



# TruFlow

# Maintenance Manual

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Title	<u>TABLE OF CONTENTS</u>	Page
Introduction.....		2
What is TruFlow? .....		2
The Truflow System Components: .....		3
Variable Frequency Drives (VFD)? .....		3
J-Couple.....		5
Touchscreen.....		5
Touchscreen Windows.....		6
Kitchen Setup .....		7
Message Status .....		8
Messages .....		9
Report Window .....		10
How to Log In / Log Out.....		12
Primary Toolbox.....		13
Changing Date and Time .....		13
Changing Message Centre Text .....		14
Changing Company Name .....		14
Changing Time to Dashboard .....		14
Changing Language to French .....		14
Energy Reduction Goal Setup.....		15
Update Reduction Goal.....		15
Update Gas Cost .....		15
Update Electricity Cost.....		15
Update Air Conditioning Cost .....		16
Update Time-of-Use Electricity.....		16
Setting Up the Automatic Start/Stop Times .....		17
Hood ON/OFF Schedule.....		17
Setting the automatic on/off times for exhaust fans running on motor starters. ....		17
Optional Water Wash Sequence(s) setup.....		19
Zoneflow/dampers .....		20-22
Appendix.....		23
A. TruFlow stainless steel enclosures dimensions .....		23
B. Remote wiring .....		24
C. PXR factory setup.....		27
D. PXR sensor fault operation.....		28
E. Factory drive terminal schematic .....		29
F. Technical specification for locating drives .....		30
G. Hazardous warning .....		31
H. Good wiring practice .....		32
I. Grounding .....		33
J. Starting the drive manually .....		34
K. Overriding the drive.....		35
L. Accessing the drive program menu.....		36
M: Factory variable frequency drive parameters.....		37
N: Drive maintenance and troubleshooting .....		40
O. Wireless remote option .....		45
P. J-Couple factory supplied cable .....		48
Q. Code changes.....		49
R. Testing KES TruFlows .....		50
S. Replacing the HMI Memory Card .....		51
T. Truflow Factory Setup .....		52

## **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!

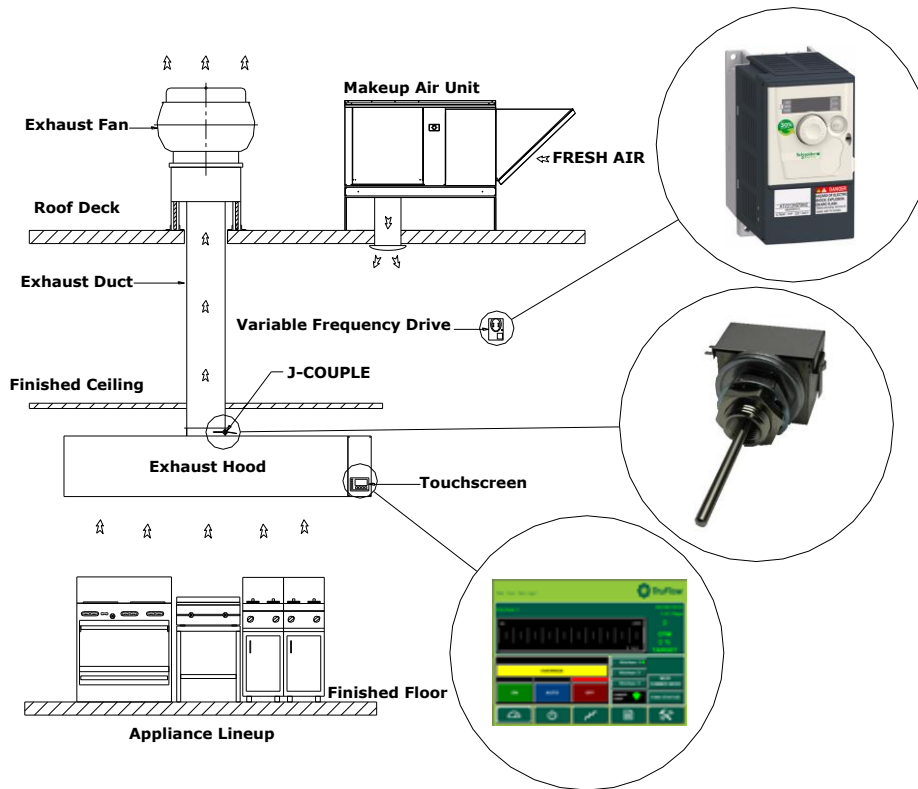
TruFlow not only saves you money on energy expenses it can also help extend the life of your equipment by demanding exhaust only when it is really required. TruFlow can be specified on new hoods or can be retrofitted on your existing hoods. Since the panel can be hood mounted or wall mounted, it allows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

