Spring Air
Solutions for Energy Savings

TruFlow Lite

Maintenance Manual

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TABLE OF CONTENTS

Title Page

Introduction

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

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

TruFlow Lite 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!

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.

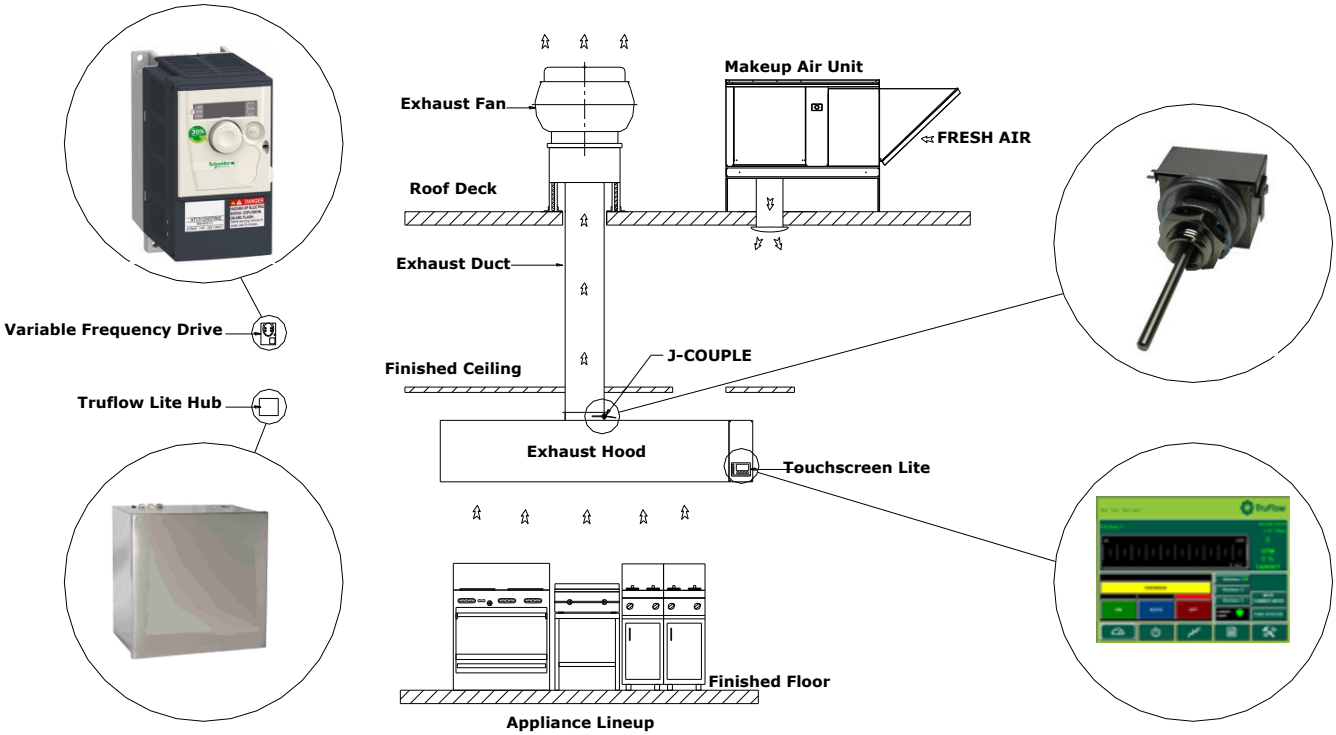
TruFlow Lite not only saves you money on energy expenses it can also help extend the life of your equipment by demanding exhaust only when it is really required. TruFlow Lite can be specified on new hoods or can be retrofitted on your existing hoods. Since the panel can be hood mounted or wall mounted,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

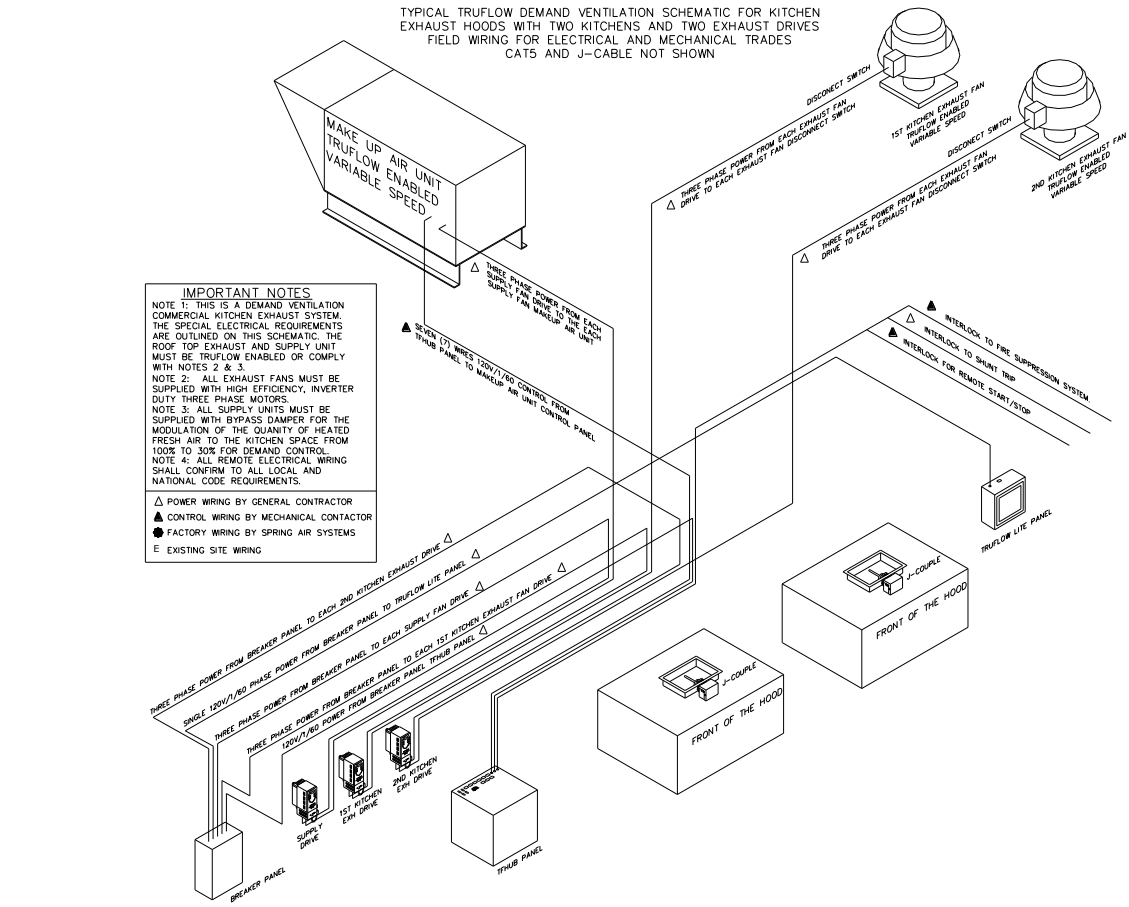
The TruFlow Lite system reduces the amount of air exhausted from the kitchen to match the amount of cooking. As more appliances are used, the exhaust and supply volume increase, as less appliances are used the exhaust and supply volume decreases.

What is TruFlow Lite?

The TruFlow Lite Energy Management Controller has been designed to change kitchen exhaust forever. TruFlow Lite 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 Lite automatically senses the reduction and decreases the amount of exhaust and supply to match exactly what is happening under the exhaust hood. The TruFlow Lite 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 Lite automatically modulates the exhaust and supply to suit the actual cooking operation at any given time during the cooking day.

The Truflow Lite System Components:



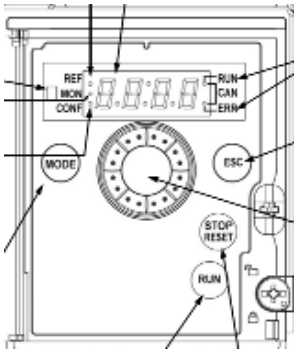


What are Variable Frequency Drives (VFD)?

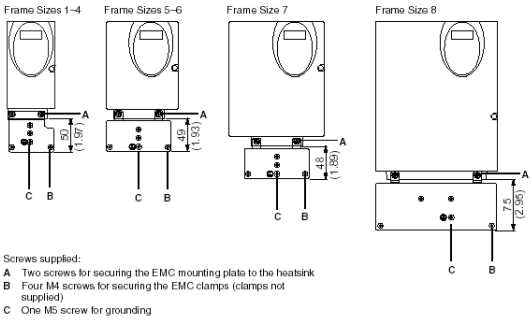
The variable speed drives for the exhaust and/or supply fan can be located in a stainless steel enclosure adjacent to the Truflow Hub panel or anywhere else in the building.

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)

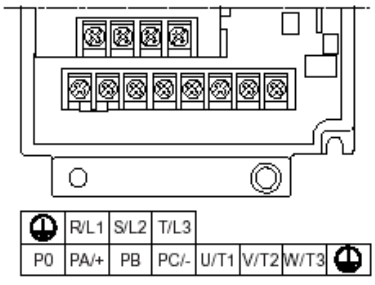
A CAT5 cable is connected to each drive in series from the TruFlow Lite Hub. The first cable connects from the Touchscreen to the first drive "Y" connector. The 2nd drive cable connects from the first drive "Y" connector to the 2nd drive "Y" connector. Each drive is connected in series. When the Touchscreen 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 TruFlow Lite Hub 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.



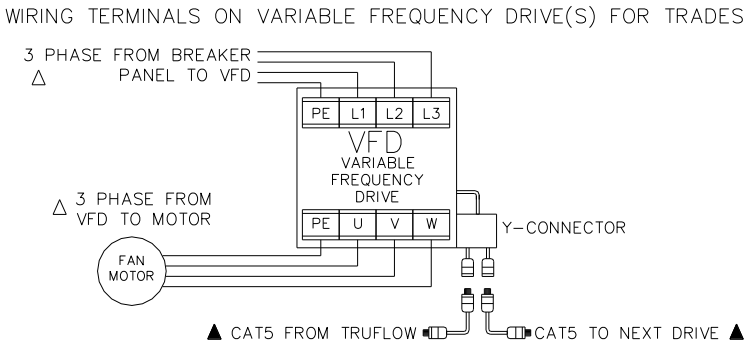
VFD front display



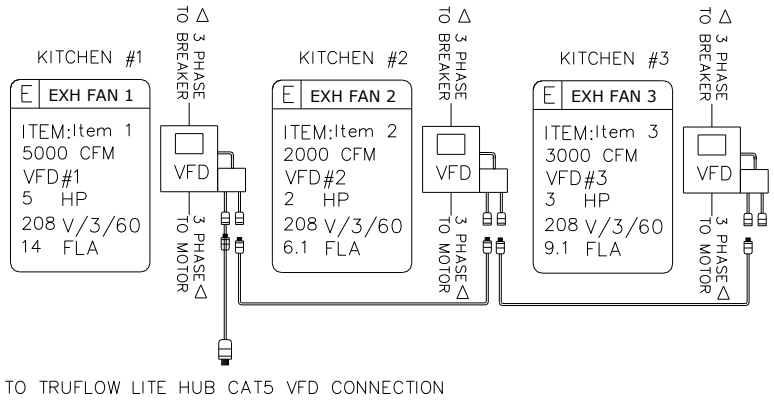
VFD frame sizes and EMC mounting plate



VFD terminal locations



*Remote wiring to VFD*The three-phase power supply from the breaker panel connects to terminals R/L1, S/L2 and T/L3 on the drive (shown above). The three-phase power from the variable speed drive to the motor connects to terminals U/T1, V/T2, and W/T3.



