



# VOYAGER POWER SOURCE, OPERATOR'S MANUAL VERSION 3.6



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# Limited warranty

Avion Power warrants Voyager batteries to be free from defects in materials and workmanship for one year following shipment. This limited warranty applies to the original purchaser of the battery and is not transferable except by Avion Power's authorized distributors.

The Voyager battery is produced with standard commercial parts, any of which may fail under some circumstances. Although the probability of such failure is low, it is not zero. During the limited warranty period, we will repair or replace, at our option, any defective product or parts at no additional charge. A return merchandise authorization (RMA) number must be obtained prior to returning a battery to Avion Power. A battery returned to Avion Power with shipping pre-paid, will be repaired or replaced, tested, and returned promptly. All replaced parts and products become the property of Avion Power.

This limited warranty does NOT extend to any batteries which have been damaged as a result of accident, abuse, modification, misuse such as failure to follow operating instructions provided by Avion Power, or other contingencies beyond our control. NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. AVION POWER IS NOT LIABLE FOR CONSEQUENTIAL DAMAGES.

# Warning

- Personnel using the Voyager must read and understand this manual and adhere to the warnings, cautions, and notes. Failure to do so may result in serious damage, injury, or death.
- Unplug and store Voyager before takeoff
- Secure Voyager during flight
- Do not use Voyager if the LCD displays "SERVICE"
- Do not use Voyager if the case is cracked, crushed, or punctured
- Do not disassemble or modify Voyager
- Do not short circuit battery terminals
- Do not heat Voyager above 85° C
- Do not incinerate or expose to fire

# Overview

- The Voyager Power Source is a lightweight, high-power battery designed to start aircraft engines and provide auxiliary power. On a single charge, Voyager can conduct multiple starts, power on-board electronics, or provide a combination of auxiliary power and starting power. Voyager can be recharged in-flight or on the ground.
- Voyager 28V / 20Ah, Orange. Part number VPS 26/20-O
- Voyager 28V / 20Ah, Black. Part number VPS 26/20-B
- Voyager 28V / 10Ah, Orange. Part number VPS 26/10-O
- Voyager 28V / 10Ah, Black. Part number VPS 26/10-B

# Specifications

	28V / 20Ah	28V / 10Ah
Operating voltage	16V – 28V	16V – 28V
Charging voltage	28.8V	28.8V
Nominal voltage	26V	26V
Capacity	20Ah	10Ah
Starts per charge <sup>1</sup>	14	7
Continuous current	200A	200A
Ipp / Ipr	1250A / 950A	800A / 600A
Cranking power	16kW	12kW
Operating temperature	-20° to 60° C	-20° to 60° C
Storage temperature	-40° to 60° C	-40° to 60° C
Storage temperature (optimal) <sup>2</sup>	10° to 20° C	10° to 20° C
Length, width, height	17.7" x 6.2" x 4.6"	17.7" x 6.2" x 2.7"
Weight	15 lbs	9lbs

1. Starts per charge is an estimated specification based on multiple tests on a wide range of aircraft. Actual starts per charge depends on specific power requirements of a given aircraft as well as prevailing environmental conditions.

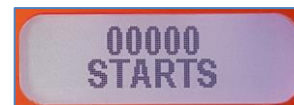
2. Storage at room temperature maximizes available capacity and cranking power.

# Features

- Power button - The power button is located at the rear of the unit. It provides audible and tactile feedback when pressed and is recessed into Voyager's housing to prevent inadvertent activation.
- Liquid crystal display (LCD) - An LCD communicates Voyager's state of charge and mission readiness.
- Battery management unit (BMU) - The battery management unit is an electronic safeguard that continuously monitors critical functions and metrics. The BMU will activate redundant safeties that disconnect Voyager if a metric is outside acceptable limits.
- Internal charging circuit - Voyager can recharge using power from an aircraft or from 110 / 220V power grids through a power supply.
- Shell - Voyager's high-visibility shell is made of fire-retardant material and is water resistant.
- NATO connector - Voyager's NATO connector plugs directly into an aircraft's external power receptacle. Alternatively, a six-foot extension cable is available for pilots who prefer to place Voyager on the ground during use.

