

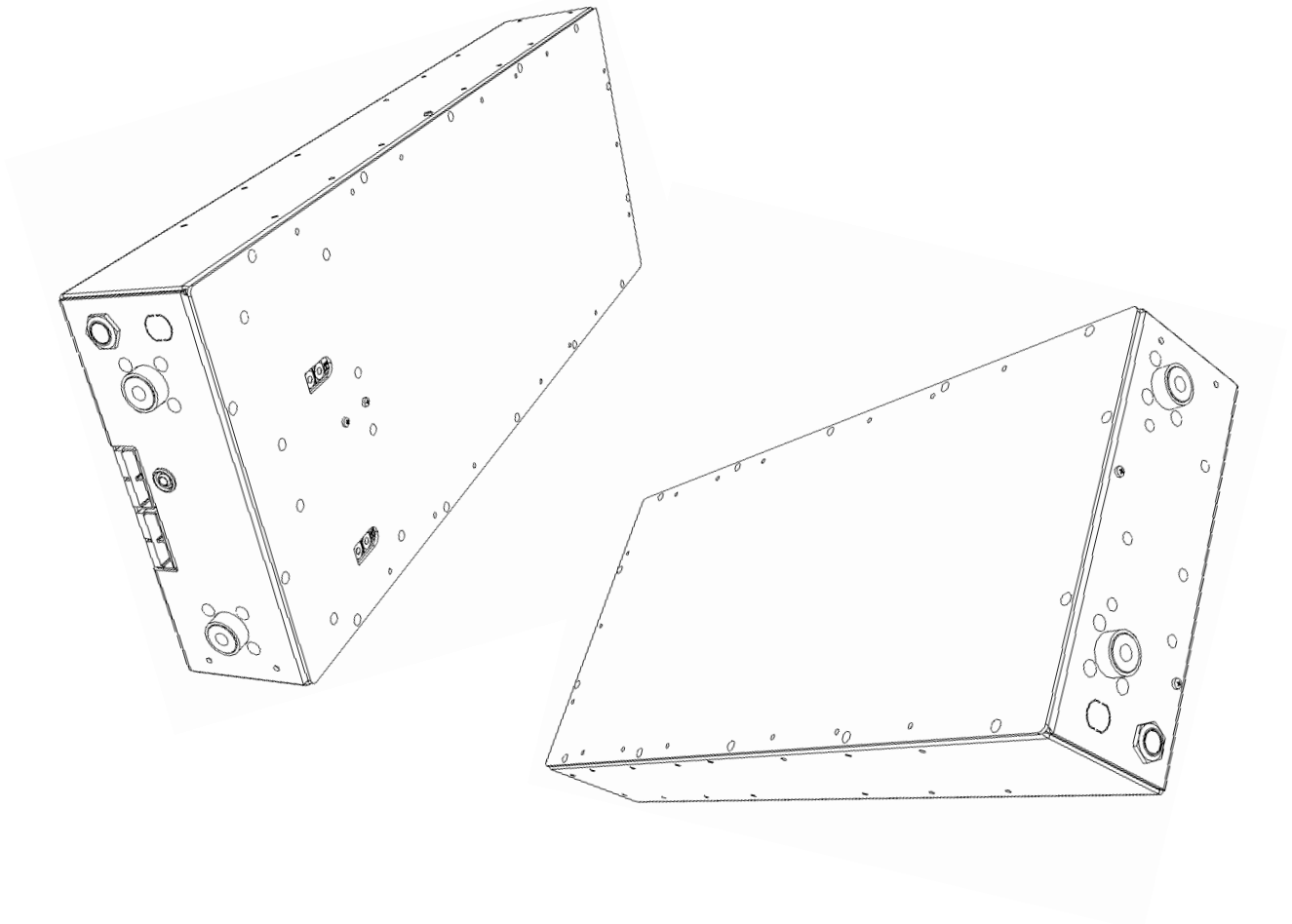
Installation & User Guide

Xtra Slimline Range

Models:

RM12-220LFPXSL

RM12-220LFPXSLSS



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1 Introduction

This Installation and User Guide describes how to connect and safely operate the Xtra Slimline range of 12V batteries, covering the following XSL 12V battery range:

- RM12-220LFPXSL: 12V 220Ah Xtra Slimline LFP Battery
- RM12-220LFPXSLSS: 12V 220Ah Xtra Slimline LFP Battery with integrated 40A DC-DC charger

As with all batteries, you should consider the mechanical and environmental conditions that you intend to operate the battery in to maximise overall performance and achieve the longest battery life. REMCO offer these general guidelines; however, you should seek our further advice or that of a qualified electrical tradesperson if you are in any doubt.



