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**Connection
Systems**



**RED BOX
AVIATION**

HybRED 170-6 MANUAL

LPA Connection Systems

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MODEL HybRED 170/6

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HEALTH AND SAFETY INFORMATION

To The New Owner

The purpose of this manual is to assist owners and operators in maintaining and operating the HybRED unit. Please read it carefully; information and instructions furnished can help you achieve years of dependable performance.

I M P O R T A N T

The owner's manual for the Engine is included with your owner's packet which contains additional information that will not be repeated in this manual. You are urged to refer to the owner's manuals before attempting any operation or repair of the unit.

It is the owner's responsibility to make certain the operator reads and understands this manual before operating this machine. It is also the owner's responsibility to make certain that the operator is a qualified and physically able individual, properly trained in the operation of this equipment.

Using This Manual

General operation, adjustment and maintenance guidance is outlined for both the experienced and novice user. Operating conditions vary considerably and cannot all be addressed individually. Through experience, however, operators should find no difficulty in developing good operating skills suitable to most conditions.

Important

This ground power pack is designed to deliver up to 72 Kilowatts of instant power for short periods. It is extremely powerful using military aerospace technology. It is designed for the professional operator and should be used only by personnel who have received instruction on the correct operating procedures. Failure to follow the correct procedures, or to take adequate precautions can cause damage to electrical systems, result in injury to the operator, or damage to equipment.

Before Use

Read, note and understand the following operating procedures and ensure all users of the equipment are made fully aware of these instructions ALSO read any details on the unit.

Delivery Checks

Check for damage upon delivery of the machine. Contact the delivery carrier and LPA immediately, if damage is noticed. Keep all shipping papers for LPA Service Representative.

I M P O R T A N T

For the Purposes of Shipping and Transport the Engine has been drained of Oil and Fuel. These must be correctly filled before use or permanent damage will occur.

FUEL – Unleaded Petrol 95 RON minimum

OIL. - 5W-30, 10W-30 (Check Engine Manual for Temperatures)

ENGINE LINK – Must be refitted – See Chapter Below or Card affixed to Engine

Perform the following steps before starting the HybRED for the first time.

1. Clean unit, removing dirt and debris accumulation.
2. Check the engine oil level. Refer to the Briggs & Stratton Engine Manual.
3. Tighten any bolts that may have loosened
4. Fill the gas tank with fresh gasoline. Run the unit for 5 minutes.
5. Shut engine off and check for any fluid leaks and/or loose fittings. Adjust and tighten bolts and/or fittings if necessary.

Engine Servicing

The engine must be serviced in accordance with the manufacturer's maintenance schedule (page 4 of service manual included in owner's packet). The unit has been fitted with an hour run meter which will function whenever the ignition key is on.

