Half/Pack® Factor AFL™

INCLUDING STANDARD, FREEDOM AND SIERRA

SERVICE MANUAL

ISSUED APRIL 2018

TP1HPFAC-SM-0418

Environmental Solutions Group
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WARNING

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

IMPORTANT SAFETY NOTICE

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

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

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NOTES

SECTION 1
GENERAL INFORMATION

Half/Pack® Factor AFL™
General Information

INTRODUCTION

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

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

IMPORTANT!

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

SERVICE/PARTS ASSISTANCE

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

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

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

PRECAUTIONARY STATEMENTS

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

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

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

⚠ WARNING

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

⚠ WARNING

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

⚠ DANGER

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

⚠ DANGER

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

⚠ DANGER

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

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General Information

⚠ DANGER

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

⚠ DANGER

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

⚠ DANGER

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

⚠ DANGER

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

⚠ DANGER

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

⚠ DANGER

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

⚠ DANGER

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

⚠ DANGER

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

NOTICE

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

NOTICE

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

NOTICE

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

NOTICE

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

NOTICE

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

LOCK-OUT/TAG-OUT PROCEDURES

NOTICE

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

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

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

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

Follow These Steps:

1. 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 you raise the tailgate for service, maintenance or cleaning.
4. SET the body props when you raise the body for service, maintenance or cleaning.
5. When there are in-cab controls, turn the ignition switch to ON then:
   a. Move the switches of the hydraulic controls. This relieves the pressure in the cylinders.
   b. Turn the ignition switch to OFF.
6. When there are no in-cab controls, move the outside control levers to relieve the pressure in the cylinders.
7. Put a LOCK-OUT/TAG-OUT Tag onto the steering wheel.
8. Remove the ignition key from the cab, lock the vehicle, and put the key in a secure location.
9. You can order Lock-Out/Tag-Out Tags (Part Number 212-1586) through your Heil Dealer or through Heil.

STORING REFUSE IN THE BODY

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

MAINTENANCE/LUBRICATION INFORMATION

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

GREASE LUBRICANT RECOMMENDATION

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

Use grade NLG1000 grease or equivalent.

OIL LUBRICANT RECOMMENDATION

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

HYDRAULIC OIL SPECIFICATIONS

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

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

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

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

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

STANDARD TORQUE DATA FOR NUTS AND BOLTS

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

NOTICE

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

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

STANDARD TORQUE DATA FOR NUTS AND BOLTS TABLE

Bolt Size (D)	Nut Type (STD/Lock)	Thread Turns per Inch (p)	Grade	Heil Plain Dry Condition Torque Value (ft-lbs)	Heil Zinc Plated Fastener Torque Value (ft-lbs)	Heil Lubricated Fastener Torque Value (ft-lbs)	Heil Deformed Lock Nut Torque Value (ft-lbs)
1/4	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	
	Lock	16	5				22
			8				31

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)
		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	
		18	5	184	166	120	
			8	260	234	169	
	Lock	11	5				106
			8				149

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)
		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	
		12	5	975	877	634	
			8	1564	1408	1017	
	Lock	7	5				565
			8				907

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				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.	
5	5	Three radial lines. Quenched and tempered medium carbon steel.	
8	8	Six radial lines. Quenched and tempered special carbon or alloy steel	

TORQUE FOR HYDRAULIC TUBES AND FITTINGS

FLAT FACE ORFS FITTINGS		
	SET WRENCH TO	
NOMINAL TUBE OD	TORQUE WRENCH SETTING	ALTERNATE TORQUE UNITS
1/4"	21 ft-lbs.	250 in-lbs.
3/8"	33.5 ft-lbs.	400 in-lbs.
1/2"	50 ft-lbs.	600 in-lbs.
5/8"	50 ft-lbs.	600 in-lbs.
3/4"	75 ft-lbs.	900 in-lbs.
1"	105 ft-lbs.	1260 in-lbs.
1-1/4"	130 ft-lbs.	1560 in-lbs.
1-1/2"	178.5 ft-lbs.	2140 in-lbs.

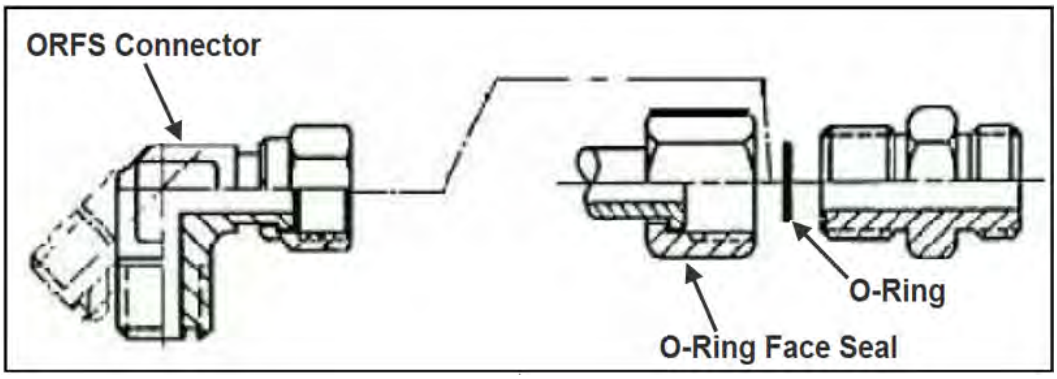


Figure 2. Torque for Hydraulic Tubes and Fittings

TORQUE FOR HYDRAULIC TUBES AND FITTINGS (CONTINUED)

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

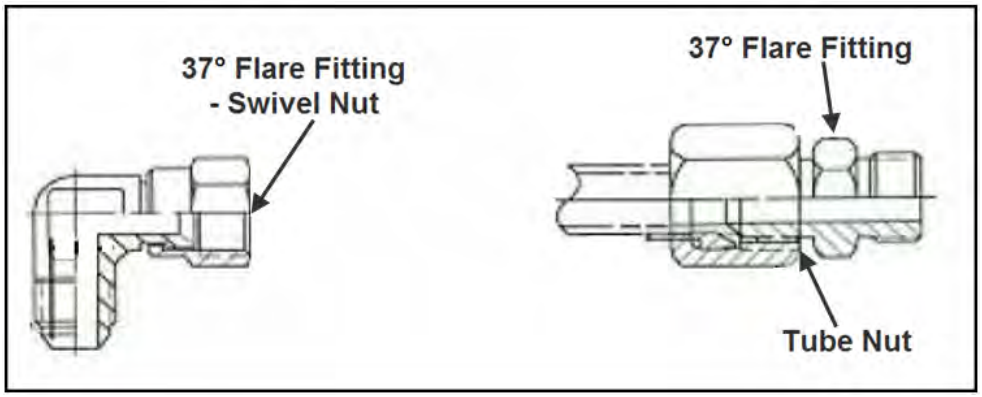


Figure 3. Torque for Hydraulic Tubes and Fittings

TORQUE FOR HYDRAULIC TUBES AND FITTINGS (CONTINUED)

FROM SAE J2593 TABLE 7		
BOSS (ORB)	**(STEEL) SET WRENCH TO**	
NOMINAL TUBE OD	**TORQUE WRENCH SETTING**	**ALTERNATE TORQUE UNITS**
3/16"	9 ft-lbs.	110 in-lbs.
1/4"	16.5 ft-lbs.	200 in-lbs.
5/16"	21 ft-lbs.	250 in-lbs.
3/8"	29 ft-lbs.	350 in-lbs.
1/2"	64 ft-lbs.	770 in-lbs.
5/8"	89 ft-lbs.	1070 in-lbs.
3/4"	130 ft-lbs.	1560 in-lbs.
7/8"	178.5 ft-lbs.	2140 in-lbs.
1"	224 ft-lbs.	2690 in-lbs.
1-1/4"	250 ft-lbs.	3000 in-lbs.
1-1/2"	300 ft-lbs.	3600 in-lbs.
ALUMINUM SET		
TORQUE WRENCH SETTING	**ALTERNATE TORQUE UNITS**	
6 ft-lbs.	70 in-lbs.	
11 ft-lbs.	130 in-lbs.	
14 ft-lbs.	170 in-lbs.	
21 ft-lbs.	250 in-lbs.	
37.5 ft-lbs.	450 in-lbs.	
54 ft-lbs.	650 in-lbs.	
91.5 ft-lbs.	1100 in-lbs.	
116.5 ft-lbs.	1400 in-lbs.	
146 ft-lbs.	1750 in-lbs.	
154 ft-lbs.	1850 in-lbs.	
200 ft-lbs.	2400 in-lbs.	

TORQUE FOR HYDRAULIC TUBES AND FITTINGS (CONTINUED)

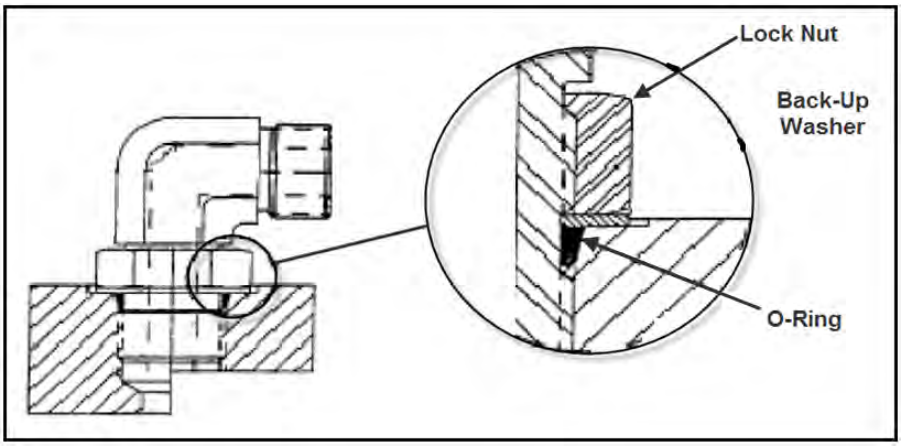


Figure 4. Torque for Hydraulic Tubes and Fittings

SPLIT- FLANGE (HALF CLAMP) CONNECTORS (CODE 61)				
		SET WRENCH TO		
NOMINAL TUBE OD	BOLT SIZE	BOLT TORQUE [FT-LBS]	BOLT TORQUE [IN-LBS]	ALUMINUM FT-LBS [IN-LBS]
1/2"	5/16-18 x 1.25	17 ft-lbs.	200 in-lbs.	12 [130]
3/4"	3/8-16 x 1.25	25 ft-lbs.	300 in-lbs.	17 [200]
1"	3/8-16 x 1.25	32 ft-lbs.	380 in-lbs.	21 [250]
1-1/4"	7/16-14 x 1.50	41 ft-lbs.	490 in-lbs.	27 [320]
1-1/2"	1/2-13 x 1.50	53 ft-lbs.	640 in-lbs.	35 [420]
2"	1/2-13 x 1.50	61 ft-lbs.	730 in-lbs.	40 [480]
2-1/2"	1/2-13 x 1.75	86 ft-lbs.	1030 in-lbs.	56 [670]
3"	5/8-11 x 1.75	144 ft-lbs.	1730 in-lbs.	94 [1130]
3-1/2"	5/8-11 x 2.00	125 ft-lbs.	1500 in-lbs.	82 [980]
4"	5/8-11 x 2.00	125 ft-lbs.	1500 in-lbs.	82 [980]
5"	5/8-11 x 2.25	125 ft-lbs.	1500 in-lbs.	82 [980]

TORQUE FOR HYDRAULIC TUBES AND FITTINGS (CONTINUED)

SPLIT- FLANGE (HALF CLAMP) CONNECTORS (CODE 62)				
		SET WRENCH TO		
NOMINAL TUBE OD	BOLT SIZE	BOLT TORQUE [FT-LBS]	BOLT TORQUE [IN-LBS]	ALUMINUM FT-LBS [IN-LBS]
1/2"	5/16-18 x 1.25	17 ft-lbs.	200 in-lbs.	12 [130]
3/4"	3/8-16 x 1.25	30 ft-lbs.	360 in-lbs.	20 [240]
1"	3/8-16 x 1.25	46 ft-lbs.	550 in-lbs.	30 [360]
1-1/4"	1/2-13 x 1.75	69 ft-lbs.	830 in-lbs.	45 [540]
1-1/2"	5/8-11 x 2.25	125 ft-lbs.	1500 in-lbs.	82 [980]
2"	3/4-10 x 2.75	209 ft-lbs.	2510 in-lbs.	136 [1640]

COLD WEATHER WARMUP PROCEDURE

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

⚠ WARNING

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

Follow the steps below to warm up the hydraulic oil.

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

BATTERY DISCONNECT SWITCH

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

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

NOTICE

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

NOTICE

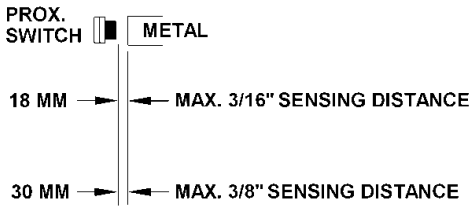
Always disconnect the battery before welding on the chassis or body.

PROXIMITY SWITCH TROUBLESHOOTING

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

NOTICE

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

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

DECALS ON THE UNIT

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

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

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

DECAL CARE

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

A. General Instructions

Following these instructions helps the decals adhere longer.

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

B. Pressure Washer Precautions

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

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

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

C. Remove Difficult Debris

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

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

DECAL CARE (CONTINUED)

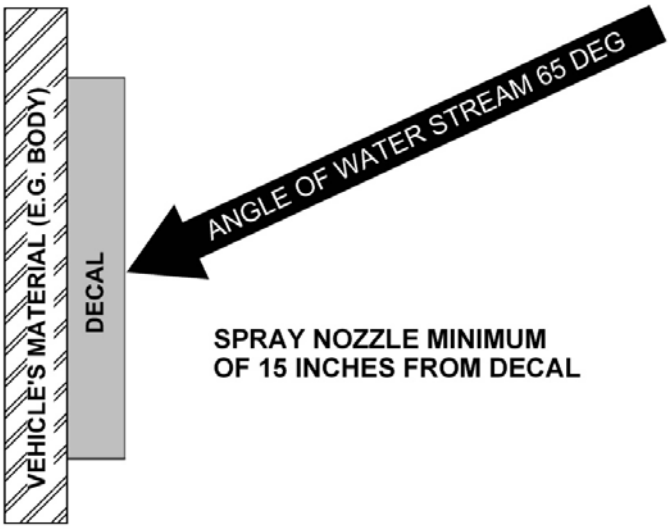


Figure 5. Recommended Technique

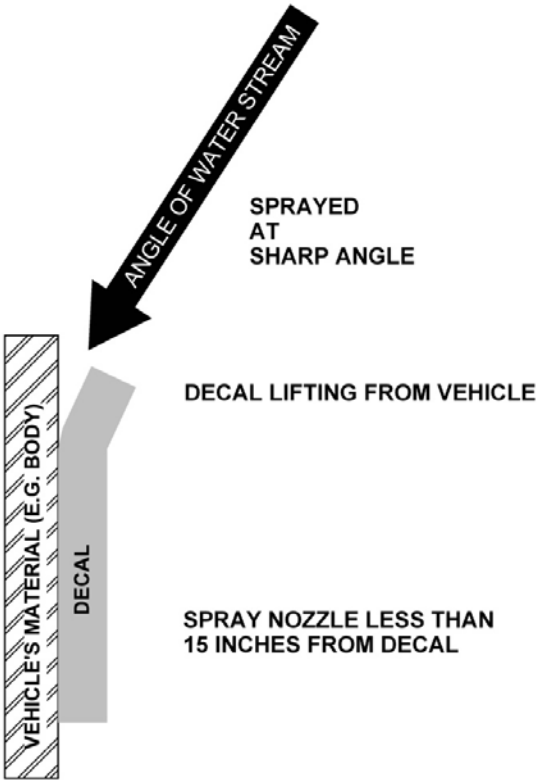
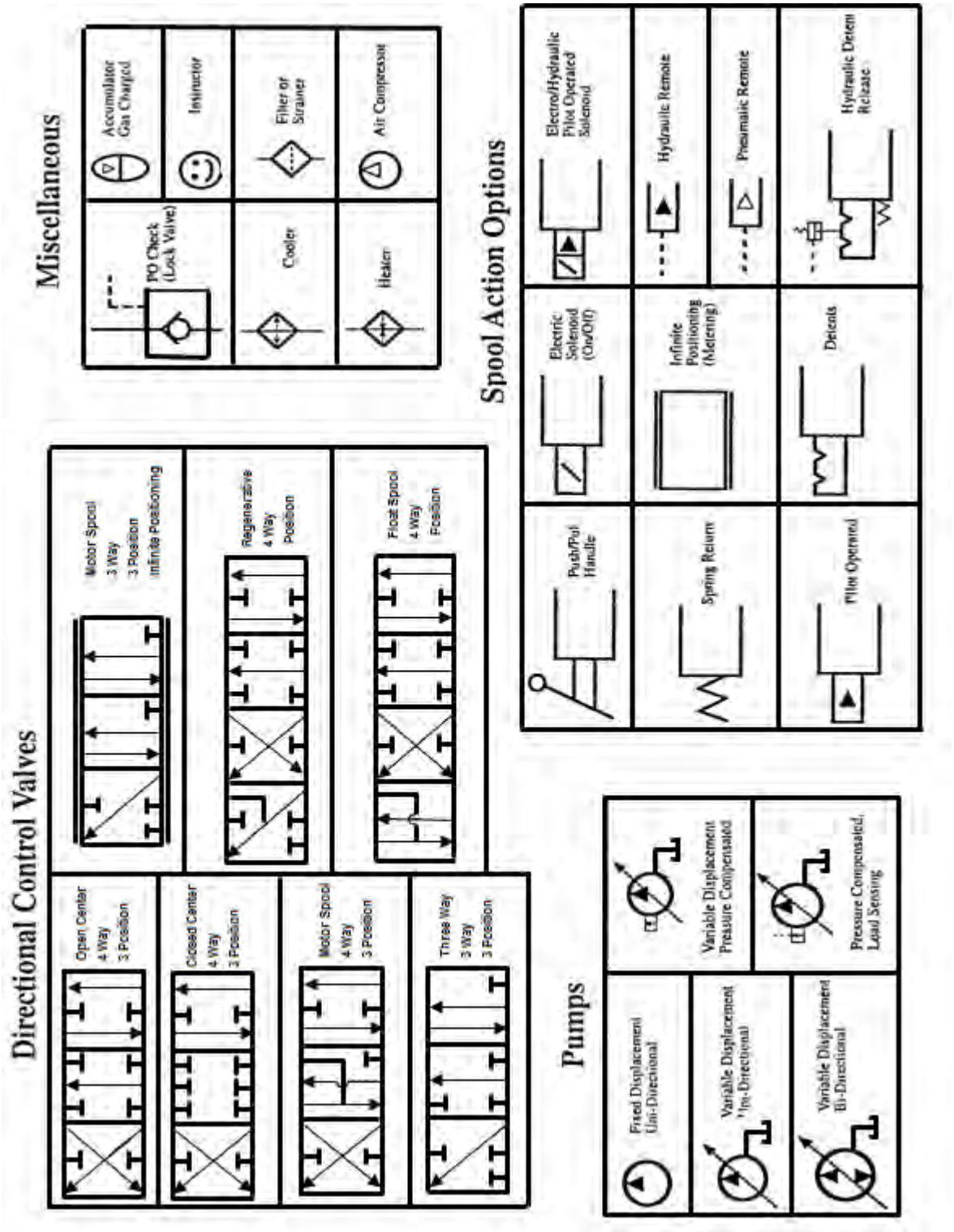
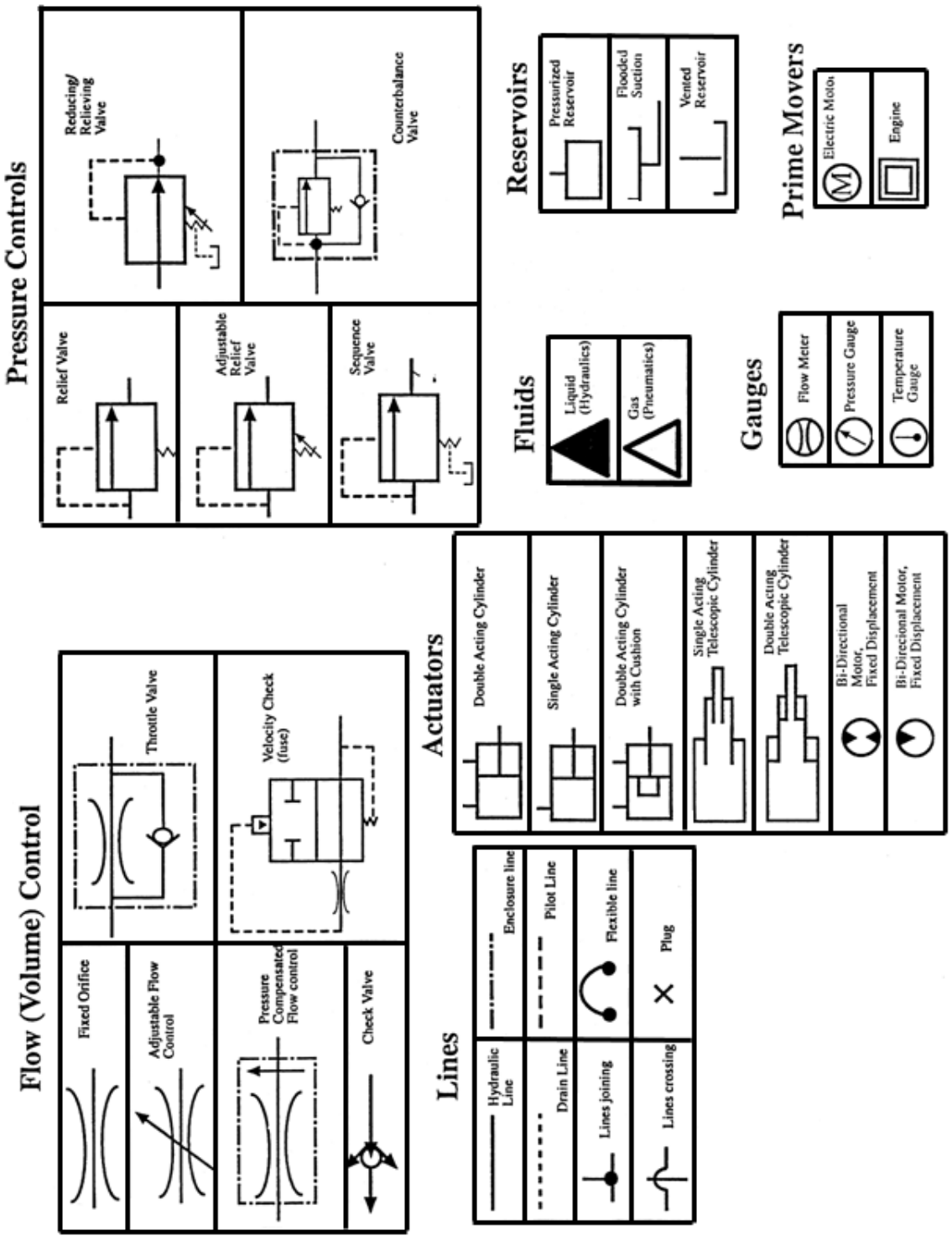


Figure 6. Incorrect Technique

HYDRAULIC SYMBOLS

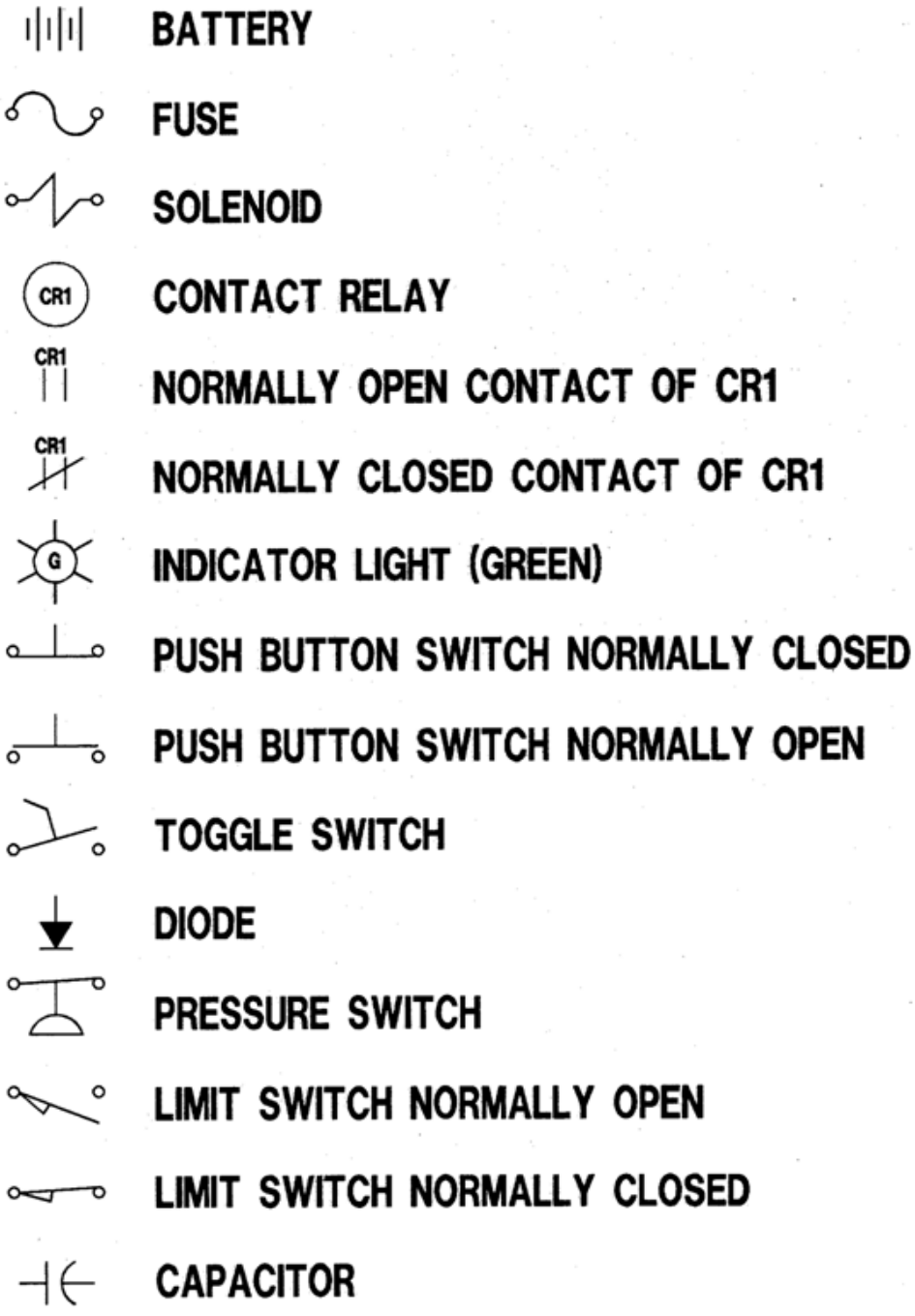


HYDRAULIC SYMBOLS (CONTINUED)



ELECTRICAL SYMBOLS

SYMBOL DEFINITIONS

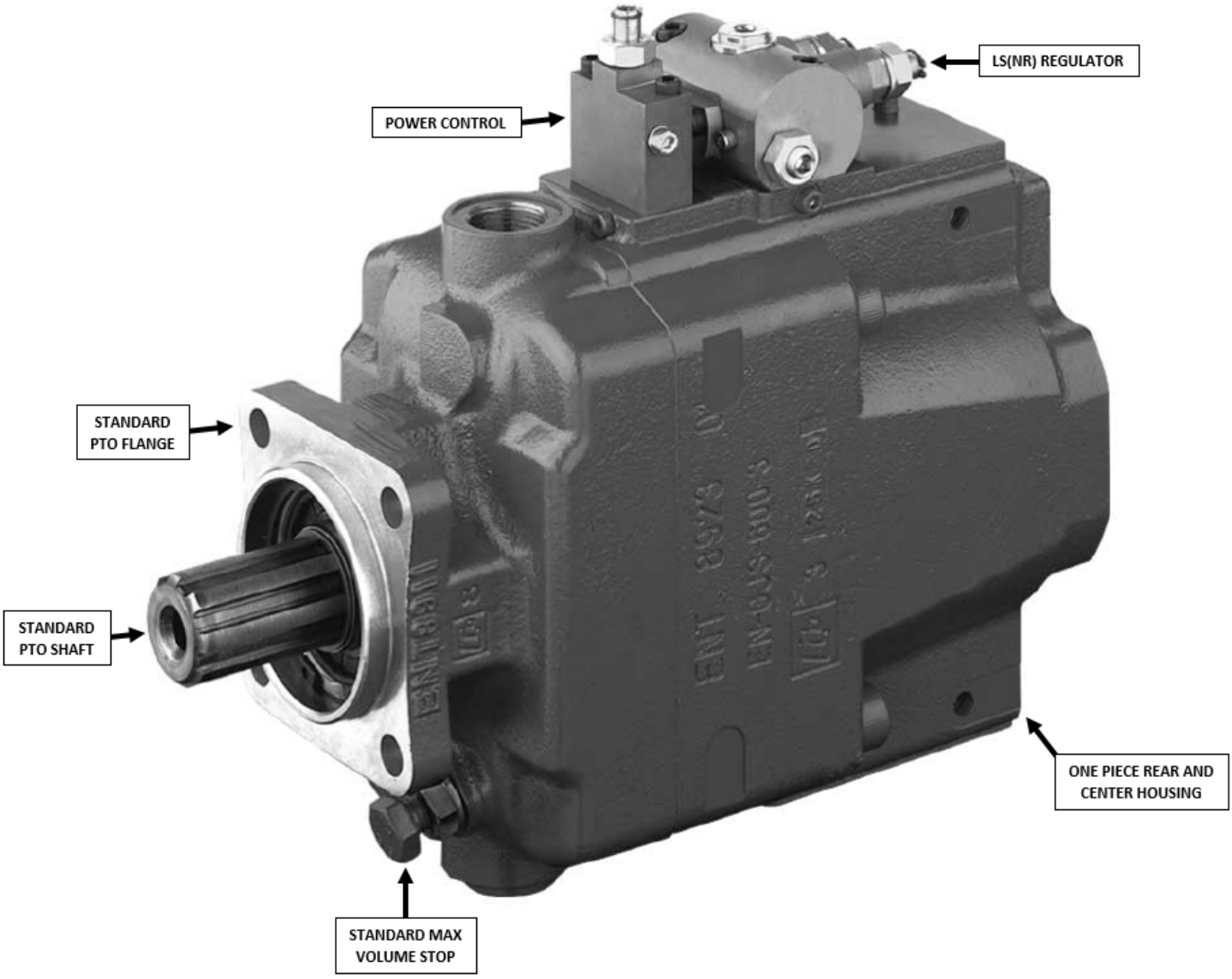


Half/Pack® Factor AFL™

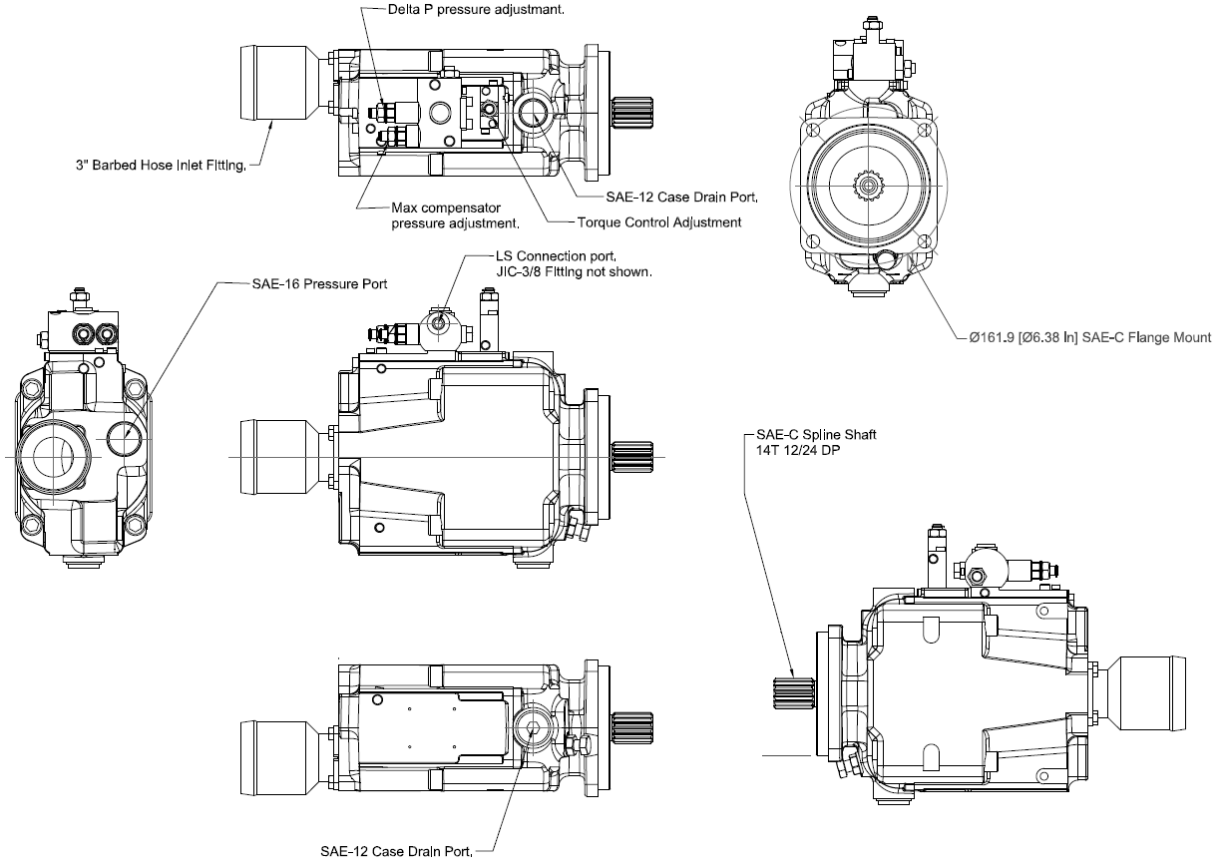
NOTES

SECTION 2
PUMP

LOAD SENSE PISTON PUMP (219-2426) NOMENCLATURE



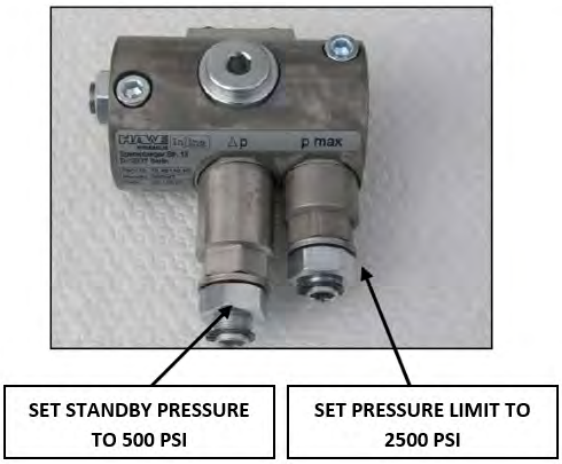
LOAD SENSE PISTON PUMP (219-2426) NOMENCLATURE (CONTINUED)



LOAD SENSE PISTON PUMP (219-2426) COMPENSATOR

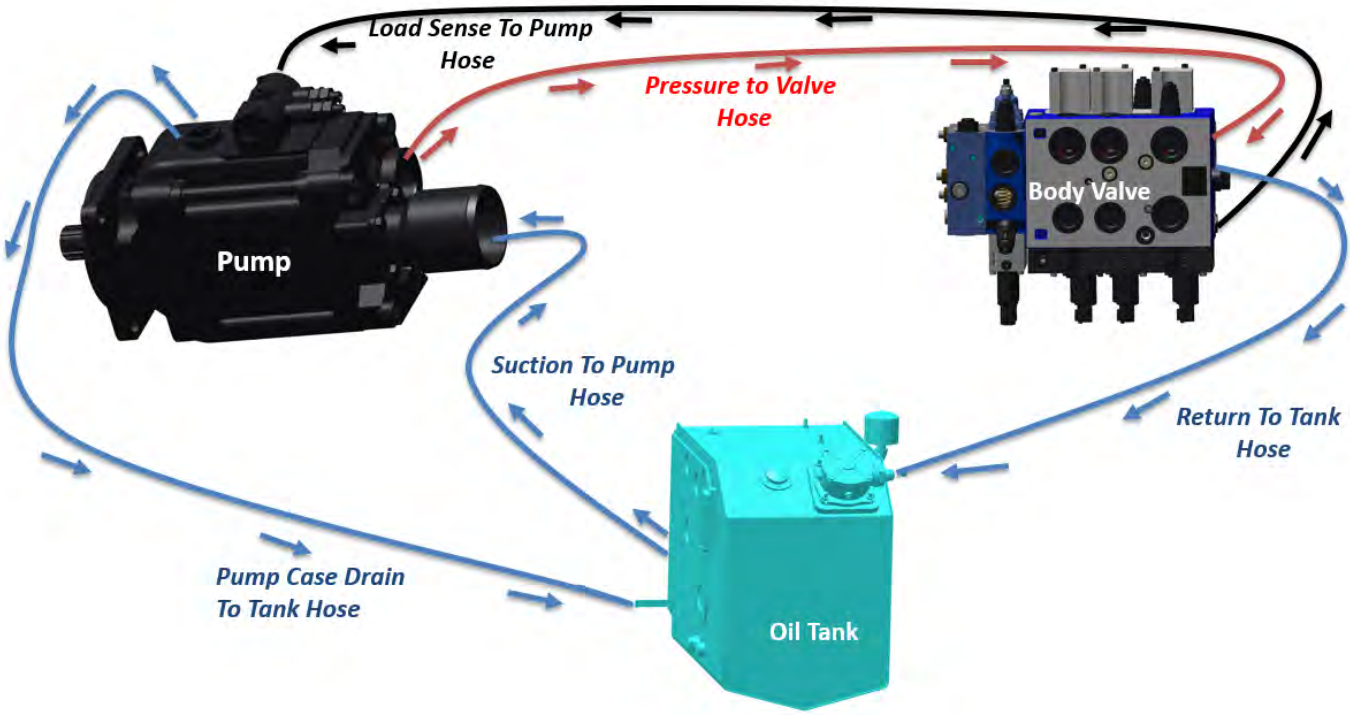
The Compensator regulates the hydraulic pressure and is preset at the factory. It is set to signal the pump to provide and maintain Stand-By Pressure (500 psi). Also, it limits the working pressure to 2500 psi. It also acts as a variable flow switch for the pump. The more pressure we provide to the load sense line from the valve, the more flow the pump provides the valve and cylinders we are using.

Please call Heil Technical Services at 866-310-4345 BEFORE attempting any adjustments. It is rare for this to be out of adjustment.



Half/Pack® Factor AFL™
Pump

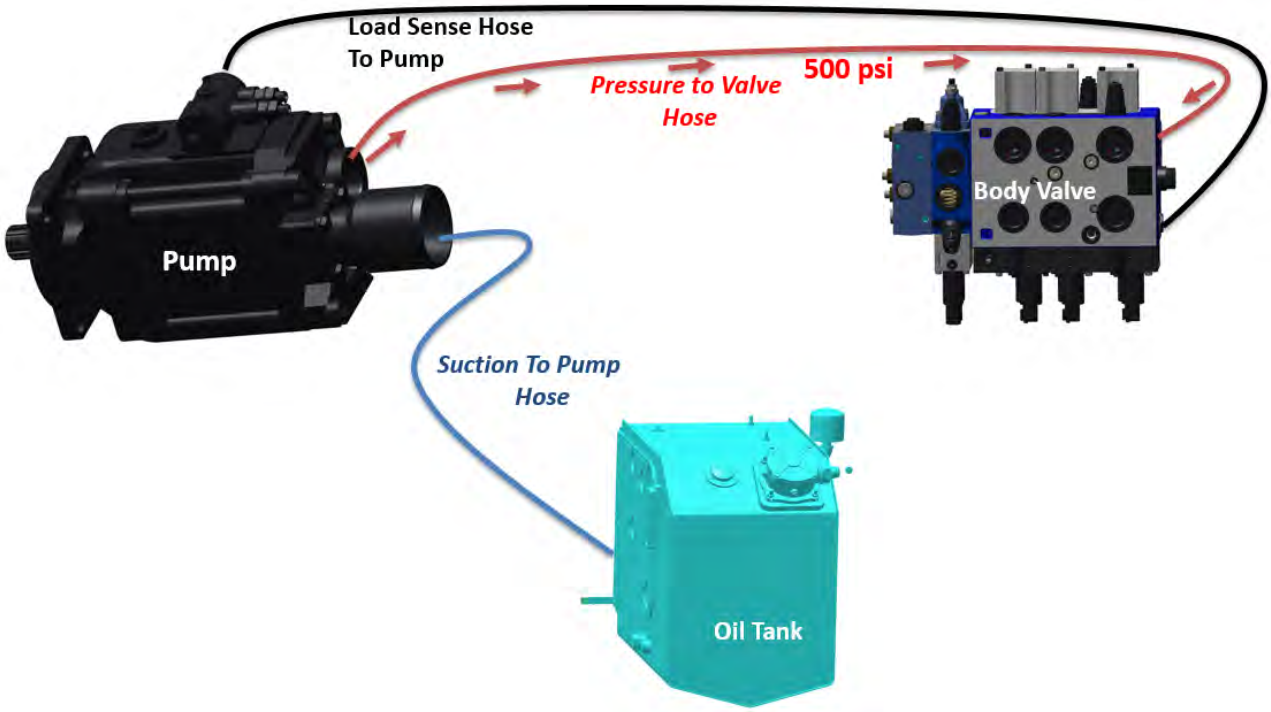
DIRECTION OF HYDRAULIC OIL FLOW



HYDRAULIC STAND-BY PRESSURE

With the engine running, pump ON and NO function has been initiated, the pressure hose should have 500 psi. This can be checked with a gauge on the gauge port at the Body Valve. This is called The Stand-By Pressure.

If there is no pressure on the gauge with the engine running and pump on, there may be a problem with the compensator located on the pump.



PUMP INSPECTION

Important Inspection Tasks

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

NOTICE

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

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

NOTICE

Damaged tubes and hoses should be replaced immediately!

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

PUMP MAINTENANCE

Important Inspection Tasks

A. Hydraulic Fluid

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

NOTICE

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

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

PUMP MAINTENANCE (CONTINUED)

⚠ CAUTION

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

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

NOTICE

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

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

PUMP REPAIR

Important Inspection Tasks

A. Troubleshooting

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

B. Repair

NOTICE

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

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

PUMP START-UP PROCEDURE

NOTICE

When installing a new pump, you MUST prime (fill) the new pump with hydraulic fluid BEFORE operating, otherwise damage WILL occur.

When replacing or re-installing the hydraulic pump after repairs, the housing of the pump must be filled with hydraulic fluid through the case drain port, either before or after mounting the transmission.

1. Attach case drain hose between the pump connection and the reservoir.
2. Connect the inlet hose to the rear of the pump and reservoir. After filling reservoir, loosen top adapter screws on the inlet and rotate hose adapter down, cracking the top of the adapter away from the pump.
3. Open the tank shut-off valve to purge as much air as possible out of the hose, filling the inlet hose with oil.
4. Tighten the inlet retainer screws, top off fluid level of the reservoir if necessary.

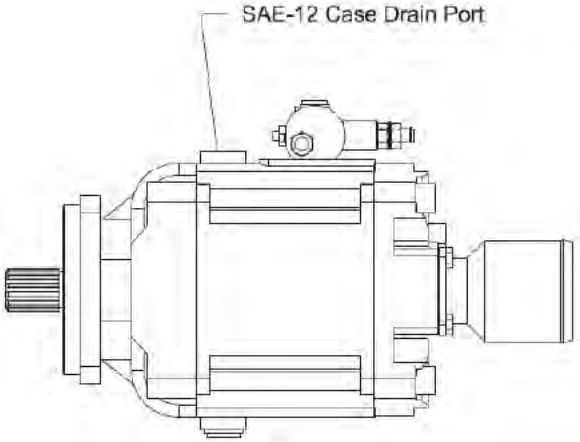


Figure 7. Case Drain Port

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NOTES

SECTION 3
BODY AND TAILGATE

BODY NOMENCLATURE

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

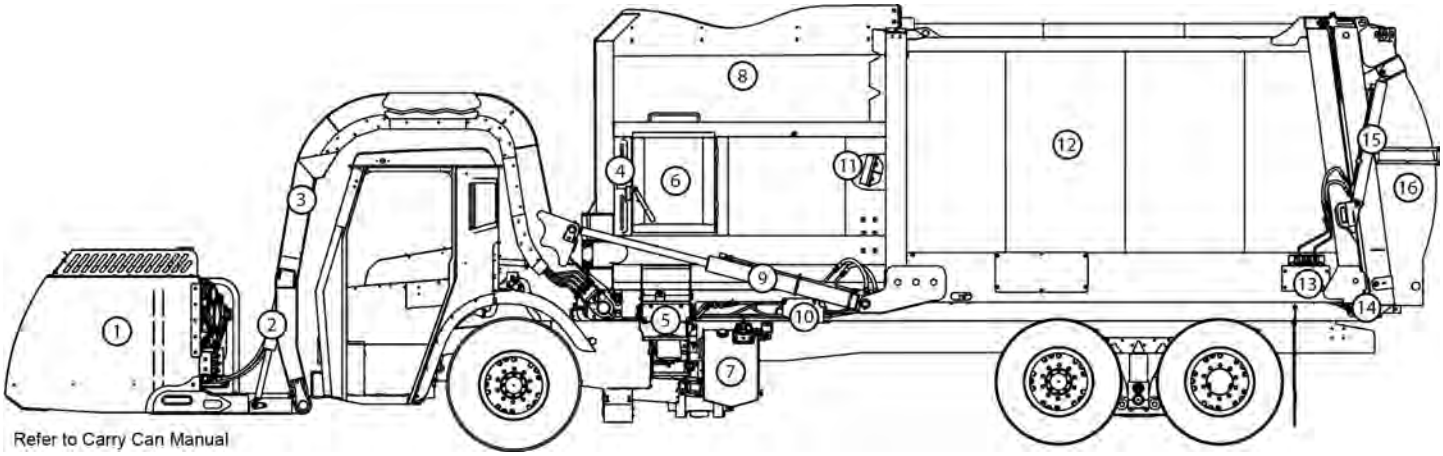


Figure 8. Body Nomenclature

NO.	DESCRIPTION	NO.	DESCRIPTION	NO.	DESCRIPTION	NO.	DESCRIPTION
1	CARRY CAN	5	SIDE DOOR ACCESS LADDER	9	LIFT ARM CYLINDERS	13	TAILGATE VALVE
2	FORKS & FORK CYLINDERS	6	SIDE DOOR	10	BODY VALVE	14	TAILGATE LOCK CYLINDER
3	LIFT ARMS	7	HYDRAULIC OIL TANK	11	ARM STOP	15	TAILGATE LIFT CYLINDER
4	PACKER/EJECTOR PANEL & CYLINDERS	8	HOPPER	12	BODY	16	TAILGATE

TAILGATE NOMENCLATURE

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

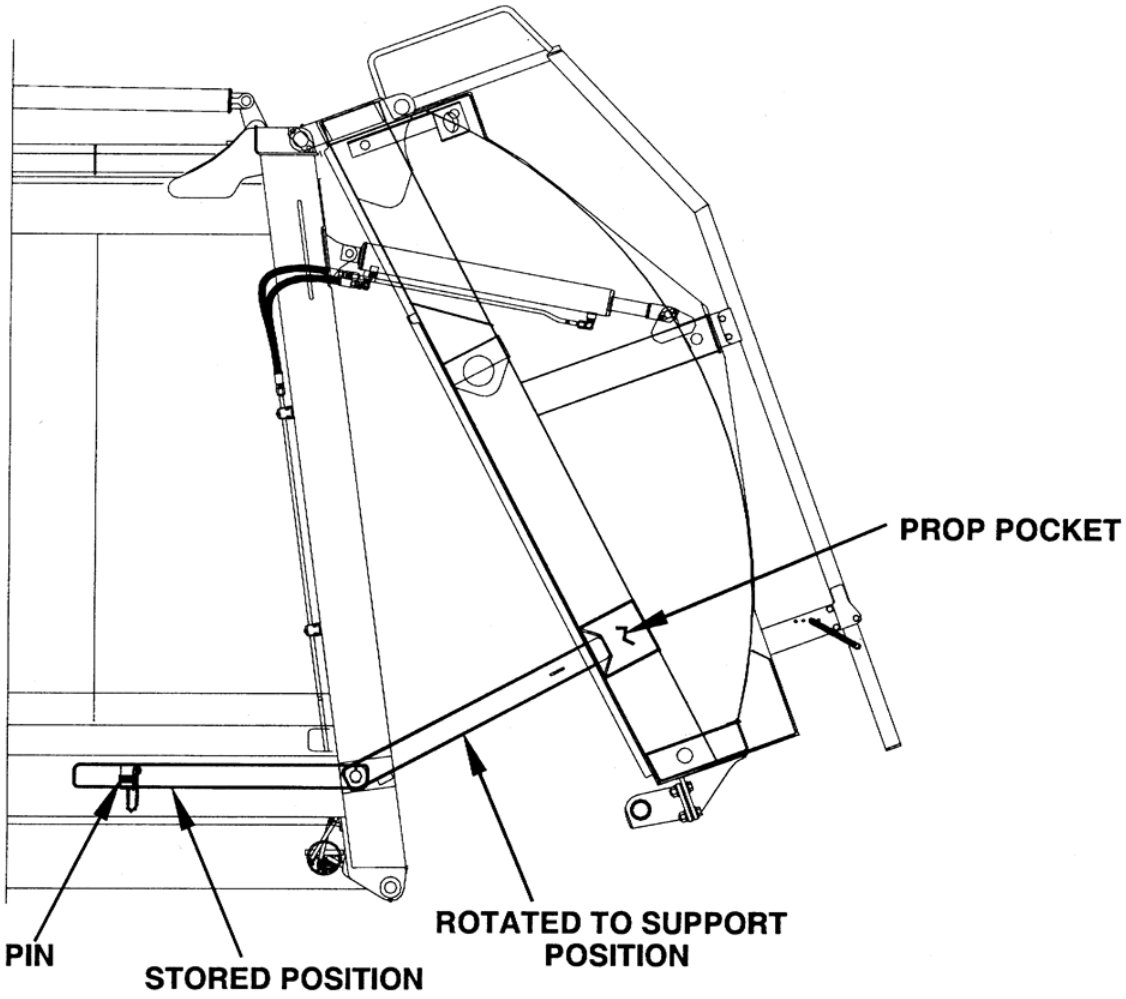
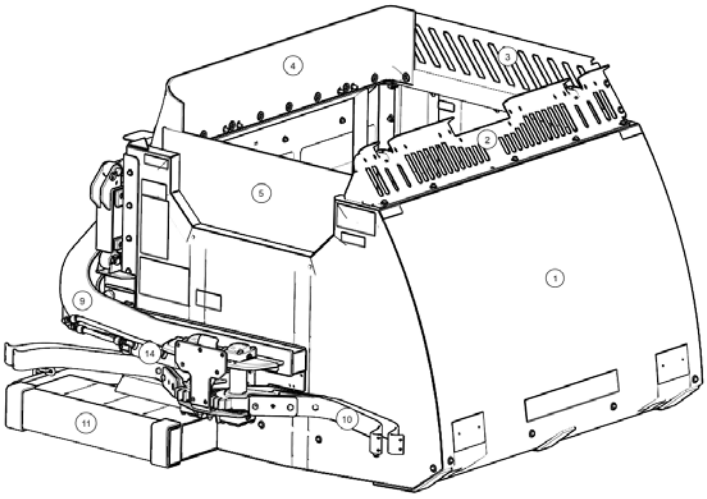
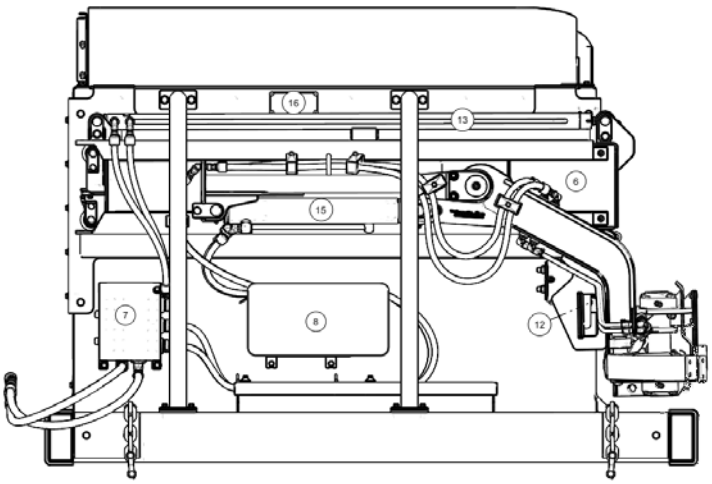


Figure 9. Tailgate Nomenclature

CUROTTO-CAN NOMENCLATURE





ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Curotto-Can Body	9	Grabber Beam Subassembly
2	Front Windscreen	10	Gripper Arms x 2
3	Street Side Windscreen	11	Fork Pocket Assembly x 2
4	Rear Spill Guard	12	Hinge Main Assembly
5	Curb Side Spill Guard	13	Slide Cylinder
6	Slide Assembly	14	Gripper Arm Cylinder
7	Hydraulic Valve/Manifold	15	Can Pivot Arm Cylinder
8	Controller Module	16	Serial Number Plate

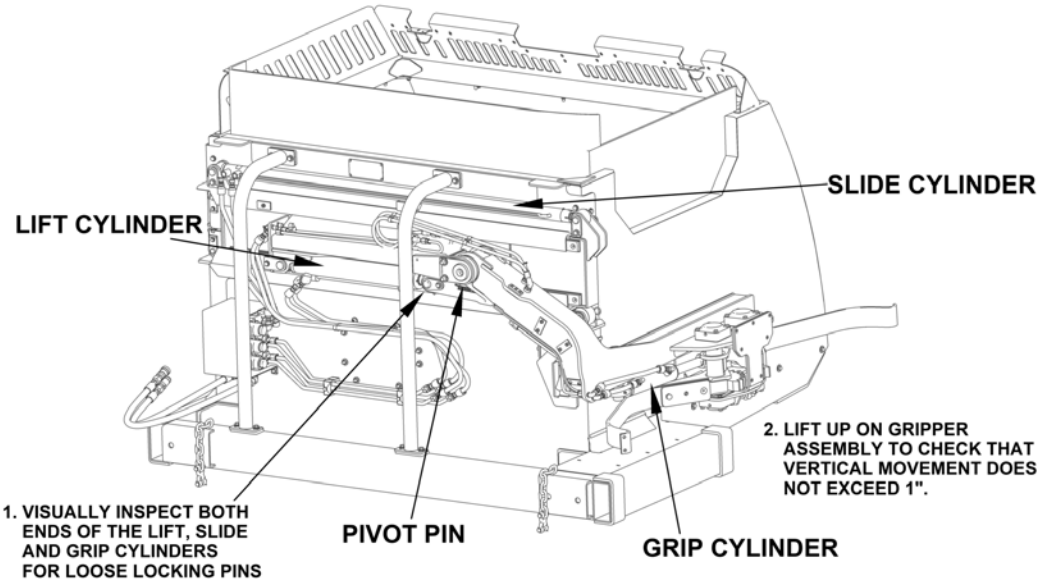
NOTE: To order Curotto-Can replacements parts, refer to the Curotto-Can Parts Book and contact Heil Parts Central at 800-528-5308.

CUROTTO-CAN TOP WEEKLY CHECKS

Always complete an Operational **Lock-Out/Tag-Out** before starting inspection. If any check does not complete successfully the Curotto-Can must be repaired before use otherwise the Warranty is void and equipment damage or operator injury could result.

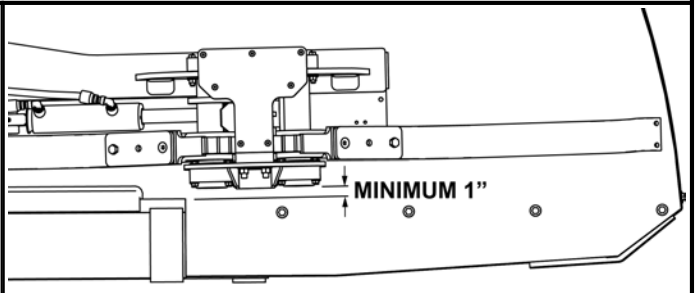
CYLINDER PIN CHECK / DUMP ARM PIVOT PEN CHECK

1. Visually inspect both ends of the Lift, Slide and Grip Cylinders for loose locking pins.
2. Lift up on Gripper Assembly to check that vertical movement does not exceed 1".



DOGBONE CLEARANCE CHECK

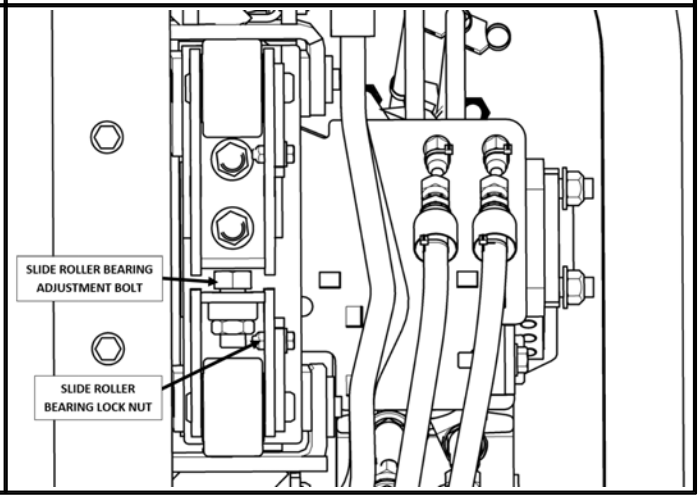
1. Check that the dogbone assembly is NOT sagging too close to the fork pocket. There must be a minimum of 1” between the dogbone and fork pocket.
2. If sagging, inspect pivot pin (see #1 for location) and the wear strips (see item #4).
3. If sagging, also adjust the lower roller bearing adjustment bolt (see Adjustable Roller for Slide/Carriage below).



ADJUSTABLE ROLLER FOR SLIDE/CARRIAGE CHECK

As the slide track wears, the arm starts to slump and the dogbone plate could come into contact with the fork tube. Check for arm slump weekly and, if needed, adjust the lower roller bearing position to keep the slide alignment parallel to the carriage.

1. Loosen lower roller bearing lock nut.
2. Turn adjustment bolt counter-clockwise until slide is parallel to the carriage.
3. Tighten lower roller bearing lock nut.



CUROTTO-CAN TOP WEEKLY CHECKS

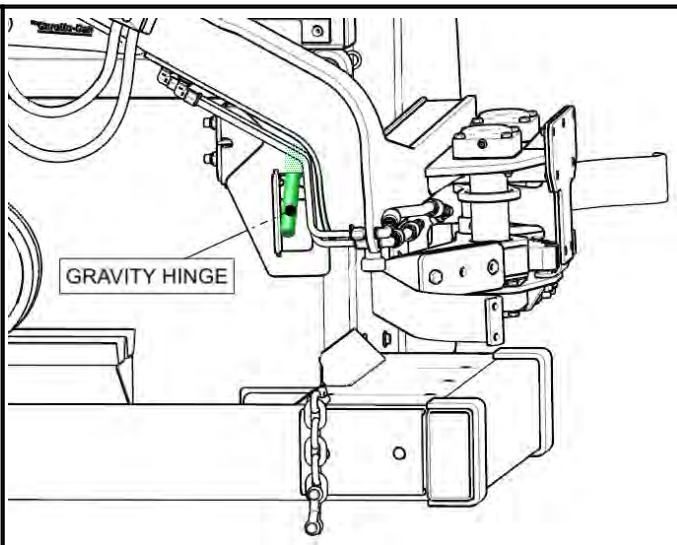
Always complete an Operational **Lock-Out/Tag-Out** before starting inspection. If any check does not complete successfully the Curotto-Can must be repaired before use otherwise the Warranty is void and equipment damage or operator injury could result.

GRAVITY HINGE CLEARANCE CHECK

1. Retract arm and slide fully.
2. Complete Operational **Lock-Out/Tag-Out** procedure.
3. Make sure that the tab swings freely into the pocket with a 3/8" to 1/2" gap.

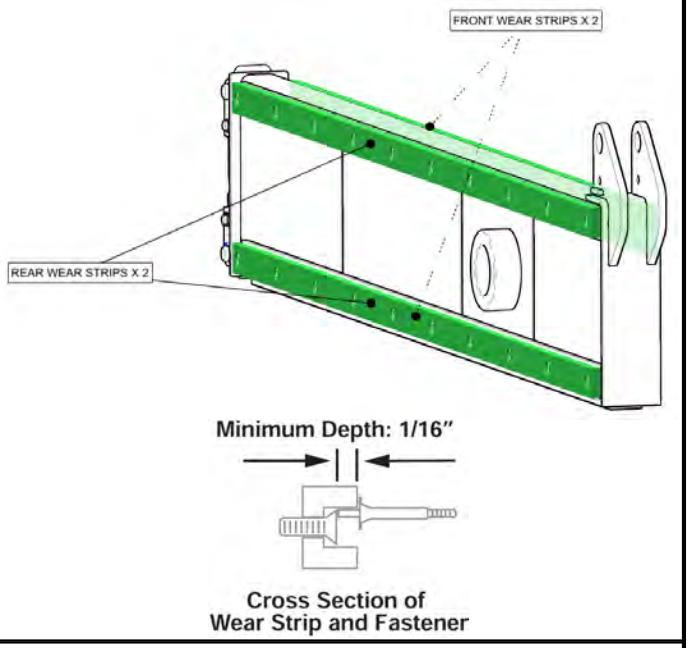
NOTICE

The specified gap prevents the face of the gripper head from traveling outboard of the fork pocket.



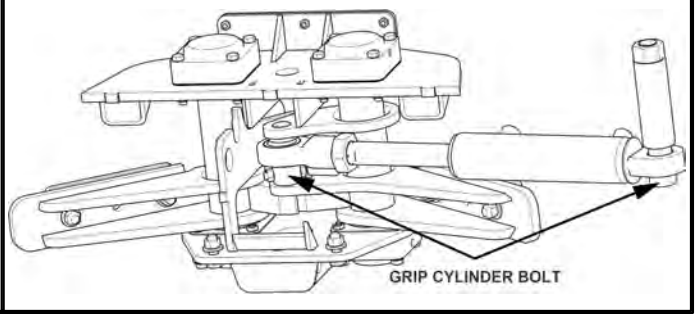
WEAR STRIP DEPTH CHECK

1. Fully extend slide out.
2. Complete Operational Lockout.
3. Check the four (4) wear strips. If depth in any one hole is less than 1/16” replace entire wear strip.
4. Also check each bolt for tightness.
5. When replacing wear strips use Loctite on all fasteners.



GRIP CYLINDER BOLT CHECK

1. Slightly open the grippers so that they are 2” from the stop pads.
2. Lift up and down on the front end of the gripper arms.
3. Arms and pivots should feel tight.
4. If loose tighten the grip cylinder bolt.
5. Use Loctite on grip cylinder bolt.



