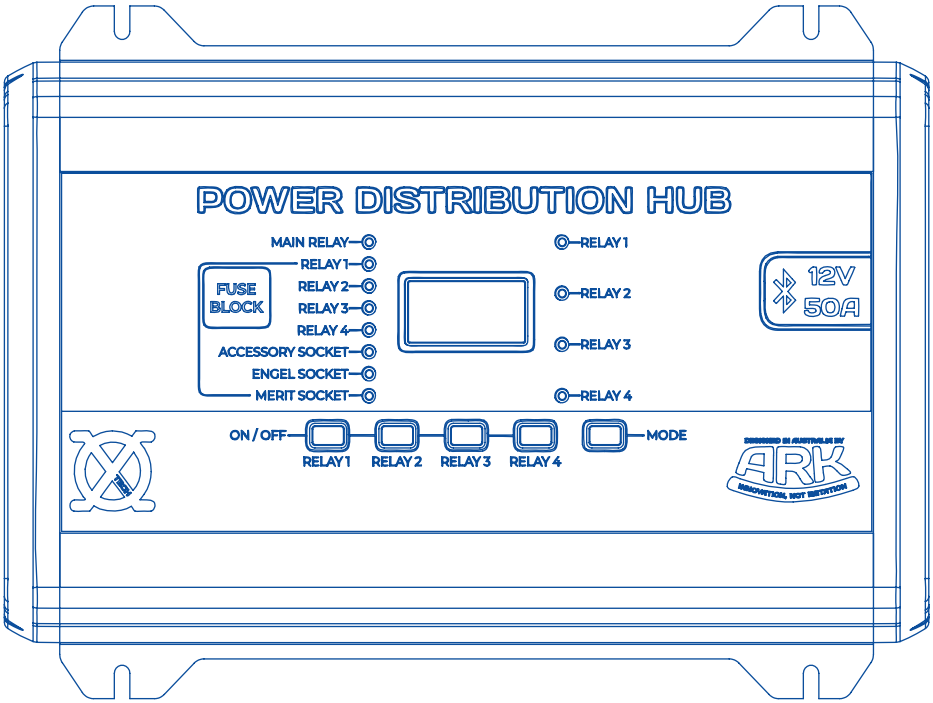
POWER DISTRIBUTION HUB (PDH) MANUAL

V1. 9/21

XO TECH 12V DC 50A POWER MANAGEMENT SYSTEM WITH APP CONTROL



Ensure this manual is stored in a safe place and handed over to new owners for reference on operation and maintenance.

Part No. XOTPDH504

ARK
INNOVATION, NOT IMITATION

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PLEASE READ THIS MANUAL CAREFULLY BEFORE INSTALLATION AND FIRST USE. PLEASE KEEP IN A SAFE AND SECURE PLACE FOR FUTURE REFERENCE. IF YOU SELL OR PASS ON THIS PRODUCT PLEASE ALSO PASS THE MANUAL ALONG WITH IT.

THIS PRODUCT SHOULD NOT BE USED FOR ANY MEDICAL PURPOSE, LIFE SUSTAINING EQUIPMENT, SAFETY APPLICATIONS, OR ANY APPLICATION WHERE EQUIPMENT FAILURE CAN CAUSE INJURY, DEATH, FIRES OR ANY OTHER HAZARD.

PLEASE READ ALL MANUALS, WARNING, AND INSTRUCTIONS BEFORE INSTALLING AND USING THIS PRODUCT. FAILURE TO ADHERE TO THESE INSTRUCTIONS PROPERLY, OR IMPROPER USE OF THIS PRODUCT COULD RESULT IN PERSONAL INJURY, DEATH OR DAMAGE TO PROPERTY.

WARNING: ENSURE POLARITY OF YOUR ANDERSON STYLE CONNECTOR IS CORRECT AND THERE IS NO LOAD CONNECTED TO THE PDH WHEN TURNING ON FOR THIS FIRST TIME. ALWAYS ENSURE A 50AMP INLINE FUSE IS INSTALLED ON POSITIVE WIRE FROM BATTERY.

1. Warnings & Safety instructions

Ark Corporation accept no liability for damage in the following cases:

- Damage to product as a result from mechanical influences and/or incorrect installation of the device.
- Alterations or modifications to the device without express permission from Ark Corporation
- Use for purposes other than those described in the operating manual.

Note: Always follow basic safety information when using electrical devices to protect against electric shock, fire hazards or injury.

