ecovent

Control Hub, Vent & Wall Sensor

Programming & Functional Test Procedure

Revision History

#	Revision	Description of Change	Created by:	Approved by:	DCR #	Release Date
1	-	Initial Release	A. Smola	M. DeLorenzo	DCR-000003	01/13/2016
2	A	Update based on Sanmina Feedback	A. Smola	A. Smola	DCR-000041	03/23/2016
3	B	Expand vent functional test procedure	T. Frey			

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Device Programming

Vent

The vent board is the simplest of the Ecovent boards, it has a single ST Micro STM32 Microcontroller. To program this device, select 'Program Vent' from the Ecovent Program + Functional Test application.

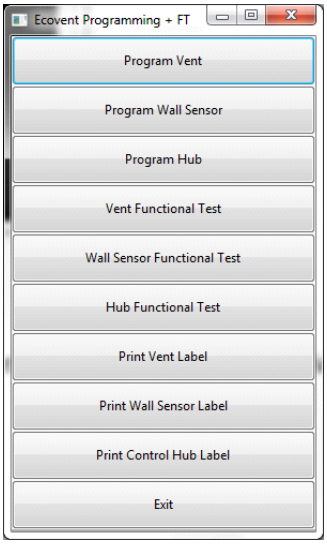


Figure 1

The user will be prompted to enter the serial number. This serial number is the vent PCBA serial number.

Figure 2

Scan the barcode (1D or 2D). It can be entered manually if necessary.

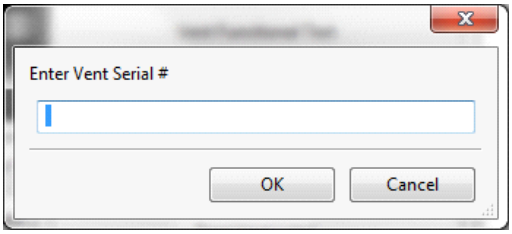


Figure 3

Place the vent PCB securely in the programming fixture. The programming fixture is shown below. Make sure that the power is plugged in and that the programming cable is attached. Make sure that the vent board is installed under the plexi-glass cover and that the cover is secured so that the board makes good contact. Place a weight on top of the plexi-glass cover to ensure good contact between board and programming fixture.

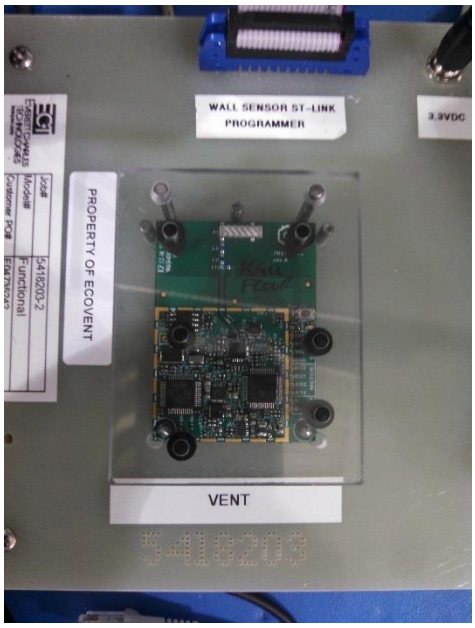


Figure 4

Once the user presses 'OK' the programming will begin. A progress bar will appear that will provide status.

Figure 5

When complete, a status will be presented indicating PASS or FAILURE.

PASS:

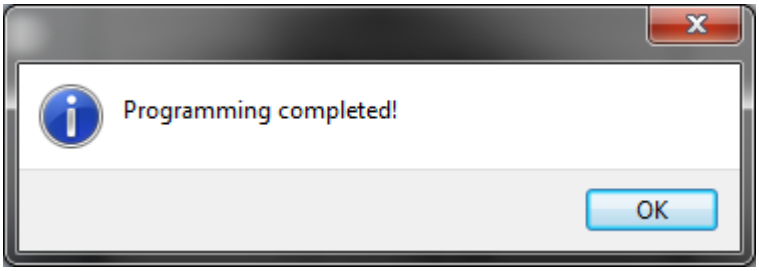


Figure 6

FAIL:

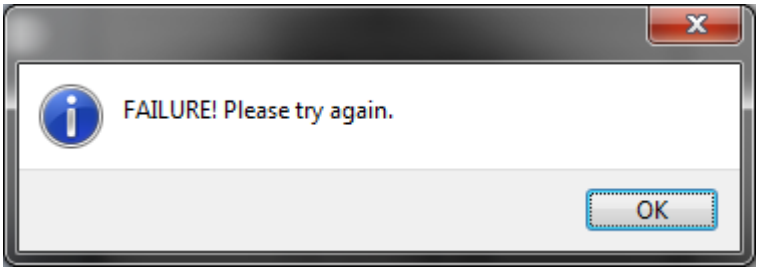


Figure 7

After the device is programmed the programming results and board serial number are uploaded to the Ecovent cloud. Additionally, a log file is produced. The log file is placed in the c:\users\ecovent\desktop\ecovent-functional-test\logs directory with a filename format “vent_<serial_number>.prog.log”

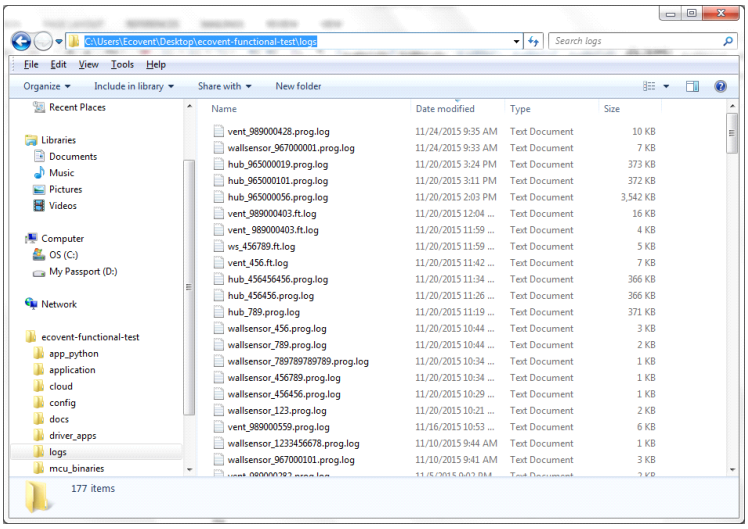


Figure 8

The log file contains output of the various programming steps in human readable output. If a failure occurs as part of programming, further details are available in log.

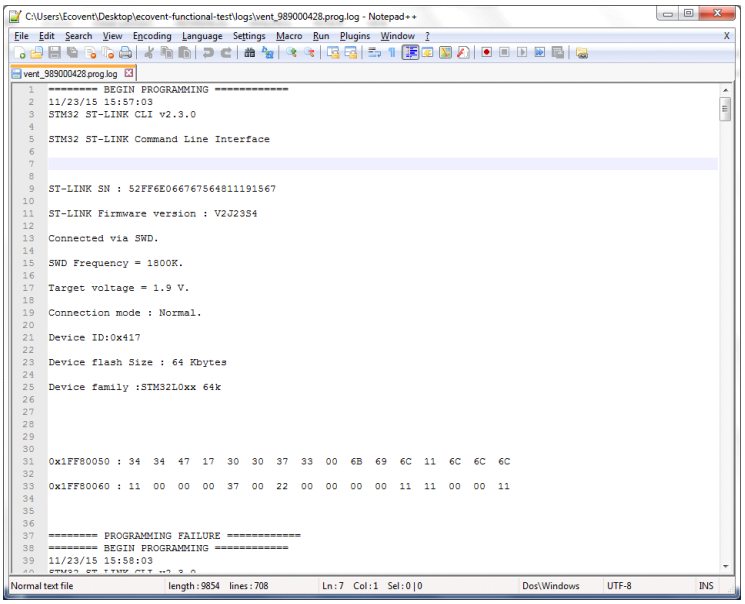


Figure 9

Wall Sensor

The wall sensor board has an ST Micro MCU and a Bluetooth Module. When the wall sensor is programmed, both devices are automatically programmed. A failure of either device to program will result in a failure of the programming operation. To program the wall sensor, select 'Program Wall Sensor' from the menu.

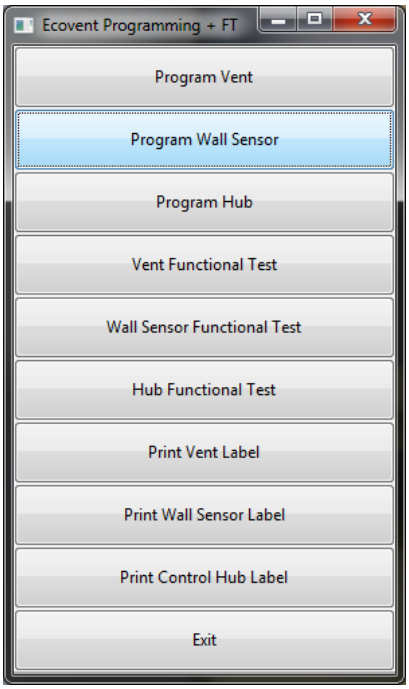


Figure 10

The user will be prompted to enter the serial number. This serial number is the wall sensor top PCBA serial number.

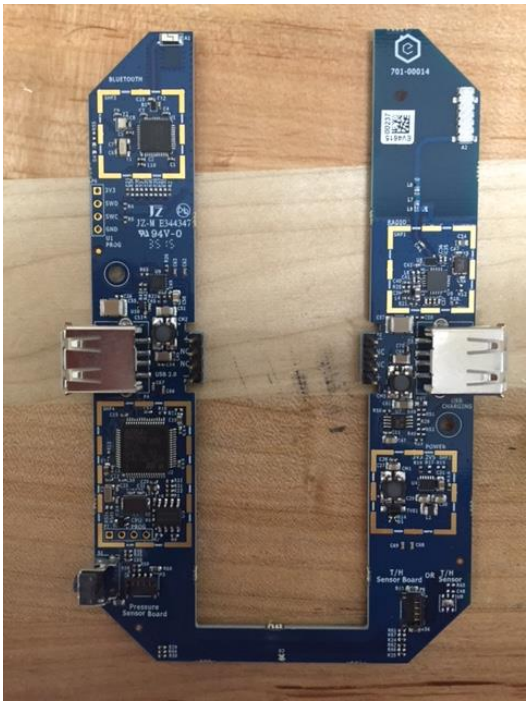


Figure 11

Scan the barcode (1D or 2D). It can be entered manually if necessary.