CUROTTO-CAN TOP WEEKLY CHECKS

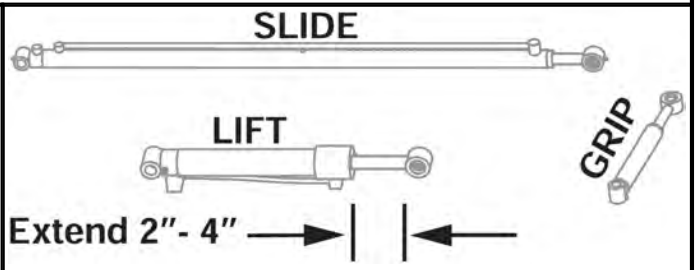
Always complete an Operational **Lock-Out/Tag-Out** before starting inspection. If any check does not complete successfully the Curotto-Can must be repaired before use otherwise the Warranty is void and equipment damage or operator injury could result.

GRIPPER BELT TENSION CHECK

1. Check buck - it must be tight, touching the inside of the gripper and not have any play or movement.
2. Check that the belt has enough tension so that it does not touch the arm. If the belt touches the arm, carts might be damaged.
3. Check that the band retainers are present and not damaged.

AUTO-RETRACT FUNCTION CHECK

1. Extend all cylinders 2” - 4”.
2. Engage ARMS UP function - all cylinders should auto retract.
3. Extend all cylinders again 2” - 4”.
4. Engage FORKS EXTEND function - all cylinders should auto retract.
5. If Auto-retract does not work - repair before using.



PACKER BLADE LOCKOUT CHECK

1. Fully retract all cylinders to their home position.
2. Raise the Curotto-Can slightly above the canopy. Note: DO NOT put the Curotto-Can in the hopper.
3. Engage AUTOPACK - packer blade should NOT move.
4. Do not run unit if packer blade moves - unit must be repaired before using.

CYLINDER CUSHION CHECK

1. Extend the slide cylinder halfway then fully retract.
2. Check for cushion on the retract function, there should be approximately 1” of cushion.
3. Close the grippers then fully extend and retract the dump cylinder.
4. Check for cushion at the top of the stroke of the dump cylinder.
5. There should be a smooth cushion of approximately 1” on the dump function.
6. The piston should not slam into the barrel in the slide retract or dump cycle.
7. No cushion ? – unit must be repaired prior to use.

SERVICE HOIST RAISE/LOWER OPERATION

Before attempting to raise and lower the body, be sure the unit is on a firm level surface with the Parking Brake ENGAGED and HOLDING. The service hoist controls are located on the street side of the unit. See Figure 45.

The factory-supplied body props are located on both sides under the body and forward of the rear wheels. Refer to Figure 46.

Observe and obey the following DANGER and WARNING notices while you prop the body with the factory body props.

⚠ DANGER

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

⚠ DANGER

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

⚠ WARNING

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

⚠ WARNING

The extra weight from the refuse or Carry Can is dangerous while you work around the unit with the body raised. The extra weight can make the unit unstable. Serious injury or death or damage to the unit can occur if you do not remove the extra weight. Do not leave refuse or the Carry Can in the body while you prop the body. Remove the refuse and/or the Carry Can from the body before you raise the body.

NOTICE

Empty body of all refuse before using body props.

Figure 10. Typical Service Hoist Controls Location

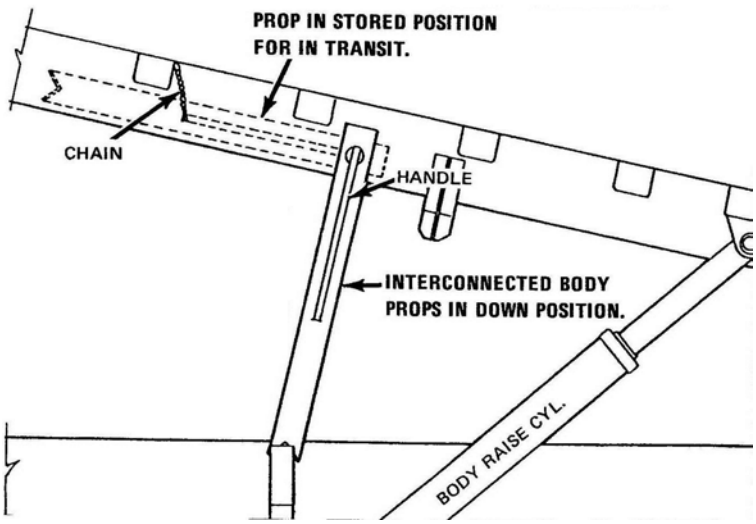


Figure 11. Factory Body Props

SERVICE HOIST RAISE/LOWER OPERATION (CONTINUED)

A. Raising the Body

1. Empty body of all refuse.
2. Make sure that body is on firm, level ground with the Parking Brake engaged and holding.
3. CLOSE the manual override valve on the power unit – PUSH the knob IN and turn it CLOCKWISE.
4. Remove the bolts and springs from the chassis mounting brackets.
5. If equipped with quick disconnects, uncouple prior to raising the body.
6. Make sure there is adequate slack in hoses that do not have disconnects. If there is not adequate slack in hoses that do not have disconnects, remove those hose clamps.
7. Observe and obey the DANGER labels for an elevated chassis.
8. PRESS and HOLD the UP button to RAISE the body.
9. RELEASE the UP button when the body is at the height you want.
10. Release the prop handles and LOWER the body props, then PRESS the DOWN button to lower the body onto the lugs.
11. **NEVER** open the override valve when the body is elevated.
12. Perform the maintenance or service procedures.

B. Lowering the Body

1. PRESS the UP button until the body is not resting on the body props.
2. RAISE the body props and store the handles.
3. Press and hold the DOWN button to lower the body.
4. Release the DOWN button when the body is completely down and resting on the chassis.
5. OPEN the manual override valve – PUSH the knob IN and turn it COUNTER-CLOCKWISE.
6. Make sure the manual override valve is open – PUSH the service hoist UP button. The body will not raise.
7. If any hose clamps were removed to create adequate slack during body raise, then re-install those hose clamps.
8. If equipped with quick disconnects, reattach the quick disconnects.
9. Install the bolts and springs to the chassis mounting brackets.

TAILGATE SUPPORT PROPS

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

⚠ DANGER

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

⚠ CAUTION

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

A. How to Use the Tailgate Props

1. Set unit on flat, stable ground, apply the parking brake, and chock the wheels.
2. Make sure the area around the tailgate is clear of all people.
3. **UNLOCK** the tailgate. Make sure the tailgate unlock flags are down (if equipped).
4. Use the tailgate raise lever or rocker switch in the cab (if equipped) and **RAISE** the tailgate enough to **RELEASE** and **ROTATE** the props so that you can **SECURE** each prop on its prop pin on each side of the tailgate.
5. **LOWER** the tailgate until you can **SECURE** each prop on its pin.
6. Turn **OFF** the engine and **REMOVE** the ignition key.
7. Put the unit in the **Lock-Out/Tag-Out** 9 mode.

B. How to Store the Tailgate Props

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

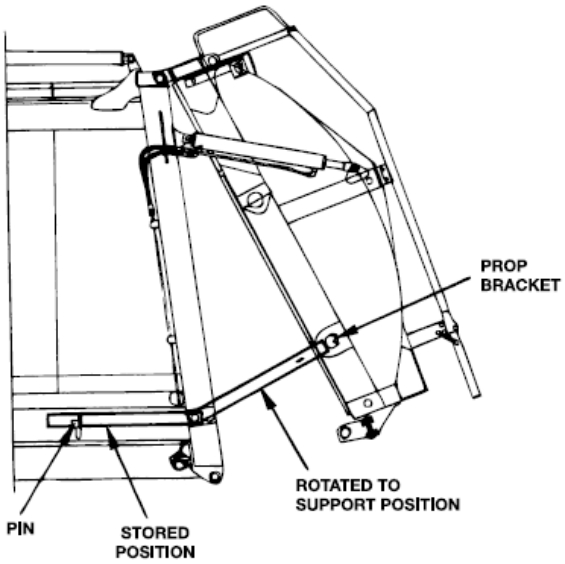


Figure 12. Tailgate Support Props

SIDE ACCESS DOOR

A hinged access door is located on the street side of the unit and provides access to the body area for cleanout purposes. Never enter the door unless the truck engine is stopped, the ignition key is removed, and the unit is in **Lock-Out/Tag-Out mode** 9. See the figure below.

⚠ WARNING

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

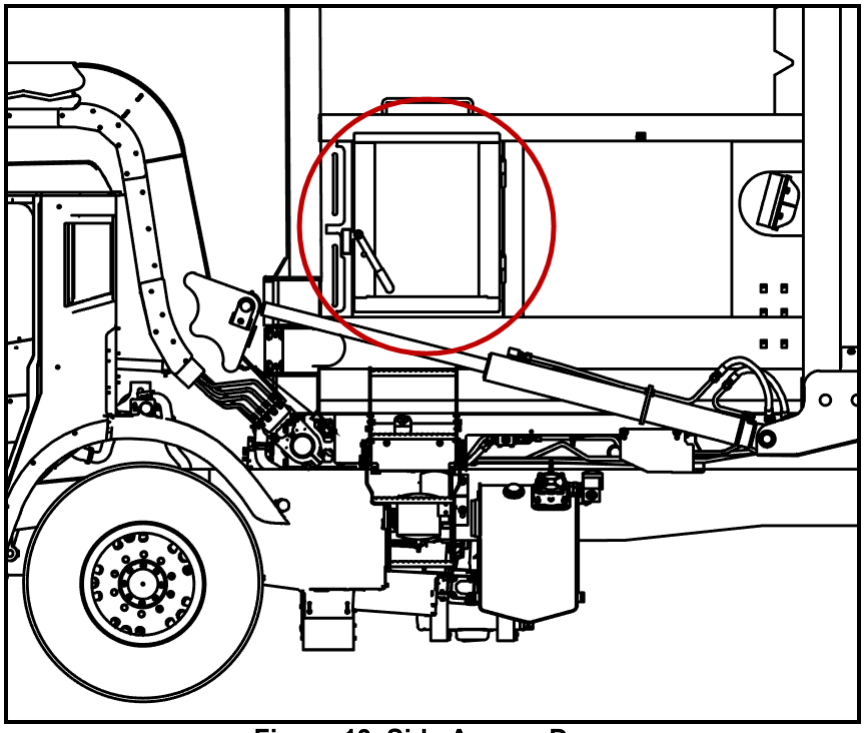


Figure 13. Side Access Door

SIDE ACCESS DOOR PROXIMITY SWITCH

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

NOTICE

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

Figure 14. Side Door Proximity Switch

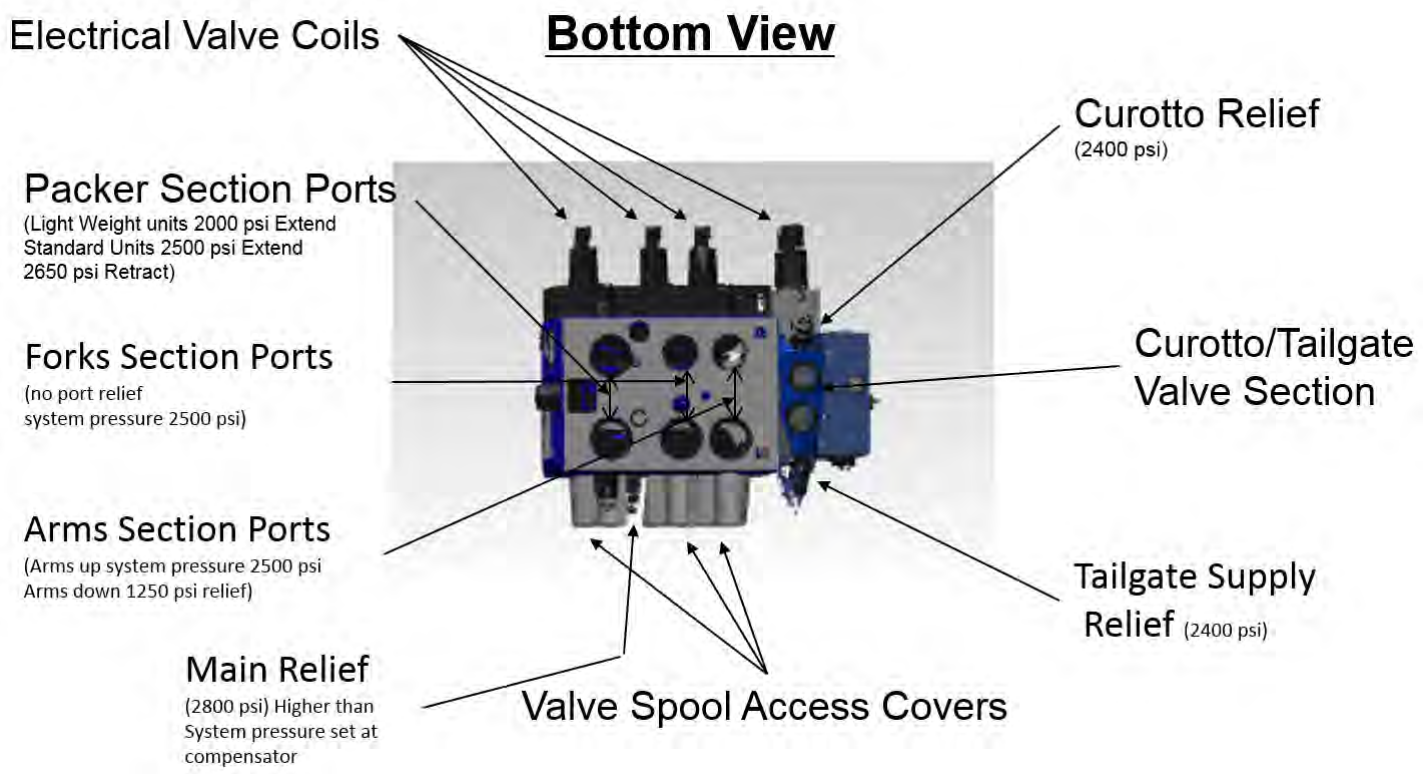
MAIN UNDERBODY VALVE

The Under Body Valve is a Proportional Control Valve. We can control how much hydraulic oil goes to these circuits by shifting the valve spools small or large amounts. This is done with Pulse Width Modulation (PWM). Instead of just 12v turning on and off a valve coil, with PWM we can control what the coil receives so we can adjust speeds and cushion the cylinders.

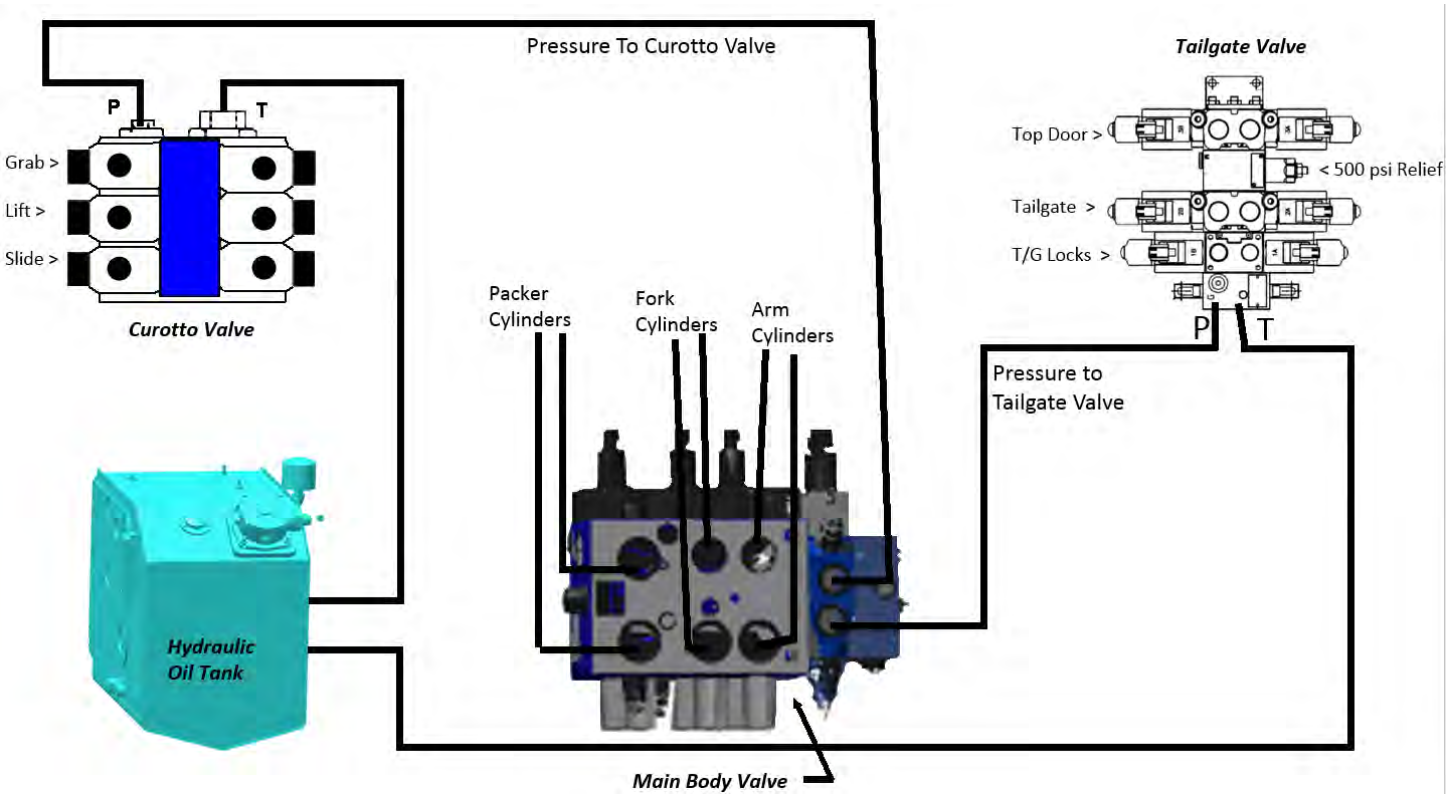
The 8 valve coils on the Main Under Body Valve are controlled by output signals from the Cortex Controller and can be viewed with the **In-Sight™ Diagnostic Display** in the cab.

On the Output section of this document we see outputs that showed PWM %. This is only used for signals going to the Under Body Valve for Pack Extend and Retract, Arms Up and Down, Forks Up and Down, and Carry Can/Tailgate sections.

A test light is the best tool to see If you are getting the signal to the valve.



BODY VALVE TO CUROTTO AND TAILGATE VALVES



INSTRUCTIONS OF INSPECTION FOR OVER-PACKING

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

A. Prepare the Unit for Inspection of Cracks

1. Before performing the inspections, you must set up the unit.
2. Clear the area around the unit of all unnecessary people and equipment.
3. Start the engine and let the hydraulic oil warm up to at least 100 degrees F. Monitor the temperature sight gauge for the temperature of the hydraulic oil. When the unit is in a cold-weather climate and the ambient air temperature is below 0 degrees F, follow the procedures in the Operator's and Service for **Cold Weather Warm-Up Procedure** 21.

⚠ DANGER

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

⚠ DANGER

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

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

⚠ DANGER

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

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

B. Lock-Out/Tag-Out

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

NOTICE

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

INSTRUCTIONS OF INSPECTION FOR OVER-PACKING (CONTINUED)

C. Over-Packing Inspections

1. Thoroughly clean the inside and outside of the body before you inspect the unit for cracks.
2. Inspect for cracks in the metal of the unit as shown in the following illustrations. (The red dots indicate the inspection points.) Check both sides of the body.

   (a) For Point 1, check inside of body where the Packer track meets front hopper head.

   (b) For Points 2 and 3, check underneath the body:

   - For Point 2, check the top edge of cross shaft lug attachment to floor sheet
   - For Point 3, check the longmember to front subframe crossmember corner.

   (c) For Points 4 and 5, check:

   - For Point 4, check the lower joint at which the three bolsters shown meet
   - For Point 5, check around the boss for the pin to attach the arm cylinder.

   (d) For Point 6, check the upper joint at which the three bolsters shown meet.

   (e) For Point 7, check the body side at the center of the body and the bend in the body side sheet.

   (f) For Point 8, check the end of the bolster on the body side.

   (g) For Point 9, with the tailgate open, check the back surface of the rear body bolster.

   (h) For Point 10, check the body roof sheet in the corner. See the figure on the next page.

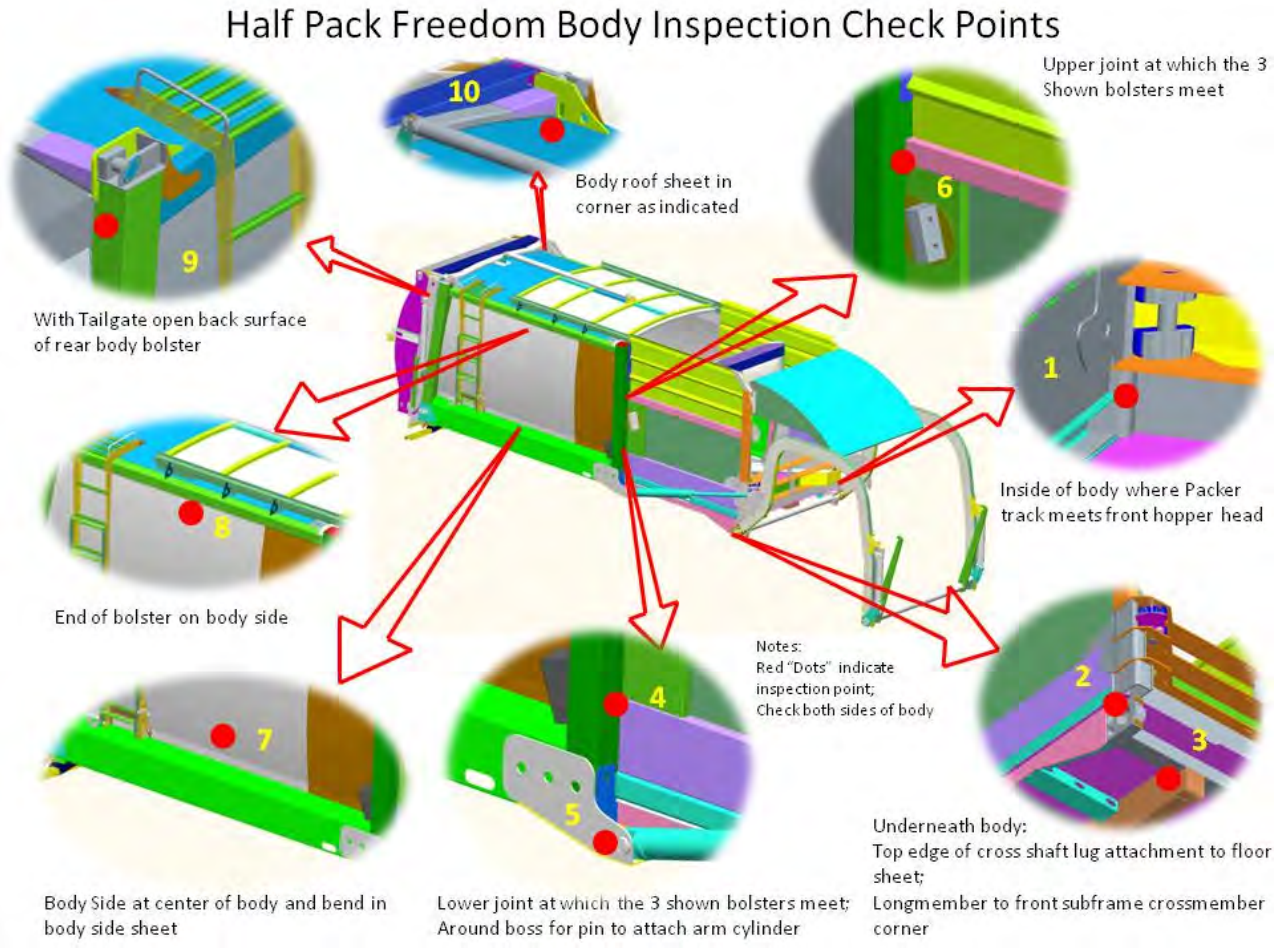


Figure 15. Front Loaders Body Inspection Check Points

INSTRUCTIONS OF INSPECTION FOR OVER-PACKING (CONTINUED)

C. Over-Packing Inspections (Continued)

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

WELDING AND ELECTRONIC DEVICES / ELECTRICAL LUBRICANTS

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

⚠ WARNING

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

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

NOTICE

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

Electrical Anti-Corrosion Lubricant

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

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

These lubricants may be obtained at an electrical supply store.

NOTES

SECTION 4
MAINTENANCE AND ADJUSTMENT

BODY DAILY CHECKLIST

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

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

BODY PREVENTIVE MAINTENANCE CHART

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

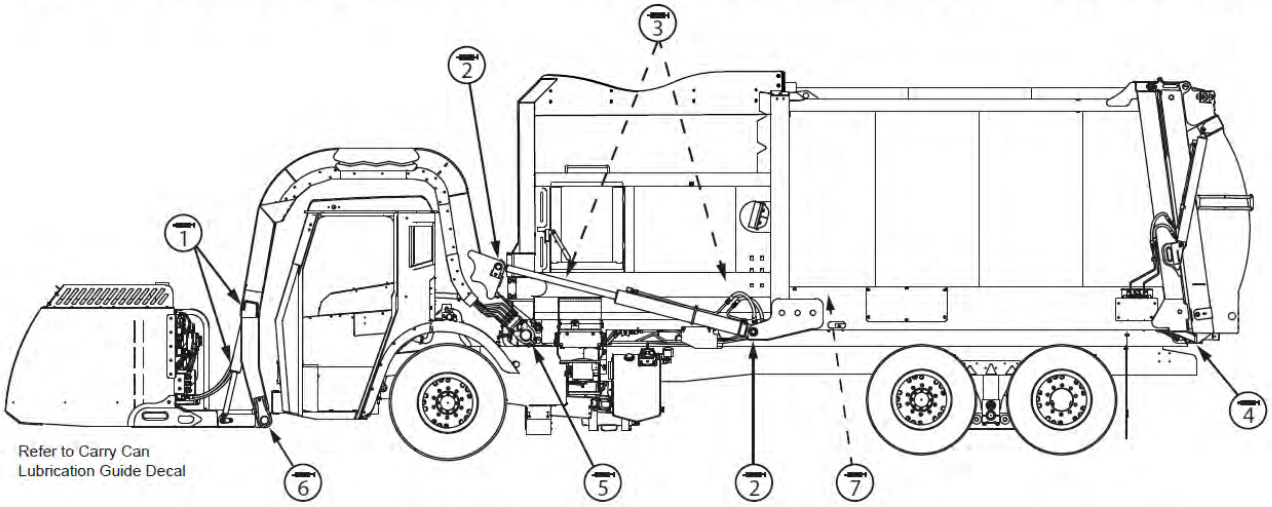
BODY PREVENTIVE MAINTENANCE CHART						
	*HOURS OF OPERATION					
COMPONENT/SYSTEM	**8**	**40**	**200**	**1000**	**2000**	**CHECK/SERVICE**
Hydraulic System	☑					Check oil level – add if necessary
		☑				Check cylinders, pump, hoses, tubes, fittings, and adapters for leaks. Check hoses for cracks, crushes, and cover blisters. Repair or replace if necessary with genuine Heil parts. Any replacement hose should be the same size and pressure rating as listed on the original OEM hose.
		☑				Check Control valve seals for leaks. Repair or replace if necessary.
				☑		Replace filter 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.
Electrical, Battery Cables	☑					Check for proper operation.
		☑				Check battery cables from battery to starter for loose cables, rubbing or damage and abrasions to cables. Replace if necessary.
Operator Controls	☑					
Front Mount Pump or Power Take-Off (PTO)		☑				Check seals for leaks and operation. Replace if necessary
		☑				Check drive line for smooth operation. Replace as necessary.
		☑				Check set screws for tightness. Tighten as necessary.
		☑				Make sure keys are in place. Replace if necessary.
			☑			For greaseable PTOs (non-wet spline), remove the pump's bolt flange about 2 inches from the PTO and apply grease to female pilot of PTO pump flange. Failure to lubricate female pilot of PTO as given may cause damage to the pump shaft. Greasing is NOT required on wet spline PTOs such as the Chelsea 890/897 series.

BODY PREVENTIVE MAINTENANCE CHART						
*HOURS OF OPERATION						
COMPONENT/SYSTEM	**8**	**40**	**200**	**1000**	**2000**	**CHECK/SERVICE**
Grease Fittings		☑				Lubricate as shown on **Body Lubrication Guide** 59.
Body Undercoating					☑	Inspect body undercoating and repair as necessary.
Fork Bearing Block Bolts			☑			Each of the four fork bearing block bolt torques should be 460 Ft-Lbs.
Calibrate Cylinder Sensors					☑	Calibrate cylinder sensors. See **Cylinder Sensors Calibration** 68.
Tailgate Seal Integrity	☑					
Packer/Ejector Cylinder Preventive Maintenance	☑	☑	☑			See **Packer/Ejector Cylinder Preventive Maintenance**.
Packer/Ejector Panel Bolt-in Cylinder Mount Bolts			☑			Check for tightness. Bolt torques should be 192 Ft-Lbs. (lubricated threads)
* Daily = 8 hrs. Weekly = 40 hrs. Monthly = 200 hrs. 6 Months = 1000 hrs. Yearly = 2000 hrs.						

BODY LUBRICATION GUIDE

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

HALFPACK (featuring ODYSSEY™ CONTROLS) BODY LUBRICATION GUIDE



REF NO.	DESCRIPTION	QTY.	FREQUENCY	REF NO.	DESCRIPTION	QTY.	FREQUENCY
1	FORK CYLINDERS	4	Weekly/Every 50 Hours	5	ARM CROSS SHAFT	4	Weekly/Every 50 Hours
2	ARM CYLINDERS	4	Weekly/Every 50 Hours	6	FORK CROSS SHAFT	2	Weekly/Every 50 Hours
3	PACKER/EJECTOR CYLINDERS	4	Weekly/Every 50 Hours	7	PACKER PANEL TRACKS	2	Monthly/Every 200 Hours
4	SHUR-LOCK TAILGATE CYLINDER BRACKET	2	Weekly/Every 50 Hours				

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

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

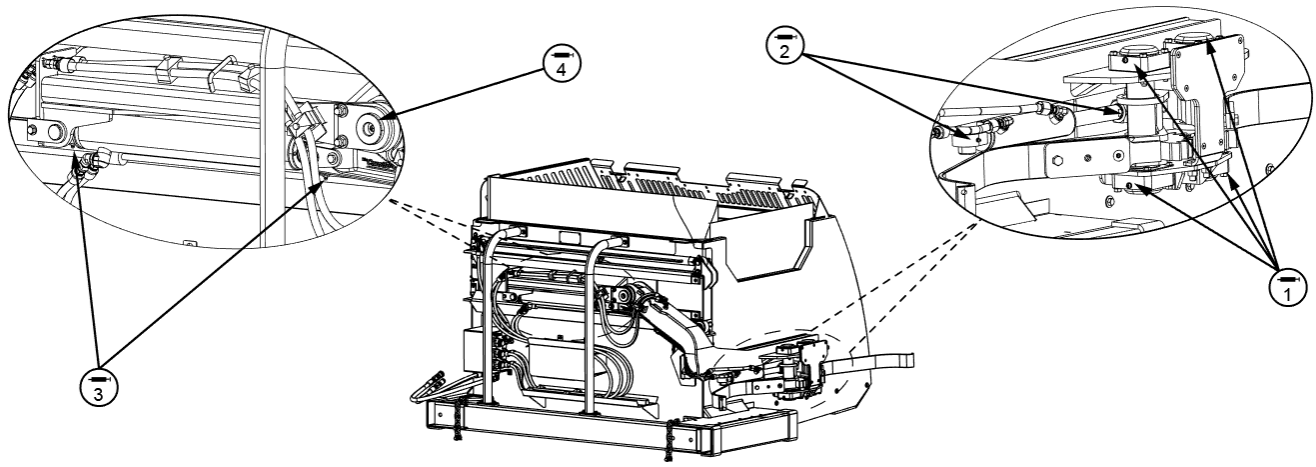
212-3352

CUROTTO-CAN 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.

The Curotto-Can comes standard with a multiple point lubrication system or with an optional single point lubrication system.

CUROTTO-CAN LUBRICATION GUIDE



REF NO.	DESCRIPTION	QTY.	FREQUENCY
1	BEARING CAPS 4 PLACES	4	WEEKLY/EVERY 40 HOURS
2	GRIPPER CYLINDER	2	WEEKLY/EVERY 40 HOURS
3	LIFT CYLINDER	2	WEEKLY/EVERY 40 HOURS
4	MAIN PIVOT PIN	1	WEEKLY/EVERY 40 HOURS

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

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

212-3412

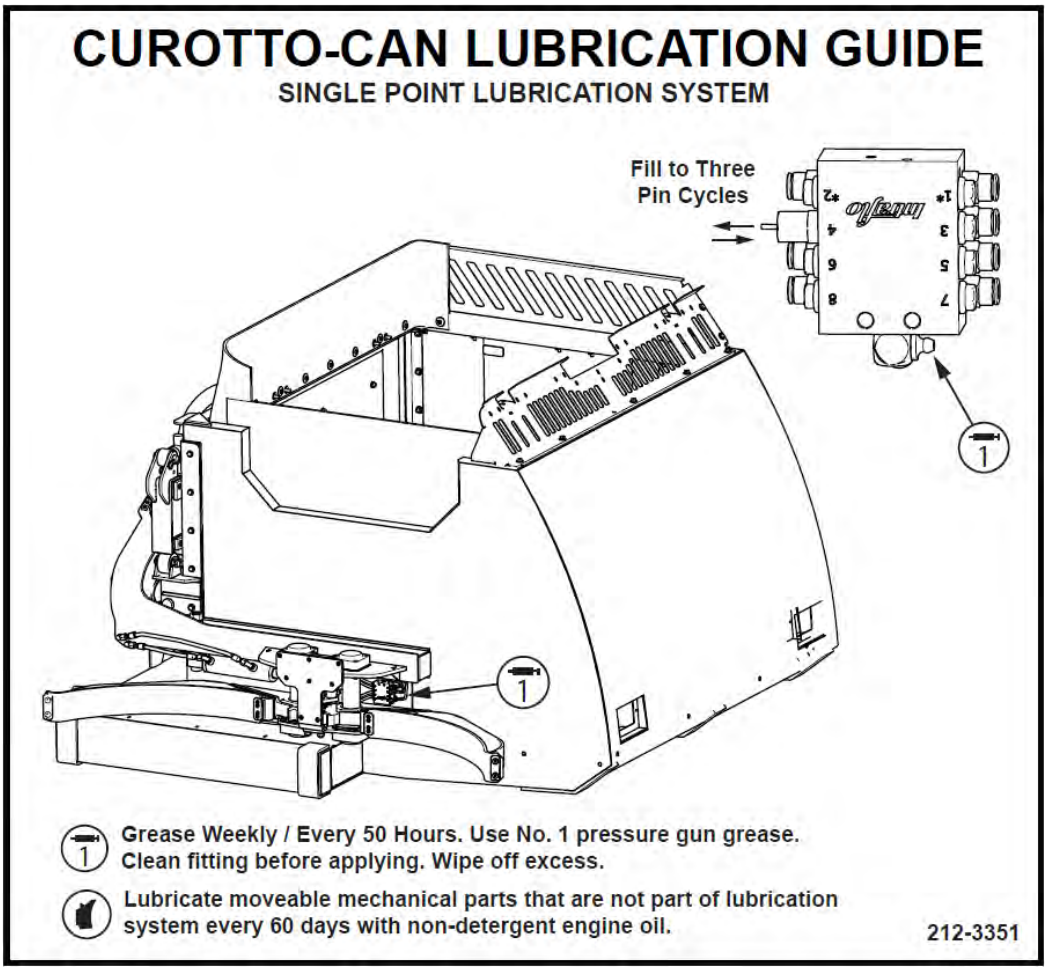
CUROTTO-CAN OPTIONAL SINGLE POINT LUBRICATION GUIDE

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.

The Curotto-Can comes standard with a multiple point lubrication system or with an optional single point lubrication system.

For the Single Point Lubrication System:

- Both the grease and the fittings MUST be clean
- There MUST not be any blocked lines or ports due to its series operation. Never cap or block any of the lubrication lines as this will the block flow of grease to the entire system. Repair any damaged lines or system components immediately.



PACKER/EJECTOR CYLINDERS PREVENTIVE MAINTENANCE

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

⚠ WARNING

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

⚠ CAUTION

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

HEIL PACKER/EJECTOR CYLINDERS PREVENTIVE MAINTENANCE CHART

DAILY	WEEKLY	MONTHLY
• Using a plastic bladed shovel, clean behind the packer panel and pockets around sphericals. DO NOT damage cylinder rods by striking with any metal object. • Visually inspect that lube lines (if equipped) are connected and not damaged or leaking. • Visually inspect packer tracks and hopper floor for excessive wear or damage. Repair or replace if necessary.	• Grease Packer/Ejector cylinder spherical bearings/pins • Inspect packer/ejector cylinder bearings/pins (both ends) for wear, rust or damage and replace if necessary.	Perform the operational “Checks and Inspections” found in the Operation Manual. If unit recalibration is required, refer to **Cylinder Sensors / Arc Sensor Calibration** 68 in Service Manual.

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 (see figure to right)

PACKER/EJECTOR PANEL ADJUSTMENT

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

NOTICE

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

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

INSIGHT™ DIAGNOSTIC DISPLAY

The Heil InSight Display is the information center for the operator and troubleshooting tool for the service mechanic. The next few pages cover basic functionality. For additional information, see **Dedicated Half/Pack Factor AFL Cortex Controller™ Program 109-0305** 94 in the **Body Controller Software** 93 section of this manual.

For the operator, it shows operation warnings and explains why the system may prevent a function so the operator can correct and operate in a safe and productive manner.

For the service technician, it displays information regarding sensor failures, and with proper training, can be used to test sensors and other inputs and output functions.

When the truck key switch is on, the home screen below will be displayed. This screen will show the operator various cab control conditions, including if:

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

HOME
Press this button anytime you want to return to the home screen

COUNTERS
Press to enter counter screen

CAMERA
If cameras are wired into this display, press this button to enter camera mode

BRIGHTNESS
Press to change brightness of screen

OPTIONS
Press to enter option configuration screen

SERVICE
Press to view Inputs, Outputs, Setpoints and Power screens

CALIBRATION
Press to enter Calibration Mode

MAINTENANCE
Press to enter maintenance mode used to Reset Counters and enter Service Mode

NAVIGATION / ENTER BUTTON
Press UP, DOWN, LEFT and RIGHT to scroll through Inputs, Outputs or other data. Press center button for OK, to confirm selection.

DIAGNOSTIC DISPLAY MESSAGES

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

See **Body Controller Software Section** 93 for display screen shots of potential diagnostic messages, listed disabled functions and instructions for fault reset.

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

SERVICE SCREENS

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

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

SERVICE
Press to view Inputs, Outputs, Setpoints and Power screens

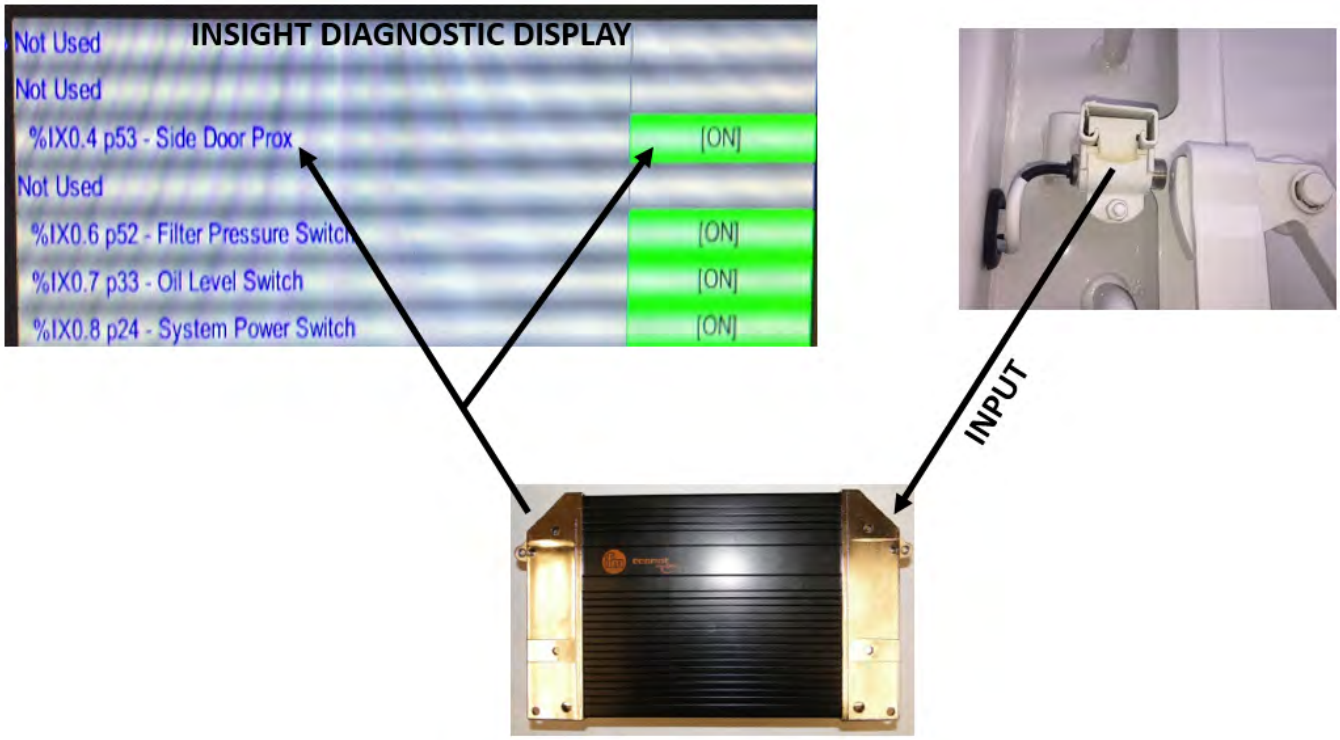
INPUTS / OUTPUTS

A. Inputs

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

Example Input:

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



INPUTS / OUTPUTS (CONTINUED)

B. Outputs

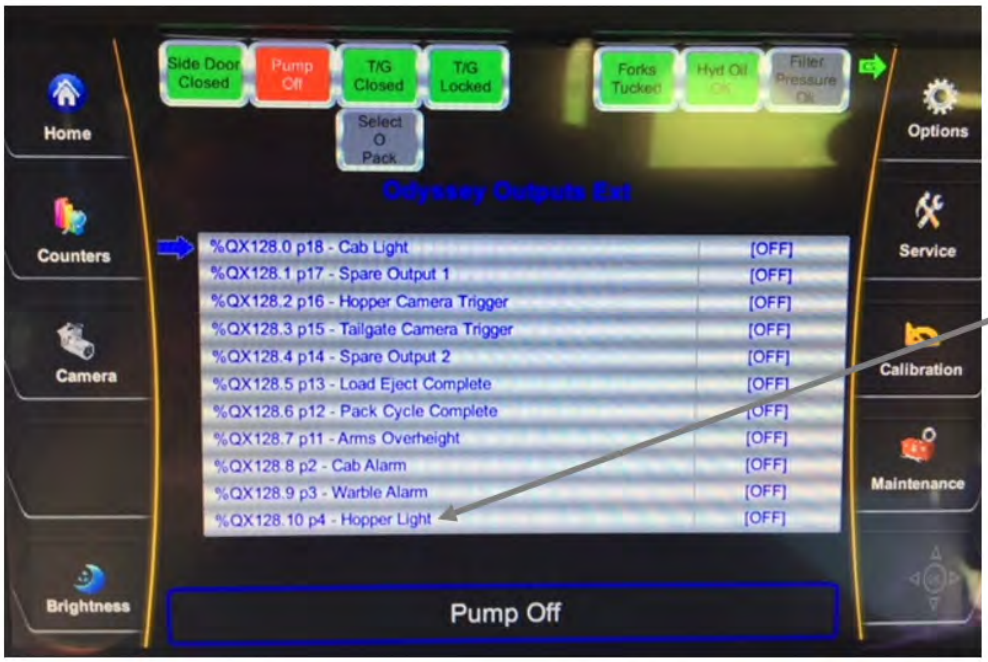
Outputs are signals sent out of the Cortex Controller to turn something ON or to make something happen. Any signal that is sent out of the controller is an output. Output examples are: Signals sent to valve coils that move a valve spool or to turn on a light. See the figure below.

Example Output:

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

Output signals send power to:

- Coils/Solenoids
- Lights
- Body Valve Coils/Pulse Width Modulation (PWM)
  - Packer Extend PWM
  - Packer Retract PWM
  - Forks Up PWM
  - Forks Down PWM
  - Arms Up PWM
  - Arms Down PWM
  - Tailgate Flow PWM
  - Curotto-Can Flow PWM
- Curotto-Can Valve Coils/SOL
- Tailgate Valve Coils/SOL
- Screen readouts



SERVICE MODE

The Half/Pack (featuring Odyssey Controls) units have a Service Mode within their Cortex Controller™ programming initiated on the InSight™ Diagnostic Display. Service Mode is to be used ONLY by authorized service personnel in the event of a Cylinder or Packer Sensor failure on route to recover to a safe arms and forks position. Service Mode can also be used to move the functions while servicing a failed Cylinder Sensor.

NOTICE

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

NOTICE

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

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

CYLINDER SENSORS

Half/Pack (featuring Odyssey Controls) uses linear position sensors inside the street side arm and fork cylinders to transmit arm/fork positional data to the Cortex Controller™. These cylinder sensors cannot be replaced in the field. It is recommended to calibrate these sensors annually to compensate for mechanical drifting of components. See **Cylinder Sensors / Arc Sensor Calibration**.

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

CYLINDER SENSORS / ARC SENSOR CALIBRATION

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

NOTICE

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

1. Place the unit in **Calibration Mode**
   - **a.** On the InSight™ Diagnostic Display, enter Calibration Screen and hold the OK button down for 5 seconds and release.
   - **b.** The password screen will appear on the display.
   - **c.** Enter the Calibration Password provided by Heil Technical Services and press OK. Contact Heil Technical Services for the Calibration Password.
   - **d.** The display will now walk the Authorized Service Person through the calibration routine with prompts on the display.
   - **e.** The Authorized Service Person can cancel the calibration routine at any point or skip a section by selection ESC or SKIP from the menu.

CYLINDER SENSORS CALIBRATION (CONTINUED)

NOTICE

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

2. Perform the calibration steps below.

a. Place Arms all the way DOWN and fully retract the Packer Blade – press OK (the display will move to the next screen)

b. Raise the arms to just below the top of the windshield – press OK (this is the arms interlock position, 47°)

c. Raise the arms to the forks roll position (as shown on the display, 72°) – press OK

d. Raise the arms to the fully raised position – press OK (this is the arms fully raised position)

e. Lower the arms all the way down.

f. Lower the forks parallel to the ground (load position, 82°) – press OK

g. Raise the forks to the Forks Clear position (70°) – press OK

h. Extend the packer manually to the end of the first stage of the cylinder – Press OK (this is the packer fully extended position)

i. Extend the packer to just inside the body – press OK (this is the packer travel position)

j. At this point the truck is calibrated and pressing OK finishes the sequence.

COLD WEATHER WARM-UP PROCEDURE

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

⚠ WARNING

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

Follow the steps below to warm up the hydraulic oil.

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

PREPARING THE UNIT TO CHECK THE OIL LEVEL

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

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

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

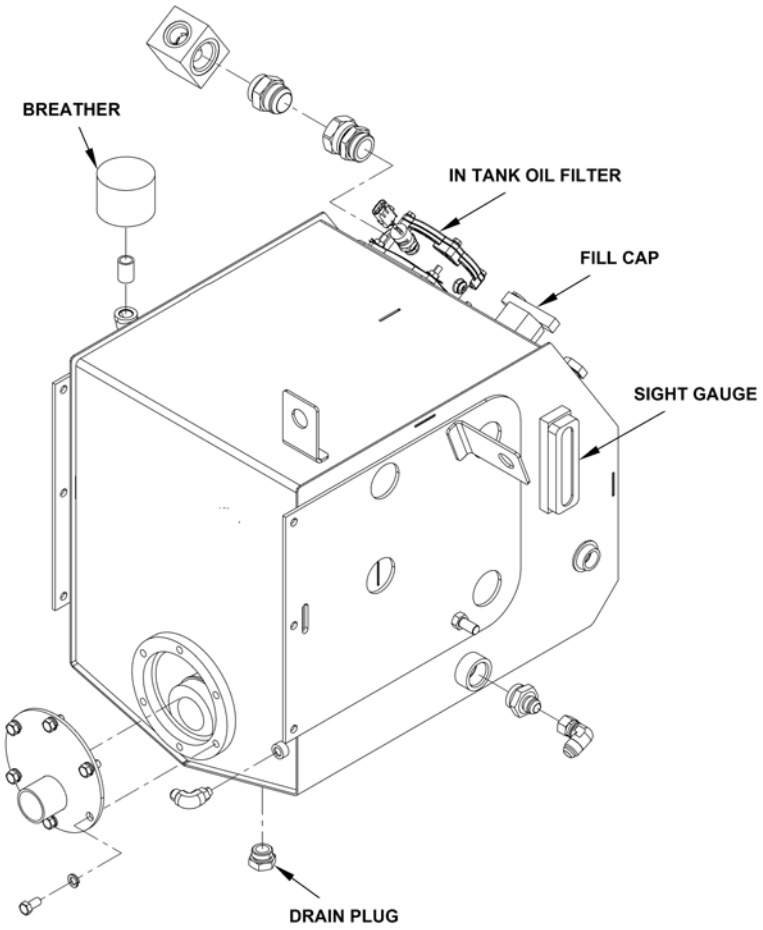


Figure 16. Hydraulic Oil Tank and Sight Gauge

CHECK OIL LEVEL

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

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

WHEN TO CHANGE OIL FILTER ELEMENT

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

Change the filter element every 1000 hours or every six (6) months or when indicated by the filter monitor light located in the cab.

CHANGE HYDRAULIC OIL FILTER ELEMENT

To change the hydraulic oil filter, refer to the figure below and follow these steps:

1. Remove nuts and filter cover.
2. Remove the filter element with the by-pass assembly and discard as required.
3. Clean the housing with a clean, lint-free cloth.
4. Check the o-ring and gasket. Replace them if necessary.
5. Lubricate all o-rings and gaskets.
6. Install new element.
7. Reinstall cover with nuts. Torque nuts to 13 ft/lbs.

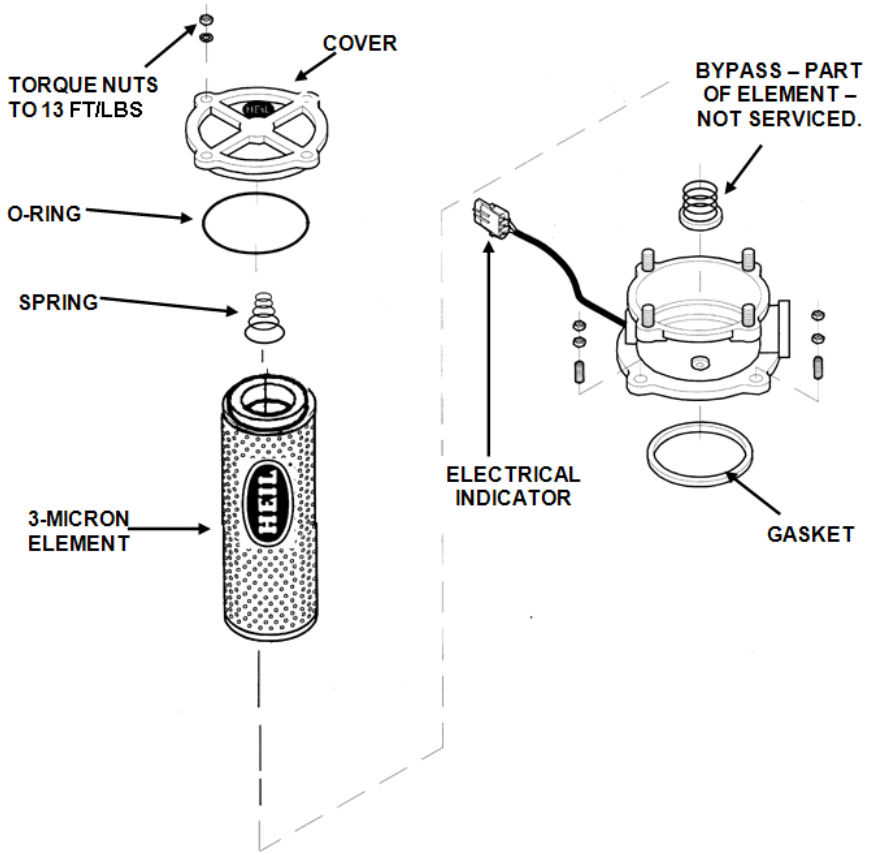


Figure 17. Hydraulic Oil Filter

DRAIN AND CLEAN THE HYDRAULIC OIL TANK

Change the hydraulic oil at least annually or every 2000 hours of operating time, whichever comes first.

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

⚠ CAUTION

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

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

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

⚠ WARNING

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

NOTICE

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

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

DRAIN AND CLEAN THE HYDRAULIC OIL TANK (CONTINUED)

NOTICE

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

13. Fill tank with recommended oil, checking the sight gauge as you fill. Refer to **Hydraulic Oil Specifications** 10.
14. Check the entire system to make sure all connections are tight and no leaks are found.
15. Start the truck's engine and engage the pump.

⚠ WARNING

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

16. Operate the packing panel through 10 cycles to be sure all air is out of the circuits.
17. Operate the automated container lift mechanism.
18. Operate tailgate – full up and full down.
19. Operate body raise (dump units) – full up and full down.
20. With the packing panel in the retracted position and lift in the in-transit position, check tank oil level. If necessary, add recommended as described under **Check Oil Level** 72.

PRESSURE ADJUSTMENT PROCEDURES

A. Unit Preparation

Follow these unit preparation steps prior to making any pressure adjustments listed in this section. Reliefs must be set at idle.

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

Figure 18. Main Body Valve with Cover

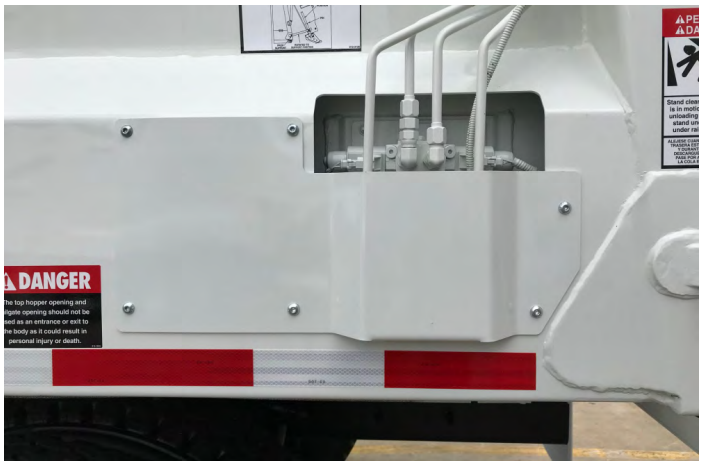


Figure 19. Tailgate Valve with Cover

PRESSURE ADJUSTMENT PROCEDURES (CONTINUED)

D. Pressures and Cycle Times

			Half/Pack Factor AFL	
			Diesel	**CNG**
HYDRAULIC PRESSURES	**UNDERBODY VALVE**	**MAIN RELIEF @1200 ENGINE RPM**	2800 PSI	2800 PSI
		PACKER EXTEND	STANDARD/SIERRA 2650 PSI SIERRA/FREEDOM 2000 PSI	STANDARD/SIERRA 2650 PSI SIERRA/FREEDOM 2000 PSI
		PACKER RETRACT	2650 PSI	2650 PSI
		ARMS UP	NO CIRCUIT RELIEF	NO CIRCUIT RELIEF
		ARMS DOWN (5500# ARMS)	1250 PSI	1250 PSI
		FORKS UP	NO CIRCUIT RELIEF	NO CIRCUIT RELIEF
		FORKS DOWN	NO CIRCUIT RELIEF	NO CIRCUIT RELIEF
		AUXILIARY SECTION-TAILGATE VALVE SUPPLY	PORT RELIEF - 2400 PSI / LOAD SENSE RELIEF - 2000	PORT RELIEF - 2400 PSI / LOAD SENSE RELIEF - 2000
		AUXILIARY SECTION-OPTION VALVE SUPPLY - SEE NOTE 3	PORT RELIEF - 2400 PSI / LOAD SENSE RELIEF - 2000	PORT RELIEF - 2400 PSI / LOAD SENSE RELIEF - 2000
	TAILGATE VALVE	**TOP DOOR CLOSE**	580 PSI	580 PSI
		TOP DOOR OPEN	725 PSI	725 PSI
		TAILGATE OPEN	1300 PSI	1300 PSI
		TAILGATE CLOSE	NO CIRCUIT RELIEF	NO CIRCUIT RELIEF
		TAILGATE UNLOCK	NO CIRCUIT RELIEF	NO CIRCUIT RELIEF
		TAILGATE LOCK	NO CIRCUIT RELIEF	NO CIRCUIT RELIEF

CUROTTO CAN						
	ARM FULL EXTEND	**ARM FULL RETRACT**	**LIFT ARM UP**	**LIFT ARM DOWN**	**GRABBER OPEN**	**GRABBER CLOSE**
CYCLE TIME @ IDLE	1.5-2.0 sec	1.5-2.0 sec	1.0-1.5 sec	1.25-1.75 sec	<0.75 sec	0.75 sec-1.0 sec

PRESSURE ADJUSTMENT PROCEDURES (CONTINUED)

D. Pressures and Cycle Times (Continued)

NOTES:	1. Main Pressure settings have a tolerance range of +/- 50 p.s.i. and are to be set at operating speed - WI594
	2. Port Relief Pressure settings have a tolerance range of +/- 100 p.s.i. and are to be set at operating speed - WI594
	3. Options include: Carry Can Hydraulic Supply, Commercial Gripper, Adjustable Forks, Hydraulic Cab Shield
	4. Throttle Advance set to 1250 rpm
	5. Unless noted, all pressures are good for Standard, Sierra, and Freedom units
	6. Cycle Times based on 700 RPM at idle.

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

CLAMP-ON ARM BOLTS MAINTENANCE

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

NOTICE

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

NOTICE

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

Torque as follows:

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

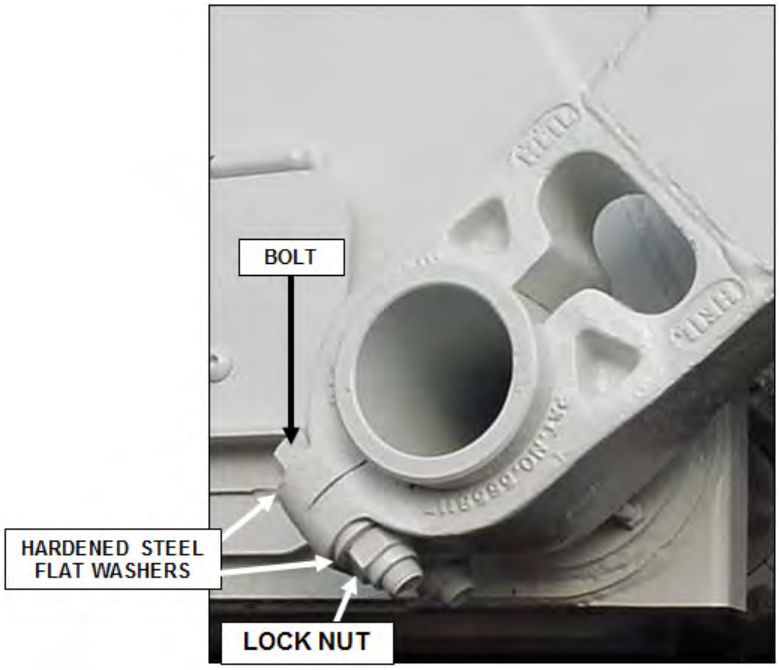


Figure 20. Clamp-on Arm Bolts Maintenance

REPAIRING CRACKED WELD JOINTS

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

CLEAN AND INSPECT THE TAILGATE SEAL

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

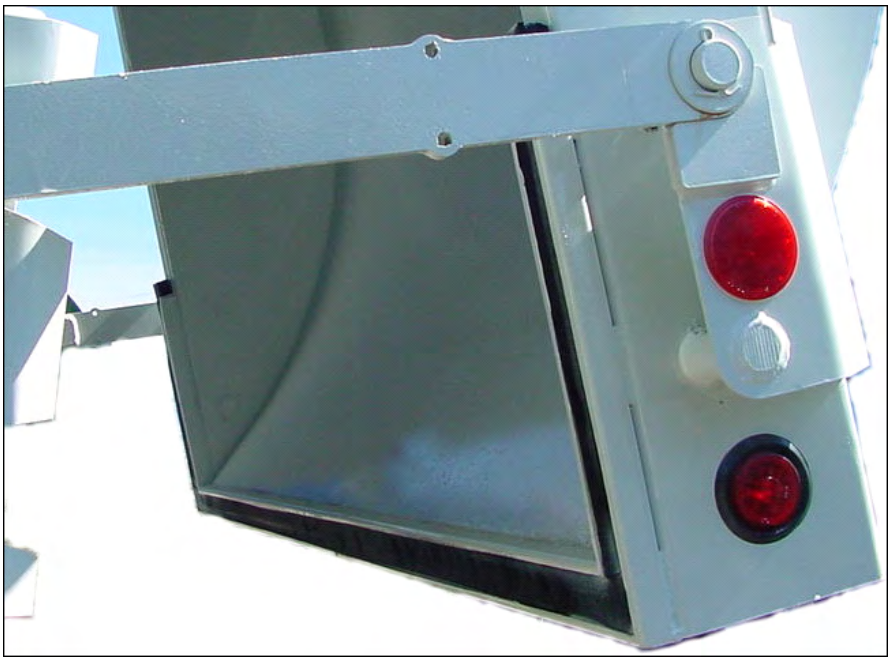


Figure 21. Tailgate Seal

SECTION 5
BODY CONTROLLER HARDWARE

CORTEX CONTROLLER™ AND MODULE LOCATIONS

The 32-bit, 80 I/O Cortex Controller is located midway within the street side of the body behind a steel cover. See the image below and **Body Controller Hardware section** 79.

Figure 22. Cortex Controller Location

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

Figure 23. Cortex Controller Module Location

CORTEX CONTROLLER™ AND MODULE COMPONENTS

For residential, dedicated Curotto-Can units, see the image below and component descriptions on the next page.