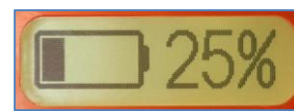
## Liquid Crystal Display (LCD)

Voyager's LCD communicates the state of charge and the health of the battery. When Voyager is powered "on," the Avion Power logo and the aggregate start count are displayed. The start counter tracks the number of engine starts and will increase when the discharge current is above 300A for at least five seconds.



### State of charge

After Voyager is powered "on," the LCD will display the state of charge. A green backlight will be lighted when the state of charge is greater than 30%. The backlight changes to yellow when the state of charge is less than 30%.



Operators should familiarize themselves with the capacity used during various tasks and ensure adequate state of charge before starting the aircraft or beginning maintenance.

Voyager exhibits minimal self-discharge, losing only 3% per month when "off." Voyager has no memory effect and can be fully discharged without harming the battery.

NOTE: The actual state of charge may differ from the displayed state of charge by +/- 10%. Voyager's state of charge is updated every five seconds.

## Battery health

Voyager's firmware monitors and controls critical operations of the battery. If a fault is detected, the firmware disconnects the battery and communicates its status through the LCD.



- If cell temperature exceeds 95° C, Voyager will electronically disconnect and the LCD will display the yellow backlight and the text, "OFFLINE OVERTEMP." Operators should discontinue use and allow the Voyager to cool. Voyager will reconnect and the LCD will show the state of charge when cell temperature returns to operational levels.
- If current levels exceed Voyager's specifications, the battery will electronically disconnect and the LCD will display a yellow backlight and the text, "OFFLINE OVERLOAD." To reset the Voyager, the operator should power Voyager "off," wait ten seconds, then power Voyager "on."
- If Voyager requires service, the battery will electronically disconnect and the LCD will display a red backlight and the text, "SERVICE." Operators should discontinue use and contact Avion Power.

## Operation

Voyager is mechanically compatible with any aircraft that has a standard NATO power receptacle; it is designed to meet the starting requirements of many reciprocating, pneumatic, and electronic controlled (ECU) turbine aircraft engines. Voyager can also provide sufficient power for many ground-based activities.

**WARNING:** Un-plug Voyager before takeoff.

**CAUTION:** Avion Power provides operating specifications for each Voyager model. It is the operator's responsibility to ensure that these specifications are adequate to complete the task for which Voyager is being used.

**CAUTION:** Voyager's operating temperature range is between -20° C and 60° C. If Voyager has cooled below -20° C, the operator should warm Voyager before use.

**CAUTION:** Inspect Voyager's terminals to ensure that debris or lubricant has not collected inside the NATO connector.

**CAUTION:** Make sure that a Voyager inserted into an aircraft's external power receptacle is adequately secured.

**CAUTION:** Voyager's voltage must be compatible with the aircraft. 26V Voyagers are not compatible with 12V aircraft. 12V Voyagers are not compatible with 28V aircraft.

**CAUTION:** Operators should monitor the state of charge while using Voyager as a ground power unit.

**NOTE:** Refer to Pilot Operating Handbook (POH) and Aircraft Flight Manual (AFM) for guidance on external power sources.

## Starting an aircraft

To use the Voyager to start an aircraft:

- Power Voyager “on” and confirm adequate state of charge
- Plug Voyager into the aircraft and start the engine
- Un-plug, power “off,” and store Voyager safely

## Ground power

Voyager has adequate capacity for many maintenance and avionics-focused activities that traditionally rely on large power carts located at fixed bases. Additionally, Voyager’s portability can offer auxiliary power to battery dependent pilots, such as EMS pilots and electronic news pilots, who operate in remote areas.

When used as a auxiliary power supply, Voyager’s run-time is dependent on the activity’s electrical load and the prevailing environmental conditions. The following hypothetical situation is an example of Voyager’s potential run-time.

A maintenance activity draws 18A. Estimated runtime is given by dividing Voyager’s 20Ah capacity by 18A ( $20\text{Ah} / 18\text{A} = 1.11$  hours) or 66 minutes. The estimated runtime is not exact and some allowance must be made for other variables. This example assumes moderate ambient temperature.

