HYPERTRUCK ERX™
OPERATOR'S MANUAL

HYLIION®

Rev 1.0

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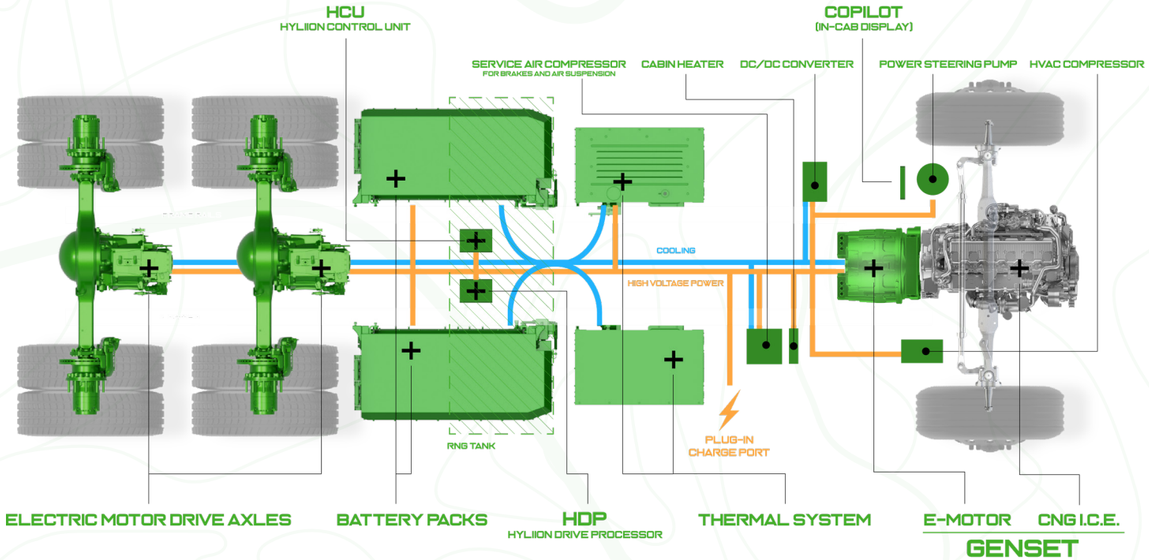
COMPONENT OVERVIEW



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INTRODUCTION

Thank you for choosing the Hyliion Hypertruck ERX. We are proud of the advanced engineering and quality construction of each system that we build.

The purpose of this guide is to enable you to operate the Hyliion Hypertruck ERX. Please read it carefully and make sure to follow all safety warnings.

This guide is not a service manual nor is it designed to allow you to trouble-shoot or repair the system. If you have any questions regarding any aspect of the system functionality, please call Hyliion Customer Support at 1-833-HYLIION (1-833-495-4466). Hyliion will answer your questions, help you manage the maintenance tasks outlined herein, and/or arrange for service and repair from a Hyliion Certified Service Provider.

Please make sure to leave this operator's manual in a convenient location so that you can refer to it as needed. All information and specifications in this manual are current at the time of printing. Due to Hyliion's policy of continuous improvement, we reserve the right to make changes at any time, without notice.

Telematics features are dependent on cellular data transmission. Some areas may have limited or no cellular connectivity, resulting in a loss or interruption of data transmission. As a result, certain features may be temporarily unavailable. Even in areas with good reception, cellular connectivity can be adversely affected by tall buildings, apartments, tunnels, underground parking, mountains, etc. Even if the signal strength indicates good reception, connectivity may be disrupted. This does not indicate a malfunction.

NOTICE

This manual is intended for use with any vehicle chassis produced with the Hyliion Hypertruck ERX powertrain. The information provided hereafter is supplemental to the base chassis information and only covers the Hypertruck ERX specific operational procedures. The base chassis operator's manual should be referenced for any information not relating to the Hypertruck ERX system.

SYMBOLS

The following symbols have been included in this manual for the purpose of protecting yourself and passengers. Please do not ignore any of the messages that are accompanied by one of the following symbols.

WARNING

When a warning symbol is present, hazards are possible that could result in injury, death, or damage to property.

NOTE

When a note symbol is present, the information provided that is not safety critical, but rather provides helpful information for the proper operation of the vehicle.

OTHER SAFETY INFORMATION

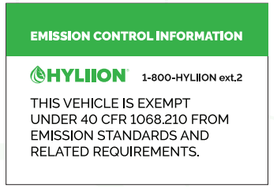
LIFTING VEHICLE

Please follow proper safety precautions when lifting the Hypertruck ERX. Ensure the vehicle has the parking brake applied and the wheels are chocked. The vehicle may be lifted from the axle housing, clamp group, or the frame rail.

