



LIGHTNING eMOTORS GM4500

SUPPLEMENTARY OWNER'S MANUAL





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Safety Information

Carefully follow the safety instructions and documentation in this manual. Although the Lightning eMotors vehicle was developed in accordance with generally accepted rules of current technology, there is still a risk of personal injury or damage to the equipment if the information that follows is ignored.

The table below describes the safety hazard markings and other highlighted notes you will see throughout this manual.

	HIGH VOLTAGE	Identifies a dangerous HIGH-VOLTAGE situation that WILL result in death or life-threatening injuries if not avoided.
	DANGER	Identifies a dangerous situation that WILL result in death or life-threatening injuries if not avoided.
	WARNING	Identifies a dangerous situation that COULD result in death or serious injuries if not avoided.
	CAUTION	Identifies a situation that COULD result in damage to equipment or bodily injury if not avoided.
	NOTICE	Identifies an important message. Failure to read or follow direction(s) MIGHT cause damage or be detrimental to vehicle operations .
	INFORMATION	Identifies a message that may include helpful tips, trouble-shooting suggestions, and/or more detailed information.

Common Acronyms

AC	Alternating Current
BEV	Battery Electric Vehicle
DC	Direct Current
DCFC	Direct Current Fast Charge
EV	Electric Vehicle
GVWR	Gross Vehicle Weight Rating
HV	High Voltage
ICE	Internal Combustion Engine
MSD	Manual Service Disconnect
PPE	Personal Protective Equipment
SOC	State of Charge
ZEV	Zero Emission Vehicle
HSA	Hill Start Assist
UVM	Unintended Vehicle Motion

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Introduction

Welcome to your new Lightning eMotors vehicle.

This Supplementary Owner's Manual is an introduction to Lightning eMotors vehicle—your new all-electric vehicle (EV). This manual allows you to become quickly acquainted with the system components, normal operation, and other critical information.

Please familiarize yourself with your new BEV (Battery Electric Vehicle) by thoroughly reading this Supplementary Owner's Manual, and then following all advice and warnings presented within it.

This manual is intended for owners and operators of the Lightning eMotors vehicle. It is designed to provide both new and experienced drivers with a thorough understanding of the following Lightning eMotors vehicle concepts:

- Safety Information
- Features and components
- Driving and operating
- Warning signs and protocol in the case of malfunction or abnormal operations conditions



NOTICE

Before you continue reading this document, please confirm that you have read the original *GM4500 Owner's Manual*.

Knowledge of both this Supplementary Owner's Manual and the original *GM4500 Owner's Manual* are integral to the best possible operational experience and vehicle longevity.

What is a Lightning eMotors vehicle?

Lightning eMotors' electric vehicle is an all-electric version of the GM4500 Shuttle, Cargo, School Bus, & Kit. In the Lightning eMotors vehicle, the internal combustion engine and fuel tank are replaced with an electric drivetrain and batteries.

The two most obvious benefits of the Lightning eMotors vehicle are:

- As a BEV (Battery Electric Vehicle), it requires no fuel.
- As a ZEV (Zero Emission Vehicle), it adds no pollutants to the air.

The Lightning eMotors vehicle is designed to mirror the normal behavior and drivability of a conventional vehicle. However, it does drive somewhat differently. Awareness of differences, such as drivability, vehicle care, and component care are key to understanding the Lightning eMotors vehicle.



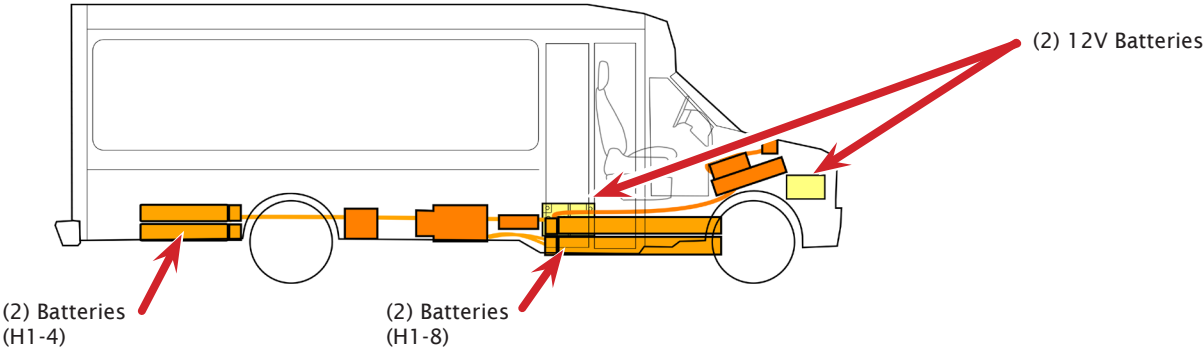
NOTICE

Certain features and options presented in this manual may not be available or may reside in different locations on your specific vehicle.

Battery Configuration

The GM4500 vehicle is available in following battery configuration.

CONFIGURATION	BATTERIES	CAPACITY
GM4500; REAR BATTERIES; 2X H1-4 PROTERRA	Two (2) H1-4 battery packs (804-002)	20 kWh (each) 40 kWh (total)
GM4500; CENTER BATTERIES; 2X H1-8 PROTERRA	Two (2) H1-8 battery packs (804-001)	40 kWh (each) 80 kWh (total)
	4 (total)	120 kWh (total)
RANGE ~130 miles		



Warranty Summary

What is Covered: This warranty covers the following “Powertrain” components: control system and control software, lithium-ion high-voltage battery packs, (collectively referred to as the “Battery”); electric drive module assembly (includes electric motor and gearbox); transmission range sensor; charge cord; and associated brackets and supports.

How Long Coverage Lasts: The vehicle warranty lasts for the first sixty (60) months or 60,000 miles, whichever comes first, after delivery to the customer.

Who is Covered: This warranty is extended to the original purchaser.

Full Warranty Location: The standard Limited warranty is set forth at <https://lightningemotors.com/warranty> and governs any reference to warranty details described in this manual.

How to Make a Claim: For warranty service, please contact Lightning at +1 (970) 744-4926 or support@lightningemotors.com, or a Lightning authorized service provider.

For physical copies, more-current vehicle repair and service network information may be obtained by contacting Lightning at +1 (970) 744-4926 or support@lightningemotors.com

Authorized repairs and Service locations

Lightning eMotors
815 14th Street SW
Loveland, CO 80537
(970) 744-4926

For more-current vehicle service locations please contact Lightning at +1 (970) 744-4926 or support@lightningemotors.com

Warranty Coverage

The Lightning eMotors vehicle features modifications to the stock GM4500 Shuttle, Cargo, School Bus, & Kit. All systems and sub-systems present in the vehicle due to the modifications are covered by the *Standard Limited Warranty, Lightning eMotors Powertrain System*. Your warranty may differ.

See the *Standard Limited Warranty* for more details.

All stock systems, sub-systems, and components are covered by the OEM manufacturer's warranty.