1.1 General safety

- Only use the PDH as intended
- The device must not be used if itself or the battery connection cable is visibly damaged in any way shape or form.
- This device may only be repaired by a qualified and authorised person. Failure to adhere to this direction could cause harm and will void product warranty.
- Always keep and use device out of reach of children.
- Children must be supervised to ensure they do not play with device.
- Do not mount device in wet areas.
- Use of accessories not recommended or sold by Ark Corporation may result in fire, electric shock or other harms to person.
- Remove personal metal items such as rings, necklaces, bracelets, and watches before working with a vehicle battery. A vehicle battery can produce a short circuit strong enough to weld such metals which will result in severe burns.

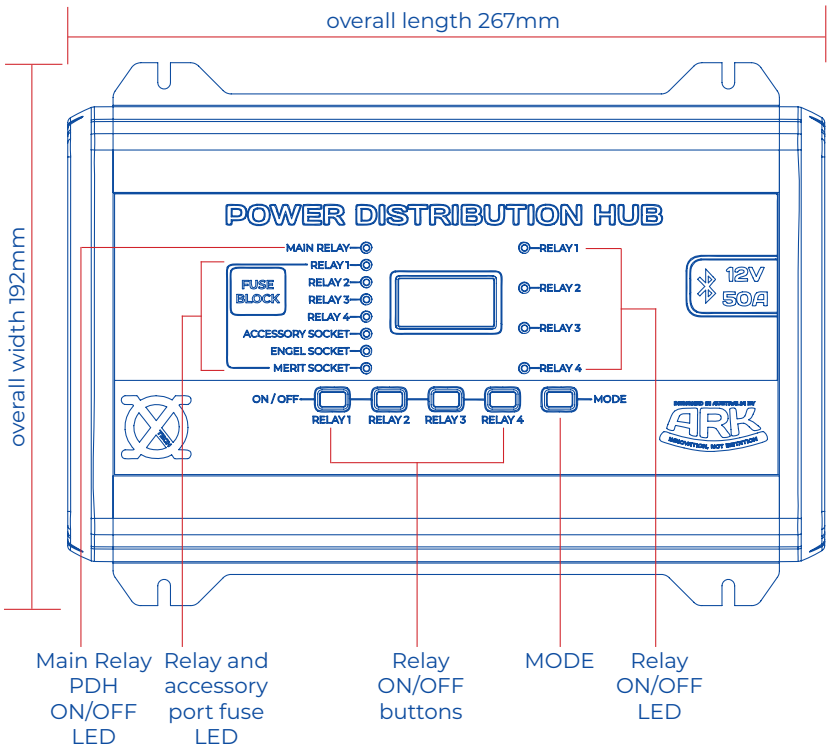
1.2 Operating the PDH safely

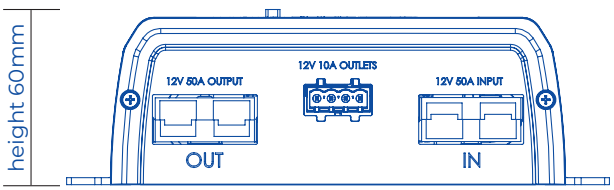
Do NOT operate the device if:

- Near corrosive fumes.
- Near combustible materials.
- In areas where there is risk of explosion.
- In areas submerged under water or other liquids.
- There is visible damage to any ports.
- There is visible damage to wiring.
- If there is not a secure connection to the battery.