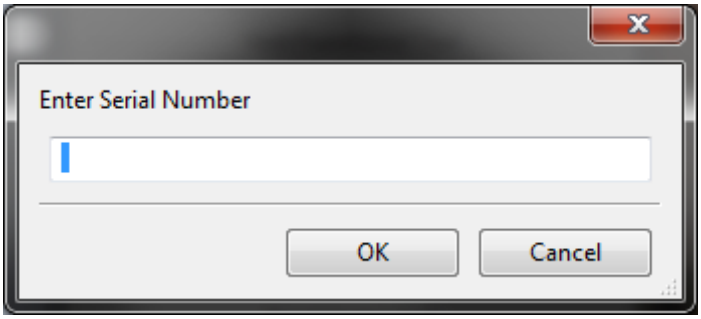


Figure 12

At this point the user should secure the device in the programming fixture. The programming fixture is shown below. Make sure that the power is plugged in to the USB port (right side of picture) and that BOTH programming cables are attached. Make sure that the Wall Sensor board is installed under the plexi-glass cover and that the cover is secured so that the board makes good contact. The LED may turn yellow while the device is being programmed, this is OK.

Figure 13

Once the user presses 'OK' the programming will begin. A progress bar will appear that will provide status.

Figure 14

When complete, a status will be presented indicating PASS or FAILURE.

PASS:

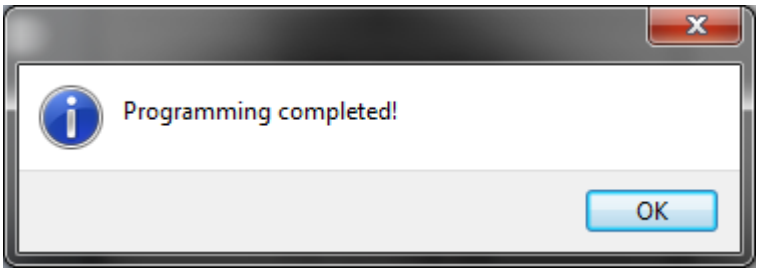


Figure 15

FAIL:

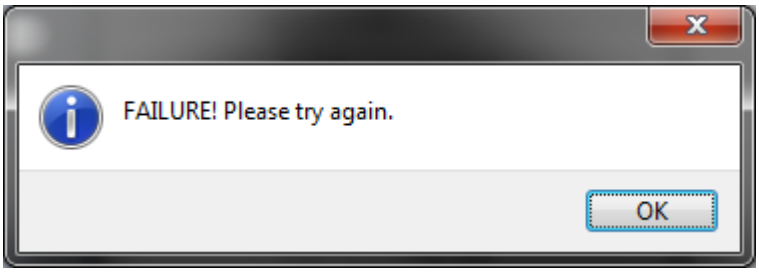


Figure 16

After the device is programmed the programming results and board serial number are uploaded to the Ecovent cloud. Additionally, a log file is produced. The log file is placed in the c:\users\ecovent\desktop\ecovent-functional-test\logs directory with a filename format "ws_<serial_number>.prog.log"

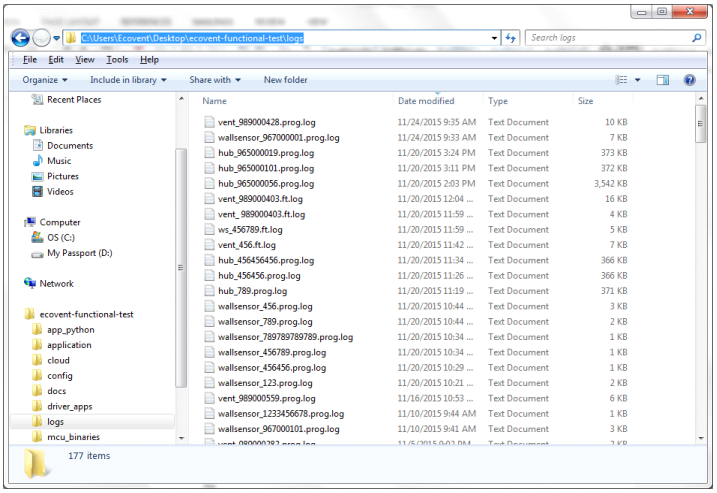


Figure 17

The log file contains output of the various programming steps in human readable output. If a failure occurs as part of programming, further details are available in log.

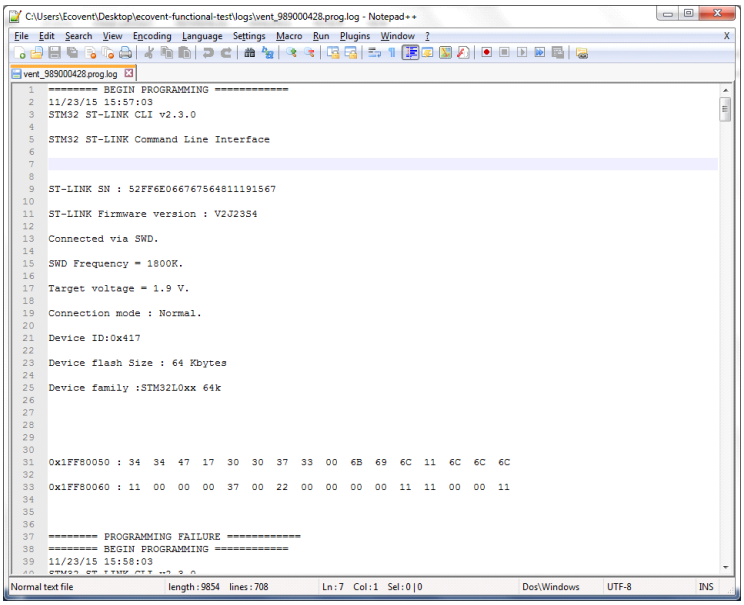

C:\Users\Ecovent\Desktop\ecovent-functional-test\logs\vent_989000428.prog.log - Notepad++
File Edit Search View Encoding Language Settings Macro Run Plugins Window ?
vent_989000428.prog.log
======== BEGIN PROGRAMMING ============
11/23/15 15:57:03
STM32 ST-LINK CLI v2.3.0
STM32 ST-LINK Command Line Interface
ST-LINK SN : 52FF6E066767564811191567
ST-LINK Firmware version : V2J23S4
Connected via SWD.
SWD Frequency = 1800K.
Target voltage = 1.9 V.
Connection mode : Normal.
Device ID:0x417
Device flash Size : 64 Kbytes
Device family :STM32L0xx 64k
0x1FF80050 : 34 34 47 17 30 30 37 33 00 6B 69 6C 11 6C 6C 6C
0x1FF80060 : 11 00 00 00 37 00 22 00 00 00 00 11 11 00 00 11
======== PROGRAMMING FAILURE ============
======== BEGIN PROGRAMMING ============
11/23/15 15:58:03
Normal text file length : 9854 lines : 708 Ln : 7 Col : 1 Sel : 0 | 0 Dos\Windows UTF-8 INS

Figure 18

Control Hub

The control hub is the most complex of the Ecovent boards. Although the procedure is fully automated, there are several steps as part of the procedure. They are conducted in the order listed below.

There are three discrete programming steps:

1) Programming Operating System to NAND Flash
2) Installing Ecovent Application
3) Programming Microcontroller.

A fixture is provided for programming the hub. The board is installed in the fixture as shown below. The fixture is connected to the ST programmer via the blue connector. USB and Ethernet connections must be directly from the computer \ router to the Control Hub board.

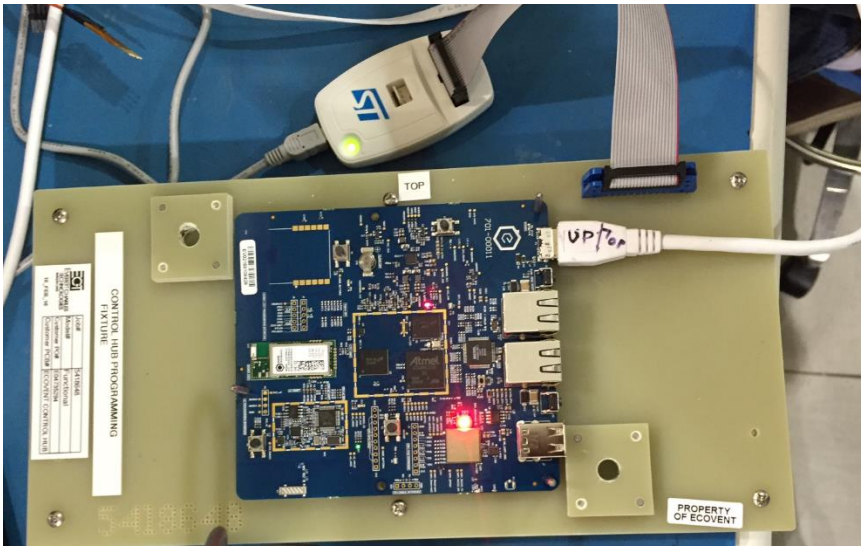


Figure 19

To program the control hub, select 'Program Hub' from the menu.

