SCP Cube MK2

New-Generation Supercapacitor Industrial Power Backup Solution

User's Manual

Version 1.0

P/N: 4016004100100P

2024.04

Revision History

Version	Date	Description
1.0	2024.04	Initial release

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Declaration of Conformity

CE

The CE symbol on your product indicates that it is in compliance with the directives of the Union European (EU). A Certificate of Compliance is available by contacting Technical Support.

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from ARBOR. Please contact your local supplier for ordering information.

Warning

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC Class A

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

RoHS

ARBOR Technology Corp. certifies that all components in its products are in compliance and conform to the European Union's Restriction of Use of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2002/95/EC.

The above mentioned directive was published on 2/13/2003. The main purpose of the directive is to prohibit the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE) in electrical and electronic products. Member states of the EU are to enforce by 7/1/2006.

ARBOR Technology Corp. hereby states that the listed products do not contain unintentional additions of lead, mercury, hex chrome, PBB or PBDB that exceed a maximum concentration value of 0.1% by weight or for cadmium exceed 0.01% by weight, per homogenous material. Homogenous material is defined as a substance or mixture of substances with uniform composition (such as solders, resins, plating, etc.). Lead-free solder is used for all terminations (Sn(96-96.5%), Ag(3.0-3.5%) and Cu(0.5%)).

SVHC / REACH

To minimize the environmental impact and take more responsibility to the earth we live, Arbor hereby confirms all products comply with the restriction of SVHC (Substances of Very High Concern) in (EC) 1907/2006 (REACH --Registration, Evaluation, Authorization, and Restriction of Chemicals) regulated by the European Union.

All substances listed in SVHC < 0.1 % by weight (1000 ppm)

Important Safety Instructions

Read these safety instructions carefully

1. Read all cautions and warnings on the equipment.
2. Place this equipment on a reliable surface when installing. Dropping it or letting it fall may cause damage
3. Make sure the correct voltage is connected to the equipment.
4. For pluggable equipment, the socket outlet should be near the equipment and should be easily accessible.
5. Keep this equipment away from humidity.
6. The openings on the enclosure are for air convection and protect the equipment from overheating. DO NOT COVER THE OPENINGS.
7. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
8. Never pour any liquid into opening. This may cause fire or electrical shock.
9. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
10. If one of the following situations arises, get the equipment checked by service personnel:
    a. The power cord or plug is damaged.
    b. Liquid has penetrated into the equipment.
    c. The equipment has been exposed to moisture.
    d. The equipment does not work well, or you cannot get it to work according to the user's manual.
    e. The equipment has been dropped or damaged.
    f. The equipment has obvious signs of breakage.
11. Keep this User's Manual for later reference.

Warning

The Box PC and its components contain very delicately Integrated Circuits (IC). To protect the Box PC and its components against damage caused by static electricity, you should always follow the precautions below when handling it:

1. Disconnect your Box PC from the power source when you want to work on the inside.
2. Use a grounded wrist strap when handling computer components.
3. Place components on a grounded antistatic pad or on the bag that came with the Box PC, whenever components are separated from the system.

Supercapacitor Replacement

Incorrect replacement of the supercapacitor may lead to malfunction of the product. The supercapacitor must be replaced by the manufacturer.

Do not throw supercapacitors into the trash can. It must be disposed of in accordance with local regulations concerning special waste.

Technical Support

If you have any technical difficulties, please contact us at:

https://www.arbor-technology.com

Warranty

This product is warranted to be in good working order for a period of one year from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster.

Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, or inability to use this product. Vendor will not be liable for any claim made by any other related party.

Vendors disclaim all other warranties, either expressed or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose, with respect to the hardware, the accompanying product's manual(s) and written materials, and any accompanying hardware. This limited warranty gives you specific legal rights.

Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.

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Chapter 1

Introduction

1.1 Product Highlights

- Designed for industrial box PC & panel PC
- Maintenance free supercapacitors
- Safe and reliable; no danger of fire or explosion
- No danger of overcharging
- Fully discharged for safety
- Environmentally friendly without hazardous materials
- Wide operating temperature range (-20°C to 70°C)
- Multi-function control utility

1.2 Package Contents

Upon opening the package, carefully inspect the contents. If any of the items is missing or appears damaged, contact your local dealer or distributor. The package should contain the following items:

1 x SCP Cube

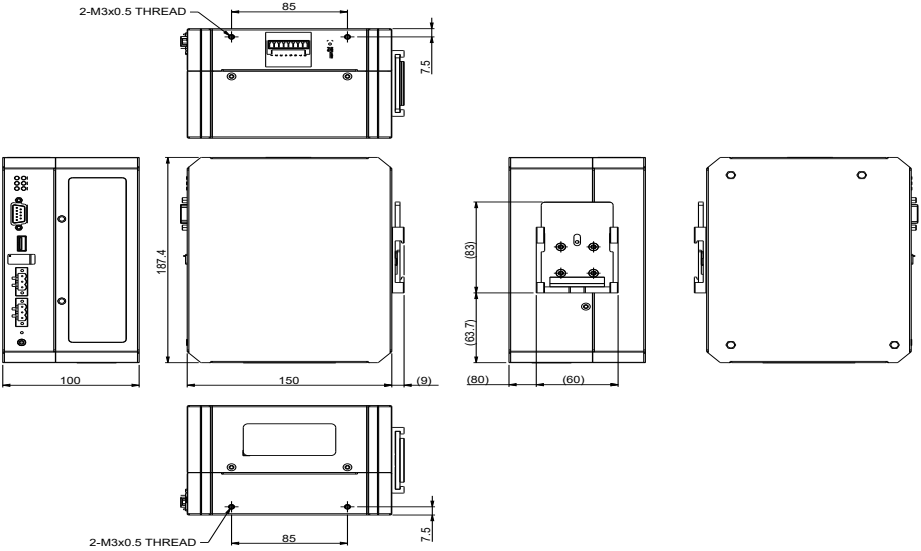
1 x **Accessory Box** that contains the following items:

- 1 x User's manual
- 1 x USB to USB cable
- 1 x RS-232 DB9 to DB9 cable
- 2 x 3-pin plug for terminal block
- 1 x 8-pin plug for terminal block

1.3 Ordering Information

SCP-43-MK2	4S3P supercap power backup system MK2
SCP-41-MK2	4S1P supercap power backup system MK2

1.4 Dimensions



1.5 Specifications

System	
Chip	High current supercap backup controller
Supercapacitor	
Capacity	400 Farads / each
Power Requirement	
Power Input	DC 12~35V input support
Power Output	DC 12V / 24V output with switch support Max. 120W
I/O	
Power In	1 x 3-pin terminal block
Power Out	1 x 3-pin terminal block

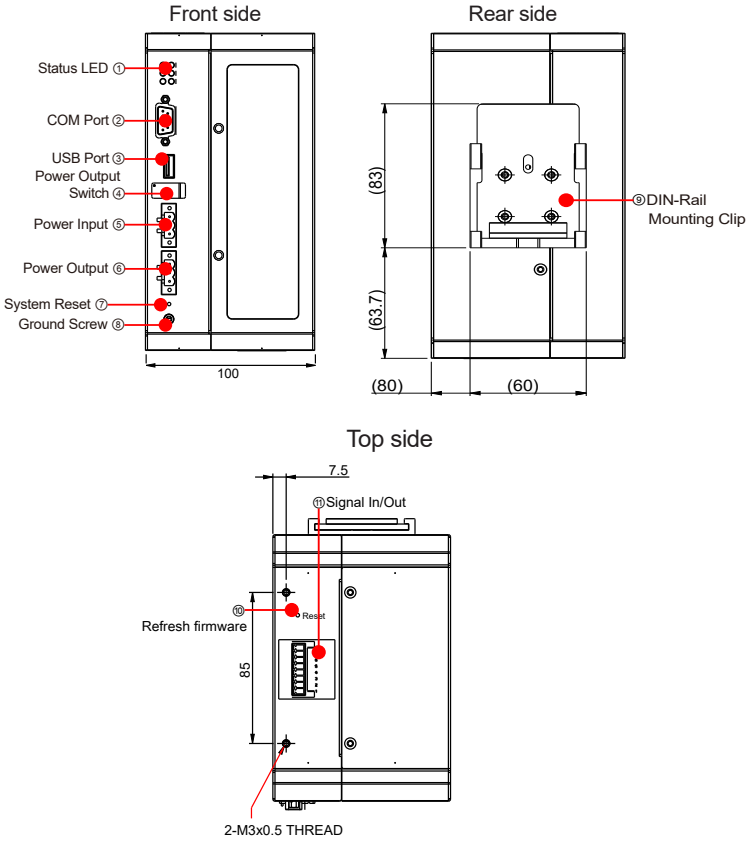
Switch	1 x slide switch for power output control
USB	1 x Type-A connector
COM	1 x COM with RS-232
Signal In/Out*	1 x 8-pin terminal block
Environmental	
Operating Temp.	-20ºC ~ 70ºC (-4ºF ~ 140°F)
Storage Temp.	-30ºC ~ 80°C (-22°F ~ 158°F)
Operating Humidity	10 ~ 95% RH @ 70°C (non-condensing)
Vibration	0.5 Grms/5~500Hz/random operation
Shock	Operating 10G (11ms), non-operating 30G
Mechanical	
Mounting	DIN rail mount with bracket
Chassis	DIN rail-mounting chassis, and SGCC steel chassis
Weight	2.2 kg (4.85lb)
Dimensions (W x D x H)	100 X 150 X 187.4 mm (3.94” x 5.91” x 7.38”)
OS Support	
Windows 7/10	
Ordering Information	
SCP-43-MK2	4S3P supercap power backup system MK2
SCP-41-MK2	4S1P supercap power backup system MK2