2. Overview

2.1 PDH Function & Dimension





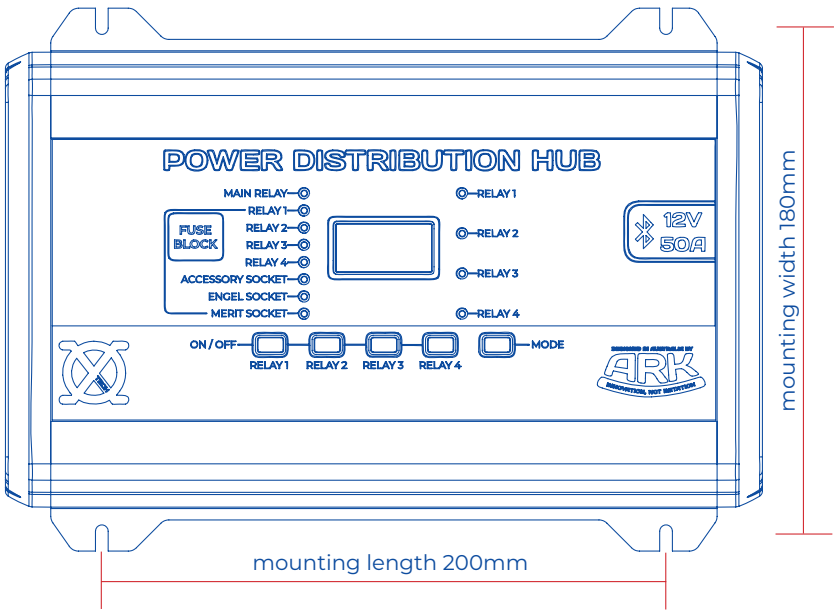
2.2 Packaging contents

- 1 x Power Distribution Hub (PDH)
- 2 x Anderson style connector
- 4 x Cable Ties
- 2 x Red Heat Shrink
- 4 x Black Heat Shrink
- 4 x 8mm Ring Terminals
- 2 x 10mm Ring Terminals
- 1 x Product Manual

3. Getting Started (introduction of the device)

3.1 Fitting the PDH

- Choose a location that is easily accessible with adequate ventilation.
- Ensure the location you have chosen to install your PDH is free of potential risks that may damage the device i.e. splashing water, venting gases, naked flames or potential combustible gases or liquids.
- Make sure there is enough room to connect power input and accessories.
- Use 4x M4 fasteners to secure the PDH to a flat level surface free of bumps and intrusions. (Fasteners not included)



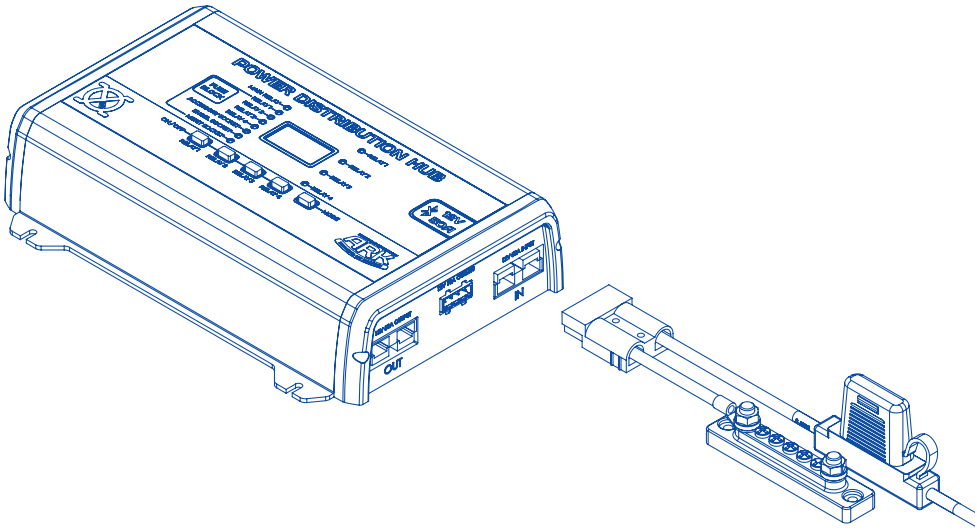
3.2 Connecting the PDH to battery

Using a 50A fuse is a MUST and should be considered on any installation.

You can connect your PDH to your battery using an Anderson style connector. Please ensure a 50A fuse is fitted inline on the Positive cable as close to the battery as possible, it is highly recommended to use wiring no less than 8AWG. (50A fuse not included)

With the Negative cable, we suggest using a negative busbar as illustrated inline with this connection before returning to the battery. (Busbar not included)

Ensure all connections to the battery are tight and secure and plug the power to the top Anderson style connector on the PDH labelled “INPUT”.



HANDY HINT - Using a negative busbar will prevent the need of returning all your negative lines from your devices controlled by the 4 x Relay outputs back to the battery and provide a common ground for these devices.

3.3 Pairing the PDH

Before you enter the pairing stage ensure the PDH is connected to the battery and is powered. Ensure there is **NO** load on the device. It is recommended that **NO** accessories or relays are connected to the device at this stage.

