Mobile Computer Cart

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Operation Manual

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Table of Contents

1. Introduction

1.1. Overview

The primary objective of the cart is to accommodate a data acquisition computer that can be taken easily outside the engineering building for outdoor experiments. Current available products on the market are very expensive and made to be used indoors only. This guide describes the mobile computer carts components and how to operate it in a correct manner. The main components include the monitor mounts, telescoping tubing, wheels, windows, latches and doors. (**Figure 1**) below represents the initial prototype design, and (**Figure 2**) represents the final manufactured design.
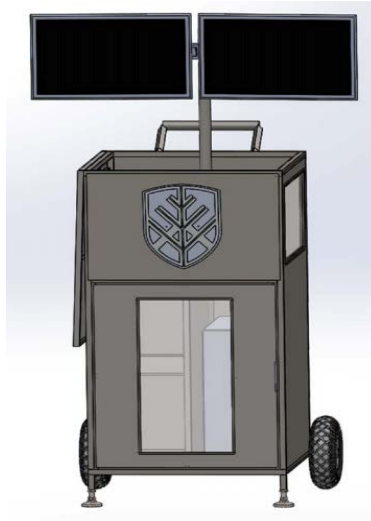
Figure 1: Initial prototype

Figure 2: Final manufactured design

2. Components

2.1. Dual 24" screen mount / Monitor mount

The computer cart uses two 24'' Dell monitors that connect directly to the CPU using two HDMI cables. The power monitors are powered using the power strip located in the storage compartment. The cables run from the top compartment to the CPU through a hole located in the top. Both monitors are mounted to a Tyke Supply Dual LCD Monitor Stand seen in (**figure 3**).

Figure 3: Tyke Supply Dual LCD Monitor Stand

2.2. Telescoping Tube

The telescoping tube consists of two steel square tubing. The first telescoping tube is welded at the center of the base. The second tube is smaller in cross sectional area to fit perfectly inside of the first tube. The telescoping tube is drilled to fit a pin inside of it in order to hold the tube in place. (**Figure 4**) shows where the two tubes meet as well as the pin.

Figure 4: Telescoping Tubing and Pin

2.3. Wheels and legs

The cart has two 16" wheels to ease with the maneuverability and usage as well as 2 legs to sit on while in place. The wheels can be taken off by removing a steel pin. (**Figure 5**) shows the wheels and the legs of the cart.

Figure 5: Wheels and Legs

2.4. Windows

The windows are made out of 1/8" impact resistant polycarbonate. The plastic is inserted into the aluminum framing and bolted to the cart. A clear epoxy was applied to the gaps to create a watertight seal. (**Figure 6**) shows the window frame.

Figure 6: Window Frame

2.5. Lid and latches

The lid of the cart sits on weather stripping. The latches tightly close the lid to seal the lid from any leakage. (**Figure 7**) shows the lid closed with latches as well as a handle to ease the use of the lid and a lock for equipment protection.

Figure 7: Lid and latches

Warning: Do not transport with Monitors in upright position

3. Operation

3.1. Monitor mount / Monitors

The Tyke Supply Dual LCD Monitor Stand can support two 24'' monitors that weigh less than 16 lbs. apiece. The two monitors being used are 24'' Dell screens that attach directly to the mount. The monitor mount attaches to the round telescoping tubing section. The following section describes how to assemble and operate the monitors and mount.

Warning: Do not use Monitors larger than 24''

<u>**Steps**</u>

1. Have one person hold the monitor on a table sitting up vertically
2. Another person align the 4 mount holes to the 4 monitor holes (**Figure 8**)
3. Connect the mount to the monitor using 4 screws (Use Philips head screw driver)
4. Repeat Process 1-3 for monitor #2
5. Have telescoping tubing in the upright position
6. **Two people** pick up the attached monitors and mount and place circular section over round tubing (**Figure 9**)
7. Tighten down the round section using an Allen wrench until it does not rotate
8. The monitor mount tightness can be adjusted by removing the plastic caps and loosening the bolts
9. Attach the HDMI and power cord to the monitors and CPU
10. Turn the power on to the monitors
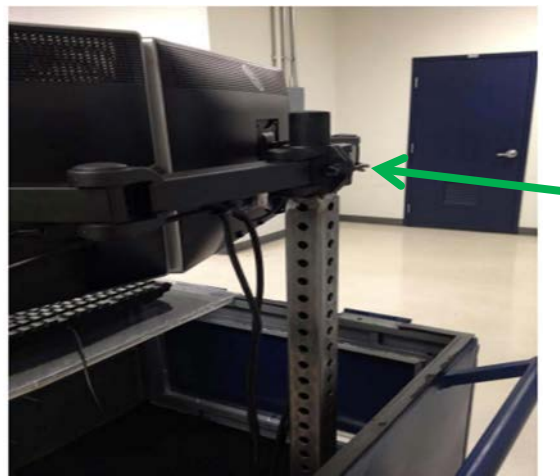
Figure 8: Hole Alignment for Mounting Monitors

Figure 9: Mounting Stand to Telescoping Tubing

3.2. Telescoping tube and adjustment

Once the monitor mount is tightened down onto the telescoping tubing it can now be adjusted in and out of the cart storage area. Before the monitors can be lowered into the area they must be turn to face the exterior of the cart. The monitors can then be lowered using the telescoping tube. To operate the telescoping tube, hold the tube then remove the pin to adjust the tube to a comfortable height. Place the pin again to hold the tube in place. The following section describes how to adjust the monitor in and out of the cart.