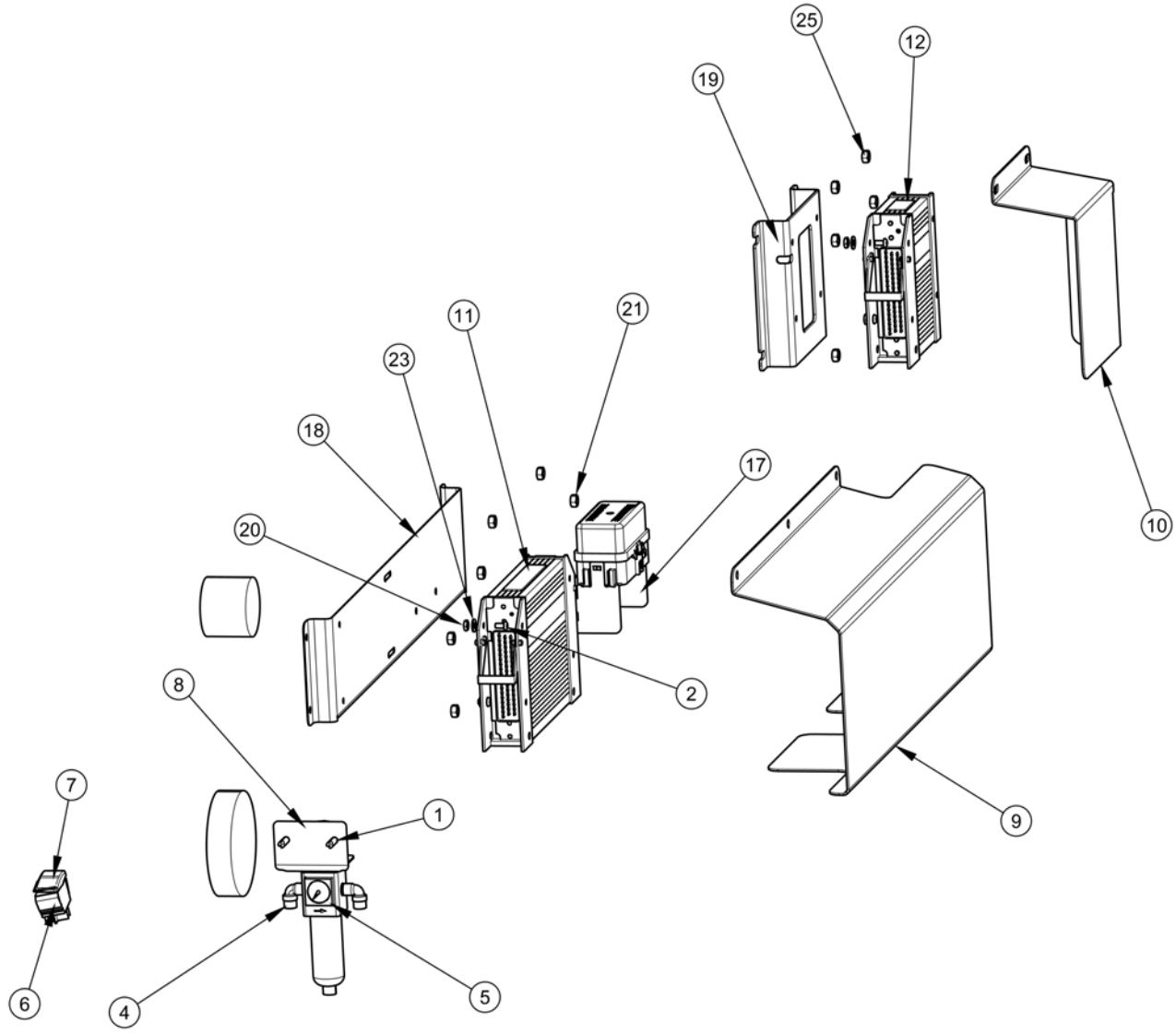


Figure 24. Cortex Controller and Module Components

Half/Pack® Factor AFL™

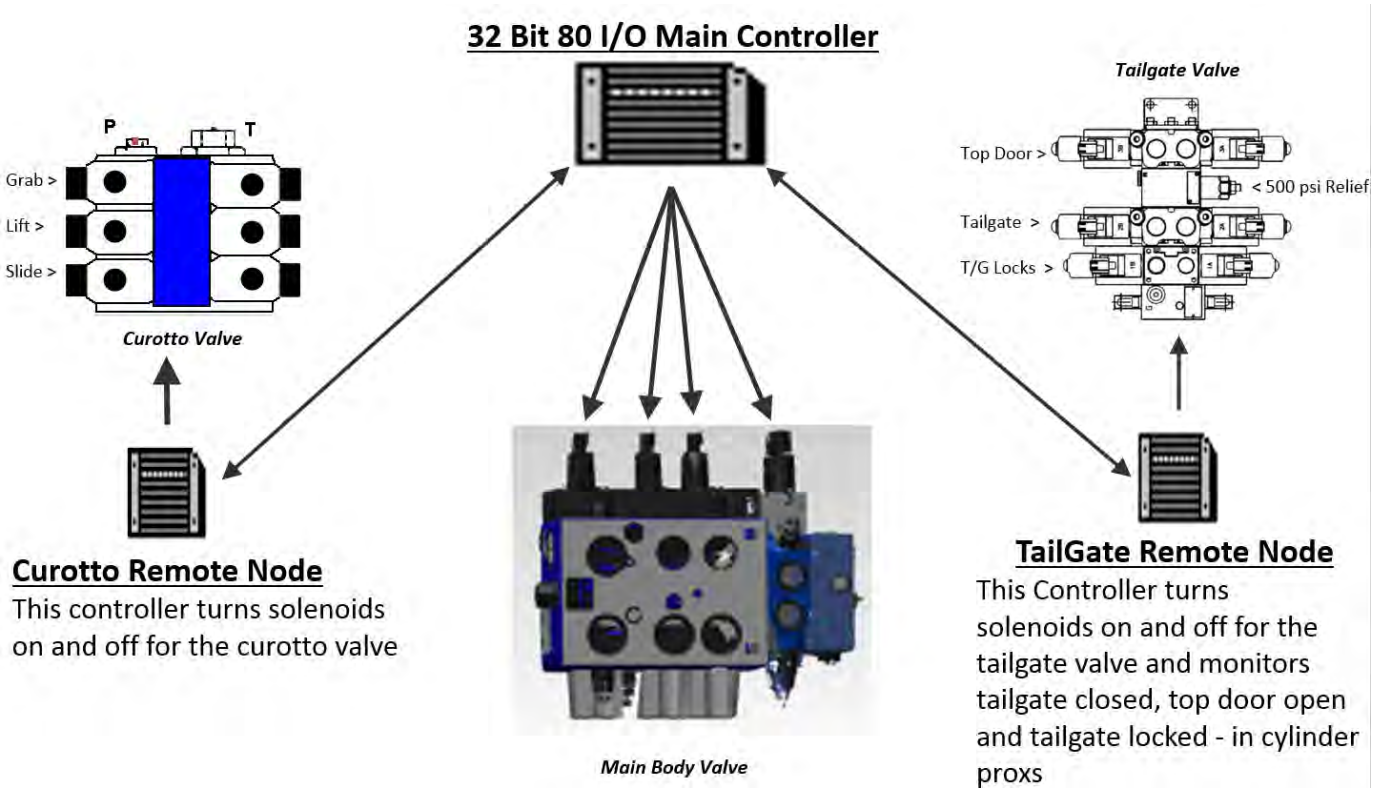
Body Controller Hardware

CORTEX CONTROLLER™ AND MODULE COMPONENTS (CONTINUED)

ITEM	PART NUMBER	DESCRIPTION	QTY	NOTES
-	**474-0004-003**	**KIT, UNIT, DEDICATED CAN**	**REF**	
1	047-2151-011	1/4" 14X11" LG TEK SCREW #3	2	
2	047-2621-375	SCREW, BUTTON, HEAD CAP	8	
-3	054-5449-A	1/4" O.D. BLACK AIR LINE	1	
4	054-8470-004	AIR LINE CONNECTOR ELBOW	2	
5	075-0721	FILTER/REGULATOR W/GAUGE	1	
6	108-7691	ROCKER SW, MAINTAINED, DPST	1	
7	108-8626-241	SWITCH ACTUATOR, DUAL CONTROLS	1	
8	211-9967	AIR FILTER/REGULATOR BRACKET	1	
9	234-3374	PLATE, RAIN SHIELD MAIN CONTROLLER	1	
10	234-3374-001	PLATE, RAIN SHIELD T/G CONTROLLER	1	
11	254-4897	CONTROLLER, CORTEX CONTROLLER™, 80 10, 32 BIT	1	
12	254-4912-001	MODULE, CORTEX REMOTE 32 I/O VARIOUS	2	
-13	263-1738-004	HARNESS, JOYSTICK SPLITTER, AFL	1	
-14	263-1815-003	HARNESS, ODYSSEY CONTROL PANEL, 2018 AFL HP/ODY	1	
-15	263-1815-004	HARNESS, ODYSSEY VALVE OVERLAY, 2018 AFL HP/ODY	1	
-16	263-1815-008	HARNESS, ODYSSEY ARM, 2018 AFL HP/ ODY	1	
17	311-5666	BRACKET, MOUNTING, FUSE BLOCK	1	
18	311-6232	PANEL, CONTROLLER MOUNT	1	
19	311-6304	BRACKET, CONTROLLER BODY SIDE	1	
20	FSP230400	LOCKNUT, #10 UNC GR, PLATED	8	
21	FSP320700	NUT, 1/4" UNC GR8, PLATED	2	
22	FSP420711	MACHINE SCREW 1/4"-20 NC X 1/2, PLATED	2	
23	FSP510400	WASHER, FLAT, #10 STD, PLATED	8	
24	FSP510700	WASHER, FLAT, 1/4" STD, PLATED	2	
25	FSS230700	LOCKNUT, 1/4" UNC STAINLESS STEEL	13	

CORTEX CONTROLLER™ AND MODULE FUNCTIONS

For residential units, remote controller nodes reduce wiring in the body harness and decrease troubleshooting time, i.e. if power ground and signal are going to node, the tech then knows issues is between node and valve.



CORTEX CONTROLLER™ PROGRAMMING

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

PROGRAMMING CABLES AND ADAPTERS

Description	Part Number
Cortex Controller RS232 Cable	263-1678
InSight™ CAN Programming Cable	263-1721
USB to RS232 Adapter	108-8619
USB to CAN Adapter	108-8620
USB to M12 Cable (USB to 7" and 12" Displays)	108-8714

INSIGHT™ DIAGNOSTIC DISPLAY

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

NOTES

CORTEX CONTROLLER™ 80 I/O ASSEMBLY

CORTEX CONTROLLER™ 80 I/O ASSEMBLY

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

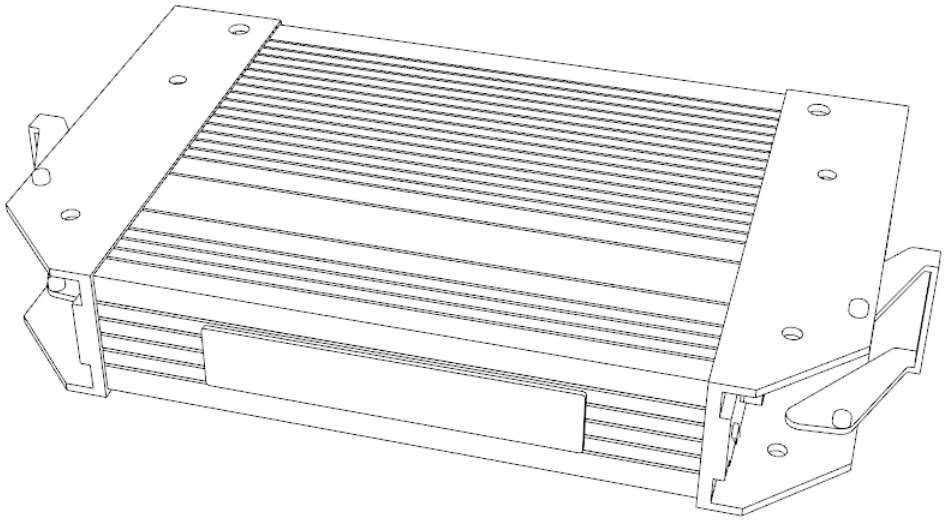


Figure 25. 80 I/O Cortex Controller Hardware

CORTEX CONTROLLER™ PIN NUMBER DIAGRAM

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

Figure 26. Controller Pin Number Locations (For 80 I/O, Same for Both Controller Sides)

CORTEX CONTROLLER™ 55-POLE CABLE ASSEMBLY

Follow these steps to assemble the Cortex Controller Cable.

A. Cable and Controller Parts Identification

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

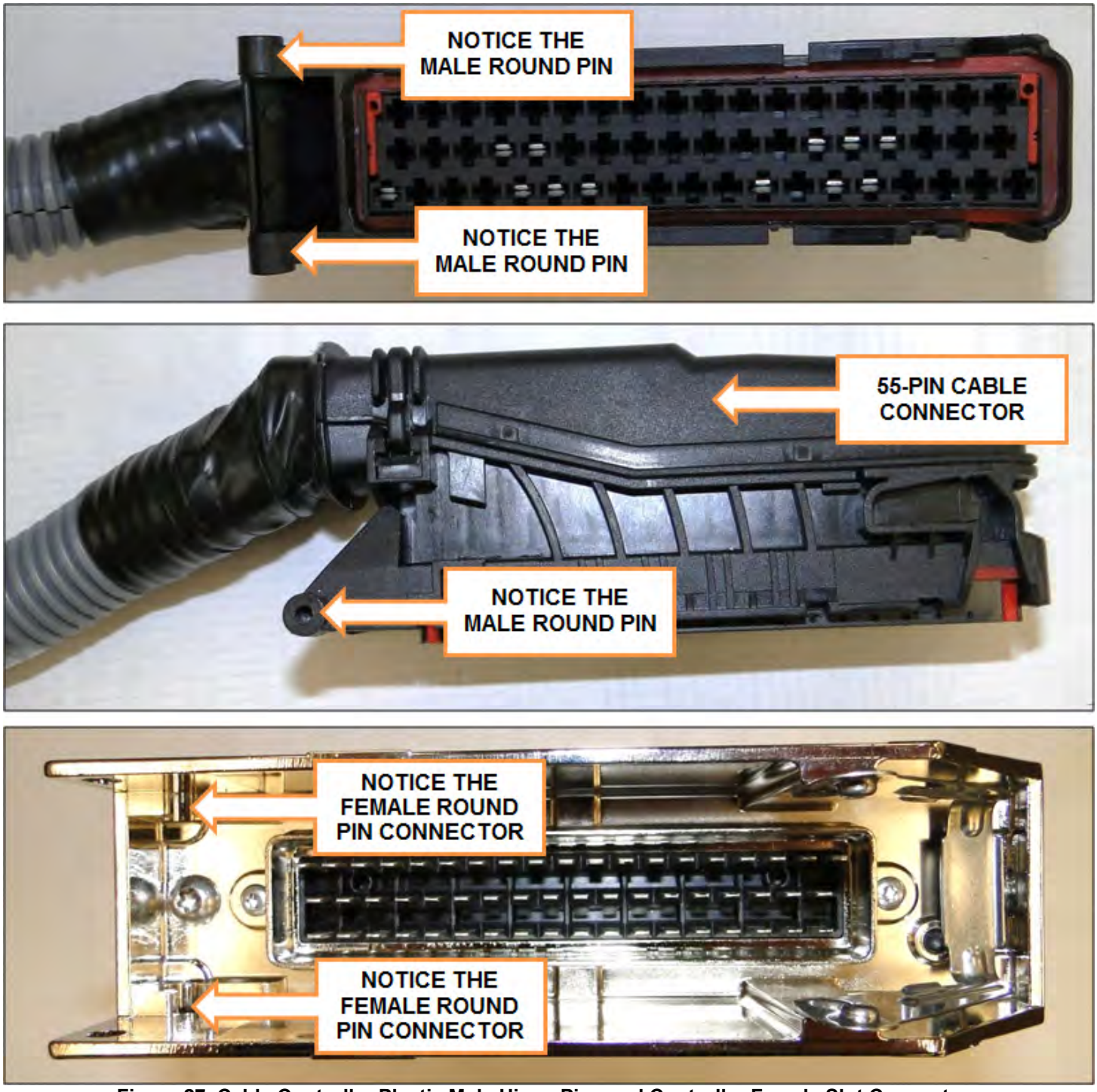


Figure 27. Cable Controller Plastic Male Hinge Pins and Controller Female Slot Connectors

CORTEX CONTROLLER™ 55-POLE CABLE ASSEMBLY (CONTINUED)

B. Female Controller Connector Close-Up View

See the figure below to identify the controller female connector.

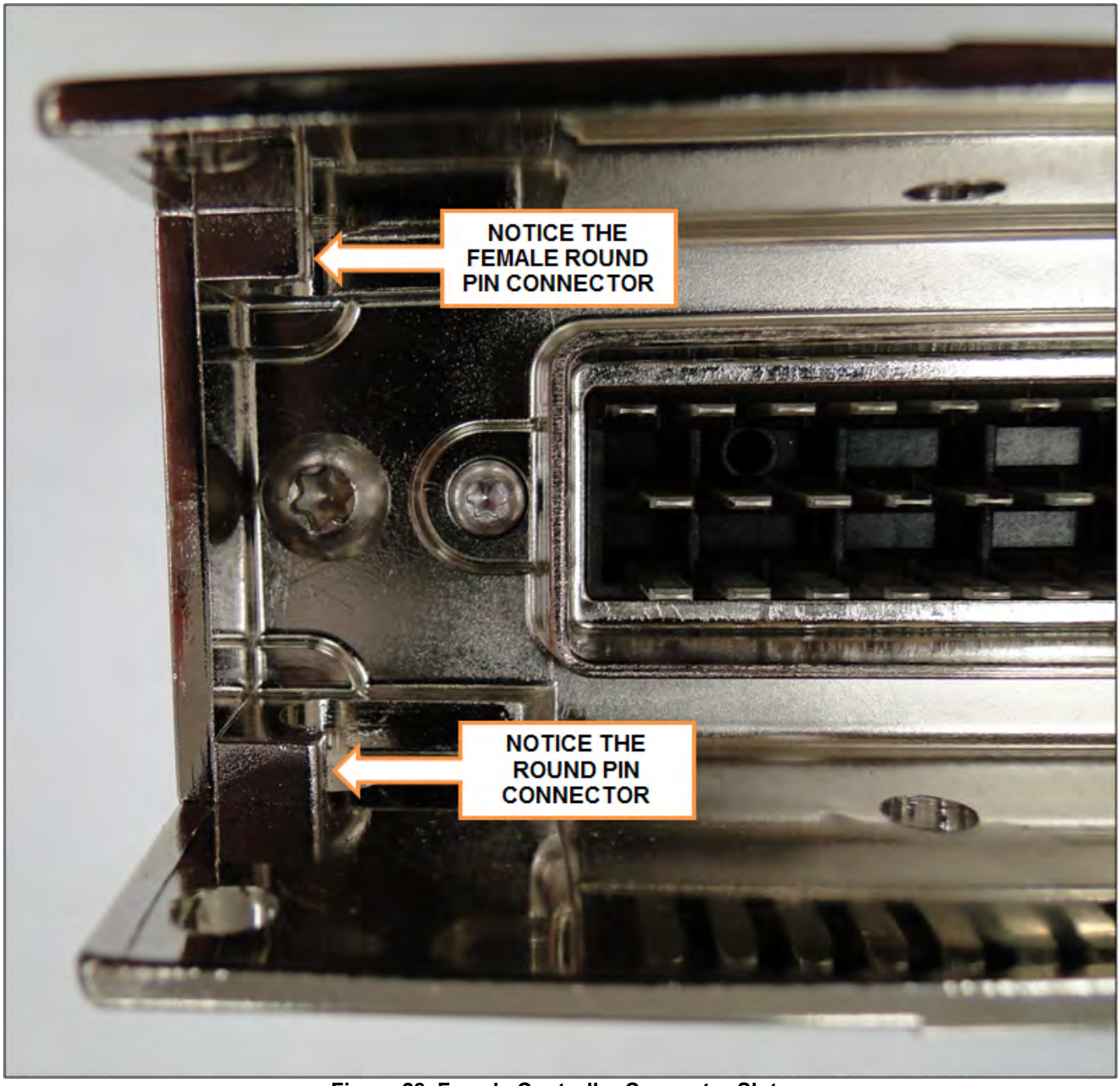


Figure 28. Female Controller Connector Slots

CORTEX CONTROLLER™ 55-POLE CABLE ASSEMBLY (CONTINUED)

C. Connecting the 55-Pole Cable Connector

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

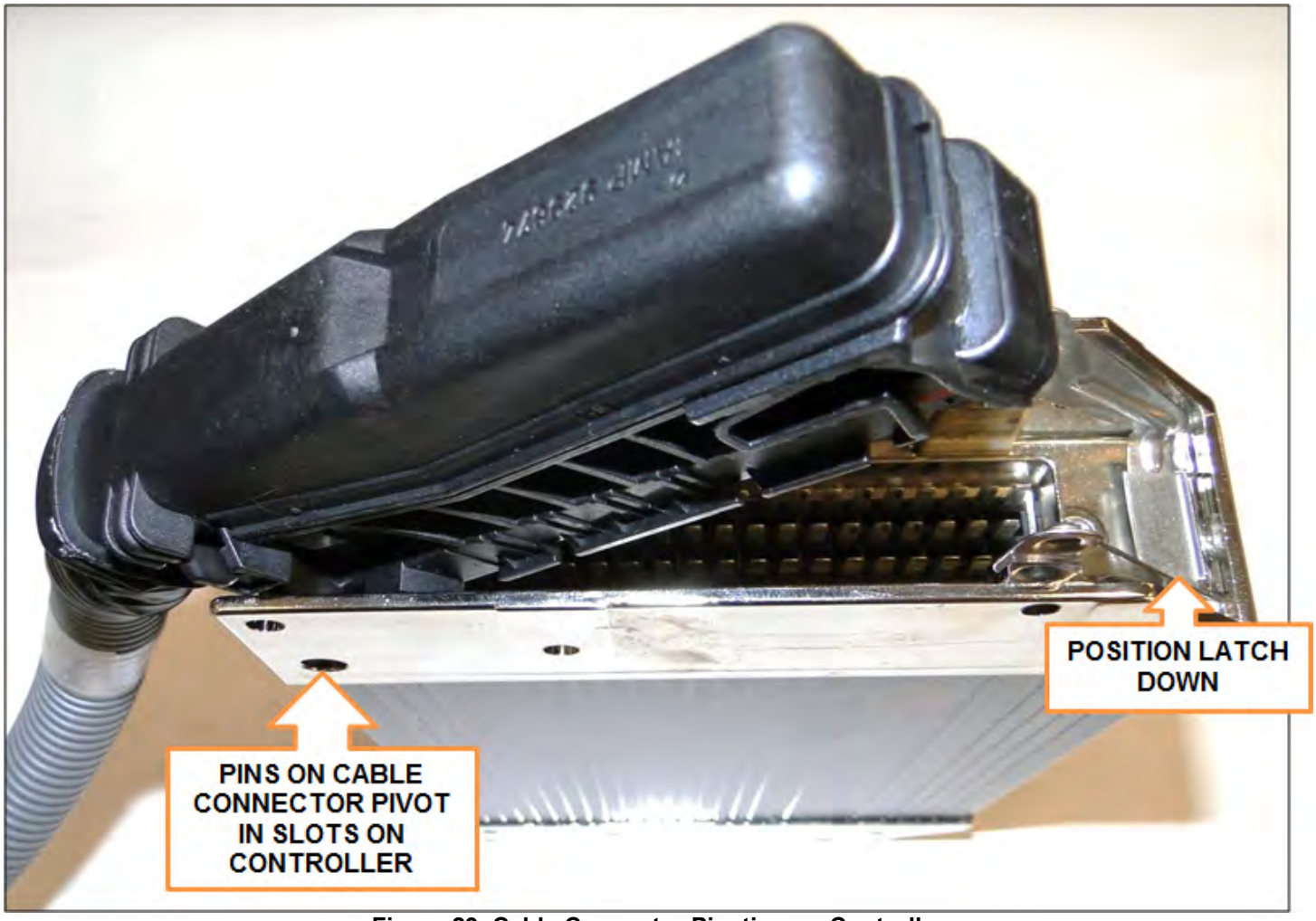


Figure 29. Cable Connector Pivoting on Controller

CORTEX CONTROLLER™ 55-POLE CABLE ASSEMBLY (CONTINUED)

D. Pivot Cable Connector and Latch

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

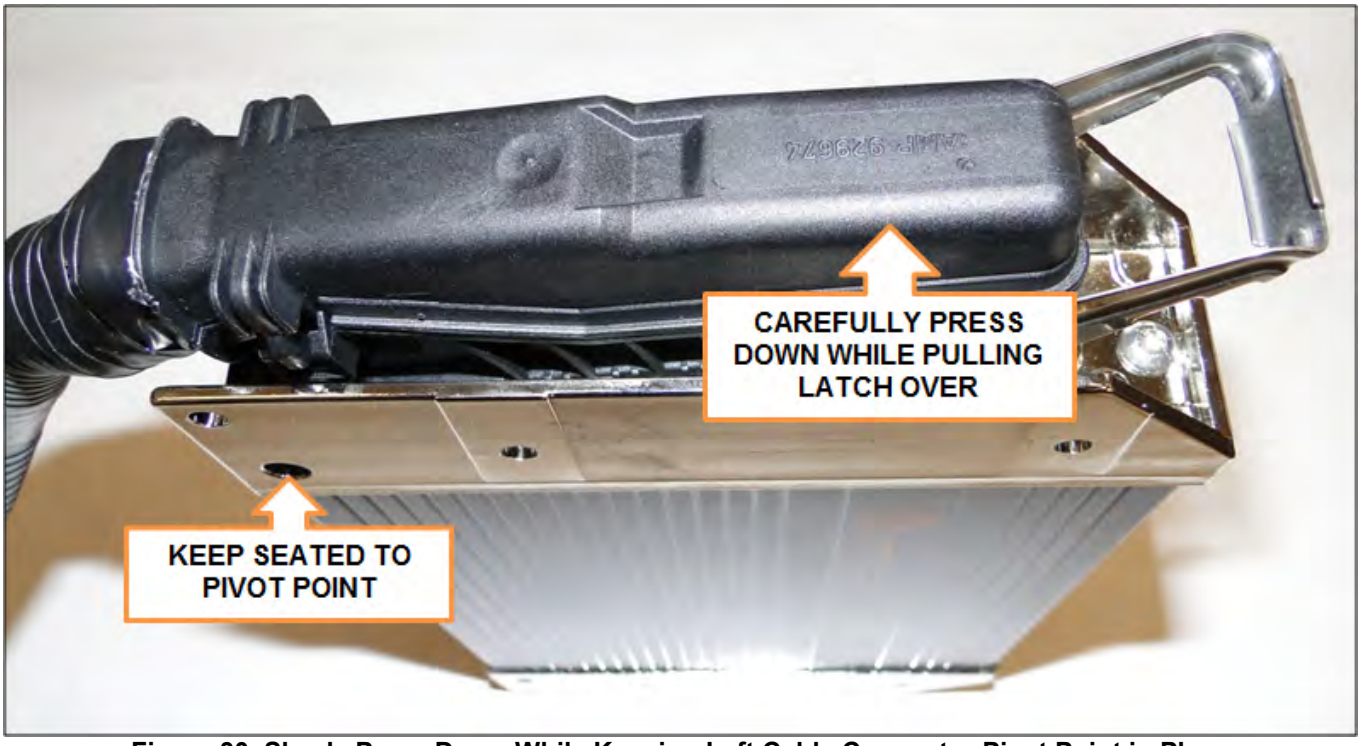


Figure 30. Slowly Press Down While Keeping Left Cable Connector Pivot Point in Place

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

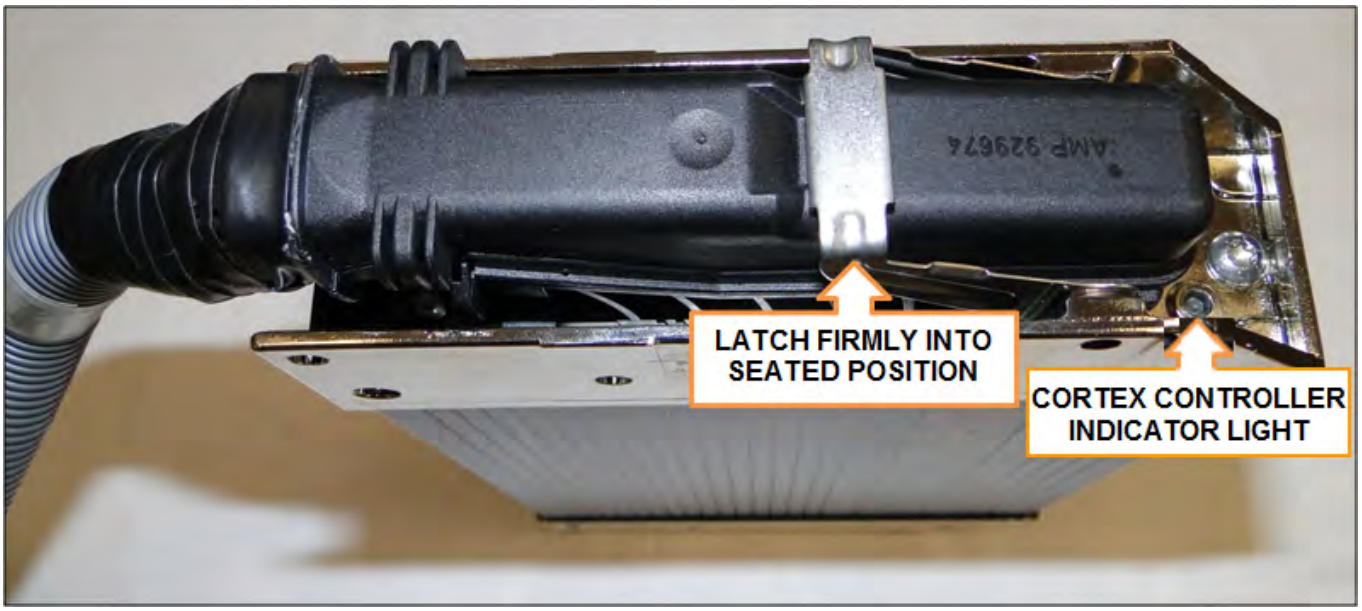


Figure 31. Latch Controller to Cable Connector

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

SECTION
BODY CONTROLLER SOFTWARE

Half/Pack® Factor AFL™
Body Controller Software

Dedicated Half/Pack Factor AFL Cortex32 Controller™ Program 109-0305 (Rev. 051517)

Section 1: CORTEX32 Controller Hardware

1.01: CORTEX32 Controller Indicator Lights

The 2018 Dedicated Half/Pack Factor AFL vehicle control system consists of 3 CORTEX32 Controllers. The "MAIN" CORTEX32 Controller is an Extended Controller consisting of 80 Inputs / Outputs, the Remote Tailgate CORTEX32 Controller ("RTG") and the Remote Can CORTEX32 Controller ("RCN")* is a Standard Controller consisting of 32 Inputs / Outputs. The CORTEX32 controllers operates with a voltage ranging from (8 to 32) Volt DC. Each CORTEX32 Controller has a three-color LED (Red / Green / Blue) which indicates the current status of the Controller. The LED operating status identifications are detailed in the table below.

Note*: The Remote Can CORTEX32 Controller ("RCN") is a Standard Controller consisting of 32 Inputs / Outputs which is used as a DEDICATED remote Can controller on Residential units.

CORTEX32 CONTROLLER DETAILS			
Controller No.	**Controller Type**	**Controller Location**	**Controller Name**
1.	CORTEX32 CR0233	StreetSide Body Side Skirt (Middle)	(Main) Main Controller
2.	CORTEX32 CR2530	StreetSide Body Side Skirt (Rear)	(RTG) Remote Tailgate Controller
3.	CORTEX32 CR2530	Dedicated Can Street Side (Rear)	(RCN) Remote Can Controller

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

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

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

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

1.02: Inputs

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

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

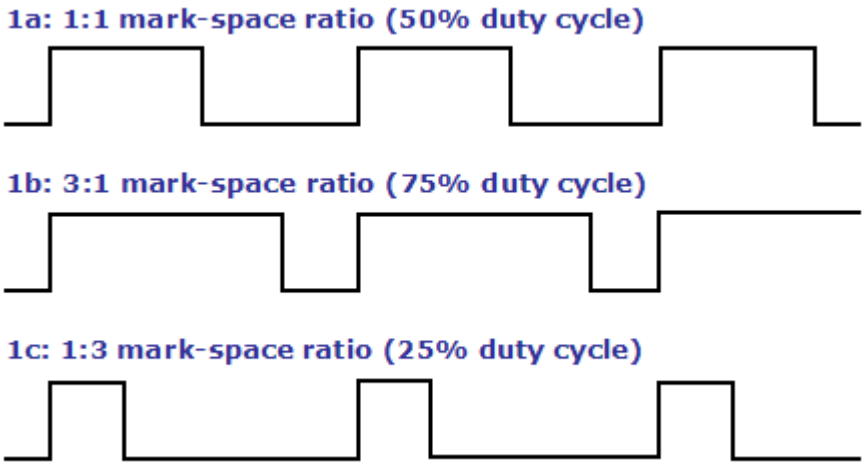
1.03: Outputs

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

Pulse Width Modulation (P.W.M):

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

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



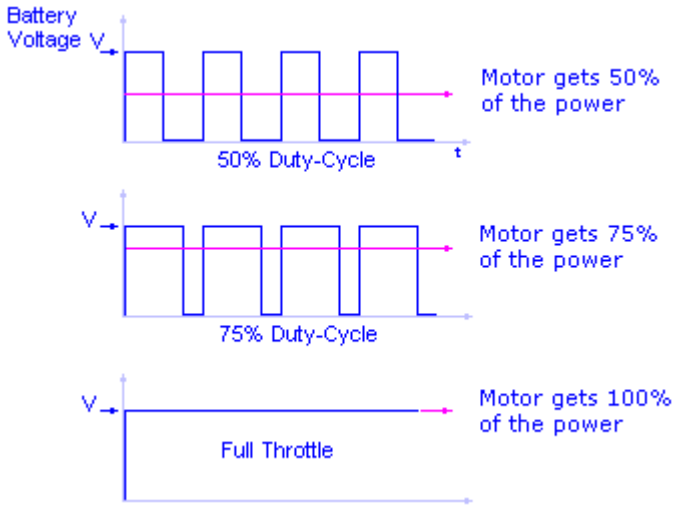


Figure: Pulse Width Modulation (PWM) Output Waveforms

1.04: Communication Ports

There are 4-CAN and 1-RS-232 communication port in the 80 I/O CORTEX32 Controller which will be utilized for the programming and communication purposes. The Serial port (RS-232) in the ST side will be utilized to download user programs via CORTEX Download tool (Downloader 32) and CAN ports in the ST side for communication between Controller and field devices. See Note below.

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

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

1.05: Diagnostic Display

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

1.06: CORTEX32 - Connector Pin Details

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

PROGRAM NUMBER:	**109-0305**	**CONTROLLER TYPE**	**I/O ADDRESS**	**CONNECTOR PIN-OUT DETAILS**
REVISION NUMBER:	**2016xxxx**			
HALF/PACK FACTOR AFL 80 I/O RESIDENTIAL (DEDICATED CAN)				
IN-CAB INPUT FUNCTIONS				
A01	SYSTEM POWER SWITCH	MAIN	%IX0.08	P1-24
A02	CHASSIS NUETRAL	MAIN	%IX0.10	P1-23
A03	PANEL SELECT SWITCH	MAIN	%IX0.09	P1-41

Half/Pack® Factor AFL™

Body Controller Software

PROGRAM NUMBER:	109-0305	CONTROLLER TYPE	I/O ADDRESS	CONNECTOR PIN-OUT DETAILS
REVISION NUMBER:	2016xxxx			
HALF/PACK FACTOR AFL 80 I/O RESIDENTIAL (DEDICATED CAN)				
A04	LEFT TURN SIGNAL	MAIN	%IX0.13	P1-39
A05	RIGHT TURN SIGNAL	MAIN	%IX0.11	P1-40
A06	TRANSMISSION TEMP. SIGNAL SWITCH	MAIN	%IX0.15	P1-38
A07	SCALE ALARM-1	MAIN	%IX128.00	P2-55
A08	SCALE ALARM-2	MAIN	%IX128.02	P2-54
IN-CAB OUTPUT FUNCTIONS				
B01	CAB ALARM	MAIN	%QX128.08	P2-2
B02	THROTTLE ADVANCE	MAIN	%QX0.10	P1-4
B03	THROTTLE LIMIT	MAIN	%QX0.11	P1-5
B04	WARBLE ALARM	MAIN	%QX128.09	P2-3
B05	HOPPER FLOOD LIGHT	MAIN	%QX128.10	P2-4
BODY INPUT FUNCTIONS				
C01	OIL FILTER PRESSURE SWITCH	MAIN	%IX0.06	P1-52
C02	SIDE DOOR CLOSED PROX. SWITCH	MAIN	%IX0.04	P1-53
C03	TAILGATE CLOSED PROX. SWITCH	RTG	%IX0.00	P1-55
C04	LIFT BELOW TRANSIT PROX. SWITCH (2018 COMMERCIAL HP USE ONLY)	MAIN	%IX0.01	P1-36
C05	FORKS TUCKED PROX. SWITCH (2018 COMMERCIAL HP USE ONLY)	MAIN	%IX0.03	P1-35
C06	ARMS UP PROX. SWITCH (2018 COMMERCIAL HP USE ONLY)	MAIN	%IX0.05	P1-34
BODY OUTPUT FUNCTIONS				
D01	TAILGATE UP	RTG	%QX0.02	P1-16
D02	TAILGATE DOWN	RTG	%QX0.03	P1-15
D03	TAILGATE LOCK SOLENOID	RTG	%QX0.04	P1-14
D04	TAILGATE UNLOCK SOLENOID	RTG	%QX0.07	P1-11
D05	BACK UP ALARM	MAIN	%QX128.12	P2-6
D06	ARMS UP	MAIN	%QX0.04	P1-14
D07	ARMS DOWN	MAIN	%QX0.05	P1-13

Half/Pack® Factor AFL™

Body Controller Software

PROGRAM NUMBER:	109-0305	CONTROLLER TYPE	I/O ADDRESS	CONNECTOR PIN-OUT DETAILS
REVISION NUMBER:	2016xxxx			
HALF/PACK FACTOR AFL 80 I/O RESIDENTIAL (DEDICATED CAN)				
D08	CAB PROTECTOR UP	MAIN	%QX0.03	P1-15
D09	CAB PROTECTOR DOWN	MAIN	%QX0.02	P1-16
D10	ALLISON PTO ENABLE	MAIN	%QX0.00	P1-18
D11	PTO 2 SOL	MAIN	%QX0.09	P1-3
D12	PTO 1 SOL	MAIN	%QX0.08	P1-2
D13	CARRY CAN GRAB/COVER CLOSE SOL	MAIN	%QX128.20	P2-29
D14	CARRY CAN RELEASE/COVER OPEN SOL	MAIN	%QX128.21	P2-30
D15	CARRY CAN UP	RCN	%QX0.06	P1-12
D16	CARRY CAN DOWN	RCN	%QX0.05	P1-13
D17	CARRY CAN IN	RCN	%QX0.04	P1-14
D18	CARRY CAN OUT	RCN	%QX0.03	P1-15
D19	CARRY CAN GRAB	RCN	%QX0.02	P1-16
D20	CARRY CAN RELEASE	RCN	%QX0.01	P1-17
D21	TAILGATE FLOW SOLENOID	MAIN	%QX0.14	P1-8
OPTION IN-CAB OUTPUT FUNCTIONS				
E01	CAB FLOOD LIGHTS	MAIN	%QX128.00	P2-18
OPTION BODY INPUT FUNCTIONS				
F01	HIGH PRESS FILTER INDICATOR	MAIN	%IX128.04	P2-53
F02	BAYNE CAN DOWN	RCN	%IX0.06	P1-52
F03	BAYNE CAN UP	RCN	%IX0.07	P1-33
F04	CAB PROTECTOR DOWN	MAIN	%IX0.14	P1-21
F05	TAILGATE LOCKED PROXIMITY SWITCH	RTG	%IX0.02	P1-54
F06	TOP DOOR OPEN PROXIMITY SWITCH	RTG	%IX0.01	P1-36
F07	OIL LEVEL SWITCH	MAIN	%IX0.07	P1-33
F08	EXTERNAL THROTTLE ADVANCE	MAIN	%IX128.06	P2-52
OPTION IN-CAB OUTPUT FUNCTIONS				
G01	CARRY CAN COVER UP	RCN	%QX0.10	P1-4

Half/Pack® Factor AFL™

Body Controller Software

PROGRAM NUMBER:	109-0305	CONTROLLER TYPE	I/O ADDRESS	CONNECTOR PIN-OUT DETAILS
REVISION NUMBER:	2016xxxx			
HALF/PACK FACTOR AFL 80 I/O RESIDENTIAL (DEDICATED CAN)				
G02	CARRY CAN COVER DOWN	RCN	%QX0.11	P1-5
G03	TAILGATE CAMERA OUTPUT	MAIN	%QX128.03	P2-15
G04	HOPPER CAMERA OUTPUT	MAIN	%QX128.02	P2-16
G05	STROBE LIGHT 1	MAIN	%QX128.14	P2-8
G06	STROBE LIGHT 2	MAIN	%QX128.15	P2-9
G07	TOP DOOR CLOSE	RTG	%QX0.06	P1-12
G08	TOP DOOR OPEN	RTG	%QX0.05	P1-13
G09	CONTAINER FLOOD LIGHT	MAIN	%QX128.11	P2-5
G10	CARRY CAN LIGHTS	RCN	%QX0.07	P1-11
G11	AUXILLIARY BACKUP LIGHT	MAIN	%QX128.13	P2-7
ANALOG INPUT FUNCTIONS				
H01	PACKER POSITION	MAIN	%IW4	P1-54
H02	OIL TANK TEMPERATURE	MAIN	%IW14	P1-22
H03	BODY VALVE PRESSURE	MAIN	%IW2	P1-55
OPTION BODY OUTPUT FUNCTIONS				
OPEN INPUTS				
	SPARE INPUT	MAIN	%IX128.01	P2-36
	SPARE INPUT	MAIN	%IX128.03	P2-35
	SPARE INPUT	MAIN	%IX128.05	P2-34
	SPARE INPUT	MAIN	%IX128.07	P2-33
OPEN OUTPUTS				
	SPARE OUTPUT	MAIN	%QX128.04	P2-14
	SPARE OUTPUT	MAIN	%QX128.05	P2-13
	SPARE OUTPUT	MAIN	%QX128.06	P2-12
	SPARE OUTPUT	MAIN	%QX128.07	P2-11

Half/Pack® Factor AFL™

Body Controller Software

PROGRAM NUMBER:	109-0305	CONTROLLER TYPE	I/O ADDRESS	CONNECTOR PIN-OUT DETAILS
REVISION NUMBER:	2016xxxx			
HALF/PACK FACTOR AFL 80 I/O RESIDENTIAL (DEDICATED CAN)				

DUAL CONTROL PANEL BOX WHICH FUNCTIONS USING PANEL SELECTOR SWITCH			
CAN IN-CAB INPUT FUNCTIONS			
I01	HYDRAULIC PUMP ENABLE PUSH BUTTON	LOWER BANK	
I02	PACKER EXTEND PUSH BUTTON	LOWER BANK	
I03	PACKER RETRACT PUSH BUTTON	LOWER BANK	
I04	PACKER OVERHEIGHT OVERRIDE SWITCH	LOWER BANK	
I05	SELECT–O–PACK SWITCH	LOWER BANK	
I06	CAB COVER RAISE SWITCH ENABLE	LOWER BANK	
I07	CAB COVER LOWER SWITCH ENABLE	LOWER BANK	
I08	TAILGATE RAISE ENABLE SWITCH	LOWER BANK	
I09	TAILGATE LOWER ENABLE SWITCH	LOWER BANK	
I10	TAILGATE LOCK ENABLE SWITCH	LOWER BANK	
I11	TAILGATE UNLOCK ENABLE SWITCH	LOWER BANK	
I12	AUTOLIFT ENABLE SWITCH	UPPER BANK	
MULTI FUNCTION JOYSTICK CONTROLS			
J01	JOYSTICK ROCKER (GRABBER) SWITCH		
J02	JOYSTICK ROCKER (RELEASE) SWITCH		
J03	JOYSTICK Y-AXIS (NEGATIVE DIRECTION)		
J04	JOYSTICK Y-AXIS (POSITIVE DIRECTION)		
J05	JOYSTICK X-AXIS (NEGATIVE DIRECTION)		
J06	JOYSTICK X-AXIS (POSITIVE DIRECTION)		
J07	JOYSTICK AUTOLIFT MODE BUTTON		
J08	JOYSTICK OPERATOR PRESENCE		
OPTION AUXILLIARY-CAB INPUT FUNCTIONS			
K01	AUXILLIARY CONTROLS ENABLE SWITCH		
K02	AUXILLIARY ARMS RAISE SWITCH		

Half/Pack® Factor AFL™

Body Controller Software

PROGRAM NUMBER:	109-0305	CONTROLLER TYPE	I/O ADDRESS	CONNECTOR PIN-OUT DETAILS
REVISION NUMBER:	2016xxxx			
HALF/PACK FACTOR AFL 80 I/O RESIDENTIAL (DEDICATED CAN)				
K03	AUXILLIARY ARMS LOWER SWITCH			
K04	AUXILLIARY FORKS RAISE SWITCH			
K05	AUXILLIARY FORKS LOWER SWITCH			
K06	AUXILLIARY PACKER EXTEND SWITCH			
K07	AUXILLIARY PACKER RETRACT SWITCH			
K08	AUXILLIARY CUROTTO CONTROLS ENABLE SWITCH			
K09	AUXILLIARY CUROTTO GRAB SWITCH			
K10	AUXILLIARY CUROTTO RELEASE SWITCH			
K11	AUXILLIARY CUROTTO DUMP SWITCH			
K12	AUXILLIARY CUROTTO UNDUMP SWITCH			
K13	AUXILLIARY CUROTTO IN SWITCH			
K14	AUXILLIARY CUROTTO OUT SWITCH			
OPTION CAN IN-CAB INPUT FUNCTIONS				
L01	TRAVEL POSITION SWITCH	LOWER BANK		
L02	STROBE LIGHT ENABLE SWITCH	UPPER BANK		
L03	TOP DOOR OPEN SWITCH	UPPER BANK		
L04	TOP DOOR CLOSE SWITCH	UPPER BANK		
L05	HOPPER LIGHT ENABLE SWITCH	UPPER BANK		
L06	AUXILLIARY LIGHT ENABLE SWITCH	UPPER BANK		
L07	CONTAINER LIGHT ENABLE SWITCH	UPPER BANK		
L08	CAB LIGHT SWITCH	UPPER BANK		
L09	CUROTTO CAN COVER OPEN SWITCH	UPPER BANK		
L10	CUROTTO CAN COVER CLOSE SWITCH	UPPER BANK		
L11	CAN LIGHT ENABLE SWITCH	UPPER BANK		

Section 2: J1939 Details

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

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

Section 3: Default Parameters

3.01 Program 109-0305 Parameter Defaults

44	Parameter	Default Setting
A	Start Filter Warning	5 Hours
B	Start Filter Shutdown	6 Hours
C	Packer Extend Auto Pack Time Out	35 Seconds
D	Packer Auto Retract Time Out	35 Seconds
E	Engine Over speed	1800 RPM
F	Engine ON	Engine Speed > 400 RPM
G	Bypass Time Reset	15 minutes
H	Pump Bypass Run Time	180 Seconds
I	Bypass Beep Time	60 Seconds
J	Road Speed Ok	< 5mph
K	Curotto Can Demo Time	3 Seconds
L	Carry Can Stow Time	2 Seconds
M	Throttle Advance	1350 RPM
N	Throttle Limit	1500 RPM
O	Hydraulic Oil Operating Temp	70°F - 190°F

Section 4: I/O Functions

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

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

4.01: Standard In-Cab Input Functions

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

This circuit monitors the transmission Neutral circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting

A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

4.02: Standard In-Cab Output Functions

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

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

This output function controls the Warble Alarm.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

4.03: Standard Body Input Functions

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

4.04: Standard Body Output Functions

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

This output function controls the Tailgate Up output circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

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

This output function controls the Tailgate Down output circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

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

This output function controls the Tailgate Lock output circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

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

This output function controls the Tailgate Unlock output circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

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

This output function controls the Back Up Alarm output.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

Note: If Tailgate is not closed OR if Tailgate is not Locked i.e. if condition (A OR B) is true, then Back Up Alarm is activated.

D06 Output Function – Arms Up PWM control (Body Output %QX0.04)

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

D07 Output Function – Arms Down PWM control (Body Output %QX0.05)

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Auto Lift Enable Switch	Activated	N/A	ON
B	Pump On	Activated	N/A	ON

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

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Pump Enable Push Button	Activated	CAN	ON
	System Power Switch	Activated	%IX0.8	ON

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

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

Note: With condition (A AND B AND C AND F) true, Condition (D OR E) will activate the PTO-1 pump.
For condition 'B' to be true, Road Speed value should be less than '15' mph.
For condition 'C' to be true, Engine Speed value should be less than '900' RPM.
Condition 'F' Low Oil Switch will be considered only during Calibration mode.
Condition 'G' –When vehicle is in Neutral condition and Engine speed condition 'C' is less than 1700 RPM, along with other interlocks the PTO-1 pump will be activated.

D13 Output Function – Carry Can Cover Close (Body Output %QX128.20)

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

Conditions Necessary to activate the circuit:

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

D14 Output Function – Carry Can Cover Open (Body Output %QX128.21)

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

Conditions Necessary to activate the circuit:

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

D15 Output Function – Curotto - Carry Can Up (Body Output %QX0.06)

This function controls the Curotto - Carry Can Up signal.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Panel Selector Switch	Activated	%IX0.09	ON
	and Carry Can Auxiliary Enable Switch	Deactivated	CAN	OFF
B	Carry Can Up	Activated	CAN	ON (Refer Sec. I26)
	and Carry Can Auxiliary Enable Switch	Activated	CAN	ON
C	and Autolift Enable Switch	Activated	CAN	ON
D	Bayne Up	Activated	N/A	ON
E	and Scale Alarm 2	Deactivated	%IX128.2	OFF (See Section A04)
F	Pump On	Activated	N/A	ON

Note: This signal is energized using a CAN based control by energizing the Carry Can Up switch either from Street side or from Curb side panel.
The Curotto system is operated in Carry Can mode with Arm below 25 Deg. and Scale Alarm 2 is deactivated i.e. Over Weight condition is not present or if Bayne Up control is enabled.
With Conditions ((A OR B) AND C) true OR 'D' true, condition (E AND F) will activate the Carry Can Up Output signal either in Auxiliary control mode or Non-Auxiliary control mode.

D16 Output Function – Curotto - Carry Can Down (Body Output %QX0.05)

This function controls the Curotto - Carry Can Down signal.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Panel Selector Switch	Activated	%IX0.09	ON
	and Carry Can Auxiliary Enable Switch	Deactivated	CAN	OFF
B	Carry Can Down	Activated	CAN	ON (Refer Sec. I27)
	and Carry Can Auxiliary Enable Switch	Activated	CAN	ON
C	Autolift Enable Switch	Activated	CAN	ON

	and Scale Alarm 2	Deactivated	%IX128.2	OFF (See Section A04)
	and Pump On	Activated	N/A	ON
D	Bayne Down	Activated	N/A	ON
	Pump On	Activated	N/A	ON
E	Stow Can	Activated	N/A	ON

Note: This signal is energized using a CAN based control by energizing the Carry Can Down switch either from Street side or from Curb side panel.
The Curotto system is operated in Carry Can mode with Arm below 25 Deg. and Scale Alarm 2 is deactivated i.e. Over Weight condition is not present or if Bayne Down control is enabled.
With Conditions (A OR B) true, Condition (C OR D OR E) true will activate the Carry Can Down Output either in Auxiliary control mode or Non-Auxiliary control mode.

D17 Output Function – Curotto - Carry Can In (Body Output %QX0.04)

This function controls the Curotto - Carry Can In signal.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Panel Selector Switch	Activated	%IX0.09	ON
	and Carry Can Auxiliary Enable Switch	Deactivated	CAN	OFF
B	Carry Can In	Activated	CAN	ON
	and Carry Can Auxiliary Enable Switch	Activated	CAN	ON
C	and Autolift Enable Switch	Activated	CAN	ON
D	and Pump On	Activated	N/A	ON
E	and Scale Alarm 2	Deactivated	%IX128.2	OFF (See Section A04)
F	Pump On	Activated	N/A	ON
	and Stow Can	Activated	N/A	ON

Note: This signal is energized using a CAN based control by energizing the Carry Can In switch either from Street side or from Curb side panel.
The Curotto system is operated in Carry Can mode with Arm below 25 Deg. and Scale Alarm 2 is deactivated i.e. Over Weight condition is not present.
With Conditions (A OR B) true, Condition (C AND D AND E) true will activate the Curotto Carry Can In signal either in Auxiliary control mode or Non-Auxiliary control mode.
The Carry Can In signal is also activated with Condition ‘F’ true, which is a Stow Can signal.

D18 Output Function – Curotto - Carry Can Out (Body Output %QX0.03)

This function controls the Curotto - Carry Can out signal.

Condition	Modifiable Parameters	Default Setting

A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Panel Selector Switch	Activated	%IX0.09	ON
	and Carry Can Auxiliary Enable Switch	Deactivated	CAN	OFF
B	Carry Can Out	Activated	CAN	ON
	and Carry Can Auxiliary Enable Switch	Activated	CAN	ON
C	and Autolift Enable Switch	Activated	CAN	ON
D	and Pump On	Activated	N/A	ON
E	and Scale Alarm 2	Deactivated	%IX128.2	OFF (See Section A04)

Note: This signal is energized using a CAN based control by energizing the Carry Can Out switch either from Street side or from Curb side panel.
The Curotto system is operated in Carry Can mode with Arm below 25 Deg. and Scale Alarm 2 is deactivated i.e. Over Weight condition is not present.
With Condition (A OR B) true, Condition (C AND D AND E) true will activate the Curotto Carry Can Out signal in either Auxiliary control mode or Non-Auxiliary control mode.

D19 Output Function – Curotto - Carry Can Grab (Body Output %QX0.02)

This function controls the Curotto - Carry Can Grabber signal.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Carry Can Auxiliary Enable Switch	Activated	CAN	ON
	Carry Can Grab	Activated	CAN	ON (Refer Sec. I24)
B	Carry Can Auxiliary Enable Switch	Deactivated	CAN	OFF
	Joystick Right Button	Activated	JOYSTICK	ON
C	Autolift Enable Switch	Activated	CAN	ON
D	and Scale Alarm 2	Deactivated	%IX128.4	OFF (See Section A04)
E	and Pump On	Activated	N/A	ON

Note: This signal is energized using a CAN based control by energizing the Carry Can Grab switch.
The Curotto system is operated in Carry Can mode with Arm below 25 Deg. and Scale Alarm 2 is deactivated i.e. Over Weight condition is not present.
With Conditions (C AND D AND E) true, condition (A OR B) will activate the Carry Can Grabber output either in Auxiliary control mode or Non-Auxiliary control mode.

D20 Output Function – Curotto - Carry Can Release (Body Output %QX0.01)

This function controls the Curotto - Carry Can Release signal.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Carry Can Auxiliary Enable Switch	Activated	CAN	ON
	Carry Can Release	Activated	CAN	ON (Refer Sec. I25)
B	Carry Can Auxiliary Enable Switch	Deactivated	CAN	OFF
	Joystick Left Button	Activated	JOYSTICK	ON
C	Autolift Enable Switch	Activated	CAN	ON
D	and Scale Alarm 2	Deactivated	%IX128.4	OFF (See Section A04)
E	and Pump On	Activated	N/A	ON
F	and Pump On	Activated	N/A	ON
	and Stow Can	Activated	N/A	ON

Note: This signal is energized using a CAN based control by energizing the Carry Can Release switch.
The Curotto system is operated in Carry Can mode with Arm below 25 Deg. and Scale Alarm 2 is deactivated i.e. Over Weight condition is not present.
With Condition (A OR B)) true, Condition (C AND D AND E) true, will activate the Curotto Carry Can Release signal either from Auxiliary control mode or from Non-Auxiliary control mode.
The Carry Can Release signal is also activated with Condition ‘F’ true, which is a Stow Can signal.

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

This output function controls the Tailgate PWM control output circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

4.05: Optional In-Cab Input Functions

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4.06: Optional In-Cab Output Functions

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

4.07: Optional Body Input Functions

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
High Pressure Filter Switch	Activated	%IX128.4	ON

F02 Input Function – Bayne Can Down Switch (Body Input %IX0.06)

This input circuit monitors the status of a Bayne Carry can down button (if installed). The input is ON when the Down button is pressed. This circuit is used for controlling the Bayne Carry Can tipper.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Bayne Can Down Switch	Activated	%IX0.06	ON

F03 Input Function – Bayne Can Up Switch (Body Input %IX0.07)

This input circuit monitors the status of a Bayne Carry can up button (if installed). The input is ON when the Up button is pressed. This circuit is used for controlling the Bayne Can tipper.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Bayne Can Up Switch	Activated	%IX0.07	ON

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status

Cab Protector Down Prox. Switch	Activated	%IX0.14	ON

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Oil Level Switch	Activated	%IX0.07	ON

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

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

Condition	Modifiable Parameters	Default Setting
USED FOR FUTURE EXPANSION		

Function Logic:

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

4.08: Optional Body Output Functions

G01 Output Function – Curotto - Carry Can Cover Up (Body Output %QX0.10)

This function controls the Curotto - Carry Can Cover Up signal.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Cover Open function	Activated	N/A	ON(See Note below)
B	or Cover Open Push Button	Activated	CAN	ON
C	and Pump On	Activated	N/A	ON

Note: With Condition 'C' true, Condition (A OR B) will activate the Carry Can Cover Up output. Cover Open function will activate automatically for 2 seconds when arms travel below 15 degrees.

G02 Output Function – Curotto - Carry Can Cover Down (Body Output %QX0.11)

This function controls the Curotto - Carry Can Cover Down signal.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Cover Close function	Activated	N/A	ON(See Note below)
B	or Cover Close Push Button	Activated	CAN	ON
C	and Pump On	Activated	N/A	ON

Note: With Condition 'C' true, Condition (A OR B) will activate the Carry Can Cover Down output. Cover Open function will activate automatically for 2 seconds when arms travel above 15 degrees.

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

Condition	Function or Component	Status	I/O Address	Status
A	Forks Tucked	Deactivated	N/A	OFF (See Note below)

When the Fork is not in Tucked position and Arm Angle is more than 10 Deg., Hopper camera output is turned ON.

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

This circuit operates the Strobe light circuit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

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

This circuit operates the Strobe light circuit -2.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

B	Pump On	Activated	N/A	ON
C	Reverse	Activated	N/A	ON
D	Turn Signal	Deactivated	N/A	OFF

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

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

This output function controls the Top Door Close output.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

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

This output function controls the Top Door Open output.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

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

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

Condition	Modifiable Parameters	Default Setting

A	None	N/A

Conditions Necessary to activate the circuit:

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

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

G10 Output Function (Option) – Curotto - Carry Can Light (In Cab Output %QX0.07)

This output function controls the Curotto - Carry Can Light output. Here CAN control is used to turn ON/OFF the Curotto Can – Light, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

Note: With condition 'A' true, the Curotto Can Lights will activate.

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Conditions Necessary to activate the circuit:

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

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

4.09: Analog Input Functions

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

This circuit measures the value of Packer Position.

Condition	Modifiable Parameters	Default Setting

A	None	N/A

Function Logic:

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

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

This circuit measures the Hydraulic Oil Temperature.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

This circuit is used to measure the Body Valve pressure.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

4.10: CAN In-Cab Input Functions

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

I12 Input Function – Auto Lift Enable Switch (CAN - In Cab Input)

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Auto Lift Up Enable Circuit	Activated	CAN	ON (CAN Control)

4.11: MULTI FUNCTION JOYSTICK CONTROL INPUT FUNCTIONS

The Multifunction Joystick control can operate in 2 modes:

1. Carry Can mode: If the Autolift switch is enabled (turned ON), then the Joystick is used for controlling the carry can operations. If the Mode button is pressed, the joystick controls the Arms / Forks in Auto lift mode.
2. Manual mode: If the Autolift switch is disabled (turned OFF), then Joystick controls only the Arms/Forks.

J01 Input Function – Joystick – Rocker (GRAB) Switch (CAN – Cab Input)

Here the Rocker switch GRAB position is used to Grab / Hold the Can.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
. Curotto Can – Grabber Enable	Activated	CAN	ON (CAN Control)

J02 Input Function – Joystick – Rocker (RELEASE) Switch (CAN – Cab Input)

Here the Rocker switch RELEASE position is used to release the Can from Gripper.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Curotto Can – Release Enable	Activated	CAN	ON (CAN Control)

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

1. **Carry Can mode:** Pulling back the Joystick (Y-axis in Negative direction) performs the Curotto can Dump operation.
2. **Manual mode:** Pulling back the Joystick (Y-axis in Negative direction) performs the Arms up operation.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

1. **Carry Can mode:** Pushing the Joystick forward (Y-axis in Positive Direction) performs the Curotto can Un-dump operation.
2. **Manual mode:** Pushing the Joystick forward (Y-axis in Positive Direction) performs the Arms Down operation.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

1. **Carry Can mode:** Moving the Joystick Left (X-axis in Negative direction) makes the Curotto can Arm retract.
2. **Manual mode:** Moving the Joystick Left (X-axis in Negative direction) performs the Forks up operation.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

1. **Carry Can mode:** Moving the Joystick Right (X-axis in Positive direction) makes the Curotto can Arm extend.
2. **Manual mode:** Moving the Joystick Right (X-axis in Positive direction) performs the Forks down operation

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

J07 Input Function – Joystick –Autolift Mode Button (CAN – Cab Input)

When the Auto Lift switch is ON and the Auto lift mode button (Red) is pressed it activates the Auto lift option i.e. press and hold the Auto lift mode button (Red) and pull back the Joystick (Y- axis Negative direction), this lifts the Curotto can and completes the Auto dump cycle.
Press and hold the Auto lift mode button (Red) and push the Joystick forward (Y- axis Positive direction), this makes the Curotto can roll out of the Hopper and brings the Arms to down position.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Auto lift Mode Button	Activated	CAN	ON (CAN Control)

J08 Input Function – Joystick – Operator presence (CAN – Cab Input)

Joystick operator presence input is a capacitive sensor embedded in the Multi-function joysticks that is activated when the operators hand is placed around the joystick handle.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Joystick Operator Presence	Activated	CAN	ON (CAN Control)

4.12: OPTION CAN Auxiliary-Cab Input Functions

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

K08 Input Function – Auxiliary Curotto Control Enable Switch (CAN - In Cab Input)

This is used to turn ON the Auxiliary Curotto Control Enable switch that Enables or Disables the control for operating the Auxiliary Curotto control.

.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Auxiliary Controls Enable Switch	Activated	CAN	ON (CAN Control)

K09 Input Function – Auxiliary Curotto (GRAB) Switch (CAN - In Cab Input)

Here the Auxiliary Curotto control (GRAB) switch is used to Grab / Hold the Can. This input will be active only if Auxiliary Curotto Control Enable Switch is ON (Refer K08).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Auxiliary Curotto (Grab) Switch	Activated	CAN	ON (CAN Control)

K10 Input Function – Auxiliary Curotto (RELEASE) Switch (CAN - In Cab Input)

Here the Auxiliary Curotto control (RELEASE) is used to release the Can from Gripper. This input will be active only if Auxiliary Curotto Control Enable Switch is ON (Refer K08).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status

Auxiliary Curotto (Release) Switch	Activated	CAN	ON (CAN Control)

K11 Input Function – Auxiliary Curotto (DUMP) Switch (CAN - In Cab Input)

Here the Auxiliary Curotto control (DUMP) switch performs the Curotto Can Dump. This input will be active only if Auxiliary Curotto Control Enable Switch is ON (Refer K08).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Auxiliary Curotto (Dump) Switch	Activated	CAN	ON (CAN Control)

K12 Input Function – Auxiliary Curotto (UNDUMP) Switch (CAN - In Cab Input)

Here the Auxiliary Curotto control (UNDUMP) switch performs the Curotto Can Undump. This input will be active only if Auxiliary Curotto Control Enable Switch is ON (Refer K08).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Auxiliary Curotto (Undump) Switch	Activated	CAN	ON (CAN Control)

K13 Input Function – Auxiliary Curotto (IN) Switch (CAN - In Cab Input)

Here the Auxiliary Curotto control (IN) switch makes the Curotto Can Arm retract. This input will be active only if Auxiliary Curotto Control Enable Switch is ON (Refer K08).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Auxiliary Curotto (IN) Switch	Activated	CAN	ON (CAN Control)

K14 Input Function – Auxiliary Curotto (OUT) Switch (CAN - In Cab Input)

Here the Auxiliary Curotto control (OUT) switch makes the Curotto Can Arm extend. This input will be active only if Auxiliary Curotto Control Enable Switch is ON (Refer K08).

