Mini PAGlink™

PAG™

V-MOUNT

Intelligent Linking Batteries

User Guide

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Mini PAGlink™

A User Guide for Mini PAGlink V-Mount Intelligent Linking Batteries.

Please read the important safety information and instructions before using your battery.

1. Introduction

1.1 Models covered by these instructions:

Model No.	Name	Capacity	Mount
8141	MPL50	50Wh	V-Mount
8241	MPL99	99Wh	V-Mount

1.2 Mini PAGlink V-Mount batteries are designed to be compatible with the Sony V-Mount battery plate.

1.3 They feature all the benefits of PAGlink intelligent linking technology combined with a reduced form factor and increased durability.

1.4 They are available in 2 flight-friendly capacities: 50Wh and 99Wh. Batteries can be linked to create greater capacities on location, allowing you to travel with all the power you need.

1.5 The unique PAGlink technology allows up to 10 batteries to be linked for charge or discharge, regardless of their rated capacity or their state-of-charge. The MPL50V and MPL99V can be linked with each other for charge or discharge.

1.6 The batteries can be used as a single power source for smaller camcorders and their accessories. In this application they replace a multitude of incompatible batteries. However, they can also be used to power larger cameras and other production equipment, such as monitors.

MPL50 Front

MPL50 Back

1.7 The batteries feature built-in D-Tap outputs (12V) and a replaceable USB output unit (5V 2A) that can be swapped for Lemo, Hirose or D-Tap output units, already available for the PAG PowerHub (Gold Mount version, Model 9712).

1.8 These smaller, lighter batteries allow you to control the capacity and weight of your power source to suit the application: 1 battery is ideal for handheld applications, 2 or more linked batteries provide longer run-time or an increased current draw of up to 12A, ideal for powering multiple accessories. Current is delivered using superior, high-current pin contacts.

1.9 PAGlink allows seamless hot-swapping for continuous power, or the ability to add another battery just to keep shooting, which means no more time-wasting camera reboots.

1.10 Simultaneous discharge from linked batteries means no dead weight on your camera. Sharing the current load extends overall battery life to provide a better return on investment. Both the MPL50 and MPL99 batteries are guaranteed for 2 years.

1.11 The PAGlink technology will automatically select the most suitable batteries for discharge, according to their charge status. Batteries do not discharge into each other. The system ensures that the maximum linked output is kept to a safe level.

1.12 The intelligent PAGlink batteries manage their own charging safely and efficiently, and can be charged, whilst linked, using PAGlink

1. Introduction

chargers, as well as other reputable manufacturer's V-Mount Li-Ion chargers, for maximum versatility and economic integration.

1.13 Batteries in any state of charge can be linked for charging, in multiples of 8 or fewer. During charging, the least-charged batteries are given priority. When the batteries reach a similar state of charge, they will charge simultaneously. The charge status of each battery is shown on its individual display.

1.14 The batteries feature an ergonomic design and a 'soft-touch' coated protective band for safer handling and increased durability.

1.15 1/4" bush inserts have been incorporated to enable the mounting of accessories to individual or linked batteries.

1.16 The battery display provides remaining run-time, on-load, in 1 minute increments, for the total of all linked batteries. It shows remaining capacity for each individual battery in 1% increments, at any time. It also provides useful data, such as the number of charge/discharge cycles, to assist with battery management.

1.17 When linked, Mini PAGlink batteries form a network that allows them to communicate with each other and report to the camera as one battery.

1.18 They will automatically detect and adapt to camera data systems that allow batteries to provide capacity information in the viewfinder/LCD.

1.19 The batteries feature a fully-serviceable, modular construction that allows authorised replacement of the cell-pack whilst maintaining conformity with UN standards and IATA air transport regulations. The battery cases and internal electronics can be reused in the interest of greater sustainability.

1.20 The battery firmware can be updated easily by the customer, via external contacts, using an update tool provided by PAG.

1.21 PAG's patented intelligent battery linking technology remains far in advance of any other camera battery system available today.

1.22 PAG Li-Ion batteries are tested by Intertek Group plc to UN 38.3 standard in compliance with IATA Air Transport regulations.

