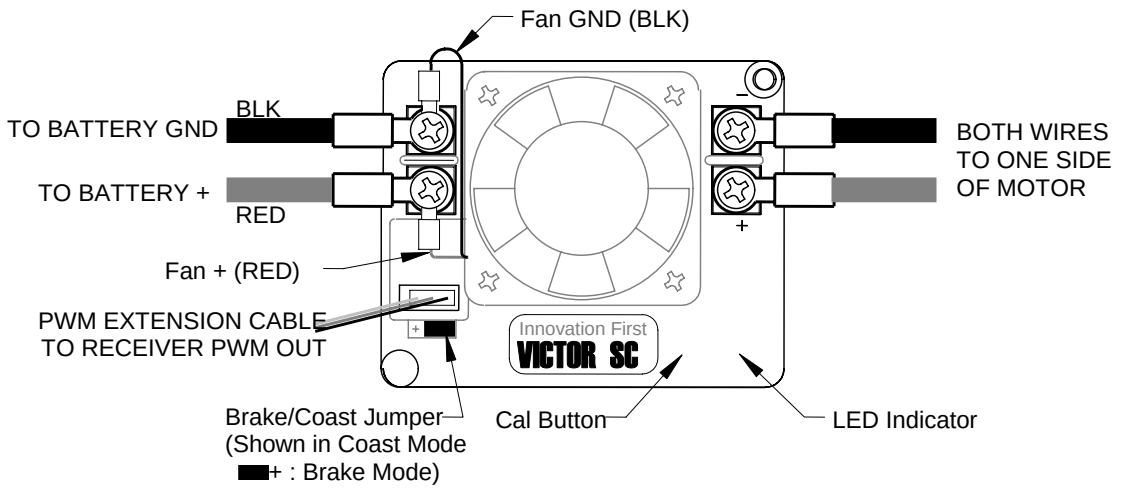
The Victor/Thor spin controllers are specifically engineered for robotic applications. The high current capacity, low voltage drop, and peak surge capacity make the Victor/Thor SC ideal for drive systems while its braking options and precise control meet the demanding needs of arms and lift systems. This controller safely handles the high continuous current draws and extreme current surges produced by Competition robots. The innovative FET switching architecture and an integral cooling fan ensures cool FET junction temperatures. The low voltage drop and high switching speed ensures the motor receives maximum power, providing significant improvements in acceleration, direction changes, and lifting torque. The LED indicator will be GREEN in 'full-forward' condition, RED in 'full-reverse' and ORANGE while in neutral.

The Victor/Thor SC (Spin Controller) is a standard speed controller reprogrammed to function as a single direction spinning-mass controller. The Victor/Thor SC can handle up to 90A/150 continuous. This is achieved by reworking the controller so that both the forward and reverse components are now dedicated to a single direction.

The Victor/Thor SC has several major benefits for a spinning robot or an inertia device.

- The first benefit is a user controlled soft start-up. This will help conserve battery capacity since a motor is basically stalled at startup.
- The second benefit is the ability for a spinning robot to spin at a variable rate. This becomes very important if your robot is out of balance or unstable at full speed.
- The final and most important benefit is a special ramp down feature that takes over if you loose your control signal. When the signal is lost, or you turn off your transmitter, the controller softly ramps the dynamic braking from 0% to 100% over a ten second time period, then remains at 100% braking indefinitely (or until the control signal returns). This allows designers to make their inertia devices or spin-bots spin faster and more freely than previously possible. The automatic proportional braking feature enables the robot to meet the spin down time rule during inspection and competition.
- The Victor/Thor SC has a special fail-safe so that even if input power is lost it will still go into 'shunt braking' mode to spin down quickly.

Victor/Thor SC Details



Wiring Guidelines

1. The fan must be wired so it is always ON when the spin controller is ON.
2. Attach the fan wires and connect to the appropriate voltage.
3. The input and output wires should be 10AWG wire minimum and firmly connected to ensure low voltage drop and minimal temperature rise.
4. Use circle lugs designed for your wire size. The lug should have a hole designed for a #6 or #8 screw. If the center hole is too large, (#10 or larger) inadequate mechanical contact may result in excessively high resistance and temperature rise.
5. Check all lug connection after crimping and soldering. You should not be able to pull the lug off the wire with your hands.
6. Once the input and output wires are firmly connected, tie the wires using tie straps within 2" of the Victor/Thor. This will ensure the wires do not move and loosen the connections.

WARNING: BEFORE APPLYING POWER:

1. **Ensure the input connections are not reversed. Connecting 24V and GND backwards will destroy the unit.**
2. **Ensure there is a circuit breaker either inline with the 24v power input to the speed controller, or inline with the motor. Use an appropriate circuit breaker for your application to ensure that long term exposure to a stalled motor (high currents) will not overheat the Victor/Thor.**

PWM Connection

You will need (1) PWM extension cable or PWM Signal Driver.