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Auxiliary Curotto (OUT) Switch	Activated	CAN	ON (CAN Control)

4.13: OPTION CAN In-Cab Input Functions

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

L02 Input Function – Strobe Light Switch (CAN - In Cab Input)

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

L04 Input Function – Top Door Close Switch (CAN - In Cab Input)

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

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

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

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

L09 Input Function – Curotto Can – Cover Open Switch (CAN - In Cab Input)

This CAN control is used to open the Curotto Can – Auto Cover, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Curotto Can – Cover Open	Activated	CAN	ON (CAN Control)

L10 Input Function – Curotto Can – Cover Close Switch (CAN - In Cab Input)

This CAN control is used to close the Curotto Can – Auto Cover, either from Street side or from the Curb side of a dual control panel unit.

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Curotto Can – Cover Close	Activated	CAN	ON (CAN Control)

L11 Input Function – Curotto Can – Light Enable Switch (CAN - In Cab Input)

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

Condition	Modifiable Parameters	Default Setting
A	None	N/A

Function Logic:

Input Device	Status	I/O Address	Status
Curotto Can – Light	Activated	CAN	ON (CAN Control)

Section 5: Special Features

5.01: Auto Pack Mode

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

5.02: Select-O-Pack

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

5.03: Travel Position

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

5.04: INSIGHT Display Functionality

CORTEX32 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 CORTEX32 controller.
This display has provision of connecting 1-Input (Digital or Analog), 1-Ouput terminal to it. Also, a Analog video input which supports PAL/NTSC standard can also be connected to it.
Other features of this display are, it has an Integrated Buzzer and 2 sensors which can be used to monitor the Temperature inside the housing.

There are 2 types of INSIGHT display devices used here for performing various operations as mentioned below:

A. INSIGHT Display (7“)
B. INSIGHT Display (12“)

5.04.01A: INSIGHT Display (7”) Operating Elements

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

Fig.: 7" INSIGHT Display Unit

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

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

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

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

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

5.04.01B: INSIGHT Display (12") Operating Elements

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

Fig.: 12" INSIGHT Display Unit

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

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

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

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

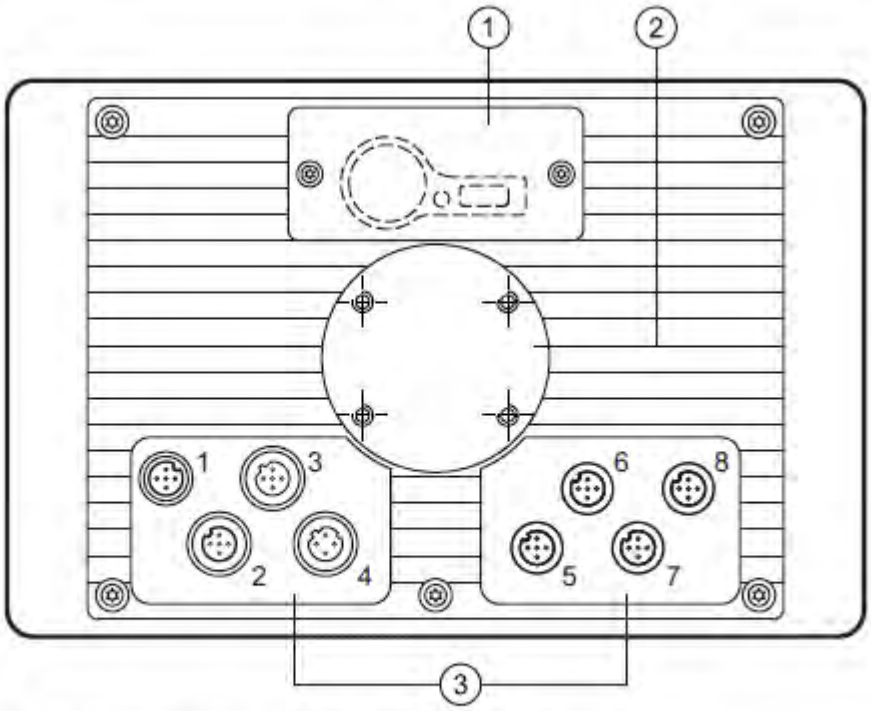
4. INSIGHT Display: This is used for displaying the current status of the Input / Output, Engine Run Speed, Temperature, Auto/Manual mode etc. This can be programmed for graphically representing a process. This can also be used for changing the set points for Analog values.

5.04.02: Display Operating States:

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

5.04.03:Rear Panel Housing connection:

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



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

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

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

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

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

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

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

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

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

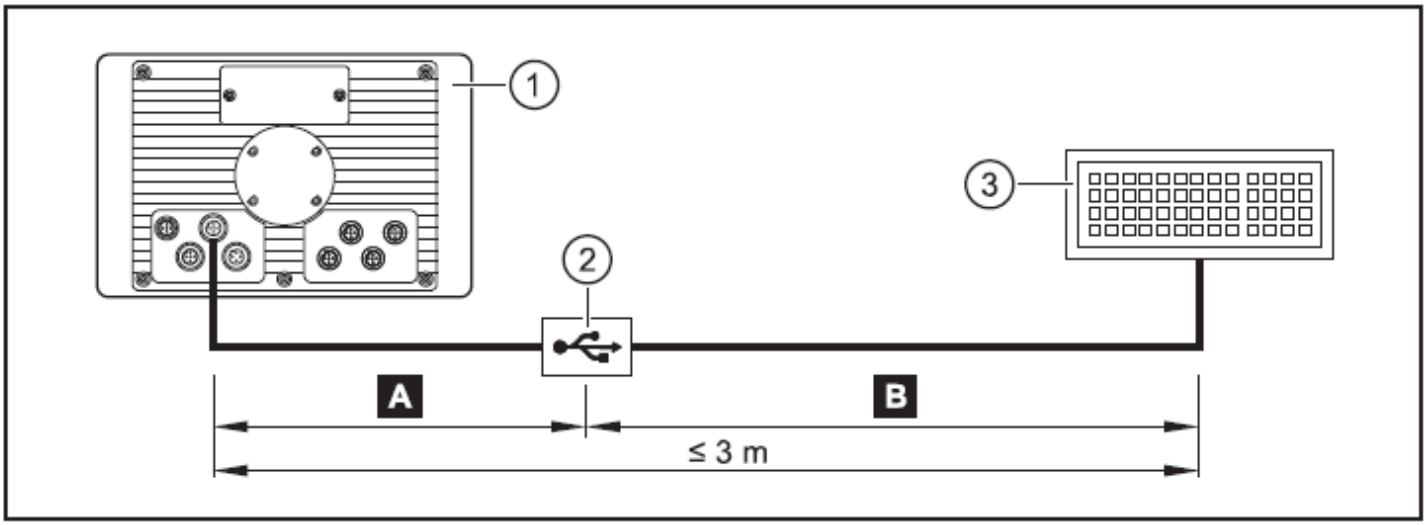
(8) N/A	
1	
2	
3	
4	
5	

5.04.04:Interface details:

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

2. Ethernet Camera: The device supports Ethernet cameras.

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



USB connection via M12 connector

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

A Permanent connection: Dialogue module – USB connector

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

B Temporary connection: USB connector – USB device

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

5.05: Half/Pack Factor AFL Interlock Functionality

5.05.01: Residential Mode

A. Curb Side Control

1. Manual mode:
    - The angle of the Curotto-Can is limited and the location in the arm arc where the Curotto-Can can be adjusted is limited to below the Overheight position.
    - This Curotto-Can angle adjustment range will be 10 degrees up and down from the level position.
2. Carry Can mode: The unit is limited to Curotto-Can functions at all time.
3. AutoLift mode: In this mode full range of interlocks such as:
    - Cab/Curotto-Can interlocks below the windshield where the Curotto-Can cannot be feathered into the cab.
    - The Curotto-Can cannot be feathered above the windshield at all. The only way to roll the Curotto-Can is via the prescribed roll-in position during AutoLift and even then only when the Engine speed is > 1000 RPM and the AutoLift is started below the windshield height.
    - Arms cannot be lowered unless the Curotto-Can clear position (can is fully outside of the hopper) has been reached.
    - The AutoLift cycle can be stopped or started from any position. If the cycle is started above the windshield then regardless of the state of the Engine speed the Curotto-Can will not roll until the arms are fully raised.
    - If the packer is away from home the arms will interlock at the top of the windshield (or at the more accurately labeled “interlock position” since this position is adjustable.) Also the packer will not be able to move if the arms are above the interlock position.
    - If the top door, if any, is not fully open the arms will interlock at the interlock position.
    - If the top door is not fully open the arms and Curotto-Can will not be allowed to move above Overheight position.

B. Street Side Control

1. Manual mode:
    - The angle of the Curotto-Can is limited and the location in the arm arc where the Curotto-Can can be adjusted is limited to below the Overheight position.
    - This Curotto-Can angle adjustment range will be 10 degrees up and down from the level position.
2. Carry Can mode: The unit is limited to Curotto-Can functions at all time.
3. AutoLift mode: In this mode full range of interlocks such as:
    - Cab/Curotto-Can interlocks below the windshield where the Curotto-Can cannot be feathered into the cab.
    - The Curotto-Can cannot be feathered above the windshield at all. The only way to roll the Curotto-Can is via the prescribed roll-in position during AutoLift and even then only when the Engine speed is > 1000 RPM and the AutoLift is started below the windshield height.
    - Arms cannot be lowered unless the Curotto-Can clear position (can is fully outside of the hopper) has been reached.
    - The AutoLift cycle can be stopped or started from any position. If the cycle is started above the windshield then regardless of the state of the Engine speed the Curotto-Can will not roll until the arms are fully raised.
    - If the packer is away from home the arms will interlock at the top of the windshield (or at the more accurately labeled “interlock position” since this position is adjustable.) Also the packer will not be able to move if the arms are above the interlock position.
    - If the top door, if any, is not fully open the arms will interlock at the interlock position.
    - If the top door is not fully open the arms and Curotto-Can will not be allowed to move above Overheight position.

Note: In Carry Can mode, all interlocks are active on the street side and curb side even with knob or 2-lever joysticks installed. Autolift function is not available with knob or 2-lever joystick.

Section 6: Diagnostic Messages and Alarms

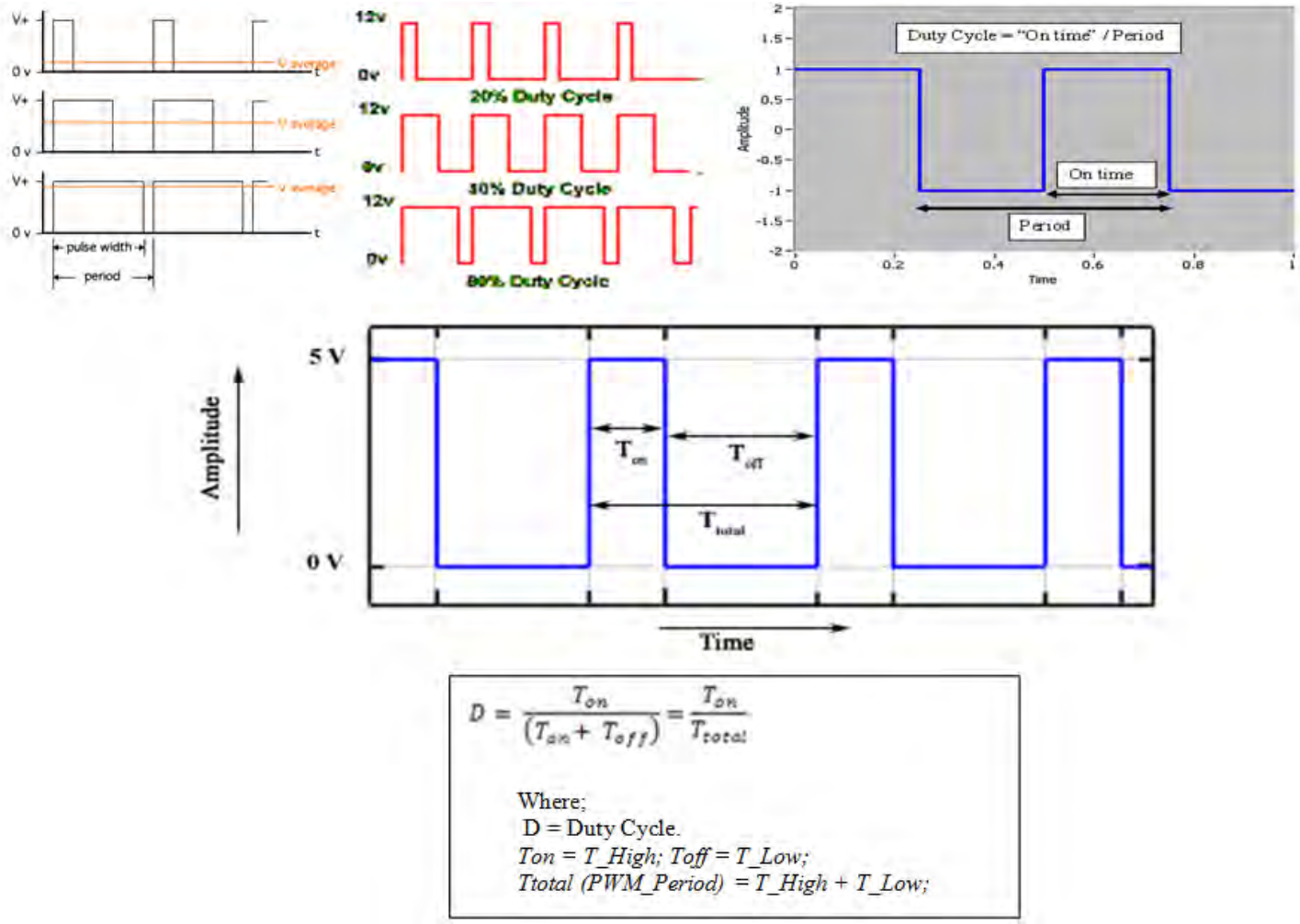
6.01: Testing I/O Voltage

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

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

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

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



Figures: PWM Output signal Waveforms

6.02: Monitoring Input Status

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

6.03: Monitoring Output Status

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

6.04: Diagnostic Display Messages

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

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

  Insight Display Illustration:

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

  Disabled Functions: Packer.

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

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

  Insight Display Illustration:

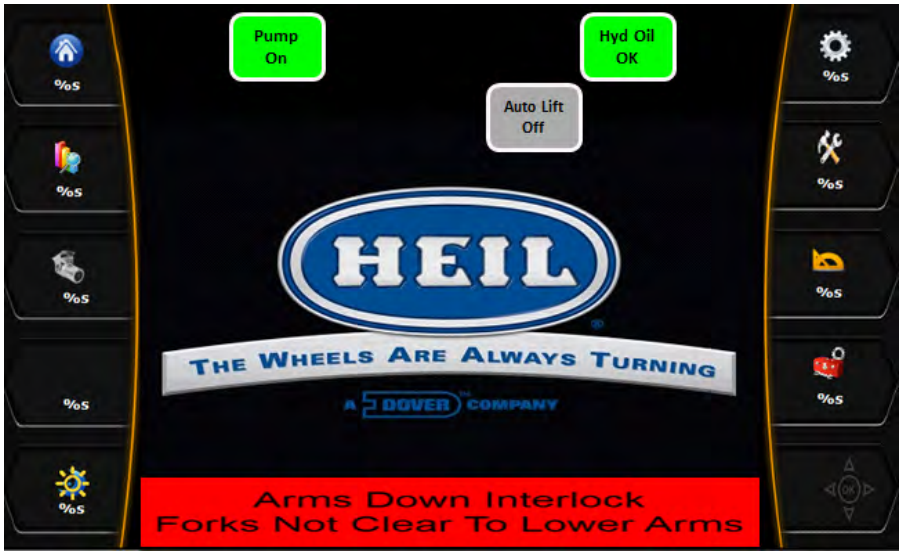
Indication: A. Scale Alarm-2 ON due to Overweight.
B. PTO-1 and PTO-2 pump Active signal ON.

Disabled Functions: Arms Up interlock and Forks raise Interlock

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

- **Cab Protector Down with Arms Lowered Interlock and Arms Active and Arms up Interlock (standard equipment)**
The arms have been lowered when the top door is not fully open or the Arm position angle is greater than the Fork roll position value (700) and Arms Up position is less than (1000) and the Packer/ Cab protector switch has not been enabled and the Fork position is greater than Feather Up range (610) and Arms up PWM Value less than (800) and Cab Protector Down configuration bit is ON and Top door configuration bit is ON and Residential configuration bit is ON, the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:



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

C. Top Door Configuration bit is ON.
D. Cab Protector Down Configuration bit is ON.

Disabled Functions: Forks will not be Lowered.

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

- **Cab Protector Down with Forks Untuck and Arms Lowered Docked Interlock (standard equipment)**

The arms have been lowered when the top door is not fully open and Forks Untuck position is '113' and Arm Angle position is lesser than '110', the diagnostic message will be displayed in the Insight display.

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

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

Disabled Functions: Forks will not be Lowered.

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

- **Top Door Open and Arms Lowered Interlock (standard equipment)**

If arms have been lowered when the top door is not fully open or the Arm position angle is greater than the Fork roll position value (700) and the Fork position is greater than Feather Up range (610) and the Top door configuration bit is ON and Residential configuration bit is ON, the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

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

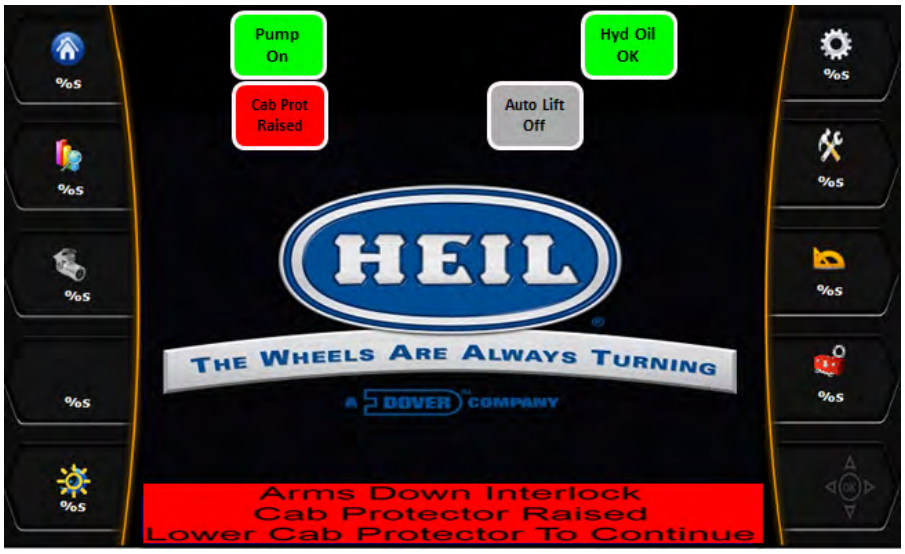
Disabled Functions: Forks will not lowered.

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

- **Cab Protector Raised and Arms Lowered Interlock (standard equipment)**

The arms have been lowered when the Arm position angle is greater than the Fork roll position value (700) and the Packer/ Cab protector switch has been enabled and the Fork position is greater than Feather Up range (610) and Cab Protector Down configuration bit is ON and Residential configuration bit is ON, then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:



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

Disabled Functions: Forks will not Lowered.

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

- **Travel Position Not Allowed Interlock Active (standard equipment)**

If Auto lift enable switch is turned ON from either street side or from the curb side of the dual control panel and Travel position switch is activated while the Packer Extend/Retract push button has been pressed or Packer extend/retract Auxiliary controls are activated, then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

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

Disabled Functions: NONE.

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

- **Tailgate Closed While Ejecting (standard equipment)**

If Packer has reached the fully extended proximity switch while the tailgate is closed for at least 2 Seconds, then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:

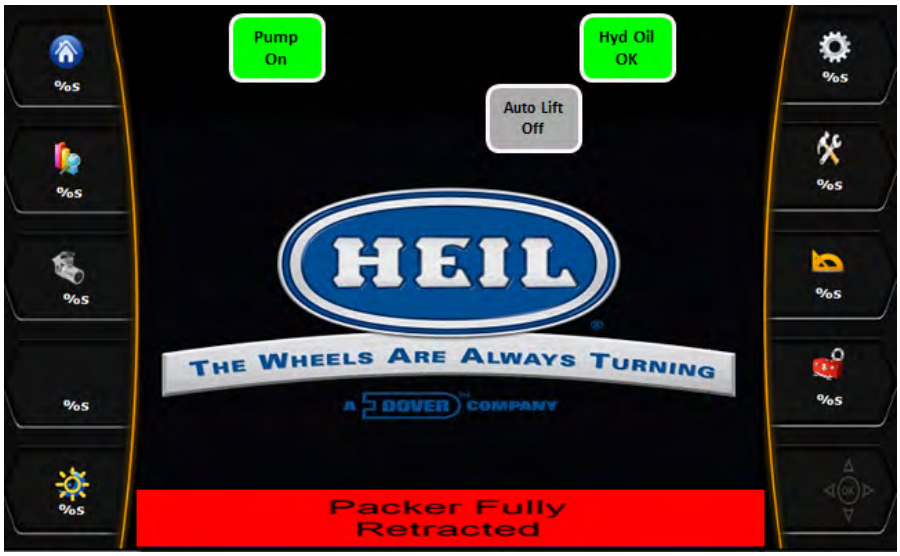
Indications: Packer Fully Extended and Tailgate Closed inputs are lit.

Disabled Functions: None.

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

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

  Insight Display Illustration:



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

  Disabled Functions: None.

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

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

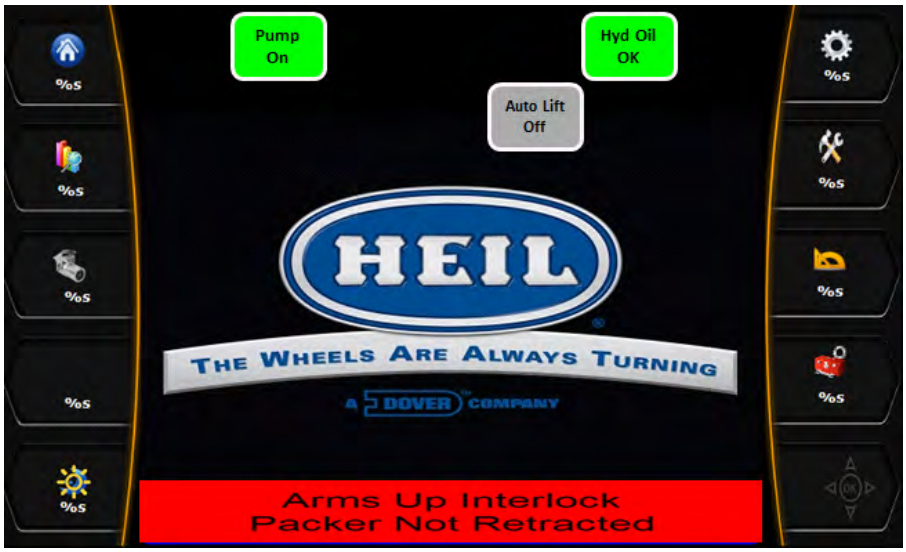
  Insight Display Illustration:

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

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

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

Insight Display Illustration:



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

Disabled Functions: Forks will not raise above windshield.

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

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

Insight Display Illustration:

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

Disabled Functions: Packer will not extend.

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

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

Insight Display Illustration:

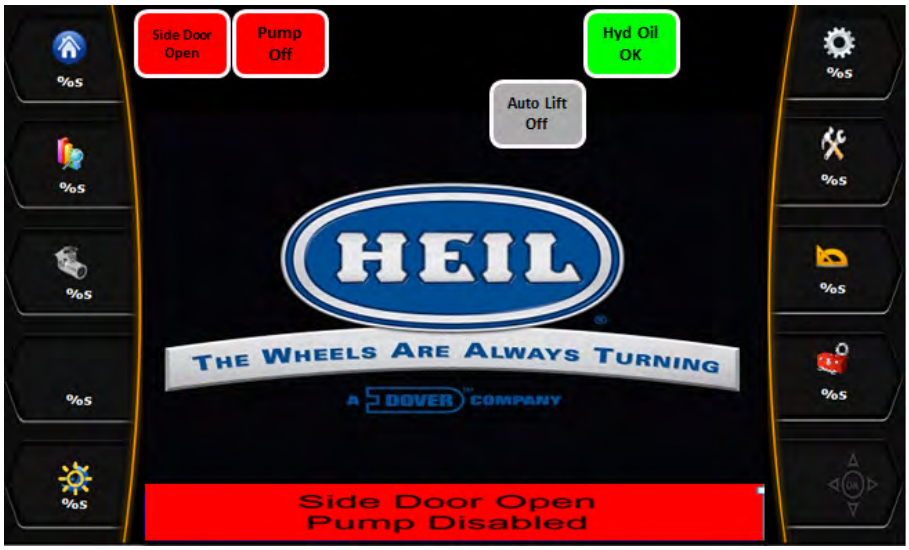
Indication: A. System Power input is not lit.
B. Packer does not move.

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

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

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

  Insight Display Illustration:



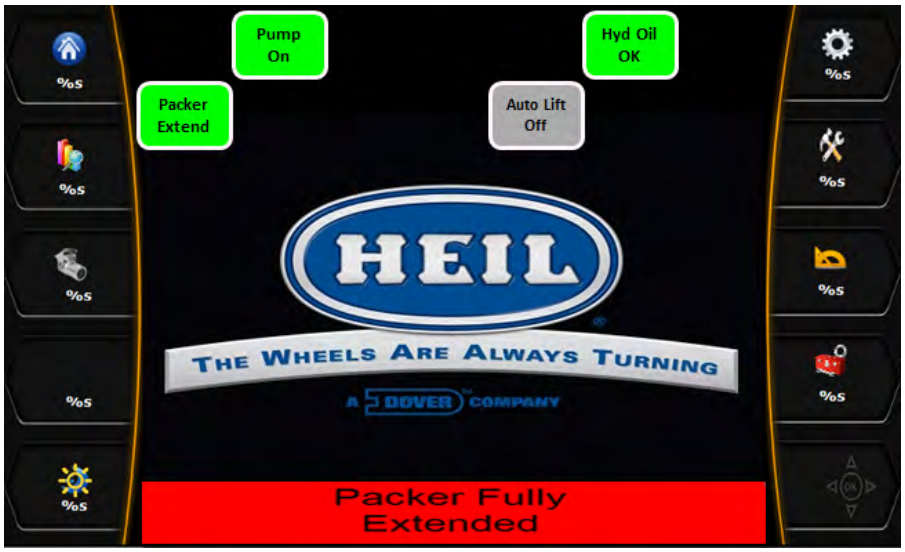
  Indication: A. Pump turns OFF unexpectedly.
  B. Packer does not pack.
  C. Pump will not turn ON.

  Disabled Functions: Pump and all packer functions.

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

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

  Insight Display Illustration:



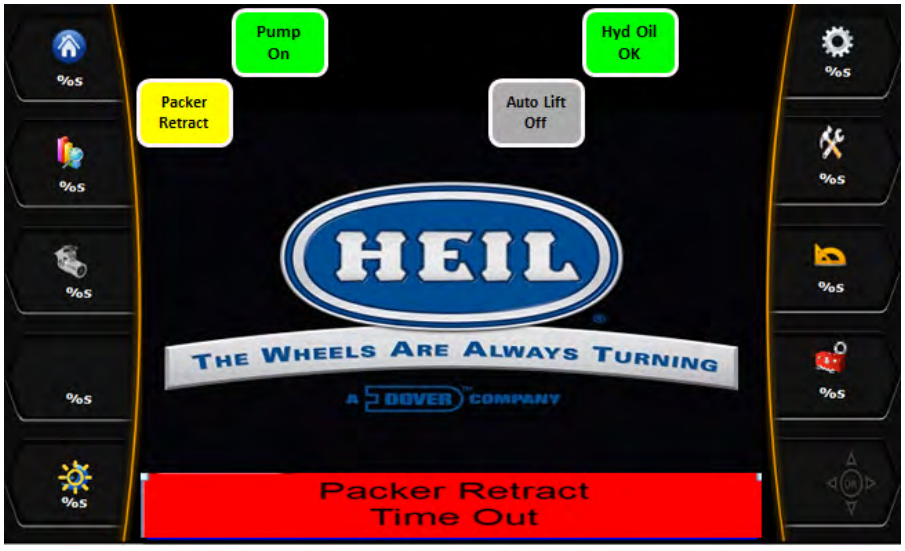
Indication: The diagnostic message will be displayed in the Insight display.

Disabled Functions: None

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

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

  Insight Display Illustration:



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

  Disabled Functions: Packer retract.

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

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

  Insight Display Illustration:

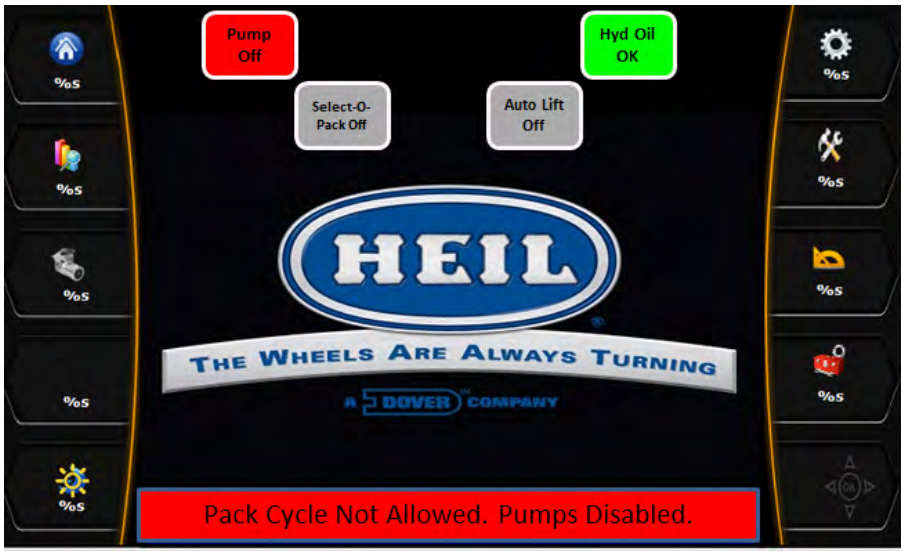
  Indication: The packer does not move.

  Disabled Functions: Packer will not move.

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

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

  Insight Display Illustration:



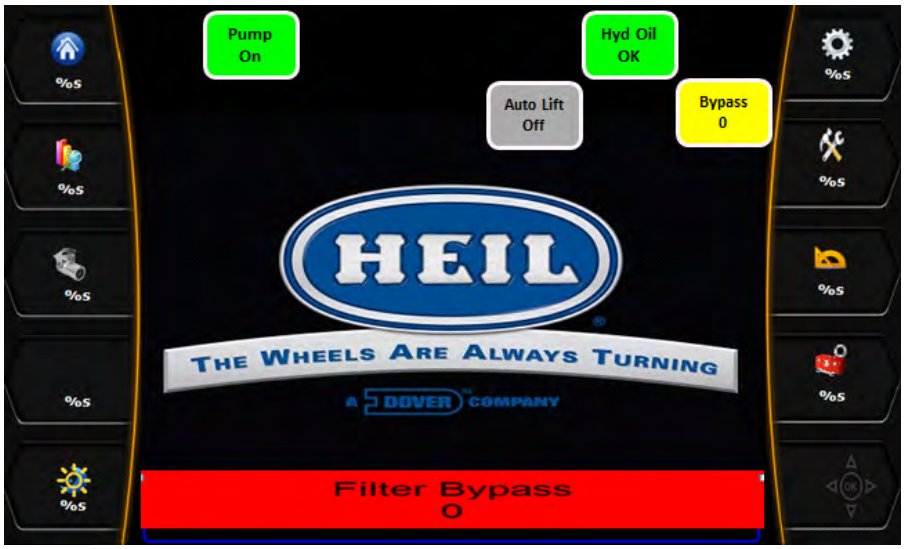
  Indication: The packer does not move.

Disabled Functions: Packer extend.

Fault Reset: Turn ON the pump.

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

  Insight Display Illustration:



  Indication: The Pump will only work for 3 minutes.

  Disabled Functions: Pump

  Fault Reset: Replace hydraulic oil filter.

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

  Insight Display Illustration:

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

Disabled Functions: Forks will not raise above windshield.

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

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

Insight Display Illustration:

Indication: A. Arms Overheight light ON.
B. Top Door Open light ON.

C. Scale Alarm-2 ON due to Overweight.
D. PTO-1 and PTO-2 pump Active signal ON.
E. Top Door Open Configuration bit is ON.

Disabled Functions: Forks will not raise above windshield.

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

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

Insight Display Illustration:

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

Disabled Functions: Forks will not raise above windshield.

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

- **Packer Sensor Fault (standard equipment)**
The Packer position value is less than '100' or greater than '4600' during the Packing operation the diagnostic message will be displayed in the Insight display. (Refer section 4.09 – H01 – Packer Position for details).

Insight Display Illustration:

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

Disabled Functions: Packer functions and Fork function.

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

- **Fork Sensor Fault (standard equipment)**
The Fork position value is less than '-100' or greater than '1400' during the operation then the diagnostic message will be displayed in the Insight display. Also the value is not within the High or Low limit.

Insight Display Illustration:

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

Disabled Functions: Forks will not raise above windshield.

Fault Reset: Check for the Faulty sensor or Sensor mounting position or calibrate the faulty sensor and check Cab protector prox. switches for proper operation.

- **Arm Sensor Fault (standard equipment)**
  The Arm position value is greater than '1100' or less than '-100' during the operation then the diagnostic message will be displayed in the Insight display. Also the value is not within the High or Low limit (do we need this statement as we have given the Hi limit in 1st line)

  Insight Display Illustration:

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

  Disabled Functions: Forks will not raise above windshield.

  Fault Reset: Check for the Faulty sensor or Sensor mounting position or calibrate the faulty sensor for proper operation.

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

  Insight Display Illustration:

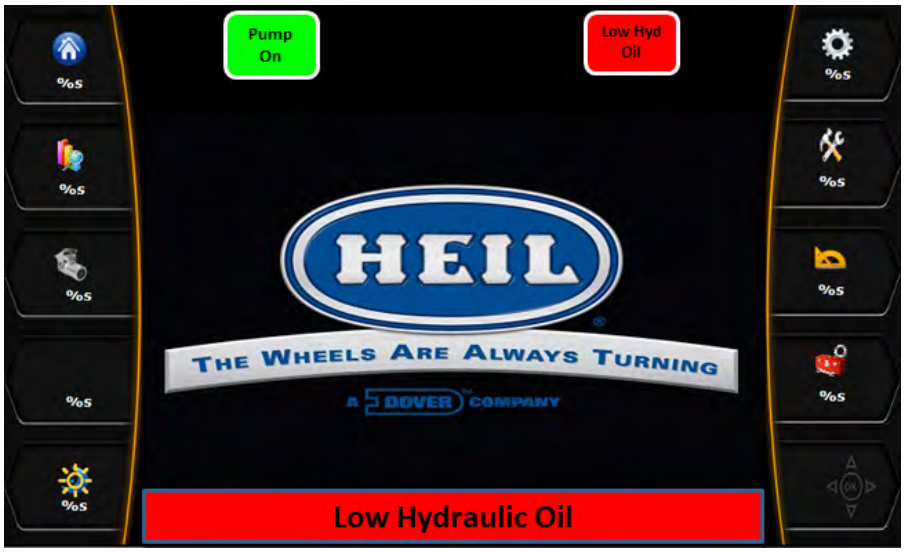
  Indication: A. Arms Overheight light ON.
  B. Top Door Open light ON.
  C. PTO-1 and PTO-2 pump Active signal ON.

  Disabled Functions: Forks will not raise above windshield.

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

- **Low Oil Level Fault (standard equipment)**
  The hydraulic oil level has dropped below a safe operating level during operation then the diagnostic message will be displayed in the Insight display.

Insight Display Illustration:



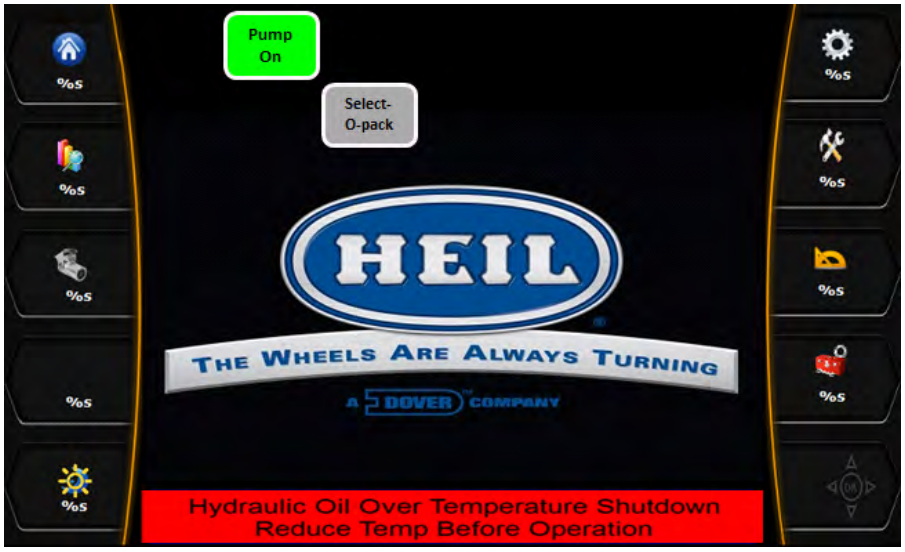
Indication: Low Hydraulic Oil Level

Disabled Functions: Hydraulic Pump

Fault Reset: Refill hydraulic oil tank.

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

Insight Display Illustration:



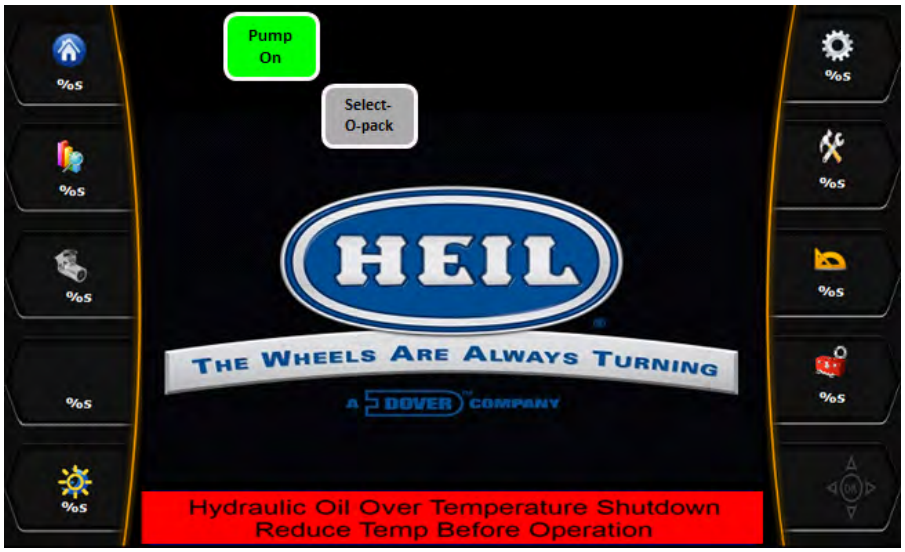
Indication: A. Hydraulic Oil over temperature shutdown.

Disabled Functions: Hydraulic Pump

Fault Reset: Reduce temperature before operation.

- **High Temperature Fault (standard equipment)**
  If the Hydraulic Oil temperature is greater than 180º F, then the diagnostic message will be displayed on the Insight display.

  Insight Display Illustration:



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

  Fault Reset: Reduce temperature before operation.

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

  Insight Display Illustration:

Indication: A. System Power input is not lit.

B. Pump does not turn ON

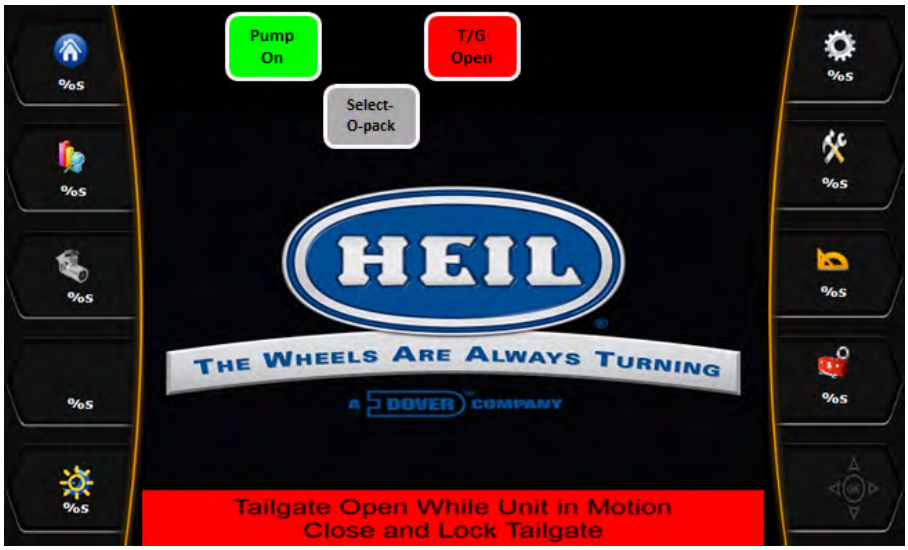
Disabled Functions: Body pump

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

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

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

Insight Display Illustration:



Indication: Tailgate open.

Disabled Functions: None

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

further.

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

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

Insight Display Illustration:

Indication: A. Tailgate Unlocked.

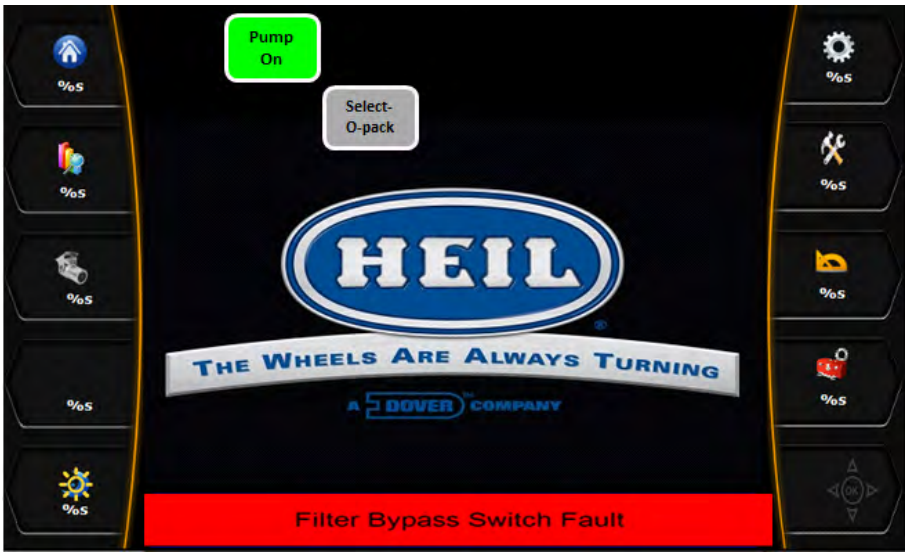
Disabled Functions: None.

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

- **Filter Bypass Switch Fault (standard equipment)**

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

Insight Display Illustration:



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

Disabled Functions: None.

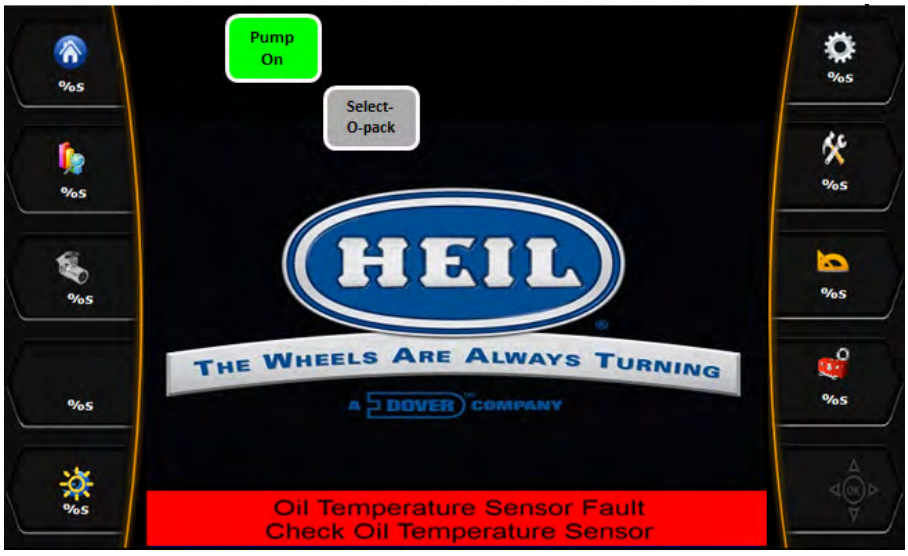
Fault Reset: Cycle System Power Switch or Restore filter pressure switch input to CORTEX Controller.

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

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

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

Insight Display Illustration:



Indication: Oil Temperature Sensor fault

Disabled Functions: None

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

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

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

Insight Display Illustration:

Indication: A. No Voltage on Extended side controller.

Disabled Functions: CORTEX32 Extended Controller.

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

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

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

Insight Display Illustration:

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

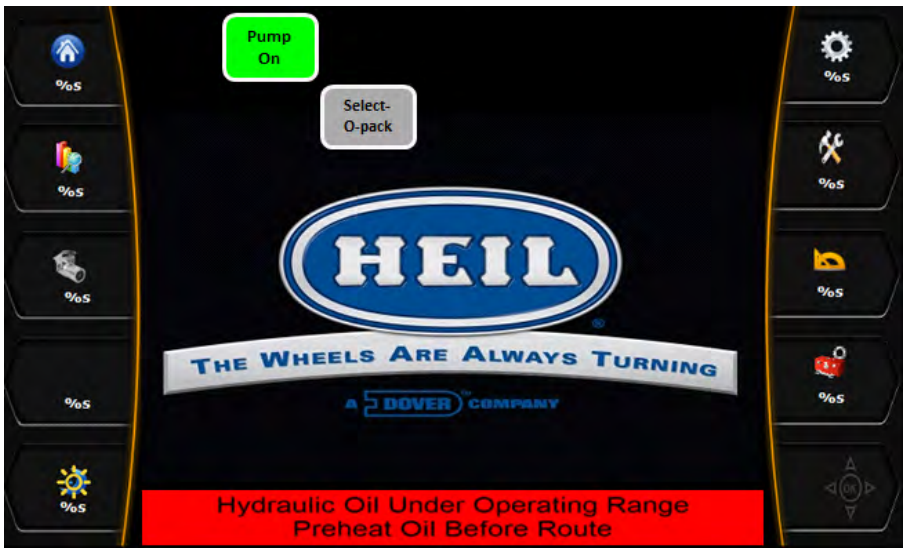
Disabled Functions: CORTEX32 Extended Controller.

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

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

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

Insight Display Illustration:



Indication: Hydraulic Oil temperature under Operating range

Disabled Functions: None

Fault Reset: Preheat Oil before route.

SECTION 7
COMPRESSED NATURAL GAS (CNG) OPTION

Half/Pack® Factor AFL™
Compressed Natural Gas (CNG) Option

IMPORTANT SAFETY INFORMATION

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 Operation Manual and Heil Parts and Service Manual before operating or servicing the unit. CNG training is required for any person inspecting, operating, or performing maintenance on a CNG unit.

Read, understand and follow the instructions within this document before operating, servicing or adjusting referenced equipment. Anyone using or maintaining this equipment must be familiar with the product and fully trained to operate and maintain the unit. Improper usage or maintenance of this equipment may result in injury or death.

Always keep a copy of this manual readily available for persons who operate the equipment or perform maintenance procedures. Safe working procedures must be followed at all times. **Lock-Out/Tag-Out Procedures** 9 must be followed when performing applicable procedures.

A vehicle equipped with a compressed natural gas fuel system will have a blue reflective decal on the rear of the vehicle identifying Compressed Natural Gas (CNG). See the image below.

IMPORTANT SAFETY INFORMATION (CONTINUED)

A. Safety Notices

Throughout this manual, safety notices are included to warn operators and maintenance technicians of the dangers associated with the described equipment operations and maintenance. Improper operation or maintenance procedures may cause serious injury or death. Safety notices accompany potentially hazardous situations throughout this manual. Please read and follow instructions carefully.

For supplemental information, refer to the following codes:

- United States: NFPA 52, State and Local Regulations
- Canada: CAN/CGA B109, CAN/CSA B108, FMVSS 304

⚠ DANGER

The CNG Fuel Module System contains some lines that are under continuous high pressure. DO NOT attempt to loosen or disconnect those lines.

⚠ DANGER

Natural Gas is Flammable and Explosive. Never use an open flame (match, lighter, or other) to light a work area near the CNG fuel storage system.

⚠ DANGER

Keep work area well ventilated to avoid asphyxiation due to concentrated levels of carbon monoxide.

⚠ WARNING

Do not start the engine if a natural gas leak is detected.

⚠ WARNING

Never open system components while the system is under pressure. Treat all cylinders as full until defueling has been completed.

⚠ WARNING

Never weld or perform any type of "hot work" on any part of a compressed natural gas vehicle unless the compressed natural gas fuel system has been purged with inert gas.

Half/Pack® Factor AFL™
Compressed Natural Gas (CNG) Option

IMPORTANT SAFETY INFORMATION (CONTINUED)

⚠ WARNING

Avoid open flames and sparks near a compressed natural gas vehicle.

⚠ WARNING

Do not smoke cigarettes, cigars, or use any other lit or sparking items within 30 feet of a compressed natural gas vehicle or a dispensing/filling station.

⚠ WARNING

Do not use a cell phone or other electronic device within 30 feet of a compressed natural gas vehicle or a dispensing/filling station.

⚠ CAUTION

Keep the compressed natural gas equipment area well ventilated.

⚠ CAUTION

A portable fire extinguisher must be installed on the vehicle in an accessible location.

Properties of Natural Gas:

- Auto Ignition Point: 900 - 1170° F (482 - 632°C)
- Lower Explosive Limit (%): 3.8 – 6.5
- Upper Explosive Limit (%): 13 – 17

COMPRESSED NATURAL GAS (CNG) FUEL MODULE

A. Fuel Module Functions

The CNG fuel tanks contain CNG at a pressure of 3,600 psi in USA, (3,000 psi in Canada). The CNG Fuel Module serves multiple functions within a natural gas vehicle (NGV) fuel system.

These functions include:

- Storage tank refueling
- Storage tank pressure measurement
- Manual and ignition controlled fuel shut-off
- Pressure reduction from storage tanks to engine supply
- Fuel system filtration
- Liquid removal from fuel system

B. Fuel Module Components

The images on the following pages show a typical CNG system configuration. Your CNG system configuration may vary.

1. High Pressure Gauge

   The high pressure gauge, located in the front panel of the fuel control module, indicates the pressure of the CNG being supplied to the regulator. If the manual shut-off valve is turned to ‘on’ and all other valves are open between the fuel tank and the fuel control module, this gauge reflects fuel tank pressure.

2. Low Pressure Gauge

   Located below the high pressure gauge in the front panel of the fuel control module, the low pressure gauge indicates the pressure of the CNG leaving the regulator and supplying the vehicle’s engine. A typical reading for this gauge is 100-120 psi, dependent upon regulator setting.

3. Manual Shut-Off Valve

   The manual shut-off valve is located on the bottom front of the fuel control module. Rotate the handle clockwise so arrow turns down and points to the ‘OFF’ position; fuel flow from the tanks to the vehicle’s engine is prohibited. Rotate the handle counterclockwise so arrow points to the ‘ON’ position to allow fuel flow from the tanks to the vehicle’s engine.

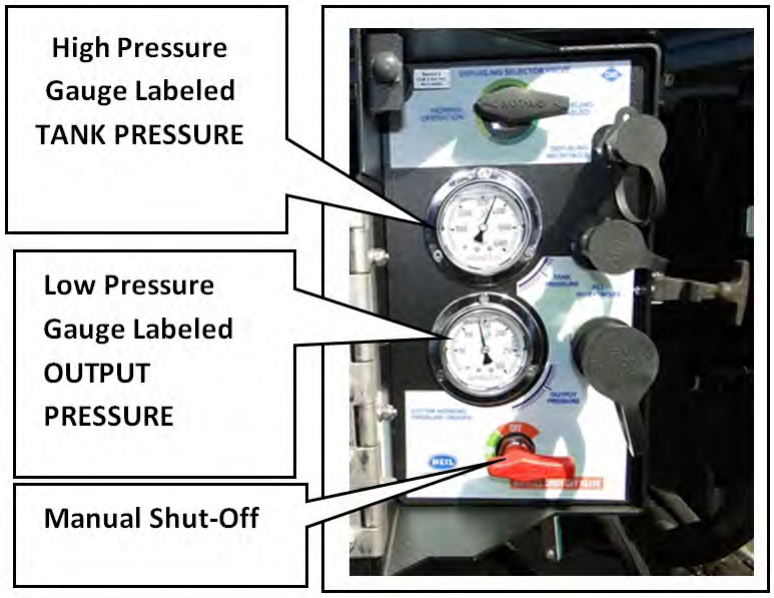


Figure 32. Manual Shut-Off Valve

COMPRESSED NATURAL GAS (CNG) FUEL MODULE (CONTINUED)

B. Fuel Module Components (Continued)

4. Purge Valve

   Located inside the side maintenance access door, the purge valve, when loosened, purges CNG from the vehicle's fuel control module to allow safe access to the filter assembly.

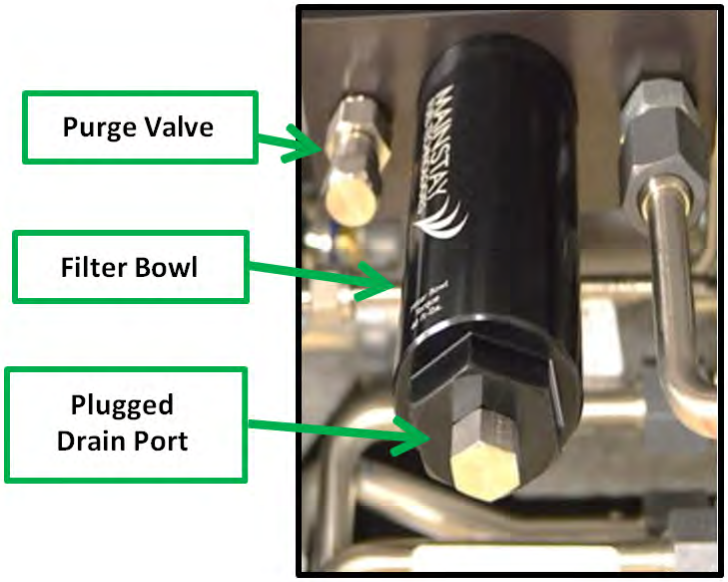


Figure 33. Purge Valve

5. Fuel Filter

   The fuel filter is located inside the side maintenance access door, within the filter bowl. This filter collects both solid and liquid contaminants. It requires periodic maintenance, as outlined in **CNG Fuel Module Maintenance and Part Replacement** 183.

Figure 34. Side Maintenance Access

MAINTENANCE

Routine maintenance of the compressed natural gas system in accordance with the **Table 1. Inspection/Preventive Care Schedule** (below) will ensure that the system and components are functioning properly.

⚠ WARNING

System components must not be under pressure during servicing. Servicing components under pressure may cause serious injury.

⚠ WARNING

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

⚠ WARNING

Make sure the unit is in the **Lock-Out/Tag-Out mode** 9 when you do maintenance or service procedures, or when you go in the hopper, climb in or on the body or on equipment. The unit can be operated intentionally or accidentally when the unit is not in the Lock-Out/Tag-Out mode which can cause serious injury or death to anyone in the hopper, in or on the body or on equipment.

⚠ CAUTION

Maintenance of a compressed natural gas system is to be performed ONLY by authorized service personnel. Unauthorized maintenance can result in personal injury and/or extensive damage to the unit.

Table 1. Inspection/Preventive Care Schedule

ITEM	FREQUENCY
Storage System:	
Leak Test with Methane Detector*	Every month
Component Inspection*	Every month
Drain Filter	Every 10,000 miles
Replace Filter Element	Every 40,000 miles
Drain Vent Lines	Every month (or immediately if blue vent cap is missing)
Cylinders*	Inspect compressed gas cylinders as outlined by cylinder manufacturer
* To be completed by a qualified and trained person.	

PREPARATION BEFORE MAINTENANCE

It is necessary to prepare the truck to be serviced. A mechanic's initial focus while preparing the vehicle for service should be safety. The primary preparation involves relieving the pressure within the system BEFORE performing any maintenance procedures.

Follow the steps as outlined below to ensure that no pressure remains.

1. Leave the Fuel Management Module Manual Shut-Off Valve in the Open "O" position.
2. Turn OFF each supply Tank's valve(s) inside CNrG Tailgate.

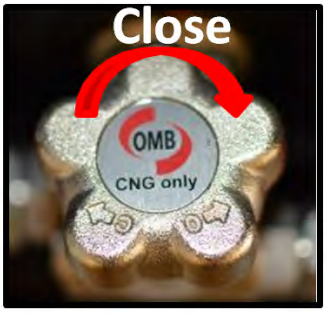


Figure 35. Tank Valve

3. Start the vehicle's engine, allowing it to run until the engine shuts off. This will ensure that all CNG in the lines has been consumed.
4. As an added safety precaution, open the system purge valve to ensure no latent pressure remains.
5. Ensure the high pressure gauge on the fuel control module reads 0 psi.
6. Turn off the power supply if an electrical component of the system requires service.
7. Perform any maintenance ONLY after completing these instructions.

CNG FUEL MODULE MAINTENANCE AND PART REPLACEMENT

A. Fuel Filter Location / Access Procedure

1. Locate the fuel filter inside the side maintenance access door of the **CNG Fuel Module** 179.
2. Follow instructions in **Preparation before Maintenance** 182 to ensure pressure has been relieved.
3. When the unit has been fully depressurized, it is safe to remove the fuel filter.

⚠ DANGER

To avoid serious injury or death, the flow of fuel to the filter must be shut off and pressure within the filter must be relieved before servicing the fuel filter.

B. O-Ring Information

The O-rings installed throughout the fuel module are Hydrogenated Nitrile (HNBR) O-rings. Recommended lubricants for use with these O-rings include:

- Super O-Lube, Parker -65 to 400
- DC-55, Dow Corning Co. -65 to 275
- Celvacene, Consolidated Vacuum Corp. -40 to 200

C. Procedure for Draining the Filter Bowl

Preventive Maintenance Schedule for the Filter Bowl:

Drain the filter every 10,000 Miles.

Alter the preventive maintenance schedule to 5,000 Miles if high volume of oil (>10 ml) is present in filter bowl.

1. Follow instructions in **Preparation before Maintenance** 182 to ensure pressure has been relieved.
2. Locate the fuel filter following directions in **Preparation before Maintenance** 182 and **Compressed Natural Gas (CNG) Fuel Module** 179 section.
3. A plugged drain port is located on the bottom of the filter bowl.
4. Use a 9/16” socket or wrench to remove the plug. Allow liquid to drain from the filter bowl.
5. Measure the amount of drainage.
6. Adjust the preventive maintenance schedule if necessary, based upon the amount of oil present.
7. Check the O-ring for damage or debris. Replace if necessary.
8. Reinstall the drain plug. Torque to 15 ft.-lbs.
9. Close the pressure bleed valve.
10. Slowly OPEN one (1) supply tank valve.

⚠ CAUTION

Test the plug with leak detector before opening all tank valves. If a leak is detected, check for debris and replace the O-ring, first following the **Preparation before Maintenance** 182 steps.

CNG FUEL MODULE MAINTENANCE AND PART REPLACEMENT (CONTINUED)

C. Procedure for Draining the Filter Bowl (Continued)

11. Open remaining tank valves if no leak is detected.
12. Check the high pressure gauge to confirm a rise in fuel pressure.

NOTICE

Low pressure gauge may not register pressure until vehicle ignition is turned "ON".

D. Fuel Filter Replacement Procedure

Filter Element Replacement Schedule:

Replace filter element after 40,000 miles or every 12 months, whichever comes first. Filter element replacement kits are available from Heil (Part Number 372-8385).

Figure 36. Fuel Filter Replacement Kit (Part Number 372-8385)

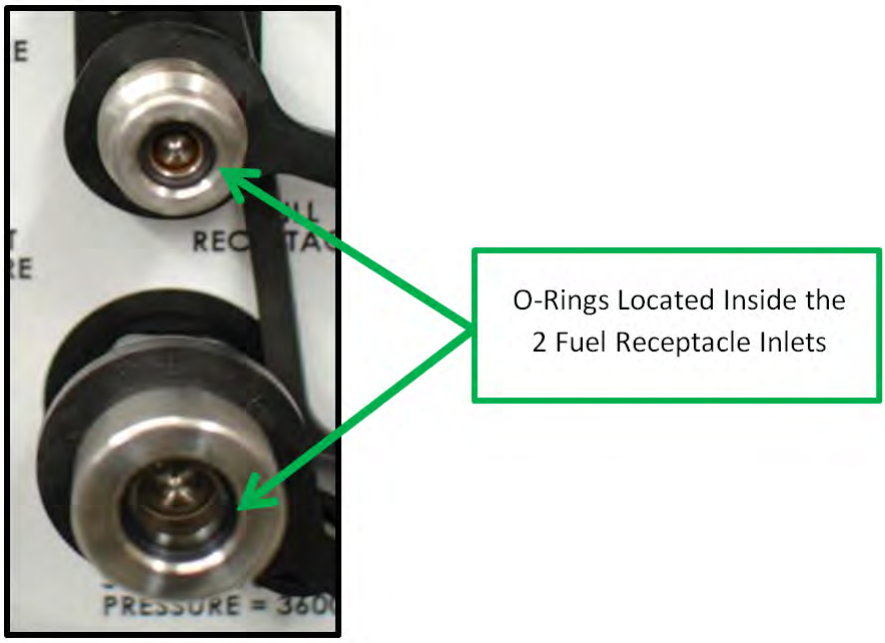


Figure 37. O-Ring Location in Inlets

CNG FUEL MODULE MAINTENANCE AND PART REPLACEMENT (CONTINUED)

D. Fuel Filter Replacement Procedure (Continued)

1. Follow instructions in **Preparation before Maintenance** 182 to ensure pressure has been relieved
2. Locate the fuel filter inside the CNG module. Locate this fuel filter following directions in **Compressed Natural Gas (CNG) Fuel Module** 179 section.
3. The filter bowl is threaded into the filter housing.
4. Loosen filter housing with a 1-1/4” wrench or socket.
5. Remove filter bowl.
6. Grasp filter element, pulling downward to remove.
7. If filter comes apart upon removal from filter bowl, make sure plastic end is removed from filter bowl.
8. Install new element by pressing into place until it snaps into position.
9. Empty and clean filter bowl.
10. Discard old O-rings.
11. Apply **approved lubricant (See Section B)** 183 to new O-rings and carefully install.
12. Place lubricant on filter housing threads.
13. Reinstall filter bowl in the filter housing and torque to 40 ft.-lbs.
14. Close the pressure bleed valve.
15. Open each tank’s valve.
16. Check the high pressure gauge to confirm increased fuel pressure.

NOTICE

Low pressure gauge may not register pressure until vehicle ignition is turned "ON".