Note: 1. To download USB-to-COM driver and SCP Cube Utility, please visit ARBOR website and locate the driver page of the SCP Cube.
Note: 2. The automatic output power switch control and power ignition control function depends on your device's configuration.
Note: 3. Signal in/out includes ignition in/out signal and remote power switch signal, which may include but is not limited to the above mentioned.

Chapter 2

Installation

2.1 Getting to Know the SCP Cube



No.	Item	Descriptions
1	Status LED	Displays power & charging status. See below for details.
2	COM Port	RS-232 COM Port To connect to industrial PC system for monitoring SCP Cube power status.
3	USB Port	USB 2.0 Port To connect to industrial PC system for monitoring SCP Cube power status.
4	Power Output Switch	Select 24V or 12V output voltage according to the power input of the connected industrial PC system.
5	Power Input	DC 12~35V wide voltage power input terminal block To connect to the power source.

6	Power Output Terminal Block	DC 24V or 12V power output terminal block To connect to the power input of the industrial PC system.
7	Ground Screw	Ground screw for ground connection.
8	DIN-Rail Mounting Clip	For DIN-rail mounting.

Status LED

Group	Item	Color	Descriptions
PWR IN (Top)	ON	Green	Solid: SCP Cube is connected to power source.
	OFF	Red	Solid: SCP Cube is disconnected from power source.
Charging (Middle)		Yellow	Solid: SCP Cube is charging from the power source. Flashing: SCP Cube is exporting power to connected device.
		Green	Solid: SCP Cube is fully charged.
PWR OUT (Bottom)	24V	Green	Solid: SCP Cube power output is 24V.
	12V	Blue	Solid: SCP Cube power output is 12V.

The following is a depiction of some different states of the SCP Cube:

The SCP Cube is connected to a power source.

Charging is in process.

The power output mode is 12V.

The SCP Cube is disconnected from a power source.

It's exporting power to the connected device.

The power output mode is 24V.

The SCP Cube is connected to a power source.

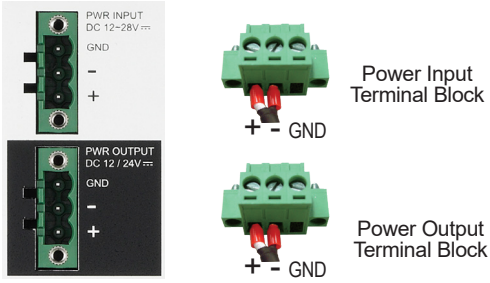
It's fully charged.

The power output mode is 24V.

2.2 Connection

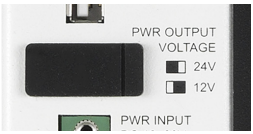
A. Wiring the Power Input and Power Output

1. Before wiring, make sure the power source is disconnected.
2. Find the terminal block in the accessory box.
3. Use the wire-stripping tool to strip a short insulation segment from the output wires of the DC power source.
4. Identify the positive and negative feed positions for the terminal block connection. See the symbols printed on the panel indicating the polarities and power range in voltage.
5. Insert the exposed wires into the terminal block plugs. Only wires with insulation should extend from the terminal block plugs. Note that the polarities between the wires and the terminal block plugs must be positive to positive and negative to negative.
6. Use a slotted screwdriver to tighten the captive screws. Plug the terminal block firmly, which wired, into the receptacle on the rear panel.



B. Connecting the SCP Cube to Your Industrial PC System

1. Connect the power input of your IPC to the power output of the SCP Cube.
2. Slide the **PWR OUTPUT VOLTAGE** switch on the SCP Cube to 24V or 12V according to the power input of the connected system.



