



# Chapter 6: Testing & Start-Up

## 6 Post-Installation GREEN MACHINE Testing & Start Up

### 6.1 VST Control Panel Initial Start-Up Power:

When the power is turned ON to the VST Control Panel, the Main Screen will show on the PLC with the label **GM DISABLED – ENTER CODE**. See **Figure 6-1**. The CODE was initiated to prevent the electrical contractor from starting the GREEN MACHINE before the Start-Up was completed. The Start-Up can be completed with the GM DISABLED. The CODE to the VST Control Panel must be entered before the GREEN MACHINE can become operational. The CODE will be supplied to the Start-Up Contractor via e-mail after Appendix B is submitted online.

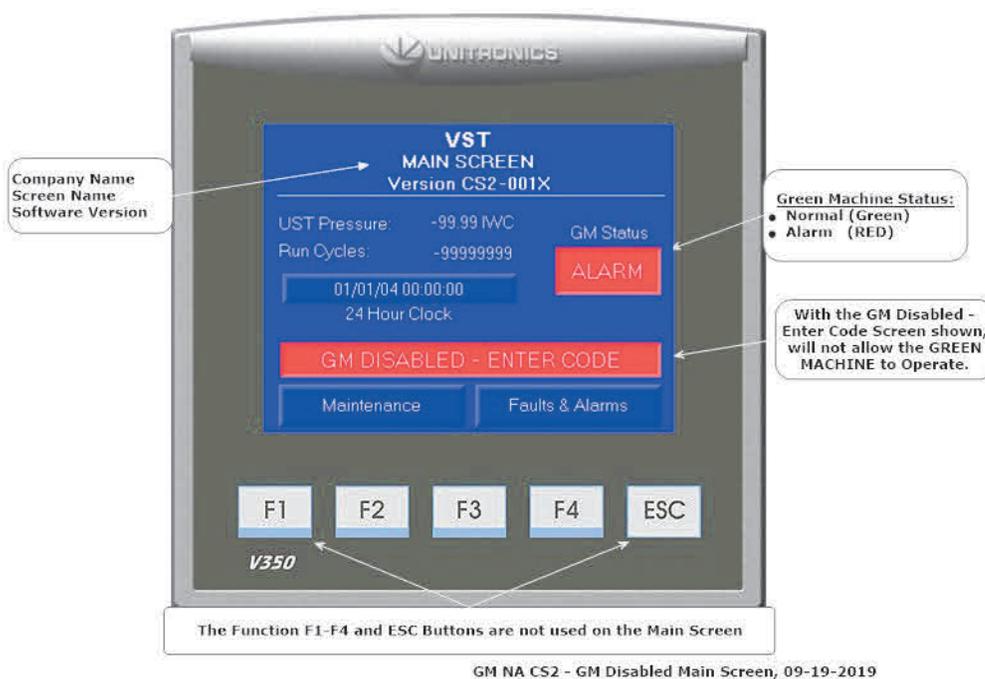


Figure 6-1: Main Screen with the GM DISABLED – ENTER CODE



## 6.2 Before beginning the Testing and Start-Up procedures

Follow the steps below to prepare the GREEN MACHINE and VST Control Panel for Testing & Start-Up

STEPS	DESCRIPTION
1.	Unlock the hasps and remove the cover on the GREEN MACHINE.
2.	Close the 3-way valve below the Pressure Sensor (the handle is horizontal).
3.	Close the three (3) ball valves between the GREEN MACHINE and the vent risers. <b>Reference Figure 6-2.</b>
4.	Remove the caps from the 3 tees. <b>Reference Figure 6-2.</b>
5.	Turn ON the GREEN MACHINE breaker at the Main Distribution Panel OR power is provided by the ESO Relay.
6.	Turn the Power Switch to the “ON” position located on the front of the Control Panel.
7.	At the PLC Main Screen, push the Maintenance Screen button to access the Password Screen.
8.	Enter 878 at the Password Screen to access the Maintenance Screen. (The GREEN MACHINE will now be in the Manual OFF mode.)
9.	Make sure the Maintenance Switch is ON at the VST Control Panel. (The GREEN MACHINE cannot operate in the Automatic Mode when the Maintenance Screen is showing regardless of the UST pressure.)

## 6.3 Post Installation Start-Up Tests

During post-installation testing, the GREEN MACHINE will use outside air (no gasoline vapor from the USTs) to conduct these tests.

**The following tests must be conducted in the order shown below to avoid damage to the equipment.**

<b>6.4</b>	Bump Test
<b>6.5</b>	Functionality Test
<b>6.6</b>	Programming the Fuel Management System for the GREEN MACHINE Overfill Alarm Relay
<b>6.7</b>	Test the Overfill Alarm on the GREEN MACHINE VST Control Panel:
	<b>6.7.1</b> The TLS-350 Overfill Alarm Connection
	<b>6.7.2</b> The TLS-450 Overfill Alarm Connection
	<b>6.7.3</b> The TLS-450 PLUS Overfill Alarm Connection
<b>6.8</b>	Changing the Date and Time Procedure
<b>6.9</b>	Submitting Appendix B and Verification CODE Retrieval

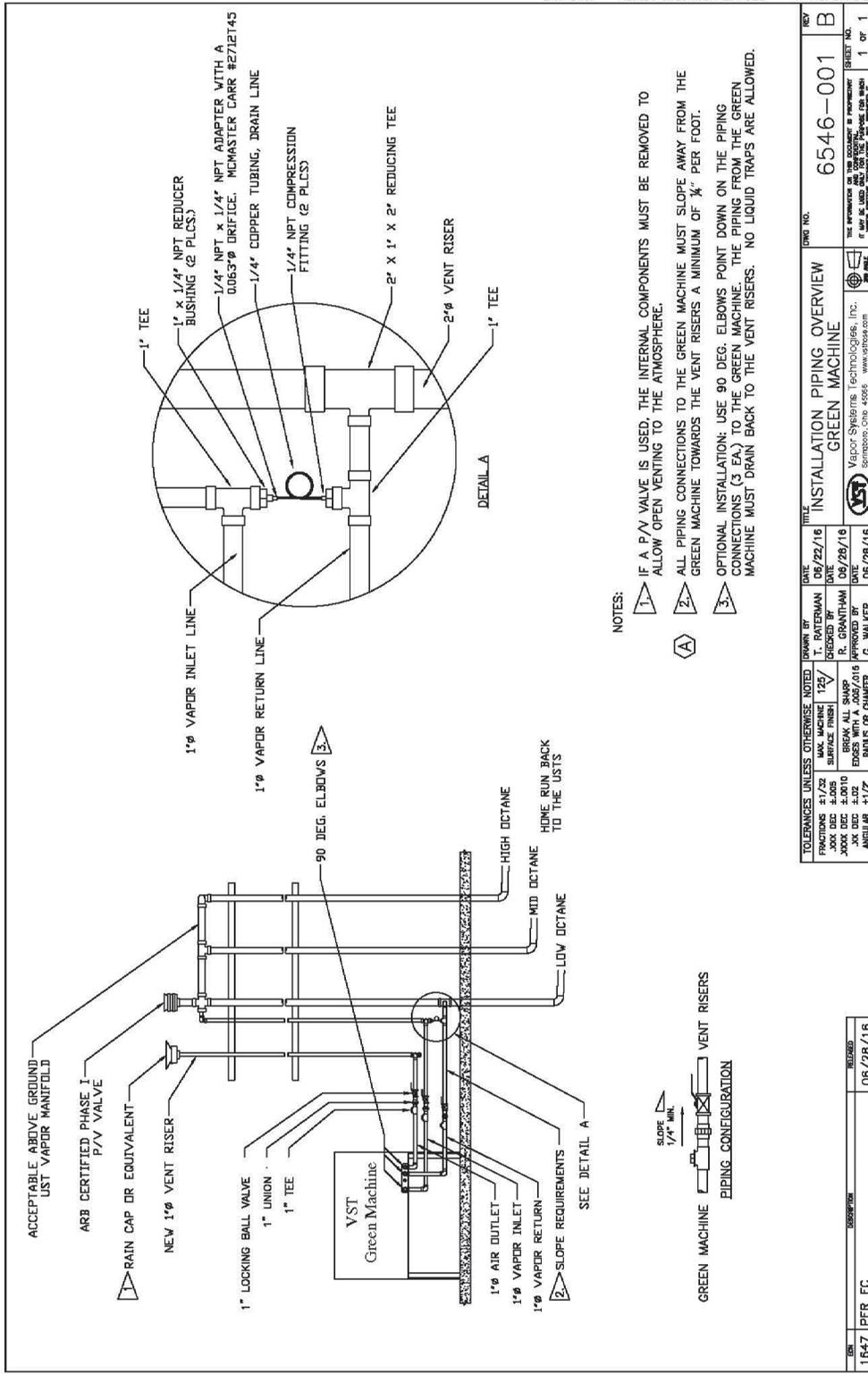
The final step in the installation process is to start up the GREEN MACHINE and get it field commission ready. This final commissioning process requires a verification code that will be entered into the PLC.