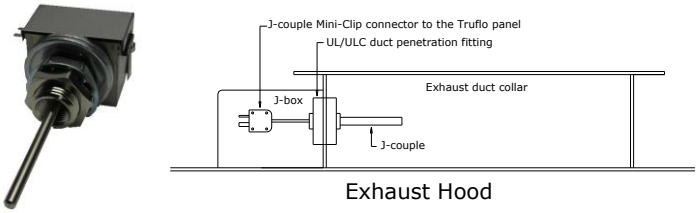
Multiple VFD control connections

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.

What is the J-Couple?

TruFlow measures the temperature in each exhaust duct collar for each hood connected to an exhaust fan that will be sped up or slowed down using a j-couple.

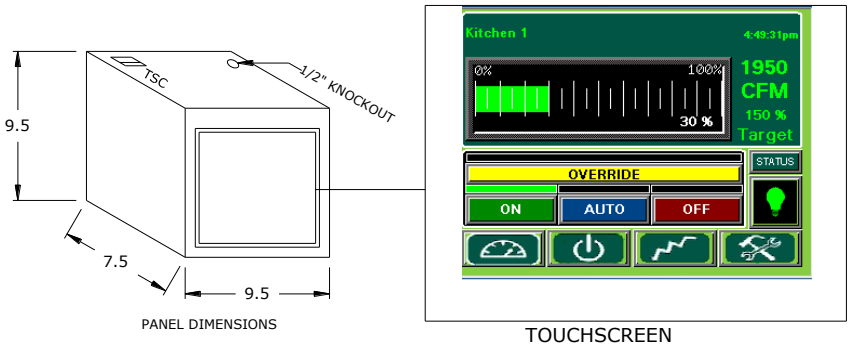
The J-couple is mounted in the center of each exhaust hood duct collar. The J-couple threads into a UL/ULC listed hood penetration fitting. The J-couple wiring is terminated in a factory supplied J-Box. Each hood duct collar connected to an exhaust fan connected to TruFlow Lite has a J-couple. The J-Couples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



J-Couple hood duct collar mounting

What is the Touchscreen?

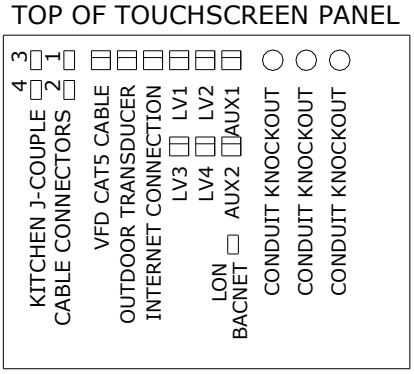
The Touchscreen is the communication interface between the operator and variable volume kitchen exhaust system. The Touchscreen has four windows: Dashboard, Power, Operation Status, and Primary Toolbox. Each window is described in detail in the following sections to set up your Truflow Lite systems to provide the optimum performance for your commercial kitchen.



Truflow Lite Touchscreen Wall Mounted Panel

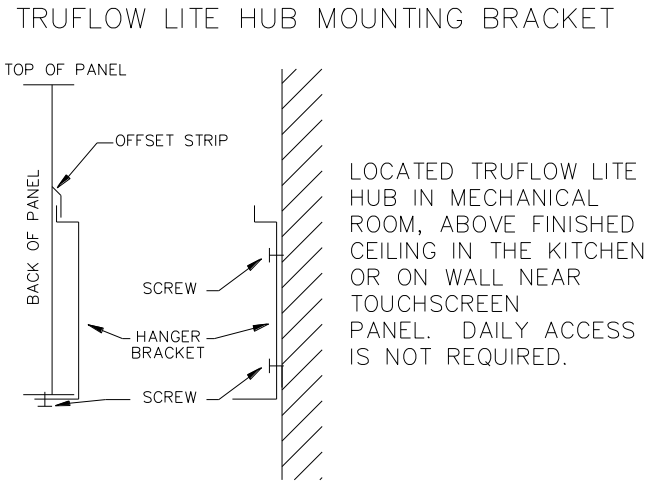
What is the Truflow Lite Hub?

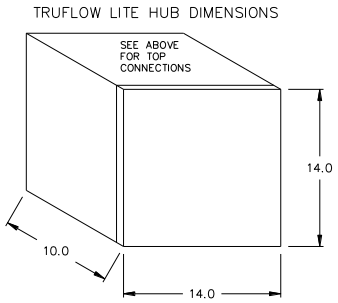
The TruFlow Lite Hub is the heart of the TruFlow Lite system, integrating the j-couples CAT5, LON or BacNet serial port connections, 24V inputs, 120V outputs, and VFDs to provide a complete commercial kitchen demand ventilation controller.



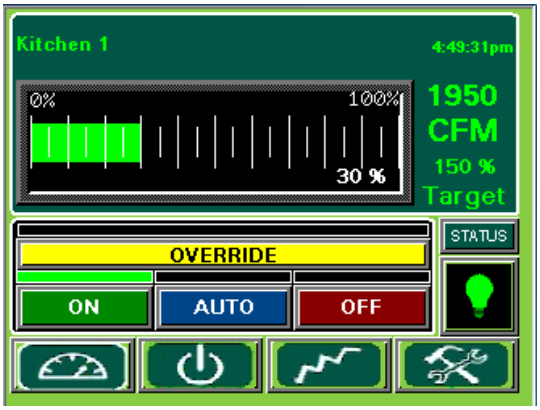
List of connections to the Truflow Lite Hub

- Kitchen 1: J-Couple Cable female plug.
- Kitchen 2: J-Couple Cable female plug.
- Kitchen 3: J-Couple Cable female plug
- CAT5 for all drives (VFD) Drives connected in series together through "Y" connector on each drive. Do not remove "Y" connections on drives even if one drive as Truflow Hub Lite will not operate.
- LV1 –CAT5 to 1st KES
- LV2 - CAT5 to 1st KES
- LV3 –CAT5 to 2nd KES
- LV4 - CAT5 to 2nd KES
- AUX1 – CAT5 cable to Touchscreen panel
- AUX2 – Optional CAT5 to SFT or SAT Truflow Enabled makeup air unit.
- Serial Connection for LON or BacNet from building Management System
- Interlock to Hood lights
- Interlock to supply unit on/off
- Interlock to supply unit summer/winter
- Interlock to fire suppression system
- Interlock to shunt trips
- Interlock to RSS, remote systems shutoff
- Interlock to motorized fresh air damper and end switch.





Let's take a closer look at the Dashboard and other TruFlow Lite Windows



This is the Dashboard Window for Kitchen1. The Dashboard displays the Kitchen1 operational parameters. The Kitchen1 name can be changed through the setup screen with a password.

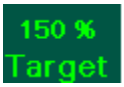
The exhaust fan volume is 1950CFM.

The Target indicates the kitchen operation is Green and 150% of target. Kitchen1 is exceeding the Energy Savings Goal by 50% and is saving energy!

The canopy lights are off. When the canopy lights are on the Lights icon is yellow. 

Target Bar

This bar is a visual representation of the operating efficiency and updates continuously. When the staff is meeting or exceeding your Energy Reduction Goal, this bar will be on target (shown above) and the efficiency icon will show the percentage by which the Energy Reduction Goal is being exceeded. When the Energy Reduction Goal is not being achieved, the graph will show a red hunting target (shown left), and the Efficiency icon will show the percentage of the Energy Reduction Goal that is being reached.



Override 

To override the TruFlow Lite, t*ouch* and hold for 3 seconds. Operation will drive to 100% for a pre-set length of time and the **Efficiency** icon will zero out. The override time is adjustable through the **Power** window.

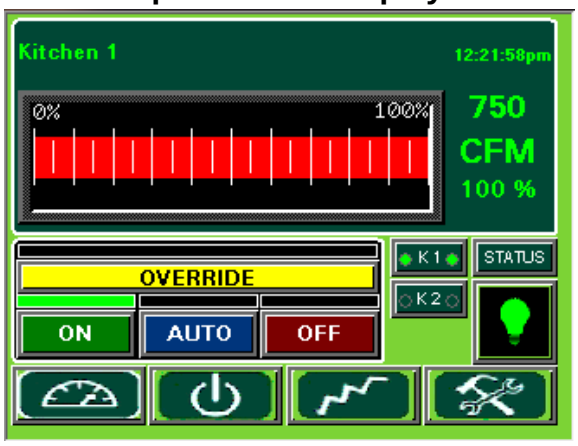
Touch to open the **Power** window.

Touch to open the **Message Screen** window.

Touch to open the **Primary Toolbox** window.
This window is accessible only with a password.

The **Time** can be changed in the **Primary Toolbox** window with a password.

Multiple Kitchen displays:



The DASHBOARD for a multiple kitchen Truflow Lite displays the Kitchen Name and Status Bar.

When the kitchens are exceeding the set Energy Savings Goals, the Status Bar will be in the green.

kitchens can be accessed by selecting the Kitchen name on the Dashboard.

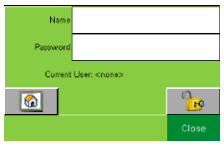
The Status bar for kitchens not meeting the Energy Savings Goal will be red

How to Log In and Log Out

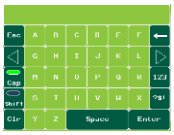
In order to make any changes to user settings, you must log in as Manager with your password.
Only authorized service agents will be able to view certain drive information and change system settings with their own login. If you do not know your login or password, please contact Spring Air Systems, Inc.

Touch the icon for the **Primary Toolbox** window.

Touch the **unlock** icon.



