



HALF/PACK®

INCLUDING STANDARD & SIERRA
COMMON BODY PLATFORM

SERVICE MANUAL

ISSUED JUNE 2026

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



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

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

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

WARNING

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

PLEASE NOTE THAT THIS MANUAL IS APPLICABLE TO THE HEIL BODY ONLY. PLEASE CONSULT THE RESPECTIVE CHASSIS MANUAL FOR ANY AND ALL ISSUES OR QUESTIONS RELATED TO THE CHASSIS. HEIL CANNOT SPEAK FOR THE CHASSIS MAKER.

IMPORTANT SAFETY NOTICE

Proper service and repair are important to the safe, reliable operation of The 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.

The Heil Co., 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. The Heil Co. 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.

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SECTION 1

GENERAL INFORMATION

GENERAL INFORMATION

Introduction

The following sections are guides for maintenance and service of the Heil unit. The sections cover preventive maintenance, adjustment, and troubleshooting tips. 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. This manual does not contain and should not be relied upon to cover any CNG system specifics. You must consult the applicable CNG system manual as well as this Manual.



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 provide prompt and professional assistance.

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

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

GENERAL INFORMATION

Recommended Spare Parts

PART #	DESCRIPTION	QTY
BODY & TAILGATE ASSEMBLIES		
003-5142	TAILGATE LOCK BUSHING	2
022-3509-018	SEAL, TAILGATE	1
022-4058	SEAL, SUMP DOOR	1
019-1242	SPRING, 2.00" OD X 3.50"	4
014-2112	PAD, ARM STOP	2
003-4013	BEARING, ARM, SAE	4
HYDRAULICS		
001-7142	CYLINDER WITH SENSOR PORT, FORK	1
001-7141	CYLINDER WITHOUT SENSOR, CAN FORK, GEN 3	1
001-7316	FEL ARM CYL, W/SCRAPER & CUSHION 2024	2
001-7234	CYLINDER, TOP DOOR	1
001-7185	CYLINDER, TAILGATE RAISE	2
001-7311	CYLINDER, T/G LOCK, W SENSOR	2
001-7314	PACKER CYLINDER MODULE 23YD FEL /28YD ASL, MAILHOT	2
001-7338	PACKER/EJECTOR TELESCOPIC CYLINDER , 23YD FEL / 28YD ASL	2
001-7339	PACKER/EJECTOR TELESCOPIC CYLINDER , 23YD FEL / 28YD ASL	2
001-7275	PACKER/EJECTOR TELESCOPIC CYLINDER 32YD	2
001-7159	PACKER CYLINDER MODULE 32YRD	2
001-6909	PACKER CYLINDER MODULE 32YRD	2
001-7329	PACKER CYLINDER MODULE 33YRD	2
001-7354	PACKER CYLINDER MODULE 33YRD	2
001-7353	PACKER CYLINDER MODULE 33YRD	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	1
075-0896	STRAINER, SUCTION, 100 MESH	1

GENERAL INFORMATION

PART #	DESCRIPTION	QTY
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		
108-8734-002	AUDIBLE ALARM, J1939,	1
108-8788	CONNECTOR, M12	2
108-8789-002	CABLE, ETHERNET	1
108-8789-005	CABLE, ETHERNET	3
263-1928-002	BODY REAR	1
263-1928-003	MAIN CONTROLLER	1
263-1928-008	OIL TANK	1
263-1928-009	DISPLAY	1
263-1928-011	MAIN CONTROL PANEL	1
263-1928-012	PANEL SPLITTER	1
263-1928-013	SECONDARY CONTROL PANEL	1
263-1928-016	HP STANDARD COMMERCIAL ARM	1
263-1928-018	BODY VALVE CONTROL HP STANDARD	1
263-1928-051	JOYSTICK SPLITTER	1
263-1928-054	HP HOPPER FRONT	1
263-1928-058	DEFUEL DETECTION SMART FMM	1
263-1928-059	EATON ROCKER SWITCH CAMERA TRIGGER	1
263-1928-060	HP BODY FRONT	1
263-1928-061	CAB TO BODY (MACK LR, AUTOCAR, PETE)NTSEAL	1
263-1928-062	CAB TO BODY (BATTLE) NTSEAL	1
263-1928-024	CAB TO BODY (AUTOCAR PO1 CAB)	1
263-1928-063	CAB TO BODY (AUOTCAR PO1 CHASSIS) NTSEAL	1
263-1928-064	CAB TO BODY (ECONIC) NTSEAL	1
263-1928-065	IN CAB CONTROLS (ECONIC)	1
263-1928-066	CAMERA SPLITTER STD	1

GENERAL INFORMATION

PART #	DESCRIPTION	QTY
263-1928-067	CAMERA SPLITTER STD 4 CAM	1
263-1928-068	CARLING ROCKER SWITCH CAMERA TRIGGER	1
263-1928-069	360 CAMERA	1
263-1928-100	TAILGATE UPPER CLUSTER	1
263-1928-101	TAILGATE MIDDLE CLUSTER 6 STROBES	1
263-1928-102	TAILGATE MIDDLE CLUSTER CAM FLOOD	1
263-1928-103	TAILGATE MIDDLE CLUSTER 2 STROBES	1
263-1928-104	TAILGATE LOWER CLUSTER	1
263-1309-003	HARNESS, WM ALARMD ADPT	1
263-1935-001	3RD EYE CABLE PN 29059	1
108-8503-18B	8 MAC VALVE ASSY	1
108-8626-910	SWITCHBANK PRIMARY	1
108-8626-911	SWITCHBANK SECONDARY	1
108-8626-050	SWITCHBANK CURROTTO	1
254-4961	CAB CONTROLLER	1
254-4954	BODY CONTROLLER	1
108-8790	DISPLAY	1
063-0141	ARC SENSOR	1
063-0151	SENSOR MAGNET (TG CYLINDER SENSORS)	3
113-7504	ARC SENSOR MOUNTING WELDMENT	1
113-7504-003	ARC SENSOR BRACKET	1
063-0122	PROX 18MM	1
063-0123	PROX 30MM	3
263-1150-008	"CABLE 130'", LIGHT OPTION W/ 2PIN DEUTSCH"	1
263-1820-001	HARNESS CAN TO CAN GATE WAY AFL, 2016 AUTOCAR	1
263-1820-003	HARNESS, GATEWAY CONNECTION, 2017 PETERBILT	1
263-1701-022	CAB MOUNTED DUAL LED STROBES MACK MR	1
263-1701-005	HARNESS CAB MOUNTED DUAL LED FLOOD, MACK MR	1
263-1146-001-	CABLE, PROX EXTENSION 70"	1
108-8788	CONNECTOR, M12 4-PIN BULKHEAD (ETHERNET)	1

GENERAL INFORMATION

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

Registration & 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**.

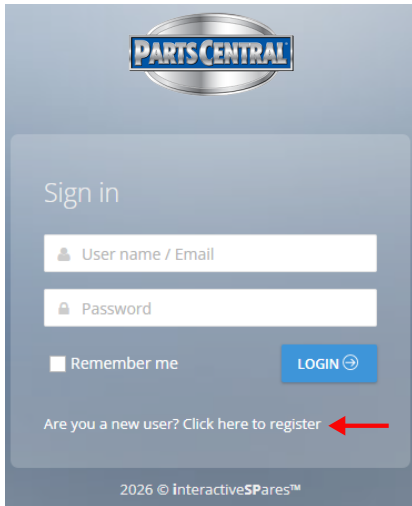


Figure 1.

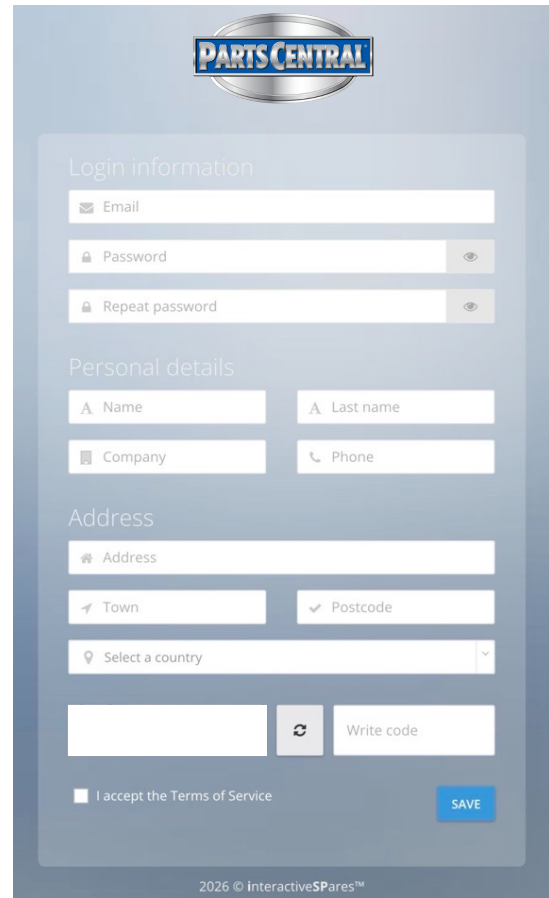


Figure 2.

GENERAL INFORMATION

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:

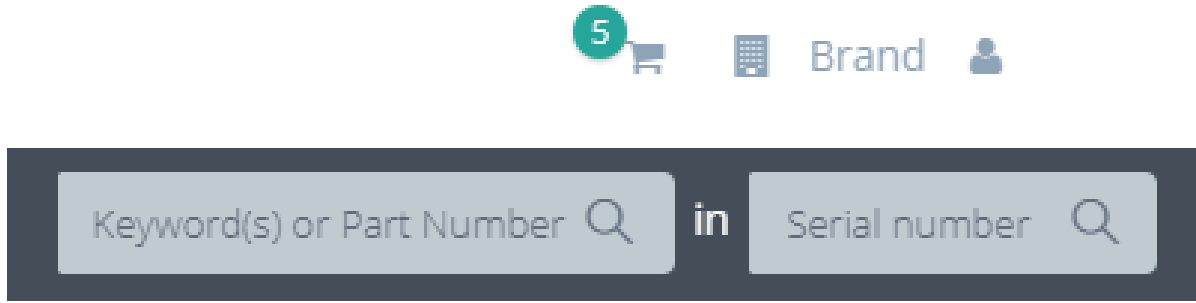


Figure 3.

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.

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).

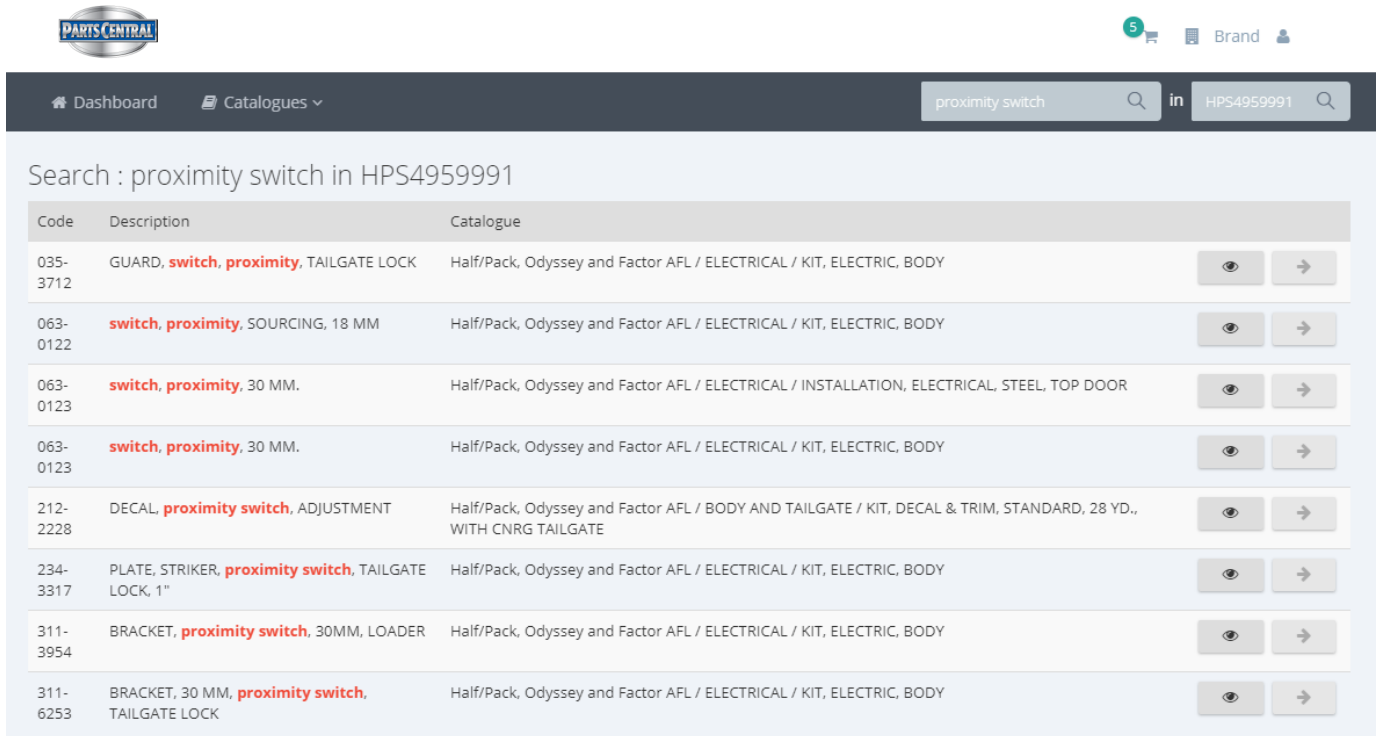


Figure 4.

GENERAL INFORMATION

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.

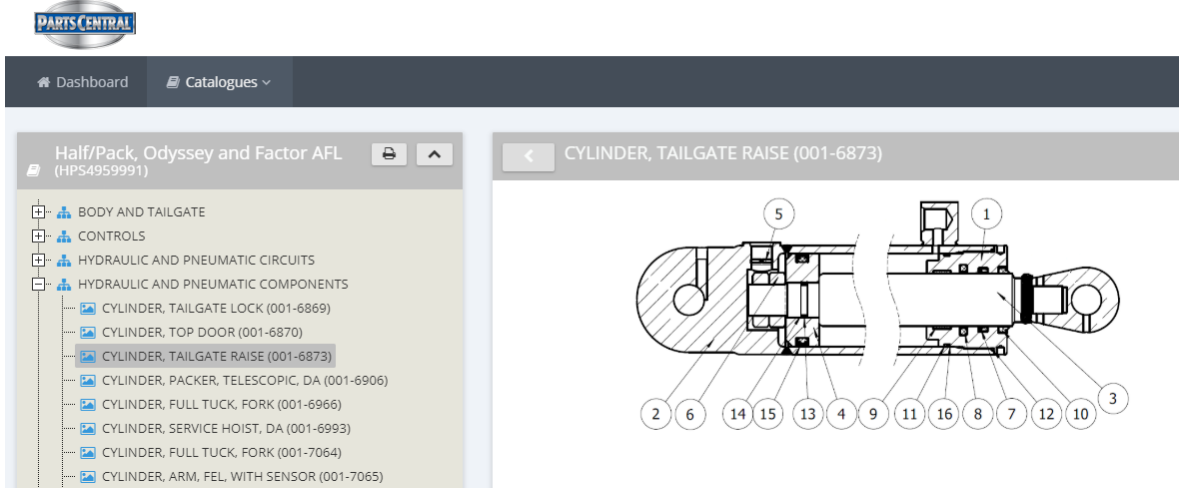


Figure 5.

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.

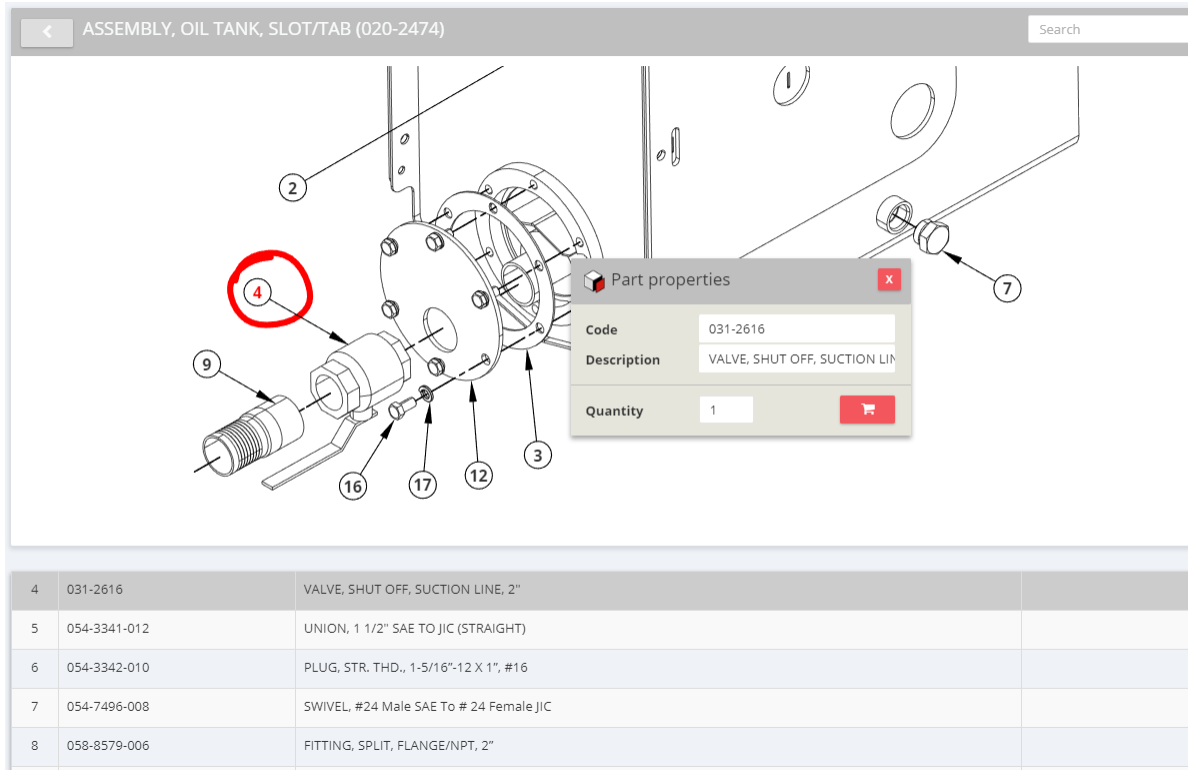


Figure 6.

GENERAL INFORMATION

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 SERIOUS INJURY or DEATH if you do not follow proper instructions.
- **WARNING** – indicates a hazardous situation, which if not avoided COULD result in SERIOUS INJURY or DEATH 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 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 or 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 and the Service Manual for this unit, other applicable manufacturer's manuals and the safety decals on the product.

WARNING

Never weld on a compressed natural gas vehicle unless the compressed natural gas fuel system has been purged with inert gas. SERIOUS INJURY or DEATH can occur.

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 will result in SERIOUS INJURY or DEATH 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 will cause SERIOUS INJURY or DEATH to you, bystanders, or equipment.

DANGER

Always prop the tailgate when you leave it raised for maintenance, service or cleaning procedures. Always utilize the tailgate props according to specifications when propping the tailgate (see "**Tailgate Support Props**" on page 65). Never place any part of your body between the unit and the tailgate while propping or stowing the tailgate props. This area is extremely dangerous. SERIOUS INJURY or DEATH will 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 will 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. A safety spotter is recommended to make sure that no one enters the tailgate area while the tailgate is being closed.

GENERAL INFORMATION

DANGER

The packer and crusher panels are dangerous. They will cause **SERIOUS INJURY** or **DEATH** 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 **“Lock-Out/Tag-Out Procedure”** on page 12 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. Failure to do so will result in **SERIOUS INJURY** or **DEATH**.

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** will 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 will fail and cause **SERIOUS INJURY** or **DEATH** 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** will 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. **SERIOUS INJURY** or **DEATH** will 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 Procedure”** on page 12 when you do **ANY** 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. When the unit is not in the Lock-Out/Tag-Out, 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**.

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.

GENERAL INFORMATION

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. SERIOUS INJURY or DEATH 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 SERIOUS INJURY or DEATH.

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. Failure to do so can result in SERIOUS INJURY or DEATH.

WARNING

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

WARNING

Improper ejecting of the refuse can cause the unit to tip or rollover. SERIOUS INJURY or DEATH can occur if the unit rolls or tips over.

WARNING

Isopropyl alcohol is flammable and is harmful to eyes and skin. SERIOUS INJURY or DEATH can occur. Keep isopropyl alcohol away from heat or open sources of ignition. Refer to OSHA standards and 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 SERIOUS INJURY or DEATH. 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. SERIOUS INJURY or DEATH can occur. Use enough pressure with the grabber to raise the container with the lift arm and not damage the container.

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 applicable to the unit 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.

GENERAL INFORMATION

Lock-Out/Tag-Out Procedure

⚠ DANGER

This procedure **MUST** be followed before entering the unit's body or performing any maintenance, repair, or cleaning procedures on the unit.

⚠ WARNING

If you do not have functioning Lock-Out/Tag-Out equipment and/or are not an authorized employee, **STOP** and **DO NOT** initiate any service on the unit. Contact your supervisor immediately.

NOTICE

This Lock-Out/Tag-Out procedure represents Heil's minimum recommendation and should be used in conjunction with, and should not supersede additional or more stringent safety requirements specified by your company's policy. Please check with your supervisor to determine if your company has a specific Lock-Out/Tag-Out procedure. Contact your supervisor, Heil Technical Service, or reference OSHA Regulation 1910.147 if you have any questions about Lock-Out/Tag-Out.

Watch the Lock-Out/Tag-Out service shack video online at **Heil Service Shack**.

A. Put the unit in a Lock-Out/Tag-Out:

1. **BEFORE** you enter the unit's body
2. **BEFORE** you perform ANY maintenance, repair or cleaning procedures on the unit.



B. All stored energy must be removed and/or protected against, common sources found on Heil units (Including, but not limited to):

1. Hydraulics
2. Electrical
3. Gravity
4. Pneumatics
5. Mechanical

C. Examples of some basic equipment required:

1. Multi-hasp
2. Single-keyed red lock
3. Lockout tag



Figure 7.

GENERAL INFORMATION

Follow These Steps:

1. APPLY the brakes. MAKE SURE the brakes prevent the unit from moving and are functioning properly.
2. Chock all wheels.
3. SET the tailgate props when the tailgate is raised for any service, maintenance or cleaning.
4. SET the body props when the body is raised for any service, maintenance or cleaning.
5. BEFORE disconnecting main battery power, VERIFY all the following stored energy sources are depleted according to your company policy:
 - a. Hydraulic (Such as forks or grabber arm in stowed position)
 - b. Pneumatic (Such as tag axles).
 - c. Mechanical (Such as springs)
 - d. Gravity (Such as tailgate raised)
6. REMOVE the key from the ignition and store it in your pocket, or another secured location for your safety.
7. Disconnect the battery power by flipping the battery box disconnect switch to OFF.
 - a. VERIFY all electrical stored energy is depleted according to your company procedure.
8. INSERT the multi-hasp into the disconnect switch.
9. ATTACH your red single-keyed Lock-Out/Tag-Out lock with your tag exposed and visible to the multi-hasp.
 - a. ALWAYS use individually assigned locks and tags when performing ANY service or maintenance with other authorized employees. Each employee MUST place their personally assigned tag and lock to the multi-hasp connected to the disconnect switch.
10. REMOVE your lock key and put it in your pocket for your safety.
 - a. ONLY the person who placed the lock and tag on the multi-hasp is authorized to remove it.
 - b. NEVER remove another employee's Lock-Out/Tag-Out equipment without approval from the authorized person responsible.
 - c. Shift or personnel changes: Off-going employees MUST provide all details pertaining to the unit's status to the oncoming employee(s). The oncoming employee(s) MUST perform the Lock-Out/Tag-Out procedure to verify all stored energy is removed from the unit BEFORE applying their Lock-Out/Tag-Out equipment.
11. BEFORE removing your Lock-Out/Tag-Out equipment to return the unit to service, follow these steps:
 - a. INSPECT the work area to ensure all nonessential items have been removed.
 - b. VERIFY all unit components are operationally intact.
 - c. ENSURE all employees are safely positioned or removed from the area.
 - d. NOTIFY all affected employees that the Lock-Out/Tag-Out devices are being removed.

GENERAL INFORMATION

Storing Refuse In The Body

DO NOT store refuse in the body. The different types of debris and corrosive elements usually collected can cause severe corrosion inside the body, decreasing the life of your body and impact unloading. Additionally, 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 to apply **grade NLG1000 grease or equivalent**. 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 shown on the lubrication decal on the unit and in the **“Body Lubrication Guide” on page 72**.

Oil Lubricant Recommendation

Use only engine oil to lubricate all movable 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 components in a hydraulic system. It transmits power, provides lubrication, cooling function and has the following features:

- High viscosity index and 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 / filter ability
- 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 detailed information. 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. System performance/oil service life may be compromised.

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

GENERAL INFORMATION

Standard Torque Data For Nuts & Bolts

The following recommended torque data is a general guideline. Recommended torque, in foot pounds, for all Standard Application nuts and bolts provided in the following table.

NOTICE

Torque specifications on a drawing override torque values in the Standard Torque Data for Nuts and Bolts Table.

- All thread surfaces are clean and lubricated with SAE-30 engine oil. See notice above.
- Joints are rigid, that is no gaskets or compressible materials are used.
- When re-using nuts or bolts use minimum torque values.

STANDARD TORQUE DATA FOR NUTS AND BOLTS TABLE							
Bolt Size (D)	Nut Type (STD/ Lock)	Thread Turns per Inch (p)	Grade	Heil Plain Dry Condition Torque Value (ft-lbs)	Heil Zinc Plated Fastener Torque Value (ft-lbs)	Heil Lubricated Fastener Torque Value (ft-lbs)	Heil Deformed Lock Nut Torque Value (ft-lbs)
1/4 0.25	STD	20	5	9	8	6	
			8	13	12	8	
		28	5	10	9	7	
			8	15	13	10	
	Lock	20	5				6
			8				8
		28	5				7
			8				10
5/16 .3125	STD	18	5	19	17	12	
			8	27	24	17	
		24	5	21	19	14	
			8	29	27	19	
	Lock	18	5				12
			8				17
		24	5				14
			8				19
3/8 .375	STD	16	5	33	30	22	
			8	47	42	31	
		24	5	38	34	25	
			8	54	48	35	
	Lock	16	5				22
			8				31
		24	5				25
			8				35

GENERAL INFORMATION

STANDARD TORQUE DATA FOR NUTS AND BOLTS TABLE							
Bolt Size (D)	Nut Type (STD/ Lock)	Thread Turns per Inch (p)	Grade	Heil Plain Dry Condition Torque Value (ft-lbs)	Heil Zinc Plated Fastener Torque Value (ft-lbs)	Heil Lubricated Fastener Torque Value (ft-lbs)	Heil Deformed Lock Nut Torque Value (ft-lbs)
7/16 .4375	STD	14	5	53	48	35	
			8	76	68	49	
		20	5	60	54	39	
			8	84	76	55	
	Lock	14	5				35
			8				49
		20	5				39
			8				55
1/2 .500	STD	13	5	82	73	53	
			8	115	104	75	
		20	5	92	83	60	
			8	130	117	84	
	Lock	13	5				53
			8				75
		20	5				60
			8				84
9/16 .5625	STD	12	5	118	106	77	
			8	166	150	108	
		18	5	131	118	85	
			8	186	167	121	
	Lock	12	5				77
			8				108
		18	5				85
			8				121

GENERAL INFORMATION

STANDARD TORQUE DATA FOR NUTS AND BOLTS TABLE							
Bolt Size (D)	Nut Type (STD/ Lock)	Thread Turns per Inch (p)	Grade	Heil Plain Dry Condition Torque Value (ft-lbs)	Heil Zinc Plated Fastener Torque Value (ft-lbs)	Heil Lubricated Fastener Torque Value (ft-lbs)	Heil Deformed Lock Nut Torque Value (ft-lbs)
5/8 .625	STD	11	5	162	146	106	
			8	230	207	149	
		18	5	184	166	120	
			8	260	234	169	
	Lock	11	5				106
			8				149
		18	5				120
			8				169
3/4 0.750	STD	10	5	288	260	188	
			8	408	367	265	
		16	5	322	290	209	
			8	455	409	295	
	Lock	10	5				188
			8				265
		16	5				209
			8				295
7/8 0.8750	STD	9	5	465	418	302	
			8	657	591	427	
		14	5	513	461	333	
			8	724	652	471	
	Lock	9	5				302
			8				427
		14	5				333
			8				471

GENERAL INFORMATION

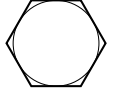
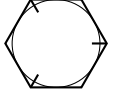
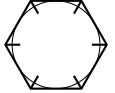
STANDARD TORQUE DATA FOR NUTS AND BOLTS TABLE							
Bolt Size (D)	Nut Type (STD/ Lock)	Thread Turns per Inch (p)	Grade	Heil Plain Dry Condition Torque Value (ft-lbs)	Heil Zinc Plated Fastener Torque Value (ft-lbs)	Heil Lubricated Fastener Torque Value (ft-lbs)	Heil Deformed Lock Nut Torque Value (ft-lbs)
1 1.0000	STD	8	5	697	627	453	
			8	984	886	640	
		14	5	782	704	508	
			8	1105	994	718	
	Lock	8	5				453
			8				640
		14	5				508
			8				718
1-1/8 1.1250	STD	7	5	869	782	565	
			8	1395	1256	907	
		12	5	975	877	634	
			8	1564	1408	1017	
	Lock	7	5				565
			8				907
		12	5				634
			8				1017
1-1/4 1.2500	STD	7	5	1227	1104	797	
			8	1969	1772	1280	
		12	5	1358	1222	883	
			8	2179	1961	1417	
	Lock	7	5				797
			8				1280
		12	5				883
			8				1417

GENERAL INFORMATION

STANDARD TORQUE DATA FOR NUTS AND BOLTS TABLE							
Bolt Size (D)	Nut Type (STD/ Lock)	Thread Turns per Inch (p)	Grade	Heil Plain Dry Condition Torque Value (ft-lbs)	Heil Zinc Plated Fastener Torque Value (ft-lbs)	Heil Lubricated Fastener Torque Value (ft-lbs)	Heil Deformed Lock Nut Torque Value (ft-lbs)
1-3/8 1.3750	STD	6	5	1608	1447	1045	
			8	2580	2322	1677	
		12	5	1830	1647	1190	
			8	2938	2644	1909	
	Lock	6	5				1045
			8				1677
		12	5				1190
			8				1909
1-1/2 1.5000	STD	6	5	2134	1921	1387	
			8	3425	3083	2226	
		12	5	2401	2161	1561	
			8	3854	3468	2505	
	Lock	6	5				1387
			8				2226
		12	5				1561
			8				2505

GENERAL INFORMATION

Bolt Type Identification Chart

IH Type	S.A.E. Grade	Description	Bolt Head Marking**
1	1 or 2	No radial lines. Low or medium carbon steel not heat treated. NOT USED, replace with same grade bolt.	
5	5	Three radial lines. Quenched and tempered medium carbon steel.	
8	8	Six radial lines. Quenched and tempered special carbon or alloy steel	

Torque For Hydraulic Tubes & Fittings

37 DEGREE FLARE (JIC) FITTINGS		
	SET WRENCH TO (DRY TORQUE CAN VARY +/- 10%)	
NOMINAL TUBE OD	TORQUE WRENCH SETTING	ALTERNATE TORQUE UNITS
1/8"	6.5 ft-lbs.	80 in-lbs.
3/16"	9 ft-lbs.	110 in-lbs.
1/4"	12.5 ft-lbs.	150 in-lbs.
5/16"	16.5 ft-lbs.	200 in-lbs.
3/8"	21 ft-lbs.	250 in-lbs.
1/2"	41 ft-lbs.	490 in-lbs.
5/8"	64 ft-lbs.	770 in-lbs.
3/4"	89 ft-lbs.	1070 in-lbs.
7/8"	105 ft-lbs.	1260 in-lbs.
1"	130 ft-lbs.	1560 in-lbs.
1-1/4"	142.5 ft-lbs.	1710 in-lbs.
1-1/2"	178.5 ft-lbs.	2140 in-lbs.
2"	250 ft-lbs.	3000 in-lbs.

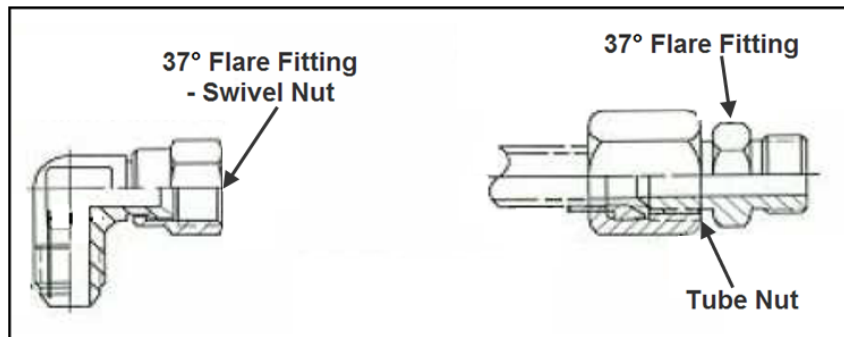


Figure 8.

GENERAL INFORMATION

FROM SAE J2593 TABLE 7		
BOSS (ORB)	(STEEL) SET WRENCH TO (DRY TORQUE +0%, -25%)	
NOMINAL TUBE OD	TORQUE WRENCH SETTING	ALTERNATE TORQUE UNITS
3/16"	9 ft-lbs.	110 in-lbs.
1/4"	16.5 ft-lbs.	200 in-lbs.
5/16"	21 ft-lbs.	250 in-lbs.
3/8"	29 ft-lbs.	350 in-lbs.
1/2"	64 ft-lbs.	770 in-lbs.
5/8"	89 ft-lbs.	1070 in-lbs.
3/4"	130 ft-lbs.	1560 in-lbs.
7/8"	178.5 ft-lbs.	2140 in-lbs.
1"	224 ft-lbs.	2690 in-lbs.
1-1/4"	250 ft-lbs.	3000 in-lbs.
1-1/2"	300 ft-lbs.	3600 in-lbs.

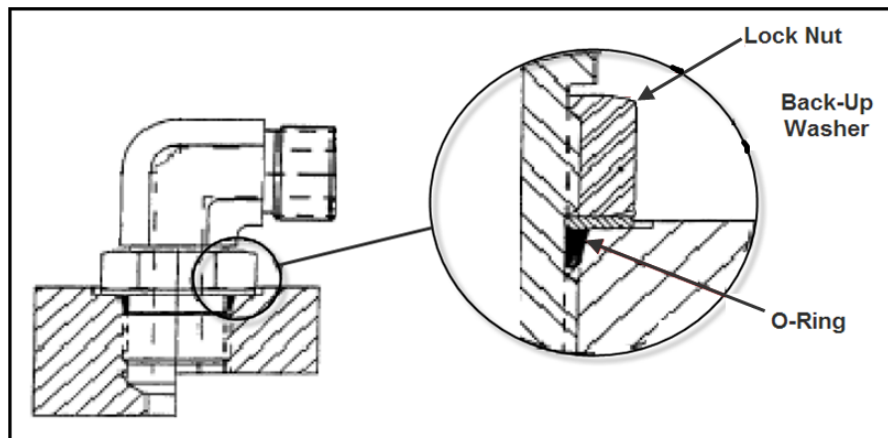


Figure 9.

GENERAL INFORMATION

SPLIT- FLANGE (HALF CLAMP) CONNECTORS (CODE 61)			
		SET WRENCH TO *DRY TORQUE*	
NOMINAL TUBE OD	BOLT SIZE	BOLT TORQUE [FT-LBS] *+/-4 FT-LBS	BOLT TORQUE [IN-LBS] *+/-50 IN-LBS
1/2"	5/16-18 x 1.25	17 ft-lbs.	200 in-lbs.
3/4"	3/8-16 x 1.25	25 ft-lbs.	300 in-lbs.
1"	3/8-16 x 1.25	32 ft-lbs.	380 in-lbs.
1-1/4"	7/16-14 x 1.50	41 ft-lbs.	490 in-lbs.
1-1/2"	1/2-13 x 1.50	53 ft-lbs.	640 in-lbs.
2"	1/2-13 x 1.50	61 ft-lbs.	730 in-lbs.
2-1/2"	1/2-13 x 1.75	86 ft-lbs.	1030 in-lbs.
3"	5/8-11 x 1.75	144 ft-lbs.	1730 in-lbs.
3-1/2"	5/8-11 x 2.00	125 ft-lbs.	1500 in-lbs.
4"	5/8-11 x 2.00	125 ft-lbs.	1500 in-lbs.
5"	5/8-11 x 2.25	125 ft-lbs.	1500 in-lbs.

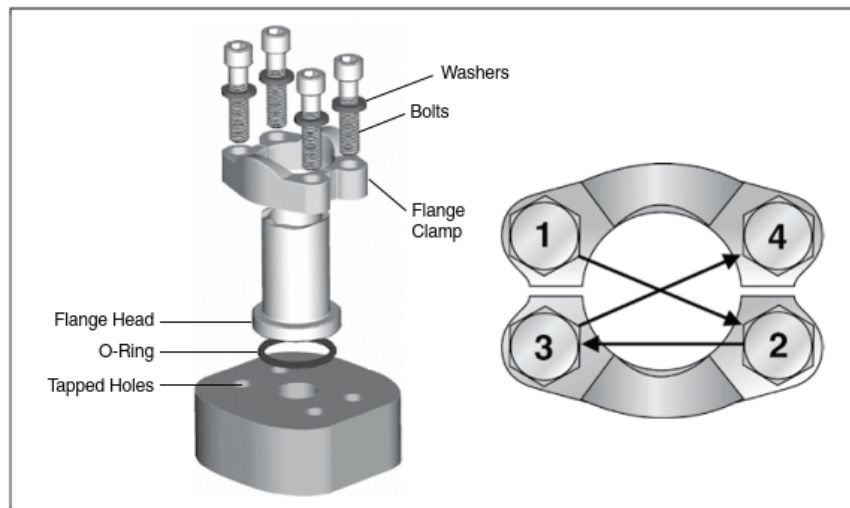


Figure 10.

GENERAL INFORMATION

Hydraulic Oil Warm-Up Procedure

It is necessary to warm up the unit's hydraulic oil before you start your daily route operation or to check the oil level. Make sure the hydraulic oil has reached normal operating temperature or a minimum of 100°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 functions through ten (10) cycles while the engine idles. See the Operator's Manual applicable to this unit for operation instructions.
6. Make sure the hydraulic oil has reached normal operating temperature or a minimum of 100°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 street side 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.

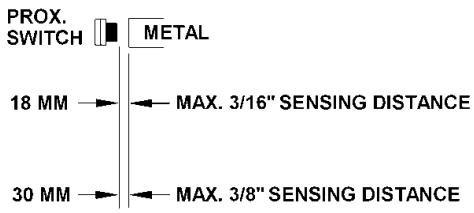
GENERAL INFORMATION

Side Access Door 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

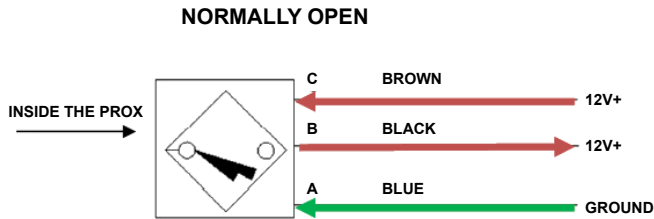
Heil proximity switches have a Light Emitting Diode (LED) on the switch to indicate when the switch is sensing metal. Green indicates the switch is ON. Yellow indicates the switch senses metal. Some proximity switches only have the yellow light. The proximity switch can sometimes fail, and the LED indicator will remain operable. It is recommended to use the In-Cab display input screen to verify that the proximity switch is sending the proper on/off signal to the controller.

Proximity Switch Troubleshooting Table	
Probable Cause	Remedy
Loose or corroded electrical connections.	Replace the electrical connections.
Damaged Switch Cracked Ferrite core causing the fine internal wire to break. 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.	Make sure the power source from the chassis manufacturer is clean. 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.	Check the in-line fuses. The in-line fuses are located in the cab. Unplug proximity switch. Check the power wire (terminal C) for +12 VDC with a multi-meter. Check ground signal with multi-meter for continuity to chassis ground. Check the signal wire for continuity to appropriate controller input terminal. If all three (3) wires are good, replace the proximity switch.

GENERAL INFORMATION

WIRING DIAGRAM

3-WIRE DC, PNP (SOURCING)



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.

DIMENSIONS

ALL DIMENSIONS IN MM UNLESS OTHERWISE SPECIFIED
DRAWING NOT TO SCALE

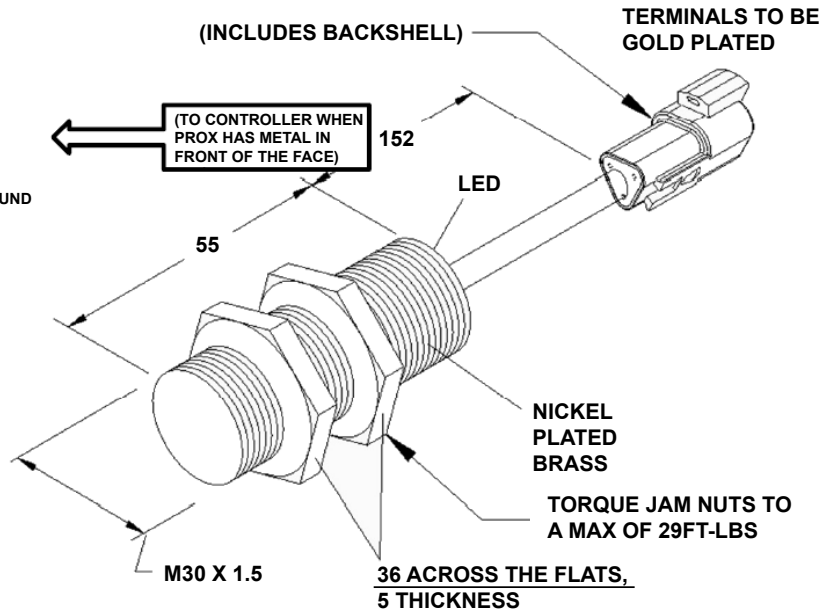


Figure 11.

Decals On The Unit

Make sure you can read all hazard and instruction decals. Clean decals if you cannot read the words.

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

When you replace a part that has a decal, make sure a new decal is installed on the new part. See the applicable Operation Manual for a complete decal kit and individual decals. Order the decal kit and 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 Guidelines

Following these guidelines 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

GENERAL INFORMATION

- 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: ≤ 800 PSI.
- 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.

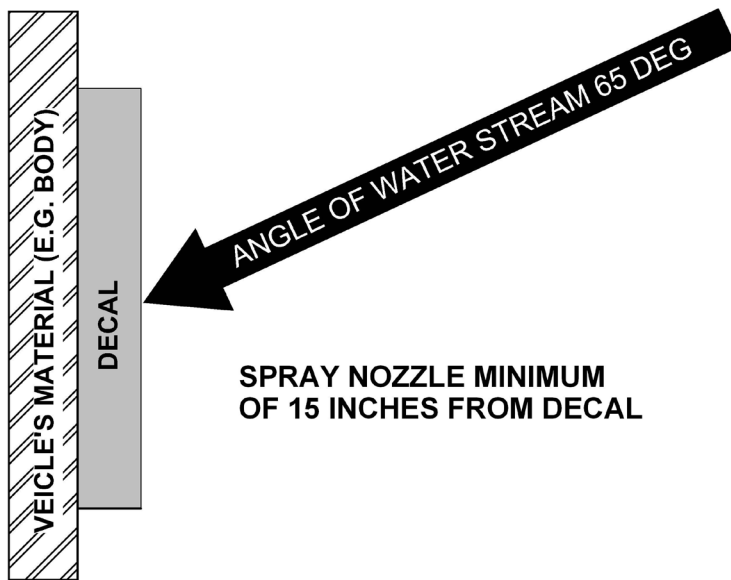


Figure 12. Recommended Technique

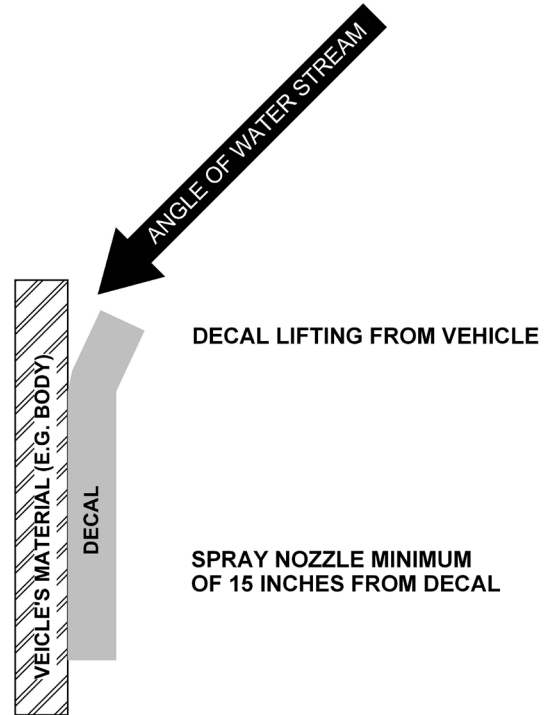
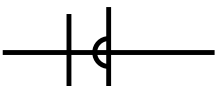
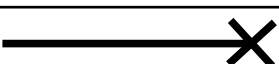
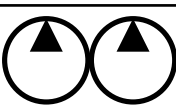
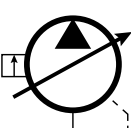
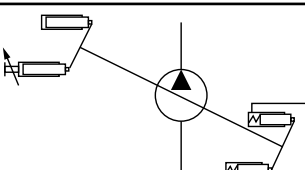
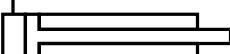


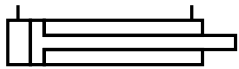
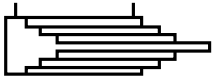
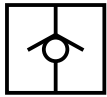
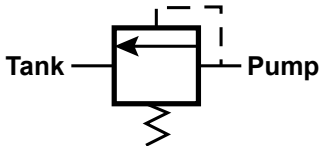
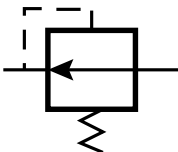
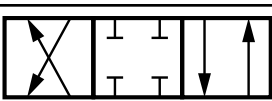
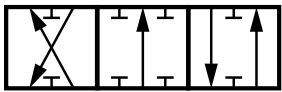
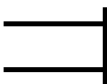
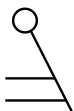
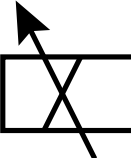
Figure 13. Incorrect Technique

GENERAL INFORMATION

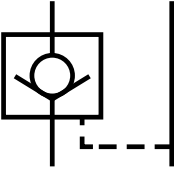
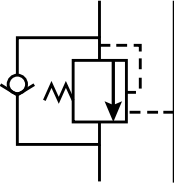
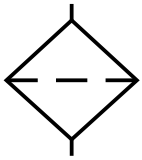
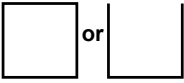
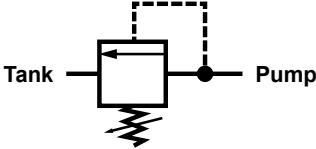
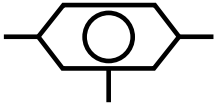
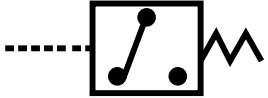
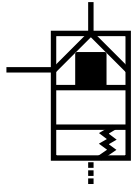
Hydraulic Symbols

	Fluid Lines
	Pilot Lines
	Component Enclosure
	Connection Of Lines
	No Connection Of Lines
	Plugged Port
	Indicates Direction Of Flow
	Fixed Displacement, Unidirectional Pump
	Fixed Displacement, Bi-directional Pump
	Fixed Displacement, Tandem Pump
	Variable Displacement Pump
	Variable Displacement, Pressure Compensated Pump
	Variable Displacement, Pressure Compensated Piston Pump
	Fixed Displacement, Unidirectional Motor
	Fixed Displacement, Bi-directional Motor
	Variable Displacement, Bi-directional Motor
	Single Acting Rod Cylinder

GENERAL INFORMATION

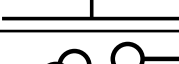
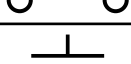
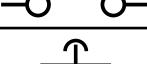
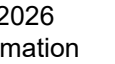
	Double Acting Rod Cylinder
	Single Acting Telescopic Cylinder
	Double Acting Telescopic Cylinder
	Check Valve
	Pilot Operated Relief Valve
	Pressure Reducing Valve
	Three Position, Four Way Closed Center Valve Spool
	Three Position, Four Way Open Center Valve Spool
	Spring Actuator
	Manual Actuator
	Manual Handle Actuator
	Hydraulic Actuator
	Pneumatic Actuator
	Electric Solenoid Actuator
	Electro Proportional Actuator

GENERAL INFORMATION

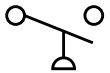
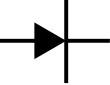
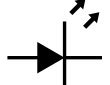
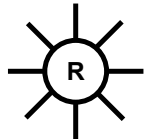
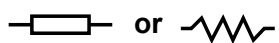
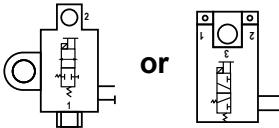
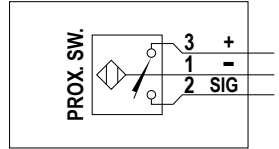
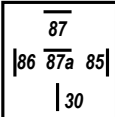
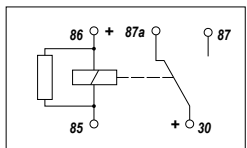
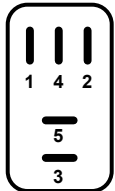
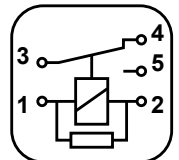
	Pilot Operated Check Valve
	Counterbalance Valve
	Filter, Strainer, Screen
	Reservoir
	Pressure Gauge
	Adjustable Relief Valve
	Orifice (Flow Restrictor)
	Adjustable Orifice (Flow Restrictor)
	Shuttle Valve
	Pressure Switch
	Shut Off Valve
	Logic Valve

GENERAL INFORMATION

Electrical Symbols

	Alternating Current
	Direct Current
	Ammeter (Amp Meter)
	Volt Meter - Measures Voltage
	Watt Meter - Measures Electric Power
	Ohm Meter
	Wire
	Connected Wires
	Unconnected Wires
	Fuse
	Breaker
	Chassis Ground Or Ground
	Battery
	On/Off Switch
	Push to make switch/sometimes momentary
	Momentary Push Button
	Push To Break Switch
	Normally Open Limit Switch
	Normally Closed Limit Switch

GENERAL INFORMATION

	Pressure Switch
	Diode
	LED - Diode
	Lamp
	Indicator Light
	Resistor
	Solenoid Operated 3 Way pneumatic valve/MAC Valv
	Proximity Switch
	Relay Socket (General)
	Relay (General)
	Micro Relay Socket
	Micro Relay

SECTION 2

PUMP

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°F, maximum 176°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.

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 be taken and tested for contamination kind, size, and level with the results being documented.

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.

PUMP

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

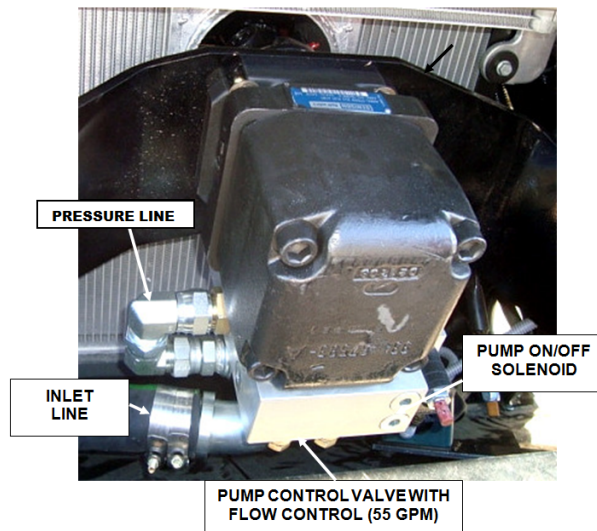


Figure 14.

PUMP

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 Controller.

Troubleshooting Pump 219-2303-003 With 031-6427 Manifold

The pump control valve is designed to easily allow 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 controller programming 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.

Does the system work now?

- If so replace the coil
- If not proceed to step 3.

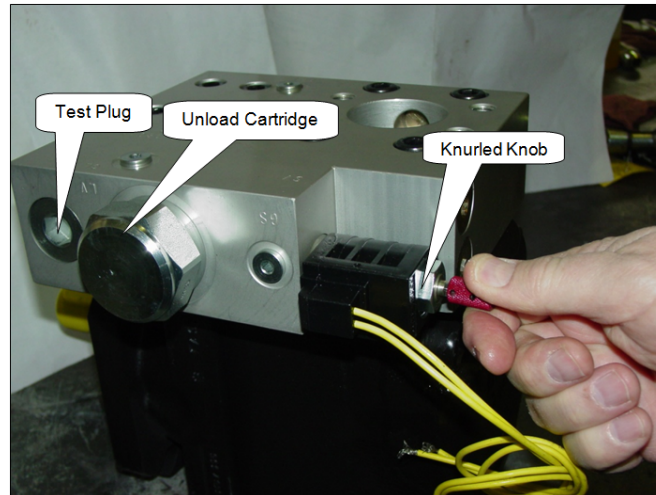


Figure 15.

3. Remove the unloading cartridge. Temporarily set aside in a clean location.

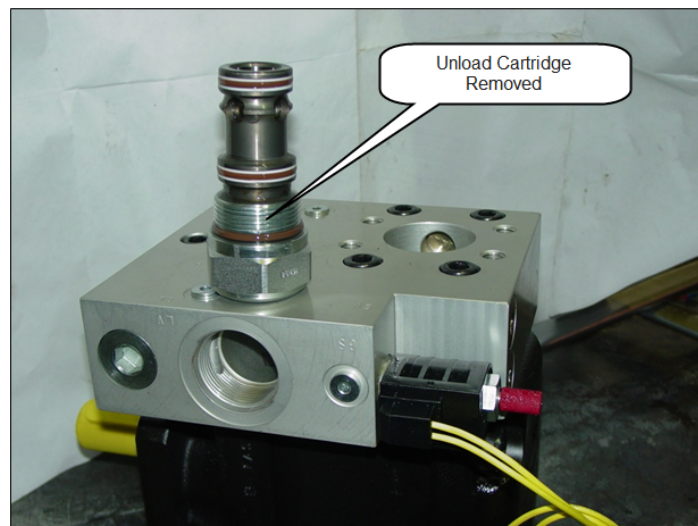
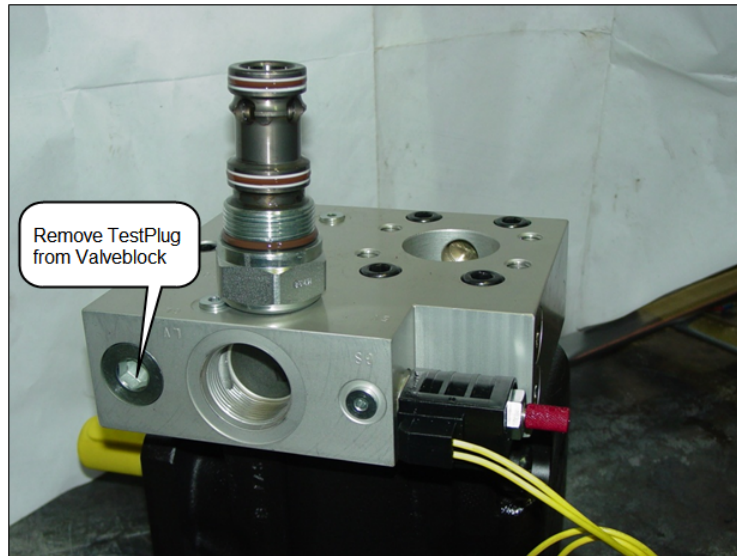


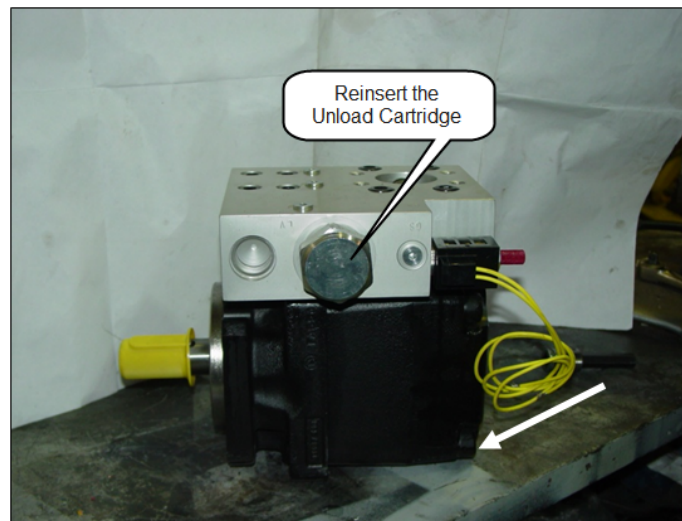
Figure 16.

PUMP

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

**Figure 17.**

6. Reinsert the unload cartridge.

**Figure 18.**

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.

NOTICE

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

PUMP

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. 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.

NOTICE

Before making adjustments, Lock-Out/Tag-Out the unit using your company's policy. If one is not available, at a minimum follow the **"Lock-Out/Tag-Out Procedure"** on page 12 provided in this service manual.

1. Test the cartridge for damage by flow testing the pump before disassembling.

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.

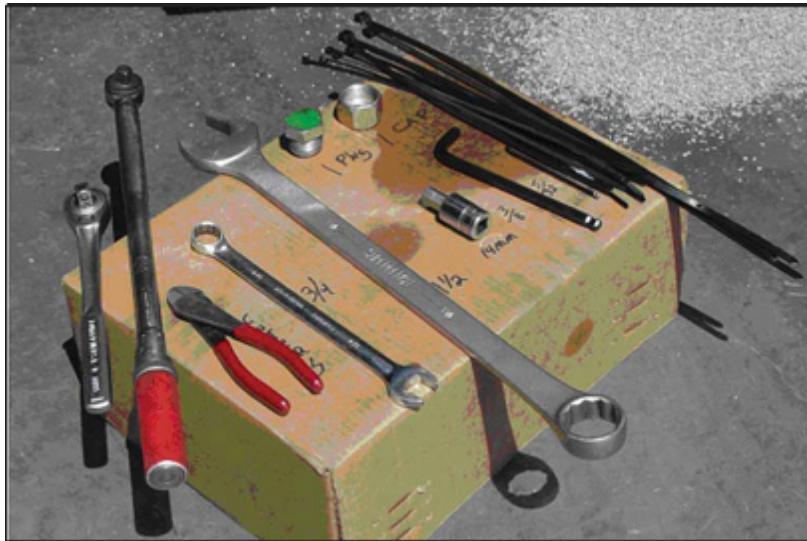


Figure 19. Tools Required

PUMP

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



Figure 20.

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



Figure 21.

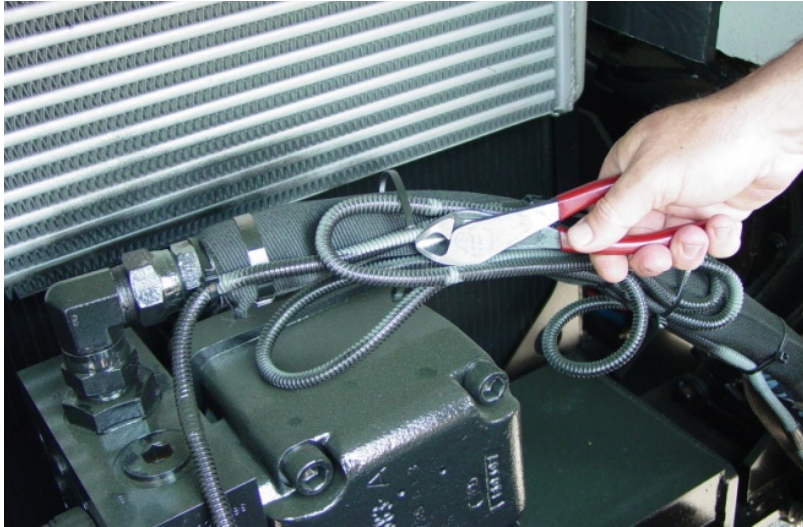
4. Remove the grill from the chassis. The number of bolts for the grill varies with chassis brand.



Figure 22.

PUMP

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

**Figure 23.**

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

**Figure 24.**

7. Remove the one-inch hydraulic pressure hose.

**Figure 25.**

PUMP

8. Remove the four suction line flange bolts.

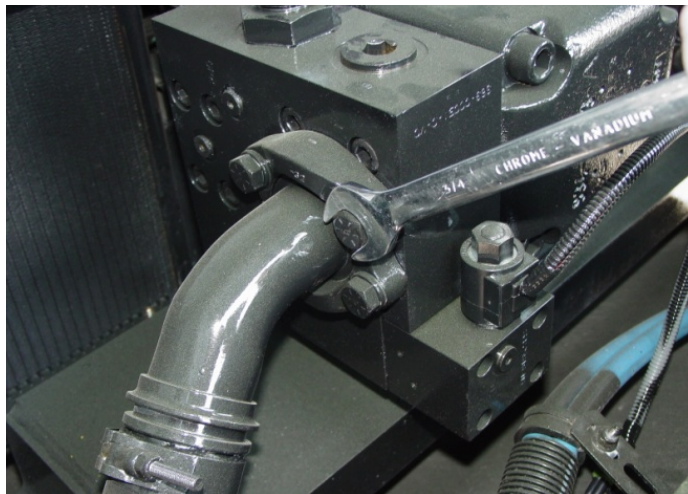


Figure 26.

9. Remove the eight bolts connecting the manifold to the pump. There are four small bolts and four large bolts.

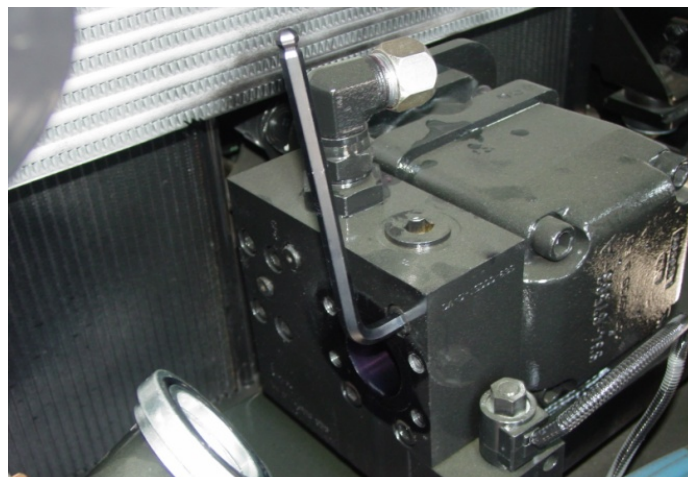


Figure 27.

10. Carefully, remove the manifold from the pump.



Figure 28.

PUMP

11. Remove the four pump housing connection bolts.



Figure 29.

12. Carefully remove the pump case housing.



Figure 30.

