

PROTRXion™

Quick Start Guide

inVENTUS™
POWER

M-24V80-TRX
M-24V90-TRX
M-36V80-TRX
M-48V60-TRX



Designed & Manufactured by

inVENTUS™
POWER

Inventus Power, Inc.
1200 Internationale Parkway
Woodridge, IL 60517

inventuspower.com
info@inventuspower.com
+1 877.423.4242

Applicable Models

| Model | Part No. (CANopen) |
|--|--------------------|
| M-24V80-TRX (with heater) | 58571-007 |
| M-24V90-TRX (with heater) | 57481-002 |
| M-36V80-TRX (with heater) | 58946-201 |
| M-48V60-TRX (with heater) | 58560-202 |
| M-48V60-TRX (with heater) <i>European Market Only</i> | 59092-201 |
| M-48V60-TRX (without heater) | 58560-601 |

Document Information

| Release Date | Revision | Scope of Change |
|--------------|----------|----------------------------------|
| 2024-07-30 | V2.8 | Minor edits to version 2 release |

Inventus Power® and PROTRXion™ are trademarks of Inventus Power.

Copyright© 2024 Inventus Power All rights reserved.

Technical Support

If you have any technical questions regarding the PROTRXion™ battery, please contact our technical support team at:

Phone: **+1.877.423.4242**

E-mail: **tech_support@inventuspower.com**

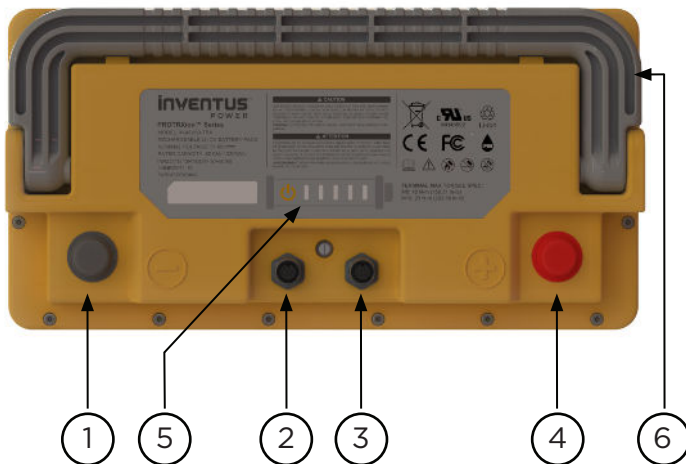
Please read the detailed User Manual first and refer to this guide as another quick resource.



Before installation or maintenance of your batteries, the following equipment is required:

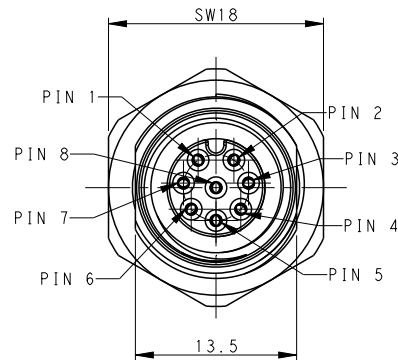
- Rubber gloves
- Safety goggles or other eye protection
- Insulated Torque Wrench / Philips Screwdriver
- Voltmeter

Mechanical Features



| # | Description |
|---|-----------------------------------|
| 1 | Negative Terminal |
| 2 | Signal Connector #1 |
| 3 | Signal Connector #2 |
| 4 | Positive Terminal |
| 5 | Battery State of Charge Indicator |
| 6 | Retractable Pull Handle |

If in doubt, please consult with **Inventus Power Technical Support** (tech_support@inventuspower.com) on further instructions on the signal cable connections to the host system.