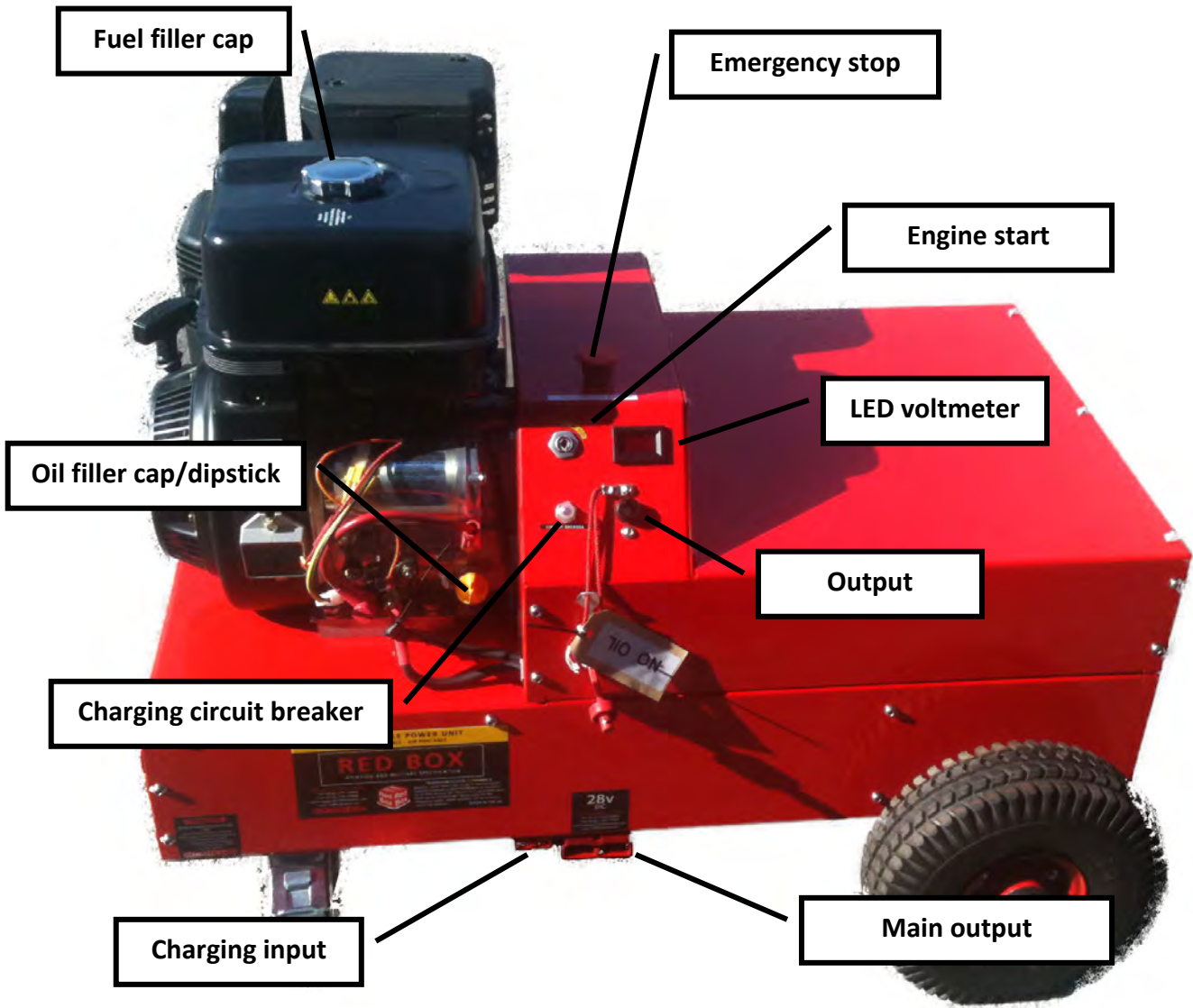


Safety Information

1. **NEVER** use when the battery is below 22 Volts, or the warning buzzer has sounded
2. When not in use, disconnect and remove the aircraft. Do not leave cables connected when the unit is being manoeuvred, they may become damaged.
3. **NEVER** use or operate the isolator as a starting switch.
4. **NEVER** short circuit the equipment - check that onboard battery terminals or bare leads etc. are not touching the aircraft. Always check the orientation of the aircraft lead, before attempting to plug the lead into the aircraft.
5. **NEVER** under any circumstances, **BACK** charge from the aircraft.
6. **NEVER** attempt to use any other type of external charger other than the one supplied.
7. **DO NOT** leave the unit exposed to, strong sun or rain.
8. **DO NOT** use the unit inside, with the engine running without adequate ventilation.
9. **DO NOT** transit the unit in any vehicle or aircraft unless it is securely restrained, and the isolator key is removed.
10. **DO NOT** open the unit – There is high speed rotating machinery which could cause serious injury. There are no user serviceable components inside. If a fault occurs contact LPA immediately, or local service agent.
11. **NEVER – Refuel** or check Oil levels with the Engine Running.
12. **DO NOT** use any other leads than those supplied - If longer or alternative leads are required contact LPA.
13. Do not use the mains charger outside. It is an Indoor unit only.
14. The mains supply for the charger **must be used** in accordance with the local legislation.
15. Add this Charger unit to your Portable Appliance Register and Safety test at least every 3 months.

