RAPID RAIL[®]

CONTINUOUS-PACK AUTOMATED SIDE LOADER

SERVICE MANUAL

ISSUED FEBRUARY 2025

TP1RR-SM-0225



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

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

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Rapid Rail[®] CONTINUOUS-PACK AUTOMATED SIDE LOADER

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SECTION 1 GENERAL INFORMATION

RAPID RAIL® 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 <u>must</u> 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.

RECOMMENDED SPARE PARTS

PART NO.	DESCRIPTION	QTY
BODY AND TAILGATE ASS	SEMBLIES	
003-4438	BEARING, SPHERICAL, PACKER, LOWER	1
005-4131	LINK, DOUBLE	2
005-4132	ASSEMBLY, LINK	2
048-6231	PIN, ACTUATOR, 1-1/2" DIA.	6
048-6024-001	PIN. 3/4" DIA	2
048-6235	PIN, SHEAVE	2
048-6238	PIN, PACKER, 1" DIA.	2
022-3996	TUBING, T/G SEAL, EPDM, RR	1
048-6023-001	PIN 1"	2
097-0554	TAILGATE CABLE RAPID RAIL	2
005-4130	SINGLE LINK	2
108-5031	WHISKER SWITCH	1
272-8233	KIT, SEAL, PACKER	1
LOADER AND GRABBER A	SSEMBLIES	·
093-3227	ASSEMBLY, DRIVE GEAR, GRABBER	1
093-3228	WELDMENT, GEAR, IDLE	1
003-4449	CAM, FOLLOWER, 4" DIA.	1
003-4450	CAM, FOLLOWER, 2" DIA.	2
001-6393	CYLINDER, AIR	1
032-1548	END, YOKE, LATCH, MECHANICAL	1
003-4432	BEARING, SPHERICAL, 2"	5
019-1404	SPRING, GRABBER, HUGGER, EXTENSION	1
062-0805	ASSEMBLY, GRABBER, ROLLER 4"	2
071-0843	BELT, ARM, 47"	2
071-0838	BELT, GRIP, UNIVERSAL (90/300 UNIVERSAL)	2
071-0839	GRIP, BELT	1
019-1404	SPRING, EXTENSION, HUGGER GRABBER	1
062-0804	ASSEMBLY, ROLLER, TRI-CUFF	2
093-3075	ARM, INNER, SINGLE GRABBER, TRI-CUFF	1
071-0837	BELT, 30/150 HUGGER	2
019-1390	SPRING, GRABBER (90/300 UNIVERSAL)	1
062-0712	ROLLER, GRABBER, 4"	1
062-0717	ROLLER, 2-1/2" DIA.	4
HYDRAULICS		•
001-7066	CYLINDER, IN/OUT	1
001-6973	CYLINDER, DUMP	1
001-6904	CYLINDER, ARM RAISE	1
001-6393	CYLINDER, AIR, 1-1/2" BORE X 2" STROKE	1
001-7003	CYLINDER, PACKER	2
001-6445	CYLINDER, BODY HOIST	1

General Information

001-6991	CYLINDER, TAILGATE	1
001-6974	CYLINDER, GRIP	1
031-6194	VALVE, BODY	1
031-6395	VALVE, HUSCO, LOADER	1
031-2616	VALVE, SHUT OFF, SUCTION LINE	1
031-6194-006	VALVE, PILOT OPERATED ,DIRECTIONAL CONTROL	1
031-6194-008	VALVE, CONTROL DIRECTIONAL	2
031-6395-009	VALVE, RELIEF (INLET SECTION – SET @ 220PSI)	1
031-6395-008	VALVE, RELIEF (IN/OUT SECTION – SET @ 2350PSI)	2
075-0712	FILTER. BREATHER	1
075-0721	FILTER, REGULATOR, W/GAUGE	1
075-0578	FILTER, SUCTION STRAINER	1
075-0953	FILTER, RETURN LINE	4
ELECTRICAL		
063-0108	SWITCH, PROXIMITY, NO, SOURCING 18MM	1
063-0034	SWITCH, PROXIMITY, 5-WIRE	1
063-0109	SWITCH, PROXIMITY, NO, 30 MM	4
CONTROLS		
108-8458	RELAY, POWER MODULE	2
108-7760	SWITCH, ROCKER TYPE, SPST	2
108-7760-003	SWITCH, ROCKER	3
115-1256-001	INDICATOR,LED, RED 16MM	3
115-1256-002	INDICATOR, LED, GREEN 16MM	1
115-1256-003	INDICATOR ,LED, YELLOW 16MM	2

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.

<u>Note</u>: 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 and Login

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

PARTS CENT	RAL
🛔 User name / Email	
Password	
Remember me	
Are you a new user? Click here	e to register 🔶
2019 © interactive	S P ares™

Parts	CENTRAL
A Name	A Last name
Password	Email
Company	C Phone
Address	
1 Town	✓ Postcode
Select a country	~
🛤 Select a language	~
	SAVE
	eractive SP ares™

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

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



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

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

PAR	ISCENTRAL			S Brand	🎍 Chris
希 Da	ishboard 🛛 🖉 Catalogues 🗸		proximity switch	Q in HPS4955	9991 Q
Searc	h : proximity switch in HPS49	059991			
Code	Description	Catalogue			
035- 3712	GUARD, switch , proximity , TAILGATE LOCK	Half/Pack, Odyssey and Factor AFL / ELECTRICAL / KIT, ELECTRIC, BC	YDC	۲	>
063- 0122	switch, proximity, SOURCING, 18 MM	Half/Pack, Odyssey and Factor AFL / ELECTRICAL / KIT, ELECTRIC, BC	YDC	۲	>
063- 0123	switch, proximity, 30 MM.	Half/Pack, Odyssey and Factor AFL / ELECTRICAL / INSTALLATION, E	ELECTRICAL, STEEL, TOP DOO	R	>
063- 0123	switch, proximity, 30 MM.	Half/Pack, Odyssey and Factor AFL / ELECTRICAL / KIT, ELECTRIC, BC	YDC	۲	>
212- 2228	DECAL, proximity switch , ADJUSTMENT	Half/Pack, Odyssey and Factor AFL / BODY AND TAILGATE / KIT, DEG WITH CNRG TAILGATE	CAL & TRIM, STANDARD, 28 Y	D., 💿	>
234- 3317	PLATE, STRIKER , proximity switch , TAILGATE LOCK, 1"	Half/Pack, Odyssey and Factor AFL / ELECTRICAL / KIT, ELECTRIC, BC	YDC	۲	>
311- 3954	BRACKET, proximity switch, 30MM, LOADER	Half/Pack, Odyssey and Factor AFL / ELECTRICAL / KIT, ELECTRIC, BC	YDC	۲	>
311- 6253	BRACKET, 30 MM, proximity switch , TAILGATE LOCK	Half/Pack, Odyssey and Factor AFL / ELECTRICAL / KIT, ELECTRIC, BC	DDY	۲	>

Search by Body Serial Number

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



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



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

The following warnings are generally in the Operator's Manual for each specific unit, or are generic safety messages if an Operator's Manual does not have these safety messages. Other safety alert messages may be in other sections of the 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.

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

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

A DANGER

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

\Lambda DANGER

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

A DANGER

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

A DANGER

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

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

A 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.

A 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.

A DANGER

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

A DANGER

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

A DANGER

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

A DANGER

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

Make sure the unit is in the Lockout/Tagout mode 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 Lockout/Tagout mode, equipment operated while you do maintenance or service procedures, go in the hopper or climb in or on the body or on equipment can cause death or serious injury.

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

A WARNING

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

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

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.

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

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

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

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

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

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

NOTICE

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

NOTICE

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

NOTICE

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

NOTICE

The following lockout/tagout procedure represents Heil's minimum recommendation and should be used in conjunction with and should not supersede additional or more stringent safety requirements called out by your company policy. Please check with your supervisor to determine if your company has a specific lockout/tagout procedure. Contact your supervisor, Heil Technical Service, or reference *OSHA Regulation 1910.147* if you have any questions about Lockout/Tagout procedures.

LOCKOUT/TAGOUT PROCEDURE

A DANGER

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

If you do not have functioning Lockout/Tagout gear and/or are not an authorized employee, STOP and DO NOT initiate any service on the unit. Contact your supervisor immediately.

NOTICE

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

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

- A. Put the unit in a Lockout/Tagout mode:
 - 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, see Figure 1:

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



Figure 1. Examples of Lockout/Tagout Gear.

RAPID RAIL® General Information

LOCKOUT/TAGOUT PROCEDURE (CONTINUED)

Follow These Steps:

- 1. APPLY the brakes. MAKE SURE the brakes do not let the unit move and they work 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. Mechnaical (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 Lockout/Tagout 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 Lockout/Tagout gear 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 Lockout/Tagout procedure to verify all stored energy is removed from the unit BEFORE applying their Lockout/Tagout gear.

11. BEFORE removing your Lockout/Tagout gear 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 Lockout/Tagout devices are being removed.

RAPID RAIL® General Information

STORING REFUSE IN THE BODY

Heil does not recommend storing refuse in the body overnight. The different types of debris and corrosive elements usually collected can cause severe corrosion inside the body, decreasing the life of your body 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. 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** paragraph of this section.

Use grade NLG1000 grease or equivalent.

OIL LUBRICANT RECOMMENDATION

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

HYDRAULIC OIL SPECIFICATIONS

Hydraulic fluid is one of the most important 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

STANDARD TORQUE DATA FOR NUTS AND 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

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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	STD	20	5	9	8	6		
0.25			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	STD	18	5	19	17	12		
.3125			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	STD	16	5	33	30	22		
.375			8	47	42	31		
		24	5	38	34	25		
			8	54	48	35		

RAPID RAIL[®]

General Information

		Thread Turns		Heil Plain Dry Condition Torque	Heil Zinc Plated Fastener Torque	Heil Lubricated Fastener	Heil Deformed Lock Nut Torque
Bolt Size (D)	Nut Type (STD/Lock)	per Inch (p)	Grade	Value (ft-lbs)	Value (ft-lbs)	Torque Value (ft-lbs)	Value (ft-lbs)
	Lock	16	5				22
			8				31
		24	5				25
			8				35
7/16	STD	14	5	53	48	35	
4375			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	STD	13	5	82	73	53	
500			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	STD	12	5	118	106	77	
.5625			8	166	150	108	
		18	5	131	118	85	
			8	186	167	121	
	Lock	12	5				77
			8				108
		18	5				85
			8				121
5/8	STD	11	5	162	146	106	
.625			8	230	207	149	
			1	1	1		1

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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)
			8	260	234	169	
	Lock	11	5				106
			8				149
		18	5				120
			8				169
3/4	STD	10	5	288	260	188	
0.750			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	STD	9	5	465	418	302	
0.8750			8	657	591	427	
		14	5	513	461	333	
			8	724	652	471	
	Lock	9	5				302
			8				427
		14	5				333
			8				471
1	STD	8	5	697	627	453	
1.0000			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	STD	7	5	869	782	565	
1.1250			8	1395	1256	907	

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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)	
		12	5	975	877	634		
			8	1564	1408	1017		
	Lock	7	5				565	
			8				907	
		12	5				634	
			8				1017	
1-1/4	STD	7	5	1227	1104	797		
1.2500			8	1969	1772	1280		
		12	5	1358	1222	883		
			8	2179	1961	1417		
	Lock	7	5				797	
			8				1280	
		12	5				883	
			8				1417	
1-3/8	STD	6	5	1608	1447	1045		
1.3750			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	STD	6	5	2134	1921	1387		
1.5000			8	3425	3083	2226		
		12	5	2401	2161	1561		
			8	3854	3468	2505		
	Lock	6	5				1387	
			8				2226	
		12	5				1561	
			8				2505	

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.	\bigcirc
5	5	Three radial lines. Quenched and tempered medium carbon steel.	\bigcirc
8	8	Six radial lines. Quenched and tempered special carbon or alloy steel	$\left(\begin{array}{c} \\ \end{array} \right)$

General Information

TORQUE FOR HYDRAULIC TUBES AND 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-Ibs.	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 2. Torque for Hydraulic Tubes and Fittings

General Information

TORQUE FOR HYDRAULIC TUBES AND FITTINGS (CONTINUED)

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-Ibs.	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-Ibs.	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 3. Torque for Hydraulic Tubes and Fittings

General Information

TORQUE FOR HYDRAULIC TUBES AND FITTINGS (CONTINUED)

SPLIT-FLANGE (HALF CLAMP) CONNECTORS (CODE 61)				
		SET WRENCH TO *DRY TORQU	IE*	
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-Ibs.	
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 4. Bolt Torque Sequence.

COLD WEATHER WARMUP PROCEDURE

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

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 for operation instructions.
- 6. Make sure the oil temperature on the site gauge is between 120° and 160° F. If not, repeat step 5.
- 7. Check for fluid leaks. Repair if necessary.
- 8. The unit is now ready to go on route.

