

Cart Fan

(Order Code DTS-CFAN)



The Cart Fan is a modular fan you can mount on Vernier Dynamics Carts and Go Direct[®] Sensor Carts that allows students to perform kinematics and dynamics experiments. Using one or multiple fans on a single cart allows students to investigate constant acceleration, balanced/unbalanced forces, and variable thrust angles.

Note: Vernier products are designed for educational use. Our products are not designed nor are they recommended for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

What's Included

- Cart Fan
- Mounting Plate and mounting screws
- Micro-USB cable

Assembly

1. Connect the Mounting Plate to the Dynamics or Go Direct Sensor Cart:
 - If you are using a Go Direct Sensor Cart, use the four corner screws to attach the Mounting Plate to the four corner threaded holes in the top of the Sensor Cart.
 - If you are using a Dynamics Cart, use two half-inch 10-32 screws to connect the Mounting Plate to the Low-g Accelerometer holes on the cart surface. For additional security, use the half-inch ¼"-20 screw to connect the Mounting Plate to the DFS hole.
2. Insert the Cart Fan(s) into the appropriate mounting position(s) for your experiment. The Cart Fan can be mounted pointing forward or backward. The mounting bracket can be pointed off axis in 15 degree intervals.

Charging the Sensor

The Cart Fan arrives in a low battery state and may not be able to run on the higher thrust level without first charging for several hours.

Connect Cart Fan to the included Micro USB Cable and any USB device. An LED next to the USB port on the Cart Fan indicates charging status.

Charging	Orange LED next to battery icon is solid while sensor is charging.
Fully charged	Green LED next to battery icon is solid when sensor is fully charged.

Powering the Cart Fan

Turning on the Cart Fan	Press the Start/Stop button once. When the unit is on, the Thrust/Duration indicator LEDs are on and solid.
Turning off the Cart Fan	Press and hold the Start/Stop button for three seconds or more to turn the Cart Fan off. The Thrust/Duration indicator LEDs turn off when the unit is off. If the Cart Fan sits idle for more than 2 minutes, it will automatically turn itself off.

Using the Cart Fan

The Cart Fan can be placed in any of the three brackets in the Mounting Plate; they are molded to attach firmly. When using a single Cart Fan, it is recommended that it is placed in the middle bracket.

Typical Operation of the Cart Fan

1. Press the Start/Stop button to turn on the Cart Fan.
2. Use the Selection button to select the desired thrust. As you press the Selection button, the Thrust/Duration LEDs will light green and indicate the thrust level.
3. Press and hold the Selection button for two seconds to switch to duration selection. The Thrust/Duration LEDs will switch to red. As you press the Selection button, the Thrust/Duration LEDs will indicate the duration.
4. Press the Start/Stop button to start the Cart Fan. The Thrust/Duration indicator LEDs will flash orange as the Cart Fan counts down 2 seconds until the fan starts.

Indicator LEDs	Thrust (Green)	Duration (Red)
1	Low	1 s
2	Medium	3 s
3	High	6 s
4	Super	60 s

The Cart Fan thrust levels were selected so that even at the lowest setting, they are much greater (~20×) than that of a dynamics cart's rolling friction. The thrust increases by about 25% with each increase in level. For most experiments, the medium thrust level is sufficient. It is recommended that students measure thrust levels themselves in their experimental setup before completing any task where high precision is required.

Thrust levels vary from unit to unit. When using multiple fans to multiply the net force on a single cart, slight variations in thrust are insignificant. But when using multiple fans to show balanced/unbalanced forces, variation from unit to unit will be more obvious. For example, two fans set to the same thrust level and pointed in

opposite directions may propel the dynamics cart at a close-to, but not exactly, constant speed.

The Cart Fan duration levels were selected to facilitate a variety of experiments. The first duration level is useful for a quick burst, intended to simply get the dynamics cart moving. The second duration level is useful for experiments that require constant thrust over a 1 m track. The third and fourth duration levels are good for gathering static thrust data.

As the Cart Fan is operated, the battery level decreases. The Cart Fan firmware includes code that maintains the fan thrust as the battery level changes. If the Cart Fan determines that the selected thrust cannot be maintained given the current battery level, the Thrust/Duration indicator LEDs will flash from left to right while the battery indicator LED will flash red and green, indicating that the Cart Fan needs to charge.

Videos

View videos related to this product at www.vernier.com/dts-cfan

Care and Maintenance

Battery Information

The Cart Fan contains a 18650 battery. Although the battery is warranted for one year, the expected battery life should be several years. Replacement batteries are available from Vernier (order code: DTS-CFAN-BAT).

Storage and Maintenance

To store the Cart Fan for extended periods of time, turn the device off by holding the button down for at least three seconds. Over several months, the battery will discharge but will not be damaged. After such storage, charge the device for a few hours, and the unit will be ready to go.

Exposing the battery to temperatures over 35°C (95°F) will reduce its lifespan. If possible, store the device in an area that is not exposed to temperature extremes.

Troubleshooting

For troubleshooting and FAQs, see www.vernier.com/tit/20221

Repair Information

If you have followed the troubleshooting steps and are still having trouble with your Cart Fan, contact Vernier Technical Support at support@vernier.com or call 888-837-6437. Support specialists will work with you to determine if the unit needs to be sent in for repair. At that time, a Return Merchandise Authorization (RMA) number will be issued and instructions will be communicated on how to return the unit for repair.

Accessories/Replacements

Item	Order Code
Cart Fan (No Mounting Plate)	DTS-CFAN-FAN
Mounting Plate for Cart Fan	DTS-CFAN-BASE
Replacement Battery for Cart Fan	DTS-CFAN-BAT

Warranty

Warranty information for this product can be found on the Support tab at www.vernier.com/dts-cfan

General warranty information can be found at www.vernier.com/warranty



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