### **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:



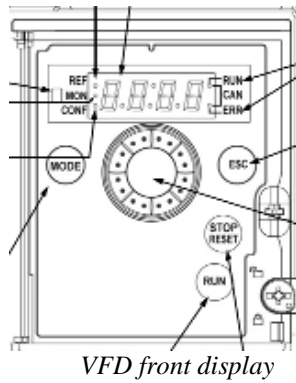
## What is Variable Frequency Drives (VFD)?

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.

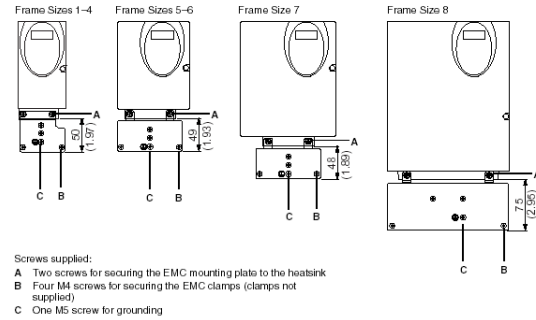


- When the makeup air unit is direct gas fire (like the Spring Air Systems SAT unit) the supply drive can be located in the makeup air unit control panel or with the exhaust fan drive(s) in a separate enclosure. (SV Type)
- When the make up air unit is indirect gas fired (like the Spring Air SFT unit) 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)

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 2<sup>nd</sup> drive cable connects from the first drive "Y" connector to the 2<sup>nd</sup> 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 modulates depending on the temperature reading 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 Panel 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

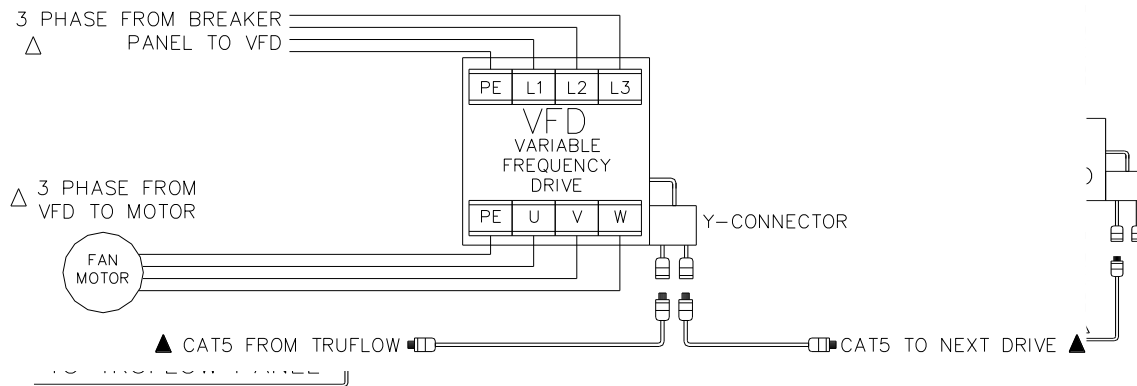


VFD frame sizes and EMC mounting plate

VFD front display

VFD terminals and remote wiring

WIRING TERMINALS ON VARIABLE FREQUENCY DRIVE(S) FOR TRADES



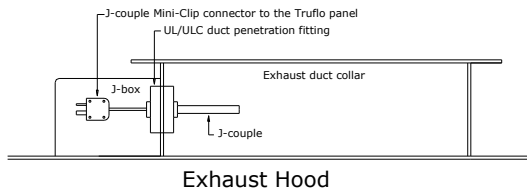
Multiple VFD Connections

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.

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?

