grease into joint to remove the old grease. Wipe off excess grease. Lubricate moveable mechanical parts without fittings every 60 days with non-detergent engine oil.

HALF/PACK® BODY LUBRICATION GUIDE



REF NO.	DESCRIPTION	QTY.	FREQUENCY	REF NO.	DESCRIPTION	QTY.	FREQUENCY
1	FORK CYLINDERS	4	WEEKLY/EVERY 40 HOURS	5	ARM CROSS SHAFT	4	WEEKLY/EVERY 40 HOURS
2	ARM CYLINDERS	4	WEEKLY/EVERY 40 HOURS	6	PUMP DRIVE SHAFT	2	WEEKLY/EVERY 40 HOURS
3	PACKER/EJECTOR CYLINDERS	4	WEEKLY/EVERY 40 HOURS	7	FORK CROSS SHAFT	2	WEEKLY/EVERY 40 HOURS
4	SHUR-LOCK TAILGATE CYLINDER BRACKET	2	WEEKLY/EVERY 40 HOURS	8	PACKER PANEL TRACKS	2	MONTHLY/EVERY 200 HOURS

Use No. 1 pressure gun grease. Clean fittings before applying grease and always pump enough grease to remove old grease. Wipe off excess.

Lubricate moveable mechanical parts without fittings every 60 days with non-detergent engine oil.

212-3406

PACKER/EJECTOR CYLINDERS PREVENTIVE MAINTENANCE

It is critical to follow the guidelines of the **Body Preventive Maintenance Chart** and **Body Lubrication Guide** found in this section of this Service Manual and the Body Lubrication Guide decal on the unit. Failure to follow stated routine preventive maintenance can lead to premature cylinder failure that is not covered by your warranty.

⚠ WARNING

Make sure that the unit is in Lock-Out/Tag-Out mode before you perform maintenance/service procedures, or when you enter or climb on the hopper/body/related assemblies. Equipment is operational when the unit is not in Lock-Out/Tag-Out mode. Equipment operated while you do maintenance or service procedures can cause serious injury or death so also make sure to clear the area around the unit of all bystanders.

⚠ CAUTION

Failure to follow these instructions can result in damage to the Heil body, truck chassis or can cause personal injury!

HEIL PACKER/EJECTOR CYLINDERS PREVENTIVE MAINTENANCE CHART

DAILY	WEEKLY	MONTHLY
• Using a plastic bladed shovel, clean behind the packer panel and pockets around sphericals. DO NOT damage cylinder rods by striking with any metal object. • Visually inspect that lube lines (if equipped) are connected and not damaged or leaking. • Visually inspect packer tracks and hopper floor for excessive wear or damage. Repair or replace if necessary.	• Grease Packer/Ejector cylinder spherical bearings/ pins • Inspect packer/ejector cylinder bearings/pins (both ends) for wear, rust or damage and replace if necessary.	Perform the operational “Checks and Inspections” found in the Operation Manual. If unit recalibration is required, refer to Arc Sensor Calibration 104 in Service Manual.

Side Loading and Premature Cylinder Failure can be caused by:

- Inadequate greasing intervals
  - causing increased friction at spherical bearings
  - potentially resulting in seizing of spherical bearings
- Packing into the second stage of a multistage cylinder
- Binding of components caused by debris (see figure to right)

PACKER/EJECTOR PANEL ADJUSTMENT

Follow this procedure and refer to the figure below to adjust the Packer/Ejector for Autopack units.

NOTICE

Failure to maintain proper adjustment may affect payloads and/or cause structural damage to the unit.

Packer/Ejector Panel adjustment may be needed when the arc sensor for the packer is changed or is needed to be re-calibrated. Calibration should be performed ONLY by authorized service personnel. See **Arc Sensor Calibration** 104 for more information.

CYLINDER SENSORS

Half/Pack uses high pressure proximity sensors (Part Number 063-0151) inside the tailgate lock cylinders (QTY 2), tailgate raise cylinder (QTY 1), and top door cylinder (QTY 1).

Proximity Switch Adjustment

All Proximity Switch Adjustments, for safety reasons, must be made with any container removed (if equipped) and disconnected from the unit/truck. Unit should be on level ground. Clear the area around the unit of all unnecessary people and equipment. It is strongly recommended that the truck be quarantined from other units and uninvolved personnel outside the shop area when adjusting the Proximity Switches on the unit. The person making adjustment must know how to safely operate the unit and fully understand the adjustment he/she is making. The use of a spotter may be needed when cycling the arms and forks.

Commercial and Residential

- Arms Up Proximity Switch
- Lift Below Transit Proximity Switch

Residential Only

- Forks Roll Proximity Switch
- Forks Level Proximity Switch
- Arms Down Proximity Switch
- Autolift
- Forks Clear Proximity Switch

MTS SENSOR CONNECTOR REPLACEMENT (BOLTED FLANGE DESIGN)

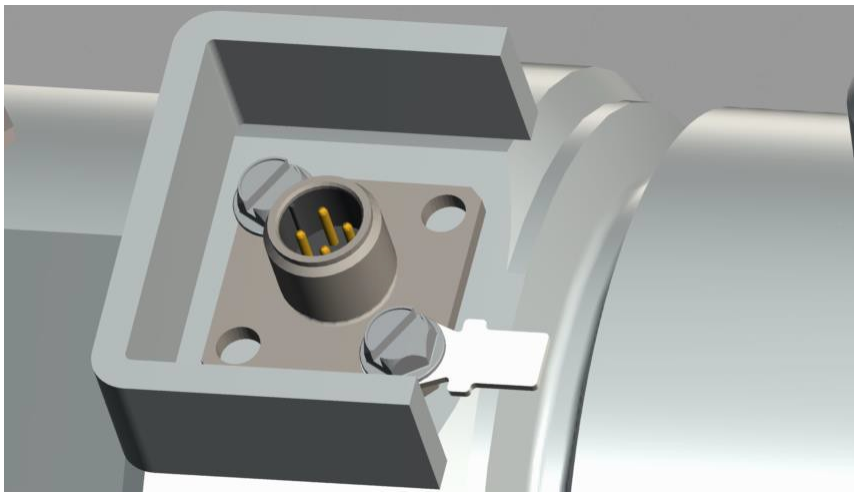
Required Equipment:

- Soldering iron and solder
- Heat-shrink tubing suitable for 20AWG wire, cut into 1/2” lengths
- Replacement connector kit (Heil Part Number 001-7064-105)
- Heat gun
- Wire cutter/stripper
- Flat-head screwdriver, Phillips screwdriver, 1/16” hex key, or 1/4” nut driver (depending on the fastener used to connect the flange body to the cylinder)

MTS SENSOR CONNECTOR REPLACEMENT (BOLTED FLANGE DESIGN) (CONTINUED)

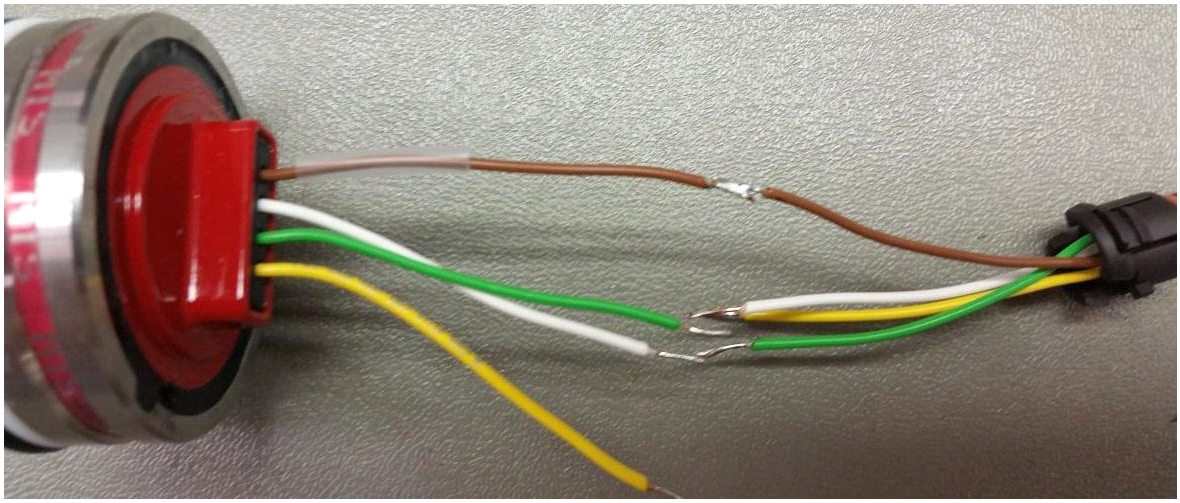
Procedure:

1. Remove the fasteners that are connecting the flange body to the cylinder (there may be 2 or 4 fasteners, and they may be one of several different types, depending on the cylinder).

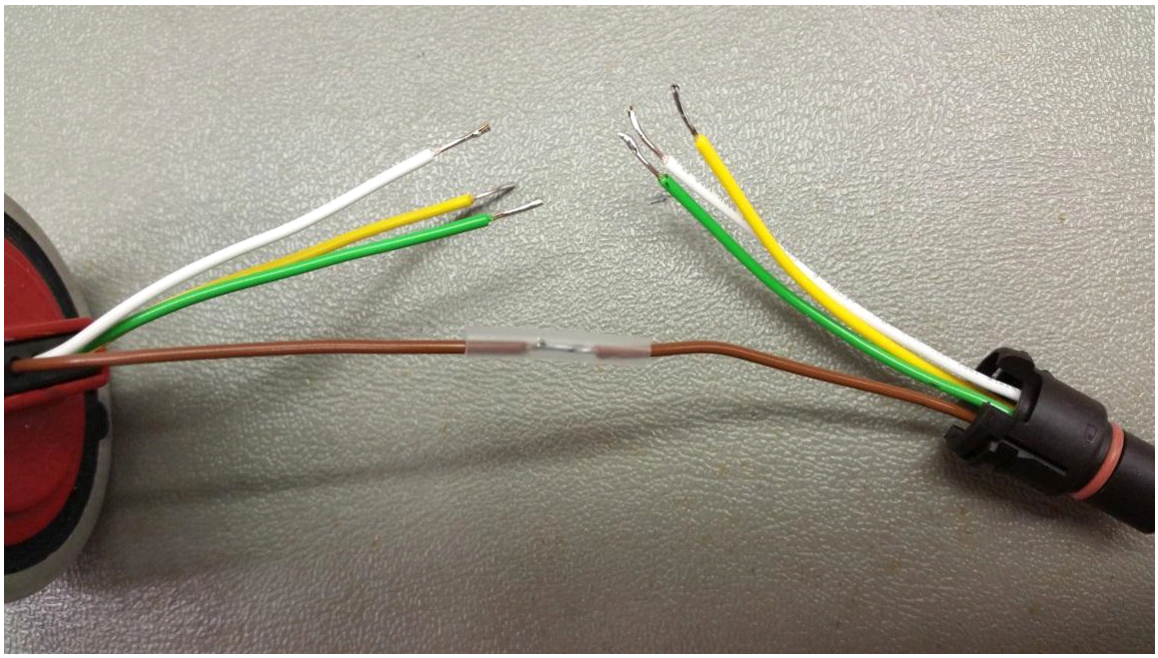


2. With the fasteners removed, pull the flange and connector body away from the cylinder.
3. Separate the metal flange from the black connector core by squeezing the black tabs at the bottom of the connector core, and pulling the two components apart.
4. Inspect the wires, connector pins, and black connector core for damage. If there is no damage to these components, then only the metal flange needs to be replaced. Take note of the orientation of the connector key relative to the flange bolt pattern.
5. Proceed to step 17 if only the metal flange needs to be replaced.
6. Measure the total visible wire length from where the wires exit the cylinder body to the back of the black connector core.
7. Cut the wires at approximately half of the total visible length.
8. Cut the wires on the replacement connector included in the repair kit at the same length.
9. Strip approximately 1/4” of insulation from the ends of each wire.
10. Tin the bare wire ends.
11. Slide a piece of heat-shrink tubing over one of the brown wire.
12. Lay the tinned ends of the brown wires adjacent to each other.
13. Apply solder to the joint.

MTS SENSOR CONNECTOR REPLACEMENT (BOLTED FLANGE DESIGN) (CONTINUED)



14. Slide the heat-shrink tubing over the solder joint so that the joint is in the middle of the tubing.



15. Shrink the tubing into place with a heat gun.
16. Repeat steps 11-15 for the yellow, white and green wires.
17. Install the new metal flange included with the repair kit onto the black connector core. Make sure that the connector key is oriented relative to the bolt pattern the same as it was before the replacement. The flange should snap into place. After the flange is snapped into place, hold onto the flange and gently pull on the wires to make sure the assembly does not come apart.
18. Carefully feed the wires back into the cylinder body until the metal flange makes contact with the cylinder.
19. Align the flange holes with the threaded holes in the cylinder, and re-install the fasteners. Take care not to over-tighten the fasteners.
20. Connect the sensor to the controller and verify proper operation.

PAINTING CYLINDERS WITH IN-CYLINDER SENSORS

Powder coating or electrostatic painting of cylinders uses a high voltage electrostatic charge that can damage the electronics of in-cylinder mounted displacement sensors. Heil recommends using standard painting procedures rather than powder coating for cylinders with in-cylinder sensors.

IN-CYLINDER PROXIMITY SENSOR REPLACEMENT

Heil Half/Pack units use high-pressure In-Cylinder Proximity Sensors (Part Number 063-0151) to communicate piston positioning of the tailgate lock cylinders (QTY 2), tailgate raise cylinder (QTY 1), and top door cylinder (QTY 1) to the Cortex Controller™. Only properly trained and authorized service personnel should attempt any type of hydraulic system work.

⚠ CAUTION

DO NOT operate cylinder with proximity sensor removed. The sensor port is wet port (hydraulic pressurized port). The unit must be in Lock-Out/Tag-Out Mode BEFORE you remove the proximity sensor.

1. Position the cylinder so that the cylinder piston is aligned with the sensor port. This position is fully collapsed on Tailgate Raise and Top Door cylinders and fully extended on Tailgate Lock cylinders. See the figures below.
2. Place the unit in **Lock-Out/Tag-Out Mode** 15.
3. Remove faulty sensor. Replace with new sensor (Part Number 063-0151) by gently turning the new sensor into the port clockwise until it makes contact with the cylinder piston, then turn counterclockwise 1/2 turn and tighten the jam nut to lock the sensor in place. For confirmation of a successful installation, make sure at least two threads of the sensor are protruding out of the lock nut.
4. Take the unit out of **Lock-Out/Tag-Out Mode** 15.

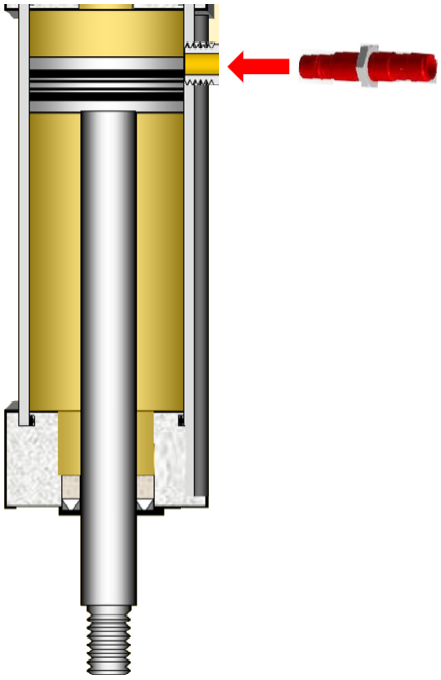


Figure 52. Tailgate Raise or Top Door Cylinder Fully Collapsed

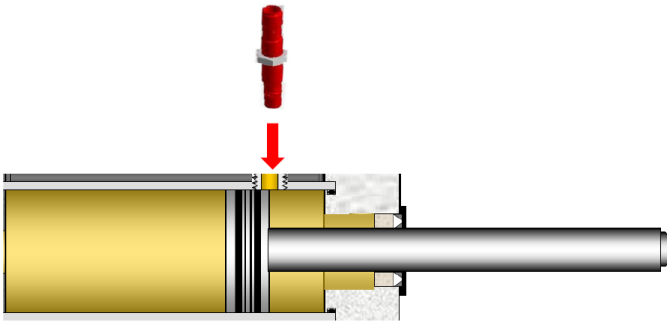


Figure 53. Tailgate Lock Cylinder Fully Extended

IN-CYLINDER PROXIMITY SENSOR TROUBLESHOOTING

Wire colors in the figure below represent the Heil harness side of connections.

1. Make sure the 12 V supply is good at Pin-C.
2. Make sure the ground is good at Pin-A.
3. When the cylinder piston is in front of the proximity sensor, you should see 12 V at Pin-B. When the piston is not in front of the proximity sensor, there should be 0v on Pin-B.

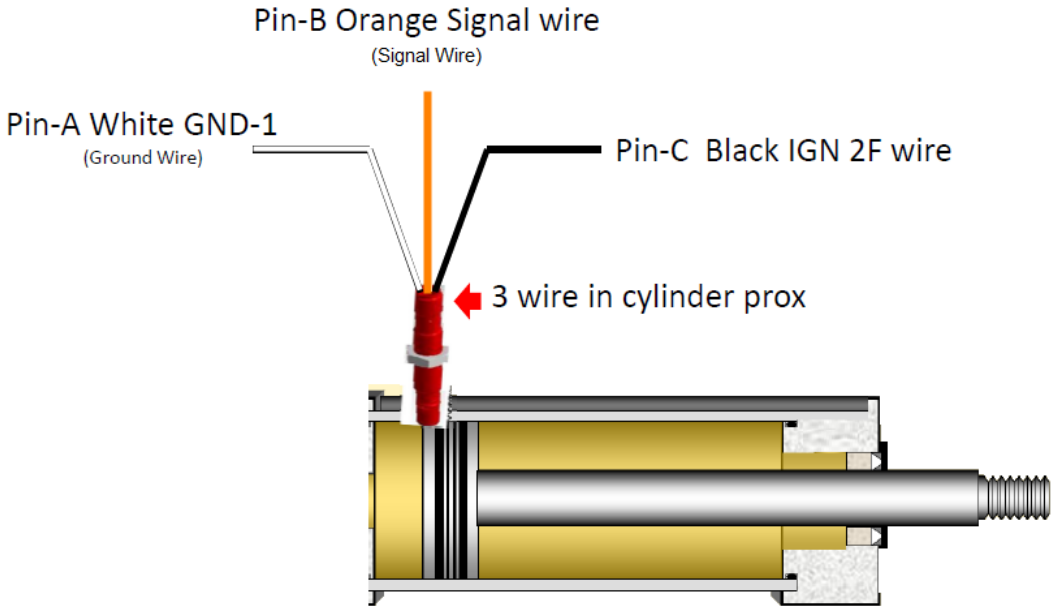


Figure 54. Wire Colors Above Represent Heil Harness Side of Connections

COLD WEATHER WARM-UP PROCEDURE

When ambient air temperature is cold (below 0 degrees F), it is necessary to warm up the unit's hydraulic oil before you start your daily route operation or to check the oil level. The hydraulic oil is sufficiently warmed when the temperature is between 120° and 160°F.

⚠ WARNING

Moving parts on the unit are dangerous. Serious injury or death can occur if a person is struck by the equipment. Clear all people from the area before you operate the unit.

Follow the steps below to warm up the hydraulic oil.

1. START the TRUCK and let the engine idle.
2. APPLY the PARKING BRAKE and make sure it holds.
3. ENGAGE the HYDRAULIC PUMP for approximately five minutes.
4. MAKE SURE the AREA IS CLEAR of all unnecessary people BEFORE you operate the controls.
5. OPERATE the PACKER EXTEND and PACKER RETRACT functions through ten (10) cycles while the engine idles. See the Operator's Manual for operation instructions.
6. Make sure the oil temperature on the site gauge is between 120° and 160°F. If not, repeat step 5.
7. Check for fluid leaks. Repair if necessary.
8. The unit is now ready to go on route.

PREPARING THE UNIT TO CHECK THE OIL LEVEL

Before checking the oil level or adding oil, make sure the unit is in the following position with all cylinders collapsed:

- Truck – on level ground
- Tailgate and Body – fully down and locked
- Packer Panel – at the front of the body
- Forks – fully tucked
- Lift Arms – fully raised

The oil tank is mounted behind the chassis cab. The oil level in the standard tank must be kept between the low and full marks as indicated on the sight gauge. See the figure below.

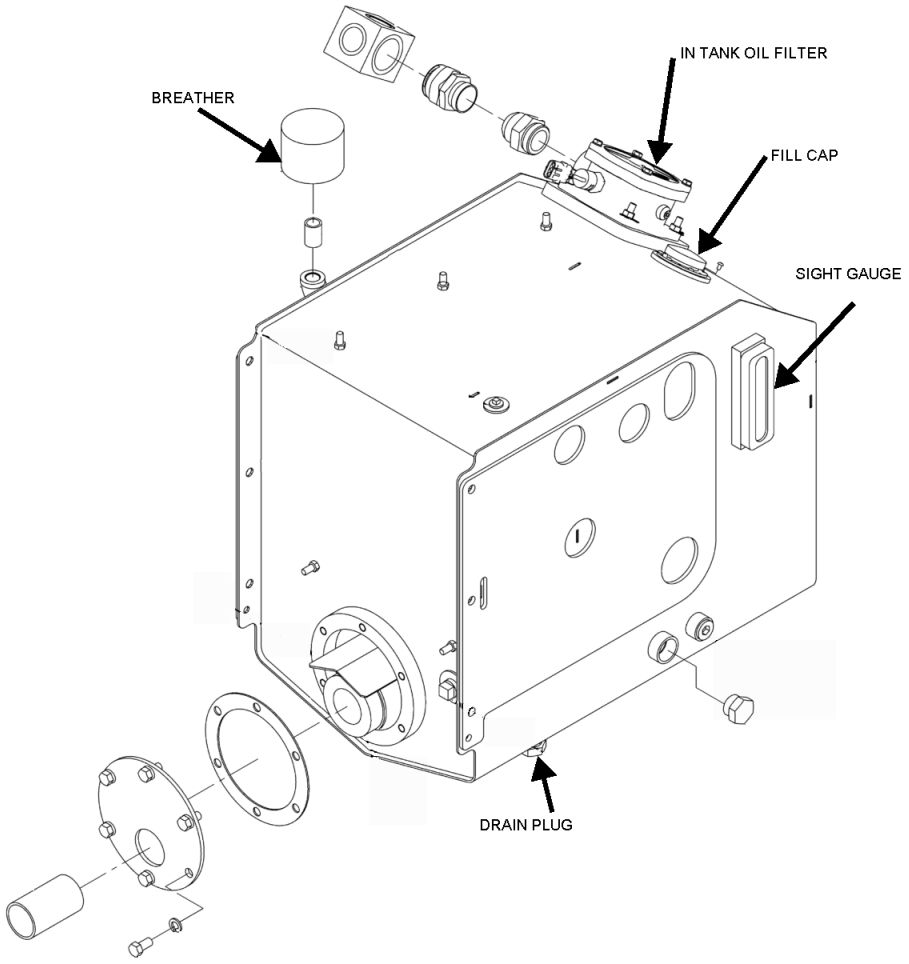


Figure 55. Hydraulic Oil Tank and Sight Gauge

CHECK OIL LEVEL

Check the hydraulic oil level (after warning up the oil) daily or every eight (8) hours, whichever comes first. Fill as necessary.

Important: Contamination is a hydraulic system's worst enemy. Do not let dirt enter the system. Use a clean rag and remove dirt or other contamination around any system component before you disconnect or remove it. While you fill the reservoir, filter the oil through a 200 mesh (or finer) screen. Never use a cloth to filter the oil.

WHEN TO CHANGE OIL FILTER ELEMENT

Change the filter more often under certain conditions such as an extremely dusty atmosphere or area. Use only Heil replacement filters. Purchase the filter element from your local Heil distributor.

Change the filter element when oil analysis shows the oil has expired.

CHANGE HYDRAULIC OIL FILTER ELEMENT

Watch the Service Shack Video online at **www.Heil.com/Heil-Service-Shack** and selecting **Changing Filters**.

Replace the hydraulic filter element after first 30 days of operation, then every 6 months or 1000 hours of operation OR when filter bypass light is ON. To change the hydraulic oil filter, refer to the figure below and follow these steps:

1. Using a 1/2" wrench, remove the four (4) nuts from the filter cover located on the hydraulic oil tank.
2. Set the nuts aside for reuse and then remove the filter cover.
3. Remove the filter element with the by-pass assembly and responsibly discard as required.
4. Clean the housing with a clean, lint-free cloth.
5. Check the o-ring and gasket. Replace them if necessary.
6. Lubricate all o-rings and gaskets.
7. Install new element.
8. Reinstall cover with nuts. Torque nuts to 13 ft-lbs.

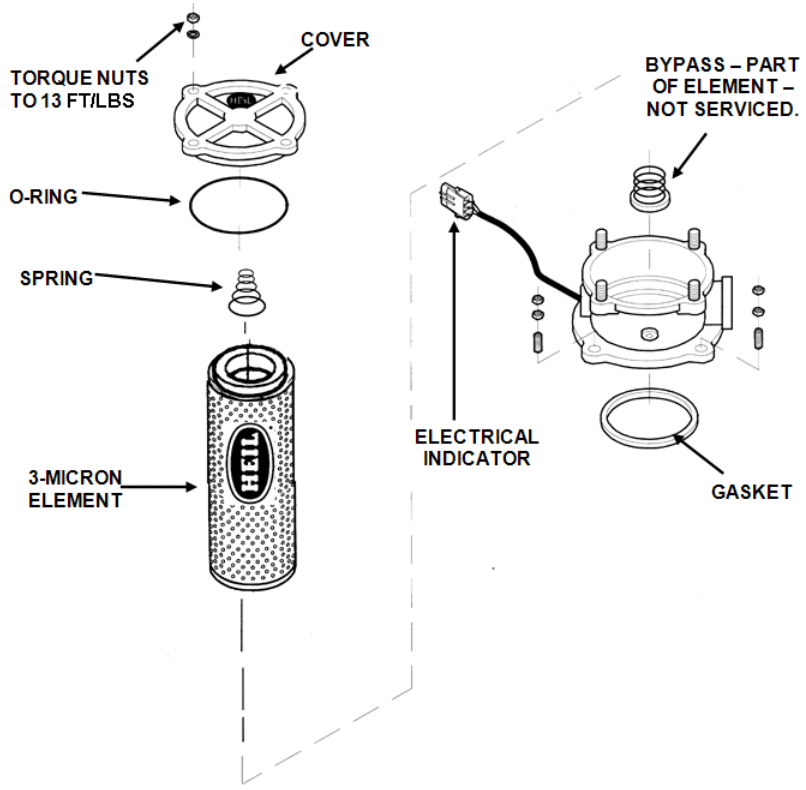


Figure 56. Hydraulic Oil Filter

DRAIN AND CLEAN THE HYDRAULIC OIL TANK

Change the hydraulic oil when the oil sample shows to change it.

Remember that almost all hydraulic system malfunctions can be traced to dirt in the fluid. When working with the hydraulic system, the hands, tools, working area and parts must be as clean as possible.

⚠ CAUTION

Wear proper eye protection when you are working on or around hydraulic lines or components. Wear proper eye protection and avoid contact with hydraulic oil if possible. Never check for oil leaks with your hands.

To drain and clean the hydraulic oil tank, follow these steps:

1. Disengage the pump, shut off the engine and remove the ignition key.

⚠ WARNING

Make sure the unit is in the Lock-Out/Tag-Out mode when you do maintenance or service procedures, or when you go in the hopper, climb in or on the body or on equipment. Equipment can be operated when the unit is not in the Lock-Out/Tag-Out mode. When the unit is not in the Lock-Out/Tag-Out mode, equipment operated while you do maintenance or service procedures, go in the hopper or climb in or on the body or on equipment can cause serious injury or death.

NOTICE

If your employer or company has Lock-Out/Tag-Out procedures that are different from the following procedures, use your employer's or company's procedures. If your employer or company does not have Lock-Out/Tag-Out procedures, use the procedures that follow.

2. Contact your supervisor if you have any questions about Lock-Out/Tag-Out procedures. If your supervisor has any questions, that person can contact ESG Technical Service. Perform the **Lock Out/Tag Out procedures** 15.
3. Remove the fill cap from the top of the tank.
4. Remove the drain plug from the bottom of the tank so that the oil drains into a container.
5. While fluid is draining from the tank, remove and replace the filter/breather assembly. Change the assembly every time the in-tank filter is replaced.
6. To drain the entire hydraulic system, disconnect all hoses at the adapter and drain the hoses into a container.
7. Remove and replace the in-tank filter as described in **Change the Hydraulic Oil Filter**.
8. Remove the outlet flange and 100 mesh suction strainer to gain access to the tank inside.
9. Remove sediment from the tank bottom.
10. Install the outlet flange with a new gasket and the 100 mesh suction strainer into the tank.
11. Install the drain plug in the tank bottom.
12. Reconnect and tighten all hose connections that were disconnected.

DRAIN AND CLEAN THE HYDRAULIC OIL TANK (CONTINUED)

NOTICE

Before filling the tank be sure the funnel is clean and 200 mesh (or finer) screen is used to strain the hydraulic oil.

13. Fill tank with recommended oil, checking the sight gauge as you fill. Refer to **Hydraulic Oil Specifications** 16.
14. Check the entire system to make sure all connections are tight and no leaks are found.
15. Start the truck's engine and engage the pump.

⚠ WARNING

Moving equipment can be dangerous to bystanders. Serious injury or death can occur if a person is in the wrong area or is not attentive to the operations. Clear the area of all unnecessary people before you operate the controls.

16. Operate the packing panel through 10 cycles to be sure all air is out of the circuits.
17. Operate the automated container lift mechanism.
18. Operate tailgate – full up and full down.
19. Operate body raise (dump units) – full up and full down.
20. With the packing panel in the retracted position and lift in the in-transit position, check tank oil level. If necessary, add recommended as described under **Check Oil Level** 84.

PRESSURE ADJUSTMENT PROCEDURES

A. Unit Preparation

Follow these unit preparation steps prior to making any pressure adjustments listed in this section.

1. Make sure area around unit is clear to enable arm, fork, and tailgate operation.
2. Place wheel chocks on both sides of driver side rear wheel.
3. Make sure parking brake is set.
4. Notify anyone in area that the arms, forks, and tailgate will be operated during this procedure
5. Make sure unit is full of hydraulic oil.
6. Make sure hydraulic oil is at least 120 degrees F before beginning any pressure checks or adjustments. Refer to **Cold Weather Warmup Procedure** 82.

B. Required Tools

These are the tools required to make pressure adjustments.

Quantity	Tool
1	PPE Personal Protective Equipment
1	Open End Wrenches Set
1	0-5000 PSI hydraulic pressure gauge

C. Streetwise Hydraulics™ Valve Locations

The hydraulic control valves are located on the street side of the body. The main body valve that controls the packer, arms and forks is located beneath the body and behind a steel cover as seen in the left figure below, at the arrow location. The tailgate valve that controls the tailgate lock/unlock, tailgate open/close, and top door open/close hydraulic circuits is located behind a steel cover as seen in the right figure below.

Figure 57. Main Body Valve with Cover

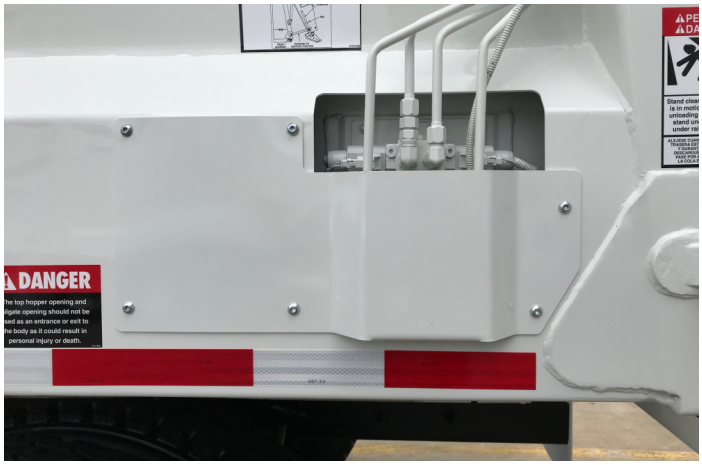


Figure 58. Tailgate Valve with Cover

PRESSURE ADJUSTMENT PROCEDURES (CONTINUED)

D. Pressures and Cycle Times

			Commercial Half Pack	
			Diesel	**CNG**
HYDRAULIC PRESSURE	**UNDERBODY VALVE**	**MAIN RELIEF @1200 ENGINE RPM**	2500 PSI	2500 PSI
		PACKER EXTEND	STANDARD: 2650 PSI SIERRA/FREEDOM: 2000 PSI	STANDARD: 2650 PSI SIERRA/FREEDOM: 2000 PSI
		PACKER RETRACT	2650 PSI	2650 PSI
		ARMS UP	NO CIRCUIT RELIEF	NO CIRCUIT RELIEF
		ARMS DOWN 8000# ARMS	1250 PSI	1250 PSI
		FORKS UP	NO CIRCUIT RELIEF	NO CIRCUIT RELIEF
		FORKS DOWN	NO CIRCUIT RELIEF	NO CIRCUIT RELIEF
		AUXILIARY SECTION-TAILGATE VALVE SUPPLY	2000 PSI	2000 PSI
		AUXILIARY SECTION-OPTION VALVE SUPPLY - SEE NOTE 3	2000 PSI	2000 PSI
	TAILGATE VALVE	**TOP DOOR CLOSE**	750 PSI	750 PSI
		TOP DOOR OPEN	500 PSI	500 PSI
		TAILGATE OPEN	1300 PSI	1300 PSI
		TAILGATE CLOSE	1300 PSI	1300 PSI
		TAILGATE UNLOCK	2000 PSI	2000 PSI
		TAILGATE LOCK	2000 PSI	2000 PSI
FUNCTION CYCLE TIMES		**AUTOPACK CYCLE TIME @ 45 GPM**	20-23 sec	20-23 sec
		ARM ONLY CYCLE TIME - 8000# ARMS @ 45 GPM	17-19 sec @ ENGINE IDLE	18-21 sec @ ENGINE IDLE
		STANDARD TAILGATE AND CNRG® TAILGATE	RAISE 14-25 sec LOWER 14-17 sec	RAISE 14-25 sec LOWER 14-17 sec
		TOP DOOR CYCLE TIME	CLOSE 12-18 sec OPEN 26-32 sec	CLOSE 12-18 sec OPEN 26-32 sec

PRESSURE ADJUSTMENT PROCEDURES (CONTINUED)

NOTES:	1: Main Pressure settings have a tolerance range of +/- 50 p.s.i. and are to be set at operating speed.
	2: Options include: Commercial Gripper, Adjustable Forks, Hydraulic Cab Shield
	3: Throttle Advance set to 1200 rpm
	4: Unless noted, all pressures are good for Standard and Sierra. Freedom units are pack extend 2000 PSI
	5: Cycle Times based on 700 RPM at idle except Autopack @ 1200 RPM

F. Contact **Heil Technical Services** at **866-310-4345** for help with pressure adjustments.

CLAMP-ON ARM BOLTS MAINTENANCE

Check clamp-on arm bolts for tightness monthly. See the figure below.

NOTICE

Do not use an impact wrench as thread damage might occur.

NOTICE

If bolts are removed, the bolts MUST be replaced. Contact your local Heil Dealer or Parts Central for parts.

Torque as follows:

1. Lubricate threads with anti-seize compound.
2. Torque the lock nut to 600 ft. lbs. using a torque wrench.

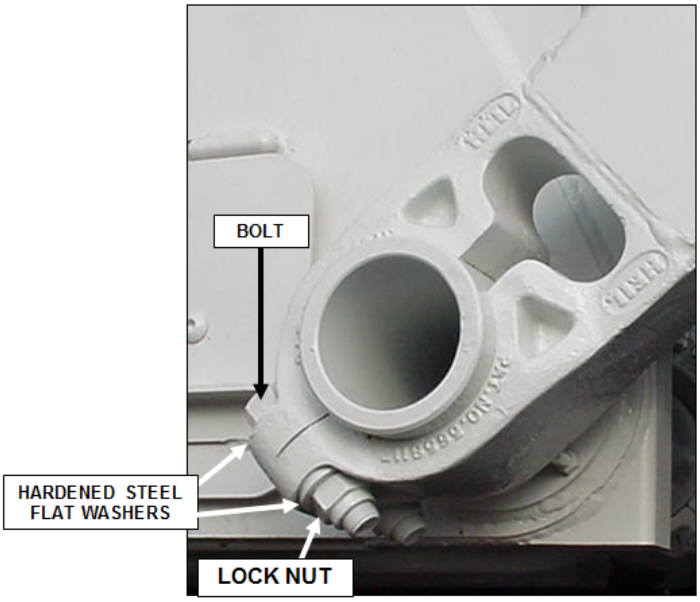


Figure 59. Clamp-on Arm Bolts Maintenance

BEARING BLOCKS MAINTENANCE

Half/Packs have the option of having 3 or 4 bearing blocks for the arm cross shaft. It is very important to keep the mounting bolts torqued to 200 ft. lbs. using a torque wrench (lubricated threads). See the figure below.

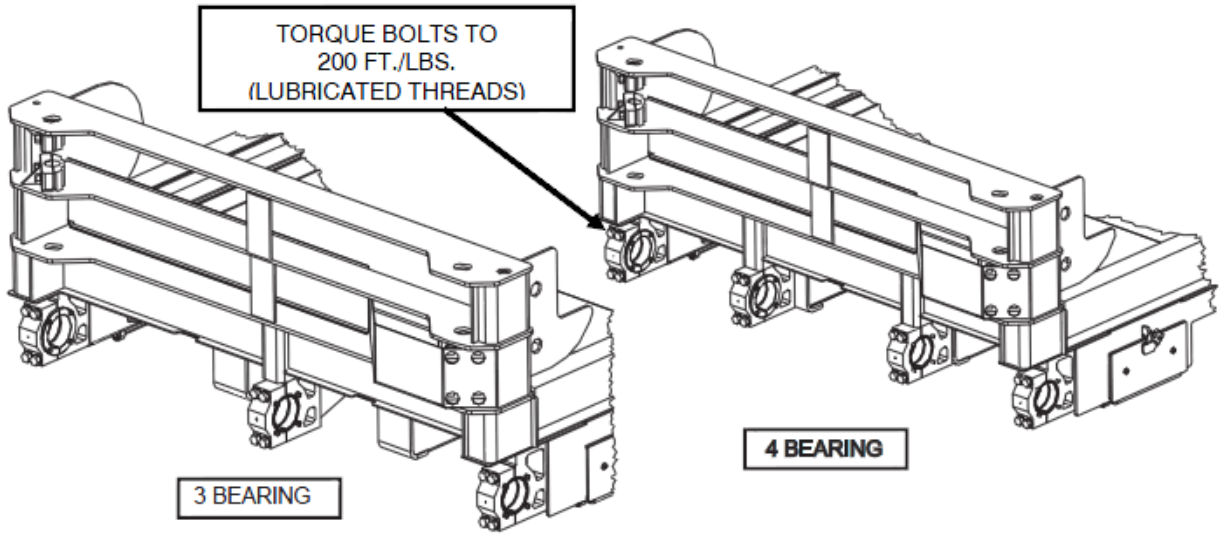


Figure 60. Optional Bearing Blocks Maintenance

REPAIRING CRACKED WELD JOINTS

Repair all cracked weld joints immediately after finding cracked weld joints. If you are unsure of the proper repair procedure, call Heil Technical Services at 866-310-4345.

INSPECT PROXIMITY SWITCHES

See **Proximity Switch Troubleshooting** 18 for recommended procedures for inspecting proximity switches.

CLEAN AND INSPECT THE TAILGATE SEAL

Periodically check the tailgate seal to make sure it mates properly with the body and inspect for possible wear, damage or leaking. Replace the seal as necessary. See the figure below.

