WA Technology

E-Ray 12 Volt Lithium Ion Battery

- *When is a Charger Required ?*
- *Type of Charger Needed ?*

When E-Ray's Lithium Ion Battery Needs Charging:

When the first 2024 MY (Model Year) Owner's Manual was released in July 2023 it had two confusing statements. One said if the EV battery was low, it needed to be plugged into a charger! There is no such plug or charger or way to do that! That statement was removed from subsequent 2024 Owner's Manuals.

The other stated if the car was "stored" for over a week either disconnect battery negative cable and unique to E-Ray Controller Area Connecting Network (CAN) signal connecters or plug in a Maintenance Charger. BUT why after a week when Lithium Ion batteries can handle a longer storage time then Lead Acid batteries? Gee, are those special CAN connectors involved with draining the battery? In the Jay Leno E-Ray video with Tadge Juechter (*Executive Chief Corvette Engineer at the time*) they discussed Lithium Ion batteries. When Jay mentioned his other cars with Lithium Ion 12 volt batteries can go much longer than lead acid batteries without charging, Tadge agreed. When I got my E-Ray in February 2024 the Owner's Manual that came with the car had the *"after 1 week storage use charger statement."* After I could not get an answer thru formal channels, I contacted Tadge Juechter. (*The following Pic shows his email response*.)

Owner's Manual, Page 268: 12-volt Lithium-ion Battery(E-Ray)
When the vehicle is going to be stored for longer than one week a battery maintainer package can be used to keep the battery charged when the vehicle is not in use.
Not what Tadge Juechter said in the Jay Leno E-Ray video so when my E-Ray arrived February 28 contacted him! He wrote:

Hi Jerry,
Our Owner's Manuals are very conservatively written. E-Ray can stand for several weeks easily without a tender. Longer than that, I would put the tender on it. Li batteries are actually better than lead-acid for sit-time. I never bother disconnecting the terminal. Congrats on getting such an early VIN!
Tadge Juechter

GM corrected what appears to have been a misstatement in all MY 2024 Owner's Manuals in the MY 2025 Owner's Manual (see Pic Below.) ***For Li-Ion batteries it now states need a charger if stored for a long time! No mention of "how long."***

2024 Owner's Manual

268 Vehicle Care

12-volt Lithium-ion Battery (E-Ray)

When the vehicle is going to be stored for longer than one week, the 12-volt lithium-ion battery negative and Controller Area Network (CAN) signal connectors should be disconnected to preserve the life of the 12-volt lithium-ion battery. Ensure the signal connector is facing downwards and shielded from direct water exposure to prevent corrosion while disconnected. A battery maintainer package can be used to keep the battery charged when the vehicle is not in use.

2025 Owner's Manual

280 Vehicle Care

12-Volt Lithium-Ion Battery (E-Ray)

Use the Battery Voltage info tile to determine if your battery is low and needs to be charged. See *Instrument Cluster* ➪ *81* under the "Info Tiles" section for more information.

GM recommends charging your 12-volt lithium-ion battery when storing your vehicle for long periods of time. See "Vehicle Storage" later on in this section.

From Page 282 Storage

When storing the vehicle on a long-term basis:

- Attach a compatible battery tender or trickle charger to the 12-volt lithium-ion battery.
- Keep the remote key more than 3 m (10 ft) away from the vehicle.

The 2025 Owner's Manual eliminated the reference to "stored over a week." Also searched and no mention of "Controller Area Network (CAN) or removing the cables (wherever they were!) LOL

Issue Resolved!

Next Issue: *Type of Charger Needed:*

GM Specifies and Sells the Same CTEK Sourced Maintenance Charger for All C8s. MY 2025 GM Charger Instructions State, for Li-Ion and Lead Acid Batteries.

I bought the GM MY 2025 Charger, part # 85530676 from GM Parts Source ShopChevyParts.com for $127 + shipping (MSRP = $175.) ***Details of my tests follow in a Pic/Caption Format. You can scan and read what is important to you.*** **(*I bought Jake floor mats and Red engine cover from ShopChevtParts.com for my 2020 C8. Also Jake Logo weather mats for my E-Ray. Good vendor.*)**

BTW, I bought the GM Spec'd Li-Ion/Lead Acid charger because I decided to use my 10 year old CTEK (*seldom used*) when the 2nd Schumacher charger in 23 years I was using on my Street Rod failed. Bought two microprocessor based chargers (~$60/ea.) that had great specs but both failed within 1 year. Decided another cheap charger was not what I needed!

Routed the charger wires thru a split small hollow tube that is ~5 feet high so I can duck under when needed!

Can A Conventional Lead Acid Battery Be Used?

New Info, NOPE! See GM Tech Link in Appendix, TIP page 17:

TIP: Older unapproved battery maintainers may not provide current as the 12V LiB is normally sitting at 13.3V, and older chargers will not output any current when the voltage appears to be at a fully charged level. As a result, the 12V LiB will drain and the contactors will open during programming when an older legacy battery maintainer is connected.

Note all GM Maintenance Chargers sold from 2020 for C8s are for Li-ion & Lead Acid batteries, as they are labeled!

I drive my E-Ray at least several time a week and usually a 50/60 mile round trip to town. The alternator has more than enough time to charge to the level GM desires. I typically measure 13.3 volts about 85 to 90% capacity. If the car sits for ~4 days the dash gauge reads fully charged 13.3 Volts in ~5 miles.

My E-Ray:

- **Was built February 7th, 2024**
- **Sat on QC Hold with ~100 others (*GM's QA Method To Check For Possible Manufacturing issues that might require modified tooling or training etc at some assembly stations etc.)***
- **Left BG on February 27**
- **At My Dealer Late February 28**

So the battery was sitting for a minimum 20 days after install and some time before it was installed. Thought I should use a charger. It wasn't clear if my old equivalent to GM CTEK built charger would work. I bought my Model 3300 CTEK charger in 2013 for my C7. Plugged into my E-Ray after measuring the battery voltage at 13.2 volts. It indicated Fully Charged in seconds. Tried one other time with the same result. . I and some others who have posted on Forums INCORRECTLY thought the old charger might work. Since the E-Ray alternator charges the Li-Ion 12 volt battery to 13.3 volts when I plugged my 2014 CTEK Charger similar to what GM sold that year it instantly showed filly charge. Yep since 100% charger on a Lead Acid battery is ~12.9 volts, logical. MISTAKENLY thought IF the Li-Ion battery dropped to 12.9 volts it would charge. BUT as the TechLink Top says, nope battery contactors will OPEN when the old charger is connected.

Had driven my E-Ray home ~50 miles from the dealer. The LT2 alternator charges the battery to ~13.3 Volts, which is above the voltage that would cause my Model 3300 lead acid battery charger was seeing 13.3 volts when it was connected and lit the fully charged LED.

Should A CTEK (or Other Brand) Dedicated Lithium Ion Battery Charger Be Used?