3. To monitor the SCP Cube power status, connect the SCP Cube to your industrial PC system via USB or COM port.

If you are using USB port, you need to install USB-to-COM port driver. See next section for details.

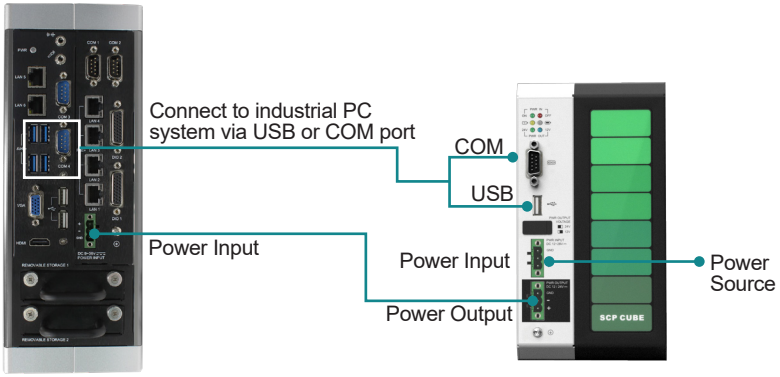
C. Connecting the SCP Cube to power source

Connect the power input of the SCP Cube to the power source (DC 12~35V).

D. Grounding the SCP Cube

Remove the ground screw from the front panel. Then attach a ground wire to the panel with the screw.

The following diagram illustrates a sample connection. Actual connection may vary according to your industrial PC system.



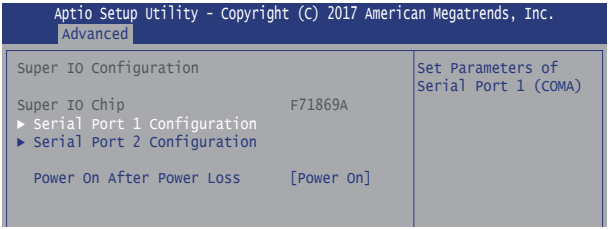
Connection Diagram Example

2.3 Ensure Your PC is On Automatically When Power Resumes

To ensure that your industrial PC restarts automatically after a power outage is over, you have to enable the computer to "see" the power returning by configuring the PC's BIOS settings as described below:

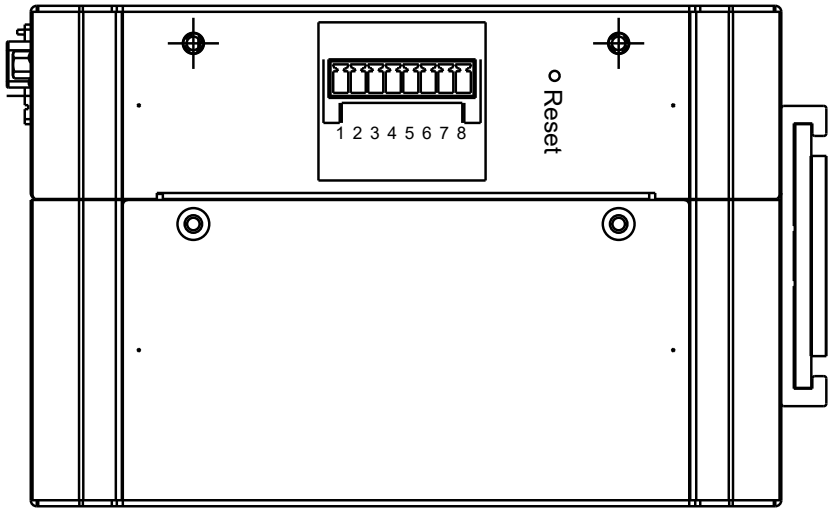
1. Open your computer's BIOS settings menu.

2. Look for the Power Settings menu. Ensure the "Power on after Power Loss" (or similar) setting is set to "Power On" as the example below:



2.4 Signal In/Out pin Definition

The SCP Cube MK2 is enable to connect Ignition input/output signal. Please find the definition table as below for your reference:

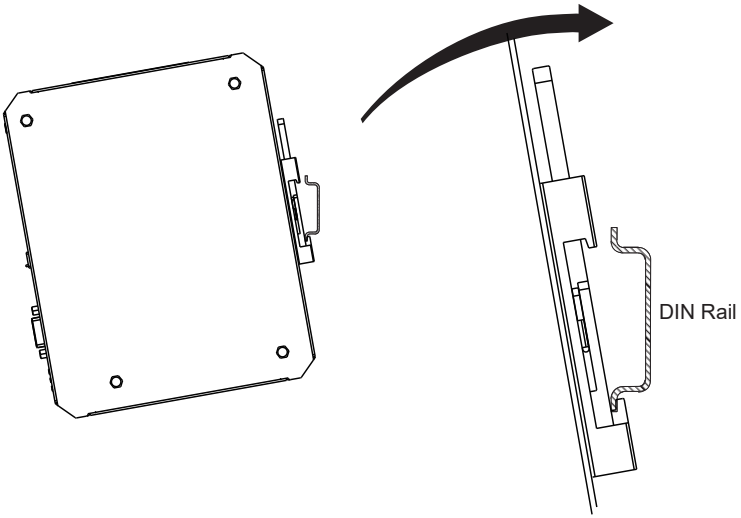


No.	Name	Description
1	T_IGN_IN	Ignition input for Train (66~154VDC)
2	T_IGN_OUT	Ignition output for Train (voltage depend on input)
3	ISO_GND	Isolated GND
4	IGN_IN	Ignition input for CAR (12~35VDC)
5	IGN_OUT	Ignition output for CAR (voltage depend on input)
6	NC	Not connect
7	ATX_OUT	Power button for ATX mode
8	ATX_GND	ATX GND

2.5 DIN-Rail Mounting

The DIN-rail mounting clip is screwed on the SCP Cube in the factory. To DIN mount the SCP Cube:

1. Snap the DIN Rail clip to the upper edge of the DIN Rail.
2. Press the SCP Cube firmly downward towards the DIN Rail until the DIN Rail clip tab engages and snaps to the bottom edge of the DIN Rail.



2.6 Monitoring Power Status

Prerequisites

The SCP Cube comes with a Windows-based monitoring utility to monitor the SCP Cube power status. You can also use the utility to configure the shutdown mode and timeout settings.

To use the utility, make sure your industrial PC system meets the following requirement:

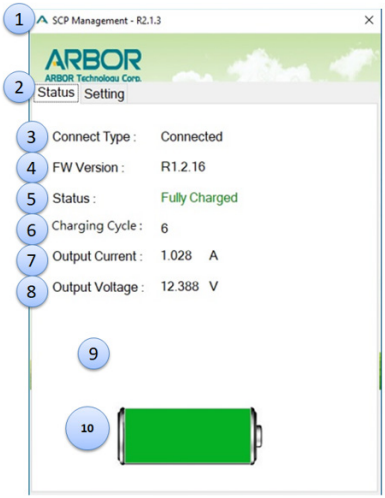
- Windows system with **.NET Framework 3.5** or above installed.
- **USB-to-COM driver installed:** This is required only if the SCP Cube is connected to your industrial PC system via USB port. To install the driver:

  1. Visit ARBOR website and locate the driver page of the SCP Cube. Download the SCP Cube utility software and save it to the industrial PC.

  2. Extract the files. Double-click the **CDM21226_Setup.exe** file and follow the on-screen instructions to complete the installation.

2.7 Monitoring SCP Cube Power Status sheet

Run the exe file of the **SCP Cube Utility** to launch the utility, and then on the **Status** tab you can view the SCP Cube power information.



Label	Description
①	Utility name and version
②	Sheet
③	Connection status
④	Utility version
⑤	Super Capacity status
⑥	Charging Cycle status
⑦	Output current
⑧	Output voltage
⑨	Shutdown countdown timer
⑩	Percentage of power

① Utility name and version

Function: Display utility name and version

② Sheet

Function: Switch sheet

③ Connection status

Function: Display the connection status between the Super Capacity device and the device

④ Utility version

Function: Display the current Super Capicity utility version

⑤ Super capacity status

Function: "**Fully charged**" means that the battery is completely charged.

"**Charging**" indicates that the super capacity is being charged.

"Discharging" means disconnecting the external power supply, resulting in the supercapacitor no longer being charged.

