

TURBOthirty

Operating Instructions



WARNING

It is dangerous to work in the vicinity of a lead-acid battery since they generate explosive gases during normal battery operation. To prevent an explosion when using a lead-acid battery, such as an automobile battery, you MUST disconnect the 6 foot leads from the TURBOthirty before putting on or taking off the leads connecting to the lead-acid battery terminals. Operate the TURBOthirty as far away from the lead-acid battery as possible. This will keep any sparks or arcing away from the lead-acid battery.

To reduce the risk of injury, use only high-rate rechargeable nickel cadmium batteries with the TURBOthirty. Any other type of battery may burst and cause personal injury.

DO NOT leave the TURBOthirty 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 TURBOthirty is designed to provide data about high-rate rechargeable nickel cadmium batteries used in R/C car racing. In order to simulate the discharge rates obtained during racing, the TURBOthirty is designed to discharge at high currents. While the methods used in the TURBOthirty 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 TURBOthirty.

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 TURBOthirty 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. The TURBOthirty 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 5 to 30 amps for a single cell and between 5 to 25 amps for 4, 6 or 7 cells. After the discharge cycle, the discharge time and the discharge average cell voltage 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 cell resistance. Another mode available on the TURBOthirty is the buzz box mode. This mode is used to obtain higher initial voltage from SCR cells. The final mode available 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 power-down memory to be used when the TURBOthirty is powered up the next time.

SUPPLY VOLTS

The TURBOthru 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 long 5 foot supply lead plugs into the connector on the left side of the TURBOthru (see WARNING notes above). You MUST connect to the supply first then the battery pack. Otherwise the TURBOthru will not work. The battery pack connector and the supply volts 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 TURBOthru are voltage sensing leads. They are used mainly for the discharge or cycle modes to get an accurate voltage measurement. 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.

BATTERY BOX

To connect to the supplied battery box, simply plug the battery box into the battery pack connector from the TURBOthru. 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. They should be cleaned twice a day.

GENERAL OPERATION

To select the mode of operation, simply push the increment function (INCR FUNC) button until you get to the desired mode. At that mode you may be able to increment a settable value by pushing the set (SET/OFF) button. A cursor line will appear under the digit of any settable values. After setting the desired value, push the start (START) button to begin the selected mode of operation. You can only start a mode of operation from a screen that has the top line displayed. To stop the TURBOthru at any time, push the (SET/OFF) button. The decrement function (DECR FUNC) will scroll thru the modes backwards. The menu change button (MENU CHNG) will toggle between the modes of operation and the default values (settable) menu. To go directly to charge mode from any screen, push the (INCR FUNC) button and hold it down, then push the (START) button. Use the same technique to go to the discharge mode with the (INCR FUNC)-(SET/OFF) push buttons. For the cycle mode use the (INCR FUNC)-(MENU CHNG) push buttons. For the motor run mode use the (INCR FUNC)-(DECR FUNC) push buttons. Using the dual push buttons will enable you to quickly get to the desired mode of operation. The selectable modes are as follows in order displayed.

- *Charge mode
- *Display peak charge volts
- *Display supply volts
- *Discharge mode
- *Display discharge average pack volts
- *Display relative internal cell resistance
- *Automatic cycle mode
- *Motor run mode
- *Buzz box mode
- *Save settable values mode

The default values menu screens are as follows in order displayed.

- *Trickle charge select (3 amps)
- *Long lockout select (10 minutes)
- *Peak detect drop-back volts - number 1 peak
- *Delay time - number 1 peak
- *Charge Amps - number 2 peak
- *Peak detect drop-back volts - number 2 peak
- *Delay time - number 2 peak
- *Charge Amps - number 3 peak
- *Peak detect drop-back volts - number 3 peak
- *Number of cell and cutoff volts for discharge
- *Cool down time between cycles
- *Motor run time