This was posted as received from CTEK to the question:

Lithium-ion is a general term used for many types of lithium batteries including Li-FePO4, Li-Fe, Li-iron and LFP type batteries our Lithium Charger, will work fine on your E-Ray 12V lithium battery. It has 8 Step Cycles

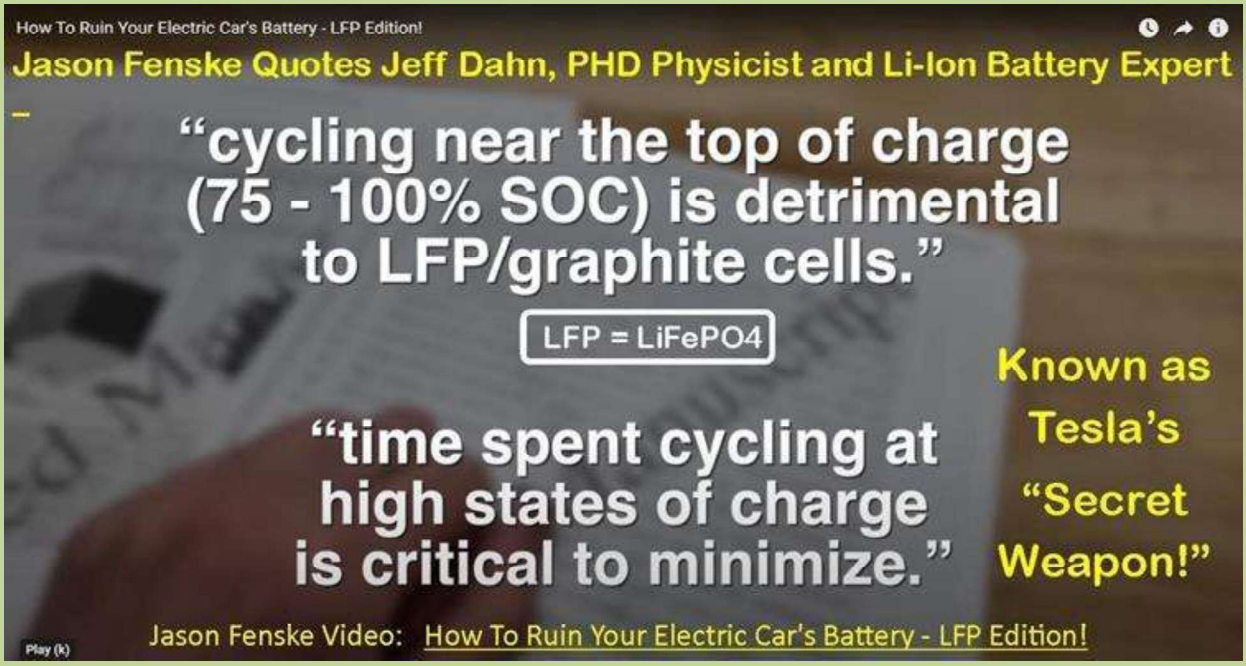
1 STEP- ACCEPT Tests if the battery can accept charge. This step prevents charging from proceeding on a defective battery.
2 STEP -BULK Charging with maximum current until about 90% battery capacity.
3 STEP -ABSORPTION Charging with declining current up to 95% battery capacity.
4 STEP -ANALYZE Tests if the battery can hold charge. Batteries that cannot hold charge may need to be replaced.
5 STEP -COMPLETION Final charge with reduced current up to approximately 98% battery capacity.
6 STEP -MAXIMIZATION Final charge with maximum voltage up to 100% battery capacity. ***(My Note: Does GM want the battery charged to this higher voltage? Also will the Li-Ion Battery Management Control, BMC, allow the battery to be charged at the higher level?***
7 STEP -FLOAT Maintaining the battery voltage at maximum level by providing a constant voltage charge.
8 STEP -PULSE Maintaining the battery at 95–100% capacity. The charger monitors the battery voltage and gives a pulse when necessary to keep the battery fully charged.

They Added: *Another option is our client-branded Corvette charger that is both 12V lead-acid and lithium compatible (Lithium-ion (Li-FePO4, Li-Fe, Li-iron, LFP type). For more information on the GM Corvette charger please contact your local dealership*

There is some additional Technical Information that Cautions charging to 100% other than perhaps once a month! It is discussed in detail in a video by Jason Fenske (Engineering Explained.) An expert in mechanical car issues and ICEs, Jason is gaining an understanding of EV's and the technical questions centered around their batteries. He notes he has read many tech papers on the subject.

This is one of his several Video's, this one related to LiFePO4 batteries:
https://www.youtube.com/watch?v=w1zKfIQUQ-s&t=1s

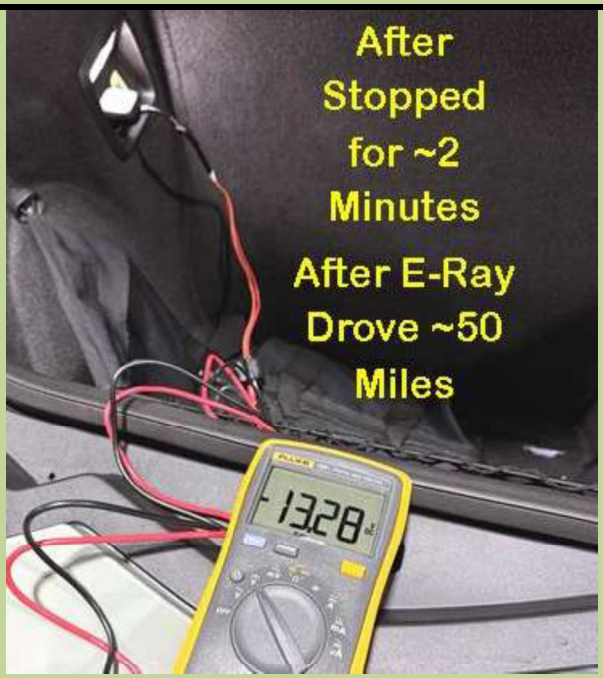
This is a Pic From The Video To Which I Added Info: (See Appendix Page 14)

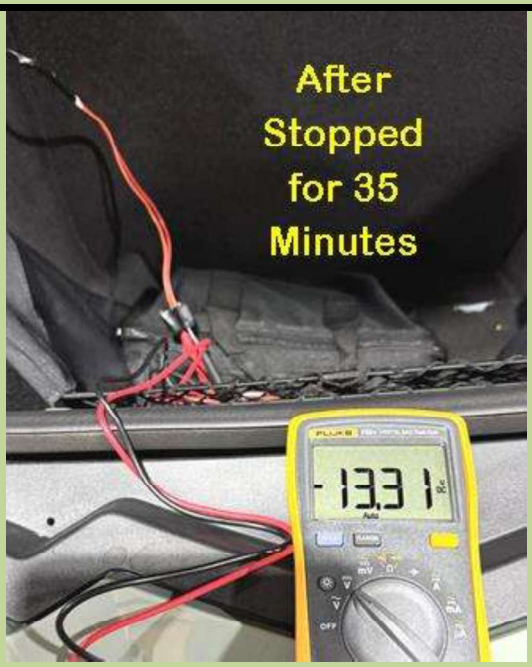


PIC/Caption Test Info

Before I installed the GM Spec'd and Sold E-Ray Charger, I made a battery voltage measurement. Had just finished a ~50 mile roundtrip drive to town. The LT2 alternator charges the battery when engine is running.

For fun, checked after I stopped before ~2 minutes as there is a higher parasitic current draw until the battery saver circuits fully activate. The Frunk light goes off in less than 10 minutes but some other circuits may still be active up to ~20 minutes. Note the Frunk light is lite in this Pic..



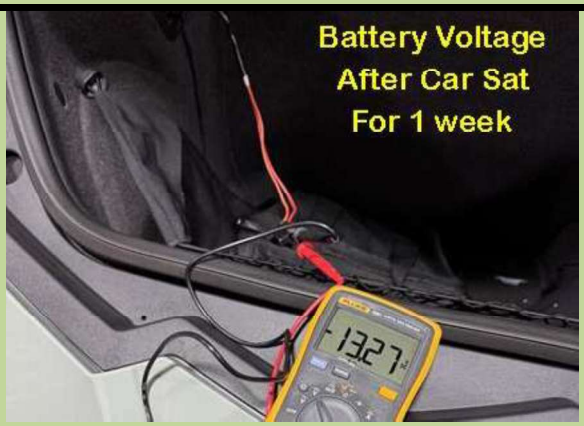


By 35 minutes all parasitic current draw is at its low level. Not sure what that level is for the E-Ray but Andybump measured >10 milliamps after ~15 minutes for his C8. That is very low. Equivalent to a 0.12 Watt Bulb!