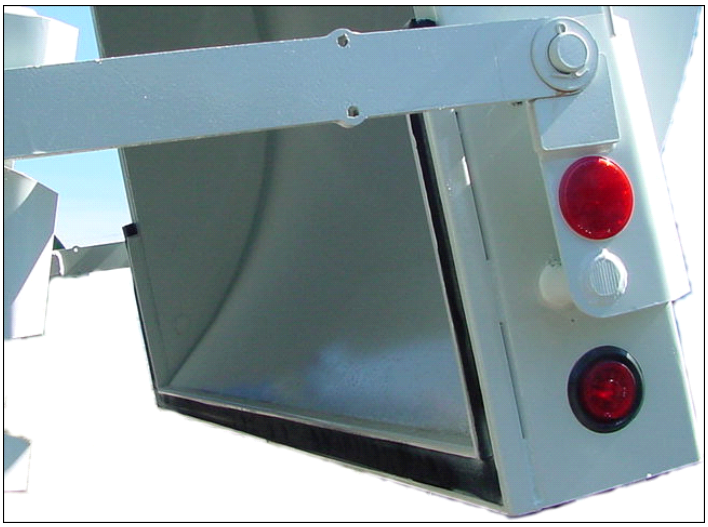


Figure 61. Tailgate Seal

SECTION 5
BODY CONTROLLER HARDWARE

CORTEX CONTROLLER™ AND MODULE (NODE) LOCATIONS

The 80 I/O Cortex Controller is located midway within the street side of the body behind a steel cover. See the image below.

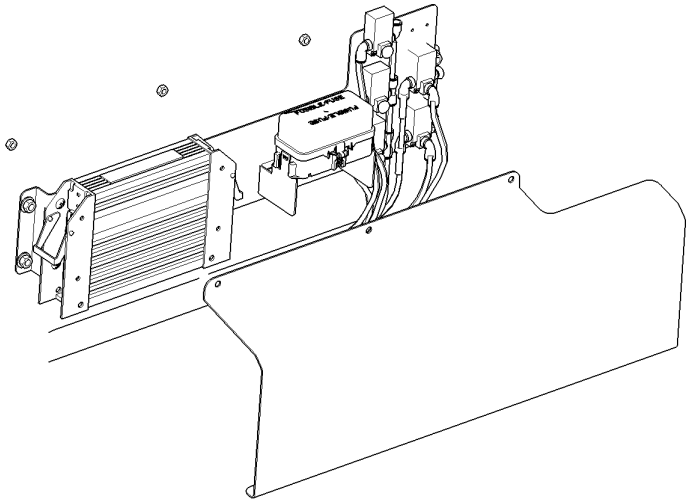


Figure 62. Cortex Controller Location

The 32 I/O Cortex Controller Module is located on the street side of the body behind a steel cover, left of the tailgate valve. See the image below.

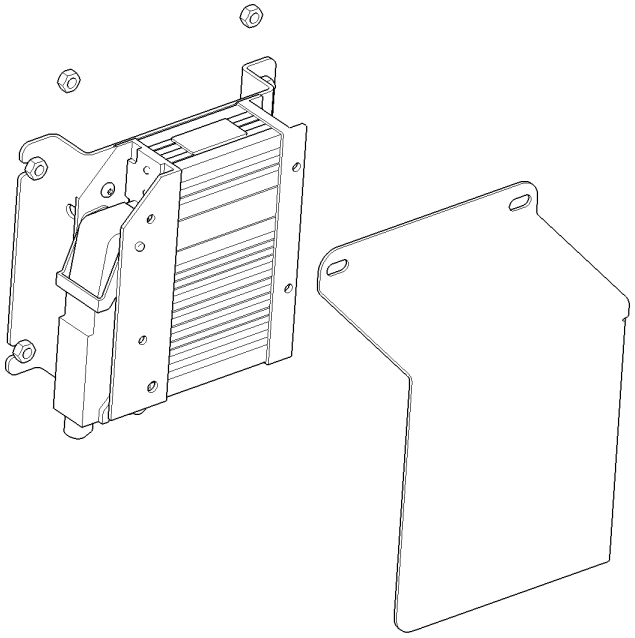
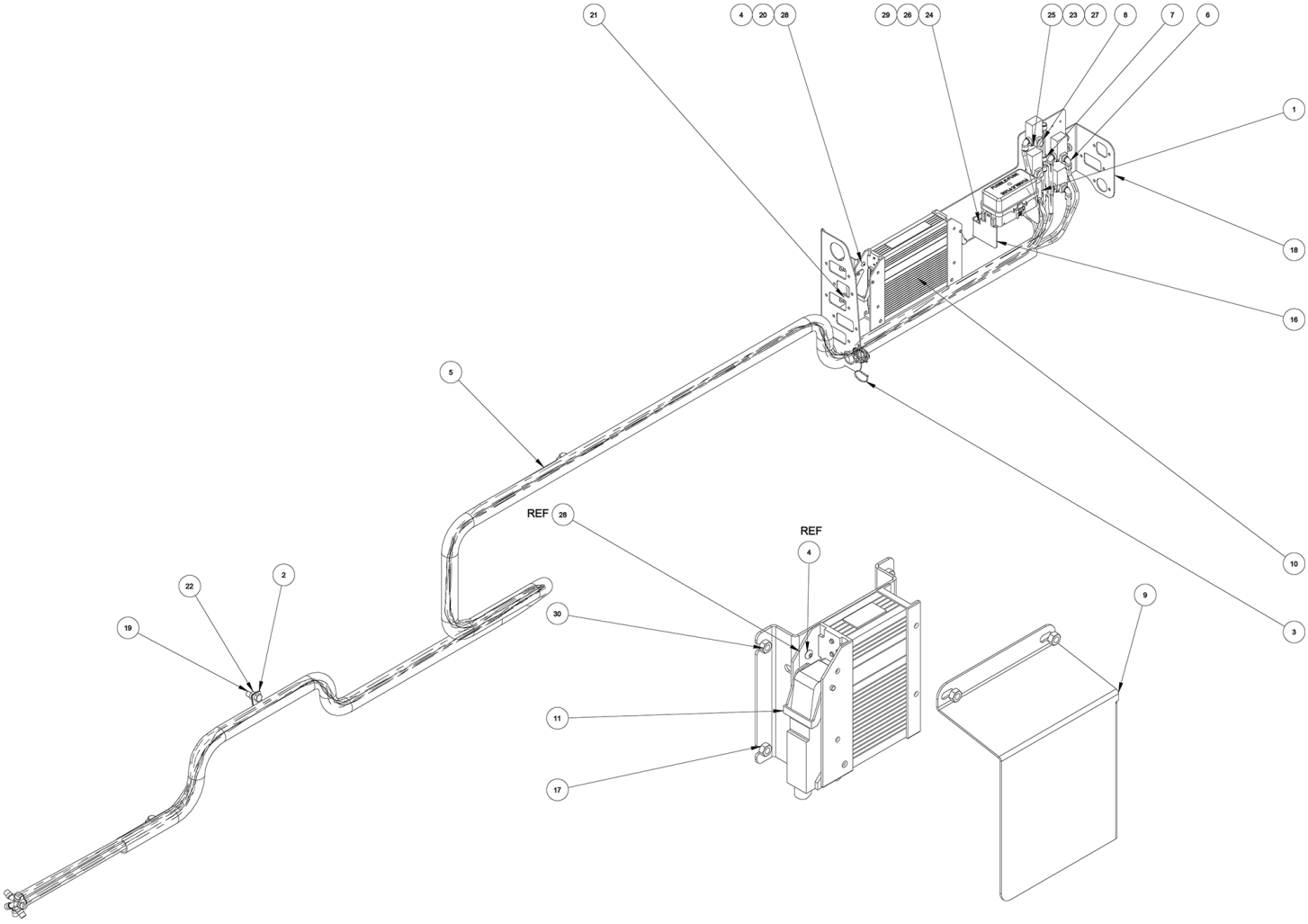


Figure 63. Cortex Controller Module Location

CORTEX CONTROLLER™ AND MODULE COMPONENTS

See the image(s) below and component descriptions on the next page.



CORTEX CONTROLLER™ AND MODULE COMPONENTS (CONTINUED)

Refer to image on previous page.

REF	PART NUMBER	DESCRIPTION	QTY
1	031-5724-012	2 POSITION 3 WAY MAC VALVE	7
2	036-1122-012	TUBE CLAMP 3/4	3
3	036-1290	HARNESS STRAP	12
4	047-2621-375	SCREW, BUTTON HEAD CAP	8
5	054-7494-035	AIR LINE HARNESS-7 LINES 1/4" O.D.	1
6	054-8470-003	AIR LINE CONNECTOR ELBOW	19
7	054-8471-003	AIR LINE CONNECTOR TEE	2
8	108-5354-006	BREATHER	7
9	234-3374-001	PLATE, RAIN SHIELD T/G CONTROLLER	1
10	254-4897	CONTROLLER, IFM, 80 IO, 32 BIT	1
11	254-4912	CONTROLLER, CORTEX REMOTE MODULE	1
12	263-1814-040	HARNESS, HYDRAULIC PUMPS	1
13	263-1908-002	HARNESS, CONROLLER	1
14	263-1908-013	HARNESS, COMM HP OVERLAY	1
15	263-1908-015	HARNESS, MAC VALVE ASSY	1
16	311-5666	BRACKET, MOUNTING, FUSE BLOCK	1
17	311-6304	BRACKET, CONTROLLER BODY SIDE	1
18	311-6853	PANEL, CONTROLLER MOUNT	1
19	FSP070920	HHCS 3/8-16 UNC X 1"LG. GR5 PLATED	3
20	FSP230400	LOCKNUT, #10 UNC GR5, PLATED	8
21	FSP230800	LOCKNUT, 5/16" UNC GR5, PLATED	4
22	FSP230900	LOCKNUT, 3/8" UNC GR5, PLATED	3
23	FSP280200	NUT #6-32, PLATED	10
24	FSP320700	NUT, 1/4" UNC GR8, PLATED	2
25	FSP420220	MACH. SCREW #6-32 X 1-1/4", PLATED	10
26	FSP420711	MACH. SCREW 1/4-20 NC X 1/2, PLATED	2
27	FSP510200	WASHER, FLAT, #6 STD, PLATED	10
28	FSP510400	WASHER, FLAT, #10 STD , PLATED	8
29	FSP510700	WASHER, FLAT, 1/4" STD , PLATED	6
30	FSS230700	LOCKNUT, 1/4" UNC STAINLESS STEEL	6

CORTEX CONTROLLER™ PROGRAMMING

Contact Heil Environmental for re-programming of the Cortex Controller.

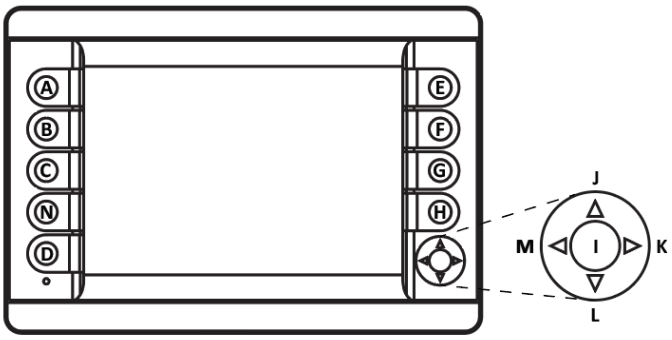
INSIGHT™ DIAGNOSTIC DISPLAY

The Heil InSight Diagnostic Display is the information center for the operator and troubleshooting tool for the service mechanic. The next few pages cover basic functionality. For additional information, see Commercial Half/Pack Cortex Controller™ Program 109-0308 in the Body Controller Software 115 the Body Controller Software section of this manual.

For the operator, it shows operation warnings and explains why the system may prevent a function so the operator can correct and operate in a safe and productive manner. For the service technician, it displays information regarding sensor failures, and with proper training, can be used to test sensors and other inputs and output functions.

Note: To toggle from Camera Mode to Home Screen: Hold right top button for 5 seconds. To toggle from Home Screen to Camera Mode: Hold left top button for 5 seconds (or power cycle truck ignition). While in Camera Mode, you can temporarily view any message on the display by holding down the right arrow on the display. See **Camera System** 97.

HEIL INSIGHT™ DIAGNOSTIC DISPLAY FUNCTIONS



A = HOME
1. RETURNS TO HOME SCREEN
2. TURNS ON CAMERA INPUT (IF OFF) - PRESS AND HOLD 5 SECONDS

B = COUNTERS
1. DISPLAYS COUNTERS/HOURS FOR CERTAIN FUNCTIONS WHILE IN SERVICE SCREEN
2. ACTIVATES CAN SHAKE FEATURE IF IN SERVICE SCREEN

C = CAMERA CONFIG
DISPLAYS CAMERA CONFIGURATION SCREEN

D = BRIGHTNESS
CHANGES BRIGHTNESS OF DISPLAY FOR NIGHT/DAY OPERATION

E = OPTIONS
1. DISPLAYS OPTIONS SCREEN TO CONFIGURE UNIT OPTIONS
2. TURNS OFF CAMERA INPUT (IF ON) - PRESS AND HOLD 5 SECONDS

F = SERVICE
DISPLAYS SERVICE SCREEN TO VIEW INPUTS/OUTPUTS FOR TROUBLESHOOTING

G = CALIBRATION
DISPLAYS CALIBRATION SCREEN TO CALIBRATE UNIT SETPOINTS

H = MAINTENANCE
1. DISPLAYS MAINTENANCE SCREEN TO ACTIVE SERVICE MODE
2. DEPRESSURIZES CUROTTO HYDRAULICS

I = OK
SELECTS ITEMS ON THE DISPLAY

J = UP ARROW
SCROLLS UP WHILE IN MENU SCREEN

K = RIGHT ARROW
MOMENTARILY TOGGLES TO DISPLAY CONTROLS SCREEN WHILE CAMERA VIEW IS ACTIVE

L = DOWN ARROW
SCROLLS DOWN WHILE IN MENU SCREEN

M = LEFT ARROW
BACKSPACE WHILE IN PASSWORD SCREEN

N = COUNTERS RESET
RESETS ALL COUNTERS IN MAINTENANCE SCREEN

212-3456

Heil InSight™ Diagnostic Display Functions Decal, Located in the Cab

INSIGHT™ DIAGNOSTIC DISPLAY

The Half/Pack comes standard with a 7" InSight Diagnostic Display or optionally with a 12" InSight Diagnostic Display. Contact Heil for re-programming of the display.

HOME SCREEN

When the truck key switch is on (for trucks without an integrated camera system) or after you toggle from Camera Mode to Home Screen (for trucks with an integrated camera system), the home screen will be displayed. This screen will show the operator button menu icons, diagnostic display messages and various cab control conditions, including if:

- Pump is on/off,
- Side Door is closed,
- Tailgate is closed,
- Tailgate is locked,
- Select O Pack on/off
- Forks Tucked
- Hydraulic Oil Low/OK,
- Filter Pressure OK.

When a fault occurs, the In-Cab Alarm will sound and a diagnostic message will be displayed with the status of respective Input / Output in the Insight display unit. See the figure below.

See **Body Controller Software Section** 115 for display screen shots of potential diagnostic messages, listed disabled functions and instructions for fault reset.

DIAGNOSTIC DISPLAY MESSAGES
When a fault occurs, the In-Cab Alarm will sound and a Diagnostic Message will be displayed.

CAMERA SCREEN AND SYSTEM (IF EQUIPPED)

Depending on unit option configuration, your unit can be equipped with multiple cameras that are viewable on the InSight™ Diagnostic Display.

Toggle Camera / Home Screen Modes

For trucks equipped with a camera system, when the truck key switch is first tuned ON, the camera views will be shown on the display. You can temporarily view any message on the display by holding down the right arrow on the display. Release the right arrow to return to the camera view. You can also toggle from Camera Mode to the Heil Home Screen by following the instructions below.

1. 2018 models with 109-0309-20180509 revision of display code or later:
   a. Toggle from Camera Mode to Home Screen: Hold right top button for 5 seconds.
   b. Toggle from Home Screen to Camera Mode: Hold left top button for 5 seconds (or power cycle truck ignition).
2. 2018 models with 109-0309-20180416 revision of display code:
   a. Toggle from Camera Mode to Home Screen: Hold OK button + right top button for 5 seconds.
   b. Toggle from Home Screen to Camera Mode: Hold OK button + left top button for 5 seconds (or power cycle truck ignition).

3rd Eye Remote

1. Red Power Button: turns power on/off to the video box.
2. The “JUMP” Button: cycles through the different input configurations for the camera view, i.e. you can select whether you want to see 1,2,3 or 4 different cameras at one time.
3. The “SOURCE” Button: cycles through the different camera views, i.e. once you have the input configuration selected using the “JUMP” button, the “SOURCE” button determines what camera view you see.
4. The “MIRROR” Button: changes the camera view to a mirrored image of the previous view.

Camera Boot Up Process

If the video box gets turned off, the following steps need to be performed:

1. Make sure the key switch is ON for the unit.
2. On the 3rd Eye Remote, press the red power button on the top right.
3. Turn the key switch OFF and then turn the key switch back ON (i.e. power cycle truck ignition).

You should now have the camera box turned on and the camera views (if configured) will be visible on the display.

CAMERA SCREEN AND SYSTEM (IF EQUIPPED)

Camera System Configuration

The camera system will be configured in the InSight™ Diagnostic Display when you receive the Heil unit. However, if you install or uninstall cameras or install a new display on the unit, follow these steps to turn the cameras installed on your unit ON or OFF.

1. Select the Camera Config button (3rd button from the top on the left of the display). See the image below.

2. Type in the Camera Configuration password. Contact Heil Technical Service at 866-310-4345 to get the password.
3. Check the unit sales order to find what cameras are to be installed on the unit. On the camera configuration screen, scroll and select using the “OK” button the corresponding cameras per the sales order. ONLY CONFIGURE THE CAMERAS LISTED ON THE SALES ORDER. See the image below.

4. Cycle the power to the display and the cameras will be correctly configured.

CAMERA SCREEN AND SYSTEM (IF EQUIPPED)

Camera System Configuration (Continued)

5. In the event that you need to turn off the camera view and go back to the control screen, press and hold the top right button on the display for 5 seconds. If a trigger is active (Reverse, L Turn, or R Turn), you will not be able to turn off the camera view. See the image below.

6. To turn the cameras back on, press and hold the top left button on the display for 5 seconds OR cycle the power to the display. See the image below.

COUNTERS SCREEN

The Counters Screen allows you to monitor daily and total arm cycles, daily and total pack cycles, maintenance hours, pump hours and filter bypass hours.

SERVICE SCREENS

By pressing the service button you can toggle through several different screens in the display. These screens can be viewed anytime the key switch is on or the truck is running. Nothing on these screens can be adjusted and are view only. Input and Output Screens have several components. To see them all, you may need to press the down directional button to scroll down the list.

- Inputs
- Inputs Ext
- Multiplex Inputs
- Remote Inputs
- Setpoints
- Outputs
- Outputs Ext
- Remote Outputs
- Control Power

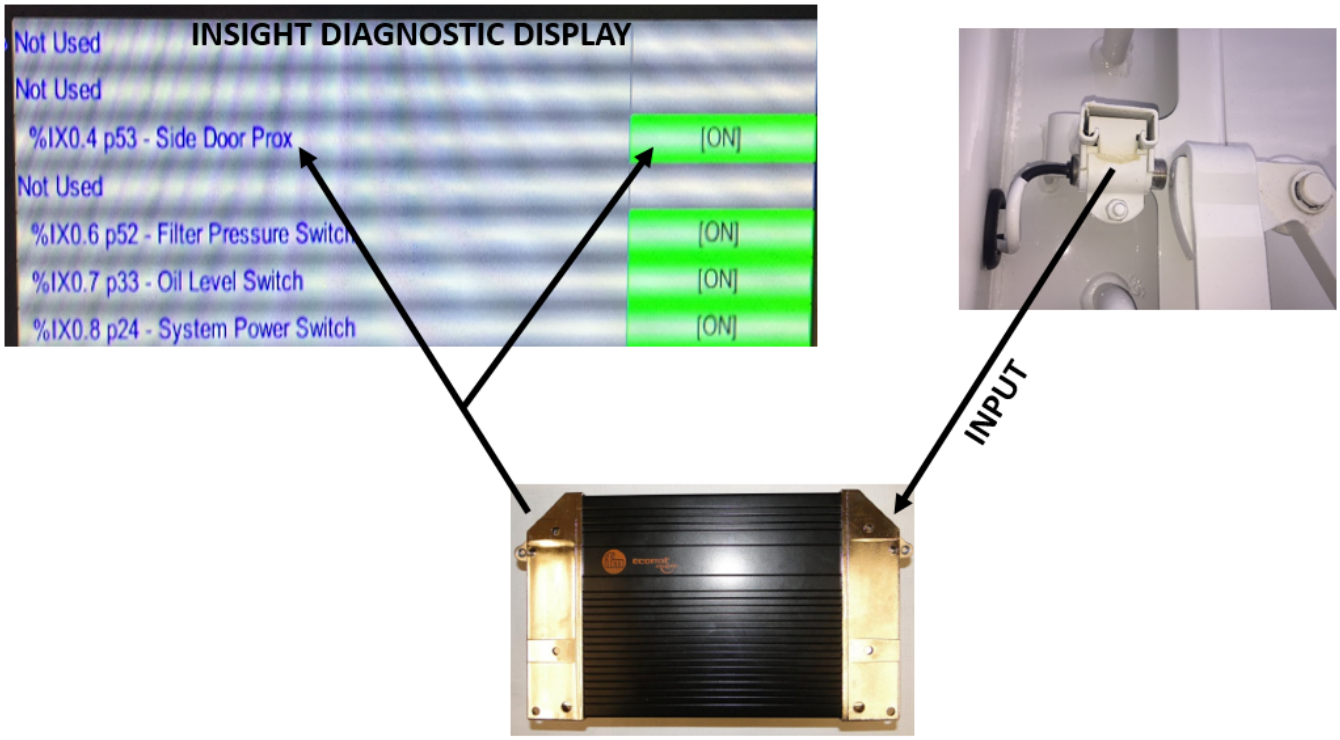
INPUTS / OUTPUTS

A. Inputs

Inputs are signals the controller receives from sensors or switches. Examples being: Prox switch signals, fork cylinder sensors, arm cylinder sensors, packer position sensor, pump on/off push button, system power button, packer extend or retract push buttons and so on. Any switch or sensor that sends signals to the controller are called INPUTS. All inputs can be viewed on the Cortex Controller InSight Diagnostic Display. These screens will show the state of all inputs. Once you are on an input screen, you may need to scroll down to see all inputs on that screen.

Example Input:

Side Door Proximity Switch is CLOSED: the signal from the Side Door Proximity Switch will travel to the Cortex Controller. When this happens, the InSight Diagnostic Display will show the Input to be ON. See the figure below.



INPUTS / OUTPUTS (CONTINUED)

B. Outputs

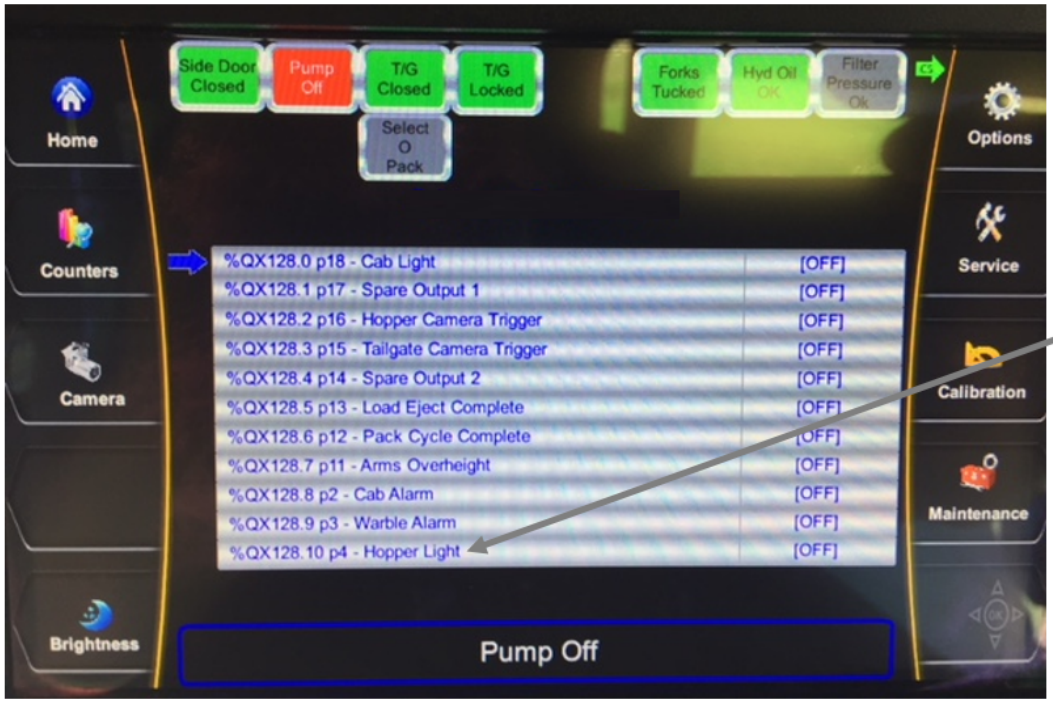
Outputs are signals sent out of the Cortex Controller to turn something ON or to make something happen. Any signal that is sent out of the controller is an output. Output examples are: Signals sent to valve coils that move a valve spool or to turn on a light. See the figure below.

Example Output:

Hopper Lights are ON: Turning the HOPPER LIGHT switch ON sends an Input signal from the switch to the controller and the controller sends an Output signal to the light to turn the light ON.

Output examples:

- Coils/Solenoids
- Lights
- Mac Valves that Control Pneumatics to the Body Valve
- Tailgate Valve Coils/SOL
- Screen readouts



SERVICE MODE

The Half/Pack units have a Service Mode within their Cortex Controller programming initiated on the Insight Diagnostic Display. Service Mode is to be used ONLY by authorized service personnel in the event of a Cylinder on Half/Pack with Odyssey controls and Packer Sensor on all other Half/Packs, failure on route to recover to a safe arms and forks position. Service Mode can also be used to move the functions while servicing a failed Cylinder Sensor.

Watch the Service Shack Video online at **www.Heil.com/Heil-Service-Shack** by selecting **Entering Service Mode**.

NOTICE

Service Mode is to be used ONLY by authorized service personnel. Unauthorized use of Service Mode can result in extensive damage to the unit.

NOTICE

The arms, forks and packer will move very, very slowly due to the unit being in Service Mode.

1. Place the unit in Service Mode.
   a. On the Insight Diagnostic display, enter Maintenance Mode and scroll to Service Mode press the OK button for 3 seconds to turn on Service Mode.
   b. The password screen will appear on the display.
   c. Enter the service password 4 3 2 1 and press OK.
   d. Select Service Mode with the arrows, then press OK button down for 3 seconds to enter service mode.
   e. Press ESC to exit.
2. When service is complete, go back to the maintenance screen and turn off Service Mode. See Step 1 above. Service Mode also resets if power to the unit is cycled.

CALIBRATION SCREEN

The Calibration Screen allows you to calibrate various sensors dependent on how the unit is configured.

ARC SENSOR CALIBRATION

Arc Sensor Calibration may be needed when the arc sensor for the packer is changed and needs to be re-calibrated. Calibration should be performed on an annual basis ONLY by properly trained and authorized service personnel. This procedure requires a password to place the unit in Calibration Mode. This password can be provided to authorized service personnel by contacting Heil Technical Services at 866-310-4345.

NOTICE

The unit does NOT have to be placed in Service Mode prior to being placed in Calibration Mode.

1. Remove any carry cans (Curotto or Bayne or any other can) from the forks. The forks have to be empty when doing the calibration. Refer to the Carry Can Manufacturer Operation and Service Manual.
2. Place the unit in **Calibration Mode**
   a. On the InSight™ Diagnostic Display, press and release the Calibration button. See image above.
   b. The password screen will appear on the display.
   c. Enter the Calibration Password provided by Heil Technical Services and press OK. Contact Heil Technical Services for the Calibration Password.
   d. The display will now walk the Authorized Service Person through the calibration routine with prompts on the display.
   e. The Authorized Service Person can cancel the calibration routine at any point or skip a section by selection ESC or SKIP from the menu.

ARC SENSOR CALIBRATION (CONTINUED)

NOTICE

The arms, forks and packer will move very, very slow due to the unit being in Calibration Mode.

3. Perform the calibration steps below.
   a. Fully retract the Packer Blade – press OK (the display will move to the next screen)
   b. Extend the packer manually to the end of the first stage of the cylinder – Press OK (this is the packer fully extended position)
   c. Extend the packer to just inside the body – press OK (this is the packer travel position)
   d. At this point the truck is calibrated and pressing OK finishes the sequence.

MAINTENANCE SCREEN

The Half/Pack unit has a Maintenance Mode within its Cortex Controller™ programming initiated on the InSight™ Diagnostic Display. Maintenance Mode is to be used ONLY by authorized service personnel in the event of a Cylinder or Packer Sensor failure on route to recover to a safe arms and forks position. Maintenance Mode can also be used to move the functions while servicing a failed Cylinder Sensor.

NOTICE

Maintenance Mode is to be used ONLY by authorized service personnel. Unauthorized use of Maintenence Mode can result in extensive damage to the unit.

NOTICE

The arms, forks and packer will move very, very slowly due to the unit being in Service Mode.

1. Place the unit in **Maintenance Mode**.
   a. On the InSight™ Diagnostic Display, enter Maintenance Mode and then hold the OK button down for 5 seconds and release.
   b. The password screen will appear on the display.
   c. Enter the service password 4 3 2 1 and press OK.
   d. The bottom option should be Service Mode. Select it with the arrows and then press OK making sure that option changes from OFF to ON.
   e. Press ESC to exit.

2. When service is complete, go back to the maintenance screen and turn off Service Mode. See Step 1 above. Service Mode also resets if power to the unit is cycled.

CORTEX CONTROLLER™ 80 I/O ASSEMBLY

CORTEX CONTROLLER™ 80 I/O ASSEMBLY

There are no serviceable parts within the Cortex Controller™ housing. Refer to the figure below. Do not open the Cortex Controller™ housing. Send the Cortex Controller™ to Heil Environmental for repair or programming.

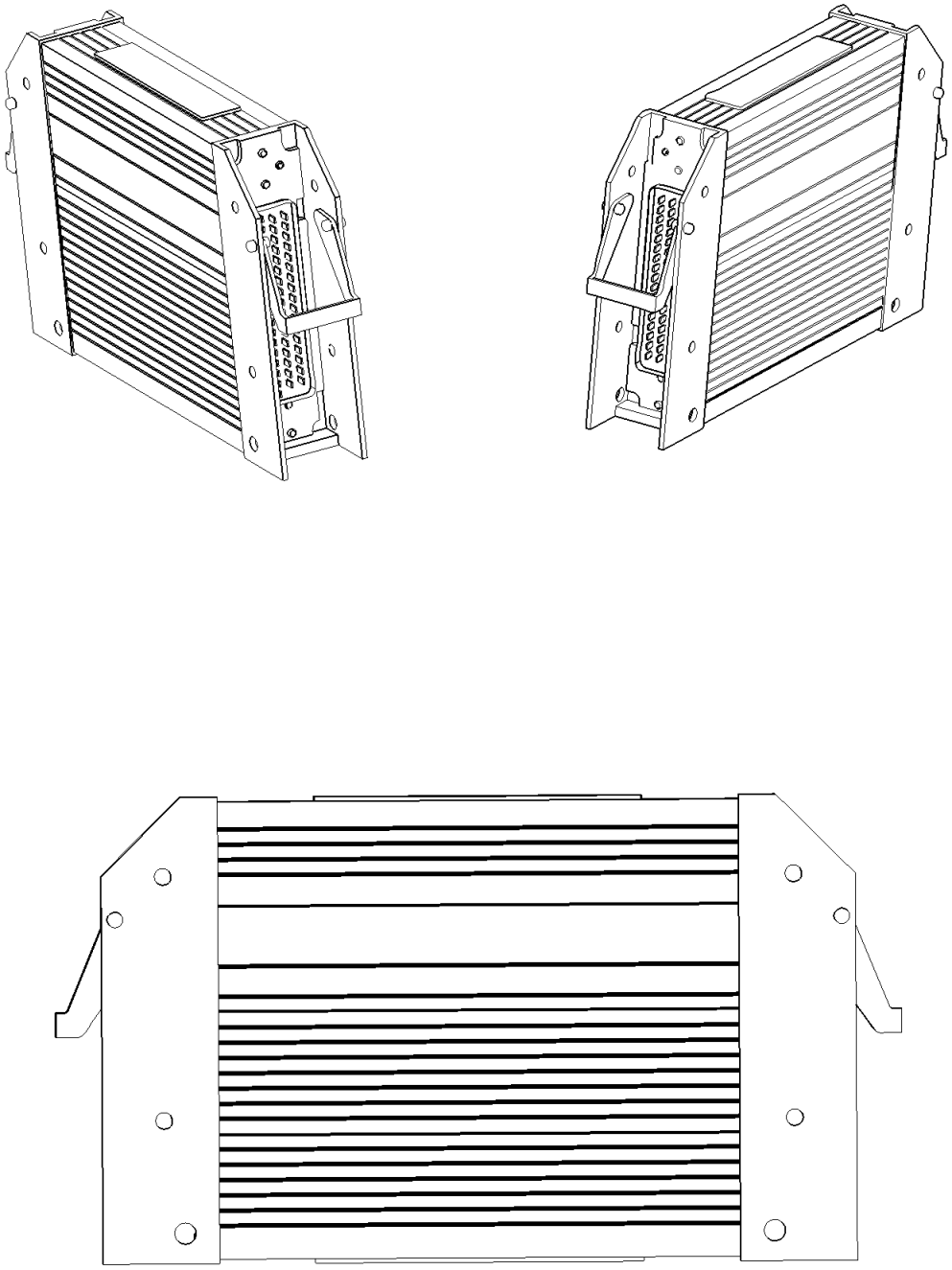


Figure 64. 80 I/O Cortex Controller Hardware

CORTEX CONTROLLER™ PIN NUMBER DIAGRAM

Refer to the figure below for the Cortex Controller™ male pin locations. Controller pin numbers are located on the black plastic for pin numbers 1 and 19 (top row left to top row right), 20 and 37 (middle row left to middle row right), and 38 and 55 (bottom row left and bottom row right).

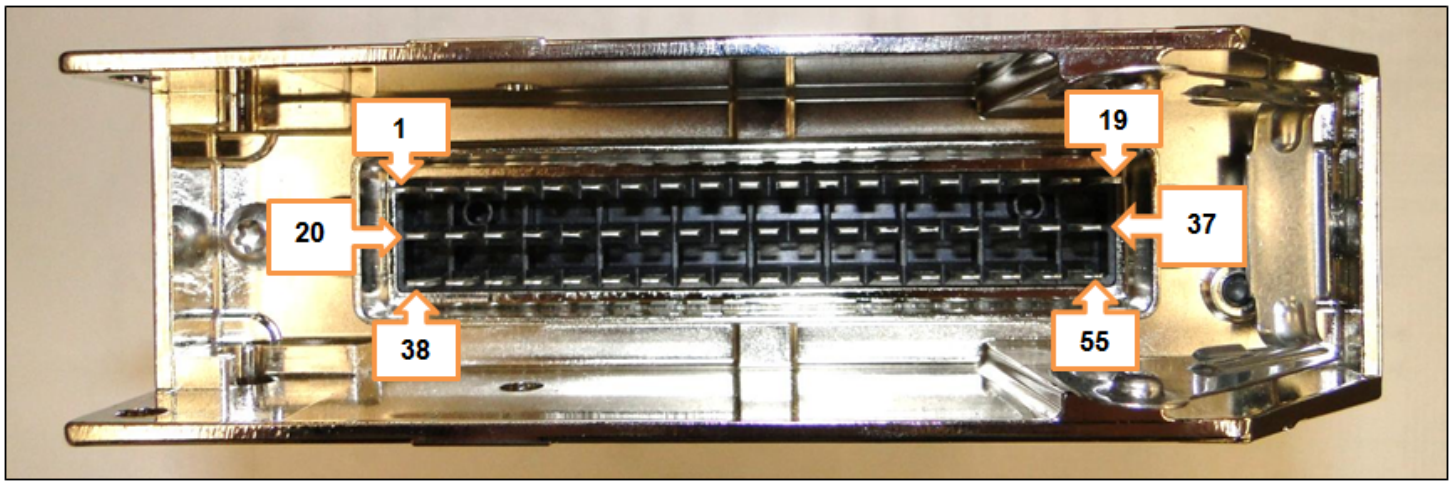


Figure 65. Controller Pin Number Locations (For 80 I/O, Same for Both Controller Sides)

CORTEX CONTROLLER™ 55-POLE CABLE ASSEMBLY

Follow these steps to assemble the Cortex Controller Cable.

A. Cable and Controller Parts Identification

See the figure below to identify the 55-Pole Cable Connector parts.

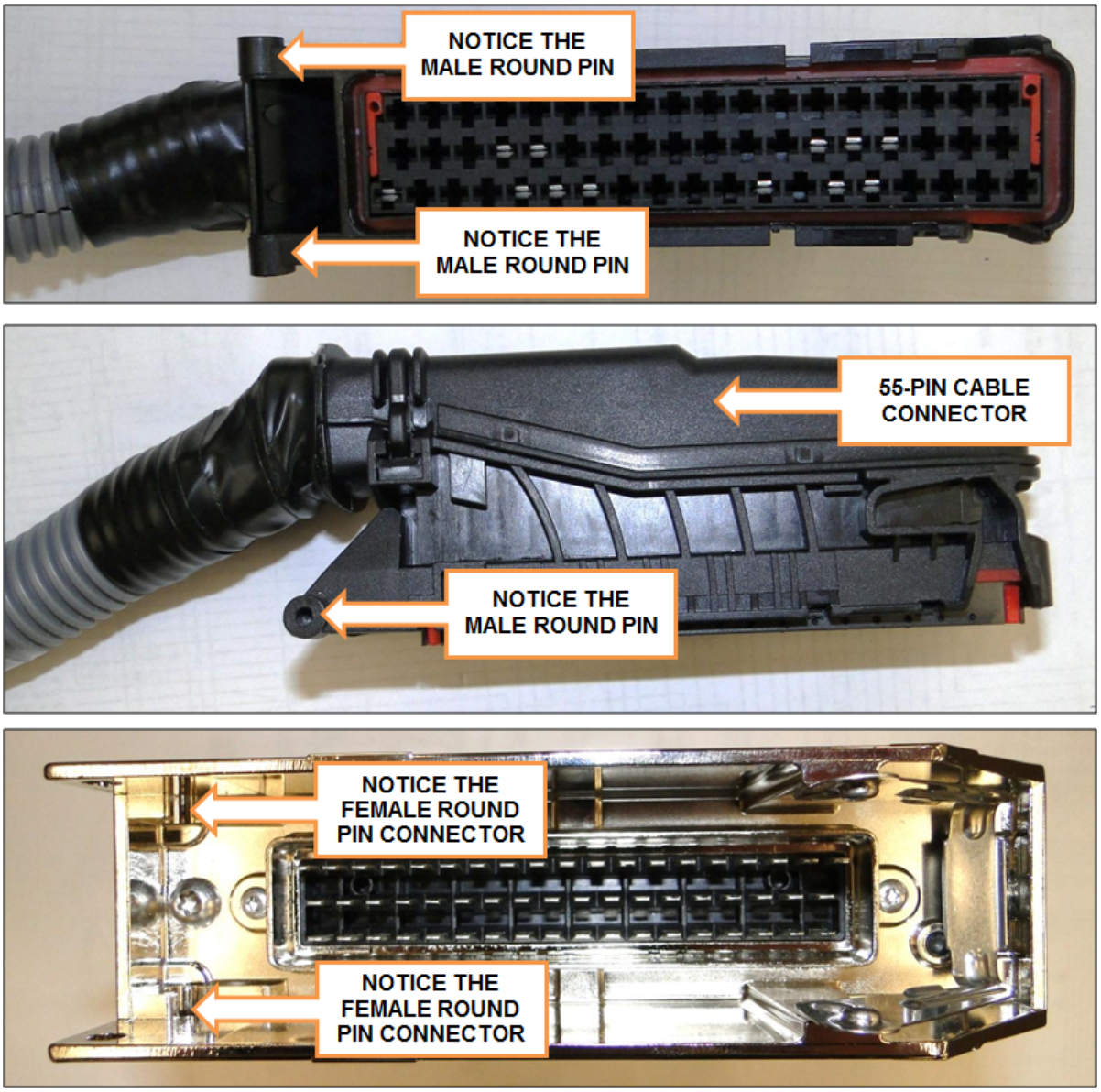


Figure 66. Cable Controller Plastic Male Hinge Pins and Controller Female Slot Connectors

CORTEX CONTROLLER™ 55-POLE CABLE ASSEMBLY (CONTINUED)

B. Female Controller Connector Close-Up View

See the figure below to identify the controller female connector.