BATTERY DISCONNECT SWITCH

The battery box is typically located on the 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.

RAPID RAIL® General Information

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.

Proximity Switch Troubleshooting Table		
Probable Cause	Remedy	
Loose or corroded electrical connections.	Replace the electrical connections.	
 Damaged Switch A. Cracked Ferrite core causing the fine internal wire to break. B. Cracked Ferrite core – but wire is not broken – the sensitivity of switch will increase which causes sensing distance to increase or switch work intermittently as the temperature changes. 	 DO NOT strike switch to make it work. DO NOT damage the switch when you adjust it. DO NOT adjust switch too close to the metal it is sensing. 	
Voltage spikes from truck chassis electrical system will break down the internal electronics of the proximity switch.	 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: PROX. SWITCH METAL 18 MM - MAX. 3/16" SENSING DISTANCE 30 MM - MAX. 3/8" SENSING DISTANCE	
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 fuse relay block (Half/Packs with IFM controllers). The fuse/relay box is located in the cab. Or Check the in-line fuses (Side Loaders with IFM controllers). The in-line fuses are located in the cab. Unplug proximity switch. Check the power wire (terminal C) for +12 VDC with a multimeter. Check ground signal with multi-meter for continuity to chassis ground. Check the signal wire for continuity to appropriate controller input terminal. See Service Manual. If all three (3) wires are good, replace the proximity switch. 	

General Information

PROXIMITY SWITCH TROUBLESHOOTING (CONTINUED)



RAPID RAIL® General Information

DECALS ON THE UNIT

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

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 Parts and Service 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
- Spray angle: 65° from vehicle's body (do not use sharp angles this can lift the decals from the unit)
- Distance of nozzle to decal: 38 cm minimum
- Water pressure: <= 5.5 MPa
- Length of time: not more than 30 sec.
- NEVER use a "turbo pressure nozzle".

C.Remove Difficult Debris

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

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

DECAL CARE (CONTINUED)



INCORRECT TECHNIQUE Figure 6. Incorrect Technique

HYDRAULIC SYMBOLS


RAPID RAIL® General Information

HYDRAULIC SYMBOLS (CONTINUED)



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SECTION 2 PUMPS

TANDEM VANE PUMP WITH MONOBLOCK

A. Tandem Pump Design (Pre 2022)

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

The pump section (pump 1) closest to the input shaft operates the lift and shuts OFF first. The pump section (pump 2) farthest from the input operates the packer and stays ON at higher RPMs.



Figure 7. Tandem Vane Pump with Monoblock



Figure 8. Isolated Flow.

Pumps

TANDEM VANE PUMP WITH MONOBLOCK (CONTINUED)

B. Tandem Pump Design (Post 2022)

Note: This deign is commonly found on units manufactured after 2022.

On these systems, pump section P1 is the closest to the pump shaft and operates the lift functions.



Figure 9. Tandem Vane Pump with Monobloc.

Figure 10. Pump Relief Valve.



Figure 11. Dual Vane Pump Monobloc Schematic.

TANDEM VANE PUMP O.I.G.A.I. HYDRAULIC SYSTEM TROUBLESHOOTING

The Operate-in-Gear-at-Idle (OIGAI) system is designed to perform side-loading operations at standard idle speed. It consists of three major components: the monoblock, the tandem Vane pump, and the PTO.

On all systems, the loader is operated from P1, the front section (closest to the pump input shaft). P1 will also run the body function on some units. P2, the rear section (farthest from the input shaft), operates the body section or the packer only, depending on the units.

A Major Components

Heil uses three different types of hydraulic flow-sharing systems:

- 1. (Rapid Rail & Liberty Only) Separate flow: In a separate flow system, each pump section controls one aspect of the system independently of the other.
- (DPF Python Only) Power beyond combined flow : On a power beyond combined flow, P1 controls the lift and body functions, and P2 adds flow while running the packer. The P2 flow is combined with the P1 flow at the outlet of the lift valve.
- 3. (*DPF Rapid Rail Only*) Combined flow : On a combined flow system, P1 controls the lift, P2 controls the body function, and P1 is combined with P2 when running the Packer. P1 flow is combined with P2 flow at the pump.

B. Troubleshooting

Some symptoms of a problem in the pump circuit can be no operation or slow operation of the loader or packer system.

A malfunction of one pump's section will affect the truck's specific function. For example, the packer will work correctly but not the loader or vice versa. However, even though it is possible for both sections to fail, if both the body and lift do not function, problems might be electrical or the PTO.

There are four primary causes for the pump circuit not to operate properly:

- 1. Low or no voltage to the unloader valve coil
- 2. Malfunction in the manifold assembly
- 3. Internal problem with the pump
- 4. PTO slippage or not engaging

NOTICE

Perform the following test AFTER finding that there is insufficient OR no flow to the loader and/or body valves.

- 1. Check the Electrical Supply to the pump manifold Coils. The coil activation will vary depending on the unit type.
 - a. RR and Liberty: P1 (SV4) and P2 (SV2) solenoid will be active at IDLE.

RR and Liberty Pump Control Manifold	SV2 - P2 Pump Activation	SV4 - P1 Activation
Arm	ON	ON
Body	ON	ON

b. DPF Python: P1 (SV4) will be active at IDLE, and P2 (SV2) will only be active when the packer extend button is pressed.

DPF Python Pump Control Manifold	SV2 - P2 Pump Activation	SV4 - P1 Pump Activation
Arm Only	OFF	ON
Body	OFF	ON
Packer Function	ON	ON

c. DPF Rapid Rail: Solenoid activation at IDLE is a little more complex; the table below shows the basics:

DPF RR Pump Control Manifold	SV1 - Lift Priority GREEN	SV2 - Pump 2 Solenoid WHITE	SV3 - Body Priority YELLOW	SV4 - Pump 1 Solenoid BLACK
Arm Only	ON	OFF	OFF	ON
Arm & Body	ON	ON	OFF	ON
Body Only Arm Stowed	ON	ON	OFF	ON
Packer Only Arm Stowed	OFF	ON	ON	ON
Packer Only Arm Out	ON	ON	OFF	ON

With the system power on and the engine idling, test the voltage at the coils according to the activation charts above. It should read at least 10 VDC. If the proper voltage is present and the problem persists, proceed to step (2). If the voltage falls below 10VDC, check the electrical system for issues that could cause a drop or loss of voltage. Examples include a broken or shorted wire, a blown fuse, etc.

(a). If the voltage reads 0 V, make sure all conditions are met to activate the pump, such as the side door interlock switch, low oil level switch, RPM reading, etc.

- (2). Use an ohm meter to check the coil's resistance. If the measurement is less than 5 ohms or more than 20, then the coil is damaged. If so, replace it.
- (3). Eliminate all cartridge valves from the pump manifold circuit; unfortunately, there are not many options for forcing the fluid out of the pump on those manifolds.

(a). To test the P2 section of the pump, the drain hose from the manifold can be capped. This will force the oil out of P2 by overriding the solenoid valve and the relief valve.

(b). Then, for the P1 section, you need to replace the solenoid cartridge valve SV4 AND the relief with long cavity plugs, **031-6650-101**. On DPF RR, you will also need to replace SV1 with a short cavity plug, **054-3342-010**, and SV3 with a long cavity plug, **031-6650-101**.

- (4). If the first three tests are not positive, refer to the Power Take-Off 39 section for additional troubleshooting steps.
- (5). Restart the truck and test its functions. If the lift and packer functions are back to normal operation (with speed and pressure within specifications), replace or repair the necessary parts.

MOUNT PUMP MONOBLOCK TO TANDEM PUMP

Follow these steps when mounting a monoblock to the tandem pump.

- 1. Loosen the rear end cap bolts and front mounting cap bolts to allow slight movement between the P1, center pump, and P2 housings. This aligns the P1 and P2 pressure ports with the monoblock.
- 2. Mount the monoblock using the eight (8) cap screws with hi-collar lock washers and torque the cap screws. NOTE: Make sure the o-rings stay in place.
- 3. Re-torque the bolts on the rear end cap and front mounting cap housings of the pump.
- 4. If either the unloader valve cartridge or the pilot valve cartridge (that screw into the unloader valve cartridge) is removed, it needs to be re-torqued. Re-torque the unloader cartridge to 110 ft. lbs. and the pilot cartridge (not shown) to 15 ft. lbs.



Figure 12.

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 is 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. See "Direct Mount Pump" image.



Figure 13. Direct Mount 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. See "Remote Mount Pump" image.



Figure 14. Remote Mount Pump.

PUMP TYPES (CONTINUED)

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 15. 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 "PTO Pressure Switch" image.

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. See "PTO Pressure Switch" image.

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

C. PTO Pressure Switch Function

Only complete the following check if a PTO pressure switch is installed on the assembly. See "PTO Pressure Switch" image.

- 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 16. 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. See "Transmission Pressure Feed to PTO" image.
 - 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 OFF = 170 230 PSI
 - (b) Pump ON = 220 300 PSI



Figure 17. Transmission Pressure Feed to PTO.

- 2. If pressure is the same pump OFF vs pump 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 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. See "Transmission Pressure Measurement" image.
 - (2) Check to see if the pressure is within the specifications provided above



Figure 18. Transmission Pressure Measurement.

E. Clutch Slippage Test

Applies to the Chelsea 890 PTO only. See "Clutch Slippage Test" image.

- 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**
- 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** (For Odyssey models, deadhead the tailgate lock)
- 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, 10F on a 300F reading is not a concern, however, 10F on a 100F reading is a concern



Figure 19. Clutch Slippage Test.

SECTION 3 LIFT ARM

LIFT SPECIFICATIONS

Valve Pressure Settings	Pressures and Times
Arm Valve Relief	2200 PSI
Loader In/Out Relief	2350 PSI
Release	1100 PSI
Body Valve Relief	2400 PSI
Grabber Pressure Switch	2000 PSI
Cycle Times	
Loader Cycle	8-9 seconds

RAPID RAIL® Lift Arm

LIFT ARM NOMENCLATURE

Refer to the Parts Manual Section 2 for Lift Arm part numbers.



Figure 20. Lift Arm Nomenclature

RAPID RAIL[®]

Lift Arm



Lift Arm



RAPID RAIL[®]

Lift Arm



RAPID RAIL®

Lift Arm



Lift Arm



RAPID RAIL® Lift Arm

LIFT ARM LUBRICATION GUIDE

NOTICE

Clean all fittings before applying grease and always pump enough grease into the joint to remove the old grease. Wipe off excess.



Figure 21. Lift Arm Lubrication Guide

LIFT ARM PREVENTIVE MAINTENANCE CHART

RAPID RAIL [®] LOADER PREVENTIVE MAINTENANCE CHART			
ACTIVITY	INTERVAL	SERVICE/CHECK	
Grease Lift	Twice Weekly (20 hrs)	See the Rapid Rail Lift Lubrication Guide or the Lubrication decal on the lift arm.	
Pin Retaining Bolts-Tighten	Weekly (40 hrs)	Check the Pin Retaining Bolts to ensure they are in place and not broken. This may indicate bearing or pin damage. If you find one that's worn or broken, replace the bearing, pin, and retaining bolt.	
Hydraulic Plumbing	Weekly (40 hrs)	Check hoses, tubes, and fittings for damage, wear, or leaks. Replace as necessary. NOTE: Do not replace steel tubes with hoses. IMPORTANT: Do not replace hoses with different sizes. This will cause inconsistent hydraulic reaction.	
Mounts	Weekly (40 hrs)	Make sure the chassis rail is undamaged. Make sure chassis bolts are present and tight. Check brackets for cracks. Make sure lift bolts are present and secure.	
Lift Mount Base Bolts	Weekly (40 hrs)	Visually inspect the mounting bolts for security and movement. Check the nuts and bolts to make sure the weld is secure.	
Lift Stress or Weld Cracks	Weekly (40 hrs)	Inspect the Rapid Rail lift arm for any structural cracks or cracks in the areas of welds. Cracks must be ground out and repaired. If cracking continues, replace the affected parts.	
Grabber Assembly with Belt	Weekly (40 hrs)	Check for wear, cuts or damage. Replace if any of these conditions are present.	
Tailgate Cable	Weekly (40 hrs)	Inspect cable for fraying or any other visible damage. Replace if any of these conditions are present.	
Cable Carrier Chain	Monthly (200 hrs)	Inspect the cable carrier chain for free movement and ensure there is no binding.	
Arm Cushion Bumper	Monthly (200 hrs)	Inspect the arm cushion bumper and all retaining hardware.	
Latch Mechanism	Monthly (200 hrs)	Inspect the latch mechanism for proper actuation.	
Grabber Open Proximity Switch	Monthly (200 hrs)	To make grabber open proximity switch adjustments you will need a 15/16" wrench. Adjust the proximity switch to deactivate if the grabber is extended outside the width of the vehicle. The grabber open prox should be adjusted so it is activated when the grabbers are fully open.	
Carriage Cam Followers	Monthly (200 hrs)	Inspect the carriage cam followers for excessive wear and damage, and the retaining nuts for tightness: 4" Cam follower (003-4449 x 6 pcs) - DRY torque requirement of 500 FT-LBS. 2" Cam follower (003- 4450 x 12 pcs) - DRY torque requirement of 150 FT- LBS.	

