

ETX680-24-TSO Manual

with Instructions for Continued Airworthiness

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Revision Log

Rev	Description	Date	Approved By:
New	Created New	9/16/2023	Nicoson
A	Revised per FAA comments (ref. 773-24-00018), and subsequent FAA OMT comments.	3/6/2024	Nicoson
B	p. 9: “AC 43.13-1B” was “AC 43.13-2B”. p. 11: Added placard part number and larger image of placard. p. 16: Added figure 10 to show battery top label. p. 18: Clarified over-discharge disconnect.	5/1/2024	Nicoson
C	p. 8; Section Installation, Install Requirements. Removed Note – <i>“Note: Aircraft certificated in the Utility Category are not eligible for this installation.”</i>	6/10/2024	Nicoson
D	Clarified Titles, removed initial installation discussion.	7/11/2024	Nicoson
E	Added Appendices for aircraft installation details	6/30/2025	Nicoson
E1	Updates per AED comments	3/13/2026	Nicoson
F	Revised the Appendices for additional aircraft	4/7/2026	Nicoson
F1	Revised the Appendices	9/18/2026	Nicoson

ICON KEY

 Valuable information

 Caution

 Warning

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Airworthiness Limitations

The Airworthiness Limitations section is FAA approved and specifies maintenance required under Secs. 43.16 and 91.403 of Title 14 of the Code of Federal Regulations unless an alternative program has been FAA approved.

There are no new (or additional) airworthiness limitations associated with this equipment and/or installation.

FAA APPROVAL:

Introduction

This manual covers the installation, inspection, maintenance (charging) and replacement aspects for the ETX680-24-TSO battery installed on 14 CFR Part 23 aircraft. The installation of the rechargeable lithium battery defined herein meets the guidance of AC 20-184. In accordance with Federal Aviation Administration (FAA) Advisory Circular (AC) 23.1309-1E and FAA Technical Standard Order (TSO) TSO-C179b, the Failure Condition Classification (FCC) for this TSO Battery is “Major” - unless other installations deem the analysis lessor or greater, dependent on the function(s) in the installation.



Although many internal and external safety features have been designed per TSO-C179b and AC 20-184, failure to follow all application use, installation, charging, and storage instructions may result in battery damage and could lead to fire!

Abbreviations

The following table describes the terminology used in this document.

ICA Revisions

AC	Advisory Circular / Alternating Current
Ah	Amp-Hour is a unit of measure of charge that can be stored in a battery.
AFMS	Airplane Flight Manual Supplement
AML	Approved Model List
BMS	The Battery Management System refers to the collection of electronics responsible for monitoring and protecting the battery cells.
Cell	A single encased electrochemical unit (one positive and one negative electrode) which exhibits a voltage differential across two terminals.
CFR	Code of Federal Regulations
DAL	Design Assurance Level (DAL), as defined by the RTCA
DC	Direct Current
FCC	Failure Condition Classification
GPU	Ground Power Unit
HMR	Hazardous Materials Regulations
IAW	In Accordance With
ICA	Instructions for Continued Airworthiness
LED	Light Emitting Diode
LRU	Line Replaceable Unit
OEM	Original Equipment Manufacturer
OVPD	Over-Voltage Protection Device
RTCA	Radio Technical Commission for Aeronautics
SDS	Safety Data Sheet
STC	Supplemental Type Certificate
TSO	Technical Standards Order

ICA Revisions

When a revision to the Instruction for Continued Airworthiness (ICA) is necessary, the STC holder will coordinate changes with the FAA. Revisions to the ICA will be available from the documentation section of the EarthX Website: <https://earthxbatteries.com/>.

Description

EarthX Lithium batteries are a maintenance free replacement for the 24-volt lead-acid or lithium batteries. The battery operation is automatic (no operator control). The battery is part of the main aircraft electrical system with the alternator being the primary power source and the battery being the secondary power source; the battery function in the aircraft is unchanged. This battery includes a thermal run-away containment system. The containment system includes a vent tube designed to carry vapor or smoke to the exterior of the aircraft in the extremely improbable event of a thermal run-away condition. There are no emissions during normal operation. The battery can operate at high G loads (see specification section below).

Specification

Table 1 Battery Specification

Voltage	26.4 V
Capacity (1C, 1hour rate at 23°C)	11.7Ah @ 1C rate
Peak Power (I _{pp}), 23/-18 °C	850 / 400 amps
Rated Power (I _{pr}), 23/-18 °C	500 / 250 amps
Weight	7.2lb (3.27Kg)
Maximum Altitude	25,000 Ft
Operational and Crash Safety G Load	20g

Dimensions

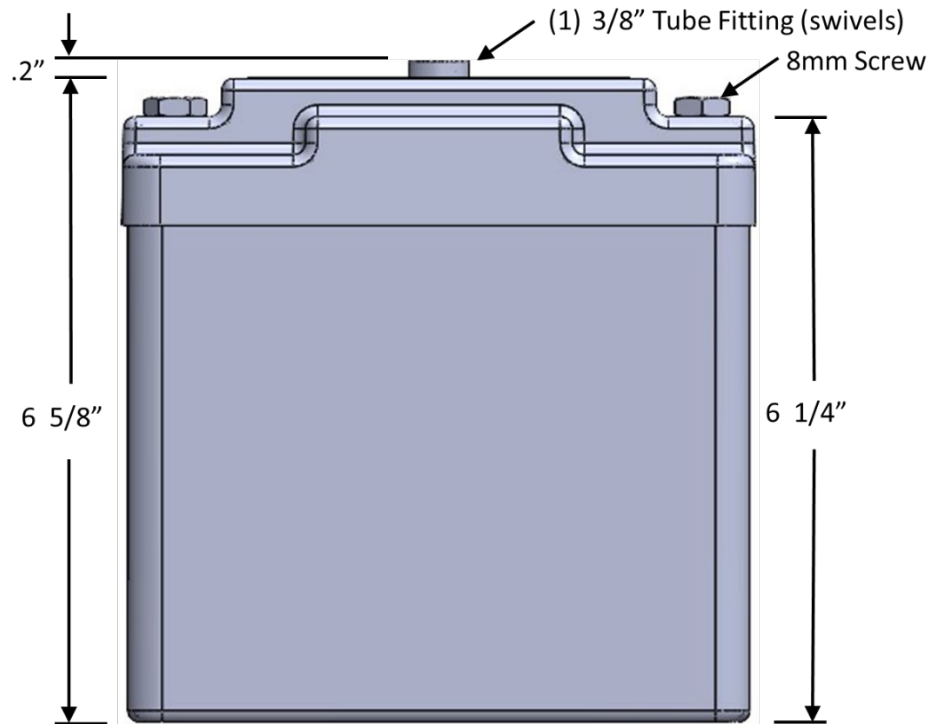


Figure 1 Battery Dimensions - Back View

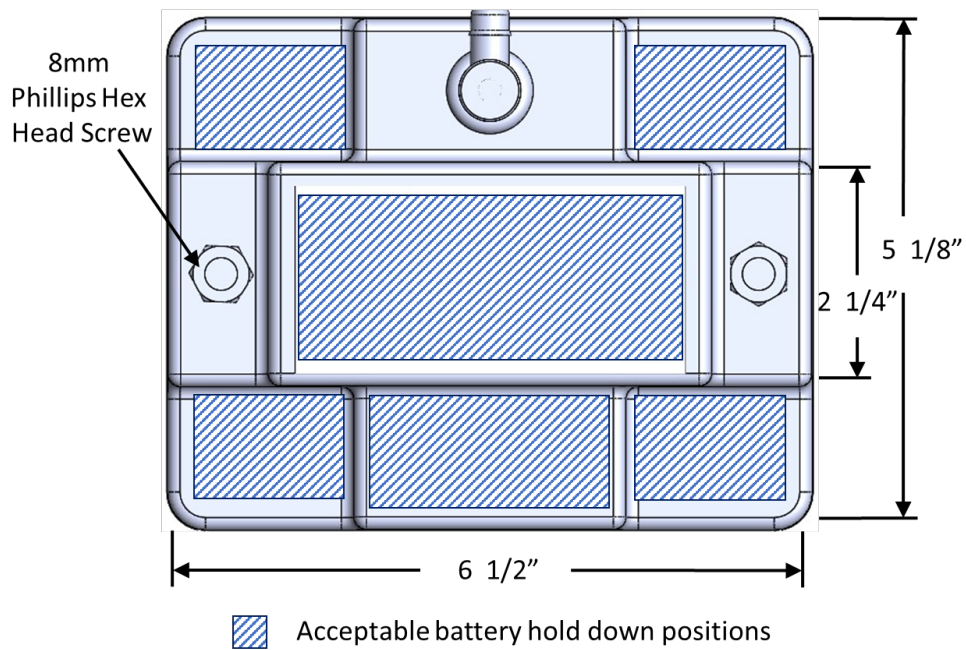


Figure 2 Battery Dimensions - Top View

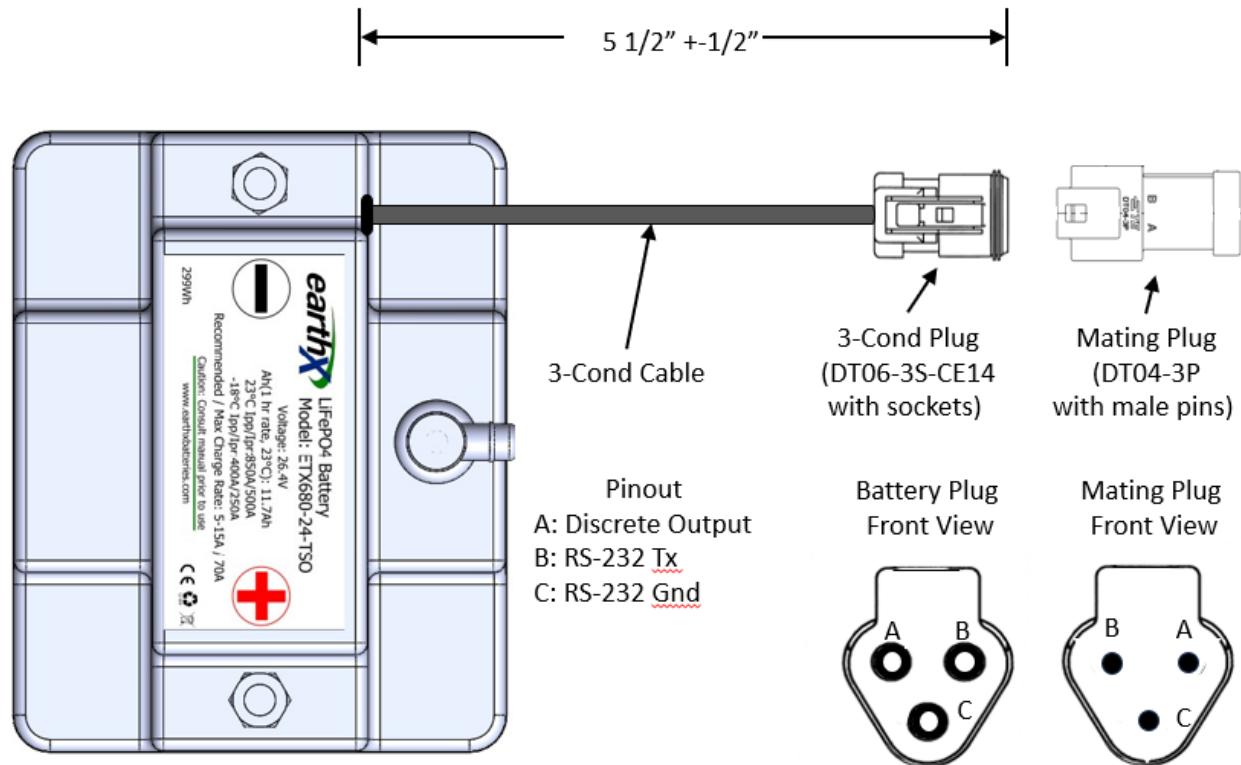


Figure 3 Fault/Status Monitoring Output

Initial Installation

The initial installation of the EarthX battery requires the installation of battery vent tubing, and a Fault/Status LED in addition to the battery. See the Appendix for the aircraft specific initial installation process.

