PowerMatch™

Power Meter with Balancing

INSTRUCTION MANUAL

INSTRUCTIONS

The PowerMatch meter is a perfect device for matching electronic components to optimize electric flight performance and satisfaction. An easy-to-read 2×16 LCD, easy menus, and high quality input/output connections make it simple to measure cell voltages, pack voltages, current, power, remaining battery capacity, and more! Match propellers to motors for optimum performance. Match battery packs to motors. Determine system loads. It even includes a built-in balancer which is perfect for conditioning up to 7S LiPo or LiFe packs! The PowerMatch meter is an extremely handy and useful tool for the workbench or flight line.

It is strongly recommended to completely read this manual before use! Damage resulting from misuse or modification will void your warranty.

GREAT PLANES® MODEL MANUFACTURING COMPANY

ElectriFly® by Great Planes

SPECIFICATIONS

Battery Types	LiPo, LiFe, Li-Ion, NiCd, NiMH with auto-detection
Voltage Measurement Range	4–8 NiCd, NiMH cells 2–7 LiPo, LiFe, Li-Ion cells 4.0 – 30.0V absolute maximum range
Lithium Balancing Accuracy	10mV per cell
Lithium Balancing Connection	ElectriFly compatible, FlightPower® adapters included
Lithium Max. Node Current	180mA max.
Maximum Rated Current	80A instantaneous
Maximum Capacity Displayed	65,000mAh (65.0Ah)
Auto-Off	After 30 seconds of inactivity
Protection Systems	Reverse polarity protection, Low LiPo voltage alert with auto-shut down
Case Size	100 × 65 × 25mm (3.9 × 2.6 × 1.0")
Weight	127.8g (4.5 oz.)

SPECIAL FEATURES and FUNCTIONS

- Battery Checker Mode recognizes the number of cells in a pack and measures cell and pack voltages
- Cell Balancer Mode balances up to 7S lithium battery packs
- Power Checker Mode can display measured power, current, battery voltage, and used capacity while under loads up to 80 amps instantaneous
- Deans® Ultra Plug® male on input, Deans® Ultra Plug® female on the output, with built-in radio battery jack and balancing connection

IMPORTANT WARNINGS

Disconnect the battery from the meter immediately if the meter or battery become hot!! Allow the meter and battery to cool down before reconnecting.

NEVER allow water, moisture or foreign objects into the meter.

NEVER block the air intake holes or fan as this could cause the meter to overheat.

NEVER attempt to use batteries with more cells or total voltage than listed in the specifications.

NEVER attempt to pass more current/power through the meter than listed in the specifications.

ALWAYS disconnect the battery from the meter when not in use.

ALWAYS keep out of reach of children.

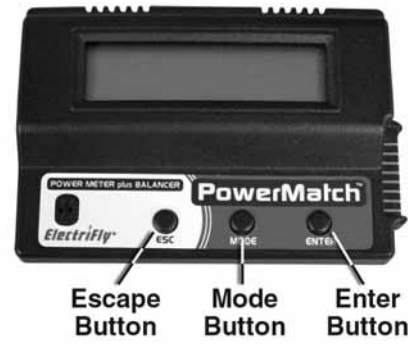
GLOSSARY OF TERMS

Amps (A): The unit of measure for charge or discharge current.

Milli-amps (mA): A unit of measure for current, being amps (A) multiplied by 1000 and listed as "mA". So 2.5A is the same as 2500mA (2.5 × 1000). Or, to convert mA to amps, divide the mA number by 1000. So 25mA is the same as 0.025A (25 divided by 1000).