RAPID RAIL® Lift Arm

LIFT ARM CONTROL VALVE

A sectioned control valve for the loader (Shown Below) shows the different functions and relief valves.



Figure 22. Lift Arm Control Valve

RAPID RAIL® Lift Arm

LIFT ARM PROXIMITY SWITCHES

The lift arm has five sourcing proximity switches, four 30mm and one 18mm.

Before adjusting any switch, make sure the unit is in Lock-Out mode. See the Lock-Out/Tag-Out Procedures 14.





RAPID RAIL®

LIFT ARM PROXIMITY SWITCHES (CONTINUED)

A. In-Proximity Switch (N.O.)

This switch is located on the street side of the unit on the backside of the loader carriage. The sensing striker for the switch is welded on the street side of the loader track assembly. This switch is used to stop the In/Out cylinder when the arm is retracting before the cylinder is fully collapsed. It is activated when the gap between the striker and switch is 3/8", and stops the movement of the arm by interrupting power to the In solenoid mounted on the loader valve.

B. Up Proximity Switch (N.O.)

This switch is located on the front street side of the loader carriage assembly. The striker cam for the switch is located on the front street side of the loader carriage mounted on the lift arm pivot pin. This switch is used to limit how far the lift arm raises by interrupting the power to the UP solenoid mounted on the loader valve. This switch is adjusted by setting the correct gap turning the striker cam on the lift arm pivot pin and must be set to activate the switch just before the lift cylinder reaches the end of its UP stroke. Always mark the cam and pin to reference their old position before making any adjustment. If this switch doesn't have the correct gap with the striker cam, the main relief valve could open causing erratic dumping arm motion in the coordinated mode or the container may dump outside the hopper.

C.Un-Dump Proximity Switch (N.O.)

This switch is located on the bottom of the loader dump arm assembly on the curb side of the unit. It is activated by sensing the striker ear on the cab side of the dump cylinder rod eye. The switch is used to stop the retraction of the dump cylinder by interrupting the power circuit to the Un-Dump solenoid, mounted on the loader valve. This switch is adjusted by moving the switch to the correct gap setting so switch is activated when the grippers are parallel to the ground. If the gap between the switch and striker doesn't shut off the un-Dump solenoid, the loader will not travel all the way in during the next cycle in the coordinated mode.

D.Dump Enable Proximity Switch (N.O.)

This switch is located on the rear street side of the loader carriage assembly with the striker cam located on the rear street side of the lift pivot pin. This proximity switch enables the dumping motion of the gripper arm in the coordinated mode by completing the power circuit to the DUMP solenoid mounted on the 4-stack valve. This switch is adjusted by loosening the set screws and turning the striker cam on the lift arm pivot pin and must be set to activate the switch to begin the dump cylinder motion when the loader arm is two-thirds of the way up. Always mark the cam and pin to reference their old position before making any adjustment. If the switch does not make any contact with the striker cam or not working correctly, the loader arm will come in and up, but will not dump in the coordinated mode. If the switch is making contact too early, the container may miss the hopper or it will not rise to the full height above the hopper. If the switch makes contact with the striker too late, it will not begin to dump the container until the arm is fully raised above the hopper.

E. Grabber Open Proximity Switch (N.O.)

This switch is on the Dump arm and is activated by the fully opening of the grabber arms. This switch is used to prevent the lift arm from raising up, with the grabber arms open. This switch will energize the in-cab alarm if the truck movies with the Grabber Arms not fully open.

RAPID RAIL[®] Lift Arm

CARRIAGE ASSEMBLY ROLLER BEARING TORQUE CHECK

There are eighteen (18) bearings in the carriage assembly. If the torque is less than specified, the life of the bearing is much shorter. If the torque is greater than specified, the bearings will freeze and fail prematurely.

NOTICE

It is critical that you routinely check the torque of the following roller bearings on the loader's carriage assembly. The life expectancy of each of these bearings is dependent upon tightening these bearings to the following torque requirements during installation of new bearings AND routinely maintaining these torque requirements. The bearings are the 2" and 4" cam followers (bearings). See Parts Manual for the Part Numbers and locations of these bearings.

NOTICE

Check the torque of these bearings every month or 200 hours.

The 18 bearings in the carriage assembly:

- 003-4449, 4" Cam follower, Quantity 6 DRY torque requirement of 500 ft-lbs; WET torque requirement of 375 ft-lbs
- 003-4450, 2" Cam follower, Quantity 12 DRY torque requirement of 150 ft-lbs; WET torque requirement of 115 ft-lbs

RAPID RAIL[®] Lift Arm

UNIVERSAL BELT AND TRI-CUFF GRABBER ADJUSTMENTS

A. 60-90 Gallon Belt Grabbers

Adjust the grabber belt length so the distance between the roller on the inner arm and the outside roller is 30" (+/- 1"). See illustration below.

NOTICE

The grabber belt holes on the inside end of the belt are farther apart to make longer adjustments. The holes on the outside end of the belt are closer together to make shorter adjustments.

NOTICE

When the grabbers are used with the Python Lift, adjust the outer rollers so that they do not touch each other when the grabbers are completely closed. This distance should be at least 2" apart.



Figure 24. 60-90 Gallon Belt Grabbers

RAPID RAIL®

Lift Arm

UNIVERSAL BELT AND TRI-CUFF GRABBER ADJUSTMENTS (CONTINUED)

B. 90-300 Gallon Belt Grabbers

Adjust the grabber belt length so the distance between the inner arm and the outside roller is approximate 30" (+/- 1") to obtain a firm grip for smaller containers. The total overall length of the grabber belt must be set to obtain a firm grip for larger containers. See illustration below.

NOTICE

Do not adjust the total overall belt length too far as this may cause the grabber belt to touch or wear against the outer arm.

NOTICE

When used with the Python lift the grabbers should be adjusted so the outer rollers do not touch each other when the grabbers are completely closed. This distance should be at least 2" apart.



Figure 25. 90-300 Gallon Belt Grabbers

RAPID RAIL®

Lift Arm

UNIVERSAL BELT AND TRI-CUFF GRABBER ADJUSTMENTS (CONTINUED)

C. 30-110 Gallon Tri-Cuff Belt Grabbers

Adjust the grabber belt length so the distance between the roller on the inner arm and the outside roller is 30" (+/- 1"). See illustration below.

NOTICE

The grabber belt holes on the inside end of the belt are farther apart to make longer adjustments. The holes on the outside end of the belt are closer together to make shorter adjustments.



Figure 26. 30-110 Gallon Tri-Cuff Belt Grabbers

RAPID RAIL® Lift Arm

SECTION 4 BODY AND TAILGATE

NOMENCLATURE





RAPID RAIL[®] Body and Tailgate

SPECIFICATIONS

Hydraulic Oil Tank	40 Gal.
Hydraulic In-Tank Oil Filter	
Hydraulic Oil Tank Suction Strainer	100 Mesh Screen
Hydraulic Pump	Gear or Vane Type
Operate-in-gear - Remote Mount	
Front Mount	
Vane Pump	Lift; 14 GPM @ 750 RPM @ 2200 PSI
	Packer; 27 GPM @ 1500 RPM @ 2200 PSI
EOS Setting	Disengage P1 - @1000 RPM, P2 - @1800 RPM

Valve Pressure Settings:

Loader Main Systems	2200 PSI
Loader In/Out Cross-Port Relief	1100 PSI
Release	1100 PSI
Body Main Relief Valve	2500 PSI
Packer Pressure Switch	2200 PSI
Packing Cycle Controls Elec	ctric over Hydraulic
Cycle Times:	
Packer Cycle (Empty Hopper - @ 14 GPM @ 750 RPM - 180° Sweep	11-14 Seconds

RAPID RAIL[®] Body and Tailgate

PROXIMITY SWITCHES

The BODY-UP 5 WIRE PROXIMITY SWITCH (063-0034) is located on the left body prop up bracket with the striker located on the body above the switch. This switch turns on an alarm when the body is raised off the chassis. See Figure 18

NOTICE

If the Body Up 5 Wire Proximity Switch does not activate the alarm, do not operate the truck. Further troubleshooting is required.

The TAILGATE 5 WIRE UNLATCH PROXIMITY SWITCH (063-0034) is mounted on the tailgate with the striker mounted on the tailgate hinge. It is activated by breaking contact with the striker. When the tailgate latch is released, this switch interrupts an electrical circuit causing an alarm to sound, warning the driver that the tailgate is not fully closed and latched. See Figure 18.

NOTICE

If the Tailgate 5 WIRE Unlatch Proximity Switch does not activate the alarm, do not operate the truck. Further troubleshooting is required.

The TAILGATE 5 WIRE UNLATCH PROXIMITY SWITCH (063-0034) is mounted on the tailgate with the striker mounted on the tailgate latch. It is activated by breaking contact with the striker. When the tailgate latch is released, this switch interrupts an electrical circuit causing an alarm to sound, warning the driver that the tailgate is not fully closed and latched. See Figure 18.

The PACKER REVERSING PROXIMITY SWITCH (063-0109) is nonadjustable and located under the body behind the packer actuator plate. This switch is used to signal when to reverse the direction of the packer paddle in the automatic packing condition. It should adjust to reverse motion of the packer paddle occurs before the left or the right hand packer cylinder completely bottoms out. IF THE SWITCH DOES NOT WORK, THE FULL BODY ALARM WILL SOUND. See Figure 18.



Figure 28. Proximity Switch Locations
RAPID RAIL® Body and Tailgate

BODY/TAILGATE/PACKER VALVE

The Body/Packer Valve is located between the chassis rails and controls the packer panel left and right movements, body raise/lower and tailgate raise/lower functions.



Figure 30. Body/Packer Valve Hydraulic Schematic

RAPID RAIL[®] Body and Tailgate

BODY / TAILGATE / PACKER VALVE TROUBLESHOOTING

NOTICE

If spools are sticking, operation of the manual overrides can free them.

A. Packer Does Not Move

- 1. Operate manual overrides on packer pilot valve.
- 2. If Packer now moves: check for electrical problems such as wiring, solenoid coil, and current from controller or pressure switch failure.
- 3. If Packer does not move: Disconnect the solenoid of the Blocker valve #4. Operate the manual override on Tailgate section.
- 4. If Tailgate moves: replace Solenoid (blocker) Valve #4.
- 5. If Tailgate does not move: Verify the presence of the orifice #14, and make sure it is clear of debris.
- 6. If orifice #14 is in place and clean, check for bad pump or relief valve #5.
- 7. If orifice # is absent, complete valve and manifold assembly will need to be replaced.

B. Packer Operates but Tailgate and/or Body Does Not

- 1. Remove valve #4 and replace with an SAE- 10 plug. Run truck BRIEFLY to operate the tailgate or body raise function. Shut truck down as soon as possible.
- 2. If Tailgate or Body Raise operates: check for wiring, bad coil or bad Solenoid (blocker) Valve #4.
- 3. If Tailgate or Body Raise does not operate: start truck again, run BRIEFLY to operate manual overrides on tailgate or body raise valve. Shut truck down as soon as possible.
- 4. If Tailgate or Body Raise now moves: check for wiring, coil or controller problem.
- 5. If Tailgate does not move: Verify the presence of the orifice #14, and make sure it is clear of debris.
- 6. If orifice # is in place and clean, replace logic valve #3.
- 7. If orifice #14 is absent, install a new orifice.

C.Packer Operates but Has Insufficient Force or Speed

- 1. Install pressure gauge and "bottom out" the Tailgate lower function.
- 2. Main relief #5 should be set for 2500 PSI, adjust as required.
- 3. If 2500 PSI is not obtainable, replace relief valve #5. Then, if not obtainable, replace Pump.
- D.Sweep panel "falls away" while Body is elevated
 - 1. Replace check valve #2.
- E. Packer operates decent, but is slow to start after operation of Tailgate or Body Raise
 - 1. Clean orifice #14.

RAPID RAIL®

Body and Tailgate

BODY / TAILGATE / PACKER VALVE TROUBLESHOOTING (CONTINUED)



Figure 31.

RAPID RAIL[®] Body and Tailgate

BODY PROPS

The factory-supplied body props are located on both sides under the body and forward of the rear wheels. Refer the figure below. Follow these steps to lower the body props.





Figure 32. Factory Body Props

RAPID RAIL[®] Body and 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.

A 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.

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** 14 mode.

B. How to Store the Tailgate Props

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



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Figure 33. Tailgate Support Props

RAPID RAIL[®] Body and Tailgate

WELDING AND ELECTRONIC DEVICES / ELECTRICAL LUBRICANTS

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

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

- Disconnect all battery connections.
- Place welding ground as close as possible to the area that is being repaired.
- Disconnect the Mobile 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.