Touch the white fields beside **name** and **password** and use the pop-up keyboard to type in your login name and password

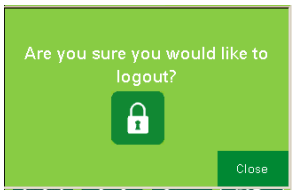


Touch the **unlock** icon again to login to complete login. *Touch* **close**.

You are now logged in and will be able to make changes to user settings.

Once you are completed with your changes, you will need to log out.

Touch the **lock** icon.



When the confirmation window pops up, *touch* the **lock** icon again.

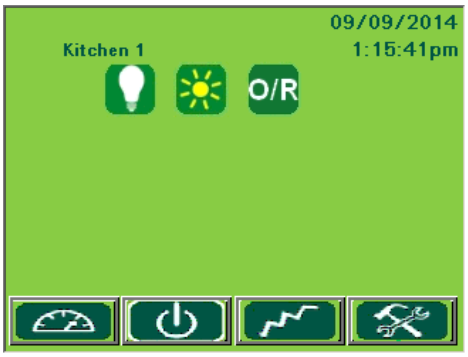
Touch **close** to exit confirmation screen.

You are now logged out and will not be able to make any changes.

Power Window

The Power Window provides access to all of the exhaust components controlled by the TruFlow. These include canopy lights, fan on/off, summer/winter and override settings.

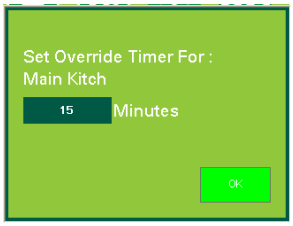
Touch the icon for the **Power** window.



Canopy Lights.
Touch icon to turn on/off lights. When canopy lights are on, icon has a white border.

Summer/Winter.
Touch icon to switch between summer and winter mode.
When in winter mode, makeup air burner will activate as required to maintain makeup
air temperature.

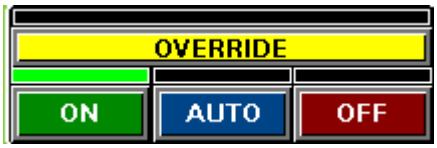
Override Timer
Touch icon to access Override Timer window to adjust the length of Override time.



Touch the dark green field next to minutes.

Type the time, in minutes, the Override should run for using the pop-up keyboard.

Touch **OK** to return to **Power** window.

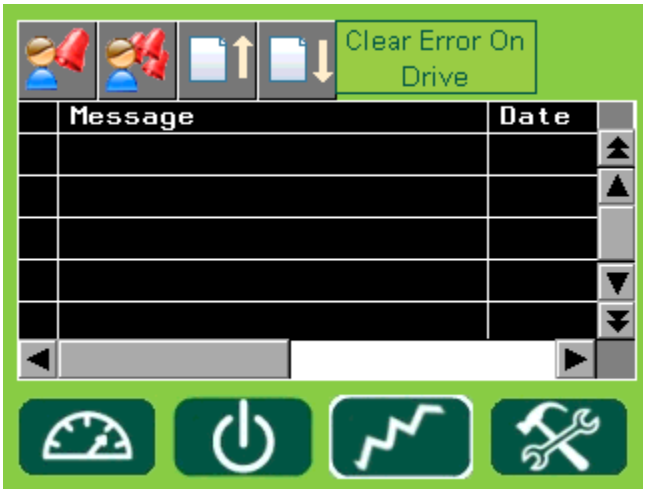


Manual System Operation.
Touch 'ON' button to operate exhaust system manually.
When manual operation is engaged, there will be a green line above. Automatic start/stop times can be setup in the **Primary Toolbox**

Multiple Kitchen Display:

Operation Message Window

The **Operation Status** window provides a list of current and previous operation messages that have been recorded by the TruFlow. You will need to go to this screen to clear messages. Current messages will show in red on the list; acknowledged messages will be yellow and cleared messages will be green.



From the **Dashboard** *touch* the **Operation Message** Window icon.

Acknowledge All Messages icon
Touch this icon to acknowledge all active messages.

Acknowledge Message icon
Touch this icon to acknowledge only the highlighted active message.

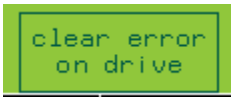
Scroll Up one line
Touch this icon to scroll the page up by one line.

Scroll Down one line
Touch this icon to scroll the page down by one line.

Scroll Up one page
Touch this icon to scroll the page up by one page.

Scroll Down one page
Touch this icon to scroll the page down by one line.

Clear errors on VFD.



Touch this icon to clear the drive errors.

Messages (errors) will also be recorded on the VFD. Some messages also require the VFD to be restarted. For a list of messages that require the VFD to be restarted prior to touching **clear error on drive**, see Appendix K.

The exception to this is Thermal Start messages and J-Couple Trouble messages. These messages will not be recorded on the VFD.

Unless directed to do by an authorized service agent, or Spring Air Systems, do not turn off power to the TruFlow Lite Touchscreen or HUB. Turning off the power to the TruFlow Lite Touchscreen or HUB will cause all recorded messages to be deleted.

Operation Messages

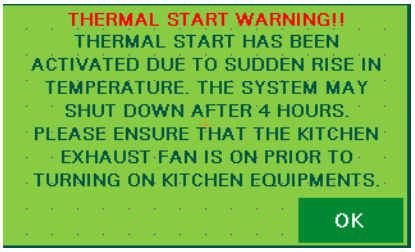
When a message that requires immediate attention or action occurs, the screen will change to red with a yellow exclamation mark. These types of alarm include certain drive errors where the VFD cannot reset automatically, and catastrophic equipment failures (exhaust fan or makeup air unit not running).

Touching the screen anywhere and opens the **Operation Status** window. The current message including the date, time, state and whether the message has been acknowledged will be shown. There will also be an explanation of the cause of the message.

Once the cause of the message has been corrected, it can be acknowledged by touching the Acknowledge Message icon and then the Clear Error On Drive icon to resume normal operation.

Current messages will be highlighted in red; messages that have been acknowledged but not cleared will be highlighted yellow; messages that have been both acknowledged and cleared will be highlighted in green.

Thermal Start



The TruFlow Lite will automatically turn on the exhaust and supply fans when a threshold temperature under the hood is reached.

When this occurs, the window shown left will popup.

Touch **ok** to exit the thermal start warning window.

Be sure to turn the fans on manually, or switch operation (if setup) to schedule for continual operation. If you do not, the thermal start will turn the system off after four hours, and this process will begin again.

J-Couple Cable Trouble

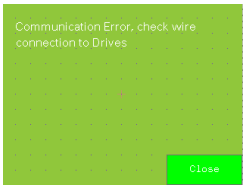
J-Couple Cable Trouble messages occur when the J-couple cable has been unplugged. This occurrence will cause the TruFlow Lite to operate on high (100%) until the cable is plugged back in. J-Couple Cable Trouble message will *not* shut down the exhaust system.

Surface Fire Suppression

In the event the surface fire suppression activates, the TruFlow Lite will show this popup:

Once the fire is out and the suppression system is reset, *touch* **reset** to return to normal operation. If you have a multiple-kitchen TruFlow Lite system, you will need to repeat this step on each kitchen's dashboard.

Communication Alarm Popups



This is a typical popup displayed after a MODbus, Comm Port or communication message.

Communication messages occur when there is a timeout or lack of communication between the TruFlow Lite and one or more of the VFDs. Communication messages are *not* fatal; however, the message that causes them may be.

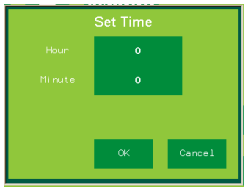
Primary Toolbox Window

When logged in with the Manager's permissions, you will be able to adjust the user settings and view drive information.

When logged in with authorized service technician permissions, you will also be able to adjust user settings and view drive information. Additionally, you will have access to system setup items.

Updating the Time

Touch the dark green field with the time.



Touch the dark green field next to Hour or Minute.

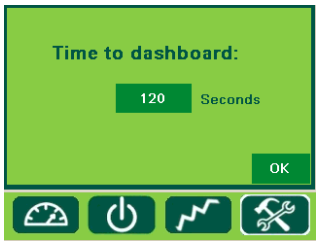
Type the new time using the pop-up keyboard.
Touch **enter** to return to Set Date window.

Touch **OK** to save changes or **Cancel** to delete and return to the **Primary Toolbox** window. TruFlow Lite does *not* automatically update for daylight savings.

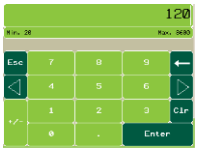
Updating Time to Dashboard

The default window on TruFlow Lite is the **Dashboard** window. After a set number of seconds of inactivity, the TruFlow Lite will return to the **Dashboard**.

To change the length of time before TruFlow Lite returns to the **Dashboard**, *touch* the Time to Dash icon.



In the pop-up window, *touch* the dark green field to the left of **Seconds**.



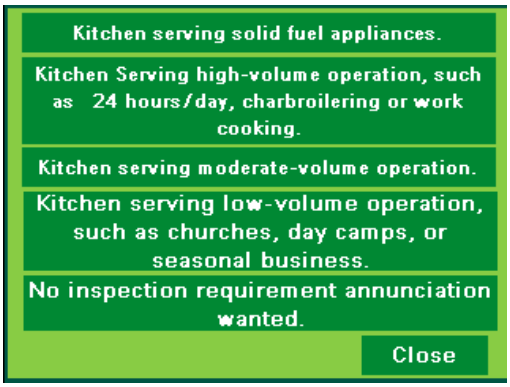
Type the new time using the pop-up keyboard.
Touch **enter** to return to Time to Dashboard window.

Touch **OK** to save changes or **Cancel** to delete and return to the **Primary Toolbox** window.

Maintenance Tracking

TruFlow Lite can provide pop-up reminders for scheduling service of the kitchen exhaust system specific to the kitchen usage.

Touch the **Cooking Behavior** icon. This will open a pop-up window with several self-explanatory options



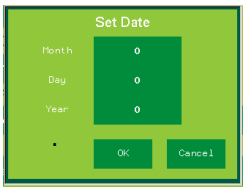
Each option of cooking behavior has its own maintenance schedule. Kitchens serving solid fuel appliances will have a more frequent maintenance schedule (thus more frequent pop-up reminders) than kitchens service low-volume operations.

If no maintenance reminder is required, *touch* the "No Inspection" bar.

The selected maintenance level will be colored pink.

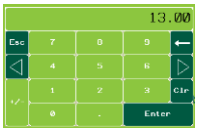
The start date of the maintenance reminders can also be updated.

Touch the checkbox below Maintenance Start Date.



Touch the dark green field next to Month, Day or Year.

Type the new information in the pop-up keyboard.