E. Fuel Module Receptacle O-Ring Replacement Procedure

HEIL O-ring Replacement Kit
Contains 2 each of the NGV-1 and CL-50 O-rings

Figure 38. O-Ring Replacement Kit (Part Number 372-8386)

CNG FUEL MODULE MAINTENANCE AND PART REPLACEMENT (CONTINUED)

E. Fuel Module Receptacle O-Ring Replacement Procedure (Continued)

The O-ring seals, located in the inlets of the two (2) fueling receptacles, can wear or become damaged over time and with repeated use. If damaged, a leak may occur when fueling.

Procedure to replace O-ring:

1. Carefully remove the worn O-ring.

⚠ CAUTION

Avoid damaging the inner surface of the O-ring groove.

2. Damage on the inner surface of the O-ring groove may result in a permanent leak and require replacement of the fueling receptacle.
3. Clean area of dirt or debris.
4. Lubricate the new O-ring with **approved lubricant (See Section B)** 183.
5. Install new O-ring into the O-ring groove, being careful not to damage either the new O-ring or the O-ring groove.

F. Fuel Module Receptacle Replacement Procedure

The fuel receptacles are threaded into fittings that are mounted into the manifold going through the face plate of the fuel module and are equipped with an O-ring that seals the connection. When purchasing any replacement receptacles, Heil recommends that any exposed O-rings be replaced to avoid leaking from damaged or worn O-rings.

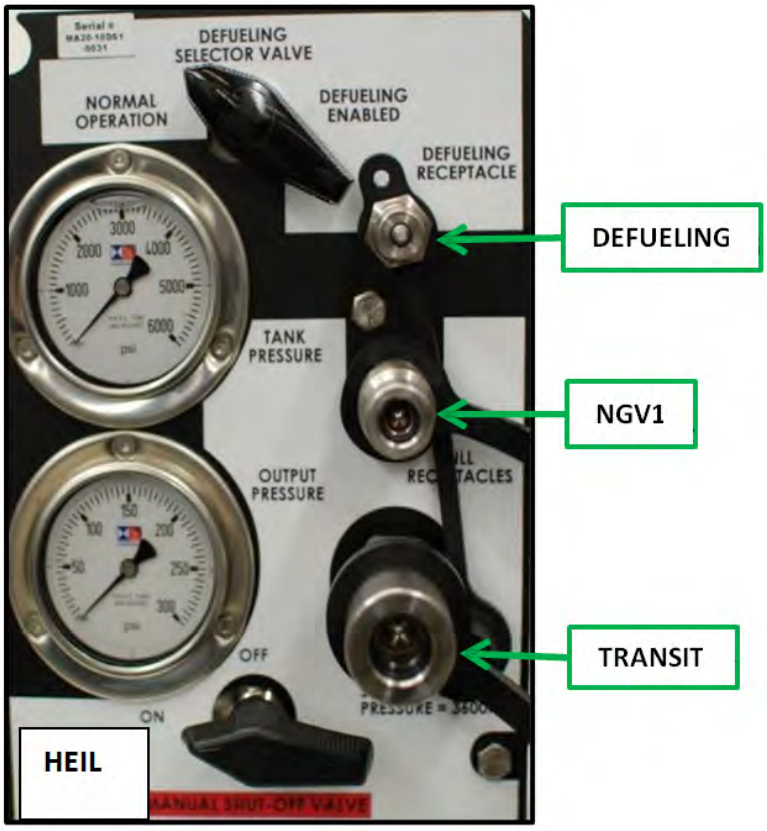


Figure 39. Defueling Receptacle, NGV1 Receptacle and Transit Fill Receptacle Locations

CNG FUEL MODULE MAINTENANCE AND PART REPLACEMENT (CONTINUED)

G. Defueling Receptacle Replacement Procedure

1. Follow directions in **Truck Preparation** 182 to relieve pressure before performing any maintenance. A check engine light or fault code may illuminate if the gas pressure is too low. This should resolve when gas pressure is restored.
2. Remove dust cap.

NOTICE

Reserve dust cap for reinstall. The replacement defueling receptacle does not include a dust cap.

3. Use a 3/4” thin profile wrench to support flats on the corresponding fitting. Use a second 3/4" wrench to loosen the receptacle from the corresponding fitting. A small volume of gas may escape as this connection is loosened.
4. Once loosened, allow any built-up pressure to completely escape before removing the receptacle.
5. Install the new receptacle onto the corresponding fitting.
6. Use a 3/4” thin profile wrench to support flats on the corresponding fitting and torque receptacle to 24 ft.-lbs.
7. Slowly OPEN one (1) supply tank valve.

⚠ CAUTION

Test the receptacle with the leak detector before opening all tank valves. If a leak is detected, check for debris and/or replace the O-ring.

8. If a leak is detected, follow steps in **Truck Preparation** 182 to relieve pressure in the unit.
9. Repair the leak and retest with leak detector.
10. Open remaining tank valves if no leak is detected.
11. When receptacle is satisfactorily replaced with no leaks, reinstall dust cap.

Figure 40. Defueling Receptacle

CNG FUEL MODULE MAINTENANCE AND PART REPLACEMENT (CONTINUED)

H. NGV1 Receptacle Replacement Procedure

1. Follow directions in **Truck Preparation** 182 to relieve pressure before performing any maintenance.

⚠ CAUTION

A check engine light or fault code may illuminate if the gas pressure is too low. This should resolve when gas pressure is restored.

2. Slide the portion of the dust cap that wraps around the fuel receptacle away from the face plate to expose the flats on the fuel receptacle.
3. Use a 3/4” thin profile wrench to support flats on the corresponding fitting. Use a second 3/4” wrench to loosen the receptacle from the fitting. A small volume of gas may escape as this connection is loosened.
4. Once loosened, allow any built-up pressure to completely escape. Remove the receptacle.
5. It is recommended that the O-ring (SAE size 6) on the fitting be replaced.
6. Remove and discard the old O-ring.
7. Remove any dirt or debris from the area.
8. Lubricate a new O-ring with a small amount of **approved lubricant (See Section B)** 183.
9. Using an O-ring torpedo, install the new, lubricated O-ring on the corresponding fitting.

Figure 41. NGV1 Receptacle

CNG FUEL MODULE MAINTENANCE AND PART REPLACEMENT (CONTINUED)

H. NGV1 Receptacle Replacement Procedure (Continued)

⚠ CAUTION

Be very careful not to cut or damage the new O-ring with the threads of the bulkhead fitting during installment of the O-ring.

10. Install the new receptacle onto the corresponding fitting. Torque the receptacle to 24 ft.-lbs.
11. Return the portion of the dust cap that wraps around the receptacle to its original position.
12. Slowly OPEN one (1) supply tank valve.

⚠ CAUTION

Test the receptacle with the leak detector before opening all tank valves. If a leak is detected, check for debris and/or replace the O-ring.

13. If a leak is detected, follow steps in **Truck Preparation** 182 to relieve pressure in the unit.
14. Repair the leak and retest with leak detector.
15. Open remaining tank valves if no leak is detected.
16. Check the high pressure gauge to confirm a rise in fuel pressure.

NOTICE

Low pressure gauge may not register pressure until vehicle ignition is turned "ON".

I. Transit Fill Receptacle Replacement Procedure:

1. Follow directions in **Truck Preparation** 182 to relieve pressure before performing any maintenance.
2. A check engine light or fault code may illuminate if the gas pressure is too low. This should resolve when gas pressure is restored
3. Slide the portion of the dust cap that wraps around the fuel receptacle away from the face plate to expose the hex of the fuel receptacle.
4. Use a 1-1/16” thin profile wrench (often referred to as a cylinder wrench or pump wrench) to support the flats of the corresponding fitting.
5. Use a second wrench, 1-1/4”, to loosen the receptacle from the fitting. A small volume of gas may escape as this connection is loosened.

Figure 42. Transit (CL-50) Receptacle

CNG FUEL MODULE MAINTENANCE AND PART REPLACEMENT (CONTINUED)

I. Transit Fill Receptacle Replacement Procedure (Continued)

⚠ CAUTION

Allow pressure to bleed down completely before removing the receptacle.

6. It is recommended that the O-ring (SAE size 10) on the fitting be replaced.
7. Remove and discard the old O-ring.
8. Thoroughly clean the area of dirt and debris.
9. Lubricate the new O-ring with a small amount of **approved lubricant (See Section B)** 183.
10. Using an O-ring torpedo, install the new, lubricated O-ring on the corresponding fitting.

⚠ CAUTION

To avoid leaks, prevent any damage or cuts to the new O-ring that may occur with contact between the fitting and the O-ring.

11. Install the new receptacle onto the corresponding fitting. Using a 1-1/16” cylinder wrench to support the flats of the fitting. Torque the receptacle to 48 ft. lbs.
12. Ensure the dust cap on the new receptacle is in the original position.
13. Slowly OPEN one (1) supply tank valve.

⚠ CAUTION

Test the receptacle with the leak detector before opening all tank valves. If a leak is detected, check for debris and/or replace the O-ring.

14. If a leak is detected, follow steps in **Preparation before Maintenance** 182 to relieve pressure in the unit.
15. Repair the leak and retest with leak detector.
16. Open remaining tank valves if no leak is detected.
17. Check the high pressure gauge to confirm a rise in fuel pressure.

NOTICE

Low pressure gauge may not register pressure until vehicle ignition is turned "ON".

FUEL MANAGEMENT MODULE (FMM) REFERENCE DRAWING

Component drawing for Heil 151-4764 Fuel Management Module is shown below.

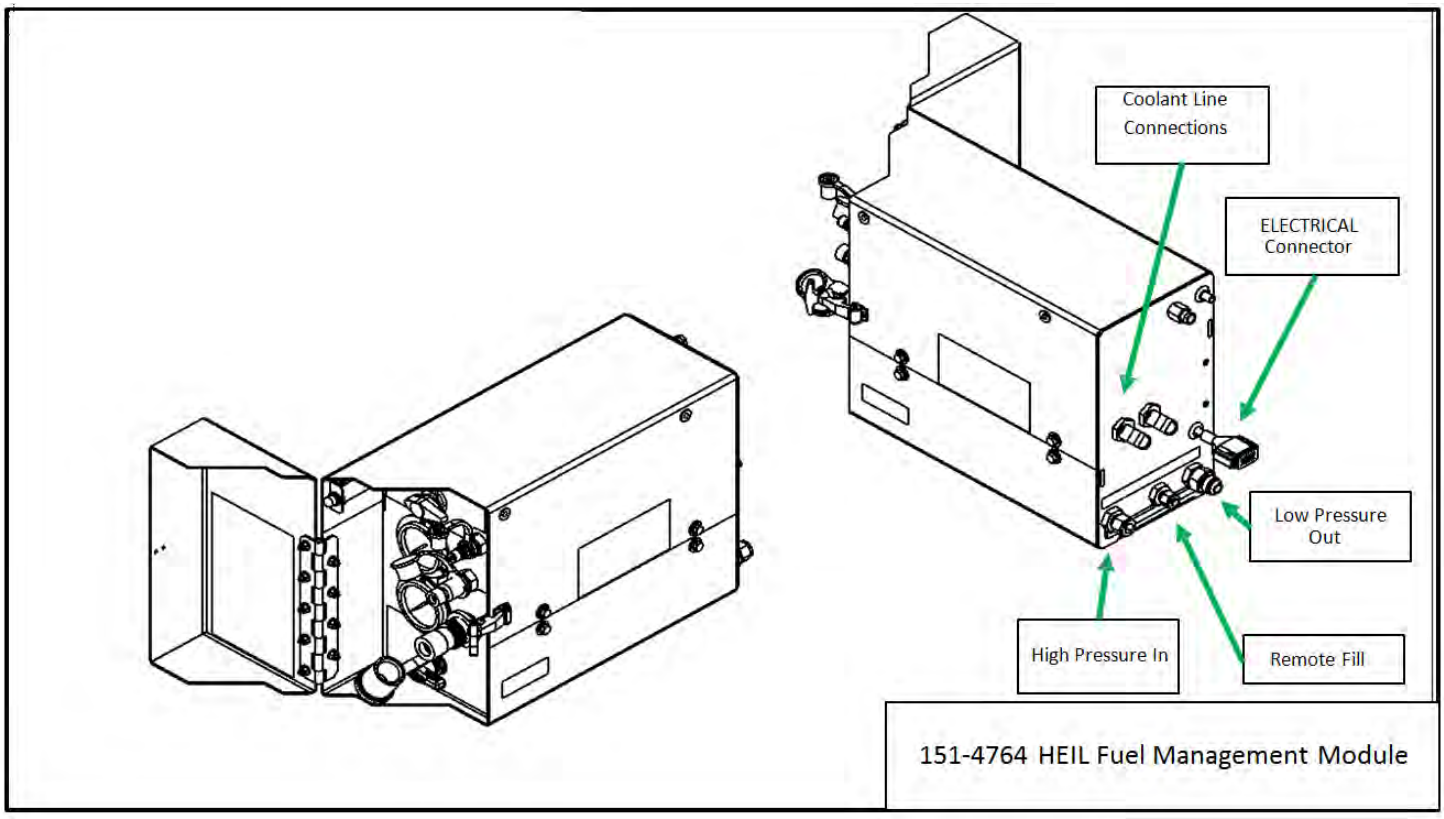
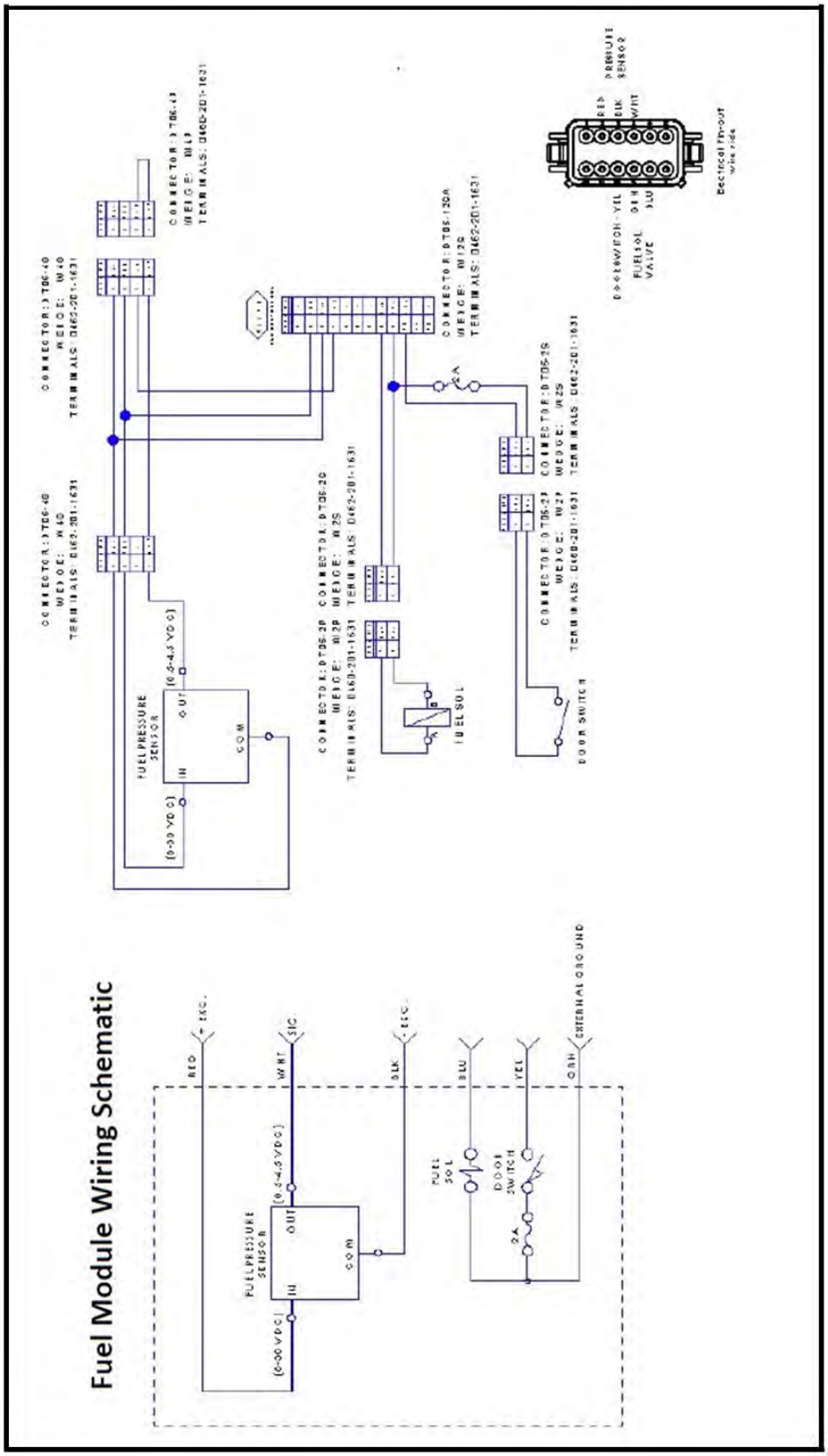


Figure 43. Fuel Management Module

Half/Pack® Factor AFL™
Compressed Natural Gas (CNG) Option

FUEL MANAGEMENT MODULE ELECTRICAL SCHEMATIC

Reference as necessary for service and troubleshooting.



CNG FUEL MODULE TROUBLESHOOTING

Heil offers support via the technical assistance line, as well as products, such as a Fuel Module Mini-Tester (Part Number 044-0488), to assist with troubleshooting.

Please provide the following when calling Heil Technical Services at 866-310-4345 with troubleshooting questions:

1. Serial # of CNG Fuel Module
2. Truck Serial #
3. Details of:
   - When the problem started
   - What the problem entails
   - Any troubleshooting performed
   - Results of troubleshooting actions

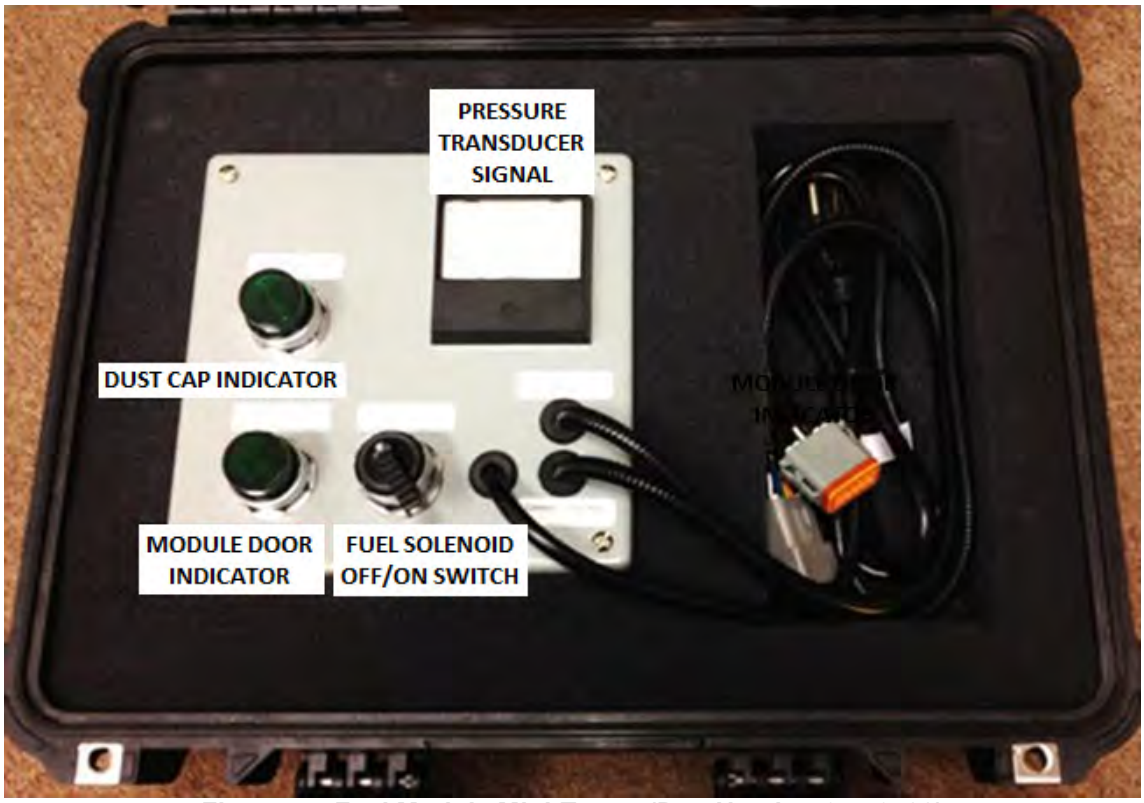


Figure 44. Fuel Module Mini-Tester (Part Number 044-0488)

The next section contains helpful information to assist with basic troubleshooting in the field.

CNG FUEL MODULE TROUBLESHOOTING (CONTINUED)

The following table lists possible problems, along with causes, corrections, and results.

PROBLEM OBSERVED	POSSIBLE CAUSES	CORRECTIVE/DIAGNOSTIC ACTIONS	RESULTS AND OTHER ACTIONS
Vehicle's starter will not operate.	Interrupt door switch signal is not being properly recognized by the vehicle.	Disconnect the 12-pin electrical connector at the rear of the fuel module. Use an ohm meter or continuity tester across pins (GRN) and 10 (YEL) of the fuel module side of the connector (female connector). Press and release the fuel module interrupt door switch. When the switch is depressed, there should be continuity between pins 9 (GRN) and 10 (YEL). Continuity should be lost when the switch is released.	If operation of the door switch makes and breaks continuity as described, and the starter will not operate, there is most likely a problem in the vehicle's wiring. If the operation of the door switch does NOT make or break continuity as described, there is most likely a wiring problem in the fuel module. If the problem cannot be resolved, call **866-310-4345** for technical assistance.
Vehicle's starter operates but the vehicle does not run.	Fuel is not making it through the fuel module to the engine.	*The manual valve on the front of the fuel module should be set to "On". *The fuel module high pressure gauge should read above 5000 psi. Disconnect the 12-pin electrical connector at the rear of the fuel module. Use a DC voltmeter across pins 8 (BLU) and 9 (GRN) of the vehicle side of the connector (male connector). The voltage should read: • Ignition switch "Off" 0 vdc. • Ignition switch "Run" 12 vdc. • Ignition switch "Start" 12 vdc. *Reconnect the 12-pin electrical connector at the rear of the fuel module. Have an assistant repeatedly cycle the ignition switch between "Off" and "Run" while listening for the "click" of the fuel solenoid being actuated near the maintenance door.	*If the voltage does NOT change as described, the problem is most likely located in the vehicle's electrical signal that actuates the fuel solenoid. *If the voltage changes as described and the "click" of the fuel solenoid is detected, the problem is most likely an engine control problem prohibiting the vehicle from starting. *If the voltage changes as described but the "click" of the fuel solenoid is NOT detected then the problem is most likely a failed solenoid in the fuel module. *If the problem cannot be resolved, call **866-310-4345** for technical assistance.

CNG FUEL MODULE TROUBLESHOOTING (CONTINUED)

The following table lists possible problems, along with causes, corrections, and results.

PROBLEM OBSERVED	POSSIBLE CAUSES	CORRECTIVE/DIAGNOSTIC ACTIONS	RESULTS AND OTHER ACTIONS
Heil Standard CNG and CNrG™ Tailgate Solenoid System Options: In-cab fuel gauge does not indicate the fuel level correctly.	The fuel module pressure transducer, the fuel gauge or the interconnecting wiring may be defective.	Confirm that the 12-pin electrical connector at the rear of the fuel module is connected and place the vehicle's ignition switch in the "Run" position. Use a voltmeter to read: • Voltage between connector positions 2 (RED) and 3 (BLK). the voltage should be 12 vdc. • Voltage between connector positions 3 (BLK) and 4 (WHT). the voltage should be between 0.5 to 5.0 vdc.	*If the voltage across 2 and 3 is 0 or significantly below battery voltage, there is a problem with the vehicle's wiring not supplying power to the fuel module's pressure transducer. *If the voltage across 3 and 4 is either 0 or 5.5 vdc, the fuel module's pressure transducer is most likely defective. Call **866-310-4345** for technical assistance. *If the voltage across 3 and 4 is between 0.5 to 5.0 vdc then the fuel module's pressure transducer is operating correctly. The problem is likely in the vehicle's wiring or the in-cab fuel gauge. *If the problem cannot be resolved, call **866-310-4345** for technical assistance.
Heil CNrG™ Tailgate Solenoid System Option: In-cab Cortex Display does not indicate the fuel level correctly or an alarm is activated on the Cortex Display indicating "Transducer-# Unplugged/ Short Check Sensor and Wiring" Fail for a given Tank#.	The fuel cylinder pressure transducer or the interconnecting wiring may be defective.	Confirm that the 3pin electrical connector at the transducer is connected and place the vehicle's ignition switch in the "Run" position. Use a voltmeter to read: • Voltage between connector positions A (BRN) and B (BLK). The voltage should be approximately 12 vdc. • Voltage between connector positions B (BLK) and C (YEL). The voltage should be between 0.5 to 5.0 vdc.	*If the voltage across A and B is 0 or significantly below battery voltage, there is a problem with the vehicle's wiring not supplying power to the fuel module's pressure transducer. *If the voltage across B and C is either 0 or 5.5 vdc, the fuel tank's pressure transducer is most likely defective. Call **866-310-4345** for technical assistance. *If the voltage across B and C is between 0.5 to 5.0 vdc then the fuel module's pressure

PROBLEM OBSERVED	POSSIBLE CAUSES	CORRECTIVE/DIAGNOSTIC ACTIONS	RESULTS AND OTHER ACTIONS
			transducer is operating correctly. The problem is likely in the Cortex Display or the Cortex Controller. *If the problem cannot be resolved, call **866-310-4345** for technical assistance.

CNG VEHICLE OPERATOR EMERGENCY RESPONSE

⚠ WARNING

During an emergency situation, never jeopardize safety to shut down the system. If it becomes evident that the steps cannot be safely completed, move to a safe distance, call 9-1-1 and alert emergency personnel of the situation, informing them of the presence of a CNG system and that it is not properly shut down.

Emergency Response for Gas Leaks

If the vehicle has sustained damage or a gas leak is detected:

1. Do not approach the vehicle if any sources of ignition may exist such as fire, sparks, electrostatic charges, lights or electronic devices.
3. If the vehicle is indoors, move the vehicle outside and away from any ignition sources.
4. Do not use road flares.
5. Do not smoke or allow anyone else to smoke near the vehicle.
6. Turn the ignition switch off, set the parking brake and turn off the battery at the main disconnect.
7. If it is safe to do so, close the main shutoff valve and the cylinder valves. Check the fuel system near the damaged area for leaks by smell, sight, and sound. CNG is odorized and can be detected by smell.
8. Keep traffic and pedestrians away.
9. Beware that gas may continue to leak once ignition is turned off and the manual shutoff valves are closed.
10. Have a qualified technician verify leak locations with suitable methane detection fluid.
11. Have the leaks repaired by a qualified technician immediately.

CNG Vehicle Fire Procedures

In the event of a CNG fire, it is imperative that the vehicle operator acts quickly:

1. Get passengers out of the vehicle as quickly as possible.
2. Evacuate the area.
3. Call 9-1-1.
4. If possible without putting yourself in harm's way, dump the refuse load from the body and move the vehicle a safe distance away from any burning refuse.

CNG VEHICLE OPERATOR EMERGENCY RESPONSE (CONTINUED)

CNG Vehicle Emergency Shut Down Procedure

Complete the following steps to shut down the CNG system:

1. Turn OFF Ignition and Electrical System.
2. Turn OFF Fuel Module Manual Shut-Off Valve.
3. Close each Tank Valve.
4. Call Technical Services at 866-310-4345 for further assistance.

Emergency Venting/Defueling Procedure

If an emergency arises in which the fuel must be purged immediately, an emergency vent can be performed as follows:

1. Ensure that an electrical ground connection has been established between the cylinders, the vent system, and earth ground.
2. Connect the on-board defueling connection to the vent system using a conductive high pressure defueling hose.
3. Slowly open the hand valve to achieve a slow and steady flow to prevent freezing. No gas flow may indicate a normally closed solenoid valve on the cylinder. Consult the vehicle manufacturer for information on opening electronic solenoids.
4. Allow the on-board storage system to vent completely.
5. When completed, disconnect all connections.

CNG FUEL CYLINDER AND SYSTEM INSPECTIONS

⚠ WARNING

If a CNG-fueled vehicle has been involved in an accident or fire, the system and cylinders must be inspected by a certified CNG fuel system inspector.

NOTICE

Inspections must be performed by qualified inspectors using guidelines from the fuel cylinder manufacturer in addition to the guidelines listed here.

1. Based on cylinder manufacturer recommendations and industry standard practices, visual CNG cylinder inspections should be performed at a frequency of 3 years or 36,000 miles, whichever occurs first.
2. In addition, Heil recommends a daily walk-around or pre-trip and post-trip visual inspection be performed.

DAILY SYSTEM INSPECTION

Inspect the following items each day before vehicle operation:

1. Make sure all manual tank valves and the red-handled emergency shutoff valve on the FMM are in the OPEN position.
2. Check the high pressure gauge to make sure enough fuel is on-board and refuel if necessary.
3. Drain the low pressure filters located at engine per the engine manufacturers' recommendation.
4. Turn the ignition key to the on position, and watch the low pressure gauge. It should show about 125 psi.
5. Check the dashboard fuel gauge to make sure it is functioning.
6. Check the entire fuel system for any signs of damage or wear. Include checks for:
   a. Gas leaks – Smell for gas, look for frost or ice and listen for hissing noises at joints and components.
   b. PRD components - Make sure all PRD vent line caps are in place.
   c. Structural damage - Housings, covers bent or damaged, fasteners missing or loose, check inside of tailgate for dents over 1/4" deep, or punctures.
7. If any system components or structural parts are damaged, perform a detailed inspection.

If everything checks out good, the vehicle is cleared for operation. If anything is wrong, a qualified CNG system technician should make the necessary repairs.

DETAILED CNG FUEL SYSTEM INSPECTION

1. Check all CNrG Tailgate guards and covers for damage.
2. Remove the Oblong Access Covers fastened with Thumbscrews.

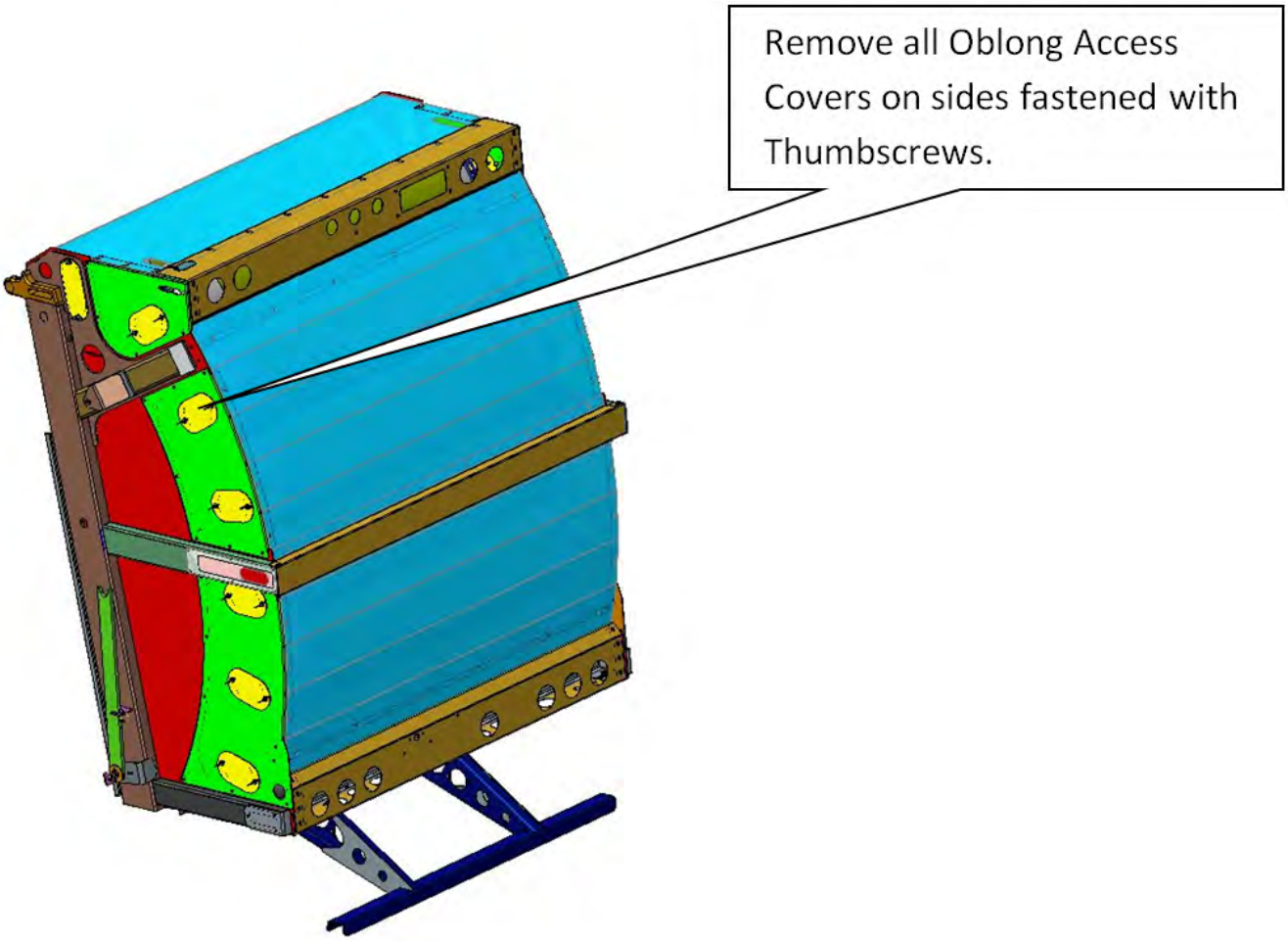


Figure 45. Tailgate Access Covers

3. Thoroughly pressure wash inside (refuse side) of tailgate and inspect for any dents over 1/4” in depth, or punctures.

DETAILED CNG FUEL SYSTEM INSPECTION (CONTINUED)

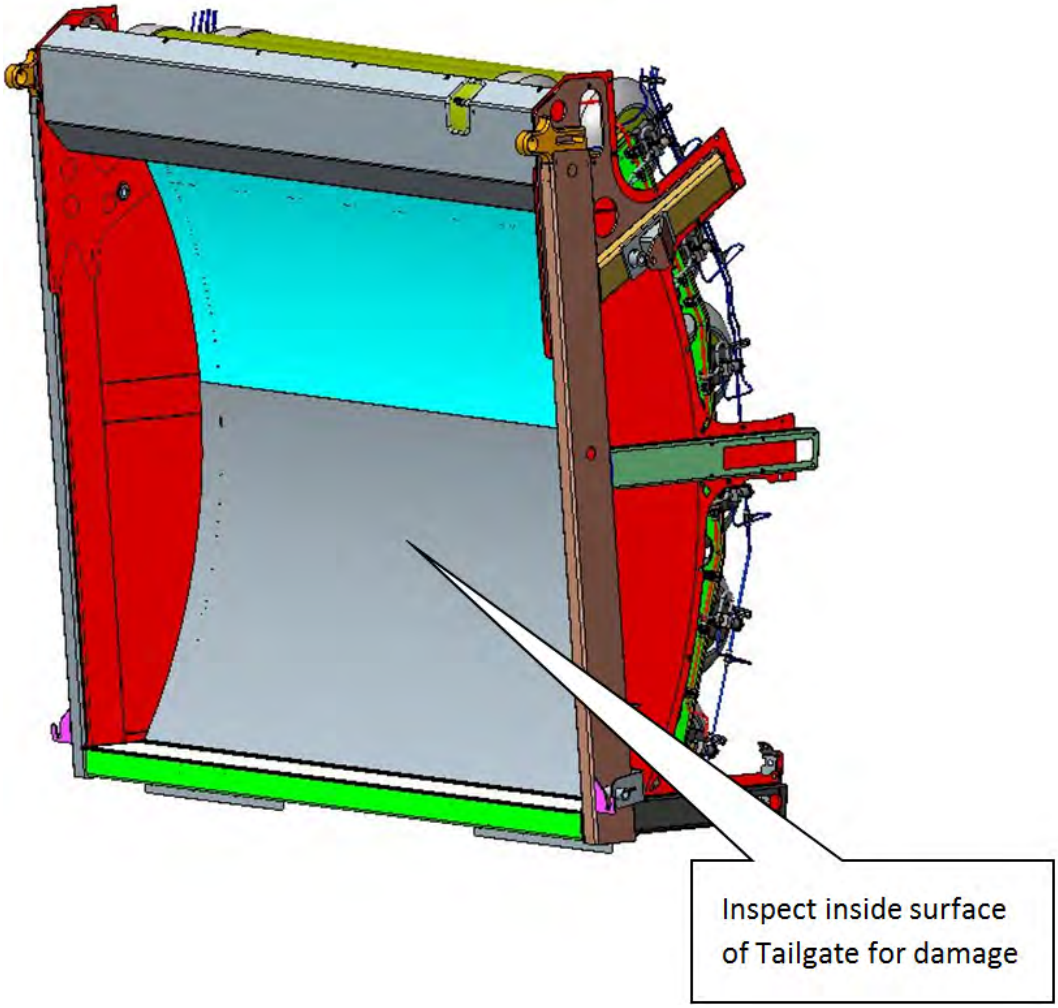


Figure 46. Inside Tailgate Surface

4. Make sure cylinders mounts are secure. Check mounts and all fasteners.
5. Verify cylinder labels are in place and for each cylinder, make sure cylinder service life has not expired.
6. Inspect cylinder valves and PRDs for leaks and damage.
7. Inspect all plumbing tubes, hoses and fuel flow components for leaks. A CNG Gas Leak Detector is recommended.
8. Examine all cylinders for damage using the cylinder manufacturer's guidelines. Inspection records should be kept with vehicle records, and the system label should be updated to reflect the current inspection status.
9. Check condition of tailgate to body hose connection and guards.

If all items pass inspection, the vehicle is cleared for operation. If any issues are identified, a qualified CNG System Technician should make the necessary repairs.

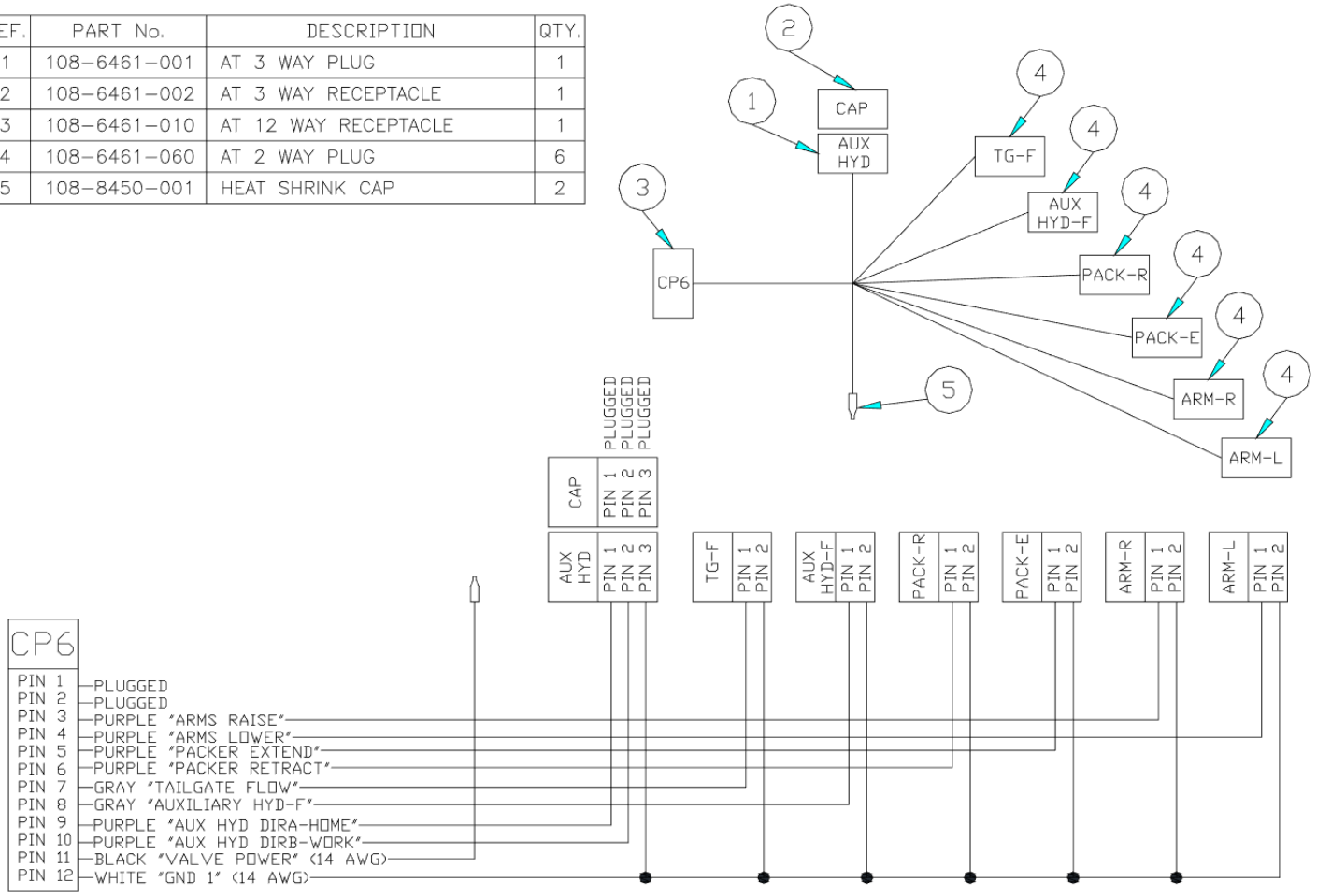
NOTICE

Remember, the above applies to CNG fuel system inspections, not service intervals to the maintenance items, such as fuel filters.

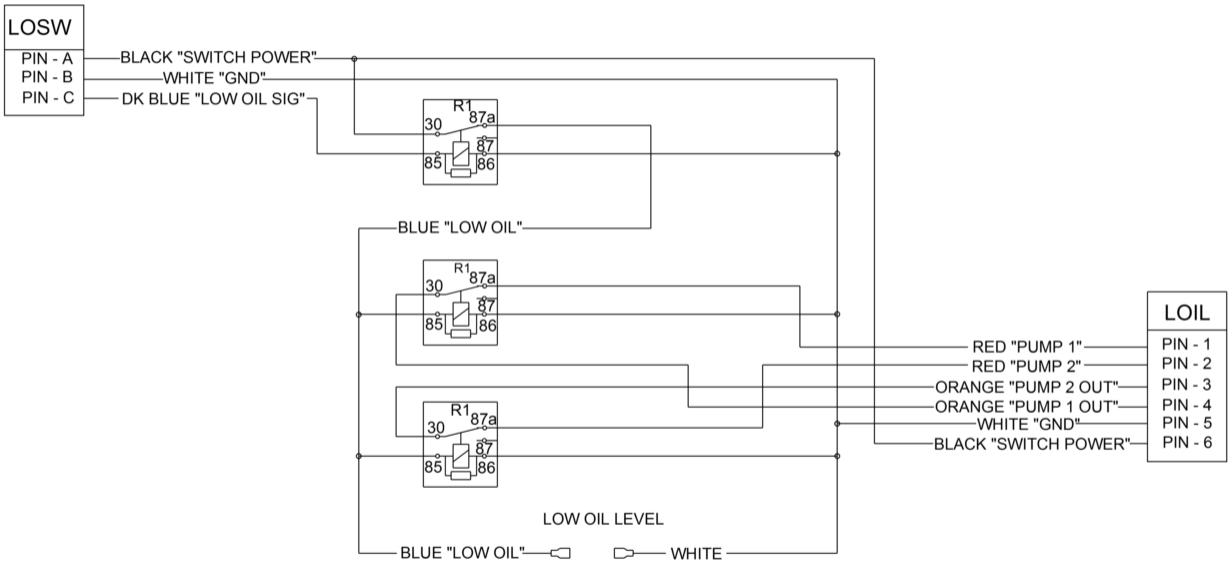
SECTION 9
SCHEMATICS

Half/Pack® Factor AFL™
Schematics
MAC VALVE HARNESS - 263-1815-011

REF.	PART No.	DESCRIPTION	QTY.
1	108-6461-001	AT 3 WAY PLUG	1
2	108-6461-002	AT 3 WAY RECEPTACLE	1
3	108-6461-010	AT 12 WAY RECEPTACLE	1
4	108-6461-060	AT 2 WAY PLUG	6
5	108-8450-001	HEAT SHRINK CAP	2



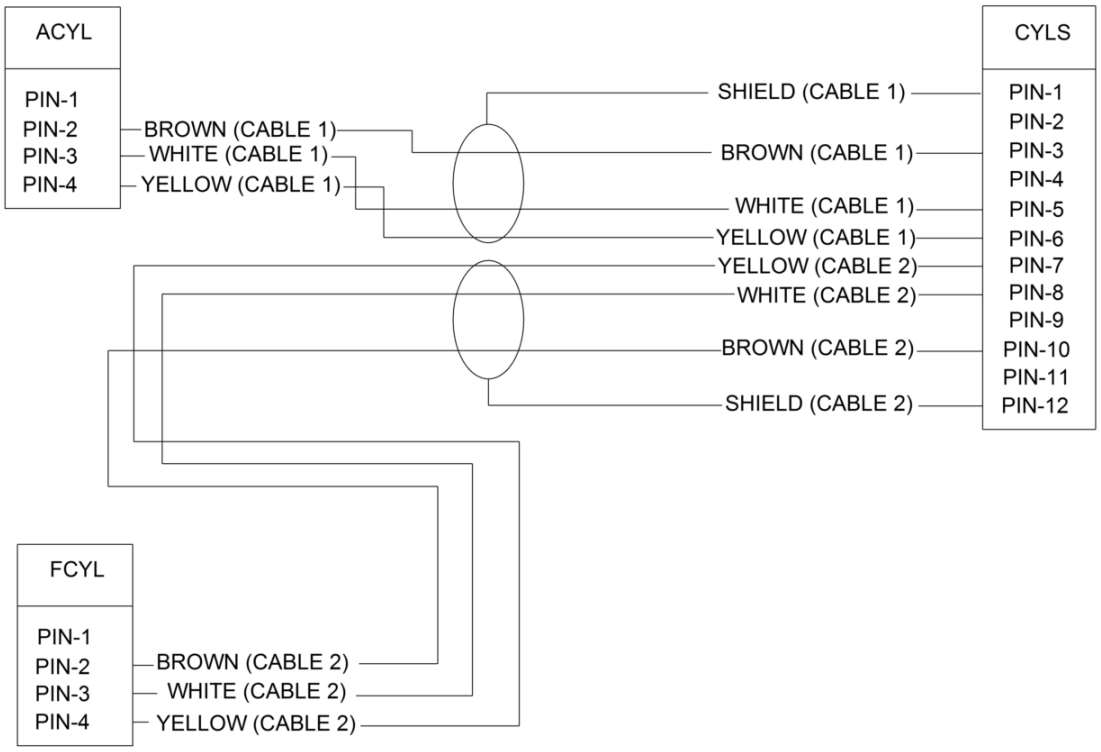
LOW OIL LEVEL HARNESS - 263-1703-008

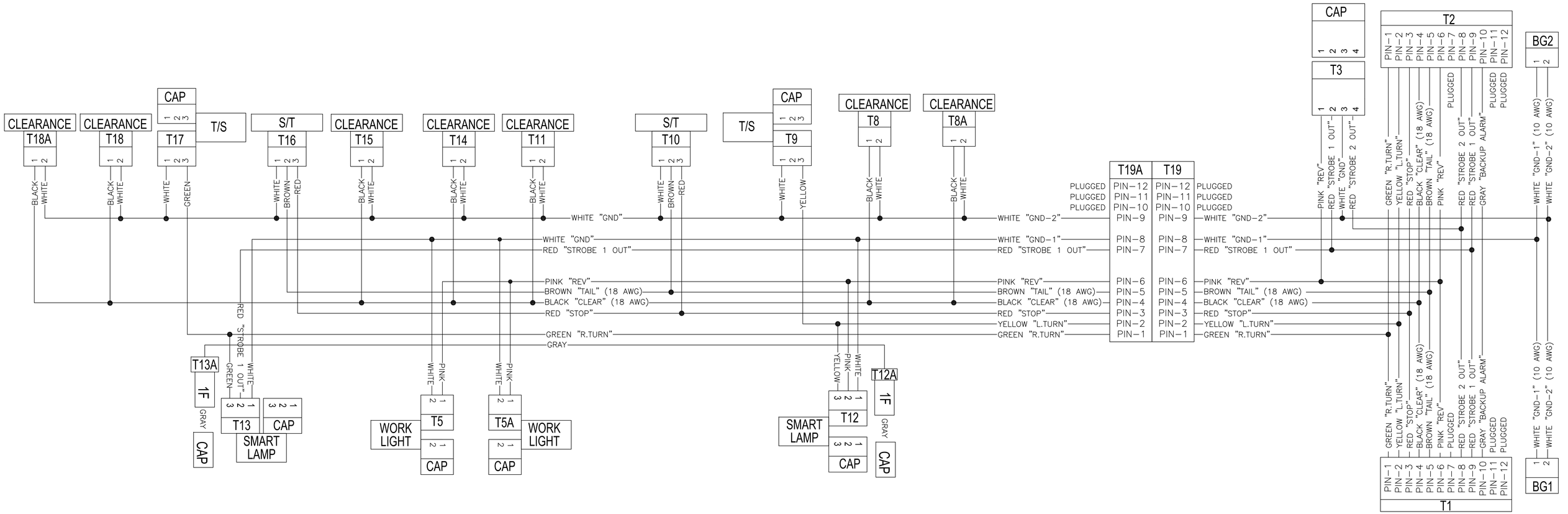


Half/Pack® Factor AFL™

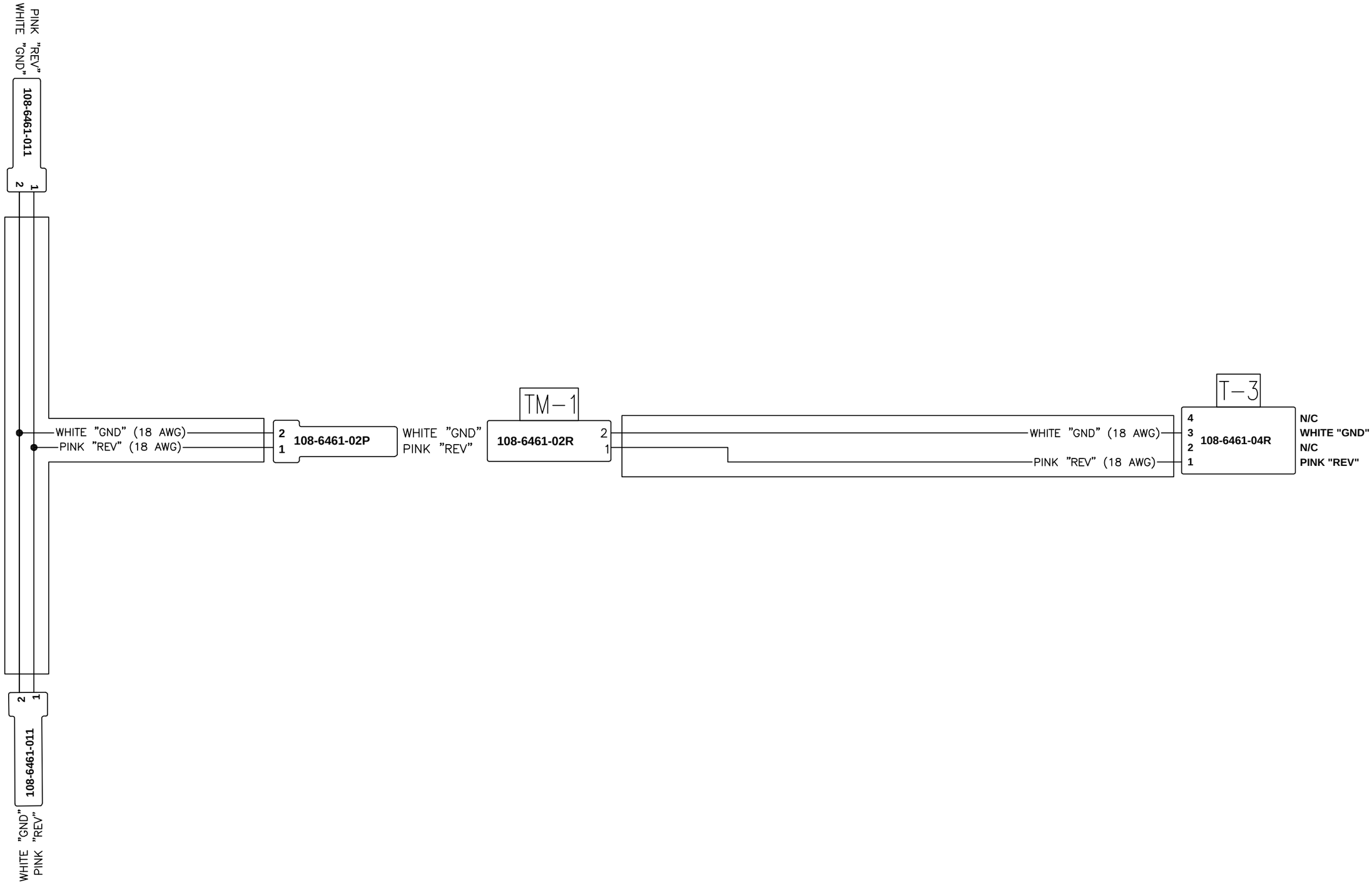
Schematics

ARM SENSORS HARNESS - 263-1740-010

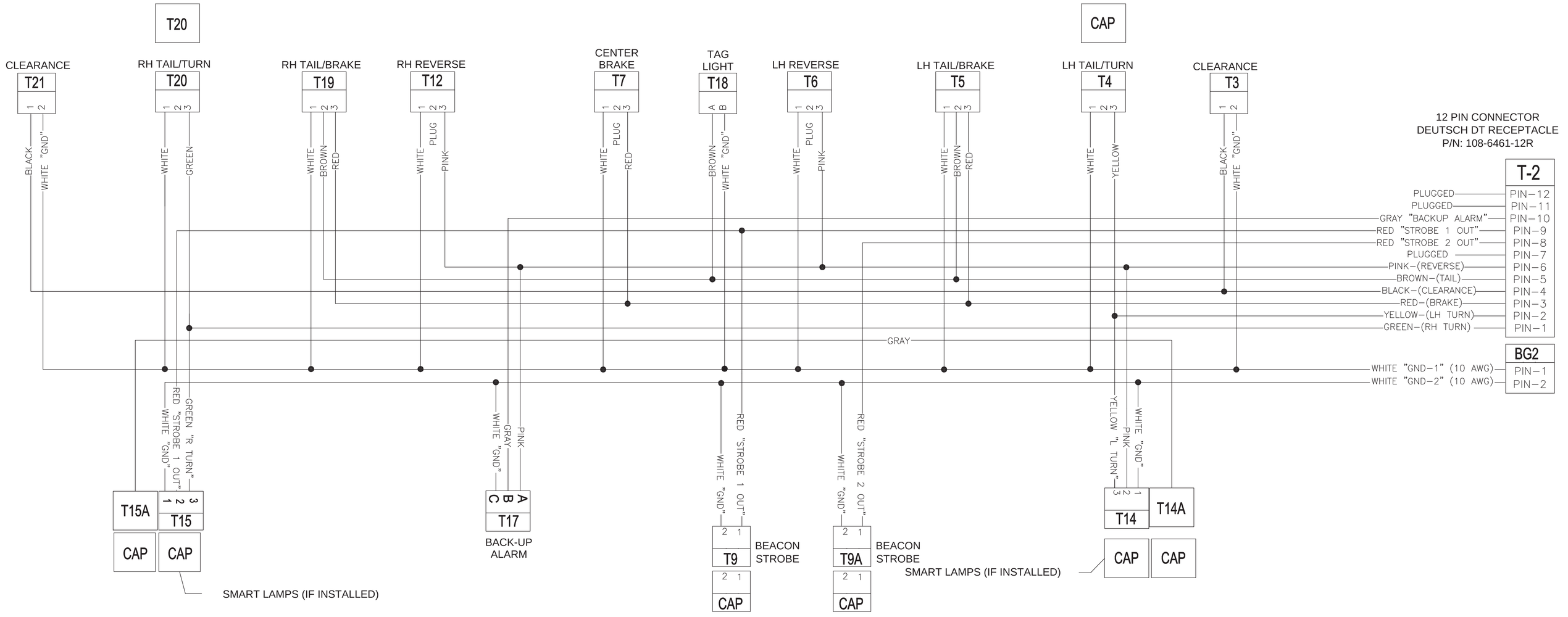




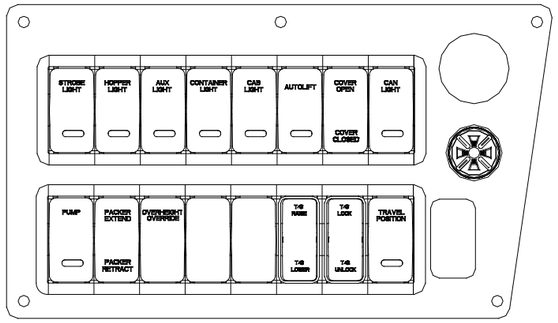
Tailgate Upper Cluster Harness
263-1740-002
02/23/2016



Camera Flood Lights Tailgate Middle Cluster Harness
263-1740-004
10/30/2013



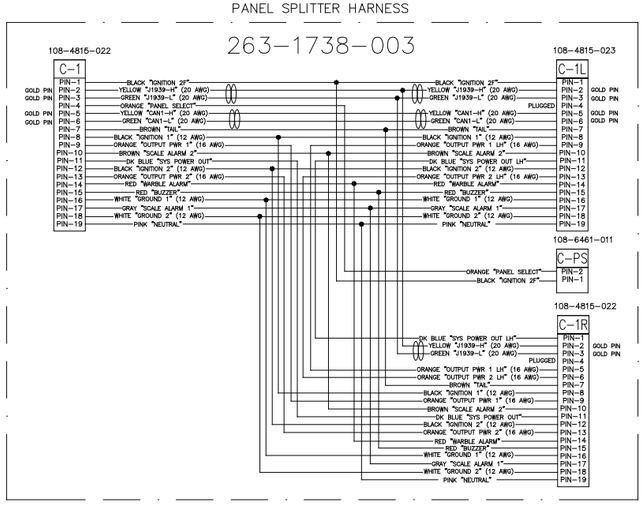
Tailgate Lower Cluster Harness
263-1740-003
03/08/2013



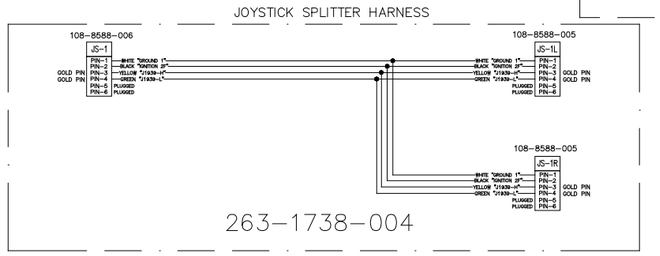
STANDARD CONTROL PANEL

PANEL SPLITTER HARNESS

263-1738-003



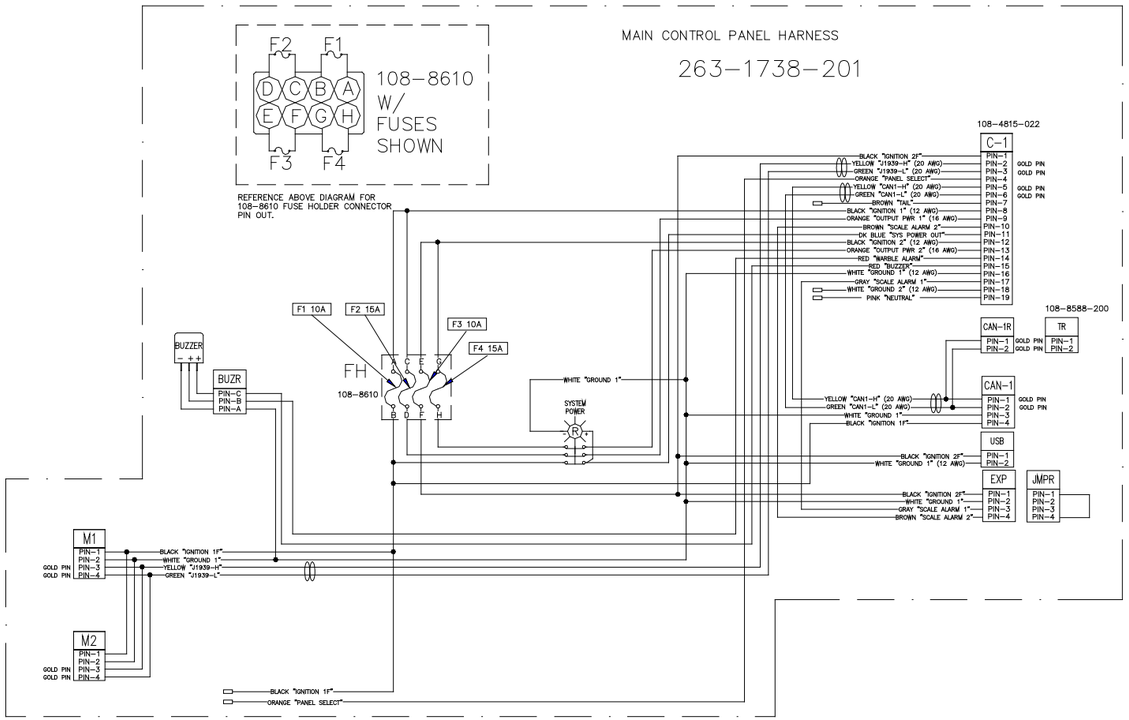
JOYSTICK SPLITTER HARNESS



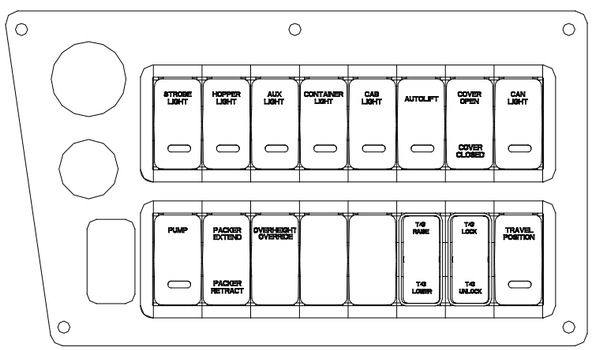
263-1738-004

MAIN CONTROL PANEL HARNESS

263-1738-201

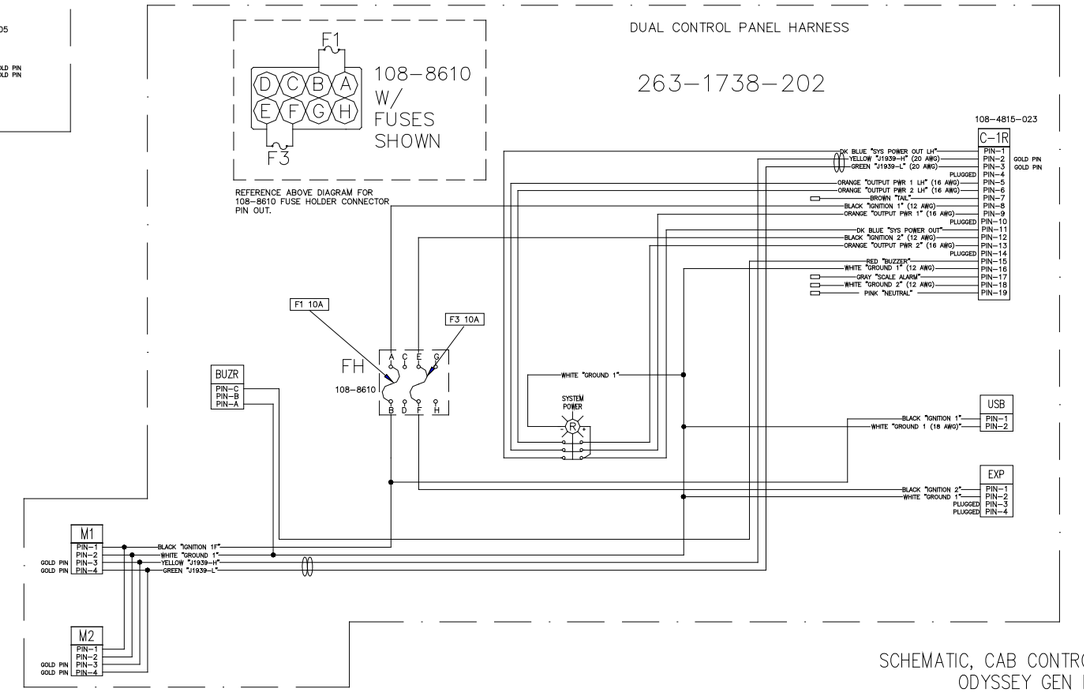


DUAL CONTROL PANEL, AUTOCAR ONLY (OPTION)