SECTION 5 MAINTENANCE AND ADJUSTMENT

BODY DAILY CHECKLIST

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

DAILY CHECKLI	ST MAINTENANCE ITEMS
Item	Required Action
Low air pressure in tires	Inflate the tire to the correct air pressure given on the tire.
Worn tire	Replace when the wear is greater than allowed by law or before the tread is no longer visible.
Damaged tire	Replace immediately BEFORE going on route.
Hydraulic pump leaks	Determine the cause of the leak and repair immediately.
Damaged hydraulic pump	Repair or replace IMMEDIATELY.
Loose or missing hardware for the hydraulic pump	Tighten loose hardware. Replace missing hardware immediately.
Damaged decal or decal not readable	Replace decal immediately.
Low level of hydraulic oil	Fill the hydraulic oil tank immediately.
Worn or damaged hoses	Replace immediately.
Leaks at cylinders, hoses or fittings	Tighten loose connection.
Loose or missing hardware	Tighten loose connections. Replace missing hardware.
Worn fiber guards	Replace hoses/fittings as necessary. Install new fiber guard on new hoses.
Worn or damaged tailgate lock components	Replace worn or damaged components.
Loose or missing tailgate lock hardware	Tighten loose hardware. Replace missing hardware.
Damaged tailgate seal	Replace seal.
Body structure, 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.

BODY PREVENTIVE MAINTENANCE CHART

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

BODY PREVENTIVE MAINTENANCE CHART						
*HOURS OF OPERATION						
COMPONENT/SYSTEM	8	40	200	1000	2000	CHECK/SERVICE
Hydraulic System						Check oil level – add if necessary
						Check cylinders, pump, hoses, tubes, fittings, and adapters for leaks. Inspect tailgate cable for damage. Replace if damaged. 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.
Electrical, Battery Cables						Check for proper operation.
						Check battery cables from battery to starter for loose cables, rubbing or damage and abrasions to cables. Replace if necessary.
Operator Controls						
Front Mount Pump or Power Take- Off (PTO)						Check seals for leaks and operation. Replace if necessary
						Check drive line for smooth operation. Replace as necessary.
						Check set screws for tightness. Tighten as necessary.
						Make sure keys are in place. Replace if necessary.
						For greasable PTOs (non-wet spline),

RAPID RAIL[®]

Maintenance and Adjustment

BODY PREVENTIVE MAINTENANCE CHART						
*HOURS OF OPERATION						
COMPONENT/SYSTEM	8	40	200	1000	2000	CHECK/SERVICE
						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.
Grease Fittings						Lubricate as shown on Body Lube Chart (pg.74)
Body Undercoating					A	Inspect body undercoating and repair as necessary.
Tailgate Seal Integrity						
PTO/Transmission Interface Inspection						Check the torque on the PTO mounting screws and tighten to the proper torque specification (pg.73)
* Daily = 8 hrs. Weekly = 40 hrs. Monthly = 200 hrs. 6 Months = 1000 hrs. Yearly = 2000 hrs.						

PTO INSPECTION AND 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

1. ACTIONS

The tools and materials necessary to perform the Inspection/Preventive Maintenance are shown in **Table below**.

ltem	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 screw s
Torque Wrench	Commercially available	To properly tighten PTO mounting screw s
Marker	Commercially available	To make w itness marks on the PTO mounting flange

Table. Tools and Materials

With the unit in LockOut/TagOut mode with the hydraulic pressure relieved, carefully follow the steps below.

- A. PTO/Transmission Interface Inspection/Preventive Maintenance (MONTHLY/200 HOURS OF OPERATION)
- (1) Inspect for transmission fluid leaking from the PTO/transmission interface. Thoroughly clean around this area.
- (2) Using a torque wrench, check the PTO mounting screws. If they are set less than 45 FT-LBS, tighten to 45 FT-LBS.
- (3) Using an oil-resistant marker, add a witness mark on each screw head and across the PTO mounting flange. For future inspections, this will help identify if the PTO mounting screws loosen over time. See Figure below.



Witness Marks on PTO Mounting Screws and Flange

- (4) Take the unit out of Lock-Out/Tag-Out mode and operate unit functions.
- (5) Check for transmission fluid leaks around the PTO/transmission interface. If there are leaks, contact Technical Services.
- (6) When there are no transmission fluid leaks, place the unit back into service.

BODY LUBRICATION GUIDE

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



PACKER/EJECTOR CYLINDERS PREVENTIVE MAINTENANCE

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

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

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 	 Grease Packer/ Ejector cylinder spherical bearings/ pins Inspect packer/ ejector cylinder bearings/pins (both ends) for wear, rust or damage and replace if necessary. 	 Half/Pack[®], DuraPack[®] Python[®] and DuraPack[®] Rapid Rail[®] 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 in Service Manual. Half/Pack[®] (Featuring Odyssey[®] Controls) Perform the operational Checks and Inspections found in the Operation Manual. If unit recalibration is required, refer to Half/Pack[®] (Featuring Odyssey[®] Controls) Cylinder Sensors Calibration in Service Manual.
necessary.		

Side Loading and Premature Cylinder Failure can be caused by:

- Inadequate greasing intervals.
 - o causing increased friction at spherical bearings
 - o potentially resulting in seizing of spherical bearings
- Packing into the second stage of a multistage cylinder.
- Binding of components caused by debris

COLD WEATHER WARM-UP PROCEDURE

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

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 for operation instructions.
- 6. Make sure the oil temperature on the site gauge is between 120° and 160°F. If not, repeat step 5.
- 7. Check for fluid leaks. Repair if necessary.
- 8. The unit is now ready to go on route.

PREPARING THE UNIT TO CHECK THE OIL LEVEL

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

- Truck on level ground
- Body fully down
- Tailgate fully up
- Packer Panel in the in-transit position with all cylinders retracted
- Lift Arm (if equipped) is fully retracted

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





Figure 34. Hydraulic Oil Tank and Sight Gauge

CHECK OIL LEVEL

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

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

WHEN TO CHANGE OIL FILTER ELEMENT

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

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

CHANGE HYDRAULIC OIL FILTER ELEMENT

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

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

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



Figure 35. Hydraulic Oil Filter

DRAIN AND 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.

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.

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

NOTICE

If your employer or company has 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, use the procedure that follows.

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

- 1. Perform the **Lock Out/Tag Out procedures** 14. If you have any questions about the Lock-Out/Tag-Out procedure, please contact your supervisor or **ESG 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.
- 8. Remove the outlet flange and 100 mesh suction strainer to gain access to the tank inside.
- 9. Remove sediment from the tank bottom.
- 10. Install the outlet flange with a new gasket and the 100 mesh suction strainer into the tank.
- 11. Install the drain plug in the tank bottom.
- 12. Reconnect and tighten all hose connections that were disconnected.

DRAIN AND CLEAN THE HYDRAULIC OIL TANK (CONTINUED)

NOTICE

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

- 13. Fill tank with recommended oil, checking the sight gauge as you fill. Refer to Hydraulic Oil Specifications 16.
- 14. Check the entire system to make sure all connections are tight and no leaks are found.

15. Start the truck's engine and engage the pump.

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

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

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
- 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.
- Half/Pack Only Remove both ends of the packing circuit's dump valve return line routed between the dump valve and hydraulic reservoir. Thoroughly clean the entire length of the return line between the dump valve and the hydraulic reservoir.
- 10. 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.

Maintenance and Adjustment

PURGE THE HYDRAULIC SYSTEM (CONTINUED)

- 11. Fill the hydraulic reservoir with clean hydraulic oil
- 12. 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.
- 13. Double-check the routing of all lines and verify that all fittings, flanges, and covers are properly installed and tight.
- 14. Start the vehicle and turn the pump on.
- 15. 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.
- 16. 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.
- 17. Operate each hydraulic function through a complete cycle at least ten times at engine idle.
- 18. 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.
- 19. 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.
- 20. Install a new OEM in-tank hydraulic filter and reinstall the filter cover.
- 21. Check the hydraulic system for leaks.
- 22. Run the unit for 40 hours and recheck the hydraulic filter and system magnets for debris. Service the hydraulic filter and magnets as needed.

NOTICE

Extra magnets may be placed inside the hydraulic reservoir to accelerate the removal of metal particles.

PRESSURE ADJUSTMENT SETTINGS

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. Place wheel chocks on both sides of driver side rear wheel.
- 3. Make sure parking brake is set.
- 4. Notify anyone in area that the arms and forks will be operated during this procedure.
- 5. Make sure unit is full of hydraulic oil.
- 6. Make sure hydraulic oil is at least 120 degrees F before beginning any pressure checks or adjustments.
 - 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.

NOTICE

The unit must remain in neutral during all pressure setting procedures. Make sure that the work area is clear of uninvolved people and that the parking brake is fully applied and wheels fully chocked.

B. Required Tools

These are the tools required to make pressure adjustments.

QUANTITY	TOOL
1	1/8" open end wrench
1	Ratchet with screwdriver attachment
1	0-5000 PSI hydraulic pressure gauge

C.Valve Locations

The hydraulic body control valve is located behind the lift arm under the front of the hopper as shown in Figure 26.

PRESSURE ADJUSTMENT SETTINGS (CONTINUED)



Figure 36. Body Valve

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Maintenance and Adjustment

PRESSURE ADJUSTMENT SETTINGS (CONTINUED)

D.Pressures

HYDRAULIC PRESSURES						
LOADER MAIN RELIEF	RELEASE RELIEF	IN RELIEF	BODY MAIN RELIEF	GRABBER PRESS. SWITCH	PACKER PRESS. SWITCH	
2200	1100	2350	2400	2000	2200	

Notes:

- 1. Main Pressure settings have a tolerance range of +/- 50 p.s.i. and are to be set at operating speed.
- 2. Port Relief Pressure settings have a tolerance range of +/- 100 p.s.i. and are to be set at operating speed.
- 3. Options include: Commercial Gripper

E. Function Cycle Times

FUNCTION CYCLE TIMES			
LIFT CYCLE TIME	PACKER CYCLE TIME @ 16 GPM 180 deg sweep		
8 - 9 sec	11 -14 sec		

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

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.

OIL LUBRICANT RECOMMENDATION

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

GREASE LUBRICANT RECOMMENDATION

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

Use grade NLG1000 grease or equivalent.

TAILGATE LUBRICATION

See Grease Lubrication Recommendation and Body Lubrication Guidein this section.

INSPECT PROXIMITY SWITCHES

See **Proximity Switch Troubleshooting** ²⁶ for recommended procedures for inspecting proximity switches.

CLEAN AND 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.

SECTION 6 BODY CONTROLLER HARDWARE

RAPID RAIL[®] Body Controller Hardware

MOBILE CONTROLLER 98 I/O ASSEMBLY

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

Note: the STA and STB are keyed specifically and not interchangeable.



Figure 37. Heil Mobile Controller Connections



Figure 38. Heil Mobile Controller Side View

RAPID RAIL[®] Body Controller Hardware

MOBILE CONTROLLER PIN NUMBER DIAGRAM

Refer to the figure below for the Heil Mobile Controller female pin locations.



Figure 39. Female Pin Positions.

MOBILE CONTROLLER 81-PIN CABLE ASSEMBLY

Refer to the following steps for assembly and connecting the Mobile Controller Cable.

A Cable Parts Identification

Refer to the figures below to identify the 81-Pin Cable Connector parts.



Figure 40.

Figure 41.

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Body Controller Hardware

MOBILE CONTROLLER 81-PIN CABLE ASSEMBLY (CONTINUED)

B. Male and Female Controller Connector Close-Up View

See figure below to identify the female cable and male controller connection points.



Figure 42. Cable to Controller Connection Points.

Body Controller Hardware

MOBILE CONTROLLER 81-PIN CABLE ASSEMBLY (CONTINUED)

C. Connecting the 81-Pin Cable Connector

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



Figure 43.

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



Figure 44.



Figure 45.



Figure 46.

- 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.

RAPID RAIL[®] Body Controller Hardware

INSIGHT[™] STANDARD DIAGNOSTIC DISPLAY

See the figures below for front and rear photos and rear illustration. Contact Heil for re-programming of the display.



Figure 47. Insight Display Front Photo



Figure 48. Insight Display Rear Photo



Figure 49. Insight Display Rear Illustration

- (1) M12 connector
- (2) M52 thread for fixing nut
- (3) Locating pins

RAPID RAIL[®] Body Controller Hardware

INSIGHT™ STANDARD DIAGNOSTIC DISPLAY CABLE

See the figure below for a rear view of the display with cable connected.



Figure 50. Rear View of Display with Cable Connected

MOBILE CONTROLLER PROGRAMMING

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

SECTION 7 BODY CONTROLLER SOFTWARE

RAPID RAIL[®] Body Controller Software

RAPID RAIL® MOBILE CONTROLLER PROGRAM 109-0357

INPUTS

The Mobile Controller Inputs are activated by a positive +12 volt signal. All Switches, Proximity, Pressure, Toggle, Push buttons, etc., used as input devices to the Controller, supply a +12 volt signal to an Mobile Controller input to turn the Input ON unless otherwise specified.