Modifications made to stock GM4500

ORIGINAL	REPLACEMENT
Engine	Electric motor
Transmission/Gearbox	Single-speed transmission/Gearbox
Fuel tank and fuel system	Batteries and high-voltage (HV) electric wiring
A/C compressor	HV A/C compressor
Heating elements	HV heaters
Engine coolant system	EV coolant system
Exhaust system	None
Power steering pump	Replacement power steering pump

Additions to stock GM4500

ADD ONS	REASON
Framework	Added to chassis to secure batteries and auxiliary components
Hydroboost brake	Uses the pressure of the power steering pump to power the brake booster that supplements the driver's input.
Controllers	Added to manage and control EV powertrain and sub-systems
Low voltage wiring system	Added to control EV systems and sub-systems

	NOTICE	The warranty does NOT cover battery replacement due to improper vehicle storage. See the Lightning eMotors vehicle Storage section (page 22) to understand proper vehicle storage steps.
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The cargo capacity of the GM4500 changes during the electrification process. Consult the cargo capacity label located on the inside of the driver's door for specific details on payloads.

Depending on additional upfitter equipment present on your vehicle, the available cargo capacity can vary across Lightning vehicles.

GENERAL VEHICLE CARGO LIMITS (LBS)

VEHICLE	POUNDS (LBS)
Cutaway	~7,675

The GVWR has not changed, and is 14,200 lbs.

	INFORMATION	For Customer Support, email support@lightningemotors.com or call (970) 744-4926.
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Lightning eMotors Vehicle Components

This section features the main components that make up the Lightning eMotors vehicle.

System Basics

For reference, the following are labeled, rendered images of the Lightning eMotors vehicle.



NOTICE

These images are conceptual illustrations only.

Lightning eMotors vehicle components in your vehicle may exist in different locations or be different shapes and sizes than indicated.

System Basics, cont.

HIGH-VOLTAGE BATTERIES

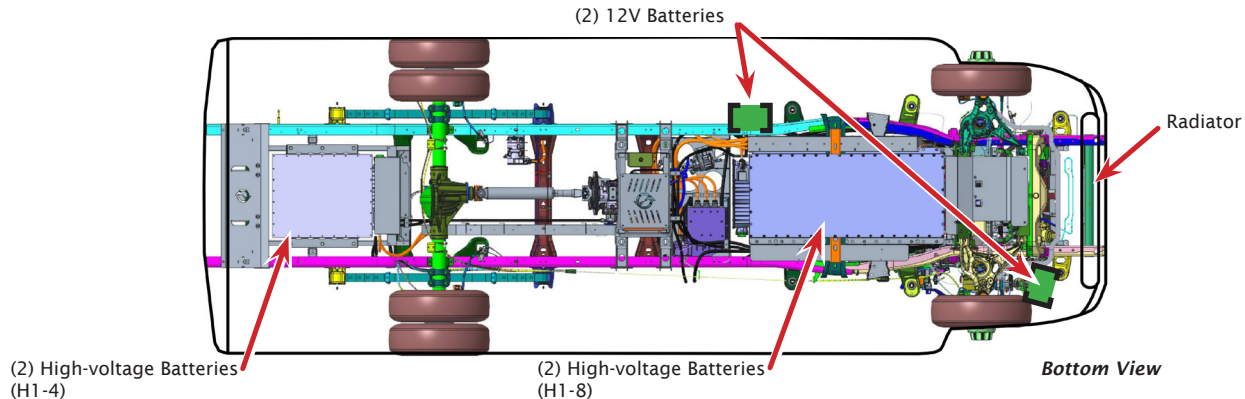
High-voltage batteries provide electricity to the vehicle. These replace the need to fill a gas tank with fuel.

LOW-VOLTAGE BATTERIES

Low-voltage batteries provide electricity to the vehicle's low-voltage components: radio, heater, A/C, digital display, etc.

RADIATOR

Provides thermal management to the high-voltage components.



System Basics, cont.

INVERTER

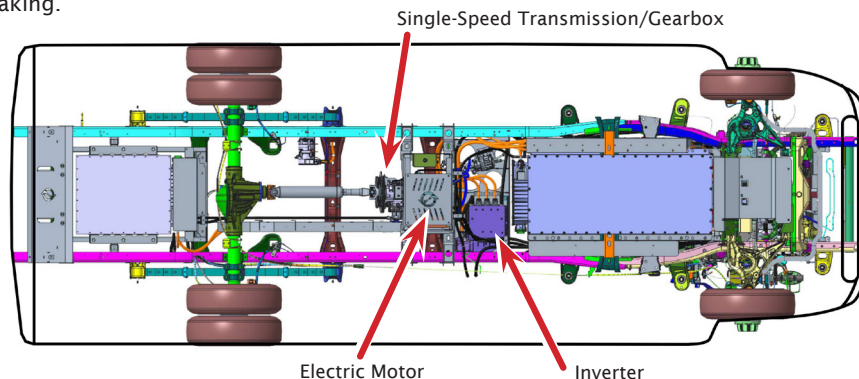
Converts high-voltage DC electricity into three phase (AC) electricity required by the electric motor. Also converts three phase (AC) electricity to DC electricity during regenerative braking events.

SINGLE-SPEED TRANSMISSION/GEARBOX

The transmission/gearbox is a reduction gear set to change the motor revolutions into the correct revolutions to turn the drive-shaft at the correct speed.

ELECTRIC MOTOR

The main propulsion device for the vehicle. Provides the forward and reverse power and acts as a generator to slow the vehicle through regenerative braking.



Bottom View

System Basics, cont.

DCFC CONVERTER

The vehicle is outfitted with a SAE J1772 compliant CCS Type 1 combo charging port. The vehicle accepts high-voltage Direct Current at up to 80kW (see page 41)..

LEVEL 2 AC CHARGER

The vehicle is outfitted with a SAE J1772 compliant CCS Type 1 combo charging port. The vehicle can accept AC (120V or 240V) current (see page 41).

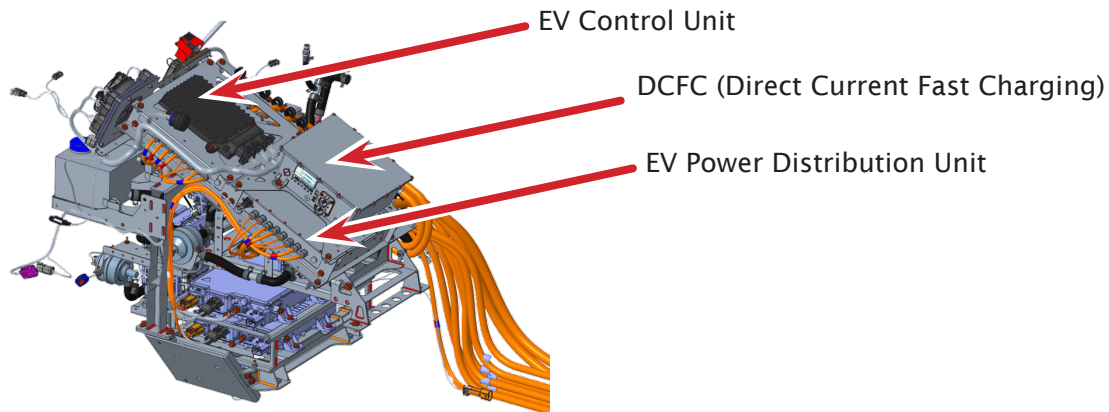
EV CONTROL UNIT

Manages all electric vehicle components and their interaction with the vehicle.