TE Connector P/N: T4131012081-000

Battery Terminal Torque Rating

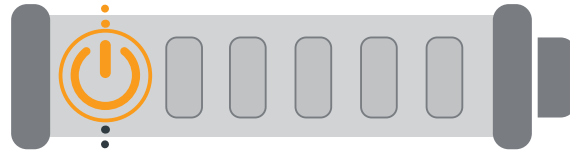
| Model | Terminal Type | Wrench Size | Torque (Nm) |
|----------------------------|---|-------------|-------------|
| M-24V80-TRX M-24V90-TRX | ISO M8 x 1.25 x 20mm Bolt (Negative Terminal) | 13mm | 17 ± 1 |
| M-36V80-TRX M-48V60-TRX | ISO M10 x 1.5 x 20mm Bolt (Positive Terminal) | 17mm | 22 ± 1 |

Wake-Up & Ship Mode

TO WAKE UP THE BATTERY

Press the SOC button
for 5 seconds

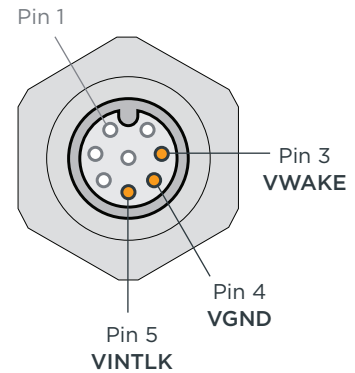
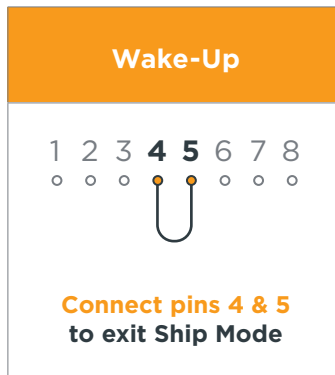
We recommend to place the battery in Ship Mode when it is not used to prevent self-consumption current drain and extend storage life.



TO PLACE IN SHIP MODE

Press the SOC button
for 20 seconds

Battery can also receive a wake up signal from the signal connector by shorting pin 4 (VGND) to pin 5 (VINTLK) to wake up battery from Ship Mode.



Power Cables

Power cables are not included with the battery unless a integration kit is purchased. Choose the appropriate power cable size based on the system load requirements. When connected in parallel configuration, it is preferable for all cables to be the same length and wire gauge. Refer to ampacity table in User Manual when selecting power cables.

Communication Cables

Communication cables are not included with the battery unless a integration kit is purchased. If your application requires communication, please connect a CAN cable to the battery signal connector and respective system or chargers.

| Item | Mfg Part No. | Cable Length | Where to Purchase |
|--------------|-----------------|-------------------|-------------------------|
| Pack to Host | T4161120008-001 | 0.5 meter (1.64') | Digikey |
| Pack to Pack | 903-09458-001 | 0.6 meter (1.97') | Inventus Power |

Charging

Many types of lead acid chargers are compatible with our PROTRXion™ batteries and safely charge in temperature ranges as shown in the table below. When choosing an intelligent charger, please discuss with Inventus Technical Support on suitable off-the-shelf charger solutions. Charger datasheets can be provided upon request.

Charge Voltage / Current

| Model | M-24V80-TRX | M-24V90-TRX | M-36V80-TRX | M-48V60-TRX |
|---|-----------------------------------|-------------|-----------------------------------|-------------|
| Max Charge Voltage | 28.0 VDC | 28.0 VDC | 41.0 VDC | 58.1 VDC |
| Recommended Charge Voltage | 28.0 VDC | 28.0 VDC | 41.0 VDC | 57.4 VDC |
| Recommended Charge Current (Use for constant current charging) | 40A (0.5C) | 45A (0.5C) | 26.4A (0.3C) | 18A (0.3C) |
| Max Charge Current (Temperature dependent) | 80A (1.0C) | 90A (1.0C) | 40A (0.5C) | 38A (0.6C) |
| Charge Temperature (without heater) | 0°C to 55°C (32°F to 131°F) | | 0°C to 45°C (32°F to 113°F) | |
| Charge Temperature (with heater) | -35°C to 55°C (-31°F to 131°F) | | -35°C to 45°C (-31°F to 113°F) | |

Pin Definition

Pin Definition (M-24V80-TRX / M-24V90-TRX / M-36V80-TRX)

| Pin # | Symbol | Description |
|-------|------------|---|
| 1 | VCANH | CAN High for communication to the vehicle/machine |
| 2 | VCANL | CAN Low for communication to the vehicle/machine |
| 3 | VWAKE | Wake up input pin - active low to enable discharging |
| 4 | VGND | Pack signal ground used to pull Wake up and Interlock low |
| 5 | VINTLK | Interlock input pin - active low to enable charging |
| 6 | VCANH_BATT | CAN High for module to module communications |
| 7 | VCANL_BATT | CAN Low for module to module communications |
| 8 | VSUPPLY | Unregulated 24V/36V output - 2A continuous max. |