With an Input ON, the corresponding Input field (with Description and Address) shown on the INSIGHT display will also be ON.

Refer section Insight Display Functionality for more details about Diagnostic display options and INSIGHT display tool.

OUTPUTS

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

With an Output ON, the corresponding Output field (with Description and Address) shown on the INSIGHT display will also be ON.

Refer section Insight Display Functionality for more details about Diagnostic display options and INSIGHT display tool.

COMMUNICATION PORTS

There are 2-CAN Ethernet communication ports in each 98 I/O Mobile Controllers which will be utilized for the programming and communication purpose.

DIAGNOSTIC DISPLAY

Refer section Insight Display Functionality for more details about Diagnostic display options and INSIGHT display tool.
Body Controller Software

CONTROLLER CONNECTOR PIN DETAILS

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

	RAPID RAIL	RAPID RAIL	CONNECTOR PIN-OUT DETAILS
	IN-CAB INPUT FUNCTIONS		
A01	CHASSIS SERVICE BRAKE SIGNAL	IN0501	ST A-41
A02	TRANSMISSION TEMP. SIGNAL SWITCH	IN1200	ST B-10
A03	SYSTEM POWER SWITCH	IN1103	ST B-08
A04	CHASSIS NEUTRAL SIGNAL	IN0400	ST A-46
A05	CHASSIS TACH. SIGNAL	IN0500	ST A-40
A06	PACKER RIGHT ROCKER SWITCH	IN0702	ST A-61
A07	PACKER LEFT ROCKER SWITCH	IN0502	ST A-42
A08	MANUAL PACK MODE SELECTOR SWITCH	IN0301	ST A-45
A09	LIFT COORDINATED MODE ROCKER SWITCH	IN0001	ST A-46
A10	LOADER GRIP ROCKER SWITCH	IN1100	ST B-06
A11	LOADER RELEASE ROCKER SWITCH	IN0401	ST A-47
A12	LOADER UN DUMP ROCKER SWITCH	IN0000	ST A-25
A13	LOADER IN ROCKER SWITCH	IN1302	ST B-27
A14	LOADER OUT ROCKER SWITCH	IN0300	ST A-44
A15	LOADER UP ROCKER SWITCH	IN0603	ST A-58
A16	LOADER DOWN ROCKER SWITCH	IN1301	ST B-28
A17	LOADER DUMP ROCKER SWITCH	IN1303	ST B-09
	IN-CAB OUTPUT FUNCTIONS		
B01	FILTER BYPASS INDICATOR	OUT0305	ST B-21
B02	IN-CAB ALARM	OUT0301	ST B-17
B03	HYDRAULIC PUMP, LOADER (PUMP#P1)	OUT0103	ST A-09
B04	HYDRAULIC PUMP, BODY/PACKER (PUMP#P2)	OUT0006	ST A-22
B05	PACKER LEFT INDICATOR	OUT0003	ST A-19
B06	PACKER RIGHT INDICATOR	OUT0106	ST A-12
B07	BODY/TAILGATE INDICATOR	OUT0306	ST B-22
B08	PACKER PRESSURE SWITCH INDICATOR	OUT0001	ST A-17
B09	WHELEN STROBE INDICATOR	OUT0001	ST A-17
B10	IN-CAB CHIME	OUT0101	ST A-07
B11	TRANSMISSION TEMPERATURE INDICATOR	OUT0307	ST B-23
	BODY INPUT FUNCTIONS		
C01	BODY/TAILGATE RAISED ALARM	IN0901	ST A-39
C02	LOADER IN PROXIMITY SWITCH	IN0800	ST A-36
C03	LOADER DUMP PROXIMITY SWITCH	IN0701	ST A-58
C04	PACKER PRESSURE SWITCH	IN0602	ST A-57
C05	CHASSIS REVERSE SIGNAL	IN1203	ST B-13
C06	PACKER PROXIMITY SWITCH	IN1101	ST B-07

	RAPID RAIL	RAPID RAIL	CONNECTOR PIN-OUT DETAILS
C07	FILTER PRESSURE SWITCH	IN0801	ST A-37
C08	LOADER UN DUMP PROXIMITY SWITCH	IN1201	ST B-11
C09	LOADER UP PROXIMITY SWITCH	IN0003	ST A-28
C10	GRIPPER FULL OPEN PROXIMITY SWITCH	IN1301	ST B-26
C11	COORDINATED IN PROXIMITY SWITCH (Starr Only)	IN0002	ST A-27
C12	STARR (Only) JUMPER INPUT	IN0600	ST A-55
C13	GRABBER CLOSED PRESSURE SWITCH	IN0900	ST A-38
	BODY OUTPUT FUNCTIONS		
D01	GRIPPER CLOSE OUTPUT	OUT0100	ST A-06
D02	LOADER RELEASE OUTPUT	OUT0004	ST A-20
D03	LOADER IN OUTPUT	OUT0304	ST B-20
D04	LOADER OUT OUTPUT	OUT0002	ST A-18
D05	LOADER UP OUTPUT	OUT0302	ST B-18
D06	LOADER DOWN OUTPUT	OUT0300	ST B-16
D07	LOADER DUMP OUTPUT	OUT0102	ST A-08
D08	LOADER UN DUMP OUTPUT	OUT0000	ST A-16
D09	PACKER RIGHT SOLENOID	OUT0303	ST B-19
D10	PACKER LEFT SOLENOID	OUT0105	ST A-11
D11	LOADER LATCH SOLENOID	OUT0108	ST A-14
D12	REVERSE FLOOD LIGHTS	OUT0104	ST A-10
	OPTION IN-CAB INPUT FUNCTIONS		
E01	AUTO-NEUTRAL (FORCE TO NEUTRAL) ENABLE SWITCH	IN0503	ST A-43
E02	FINESSE VALVE (NOT USED. FUTURE EXPANSION)	IN1300	ST B-25
E03	OPERATE IN NEUTRAL FLAG	IN1202	ST B-12
E04	TURN SIGNAL	IN0700	ST A-59
OPTION IN-CAB OUTPUT FUNCTIONS			
F1	ALLISON WIRES 142/117	OUT0107	ST A-13
F2	ALLISON WIRE 162	OUT0005	ST A-21
	OPTION BODY INPUT FUNCTIONS		
G01	LOW ENGINE TORQUE PRESSURE SWITCH	IN0601	ST A-56
G02	FIFTH WHEEL PROXIMITY SWITCH (Starr Only)	IN0703	ST A-62

J1939 DETAILS

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

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

DEFAULT PARAMETERS

Program 109-0357 Parameter Defaults

SI. No.	Parameter	Default Setting
А	Start Filter Warning	5 Hours
В	Start Filter Shutdown	6 Hours
Pump Speed	Details (O.I.G.A.I)	
С	Max Engage Speed (Pump 1, Loader)	850 RPM
D	Max Operating Speed (Pump 1)	900 RPM
E	Max Engage Speed (Pump 2, Body)	1700 RPM
F	Max Operating Speed (Pump 2)	1800 RPM

Note: When utilizing the optional Operate-In-Neutral pump (O.I.N.), the default pump settings will change automatically to the following (Refer E03).

Pump Speed Details (O.I.N.)

SI. No.	Parameter	Default Setting
А	Max Engage Speed (Pump 1, Loader)	1000 RPM
В	Max Operating Speed (Pump 1)	1800 RPM
С	Max Engage Speed (Pump 2, Body)	1000 RPM
D	Max Operating Speed (Pump 2)	1800 RPM

I/O FUNCTIONS

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

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

STANDARD IN-CAB INPUT FUNCTIONS

A01 Input Function - Chassis Service Brake (In Cab Input IN0501)

This circuit monitors the ON/OFF status of the Chassis Service Brake. This input will be ON when the Service brakes are applied.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Chassis Service Brake	Activated	IN0501	ON

A02 Input Function - Transmission Temp Signal Switch (In Cab Input IN1200)

This circuit uses two methods to monitor the transmission fluid temperature. The first method uses a temperature switch with a 300°F set point. This switch is plumbed into the converter out transmission fluid line. The second method uses a relay to monitor the transmission temperature warning indicator output from the Allison ECU. This ECU output normally turns ON when the transmission sump fluid temperature reaches 250°F.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Input Device	Status	I/O	Status
Transmission Temp. Switch	Activated	IN1200	ON

A03 Input Function - System Power Switch (In Cab Input IN1102)

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.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Function Logic:

Input Device	Status	I/O	Status
System Power Switch	Activated	IN1102	ON

A04 Input Function - Chassis Neutral Signal (In Cab Input IN0400)

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

Function Logic:

Input Device	Status	I/O	Status
Chassis Transmission	In Neutral	IN0400	ON

A05 Input Function - Chassis Tach. Signal (In Cab Input IN0500)

This circuit monitors the signal generated by the alternator "R" Stator. This signal is typically a -1.4V to +15V square wave, of which the frequency varies relative to engine speed. This signal should register no less than 6.9VDC. The Mobile Controller uses the Engine Idle, "Tach Hz/2 at Engine Idle" and "Tach. Hz/2" parameters to form a proportional equation of which the result is engine RPM. This equation is executed every $\frac{1}{2}$ second. The pulse may be too fast to see on the Mobile Controller.

Condition	Modifiable Parameters	Default Setting
A	Engine Idle	1000

Input Device	Status	I/O	Status
"R" Stator Pulse	High (>6.5V)	IN0500	ON
"R" Stator Pulse	Low (<2.5V)	IN0500	OFF

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A06 Input Function - Packer Right Rocker Switch (In Cab Input IN0702)

This circuit monitors the ON/OFF status of the Packer Right Rocker Switch. This Switch is used to activate the Packer Right input.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Packer Right Rocker Switch	Activated	IN0702	ON

A07 Input Function - Packer Left Rocker Switch (In Cab Input IN0502)

This circuit monitors the ON/OFF status of the Packer Left Rocker Switch. This Switch is used to activate the Packer Left input.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Packer Left Rocker Switch	Activated	IN0502	ON

A08 Input Function - Manual Pack Mode Selector Switch(In Cab Input IN0301)

This circuit monitors the ON/OFF status of the Manual Pack Mode Rocker switch. This switch places the Packer in manual mode when the input is ON.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Input Device	Status	I/O	Status
Manual Pack Mode Rocker Switch	Activated	IN0301	ON

Body Controller Software

A09 Input Function - Lift Coordinated Mode Rocker Swtich (In Cab Input IN0001)

This circuit monitors the ON/OFF status of the Lift Coordinated Mode Rocker switch. This switch places the Lift controls in Coordinated mode when the input is ON.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Lift Coordinated Mode Rocker switch	Activated	IN0001	ON

A10 Input Function - Loader Grip Rocker Switch (In Cab Input IN1100)

This circuit monitors the ON/OFF status of the Loader Grip Rocker Switch. This switch is used to activate the Loader Arm Grip input.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Loader Grip Rocker Switch	Activated	IN1100	ON

A11 Input Function - Loader Release Rocker Switch (In Cab Input IN0401)

This circuit monitors the ON/OFF status of the Loader Release Rocker Switch. This switch is used to activate the Loader Arm Release input.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Input Device	Status	I/O	Status
Loader Release Rocker Switch	Activated	IN0401	ON

Body Controller Software

A12 Input Function - Loader Undump Rocker Switch (In Cab Input IN0000)

This circuit monitors the ON/OFF status of the Loader Undump Rocker Switch. This switch is used activate the Loader Undump input.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Loader Undump Rocker Switch	Activated	IN0000	ON

A13 Input Function - Loader In Rocker Switch (In Cab Input IN1302)

This circuit monitors the ON/OFF status of the Loader In Rocker Switch. This switch is used to activate the Loader In input (i.e. used to bring the Loader into stowed position).

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Loader In Rocker Switch	Activated	IN1302	ON

A14 Input Function - Loader Out Rocker Switch (In Cab Input IN0300)

This circuit monitors the ON/OFF status of the Loader Out Rocker Switch. This switch is used to activate the Loader Out input (i.e. used to extend the Loader Arm).

