

# TURBODYNO

## *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, your **MUST** disconnect the 6 foot leads from the TURBOdyno before putting on or taking off the leads connecting to the lead-acid battery terminals. Operating the TURBOdyno 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, **ALWAYS WEAR SAFETY GLASSES** when operating the TURBOdyno.

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 TURBOdyno is the first microprocessor based R/C motor dyno system that has the capability of measuring TORQUE directly. It will also measure rpm, amps, and volts making it a true dyno. It is important to note that the load/slave motor's condition has no affect on any readings, since the torque readings are taken directly from the load cell. The TURBOdyno can calculate motor efficiency and output watts (horsepower = watts/745). It can then print the results to a Hewlett-Packard thermal printer. The TURBOdyno will execute up to six settable values in either torque, amps or volts. It can execute these steps automatically or manually. The steps can be saved in Power Down Memory as 1 of 8 possible setups. The setup can then be recalled upon powering up the TURBOdyno. It has the capability of up to 16 inch ounces of torque, 60,000 rpm and 30 amps of load on the test motor. The motor test voltage may be set from 4 to 8.4 volts.

### **SUPPLY VOLTS**

The TURBOdyno will operate from a 12 to 13.8 volt DC regulated supply with 30 amp or more capacity. It will operate with less amperage, but the maximum motor run current will be limited to

the maximum capacity of the supply. The TURBODyno has a soft start capability to limit the motor start up surge current. Otherwise, the motor would trip the overcurrent protection on the power supplies.

Automobile battery voltage will drop considerably when loaded to 30 amps. This fact makes automotive batteries undesirable as a power source.

We recommend the power supply called "The Power Source". It is available in a 30, 45 and 75 amp size. The 30 amp model works well with the TURBODyno. They are available from Rivergate Hobby Center, Inc. at (615) 859-3455.

## CONNECTIONS

The long 5 foot supply lead plugs into the connector on the right side of the TURBODyno(see above WARNING notes). The red alligator clip connects to the positive(+) on your dc supply. The black lead connects to the negative(-). Damage may result if polarity is not observed. It is suggested that the supply lead be permanently attached to the supply so the polarity will always be correct.

The motor leads that exit from the left side must be soldered to the motor to assure perfect connections to the motor. Solder the red motor lead to the (+) positive motor terminal. Solder the black motor lead to the (-) negative motor terminal. The small leads wrapped around the large leads control the voltage applied to the motor. This assures that the voltage set will be the exact voltage applied to the motor. Watch the small lead to make sure it doesn't break off. Otherwise, full supply voltage may be applied to the test motor. If the motor wires are hooked up backwards, the motor will run slowly with a heavy load on it. It may be stopped by pushing the (START/STOP) button or by disconnecting the power lead from the TURBODyno. Before you reconnect the power, REMEMBER TO UNCOUPLE THE TEST MOTOR from the load/slave motor. Otherwise, the TURBODyno will not be calibrated correctly.

The test motor sits on top of the silicon rubber on the motor pod and the shaft is inserted into the coupler. Tighten the set screw down on the flat of the shaft of the test motor. The rear of the test motor will hang over the motor pod.

## GENERAL OPERATION

The normal sequence of operation is as follows. Upon power-up, the display will end up at the RECALL screen. The number that the cursor is under is settable. It is one setup out of eight that you can recall from Power Down Memory. The TURBODyno comes with four setups preprogrammed. Push the start (START/STOP) button to recall. Then push the increment function (INCR FUNC) button to go to the MOTOR RUN screen. The motor may be run only from this screen. See the above paragraph for connecting to the TURBODyno. Now hold the motor between the forefinger and the thumb to keep it from rotating. Do not apply down force to the motor. Down force will cause misalignment of the test motor which could cause drag on the bearings. Now push the start

(START/STOP) button to run the sequence of steps. The motor will start slowly and accelerate to the first load setting. It will then load the motor to the next step settings in sequence. The duration between steps is 4 seconds. When the last step is completed, the motor will turn off. To print the results, press the (PRINT) button. The TURBOdyno is now ready to run another motor.

By holding down the (INCR FUNC) button and pushing one of the other buttons at the same time, you may jump directly to one of the screens defined below.