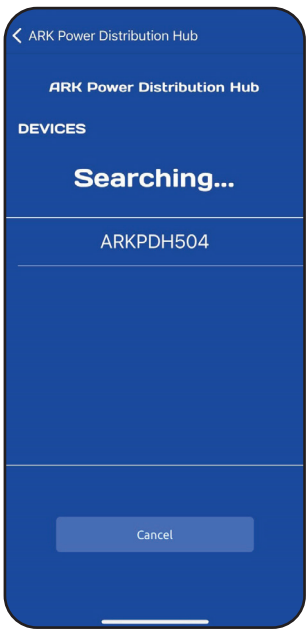
Step 1: Please hold Mode button on the PDH for at least 10 seconds or more until the device enters pairing mode and the display reads “Pairing Mode”

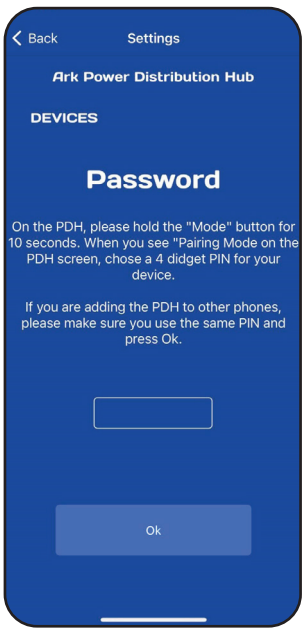
Step 2: Open the Ark Smart Hub App and allow App to access Bluetooth Services on your device, then choose PDH button

Step 3: Click on “Add Device”.

Step 4: In the searching list please choose ARKPDH504.

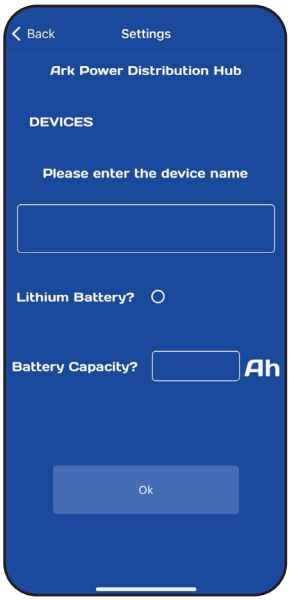
Step 5: Please Choose a 4-digit password for your device and select OK.

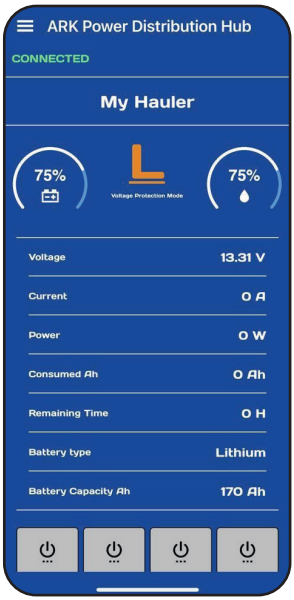




Step 6: Please enter a device name. If using a lithium battery press the tab until green. If using another battery i.e AGM, Gel, Lead Acid DO NOT SELECT TAB. Then input battery capacity and select OK.

Your Device is now connected, and your battery information will be displayed.

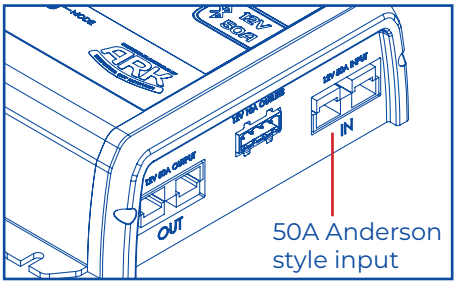


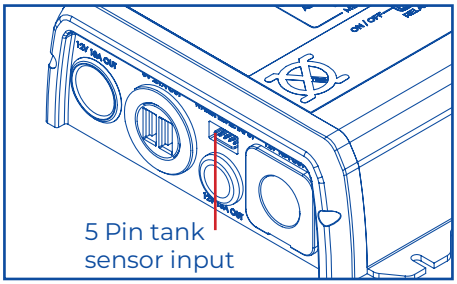


3.4 Connecting the accessories

The PDH has Two Inputs.

- Battery input
- 1x Water Tank Sensor.



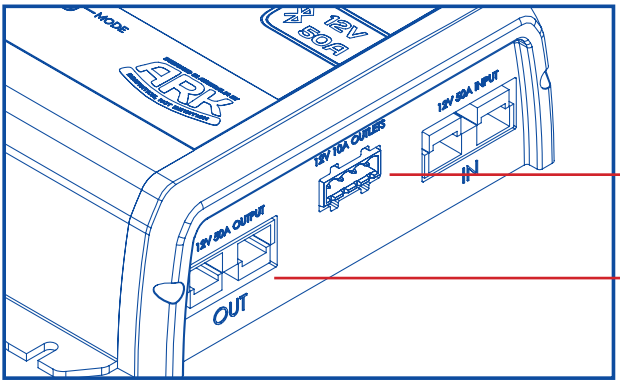


The Water tank sensor port will accept AMP-171822-5 5 pin connectors (not included)
These are common on the market and are readily available through RV Electronics Australia.
Acceptable models include:

1. SP0004
2. SP0011
3. SP0028

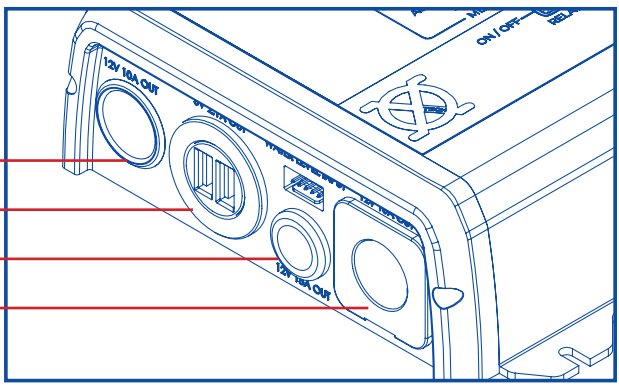
The PDH has NINE outputs:

- 1x Anderson Style Plug (50A)
- 1x Standard Socket (10A)
- 1x Engel Socket (10A)
- 1x Merit Socket (15A)
- 1x Dual USB port (5V 2.1A)
- 4x Controllable Relays (10A EACH) - Accessory 12V + Outlet



Controllable Relays x 4
Accessory 12V + Outlet

Anderson Style
Connector 50A



Standard Socket 10A

Dual USB Port 2.1A

Merit Socket 15A

Engel Socket 10A

CAUTION - If all outputs are used at once, the total maximum current the PDH can operate is 50A only, if overloaded the device will enter Current Protection Mode (Page 9)

4. Features and Specifications

4.1 Features – Protection Modes

The PDH incorporates 3 protection modes to keep the device and the battery it is connected to safe.

- Voltage Protection Mode
- Current Protection Mode
- Temperature Protection Mode

Voltage Protection mode:

Voltage protection mode is incorporated into the PDH to protect the battery from draining past certain points based on the selected settings by the user.

Voltage Cut Out Settings:

- High: 12.1v – When the device is in High Mode the letter “H” will be displayed in the top left-hand corner of the PDH screen
- Medium: 11.6v - When the device is in Medium Mode the letter “M” will be displayed in the top left-hand corner of the PDH screen
- Low: 10.9v - When the device is in Low Mode the letter “L” will be displayed in the top left-hand corner of the PDH screen
- No: No Protection – (No cut out point). When the device is in No Mode the letter “N” will be displayed in the top left-hand corner of the PDH screen.

“N” Setting will not offer any voltage protection. This mode is to be used in circumstances where the battery must be pushed to its absolute limits. Using “N” setting runs the risk of permanent damage to the battery because it will allow the user to use the battery to the last volt. When “N” mode is activated by the user, the device will start an override timer for “N” mode. This timer lasts 15 minutes.
After 15 Minutes the device will then override to medium settings.

Voltage Protection Reset:

If Voltage Protection is triggered the device will wait 4 minutes before re-checking the battery voltage state.
Voltage protection will override at the following voltage:

- High: 12.6v
- Medium: 12.2v
- Low: 12.0v

If Device is turned off, it will remember which voltage setting it was previously in and automatically be set to that setting unless in “N” mode.

If the device is turned off in “N” mode, when turned back on it will restart in “M” settings.

When In protection mode this following symbol will be displayed on screen.

Protection Mode can be overridden by changing Voltage Cut Out Settings: for example, if the user has it set at High however the accessory can operate within the medium or low setting range, the user can change this setting through the mobile app or by pressing the mode button on the PDH.

If device is overloaded, it will appear on screen and will not come out of voltage protection mode until the overloading issue is addressed. Overloading occurs when there is too much draw on the device based on the user selected settings.

Current Protection:

The PDH is designed to operate with a total maximum current of 50amp. If this current is exceeded the device will trigger current protection mode.

When Current protection mode is triggered the following symbol will be displayed on screen.

Temperature Protection:

The PDH internal operating temperature range is between -20 ˚C to 85 ˚C. When in temperature protection mode the following symbol will be displayed.

Temperature protection mode is triggered above 85 ˚C. Device will not exit temperature protection mode until the internal temperature is below 55 ˚C.

4.2 Features – Battery Analysis

On initial start-up it is advised the PDH be connected to a fully charged battery. When the PDH is first turned on, in order to estimate the state of charge (SOC) of the battery, there should no load connected to the device for 1 minute so the PDH can estimate the charge level of the battery. The user must make sure they select the correct battery profile and capacity which can be changed in the settings menu in the mobile app.