⑥ Charging cycle status

Function: Display the charging cycle times of supercapacitor

⑦ Output current

Function: The output current of supercapacitor

⑧ Output voltage

Function: The output voltage of supercapacitor

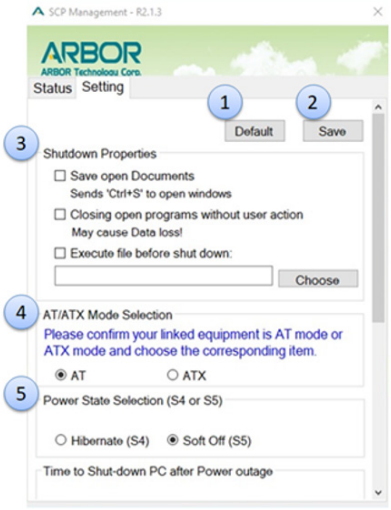
⑨ Countdown timer

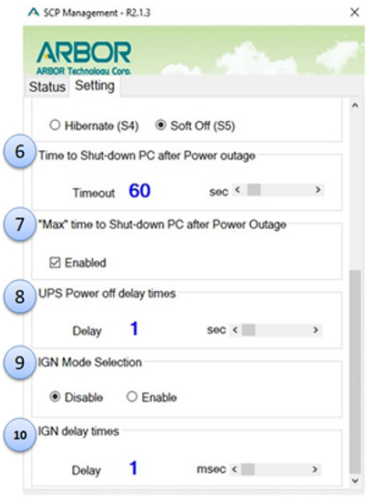
Function: When the supercapacitor is discharging, a countdown will start. The display will show red seconds, and the system will shut down when the timer ends.

⑩ Percentage of power

Function: Display the power of supercapacitor

2.8 Monitoring SCP Cube Power Setting sheet





Label	Description
①	Default
②	Save
③	Shutdown Properties
④	AT/ATX Mode Selections
⑤	Power State Selection
⑥	Shutdown time out setting
⑦	Max time to shut-down PC
⑧	UPS Power off delay times
⑨	IGN Mode Selection
⑩	IGN delay times

① Default

Function: Restore to the default setting

② Save

Function: Save settings

③ Shutdown Properties

Function: If user has confirmed the relevant settings, then when the supercapacitor is in the "Discharging" state and the countdown is less than 15 seconds, the settings related to this item will be enabled. Below are the functions of each setting:

Save Open Documents - To save files in an open window, note that the application sends "Ctrl + S" keystrokes, but saving still depends on the program.

Closing open programs without user action – Closing open windows. Please note that the application will attempt to close each window, but success is dependent on the window program.

Execute file before shut down – The user can select a file to be executed by clicking the "Choose" button.

④ AT/ATX Mode Selections

Function: Set the power supply mode of the supercapacitor:

AT mode (no standby voltage after shutdown) - power on when connecting to power
ATX mode - Press the power button to switch on/off

⑤ Power State Selection

Function: After the supercapacitor finishes discharging and the application countdown ends, two different states can be selected.

Hibernate(S4) - Computer will goes to sleep mode
Soft Off(S5) - Computer will shuts down

⑥ Shutdown time out setting

Function: When the supercapacitor is discharging, the default countdown is 60 seconds, and it can be set between 30 to 600 seconds.

⑦ Max time to shut-down PC

Function: When the supercapacitor is discharging and the power display is empty, the application will initiate a 10-second countdown before shutting down.

⑧ UPS Power off delay times

Function: When the application turns off the computer, how long does it take for the supercapacitor to turn off the output voltage.

⑨ IGN Mode Selection

Function: Enable or disable the IGN function of supercapacitor.

⑩ IGN delay times

Function: Set the delay sending time of IGN Out signal

Chapter 3

Operation Mode

3.1 Operation

3.1.1 Proper way to shutdown

SCP Management is a resident program that will run automatically when user start the computer after installation.

It usually shrinks at the right end of the taskbar. When the mains power is interrupted (Discharging), it will automatically pop up to the screen and start to countdown. If the countdown ends and the mains power is not restored, the system will shut down automatically and safely.

3.1.2 Set a countdown timer

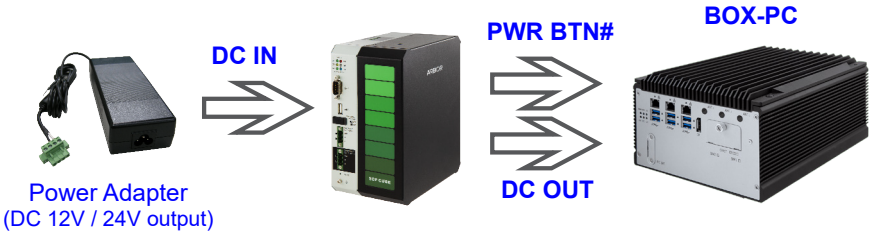
The SCP Management countdown timer is set to 60 seconds by default. However, users can adjust the timer based on the device's power consumption. The timer can be set to a shorter duration, such as 30 seconds or 600 seconds if required.