This unit has been designed and manufactured to provide many years of service if used in accordance with the instructions and used with care.

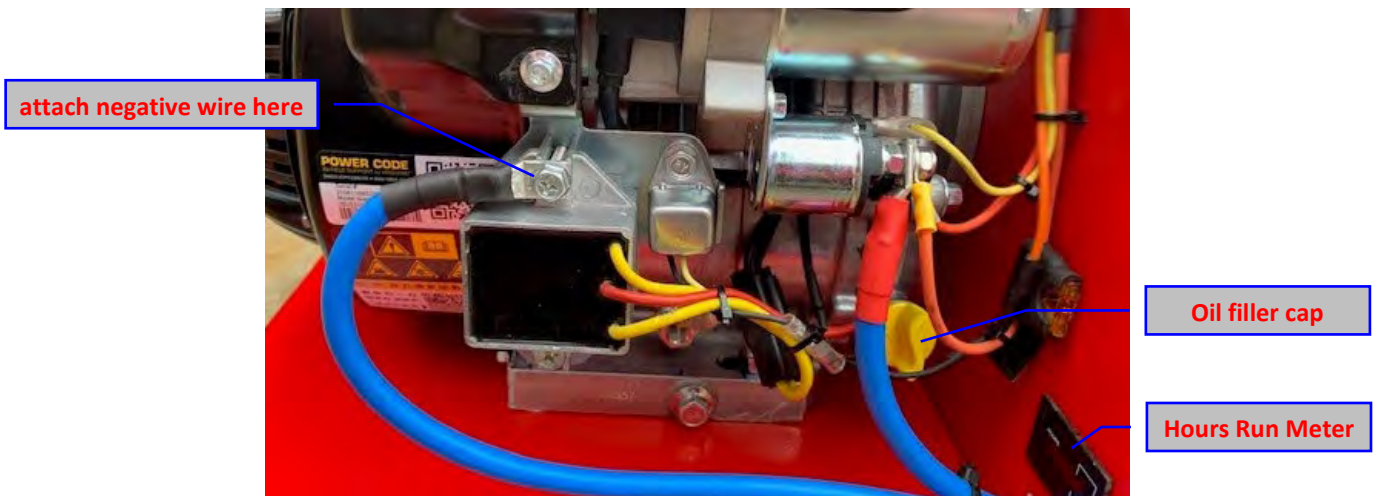
HybRED 170 COMPONENT LAYOUT



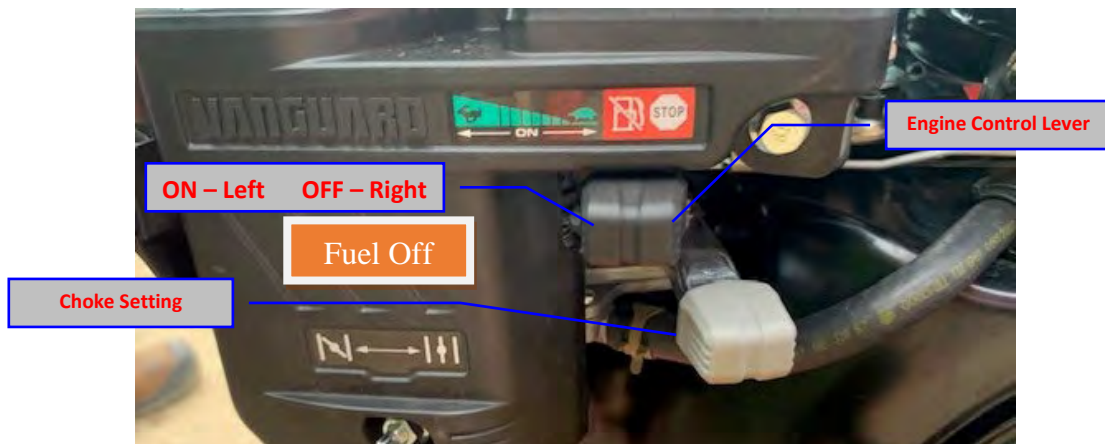
HybRED 170 Start and Continuous Power Unit

Important: Follow these steps before first operation.