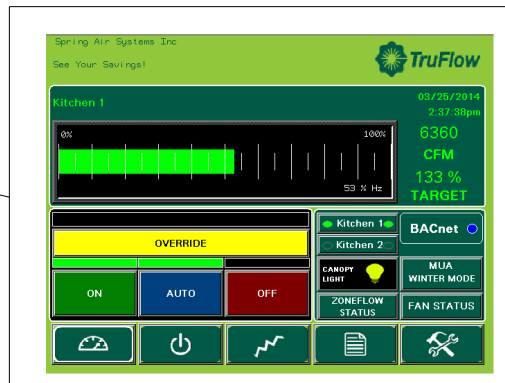
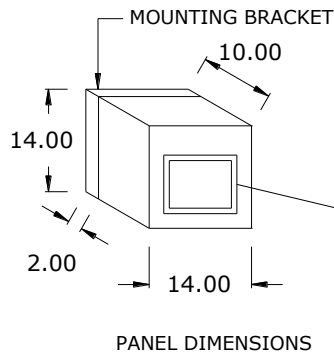
The J-couple is mounted in the center of each exhaust hood duct collar. The J-couple threads into a UL/ULC listed hood penetration fitting. The J-couple wiring is terminated in a factory supplied J-Box. Each hood duct collar connected to an exhaust fan connected to Truflow has a J-couple. The J-Couples 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

## What is the Touchscreen?

The TruFlow Touchscreen is the heart of the TruFlow system, integrating the j-couples and VFDs to provide a complete commercial kitchen energy management controller. The TruFlow Touchscreen has five windows: Dashboard, Power, Operation Status, and Primary Toolbox.

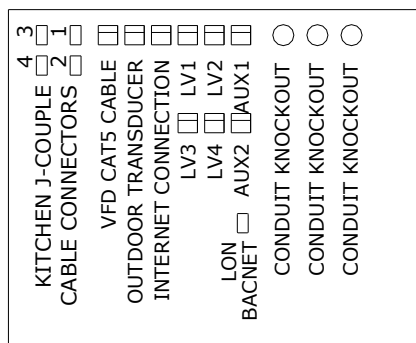


Touchscreen Wall Mounted Panel

TOUCHSCREEN

Touchscreen Panel Top Knockouts list from left to right.

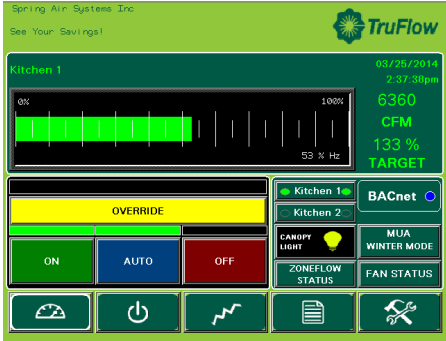
### TOP OF TOUCHSCREEN PANEL



Knockouts at top of Touchscreen Panel

- 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 1<sup>st</sup> KES
- LV2 - Optional CAT5 to 1<sup>st</sup> KES
- LV1 – Optional CAT5 to 1<sup>st</sup> KES
- LV2 - Optional CAT5 to 1<sup>st</sup> KES
- LV3 – Optional CAT5 to 2<sup>nd</sup> KES
- LV4 - Optional CAT5 to 2<sup>nd</sup> KES
- AUX1 – Optional CAT5 to water wash panel
- AUX2 – Optional CAT5 to SAT to SFT makeup air unit

Let's take a closer look at the Touchscreen Windows.



The **Dashboard** is the heart of the TruFlow system. It provides current exhaust operating data and a visual representation to the kitchen staff whether or not they are meeting your Energy Reduction Goal.

**Target**

The dashboard shows the operating efficiency of **133 % TARGET** the kitchen as it relates to your Energy Reduction Goal. In the example, the kitchen has exceeded the Energy Reduction Goal by 33%.

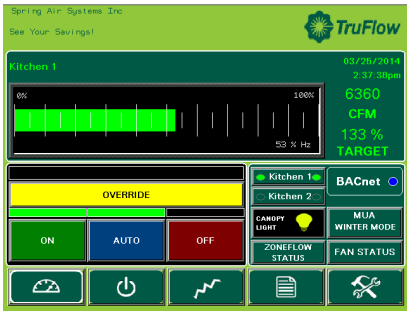
**6360 CFM** **Current Exhaust Volume**



**Canopy Lights** Touch this icon to turn on and off the canopy lights. When the lights are on the bulb is yellow.

**Status Bar**

This graph is a visual representation of the operating efficiency and updates continuously. When the staff is meeting or exceeding your Energy Reduction Goal, this graph will be on target (shown above) and the efficiency icon will show the percentage the Energy Reduction Goal is being exceeded. When the Energy Reduction Goal is not been 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, touch and hold the override bar for 3 seconds. Operation will drive to 100% for a pre-set length of time and the **Efficiency** icon will be crossed out. The override time is adjustable through the **Kitchen** window.