DUAL CONTROL PANEL HARNESS

263-1738-202



SCHEMATIC, CAB CONTROL PANELS
ODYSSEY GEN III

5/25/16

701-9214-001

263-1815-001

263-1815-006

263-1740-009

263-1815-004

263-1815-008

263-1815-031

263-1816

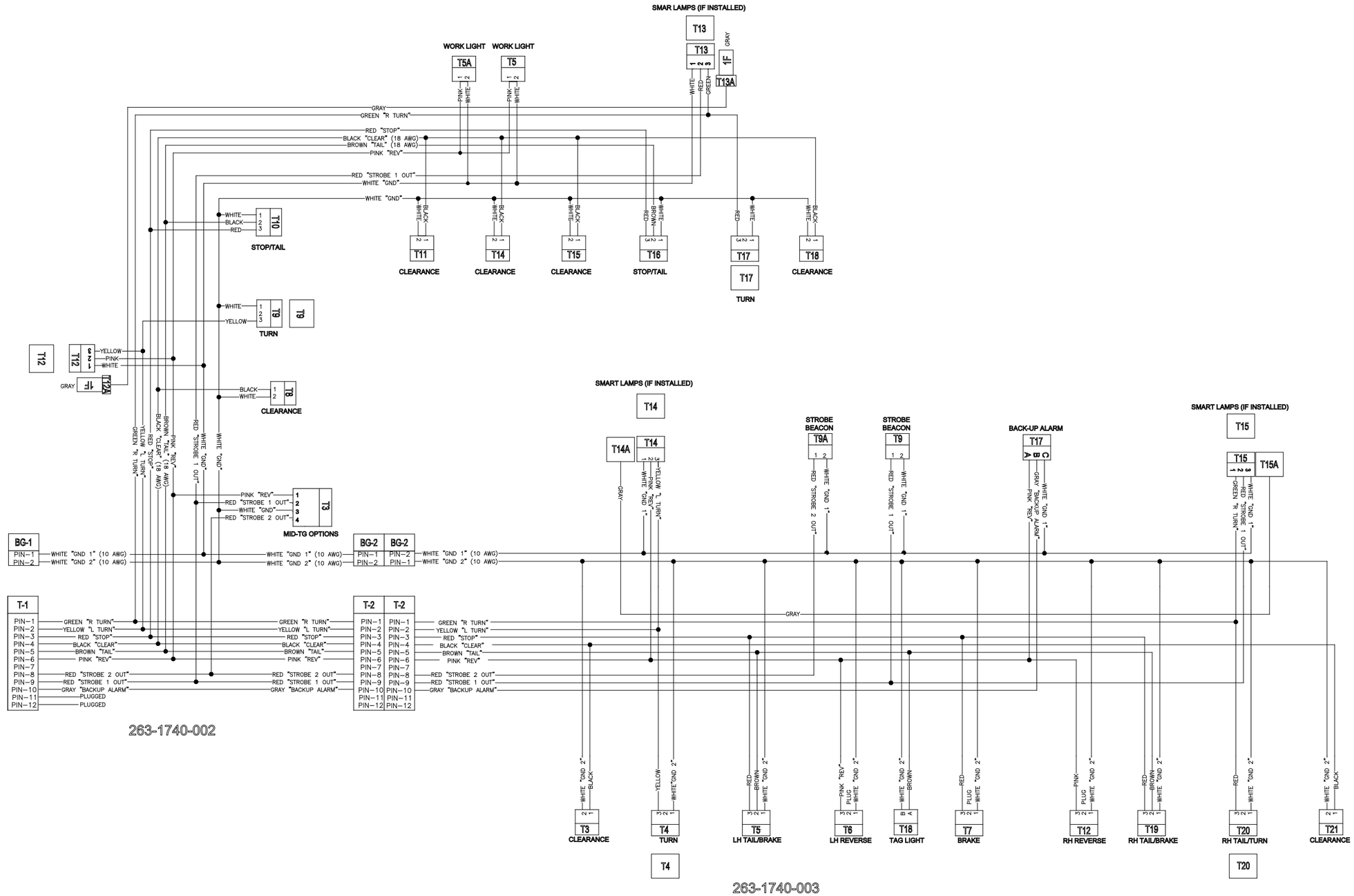
263-1816

263-1815-002

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

MAIN TRUNK SHALL BE TURCK
101552340 4 CONDUCTOR CABLE

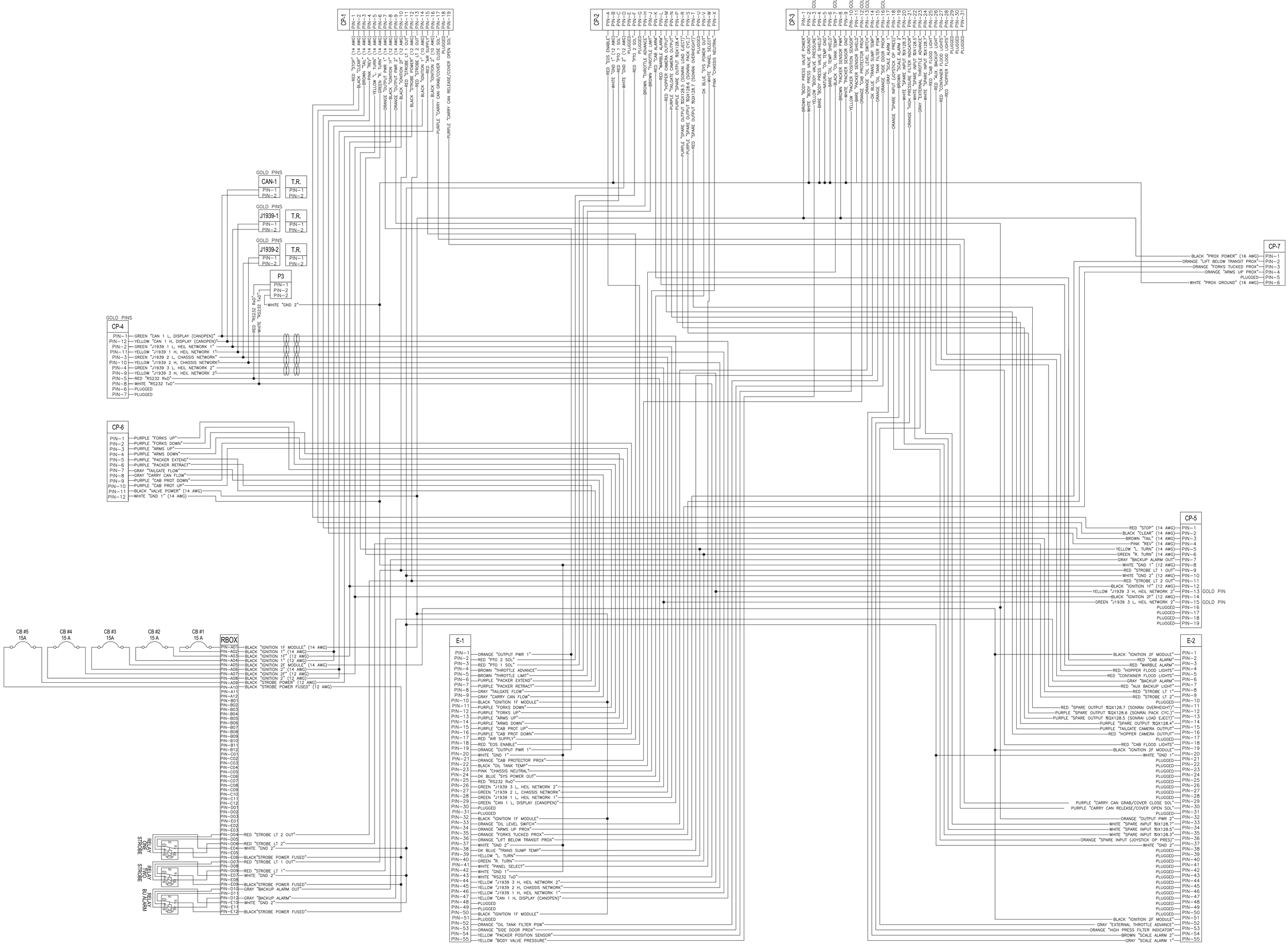
REV D3 03/19/18
FORT PAYNE, AL
SCHEMATIC, BODY
2018 HP/ODYSSEY
701-9214-003



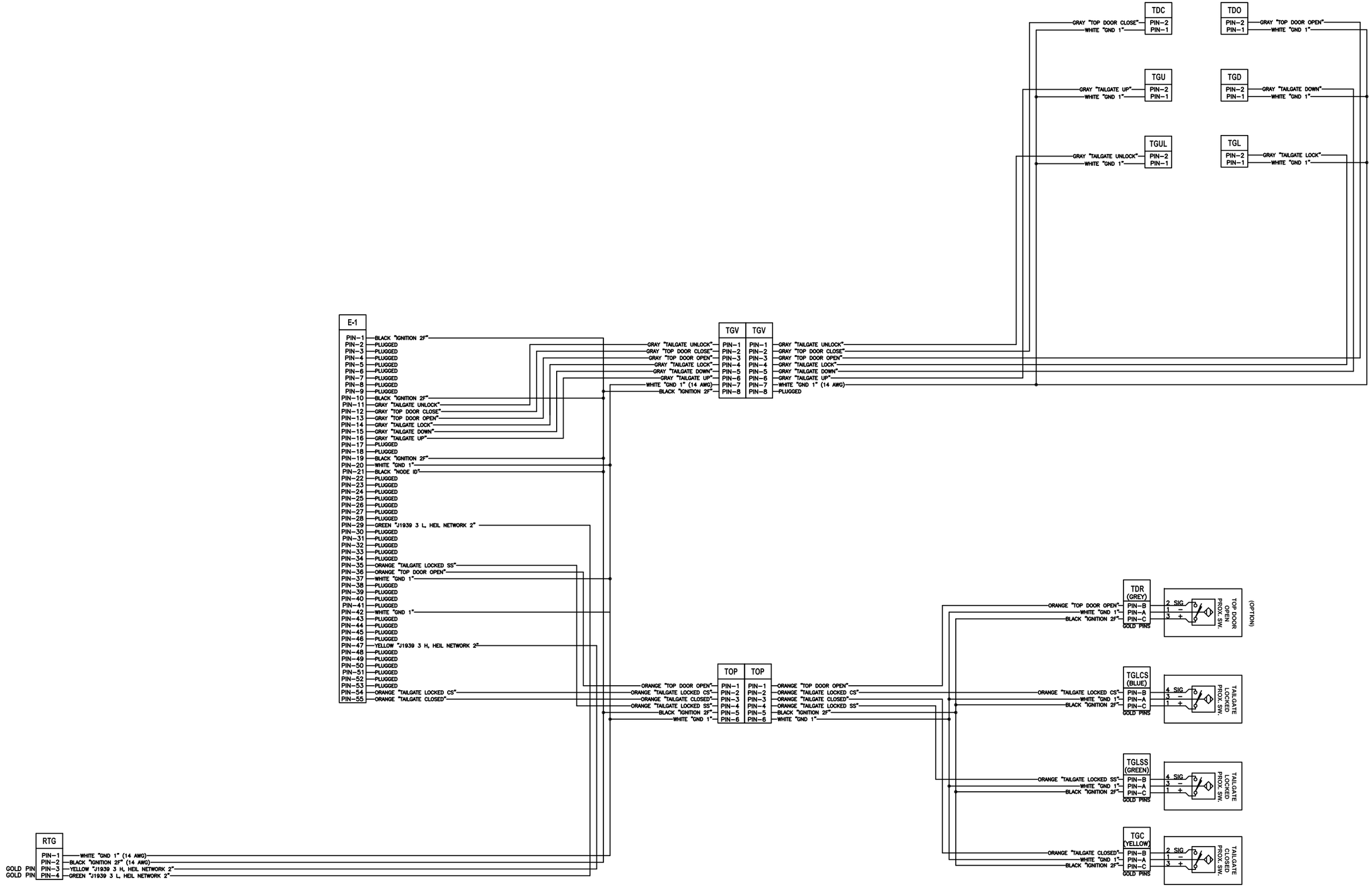
SCHEMATIC, TAILGATE
ODYSSEY GEN III

11/18/2015

701-9214-004



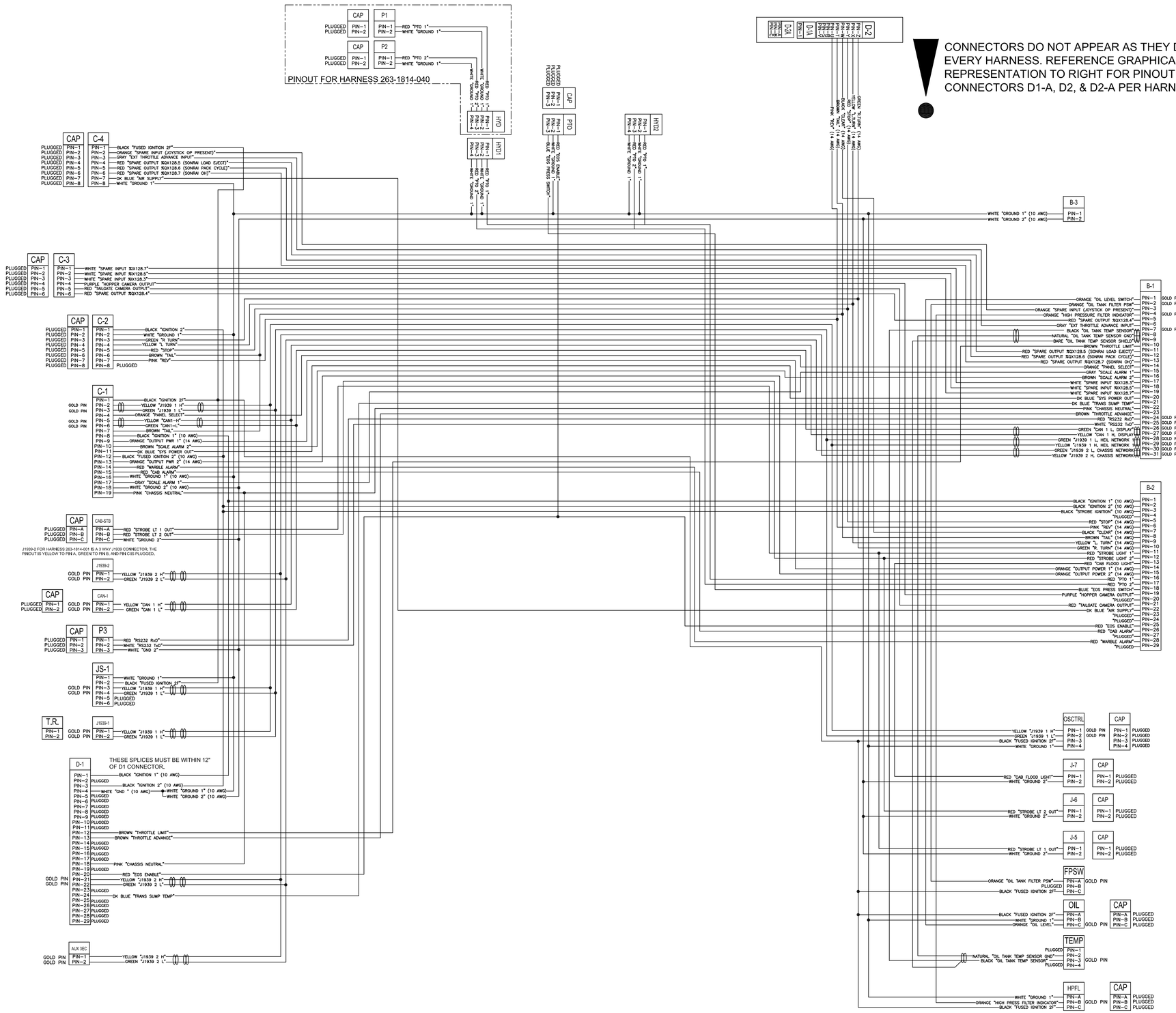
Controller Schematic
701-9214-005
05/25/2016



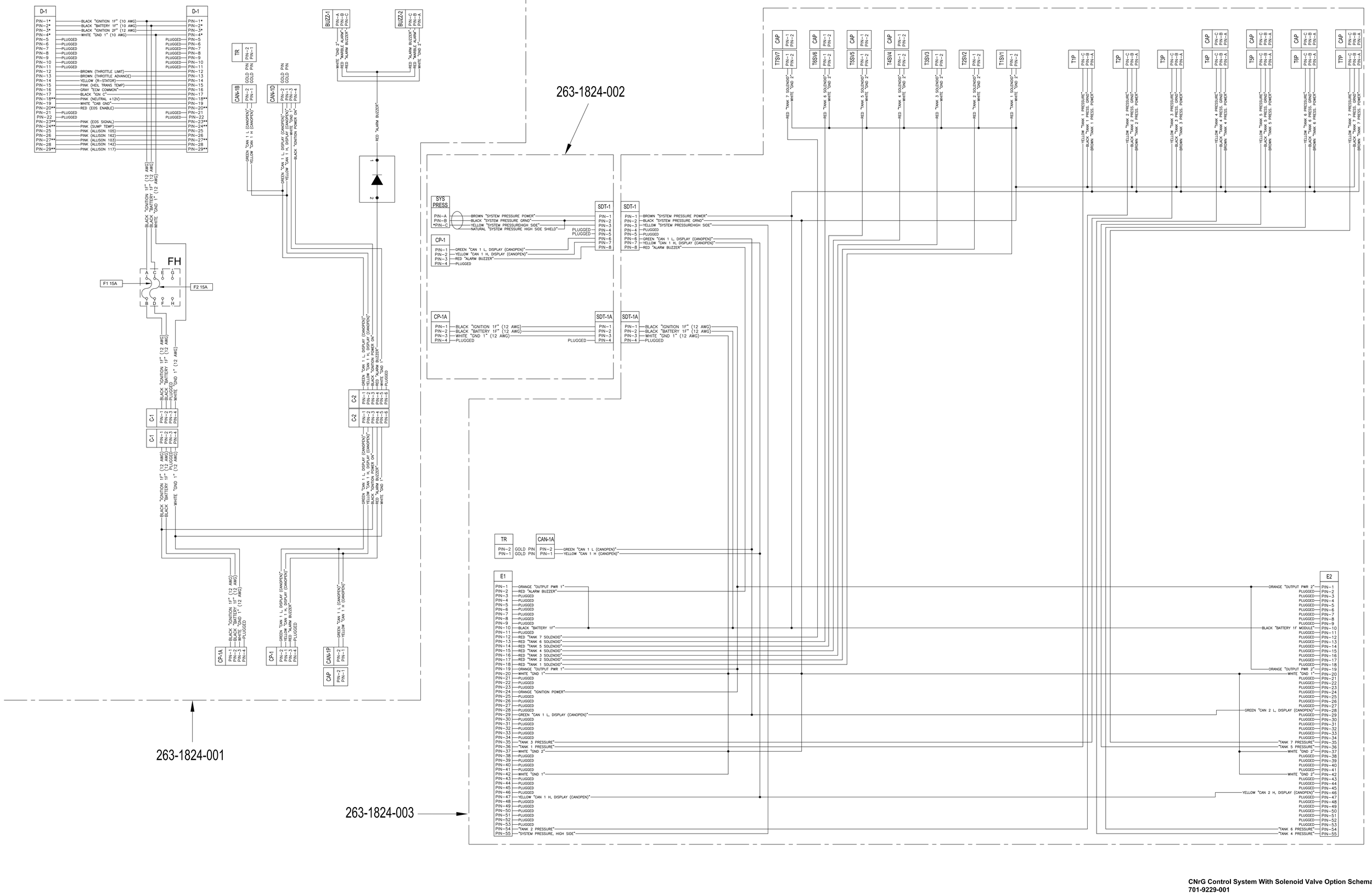
Remote Tailgate Controller Schematic
701-9214-007
08/03/2016

SCHEMATIC, DEDICATED REMOTE
CAN CONTROLLER, GEN III ODYSSEY

6/10/16 701-9214-009



Cab to Body Schematic
701-9214-002
06/12/2017



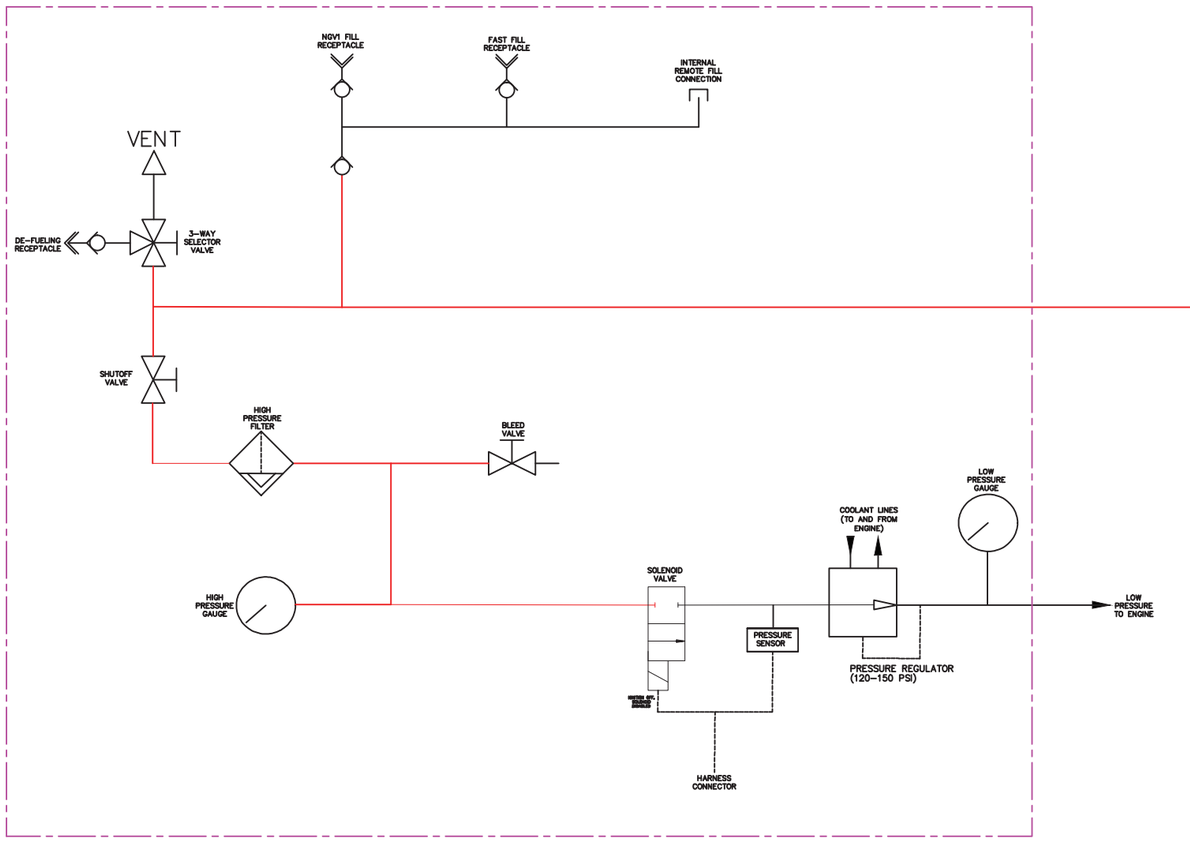
CNrG Control System With Solenoid Valve Option Schematic
701-9229-001
08/17/2016

ITEM	DESCRIPTION
10	PLUG
9	VENTING PIPES
8	LIVE PORT FOR PRESSURE TRANSDUCER
7	THERMAL PRD (TPRD)
6	EXCESS FLOW DEVICE
5	12V SUPPLY FOR SOLENOID
4	OUTLET PORT 9/16"–18UNF
3	SOLENOID VALVE
2	MANUAL VALVE
1	INLET PORT FOR 9/16"–18UNF

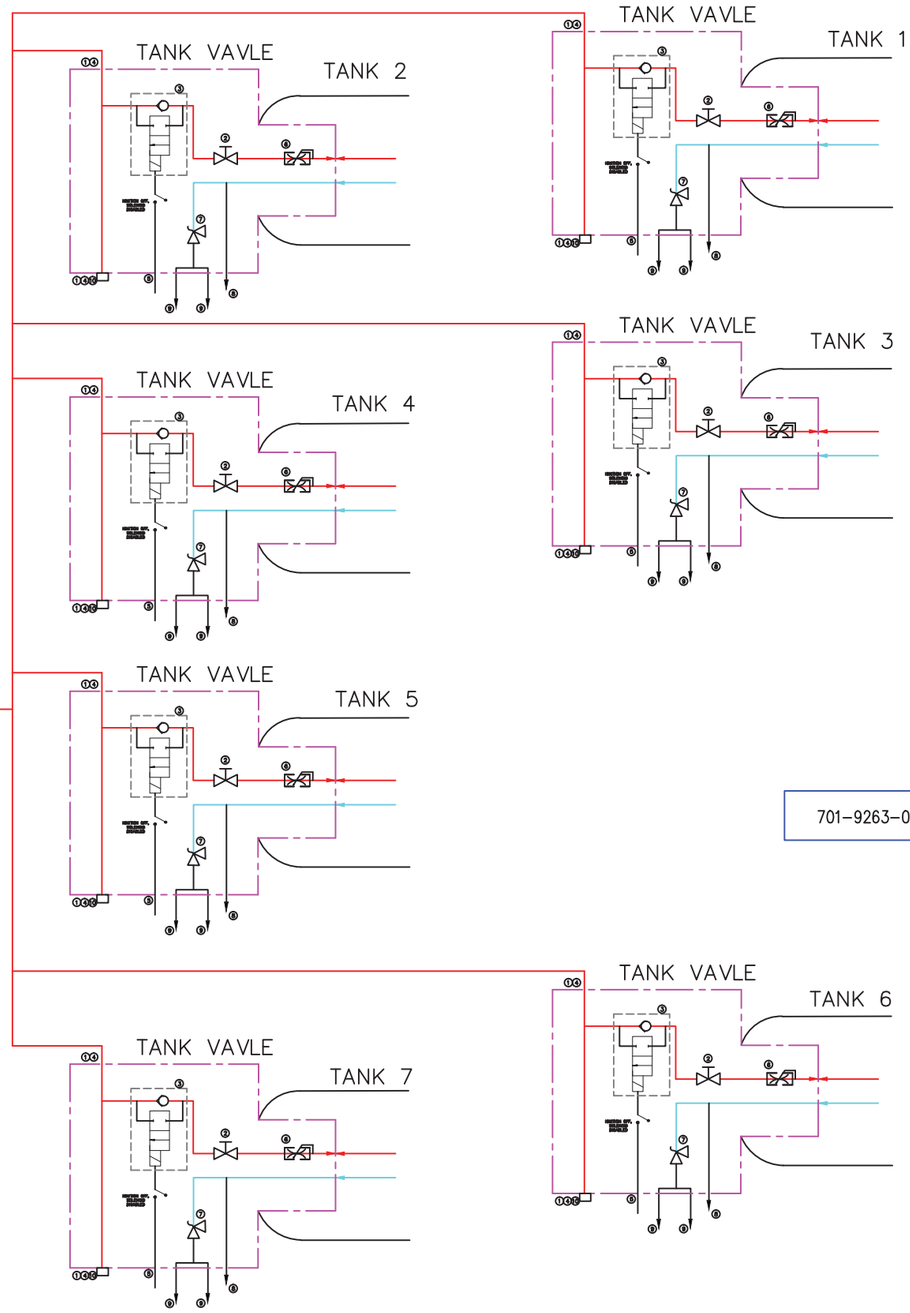
LEGEND

- FLOW PATH FOR CNG
- GAS FLOW FROM TANKS TO VENT LINES

NOTE:
1) FLOW PATH FOR GAS GOING IN AND OUT FROM TANK TO FMM WILL REMAIN SAME IRRESPECTIVE OF 3–7 TANK SYSTEMS. CURRENT SCHEMATIC SHOWN FOR 7 TANK SYSTEM.
2) IN THE SCENARIO OF IGNITION OFF, TANKS ARE DISCONNECTED FROM SYSTEM PRESSURE AS SHOWN. GAS CAN GO IN THE TANKS BUT WILL NOT BE ABLE TO COME OUT OF THE TANKS. YOU WILL BE ABLE TO FILL THE TANKS WHEN IGNITION IS OFF.



FUEL MANAGEMENT MODULE (FMM) BOX



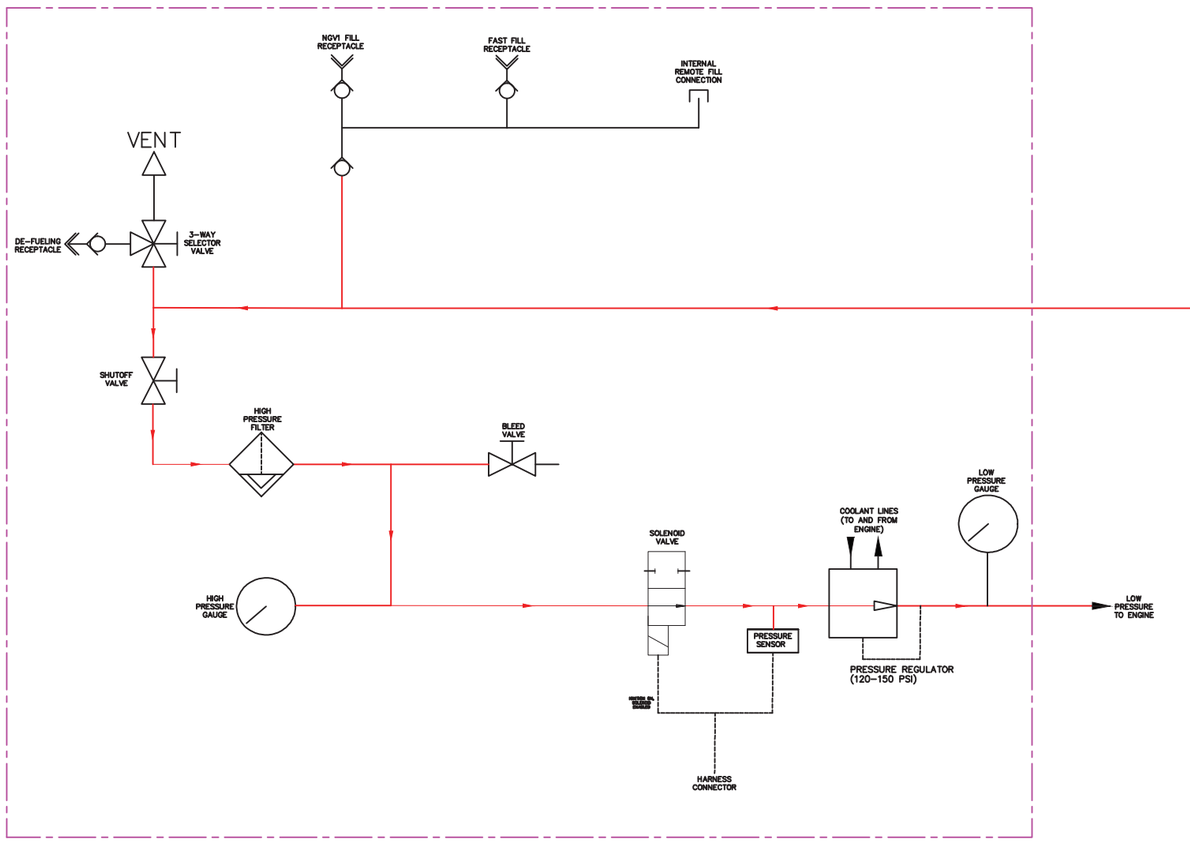
SCHEMATIC SHOWING FLOW PATH OF GAS WHEN IGNITION IS OFF AND TRUCK IS PARKED WITH FUEL IN TANKS AND LINES

701–9263–001

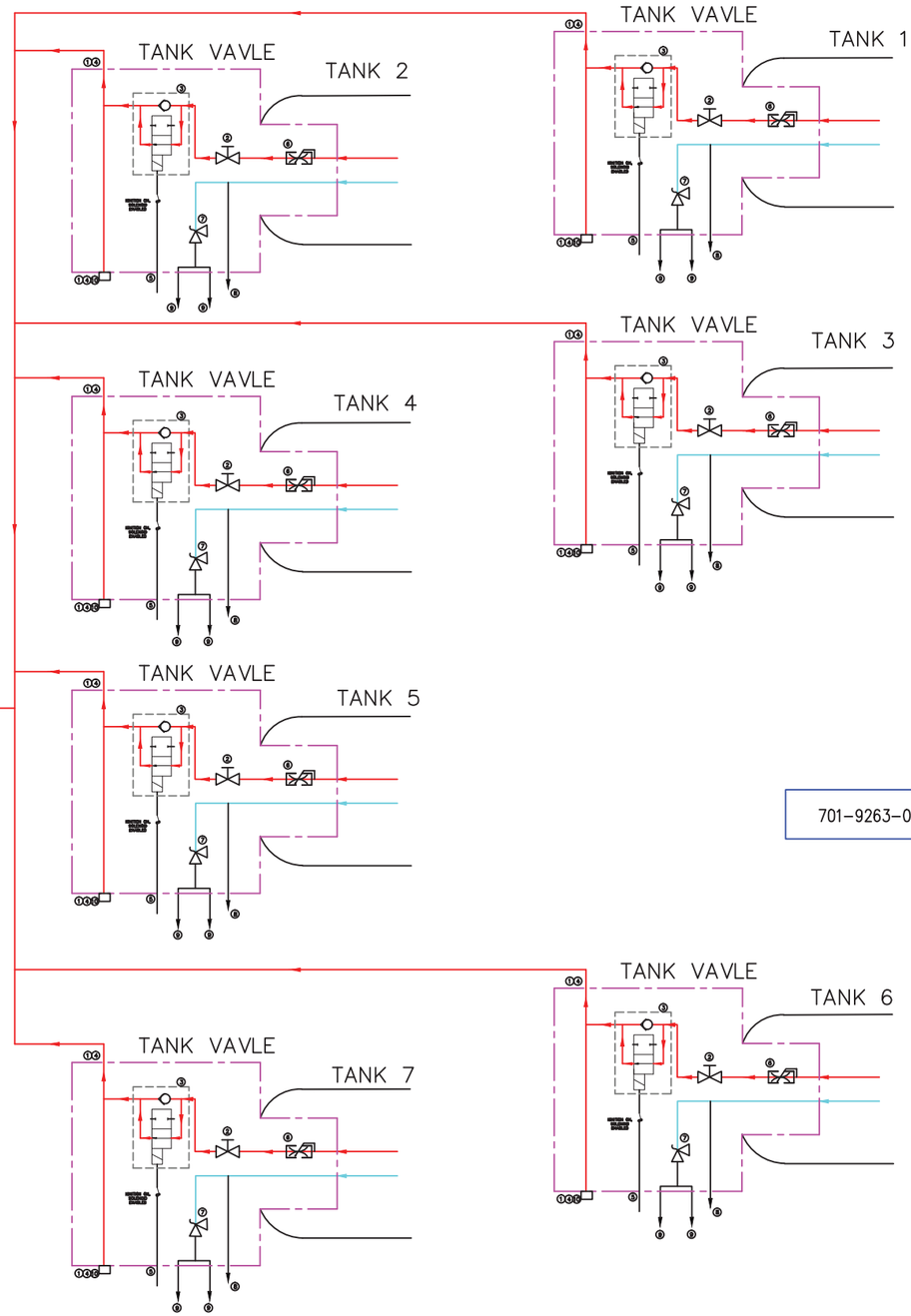
11/16/2016

SCHEMATIC 105 DGE, CNrG
W/SOLENOID VALVE, HP ALL

701–9263–001



FUEL MANAGEMENT MODULE (FMM) BOX



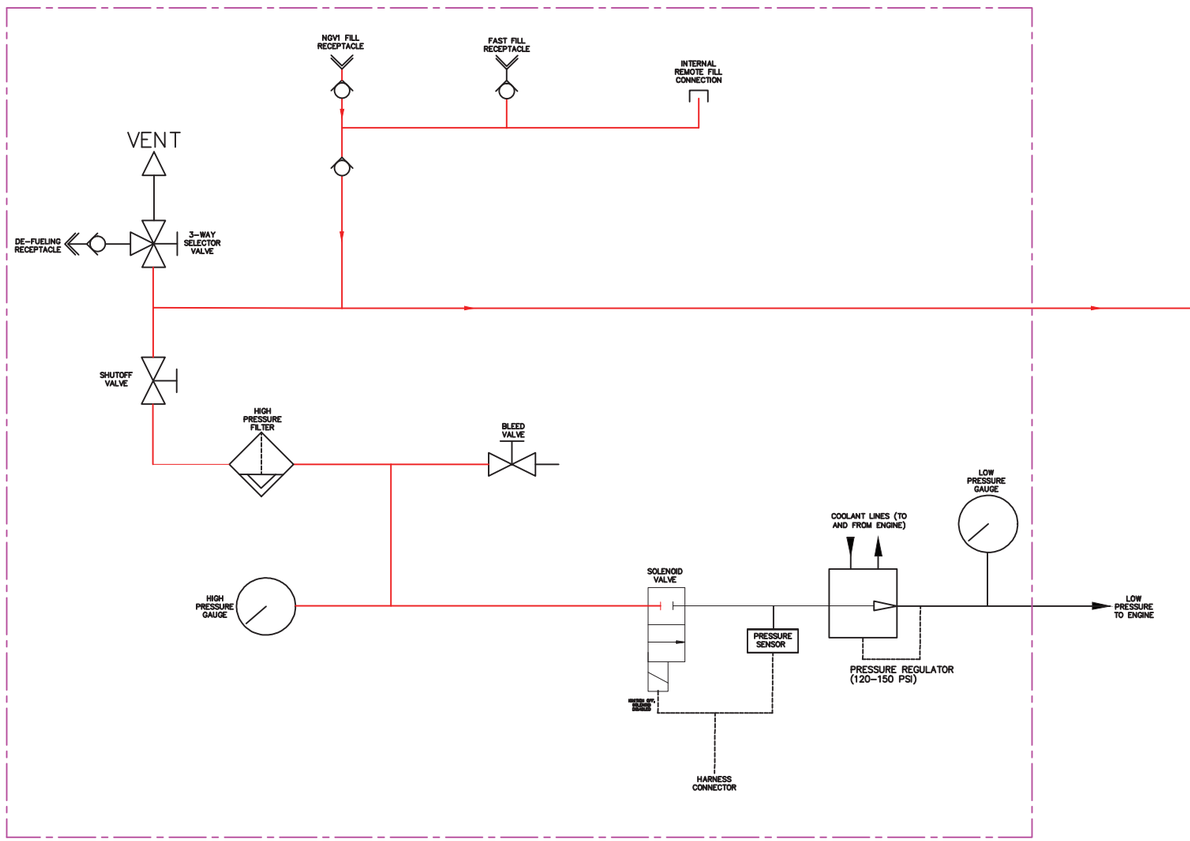
701-9263-001

SCHEMATIC SHOWING FLOW PATH OF GAS WHEN IGNITION IS ON AND TRUCK IS RUNNING WITH FUEL IN TANKS AND LINES

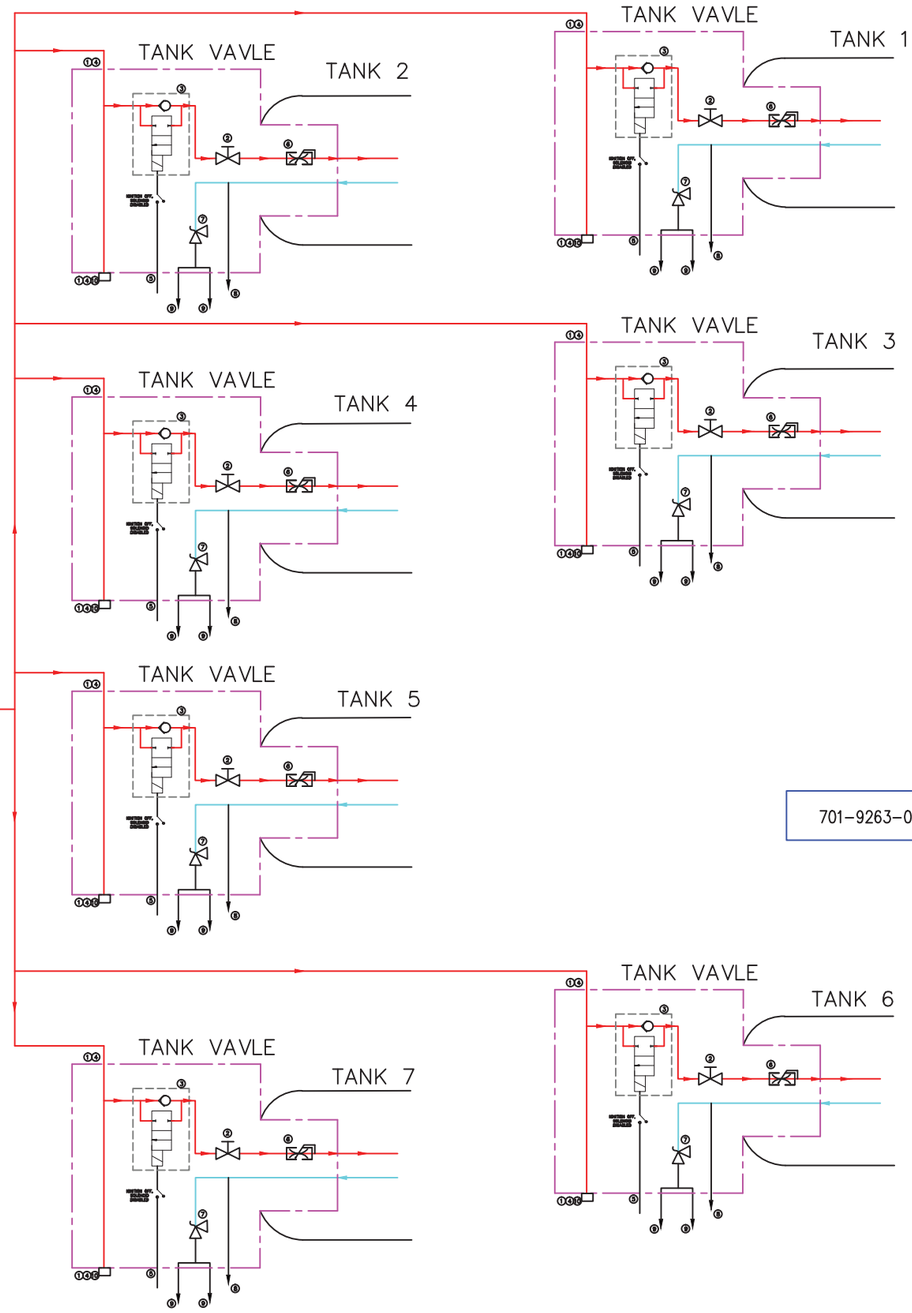
11/16/2016

SCHEMATIC 105 DGE, CNrG
W/SOLENOID VALVE, HP ALL

701-9263-001



FUEL MANAGEMENT MODULE (FMM) BOX



SCHEMATIC SHOWING FLOW PATH OF GAS WHEN REFUELING THE TRUCK AND IGNITION IS OFF

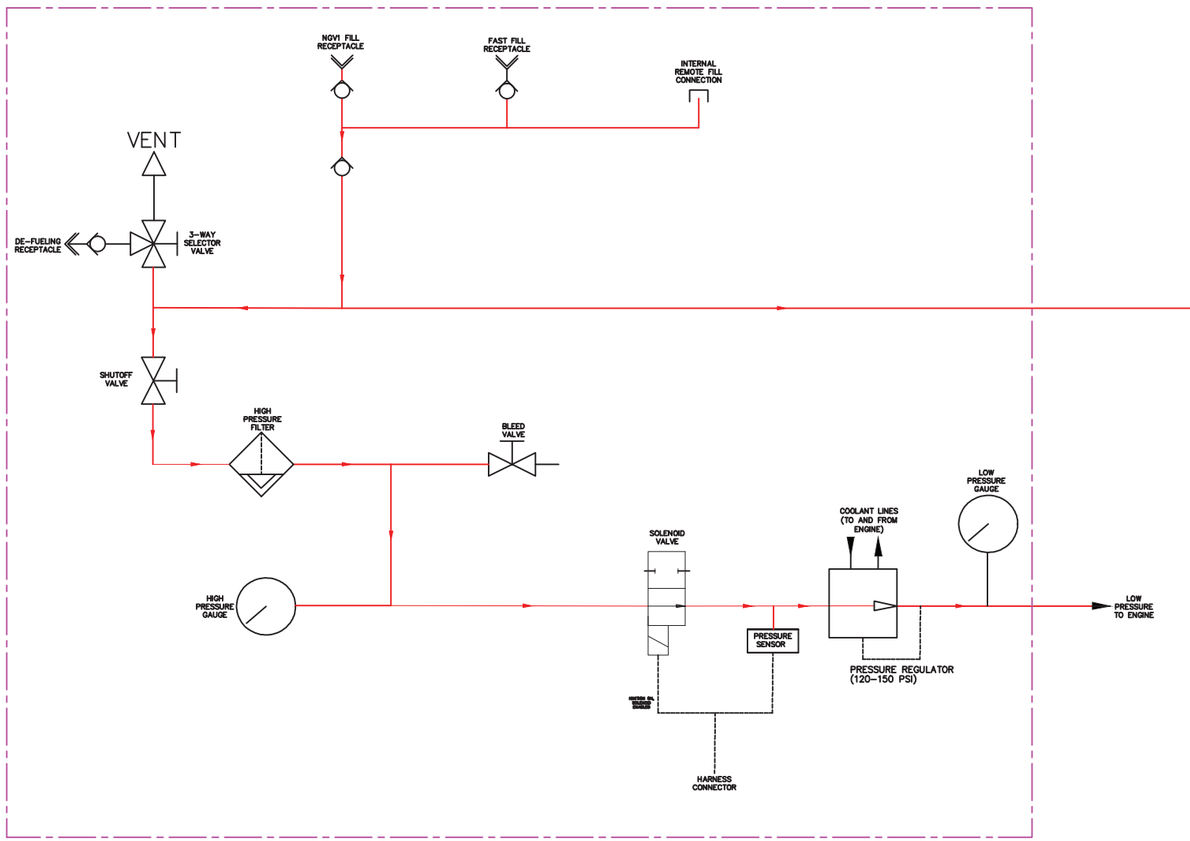
701-9263-001

SHEET 3 OF 4

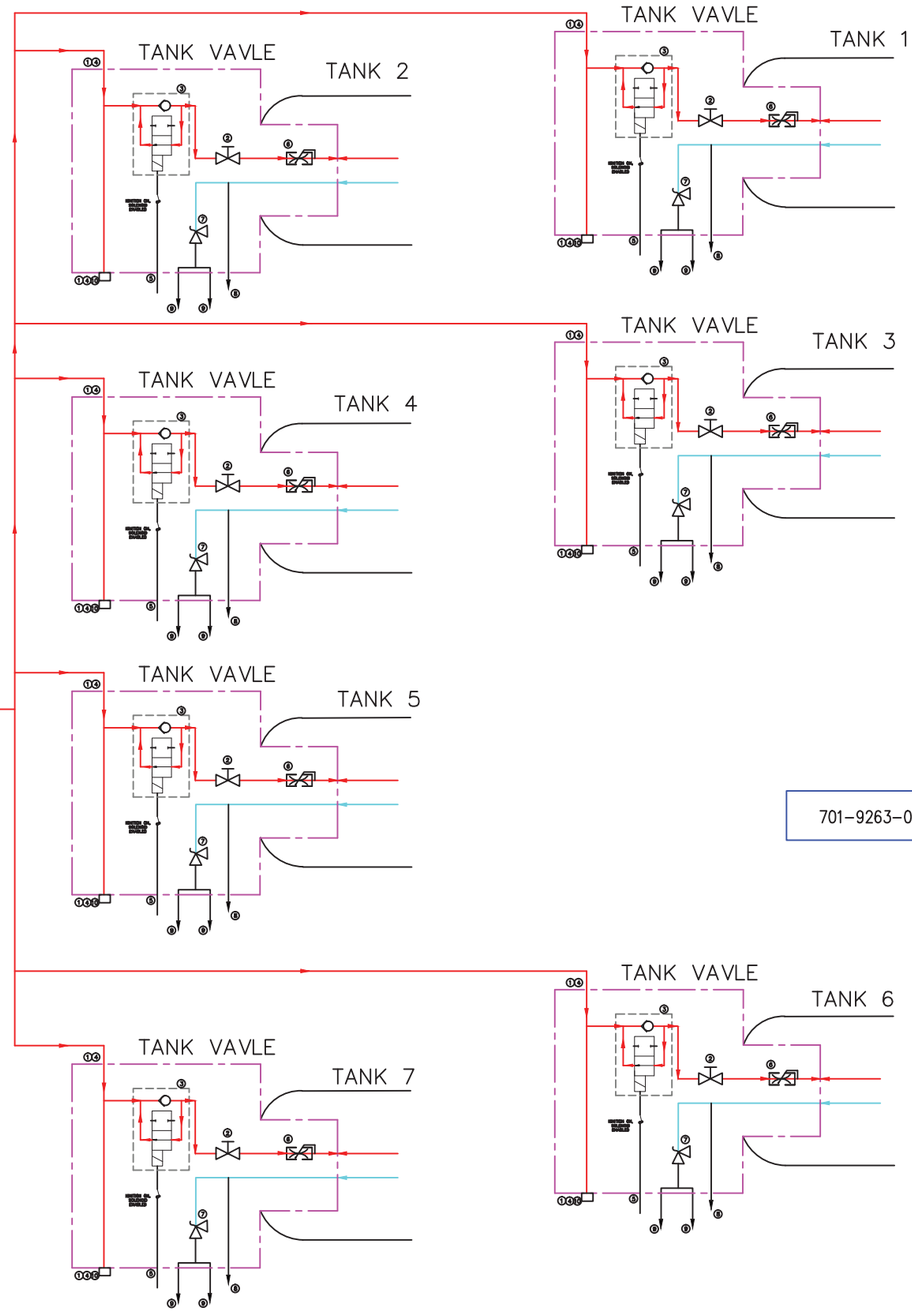
11/16/2016

SCHEMATIC 105 DGE, CNrG
W/SOLENOID VALVE, HP ALL

701-9263-001



FUEL MANAGEMENT MODULE (FMM) BOX



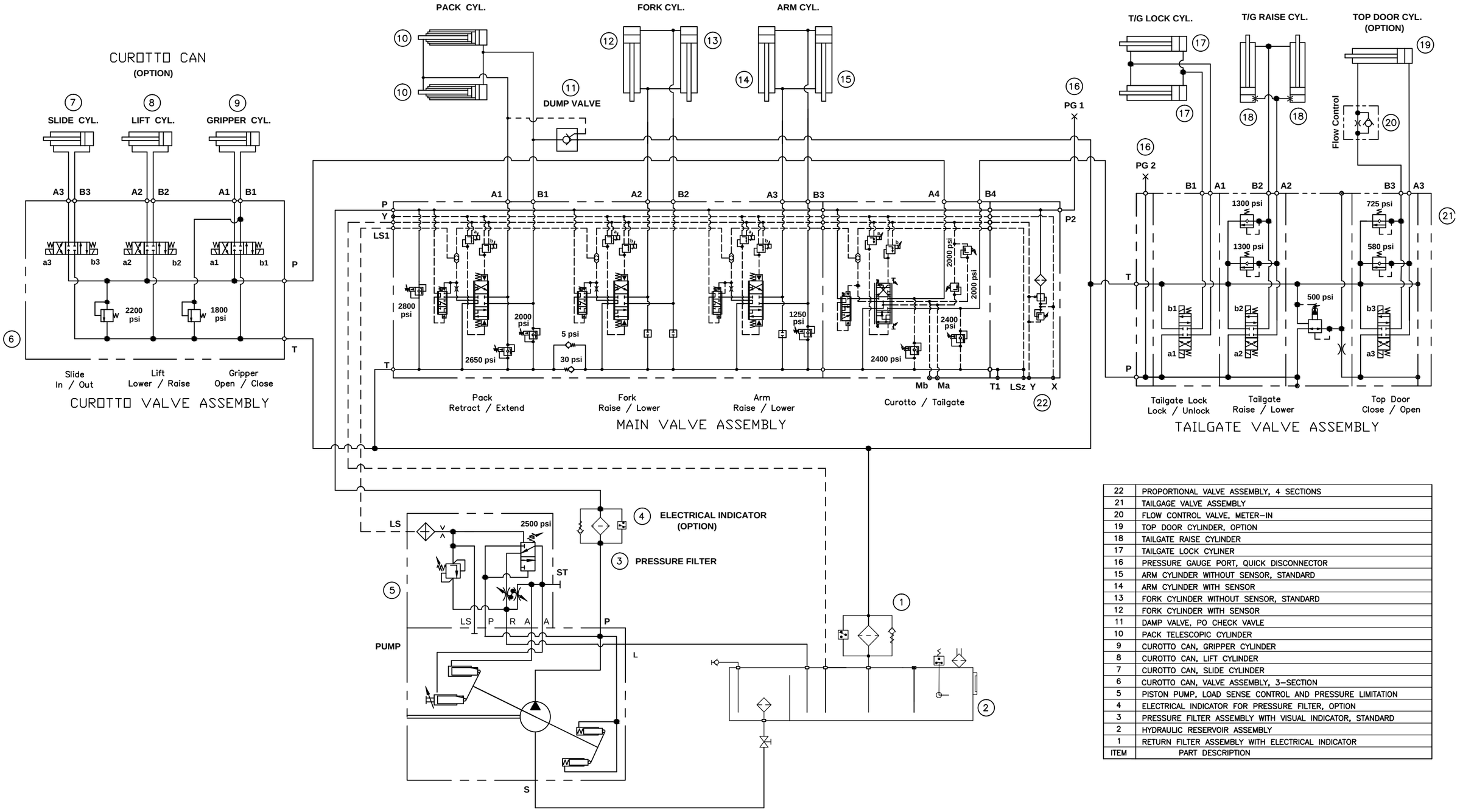
701-9263-001

SCHEMATIC SHOWING FLOW PATH OF GAS WHEN REFUELING THE TRUCK AND IGNITION IS ON

11/16/2016

SCHEMATIC 105 DGE, CNrG
W/SOLENOID VALVE, HP ALL

701-9263-001



ITEM	PART DESCRIPTION
22	PROPORTIONAL VALVE ASSEMBLY, 4 SECTIONS
21	TAILGAGE VALVE ASSEMBLY
20	FLOW CONTROL VALVE, METER-IN
19	TOP DOOR CYLINDER, OPTION
18	TAILGATE RAISE CYLINDER
17	TAILGATE LOCK CYLINER
16	PRESSURE GAUGE PORT, QUICK DISCONNECTOR
15	ARM CYLINDER WITHOUT SENSOR, STANDARD
14	ARM CYLINDER WITH SENSOR
13	FORK CYLINDER WITHOUT SENSOR, STANDARD
12	FORK CYLINDER WITH SENSOR
11	DAMP VALVE, PO CHECK VAVLE
10	PACK TELESCOPIC CYLINDER
9	CUROTTO CAN, GRIPPER CYLINDER
8	CUROTTO CAN, LIFT CYLINDER
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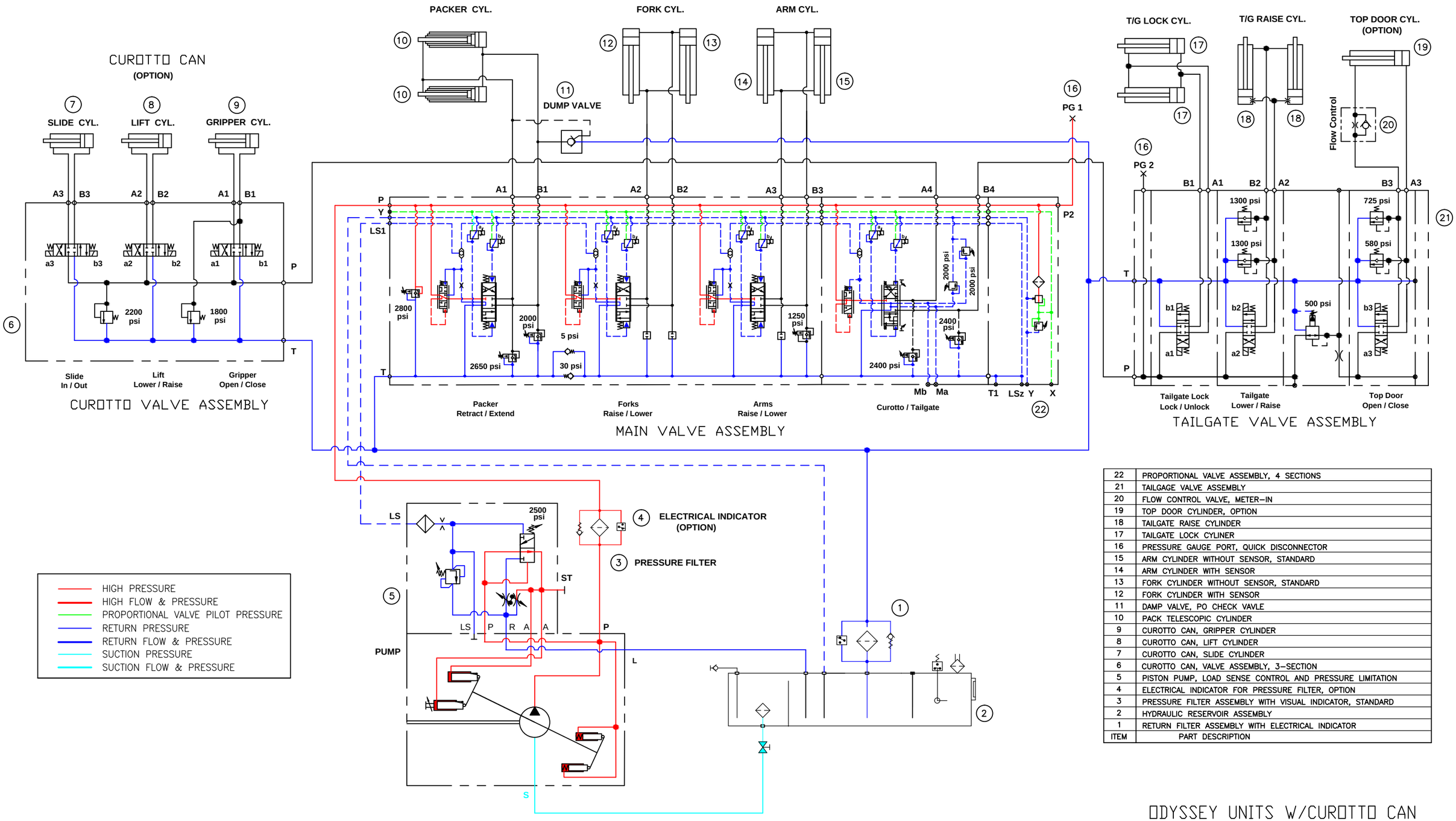
6	CUROTTO CAN, VALVE ASSEMBLY, 3-SECTION
5	PISTON PUMP, LOAD SENSE CONTROL AND PRESSURE LIMITATION
4	ELECTRICAL INDICATOR FOR PRESSURE FILTER, OPTION
3	PRESSURE FILTER ASSEMBLY WITH VISUAL INDICATOR, STANDARD
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

HYDRAULIC SCHEMATIC FOR ODYSSEY, AUTOMATED FRONT LOADER

701-9149

13-AUG-2014

ODYSSEY UNIT, SYSTEM AT IDLE



HIGH PRESSURE
HIGH FLOW & PRESSURE
PROPORTIONAL VALVE PILOT PRESSURE
RETURN PRESSURE
RETURN FLOW & PRESSURE
SUCTION PRESSURE
SUCTION FLOW & PRESSURE

ITEM	PART DESCRIPTION
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21	TAILGAGE VALVE ASSEMBLY
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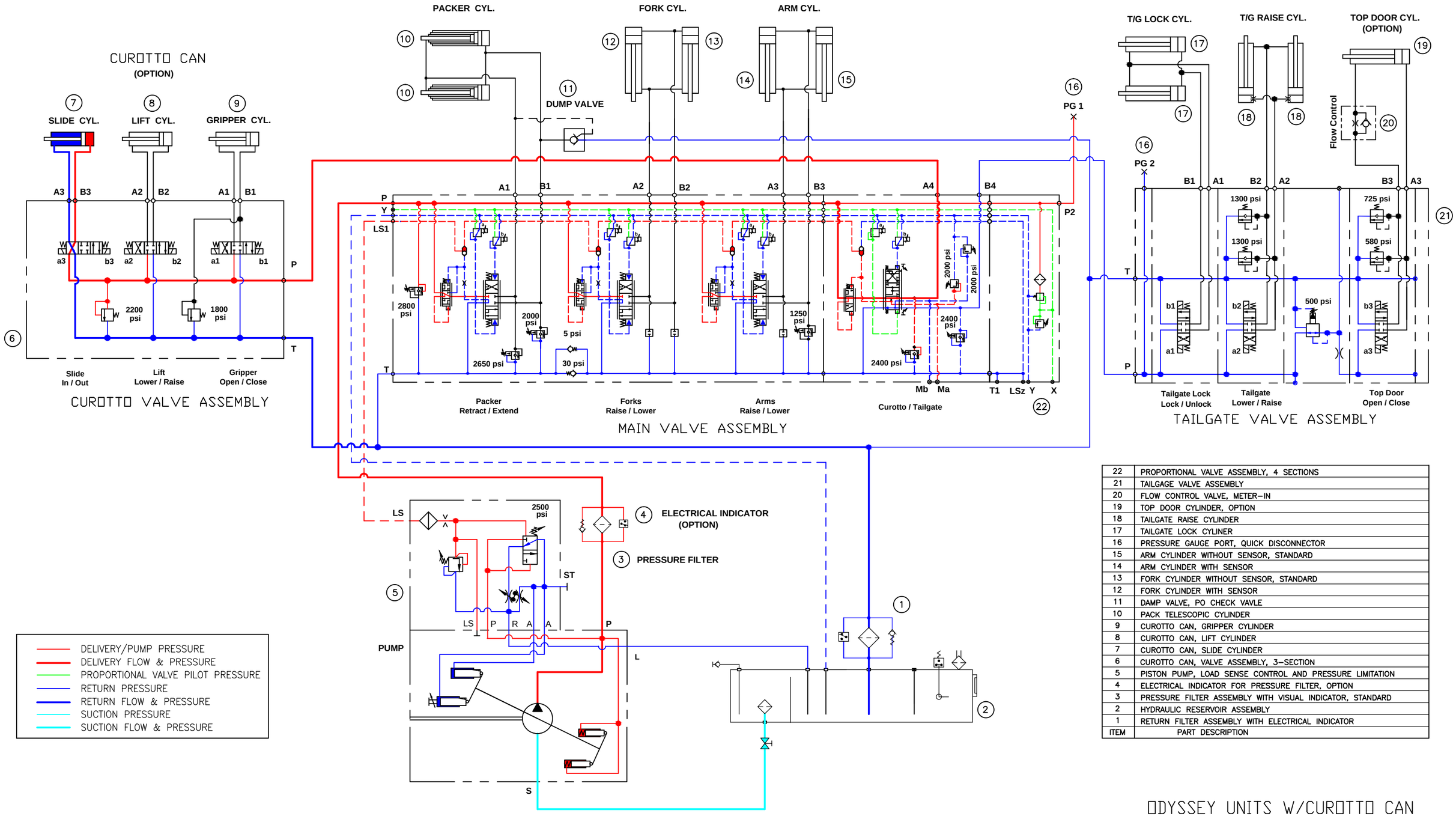
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

