



PAGlink™

V-MOUNT SYSTEM GUIDE



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PAGlinkTM

- PAGlink is the world's first intelligent linking battery system.

- It comprises high-power, V-Mount Li-Ion batteries, designed to power the wide variety of cameras used for broadcast acquisition, video production and digital cinematography.

- PAGlink batteries have the ability to sustain high-current loads of up to 12A, when linked, providing more power for cameras and multiple accessories.

- PAGlink batteries can be linked in greater numbers (up to 8), in any state of charge, combining capacities for extended run-time.

- PAGlink offers continuous power from hot-swapping batteries.

- PAGlink batteries are smaller and lighter than those of equivalent capacity offered by other manufacturers.

- Linked batteries form a network that manages charge and discharge safely and efficiently.

- PAG works closely with camera manufacturers to ensure that PAGlink batteries are compatible with multiple camera data systems and viewfinder displays.

- All PAGlink batteries incorporate a display that provides run-time information, on-load.

- PAGlink batteries and chargers are capable of receiving firmware upgrades in the field, to accommodate developments in camera technology.

- PAGlink batteries feature fail-safe electronic protection systems with Parylene coated circuits.

- PAGlink batteries are tested to UN standards by an independent authority, for legal transport by air.

- PAG offers a 3 year guarantee on its 96Wh PAGlink batteries, with no restrictive conditions.

- The PAGlink system provides more efficient, linked battery charging - an industry first, developed by PAG.

- PAGlink lets you charge up to 8 batteries, in any state of charge, on each charging position.

- PAGlink offers the world's first, single position, multi-battery charger, designed for light travel.

- PAGlink provides more outputs for camera accessories via a user-configurable PowerHub.

- PAGlink batteries provide data for easier battery management, via a small, inexpensive reader.

- The PAGlink system is the best value for money in the industry.

INTERNATIONAL PATENTS APPLY

PAGlink Intelligent Battery System



PAGlink is an intelligent battery system designed for modern, intelligent cameras

Cameras are becoming increasingly computerised. They benefit from communication with the batteries used to power them. PAGlink is the first digital battery system designed to communicate automatically with multiple camera data systems.

PAG works closely with the camera manufacturers to ensure that the information required by the camera is provided by the PAGlink batteries. Some less advanced 'digital' battery systems, are designed to communicate with one specific camera data system; many battery systems do not communicate at all.

PAGlink's multi-system communication enables the batteries to report capacity for display in camera viewfinders, and adjusts automatically when it encounters a new data system.

A lack of battery communication can result in unexpected loss of power, which could corrupt your files. Retrieving the images is time consuming, with no guarantee that they will be usable - a scenario that is too costly to risk. For this reason you should choose a battery system that is as technologically sophisticated as your camera.

PAGlink is sophisticated but not complicated. It is designed to make your life easier. Communication takes place without user intervention. PAGlink gives you reassurance that you will not unexpectedly lose power, and allows you to concentrate on getting the images you want.

Linked Battery Charging

PAGlink battery charging is more efficient and more convenient. For the first time it is possible to link batteries for charging; up to 16 batteries can be charged simultaneously on one 2-position PAGlink charger.

More Outputs for Accessories

PAGlink provides more power for your camera set-up by linking batteries to create higher-capacities and a greater current-draw capability. The PAGlink PowerHub is a discharge plate that provides the outputs you need to power all your camera accessories, using a variety of interchangeable and user-configurable connectors.



Link-up and Power-up

The PAGlink system comprises 96 Watt-hour and 150 Watt-hour Li-Ion battery packs that can be linked in multiples, combining their capacities to produce greatly extended camera run-times:

2 x 96Wh batteries linked = 192 Watt-hours

2 x 150Wh batteries linked = 300 Watt-hours

Whatever the requirement, PAGlink provides the power.

High-Load Applications

Individually, PAGlink batteries can provide a maximum continuous current of 8A, but when linked this capability increases to 12A, ideal for the most power-hungry camera and its accessories.