## 6.4 How to get a verification code:

STEPS	DESCRIPTION
1.	Go to <a href="http://www.vsthose.com">www.vsthose.com</a> .
2.	Click on VST Education & Training (at the bottom of the webpage)
3.	Under “US GREEN MACHINE,” Click on “Supporting Documents and Instructional Videos.”
4.	Click on “Start-Up / Commissioning Contractor.”
	<b>Note: If you have not been trained to conduct Appendix, Click on “Appendix B – Training Video”, then go to Step 5.</b>
5.	Click on “Appendix B - Start-Up Contractor Check-Out Form.”
6.	Fill out Appendix B with the required photos then click on Submit.
7.	Receive an email from VST with the verification code and a copy of the filled-out Appendix B.

**These items are to be checked in Appendix B as they are completed.**



NOTES:

- 1 IF A P/V VALVE IS USED, THE INTERNAL COMPONENTS MUST BE REMOVED TO ALLOW OPEN VENTING TO THE ATMOSPHERE.
- 2 ALL PIPING CONNECTIONS TO THE GREEN MACHINE MUST SLOPE AWAY FROM THE GREEN MACHINE TOWARDS THE VENT RISERS A MINIMUM OF 1/4" PER FOOT.
- 3 OPTIONAL INSTALLATION: USE 90 DEG. ELBOWS POINT DOWN ON THE PIPING CONNECTIONS (3 EA.) TO THE GREEN MACHINE. THE PIPING FROM THE GREEN MACHINE MUST DRAIN BACK TO THE VENT RISERS. NO LIQUID TRAPS ARE ALLOWED.

REV	DESCRIPTION	DATE	BY	DATE	BY	DATE	BY
1	PER EC	06/28/18					

DATE	DESIGNED BY	DATE	APPROVED BY	DATE	DATE
06/22/16	T. BATERMAN	06/22/16	R. GRANTHAM	06/28/16	06/28/16
			C. WALKER		

FRACIIONS	±1/32
XXXX DEG	±0.010
XXX DEG	±0.02
ANGULAR	±1/2

TOLERANCES UNLESS OTHERWISE NOTED	UNLESS OTHERWISE NOTED	DATE	BY
FRACIIONS ±1/32	1/2	06/22/16	T. BATERMAN
XXXX DEG ±0.010	SURFACE FINISH	DATE	BY
XXX DEG ±0.02	BREAK ALL SHARP EDGES WITH A 0.031/015 RADIUS OR CHAMFER	DATE	BY
ANGULAR ±1/2		DATE	BY

DRW NO.	6546-001
TITLE	INSTALLATION PIPING OVERVIEW GREEN MACHINE
REV	B

Figure 6-2: Vapor Piping Overview



## 6.5 Bump Test

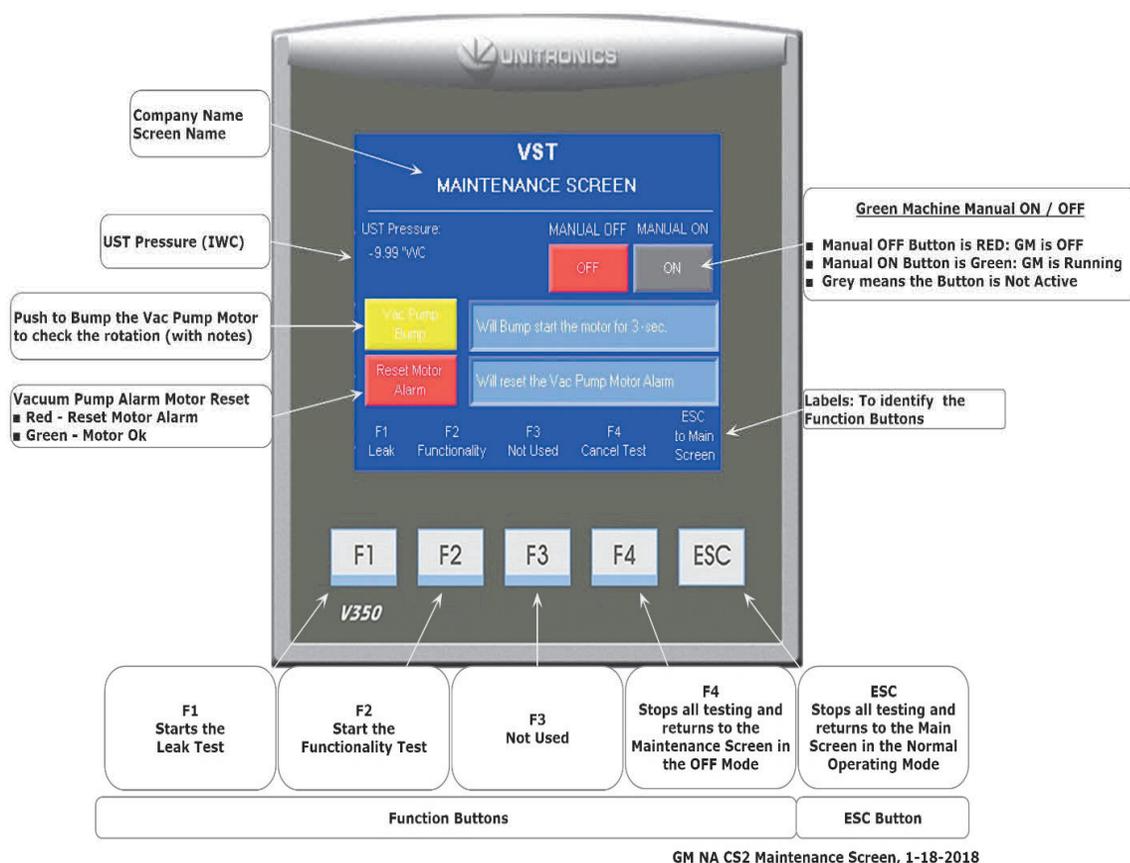


Figure 6-3: Maintenance Screen

### 6.5.1 Purpose of the Bump Test

The purpose of the Bump Test is to ensure that the Vacuum Pump Motor is rotating in the correct direction when the GREEN MACHINE is running.

