

WARNING

To reduce the risk of injury, use only rechargeable nickel cadmium or nickel metal batteries with the TURBO35. Any other type of battery may burst and cause personal injury. DO NOT leave the TURBO35 unattended. The remote possibility of an electronic failure could cause an extreme overcharge. This could cause the battery to burst and cause a fire hazard.

The TURBO35 is designed to provide data about rechargeable nickel cadmium and nickel metal batteries. In order to simulate the discharge rates obtained during racing, the TURBO35 is designed to discharge at high currents. While the methods used in the TURBO35 are common in selecting cells, excessive cell heat generated during the process may cause damage to the cells or cause them to vent battery acids. To reduce the risk of injury, ALWAYS WEAR SAFETY GLASSES when operating the TURBO35. Since the cells are extremely hot, be careful not to handle the cells until cooled.

Always make sure all the batteries in the pack are in the same state of discharge before charging a pack. Otherwise, the the cells that are partially charged before charging will get extremely hot and may be damaged or vent battery acids.

Check your battery pack occasionally for overheating. If the cells are too hot to touch, there is something wrong and the pack must be disconnected from the charger.

Competition Electronics, Inc. shall not be liable for any property damage or personal injury which may result from the failure to follow these instructions or other improper use of this product.

GENERAL DESCRIPTION

The TURBO35 GFX is a microprocessor based charger/discharger system for rechargeable batteries used in R/C. It is a linear type and can fully charge 1 to 8 cells at a digitally presettable amperage up to a maximum of 12.0 amps using the peak detection method. It can automatically repeat with a different charge amp rates and peak detect drop-back volts for each peak.

After a charge, the charge time, peak charge volts and time since the charge was done can be displayed. Turboflex charging (reflex) may also be selected with intensity being settable from 1 to 9 for every peak.

The GFX can discharge 1 thru 8 cell packs and automatically turn off at a user settable cutoff voltage. The settable discharge amps can be between .5 to 35 amps for 1 thru 6 cells, between .5 to 25 amps for 7 cells and between .5 to 20 amps for 8 cells.

After the discharge cycle, the discharge time and the discharge average cell voltage can be displayed. Also, the discharge average cell voltage where $(\text{pack voltage} / \# \text{ cells}) = 1 \text{ volt}$ can be displayed.

It can also automatically charge, repeak and discharge 1 thru 8 cells using the parameters set for the charge and discharge functions. It can automatically cycle cells up to 9 times with up to a 180 minute wait between cycles.

Upon completion of the last cycle, all the charge and discharge readings can be displayed along with the relative and actual internal cell resistance.

The GFX reads pack voltage down to 1 mV resolution for readings below 2 volts. This allows greater accuracy for single cell readings and calculations such as actual internal resistance.

The GFX can condition battery packs for off-road or oval racing by simulating discharge characteristics for these applications. This feature may enhance the performance of battery packs. It is not intended for use when taking readings. Use standard type discharge for accurate readings.

Another available feature of the GFX is the motor break-in mode. Here the motor voltage and run time may be set. The run current is displayed. Another screen will display the source supply voltage.

All the settable values can be saved in one of ten available power-down memories. Upon power up, the last setup used will be automatically reloaded from memory.

The GFX comes standard with keyboard audio feedback. It will also alert the user when a cycle is done, and the audio annunciator can be set for continuous mode, a 5-second burst, or no alert at all at the end of a cycle.

The GFX includes a serial interface for use with HyperTerminal © in Windows and Competition Electronics' TURBOLABEL© label printing and data collection program.

Finally, another useful enhancement to the GFX is the new, more "user-friendly" menu system which allows more intuitive operation of the GFX. All TURBO35 GFX functions and display data are grouped under logical control modes for easy access.

SUPPLY VOLTS

The GFX will operate from any DC supply within the voltage range of 12 to 16 volts and 20 amp or more capacity. It will operate with less amperage, but the charge current and motor run will be limited to the maximum capacity of the supply. A 15 volt supply is required to charge 8 cells.

CONNECTIONS

The 14 gauge 4 foot pair of leads on the left side of the Turbo 35 are connected to the power supply. Install provided alligator clips, or your own terminals on the leads for a good connection. The 12 gauge 18 inch pair of leads on the right side of the Turbo35 are connected to the battery. Install provided alligator clips, or your own connector, using correct polarity. You MUST connect to the supply first, then the battery pack.