The PAGlink connector system incorporates hard-wearing, heavy duty pin contacts designed for high loads, rather than the blade contacts used by other manufacturers.

A Truly Digital Battery System

When linked, PAGlink batteries communicate digitally at high-speed, and report their state of charge. The battery with one or more on its tail becomes the 'master' and manages the output of all the other connected batteries. The master battery is always active, but not necessarily delivering current. It sees the load and then decides which batteries to connect to the bus bar, according to their charge status, to meet the demand. The system makes the most efficient use of the energy available, and prevents a transfer of charge between batteries. This patented system was developed by PAG and is unique to PAGlink.

The rear 'master' battery adds or removes power from the output line

Communication



The system also ensures that the maximum linked output is managed to a safe level.

Camera Run-Time and Battery Capacity at a Glance

The PAGlink System features a choice between batteries that have a numeric display or a 5-light indicator. Both options will provide a prediction of remaining run-time, on-load, after two button-presses. When batteries are linked, the run-time for the total of all connected batteries is shown. Individual battery capacity is displayed at all times with a single button press.



The numeric Run-Time & Capacity Display, found on battery models **9304 PL96T** and **9309 PL150T**, provides a run-time prediction expressed in hours and minutes (1). Capacity is displayed as a percentage, in 1% increments (2).



When battery capacity drops below 5% the display will indicate that the battery should be charged by pointing to the empty battery symbol (3). When the battery is fully charged the display will indicate '100' (4).

The 5-Light Run-Time & Capacity Indicator, found on battery models **9303 PL96e** and **9309 PL150e**, provides a run-time prediction, in hours and minutes:



The 'HRS' LED flashes twice (5), and then the number of remaining hours is indicated by the number of lit LEDs: 1 LED = 1 hour (6).



The 'MINS' LED flashes twice (7), and then the number of remaining minutes is indicated by the number of lit LEDs: 1 LED = 10 minutes (8).

The 5-Light indicator shows available battery capacity as a percentage. A single button press, on or off-load, shows capacity in approximately 20% blocks:

5 LEDs	=	80 - 100%	remaining
4 LEDs	=	60 - 79%	remaining
3 LEDs	=	40 - 59%	remaining
2 LEDs	=	20 - 39%	remaining
1 LED	=	10 - 19%	remaining
1 LED flashing	=	0 - 10%	remaining

When batteries are linked, the capacity figure displayed is always for the individual pack.

It is possible to link PAGlink batteries regardless of their display type or their capacity. They can be mixed for either charge or discharge. Linking a battery that has a numeric display with one that has a 5-light indicator provides a numeric run-time display for the combined power.

All PAGlink batteries maintain an accurate state-of-charge display by tracking their performance and adjusting calibration values to compensate for the aging of the cells.

Future-Proof Batteries and Chargers

PAG batteries and chargers are firmware upgradeable.

The program can be updated in the field by the user, in a matter of seconds, without the need to open the battery case. An update can be supplied by contacting PAG or your PAG dealer. Updates enable you take advantage of the technological advances that PAG introduces to accommodate developments in camera technology.

In-Viewfinder Capacity Information

Battery status can be shown as a percentage of available capacity in the viewfinder/LCD of a camera designed to accept this data. Different data standards are used by camera and battery manufacturers.

PAGlink batteries automatically adjust the data output standard to support the following: SMB (Sony), I²C (IDX), and even the old 0 to 5V analogue system (used by Anton Bauer).



When the batteries are linked, the data displayed in the viewfinder/LCD is for the combined capacity available.

PAGlink batteries can also be programmed easily by the user to provide capacity data in the viewfinders of Red cameras.



Simply press the display button twice, holding down on the second press, until 'rEd' appears on the display (PL96T battery) or the top 2 LEDs light (PL96e battery). This indicates that the battery is now compatible with the Red data protocol (reversed SMB). When the battery is connected to a camera with a different data protocol it will automatically adjust to communicate with that system.