Touch **enter** to return to Set Date window.
Touch **OK** to save changes or **Cancel** to delete them.

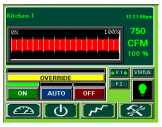
Changing Language to French:

Touch the dark green box beside French to switch the TruFlow Lite text to the French language.

Energy Reduction Goal

As its name indicates, the Energy Reduction Goal is the percentage of energy the operator would like to save by turning down or off unused appliances. Once these appliances are turned off, the temperature in the hood will drop, allowing TruFlow Lite to slow down the exhaust fan(s) and makeup air.

When the kitchen staff is meeting or exceeding the Energy Reduction Goal, the bar will be green or yellow.



If the kitchen staff is not meeting the Energy Reduction Goal, the bar will be red.

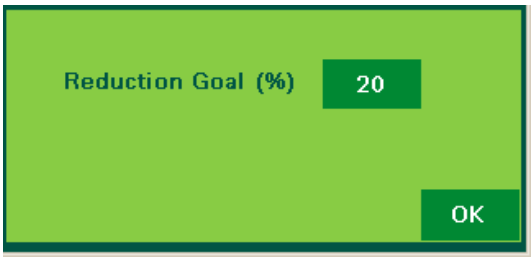
Having an Energy Reduction Goal setup helps encourage staff members to be conscientious about turning off unnecessary cooking equipment.

The Energy Reduction Goal is initially factory set to 20%. This number can be adjusted as needed to encourage staff to be more energy efficient.

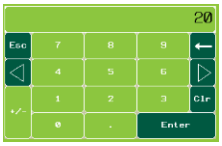
Setting up the Energy Reduction Goal and setting guidelines for staff to turn down or off appliances is key to getting the most savings.

Adjusting the Energy Reduction Goal

Touch the **Energy Reduction Goal Setup** icon to access the Energy Reduction Goal Setup window.



In the Energy Reduction Goal Setup window, *touch* the dark green field beside “Reduction Goal (%).



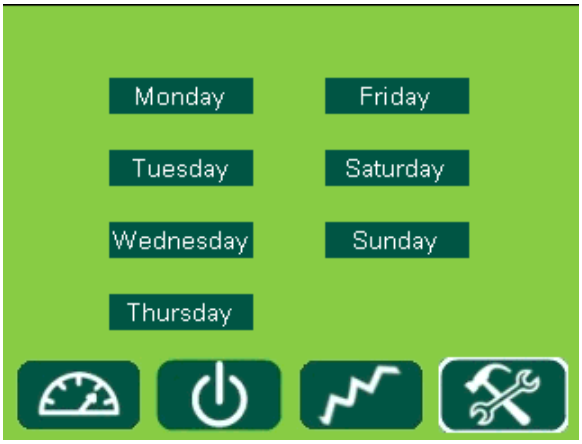
Type the reduction goal percentage in the pop-up keyboard.

Touch **Enter** to return to Energy Goal Setup window.
Touch **OK** to return to the **Primary Toolbox** window.

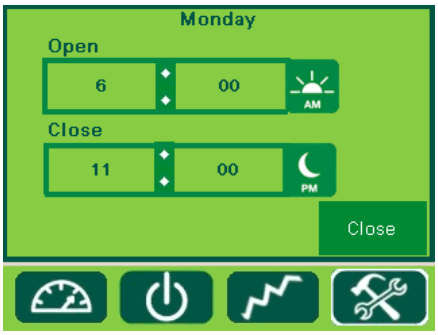
Automatic Start/Stop Schedule

The automatic schedule is useful when the exhaust system is required to turn on and off at a set time each day. A different automatic start and stop time can be set for each day of the week. An automatic start/stop time will need to be set for every day of the week you will *not* be operating the exhaust system in manual (HAND) mode.

From the **Primary** Toolbox window, *touch* **Automatic Schedule** icon.

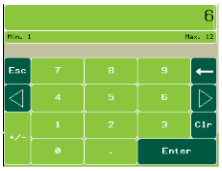


Touch the name icon for the date you would like to set up.



Touch the AM/PM icon to change.

Touch the number of the time you would like to update and using the pop-up keyboard change the number.

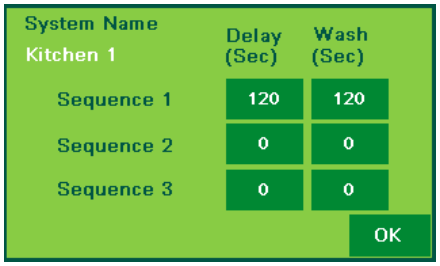


If the hood need to stay turned off on a particular day, set the on and off times to the same.
For example, if the kitchen does not operate on Sundays, set Sunday's opening and closing time to 12:00 a.m.

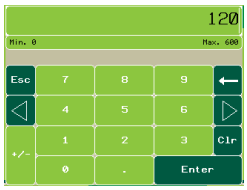
Water Wash Sequence(s) setup (OPTIONAL)

If the hoods are equipped with a water wash system, the length of time after the exhaust system is turned off before the wash cycle will turn on and how long the wash sequence will run for can be adjusted. A different setting can be set for up to three different water wash systems as long as they are connected to the TruFlow Lite. These settings can be adjusted using with the Manager's or service technician's login.

Touch the **water wash timer** icon to access the Water Wash Timer window.



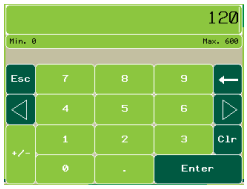
Touch the dark green field beneath the delay time for the sequence you are setting up.



Using the pop-up keyboard, *type* the length of time (in seconds) after the exhaust system has been turned off before the wash sequence will run.

Touch **enter** to return to the Water Wash Timer window.

Touch the dark green field under the wash time for the sequence you are setting up.



Using the pop-up keyboard, *type* the length of time (in seconds) after the wash sequence should run for.

Press **enter** to return to the Water Wash Timer window.

Repeat these steps for each water wash system connected to the TruFlow Lite.

Press **OK** to return to the **Primary Toolbox** window.

Activating the Wash

The wash cycle will run when the exhaust fan is turned OFF.

A blinking water drop will show on the **Dashboard** window when the wash sequence is running. The number in the water drop indicates which number sequence is currently running.

Secondary Toolbox

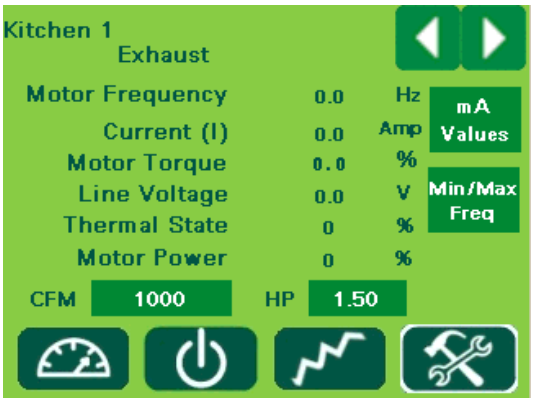
The Secondary Toolbox provides access to TruFlow Lite setup features and variable speed drive information.

The Manager login will only have access to view this information. The Administrative login has access to change some setup and drive settings.

Touch the Secondary Toolbox icon.

Accessing Drive Setup Information

Touch the Kitchen 1 bar to access the Drive Information window.



The current operating information for the drive selected will be displayed.

This display provides useful information for diagnosing possible problems at a glance.

Use the next page icon to change between drives (if applicable).

The CFM and horsepower information are factory set, but can be adjusted in the field if required. This information will need to be adjusted if the fan's motor is changed to larger or smaller.

It is important to remember that if a larger motor is being installed, the variable speed drive will also need to be changed.

Touch the dark green field to the right of "CFM" to change the CFM setting.

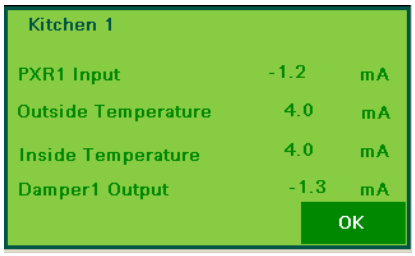
Touch the dark green field to the right of "HP" to change the horsepower setting.

Viewing Operating mA Values

The operating mA values can be viewed at any time; however values will only be present when the fans are turned on.

These values can be viewed to diagnose possible CAT5 cabling or signal problems.

Touch the mA Values icon to view the current data available.



PXR1 Input is the value being received from the variable speed drives – it represents the current operating speed of the fans.

Outside Temperature value is used for energy calculations.

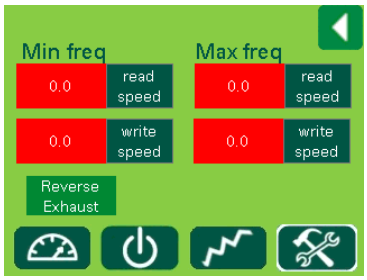
Inside Temperature value is also used for energy calculations.

Damper Output value is the mA value being received from the makeup air damper (if present).

Viewing VFD Frequency Settings

Access to the VFD Frequency Settings will only be available when logged in as Administrative and the fans are turned off. The minimum and maximum frequency (speed) settings can be both viewed and changed in this window.

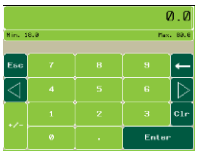
Touch the icon for the VFD Frequency Settings window.



Touch **read speed** for Min freq. The field will turn pink for several seconds and then display the current minimum operating frequency on the drive.

Touch **read speed** for Max freq. The field will turn pink for several seconds, then display the current maximum frequency on the drive.

If it is necessary to change the minimum or maximum frequency of the VFD, *touch* the field to the left of Write Speed under Min. freq.

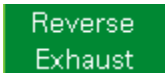


Using the pop-up keyboard, *type* in the new minimum frequency.

Touch **enter** to return to the VFD Frequency Settings window.

Touch **write speed** for Min. Frequency. The new setting is now saved (written) to the drive.

Repeat these steps for Max. Frequency.