EV POWER DISTRIBUTION UNIT

Distributes power to various system components throughout the vehicle.

System Basics, cont.

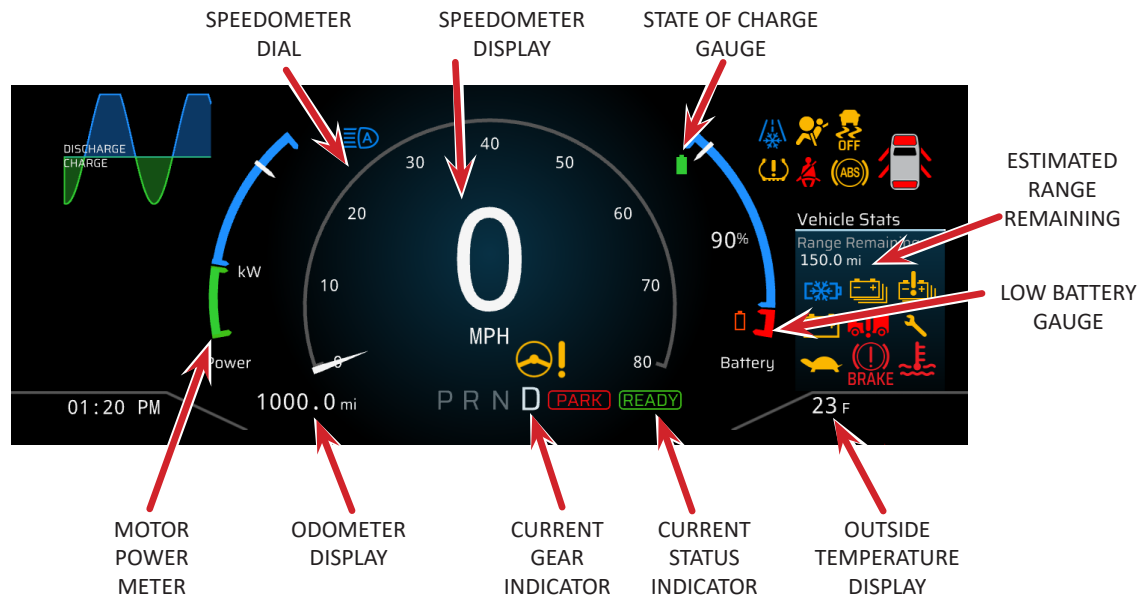


Dashboard Elements

Instrument Panel

The digital dashboard contains gauges and displays that present different information than those found in a stock GM4500.

DIGITAL INSTRUMENT GAUGE CLUSTER



High-Voltage Battery Packs

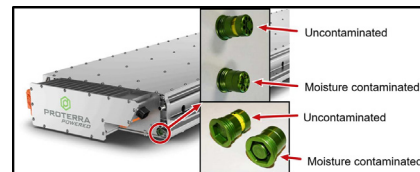
The Lightning eMotors vehicle is equipped with high-voltage battery packs to provide power to the electric vehicle. There is one annual maintenance task for the desiccant within the battery. There is no other service required for the high-voltage batteries.

As with all electric vehicles, the high-voltage batteries may incur some capacity degradation. This is normal. This capacity degradation is a result of time, usage, charging duty cycle, environmental factors and temperature, and other vehicle factors.



PROTERRA BATTERY DESICCANT REPLACEMENT

Annually or when moisture contamination is indicated (as shown below).



*For additional information, please email support@lightningemotors.com or call 970-744-4926.

High-Voltage Battery Packs, cont.

**HIGH VOLTAGE**

The Lightning eMotors vehicle consists of high-voltage components and wiring throughout the vehicle. **All high-voltage wires are jacketed with solid orange coverings or orange tape.** Most high-voltage components are marked with the high-voltage warning shown here.



NEVER touch any of these wires or components.

FAILURE TO COMPLY WITH THIS WARNING CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

**DANGER**

Only trained and authorized vehicle technicians can service or touch these battery packs. Handling the battery packs or improperly disassembling them can result in serious personal injury or death.

The battery packs contain chemicals that can cause bodily harm or damage to the environment. Only authorized personnel can dispose of Lightning eMotors vehicle battery packs.

If the vehicle is ever in a collision and there is a chance the batteries have been damaged, a high-voltage battery fire could occur.

DO NOT attempt to put out the fire or deactivate the high voltage. Walk away from the vehicle and call 911.

Lightning eMotors Vehicle Storage

If a Lightning eMotors vehicle is going to be garaged (one to four weeks), there are a couple of steps that should be taken to ensure the functionality of the vehicle and long-term health of certain components, including the HV batteries:

- HV batteries must be drawn down to approximately 60% State of Charge (SOC).
- HV batteries must be stored in a temperature-controlled area that is consistently between 59–68 degrees Fahrenheit (°F) or 15–20 degrees Celsius (°C).
- All 12V batteries in the vehicle must be disconnected.

If a Lightning eMotors vehicle is going to be stored for 1 month or longer, perform the following steps and repeat every 3–5 months.

- Reconnect 12V batteries.
- Draw the HV batteries down to 30% SOC, then charge the HV batteries back to 60% SOC using a Level 1 or Level 2 charger.
- After recharge, disconnect all 12V batteries in the vehicle.

Warning Lamps and Indicators

Many of the warning lamps and indicators operate the same as a stock GM4500, but with some additional warnings and information lamps and indicators. Refer to the original *GM4500 Owner's Manual (Instrument Cluster)* for more information, especially for warning lamps and indicators not listed here.

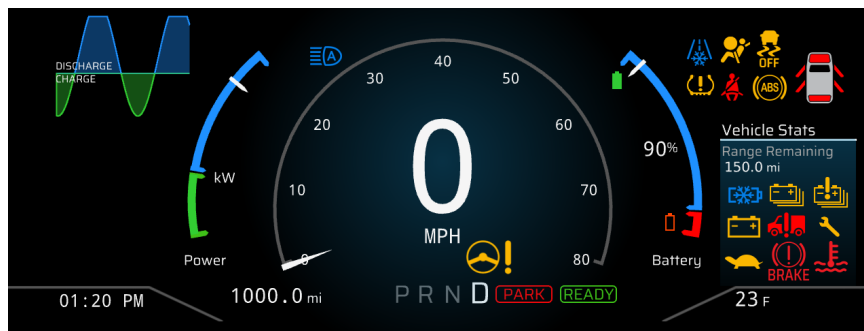
The warning lamps and indicators below provide information about vehicle status and alerts you to conditions that may become critical or serious. If any of the warning lamps and indicators below illuminate during operation or remain illuminated within 30 seconds of starting the vehicle, park the vehicle, turn the vehicle OFF and alert the Supervisor or Service Provider immediately.



