UF | Multihazard Research Labs
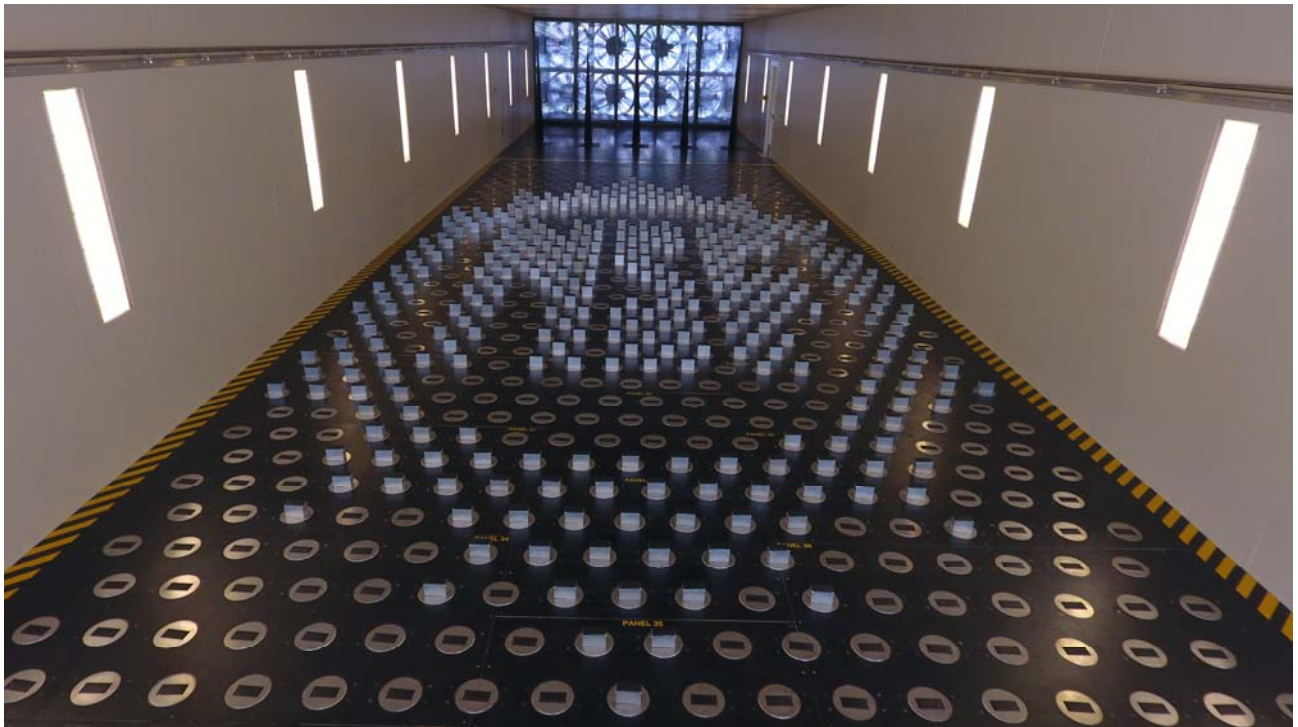Eng. School *of* Sustainable Infrastructure and Environment

Basic Operations Manual v1.0   **April 6, 2017**

Boundary Layer Wind Tunnel

Powell Family Structures & Materials Laboratory

Engineering

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1   Overview

1.1   System Software Introduction

The University of Florida Boundary Layer Wind Tunnel (BLWT) operational software is based entirely on the National Instruments Labview platform. The software provides both operations and diagnostics information for safe and effective operations of the tunnel.

1.2   Software Components

The operational software for the wind tunnel consists of three separate virtual instruments,

1.   Motor MainR2.vi
2.   Terraformer Control.vi
3.   TurntableR2.vi

Each of the instruments performs specific functions. However, all of the instruments communicate with each other and need to be running in order for the system to work properly.