Durability

PAGlink batteries embody premium grade, sealed Li-Ion rechargeable cylindrical cells, essential for a safe Li-Ion battery and a contributing factor towards extended battery life. The mechanical design of the battery provides

protection in the event of accident or abuse, cradling the cells against damaging shock and vibration. PAG battery cases are manufactured from high-impact, injection-moulded polycarbonate. The material is inherently very strong (it is used for motorcycle crash helmets) and is unaffected by the solvent of the battery electrolyte. Commonly used materials, such as ABS, are dissolved and weakened by electrolyte. PAG cases also feature non-slip external features for secure handling.

Protection Circuits

PAGlink batteries incorporate multi-level electronic protection and safety shutdown systems that protect the battery and help prolong its life:

- 3 over-current shutdown systems.
- 2 over-voltage shutdown systems.
- 2 under-voltage shutdown systems.
- 3 thermal shutdown systems (including non-resetting thermal fuse).

For more information see the battery instruction booklet.

All protection circuits within the battery are designed to withstand the leakage of electrolyte. This is achieved by using a special layout and a coating of Parylene, the premier vapour-deposited conformal coating.

If the battery has been shut down by its protection circuit it can be recovered by simply removing it from the load and pressing the display button, provided the battery still retains some charge.

Flight-Friendly UN Tested Batteries

The PAGlink system has been conceived so that you can fly with all the high-capacity Li-Ion battery power that you need. All PAG Li-Ion batteries are



independently tested to UN standards in accordance with IATA Air Transport Regulations. These currently state that UN tested Li-Ion batteries, which have capacities no greater than 100Wh, can be legally transported on passenger aircraft, in carry-on luggage, without quantity restriction. 150Wh batteries are restricted to 2 units per person.

Improved Performance in Extreme Climates

Batteries and cameras do not perform as well at sub-zero temperatures. It is important that they are not left in extremely cold environments overnight or exposed during use. PAGlink batteries have an enhanced low temperature performance that means they will still operate at -20°C , however, the optimum battery discharge temperature is $+10^{\circ}\text{C}$ to $+45^{\circ}\text{C}$.

Replaceable Battery Linking Mechanism

If linked batteries suffer an excessive blow, the unique PAGlink mechanism will allow them to separate safely, protecting the battery packs from irreparable damage. The mechanism can be easily replaced, without opening the sealed battery case. It is a mandatory requirement for Li-Ion batteries to be sealed, in order to preserve the original build standard of the UN certified device, and for this reason Li-Ion batteries should never be opened, *let alone recycled*. Although PAGlink batteries are designed to survive the rigours of normal professional use, it is common sense to handle batteries with care and to avoid subjecting them to severe impact.



**Replaceable
PAGlink
Mechanism**

The Industry's Best Value Battery System

PAGlink is a high-quality battery system that is competitively priced. PAG's total battery design philosophy ensures that you receive the longest possible working life from your PAGlink batteries. Some customers have reported good capacity from their PAG Li-Ion batteries even after 7 years use. This is well in excess of the industry average life.

PAG guarantees its 96Wh PAGlink Li-Ion batteries for 3 years, with no restrictions on the conditions of use.

PAG guarantees its 150Wh PAGlink Li-Ion batteries for 2 years, with no restrictions on the conditions of use.

When the already attractive price is divided by the number of years service provided, we believe that PAG batteries offer the best value for money in the industry.

PAGlink is also available as a Gold Mount system of linking batteries and chargers. Visit paguk.com for more information.