Figure 1: RM12-220LFPXSL Battery



Figure 2: RM12-220LFPXSLSS Battery

2 Safety Measures

This battery contains lithium iron phosphate (LFP) cells. While LFP cells are the safest Li-Ion chemistry, the stored chemical energy represents a risk of fire, burns or explosion if misused.



- Avoid mechanical shock
- Do not expose to fire
- Do not pierce battery
- Do not disassemble
- Do not drill into enclosure
- Do not short the terminals
- Keep away from water
- Avoid direct sunlight
- Do not charge battery below 0°C or above 45°C
- Do not store battery below -20°C or above 60°C

To ensure a long and safe life from your battery, please ensure you consider the following:

2.1 Ensure the battery is physically secure

Ensure the battery is **safely secured** before travel. Even though lithium batteries are light weight in comparison to lead acid, they can still become a dangerous projectile in a moving vehicle, RV, cart, or boat if not secured. Consider making use of the included mounting brackets and screws to safely secure the battery. Refer to Section 5 for further information.

2.2 Do not penetrate the battery enclosure

Do not under any circumstances drill or penetrate the enclosure. Doing so may inadvertently penetrate one of the cells which could cause thermal runaway and vapour emissions. Use only the existing mounting holes in the battery and short screw lengths no greater than 13mm.

We strongly recommend the use of the included mounting kit with screws and brackets that are designed to safely attach to the battery. Alternatively, use strapping and clamping to secure your battery in place.

2.3 Maintain an acceptable temperature range

Like all batteries, REMCO batteries operate and perform the best, as well as last the longest, in a cool and stable temperature environment between 10°C and 25°C. The **maximum window of full operation is 0°C - 45°C**. Do not attempt to charge the battery below 0°C or above 45°C.

If your intended installation location is regularly outside this suggested range, you should consider a different location, or actively cool or heat the environment in order to preserve battery life. If the ambient temperature that the battery operates in is greater than 60°C, you should cease use immediately. Avoid direct sunlight – the internal temperature of the enclosure can rise quickly due to radiation from the sun.

Operating outside of these guidelines diminishes the life and performance of the battery and voids the warranty.

2.4 Avoid repeated shock and vibration

The battery is not designed to operate continuously in high shock or high vibration environments. Normal use in a 4WD environment is acceptable, however, dropping or exposing the battery to a high number of excessive vibrations may lead to a fault or complete failure.

2.5 Avoid exposure to water or salt spray

The battery is not designed to operate in a wet environment. Do not submerge the battery in water or expose the battery to direct water spray. Salt laden air may cause corrosion in the long term; minimise exposure by installing the battery in a protected hatch or compartment in marine environments.

2.6 Do not short circuit the battery

Do not short circuit the battery. Pay attention when using metallic tools in the vicinity of the terminals, as accidentally contacting the positive and negative terminal with a metallic object like a spanner may cause a short circuit and spark.

Always perform work on passive wiring first and connect the live battery as the last connection. If you must work on live circuits, exercise due care, and use insulated tools where possible. If you are unsure how to install the battery, seek advice from your local REMCO dealer or a suitably qualified electrical tradesperson.

Check to ensure the connecting Anderson plugs are correctly wired (positive and negative) and do not attempt to mismatch Anderson colours when connecting.

3 Longevity & Depth of Discharge

One of the advantages of lithium batteries over lead-acid batteries is longevity. If you want to realise the long life potential out of your lithium battery, then consideration must be given to depth of discharge.

A battery lifespan is rated by the number of cycles before the original capacity has reduced by a certain amount.

A cycle is defined as discharging from fully charged, to a percentage Depth of Discharge (DoD), and then charging back to full again. So, **DoD describes what percentage of the battery capacity is being used** each time.