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Loader Out Rocker Switch	Activated	IN0300	ON

Body Controller Softw are

Body Controller Software

A15 Input Function - Loader Up Rocker Switch (In Cab Input IN0603)

This circuit monitors the ON/OFF status of the Loader Up Rocker Switch. This input is used to activate the Loader Up input.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Loader Up Rocker Switch	Activated	IN0603	ON

A16 Input Function - Loader Down Rocker Switch (In Cab Input IN1303)

This circuit monitors the ON/OFF status of the Loader Down Rocker Switch. This input is used to activate the Loader Down input.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Loader Down Rocker Switch	Activated	IN1303	ON

A17 Input Function - Loader Dump Rocker Switch (In Cab Input IN1103)

This circuit monitors the ON/OFF status of the Loader Dump Rocker Switch. This switch is used to activate the Loader Dump input.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Input Device	Status	I/O	Status
Loader Dump Rocker Switch	Activated	IN1103	ON

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STANDARD IN-CAB OUTPUT FUNCTIONS

B01 Output Function - Filter Bypass Indicator (In Cab Output OUT0305)

This function controls the filter bypass indicator. When activated, it shows that the filter was bypassed in the last 15 minutes. The light turns ON for 1 second every hour during the first 5 hours of bypass. (For example, in the first hour, it flashes for 1 second, then pauses for 11 seconds. In the second hour, it flashes for 2 seconds, pauses for 10 seconds, etc.) Once 5 hours of bypass is reached, the indicator will become continuous.

This sequence continues until the sixth hour, when the light turns ON continuously, and Fault #32 is set. The pump then shuts OFF. Once the time reaches "Start Filter Shutdown," the hydraulic pump disengages, and the indicator flashes. Under these conditions, the pump operates only in three-minute intervals. Resetting the system power switch will restart the interval. The pump remains in this fault mode until the hydraulic filter is serviced. After changing the filter, the light stays on until the pump runs for thirty minutes with a clean filter.

Condition	Modifiable Parameters	Default Setting
А	Start Filter Warning	5 Hours
В	Start Filter Shutdown Warning	6 Hours

Conditions necessary to activate the circuit

Condition	Function or Component	Status	I/O	Status
٨	System Power Switch	Activated	OUT0305	ON
А	and Filter Pressure Switch	Deactivated	IN0801	OFF
В	Hydraulic Pump – Loader – P1	Activated	IN0003	ON
С	Filter Bypass Indicator	Activated	OUT0305	ON

Note: With condition (A AND B) true will activate the Filter Bypass Indicator output. These conditions indicate that the filter is in bypass. Each time this condition occurs the indicator will continue the flash sequence for 15 minutes after bypass conditions have subsided. Under cold weather conditions, the hydraulic filter may go into bypass when low oil temperatures create a high oil viscosity. This will subside when the hydraulic system reaches operating temperature.

B02 Output Function - In-Cab Alarm (In Cab Output OUT0301)

This output function controls the cab alarm circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions necessary to activate the circuit

Condition	Function or Component	Status	I/O	Status
А	Critical Fault	Activated	N/A	ON
В	or System Fault	Activated	N/A	ON
С	or Body/Tailgate Alarm	Activated	IN0901	ON
D	Packer Pressure Switch Indicator	Activated	OUT0101	ON
E	In-Cab Alarm	Activated	OUT0301	ON

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

B03 Output Function - Hydraulic Pump, Loader – P1 (In Cab Output OUT0103)

This output function controls the Hydraulic Pump for the Loader-P1. Circuit will engage the pump upon activation of the chassis Service Brake or transmission Neutral signal or upon pressing the Grabber Open push button.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	System Power Switch	Activated	IN1102	ON
В	Chassis Service Brake	Activated	IN0501	ON (momentary)
С	or Chassis Neutral	Activated	IN0400	ON
D	or Loader Release Rocker Switch	Activated	IN0401	ON (momentary)
E	Hydraulic Pump – Loader – P1	Activated	OUT0103	ON

Note: With condition A true, condition (B OR C OR D) will operate pump (E) within the RPM range indicated. Refer section 3.01 for additional information on the default pump settings.

B04 Output Function - Hydraulic Pump, Body/Packer – P2 (In Cab Output OUT0006)

This output function controls the hydraulic pump for the body functions. Circuit will engage when the engine speed is in the range indicated.

Condition	Modifiable Parameters	Default Setting
Α	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	System Power Switch	Activated	OUT0303	ON
В	Low Engine Torque PSW (Optional)	Deactivated	IN0601	OFF
С	Hydraulic Pump – Packer – P2	Activated	OUT0006	ON

Note: With conditions (A AND B) true the pump (C) will operate within the RPM range indicated. Refer section 3.01 for additional information on the default pump settings.

B05 Output Function - Packer Left Indicator (In Cab Output OUT0003)

This output function controls the indicator lamp for the Pack Left function.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
A	Pack Left Solenoid	Activated	IN0801	ON
В	Pack Left Indicator	Activated	IN0500	ON

Note: With condition (A) true, the Pack Left Indicator (B) will activate.

B06 Output Function - Packer Right Indicator (In Cab Output OUT0106)

This output function controls the indicator lamp for the Pack Right function.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	Pack Right Solenoid	Activated	OUT0303	ON
В	Pack Right Indicator	Activated	OUT0106	ON

Note: With condition (A) true, the Pack Right Indicator (B) will activate.

B07 Output Function - Body/Tailgate Indicator (In Cab Output OUT0306)

This output function controls the Body/Tailgate Indicator circuit.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	Body/Tailgate Alarm	Activated	IN0901	ON
В	Chassis Neutral	Deactivated	IN0400	OFF
	Chassis Service Brake	Deactivated	IN0501	OFF
	Loader In Proximity Switch	Deactivated	IN0800	OFF
С	Loader In Proximity Switch	Deactivated	IN0800	OFF
	Gripper Full Open Proximity Switch	Deactivated	IN1301	OFF

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Condition	Function or Component	Status	I/O	Status
D	Body/Tailgate Indicator	Activated	OUT0306	ON

Note: With condition (A OR B OR C) true, the Body/Tailgate Indicator (D) will activate.

B08 Output Function - Packer Pressure Switch Indicator (In Cab Output OUT0001)

This output function controls the Packer Pressure Switch indicator.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
A	Packer Pressure Switch	Activated	IN0602	ON

Note: With Condition 'A' true , will activate the Packer Pressure Switch indicator output.

B09 Output Function - Whelen Strobe Indicator (In Cab Output OUT0001)

This output function controls the Whelen Strobe indicator.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	Turn Signal	Deactivated	IN0700	OFF
В	and Hydraulic Pump – Loader – P1	Activated	OUT0103	ON
С	or Hydraulic Pump – Body – P2	Activated	OUT0006	ON
D	or Chassis Reverse Signal	Activated	IN1203	ON

Note: With (B OR C OR D) true, condition 'A' will activate the Whelen Strobe indicator output.

B10 Output Function - In-Cab Chime (In Cab Output OUT0101)

This output function controls In-Cab Chime.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	Body/Tailgate Alarm	Activated	IN0901	ON
В	Loader In Proximity	Deactivated	IN0800	OFF

Condition	Function or Component	Status	I/O	Status
С	or Gripper Fully Open Prox.	Deactivated	IN1301	OFF
D	Chassis Neutral	Deactivated	IN0400	OFF
E	Chassis Service Brake	Deactivated	IN0501	OFF
F	In-Cab Chime	Activated	OUT0101	ON

Note: With condition (A) true or conditions (B or C and D and E) true, the In-Cab Chime circuit (F) will activate.

B11 Output Function - Transmission Temperature Indicator(In Cab Output OUT0307)

This output function controls the Transmission Indicator light.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	Trans Temp Switch	Deactivated	IN1200	OFF
В	Trans Temp Indicator	Activated	OUT0307	ON

Note: With condition (A) true, the indicator (B) will flash, once per second, when Fault #31 is set. This indicates the transmission fluid temperature has exceeded a safe operating range.

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C01 Input Function - Body/Tailgate Raised Alarm Proximity Switch (Body Input IN1901)

This circuit monitors the ON/OFF status of the Body/Tailgate Raised proximity switch. This input is ON when the Body / Tailgate is in Raised position.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Body/Tailgate Alarm	Activated	IN1901	ON

C02 Input Function - Loader In Proximity Switch (Body Input IN0800)

This circuit monitors the ON/OFF status of the Loader In proximity switch. This input is ON when the Loader Arm is in the stowed position.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Loader In Proximity Switch	Activated	IN0800	ON

C03 Input Function - Loader Dump Proximity Switch (Body Input IN0701)

This circuit monitors the ON/OFF status of the Loader Dump Proximity Switch. This input is ON when the Loader Arm is raised to the Dump position.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Input Device	Status	I/O	Status
Loader Dump Proximity Switch	Activated	IN0701	ON

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C04 Input Function - Packer Pressure Switch (Body Input IN0602)

This circuit monitors the ON/OFF status of the Packer Pressure Switch. This input is used reverse the Packer automatically when the Body packs out.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Packer Pressure Switch	Activated	IN0602	ON

C05 Input Function - Chassis Reverse Signal (Body Input IN1203)

This circuit monitors the ON/OFF status of the Chassis Reverse signal. This input is ON when the Engine transmission is put into Reverse. This input, when turned ON, will enable the Reverse flood lights and Whelen Strobe lights.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Chassis Reverse Signal	Activated	IN1203	ON

C06 Input Function - Packer Proximity Switch (Body Input IN1101)

This circuit monitors the ON/OFF status of the Packer proximity switch. This input is used for Packer operation.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Input Device	Status	I/O	Status
Packer Proximity Switch	Activated	IN1101	ON

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C07 Input Function - Filter Pressure Switch (Body Input IN0801)

This circuit monitors the ON/OFF status of the filter pressure switch. The input is OFF when the Filter is in Bypass.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Filter Pressure Switch	Activated	IN0801	ON

C08 Input Function - Loader Undump Proximity Switch (Body Input IN1201)

This circuit monitors the ON/OFF status of the Loader Undump proximity switch. This input is ON when the Grabber beam is in the Undump position.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Loader Undump Prox. Switch	Activated	IN1201	ON

C09 Input Function - Loader Up Proximity Switch (Body Input IN0003)

This circuit monitors the ON/OFF status of the Loader Up proximity switch. This input is ON when the Loader Arm is in the Raised position.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Input Device	Status	I/O	Status
Loader Up Prox. Switch	Activated	IN0003	ON

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C10 Input Function - Gripper Fully Open Proximity Switch (Body Input IN1301)

This circuit monitors the ON/OFF status of the Gripper Fully Open proximity switch. This input is ON when the Grabber is fully Open (i.e. Release the Can).

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Gripper Fully Open Prox. Switch	Activated	IN1301	ON

C11 Input Function - Coordinated In Proximity Switch (Body Input IN0002)

This circuit monitors the ON/OFF status of the Coordinated In proximity switch. For STARR units only.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Coordinated In Proximity Switch	Activated	IN0002	ON

C12 Input Function - (Body Input IN0600)

This circuit monitors the ON/OFF status of the STARR jumper input. This input is a jumper located near the ln proximity switch that allows the program to automatically determine that this is a STARR unit instead of a standard Rapid Rail.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O	Status
STARR Jumper input	Activated	IN0600	ON

C13 Input Function - Grabber Closed Pressure Switch (Body Input IN0900)

This circuit monitors the ON/OFF status of the Grabber Closed pressure switch. This input is ON when the pressure in the Grabber cylinder reaches the set point.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Input Device	Status	I/O	Status
Grabber Closed Pressure Switch	Activated	IN0900	ON

D01 Output Function - Gripper Close Output (Body Output OUT0100)

This output function controls the Gripper Close Output.

Condition	Modifiable Parameters	Default Setting
A	Gripper Close Time	1.2 sec. (See Note)

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	System Power Switch	Activated	IN1102	ON
В	Lift Coordinated Mode Rocker Sw.	Activated	IN0001	(See Note)
С	Loader Grip Rocker Switch	Activated	IN1100	ON
D	Loader Release Rocker Switch	Deactivated	IN0401	OFF
E	Hydraulic Pump – Loader – P1	Activated	OUT0103	ON
F	Finesse Valve Input (option)	Activated	IN1300	(See Note)
G	Operate-In-Neutral (option)	Activated	IN1202	ON
Н	Gripper Close Output	Activated	OUT0100	ON

Note: If condition (A) is true and (B) is OFF, conditions (C, D, and E) activate the Gripper Close Output (H). If (A) is true and (B) is ON, (C and E) activate (H) for 1.2 seconds, then raise the loader to dump if (F) is OFF. If the grabbers close in stages, the time before raising is reduced. Regardless of how many times the grabbers close before gripping the container, 0.7 seconds is always available to grab before the arm raises. The close timer resets to 1.2 seconds upon undumping or lowering the arm. If (A) is true, (B) is ON, and (F) is ON, the Gripper Close Rocker Switch (C) will control the output, and the lift will NOT rise automatically. If (G) is ON, the 1.2-second timer extends to 2.4 seconds if engine speed is below 900 RPM, but stays at 1.2 seconds if above due to a smaller pump. The timer does not count while the arm moves out, allowing simultaneous grabbing and extending without reducing close time.