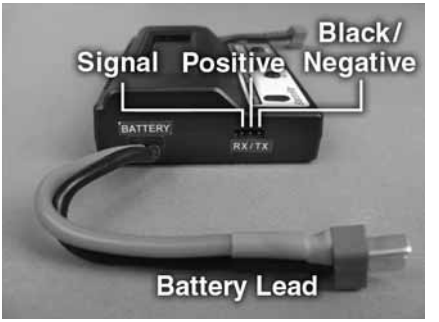
Capacity, milli-amp hours (mAh), and amp-hours (Ah): Charge energy stored by a battery is called **capacity**, which is defined as how much current a battery can supply in one hour of time. Most hobby batteries are rated for capacity in **"mAh" or milli-amp hours**. A 650mAh battery can deliver 650mA of current for one hour ($650\,\underline{mA} \times 1\,\underline{hr} = 650\,\underline{mAh}$). A 3200mAh battery can deliver 3200mA (3.2A) of current for one hour (3200mA × 1hr = 3200mAh), etc. Very large batteries, such as lead-acid field batteries, are usually rated in **"Ah" or amp-hours**. A "12V 7A" field battery can deliver 7 amps of current for one hour ($7\underline{A} \times 1\,\underline{hr} = 7\underline{Ah}$).

INPUT POWER – CONNECTION, PROTECTIONS & LIMITATIONS



The meter draws input power from the battery that is connected for measurement. The meter will automatically enter a sleep mode if no commands are given within 30 seconds, but note that power will still remain active in the meter during this time. Simply press **ENTER** to re-activate the meter.

The **BATTERY** lead on the left side of the meter is used for connecting large power batteries. Lithium packs up to 7S can be used, including LiPo batteries rated at 25.9V, LiFe packs up to 23.1V, and Li-Ion packs up to 25.2V.

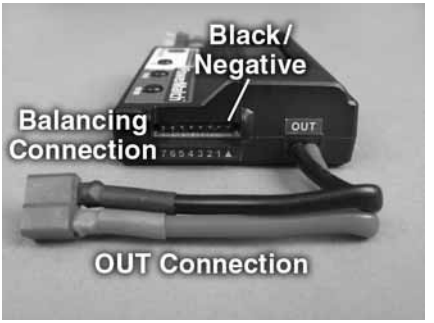


The **RX/TX** battery jack can accept NiCd and NiMH batteries having a nominal rating of up to 9.6V, with a universal or Futaba® J type connector.

The PowerMatch meter can handle up to 80 amps of current instantaneously, and measure capacity up to 65Ah (65,000mAh). Passing more than 50 amps through the meter continuously for over 2 minutes will cause heat to generate and cause readings to become less accurate. Do not exceed the maximum rated current or voltage handling capabilities of the meter.

OUTPUT and BALANCING CONNECTIONS

The **OUT** connection is located on the right side of the meter, and includes a Deans Ultra female connector.



A **balancing connection** is located on the right side of the meter, capable of handling 2S-7S lithium batteries. Terminal spacings are compatible with ElectriFly style balancing plugs. An adapter is included for connection of FlightPower® and Thunder Power™ battery balancing plugs.

MENU STRUCTURE

The PowerMatch meter has four different operational modes:

MODE	OPERATION
BATTERY CHECKER	Shows the present status of the battery.
CELL BALANCER	Determines how well cells in a lithium battery are balanced, and balancing can be initiated through this mode.
POWER CHECKER	For measuring and storing various types of data measured under loaded conditions.
USER SETTING	For setting low voltage detection level for lithium batteries.

BATTERY CHECKER MODE – LiPo, LiFe, Li-Ion BATTERIES

This mode is used to measure the present status of a lithium battery, showing the number of cells in the battery, static battery voltage, capacity remaining, highest cell voltage, lowest cell voltage, gap in voltage between the highest and lowest cell, and individual cell voltages.