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



Figure 31.

PUMP

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

- Sheared or worn shaft splines
- Broken bearing



Figure 33.

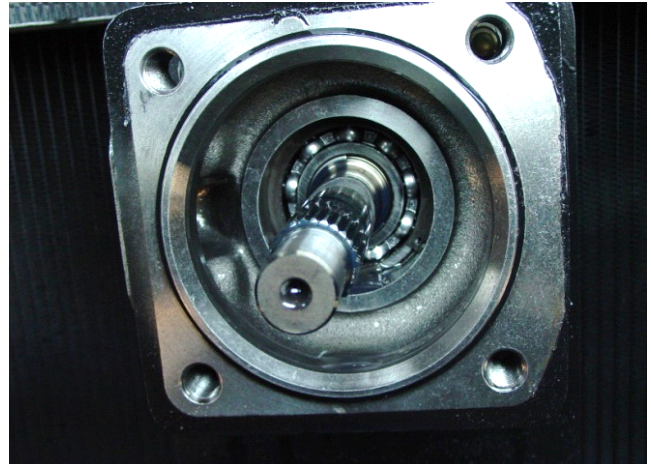


Figure 32.

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



Figure 34.

16. Check the outer housing O-ring for wear or damage such as nicks, fraying, or cuts.

- a. Replace the o-ring if it is damaged.



Figure 35.

PUMP

17. Reinstall the pump cartridge back on the pump shaft.



Figure 36.

18. Install the outer pump housing and finger-tighten the four pump housing bolts.



Figure 37.

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



Figure 38.

PUMP

20. Install the new pump manifold using the new bolts included with the new valve.



Figure 39.

21. Tighten the eight pump manifold bolts as follows:

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

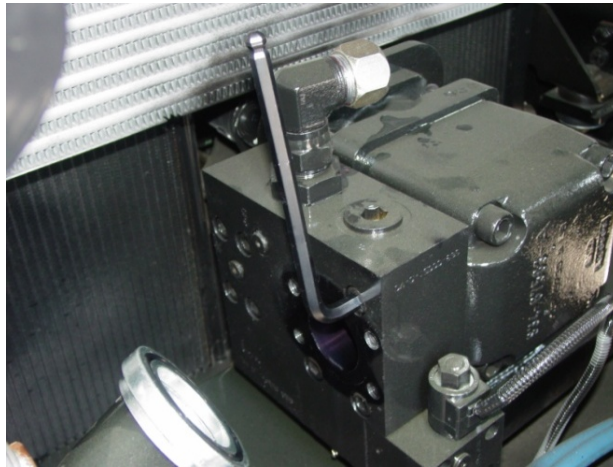


Figure 40.

22. Install the suction line flange to the pump manifold and tighten the four bolts on the flange.

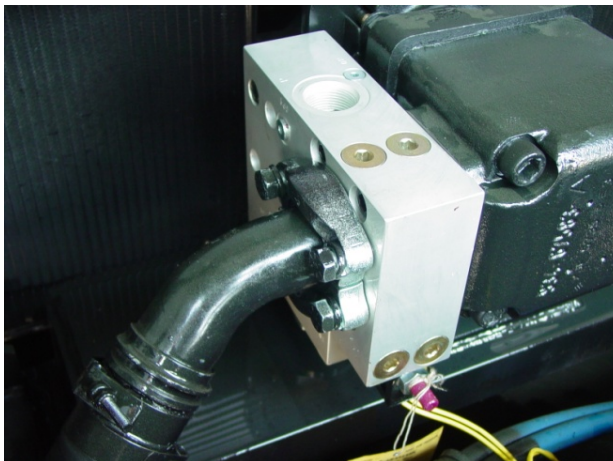


Figure 41.

PUMP

23. Install one straight connector, 054-3341-10, to the P Port on the manifold.

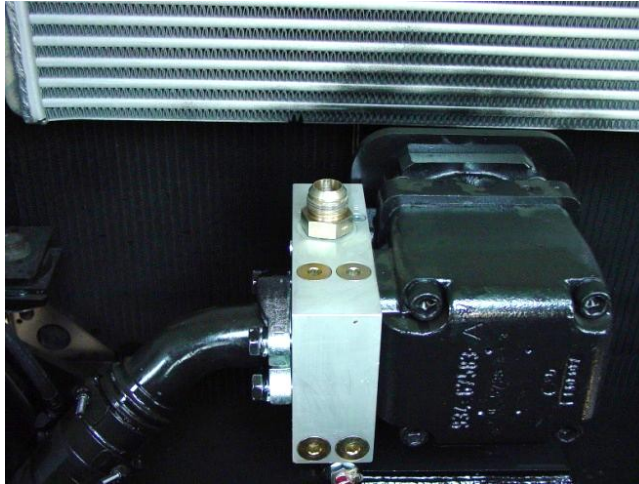


Figure 42.

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

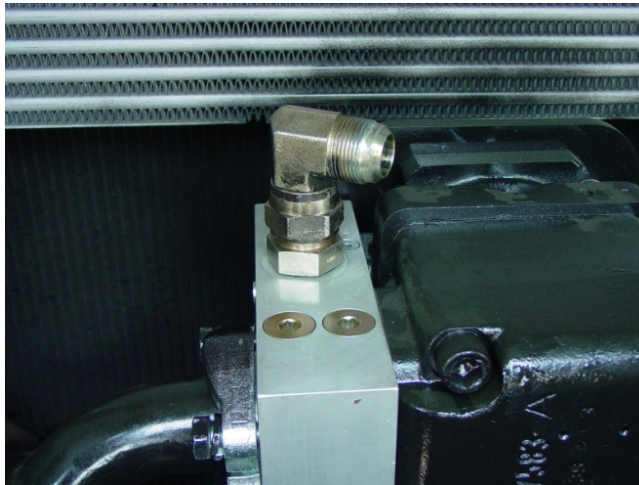


Figure 43.

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

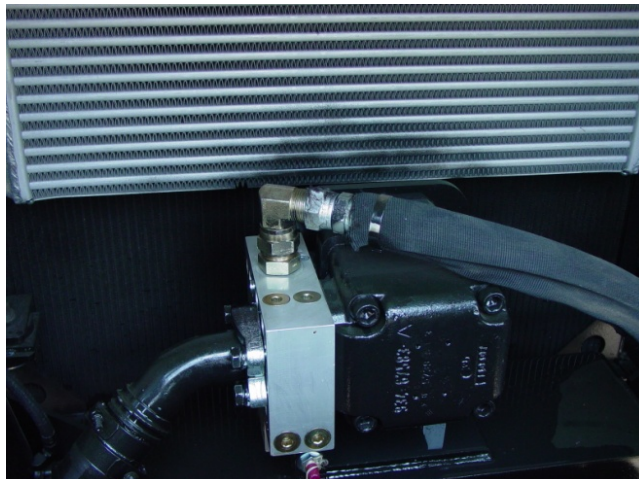


Figure 44.

PUMP

26. Install the following two-way Deutsch connector to the two wires coming from the solenoid on the new manifold:

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

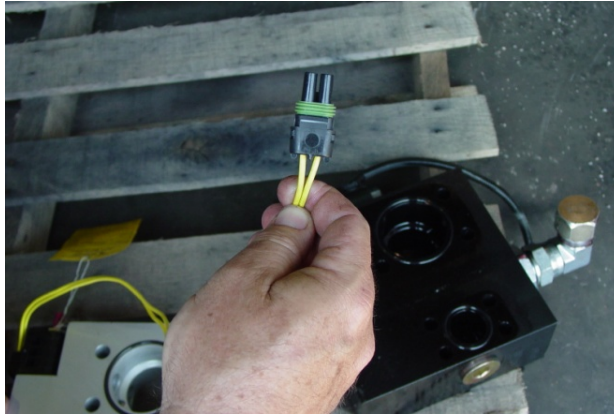


Figure 45.

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



Figure 46.

28. Attach the grill to the chassis.

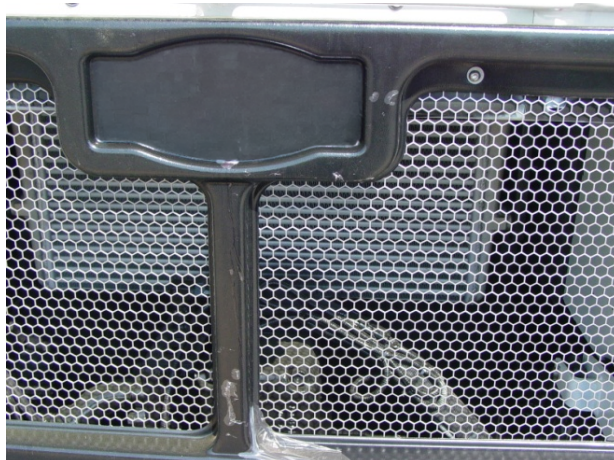


Figure 47.

PUMP

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



Figure 49.



Figure 48.

Tandem O.I.G.A.I. Pump

Tandem Pump Design

Note: This design is still available, however it is not frequently installed.

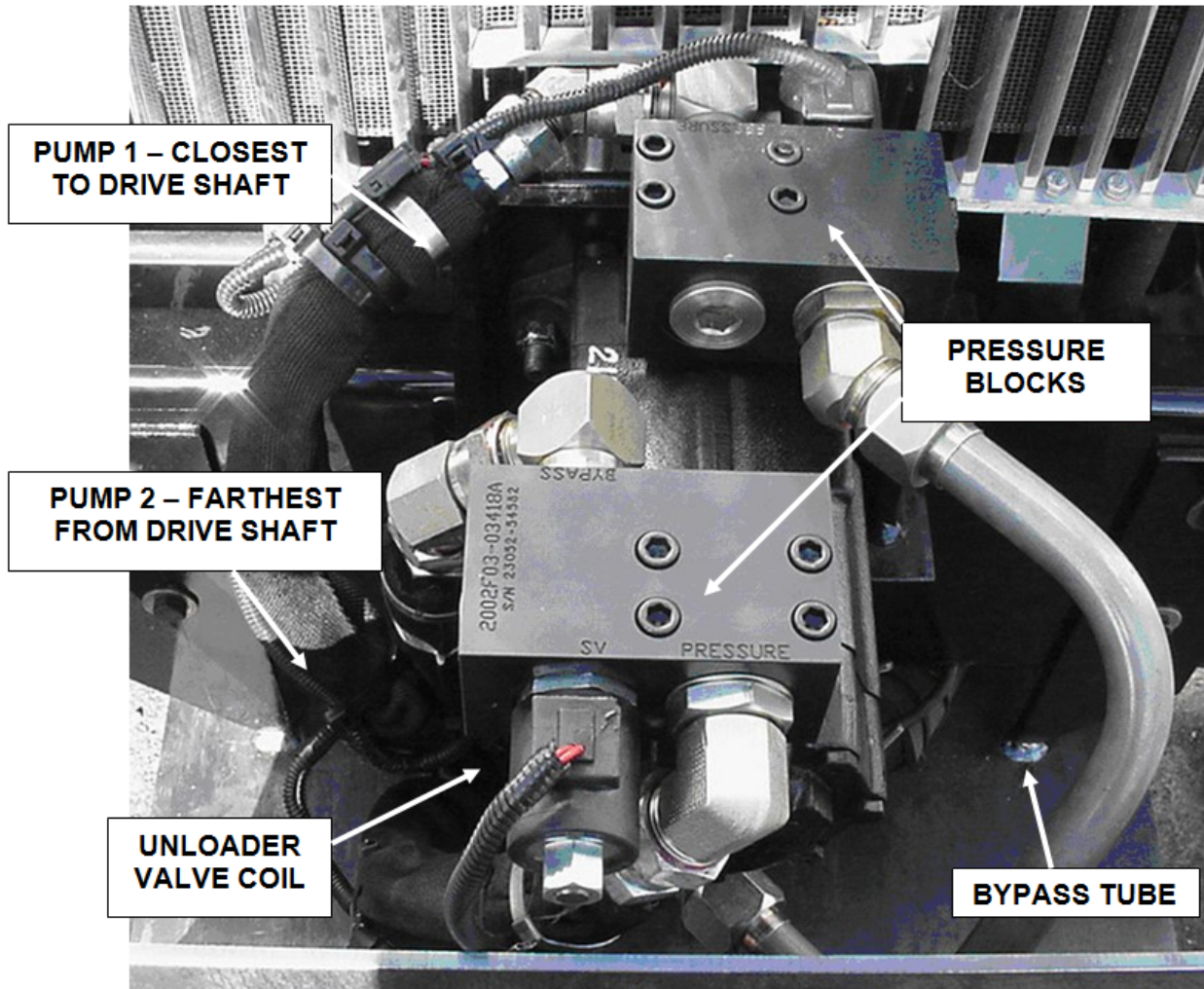


Figure 50.

PUMP

In this application, the flow from Pump 1 (the section closest to the shaft) and Pump 2 (the section furthest from the shaft) is combined using in-line check valves. Pump 2 will cut off when the pressure reaches a predetermined set point and/or when the RPM reaches the preset speed.

Note: The option will vary based on the vendor pump logic.

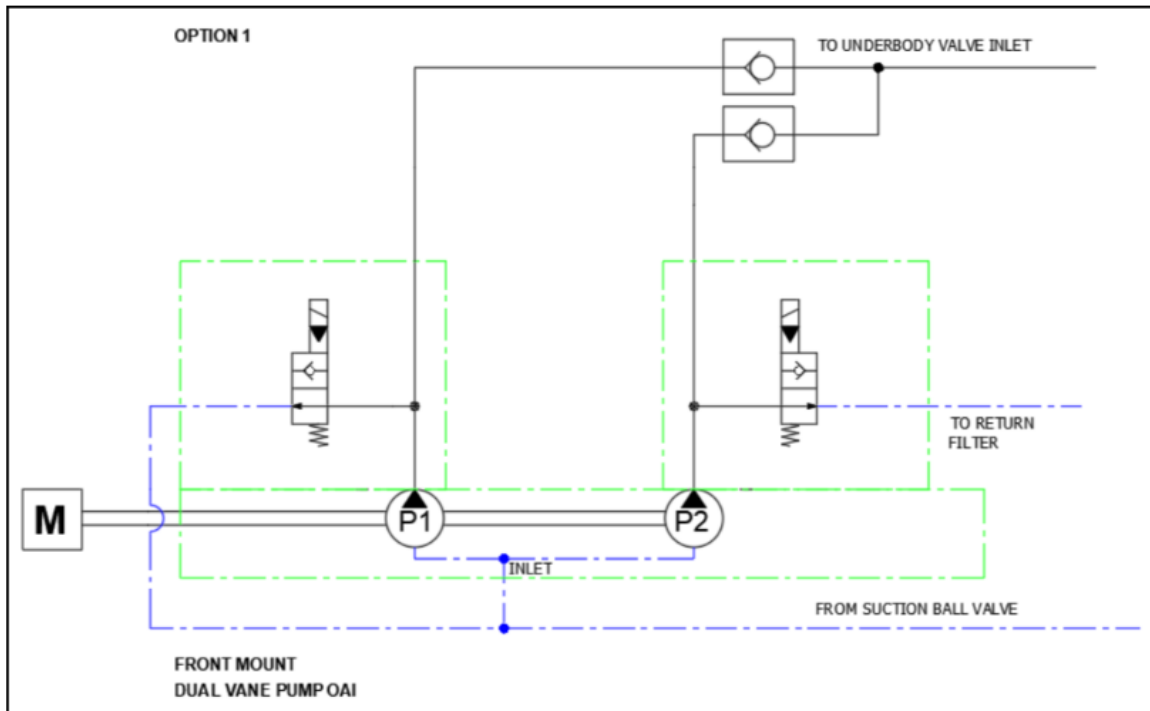


Figure 51. Option One

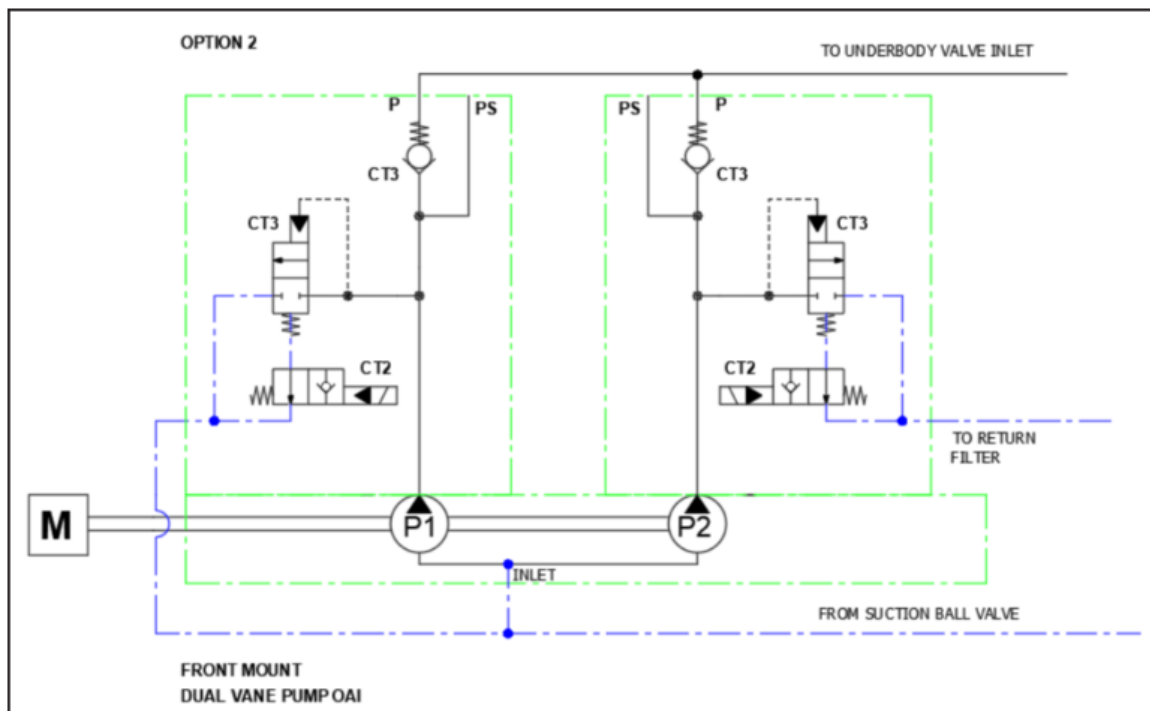


Figure 52. Option Two

PUMP

Tandem Vane Pump Front Loader O.A.I. Operation

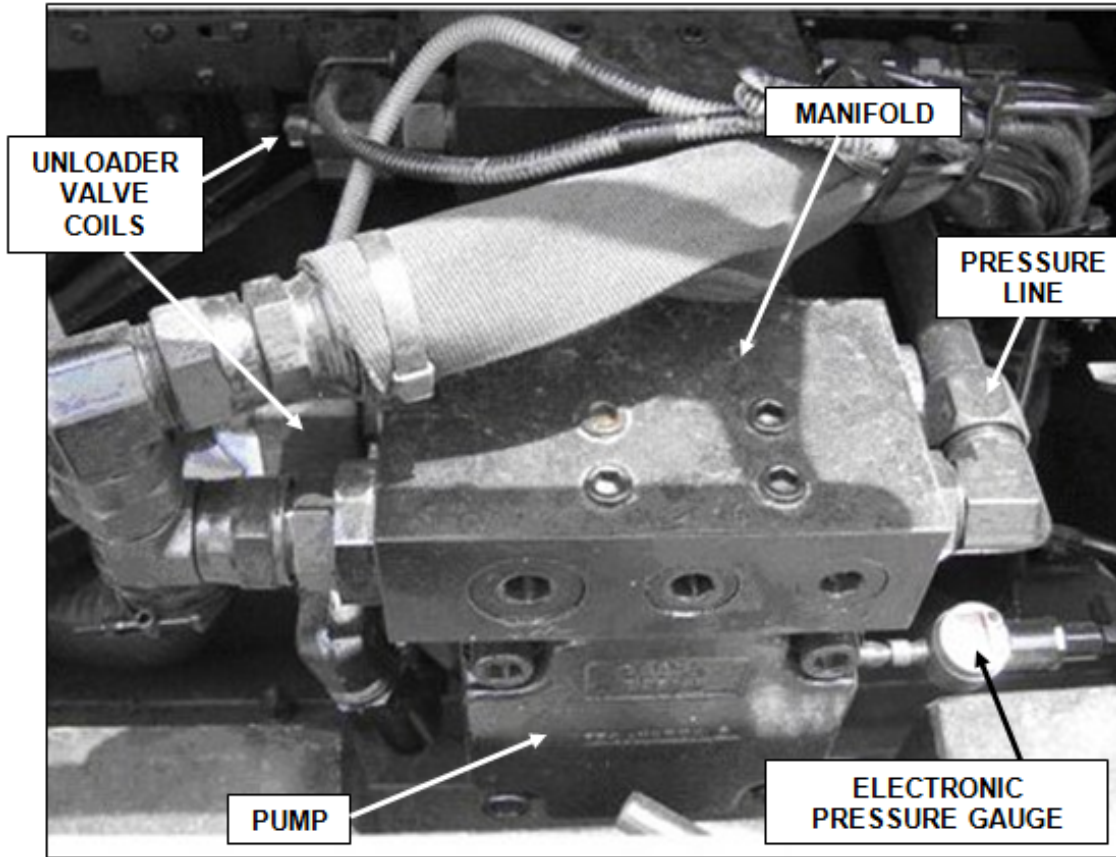


Figure 53.

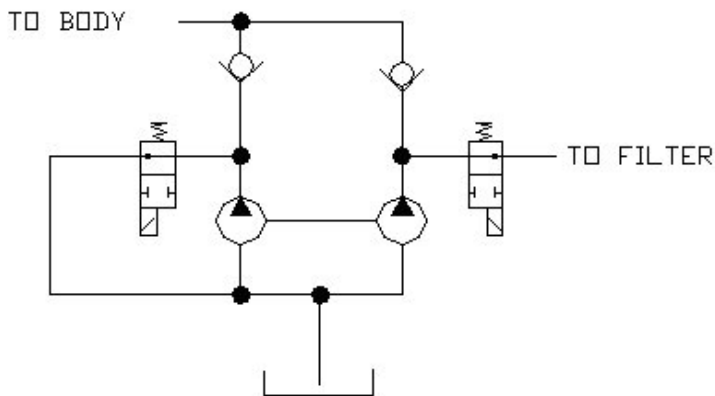


Figure 54.

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.

PUMP

Power Take-Off Families

We use three different Power Take-Off (PTO) families to drive the hydraulic pumps at Heil.

A. Engine Driven PTO

Commonly called FEPTO. We use a crankshaft adapter then install a driveline and mount the pump in front of the engine.

B. Constant Drive Transmission Mount PTO

This PTO is driven by transmission interface gears and will provide power to the pump once the engine is running. They do not contain electrical, hydraulics, or a clutch.

C. Clutch Shift Transmission Mount PTO

This PTO is driven by transmission interface gear and will provide power to the pump once the engine is running, the PTO solenoid is activated with 12V, and it's internal clutch is engaged.

Pump Types

Constant Drive and Clutch Shift Transmission Mount PTO families can be found in three different pump types.

A. Direct Mount Pump

This is a very compact system and pump options are limited. The pump installed directly on the PTO flange has to be relatively small.

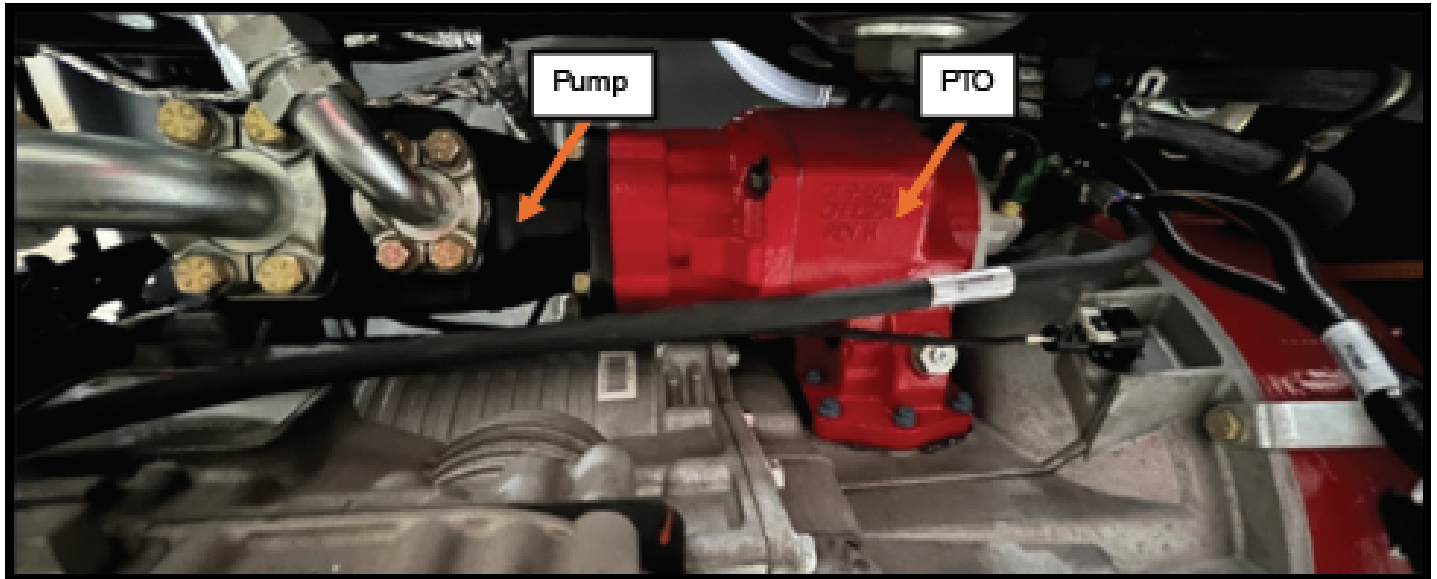


Figure 55. Direct Mount Pump

PUMP

B. Remote Mount Pump

This installation is more complex but offers greater flexibility and better pump options. The PTO and pump are not directly connected; instead, a driveline transfers power from the PTO to the pump that is remotely mounted with a separate bracket.

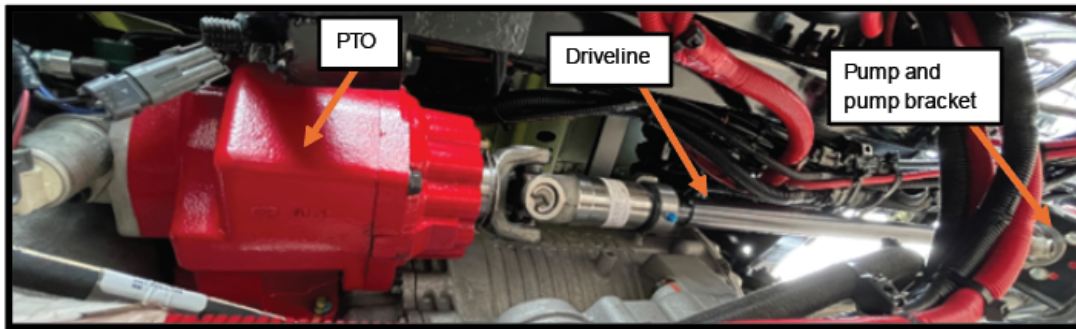


Figure 56. Remote Mount Pump

C. Extended Shaft PTO

This PTO integrates direct-mount and remote-mount pump capabilities. Its built-in driveshaft allows for mounting a pump further from the PTO unit, creating space for a larger pump and manifold system.

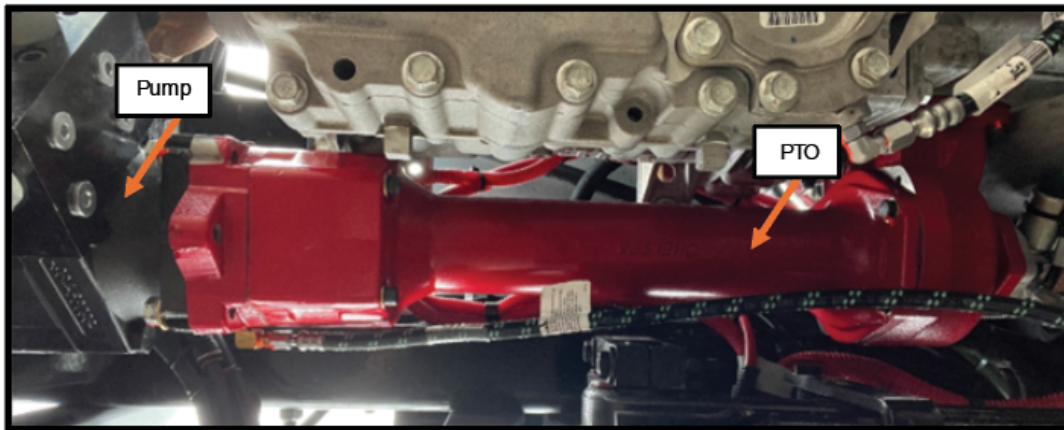


Figure 57. Extended Shaft PTO.

PTO Troubleshooting

The following troubleshooting steps are used when the driveline is not equipped or not visible so outside testing must be performed to test if the pump is turning (ex., Clutch Shift Direct Mount or Extended Shaft). The Remote Mount Pump does not require a specific test because the driveline is visible from the outside.

A. Check Voltage at the PTO Solenoid

Heil units have a solenoid valve attached to the drive unit. Once this solenoid is activated, it provides transmission oil pressure to the piston and engages the PTO clutches (see “**Figure 58. PTO Pressure Switch**” on page 52).

1. Reading should be over 10V with the **PUMP SWITCH ON** and **ENGINE RUNNING**

NOTICE

On newer units, keep the solenoid connected and back-probe the connector. If the connector is undone, the controller will see an “Open Loop” condition (wire break) causing it to self-protect and shut-down the output.

B. Check Coil Resistance

Unplug the coil connector and measure resistance in Ohms.

1. Coil resistance should be 8 ohm +/- 20%

PUMP

C. PTO Pressure Switch Function

Only complete the following check if a PTO pressure switch is installed on the assembly.

1. This is normally an open switch. Which means, when the transmission oil pressure reaches the pressure set-point (via the solenoid activation) it will close it's contact and allow it to send a signal to the controller
 - a. The PTO pressure switch is correctly activated when the blue wire switches to ground

NOTICE

On newer units, keep the switch connected and back-probe the connector. If the connector is disconnected, the controller will see and "Open Loop" condition when it is expecting signal feedback. Also, the in-cab display may show a warning when unplugging the switch.

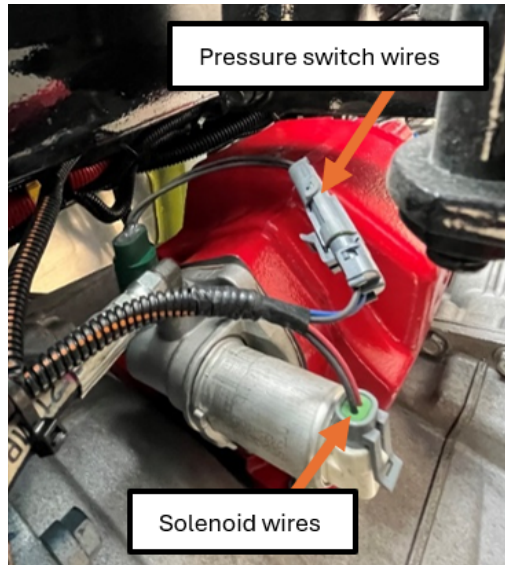


Figure 58. PTO Pressure Switch

D. Transmission Pressure Check

This is a multi-step process and each step of the following process will guide you through the failure mode.

1. Install a 500 PSI pressure gauge to the feed line between the transmission port and the PTO.
 - a. Tee-in the so the PTO will not engage
 - b. Start the unit and let the engine run at idle
 - (1) Expected Pressure:
 - (a) Pump Switch OFF = 170 - 230 PSI
 - (b) Pump Switch ON = 220 - 300 PSI



Figure 59. Transmission Pressure Feed To Pto

PUMP

2. If pressure is the same pump switch **OFF** vs pump switch **ON**, there may be a **missing wire** or **TCM not configured correctly**.
3. If pressure difference is greater than **40 PSI**, there is an internal leak such as:
 - a. Solenoid valve bypassing to sump
 - b. Clutch piston seal bypassing to sump
4. If pressure with pump switch OFF is lower than specifications, it's possible:
 - a. the Solenoid valve is bypassing to sump
 - b. there is a Transmission pressure problem (if so, follow the next step)
 - (1) Install a pressure gauge directly on the transmission port.
 - (2) Check to see if the pressure is within the specifications provided above

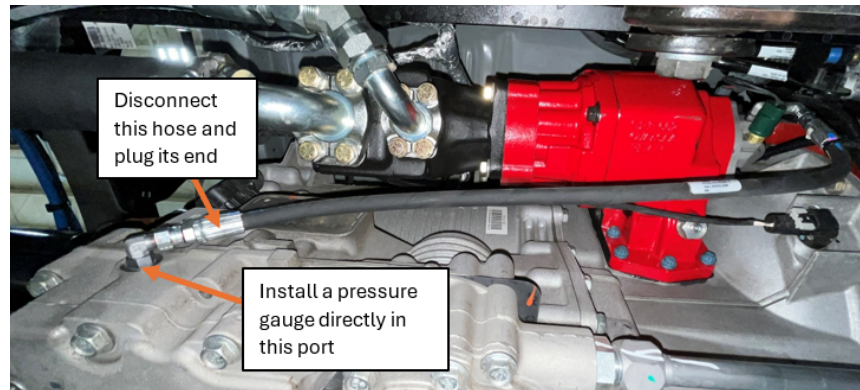


Figure 60. Transmission Pressure Measurement

E. Clutch Slippage Test

Applies to the Chelsea 890 PTO **only**.

1. Only the Chelsea 890 PTO has the clutch housing separated from the drive unit.
2. Before testing, the unit **MUST** be completely cooled down to **room temperature**.
3. Using an infrared thermometer, measure the temperature by aiming the thermometer at the drive unit and clutch housing.
 - a. Take note of the reading and the exact location where the laser was pointing.
4. Start the truck, turn the pump ON and deadhead a hydraulic function for a minimum of **five minutes**.
5. Shutdown the engine then take the same measurements and note the results as described in line 3.
 - a. If the clutch housing is much hotter than the drive unit, most likely the PTO clutches are slipping.
 - (1) Clutch housing temperature will depend on the transmission temperature.
 - (2) Example, 10°F on a 300°F reading is not a concern, however, 10°F on a 100°F reading is a concern.

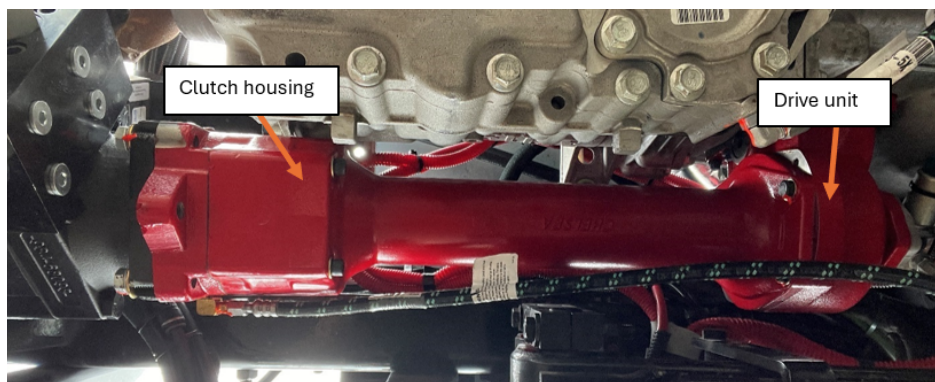


Figure 61. Clutch Slippage Test

SECTION 3

BODY & TAILGATE

BODY & TAILGATE

Body Nomenclature

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

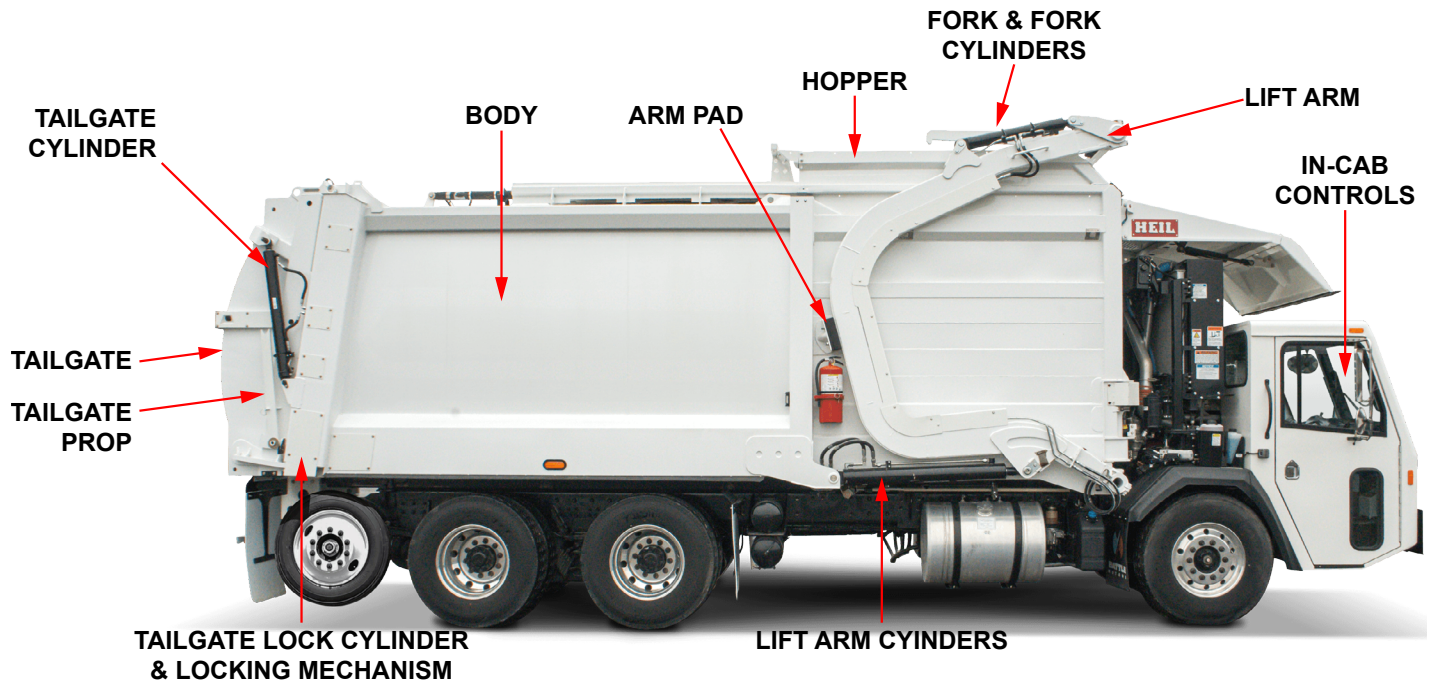


Figure 62.

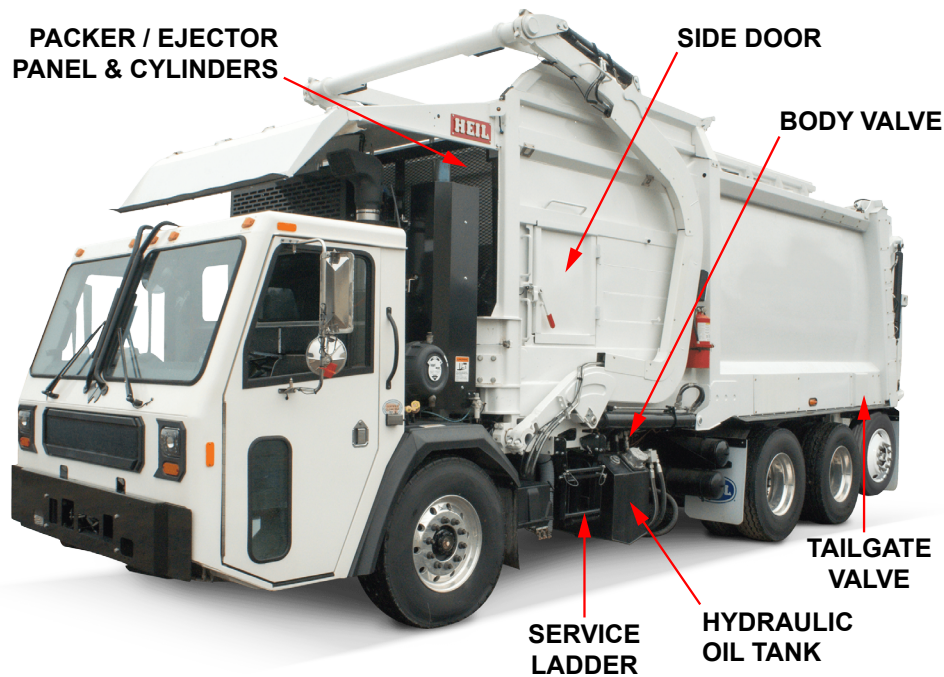


Figure 63.

BODY & TAILGATE

Propping The Body

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.

NOTICE

DO NOT raise the body to empty refuse.

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 will 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. Failure to do so can cause **SERIOUS INJURY** or **DEATH** to you or bystanders

WARNING

Never drive the unit with the body propped. **SERIOUS INJURY** or **DEATH** can occur.

NOTICE

Empty body of all refuse before using body props.

Body Lifting Devices

We use three different body lifting devices: Service Hoist, Service Hoist Lite, and Serviceable Eject.

A. Service Hoist

This lift requires an on-board 12V power unit. Refer to “**Service Hoist Operation**” on **page 57** for the specific body propping procedure.

B. Service Hoist Lite

This lift requires an external hydraulic-powered unit to raise the body. Refer to “**Service Hoist Lite Operation**” on **page 60** for the specific body propping procedure.

C. Serviceable Eject

This lift requires overhead lifting devices to raise the body. Refer to “**Serviceable Eject Operation**” on **page 62** for the specific body propping procedure.

BODY & TAILGATE

Service Hoist Operation

Operators **MUST KNOW** how to **SAFELY** prop up the unit's body. You may need to prop the body 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

Do not prop the body while the unit is on unstable or uneven ground. The unit may roll when the body is raised on unstable or uneven ground, which could cause **SERIOUS INJURY** or **DEATH** to you and bystanders. Clear the area of all people not necessary for this procedure and set the unit on stable and even ground before propping the body.

⚠ 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 using body props.

The factory-supplied body props are located on both sides under the body and forward of the rear wheels. Refer to the figures 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 - chock the wheels.
3. **CLOSE** the manual override valve on the power unit – **PUSH** the knob **IN** and turn it **CLOCKWISE**.

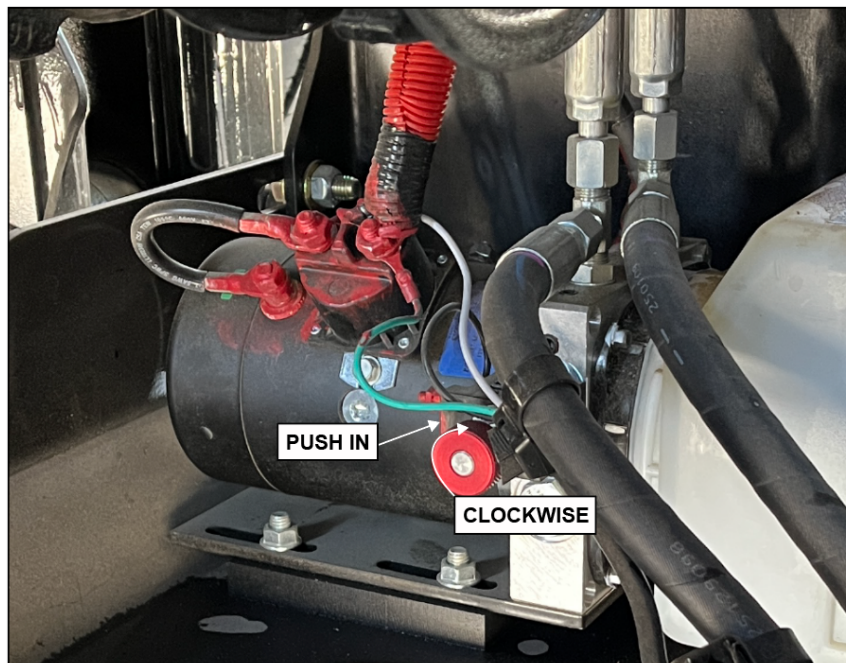


Figure 64.

BODY & TAILGATE

4. Lock-Out/Tag-Out the unit (see “**Lock-Out/Tag-Out Procedure**” on page 12).
5. Remove the bolts and springs from the chassis mounting brackets.



Figure 65. Removing Bolts and Springs from Chassis Mounting Brackets

6. If equipped with quick disconnects, uncouple prior to raising the body.
7. Disconnect all wire harnesses, hydraulic hoses, and air lines that would prevent the body from raising or be damaged by the body raising.
8. Observe and obey the DANGER labels for an elevated chassis.
9. PRESS and HOLD the UP button on the controller to RAISE the body.
10. RELEASE the UP button when the body is at the height required.



Figure 66. Service Hoist Controller

BODY & TAILGATE

11. Release the prop handles and LOWER the body props.

NOTICE

NEVER open the manual override valve while the body is elevated.



Figure 67.

12. PRESS the DOWN button on the controller to lower the body onto the lugs.



Figure 68.

13. Perform the maintenance or service procedures.
14. Once all maintenance and service procedures are complete - lower the body and store body props.

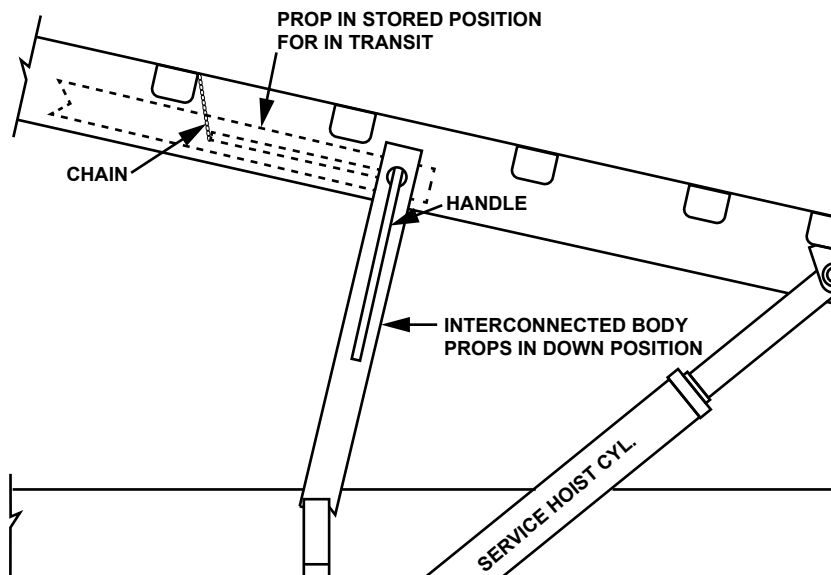


Figure 69. Factory Body Props

BODY & TAILGATE

15. OPEN the manual override valve on the power unit - PUSH the knob in and turn COUNTER-CLOCKWISE.

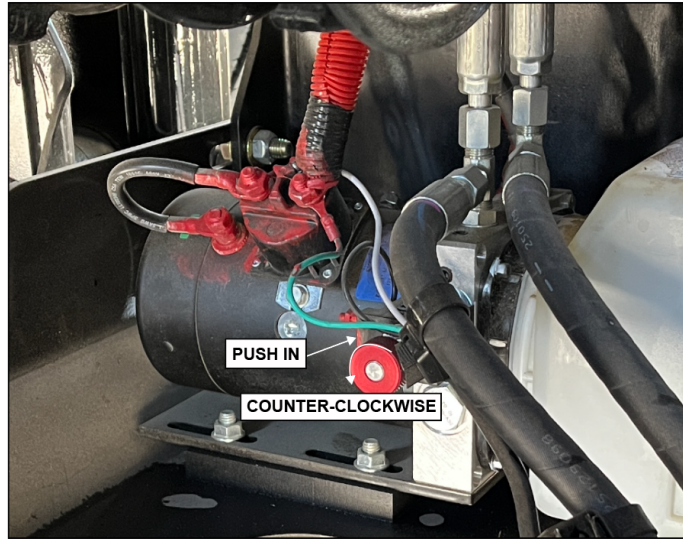


Figure 70.

16. MAKE SURE the manual override valve is open - PUSH the service hoist UP button on the controller. The body WILL NOT raise.
17. Reinstall the bolts and springs to the chassis mount brackets.

Service Hoist Lite Operation

Operators **MUST KNOW** how to **SAFELY** prop up the unit's body. You may need to prop the body for maintenance or repair procedures. Observe and obey the DANGER and WARNING notices below while you use a serviceable eject 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

Do not prop the body while the unit is on unstable or uneven ground. The unit may roll when the body is raised on unstable or uneven ground, which could cause **SERIOUS INJURY** or **DEATH** to you and bystanders. Clear the area of all people not necessary for this procedure and set the unit on stable and even ground before propping the body.

⚠ 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 using body props.

BODY & TAILGATE

The factory-supplied body props are located on both sides under the body and forward of the rear wheels. Refer to the figures 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 - chock the wheels.
3. Lock-Out/Tag-Out the unit.
4. Connect the remote hydraulic power unit to the quick coupler shown below.
 - a. ISO 7241-1 Series B 1/4" female connector required.

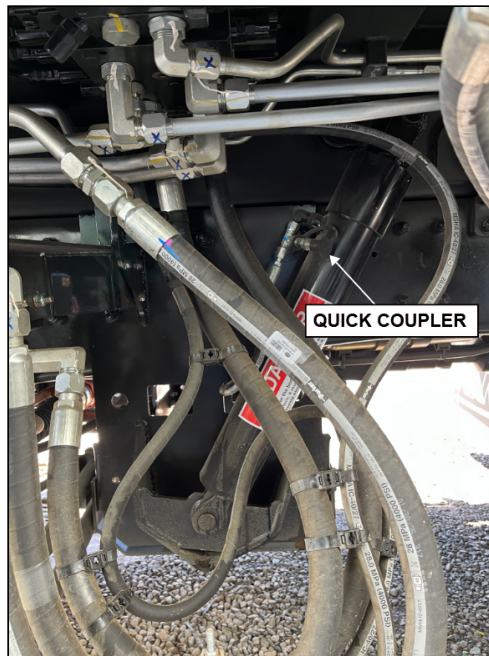


Figure 71.

5. Remove the bolts and springs from the chassis mounting brackets.



Figure 72.

6. Disconnect all wire harnesses, hydraulic hoses, and air lines that would prevent the body from raising or be damaged by the body raising.
7. Observe DANGER labels for elevated chassis and going under the chassis.
8. Raise the body and set props. Follow the instructions provided with your power unit for raising and lowering functions.
 - a. 1.25 gallons required to extend the cylinders @ 2500 PSI.

BODY & TAILGATE

9. Perform the maintenance or service procedures.
10. Once all maintenance and service procedures are complete - lower the body and store body props.

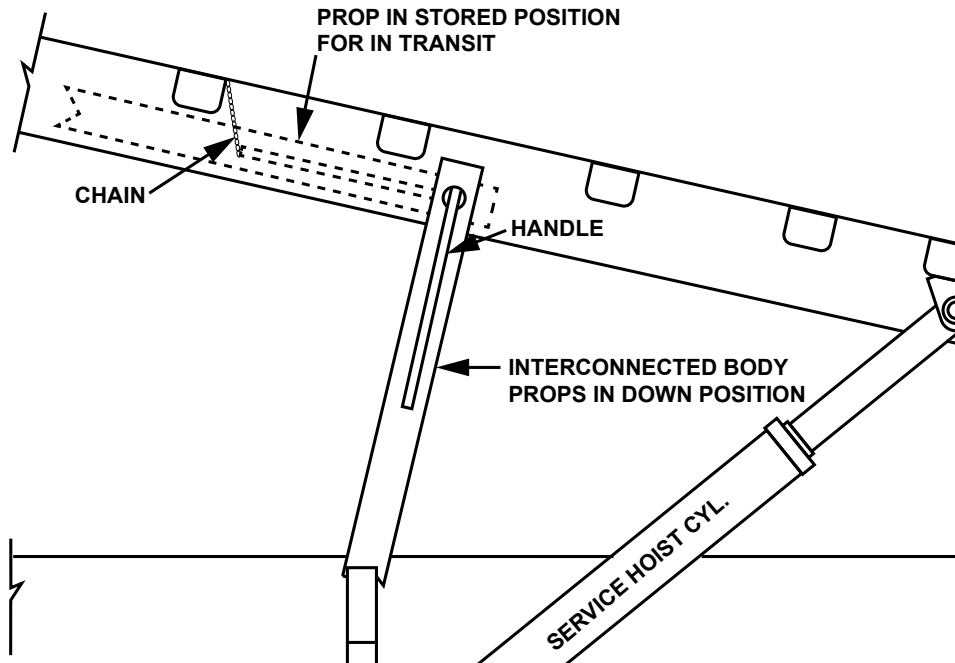


Figure 73. Factory Body Props

11. Reinstall the bolts and springs to the chassis mount brackets.
12. Disconnect the remote hydraulic power unit from the quick coupler and reinstall the dust cap to prevent premature failure of hydraulic system components.

Serviceable Eject Operation

Operators **MUST KNOW** how to **SAFELY** prop up the unit's body. You may need to prop the body for maintenance or repair procedures. Observe and obey the DANGER and WARNING notices below while you use a serviceable eject 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

Do not prop the body while the unit is on unstable or uneven ground. The unit may roll when the body is raised on unstable or uneven ground, which could cause **SERIOUS INJURY** or **DEATH** to you and bystanders. Clear the area of all people not necessary for this procedure and set the unit on stable and even ground before propping the body.

! 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 using body props.

BODY & TAILGATE

The factory-supplied body props are located on both sides under the body and forward of the rear wheels. Carefully follow the body propping procedures below.

☑ **Follow these steps to raise the body:**

1. Empty body of all refuse.
2. Verify all tire pressures are correct.
3. Make sure that the body is on firm, level ground with the parking brake engaged and holding - chock the wheels.
4. Lock-Out/Tag-Out the unit.
5. Remove the bolts and springs from the chassis mounting brackets.

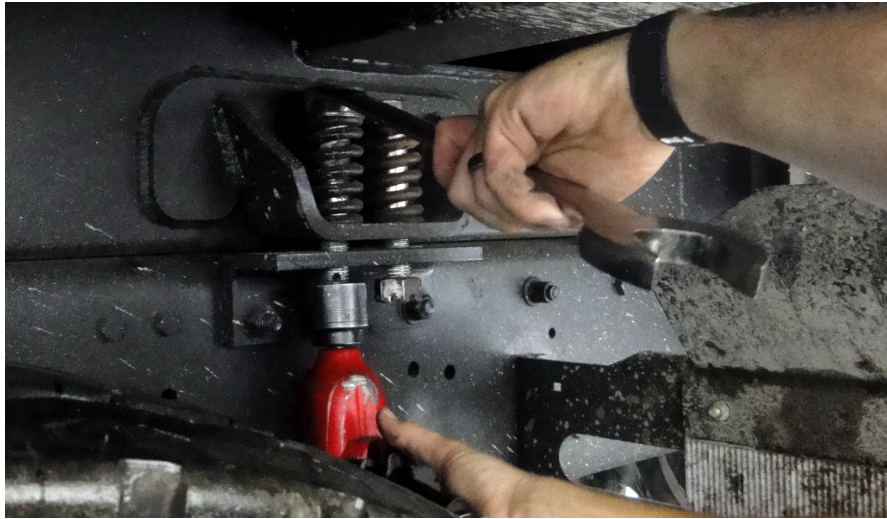


Figure 74.

6. Disconnect all wire harnesses, hydraulic hoses, and air lines that would prevent the body from raising or be damaged by the body raising.
7. Observe and obey the DANGER labels for an elevated chassis.
8. 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.
9. Using the lifting device, slowly lift the body in a controlled manner high enough to lower the factory body props.



Figure 75. Front Body Chain Hook Lugs

BODY & TAILGATE

10. RELEASE the prop handles and LOWER the body props.



Figure 76. Release and Lower Factory Body Props

11. Using the DOWN button on the control, slowly lower the body in a controlled manner until the body is resting on the prop stands.



Figure 77. Release and Lower Factory Body Props

12. 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.

BODY & TAILGATE

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 Procedure**” on page 12.

B. How To Store The Tailgate Props

1. When you finish using the props, take the unit out of the Lock-Out/Tag-Out, 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.

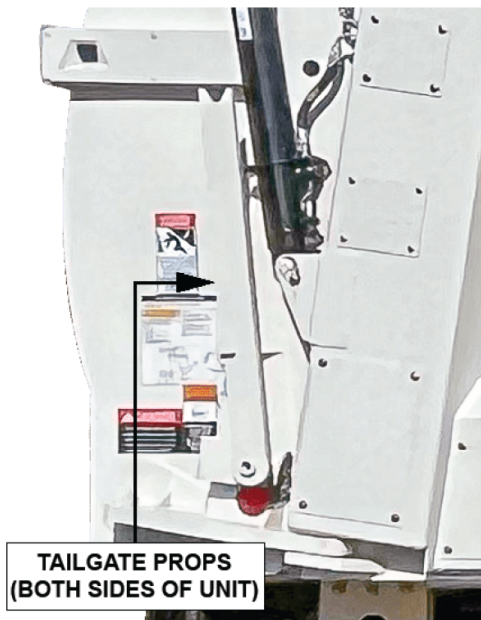


Figure 78.

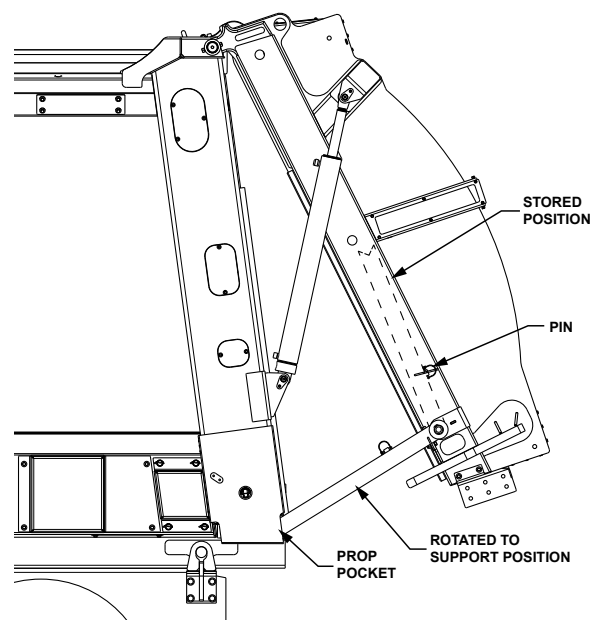


Figure 79.

BODY & TAILGATE

Side Access Doors

The hinged access door is located on the street side.

⚠ WARNINGS

Make sure the unit is in the **“Lock-Out/Tag-Out Procedure”** on **page 12** when you do maintenance or service procedures, when you go in the hopper, enter the side access doors, or climb on the body or equipment. Equipment can be operated when the unit is not in the Lock-Out/Tag-Out. When the unit is not in the Lock-Out/Tag-Out, equipment operated while you do maintenance or service procedures, enter the hopper or climb on the body or equipment can cause **SERIOUS INJURY** or **DEATH**.



Figure 80. Close the Side Access Door

Body Sump Door (Optional)

A sump compartment with an access door is located on the curb side of the unit when it is in the fully retracted position. The sump compartment is below the hopper area and collects liquids that drain out of the collected and compacted refuse that is inside the unit body. You can open the door and clean out the sump compartment. Keep the sump doors closed at all times except when you clean out the compartment.

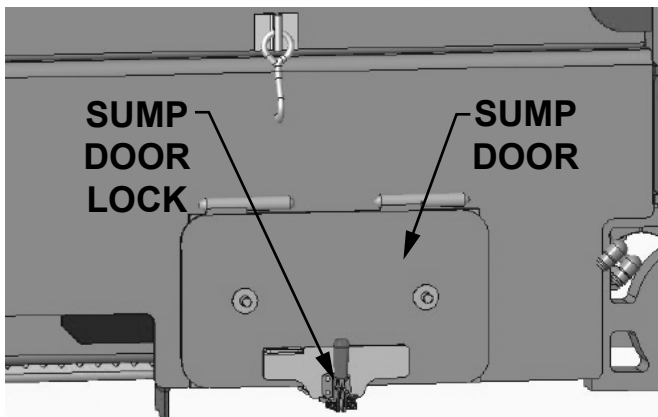


Figure 81. Sump Door

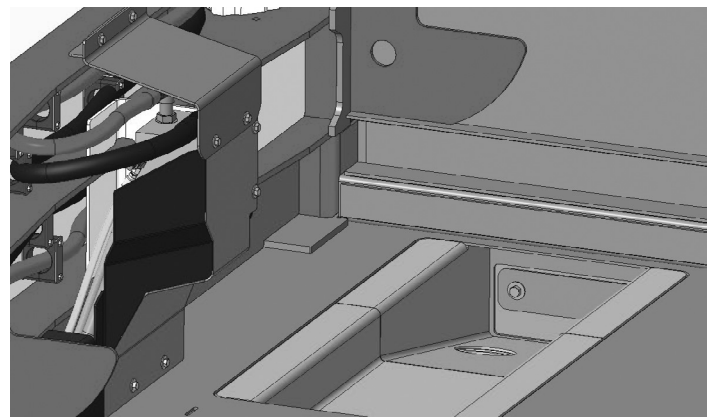


Figure 82. Inside Sump Door

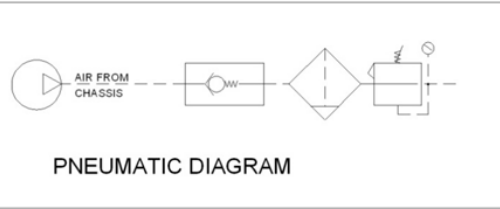
BODY & TAILGATE

Air Supply Regulator – Pneumatic Diagrams

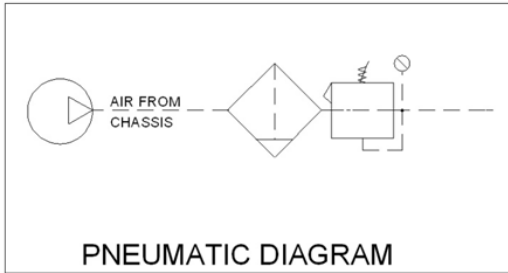
Air regulator adjustment knob set at 90 psi.
Lift knob to unlock, press knob to lock.



Air Filter
Regulator



272-7464, 272-7464-001



272-7464-002, 272-7464-003, 272-7464-004

Figure 83. Air Supply Regulator

Welding & Electronic Devices / Electrical Lubricants

⚠ WARNING

Never weld on a compressed natural gas vehicle unless the compressed natural gas fuel system has been purged with inert gas. SERIOUS INJURY or DEATH can occur.

Before welding on any unit with electronic devices like the controller, electronic control units (ECUs), and proximity switches complete the following procedures.

- Disconnect all battery connections.
- Place welding ground as close as possible to the area that is being repaired.
- Disconnect the controller and all other electronic control units (ECUs).
- 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.

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 “Side Access Door Proximity Switch Troubleshooting” on page 24 for troubleshooting procedures.

