

Turbo35 SE operating instructions

WARNING

To reduce the risk of injury, use only high-rate 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 high-rate rechargeable nickel cadmium and nickel metal batteries used in R/C car racing. 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 is a microprocessor based charger/discharger system for high-rate rechargeable batteries for use in R/C. It is a linear type and can fully charge 1 to 7 cells at a digitally presettable amperage up to a maximum of 12.0 amps using the peak detection method. It can automatically repeak up to 2 more times with 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 TURBO35 can discharge 1,4,6 or 7 cell packs and automatically turn off at a user settable cutoff voltage. The settable discharge amps can be between 10 to 35 amps for 1, 4 and 6 cells and between 10 to 25 amps for 7 cells.

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

It can also automatically charge, repeak and discharge 1,4,6,7 cells using the parameters set for the charge and discharge functions. It can automatically cycle cells up to 9 times with up to a 16 hour 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 TURBO35 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 TURBO35 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.

Another available feature of the TURBO35 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 three available power-down memories. Upon power up, the last saved setup will be automatically reloaded from memory.

The TURBO35 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 TURBO35 now includes a serial interface for use with Competition Electronics' TURBOLABEL® label printing and data collection program.

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

SUPPLY VOLTS

The TURBO35 will operate from a 12 volt automobile battery (see above WARNING notes) or any DC supply within the voltage range of 12 to 16 volts and 12 amp or more capacity. It will operate with less amperage, but the charge current will be limited to the maximum capacity of the supply.

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 battery pack connector and the supply connector are the opposite type so they cannot be plugged in backwards. The red alligator clip on the 5 foot lead connects to the positive (+) on your dc supply. The black lead connects to the negative (-). The leads supplied for the battery pack hook-up are the alligator type. 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 connector supplied may be hooked directly to your battery if it is compatible and the polarity is the same. Other adapters are available from various manufacturers.

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 effect 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 can perform four different operations: These operations are charging (CHRG), discharging (DISCHRG), Cycling through one or multiple charge/discharge cycles (CYCLE) and running a motor (MOTR). Each mode is entered by pressing the correspondingly labeled mode button on the TURBO35's front panel.

Under each basic operational mode, the user may view or set parameters related to that mode by repeatedly pushing the mode button. This causes the TURBO35's menu display to cycle through all of the available related parameters for the selected mode.

If the selected parameter is user-adjustable, you will be able to increment it's value by pushing the (UP ARROW/OFF) button. A cursor line will appear under the digit of any settable values.

If the selected parameter has multiple characters, press the left arrow button to move to the next character left. At the far left, one more press will move the cursor back to the right-most character.

Once all the user-selectable parameters have been set, return to the main mode screen and push the start (START) button to begin the selected mode of operation.

NOTE: If you don't want to go through the whole menu for the desired mode, select another mode and then reselect the desired mode. This will take you directly to the main mode screen for the selected mode.

Keep in mind that you can only start a mode of operation from a main mode screen(The screen that appears when you first press the (CHRG),(DISCHRG),(CYCLE) or (MOTR) button.)

To stop the TURBO35 at any time, push the (UP ARROW/OFF) button.

In addition to these modes, there are two other buttons (DATA) and (SETUP).

The (DATA) button allows the user to configure the serial port operation. Pressing the up arrow allows selection of graph output, manual computer download, and automatic computer download.

The (DATA) button is also used to view measured and calculated battery data. Here is where you will view most of the data and calculations which the TURBO35 provides.

The (SETUP) button allows saving and loading setups from power down memory, setting the beeper modes, and entering the machine name for computer download.

OVERVIEW OF THE TURBO35 OPERATING MODES

The following provides a more detailed description of the various modes of operation available on the TURBO35.

CHARGE MODE

Charge mode allows the user to perform a controlled charge on a cell or battery pack.

Push the (CHRG) button to get to the charge mode screen directly.

The main charge idle display will appear, and the cursor will appear under the charge current setting.

There are a number of parameters in the charge mode which can be set by the user. Press the (CHRG)button repeatedly to cycle through the charge-related parameters. As you cycle through each parameter, the cursor will appear under the right-most digit that is settable.

To set any other digit within a given parameter, simply push the (LEFT ARROW) button until the cursor is under the digit.