2   Operational Instructions

2.1   Pre-Startup Checks:

2.1.1   Verify that house air pressure is above 65 psi.

2.1.2   Open the entry and exit garage doors (fig. 1).

2.1.3   If necessary set the turntable to 0 degrees using the indicatory marks on the floor (fig. 2).

2.1.4   Verify the Cobra Probe robot gantry is out of the way and, if velocity measurements are needed, lower the pitot tubes (fig. 3).

2.1.5   If the Terraformer is required turn on the power to the system (fig. 4).

2.1.6   Visually verify that the entry and exit garage doors are open. Visually confirm that the motor bay is clear and the entry doors are secured.

2.1.7   Retrieve the main power panel key from the lock box in the control room (fig. 4), open the main VFD power panel and turn on the main circuit breaker (fig. 5).

> Note: The VFD power must NEVER be enabled if the tunnel entry and exit doors are not fully opened.
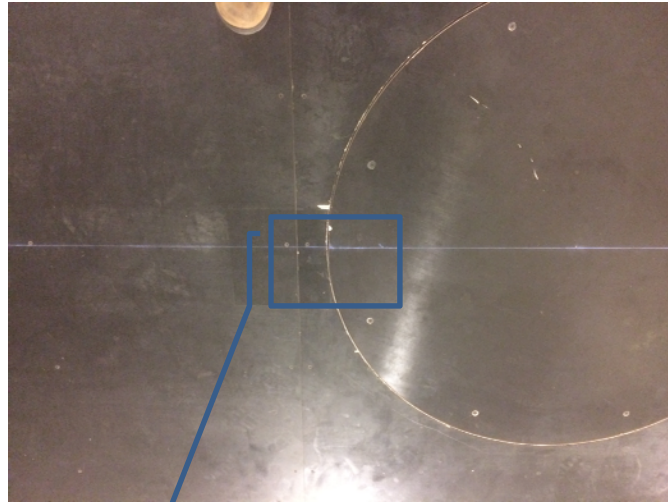

Figure 1

Entry and Exit
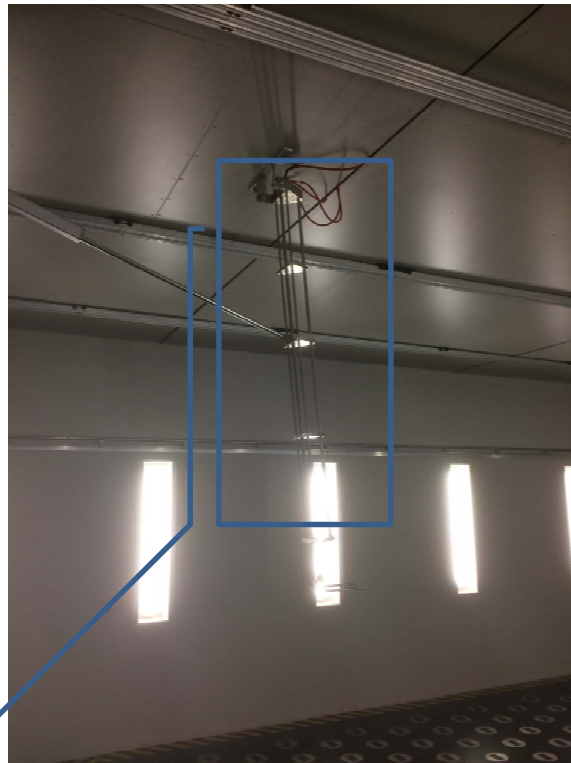Door Controls

Figure 2.

Turntable 0 degree index

Figure 3.