SECTION 4

MAINTENANCE & ADJUSTMENT

MAINTENANCE & ADJUSTMENT

Body Daily Checklist

Make sure you perform a daily check of the unit. Refer to the applicable 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. See “Preparing The Unit To Check The Oil Level” on page 80 & “Check Oil Level” on page 81.
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, lift arms, and/or attaching components have loose or missing hardware	Tighten loose hardware. Replace missing hardware.
Body structure, lift arms, and/or attaching components have 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.
Hopper liner (when equipped)	Inspect welds. Repair cracked welds. Check for damage or excessive wear. Replace as necessary.
Air regulator	90 PSI, typically located street side in the cab behind the seat
Operation	Operate All Functions to make sure all functions work correctly.

MAINTENANCE & ADJUSTMENT

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 be checked and serviced. Severe use or adverse conditions may require more frequent maintenance.

Daily = 8 hrs. Weekly = 40 hrs. Monthly = 200 hrs. 6 Months = 1000 hrs. Yearly = 2000 hrs						
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. See “Preparing The Unit To Check The Oil Level” on page 80 & “Check Oil Level” on page 81.
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	☒					
Grease Fittings		☒				Lubricate as shown on “Body Lubrication Guide” on page 72
Body Undercoating					☒	Inspect body undercoating and repair as necessary.

MAINTENANCE & ADJUSTMENT

Daily = 8 hrs. Weekly = 40 hrs. Monthly = 200 hrs. 6 Months = 1000 hrs. Yearly = 2000 hrs						
COMPONENT/SYSTEM	8	40	200	1000	2000	CHECK/SERVICE
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 PTOs (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 female pilot of PTO as given may cause damage to the pump shaft.
						Greasing is NOT required on wet spline PTOs such as the Chelsea 890/897 series.
Fork Bearing Block Bolts			☒			Each of the four fork bearing block bolt torques should be 460ft-lbs.
Clamp-On Arm Bolts			☒			Inspect for tightness. Torque locknut to 600ft-lbs.
Arm Cross-Shaft Clamp Bolts			☒			Inspect each clamp/bolt for tightness. Each bolt should be torqued to 81 ft-lbs.
Arm Cross-Shaft Bearing Block			☒			Inspect bolts for tightness. Keep the mounting bolts torqued to 200ft-lbs. using a torque wrench (lubricated threads).
Calibrate Cylinder Sensors					☒	Calibrate cylinder sensors.
Tailgate Seal Integrity	☒					See "Clean & Inspect The Tailgate Seal" on page 76
Packer/Ejector Cylinder Preventive Maintenance	☒	☒	☒			See "Packer/Ejector Cylinders Preventive Maintenance" on page 76.
Packer/Ejector Panel Bolt-in Cylinder Mount Bolts			☒			Check for tightness. Bolt torques should be 192ft-lbs. (lubricated threads)
PTO/Transmission Interface Inspection			☒			Check the torque on the PTO mounting screws and tighten to the proper torque specification

MAINTENANCE & ADJUSTMENT

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 movable mechanical parts without fittings every 60 days with engine oil.

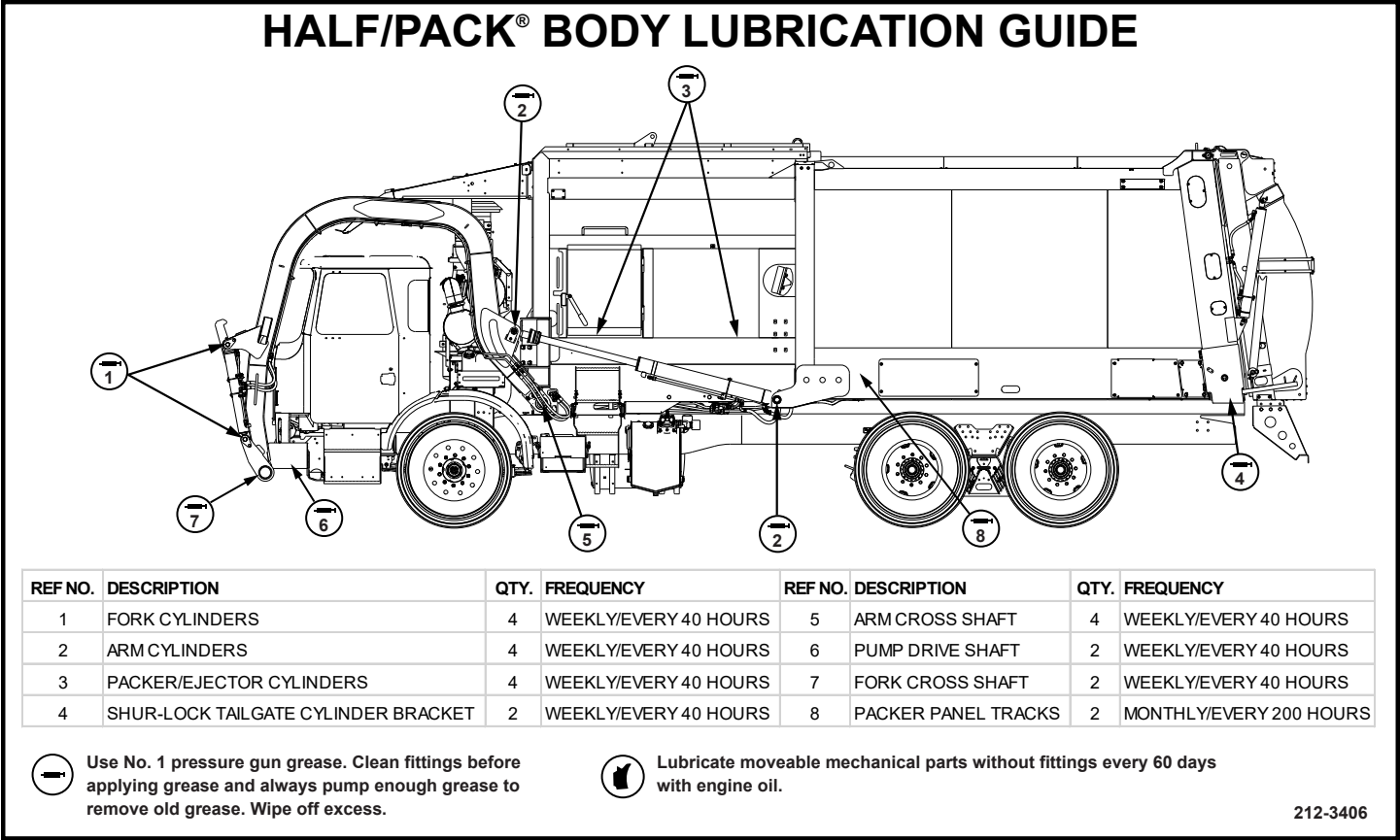


Figure 84. Half/Pack Lubrication Guide, PN 212-3406

MAINTENANCE & ADJUSTMENT

PTO Inspection & Preventive Maintenance

Due to normal torsional vibrations of transmission mounted Power Take-Offs (PTOs), it is important that Service Technicians include the PTO/transmission interface in their standard inspection and maintenance schedules. If a PTO Inspection and Preventive Maintenance schedule is not followed, it is possible that the PTO mounting screws can come loose, resulting in transmission fluid leaks between the PTO and transmission and potential damage to the PTO or drive train.

A. Tools Required

The tools and materials necessary to perform the inspection/Preventive Maintenance are shown in table below.

Item	Part Number	Application
Personal Protective Equipment	Commercially available	Safety protection as required by employer
Wrench/Socket Set	Commercially available	To tighten PTO mounting 10mm 12 pt. head screws
Torque Wrench	Commercially available	To properly tighten PTO mounting screws
Oil-Resistant Marker	Commercially available	To make witness marks on the PTO mounting flange

B. PTO Mounting Screw

With the unit in Lock-Out/Tag-Out, use a 10 mm 12 pt. closed wrench and crowsfoot to perform the following steps:

Note: PTO/Transmission Interface Inspection/Preventive Maintenance (MONTHLY/200 HOURS OF OPERATION)

1. Place the unit in “**Lock-Out/Tag-Out Procedure**” on **page 12** with the hydraulic pressure relieved.
2. Clear the work area around the unit of all unnecessary people and equipment.
3. Inspect for transmission fluid leaking from the PTO/transmission interface. Thoroughly clean around this area.
4. Using a torque wrench, check the PTO mounting screws.

Note: If they are set less than 45ft-lbs, tighten to 45ft-lbs.

5. Using an oil-resistant marker, add a witness mark on each screw head and across the PTO mounting flange.

Note: This will help identify if the PTO mounting screws loosen over time during future inspections. Witness Marks on PTO Mounting Screws and Flange



Figure 85. Witness Marks On PTO Mounting Screws And Flange

6. Take the unit out of Lock-Out/Tag-Out and operate unit functions.
7. Check for transmission fluid leaks around the PTO/transmission interface. If there are leaks, contact Technical Services.
8. If there are no transmission fluid leaks, return the unit to service.

MAINTENANCE & ADJUSTMENT

Fork Bearing Block Bolts

Each fork bearing block bolt should be torqued every 200 hours to 460ft-lbs.

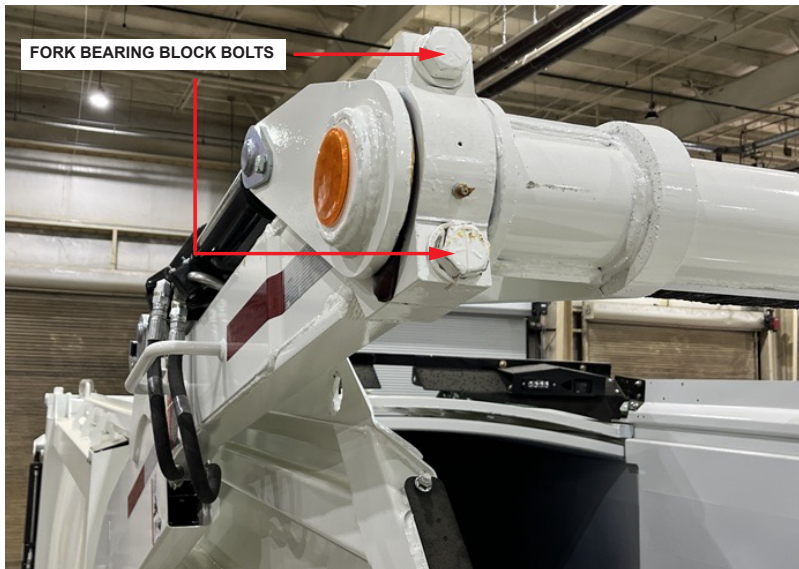


Figure 86. Image Shown With Arms Stowed

Clamp-On Arm Bolts

Inspect for tightness every 200 hours. Each locknut should be torqued to 600ft-lbs.

NOTICE

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

NOTICE

Bolts, nuts, and washers are TTY, if removed these items 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 600ft-lbs. using a torque wrench.

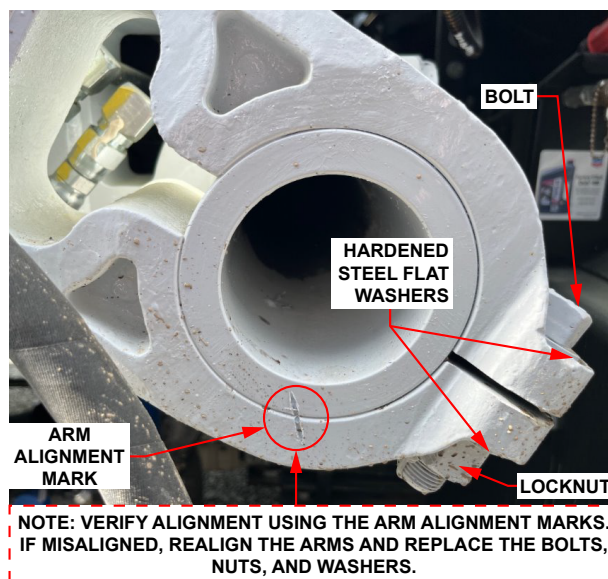


Figure 87. Clamp-On Arm Bolts

MAINTENANCE & ADJUSTMENT

Arm Cross-Shaft Clamp Bolts

Inspect each clamp every 200 hours. Each clamp bolt should be torqued to 81 ft-lbs.

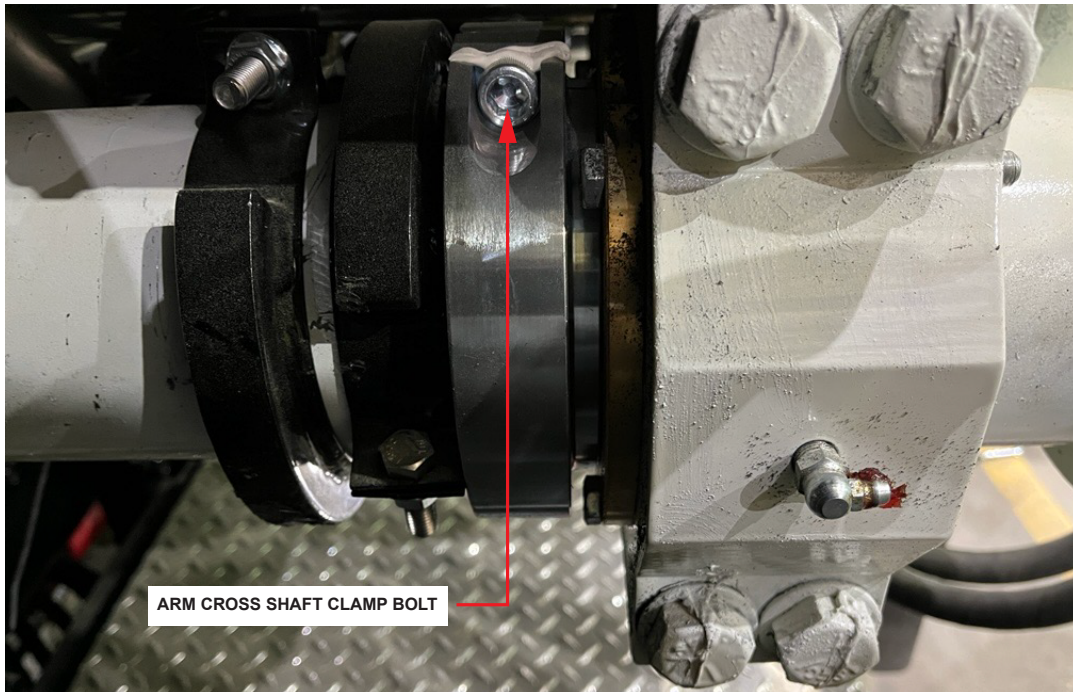


Figure 88.

Arm Cross Shaft Bearing Block

Half/Packs have the 4-bearing blocks for the arm cross shaft. It is very important to keep the mounting bolts torqued to 200ft-lbs. using a torque wrench (lubricated threads).

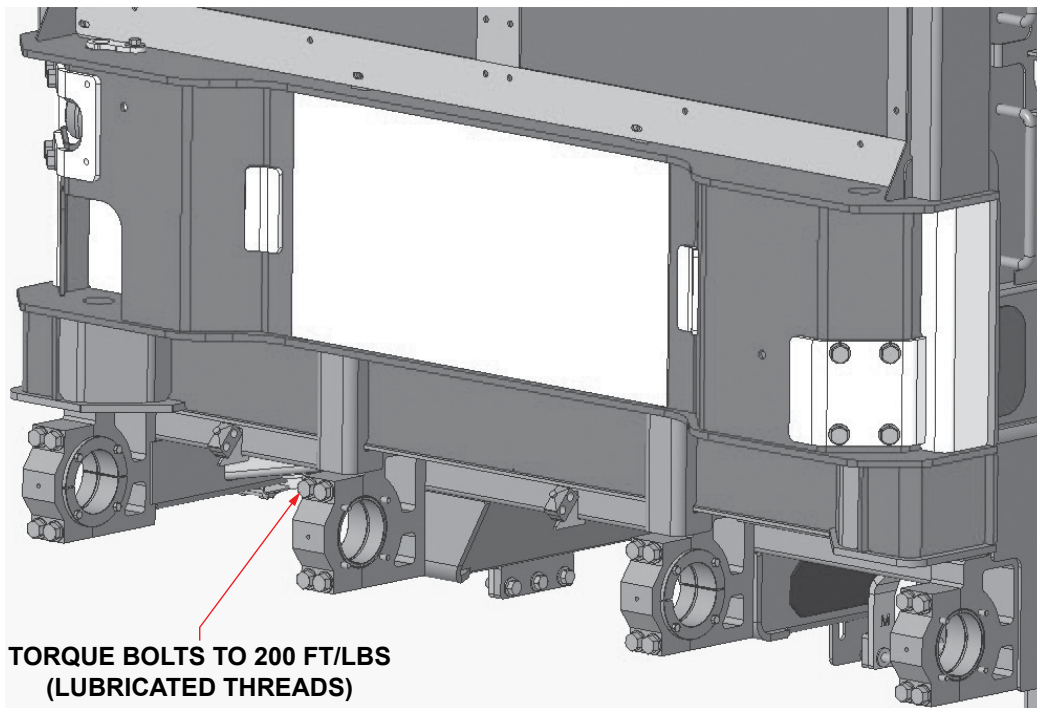


Figure 89. Bearing Blocks Maintenance

MAINTENANCE & ADJUSTMENT

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 “**Side Access Door Proximity Switch Troubleshooting**” on **page 24** for recommended procedures for inspecting proximity switches.

Tailgate Lubrication

See “**Grease Lubricant Recommendation**” on **page 14** and “**Body Lubrication Guide**” on **page 72**.

Clean & Inspect The Tailgate Seal

Daily, check the tailgate seal to make sure it mates properly with the body and inspect for possible wear, damage or leaking.

Packer/Ejector Cylinders Preventive Maintenance

It is critical to follow the guidelines of the “**Body Preventive Maintenance Chart**” on **page 70** and “**Body Lubrication Guide**” on **page 72** 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 Procedure**” on **page 12** 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. 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
• Clean behind the packer panel and pockets around spherical's. DO NOT damage cylinder rods by striking with any metal object (if applicable). • 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.	Inspect the Packer/Ejector Panel start and stop travel positions and, if necessary, adjust the proximity switches for retract and extend settings. Refer to “Packer/Ejector Panel Adjustment” on page 89.

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.



Figure 90.

MAINTENANCE & ADJUSTMENT

Proximity Switch Adjustment

Half/Pack uses a standard proximity switch for the side door, arm, and forks and high-pressure proximity sensors inside the tailgate lock cylinders (QTY 2), tailgate raise cylinder (QTY 1), and top door cylinder (QTY 1).

NOTICE

All adjustments must be made with any container removed and the unit on level ground. Clear the area of all unnecessary personnel and equipment. When adjusting proximity switches, it is strongly recommended that the truck be isolated and uninvolved personnel remain outside the shop area. Only trained personnel who fully understand the adjustment may perform this work. A spotter may be required when cycling the arms and forks.

Side Door

See **“Side Access Door Proximity Switch Troubleshooting”** on page 24

Arm & Forks

To perform the adjustment, complete these steps:

1. Lower arm assembly until it is approximately 8” below the top edge of the windshield.
2. Adjust the inner proximity switch.
 - a. Loosen the clamp and rotate by flag until the light on the proximity switch illuminates
3. Verify the “LIFT ABOVE TRANSIT” icon is not illuminated.
4. Raise the arms until the “LIFT ABOVE TRANSIT” icon and audible alarm are ON.
 - a. Check that the arms are at the same 8” distance below the top edge of the windshield.
5. With the forks fully tucked in, lower the arms and verify that the proximity switch on the forks is ON.
6. Raise arms FULLY UP with the forks FULLY TUCKED IN until they’re resting on the arm pads.
7. Adjust outer proximity switch flag until the proximity switch turns ON and the “LIFT ABOVE TRANSIT” icon on the in-cab display turns OFF.
8. Lower the arms slightly to turn the proximity switch OFF.
9. Once complete:
 - a. Verify the aluminum cab protector is installed
 - b. Verify the “LIFT ABOVE TRANSIT” icon turns ON and the audible alarm is activated.

Tailgate Lock Cylinders

See **“In-Cylinder High-Pressure Proximity Switch Replacement”** on page 78 and **“In-Cylinder High-Pressure Proximity Switch Troubleshooting”** on page 78

Tailgate Raise Cylinder

See **“In-Cylinder High-Pressure Proximity Switch Replacement”** on page 78 and **“In-Cylinder High-Pressure Proximity Switch Troubleshooting”** on page 78

Top Door Cylinder

See **“In-Cylinder High-Pressure Proximity Switch Replacement”** on page 78 and **“In-Cylinder High-Pressure Proximity Switch Troubleshooting”** on page 78

MAINTENANCE & ADJUSTMENT

In-Cylinder High-Pressure Proximity Switch 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 Controller. Only properly trained and authorized service personnel should attempt any type of hydraulic system work.

⚠ CAUTION

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

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.
2. Place the unit in **“Lock-Out/Tag-Out Procedure”** on page 12.
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.

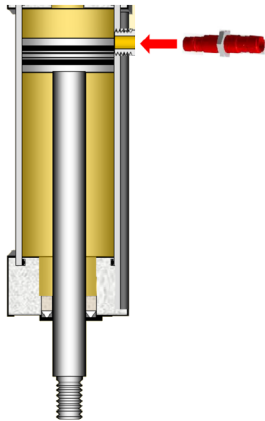


Figure 92. Tailgate Raise or Top Door Cylinder Fully

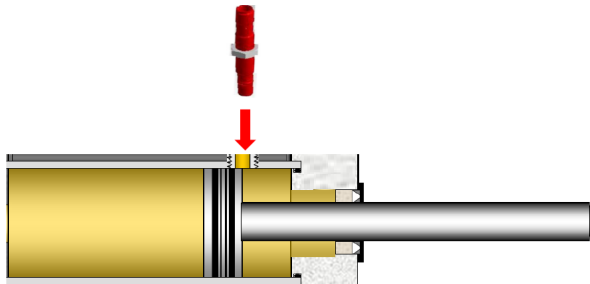


Figure 91. Tailgate Lock Cylinder Fully Extended

In-Cylinder High-Pressure Proximity Switch 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.

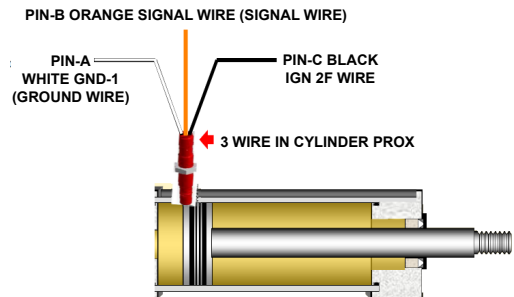


Figure 93.

MAINTENANCE & ADJUSTMENT

Cylinder Bypass

Bypassing occurs when the hydraulic oil “bypasses” the seals on the piston to the other side of the cylinder when pressurized, causing the hydraulic function to slow down and/or have erratic functionality.

Note: “A” = Retract and “B” = Extend

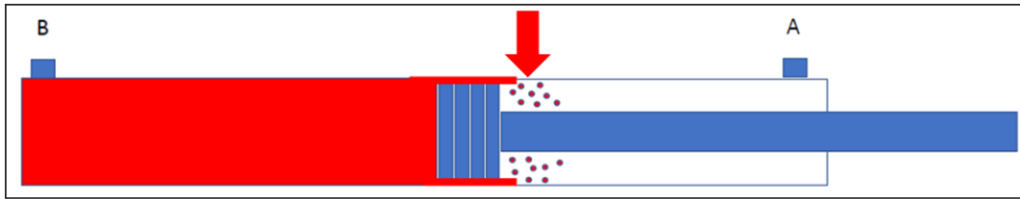


Figure 94. Pressurized Oil Bypassing the Piston Inside the Cylinder

In some cases, cylinder bypass is unavoidable due to years of wear or failure of an internal hydraulic part. However, there are several ways to prevent this from happening:

- Contain leaks
- Keep the oil clean when opening the system to fill or inspect
- Prevent side loading
- Maintain proper system pressures
- Follow the “**Body Preventive Maintenance Chart**” on **page 70** provided in this manual

Standard Bypass Test

Carefully follow the troubleshooting steps below.

NOTICE

For units equipped with in-cylinder sensors, the controller may partially close the control valve once the cylinder reaches its fully extended or retracted position. This action reduces the flow to the cylinder and can result in an inaccurate result for the bypass test. As a best practice, apply direct power (12V or air) to the appropriate valve actuator for effective troubleshooting.

CAUTION

Make sure the area is clear of all unnecessary people and equipment before performing the bypass tests.

A. Troubleshooting Cylinder Bypass in the Extend Position

1. Fully extend the cylinder.
2. Remove the hose or tube from the cylinder port “A”
 - a. Ensure the hose or tube is properly secured and stored in a clean area, away from potential sources of contamination that could be introduced to the system.
3. Pressurize port “B” or “deadhead” the cylinder
 - a. The pressure used should be the pressure that is set in the hydraulic circuit for this cylinder.

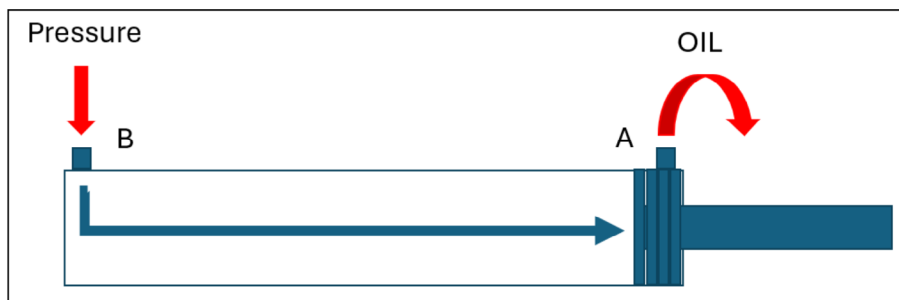


Figure 95.

NOTE: If more than 8 oz per minute exits out of port “A,” this cylinder is experiencing cylinder bypass.

MAINTENANCE & ADJUSTMENT

4. Repeat steps 1-3 in reverse to test for bypass in the other direction.

B. Troubleshooting Cylinder Bypass in the Retract Position

1. Fully retract the cylinder
2. Remove the hose or tube from cylinder port "B"
 - a. Make sure the hose or tube is properly secured and stored in a clean area, away from potential sources of contamination that could be introduced to the system.
3. Pressurize port "A" or "deadhead" the cylinder
 - a. The pressure used should be the pressure set in the hydraulic circuit for this cylinder.

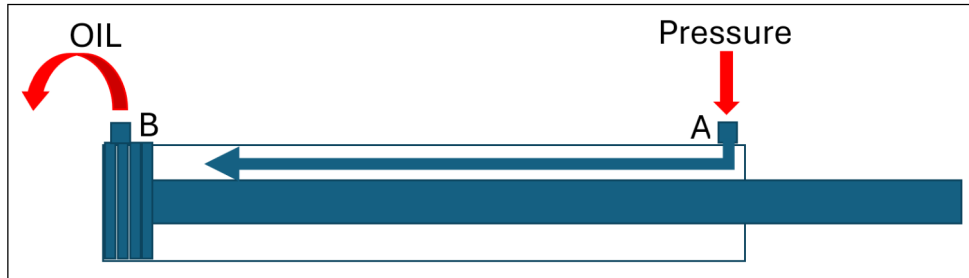


Figure 96.

Note: If more than 8 oz per minute exits out of port "B," this cylinder is experiencing cylinder bypass.

4. If more than 8 oz of hydraulic oil bypasses the piston - rebuild or replace the cylinder to restore full functionality.

Arm Cylinder Bypass Test

If the standard bypass test does not result in failure and the cylinders continue to show signs of bypassing, perform the following troubleshooting test.

Additionally, this test can be used to determine:

- The cylinder bypassing
- Valve internal leakage problem
- Spool positioning problem

NOTICE

A lifting device, such as a forklift or crane, is required for this test.

1. Raise the arm to the top height of the windshield and rest it on the lifting device.
2. Perform "**Lock-Out/Tag-Out Procedure**" on page 12
3. Remove BOTH hoses on the ROD side of the arm cylinders and CAP one cylinder with a stell cap.
4. Remove BOTH hoses on the BORE side on BOTH cylinders - cap the hose, NOT the cylinder.
5. Leave BOTH cylinder bores open to the atmosphere
6. Remove the lifting device and watch for the arms to go down
7. If it goes down, the CAPPED cylinder is bypassing
8. Repeat steps 1-6 on the other side - it is possible to have two cylinders bypassing

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 – in the in-transit position with all cylinders retracted
- Lift Arm (if equipped) – is fully retracted

The oil level in the tank must be kept between the low and full marks as indicated on the sight gauge.

MAINTENANCE & ADJUSTMENT

Check Oil Level

Check the hydraulic oil level (after warming up the oil) daily or every eight (8) hours, whichever comes first. All cylinders must be collapsed for an accurate oil level reading.

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

Hydraulic Tank Nomenclature

The oil tank is mounted behind the chassis cab.

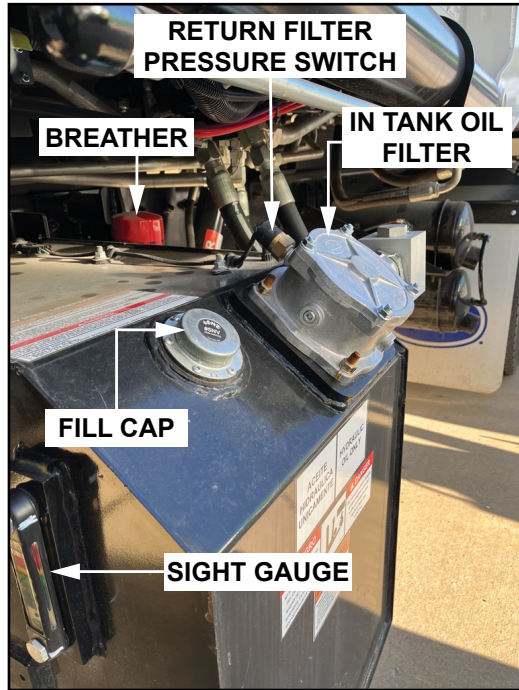


Figure 97.

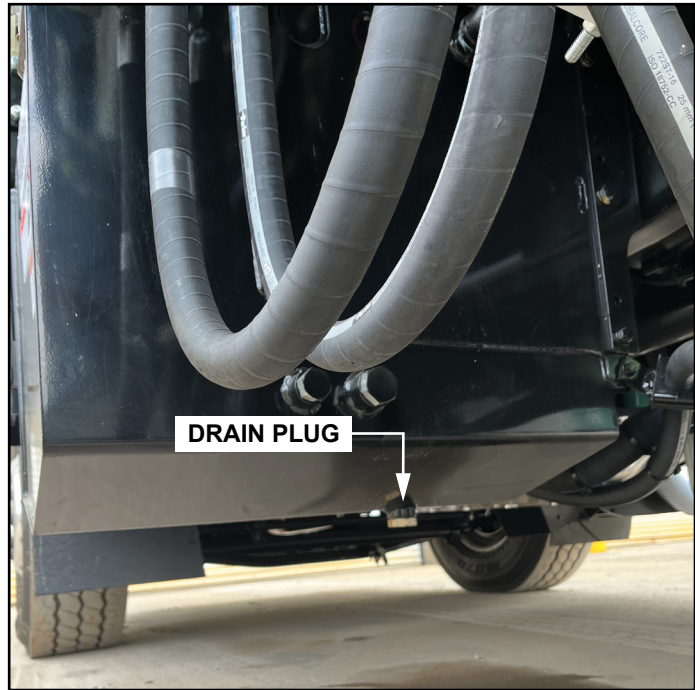


Figure 98.

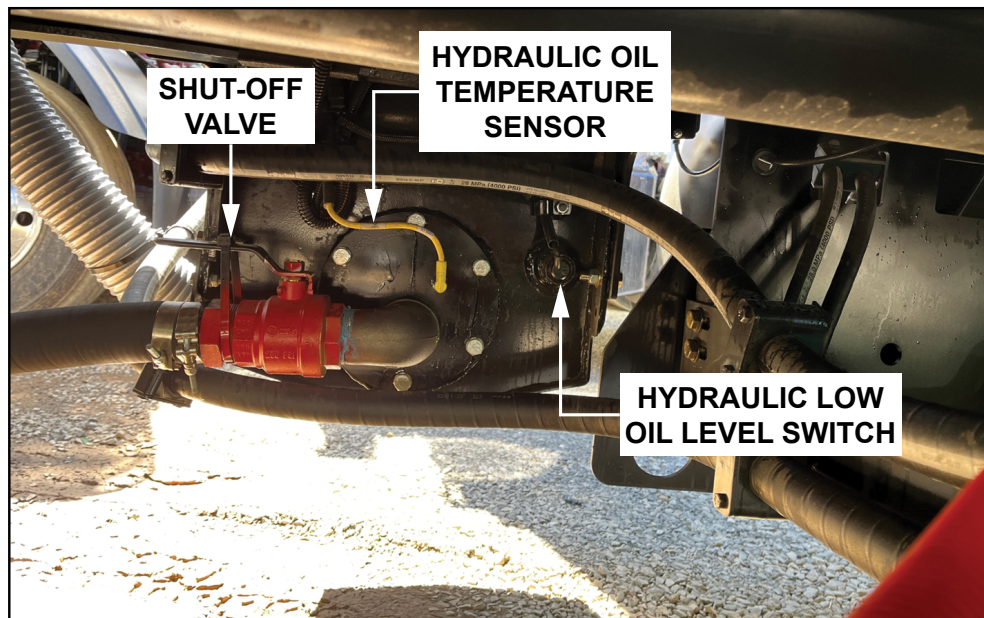


Figure 99.

MAINTENANCE & ADJUSTMENT

When To Change Oil Filter Element

Change the filter more often under certain conditions, such as a highly 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 **Heil Service Shack**.

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 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.
9. Verify work completed. Refer to the "Filter Bypass Explanation & Reset Instructions" on page 83.

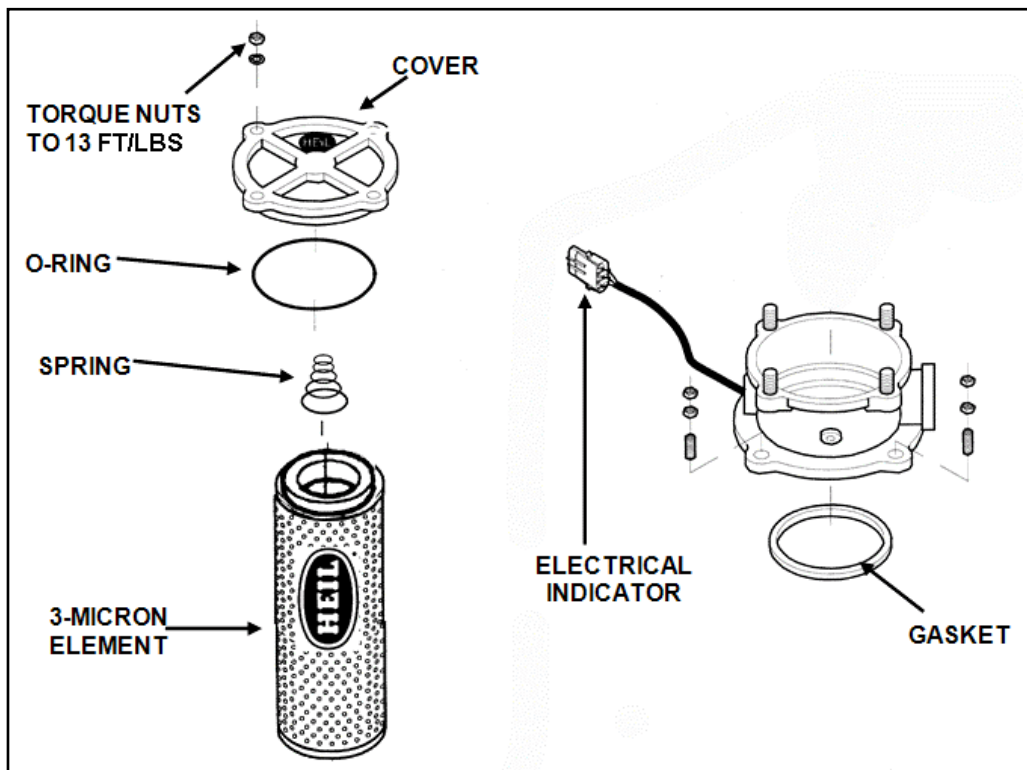


Figure 100.

MAINTENANCE & ADJUSTMENT

Filter Bypass Explanation & Reset Instructions

A. Understanding Filter Bypass:

A filter pressure switch is installed on the return filter housing and is wired normally closed when the ignition is ON. When the filter status is normal, the signal (input) to the controller remains ON.

If the pressure switch detects 30 psi of back pressure, it indicates that the filter is clogged and requires replacement (assuming no component malfunction). At 30 psi or greater, the switch opens the circuit, causing the controller input to be lost. This condition triggers a filter bypass warning.

When in this condition, the filter warning light blinks once for each hour in bypass. For example, after four hours, the light will blink four times, pause, and repeat. The blinking stops when the filter is changed.

NOTE: Usually, there is sufficient time to continue the route and complete the shift.

After 6 hours have passed, the system turns off the hydraulic pump. The operator must turn off the system power button, then turn it on again, and press the hydraulic pump ON button to regain hydraulic function. After every 3 minutes, this will continue to happen. At this point, the system will not reset automatically after a filter change. It will require a technician to change the filter and then reset the system.

B. Resetting the System:

NOTICE

The following three conditions **MUST** be met for the filter change warning to reset. Additionally, the filter warning will reset automatically after keeping the three conditions as described below for a total of 15 minutes.

1. The engine must be running.
2. Pump should be enabled in the controller.
3. The input for filter pressure switch must be on in the input screen of the display.

NOTE: In some cases, the chassis may automatically shut off the engine. The technician can restart the engine, turn the pump back on, and the system will continue the 15-minute count

NOTE: If a malfunction occurs—such as a failed pressure switch, broken input wire, or loss of ignition power to the pressure switch—the system will not reset because a required reset condition is missing. In this case, the system must be troubleshooted to identify and correct the issue. Once the issue is corrected, perform the reset procedure.

Drain & Clean The Hydraulic Oil Tank

Change the hydraulic oil according to the applicable service intervals.

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.

⚠ WARNING

Make sure the unit is in “**Lock-Out/Tag-Out Procedure**” on **page 12** before performing maintenance, service procedures, entering the hopper, climbing on the body, or on equipment. Equipment can be operated when the unit is not in Lock-Out/Tag-Out. Operating equipment while conducting maintenance, entering the hopper, or climbing in or on the body can lead to **SERIOUS INJURY** or **DEATH** if the unit is not in Lock-Out/Tag-Out.

NOTICE

If your employer or company has a Lock-Out/Tag-Out procedure that is different from the following procedure, use your employer's or company's procedure. If your employer or company does not have a Lock-Out/Tag-Out procedure, refer to the “**Lock-Out/Tag-Out Procedure**” on **page 12**.

MAINTENANCE & ADJUSTMENT

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

1. Perform the “**Lock-Out/Tag-Out Procedure**” on **page 12**. If you have any questions about the Lock-Out/Tag-Out procedure, please contact your supervisor or Heil Technical Service.
2. Disengage the pump, shut off the engine and remove the ignition key.
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 Hydraulic Oil Filter Element**” on **page 82**.
8. Remove the outlet flange and 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 suction strainer into the tank.
11. Install the drain plug in the tank bottom.
12. Reconnect and tighten all hose connections that were disconnected.

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**” on **page 14**.
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. With the packing panel in the retracted position and lift in the in-transit position, check tank oil level. If necessary, add recommended oil as described under “**Preparing The Unit To Check The Oil Level**” on **page 80**.

Purge The Hydraulic System

If a catastrophic hydraulic component failure occurs, the hydraulic system must be flushed entirely. Remove the in-tank filter assembly cover and inspect the return oil filter and magnets to identify a catastrophic component failure. If the return filter has metal debris or the magnets are full of shavings, perform a complete hydraulic system flush to prevent future failures due to oil contamination.

To purge the system, follow these steps:

1. Completely retract all cylinders to remove as much oil as possible, directing it into the hydraulic reservoir.
2. Completely drain the hydraulic reservoir and discard the in-tank filter.
3. Remove all debris from the filter magnet of the unit’s in-tank filter assembly.
4. Remove the hydraulic reservoir outlet flange and suction strainer.
5. Clean the hydraulic reservoir by removing all dirt and debris from the bottom of the tank. Rinse and clean the tank with a nonflammable cleaning solvent.
6. Remove, thoroughly clean, and reinstall the suction strainer, outlet flange, drain plug, system magnets, etc.
7. Reassemble the in-tank return filter assembly using a new OEM replacement filter

MAINTENANCE & ADJUSTMENT

8. Remove the suction line from the pump and thoroughly clean the entire length of the inside of the suction line from the pump to the connection at the hydraulic reservoir.
9. Replace the failed hydraulic component that has introduced the contamination into the system.

NOTICE

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

10. Fill the hydraulic reservoir with clean hydraulic oil
11. Make sure the suction line shut-off valve is in the on position. Secure the handle with a plastic zip tie to prevent the valve from closing due to vibration or being inadvertently closed.
12. Double-check the routing of all lines and verify that all fittings, flanges, and covers are properly installed and tight.
13. Start the vehicle and turn the pump on.
14. Run each hydraulic function at engine idle "only." Operate each hydraulic function through one complete cycle to flush any residual contaminated oil from hydraulic cylinders. A complete cycle consists of operating a cylinder to its full extended position and retracting it to the completely collapsed position.
15. After cycling the cylinders as described, remove the filter cover and inspect the filter magnets. If the magnets are covered with metal, replace the filter element, clean the magnets, and reinstall the filter cover.
16. Operate each hydraulic function through a complete cycle at least ten times at engine idle.
17. Remove the filter cover and inspect the magnets. If the magnets are clean, proceed to step 21. If the magnets are covered with metal, repeat steps 18 through 20.
18. At engine throttle, operate each hydraulic function (except the packer) through a complete cycle at least ten times. Operate the packer to the full eject position at engine throttle and back at engine idle.
19. Install a new OEM in-tank hydraulic filter and reinstall the filter cover.
20. Check the hydraulic system for leaks.
21. Run the unit for 40 hours and recheck the hydraulic filter and system magnets for debris. Service the hydraulic filter and magnets as needed.

Pressure Adjustments

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 and fork operation.
2. MAKE SURE the unit is on flat, stable ground and apply the parking brake and chock the wheels.
3. Notify anyone in area that the arms and forks will be operated during this procedure.
4. Make sure unit is full of hydraulic oil.
5. Make sure Hydraulic oil is at least 100°F before beginning any pressure checks or adjustments.
 - a. If unit oil is not at desired temperature, engage the hydraulic pump.
 - b. Activate and hold the tailgate lock function for two minutes.
 - c. After two minutes release tailgate lock function and cycle the packer/ejector circuit to mix the hot oil.
 - d. Repeat steps (b) and (c) until oil is at desired temperature.

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.

WARNING

The hydraulic fluid may be under pressure and may spray while you open the connection. Hydraulic fluid may 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.

MAINTENANCE & ADJUSTMENT

NOTICE

This procedure requires two properly trained technicians, one to operate the controls from within the cab while the other will be working on the pressures settings from the street side of the unit.

NOTICE

The unit must remain in neutral during all pressure setting procedures.

B. Valve Locations

The main body valve is located under the body on the street side.

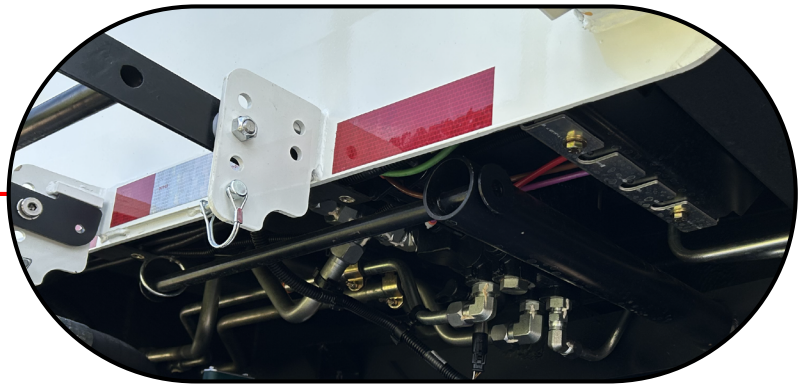
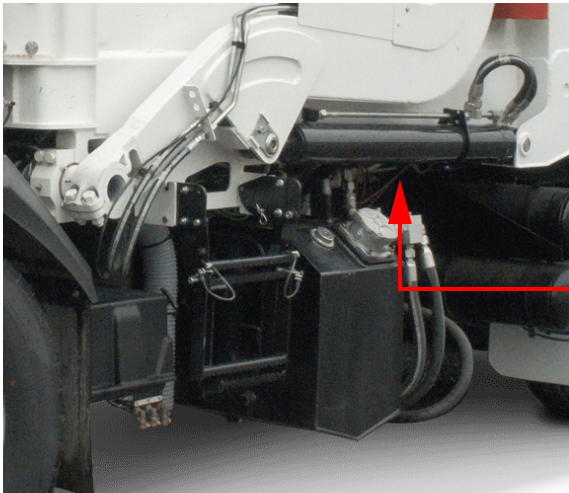


Figure 101.

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 on the street side.

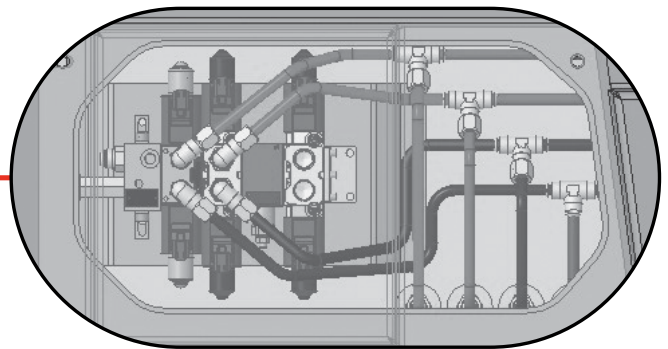


Figure 102.

MAINTENANCE & ADJUSTMENT

C. Pressures & Cycle Times

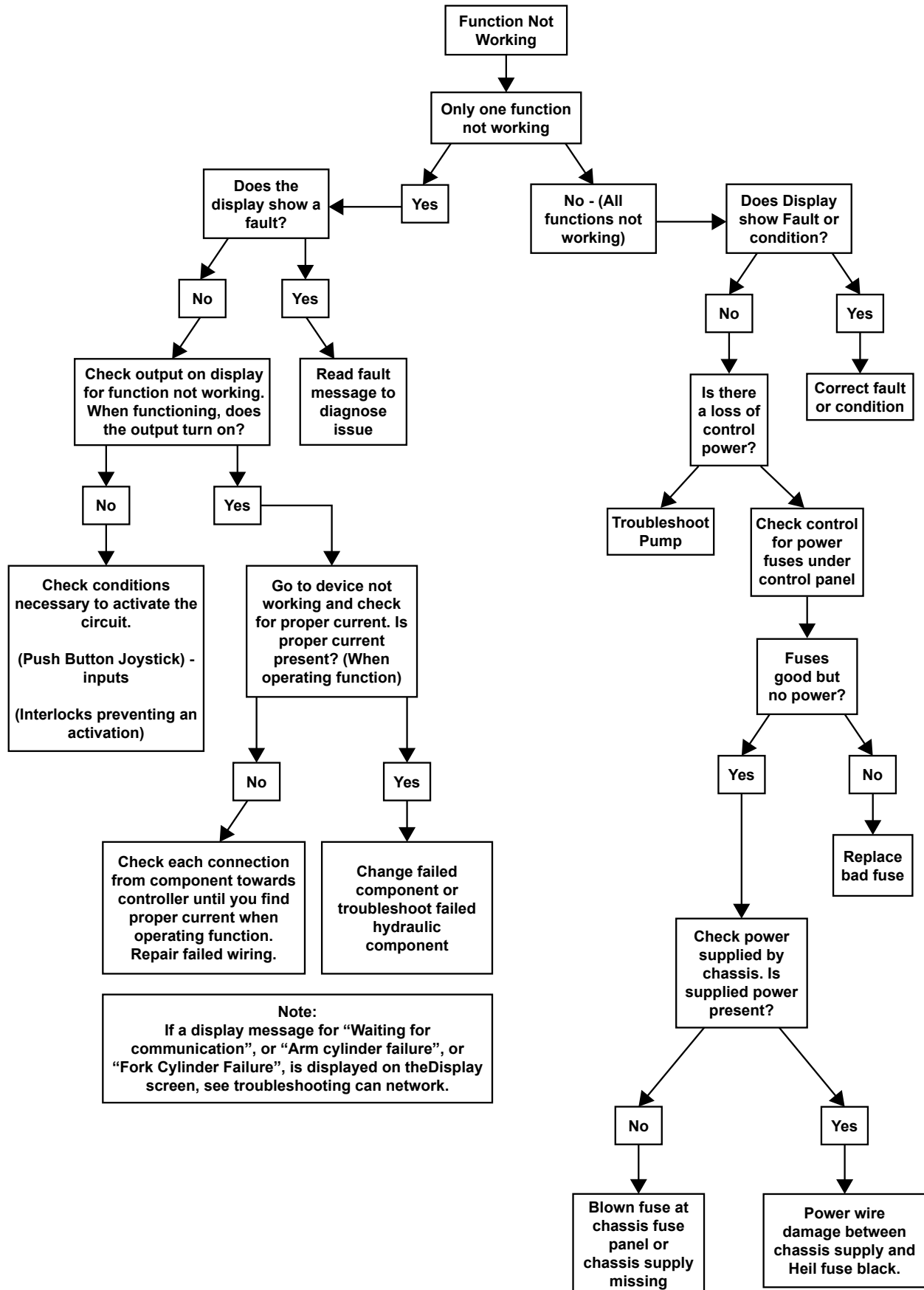
			Diesel
HYDRAULIC PRESSURE	UNDERBODY VALVE	MAIN RELIEF@1200 ENGINE RPM	2500 PSI
		PACKER EXTEND	STANDARD: 2650 PSI SIERRA: 2650 PSI
		PACKER RETRACT	2650 PSI
		ARMS UP	NO CIRCUIT RELIEF
		ARMS DOWN 8000# ARMS	1250 PSI
		FORKS UP	NO CIRCUIT RELIEF
		FORKS DOWN	NO CIRCUIT RELIEF
		AUXILIARY SECTION-TAILGATE VALVE SUPPLY	2500 PSI
		AUXILIARY SECTION-OPTION VALVE SUPPLY - SEE NOTE 3	2500 PSI
	TAILGATE VALVE	TOP DOOR CLOSE	725 PSI (Protection Pressure)
		TOP DOOR OPEN	580 PSI
		TAILGATE OPEN	1300 PSI
		TAILGATE CLOSE	1300 PSI
		TAILGATE UNLOCK	2500 PSI
		TAILGATE LOCK	2500 PSI
FUNCTION CYCLE TIMES		AUTOPACK CYCLE TIME @ 25 GPM	20-23 sec
		ARM ONLY CYCLE TIME -8000# ARMS @ 25 GPM	17-19 sec @ ENGINE IDLE
		STANDARD TAILGATE AND CNRG® TAILGATE	RAISE 14-25 sec LOWER 14-17 sec
		TOP DOOR CYCLE TIME	CLOSE 12-18 sec OPEN 26-32 sec

- 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.
 - 5: Cycle Times based on 700 RPM at idle except Autopack @ 1200 RPM

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

MAINTENANCE & ADJUSTMENT

Troubleshooting Electrical



MAINTENANCE & ADJUSTMENT

Packer/Ejector Panel Adjustment

See “Arc Sensor Calibration” on page 92.

Packer Position Sensor

NOTICE

Proper maintenance of the packer panel and ejector panel is important to the overall operation of the unit. Failure to maintain proper adjustment may affect payloads and/or cause structural damage to the unit.

The packer sensor is called an “ARC” Sensor and detects the position of the packer.

A. Functionality

1. As the packer moves, a striker attached to the rod eye of the curbside packer cylinder moves across the sensor, then sensor sends a signal back to the controller to show its position.

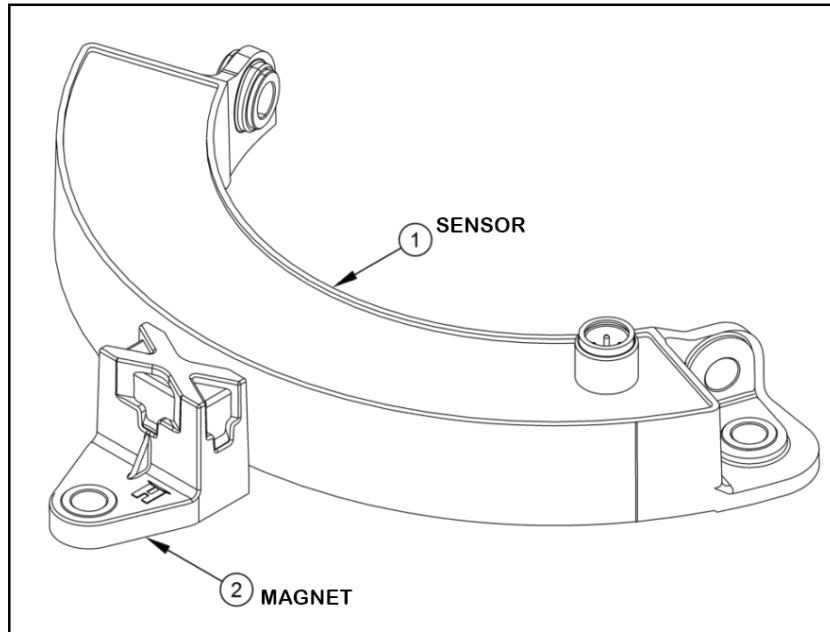


Figure 103. Arc Sensor

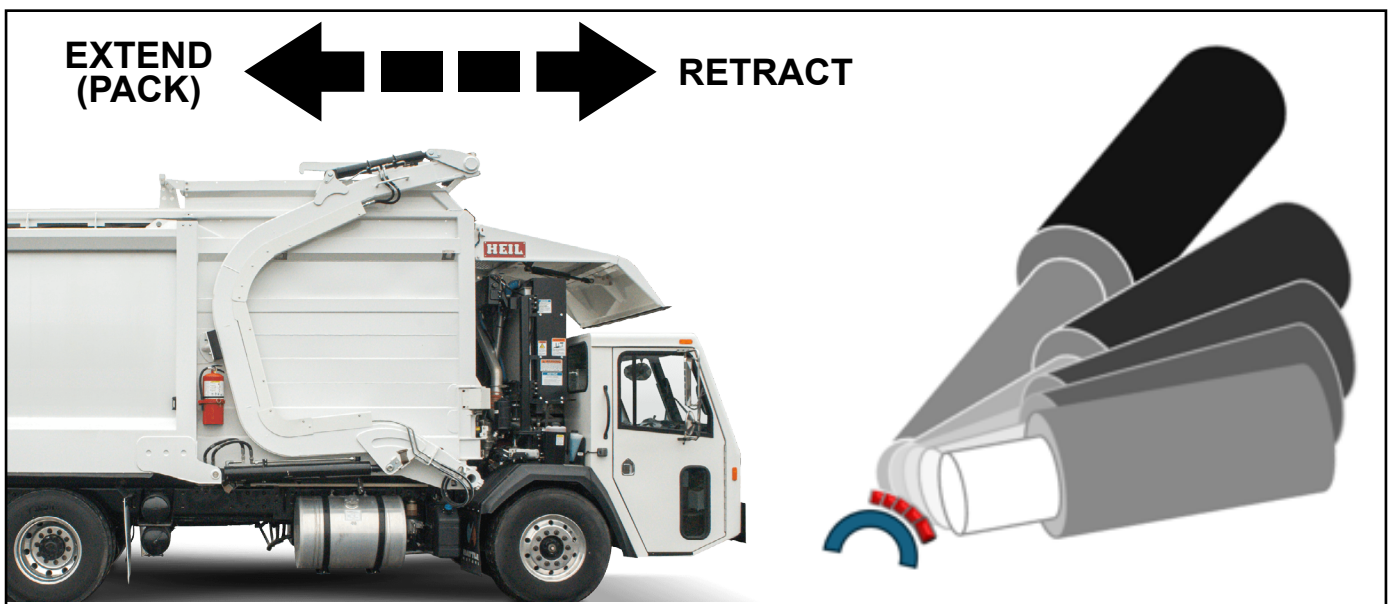


Figure 104.

MAINTENANCE & ADJUSTMENT

B. Troubleshooting

Use the following details to assist with troubleshooting the arc sensor.

1. Pin Positions: Heil uses pins 1, 2, and 3 ONLY.

- **Pin 1 = Supply Voltage 9 to 24 VDC**
- **Pin 2 = Output 0.5V – 4.5V**
- **Pin 3 = GND**
- **Pin 4 = Output 4.5V-0.5V**

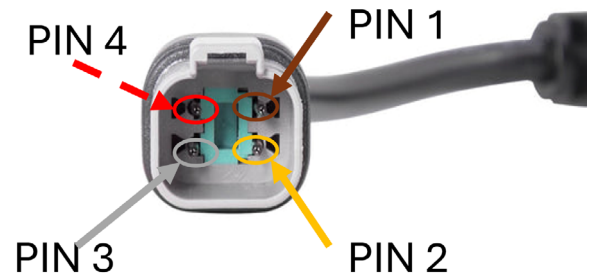


Figure 105. Arc Sensor Pin Locations

2. Voltage Readings:

- White wire - 0V ground
- Brown wire - Between 10.5 VDC and 14.6 VDC
- Yellow wire:
 - Home position - around 3.5 VDC
 - Pack position - a little less than 2 VDC
 - Travel position - around 1.75 VDC
 - Full extend position - around 1 VDC

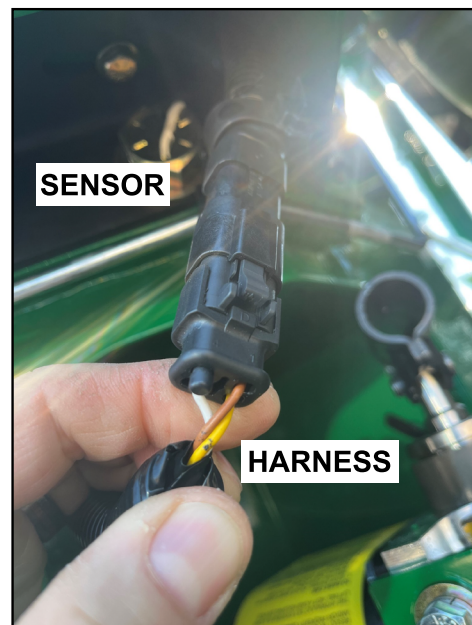


Figure 106. Arc Sensor Harness

3. Schematics:

Note: The schematic numbers shown in the images below can be used as a reference.

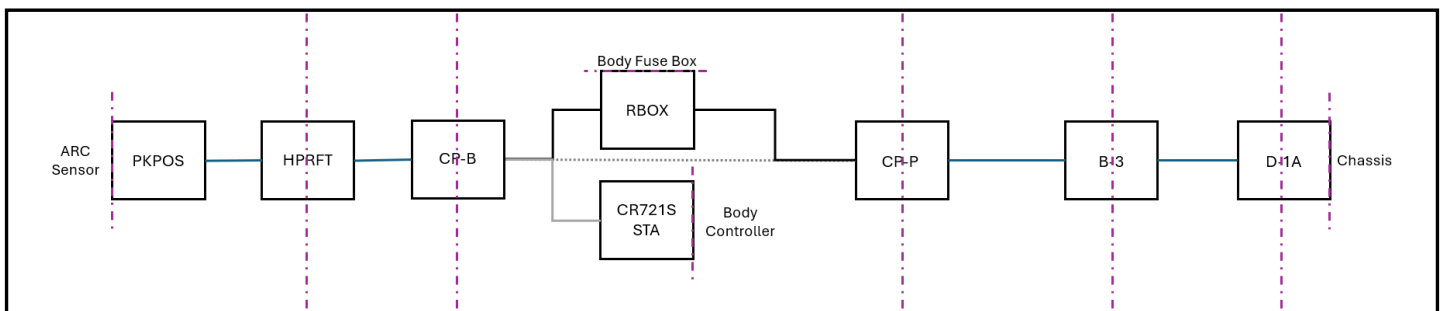


Figure 107. Basic Schematic

MAINTENANCE & ADJUSTMENT

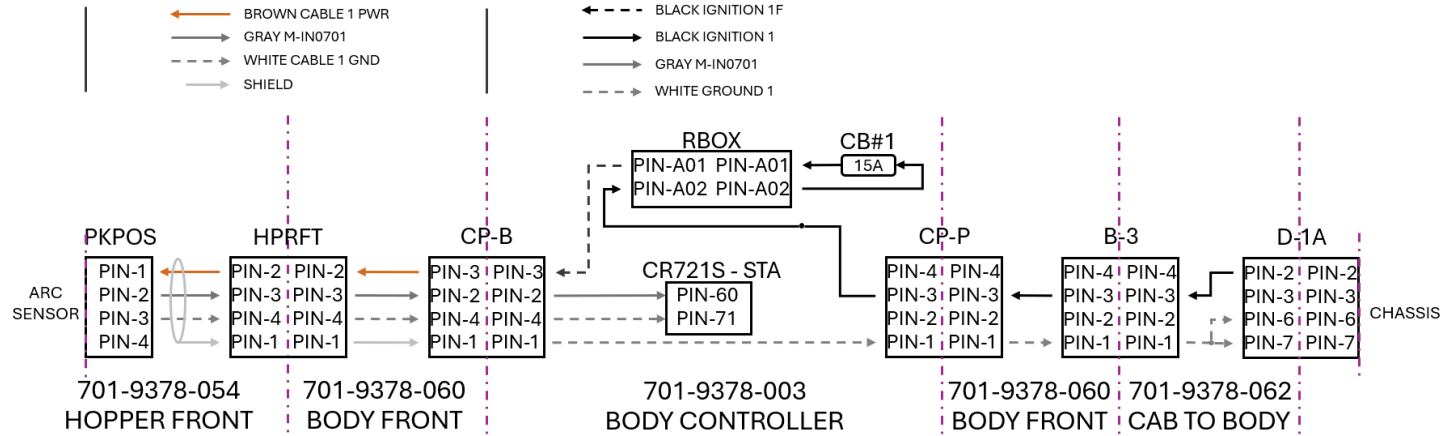


Figure 108.

C. Arc Sensor Guidelines

When replacing the curbside pack/eject cylinder, the magnet bracket needs to be repositioned. The magnet must be reinstalled with the correct air gap.

Use the images below as reference for the proper location for each position.

Note: Once it is calibrated, no adjustment is needed unless it fails. Then, the new sensor will need to be calibrated.