This article meets the minimum requirements of technical standard order (TSO) C179b. The article may be installed only according to 14 CFR part 43 on aircraft eligible IAW the Approved Model List for STC SA01134DE.

Installation Limitations

Automatic over-voltage protection is required on the aircraft charging system. Do not install battery if the aircraft does NOT have over-voltage protection. See the Approved Model List (AML) STC document for all limitations.

Maintenance Removal and Installation



Remove all metal objects from your person before handling the battery and use insulated tools for installation.



The power terminals are ALWAYS live. Do not short across the terminals. Use caution when handling the battery inside the aircraft around metallic structures.

Battery Removal

1. Access the battery compartment.
2. Disconnect the battery cables (remove the negative cable first).
3. Remove the tie down hardware, store for reuse.
4. Note the routing and placement of wires, cables, vent tube and foam insert (if installed).
5. Disconnect the vent tube at the battery.
6. Disconnect the battery fault/status monitoring plug.
7. Remove the battery by lifting out of the battery tray.

Battery Re-installation

It is recommended you check the voltage before installing. If the voltage is below 26.4V, charge the battery before installing. Follow these steps to install the battery (reinstallation or after service). Qualified personnel should inspect the box, connections, and venting provisions for corrosion, loose fasteners or damage. Check positive battery cable for cuts or wear marks in the insulation. Inspect the battery to be installed per steps 1 thru 4 of the “Battery Inspection Instructions” section of this document. Replace or repair parts as required. Refer to the Appendix for battery mounting and install kits for specific aircraft models.

1. Reinstall the battery in the battery box or battery tray. **Only install an EarthX battery with the same part number IAW the Approved Model List for STC SA01134DE. Follow the battery handling instructions detailed in the “Battery Storage and Handling” section of this document.**
2. Connect the positive (red) cable first. Make sure the Phillips screw is securely fastened (45in-lbs), but do not over-tighten. Next, connect the negative (black) cable. Do not connect the battery in reverse polarity (positive to negative or negative to positive).
3. Connect the existing vent tube and barbed fitting to the new battery’s vent tube stubs (remove the protective caps that are installed at the factory over the vent tube stubs).
4. Reconnect the battery fault/status monitoring plug.
5. Re-install the battery hold down bracket or battery box cover and tighten securely.

Battery Vent Replacement

The vent system is made up of tubing, fittings, fasteners and grommets. Worn or kinked tubing should be replaced. The tubing should also be replaced if a tube connection to a fitting is loose. See Table 1 below for replacement parts. Follow these steps to replace all or part of the battery vent as required.

1. To remove a section of tubing, cut the tube (longitudinally) at each end, at the tube fittings. Remove the section of tubing noting the route. If the tube is held by an Adel clamp, loosen the clamp and pull the tube through the clamp.
2. Cut a new piece of tubing the same exact same length as piece removed.
3. Re-install the new tubing in the same manner as the tube that was removed. The vent tube should include downward sloping and or vertical section, so condensate drains to the outside of the aircraft. The tubing minimum bend radius is 3”, so elbows are required to make small radius bends. See the installation example below.

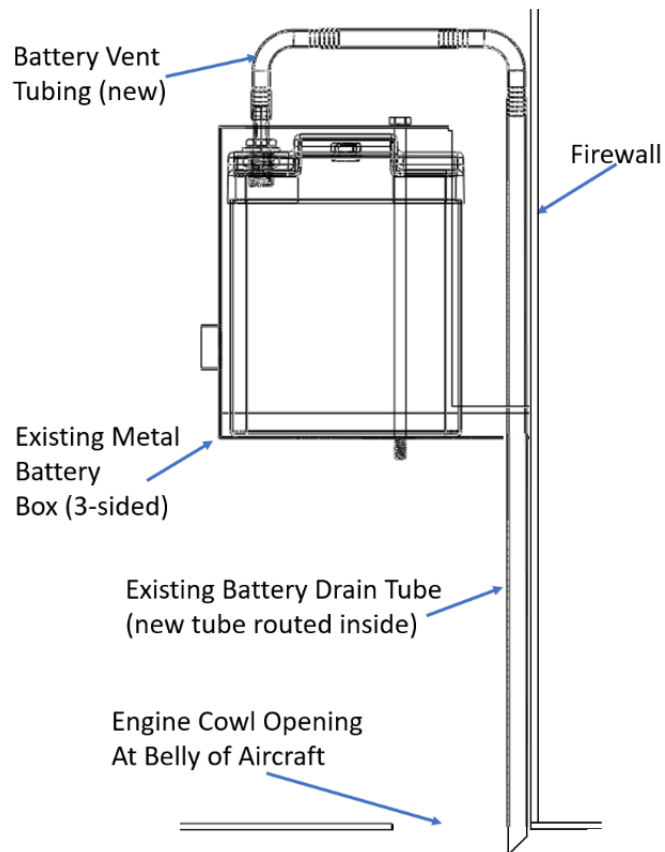


Figure 4 Firewall Forward Battery Vent Installation Example

4. If replacing the tube that exits the belly of the aircraft, leave at least 1" exposed on the outside of the aircraft and secure in place with RTV silicon. Cut the tube at an angle towards the aft of the aircraft.

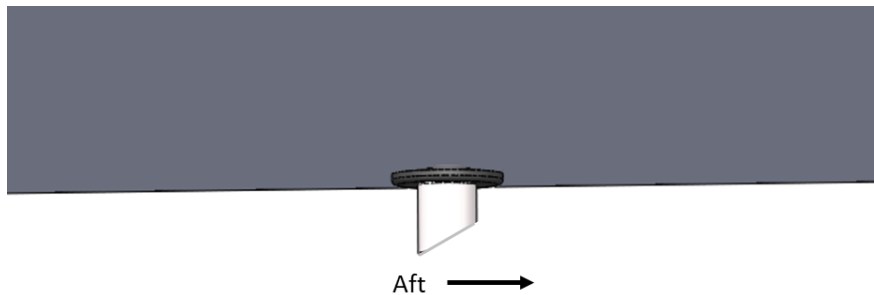


Figure 5 Fuselage Installed Battery Vent Tube Example

Part Number	Part Description
5239K15	3/8" Teflon Tubing
5670K18	90 Degree 3/8" SS Elbows
9600K316	3/8"ID 9/16" OD, 1/16" Panel Grommet
9600K86	3/8"ID 9/16" OD, 1/8" Panel Grommet

Table 1 – Vent System Parts



Be careful not to crush or restrict flow through the tubing.



Only EarthX supplied tubing and tube fittings should be used.

Fault/Status Indicator LED Bulb or Fuse Replacement

To replace the LED bulb, remove the LED lens bezel by turning it counterclockwise, slide the bulb out of the housing, then replace it with a new bulb (24 volt, T1 3/4 Midget Flange type LED bulb).

To replace the fuse, push the ends of the fuse holder together and 1/4 turn counterclockwise to open the fuse housing, then replace with a new fuse (1/4 x 1 1/4", 1-amp, fast blow fuse).

Fault/Status Indicator Replacement

The installation or replacement of the EarthX Fault/Status LED Indicator (part# 11MM24) is detailed below.

1. Power OFF the aircraft to remove power.
2. Removed the trim panel if required.
3. Remove the LED lens bezel by turning it counterclockwise.
4. Remove the panel nut from the front of the LED housing and feed the LED housing through the hole.
5. Unplug the black, red and white wire from the old LED housing, and plug them into the new LED at the same positions.
6. Secure the new Fault/Status Indicator in place on the panel in the same location as the old Fault/Status Indicator.

Return to Service Checks (Tests)

Follow these steps to check the battery operation prior to returning to service:

1. Verify the vent tube protruding from the aircraft can NOT be pushed up and into the interior of the aircraft with the force of an index finger.
2. Apply power to the aircraft via master switch, observe proper voltage, greater than 26V.
3. Verify the battery Fault/Status LED is off (no faults).
4. Press the LED "push-to-test lens" and observe the LED illuminates.
5. At the battery, jumper the fault/status discrete output to battery negative terminal using a test clip and verify panel LED indicator is "On".
6. Verify engine starts as normal.

Inspection

The supplemental Instructions for Continued Airworthiness (ICA) are required by 14 CFR part 23 for this Article (Part) installed on Aircraft (14 CFR 23.1529 for this application and TSO).

Battery Inspection Intervals

Battery:

Upon installation, record the next battery inspection due date based on the battery age as follows:

- 0-24 months: The battery must be inspected on or before the date the battery turns 24 months old.
- 24+ Months: If the battery was inspected at Annual Inspection, the due date for the next inspection is at the next annual inspection. If the battery was inspected at a time other than annual inspection, inspect the battery no later than 12 months after the last inspection date.

Charging Systems:

Annually: An annual inspection (check and/or test) is required for the voltage regulator and OVPD of the aircraft charging system for safe operation of the battery and aircraft electrical system.

Battery Inspection Instructions

The following inspections/tests shall be performed:

- 1) Visually inspect the battery for signs of damage; plastic case cracks, warped plastic or long side of the battery is swollen. Replace if damaged.
- 2) Verify the battery fault/status monitoring LED is operational (not required for digital communications). To do this, use a wire jumper to connect the fault/status discrete output (which connects to the remote LED) to battery ground, and verify the LED is lit.
- 3) Ensure the battery is fully charged. Turn off the aircraft master switch and any other battery loads, then measure the voltage at the battery terminals. A fully charged battery should be 26.6 volts or greater. If not, charge the battery (see section below).
- 4) After fully charging the battery in the previous step, allow the battery to rest over-night (minimum of 12 hours) without any load applied to the battery. Verify the battery is “holding a charge” by confirming the voltage is greater than 26.6 volts.
- 5) Verify the battery capacity. A battery’s current capacity as compared to its original capacity is an indication of the battery’s remaining service life. A battery with greater than 80% of its original “rated” capacity is considered fit for continued service. If the battery capacity is less than 80%, then it must be replaced. Alternately, if the batteries tested capacity is capable of supporting the aircraft’s emergency load for the required amount of time it is considered fit for continued service. It is recommended that the battery be replaced after 6 years of service. To test the battery capacity with a battery load tester:
 - a. Fully charge the battery
 - b. Connect the battery to a constant current load tester.
 - c. Set the tester’s current setting to a 1C rate (i.e. 11.7 amps for 11.7Ah battery)
 - d. Begin discharging and start a timer.
 - e. End the test when 48 minutes has expired or voltage drops to below the cutoff voltage (22 volts). If the battery delivers power for 48 minutes with voltage above 22 volts, it passes.
 - f. Fully charge the battery.

Alternately, if no battery tester is available:

- a. Fully charge the battery
- b. Turn on all electrical loads for flight operation and start a timer.