CHARGE MODE

To run the charge mode, push the (INCR FUNC) button until you see the message CHARGE #PK1 3.0. You may also push the (INCR FUNC) button and hold it down while then pressing the (START) push button to get there directly. The cursor will be under the digit that is settable. To set any other digit, simply push the (INCR FUNC) button or (DECR FUNC) button until the cursor is under the digit. To increment the digit setting, push the (SET/OFF) button until you reach the desired setting. The value can be set up to a maximum of 19.9 amps at this time, but the TURBOthru 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 next to the #PK part of the screen. Using 1 peak will charge your battery completely. Using peaks 2 and 3 will repeak your battery. The charge amps for peaks 2 and 3, delay between peaks and peak detect drop back voltages are settable in the default values menu. (see DEFAULT VALUES MENU)

To run the charge mode, you must have the message CHARGE #PK1 3.0 on the display. When you push the (START) button, the message CHARGING 1 XXXX will appear on the second line of the display. The XXXX is the actual supply voltage, under load, at the TURBOthru. 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 and 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 (INCR FUNC) 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 3000mah 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 (SET/OFF) or the (INCR FUNC) push button to go directly to the screen needed to change the value. We recommend a value of .03 volts for a single cell and .05 volts for packs. Generally, the larger the value the faster 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.

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 (SET/OFF) button is pushed. The long peak detect lockout is meant to be used with packs that have a bad tendency to false peak.

PEAK CHARGE VOLTS DISPLAY MODE

To display the peak charge volts, push the (INCR FUNC) button until you see the message 'PEAK CHG VXXX.XX'.

The 'XX.XX' digits show the peak charge volts.

SUPPLY VOLTS DISPLAY MODE

To display the supply volts, push the (INCR FUNC) button until you see the message 'SUPPLY VOLT XX.XX'. The 'XX.XX' digits show the supply volts. It is useful to detect a nearly dead automobile battery or a supply that is past the maximum of 1.8 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

To run the discharge mode, push the (INCR FUNC) button until you see the message 'DISCHG AMP XX.XC'. You may also push the (INCR FUNC) button and hold it down while then pressing the (SET/OFF) push button to get there directly. The letters 'DISCHG' mean you are in the discharge mode. The 'XX' digits show the discharge rate selected in amps. Maximum discharge rate for 1 cell is 30 amps or 25 amps for 4/6 and 7 cells. Minimum setting is 5 amps. The 'XC' indicates the number of cells to be discharged. Set the amps and number of cells by using the (INCR FUNC) button and the (SET/OFF) button. The cutoff volts for 1, 4/6 and 7 cell packs can be set in the DEFAULT MENU. To get there, just press the (MENU CHNG) push button. Press the (MENU CHNG) push button again to get back.

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 1.5 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 'DISCHNG XX.XX' will appear to indicate 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 either the (INCR FUNC) or the set digit (SET/OFF) button. 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.

DISCHARGE AVERAGE VOLTAGE DISPLAY

After the discharge or cycle mode has been run, the average voltage of the pack or cell during discharge can be displayed. Just push the (INCR FUNC) button until the message 'DISCHG AVE XX.XX' is 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 (INCR FUNC) button until the message 'INTERNAL RES XX' is displayed. The method of calculating the internal

cell resistance was developed by Jeff Pack from "The Pack Shopper". Jeff is a programmer for one of the largest software houses in the US. He has designed, for his own matching business, one of the most advanced cell matching computer systems used today for matching cells.

The lower the relative internal resistance the more punch the cell will deliver. Another effect the oval racers find is that the lower resistance SCE packs have more speed at the end of the run. The SCE's will have a range from 25 to 40 for a single cell. The SCE's will have a range from 35 to 75.

AUTOMATIC CYCLE MODE

To get to the this mode, push the (INCR FUNC) button until the message 'CYCLES X CELLS X' appears. You may also push the (INCR FUNC) button and hold it down while then pressing the (MENU CHNG) push button to get there directly. 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 (INCR FUNC) button and the (SET/OFF) button. The cool down minutes between cycles for more than one cycle can be set in the DEFAULT MENU. To get there, just press the (MENU CHNG) push button then the (INCR FUNC) to get to the message 'COOL DWN MIN XXX'. Press the (MENU CHNG) push button again to get back. The TURBOthity 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 XXXX' will appear. The 'X' in 'CYCLX' indicates the cycle number being run now. 'CHGX' tells that the TURBOthity is charging and that it is working on the 1st, 2nd or 3rd peak. The 'XXX' 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 DL XX.XX.XX' indicates that it is in delay number 1, 2 or 3 as designated in 'DL XX' by the 'X' digit. The delays are set up in the charge mode. There is a 1/5 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 CYCLX' indicates that it is in the cool down period between cycles. The 'X' in 'CYCLX' 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