⚠	Remove air from suspension before lifting. Failure to do so may result in shifting of the vehicle, potentially resulting in injury or death.
!	Do not lift the vehicle from any suspension or fuel system components as it may damage the vehicle.

LABEL LOCATIONS

Battery pack



Battery pack

Top of battery pack

Inside doors

Battery pack

Battery pack

HYPERTRUCK ERX SYSTEMS

Generator
The generator converts the power from the engine into electricity to charge the vehicle batteries.

Battery pack
Contains high voltage battery modules that power multiple vehicle operations.

Power steering pump
Stock mechanical power steering pump is replaced with a high voltage electrical version.

eAxle
Axle that contains a two-speed transmission and an integrated motor.

Motor
Converts high-voltage AC current into mechanical energy that is used to propel the vehicle.

Inverter
Converts AC power to DC power and vice-versa.

This is a high voltage vehicle, avoid contact with the above systems and orange high voltage cables.

Thermal system
The thermal system cools the eAxle motor, battery packs, and the generator.

Service air compressor
Stock service air compressor is replaced with a high voltage electrical version.

HVAC compressor
Stock mechanical AC compressor is replaced with a high voltage electrical version.

Coolant heater
Provides heat for the cabin HVAC system in BEV mode.

DC-DC converter
Converts high-voltage DC power to low-voltage DC power.

EMERGENCY PROCEDURES

In case of an emergency please adhere to the following if possible.

- Put the vehicle in neutral, apply the parking brake, and turn off the ignition switch.
- Follow the “Fuel System Shut Down Procedure” listed in the fuel system operator manual.
- Emergency responders should be called to the scene if there is an odor of natural gas or a visible flame.
- In the case of a fire, move 100 feet away from the truck. Do not attempt to extinguish a fire.
- Notify first responders that the vehicle contains both CNG and high-voltage batteries.
- Do not cool the TPRDs.

TPRDs release pressure after reaching a temperature threshold. Cooling the TPRDs may result in explosive behavior, potentially damaging the vehicle and nearby personnel.

TOWING

In the event of an emergency or situation in which the vehicle must be towed.

- Attempt to pull the vehicle the emergency area of hard shoulder for safe working space.
- Put on all required safety clothing and PPE.
- Set up roadside safety indicators (cones, triangles, or road flares).
- It is recommended that, if possible, attempt to tow the vehicle from the rear of the truck. If the vehicle must be towed with rear wheels on the ground, see page 27 for a detailed towing procedure. The procedures listed must be followed to prevent damage to the Hypertruck ERX.

Close the manual shut-off valves and the FMM for the CNG system before towing.

EMERGENCY

STARTING WITH JUMPER CABLES

If the low-voltage battery is fully discharged and the vehicle will not start, it may be jumped with an equivalent voltage system from another vehicle. Proceed with the following steps: (Location of terminal).

- Engage the parking brake on both vehicles.
- Shift the Hypertruck ERX into neutral.
- Turn off all electrical systems for both vehicles.
- Ensure the 12V battery disconnect for the ERX is switched to the “off” position.
- If the assisting vehicle has a 12V battery disconnect, switch it to the “off” position.
- First, attach one jumper cable to the positive terminal of the discharged battery, then attach the other end to the positive terminal of the (good) battery.
- Attach the second jumper cable first to the negative terminal of the (good) battery, then attach the other end to bare metal on the Hypertruck ERX.
- Return any 12V battery disconnects to the “on” position.
- Turn ignition key one click to the right to wake up the HCU and close contactors.
- Start the assisting vehicle and let it run for two minutes.
- Try to fully start the truck. If the truck does not start turn the key back to its “off” position and wait five minutes.

⚠	Remove metal jewelry that may contact the battery.

FUSE REPLACEMENT

- Unmate the HVIL disconnect found in the passenger's toolbox or behind the driver side fairing. (pg. 19)
- Ensure MSDs are removed and truck is de-energized. (pg. 18)
- Proceed to replace fuses.

⚠	Always replace a fuse with one of the same rating to avoid damaging the vehicle.

CONTROLS

DASHBOARD CONTROLS

The dashboard clusters and switches unique to the Hypertruck ERX system are marked in Figure 1 and described in detail below.