Touch to open the **Kitchen Setup**  
Touch to open **Alarm Status** window



Touch to open the **Report** window



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



The **Company Name, Message Center, Date** and **Time of Day** can be changed in the **Primary Toolbox** window with a password.



**Lon or BACnet Connection**

When this symbol is displayed on the **Dashboard**, the complete TruFlow operation is controlled by the building computer. The only local interaction with the TruFlow is the Override. The TruFlow ON/OFF operation is controlled by the building computer.



**Motor Starters**

Touch the motor icon for the motor starter you would like to turn on or off.

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



Fan Status. When system is on, fan icon rotates.



Canopy Lights. Touch icon to turn on/off lights. When canopy lights are on, the bulb is yellow



Kitchen Start. Touch ON/OFF button to start/stop Kitchen



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



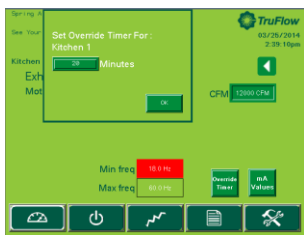
Manual System Operation.

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.



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.



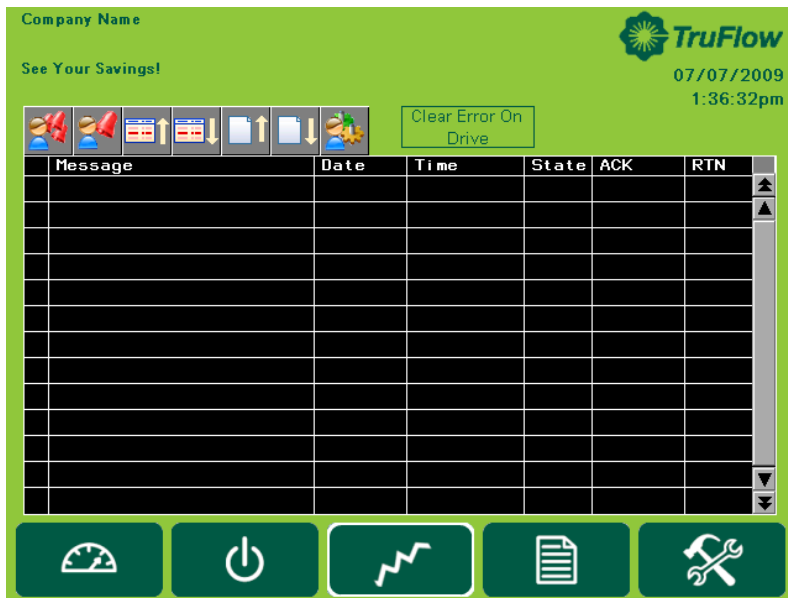
Touch OK to return to Power window.

**Multiple Kitchen Display:**





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



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



Acknowledge Messages 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.

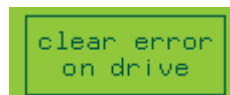


Scroll Up one page  
Touch this icon to scroll the page up by one page.



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

Clear errors on VFD.



Touching 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 N.

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 Touchscreen. Turning off the power to the TruFlow Touchscreen will cause all recorded messages to be deleted.

## Messages



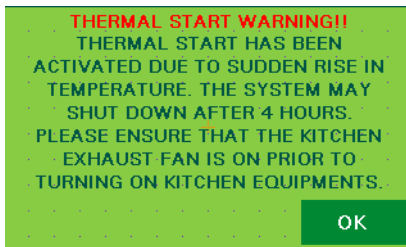
When a message that requires immediate attention or action occurs, the screen will change to red with a yellow exclamation mark. These types of messages include certain drive errors where the VFD cannot reset automatically, and catastrophic equipment failures (exhaust fan or makeup air unit not running).

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. There will also be an explanation of the cause.

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 button 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 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.

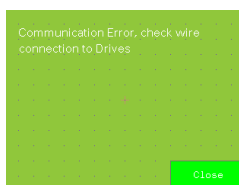
Touch ok to exit the thermal start warning window.

Be sure to turn the fans on manually, or switch operation 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 errors occur when the J-couple cable has been unplugged. This message will cause the TruFlow to operate on high (100%) until the cable is plugged back in.