D02 Output Function - Loader Release Output (Body Output OUT0004)

This output function controls the Loader Release Output.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	System Power Switch	Activated	IN1102	ON
В	Lift Coordinated Mode Rocker Sw.	Activated	IN0001	(See Note)
С	Loader Release Rocker Switch	Activated	IN0401	ON
D	Loader Grip Rocker Switch	Deactivated	IN1100	OFF
E	Loader Dump Proximity Sw.	Deactivated	IN0701	OFF
F	Hydraulic Pump – Loader – P1	Activated	OUT0103	ON
G	Loader Release Output	Activated	OUT0004	ON

Note: With condition (A) true and condition (B) OFF, conditions (C, D, E, and F) will activate the Loader Release output

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(G). With condition (A) true and condition (B) ON, conditions (C, E, and F) will activate the Loader Release output (G) for 0.5 seconds and as long as condition (C) is true.

D03 Output Function - Loader In Output (Body Output OUT0304)

This output function controls the Loader In output.

Condition	Modifiable Parameters	Default Setting
А	Gripper Close Time	1.2 sec. (See Note for D01)
В	Loader Release Time	0.5 Sec.

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	System Power Switch	Activated	IN1102	ON
В	Lift Coordinated Mode Rocker Sw.	Activated	IN0001	(See Note)
С	Loader In Rocker Switch	Activated	IN1302	ON
D	Loader In Proximity Switch	Deactivated	IN0800	OFF
E	Loader Grip Rocker Switch	Activated	IN11000	ON
F	Loader Release Rocker Switch	Activated	IN0401	ON
G	STARR (Only) Jumper Input	Activated	IN0600	(See Note)
н	Coordinated In Proximity Switch (Starr Only)	Activated	IN0002	ON (STARR ONLY)
I	Finesse Valve Input (option)	Activated	IN1300	(See Note)
J	Loader In Output	Activated	IN1202	ON

Note: With condition (A) true and condition (B) OFF, condition (C) will activate the Loader In output while condition (D) is met. With condition (A) true and condition (B) ON, condition (C) will activate the output or condition (E) ON and condition (I) OFF will activate the output after 1.2 seconds (see note for D01) or condition (F) will activate the output after 0.5 seconds until the following occurs: If condition (G) is OFF, condition (D) will deactivate the output. If condition (G) is ON, condition (H) will deactivate the output.

D04 Output Function - Loader Out Output (Body Output OUT0002)

This output function controls the Loader Out output.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	System Power Switch	Activated	IN1102	ON
В	Lift Coordinated Mode Rocker Sw.	Activated	IN0001	(See Note)
С	Loader Out Rocker Switch	Activated	IN0300	ON
D	Hydraulic Pump – Loader – P1	Activated	OUT0103	ON
E	Loader Out Output	Activated	OUT0002	ON

Note: With condition (A) true and condition (B) OFF, conditions (C) and (D) will activate the Loader Out output (E). With condition (A) true and condition (B) ON, conditions (C) and (D) will activate the output.

D05 Output Function - Loader Up Output (Body Output OUT0302)

This output function controls the Loader Up output.

Condition	Modifiable Parameters	Default Setting
А	Loader Grip Time	1.2 sec. (See Note for D01)

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	System Power Switch	Activated	IN1102	ON
В	Lift Coordinated Mode Rocker Sw.	Activated	IN0001	(See Note)
С	Loader Up Rocker Switch	Activated	IN0603	ON
D	Loader Grip Rocker Switch	Activated	IN1100	ON
E	Hydraulic Pump – Loader – P1	Activated	OUT0103	ON
F	Loader Up Prox. Sw.	Deactivated	IN0003	OFF
G	Gripper Fully Open Prox. Switch	Deactivated	IN1301	OFF
н	Fifth Wheel Prox. Switch (Starr Only)	Deactivated	IN0703	OFF (STARR ONLY)
I	Finesse Valve Input (option)	Activated	IN1300	(See Note)
J	Loader Up Output	Activated	OUT0302	ON

Note: With conditions (A), (E) and (H) true and condition (B) OFF, condition (C) will activate the Loader Up output (I) if condition (G) is true. With condition (A), (E) and (H) true and condition (B) ON and (F, and G) OFF, condition (C) will activate the output or condition (D) will activate the output after 1.2 seconds (see note for D01) if condition (I) is OFF until condition (D) is released. In either state (i.e. condition (B) on or OFF), if condition (G) is true (i.e. OFF) then the lift will raise normally. If condition (I) is ON then condition (C) will control the lift until condition (F) is true. If condition (G) is false (i.e. ON) then the lift will raise for ca. 0.3 seconds then stop to prevent damage to the body of the unit.

D06 Output Function - Loader Down Output (Body Output OUT0300)

This output function controls the Loader Down output.

Condition	Modifiable Parameters	Default Setting
А	Loader Grip Time	1.2 sec. (See Note for D01)

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	System Power Switch	Activated	IN1102	ON
В	Lift Coordinated Mode Rocker Sw.	Activated	IN0001	(See Note)
С	Loader Down Rocker Switch	Activated	IN1303	ON
D	Loader Un-Dump Rocker Switch	Activated	IN0000	ON
E	Hydraulic Pump – Loader – P1	Activated	OUT0103	ON
F	Loader Down Output	Activated	OUT0300	ON

Note: With condition (A) true and condition (B) OFF, conditions (C) and (E) will activate the Loader Down output (F). With condition (A) true and conditions (B) and (E) ON, condition (C) will activate the output or condition (D) will activate the output after 0.5 seconds until condition (D) is released.

D07 Output Function - Loader Dump Output (Body Output OUT0102)

This output function controls the Loader Dump output.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	System Power Switch	Activated	IN1102	ON
В	Lift Coordinated Mode Rocker Sw.	Activated	IN0001	(See Note)
С	Loader Dump Rocker Switch	Activated	IN1103	ON
D	Loader Grip Rocker Switch	Activated	IN1100	ON
E	Loader Dump Prox. Switch	Activated	IN0701	ON
F	Hydraulic Pump – Loader – P1	Activated	OUT0103	ON
G	Loader Dump Output	Activated	OUT0102	ON

Note: With condition (A) true and condition (B) OFF, conditions (C) and (F) will activate the Loader Dump output (G). With condition (A) true and conditions (B) ON and (E) true.

D08 Output Function - Loader Un-Dump Output (Body Output OUT0000)

This output function controls the Loader Un-Dump output.

Condition	Modifiable Parameters	Default Setting
А	Un-dump Time	0.5 Sec.

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	System Power Switch	Activated	IN1102	ON
В	Lift Coordinated Mode Rocker Sw.	Activated	IN0001	(See Note)
С	Loader Un-Dump Rocker Switch	Activated	IN0000	ON
D	Hydraulic Pump – Loader – P1	Activated	OUT0103	ON
E	Loader Undump Prox. Switch	Deactivated	IN1201	OFF
F	Loader Un-Dump Output	Activated	OUT0000	ON

Note: With condition (A) true and condition (D) ON and conditions (B and E) OFF, condition (C) will activate the Loader Un-Dump output (E). With condition (A) true and conditions (B, and D) ON and condition (E) OFF, condition (C) will activate the output then 0.5 seconds later the lift will lower.

D09 Output Function - Pack Right Solenoid (Body Output OUT0303)

This output function controls the Pack Right solenoid.

Condition	Modifiable Parameters	Default Setting
A	Packer Reverse Delay	0.5 Sec.

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	System Power Switch	Activated	IN1102	ON
В	Hydraulic Pump – Packer – P2	Activated	OUT0006	ON
С	Manual Packer Rocker Switch	Activated	IN0301	(See Note)
D	Packer Right Rocker Switch	Activated	IN0702	ON
E	Packer Proximity Switch	Activated	IN1101	ON
F	Packer Pressure Switch	Activated	IN0602	ON
G	Pack Right Solenoid	Activated	OUT0303	ON

Note: With conditions (A) and (B) true, and condition (C) ON, condition (D) will activate the Pack Right solenoid (G). With conditions (A) and (B) true, condition (C) OFF the packer will oscillate between Pack Left and Pack Right. When either conditions (E) or (F) are met the packer will reverse after 0.5 seconds.

D10 Output Function - Pack Left Solenoid (Body Output OUT0105)

This output function controls the Pack Left solenoid.

Condition	Modifiable Parameters	Default Setting
А	Packer Reverse Delay	0.5 Sec.
В	Packer Startup Time	5.0 Sec.

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	System Power Switch	Activated	IN1102	ON
В	Hydraulic Pump – Packer – P2	Activated	OUT0006	ON
С	Manual Packer Rocker Switch	Activated	IN0301	(See Note)
D	Packer Left Rocker Switch	Activated	IN0502	ON
E	Packer Proximity Switch	Activated	IN1101	ON
F	Packer Pressure Switch	Activated	IN0602	ON
G	Pack Left Solenoid	Activated	OUT0105	ON

Note: With conditions (A) and (B) true and condition (C) ON, condition (D) will activate the Pack Left solenoid (G). With conditions (A) and (B) true and condition (C) OFF the packer will oscillate between Pack Left and Pack Right. When either conditions (E) or (F) are met the packer will reverse after 0.5 seconds. Turning the vehicle OFF and then on with the Packer in Auto (condition (C) OFF) will allow the Packer to continue from it's previous location. (i.e. in auto-mode, the packer remembers it's location and continues to pack from there.) If condition (C) is "cycled" (i.e. turned ON then OFF again regardless of the period of time) the Pack Left solenoid will energize for a minimum of 5 seconds. Conditions (E) and

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(F) will be ignored during this 5 seconds. After the initial 5 seconds the pack will oscillate as normal (if condition (C) is OFF).

D11 Output Function - Loader Latch Solenoid (Body Output OUT0108)

This output function controls the Loader Latch solenoid.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	Chassis Service Brake	Activated	IN0501	ON
В	Chassis Neutral	Activated	IN0400	ON
С	Loader In Output	Activated	OUT0304	ON
D	Loader Out Output	Activated	OUT0002	ON
E	Hydraulic Pump – Packer – P2	Activated	OUT0006	ON
F	Loader Latch Solenoid	Activated	OUT0108	ON

Note: With condition (A OR B) true AND (C OR D) true, condition (E) will activate the Loader Latch Solenoid (F).

D12 Output Function - Reverse Flood Lights (Body Output OUT0104)

This output function controls the Reverse Flood Light output.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	Chassis Reverse Signal	Activated	IN1203	ON
В	Reverse Flood Lights Output	Activated	OUT0104	ON

Note: With condition (A) true, the Reverse Flood Lights output (B) will be activated.

OPTIONAL IN-CAB INPUT FUNCTIONS

E01 Input Function - Auto-Neutral (Force to Neutral) Enable Switch (In-Cab Input IN0503)

This circuit monitors the ON/OFF status of the Auto-Neutral Enable switch. Refer section 3.01 for additional information on the pump default operation speeds. See section 5.03 for additional information on how the Auto-Neutral (Force to Neutral) functions.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Auto-Neutral (Force to Neutral) Enable Switch	Activated	IN0503	ON

E02 Input Function - Finesse Valve (In-Cab Input IN1300)

Finesse Valve.

E03 Input Function - Operate In Neutral Flag (In-Cab Input IN1202)

This circuit monitors the ON/OFF status of the Operate In Neutral flag. This input will be ON when the engine transmission is in Neutral. When utilizing this input, the default pump settings will change automatically. (Refer section 3.01 for pump settings detail).

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Function Logic:

Input Device	Status	I/O	Status
Operate In Neutral Flag	Activated	IN1202	ON

E04 Input Function - Turn Signal (In-Cab Input IN0700)

This circuit monitors the ON/OFF status of the Turn Signal circuit. This circuit is used for enabling and disabling the Whelen strobe.

Condition	Modifiable Parameters	Default Setting
А	None	N/A

Input Device	Status	I/O	Status
Turn Signal	Activated	IN0700	ON

Body Controller Software

OPTIONAL IN-CAB OUTPUT FUNCTIONS

F01 Output Function - Allison Wires 142/117 (In-Cab Output OUT0107)

This output function controls Allison wires 142 and 117 which are part of the Auto-Neutral (Force to Neutral) function of the transmission. This enables Auto-Neutral (Force to Neutral) condition waiting on the Service Brake signal (output F02).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	Auto-Neutral (Force to Neutral) Enable Sw.	Activated	IN0503	See Note
В	Lift Coordinated Mode Rocker Sw.	Activated	IN0001	See Note
С	STARR Jumper Input	Activated	IN0600	See Note
D	Loader In Proximity Sw.	Activated	IN0800	See Note
E	Coordinated In Proximity Switch	Activated	IN0002	See Note
F	Loader Grip Rocker Switch	Activated	IN1100	See Note
G	Chassis Service Brake	Activated	IN0501	See Note
Н	Chassis Neutral	Activated	IN0400	See Note

Note: With condition (A) ON and condition (F) ON OR condition (A) OFF, condition (G) OFF, the Loader Is IN (Loader IN is defined as: condition (B) ON, condition (C) ON and on or past condition (E) OR condition (C) OFF and on or past condition (D)) AND condition (H) OFF the output will be ON. Refer section 3.01 for additional information on the pump default operation speeds. See section 5.03 for additional information on how the Auto-Neutral (Force to Neutral) functions.