24-SEP-2014

ODYSSEY UNITS W/CUROTTO CAN
SYSTEM AT IDLE
701-9149-001

ODYSSEY UNIT, CUROTTO SLIDE OUT



DELIVERY/PUMP PRESSURE	
DELIVERY FLOW & PRESSURE	
PROPORTIONAL VALVE PILOT PRESSURE	
RETURN PRESSURE	
RETURN FLOW & PRESSURE	
SUCTION PRESSURE	
SUCTION FLOW & PRESSURE	

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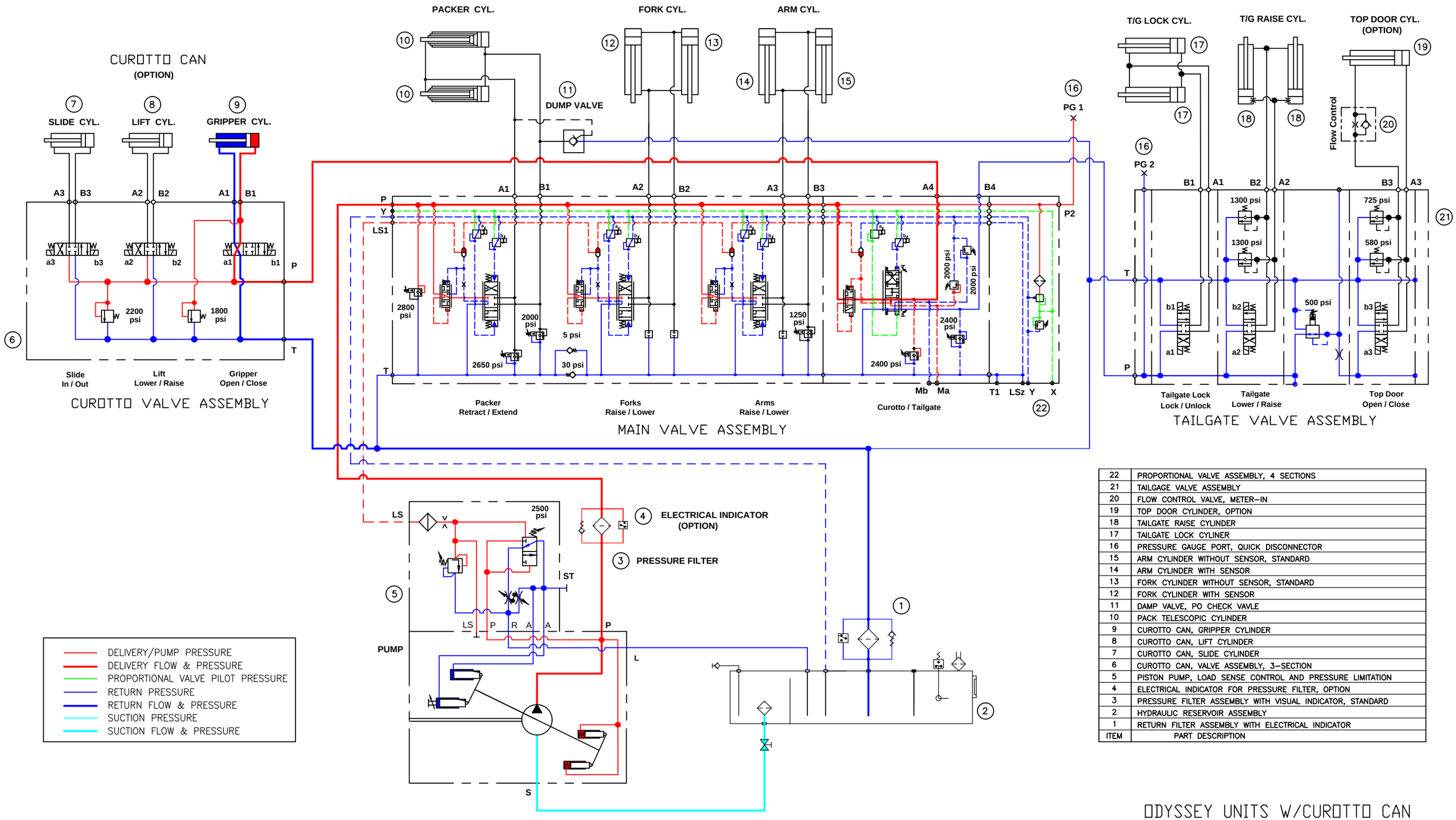
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

ODYSSEY UNITS W/CUROTTO CAN
CUROTTO SLIDE OUT

701-9149-002

24-SEP-2014

ODYSSEY UNIT, CUROTTO GRIPPER CLOSE



DELIVERY/PUMP PRESSURE	
DELIVERY FLOW & PRESSURE	
PROPORTIONAL VALVE PILOT PRESSURE	
RETURN PRESSURE	
RETURN FLOW & PRESSURE	
SUCTION PRESSURE	
SUCTION FLOW & PRESSURE	

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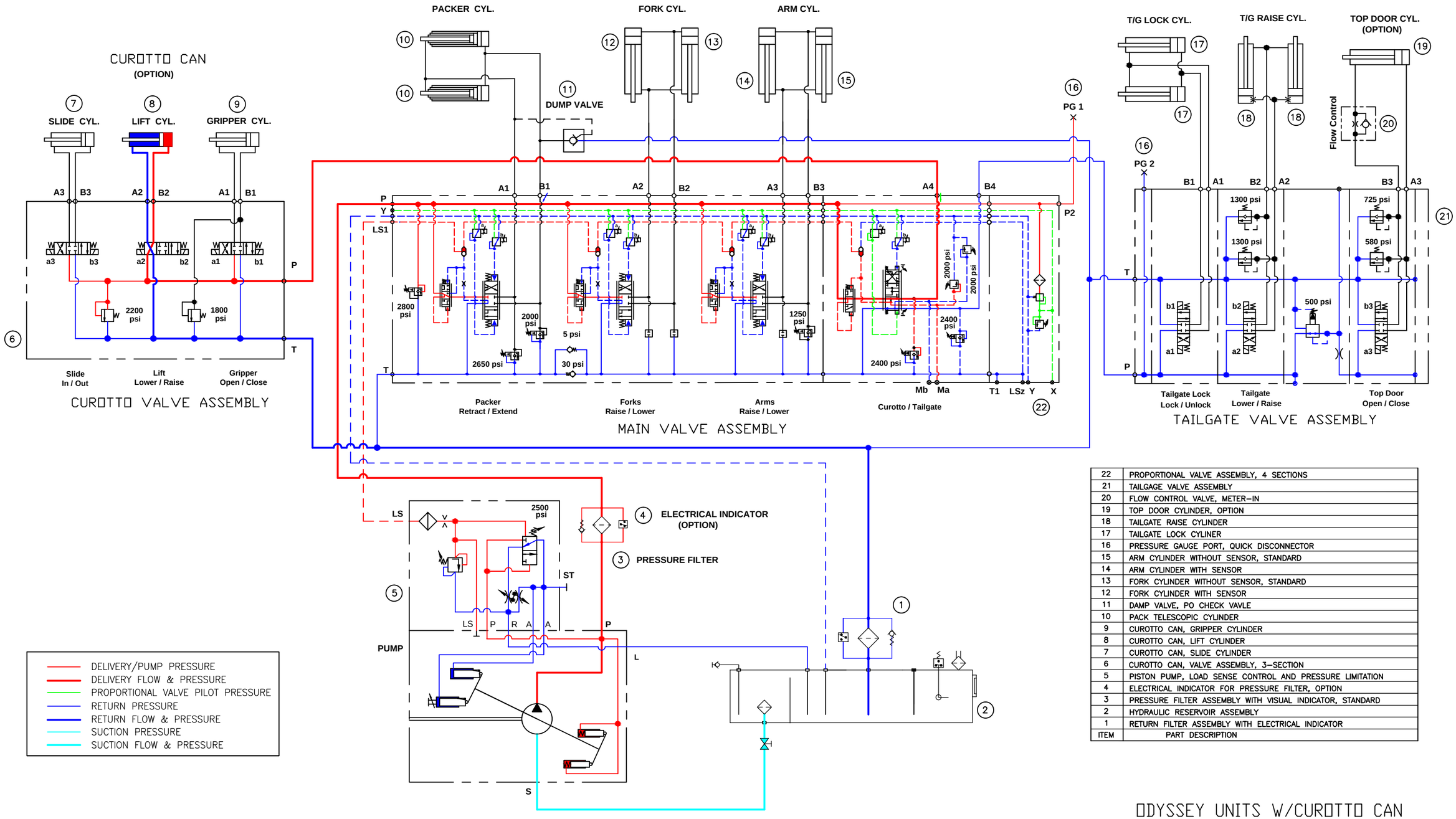
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

24-SEP-2014

ODYSSEY UNITS W/CUROTTO CAN
CUROTTO GRIPPER CLOSE

701-9149-003

ODYSSEY UNIT, CUROTTO LIFT RAISE



DELIVERY/PUMP PRESSURE	
DELIVERY FLOW & PRESSURE	
PROPORTIONAL VALVE PILOT PRESSURE	
RETURN PRESSURE	
RETURN FLOW & PRESSURE	
SUCTION PRESSURE	
SUCTION FLOW & PRESSURE	

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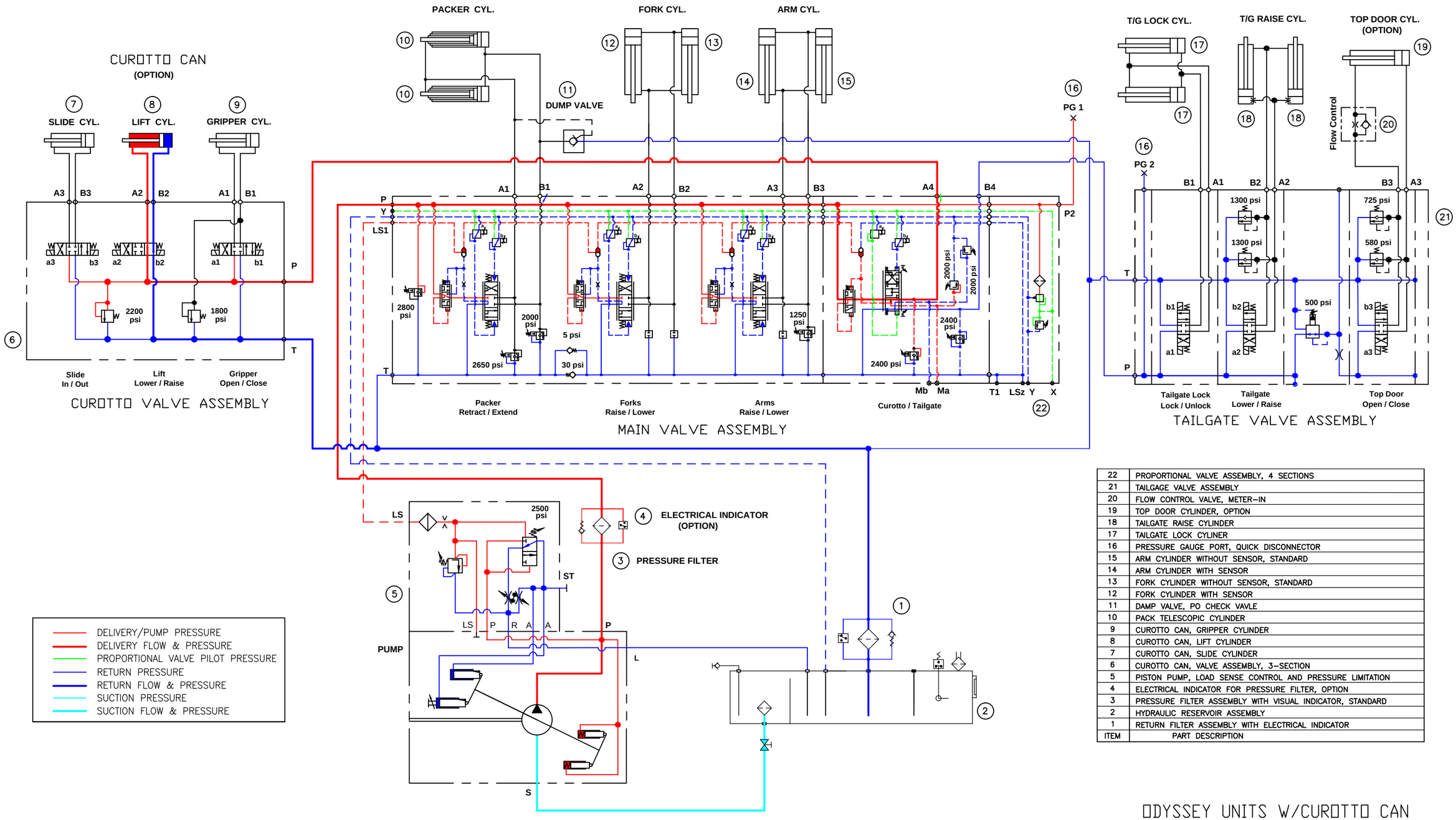
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

ODYSSEY UNITS W/CUROTTO CAN
CUROTTO LIFT RAISE

701-9149-004

28-JULY-14

ODYSSEY UNIT, CUROTTO LIFT LOWER



DELIVERY/PUMP PRESSURE	
DELIVERY FLOW & PRESSURE	
PROPORTIONAL VALVE PILOT PRESSURE	
RETURN PRESSURE	
RETURN FLOW & PRESSURE	
SUCTION PRESSURE	
SUCTION FLOW & PRESSURE	

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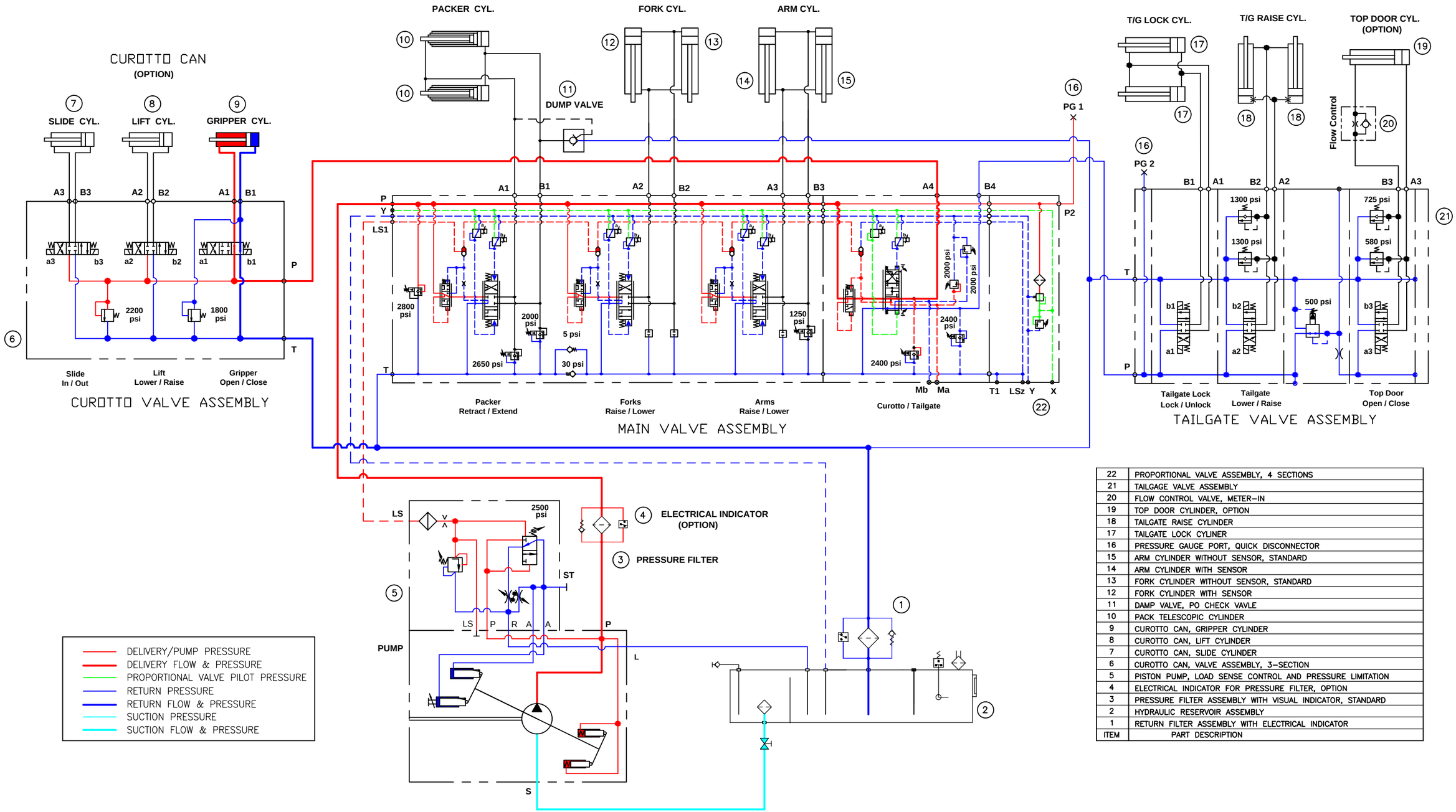
24-SEP-2014

ODYSSEY UNITS W/CUROTTO CAN
CUROTTO LIFT LOWER
701-9149-005

ODYSSEY UNIT, CUROTTO GRIPPER OPEN



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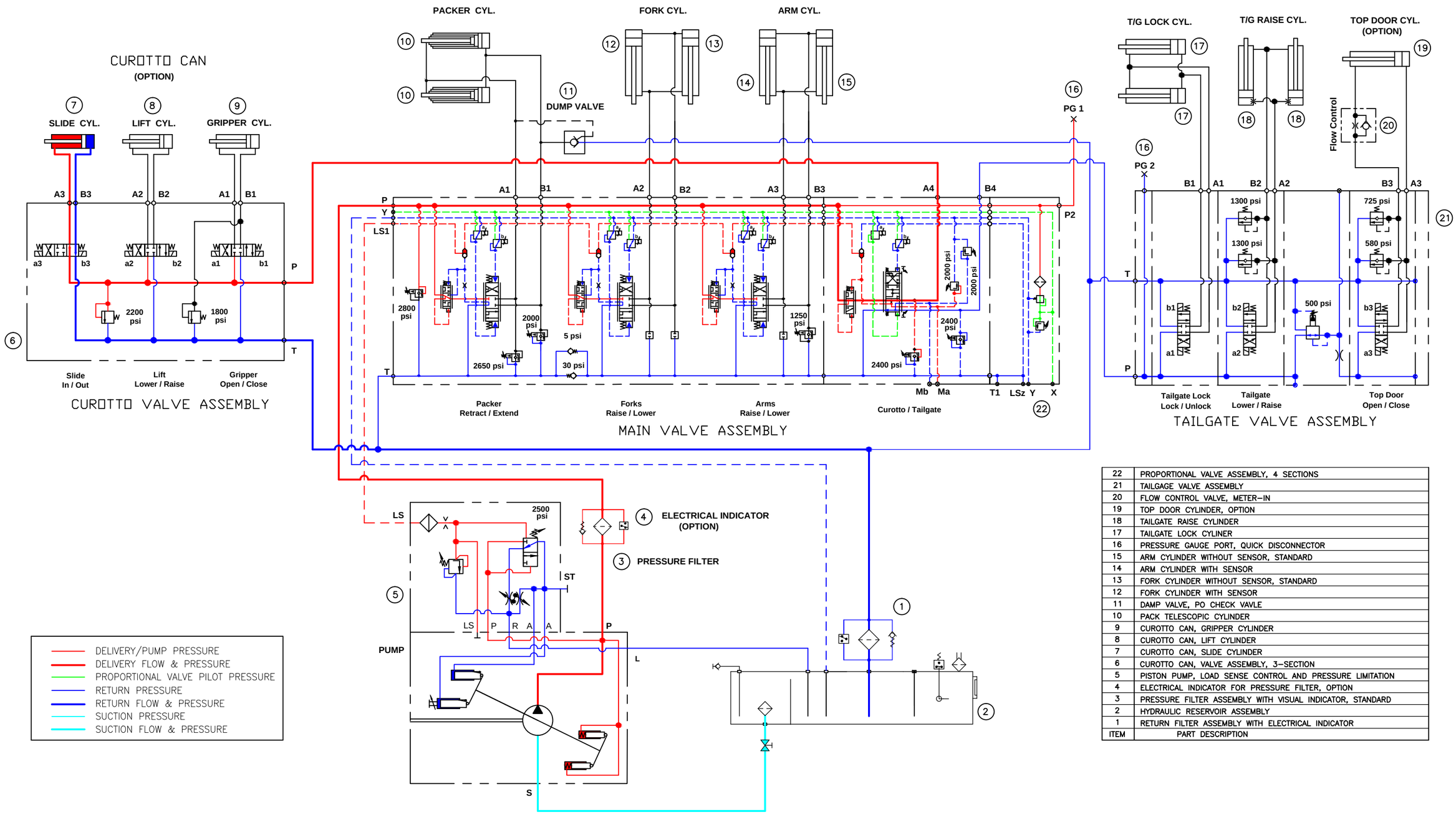
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

24-SEP-2014

ODYSSEY UNITS W/CUROTTO CAN
CUROTTO GRIPPER OPEN
701-9149-006

ODYSSEY UNIT, CUROTTO SLIDE IN



DELIVERY/PUMP PRESSURE	
DELIVERY FLOW & PRESSURE	
PROPORTIONAL VALVE PILOT PRESSURE	
RETURN PRESSURE	
RETURN FLOW & PRESSURE	
SUCTION PRESSURE	
SUCTION FLOW & PRESSURE	

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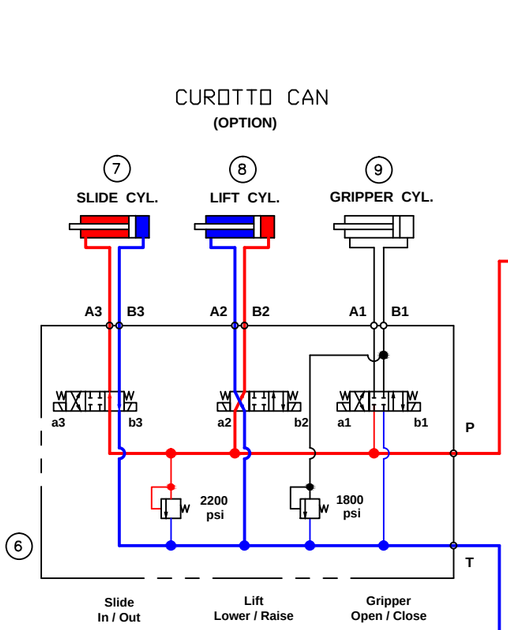
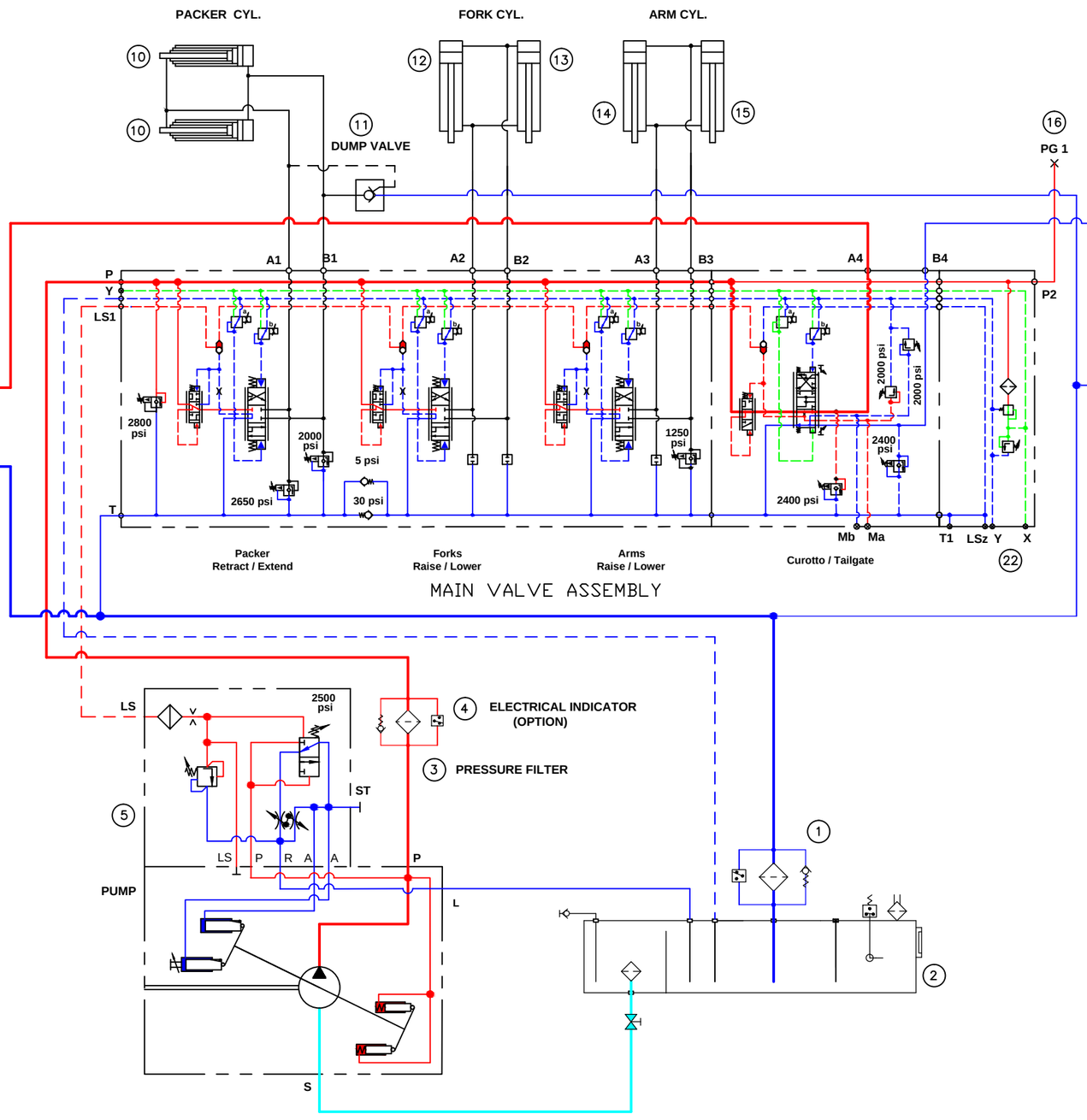
24-SEP-2014

ODYSSEY UNITS W/CUROTTO CAN
CUROTTO SLIDE IN
701-9149-007

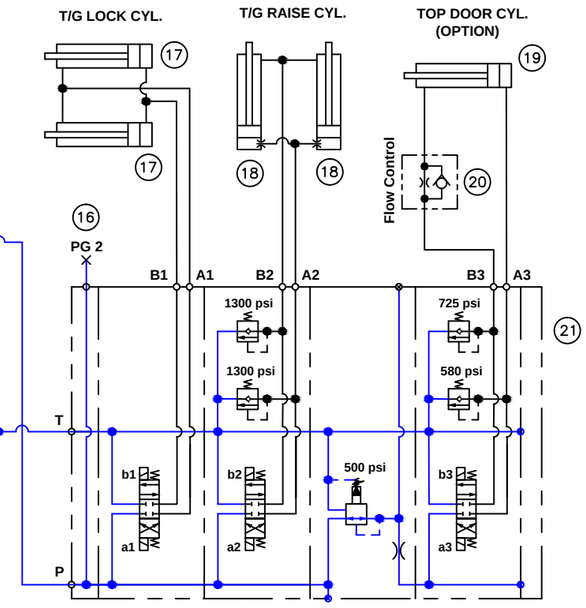
ODYSSEY UNIT, CUROTTO LIFT RAISE AND SLIDE IN



CUROTTO VALVE ASSEMBLY



MAIN VALVE ASSEMBLY



TAILGATE VALVE ASSEMBLY

DELIVERY/PUMP PRESSURE	
DELIVERY FLOW & PRESSURE	
PROPORTIONAL VALVE PILOT PRESSURE	
RETURN PRESSURE	
RETURN FLOW & PRESSURE	
SUCTION PRESSURE	
SUCTION FLOW & PRESSURE	

ITEM	PART DESCRIPTION
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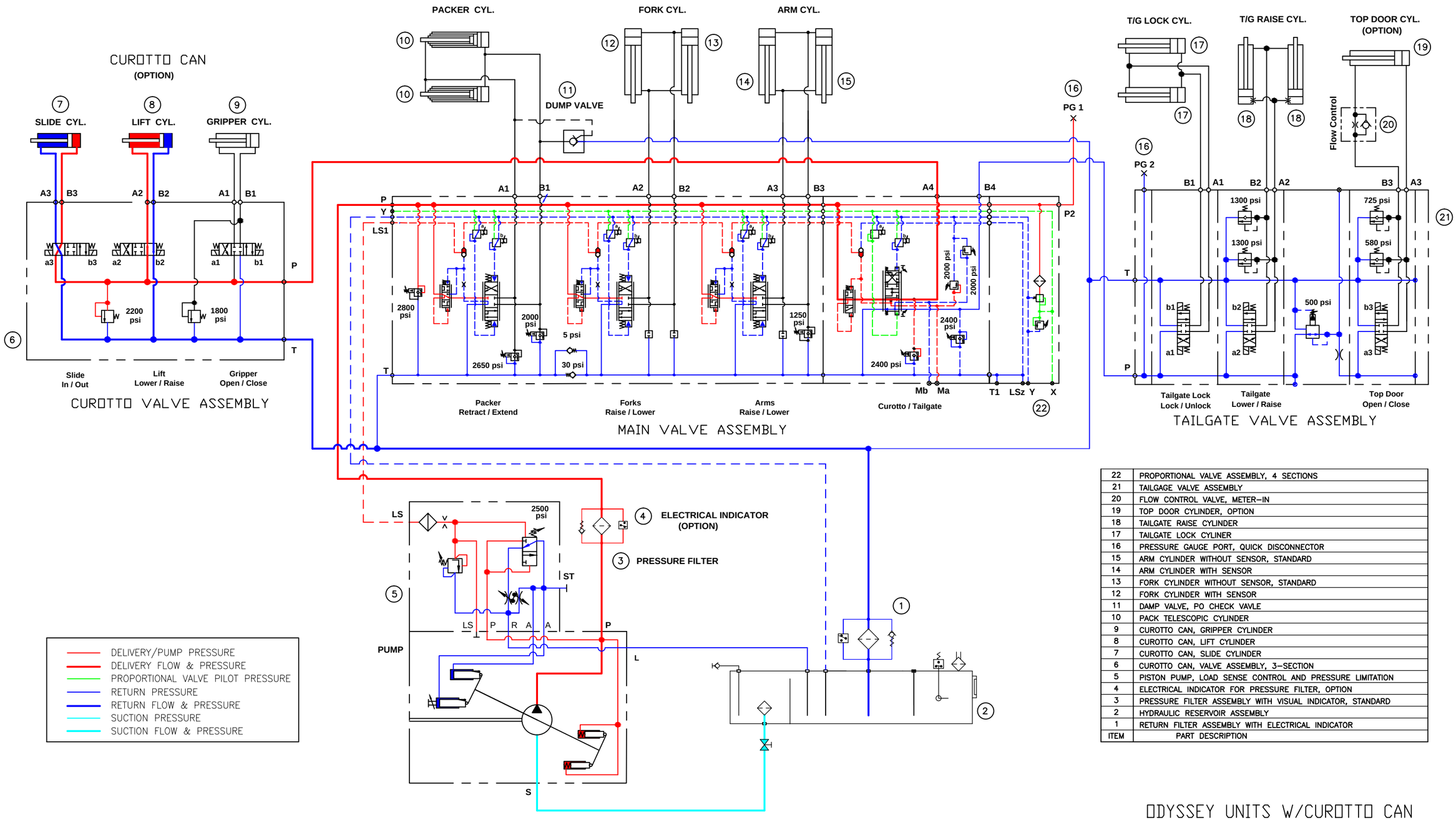
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

24-SEP-2014

ODYSSEY UNITS W/CUROTTO CAN
CUROTTO LIFT RAISE AND SLIDE IN
701-9149-008

ODYSSEY UNIT, CUROTTO LIFT LOWER AND SLIDE OUT



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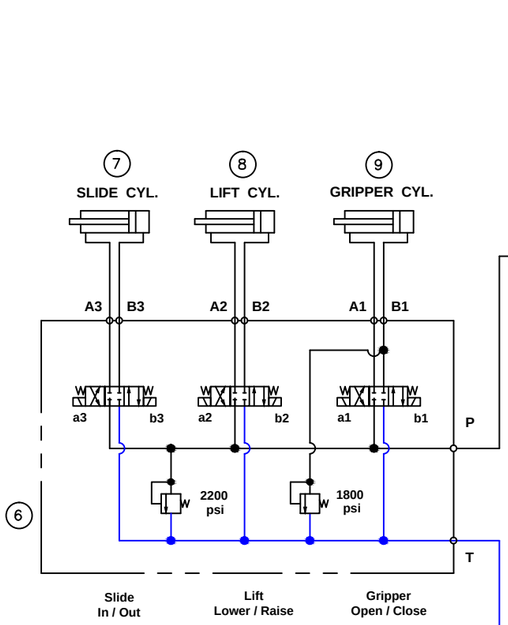
24-SEP-2014

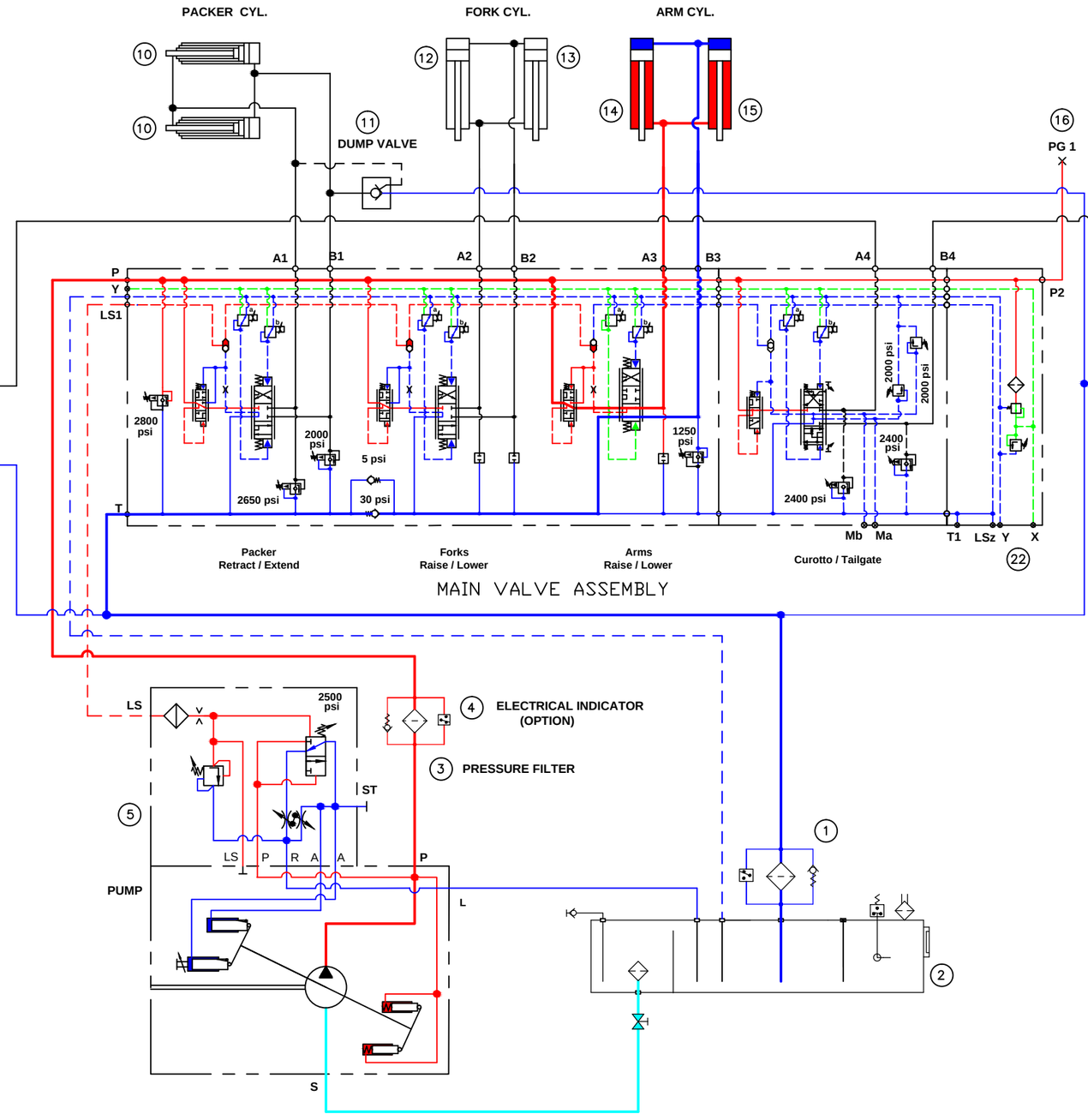
ODYSSEY UNITS W/CUROTTO CAN
CUROTTO LIFT LOWER AND SLIDE OUT

701-9149-009

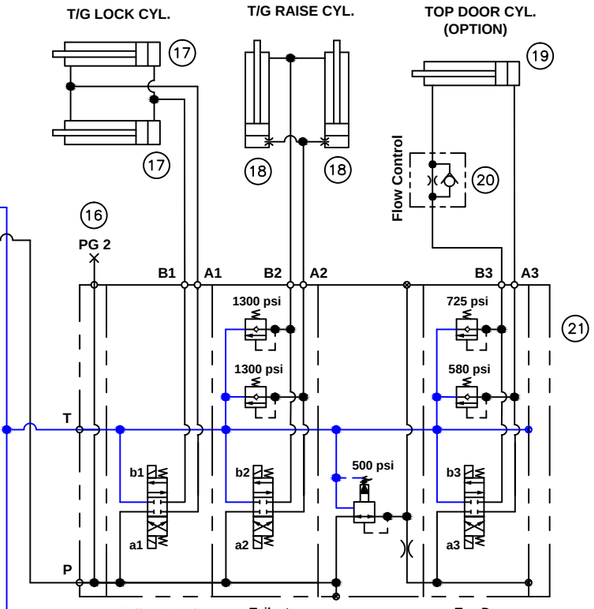
ODYSSEY UNIT, HALF-PACK ARM RAISE



CUROTTO VALVE ASSEMBLY



MAIN VALVE ASSEMBLY



TAILGATE VALVE ASSEMBLY

DELIVERY/PUMP PRESSURE	
DELIVERY FLOW & PRESSURE	
PROPORTIONAL VALVE PILOT PRESSURE	
RETURN PRESSURE	
RETURN FLOW & PRESSURE	
SUCTION PRESSURE	
SUCTION FLOW & PRESSURE	

ITEM	PART DESCRIPTION
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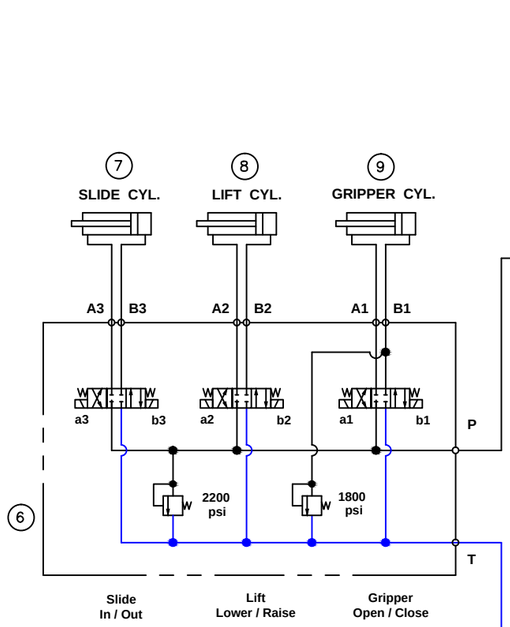
24-SEP-2014

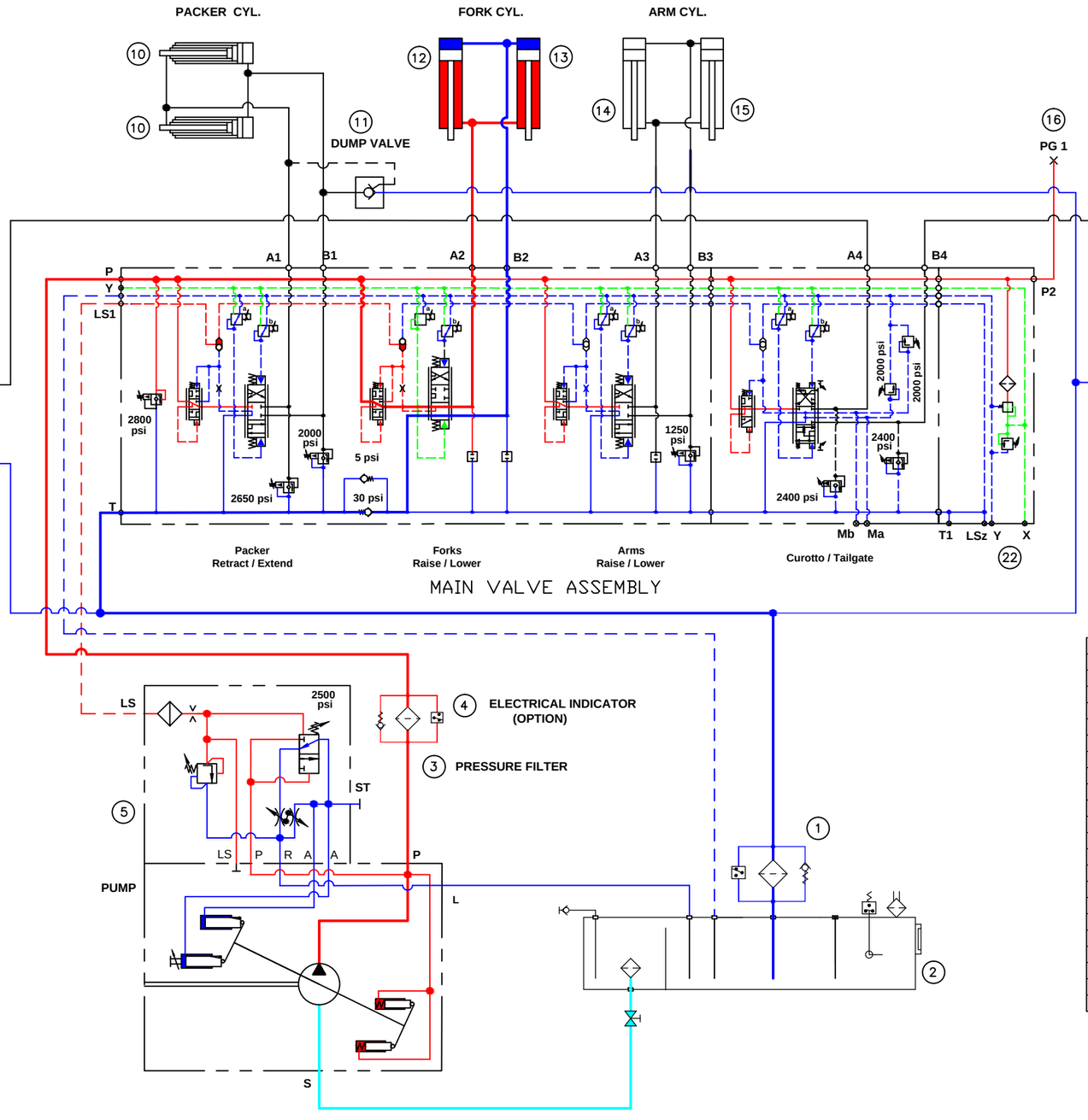
ODYSSEY UNITS W/CUROTTO CAN
HALF-PACK ARM RAISE

701-9149-010

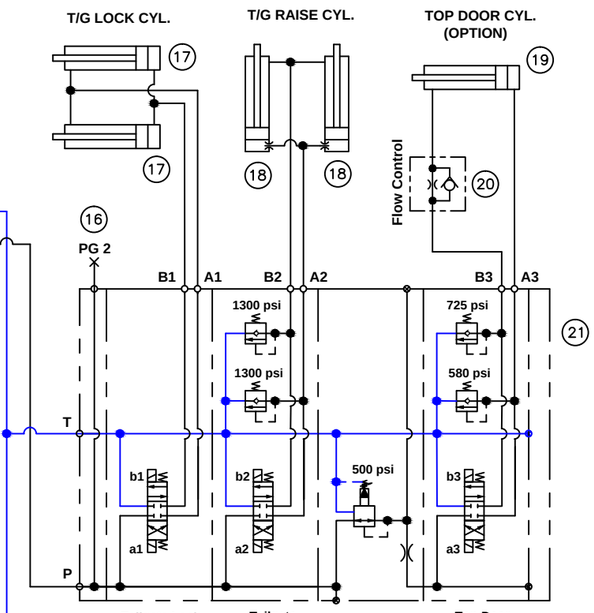
ODYSSEY UNIT, HALF-PACK FORK RAISE



CUROTTO VALVE ASSEMBLY



MAIN VALVE ASSEMBLY



TAILGATE VALVE ASSEMBLY

22	PROPORTIONAL VALVE ASSEMBLY, 4 SECTIONS
21	TAILGAGE VALVE ASSEMBLY
20	FLOW CONTROL VALVE, METER-IN
19	TOP DOOR CYLINDER, OPTION
18	TAILGATE RAISE CYLINDER
17	TAILGATE LOCK CYLINER
16	PRESSURE GAUGE PORT, QUICK DISCONNECTOR
15	ARM CYLINDER WITHOUT SENSOR, STANDARD
14	ARM CYLINDER WITH SENSOR
13	FORK CYLINDER WITHOUT SENSOR, STANDARD
12	FORK CYLINDER WITH SENSOR
11	DAMP VALVE, PO CHECK VAVLE
10	PACK TELESCOPIC CYLINDER
9	CUROTTO CAN, GRIPPER CYLINDER
8	CUROTTO CAN, LIFT CYLINDER
7	CUROTTO CAN, SLIDE CYLINDER
6	CUROTTO CAN, VALVE ASSEMBLY, 3-SECTION
5	PISTON PUMP, LOAD SENSE CONTROL AND PRESSURE LIMITATION
4	ELECTRICAL INDICATOR FOR PRESSURE FILTER, OPTION
3	PRESSURE FILTER ASSEMBLY WITH VISUAL INDICATOR, STANDARD
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR
ITEM	PART DESCRIPTION

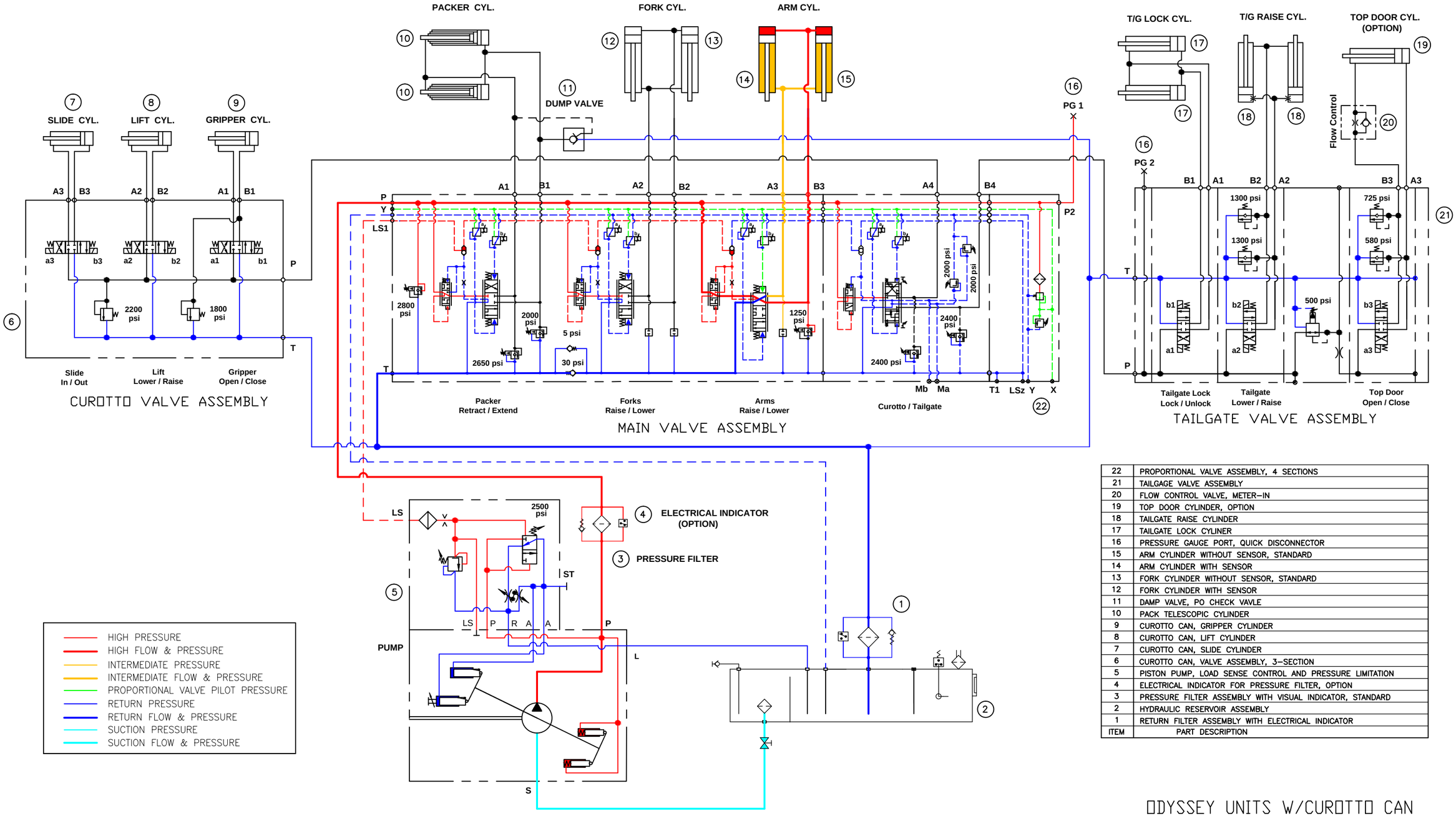
- HIGH PRESSURE
- HIGH FLOW & PRESSURE
- PROPORTIONAL VALVE PILOT PRESSURE
- RETURN PRESSURE
- RETURN FLOW & PRESSURE
- SUCTION PRESSURE
- SUCTION FLOW & PRESSURE

24-SEP-2014

ODYSSEY UNITS W/CUROTTO CAN
HALF-PACK FORK RAISE

701-9149-011

ODYSSEY UNIT, HALF-PACK ARM LOWER



ITEM	PART DESCRIPTION
22	PROPORTIONAL VALVE ASSEMBLY, 4 SECTIONS
21	TAILGAGE VALVE ASSEMBLY
20	FLOW CONTROL VALVE, METER-IN
19	TOP DOOR CYLINDER, OPTION
18	TAILGATE RAISE CYLINDER
17	TAILGATE LOCK CYLINER
16	PRESSURE GAUGE PORT, QUICK DISCONNECTOR
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14	ARM CYLINDER WITH SENSOR
13	FORK CYLINDER WITHOUT SENSOR, STANDARD
12	FORK CYLINDER WITH SENSOR
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8	CUROTTO CAN, LIFT CYLINDER
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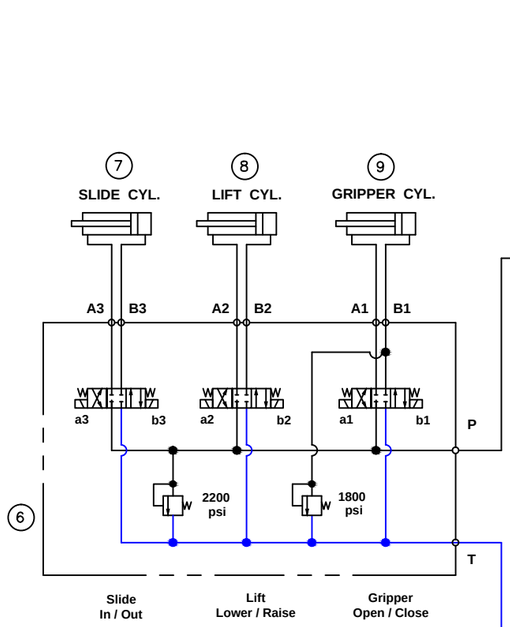
6	CUROTTO CAN, VALVE ASSEMBLY, 3-SECTION
5	PISTON PUMP, LOAD SENSE CONTROL AND PRESSURE LIMITATION
4	ELECTRICAL INDICATOR FOR PRESSURE FILTER, OPTION
3	PRESSURE FILTER ASSEMBLY WITH VISUAL INDICATOR, STANDARD
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

ODYSSEY UNITS W/CUROTTO CAN
HALF-PACK ARM LOWER

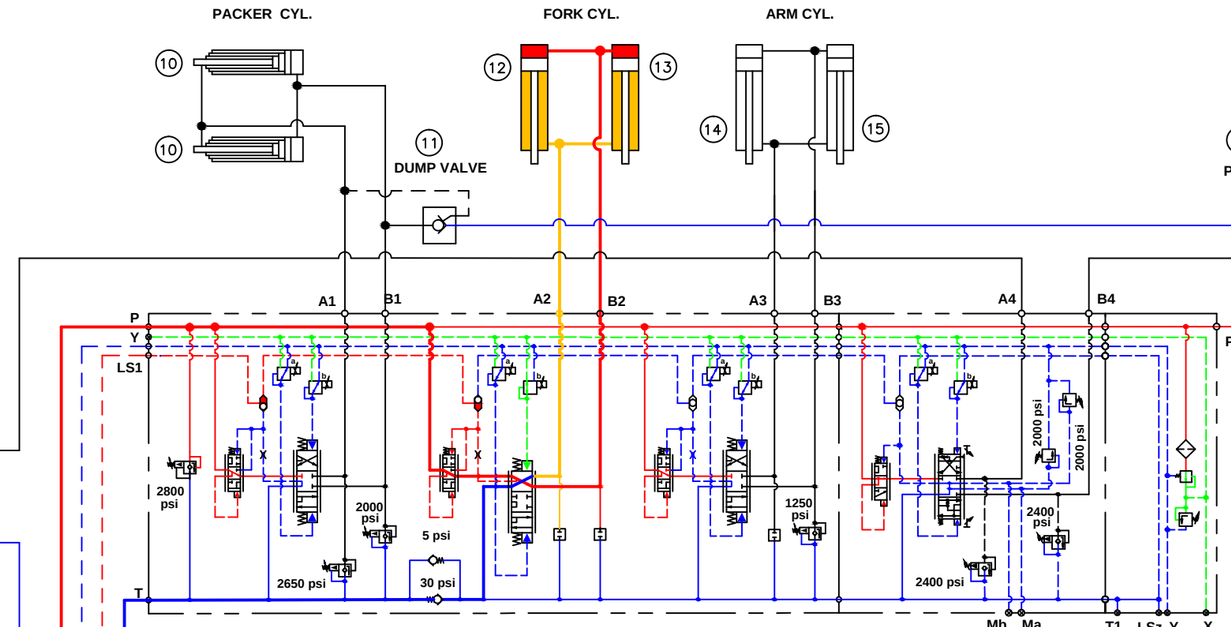
701-9149-012

24-SEP-2014

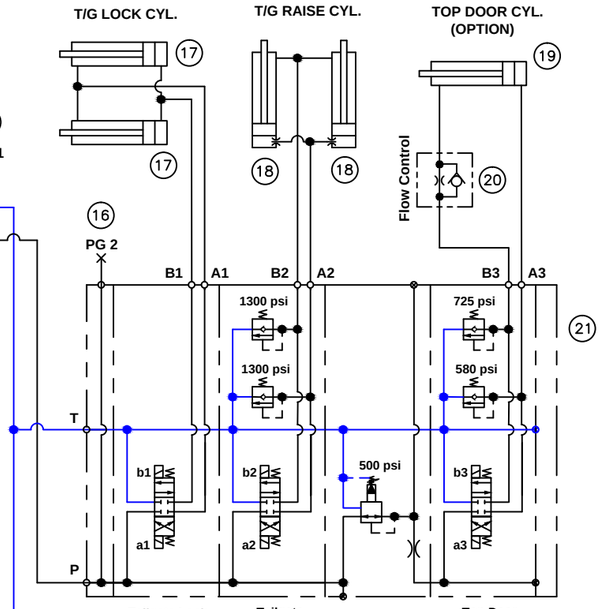
ODYSSEY UNIT, HALF-PACK FORK LOWER



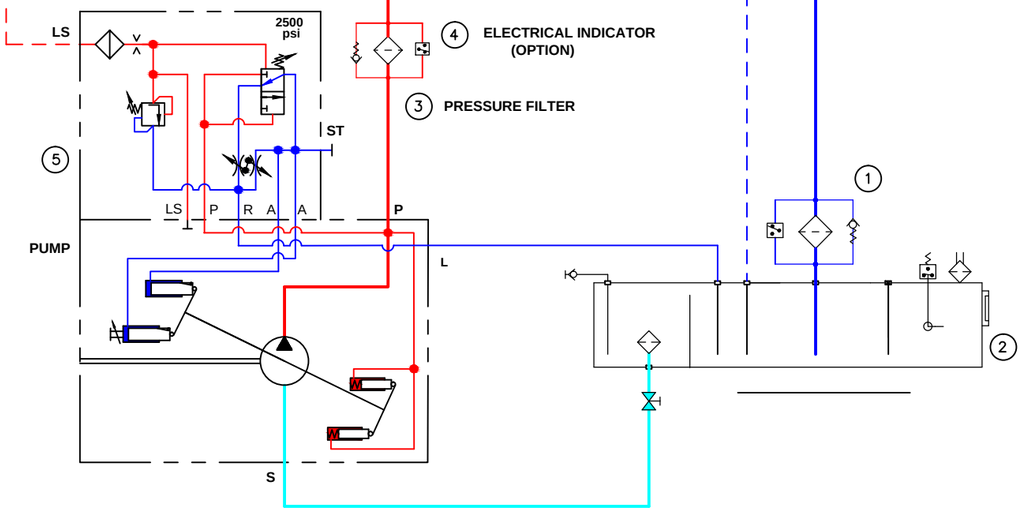
CUROTTO VALVE ASSEMBLY



MAIN VALVE ASSEMBLY



TAILGATE VALVE ASSEMBLY



HIGH PRESSURE	
HIGH FLOW & PRESSURE	
INTERMEDIATE PRESSURE	
INTERMEDIATE FLOW & PRESSURE	
PROPORTIONAL VALVE PILOT PRESSURE	
RETURN PRESSURE	
RETURN FLOW & PRESSURE	
SUCTION PRESSURE	
SUCTION FLOW & PRESSURE	

ITEM	PART DESCRIPTION
22	PROPORTIONAL VALVE ASSEMBLY, 4 SECTIONS
21	TAILGAGE VALVE ASSEMBLY
20	FLOW CONTROL VALVE, METER-IN
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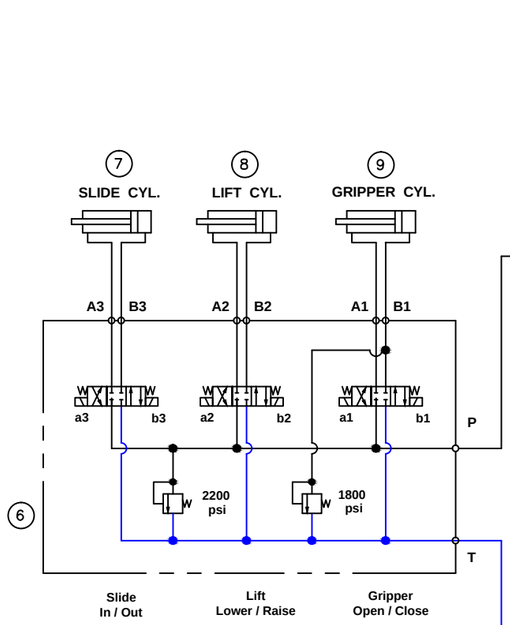
18	TAILGATE RAISE CYLINDER
17	TAILGATE LOCK CYLINER
16	PRESSURE GAUGE PORT, QUICK DISCONNECTOR
15	ARM CYLINDER WITHOUT SENSOR, STANDARD
14	ARM CYLINDER WITH SENSOR
13	FORK CYLINDER WITHOUT SENSOR, STANDARD
12	FORK CYLINDER WITH SENSOR
11	DAMP VALVE, PO CHECK VAVLE
10	PACK TELESCOPIC CYLINDER
9	CUROTTO CAN, GRIPPER CYLINDER
8	CUROTTO CAN, LIFT CYLINDER
7	CUROTTO CAN, SLIDE CYLINDER
6	CUROTTO CAN, VALVE ASSEMBLY, 3-SECTION
5	PISTON PUMP, LOAD SENSE CONTROL AND PRESSURE LIMITATION
4	ELECTRICAL INDICATOR FOR PRESSURE FILTER, OPTION
3	PRESSURE FILTER ASSEMBLY WITH VISUAL INDICATOR, STANDARD
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