1. Unscrew the oil filler cap/dipstick and fill with oil up to the 'upper limit' indicator on the dipstick. Replace the oil filler cap/dipstick and screw on securely.



2. Unscrew the fuel filler cap from on top of the fuel tank and fill with fuel. Use only unleaded petrol/gasoline. Replace the fuel filler cap and screw on securely.
3. Using a 10mm AF spanner – reconnect the negative wire as shown. (removed for shipping)



4. Moving the Top Black lever to the Right – Stops the engine from running and Shuts off the Fuel Valve. Move to the Left to Run.

OPERATION

Operational Modes

1. Ancillary Power Modes A and B - High Power (With Engine Running)
2. Ancillary Power Mode Low Power (Internal cells only)
3. Starting Mode (Internal cells only)

1 Ancillary Power Modes High Power (With Engine Running)

Mode A. Continuous max. 170 amps @ 28.5 volts @ 25° Celsius ambient (With Engine Running)

Mode B. Short maximum of 256 amps @ 24/26 volts for less than 1 Hour (with Engine PLUS internal cells)

In Ancillary High mode the unit can operate for long periods to a maximum current of 170 amps @ 28.5 volts (25° Celsius ambient), with the Engine Running **AND THE POWER CELLS FULLY CHARGED.**

Also, as delivered, the unit can combine 170Amps with the Engine PLUS 86 Amps from the battery cells, but at 24/26 volts, **for less than one hour (dependant upon the cell capacity), OR** greater currents for much shorter periods.

NOTE In Mode B, when drawing current loads greater than 170 amps great care must be taken to monitor the unit voltmeter (on line) and the unit output must be switched off when the reading drops to 24 volts OR the load must be reduced below 170 amps. Failure to monitor the voltmeter may result in the batteries becoming deep discharged and sustaining damage.

Operation - Starting

- 1. Check Status -(ensure batteries are fully charged)** see page 11
2. Release the “Twist” Engine, Emergency Stop.
3. Ensure the “Engine Control Valve” Black lever, is “ON” to the left – this opens the fuel valve.
4. Select the “Choke” Grey lever to the appropriate settings for the starting conditions (temperature).
5. Turn the Key switch – Until the Engine Starts

The unit does not require the throttle lever to be adjusted. The Engine Throttle is a demand-based system and will alter the engine speed depending upon the power/load required

6. Check the isolator is in the OFF position.

Adjust the Choke setting as required as the Engine heats up

7. Attach the cable into the unit first and then into the aircraft.
8. When correct the unit is now ready for use - Check the time.
9. THEN Switch on the Isolator when directed from the cockpit. –

NOTE .The unit will display the Output Voltage from the system. It will not display the load being drawn from the main output.

IMPORTANT NOTE -

The LED Voltmeter will show the Voltage of the system. When the current draw is below the rating of the Alternator (170 Amps) then the voltage displayed will be in the region of 28 Volts. As the current drawn from the system is increased above 170 amps the voltage will start to drop as the total current is a combination of the 28 volts from the Alternator and the 24/26 volts from the internal cells.

Example - If the total Load is 300 Amps the first 170 Amps would come from the Alternator and the additional 130 amps from the internal cells.

It is therefore vitally important that during this type of operation the voltage is monitored. At this point the load **must be disconnected immediately** and the unit allowed to fully recharge. Use below 22 volts will shorten the life of the cells and lower voltages will cause damage to the cells.