So with whatever parasitic current was flowing at 2 minutes caused the battery voltage to be 0.03 volts lower that with the low parasitic current draw at 35 minutes. Therefore the base starting voltage would be ~13.3 *IF the charger was installed at that time.*

But after 1 hr 15 minutes it had not reached to 100% charge and I did not have the time to wait.

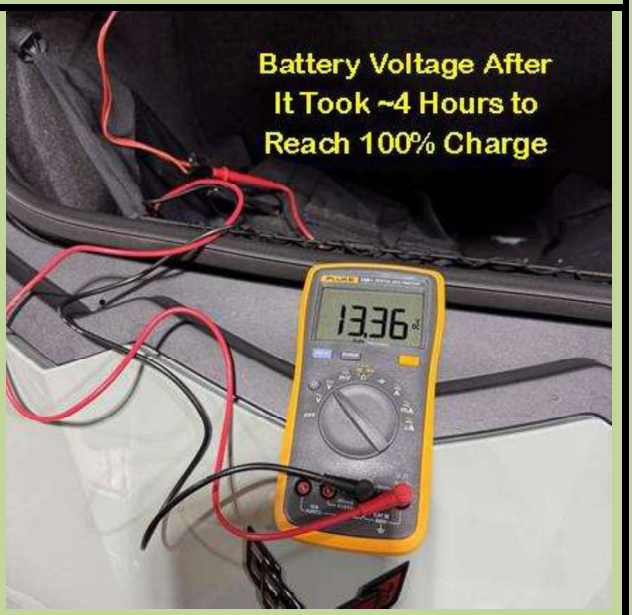
Was out of town for a week and prior to leaving had no time to wait and see the max charge. So when I returned home and plugged in the charger, the voltage at start was 13.27. So in that week battery voltage reduced from ~13.31 to 13.27. Therefore the battery voltage dropped 0.04 volts.



After installing the GM MY 2025 charger, within seconds it showed what the instructions say is 80% charged LED. As expected looking at the capacity versus voltage table for LiFePO4 battery in the appendix. 80% capacity is at about the measured 13.27 volts.

But as some Internet info suggests, charge significantly slows when past 80%. It too ~4 hrs to reach what the instructions label 100% charge. BTW Jason Fenske's video shows why with a parking lot analogy!

About 30 minutes after the charger reached 100% it was removed with the parasitic current draw at a low level, the Battery Voltage 13.36. That is significantly below the 14.4 volts a Li-Ion battery can be charged. The Capacity Vs Voltage table in the appendix shows it could be called ~99% but that is before the voltage/capacity curve takes a sharp turn upward . It shows max voltage at 100% capacity can be 14.4 volts.



An internet discussion re measuring Li-Ion battery voltages states, quoting:

"Voltage: ***The higher the battery voltage, the fuller the battery is. In order to get accurate results, you must keep the battery at rest for at least four hours before measuring. Some manufacturers even recommend around 24 hours of rest.***

So after 24 hours from being charged to 100% with the GM Spec'd Charger it shows13.30. That is what it is when the LT2 alternator charges the battery. Using the table in the appendix that is ~90% charge.

What About Using and Older Model CTEK Charger? Or my equivalent 10 year old CTEK Model 3300?

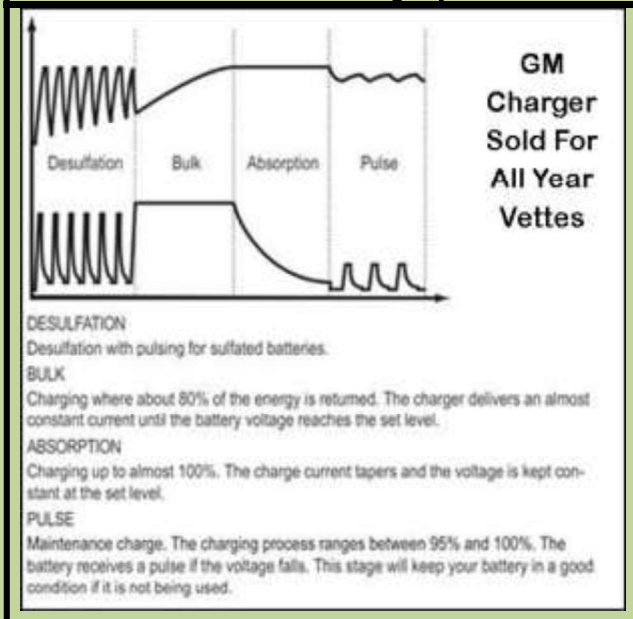
When I used my old CTEK Madel 3300 on my E-Ray, within seconds it showed Green Fully Charged.

Myself and other who posted thought it might work! NOT!

See TIP on top of mage 3 from 5 page GM Tech Link in Appendix states:

Older unapproved battery maintainers may not provide current as the 12V LiB normally sitting at 13.3V,. If legacy battery maintainers are installed internal connections may open.

In 6 page GM Tech Talk in Appendix it warns about using as they cll them old legacy lead Acid battery GM Chargers and it would appear others. The E-Ray BMC may block their use!

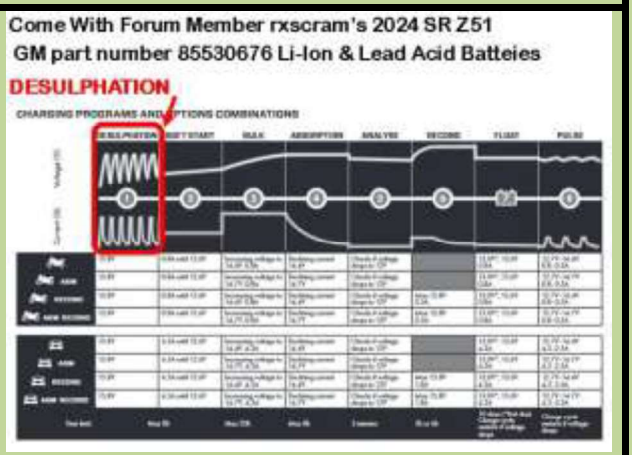


CAUTION: Li-Ion chargers should NOT HAVE a Desulphation cycle. Found, CTEK method of operation prevents Desulphation cycle being used (full details in appendix.)

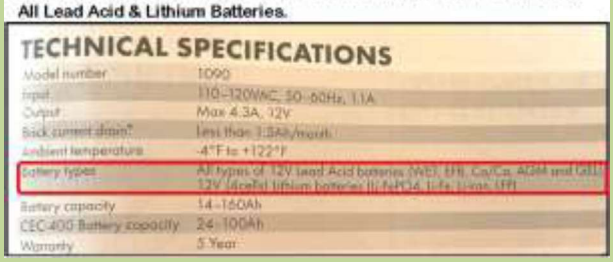
- *CTEK Desulphation is accomplished if needed by* ***sensing if the lead acid battery is sulfated*** ***by measuring the internal resistance.***
- *A sulphated lead acid battery has a high internal resistance;*
- ***A Li-ion battery has low resistance***
- *The Desulphation Cycle is bypassed if not need.*

Even better that my "deduction" of no issue that the CTEK Desulphation Cycle is skipped is this Pic on right posted by Forum Member *rxscram. It is from his* 2024 Corvette charger that shows the charge cycles and is for the combo Li-Ion/Lead Acid charger. It shows that, like most CTEK charges, the first Cycle is Desulphation. Therefore NOT a problem as this charger if usable for Li-Ion batteries.

My deduction using Google answers concluding it skips Desulphation if the measured resistance is low, as it is in Li-Ion batteries.



Forum Member Andybump's 2021 Corvette Charger ALSO States For: All Lead Acid & Lithium Batteries.



