



Truflow Operation and Maintenance Manual

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TRUFLOW Maintenance and Operation Manual

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Truflow Maintenance Manual

“SEE WHAT YOU SAVE”

Introduction

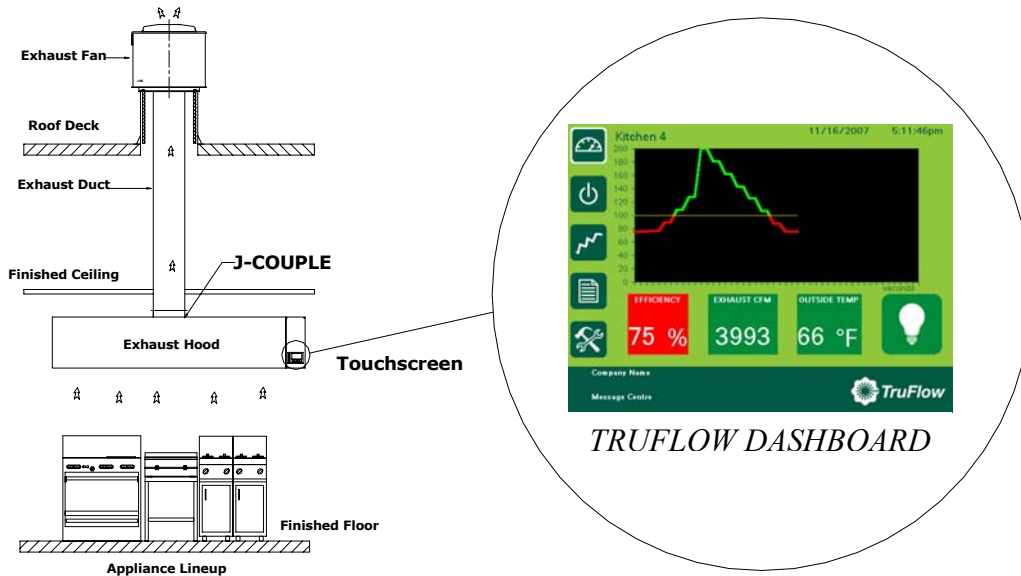
Thank you for purchasing a Spring Air Systems Truflow Energy Controller. Truflow provides precise, real-time measurement allowing you to effectively manage your team to reduce energy use.

Truflow is the most economical and efficient kitchen ventilation energy management system available.

The average commercial kitchen exhaust system operates at 100% capacity for 12 to 18 hours per day, blowing thousands of wasted energy dollars out the roof!

Truflow measures heat from the appliances and automatically adjusts fan speeds throughout the day, giving you the precise amount of exhaust at all times.

Truflow monitors ventilation system efficiency relative to your utility costs, in real-time, so that you can manage your kitchen to take advantage of off peak times by turning down appliances. Setting an energy reduction goal reduces your utility costs even more!



*TRUFLOW Kitchen
Figure 1*

You have the ability to increase the exhaust volume to 100% at any time. Because you control it, overrides are kept to a minimum to maximize energy efficiency. The override system runs for an adjustable timed period of 15 minutes and can be activated at the hood or via a remote control.

Truflow not only saves you money on energy expenses it can also help extend the life of your equipment by demanding exhaust only when it is really required. Truflow can be specified on new hoods or can be retrofitted on your existing hoods. Since the panel can be hood mounted or wall mounted, it allows you many convenient options of where to locate the panel and wireless remote unit. Truflow is Internet accessible, so it is ideal for multi-unit management.

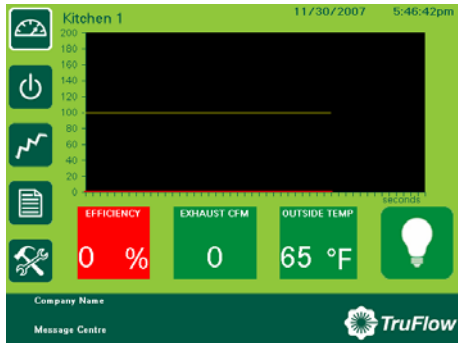
The TRUFLOW system reduces the amount of air exhausted from the kitchen to match the amount of cooking. As more appliances are used, the exhaust and supply volume increase, as less appliances are used the exhaust and supply volume decreases.

Quick Start

Prior to Quick Start:

1. The commercial kitchen hood(s) exhaust fan(s), and supply fan(s) have been installed in accordance with all applicable national and local codes.
2. The interconnection wiring and cables have been completed in accordance with all applicable national and local codes.
3. The commercial kitchen surface fire suppression system has been installed per NFPA code and tagged.
4. An authorized Spring Air Systems Inc. service technician has been to site to provide a factory startup service and tagged the panel.
5. The circuit breaker is on and providing 120V/1/60 power to the panel.

One Kitchen Operation:



Truflow dashboard powered on with one kitchen connected to Truflow panel.



Press the icon on the left to turn on the canopy lights



Press the System Control icon to change to the Power screen.



Press the Hand icon to manually operate the kitchen on/off operation



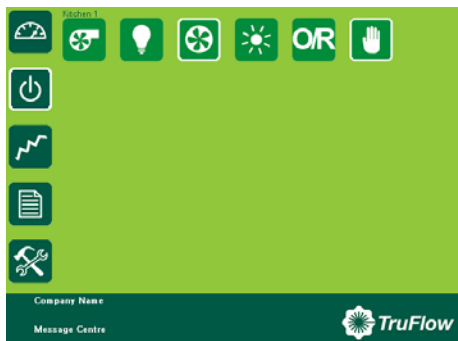
The Hand icon should have a white border while activated. If it does not, press the Hand icon again.



Press the Kitchen Start icon.



The Kitchen Start icon has a white border while the kitchen is operating.



Press the summer/winter switch depending on the time of year.



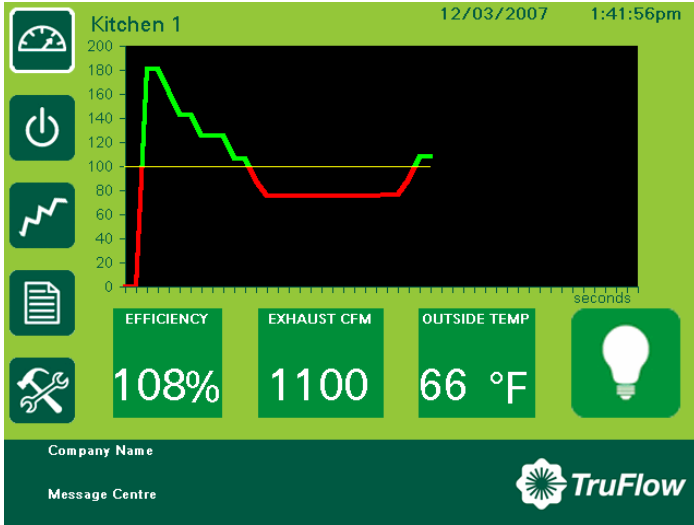
Summer



Winter

The Truflow will automatically change to the Dashboard display. The kitchen is now operational.

Let's take a closer look at the DASHBOARD for Kitchen 1




Kitchen 1 This is the Kitchen1 DASHBOARD, displaying the Kitchen 1 operational parameters. The Kitchen 1 name can be changed through the setup screen with a password.


EFFICIENCY
108% The **Efficiency vs. Seconds** DASHBOARD graph indicates kitchen operation is green and 108% efficiency. Kitchen1 is 8% over the targeted energy savings.


EXHAUST CFM
1100 The exhaust fan volume is 1100CFM at 108% efficiency.


OUTSIDE TEMP
66 °F The outside temperature is 66F.


 is a white border around the


The canopy lights are off. When the canopy lights are on there Light icon.

 **EFFICIENCY**
108% To override the Truflow press the Efficiency button. An Efficiency button crossed out will appear and the Kitchen1 operation will drive to 100% exhaust. The override time is adjustable from the O/R button on the Power screen.

 Press this button to switch to System Control screen.

 Press this button to switch to Error Status screen.

 Press this button to switch to Report screen.

 Press this button to switch to Setup Screen. This screen is accessible only with a password.

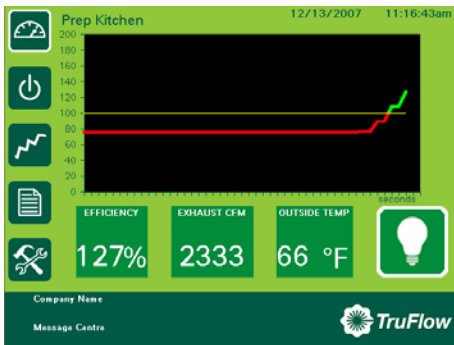
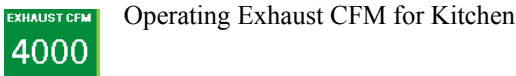
Company Name
Message Centre The Company Name and Message Center are accessible from the Setup Screen with a password.

12/03/2007 **1:41:56pm** The date and time of day are displayed at the top right of the DASHBOARD screen. Both the date and time are adjustable from the setup screen with a password.

Multiple Kitchen Operation



The DASHBOARD for a multiple kitchen Truflow displays the Kitchen Name, Efficiency, Exhaust CFM and the Canopy light switch for each kitchen connected to the Truflow. The example dashboard to the left has three kitchens connected to the Truflow.



Pressing the Kitchen Name, Efficiency or Exhaust CFM button for any Kitchen displayed changes the screen display to the Individual Efficiency graph of the specific kitchen. The Efficiency button for Kitchen3 was pressed from the DASHBOARD screen to display the screen shown on the left.



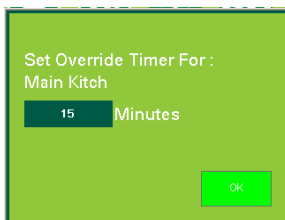
Press the System Control button to change to the Power screen.

For a description of the functions for each button for each kitchen see the ONE KITCHEN OPERATION above. The button functions are identical to the ONE KITCHEN OPERATION for each extra Kitchen.

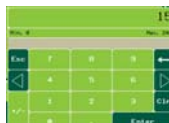
Adjusting the Override Time:



From the Power screen press the O/R button and the Override timer screen will appear.



Press the 15 box and the Truflow numerical keyboard appears.



Type the new Override value and press Enter to save.

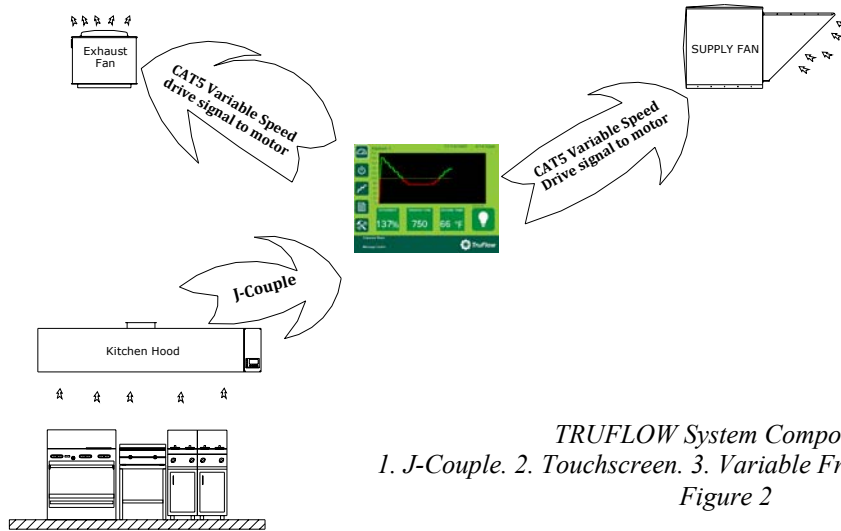


Press the OK button to return to Power screen

What is TRUFLOW?

The TRUFLOW Energy Management Controller has been designed to change kitchen exhaust forever. TRUFLOW will automatically reduce the exhaust and supply air into the kitchen whenever appliances are not used at full capacity. When the appliances are not used and the heat is turned down or off TRUFLOW automatically senses the reduction and decreases the amount of exhaust and supply to match exactly what is happening under the exhaust hood. The TRUFLOW duct mounted J-Couple monitors the exhaust temperature, which fluctuates based on the amount of appliances operating under the exhaust hood. As the amount of cooking increases the exhaust duct temperature rises and reaches an equilibrium temperature during each hour of the day. TRUFLOW automatically modulates the exhaust and supply to suit the actual cooking operation at any given time during the cooking day.

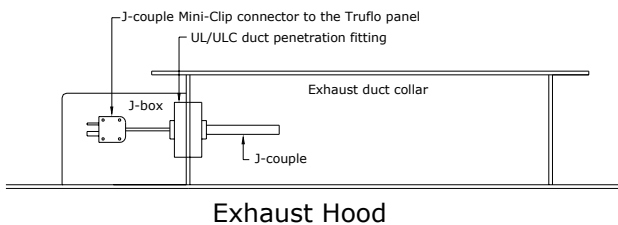
The Truflow System Components:



TRUFLOW System Components
 1. J-Couple. 2. Touchscreen. 3. Variable Frequency Drive (VFD)
 Figure 2

What is the J-Couple?

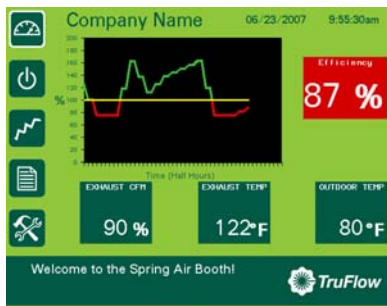
The J-couple is mounted in the center of each exhaust hood duct collar. The J-couple threads into a UL/ULC listed hood penetration fitting. The J-couple wiring is terminated in a factory supplied J-Box. Each hood duct collar connected to an exhaust fan connected to Truflow has a J-couple. The J-Couples are wired in series, connected together with factory supplied Mini-clips from the last duct collar to the Truflow panel.



J-Couple hood duct collar mounting
 Figure 3

What is the Touchscreen?

a. Dashboard



The Touchscreen is the heart of the Truflow, integrating the J-Couples and VSD to provide a complete commercial kitchen Energy Management Controller. The Touchscreen includes five functional screens: Dashboard, System Control, Alarm Status, Reports and Setup & Diagnostics.

Press the Dashboard icon to view the Dashboard. The Dashboard includes a graph that represents the energy use throughout the day. The graph provides energy consumption measured against a reduction goal. The Dashboard tells the kitchen staff whether the system is exceeding the goal or not.

EFFICIENCY, Exhaust CFM, outdoor temperature is also displayed. The outdoor temperature measurement allows for real-time energy savings reports directly from TruFlow!

b. System Control



The System Control displays components of all exhaust systems controlled by TruFlow including Hood lights, Fan on/off switch, Summer/winter switch, and Override timer.

c. Alarm Status

Message	Date	Time	State	ACK
High Exhaust Temp	06/23/2007	10:00:00	Active	
High Exhaust Temp	06/23/2007	10:00:00	Active	
High Exhaust Temp	06/23/2007	10:00:00	Active	
High Exhaust Temp	06/23/2007	10:00:00	Active	
High Exhaust Temp	06/23/2007	10:00:00	Active	
High Exhaust Temp	06/23/2007	10:00:00	Active	
High Exhaust Temp	06/23/2007	10:00:00	Active	
High Exhaust Temp	06/23/2007	10:00:00	Active	
High Exhaust Temp	06/23/2007	10:00:00	Active	
High Exhaust Temp	06/23/2007	10:00:00	Active	



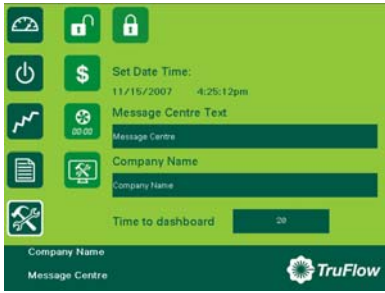
The Alarm conditions are displayed for all systems controlled by TruFlow. Touch the single bell icon to clear selected alarm. Touch multi-bell icon to clear all alarms. This action does not FIX the problem, it simply records that an alarm or alarms have been acknowledged. A Service Company must still be called!

e. Reports



TruFlow can record a full year of data. The standard reports provided are seen on the Report screen. % Time Exceeding Goal is the key energy management report.

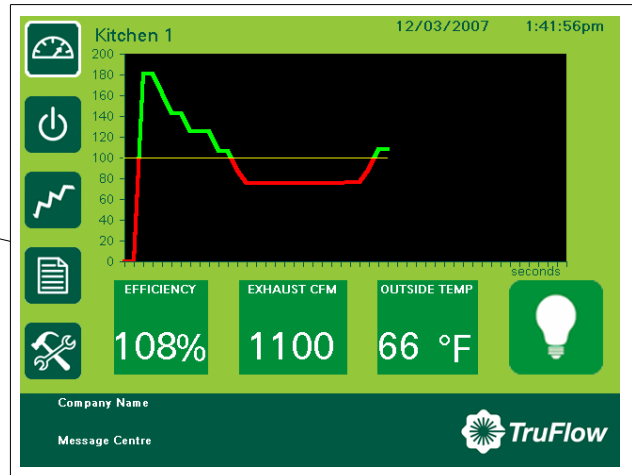
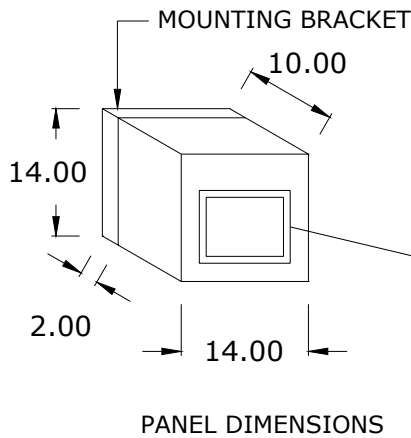
f. Setup & Diagnostics



The main system setup display allows entry of reduction goal, primary message center text, and company or restaurant name.