- c. Measure and record the battery's discharge amps using a DC clamp-on current meter at the positive terminal of the battery.
- d. Using the measured amps in the previous step and the battery's nameplate rated capacity (in Ah), calculate the time to discharge the battery 80%.

$$\text{Time to discharge 80\% (Hours)} = \frac{\text{Rated Capacity in Ah} * .8}{\text{Measured Discharge Amps}}$$

For Example, (11.7 Ah Rated Capacity, 8 amp measured discharge rate)

$$\text{Time to discharge 80\%} = \frac{11.7 * .8}{8} = 1.17 \text{ hours}$$

- e. Terminate the test after the number of hours calculated in the previous step has expired or if the battery is over-discharged (shuts off discharge current). If the battery is still supplying power at the termination of the test, then the battery's capacity is greater than 80%. If the battery's capacity is greater than 80%, then the battery has passed the test.
- f. Fully charge the battery.
- 6) Inspect battery cables for wear, loose terminal connectors, and terminal screws are properly secured (torque to 45in-lbs).
- 7) Inspect the vent tubes for blockage (plugged, pinched, or kinked) and loose connections.
- 8) Verify the battery box, and or battery restraint system is in good working order (no corrosion, loose fasteners, or signs of wear). If a foam insert is supplied, inspect the foam insert for signs of wear and that the battery movement with foam insert installed, is less than 1/8" side to side.
- 9) Record inspection results in the Aircraft Logbook(s).

The following other conditions indicate battery end-of-life, and the battery shall be replaced:

- Insufficient power to crank engine.
- On-going battery fault indication (refer to the "Troubleshooting" section).
- Will not hold a charge (<26.6 volts a week after charging the battery to full charge).



At battery end-of-life contact EarthX. The only approved replacement lithium battery is an EarthX battery of the same part number. The part number is displayed on the top label of the battery.

Aircraft Charging System Inspection Instructions

The regulator and OVPD may physically be separate devices or in a single housing. Follow the regulator and/or OVPD manufacturer's ICA or maintenance instructions for periodic checks.

Maintenance

This is a maintenance free battery with no internal replaceable components. Charging is only required as needed.

Configuration Control

The battery "Configuration Control" information is on the back side battery label (revision, TSO number, manufacturing date and serial number).

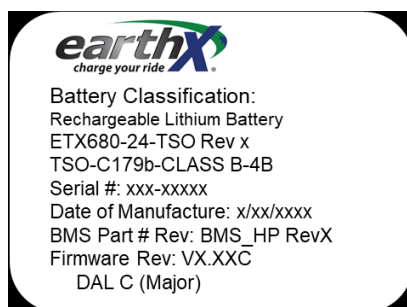


Figure 7 Example Battery Label

Battery Charging

If at any time the aircraft will not start, or the battery seems low, or the voltage is less than 26.4 volts, charge it. To charge the battery, connect the battery charger to the battery and leave the charger “On” until the charge light is extinguished. The recommended and maximum charge rate is specified on the top label of the battery. Never exceed the maximum charging amps for your battery.

This table shows typical charging times using the Optimate series of chargers.

Charging Amps	Charging Time
5 amp (Optimate TM281	3 hours

Table 2 Charge Time

Lithium batteries have a very low self-discharge rate which means the battery, if disconnected from the aircraft, could “hold its charge” for over a year. However, some aircraft may have systems that use a small amount of power with the “Master switch” off. In those cases, we recommend disconnecting a battery cable from the battery during long term storage (greater than 6 months).

Only an approved battery charger shall be used, see EarthX website for compatible chargers.

If the battery has been over-discharged and “disconnected” (meaning automatic electronic disconnect commanded by the Battery Management System), the voltage at the battery terminal should be near zero volts if the battery still has a load on it. If the battery is disconnected from the load, it will automatically reconnect, and the terminal voltage should return to > 20 volts (remove the load by removing the positive or negative cables from the battery). In this case, simply connect the battery to a charger to restore charge (charge with 1-10 amps for 20-30 minutes). If the battery is holding a charge (voltage not decreasing over 10-minute period), the battery is ok to fully charge. If the battery voltage does not return to >20 volt after removing all loads, then (step 1) connect the Optimate battery cables to the battery (red clamp to positive and black clamp to negative), next (step 2) plug the charger power cord into AC outlet. The charger should startup and go into the “Save” charging mode. If not contact EarthX technical support.

If using a Ground Power Unit (GPU), the current rating or current setting SHALL NOT be more than the max charge rate stated on the battery label or in this manual. It is recommended that a warning label is placed next to the GPU plug stating the max current allowed.



Never charge a faulty battery (a battery that will not accept a charge or hold a charge).



Never use the de-sulfate setting on your charger.



If the battery gets hot while charging, discontinue charging and use.



Do not charge battery in temperatures above 140 degrees F (60C), or in direct sunlight.



When charging a battery outside the aircraft, place it on a non-flammable surface, and remove any flammable items nearby.

Troubleshooting

The battery is an integral part of the aircraft electrical system and as such it is useful to know the aircraft electrical system voltage and or current at the time of the battery fault.

The Voltage/Current column in the table below lists the voltage/current level or condition that could correspond with the battery fault. For example, over-voltage is an electrical system problem and may be reported and addressed with other aircraft equipment.

The table below is a summary of the battery's fault/status codes (discrete output).

LED Light	Voltage	Possible Cause	Recommended Action
Slow Flashing (5s on/5s off)	Less than 25.5V	Battery over-discharged due to faulty charging system (alternator) not charging the battery.	Charge the battery. Verify aircraft charging system is functioning.
Slow Flashing (5s on/5s off) (> 1 hour)	25.5-29V	Weak or failing cell	Charge the battery with an approved charger and observe fault LED. If LED persists (another flight), charge the battery a second time. If the LED fault persists, for several consecutive flights, the battery should be replaced.
Slow Flashing (5s on/5s off)	Greater than 31V	Over-charging (due to faulty charging system regulator)	Verify aircraft charging system is functioning properly; could be faulty voltage regulator and or over- voltage protection device.
Solid Light	Any voltage	BMS electronics issue	Isolate the battery from the aircraft (disconnect positive or negative cable). If the fault is not extinguished, the battery should be replaced.
Solid Light that turns off after 3 minutes	Any voltage	Short Circuit protection was activated	Verify normal voltage (25.5-29V) at the battery terminals. Battery can be returned to service.

Short Flashing (2s on/2s off)	Any voltage	Battery temperature very high (> 85°C / 185°F) due to environment or excessive discharge.	If due to excessive discharge amperage, let the battery cool down prior to cranking or charging. If the environmental temperature is too high, engineer means to cool battery when in service.
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Table 3 Battery Fault / Status Codes

For additional information go to <https://earthxbatteries.com/> and review the FAQs.

Battery Storage and Handling

Upon receiving the battery check it for any physical damage, such as cracks, or a swollen case.

If storing the battery, it can be stored at temperatures between -40°C to +70°C. The recommended storage temperature is -10°C to 40°C. Our batteries have no liquid inside and will not freeze. Keep batteries in their original packaging or use appropriate containers to prevent short circuit of the terminals and physical damage.

If the aircraft is to be put in storage for an extended period (> 6 months), disconnect the battery cable to eliminate drain from the Aircraft's electrical system. A fully charged battery can be put in storage for up to a year without charging but should be charged and inspected annually.

Special care must be taken in the handling, shipping, and storage of rechargeable lithium batteries. As a result, installers, end users, and personnel involved in the maintenance and disposal of rechargeable lithium batteries require training in the special characteristics related to rechargeable lithium battery safety. Leaving battery output terminals or leads exposed may result in external short-circuiting of the battery during shipping, handling, testing and installation. Terminals of batteries shall be covered with non-conductive protective devices to avoid any possibility of shorting during handling, shipping, and storage.

Batteries can be recycled at any location accepting lithium-ion type batteries. Drain battery and or cover terminals with electrical insulating tape prior to recycling. For recycling information and where to recycle check this website (<https://www.call2recycle.org/>).



Do not incinerate or expose to open flames!



The Safety Data Sheet (SDS) is available on EarthX's website.



Always follow the manufacturers' recommended safety precautions and procedures.

Weight and Balance

The installation of the ETX680-24-TSO battery is considered a permanent installation. The basic aircraft weight and balance should be updated inclusive of the added equipment when the installation is

completed and documented on the aircraft Weight and Balance Record (WBR). The ETX680-24-TSO battery weighs 7.2 pounds. When updating the weight and balance, use the same battery location / arm measurement as the original aircraft battery.

Reference Documents

- ETX680-24-TSO FAA Approved Airplane Flight Manual Supplement (AFMS) for ETX680-24-TSO Battery

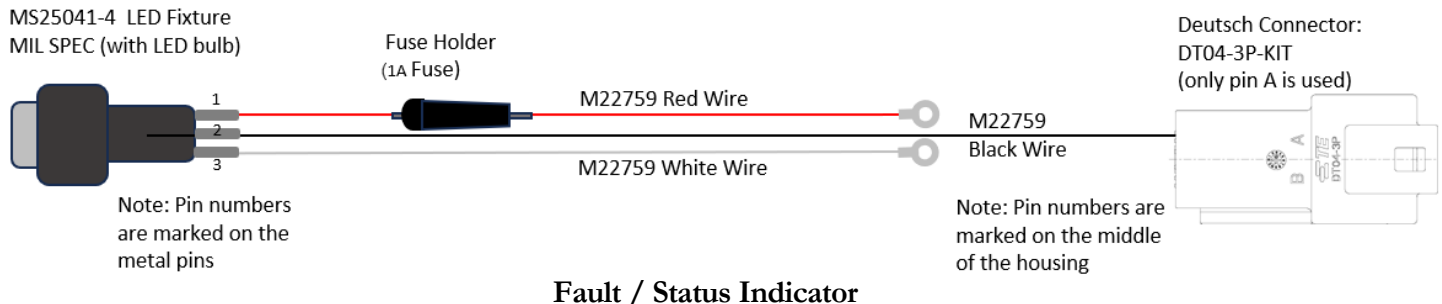
Regulations / Standards

This battery is designed and tested to the following safety regulations as outlined in:

- FAA Technical Standard Order TSO-C179b
- FAA AC 20-184, Guidance on Testing and Installation of Rechargeable Lithium Battery and Battery Systems on Aircraft
- FAA AC 23.1309-1E, System Safety Analysis and Assessment for Part 23 Airplanes
- RTCA DO-160G, Environmental and Test Procedures for Airborne Equipment
- RTCA DO-254, Design Assurance Guidance for Airborne Electronic Hardware
- RTCA DO-311A, Minimum Operational Performance Standards for Rechargeable Lithium Batteries and Battery Systems
- UN 38.3, – United Nations ST/SG/AC.10/11/Rev.6, Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, Section 38.3, Lithium Metal and Lithium-Ion Batteries.

Appendix i: Fault/Status LED Initial Installation Common to all Aircraft

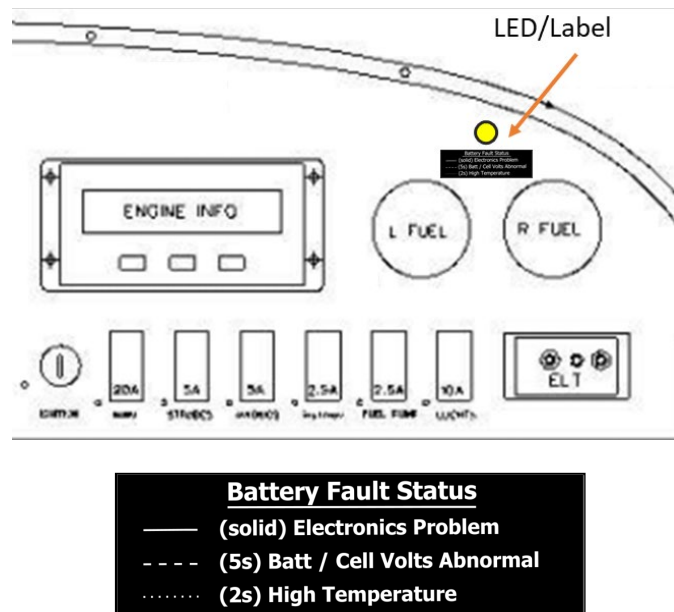
The installation of the EarthX Fault/Status LED Indicator (part# 11MM24) is detailed below. The LED is yellow or amber in color.