Pin Definition (M-48V60-TRX)

| Pin # | Symbol | Description |
|-------|------------|---|
| 1 | VCANH | CAN High for communication to the vehicle/machine |
| 2 | VCANL | CAN Low for communication to the vehicle/machine |
| 3 | VWAKE | Wake up input pin - active low to enable discharging |
| 4 | VGND | Pack signal ground used to pull Wake up and Interlock low |
| 5 | VINTLK | Interlock input pin - active low to enable charging |
| 6 | VCANH_BATT | CAN High for module to module communications |
| 7 | VCANL_BATT | CAN Low for module to module communications |
| 8 | VSUPPLY | Aux Power Supply (15V, <15mA current limit) |

Note: Pins 6 and 8 are swapped for M-48V60-TRX models manufactured prior to March 1st, 2023.

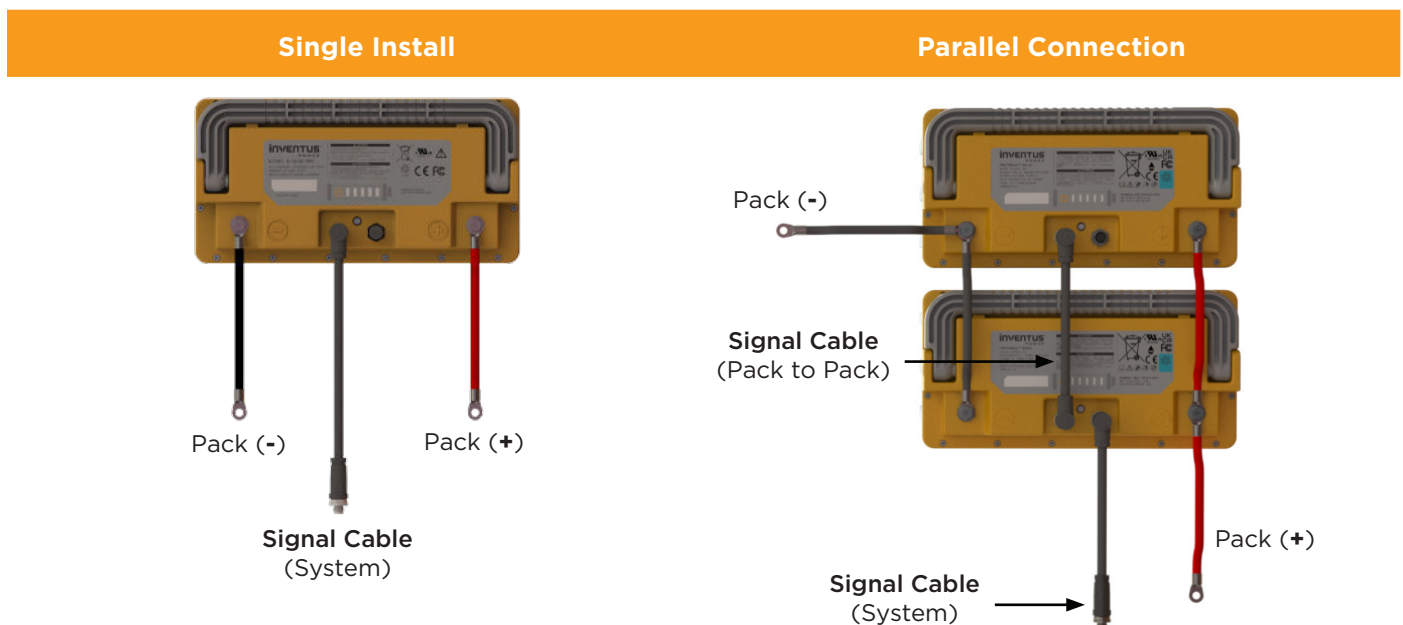
Connecting the Battery

1. Remove power to the vehicle/device prior to installation of the PROTRXion[™] battery.
2. Remove all other batteries from the system prior to replacing them with PROTRXion[™] batteries.
3. Remove the protective battery terminal covers from the terminals. Retain these covers in the event that you need to remove or move the battery at some future time.
4. Attach the negative cable from the device to the negative terminal on the battery.
5. Attach the positive cable from the device to the positive terminal on the battery.
6. Attach M12 communication cables between batteries if more than one battery and from battery to host system if the host system requires CANbus communication. Connect communication cables to the TE M12 connector on the battery with 0.60 Nm [6.1 kgfcm] or less torque in order to maintain good connection and avoid damaging the battery. **DO NOT** rotate the mating connector or loosen the nut on the battery M12 connectors to avoid damaging the battery.
7. If the battery charger is integrated with the device drawing power from the PROTRXion[™] battery, then please follow manufacturers recommended sequence for each battery connection.