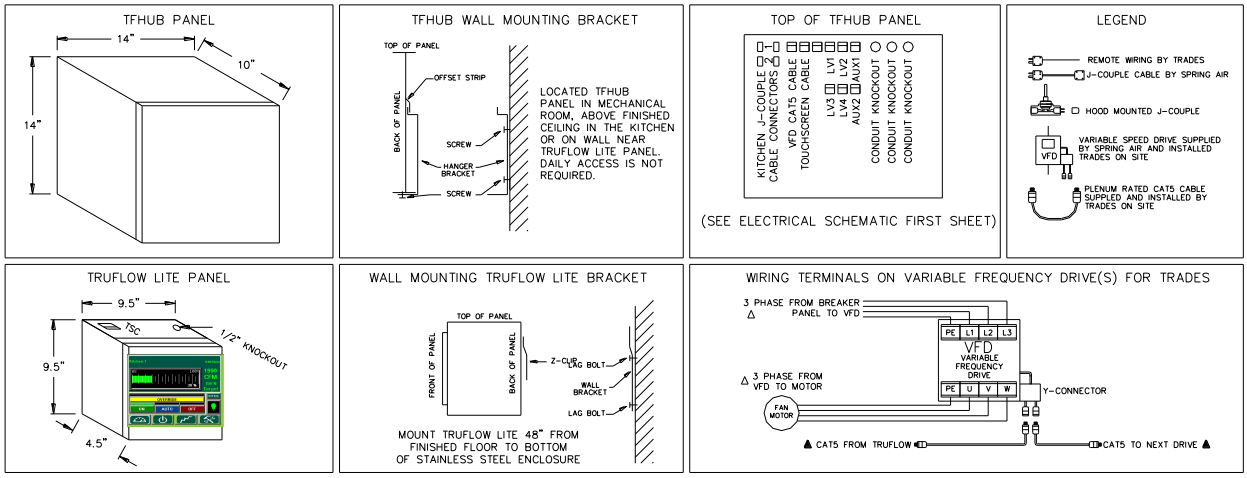


The rotation of the exhaust drive can be changed by *touching* the **Reverse Exhaust** icon. *This option should be used as a test only; the exhaust fan must be properly wired for the correct rotation.*

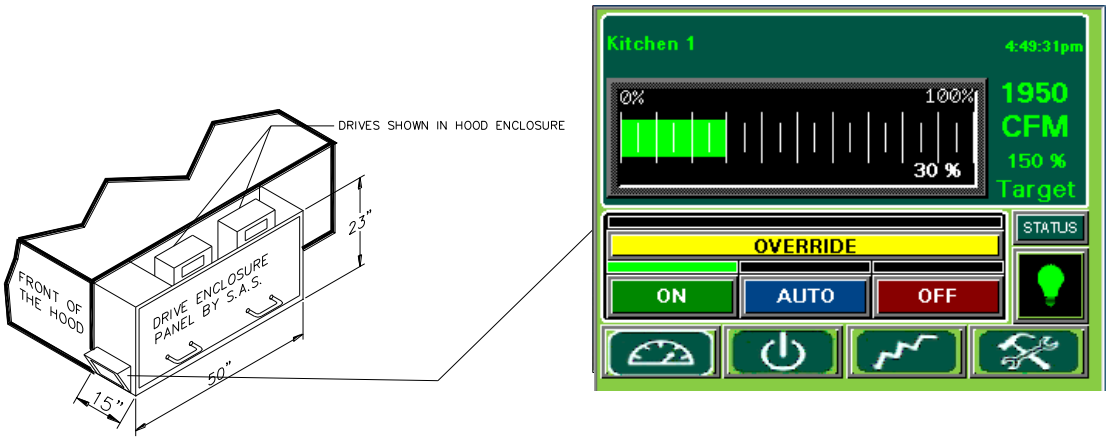
APPENDIX

APPENDIX A. Panel Dimensions

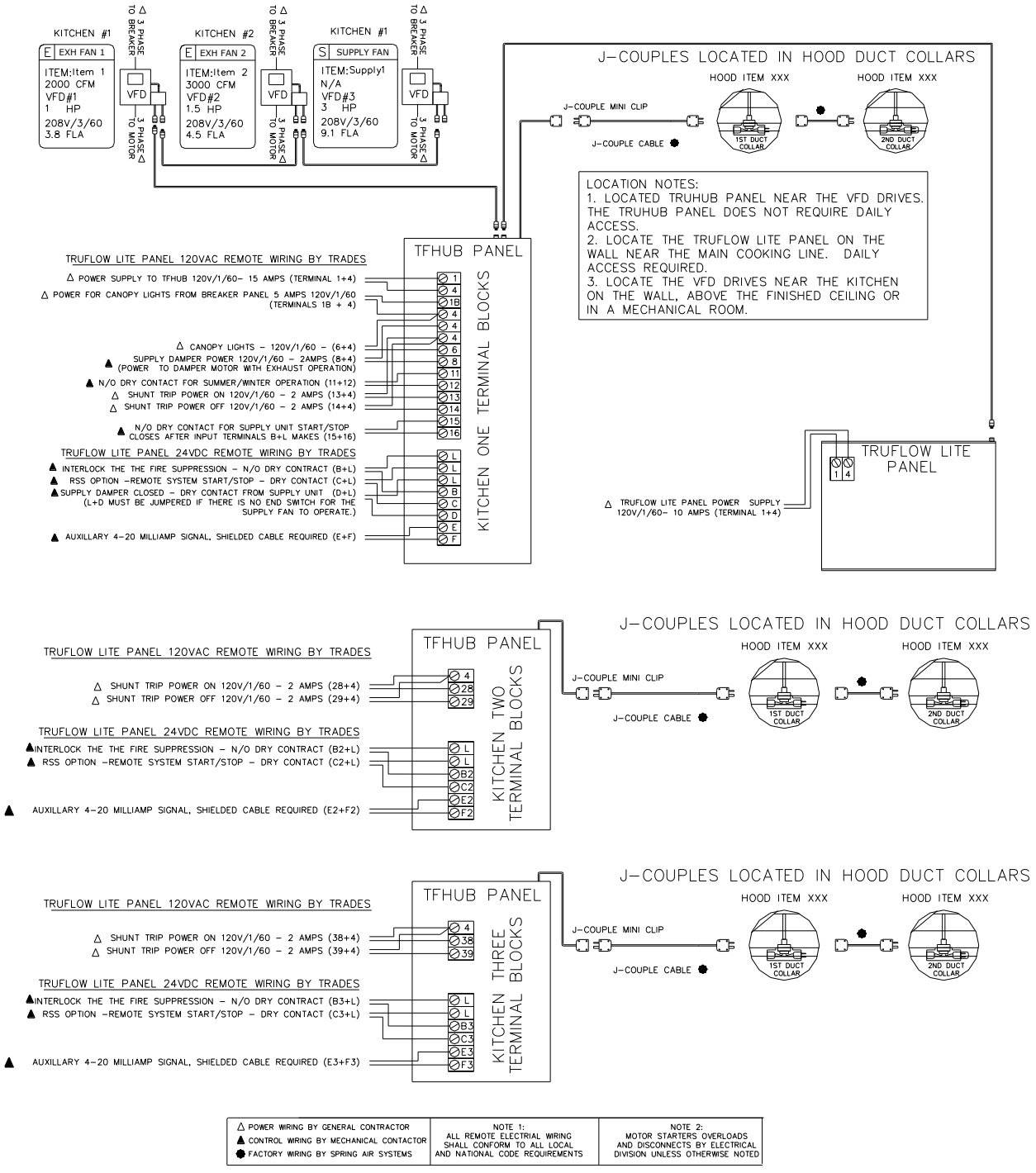
TruFlow stainless steel panel dimensions
Wall mounted.



TruFlow stainless steel panel dimensions
Hood mounted.



APPENDIX B. Remote Wiring



APPENDIX C. PXR Factory Setup

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

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 /\ to increase parameter set value and \/ to decrease parameter set value. Set P = 28 and then press SEL.
[=0	Press \/ to next parameter, integral time, [. 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 /\ 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 \/ fiver 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.

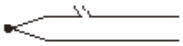
	3rd Block Parameters
	Press SEL and hold for about 5 seconds until P-n1 appears on the display. Release SEL.
P-n1=3	Press SEL again to set the Control Action, P-n1. Use the /\ and \/ to adjust the value to 3. Press SEL.
SV-L=55	Press \/ to next parameter, Lower limit of SV, SV-L. Press SEL and adjust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

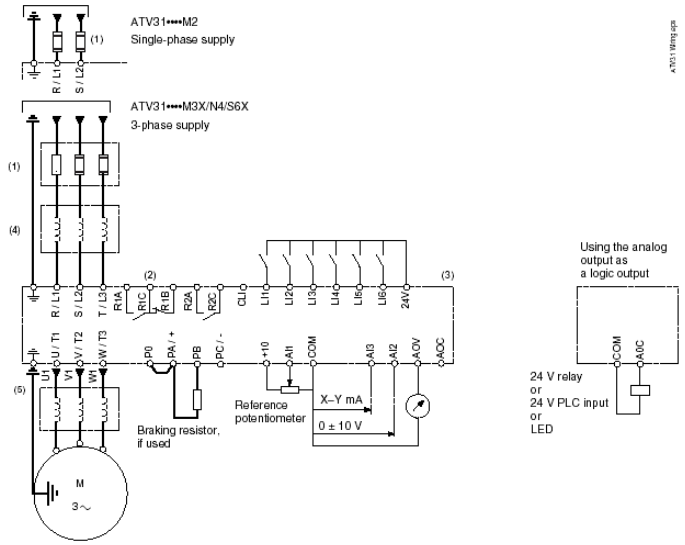
Condition		Display	Control output
Break		U U U U	ON or more than 20mA (Note) OFF or less than 4 mA
Short circuit		short-circuit point Temperature display	Input is controlled as short-circuit point temperature. (Note)

• 4-20mA DC

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

APPENDIX E. 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	• 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 and Grounding

Good wiring practice requires separation of control circuit wiring from all power (line) wiring. In additional, 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**.

⚠CAUTION

IMPROPER WIRING PRACTICES

- 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 metallic conduits carrying power from those carrying control wiring by at least 76mm (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 305mm (12in.).
- 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.
- 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.

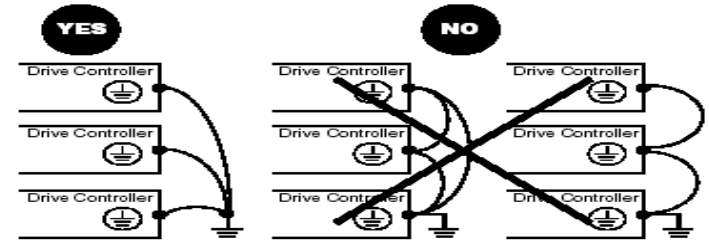
⚠ DANGER

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.