NOTE - DoD is different to State of Charge (SoC, also known as Charge Level); in fact, they add together to 100%. So, 80% DoD equates to 20% SoC.

The less DoD you use each cycle, the longer the battery will last.

REMCO Lithium Iron Phosphate (LFP) batteries have a cycle life of 5,000 cycles at 50% DoD and 2,000 cycles at 80% DoD.

4 Battery Management System

Your battery comes with an integrated Battery Management System (BMS).

The BMS is an electronic solid-state circuit board which manages the cells and protects the battery across a range of scenarios which primarily includes over charge and over discharge protection. Over charging or over discharging a lithium battery may lead to a hazardous scenario.

It has the following features:

- Cell over-voltage protection
- Cell under-voltage protection
- Over current protection
- In-rush current protection
- Short circuit protection
- Transient voltage protection and fusing, with fail-safe monitoring of the fuse
- Fail-safe operation if connection to any cell is lost
- Blocking charge above 45°C (with automatic recovery)
- Blocking discharge (all loads disconnect) above 60°C (with automatic recovery)
- Smart passive cell balancing

5 Installation

5.1 Stowage

The Xtra Slimline battery is likely to be stowed in a car, RV or 4WD or used as a portable battery for camping. An important part of the battery installation is securely fixing it down or safely stowing it away during transport so that it does not become a projectile in an accident. Consider making use of the included mounting brackets and screws to safely secure the battery.

5.2 Mounting orientation

The Xtra Slimline battery is best mounted on its side with the red terminal at the top. Do not mount on its side with the black terminal at the top. Please refer to the figures below.



Figure 3: Recommended orientation for RM12-220LFPXSL batteries.



Figure 4: Do not install the RM12-220LFPXSL in the above orientation.



Figure 5: Recommended orientation for RM12-220LFPXSLSS batteries.



Figure 6: Do not install the RM12-220LFPXSLSS in the above orientation.

5.3 Connecting DC loads and chargers

Always follow the “Battery Charge Range” described in the specification table in Section 8 below. **Do not** attempt to plug in chargers with a voltage higher than 14.6V. Doing so may lead to **permanent** damage of your battery.

5.3.1 On/Off Switch

The RM12-220LFPXSL and RM12-220LFPXSLSS both feature an On/Off switch with LED indicator on the front of the battery. See Figure 7 below. This can be used to switch off all loads powered by the lithium battery. When illuminated, the battery is switched on/ready to use. When not illuminated, the battery is switched off/not ready for use. It is important to note that this switch cannot remotely control external chargers; if you still have a charger active on the system then this voltage will still be seen by all loads connected to the battery and may even provide enough current to power them. The battery cannot accept charge whilst it is in the off position. The switch cannot be used to reset the battery’s BMS (i.e., after an overload or low voltage disconnect event)



Figure 7: The On/Off switch

5.3.2 RM12-220LFPXSL

The RM12-220LFPXSL features M8 threaded hole terminals for charging or running loads. Please see section 5.3.5 below for current limits.

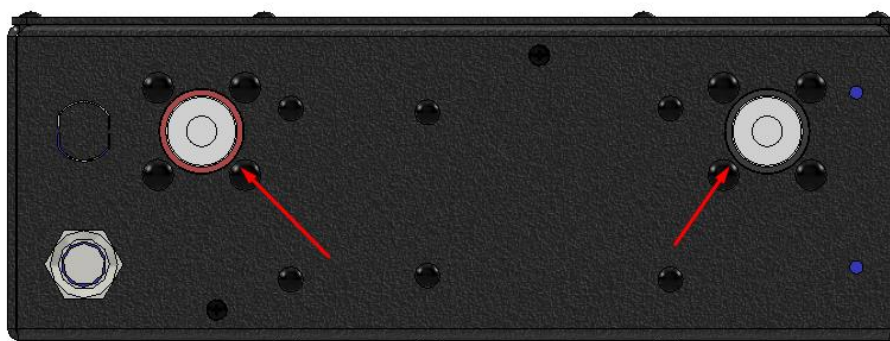


Figure 8: RM12-220LFPXSL M8 threaded hole terminals

5.3.3 RM12-220LFPXSLSS

The RM12-220LFPXSLSS model features M8 threaded hole terminals for charging or running loads. There is also one (1) grey Anderson plug and one (1) blue Anderson plug as shown in Figure 9 below. The single grey Anderson can be used as an input/output for charging or running loads. The blue Anderson connector is reserved for a 10V to 16V DC input, using the integrated DC-DC charger. See section 5.4 below for more information on the DC-DC charger fitted in SS models. Please see section 5.3.5 below for current limits.