To increment the digit setting, push the (UP ARROW/OFF) button until you reach the desired setting. When you reach the

upper limit of the digit's settable range, the digit will be reset to it's lowest settable value.

The value of the charge current can be set up to a maximum of 19.9 amps at this time, but the TURBO35 will only allow you to run a maximum of 12.0 amps when you push the (START) button.

You can also set the number of peaks by setting the number in front of the 'PEAK' part of the screen. Using 1 peak will charge your battery completely. Using peaks 2 and 3 will repeak your battery.

To set trickle charge on/off, long lockout on/off, charge amps for peaks 2 and 3, delay between peaks, Turboflex intensity, Turboflex on/off and peak detect drop back voltages press the (CHARGE) button repeatedly until they appear on the screen.

To run the charge mode, you must have the message '2 PEAK CHR 3.0' on the display.

When you push the (START) button, the message 'CHARGING 1 XX.XX' will appear on the second line of the display. The 'XX.XX' is the actual supply voltage, under load, at the TURBO35. The '1' after 'CHARGING' tells which peak the charger is on. During time delay, the upper left hand number is the amount of delay time that has been completed. The top line of the display, from left to right, will show the actual charge time in seconds, the pack volts, the charge current and will be updated constantly. The actual charge current shown on the display will fluctuate slightly and will be within 0.1 of an amp of the value selected.

After a completed charge, the number in the upper left hand corner will be the time since the charge has been completed. To get the actual charge time, just push the (CHRG) push button and the time will appear in the upper left hand corner of the display. It is normal and desirable for the batteries to be slightly warm at the end of the charge cycle. If your battery false peaks, the cells will be cold and the charge time will be short. For maximum performance, never repeak your batteries more than twice.

The charge mode will only allow a maximum of 3800mahr charge before automatically shutting off. This is to assure that batteries that tend not to peak will be shut off before they are overcharged excessively.

The charge mode has a peak detect drop-back voltage warning built into it. If the peak detect drop-back voltage exceeds .03 volt for a single cell or .09 for a multiple cell pack, the warning message 'PEAK DET TOO HI-BAT MAY NOT PEAK' will appear. If you still desire to continue, just press the (START) push button again. Otherwise, push the (STOP) button, then press the (CHARG) button repeatedly until the screen needed to change the value appears. For nickel cadmium we recommend a value of .03 volts for a single cell and .05 volts and .01 volts for 1 cell and .03 for a pack for nickel metal batteries. Generally, the larger the value the hotter the battery will become at the end of the charge. Any value over .03 volts for a single cell may cause the cell not to peak. A high value of charge current will also give hotter batteries. A value of .08 volts should fully charge most battery packs with one peak.

The standard peak detect lockout time is 60 seconds. This means the charge will run 60 seconds even if the battery voltage is dropping. A long peak detect lockout of 10 minutes can be selected in the default menu. The long lockout will only last one charge and must be reselected if needed again. It will also be cleared if the (UP ARROW/OFF) button is pushed. The long peak detect lockout is meant to be used with packs that have a bad tendency to false peak.

LONG LOCKOUT FEATURE

The long lockout feature causes your TURBO35 to ignore peaking behavior for 10 minutes when charging battery packs or cells.

The long lockout will only last one charge and must be reselected if needed again. It will also be cleared if the (UP ARROW/OFF) button is pushed.

The long peak detect lockout is meant to be used with packs that have a bad tendency to false peak.

DATA OBTAINED DURING A CHARGE CYCLE

After a charge cycle has been run, the user may examine the data gathered on the battery pack.

PEAK CHARGE VOLTS DISPLAY

Peak Charge Volts is the maximum voltage read across the pack during the charge cycle.

To display the peak charge volts, push the (DATA) button until you see the message 'PEAK CHG V XX.XX'. The 'XX.XX' digits show the peak charge volts.

SUPPLY VOLTS DISPLAY

Supply volts is a real-time reading of the supply voltage to the TURBO35. It can be read at any time, not just after a charge.

To display the supply volts, push the (DATA) button until you see the message 'SUPLY VOLT XX.XX'. The 'XX.XX' digits show the supply volts.