1. INCR FUNC and START/STOP - RECALL SETUP screen
2. INCR FUNC and INCR SET - MOTOR RUN screen
3. INCR FUNC and PRINT - SELECT CONSTANT MOTOR AMPS/VOLTS VALUE screen
4. INCR FUNC and DECR FUNC - SELECT AUTO/MANUAL screen

## **STANDARD SETUPS**

The TURBOdyno comes with 4 preprogrammed setups. Eight setups are savable in Power Down Memory with up to six steps each. Setup 1 is for 11 to 15 turn modified motors. Setup 2 is for stock motors. Setup 3 is for 15 to 24 turn modified motors. These setups load the motor to preprogrammed torque levels. They are approximate loads for these motors and may have to be varied to limit the maximum current draw to under 35 amps. Setup 4 will load the motor to preprogrammed amp draw levels from 7.5 to 30 amps. Setups 4 to 8 are blank. The setups can be recalled, modified, then stored back in Power Down Memory. Note that the motor loads might not be able to be set lower than 4 to 7 amps because of the drag of the slave motor.

The standard setups may be reloaded into Power Down Memory at any time by holding down the increment function (INCR FUNC) push button during power up. The button must be held down until the "RECALL SETUP 1" screen is displayed.

## **SCREEN DESCRIPTIONS**

The following paragraphs describes each screen for the TURBOdyno. A list of the screens is shown first.

1. RECALL SCREEN
2. MOTOR RUN SCREEN
3. AUXILIARY DATA SCREEN

4. SELECT AUTO/MANUAL
5. ZERO CHECK/RECALIBRATION SCREEN
6. SELECT STEP VALUE TYPE
7. SELECT CONSTANT MOTOR AMPS/VOLTS VALUE
8. SELECT AMPS/TORQUE/VOLTS VALUE
9. STORE SETUP
10. CLEAR CURRENT MEMORY

### **RECALL (Actual screen shown below)**

"RECALL SETUP 1"

To recall a desired setup, press the start (START/STOP) button while at this screen. See STANDARD SETUPS paragraph for setup definitions.

### **MOTOR RUN SCREEN (Actual screen shown below)**

"RPM XXXXX V X.XX

A XX.X T XX.X S1"

This screen shows the RPM in the upper left hand corner. The motor volts is shown in the upper right hand corner. The lower left hand corner is the motor amp draw. The lower middle shows the torque reading and the lower right shows the current step number. These readings are shown while the motor is running. The data may also be reviewed at the end of the motor run by changing the step number in the lower right corner of the display.

### **AUXILIARY DATA (Actual screen shown below)**

"WATTS OUTPUT XXX

EFFICIENCY XX S1"

This screen shows the motor efficiency and output watts. Horsepower can be calculated by dividing the output watts by 745. The step number is shown in the lower right hand corner. To review the data at the end of the run, push the increment set(INCR SET) button. This will increment the step number to show the data for each step. This screen may also be displayed while the motor is running in the manual mode only. This feature could be used to set motor efficiency by changing the motor timing while it is running.

### **SELECT AUTO/MANUAL (Actual screen shown below)**

"MANUAL STEP OR

AUTOMATIC STEP A"

This screen will allow the selection of automatic or manual step increments. Automatic step increments will give more consistent motor data result because it is done exactly the same every time. "A" will select automatic and "M" will select manual. Push the (INCR SET) button will toggle between the two selections.

### **ZERO CHECK/RECALIBRATION SCREEN (Actual screen shown below)**

"UNCOUPLE MOTORS

PRESS START X.X"

This screen will allow you to check and/or recalibrate the zero setting of the torque sensor. Make sure the motor pod is setting in the location it will be used. THE LOAD/SLAVE MOTOR MOUNT MUST REST AGAINST THE TORQUE SENSOR UNDERNEATH IT. If it doesn't, move the load motor wires in the direction of the length of the rectangular hole until the mount rests against the sensor. Be careful so the wires don't drag on the edge of the hole. If the torque reading is not 0.0 or -0.0 push the start button to recalibrate. The test motor MUST NOT be mounted to the motor coupler, otherwise, the zero torque will not be correct. The torque sensor is automatically calibrated upon power-up. If you get the message "CALIBRATION OUT OF RANGE", check the load motor connection wires to see if they are dragging on the fixture hole. If they are correctly positioned, call

us for further instructions.

**SELECT STEP VALUE TYPE (Actual screen shown below)**

"TEST IN TORQUE

AMP,VOLT STEPS A"

The TURBOdyno will use this selection to change the test value type to amps, torque or volts. If the selection is either amps or torque, the motor has a constant voltage applied to it. If the selection is volts, the motor amps are held constant. The values are set in the next screen.

**SELECT CONSTANT MOTOR AMPS/VOLTS VALUE (Actual screen shown below)**

"CONSTANT MOTOR

AMPS X.XX"

OR

"CONSTANT MOTOR

VOLTS X.XX"

The value of the motor volts or amps is set on this screen. Constant motor volts are used when the step value type is either amps or torque. Constant motor amps are used when the step value type is volts.