The power of TruFlow lies in the setting of an energy reduction goal. The goal represents a target % reduction of past utility costs (hourly or monthly rate). **Goal can be reset at any time to maximize energy efficiency and savings!**

Gas and electricity costs can be entered at any time as monthly or hourly rates. Truflow can measure gas in joules or therms by selecting Imperial or Metric Units. The User may set daily or weekly operating times. The Diagnostics screen provides a comprehensive service screen to quickly diagnose problems. The screen can be accessed via Internet for remote service by Spring Air directly or Authorized Service Technician.

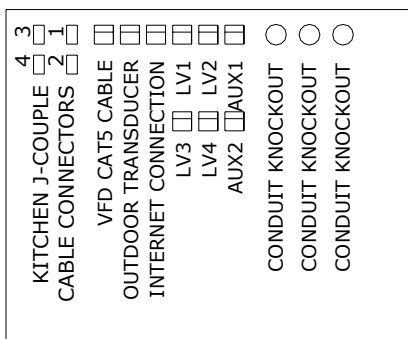


Touchscreen Wall Mounted Panel
Figure 4

TOUCHSCREEN

Touchscreen Panel Top Knockouts list from left to right.

TOP OF TOUCHSCREEN PANEL



Knockouts at top of Touchscreen Panel
Figure 5

- Kitchen 1 J-Couple female plug.
- Kitchen 2 J-Couple female plug.
- Kitchen 2 J-Couple female plug.
- Kitchen 2 J-Couple female plug.
- VFD CAT5 plug for all drives.
- Outdoor Temperature Transducer supplied by Spring Air installed by contractor.
- Optional Internet connection.
- LV1 – Optional CAT5 to 1st KES
- LV2 - Optional CAT5 to 1st KES
- LV1 – Optional CAT5 to 1st KES
- LV2 - Optional CAT5 to 1st KES
- LV3 – Optional CAT5 to 2nd KES
- LV4 - Optional CAT5 to 2nd KES
- AUX1 – Optional CAT5 to water wash panel
- AUX2 – Optional CAT5 to SAT to SFT makeup air

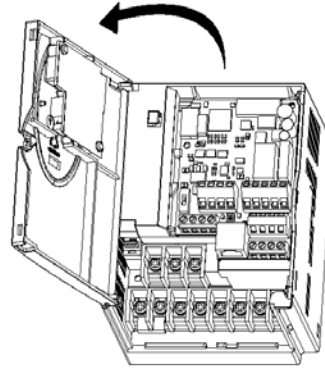
What is Variable Frequency Drives (VFD)?

The variable speed drives for the exhaust and/or supply fan can be located in a stainless steel enclosure adjacent to the Touchscreen panel or anywhere else in the building.

- When the makeup air unit is direct gas fire (like the Spring Air Systems SAT unit) the supply drive can be located in the makeup air unit control panel or with the exhaust fan drive(s) in a separate enclosure. (SV Type)
- When the make up air unit is indirect gas fired (like the Spring Air SFT unit) the supply drive is not required. The Touchscreen panel sends a 4-20milliamp signal through a CAT5 cable to the makeup air unit modulating bypass damper. (SC Type)

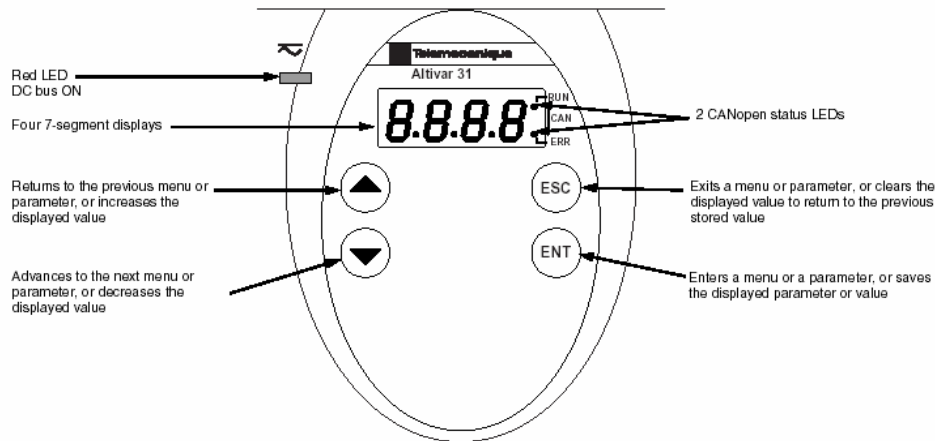


VSD front
Figure 6

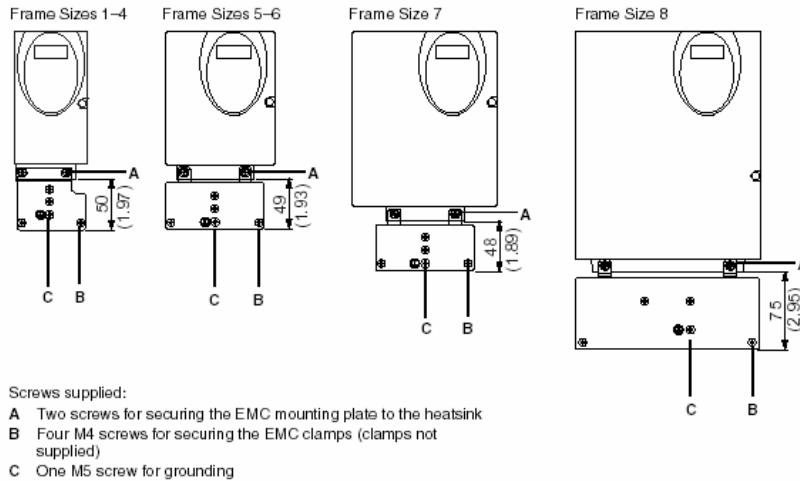


VSD open front
Figure 7

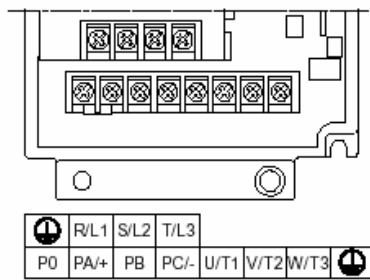
A CAT5 cable is connected to each drive in series from the Touchscreen panel. The first cable connects from the Touchscreen to the first drive “Y” connector. The 2nd drive cable connects from the first drive “Y” connector to the 2nd drive “Y” connector. Each drive is connected in series. When the Touchscreen is initially activated the communication software starts all the exhaust and/or supply drives at 100% capacity for 20 seconds for each kitchen. After the initial 20 seconds, the exhaust and/or supply drives ramp up and down depending on the signal from the J-couple(s). As the exhaust volume increases and decreases the supply volume increases and decreases in unison to maximize energy savings. The supply unit motorized damper end switch can also be interlocked to the Touchscreen such that the end switch must close to start the supply fan drive operation. The drive changes the AC frequency to the exhaust motor between 18Hz and 60Hz.



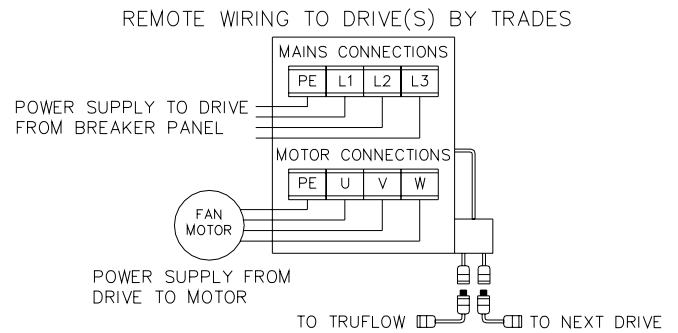
VSD front display
Figure 8



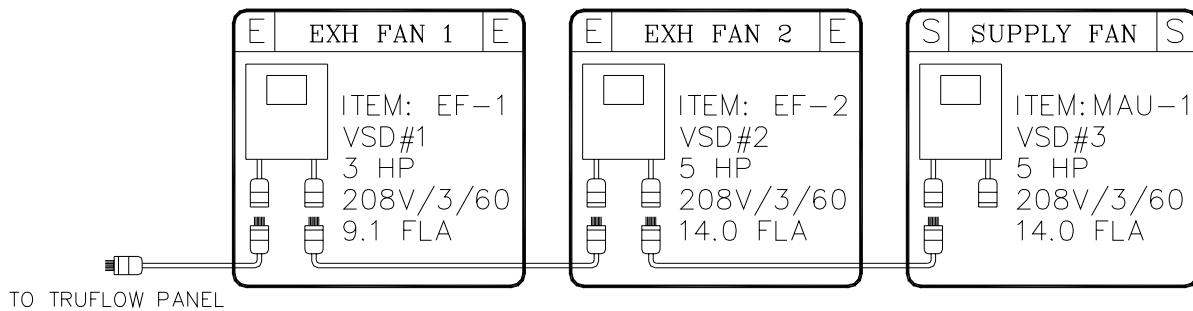
VSD frame sizes and EMC mounting plate
 Figure 9



VSD terminal locations
 Figure 10



Remote wiring to VSD
 Figure 11



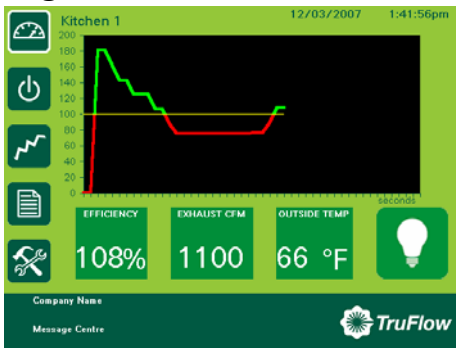
Multiple VSD control connections
 Figure 12

The figure 13 indicates where the three-phase power supply from the breaker panel connects to terminals R/L1, S/L2 and T/L3 on the drive. The three-phase power from the variable speed drive to the motor connects to terminals U/T1, V/T2, and W/T3.

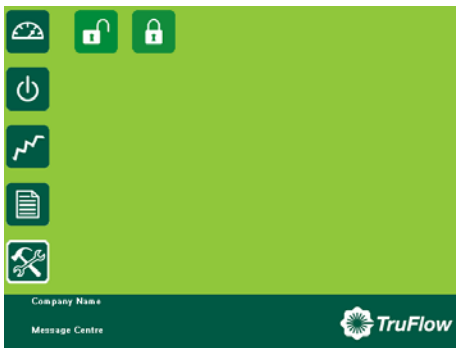
The lowest possible exhaust volume is 30% of the maximum to meet the existing code and ensure that the products of combustion are always adequately exhausted. At 30% exhaust the drive is operating at 18HZ.

User Setup

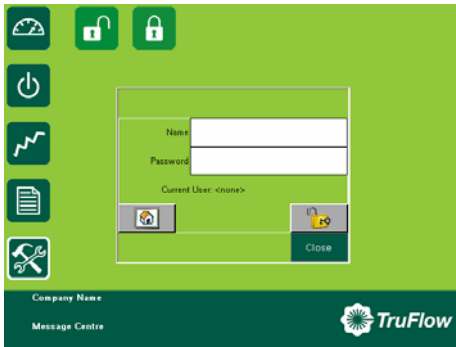
Login



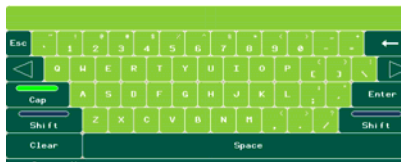
From the DASHBOARD screen press the Setup icon.



Press the Login icon.

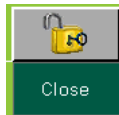
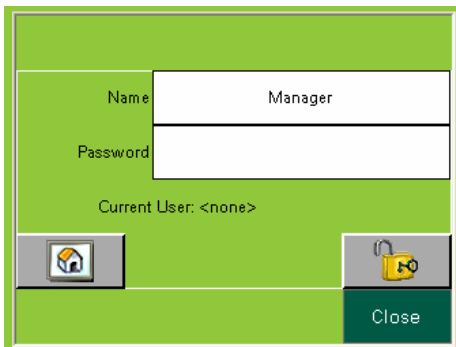


Press the text box beside Name.



A typewriter pad appears. Enter the login name. The login name is case sensitive. The CAPS key is on

automatically. If you do not know your login name and password call Spring Air Systems. After the login Name is complete press the Enter key. The screen will return to the Login screen.



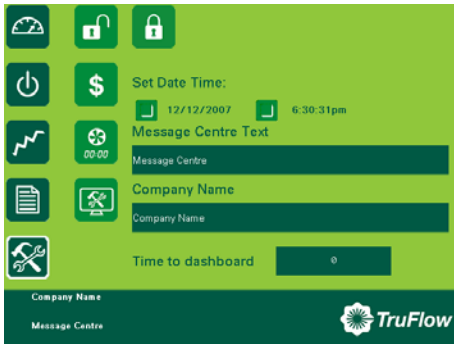
Press the UNLOCK icon. Press the word Close to close the login box. You have completed the login.

Logout

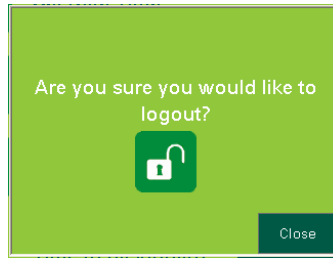
After you have completed the user setup, ensure that you logout of the setup so that your setup entries are saved and cannot be changed accidentally by the kitchen staff.



Press the Setup screen button.

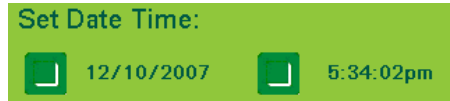
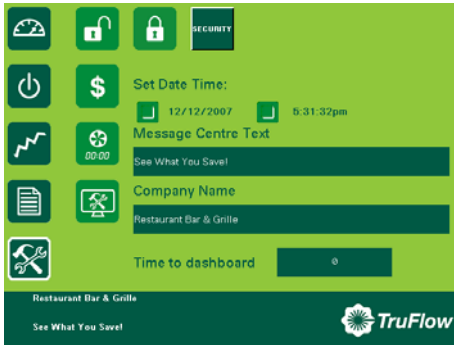


Press the lock.



Press the lock again. You are now logged out. Once you have logged out there is no longer access to any setup screen. All settings are saved until you login again and change them.

User Setup Screen Overview



Press to set Date and Time on DASHBOARD



Press to setup annual energy savings goals for Truflow Kitchen Operation



Press to setup automatic Kitchen open and closed operating times.



Press to change message on bottom of DASHBOARD screen.



Press to change company name on top of DASHBOARD screen.



Press to change the time before Truflow switches from any screen back to DASHBOARD screen.



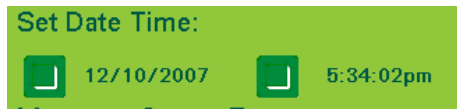
Press Security button to add or remove users and their passwords.




Press Setup icon to view current drive information.

User Setup Screen Button Functions

Setting Date and Time



 Press the box beside the date and time to change the date and time. A popup screen appears. Enter the new date and/or time.

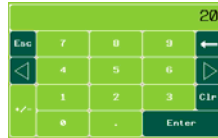
Energy Goal Reduction Setup



Press the dollar icon and the Goal Reduction Screen appears.



Press the Reduction Goal box to select a goal reduction for the Kitchen operated by the Truflow panel.



A Reduction Goal keyboard appears. Enter the Reduction Goal by touching the keypad and press the Enter button.



Gas Cost: Press the Gas Cost box and enter the cost of energy for the kitchen based on \$/thm (\$/1,000,000 Btu's) using the pop up key board.



A Gas Cost keyboard appears. Enter the Gas cost by touching the keypad and press the Enter button.



Electricity Cost:

Press the Electricity Cost box and enter the cost of electricity for the kitchen based \$/KWH using the pop up key board.



An Electricity Cost keyboard appears. Enter the Electricity cost by touching the keypad and press the Enter button



Demand Electricity Cost: If the commercial kitchen operation pays extra for electricity during peak periods of the day select the Demand Electrical button.



Enter the higher electrical rate at peak periods in the Demand Electricity cost box. Press the 0.00 in the box and a Demand Electrical Cost keyboard appears. Enter Demand Electrical cost by touching the keypad and press the Enter button

Demand Electricity Cost:



Enter of the time of day the Peak electrical rate starts.



Enter the time of day the Peak electrical rate ends

For calculation of the energy cost select whether the kitchen is air conditioned with DX or chilled water cooling. The cost of cooling the fresh air into the kitchen will be added to the kitchen energy during the summer months.



DX Cooling Option:

No DX or chilled water cooling of kitchen fresh air.