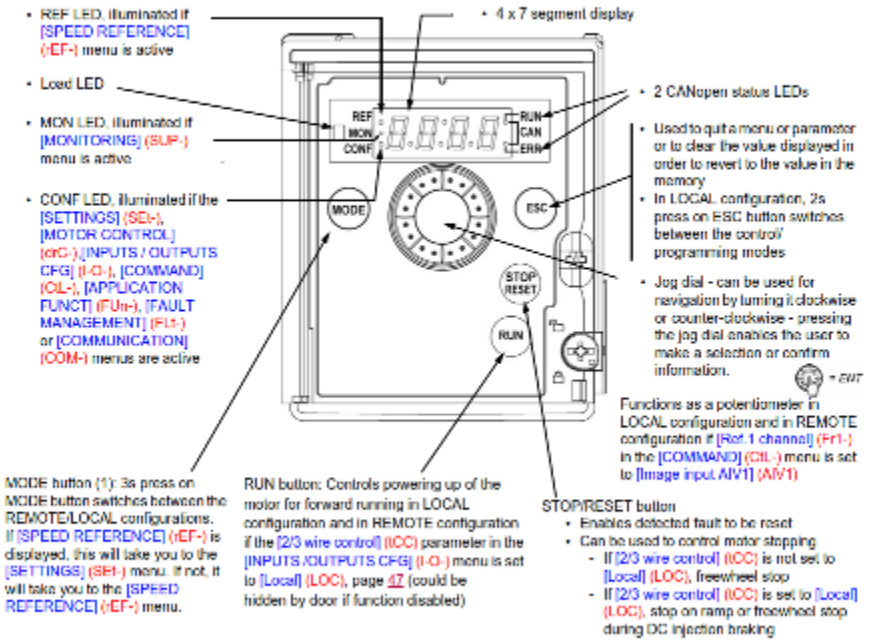
Ground multiple drive controllers as shown in the figure below. Do not loop the ground cables or connect them in series.



APPENDIX H. Starting the Drive Manually\f C \l "2" }

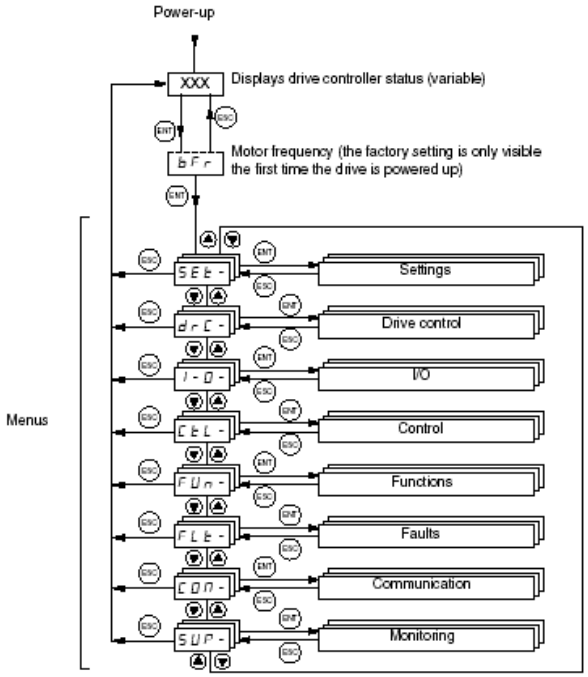
Description of the HMI

Functions of the display and the keys

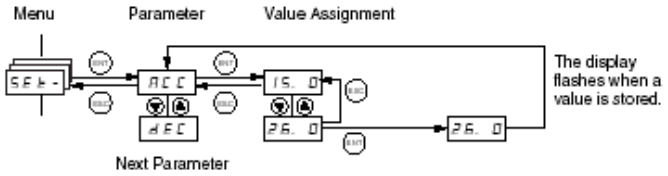


Note1: In LOCAL configuration, the three Leds REF, MON,and CONF are blinking simultaneously in programming mode and are working as a Led chaser in control mode.

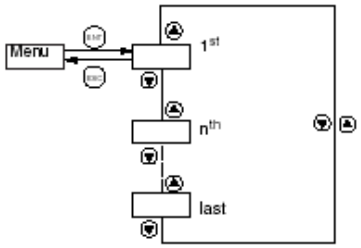
APPENDIX I. Accessing the Drive Program Menu



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 J. Factory Variable Frequency Drive Parameters

ALTIVAR VFD TruFlow PROGRAM PARAMETERS

Power the Altivar VFD and proceed to input the following settings for Modbus applications.

[bFr]	On power up select ENT –**bF**r will display, select ENT and set value to 60 Hz.
[SEt]	**Press ENT ↓or scroll down to SEt press ENT to enter Settings Menu.**
ACC = 10	Press ENT again and scroll down to **ACC**. Press ENT and set value to 10 sec. Press ENT
dEC = 10	Press ESC ↓ or scroll down to **dEC** press ENT, set value to 10 sec. Press ENT
LSP = 18	Press ESC ↓ or scroll down to **LSP** press ENT, set value to 18 Hz. Press ENT
HSP = 60	Press ESC ↓ or scroll down to **HSP** press ENT, confirm value to 60 Hz. Press ENT
ttd = 118	Press ESC ↓ or scroll down to **ttd** press ENT, set value to 118. Press ENT
SP2 = 60	Press ESC ↓ or scroll down to **SP2** press ENT, set value to 60 Hz. Press ENT
[drC]	**Press ESC twice ↑or scroll up to drC press ENT to enter Drive Control Menu.**
nCr = FLA	Press ↓ or scroll down to **nCr** press ENT, set value to 20% above the FLA rating of installed motor.
tUn = POn	Press ESC ↓ or scroll down to **tUn** press ENT, set value to POn. Press ENT
tFr = 72	Press ESC ↓ or scroll down to **tFr** press ENT, set value to 72 Hz. Press ENT
[CTL]	**Press ESC twice ↑ or scroll up to CTL press ENT to enter Control Menu.**
LAC = L3	Press ENT ↓ or scroll down to **LAC** press ENT, set value to L3. Hold ENT for 3 sec.
Fr2 = Mdb	Press ESC ↓ or scroll down to **Fr2** press ENT, set value to Mdb. Press ENT
rFC = LI5	Press ESC ↓ or scroll down to **rFC** press ENT, set value to LI5. Press ENT
[I-O]	**Press ESC twice ↑ or scroll up to IO press ENT to enter I/O Menu**
tCt = LEL	Press ENT ↓ or scroll down to **tCt** press ENT, set value to LEL. Press ENT
rrS = nO	Press ↓ or scroll down **rrS** press ENT, set value to nO. Press ENT
AOIt = 4A	Press ↓ or scroll down to **AOIt** press ENT, set value to 4A. Press ENT
dO = OFr	Press ESC ↓ or scroll down to **dO** press ENT, set value to OFr. Press ENT
r1 = rUn	Press ESC ↓ or scroll down to **r1** press ENT, set value to rUn. Press ENT
[FUn]	**Press ESC twice ↑ or scroll up to FUn press ENT enter Application Function Menu**
SA1 = nO	Press ↓ or scroll down **SA1** press ENT, SA2 will display, press ENT again and set value to nO. Press ENT
[FLt]	**Press ESC 3 times ↑ or scroll up to FLt press ENT to enter Fault Menu**
Atr = yes	Press ↓ or scroll down **Atr** press ENT, set value to yes. Press ENT
drn = yes	Press ESC ↓ or scroll down to **drn** press ENT, set value to yes. Hold ENT for 3 sec.
[CON]	**Press ESC twice ↑ or scroll up to CON press ENT to enter Communication Menu**
Add = 2-7	Press ENT ↓ or scroll down to **Add** press ENT, set value to 2 min. Assign Drive address based on Exhaust or Supply Fan designation. Press ENT

tFO = 8n1	Press ↓ or scroll down **tFO** press ENT, set value to 8n1. Press ENT
FCS	Under **drC** parameter block set to InI to return VFD to factory settings.

NOTE: Assigning Drive address requires power cycle to confirm setting.

ALTIVAR VFD TruFlow PROGRAM PARAMETERS

Power the Altivar VFD and proceed to input the following settings for CANopen applications.

[bFr]	On power up select ENT –**bF**r will display, select ENT and set value to 60 Hz.
[SEt]	**Press ENT ↓or scroll down to SEt press ENT to enter Settings Menu.**
ACC = 10	Press ENT again and scroll down to **ACC**. Press ENT and set value to 10 sec. Press ENT
dEC = 10	Press ESC ↓ or scroll down to **dEC** press ENT, set value to 10 sec. Press ENT
LSP = 18	Press ESC ↓ or scroll down to **LSP** press ENT, set value to 18 Hz. Press ENT
HSP = 60	Press ESC ↓ or scroll down to **HSP** press ENT, confirm value to 60 Hz. Press ENT
ttd = 118	Press ESC ↓ or scroll down to **ttd** press ENT, set value to 118. Press ENT
SP2 = 60	Press ESC ↓ or scroll down to **SP2** press ENT, set value to 60 Hz. Press ENT
[drC]	**Press ESC twice ↑or scroll up to drC press ENT to enter Drive Control Menu.**
nCr = FLA	Press ↓ or scroll down to **nCr** press ENT, set value to 20% above the FLA rating of installed motor.
tUn = POn	Press ESC ↓ or scroll down to **tUn** press ENT, set value to POn. Press ENT
tFr = 72	Press ESC ↓ or scroll down to **tFr** press ENT, set value to 72 Hz. Press ENT
[CTL]	**Press ESC twice ↑ or scroll up to CTL press ENT to enter Control Menu.**
LAC = L3	Press ENT ↓ or scroll down to **LAC** press ENT, set value to L3. Hold ENT for 3 sec.
Fr2 = NET	Press ESC ↓ or scroll down to **Fr2** press ENT, set value to NET. Press ENT
rFC = LI5	Press ESC ↓ or scroll down to **rFC** press ENT, set value to LI5. Press ENT
[I-O]	**Press ESC twice ↑ or scroll up to IO press ENT to enter I/O Menu**
tCt = LEL	Press ENT ↓ or scroll down to **tCt** press ENT, set value to LEL. Press ENT
rrS = nO	Press ↓ or scroll down **rrS** press ENT, set value to nO. Press ENT
AOIt = 4A	Press ↓ or scroll down to **AOIt** press ENT, set value to 4A. Press ENT
dO = OFr	Press ESC ↓ or scroll down to **dO** press ENT, set value to OFr. Press ENT
r1 = rUn	Press ESC ↓ or scroll down to **r1** press ENT, set value to rUn. Press ENT
[FUn]	**Press ESC twice ↑ or scroll up to FUn press ENT enter Application Function Menu**
SA1 = nO	Press ↓ or scroll down **SA1** press ENT, SA2 will display, press ENT again and set value to nO. Press ENT
[FLt]	**Press ESC 3 times ↑ or scroll up to FLt press ENT to enter Fault Menu**
Atr = yes	Press ↓ or scroll down **Atr** press ENT, set value to yes. Press ENT
tAr = Ct	Press ESC ↓ or scroll down to **tAr** press ENT, set value to Ct. Press ENT
drn = yes	Press ESC ↓ or scroll down to **drn** press ENT, set value to yes. Hold ENT for 3 sec.