3.1.3 AT/ATX Mode Selections

The SuperCapacitor support two different power supply mode: AT and ATX mode.

AT mode: In AT mode, the supercapacitor is linked with the mains power supply, allowing it to directly provide power to the back-end equipment and switch it on. If the mains power is disconnected and the SCP Management initiates the countdown to shut down, the supercapacitor detects when the back-end equipment's power consumption has reached the shutdown state and subsequently disables the output power supply.

ATX mode: In ATX mode, after connecting the supercapacitor to the mains power supply, it outputs power and sends a signal from the SW Pin to the back-end device. In case the back-end device is compatible with the SW Pin, it will receive the signal and initiate the boot process. If the mains power fails, SCP Management completes its countdown then shuts down, but the supercapacitor does not turn off the power output. This allows the user to restart the back-end device by pressing its power button.



3.1.4 Power-off state settings

Based on the field applications, users can set the back-end device to shut down or hibernate when the countdown ends.

3.1.5 Beck-end device judgment by power off state

SCP Management will notify the supercapacitor when it is shut down due to a mains power interruption (Discharging). Then the supercapacitor will wait for the power consumption of the back-end device to reduce to the shutdown state.

3.1.6 Assistance function

SCP Management provides assistance to users in closing window programs when the main power is interrupted. It triggers the window program's function and files. For related functions, please refer to "Shutdown Properties on page 17". SCP Management cannot guarantee the proper functioning of assistance functions as it depends on the normal running of the window program.

3.1.7 IGN mode settings

The supercapacitor can support IGN in-vehicle applications, allowing it to send a delayed IGN IN-signal and export it to the IGN OUT through the supercapacitor.

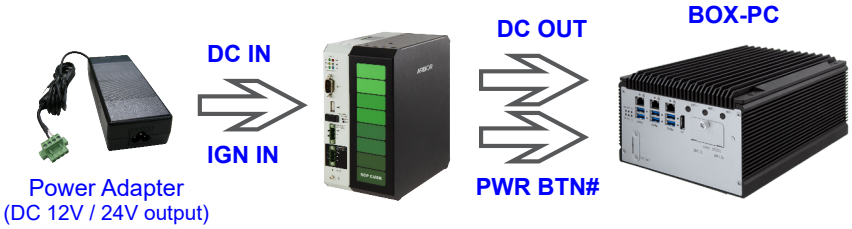
The actions of the IGN mode vary depending on the AT/ATX mode settings:

	IGN Mode Disable	IGN Mode Enable
AT Mode	Regardless of any IGN IN status changes, the signal will not be bypassed to IGN OUT.	When a signal is received from IGN IN, it should be directly transferred to IGN OUT.
ATX Mode		When a signal is received from IGN IN, it should be directly transferred to signal to Power button.

Note: The IGN OUT delay output can be adjusted by "IGN Delay Times". The default setting is 1 ms, and the maximum is 10000 ms (10 sec).

AT Mode

ATX Mode



3.1.8 DC Power Mode

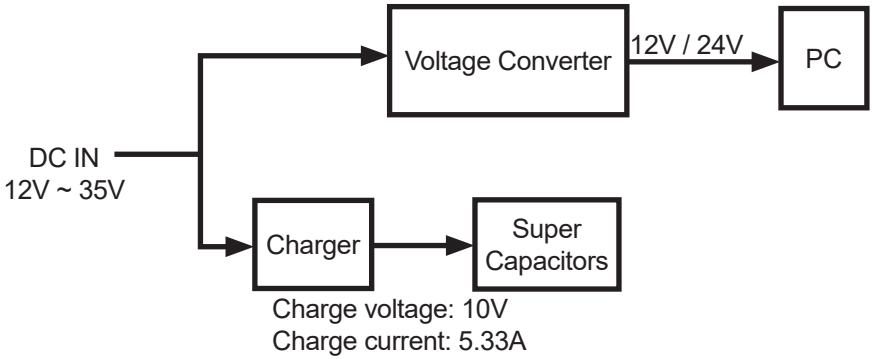


Figure 3-1 SCP Cube Operation on DC Power

When DC power is available to the SCP Cube:

- The DC power supply provides both charging current for the supercapacitors and the load current for the connected IPC at the same time.
- The charging current for supercapacitors is 5.33A at maximum. It will decrease automatically if the adapter rated power is less than the sum of the charging power and load power.