1. **Right Control Stalk (RCS):** The RCS serves two primary functions. It allows the driver to select the desired level of regenerative braking and select the current drive mode. Regenerative braking is used to recuperate energy, charging the high voltage batteries and slowing the vehicle down. This increases the effective range of the vehicle and reduces wear on the friction brakes
2. **Co-Pilot Display:** The Co-Pilot Display allows the user to monitor and control the Hypertruck ERX system. It provides real-time feedback on system status, allows the operator to switch the power mode, and warns the driver of any issues with the system.

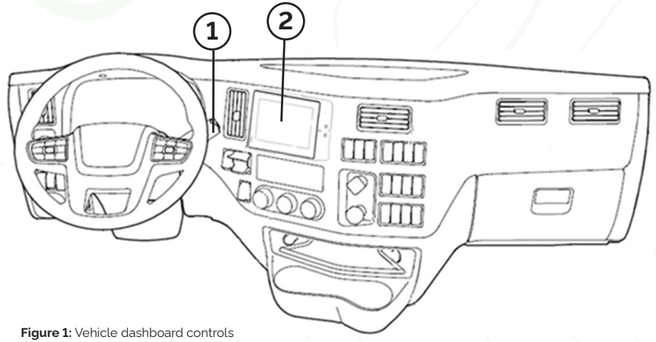


Figure 1: Vehicle dashboard controls

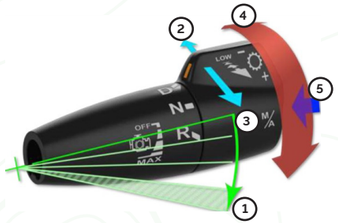


Figure 2: Right control stalk

1: Control in the "down'" direction perpendicular to the steering column with multiple positions corresponding to the regenerative braking level. The lowest position is a momentary position for maximum regenerative braking.

2: Push the control away from the steering wheel parallel to the steering column for Downshift Request and Low Mode Request.

3: Pull the control towards the steering wheel parallel to the steering column for Upshift request and Configuration Swap (changes the throttle response).

4: Three position rotary control for DNR

5: Push button control for Automatic/Manual mode switch.

COPILOT

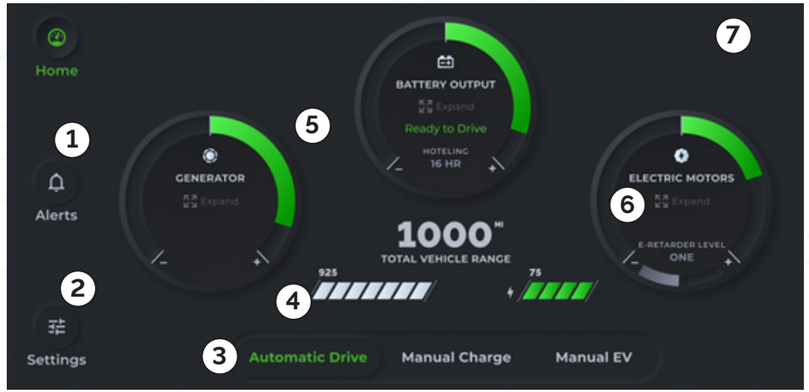


Figure 3: Co-Pilot display - home screen

1. Alerts: Switches to the alerts screen.
2. Settings: Switches to the settings screen.
3. Mode selection: Allows the selection of automatic, manual charge, and manual EV mode.
4. Vehicle range: Displays the total fuel, EV, and combined range.
5. System power status: Displays the flow of power from various systems.
6. Expand: Opens the system overview page.
7. Alert indicator zone: Provides visual cues on truck status.

ALERT INDICATOR ZONE

Table 1: System indicators

Ready To Drive Illuminated when the truck is ready to drive	**Power Steering** Illuminated if there is an issue with the power steering	**eAxles** Illuminated if there is an issue with the eAxles	**Plug In Charging** Illuminated while the vehicle is plugged into a charger
Condenser Illuminated if there is an issue with the condenser	**Compressor** Illuminated if there is an issue with the compressor	**High Voltage** Illuminated if there is an issue is occurring with the high-voltage system	**DC/DC** Illuminated if there is an issue with the DC/DC converter
Regenerative Braking Illuminated if RBS is not functioning properly	**Thermal Systems** Illuminated if there is an issue with with the thermal systems	**Generator** Illuminated if there is an issue with with the generator	**Limited Performance** Illuminated when the truck is limiting performance (derating)