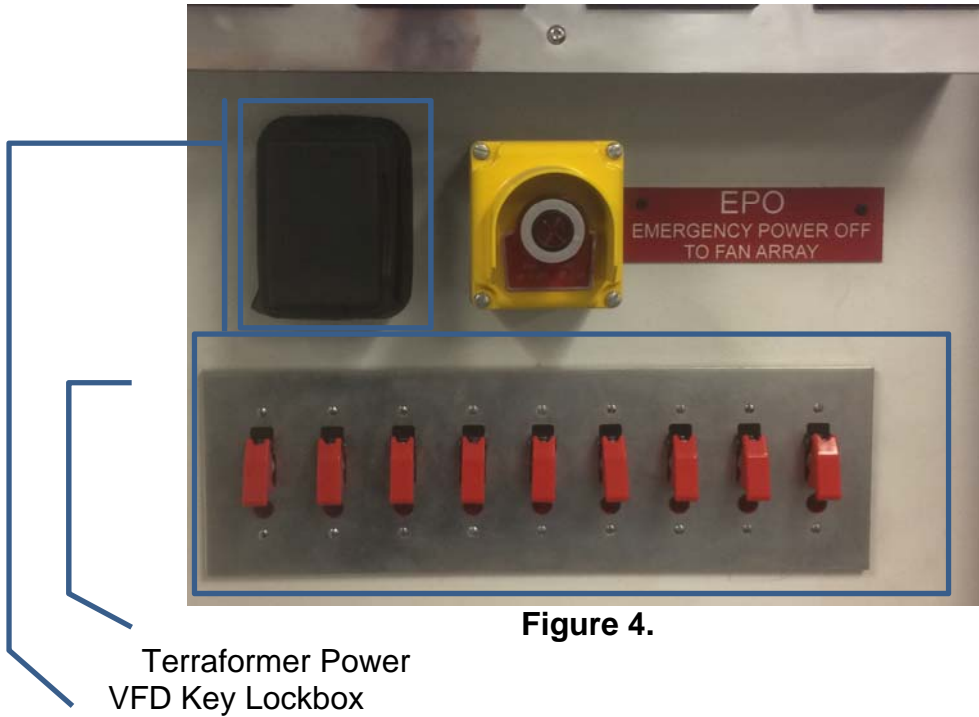Pitot Tubes

Figure 4.

Terraformer Power
VFD Key Lockbox

2.2 Starting the Software

    2.2.1   Login to the BLWT Control computer.

    2.2.2   Locate the VFDRio_V1.11.lvproj icon on the desktop and double click to open the software.

    2.2.3   Open the **TurntableR2.vi, Terraformer Control.vi** and the **Motor Main.vi** (fig. 5,6,7,8).
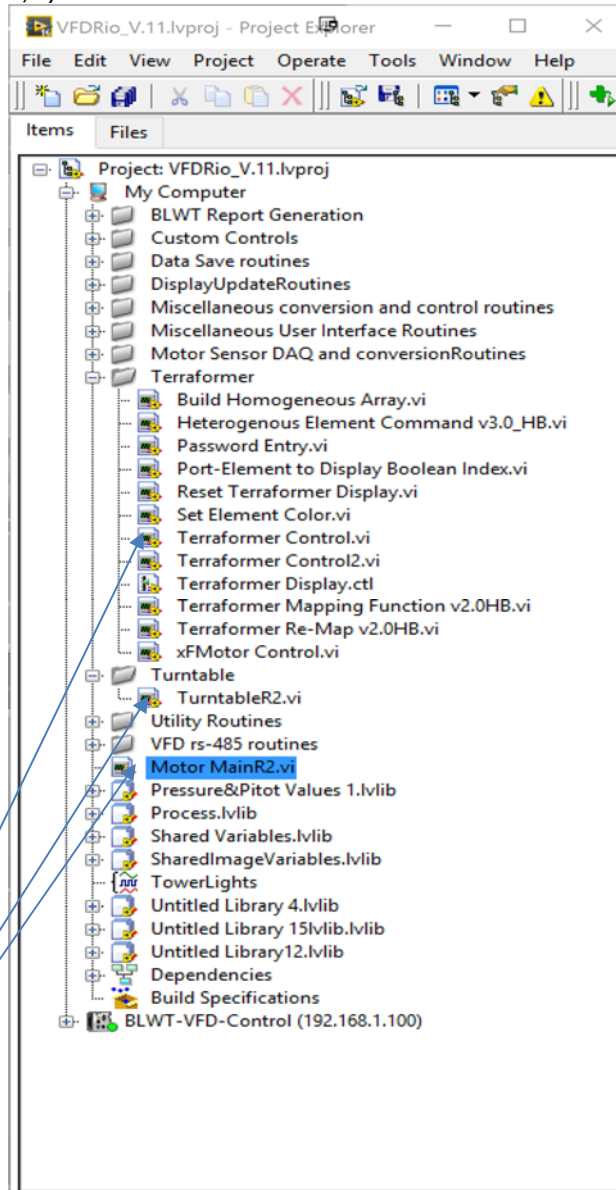