Press the Button when there is DX or Chilled Water cooling of kitchen fresh air.



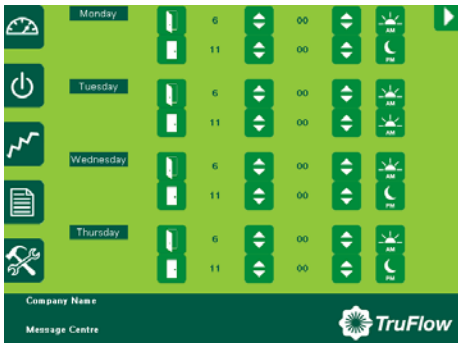
Press the Setup button again to return to the primary set up screen

Time to Dashboard:



Press the 20 in the Time to dashboard box to select the number of seconds before the Truflow switches back to the DASHBOARD screen. If you want the Truflow to remain on the last screen viewed set the number to 0.

Setting the automatic Opening and Closing Times:



Select the time for the kitchen exhaust system to start for Monday through Sunday.



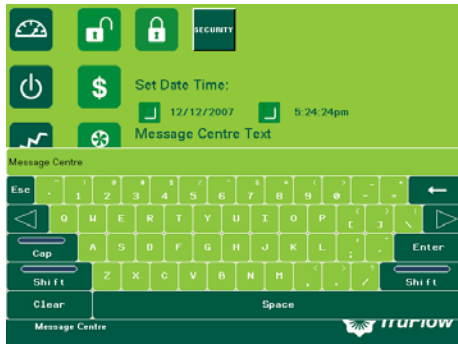
Select the time for the kitchen exhaust system to stop for Monday through Sunday.



Press the next page button to set Friday, Saturday and Sunday.

If the Kitchen does not operate on a specific day, make the start and stop time the same on that day and the kitchen exhaust system will not operate that day.

Entering the Message Center Text:

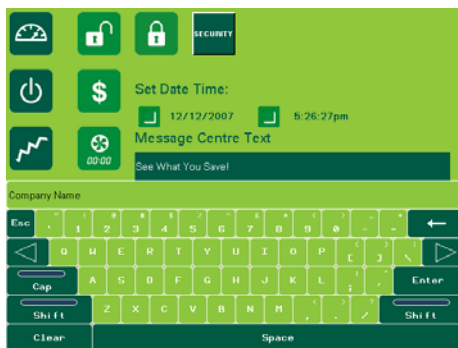


Message Centre Text

Message Centre

Press the words Message Center to open the Message Center Text keyboard. Using this keyboard, enter the daily message for the kitchen staff. When you have completed the message press Enter.

Entering the Company Name:

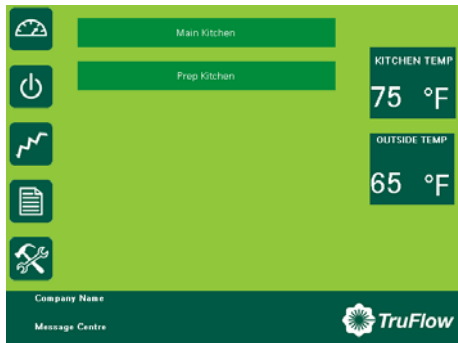


Company Name

Company Name

Press the words Company Name to open the Company Name Text keyboard. Using this keyboard enter a kitchen or restaurant name. This is important if the Truflow will be accessed through the Internet. This name will help distinguish one Truflow panel from another run by the same organization. When you have completed the kitchen or restaurant name press Enter

Secondary Setup Button



Press the Secondary Setup button to view the kitchen room temperature, the outdoor air temperature and the number of kitchens connected to the Truflow. The Truflow on the left has two kitchen connected, one called Main and the other called Prep.

Main Kitchen

Press the Main Kitchen bar to view all fan drives connected to the main kitchen.

Prep Kitchen

Press the Prep Kitchen bar to view all fan drives connected to the prep kitchen fan drives.

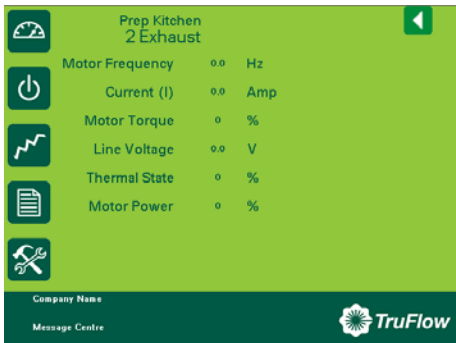
Viewing Drive Parameters



After pressing the Main Kitchen and/or Prep Kitchen bar the drive parameters can be viewed for that specific kitchen.

The user can not change any parameters. The user can view Motor Frequency, Current, Motor Torque, Line Voltage, Thermal State, and Motor Power.

In the example on the left the Prep Kitchen has two exhaust fans. Exhaust is first exhaust fan parameters.



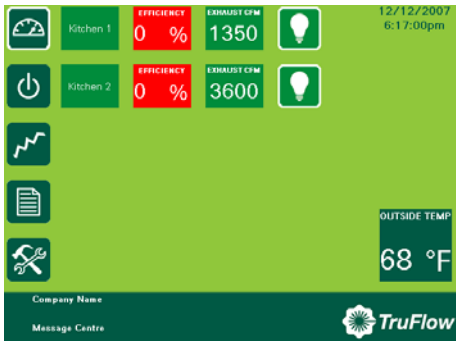
Press the Right Arrow icon at the top right of the screen to view the second exhaust fan parameters. (2Exhaust)



Press the Left Arrow key once to return to the first exhaust fan parameters.

Press the Left Arrow key again to return to the Secondary Setup Screen.

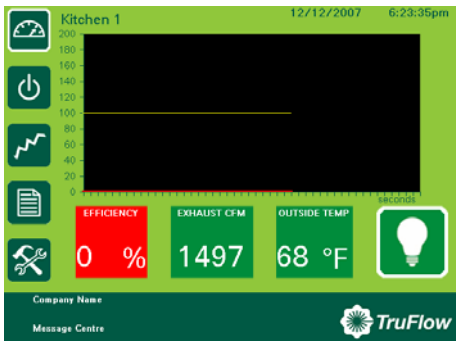
Changing the Kitchen Names:



User must first Login to the Truflow. On this Truflow there are two kitchens operating: Kitchen 1 and Kitchen 2.

Press the Kitchen 1 box to change the screen to the efficiency graph screen.

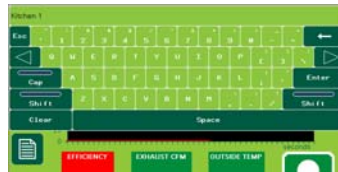
Kitchen 1 efficiency graph screen



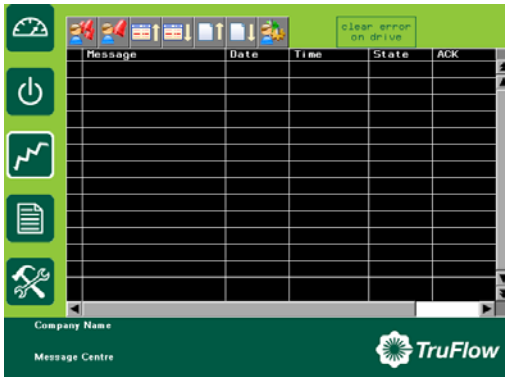
Press the Kitchen 1 word at the top left of the screen



The Truflow keyboard appears. Type the name of the kitchen using up to 10 characters. Press the enter key when you are done. Return to the DASHBOARD and press the Kitchen 2 box to change the screen to the Kitchen 2 efficiency graph. Repeat as above.



THE DIAGNOSTIC SCREEN



From the DASHBOARD press the Diagnostic button. The Diagnostic screen includes a record of all faults during the operation of the Truflow.



Acknowledge All Faults button



Acknowledge Fault button



Scroll Up one line



Scroll Down one line



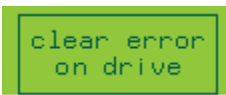
Scroll Up one page



Scroll Down one page



Run diagnostic script when available.



Clear Com or Comport error.

Errors



When an error occurs the screen will change to red with a yellow exclamation mark.

Touch the screen anywhere and the diagnostic screen appears. The screen displays the latest error message including the date, time, state and whether the error has been acknowledged. Most errors are self explanatory.



Press this button for additional explanation. When available, a popup screen appears with additional information.

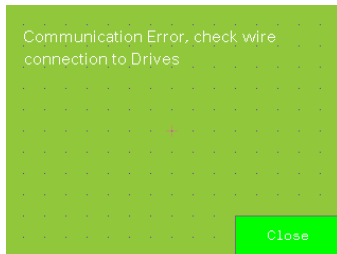
Whenever there is a COMM PORT or COMM error or fault, the Clear Error On Drive button must be pressed after the fault has been corrected to resume normal operation.

Common Truflow Error (fault) Messages

- a) Drive(x) Motor Overload/Over-speed fault. Motor overload setting incorrect or RPM too high.
- b) Drive(x) Exhaust over-current fault. Running motor amp too high.
- c) Drive(x) Impending Short Circuit. Possible dead short at fan(x) motor soon.
- d) Drive(x) Motor short circuit fault to earth. Dead short at fan(x) motor
- e) Drive(x) Line supply over-voltage fault. Input voltage source to drive too high.
- f) Drive(x) Line under-voltage fault. Input voltage source to drive too low.
- g) Drive(x) Supply phase loss fault. Input voltage source to drive has lost a phase.
- h) Drive(x) Drive over-heating fault. Drive(x) is overheating. Shut off fan.
- i) Drive(x) Internal Fault. Drive(x) has internal fault that will not allow drive(x) to operate from Touchscreen panel.
- j) Drive(x) MODbus Communication fault. Drive(x) connected to the Truflow is not communicating with Truflow.
- k) Drive(x) External Fault. Drive(x) is faulty.
- l) Drive(x) Brake control fault. Possible exhaust fan problem.
- m) Drive(x) Drive voltage disabled. Not input voltage source to Drive(x).
- n) Drive(x) Drive configuration invalid. Drive(x) has lost factory drive configuration.
- o) Surface Fire. The surface fire suppression system has activated.
- p) COMM(x) Fault: Drive(x) has no communication. Drive(x) CAT5 is probably not connected to Truflow.
- q) COMM2 Port Error: The CAT5 to all drives is not connected to the Truflow.
- r) J-Couple Cable Trouble: The J-couples are not connected to the Truflow.

Drive Faults and Errors:

- a) Drive in SLF state: Drive(x) is not communicating with the Truflow.
- b) Drive in NST state: Drive(x) is communicating but no information is being sent by Truflow.

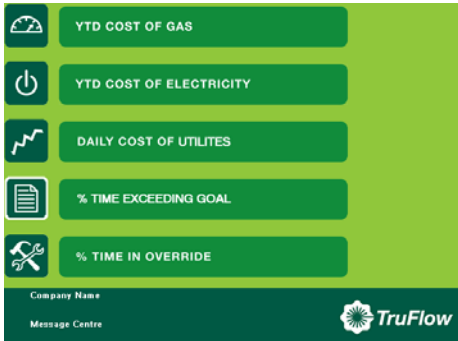


Typical fault displayed on diagnostic screen after MODbus, Comm Port or Comm fault.



Typical fault displayed on DASHBOARD screen after surface fire suppression activates.

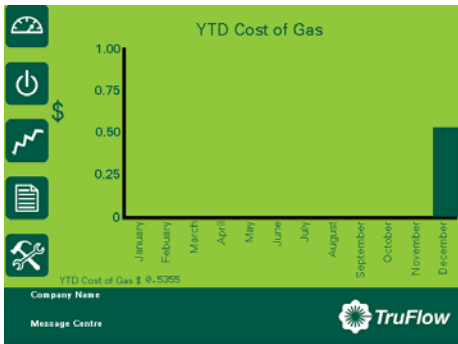
The Report Screen



From the DASHBOARD press the Report button.

The reports available are listed on the screen. Press any bar to view the reports named.

YTD Cost of Gas

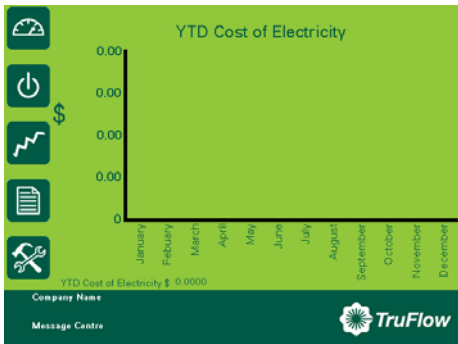


The YTD Cost of Gas report is a chart of the cost of gas in dollars vs. the month of the year for all kitchens connected to Truflow. The first month of the year is the month the Truflow was commissioned. The cost of gas includes the cost to heat the kitchen makeup air unit that is replacing the kitchen exhaust during winter operation.

YTD Cost of Gas \$ 0.5945

The yearly accumulative gas cost is shown just above the Company Name on the lower left side of the chart.

YTD Cost of Electricity

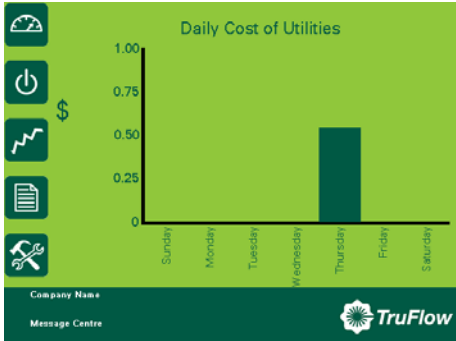


The YTD Cost of Electricity report is a chart of the cost of electricity in dollars vs. the month of the year for all kitchens connected to Truflow. The first month of the year is the month the Truflow was commissioned. The electricity cost includes the cost to run any motor connected to the Truflow and the cost to air condition the kitchen during the summer from a DX or chilled water makeup air unit.

YTD Cost of Electricity \$ 0.0000

The yearly accumulative electrical cost is shown just above the Company Name on the lower left side of the chart.

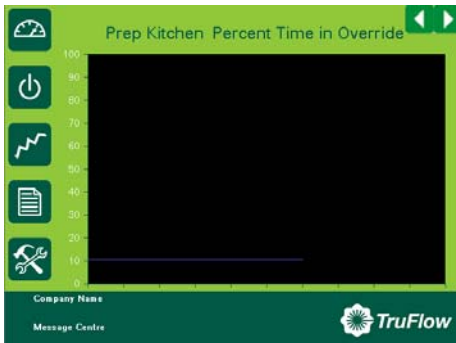
Daily Cost of Utilities



DAILY COST OF UTILITES

The Daily Cost of Utilities report is a chart of the daily cost of gas and electricity in dollars vs. the day of the week for all kitchens connected to Truflow. The first day of the week is the day the Truflow was commissioned. The electricity cost includes the cost to run any motor connected to the Truflow and the cost to air condition the kitchen during the summer from a DX or chilled water makeup air unit. The cost of gas includes the cost to heat the kitchen makeup air unit that is replacing the kitchen exhaust during winter operation.

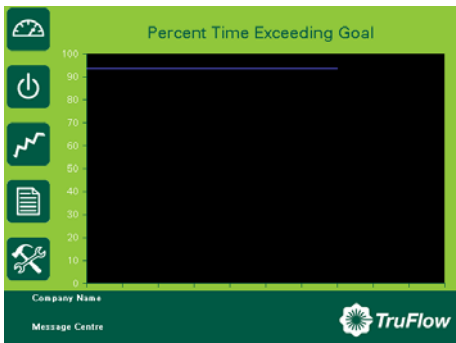
% Time in Override



% TIME IN OVERRIDE

The % Time in Override graph plots the percentage of time in override vs. the total time of operation. If the percentage time in override exceeds 20% call an authorized Spring Air Systems service technician to adjust the Truflow Override Sensitivity range with the Truflow.

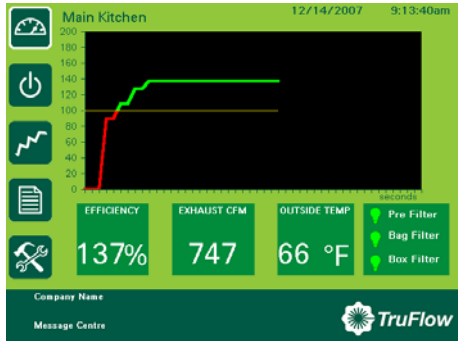
% Time Exceeding Goal



% TIME EXCEEDING GOAL

The % Time Exceeding goal graph plots the percentage of time you have exceeded your goal vs. the total time of operation. If the value is above zero you are exceeding your annual goal reduction.