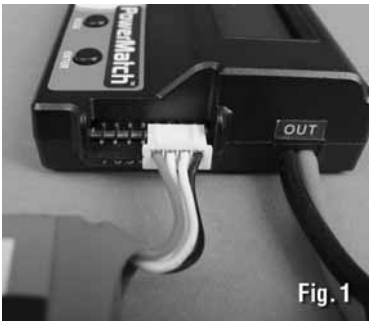


Fig. 1

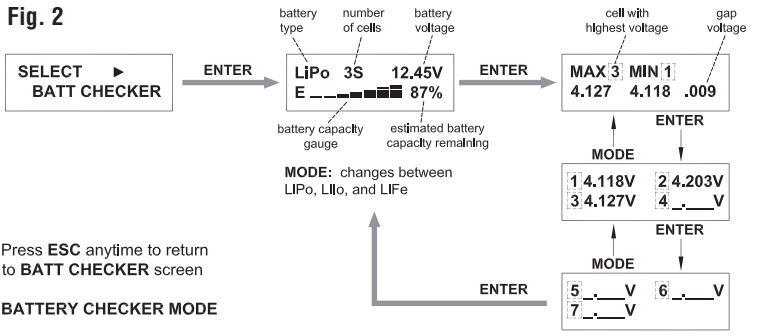
1. Connect the 2S-7S lithium battery to PowerMatch's balancing terminals. Make sure the negative wire of the battery's balancing plug is connected to the terminal at far right as shown in Fig. 1. Do NOT connect the lithium battery's main lead to the meter.

WARNING! NEVER allow the positive and negative output connections to touch while a battery is connected to the input. Failure to do so could result in permanent damage to the battery and/or the meter and void your warranty.

2. The BATT CHECKER screen should appear automatically. If not, press MODE until this screen appears.

3. Press ENTER to view this function.

Fig. 2



4. The battery status screen will appear, showing the battery type, number of cells, total pack voltage, and estimated amount of capacity remaining in the battery.

5. Press MODE as needed to change the battery type shown on this screen, from Li-Ion to LiFe to LiPo. It's important to select the proper battery type so PowerMatch can accurately display data.

6. Press ENTER to view the cell with highest “MAX” voltage, cell with the lowest “MIN” voltage, and the voltage difference or “gap” between those two cells. The cell numbers will show directly next to “MAX” or “MIN”.

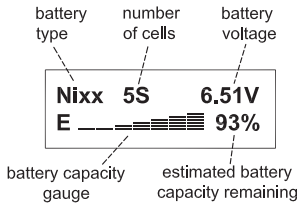
7. Press ENTER to see voltages for cells 1-4. Press ENTER again to see voltages for cells 5-7. Press MODE to move to the previous screen as show in Fig. 2.

Press ESC at any time to return to the main BATT CHECKER screen.

BATTERY CHECKER MODE – NiCd & NiMH RADIO BATTERIES

This mode can also be used to measure the current status of a nickel-cadmium (NiCd) or nickel-metal hydride (NiMH) transmitter or receiver battery.

Fig. 3



Battery Voltage Chart

No. of Cells	Rated Nominal Voltage
4	4.8V
5	6.0V
6	7.2V
7	8.4V
8	9.6V

1. Connect the 4-8 cell NiCd or NiMH battery’s universal or Futaba-J plug to the meter’s Rx/Tx jack. Make sure the battery’s negative wire (black or brown) is on the right as shown in Fig. 3.

2. The BATT CHECKER screen should appear automatically. If another function appears, press MODE until this screen appears.

3. Press ENTER to view this function.

4. It’s not necessary to set the meter for “NiCd” or “NiMH” battery type. Press MODE to change the number of cells shown on the top line of the screen. Refer to the chart at left to make sure the number of cells shown matches the number of cells in your pack, so the meter can accurately calculate the estimated battery capacity remaining.

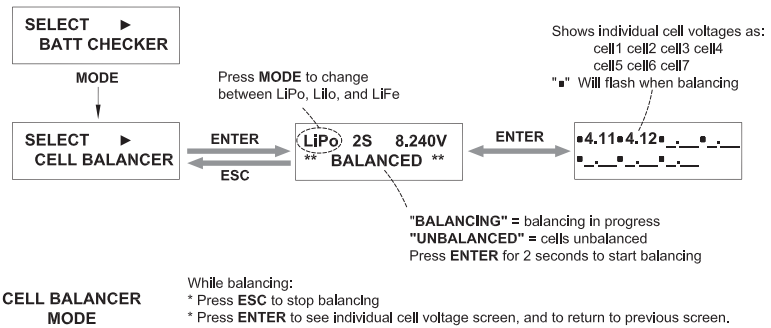
CELL BALANCER MODE

This mode indicates if cells in a LiPo pack are balanced, unbalanced, or in the process of being balanced. Discharge-balancing can be started in this mode, applying a 180mA maximum discharge current to reduce the voltage of each cell to the voltage of the lowest cell in the pack.