Fault/Status Indicator (LED) Install Procedure

A suitable location for the Fault/Status Indicator will be determined by the installer. One example is shown below, but aircraft will vary. Find an open area that will not interfere with other equipment and in plain view of

the pilot. LED must be visible in all operating conditions. Install the “Battery Fault Status” label near the LED. Follow shop best practice and/or AC 43.13 guidance.

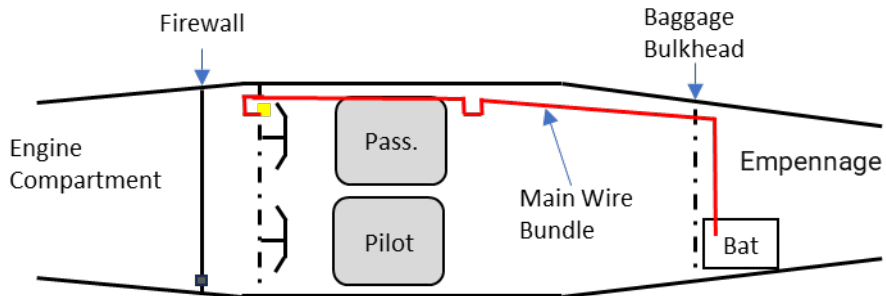


LED/Label Installation Example

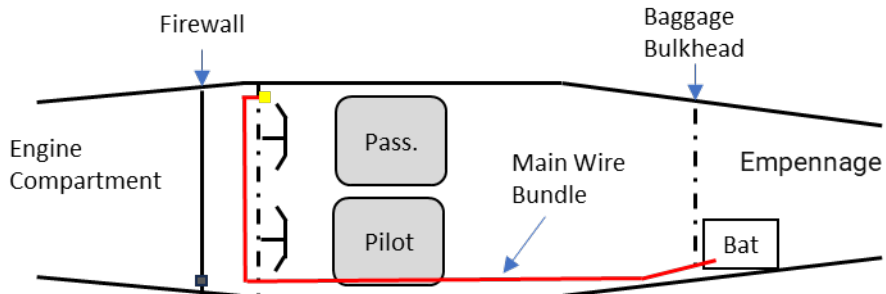
1. Removed trim panel - drill a 7/16” hole in the panel.
2. Remove the panel nut from the front side of the LED housing and feed the LED housing through the hole from the back side of the panel.
3. Secure the LED in place with the panel nut removed in the previous step.
4. Secure the LED Placard (1” x 3”) to the panel in close proximity to the LED (P/N: 200208).
5. Route the black wire from the LED to the battery through the main wire bundle, secure in place with zip ties. Follow shop best practices and AC 43.13 guidance. The routing is shown in the diagrams below.
6. At the battery, cut the LED’s black wire to length and crimp on the pin connector (only one required). Plug the wire/pin into the back of the housing, then push the wedge lock into place from the front. Then plug the 3-pin connector into the battery.



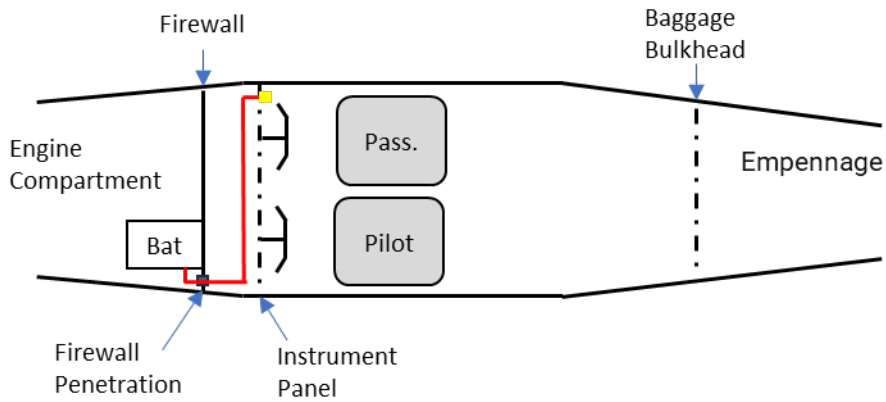
7. Behind the instrument panel, route the red wire (with inline fuse) to the instrument (or lights) circuit breaker (1 to 10 amp typical); crimp (supplied) #6 ring lug to wire and secure to breaker.
8. Route the white wire to an adequate or available ground stud, crimp on (supplied) #6 ring lug and secure in place.
9. Lastly, at the back of the LED crimp a .110” quick connect terminal onto the black, white and red wires. Then plug the red wire’s quick connect onto pin 1 of the LED; the black wire’s quick connect to pin 2 of the LED; and the white wire’s quick connect onto pin 3 of the LED. Note: the LED’s pin numbers are marked on the metal pins (hard to see).



Cessna 177, 182, 185, R172, 172RG Wire Routing



Piper/Mooney/Commander Wire Routing



Cessna 152, 172, 182, 206, 210/ Cirrus/ Diamond Firewall Forward Wire Routing

Appendix A: Cessna 172N, 172P, 172Q, 172R, 172S, R172K, RG172 Install

Install Parts Kit:

Early 172N model, serial # 17269310-17272885: ETX680-24-TSO-SPC-KIT

R172 1978 and 1979 models: ETX680-24-TSO-SPC-KIT

All Other Models: ETX680-24-TSO-HDB-KIT

Install Kit Weight: 0.8lb

Fault/Status Indicator (LED) Install Procedure

Install the indicator LED per the instructions in the Appendix i.

Follow these steps to install the battery vent, as well as the installation practices of AC 43.13-1B, paragraphs 11-19 and 11-22.

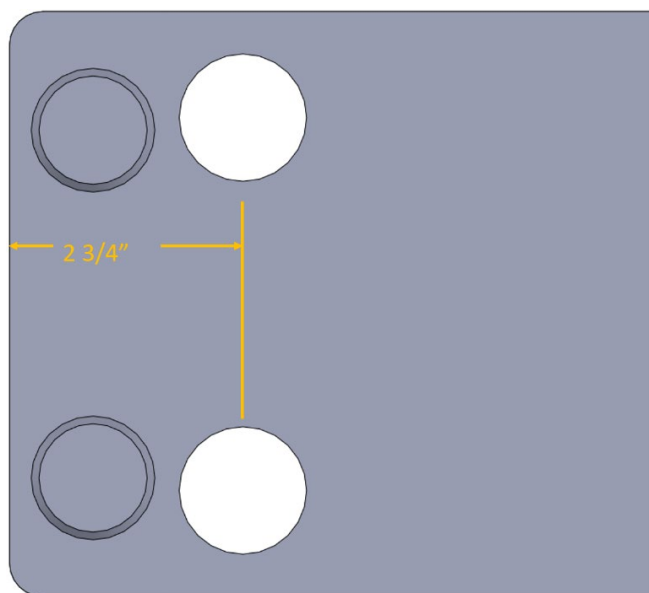
Battery (172N model, serial # 17269310-17272885; R172 1978 and 1979 models)

1. Place the ETX680-24-TSO battery into the battery box with the Foam Insert (230908).
2. Modify the existing battery box cover; cut two 1 1/2" holes in the battery box cover directly over top of the battery terminals if there is a risk of the terminals shorting.

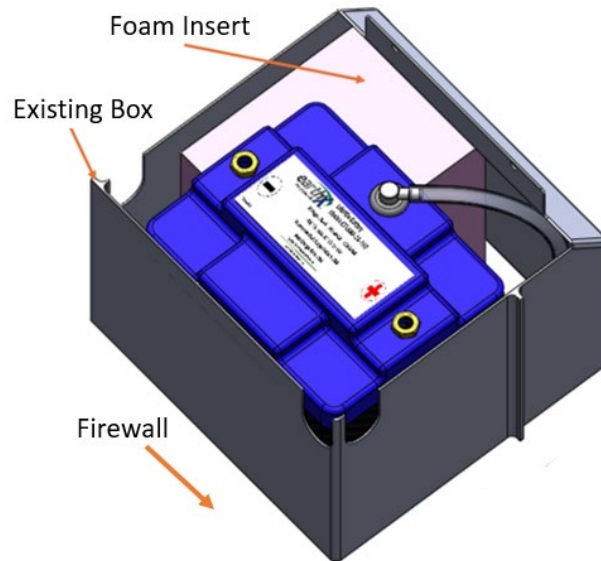
Terminal Adapter



Note, skip this step if the battery box cover has electrical insulation on the underside and or if using the terminal adapters.



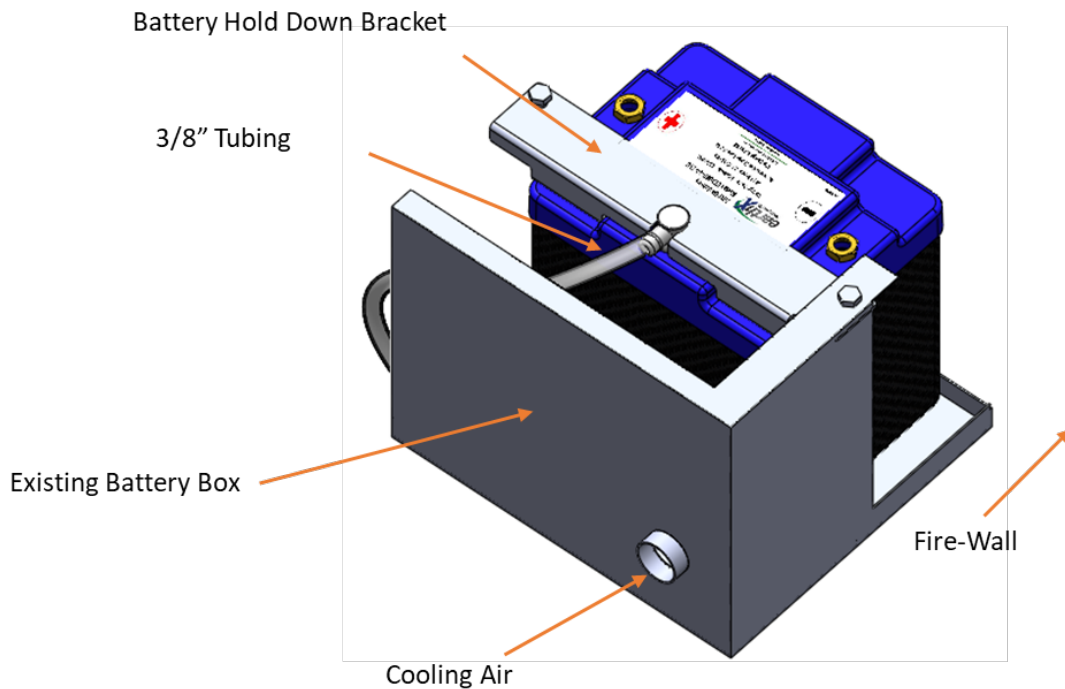
Battery Cover Modification



Battery Mounting (Battery Box)