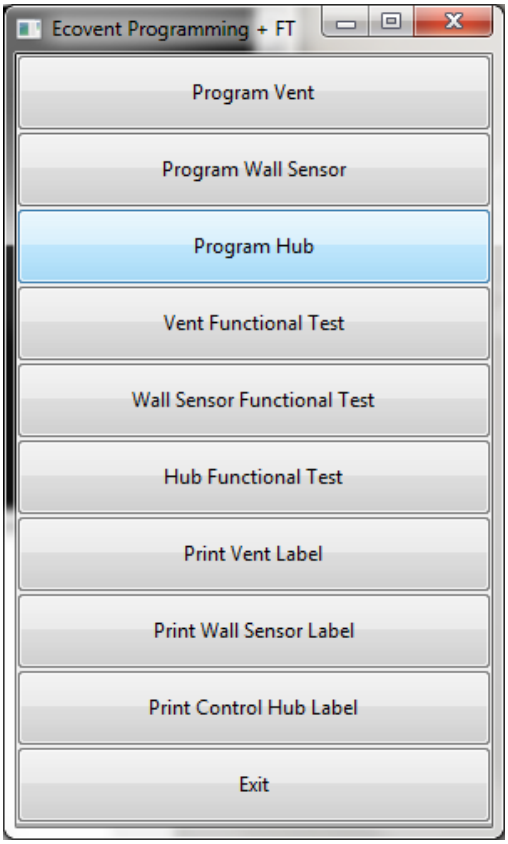


Figure 20

The first prompt will be to enter the serial number. The serial number entered here is the control hub PCBA serial number. It should be scanned, but can be typed if necessary.

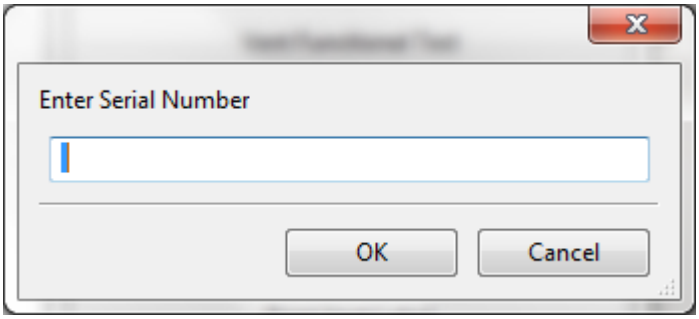


Figure 21

After entering the serial number, a dialog is presented with programming options. By default, all stages of programming are selected. If the board is being reworked due to a failed step, a subset of programming options can be selected.

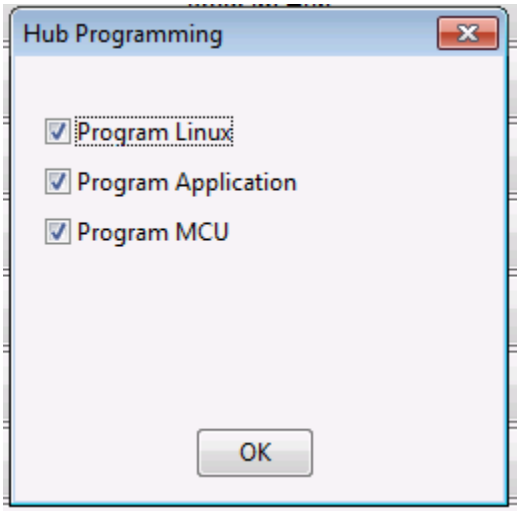


Figure 22

Next, a dialog should popup indicating that a MAC address has been obtained. Ecovent has a Web based cloud service to manage its MAC addresses. The serial number of the device is sent to the cloud and the cloud provides a new MAC address or provides the previously assigned MAC address if it has already been assigned.

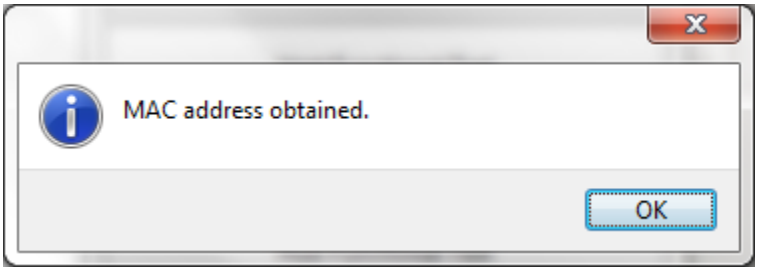


Figure 23

If the user is prompted for a MAC address that means that the programming software was unable to obtain a MAC address from the cloud.

The user will be prompted to Switch SW1 to OFF on the PCB, this should be the default position for the switch on a newly manufactured unit. Placing this switch in the OFF position allows the NAND flash to be programmed. In the ON position, the NAND flash cannot be programmed.

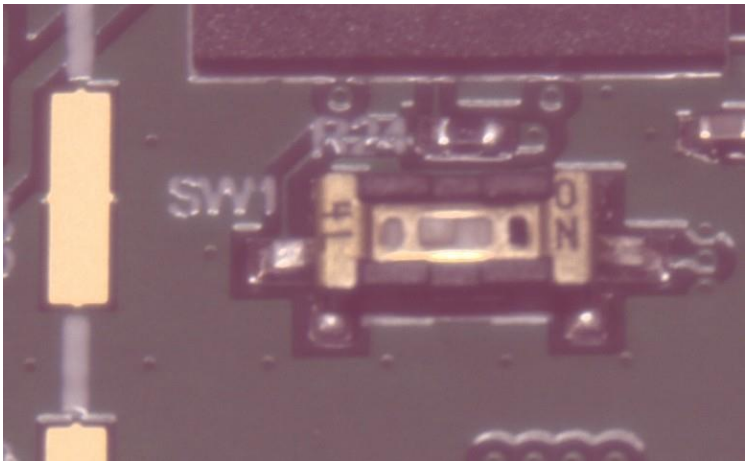


Figure 24

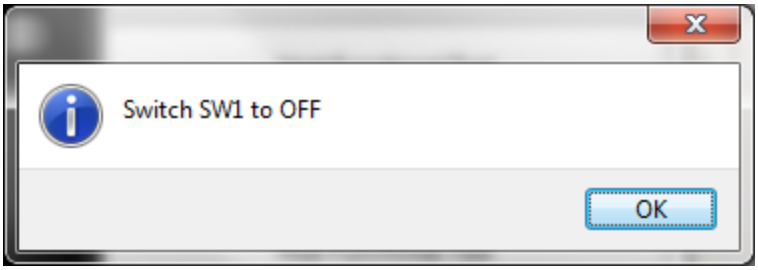


Figure 25

The user will then be prompted to attach USB programming cable. Make sure cable is inserted all the way. The board should power up.

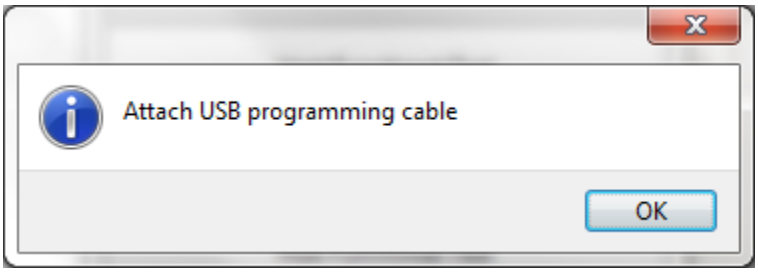


Figure 26

Now, the user will be prompted to switch SW1 to ON position.

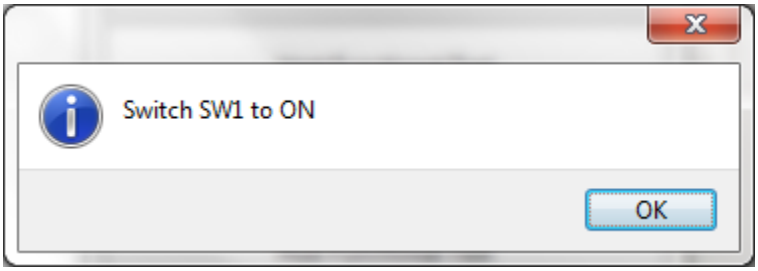


Figure 27

After pressing OK, a progress dialog will appear, this first phase should take approximately 5-10 seconds.

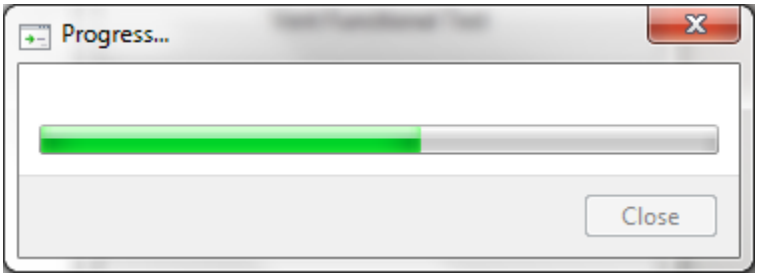


Figure 28

If the board is being programmed for the first time, after this completes, the board must be reset. The user will be presented with the following dialog prompting them to reset the board. Press reset, then press OK. ***If the board is being reprogrammed, do not reset the board at this step.***

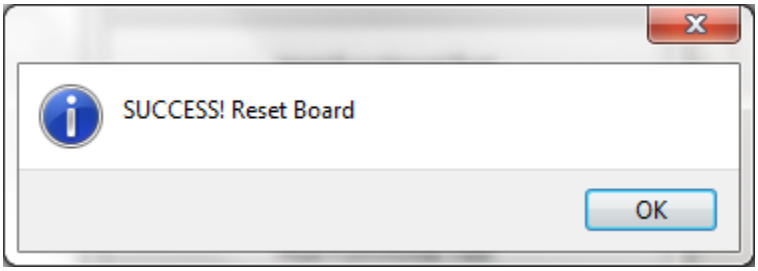


Figure 29

At this point, another progress dialog will be presented. This programming step takes much longer, approximately 3-5 minutes.

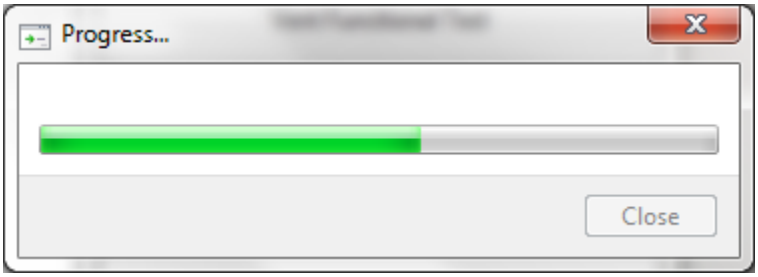


Figure 30

After completion of this step, the board must be reset again, the user will be prompted to do this.