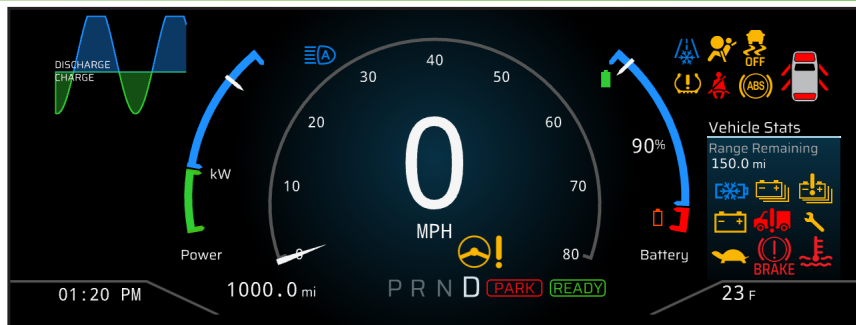
CAUTION

If a warning lamp or indicator illuminates, heed the warnings or follow the instructions below, as well as those stated in the original *GM4500 Owner's Manual (Instrument Cluster)*.

Operating the vehicle without consulting the required guide could result in damage to the Lightning eMotors vehicle or bodily injury.



	High beams illuminated		Cold HV battery
	Icy road conditions		HV low state of charge
	Airbags malfunctioning		HV battery fault
	Loss of traction		Reduced performance - vehicle will only drive slow speeds
	TPMS Warning		Brake warning lamp
	Seatbelt warning		Coolant overheating
	Anti-lock braking system		Parking brake
	Door is open		Steering System Malfunction



12V CHARGE SYSTEM WARNING

Illuminates when there is an issue with the vehicle's 12V charge system. This could be a result of a 12V charge system fault or a low charge on the 12V battery.



SYSTEM MALFUNCTION*

Illuminates when a debilitating fault or defect has been detected. Do not operate the vehicle after this lamp illuminates.



SERVICE REQUEST

Illuminates when system service(s) are detected. Immediate stop is not required. Notify Supervisor or Service Provider at earliest convenience.



VEHICLE READY

Illuminates a flashing orange when the vehicle turns on. Once the HV system is active and ready, it illuminates a solid green and you can initiate vehicle movement.



CAUTION

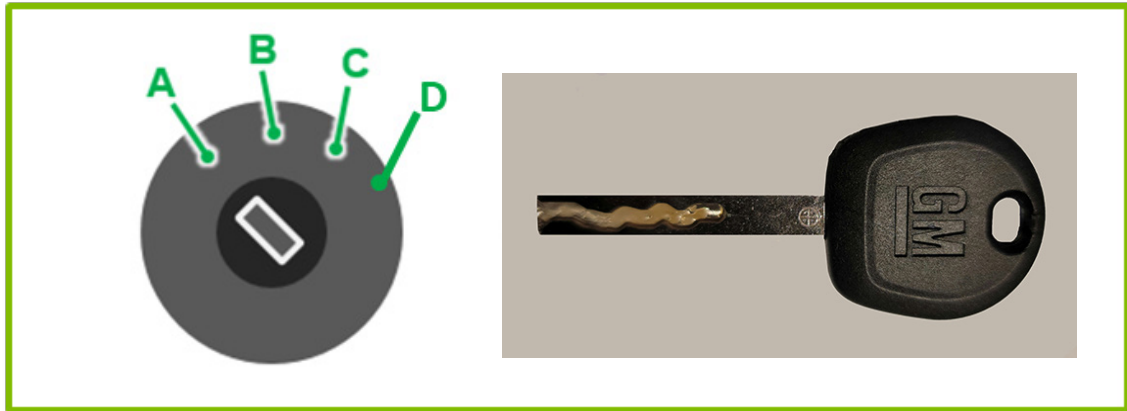
*When the SYSTEM MALFUNCTION light starts flashing, you MUST IMMEDIATELY STOP the vehicle and contact the Supervisor or Service Provider.

Vehicle Operation

This section describes the components and steps necessary for operating a Lightning eMotors vehicle.

Ignition Switch

Start the Lightning eMotors vehicle by turning the key in the ignition switch. There are three positions that control the vehicle's operation:



Ignition Switch, cont.

OFF

A POSITION - First position (left), **Ignition is OFF**. This is the default position when the key is not present.

ACCESSORIES

B POSITION - Second position (middle), **Accessories are on**. The high-voltage electric system is active, but the traction motor does not enable. The 12V battery does not drain. Vehicle accessories, such as the radio, run in this mode.

Do not leave the ignition in this position for long periods of time. This position drains the vehicle's battery and reduces the vehicle's range.

RUN

C POSITION - Third position (right), **High-Voltage Electric System (RUN) is ON**. It keeps the vehicle's main power systems running and the vehicle is ready to drive.

When the Vehicle Ready indicator turns green, the vehicle is ready to be driven.

If the vehicle is turned from RUN to ACCESSORIES while driving, all traction power is lost.

Blank

D POSITION - Last position (right), The ignition switch can still be turned to a fourth (4th) position, which is "Start" in the stock vehicle. It is not necessary to "Start" the electric vehicle, though turning to "Start" will not cause any issues.



INFORMATION

It is not necessary to turn the ignition to START in the Lightning eMotors vehicle. Simply turn the ignition to RUN.

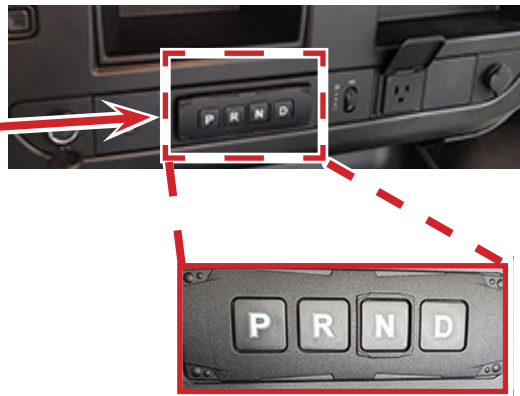
Transmission / Drive Selector

The Transmission/Drive Selector pushbuttons in the Lightning eMotors vehicle operate similarly to the stock GM4500.

Refer to the original *GM4500 Owner's Manual (Transmission)* for more information and important warnings. Lightning eMotors requires that the vehicle be disconnected from a charging port before you can move the Drive Selector pushbuttons.

To put the vehicle in gear, follow the instructions below:

1. Press the brake pedal.
2. Press the Drive Selector pushbutton of your required gear.
3. Complete the drive and then come to a full stop by engaging the brakes.
4. Press the **P** (PARK) Drive Selector pushbutton. A mechanical whirring sound may be heard as the parking pawl engages.
5. Fully engage the parking brake.



INFORMATION

The aftermarket body manufacturer may have additional requirements for the pushbuttons to be utilized. These may include wheelchair lifts being fully retracted, doors being closed, or the parking brake being disengaged.

Transmission / Drive Selector, cont.

P (PARK)

This position engages the parking pawl, which locks the transmission and keeps the wheels from turning.

R (REVERSE)

This position allows the vehicle to move in reverse. Always be at a full stop before moving the Drive Selector into and out of reverse.