Otherwise the TURBO35 will not work. The red wire on the 4 foot lead connects to the positive (+) on your dc supply. The black lead connects to the negative (-). Be sure you observe polarity when connecting to your battery pack, positive to red and negative (-) to black. Damage may result if polarity is not observed.

The small leads from the TURBO35 are voltage sensing leads. They are used mainly for the discharge or cycle modes to get an accurate voltage measurement. With the increased resolution of the TURBO35, it is important that you remember to connect these leads; this will ensure that you get all the accuracy which the TURBO35 can deliver. Connect them directly to the battery pack while observing correct polarity. Voltage sensing is also done thru the heavy current carrying leads but will give slight voltage errors especially with heavy charge or discharge current. The slight error, however, doesn't affect the charging of the battery.

CONNECTION TO THE OPTIONAL BATTERY BOX (CEI-2090)

To connect to the optional battery box, connect the alligator clips to bare 14 gauge wires on the battery box, or install a high quality connector of choice - must be rated at 35 amps if you intend to discharge at full capability. Then connect the small red alligator clip to the small red lead on the battery box and the small black alligator clip to the small black lead. The small voltage sensing leads must be connected to get accurate discharge readings. DO NOT hook up any extra wire to the battery box high current leads. This can cause the discharge current to taper off at the end of the discharge.

Mount the end of the battery box with the springs to a flat surface with the holes provided. The other end of the box is left free to move. Do not tighten the screws all the way, otherwise the battery box will not move freely.

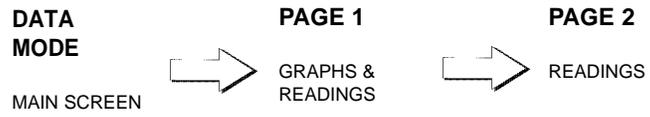
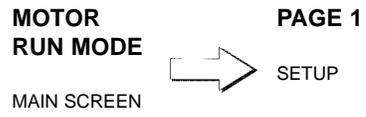
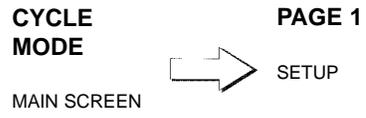
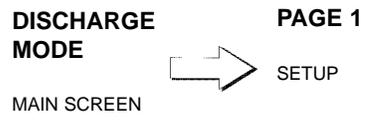
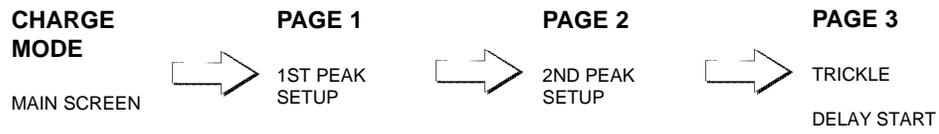
The battery box may be forced open by squeezing the spring end of the rods and the box between the thumb and the forefingers. This is useful for placing the battery in the box. The positive terminal of the battery goes to the red lead end of the battery box. Rotating the battery in the box will ensure good connection between the contacts and the battery. To remove the battery, place your finger underneath the battery and push up.

The contacts used are tin plated brass contacts. The contacts can be cleaned using a model train track cleaner for brass tracks such as Rail Zip made by Pacer Tech.

GENERAL OPERATION

The Turbo35 GFX operating system uses 6 MODES for operation with PAGES for each mode to change settable values. An operation can be started from any page of the charge, discharge, cycle or motor run mode. The following is a brief overview of this system.

MODES



Whenever a settable value is highlighted, information about that function is displayed on the bottom line of the screen.

CHARGE MODE

Change the charge amp setting during operation by rotating the dial. Use the 'ASet:' location on the display to monitor adjustment. View the charge graph real time during operation by pressing the mode button while the unit is charging.

DISCHARGE MODE

View the discharge graph real time during operation by pressing the mode button while the unit is discharging. Set AIR to ON when actual internal resistance measurement is desired. When this test is performed, it will affect a point on the discharge graph at 120 seconds. Set AIR to OFF if this is not desired.

To calculate R.I.R. (relative internal resistance) the GFX must complete a CYCLE. This reading will show 0 if you do a discharge only.

CYCLE MODE

Combines settings from charge and discharge modes to cycle a battery. See a complete list of readings in data mode.

MOTOR MODE

Runs motors up to 20 amps.

DATA MODE

View readings from cycle or discharge operation.

SET MODE

Load setups saved in memory. Save changes made to setups. Rename a setup with up to 9 characters. Save rename to a numbered memory location, 10 locations available.

WHAT IS TURBOFLEX?