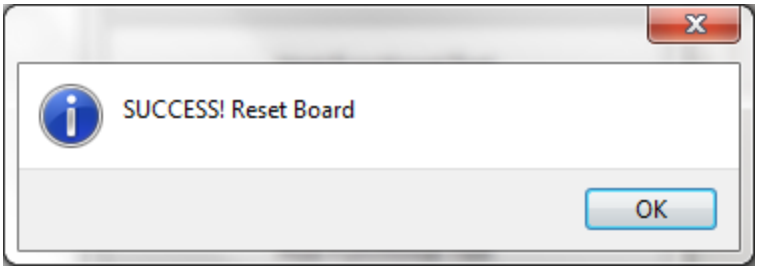


Figure 31

When the board powers back on, the D11 LED should blink red for 2-3 seconds, then turn off, then turn solid ON. When it turns on solid press OK.

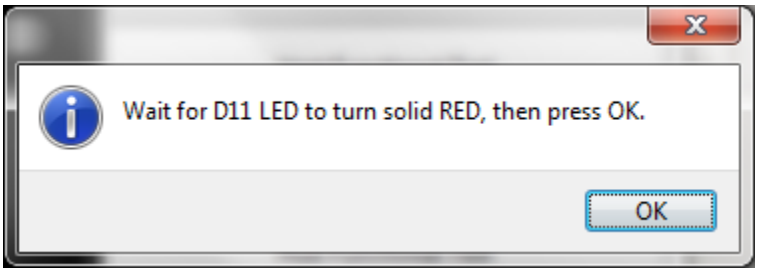


Figure 32

The D11 LED will remain solid red for approximately 3-5 minutes. It will then turn GREEN. When it turns GREEN, press OK.

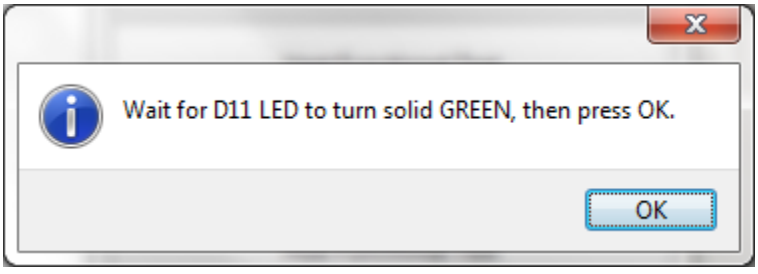
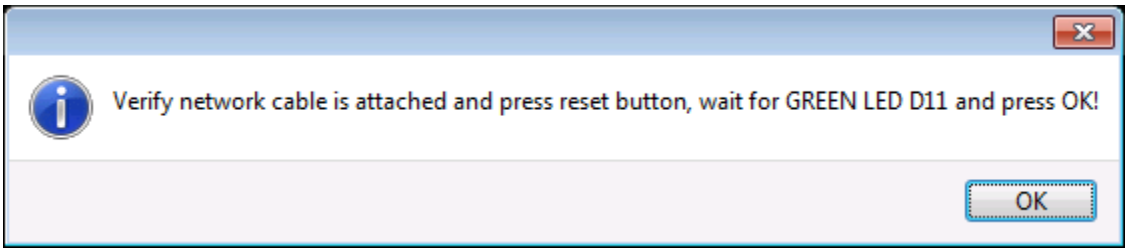


Figure 33

Once the D11 LED turns GREEN, the first part of the programming process is complete.

Figure 34

At this point, the user should verify that the network cable is attached. A dialog will be presented…



The reset button should be pressed and the user should wait for the D11 LED to turn GREEN, then press OK. This will start the 2nd part of the programming process.

A progress box will be presented.

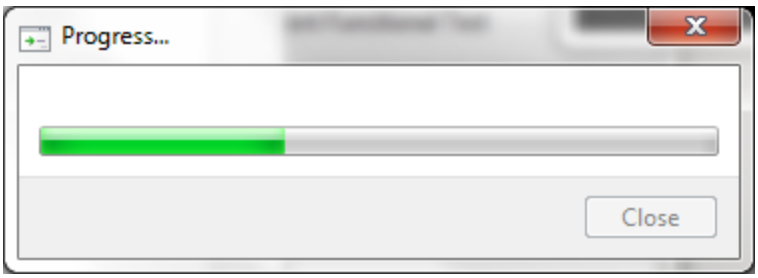


Figure 35

When this completes, the board has now had the application installed and a MAC address assigned. The third and last step is to program the MCU on the control hub.

If the board is in the fixture, the MCU programming leads are effectively attached. This step should only take approximately 30 seconds.

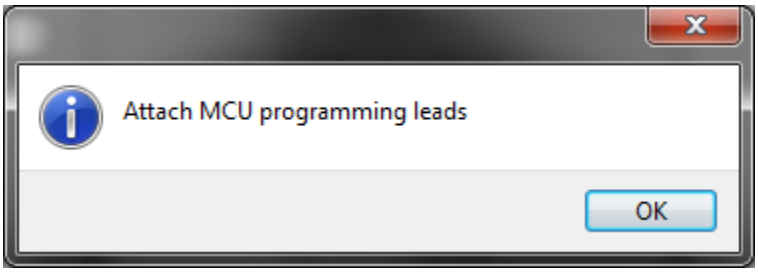


Figure 36

A progress bar will be presented and then either a success or failure dialog box will be shown.

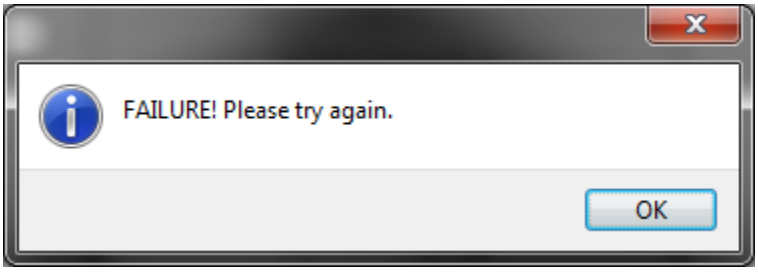


Figure 37

Figure 38

If the programming steps were all successful, the device is now ready for functional test. If any of the steps failed, the device must be reprogrammed.

Device Functional Test

Vent

The Vent should be partially assembled as per the assembly instructions prior to functional test. Visually inspect vent to verify that the assembly was completed correctly. Refer to assembly visual aids and documentation.

a) Nuts are fully seated in doors: flat, and not creating any ‘wave’ shape
b) Doors are fully seated into the door track: no ribs are out of the track
c) Vent is assembled properly: Adequate clearance between door and outer box
d) All side screws installed and flush with the outer box
e) No excessive flash, scratches, dents, or contamination observed.

To test this device, select ‘Vent Functional Test' from the Ecovent Program + Functional Test application.

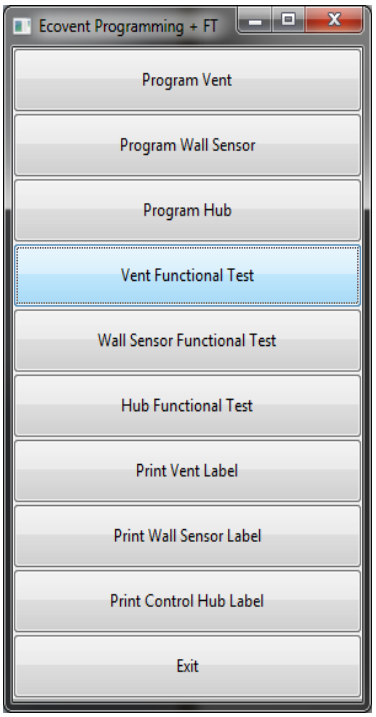


Figure 39

The device must be powered off the Ecovent provided networked power strip. Test code ensures that only one device is powered on at a time this way.

Verify that the Ecovent provided power adapter is plugged into white power cord associated with test station.

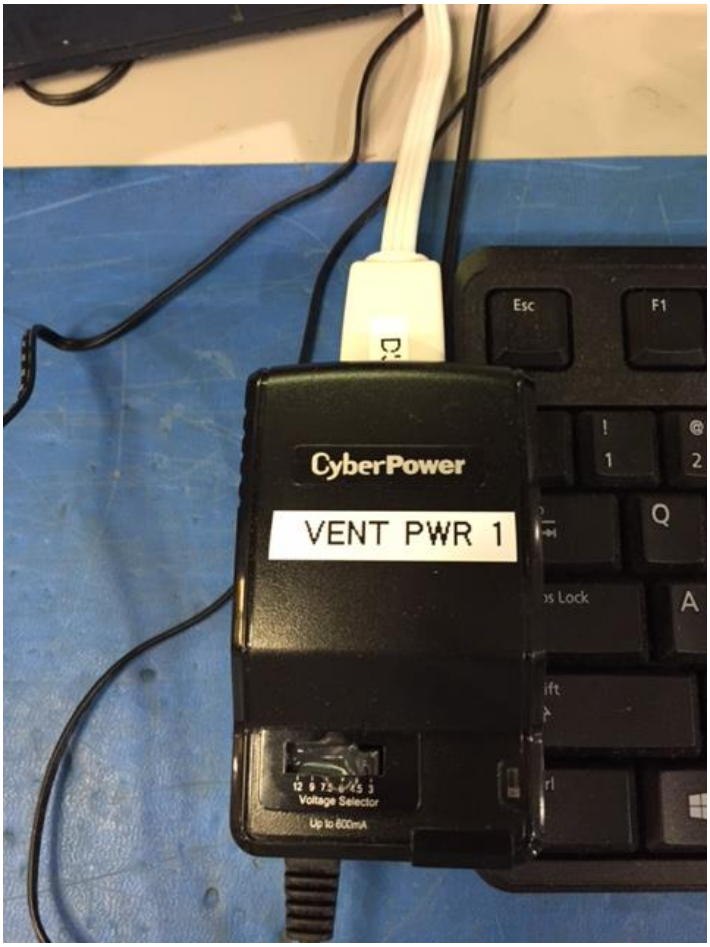


Figure 40

Then install battery pack adapter into vent.