N (NEUTRAL)

This position allows the vehicle to roll freely either forward or in reverse. Hitting the accelerator pedal does not cause the vehicle to move. Always engage the brakes when the Drive Selector is in neutral.

D (DRIVE)

This position is the normal driving position. Engaging the accelerator pedal causes the vehicle to move forward. Always come to a full stop before moving the Drive Selector into and out of DRIVE.

Start the Electric Vehicle

Before starting the electric vehicle, check the following conditions:

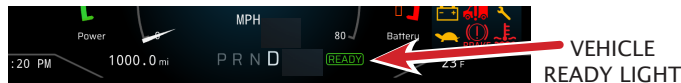
- Verify the driver and all passengers have properly secured seatbelts.
- Verify that the parking brake is engaged.
- Verify that the Drive Selector is in **P** (PARK).
- Make sure that the driver and vehicle are in a safe place to start the electric motor.

To start the vehicle, follow these instructions:

1. Fully press the brake pedal to engage the brakes. Pressing the brakes makes a sound, which is normal.
2. Turn the key to the RUN position.
3. Press the Drive Selector pushbutton of your required gear.



When the vehicle turns on, the Vehicle Ready indicator remains dim. The indicator illuminates once the HV system is active and ready. This may take several seconds.



If you attempt to operate the vehicle before the indicator is illuminated, you may experience a warning light which requires a key cycle to be performed.



NOTICE

When performing a key cycle, turn the ignition to the off position, wait a minimum of 45 seconds before keying the vehicle back on.

Start the Electric Vehicle, cont.

	CAUTION	If the high-voltage electric system encounters a fault, or if any of the warning lights or indicators remain ON for 30 seconds after the vehicle's ignition is started, turn OFF the ignition. Perform the key cycle, if this continues, immediately inform the Supervisor or Service Provider.
	NOTICE	When performing a key cycle, turn the ignition to the off position, wait a minimum of 45 seconds before keying the vehicle back on.
	INFORMATION	When the vehicle's ignition is in the RUN position, some chimes may sound from the dashboard, as well as some clicks and other sounds, from the electric vehicle. These clicks are the high-voltage system readying itself for operation, including starting the thermal management systems, fans, pumps, and opening and closing high-voltage connections.

Turn off the Electric Vehicle

To turn the vehicle off, follow these instructions:

1. Press the P pushbutton to put the vehicle in Park. Engage the parking brake.



Parking Brake

2. Switch the ignition to the OFF position.
3. Remove the key from the ignition and exit the vehicle.
4. If vehicle is to be charged, refer to the charging instructions on page 39. Prior to plugging in charger, make sure the vehicle's energy has dissipated and the dash lights power down completely.



NOTICE

Do not leave the key in the ignition when exiting the vehicle, and do not leave the ignition switched to ACCESSORIES.

These conditions can drain battery charge and reduce vehicle range.

Driving and Operating the Lightning eMotors Vehicle

The Lightning eMotors vehicle is designed to drive as closely as possible to a conventional vehicle, but drivability, specifically regenerative braking, has changed. See details below.



WARNING

Follow all safety warnings found in the original *GM4500 Owner's Manual*. Always follow the traffic laws and pay close attention to the surroundings when driving.

Failure to heed warnings and distracted driving can result in serious bodily injury or death, or irreparable damage to equipment or property.

Acceleration

To accelerate the vehicle, press the accelerator pedal. In this way, the Lightning eMotors vehicle acts the same as a conventional vehicle. When you release the accelerator pedal when traveling over (>) 5 mph, the vehicle slows rapidly as the electric motor provides regenerative braking.

To keep the vehicle from regenerative braking, press slightly on the accelerator pedal.

Brakes and Regenerative Braking

The brakes on the Lightning eMotors vehicle function the same as the stock GM4500 Shuttle, Cargo, School Bus, & Kit. Refer to the original *GM4500 Owner's Manual (Brakes)* for more information.

To slow the vehicle, press the brake pedal and modulate pressure to change braking rate. To coast and engage regenerative braking, simply lift your foot from the accelerator pedal while the vehicle is moving forward. Regenerative braking does NOT increase by pressing the stock brake pedal. Engaging the stock brakes allows you to slow the vehicle quicker but may reduce regenerative braking.

Brake lights illuminate either when the driver presses the brake pedal or the regenerative braking system decelerates the vehicle at a significant rate.



INFORMATION

The Power Gauge shows how much power is being regenerated during regenerative braking. When the vehicle slows during regenerative braking, the brake lights illuminate.



WARNING

While using regenerative braking to slow the vehicle is beneficial for efficiency, DO NOT compromise driver safety or the safety of others by relying upon the regenerative braking system. If you need to slow more dramatically or avoid obstacles, pedestrians, or collisions, use the brake pedal to apply braking force. Failure to apply brakes during a necessary emergency stop could result in injury or death to the driver or others, or irreparable damage to equipment or property.

Hill Start Assist (HSA)

For more information on the operating conditions of the HSA feature, please refer to the GM4500 Owner's Manual. The HSA feature on the Lightning ZEV4 GM4500 utilizes the OE General Motors system to assist the driver in avoiding unintentional vehicle motion while transferring from the brake pedal to the accelerator. This feature should not be used to hold the vehicle, as the assist will release after about 2 seconds and may not always engage depending on conditions.

When the HSA feature is active on the LeM ZEV4, additional accelerator input may be necessary to overcome the incline and accelerate the vehicle. It is always recommended to allow additional space between your vehicle and surrounding vehicles.

**WARNING**

Do not rely on the Hill Start Assist feature. HSA does not replace the need to pay attention and drive safely. You may not hear or feel alerts or warnings provided by this system. Failure to use proper care when driving may result in injury, death, or vehicle damage.

Speed Limitation

The Lightning eMotors vehicle has a limited top speed of 65mph. This feature is intended to improve battery efficiency and vehicle safety. The vehicle may occasionally exceed the top speed limit when traveling downhill. The limited speed may be reduced further if the batteries or the motor overheat. These conditions will be designated by malfunction indicator lamps, (MIL), on the dash. It is advisable to ensure that brakes don't overheat on extended downhill drives by periodically allowing them to cool.

Load Carrying

The published load carrying and cargo capacity in the original *GM4500 Owner's Manual (Load Carrying)* has been reduced due to the vehicle's batteries. Refer to the sticker found inside the driver's side door for information regarding the maximum cargo capacity and passenger capacity.



CAUTION

NEVER tow a vehicle or trailer with the Lightning eMotors electric vehicle, even if a trailer hitch and trailer brake controller are present.
Towing a vehicle or trailer can cause serious or irreparable damage to the Lightning eMotors electric vehicle.



Auto Park

The GM4500 ZEV4 vehicles are equipped with an Auto Park feature that will ensure the vehicle is secured and immobile in the event of any of the following:

- Driver's seat is determined to be unoccupied or indeterminate and driver door is open when vehicle speed is low and not in Park
- Driver has keyed off the vehicle without placing the PRNDL in Park.
- Charge plug is detected and vehicle speed is low and not in Park.