1. Use a PWM Signal Driver to ensure the signal from your receiver is Victor/Thor compatible if you are not using an IFI Control System.
2. The male PWM cable connector connects to the speed controller. The unit housing is design to provide a firm connection. Trim the shroud corners slightly if necessary for insertion into the Victor/Thor.
3. The PWM extension cable should be installed with the black wire towards the fan.
4. Standard Radio Controlled PWM connectors are fragile. Use caution when inserting and removing the PWM cable so the contacts on both connectors are not damaged.

Mounting Guidelines

You will need (2) #4 or #6 screws.

1. The Victor/Thor can be installed in any orientation.
2. The speed controller must have adequate space above the fan for airflow, a minimum of 2 inches.
3. Do not over-tighten the mounting screws through the speed controller. A snug connection will hold the speed controller in place without crushing the case.

Calibration Instructions

The unit is pre-calibrated to values compatible with an IFI Control System and re-calibration is not needed. You can re-calibrate to achieve 'full forward/reverse' from your joystick movement if necessary.

NOTE: While in calibration mode, the unit will record the max PWM value detected as 'full forward', the min PWM value as 'full reverse', and 'neutral' will be the PWM value recorded at the release of the Cal button. The following steps will guide.

User Calibration:

1. Power ON the speed controller.
2. Press and hold the Cal button. After a moment, the LED indicator on the unit will begin alternating between RED and GREEN to indicate a cal mode.
3. While continuing to hold the Cal button, move the joystick to the maximum and minimum positions. This can be done in any order and as many times as desired.
4. While continuing to hold the Cal button, return the joystick to center (neutral position).
5. Release the Cal button.
6. A flashing GREEN indicator confirms a successful calibration.
7. A flashing RED indicator denotes an unsuccessful calibration.

An unsuccessful calibration occurs when either:

a) Insufficient joystick travel was detected in forward and/or reverse.
b) The trim tab is too far from center.

Resetting Calibration to Factory Pre-calibration:

1. Power OFF the speed controller.
2. Press and hold the Cal button.
3. While continuing to hold the Cal button, Power ON the speed controller.
4. A flashing GREEN indicator denotes calibration is reset. Release the Cal button.

Brake / Coast Configuration

The Brake / Coast jumper is used to set the speed controller's action during a neutral and reverse condition. The Brake provides significant resistance to motor rotation.

The speed controller checks the status of the jumper approximately 60 times per second. This allows the user to change from brake to coast during operation. A limit switch may be connected to the jumper connector instead of the jumper. The limit switch can be triggered by various means including the use of a servo.

A special 'ramp-down' feature that takes over if you loose your control signal. When the signal is lost, or you turn off your transmitter, the controller softly ramps the dynamic braking from 0% to 100% over a ten second time period, then remains at 100% braking indefinitely (or until the control signal returns). Dynamic braking also occurs while the unit is in a reverse mode.

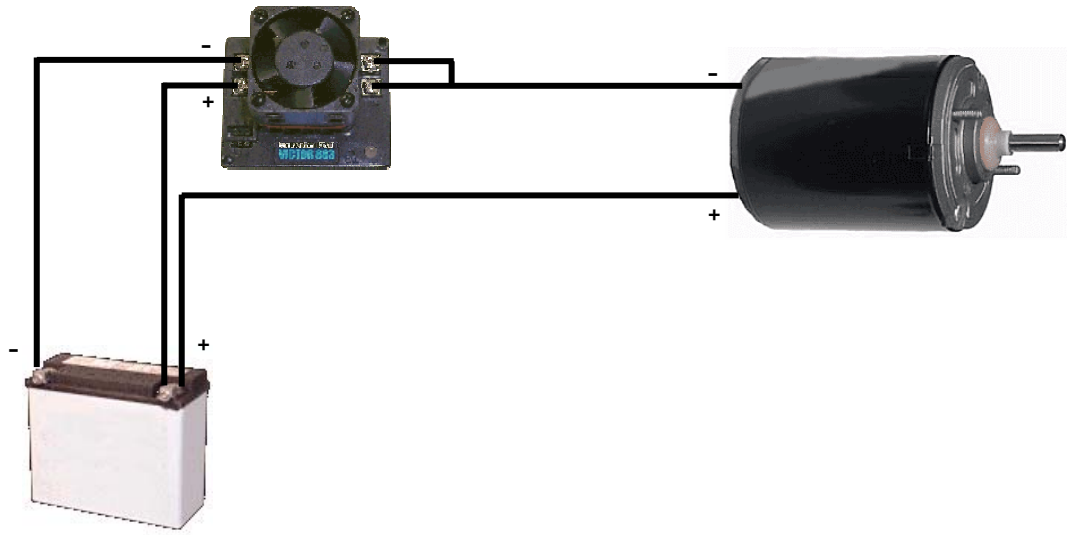
Brake / Coast Guidelines:

1. The jumper should always be installed in either the Coast or Brake position. If you lose the jumper, a standard computer jumper will work.
2. The Coast condition sets the output to an open circuit during neutral and reverse.
3. The Brake condition sets the output to a short across the motor leads during neutral and reverse dynamic braking.