F02 Output Function - Allison Wire 162 (In-Cab Output OUT0005)

This output function controls Allison wire 162, the service brake input for the Auto-Neutral (Force to Neutral) function.

Condition	Modifiable Parameters	Default Setting	
А	None	N/A	

Conditions necessary to activate the circuit:

Condition	Function or Component	Status	I/O	Status
А	STARR Jumper Input	Activated	IN0600	See Note
В	Loader In Proximity Sw.	Activated	IN0800	See Note
С	Coordinated In Proximity Switch	Activated	IN0002	See Note
D	Chassis Service Brake	Activated	IN0501	See Note
E	Chassis Neutral	Activated	IN0400	See Note

Note: With Loader IN (see F01) and condition (E) OFF, condition (D) the output will be ON. Refer section 3.01 for additional information on the pump default operation speeds. See section 5.03 for additional information on how the Auto-Neutral (Force to Neutral) functions.

OPTIONAL BODY INPUT FUNCTIONS

G01 Input Function - Low Engine Torque Pressure Switch (Body Input IN0601)

This circuit monitors the ON/OFF status of the low engine torque pressure switch. This input will be ON when the Engine Torque is low and will disable the Packer pump.

Condition	Modifiable Parameters	Default Setting	
А	None	N/A	

Function Logic:

Input Device	Status	I/O	Status
Low Engine Torque Press Sw.	Activated	IN0601	ON

G02 Input Function - (Body Input IN0703)

This circuit monitors the ON/OFF status of the fifth wheel proximity switch.

Condition	Modifiable Parameters	Default Setting	
А	None	N/A	

Input Device	Status	I/O	Status
Fifth Wheel Prox. Switch	Activated	IN0703	ON

SPECIAL FEATURES

Auto/Manual Pack Mode

Auto/Manual Pack Mode is a standard feature on all Mobile Controller controlled products. While in Auto Mode the packer will make an approx. 180° sweep continuously pausing for 0.5 seconds at the end of each sweep (or when the packer pressure switch is seen during the sweep). While in Manual mode it will be necessary to hold the Packer Left or Pack Right buttons in order to sweep the Packer. Manual/Auto Mode is controlled by a rocker switch located on the control panel.

Coordinated Lift/Manual Lift Mode

This unit is equipped with Coordinated Lift Mode. In Coordinated Lift Mode, the Loader is extended manually by pressing the Loader Out button. Pressing and holding the Grip button will grip a Can and approx.1 second later start the Loader In and Up, Dumping the Can when the dump proximity switch is reached. Pressing and holding the Un-dump button will undump the Can and bring the Loader Arm down. The Loader is then manually extended. Pressing and holding the release button will release the container then retract the Loader arm. In Manual Mode, all of the functions of the loader arm are activated by the loader buttons. Manual/Auto mode is controlled by a rocker switch located on the control panel.

OPTIONAL AUTO-NEUTRAL (FORCE TO NEUTRAL) OPERATION

This unit can be equipped with Auto-Neutral (Force to Neutral) operation. This operation places the transmission in Neutral automatically and returns it to drive on demand.

The Auto-Neutral (Force to Neutral) operation is as follows:

1) With the Auto-Neutral (Force to Neutral) switch (input IN0503) ON when the service brake is applied and the lift starts to extend (i.e. leaves the Loader In proximity switch, input IN0800 is OFF) the truck will shift into Neutral.

2) When the Can is released, the Lift retracted and the service brake is released the transmission will return to gear.

3) If the driver needs to move forward to reposition a Can (for example) the driver can "momentarily" shift the vehicle to drive by pressing the drive rocker switch or releasing the "trigger" on Auto-Neutral (Force to Neutral) joystick options. When the driver is ready to go back to Neutral simply release the rocker or grasp the "trigger".

4) If at any time during this operation the brake signal is lost then the transmission will have to be manually returned to gear.

5) Whenever the Auto-Neutral (Force to Neutral) switch (input IN0503) is ON the pump defaults are changed to 1400 enable and 1500 disable for both pumps. It is assumed that the Auto-Neutral (Force to Neutral) function will only be used with smaller pumps allowing Operate-In-Neutral applications.

INSIGHT DISPLAY FUNCTIONALITY

Mobile Controller uses a hand held device (INSIGHT) for displaying the current status of Input / Output, Engine speed, Temperatures etc., and can be used to SET/RESET any particular Input/Output bit. This can also be used for configuring or selecting different options in Mobile Controller.

The basic display terminal with all the function keys is as shown in the figure below.



Figure 51. INSIGHT Display Unit

Operating Elements

INSIGHT is a basic 2.8" color Display unit, which consists of 4 freely programmable back lit function keys and a H.M.I (Graphic) display terminal:

The display is fitted with the following operating elements:

1. 4 Function Keys with Pressure points

a. There will be 4 back lit freely programmable function keys available in INSIGHT. These can be used as password protection keys (for Ex: key from left to right can be considered as "1 - 2 - 3 - 4 or A-B - C - D") or these function keys can be assigned specific function / Operation.

2. 1 Rocker switch (KEY-UP / KEY-DOWN / KEY-LEFT / KEY-RIGHT)

a. The Rocker switch may be used for cursor movement function (Up / Down / Right / Left). This can also be used for navigation purpose from current page to next page or to the previous page.

3. Status LED's (Function display with 2-color LED (red/green).

a. It has 2 color LED (Red / Green). Refer section 5.04.04 for more details.

i. For Ex: When a particular Input / Output bit is selected using Rocker switch, the OK key can be used to turn ON / OFF that particular bit. Once a particular bit is turned ON / OFF, the respective bit color will be changed from Red to Green or vice versa, which will be displayed on the H.M.I terminal as shown in the figure below.

Note: By holding the OK button down for 10 seconds and entering "4 - 3 - 2 - 1" then OK again, we can get access to the screen to Reset the Arm Cycle counts and Packer cycle counts.

4. OK Key Push Button

a. This key is used for enabling or disabling the Input /Output from H.M.I.

5. H.M.I Display.

a. This is used for displaying the current status of the Input / Output, Engine Run Speed, Temperature, Auto/Manual mode etc. This can be programmed for graphically representing a process. This can also be used for changing the set points for Analog values. Following figure shows current state of the Input / Output variables.



Figure 52. INSIGHT Display with Input/Output Status Indication

Display Operating States

SI No.	Operating States	State Transition Conditions	LED Color	Flashing Frequency
1	INIT state (Reset)	 Operating system initialized or Waiting for correct supply voltage Temporary state replaced by RUN or STOP 	Yellow	-
2	Run state	Operating voltage reached minimum value	Green	2 Hz
3	Stop state	 Application program not loaded STOP command sent from interface 	Green Green flashing	N/A 5 Hz
4	ERROR state	Supply Voltage is too low	RED	5 Hz
5	FATAL Error state	 Memory Error (RAM / Flash) Exception error Operating system error 	RED	-

Rear Panel Housing connection:

Table below provides Wiring details for the Interface cable of INSIGHT display unit.

Illustration	Pin	Description	Note
	1	n.c.	
2 1			
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			0.001/00
	2	VBB	832 V DC
	3	GND	TERMINAL 31
	4	CAN-H	
	5	CAN-L	

Display Status LED's

LED Color	Flashing Frequency	Description
OFF	Permanently OFF	No Operating Voltage
Green	5 Hz	No Operating system loaded
Green	2 Hz	RUN State (application is running)
Green	Permanently ON	STOP State (application stopped)
Red	5 Hz	Application stopped due to under voltage
Red	Permanently ON	FATAL ERROR or STOP state with error
Yellow / Orange	Briefly ON	INIT state, reset checks

DIAGNOSTICS

Testing I/O Voltage

To test the voltage at an input or output terminal a Digital Multi Meter is always the best tool. Incandescent test lights cannot be used to test inputs from certain electronic input device. The amperage required to light an incandescent tester may exceed the maximum output of the device. If using a test light it must be an LED type tester. Upon inspection of the Mobile Controller assembly, note that there are through holes in the upper circuit boards. These holes provide test probe access to the lower I/O terminals.

Monitoring Input Status

With an Input ON, the corresponding Input field (with Description and Address) located in INSIGHT display will also be ON.

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

Monitoring Output Status

With an Output ON, the corresponding Output field (with Description and Address) located in INSIGHT display will also be ON.

Refer to INSIGHT DISPLAY FUNCTIONALITY for more details about Diagnostic display options and INSIGHT display tool.

Diagnostic Beep Codes

Each Diagnostic code consists of a two-digit number. When a fault has been set the In-Cab Alarm will sound for 5 seconds, then pause. Then beep a number of times specifying the first digit of the code, pause for 2 seconds. Then resume to beep a number of times specifying the second digit of the code. See the following or the decal in the cab for the explanation of each beep code.

There are two classes of faults the first is a system fault. A system fault indicates a possible electrical problem with some part of a specific circuit. The second is a Critical Fault. A critical fault indicates that a problem is occurring which has or will shut the hydraulic pump system down.

CRITICAL FAULTS

• Fault #31- High Transmission Temperature:

Operate In Gear At Idle systems monitor the temperature of the transmission sump fluid and the fluid flowing out of the torque converter to the cooler. This fault will be set when either of these temperature levels exceed operating range. The maximum operating temperature for the transmission sump fluid is 250°F. The maximum operating temperature for the converter out fluid is 300°F

Indication: A. The transmission temperature has exceeded a safe operating range.

B. An open has occurred in the Trans. Temp. Input circuit.

Disabled Functions: Hydraulic Pump

Fault Reset: In order to reset this fault:

- 1. the transmission must be placed in neutral range
- 2. and the engine must be running at or above idle speed
- 3. and the trans. temperature must cool to a safe level and remain at a safe level for three minutes.

• Fault #32- Filter Bypass Shutdown:

The hydraulic system has been operating in bypass condition in excess of the number of hours set by the Start Filter Shutdown parameter.

Indications: The hydraulic filter needs servicing

Disabled Functions: Hydraulic Pump

Fault Reset: Cycling the System Power Switch will allow three minutes of further operation or service hydraulic filter.

• Fault #41- Engine Speed Not Detected:

The Mobile Controller is unable to correctly count the R stator pulse.

Indication: A. Intermittent connection in the R Stator input circuit.

- B. Invalid R Stator Signal due to a faulty alternator output.
- C. The ignition switch has been left in the run position with the engine shutdown.

Disabled Functions: Hydraulic Pump

Fault Reset: Self reset upon restoration of the R Stator circuit.

• Fault #42- Loss of Engine Idle Calibration:

The Engine Idle parameter has been erased from memory.

Indication: A. Engine Idle needs to be calibrated.

B. Internal data storage device has malfunction. Replace Mobile Controller

Disabled Functions: Hydraulic Pump

Fault Reset: Cycling the System Power Switch will allow three minutes of further operation or complete the engine speed calibration procedure.

• Fault #43- Loss of Engine Tach. Calibration:

The Tach. Hz./2 at Engine Idle has been erased from Mobile Controller memory.

Indication: A. Engine speed needs to be calibrated.

B. Internal data storage device has malfunction. Replace Mobile Controller.

Disabled Functions: Hydraulic Pump

Fault Reset: Cycling the System Power Switch will allow three minutes of further operation or complete the engine speed calibration procedure.

• Fault #54- Filter Bypass Switch Fault

The Mobile Controller has lost the signal from the filter pressure switch while neither hydraulic pump was in operation. This is recognized as a fault because there should be no hydraulic pressure to bypass the filter under this condition.

Indication: A. The filter bypass pressure switch has been disconnected.

- B. An open has occurred in the filter bypass input circuit.
 - C. The filter pressure switch has failed open.

Disabled Functions: None

Fault Reset: Cycle system power switch or restore filter pressure switch input to the Mobile Controller.

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

SECTION 8 SCHEMATICS





NOTE: CONTACT STATES SHOWN WITH UNIT ENERGIZED AND NO TARGET PRESENT.








Normally open 3 RED/WHITE 2 RED/BLACK 1 GREEN/YELLOW

Male Receptacle End View

10-

20

30

RED/BLACK

GREEN/YELLOW

RED/WHITE







FEMALE LIGHT CONN.





IFM, CAB TO BODY HARNESS 701-9042-002 10/10/2018, REV C.







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1	. 254-4953	CONTROLLER, 98 1/0, IFM	REF
2	. 263-1706-032	HARNESS, CAB TO BODY RR	REF
3	. 263-1706-033	HARNESS, CAB TO BODY RR	REF
4	. 263–1706–034	HARNESS, CAB TO BODY RR	REF
5	. 263-1706-035	HARNESS, CAB TO BODY RR	REF
6	. 263-1706-036	HARNESS, CAB TO BODY RR	REF
7	. 263-1706-037	HARNESS, CAB TO BODY RR	REF
8	. 263–1714	HARNESS, IFM DISPLAY MODULE	REF



CAB, ELECTRICAL 701-9042-014 06/28/21







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