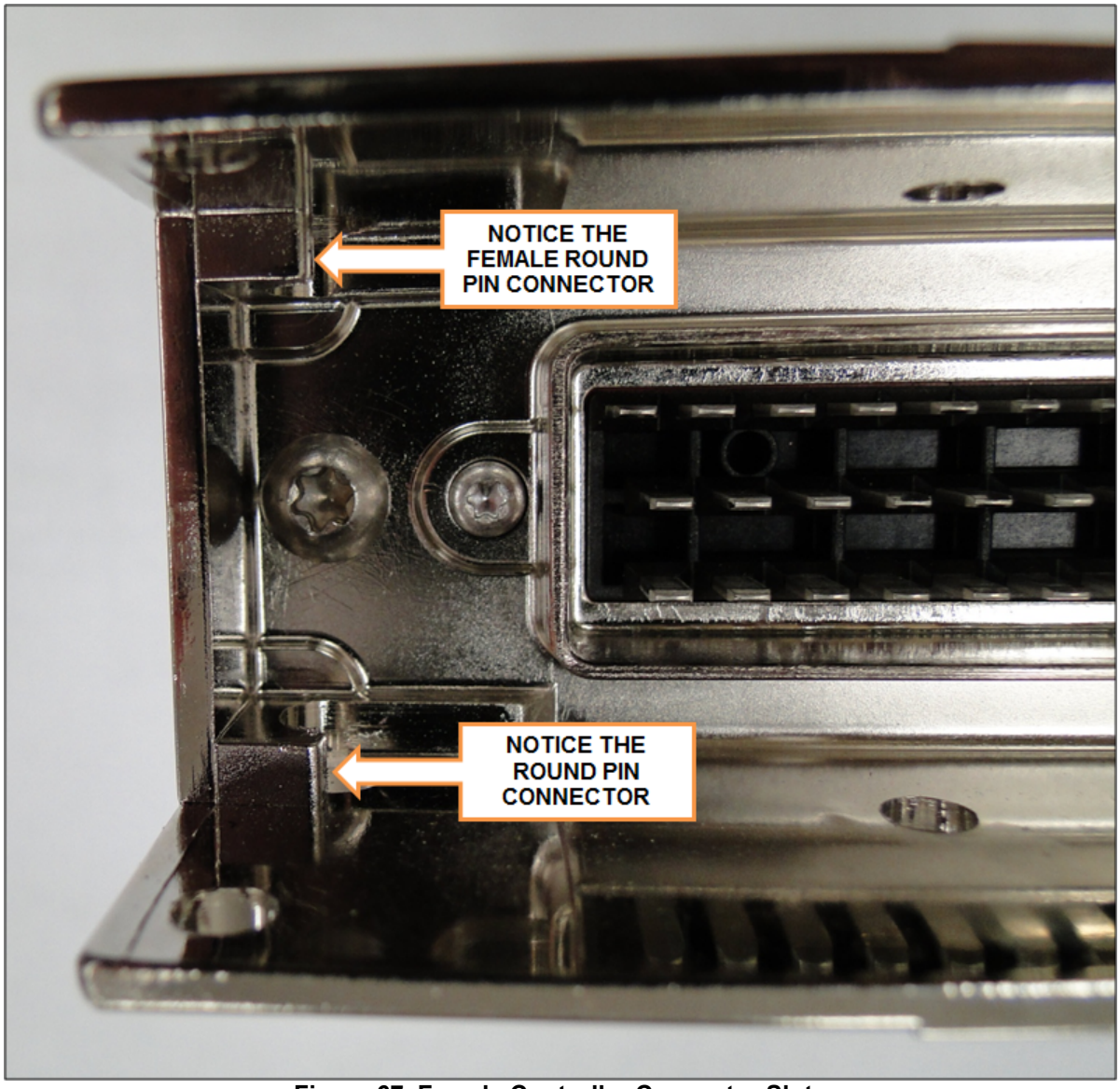


Figure 67. Female Controller Connector Slots

CORTEX CONTROLLER™ 55-POLE CABLE ASSEMBLY (CONTINUED)

C. Connecting the 55-Pole Cable Connector

Refer to the figure below and then slide cable male connectors into controller female connectors.

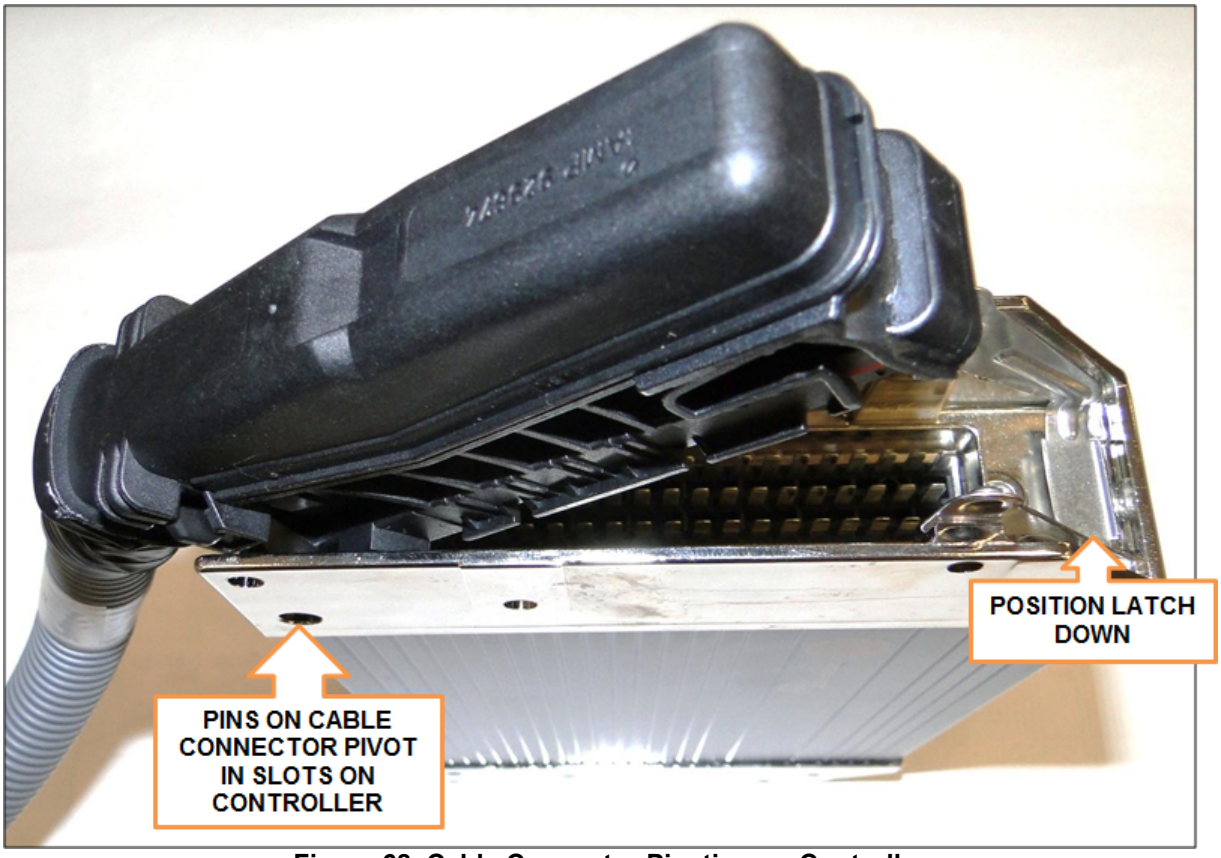


Figure 68. Cable Connector Pivoting on Controller

CORTEX CONTROLLER™ 55-POLE CABLE ASSEMBLY (CONTINUED)

D. Pivot Cable Connector and Latch

1. While keeping left side of cable connector seated, carefully pivot cable connector until flush with controller. See the figure below.

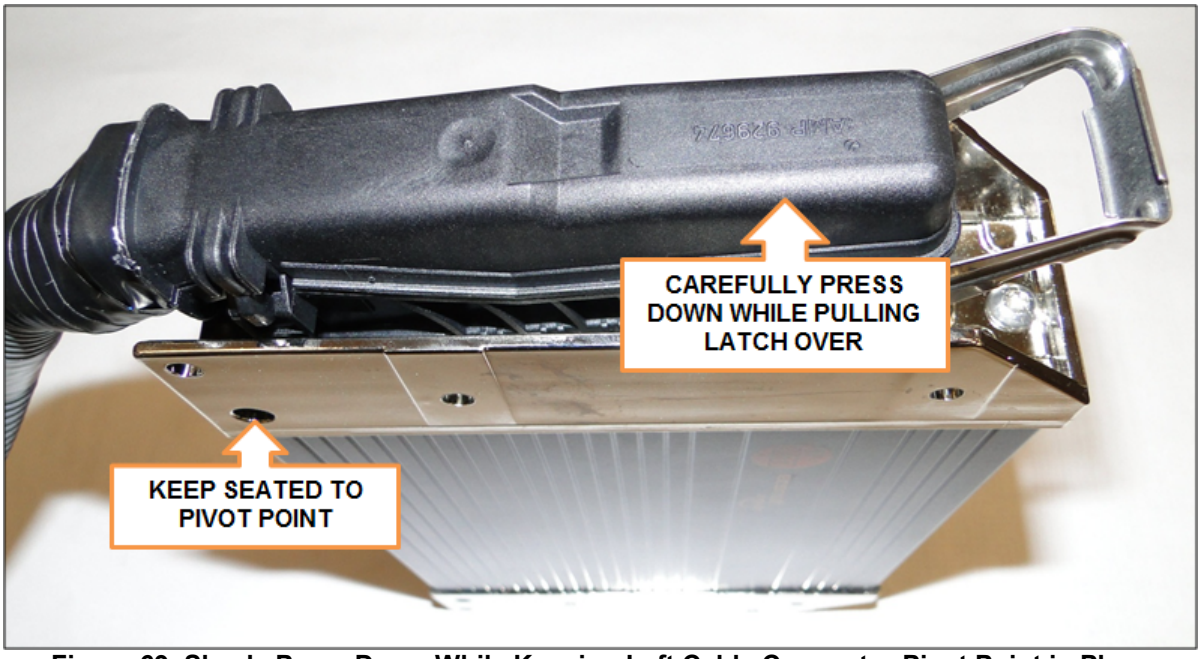


Figure 69. Slowly Press Down While Keeping Left Cable Connector Pivot Point in Place

2. Latch cable to controller until latch is secure and flush with rear of cable connector. See the figure below.

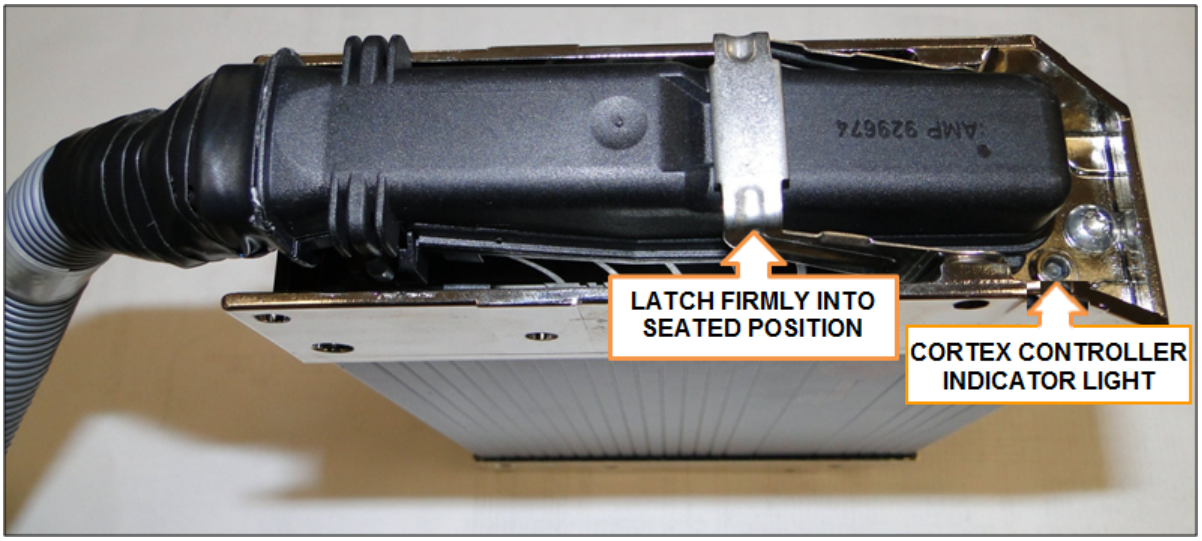


Figure 70. Latch Controller to Cable Connector

3. Repeat steps 1 through 5 to attach the second cable connector to the reverse side of the controller.
4. To remove cable from controller, reverse above process.

HALF/PACK®
Body Controller Hardware

SECTION 6
BODY CONTROLLER SOFTWARE

HALF/PACK® COMMERCIAL CORTEX CONTROLLER™ PROGRAM 109-0352

Section 1: CORTEX32 Controller Hardware

1.01: CORTEX32 Controller Indicator Lights

The 2018 Half/Pack Commercial vehicle control system consists of 2 CORTEX32 Controllers. The “MAIN” CORTEX32 Controller is an Extended Controller consisting of 80 Inputs / Outputs and the Remote Tailgate CORTEX32 Controller (“RTG”) is a Standard Controller consisting of 32 Inputs / Outputs. The CORTEX32 controllers operates with a voltage ranging from (8 to 32) Volt DC. Each CORTEX32 Controller has a three-color LED (Red / Green / Blue) which indicates the current status of the Controller. The LED operating status identifications are detailed in the table below.

CORTEX32 CONTROLLER DETAILS			
Controller No.	**Controller Type**	**Controller Location**	**Controller Name**
1.	CORTEX32 CR0233	StreetSide Body Side Skirt (Middle)	(Main) Main Controller
2.	CORTEX32 CR2530	StreetSide Body Side Skirt (Rear)	(RTG) Remote Tailgate Controller
3.	CORTEX32 CR2530	Cab (Behind Driver Seat)	(CAB) Cab Controller

LED Color	Status	Description
OFF	OFF	No Operating Voltage
Yellow	1 x ON	Initialization or Reset Checks
Orange	ON	Error in start-up phase
Green	5.0 Hz	No Operating System Loaded
Green	2.0 Hz ON	Run Stop
Red	2.0 Hz ON	Run with Error Fatal Error or Stop with Error
Red[3]	5.0 Hz ON	Application Stopped due to under Voltage. Fatal Error System fault
Blue[1,2]	2.0 Hz*	Communication OK between 2 Controllers (for 80 I/O CORTEX32 Controller)[1]. Communication OK between Main, RCN and RTG Controllers (for 32 I/O CORTEX32 Controller Only)[2]

Note[1]: LED will flash Blue when there is a good communication between the 2 halves of the Controller. This condition is applicable only for 80 I/O CORTEX32 Controllers.

Note[2]: LED will flash Blue when there is a good communication between the MAIN, RTG and RCN Controllers. This condition is applicable only for 32 I/O CORTEX32 Controllers.

Note[3]: Applicable only for Remote Tailgate CORTEX32 Controller (“RTG”) and the Remote Can CORTEX32 Controller (“RCN”).

1.02: Inputs

The CORTEX32 Controller Inputs are activated by positive +12 volt signals and some Ground signals (some chassis signals). All Switches, Proximity, Pressure, Toggle, Push buttons, etc., used as input devices to the Controller, supply a +12 volt signal to a CORTEX32 Extended Controller input to turn the Input ON unless otherwise specified.
With an Input ON, the corresponding Input field (with Description and Address) shown on the INSIGHT display will also be ON.

Refer section 5.04 for more details about Diagnostic display options and INSIGHT display tool.

1.03: Outputs

During each cycle the CPU will analyze the status of the inputs, and based upon the logic of the programming, will produce the appropriate +12 volt DC outputs.

Pulse Width Modulation (P.W.M):

a. The primary use of a PWM signal is to allow the control of the power, supplied to electrical devices.
b. The Average value of Voltage (and Current) fed to the load is controlled by turning the switch between supply and load ON and OFF at a fast pace. The longer the switch is ON compared to the OFF periods, the higher the power supplied to the load is.
c. The main advantage of PWM is that power loss in the switching devices is very low. When a switch is OFF there is practically no current, and when switch is ON, there is almost no voltage drop across the switch. Refer figure below for PWM output signals and Waveforms.
d. To test a PWM output use an Incandescent test light and the brightness will vary with the Voltage level.

Refer section 5.04 for more details about Diagnostic display options and INSIGHT display tool.

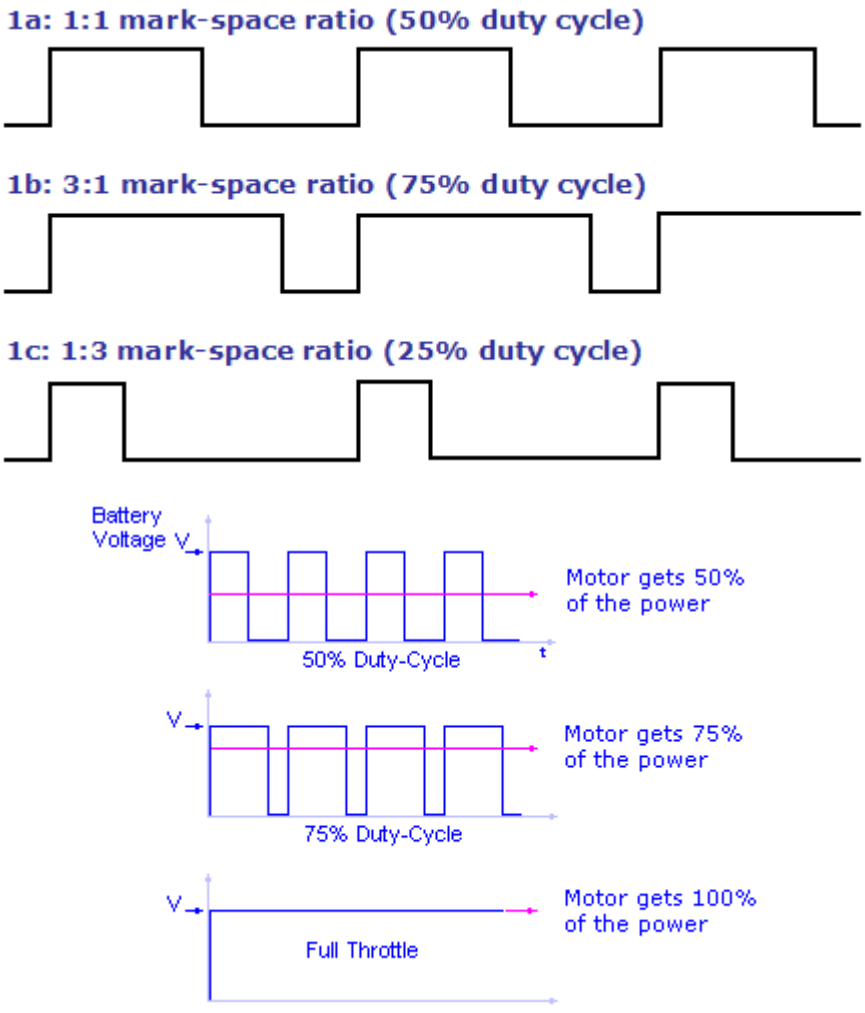


Figure: Pulse Width Modulation (PWM) Output Waveforms

1.04: Communication Ports

There are 4-CAN and 1-RS-232 communication port in the 80 I/O CORTEX32 Controller which will be utilized for the programming and communication purposes. The Serial port (RS-232) in the ST side will be utilized to download user

programs via CORTEX Download tool (Downloader 32) and CAN ports in the ST side for communication between Controller and field devices. See Note below.

The Remote Tailgate (RTG) and Remote Can (RCN) 32 I/O CORTEX32 controllers consists of 2-CAN communication ports each. One of these ports will be used for communicating with the “MAIN” controller. The second CAN port in both Remote Tailgate “RTG” and the Remote Can (“RCN”) controller will not be used.

Note: Communication ports from both Controllers should not be used for downloading or uploading programs in parallel as it may lead to malfunctioning or shutdown of the system. Only the communication ports assigned to the Master control unit needs to be used for Programming and communication purpose.

1.05: Diagnostic Display

Refer section 5.04 for more details about Diagnostic display options and INSIGHT display tool.

1.06: CORTEX32 - Connector Pin Details

The table below gives connection details between CORTEX32 Controller Input/output and Connector Pins.

MAIN CONTROLLER			
109-0350, 109-0351, and 109-0352			
Program Number:	109-035X	I/O ADDRESS	CONNECTOR PINOUT
Revision Number:	2020xxxx		
ODYSSEY 80 I/O COMMERCIAL			
IGNITION 2F		-	E2 PIN 1
PLUGGED		%QX128.8	E2 PIN 2
PLUGGED		%QX128.9	E2 PIN 3
HOPPER FLOOD LIGHTS		%QX128.10	E2 PIN 4
CONTAINER LIGHT		%QX128.11	E2 PIN 5
BACKUP ALARM		%QX128.12	E2 PIN 6
AUX LIGHT		%QX128.13	E2 PIN 7
STROBE LIGHT 1		%QX128.14	E2 PIN 8
STROBE LIGHT 2		%QX128.15	E2 PIN 9
PLUGGED		-	E2 PIN 10
PLUGGED		%QX128.7	E2 PIN 11
PLUGGED		%QX128.6	E2 PIN 12
PLUGGED		%QX128.5	E2 PIN 13
PLUGGED		%QX128.4	E2 PIN 14
PLUGGED		%QX128.3	E2 PIN 15

PLUGGED	%QX128.2	E2 PIN 16
PLUGGED	%QX128.1	E2 PIN 17
CAB FLOOD LIGHTS	%QX128.0	E2 PIN 18
IGNITION 2F	-	E2 PIN 19
GROUND 2	-	E2 PIN 20
PLUGGED	%IX128.14	E2 PIN 21
PLUGGED	%IX128.12	E2 PIN 22
PLUGGED	%IX128.10	E2 PIN 23
PLUGGED	%IX128.8	E2 PIN 24
PLUGGED	-	E2 PIN 25
PLUGGED	-	E2 PIN 26
PLUGGED	-	E2 PIN 27
PLUGGED	-	E2 PIN 28
GRAB/FORKS IN	%QX128.20	E2 PIN 29
RELEASE/FORKS OUT	%QX128.21	E2 PIN 30
PLUGGED	%QX128.22	E2 PIN 31
OUTPUT POWER 2	-	E2 PIN 32
PLUGGED	%IX128.7	E2 PIN 33
PLUGGED	%IX128.5	E2 PIN 34
PLUGGED	%IX128.3	E2 PIN 35
PLUGGED	%IX128.1	E2 PIN 36
GROUND 2	-	E2 PIN 37
PLUGGED	%IX128.15	E2 PIN 38
PLUGGED	%IX128.13	E2 PIN 39
PLUGGED	%IX128.11	E2 PIN 40
PLUGGED	%IX128.9	E2 PIN 41
PLUGGED	%IX128.16	E2 PIN 42
PLUGGED	%IX128.17	E2 PIN 43
PLUGGED	%IX128.18	E2 PIN 44
PLUGGED	%IX128.19	E2 PIN 45
PLUGGED	%IX128.20	E2 PIN 46

PLUGGED		%IX128.21	E2 PIN 47
PLUGGED		%IX128.22	E2 PIN 48
PLUGGED		%IX128.23	E2 PIN 49
PLUGGED		%QX128.23	E2 PIN 50
IGNITION 2F		-	E2 PIN 51
PLUGGED		%IX128.6	E2 PIN 52
HIGH PRESSURE FILTER		%IX128.4	E2 PIN 53
PLUGGED		%IX128.2	E2 PIN 54
PLUGGED		%IX128.0	E2 PIN 55
Program Number:	109-035X	I/O ADDRESS	CONNECTOR PINOUT
Revision Number:	2020xxxx		
ODYSSEY 80 I/O COMMERCIAL			
OUTPUT POWER 1		-	E1 PIN 1
PTO 1 SOLENOID		%QX0.8	E1 PIN 2
PTO 2 SOLENOID		%QX0.9	E1 PIN 3
PLUGGED		%QX0.10	E1 PIN 4
PLUGGED		%QX0.11	E1 PIN 5
PACKER EXTEND		%QX0.12	E1 PIN 6
PACKER RETRACT		%QX0.13	E1 PIN 7
TAILGATE FLOW		%QX0.14	E1 PIN 8
CARRY CAN FLOW		%QX0.15	E1 PIN 9
IGNITION 1F		-	E1 PIN 10
FORKS DOWN		%QX0.7	E1 PIN 11
FORKS RAISE		%QX0.6	E1 PIN 12
ARMS RAISE		%QX0.5	E1 PIN 13
ARMS DOWN		%QX0.4	E1 PIN 14
CAB PROTECTOR RAISE		%QX0.3	E1 PIN 15
CAB PROTECTOR LOWER		%QX0.2	E1 PIN 16
PLUGGED		%QX0.1	E1 PIN 17
PTO ENABLE		%QX0.0	E1 PIN 18

OUTPUT POWER 1	-	E1 PIN 19
GROUND 1	-	E1 PIN 20
CAB PROTECTOR PROX	%IX0.14	E1 PIN 21
OIL TEMPERATURE	%IX0.12	E1 PIN 22
PLUGGED	%IX0.10	E1 PIN 23
SYSTEM POWER SWITCH	%IX0.8	E1 PIN 24
RS232 RECEIVE	-	E1 PIN 25
J1939 3 L	-	E1 PIN 26
J1939 2 L	-	E1 PIN 27
J1939 1 L	-	E1 PIN 28
CAN 1 L	-	E1 PIN 29
PLUGGED	-	E1 PIN 30
PLUGGED	-	E1 PIN 31
IGNITION 1F	-	E1 PIN 32
LOW OIL SWITCH	%IX0.7	E1 PIN 33
ARMS UP PROX	%IX0.5	E1 PIN 34
FORKS TUCKED PROX	%IX0.3	E1 PIN 35
OVERHEIGHT PROX	%IX0.1	E1 PIN 36
GROUND 1	-	E1 PIN 37
PLUGGED	%IX0.15	E1 PIN 38
LEFT TURN SIGNAL	%IX0.13	E1 PIN 39
RIGHT TURN SIGNAL	%IX0.11	E1 PIN 40
PTO PRESSURE SWITCH	%IX0.9	E1 PIN 41
GROUND 1	-	E1 PIN 42
RS232 TRANSMIT	-	E1 PIN 43
J1939 3 H	-	E1 PIN 44
J1939 2 H	-	E1 PIN 45
J1939 1 H	-	E1 PIN 46
CAN 1 H	-	E1 PIN 47
PLUGGED	-	E1 PIN 48
PLUGGED	-	E1 PIN 49

IGNITION 1F	-	E1 PIN 50
PLUGGED	-	E1 PIN 51
FILTER PRESSURE SWITCH	%IX0.6	E1 PIN 52
SIDE DOOR PROX	%IX0.4	E1 PIN 53
PACKER POSITION SENSOR	%IX0.2	E1 PIN 54
BODY VALVE PRESSURE	%IX0.0	E1 PIN 55

CAB CONTROLLER			
109-0350, 109-0351, and 109-0352			
Program Number:	109-0353	I/O ADDRESS	CONNECTOR PINOUT
Revision Number:	2020xxxx		
ODYSSEY 80 I/O COMMERCIAL			
OUTPUT POWER 1		-	E1 PIN 1
CARRY CAN COVER UP		%QX0.8	E1 PIN 2
CARRY CAN COVER DOWN		%QX0.9	E1 PIN 3
SPARE OUTPUT		%QX0.10	E1 PIN 4
AUX AIR SUPPLY		%QX0.11	E1 PIN 5
WARBLE ALARM		%QX0.12	E1 PIN 6
CAB ALARM		%QX0.13	E1 PIN 7
AIR SUPPLY		%QX0.14	E1 PIN 8
FUSED IGNITION 2F		%QX0.15	E1 PIN 9
RIGHT TURN CAMERA TRIGGER		-	E1 PIN 10
LEFT TURN CAMERA TRIGGER		%QX0.7	E1 PIN 11
FREIGHTLINER BRAKE LOCKOUT		%QX0.6	E1 PIN 12
HOPPER CAMERA TRIGGER		%QX0.5	E1 PIN 13
REVERSE CAMERA TRIGGER		%QX0.4	E1 PIN 14
OUT OF DIMENSION		%QX0.3	E1 PIN 15
THROTTLE LIMIT		%QX0.2	E1 PIN 16
THROTTLE ADVANCE		%QX0.1	E1 PIN 17
PLUGGED		%QX0.0	E1 PIN 18
IGNITION 2F		-	E1 PIN 19

SPARE INPUT	-	E1 PIN 20
SPARE INPUT	%IX0.14	E1 PIN 21
SPARE INPUT	%IX0.12	E1 PIN 22
PLUGGED	%IX0.10	E1 PIN 23
PLUGGED	%IX0.8	E1 PIN 24
PLUGGED	-	E1 PIN 25
PLUGGED	-	E1 PIN 26
PLUGGED	-	E1 PIN 27
PLUGGED	-	E1 PIN 28
J1939 3 L	-	E1 PIN 29
PLUGGED	-	E1 PIN 30
PLUGGED	-	E1 PIN 31
PANEL SELECT	-	E1 PIN 32
PLUGGED	%IX0.7	E1 PIN 33
CHASSIS NEUTRAL	%IX0.5	E1 PIN 34
TRANSMISSION SUMP TEMP	%IX0.3	E1 PIN 35
GROUND 1	%IX0.1	E1 PIN 36
SPARE INPUT	-	E1 PIN 37
EXTERNAL THROTTLE ADVANCE	%IX0.15	E1 PIN 38
PLUGGED	%IX0.13	E1 PIN 39
PLUGGED	%IX0.11	E1 PIN 40
PLUGGED	%IX0.9	E1 PIN 41
GROUND 1	-	E1 PIN 42
PLUGGED	-	E1 PIN 43
PLUGGED	-	E1 PIN 44
PLUGGED	-	E1 PIN 45
PLUGGED	-	E1 PIN 46
J1939 3 H	-	E1 PIN 47
PLUGGED	-	E1 PIN 48
PLUGGED	-	E1 PIN 49
PLUGGED	-	E1 PIN 50

PLUGGED	-	E1 PIN 51
PLUGGED	%IX0.6	E1 PIN 52
PLUGGED	%IX0.4	E1 PIN 53
SCALE ALARM 2	%IX0.2	E1 PIN 54
SCALE ALARM 1	%IX0.0	E1 PIN 55

TAILGATE CONTROLLER			
109-0350, 109-0351, and 109-0352			
Program Number:	109-0317	I/O ADDRESS	CONNECTOR PINOUT
Revision Number:	2020xxxx		
ODYSSEY 80 I/O COMMERCIAL			
IGNITION 2F		-	E1 PIN 1
PLUGGED		%QX0.8	E1 PIN 2
PLUGGED		%QX0.9	E1 PIN 3
PLUGGED		%QX0.10	E1 PIN 4
PLUGGED		%QX0.11	E1 PIN 5
PLUGGED		%QX0.12	E1 PIN 6
PLUGGED		%QX0.13	E1 PIN 7
PLUGGED		%QX0.14	E1 PIN 8
PLUGGED		%QX0.15	E1 PIN 9
IGNITION 2F		-	E1 PIN 10
TAILGATE UNLOCK		%QX0.7	E1 PIN 11
TOP DOOR CLOSE		%QX0.6	E1 PIN 12
TOP DOOR OPEN		%QX0.5	E1 PIN 13
TAILGATE LOCK		%QX0.4	E1 PIN 14
TAILGATE DOWN		%QX0.3	E1 PIN 15
TAILGATE RAISE		%QX0.2	E1 PIN 16
PLUGGED		%QX0.1	E1 PIN 17
PLUGGED		%QX0.0	E1 PIN 18
IGNITION 2F		-	E1 PIN 19
GROUND 1		-	E1 PIN 20

NODE ID	%IX0.14	E1 PIN 21
PLUGGED	%IX0.12	E1 PIN 22
PLUGGED	%IX0.10	E1 PIN 23
PLUGGED	%IX0.8	E1 PIN 24
PLUGGED	-	E1 PIN 25
PLUGGED	-	E1 PIN 26
PLUGGED	-	E1 PIN 27
PLUGGED	-	E1 PIN 28
J1939 3 L	-	E1 PIN 29
PLUGGED	-	E1 PIN 30
PLUGGED	-	E1 PIN 31
PLUGGED	-	E1 PIN 32
PLUGGED	%IX0.7	E1 PIN 33
PLUGGED	%IX0.5	E1 PIN 34
TAILGATE LOCK PROX SS	%IX0.3	E1 PIN 35
TOP DOOR OPEN PROX	%IX0.1	E1 PIN 36
GROUND 1	-	E1 PIN 37
PLUGGED	%IX0.15	E1 PIN 38
PLUGGED	%IX0.13	E1 PIN 39
PLUGGED	%IX0.11	E1 PIN 40
PLUGGED	%IX0.9	E1 PIN 41
GROUND 1	-	E1 PIN 42
PLUGGED	-	E1 PIN 43
PLUGGED	-	E1 PIN 44
PLUGGED	-	E1 PIN 45
PLUGGED	-	E1 PIN 46
J1939 3 H	-	E1 PIN 47
PLUGGED	-	E1 PIN 48
PLUGGED	-	E1 PIN 49
PLUGGED	-	E1 PIN 50
PLUGGED	-	E1 PIN 51

PLUGGED	%IX0.6	E1 PIN 52
PLUGGED	%IX0.4	E1 PIN 53
TAILGATE LOCK PROX CS	%IX0.2	E1 PIN 54
TAILGATE CLOSED PROX	%IX0.0	E1 PIN 55

Section 2: J1939 Details

The Engine information is directly read through the SAE J1939 standard. SAE J1939 is the vehicle bus standard used for communication and diagnostics among vehicle components, like heavy duty truck industry. J1939 is used in heavy vehicles for on-street and off-road operations and works on the physical layer with CAN-high speed according to ISO11898. J1939 is a multi-master system with decentralized network management without channel-based communication.

J1939 can provide information's like Engine RPM, Transmission Gear info, Parking Brake Info, and Road Speed.

Section 3: Default Parameters

3.01 Program 109-0308 Parameter Defaults

Sl. No.	Parameter	Default Setting
A	Start Filter Warning	5 Hours
B	Start Filter Shutdown	6 Hours
C	Packer Extend Auto Pack Time Out	35 Seconds
D	Packer Auto Retract Time Out	35 Seconds
E	Engine Over speed	1800 RPM
F	Engine ON	Engine Speed > 400 RPM
G	Bypass Time Reset	15 minutes
H	Pump Bypass Run Time	180 Seconds
I	Bypass Beep Time	60 Seconds
J	Road Speed Ok	< 5mph
K	Curotto Can Demo Time	3 Seconds
L	Carry Can Stow Time	2 Seconds
M	Throttle Advance	1350 RPM
N	Throttle Limit	1500 RPM
O	Hydraulic Oil Operating Temp	70°F - 190°F

Section 4: I/O Functions

The following sheets detail the functionality of the Input and Output functions provided through the CORTEX32 Controller.

Note: Status of all the Inputs / Outputs can be monitored using the Insight In-Cab display. Refer section 5.04 for more details about Diagnostic display options and INSIGHT display.

4.01: Standard In-Cab Input Functions

A01 Input Function -- System Power Switch (In Cab Input %IX0.08)

This circuit monitors the ON/OFF status of the system power switch (“mushroom button”).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
System Power Switch	Activated	%IX0.08	ON

A02 Input Function – Chassis Neutral Signal (In Cab Input %IX0.10)

This circuit monitors the transmission Neutral circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Chassis Transmission	In Neutral	%IX0.10	ON

A03 Input Function – Panel Selector Switch Enable (In Cab Input %IX0.09)

This signal is used for switching between Street Side and Curb Side Joysticks and panels.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Panel Selector Switch Enable Circuit	Activated	%IX0.09	ON

A04 Input Function – Left Turn Signal Enabled (In Cab Input %IX0.13)

This circuit monitors the status of the Left Turn Signal circuit. This circuit is used for enabling and disabling Front / Rear strobe circuits.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Turn Signal Enable Circuit	Activated	%IX0.13	ON

A05 Input Function – Right Turn Signal Enabled (In Cab Input %IX0.11)

This circuit monitors the status of the Right Turn Signal circuit. This circuit is used for enabling and disabling Front / Rear strobe circuits.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Turn Signal Enable Circuit	Activated	%IX0.11	ON

A06 Input Function – Transmission Temperature Signal Switch (In Cab Input %IX0.15)

This circuit monitors the status of the Transmission Oil Temperature. The input is ON when the Temperature of the Transmission Oil is OK.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Transmission Temperature Switch Circuit	Activated	%IX0.15	ON

A07 Input Function Scale Alarm-1 (In Cab Input %IX128.00)

This circuit monitors the ON/OFF status of the Scale Alarm-1 condition. This Scale Input goes High (ON) when approaching maximum weight on the scale system.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Scale Alarm-1	Activated	%IX128.00	ON

A08 Input Function Scale Alarm-2 (In Cab Input %IX128.02)

This circuit monitors the ON/OFF status of the Scale Alarm-2 condition. This Scale Input goes Low (OFF) during overweight condition.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Scale Alarm-2	Activated	%IX128.02	OFF

4.02: Standard In-Cab Output Functions

B01 Output Function – In-Cab Alarm (In Cab Output %QX128.08)

This output function controls the In-Cab Alarm. See Section 6.04 for a complete explanation of the Diagnostic Messages associated with this unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Arms Full Up Position	Deactivated	N/A	OFF
	or Forks Full Tucked Position	Deactivated	N/A	OFF
B	Lift below Transit Position	Deactivated	N/A	OFF
C	Chassis Neutral	Deactivated	%IX0.10	OFF
D	Tailgate Closed Prox. Switch	Deactivated	%IX0.00	OFF
E	Active Diagnostic message	Activated	N/A	ON (Refer Section 6.04)

Note: With (A AND B AND C) OR condition (D OR E) true will activate the In-Cab Alarm output.

B02 Output Function – Throttle Advance Signal (In Cab Output %QX0.10)

This output function controls the Throttle Advance signal transmitted to the vehicles Engine.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Packer Extend PWM	Activated	%QX0.12	ON
	or Packer Retract PWM	Activated	%QX0.13	ON
B	Auto Lift Enable Switch	Activated	CAN	ON
C	Auto Lift Down cycle	Activated	N/A	ON
	or Auto Lift Up cycle	Activated	N/A	ON
D	Neutral Signal	Activated	%IX0.10	ON

Note: With condition 'D' true, condition (A OR (B AND C)) will activate the Throttle Advance output. Throttle advance output is disabled in Service mode or Calibration mode.

B03 Output Function – Throttle Limit (In Cab Output %QX0.11)

This output function controls the Throttle Limit command sent to the Engine.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Pump On	Activated	N/A	ON
B	Neutral Signal	Activated	%IX0.10	ON (See Note Below)
C	Throttle Advance Output	Deactivated	%QX0.10	OFF

Note: With condition 'A' true, Condition (B AND C) will activate the Throttle Limit output.

B04 Output Function – WARBLE Alarm (In Cab Output %QX128.09)

This output function controls the Warble Alarm.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Tailgate Closed Prox. Switch	Deactivated	%IX0.00	OFF

Note: Condition 'A' true will activate the Warble Alarm output.

B05 Output Function – Hopper Flood Light (In Cab Output %QX128.10)

This output function controls the Hopper Flood Light. Here CAN control is used to turn ON/OFF the Hopper Light Circuit, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Hopper Light Switch	Activated	CAN	ON

Note: With condition (A) true the Hopper Flood Light output will activate.