This system utilizes the Park Pawl to command the vehicle into a park state when any of these conditions are true. This system will not engage above approximately 3mph (5kph).



NOTICE

This system is a backup and should not be used as the primary method of parking. The driver is still expected to select Park whenever they desire the vehicle to be "Parked".

Faults with the Auto Park system may result in an illuminated Malfunction Indicator Lamp (MIL).



UVM Monitor

UVM Monitor – motion in park after 3 seconds, or torque in Neutral

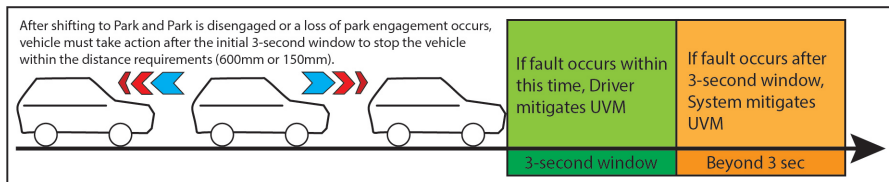
The GM4500 ZEV4 monitors the vehicle for Unintended Vehicle Motion (UVM) and will apply the driveshaft mounted (Gen1) or Linear Actuator (Gen2) Electronic Park Brake (EPB) when certain conditions are met.

UVM includes the following:

- The vehicle is stopped and has been placed in Park for 3 seconds or more and movement is detected.

	CAUTION	UVM only monitors for motion that initiates after the first 3 seconds of being placed in Park. Any movement that initiates within the first three seconds of Park state is the sole responsibility of the driver to mitigate this movement. See visualization below.
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Faults with the UVM Monitoring system may result in an illuminated Malfunction Indicator Lamp (MIL).



	NOTICE	This system is a backup and should not be relied upon to hold or stop the vehicle during normal operation. The driver is expected to always maintain full control of the vehicle and always ensure safe operating conditions.
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Accessing Lightning Insights

Every vehicle is equipped with a telematics controller that collects vehicle data.

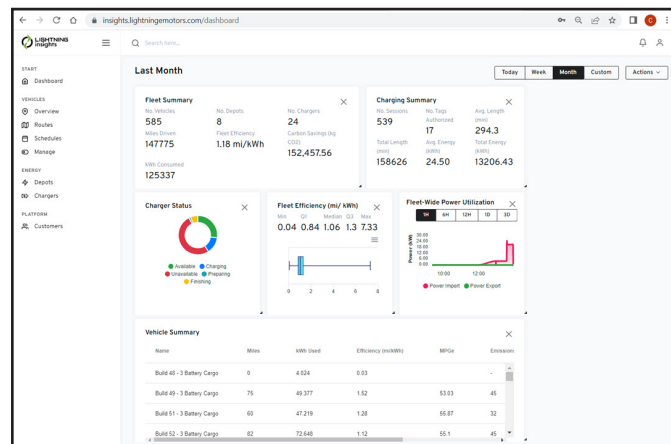
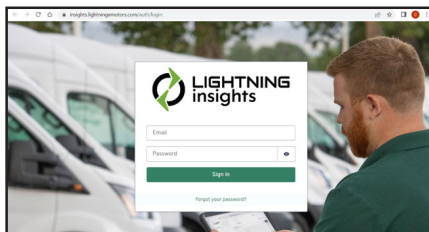
This data is available to users through the Lightning Insights application and requires a subscription.

This app, which is available on both desktop and mobile platforms, connects directly into the Lightning eMotors data platform and gives users the opportunity to see where a vehicle is, how much range is remaining, and how much state of charge is remaining.

To access the Lightning Insights application, follow the instructions below:

1. Go to insights.lightningemotors.com.
2. Press the **Sign Up** button and enter your information.
3. After allowing up to 24 hours for your account to be authorized, log in to your account.

When you log in, every vehicle in your fleet is automatically loaded into your account. You can go down the list and click on specific vehicles to get more detailed information on them.



Vehicle Charging

This section features the actions and components necessary to charge a Lightning eMotors vehicle.



HIGH VOLTAGE

FAILURE TO FOLLOW ANY OF THESE WARNINGS COULD CAUSE FIRE OR ELECTROCUTION, LEADING TO SERIOUS INJURY OR DEATH AND/OR DAMAGE TO EQUIPMENT AND/OR PROPERTY:

- DO NOT plug an extension cord, surge protector, two-pronged adapter, timer, or any other adapter into the 120V convenience cord to charge the vehicle.
- DO NOT charge the vehicle or operate charging equipment in areas with flammable vapors. Also ensure that charging occurs at least 18in (450mm) above the floor. The charging system uses components and electricity that may cause arcs or sparks.
- DO NOT attempt to repair or disassemble charging equipment.
- DO NOT charge or handle charging equipment if damaged or appears faulty.
- NEVER immerse charging equipment and chargers in water or other liquids.
- NEVER open or tamper with charging equipment and chargers.

Ensure that electrical outlets (to which the convenience cord is connected) are in good working order and that the connection to the AC wall outlet is firm.

If the connection feels loose, DO NOT use the AC wall outlet for charging and have qualified personnel replace the AC wall outlet before use.

General Charging Information

The battery system on the Lightning eMotors vehicle consists of several high-voltage, lightweight, lithium-ion battery packs.

CONFIGURATION	BATTERIES (Lithium-ion)	ENERGY CAPACITY	RANGE	THERMAL MGMT.
GM4-120	4 battery pack (Proterra)	120 kWh	~130 miles	Water/Glycol (cooled and heated)



HIGH VOLTAGE

Ensure that qualified personnel that are knowledgeable of local regulations complete the installation or service on charging equipment.
Failure to follow this warning could cause fire or electrocution, leading to serious injury, death, or damage to equipment or property.

General Charging Information, cont.

Charging the batteries on a Lightning eMotors vehicle takes time.

Configuration and charge times are indicated in the following table, organized by what kind of charging is applied.

	NOTICE	Level 1 AC estimated charge times are based on a charger capable of 8 amps. Typical ratings for Level 1 charging is between 8-16 amps. Level 2 AC estimated charge times are based on a charger capable of 30 amps. Typical ratings for Level 2 charging is between 16-32 amps. Level 3 DCFC estimated charge times are based on a charger capable of 150 amps. Typical ratings for Level 3 charging is around 150 amps. Charge times may vary.
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120V CHARGING (LEVEL 1)	120 hours
240 CHARGING (LEVEL 2)	8.5 hours
DC FAST CHARGING (LEVEL 3)	2.5 hours*

* Measurement from a 10% charge to a 90% charge on DCFC.

Charging Icon

When you connect the charger, you will hear a series of clicks as the charger locks into place. When the charger is properly connected, the charging icon illuminates and displays the charge percentage.