KES Users Screens (Optional)

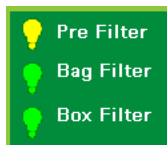
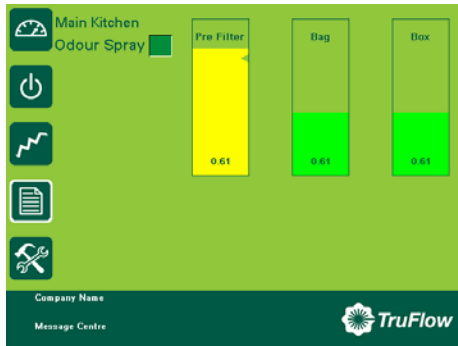


When a Spring Air Systems commercial kitchen Enviro (KES) unit is installed in the exhaust ductwork in conjunction with the kitchen exhaust hoods the DASHBOARD incorporates a Pre Filter, Bag Filter and Box

Filter status button. The KES unit is designed to remove grease and particulates from the kitchen exhaust air in accordance to the UL1978 standard for commercial kitchen exhaust. The grease and particulates are removed with three particulate filters located in the KES unit. These filters will clog with particulate and grease and must be replaced from time to time. The Enviro Status button informs the user the

condition of each of the three filters. Green indicates the filter is OK. Yellow indicates the filter is nearing the end of the filters useful life and will require replacing shortly. Red indicates the filter is about to clog and must be replaced as soon as possible.

Filter Annunciation:



Press the Enviro Status button on the DASHBOARD and the Enviro Status screen appears.

The first bar indicates the amount of the Pre Filter that has been used. The yellow area is the used portion of the Pre Filter and the green area above the yellow area is the portion left. In this case the Pre Filter has about 20% usage left. The 0.61 value is the pressure drop in inches W.C. across the filter.



The second bar indicates the amount of the Bag Filter that has been used. The bright green area is the used portion of the Bag Filter and the green area above the bright green area is the portion left. In this case the Bag Filter has about 80% usage left. The 0.31 value is the actual pressure drop in inches W.C. across the filter.



The third bar indicates the amount of the Box Filter that has been used. The bright green area is the used portion of the Box Filter and the green area above the bright green area is the portion left. In this case the Box Filter has about 90% usage left. The 0.21 value is the actual pressure drop in inches W.C. across the filter.

Odor Spray Unit (Optional)



When the Spring Air Systems Enviro (KES) unit has an optional Odor Spray unit mounted on the KESF fan section or in the ductwork, this box will appear on the top left of the Enviro status screen. Press the green box to set the Odor Spray timers.



The Odor Spray has two timers: Cycle Timer and Duration Timer. The Cycle Timer is the time in minutes between spraying. The Duration Timer is the time in seconds of the actual spray.

Press the Cycle Timer box to open the Truflow number keypad. Select the desired length of the Cycle timer and press Enter to return to the Odor Spray timer screen.



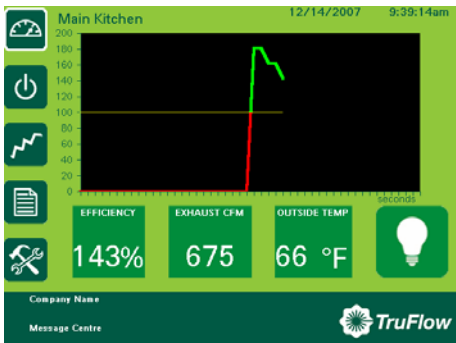
Press the Duration Timer box to open the Truflow number keypad. Select the desired length of the Duration timer and press Enter to return to the Odor Spray timer screen.

TRUFLOW Wash Screens (Optional)

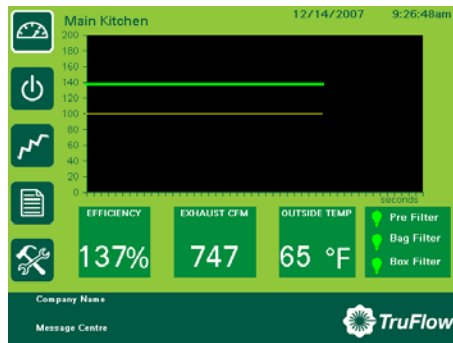


The Truflow Wash panel can be supplied with up to three wash sequence. To set each wash delay and wash time, press the Setup button on the DASHBOARD.

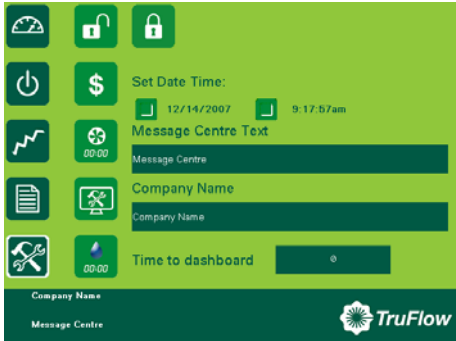
STANDARD DASHBOARD



DASHBOARD with KES

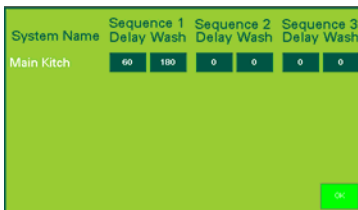


Setup screen

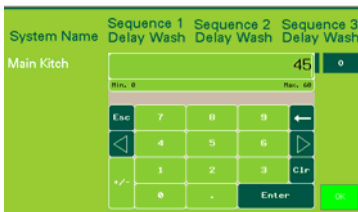


From the setup screen press the Water Droplet button. If there is no water droplet on the setup screen the Truflow has not been factory set to include activating wash panels. Call Spring Air for details to setup the wash function.

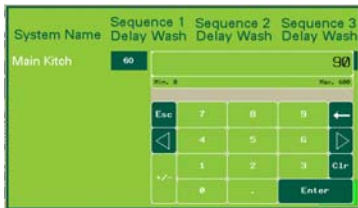
Wash Sequence 1



The Wash Delay and Wash Timer screen appears. If the Truflow has only one wash sequence leave Sequence 2 and Sequence 3 Delay and Wash timers at 0.



To set Sequence 1 Wash Delay press the green box below Delay.



To set Sequence 1 Wash time press the green box below Wash.

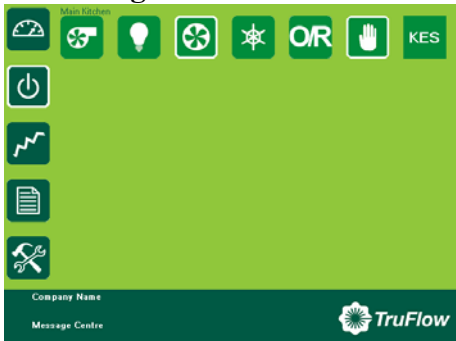


After the Delay and Wash times have been entered press the OK button to resume setup.



To check the wash settings from the DASHBOARD press the System Control button.

Activating the Wash



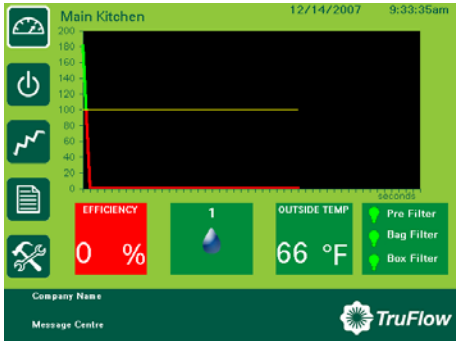
Turn the Main Kitchen on.



Turn the Main Kitchen off.

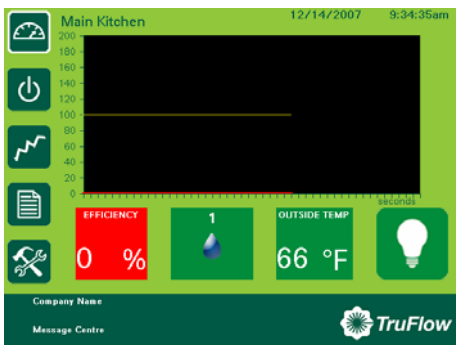
The exhaust and supply fan shut off and after the Delay time set above the WASH 1 will start for the length of time set above.

KES DASHBOARD in WASH Mode:



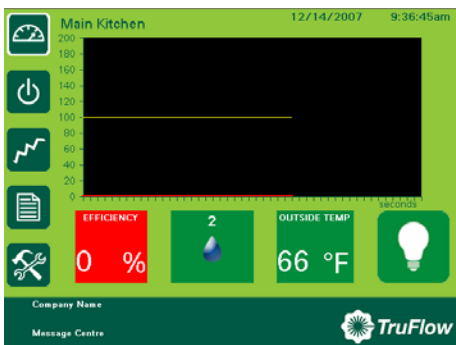
After the Wash Delay time is entered above, the Exhaust CFM button will change to a water droplet with the number 1 above.

Standard DASHBOARD in WASH Sequence 1:



After the Wash Delay time is entered above the Exhaust CFM button will change to a water droplet with the number 1 above.

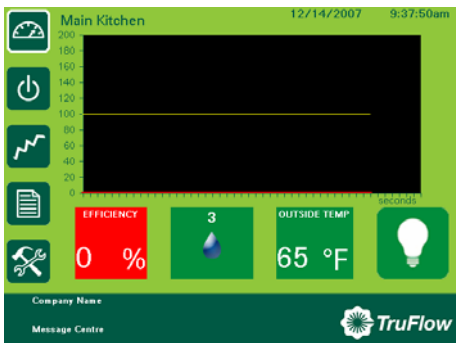
Standard DASHBOARD in WASH Sequence 2



After the second Wash Delay time is entered above the Exhaust CFM button will change to a water droplet with the number 2 above.

If zero was entered for the second Wash Delay and second Wash time there is no second wash.

Standard DASHBOARD in WASH Sequence 3



After the third Wash Delay time is entered above the Exhaust CFM button will change to a water droplet with the number 3 above.

If zero was entered for the third Wash Delay and third Wash time there is no third wash.

Once all the washes have completed, the Truflow panel will remain idle until the next time the kitchen is turned on from the Systems Control screen, from the Automatic open and close time settings or through the RSS on override.



TRUFLOW TOUCHSCREEN STARTUP REPORT

**BEFORE ATTEMPTING TO SERVICE THE VARIABLE SPEED DRIVES
PLEASE READ APPENDIX J CAREFULLY.**

General Information

Spring Air Service Company	
Job Name	
Date	
Customer	
Location	

Truflow Model No.	
Number of Kitchens (1 to 4)	

Kitchen One

Total Exhaust CFM			
Number of Hoods connected			
Number of Exhaust Drives Connected			
Exhaust Drive 1	HP		Voltage
Exhaust Fan 1	Manufacturer		Model No.
Exhaust Drive 2	HP		Voltage
Exhaust Fan 2	Manufacturer		Model No.
Exhaust Drive 3	HP		Voltage
Exhaust Fan 3	Manufacturer		Model No.
Exhaust Drive 4	HP		Voltage
Exhaust Fan 4	Manufacturer		Model No.
Exhaust Drive 5	HP		Voltage
Exhaust Fan 5	Manufacturer		Model No.
Exhaust Drive 6	HP		Voltage
Exhaust Fan 6	Manufacturer		Model No.
Total Supply CFM			
Supply Fan Manufacture			Model No.
Supply inlet 10 feet from exhaust			
a	Supply Drive 1	HP	Voltage
b	Supply control signal (4-20 milliamps)	Low setting	High Setting
Information supplied by Spring Air Systems			

Kitchen Two					
Total Exhaust CFM					
Number of Hoods connected					
Number of Exhaust Drives Connected					
Exhaust Drive 1	HP		Voltage		
Exhaust Fan 1	Manufacturer		Model No.		
Exhaust Drive 2	HP		Voltage		
Exhaust Fan 2	Manufacturer		Model No.		
Exhaust Drive 3	HP		Voltage		
Exhaust Fan 3	Manufacturer		Model No.		
Exhaust Drive 4	HP		Voltage		
Exhaust Fan 4	Manufacturer		Model No.		
Exhaust Drive 5	HP		Voltage		
Exhaust Fan 5	Manufacturer		Model No.		
Exhaust Drive 6	HP		Voltage		
Exhaust Fan 6	Manufacturer		Model No.		
Total Supply CFM					
Supply Fan Manufacture			Model No.		
Supply inlet 10 feet from exhaust					
a	Supply Drive 1	HP		Voltage	
b	Supply control signal (4-20 milliamps)	Low setting		High Setting	
Information supplied by Spring Air Systems					

Kitchen Three					
Total Exhaust CFM					
Number of Hoods connected					
Number of Exhaust Drives Connected					
Exhaust Drive 1	HP		Voltage		
Exhaust Fan 1	Manufacturer		Model No.		
Exhaust Drive 2	HP		Voltage		
Exhaust Fan 2	Manufacturer		Model No.		
Exhaust Drive 3	HP		Voltage		
Exhaust Fan 3	Manufacturer		Model No.		
Exhaust Drive 4	HP		Voltage		
Exhaust Fan 4	Manufacturer		Model No.		
Exhaust Drive 5	HP		Voltage		
Exhaust Fan 5	Manufacturer		Model No.		
Exhaust Drive 6	HP		Voltage		
Exhaust Fan 6	Manufacturer		Model No.		
Total Supply CFM					
Supply Fan Manufacture			Model No.		
Supply inlet 10 feet from exhaust					
a	Supply Drive 1	HP		Voltage	
b	Supply control signal (4-20 milliamps)	Low setting		High Setting	
Information supplied by Spring Air Systems					

Kitchen four					
Total Exhaust CFM					
Number of Hoods connected					
Number of Exhaust Drives Connected					
Exhaust Drive 1	HP		Voltage		
Exhaust Fan 1	Manufacturer		Model No.		
Exhaust Drive 2	HP		Voltage		
Exhaust Fan 2	Manufacturer		Model No.		
Exhaust Drive 3	HP		Voltage		
Exhaust Fan 3	Manufacturer		Model No.		
Exhaust Drive 4	HP		Voltage		
Exhaust Fan 4	Manufacturer		Model No.		
Exhaust Drive 5	HP		Voltage		
Exhaust Fan 5	Manufacturer		Model No.		
Exhaust Drive 6	HP		Voltage		
Exhaust Fan 6	Manufacturer		Model No.		
Total Supply CFM					
Supply Fan Manufacture			Model No.		
Supply inlet 10 feet from exhaust					
a	Supply Drive 1	HP		Voltage	
b	Supply control signal (4-20 milliamps)	Low setting		High Setting	
Information supplied by Spring Air Systems					

Startup Procedure

Item	Description	Y / N
1	Turn off all Cooking equipment.	
2	Disconnect power to the Truflow	

Check Truflow Panel Connections prior to startup		
3	Check that all VFD CAT5 cable is connected to drives. Each drive CAT5 is connected in series starting from Truflow VFD.	
4	Check that Outdoor Temperature Transducer CAT5 is connected.	
5	Install J-Couple cable with mini-clips from Truflow to each hood duct collar connected to Kitchen1.	
	Install J-Couple cable with mini-clips from Truflow to each hood duct collar connected to Kitchen2.	
	Install J-Couple cable with mini-clips from Truflow to each hood duct collar connected to Kitchen3.	
	Install J-Couple cable with mini-clips from Truflow to each hood duct collar connected to Kitchen4 .	
6	Check that CAT5 internet cable is connected to Truflow.	
7	Check that LON is connected to Truflow.	
8	If there are no wires on terminals D+L, jumper these terminals (1 st Kitchen).	
	If there are no wires on terminals D2+L2, jumper these terminals (2 nd Kitchen).	
	If there are no wires on terminals D3+L3, jumper these terminals (3 rd Kitchen).	
	If there are no wires on terminals D4+L4, jumper these terminals (4 th Kitchen).	

Check Exhaust Fan Drives		
9	Turn power off to all exhaust fan drives at breaker panel.	
10	Exhaust Drive 1: Check that drive connected is powered from breaker panel and connected to Drive 1 terminals L1,L2,L3.	
	Exhaust Drive 2: Check that drive connected is powered from breaker panel and connected to Drive 2 terminals L1,L2,L3.	
	Exhaust Drive 3: Check that drive connected is powered from breaker panel and connected to Drive 3 terminals L1,L2,L3.	
	Exhaust Drive 4: Check that drive connected is powered from breaker panel and connected to Drive 4 terminals L1,L2,L3.	
	Exhaust Drive 5: Check that drive connected is powered from breaker panel and connected to Drive 5 terminals L1,L2,L3.	
	Exhaust Drive 6: Check that drive connected is powered from breaker panel and connected to Drive 6 terminals L1,L2,L3.	
11	Exhaust Drive 1: Check that drive connected is connected to exhaust fan disconnect from Drive 1 terminals U1,U2,U3.	
	Exhaust Drive 2: Check that drive connected is connected to exhaust fan disconnect from Drive 2 terminals U1,U2,U3.	
	Exhaust Drive 3: Check that drive connected is connected to exhaust fan disconnect from Drive 3 terminals U1,U2,U3.	
	Exhaust Drive 4: Check that drive connected is connected to exhaust fan disconnect from Drive 4 terminals U1,U2,U3.	
	Exhaust Drive 5: Check that drive connected is connected to exhaust fan disconnect from Drive 5 terminals U1,U2,U3.	
	Exhaust Drive 6: Check that drive connected is connected to exhaust fan disconnect from Drive 6 terminals U1,U2,U3.	
12	Check that each exhaust fan disconnect switch is in on position and that fan discharge is free and clear.	

Check Supply Fan Drives		
13	Turn power off to all supply fan drives at breaker panel.	
14	Supply Drive 1: Check that drive connected is powered from breaker panel and connected to Drive 1 terminals L1,L2,L3.	
	Supply Drive 2: Check that drive connected is powered from breaker panel and connected to Drive 21 terminals L1,L2,L3.	
15	Supply Drive 1: Check that drive connected is connected to exhaust fan disconnect from Drive 1 terminals U1,U2,U3.	
	Supply Drive 2: Check that drive connected is connected to exhaust fan disconnect from Drive 2 terminals U1,U2,U3.	