SYSTEM OVERVIEW

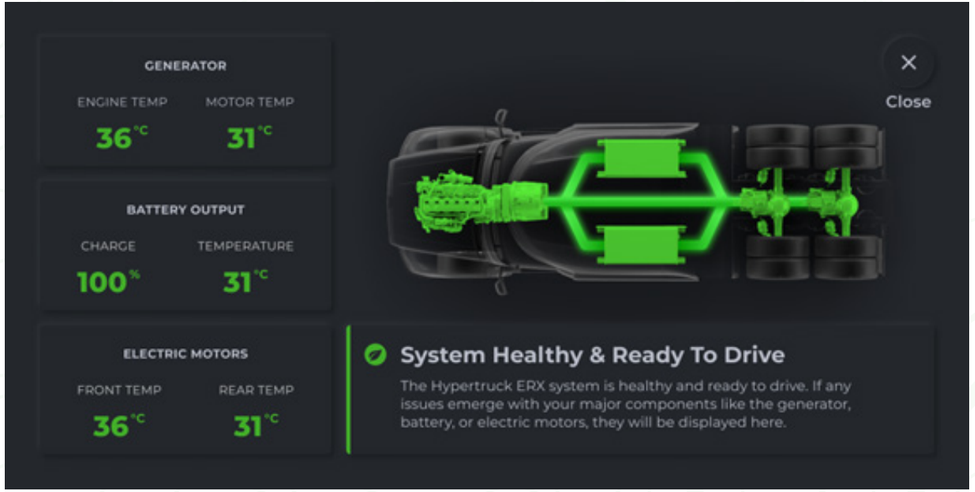


Figure 4: System overview

The **system overview** screen provides more information on the individual components of the Hyliion system and highlights the status and energy flow.

ALERTS

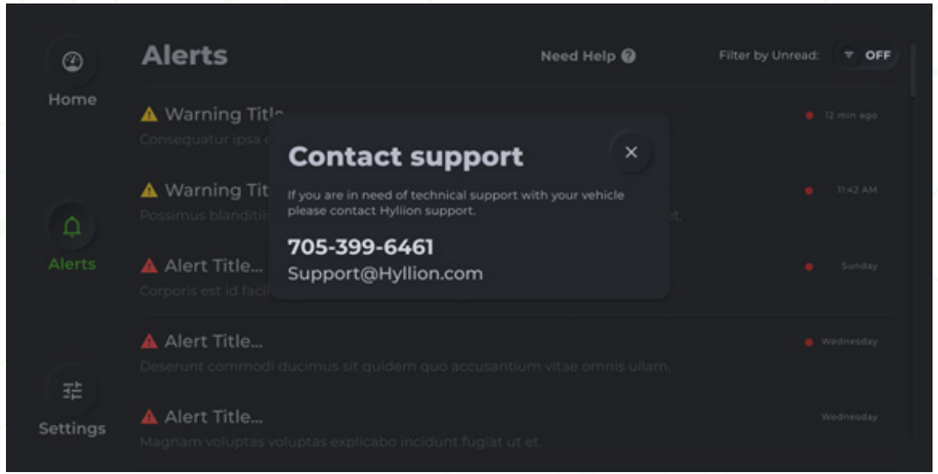


Figure 5: System alerts

The **alerts** screen provides information relating to past system issues.

1. Warning: Provides notification of a minor issue with the system.
2. Alert: Provides notification of a major issue with the system. Requires immediate attention.
3. Need Help: Provides contact information for Hyliion.

SETTINGS

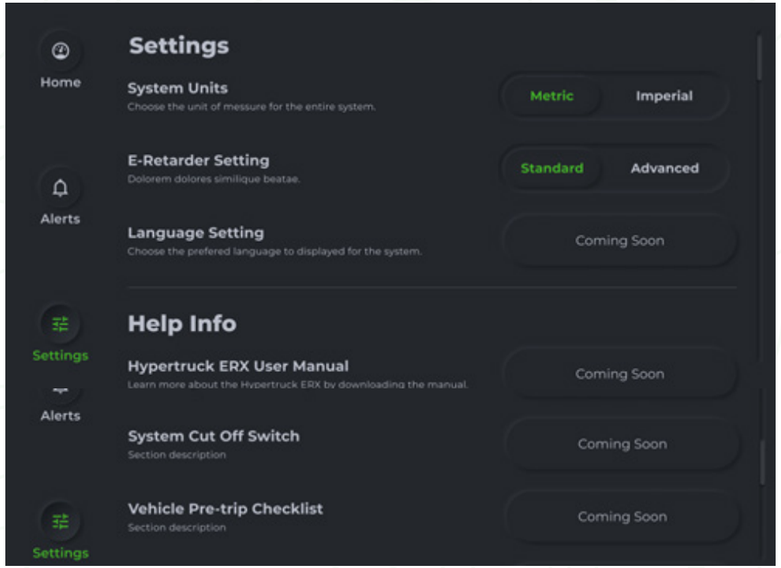


Figure 6: System settings

The **settings** screen provides customization options and links to related material.