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2. Specification

2.1 Cell Technology:
Premium-grade Lithium-Ion sealed rechargeable cylindrical cells.

2.2 Capacity:

Model 8141: 50 Watt-hours (nominal 3.5 Ampere-hours).

Model 8241: 99 Watt-hours (nominal 6.7 Ampere-hours).

2.3 Voltage:
14.8V nominal.

2.4 Output Current:
The rated maximum continuous output current for an individual 50Wh battery is 8A, and for a 99Wh battery it is 10A. Two or more linked batteries of any rated capacity, in a similar state of charge, will deliver an increased continuous current of up to 12A.

2.5 Fixed D-Tap Outputs:
12V (unregulated), designed for powering camera accessories.
Model 8141 MPL50G features 1 built-in D-Tap output.
Model 8241 MPL99G features 2 built-in D-Tap outputs.

2.6 Removable USB Output:
Each battery incorporates 1 removable USB output unit, 5V regulated, 2A continuous, 3A peak. The unit can be removed and replaced with a Hirose (4-pin), Lemo (2-pin), D-Tap or a 2.1mm DC output unit. These are available individually from PAG or its resellers. They are the same interchangeable output units available for the Gold Mount PAGlink PowerHub Model 9712.

2.7 Temperature Range:

Charging:

0°C to +45°C	Optimum +10 to +40°C
+32°F to +113°F	Optimum +50°F to +104°F

Discharging:

-20°C to +50°C	Optimum +10°C to +40°C
-4°F to +122°F	Optimum +50°F to +104°F

Storage:
+10°C to +30°C (+50°F to +86°F).

2.8 Overall Dimensions (L x W x H):

Model 8141 MPL50V: 109mm (4.3") x 87mm (3.4") x 31mm (1.2")

Model 8241 MPL99V: 109mm (4.3") x 87mm (3.4") x 50mm (2.0")

2.9 Weight:

Model 8141 MPL50V: 360g (12.7oz) approx.

Model 8241 MPL99V: 590g (21oz) approx.

3. Charging

3.1 IMPORTANT: READ THE CHARGER HANDBOOK BEFORE ATTEMPTING TO CHARGE THE BATTERY.

3.2 **NOTE: The battery is put into 'ship mode' prior to transit. It can be activated by connecting it to a charger that is powered-up, or by linking it to a battery that is already active.**

3.3 Mini PAGlink batteries can be charged individually or linked, regardless of their capacity or state of charge.

3.4 The least-charged batteries are given priority until all the batteries are in a similar state-of-charge. They will then be fully-charged simultaneously. Up to 10 batteries can be linked for charging on each position. The following PAGlink chargers can be used:

9707	PAGlink PL16 Charger	2-positions, 10 batteries on each
9711	PAGlink PL16+ Charger	4-positions, 10 batteries on each
9713V	PAGlink Micro Charger	1-position, 10 batteries in total

V-Mount Li-Ion Chargers of other reputable manufacturers may also be suitable. The number of linked batteries that can be charged on each position is dependent on the charger model and firmware version.

3.5 **Charge Times:** From fully-discharged to fully-charged:

Capacity	PL16	Micro Charger
50Wh	01:15	02:00
100Wh	01:30	04:00
200Wh	03:00	08:00
300Wh	04:45	12:00
400Wh	06:00	16:00
600Wh	09:00	24:00
800Wh	12:00	-
1600Wh	24:00	-

3.6 Mini PAGlink batteries display their individual status during charging on their built-in display.

3.7 The batteries incorporate a temperature sensor which will inhibit charging if their temperature is below 0°C. See **Specification** for the charging temperature range.

4. Discharging

4.1 Mini PAGlink batteries can be discharged individually or linked. The batteries can be in any state of charge. The maximum number of PAGlink batteries that may be linked has been limited to 10. If more than 10 batteries are linked, the management system will shut-down the supply, and no current will flow.

4.2 Linking batteries for discharge provides a number of benefits. The combined capacity extends the run-time of your camera set-up. Two linked 50Wh batteries will provide 100Wh; a 50Wh and a 99Wh battery linked will provide 149Wh; two 99Wh batteries will provide 198Wh.