[CON]	**Press ESC twice ↑ or scroll up to CON press ENT to enter <u>Communication Menu</u>**
AdCO =1-8	Press ENT ↓ or scroll down to **AdCO** press ENT, set value to 1 min. Assign Drive address based on Exhaust or Supply Fan designation. Press ENT
bdCO=500	Press ↓ or scroll down **bdCO** press ENT, set value to 500. Press ENT
FCS	Under **drC** parameter block set to InI to return VFD to factory settings.

NOTE: Assigning Drive address requires power cycle to confirm settings.

APPENDIX K. Drive Maintenance and Troubleshooting

PRECAUTIONS

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

⚠ DANGER

HAZARDOUS VOLTAGE

- 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 (tCC 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 faulty 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-menue, see the *ATV31 Programming Manual*).

Faults Which Cannot be Automatically Reset

Fault	Probable Cause	Remedy
bLF Brake sequence	Brake release current not reached	• Check the drive controller and motor connections. • Check the motor windings. • Check the Ibr setting in the FUn-menu. Refer to the *ATV31 Programming Manual*.
CrF Precharge circuit fault	Precharge circuit damaged	• Reset the drive controller. • Replace the drive controller.
InF Internal fault	• Internal fault • Internal connection fault	• Remove sources of electromagnetic interference. • Replace the drive controller.
OCF Overcurrent	• Incorrect parameter settings in the SEt- and drC- menus • Acceleration too rapid • Drive controller and/or motor undersized for load • Mechanical blockage	• 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.
SCF Motor short circuit	• 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	• 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.
SOF Overspeed	• Instability • Overhauling load	• Check the motor, gain, and stability parameters. • Add a braking resistor. • Check the size of the motor, drive controller, and load.
tnF Auto-tuning fault	• Motor or motor power not suitable for the drive controller • Motor not connected to the drive controller	• 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
CDF Serial link failure CANopen	Loss of communication between drive controller and communication device or remote keypad.	• Check the communication bus. • Refer to the product-specific documentation.
EPF External fault	User defined	User defined
LFF Loss of 4-20 mA follower	Loss of the 4-20 mA reference on input AI3	Check the connection on input AI3.
obF Overvoltage during deceleration	• Braking too rapidly • Overhauling load	• Increase the deceleration time. • Install a braking resistor if necessary. • Activate the brA function if it is compatible with the application. Refer to the *ATV31 Programming Manual*.
oHF Drive overload	• 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.
oLF Motor overload	• Thermal trip due to prolonged motor overload • Motor power rating too low for the application	Check the ItH 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
oPF Motor phase failure	• Loss of phase at drive controller output • Downstream contactor open • Motor not connected • Instability in the motor current • Drive controller oversized for motor	• Check the connections from the drive controller to the motor. • If a downstream contactor is being used, set OPL to OAC. Refer to the *ATV31 Programming Manual*, FLt- menu. • Test the drive controller on a low power motor or without a motor: set OPL to nO. Refer to the *ATV31 Programming Manual*, FLt- menu. • Check and optimize the UFr (page 32), UnS (page 35), and nCr (page 35) parameters and perform auto-tuning (page 36).
oSF Overvoltage during steady state operation or during acceleration	• Line voltage too high • Line supply transients	• Check the line voltage. Compare with the drive controller nameplate rating. • Reset the drive controller.
PHF Input phase failure	• Input phase loss, blown fuse • 3-phase drive controller used on a single phase line supply • Input phase imbalance • Transient phase fault *Note: This protection only operates with the drive controller running under load.*	• Check the connections and the fuses. • Disable the fault by setting IPL to nO. Refer to the *ATV31 Programming Manual*. • Verify that the input power is correct. • Supply 3-phase power if needed.
SLF Serial link failure Modbus	Loss of connection between drive controller and communication device or remote keypad.	• Check the communication connection. • Refer to the product-specific documentation.

APPENDIX L. Wireless Remote Information

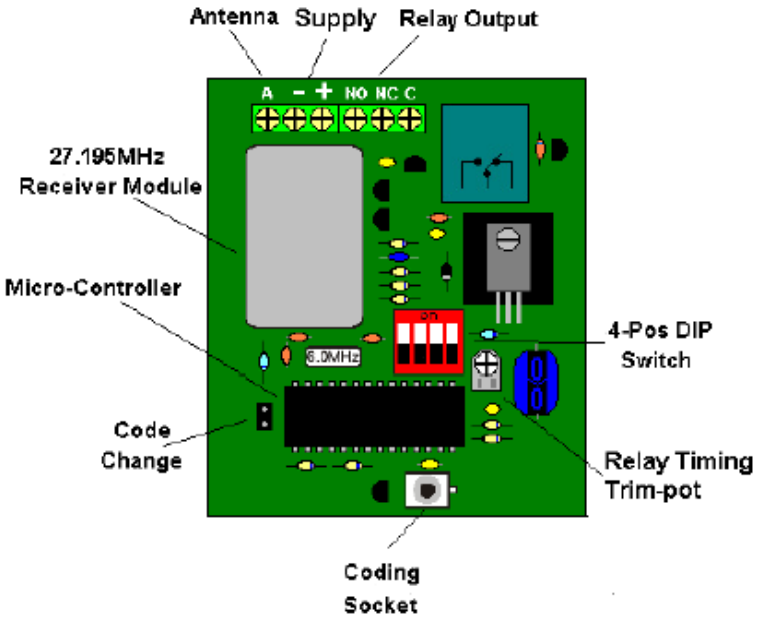
Remote Switch System 1 Installation Guide

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:

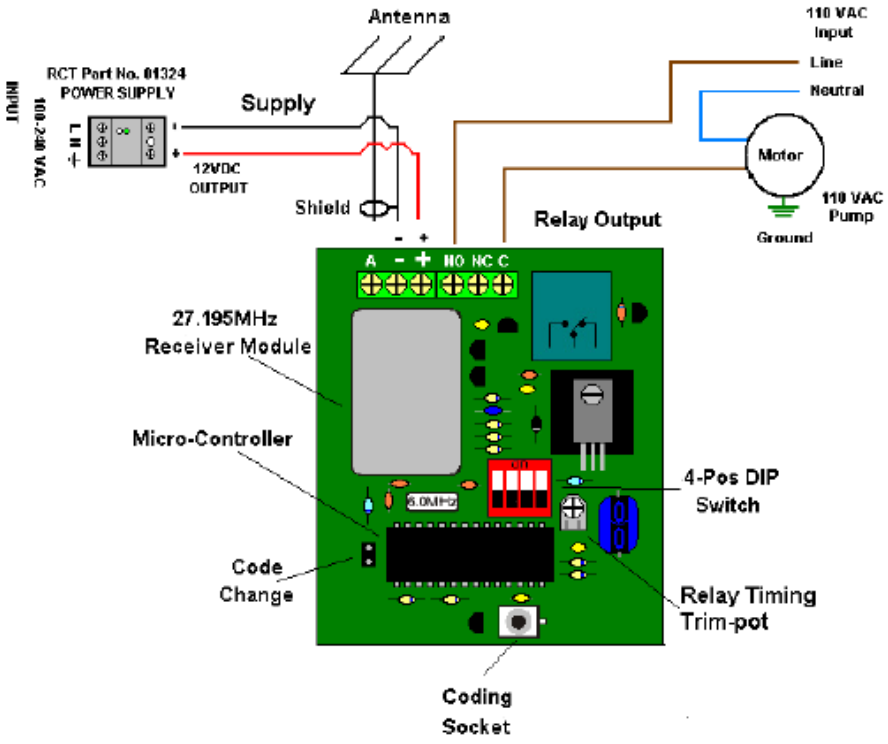
1. Supply Connections
2. Antenna Connections
3. 4 Position DIP Switch
4. Relay Timing Trim-pot
5. Coding Socket
6. Code Change Pins
7. Relay Connections



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

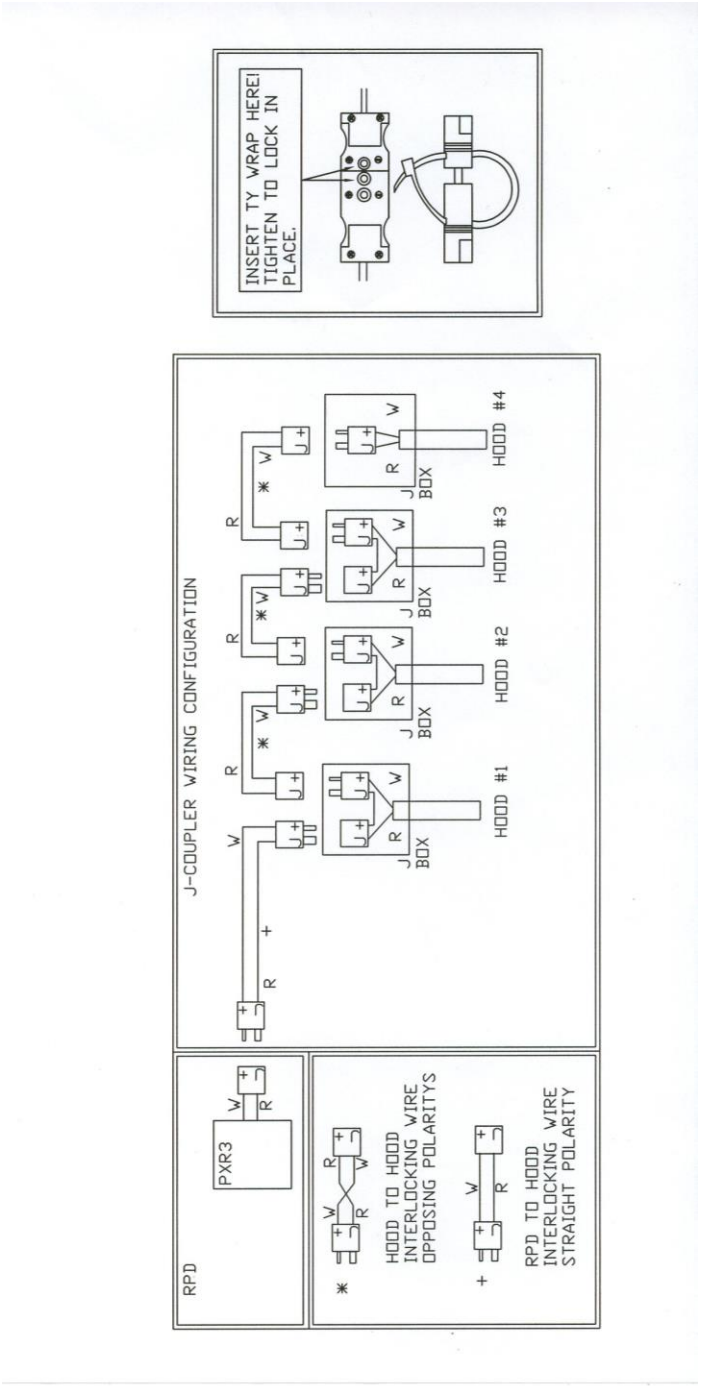
Other features include multi-transmitter programming and multi-receiver programming. These features allow the user program multiple transmitters to control one receiver. Once a transmitter has been programmed, it can be used to program additional receivers. A red LED will blink repeatedly indicating 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 form 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 M. J-Couple Remote Factory Supplied Cable



APPENDIX N. 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)

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.