CONTROLS

OTHER IN-CAB CONTROLS

Low-voltage disconnect: Controls the connection of Hyliion system low-voltage components to the battery system. When in the "off" position, it prevents the electronic components from draining the 12V battery. Located under the driver's seat.

EXTERIOR CONTROLS

Manual shutoff valve: Used to shut off the flow of CNG from the fuel tanks to the engine; divided into the individual tank valves and the FMM valve.

Manual Service Disconnect (MSD): Used to disconnect the high voltage source from the rest of the system. Located on each of the battery packs and the s-box.

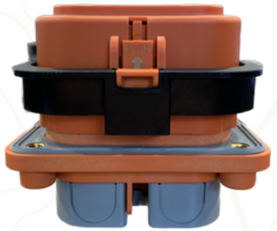
- Open the HVIL Disconnect (See pg 19).
- Turn ignition key to “off” position and remove key.
- Turn low-voltage disconnect located under the driver’s seat to “off”.
- Unmate either HVIL disconnect.
- Remove MSDs using proper safety (Catagory 2 gloves) and precautions.

!	MSD should only be removed when servicing the battery or in emergency situations.

1. Pull up the small orange tab on the bottom of the black handle.
2. Push in the orange tab to pull up on the black handle. The handle will only partially pull up.

3. Press on the orange tab, underneath where the black handle was, and pull the black handle all the way up.

4. Pull out on the black handle to remove the plug and disconnect high voltage.

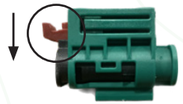


Replace the MSDs by pushing the black handle to the lowered position and clicking the small orange tab down.

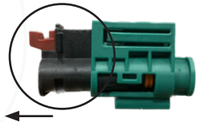
Figure 7: Removing the MSD

HVIL Disconnect: Low-voltage device used to disconnect the high-voltage source from the rest of the system. When open, the high-voltage connections will not be powered. Located in passenger-side toolbox and behind the driver side fairing.

OPENING THE HVIL DISCONNECT



Depress the red tab.

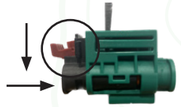


While the tab is depressed pull the plug housing away from the socket housing.

The disconnect is now in the “off” position. It should be locked out using between 4.5 and 6 mm padlock.

CLOSING THE HVIL DISCONNECT

Actuate safety arm with a screwdriver or similar tool, maintaining pressure through next step.



Depress the red tab and press the plug housing into the socket housing.

Press the red tab (CPA) into the plug housing until it sits flush.

Figure 8: Manipulating the HVIL Disconnect

Do NOT disconnect the HVIL while the vehicle is powered on or charging. Failure to comply may result in damage to the vehicle, injury, or death

PRE-DRIVE CHECK

Before driving the vehicle, please follow the procedure below.

- Walk around the truck to ensure there are no detached wires, loose connections, or signs of leakage.
- Ensure the HVIL is in the ON position.
- Ensure the MSD is connected for each battery pack.
- Ensure pressure relief devices are capped to prevent water intrusion.
- Visually inspect the following systems for damage and wear.
  - Suspension and slack adjusters
  - Wheels and tires
  - CNG enclosure and readily accessible fuel systems

If high voltage components appear damaged during inspection do not attempt to fix. Contact certified Hyliion personnel to inspect and repair the vehicle. Failure to comply may result in injury or death.

STARTUP PROCEDURE

Prior to starting the vehicle ensure that it is unplugged from the charger. Refer to the fuel system operator manual for CNG system startup procedure.

- Turn low-voltage disconnect to ON position.
- Turn ignition key to ON position.
- Hold brake pedal and move ignition key to “crank” position.
- Wait for the “Ready To Drive” indicator to illuminate.
- Wait for brake air pressure to exceed minimum.
- Release the parking brake and shift the vehicle into drive while actively braking.

DRIVING PROCEDURE

The Co-Pilot device is the main source of interaction with the Hyliion system while driving. When powering on the vehicle the user will automatically be directed to the Hyliion Co-Pilot home screen. The Co-Pilot provides the input for selecting the three drive modes: Automatic, manual EV, and manual charge mode. Automatic should be the mode used for most of the time spent driving the vehicle. It will attempt to maintain the optimal charge level and maximize fuel efficiency. Manual EV mode will force the vehicle to operate purely on battery power and is meant for driving in areas with noise or emissions restrictions and short range trips. Manual charge should only be used when the batteries require charging to their full capacity, such as when preparing to drive the vehicle in manual EV mode.