The supply voltage reading is useful to detect a nearly dead automobile battery or a supply that is past the maximum of 18 volts allowable under the warranty.

The supply volts are also displayed while running main modes of operation. This is useful for detecting a weak supply during charging.

DISCHARGE MODE

Discharge cycle mode allows controlled discharge of a cell or a battery pack. No relative internal resistance reading will be displayed in this mode - you must run a cycle to obtain this value.

Warning

Cells temperature can exceed 200 degrees F during discharge. Be careful to let the batteries cool before handling.

To get to the discharge mode, push the (DISCHRG) button. The letters 'DISCHG AMP' indicate that the TURBO35 is in the discharge mode. The 'XX' digits show the discharge rate selected in amps. Maximum discharge rate for 1,4 and 6 cell is 35 amps or 25 amps for 7 cells. Minimum setting is 10 amps. The 'XC' indicates the number of cells to be discharged.

Set the amps and number of cells by using the (LEFT ARROW) button and the (UP ARROW/OFF) button.

The cutoff volts for 1,4,6 and 7 cell packs can be set in the DISCHARGE MENU. To get there, just press the (DISCHRG) push button until it appears.

To run the discharge mode, you must have the 'DISCHG AMP XX XC' message on the display and the voltage ON THE DISPLAY must be above the cutoff voltage and below a maximum of 1.67 volts per cell. You may have to wait a few seconds for the voltage to come up when connecting up a pack before you can push the (START) button. When you push the (START) button, the message 'DISCHGING XX.XX' will appear, indicating that you are actually discharging. The 'XX.XX' digits show the supply volts. The actual discharge time in seconds, the pack volts and the discharge current will be displayed on the top line of the display and are updated constantly.

After your pack has reached the drop-out voltage, the message 'DISCHARGE DONE' will be displayed.

To get to the 'DISCHG AMP XX XC' display, push the (DISCHRG) button again.

You can also immediately start another discharge cycle by pressing (START) again.

The discharge time for the pack is displayed in the upper left hand corner. The discharge time is useful to check the amount of time left in your pack to determine gear sizes. A 20 amp discharge rate is useful to get approximate run time left for 1/10 scale cars.

ROAD-SIMULATED DISCHARGE

The TURBO35 contains a road-simulated discharge mode which can simulate discharge conditions for both off-road and oval type racing.

It is designed to condition your battery packs to road conditions and has been found in some cases to enhance battery pack performance.

Discharge current data and calculations based upon current measurements are invalid when road-simulated discharge is in use, as the discharge current rate is varied during the discharge cycle and measurements are rendered invalid. Road-simulated discharge mode is intended for conditioning only.

DATA OBTAINED DURING A DISCHARGE CYCLE

After a discharge cycle has been run, the user may examine the data gathered on the battery pack.

ACTUAL INTERNAL CELL RESISTANCE DISPLAY

After the discharge mode has been run, the actual internal resistance of the cell can be displayed. Just push the (DATA) button until the message 'ACTINT RES XX.XX' is displayed.

The actual internal resistance is calculated using a method very close to the ANSI specification for NiCd batteries.

The lower the internal resistance the more punch the cell will deliver. Another effect the oval racers find is that the lower resistance SCRC packs have more speed at the end of the run.

mAHr DISPLAY

After the discharge mode has been run, the mAHr rating of the battery pack can be displayed.

mAHr is an indication of how long the pack can sustain a certain output current. For example, a 2000 mAHr rating indicates that the battery pack can supply 2 amps (200 mA) for 1 hour.

mWHr DISPLAY

After the discharge mode has been run, the mWHr rating of the battery pack can be displayed.

mWHr is an indication of how long the pack can deliver a certain output power. For example, a 1700 mWHr rating indicates that the battery pack can supply 1.7 watts (1700 mW) for 1 hour.

DISCHARGE TIME DISPLAY

After the discharge mode has been run, the discharge time of the battery pack can be displayed. This indicates how long it took to discharge the pack.

DISCHARGE AVERAGE VOLTAGE DISPLAY

After the discharge mode has been run, the average voltage of the pack or cell during discharge can be displayed. Just push the (DATA) button until the message 'DS AVE V X.XX' is displayed.