4.03: Standard Body Input Functions

C01 Input Function – Oil Filter Pressure Switch (Body Input %IX0.06)

This circuit monitors the ON/OFF status of the Oil Filter Pressure Switch. The input is OFF when the filter is in bypass. The input is ON when the filter is in normal operation i.e. not in bypass.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Filter Pressure Switch	Activated	%IX0.06	ON

C02 Input Function -- Side Door Closed Proximity Switch (Body Input %IX0.04)

This circuit monitors the ON/OFF status of the Side Door Closed Proximity Switch. The input is ON when the side door is closed.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Side Door Proximity Switch	Activated	%IX0.04	ON

C03 Input Function -- Tailgate Closed Proximity Switch (Body Input %IX0.00)

This circuit monitors the ON/OFF status of the Tailgate Closed Proximity Switch. The input is ON when the Tailgate is closed.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Tailgate Closed Proximity Switch	Activated	%IX0.00	ON

C04 Input Function – Lift Below Transit Proximity Switch (Body Input %IX0.01)

This circuit monitors the ON/OFF status of the Lift Below Transit Proximity Switch. The input is ON when the arm is in the Lowered position. NOT USED.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
NOT USED. FUTURE EXPANSION			

C05 Input Function – Forks Tucked Proximity Switch (Body Input %IX0.03)

This circuit monitors the ON/OFF status of the Forks Tucked Proximity Switch. The input is ON when the Forks are fully tucked position. NOT USED.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
NOT USED. FUTURE EXPANSION			

C06 Input Function – Arms Up Proximity Switch (Body Input %IX0.03)

This circuit monitors the ON/OFF status of the Arms Up Proximity Switch. The input is ON when the Arms are in raised position. NOT USED.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
NOT USED. FUTURE EXPANSION			

4.04: Standard Body Output Functions

D01 Output Function – Tailgate Up Solenoid (Body Output %QX0.02)

This output function controls the Tailgate Up output circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Tailgate Raise Push Button	Activated	CAN	ON
B	Panel Selector Switch	Activated	%IX0.09	ON
C	Road Speed OK	Activated	N/A	ON (see Note below)
D	and Pump On	Activated	N/A	ON
E	Tailgate Locked Prox.	Deactivated	%IX0.02	OFF

Note: This signal is energized using a CAN based control by energizing the Tailgate Raise switch either from Street side or from Curb side panel. With Conditions (A AND B AND C AND D) true, function 'E' will activate the Tailgate Up Solenoid output.
For condition 'C' to be true, Road Speed value should be less than '5' mph.

D02 Output Function – Tailgate Down Solenoid (Body Output %QX0.03)

This output function controls the Tailgate Down output circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Tailgate Lower Push Button	Activated	CAN	ON
B	Panel Selector Switch	Activated	%IX0.09	ON
C	Road Speed OK	Activated	N/A	ON (see Note below)
D	and Pump On	Activated	N/A	ON

Note: This signal is energized using a CAN based control by energizing the Tailgate Lower switch either from Street side or from Curb side panel.
If Conditions (A AND B AND C AND D) are true, will activate the Tailgate Down Solenoid output.
For condition 'C' to be true, Road Speed value should be less than '5' mph.

D03 Output Function – Tailgate Lock Solenoid (Body Output %QX0.04)

This output function controls the Tailgate Lock output circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Tailgate Lock Push Button	Activated	CAN	ON
B	Panel Selector Switch	Activated	%IX0.09	ON
C	Road Speed OK	Activated	N/A	ON (see Note below)

Condition	Function or Component	Status	I/O Address	Status
D	Tailgate Locked Prox.	Deactivated	%IX0.02	OFF
E	and Pump On	Activated	N/A	ON

Note: This signal is energized using a CAN based control by energizing the Tailgate Lock switch either from Street side or from Curb side panel. With ((A AND B AND C AND D)) true, Condition 'E' will activate the Tailgate Lock output. For condition 'C' to be true, Road Speed value should be less than '5' mph.

D04 Output Function – Tailgate Unlock Solenoid (Body Output %QX0.07)

This output function controls the Tailgate Unlock output circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Tailgate Un Lock Push Button	Activated	CAN	ON
B	Panel Selector Switch	Activated	%IX0.09	ON
C	or Tailgate Down	Activated	%QX0.03	ON (see Note below)
	and Tailgate Closed Prox.	Deactivated	%IX0.00	OFF
D	Tailgate Locked Prox.	Activated	N/A	ON (see Note below)
E	and Pump On	Activated	N/A	ON

Note: This signal is energized using a CAN based control by energizing the Tailgate Unlock switch either from Street side or from Curb side panel. With conditions ((A AND B) OR C) true, function (D AND E) will activate the Tailgate Unlock output. For condition 'D' to be true, Road Speed value should be less than '5' mph.

D05 Output Function – Back Up Alarm (Body Output %QX128.12)

This output function controls the Back Up Alarm output.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Tailgate Closed Prox.	Deactivated	%IX0.00	ON

Note: If Tailgate is not closed, then Back Up Alarm is activated.

D06 Output Function – Arms Up PWM control (Body Output %QX0.05)

This output function controls the Arms up PWM Control output circuit.
The Arms up PWM control circuit either with the Auto Lift signal (fixed speed) or with the Manual lift signal (variable speed) will control the speed of Arm Up movement when operated.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Auto Lift Enable Switch	Activated	N/A	ON
B	Pump On	Activated	N/A	ON
C	Arms up Interlock	Deactivated	N/A	OFF
D	Aux Controls Enable	Activated	N/A	ON (Manual Control – Var. speed)
E	Aux Arms Raise	Activated	N/A	ON (Manual Control – Var. speed)
F	Sensor Failure	Deactivated	N/A	OFF
G	Raise Arms	Activated	N/A	ON

Note: The Arms Valve PWM output provides flow to the hydraulic hoses on the arms cylinder. This flow, when combined with the activation of Arms up function, will move the Arms up (with fixed or variable speed). The flow setting of this valve is adjustable using the Insight diagnostic display.

D07 Output Function – Arms Down PWM control (Body Output %QX0.04)

This output function controls the Arms down PWM Control output circuit. The Arms down PWM control circuit either with the Auto Lift signal (fixed speed) or with the Manual lift signal (variable speed) will control the speed of Arm down movement when operated.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Auto Lift Enable Switch	Activated	N/A	ON
B	Pump On	Activated	N/A	ON
C	Arms Down Interlock	Deactivated	N/A	OFF
D	Aux Controls Enable	Activated	N/A	ON (Manual Control – Var. speed)
E	Aux Arms Lower	Activated	N/A	ON (Manual Control – Var. speed)
F	Sensor Failure	Deactivated	N/A	OFF
G	Lower Arms	Activated	N/A	ON

Note: The Arms Valve PWM output provides flow to the hydraulic hoses on the arms cylinder. This flow, when combined with the activation of arms down function, will move the Arms down (with fixed or variable speed). The flow setting of this valve is adjustable using the Insight diagnostic display.

D08 Output Function – Cab Protector Up Control (Body Output %QX0.03)

This function controls the Cab Protector up output. Not used.

Condition	Modifiable Parameters	Default Setting

A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
NOT USED				

D09 Output Function – Cab Protector Down Control (Body Output %QX0.02)

This function controls the Cab Protector Down output. Not used.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
NOT USED				

D10 Output Function – Allison PTO Enabled (Body Output %QX0.00)

This output function controls the Allison Power Take Off (PTO).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Pump Enable Push Button	Activated	CAN	ON
	System Power Switch	Activated	%IX0.8	ON
	Side Door Prox. Switch	Activated	%IX0.4	ON
B	Road Speed	Activated	N/A	ON (see Note below)
C	Engine Speed	Activated	N/A	ON (see Note below)
D	Filter Bypass	Deactivated	N/A	OFF
E	Filter Pressure Switch	Activated	%IX0.6	ON
F	Low Oil Level Switch	Activated	%IX0.7	ON (see Note Below)

Note: With condition (A AND B AND C AND F) true, Condition (D OR E) will activate the Allison PTO pump.
For condition ‘B’ to be true, Road Speed value should be less than ‘15’ mph.
For condition ‘C’ to be true, Engine Speed value should be less than ‘900’ RPM.
Condition ‘F’ Low Oil Switch will be considered only during Calibration mode.

D11 Output Function – PTO-2 Pump (Body Output %QX0.09)

This output function controls the Power Take Off (PTO) Pump-2 output.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Pump Enable Push Button	Activated	CAN	ON
	System Power Switch	Activated	%IX0.8	ON
	Side Door Prox. Switch	Activated	%IX0.4	ON
B	Road Speed	Activated	N/A	ON (see Note below)
C	Engine Speed	Activated	N/A	ON (see Note below)
D	Filter Bypass	Deactivated	N/A	OFF
E	Filter Pressure Switch	Activated	%IX0.6	ON
F	Low Oil Level Switch	Activated	%IX0.7	ON (see Note Below)

Note: With condition (A AND B AND C AND F) true, Condition (D OR E) will activate the PTO-2 pump.
For condition 'B' to be true, Road Speed value should be less than '15' mph.
For condition 'C' to be true, Engine Speed value should be less than '900' RPM.
Condition 'F' Low Oil Switch will be considered only during Calibration mode.

D12 Output Function – PTO-1 Pump (Body Output %QX0.08)

This output function controls the Power Take Off (PTO) Pump-1 output.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Pump Enable Push Button	Activated	CAN	ON
	System Power Switch	Activated	%IX0.8	ON
	Side Door Prox. Switch	Activated	%IX0.4	ON
B	Road Speed	Activated	N/A	ON (see Note below)
C	Engine Speed	Activated	N/A	ON (see Note below)
D	Filter Bypass	Deactivated	N/A	OFF
E	Filter Pressure Switch	Activated	%IX0.6	ON
F	Low Oil Level Switch	Activated	%IX0.7	ON (see Note Below)

Note: With condition (A AND B AND C AND F) true, Condition (D OR E) will activate the PTO-1 pump.
For condition 'B' to be true, Road Speed value should be less than '15' mph.
For condition 'C' to be true, Engine Speed value should be less than '900' RPM.
Condition 'F' Low Oil Switch will be considered only during Calibration mode.

D21 Output Function – Tailgate Enable PWM control (Body Output %QX0.14)

This output function controls the Tailgate PWM control output circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Tailgate Down	Activated	%QX0.03	ON
	or Tailgate Up	Activated	%QX0.02	ON
	or Tailgate Lock	Activated	%QX0.04	ON
	or Tailgate Unlock	Activated	%QX0.07	ON
	or Top Door Open	Activated	%QX0.05	ON
	or Top Door Close	Activated	%QX0.06	ON
B	and Pump On	Activated	N/A	ON

Note: The Tailgate PWM output provides flow to the Tailgate hydraulic valve assembly. This flow, when combined with activation of a Tailgate function, will move the Tailgate Up, Down, Lock, Unlock, Top Door Open or Top Door Close. With condition 'B' true, Tailgate Valve PWM output will activate any of the output in condition 'A'.

4.05: Optional In-Cab Input Functions

FUTURE EXPANSION

4.06: Optional In-Cab Output Functions

E01 Output Function (Option) – CAB Flood light control (In Cab Output %QX128.00)

This output function controls the Cab Flood Light output. Here CAN control is used to turn ON/OFF the In-Cabinet Light Circuit, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Cab Flood Switch	Activated	CAN	ON

4.07: Optional Body Input Functions

F01 Input Function – High Pressure Filter Switch (Body Input %IX128.4)

This circuit monitors the ON/OFF status of the High Pressure Filter Switch.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status

High Pressure Filter Switch	Activated	%IX128.4	ON

F04 Input Function – Cab Protector Down Proximity Switch (Body Input %IX0.14)

This circuit monitors the ON/OFF status of the Cab Protector Down Proximity Switch. The input is ON when the Cab Protector is down. This circuit is used to interlock the arms when the aluminum cab protector is raised.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Cab Protector Down Prox. Switch	Activated	%IX0.14	ON

F05 Input Function -- Tailgate Locked Proximity Switch (Body Input %IX0.02)

This circuit monitors the ON/OFF status of the Tailgate Locked Proximity Switch i.e. it indicates the position of the Tailgate lock cylinders. The input is ON when the Tailgate cylinder is locked.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Tailgate Locked Proximity Switch	Activated	%IX0.02	ON

F06 Input Function – Top Door Fully Open Proximity Switch (Body Input %IX0.01)

This circuit monitors the ON/OFF status of the Top Door Open Proximity Switch. The input is ON when the top door is fully open.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Top Door Proximity Switch	Activated	%IX0.01	ON

F07 Input Function – Oil Level Switch (Body Input %IX0.07)

This circuit monitors the status of the Hydraulic Oil Level. The input is ON when the Hydraulic Oil Level in the tank is sufficient. This function is used for activating the Pump.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status

Oil Level Switch	Activated	%IX0.07	ON

F08 Input Function – External Throttle Advance Switch (Body Input %IX128.06)

This circuit monitors the status of the External Throttle advance switch.
This input is USED FOR FUTURE EXPANSION

Condition	Modifiable Parameters	Default Setting
USED FOR FUTURE EXPANSION		

Function Logic:

Input Device	Status	I/O Address	Status
External Throttle Advance Switch	Activated	%IX128.06	ON

4.08: Optional Body Output Functions

G03 Output Function – Tailgate Camera Output (Body Output %QX128.03)

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status

G04 Output Function – Hopper Camera Output (Body Output %QX128.02)

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status

G05 Output Function – Strobe Light 1 Circuit (In Cab Output %QX128.14)

This circuit operates the Strobe light circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Strobe Switch Enabled	Activated	CAN	ON

Condition	Function or Component	Status	I/O Address	Status
B	Pump On	Activated	N/A	ON
C	Reverse	Activated	N/A	ON
D	Turn Signal	Deactivated	N/A	OFF

Note: The Strobe light circuit-1 can be turned ON in following conditions:
With Pump ON or Reverse signal activated or Strobe switch ON
If the unit is configured with Whelen strobes, the strobes are ON in the above conditions with Turn signal being deactivated.

G06 Output Function – Strobe Light 2 Circuit (In Cab Output %QX128.15)

This circuit operates the Strobe light circuit -2.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Strobe Switch Enabled	Activated	CAN	ON
B	Pump On	Activated	N/A	ON
C	Reverse	Activated	N/A	ON
D	Turn Signal	Deactivated	N/A	OFF

Note: The Strobe light circuit-2 can be turned ON in following conditions:
With Pump ON or Reverse signal activated or Strobe switch ON
If the unit is configured with Whelen strobes, the strobes are ON in the above conditions with Turn signal being deactivated.

G07 Output Function -- Top Door Close (Body Output %QX0.06)

This output function controls the Top Door Close output.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Top Door Close Push Button	Activated	CAN	ON
B	and Pump On	Activated	N/A	ON

Note: This signal is energized using a CAN based control by energizing the Top Door Open switch either from Street side or from Curb side panel. With Conditions (A AND B) true, will activate the Top Door Close output.

G08 Output Function -- Top Door Open (Body Output %QX0.05)

This output function controls the Top Door Open output.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Top Door Open Push Button	Activated	CAN	ON
B	and Pump On	Activated	N/A	ON

Note: This signal is energized using a CAN based control by energizing the Top Door Open switch either from Street side or from Curb side panel. With condition (A AND B) true, will activate the Top Door Open output signal.

G09 Output Function – Container Light Circuit (In Cab Output %QX128.11)

This circuit operates the Container light circuit. Here CAN control is used to turn ON/OFF the Container Light Circuit either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Container Light Switch	Activated	CAN	ON

Note: With condition ‘A’ true, will activate the Container Light Output signal either from Street side or from Curb Side of the dual control panel unit.

G11 Output Function – Auxiliary Backup Light Circuit (In Cab Output %QX128.13)

This circuit operates the Auxiliary Backup light circuit. Here Reverse and Switch control is used to turn ON/OFF the Auxiliary Backup Light Circuit, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Reverse	Activated	CAN	ON
B	Auxiliary Light Switch	Activated	CAN	ON

Note: With condition ‘A’ or ‘B’ true, the Auxiliary Backup Light Output will activate.

4.09: Analog Input Functions

H01 Input Function – Packer Position (Analog Input %IW02)

This circuit measures the value of Packer Position.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Packer Position	Activated	%IW02	VOLTAGE

H02 Input Function – Oil Tank Temperature (Analog Input %IW14)

This circuit measures the Hydraulic Oil Temperature.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Oil Temperature	Activated	%IW14	VOLTAGE

H03 Input Function – Body Valve Pressure (Analog Input %IW0)

This circuit is used to measure the Body Valve pressure.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Body Valve pressure	Activated	%IW0	VOLTAGE

4.10: CAN In-Cab Input Functions

I01 Input Function -- Hydraulic Pump Enable Push Button (CAN - In Cab Input)

This CAN control button is used to turn ON the Hydraulic Pump, either from Street side or from the Curb side of dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Hydraulic Pump Enable Input	Activated	CAN	ON (CAN Control)

I02 Input Function -- Packer Extend Input (CAN - In Cab Input)

This CAN control is used to turn ON/OFF the Packer Extend control either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Packer Extend Input	Activated	CAN	ON (CAN Control)

I03 Input Function -- Packer Retract Input (CAN - In Cab Input)

This CAN control is used to turn ON/OFF the Packer Retract control either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Packer Retract Input	Activated	CAN	ON (CAN Control)

I04 Input Function -- Packer Over-height Override Switch Circuit (CAN - In Cab Input)

This CAN control is used to turn ON/OFF the Packer Over-height Override control either from Street side or from the Curb side of a dual control panel unit. This switch is for future expansion if needed, and currently interrupts a pack cycle in progress.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Packer Over-height Override Input	Activated	CAN	ON (CAN Control)

I05 Input Function – Select-O-Pack Switch Circuit (CAN - In Cab Input)

This CAN control is used to turn ON/OFF the Select-O-Pack control either from Street side or from the Curb side of a dual control panel unit. This circuit monitors the ON/OFF status of the Select-O-Pack Switch. This circuit enables Auto Pack and Auto Retract action.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Select-O-Pack Input	Activated	CAN	ON (CAN Control)

I06 Input Function – CAB Cover Raise Switch Circuit (CAN - In Cab Input)

This CAN control is used to raise the Cab protector shield, either from Street side or from the Curb side of a dual control panel unit. Future Expansion.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Cab Cover Raise Input	Activated	CAN	ON (CAN Control)

I07 Input Function – CAB Cover Lower Switch Circuit (CAN - In Cab Input)

This CAN control is used to lower the Cab protector shield, either from Street side or from the Curb side of a dual control panel unit. Future Expansion.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Cab Cover Lower Input	Activated	CAN	ON (CAN Control)

I08 Input Function – Tailgate Raise Switch (CAN - In Cab Input)

This CAN control is used to raise the Tailgate, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Tailgate Raise Input	Activated	CAN	ON (CAN Control)

I09 Input Function – Tailgate Lower Switch (CAN - In Cab Input)

This CAN control is used to lower the Tailgate, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Tailgate Lower Input	Activated	CAN	ON (CAN Control)

I10 Input Function – Tailgate Lock Switch (CAN - In Cab Input)

This CAN control is used to lock the Tailgate, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Tailgate Lock Input	Activated	CAN	ON (CAN Control)

I11 Input Function – Tailgate Unlock Switch (CAN - In Cab Input)

This CAN control is used to unlock the Tailgate, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Tailgate Unlock Input	Activated	CAN	ON (CAN Control)

I12 Input Function – Commercial Grabber Enable Switch (CAN - In Cab Input)

This CAN control is used to enable the Grabber control in commercial mode.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Commercial Grabber Enable Switch	Activated	CAN	ON (CAN Control)

4.11: SIMPLE JOYSTICK CONTROL INPUT FUNCTIONS

J03 Input Function – Joystick – Y-AXIS (Negative Direction) (CAN – Cab Input)

Pulling back the Joystick (Y-axis in Negative direction) performs the Arms up operation.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status

Y-Axis Negative direction	Activated	CAN	ON (CAN Control)

J04 Input Function – Joystick – Y-POS. (Positive Direction) (CAN – Cab Input)

Pushing the Joystick forward (Y-axis in Positive Direction) performs the Arms Down operation.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Y-Axis Positive direction	Activated	CAN	ON (CAN Control)

J05 Input Function – Joystick – X-AXIS (Negative Direction) (CAN – Cab Input)

Moving the Joystick Left (X-axis in Negative direction) performs the Forks up operation.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
X-Axis Negative direction	Activated	CAN	ON (CAN Control)

J06 Input Function – Joystick – X-AXIS (Positive Direction) (CAN – Cab Input)

Moving the Joystick Right (X-axis in Positive direction) performs the Forks down operation

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
X-Axis Positive direction	Activated	CAN	ON (CAN Control)

4.12: OPTION CAN Auxiliary-Cab Input Functions

K01 Input Function – Auxiliary Arms/Forks Control Enable Switch (CAN - In Cab Input)

This is used to turn ON the - Auxiliary Arms/Forks control Enable switch that Enables or Disables the control for operating the Auxiliary Arms/Forks control.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status

Auxiliary Arms/Forks Control Enable	Activated	CAN	ON (CAN Control)

K02 Input Function – Auxiliary Arms Raise Switch (CAN - In Cab Input)

This Auxiliary CAN control is used to turn ON the - Arms Raise switch using Auxiliary control. This input is operative only if Auxiliary Controls Enable Switch is ON (Refer K01).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Auxiliary Arms Raise	Activated	CAN	ON (CAN Control)

K03 Input Function – Auxiliary Arms Lower Switch (CAN - In Cab Input)

This Auxiliary CAN control is used to turn ON the - Arms Lower switch using Auxiliary control. This input is operative only if Auxiliary Controls Enable Switch is ON (Refer K01).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Auxiliary Arms Lower	Activated	CAN	ON (CAN Control)

K04 Input Function – Auxiliary Forks Raise Switch (CAN - In Cab Input)

This Auxiliary CAN control is used to turn ON the - Forks Raise switch using Auxiliary control. This input is operative only if Auxiliary Controls Enable Switch is ON (Refer K01).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Auxiliary Forks Raise	Activated	CAN	ON (CAN Control)

K05 Input Function – Auxiliary Forks Lower Switch (CAN - In Cab Input)

This Auxiliary CAN control is used to turn ON the - Forks Lower switch using Auxiliary control. This input is operative only if Auxiliary Controls Enable Switch is ON (Refer K01).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status

Auxiliary Forks Lower	Activated	CAN	ON (CAN Control)

K06 Input Function – Auxiliary Packer Extend (CAN - In Cab Input)

This Auxiliary CAN control is used to turn ON the - Packer Extend switch using Auxiliary control. This input is operative only if Auxiliary Controls Enable Switch is ON (Refer K01).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Auxiliary Packer Extend	Activated	CAN	ON (CAN Control)

K07 Input Function – Auxiliary Packer Retract (CAN - In Cab Input)

This Auxiliary CAN control is used to turn ON the - Packer Retract switch using Auxiliary control.
This input is operative only if Auxiliary Controls Enable Switch is ON (Refer K01).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Auxiliary Packer Retract	Activated	CAN	ON (CAN Control)

4.13: OPTION CAN In-Cab Input Functions

L01 Input Function – Travel Position Switch (CAN - In Cab Input)

This CAN control is used to turn ON/OFF the Travel position Signal of the Packer, either from Street side or from the Curb side of a dual control panel unit. This switch is used to move the Packer to the travel position when there is no top door.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Travel Position Switch	Activated	CAN	ON (CAN Control)

L02 Input Function – Top Door Open Switch (CAN - In Cab Input)

This CAN control is used to open the Top Door, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Top Door Open Switch	Activated	CAN	ON (CAN Control)

L03 Input Function – Top Door Close Switch (CAN - In Cab Input)

This CAN control is used to close the Top Door during the Travel position Signal of the Packer, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Top Door Close Switch	Activated	CAN	ON (CAN Control)

L04 Input Function – Strobe Light Switch (CAN - In Cab Input)

This CAN control is used to turn ON/OFF the Strobe Light Circuit, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Strobe Light Circuit Switch	Activated	CAN	ON (CAN Control)

L05 Input Function – Hopper Light Switch (CAN - In Cab Input)

This CAN control is used to turn ON/OFF the Hopper Light Circuit, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Hopper Light Circuit Switch	Activated	CAN	ON (CAN Control)

L06 Input Function – Auxiliary Light Switch Circuit (CAN - In Cab Input)

This CAN control is used to turn ON/OFF the Auxiliary Backup Light Circuit, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Auxiliary Backup Light Circuit Switch	Activated	CAN	ON (CAN Control)

L07 Input Function – Container Light Switch Circuit (CAN - In Cab Input)

This CAN control is used to turn ON/OFF the Container Light Circuit, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Container Light Circuit Switch	Activated	CAN	ON (CAN Control)

L08 Input Function – CAB Light Switch (CAN - In Cab Input)

This CAN control is used to turn ON/OFF the forward facing Cab Light Circuit, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Cab Light Circuit Switch	Activated	CAN	ON (CAN Control)

Section 5: Special Features

5.01: Auto Pack Mode

Auto Pack is a standard feature on all CORTEX controlled FEL (Front End Loader) products. While in Auto Pack the Packer will complete its cycle automatically with a momentary activation of the Packer Extend push button.

5.02: Select-O-Pack

Select-O-Pack is an option for Commercial FEL products and is standard on Residential FEL products.
If the Select-O-Pack switch is enabled, then an Auto pack cycle will begin when the Arms reach a pre-defined position during a lower action.
For Commercial or Non-Curotto Can units that predefined location is when the Arms above Height proximity switch activates during a down motion, while on Curotto Can units it activates when the Arms read the bottom of the cycle.

5.03: Travel Position

When the Travel position switch is enabled pressing Packer Extend will Extend Packer to Travel position and stop. The indication will flash while moving and turn solid when at the Travel position. To return to the home turn OFF Travel position switch and hold retract. Travel position functionality is available only in manual mode

5.04: INSIGHT Display Functionality

There are 2 types of INSIGHT display devices used here for performing various operations as mentioned below:-
A. INSIGHT Display (7“)

B. INSIGHT Display (12“)

5.04.01A: INSIGHT Display (7”) Operating Elements

INSIGHT Display (7”) :- Consists of 9 backlit function keys, Analogue video input, and a INSIGHT (Graphic) display terminal as shown below:

Fig.: 7” INSIGHT Display Unit

The display is fitted with the following operating elements:
1. 9 **Function Keys**
2. 4 **Directional Arrows (**Up / Down / Right / Left)
3. **OK Push Button**
4. **INSIGHT Display**.

1. Function Keys: There will be 9 backlit freely programmable function keys available in INSIGHT. The Function Keys primary use is to allow transition between operations screens. They also change to password protection keys if a password protected screen is activated (for Ex: Left side keys Top to Bottom **“1 – 2 – 3 – 4 ”** and Right side keys Top to Bottom **“5 – 6 – 7 - 8”**).

2. Directional Arrows: The Directional Arrows may be used for cursor movement function (Up / Down / Right / Left). This can be used for cursor location purposes from within Input, Output, Maintenance or Options Screens.

3. OK Push Button:
Note: For example: When a particular Input / Output bit is selected using Direction Arrows, the OK Push Button can be used to turn ON / OFF that particular bit. Once a particular bit is turned ON / OFF, the respective bit color will be changed from Gray to Green or vice versa, which will be displayed on the INSIGHT terminal.

4. INSIGHT Display: This is used for displaying the current status of the Input / Output, Engine Run Speed, Temperature, Auto/Manual mode etc. This can be programmed for graphically representing a process. This can also be used for changing the set points for Analog values.

5.04.01B: INSIGHT Display (12”) Operating Elements

INSIGHT Display (12”):- Consists of 13 backlit function keys, Analogue video input, and a INSIGHT (Graphic) display terminal as shown below:

Fig.: 12” INSIGHT Display Unit

The display is fitted with the following operating elements:
1. **13 Function Keys**
2. 4 **Directional Arrows (**Up / Down / Right / Left)
3. **OK Push Button**
4. **INSIGHT Display**.

1. Function Keys: There will be 13 backlit freely programmable function keys available in INSIGHT. The Function Keys primary use is to allow transition between operations screens. They also change to password protection keys if a password protected screen is activated (for Ex: Left side keys Top to Bottom **“1 – 2 – 3 – 4 ”** and Right side keys Top to Bottom **“5 – 6 – 7 - 8”**).

2. Directional Arrows: The Directional Arrows may be used for cursor movement function (Up / Down / Right / Left). This can be used for cursor location purposes from within Input, Output, Maintenance or Options Screens.

3. OK Push Button:
Note: For example: When a particular Input / Output bit is selected using Direction Arrows, the OK Push Button can be used to turn ON / OFF that particular bit. Once a particular bit is turned ON / OFF, the respective bit color will be changed from Gray to Green or vice versa, which will be displayed on the INSIGHT terminal.

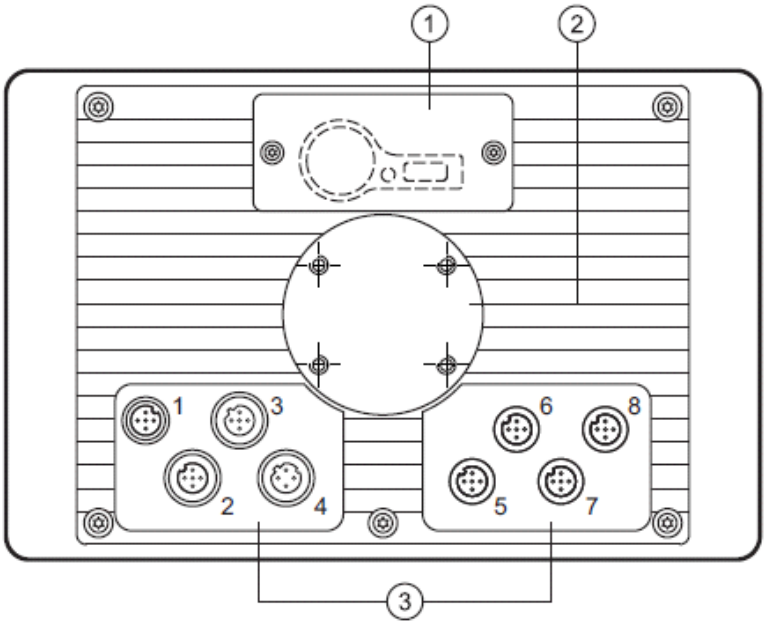
4. INSIGHT Display: This is used for displaying the current status of the Input / Output, Engine Run Speed, Temperature, Auto/Manual mode etc. This can be programmed for graphically representing a process. This can also be used for changing the set points for Analog values.

5.04.02: Display Operating States:

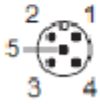
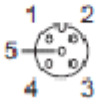
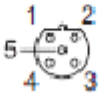
Colour	Status	Description
–	permanently off	no operating voltage
green	5 Hz	boot process application
	2 Hz	application running (RUN) or set-up running
	permanently on	application has stopped (STOP) or no project available
red	2 Hz	application is running with an error (RUN with error)
	permanently on	system error (fatal error), device is in reset (e.g. internal voltage error)
red/orange	2 Hz colour change	overtemperature/undertemperature, device is in reset until temperature in normal range
orange	5 Hz	boot process system recovery/update
	2 Hz	system recovery/update running
	briefly on	System reset

5.04.03:Rear Panel Housing connection:

Table below provides Wiring details for the Interface cable of INSIGHT (7" and 12") display units:-



1: Service cover for USB connection, battery and watchdog reset
2: Locator for RAM® mount system and mounting frame
3: M12 connector (fig. shows max. number of connectors)

1	2, 5, 6, 7, 8	3	4
Connector A-coded, 5 poles	Socket A-coded, 5 poles	Socket B-coded, 5 poles	Socket D-coded, 4 poles
			

(1) Supply, input/output	
1	10...32 V DC (clamp 30) (IN)
2	IN
3	GND (clamp 31) (IN)
4	OUT
5	10...32 V DC (clamp 15) (IN)

(2) CAN1	
1	Shield
2	VBB_c (OUT)
3	CAN1_GND (OUT)
4	CAN1_H
5	CAN1_L

(3) USB	
1	+5 V DC
2	-Data
3	+Data
4	ID
5	GND

(4) Ethernet	
1	TxD+
2	RxD+
3	TxD-
4	RxD-
	Housing = screen

(5) CAN2	
1	Shield
2	VBB_c (OUT)
3	CAN2_GND (OUT)
4	CAN2_H
5	CAN2_L

(6) CAN3/4	
1	CAN3_H
2	CAN3_L
3	CAN3/4_GND (OUT)
4	CAN4_H
5	CAN4_L

(7) Analogue video input	
1	Shield
2	GND (video 2)
3	GND (video 1)
4	FBAS1 (video 1)
5	FBAS2 (video 2)

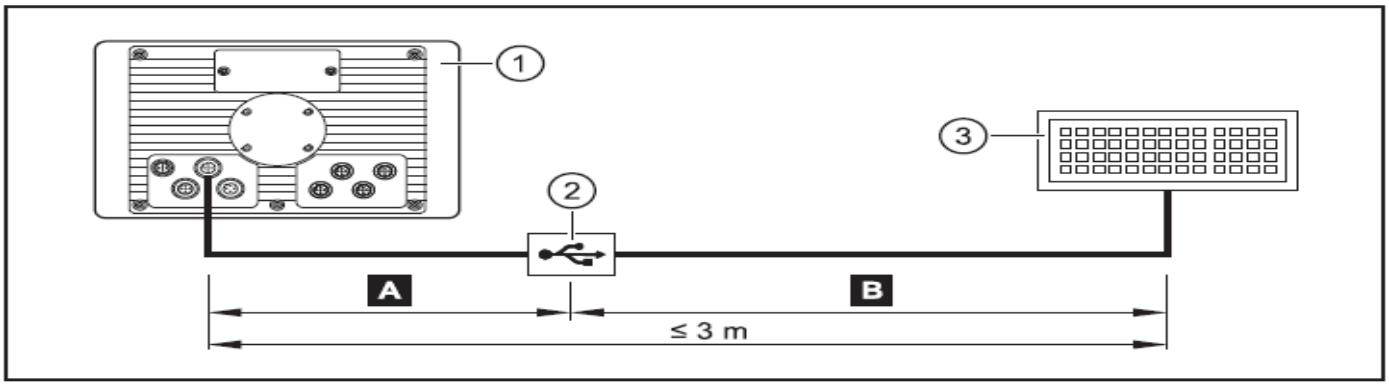
(8) N/A	
1	
2	
3	
4	
5	

5.04.04:Interface details:

1. Ethernet Interface: Use a Shielded CAT5 cable (Shielded Twisted Pair - STP) for connection with maximum lebgth of 25 mts.

2. Ethernet Camera: The device supports Ethernet cameras.

3. USB Interface: The USB interfaces are used for temporary connection of an external keyboard, mouse or a USB memory stick during servicing or maintenance. The USB device is connected to the display unit using a M12 connector.
NOTE: They are not intended for actual operation (Remove the USB device after their use).



USB connection via M12 connector

1: Dialogue module
2: USB connector, for example in the control panel or in the dashboard
3: USB keyboard, mouse or memory stick

A Permanent connection: Dialogue module – USB connector

- ► Use prewired cable.
  (e.g. art. no. EC2099, M12 connector, B-coded on USB socket, type A, watertight, cable length 1.5 m, wires twisted and screened)
- ► Use only cables with twisted and screened wires for individual wiring. Keep length "A" as short as possible and position the USB connector in immediate vicinity to the dialogue module. The length "A" considerably influences the quality of the USB data transmission.

B Temporary connection: USB connector – USB device

- ► Use a connection cable with the designation "Full Speed/High Speed" (= USB connection cable with twisted and screened cores).
- ► Do not make a connection using several USB connection cables.
- ► Remove connection cable after the programming or service works.

5.05: Commercial Half-Pack Interlock Functionality

5.05.01: Commercial Mode

A. Curb Side Control

WARNING: Operator can roll the forks to Full Tuck with or without a can present. If a can is present and the operator rolls the forks to far, damage to the cab, cab protector, can and operator may occur.

- No Curotto controls available
- All standard commercial control interlocks.
- No fork interlock
- No Autolift available

B. Street Side Control:

WARNING: Operator can roll the forks to Full Tuck with or without a can present. If a can is present and the operator rolls the forks to far, damage to the cab, cab protector, can and operator may occur.

- No Curotto controls available
- All standard commercial control interlocks.
- No fork interlock
- No Autolift available

Section 6: Diagnostic Messages and Alarms

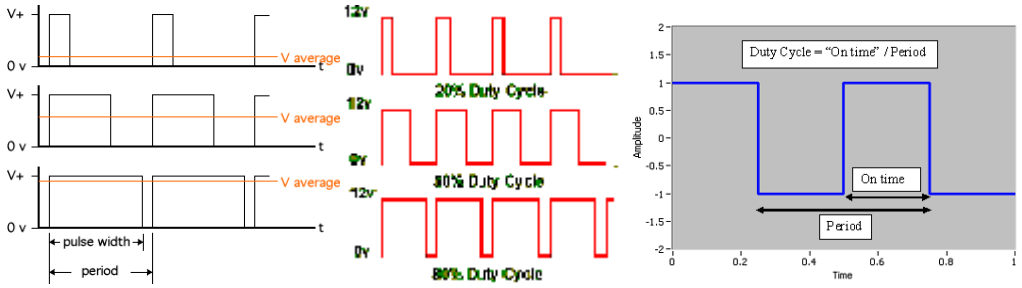
6.01: Testing I/O Voltage

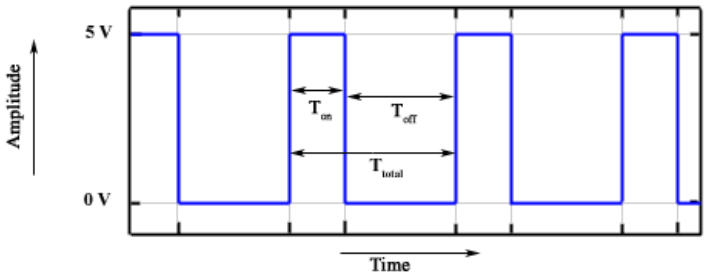
To test the voltage at an input or output terminal a Digital Multi Meter is always the best tool. Incandescent test lights cannot be used to test inputs from certain electronic input devices, the amperage required to light an incandescent tester may exceed the maximum output of the device. If using a test light it must be an LED type tester.

PWM Signal: PWM Controls amount of power, supplied to electrical devices. Main advantage of PWM is that power loss in the switching devices is very low.
The Average value of Voltage (and Current) fed to the load is controlled by turning the switch between supply and load ON and OFF at a fast pace. The longer the switch is ON compared to the OFF periods, the higher the power supplied to the load is. Refer figure below for PWM waveforms:

Voltage can be measured for a PWM signal by using the following equation:
Voltage_Multimeter = (12V * T_High + 0V * T_Low) / PWM_Period
Where **PWM_Period = T_High + T_Low (Seconds)**

For Ex: T_Low = Test Bulb OFF Time. T_High = Test Bulb ON Time





$$D = \frac{T_{on}}{(T_{on} + T_{off})} = \frac{T_{on}}{T_{total}}$$

Where;
D = Duty Cycle.
Ton = T_High; Toff = T_Low;
Ttotal (PWM_Period) = T_High + T_Low;

Figures: PWM Output signal Waveforms

6.02: Monitoring Input Status

With an Input ON, the corresponding Input field (with Description and Address) located in INSIGHT display will also be ON.
Refer section 5.04 for more details about Diagnostic display options and INSIGHT display tool.

6.03: Monitoring Output Status

With an Output ON, the corresponding Output field (with Description and Address) located in INSIGHT display will also be ON.
Refer section 5.04 for more details about Diagnostic display options and INSIGHT display tool.

6.04: Diagnostic Display Messages

When a fault has been set the IN-Cab Alarm will sound and a Diagnostic message will be displayed with the status of respective Input / Output in the Insight display unit.

- **Top Door Open and Auto Pack Interlock (standard equipment)**
  If Top door is not fully open with Top door configuration bit is ON and Residential Curotto Configuration bit ON and Select-O-Pack option enabled and Travel position switch enabled or Packer Extend Push Button pressed, Top Door Open diagnostic message will be displayed in the Insight display.

  Insight Display Illustration:

  Indication: A. Top Door Open light ON.
  B. Residential Curotto Configuration bit is ON..
  C. Top Door Configuration bit is ON.
  D. Select-O-Pack bit is ON
  E. Packer Extend Push Button pressed.
  F. Travel Position Switch ON.

  Disabled Functions: Packer.

  Fault Reset: Open the top door fully. Check top door, Packer Extend prox. Select-O-Pack switch for proper operation

- **Auto Lift Enabled and Overweight Alarm Active (standard equipment)**
  If Auto lift enable switch is turned ON from either street side or from the curb side of the dual control panel for Bank-2 Switch-6 and Bank-4 Switch-6 and Scale Alarm-2 is enabled due to Overweight / PTO-1 or PTO-2 pump is ON, the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

Indication: A. Scale Alarm-2 ON due to Overweight.
B. PTO-1 and PTO-2 pump Active signal ON.

Disabled Functions: Arms Up interlock and Forks raise Interlock

Fault Reset: Check Auto Lift Enable switch and check for Overweight condition for proper operation.