PAGlink PL96T Battery / Model 9304



< NEW VERSION WITH
BOLDER LABELLING
FOR AIR TRANSPORT

- > 96 Watt-hours (14.8V 6.5Ah)
- > Draw up to 12A when linked (8A individually)
- > Auto-compatible with multiple camera data systems and viewfinder capacity displays
- > Hot-swap batteries for continuous power
- > Charge batteries individually or linked
- > Numeric Run-Time & Capacity Display
- > UN tested and IATA approved for transport by passenger aircraft without quantity restriction
- > Improved low-temperature performance
- > Dimensions (H x W x D): 133 x 84 x 50mm
- > Weight: 0.73kg

PAGlink PL96e Battery / Model 9303



< NEW VERSION WITH
BOLDER LABELLING
FOR AIR TRANSPORT

- › 96 Watt-hours (14.8V 6.5Ah)
- › Draw up to 12A when linked (8A individually)
- › Auto-compatible with multiple camera data systems and viewfinder capacity displays
- › Hot-swap batteries for continuous power
- › Charge batteries individually or linked
- › 5-Light Run-Time & Capacity Indicator
- › UN tested and IATA approved for transport by passenger aircraft without quantity restriction
- › Improved low-temperature performance
- › Dimensions (H x W x D): 133 x 84 x 50mm
- › Weight: 0.73kg

PAGlink PL150T Battery / Model 9309



- › 150 Watt-hours (14.8V 10Ah)
- › Draw up to 12A when linked (8A individually)
- › Auto-compatible with multiple camera data systems and viewfinder capacity displays
- › Hot-swap batteries for continuous power
- › Charge batteries individually or linked
- › Numeric Run-Time & Capacity Display
- › UN tested and IATA approved for transport by passenger aircraft, restricted to 2 units per person
- › Improved low-temperature performance
- › Dimensions (H x W x D): 133 x 84 x 50mm
- › Weight: 0.77kg

PAGlink PL150e Battery / Model 9308



- > 150 Watt-hours (14.8V 10Ah)
- > Draw up to 12A when linked (8A individually)
- > Auto-compatible with multiple camera data systems and viewfinder capacity displays
- > Hot-swap batteries for continuous power
- > Charge batteries individually or linked
- > 5-Light Run-Time & Capacity Indicator
- > UN tested and IATA approved for transport by passenger aircraft, restricted to 2 units per person
- > Improved low-temperature performance
- > Dimensions (H x W x D): 133 x 84 x 50mm
- > Weight: 0.77kg



Linked Battery Charging - An Industry First

PAGlink batteries can be charged from any discharged state, individually or linked, using a PAGlink Charger, such as the 2-position PL16 Charger (Model 9707), the 4-position PL16+ Charger (Model 9711) and the single-position PL Micro Charger (Model 9710).

The batteries communicate with each other to manage the charging process, which is fully automatic. The charger uses the available power efficiently and intelligently to achieve fully-charged batteries as quickly and safely as possible.

Up to 8 PAGlink batteries can be linked for charging on each charging position of any PAGlink charger. The most discharged batteries are given charging priority.



Two-position PAGlink PL16 Charger

After a shoot, simply stack your batteries on the charger, and by the morning they will be fully-charged and ready to use. This means no more midnight battery swapping. Eight fully-discharged batteries can be fully-charged in approximately 11 hours, without intervention.

The battery's state of charge is displayed on its individual capacity indicator, so that you know at a glance which batteries are fully-charged and ready to use. Fully-charged batteries stop accepting charge automatically and independently of others in the stack.

When charging batteries that have the numeric display, the display characters can be inverted, for legibility, with a

single button press. The display reverts automatically after the battery is removed from the charger.

All PAGlink chargers are quiet, cool-running, and designed for location use.

Ultra-Compact Charging

The PAGlink Micro Charger is the world's first, single-position, multi-battery charger, that will fit in your coat pocket. When you want to charge PAGlink batteries on location and travel light, the Micro Charger is the answer.



The ultra-compact PL Micro Charger

The charger clips over the battery contacts, and is connected to a plug-in power supply unit that features interchangeable plug adaptors for use worldwide (AC input 100-240V).