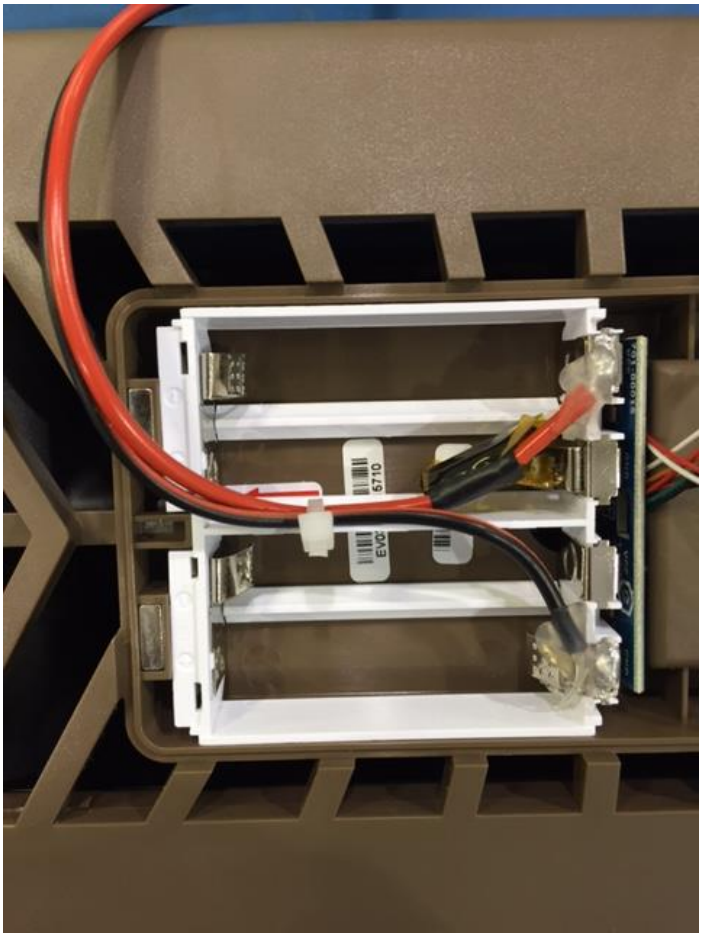


Figure 41

The user will be prompted to enter the top level assembly serial number; this number should be scanned if possible but can be entered manually if necessary.

Subsequently the user will be prompted to enter the PCBA serial number; this number should be scanned if possible but can be entered manually if necessary.

The user must make sure that the KGU hub is powered on.

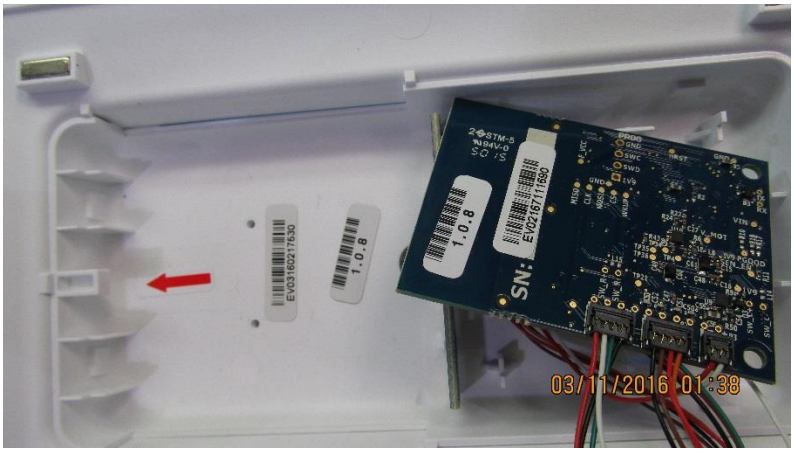


Figure 42

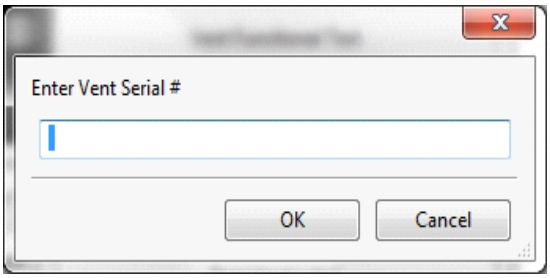


Figure 43

At this point, a database will be queried and if the vent PCBA has been programmed, if it has, the functional test will commence. If the device has not been programmed, an error message will be presented. If this error message is presented, the device should be reprogrammed. If after reprogramming functional test fails. The issue should be escalated to Engineering.

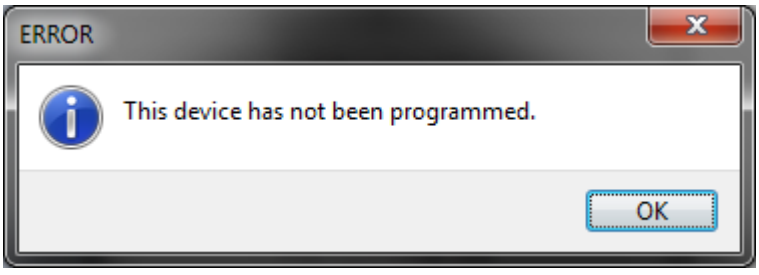


Figure 44

The functional test will start and a progress bar will be presented.

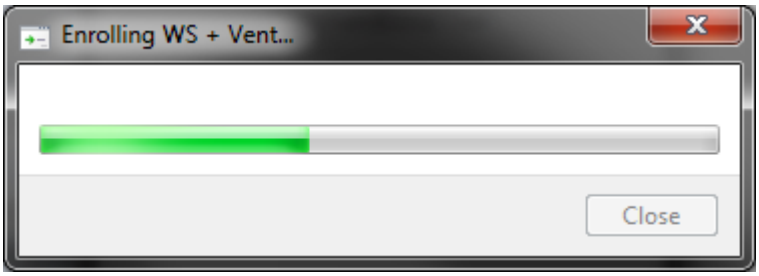
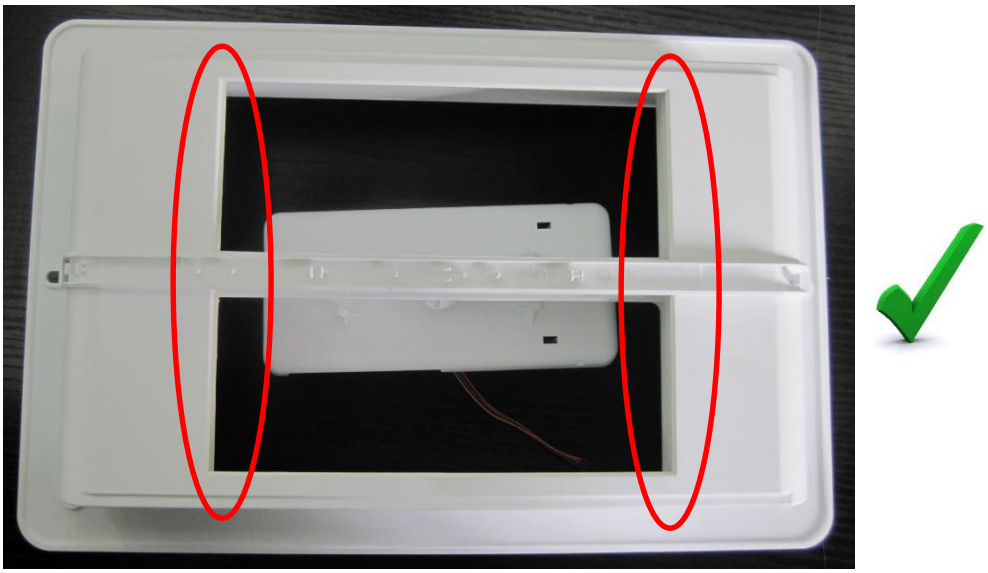


Figure 45

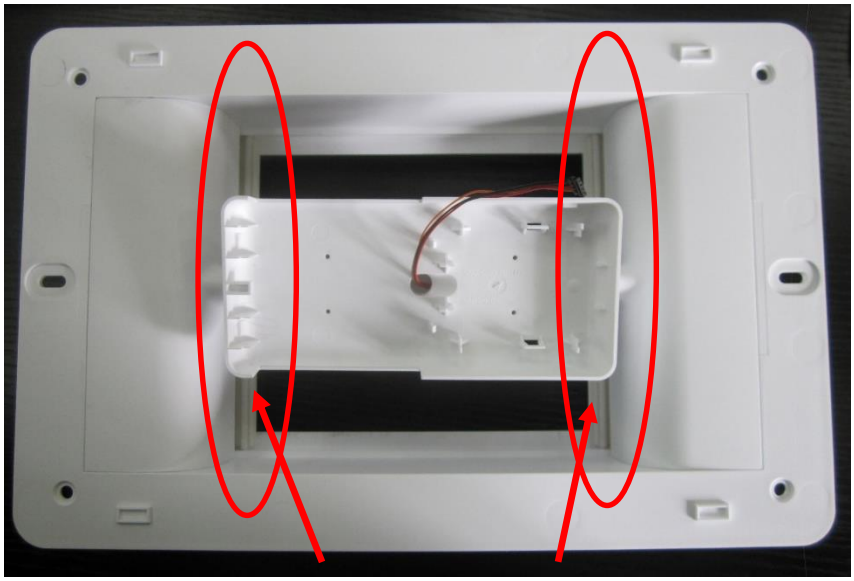
The vent will open and close once. Observe the motion of the doors to verify that the doors open and close fully. If visual confirmation of the cycle is missed, the process must be started from the beginning by power cycling the vent.

a) If the doors open and close fully, continue the test.
b) If the doors do not close fully, Mark as Failure
c) If the doors do not open fully, Mark as Failure