Where total continuous consumption is above 8A, two or more batteries, of any rated capacity, should be linked. This will increase the maximum continuous discharge current to 12A, provided the batteries are in a similar state of charge. Sharing the current load across multiple batteries prolongs individual battery life and provides a better return on investment.

4.3 Linked batteries form a network which allows communication between batteries, ensuring that a safe protocol is followed under all circumstances.

4.4 The PAGlink management system elects the battery with one or more connected to its front contacts to be the 'master' and ensures that this battery is always active (but not necessarily delivering current). The system makes the most efficient use of the power available, and prevents a transfer of charge between batteries. As discharge progresses, batteries are electronically added to or subtracted from the bus bar to deliver the current required. The linked batteries discharge simultaneously rather than sequentially. Their individual state of charge and the total run-time can be viewed via their displays. As long as the 'master' remains connected, batteries may be added or hot-swapped in order to achieve continuous running.

4.5 The batteries incorporate a precision, fixed, end-of-discharge cutoff, set to 12.5V, as measured by the battery. This cutoff will only operate if the battery capacity is less than 5%, eliminating unwanted operation due to high current and low battery temperature.

4.6 The batteries incorporate a current limit of 8A for an individual 50Wh battery, 10A for an individual 99Wh battery, and 12A for linked batteries of any rated capacity. Consumption above this for more than 5 seconds will trigger the over-current protection, turning the battery output off. It can be recovered by simply removing it from the load and pressing the display button, provided the battery still retains some charge.

4.7 The batteries may be discharged within the temperature range -20°C to +50°C, but for optimum performance, +10°C to +40°C is recommended. The operating time will be shorter in conditions of low temperature, and discharging will be electronically inhibited if the battery temperature is below -20°C.

4. Discharging

4.8 When the battery has been discharged at a high rate it will become warm, and it is advisable to let it cool before charging it.

4.9 When not in use, batteries should be kept in an **unlinked state** to ensure a lower self-discharge rate.

5. Storage

5.1 For the short term, batteries can be left stacked on a charger until required; the charger will keep them topped-up ready for use.

5.2 For long-term storage, batteries should be in a half-charged state (between 20% and 80%), and not linked.

5.3 After a long period of inactivity, a Mini PAGlink battery will automatically enter **Ship Mode**, which greatly reduces its rate of self-discharge. It can be reactivated by connecting it to a charger that is powered-up, or by linking it to a battery that is already active.

5.4 Batteries should be stored in a cool, dry place at a temperature between +10°C and +30°C (+50°F to +86°F). Long-term storage outside of this temperature range may reduce the batteries' life. Maintenance charging is not required during long term storage.

5.5 After storage it is advisable to fully-charge batteries before use.

6. Battery Linking Features

6.1 Linking Batteries:

To link batteries, align the V-shaped connector on the rear of a battery with the V slot on the front of another. Slide the front battery down until you hear a click and the battery's red locking release button, on the left side, pops out.

To unlink batteries, grip the rear battery firmly, hold-in the front battery's red locking/release button, then pull the front battery up and away.

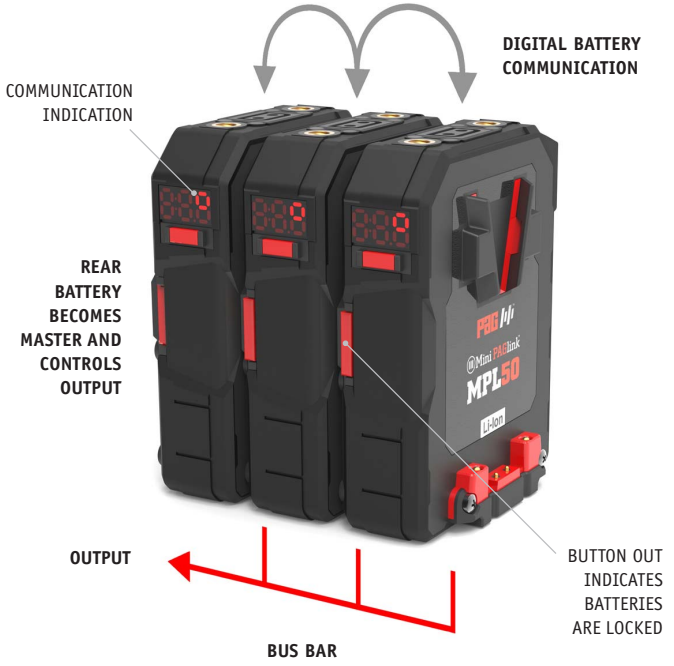
6.2 Mini PAGlink batteries can be discharged and charged individually or linked, combining their capacities. Two 50Wh batteries will provide 100Wh when linked; a 50Wh and a 99Wh battery will provide 149Wh.