1. Connect the 2S-7S lithium battery to the balancing terminals on the meter. Make sure the negative wire of the battery's balancing plug is connected to the terminal at far right as shown in Fig. 1 on page 6. Do NOT connect the lithium battery's main lead to the meter.

2. The BATT CHECKER screen should appear automatically. Press MODE until the CELL BALANCER screen appears.

3. Press ENTER to view this function.



4. The top line of the display will show the lithium type, the number of cells detected in the pack, and total pack voltage. Press MODE to change the battery type to match the battery connected to the meter.

5. The bottom line of the display will show BALANCED or UNBALANCED, to indicate the condition of the cells in the pack. If UNBALANCED shows, press and hold ENTER for two seconds to start the balancing function to equalize the voltage of all cells in the pack. The display will show BALANCING at this time.

6. Press ENTER to view the voltages for all cells in the pack. A flashing "■" symbol next to any cell voltage indicates that cell is being balanced. Press ENTER to return to the previous screen. Press ESC to manually stop the balancing function. Once balancing is complete the meter will automatically move to power down mode in 15 seconds. Press ENTER to revive the meter which will revert to the previous screen.

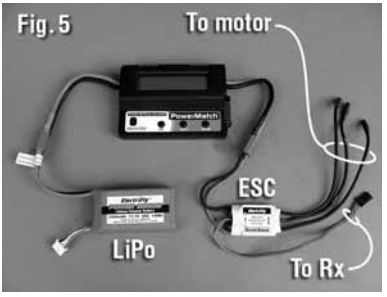
If balancing is not in progress, pressing ESC will return to the CELL BALANCER screen.

POWER CHECKER MODE

This mode is for measuring total load current, battery voltage, used battery capacity, and electric power. This function can be used to measure data between a battery and electronic speed control, charger and a battery, or discharger and battery. PowerMatch can measure and store average, minimum, and maximum values in this mode.

Note that heating may occur within PowerMatch when high currents are passed through the meter continuously for more than 2 minutes. This may cause the accuracy of the readings on the display to decrease. It's therefore not recommended to allow continuous current of over 50A to pass through the meter continuously for more than 2 minutes. Once a load current has passed continuously through the meter for 3 minutes all data on the LCD will automatically begin to flash. This simply notes that meter accuracy may be reduced as a result of internal heating if higher currents are being passed through the meter. The flashing will stop when the battery is disconnected from the meter, or if the function is stopped manually by pressing ESC.

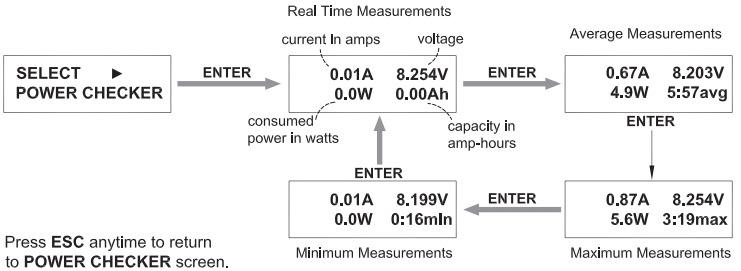
MEASURING DATA FROM BATTERY TO ESC:



1. Connect the 2S-7S lithium battery to the BATTERY input as shown in Fig. 5. Do NOT connect the lithium battery's balancing lead to the meter.

2. The POWER CHECKER screen should appear automatically. If not, press MODE until this screen appears.

3. Press ENTER to view this function.



POWER CHECKER MODE

4. The first screen shows the present condition of the battery and meter. This includes current flow in amps (A), meter input voltage (V), power across the meter in watts (W), and total energy that has passed through the meter in amp-hours (Ah - not milli-amp hours). Power can be delivered through the meter at this time (refer to sections that follow). The meter will display and track current, power, and energy data once 500mA has passed through for 3 seconds.

5. The meter can show three types of measured data: average, maximum, and minimum values.

Average: Press ENTER to find the “avg” screen, which shows the average values measured. Measurements and data are updated at continuous intervals.