Up to 8 linked PAGlink batteries can be charged using the Micro Charger. It is also suitable for charging standard, non-linking V-Mount Li-Ion batteries manufactured by PAG and Sony. One fully-discharged 96Wh battery will be 80% charged in approximately 3 hours. Two fully discharged linked batteries will be fully charged in approximately 7 hours. *See PAGlink Charge Times on Page 26.*

Non-PAGlink Chargers

Linked PAGlink batteries may be charged simultaneously on any reputable constant-voltage charger designed for professional V-Mount Li-Ion batteries, such as the PAG Cube charger Model 9702V, and Sony chargers. However, all linked batteries must be within 40% state-of-charge of each other to be charged linked on non-PAGlink chargers.

PAG AR Series 2 and Quasar chargers can be used for charging PAGlink batteries individually, via their front PP90 sockets (using charge adaptor Model 9617), but they will not charge batteries that are linked.

PAGlink PL16 Charger / Model 9707



- > 2 x V-Mount charging positions
- > Intelligent Parallel Charging for up to 16 PAGlink batteries (8 on each position)
- > Intelligent Parallel Charging for the latest PAG and Sony non-linking V-Mount Li-Ion batteries
- > Sequential charging for older PAG batteries
- > Built-in 100W camera power supply with XLR4 output
- > Dimensions (H x W x D): 75 x 210 x 190mm
- > Weight: 1.4kg

PAGlink PL16+ Charger / Model 9711



- > 4 x V-Mount charging positions
- > Intelligent Parallel Charging for up to 32 PAGlink batteries (8 on each position)
- > Intelligent Parallel Charging for the latest PAG and Sony non-linking V-Mount Li-Ion batteries
- > Sequential charging for older PAG batteries
- > Dimensions (H x W x D): 75 x 210 x 315mm
- > Weight: 1.6kg

PAGlink Micro Charger / Model 9710



- > 1 x V-Mount charging position
- > Simultaneous charging for up to 8 PAGlink batteries
- > Individual charging for all PAG and Sony V-Mount non-linking Li-Ion batteries
- > Dimensions: 110 x 87 x 58mm (boxed)
- > Weight: 200g

Supplied with plug adaptor for country of use:



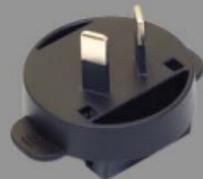
UK
9710U



Euro
9710E



US/Japan
9710J



Australia
9710A

PAGlink Charge Times

The following charge times are for fully-discharged 96 Watt-hour PAGlink batteries:

PAGLINK PL16 & PL16+ CHARGER:

PL16	PL16+	TOTAL	CHARGE TIME
		1	2 hrs 30 mins
1 • 1	1 • 1 • 0 • 0	2	3 hrs
2 • 2	1 • 1 • 1 • 1	4	6 hrs
3 • 3	2 • 2 • 1 • 1	6	9 hrs 30 mins
4 • 4	2 • 2 • 2 • 2	8	11 hrs 45 mins
8 • 8	4 • 4 • 4 • 4	16	24 hrs
	8 • 8 • 8 • 8	32	48 hrs

PAGLINK MICRO CHARGER:

TOTAL	CHARGE TIME
1	3 hrs 15 mins
2	7 hrs 15 mins
3	11 hrs 15 mins
4	15 hrs



More Outputs for Camera Accessories

PAGlink batteries are the first that include their linking contacts in the output line. Linked batteries are capable of supplying up to 12A current, enough to power a camera and multiple accessories simultaneously. The PAGlink PowerHub is a discharge plate that provides multiple output connectors; it is suitable for powering 12V accessories such as a camera light, a monitor, audio and transmission devices.

The PowerHub (Model 9709) features four D-Tap plug-in output connectors which are interchangeable with Hirose (9709H) and 2.1mm jack (9709P) options. Other options are possible. The connectors can be repositioned to the left or right side of the camera, allowing you to customise the PowerHub to your individual requirement.



A USB module (1 Amp) is incorporated for charging your smartphone, or for powering other camera accessories (5V).

The low-profile PowerHub discharge plate can be used sandwiched between two PAGlink batteries, to maintain the hot-swap capability, or connected to the rear PAGlink battery, allowing an accessory bracket to be mounted to its face.