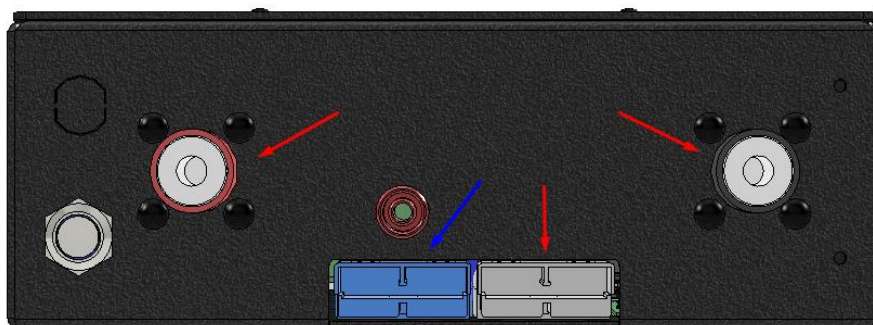


Figure 9: RM12-220LFPXSLSS M8 threaded hole terminals and Grey and Blue Anderson style connectors

5.3.4 Regulated Charge Sources

Charge sources that can be connected to either the M8 terminals (all models) or grey Anderson connector (RM12-220LFPXSLSS models only) could include:

- External AC-DC charger;
- External (regulated) solar charger; or
- External DC-DC charger.

For connected chargers and devices, M8 ring lugs must be used. Always check the polarity to avoid damage to chargers, loads or the battery.

For RM12-220LFPXSLSS models, a grey Anderson plug may be used. Check to ensure the Anderson is correctly wired (positive and negative) and do not attempt to use any coloured Anderson other than grey. The grey Anderson connection can only support 120A total.

5.3.5 Current Limits

Please consider the following current limits when connecting charging devices and loads.

Parameter	RM12-220LFPXSL	RM12-220LFPXSLSS
Max. Current <i>Input or Output</i>	240 A Total	120 A Grey Anderson 240 A M8 Terminals 240 A Total
Max. Discharge Current <i>Output</i>	240 A (480 A Surge)	240 A (480 A Surge)
Max. Charge Current <i>Input</i>	240 A maximum 140 A max. recommended	240 A maximum 140 A max. recommended

Table 1: Xtra Slimline Grey Anderson specifications

5.4 Connecting to the integrated DC-DC charger (SS models only)

RM12-220LFPXSLSS models feature an integrated DC-DC charger with *Smart Sense* technology. The integrated charger will attempt to automatically charge your lithium battery from a vehicle source when it senses an alternator is running and voltage is above 13.3V. It will automatically stop charging when the voltage drops below 12.3V. Without this feature, your lithium battery would continue to charge when the vehicle is switched off, draining your vehicle's starter battery.

After connecting the source via the blue Anderson plug, the vehicle engine can be started. The green LED status light should illuminate if the charger is ready to charge. This indicates that the power source to the battery is adequate for charging.

Note: Some modern vehicles are fitted with a 'smart alternator' meaning the alternator may not be active even if the engine is running. This may result in the green light not remaining illuminated when the engine is running. These installations can be more difficult to configure and it may be necessary to leave the vehicle running for longer to ensure correct charger operation before changing DC-DC charger settings.

Note: The lithium battery may not charge if it is already fully charged.

To ensure your installation is configured correctly, switch off your vehicle and remove the key. The green LED status light on the battery should turn off after a **30 second** delay.

The system is pre-configured and should work for most scenarios, however if you find you need to alter the voltage or time delay settings, please refer to Section 7 below.

Do not attempt to plug in a DC source higher than 16V. Doing so may lead to **permanent** damage to your battery and/or integrated charger.