Figure 5.
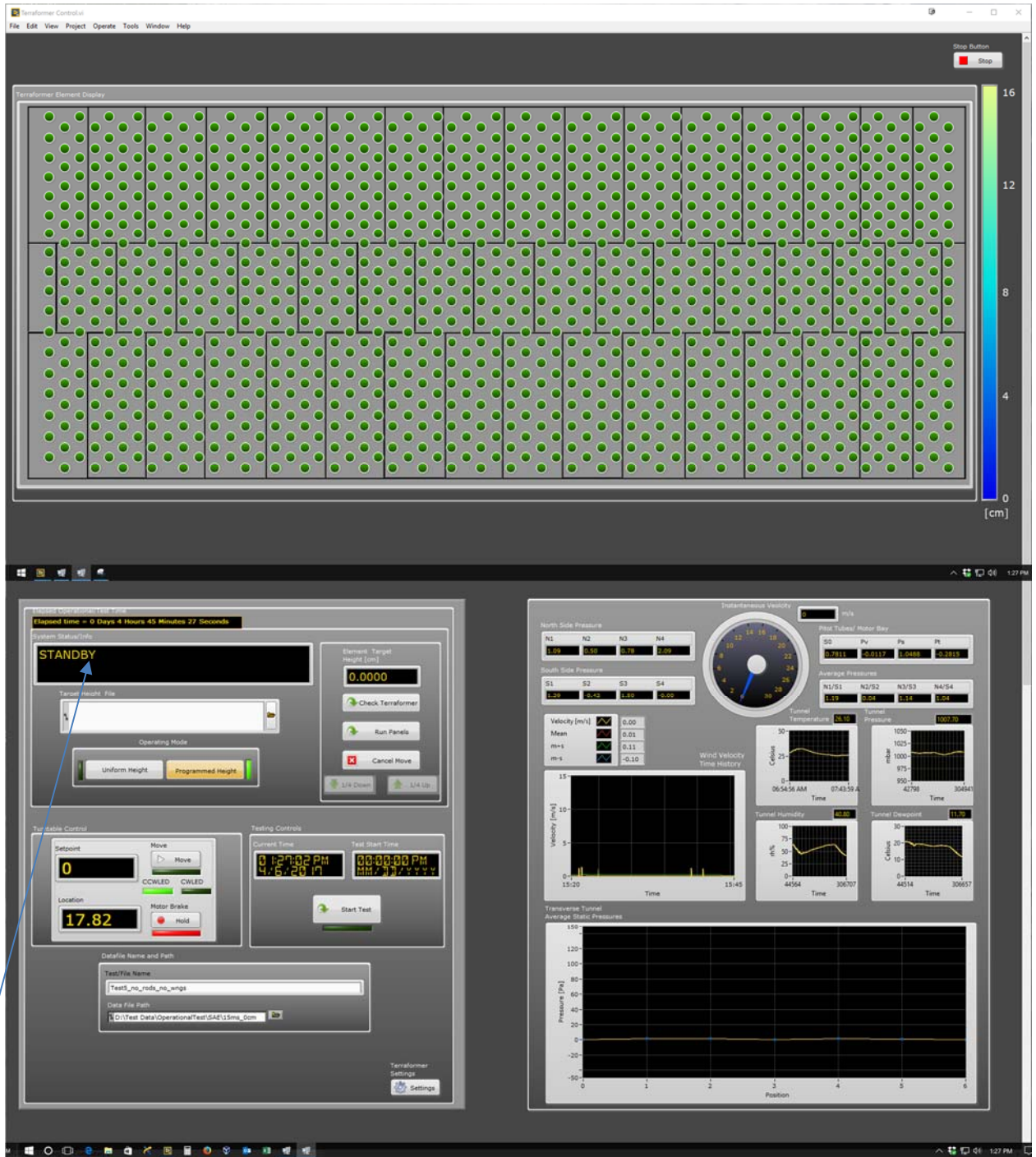
Tunnel Control vi's.