The TURBO35 employs our own version of reflex charging called TurboFlex. TurboFlex charging can recondition cells by lowering the internal resistance thru breaking up of the crystalline structure formed by aging cells, It can also reduce heat buildup during charging by reducing gas build up

in the cells. It is intended for use with NiCd cells only.

Before charging you may select one of 9 intensities for each of the three peaks in the default menu. Also TurboFlex may be turned on or off for each of the three peaks. Intensity 1 is the lowest and 9 is the highest. We recommend intensity 6 for RC-2000/2400.

WHAT ARE FALSE PEAKS?

Your TURBO35 GFX uses the peak-detection method to determine when your pack or cell is fully charged. When a pack or cell is fully charged, it's voltage drop as measured by the GFX will cease to increase, as it does during the bulk of the charge time, and will begin to drop. Your GFX detects this drop, and terminates the charge cycle.

Peak detection is normally a highly reliable method of detecting a fully charged condition. However, under certain conditions, a battery pack or cell can exhibit a "false peak." Under these circumstances, it peaks before it is charged, and the result is that the battery pack or cell does not receive a full charge.

False peaks can be caused by several things. Batteries that have been fully discharged can false peak for several minutes. Use the long lockout to alleviate this problem.

Another cause is using alligator clips on solid leads. This can produce a poor connection that can't handle the charge current. It is best to clip onto braided wire or multi-strand wire where more area is contacted by the alligator clips.

Using connectors that are worn or dirty can also produce false peaks because of poor connections.

Turboflexing can also cause batteries that haven't been flex charged before to false peak. Either continue to restart the TURBO35 until the batteries continue to charge or use the long lockout so the batteries will charge 10 minutes before the peak detecting occurs.

DISCHARGING FOR PERFORMANCE - NiCd only

To get maximum performance from your batteries, discharge them first using the discharge function then fully discharge them using a .1 ohm 10 watt or a 1 ohm 5 watt resistor across each cell until the pack is cool. Any longer than that is not necessary and may cause them to false peak at the beginning of a charge. By putting a resistor across each cell, all cells will be fully discharged. Store NiMh cells with partial charge.

OVER TEMPERATURE

DO NOT BLOCK THE AIR FLOW AROUND THE SLOTS OR THE FAN INLET IN THE BACK OF THE CASE. THIS COULD CAUSE EXCESSIVE HEAT BUILD UP AND MAY SHORT OUT THE OUTPUT CIRCUIT FETS WHICH WOULD VOID THE WARRANTY. BLOW OUT DIRT IN THE FAN AND HEATSINK AREA OCCASIONALLY. OTHERWISE THERE MAY BE EXCESSIVE HEAT BUILD UP THAT COULD CAUSE THE UNIT TO FAIL

FUSES

Sooner or later you will blow a fuse by hooking up the supply backwards. It is best to go out and buy extra 20 amp fuses at the automotive store now so you will have them on hand.

We have seen fuses that looked OK but were cracked. The opening in the case with the double fuses contains two 20 amp fuses in parallel. It is almost certain if one of these fuses are blown, they both are blown. They will fatigue after a while and finally blow. How long they last will depend on the discharge current. The higher the normal discharge current used, the shorter the life. They are the fuses that are in series with the battery pack. The single fuse in its own opening is for the power supply and is also rated at 20 amps.

USING THE DATA PORT

The TURBO35 contains an RS-232 serial port which can be used for printing battery pack and cell data and for transmitting data to be used with TURBOLABEL[®] or HYPERTERMINAL[®]. Data output can be transmitted 'real time' or after a cycle, discharge.

Using the COMM setting on page 1 of the Data mode, the serial port can be configured for 5 different modes, as follows.

GRAPH MANUAL

Pressing the (START) button when the COMM menu item 'GRAPH MANUAL' is highlighted will cause the GFX to transmit a group of data formatted for a printer or HyperTerminal out of the serial port.

This data will include whatever data was collected during the cycle. It will also include a graph of pack voltage readings taken at five second intervals, if a discharge or automatic cycle was run.

GRAPH AUTOMATIC

When the port is set for COMP AUTOMATIC, each time the GFX completes a cycle, it will automatically transmit a group of data out of the serial port which is formatted for a printer or HyperTerminal.

REAL TIME

When the port is set for REAL TIME, the GFX will automatically transmit the voltage and time every 1 second out of the serial port which is formatted for a printer or HyperTerminal.

COMP MANUAL

Pressing the (START) button while the COMM menu item 'COMP MANUAL' is highlighted will cause the GFX to transmit a "data packet" out of the serial port which is formatted for TURBOLABEL© use.