The highlighted area states All Types of Lead Acid and Lithium Batteries. As Andy notes even though there was no E-Ray in 2021. GM knew it was coming and specified that requirement to CTEK!

In addition, Member Andybump's 2021 Corvette Logo Charger states it is for Li-Ion and Lead Acid batteries.

My 2013 CTEK Model 3300 equivalent to the Corvette Logo charger states it's for Lead Acid batteries. Because my E-Ray battery was at the alternator set 13.3 volts it showed Green Fully Charged in seconds. The battery would probably have to be below 13.0 volts for it to start charging. That is only ~30% charged BUT more than enough to start the E-Ray. The alternator would then charge to 13.3!

Bottom Line: Is an Older GM CTEK Charger Acceptable?

GM says in the 5-page Teck Link presented in full in the Appendix:

TIP: Older unapproved battery maintainers may not provide current as the 12V LiB is normally sitting at 13.3V, and the contactors will open during programming when an older legacy battery maintainer is connected Allowing theLi-Ion battery to drain!

CTEK 56-926 Lithium with 12 volt Plug for Frunk Receptacle

Is the CTEK (Or Other) Dedicated Li-Ion Charger Acceptable to Use?

No guidance from GM who may just say we have specified what we and the battery manufacture agreed is the optimum an don't test other chargers.

It may be OK although long use at that higher voltage may reduce battery life. That is an issue for Hybrid and EV batteries but the 12 volt battery is relatively low cost to replace in the E-Ray compared to an EV battery even if the life is reduced somewhat.

Dedicated Li-Ion charger with required end plug for E-ray may cost more than GM Sold charger from a GM parts discounter as the one left on Amazon.

Another Issue For Those Who Hae Not Accessed The Battery:

How To Remove The Plastic Frunk Covers

I removed the three plastic covers on my 2020 C8 a number of times. But when looking for any information printed on the E-Ray Lithium Ion battery, such as is it a LiFePO4 type, I removed the Frunk Plastic covers.

When putting the rear panel back, one of the two Yellow Plastic fasteners that hold the front of the rear ,panel came out of its holding slot. It fell into an opening down to the bottom and may still be sitting on an aero panel. I tried braking hard to see if I could have, by inertia, it move and fall thru a side opening. No luck. So bought a new one.

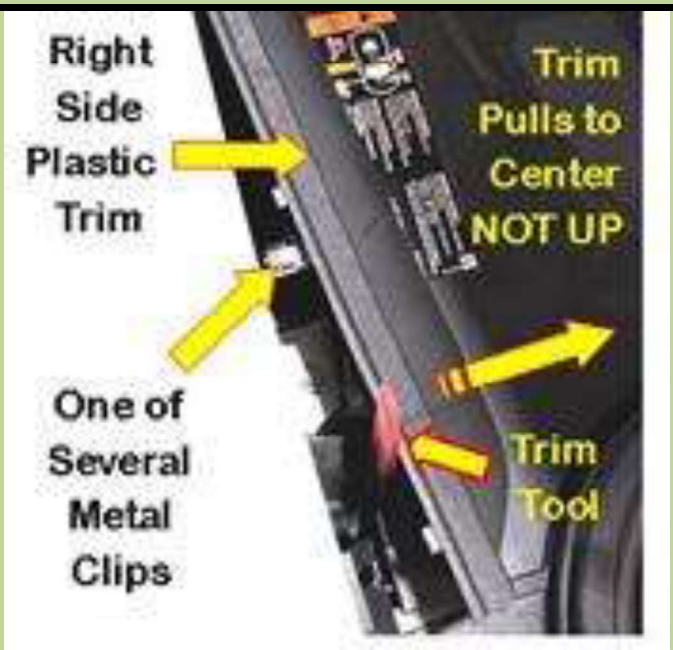
The following is a pic sequence of removing the Frunk Plastic Covers. With "Cautions" and how to assure you won't lose a Yellow Plastic Panel Fastener!

The Frunk has 3 Plastic Covers that must be removed to access the battery as well as the Lift Reservoir. The two side plastic covers must be removed 1st. Then the rear panel covering the battery, lift reservoir fill cap etc. can be removed.

With my 2020 C8 was able to remove the plastic covers with my hands, which IMO was saver. But for the E-Ray, need plastic Trim Tools to leverage the clips that hold the sides off.

You must be careful and ONLY leverage in the correct direction.

Note in Pic is the purchased yellow plastic clip that fell out of its holder and may still be sitting on a lower aero panel! LOL



The key point in removing the side panels is they DO NOT clip to the bottom. They must move toward the center of the car, as noted with arrows. The metal clips are tight. Best to start in the front and using two trim tools work backward.

Be careful as you move back as there is a thin section, don't break!

One clip is behind the hood hinge. You can remove it with your fingers.

The thin sections of the sides will bend but be careful when removing, don't break.

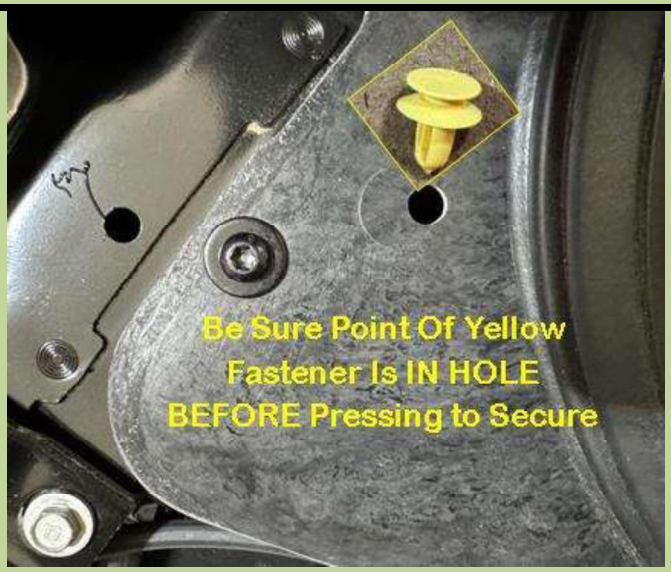
When reinstalling, start from the front and note the upper part fits under the sheet metal, Can pull up and pull into the fender with your fingers.

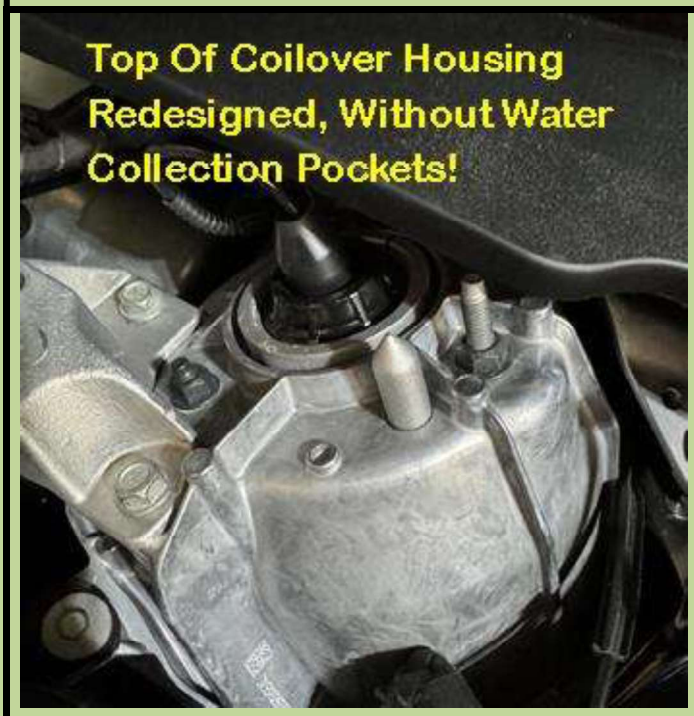
This is the underside of the rear panel. As noted there are two yellow plastic fasteners that hold the front in hole in a lower pane;. These clips are pulled out first. Best done using your fingers under the rear panel front sides.