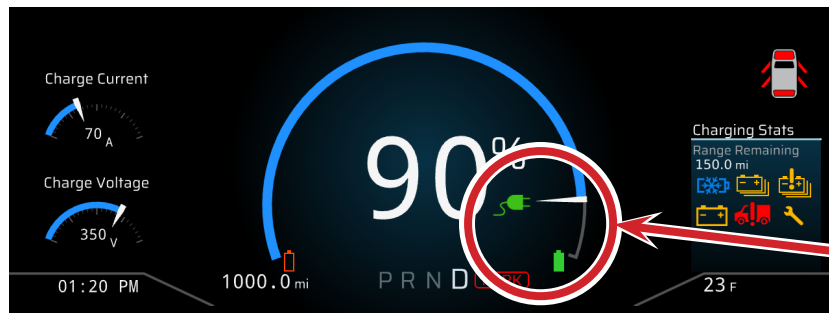


NOTICE

If the charging icon does not illuminate when the charger is connected to the charge port, disconnect the charger for 45 seconds and then reconnect.

If the charging icon still does not illuminate, repeat the 45-second disconnect a total of three times if necessary. If the charging icon does not illuminate after three 45-second disconnects, immediately inform the Supervisor or Service Provider.

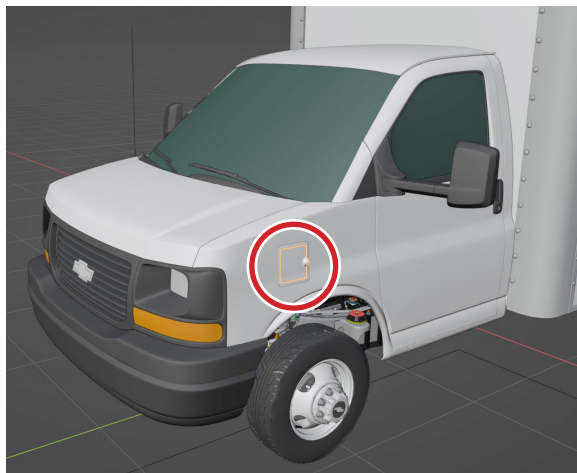
DIGITAL INSTRUMENT CHARGING DISPLAY



CHARGING ICON

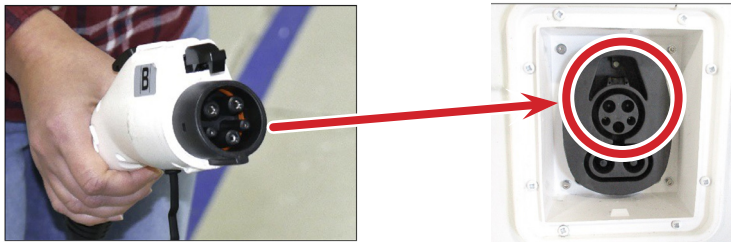
Charge Port Location

The charging port on the Lightning eMotors vehicle is located directly in front of the driver's side door.



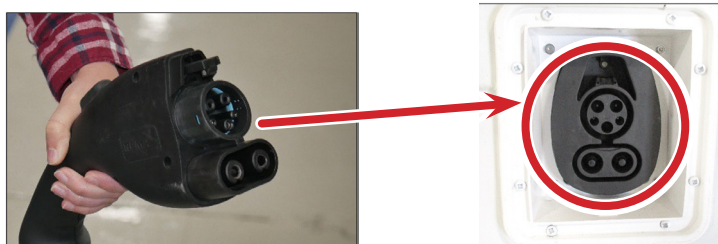
Level 1 and 2 / AC Charging

Open the charge port door to find the SAE J1772-compliant CCS Type 1 combo charging port.
The Lightning eMotors vehicle can be charged with a SAE J1772-compliant AC charge ports and charging stations.



Level 3 / DC Fast Charging

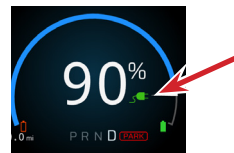
The Lightning eMotors vehicle also comes standard with Level 3/DC Fast charge capabilities.
It can be charged with a SAE J1772-compliant DC Fast Charge ports and charging stations.



Charge the Lightning eMotors vehicle Using AC

To charge the vehicle using Level 1 or Level 2 AC charging, carefully follow the instructions below:

1. Stop the vehicle and place the Transmission/Drive Selector into **P** (PARK).
2. Apply the parking brake and turn the ignition to OFF.
3. **Wait 45-60 seconds. This allows the systems to fully shut down.**
4. Open the driver's side door and exit the vehicle.
5. Open the charge port door.
6. Follow the instructions on the 120V convenience charger or the 240V charging station to begin the charging process. If charging session does not begin, unplug the charger and wait 60 seconds and try again.
7. Monitor the charging icon on the digital dashboard to ensure that the charger is properly connected and has begun charging.
8. When finished charging, end charging session by removing the SAE J1772-compliant charger from the charge port and snap the charge port lid in place.



Charge the Lightning eMotors vehicle Using DC Fast Charge

To charge the vehicle using Level 3 DC Fast charging, carefully follow the instructions below:

1. Stop the vehicle and place the Transmission/Drive Selector into **P** (PARK).
2. Apply the parking brake and turn the ignition to OFF.
3. **Wait 45-60 seconds. This allows the systems to fully shut down.**
4. Open the driver's side door and exit the vehicle.
5. Open the charge port door.
6. Follow the instructions on the DC Fast Charge station to begin the charging process. If charging session does not begin, unplug the charger and wait 60 seconds and try again.
7. Monitor the charging icon on the digital dashboard to ensure that the charger is properly connected and has begun charging.
8. When finished charging, end charging session by pressing the STOP button on the charging station. This disengages the locking connector that prevents you from removing the charger during an active charge session.
9. Remove the SAE J1772-compliant charger from the charge port and snap the charge port lid in place.



	INFORMATION	The SAE 1772-compliant charger locks into the charge port to avoid arcing. ARCING happens when electric current jumps a gap between two electric conductors. This can result in a large release of energy that can potentially cause serious injury or death. The Lightning eMotors vehicle's charger remains locked into the DC Fast Charge station until it has attained a full charge. Contact the Supervisor or Service Provider for support if the SAE J1772-compliant charger does not unlock and cannot be removed.
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Roadside Emergencies

This section provides information and guidelines for encountering a roadside emergency. Please refer to the original *GM4500 Owner's Manual (Roadside Emergencies)* for more safety information about the vehicle.

The vehicle must be towed to the nearest charging station if the vehicle runs completely out of high-voltage battery charge while driving.

Jump Starting the Vehicle's 12V battery

Charging the 12V battery does not charge the high-voltage system. The vehicle will not start if the 12V battery is dead, even if the HV batteries have a healthy SOC. In order to restart the vehicle, the 12V battery must be jump-started using the normal procedure outlined in the GM4500 Owner's Manual (Roadside Emergencies).

Transport the Vehicle

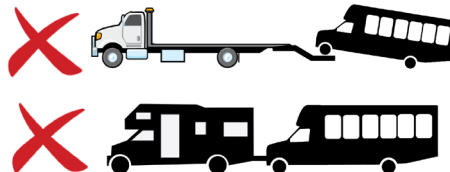
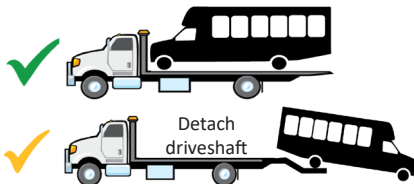
To tow an unresponsive Lightning eMotors vehicle, A FLATBED TOW TRUCK MUST BE USED.