- **Cab Protector Down with Arms Lowered Interlock and Arms Active and Arms up Interlock (standard equipment)**
  The arms have been lowered when the top door is not fully open or the Arm position angle is greater than the Fork roll position value (765) and Arms Up position in less than (910) and the Packer/ Cab protector switch has not been enabled and the Fork position is greater than Feather Up range (710) and Arms up PWM Value less than (800) and Cab Protector Down configuration bit is ON and Top door configuration bit is ON and Residential configuration bit is ON, the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

Indication: A. Top Door Open light ON.
B. Residential Configuration bit is ON.
C. Top Door Configuration bit is ON.
D. Cab Protector Down Configuration bit is ON.

Disabled Functions: Forks will not Lowered.

Fault Reset: Open the top door fully. Check top door, Cab protector down prox., Lift below Transit prox., Forks position and Arms position for proper operation.

- **Cab Protector Down with Forks Untuck and Arms Lowered Docked Interlock (standard equipment)**
  The arms have been lowered when the top door is not fully open and Forks Untuck position is '113' and Arm Angle position is lesser than '110', the diagnostic message will be displayed in the Insight display.

Insight Display Illustration: **BEEP CODE 19-2**

Indication: A. Top Door Open light ON.
B. Residential Configuration bit is ON.
C. Top Door Configuration bit is ON.
D. Cab Protector Down Configuration bit is ON.

Disabled Functions: Forks will not be Lowered.

Fault Reset: Open the top door fully. Check top door, Cab protector down prox., Lift below Transit prox., Forks position and Arms position for proper operation.

- **Top Door Open and Arms Lowered Interlock (standard equipment)**
  If arms have been lowered when the top door is not fully or the Arm position angle is greater than the Fork roll position value (765) and the Fork position is greater than Feather Up range (710) and the Top door configuration bit is ON and Residential configuration bit is ON, the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

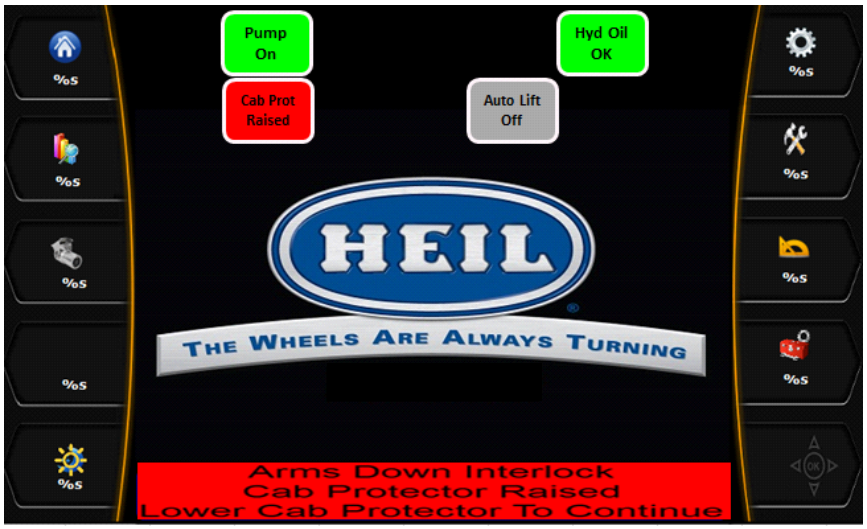
Indication: A. Top Door Open light ON.
B. Residential Configuration bit is ON.
C. Top Door Configuration bit is ON.

Disabled Functions: Forks will not lowered.

Fault Reset: Open the top door fully. Check top door, Lift below Transit prox., Forks position and Arms position for proper operation.

- **Cab Protector Raised and Arms Lowered Interlock (standard equipment)**
  The arms have been lowered when the Arm position angle is greater than the Fork roll position value (765) and the Packer/ Cab protector switch has been enabled and the Fork position is greater than Feather Up range (710) and Cab Protector Down configuration bit is ON and Residential configuration bit is ON, then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:



Indication: A. Top Door Open light ON.
B. Residential Configuration bit is ON.
C. Cab Protector Up Configuration bit is ON.

Disabled Functions: Forks will not Lowered.

Fault Reset: Open the top door fully. Check Cab protector down prox., Lift below Transit prox., Forks position and Arms position for proper operation.

- **Travel Position Not Allowed Interlock Active (standard equipment)**
  If Auto lift enable switch is turned ON from either street side or from the curb side of the dual control panel and Travel position switch is activated while the Packer Extend/Retract push button has been pressed or Packer extend/retract Auxiliary controls are activated, then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

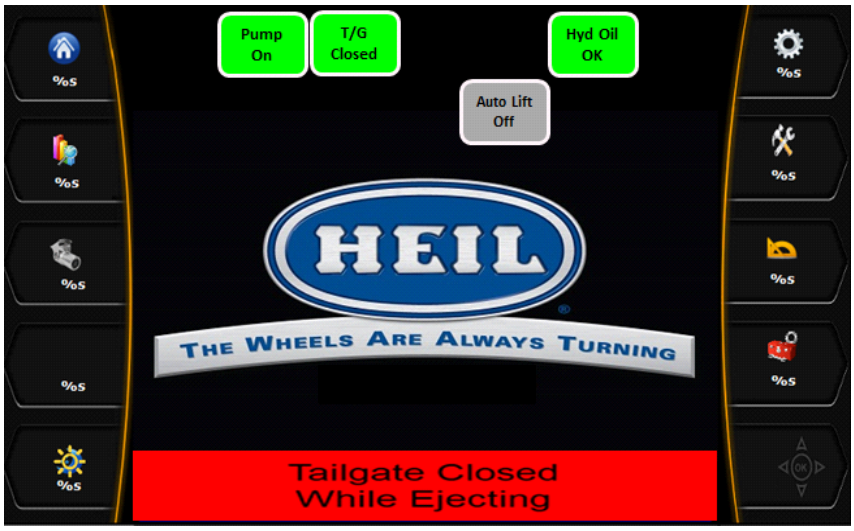
Indication: A. Packer Retract push button pressed.
B. Packer Extend push button pressed.
C. Travel Position switch ON
D. Auto Lift Enable Switch ON

Disabled Functions: NONE.

Fault Reset: Turn OFF Auto Lift Enable Switch and Travel Position switch. Turn OFF the Packer extend/ retract Auxiliary controls to manually move the packer.

- **Tailgate Closed While Ejecting (standard equipment)**
  If Packer has reached the fully extended proximity switch while the tailgate is closed for at least 2 Seconds, then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:



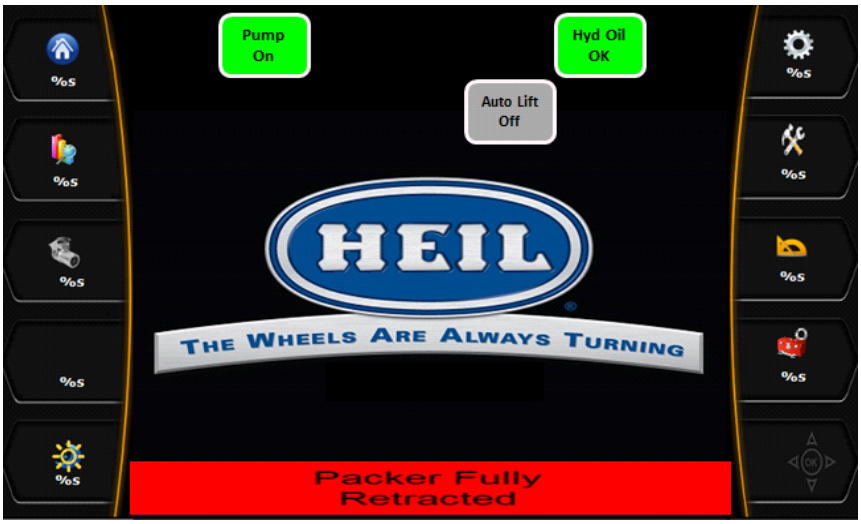
Indications: Packer Fully Extended and Tailgate Closed inputs are lit.

Disabled Functions: None.

Fault Reset: Manually retract the packer or open the tailgate.

- **Packer Retract Pressed While Retracted (standard equipment)**
  If the packer is fully retracted but the packer return push button is still pressed or the Packer retract Auxiliary controls were activated, then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:



Indications: The packer was manually returned and the retract button was not released.

Disabled Functions: None.

Fault Reset: Release the packer retract button and Packer retract Auxiliary controls or check that the packer return proximity switch is properly placed.

- **Auto-Pack Has Timed-Out (standard equipment)**
  The CORTEX Controller has a timer to monitor packer extend and packer retract operations. If the packer extend time exceeds 35 seconds before the extend prox. switch is activated, this beep code will activate. In Auto Pack, the packer will automatically retract. Packer extend may time out when the body is full or when operated at Engine idle (low hydraulic pump flow.)

Insight Display Illustration:

Indications: Diagnostic message will be displayed in the Insight display. Packer extend prox. is not activated 35 seconds after start of extend cycle.

Disabled Functions: Packer Extend
Fault Reset: Check packer extend prox. switch for proper operation and adjustment. Operate packer above Engine idle.

- **Arms Raised Interlock Active (standard equipment)**
  If the arms have been raised when the top door is not fully open or the packer is not fully retracted and the Packer/ Cab protector switch has not been enabled / Scale Alarm-2 is enabled due to Overweight / PTO-1 or PTO-2 pump is ON, the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

Indication: A. Arms Overheight light ON.
B. Top Door Open light ON.
C. Scale Alarm-2 ON due to Overweight.
D. PTO-1 and PTO-2 pump Active signal ON.

Disabled Functions: Forks will not raise above windshield.

Fault Reset: Open the top door fully. Restart packer panel. Check top door and Packer retract prox. switches for proper operation.

- **Packer Extend Interlock Active (standard equipment)**
  If the Packer extend push button was pressed or the Packer extend Auxiliary controls were activated while the Arms were raised and the Packer/Overheight Over-ride switch was not enabled, then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

Indication: A. Arms are raised
B. Packer Extend push button pressed.
C. Packer Override switch OFF.

Disabled Functions: Packer will not extend.

Fault Reset: Lower the arms until the Arms Raised light goes out. Turn OFF the Packer extend Auxiliary controls. Turn the Packer/Overheight Over-ride switch ON to manually move the packer.

- **Packer Extend PB with System Power OFF (standard equipment)**
  If the Packer extend push button pressed or the Packer extend Auxiliary controls were enabled with the system power turned OFF, the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

Indication: A. System Power input is not lit.
B. Packer does not move.

Disabled Functions: PTO-1 pump and PTO-2 pump

Fault Reset: Turn the system power ON before utilizing Packer push buttons.

- **Side Door Open (standard equipment)**
  If the side door was opened during a packing operation or the pump enable switch was turned ON or the Auxiliary control for Packer Extend / Retract was enabled while the side door was open, the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

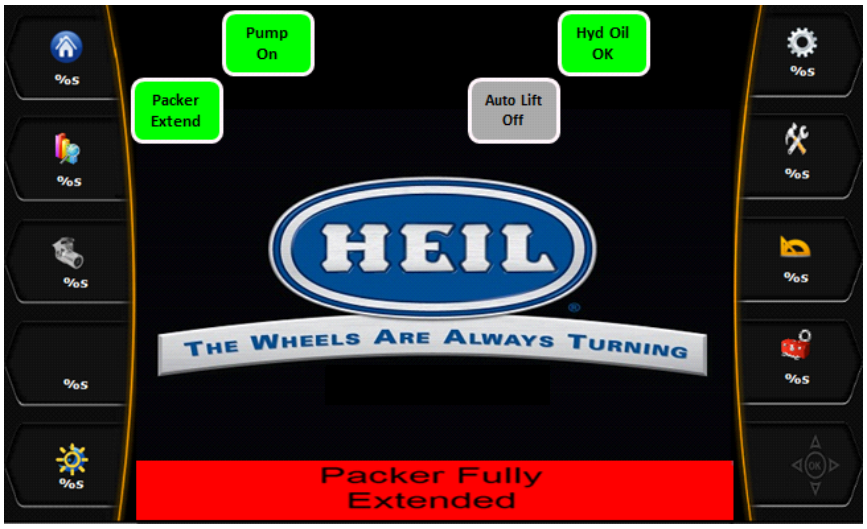
Indication: A. Pump turns OFF unexpectedly.
B. Packer does not pack.
C. Pump will not turn ON.

Disabled Functions: Pump and all packer functions.

Fault Reset: Close the side door or repair faulty side door proximity switch.

- **Packer Extend PB held when fully extended (standard equipment)**
  If the Packer extend pushbutton was pressed (or was being pressed) or the Packer Auxiliary controls were activated after the packer extended proximity switch is turned ON.

Insight Display Illustration:



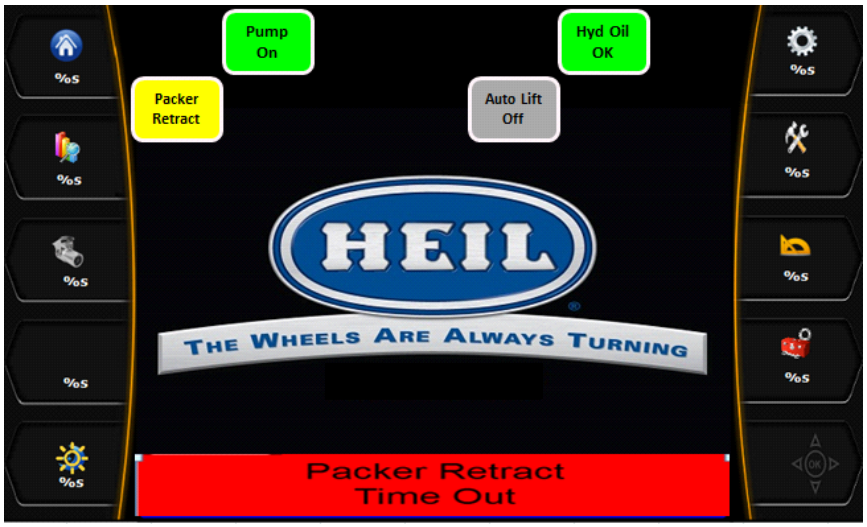
Indication: The diagnostic message will be displayed in the Insight display.

Disabled Functions: None

Fault Reset: Release the Packer extend push button or Turn OFF the Auxiliary Controls.

- **Packer Retract Has Timed Out (standard equipment)**
  The CORTEX Controller has a timer to monitor packer extend and packer retract operations. If the packer extend time exceeds 35 seconds before the extend prox. switch is activated, this beep code will activate. Packer retract may time out when the packer cannot fully retract due to the accumulation of material behind the packer panel.

Insight Display Illustration:



Indication: The diagnostic message will be displayed in the Insight display. Packer retract prox switch is not activated 35 seconds after the start of the retract cycle.

Disabled Functions: Packer retract.

Fault Reset: Check packer retract prox switch for proper operation and adjustment. Remove accumulated material from behind packer panel.

- **Packer Retract And Extend At Same Time (standard equipment)**
  If the Packer retract and extend push buttons have been pressed at the same time, then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

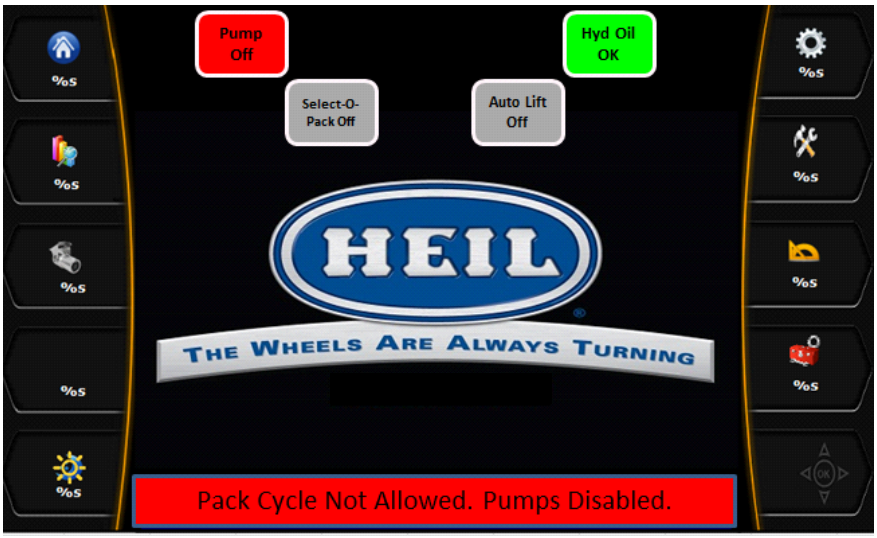
Indication: The packer does not move.

Disabled Functions: Packer will not move.

Fault Reset: Determine why pack extend and retract buttons are active at the same time.

- **Packer Extend w/o Pump ON (standard equipment)**
  If the packer extend push button was pressed without the pump being ON, the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:



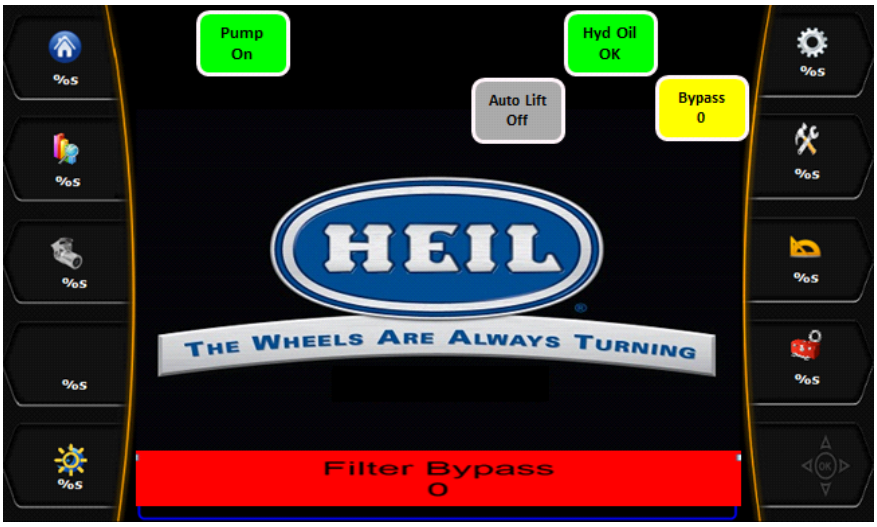
Indication: The packer does not move.

Disabled Functions: Packer extend.

Fault Reset: Turn ON the pump.

- **Hydraulic Filter Is In Bypass (standard equipment)**
  If the hydraulic filter has been in bypass for more than 11 hours, then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:



Indication: The Pump will only work for 3 minutes.

Disabled Functions: Pump

Fault Reset: Replace hydraulic oil filter.

- **Arms Raised Interlock and Overweight Alarm Active (standard equipment)**
  If the arms have been raised when the top door is not fully open or the packer is not fully retracted and the Packer/ Cab protector switch has not been enabled / Scale Alarm-2 is enabled due to Overweight / PTO-1 or PTO-2 pump is ON, then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

Indication: A. Arms Overheight light ON.
B. Top Door Open light ON.
C. Scale Alarm-2 ON due to Overweight.
D. PTO-1 and PTO-2 pump Active signal ON.

Disabled Functions: Forks will not raise above windshield.

Fault Reset: Open the top door fully. Restart packer panel. Check top door and packer retract prox. switches and Auto Lift Enable switch for proper operation. Check for Overweight condition for proper operation.

- **Top Door Open and Arms Raised Interlock (standard equipment)**
  If the arms have been raised when the top door is not fully open or the packer is not fully retracted and the Packer/ Cab protector switch has not been enabled / Scale Alarm-2 is enabled due to Overweight and Auto Lift Switch is Disabled / PTO-1 or PTO-2 pump is ON and Top Door Open Configuration bit is ON then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

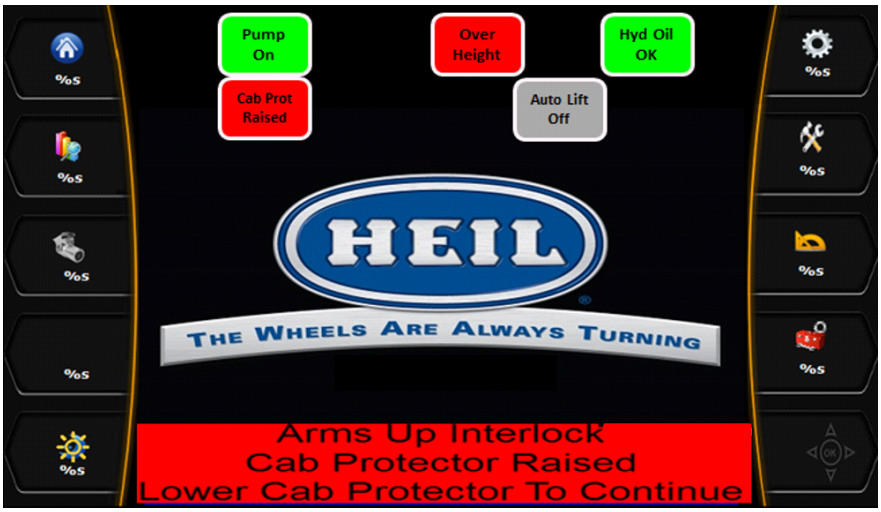
Indication: A. Arms Overheight light ON.
B. Top Door Open light ON.
C. Scale Alarm-2 ON due to Overweight.
D. PTO-1 and PTO-2 pump Active signal ON.
E. Top Door Open Configuration bit is ON.

Disabled Functions: Forks will not raise above windshield.

Fault Reset: Open the top door fully. Restart packer panel. Check top door and packer retract prox. switches and Auto Lift Enable switch for proper operation.

- **Cab Protector Raised and Arms Raised Interlock (standard equipment)**
  If the arms have been raised when the packer is not fully retracted and the Packer/Cab protector switch has been enabled / Scale Alarm-2 is enabled due to Overweight and Auto Lift Switch is Disabled / Packer Extend or Packer Retract bit is ON/ PTO-1 or PTO-2 pump is ON, then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:



Indication: A. Top Door Open light ON.
B. Arms Overheight light ON.
C. Scale Alarm-2 ON due to Overweight.
D. PTO-1 and PTO-2 pump Active signal ON.
E. Cab Protector Up Configuration bit is ON.

Disabled Functions: Forks will not raise above windshield.

Fault Reset: Open the top door fully. Restart packer panel. Check Packer Retract prox. Switches, Cab protector down prox. Switches and Auto Lift Enable switch for proper operation.

- **Packer Sensor Fault (standard equipment)**
  The Packer position value is less than 100 during the Packing operation the diagnostic message will be displayed in the Insight display. (Refer section 4.09 – H04 – Packer Position for details).

Insight Display Illustration:

Indication: A. Packer Sensor faulty
B. Sensor failure ON

Disabled Functions: Packer functions and Fork function.

Fault Reset: Check for the Faulty sensor or Sensor mounting position or calibrate the faulty sensor and also check Packer Cylinder for proper operation.

- **Arms Raised Interlock with Forks Untuck and Arms Raised Docked Interlock (standard equipment)**
  If the arms have been raised when the top door is not fully open or the packer is not fully retracted and the Forks Untuck position is '113' and Arm Angle position is greater than '450', the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

Indication: A. Arms Overheight light ON.
B. Top Door Open light ON.
C. PTO-1 and PTO-2 pump Active signal ON.

Disabled Functions: Forks will not raise above windshield.

Fault Reset: Open the top door fully. Restart packer panel. Check top door and Packer retract prox. switches for proper operation.

- **Side Door Interlock Fault (standard equipment)**

If the Side door is opened with either pump enabled, the diagnostic message will be displayed on the Insight display.

Insight Display Illustration:

Indication: A. Pump turns OFF unexpectedly.
B. Packer does not pack.
C. Pump will not turn ON.

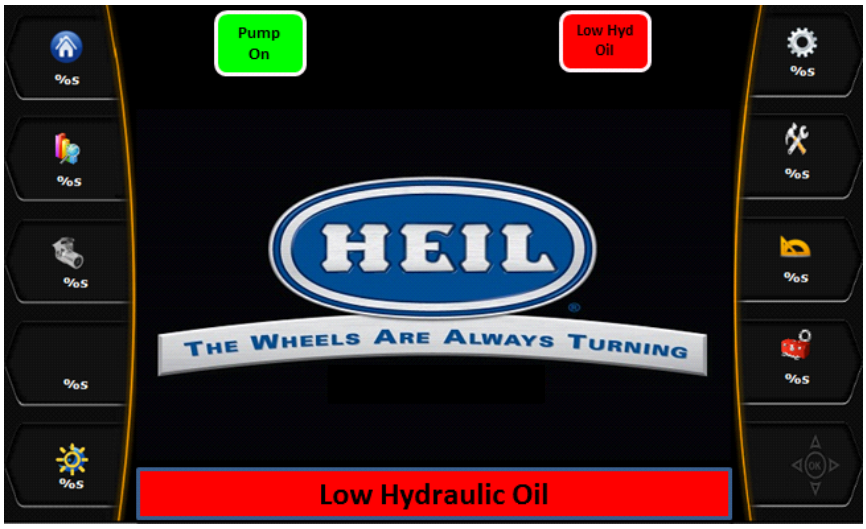
Disabled Functions: Pumps.

Fault Reset: Close the Side door or repair faulty Side door proximity switch.

- **Low Oil Level Fault (standard equipment)**

The hydraulic oil level has dropped below a safe operating level during operation then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:



Indication: Low Hydraulic Oil Level

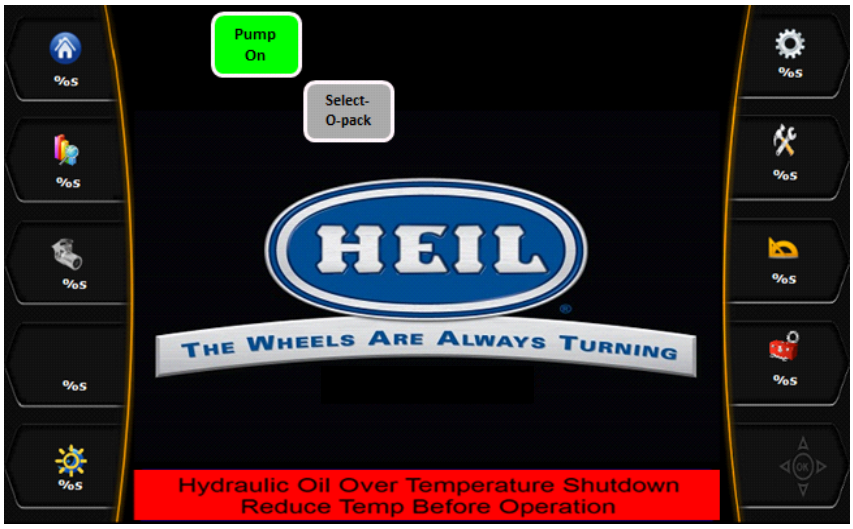
A. Disabled Functions: Hydraulic Pump

Fault Reset: Refill hydraulic oil tank.

- **Oil Over Temperature Shutdown Fault (standard equipment)**

If the Hydraulic Oil temperature is greater than 190º F, then the diagnostic message will be displayed in the Insight display. This is recognized as a fault because the Oil temperature should always be within the specified limit (Less than 190 º F) for the system to function properly.

Insight Display Illustration:



Indication: A. Hydraulic Oil over temperature shutdown.

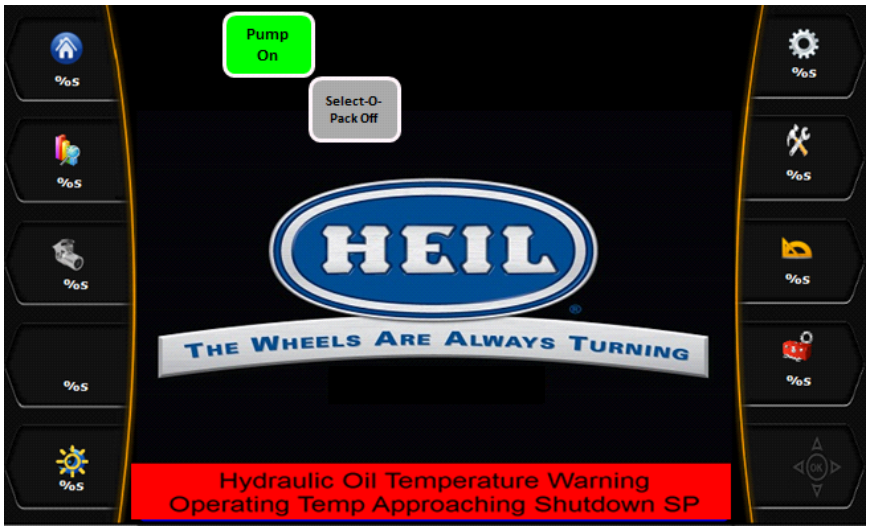
Disabled Functions: Hydraulic Pump

Fault Reset: Reduce temperature before operation.

- **High Temperature Fault (standard equipment)**

If the Hydraulic Oil temperature is greater than 180º F, then the diagnostic message will be displayed on the Insight display.

Insight Display Illustration:



Indication: A. Hydraulic Oil over temperature warning
B. Operating Temperature Approaching Shutdown set point (180 Deg. F)
Disabled Functions: None

Fault Reset: Reduce temperature before operation.

- **Pump Enable PB with System Power disabled Interlock (standard equipment)**

With System Power turned OFF and if the Pump Enable push button presses either from street side or from the curb side of the dual control panel for Bank-1 Switch-1 and Bank-3 Switch-1, the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

Indication: A. System Power input is not lit.

B. Pump does not turn ON

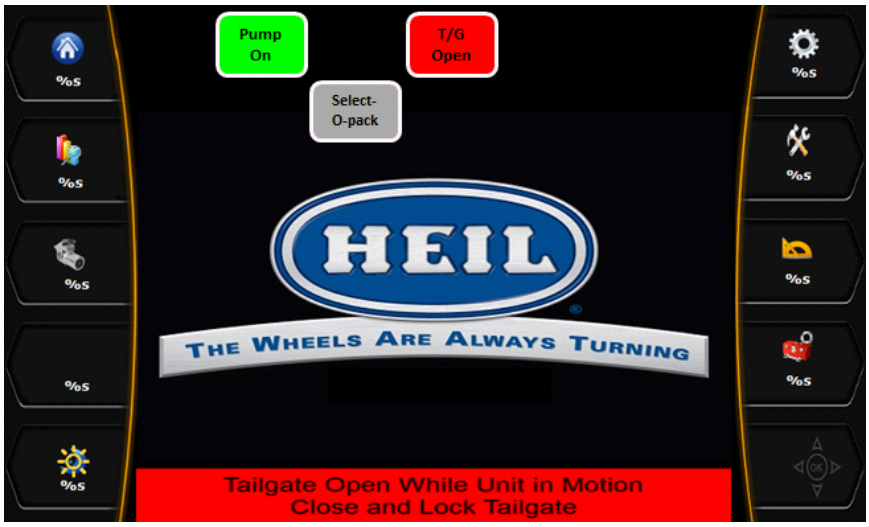
Disabled Functions: Body pump and Lift pump

Fault Reset: Turn the system power ON before utilizing Pump push button.

Tailgate Open Indicator and Road Speed limit fault (standard equipment)

If the Tailgate is open when the Road speed is greater than 10mph i.e. if the Tailgate is open when the unit is in motion, the diagnostic message will be displayed on the Insight display.
NOTE: Tailgate operation can be performed only when the Road speed is less than 5mph.

Insight Display Illustration:



Indication: Tailgate open.

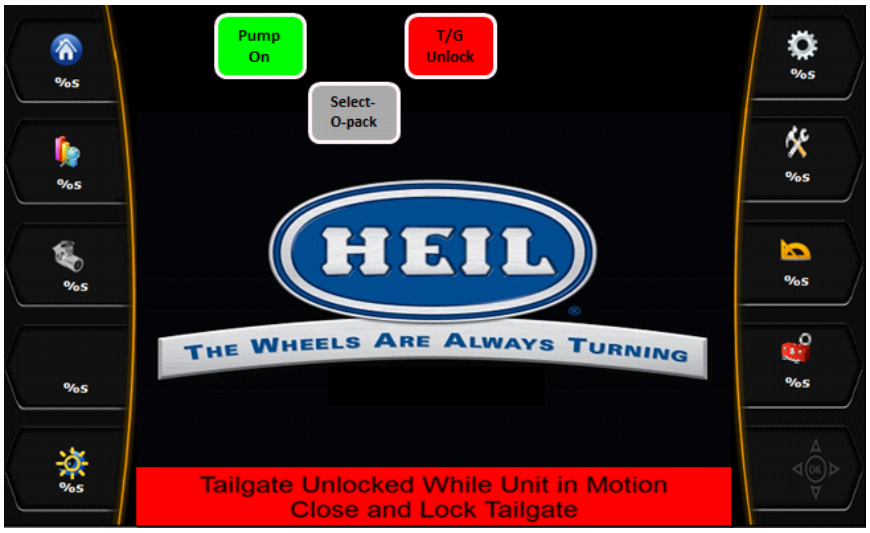
Disabled Functions: None

Fault Reset: Close and Lock the Tailgate or repair the faulty Tailgate open proximity switch to proceed further.

- **Tailgate Unlocked and Road Speed High Interlock (standard equipment)**

If the Tailgate is unlocked when the Road speed is greater than 10mph i.e. if the Tailgate is unlocked when the unit is in motion, the diagnostic message will be displayed on the Insight display.
NOTE: Tailgate operation can be performed only when the Road speed is less than 5mph.

Insight Display Illustration:



Indication: A. Tailgate Unlocked.

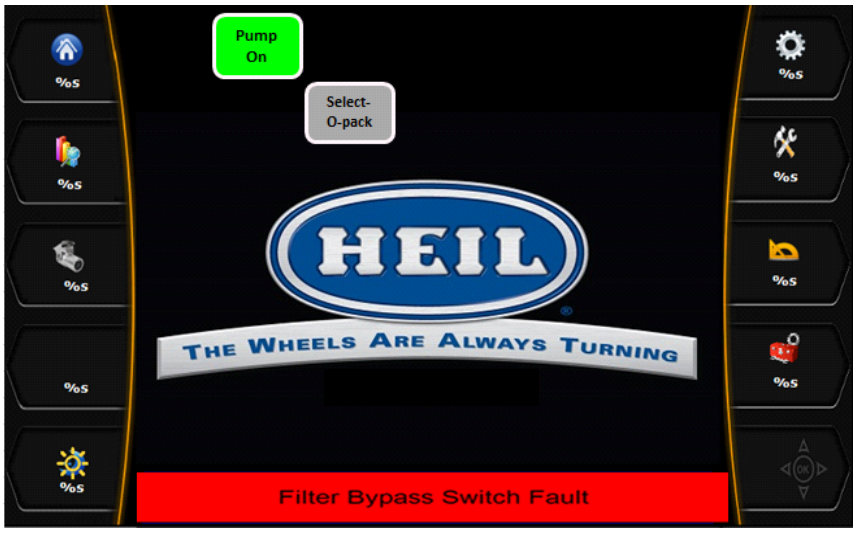
Disabled Functions: None.

Fault Reset: Close and Lock the Tailgate or repair the faulty Tailgate Locked proximity switch to proceed further.

Filter Bypass Switch Fault (standard equipment)

If the CORTEX Controller has lost the signal from the filter pressure switch while neither hydraulic pump was in operation the diagnostic message will be displayed in the Insight display. This is recognized as a fault because there should be no hydraulic pressure to bypass the filter under this condition.

Insight Display Illustration:



Indication: A. The filter bypass pressure switch has been disconnected.
B. An open has occurred in the filter bypass input circuit.
C. The filter pressure switch has failed to open.

Disabled Functions: None.

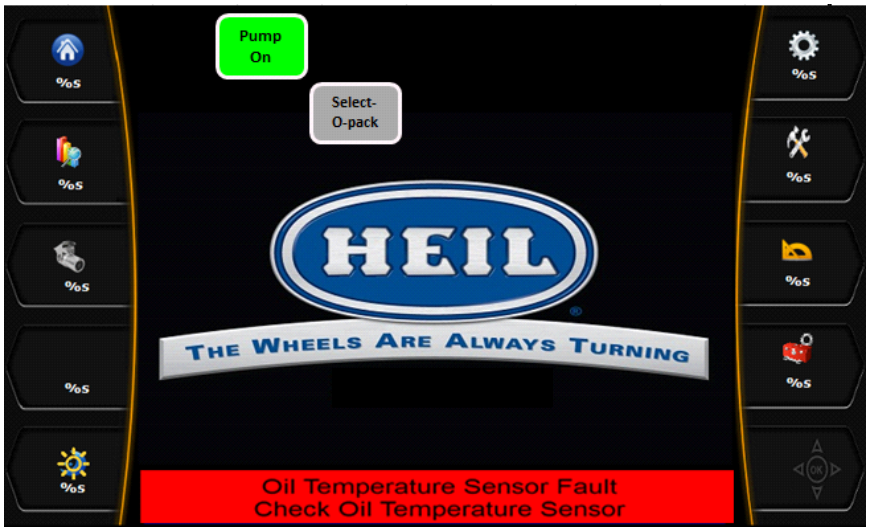
Fault Reset: Cycle System Power Switch or Restore filter pressure switch input to CORTEX Controller.

Note: This fault is applicable on dry valve pump units only.

- **Temperature Sensor Fault (standard equipment)**

The CORTEX32 Controller has received a signal from the Temperature sensor switch indicating that the Hydraulic Oil temperature is out of specified limit i.e. Oil temperature value is less than '-100' or exceeds '4000'. This is recognized as a fault because Hydraulic Oil temperature should be within specified limit for proper operation of the system.

Insight Display Illustration:



Indication: Oil temperature Sensor fault

Disabled Functions: None

Fault Reset: When the Temperature returns to defined limit (i.e. within -100 to 4000), the switch will reset. If the switch does not reset, there is a possible problem with the Temperature switch or the harnessing.

- **No Voltage on Extended Controller side Fault (Standard equipment)**

If the Voltage measured across VBB1_E, VBB2_E, VBB3_E, and VBB_RELAYIS_VOLTAGE terminal (i.e. Connector-2 Pin-19, Pin-1, Pin-32, and Pin-51) is less than 8 Volts, then this is recognized as a fault.

Insight Display Illustration:

Indication: A. No Voltage on Extended side controller.

Disabled Functions: CORTEX32 Extended Controller.

Fault Reset: When the Voltage (greater than 8 VDC) is available at these VBB terminals (VBB1_E and VBB2_E and VBB3_E and VBB_RELAYIS_VOLTAGE), CORTEX32 extended controller will turn ON and start functioning normally. If the extended controller doesn't start, there is a possible problem with the CORTEX32 Extended controller or 55-Pin connector connection or the harnessing.

- **No Ignition Voltage on Extended Controller side Fault (Standard equipment)**

If the Voltage measured across VBB2_E and VBB_RELAYIS_VOLTAGE terminal (i.e. Connector-2 Pin-19 and Pin-51) is less than 8 Volts, then this is recognized as a fault.

Insight Display Illustration:

Indication: A. No Ignition Voltage on Extended side controller.

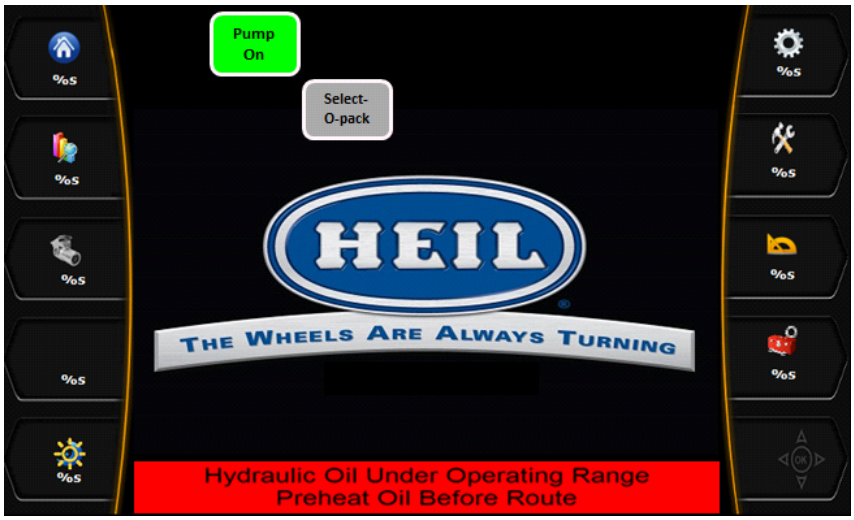
Disabled Functions: CORTEX32 Extended Controller.