- Damage will occur to the Vacuum Pump if it rotates in the wrong direction.

### 6.5.2 Preparation for the Bump Test

1. Make sure the Maintenance Screen is showing on the PLC. **See Figure 6-3.** (The GREEN MACHINE is now in the Manual OFF mode and will not operate.)

If the PLC is not in the Maintenance Screen: At the Main Screen, push the Maintenance Screen button to access the Password Screen then enter the password to access the Maintenance Screen: Password is 878.

2. One person needs to be at the VST Control Panel to begin the Bump Test.
3. A second person needs to be at the GREEN MACHINE when the Motor Bump Test begins.
4. After the test is started, the motor will rotate for 5-seconds, which will allow the person at the GREEN MACHINE to check the rotation of the motor.



### 6.5.3 Bump Test Procedure

1. At the Maintenance Screen, push the Vac Pump Bump button to go to the Bump Motor Confirmation Screen. **See Figure 6-3.**
2. At the Bump Motor Confirmation Screen, push the red Confirm Motor Bump button to start the Vacuum Pump motor rotation. Then cancel the Bump Motor; push the green button to return to the previous screen. **See Figure 6-4.**
3. The Vacuum Pump Motor will rotate for 5-seconds, which is just enough time for the second person at the GREEN MACHINE to check the motor rotation. The motor rotation is indicated by a directional arrow on the pump.
4. If the motor is rotating in the correct direction, the test is completed.

If the motor is not rotating in the correct direction, switch two of the motor wires, T5 and T8, at the Vacuum Pump Motor Junction Box. **See Figure 6-5.**

5. After changing the motor leads, run the Bump Test again to make sure the Vacuum Pump Motor is rotating in the correct direction.
6. When the test is completed, the PLC will show the Main Screen.

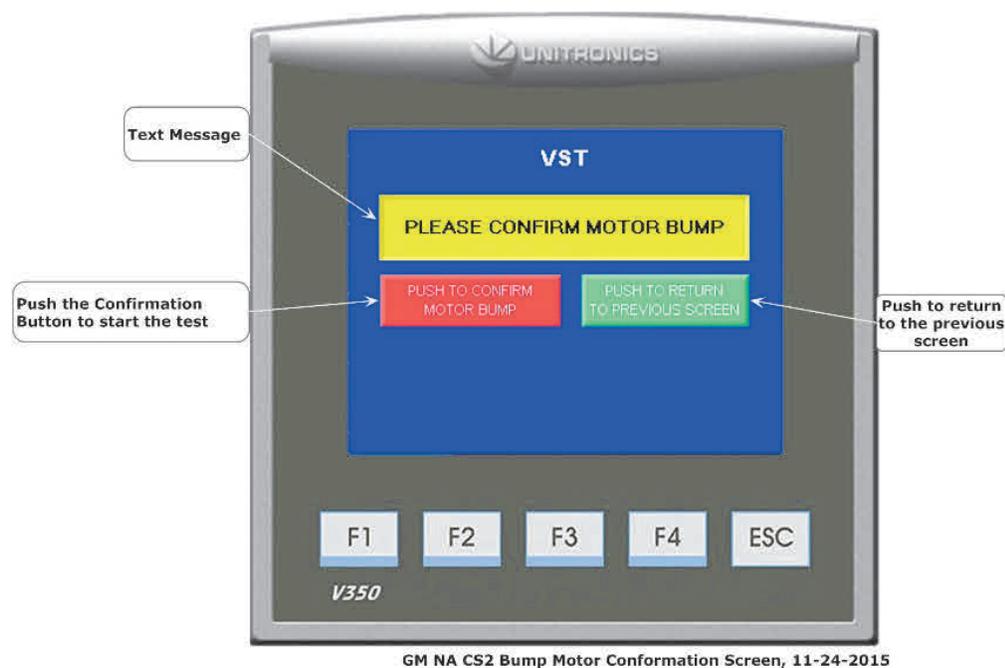


Figure 6-4: Bump Confirmation Screen

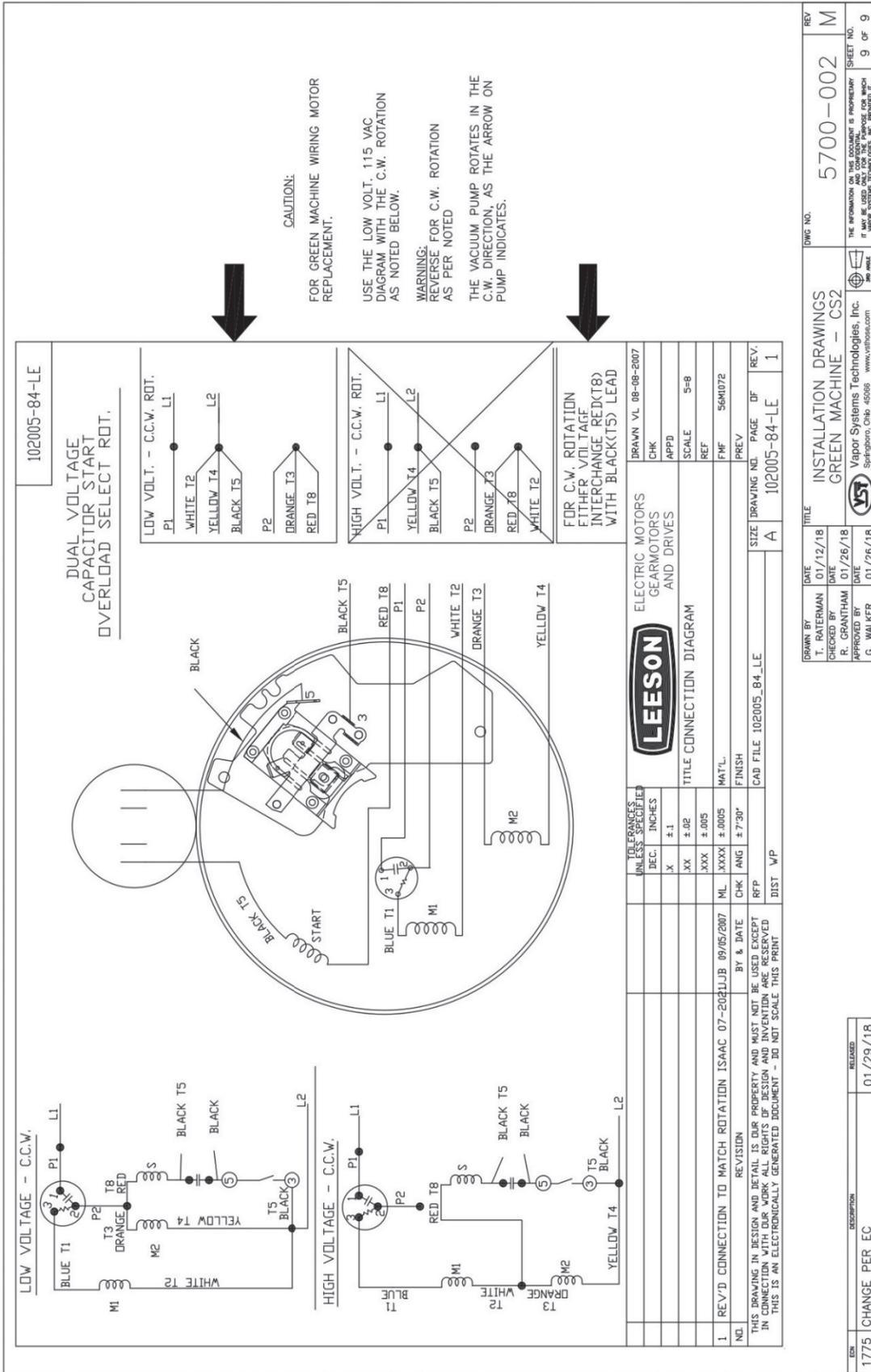


Figure 6-5: Vacuum Pump Motor Wiring Diagram



## 6.6 Functionality Test

### 6.6.1 The Purpose of the Functionality Test

The purpose of the Functionality Test is to verify that the Control Panel, Vacuum Pump, and the Control Valves are working properly.