6 User Guide

Once the battery is securely installed and electrically connected, it is ready for use. The internal BMS will actively ensure the battery is always protected and operating safely. The battery requires no user interface or intervention under normal conditions.

Monitoring a lithium battery is difficult, as they hold their voltage over the cycle, dropping off only when the battery is ~90% discharged, as indicated in Figure 10 for illustrative purposes. To properly monitor the SoC of a lithium battery, it's recommended to install a battery monitoring system. For basic information, a basic voltage monitor can be used.

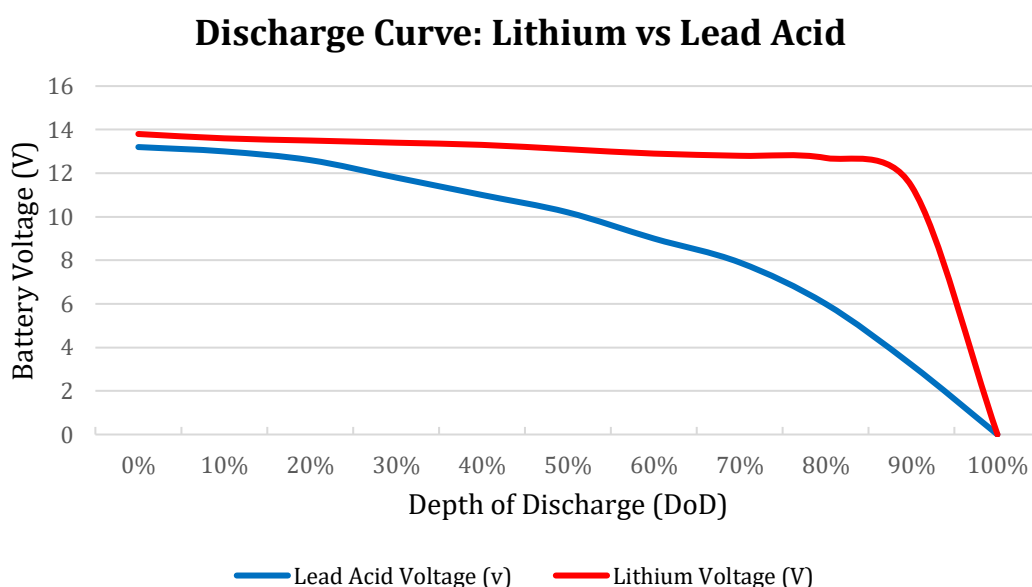


Figure 10: Voltage Curve Lead Acid vs Lithium

The Xtra Slimline battery voltages below are a useful guide:

1. A normal full battery open circuit voltage (V_{OC}) with no load rests at 13.3V to 13.8V;
2. Depending on the load, voltage may dip 0.5V below the V_{OC} ;
3. Below 13V V_{OC} the battery is low and should be charged to promote a long lifespan.
4. Below 12V V_{OC} the battery is close to empty, and should be charged straight away;
5. The integrated BMS Low Voltage Disconnect (LVD) is set at ~10.5V. The battery will not allow further discharge below this voltage.

Do not attempt to charge the battery with a voltage higher than 14.6V. Doing so may lead to **permanent** damage of your battery.

7 Advanced Configuration – SS models only

Occasionally, it may be necessary to alter the integrated DC-DC charger settings to ensure it is operating effectively. This may be necessary if your integrated DC-DC charger is not engaging or disengaging correctly:

When the vehicle's alternator is running:

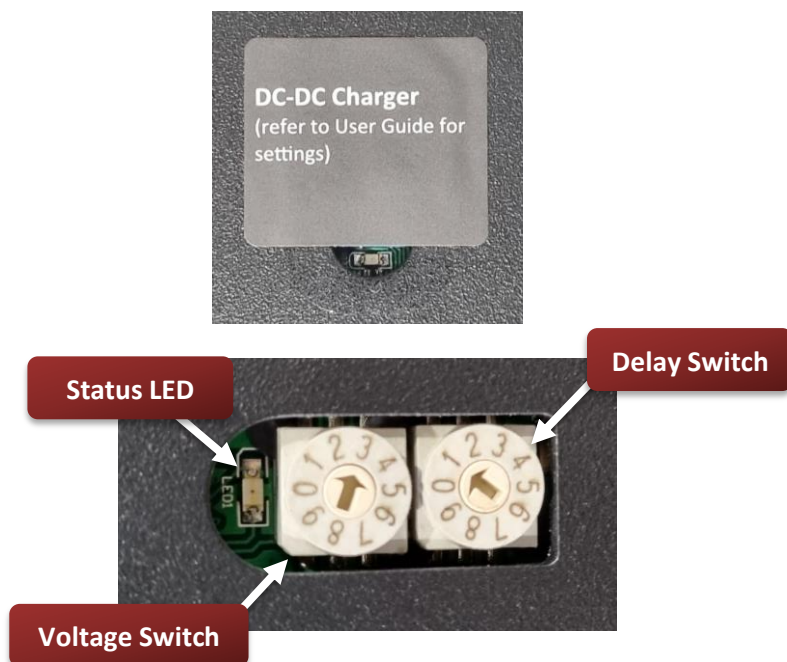
- The green status LED should illuminate (after a 15 second delay)
- The integrated DC-DC charger should start charging the lithium battery if the State of Charge is below 100%.

When the vehicle's alternator is not running:

- The green status LED should extinguish (after a 30 second delay – default setting)
- The integrated DC-DC charger should stop charging the lithium battery.

If the integrated DC-DC charger is not charging your lithium battery in the above conditions, it may be necessary to alter the voltage and delay settings.

There are two (2) DC-DC control panels on all RM12-220LFPXSLSS models, hidden behind service stickers. Remove the service stickers to gain access to the below controls:



- Status LED: Will illuminate when the DC-DC charger is active
- Voltage Switch: Will alter the ON and OFF voltage points for the DC-DC charger
- Delay Switch: Will alter the delay time before switching the DC-DC charger off

Note: It is recommended to match the settings on both DC-DC panels to avoid unexpected behaviour.

The DC-DC charger will wait for a set time before switching off if input voltage drops below the OFF point. It is possible to alter the ON and OFF voltage points as well as this time delay by using the above switches. Please see Table 2 below for further information on the various switch configurations.

Voltage Switch Position	Voltage		Delay Switch Position	OFF-Delay Time
	ON Level	OFF Level		
0	11.0 V	10.0 V	0	No Delay
1	12.0 V	11.0 V	1	30 s
2	13.0 V	12.0 V	2	1 min
3	13.3 V	12.3 V	3	1.5 min
4	13.5 V	12.5 V	4	3 min
5	13.7 V	12.7 V	5	5 min
6	14.0 V	13.0 V	6	Ignition Trigger
7* (Same as Pos. 0)	11.0 V	10.0 V	7* (Same as Pos. 0)	No Delay
8* (Same as Pos. 0)	11.0 V	10.0 V	8* (Same as Pos. 0)	No Delay
9* (Same as Pos. 0)	11.0 V	10.0 V	9* (Same as Pos. 0)	No Delay

Table 2: Voltage/Delay Switch settings.

Example: If you select '0' for the Voltage Switch Position, then the source battery will stop delivering charge once it drops to 10.0V. So that the source battery voltage does not get too low, its best to select a higher voltage shut off point, such as '4' – 12.5V.

7.1 Ignition trigger

The Ignition Trigger Input, a red socket on the front face of the battery (Figure 11), can be used to only charge the Xtra Slimline when an ignition feed is live. Please consult your auto electrician to discuss a suitable place to connect an ignition trigger input to in your vehicle. The Ignition Trigger requires only a single 12V positive signal and uses the common ground of the battery. The rotary switches will need to be configured to ignition trigger mode – 0,6. Please see Table 2 above.

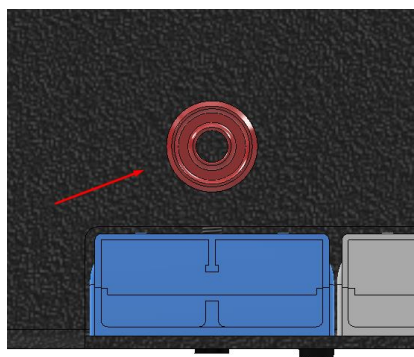


Figure 11: Ignition Trigger Input

7.2 Bluetooth feature (optional)

RM12-220LFPXSL and RM12-220LFPXSLSS are compatible with all other third-party Smart Shunt on the market. Adding Bluetooth feature to the battery could be achieved by adding any Smart Shunt with Bluetooth capability to system (Figure 12).