COMP AUTOMATIC

When the port is set for COMP AUTOMATIC, each time the GFX completes a cycle, it will transmit a "data packet" out of the serial port which is formatted for TURBOLABEL© use.

COMPUTER INTERFACE CONSIDERATIONS

When interfacing the GFX to a PC you will need a standard 9-pin PC serial cable with a male DB-9 connector on one end and a female DB-9 connector on the other. The cable is available from any Radio Shack store, or from their web site (www.RadioShack.com). The Radio Shack part number is 6 ft. Serial RS-2432C Cable Male DB9 to Female DB9 # 26-117

HOW TO CONNECT THE GFX TO A PC FOR HYPERTERMINAL

1. Locate the HyperTerminal application on your PC and start it (Go to Start> Programs> Accessories> Communications> HyperTerminal).
2. HyperTerminal will present the user with a dialog box in which you may name a new connection and select an icon for it. Enter an appropriate name and choose an icon you like. Click once on the "OK" button.
3. A dialog box entitled "Connect to" will appear. Click on the arrow of the drop-down combo box entitled "Connect Using". Select "Direct to Comx" where "x" is the number of the Com port on your PC which you intend to use. For most PC's, this will be Com1, but this can vary, especially with laptops. Newer PC's may not have a Com port. Click once on the "OK" button.
4. Another dialog box will appear in which you can set the communications parameters for the Com port you selected. Select Bits per Second = 9600, Data Bits = 8, Parity = None, Stop Bits = 1, and Flow Control = None. Click once on the "OK" button.
5. Use the mouse to select (click on) File| Save from the main HyperTerminal menu. This will save the connection you have just created.
6. Now, use the mouse to select File|Exit to exit the program. When you do, the program group window will reappear from underneath where the HyperTerminal was. You will see the icon you selected appearing in the window, with the title you selected appearing underneath. Double-click on the icon to activate your connection.
7. Now, make sure that you have connected the 9 pin serial PC cable to the GFX. Connect the PC end of the cable to the com port you selected.
8. On the GFX, rotate the dial on the COMM function (1st page in Data mode) until the selection you want appears on the display. This will most

likely be "Graph Manual". Then, press the "Start" key. If you have done everything correctly, and data from a discharge is present in the GFX's memory, a graph will be transmitted and will appear on the HyperTerminal window.

HOW TO CONNECT THE GFX TO A PARALLEL PORT ASCII PRINTER USING THE B&B ELECTRONICS SERIAL TO PARALLEL CONVERTER.

1. On top of the converter are a series of small switches. Note that they are labeled: "1"- "8". Also note the markings: "off", and "on". Using a pointed object such as a pencil, set the switches as follows:

switch	setting
1	ON
2	ON
3	OFF
4	ON
5	OFF
6	OFF
7	OFF
8	OFF

2. Connect the free end of the smaller PC serial cable to your Turbo35's RS-232 serial port. Connect the free end of the larger parallel cable to the Printer's parallel input connector. The cables and adapters are available from any Radio Shack store, or from their web site (www.RadioShack.com). The Radio Shack part numbers are as follows:

Standard PC Printer Cable	
Female DB9 to Male DB25 Serial Port adapter	#26-209B
6 ft. Serial RS-2432C Cable Male DB9 to Female DB9	#26-117
Male DB9 to Male DB9 Gender Adapter	#26-231

This Serial <-> Parallel converter is made by B&B Electronics Mfg. Co., Inc. The B&B part number is 232SPS2. More information about this device, including a user's manual in .PDF can be found at their website, which is www.bb-elec.com. For European customers, you can use their European website, which is www.bb-europe.com.

The printer must be a ASCII compatible printer. A dot matrix printer will work. Most inkjet printers will not.

The Radio Shack and B&B trademarks are the exclusive property of these companies.

OPERATING TEMPERATURE RANGE

The OPERATING TEMPERATURE RANGE for the TURBO35 is 32 TO 100 degrees Fahrenheit.

IF IT DOESN'T WORK

If the unit does not power up correctly, disconnect the battery, then the supply, wait 10 seconds and reconnect the supply.

If the settable values have become corrupted or the unit does not operate properly try resetting the memory. Disconnect the power, hold down the page button, apply power and continue to hold until 'system init' is displayed.

Make sure that you have connected the supply leads first and then the battery leads.

Check the fuses to make sure that they are not blown. See section on FUSES.