### 6.6.2 Preparation for the Functionality Test

1. At the VST Control Panel, make sure the Maintenance Screen is showing on the PLC. **See Figure 6-6.** (The GREEN MACHINE is now in the Manual OFF mode and will not operate.)

If the PLC is not in the Maintenance Screen: At the Main Screen, push the Maintenance Screen button to access the Password Screen, then enter the password to access the Maintenance Screen: Password is 878.

2. At the GREEN MACHINE, make sure the locks from the three ball valves have been removed, all three valves are closed, and the caps from the three tees have been removed. **See Figure 6-7.**
3. Unlock the hasp and remove the cover from the GREEN MACHINE.
4. Close the 3-way valve below the Pressure Sensor so the handle is turned HORIZONTAL (OFF or Closed). Leaving the valve ON or Open during this test may damage the Pressure Sensor.

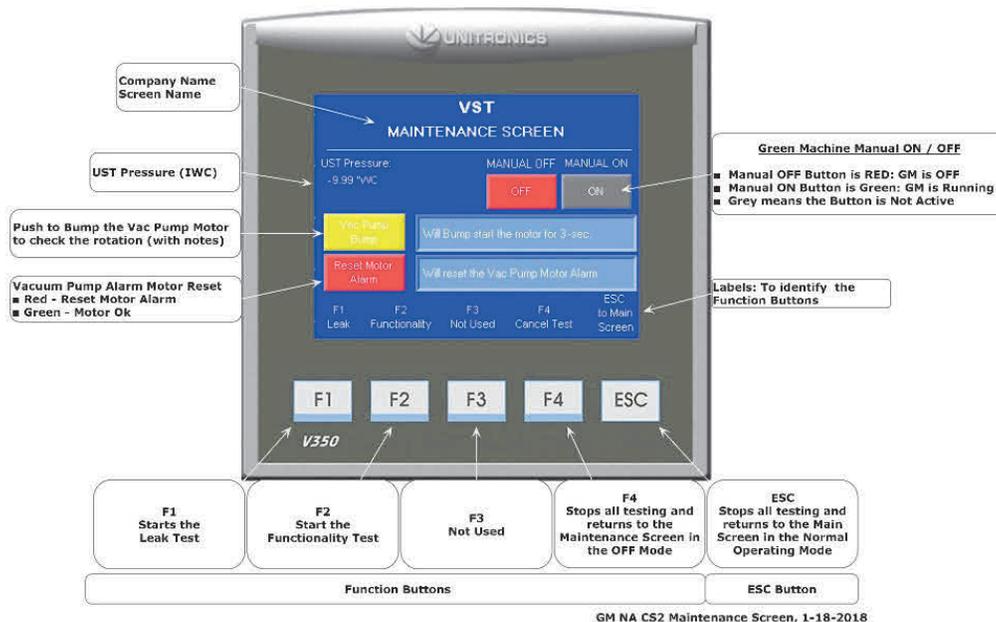
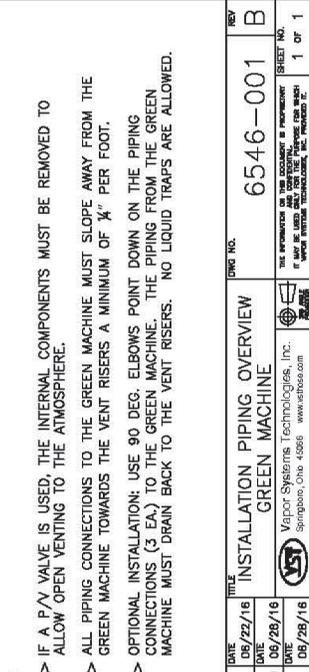
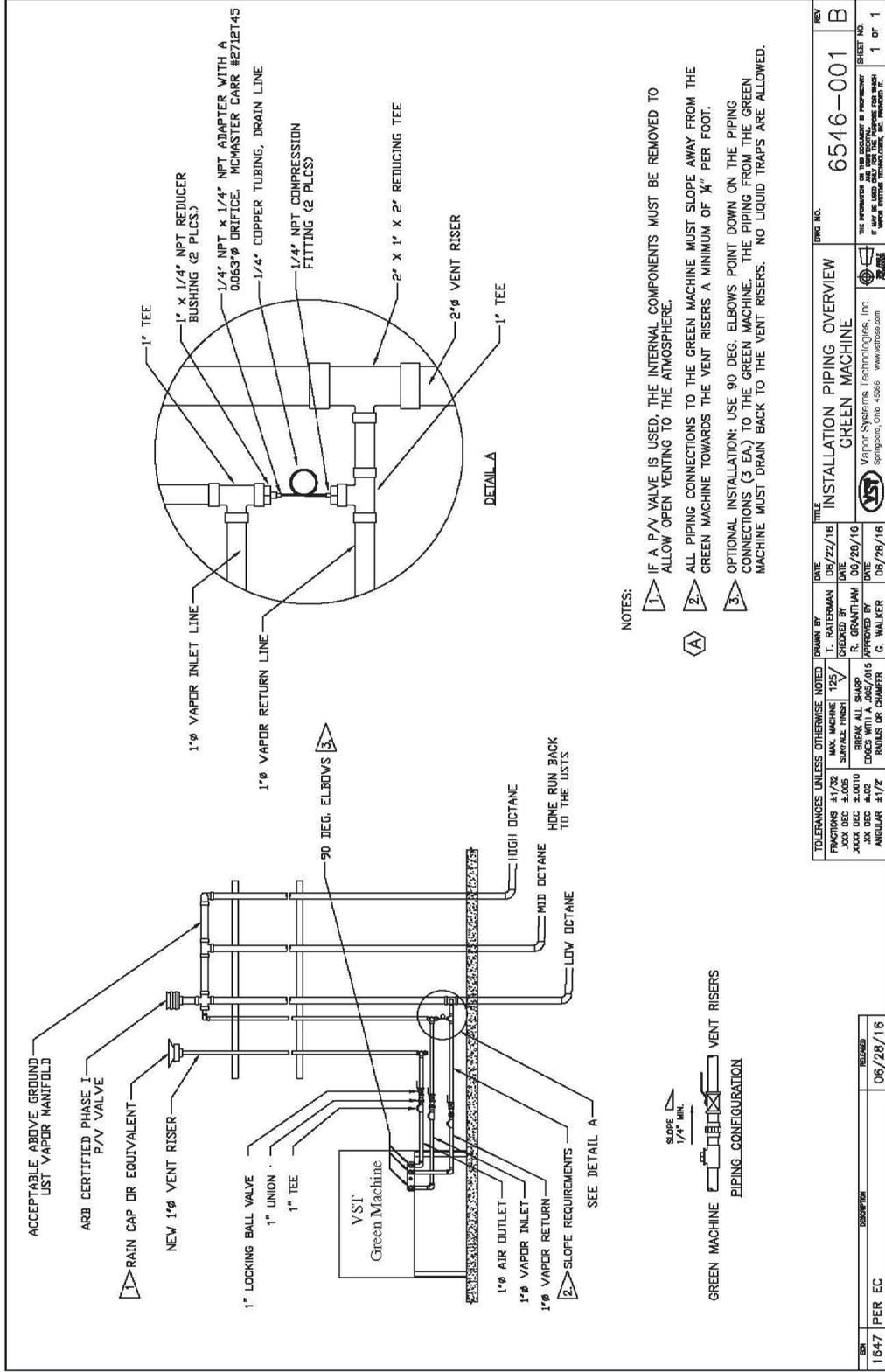
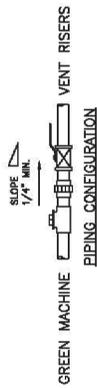