The PDH uses coulomb counting to monitor the SOC of the battery. PDH has a smart feature which recognises when the battery is being charged. In such situations the SOC information will not be displayed on screen of the device or the mobile app. Once the battery has exited a charge cycle the PDH will analyse the battery and reassess the SOC.

It is important to note that the PDH will not assess the SOC when there is a load connected to the PDH. For example, when a fridge is connected to the PDH and the fridge compressor is running simultaneously when the battery comes out of a charge cycle, The PDH will not display SOC. When out of a charge cycle and the fridge compressor is not running, battery analysis will be applied for 10mins to display SOC.

4.3 Features – Battery selection and state of charge display

The PDH device is designed with 2 battery profiles.

- Lithium (LiFePO4)
- Not Lithium (Lead-Acid, AGM, Calcium, Gel)

The device will recognise when the battery is being charged and a message will display on the screen “battery is being charged”. When battery is being charged all SOC calculations will NOT be displayed because there is not an accurate measure when battery is being charged. Battery percentage and hours remaining till charged will not be displayed. Usage will still be displayed when battery is being charged e.g current draw, amp usage etc.

Lithium Batteries (LiFePO4) – Voltage more than 13.9, the system will assume battery is being charged. When voltage is 13.75 and below all SOC displayed will restart.

Not Lithium batteries (Lead-Acid, AGM, Calcium, Gel) - Voltage more than 13.25, the system will assume battery is being charged. When voltage is 13.1 and below all SOC displayed will restart.

"Analysing" will be displayed on screen when SOC is being calculated.

"Analysing" will be displayed if there is a load on the battery SOC has NOT been calculated.

On initial start-up, the system will analyse the battery and there should be no load placed on the battery for 1 entire minute to accurately assess SOC.

When device is analysing the battery 0% will be displayed on the device App.

If changing battery type and size, you must do this through the device mobile App. No load should be placed on the battery to ensure the device accurately assesses SOC correctly.

4.4 Screensaver Mode

Screensaver Mode will be automatically activated when there is no load on the PDH after 30mins, this turns the screen on the PDH OFF saving additional power for your battery.

The screen will be automatically turned ON when a load on the PDH is connected or any button on the device is pressed.

4.5 Input/Outputs and Relays

Power Input:

The main power Input is the top right hand side Anderson style on the device.

Outputs:

- 1x 50A Anderson Style connector – (Lower right side)
- 1x 10A Standard Socket – Cig Socket
- 1x 2.1A Dual USB
- 1x 10A Engel Socket
- 1x 15A Merit Socket
- 4x 10A Wired Relays (12V Positive Outlet only, Negative to earth BUSBAR as suggested or direct to battery)

HANDY HINT - All Outputs and Relays are Rated to 10amp (except Anderson style connector which is 50amp and Merit Socket which is 15 amp) and fused with thermal cut out fuses. Relays will automatically cut out if above operating temperature. Relays will reset when fuses reach below cut out temperature. If fuses keep cutting in and out the PDH is overloaded.

4.6 Technical Specifications Table	
Electrical:	
Input Voltage:	12V
Maximum Total Input/Output Current:	50A
Maximum Current per Output: • 1x Anderson style connector • 1x 12v DC Socket • 1x Dual USB • 1x Engel Socket • 1x Merit Socket • 4x Relays	 50A 10A 2.1A Combined 10A 15A 10A each
Voltage Protection cut off: • High • Medium • Low • No Protection	 12.1V 11.6V 10.9V
Voltage Protection Reset: • High • Medium • Low	 12.6V 12.2V 12.0V
General:	
Operating Temperature:	-20°C to 85°C
Storage Temperature:	-40°C to 85°C
Internal Temperature Protection Triggered:	85°C
Temperature Protection Reset:	55°C
Standby Usage:	0.2Ah
Weight:	1.3kg
Compliance:	
AS/NZS 4268	Australian / New Zealand
FCC	USA
IC	Canada

5. Using Ark Smart Hub App

5.1 Downloading App

Download Ark Smart Hub App from App store or Google Play. Alternatively, you can scan the below QR code for the link.