Operation – Stopping

- 1 When Power is no longer required turn the Output Isolator “Off” and remove the Key.
- 2 Disconnect the Lead from the Aircraft and then from the Unit.
- 3 Turn the Engine “Start Switch to Off”
- 4 Push the Engine/Emergency Stop Switch down.
- 5 When the engine has stopped move the Engine Control Lever (Black) to the right – this will Stop the engine from running and close the fuel valve.

2. Ancillary Power Mode (Low Power) - Cells only

Maximum 86 amps for one hour (Engine Not Running)

In auxiliary low power mode the unit, as delivered, can supply up to 86 amps for a maximum of one hour, or greater currents for shorter periods, using the cells only (Not the Engine Running). When drawing current great care must be taken to monitor the unit voltmeter and the unit must be switched off when the reading drops to 22 volts. Failure to monitor the voltmeter may result in the batteries becoming deep discharged and sustaining damage.

Operation.

1. **Check Status -(ensure batteries are fully charged)** see page 11
2. Check the isolator is in the OFF position
3. Attach the aircraft cable into unit. and then into the aircraft
4. Switch on the Isolator when directed from the cockpit - Check the time .
5. The Unit will display the Output Voltage
6. Carefully monitor the unit voltmeter. When it falls to **22** volts (online) **SWITCH OFF immediately** and recharge.

3. Starting Mode (No Engine Running) 3000 Amps Peak

In starting mode, the unit runs from the battery cells only.

Operation for engine starting

1. **Check Status** - see page 11
2. Check the isolator is in the OFF position.
3. Plug the aircraft cable into the aircraft and then into the unit.
4. Switch on the isolator when directed from cockpit.
5. Check the voltage display in the cockpit

NOTE: The ultimate responsibility for the power available remains in the cockpit

6. When operation completed - Switch OFF the isolator and remove key.
7. Remove all cables.
8. REPLACE THE UNIT ON CHARGE AS SOON AS POSSIBLE – For optimum cell health the unit should be put on charge continuously for a period of 24 Hrs once every 1 - 2 weeks

NEVER use the isolator as a starter switch or operate when high currents are already being drawn.

RECHARGING – from the Separate Mains AC Charger

Although the Engine can deliver high currents and therefore charge the internal cells in a rapid time it is vitally important for the health and long life of the cells, they must be charged on a regular basis on the mains charger supplied. This tops up the final stage of the charge profile required and improves the life of the cells. It is recommended that when the unit is in regular use – 2 /3 times a week – the unit is charged for a continuous 24-hour period at least once every 2 weeks.

1. Check the isolator is in the OFF position and the Engine not running.
2. Connect the output lead of the charger to the small connector on the unit (Charging Input)
3. Connect the charger to a suitable AC outlet.
4. Switch on the Charger.
5. If at anytime the status of the unit is required - switch OFF the AC mains, refer to **Check Status**.

NOTE: - When Charger shows Green, the cells are charged to approximately - 90% of their full capacity and can be used. For 100% charge the cells require the last few percent to be 'Trickled' or- float charged in. For optimum cell health the unit should be put on charge continuously for period of 24 Hrs once every 1 - 2 weeks

TO CHECK UNIT STATUS

1. Switch OFF the Engine - if on - and remove both aircraft and separate mains charger if in use.
2. Switch on the isolator. The unit will show the Voltage on the LED Meter.
3. 24.0 Volts is considered DISCHARGED
26.0Volts is Fully Charged.
(GPU disconnected - "off line")
4. If the unit has just performed a start, wait 2-4 minutes to allow the voltage to stabilise and a more accurate reading be obtained.
5. If the unit is used until the batteries are FLAT - (24VOLTS with cables disconnected then it must be put back on charge, and fully recharged, within 12 hours.