Linking batteries increases the maximum continuous current draw capability to 12A, provided the batteries linked are in a similar state of charge. *See Specification for the batteries' individual current draw capability.*

The maximum number of PAGlink batteries that may be linked has been limited to 10. If more than 10 batteries are linked, the management system will shut-down the supply, and no current will flow.

Linked batteries form a network which allows communication between batteries, ensuring that a safe protocol is followed under all circumstances. The PAGlink management system elects the battery with one or more connected to its front contacts to be the 'master' and ensures that this battery is always active (but not necessarily delivering current). The system makes the most efficient use of the energy available, and prevents a transfer of charge between batteries.

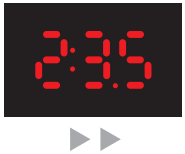
As discharge progresses, batteries are electronically added to or subtracted from the bus bar to deliver the current required.
The status of individual batteries and total run-time can be viewed via the battery displays. As long as the 'master' remains connected, batteries may be added to or removed from the stack (hot-swapped) in order to achieve continuous running.



7. Run-Time, Capacity & Data Display

7.1 The Battery Display:

The battery is able to display a numeric run-time prediction against load, and charge status as a percentage.



When connected to a camera that is turned-on, two presses of the battery's display button will show a predicted **run-time** against the given load, expressed in hours and minutes. When batteries are linked the run-time displayed relates to the **total** for the connected batteries.

A single button press of the display, off or on-load, shows a percentage figure of **available capacity**. When the batteries are linked this figure still relates to the battery's individual capacity.

When individual battery capacity drops below 5% the display will indicate that the battery should be charged, as shown.

When the battery is fully charged the display will indicate 100%.

7.2 Display Data Output:

Data stored in the battery's microprocessor can be revealed using the battery display:

Press display button x3 in 1 sec intervals & hold for data mode

Release to see 1st menu item: 'Pd' (voltage)

Press & hold for 3 seconds to see voltage reading

Press without holding for 2nd menu item

Press & hold for temperature in degrees celsius

Press twice without holding for 3rd menu item

Press & hold for number of charge/ discharge cycles

Press x3 without holding for software version

Press & hold for version number...

...which appears in 2 parts indicating version 2.0

After selecting to view the software version number, the battery will enter **Ship Mode** automatically. Ship Mode reduces battery self-discharge and can be used when you are going to store or ship your batteries. To exit Ship Mode, link the battery to another active battery or connect it to a charger that is powered-up.

7.3 In-Viewfinder Battery Status

Battery status can be shown as a percentage of available capacity in the viewfinder/LCD of cameras designed to accept this data. Different data standards are used by camera and battery manufacturers. PAGlink Gold Mount batteries automatically adjust the data output standard to support the system that allows Anton Bauer batteries to display capacity information in the viewfinder/LCD. When the batteries are linked, the data displayed is for the combined capacity available.

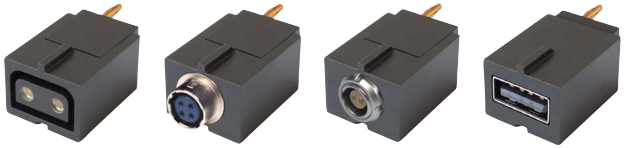
8. Battery Outputs

8.1 Mini PAGlink batteries feature built-in D-Tap outputs (unregulated) designed for powering 12V camera accessories. They also incorporate a USB output unit, regulated at 5V (2A), which is interchangeable with other output unit types: Hirose (4-pin), Lemo (2-pin) & D-Tap.