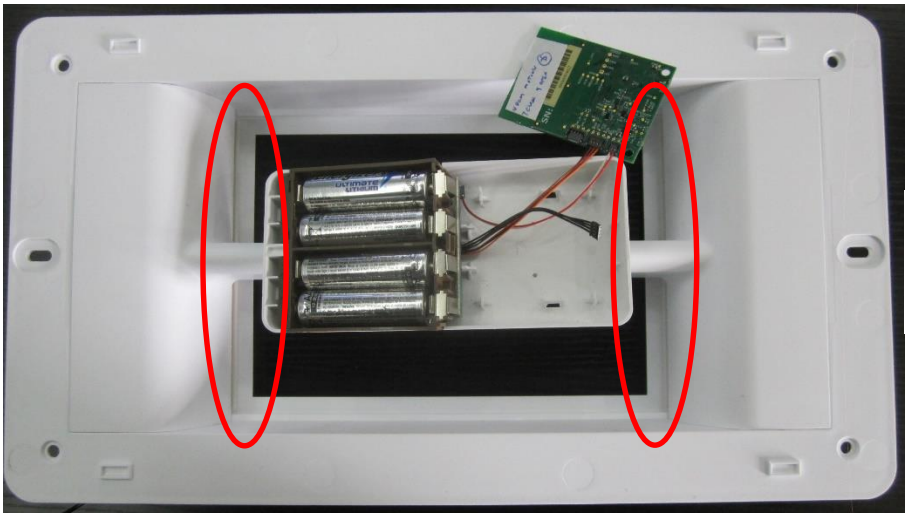
Examples of Passing Door Open & Close Conditions



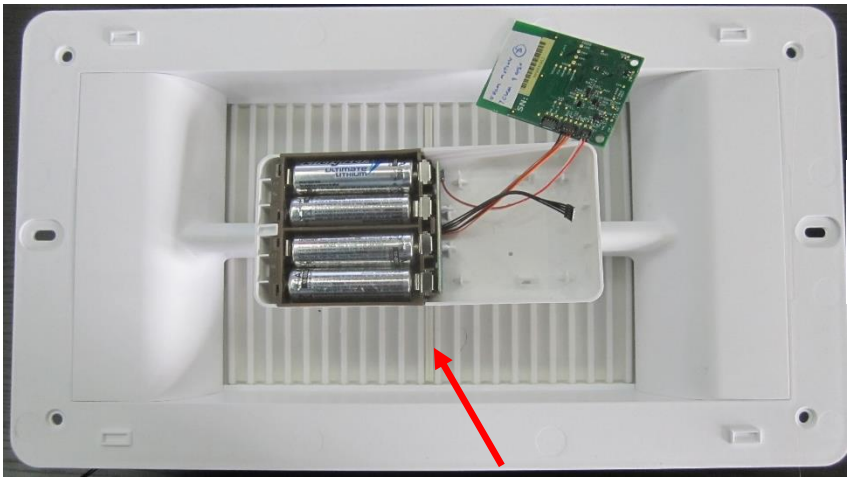
Fully Opened Vent as shown from the Back
(Note: All Vents, doors cannot be seen, hidden behind plastic outer box)



Fully Opened 10” Vent as shown from the Front
(Note: Approximately 1 rib will be visible on 10 inch vents. 10” x 4” and 10” x 6” Only)

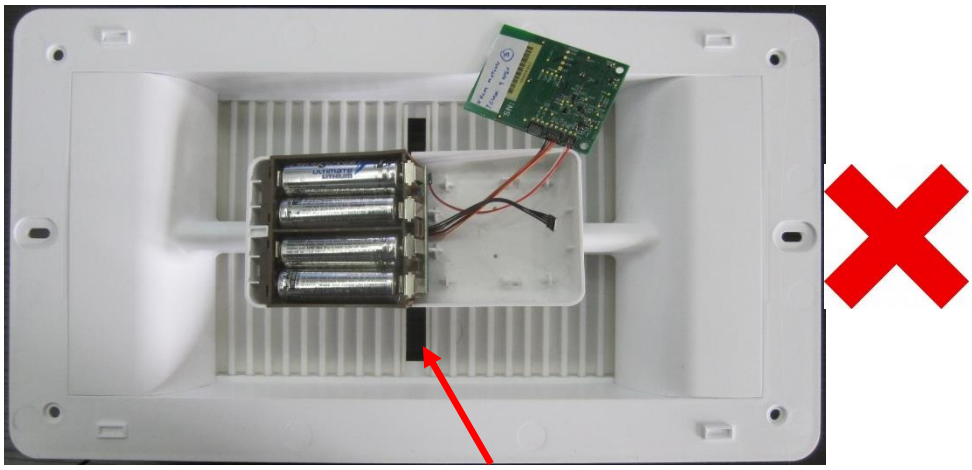


Fully Opened 12” Vent as shown from the Front
(Note: No door parts will be visible on 12 inch vents. 12” x 4” and 12” x 6” Only)

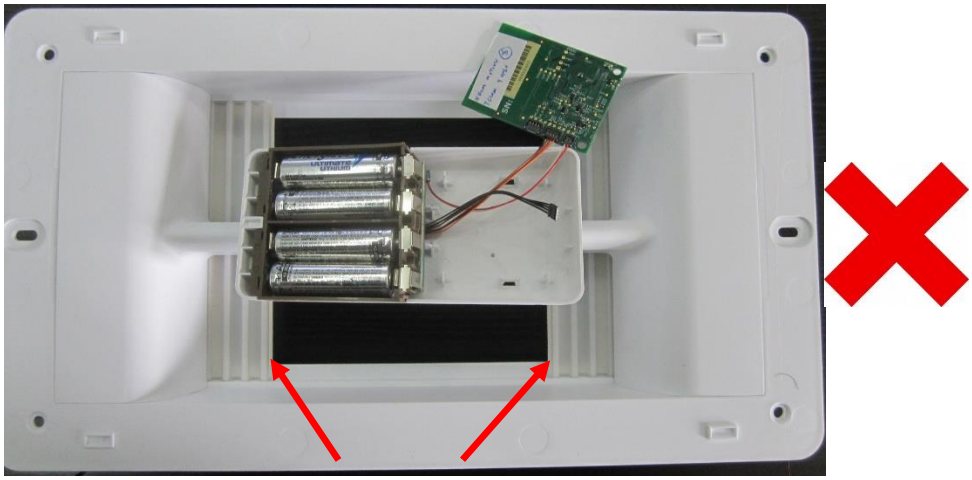


Fully Closed Vent as shown from the Front
(Note: All Vents, doors are completely closed and touching each other in the middle)

Examples of Failing Door Open & Close Conditions



Vent **Not** Fully Closed
(Note: Doors stop before touching each other, a gap can be seen)



Vent **Not** Fully Open
(Note: Doors stop before moving to a full open position)

When the functional test has completed, the user will be presented with a status indicating success or failure of the test. This indicator only applies to the communications portion of test, not the mechanical function portion. If vent does not open and close fully, vent should be scanned as a failure in the quality system.

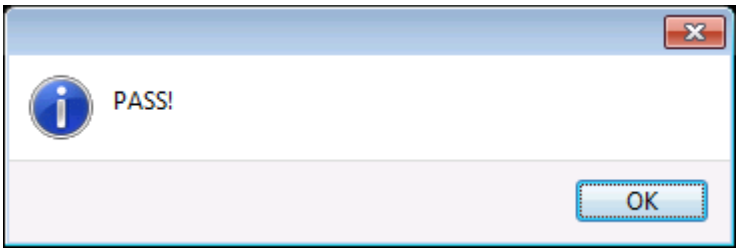


Figure 46

On success, three labels will be printed. Two are identical product labels. These should be affixed to the vent as per the assembly instructions. If a label needs to be reprinted, please follow the instructions in the label printing section. The third is a label for the outside of the pulp packaging, it should be placed in the pulp packaging box and will be affixed later.

Figure 47

Wall Sensor

The wall sensor should be fully assembled as per the assembly instructions prior to functional test. To test this device, select 'Vent Functional Test' from the Ecovent Program + Functional Test application.

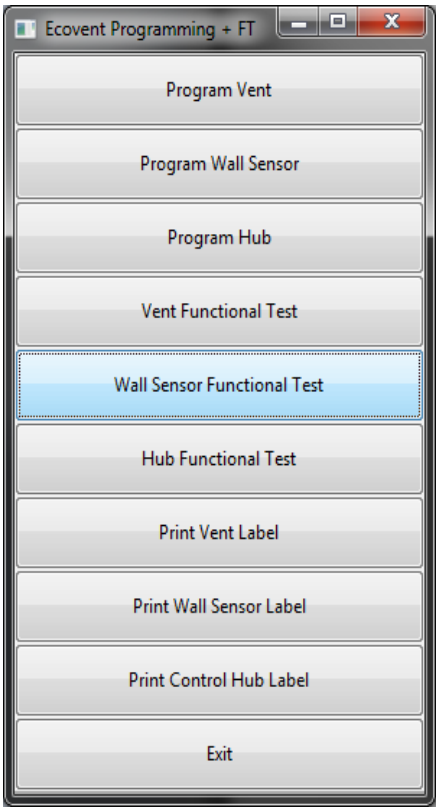


Figure 48

The user will be prompted to first enter the top level serial number; this number should be scanned if possible but can be entered manually if necessary. The user will then be prompted to enter the Sensor Ring PCBA serial number; this number should be scanned if possible but can be entered manually if necessary.

The wall sensor must be plugged into Ecovent provided networked power strip. It will power on automatically when needed by the test station software.

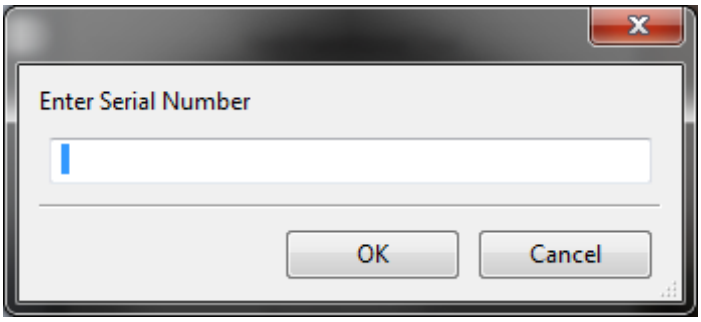


Figure 49

Figure 50

At this point, a database will be queried and if the device has been programmed, the functional test will commence. If the device has not been programmed, an error message will be presented:

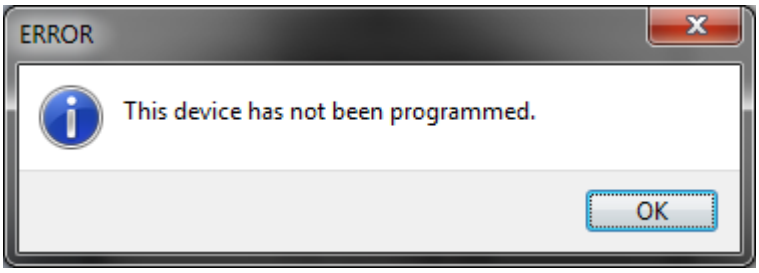


Figure 51

If the device has been programmed, the functional test will start and a progress bar will be presented.