Fault Reset: When the Voltage (greater than 8 VDC) is available at these VBB terminals (VBB2_E and VBB_RELAYIS_VOLTAGE), CORTEX32 extended controller will turn ON and start functioning normally. If the extended controller doesn't start, there is a possible problem with the CORTEX32 Extended controller or 55-Pin connector connection or the harnessing.

- **Under OperatingTemperature Warning (Optional equipment)**

If the Hydraulic Oil temperature is less than 70^{o} F, then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:



Indication: Hydraulic Oil temperature under Operating range

Disabled Functions: None

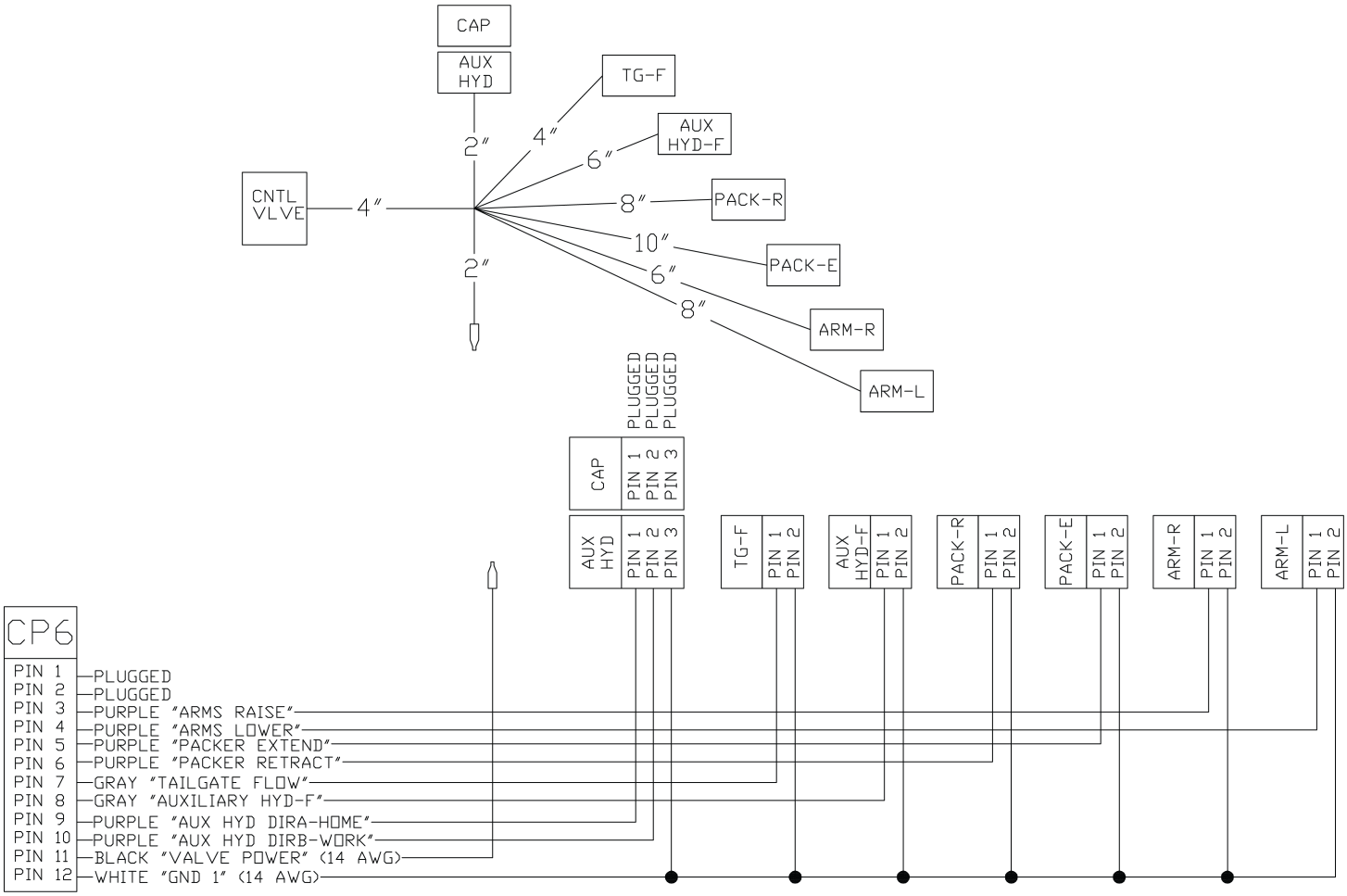
Fault Reset: Preheat Oil before route.

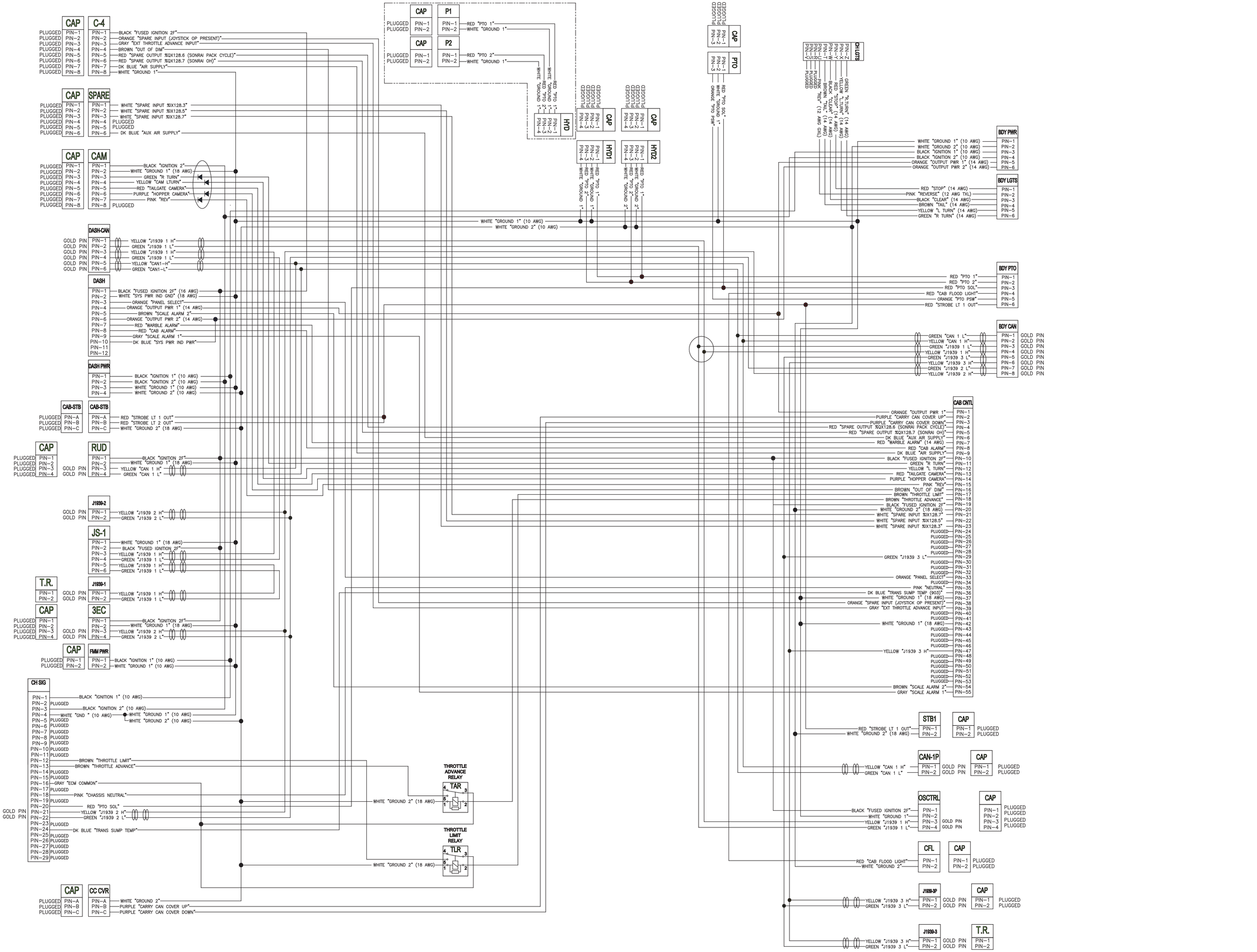
SECTION 8
SCHEMATICS

HALF/PACK®

Schematics

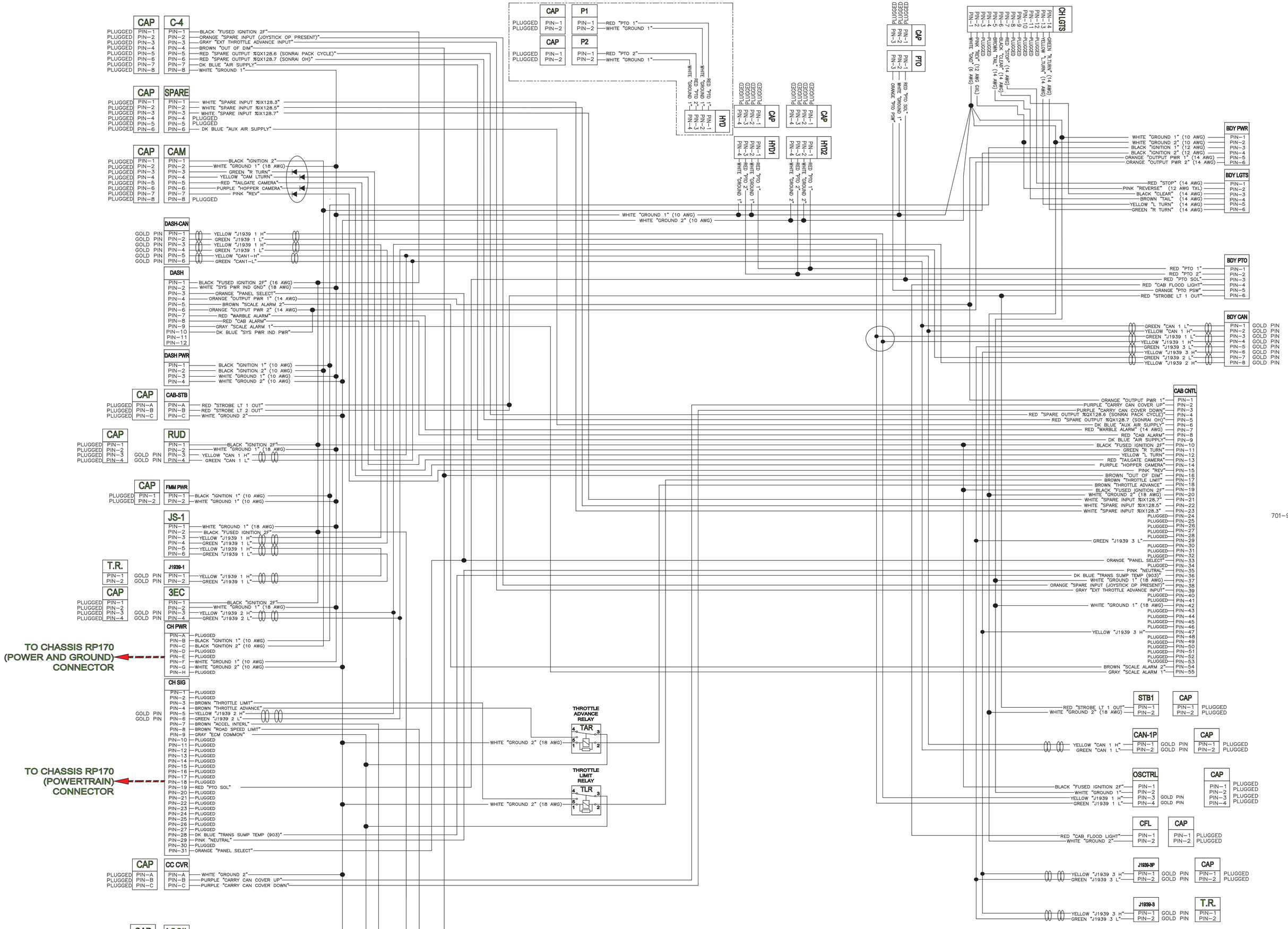
MAC VALVE COMMERCIAL HARNESS - 263-1908-015





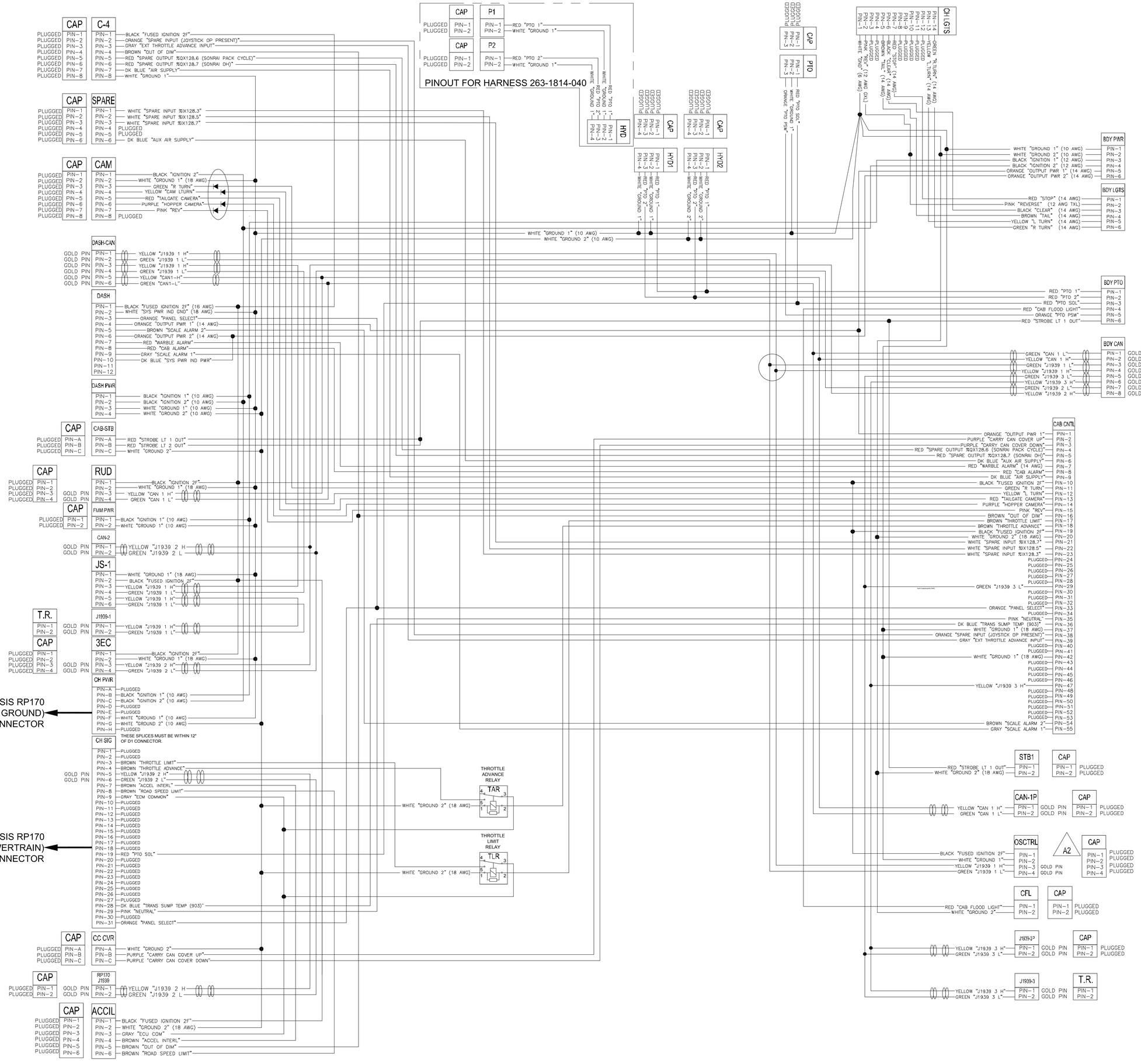
701-9340-001

SCHEMATIC, CAB TO BODY
2021 HP REFRESH, NON-RP170
701-9340-001



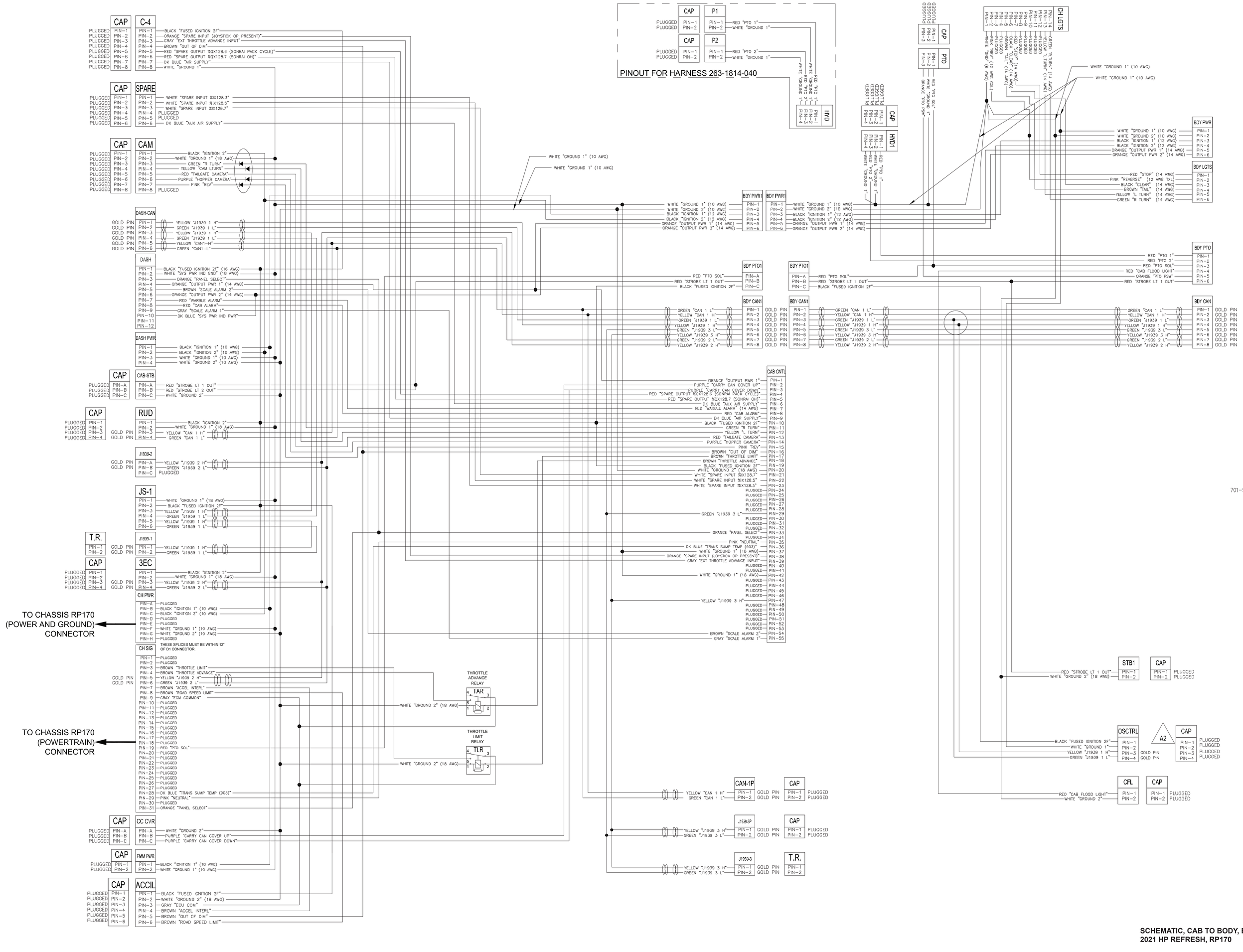
701-9340-002

SCHEMATIC, CAB TO BODY
2021 HP REFRESH, RP170
701-9340-002

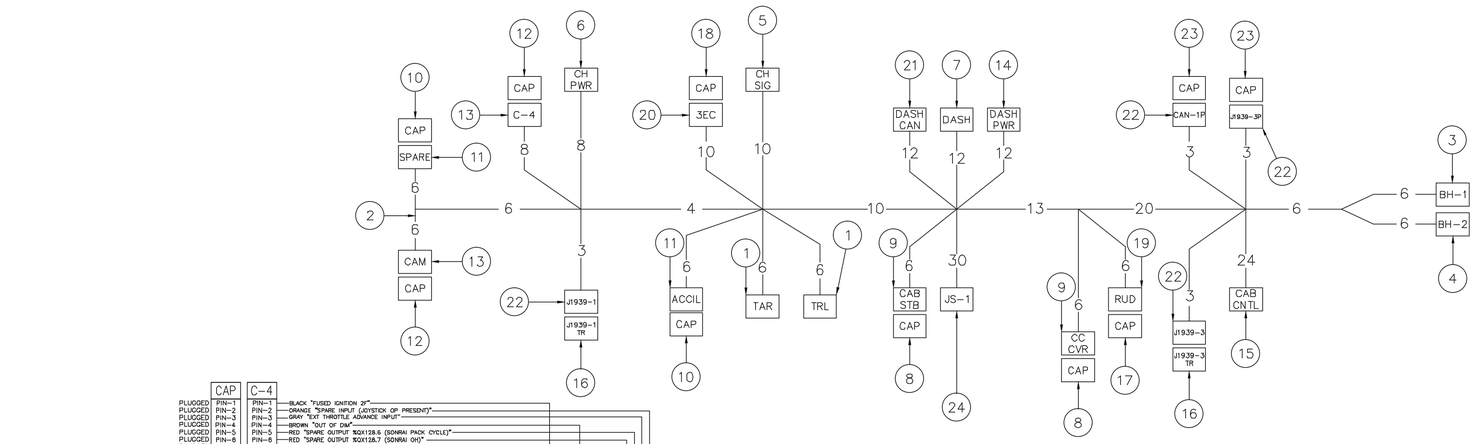


SCHEMATIC, CAB TO BODY PETERBILT 520
2021 HP REFRESH, RP170

701-9340-003


PINOUT FOR HARNESS 263-1814-040
TO CHASSIS RP170 (POWER AND GROUND) CONNECTOR
TO CHASSIS RP170 (POWERTRAIN) CONNECTOR
THESE SPLICES MUST BE WITHIN 12" OF D1 CONNECTOR.
THROTTLE ADVANCE RELAY
THROTTLE LIMIT RELAY
701-9340-004
SCHEMATIC, CAB TO BODY, ECONIC
2021 HP REFRESH, RP170
701-9340-004

REF.	PART No.	DESCRIPTION	QTY.
1	. 069-0032	ASSY, MICRO RELAY	REF
2	. 108-2648	DIODE, SILICON RECTIFIER, 6 AMPS	REF
3	. 108-4815-022	CONNECTOR, 19 POS RECEPT.	REF
4	. 108-4815-024	CONNECTOR, 23 POS RECEPT.	REF
5	. 108-4815-207	CONNECTOR, 31 POS PLUG (RP170 D-1)	REF
6	. 108-4815-209	CONNECTOR, 8 POS PLUG (RP170 D-1A)	REF
7	. 108-6461-128	CONNECTOR, 12 POS PLUG, GRAY	REF
8	. 108-6461-301	CONNECTOR, 3 POS RECEPTACLE, BLACK	REF
9	. 108-6461-311	CONNECTOR, 3 POS PLUG, BLACK	REF
10	. 108-6461-601	CONNECTOR, 6 POS RECEPTACLE, BLACK	REF
11	. 108-6461-611	CONNECTOR, 6 POS PLUG, BLACK	REF
12	. 108-6461-801	CONNECTOR, 8 POS RECEPTACLE, GRAY	REF
13	. 108-6461-811	CONNECTOR, 8 POS PLUG, GRAY	REF
14	. 108-8411-04P	DTP 4 WAY PLUG	REF
15	. 108-8572-001	IFM 55 POS CONNECTOR	REF
16	. 108-8588-200	ATM 2 PIN 120 OHM RESISTOR	REF
17	. ATO4-4P-SR02BLU	AT 4 WAY RECEPTACLE, BLUE	REF
18	. ATO4-4P-SR02BRN	AT 4 WAY RECEPTACLE, BROWN	REF
19	. ATO6-4S-SR02BLU	AT 4 WAY PLUG, BLUE	REF
20	. ATO6-4S-SR02BRN	AT 4 WAY PLUG, BROWN	REF
21	. ATO6-6S-SR02YEL	CONNECTOR, 6 POS PLUG, YELLOW	REF
22	. ATM04-2P-SR01YL	ATM 2 WAY RECEPTACLE, YELLOW	REF
23	. ATM06-2S-SR01YL	ATM 2 WAY PLUG, YELLOW	REF
24	. ATM06-6S-SR01YL	ATM 6 WAY PLUG, YELLOW	REF



NOTE:-
DIODES ARE TO BE SPLICED 4 INCHES FROM THE C-2 CONNECTORS.

TO CHASSIS RP170 (POWER AND GROUND) CONNECTOR

TO CHASSIS RP170 (POWERTRAIN) CONNECTOR

THESE SPLICES MUST BE WITHIN 12" OF DT CONNECTOR.

THROTTLE ADVANCE RELAY

THROTTLE LIMIT RELAY

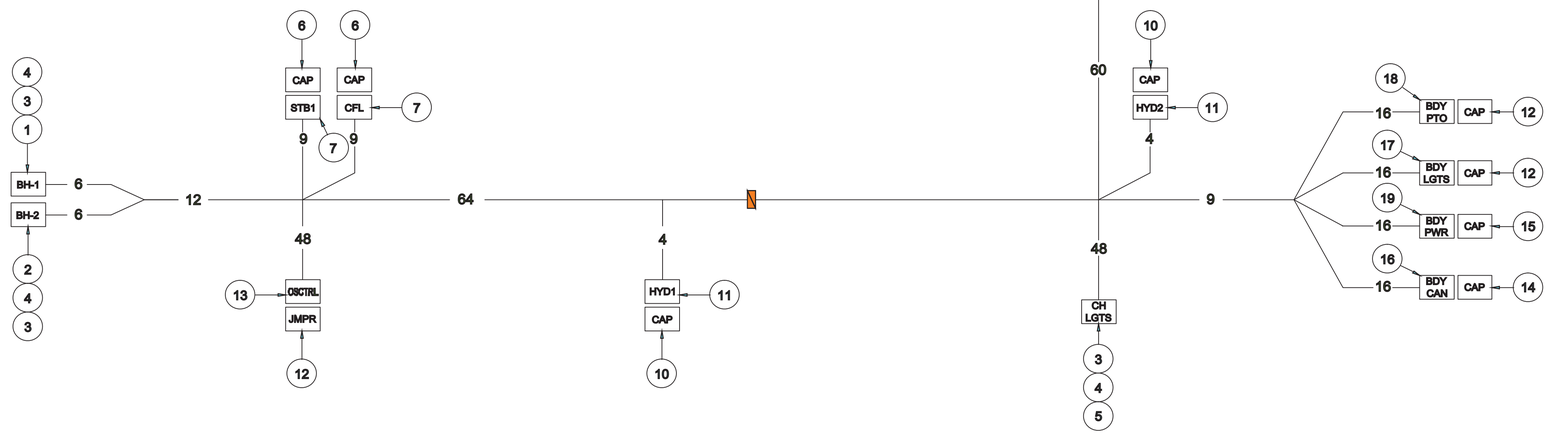
J1939 & CAN WIRING SHALL BE J1939/1802-0 CABLE

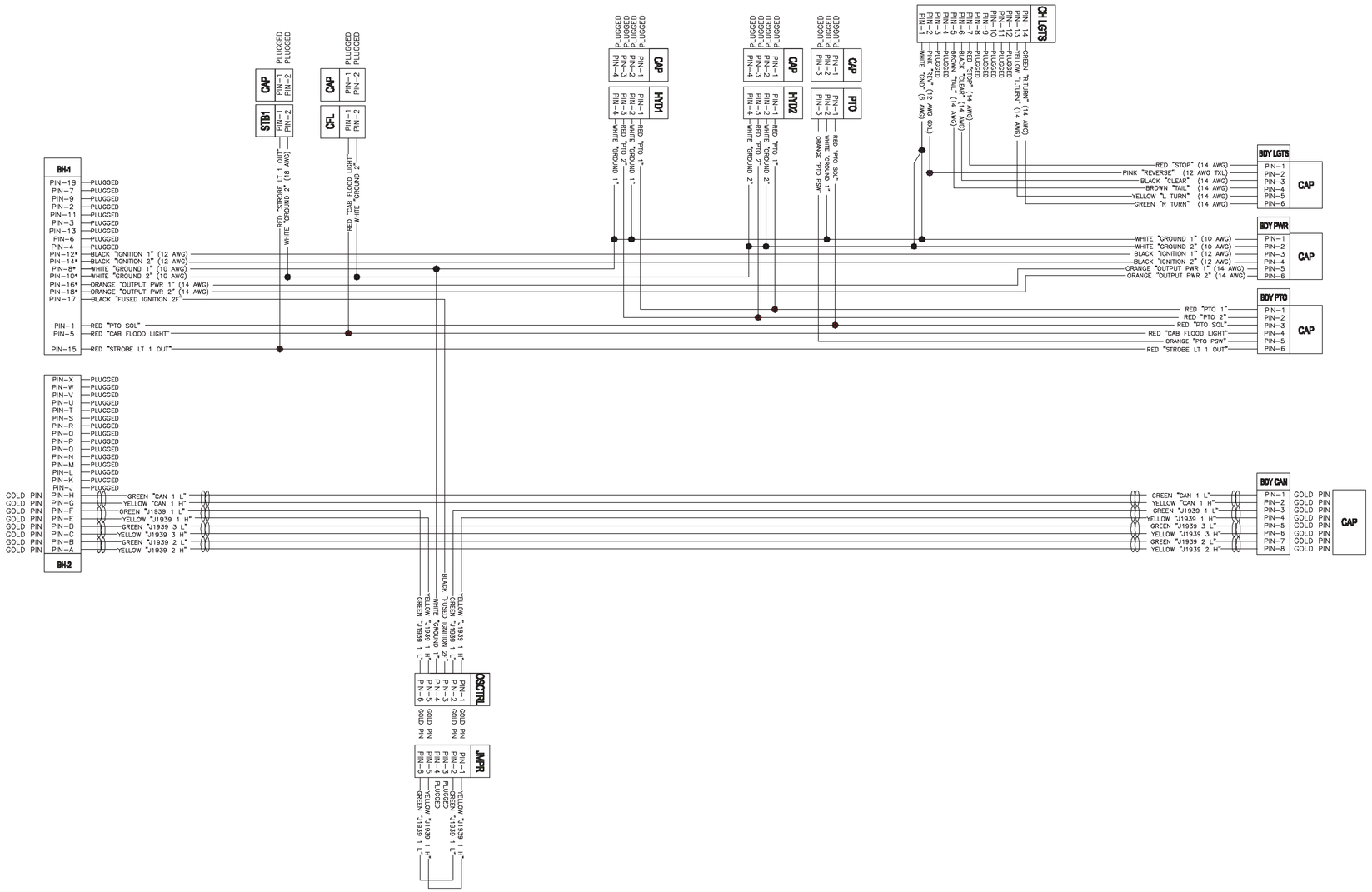
263-1907-100

HARNESS, P01 CAB
2021 HP REFRESH
AUTOCAR ACX (RP170)

263-1907-100

REF.	PART No.	DESCRIPTION	QTY.
1	. 108-4815-023	CONNECTOR, 19 POS PLUG	REF
2	. 108-4815-025	CONNECTOR, 23 POS PLUG	REF
3	. 108-4815-188	COMPRESSION BACKSHELL	REF
4	. 108-4815-189	COMPRESSION NUT	REF
5	. 108-4815-205	CONNECTOR, 14 POS PLUG (RP170 D-2)	REF
6	. 108-6461-203	CONNECTOR, 2 POS RECEPTACLE (RED)	REF
7	. 108-6461-213	CONNECTOR, 2 POS PLUG (RED)	REF
8	. 108-6461-301	CONNECTOR, 3 POS RECEPTACLE, BLACK	REF
9	. 108-6461-311	CONNECTOR, 3 POS PLUG, BLACK	REF
10	. 108-6461-401	CONNECTOR, 4 POS RECEPTACLE, BLACK	REF
11	. 108-6461-411	CONNECTOR, 4 POS PLUG, BLACK	REF
12	. 108-6461-601	CONNECTOR, 6 POS RECEPTACLE, BLACK	REF
13	. 108-6461-611	CONNECTOR, 6 POS PLUG, BLACK	REF
14	. 108-6461-801	CONNECTOR, 8 POS RECEPTACLE, GRAY	REF
15	. 108-8411-007	ATP 6 WAY RECEPT.	REF
16	. AT06-08SA-SR2YL	CONNECTOR, 8 POS PLUG, YELLOW	REF
17	. AT06-6S-SR01BLK	AT 6 WAY PLUG, BLACK	REF
18	. AT06-6S-SR02GRY	AT 6 WAY PLUG, GRAY	REF
19	. ATP06-6S-MM01	ATP 6 WAY PLUG, GREY, END CAP	REF



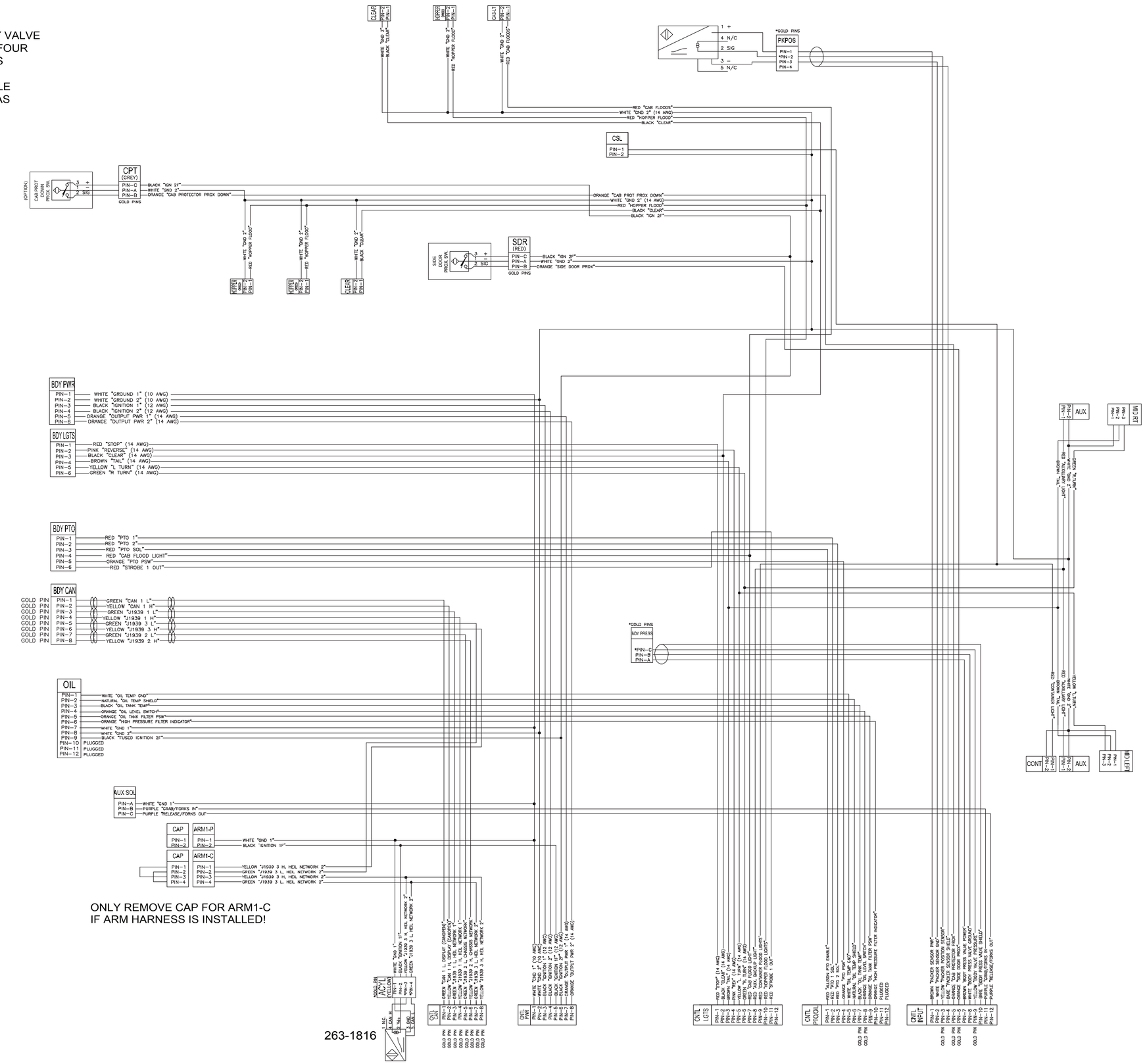


263-1907-101

HARNESS, P01 CHASSIS
2021 HP REFRESH
AUTOCAR ACX (RP170)

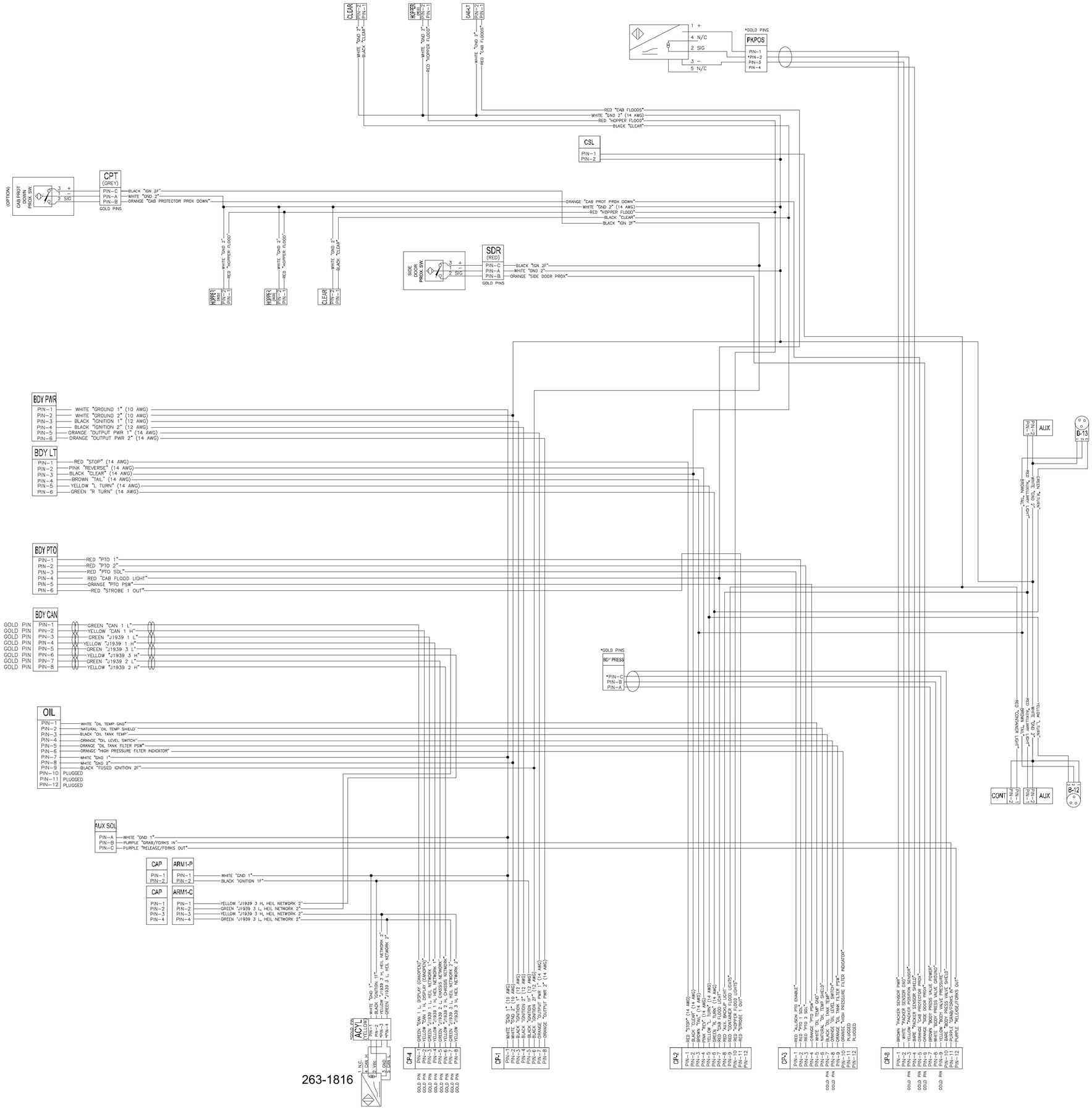
263-1907-101

NOTE:
1) "PACKER POSITION SENSOR" AND "BODY VALVE PRESSURE" CABLE TO BE TWISTED PAIR, FOUR CONDUCTOR WITH SHIELD CABLE SUCH AS HELUKABLE #17050
2) "OIL TANK TEMP SENSOR" TO BE A SINGLE TWISTED PAIR CABLE WITH SHIELD SUCH AS GENERAL CABLE C2534A.
3) J1939 WIRING MUST BE J1939/1802-0 CABLE