Pressing MODE at any time will stop the counter and measured data will be frozen at the last values recorded when the MODE button was pressed. The time of this measurement is shown at bottom right.

Pressing MODE again will reset all data on-screen back to zero, and measurements will start again automatically once 500mA has passed through the meter for 3 seconds.

Maximum: Press ENTER to see the “max” screen, which shows the maximum values measured during the test which is underway. Data is continuously monitored and updated only when a higher value has been measured. The time when the highest values are measured will be shown at bottom right.

Pressing MODE will return to the “Average” screen. Pressing MODE again will reset all data on-screen back to zero.

Minimum: Press ENTER to see the “min” screen, which shows the minimum values measured during the test which is underway. Data is continuously monitored and updated only when a lower value has been measured. The time when the lowest values are measured will be shown at bottom right.

Pressing the MODE button will return to the “Average” screen. Pressing MODE again will reset all data on-screen back to zero.

MEASURING DATA DURING CHARGE OR DISCHARGE:

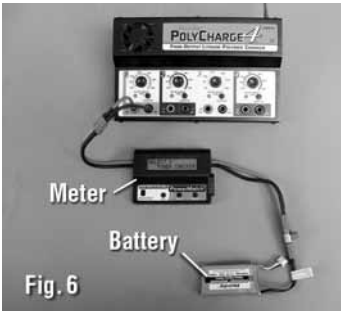


Fig. 6

1. **To charge:** Connect the 2S-7S lithium battery to the meter’s OUT connection as shown in Fig. 6. Do **NOT** connect the lithium battery’s balancing lead to the meter. The POWER CHECKER screen should appear automatically. If not, press MODE until this screen shows. Connect the charger to the meter’s BATTERY connection.

2. **To discharge:** Connect the battery to the meter’s BATTERY connection and the discharger to the meter’s OUT connection.

3. Press ENTER to view this function.

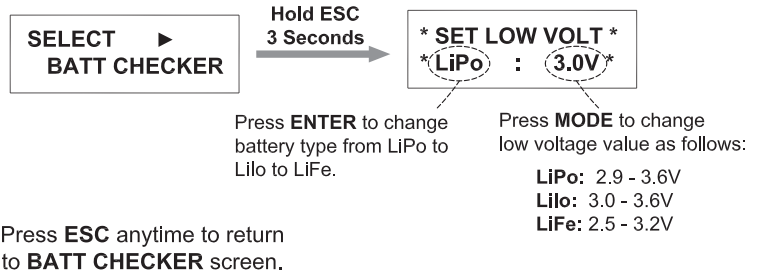
4. Command the charger to start charge or discharge. Data should appear on the meter’s LCD after 500mA of current has passed for 3 seconds.

WARNING!! Charging lithium-based rechargeable batteries poses a risk of FIRE! NEVER leave lithium batteries unattended while being charged! ALWAYS charge lithium-based batteries in a fireproof location! Always follow the instructions provided with the lithium battery and lithium charger when charging lithium batteries! Lithium batteries should NEVER get warm or change shape anytime during charge! Disconnect batteries IMMEDIATELY if they become excessively warm or hot or change shape at any time, and refer to the Troubleshooting Guide in the battery and/or charger’s

instructions for details. Do not discharge LiPo or Li-Ion batteries to a voltage that is too low. Failure to do so could result in the battery failing when being re-charged and causing a FIRE! Always read the instructions provided with lithium batteries and lithium chargers prior to use!

USER SETTING MODE

This function allows the user to set the lowest cell voltage that the meter will allow before giving a CELL VOLT LOW warning on-screen.



USER SETTING MODE

1. Connect the lithium battery to the BATTERY lead.

2. Press and hold the ESC button for three seconds. The SET LOW VOLT screen will appear.

3. To change the battery type press ENTER. Each press of the ENTER button will scroll the screen through LiPo, LiIo, or LiFe battery types. It's important to set this to the proper battery type so the meter can select the appropriate adjustable voltage range for the battery type.