5.2 Pairing Device

Refer to detailed instruction section 3.3 Pages 5-6

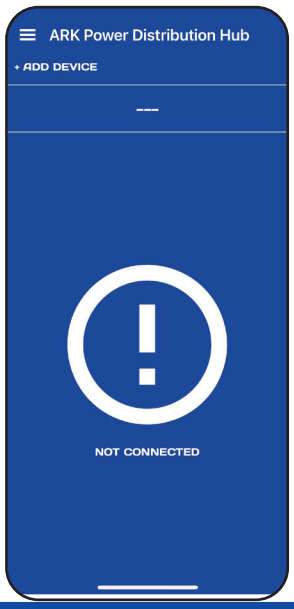
Before you enter the pairing stage ensure the PDH is connected to the battery and is powered. Ensure there is NO load on the device. It is recommended that NO accessories or relays are connected to the device at this stage.

You can pair, name and save multiple PDH devices to the app. i.e if you have a PDH in your camper and 4WD, they can be saved and named CAMPER and 4WD for quick and easy reference in app.

NOTE: Only one device at any one time can be connected to the app for relay control and monitoring of battery.

5.3 Using the App General Dashboard

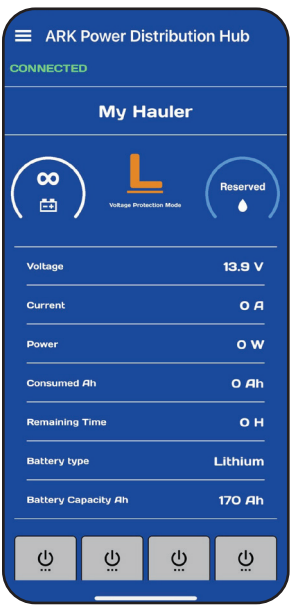
Make sure your Bluetooth is turned on and open the app. After you open the App, please choose the paired device from the scrolling menu.



After choosing the device the app will try to connect to the PDH. After connection, the app will show the PDH general dashboard like this example.

The General Dashboard provides information about the battery status, power consumption, protection mode and water level (if water sensor has been installed and connected). There are FOUR buttons which are used to control the FOUR relays.

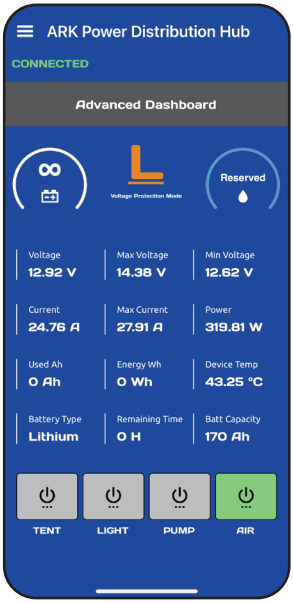
In order to change the PDH protection mode just simply tap the ORANGE voltage protection letter then cycle through the options.



The PDH has a smart feature to detect when your battery is being charged as explained in Section 4.3. When the PDH detects the battery is being charged, the battery status section will change to “∞”.

If there is no water tank sensor connected or the tank level is below 25% the status will change to “reserved”.

5.4 Using the App Advanced Dashboard



If you require more detailed information from the PDH you can use the Advanced Dashboard by selecting it from the menu.

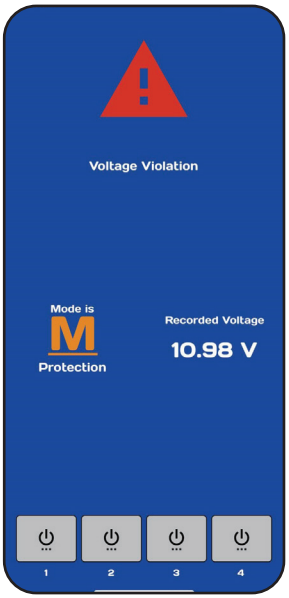
The Advanced dashboard will provide more in-depth information about power consumption, status of the PDH device and battery its is connected to.

5.5 App Settings

The settings page will provide the user with options to change battery type and battery capacity. You can also customise the name of each relay, you can re-name the paired device or delete it from the app entirely.

5.6 Violations

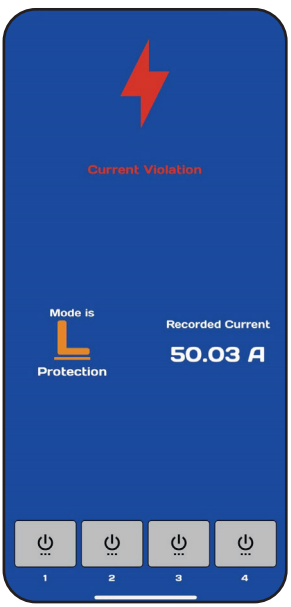
5.6.1 Voltage Violation



Whenever there is a voltage violation this page will show on the app. In this page you can see the status of the protection mode and the specific voltage recorded when the violation occurred.