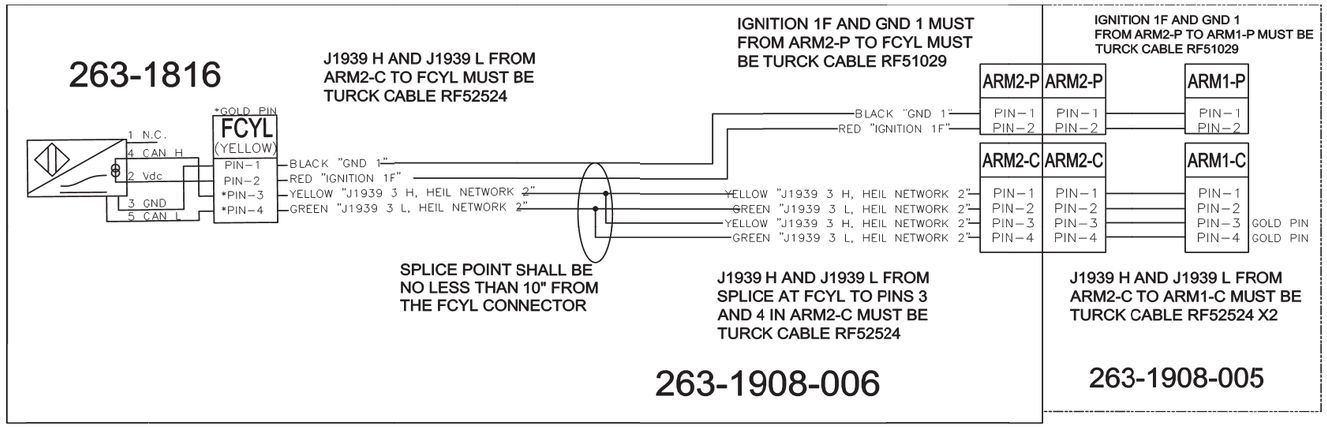
SCHEMATIC, BODY FRONT
2021 HP REFRESH

701-9341-001

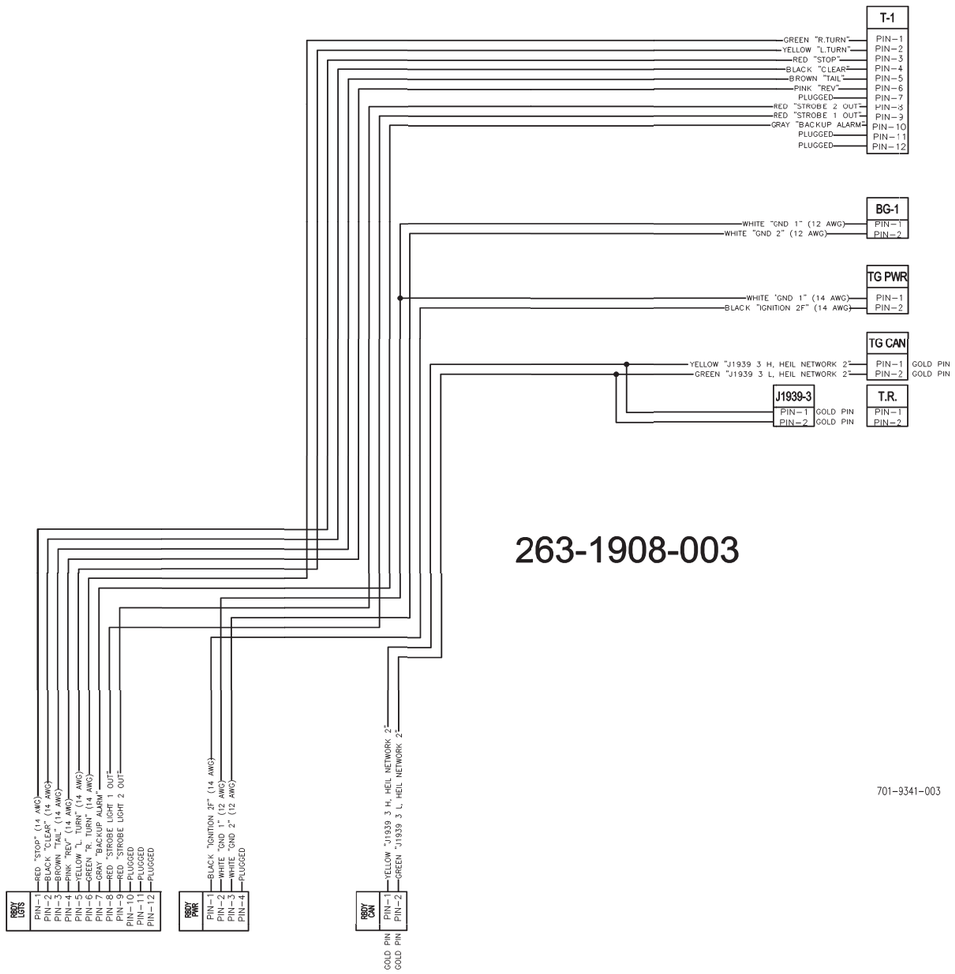


SCHEMATIC, BODY FRONT
GROTE
2021 HP REFRESH

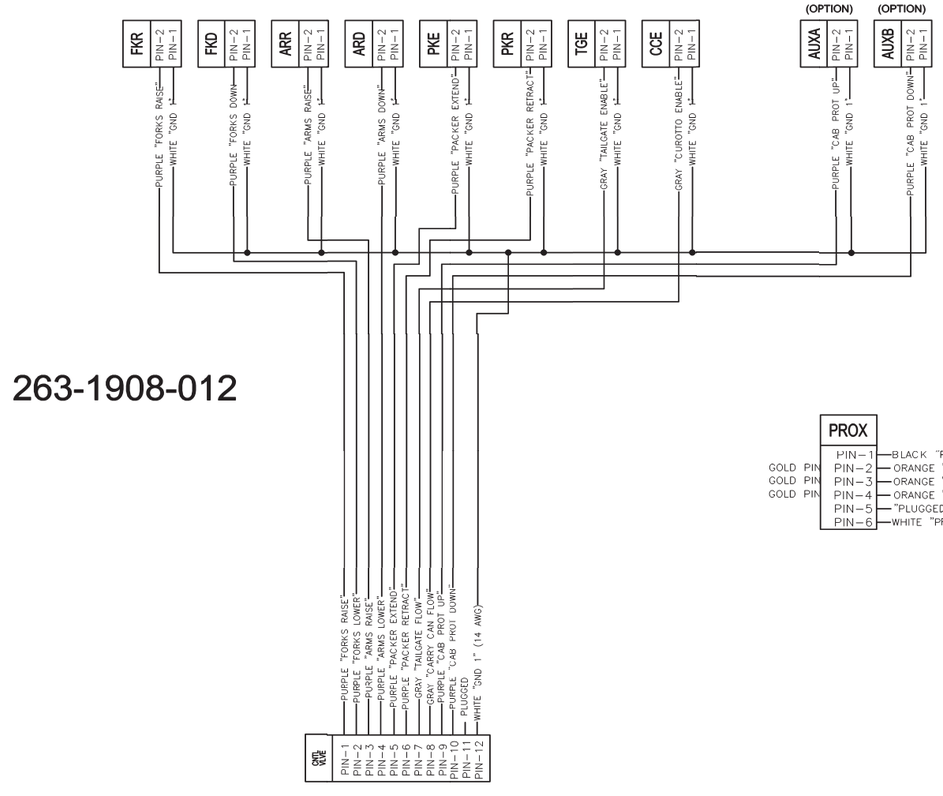
701-9341-021



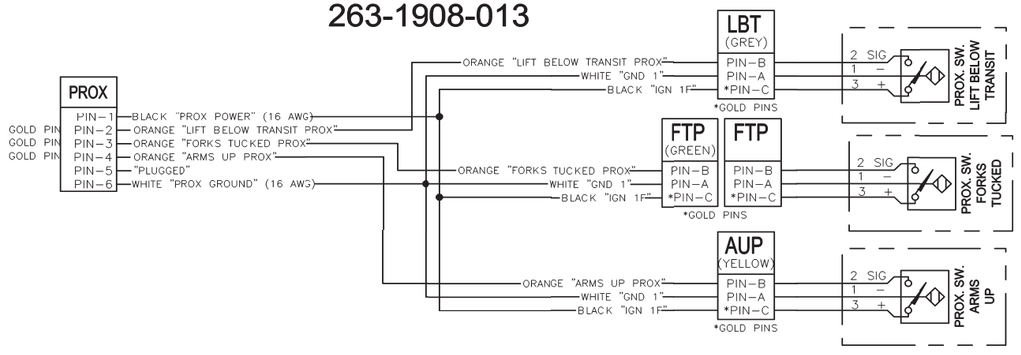
263-1908-004



263-1908-003



263-1908-012

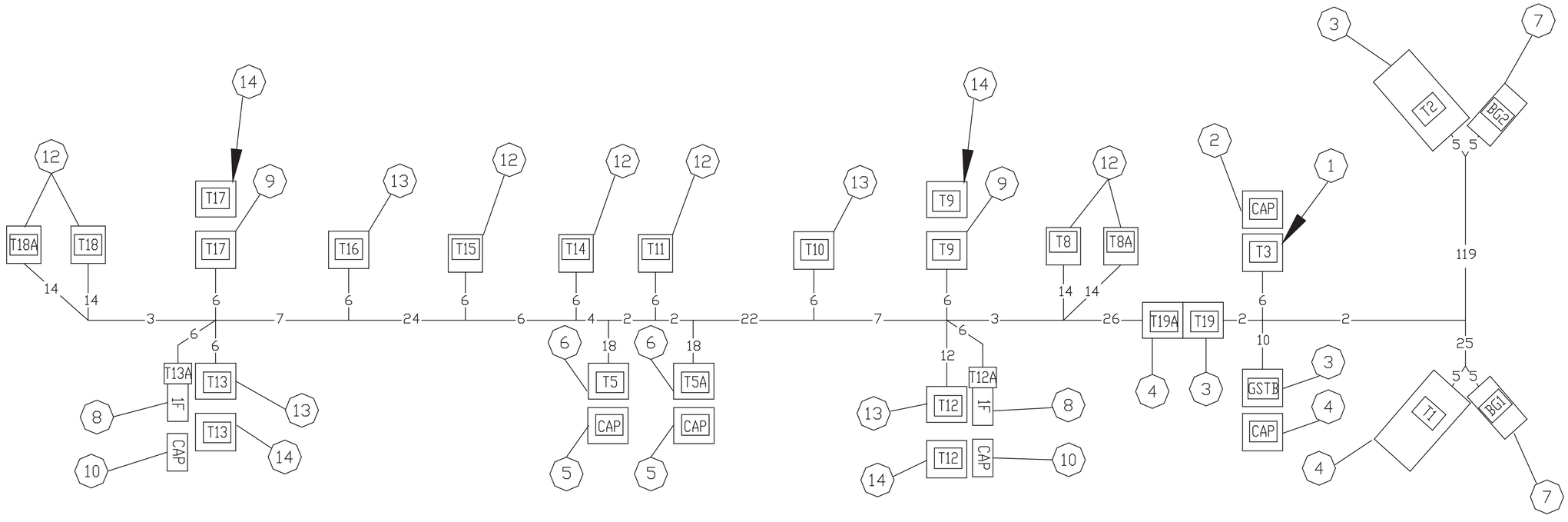


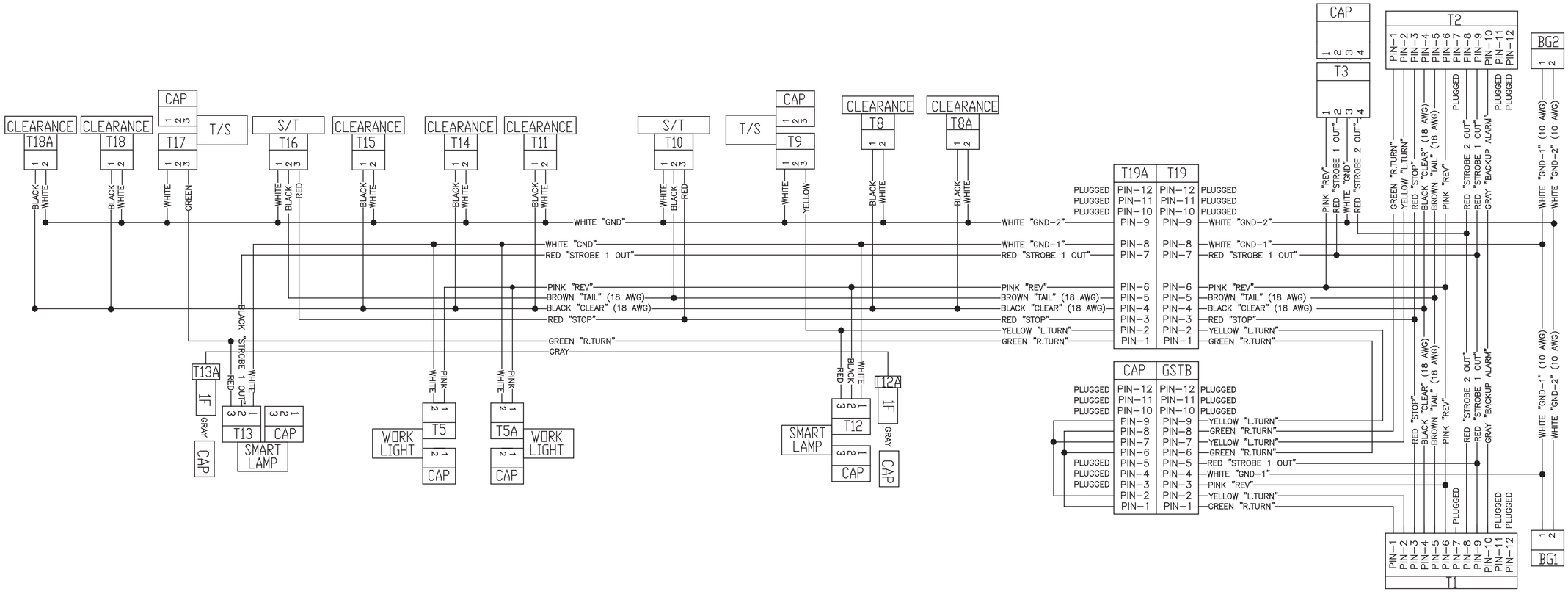
263-1908-013

701-9341-003

SCHEMATIC, BODY
2021 HP REFRESH

701-9341-003





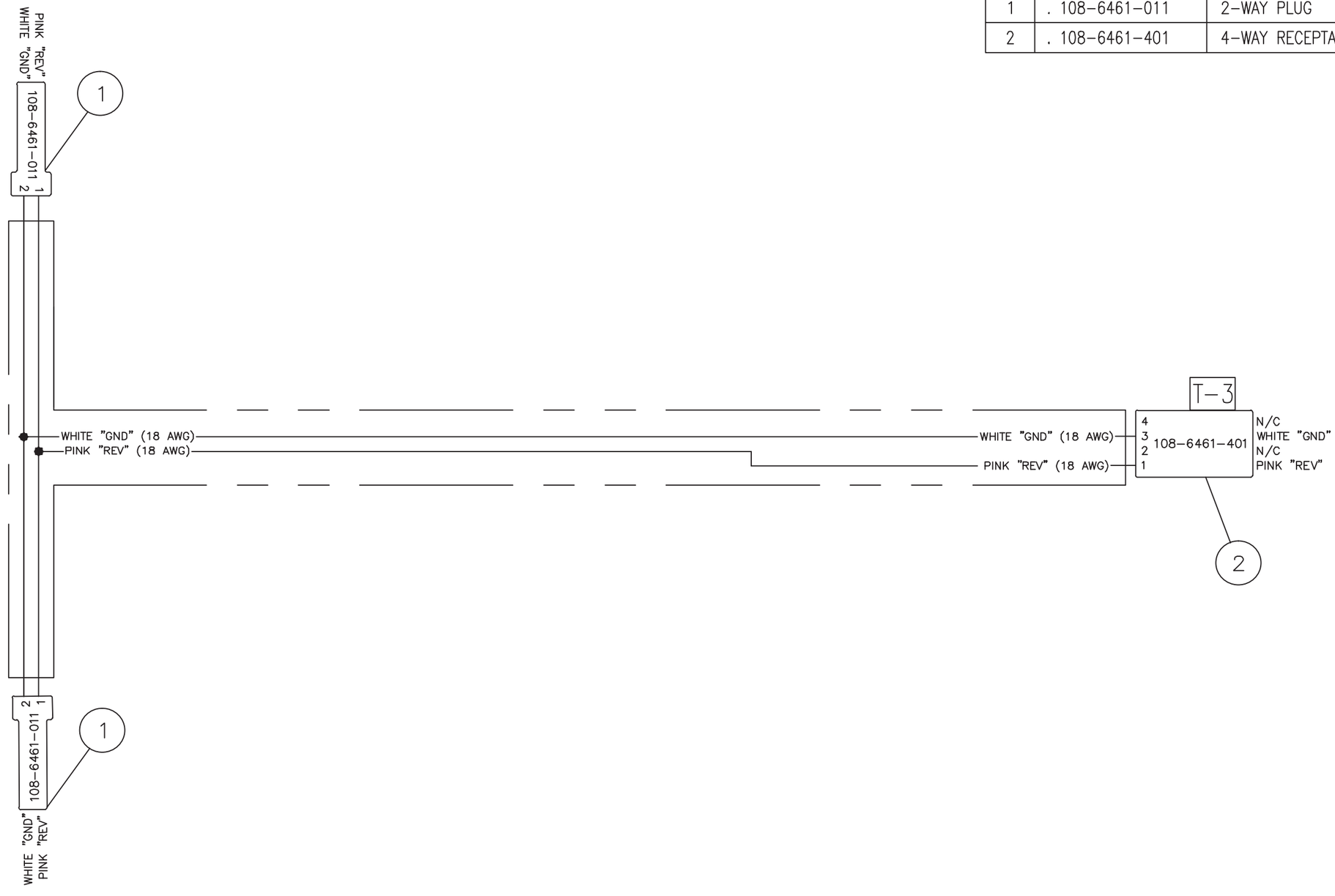
263-1890-003

HARNESS, TAILGATE UPPER CLUSTER, GROTE

263-1890-003

REF.	PART No.	DESCRIPTION	QTY.
1	. 108-6461-003	AT 4 POS PLUG KIT	1
2	. 108-6461-004	AT 4 POS RECEPTACLE KIT	1
3	. 108-6461-009	AT 12 POS PLUG KIT	3
4	. 108-6461-010	AT 12 POS RECEPTACLE KIT	3
5	. 108-6461-011	AT 2 POS PLUG KIT	2
6	. 108-6461-012	AT 2 POS RECEPTACLE KIT	2
7	. 108-8411-002	2 WAY PLUG	2
8	. 108-8493-001	SUPER SEAL 1 WAY PLUG HOUSING	2
9	. 108-8721-005	OVERMOLDED PLUG, 2 WIRE, 90°	2
10	. 108-8493-101	SUPER SEAL 1 WAY CAP HOUSING	2
11	.		
12	. 108-8721-001	OVERMOLDED TERM, FEMALE 0.18 BULLET	7
13	. 108-8721-004	OVERMOLDED PLUG, 3 WIRE, 90°	4
14	. 108-8721-006	3 WIRE CAP	4

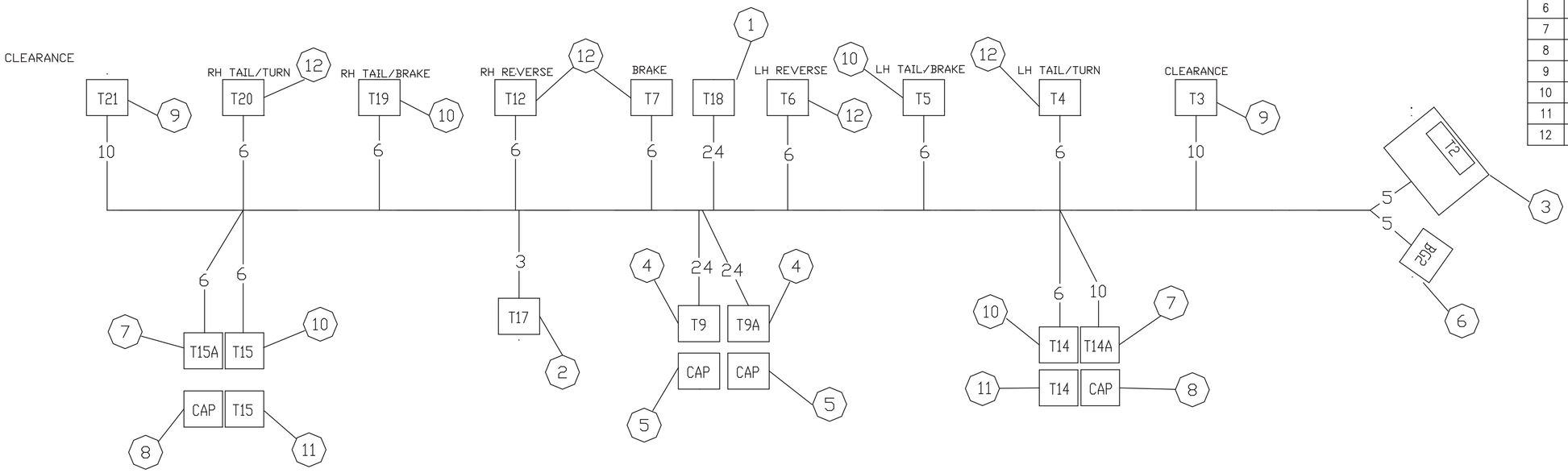
REF.	PART No.	DESCRIPTION	QTY.
1	. 108-6461-011	2-WAY PLUG	2
2	. 108-6461-401	4-WAY RECEPTACLE	1

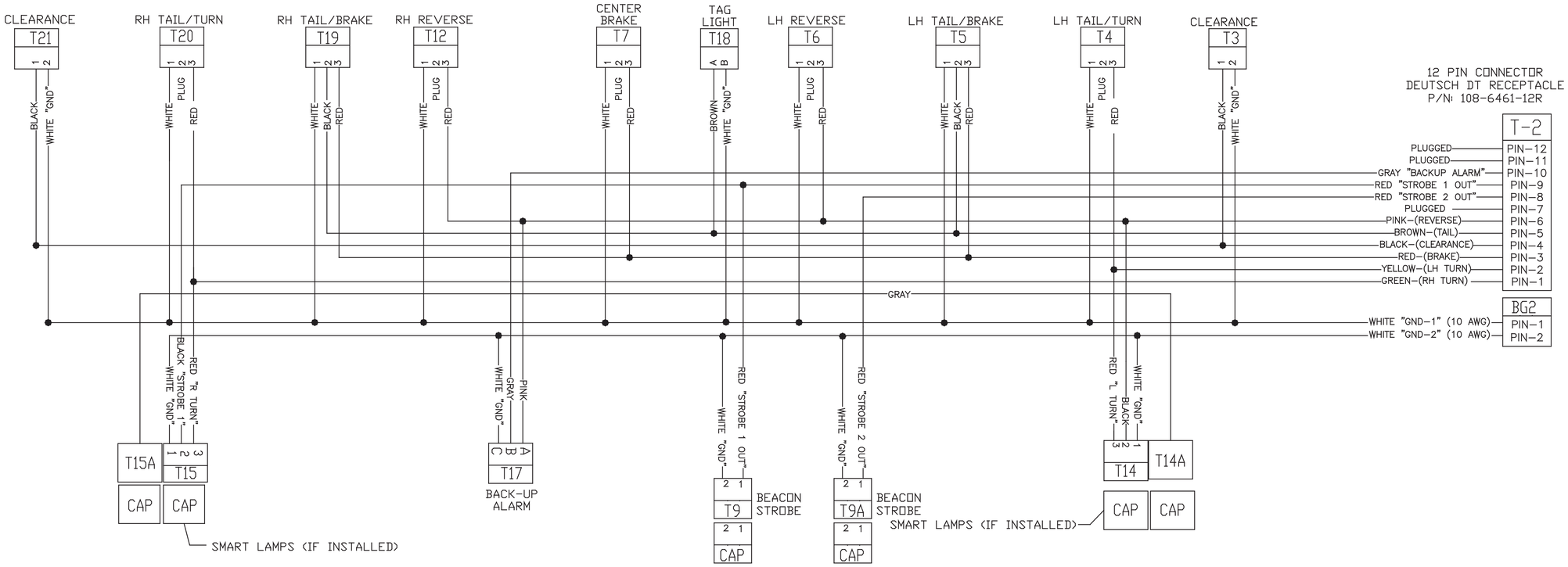


HARNESS, TAILGATE MIDDLE CLUSTER, GROTE CAMERA FLOOD LIGHTS HP 2018

263-1890-002

REF.	PART No.	DESCRIPTION	QTY.
1	. 108-4827-003	2 WAY MALE CONNECTOR	1
2	. 108-4827-006	3 WAY FEMALE CONNECTOR	1
3	. 108-6461-010	12 PIN DEUTSCH RECEPTACLE	1
4	. 108-6461-011	2 PIN DEUTSCH PLUG	2
5	. 108-6461-012	DT 2 WAY RECEPTACLE	2
6	. 108-8411-001	2 WAY RECEPTACLE	1
7	. 108-8493-001	SUPER SEAL 1 WAY PLUG HOUSING	2
8	. 108-8493-101	SUPER SEAL 1 WAY CAP HOUSING	2
9	. 108-8721-001	OVERMOLDED TERM, FEMALE 0.18 BULLET	2
10	. 108-8721-004	OVERMOLDED PLUG, 3 WIRE, 90°	4
11	. 108-8721-006	3 WIRE CAP	2
12	. 108-8721-005	OVERMOLDED PLUG, 2 WIRE, 90°	5





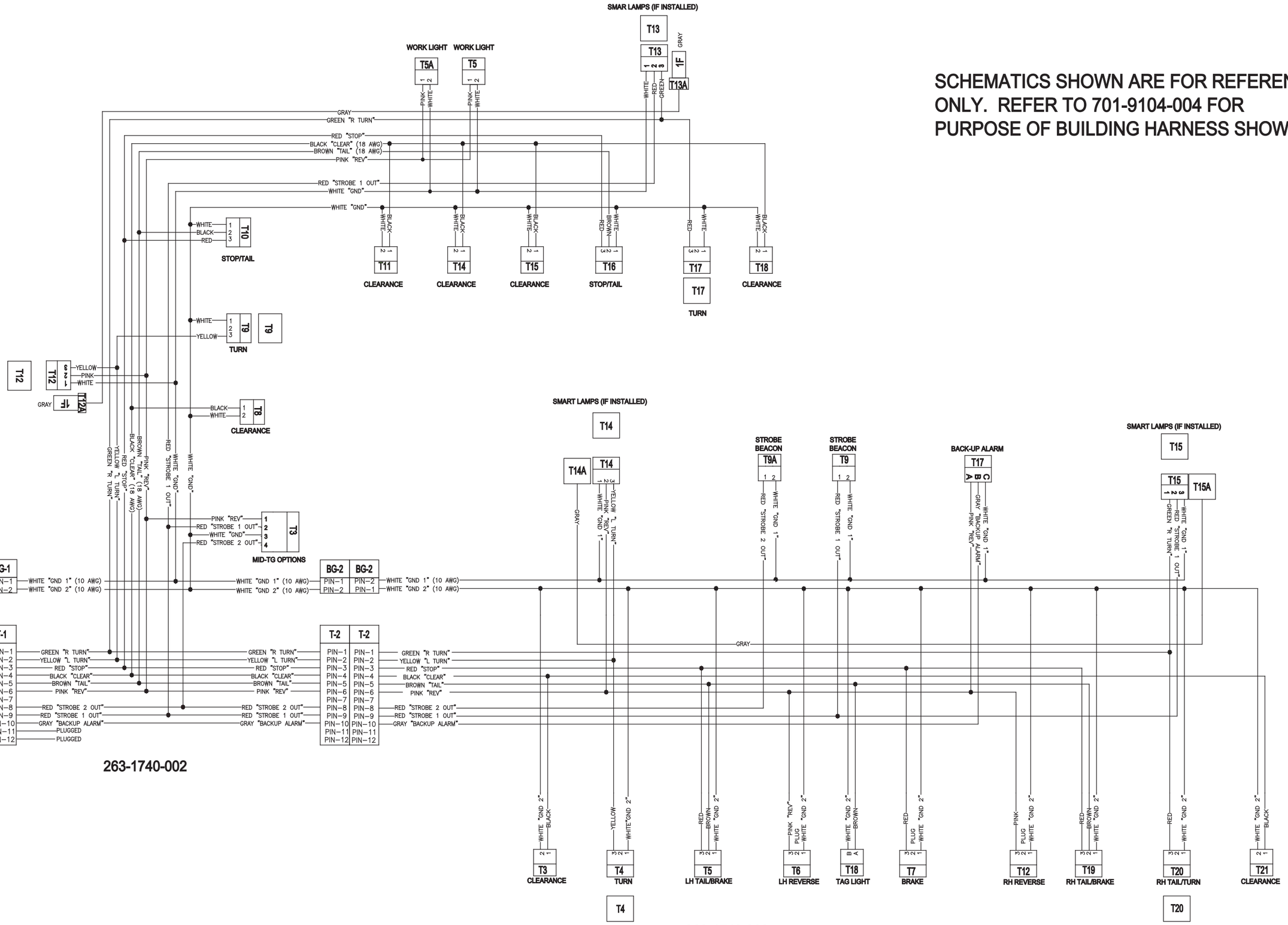
263-1890-001

HARNESS, TAILGATE LOWER
CLUSTER, GROTE

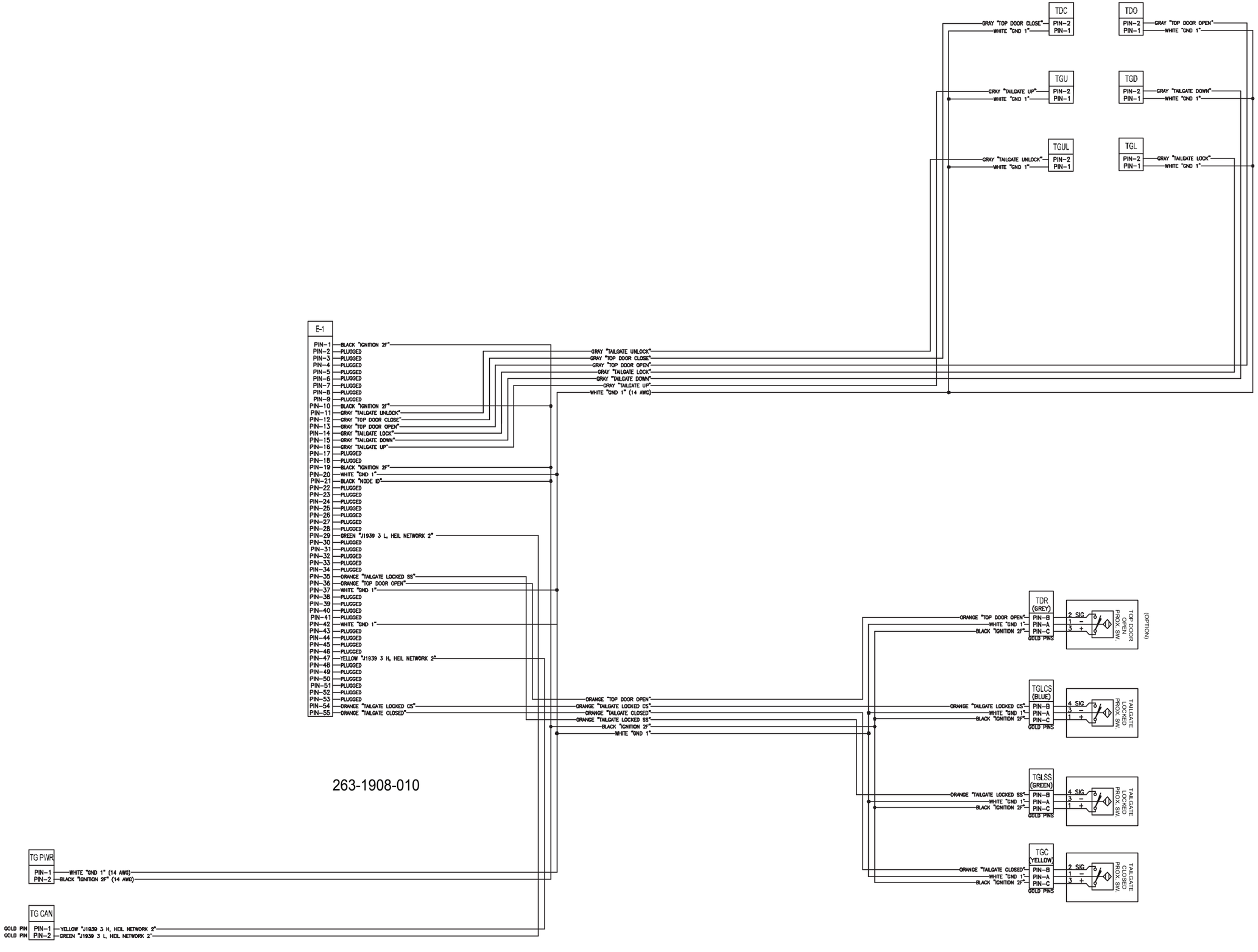
263-1890-001

SCHEMATICS SHOWN ARE FOR REFERENCE ONLY. REFER TO 701-9104-004 FOR PURPOSE OF BUILDING HARNESS SHOWN.

701-9214-004



SCHEMATIC, TAILGATE
ODYSSEY GEN III
REV: -
701-9214-004

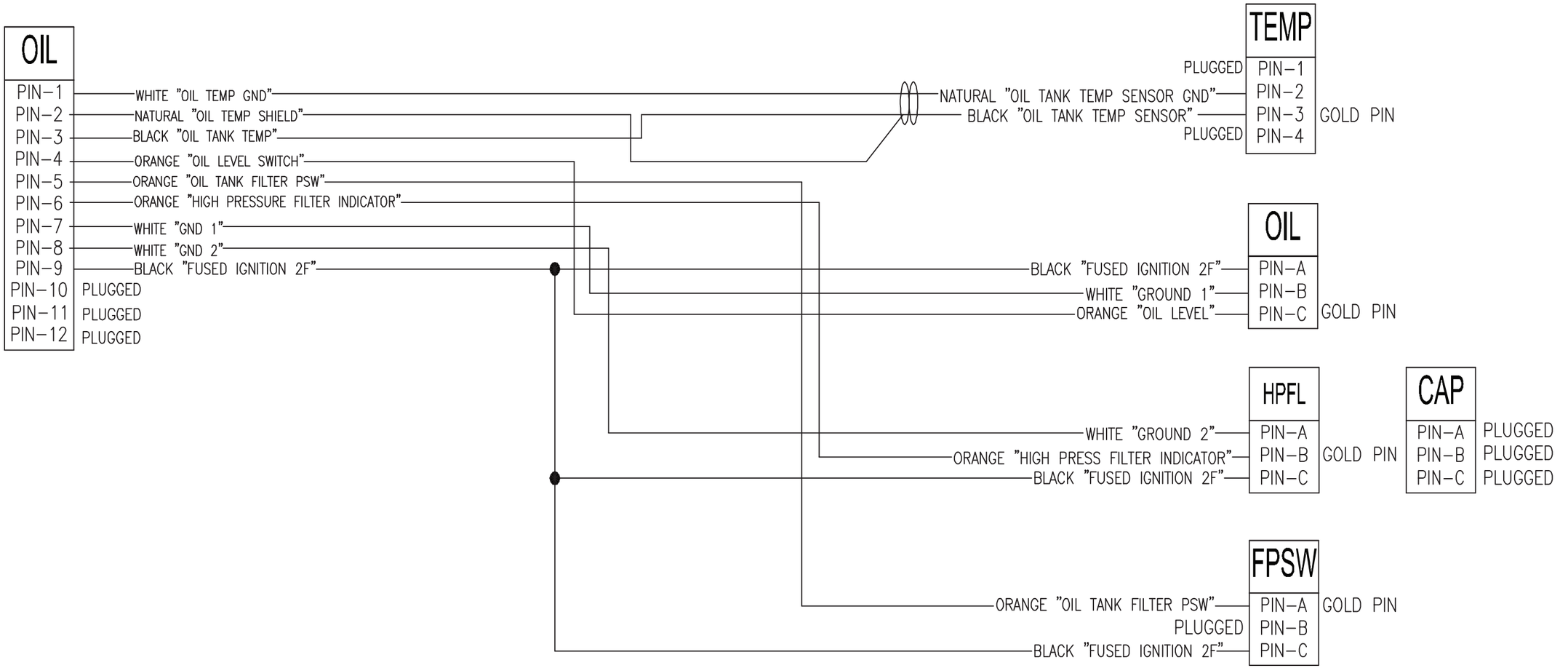


701-9341-010

SCHEMATIC, TG NODE/VALVE
2021 HP REFRESH

701-9341-010

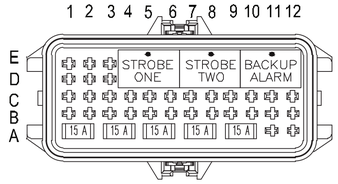
263-1908-011



701-9341-011

SCHEMATIC, OIL TANK
2021 HP REFRESH

701-9341-011



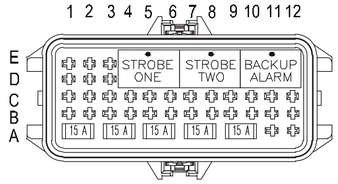
NOTE:
RELAYS ARE HEIL PN: 108-8391
(DOT INDICATES EMPTY POSITION)
FUSES ARE 10 & 15 AMP
HEIL PN: 108-7113-210
& 108-7113-215
TERMINALS (TYCO PN) 1-968857-1
WIRE SEALS (TYCO PN) 828905-1
HOLE PLUGS (TYCO PN) 828922-1
FUSE BLOCK IS HEIL PN: 108-8502-001
FUSE BLOCK COVER IS HEIL PN: 108-8502-002

RELAY BOX DETAIL

701-9341-002

SCHEMATIC, CONTROLLER
2021 HP REFRESH

701-9341-002



NOTE:
RELAYS ARE HEIL PN: 108-8391
(DOT INDICATES EMPTY POSITION)
FUSES ARE 10 & 15 AMP
HEIL PN: 108-7113-210
& 108-7113-215
TERMINALS (TYCO PN) 1-968857-1
WIRE SEALS (TYCO PN) 828905-1
HOLE PLUGS (TYCO PN) 828922-1
FUSE BLOCK IS HEIL PN: 108-8502-001
FUSE BLOCK COVER IS HEIL PN: 108-8502-002