Figure 6-6: Maintenance Screen



- NOTES:
- 1. IF A P/V VALVE IS USED, THE INTERNAL COMPONENTS MUST BE REMOVED TO ALLOW OPEN VENTING TO THE ATMOSPHERE.
  - 2. ALL PIPING CONNECTIONS TO THE GREEN MACHINE MUST SLOPE AWAY FROM THE GREEN MACHINE TOWARDS THE VENT RISERS A MINIMUM OF 1/8" PER FOOT.
  - 3. OPTIONAL INSTALLATION: USE 90 DEG. ELBOWS POINT DOWN ON THE PIPING CONNECTIONS (3 EA.) TO THE GREEN MACHINE. THE PIPING FROM THE GREEN MACHINE MUST DRAIN BACK TO THE VENT RISERS. NO LIQUID TRAPS ARE ALLOWED.



REV	DATE	BY	DESCRIPTION
B	06/28/16	R. GRANTHAM	INSTALLATION PIPING OVERVIEW GREEN MACHINE

DATE	APPROVED BY	DATE	APPROVED BY
06/28/16	R. GRANTHAM	06/28/16	C. WALKER

DATE	DESCRIPTION	REVISED
06/28/16	PER EC	

TOLERANCES UNLESS OTHERWISE NOTED	FRACIONS 1/2"	DECIMALS 0.005
ANGLES 1/2°	ANGLES 1/2°	ANGLES 1/2°
EDGES WITH A 30°/315	EDGES WITH A 30°/315	EDGES WITH A 30°/315
ANGULAR 1/2°	ANGULAR 1/2°	ANGULAR 1/2°

Figure 6-7: GREEN MACHINE Vapor Piping Layout



### 6.6.3 Functionality Test Procedures

1. Push the F2 button to access the Functionality Test Screen. **See Figure 6-8.**
2. To start the Functionality Test, push the Start Button.
3. Push the Confirm Functionality Test Button to confirm you would like to start the Functionality Test.  
**See Figure 6-9.**
4. The GREEN MACHINE will run for 60-seconds then purge for 60-seconds (this is one cycle).
5. The GREEN MACHINE will continue to cycle 5-times or until the F4 button is pushed to end the test.
  - There are 5-cycles to provide enough time to conduct the test.
  - Pushing the F4 button will return the system to the Maintenance Screen and the GREEN MACHINE will be in the OFF mode.
6. When the test has ended, the VST Control Panel PLC will display GREEN MACHINE OFF.
7. During the 60-second Run Cycle: **See Figure 6-10.**
  - Place your hand over the tee opening at the Vapor Inlet and feel for suction.
  - Next, place you hand over the tee opening at the Vapor Return and feel for zero airflow.
  - Next, place your hand over the tee opening at the Air Outlet and feel for air blowing.
8. During the Run Cycle:
  - 1) Suction at the Vapor inlet: NORMAL
  - 2) Air blowing out the Air Outlet: NORMAL
  - 3) No air blowing/suction at the Vapor Return: NORMAL
  - 4) All other blowing or suction conditions at each location, check the following items:
    - Make sure the Vacuum Pump is not in alarm. If so, see Chapter 8: Troubleshooting, Section 8.6.
    - Check the Control Valves to make sure they are all operational. See Chapter 8: Troubleshooting, Section 8.6.1, Step 5:
    - Make sure there is no debris in the valve seat. Clean the valves as shown in Section 7.5: Cleaning the Control Valves.
    - Make sure the flare nuts are tight. Check each 45-deg. flare nut to make sure they are snug but not over tightened.
9. During the 60-second Purge Cycle: **See Figure 6-10.**
  - After the Purge Cycle has begun, place your hand over the tee opening at the Vapor Return and feel for air blowing. The blowing air will reduce to zero flow soon after the Purge Cycle begins.
  - Next, place your hand over the tee opening at the Vapor Inlet and feel for zero airflow.
  - Next, place your hand over the tee opening at the Air Outlet and feel for zero airflow.



## Functionality Test, continued...

10. During the Purge Cycle:
  - 1) No air blowing/suction at the Vapor Inlet:       NORMAL
  - 2) No air blowing/suction at the Air Outlet:        NORMAL
  - 3) Momentary blowing at the Vapor Return:        NORMAL
  - 4) All other blowing or suction condition at each location:
    - Make sure the Vacuum Pump is not in alarm. If so, see Chapter 8: Troubleshooting, Section 8.6.
    - Check the Control Valves to make sure they are all operational. See Chapter 8: Troubleshooting, Section 8.6.1, Step 5:
    - Make sure there is no debris in the valve seat. Clean the valves as shown in Section 7.5: Cleaning the Control Valves.
    - Make sure the flare nuts are tight. Check each 45-deg. flare nut to make sure they are snug but not over tightened.
  
11. After the Functionality Test has ended:
  - The PLC will automatically go back to the Maintenance Screen and will remain in the OFF mode.
  - Lock open the three ball valves between the GREEN MACHINE and the Vent Risers, and replace the caps on the three tees.
  - **CAUTION: Make sure the 3-way valve below the Pressure Sensor is turned VERTICAL (ON or Open). Leaving the valve turned OFF at the Pressure Sensor will not allow the GREEN MACHINE to operate in the Normal Operating Mode.**
  - At the PLC, push the ESC button to return to the Main Screen.