REAR OF BATTERY

To remove the USB output unit, push the release slider on the rear of the battery to the left. When the unit is protruding from the battery case it can be pulled-out easily. To fit a different output unit type, align the locator at the top of the output unit with locator in the port, and push-in the unit until a click indicates that it is secured.

8.2 Output Units for Mini PAGlink batteries:



D-Tap	Hirose (4-pin)	Lemo (2-pin)	USB (5V 2A)
Model 9712D	Model 9712H	Model 9712L	Model 9712U

9. Battery Protection Features

9.1 Over-Charge Protection
Charging will be inhibited if the battery voltage exceeds a pre-set level.

9.2 Over-Discharge Protection
When the battery voltage reaches 12.5V, discharging is inhibited.

9.3 Over-Current Protection
If a single 50Wh battery is subjected to a current greater than 8A (10A for a 99Wh battery), but less than 15A, the output will be turned off after 5 seconds. If the current is greater than 15A, the output will be turned off immediately. In either case, the battery display will be inoperative and there will be no voltage available at the terminals. The battery can be reset by removing it from the load and pressing the display button.

9.4 Thermal Protection
Software protection inhibits charging if the battery temperature is below 0°C. Return the battery to the charger when the battery temperature rises above 0°C.

Software protection inhibits discharging if the battery temperature falls to -20°C, or if it rises to +70°C. The output can be restored when the battery temperature becomes within the specified range by pressing the display button.

A thermal fuse is incorporated within the battery construction as a 'backstop' protection device, and this cannot be reset. In the unlikely event of this fuse operating, please contact PAG or your PAG reseller.

9.5 Construction
The battery cases consist of high-impact ABS injection mouldings, designed to protect the cells from impact damage. The battery has been drop-tested.

The circuits are coated, making them resistant to electrolyte and ensuring the operation of the electronic safety systems in the event of damage to the battery.

Internal wiring is rated for high current and high temperature, and is double-insulated for added safety and protection.

10. Safety Information

10.1 PLEASE READ THESE IMPORTANT SAFETY INSTRUCTIONS BEFORE USING THE BATTERY AND RETAIN THEM FOR FUTURE REFERENCE.

When used correctly, Lithium-Ion batteries are a rugged and safe method of storing power. However, incorrect treatment of the battery could present a hazard. In the interest of safety, and the protection of our environment, please read and observe the following health and safety information.

WARNING:

Do not drop, throw, puncture, crush or incinerate the battery. Severe mechanical abuse of the battery could result in damage to the cells, and short-circuit internal to the battery. Li-Ion cells can deliver power at very high rates. Arcing, excessive heat and the liberation of combustible gas could result, with the potential for personal injury or ignition of adjacent flammable materials.

Do not short-circuit the battery.

Keep the battery away from fires, strong sunlight and excessively hot environments.

Avoid getting the battery wet and do not use it if it has been immersed in water.

Do not attempt to disassemble the battery. Refer faults to authorised service personnel.

Do not continue to use the battery if there is any change in the appearance of the casing.

CAUTION:

The battery electrolyte is an alkaline solution, which can cause chemical burns to human tissue. Leakage can occur as a result of severe damage to the battery. Wear protective gloves when handling all contaminated materials. In the event of contact with the skin, flood copiously with clean water. If significant amounts of electrolyte are involved, or if any has touched the eyes, seek immediate medical attention.

ELECTRIC SHOCK: This symbol appears where the information relates to the risk of electric shock.

WARNING: This symbol appears where the information relates to an issue of personal safety.

11. Servicing

11.1 The front and the rear battery contact assemblies are separate to the battery case and can be replaced by customers in the event of damage. Parts and instructions can be obtained from PAG Ltd. or from an authorised PAG service centre (see below).

11.2 Customers should not attempt to open the battery case for repair or any other purpose, unless authorised by PAG Ltd. Unauthorised servicing invalidates the battery guarantee and its air safety status.

If a fault develops, please contact a PAG service centre to receive a fault diagnosis. Batteries that require further analysis must be returned to your nearest PAG service centre. Li-Ion batteries are classified as dangerous goods and cannot be returned without prior contact. A consultation will be provided, followed by an estimate, prior to any repair.