This is the Lithium Battery. All I found were GM numbers. Perhaps some info is under the metal battery holder but did not bother to remove it.

When reinstalling the rear panel, insert the rear clips first. Have to hold it at a ~45 degree angle to slip it under the metal lip.

After the rear clips are in their respective slots BEFORE to press down the front two side where the Yellow Clips are located, BE SURE THE POINTED TIPS are in the holes where they fit. Once both tips are in, press down to fasten.





Of side interest. My 2020 C8 had pockets that could hold water around the upper coilover bolts that could cause rust. I installed aftermarket "Tower Covers."
The E-Ray design is different. There are no pockets and any water that enters from the windshield wiper area will just drain below.

Bottom Line

IMO safest to use what GM has defined no doubt with the Li-Ion battery manufacturer that is also compatible with the Battery Management Control BMC.) Like all Li-Ion batteries it has a BMC that controls things like charging, Min and Max voltages, balancing cells etc. Some are part of the car. There are no visible BMC on the battery as some that are sold where you can adjust charging parameters. With the E-Ray Li-Ion battery and GM sold charger those parameters are fixed.

APPENDIX

Lithium-Ion Battery info:

LiFe04 Voltage to SOC at rest

SOC; State of Charge

Voltage	Capacity
14.4V	100%
13.6V	100%
13.4V	99%
13.3V	90%
13.2V	70%
13.1V	40%
13.0V	30%
12.9V	20%
12.8V	17%
12.5V	14%
12.0v	9%
10.0v	0%

This is a Chart Showing lithium battery capacity versus voltage. It is a very flat curve except at the high and low extremes. So, the typical voltage reading I have made showing from 13.2 to 13.3 volts means the battery was between 70 to 90% charged.

Since it is such a flat voltage/capacity curve, judging capacity by voltage measurement is not the best method but gives an indication. It also has significant implications if charging with a CTEK designed for lead acid batteries like my ~10-year-old Model 3300 and probably older GM chargers designed for lead acid batteries. They typically charge to about 12.9 volts. That would be sufficient to start the car and allow the alternator to charge to the GM designed level of ~13.3 volts.

Other Internet Info RE Li-Ion Batteries

These are the questions I asked and Google answered:

My Question: When does a CTEK Charger start the Desulphation Cycle?
Google Answer: *Desulfation is accomplished at the very first stage of charging* ***if it is needed with a CTEK charger. If it is not needed it bypasses this stage of charging. It senses if the battery is sulfated by measuring the internal resistance of the battery."***

My Question: Does a sulfated battery have a high internal resistance?
Google Answer: *Yes, a sulfated lead acid battery has a high internal resistance; when a lead acid battery becomes sulfated, the sulfate crystals that form on the plates create a non-conductive barrier, significantly increasing the battery's internal resistance and hindering its ability to deliver current effectively.*

My Question: Does a Li-Ion Have the same internal resistance as a lead acid battery
Google Answer: No, a lithium-ion battery typically has a significantly lower

internal resistance compared to a lead-acid battery; meaning a Li-ion battery offers less resistance to current flow, allowing for faster charging and discharge rates with less energy loss as heat.

Bottom Line: **We don't know why GM may NOT WANT that higher Li-Ion battery charger voltage. Perhaps it is a reason I searched and found it provides for better battery life. In addition, Li-Ion battery manufacturers who are NOT PUSHING their own chargers state similar to this Quote:**

NOTE: *This generic Li-Ion charger statement shows they can charge from 14.4 to 14.8 volts. The GM Tech Link re the E-Ray battery states:* ***TIP: The 12 V LiB may be damaged if charged to more than 14.5 volts. This is some additional info from that GM TechLink:***

The 12V lithium-ion battery is charged by the K1 14V Power Module while the vehicle is operating in the EV modes (Stealth and Shuttle modes). Once the vehicle exits an EV mode and the engine is powering the vehicle, the generator (LT2 alternator) takes over 12V LiB charging.

The 12V LiB has an internal set of contactors that will open if voltage, current or temperature reach a critical state. Contactor self-tests run every time the vehicle is powered down and, once the self-tests begin, are completed within 5 seconds. It may be possible to hear the contactors opening and closing. The battery communicates via CAN to the K9 Body Control Module (BCM) to provide status and DTCs.

The TechLink also notes it has circuits to protect the battery:

Voltage – *In an over-voltage condition, the relay will open in any cell that exceeds 4.0 volts, which can be expected when the battery is charged above 15 volts. The relay will close once voltage is below 15 volts.*

Under Voltage – *In an under-voltage condition, the relay will open if any cell drops below 2.5 volts, which may occur when the battery is discharged below 11 volts. The relay can be closed under normal conditions by charging the battery using the EL-52800 E-XTEQ Diagnostic Charge Battery Station (DCBS) or an approved charger in power supply mode.*

Severe Discharge – *If the battery is severely discharged — any cell drops to 1.5 volts — it will set a critical low voltage and end of life fault and the relay will not close again.*

Over Current – *If there is an over-current condition, such as an external short circuit, the relay will open if current exceeds 2,000 amps. The relay can be closed under normal conditions by charging the battery using an approved charger in power supply mode.*

Over Temperature – *The relay will open if there is an over-temperature condition where the internal temperature exceeds 185°F (85°C). The relay will close once the temperature drops below 176°F (80°C).*

Here are some Internet comments about charging a Li Ion car battery to 80 to 85% versus 100%

> Charging a lithium-ion (Li-ion) car battery to 80–85% instead of 100% can help - improve the battery's long-term health and efficiency:

> Battery degradation: Charging a Li-ion battery to 100% regularly can cause it to degrade faster. This is because the high voltage needed to maintain a full charge can stress the battery's chemistry.

> Charging rates: Charging rates slow down significantly after 80%.

>Battery efficiency: Li-ion batteries are most efficient when operating between 20–80%.

>While it's safe to charge to 100% when needed, like for a long journey, it's best to avoid doing so regularly.

The Above General Statements are Supported by Extensive Testing Summarized by Jason Fenske in This Video:

https://www.youtube.com/watch?v=w1zKfIQUQ-s&t=1s

For EVs it suggested charging to 100% about once/month. That recalibrates the method used to define and display capacity or battery miles left to drive. Important for HEV's and very important for EVs. As noted, the flat volts versus battery capacity curve makes defining an accurate battery capacity with voltage measurement difficult. Jason says to get accurate values; they count elections coming in from charging and out.

However, over time that measurement becomes inaccurate. Assume they are measuring and counting amps in and out. So, it needs to be recalibrated and the high voltage at the curve end clearly defines 100%. But for the same amount of battery energy storage, it takes more energy and is harder on the battery to say charge from 75 to 100% than from say 0 to 25%. Same amount of energy storage but it requires more effort. Jason equates that to filling an empty parking lot from 0 to 25% where there are many open spaces compared to 75 to 100% where it takes effort to find empty spaces.