The regen level is controlled with the RCS and should be selected based on the desired braking characteristic and current road condition. The top position disables regeneration and should be used when limited traction is available. The middle position is standard regenerative braking, and the bottom position temporarily activates maximum regenerative braking.

Ensure regenerative braking is disabled while driving in low traction conditions as it can lead to unexpected handling characteristics.

SHUTDOWN PROCEDURE

Shift truck to neutral and apply the parking brake. Turn ignition switch to OFF position.

Do not turn off the vehicle while the generator is active and charging the batteries. Failure to comply may result in damage to personnel or property.

REFUELING PROCEDURE

Refer to the fuel system operator manual for CNG fueling procedure.

OPERATION

CHARGING PROCEDURE

- Insert the charger into the inlet and assure the charger is locked and cannot be pulled out.
- Stand clear of charger and charging inlet until charging is complete.
- Once charging is complete, press the stop button.
- Wait 30 seconds for charger to de-energize and unlock.
- Once charger is unlocked and can be removed, charging is complete.

!	Extra information on the charging status will be shown on the Co-Pilot display.

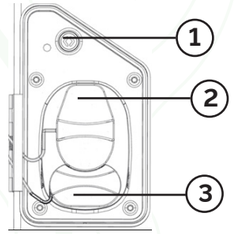


Figure 9: Charging inlet

CHARGER COMPONENTS

1. Stop button/LED indicator
2. AC charge receptacle
3. DC charge receptacle

LIGHTING LEGEND

- Charging is initializing (Blinking)
- Current is flowing (ON)
- Charging is stopped (OFF)
- Charging is inhibited (OFF)
- Charger needs to be replugged (OFF)

STORAGE PREPARATION

- Battery SOC should be between 30-50%
- Storage temperature should be between -25 to 35°C (-13 to 95°F), ideally between 20-30°C (68-86°F).
- Turn ignition key to "off" position and remove key
- Turn both low voltage disconnects under the driver's seat to "off"
- After a prolonged storage period 12V battery may be depleted. If so, follow jump-start procedure to power 12V.
- After a storage period of 3 months or longer, battery SOC needs to be recalibrated. Contact Hyliion for a recalibration of the batteries

!	Storage below -25°C and above 35°C may cause permanent damage to the high voltage batteries.

MAINTENANCE

DAILY CHECKS

These systems should be checked daily while the vehicle is actively in service.

Chassis

(See chassis operator, engine owner, and fuel system operator manuals)

Interior

(See chassis operator's manual for non-Hypertruck ERX systems)

Check that all gauges appear to be working as intended

Powertrain/fuel

Check fluid levels and vent lines

Drain low-pressure CNG filter

WEEKLY CHECKS

Chassis

(See chassis operator, engine owner, and fuel system operator manuals)

Interior

(See chassis operator's manual for non-Hypertruck ERX systems)

Powertrain/fuel

Drain high-pressure CNG ilter

HYLIION MY23 HYPERTRUCK ERX MAINTENANCE INTERVALS			
System		Tasks	Interval
Fuel E-System		Hyliion System Visual Inspections*	3 months
		Break-In Oil Change	2,500 miles - Initial Oil Change
E-Axle		Oil – Level Check	Every 25,000 miles
		Oil Change	Every 50,000 miles, or annually
Generator		Grease Change*	1000 hrs
Air Brake Compressor		Filter Change	12 months
Thermal Systems		Radiator Cleaning*	3 months

*Applicable to the on-board diagnostics (OBD) components relevant to the emissions related warranties.

MAINTENANCE

SERVICE INTERVALS

	SERVICE MILAGE/HRS	ACTUAL MILEAGE/HRS	COMPLETED BY	DATE COMPLETED
Hyliion System Visual Inspections	3 months			
Break-In Oil Change	2,500 miles			
Oil – Level Check	27,500 miles			
Oil Change	52,500 miles			
Generator Grease Change	1000 hrs			
Air Brake Compressor Filter Change	12 months			
Radiator Cleaning	3 months			

For other systems please follow the OEM recommended intervals

MAINTENANCE

SPECIFICATIONS		QTY.
Power steering filter	Paccar J37-1005	1pc
Power steering fluid	Valvoline Maxlife ATF	4L
Brake air compressor filter	Mann-Hemmel C630	1pc
Refrigerant	R-134A	3lb 14oz
Refrigerant oil	PS R1	100 ml
eAxle oil	Castrol Syngear 75w-90	8L
eAxle motor	Castrol Syngear 75w-90	1L
eAxle gear reduc.	Castrol Syngear 75w-90	1L
Generator grease	SKF LGHP 2	20g
HV system coolant	Shell Rotella ELC NF 50/50	4L

TOWING PROCEDURE

TOWING PROCEDURES

Option 1

It is recommended that, if possible, attempt to tow the vehicle from the rear of the truck.