Figure 109. Magnet Holder Location on Cylinder Rod Eye

MAINTENANCE & ADJUSTMENT

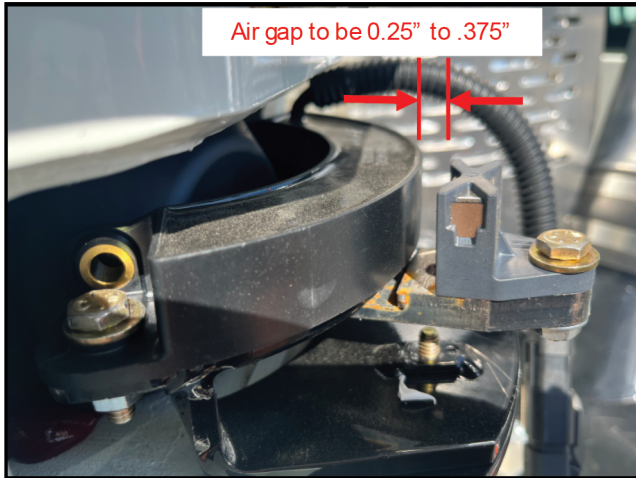


Figure 110. Air Gap Measurement



Figure 111. Home Position Retracted



Figure 112. Travel Position Extended



Figure 113. Eject Position Fully Extended

Arc Sensor Calibration

Arc Sensor Calibration may be needed when the arc sensor for the packer is changed and needs to be calibrated.

Calibration should be performed annually ONLY by properly trained and authorized service personnel. This procedure requires a password to place the unit in calibration mode.

The password can be provided to authorized service personnel by contacting Heil Technical Services at 866-310-4345.

NOTICE

The forks must be empty when performing calibration.

NOTICE

The arm and packer will move very slowly in calibration mode.

MAINTENANCE & ADJUSTMENT

1. Enter the password provided by Heil services.

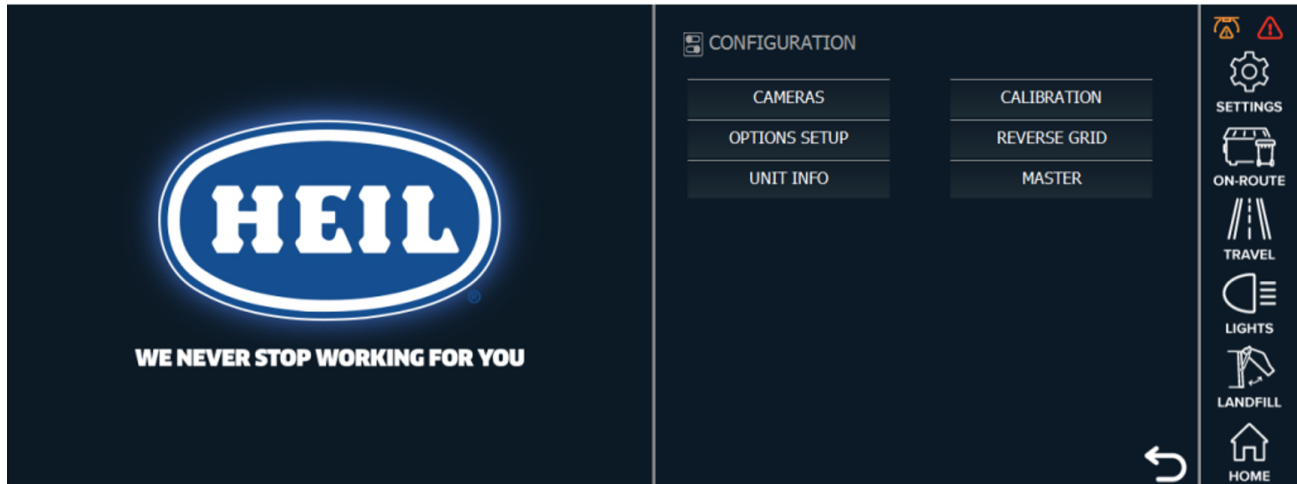


Figure 114.

2. Move packer to full retract position. Then press and hold the Set Packer Home Position icon for 1 second. Then press Next.

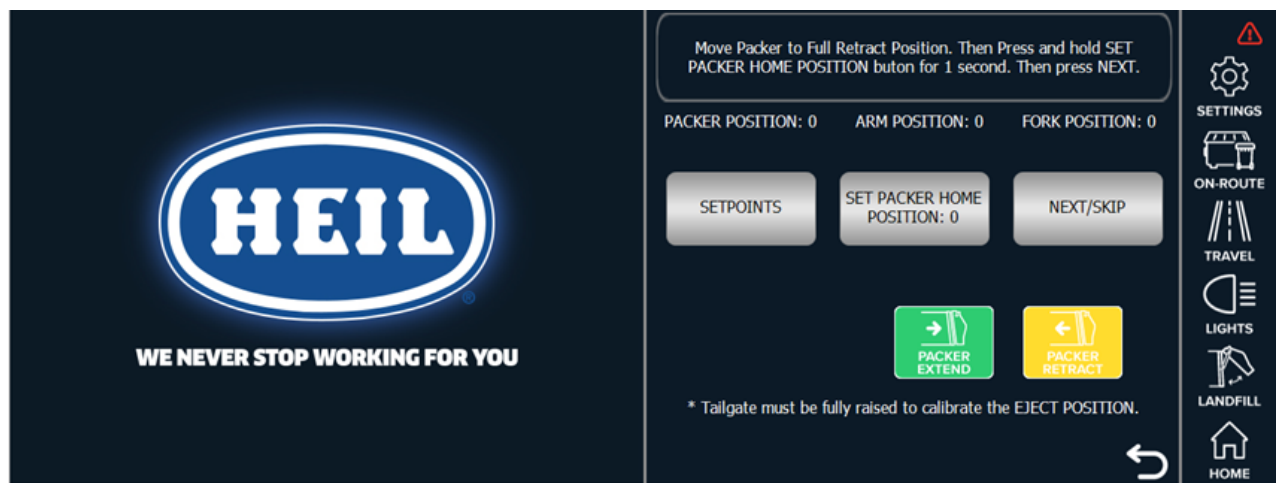


Figure 115.

3. Move packer to pack position. Then press and hold Set Pack Position icon for 1 second. Then press Next.

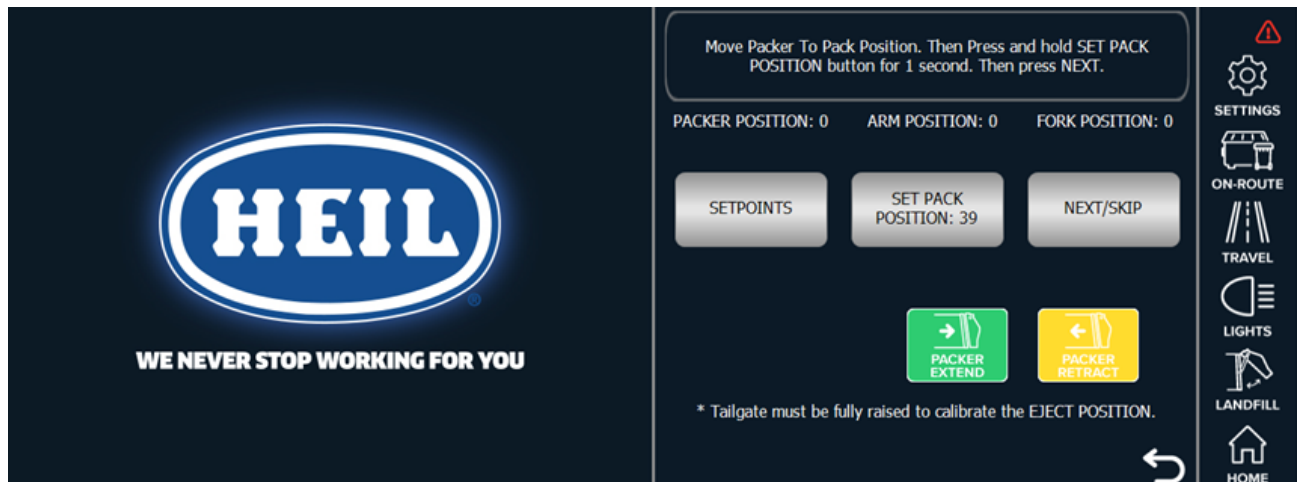


Figure 116.

MAINTENANCE & ADJUSTMENT

4. Move packer to travel position. Then press and hold Set Travel Position icon for 1 second. Then press Next.

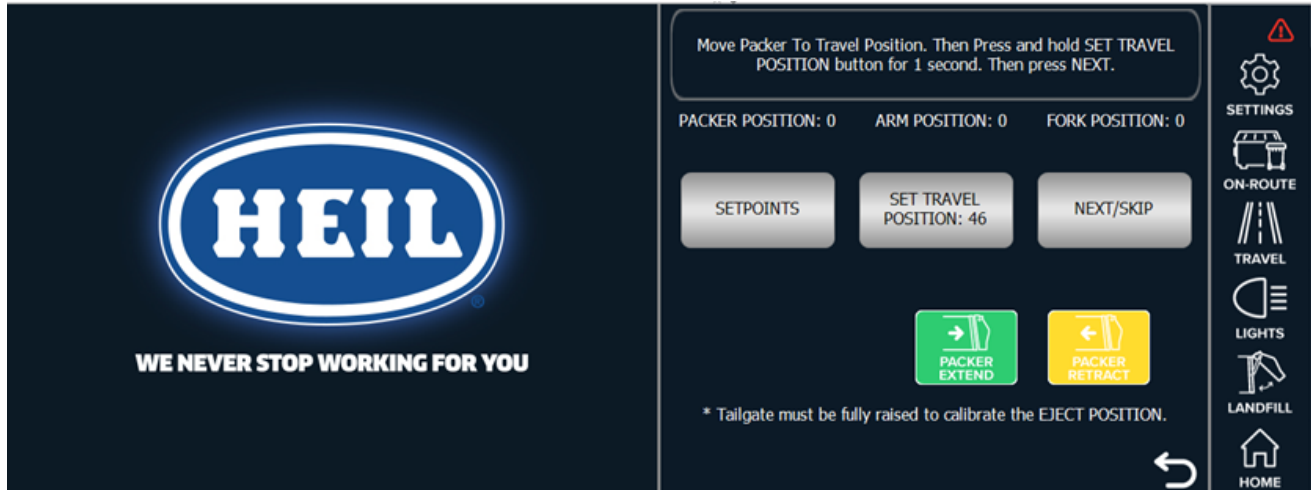


Figure 117.

5. Move packer to eject position. Then press and hold Set Eject Position icon for 1 second. Then press Next.

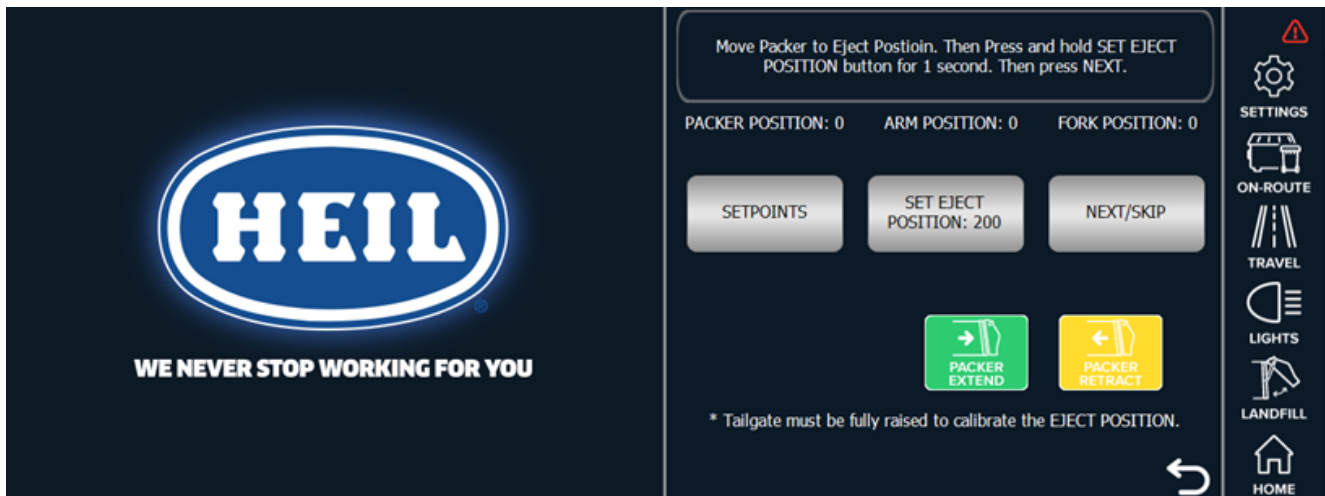


Figure 118.

6. Move packer midway between pack extend and full retract and press Next.

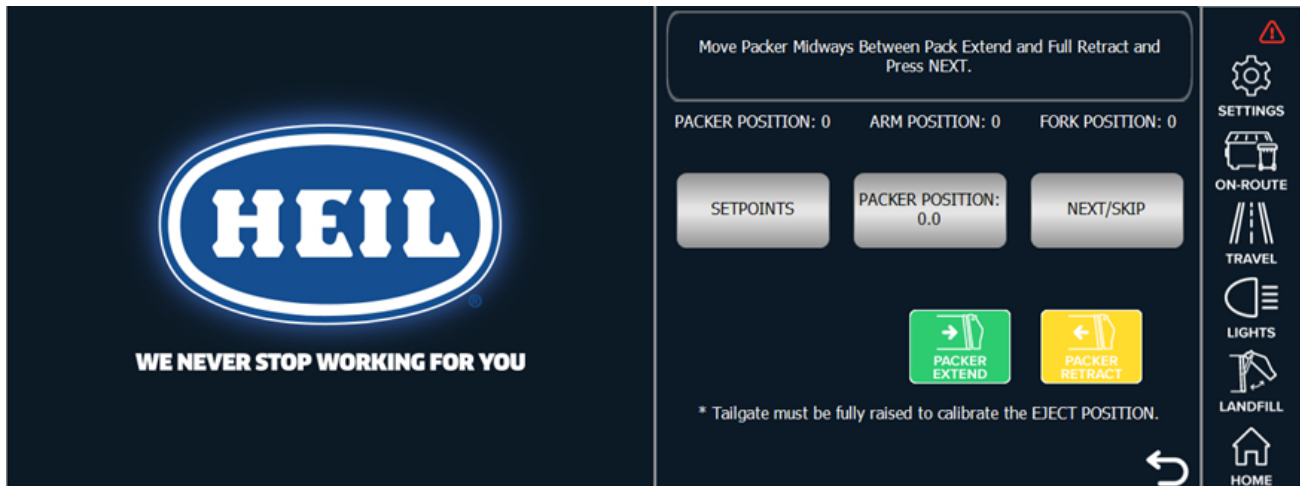


Figure 119.

MAINTENANCE & ADJUSTMENT

7. Press and hold Pack Extend icon. When current stops increasing press and hold Set Pack Ext Min Current icon for 1 second. Then press Next.

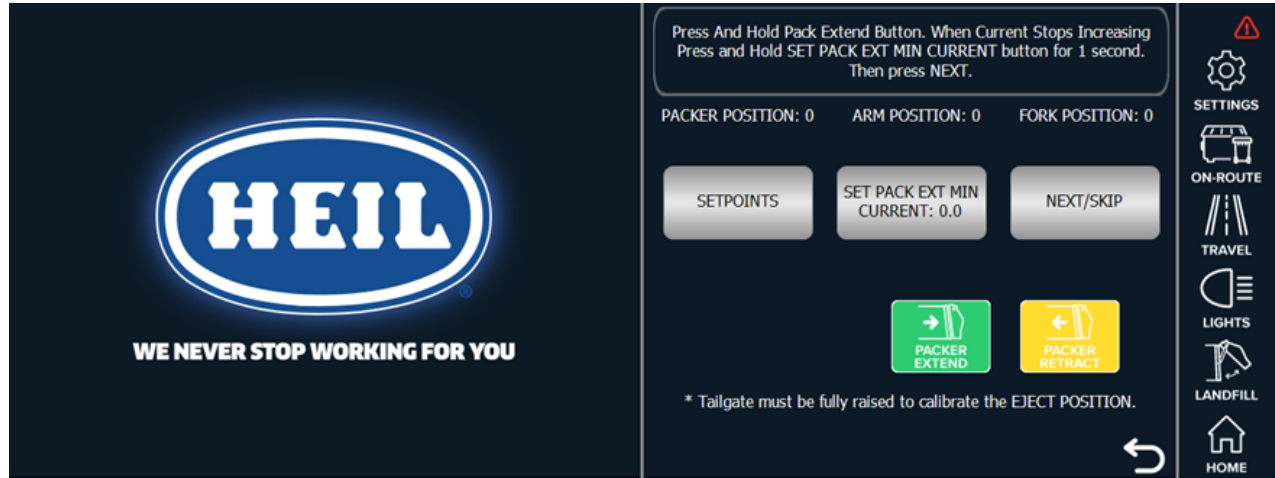


Figure 120.

8. Press and hold Pack Retract icon. When current stops increasing press and hold Set Pack Ret Min Current button for 1 second. Then press Next.

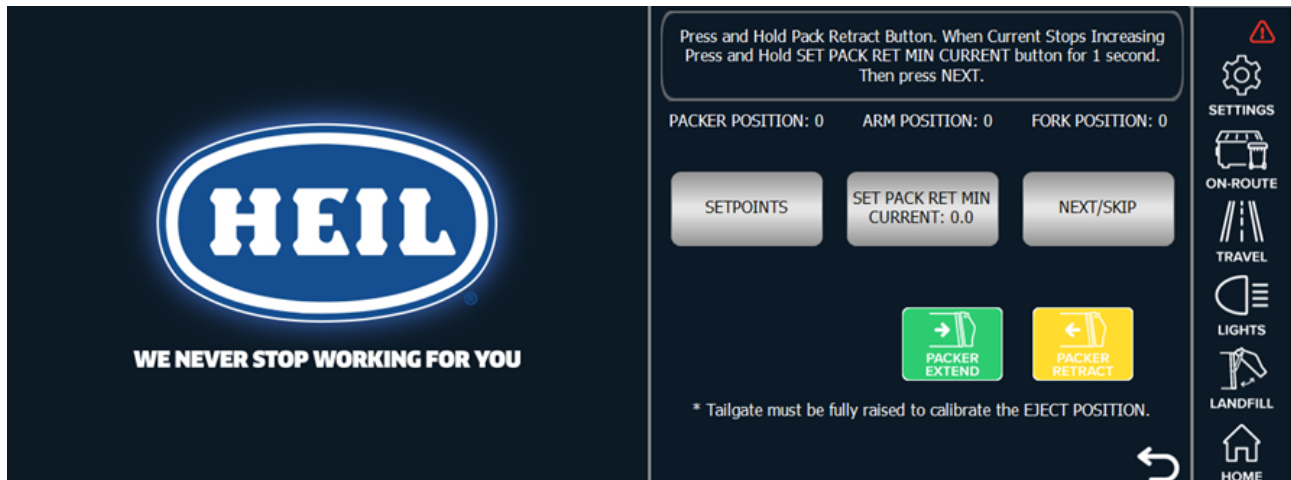


Figure 121.

9. Calibration complete! Move packer to home position.

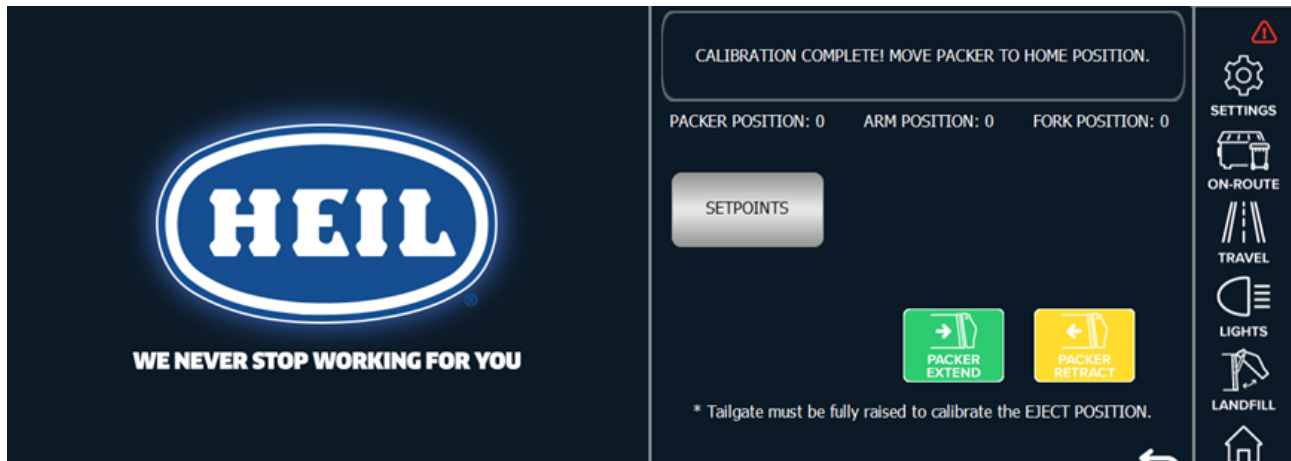


Figure 122.

SECTION 5

CONTROLLER HARDWARE

CONTROLLER HARDWARE

Controller Locations

The 124 I/O Controller is located midway within the street side of the body behind a steel cover.
The 37 I/O Controller is located in the cab (location varies by chassis):

- 1. Behind the seat (street side).
- 2. In the doghouse attached to the floor.
- 3. Behind the seat (curb side).



Figure 123. Controller Locations

Body Controller

32-bit CPU TriCore processor, 124 inputs/outputs, 4 CAN interfaces & Ethernet interfaces.

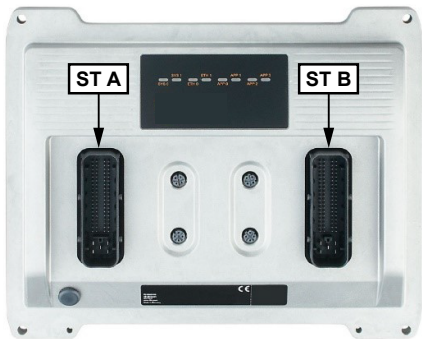


Figure 124. PN: 254-4954

Feature	Heil Body Controller PN: 254-4954
Number of Inputs	68
Number of Outputs	56
Number of Output Groups	6 (supplied via VBB0...5)

NOTICE

Do not open the Controller housing. There are no serviceable parts within the Controller housing. Send the Controller to The Heil Co. for repair or programming.

The ST A and ST B are keyed specifically and the connections are not interchangeable.

CONTROLLER HARDWARE

Operating States System				
LED SYS0		LED SYS1		System State
Color	State	Color	State	
-	Off	-	Off	No Operating Voltage
Green	5 Hz	-	Off	No Operating System Loaded
Red	On	-	Off	Hardware Error (Fatal Error+)
Red	On	Red	On	System Error (Fatal Error)
Green/Yellow	2 Hz	Green/Yellow	2 Hz	Update

Operating States PLC/Application				
LED	Color	State	Description	
SYS0	Green	On	Standard PLC	No Application
		2 Hz		Run
	Red	10 Hz		Error Application (Serious Error)
	Yellow	2 Hz		Debug Run
		On		Debug Stop
	Blue	On		Sleep Mode
SYS1	Green	On	Safe PLC	No Application
		2 Hz		Run
	Red	10 Hz		Error Application (Serious Error)
	Yellow	2 Hz		Debug Run
		On		Debug Stop
ETH0	Green	Flashing	Data Transmission Ethernet	
		On	Ethernet Connection Ok, No Data Transfer	
ETH1	Green	Flashing	Data Transmission Ethernet	
		On	Ethernet Connection Ok, No Data Transfer	
APP0 APP3	Red	On	Status Display of the Application, Freely Programmable	
	Green	On	Status Display of the Application, Freely Programmable	
	Blue	On	Status Display of the Application, Freely Programmable	

CONTROLLER HARDWARE

Body Controller Connectors

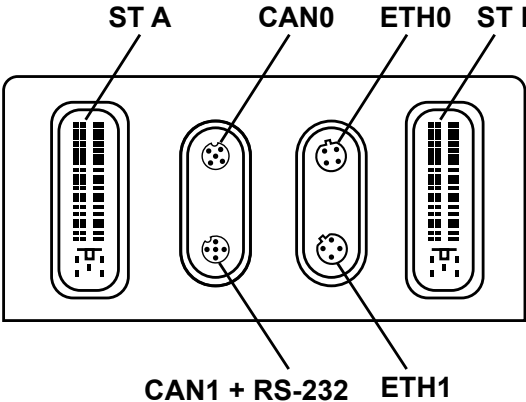
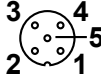
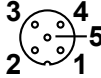
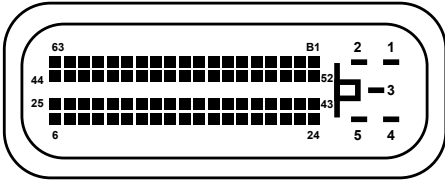
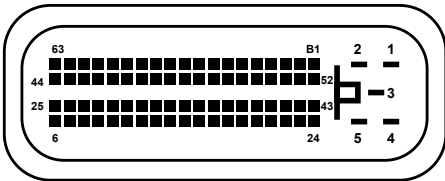
Connectors		
CAN0	M12 socket, 5 poles, A-coded 1: not used 2: not used 3: GND_COM 4: CAN0_H 5: CAN0_L	
CAN1 +RS-232	M12 socket, 5 poles, A-coded 1: RS-232_TxD 2: RS-232_RxD 3: GND_COM 4: CAN1_H 5: CAN1_L	
ETH0 / ETH1	M12 socket, 4 poles, D-coded 1: TxD+ 2: RxD+ 3: TxD- 4: RxD-	
ST A	AMP, 81 poles, A-coded 1-81: see wiring ST A	
ST B	AMP, 81 poles, B-coded 1-81: see wiring ST B	

Figure 125.

CONTROLLER HARDWARE

Cab Controller

32-bit CPU TriCore processor, 37 inputs/outputs, 4 CAN interfaces & Ethernet interfaces



Figure 126. PN: 254-4961

Feature	Heil Body Controller PN: 254-4961
Number of Inputs	32
Number of Outputs	28
Number of Output Groups	3 (supplied via VBB0...2)

Operating States System				
LED SYS0		LED SYS1		System State
Color	State	Color	State	
-	Off	-	Off	No Operating Voltage
Green	5 Hz	-	Off	No Operating system Loaded
Red	On	-	Off	Hardware Error (Fatal Error+)
Red	On	Red	On	System Error (Fatal Error)
Green/Yellow	2 Hz	Green/Yellow	2 Hz	Update

Operating States PLC/Application				
LED	Color	State	Description	
SYS0	Green	On	Standard PLC	No Application
		2 Hz		Run
	Red	10 Hz		Error Application (Serious Error)
	Yellow	2 Hz		Debug Run
		On		Debug Stop
	Blue	On		Sleep Mode
SYS1	Green	On	Safe PLC	No Application
		2 Hz		Run
	Red	10 Hz		Error Application (Serious Error)
	Yellow	2 Hz		Debug Run
		On		Debug Stop
ETH0	Green	Flashing	Data Transmission Ethernet	
		On	Ethernet Connection Ok, No Data Transfer	
ETH1	Green	Flashing	Data Transmission Ethernet	
		On	Ethernet Connection Ok, No Data Transfer	
APP0 APP3	Red	On	Status Display of the Application, Freely Programmable	
	Green	On	Status Display of the Application, Freely Programmable	
	Blue	On	Status Display of the Application, Freely Programmable	

CONTROLLER HARDWARE

Cab Controller Connectors

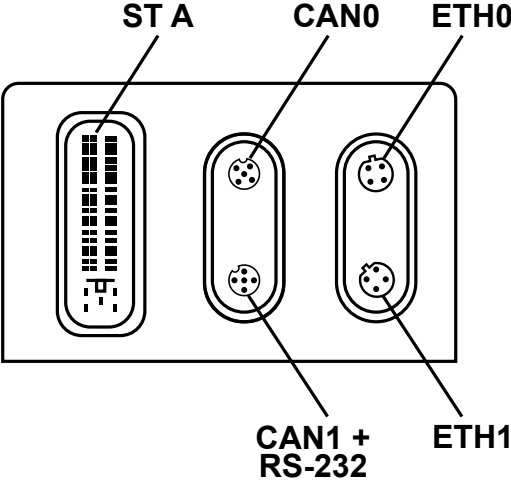
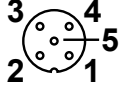
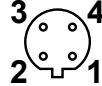
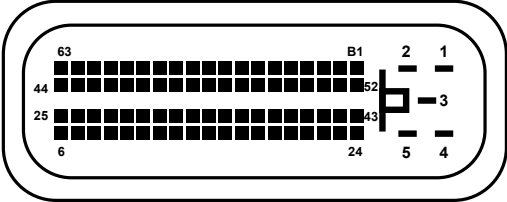
Connectors	
CAN0	M12 socket, 5 poles, A-coded 1: not used 2: not used 3: GND_COM 4: CAN0_H 5: CAN0_L 
CAN1 +RS-232	M12 socket, 5 poles, A-coded 1: RS-232_TxD 2: RS-232_RxD 3: GND_COM 4: CAN1_H 5: CAN1_L 
ETH0 / ETH1	M12 socket, 4 poles, D-coded 1: TxD+ 2: RxD+ 3: TxD- 4: RxD- 
ST A	AMP, 81 poles, A-coded 1-81: see wiring ST A 

Figure 127.

CONTROLLER HARDWARE

Controller Pin Number Diagram

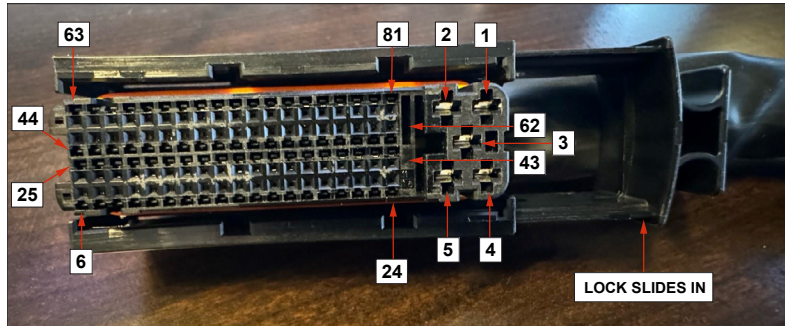


Figure 128. Heil Controller Female Pin Locations

Controller 81-Pin Cable Assembly

Refer to the following steps for assembly and connecting the controller cable.

A. Cable Parts Identification

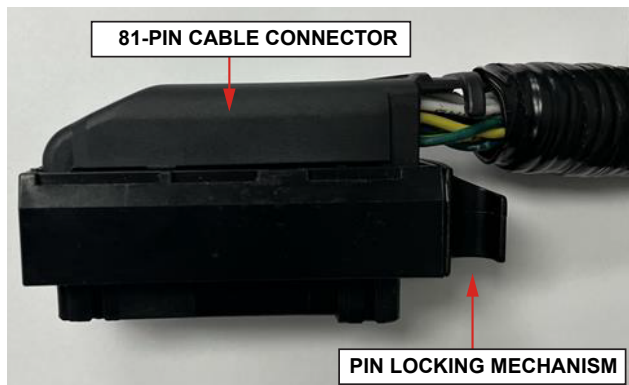


Figure 129.

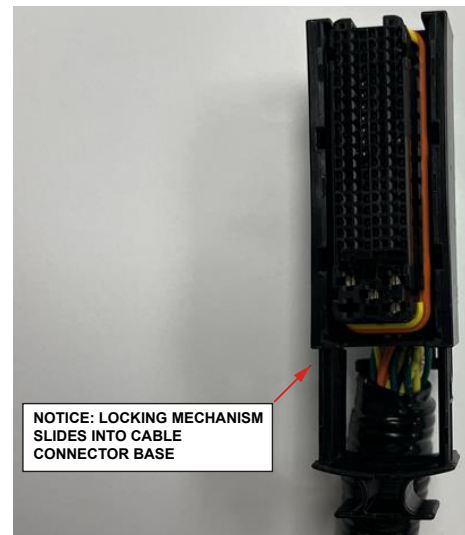


Figure 130.

B. Male and Female Controller Connector Close-Up View

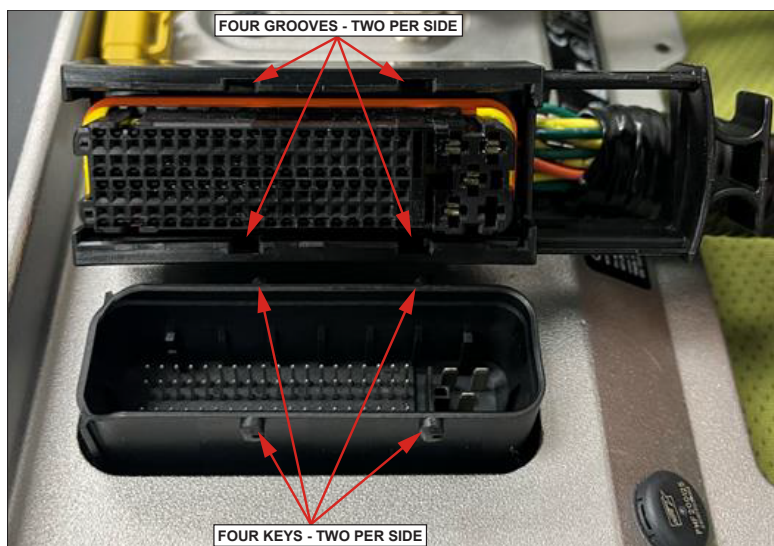


Figure 131. Connection Points

CONTROLLER HARDWARE

C. Connecting the 81-Pin Cable Connector

- 1. With the locking mechanism retracted, carefully align the keys and grooves then gently press down.



Figure 132.

- 2. Gently push the locking mechanism towards the base you hear a click and the connection is flush.



Figure 133.



Figure 134.

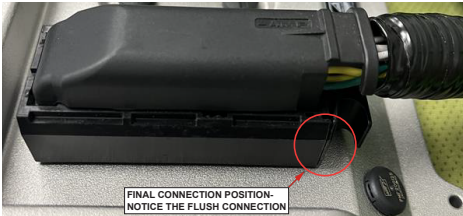


Figure 135.

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

In-Cab Display

64-bit Quad Core processor, 4 CAN interfaces, 2 Ethernet interfaces, 4 analogue video inputs (2 outputs / 2 inputs), 2 USB interfaces, program number 109-0375.



Figure 136. PN: 108-8790

Status LED	RGB LED, colors and states programmable by means of the application software		
Operating States (Factory Setting)	Paint	Status	Description
	-	off	No Operating Voltage
	Green	5 Hz	Loading Operating System
	Green	on	Executing Operating System
	Green	1 Hz	Shutting Down Operating System
	Orange	5 Hz	Loading Recovery System
Service Inputs on Power Up	Orange	on	Executing Recovery System
	Service0	Service1	Description
	0	0	Normal Start
	1	0	Setup
	0	1	Recovery App
	Note: 0 = GND and 1 = VBB		

CONTROLLER HARDWARE

Display Connector

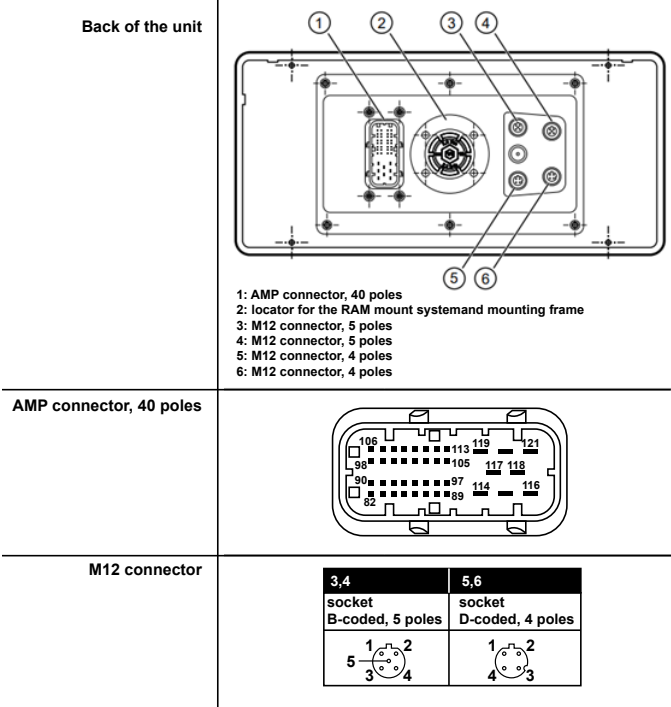


Figure 137.

Network Architecture

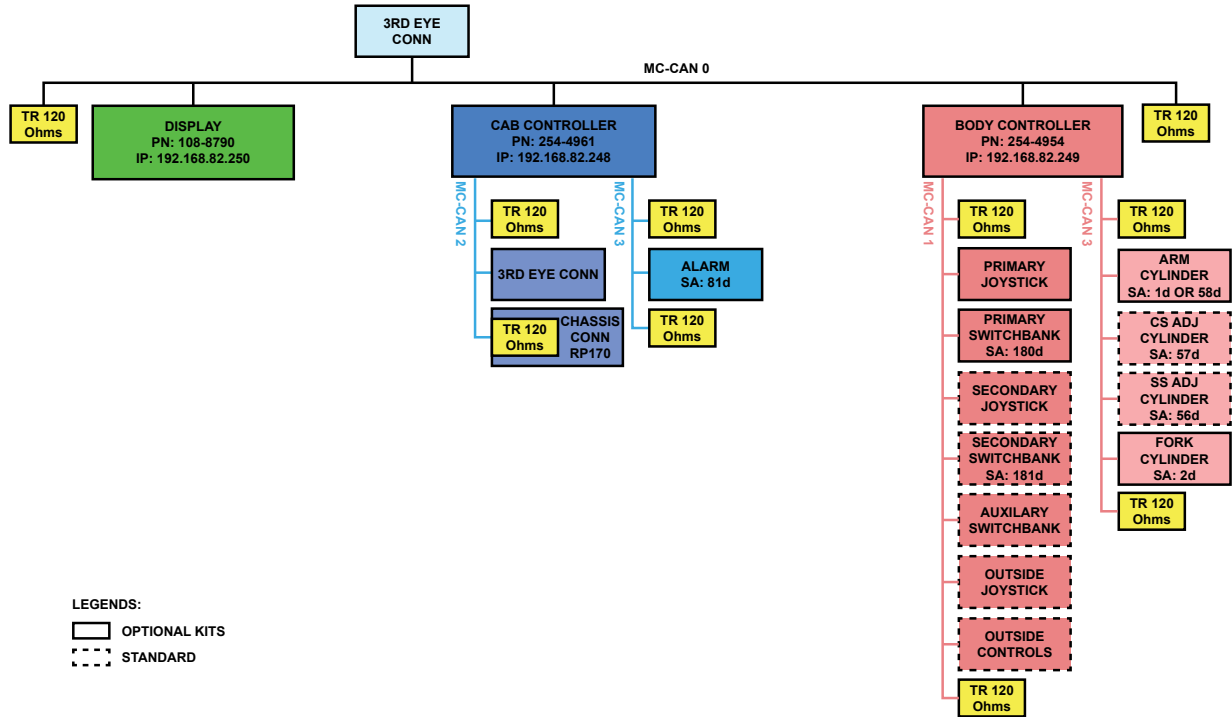
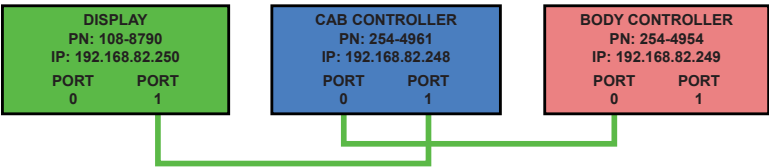


Figure 138. CAN Network Architecture



SECTION 6

CONTROLLER SOFTWARE

CONTROLLER SOFTWARE

Body (Main) Controller

MAIN CONTROLLER INPUTS					
Program Number			109-0416		
Wire Label	Connector ID	Pin #	Signal Name	Configuration	I/O Address
MC- CAN 0 L	ST A	48	Controller Network	CAN 0	
MC- CAN 0 H	ST A	49	Controller Network	CAN 0	
M - CAN 1 L	ST A	50	Joysticks/Switch Banks	CAN 1	
M - CAN 1 H	ST A	51	Joysticks/Switch Banks	CAN 1	
M - CAN 2 L	ST A	53	Chassis	Chassis Network	
M- CAN 2 H	ST A	54	Chassis	Chassis Network	
M- CAN 3 L	ST A	34	Arm Network	CAN 3	
M- CAN 3 H	ST A	35	Arm Network	CAN 3	
M- IN0000	ST A	25	Oil Tank Filter PSW	Digital Input, Active High	%IX2.0
M- IN0001	ST A	26	Oil Level	Digital Input, Active High	%IX34.0
M- IN0002	ST A	27	High Pressure Filter Body	Digital Input, Active High	%IX58.0
M- IN0101	ST A	64	R. Turn	Digital Input, Active High	%IX118.0
M- IN0102	ST A	65	L. Turn	Digital Input, Active High	%IX122.0
M- IN0103	ST A	66	Stop Brake	Digital Input, Active High	%IX126.0
M- IN0200	ST A	67	Tail	Digital Input, Active High	%IX130.0
M- IN0201	ST A	68	Reverse	Digital Input, Active High	%IX134.0
M- IN0202	ST A	69	Clear	Digital Input, Active High	%IX138.0
M- IN0300	ST A	44		Digital Input, Active High	%IX146.0
M- IN0400	ST A	46	Side Door PROX	Digital Input, Active High	%IX154.0
M- IN0500	ST A	40	Cab Protector Down Proximity	Digital Input, Active High	%IX162.0
M- IN0501	ST A	41	Arm Up PRX	Digital Input, Active High	%IX194.0
M- IN0502	ST A	42	Forks Tucked Proximity	Digital Input, Active High	%IX218.0
M- IN0503	ST A	43	Lift Below Transit Proximity	Digital Input, Active High	%IX250.0
M- IN0602	ST A	57	Top Door Open	Digital Input, Active High	%IX282.0
M- IN0701	ST A	60	Packer Position Sensor	Analogue Input, 0.5–4.5v	%IW146
M- IN0702	ST A	61	Body Valve Pressure Sensor	Analogue Input, 0.5–4.5v	%IW148
M- IN0901	ST A	39	Oil Tank Temp	Resistor Input, 842.7-1573.3ω	%IW158
M- IN1002	ST B	46	CNG Defuel Valve Closed Proximity	Digital Input, Active High	%IX378.0
M- IN1103	ST B	9	Tailgate Closed Proximity	Digital Input, Active High	%IX446.0
M- IN1600	ST B	36	Tailgate Locked Proximity SS	Digital Input, Active High	%IX610.0
M- IN1601	ST B	37	Tailgate Locked Proximity CS	Digital Input, Active High	%IX614.0

BODY CONTROLLER SOFTWARE

MAIN CONTROLLER OUTPUTS					
Program Number			109-0416		
Wire Label	Connector ID	Pin #	Signal Name	Configuration	I/O Address
M- OUT0000	ST A	16	Packer Retract	Digital Output, Active High/PWM Output	%QX2.0/%IW329
M- OUT0001	ST A	17	Top Door Close	Digital Output, Active High	%QX6.0
M- OUT0002	ST A	18		PWM Output	%IW335
M- OUT0004	ST A	20	Tailgate Unlock Sol	Digital Output, Active High	%QX18.0
M- OUT0005	ST A	21	Tailgate Lock Sol	Digital Output, Active High	%QX22.0
M- OUT0006	ST A	22	Arm Down	Digital Output, Active High/PWM Output	%QX26.0 /%IW347
M- OUT0007	ST A	23	Tailgate Lower	Digital Output, Active High	%QX30.0
M- OUT0008	ST A	24	Packer Extend	Digital Output, Active High/PWM Output	%QX34.0 /%IW353
M- OUT0100	ST A	6	Front Strobe	Digital Output, Active High	%QX38.0
M- OUT0101	ST A	7	Rear Strobe	Digital Output, Active High	%QX42.0
M- OUT0102	ST A	8	Aux Backup Light	Digital Output, Active High	%QX46.0
M- OUT0103	ST A	9	Back Up Alarm	Digital Output, Active High	%QX50.0
M- OUT0104	ST A	10	Hopper Flood Lights	Digital Output, Active High	%QX54.0
M- OUT0106	ST A	12		Digital Output, Active High	%QX62.0
M- OUT0108	ST A	14		Digital Output, Active High	%QX70.0
M- OUT0201	ST A	74	Tailgate Up	Digital Output, Active High	%QX78.0
M- OUT0202	ST A	75		PWM Output	%IW389
M- OUT0203	ST A	76	Top Door Open Sol	Digital Output, Active High	%QX86.0
M- OUT0204	ST A	77	Tailgate Flow	Digital Output, Active High/PWM Output	%QX90.0/%IW395
M- OUT0206	ST A	79		PWM Output	%IW401
M- OUT0207	ST A	80		PWM Output	%IW404
M- OUT0208	ST A	81		PWM Output	%IW407
M- OUT0303	ST B	19		Digital Output, Active High	%QX122.0
M- OUT0304	ST B	20		Digital Output, Active High	%QX126.0
M- OUT0305	ST B	21		Digital Output, Active High	%QX130.0
M- OUT0306	ST B	22		Digital Output, Active High	%QX134.0
M- OUT0307	ST B	23	Cab Flood Lights	Digital Output, Active High	%QX138.0
M- OUT0308	ST B	24	Container Flood Lights	Digital Output, Active High	%QX142.0
M- OUT0401	ST B	64		Digital Output, Active High	%QX150.0
M- OUT0406	ST B	69		Digital Output, Active High	%QX170.0
M- OUT0407	ST B	70		Digital Output, Active High	%QX174.0
M- OUT0506	ST B	79	Arm Up	Digital Output, Active High/Pwm Output	%QX206.0 /%IW482

CONTROLLER SOFTWARE

Cab Controller

CAB CONTROLLER INPUTS				
Wire Label	Connector Id	Pin Number	Signal	Configuration
MC- CAN 0 L	ST A	48	Controller Network	CAN 0
MC- CAN 0 H	ST A	49	Controller Network	CAN 0
C - CAN 1 L	ST A	50	Joysticks/Switch Banks	CAN 1
C - CAN 1 H	ST A	51	Joysticks/Switch Banks	CAN 1
C - CAN 2 L	ST A	53	Chassis	Chassis Network
C- CAN 2 H	ST A	54	Chassis	Chassis Network
C- CAN 3 L	ST A	34	Arm Network	CAN 3
C- CAN 3 H	ST A	35	Arm Network	CAN 3
C- IN0000	ST A	25	System Power	Digital Input, Active High
C- IN0001	ST A	26	Chassis Neutral	Digital Input, Active High
C- IN0002	ST A	27	Right Alley Toggle Switch	Digital Input, Active High
C- IN0101	ST A	64	Trans Sump Temp	Analogue Input, Active Low
C- IN0102	ST A	65	Left Alley Toggle Switch	Digital Input, Active High
C- IN0500	ST A	40	Panel Select	Digital Input, Active High
C- IN0501	ST A	41	Scale Alarm 1	Digital Input, Active High
C- IN0502	ST A	42	Scale Alarm 2	Digital Input, Active High
C- IN0503	ST A	43	Spare LTPS (Low Torque Press Switch)	Digital Input, Active High
C- IN0701	ST A	60	Operator Presence Joystick Input	Digital Input, Active High

CAB CONTROLLER OUTPUTS				
Wire Label	Connector Id	Pin Number	Signal	Configuration
C- OUT0000	ST A	16	CNG Fuel Solenoid	Digital Output, Active High
C- OUT0001	ST A	17	Cam Relay 1	Digital Output, Active High
C- OUT0002	ST A	18	Cam Relay 2	Digital Output, Active High
C- OUT0003	ST A	19	Cam Relay 3	Digital Output, Active High
C- OUT0004	ST A	20	Cam Relay 4	Digital Output, Active High
C- OUT0005	ST A	21	360 Grabber Camera Trigger	Digital Output, Active High
C- OUT0007	ST A	23	Front Strobe	Digital Output, Active High
C- OUT0008	ST A	24	Rear Strobe	Digital Output, Active High
C- OUT0100	ST A	6	Pump 1 SOL	Digital Output, Active High
C- OUT0101	ST A	7	Pump 2 SOL	Digital Output, Active High
C- OUT0102	ST A	8	PTO SOL	Digital Output, Active High
C- OUT0103	ST A	9	Throttle Advance	Digital Output, Active High
C- OUT0108	ST A	14	Cab Flood Light	Digital Output, Active High
C- OUT0200	ST A	73	Air Supply	Digital Output, Active High
C- OUT0201	ST A	74	Aux Air Supply	Digital Output, Active High
C- OUT0202	ST A	75	Curotto Auto Cover Open	Digital Output, Active High
C- OUT0203	ST A	76	Curotto Auto Cover Close	Digital Output, Active High
C- OUT0204	ST A	77	Aux Control Enabled	Digital Output, Active High
C- OUT0205	ST A	78	Out Of Dim	Digital Output, Active High
C- OUT0206	ST A	79	Throttle Limit	Digital Output, Active High

CONTROLLER SOFTWARE

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 Controller in CAB 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.

The Controller Inputs are activated by positive +12-volt signals and some Ground signals (some chassis signals). All Proximity Sensors, Pressure Sensors, Push buttons, etc., used as input devices to the Controller supply a +12-volt signal to a Heil- 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 in-Cab display will also be ON.

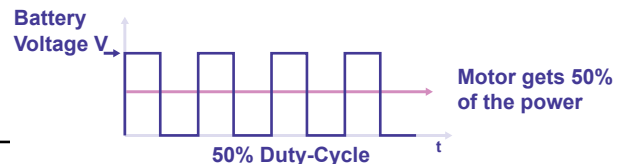
- B. **Outputs:** Outputs are signals sent out of the Controller to turn something ON or to make something happen. Any signal that is sent out of the controller is an output. Output examples are Signals sent to valve coils that move a valve spool or to turn on a light.

During each cycle, the CPU analyzes the status of the inputs and based on the programming logic, produces the appropriate +12-volt DC outputs.

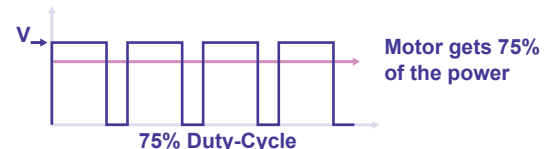
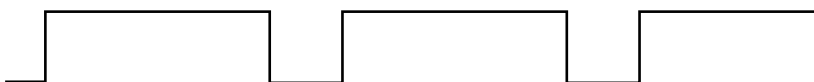
- C. **Pulse Width Modulation (PWM)**

1. The primary use of a PWM signal is to allow control of the power supplied to electrical devices.
2. The average voltage (and current) supplied to the load is controlled by rapidly switching the supply to the load ON and OFF. The longer the switch remains ON compared to the OFF periods, the higher the power supplied to the load will be.
3. 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 the switch is ON, there is almost no voltage drop across it.

1a: 1:1 mark-space ratio (50% duty cycle)



1b: 3:1 mark-space ratio (75% duty cycle)



1c: 1:3 mark-space ratio (25% duty cycle)

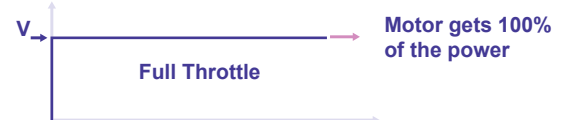
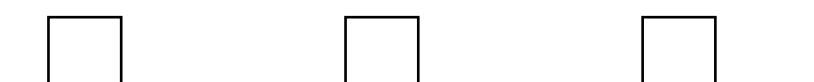


Figure 140. PWM Output Signals & Waveforms

- D. **Diagnostic Display Messages**

When a fault is set, the In-Cab alarm/buzzer will sound, and a diagnostic message will be displayed showing the status of the respective input/output on the In-Cab display unit.

CONTROLLER SOFTWAREI/O FunctionsBody Controller Inputs - ST A**1. Oil Tank Filter Pressure Switch (IN0000 – PIN25)**

Function: This circuit monitors the Oil Tank Filter Pressure Switch to confirm that the oil tank pressure is adequate for system operation. The input is activated when the oil tank maintains sufficient pressure.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Pressure Switch	Oil Tank Filter Pressure Switch	Activated	IN0000 - %IX2.0	ON

Activation Logic

- The input turns ON when the pressure switch detects sufficient pressure in the oil tank.

Control Intent

- This input provides a status signal for validating pump operation conditions, ensuring that oil pressure is available before enabling pump functions.

In-Cab Display Alarm: “Filter Bypass Switch Fault”

- The oil tank filter pressure switch connected to input channel IN0000 monitors the oil tank filter pressure. When the pressure switch detects sufficient pressure, the input signal is activated. This alarm occurs when the pressure switch remains off (indicating insufficient pressure) and neither the Lift Pump Solenoid nor the Packer Pump Solenoid is energized for a continuous duration of 10 seconds. The system then triggers a “Filter Bypass Switch Fault” alarm on the In-Cab Display.

2. OIL LEVEL SWITCH (IN0001 – PIN26)

Function: This circuit monitors the Oil Level Switch to detect low oil level in the tank and provide an interlock signal for pump control. The input is activated when the oil level is below the minimum threshold.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Level Switch	Oil Level Switch	Activated	IN0001 - %IX34.0	ON

Activation Logic

- The input turns ON when the oil level drops below the minimum threshold point, as detected by the level switch.

Control Intent

- This input acts as an interlock for pump operation, ensuring that the pump does not run when oil level is insufficient.

In-Cab Display Alarm: “Low Hydraulic Oil”

- The oil level switch connected to input channel IN0001 monitors the hydraulic oil level in the reservoir. When the oil level drops below the predefined threshold, the input signal is activated. This condition interlocks with the pump control logic to prevent operation under low oil conditions. The system then triggers a “Low Hydraulic Oil” alarm on the In-Cab Display.

3. FILTER HIGH PRESSURE SWITCH (IN0002 – PIN27)

Function: This circuit monitors the Filter High Pressure Switch to detect high-pressure status in the filter and provide an interlock signal for pump control. The input is activated when the filter reaches the high-pressure condition.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Pressure Switch	Filter High Pressure Switch	Activated	IN0002 - %IX58.0	ON

Activation Logic

- The input turns ON when the pressure switch detects that the filter has reached the specified high-pressure level.

CONTROLLER SOFTWARE

Control Intent

- This input acts as an interlock for pump operation, ensuring that the pump does not run unless the filter meets the required pressure condition.

4. RIGHT TURN (IN0101 – PIN64)

Function: This circuit monitors and detects the Right Turn signal from the chassis and provides an interlock for strobe light control. The input is activated when the right turn indicator is engaged.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Chassis Signal	Right Turn	Activated	IN0101 - %IX118.0	ON

Activation Logic

- The input turns ON when the chassis sends the right turn signal.

Control Intent

- This input is used to synchronize strobe light operation with the right turn signal for safety and visibility.

5. LEFT TURN (IN0102 – PIN65)

Function: This circuit monitors and detects the Left Turn signal from the chassis and provides an interlock for strobe light control. The input is activated when the left turn indicator is engaged.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Chassis Signal	Left Turn	Activated	IN0102 - %IX122.0	ON

Activation Logic

- The input turns ON when the chassis sends the left turn signal.

Control Intent

- This input is used to synchronize strobe light operation with the left turn signal for safety and visibility.

6. SERVICE BRAKE (IN0103 – PIN66)

Function: This circuit monitors and detects the Service Brake signal coming from the chassis. The input is activated when the service brake is engaged.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Chassis Signal	Service Brake	Activated	IN0103 - %IX126.0	ON

Note – The Service Brake memory flag will be activated either by the hardware input (IN0103) or when a Service Brake command is received via CAN communication.

Activation Logic

- The input turns ON when the chassis sends the service brake signal.

Control Intent

- This input is used for braking logic and related safety functions.

7. TAIL (IN0200 – PIN67)

Function: This circuit monitors and detects the Tail signal from the chassis. The input is activated when the taillight signal is on.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Chassis Signal	Tail	Activated	IN0200 - %IX130.0	ON

Activation Logic

- The input turns ON when the chassis sends the taillight signal.

CONTROLLER SOFTWARE

Control Intent

- This input is used to control taillight related functions.

8. REVERSE (IN0201 – PIN68)

Function: This circuit monitors and detects the Reverse signal from the chassis. The input is activated when the reverse gear is engaged.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Chassis Signal	Reverse	Activated	IN0201 - %IX134.0	ON

Note – The Reverse memory flag will be activated either by the hardware input (IN0201) or when a Reverse command is received via CAN communication.

Activation Logic

- The input turns ON when the chassis sends the reverse signal.

Control Intent

- This input is used to enable reverse-related functions such as reverse lights.

9. CLEAR (IN0202 – PIN69)

Function: This circuit monitors and detects the Clear signal from the chassis. The input is activated when the clear light signal is on.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Chassis Signal	Clear	Activated	IN0202 - %IX138.0	ON

Activation Logic

- The input turns ON when the chassis sends the clear light signal.

Control Intent

- This input is used to control clear light-related functions.

10. SIDE DOOR CLOSED PROXIMITY (IN0400 – PIN46)

Function: This circuit monitors the Side Door Closed proximity sensor to detect the closed position of the side door and provide a signal for packer operation interlock. The input is activated when the side door is fully closed.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Proximity Switch	Side Door Closed Proximity	Activated	IN0400 - %IX154.0	ON

Activation Logic

- The input turns ON when the proximity sensor confirms that the side door is closed.

Control Intent

- This input provides a signal indicating that the side door is closed. It is part of the packer control interlock system, ensuring that packer operations can only proceed when this and other required conditions are satisfied.

In-Cab Display Alarm: “Side Door Open Pump Disabled”

- The side door closed proximity sensor connected to input channel IN0400 monitors the position of the side door. When the door is not fully closed, the input signal remains inactive, indicating the door is open. This condition interlocks with the packer control to prevent operation and triggers a “Side Door Open Pump Disabled” alarm on the In-Cab Display.

CONTROLLER SOFTWARE**11. CAB PROTECTOR DOWN PROXIMITY (IN0500 – PIN40)**

Function: This circuit monitors the Cab Protector Down proximity sensor to detect the down position of the cab protector and provide a signal for interlocks related to fork raise and arm operations. The input is activated when the cab protector is in the fully down position.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Proximity Switch	Cab Protector Down Proximity	Activated	IN0500 - %IX162.0	ON

Activation Logic

The input turns ON when the proximity sensor confirms that the cab protector is fully lowered.

Control Intent

- This input is part of the interlock system for fork raise and arm operations. It ensures that these functions can only proceed when the cab protector is down, along with other required conditions.

In-Cab Display Alarm 01: “Arms Down Interlock Cab Protector Raised. Lower Cab Protector to Continue”

- This alarm is triggered when the Arms Down interlock is active and the Cab Protector Configuration is active, while the Cab Protector Down proximity signal is not detected. When this condition occurs, the system inhibits Arm Down functions and presents the alarm on the In-Cab Display.

In-Cab Display Alarm 02: “Arms Up Interlock Cab Protector Raised. Lower Cab Protector to Continue”

- This alarm is triggered when the Cab Protector Configuration is active and the Cab Protector Down proximity signal is not detected, while the Arms Up interlock is active and the PTO is engaged. Under this condition, the system prevents arm up operations for safety. The In-Cab Display shows the alarm message.

12. ARMS UP PROXIMITY (IN0501 – PIN41)

Function: This circuit monitors the Arms Up proximity sensor to detect that the arms are in the up position and provide a signal for arm movement interlock. The input is activated when the arms are in the fully raised position.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Proximity Switch	Arms Up Proximity	Activated	IN0501 - %IX194.0	ON

Activation Logic

- The input turns ON when the proximity sensor confirms that the arms are fully raised.

Control Intent

- This input is part of the interlock system for packer start and arm up operations. It ensures that these functions can only proceed when the arms are fully raised for packer start & arms are not fully raised for arm up operations, along with other required conditions.

In-Cab Display Alarm: “Arms Down Interlock. Forks Not Clear To Lower Arms”

- The Arms Up proximity sensor connected to input channel IN0501 monitors whether the arms are in the fully raised position. When the arms are up, the input signal is activated. This alarm is triggered when the Arms Down interlock is asserted, the feather is not ok, the arms are not up, and there is no active arm up command. When all these conditions are true simultaneously, the In-Cab Display shows “Arms Down Interlock. Forks Not Clear To Lower Arms”

13. FORKS TUCKED PROXIMITY (IN0502 – PIN42)

Function: This circuit monitors the Forks Tucked proximity sensor to detect that the forks are tucked and provide a signal for safe transit interlock. The input is activated when the forks are in the tucked position.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Proximity Switch	Forks Tucked Proximity	Activated	IN0502 - %IX218.0	ON

Activation Logic

- The input turns ON when the proximity sensor confirms that the forks are tucked.

CONTROLLER SOFTWARE

Control Intent

- This input is part of the interlock system for arm up operation. It ensures that these functions can only proceed when the forks are not tucked, along with other required conditions.

14. LIFT BELOW TRANSIT PROXIMITY (IN0503 – PIN43)

Function: This circuit monitors the Lift Below Transit proximity sensor to detect that the lift is in the correct position for transit and provide a signal for movement interlock. The input is activated when the lift is below the transit position.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Proximity Switch	Lift Below Transit Proximity	Activated	IN0503 - %IX250.0	ON

Activation Logic

- The input turns ON when the proximity sensor confirms that the lift is below the transit position.

Control Intent

- This input is part of the interlock system for packer and arm operations. It ensures that these functions can only proceed when the lift is below the transit position for some logic & lift is not below the transit position for some other logic, along with other required conditions.

15. TOP DOOR OPEN PROXIMITY (IN0602 – PIN57)

Function: This circuit monitors the Top Door Open proximity sensor to detect the open position of the top door and provide a signal for interlocks related to forks and arm operations. The input is activated when the top door is fully open.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Proximity Switch	Top Door Open Proximity	Activated	IN0602 - %IX282.0	ON

Activation Logic

- The input turns ON when the proximity sensor confirms that the top door is open.

Control Intent

- This input is part of the interlock system for forks and arm operations. It ensures that these functions can only proceed when the top door is open, along with other required conditions.

In-Cab Display Alarm 01: "Top Door Not Fully Open. Pack Cycle Not Allowed"

- This alarm is triggered when the Top Door Configuration is active and the Top Door Open proximity signal is not detected, while either a packer extend command or auto pack operation is active. Under this condition, the system prevents the pack cycle & the In-Cab Display shows the alarm message.

In-Cab Display Alarm 02: "Arms Down Interlock. Top Door Not Fully Open"

- This alarm occurs when the Arms Down interlock is active, the Top Door Configuration is active, and the Top Door Open proximity signal is not detected, while the PTO is engaged. Under this condition, the system prevents arm down operations for safety & the In-Cab Display shows the alarm message.

In-Cab Display Alarm 03: "Arms Up Interlock. Top Door Not Fully Open"

- This alarm is triggered when the Top Door Configuration is active and the Top Door Open proximity signal is not detected, while the Arms Up interlock is active and the PTO is engaged. Under this condition, the system prevents arm up operations for safety & the In-Cab Display shows the alarm message.

CONTROLLER SOFTWARE

16. PACKER POSITION SENSOR (IN0701 – PIN60)

Function: This circuit monitors the position of the packer using a 0 – 10V analog sensor to measure and report the packer's position for precise control and feedback in the system. The input provides a continuous voltage signal corresponding to the packer's position.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Range
Position Sensor	Packer Position Sensor	Analog	IN0701 - %IW146	0.5–4.5V

Activation Logic

- The sensor outputs a voltage in the range of 0–10V, which is fed into the controller as an analog input. The voltage level corresponds to the packer's position.