Warning: Do not pull tubing past orange mark

Warning: Place cart on level surface

Steps: Up Position

1. Place cart on a level surface

2. Unlock and open the lid
3. Remove the pin
4. Grab the telescoping tubing with one hand and pull upward (**Do not pull tubing past orange mark)**
5. When at a comfortable position place pin through tubing (**Figure 10**)
6. Check to make sure pin is secure
7. Adjust monitors to a comfortable position
8. If monitors are too tight or loose use wrench to adjust bolt

Steps: Down Position

Warning: **Do not drop monitors before adjusting**

1. Slowly turn each monitor in the position shown in (**Figure 11**)
2. Double check that each monitor will fit when moving down
3. Hold tubing with one hand
4. Remove pin and **slowly** lower the tubing with two hands
5. Check to see if monitors are in correct position and not hitting sides
6. If monitors are in correct position continue lowering
7. When monitors are completely in the down position insert pin
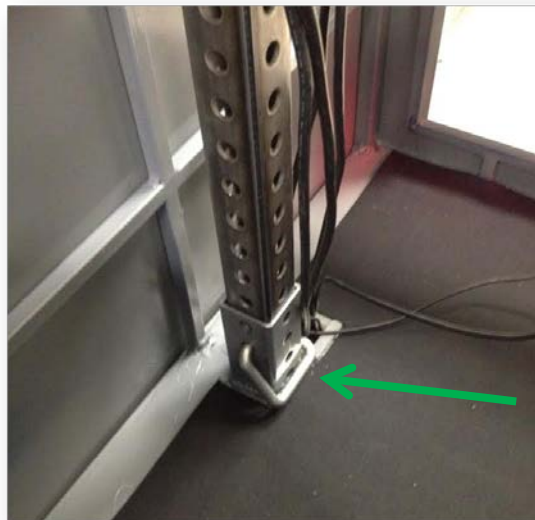8. Slowly close lid (**Make sure lock does not hit monitor**)

Figure 10: Pin through Tubing

Figure 11: Proper Monitor Position for Storage

3.3. Transportation

The mobile computer cart acts as a two wheeled dolly and can be maneuvered by one person over multiple types of terrain if used properly. There is a handle that uses two hands to tilt the cart back and push on two inflated 16 inch wheels. A bar for tilting with the foot is also located at the bottom of the cart. The cart is meant to be transported when the lid and door is closed. The following describes the proper steps before and during transportation of the cart.

<u>Steps: Before Transportation</u>

Warning: **Do not transport with Monitors in upright position**

1. Make sure monitors are inside the storage area
2. Close the lid
3. Make sure CPU and any other equipment is strapped down
4. Close the door
5. Make sure wheels are on properly

<u>Steps: Before Transportation</u>

Warning: **Watch surroundings**

Warning: **Do not push down a slope greater than 40 degrees**

1. Place foot on the lower beam (**Figure 12**)
2. Place two hands on the handle bar (**Figure 13**)
3. Pull back until cart is at a comfortable position
4. Push cart to destination at a **walking pace**
5. Let cart down slowly in a level environment

Figure 12: Footstep

Figure 13: Handle

Figure 14: Cart During Transportation

3.4. Lid/Door/Storage

Warning: Do not slam doors

The lid of the cart can open up to 270 degrees to the side of the cart to give sufficient usage space. To open the lid, make sure that the lid is unlocked then open the two latches. Once the latches are open use two hands to lift the lid and rotate it 270 degrees to the opposite side and resting against the wall. When opening the lid to not slam against the wall. The door is attached to the cart with a piano hinge and can

only open 180 degrees. **Do not slam the door or try to rotate past 180 degrees**. Both the lid and door have cam locks that are used to keep them in a locked positon. Contact the instructor to obtain the keys to unlock the cart. The inside storage shown in (**Figure 15**) has a space for the CPU and one shelf for equipment storage. The can be removed by lifting up if the user needs more space for a taller piece of equipment.

Figure 15: Inside Storage

3.5. Keyboard mount

The keyboard mount is located in the storage compartment and is used as a stand for the keyboard and mount. Once the lid is open and the monitors are in the upright position place the keyboard mount on the top of the cart. The wireless mouse and keyboard can then be used to navigate the computer.

3.6. CPU/Power supply

The CPU and the two screen monitors will be connected to a power strip inside the storage area. The connecting cord will be extended through a hole as shown in (**Figure 16**) using a 50 foot wire cord to plug-in to the nearest power source. When the cart in not in use both cords must be placed back into the cart. The power strip has multiple inlets for the CPU, monitors, and any other equipment the user wants to use. The cart is equipped with a wireless device attached to the CPU and can be used outside at a minimal distance. A Velcro strap is used to hold the CPU in position during transportation. To remove the CPU unstrap the Velcro and slowly pull the CPU out. If the CPU seems to be overheating open the front door for a couple of minutes.

Figure 16: Power Cord Hole

4. Maintenance

4.1. Replacing windows

The cart has three different windows made out of impact resistant clear polycarbonate. An aluminum frame holds them in position and is attached to the cart using screws. In the event that a window does happen to break, they can be replaced using the steps below. (**Figure 17**) shows the window and window frame used in the cart.

Steps

1. Remove screws from the aluminum framing
2. Remove framing from the cart
3. Remove any excess epoxy
4. Remove plastic from frame
5. Cut new plastic using vertical band saw at 2500 RPM
6. Slide plastic back into frame
7. Screw framing back into position
8. Apply clear epoxy to any gaps that may allow water to enter

Figure 17: Window and Frame

4.2. Wheels

The wheels on the cart can be replaced if needed such as when a tire is flat or when the size of the wheels needs to be changed. A removable pin shown in (**Figure 18**) allows the change of the wheel.

Figure 18: Pin of the wheel

Appendix