Figure 6. Turntable.vi

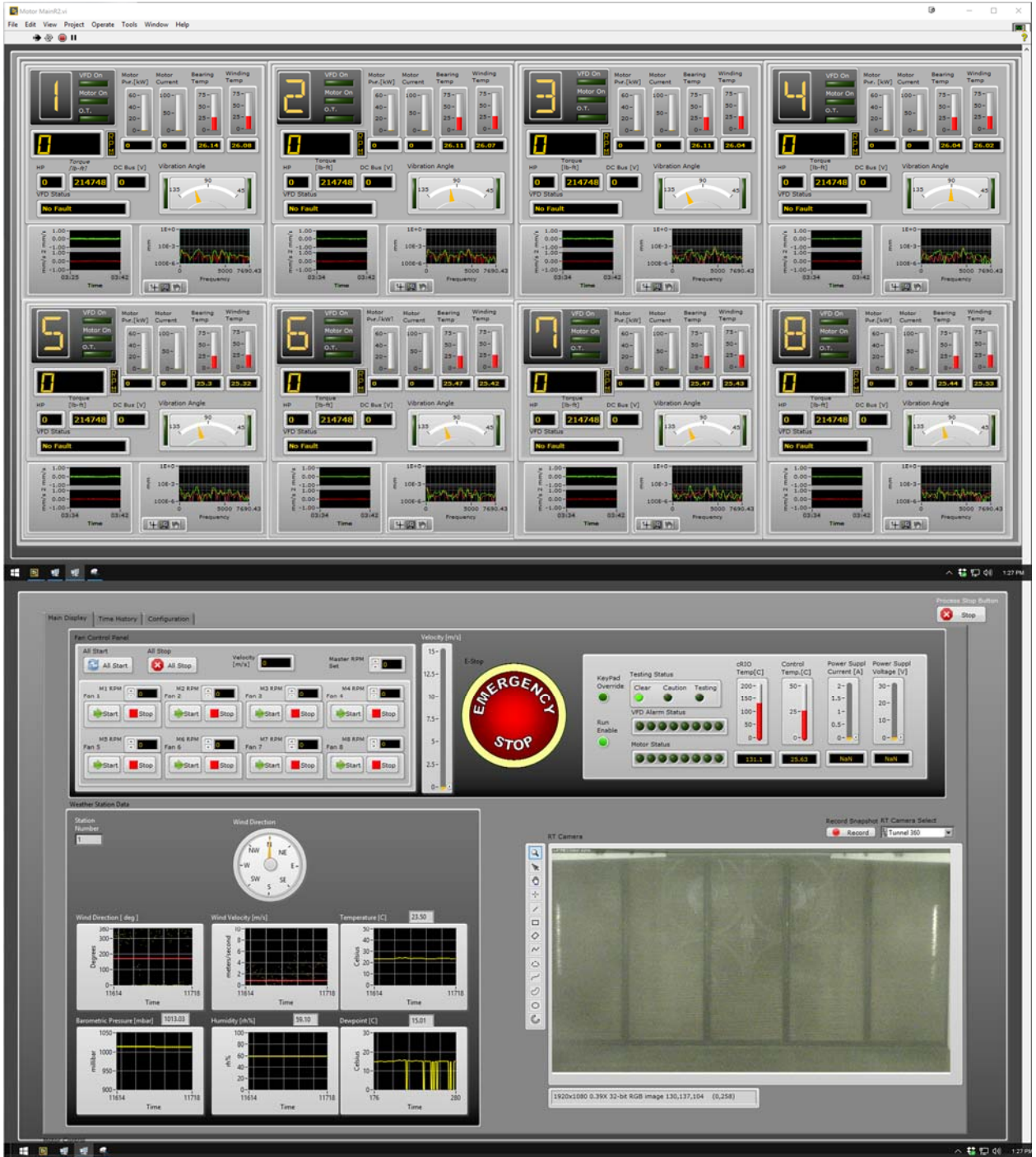Figure 7. Terraformer Control.vi

Status Window

Figure 8. Motor Control.vi

2.2.4   Start the vi's by selecting the run icon (fig.9) located at the top left corner of
each window in the following order
1.   Turntable vi.

2. Terraformer vi. Wait for the Terraformer control vi to complete it's initialization sequence before proceeding. The status window (fig. 7) will display **STANDBY** when complete.
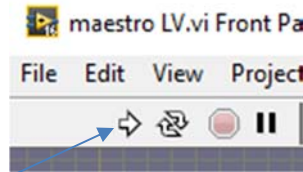3. Motor Control vi.

Figure 9. Run Icon

Run Icon

2.3 Operating the Terraformer

- Caution! The Terraformer height setting can only be changed while the main fans are not running.

2.3.1   The Terraformer can be operated in one of two modes, Uniform Height mode and Programmed height mode. In order for the Terraformer to be run you must first run an operational check on the system.

2.3.2   Refer to figure 10 and click the **Check Terraformer** button. The system will check each elements functionality and report any problems at the end of the test. *Note: If the operational test reports an error contact lab staff.

2.3.3   Next select either **Uniform Height** or **Programmed Height** mode of operation (fig.10).

2.3.4   If **Uniform Height** mode of operation has been selected enter the target height, in centimeters, in the Element Target Height data entry box otherwise select a target height file using the Target Height File dialog box.

2.3.5   Once the desired height(s) have been entered press the **Run Panel** button to execute the command.

2.3.6   Visually verify the correct operation of the panels and confirm updating the height tracking file.

Figure 10. Terraformer controls.

2.4 Operating the Main Fans

2.4.1 Refer to figure 11 for the following steps. Before operating the fans determine if they will be operated in Velocity mode or RPM mode.

2.4.2 If the fans are to run in RPM mode enter the RPM set point in the Master RPM Set box otherwise enter the desired velocity set point in the Velocity box. * Note: The turntable vi. MUST be running in order for the correct Velocity-RPM relationship to be determined when operating in Velocity mode.