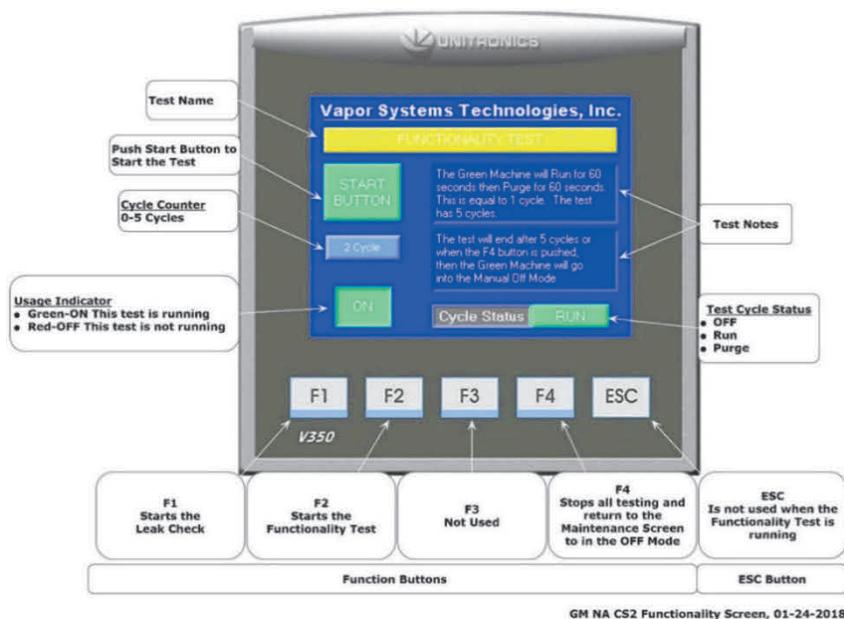
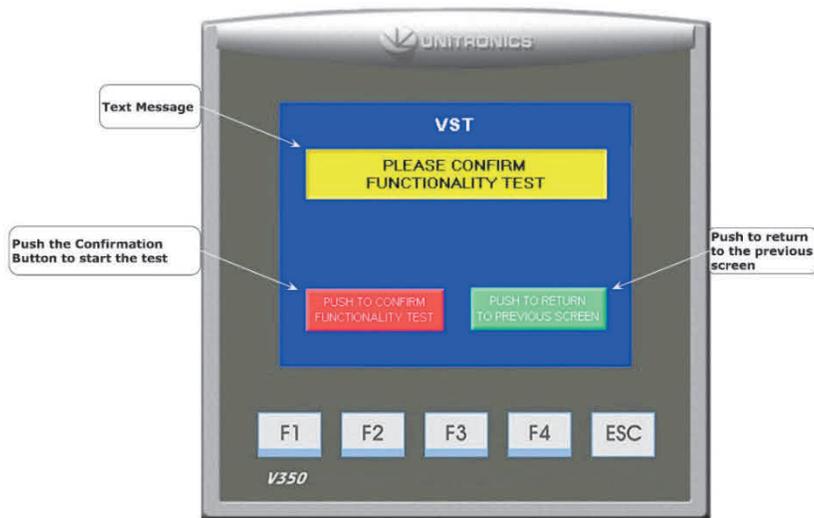


Figure 6-8: Functionality Test Screen



GM NA CS2 Functionality Confirmation Screen, 7-14-2015

Figure 6-9: Functionality Test Confirmation Button

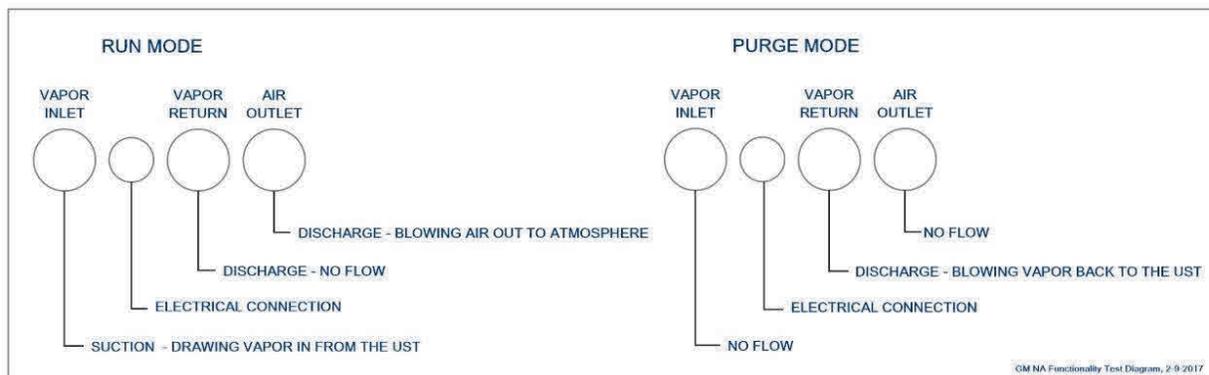


Figure 6-10: GREEN MACHINE Operation Diagram

## 6.7 Programming the Fuel Management System Overfill Alarm Relay for the GREEN MACHINE

### OVERFILL ALARM RELAY CIRCUIT

- The Electrical Contractor has installed the Overfill Alarm signal wiring from the VST Control Panel to the “Fuel Management System Overfill Alarm” output module.
  - The VST Control Panel supplies 24 VDC to the Overfill Alarm relay.
  - The Overfill Alarm output “dry” relay (N.O.) shuts down the GREEN MACHINE when a UST reaches the Overfill Level (90%) during a fuel drop.
  - Label the Overfill relay “GM Overfill Alarm.”
  - The wiring from the VST Control Panel to the Fuel Management System MUST be installed before the Start-Up of the GREEN MACHINE can be complete.
  - Reference Overfill terminal block wire numbers:
    - 24 VDC (+) – (Wire Number 02092)
    - 24 VDC (0) – (Wire Number 04051)



## 6.8 Testing the Overfill Alarm on the GREEN MACHINE VST Control Panel

### 6.8.1 TLS-350 Overfill Alarm Test

- This procedure will test the connection from the TLS-350 to the VST Control Panel.
- The VST Control Panel may or may not be wired/connected to the TLS-350 Overfill Alarm relay as outlined Chapter 3: Electrical Installation.
- When an Overfill occurs, the Overfill relay closes which completes a 24 VDC circuit to the VST Control Panel. The GREEN MACHINE will remain OFF two hours after the Overfill Alarm clears.

#### Procedures:

1. At the TLS-350, Press MODE until the screen reads SETUP MODE.
2. Press FUNCTION until the screen reads OUTPUT RELAY SETUP.
3. Press the PRINT button to print a list of output relays, then read the printout and identify the relay number associated with the OVERFILL for the GREEN MACHINE.
4. **Figure 6-11** shows the GREEN MACHINE OVERFILL relay as relay number 2.
5. Press MODE to return to ALL FUNCTIONS NORMAL screen.
6. At the ALL FUNCTIONS NORMAL screen, press FUNCTION until the screen reads TEST OUTPUT RELAYS.
7. Press the STEP button until the screen reads TEST OUTPUT RELAYS ENTER RELAY NUMBER 0.
8. Press the number on the keypad that corresponds to the relay assigned to the GREEN MACHINE output relay, then push ENTER.
9. The screen should read R X: GM OVERFILL PUSH ALARM/TEST KEY.
10. Press RED ALARM/TEST button to activate the GREEN MACHINE Overfill relay.
11. If the Overfill Alarm is active, the wiring of the Overfill Relay and the Overfill programming is correct. After two hours, the Overfill Alarm will clear.
12. If the Overfill Alarm is NOT active, contact the General Contractor or the electrical contractor to correct the wiring from the VST Control Panel to the TLS-350 Overfill relay, then conduct the test again until the test passes and the Overfill Alarm is active on the VST Control Panel PLC.
13. After the test is concluded, press the MODE button at the TLS-350 until the screen reads ALL FUNCTIONS NORMAL.
14. The Test has passed and is concluded. The GREEN MACHINE will remain OFF for two hours after the test is completed.



Figure 6-11: Output Relay Setup

### 6.8.2 TLS-450 Overfill Alarm Test

- The Overfill Relay and VST Control Panel Check is used to test the TLS-450 Overfill Relay as it is connected to the VST Control Panel. When the Overfill relay is active, the VST Control Panel will not allow the unit to operate.
- This test sets selected relays to INACTIVE for two seconds and then sets them to ACTIVE for two seconds. When the test is complete the relays are automatically reset to their original state.