RELAY BOX DETAIL

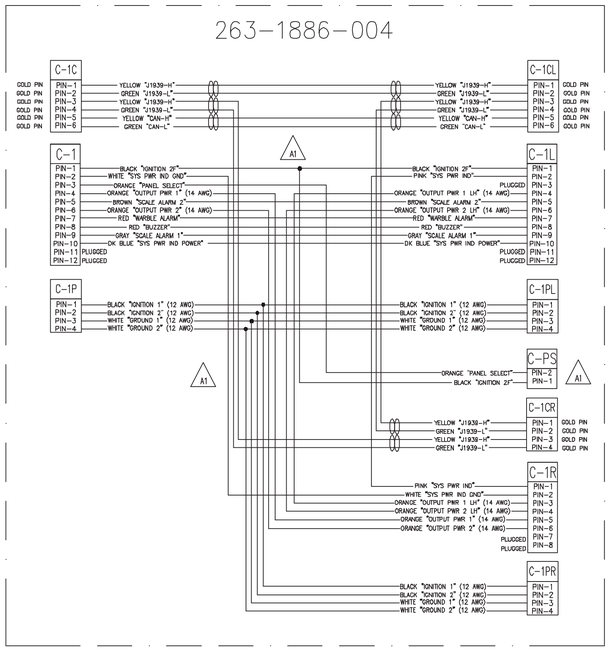
701-9341-002

SCHEMATIC, CONTROLLER
2021 HP REFRESH

701-9341-002

PANEL SPLITTER HARNESS

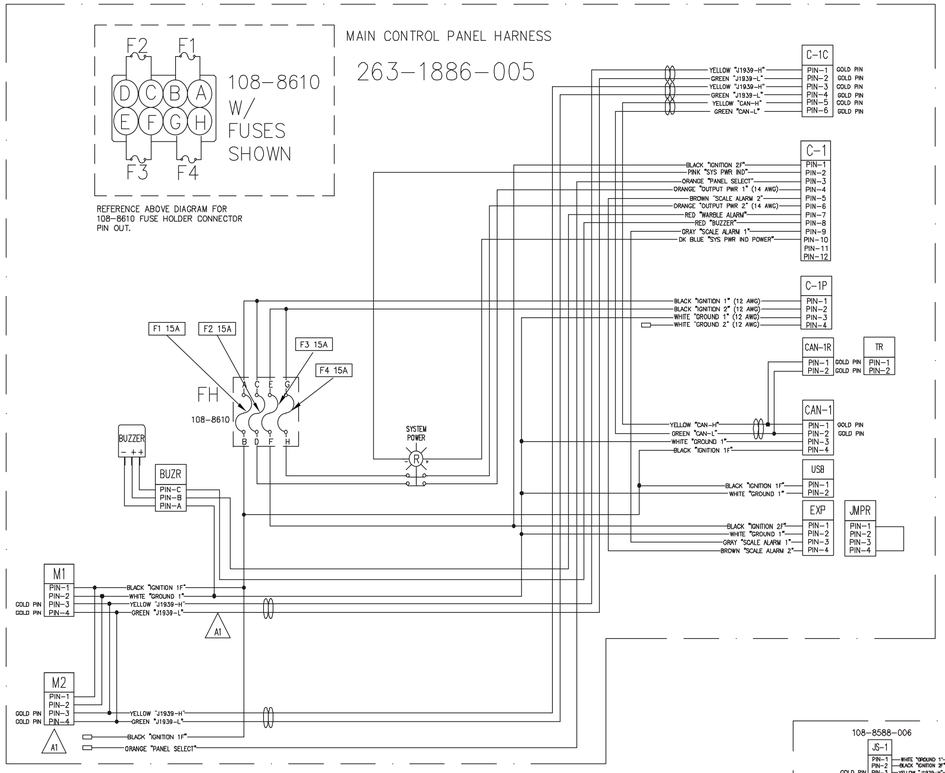
263-1886-004



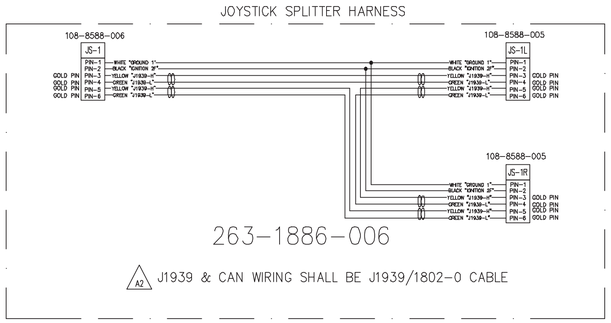
701-9287-017

MAIN CONTROL PANEL HARNESS

263-1886-005



JOYSTICK SPLITTER HARNESS

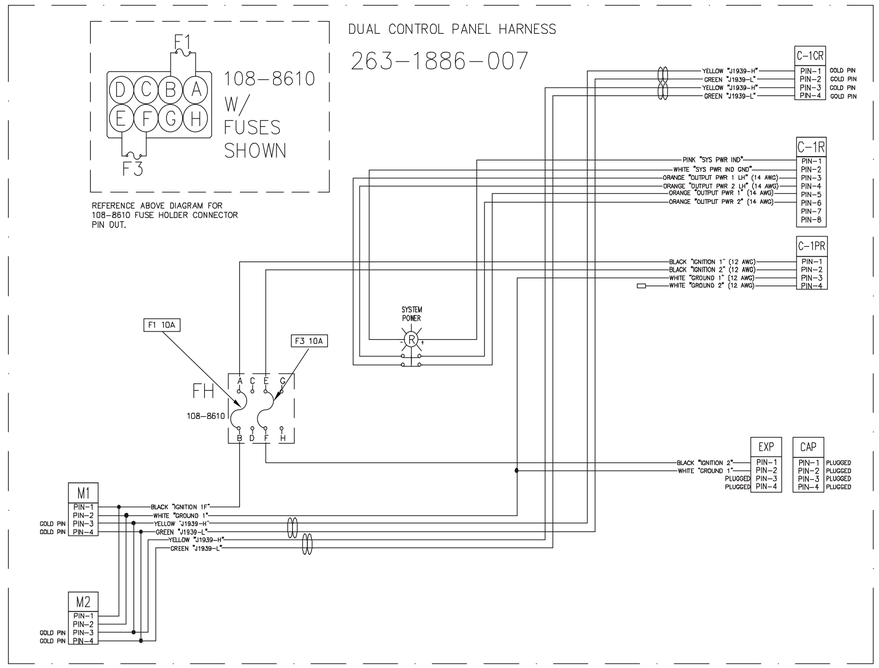


263-1886-006

A2 J1939 & CAN WIRING SHALL BE J1939/1802-0 CABLE

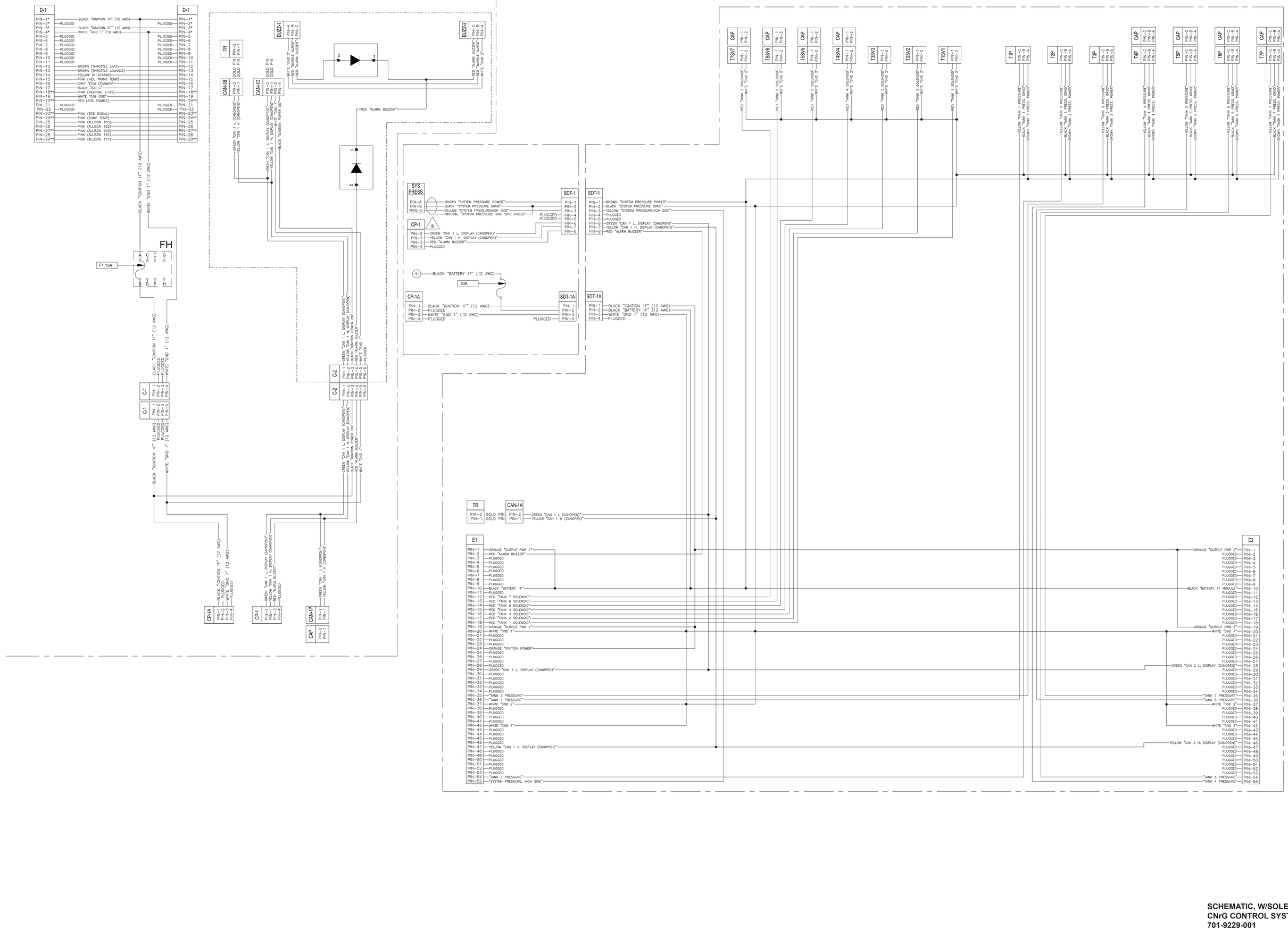
DUAL CONTROL PANEL HARNESS

263-1886-007



SCHEMATIC, CAB CONTROL PANELS
COMMAND-SST

701-9287-017



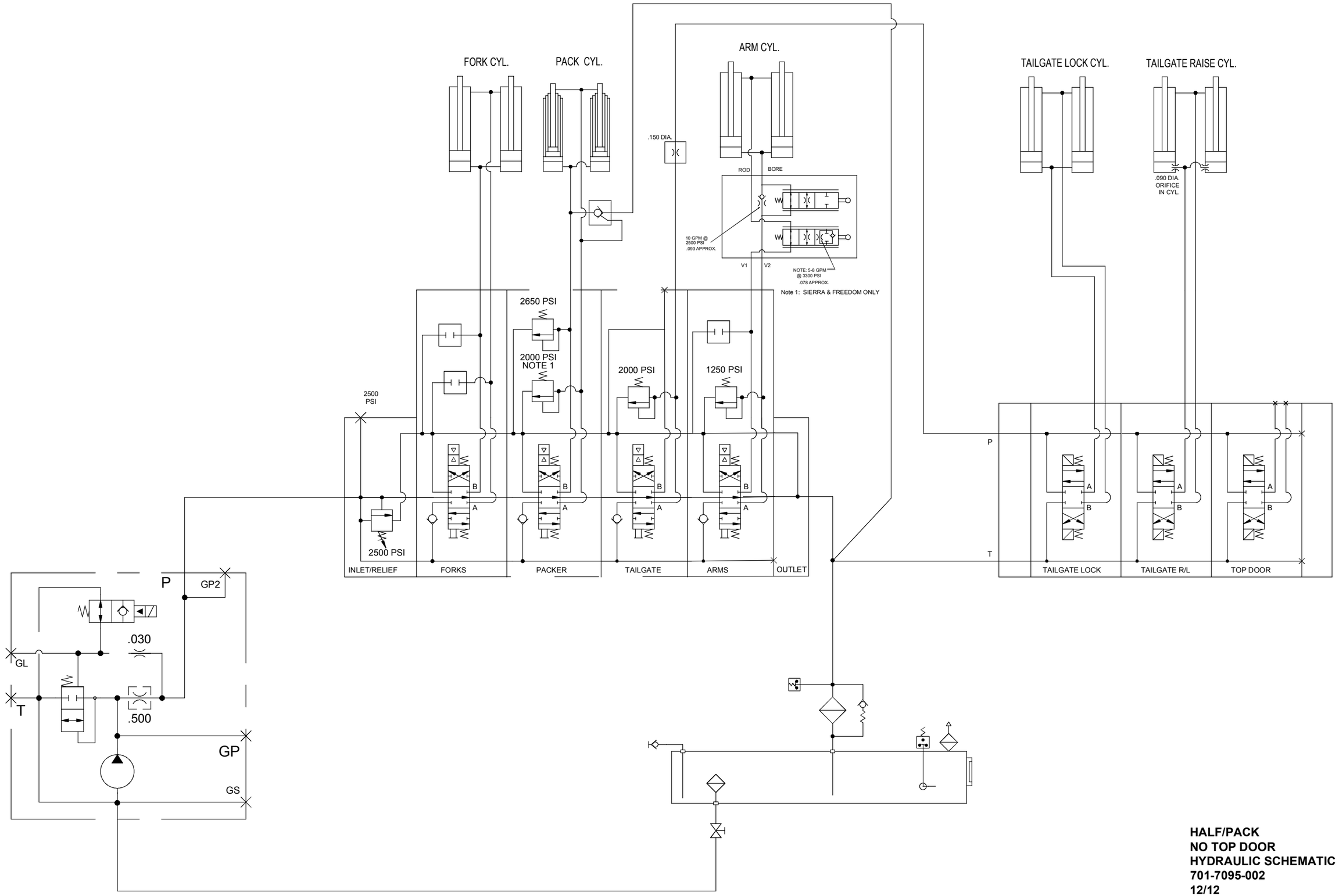
SCHEMATIC, W/SOLENOID VALVE OPTION,
CNrG CONTROL SYSTEM
701-9229-001
06/08/2016

INTENTIONALLY LEFT BLANK

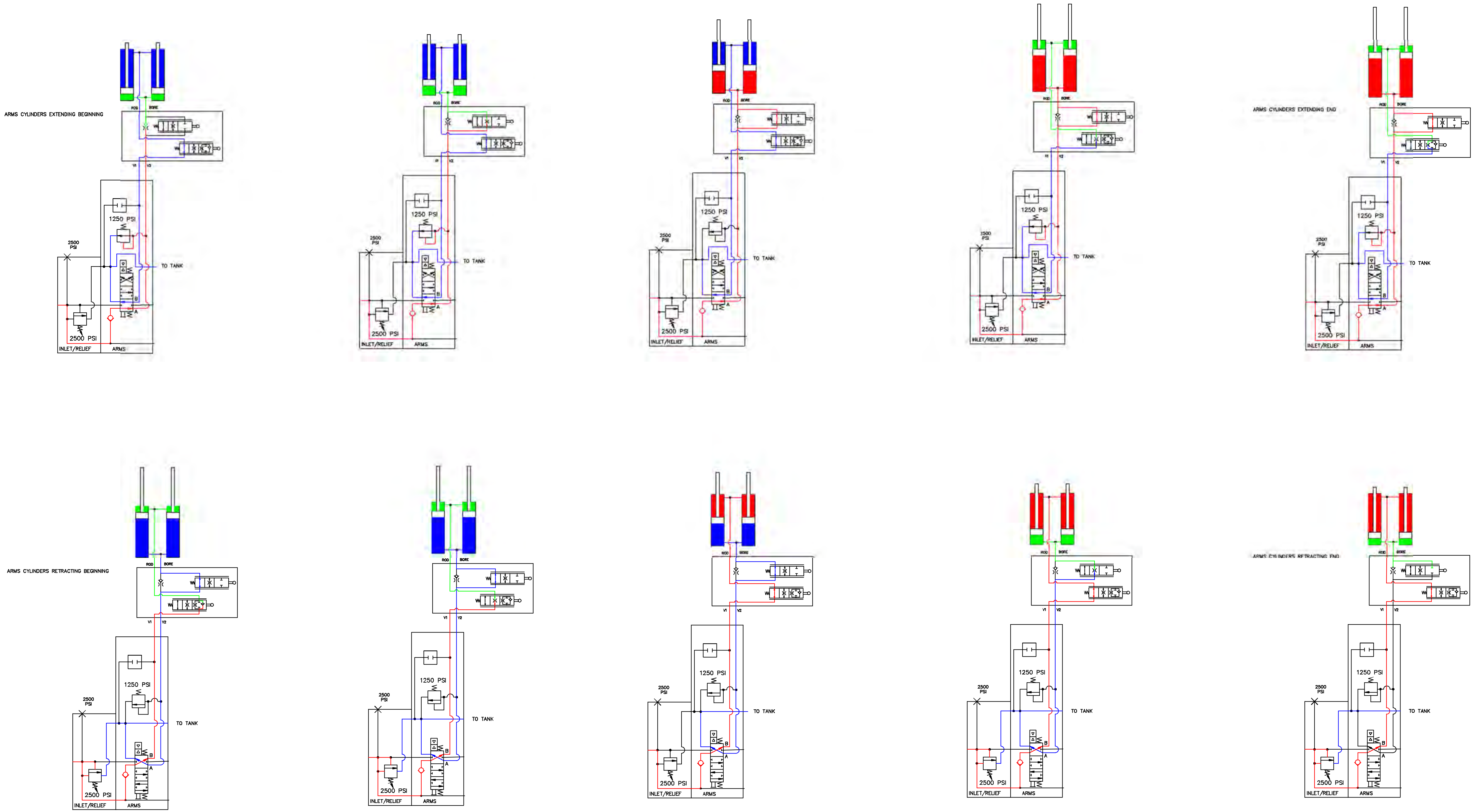
HYDRAULIC SCHEMATICS

FORK CYL.
PACK CYL.
ARM CYL.
TAILGATE LOCK CYL.
TAILGATE RAISE CYL.
TOP DOOR CYL.
.150 DIA.
ROD
BORE
10 GPM @ 2500 PSI .093 APPROX.
V1
V2
NOTE: 5-8 GPM @ 3300 PSI .078 APPROX.
Note 1: SIERRA & FREEDOM ONLY
.090 DIA. ORIFICE IN CYL.
2650 PSI
2000 PSI NOTE 1
2000 PSI
1250 PSI
500 PSI
500 PSI
2500 PSI
2500 PSI
P
T
A
B
INLET/RELIEF
FORKS
PACKER
TAILGATE
ARMS
OUTLET
TAILGATE LOCK
TAILGATE R/L
TOP DOOR
P
GP2
.030
GL
T
.500
GP
GS

HALF/PACK
HYDRAULIC SCHEMATIC
701-7095-001
12/12



HALF/PACK
NO TOP DOOR
HYDRAULIC SCHEMATIC
701-7095-002
12/12



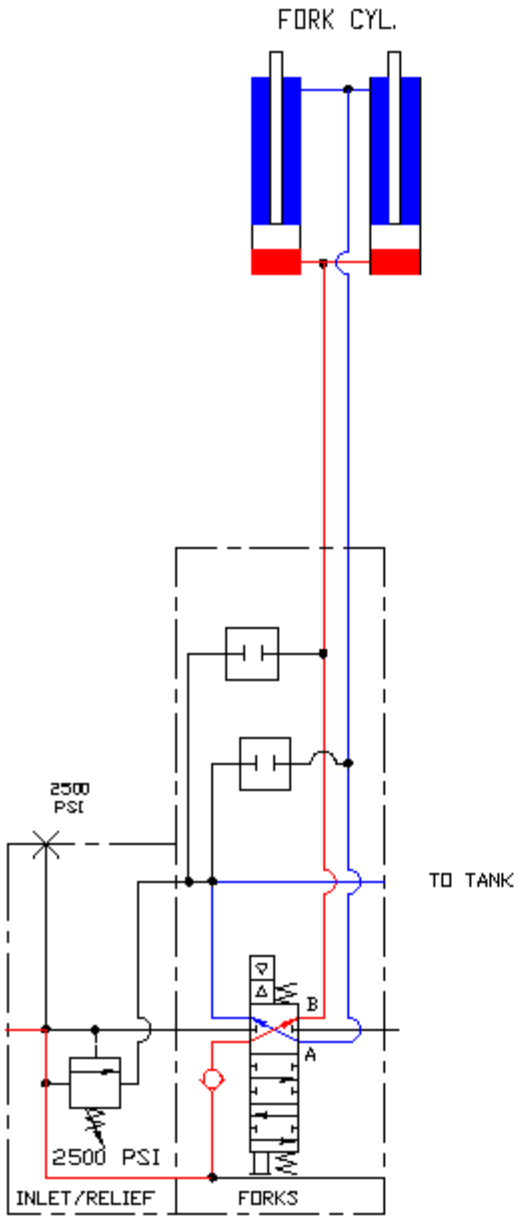
HALF/PACK FLOW DIAGRAM
ARMS
12/12

HALF/PACK®

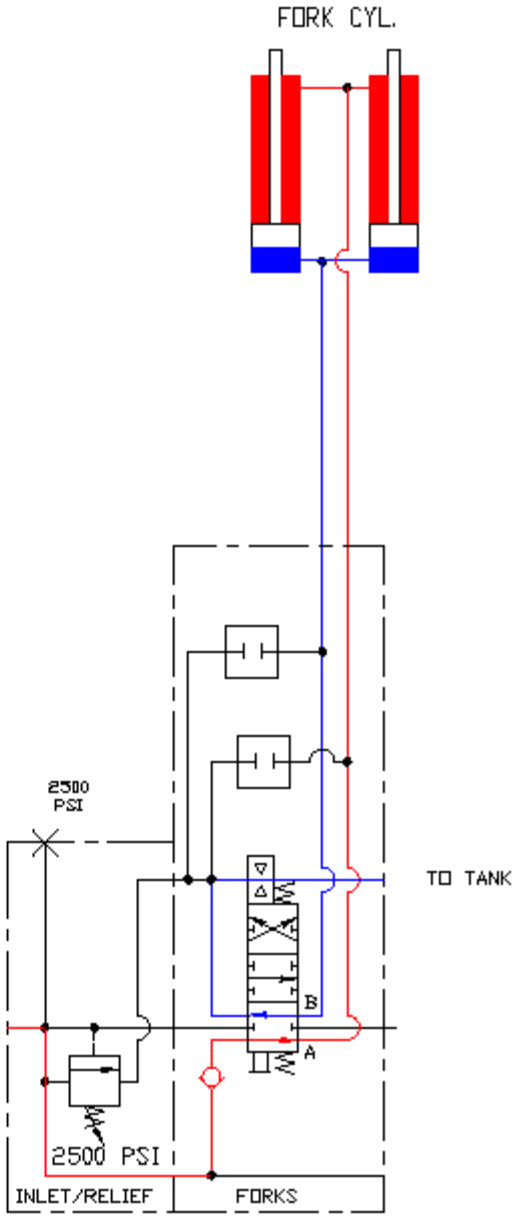
Schematics

FORKS HYDRAULIC FLOW DIAGRAM

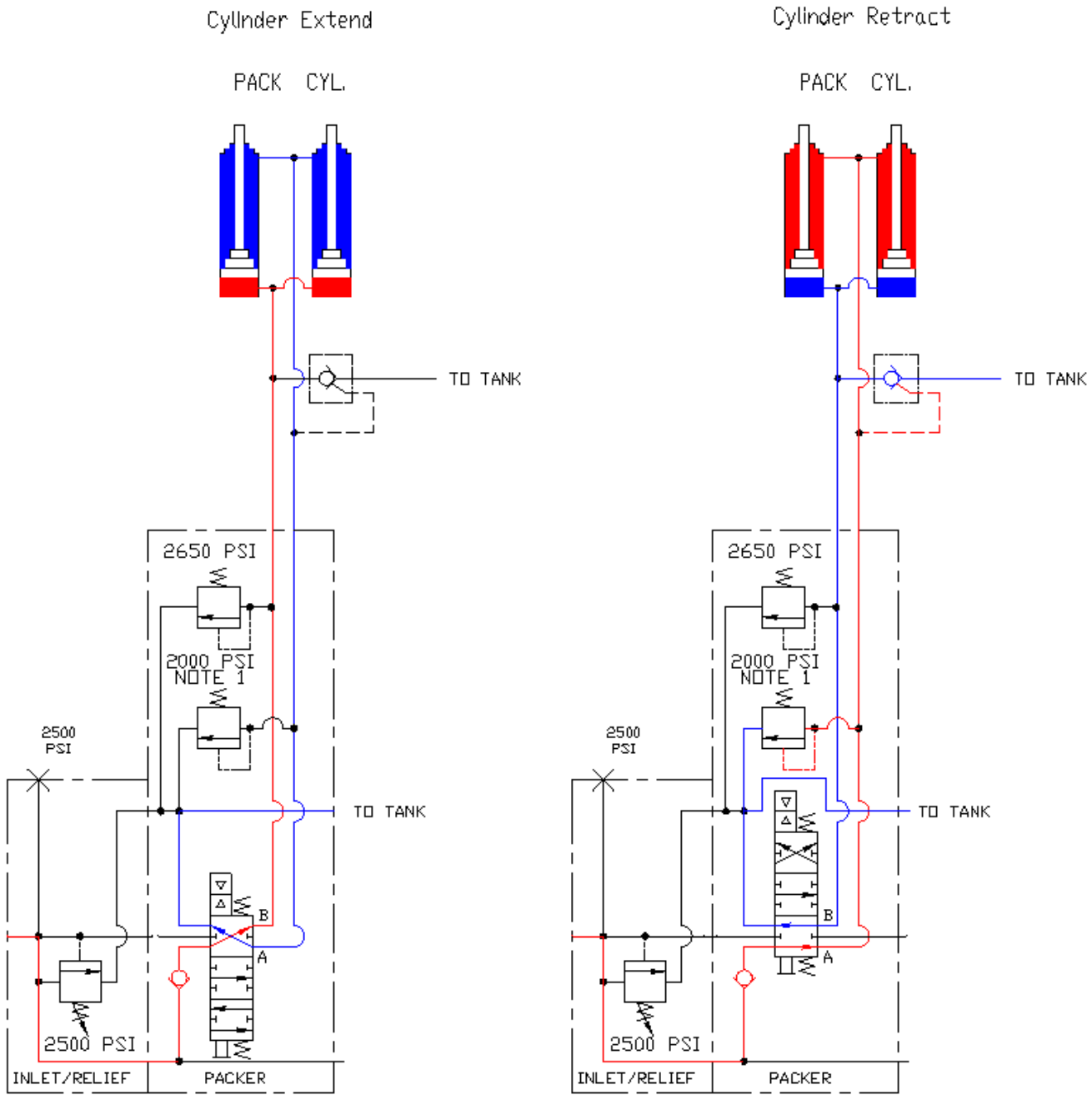
Cylinder Extend (Forks Lower)



Cylinders Retract (Forks Raise)

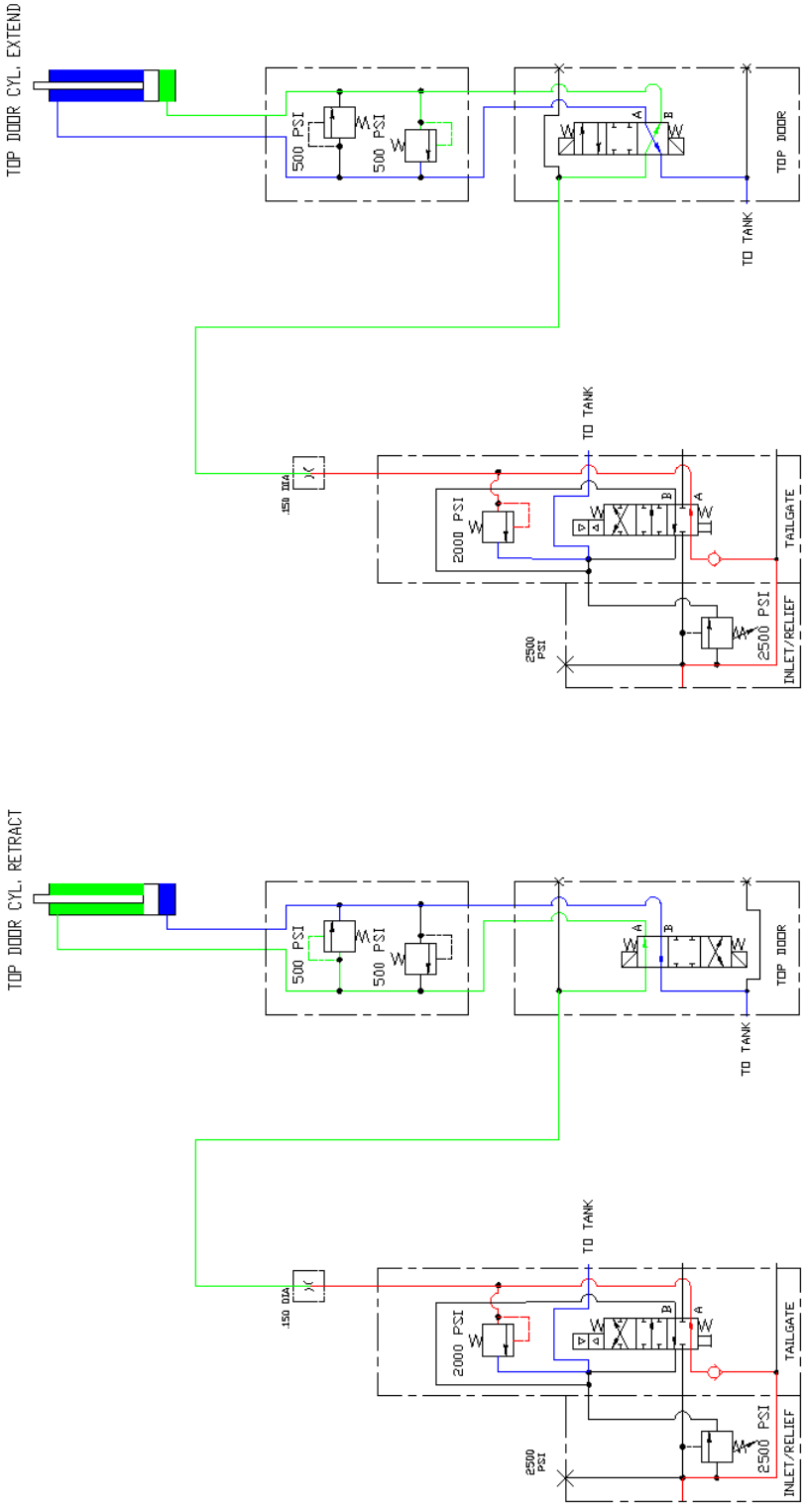


PACKER HYDRAULIC FLOW DIAGRAM

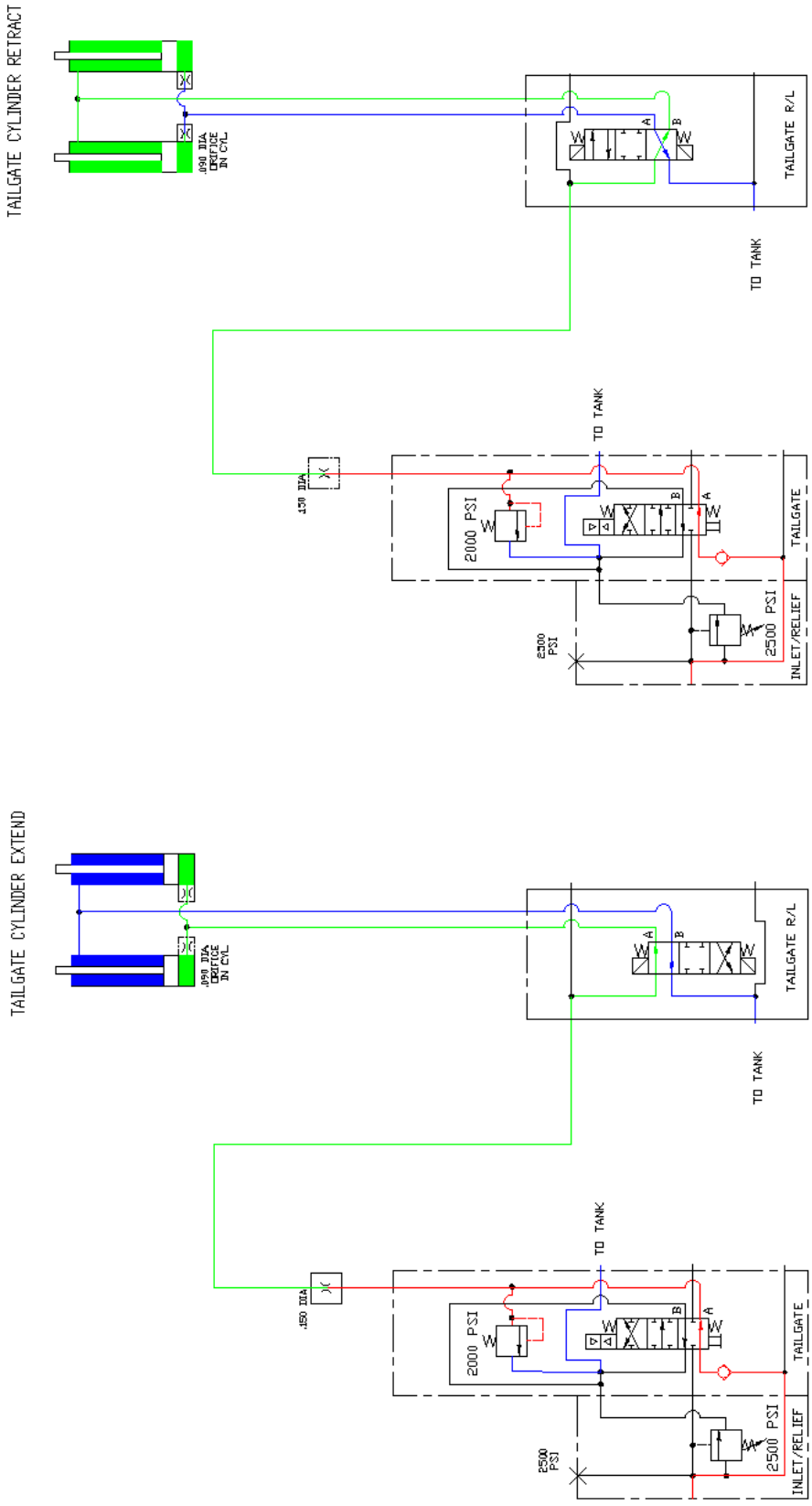


HALF/PACK®
Schematics

TOP DOOR HYDRAULIC FLOW DIAGRAM

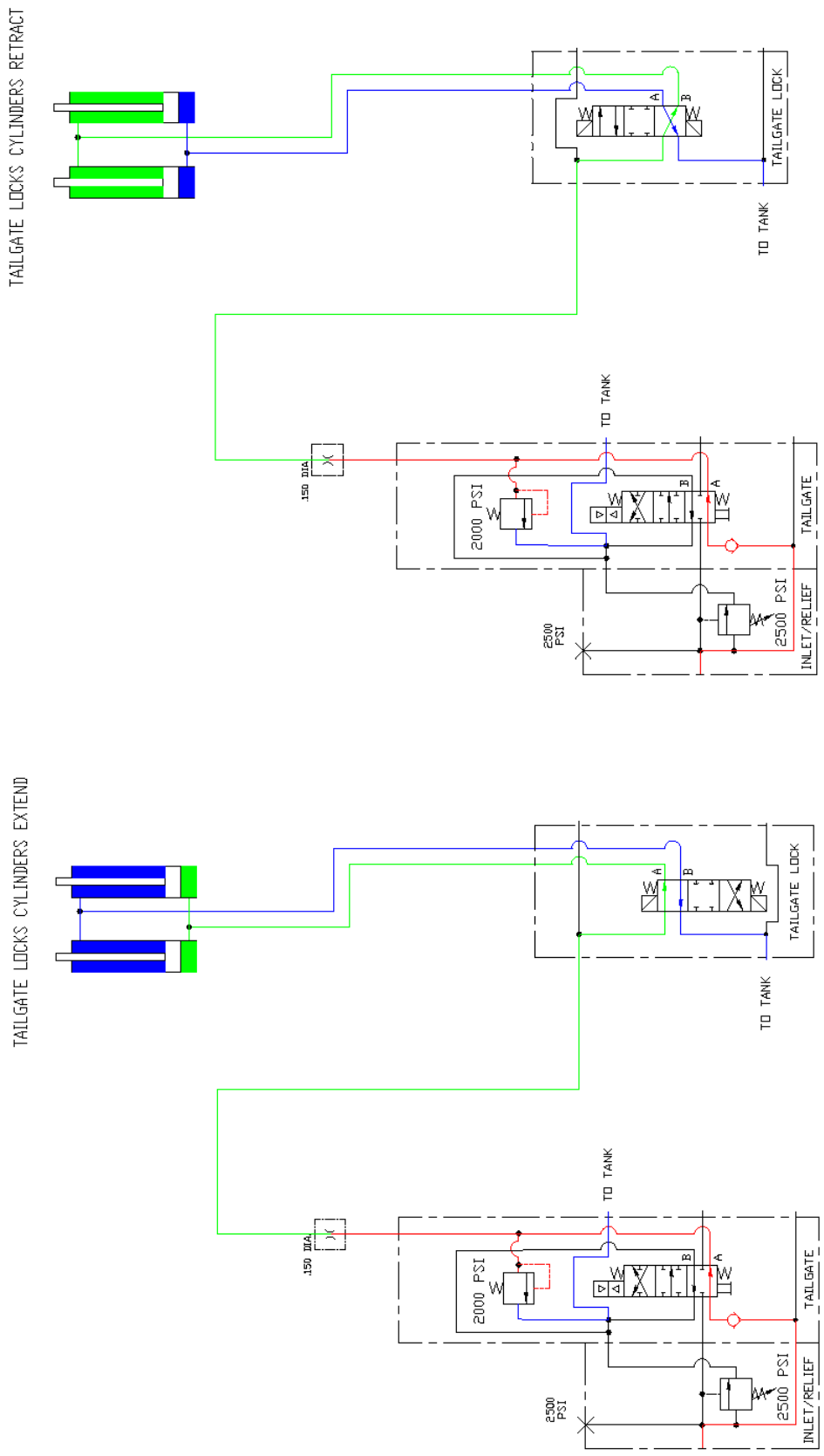


TAILGATE HYDRAULIC FLOW DIAGRAM



HALF/PACK®
Schematics

TAILGATE LOCKS HYDRAULIC FLOW DIAGRAM



A

B

C

D

E

F

G

H

I

L

M

N

O

HALF/PACK®
INDEX

P

R

S

T

W

HEIL ENVIRONMENTAL WARRANTY STATEMENT

The Heil Co. d/b/a Heil Environmental ("Heil") warrants its solid waste collection equipment to be free from defects in material and workmanship under normal use for a period of one (1) year or 2000 hours of operation (whichever comes first) from the date of equipment In-Service or during the period of coverage offered by an extended warranty program, when proper service and maintenance as described in Heil Service Bulletins and Parts & Service Manuals are performed. The standard or extended equipment warranty is not transferable except for sales demonstration units.

This warranty is expressly limited to the repair or replacement of any component or part thereof, of any such refuse or recycling collection body manufactured by Heil that is proven to Heil's satisfaction to have been defective in material or workmanship. Such components or parts shall be repaired or replaced at Heil's option without cost to the standard purchaser for parts and labor provided such unit is returned to an authorized Heil Distributor for replacement or repair. The repair or replacement must be made during the standard or extended warranty coverage period. Before any warranty can be allowed on new equipment, a validated warranty registration form must be on file with Heil's Customer Service Department within sixty (60) days of the equipment's In-Service date. Wear items are excluded from warranty coverage.

All OEM service parts sold by Heil have a six (6) month warranty from the date of purchase. Aftermarket parts purchased from Heil are supported by a 90-day warranty. The parts warranty covers parts only, providing that factory inspection reveals a defect in material or workmanship. Labor, troubleshooting, equipment downtime, etc. is not covered under the parts warranty policy.

HEIL MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, AND MAKES NO WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR ANY PARTICULAR PURPOSE. HEIL DOES NOT ASSUME ANY LIABILITY OR ACCEPT CLAIMS FOR LOSS OF PROFITS, PRODUCT DOWN TIME OR ANY OTHER DIRECT, INCIDENTAL OR INDIRECT CONSEQUENTIAL LOSSES, COSTS, DAMAGES OR DELAYS.

Any improper use, operation beyond rated equipment or component capacity, substitution of parts that are not Heil-approved, or any alteration or repair by others in such a manner as in Heil's sole judgment affect the product operation or integrity shall void the warranty.

Other than the extension of the standard warranty period purchased under a supplemental Heil Extended Warranty Program, no employee or representative is authorized to modify this warranty in any way nor shall any other warranties be granted. No dealer-supplied warranty program is endorsed or supported by Heil.

Heil retains the right to modify its factory warranty program prospectively at any time.

Revised 1/2013

WE NEVER STOP WORKING FOR YOU

www.heil.com

Customer Care:
866-ASK-HEIL
(866-275-4345)

Heil Environmental
4301 Gault Avenue North
Fort Payne, AL 35967-9984

Parts Central:
800-528-5308

Technical Service:
866-310-4345
TechSupport@DoverESG.com