MOTOR RUN MODE

To get to this mode, push the (INCR FUNC) button until the message 'MOTOR VOLTS XXXX' appears. You may also push the (INCR FUNC) button and hold it down while then pressing the (DECR FUNC) to get there directly. The 'XXX' indicates the volts you wish to run the motor at. Set the volts desired by using the (INCR FUNC) button and the (SET/OFF) button. The motor run time in seconds can be set in the DEFAULT MENU. To get there, just press the (MENU CHNG) push button. Press the (MENU CHNG) push button again to get back.

To start the motor run mode, you must have the 'MOTOR VOLTS XXXX' message on the display. Push the (START) button and the message 'MOTOR ON XXXX' will appear to indicate that you are actually running. The 'XXX' 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 TURBOthity 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 (SET/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 TURBOthity. This keeps the power supply from going into current limiting caused by the start-up current of the motor.

BZZZ BOX MODE

To get to the this mode, push the (INCR FUNC) button until the message 'BZZZ BOX SEC XX' appears. The 'XX' indicates the number of seconds to be charged. Set the seconds by using the (INCR FUNC) button and the (SET/OFF) button. The maximum allowable seconds is 19.

To set the number of amps to charge, push the (INCR FUNC) button until the message 'BZZZ BOX AMP XX' appears. The 'XX' indicates the number of amps to be charged. Set the amps by using the (INCR FUNC) button and the (SET/OFF) button. The maximum amps allowable in this mode is 18 amps.

DO NOT use this mode more than once per charge as it could cause the batteries to vent. Use of this mode at high charge amps can degrade your batteries. DO NOT use on SCE cells as they will degrade quickly at high charge amps. Use only on SCR cells.

SAVE SETTABLE VALUES

To get to the this mode, push the (INCR FUNC) button until the message 'SAVE VALUES' appears. Pushing the (START) button will store all the settable values in the power down memory for use the next time you power up the TURBOthity.

DEFAULT MENU

The default menu can be selected by pushing the

(MENU CHNG) push button. Pushing the (INCR FLNG) or (DECR FLNG) will position the cursor under the desired value to change. A listing of the screens in this menu is shown in the GENERAL OPERATION section. The main menu can be returned to by pushing the (MENU CHNG) push button again.

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 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 15 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.

TEMPERATURE RANGE 32 TO 100 degrees Fahrenheit

WHEN 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.

TILT UP STAND

Radio Shack has a hand held calculator stand (#65-705 \$2.49) that can be used to tilt up the front of the TURBOhriny. The back edge of the stand must be removed in order to double sided tape it to the bottom of the TURBOhriny.

PRINTER OPTION

The TURBOhriny can be fitted with a printer port. The discharge graph of the battery pack can then be printed. It will also print the other pertinent information on the pack along with the charge and discharge values. The cost for the printer port is \$100.00. The TURBOhriny needs to be sent back to Competition Electronics to

have this installed. It takes 5 working days or less to complete the conversion. Please include \$5.00 to cover shipping and handling. You may prepay or we can send it back UPS COD (cash only). The printer supplied by the user must be a Centronics parallel compatible type. Most printers used today are of this type.

REPAIR POLICY

All repairs are completed within 5 working days. Total charges will include parts cost, labor and return shipping. All repairs are returned UPS COD (cash only). 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

A 20 amp discharge rate is recommended for matching Sanyo SCRs and SCE's. SCR discharge times can run between 230 to 280 seconds. SCE's run between 300 and 360 seconds. SCE batteries are less stable and less rugged than SCRs. We recommend a charge rate of 3.5 amps for SCE's and 5 to 6 amps for SCRs. Set the cutoff volts at 0.9 volts per cell; ie: 6 cell at 5.4 volts. This is the default value from the factory. Set the peak detect drop-back volts at 0.03 for a single cell and 0.05 for packs. Set delay times at 120 seconds. Use a 2 peak charge (#PK2) set on the charge screen.

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 SCRs 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 relative internal resistance 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 SCE packs, the relative 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.

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