Option 2

If frame angle stays below 7.5 degrees, or the front axle is lifted no more than three feet, towing can be done from the front and axle shafts do not need to be removed, but neutral axle verification is required (page 29).

Option 3

If frame angle is greater than 7.5 degrees and towing from the front, follow below:

- Verify that the Brake DCDL Caging Bolt is in place (pg.28).
- Verify that the eAxle transmission is in neutral before attempting to tow. (pg 29).
- Utilize the system disconnect located within the drivers cab to power down the E-Power System.
- Drain 1 liter of gear oil from each hub of the required axle (pg 30).
- Remove axle shafts, making sure to replace Lube/Gear oil when complete. (pg 31).

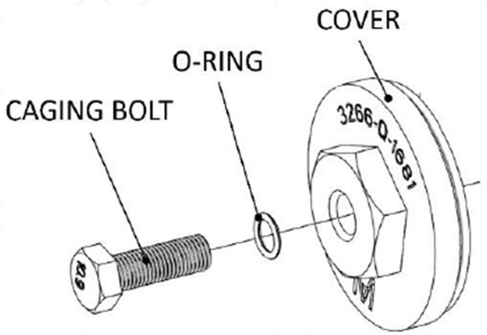
For the ePowertrain, Meritor has determined that low angle decked shipping / towing is acceptable without axle shaft removal based on the conditions that the transmission is confirmed to be in the neutral position, and up to vehicle speeds as outlined in Table 1. Low angle is defined as a frame angle no greater than 7.5 degrees as measured from horizontal, or lifting the front end less than three feet from the ground. This method also assumes towing on the rearmost drive axle and applies to a conventional mounting approach of the ePowertrain (i.e. forward facing eCarrier). Confirmation that the transmission is in the neutral position should be identified by the SCM, refer to the latest controls integration document DOC0039890 for additional information.

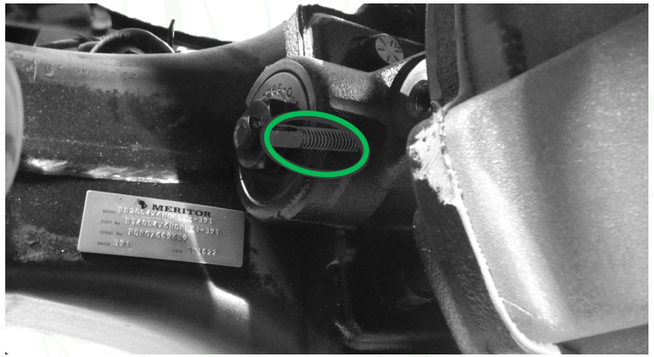
TOWING PROCEDURE

Table 1: Maximum acceptable pinion speed for neutral shipping/towing

HYPOID PINION RPM	HYPOID RATIO	WHEEL END RATIO	FINAL DRIVE RATIO	WHEEL END RPM	TIRE REV / MILE	VEHICLE SPEED MPH	DESCRIPTION
4329	3.91	2	7.82	554	511	65	Class 8 fast ratio

Prior to axle shaft removal, DCDL caging is required.