Control Intent

- This input provides real-time positional feedback for packer control and is part of the interlock system for packer, forks, and arm operations. It ensures these functions can only proceed when the packer position meets required conditions, along with other interlocks.

In-Cab Display Alarm: "Packer Sensor Communication Error"

- This alarm is triggered when the packer position sensor provides an invalid reading, or a fault condition is detected. The logic checks if the packer position is less than 4 or if a packer sensor fault occurs while IN0000 from the cab input is on. When this condition occurs, the system prevents packer, forks, and arm operations for safety & the In-Cab Display shows the alarm message.

17. BODY VALVE PRESSURE SENSOR (IN0702 – PIN61)

Function: This circuit monitors the hydraulic pressure at the body valve using a 0 – 10V analog sensor to measure and report the hydraulic pressure for monitoring and control of body-related operations. The input provides a continuous voltage signal corresponding to the pressure level.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Range
Pressure Sensor	Body Valve Pressure Sensor	Analog	IN0702 - %IW148	0.5–4.5V

Activation Logic

- The sensor outputs a voltage in the range of 0–10V, which is fed into the controller as an analog input. The voltage level corresponds to the actual pressure at the body valve.

Control Intent

- This input provides real-time pressure feedback for body valve monitoring. It is primarily used for system diagnostics, performance control, and safety checks during operation.

18. OIL TANK TEMPERATURE SENSOR (IN0901 – PIN39)

Function: This circuit monitors the oil tank temperature using a resistive sensor to measure and report the oil tank temperature for system monitoring and protection. The input provides a variable resistance signal that corresponds to the oil temperature.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Range
Temperature Sensor	Oil Tank Temperature Sensor	Analog	IN0901 - %IW158	842.7-1573.3Ω

Activation Logic

- The sensor operates on a resistive principle where resistance changes with temperature. The controller interprets this resistance as a temperature value for diagnostics and control.

Control Intent

- This input provides real-time temperature feedback and is part of the interlock system for pump control. It ensures pump operation only occurs when oil temperature is within acceptable limits, along with other required conditions.

CONTROLLER SOFTWARE

In-Cab Display Alarm 01: "Hydraulic Oil Temp Alarm Warning < 50°F"

- This alarm is triggered 10 seconds after the oil tank temperature sensor detects that the hydraulic oil temperature is below the safe operating threshold of 50°F. When this condition occurs, the system interlocks with pump control to prevent operation under low-temperature conditions, as it can affect hydraulic performance and component life. The In-Cab Display shows the alarm message.

In-Cab Display Alarm 02: "Hydraulic Oil Temp Alarm Notification > 180°F"

- This alarm is triggered 3 minutes after the hydraulic oil temperature exceeds 180°F. When this condition occurs, the system alerts the operator to prevent overheating, which can damage hydraulic components and reduce oil life. The In-Cab Display shows the alarm message.

In-Cab Display Alarm 03: "Hydraulic Oil Temp Alarm Warning > 210°F"

- This alarm is triggered 5 minutes after the hydraulic oil temperature exceeds 210°F. When this condition occurs, the system warns the operator of a critical overheating situation that can damage hydraulic components and compromise safety. The In-Cab Display shows the alarm message.

In-Cab Display Alarm 04: "Hydraulic Oil Temp Alarm Warning > 220°F"

- This alarm is triggered 1 minute after the hydraulic oil temperature exceeds 220°F. When this condition occurs, the system initiates an over-temperature shutdown to protect hydraulic components and prevent severe damage. The In-Cab Display shows the alarm message.

In-Cab Display Alarm 05: "Temperature Sensor Fault, Reading Out of Range"

- This alarm is triggered when the hydraulic oil temperature sensor reading is outside the valid range. If the sensor reports a value less than -100°F or greater than 4000°F for more than 500ms, the system identifies a sensor fault & the In-Cab Display shows the alarm message. When this condition occurs, the system alerts the operator and interlocks critical operations to prevent damage. Inspect the temperature sensor and wiring for faults.

CONTROLLER SOFTWARE**Body Controller Inputs - ST B****1. CNG DEFUEL VALVE CLOSED PROXIMITY (IN1002 – PIN46)**

Function: This circuit monitors the closed position of the CNG defuel valve using a proximity sensor to confirm that the CNG defuel valve is closed before allowing CNG solenoid open operation. The input is activated when the valve is fully closed.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Proximity Switch	CNG Defuel Valve Closed Proximity	Activated	IN1002 - %IX378.0	ON

Activation Logic

- The input turns ON when the proximity sensor detects that the CNG defuel valve is in the closed position.

Control Intent

- This input is part of the interlock system for CNG solenoid operation. It ensures that the solenoid can only open when the defuel valve is confirmed closed, along with other required conditions.

2. TAILGATE CLOSED PROXIMITY (IN1103 – PIN9)

Function: This circuit monitors the closed position of the tailgate using a proximity sensor to confirm that the tailgate is closed before allowing tailgate lock operations. The input is activated when the tailgate is fully closed.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Proximity Switch	Tailgate Closed Proximity	Activated	IN1103 - %IX446.0	ON

Activation Logic

- The input turns ON when the proximity sensor detects that the tailgate is in the closed position.

Control Intent

- This input is part of the interlock system for tailgate operation. It ensures that tailgate lock function can only proceed when the tailgate is confirmed closed, along with other required conditions.

In-Cab Display Alarm 01: "Tailgate Open and Road speed Above 5 mph"

- This alarm is triggered when the tailgate is open, and the vehicle speed is less than or equal to 5MPH. This condition creates an interlock with tailgate operations for safety. When the alarm occurs, the In-Cab Display shows the message.

In-Cab Display Alarm 02: "Tailgate Closed While Ejecting"

- This alarm is triggered when the system detects that the tailgate is closed while an ejecting operation is active. This condition can cause severe mechanical damage and is a critical safety issue. When detected, the system immediately alerts the operator and interlocks ejector movement. The In-Cab Display shows the alarm message.

3. TAILGATE LOCKED PROXIMITY SS (IN1600 – PIN36)

Function: This circuit monitors the locked position of the tailgate on the Street Side (SS) using a proximity sensor to confirm that the tailgate is unlocked on the street side before allowing tailgate operations. The input is activated when the tailgate lock on Street Side is engaged.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Proximity Switch	Tailgate Locked Proximity SS	Activated	IN1600 - %IX610.0	ON

Activation Logic

- The input turns ON when the proximity sensor detects that the street side tailgate lock is engaged.

Control Intent

- This input is part of the interlock system for tailgate operation. It ensures that tailgate functions can only proceed when the tailgate is unlocked on the street side, along with other required conditions.

In-Cab Display Alarm: "Tailgate Unlocked and Road speed Above 5 mph"

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- This alarm is triggered when neither of the tailgate lock proximity sensors (SS and CS) is detected and the vehicle speed exceeds 5MPH. This condition creates a critical safety risk, as driving with an unlocked tailgate can cause severe hazards. When detected, the system alerts the operator, and the In-Cab Display shows the alarm message.

4. TAILGATE LOCKED PROXIMITY CS (IN1601 – PIN37)

Function: This circuit monitors the locked position of the tailgate on the Curb Side (CS) using a proximity sensor to confirm that the tailgate is unlocked on the curb side before allowing tailgate operations. The input is activated when the tailgate lock on Curb Side is engaged.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Proximity Switch	Tailgate Locked Proximity CS	Activated	IN1601 - %IX614.0	ON

Activation Logic

- The input turns ON when the proximity sensor detects that the curb side tailgate lock is engaged.

Control Intent

- This input is part of the interlock system for tailgate operation. It ensures that tailgate functions can only proceed when the tailgate is unlocked on the curb side, along with other required conditions.

In-Cab Display Alarm: “Tailgate Unlocked and Road speed Above 5 mph”

- This alarm is triggered when neither of the tailgate lock proximity sensors (SS and CS) is detected and the vehicle speed exceeds 5MPH. This condition creates a critical safety risk, as driving with an unlocked tailgate can cause severe hazards. When detected, the system alerts the operator, and the In-Cab Display shows the alarm message.

CONTROLLER SOFTWARE

Body Controller Outputs – ST A

1. PACKER RETRACT (OUT0000 - %QX2.0 – PIN16)

Function: The output function controls the Packer Retract operations. Activates retracting of the packer panel based on hydraulic, safety, operator, and system interlock conditions.

Function Overview:

- Packer Retract output turns ON only when State A (operational readiness) and State B (safety + mode eligibility) are both TRUE.
- Final output also requires system power, closed side door, and no travel-position restriction.
- Retract is blocked if system detects an active retract command combined with “slow pack OFF” while “fully retracted OFF.”

To activate the packer retract output:

State A

- Packer extend command should be off AND
- PTO solenoid should be energized, or combination of hydraulic pump enable command and auto retract command, or combination of tandem pump configuration and packer pump command should be on AND
- (Double pack final retract command should be on OR
- Double pack retract command should be on and double pack retract position command should be off OR
- Tailgate closed while ejecting command should be on and packer shouldn't be in calibration mode OR
- If any one of the following is pressed: packer extend button from the In-Cab Display, button 4 from control panel switch bank, packer extend button from joystick, button 8 from outside control switch bank 2 or button 8 from outside control switch bank 3 OR
- Packer full retract command should be off and auto retract command should be on and packer shouldn't be in calibration mode and packer full extend command should be on OR
- Packer full retract command should be off and auto retract command should be on and packer shouldn't be in calibration mode and if packer retract command is already on OR
- Packer full retract command should be off and auto retract command should be on and packer shouldn't be in calibration mode and packer retract start command should be on OR
- Packer full retract command should be off and auto retract command should be on and packer shouldn't be in calibration mode and 35 seconds after the combination of packer extend command and negation of slow pack command and negation of packer fully extended command is on)

State B

- State A should be on AND
- (Vehicle should be in service mode OR
- There should be no sensor fault, and lift below transit command should be on OR
- There should be no sensor fault, and packer should be in calibration mode OR
- There should be no sensor fault, and lift below transit command should be off and button 5 of control panel switch bank should be pressed)

Packer Retract Command

- Combination of State B and system power input from cab controller and side door closed and negation of packer travel position command from the In-Cab Display should be true AND
- Combination of packer retract command and negation of slow pack command and negation of packer fully retracted command should be off.

Control Intent:

- Ensures safe, coordinated, and preventively limited packer retract operation.
- Prevents retract when unsafe or unintended.
- Allows retract only when hydraulic readiness, operator intent, system power, and safety interlocks all align.
- Protects against simultaneous extend/retract conflicts and incomplete position states.

CONTROLLER SOFTWARE

2. TOP DOOR CLOSE (OUT0001 - %QX6.0 – PIN17)

Function: The output function controls the Top Door Close solenoid. It activates when the following conditions are met:

- Top Door Close Push Button from the display is pressed AND
- Top Door Configuration is active AND
- PTO Solenoid is engaged.

Necessary conditions to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Top Door Close Push Button from Display	Activated	Memory Flag	ON
B	AND	Top Door Configuration	Activated	Memory Flag	ON
C	AND	PTO Solenoid (See Note 1)	Activated	Memory Flag	ON

Conditions: A AND B AND C will activate the TOP DOOR CLOSE output.

Note 1:

- The PTO Solenoid activates when air supply command is on, or auxiliary air supply command is on
 - (1) Air supply command activates 300ms after the lift pump is on or the packer pump is on.
 - (2) Auxiliary air supply command will be activated when auxiliary control enable command is on, arms up interlock command is off and arms down interlock command is off and either the lift pump is on, or the packer pump is on.
 - (3) Lift pump will be activated when HOC In Range 1 command is on and 500ms after EOS command is on.
 - (4) Packer pump will be activated when HOC In Range 2 command is on and 1s after EOS command is on.
 - (5) HOC In Range 1 command will be activated when:
 - (a) The hydraulic pump is enabled AND
 - (b) If the engine speed is below 900 RPM when the idle tandem pump configuration is active, or below 1800 RPM when the idle tandem pump configuration is not active AND
 - (c) If the engine speed is below 900RPM, when the idle tandem pump configuration is active or if the engine speed is below 1500RPM, when idle tandem pump configuration is not active or if the HOC In Range 1 command is already on.
 - (2) HOC In Range 2 command will be activated when the hydraulic pump is enabled, and the engine speed is below 1800RPM. Once activated, it remains on as long as the engine speed is less than or equal to 1900 RPM.
 - (3) The EOS command will be activated when the hydraulic pump is enabled, the speed is within the PTO range, the pump-on oil temperature condition is met, and the parallel combination of bypass shutdown is not active, the minimum bypass condition is satisfied, and the series combination of the oil tank filter pressure switch input and the PTO output are on.
 - (a) The Bypass Shutdown command is activated when the bypass time is more than the bypass shutdown setpoint.
 - (b) The Speed within PTO range command is activated when the hydraulic pump is enabled, and the engine speed is less than 900RPM. Once activated, it remains on as long as the hydraulic pump is enabled, and the engine speed is less than or equal to 2500 RPM.

Control Intent:

- The intent of the TOP DOOR CLOSE output logic is to:
 - (1) Ensure safe, intentional, and interlocked control of the Top Door Close solenoid.
 - (2) Prevent unintended activation of the top door by requiring a verified combination of operator command, system configuration, and hydraulic/PTO readiness.
 - (3) Ensure proper integration with hydraulic pump logic, speed conditions, air supply commands, and interlocks.

CONTROLLER SOFTWARE**3. TAILGATE UNLOCK (OUT0004 - %QX18.0 – PIN 20)**

Function: The output function controls the Tailgate Unlock solenoid. It activates when the following conditions are met:

- Tailgate Unlock Command is ON AND
- Road Speed OK is confirmed AND
- PTO Solenoid is engaged.

Necessary conditions to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Road Speed OK (See Note 1)	Activated	Memory Flag	ON
B	AND	Tailgate Unlock (See Note 2)	Activated	Memory Flag	ON
C	AND	PTO Solenoid (See Note 3)	Activated	Memory Flag	ON

Conditions: A AND B AND C will activate the TAILGATE UNLOCK output.

Note 1 - The Road Speed OK command activates when the actual road speed is less than or equal to 5 mph.

Note 2 - The Tailgate Unlock command activates when Tailgate Unlock Push Button from the display is pressed.

Note 3:

- The PTO Solenoid activates when air supply command is on, or auxiliary air supply command is on
 - (1) Air supply command activates 300ms after the lift pump is on or the packer pump is on.
 - (2) Auxiliary air supply command will be activated when auxiliary control enable command is on, arms up interlock command is off and arms down interlock command is off and either the lift pump is on, or the packer pump is on.
 - (3) Lift pump will be activated when HOC In Range 1 command is on and 500ms after EOS command is on.
 - (4) Packer pump will be activated when HOC In Range 2 command is on and 1s after EOS command is on.
 - (5) HOC In Range 1 command will be activated when:
- The hydraulic pump is enabled AND
- If the engine speed is below 900 RPM when the idle tandem pump configuration is active, or below 1800 RPM when the idle tandem pump configuration is not active AND
- If the engine speed is below 900RPM, when the idle tandem pump configuration is active or if the engine speed is below 1500RPM, when idle tandem pump configuration is not active or if the HOC In Range 1 command is already on.
 - (1) HOC In Range 2 command will be activated when the hydraulic pump is enabled, and the engine speed is below 1800RPM. Once activated, it remains on as long as the engine speed is less than or equal to 1900 RPM.
 - (2) The EOS command will be activated when the hydraulic pump is enabled, the speed is within the PTO range, the pump-on oil temperature condition is met, and the parallel combination of bypass shutdown is not active, the minimum bypass condition is satisfied, and the series combination of the oil tank filter pressure switch input and the PTO output are on.
- The Bypass Shutdown command is activated when the bypass time is more than the bypass shutdown setpoint.
- The Speed within PTO range command is activated when the hydraulic pump is enabled, and the engine speed is less than 900RPM. Once activated, it remains on as long as the hydraulic pump is enabled, and the engine speed is less than or equal to 2500 RPM.

CONTROLLER SOFTWARE**4. TAILGATE LOCK (OUT0005 - %QX22.0 – PIN 21)**

Function: The output function controls the Tailgate Lock solenoid. It activates when the following conditions are met:

- Road Speed OK is confirmed AND
- Tailgate Lock Command is ON, or Oil Warm Active Command is ON AND
- PTO Solenoid is engaged.

Necessary conditions to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Road Speed OK (See Note 1)	Activated	Memory Flag	ON
B1	AND	Tailgate Lock (See Note 2)	Activated	Memory Flag	ON
B2	OR	Oil Warm Active (See Note 3)	Activated	Memory Flag	ON
C	AND	PTO Solenoid (See Note 4)	Activated	Memory Flag	ON

Conditions: A AND (B1 OR B2) AND C will activate the TAILGATE LOCK output.

Note 1 - The Road Speed OK command activates when the actual road speed is less than or equal to 5 mph.

Note 2 - The Tailgate Lock command activates when Tailgate Lock Push Button from the display is pressed.

Note 3 - The Oil Warm Active command activates after a 5 second delay once both the Oil Warm Up command and the Ok to Warm Up command are on, and the system power input from the cab controller is also on.

Note 4:

- The PTO Solenoid activates when air supply command is on, or auxiliary air supply command is on
 - (1) Air supply command activates 300ms after the lift pump is on or the packer pump is on.
 - (2) Auxiliary air supply command will be activated when auxiliary control enable command is on, arms up interlock command is off and arms down interlock command is off and either the lift pump is on, or the packer pump is on.
 - (3) Lift pump will be activated when HOC In Range 1 command is on and 500ms after EOS command is on.
 - (4) Packer pump will be activated when HOC In Range 2 command is on and 1s after EOS command is on.
 - (5) HOC In Range 1 command will be activated when:
 - (a) The hydraulic pump is enabled AND
 - (b) If the engine speed is below 900 RPM when the idle tandem pump configuration is active, or below 1800 RPM when the idle tandem pump configuration is not active AND
- If the engine speed is below 900RPM, when the idle tandem pump configuration is active or if the engine speed is below 1500RPM, when idle tandem pump configuration is not active or if the HOC In Range 1 command is already on.
 - (1) HOC In Range 2 command will be activated when the hydraulic pump is enabled, and the engine speed is below 1800RPM. Once activated, it remains on as long as the engine speed is less than or equal to 1900 RPM.
 - (2) The EOS command will be activated when the hydraulic pump is enabled, the speed is within the PTO range, the pump-on oil temperature condition is met, and the parallel combination of bypass shutdown is not active, the minimum bypass condition is satisfied, and the series combination of the oil tank filter pressure switch input and the PTO output are on.
 - (a) The Bypass Shutdown command is activated when the bypass time is more than the bypass shutdown setpoint.
 - (b) The Speed within PTO range command is activated when the hydraulic pump is enabled, and the engine speed is less than 900RPM. Once activated, it remains on as long as the hydraulic pump is enabled, and the engine speed is less than or equal to 2500 RPM.

CONTROLLER SOFTWARE

5. ARMS DOWN (OUT0006 - %QX26.0 – PIN22)

Function: The output function controls the Arms Down operations. To activate the switch on the arms down output:

- Al cab protector configuration shouldn't be active and cab protector down proximity input should be on OR
- Vehicle speed shouldn't be within can arms range.

6. TAILGATE DOWN (OUT0007 - %QX30.0 – PIN 23)

Function: The output function controls the Tailgate Down solenoid. It activates when the following conditions are met:

- Road Speed OK is confirmed AND
- Tailgate Down Command is ON, or Oil Warm Active Command is ON AND
- PTO Solenoid is engaged AND
- (Tailgate Locked Proximity SS Input is OFF AND Tailgate Locked Proximity CS Input is OFF) OR No Tailgate Proximity Faults Command is ON
- Packer Fully Extended Command is OFF.

Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Road Speed OK (See Note 1)	Activated	Memory Flag	ON
B1	AND	Tailgate Down (See Note 2)	Activated	Memory Flag	ON
B2	OR	Oil Warm Active (See Note 3)	Activated	Memory Flag	ON
C	AND	PTO Solenoid (See Note 4)	Activated	Memory Flag	ON
D1	AND	Tailgate Locked Proximity SS	Not Activated	IN1600	OFF
D2	AND	Tailgate Locked Proximity CS	Not Activated	IN1601	OFF
D3	OR	No Tailgate Proximity Faults	Activated	Memory Flag	ON
E	AND	Packer Fully Extended (See Note 5)	Not Activated	Memory Flag	OFF

Conditions: A AND (B1 OR B2) AND C AND [(D1 AND D2) OR D3] AND E will activate the TAILGATE DOWN output.

Note 1 - The Road Speed OK command activates when the actual road speed is less than or equal to 5 mph.

Note 2 - The Tailgate Down command activates when Tailgate Down Push Button from the display is pressed.

Note 3 - The Oil Warm Active command activates after a 5 second delay once both the Oil Warm Up command and the Ok to Warm Up command are on, and the system power input from the cab controller is also on.

Note 4:

- The PTO Solenoid activates when air supply command is on, or auxiliary air supply command is on
 - (1) Air supply command activates 300ms after the lift pump is on or the packer pump is on.
 - (2) Auxiliary air supply command will be activated when auxiliary control enable command is on, arms up interlock command is off and arms down interlock command is off and either the lift pump is on, or the packer pump is on.
 - (3) Lift pump will be activated when HOC In Range 1 command is on and 500ms after EOS command is on.
 - (4) Packer pump will be activated when HOC In Range 2 command is on and 1s after EOS command is on.
 - (5) HOC In Range 1 command will be activated when:
 - (a) The hydraulic pump is enabled AND
 - (b) If the engine speed is below 900 RPM when the idle tandem pump configuration is active, or below 1800 RPM when the idle tandem pump configuration is not active AND
 - (c) If the engine speed is below 900RPM, when the idle tandem pump configuration is active or if the engine speed is below 1500RPM, when idle tandem pump configuration is not active or if the HOC In Range 1 command is already on.

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- (4) HOC In Range 2 command will be activated when the hydraulic pump is enabled, and the engine speed is below 1800RPM. Once activated, it remains on as long as the engine speed is less than or equal to 1900 RPM.
- (5) The EOS command will be activated when the hydraulic pump is enabled, the speed is within the PTO range, the pump-on oil temperature condition is met, and the parallel combination of bypass shutdown is not active, the minimum bypass condition is satisfied, and the series combination of the oil tank filter pressure switch input and the PTO output are on.
 - (a) The Bypass Shutdown command is activated when the bypass time is more than the bypass shutdown setpoint.
 - (b) The Speed within PTO range command is activated when the hydraulic pump is enabled, and the engine speed is less than 900RPM. Once activated, it remains on as long as the hydraulic pump is enabled, and the engine speed is less than or equal to 2500 RPM.

Note 5 – Packer fully extended command will be activated when packer position is more than or equal to difference between packer calibration value (42) and extend position offset value (1).

7. PACKER RETRACT (OUT0008 - %QX34.0 – PIN24)

Function: The output function controls the Packer Extend operations. To activate the switch on the packer extend output:

- Packer extend travel position command should be on and IN0000 input from cab controller should be on and Packer retract command should be off and combination of packer extend command and negation of slow pack command and negation of packer fully extended command should be off and packer extend fork position command should be on and if top door configuration is active then, top door should be open and side door should be closed AND
- PTO solenoid should be energized, or combination of hydraulic pump enable command and auto retract command should be on or combination of tandem pump configuration and packer pump command should be on AND
- (Auto pack stop command should be off and vehicle shouldn't be in service mode and packer shouldn't be calibration mode if the packer extend command is already on OR
- Packer extend lift below transit command should be on and double pack command should be on OR
- Packer extend lift below transit command should be on and OSR auto pack command should be on OR
- The Packer Extend Lift Below Transit command should be on and if any one of the following is pressed: packer extend button from the In-Cab Display, button 3 from control panel switch bank, packer extend button from joystick, button 7 from outside control switch bank 2 or button 7 from outside control switch bank 3).

8. STROBE LIGHT 1 (OUT0100 - %QX38.0 – PIN 6)

Function: The output function controls the Strobe Light 1 (Front Strobe). It activates when the following conditions are met:

- [(Strobe Light Push Button from Display is pressed, OR Pump Enable Command is ON, OR Reverse Command is ON) AND
- (Turn Signal is OFF OR Whelen Light Configuration is not active) AND
- (Speed Control Strobe Configuration is not active)] OR
- (Veolia Strobe Command is ON AND Speed Control Strobe Configuration is active).

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Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A1	-	Strobe Light Push Button from Display	Activated	Memory Flag	ON
A2	OR	Pump Enable (See Note 1)	Activated	Memory Flag	ON
A3	OR	Reverse (See Note 2)	Activated	Memory Flag	ON
B1	AND	Turn Signal (See Note 3)	Not Activated	Memory Flag	OFF
B2	OR	Whelen Light Configuration	Not Activated	Memory Flag	OFF
C	AND	Speed Control Strobe Configuration	Not Activated	Memory Flag	OFF
D1	AND	Veolia Strobe	Activated	Memory Flag	OFF
D2	AND	Speed Control Strobe Configuration	Activated	Memory Flag	OFF

Conditions: [(A1 OR A2 OR A3) AND (B1 OR B2) AND C] OR (D1 AND D2) will activate the STROBE LIGHT 1 output.

Note 1 – The Pump Enable command is activated when the Pump Enable push button on the display, or Button 1 on the control panel switch bank on the display, or the pump toggle button on the joystick is pressed, provided that the Coordinated Dump Mode command is not active.

Note 2 – The Reverse command activates when the vehicle is in reverse gear.

Note 3 – The Turn Signal command activates after a 1.5 second delay once the vehicle indicates a turn to either the left or right.

9. STROBE LIGHT 2 (OUT0101 - %QX42.0 – PIN 7)

Function: The output function controls the Strobe Light 2 (Rear Strobe). It activates when the following conditions are met:

- [(Strobe Light Push Button from Display is pressed, OR Pump Enable Command is ON, OR Reverse Command is ON) AND
- (Turn Signal is OFF OR Whelen Light Configuration is not active) AND
- (Speed Control Strobe Configuration is not active)] OR
- (Veolia Strobe Command is ON AND Speed Control Strobe Configuration is active).

Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A1	-	Strobe Light Push Button from Display	Activated	Memory Flag	ON
A2	OR	Pump Enable (See Note 1)	Activated	Memory Flag	ON
A3	OR	Reverse (See Note 2)	Activated	Memory Flag	ON
B1	AND	Turn Signal (See Note 3)	Not Activated	Memory Flag	OFF
B2	OR	Whelen Light Configuration	Not Activated	Memory Flag	OFF
C	AND	Speed Control Strobe Configuration	Not Activated	Memory Flag	OFF
D1	AND	Veolia Strobe (See Note 4)	Activated	Memory Flag	OFF
D2	AND	Speed Control Strobe Configuration	Activated	Memory Flag	OFF

Conditions: [(A1 OR A2 OR A3) AND (B1 OR B2) AND C] OR (D1 AND D2) will activate the STROBE LIGHT 2 output.

Note 1 – The Pump Enable command is activated when the Pump Enable push button on the display, or Button 1 on the control panel switch bank on the display, or the pump toggle button on the joystick is pressed, provided that the Coordinated Dump Mode command is not active.

Note 2 – The Reverse command activates when the vehicle is in reverse gear.

Note 3 – The Turn Signal command activates after a 1.5 second delay once the vehicle indicates a turn to either the left or right.

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10. AUXILIARY BACKUP LIGHT (OUT0102 - %QX46.0 – PIN 8)

Function: The output function controls the Auxiliary Backup Light. It activates when the following conditions are met:

- Auxiliary Reverse Lights Command is ON

Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Auxiliary Reverse Lights (See Note 1)	Activated	Memory Flag	ON

Note 1 – The Auxiliary Reverse Lights command activates when the Auxiliary Light push button from the display is pressed, or when the vehicle is in reverse gear.

11. BACKUP ALARM (OUT0103 - %QX50.0 – PIN 9)

Function: The output function controls the Backup Alarm. It activates when the following conditions are met:

- Tailgate Open Indicator Command is ON OR
- Tailgate Unlock Indicator Command is ON

Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Tailgate Open Indicator (See Note 1)	Activated	Memory Flag	ON
B	OR	Tailgate Unlock Indicator (See Note 2)	Activated	Memory Flag	ON

Conditions: A OR B will activate the BACKUP ALARM output.

Note 1 – The Tailgate Open Indicator command activates when the Tailgate Closed Last State command is off. The Tailgate Closed Last State command is activated when the Tailgate Closed Proximity input is on, or when the series combination of the Tailgate Closed Last State command, the negation of the Tailgate Up command, and the negation of the Tailgate Unlock command is on.

Note 2 – The Tailgate Unlock Indicator command activates when either the Tailgate Locked Proximity SS or Tailgate Locked Proximity CS sensor input is off.

Note 3 – Tailgate closed last state command activates when the tailgate closed proximity input is on or the combination of negation of tailgate up pushbutton signal from the In-Cab Display and negation of tailgate unlock pushbutton signal from the In-Cab Display and tailgate closed last state command is on.

12. HOPPER FLOOD LIGHTS (OUT0104 - %QX54.0 – PIN 10)

Function: The output function controls the Hopper Flood Lights. It activates when the following conditions are met:

- Hopper Lights Command is ON

Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Hopper Lights (See Note 1)	Activated	Memory Flag	ON

Note 1 – The Hopper Lights command activates when the Hopper Light push button from the display is pressed.

13. TAILGATE UP (OUT0201 - %QX78.0 – PIN 74)

Function: The output function controls the Tailgate Up solenoid. It activates when the system power input from the cab controller is active, and the following conditions are met:

- Road Speed OK is confirmed AND
- Tailgate Up Command is ON AND
- Tailgate Unlock Command is OFF AND
- PTO Solenoid is engaged AND
- (State A is ON) OR No Tailgate Proximity Faults Command is ON

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Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Road Speed OK (See Note 1)	Activated	Memory Flag	ON
B	AND	Tailgate Up (See Note 2)	Activated	Memory Flag	ON
C	AND	Tailgate Unlock (See Note 3)	Not Activated	Memory Flag	OFF
D	AND	PTO Solenoid (See Note 4)	Activated	Memory Flag	ON
E1	AND	State A	Activated	Memory Flag	ON
E2 E3	OR	No Tailgate Proximity Faults	Activated	Memory Flag	ON

Conditions: A AND B AND C AND D AND [(E1 AND E2) OR E3] will activate the TAILGATE UP output.

State A:

- Will be activated when tailgate locked proximity SS input is off, and tailgate locked proximity CS input is off and tailgate unlock pushbutton from the In-Cab Display is pressed.

Note 1 - The Road Speed OK command activates when the actual road speed is less than or equal to 5 mph.

Note 2 - The Tailgate up command activates when Tailgate Up Push Button from the display is pressed.

Note 3 - The Tailgate Unlock command activates when Tailgate Unlock Push Button from the display is pressed.

Note 4:

- The PTO Solenoid activates when air supply command is on, or auxiliary air supply command is on
 - (1) Air supply command activates 300ms after the lift pump is on or the packer pump is on.
 - (2) Auxiliary air supply command will be activated when auxiliary control enable command is on, arms up interlock command is off and arms down interlock command is off and either the lift pump is on, or the packer pump is on.
 - (3) Lift pump will be activated when HOC In Range 1 command is on and 500ms after EOS command is on.
 - (4) Packer pump will be activated when HOC In Range 2 command is on and 1s after EOS command is on.
 - (5) HOC In Range 1 command will be activated when:
 - (a) The hydraulic pump is enabled AND
 - (b) If the engine speed is below 900 RPM when the idle tandem pump configuration is active, or below 1800 RPM when the idle tandem pump configuration is not active AND
 - (c) If the engine speed is below 900RPM, when the idle tandem pump configuration is active or if the engine speed is below 1500RPM, when idle tandem pump configuration is not active or if the HOC In Range 1 command is already on.
 - (4) HOC In Range 2 command will be activated when the hydraulic pump is enabled, and the engine speed is below 1800RPM. Once activated, it remains on as long as the engine speed is less than or equal to 1900 RPM.
 - (5) The EOS command will be activated when the hydraulic pump is enabled, the speed is within the PTO range, the pump-on oil temperature condition is met, and the parallel combination of bypass shutdown is not active, the minimum bypass condition is satisfied, and the series combination of the oil tank filter pressure switch input and the PTO output are on.
 - (a) The Bypass Shutdown command is activated when the bypass time is more than the bypass shutdown setpoint.
 - (b) The Speed within PTO range command is activated when the hydraulic pump is enabled, and the engine speed is less than 900RPM. Once activated, it remains on as long as the hydraulic pump is enabled, and the engine speed is less than or equal to 2500 RPM.

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14. TOP DOOR OPEN (OUT0203 - %QX86.0 – PIN76)

Function: The output function controls the Top Door Open solenoid. It activates when the system power input from the cab controller is active, and the following conditions are met:

- (Top Door Last State Command is ON AND Top Door Open Indicator Command is OFF) OR Top Door Open Push Button from the display is pressed AND
- Top Door Configuration is active AND
- PTO Solenoid is engaged.

Necessary conditions to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A1	-	Top Door Open Push Button from Display	Activated	Memory Flag	ON
A2	OR	Top Door Last State (See Note 1)	Activated	Memory Flag	ON
A3	AND	Top Door Open Indicator (See Note 2)	Not Activated	Memory Flag	OFF
B	AND	Top Door Configuration	Activated	Memory Flag	ON
C	AND	PTO Solenoid (See Note 3)	Activated	Memory Flag	ON

Conditions: [A1 OR (A2 AND A3)] AND B AND C will activate the TOP DOOR OPEN output.

Note 1 - The Top Door Last State command activates when the Top Door Open Indicator command is on, or when the series combination of the Top Door Last State command and the negation of the Top Door Closed command is on.

Note 2 - The Top Door Open Indicator command activates when the Top Door Open Proximity Sensor Input is on, and the Top Door Configuration is active.

Note 3:

- The PTO Solenoid activates when air supply command is on, or auxiliary air supply command is on
 - (1) Air supply command activates 300ms after the lift pump is on or the packer pump is on.
 - (2) Auxiliary air supply command will be activated when auxiliary control enable command is on, arms up interlock command is off and arms down interlock command is off and either the lift pump is on, or the packer pump is on.
 - (3) Lift pump will be activated when HOC In Range 1 command is on and 500ms after EOS command is on.
 - (4) Packer pump will be activated when HOC In Range 2 command is on and 1s after EOS command is on.
 - (5) HOC In Range 1 command will be activated when:
 - (a) The hydraulic pump is enabled AND
 - (b) If the engine speed is below 900 RPM when the idle tandem pump configuration is active, or below 1800 RPM when the idle tandem pump configuration is not active AND
 - (c) If the engine speed is below 900RPM, when the idle tandem pump configuration is active or if the engine speed is below 1500RPM, when idle tandem pump configuration is not active or if the HOC In Range 1 command is already on.
 - (6) HOC In Range 2 command will be activated when the hydraulic pump is enabled, and the engine speed is below 1800RPM. Once activated, it remains on as long as the engine speed is less than or equal to 1900 RPM.
 - (7) The EOS command will be activated when the hydraulic pump is enabled, the speed is within the PTO range, the pump-on oil temperature condition is met, and the parallel combination of bypass shutdown is not active, the minimum bypass condition is satisfied, and the series combination of the oil tank filter pressure switch input and the PTO output are on.
 - (a) The Bypass Shutdown command is activated when the bypass time is more than the bypass shutdown setpoint.
 - (b) The Speed within PTO range command is activated when the hydraulic pump is enabled, and the engine speed is less than 900RPM. Once activated, it remains on as long as the hydraulic pump is enabled, and the engine speed is less than or equal to 2500 RPM.

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15. TAILGATE FLOW (OUT0204 - %QX90.0 – PIN77)

Function: The output function controls the Tailgate Flow operations when the system power input from the cab controller is active, and the following conditions are met:

- Tailgate up output should be on OR
- Tailgate down output should be on OR
- Tailgate lock output should be on OR
- Tailgate unlock output should be on OR
- Top door open output should be on OR
- Top door close output should be on

16. AUTO RETRACT

Function: The memory flag controls the Auto Retract operations. TO activate the switch on the auto retract command:

- Auto retract reset command shouldn't be on and packer travel position command from the In-Cab Display shouldn't be on and lift pump command should be on and OSR auto pack command should be on OR
- Auto retract reset command shouldn't be on and packer travel position command from the In-Cab Display shouldn't be on and lift pump command should be on and if rising trigger output of packer extend command is on OR
- Auto retract reset command shouldn't be on and packer travel position command from the In-Cab Display shouldn't be on and tandem pump configuration should be active and packer pump command should be on and OSR auto pack command should be on OR
- Auto retract reset command shouldn't be on and packer travel position command from the In-Cab Display shouldn't be on and tandem pump configuration should be active and packer pump command should be on and and if rising trigger output of packer extend command is on OR
- Auto retract reset command shouldn't be on and packer travel position command from the In-Cab Display shouldn't be on and double pack retract command should be off and auto retract command should be on

Note 1 – To activate the switch on the auto retract reset command:

- Tailgate closed last state command should be off OR
- If either the button 5 is pressed from the In-Cab Display keypad or button 5 of the control panel switch is pressed OR
- Packer retract and packer full retract commands should be on OR
- Travel position command should be on, or Packer retract command should be on OR
- System power input from cab controller should be off OR
- Vehicle should be in service mode or packer should be calibration mode.

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17. DOUBLE PACK

Function: There are 2 memory flags, and the respective memory flag controls the Double Pack Extend & Double Pack Retract operations. To activate the switch on the auto retract reset command:

- Step 1 will be activated when double pack command is on and either start auto pack command or start select o pack command is on.
- Step 2 will be activated when step 1 is true, and packer fully extended command is on.
- Step 3 will be activated when step 2 is true and double pack retract command is on and double pack retract position command is on.
- Step 4 will be activated when step 3 is true and double pack extend command is on and packer fully extended command is on.
- Double pack retract command will be activated when step 2 is true, and step 3 is false.
- Double pack extend command will be activated 2 seconds after step 3 is true, and step 4 is false.
- Double pack final retract command will be activated when step 4 is true, and packer fully extended command is off.

Note 1 – Start auto pack command will be activated when arms up latch command is on and arms down position command is on.

Note 2 – Start select o pack command will be activated when arms up latch command is on and lift below transit command is on.

- Note 3 – Double pack command will be activated when button 6 from control panel switch bank or select o pack button from the In-Cab Display is pressed twice.

Body Controller Outputs – ST B

1. CAB FLOOD LIGHTS (OUT0307 - %QX138.0 – PIN 23)

Function: The output function controls the Cab Flood Lights. It activates when the system power input from cab controller is activated and following conditions are met:

- Cab Flood Lights Command is ON

Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Cab Flood Lights (See Note 1)	Activated	Memory Flag	ON

Note 1 – The Cab Flood Lights command activates when the Cab Light push button from the display is pressed.

2. CONTAINER FLOOD LIGHTS (OUT0308 - %QX142.0 – PIN 24)

Function: The output function controls the Container Flood Lights. It activates when the system power input from cab controller is activated and following conditions are met:

- Container Lights Command is ON

Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Container Lights (See Note 1)	Activated	Memory Flag	ON

Note 1 – The Container Lights command activates when the Container Light push button from the display is pressed.

3. ARMS UP (OUT0506 - %QX206.0 – PIN79)

Function: The output function controls the Arms Up operations when the system power input from the cab controller is active and the following conditions are met.

- Vehicle speed should be within can arms range OR
- AI cab protector configuration should be active and cab protector down proximity input should be off OR
- Lift below transit command should be on and top door configuration should be active, and top door shouldn't be on, and PTO solenoid should be energized OR
- Lift below transit command should be on and override interlock command shouldn't be on and packer full retract command shouldn't be on.

CONTROLLER SOFTWARE**Cab Controller I/O Functions****A. CAB Controller INPUTS:****1. SYSTEM POWER (IN0000-PIN25)**

Function: This circuit monitors the ON/OFF status of the System Power Switch (“mushroom button”). This “mushroom button” should be in “UP” position for the system to be operative. If “Depressed” system power will be turned OFF.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Mushroom Head EMG PB	System Power	Activated	IN0000 - %IX2.0	ON

Activation Logic

- When the Mushroom Button is in the UP position, the System Power Input is ON, and the system is operational
- When the button is depressed, the System Power Input is OFF, and the system power is disabled

Control Intent

- This input acts as a master safety and power control, ensuring:
 - (1) Immediate shutdown capability in case of emergency or maintenance
 - (2) Operator-controlled system enablement for safe startup

2. CHASSIS NEUTRAL (IN0001-PIN26)

Function: This circuit monitors the Transmission Neutral circuit. This input is enabled when the Engine transmission is put into Neutral.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Activation Logic: The input is enabled (ON) when the engine transmission is shifted into Neutral

Control Intent : This input is typically used to:

- Validate interlocks for hydraulic or PTO operations
- Ensure safe system behavior by confirming the vehicle is not in gear during certain functions

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Chassis Transmission	Chassis Neutral	Activated	IN0001 - %IX34.0	ON

3. Panel Selection Switch (IN0500)

Function: 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	Function or Component	Status	I/O Address	Status
Selector Switch	Panel Select	Activated	IN0500 - %IX162.0	ON

4. SCALE ALARM 1 (IN0501-PIN41)

Function: This circuit monitors the ON/OFF status of the Scale Alarm-1 condition.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

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Function Logic: This Scale Input goes High (ON) when approaching maximum weight on the scale system.

Input Device	Function or Component	Status	I/O Address	Status
Weight Scale SW	Scale Alarm 1	Activated	IN0501 - %IX194.0	ON

5. SCALE ALARM 2 (IN0502-PIN42)

Function: This circuit monitors the ON/OFF status of the Scale Alarm-2 condition.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic: This scale input turns High (ON) when the bin weight exceeds the maximum allowable weight.

Input Device	Function or Component	Status	I/O Address	Status
Weight Scale SW	Scale Alarm 2	Activated	IN0502 - %IX218.0	ON

6. LOW TORQUE PRESSURE SWITCH (IN0503 – PIN 43)

Function: This circuit monitors and detects the low-pressure/low-torque of the Low Torque Pressure Switch and sends a signal to the controller for protection, interlock, or system response. The input is activated when the pressure drops below the required torque threshold.

Activation Logic

- The input turns ON when the pressure switch senses that the torque-related pressure has fallen below the designated minimum level.

Control Intent

- This input acts as a protective interlock to prevent the machine or subsystem from operating under insufficient torque conditions.
- It helps avoid mechanical damage, improper operation, or incomplete functioning due to low torque pressure.

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Pressure Switch	Low Torque Pressure Switch	Activated	IN0503 - %IX250.0	ON

7. OPERATOR PRESENCE JOYSTICK INPUT (IN0701-PIN60)

Function: This circuit monitors the ON/OFF status of the Operator Presence inputs when Deadman Joystick is selected.

Activation Logic

- When the Deadman Joystick is selected:
 - (1) The system monitors whether the Operator Presence Input is ON (i.e., operator is actively engaging the joystick)
 - (2) If the input is OFF, operations may be disabled or paused for safety

Control Intent

- This logic ensures:
- Operator engagement verification before allowing hydraulic or lift operations
- Safety interlock to prevent unintended activation when the operator is not present or actively controlling the system

Function Logic:

Input Device	Function or Component	Status	I/O Address	Status
Joystick	Operator Presence Joystick Input	Activated	IN0701 - %IX294.0	ON

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Cab Controller Outputs

1. CNG FUEL SOLENOID (OUT0000 - %QX2.0 – PIN 16)

Refer to the output “CNG SOLENOID OPEN - OUT0106” of the body controller for the control logic.

2. CAM RELAY 1 (OUT0001 - %QX6.0 – PIN 17)

Function: The output function controls the Cam Relay 1. Energizing the relay to enable camera system operation whenever specific camera view conditions are active

- It activates when the following conditions are met:
 - (1) When the camera displays the left-side cab view in single view mode from the 3rd eye switch box OR
 - (2) When the camera displays both the left-side cab view and reverse view in double view mode from the 3rd eye switch box OR
 - (3) When the 360° camera displays the reverse view with grid lines in single view mode OR
 - (4) When the 360° camera displays the reverse view without grid lines in single view mode OR
 - (5) When the camera displays the right-side cab view in single view mode from the Quad Video Box OR
 - (6) When the camera displays both the right-side cab view and reverse view in double view mode from the Quad Video Box OR
 - (7) When the camera displays the right-hand alley view in single-view mode from the Quad Video Box OR
 - (8) When the camera displays right hand alley view, left-hand alley view and reverse view in triple view mode from the Quad Video Box.

Control Intent: The intent of Cam Relay 1 is to:

- Enable the correct camera power and routing whenever the operator selects any operationally relevant camera view.
- Ensure the relay energizes when visibility critical views (left, right, alley, reverse, or composite views) are displayed.
- Support both 3rd Eye and Heil camera systems, ensuring compatibility with single and multi-view modes.
- Provide the operator with immediate camera activation aligned with selected views for safety, situational awareness, and vehicle maneuvering.

3. CAM RELAY 2 (OUT0002 - %QX10.0 – PIN 18)

Function: The output function controls the Cam Relay 2.

- It activates when the following conditions are met:
 - (1) When the camera displays the right-side cab view in single view mode from the 3rd eye switch box OR
 - (2) When the camera displays the left-side cab view in single view mode from the 3rd eye switch box OR
 - (3) When the camera displays both the right-side cab view and reverse view in double view mode from the 3rd eye switch box OR
 - (4) When the 360° camera displays the left-side cab view in single view mode OR
 - (5) When the camera displays both the right-side cab view and reverse view in double view mode from the Quad Video Box OR
 - (6) When the camera displays the right-hand alley view in single-view mode from the Quad Video Box OR
 - (7) When the camera displays the left-side cab view in single view mode from the Quad Video Box OR
 - (8) When the camera displays right-hand alley view, left-hand alley view and reverse view in triple view mode from the Quad Video Box.

Control Intent: Cam Relay 2 is intended to:

- Provide automatic camera system power routing for visibility critical views on the right and left sides of the cab.
- Ensure the relay energizes for both 3rd Eye and Heil systems, supporting single, double, and triple view modes.
- Improve operator situational awareness during maneuvering, loading, alley operations, and reversing scenarios.

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- Guarantee that whenever the operator selects side specific, alley, or multi view configurations, Cam Relay 2 is energized to enable the correct camera hardware.

4. CAM RELAY 3 (OUT0003 - %QX14.0 – PIN 19)

Function: The output function controls the Cam Relay 3. It activates when the following conditions are met:

- When the camera displays right-hand alley view, left-hand alley view and reverse view in triple view mode from the 3rd eye switch box OR
- When the camera displays the right- hand alley view in single view mode from the 3rd eye switch box OR
- When the 360° camera displays the right-side cab view in single view mode.

Control Intent: Cam Relay 3 provides camera power/control dedicated to alley and right side visibility. The intent is to:

- Ensure the operator has enhanced situational awareness when alley view or right side monitoring is active.
- Automatically power the correct camera channels when triple view alley, right side alley, or right side cab views are selected.
- Support safe vehicle operation during:
 - (1) Tight space navigation
 - (2) Alley approach and entry
 - (3) Residential/commercial route maneuvers
 - (4) Reverse aligned multi view operations

The relay guarantees consistent camera activation, so the operator always receives the required visibility for safe and informed maneuvering.

5. CAM RELAY 4 (OUT0004 - %QX18.0 – PIN 20)

Function: The output function controls the Cam Relay 4. It activates when the following conditions are met:

- When the camera displays the grabber view in single view mode without grabber lines from the 3rd eye switch box OR
- When the camera displays both the grabber view and hopper view in double view mode from the 3rd eye switch box OR
- When the camera displays the grabber view in single view mode with grabber lines from the 3rd eye switch box OR
- When the 360° camera displays the reverse view with grid lines in single view mode OR
- When the 360° camera displays the reverse view without grid lines in single view mode OR
- When the 360° camera displays the right-side cab view in single view mode OR
- When the 360° camera displays the left-side cab view in single view mode.
- Control Intent

Cam Relay 4 is intended to:

- Enable the appropriate camera feeds for hopper positioning, reverse operations, and side monitoring scenarios.
- Ensure consistent camera activation across 3rd Eye and 360° camera systems, regardless of whether the operator selects single view or double view modes.
- Improve operator awareness and safety during:
 - (1) Emptying the body and hopper positioning
 - (2) Reverse maneuvers
 - (3) Right side and left side monitoring in confined spaces

Cam Relay 4 ensures that any camera mode tied to grabber or reverse operations immediately energizes the relay so critical visual feedback is always available.

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6. 360 GRABBER CAMERA TRIGGER (OUT0005 - %QX22.0 – PIN 21)

Function: The output function controls the 360 Grabber Camera Trigger. It activates when the following conditions are met:

- When the 360° camera displays the grabber view in single view mode without grabber lines OR
- When the 360° camera displays the grabber view in single view mode with grabber lines.

7. FRONT STROBE (OUT0007 - %QX30.0 – PIN 23)

Refer to the output “FRONT STROBE - OUT0100” of the body controller for the control logic.

8. REAR STROBE (OUT0008 - %QX34.0 – PIN 24)

Refer to the output “REAR STROBE - OUT0101 THROTTLE ADVANCE” of the body controller for the control logic.

9. PUMP-1 SOL-Lift Pump (OUT0100 - %QX38.0 - PIN06)

Function: This output function controls the Lift Pump solenoid and activates 500ms after the PTO solenoid is engaged OR PTO Pressure SW ON feedback. It also Activates During Packer Extend operation.

Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Pump ON delay (500ms) OR PTO Pressure SW	Activated	Memory Flag	ON
B B1.	AND	Lift Enable SOL-1 (See below Note-1)	Activated	Memory Flag	ON
	OR	Packer Extend SOL	Activated	OUT0008	ON
C	AND	HOC in Range -1	Activated	Memory Flag	ON

Conditions: A AND (B OR B1) AND C Will Activate the PUMP-1 SOL Lift Pump output.

Note-1: The Lift Enable memory flag is activated when the road speed is below 5 mph, the engine RPM for lift operation is less than 1050, and either the chassis is in neutral, or the service brake is engaged

Note-2: HOC in Range -1 Memory Flag is activated when The Road is below 25Mph, and Engine RPM is less than 1050 RPM & Once SOL output is activated Engine Speed should not be greater than 1350 Rpm.

10. PUMP-2 SOL- Packer Pump (OUT0101 - %QX42.0 - PIN07)

Function: The output function controls the Packer Pump solenoid. It activates 500 milliseconds after the PTO solenoid is engaged, or when the PTO Pressure Switch feedback is ON & Packer operations if either the Extend solenoid or Retract solenoid is ON, Additionally, the function is triggered when the Tailgate Flow Request solenoid is ON

Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Pump ON delay (500ms) OR PTO Pressure SW	Activated	Memory Flag	ON
B	AND	Packer Pump OFF Time Delay=1 Sec (See below Note-1)	Activated	Memory Flag	ON
C	AND	HOC in Range -2 (See below Note-1)	Activated	Memory Flag	ON

Conditions: A AND B AND C Will Activate the PUMP-2 SOL Packer Pump output.

Note-1: The Packer Pump solenoid switches OFF One second after Packer operations or Tailgate operations are deactivated

Note-2: HOC in Range -2 Memory Flag is activated when The Road is below 25Mph, and Engine RPM is less than 1550 RPM & Once SOL output is activated Engine Speed should not be greater than 3000 Rpm.

CONTROLLER SOFTWARE**11. PTO SOL (OUT0102 - %QX46.0 - PIN08)**

Function: This output function controls the PTO Enable solenoid, which is activated by the Pump Enable push button.

Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Enable Pump PB	Activated	Memory Flag	ON
B	AND	Engine RPM < 1500 OR PTO SOL output	Activated	Memory Flag	ON
C	AND	Road Speed <= 25MPH	Activated	IN0203	ON
D	AND	Engine RPM < 3000	Activated	Memory Flag	ON

Conditions: A AND B AND C AND D Will Activate the PTO SOL output.

Note: To Enable PTO SOL The Engine RPM should be less than 1500 and once after enabled should not be greater than 3000RPM, & Truck Speed should be less than 25Mph.

12. THROTTLE ADVANCE (OUT0103 - %QX50.0 – PIN09)

Function: The output function controls the Throttle Advance. It activates when the following conditions are met:

- Calibration mode command from display is off and vehicle service mode command from display is off and chassis neutral input (IN0001) from cab controller is pressed AND
- (Aux control enable output (OUT0204) from cab controller is on and button 5 on the outside controls 3 switch bank is pressed) OR
- (Packer extend tailgate closed command is off and button 5 on the control panel switch bank is not pressed and disable throttle advance configuration is not active and packer extend command is on) OR
- (Packer extend tailgate closed command is off and button 5 on the control panel switch bank is not pressed and disable throttle advance configuration is not active and packer fully extended command is on and auto retract command is on and system power input (IN0000) from cab controller is on)]

Note 1: Auto lift throttle advance command activates when:

- Coordinated Dump Mode command is on and auto lift down command is on and arm down position command is off OR
- Coordinated Dump Mode command is on and auto lift up command is on, and the combination of forks tucked command or arm up position command is off.

13. CAB FLOOD LIGHT (OUT0108 - %QX70.0 – PIN 14)

Refer to the output “CAB FLOOD LIGHT - OUT0307” of the body controller for the control logic.

14. AIR SUPPLY (OUT0200 - %QX74.0 – PIN 73)

Function: The output function controls the Air Supply. It activates when the following conditions are met:

- 300ms after either the lift pump output (OUT0100) or the packer pump output (OUT0101) from the cab controller is activated.

15. AUX AIR SUPPLY (OUT0201 - %QX78.0 – PIN 74)

Function: The output function controls the Aux Air Supply. It activates when the following conditions are met:

- Arm up command should be off AND
- Arm down command should be off AND
- Aux control enabled output (OUT0204) from the cab controller should be on AND
- (Lift pump output (OUT0100) from the cab controller should be on OR
- Packer pump output (OUT0101) from the cab controller should be on).

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Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Arm up command	Not Activated	Memory Flag	OFF
B	AND	Arm down command	Not Activated	Memory Flag	OFF
C	AND	Aux control enabled output from the cab controller	Activated	OUT0204	ON
D1	AND	Lift pump output from the cab controller	Activated	OUT0100	ON
D2	OR	packer pump output from the cab controller	Activated	OUT0101	ON

Conditions: A AND B AND C AND (D1 OR D2) will activate the AUX AIR SUPPLY output.

16. AUX CONTROL ENABLED (OUT0204 - %QX90.0 – PIN77)

Function: The output function controls the Aux Control Enable. It activates when the following conditions are met:

- Button 7 on the Outside Controls 1 Switch Bank is pressed OR
- Button 1 on the Outside Controls 2 Switch Bank is pressed OR
- Button 1 on the Outside Controls 3 Switch Bank is pressed.

Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Button 7 on the Outside Controls 1 Switch Bank	Activated	Memory Flag	ON
B	OR	Button 1 on the Outside Controls 2 Switch Bank	Activated	Memory Flag	ON
C	OR	Button 1 on the Outside Controls 3 Switch Bank	Activated	Memory Flag	ON

Conditions: A OR B OR C will activate the AUX CONTROL ENABLED output.

17. OUT OF DIM (OUT0205 - %QX94.0 – PIN78)

Function: The output function controls the Out of Dim. It activates when the following conditions are met:

- If the actual road speed is more than 7MPH AND
- Run Permissive command is on.

Conditions Necessary to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Actual road speed is more than 7MPH	Activated	Memory Flag	ON
B	AND	Run Permissive command (See Note 1)	Activated	Memory Flag	ON

Conditions: A AND B will activate the OUT OF DIM output.

Note1: Run Permissive command activates when the tailgate closed last state command is off and arm up indication command is on, and side door proximity sensor input is off.

- Tailgate closed last state command activates when the tailgate closed proximity input is on or the combination of negation of tailgate up pushbutton signal from the In-Cab Display and negation of tailgate unlock pushbutton signal from the In-Cab Display and tailgate closed last state command is on.

18. THROTTLE LIMIT (OUT0206 - %QX98.0 – PIN79)

Function: The output function controls the Throttle Limit. It activates when the following conditions are met:

- Hydraulic pumps enable command is on AND
- Chassis neutral input from cab controller is on.

Necessary conditions to activate the circuit:

Condition	Logic	Function or Component	Status	I/O Address	Status
A	-	Hydraulic pump enable command	Activated	Memory Flag	ON
B	AND	Chassis neutral input from cab controller	Activated	IN0001	ON

Conditions: A AND B will activate the THROTTLE LIMIT output.

SECTION 7

IN-CAB CONTROLS

IN-CAB DISPLAY

In-Cab Main Control Panel

The in-cab main control panel can vary with different models of truck chassis and configuration. The control panels have labels or markings that identify each function and its operations. Make sure you are familiar with the control panel in your unit.

Note: If the switch bank fails, use the in-cab display switchboard as a temporary solution.



Figure 141. Control Panel

⚠ WARNING

After the system power switch is pressed and motion of components has appeared to stop, additional movement can occur. **SERIOUS INJURY or DEATH** can occur if stored energy is not released.

1. SYSTEM POWER ON and OFF/STOP SWITCH (RED) - The switch must be ON and the side door closed for the pump to turn on. The packer, lift, and tailgate will not operate with the side door/system power OFF.
 - a. PULL for ON position.
 - b. PUSH for OFF/STOP position.

NOTICE

The packer panel can be stopped at any position by pushing switch to OFF/STOP position.

2. IN-CAB ALARM - Sounds when tailgate or body is opened or raised, the lift is extended, when switching between Auto and Manual Pack Modes or Auto and Manual Lift Modes, when various other conditions occur, or a fault condition occurs. Refer to Diagnostic Fault Codes and the applicable Service Manual , "Body Controller Software" section.
3. USB CHARGING PORT
4. SWITCH BANK - Pump, Pack Extend, OVHGT Override, Auto Lift, Pack Retract, and Select-O-Pack functions are also located in the in-cab display.

IN-CAB DISPLAY

Switchbank Nomenclature

Use the push buttons and indicator lights described below to operate the unit's hydraulic functions. Note: All functions are momentary. The button works only while it is being pressed. When released, it automatically returns to its default position.



Figure 142.

⚠ WARNING

After the System Power push button is pressed and motion of components has appeared to stop, additional movement can occur and may cause **SERIOUS INJURY** or **DEATH**.

Press the button to activate the hydraulic function; press it again to deactivate it. Some buttons have lighted notification status colors around them.

NOTICE

The packer panel can be stopped at any position by pushing the system power switch.

1. PUMP BUTTON

- PUSH to turn hydraulic pump ON. The lighted ring around the switch light comes ON.
- PUSH again to turn hydraulic pump OFF. The lighted ring around the switch light goes OFF.

2. PACK EXT / RET buttons - Controls extending and retracting the packer. The lighted ring around the PACK RET button will be RED if packer is not retracted to the full retract position.

- PUSH to PACK EXT button to EXTEND packer.
- PUSH to PACK RET position to RETRACT packer.

3. OVHGT OVERRIDE BUTTON – Use this function to override the packer logic on a unit when you want to use the packer with the arms above the cab protector. The lighted ring around the OVHGT OVERRIDE button will flash RED if arms are above height and forks are not tucked OR if commercial grippers/adjustable forks are over height. This allows an operator to:

- manually operate the packer with the arms raised.
- extend the packer and clean behind the packer on Commercial units.

4. SELECT-O-PACK BUTTON - Enables Select-O-Pack function.

- PUSH to turn Select-O-Pack ON with one pack cycle (lighted ring turns YELLOW).
- PUSH again to turn Select-O-Pack ON with two pack cycles (lighted ring turns GREEN).
- PUSH again to turn Select-O-Pack OFF (lighted ring turns BLUE). Icon Functions

IN-CAB DISPLAY

This table provides a reference for the icon function colors and the status indicated.

FUNCTION COLOR	FUNCTION STATUS
Green	Active/State Achieved
Yellow/Blurring	Transition/moving
Gray	Inactive
Red	Unsafe/Not Achieved
EXCEPTIONS	
Pack Extend icon is green when inactive, flashing green when extending and green when fully extended.	
Pack retract icon is yellow when inactive, flashing yellow when retracting and yellow when fully retracted.	
Top Door icon (open) is gray when inactive, flashing green when opening and gray when fully open.	
Top Door icon (close) is red when top door is not fully open and not commanded, flashing green when closing and gray when fully closed.	
Select-O-Pack is gray when inactive, yellow when in half pack mode, green when in double pack mode.	

Boot-Up Screen

This image will appear on the display once it receives power.



Figure 143.

Customer Resource QR Code

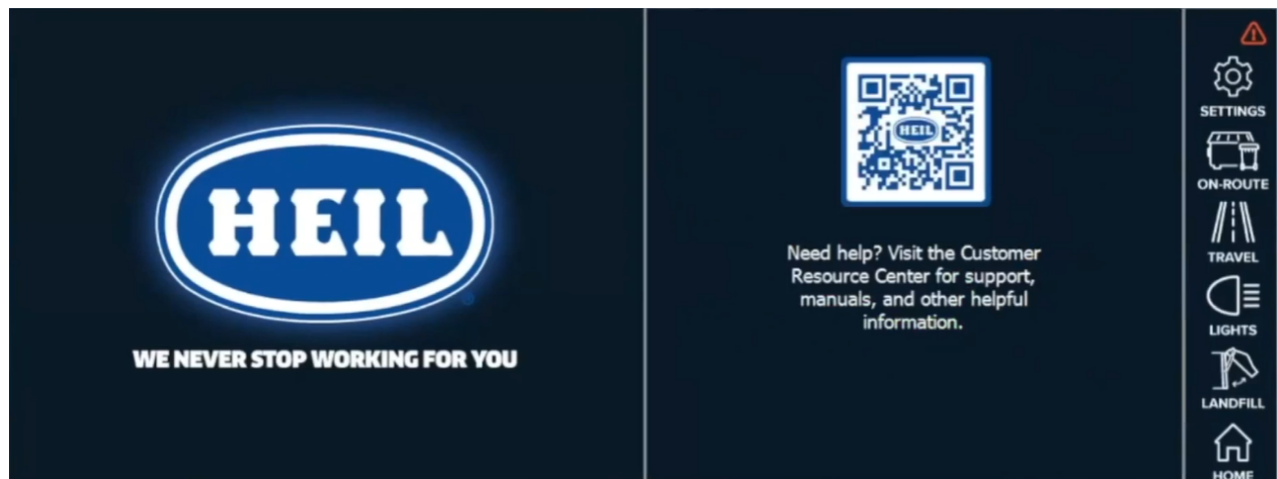


Figure 144.

IN-CAB DISPLAY

Notice Page

Appears for ten seconds along with the telltale bulb check.