**SELECT AMPS/TORQUE/VOLTS VALUE (Actual screen shown below)**

"STEP X AMPS XX.X" OR "STEP X TORQ XX.X" OR "STEP X VOLTS X.XX"

The value of the motor amps, torque or volts is set at this screen. Set the step number you want to change at the lower left side of the screen, then set the step value on the lower right side of the

screen. The type of value (amps/torque/volts) that is settable on this screen is selected at the SELECT STEP VALUE TYPE screen.

When setting up the torque values, the maximum settable torque occurs when the amp draw is around 30 amps. Amp draws to 35 amps can occur before the message "MOTOR AMP TOO HI" is displayed and the motor run is terminated.

### **STORE SETUP (Actual screen shown below)**

"STORE SETUP 1"

This screen will allow you to store the step values set in previous screens at the setup number desired. You can store 1 to 8 setups. To store a desired step, press the start (START/STOP) button while at this screen. There is no indication on the screen that the values have been saved even though they have been.

### **CLEAR CURRENT MEMORY (Actual screen shown below)**

"CLEAR SETUP VAL-

UES? PRESS START"

This screen will allow you to clear all the step values in the current memory. This doesn't affect Power Down Memory. It is useful for starting a new setup.

### **PRINT OPERATION**

Set the Hewlett Packard model 82240B optional printer on top of the TURBODyno so that the red LED (printer power on) on the printer is pointed toward the black infrared transmitter on top of the TURBODyno case.

The HP printer is available from Competition Electronics, Inc. and may be purchased at a store that has Hewlett Packard calculator products. The thermal paper is available from office supply stores. It uses an 2 1/4" X 85' roll.

To print, simply push the PRINT button.

The information available on the printout is as follows:

- 1.Constant motor volts or amps
- 2.RPM
- 3.Torque in inch ounces.
- 4.Output watts
- 5.Efficiency
- 6.Motor amps

### **OPERATING TIPS**

By watching the RPM reading while the motor is running, you can get an idea of how good the brush contact is. Dirty brushes will cause a larger variation in RPM than clean brushes/commutator. A normal variation is 100 to 200 RPM. Comm drops will help give good consistent readings. If the RPM variation is still large, the commutator may have to be cut to retrue it. A large variation can also indicate dirty brushes/commutator of the slave motor.

New brushes will not give maximum output watts until they are fully broken in .

Another cause of RPM variation could be that the coupler has come loose and is rubbing up against the ball bearing. Adjust the motor coupler out just far enough to clear the ball bearing by about .020 inches. DO NOT OVERTIGHTEN the set screw. The coupler is aluminum and may strip out.

If the "AMPS TOO HI" warning appears, you may have to set down the maximum torque setting. All the readings up to that point are still saved. This also may indicate you are using the stock motor setup on a modified motor.

### **APPLICATION INFORMATION**

One of the uses of the dyno is to approximate gearing. You can figure a new gear ratio by taking a known gear ratio from the present motor you are running along with the readings from both the present motor and a motor you desire to run. Look at the RPM at 15 amps for both motors and plug them into the following formula.

New pinion gear teeth = present motor RPM times the present pinion divided by the desired motor

RPM.

## **CAUTIONS**

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.

## **SLAVE MOTOR MAINTENANCE**

One of the first indications that the TURBODyno load/slave motor needs maintenance is that the RPM will not settle down to a 100 RPM variation under load while testing. Brush maintenance can be accomplished without removing the motor from the motor pod. First try flushing out the brush commutator area with a motor spray. A few comm drops may help but they will probably smoke and burn off quickly under heavy load. A drop of light oil in the bearing is a good idea at this time. This might be also be a good time to check commutator and brush wear. If the brushes are blue or badly worn, replace them. This indicates all the brush lubricant is gone.

If you feel the load/slave motor needs to be removed, it can be done without taking the dyno pod apart. We HIGHLY recommend that you do NOT take the dyno pod apart because of the critical mechanical alignment of the dyno pod parts. The two motor screws are accessible thru the middle bulkhead of the dyno pod. Upon reinstalling the motor, evenly tighten down the motor screws so the motor is not installed at an angle to the test motor. Note that the orange wire connects to the negative terminal of the motor. Also, watch that the motor wires don't drag on the rectangular hole. **THE LOAD/SLAVE MOTOR MOUNT MUST REST AGAINST THE TORQUE SENSOR UNDERNEATH IT.** If it doesn't, move the load motor wires in the direction of the length of the rectangular hole until the mount rests against the sensor.

If you feel the load motor must be replaced, use a 24 turn, ball bearing motor with medium hard brushes. Replacements are available from Competition Electronics.

## **FUSES**

We have seen fuses that looked OK but were cracked. It is almost certain if one of the fuses is blown, they both are blown.

## **WHEN IT DOESN'T WORK**

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 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.