You can change the voltage protection mode by tapping the orange voltage symbol. The user has full control of the relays to prevent overloading of the device during this time.

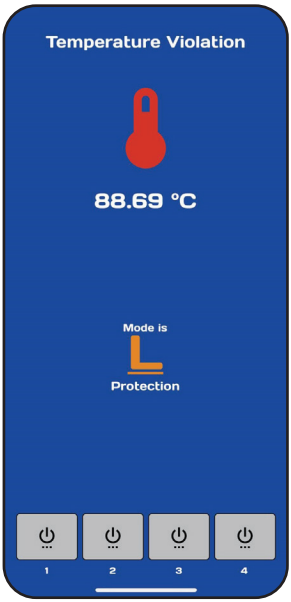
5.6.2 Current Violation



Whenever there is a current violation then this page will show on the app. In this page you can see the status of the voltage protection and the specific current recorded when the violation occurred.

The user has full control of the relays to prevent overloading of the device during this time.

5.6.3 Temperature Violation



Whenever the inside temperature of the device reaches 85˚C or above, the following page will show on the app.
In this page, you can see the present inside temperature of the device.
The voltage protection mode is also displayed in this page. The user has full control of the relays to prevent overloading of the device during this time.

6. Troubleshooting

WARNING: ENSURE POLARITY OF YOUR ANDERSON STYLE CONNECTOR IS CORRECT AND THERE IS NO LOAD CONNECTED TO THE PDH WHEN TURNING ON FOR THIS FIRST TIME. ALWAYS ENSURE A 50AMP INLINE FUSE IS INSTALLED ON POSITIVE WIRE FROM BATTERY.

PDH is connected to battery but it will not turn on:

Check polarity of the Anderson style plug. Ensure the Anderson style plug is correct and positive is connected to positive and negative connected to negative. Check all connections are secured and not loose.

PDH is connected but only Fuse indicators are alight:

The Battery input is connected to the output Anderson style socket. Remove and place in input side.

PDH has been turned on for the first time but is not displaying battery percentage:

Ensure there is NO load connected to the PDH on initial start-up for at least 1 minute. The PDH will analyse the battery when there is no load connected.

Relays are turned on but there is no output:

Check LED fuse indicators and ensure all indicators are alight. If they are not, the relay is most likely overloaded. Reduce the load and wait for the fuse to reset automatically.

PDH screen reads “analysing the battery” and mobile app says 0%:

There is a load on the device therefore the PDH cannot assess battery state of charge correctly. Ensure all loads are disconnected or if you have a permanent load connected (i.e Fridge) wait until the PDH smart algorithm detects no load (i.e fridge compressor is not running). At this stage, the PDH will automatically assess State of Charge(SOC). This Process takes up to 10 minutes and if there is any load detected during this time it will restart the process in order to measure an accurate SOC.

PDH screen reads “battery is being charged” but my battery is not being charged

Wrong battery type has been selected, “Lithium” battery type voltage is much higher than standard “Non Lithium” battery types such as AGM, Gel or Lead acid type batteries. If “Lithium” battery type is selected when fitting “Non Lithium” type batteries then the system will assume the battery is being charged because of the high volt range.

The water tank sensor is connected, and the tank is full but PDH reads 0%:

Ensure to use recommended water tank level sensor. PDH is suitable to use with Non-Metal water tanks. If your water tank is metal make sure it is not grounded. Grounded metal water tanks will interfere with water sensor communication

7. Warranty

Ark products are covered under consumer law outlined in its warranty policy available online

www.arkcorporation.com/warranty-claim-policy/

Ark does not warrant the workmanship of auto electricians, fabricators or any installers of this product. Checks should be made on the proficiencies of those hired to fit this product.

8. Maintenance

Minimal maintenance is required to keep the XO TECH Power Distribution Hub looking new and in good working order.

Periodically check all connections for firm fitment.

Periodically assess wires to ensure there is no damage or chance of short circuit. If wires are found to be damaged, immediately disconnect the PDH from the battery and replace any damaged cable.

DO NOT spray the PDH with water as it is an electrical device. Wipe any dirt or dust with a slightly damped cotton cloth.

NOTES:

POWER DISTRIBUTION HUB

XO TECH 12V DC 50A POWER MANAGEMENT SYSTEM WITH APP CONTROL

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V1. 9/21