Between batteries, the PowerHub measures only 12mm in depth. Overall its dimensions are: 83mm wide x 112mm high x 18mm deep (including proud features), its weight is only 100g.

PAGlink Battery Reader



Efficiently Manage Your Battery Inventory

Managing your batteries efficiently requires knowledge of their condition and history. Information such as charge status, available capacity, total capacity and the number of charge/discharge cycles is vital. PAG has made this easier for you with the introduction of its new PAGlink Battery Reader.

The Battery Reader (Model 9647) enables you to display data stored in the microprocessor of PAGlink intelligent digital batteries. It is a compact and lightweight tool that you slide onto the contacts of the battery.

The easy-to-understand alphanumeric display will firstly reveal the battery state of charge, as a percentage.

The up and down buttons can then be used to reveal the other categories. The following data is available:

1. State of charge as a percentage
2. Available capacity in ampere-hours
3. Cell temperature in degrees Celsius
4. Number of charge/discharge cycles
5. Voltage
6. Full capacity in ampere-hours
7. Date of birth (manufacture)
8. Software version

This information makes the tracking of battery usage and performance easy for you.

Knowing the battery's software version will help tell you if it is running the latest program. It is then possible to update the battery software, and benefit from PAG's continually developing technology, by obtaining a battery update from PAG, or your PAG distributor.

The PAGlink Battery Reader can also be used to read data stored by standard PAG V-Mount Li-Ion batteries: L96T, L96e, L95e and Sony Professional Info Batteries.

Camera Mounts & Power Leads



V-Mount Plates and D-Tap Power Leads

PAGlink was designed with multi-camera compatibility at the heart of the concept. As well as shoulder-mounted broadcast cameras, it is possible to power DSLR and digital cinema cameras using individual or linked PAGlink batteries. This includes: Blackmagic Cinema Camera, Canon EOS C100/300/500, Canon 5D & 7D, Nikon D800, Panasonic GH2/GH3, Red Epic/Scarlet, and more.

PAG offers battery mounts and power leads for a wide variety of cameras. The V-Mount Plate assembly incorporates a clamp for either 15mm or 19mm accessory rods (Models 9401 & 9402 respectively). The plate can be configured vertically or horizontally, above or below the rods, ensuring the best position in relation to the camera display and other accessories.



PAG D-Tap Power Lead
for Canon C300
Model 9637/02



D-Tap

PAG V-Mount Plate
with 15mm rod clamp
Model 9401

A D-Tap output is incorporated in the plate to enable the power connection to the camera. A PAG D-Tap Power Lead is required that features a camera specific connector. An in-line down-converter is incorporated for those cameras that require a 7.2V to 8.2V input.

Visit ***www.paguk.com*** to discover the right PAG power solution for your camera, email ***sales@paguk.com*** or telephone ***+44 (0)20 8543 3131***.

Follow us on Twitter @PAG_UK

Li-Ion Battery Air Transport Advice

FOLLOW THESE GUIDELINES TO MINIMISE PROBLEMS AT THE AIRPORT:

Advice based on IATA Regulations April 2016

- 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 an unspecified quantity of UN tested Li-Ion batteries that have capacities of **no more than 100Wh** (as the operator and state variations allow). Carry with you a copy of the manufacturer's test certificate and the test report.
- **YOU CAN** fly with two Li-Ion batteries that have capacities **greater than 100Wh, but less than 160Wh**. It is advisable to keep the batteries in separate plastic bags and bring copies of the UN test certificate & report.
- **YOU CANNOT** fly with Li-Ion batteries that have capacities **greater than 160Wh**. These are **FORBIDDEN** from passenger aircraft, unless a state exemption has been obtained (ie CAA/FAA operator).
- **ONLY** fly with Li-Ion batteries that have been tested to UN standards by an independent authority, and manufactured by a company that has a quality control programme, such as ISO 9001:2008. **PAG complies with both these requirements.**



All PAG Li-Ion Batteries are independently tested to UN standards and labelled with the UN test number



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