Truflow Panel Operation		
16	Turn power on to all drives at breaker panel	
17	Check that all drives display Nst or Rdy.	
18	Turn power on to the Truflow panel and confirm 120V across terminals 1 + 4.	
19	Press the Setup icon to go to Setup screen for temperatures.	
	Outside Temp (F)	Kitchen Temp (F)
20	Once the DASHBOARD appears press the Systems Control icon	
21a	Kitchen 1: Press the Fan on button. Check rotation of all fans.	
	Kitchen 2: Press the Fan on button. Check rotation of all fans.	
	Kitchen 3: Press the Fan on button Check rotation of all fans.	
	Kitchen 4: Press the Fan on button Check rotation of all fans.	
22	Login to Truflow as the Administrator through Setup screen.	

Truflow Panel Operation Continued						
23	Check the parameters as viewed from Setup screen selecting each Kitchen.					
24	Exh. Drive 1	Kitchen #		HZ		
		Amps		Line Voltage		
	Exh. Drive 2	Kitchen #		HZ		
		Amps		Line Voltage		
	Exh. Drive 3	Kitchen #		HZ		
		Amps		Line Voltage		
	Exh. Drive 4	Kitchen #		HZ		
		Amps		Line Voltage		
	Exh. Drive 5	Kitchen #		HZ		
		Amps		Line Voltage		
	Exh. Drive 6	Kitchen #		HZ		
		Amps		Line Voltage		
25	Supply Drive 1	Kitchen #		HZ		
		Amps		Line Voltage		
	Supply Drive 2	Kitchen #		HZ		
		Amps		Line Voltage		
26	Go to System Control screen and set Override time					
	Press O/R for Kitchen 1	Override Time				
	Press O/R for Kitchen 2	Override Time				
	Press O/R for Kitchen 3	Override Time				
	Press O/R for Kitchen 4	Override Time				
27	Return to DASHBOARD and press Efficiency button for each Kitchen					
	Kitchen 1	Screen CFM		All drives to maximum HZ		
	Kitchen 2	Screen CFM		All drives to maximum HZ		
	Kitchen 3	Screen CFM		All drives to maximum HZ		
	Kitchen 4	Screen CFM		All drives to maximum HZ		
28	Turn on all appliances. Check that CFM increases					
29	Once all appliances are on and hot, check that each drive HZ is at maximum.					
30	Very slowly reduce the PXR set point until drive HZ falls from maximum value. This may take 15 minutes in total.					
	Kitchen 1	PXR set point				
	Kitchen 2	PXR set point				
	Kitchen 3	PXR set point				
	Kitchen 4	PXR set point				
31	From System Control screen turn canopy light off and on for each Kitchen. Check for 120V between terminal 4 + 6.					
32	Spring Air SAT variable speed supply unit					
	Check that wiring is complete between all terminals.					
33	Spring Air SFT indirect gas fire unit					
3	Check that wiring is complete between all terminals.					

Comments:

Service

Technician: _____

Company: _____

Yes I have received a set of Spring Air Systems Inc. maintenance manuals.

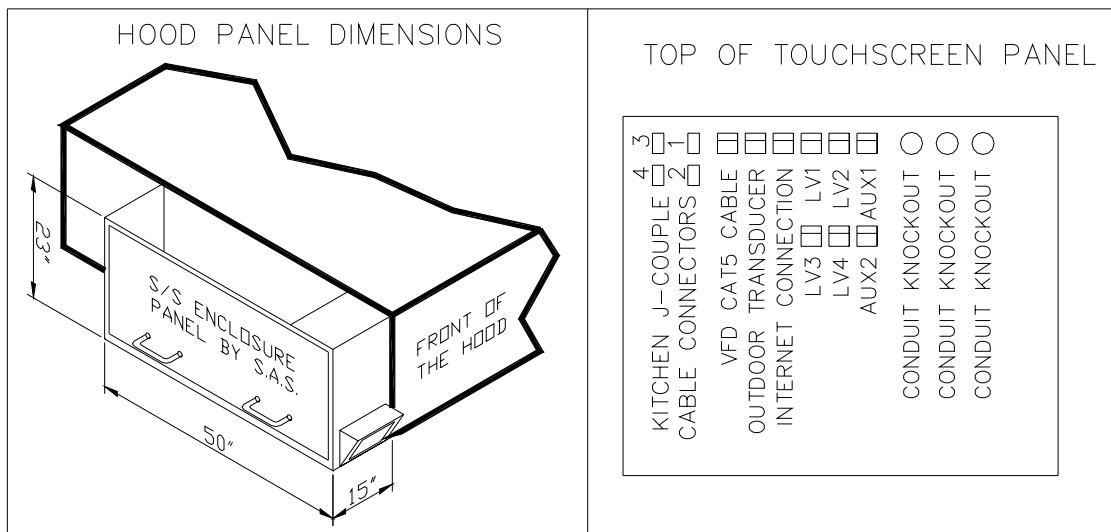
Signature _____ Print Name _____

APPENDIX

APPENDIX A.

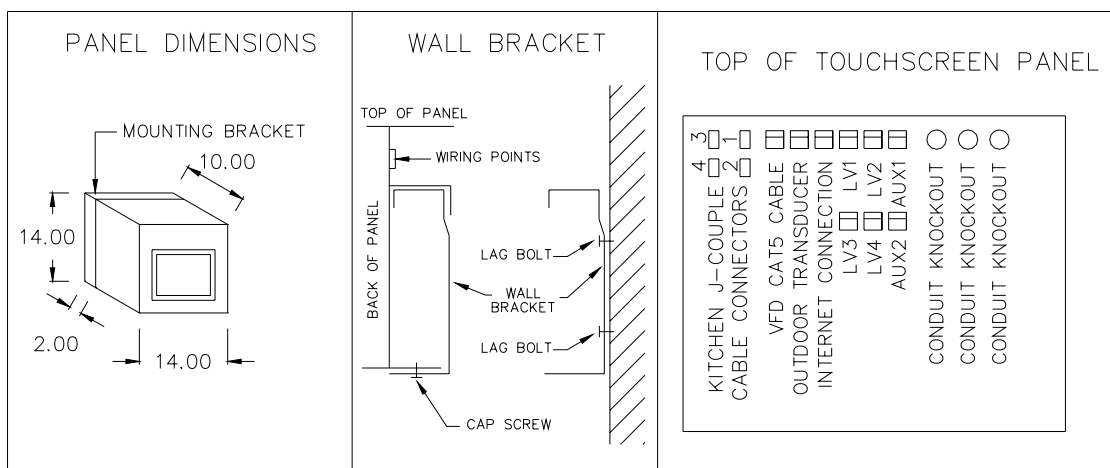
Truflow stainless steel enclosures dimensions

Hood mounted.



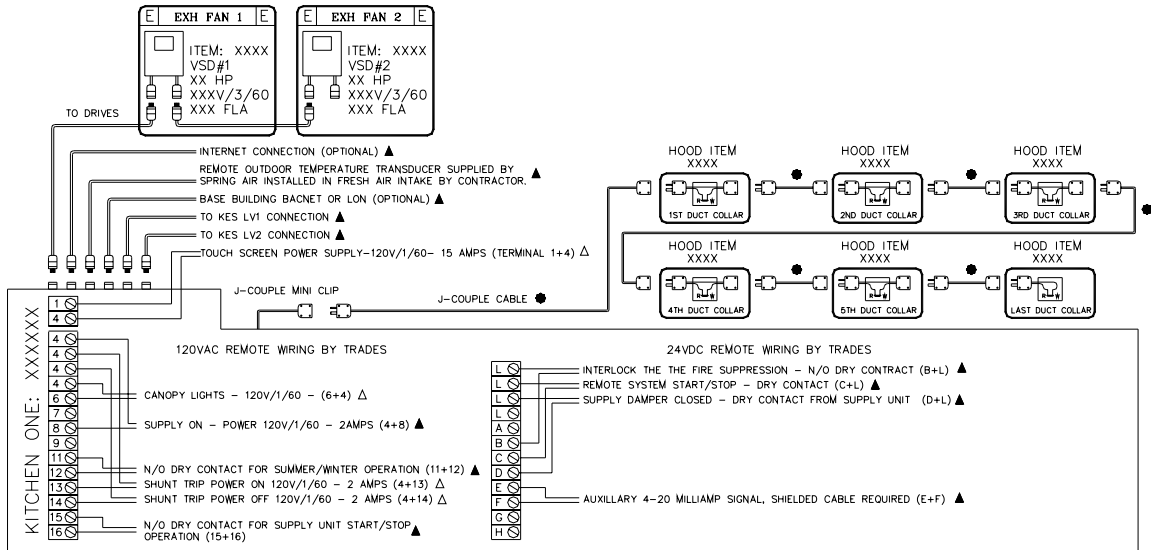
Wall Mounted.

*TRUFLOW enclosure, hood mounted
Figure 13*

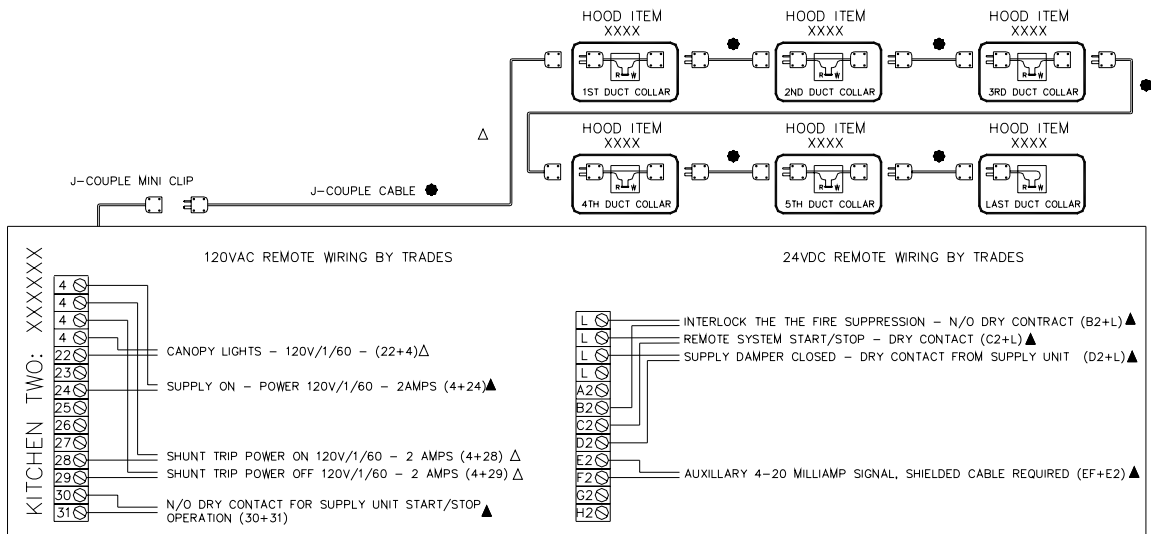
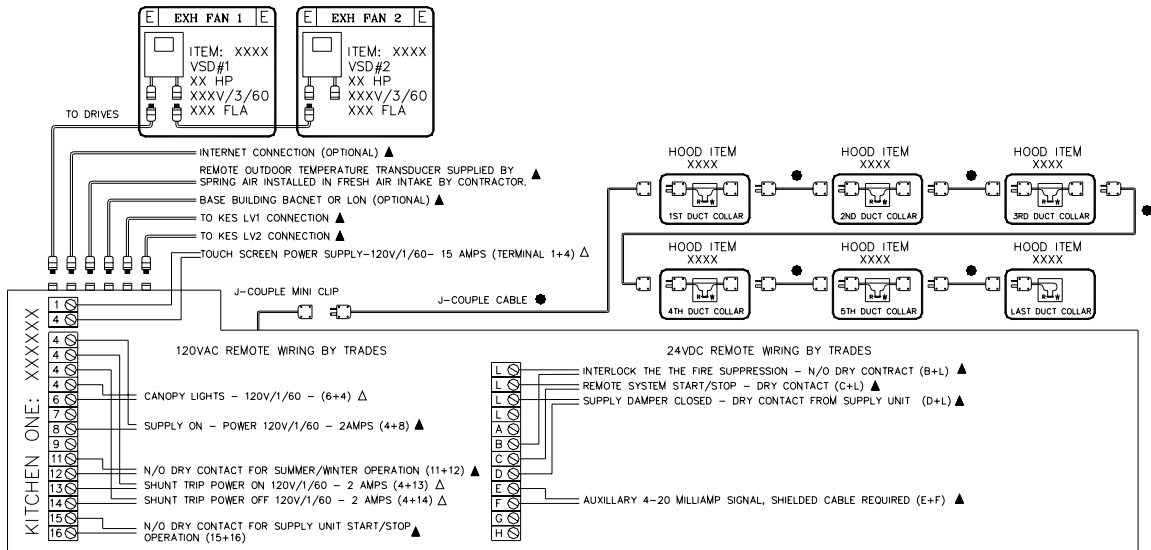


*TRUFLOW enclosure wall mounted
Figure 14*

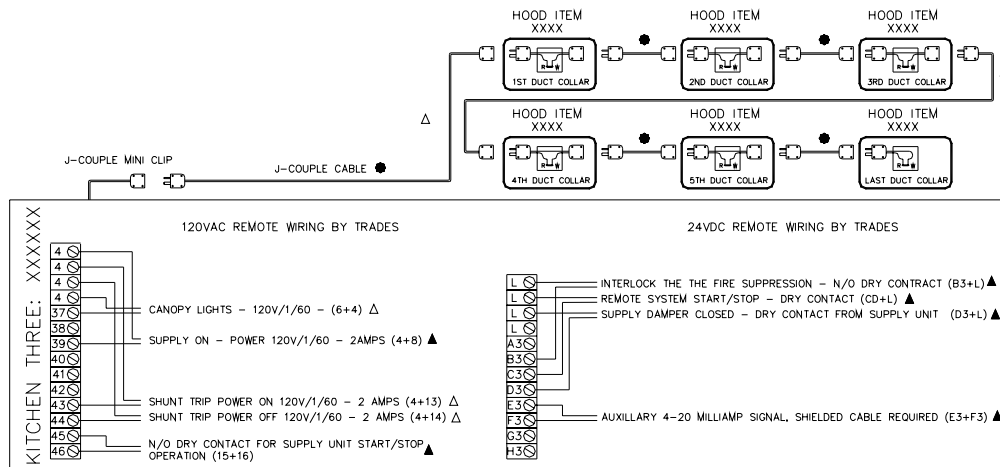
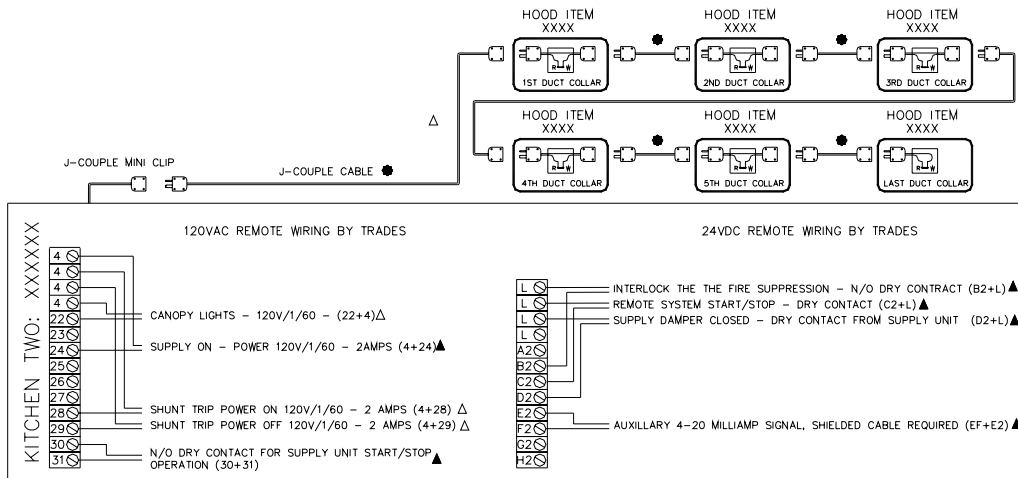
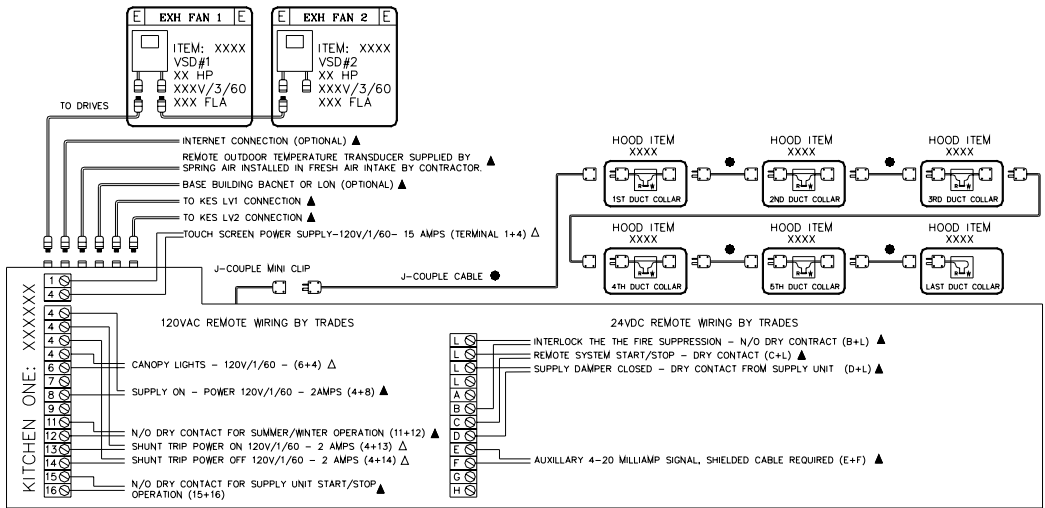
APPENDIX B. Remote Wiring