2.4.3 Next select the **All Start** control to start the fans. The Caution indicator will illuminate and an audible alarm will sound for five seconds. Finally the motors will sequentially start beginning with Fan 1 and ending with Fan 8. There is a five second delay between each motor starting.
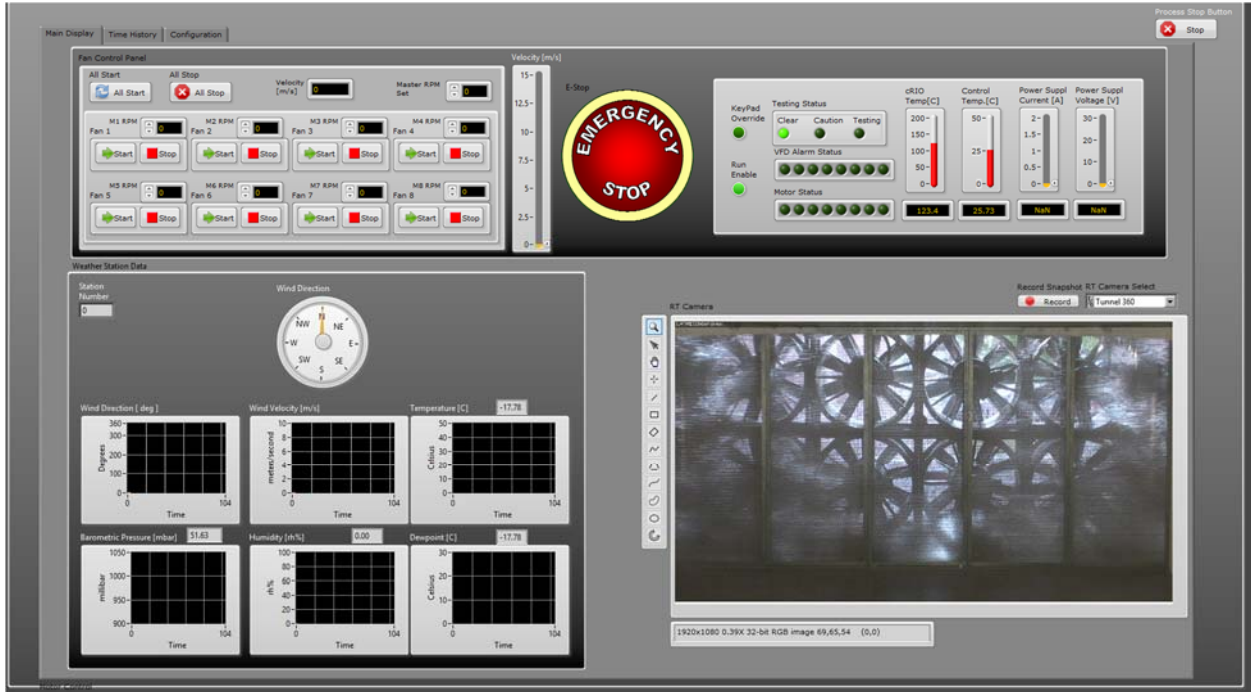
Figure 11. Motor Control Panel

2.5 Operating the Turntable

2.5.1 Refer to figure 12 and enter the desired angular position in the **Setpoint** data entry box and press the **Move** button. The program will automatically determine the correct direction of rotation and move to the desired position.
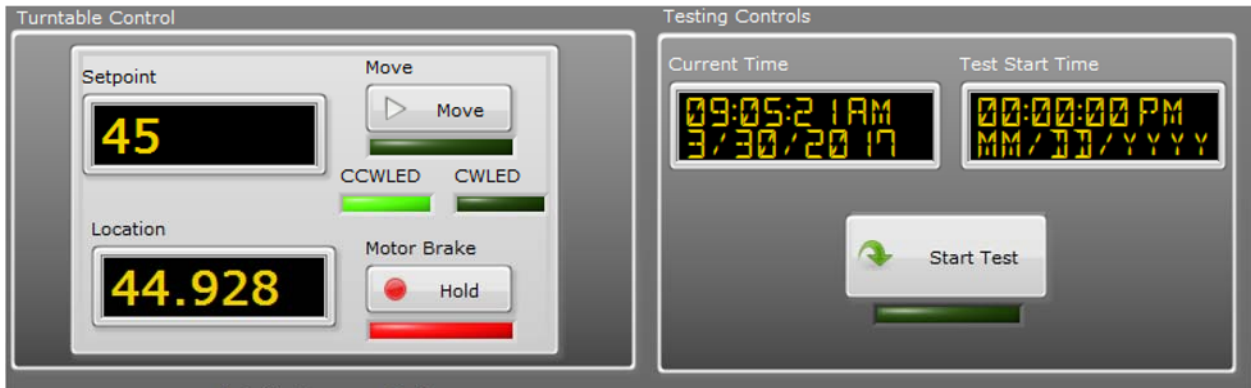