## Example Message Popups

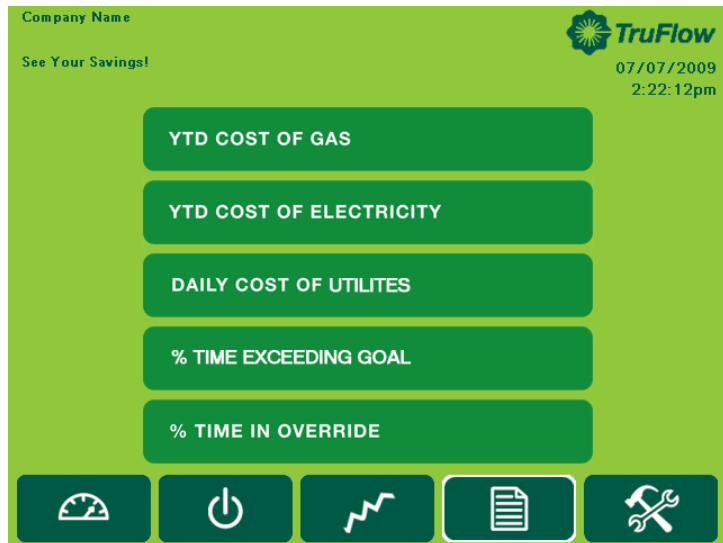


Typical fault displayed on Operation Status window after MODbus, Comm Port or Comm alarm.



Typical fault displayed on Dashboard window after surface fire suppression activates.

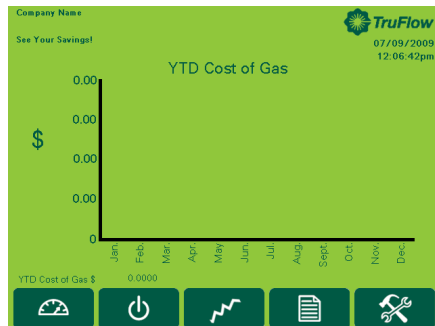
The **Report Window** provides access to reports generated using gas and electricity rates as entered by you. For accurate reports, make sure gas and electricity rates are kept up-to-date. These rates can be changed in the **Primary Toolbox** window.



The reports available are listed on the window.

Touch any bar to view the reports named.

### YTD Cost of Gas

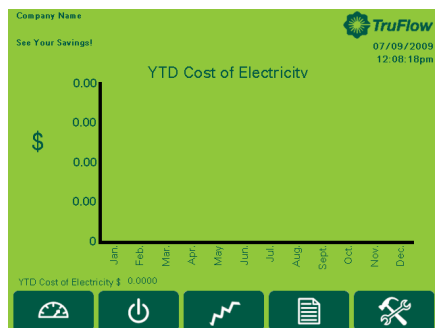


The YTD Cost of Gas report is a chart of the cost of gas in dollars for the month. The cost of gas includes the cost to heat the kitchen makeup air during winter operation.

YTD Cost of Gas \$ 0.5945

Year to Date Cost of Gas is the accumulative gas cost

### YTD Cost of Electricity

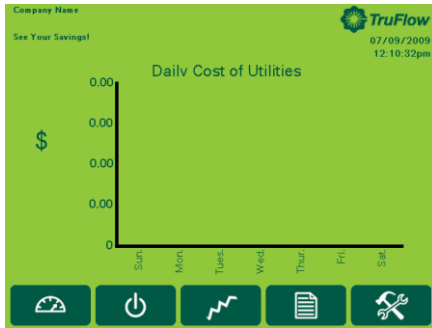


The YTD Cost of Electricity report is a chart of the cost of electricity in dollars for the month. The electricity cost includes the cost to run any motor connected to the TruFlow and the cost to air condition the kitchen during the summer, if any.

YTD Cost of Electricity \$ 0.0000

Year to Date Cost of Electricity is the accumulative electricity cost

## 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 for the day of the week. The daily costs combines electricity and gas.

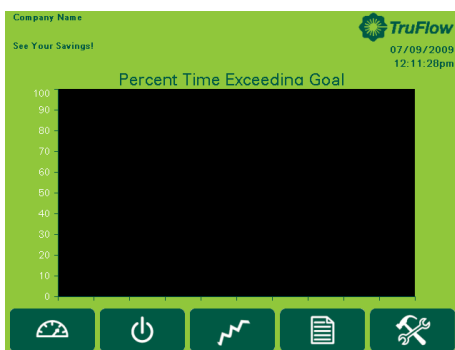
## % Time in Override



### % TIME IN OVERRIDE

The % Time in Override graph plots the percentage of time in override vs the total time of operation.

## % Time Exceeding Goal



### % TIME EXCEEDING GOAL

The % Time Exceeding goal graph plots the percentage of time you have exceeded your Energy Reduction Goal vs the total time of operation.