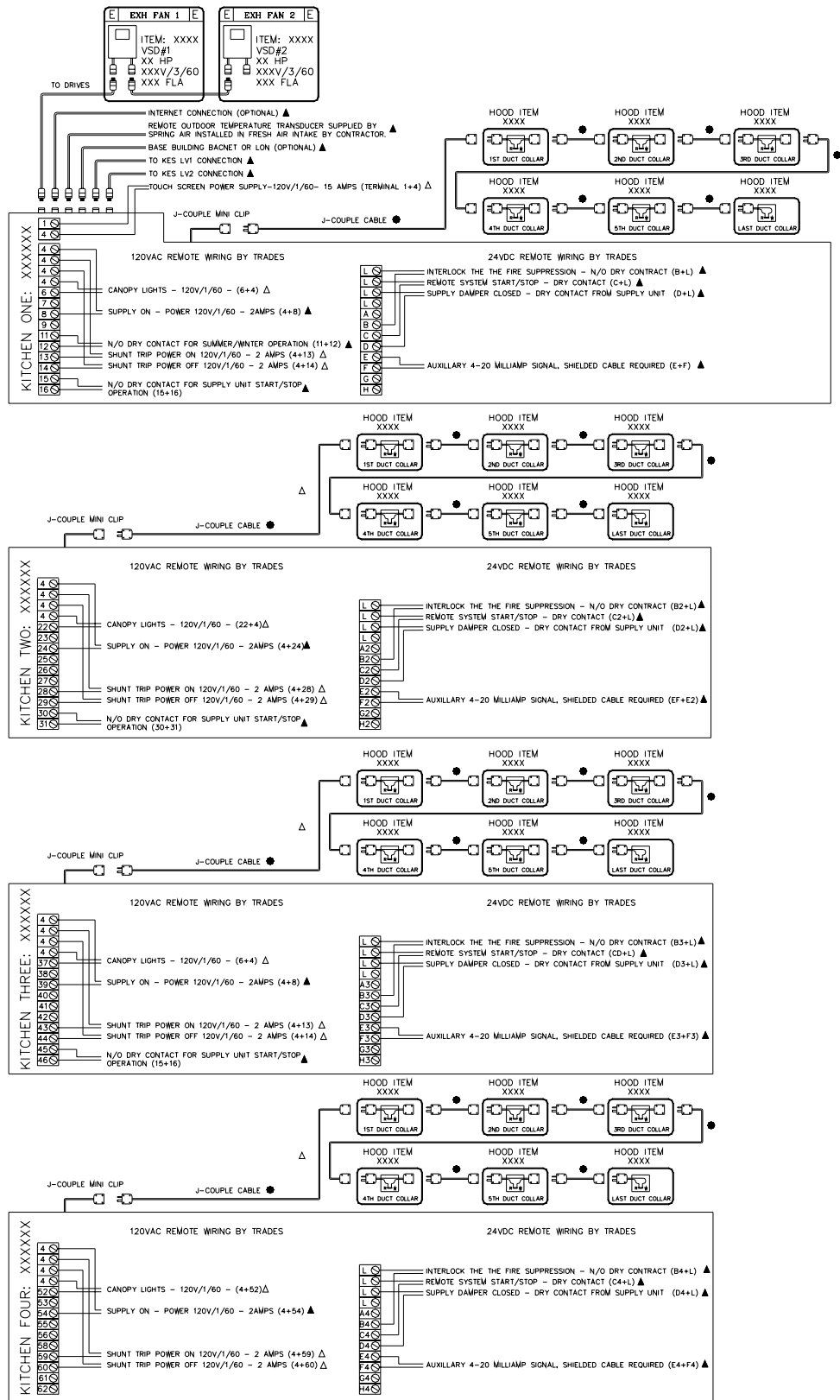
*TRUFLOW Control panel wiring schematic One Kitchen
Figure 15*



*TRUFLOW Control panel wiring schematic Two Kitchens
Figure 16*



TRUFLOW Control panel wiring schematic Three Kitchens
Figure 16



TRUFLOW Control panel wiring schematic Four Kitchens
Figure 17

APPENDIX C

PXR Factory Setup

	Set Point (SV parameter) - Factory setting ONE Duct Collar
SV=70	Press SEL once. Use ∇ and \wedge to adjust the set point to 70. Press SEL. The factory setting is 70F.

PXR3:

Factory setup

Power the Truflow panel and proceed to input the following setting.



	2nd Block Parameters
	Press SEL and hold for about 3 seconds until P appears on the display. Release SEL.
P=28	Press SEL again to set the Proportional Band. Use the \wedge to increase parameter set value and ∇ to decrease parameter set value. Set P = 28 and then press SEL.
\int =0	Press ∇ to next parameter, integral time, \int . Press SEL and set value to 0. Press SEL.
d=0	Press ∇ to next parameter, derivative action time, d. Press SEL and set value to 0. Press SEL.
hys=0	Press ∇ to next parameter, hysteresis, hys. Press SEL and set value to 0. Press SEL.
CTrL=PID	Press ∇ three times to next parameter, Control algorithm, CTrL. Press SEL and check that the setting is PID. If is not use the ∇ and \wedge to set to PID and then press SEL.
P-n2=2	Press ∇ three times to next parameter, input type code, P-n2. Press SEL and adjust setting to 2. Press SEL.
P-SL=55	Press ∇ to next parameter, Lower limit of input range, P-SL. Press SEL and adjust setting to 55. Press SEL.
P-SU=200	Press ∇ to next parameter, Upper limit of input range, P-SU. Press SEL and adjust setting to 200. Press SEL.
ALN1=1	Press ∇ five times to next parameter, Type of alarm 1, ALN1. Press SEL and adjust setting to 1. Press SEL.
	Press SEL and hold for about 2 seconds to return to set point.

	3rd Block Parameters
	Press SEL and hold for about 5 seconds until P-n1 appears on the display. Release SEL.
P-n1=3	Press SEL again to set the Control Action, P-n1. Use the \wedge and ∇ to adjust the value to 3. Press SEL.
SV-L=55	Press ∇ to next parameter, Lower limit of SV, SV-L. Press SEL and adjust setting to 55. Press SEL.
SV-H=120	Press ∇ to next parameter, Upper limit of SV, SV-H. Press SEL and adjust setting to 120. Press SEL.
	Press SEL and hold for about 2 seconds to return to set point.

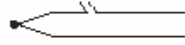

	1st Block Parameters
	Press SEL and hold for about 1 second until STbY appears on the display. (or LACH)
AT=1	Press ∇ until AT appears on display. Press SEL and set the Auto-tuning to 1. using ∇ and \wedge . Press SEL.
AL1=90	Press ∇ three times until AL1 appears on the display. Press SEL and set the Alarm1 set value to 90. Press SEL.
StbY	Set to off.
Prog	Set to off.

APPENDIX D.

PXR Sensor fault Operation

[8] Sensor fault operation

• Thermocouple

Condition		Display	Control output
Break		UUUUU	ON or more than 20mA OFF or less than 4mA (Note)
Short circuit		short-circuit point Temperature display	Input is controlled as short-circuit point temperature. (Note)

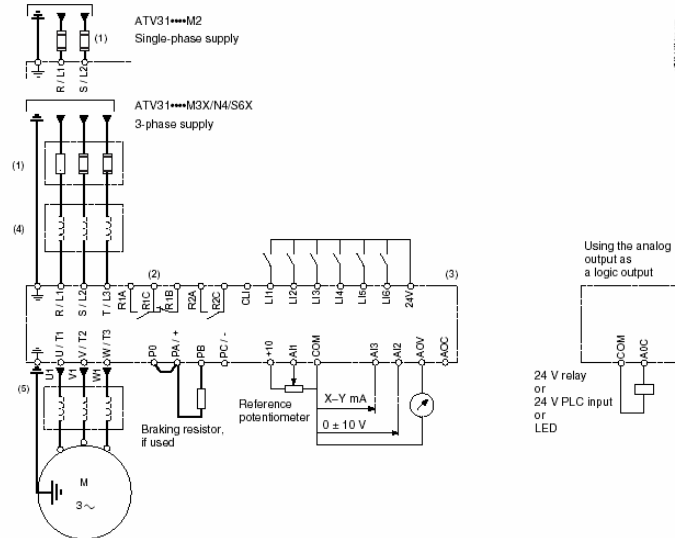
• 4-20mA DC

Over-range	UUUUU	OFF or less than 4mA (Note)
Under-range	LLLLL	ON or more than 20mA

APPENDIX E

TELE FACTORY DRIVE TERMINAL SCHEMATIC

Wiring Diagram for Factory Settings



NOTE: The line supply terminals are shown at the top and the motor terminals are shown at the bottom. Connect the power terminals before connecting the control terminals. Install surge suppressors on all inductive circuits located near the drive controller or coupled to the same circuit.

- (1) Refer to the drive controller nameplate or to the tables on pages 34–35 for recommended fuses. Fast acting or time delay Class J fuses can be used.
- (2) Fault relay contacts for remote indication of drive controller status.
- (3) Internal +24 V. If an external source is used (30 V max.), connect the 0 V terminal of the source to the 0 V (COM) terminal, and do not use the +24 V terminal on the drive controller for any purpose.
- (4) Line reactor, if used. All 575 V installations must include a line reactor. See page 21.
- (5) Installation of a load filter is recommended for all 575 V applications. See page 22.

DRIVE TECHNICAL SPECIFICATIONS FOR LOCATING DRIVE PANELS

Table 2: Environment

Degree of Protection	<ul style="list-style-type: none"> • IP20 without protective vent cover, NEMA 1, UL open type. • IP21 on wiring terminals • IP31 and IP41 all other areas • UL Type 1 without removal of the protective vent cover from the top of the controller and with the addition of the Conduit Entry Kit (see page 14).
Resistance to vibrations	Conforming to IEC/EN 60068-2-6: 1.5 mm peak to peak from 3 to 13 Hz, 1 gn from 13 to 150 Hz
Resistance to shocks	15 gn for 11 ms conforming to IEC/EN 60068-2-27
Pollution degree	Pollution degree 2 according to UL 840. Protect the drive controller against dust, corrosive gas, and falling liquid.
Maximum relative humidity	96% maximum, non-condensing and without dripping (provide heating system if there is condensation) Conforms to IEC 60068-2-3
Maximum ambient temperature	Storage: -13 to +158 °F (-25 to +70 °C) Operation: +14 to +122 °F (-10 to +50 °C) without vent cover removed and without derating +14 to +140 °F (-10 to +60 °C) with vent cover removed and with derating. Refer to derating curves on page 15.
Altitude	Up to 3,300 ft (1,000 m) without derating; derate by 1% for each additional 330 ft (100 m)

APPENDIX F

HAZARDOUS WARNING

⚠ DANGER

HAZARDOUS VOLTAGE

- Read and understand this manual before installing or operating the Altivar 31 drive controller. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.
- For more information on Altivar 31 drive controllers, see the *Altivar 31 Start-Up Guide*, VVDED303043US, and the *Altivar 31 Programming Manual*, VVDED303042US. Both manuals are shipped with the drive controller. They are also available from www.us.SquareD.com or from your Schneider Electric representative.
- The user is responsible for conforming to all applicable code requirements with respect to grounding all equipment.
- Many parts in this drive controller, including printed wiring boards, operate at line voltage. **DO NOT TOUCH**. Use only electrically insulated tools.
- **DO NOT** touch unshielded components or terminal strip screw connections with voltage present.
- **DO NOT** short across terminals PA and PC or across the DC bus capacitors.
- Install and close all covers before applying power or starting and stopping the drive controller.
- Before servicing the drive controller:
 - Disconnect all power.
 - Place a "DO NOT TURN ON" label on the drive controller disconnect.
 - Lock the disconnect in the open position.
- Disconnect all power including external control power that may be present before servicing the drive controller. **WAIT 3 MINUTES** for the DC bus capacitors to discharge. Then follow the DC bus voltage measurement procedure on page 20 to verify that the DC voltage is less than 45 Vdc. The drive controller LEDs are not accurate indicators of the absence of DC bus voltage.

Electric shock will result in death or serious injury.

APPENDIX G

GOOD WIRING PRACTICE

Good wiring practice requires the separation of control circuit wiring from all power (line) wiring. In addition, power wiring to the motor must have the maximum possible separation from all other power wiring, whether from the same drive controller or other drive controllers; **do not run in the same conduit**. This separation reduces the possibility of coupling electrical transients from power circuits into control circuits or from motor power wiring into other power circuits.

▲ CAUTION
IMPROPER WIRING PRACTICES
<ul style="list-style-type: none">• Follow the wiring practices described in this document in addition to those already required by the National Electrical Code and local electrical codes.• The drive controller will be damaged if input line voltage is applied to the output terminals (U, V, W).• Check the power connections before energizing the drive controller.• If replacing another drive controller, verify that all wiring connections to the ATV31 drive controller comply with all wiring instructions in this manual.
Failure to follow this instruction can result in injury or equipment damage.

Follow the practices below when wiring ATV31 drive controllers:

- Verify that the voltage and frequency of the input supply line and the voltage, frequency, and current of the motor match the rating on the drive controller nameplate.
- Use metallic conduit for all drive controller wiring. Do not run control and power wiring in the same conduit.
- Separate the metallic conduits carrying power wiring from those carrying control wiring by at least 76 mm (3 in.).

- Separate the non-metallic conduits or cable trays used to carry power wiring from the metallic conduit carrying control wiring by at least 305 mm (12 in.).
- Whenever power and control wiring cross, the metallic conduits and non-metallic conduits or trays must cross at right angles.
- Equip all inductive circuits near the drive controller (such as relays, contactors, and solenoid valves) with noise suppressors, or connect them to a separate circuit.

APPENDIX H GROUNDING

Ground the drive controller according to the National Electrical Code and all local codes to ensure safe, dependable operation. To ground the drive controller:

- Connect a copper wire from the equipment ground lug or terminal to the power system ground conductor. Size the wire according to the drive controller rating and national and local codes.
- Verify that resistance to ground is one ohm or less. Improper grounding causes intermittent and unreliable operation.

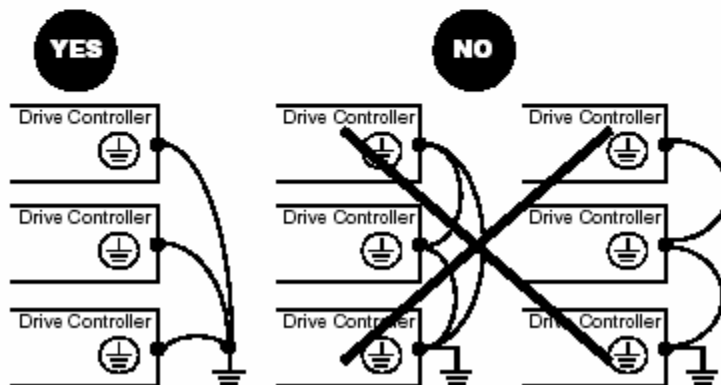
⚠ DANGER

HAZARDOUS VOLTAGE

Ground equipment using the provided ground connecting point as shown in the figure below. The drive controller panel must be properly grounded before power is applied.

Electric shock will result in death or serious injury.

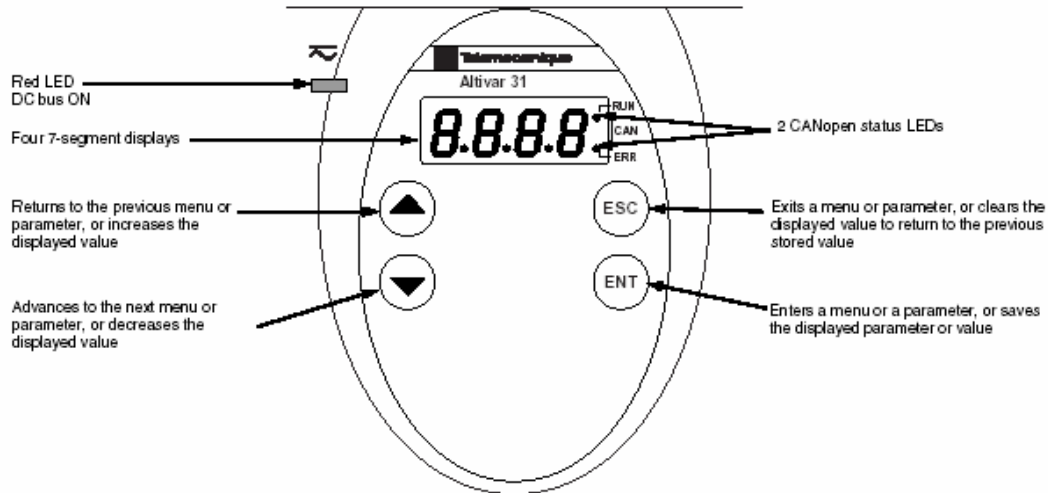
Ground multiple drive controllers as shown in the figure below. Do not loop the ground cables or connect them in series.