Battery (172N model serial #17272886 and on, and P,Q,R and S models; R172, 1980 model and on; 172RG)

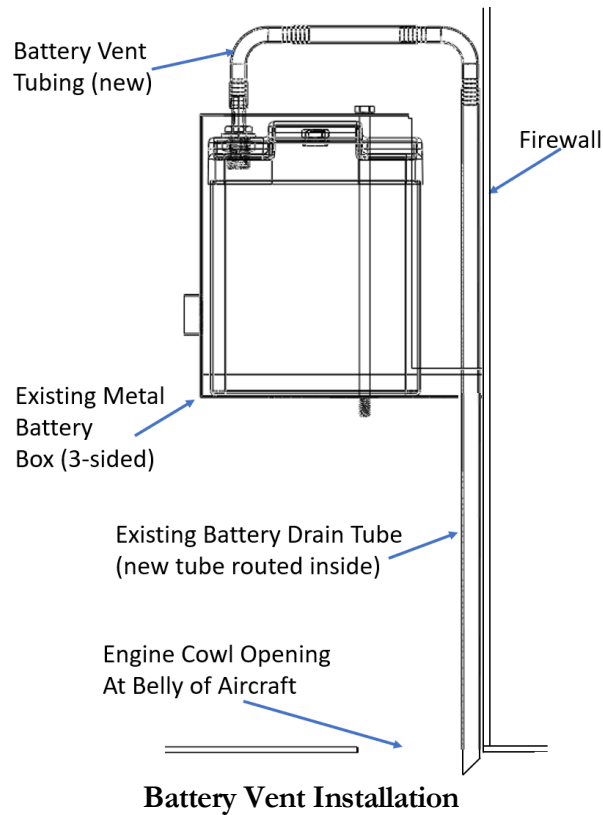
1. Place the EarthX battery onto the battery tray, with the new battery hold down bracket (ETX680-24-HDB) as shown below.
2. Re-install the existing hold down bolts. The bolts should be snug, but not over-tightened to a point it bends the hold down bracket (1/4 turn past snug). Note the heat shield is installed over-top of the hold down bracket.



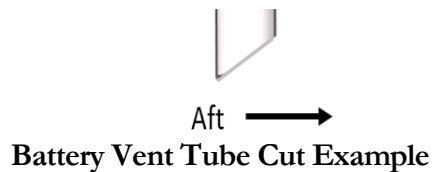
Battery Mounting (Tray and Holddown)

Vent Tube Installation

1. Use the supplied 3/8" vent tubing (5239K15) and 3/8" elbows (5670K18) to vent the battery to the belly of the aircraft. The tubing minimum bend radius is 3", so elbows are required to make small radius bends.



2. The new vent tubing is routed inside the original battery drain tubing (and drain tube clamps), so no new clamps are required.
3. Cut the vent tube to length; at least 1" should be exposed on the outside of the aircraft. Cut the tube at an angle towards the aft of the aircraft.



Appendix B: Cirrus SR20, SR22, SR22T; Piper PA-28-181, PA-28-161; Commander 114B, 114TC Install

Install Parts Kit:

ETX680-24-TSO-HDB-KIT

Install Kit Weight: 0.8lb

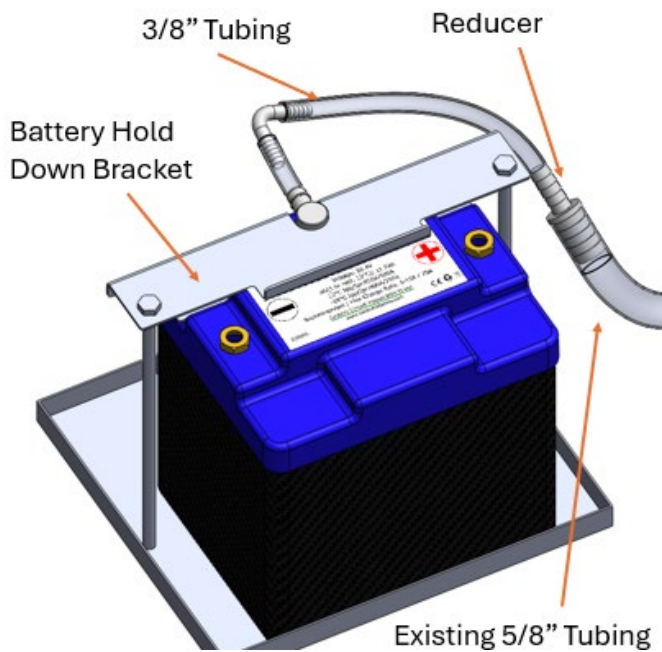
Fault/Status Indicator (LED) Install Procedure

Install the indicator LED per the instructions in the Appendix i.

Follow these steps to install the battery vent, as well as the installation practices of AC 43.13-1B, paragraphs 11-19 and 11-22.

Battery and Vent Tubing

1. Place the EarthX battery onto the battery tray, with the new battery hold down bracket (ETX680-24-HDB) as shown below.
2. Re-install the existing hold down bolts. The bolts should be snug, but not over-tightened to a point it bends the hold down bracket (1/4 turn past snug).



Battery Mounting

3. Use the supplied 3/8" vent tubing and 3/8" to 5/8" reducer tube fitting to connect the new battery vent to the aircraft's existing 5/8" vent tube. Secure the tubing connections with the supplied spring clamps.
4. Use cable ties to secure the tubing to in place.

Appendix C: Cessna 152, A152, 177B, 180K, A185F, U206G, TU206G, 206H, T206H, 210L, 210M, 210N, 210R, T210L, T210M, T210N, T210R, P210N, P210R Install

Install Parts Kit:

Late model 180K serial #18053203 and on, and A185F serial# 18504116 and on: ETX680-24-TSO-HDB-KIT (with optional ETX680-24-BASE-PLATE)

Late model 152 serial # 15283592 and on, and serial # A1520879 and on: ETX680-24-TSO-HDB-KIT (with optional ETX680-24-BASE-PLATE)

All Other Models: ETX680-24-TSO-SPC-KIT

Install Kit Weight: 0.8lb

Fault/Status Indicator (LED) Install Procedure

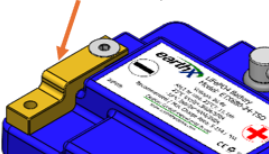
Install the indicator LED per the instructions in the Appendix i.

Follow these steps to install the battery vent, as well as the installation practices of AC 43.13-1B, paragraphs 11-19 and 11-22.

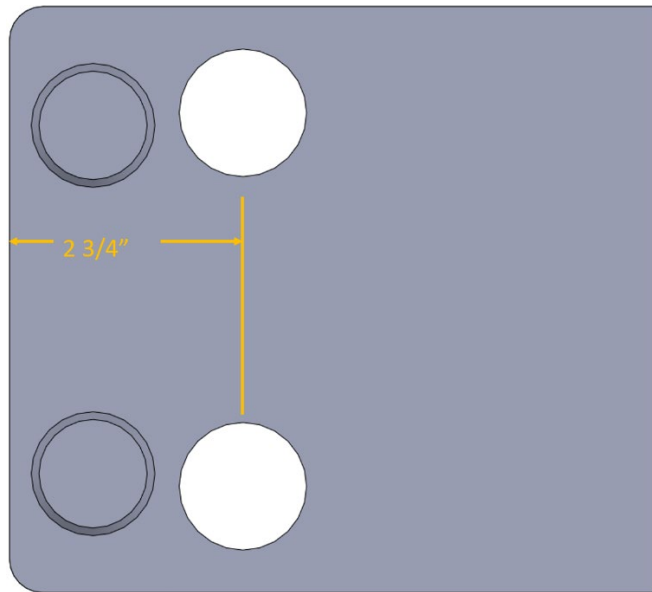
Battery (All models with battery box)

1. Place the ETX680-24-TSO battery into the battery box with the Foam Insert (230908). Note, the battery can be placed to the right or left side of the box as shown below, to accommodate the vent tube routing through the bottom of the box (see figure below).
2. Modify the existing battery box cover; cut two 1 1/2" holes in the cover directly above the battery terminals (see figure below).

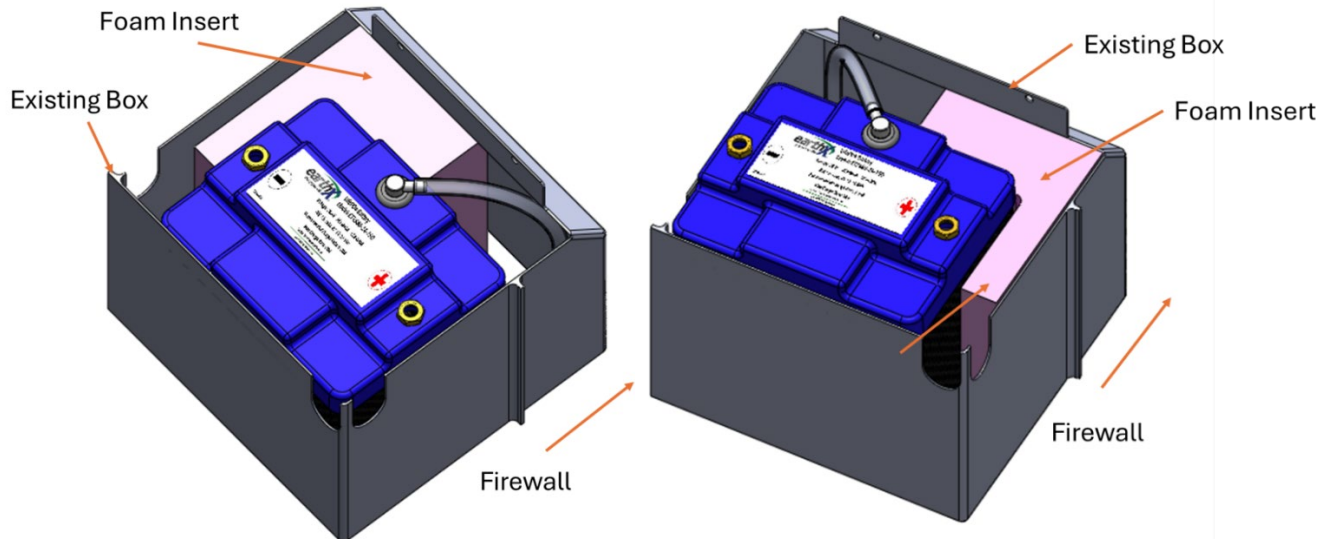
Terminal Adapter



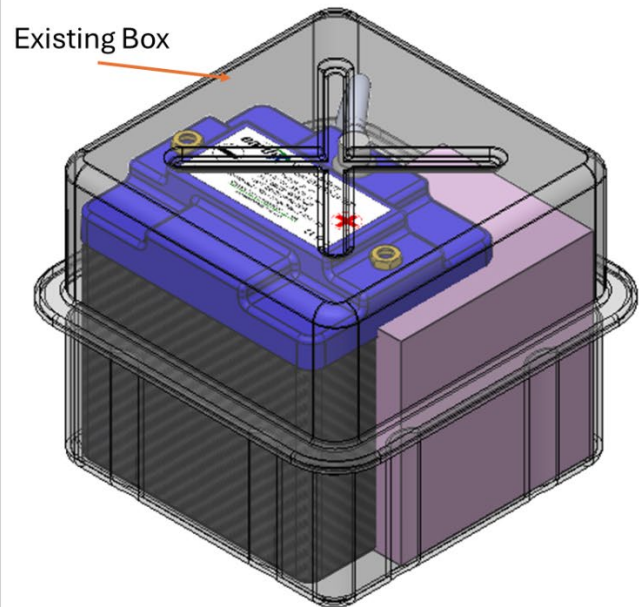
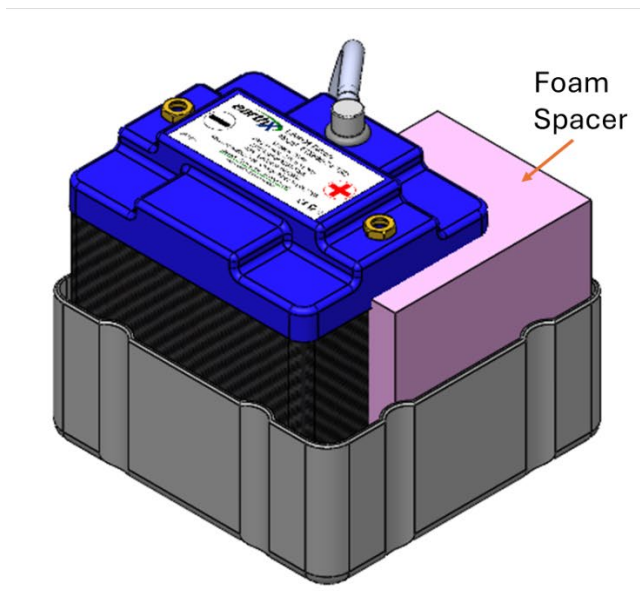
Note, skip this step if the battery box cover has electrical insulation on the underside and or if using the terminal adapters.