3.2 Operation When DC Power is Not Available

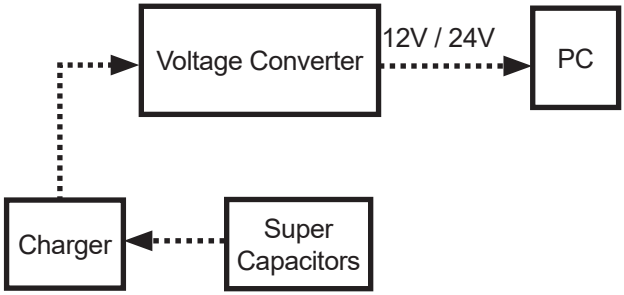


Figure 3-2 SCP Cube Operation During Power Outages

When DC power is not available to the SCP Cube:

- The supercapacitors start providing power to the connected IPC to maintain its operation.
- After the shutdown timeout expires (60 seconds by default), the SCP Cube starts to hibernate (default) or shutdown your IPC.

  If the power resumes during this phase, the countdown timer will automatically stop counting.
- During the timeout period, the SCP Cube keeps monitoring if the remaining capacity is enough for the IPC operation. If the capacity reaches a low limit, the SCP Cube will hibernate/shutdown the IPC after 10 seconds anyway, regardless of the shutdown timeout settings.

The following graphic shows the timeline of events that occur during power outages:

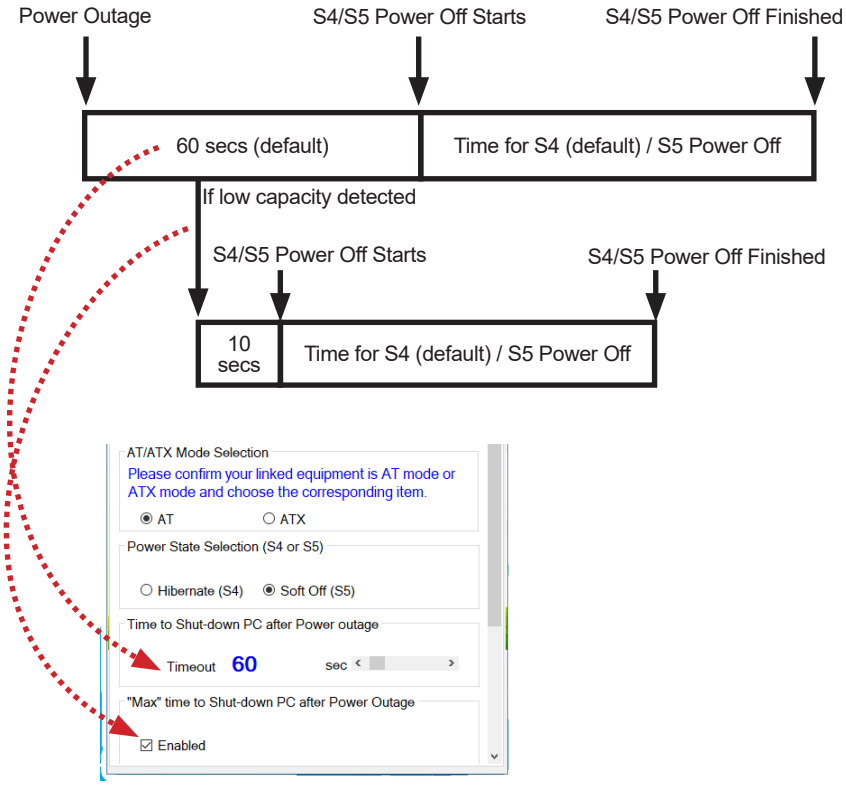


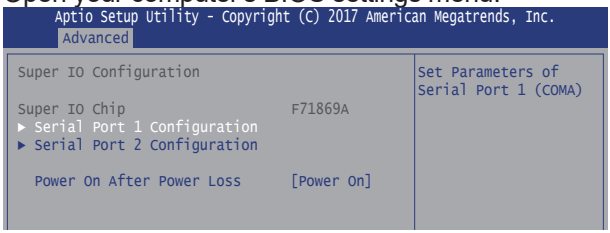
Figure 3-2.1 SCP Cube Event Timeline during Power Outages

3.3 Operation When DC Power Resumes

When the power resumes, the connected PC will restart automatically.

If not, please make sure to configure the PC's BIOS settings as described below:

1. Open your computer's BIOS settings menu.



2. Look for the Power Settings menu. Ensure the "**Power on after Power Loss**" (or similar) setting is set to "**Power On**"(AT mode)

3. Look for the Power Settings menu. Ensure the "**Power on after Power Loss**" (or similar) setting is set to "**Power off**"(ATX mode)