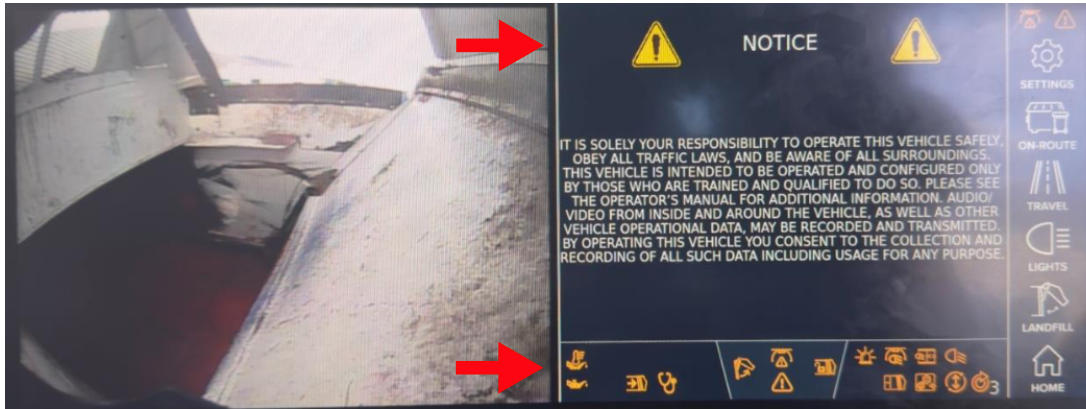


Figure 145.

Home Screen Nomenclature

Note: If cameras are configured, it will appear on the left side as shown and can show up to four cameras at one time. If not configured the Heil logo will appear.

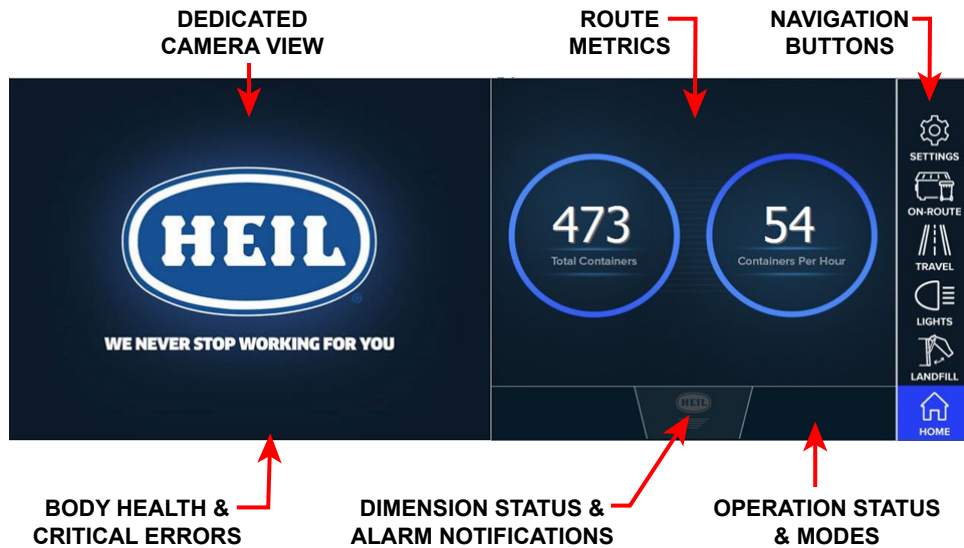


Figure 146.

Home Screen

NOTE: If camera is configured, it will be shown in the left area.

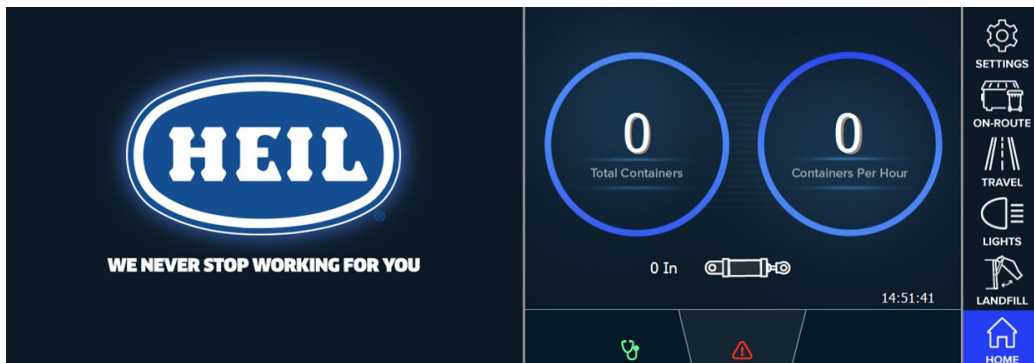


Figure 147.

IN-CAB DISPLAY

Settings Page

Here you can view active alarms and other details for the unit by tapping the corresponding icon. If an alarm occurs, it will be identified under the settings page.

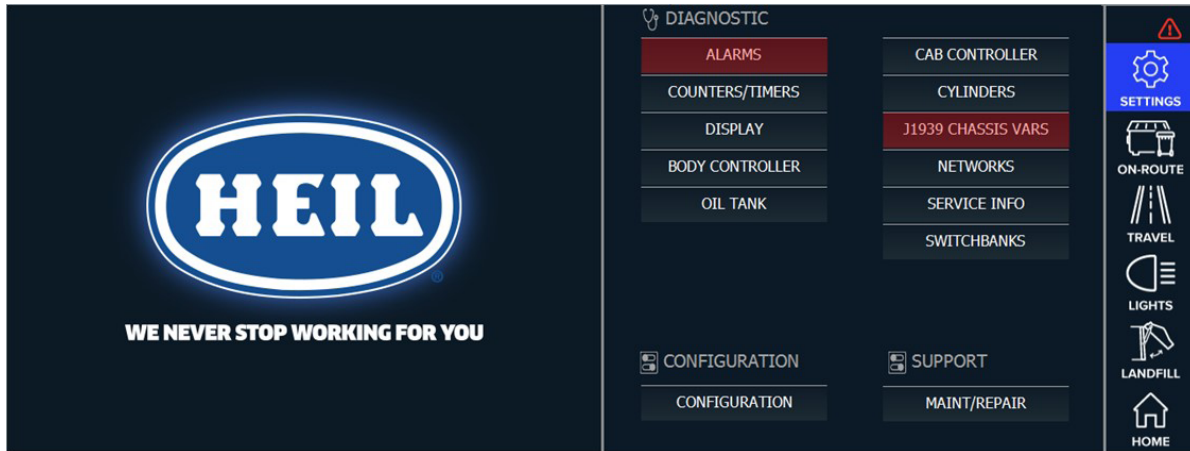


Figure 148.

A. Alarms

Press the “Clear Alarms” icon to clear current alarms. Press the back icon to return to the previous screen.

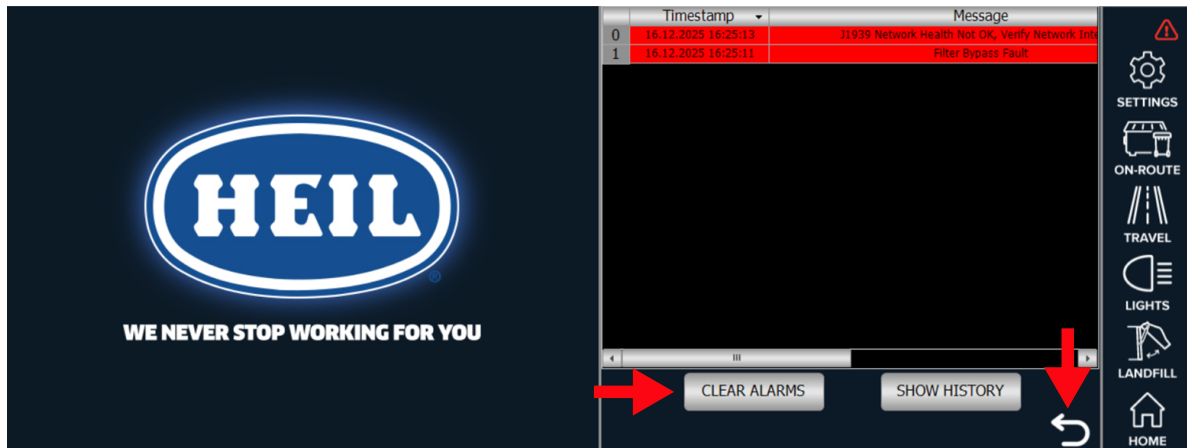


Figure 149.

B. Body Controller Inputs

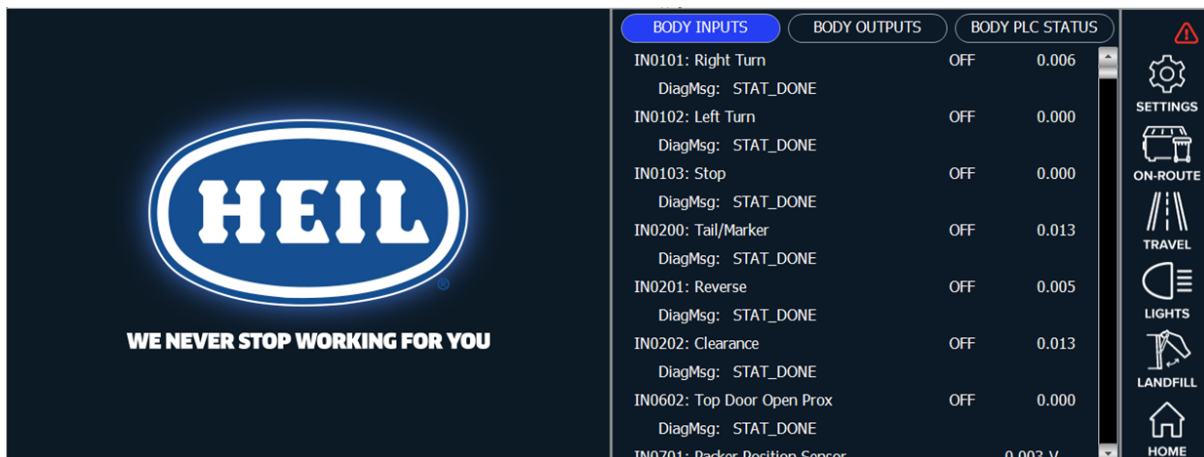


Figure 150.

IN-CAB DISPLAY

C. Body Controller Output

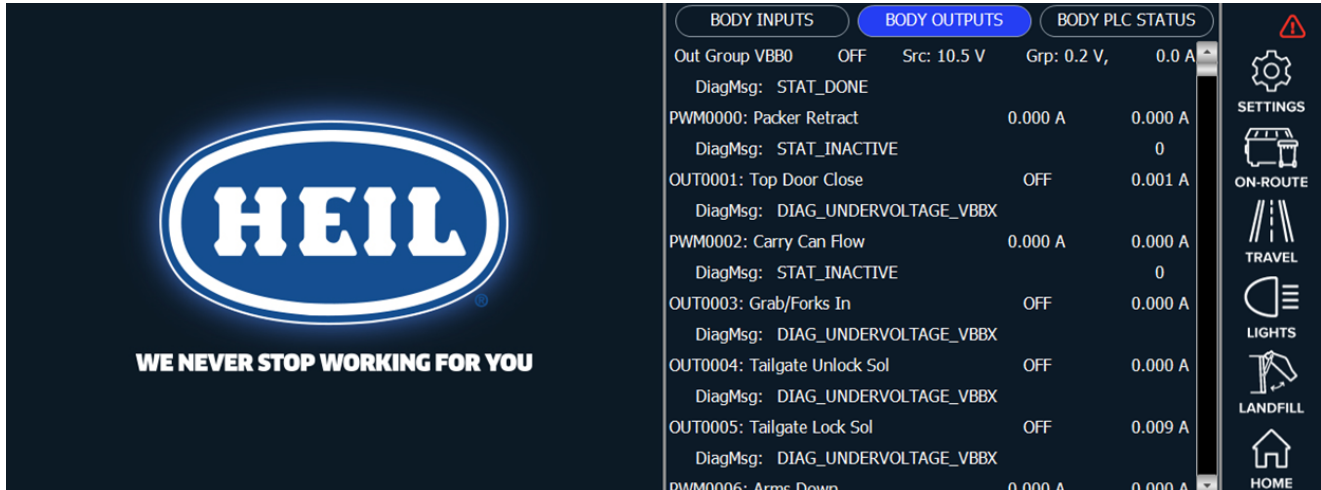


Figure 151.

D. Body Controller PLC Status

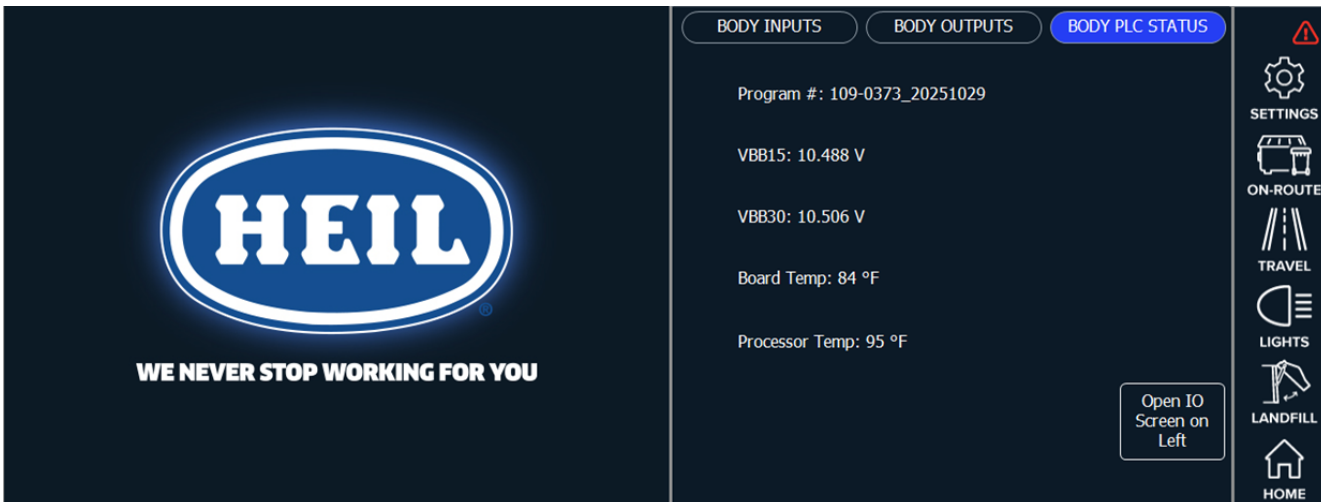


Figure 152.

E. Cab Controller PLC Status

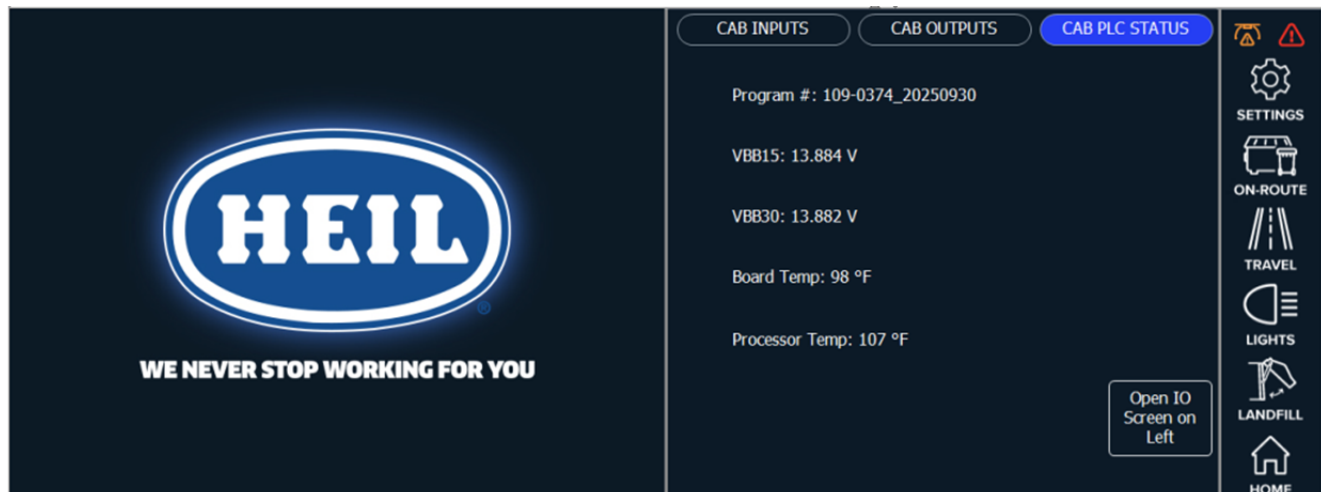


Figure 153.

IN-CAB DISPLAY

When the “Open I/O Screen on Left” icon is pressed the display will view as shown.

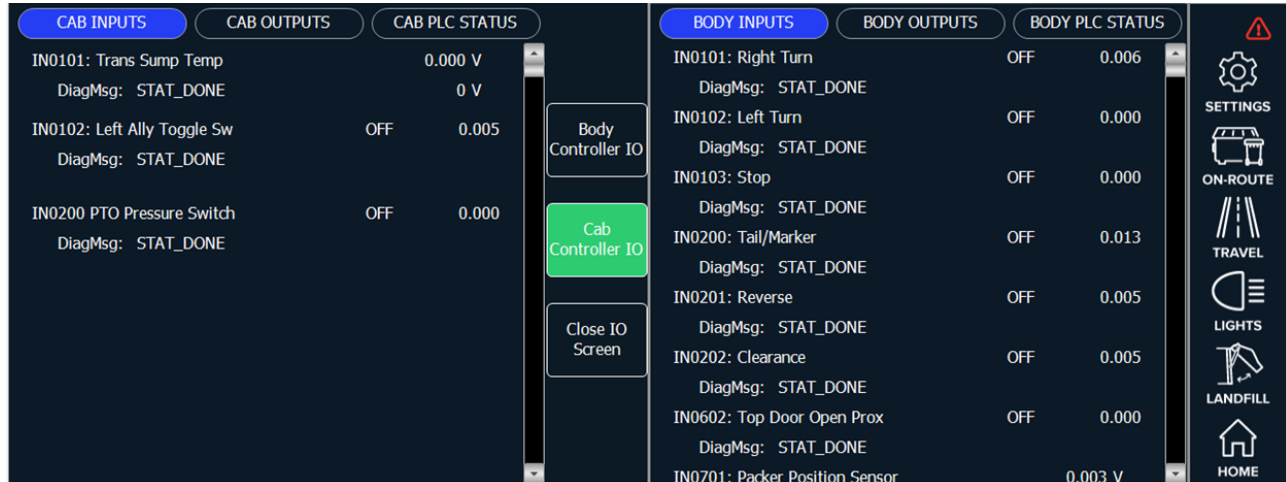


Figure 154.

F. Counters & Timers

To clear the counts, press and hold each icon (daily arm cycles, daily pack cycles, filter bypass hours) for 3 seconds.

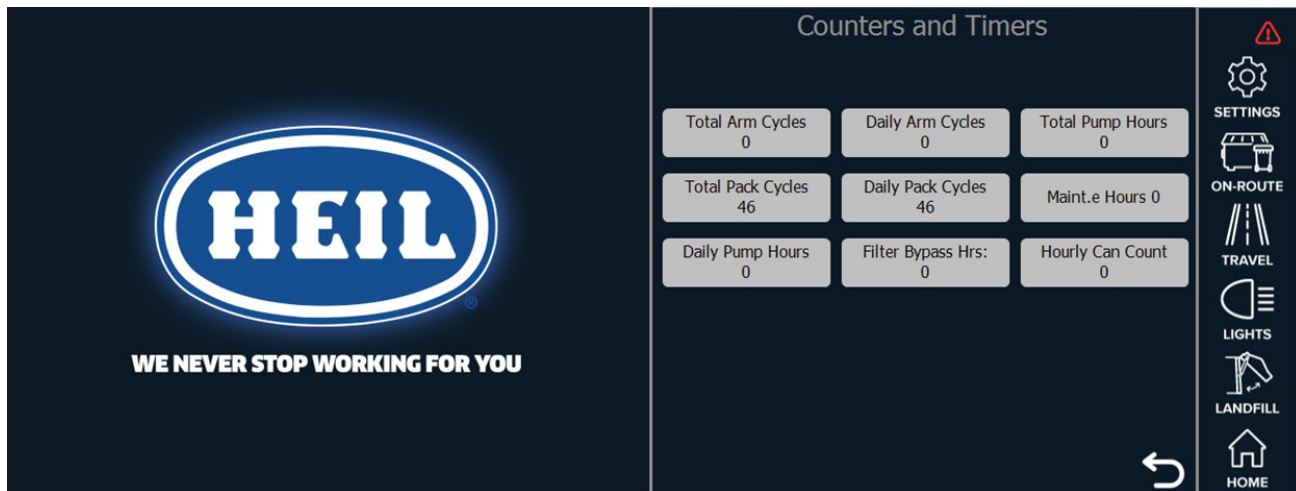


Figure 155.

G. Cylinders

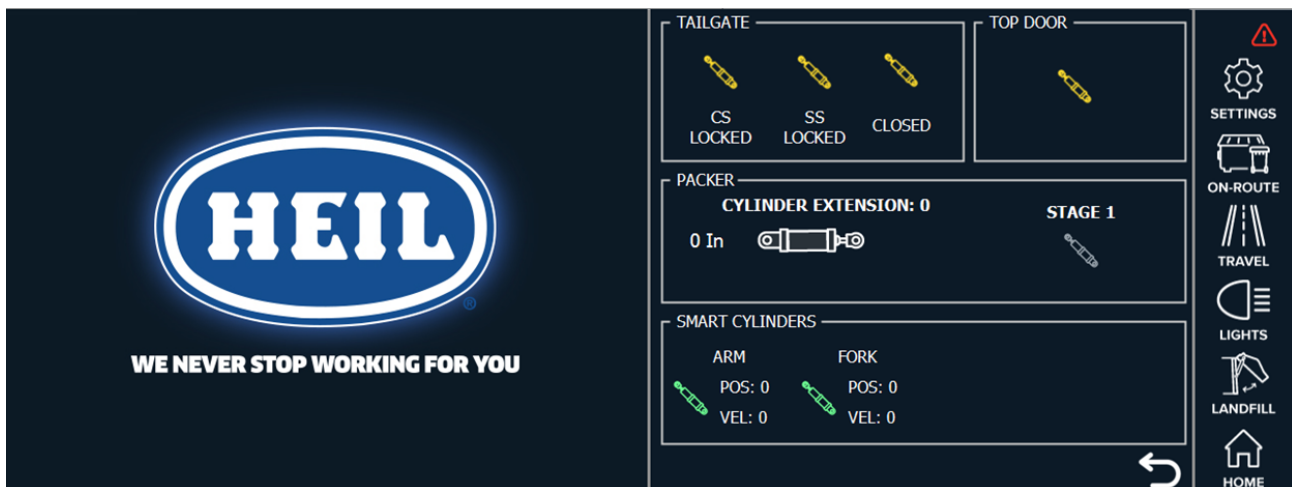


Figure 156.

IN-CAB DISPLAY

H. Display

Set the time, screen brightness, and language preference from this screen.

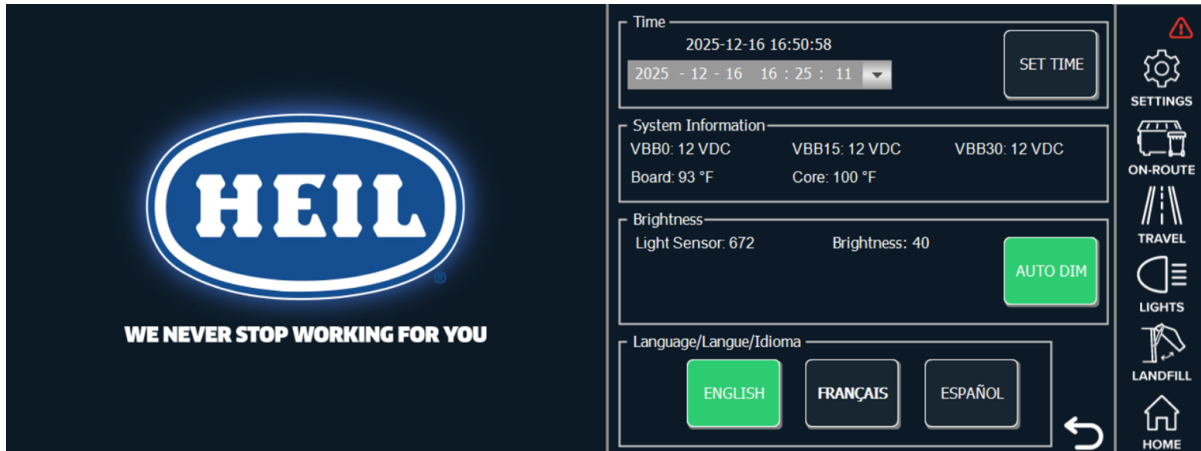


Figure 157.

I. Chassis

Note: Values & status will show when the truck is on.

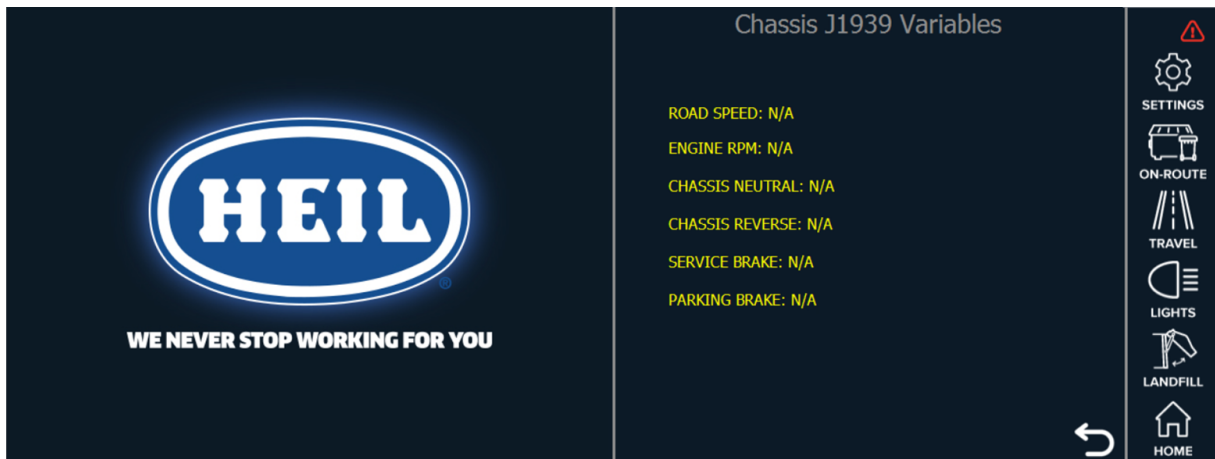


Figure 158.

J. Network

Verify the body & cab controller status here.

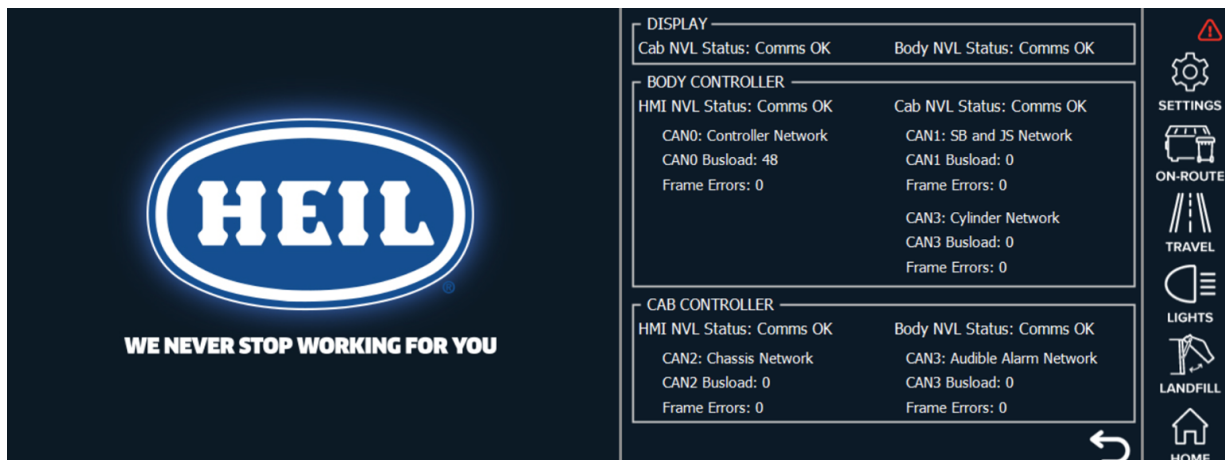


Figure 159.

IN-CAB DISPLAY

K. Oil Tank

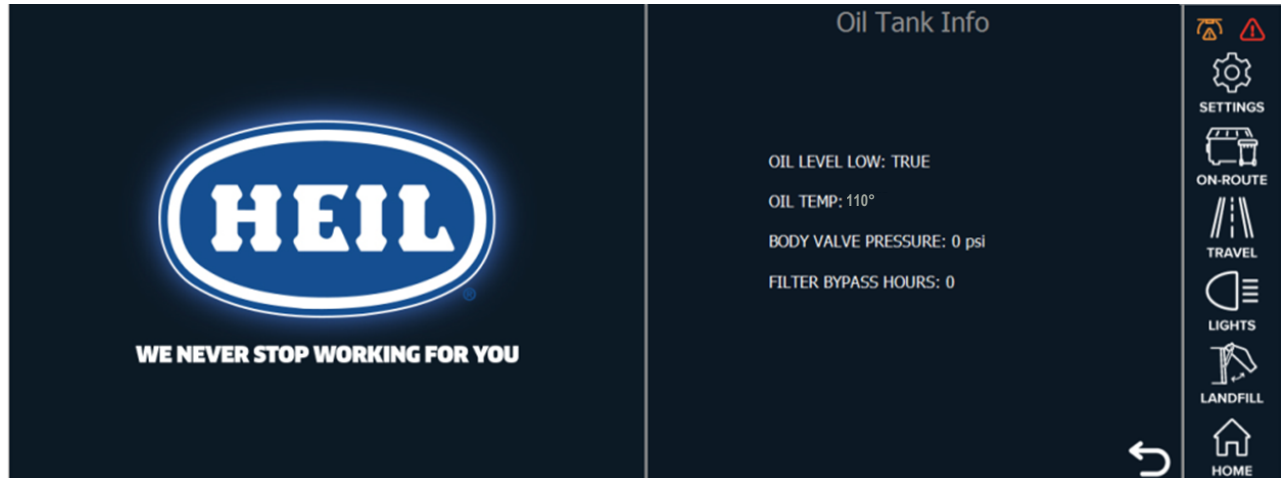


Figure 160.

L. Switch Bank Main

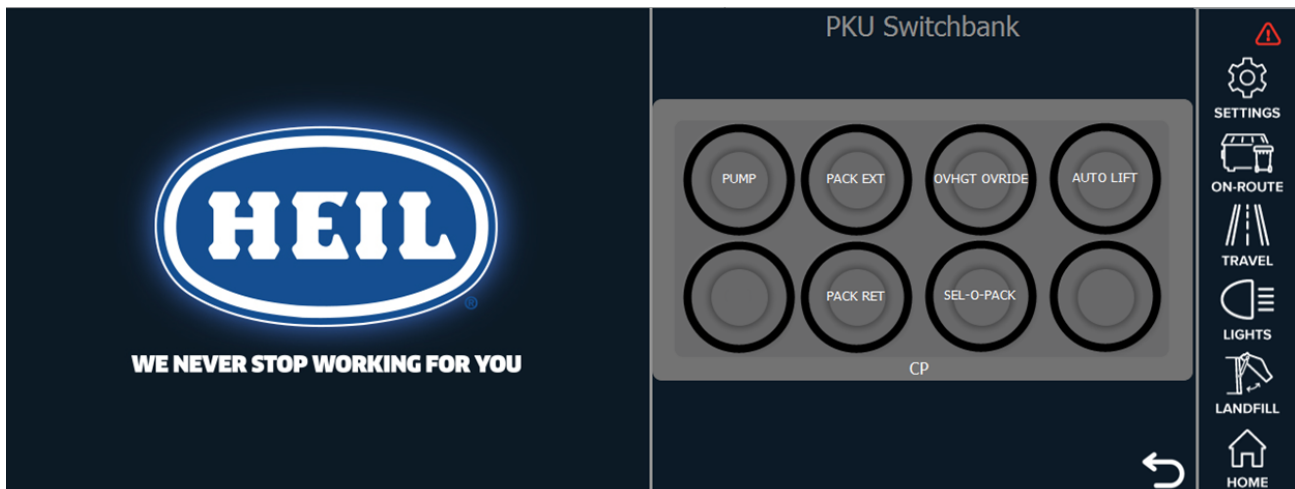


Figure 161.

On Route Screen

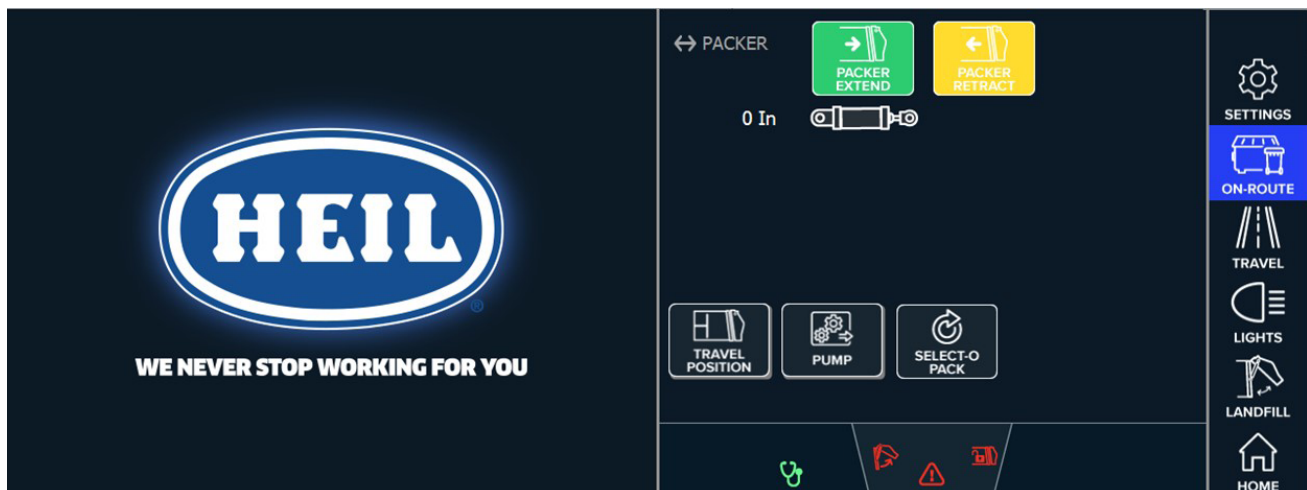


Figure 162.

IN-CAB DISPLAY

Travel Screen

Turn on the travel position from this screen.

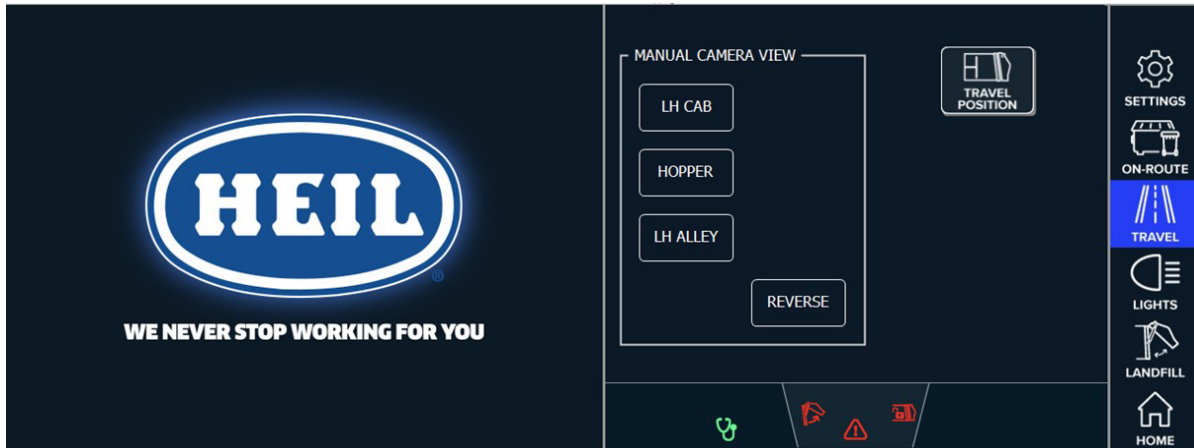


Figure 163.

Lights

A. No active lights.

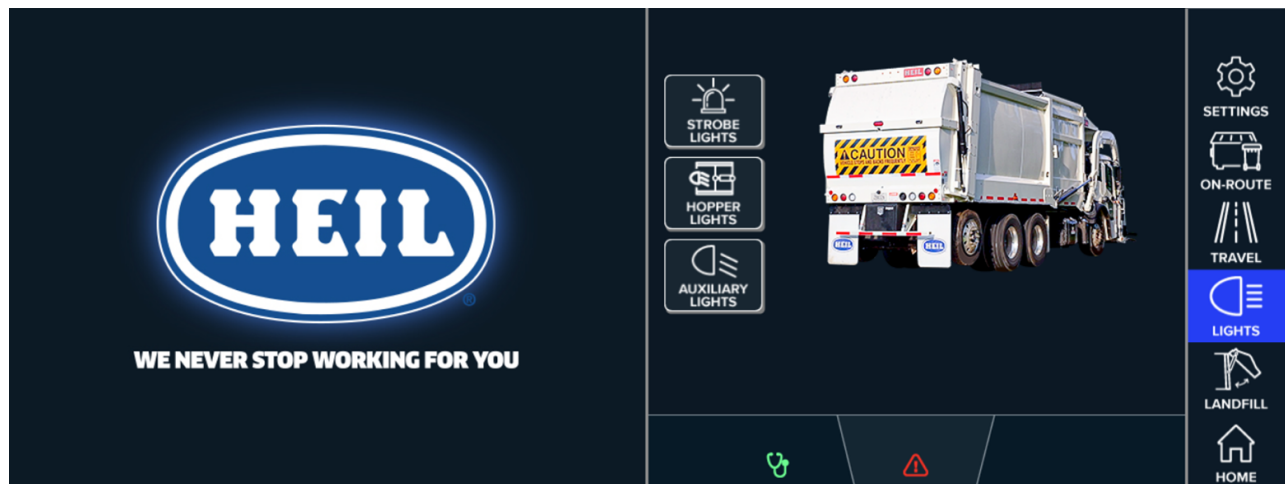


Figure 164.

B. Active lights are indicated by green icons and represented by the truck image displaying illuminated lights.

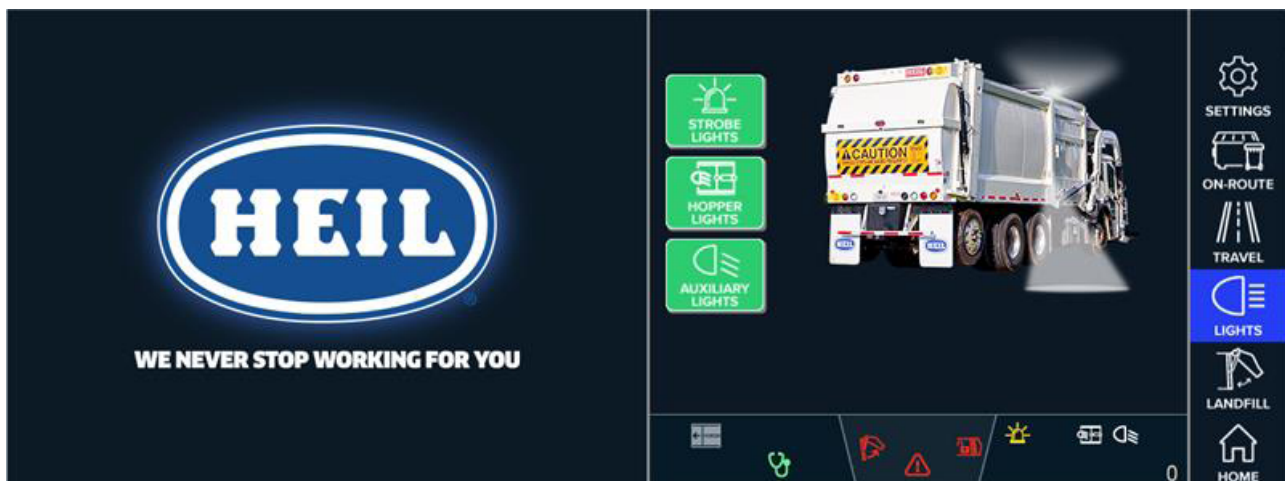


Figure 165.

IN-CAB DISPLAY

Landfill Screen

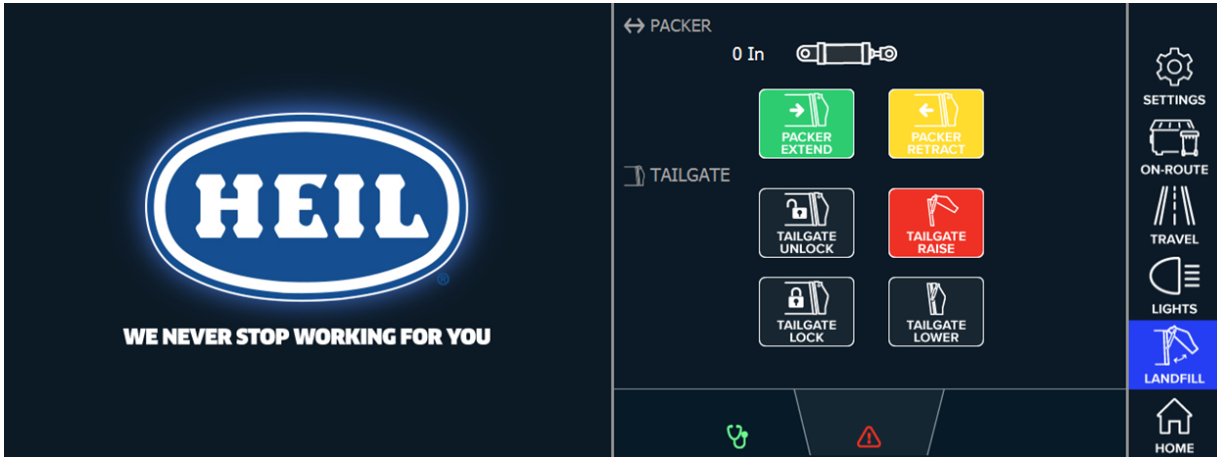
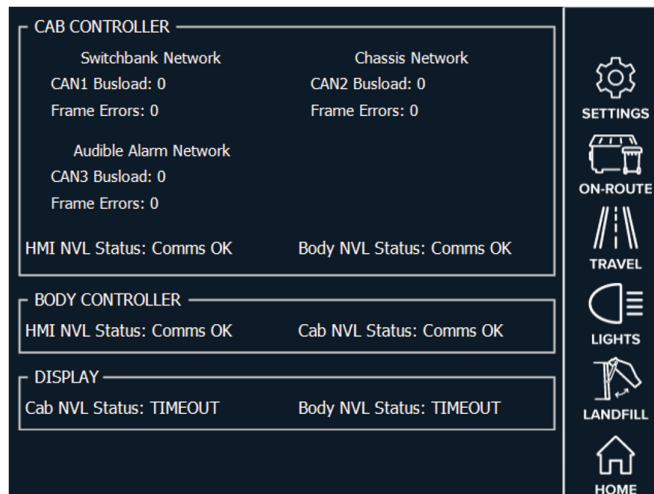
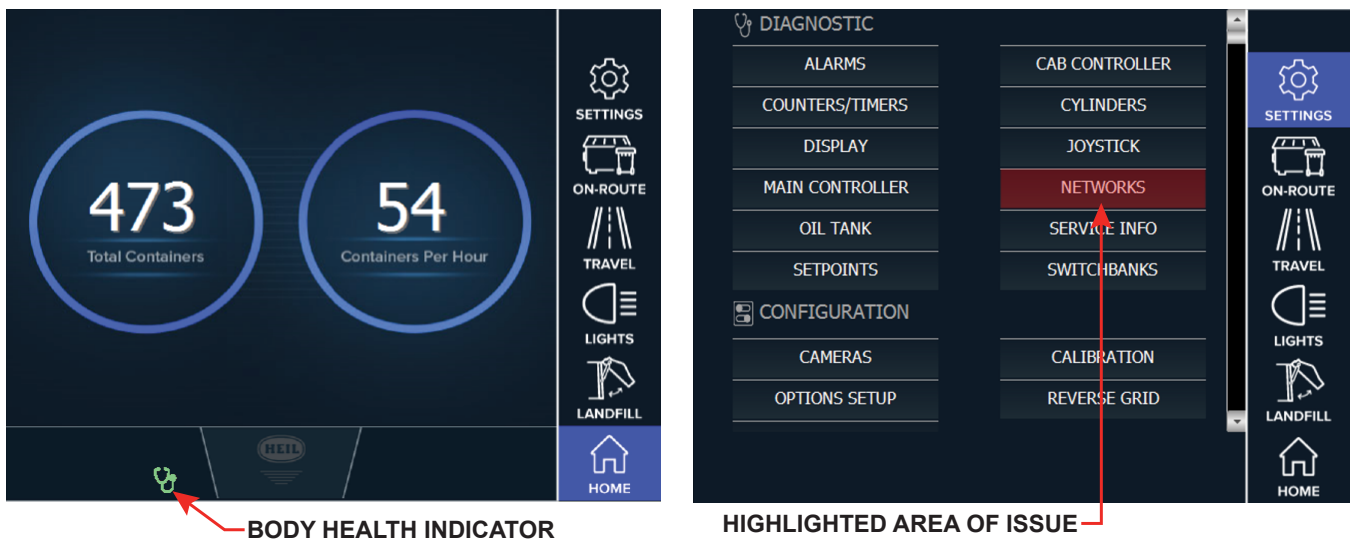


Figure 166.

Body Health

The advanced diagnostics within the control system enable the in-cab display to guide maintenance staff precisely to the root cause of the problem.



DIAGNOSTIC INFO. TEXT BASED

Figure 167.

IN-CAB DISPLAY

Out Of Dimension / Tailgate Status

In addition to the audible alert, Telltales offer a visual warning indicating that the vehicle is not positioned to safely travel above the posted speed limit. This feature helps the operator recognize when the vehicle may be exceeding height or width restrictions.

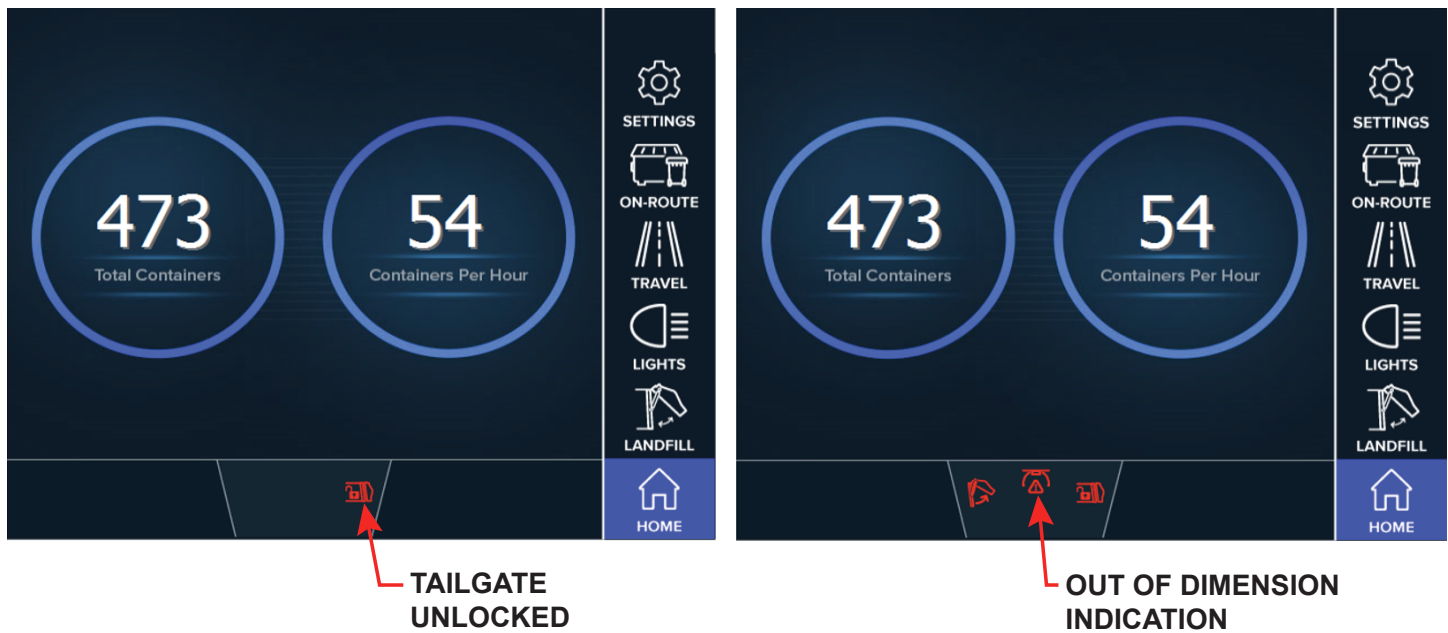


Figure 168.

IN-CAB DISPLAY

Active Telltales

While on route the driver can easily see the operation mode of the vehicle and variables associated to those modes.

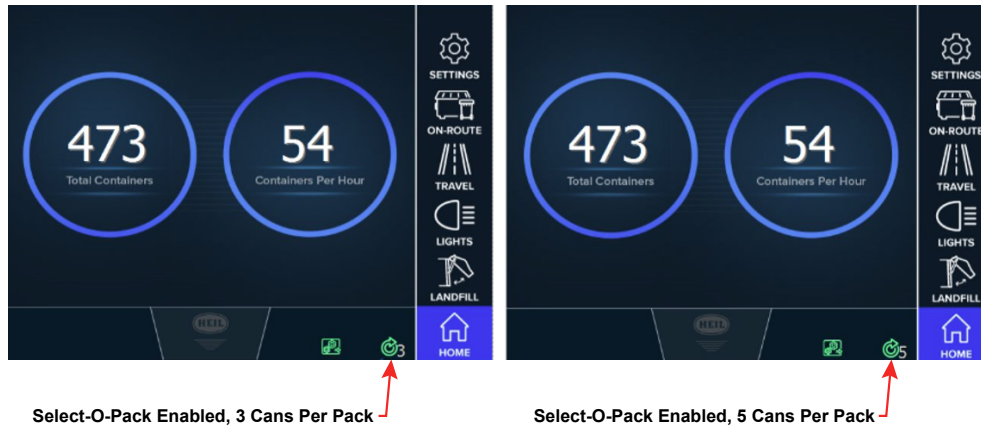


Figure 169.

Telltale Status Legend

TELLTALE	STATUS
Gray	Inactive
Green	Normal/Active/State Achieved/Select-O-Pack Set to Double Pack
Amber	Warning/Abnormal
Yellow	Strobe Lights hen Active/Select-O-Pack Set to Half Pack
Red	Fault/Unsafe/Critical
White	All Lights Except Strobe
EXCEPTION	
Select-O-Pack is gray when inactive, yellow when in half pack mode, green when in double pack mode.	

Telltale Banner

The telltale area on the bottom of the in-cab display can provide all relevant information to the operator needed to run their route. Eliminating the need to change screens or dedicate focus away from the job of collection.



Figure 170.

IN-CAB DISPLAY

Telltale icons will be stacked, and the higher priority will be displayed.

Prio 3			
Prio 2			
Prio 1			
			
Prio 1			
Prio 2			
Prio 3			

Figure 171.

A. Telltale Legend Alarms & Health

Icon	Definition	Action
	Active Alarm	Critical error detected on the Body; immediate action should be taken to resolve the issue
	Active Warning	Noncritical error detected on the Body; should be checked when possible
	Logged In	Password login active
	Hydraulic Oil Error	Hydraulic oil level or pressure is out of specified range and should be checked immediately
	Hydraulic Oil Warning	Hydraulic oil level or pressure is approaching an out-of-specified range and should be checked when possible
	Hydraulic Oil Temperature Error	Hydraulic oil temperature is out of specified range and should be checked immediately
	Hydraulic Oil Temperature Warning	Hydraulic oil temperature is approaching an out-of-specified range and should be checked when possible
	Travel Position Selected	Packer Travel Position has been selected; next movement of the pack will move to the travel position and maintain that position
	Travel Position	Packer is in the travel position
	Packer/Ejector Malfunction	Critical error detected in the Packer or Ejector
	Packer/Ejector Warning	Warning of potential issues with the packer or ejector
	Pump ON	Pump is ON and pump icon is BLUE on the in-cab display
	Pump Off (Flashing)	Pump is OFF but pump command is requested

IN-CAB DISPLAY

B. Body Lighting - Body Status

Icon	Definition	Activation Trigger / Action
	Auxiliary Lighting On	Rear auxiliary backup lights are on
	Lift Lighting On	Lift lights are on
	Hopper Lighting On	Hopper lights are on
	Strobe Lighting On	Strobe lights are on
	Select-O-Pack Enabled	Select-O-Pack is enabled with number of packs showing to the left
	Hydraulic Pump Running	Hydraulic pump is on and running at its specified parameters
	Enable Hyd Pump	Flashing when the pump needs to be on but is not
	Auto Lift Enabled	
	In Travel Position	Vehicle is in the travel position
	Travel Position Sel.	Travel Position is selected but not in travel position

C. Dimension & Tailgate Status

Icon	Definition	Activation Trigger / Action
	Tailgate Not Fully Closed	Tailgate is not sensed in the lowered position, lower tailgate before driving
	Tailgate Not Fully Locked (Flashing)	Tailgate not fully locked, lock tailgate before driving, flash above road speed limit
	Tailgate Unlocked (Solid)	Tailgate unlocked, lock tailgate before driving
	Out of Dimension	Above road speed limit, vehicle is not in the travel position, return arm, lower tailgate, close/lock any interlocked access doors.
	Out of Dimension	Below road speed limit, vehicle is not in the travel position, return arm, lower tailgate, close/lock any interlocked access doors.

Alarm Pop-Up

A notification pop-up will appear on home screen. There is an alarm pop-up (red header) and a warning pop-up (yellow header) both can be cleared with the return icon, and the in-cab alarm will sound. The alarm message is also available in the settings sub-screen.

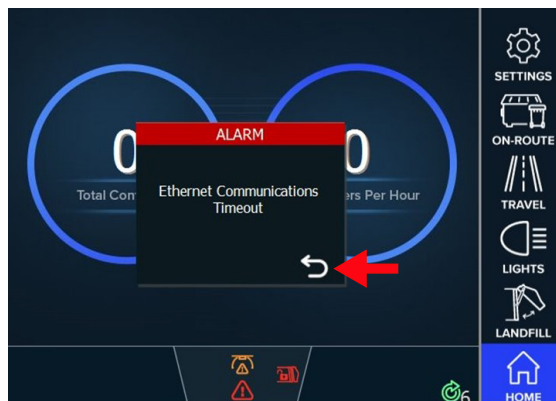


Figure 172.

IN-CAB DISPLAY

Alarm List

Alarm List	Pop Up Color
Setup Variables Not Loaded Properly (Ethernet Communication Fault)	RED
J1939-3 Network Health NOT OK Verify Network Integrity	RED
Packer Sensor Communication Error Place Unit In Service Mode and Contact Heil Tech Service	RED
Engine RPM Not Detected	AMBER
Arms Up Interlock Cab Protector Raised Lower Cab Protector To Continue	AMBER
Arms Up Interlock Top Door Not Fully Open	AMBER
Filter Bypass Hours	AMBER
Auto-Pack Not Allowed Pump Not Active	AMBER
Packer Ext/Ret On At Same Time	AMBER
Packer Retract Time Out	AMBER
Packer Fully Extended	AMBER
Auto-Pack Not Enabled	AMBER
Packer Extend Interlock	AMBER
Arms Up Interlock Packer Not Retracted	AMBER
Auto-Pack Time Out	AMBER
Packer Fully Retracted	AMBER
Tailgate Closed While Ejecting	RED
Arms Down Interlock Cab Protector Raised Lower Cab Protector To Continue	AMBER
Arms Down Interlock Top Door Not Fully Open	AMBER
Arms Down Interlock Forks Not Clear To Lower Arms	AMBER
Top Door Not Fully Open Pack Cycle Not Allowed	AMBER
Side Door Open Pump Disabled	RED
Low Hydraulic Oil	RED
Temperature Sensor Fault, Reading Out of Range	RED
Hydraulic Oil Temp Alarm Notification > 210°F	AMBER
Pump NOT Enabled Pull Red System Power to Turn ON	AMBER
Tailgate Open and Road speed Above 5 mph	RED
Tailgate Unlocked and Road speed Above 5 mph	RED
Filter Bypass Switch Fault	AMBER
Hydraulic Oil Temp Alarm Press OK to Acknowledge	AMBER
Hydraulic Oil Temp Alarm Notification > 180°F	AMBER
Hydraulic Oil Temp Alarm Warning < 50°F	AMBER
Camera Configuration Error	AMBER

IN-CAB DISPLAY

Option Setup

A password is required to access Option Setup. Authorized service personnel can obtain the password by contacting Heil Technical Services at 866-310-4345. Navigate to Settings > Configuration (enter the provided password) > Option Setup.

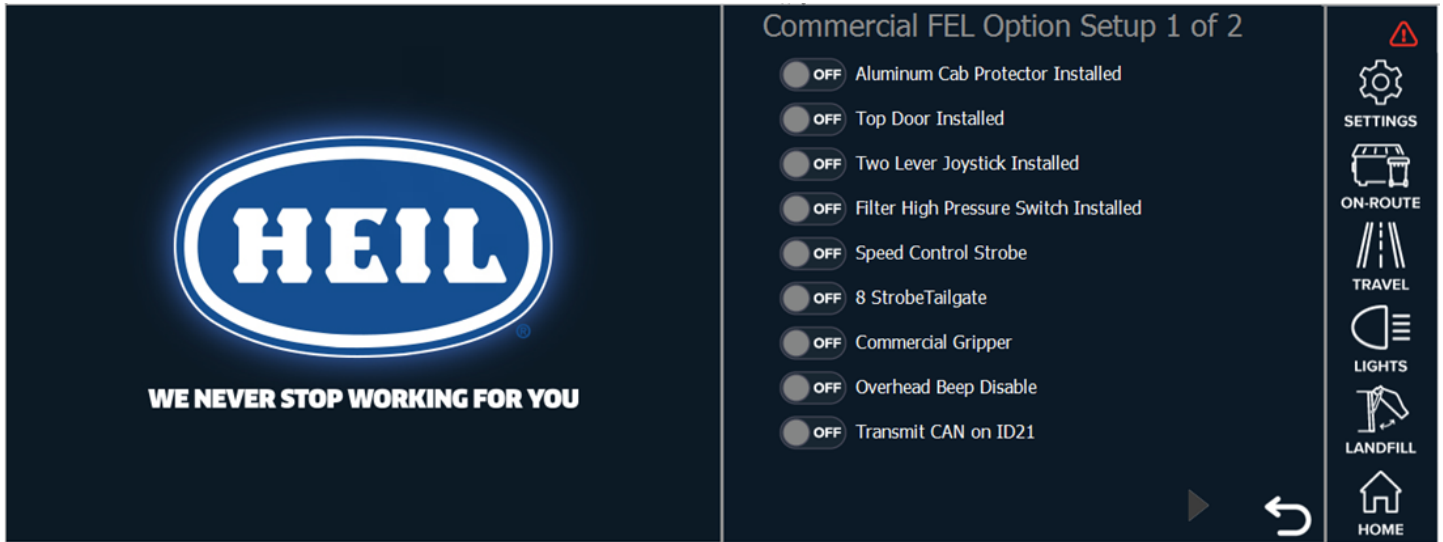


Figure 173.

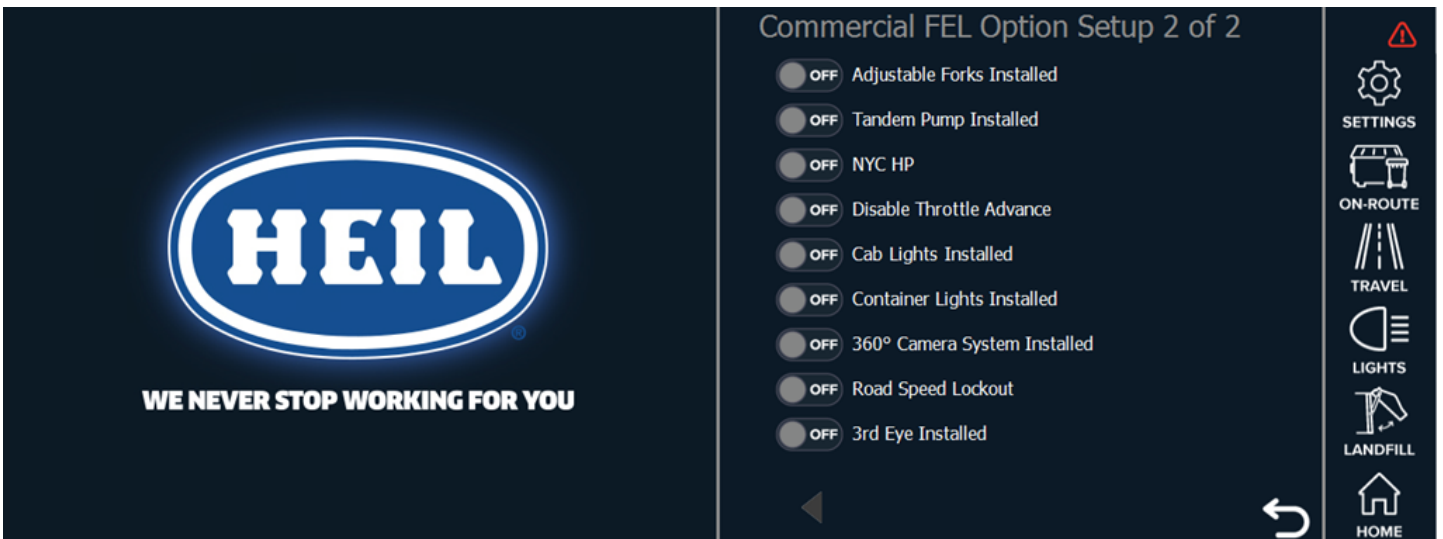


Figure 174.

IN-CAB DISPLAY

Unit Information

Figure 175.

Reverse Grid

Select the Enable box to activate Reverse Grid

Figure 176.

IN-CAB DISPLAY

Reverse Camera Grid Lines Calibration

NOTICE

Grid lines are visual aids only and do not indicate precise stopping distances.

This section outlines the procedure for configuring the reverse camera grid lines on the Heil Common Body in-cab display. The grid lines represent nominal distances of 2ft, 4ft, and 6ft behind the rear bumper for a refuse truck application. Align these reference lines to a physical calibration target to ensure consistent and repeatable visual guidance for the operator.

1. Safety & Preparation

- Wear appropriate PPE per company policy.
- Park the vehicle on a flat and level surface.
- Apply parking brake and chock wheels.
- Ensure the test area behind the vehicle is clear.

⚠ WARNING

Never allow personnel to stand behind the vehicle while the reverse camera is active as this may cause **SERIOUS INJURY** or **DEATH**.

2. Required Tools & Materials

- Heil Common Body display powered and operational
- Rear camera installed per design intent
- Measuring tape
- Printed reverse camera calibration target (banner) designed with:
 - (1) Rear bumper alignment reference
 - (2) 2ft, 4ft, and 6ft zones
 - (3) Width reference guides
- Chalk or tape (for temporary marking)

3. Calibration Target Placement

- Place the calibration banner on flat ground behind the vehicle.
- Align the rearmost point of the vehicle (rear bumper) with the banner line labeled: "REAR BUMPER ALIGN HERE."
- Ensure the banner is centered with the vehicle centerline.