Frankly my interest is more for our PHEV BMW SUV and to some degree the E-Ray EV battery than the 12 Volt Li-Ion battery. But thought some might be interested. Yep will have to switch from a gearhead to one filled with electrons! LOL

This is a GM Tech Link with Li-Ion Checking Details and Info

Corvette E-Ray 12-Volt Lithium-Ion Battery

April 30, 2024 Updated October 3, 2024

The 2024 Corvette E-Ray uses two lithium-ion batteries — one for high-voltage functions with the front electric axle and one for low-voltage operations that replaces the traditional lead-acid 12V battery. (Fig. 8)

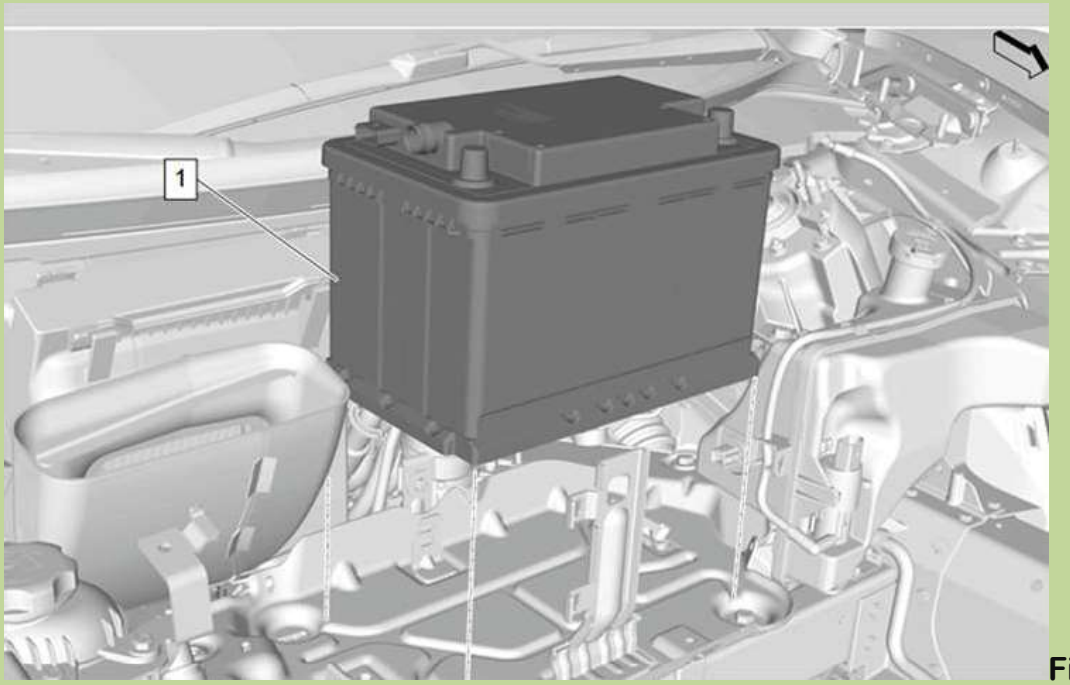


Fig. 8

While other Corvette models have 12V flooded lead-acid batteries, the 12V lithium-ion battery in the E-Ray, also known as the 12V LiB, enables the 6.2L V8 (RPO LT2) to perform a flying start when exiting Stealth mode while driving.

The 12V lithium-ion battery is charged by the K1 14V Power Module while the vehicle is operating in the EV modes (Stealth and Shuttle modes). Once the vehicle exits an EV mode and the engine is powering the vehicle, the generator takes over 12V LiB charging. (Note: I inserted Pic of 300 V DC to 12 V DC converter.)

Battery Contactors

The 12V LiB has an internal set of contactors that will open if voltage, current or temperature reach a critical state. The voltage curve is not the same as a lead-acid (PbA) 12V battery.

Contactor self-tests run every time the vehicle is powered down and, once the self-tests begin, are completed within 5 seconds. It may be possible to hear the contactors opening and closing. The battery communicates via CAN to the K9 Body Control Module (BCM) to provide status and DTCs. 12V battery voltage is displayed on the instrument cluster. (Fig. 9) GDS2 can be used to read scan tool information directly from the 12V LiB under the K244 Battery Management Control Module.

Fig. 9

Over Voltage – In an over-voltage condition, the relay will open in any cell that exceeds 4.0 volts, which can be expected when the battery is charged above 15 volts. The relay will close once voltage is below 15 volts.

Under Voltage – In an under-voltage condition, the relay will open if any cell drops below 2.5 volts, which may occur when the battery is discharged below 11 volts. The relay can be closed under normal conditions by charging the battery using the EL-52800 E-XTEQ Diagnostic Charge Battery Station (DCBS) or an approved charger in power supply mode.

Severe Discharge – If the battery is severely discharged — any cell drops to 1.5 volts — it will set a critical low voltage and end of life fault and the relay will not close again.

Over Current – If there is an over-current condition, such as an external short circuit, the relay will open if current exceeds 2,000 amps. The relay can be closed under normal conditions by charging the battery using an approved charger in power supply mode.

Over Temperature – The relay will open if there is an over-temperature condition where the internal temperature exceeds 185°F (85°C). The relay will close once the temperature drops below 176°F (80°C).

The lithium-ion battery will not decay like a lead-acid battery. The battery health will fall off sharply; it will never provide a slow crank. The contactors inside the battery provide protection to the battery and, if the battery fails, it may be due to the contactors not allowing power to the posts, resulting in the battery to appear to be completely dead.

The 12V LiB also has an internal control module (K244 Battery Management Control Module), which can be programmed with SPS and has data available to view in GDS2. The K244 Battery Management Control Module should not be confused with the K16 Battery Energy Control Module, which is strictly for the high-voltage battery.

SPS Programming

Stable battery voltage is critical during programming. Any fluctuation, spiking, over voltage or loss of voltage will interrupt programming. Install an approved battery maintainer or power supply that provides a steady and stable voltage to support the 12V system during SPS programming events.

TIP: Older unapproved battery maintainers may not provide current as the 12V LiB is normally sitting at 13.3V, and older chargers will not output any current when the voltage appears to be at a fully charged level. As a result, the 12V LiB will drain and the contactors will open during programming when an older legacy battery maintainer is connected.

The following tools are approved to provide a steady power supply while performing programming on the E-Ray. Older tools or unapproved tools, which may not keep current flow at a proper level during programming, should NOT be

used.

MTRMSP0702GM – Midtronics MSP-070 Power Supply Charger with 2-Meter Charge Cable

MTRMSP0703GM – Midtronics MSP-070 Power Supply Charger with 3-Meter Charge Cable

MTRMSP0705GM – Midtronics MSP-070 Power Supply Charger with 5-Meter Charge Cable

XTQEZ0179B – E-XTEQ 512EVO Battery Charger/Maintainer

XTQEZ0179BX2 – E-XTEQ 512EVO Battery Charger/Maintainer (Quantity: 2)

XTQEZ0179BX3 – E-XTEQ 512EVO Battery Charger/Maintainer (Quantity: 3)

XTQEXBC1012-001-G – E-XTEQ BC1012 12V/100A Diagnostic Charger/Maintainer

XTQEXBC1012-001-GX2 – E-XTEQ BC1012 12V/100A Diagnostic Charger/Maintainer (Quantity: 2)

ESS6100 – Associated Equipment 100A Reflash Power Supply Charger

IBC6008MSK – Associated Equipment 70A Intellamatic Smart Charger/Analyzer

IBC6008 – Associated Equipment 70A Intellamatic Smart Battery Charger with Power Supply

ESS6008MSK – Associated Equipment 70A Intellamatic Smart Wheel Charger

ESS6008 – Associated Equipment 70A Charger with Power Supply

Battery Testing and Charging

Currently, GM does not offer an external testing method for the 12V lithium-ion battery. Do not use the EL-52800 E-XTEQ Diagnostic Charge Battery Station (DCBS) or EL-50313 Midtronics GR8 Battery Tester/Charger to perform a load test. However, these tools may be used to charge the 12V LiB. Be sure to use the proper settings on both tools to charge the 12V LiB.

Use the scan tool — Battery Management Control Module – Battery State of Charge to determine the battery's state of charge.

TIP: The 12 V LiB may be damaged if charged to more than 14.5 volts.

When using the DCBS, select “Charging,” “manual battery selection”, and then “Lithium” when setting up the charger. If the contactors are open, the tool will automatically detect no power and ask for confirmation. Once confirmed, the DCBS will energize the battery to close the contactors.