Please note:

- a separate “ground” return wire should be used to maintain an accuracy of shunt. Using a common chassis return path might interfere with the normal battery operation.
- The shunt and battery would need be synced in order to give an accurate measurement. Calibrate shunt to 100% SOC (if capable) and charge the battery fully before use.

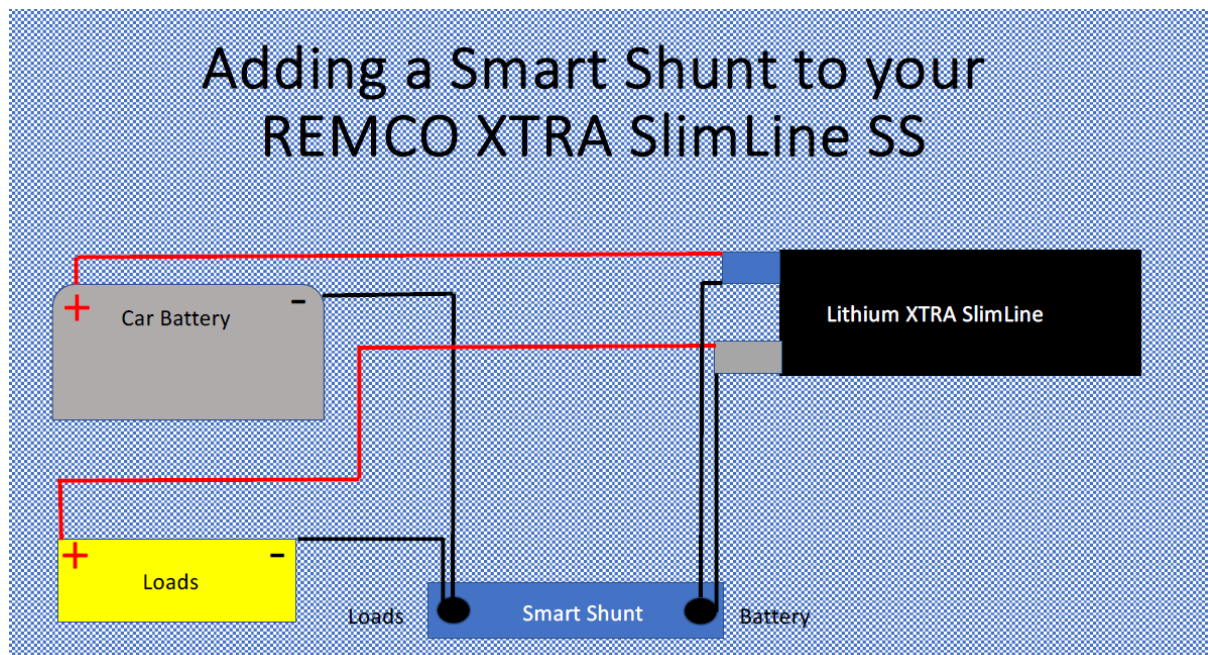


Figure 12: Smart Shunt wiring diagram

8 Specifications

	RM12-220LFPXSL	RM12-220LFPXSLSS
Battery Voltage	12 V	12 V
Battery Charge Range	13.8 – 14.6 V	13.8 – 14.6 V
Capacity	220 Ah	220 Ah
Max. discharge rate	240 A (480A Surge)	240 A (480A Surge)
Max. charge rate	140 A recommended max. 240 A maximum	140 A recommended max. 240 A maximum
Dimensions (L x W x D)	619 x 257 x 90 mm	682 x 257 x 90 mm
Operating Temperature (Discharge)	-20°C to 60°C	-20°C to 60°C
Operating Temperature (Charge)	0°C to 45°C	0°C to 45°C
Weight	22.6 kg	24.0 kg
Integrated DC-DC Charger	-	10V-16V in, 40 A input

Table 3: Xtra Slimline Specifications