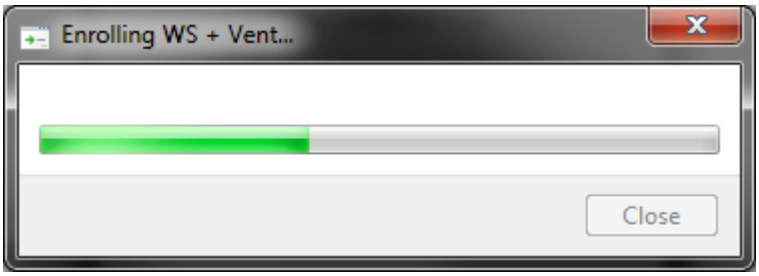


Figure 52

When the functional test has completed, the user will be presented with a status indicating success or failure of the test.

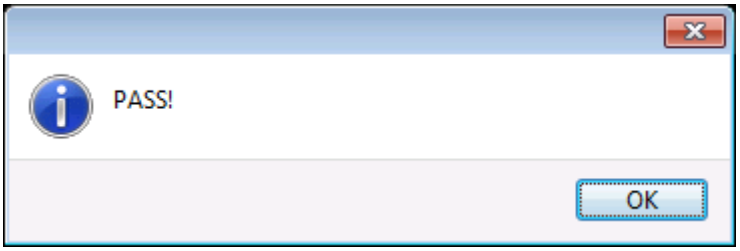


Figure 53

On success, two labels will be printed. The product label (FCC \ ETL) should be affixed to the wall sensor as per the assembly instructions. The pulp label should be attached to device with tape for subsequent application to pulp packaging. If a label needs to be reprinted, please follow the instructions in the label printing section.

Figure 54

Control Hub

The hub can be fully assembled or partially assembled for functional test. Power must be applied to the hub and the hub must be connected via Ethernet to the router that the functional testing workstation is attached to. A KGU Wall Sensor with custom manufacturing image is required for the test.

The KGU Wall Sensor must be plugged into DUT extension cord that is connected to Ecovent networked PDU.

Select the hub functional test from the menu.

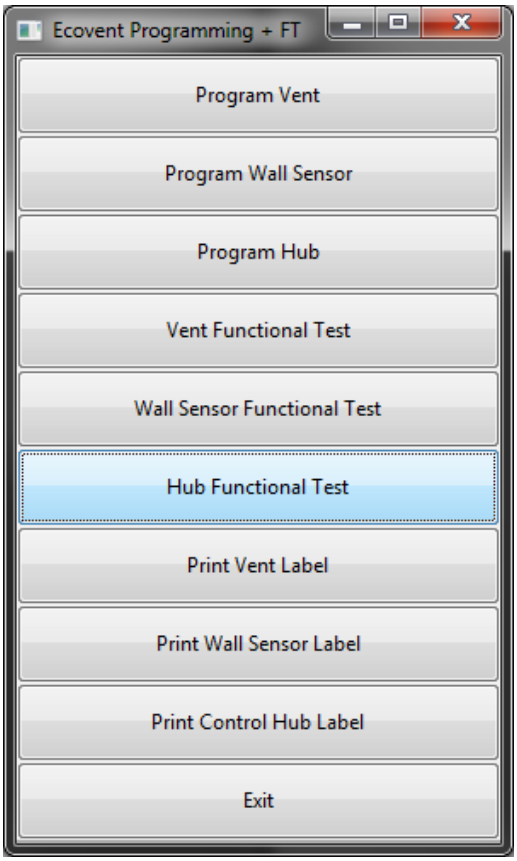


Figure 55

The operator will be prompted for serial number of board.

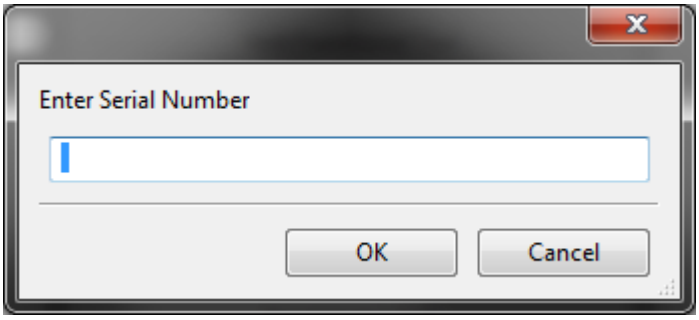


Figure 56

The cloud will be checked to verify that the serial number provided belongs to a board which has previously passes programming.

The control hub functional test requires the presence of a known good wall sensor to confirm proper operation of the radio.

When the control hub is powered up, after about 60 seconds it should blink blue.

After entering the serial number, the test will start.

A progress bar will be presented representing current state of test.

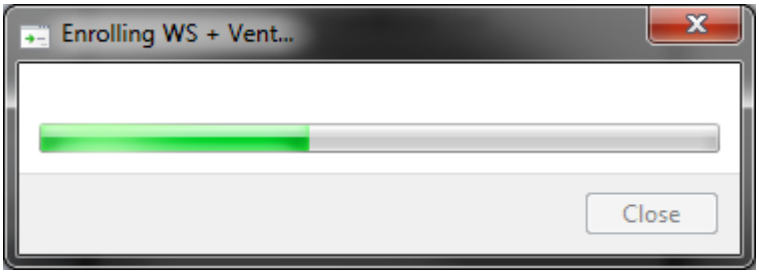


Figure 57

If the test passes, a dialog will be presented indicating such.

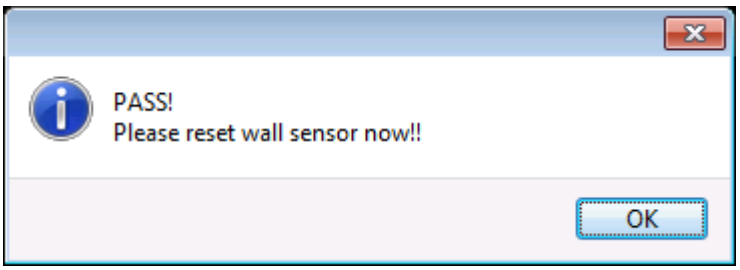


Figure 58

The KGU wall sensor should be reset at the end of the test.

Label Printing

Vent Device Label (FCC/ETL)

The label will automatically be printed at the end of the functional test, however, if a label needs to be re-printed, the user can select the 'Print Vent Label' option from the menu.

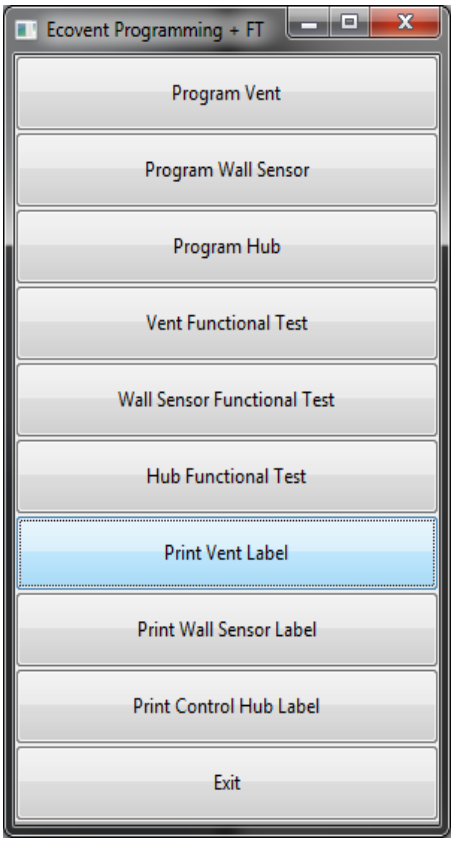


Figure 59

The user will be presented with a dialog box asking for the serial number. The serial number should be scanned if possible, but can be entered manually if necessary.

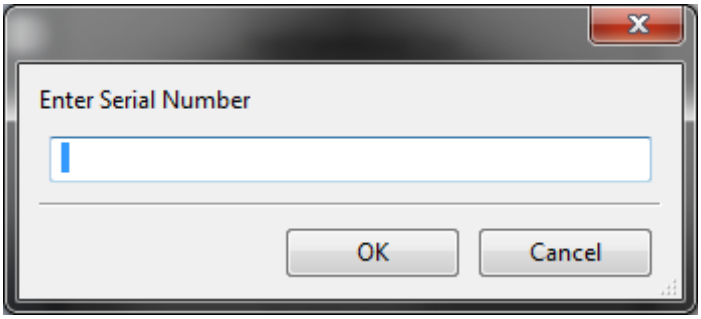


Figure 60

At this point, the database will be queried to confirm that the device serial number provided has been programmed and functionally tested prior. **If not, the print request will fail.**

Figure 61

Wall Sensor Device Label (FCC/ETL)

The label will automatically be printed at the end of the functional test, however, if a label needs to be re-printed, the user can select the 'Print Wall Sensor Label' option from the menu.

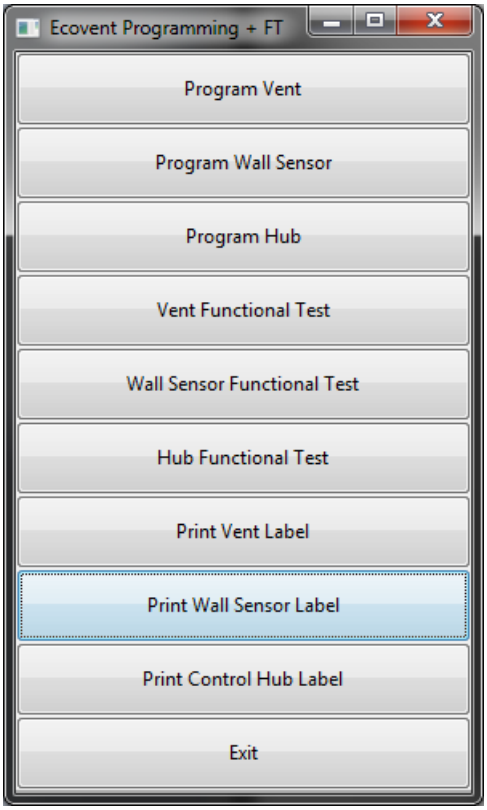


Figure 62

The user will be presented with a dialog box asking for the serial number. The serial number should be scanned if possible, but can be entered manually if necessary.