Refer to Bulletin #23-NA-055 for additional information and FAQs regarding using the DCBS.

When using the GR8, select “Charging,” “PDI”, and “In Vehicle” when setting up the charger. If the contactors are open, select “power supply mode,” set the max voltage to 14.5V and allow the battery to charge for several minutes before going to a normal charge mode.

Battery Replacement

If the 12V lithium-ion battery requires replacement, the vehicle will set DTCs in accordance with emissions regulations. The DTCs should be recorded on the warranty claim.

TIP: Since the 12V LiB is connected to the high-voltage system, the High-Voltage Service Lockout (HVSL) must be engaged before disconnecting the battery negative cable when replacing the battery. (Fig. 10) Engage the HVSL by lifting the red Connector Position Assurance tab and then, while depressing the connector tab, pull apart the connector halves until the indicator tab wording changes from ON to OFF. Place a tie strap or a high-voltage disable padlock through the exposed HVSL hole to prevent improper re-engagement.

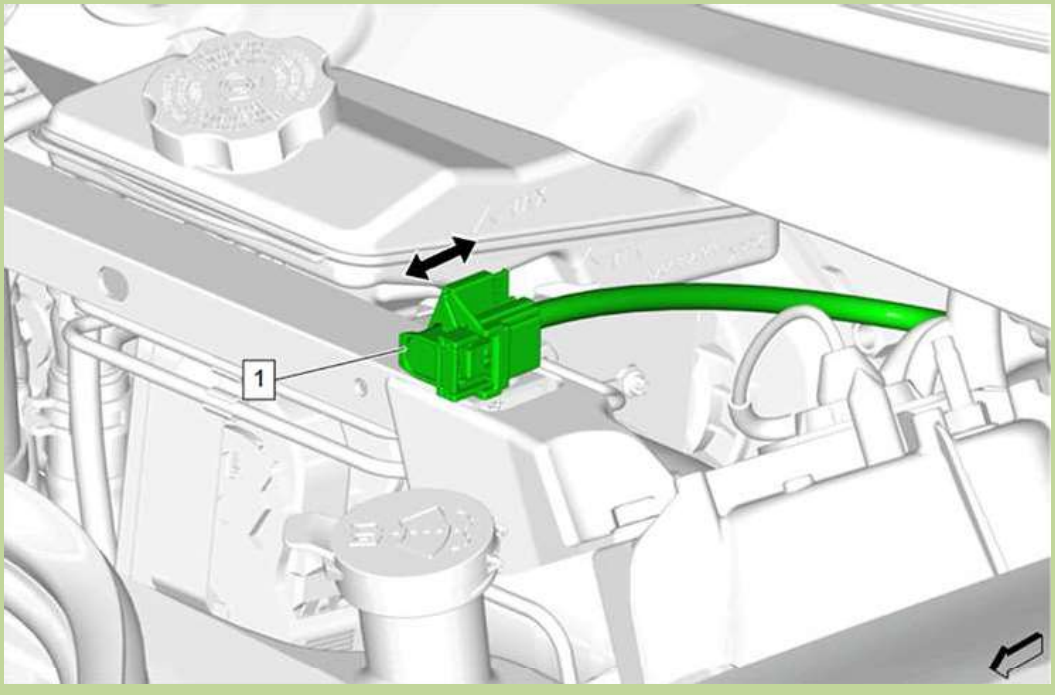


Fig. 10

The 12V LiB should be ordered as a regular service part through EPIC, but there will be a unique return process to be announced soon. Do not send a faulty 12V LiB to your local 12-volt battery recycler, as it is considered hazardous material and must not be mixed with other 12V batteries.

The 12V lithium-ion battery will have two new unique labor codes for warranty. If the traditional labor code for 12V batteries is submitted, the claim will be rejected. The new codes, as of April 1, 2024, are 4041430 – Battery Module Replacement and 404143E – Battery Module Replacement – Emissions. These codes do not require a printed test slip since an external test is not possible.

The appropriate Service Information diagnostics should be followed if an emissions-related fault is the cause of a battery failure. When the 12V LiB reaches its end of life, it will be indicated by the end-of-life parameter in GDS2 as set by the K244 Battery Management Control Module. The Driver Information Center message "Service Charging System Vehicle May Stall" will be displayed in the vehicle without any DTCs set.

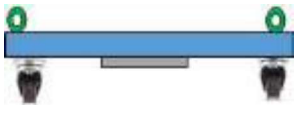
Do not replace a 12V LiB with a lead-acid battery in a customer-pay scenario, as a number of vehicle conditions may occur with the missing control module.

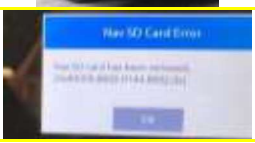
– Thanks to Lane Rezek and Brett Holsworth

"60" E-Ray, C8 Z51, 2017 Grand Sport & 2014 Z51 Stingray Mods or Info Available As PDFs:

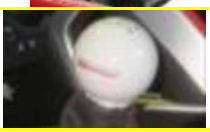
60 PDFs discuss improvements or info about a E-Ray, C8, 2017 Grand Sport, 2014 Z51 Stingray function and/or esthetics. Some are minor and others, like installing "Low Dust Brake Pads" on C8 & C7s, have detailed information.

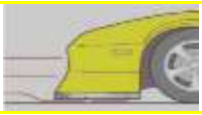
***Below are the PDF's available. Click on picture or Blue PDF link or copy and paste the PDF link (Blue type) into your browser. Or email me at TechSupport@NetWelding.com* and state the title desired, shown in Yellow:**

E-Ray PDI & Info ***Details of My E-Ray PDI*** **http://netwelding.com/E-Ray_PDI.pdf**	
E-Ray 1st Mod ***Details of My E-Ray Cross Brace*** **http://netwelding.com/E-Ray_Mod_1.pdf**	
E-Ray Need Lift? ***Yep, How I Scraped My Front Aero Panel*** **http://netwelding.com/E-Ray_Lift.pdf**	
E-Ray PPF Bottom Of Rocker Panels ***Small Amount of PPF Added To Rocker Panels*** **http://netwelding.com/E-Ray_PPF.pdf**	
E-Ray Tire Slide & Rear Mesh ***Safe way to remove and install wheels*** **http://netwelding.com/E-Ray_Tire_Slide.pdf**	
E-Ray 12 Volt Battery **http://netwelding.com/E-Ray_12_Volt.pdf**	
C8 & E-Ray Brakes ***C8 Brakes Are Anemic Compared to Other MEs*** **http://netwelding.com/C8_Big_Brakes.pdf**	