General Points

- There are no memory problems with these units, and they do NOT need cycling. However, consistently under charging can lead to a degradation in starting performance. For optimum cell health the unit should be put on charge continuously for a period of 24 Hrs once every 1 - 2 weeks
- The unit is more efficient when used from a high level of charge. Leave on charge.
- Ensure a good quality AC electricity supply is available. If you are operating in a country with inconsistencies install a power conditioner to give a clean regulated supply.
- Always take time to monitor the unit voltmeter and operational time. Batteries do not discharge linearly. It is possible to be suddenly caught unaware when using in the Ancillary Power Mode.
- In extreme cold keep the pack in a warm place. Do not leave exposed in a cold temperature and then expect the optimum performance. The cells are a large mass and may require several hours for the temperature to soak completely through them and to recover.
- Do not leave the pack in direct Sun for periods of time. The unit is fan assisted.
- Keep the unit clean and fully charged. The unit is otherwise maintenance free
- If you require technical assistance or advice - please contact LPA.
- DO NOT use the unit in rain or very damp conditions, when plugged into the AC mains charger.
- Ensure the engine is Serviced within the guidelines in the separate engine service manual.
- Regularly check the Oil level.
- Ensure only high quality "Clean" fuel is used.

CARE AND MAINTENANCE

This portable GPU is an important piece of Aircraft Support Equipment and uses state of the art technology. Please take time to understand it and you will get good service. If you have any queries about its capability, suitability for a particular job, or any general questions about the unit, please contact our technical department for advice. This unit has been designed and manufactured to provide many years of service, if used in accordance with the instructions and used with care.

The unit should be periodically checked (**2/3 Months**) that the fan is not obstructed or blocked.

The engine must be serviced in accordance with the manufacturer's maintenance schedule (page 4 of service manual included in owner's packet). The unit has been fitted with an hour run meter which will function whenever the ignition key is on.



Before long storage ensure that the cells are FULLY charged

AFTER USE PLACE THE UNIT ON CHARGE AS SOON AS POSSIBLE

Warranty

Limited warranty and limitation of liability (including limitation of consequential damages)

- (a) LPA Industries Ltd (the 'Seller') warrants that the goods are free from defects in seller's materials and workmanship
- (b) The warranty set forth in (a) above (the 'Warranty') shall apply only in favour of the buyer and shall expire on the last day of a period of one year commencing on the date of delivery of the goods from seller to buyer
- (c) The warranty is expressly made subject to the following provisions:
 - (1) The warranty shall not apply to any goods which have been repaired or altered or opened by anyone other than the seller, or his assigns, in any way so as, in the seller's judgement, to affect stability, reliability or performance; nor to any goods which have been subjected to unreasonable use, negligence or accident; nor specifically to the capacity of batteries save where this relates to defect in seller's materials or workmanship; nor to any goods which have not been used in accordance with seller's printed instructions; nor to any goods which have been damaged because of their use or the use of any other materials or equipment.
 - (2) The extent of the seller's liability for any breach of the warranty shall be limited to repairing or replacing (whichever of the two, the seller, in his own discretion, shall elect) any defects in goods attributable to seller's workmanship or materials, by the seller, at the risk and expense of the buyer, provided that the warranty shall not be effective unless the seller receives a written claim therefore within 30 days after the discovery of the defect. Seller shall have no obligation whatsoever to accept goods unless the provisions set forth in sub-paragraph (1) have been complied with in full. Any goods that are returned to the seller shall be returned expressly, to the factory door of the seller, at the expense of the buyer. Any goods that are returned or replaced by the seller shall be warranted for the remaining term of this warranty. The aforesaid remedy is expressly agreed to be the sole and exclusive remedy for breach of the warranty, accordingly without limitation to the generality of the foregoing. Seller shall not be obligated in any way in the event of breach of the said warranty to return any part of the purchase price of the goods or to give credit for any payments received.
 - (3) The foregoing warranty is in lieu of all other warranties (except of title) express, implied (including, without limitation, the warranties of merchantability and fitness for any particular purpose) or statutory and all other liabilities (contract, tort or otherwise, including, without limitation, negligence) Seller makes no warranty whatsoever express, implied or statutory to any person or entity other than buyer. In no event whatsoever shall seller be liable for loss of profits or any other incidental, consequential or special damages resulting from any defects in the goods or any breach of the warranty.



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