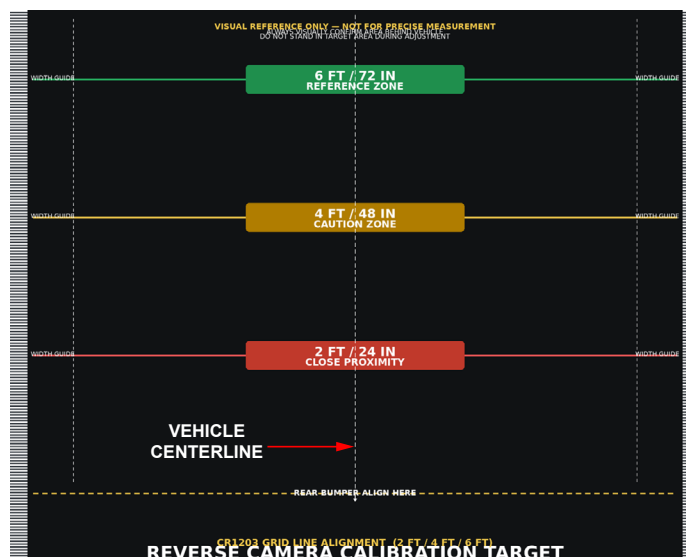


Figure 177.

IN-CAB DISPLAY

4. Camera Orientation Setup

- Go to travel screen and activate the reverse camera view on the Heil Common Body display.

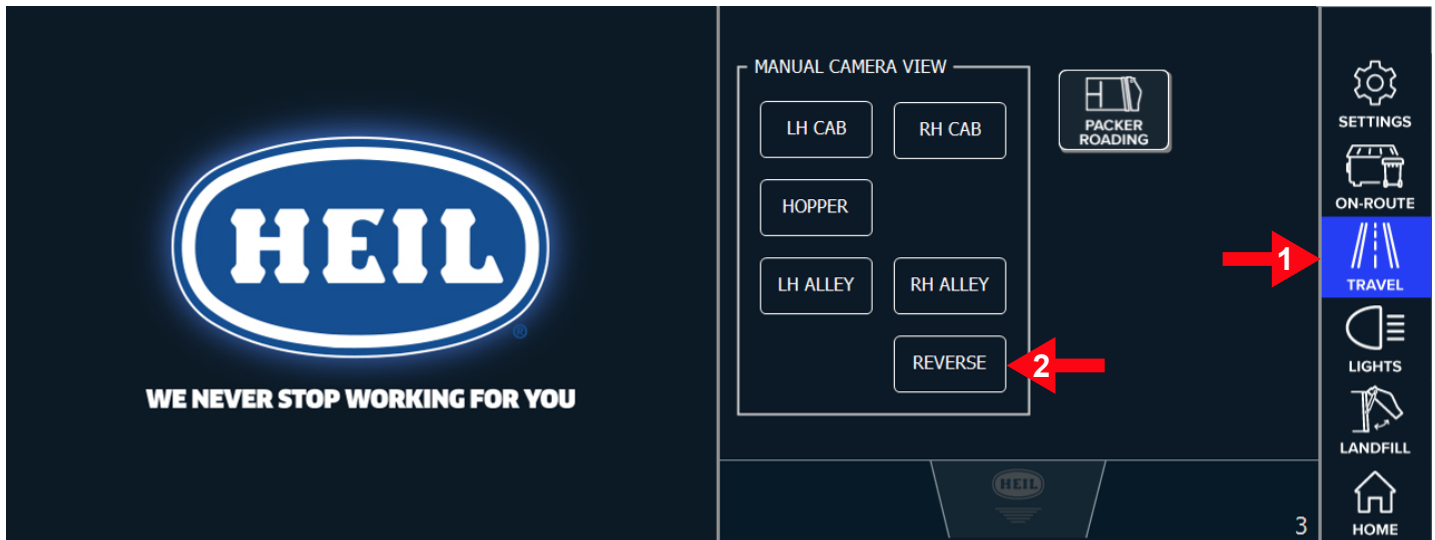


Figure 178.

- Access the camera mounting location using safe access methods.
- Adjust the camera angle until:
 - A small portion of the rear bumper is visible at the bottom of the image.
 - The calibration banner is fully visible within the camera field of view.
- Securely tighten camera mounting hardware.

Note: Do not adjust the camera angle to correct grid line alignment. Camera orientation is used only to maintain a consistent visual reference.

5. Grid Line Alignment

NOTICE

Operators must always visually verify surroundings when reversing. Grid lines provide visual reference only, as actual stopping distance may vary due to vehicle load, camera tolerances, and surface conditions.

- Go to Settings Screen and Press Configuration Button. A Password window will pop up.

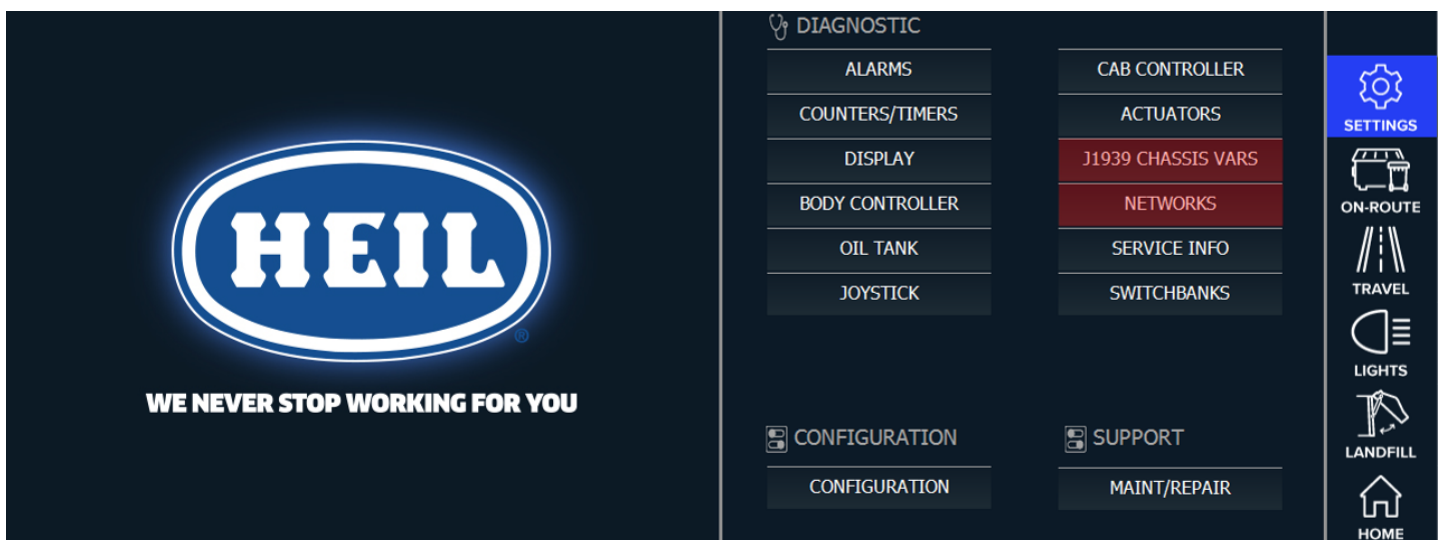


Figure 179.

IN-CAB DISPLAY

- b. Enter the password, then press the configuration icon again to open the configuration screen.

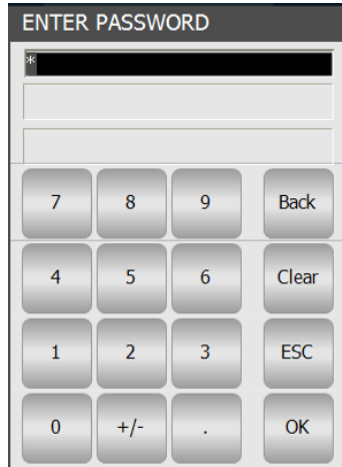


Figure 180.

- c. Press “Cameras” icon.

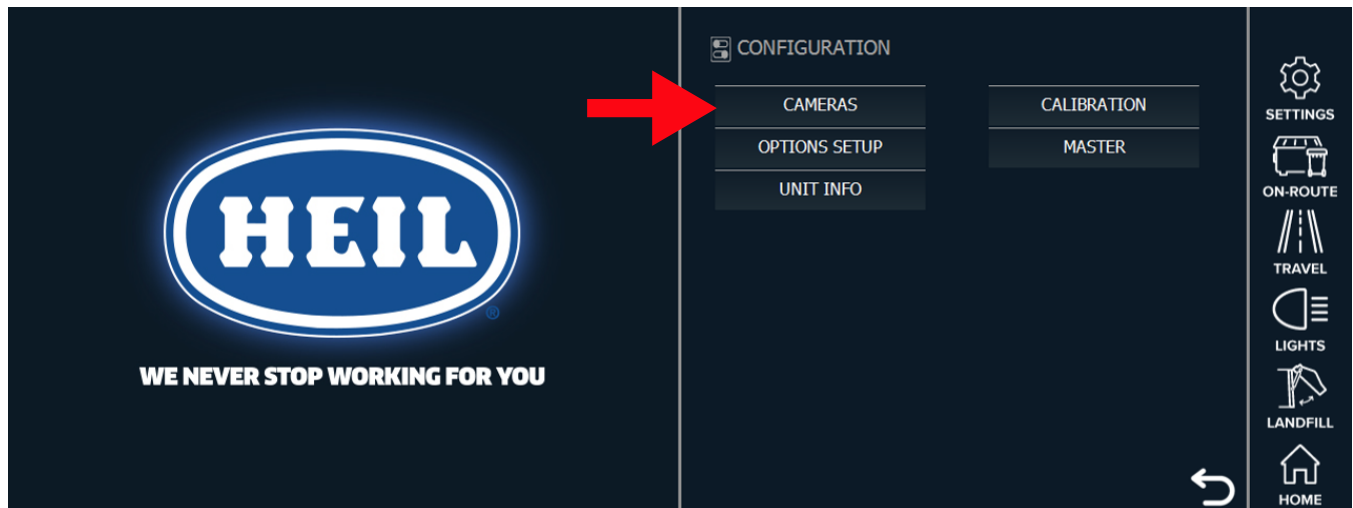


Figure 181.

- d. Press “Cameras Enabled,” “Enable Reverse Lines,” and “Reverse Grid.”

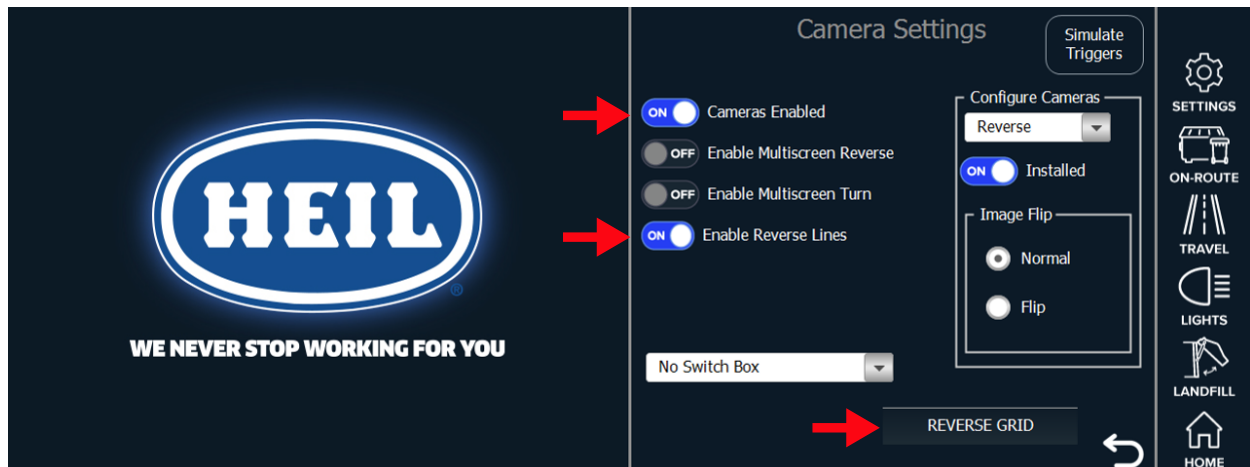


Figure 182.

IN-CAB DISPLAY

- e. Press “Enable” to activate the grid lines.

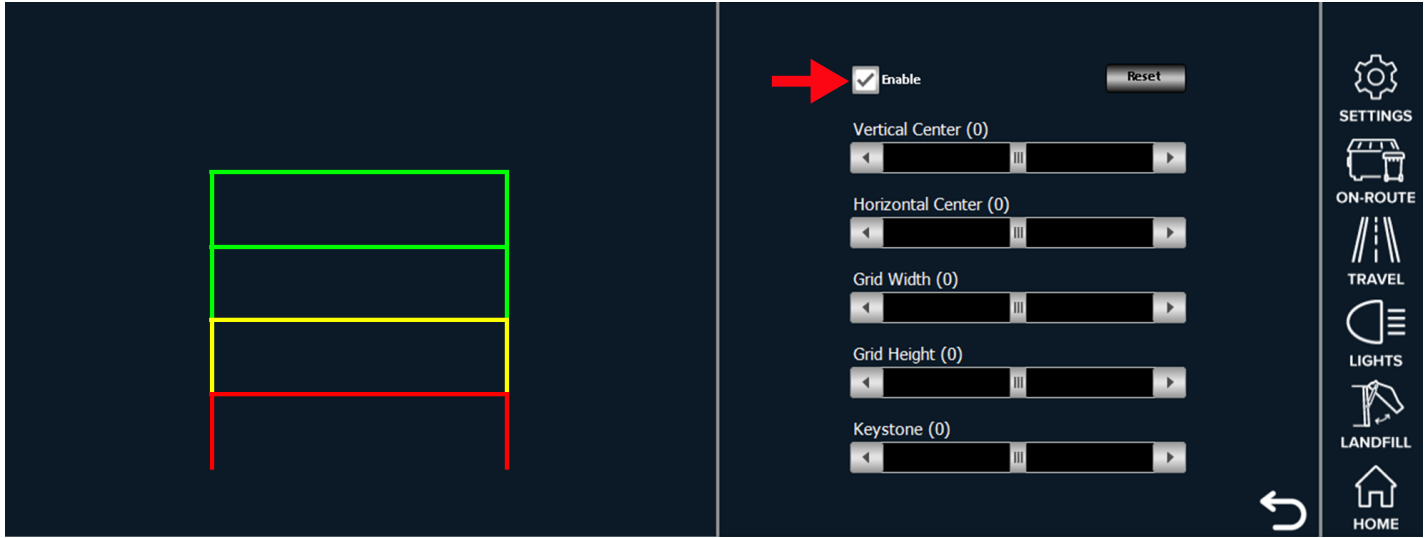


Figure 183.

ADJUSTABLE GRID PARAMETERS	
Enable	Turns grid lines ON or OFF
Vertical Center	Moves grid lines up or down
Horizontal Center	Moves grid lines left or right
Grid Width	Adjusts lateral spacing of grid lines
Grid Height	Adjusts longitudinal spacing
Keystone	Minor perspective correction only

- f. Adjust “Vertical Center” so the 2ft grid line aligns with the 2ft reference zone on the banner.
- g. Adjust “Horizontal Center” so the grid is centered relative to the vehicle centerline.
- h. Adjust “Grid Width” so lateral grid boundaries visually align with the banner width guides (Refuse Truck width reference).
- i. Adjust “Grid Height” to maintain proportional spacing between the 2ft, 4ft, and 6ft grid lines.
- j. Use “Keystone” only if necessary to correct minor perspective distortion.

Note: Keystone shall not be used to compensate for incorrect camera mounting.

6. Verify Calibration

Shift out of reverse and re-engage reverse.

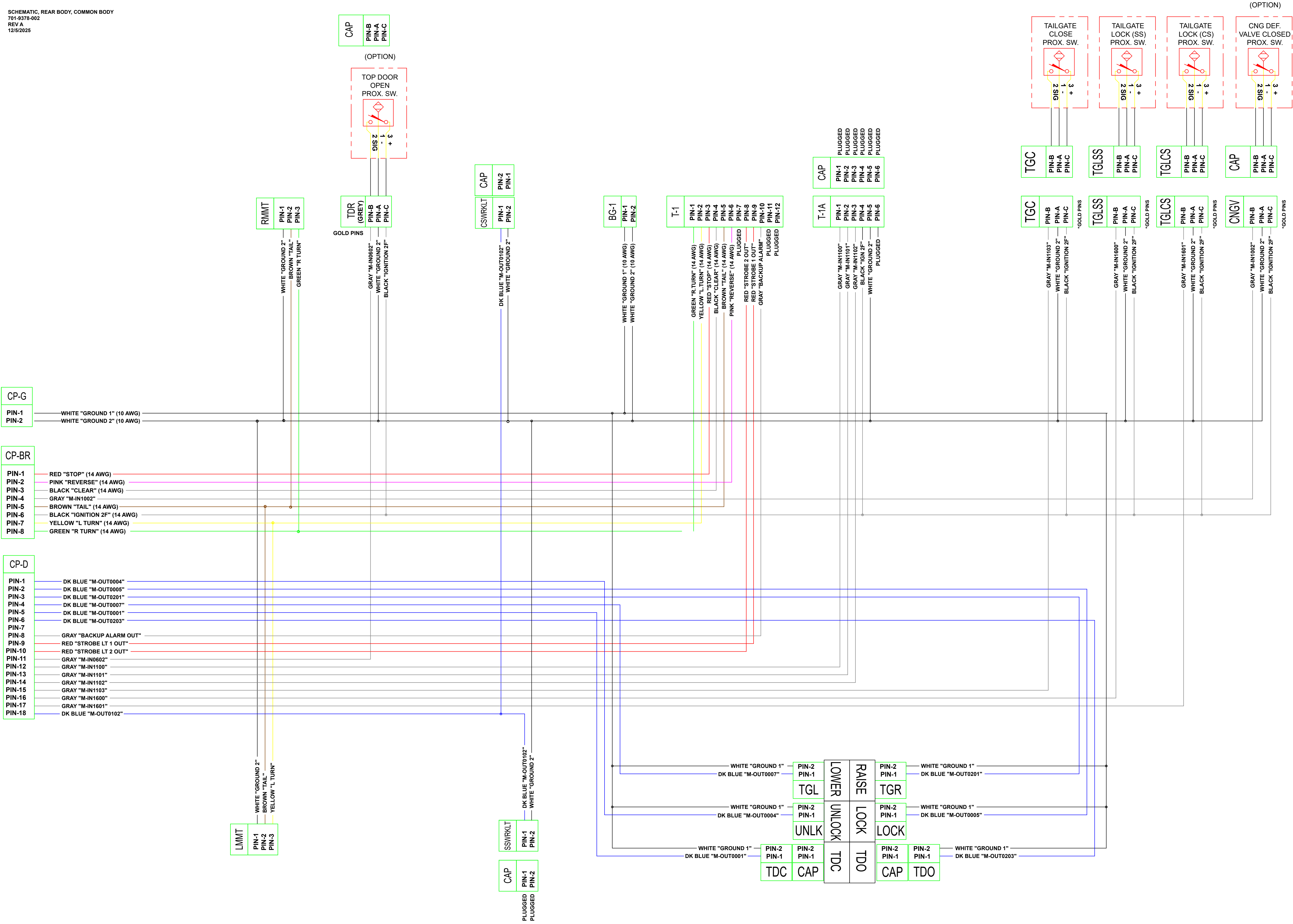
- Rear bumper reference remains visible.
- Grid lines align with the 2 ft, 4 ft, and 6 ft banner zones.
- Grid appears centered and symmetrical.

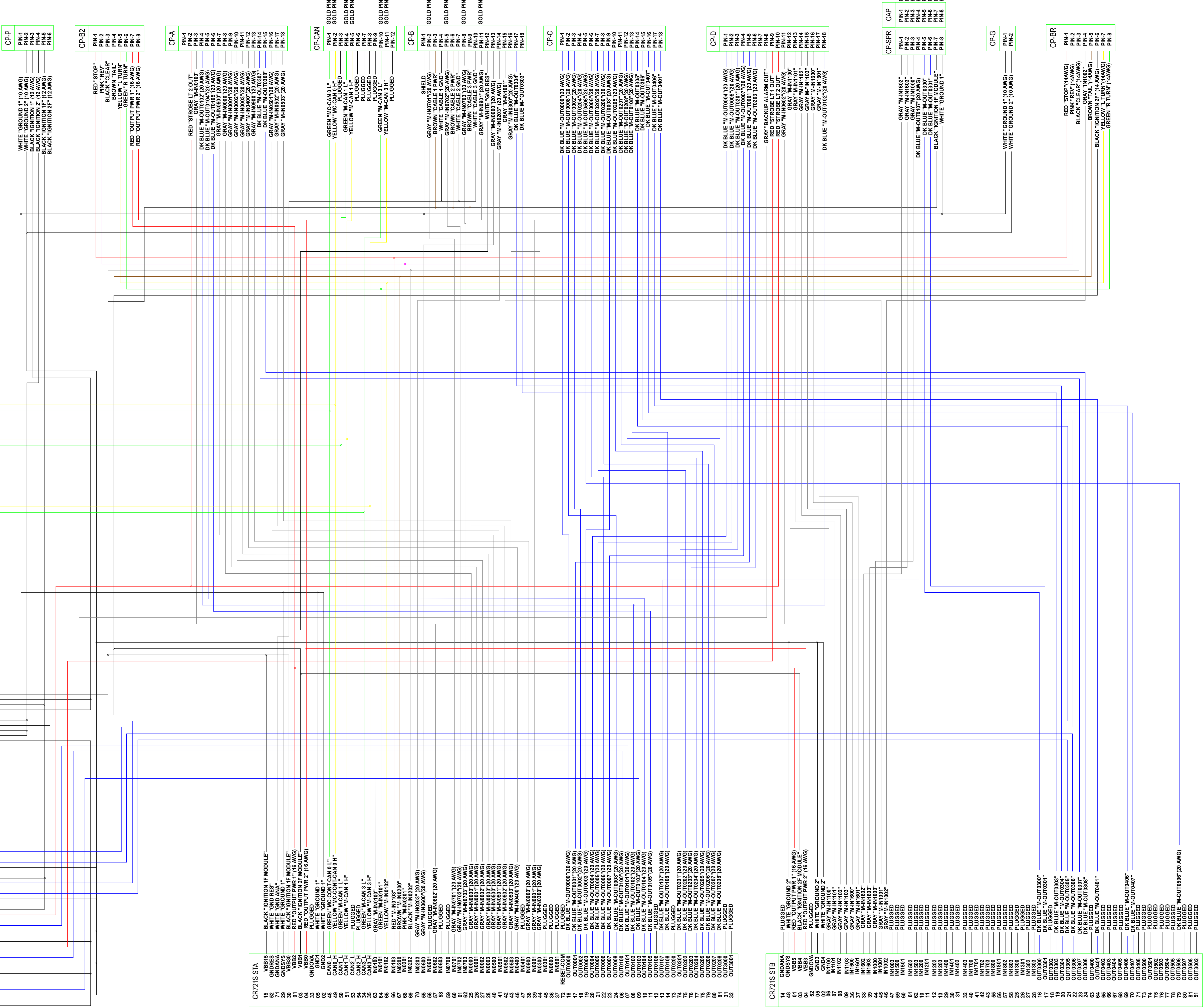
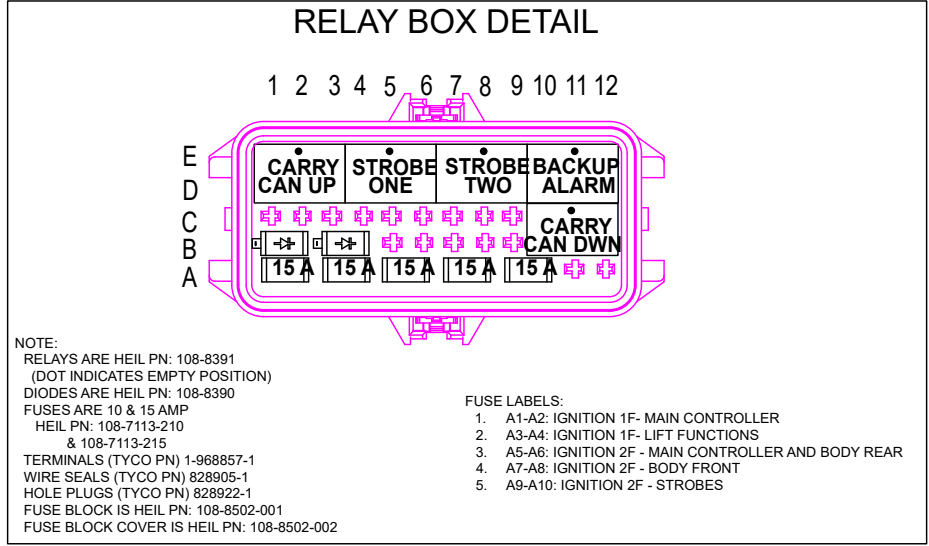
7. Remove the calibration banner after verification.

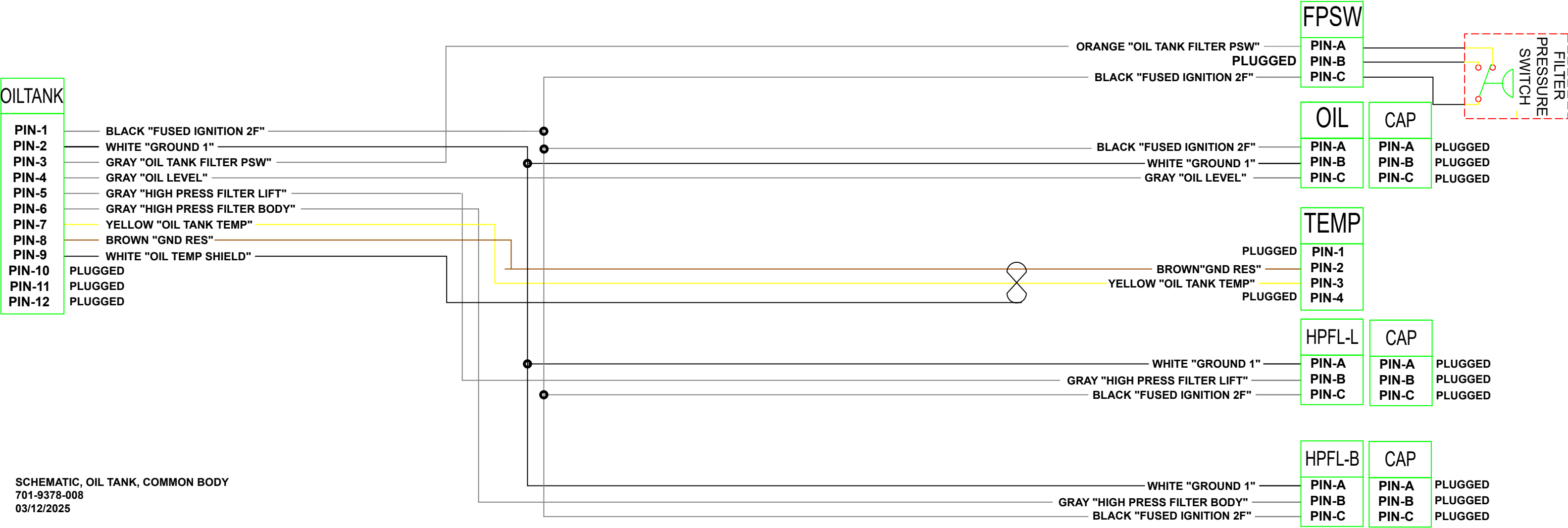
SECTION 8

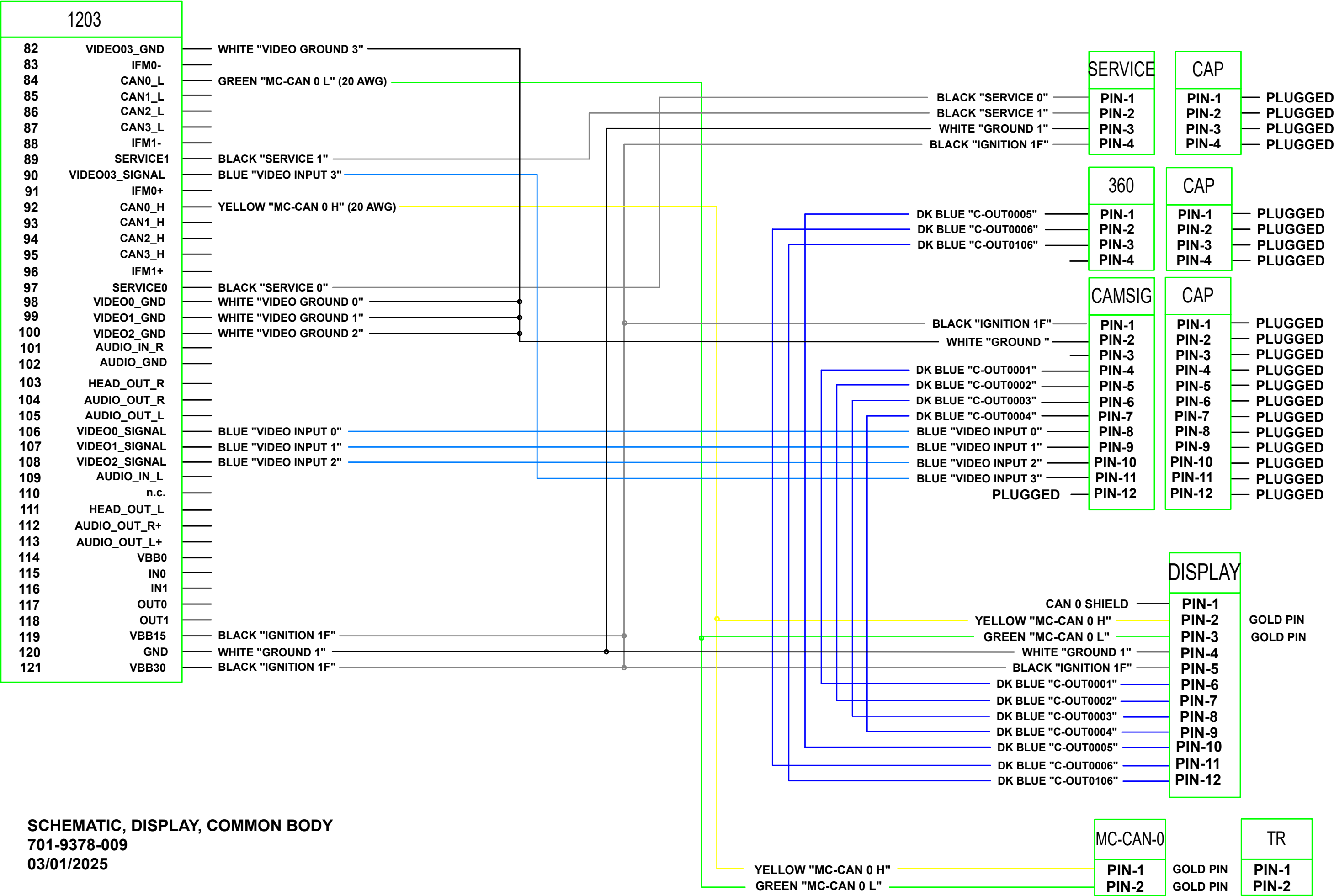
ELECTRICAL SCHEMATICS

SCHEMATIC, REAR BODY, COMMON BODY
701-9378-002
REV A
12/5/2025

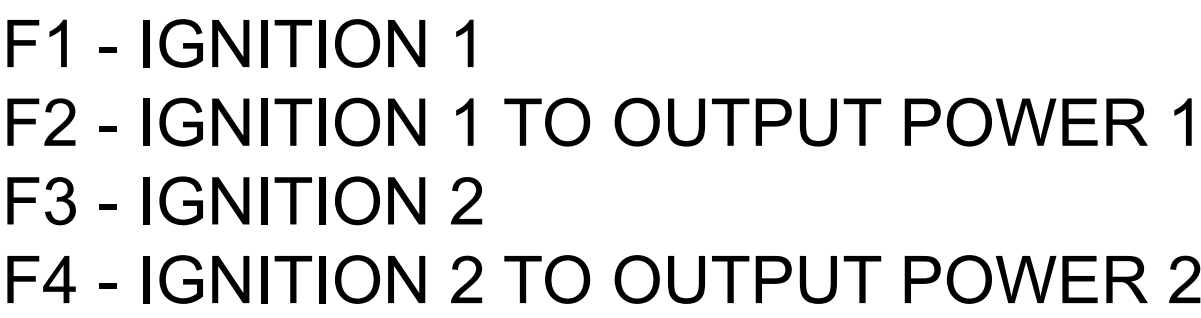


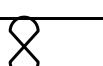


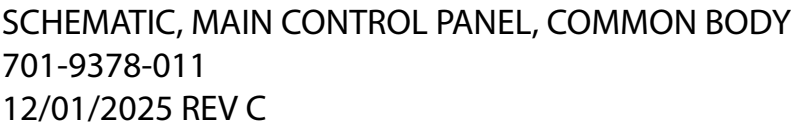


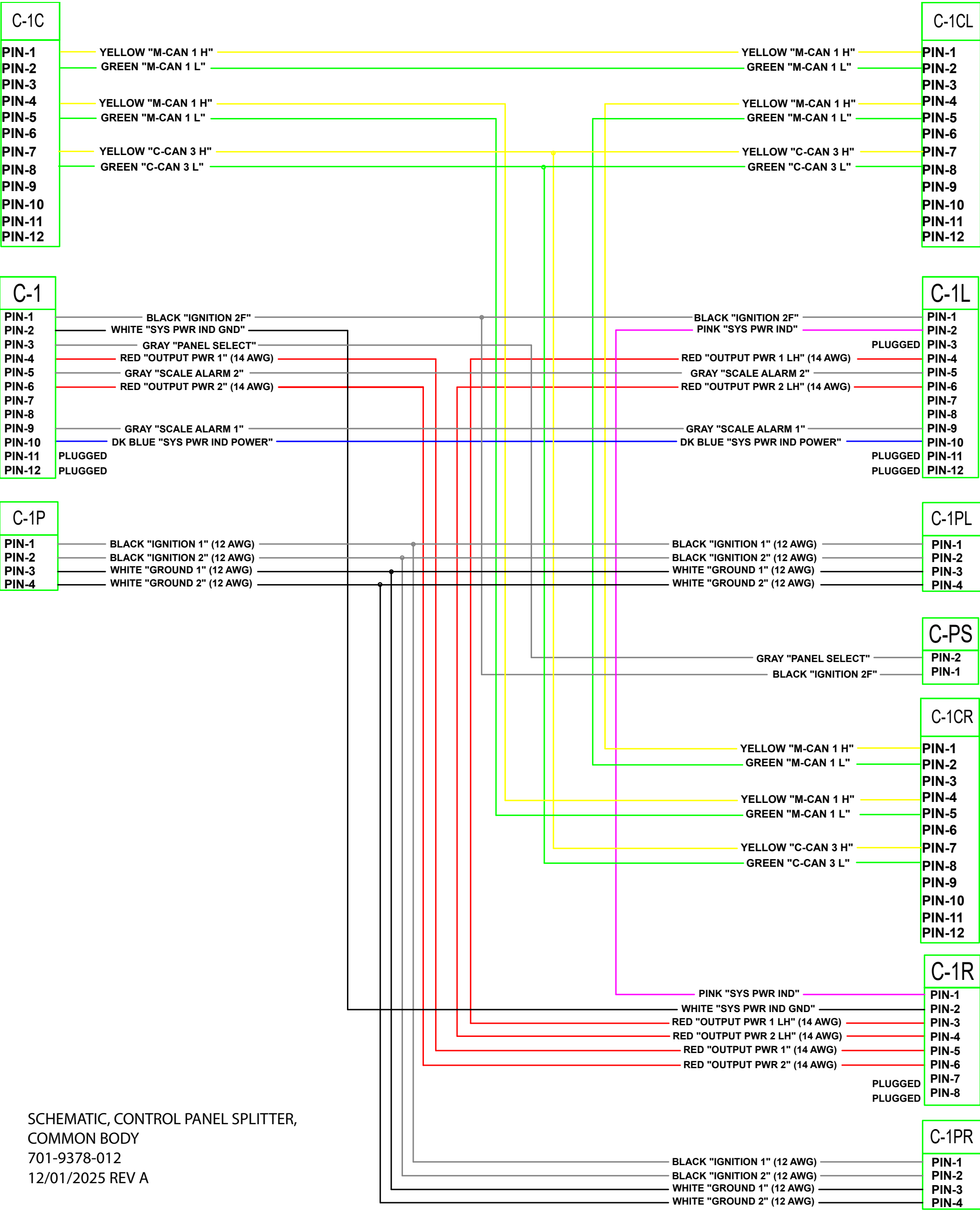


SCHEMATIC, DISPLAY, COMMON BODY
701-9378-009
03/01/2025

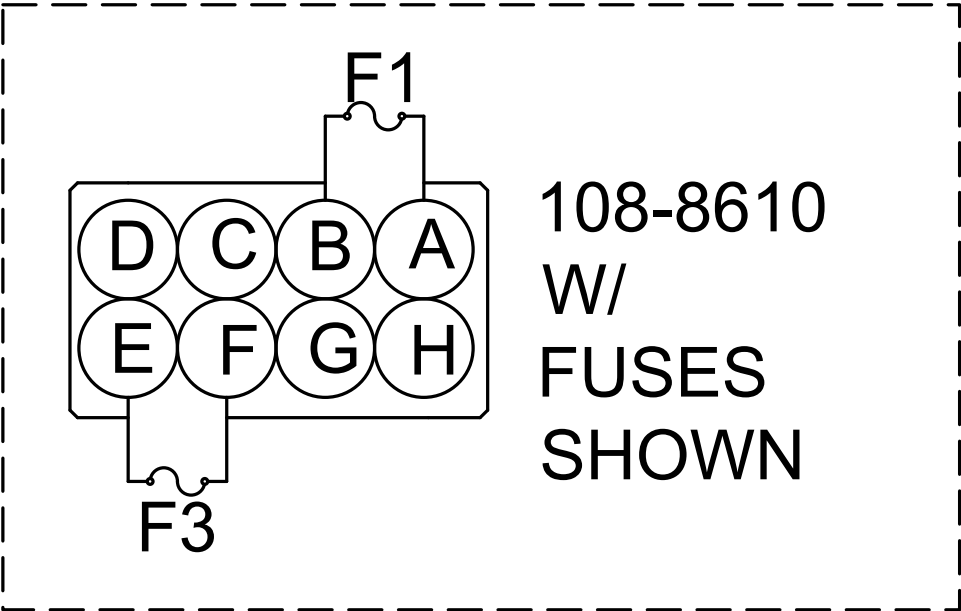


	UNTERMINATED
	TERMINATED
	TWISTED SHIELDED CABLE
	SHIELDED CABLE
	TWISTED PAIR

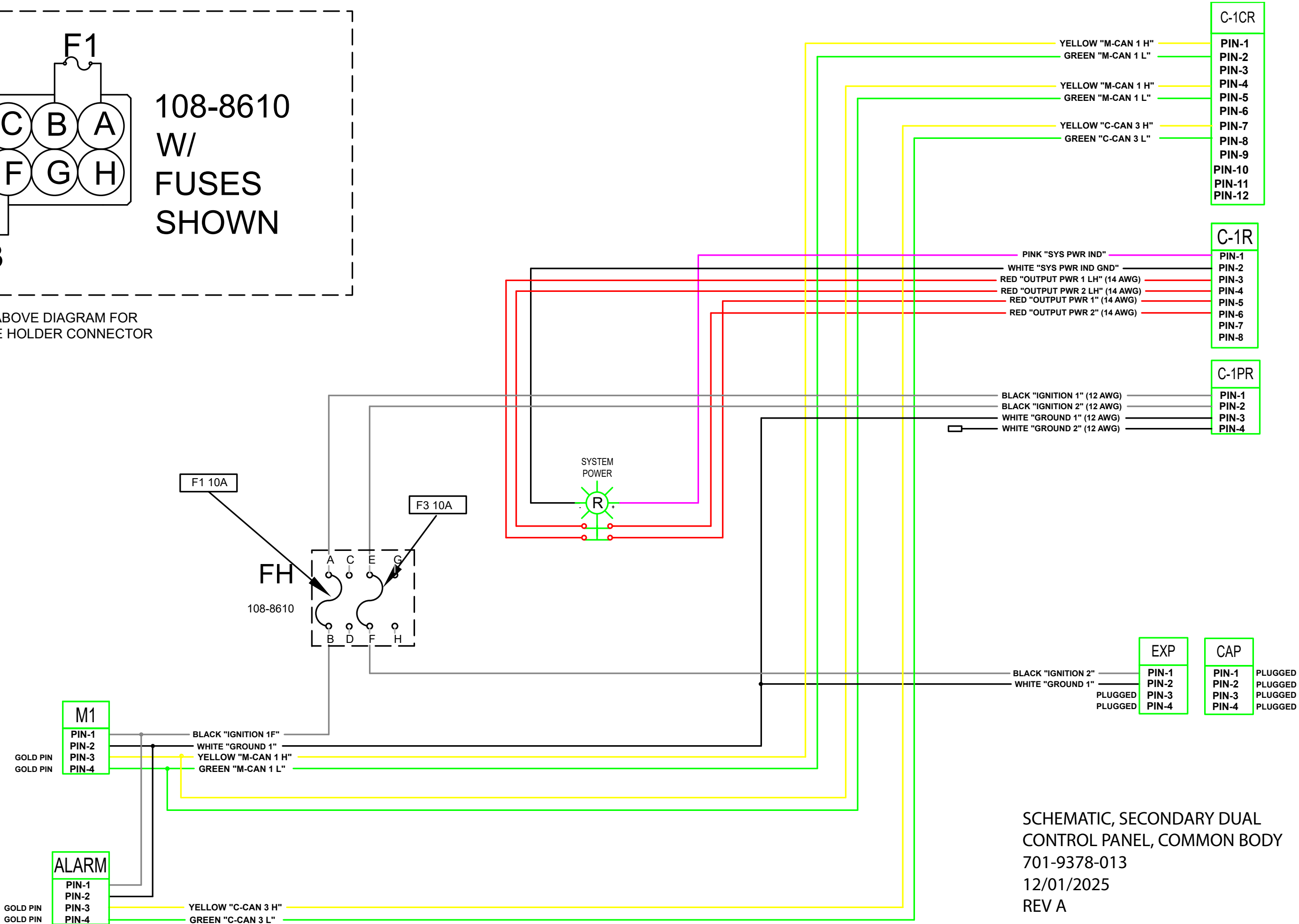




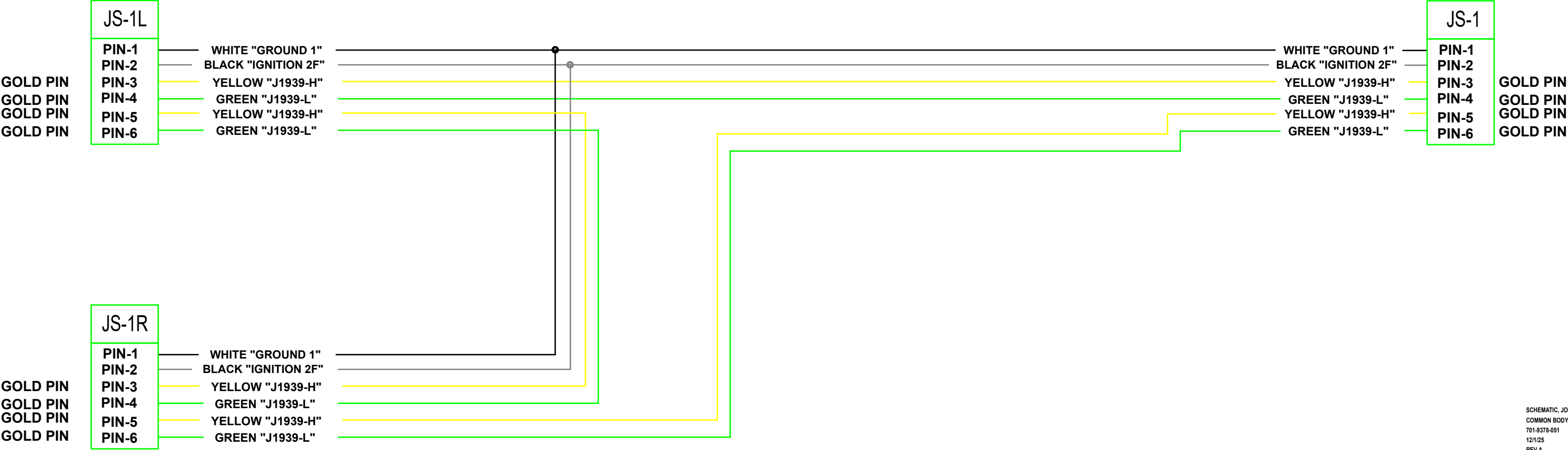
SCHEMATIC, CONTROL PANEL SPLITTER,
COMMON BODY
701-9378-012
12/01/2025 REV A

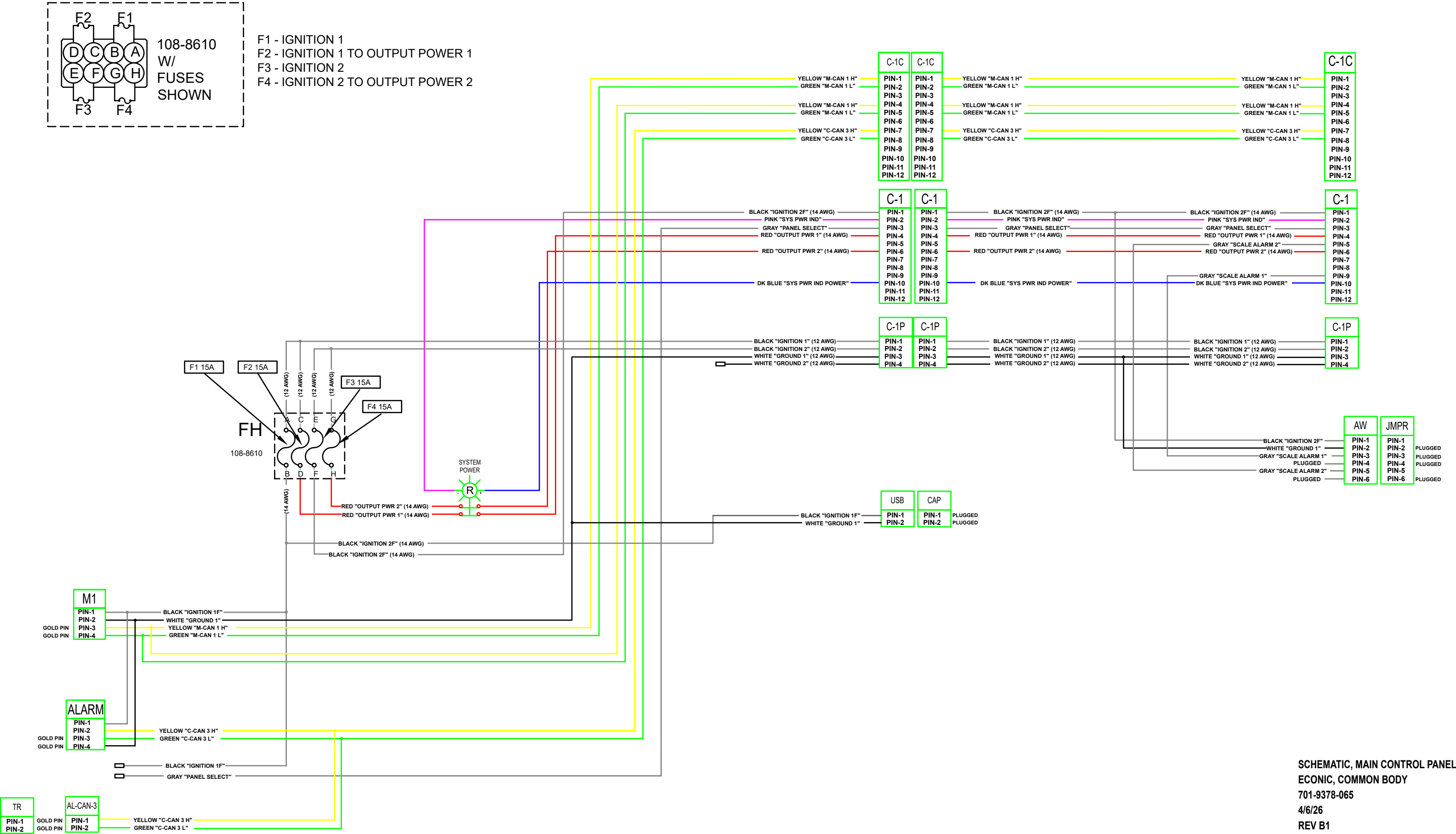


REFERENCE ABOVE DIAGRAM FOR
108-8610 FUSE HOLDER CONNECTOR
PIN OUT.