8. It is recommended to fully charge and fully discharge the battery system upon initial connection to properly calibrate the SOC.

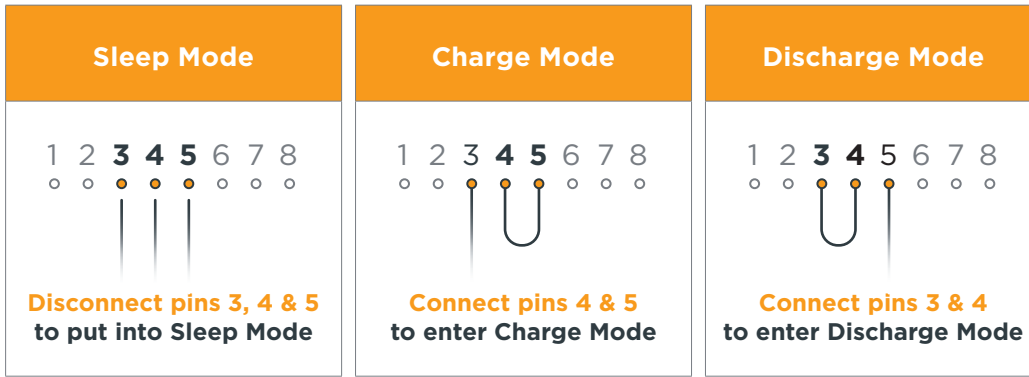
Please contact Inventus Technical Support if the system requires more than 10 batteries.

Parallel connections

The PROformance batteries can be connected in parallel to increase your energy requirements. You may connect up to 15 batteries for the M-24V80-TRX, M-24V90-TRX & M-36V80-TRX and up to 10 batteries for the M-48V60-TRX. These batteries cannot be connected in series. Refer to wiring diagram below.



Battery Modes



| Mode Name | VWAKE | VINTLK | Action | Mode Description |
|-----------|-----------------|-----------------|--|-----------------------------------|
| Sleep | Off (Open) | Off (Open) | Disconnect pins 3, 4, and 5 to enter Sleep Mode | Low power mode, MOSFETs open |
| Charge | Off (Open) | On (Low) | Connect pins 4 and 5 to enable charging | Charge allowed, MOSFETs closed |
| Charge | On (Low) | On (Low) | Connect pin 4 to pins 5 and 3 to enable charging | Charge allowed, MOSFETs closed |
| Discharge | On (Low) | Off (Open) | Connect pins 3 and 4 to allow discharging | Discharge allowed, MOSFETs closed |
| Ship | Off (Open) | N/A | Press the SOC button and hold for 20 sec | Low power mode, MOSFETs open |
| Shutdown | N/A | N/A | Apply charge voltage to exit Shutdown | Lowest power mode, MOSFETs open |

LED Status

| LED Indicator Status | SOC |
|----------------------|-----------|
| | 80 - 100% |
| | 60 - 79% |
| | 40 - 59% |
| | 20 - 39% |
| | 10 - 19% |
| | <10% |

Note: CAN lines in the battery pack DO NOT have internal termination resistance. It is recommended to properly terminate the system and battery CAN Bus lines following the CAN Bus termination standards. For any technical questions about properly adding termination resistance, please contact technical support at tech_support@inventuspower.com.