DO NOT tow the vehicle on four wheels, with a sling belt, or with wheel lift and dollies. These methods have not been approved and may cause serious or irreparable damage to the vehicle.



CAUTION

NEVER tow the Lightning eMotors vehicle on four wheels, such as behind a recreational vehicle. Towing the Lightning eMotors vehicle on four wheels could cause serious or irreparable damage to the vehicle.



The vehicle cannot be towed with four wheels on the ground; if it must be towed, the driveshaft must be removed.

Preventative Maintenance

This section describes the schedule preventative maintenance required for a Lightning eMotors vehicle, the all-electric GM4500 Shuttle, Cargo, School Bus, & Kit from Lightning eMotors. It is a supplementary section to the original *GM4500 Owner's Manual*.

To properly maintain the Lightning eMotors vehicle, read the section Scheduled Maintenance in the original *GM4500 Owner's Manual (Maintenance)*. All notes and scheduled maintenance tasks in that section pertain to the Lightning eMotors vehicle except those relating to the internal combustion engine and ancillary systems replaced by the Lightning eMotors powertrain.

The inspections and preventative maintenance schedule below have been adapted from, and uses elements of, the original *GM4500 Owner's Manual*. Follow the preventative maintenance schedule as presented below and be aware of its differences from the standard GM4500 Scheduled Maintenance section of the original *GM4500 Owner's Manual*.

While the Lightning eMotors vehicle has fewer components that require maintenance than a conventional internal combustion engine vehicle, close adherence to the maintenance schedule below ensures the reliability of your vehicle and result in the lowest possible total cost of ownership.



HIGH VOLTAGE

Only qualified technicians trained to service the Lightning eMotors vehicle can perform maintenance and inspection of the high-voltage system.
Contact the Supervisor or Service Provider for information.

Touching or servicing any vehicle systems without proper training, or without heeding the proper safety precautions, may result in serious injury, death, or damage to equipment or property.

Weekly Maintenance

General Safety Checks

EVERY WEEK	DONE	EVERY WEEK	DONE
Verify the functionality of interior and exterior lights	☐	Inspect suspension and framework for damage, cracks or leaks	☐
Inspect low-voltage battery performance	☐	Inspect steering and linkage system	☐
Activate and inspect exterior lamps and hazard warning lights for correct operation	☐	Inspect tire tread wear and correct pressure if needed	☐
Verify horn operation	☐	Check windshield for cracks, chips, or pits	☐
Check windshield washer spray and wiper operation and replace blades as needed	☐	HV and LV harnesses for wear and securement	
Check the following fluid levels, and fill if low: Brakes Coolant reservoir Power steering Windshield washer	☐ ☐ ☐ ☐	Check the following for cracks/leaks/damage: Transmission Radiator A/C hoses Heater	☐ ☐ ☐ ☐

Semiannual Maintenance

General Safety checks

EVERY SIX MONTHS	DONE
Inspect low-voltage battery terminals and clean if necessary	☐
Perform low-voltage load test	☐
Inspect body/door drains and clear obstructions if necessary	☐
Inspect coolant system fluid level and check coolant protection level (strength)	☐
Inspect all weather-stripping for wear and lubricate as needed	☐
Verify parking brake operates correctly	☐
Inspect seatbelts and seat latches for wear and functions	☐
Inspect framework and chassis components for wear, cracking, fatigue, movement, rust/corrosion or other.	☐
Verify that all safety warning lamps are operational: Brake ABS (Anti-Lock Brake System) Airbag Seatbelt	☐

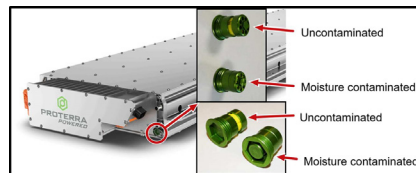
Service Intervals

Inspect the Lightning eMotors vehicle at regular intervals as specified below to keep the vehicle and its systems in good working order.

Inspecting the various systems on the vehicle can help identify potential issues and prevent problems that are more serious.

	INTERVAL (MILES)	ALTERNATIVE INTERVAL
MULTI-POINT LIGHTNING EMOTORS INSPECTION*	Every 10,000 miles	Every six (6) months
COOLANT REPLACEMENT	First replace at 150,000 miles. Next replacement after 50,000 miles or three (3) years following the last replacement.	
TRANSMISSION FLUID REPLACEMENT	Replace every 60,000 miles.	
PROTERRA BATTERY DESICCANT REPLACEMENT	Annually or when moisture contamination is indicated (as shown below).	

*For additional information, please email support@lightningemotors.com or call 970-744-4926.



System Fluid Levels and Specifications

2022-2023 GM4500	Transmission Oil (Oberanger)	Powertrain Coolant Oil	Refrigerant	Coolant/ Antifreeze	Power Steering Fluid	A/C Compressor Oil (Mitsubishi - cabin/battery)
Specification	Mobil Delvac 1 Gear Oil 75W-90	Dexron VI	R-134a	Dex-Cool coolant GM Spec 6277M"	Mercon LV	GM - 88862657
Approximate Qty.	0.5L	~4 qt.	2.54 lbs	~8 Gal. 50/50 Mix	~2 qt.	2.51 oz. (6.6 oz. System Total)

Battery Replacement and Battery Returns



HIGH VOLTAGE

Only qualified technicians trained to service the Lightning eMotors vehicle can perform maintenance and inspection of the high-voltage system.
Contact the Supervisor or Service Provider for information.

Touching or servicing any vehicle systems without proper training, or without heeding the proper safety precautions, may result in serious injury, death, or damage to equipment or property.

NEVER attempt to service the pack internals

**** If disposal of the pack is required, contact Lightning eMotors****

The pack is designed for IP67 rating. This means no high-pressure/steam jet cleaning of the pack and its surroundings is allowed.

The pack must not be submerged in water without all the connections complete.

If Battery Pack replacement is required, contact Lightning eMotors.

All used Batteries must be returned to Lightning eMotors.

Please contact Lightning eMotors to coordinate Battery replacement and returns.

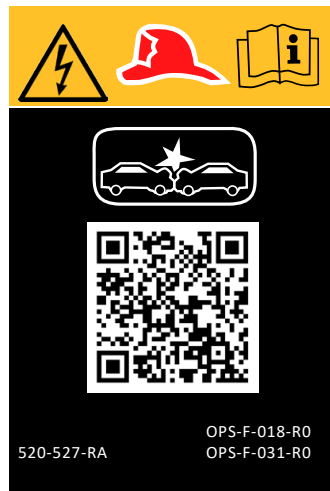
Lightning eMotors
815 14th Street SW
Loveland, CO 80537
(970) 744-4926

For more current vehicle service locations please contact Lightning at +1 (970) 744-4926 or support@lightningemotors.com.

**INFORMATION**

For Customer Support, email support@lightningmotors.com or call (970) 744-4926.
To submit a support ticket, please visit <https://lightningmotors.com/support-request/>

NOTES:



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2023

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