TOWING PROCEDURE

Verify eAxle transmission is in neutral using special spline tool

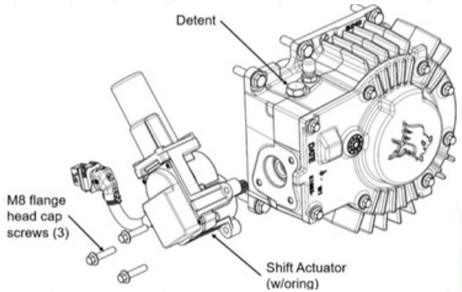


Figure 10: Actuator disassembly

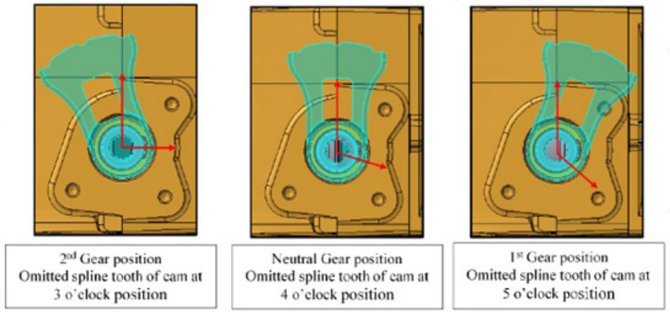


Figure 11: Gear position identification

Once the transmission has been shifted into the neutral position, the shift actuator is to be reassembled to the gear box. The o-ring and splined shaft must be free from dirt and debris. Lubricant must be applied to the o-ring and repositioned on the shift actuator. The shift actuator shaft must be positioned so that the keyway on the spline aligns with the keyway on the cam, see rightmost image in figure 12 for enlarged view. Thread adhesive (e.g. Loctite® 242) should be applied to fastener threads before assembling. Fastener torque to 32±3 Nm [21-26 ft-lbf].

AXLE SHAFT REMOVAL

Drain oil from wheel end reduction.

- Align the wheel end reduction as shown in Figure 12.
- Remove the drain plug and drain using a suitable collector.
- Clean the drain plug then replace and torque to 35±4 Nm.

Figure 12: Orientation for wheel end reduction oil drain

Unscrew all M12 12-point head screws and remove wheel end reduction assembly from axle. DO NOT REMOVE M10 SOCKED HEAD BOLTS, FIGURE 14, THEY ARE CAGING BOLTS TO KEEP THE WHEEL END REDUCTION ASSEMBLY TOGETHER.
Remove axle shafts and store in truck for reuse. If replacing reassembling axle shafts, axle shafts must be cleaned in a parts washer prior to reassembly.
Install the wheel end reduction assembly on the hub aligning all 18 bolt holes.
Install the M12 bolts with Loctite® 242 on approximately 10 threads and torque the bolts to the specification. See Figure 14.
Fill oil into both wheel end reductions.

- Align the wheel end reduction as shown in Figure 13.
- Clean the area surrounding the fill plug and remove the plug.
- Fill with oil up to the bottom of the oil port (~1L)
- Reinstall the fill plug and torque to 35±4 Nm

Figure 13: Orientation for wheel end reduction oil fill

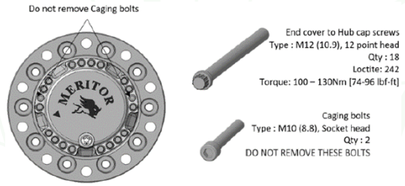
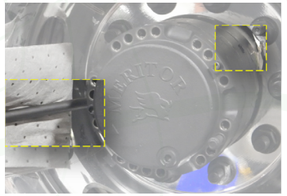


Figure 14: Wheel end cover tightening bolt torque

WHEEL END REMOVAL

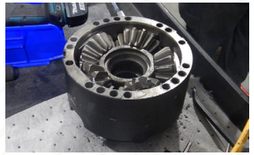
Use pry points to remove wheel end



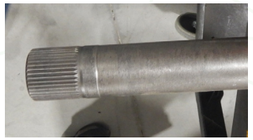
If excessive RTV was used at the factory, a rubber mallet may be used to loosen the wheel end.

Once the wheel-end is removed, check that no damage occurred to the O-ring. If damaged, replace.

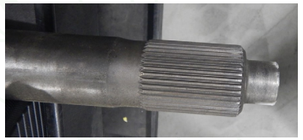
Remove axle shaft. Inspect wheel end, axle shaft and axle end for damage or excessive RTV and remove



Outer Shaft



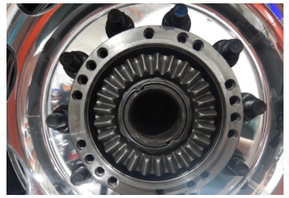
Inner Shaft



TOWING PROCEDURE

WHEEL END RE-INSTALL

Inspect housing end and gears for debris or burrs and remove

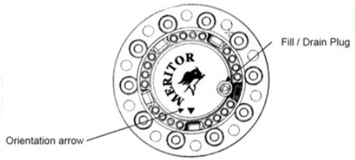


Apply parker o-ring lubricant to sealing o-ring

Align pry bar slots and re-install wheel end. Hand start at least one bolt hand tight before installing the remaining 11 bolts

Install remaining bolts and torque in a cross-star pattern to 85 ft.lb.

Refill each wheel-end with 1L of GL5 oil



NOTES

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