#### Procedures:

1. At the TLS-450 Home Screen, select the Diagnostic button to access the Diagnostic Screen.
2. At the TLS-450 Diagnostic Home Screen, select the Relay and Input button to access the Relay & Input Screen.
3. At the Relay & Input Screen, select the Test Relay to conduct the Sequential Testing Procedure.
4. Check the box for the Overfill relay connected to the VST Control Panel.
5. For the selected relay the system will perform the following sequence:
  - 5.1 Save State: The current relay state will be saved before a test is run on the specific relay.
  - 5.2 Highlight Relay: For the relay being tested, the screen will highlight that relay during its test.



### TLS 450 Overfill Alarm Test, continued...

- 5.3 Deactivate Relay: The relay being tested will be put in an Active state for two seconds and the status of the relay on the screen will be set to Sw Test.
- 5.4 Activate Relay: The relay being tested will be put in an Active state for two seconds and the status of the relay on the screen will be set to Sw Test.
- 5.5 Reset Relay: Once the test is complete, the relay will be returned to its original status which was saved at the beginning of the test and will no longer be highlighted.
- 5.6 Test Completion: Touch the selected Overfill Relay to deselect it or close the screen.
6. After the test is complete, check the VST Control Panel PLC to make sure the Overfill Alarm is active.
7. If the Overfill Alarm is active, the wiring of the Overfill Relay and the Overfill programming is correct. After two hours, the Overfill Alarm will clear.
8. If the Overfill Alarm is NOT active, contact the General Contractor or the electrical contractor to correct the wiring from the VST Control Panel to the TLS-450 Overfill relay, then conduct the test again until the test passes and the Overfill Alarm is active on the VST Control Panel PLC.

### 6.8.3 TLS 450 Plus Overfill Alarm Test

#### Procedures:

1. At the TLS-450 Plus Home Screen, select the Diagnostic button to access the Diagnostic Screen.
2. At the Diagnostic Screen, select the Relay and Input button to access the Relay & Input Screen.
3. At the Relay & Input Screen, select the Relay button to access the Relay Diagnostics Screen.
4. Check the Relay number that is connected to the VST Control Panel.
5. Push the Action button, then push the Activate Relays buttons. After the Activation button is pushed, the Relay Screen will show again.
6. If the Overfill Alarm is active, the wiring of the Overfill Relay and the Overfill programming is correct. After two hours, the Overfill Alarm will clear.
7. If the Overfill Alarm is NOT active, contact the General Contractor or the electrical contractor to correct the wiring from the VST Control Panel to the TLS-450 Plus Overfill relay, then conduct the test again until the test passes and the Overfill Alarm is active on the VST Control Panel PLC.
8. At the TLS, push the Action button, then push Finish Test.



TLS 450 Plus Overfill Alarm Test, continued...

9. Deselect the Relay #  that is connected to the VST Control Panel.
10. Push the Home button to conclude the Overfill Alarm Test

## 6.9 Changing the Date and Time Procedure

### 6.9.1 Changing the Date and Time Procedure

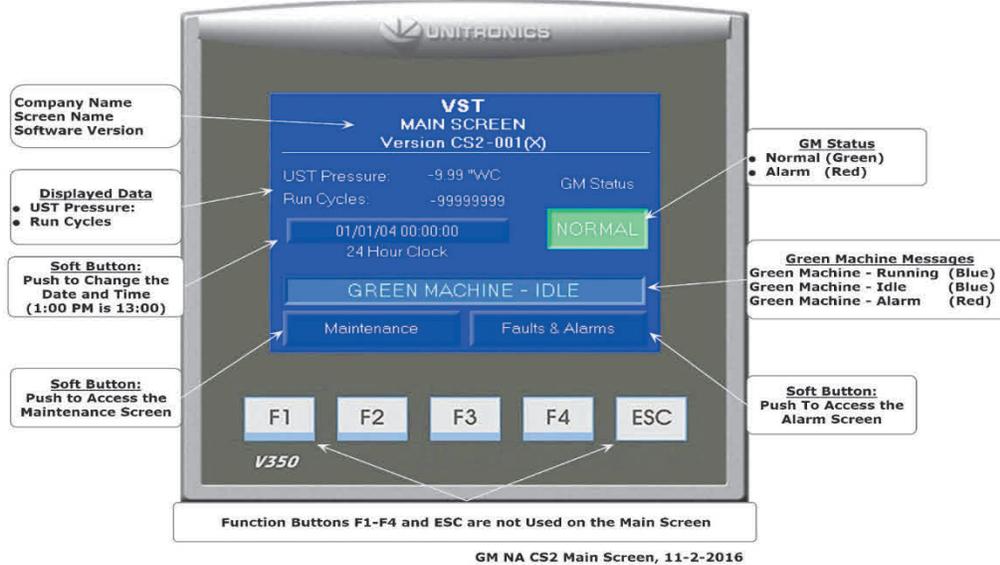


Figure 6-12: Main Screen

1. From the Main Screen, push the Date and Time soft button. This will bring up the Date and Time Interface Screen. **See Figure 6-12.**
2. On the Date and Time Interface Screen, insert the Date: (MM/DD/YY) then the Time: (HH:MM:SS). Use the ARROW keys to move from left or right if a number is not correct. The Time is a 24-hour format so 1:00 PM is set at 13:00 hours. **See Figure 6-13.**
3. After the Date and/or Time has been set, push Return button to accept the change(s) and return to the Main Screen.
4. After returning to the Main Screen, check to see if the Date and Time are correct.