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.

APPENDIX O. Testing TruFlow after Running for 30 Seconds

TESTING TRUFLOW AFTER RUNNING FOR 30 SECONDS

1. Pull the VFD 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 Operation Status window.
    e. Touch “Clear Error on Drive” button on top right of screen unit message above disappear.
    f. Start the unit from Power window.

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 message automatically clears.

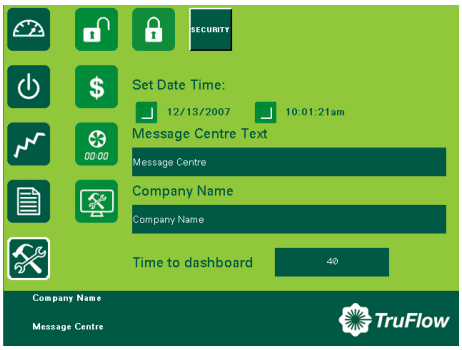
KES Truflow units only

3. 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.

4. 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. Touch “Clear Error on Drive” icon on top right of screen unit message above disappear.
    e. Unit starts to run.

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

Press the Setup button.

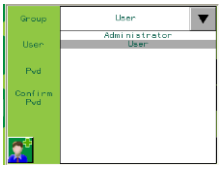


Administrator must login to see the SECURITY BUTTON.

After administrator login press the Security button.

The Password screen appears.

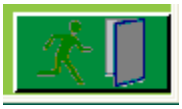
Press the down arrow beside Administrator.



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 Q
Truflow Factory Setup:
Login as Administrator. If you do not have the Administrator's password call Spring Air Systems Inc. head office Service Manager.

TRUFLOW TOUCHSCREEN STARTUP REPORT

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

General Information

Job Name	
Job Number	
Date	
Customer	
Site Contact	
Site Phone Number	
Location	

Truflow Lite Model No.	
Number of Kitchens (1 to 2)	

SHADED AREAS TO BE COMPLETED BY STARTUP TECHNICIAN

Kitchen #1					
Total Exhaust CFM					
Number of Hoods connected					
Number of Exhaust Drives Connected					
Exhaust Drive 1	HP	7.5	Voltage	208V	
Exhaust Fan 1	Manufacturer	SPRING AIR	Model No.	KES50	
Total Supply CFM	3489				
Supply Fan Manufacturer			Model No.		
Supply inlet 10 feet from exhaust					
a Supply Drive 1	HP	3	Voltage	460V	
b Supply control signal (4-20 milliamps)	Low setting		High Setting		
Information supplied by Spring Air Systems					

Check theseTruflow Panel Connections prior to startup		
Item	**Description**	**Y / N**
1	There is a 120V power supply to terminals 1 + 4 in Truflow Lite Hub .	
2	The J-couple cables are plugged into the Truflow Lite panel for each Kitchen, and to each hood in sequence.	

3	CAT5 cable runs between Touchscreen panel and TruFlow Lite Hub.	
4	The VFD CAT5 cable is connected from the VFD "Y" connector to the top of the TruFlow Lite panel labeled VFD.	
5	Additional VFD drive is connected from the 1st VFD "Y" connector to the 2nd VFD "Y" connection.	
6	Check that each fan disconnect switch is in on position and that each fan discharge is free and clear.	
7	Check that each VFD is powered with the display indicating RDY.	

Truflow Panel Commissioning		
8	Turn power on to the Truflow panel from the breaker panel.	
9	Perform the Commissioning procedure as described on page 3 once screen has powered up	
10	Turn on all of the appliances and check that the exhaust fan speeds up and the CFM increases. If the exhaust fan(s) slow down there is a problem with the J-Couple connectors at the on of the hoods. Check the J-couple connections at the hoods.	
11	Once all appliances are hot, check that each drive HZ is at maximum.	
12	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	
	Set Thermal Start setting to same as Kitchen PXR set point	
13	From System Control screen turn canopy light off and on for each Kitchen. Check for 120V between terminal 4 + 6.	

Complete the Following				
14	Is Remote Start Stop selected RSS?			
15	Is Supply Averaging Board selected SAB?			
Exhaust Fans				
16	1st Exhaust fan Min Frequency		1st Exhaust fan Max Frequency	
17	2nd Exhaust fan Min Frequency		2nd Exhaust fan Max Frequency	
18	3rd Exhaust fan Min Frequency		3rd Exhaust fan Max Frequency	
20	Exhaust fan rotation OK?			
Supply Units with VFD				
21	1st Supply fan Min Frequency		1st Supply fan Max Frequency	
Supply Units with control signal				
23	1st supply fan Min 4-20ma setting		1st supply fan Max 4-20ma setting	
25	Supply fan rotation OK?			

Comments:

Service Technician:_____

Company:_____

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

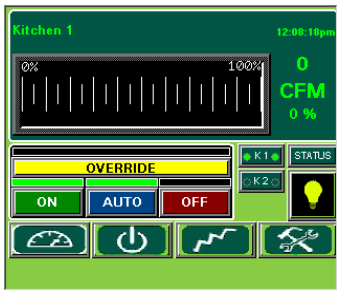
Signature _____ Print Name _____

PLEASE FOLLOW THE INSTRUCTION EXACTLY FOR SUCCESSFUL COMMISSIONING OF A TRUFLOW LITE PANEL.

1. Complete TruFlow Lite Startup Form items 1 – 7.

2. Turn the breaker off for the Truflow Lite panel for 10 seconds. Turn breaker back on.

3. Once the screen has powered the dashboard will appear



4. *Touch* 

5. *Touch*  and log off the screen.

6. *Touch*  and login on following the screen instructions.

7. Name: admin
8. Password: _____

9. 

Touch UNLOCK and then *touch* Close.

10.  *Touch* the Secondary Toolbox window icon.

11. 

Touch the Kitchen Setup window icon.

12. 

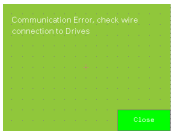
In the Kitchen Setup window, confirm number of kitchens selected. *Touch* the up or down arrows to correct if necessary.

13. 

Touch Supply Air Setup.

Confirm the supply output is selected as 4-20mA if makeup air is not controlled by a VFD. *Touch* the checkbox to correct if necessary.

14. If communication messages pop-up during the Kitchen Setup, clear them prior to continuing



This is a typical message displayed on **Operation Status Window** after a MODbus, Comm Port or Comm fault.

To clear message:

Touch the **Operation Status** Window icon.

Once on the screen *touch* the Acknowledge All Messages icon. Messages will turn green once they have been acknowledged.

Next, *touch* and hold until the Communication error clears. You may have to *touch* and hold several times to clear all messages.

After you have cleared all communication messages, return to the Kitchen Setup window.

15. Once you have completed the Kitchen Setup Screen go back to the **Operation Status** window and clear and communication errors again.

16.  *Touch* to return to the **Primary Toolbox** window.

17.  *Touch* to setup the goal reduction screen.

18. 

Touch the dark green field, *touch* **Enter** on the pop-up keyboard, then **OK** to exit.

19.  *Touch* to go to the **Power** window.

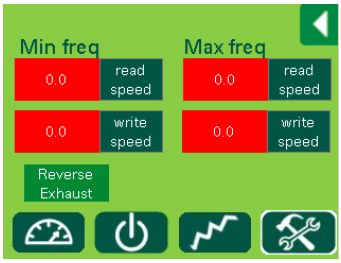
20.  *Touch* to return to the **Primary Toolbox** window.

 *Touch* to access the Secondary Toolbox window

21. 

Touch to access the Kitchen window.

Touch to access the drive information.



Touch **read speed** for Min freq. The icon will turn pink for several seconds, then change to the minimum frequency on the drive.
Record this reading on the TruFlow Lite Startup report.

Touch **read speed** for Max freq. The icon will turn pink for several seconds, then change to the maximum frequency on the drive.
Record this reading on the TruFlow Lite Startup report.

22. Continue with item 10 on the TruFlow Lite Startup Report.

23. To change the Thermal Start setting, access the Kitchen Setup window.

Touch the Thermal Start icon.

Touch the dark green field with the PXR set value.
Using the pop-up keyboard, change the PXR set value.
Touch **Enter** on the pop-up keyboard, then **OK** to exit.

24.  Return to the **Power Window**.

25. Continue with item 13 on the TruFlow Lite Startup Report.

TROUBLESHOOTING

Supply unit operation. Trouble Shooting

There must be a jumper between terminals D+L to simulate that the fresh air damper end switch has made. I4 on the PLC will light. Check that the surface fire suppression switch is not activated: I2 must be off on the PLC front face. If these conditions are not met the supply fan will not start. If I4 is not lit when terminals D+L are jumpered, place a jumper from L directly to terminal I4 on PLC. You must use maximum 22 gauge wire. Press the system on/off  button to start the exhaust fan and supply.

The exhaust fan should start and the supply fan should activate. When the supply operation has activated both O7 and O9 on the PCL face should be lit. When O7 is lit there should be 120V power on terminal 8. When O9 is lit a dry contact across terminal 15 and 16 closes.

If O7 and O9 are lit and the terminals do not show power or a dry contact you will have to trace the wires from these outputs on the PCL to our terminals.

Hood Lights: Trouble Shooting

The hood lights are activated from O2 (Out 2) on the PLC face. Press  the light button on the front of the panel and output O2 should be lit on the PLC face. Press the light off and O2 should not be lit. When O2 lights terminal 6 should have 120V power. The O2 output powers a relay which then powers terminal 6. When the light switch is turned off and on you will hear the relay pulling in and out. Put your ampmeter on 4+6 and measure for 120V when the light is pressed on and no120V when the light is pressed off. If this operation works the problem is in their remote wiring. If O2 is lit and there is no power on Terminal 6 trace the wires from O2 PCL output to the relay and then to the terminals.