Authorised PAG Service Centres:

Europe & Middle East: Aspectra B.V.
Spoorhaven 78, 2651 AV, Berkel en Rodenrijs, Netherlands
Tel: +31 (10) 5140680, Email: info@aspectra.nl

UK & RoW: PAG Ltd.
565 Kingston Road, Raynes Park, London SW20 8SA, UK
Tel: +44 (0)20 8543 3131, Email: support@paguk.com

The Americas: PAG America (a division of Carr Distribution Group)
18 Center Street, Ramsey, NJ 07446, USA
Tel: +1 631 300 8215, Email: sales@pagamerica.com

12. Recycling

12.1 Do not dispose of batteries or cells in a charged condition. Expired batteries should be disposed of in accordance with the appropriate regulations or legislation.

PAG offers a recycling service for its expired batteries in the UK. They can be returned to PAG Ltd. only by prior arrangement. They must be in a discharged state for shipping.

Please do not attempt to return Li-Ion batteries for recycling without first contacting an authorised PAG Service Centre.

13. Guarantee

13.1 Notwithstanding any provision of any agreement the following guarantee is exclusive: PAG Limited guarantees each Mini PAGlink battery it manufactures to be free of defects in material and workmanship, under normal use and service, from the date of purchase, for the period indicated below:

MPL50V Model 8141

MPL99V Model 8241

This guarantee extends only to the original purchaser. This guarantee shall not apply to fuses or any product or parts which have been subject to misuse, neglect, accident or abnormal conditions of operation.

In the event of failure of a product covered by this guarantee, PAG Limited will repair and calibrate equipment returned to an authorised Service Facility within the period of the guarantee, provided the guarantor's examination discloses to its satisfaction the product was defective.

The guarantor may, at its option, replace the product in lieu of repair. With regard to any equipment returned within this period, said repairs or replacements will be made without charge. If the failure has been caused by misuse, neglect, accident or abnormal conditions of operation, repairs will be billed at a nominal cost. In such a case, an estimate will be submitted before work is started, if requested.

The foregoing guarantee is in lieu of all other guarantees, express or implied, including but not limited to any implied guarantee or merchantability, fitness or adequacy for any particular purpose or use. PAG Limited shall not be liable for any special, incidental, or consequential damages, whether in contract, tort, or otherwise.

14. Air Transport

14.1 Compliance with IATA Dangerous Good Regulations

All PAG Li-Ion batteries comply with the International Air Transport Association (IATA) Dangerous Goods Regulations, January 2021, Section 2.3.5.9, which state that Li-Ion batteries must be tested in accordance with the UN Manual of Tests and Criteria, Part III, subsection 38.3, and manufactured by a company that has been approved to an internationally recognised quality standard such as ISO 9001:2015.

PAG Li-Ion batteries are independently tested and approved by Intertek Group PLC to comply with UN Standard 38.3.

PAG has been assessed and approved by QAS International to the standard ISO 9001:2015

14.2 Advice for Travelling by Air with Li-Ion Batteries

Since the interpretation and application of regulations may vary with each state and each operator, PAG advises that you contact both prior to travelling.

Li-Ion batteries cannot be transported in the hold unless attached to a camera. Spare Li-Ion batteries **MUST** be carried in your hand luggage.

You can carry-on up to **20** spare Li-Ion batteries, including power banks, that have capacities of **100Wh or less.**

In addition, you can fly with **2** Li-Ion batteries that have capacities **greater than 100Wh, but less than 160Wh.**

You cannot fly with Li-Ion batteries that have capacities **greater than 160Wh.** These are **forbidden** from passenger aircraft.

You cannot fly with Li-Ion batteries that the manufacturer deems to be damaged. These are **forbidden** from passenger aircraft.

Batteries **do not** need to be discharged to **30% state of charge** for transport as personal luggage, this is a requirement of **cargo shipments only.**

It is advisable to keep the batteries in separate plastic bags and to bring with you copies of the UN test certificate and UN test report, which can be provided by PAG Ltd.