To use the Voyager as an auxiliary power unit:

- Power Voyager “on” and confirm adequate state of charge
- Plug Voyager into the aircraft and monitor state of charge during Voyager-powered activity
- Un-plug, power “off,” and store Voyager safely

## Charging

Voyager’s may be charged by a base charger that is then powered by a 110V / 220V outlet, or from the NATO connector if the aircraft’s generator powers the NATO plug.

**WARNING:** Do not charge Voyager longer than three hours. Do not charge a Voyager in-flight.

**WARNING:** Base chargers are not waterproof and may create a shock hazard if operated in wet conditions.

**CAUTION:** Operators must ensure that the voltage of the charging power source is compatible with the Voyager’s voltage. Do not attempt to charge a 26V Voyager with a 12V power source or a 12V Voyager with a 28V power source. Use of unapproved power sources or procedures may damage Voyager and will void the limited warranty.

## Base charging

Avion Power base chargers accept input voltages of 110V or 220V. Operators must confirm that their charger is compatible with the voltage in geographies in which Voyager will be used. If the base charger has a voltage input selector, please select the appropriate input voltage based on your geographic location.

The Voyager and the base charger must be “on” during charging. Voyager’s LCD will display the increasing state of charge, but operators should rely on the base charger’s LED to determine when charging is complete.

The base charger will recharge an empty Voyager in 60 to 90 minutes.

## NATO charging

Voyager will charge through the NATO plug when the aircraft’s generator is “on” if the aircraft’s circuitry powers the NATO plug. This charging option usually offers higher current, allowing operators to charge Voyager very quickly.

Operators who wish to charge Voyager using the NATO plug need to determine whether the generator powers the NATO plug. After conducting a Voyager start, switch to generator power and observe Voyager’s state of charge and the aircraft’s amp meter. If the state of charge is increasing and the amp meter is above normal levels, Voyager is charging. NATO plugs are often powered on Bell Helicopters and MD Helicopters, but not on Airbus Helicopters.

The Voyager must be “on” during charging. Voyager’s LCD will display the increasing state of charge.

Charging Voyager through the NATO plug is not a primary charging method, but it can be useful in remote areas or during circumstances that force the operator to wait on the ground.

## Maintenance

Voyager does not require maintenance, other than charging.

## Troubleshooting

Contact Avion Power if Voyager’s LCD displays “SERVICE.”

## Storage

Voyager Power Sources are durable tools designed to withstand daily use as a ground power unit or start battery. In order to maximize Voyager’s performance and service life, operators should follow these storage guidelines.

- Store Voyager within its storage temperature range of -40° C to 60° C. The optimal storage temperature range is 10° C to 20° C.

- If Voyager is stored outside its operating temperature range, operators should correct Voyager’s temperature before use.
- Store in a dry location.

## Shipping

Li-Ion Batteries are classified and regulated as Class 9 dangerous goods. Voyager Power Sources qualify as “lithium-ion batteries” and are therefore subject to the regulations described by UN3480 during shipping. Packing instructions dictated by PI 965 Section 1A apply because Voyager’s watt hour rating is greater than 100Wh. The requirements of PI 965 Section 1A are shown below:

PI 965 Section 1A	
Max quantity per package for passenger aircraft	Not allowed
Max quantity per package for cargo aircraft	35 kg net
Outer packaging	UN Specification Packaging, PG II performance standards
Inner packaging	Required. Protect against short circuit
Markings	UN3480, Lithium ion batteries
Labeling	Class 9, Cargo Aircraft Only
Allowed in small package (U.S. only)	Yes
Allowed in small package (Non-U.S. only)	Yes, all IDG countries except to/from/within Europe
Allowed in air cargo	Not allowed on passenger aircraft
Allowed in air freight	Yes
Dangerous goods document for small package (U.S. and Non-U.S.)	Shipper’s declaration
Dangerous goods document for air cargo and air freight (U.S. and Non-U.S.)	Shipper’s declaration
Safety document required	No
Acceptance audit required	Yes
Information displays on the NOTOC	Yes
State of charge	Less than 30% of rated design capacity

## Material Safety Data Sheet (SDS)

Voyager’s MSDS is available at [avionpower.com/resources/](http://avionpower.com/resources/)

## Disposal

Cell recycling is encouraged. Do NOT dump into any sewers, on the ground or into any body of water.