APPENDIX I

STARTING THE DRIVE MANUALLY

ATV31***** Controllers



- Press and hold down (longer than 2 seconds) the ▲ or ▼ keys to scroll through the data quickly.
- Pressing ▲ or ▼ does not store the selection.
- To store the selection, press the ENT key. The display flashes when a value is stored.

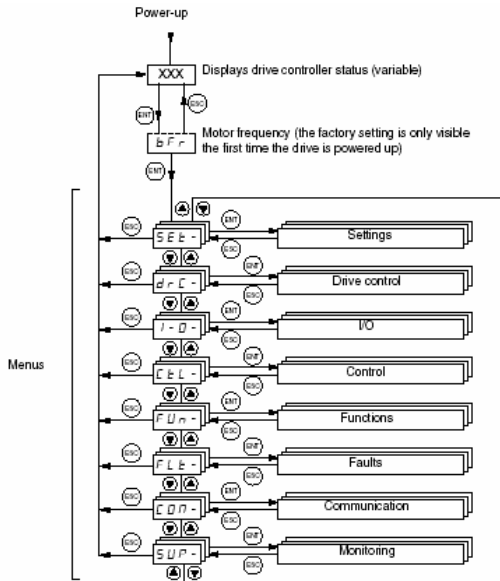
A normal display with no fault present and no run command shows:

- The value of one of the display parameters (see page 80). The default display is motor frequency, for example 43.0. In current limiting mode, the display flashes.
- init: Initialization sequence
- rdY: Drive ready
- dcb: DC injection braking in progress
- nSt: Freewheel stop
- FSt: Fast stop
- tUn: Auto-tuning in progress

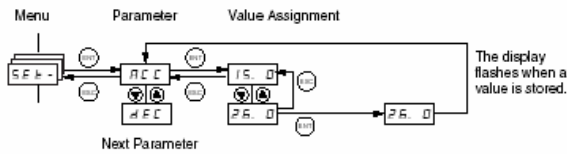
If a fault is present, the display flashes.

APPENDIX J

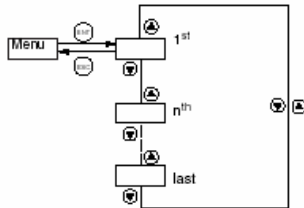
ACCESSING THE DRIVE PROGRAM MENU



The following figure illustrates how to access parameters and assign their values. To store the parameter value, press the **ENT** key. The display flashes when a value is stored.



All of the menus are drop-down type menus. Once you have reached the last parameter in a list, press the **▼** key to return to the first parameter. From the first parameter in the list, press the **▲** key to jump to the last parameter.



If you have modified a parameter in a menu and you return to that menu without accessing another menu in the meantime, you will be taken directly to the parameter you last modified. See the illustration below. If you have accessed another menu or have restarted the drive controller since the modification, you will be taken to the first parameter in the menu. See the illustration above.

APPENDIX K

SPRING AIR SYSTEMSTRUFLO - TELE PROGRAMMED PARAMETERS TOUCHSCREEN		
CODE	LONG LABEL	SAS VALUE
<i>DRC - SETTINGS</i>		
BFR	Std. Motor Frequency	60Hz
NCR	Motor Full Load Amps	DEFALUT (TRUFLO) -- +10%(KES)
TFR	Max Frequency	72Hz
<i>SET - SETTINGS</i>		
ACC	Acceleration ramp time	10.0s [35.0s - SAT Unit]
DEC	Deceleration ramp time	10.0s [35.0s - SAT Unit]
LSP	Low Speed	18Hz (TRUFLO) -- 48Hz (KES)
HSP	High Speed	60Hz (TRUFLO) -- 65Hz (KES)
TTD	Motor Thermal threshold	118%
<i>CTL - Command</i>		
FR1	Configuration reference1	REFERENCE VIA MODBUS
LAC	Function Access Level	L3
<i>FUN - Command</i>		
SA1	Summing Inputs	SA2
SA2	Summing Input 2	no
SA3	Summing Input 3	no
PS2	Preset speed	Bit 13 MODbus / Canopen
PS4	Preset speed	Bit 14 MODbus / Canopen
<i>FLT - Behavior</i>		
ATR	Automatic Restart	Yes
DRN	Derating for Undervoltage	Yes
OPL	Motor phase loss	No
<i>CON -SETTINGS</i>		
ADD	Drive Address	Value between 2-7 depends on fan
TFO	MODbus Comm Format	8n1: 8 data bit, no parity, 1 stop bit
ADCO	CANopen drive address	set to 0

Parameter list based on ALTIVAR 31 for Spring Air - TRUFLO with TOUCH SCREEN

Listed parameters entered in VFD keypad display.

Press ENT until DRC (first parameter block) is displayed.

Follow parameter blocks in order as it appears.

Once done press ESC until RDY is displayed.


Program is complete.

APPENDIX L

DRIVE MAINTENANCE AND TROUBLE SHOOTING

PRECAUTIONS

Read the following safety statements before proceeding with any maintenance or troubleshooting procedures.

 DANGER
HAZARDOUS VOLTAGE
<ul style="list-style-type: none">• Disconnect all power before servicing the drive controller.• Read and understand these procedure and the precaution on page 13 of this manual before servicing the ATV31 drive controllers.• Installation, adjustment, and maintenance of these drive controllers must be performed by qualified personnel.
Failure to follow this instruction will result in death or serious injury.

ROUTINE MAINTENANCE

Perform the following steps at regular intervals:

- Check the condition and tightness of the connections.
- Make sure that the ventilation is effective and that the temperature around the drive controller remains at an acceptable level.
- Remove dust and debris from the drive controller, if necessary.

FAULT DISPLAY

If a problem arises during setup or operation, ensure that all ambient environment, mounting, and connection recommendations have been followed.

The first fault detected is stored and displayed, flashing, on the screen. The drive controller locks and the fault relay (RA-RC) contact opens, if it has been configured for this function.

Drive Controller Does Not Start, No Fault Displayed

If the drive controller will not start and there is no display indication, consider the following:

1. Check the power supply to the drive controller.
2. The assignment of the fast stop or freewheel stop functions prevents the drive controller from starting if the corresponding logic inputs are not powered up. In this case, the drive controller displays nSt in freewheel stop mode and FSt in fast mode. This is normal, since these functions are active at zero speed so that the drive controller will stop safely if there is a wire break.
3. Ensure that the run command inputs have been actuated in accordance with the chosen control mode (ICC parameter in the I-O- menu. See page 29).
4. If an input is assigned to the limit switch function and this input is at state 0, the drive controller can only be started by sending a command for the opposite direction (see page 72).
5. If the reference channel (page 37) or the control channel (page 38) is assigned to Modbus or CANopen, the drive controller displays nSt on power up and remains stopped until the communication bus sends a command.

If a problem occurs during setup or operation, ensure that all ambient environment, mounting, and connection recommendations have been followed.

The first fault detected is stored and displayed, flashing, on the screen. The drive controller locks and the fault relay (R1A-R1C or R2A-R2C) contact opens.

Drive Controller Does Not Start, No Display

If the drive controller will not start and there is no display indication, check the power supply to the drive controller. Refer to the *ATV31 Programming Manual* for more troubleshooting information.

Faults Which Cannot be Automatically Reset

Faults which cannot be automatically reset are listed in the table beginning on page 44. To clear these faults:

1. Remove power from the drive controller.
2. Wait for the display to go off completely.
3. Determine the cause of the fault and correct it.
4. Reapply power.

CrF, SOF, tnF, bLF, and OPF can also be reset remotely via a logic input (rSF parameter in the FLt-menu, see the *ATV31 Programming Manual*).

Faults Which Cannot be Automatically Reset

Fault	Probable Cause	Remedy
<i>b L F</i> Brake sequence	Brake release current not reached	<ul style="list-style-type: none"> • Check the drive controller and motor connections. • Check the motor windings. • Check the Ibr setting in the FUn-menu. Refer to the <i>ATV31 Programming Manual</i>.
<i>C r F</i> Precharge circuit fault	Precharge circuit damaged	<ul style="list-style-type: none"> • Reset the drive controller. • Replace the drive controller.
<i>I n F</i> Internal fault	<ul style="list-style-type: none"> • Internal fault • Internal connection fault 	<ul style="list-style-type: none"> • Remove sources of electromagnetic interference. • Replace the drive controller.
<i>O C F</i> Overcurrent	<ul style="list-style-type: none"> • Incorrect parameter settings in the SEt- and drC- menus • Acceleration too rapid • Drive controller and/or motor undersized for load • Mechanical blockage 	<ul style="list-style-type: none"> • Check the SEt- and drC- parameters. • Ensure that the size of the motor and drive controller is sufficient for the load. • Clear the mechanical blockage.
<i>S C F</i> Motor short circuit	<ul style="list-style-type: none"> • Short circuit or grounding at the drive controller output • Significant ground leakage current at the drive controller output if several motors are connected in parallel 	<ul style="list-style-type: none"> • Check the cables connecting the drive controller to the motor, and check the motor insulation. • Reduce the switching frequency. • Connect output filters in series with the motor.
<i>S O F</i> Overspeed	<ul style="list-style-type: none"> • Instability • Overhauling load 	<ul style="list-style-type: none"> • Check the motor, gain, and stability parameters. • Add a braking resistor. • Check the size of the motor, drive controller, and load.
<i>t n F</i> Auto-tuning fault	<ul style="list-style-type: none"> • Motor or motor power not suitable for the drive controller • Motor not connected to the drive controller 	<ul style="list-style-type: none"> • Use the L or the P ratio (see UfT on page 36). • Check the presence of the motor during auto-tuning. • If a downstream contactor is being used, close it during auto-tuning.

Faults Which Can be Reset With the Automatic Restart Function

After the cause of the fault has been removed, the following faults can be reset:

- With the automatic restart function (Atr parameter in the FLT- menu, see the *ATV31 Programming Manual*),
- Via a logic input (rSF parameter in the FLT- menu, see the *ATV31 Programming Manual*),
- By cycling power to the drive controller.

Faults Which Can be Reset With Automatic Restart

Fault	Probable Cause	Remedy
<i>LDL</i> Serial link failure CANopen	Loss of communication between drive controller and communication device or remote keypad.	<ul style="list-style-type: none"> • Check the communication bus. • Refer to the product-specific documentation.
<i>EPF</i> External fault	User defined	User defined
<i>LLF</i> Loss of 4-20 mA follower	Loss of the 4-20 mA reference on input AI3	Check the connection on input AI3.
<i>ObF</i> Overvoltage during deceleration	<ul style="list-style-type: none"> • Braking too rapidly • Overhauling load 	<ul style="list-style-type: none"> • Increase the deceleration time. • Install a braking resistor if necessary. • Activate the brA function if it is compatible with the application. Refer to the <i>ATV31 Programming Manual</i>.
<i>OHF</i> Drive overload	<ul style="list-style-type: none"> • Drive controller or ambient temperature are too high. • Continuous motor current load is too high. 	Check the motor load, the drive controller ventilation, and the environment. Wait for the drive controller to cool before restarting.
<i>OLF</i> Motor overload	<ul style="list-style-type: none"> • Thermal trip due to prolonged motor overload • Motor power rating too low for the application 	Check the lth setting (motor thermal protection, page 32), check the motor load. Allow the motor to cool before restarting.

Faults Which Can be Reset With Automatic Restart (Continued)

Fault	Probable Cause	Remedy
<p><i>D P F</i> Motor phase failure</p>	<ul style="list-style-type: none"> • Loss of phase at drive controller output • Downstream contactor open • Motor not connected • Instability in the motor current • Drive controller oversized for motor 	<ul style="list-style-type: none"> • Check the connections from the drive controller to the motor. • If a downstream contactor is being used, set OPL to OAC. Refer to the <i>ATV31 Programming Manual</i>, FLT-menu. • Test the drive controller on a low power motor or without a motor: set OPL to nO. Refer to the <i>ATV31 Programming Manual</i>, FLT- menu. • Check and optimize the UFr (page 32), UnS (page 35), and nCr (page 35) parameters and perform auto-tuning (page 36).
<p><i>O S F</i> Overvoltage during steady state operation or during acceleration</p>	<ul style="list-style-type: none"> • Line voltage too high • Line supply transients 	<ul style="list-style-type: none"> • Check the line voltage. Compare with the drive controller nameplate rating. • Reset the drive controller.
<p><i>P H F</i> Input phase failure</p>	<ul style="list-style-type: none"> • Input phase loss, blown fuse • 3-phase drive controller used on a single phase line supply • Input phase imbalance • Transient phase fault <p><i>Note: This protection only operates with the drive controller running under load.</i></p>	<ul style="list-style-type: none"> • Check the connections and the fuses. • Disable the fault by setting IPL to nO. Refer to the <i>ATV31 Programming Manual</i>. • Verify that the input power is correct. • Supply 3-phase power if needed.
<p><i>S L F</i> Serial link failure Modbus</p>	<p>Loss of connection between drive controller and communication device or remote keypad.</p>	<ul style="list-style-type: none"> • Check the communication connection. • Refer to the product-specific documentation.

APPENDIX M
THE WIRELESS REMOTE OPTION

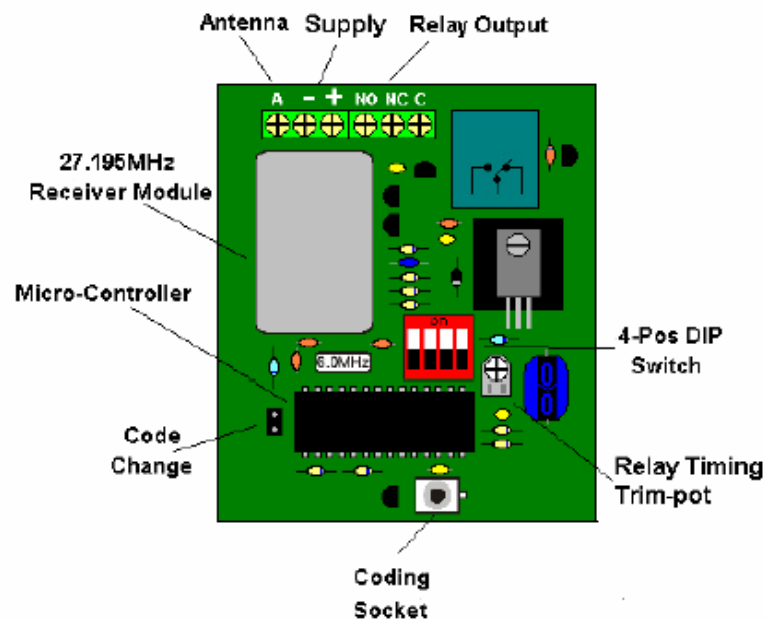
Remote Switch System 1 Installation Guide

Check all wiring connections before applying power!

The Remote Switch System 1 features include multiple relay output modes and a simple to program transmitter. Multiple transmitters can be programmed to one receiver and a single transmitter can operate multiple receivers. A Micro-controller in the receiver randomly generates one of over 4 billion security code combinations. This code is then programmed into the transmitter via a link cable, which is also used for programming multiple receivers to operate from one transmitter. A 4 position DIP switch on the receiver is used to select the mode of the receiver relay output. The receiver has eight modes that control how the relay output function. The relay is a SPDT Class C rated for 5 amps @ 250VAC with Normally Open (NO), Normally Closed (NC), and a Common (C) contact.