DISCHARGE AVERAGE VOLTAGE @ 1 VOLT PER CELL DISPLAY

After the discharge or cycle mode has been run, the average voltage of the pack or cell when pack (example 6.0 V for 6 cell) = 1 during discharge can be displayed. Just push the (DATA) button until the message 'DS AVE @1V X.XX' is displayed. This is for comparison against the discharge average voltage reading you get based on the selectable cutoff voltage (ex. 5.40v for 6 cells)

AUTOMATIC CYCLE MODE

Automatic cycle mode is a way to run one or more charge/discharge cycles on a cell or battery pack. It allows for a cooldown time between each charge/discharge cycle. You must use this mode to obtain relative I.R.

To get to this mode, push the (CYCLE) button. The message 'CYCLES X CELLS X' appears. The 'CELLS X' indicates the number of cells to be cycled. The 'CYCLES X' indicates the number of cycles to be run. Set the number of cycles and cells by using the (LEFT ARROW) button and the (UP ARROW/OFF) button. The cool down minutes between cycles for more than one cycle can be set in the CYCLE MENU by pressing the (CYCLE) button. The message 'COOL DWN MIN XXX' appears. Press the (CYCLE) push button again to get back. The TURBO35 will use the charge amps, delay times, no. of peaks and peak detect drop-back volts set up in the charge mode. It will also use the cutoff volts and discharge amps set up in the discharge mode.

To start this mode, push the (START) button. The message 'CYCLX CHGX XX.XX' will appear. The 'X' in 'CYCLX' indicates the cycle number being run now. 'CHGX' tells that the TURBO35 is charging and that it is working on the 1st, 2nd or 3rd peak. The 'XX.XX' is the supply volts. The first line on the display will show the actual charge time in seconds, the cell voltage and the charge current.

The display 'CYCLX DLYX XX.XX' indicates that it is in delay number 1, 2 or 3 as designated in 'DLYX' by the 'X' digit. The delays are set up in the charge mode. There is a 15 second delay between the last charge peak and discharge.

The display 'CYCLX DSCG XX.XX' indicates that it is in the discharge mode.

The display 'COOL DOWN CYCLEX' indicates that it is in the cool down period between cycles. The 'X' in 'CYCLEX' designates the next cycle to be run. The number in the upper left hand corner is the time that has past in minutes for the cool down period.

The cycle mode follows the sequence below.

- *Charge battery - using charge mode setup
- *Delay 15 seconds between charge and discharge
- *Discharge battery - using the discharge mode setup
- *Cool-down or completed depending on number of cycles set

DATA OBTAINED DURING AN AUTOMATIC CYCLE

After an automatic cycle has been run, the user may examine the data gathered on the battery pack.

All data gathered during individual charge and discharge cycles will be available after an automatic cycle is run. In addition, relative internal resistance will be calculated and displayed.

RELATIVE INTERNAL CELL RESISTANCE DISPLAY

After the cycle mode has been run, the relative internal resistance of the cell can be displayed. Just push the (DATA) button until the message 'REL INT RES XXX' is displayed. The method of calculating the internal cell resistance was developed by Jeff Pack.

The lower the internal resistance the more punch the cell will deliver. Another effect the oval racers find is that the lower resistance packs have more speed at the end of the run. The RC-1700/2000 will have a range from 25 to 40 for a single cell.

MOTOR RUN MODE

The motor run mode will allow you to break in new brushes on a motor, or run a motor lathe, for example.

To get to this mode, push the (MOTR) button. The 'X.XX' indicates the volts you wish to run the motor at. Set the volts desired by using the (LEFT ARROW) button and the (UP ARROW/OFF) button. The motor run time in seconds can be set in the MOTOR MENU. To get there, just press the (MOTR) push button. Press the (MOTR) push button again to get back.

To start the motor run mode, you must have the 'MOTOR VOLTS X.XX' message on the display. Push the (START) button and the message 'MOTOR ON XX.XX' will appear to indicate that you are actually running. The 'XX.XX' digits show the supply volts. The current run time in seconds, the motor volts and the motor run current will be displayed on the top line of the display and are updated constantly. It takes a few seconds for the voltage reading to respond.