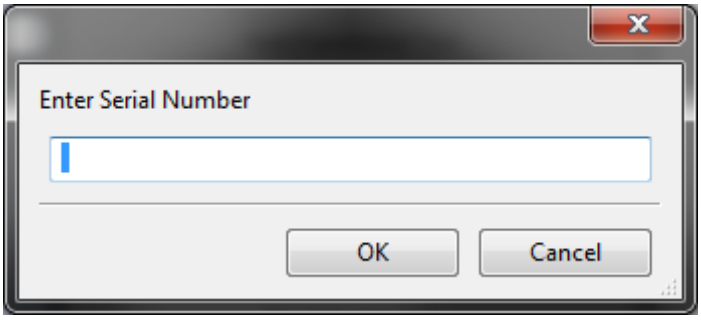


Figure 63

At this point, the database will be queried to confirm that the device serial number provided has been programmed and functionally tested prior. If not, the print request will fail.

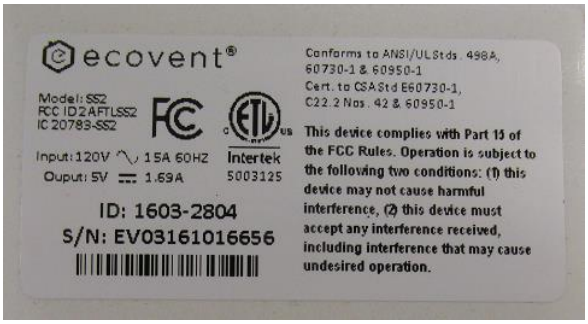


Figure 64

Control Hub Device Label (FCC/ETL)

The label will automatically be printed at the end of the functional test, however, if a label needs to be re-printed, the user can select the 'Print Wall Sensor Label' option from the menu.

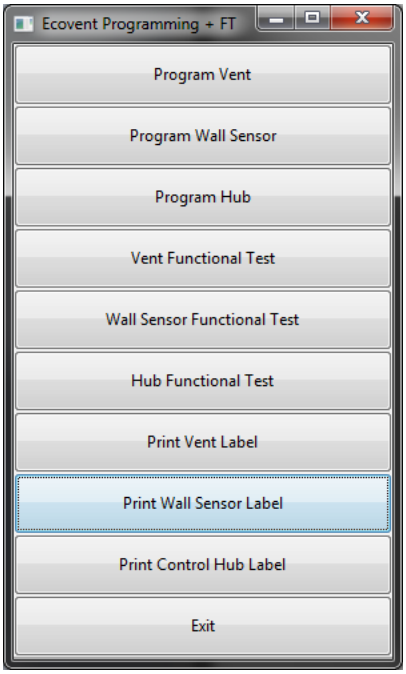


Figure 65

The user will be presented with a dialog box asking for the serial number. The serial number should be scanned if possible, but can be entered manually if necessary.

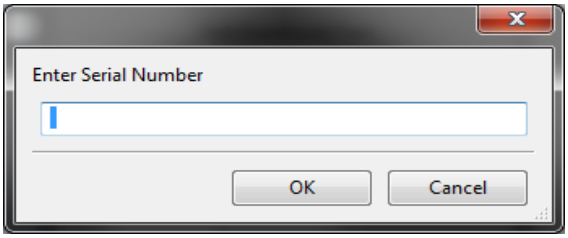


Figure 66

At this point, the database will be queried to confirm that the device serial number provided has been programmed and functionally tested prior. **If not, the print request will fail.**

Figure 67

Pulp Packaging Label (All Devices)

The label will automatically be printed at the end of the functional test. If a label needs to be re-printed, the user can select the 'Print Wall Sensor Label' option from the menu.

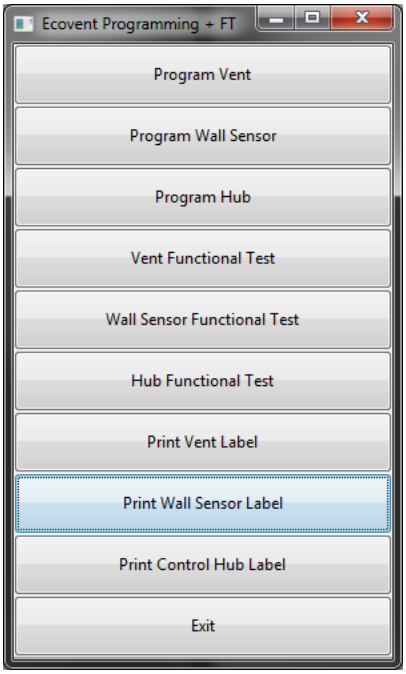


Figure 68

The user will be presented with a dialog box asking for the serial number. The serial number should be scanned if possible, but can be entered manually if necessary.

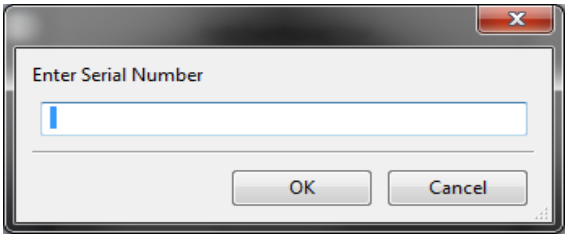


Figure 69

At this point, the database will be queried to confirm that the device serial number provided has been programmed and functionally tested prior. **If not, the print request will fail.** The device type will determined based on the serial number and an appropriate pulp packaging label will be generated for the specific device.

Example Pulp Packaging Labels (device dependent)

ecovent®
CONTROL HUB
PID
EVHUB
SN
EV02160408440
UPC
ecovent®
REGISTER 4 x 10 FLOOR
PID
EV410F
SN
EV03161215621
UPC
ecovent®
ROOM SENSOR
PID
EVSENS
SN
EV03161016656
UPC

Figure 70

Appendix A - Troubleshooting

Control Hub Programming Fails

- USB Programming Cable is Not Attached
- ST Link Programmer Is Not Connected
- Network Cable Is Not Connected
- Serial Number is Invalid
- Cloud Service Cannot Be Reached to Fetch MAC Address
- COM Port Configuration for USB Programming Cable Is Not Correct

Vent or Wall Sensor Programming Fails

- Serial number is invalid.
- Board does not have power.
- Board is not secure in programming fixture.
- Programming \ power cable(s) are not properly connected between programming fixture and computer.
- PCBA is bad.
- Wrong device was selected when programming.

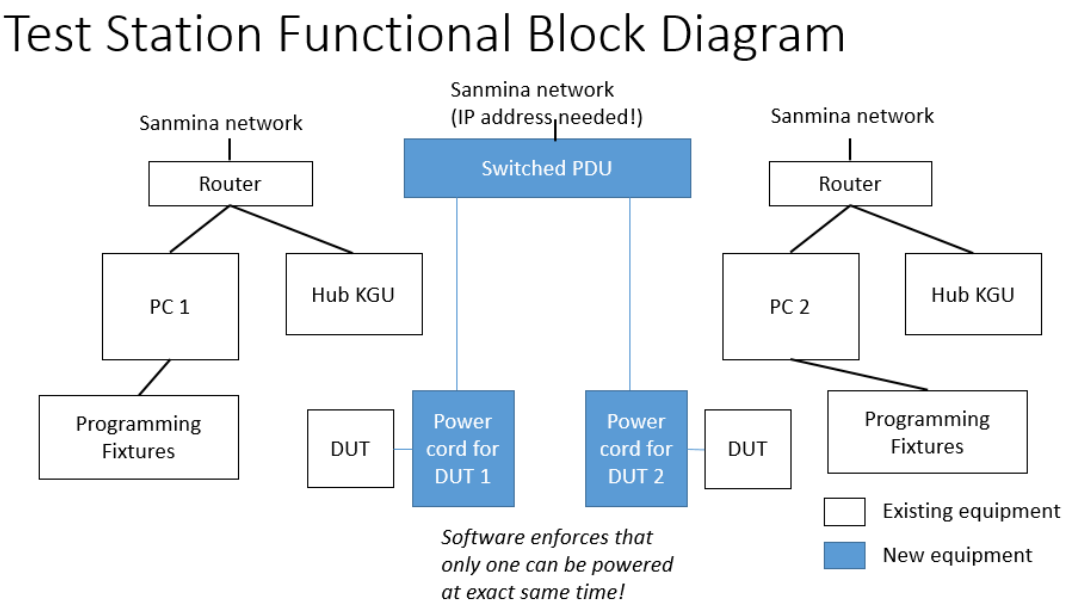
Vent or Wall Sensor Functional Test Fails

- Serial number is invalid.
- Device was not programmed prior to testing.
- All sensors are not attached to PCBA.
- Wall sensor or vent was not reset prior to start of test.
- There is a problem with KGU HUB
- Wrong device was selected when performing functional test.

Label Printing Fails

- Device was not programmed.
- Device was not tested.
- Serial number is invalid.
- Printer is 'OFFLINE' instead of 'ONLINE'
- Printer connection problem.

Appendix B – Network Topology



Appendix C – Simultaneous Test \ Program Matrix

Workstation #1

Workstation #2	Hub Program	Sensor Program	Vent Program	Hub Test	Sensor Test	Vent Test
Hub Program	Yes	Yes	Yes	Yes	Yes	Yes
Sensor Program	Yes	Yes	Yes	Yes	Yes	Yes
Vent Program	Yes	Yes	Yes	Yes	Yes	Yes
Hub Test	Yes	Yes	Yes	Yes	Yes	Yes
Sensor Test	Yes	Yes	Yes	Yes	Yes	Yes
Vent Test	Yes	Yes	Yes	Yes	Yes	Yes

Effective March 15, 2016