Joystick Position	Function
Full Forward	Full Speed Forward
Variable Forward	Proportional Forward
Neutral	Coast or Full Brake based on jumper setting (Coast is recommended)
Variable Reverse	Proportional Braking
Full Reverse	Full Braking

Technical Info	
Part Numbers	IFI-V883-SC, IFI-T883-SC
Control Signal	Standard R/C Type PWM (Pulse Width Modulation)
Victor Operating Voltage	6V to 30V (does not include the fan)
12V Fan Operating Voltage	6V to 16V
24V Fan Operating Voltage	16V to 30V
Maximum Current	Victor 883 SC: 90A continuous Thor 883 SC : 150A continuous
Surge Current	Victor 883 SC: 100A for < 2 second, 200A for < 1 second Thor 883 SC: 200A for < 2 second, 300A for < 1 second
Power Connector Type	8-32 Screw Terminals
Signal Connector Type	Use a standard non-shrouded PWM cable (3 wires)
Typical Application	Power one motor with variable speed forward, Variable braking, or off
Weight	0.25 lbs

Wiring Diagram



Troubleshooting

Indication: No ORANGE indicator on power up.
Problem: Input power issue or joystick trim tab off center.
Possible Solutions:

1. Disconnect PWM cable.
2. If indicator blinks ORANGE, the PWM value that was being received is either between 'neutral' and 'full forward', or between 'neutral' and 'full reverse'. Check joystick trim tab to ensure the controller is not in a partial forward or a partial reverse condition. If no change, check that the joystick and receiver channels match.
3. If indicator remains off, check +V or GND connections for voltage and proper polarity.

Indication: Flashing ORANGE indicator on power up.
Problem: No PWM signal.
Possible Solutions:

1. Ensure the transmitter and receiver are powered ON.
2. The PWM cable may be improperly connected. Check wire color-coding at each end. Check that the connector is not off a pin at the receiver end.
3. Check for a good PWM signal by connecting a known good servo to the PWM extension cable. If the servo does not move, this can indicate either:
   a) a faulty receiver
   b) an improperly connected cable
   c) a bad PWM extension cable

Note: The servo requires that 5V be present on the center pin of the PWM cable. This connection is not required for the Victor.

Indication: Flashing RED indicator after calibration.
Problem: Calibration Failed.
Possible Solutions:

1. Inadequate travel in forward or reverse. Repeat the calibration procedure and move the joystick further forward and/or further reverse.
2. The joystick trim tab is NOT centered. Neutral cannot be extremely far from center.

Indication: No power output from the speed controller although the indicator LED works.
Problem: Possible internal damage.
Possible Solutions:
If the indicator on the unit is operating properly and there is no output, the unit may be internally damaged. This condition is typically caused by a short circuit on the output or there has been an over-current condition to caused a failure.
Check the following:

1. Ensure the indicator is changing between ORANGE, RED and GREEN with joystick movement.
2. Disconnect the motor and check the output wiring.
3. If the indicator is working properly and the outputs are not working properly, the speed controller is probably damaged. The final test to determine if the unit is damaged is to replace it with another unit.

Indication: No power output from the speed controller and the indicator does NOT work.
Problem: No input power or possible internal damage.
Possible Solutions:
If the indicator on the unit is not operating properly and there is no output, the unit may be internally damaged. This condition is typically caused by no input power or a reverse polarity on the input.
Check the following:

1. Disconnect the output wires.
2. Ensure the indicator on the unit will not illuminate at any joystick position.
3. Check the input on the unit at the (+BATTERY to GND) with a voltmeter.

If the indicator is not working properly and the input is good, the speed controller is probably damaged. The final test to determine if the unit is damaged is to replace it with another unit.

CAUTION: Prior to replacing a potentially damaged speed controller, ensure that the wires connected to the output are not shorted and the input is not reversed. Also verify that neither of the motor output leads are shorted to the chassis of the motor and/or the robot .

APPENDIX A: Document Version History

Date Code	Changes
9-25-06	Revised Brake/Coast Section