C8 & E-Ray PDR SD Card Selection ***Things to Consider When Buying SD Card*** **http://netwelding.com/PDR_SD_Card.pdf**	
E-Ray, C8, C7 eLSD vs Positraction ***eLSD is a Modern Dif; Positraction is from 1960s*** **http://netwelding.com/eLSD _VS_Posi.pdf**	
E-Ray, C8 FWD Hybrid ***WFWD Hybrid Provides More Power & MPG*** **http://netwelding.com/C8_FWD_Hybrid.pdf**	
C8 Edge Red Engine Cover ***Engine Cover Matches Valve Cover*** **http://netwelding.com/Engine_Cover.pdf**	
C8 Engine Compartment Lights ***Multicolor Lights Remote operated*** **http://netwelding.com/Engine_Lights.pdf**	
C8 Side Skirts & Splitter ***Install C7 Carbon side skirts & splitter on C8*** **http://netwelding.com/Side_Skirts.pdf**	
C8 Z51, GS/C7 Z51 Ceramic Brake Pads ***Performance Vettes have dusty brakes. These help!*** **http://netwelding.com/Ceramic_Pads.pdf**	
C8 Low Restriction Air Intake ***Low Restriction Air Filter Why & How To*** **http://netwelding.com/C8_Air_Intake.pdf**	
C8 & C7 Splitter & C8 Condenser Mesh ***Mesh Protects AC Condenser & Splitter Install*** **http://netwelding.com/CF_Splitter.pdf**	
C8 NAV SD Card Removed Error ***Error When SD Card and Reader Are Fine*** **http://netwelding.com/NAV_SD_Card.pdf**	
C8/GS/C7 Splash Guards ***GM splash guards. ACS Best Front Guards for GS.*** ***http://netwelding.com/Splash_Guard.pdf***	
Jacking a E-Ray/C8/GS/C7 Vette ***Safely jacking either front only or back & front*** ***http://netwelding.com/Jacking_A_C7.pdf***	
E-Ray, C8 & C7 Plates & Frame; **Must Meet South Carolina Law** **http://netwelding.com/License_Plate_Frame.pdf**	
Change C8/GS/C7 Oil ***WHY change your own oil and C7 Lifting Methods*** **http://netwelding.com/Changing_Oil.pdf**	

E-Ray/C8/GS/C7 Mirror Proximity Alarm *Limit switch alarm warns when close to door frame* http://netwelding.com/Mirror_Proximity_Alarm.pdf	
Jacking Pads for E-Ray/C8/GS/C7 *Manual says Jacking Pads 2 1/2-inch max OD..* http://netwelding.com/Jacking_pads.pdf	
E-Ray/C8/GS/C7 Radar Power *For C7 tapped rear fuse panel. For GS tapped mirror* http://netwelding.com/Radar_Detector_Power.pdf	
E-Ray, C8 & C7 Wheel Chatter/Hop *Why sharp, low speed turns with cold tires causes the front tires to chatter/hop.* *http://netwelding.com/Wheel_Chatter.pdf*	
E-Ray/C8/GS/C7 Wheel Locks *Wheel locks, help protect your expensive wheels.* http://netwelding.com/Wheel_Locks.pdf	
Deer Whistle Installed on E-Ray/C8/GS/C7 *Do they work? Plus Install Info* *http://netwelding.com/Deer_Whistle.pdf*	
C8 & C7 Splitter Protector *Scrape Armor Protection for Splitter* http://netwelding.com/Splitter_Protectors.pdf	
E-Ray, C8 & C7 Cargo Area *Rear cargo area storage device and rear protector* http://netwelding.com/Rear_Cargo_Area.pdf	
C8 Front Coilover Tower Covers *Prevent water from filling Cast aluminum cavities* http://netwelding.com/Tower_Covers.pdf	
C8.R Info & GS Rear Diffuser (Fits Any C7) *Rear Carbon Flash Composite Diffuser* http://netwelding.com/Rear_Diffuser.pdf	
GS/C7 Belt Rattle *Passenger seat belt rattles against the seat back.* http://netwelding.com/Eliminate_Rattle.pdf	
Aluminum C8 & C7 Chassis and Repair *The C7 aluminum chassis. Includes weld repair info.* http://netwelding.com/Aluminum_Chassis.pdf	
Manage GS/C7 Spilled Gas & Door Lock *Protect when filling gas. Preventing door lock failure.* http://netwelding.com/Manage_Spilled_Gas.pdf	
GS/C7 License Plate Light *LED license plate light & cargo area bulbs* http://netwelding.com/License_Plate_Light.pdf	

E-Ray/GS/C7 Door Panel Protector ***Black plastic protector prevents scuffing of door*** **http://netwelding.com/Door_Panel_Protector.pdf**	
GS/C7 Improved Cup Holder ***A solution to the cup holder spilling*** **http://netwelding.com/Improved_cup_Holder.pdf**	
C7 Carbon Fiber Grille Bar ***Install genuine carbon fiber grille bar overlay*** ***http://netwelding.com/CF_Grille_Bar.pdf***	
GS/C7 Blind Spot Mirror ***Smaller rear and side windows cause C7 blind spots.*** **http://netwelding.com/Blind_Spot.pdf**	
GS/C7 Skid Pad Protector ***After the air dam, the aluminum "skid pad" hits*** **http://netwelding.com/Skid_Pad_Protector.pdf**	
GS/C7 OnStar Lights ***Rear view mirror OnStar LED's, at a quick glance, look like a police car flashing light! This is a fix.*** **http://netwelding.com/OnStar_Lights.pdf**	
GS/C7 Skip Shift Eliminator ***Skip Shift Eliminator install*** **http://netwelding.com/Skip_shift_Eliminator.pdf**	
GS/C7 Catch Can & Clean Oil Separator ***What is Coking and how to reduce the potential*** **http://netwelding.com/Catch_Can.pdf**	
GS MGW Flat Stick Shifter ***The MGW shifter shortens throw and is more precise*** **http://netwelding.com/MGW_Shifter.pdf**	
GS/C7 Round Shift Knob ***A round shift knob shortens throw on OEM shifter*** **http://netwelding.com/Shift_Knob.pdf**	
GS/C7 Stingray Sill Plate ***Stingray sill plate replaces original.*** **http://netwelding.com/Sill_Plate.pdf**	
GS/C7 Nylon Bra ***Nylon Bra Stops Bugs. Fits with Stage 3 Winglets*** **http://netwelding.com/Nylon_Bra.pdf**	
GS/C7 Clutch Fluid Change ***Clutch fluid after 3000 miles gets dirty*** **http://netwelding.com/Clutch_Fluid.pdf**	
GS/C7 Cold Air Intake ***Low Restriction Air Filter & Duct*** **http://netwelding.com/Cold_Air_Intake.pdf**	

GS/C7 Soler Modified Throttle Body ***For Improved Throttle Response*** **http://netwelding.com/Soler_Mod_TB.pdf**	
GS Splitter Stage 3 Winglet ***Stage 3 Winglets Integrate with Spats*** **http://netwelding.com/Stage_3_Winglets.pdf**	
C7 Removing GM Plastic Film ***How To Remove The Rocker Panel Film*** **http://netwelding.com/Rocker_Panel_Film.pdf**	
GS 2LT to 2.5 LT ***Red Upper Dash Pad Like 3LT*** **http://netwelding.com/Red_Dash_Pad.pdf**	
Jake Emblem/Decals for GS ***Jake Symbols Support GS Racing Image*** **http://netwelding.com/Jake_Emblems.pdf**	
Rusty GS/C7 Muffler ***Why the C7 muffler rusts way to turn matte black.*** **http://netwelding.com/Muffler_Rust.pdf**	
GS Engine Compartment Mods ***Cosmetic Additions in Engine Compartment*** **http://netwelding.com/Engine_Compartment.pdf**	
Boomy Bass Solution ***Use Presets to Adjust Bass etc. Tone/Balance*** **http://netwelding.com/Boomy_Bass**	
GS/C7 Air Dam, Functions ***Why Missing from Z51, Some GS & Z06*** **http://netwelding.com/Air_Dam.pdf**	
Rusty GS/C7 Muffler ***Why the C7 muffler rusts way to turn matte black.*** **http://netwelding.com/Muffler_Rust.pdf**	
Engineering a ProStreet Rod ***How Our '34 ProStreet Rod Was Designed and Built*** **http://netwelding.com/Engineering%20Street%20Rod%203-08.pdf**	
Motorsports Welding Article ***Wrote Article on NHRA and NASCAR Chassis Design*** **http://netwelding.com/Motorsports_Welding_2018.pdf**	
Write Flyer Build: Fun Winter Project **http://netwelding.com/Wright_Brothers_First_Airplane.pdf**	
Chris Craft Build: Fun Winter Project **http://netwelding.com/Building_Dumas_Chris_Craft_Boat_Model.pdf**