ODYSSEY UNITS W/CUROTTO CAN
HALF-PACK FORK LOWER

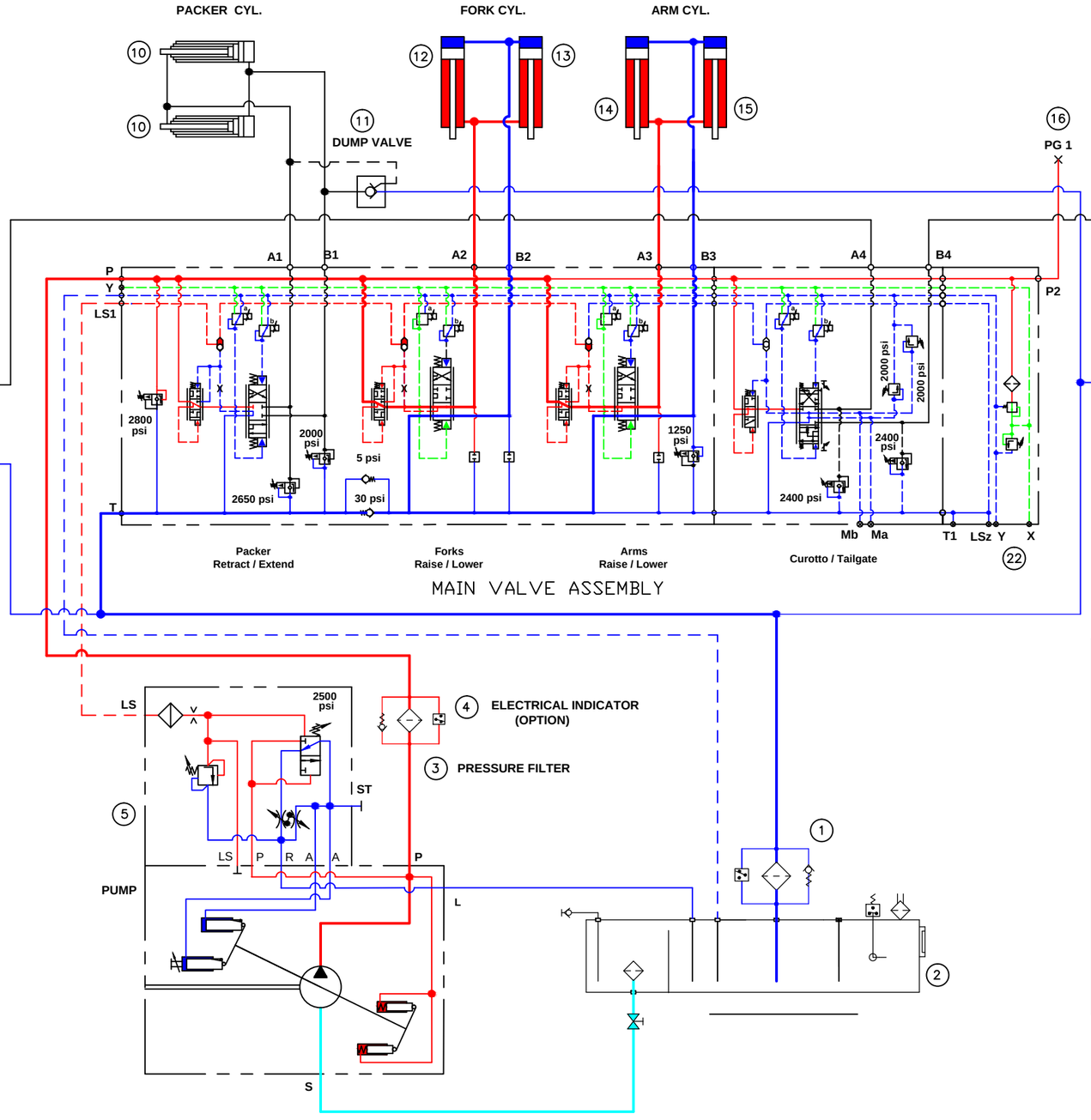
701-9149-013

24-SEP-2014

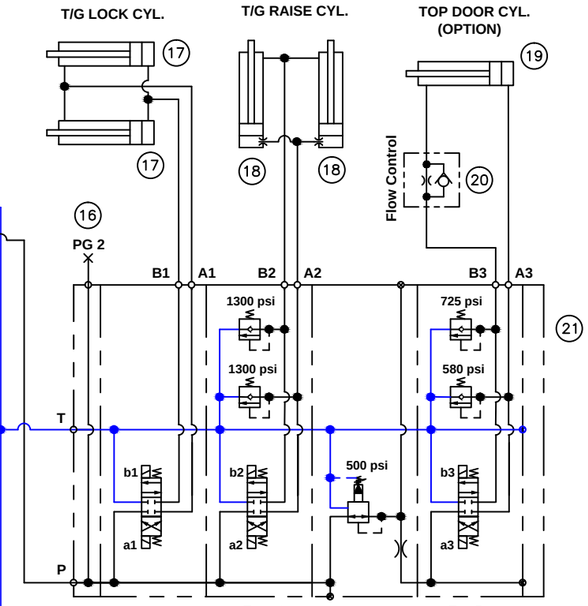
ODYSSEY UNIT, HALF-PACK ARM AND FORK RAISE



CUROTTO VALVE ASSEMBLY



MAIN VALVE ASSEMBLY



TAILGATE VALVE ASSEMBLY

HIGH PRESSURE	
HIGH FLOW & PRESSURE	
INTERMEDIATE PRESSURE	
INTERMEDIATE FLOW & PRESSURE	
PROPORTIONAL VALVE PILOT PRESSURE	
RETURN PRESSURE	
RETURN FLOW & PRESSURE	
SUCTION PRESSURE	
SUCTION FLOW & PRESSURE	

ITEM	PART DESCRIPTION
22	PROPORTIONAL VALVE ASSEMBLY, 4 SECTIONS
21	TAILGAGE VALVE ASSEMBLY
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19	TOP DOOR CYLINDER, OPTION
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17	TAILGATE LOCK CYLINER
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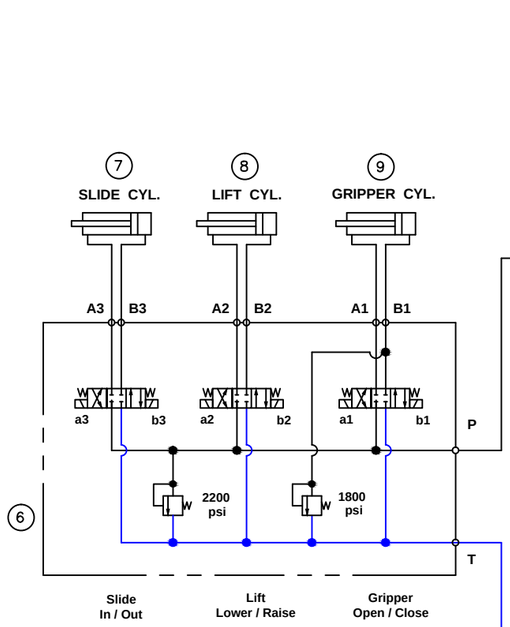
5	PISTON PUMP, LOAD SENSE CONTROL AND PRESSURE LIMITATION
4	ELECTRICAL INDICATOR FOR PRESSURE FILTER, OPTION
3	PRESSURE FILTER ASSEMBLY WITH VISUAL INDICATOR, STANDARD
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

ODYSSEY UNITS W/CUROTTO CAN
HALF-PACK ARM AND FORK RAISE

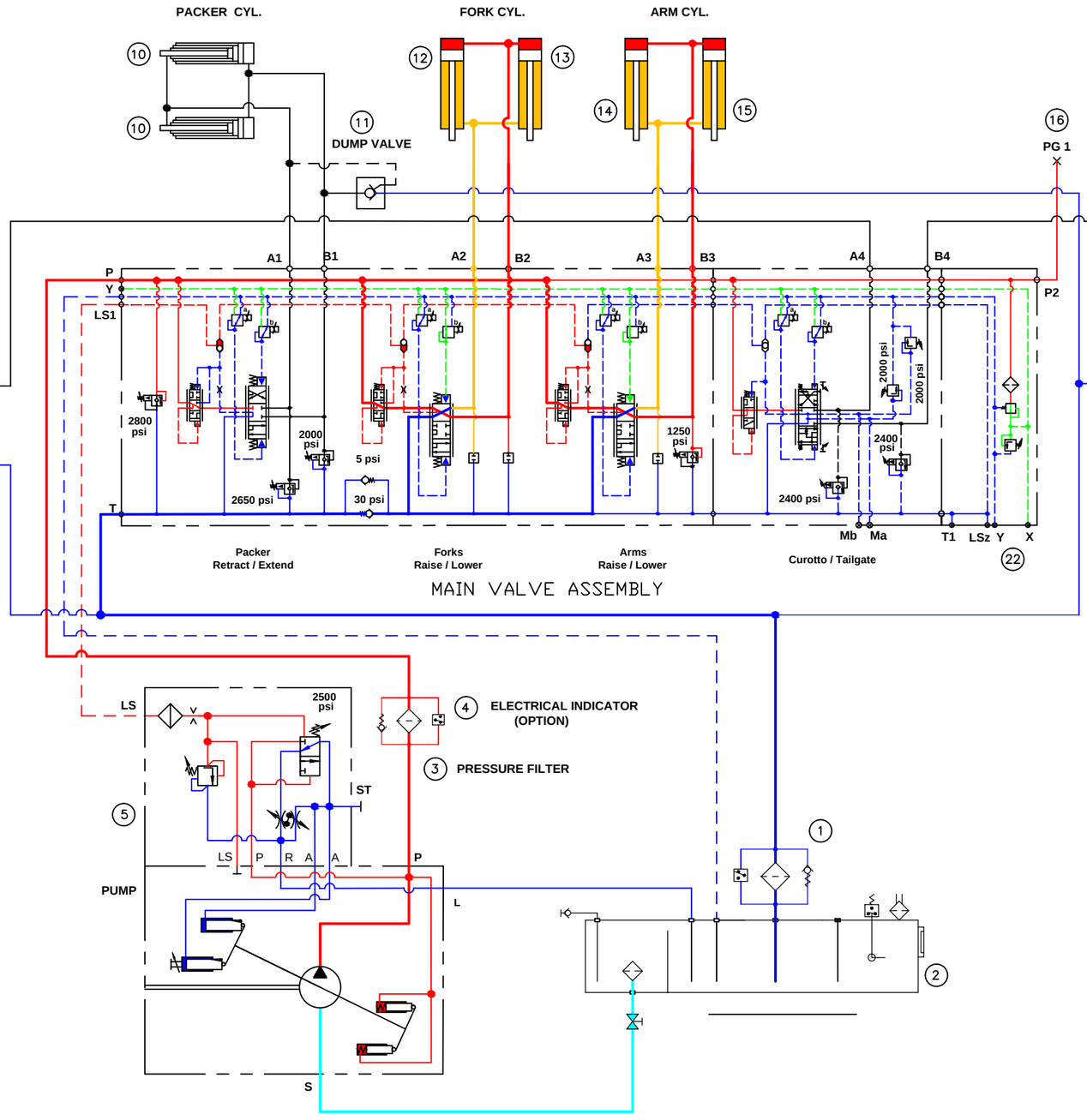
701-9149-014

24-SEP-2014

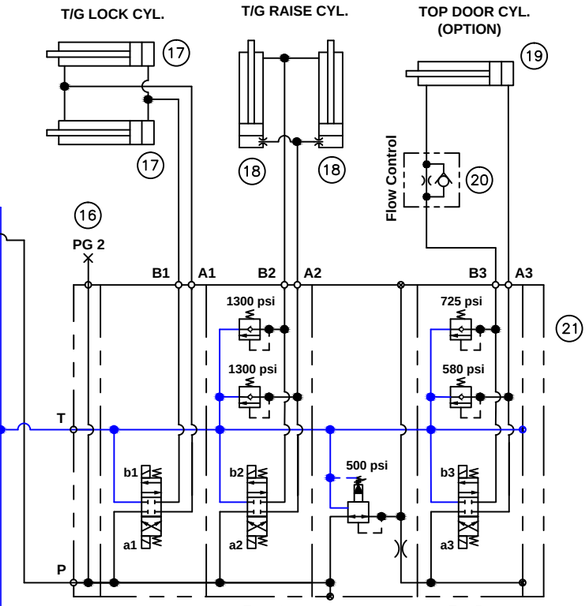
ODYSSEY UNIT, HALF-PACK ARM AND FORK LOWER



CUROTTO VALVE ASSEMBLY



MAIN VALVE ASSEMBLY



TAILGATE VALVE ASSEMBLY

HIGH PRESSURE	
HIGH FLOW & PRESSURE	
INTERMEDIATE PRESSURE	
INTERMEDIATE FLOW & PRESSURE	
PROPORTIONAL VALVE PILOT PRESSURE	
RETURN PRESSURE	
RETURN FLOW & PRESSURE	
SUCTION PRESSURE	
SUCTION FLOW & PRESSURE	

ITEM	PART DESCRIPTION
22	PROPORTIONAL VALVE ASSEMBLY, 4 SECTIONS
21	TAILGAGE VALVE ASSEMBLY
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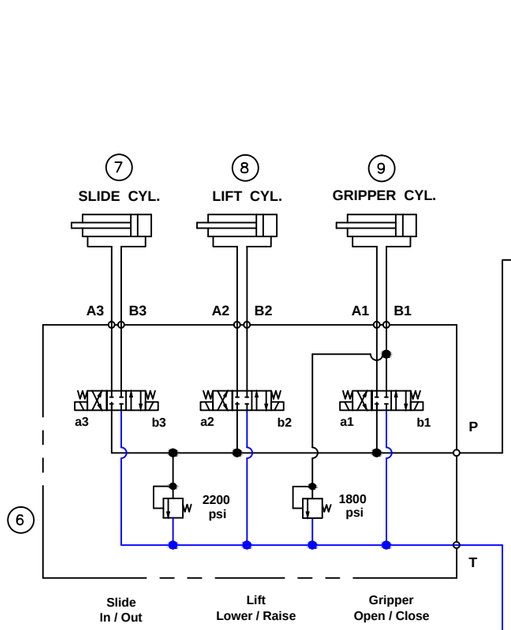
4	ELECTRICAL INDICATOR FOR PRESSURE FILTER, OPTION
3	PRESSURE FILTER ASSEMBLY WITH VISUAL INDICATOR, STANDARD
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

ODYSSEY UNITS W/CUROTTO CAN
HALF-PACK, ARM AND FORK LOWER

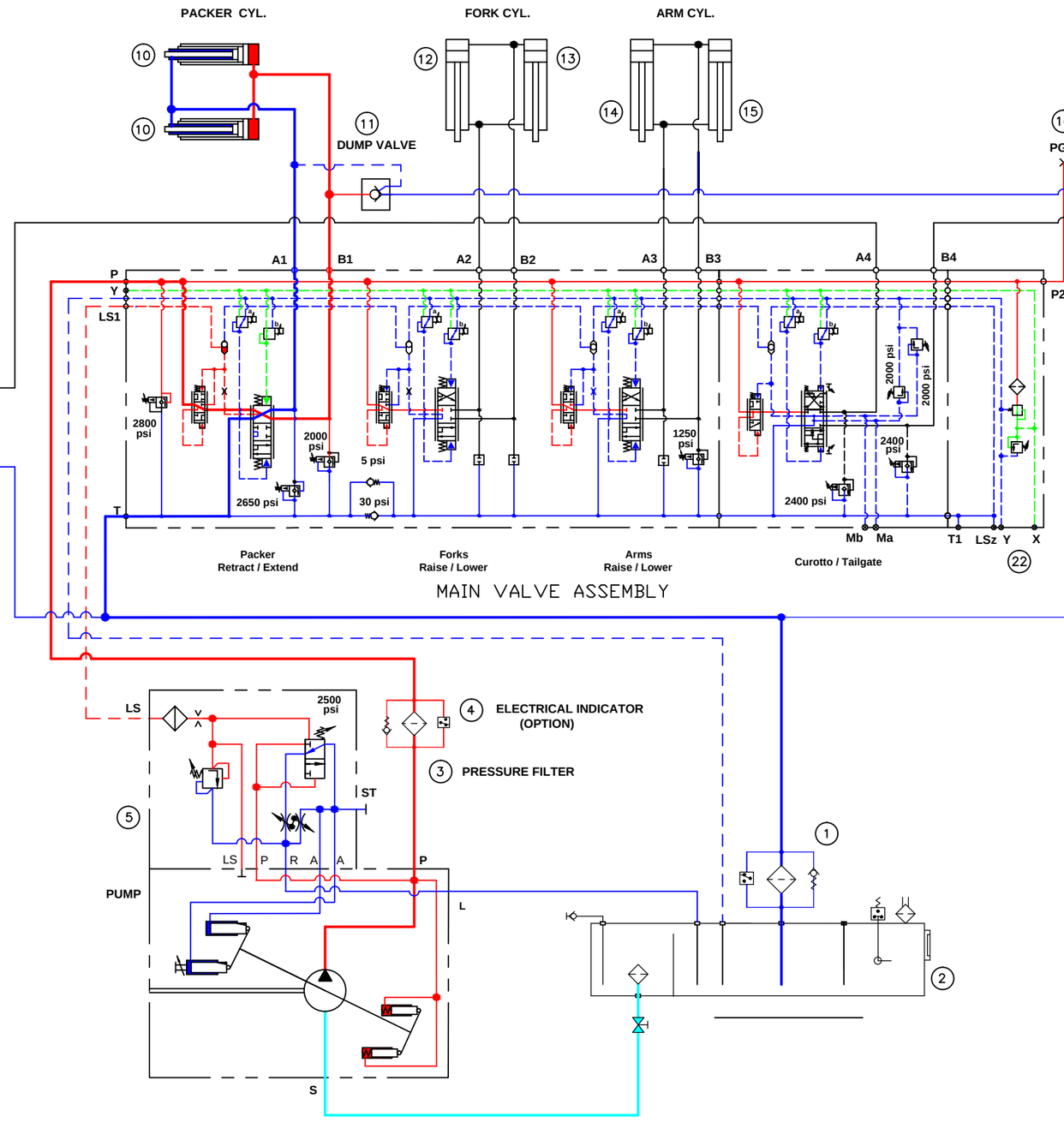
701-9149-015

24-SEP-2014

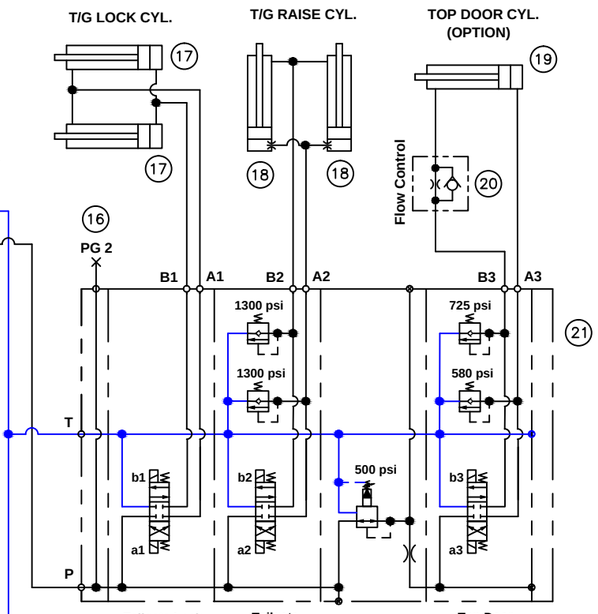
ODYSSEY UNIT, HALF-PACK PACKER EXTEND



CUROTTO VALVE ASSEMBLY



MAIN VALVE ASSEMBLY



TAILGATE VALVE ASSEMBLY

DELIVERY/PUMP PRESSURE	
DELIVERY FLOW & PRESSURE	
PROPORTIONAL VALVE PILOT PRESSURE	
RETURN PRESSURE	
RETURN FLOW & PRESSURE	
SUCTION PRESSURE	
SUCTION FLOW & PRESSURE	

ITEM	PART DESCRIPTION
22	PROPORTIONAL VALVE ASSEMBLY, 4 SECTIONS
21	TAILGAGE VALVE ASSEMBLY
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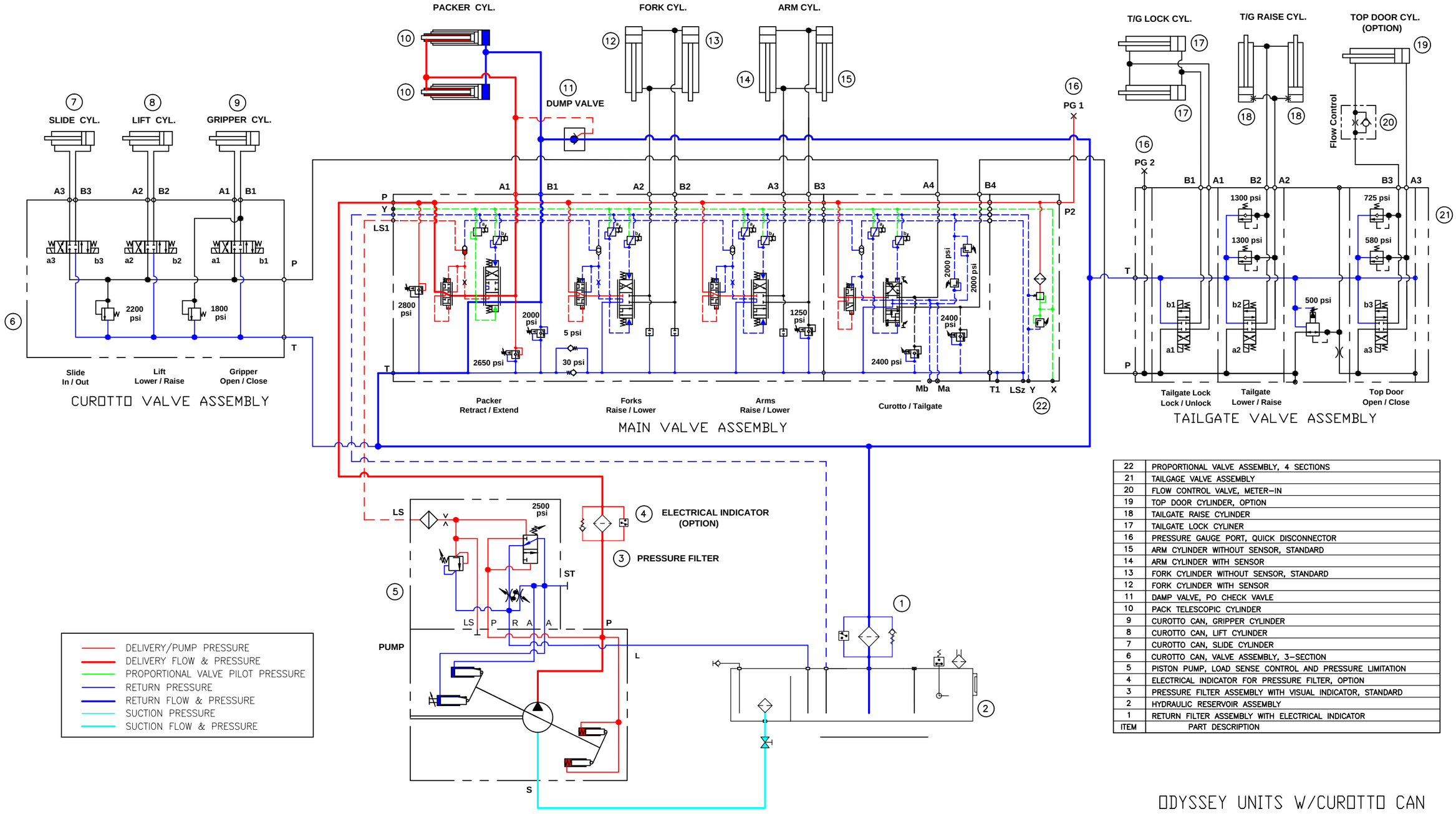
5	PISTON PUMP, LOAD SENSE CONTROL AND PRESSURE LIMITATION
4	ELECTRICAL INDICATOR FOR PRESSURE FILTER, OPTION
3	PRESSURE FILTER ASSEMBLY WITH VISUAL INDICATOR, STANDARD
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

ODYSSEY UNITS W/CUROTTO CAN
HALF-PACK PACKER EXTEND

701-9149-016

24-SEP-2014

ODYSSEY UNIT, HALF-PACK PACKER RETRACT



ITEM	PART DESCRIPTION
22	PROPORTIONAL VALVE ASSEMBLY, 4 SECTIONS
21	TAILGAGE VALVE ASSEMBLY
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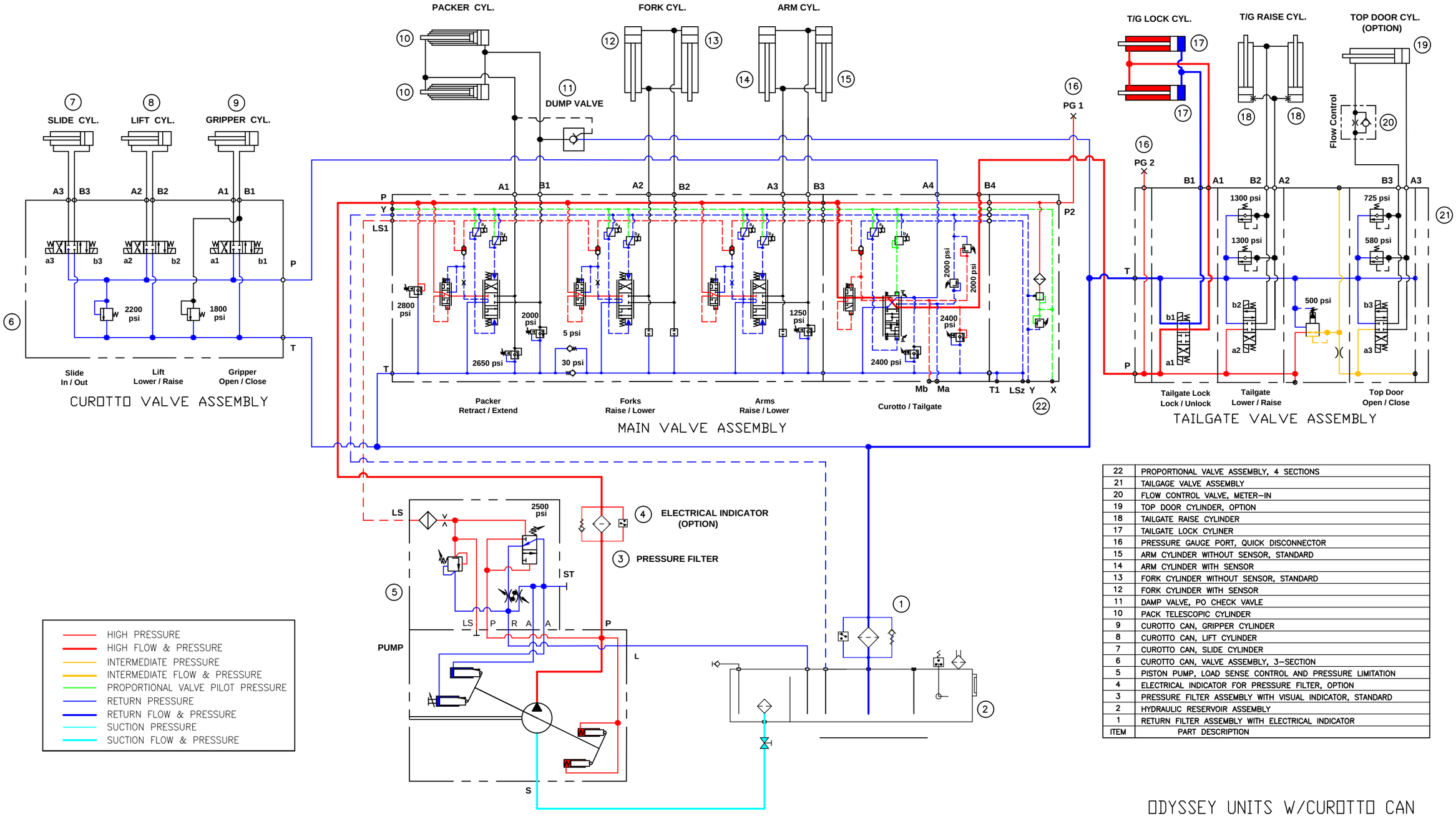
3	PRESSURE FILTER ASSEMBLY WITH VISUAL INDICATOR, STANDARD
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

ODYSSEY UNITS W/CUROTTO CAN
HALF-PACK PACKER RETRACT

701-9149-017

24-SEP-2014

ODYSSEY UNIT, TAILGATE UNLOCK



ITEM	PART DESCRIPTION
22	PROPORTIONAL VALVE ASSEMBLY, 4 SECTIONS
21	TAILGAGE VALVE ASSEMBLY
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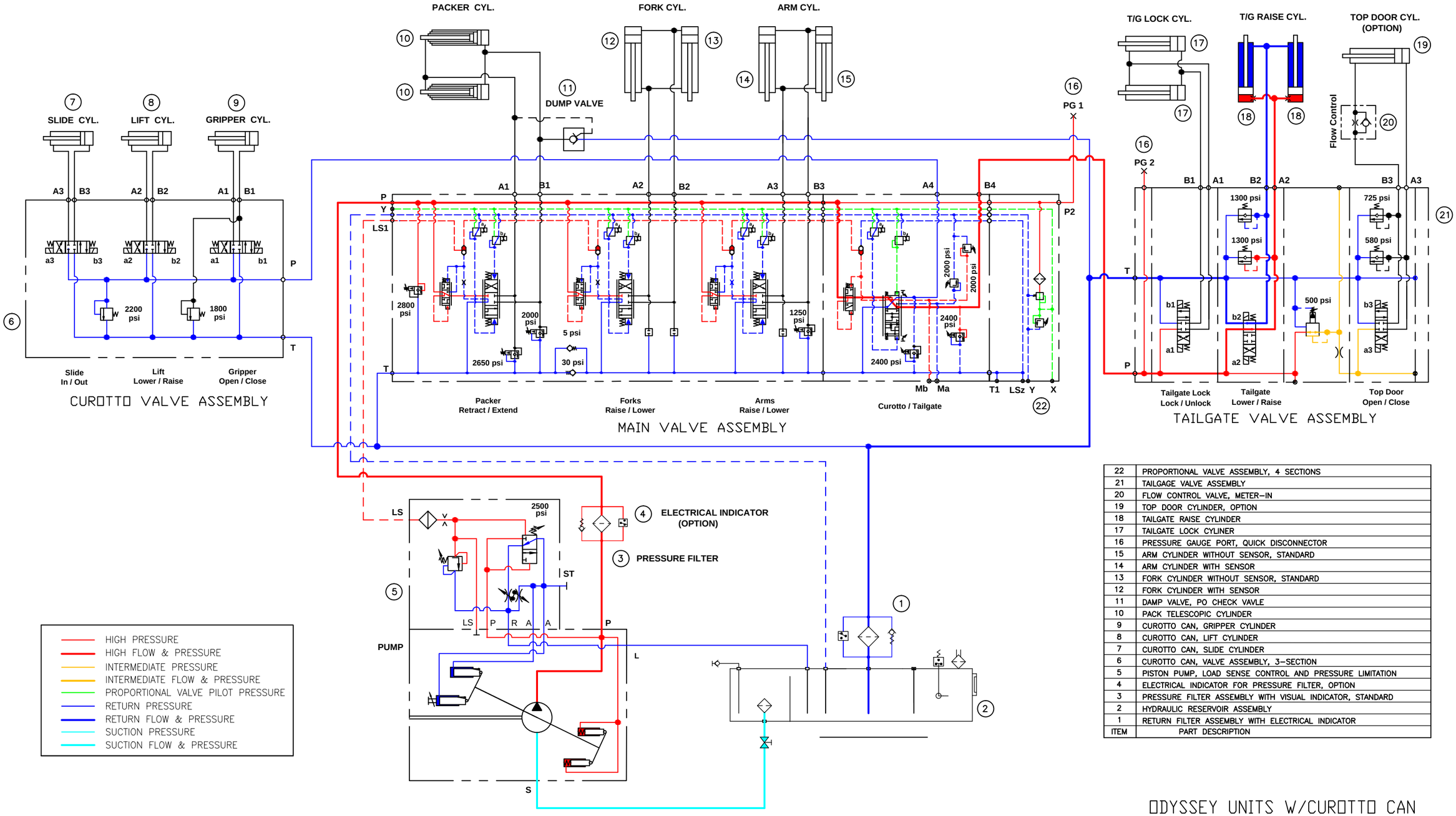
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

ODYSSEY UNITS W/CUROTTO CAN TAILGATE UNLOCK

701-9149-018

24-SEP-2014

ODYSSEY UNIT, TAILGATE RAISE



ITEM	PART DESCRIPTION
22	PROPORTIONAL VALVE ASSEMBLY, 4 SECTIONS
21	TAILGAGE VALVE ASSEMBLY
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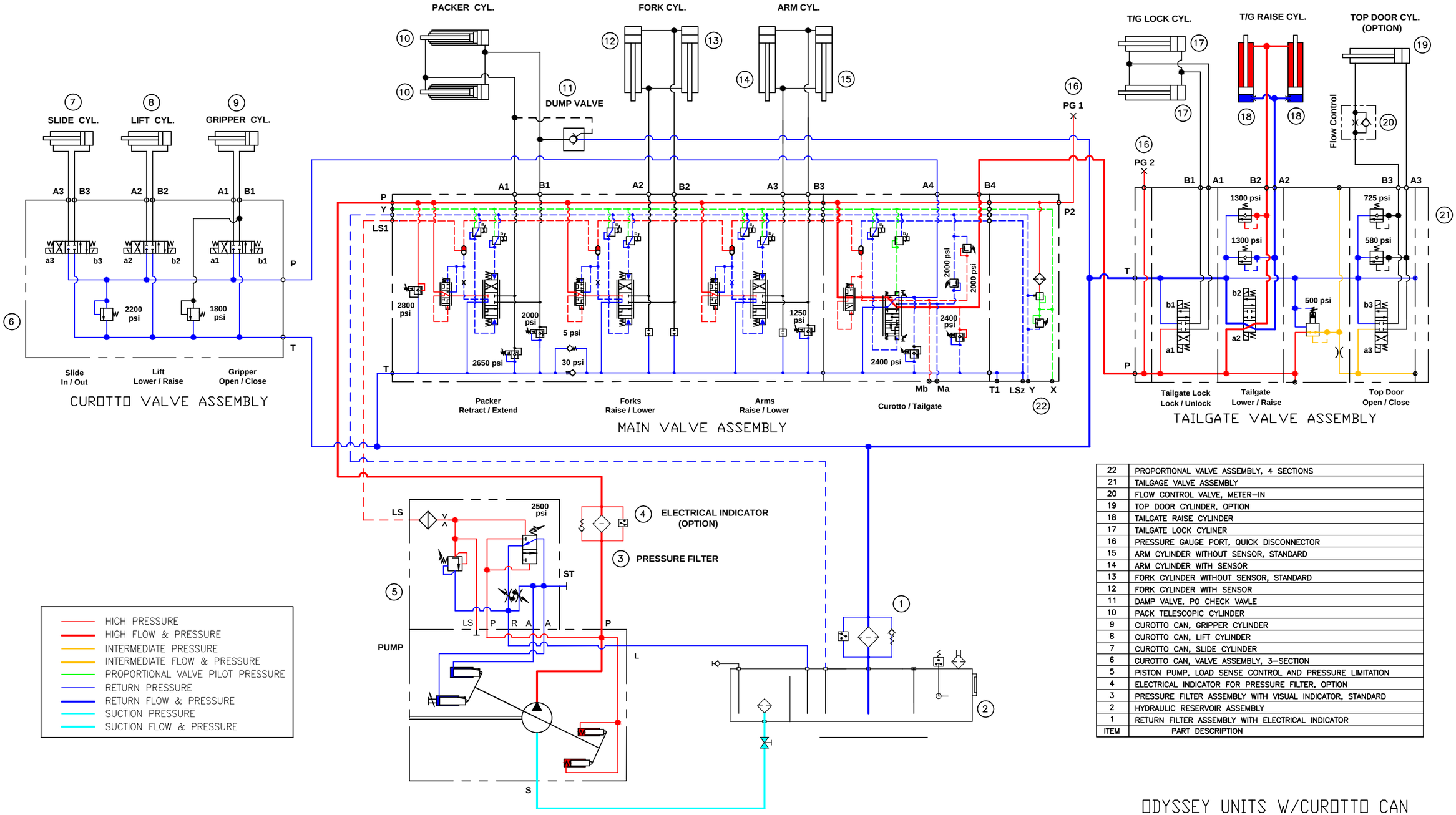
3	PRESSURE FILTER ASSEMBLY WITH VISUAL INDICATOR, STANDARD
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

ODYSSEY UNITS W/CUROTTO CAN
TAILGATE RAISE

701-9149-019

24-SEP-2014

ODYSSEY UNIT, TAILGATE LOWER



ITEM	PART DESCRIPTION
22	PROPORTIONAL VALVE ASSEMBLY, 4 SECTIONS
21	TAILGAGE VALVE ASSEMBLY
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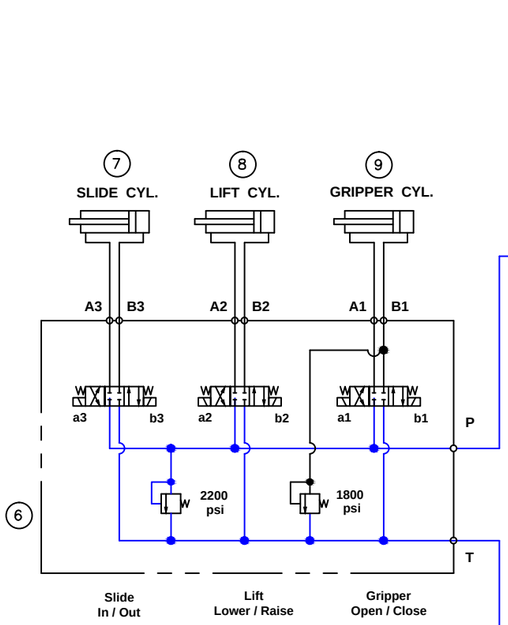
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

ODYSSEY UNITS W/CUROTTO CAN
TAILGATE LOWER

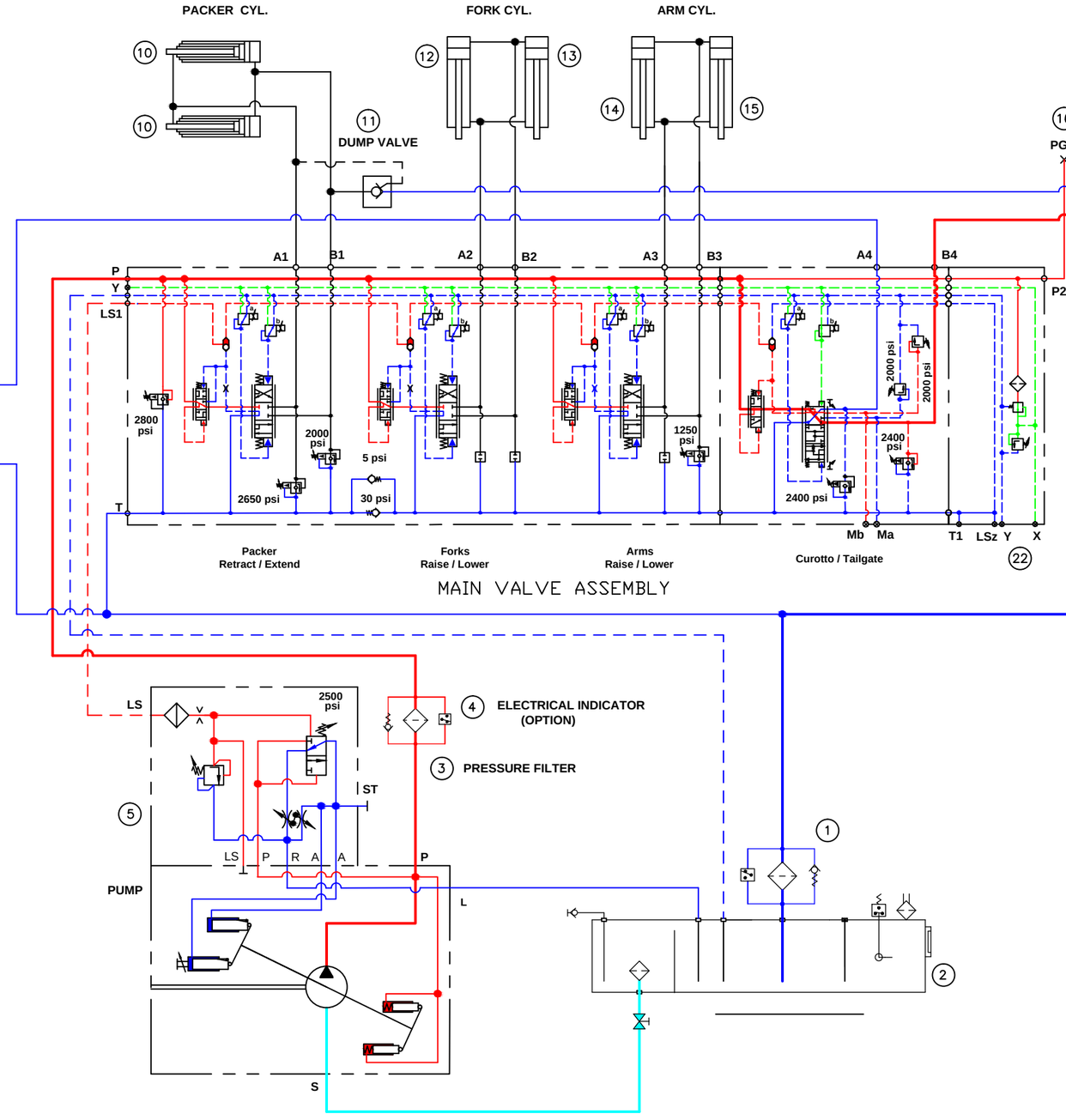
701-9149-020

24-SEP-2014

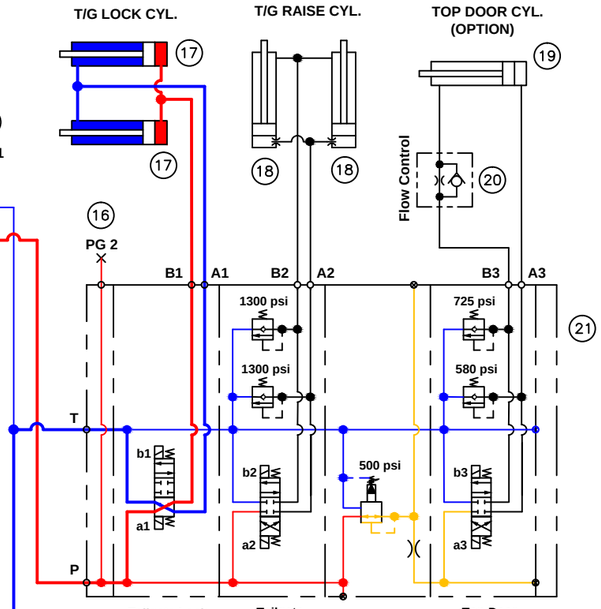
ODYSSEY UNIT, TAILGATE LOCK



CUROTTO VALVE ASSEMBLY



MAIN VALVE ASSEMBLY



TAILGATE VALVE ASSEMBLY

HIGH PRESSURE	
HIGH FLOW & PRESSURE	
INTERMEDIATE PRESSURE	
INTERMEDIATE FLOW & PRESSURE	
PROPORTIONAL VALVE PILOT PRESSURE	
RETURN PRESSURE	
RETURN FLOW & PRESSURE	
SUCTION PRESSURE	
SUCTION FLOW & PRESSURE	

ITEM	PART DESCRIPTION
22	PROPORTIONAL VALVE ASSEMBLY, 4 SECTIONS
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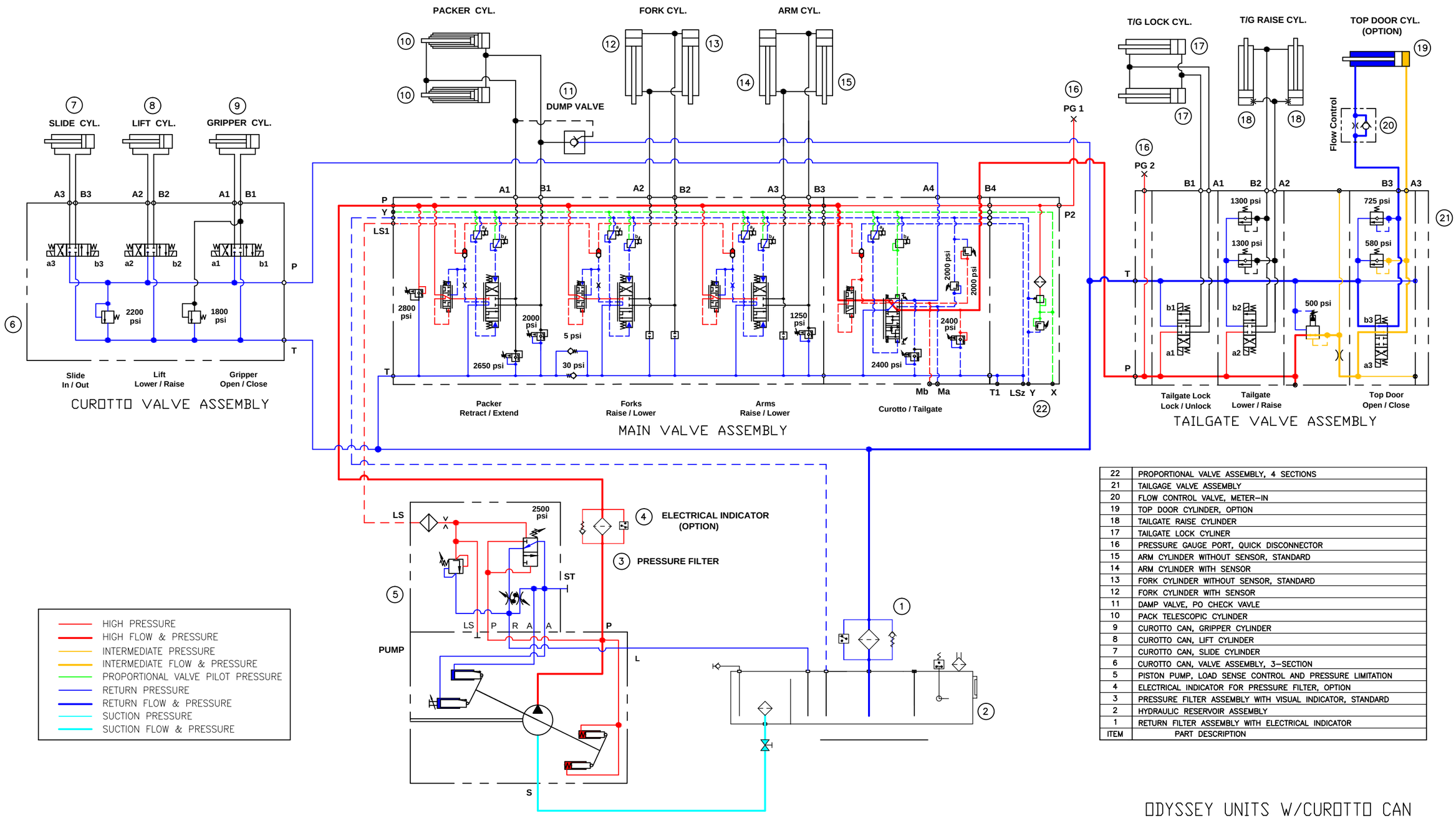
13	FORK CYLINDER WITHOUT SENSOR, STANDARD
12	FORK CYLINDER WITH SENSOR
11	DAMP VALVE, PO CHECK VAVLE
10	PACK TELESCOPIC CYLINDER
9	CUROTTO CAN, GRIPPER CYLINDER
8	CUROTTO CAN, LIFT CYLINDER
7	CUROTTO CAN, SLIDE CYLINDER
6	CUROTTO CAN, VALVE ASSEMBLY, 3-SECTION
5	PISTON PUMP, LOAD SENSE CONTROL AND PRESSURE LIMITATION
4	ELECTRICAL INDICATOR FOR PRESSURE FILTER, OPTION
3	PRESSURE FILTER ASSEMBLY WITH VISUAL INDICATOR, STANDARD
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

ODYSSEY UNITS W/CUROTTO CAN
TAILGATE LOCK

701-9149-021

24-SEP-2014

ODYSSEY UNIT, TOP-DOOR CLOSE



HIGH PRESSURE	
HIGH FLOW & PRESSURE	
INTERMEDIATE PRESSURE	
INTERMEDIATE FLOW & PRESSURE	
PROPORTIONAL VALVE PILOT PRESSURE	
RETURN PRESSURE	
RETURN FLOW & PRESSURE	
SUCTION PRESSURE	
SUCTION FLOW & PRESSURE	

ITEM	PART DESCRIPTION
22	PROPORTIONAL VALVE ASSEMBLY, 4 SECTIONS
21	TAILGAGE VALVE ASSEMBLY
20	FLOW CONTROL VALVE, METER-IN
19	TOP DOOR CYLINDER, OPTION
18	TAILGATE RAISE CYLINDER
17	TAILGATE LOCK CYLINER
16	PRESSURE GAUGE PORT, QUICK DISCONNECTOR
15	ARM CYLINDER WITHOUT SENSOR, STANDARD
14	ARM CYLINDER WITH SENSOR
13	FORK CYLINDER WITHOUT SENSOR, STANDARD
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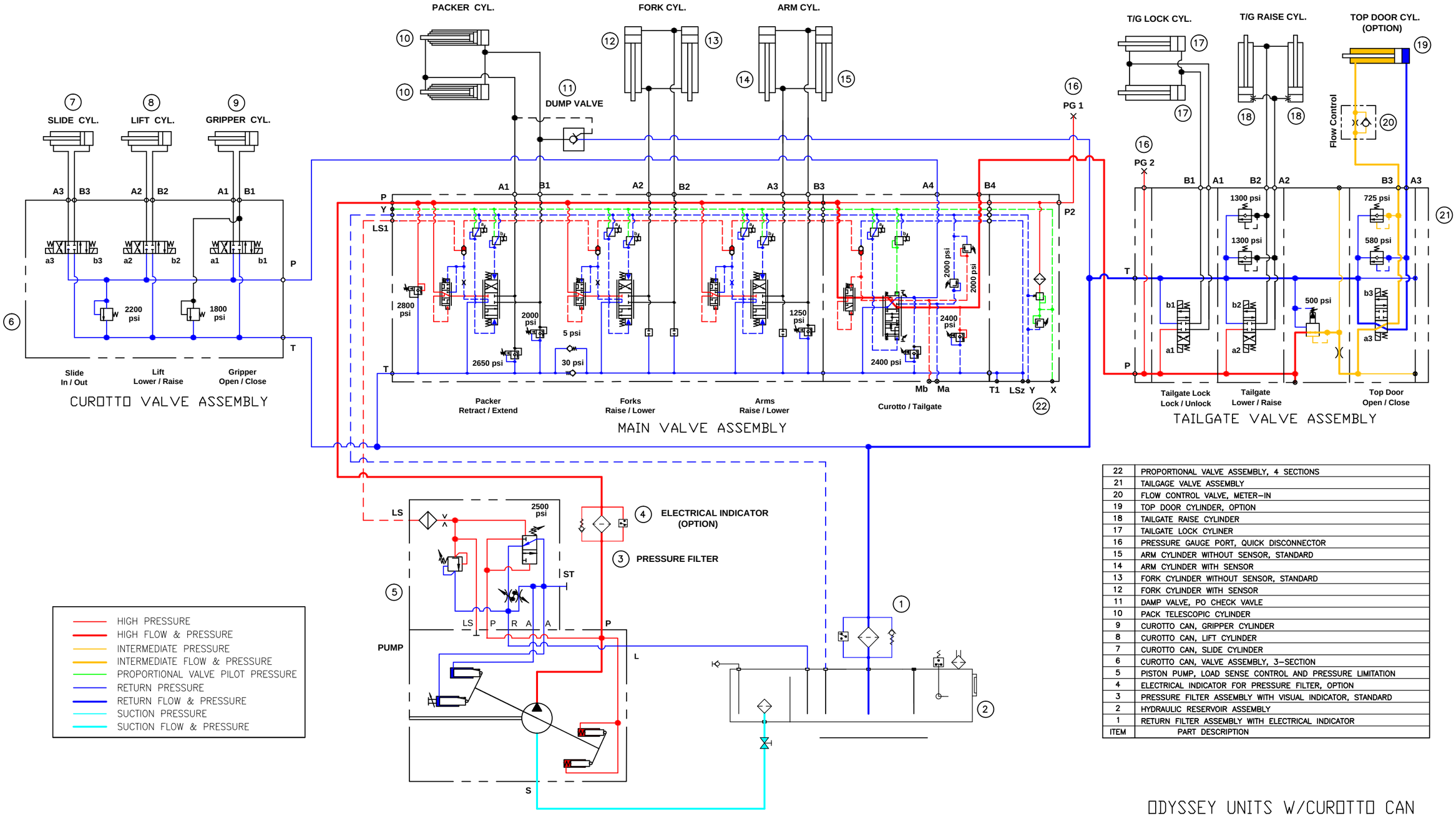
3	PRESSURE FILTER ASSEMBLY WITH VISUAL INDICATOR, STANDARD
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

24-SEP-2014

ODYSSEY UNITS W/CUROTTO CAN TOP-DOOR CLOSE

701-9149-022

ODYSSEY UNIT, TOP-DOOR OPEN



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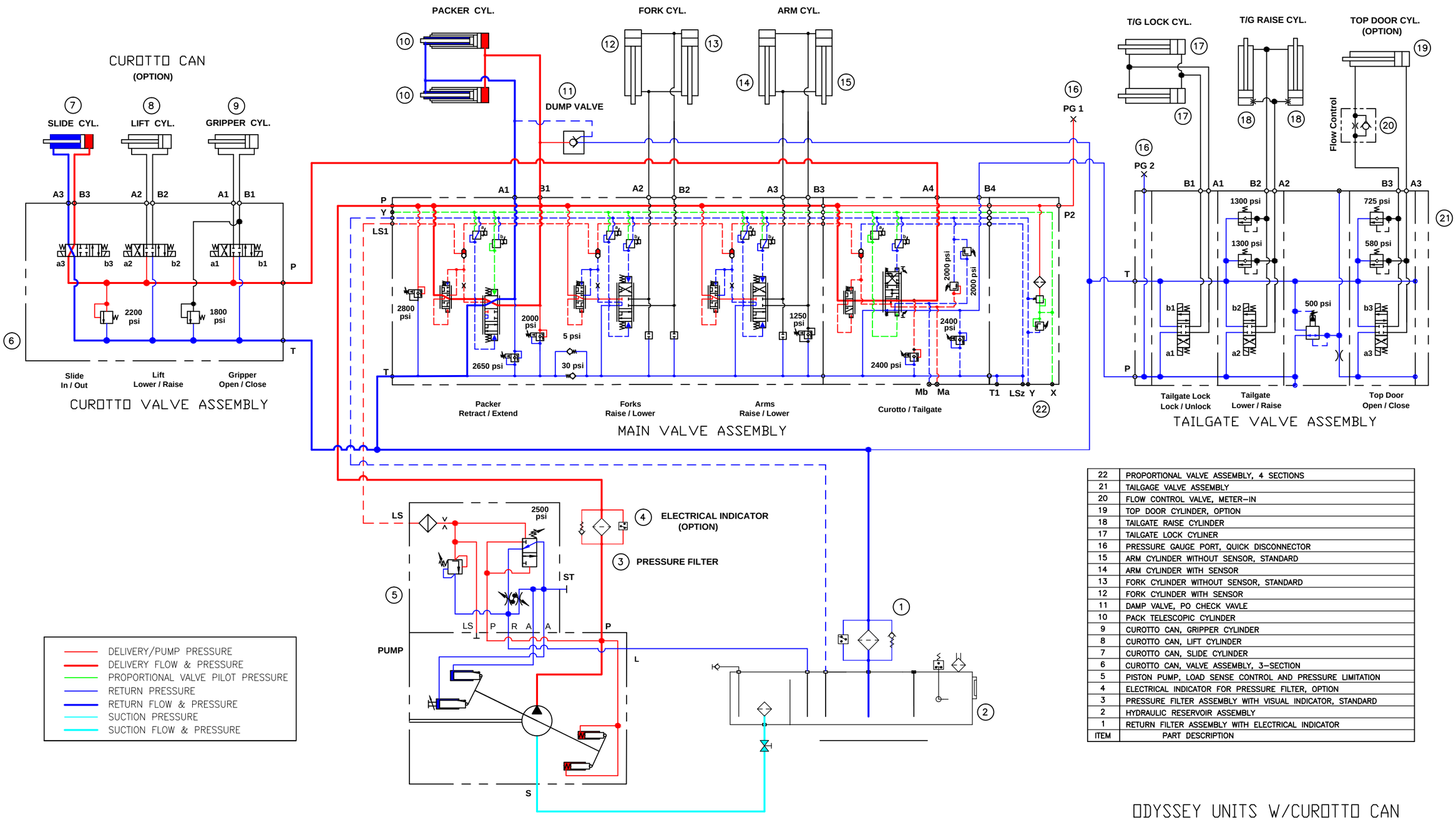
2	HYDRAULIC RESERVOIR ASSEMBLY
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

24-SEP-2014

ODYSSEY UNITS W/CUROTTO CAN TOP-DOOR OPEN

701-9149-023

ODYSSEY UNIT, SLIDE OUT AND PACK EXTEND



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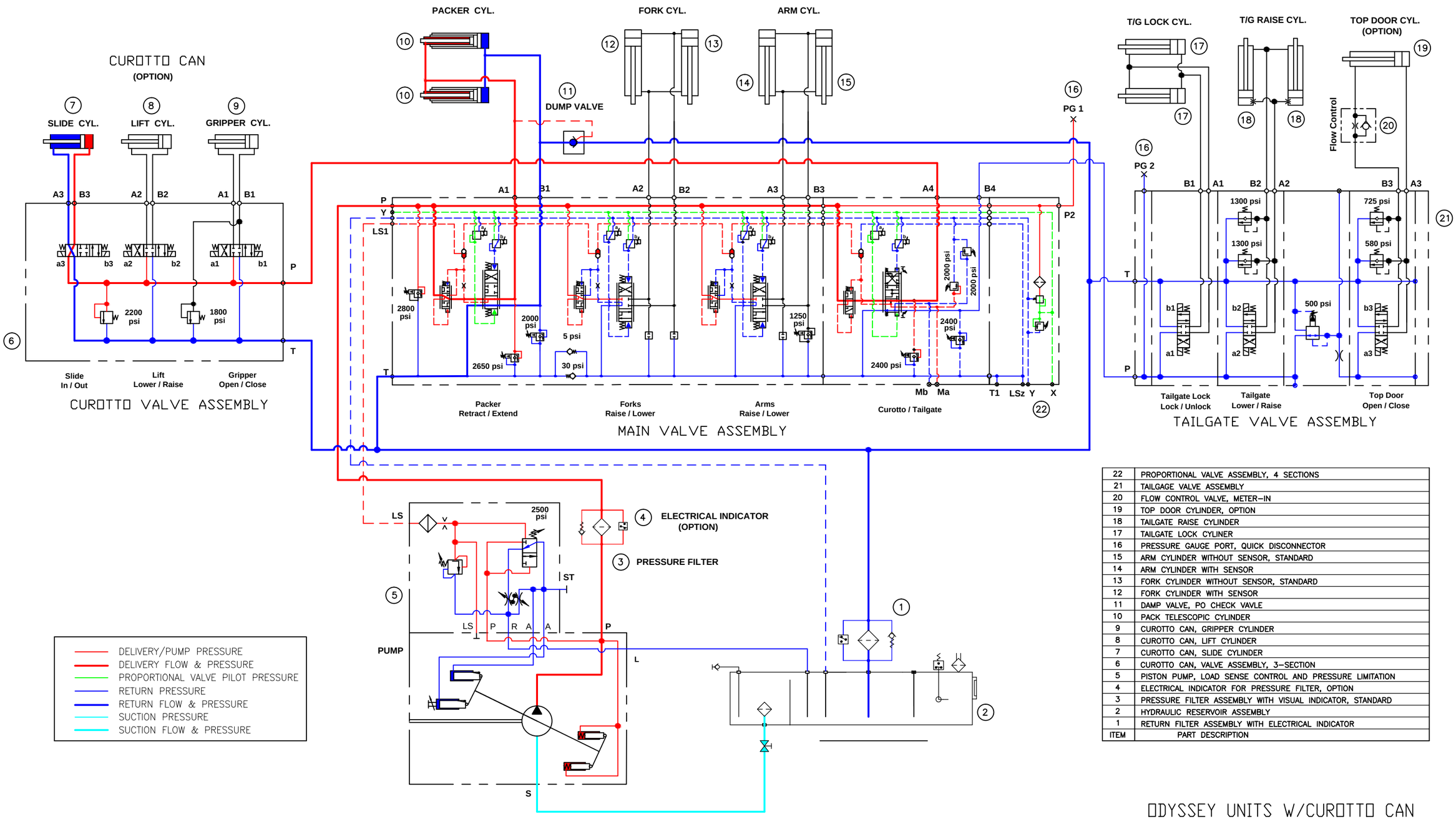
1	RETURN FILTER ASSEMBLY WITH ELECTRICAL INDICATOR

ODYSSEY UNITS W/CUROTTO CAN
SLIDE OUT AND PACK EXTEND

701-9149-024

24-SEP-2014

ODYSSEY UNIT, SLIDE OUT AND PACK RETRACT



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24-SEP-2014

ODYSSEY UNITS W/CUROTTO CAN
SLIDE OUT AND PACK RETRACT

701-9149-025

INDEX

Half/Pack® Factor AFL™
INDEX

Half/Pack® Factor AFL™
MANUAL ORDER FORM

To purchase a printed copy of the Parts Manual or complete Parts and Service Manual, fax or make a PDF copy of this form and send to your local Heil dealer.

Do you want a Parts Section ONLY? _____ Yes or No

Do you want the complete Parts and Service Manual? _____ Yes or No

The order number for the Parts Manual ONLY is:

TP1HPFAC-PM-0418

The order number for the complete Parts and Service Manual is:

TP1HPFAC-PSM-0418

UNIT SERIAL NUMBER: _____

NAME: _____

COMPANY: _____

PHYSICAL ADDRESS: _____

CITY: _____

STATE: _____ ZIP CODE: _____

CONTACT PHONE NUMBER: _____

Half/Pack® Factor AFL™
NOTES

HEIL ENVIRONMENTAL WARRANTY STATEMENT

The Heil Co. d/b/a Heil Environmental ("Heil") warrants its solid waste collection equipment to be free from defects in material and workmanship under normal use for a period of one (1) year or 2000 hours of operation (whichever comes first) from the date of equipment In-Service or during the period of coverage offered by an extended warranty program, when proper service and maintenance as described in Heil Service Bulletins and Parts & Service Manuals are performed. The standard or extended equipment warranty is not transferable except for sales demonstration units.

This warranty is expressly limited to the repair or replacement of any component or part thereof, of any such refuse or recycling collection body manufactured by Heil that is proven to Heil's satisfaction to have been defective in material or workmanship. Such components or parts shall be repaired or replaced at Heil's option without cost to the standard purchaser for parts and labor provided such unit is returned to an authorized Heil Distributor for replacement or repair. The repair or replacement must be made during the standard or extended warranty coverage period. Before any warranty can be allowed on new equipment, a validated warranty registration form must be on file with Heil's Customer Service Department within sixty (60) days of the equipment's In-Service date. Wear items are excluded from warranty coverage.

All OEM service parts sold by Heil have a six (6) month warranty from the date of purchase. Aftermarket parts purchased from Heil are supported by a 90-day warranty. The parts warranty covers parts only, providing that factory inspection reveals a defect in material or workmanship. Labor, troubleshooting, equipment downtime, etc. is not covered under the parts warranty policy.

HEIL MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, AND MAKES NO WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR ANY PARTICULAR PURPOSE. HEIL DOES NOT ASSUME ANY LIABILITY OR ACCEPT CLAIMS FOR LOSS OF PROFITS, PRODUCT DOWN TIME OR ANY OTHER DIRECT, INCIDENTAL OR INDIRECT CONSEQUENTIAL LOSSES, COSTS, DAMAGES OR DELAYS.

Any improper use, operation beyond rated equipment or component capacity, substitution of parts that are not Heil-approved, or any alteration or repair by others in such a manner as in Heil's sole judgment affect the product operation or integrity shall void the warranty.

Other than the extension of the standard warranty period purchased under a supplemental Heil Extended Warranty Program, no employee or representative is authorized to modify this warranty in any way nor shall any other warranties be granted. No dealer-supplied warranty program is endorsed or supported by Heil.

Heil retains the right to modify its factory warranty program prospectively at any time.

Revised 1/2013

www.heil.com

Customer Care:
866-ASK-HEIL
(866-275-4345)

Heil Environmental
4301 Gault Avenue North
Fort Payne, AL 35967-9984

Parts Central:
800-528-5308

Technical Service:
866-310-4345
TechSupport@DoverESG.com