The TURBO35 checks to make sure there is no voltage on the leads before it will start the motor. This will prevent you from starting this function if there is a battery hooked up to the leads. If you start the motor and then turn it off with the (UP ARROW/OFF) push button, a voltage will remain shown on the screen for a few seconds. This will prevent you from starting the motor again until the voltage reading goes close to zero.

The motor will take about 3 seconds to wind-up to speed. This is due to the soft start mode used by the TURBO35. This keeps the power supply from going into current limiting caused by the start-up current of the motor.

THE SETUP BUTTON

Setup mode allows the setting of TURBO35 system values, as described below.

SAVE SETUP SETTABLE VALUES

To get to this mode, push the (SETUP) button until the message 'SAVE SETUP X' appears. Pushing the (START) button will store all the settable values in one of the three selectable power down memories for use the next time you power up the TURBO35.

LOAD SETUP SETTABLE VALUES

To get to this mode, push the (SETUP) button until the message 'LOAD SETUP X' appears. Pushing the (START) button will load all the settable values from one of the three selectable power down memories.

BEEPER

To get to this mode, push the (SETUP) button until the message 'BEEPER: XXXXXX' appears. Pressing the ((UP ARROW/OFF) button will increment through the possible settings.

The beeper can be set to beep continuously, to beep for five seconds, or not to beep when a charge, discharge, or automatic cycle is complete.

NAME

The TURBO35 can hold a unique, 9 character name for each of its 3 setups. This is primarily used to identify machine data within TURBOLABEL© when more than one machine is connected to the PC running TURBOLABEL©.

It can be set using the standard methods described for editing the other user-changeable settings.

DATA MENU

The data menu can be selected by pushing the (DATA) push button. This menu contains various data collected during the charge, discharge, and cycle functions. The following is a list of the data displayed in the DATA menu:

- *Setup for Data Port configuration
- *Peak Charge Voltage
- *Relative Internal Resistance
- *Actual Internal Resistance
- *mA Hr
- *mW Hr
- *Discharge Time
- *Discharge Average Voltage

*Discharge Average Voltage @1 Volt Per Cell

*Supply Voltage

These values are populated accordingly depending on what cycles have been run.

OPERATING POINTERS

The following are some operating pointers and information you will find useful.

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.

You can get to the TurboFlex screen for the first peak by pressing the (CHRG) button repeatedly until the screen appears. Keep pressing the (CHARG) button to get to and set the rest of the TURBOFLEX parameters.

WHAT ARE FALSE PEAKS?

Your TURBO35 uses the peak-detection method to determine when your pack or cell is fully discharged. When a pack or cell is fully charged, it's voltage drop as measured by the TURBO35 will cease to increase, as it does during the bulk of the charge time, and will begin to drop. Your TURBO35 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 15 and 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 rated at 15 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©.

The serial port has a fixed data speed of 9600 baud.

Using the (DATA)button, the serial port can be configured for three different modes, as follows.

GRAPH MANUAL

When the port is set for GRAPHMANUAL, pressing the (START) button when the port mode appears on the display will cause the TURBO35 to transmit a group of data formatted for a printer 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.

In order to make use of this data, a printer with a serial port is required, or a serial to parallel converter is required.

COMPMANUAL

When the port is set for COMPMANUAL, pressing the (START) button when the port mode appears on the display will cause the TURBO35 to transmit a "data packet" out of the serial port which is formatted for TURBOLABEL© use.

COMP AUTOMATIC

When the port is set for COMPAUTOMATIC, each time the TURBO35 completes a cycle, the TURBO35 will transmit a "data packet" out of the serial port which is formatted for TURBOLABEL© use.

COMPUTER INTERFACE CONSIDERATIONS

When interfacing the TURBO35 to a PC, you will not experience successful data transfer unless you obtain and use the correct cable configuration.

Generally, you need two items for successful interface:

* a 9-pin straight through (pin 1 connected to pin 1, pin 2 to pin 2, etc.) with a male DB-9 connector on one end and a female DB-9 connector on the other, and

* a NULL-MODEM connector with DB-9 connectors which mate with the cable and the PC.

both of these items can be obtained at the nearest national electronics supply store chain.

OPERATING TEMPERATURE RANGE

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

IF IT DOESN'T WORK

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 TURBO35, 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.

*******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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