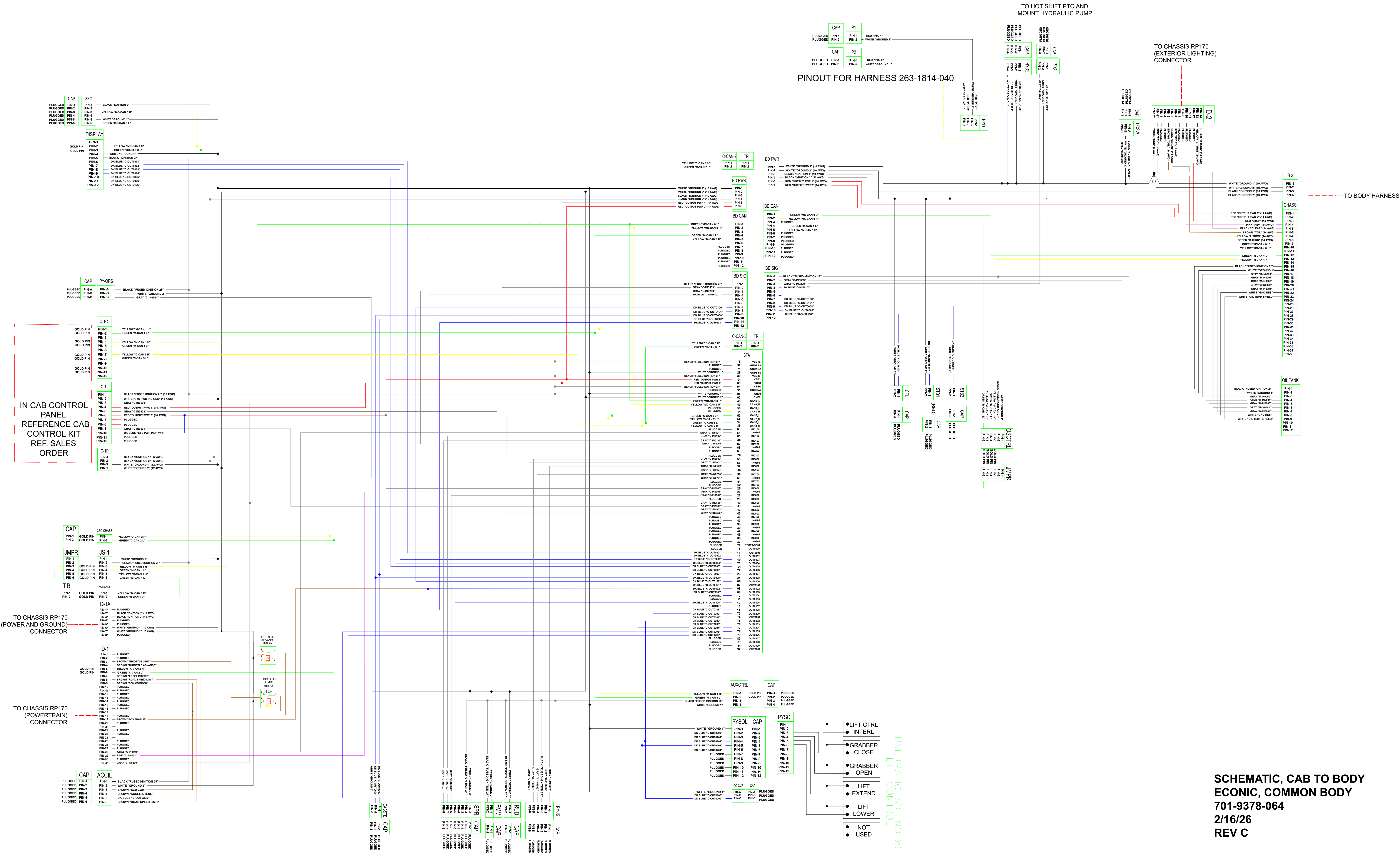


SCHEMATIC, SECONDARY DUAL
CONTROL PANEL, COMMON BODY
701-9378-013
12/01/2025
REV A





SCHEMATIC, MAIN CONTROL PANEL
ECONIC, COMMON BODY
701-9378-065
4/6/26
REV B1



TO HOT SHIFT PTO AND
MOUNT HYDRAULIC PUMP

TO CHASSIS RP170
(EXTERIOR LIGHTING)
CONNECTOR

TO FRONT MOUNT
HYDRAULIC PUMP

PINOUT FOR HARNESS 263-1814-040

NO CONNECTION

IN CAB CONTROL
PANEL
REFERENCE CAB
CONTROL KIT
REF. SALES
ORDER

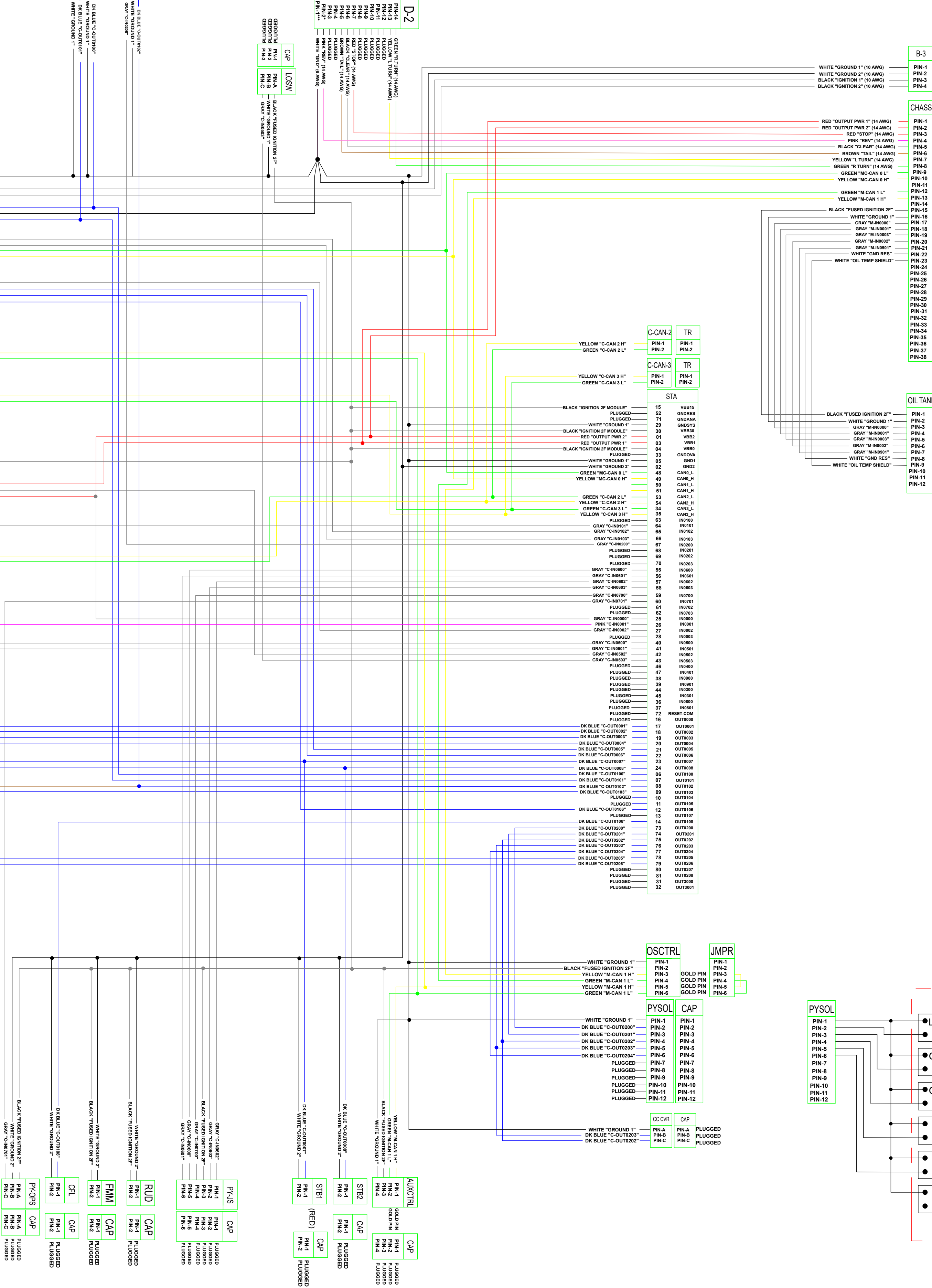
(OPTIONAL)
CHASSIS
PROVIDED
WHEEL STROBE

TO CHASSIS RP170
(POWER AND GROUND)
CONNECTOR

TO CHASSIS RP170
(POWERTRAIN)
CONNECTOR

PNEUMATIC SOLENOIDS
LIFT CONTROL

SCHEMATIC, CAB TO BODY
COMMON BODY, BATTLE
701-9378-062
2/16/26
REV C



SCHEMATIC, CAB TO BODY
COMMON BODY
701-9378-061
2/16/26
REV C

TO HOT SHIFT PTO AND
MOUNT HYDRAULIC PUMP

TO CHASSIS RP170
(EXTERIOR LIGHTING)
CONNECTOR

TO FRONT MOUNT
HYDRAULIC PUMP

PINOUT FOR HARNESS 263-1814-040

NO CONNECTION

IN CAB CONTROL
PANEL
REFERENCE CAB
CONTROL KIT
REF. SALES
ORDER

(OPTIONAL)
CHASSIS
PROVIDED
WHELEN STROBE

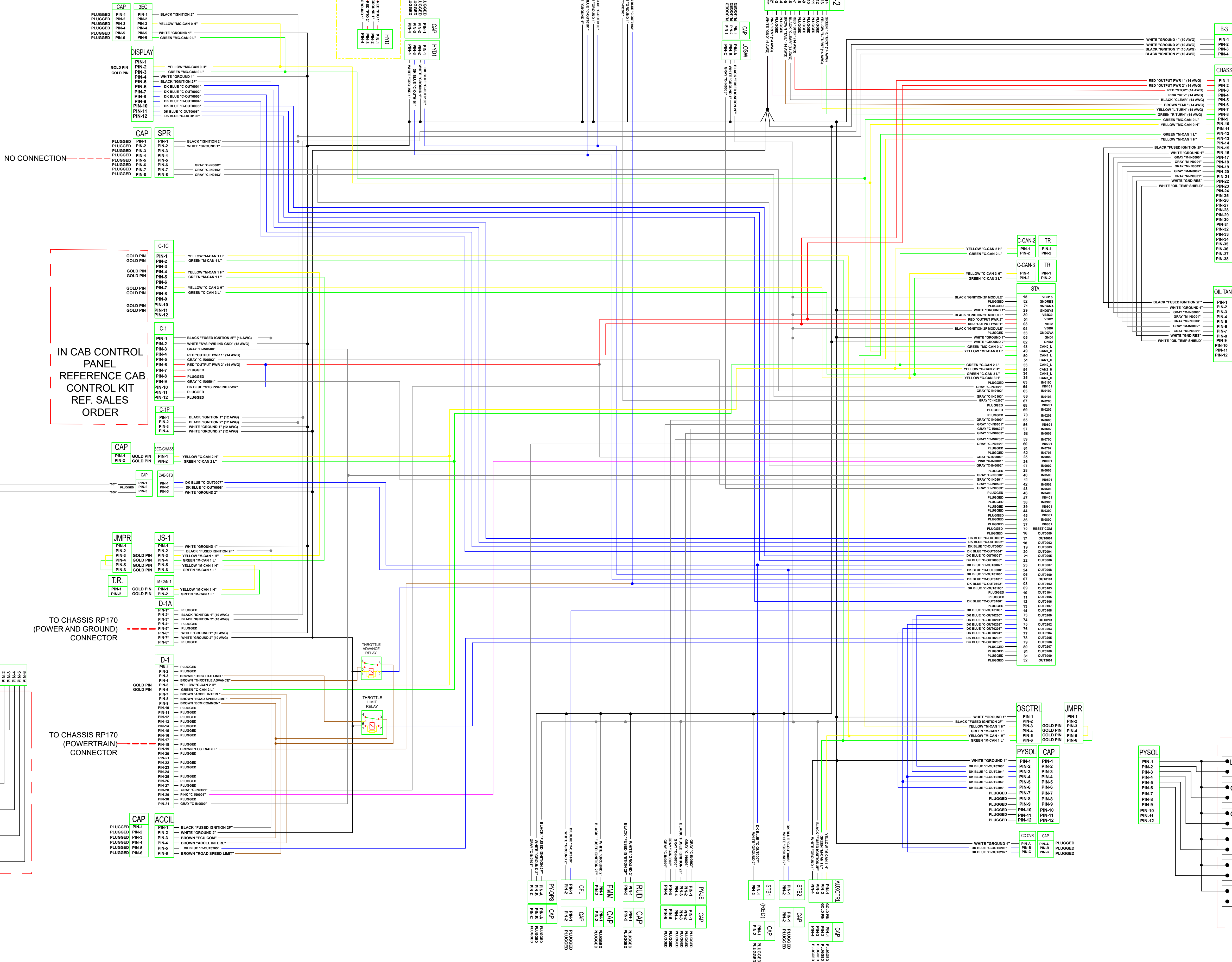
TO CHASSIS RP170
(POWER AND GROUND)
CONNECTOR

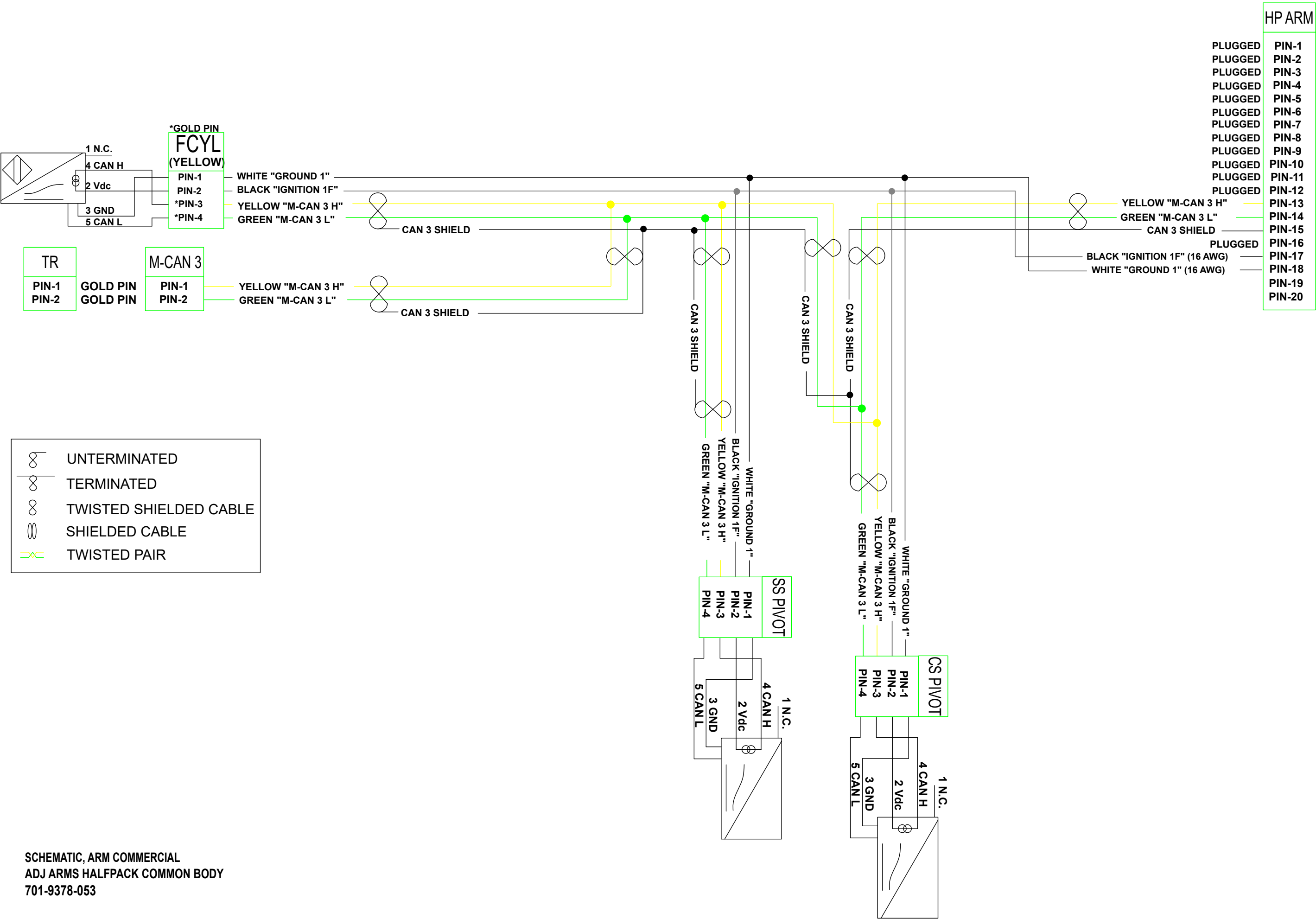
TO CHASSIS RP170
(POWERTRAIN)
CONNECTOR

PYTHON
LIFT CONTROL
JOYSTICK

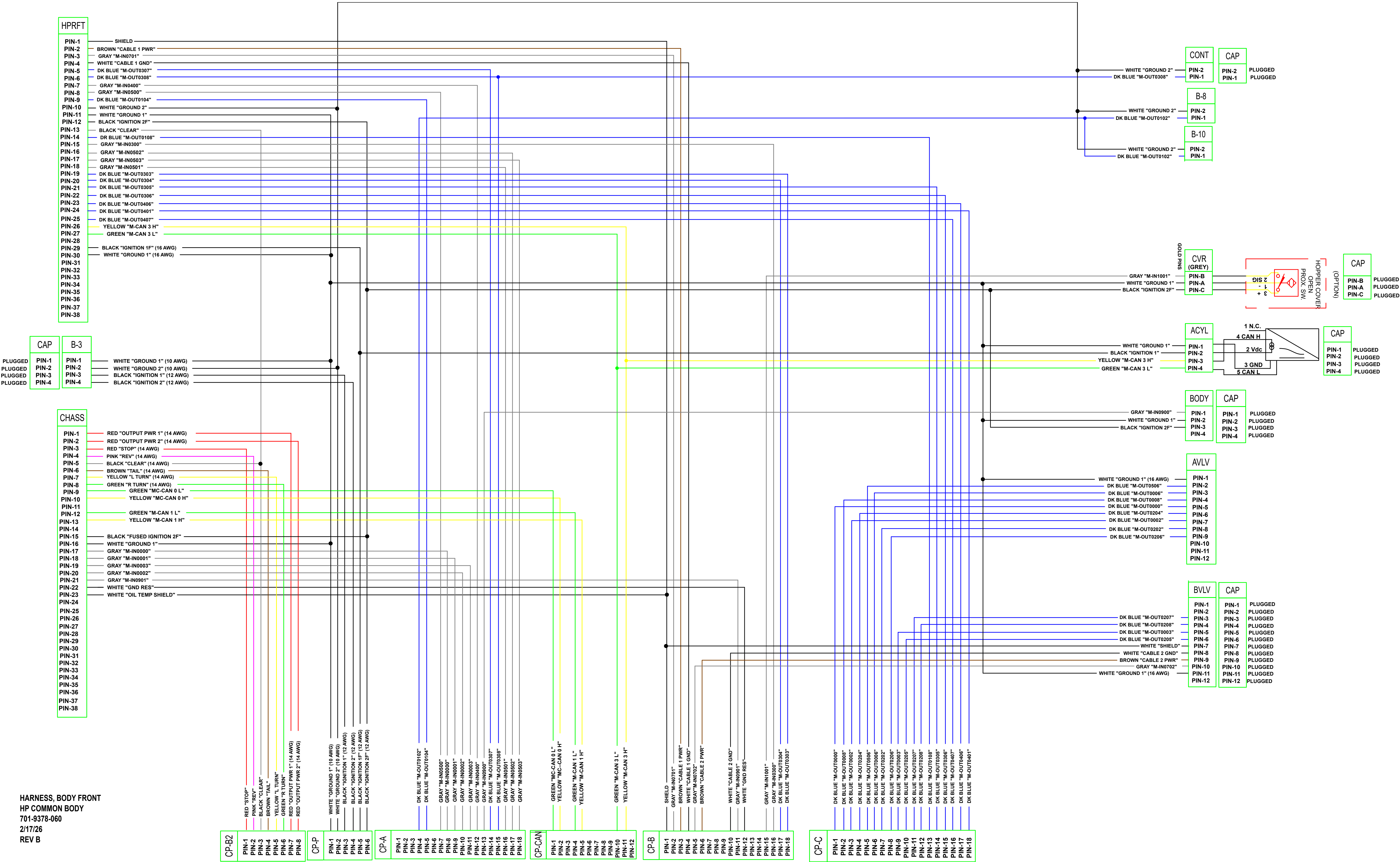
PNEUMATIC SOLENOIDS
LIFT CONTROL

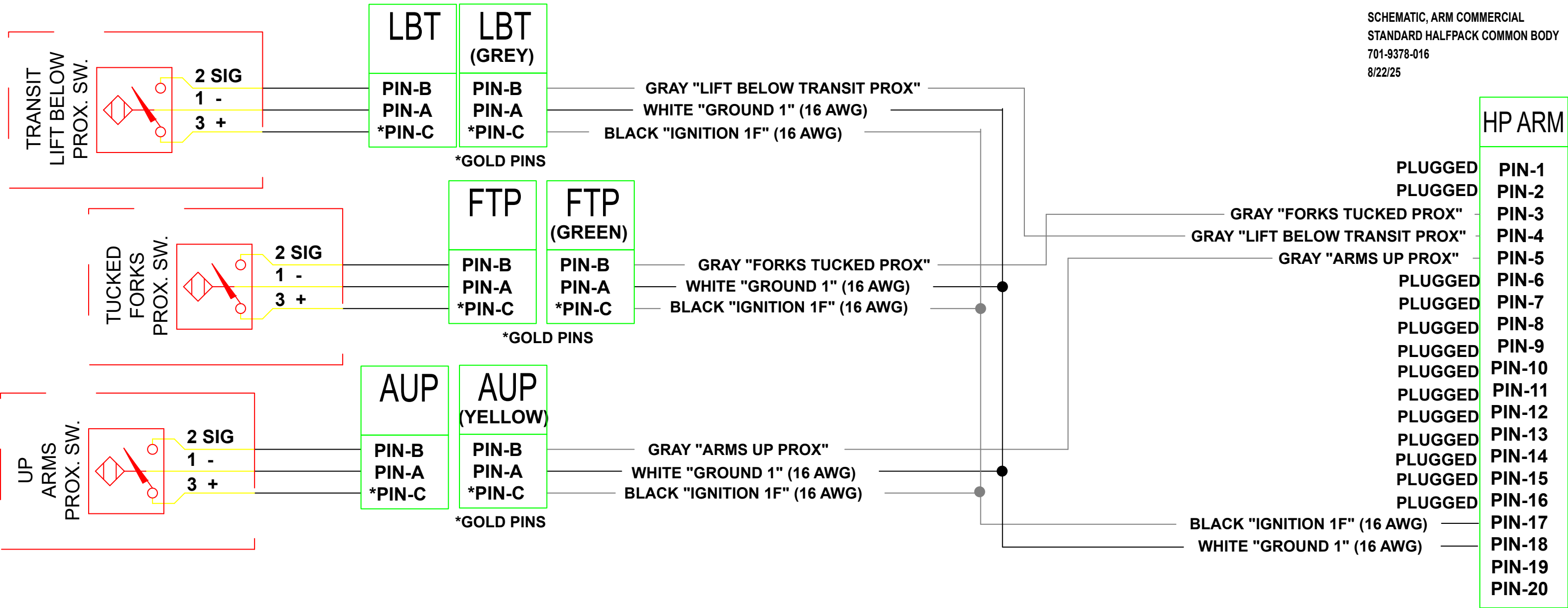
- LIFT CTRL
- INTERL
- GRABBER
- CLOSE
- GRABBER
- OPEN
- LIFT
- EXTEND
- LIFT
- LOWER
- NOT USED





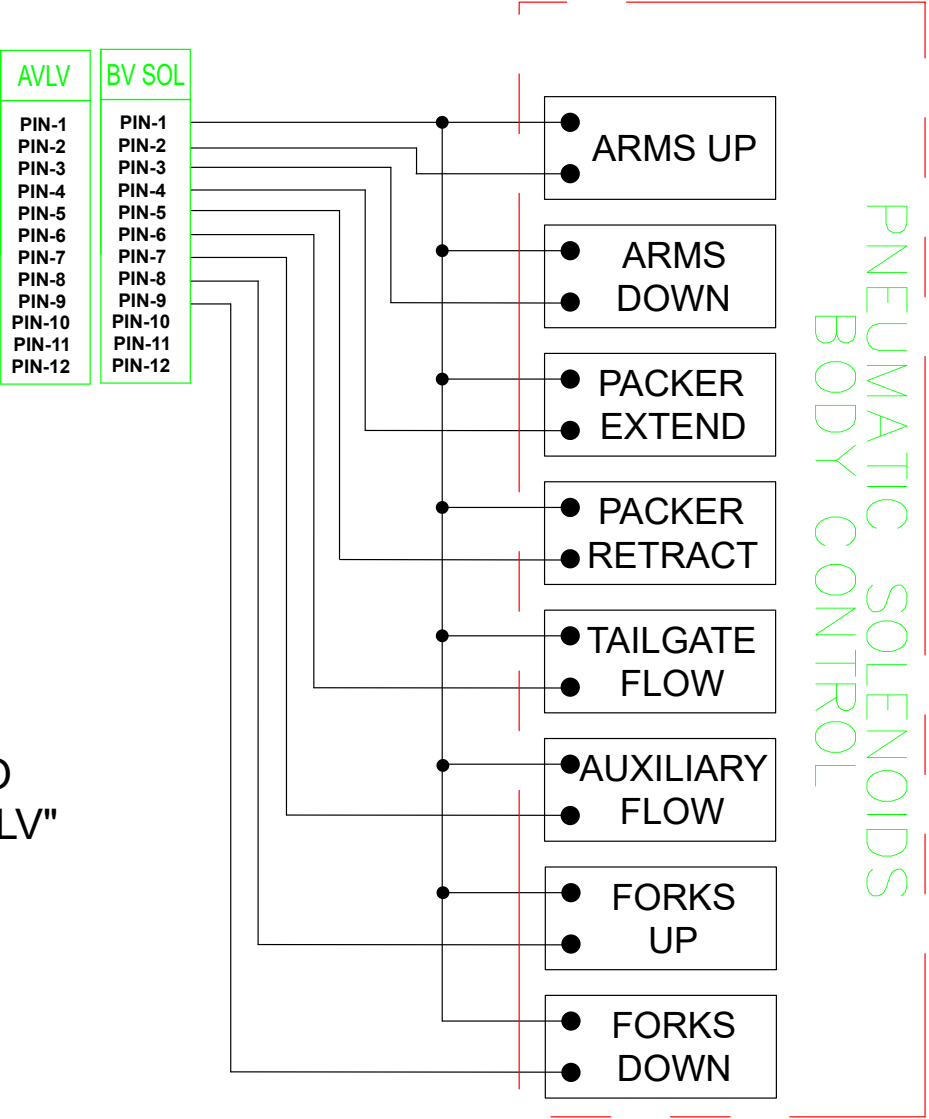
SCHEMATIC, ARM COMMERCIAL
ADJ ARMS HALFPACK COMMON BODY
701-9378-053



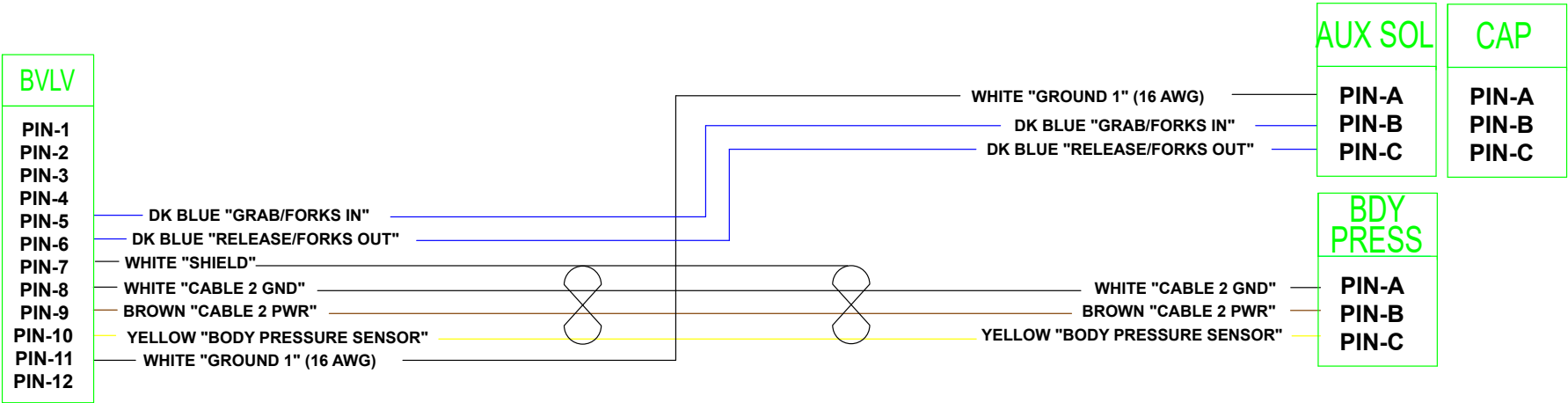


NOTE: AREA INDICATED IS FOR
UNIT INSTALLATION GUIDE ONLY.
NOT PART OF HARNESS
MANUFACTURING.

CONNECT
PNEUMATIC
SOLENOID BANK
CALLED OUT IN
CONTROLS KIT TO
CONNECTOR "AVLV"

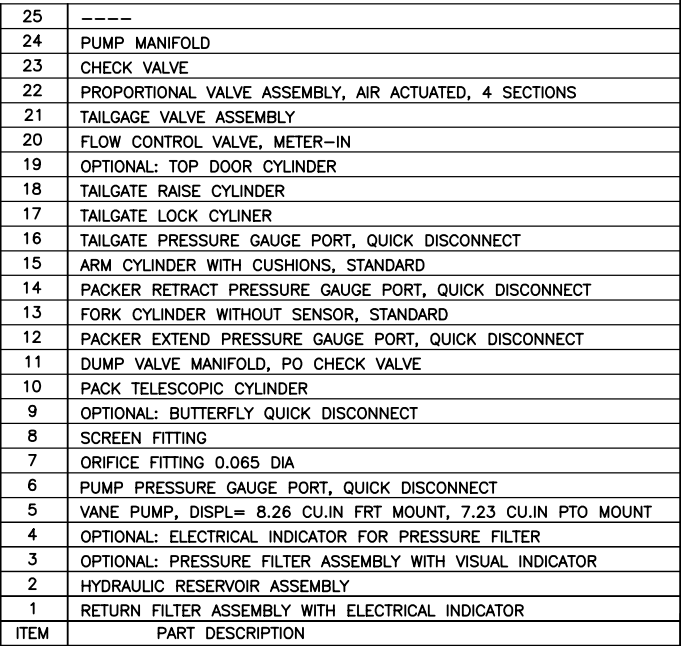


SCHEMATIC, BODY VALVE HP
COMMERCIAL STANDARD COMMON BODY
701-9378-018
9/4/25



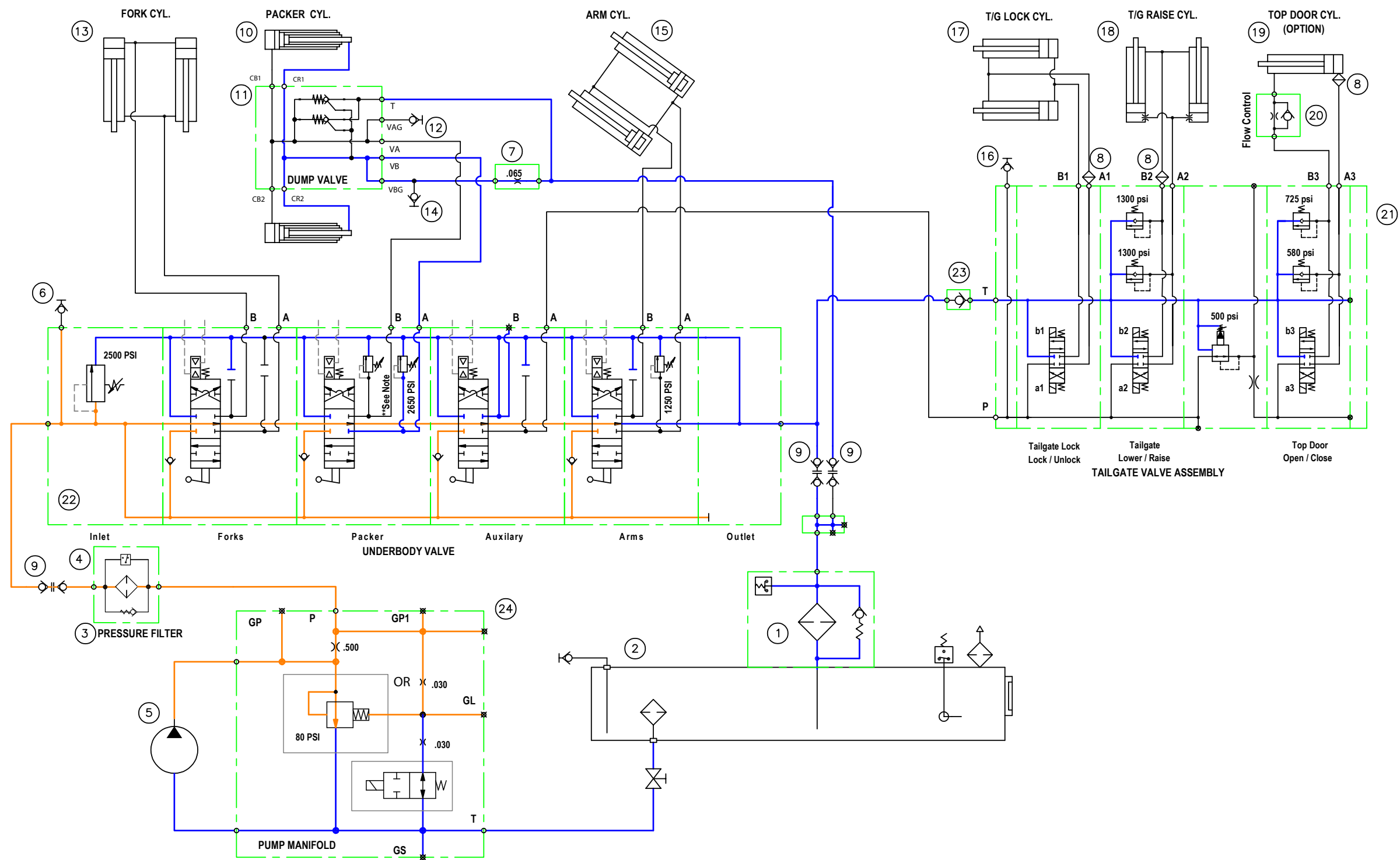
SECTION 9

HYDRAULIC SCHEMATICS



HYDRAULIC SCHEMATIC
Standard HalfPack
701-7095
03/04/2022
REV C

PUMP OFF

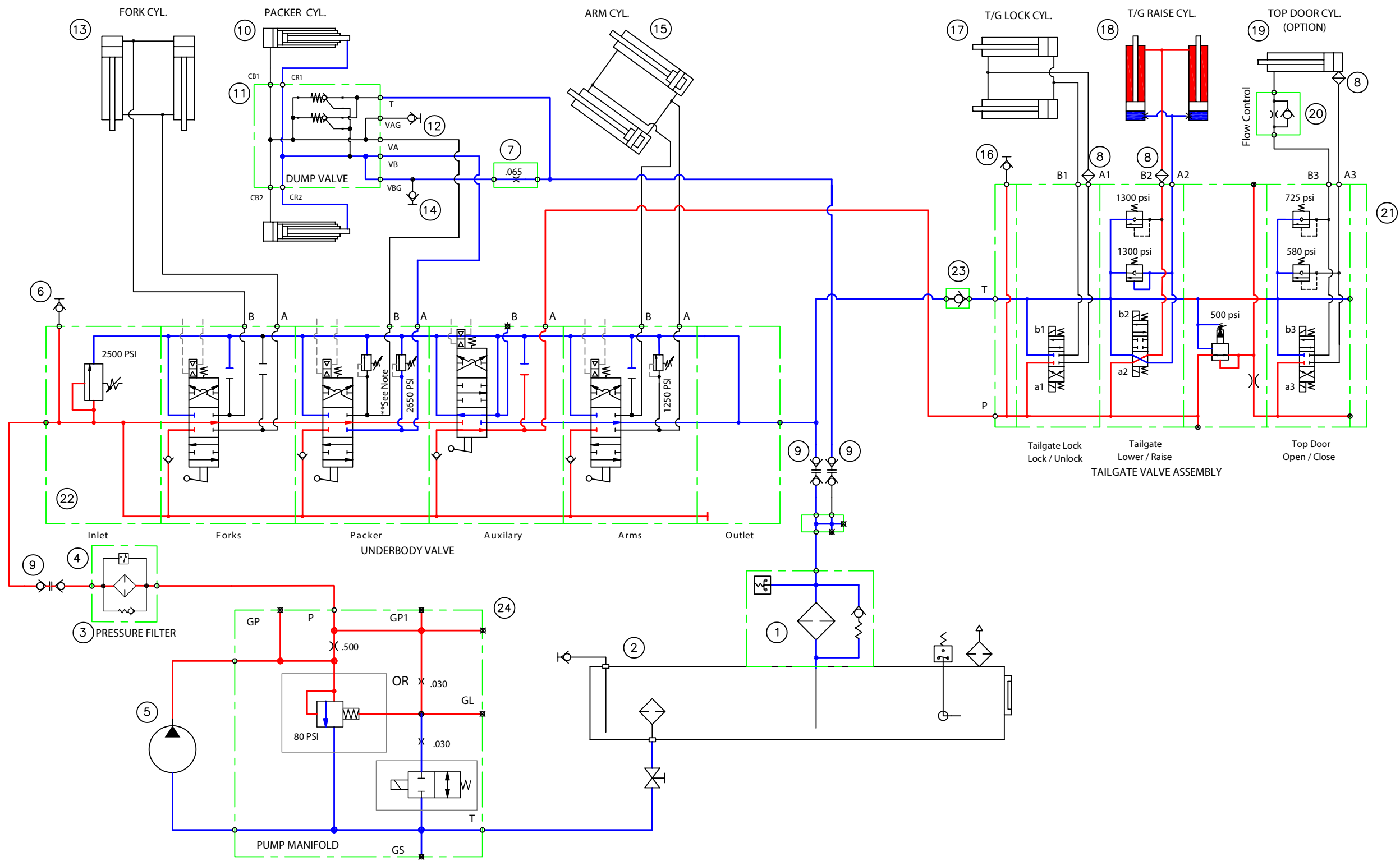


Note** Packer pressure = 2000 PSI for Lightweight body, 2650 PSI for Standard body

- High pressure / High flow
- Return pressure / Return flow
- Low pressure / Partial flow

HYDRAULIC SCHEMATIC
Standard HalfPack
PUMP OFF
701-7095-1
03/04/2022

TG LOWER



Note** Packer pressure = 2000 PSI for Lightweight body, 2650 PSI for Standard body

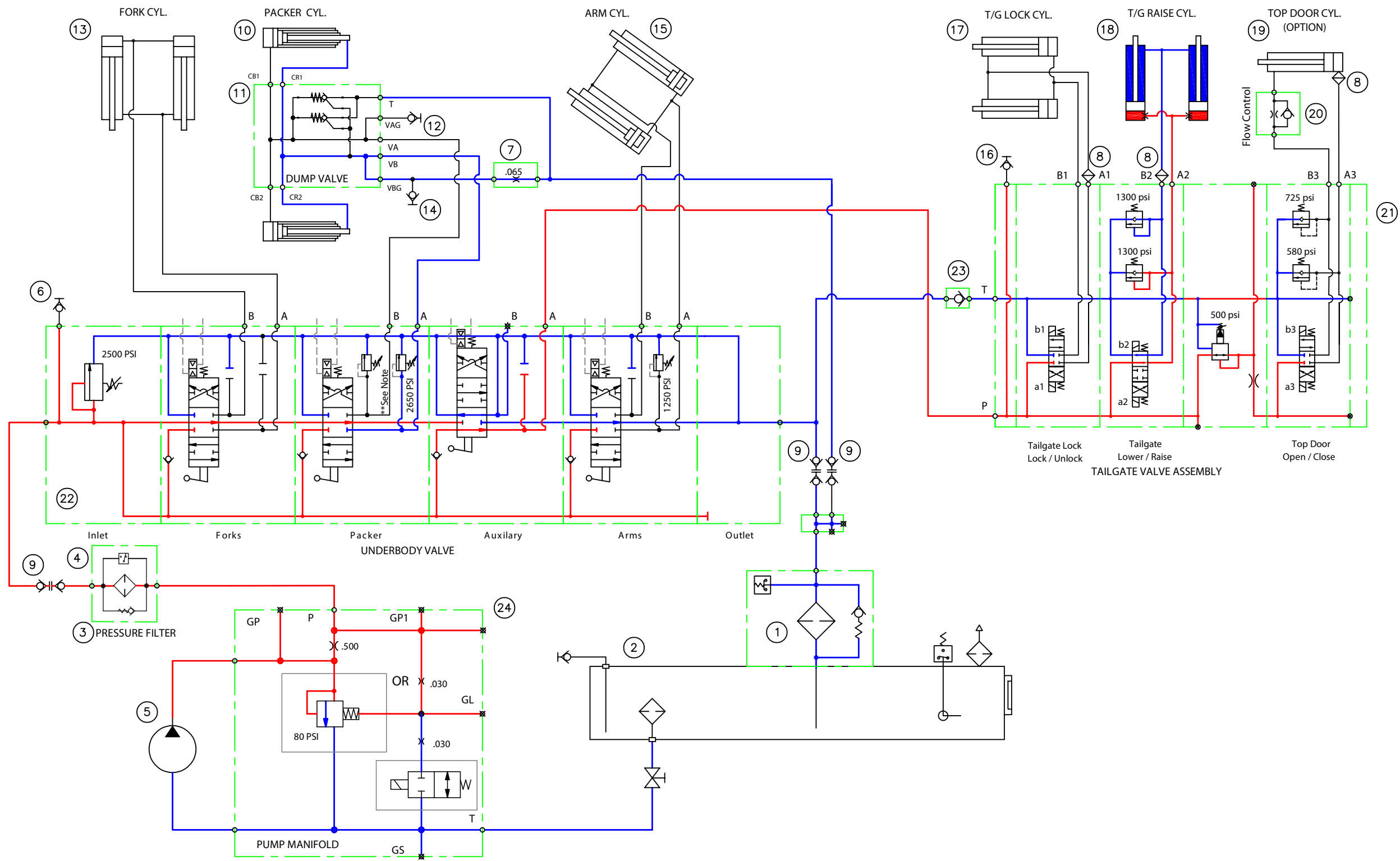
High pressure / High flow

Return pressure / Return flow

Low pressure / Partial flow

HYDRAULIC SCHEMATIC
Standard HalfPack
TG DOWN
701-7095-10
03/04/2022

TG RAISE

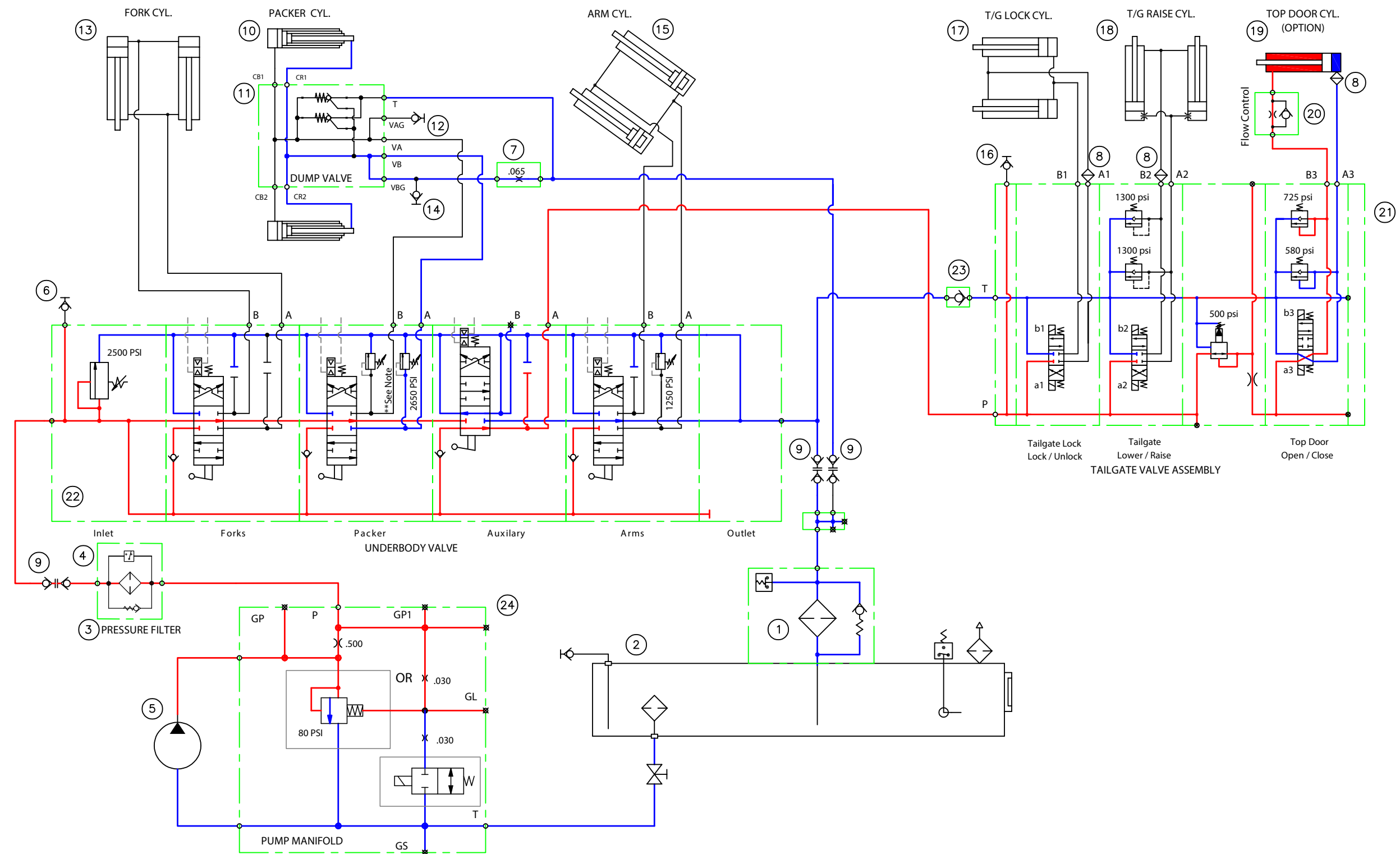


Note** Packer pressure = 2000 PSI for Lightweight body, 2650 PSI for Standard body

- High pressure / High flow
- Return pressure / Return flow
- Low pressure / Partial flow

HYDRAULIC SCHEMATIC
Standard HalfPack
TG RAISE
701-7095-11
03/04/2022

TOP DOOR OPEN

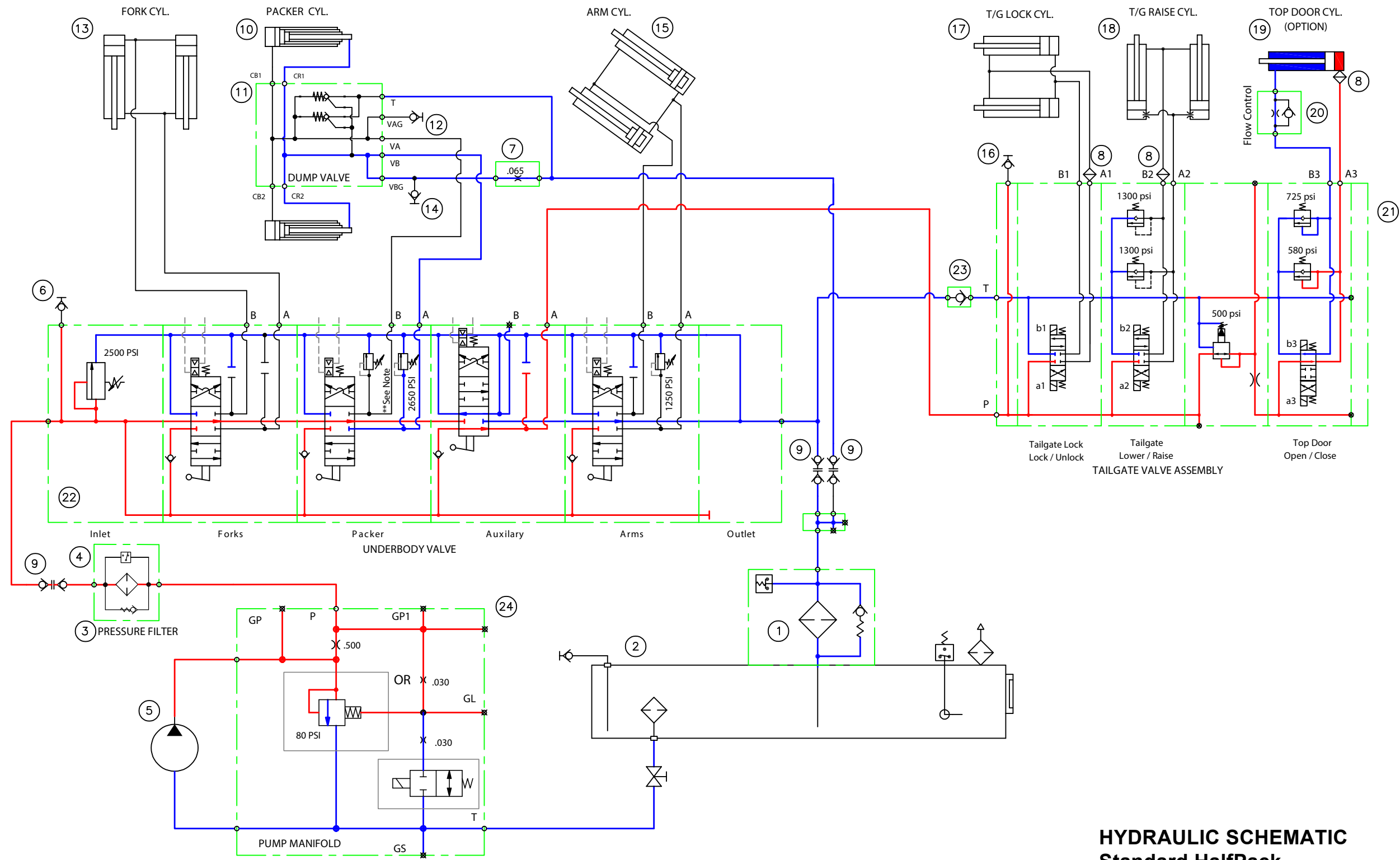


Note** Packer pressure = 2000 PSI for Lightweight body, 2650 PSI for Standard body

- High pressure / High flow
- Return pressure / Return flow
- Low pressure / Partial flow

HYDRAULIC SCHEMATIC
Standard HalfPack
TOP DOOR OPEN
701-7095-12
03/04/2022

TOP DOOR CLOSE



Note** Packer pressure = 2000 PSI for Lightweight body, 2650 PSI for Standard body

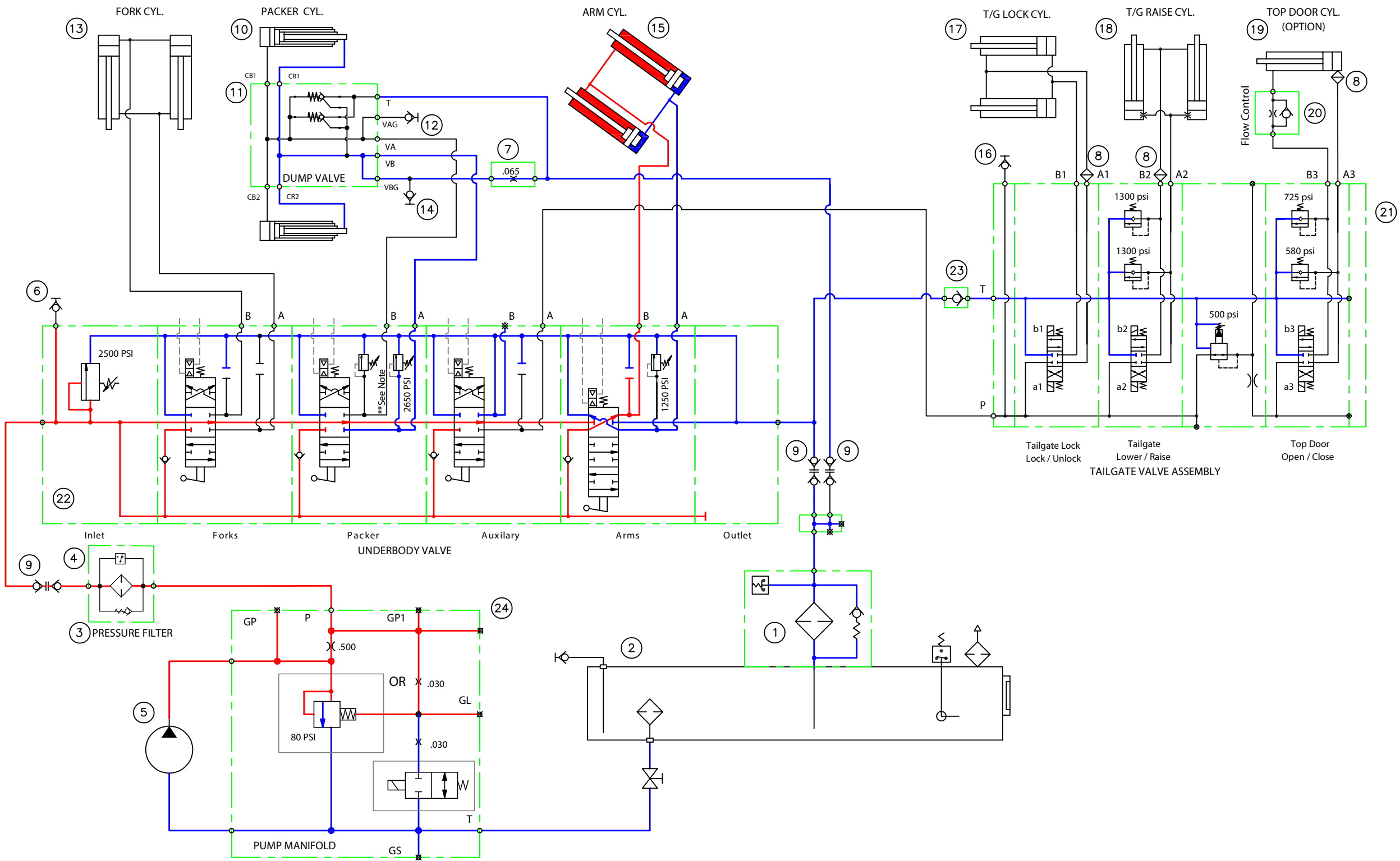
- High pressure / High flow
- Return pressure / Return flow
- Low pressure / Partial flow

HYDRAULIC SCHEMATIC
Standard HalfPack
TOP DOOR CLOSE
701-7095-13
03/04/2022

- High pressure / High flow
- Return pressure / Return flow
- Low pressure / Partial flow

HYDRAULIC SCHEMATIC
Standard HalfPack
ARMS LOWER
701-7095-14
03/04/2022

ARMS RAISE

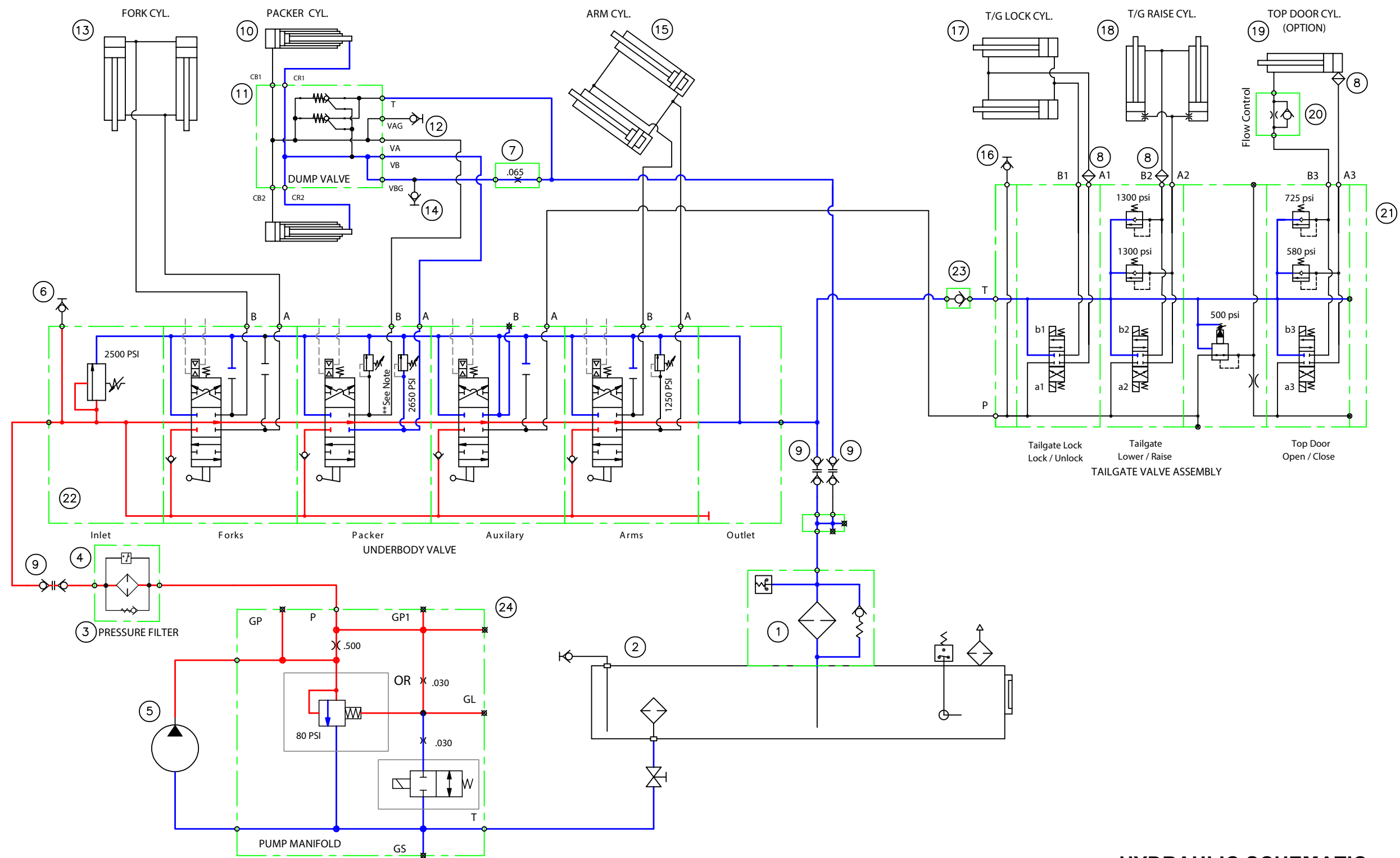


Note** Packer pressure = 2000 PSI for Lightweight body, 2650 PSI for Standard body

- High pressure / High flow
- Return pressure / Return flow
- Low pressure / Partial flow

HYDRAULIC SCHEMATIC
Standard HalfPack
ARM RAISE
701-7095-15
03/04/2022

PUMP ON

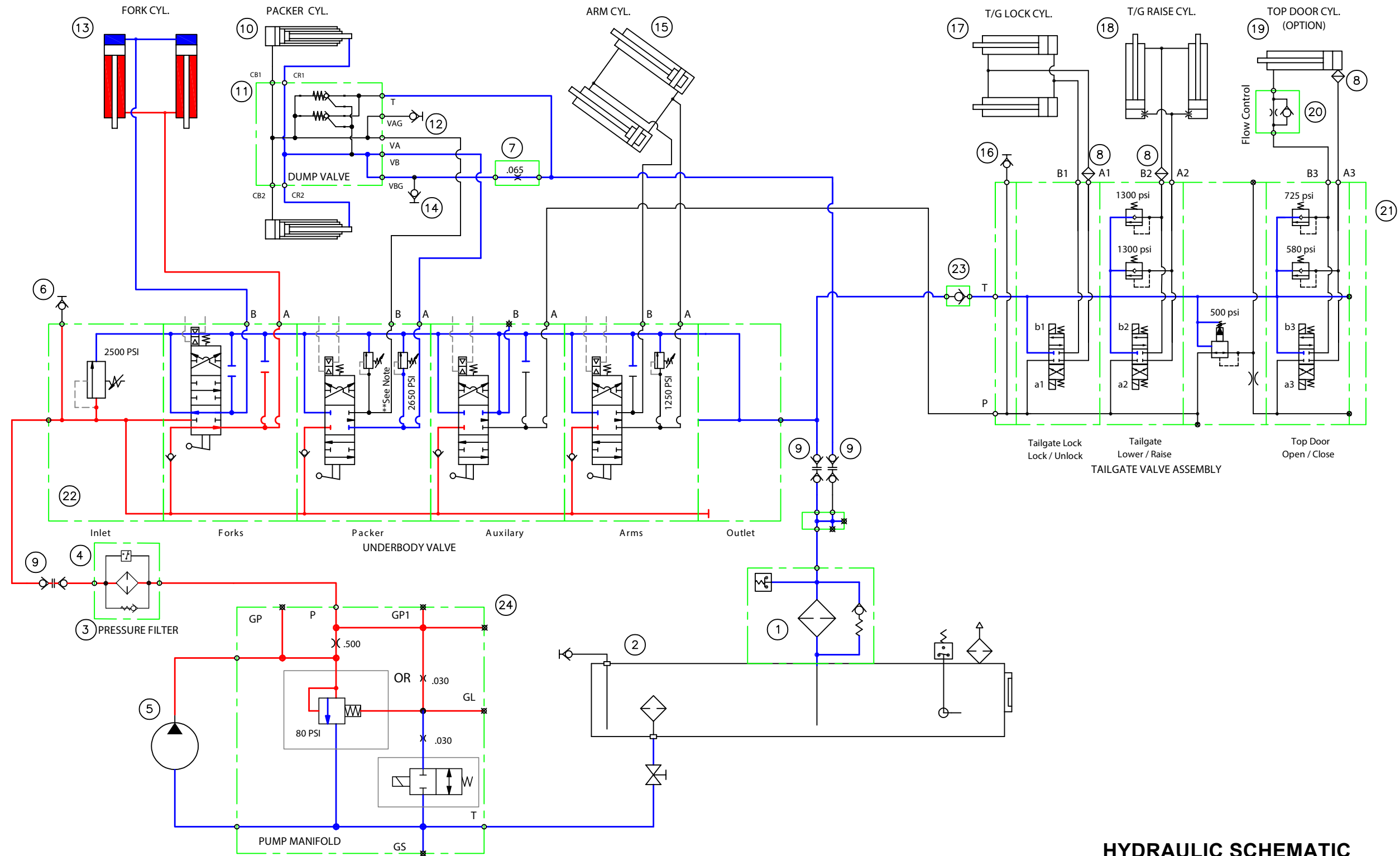


Note** Packer pressure = 2000 PSI for Lightweight body, 2650 PSI for Standard body

- High pressure / High flow
- Return pressure / Return flow
- Low pressure / Partial flow

HYDRAULIC SCHEMATIC
Standard HalfPack
PUMP ON
701-7095-2
03/04/2022

FORKS RAISE

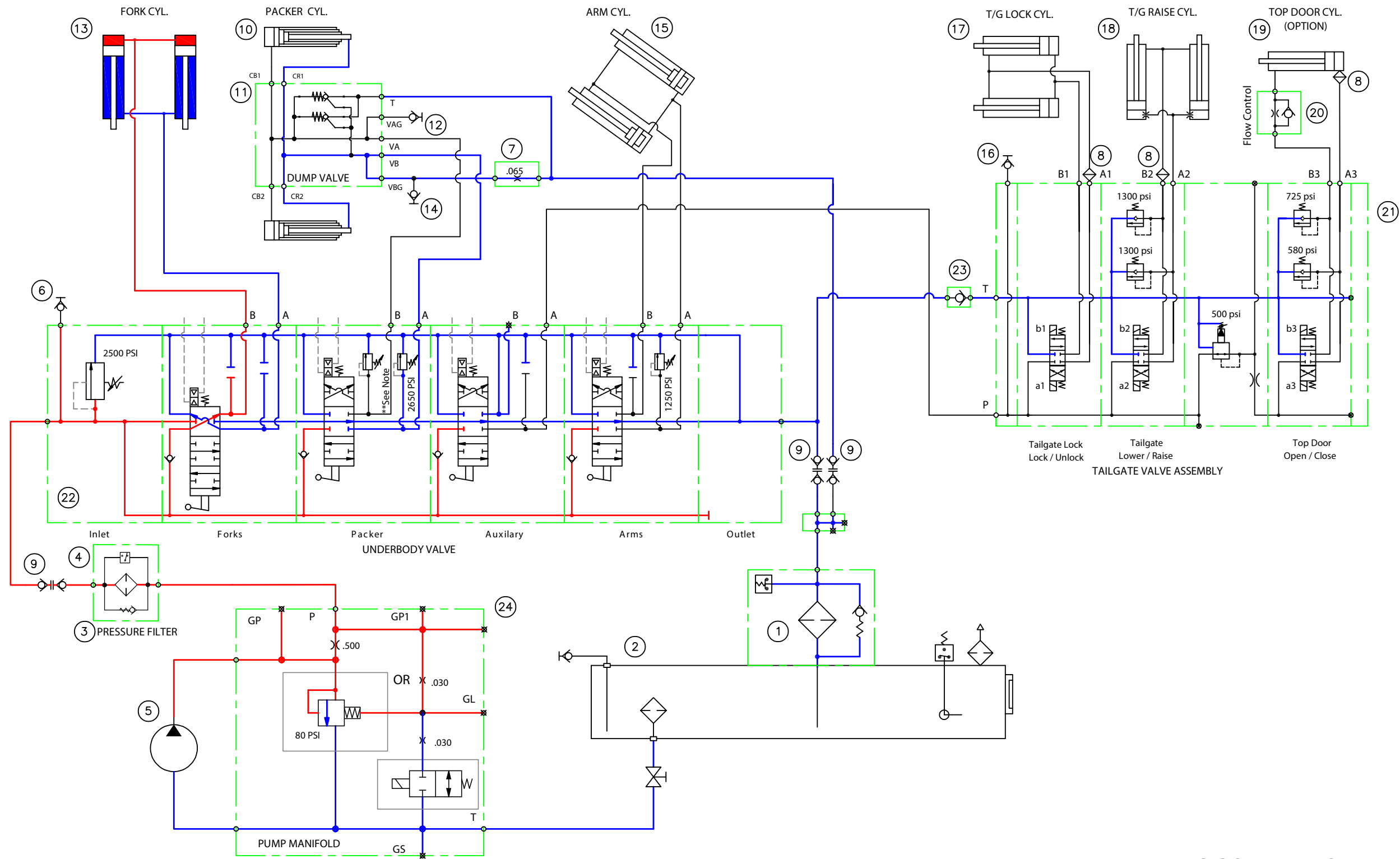


Note** Packer pressure = 2000 PSI for Lightweight body, 2650 PSI for Standard body

- High pressure / High flow
- Return pressure / Return flow
- Low pressure / Partial flow

HYDRAULIC SCHEMATIC
Standard HalfPack
FORK RAISE
701-7095-3
03/04/2022

FORKS DOWN



Note** Packer pressure = 2000 PSI for Lightweight body, 2650 PSI for Standard body

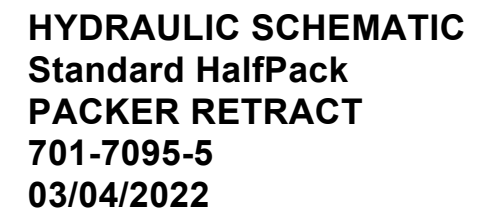
High pressure / High flow

Return pressure / Return flow

Low pressure / Partial flow

HYDRAULIC SCHEMATIC
Standard HalfPack
FORKS DOWN
701-7095-4
03/04/2022

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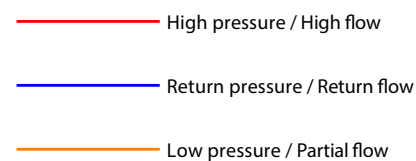
- High pressure / High flow
- Return pressure / Return flow
- Low pressure / Partial flow

EMATIC



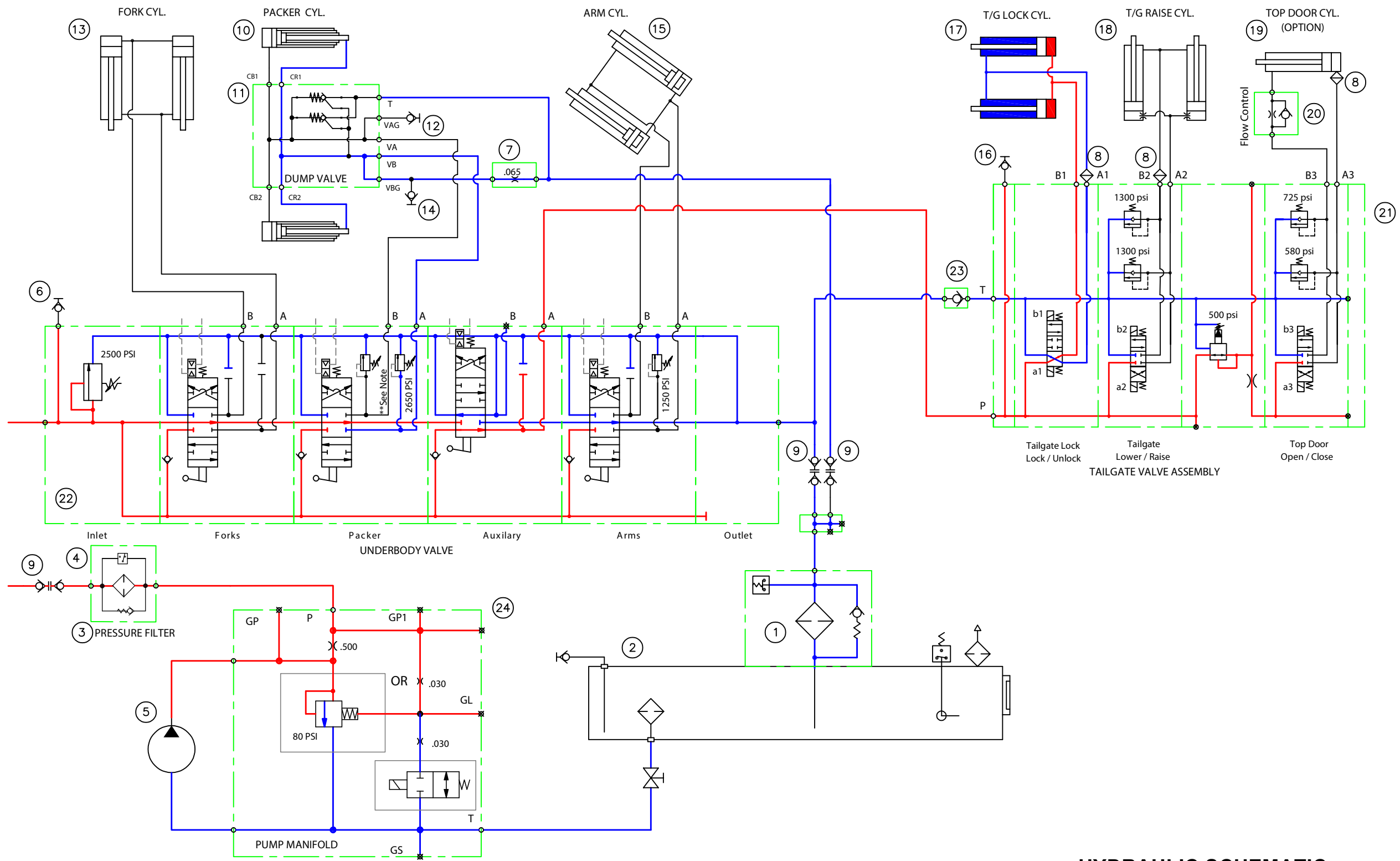
- High pressure / High flow
- Return pressure / Return flow
- Low pressure / Partial flow

HYDRAULIC SCHEMATIC
Standard HalfPack
AUXILARY SECTION
701-7095-7
03/04/2022



Note** Packer pressure = 2000 PSI for Lightweight body, 2650 PSI for Standard body

TG LOCK

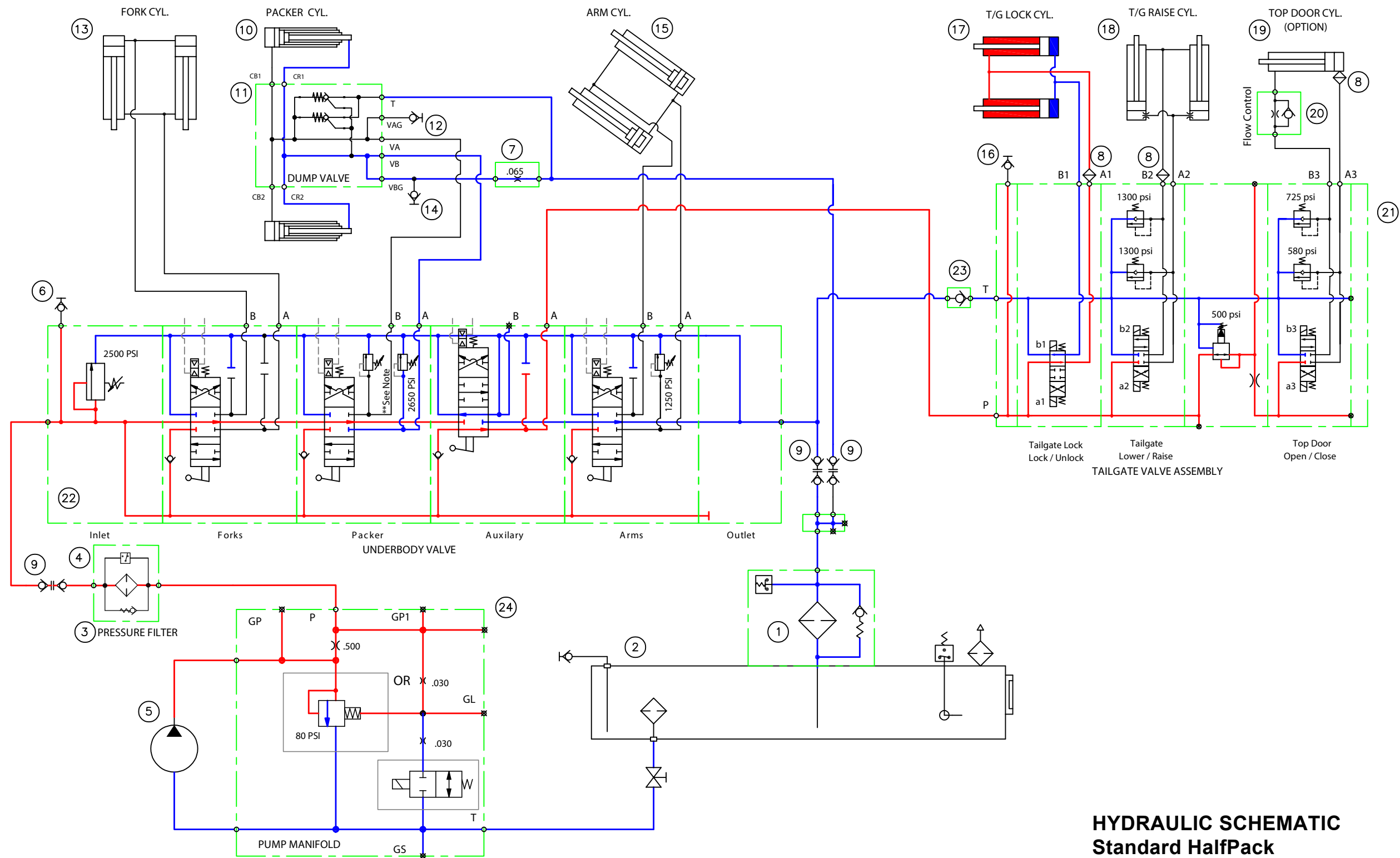


Note** Packer pressure = 2000 PSI for Lightweight body, 2650 PSI for Standard body

- High pressure / High flow
- Return pressure / Return flow
- Low pressure / Partial flow

HYDRAULIC SCHEMATIC
Standard HalfPack
TG LOCK
701-7095-8
03/04/2022

TG UNLOCK



Note** Packer pressure = 2000 PSI for Lightweight body, 2650 PSI for Standard body

- High pressure / High flow
- Return pressure / Return flow
- Low pressure / Partial flow

HYDRAULIC SCHEMATIC
Standard HalfPack
TG UNLOCK
701-7095-9
03/04/2022

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THE HEIL CO. WARRANTY STATEMENT

The Heil Co. ("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.

The statements included herein is merely a summary of the full Limited Warranty provided by Heil. Please see the full limited warranty as outlined at <https://www.heil.com/warranty/> under Heil Warranty Policies and Procedures.



WE NEVER STOP WORKING FOR YOU

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www.heil.com

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866-ASK-HEIL
(866-275-4345)

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Fort Payne, AL 35967-9984

Parts Central:
800-528-5308

Technical Service:
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Techsupport@Terex.com