Battery Cover Modification



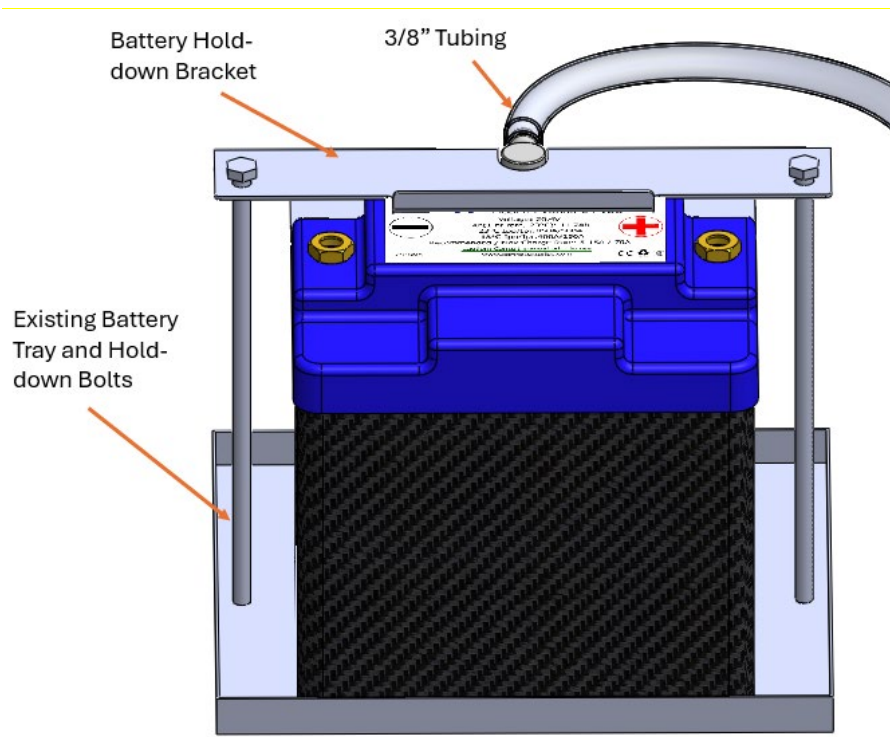
Engine Compartment Battery Mounting (alternate mounting positions are shown)



Aft Baggage Battery Mounting (with and without cover shown)

Battery (180K serial #18053203 and on, and A185F serial# 18504116 and on)

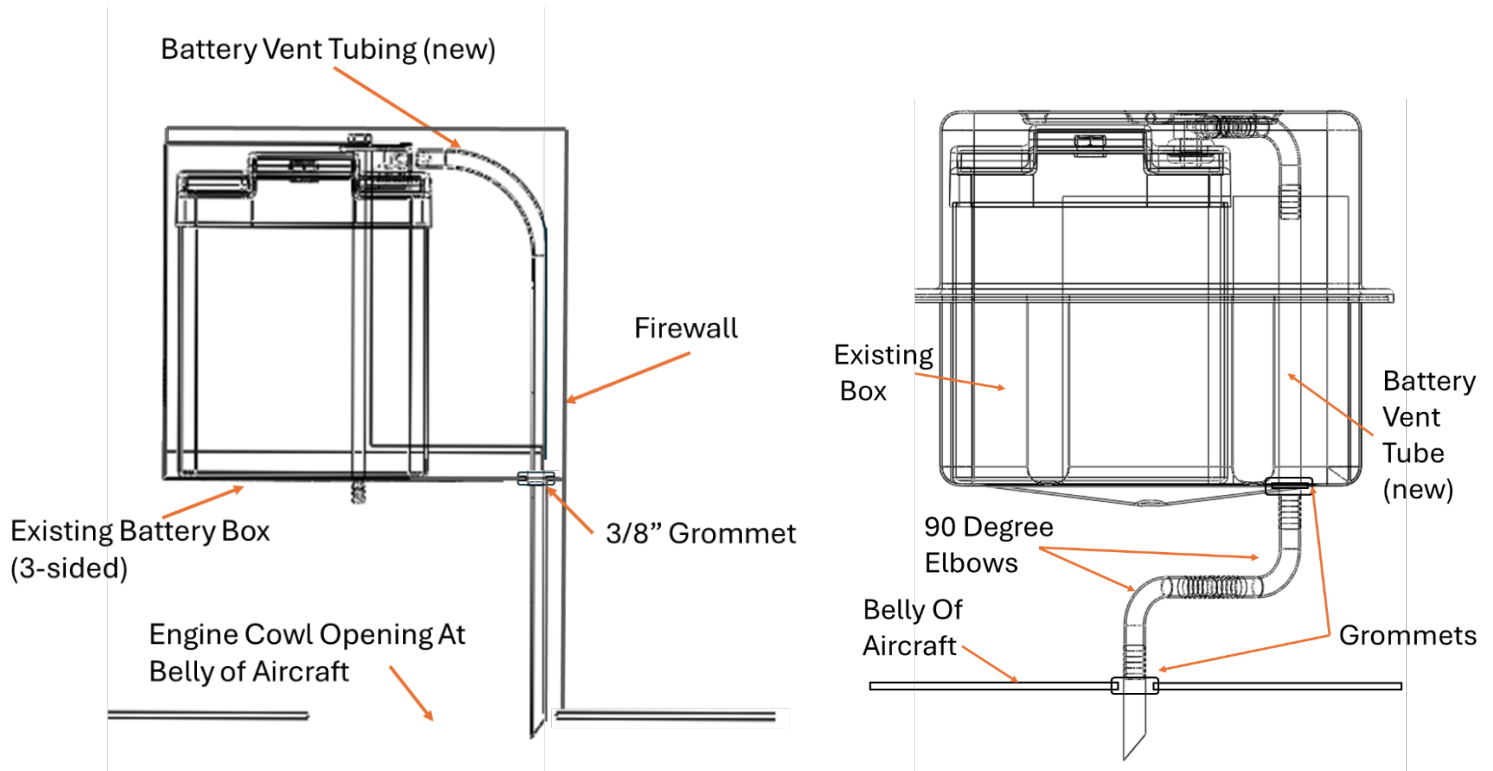
1. Place the EarthX battery onto the battery tray, with the base plate (ETX680-24-BASE-PLATE) and the new battery hold down bracket (ETX680-24-HDB) as shown below.
2. Re-install the existing hold down bolts. The bolts should be snug, but not over-tightened to a point it bends the hold down bracket (1/4 turn past snug).



Battery Mounting (Tray and Holddown)

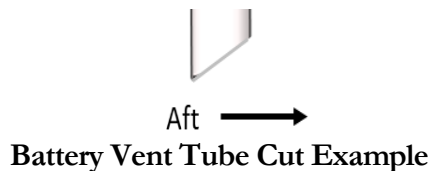
Vent Tube Installation

1. On some installs, the new vent tubing can be routed inside the original battery drain tubing (reusing the existing tube clamps). For other installs, drill a 9/16" hole in the bottom of the battery box for the vent tube, then install the supplied 3/8" ID grommet. Use the supplied 3/8" vent tubing (5239K15) and 3/8" elbows (5670K18) to vent the battery to though the bottom of the battery box to the belly of the aircraft. The tubing minimum bend radius is 3 inches, so elbows are required to make small radius bends (see figures below).



Battery Vent Installation (engine compartment and aft baggage shown)

2. The vent tube on an aft baggage installs can be secured with silicon at the aircraft exit.
3. Cut the vent tube to length; at least 1" should be exposed on the outside of the aircraft. Cut the tube at an angle towards the aft of the aircraft.



Appendix D: Diamond DA40, DA 40F, DA 40NG Install

Install Parts Kit:

DA40: ETX680-24-TSO-HDB-KIT

DA40NG: ETX680-24-TSO-NG-KIT (optional ETX680-24-BASE-PLATE)

Install Kit Weight: 0.5lb

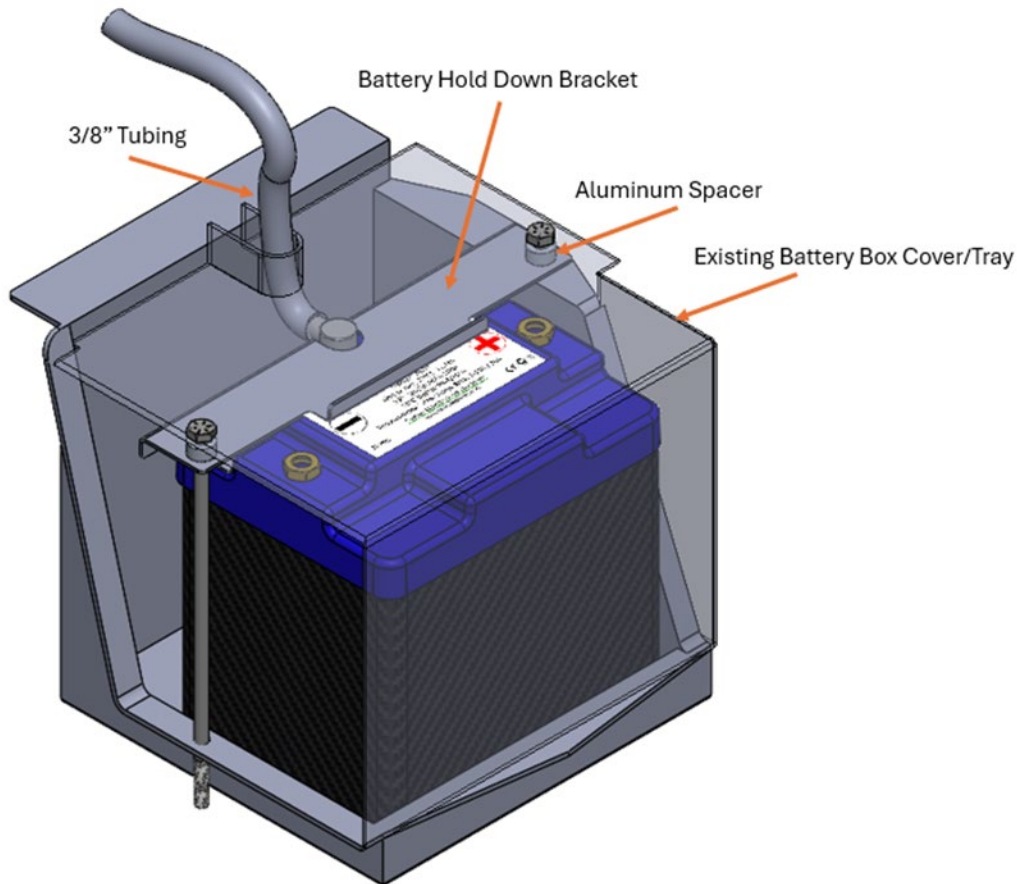
Fault/Status Indicator (LED) Install Procedure

Install the indicator LED per the instructions in the Appendix i.