- USA: Dispose in accordance with local, state and federal laws and regulations.
- Canada: Dispose in accordance with local, provincial and federal laws and regulations.



- EC: Waste must be disposed in accordance with relevant EC directives and national, regional and local environmental control regulations. For disposal within the EC, the appropriate code according to the European Waste Catalogue (EWC) should be used.

## Emergency procedures

### Fire fighting measures

Rechargeable lithium ion batteries contain graphite, lithium phosphate, solvent and lithium salt. There is no metallic lithium. The following extinguishing agents effectively control fires involving lithium ion batteries.

- Water will extinguish a lithium ion battery fire.
- Ordinary ABC fire extinguishers are effective since there is no metallic lithium in a lithium ion battery.
- CO<sub>2</sub>, dry chemical, and foam extinguishers are preferred for small fires, but may not extinguish burning lithium ion batteries. Burning batteries will burn themselves out.
- LITH-X (powdered graphite) or copper powder fire extinguishers, sand, dry ground dolomite or soda ash may also be used. These materials act as smothering agents.

### First aid measures

In case of contact with electrolyte, gases, or combustion byproducts from a lithium battery or lithium ion battery release, the following first aid measures should be considered:

- Inhalation: If contents of an opened cell are inhaled, remove source of contamination and move victim to fresh air. Obtain medical advice.
- Eye contact: Eye contact with the contents of an opened cell can cause burns; immediately flush the contaminated eye(s) with lukewarm, gently flowing water for at least 30 minutes while holding the eyelids open. Neutral saline solution may be used if available. If necessary, continue flushing during transport to emergency care facility. Take care not to rinse contaminated water into the unaffected eye or onto face. Quickly transport victim to an emergency care facility.
- Skin contact: If skin contact with contents of an open cell occurs, remove contaminated clothing, shoes and leather goods. Immediately flush with lukewarm, gently flowing water for at least 30 minutes. If irritation or pain persists, seek medical attention. Completely decontaminate clothing, shoes and leather goods before reuse or discard.
- Ingestion: If ingestion of contents of an open cell occurs, NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Have victim rinse mouth with water again. Quickly transport victim to an emergency care facility.

# Accessories

## Base charger



The base charger recharges Voyagers from a 110 / 220V wall outlet and works anywhere in the world. It provides Voyager with optimal charging. The base charger will recharge a fully discharged Voyager in about an hour. A base charger and local power cord are included with all Voyager purchases.

## Extension cable



The extension cable attaches to Voyager's nose and plugs into an aircraft like a traditional GPU. This option is useful if an aircraft has an obstructed NATO plug or if a pilot wants to use the Voyager without removing it from a storage compartment. The extension cable may also help some fixed-wing pilots avoid exposure to prop wash during Voyager starts. The extension cable uses the highest quality components to ensure maximum power transfer and unchanged voltage profiles during cabled starts. It's also light-weight and easy to coil. The standard length of the extension cable is six feet, but custom lengths are available.

## Modular accessory vest



The Modular Accessory Vest was designed by the leader in the tactical nylon industry to simplify carrying and stowing the Voyager. The nose cover prevents debris from entering the terminals and is easily removable. A flexible, transparent window allows users to see Voyager's LCD and manipulate the power button without opening the MAV. Velcro-covered MOLLE webbing covers the front and back of the MAV and allows attachment of any compatible accessory pocket. The Velcro MOLLE allows users to temporarily and easily secure Voyager to a designated spot in their baggage compartment.

## Suspender



Although our tests indicate that suspension is unnecessary, users who are concerned about stress on their aircraft's NATO connector can consider a Voyager suspender. This simple solution allows users to attach a suction cup to the fuselage of the aircraft and relieve the force that Voyager exerts on the NATO connector. A Voyager suspender can support 60 pounds and does not damage the aircraft in any way.

## Certifications

- CE
- UN/DOT 38.3
- MIL-STD-704F



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