Please call us before you send the unit back. We may be able to tell you if the unit is malfunctioning or if there is some operating consideration that needs further explanation. Phone no. (815) 874-8001.

REPAIR POLICY

All repairs are normally completed within 5 working days. Total charges will include parts cost, labor and return shipping.

It is best to contact us before you ship the unit back. The method of payment can be established at this time, and you will enable us to serve you more efficiently by avoiding irritating delays.

The preferred method of payment is Mastercard or Visa. Include your card type (VISA or MASTERCARD only), card number, your name as it appears on the card, and the card's expiration date. If you would prefer to pay by UPS COD, provide a daytime phone number so we can call you with the exact cost. You will need to obtain a cashiers check or money order in the correct amount,

When you return your GFX, include your return address, a daytime phone number and an explanation of the problem. For warranty repairs, include a dated receipt of purchase. See the separate warranty sheet for specific warranty information.

SUGGESTED BATTERY MATCHING SETUP

NiMh - Charge at 4 amps with 1 peak. Discharge at 20 amps for stock racing, 30 amps for modified racing.

NiCd - Charge at 5 amps with 2 peaks. Discharge at 20 amps for stock racing, 30 amps for modified racing.

BATTERY MATCHING TECHNIQUES

The primary number used for matching batteries is the discharge time. Group cells in a pack as close as you can. The discharge average voltage

is an important number for matching batteries for stock class. You want as high a discharge average voltage as you can get. Use the discharge time first as the primary number, then the discharge average voltage to grade with. The higher the discharge average voltage the more punch the motor will have. Use the actual internal resistance also as a grading factor for punch. The lower the resistance the better the punch. This combination will give you the most speed and punch. For packs used with modified motors, the actual internal resistance should be the second number to grade by. The discharge average voltage is not as important because you can always go to a lower wind motor to compensate for the voltage. To obtain the best possible matching, cycle new batteries 3 or 4 times. This will insure the maximum performance from each cell.

In order to achieve the best performance from your packs, you will need to determine the correct peak detection voltage to use when charging them. The ultimate method for this is to monitor the temperature of the pack right after the charge is complete. It should be about 125 degrees F. This insures that the chemical reaction that takes place while charging is complete. Start with a low peak detection voltage setting like .03 and test it on your batteries. Increase as needed to raise the final temperature. Panasonic NiMH cells may need a .03 peak detect. Gold peak and Sanyo NiMH cells may need a .04 or .05 peak detect.

We have cycled some packs using other types of peak detection that did not warm the cells. The results showed lower discharge time and average voltage.

*****LIMITED WARRANTY*****

COMPETITION ELECTRONICS, INC., warrants the product manufactured by it to be free from defects in material and workmanship for a period of 90 days from date of purchase by the original purchaser for use. COMPETITION ELECTRONICS, at its option, will repair or replace without charge, or refund the purchase price of, any product which fails during the warranty period by reason of a defect in material or workmanship found upon examination by COMPETITION ELECTRONICS, INC., to have been the cause of the failure. This warranty does not cover any failures attributable to abuse, mishandling, failure to follow operating instructions, alteration or accident.

To make claim under this warranty, the purchaser must return the product to COMPETITION ELECTRONICS, INC., at the address shown below, properly packed and with shipping charges prepaid. All claims must be made in thirty (30) days after the product failure and, in any event, within thirty (30) days after the expiration of the 90 day warranty. All claims must be accompanied by a sales slip or other written proof of date of purchase.

TO THE EXTENT PERMITTED BY LAW, ANY AND ALL IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE, ARE EXCLUDED; ANY IMPLIED WARRANTIES NOT EXCLUDED ARE LIMITED IN DURATION TO 90 DAYS FROM DATE OF PURCHASE. INCIDENTAL AND CONSEQUENTIAL DAMAGES ARE EXPRESSLY EXCLUDED FROM THE REMEDIES AVAILABLE TO PURCHASER, AND THE REMEDIES PROVIDED IN THIS WARRANTY SHALL BE EXCLUSIVE TO THE EXTENT PERMITTED BY LAW.

(Note: Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the foregoing limitations and exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.)

If any product returned by the purchaser is found by COMPETITION ELECTRONICS, INC., to require service not covered by warranty, COMPETITION ELECTRONICS, INC., will so advise the purchaser and request further instructions. COMPETITION ELECTRONICS, INC., will recondition to working order any product returned to it regardless of condition upon the purchaser's remittance of payment of 1/2 current retail price, if it is still manufactured by COMPETITION ELECTRONICS, INC.

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