The Remote Switch System 1 GL receiver is the key to setting up the system to run properly. The receiver is used to program the transmitter and to select how the relay outputs function when selected by the transmitter. Key components of the receiver are:

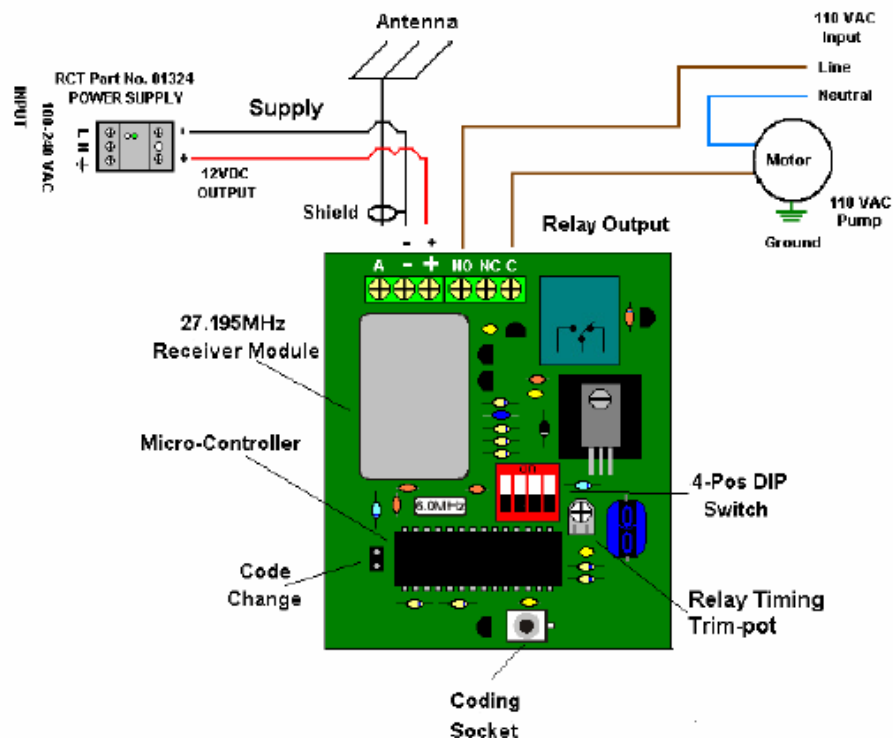
1. Supply Connections
2. Antenna Connections
3. 4 Position DIP Switch
4. Relay Timing Trim-pot
5. Coding Socket
6. Code Change Pins
7. Relay Connections



Receiver Installation Continued

RSS 1 GL Receiver Installation Instructions:

1. Open the door of the enclosure.
2. Connect the 12 VDC to the terminal block at the bottom of the receiver. Neg. 12VDC connects to the outer-right terminal marked with the "-" symbol. Pos 12VDC connects to the center terminal marked with the "+" symbol.
3. Connect your device to the output relay.
4. "NO" = a normally open contact, "C" = the common contact, "NC" = a normally closed contact.
5. Attach your antenna to the connector at the top of the receiver.
6. Double check all connections made to the receiver. Pay special attention to the polarity of power connections and the position of the relays to ensure the receiver is set up correctly.
7. Apply 12 VDC to the receiver.
8. Using a flat bladed screwdriver, short the code change pins marked by the "CC" symbol. This will randomly change the receiver security code.
9. Remove the battery cover of the transmitter to reveal the transmitter's coding socket.
10. Program the transmitter push button operation. (See Transmitter Programming)
11. Install a 9 VDC Alkaline battery and reinstall battery cover.
12. Using the 4 position DIP switch select the mode of operation for the relay. (See Receiver Relay Operation Modes)
13. Mount the RSS 1 GL Receiver inside of a larger enclosure, on a wall, or to a pole.



Antenna Directions

Antenna Directions:

Mount antenna outside of buildings, in a high location, away from V.F.D.'s, large electric motors or any obstructions. Use only high quality coaxial cable and antennas, which RCT can provide. (Do not loop excess coaxial cable into a coil. This will cause a RF (radio frequency) choke and reduce your signal range. If you can, loosely route it back and forth in an "S" configuration).

Transmitter Programming

RSS 1 GL Transmitter Programming:

The RSS 1 GL transmitter is a simple to operate single push button transmitter. The transmitter uses a red LED to display the status of the transmitter.

Transmitter LED Definitions	
Flashing when push button is pressed.	The LED will flash when a Push button on the transmitter is pressed. Indicating that the transmitter is transmitting.
Flashing when push button is not pressed.	This indicates that the battery is low.
Solid (ON)	Indicates the transmitter is connected to the receiver and is ready to be programmed via the link cable
Two Flashes	The LED will flash twice when the transmitter has successfully accepted the receiver programming
No LED (OFF) When Pressing Push Button	If the transmitter battery is completely dead or the transmitter is malfunctioning. The LED will not Flash. Replace Battery with a new 9 VDC Alkaline

Other features include multi-transmitter programming and multi-receiver programming. These features allow the user program multiple transmitters to control one receiver. Once a transmitter has been programmed, it can be used to program additional receivers. A red LED will blink repeatedly indicating a low battery condition.

Single Transmitter Programming:

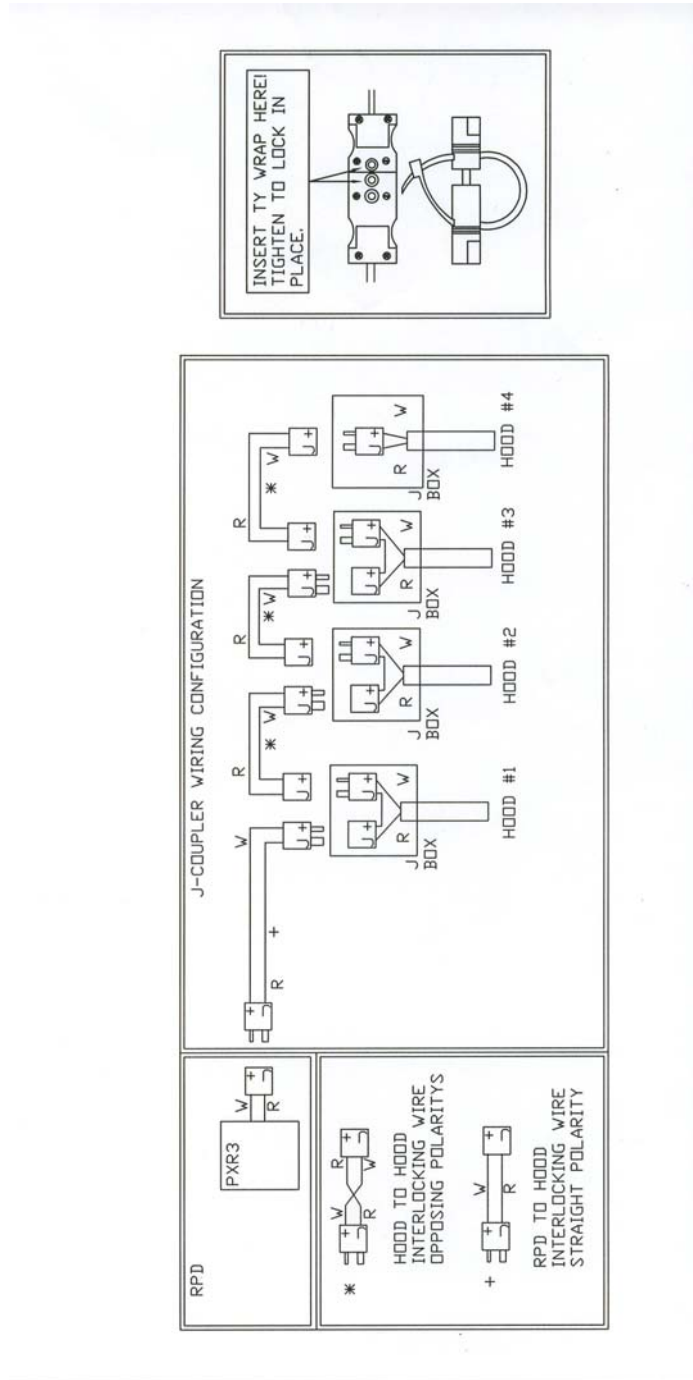
1. Apply 12VDC to the receiver (See Receiver Installation Instructions)
2. Momentarily short the two code change pins marked with the symbol "CC" on the receiver. This will randomly change the current security code of the receiver. (Skip this step if adding additional transmitters to an existing system.)
3. Connect one end of the link cable (RED) to the coding socket of the receiver. (See Receiver Installation Instructions)
4. Remove the battery cover of the transmitter.
5. Connect the opposite end of the link cable to the coding socket just above the battery of the transmitter. Observe the LED on the keypad of the transmitter. It should be solid red. This indicates a properly installed link cable.
6. Press the push button on the transmitter keypad. Observe the LED on the keypad of the transmitter. The LED will blink twice to indicate the program is complete.
7. Disconnect the link cable from the coding socket on the transmitter, and reinstall the battery cover.
8. Disconnect the link cable from the coding socket on the receiver.
9. Using the 4 position DIP switch on the receiver, select the mode of operation for the relays. (See Receiver Relay Operation Modes)



**RSS 1 GL Transmitter
PN: 5109T**

APPENDIX N

J-COUPLE REMOTE FACTORY SUPPLIED CABLE



APPENDIX O

CODE CHANGES

The National Fire Protection Association, NFPA-96 2001, code changed to provide for a reduction of the exhaust air from a commercial kitchen during low demand periods. The minimum duct velocity in the NFPA-96 2001 has been reduced from 1500 fpm to 500 fpm. In addition the International Building Code, IBM, was change in 2003 to allow for the reduction in exhaust from a commercial kitchen during low demand periods. The building and fire departments have these codes in their possession and will have no reason not to allow a Truflow installation anywhere in North America.

NFPA-96, 2001

8.2 Airflow

8.2.1 Air Velocity

8.2.1.1 The air velocity through any duct shall be not less than 152.1m/min (500 ft/min)

International Mechanical Code. 2003

Section 507 Commercial Kitchen Hoods

507.1 General

Exceptions:

3. Net exhaust volumes for hoods shall be permitted to be reduced during no-load cooking conditions, where engineered or listed multi-speed or variable-speed controls automatically operate the exhaust system to maintain capture and removal of cooking effluents as required by this section.

SIZING THE EXHAUST DUCTWORK

We recommend that the engineer size the exhaust ductwork for 1670 fpm velocity. The NPFA-96 code allows for a reduction in duct velocity to 500 fpm. By sizing the ductwork at 1670 for 100% exhaust and duct velocity will be 500 fpm at 30% exhaust volume.

APPENDIX P

TESTING TRUFLOW AFTER RUNNING FOR 30 SECONDS

The unit tested is a KES with supply VSD.

1. Pull the VSD Cat5 from top of panel jack.
 - a. Unit shuts down
 - b. ERROR: Comport2 Error/Com1 Fault/Com6 Fault after 30 seconds
 - c. Plug the VSD Cat5 back into jack.
 - d. Go the Error Status screen
 - e. Press “Clear Error on Drive button on top right of screen unit errors above disappear.
 - f. Start the unit from Power screen.
2. Pull the J-couple from top of panel jack.
 - a. Unit continues to run on high
 - b. ERROR: J-Couple cable trouble
 - c. Plug the J-Couple back into panel and error automatically clears.
3. Pull the outdoor air sensor Cat5 from top of panel jack.
 - a. The outdoor air temperature reading on the DASHBOARD reads -30F.
 - b. Plug the outdoor air sensor Cat5 back into panel.

KES Truflow units only

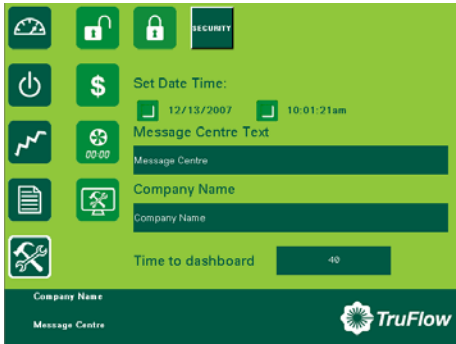
4. Pull the LV1 Cat5 out of top of panel jack.
 - a. Unit continues to run.
 - b. ERROR: LV1 Cable Fault
 - c. Plug the LV1 Cat5 back into top of panel.
5. Pull the LV2 Cat5 out of the top of panel jack.
 - a. KES unit shuts off.
 - b. ERROR: High Temp KES
 - c. Plug the LV2 Cat5 back into jack.
 - d. Press “Clear Error on Drive button on top right of screen unit errors above disappear
 - e. Unit starts to run.

APPENDIX Q

Adding or Removing Users and Changing Passwords. (Available to Administrator only)



Press the Setup button.



Administrator must login to see the SECURITY BUTTON



After administrator login press the Security button



The Password screen appears



Press the down arrow beside Administrator.



Select User and the Truflow keyboard screen appears. Type the new user name. Press Enter when you are done. Touch the box beside Pwd and add the new user password. Press the box beside Confirm Pwd and enter the user password again.



Press the + button to add the user:



Press the arrow button to add the user password:



Press the door to close the screen:



To remove a user, select the user and press the X button:

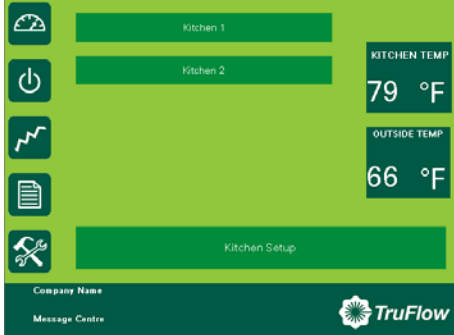
APPENDIX R

Truflow Factory Setup:

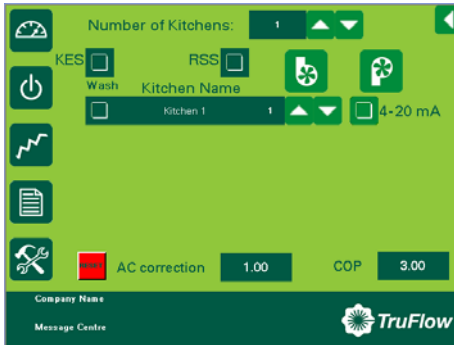
Login as Administrator. If you do not have the Administrators password call Spring Air Systems Inc. head office Service Manager.



Press the Setup button.



Press the Secondary Setup Button



Press the Kitchen Setup bar from the Secondary Setup screen.



Select the number of kitchens connected to the Truflow. Truflow provides a maximum of four independent kitchens.



Press the UP button to increase the number of kitchens.



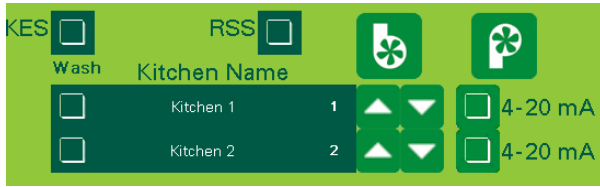
Press the DOWN button to decrease the number of kitchens.



Check the KES box if the Truflow is operating a Spring Air KES unit



Press the RSS button if the Truflow operation will be controlled by a remote dry contact across terminals C+L. If this is not checked the Truflow will operate from the System Control screen and the Automatic open and close settings.



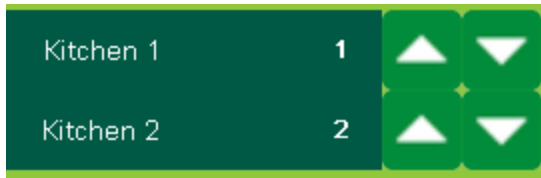
Check the Wash box for each kitchen if the Kitchen is connected to Spring Air water wash hoods.



Exhaust Fan



Supply Fan



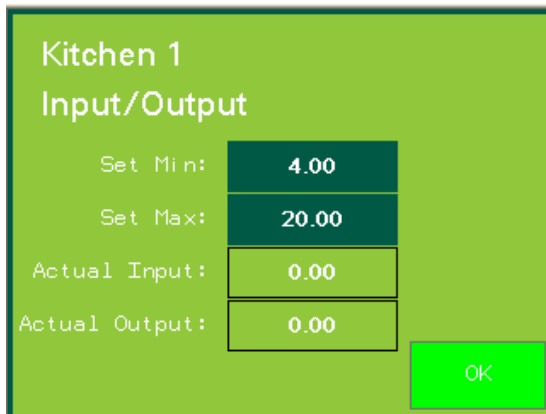
Select the number of exhaust drives on each Kitchen by press the UP button to add drives.

Press the DOWN button to remove drives.



Select the type of supply control for each kitchen. If the Truflow is controlling a supply fan with a Variable Speed Drive select the press the box to change screen to VSD.

If the supply control requires a 4-20 milliamp signal press the box to change the screen to 4-20 milliamps.



When 4-20 milliamp supply has been selected

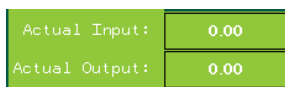
4-20 mA

Press the 4-20mA to open the Kitchen Input/Output screen.

The 4-20 milliamps can be adjusted to suit the application by adjusting the output signal.



Press the box beside Set Min and Set Max. A Truflow key pad appears to change the Min and Max to the required high and low for the application.



The Actual Input is the signal generated by the Truflow. The Actual Output is the signal send from the Truflow.



Press OK to return to Setup screen.



Press the RESET button to reset all screen Reports to zero. This does not affect the data on the Truflow Compact Flash Card. The Card must be removed to be deleted.



Press the box to select the electrical alternating current correction factory. The value is normally between 0.9 and 1.0. This will affect you electrical reports.



Press the box to select the Coefficient of Performance for the air DX or Chilled Water conditioning systems cooling the Truflow kitchen.



Press to return to Primary Setup screen.

Other Fine Products From

SPRING AIR SYSTEMS...

- Water Wash Ventilators
 - ◆ Hot Water Wash
 - ◆ Cold Water Spray/Hot Water Wash
 - ◆ Water Wash Control Panels
- Dry Extractor Hoods
- ***REV-LOW*** Hoods
- Cartridge Hoods
- Filter Hoods
- Surface Fire Suppression
- Commercial Kitchen Exhaust Fans
- Kitchen Enviro Systems
 - ◆ KES - 100% Exhaust
- Commercial Kitchen Supply Units
- Compensating Hoods
- Exhaust Fans
- Supply Fans
- Commercial Kitchen Control Panels
- Truflo & Melink Variable Speed Exhaust/Supply Systems
- Utility Distributions Systems