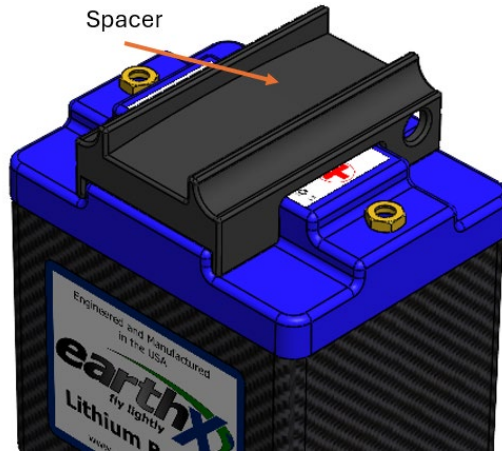
Follow these steps to install the battery vent, as well as the installation practices of AC 43.13-1B, paragraphs 11-19 and 11-22.

Battery and Vent Tubing

1. Place the ETX680-24-TSO battery onto the battery tray, then place the hold down bar onto the battery and the aluminum spacers on the hold down bar at the bolt hole location. The battery hold down bolts are inserted through the cover, aluminum spacer, and hold down bar, then secured. The DA40NG does not use the hold down bar; it uses the existing strap with the ETX680-24-NG-SPACER (see the figure below). The optional ETX680-24-BASE-PLATE can be used to hold the bottom of the battery in the center of the tray.

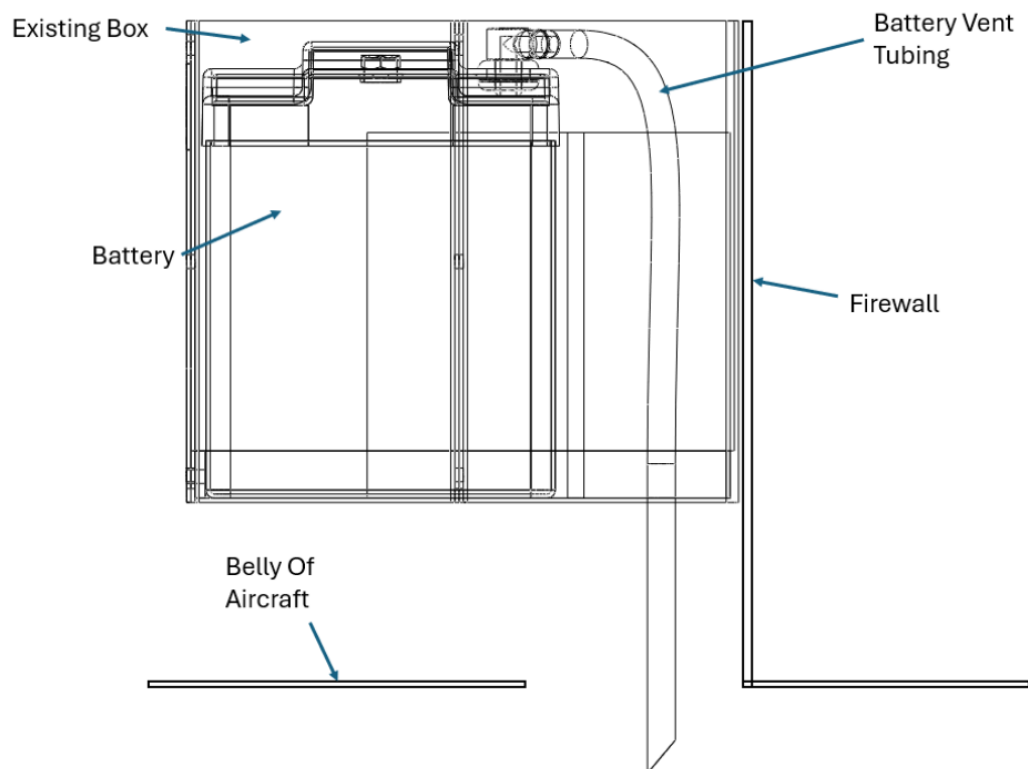


DA40 Battery Mounting



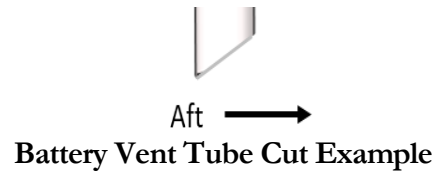
DA40NG Battery Spacer Mounting

2. Use the supplied 3/8" vent tubing (5239K15) and 3/8" elbows (5670K18) to vent the battery to the belly of the aircraft. The tubing minimum bend radius is 3", so elbows are required to make small radius bends (see figure below).



Battery Vent Installation

3. The new vent tubing is routed the same as the original battery tubing (and tube clamps), so no new clamps are required.
4. Cut the vent tube to length; at least 1" should be exposed on the outside of the aircraft. Cut the tube at an angle towards the aft of the aircraft.



Appendix E: Cessna 182Q, 182R, 182S, 182T, T182, R182, TR182, T182T Install

Install Parts Kit:

Early 1978 and 1979 Model Q: ETX680-24-TSO-182-KIT

All Later Models: ETX680-24-TSO-HDB-KIT (with optional ETX680-24-BASE-PLATE)

Install Kit Weight: 0.5lb

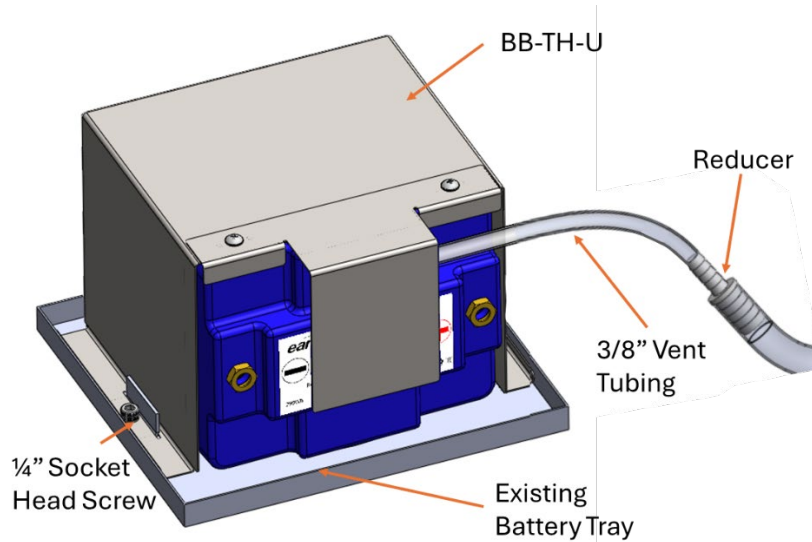
Fault/Status Indicator (LED) Install Procedure

Install the indicator LED per the instructions in the Appendix i.

Follow these steps to install the battery vent, as well as the installation practices of AC 43.13-1B, paragraphs 11-19 and 11-22.

Battery (Early Model Q 1978 and 1979)

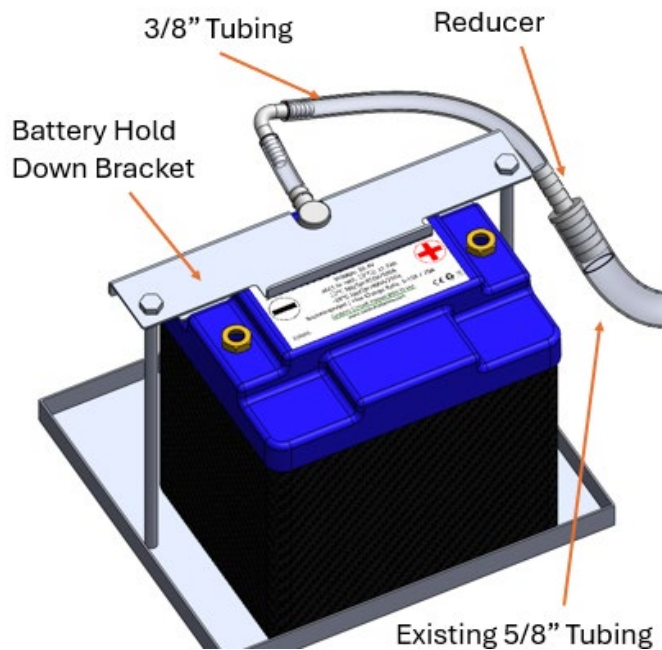
1. For early Q models: Place the ETX680-24-TSO battery into the battery tray, then place the new stainless box (BB-TH-U) over the battery with the mounting holes aligned with the existing $\frac{1}{4}$ " hold down bolt holes.
2. Secure the battery box in place with the supplied $\frac{1}{4}$ -28-inch socket head screws (see the figure below).



Battery Mounting (Model Q aircraft, 1978 and 1979)

Battery (Later Models, 1980 and On)

1. Place the EarthX battery onto the battery tray, with the base plate (ETX680-24-BASE-PLATE) and the new battery hold down bracket (ETX680-24-HDB) as shown below.
2. Re-install the existing hold down bolts. The bolts should be snug, but not over-tightened to a point it bends the hold down bracket (1/4 turn past snug).



Battery Mounting (Model Q, 1980 and on)

Vent Tube Installation

1. Use the supplied 3/8" vent tubing and 3/8" to 5/8" reducer tube fitting to connect the battery vent to the aircraft's 5/8" vent tube. Secure the tubing connections with the supplied spring clamps.

Appendix F: Beechcraft Bonanza F33A, F33C, G36, V35B, A36, A36TC, B36TC Install

Install Parts Kit:

ETX680-24-TSO-SPC-KIT

Install Kit Weight: 0.8lb

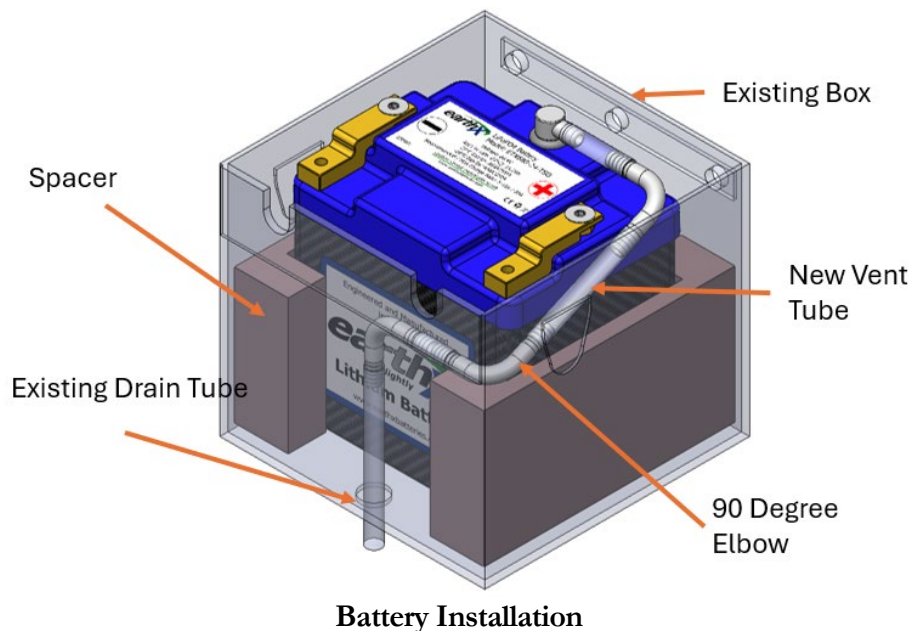
Fault/Status Indicator (LED) Install Procedure

Install the indicator LED per the instructions in the Appendix i.