Figure 12. Turntable Controls

2.6 Saving System Operational Data

2.6.1 Refer to figure 13 for the following steps.

2.6.2 Enter a file name for the data file.

2.6.3 Click on the folder icon in the **Data File** Path box and select the location to save the data file.

2.6.4 Press the **Start Test** button to initiate system data logging. The green LED will illuminate when logging is active. When the test is complete press the button a second time to stop logging.
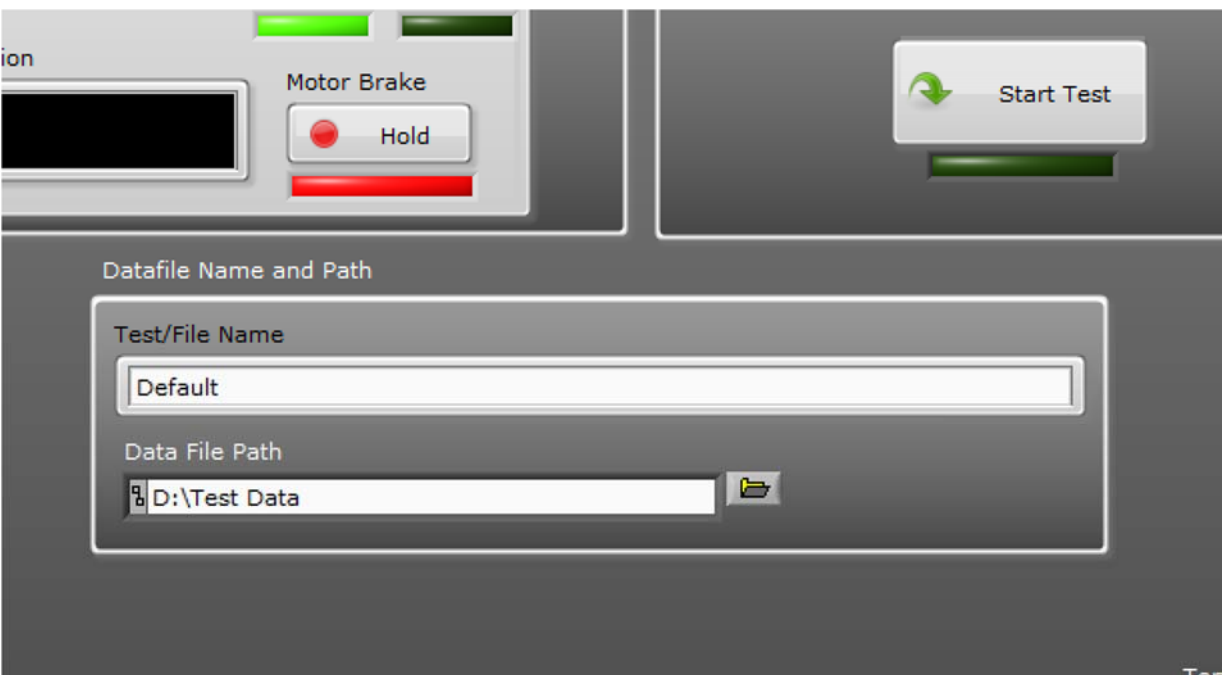

Figure 13. Operational Data Save controls.

3   System Shutdown Procedure

3.1   System shutdown procedure steps

The system shutdown procedures are essentially the reverse of the startup procedures except the control vi's do not need to be stopped.

3.1.1   Refer to figure 11 and select the **ALL STOP** button on the motor control panel and wait for the fans to stop.

3.1.2   Manually reset the terraformer to height to zero centimeters.

3.1.3   Once all of the elements have stopped verify the correct operation of the floor and update the height tracking file.

3.1.4   Turn off all terraformer power supplies

3.1.5   Turn off the VFD's and lock the main power cabinet. Return the key to the lock box.

3.1.6   Visually confirm that all fans have stopped and that ALL VFD's are off before closing the entry and exit doors. *Note: The entry and exit doors MUST be opened while the VFD's are powered.

3.1.7   Retract the pitot tubes.