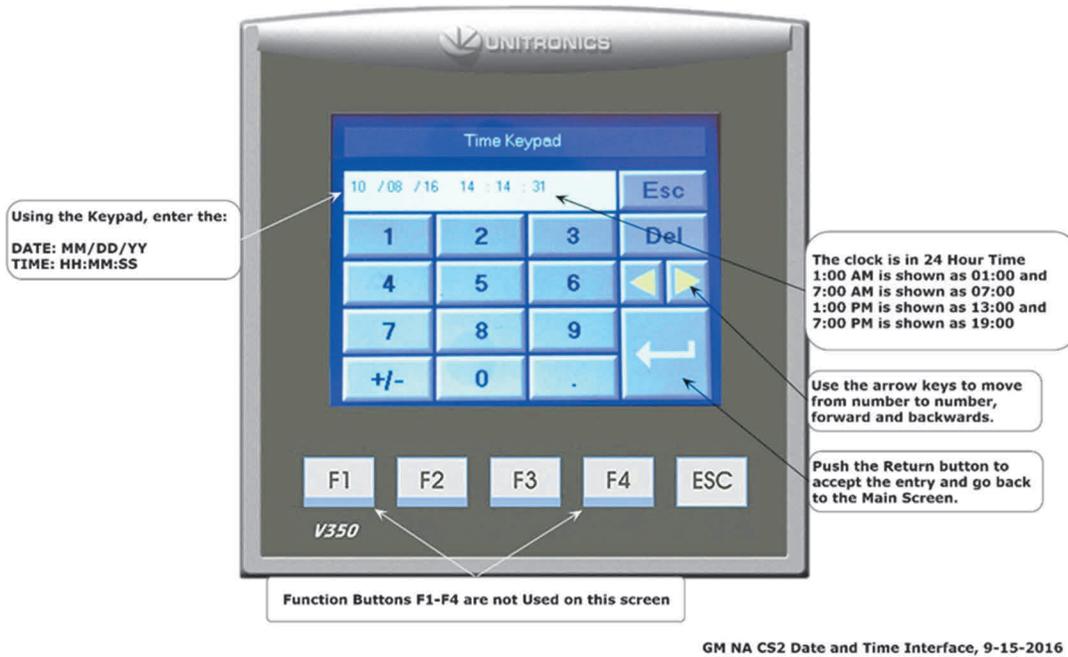


Figure 6-13: Time & Date Screen



## 6.10 Submitting Appendix B to VST for the Verification CODE

### 6.10.1 Start Up of the GREEN MACHINE

1. Go to [www.vsthose.com](http://www.vsthose.com).
2. Click on “VST Education & Training” at the bottom of the VST Screen
3. Under “US GREEN MACHINE™”  
Click on “Supporting Documents and Instructional Videos.”
4. Click on “Start-Up / Commissioning Contractor.”  
**Note: If you have not been trained to conduct Appendix B, click on “Appendix B – Training Video”, then go to Step 5.**
5. Click on “Appendix B - Start-Up Contractor Check Out Form.”
6. Fill out and submit Appendix B with the required photos.
7. Receive an email from VST with the verification code and a copy of the filled-out Appendix B.

### 6.10.2 Procedures

1. Apply power to the VST Control Panel  
The PLC starts up in the Main Screen where the GREEN MACHINE is shown to be DISABLED.  
See **Figure 6-1**.
2. Push the Maintenance button, then enter 878 on the Password Screen to go to the Maintenance Screen.
3. Using Chapter 6: Testing and Start-Up, complete the following sections:  
Chapter 6 Sections for Reference:  

Section	Title
6.4	Conduct the Bump Test
6.5	Conduct the Functionality Test
6.6	Programming the Fuel Management System Overfill Relay for the GM Overfill Alarm
6.7	Conduct the Overfill Alarm Test
6.8	Change the Date/Time per the time-zone
6.9	How to submit Appendix B to VST to obtain the Verification CODE
4. Complete Appendix B Checklist Form, then push the SUBMIT button.  
(All the fields contained in Appendix B MUST BE CHECKED OR FILLED OUT, INCLUDING PICTURES.)
5. An email with the Verification CODE is sent to the person conducting the Start-Up after Appendix B is SUBMITTED to VST.
6. On the Maintenance Screen, push the Function Buttons F1 & F2 at the same time to bring up the Password Screen to enter the Verification CODE.
7. Push the large button with 000000 showing. See **Figure 6-14**.
8. At the Verification CODE Screen, enter the CODE that was received in the email, then push ENTER.  
See **Figure 6-15**.
9. If the correct CODE was entered, the PLC will show the Main Screen and the GREEN MACHINE will now be operational.
10. If the incorrect CODE is entered, the Verification CODE Screen will show WRONG! Push the large button again and enter the correct Verification CODE.
11. Once the correct Verification CODE is entered, the PLC returns to the Main Screen and the GREEN MACHINE is now fully operational.
12. Function Buttons F1 & F2 will no longer work
13. At the Main Screen, the GREEN MACHINE will turn ON if the UST pressure is at or above 0.20 IWC, or remain OFF if the UST pressure is below 0.20 IWC.
14. The GREEN MACHINE:
  - Is Operational
  - Start-Up is complete and verified
  - The Overfill protection is installed and tested

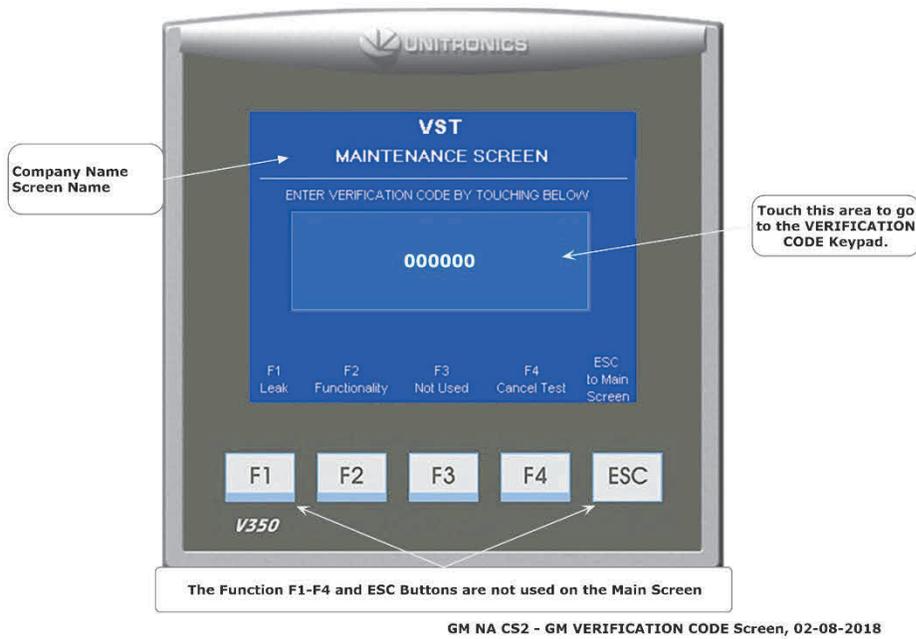


Figure 6-14: VERIFICATION CODE screen

### VST GREEN MACHINE CODE Verification Screen

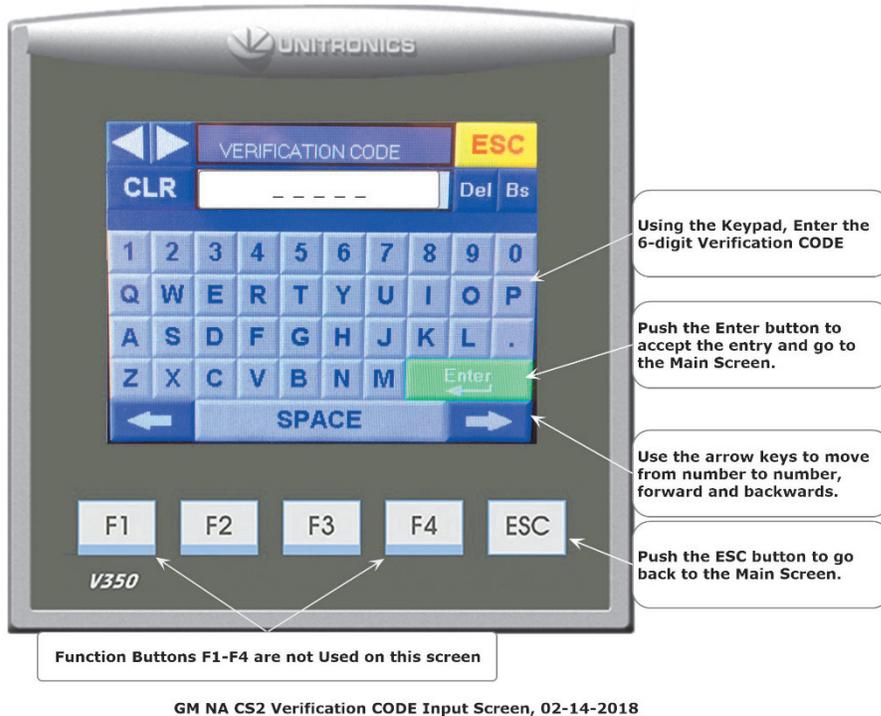


Figure 6-15: Enter the Verification CODE screen