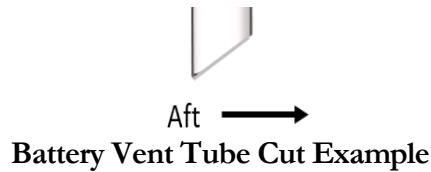
Follow these steps to install the battery vent, as well as the installation practices of AC 43.13-1B, paragraphs 11-19 and 11-22.

Battery and Vent Tubing

1. Install the supplied terminal adapter on the battery with the counter-sunk screws (torque to 45in-lb. Place the ETX680-24-TSO battery into the battery box with two spacers (260812), see figure below.
2. The new vent tubing is routed around the side of the battery to the front of the battery, then down through the existing battery drain tube to the belly of the aircraft. The tubing minimum bend radius is 3", so elbows are required to make small radius bends (see figure below).



- Cut the vent tube to length; at least 1" should be exposed on the outside of the aircraft. Cut the tube at an angle towards the aft of the aircraft.



Appendix G: Mooney M20J, M20K, M20L, M20M, M20R, M20S, M20TN, M20U, M20V Install

Install Parts Kit:

Model J Use: ETX680-24-TSO-SPC-KIT

All Later Models Use: ETX680-24-TSO-HDB-KIT (requires one kit for each battery)

Install Kit Weight: 0.8lb

Fault/Status Indicator (LED) Install Procedure

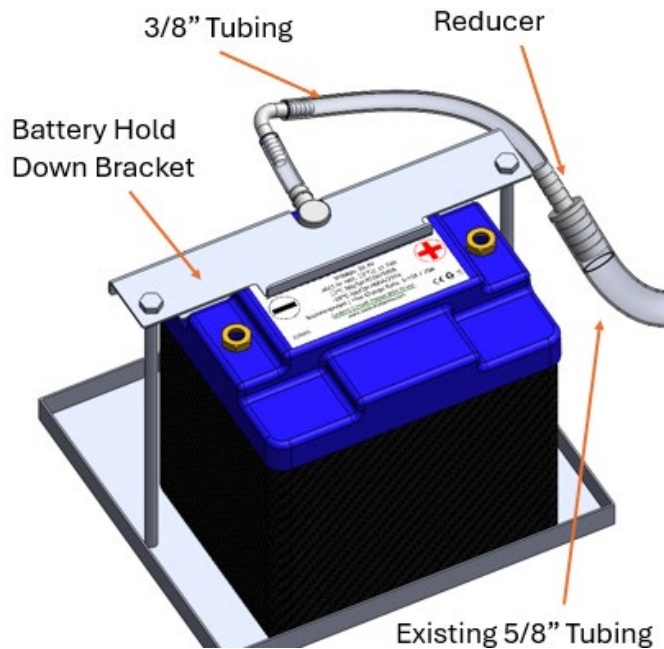
Install the indicator LED per the instructions in the Appendix i.

Follow these steps to install the battery vent, as well as the installation practices of AC 43.13-1B, paragraphs 11-19 and 11-22.

Note: for aircraft with two batteries, both batteries do not have to be retrofitted at the same time. It is acceptable to run with one lead acid battery and one lithium battery.

Battery and Vent Tubing (Later Models)

- Place the EarthX battery onto the battery tray, with the new battery hold down bracket (ETX680-24-HDB) as shown below.
- Re-install the existing hold down bolts. The bolts should be snug, but not over-tightened to a point it bends the hold down bracket (1/4 turn past snug).

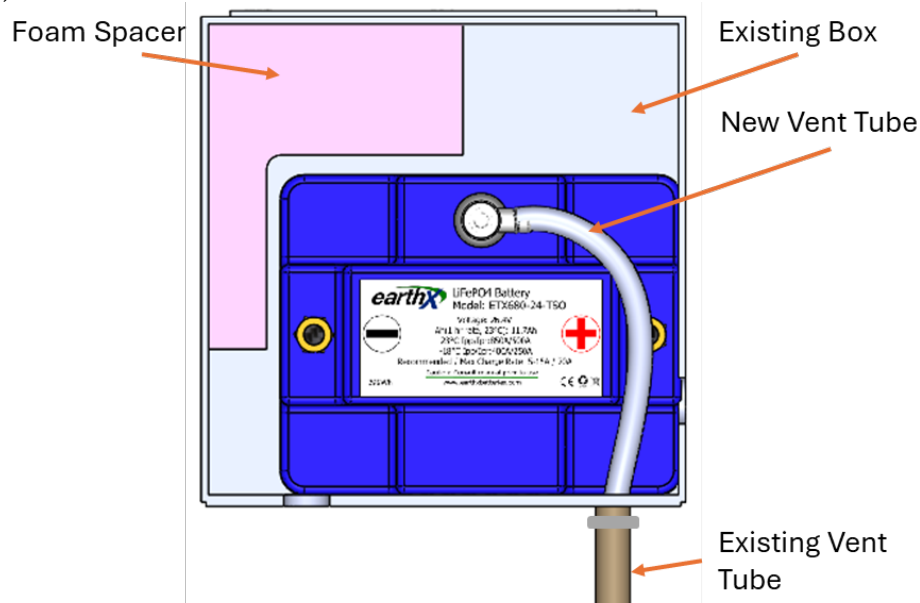


Battery Mounting

3. Use the supplied 3/8" vent tubing and 3/8" to 5/8" reducer tube fitting to connect the battery vent to the aircraft's existing 5/8" vent tube. Secure the tubing connections with the supplied spring clamps.
4. Use cable ties to secure the tubing to in place.

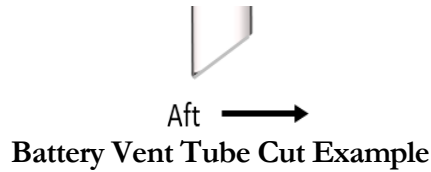
Battery and Vent Tubing (Model J)

1. Place the ETX680-24-TSO battery into the battery box with the Foam Insert (230908). (see figure below).



Battery Mounting

3. The new vent tubing is routed inside of the existing battery vent tube to the belly of the aircraft. (see figure below).
4. Cut the vent tube to length; at least 1" should be exposed on the outside of the aircraft. Cut the tube at an angle towards the aft of the aircraft.



Appendix H: Textron LC41-550FG, LC42-550FG, T240 Install

Install Parts Kit:

ETX680-24-TSO-SPC-KIT

Install Kit Weight: 0.8lb

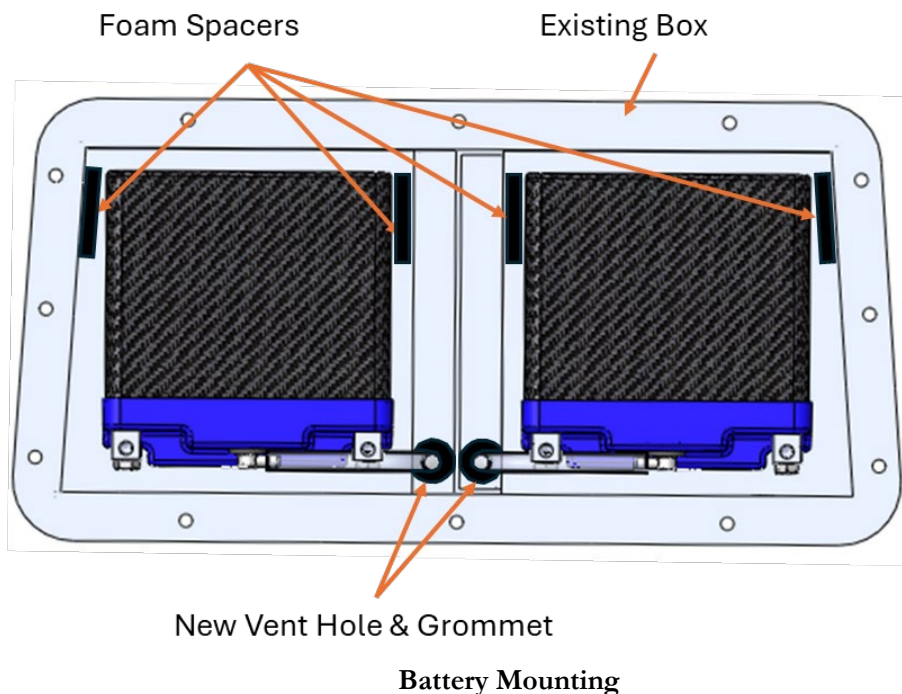
Fault/Status Indicator (LED) Install Procedure

Install the indicator LED per the instructions in the Appendix i.

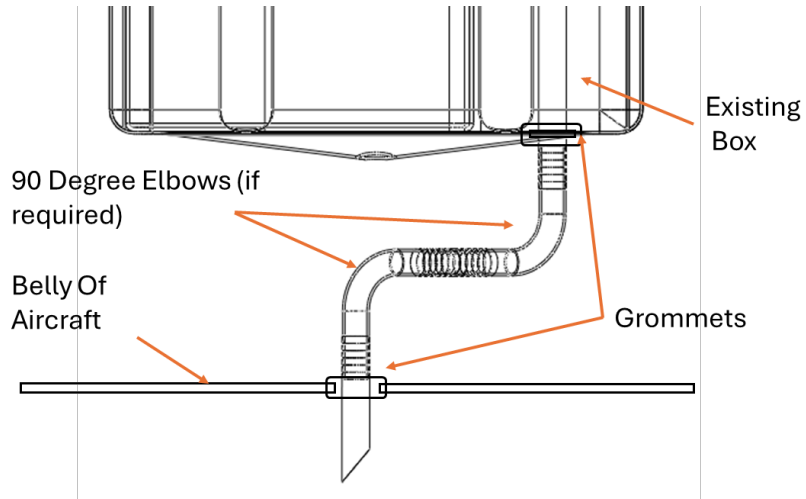
Follow these steps to install the battery vent, as well as the installation practices of AC 43.13-1B, paragraphs 11-19 and 11-22.

Battery and Vent Tubing

1. Drill two 9/16" holes in the bottom of the battery box (front inside corner) for the new vent tubes, then install the supplied 3/8" ID grommet in the holes. Use the supplied 3/8" vent tubing (5239K15) and 3/8" elbows (5670K18) to vent the battery to through the bottom of the battery box to the belly of the aircraft. (see figures below).



2. Install the supplied terminal adapter on the battery with the counter-sunk screws (torque to 45in-lb.
3. The battery should be place in the battery box on its side with the vent tube connection on top. Use the 1/4" self-adhesive foam spacers to hold the battery in position in the battery box as shown in the figure above.
4. Attach the 3/8" vent tube to the battery. The new vent tubing is routed to the belly of the aircraft. (see figure below).



Battery Vent Installation

4. Cut the vent tube to length; at least 1" should be exposed on the outside of the aircraft. Cut the tube at an angle towards the aft of the aircraft.



Aft →

Battery Vent Tube Cut Example