4. To change the low voltage setting for the battery type, press MODE. Each press of MODE will scroll the screen through the possible low voltage setting options for each battery types in 0.1V increments, as follows: **LiPo:** 2.9V - 3.6V **LiIo:** 3.0V - 3.6V **LiFe:** 2.5V - 3.2V

5. Pressing ESC will store the new settings and return to the main screen.

LOW BATTERY VOLTAGE and OUT OF BALANCE WARNINGS

If a lithium battery is connected to the meter's balancing terminals and a cell is determined to be at the minimum voltage as set in the USER SETTING MODE, four tones will sound and a warning screen like below will automatically show and alternate.

The cell with low voltage is shown on the bottom of the screen. Pressing the ESC button will clear the warning and return the display to the previous screen. Otherwise, after 15 seconds the meter will sound two tones and enter sleep mode. Pressing ENTER will revive the meter, returning it to the previous screen.

If the meter is accidentally set for the wrong battery type and the warning appears, press ESC to clear the warning and return to the previous screen. The meter will re-check the status of the battery for 5 seconds. During this time, press MODE to change the battery type on the display.

If a lithium cell becomes +/-200mV out of balance while in BATTERY CHECKER MODE or CELL BALANCER MODE the warning message at left will show. The "#" symbol denotes which cell is out of balance. If this occurs, press ESC to manually stop the function in progress. If the error occurred while in BATTERY CHECKER MODE, discharge-balance all cells in the pack to re-balance all cells (see the CELL BALANCER MODE section on page 8). If the error occurred while in CELL BALANCER MODE, the cell in question might have a problem and no longer be suitable for use – contact your battery supplier for further details.

ERROR INDICATIONS and SAFETY FEATURES

This meter uses solid-state circuitry to protect against potential damage which could be caused by reverse polarity conditions. If input power is connected backwards the screen might turn black and no other operation will occur, but the meter will be protected from damage. Re-check all input connections to make sure it is connected properly.

If connected in-line with a battery and charger, and the voltage setting in the charger is too high for the battery that is connected, a CELL VOLT LOW warning message will show. It may take up to 5 minutes for this error to show. Disconnect the battery from the meter, and re-check all settings in the charger before proceeding.

TROUBLESHOOTING GUIDE

PROBLEM: Display does not work or turns black when connected to a battery or other power source. Check the battery or power source for proper power. Check input connections for proper contact, making sure it's not connected backwards. Meter is overheated. Disconnect battery and allow meter to cool.

PROBLEM: Charger will not lock into charge mode when charging through the meter. Or, the discharger will not lock into discharge mode when discharging through the meter. Make sure the POWER CHECKER function is active with the "Real Time Measurements" screen showing – see page 10.

PROBLEM: CELL VOLTS LOW warning shows but battery/cell voltages are acceptable. Make sure the meter is set for the proper battery type according to the battery connected to the meter. Make sure the low battery voltage setting isn't too low – see page 13.

PROBLEM: LCD and/ or controls do not function properly. Input power might be connected backwards, and require re-connection. Contact Hobby Services for further details.

1-YEAR LIMITED WARRANTY – *U.S.A. and CANADA ONLY

Great Planes warrants this product to be free from defects in materials and workmanship for a period of one (1) years from the date of purchase. During that period, Great Planes will, at its option, repair or replace without service charge any product deemed defective due to those causes. You will be required to provide proof of purchase (invoice or receipt). This warranty does not cover damage caused by abuse, misuse, alteration or accident. If there is damage stemming from these causes within the stated warranty period, Great Planes will, at its option, repair or replace it for a service charge not greater than 50% of its then current retail list price. Be sure to include your daytime telephone number in case

we need to contact you about your repair. This warranty gives you specific rights. You may also have other rights, which vary from state to state.

For service on your Great Planes product, warranty or non-warranty, send it post-paid and insured to:

Hobby Services Tel: 217-398-0007
3002 N. Apollo Drive, Suite #1
Champaign, Illinois 61822

hobbyservices@hobbico.com

*For warranty and service information if purchased outside the USA or Canada, see the additional warranty information insert (if applicable) or ask your retailer for more information.

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www.greatplanes.com www.electrifly.com

Made in China

PowerMatch™