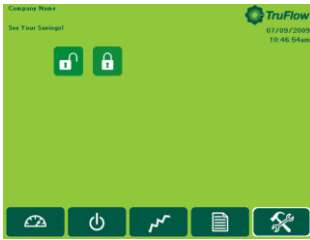
If the value is above zero you are exceeding your Energy Reduction Goal.

Some TruFlows have a built-in Auto Goal Setting feature. The Truflow will analyze the rate of change of the percentage of time exceeding goal and automatically increase your Energy Reduction Goal to increase energy savings.

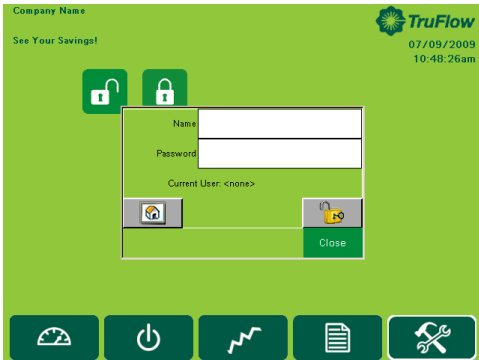
In order to make any changes to the settings on your TruFlow system or access the **Primary** Toolbox window, you will need to **log in**.



Touch the Primary Toolbox icon.



Touch the Login icon.

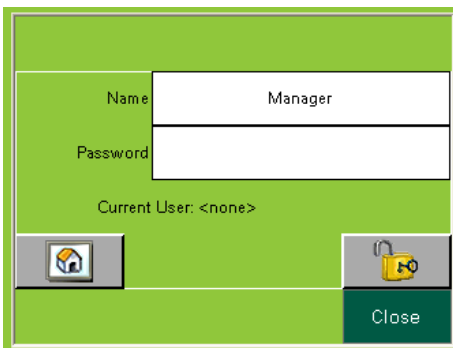


Touch the white field beside Name.

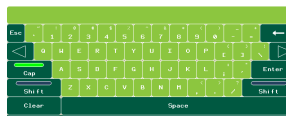


Type your login name using the pop-up keyboard.  
Touch **Enter** key.  
The login window will return.

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.



Touch the white field beside Password



Type your password using the pop-up keyboard.  
Touch **Enter** key.  
The login window will return.

The password is also case sensitive.



Touch the UNLOCK icon.  
Touch the word Close to close the login box.

You are now logged in.

### Logout

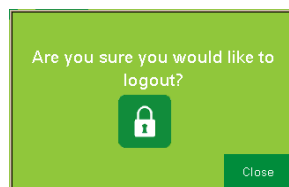
TruFlow will automatically log you out after a set amount of time (see Changing Time to Dashboard).



Touch the Primary Toolbox window icon.



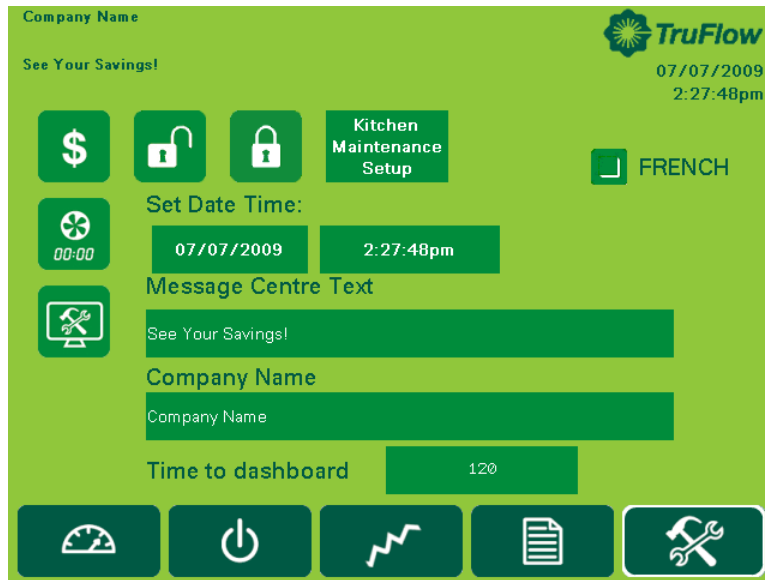
Touch the lock.



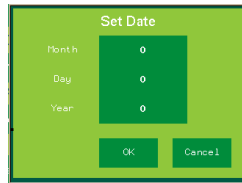
Touch the lock again.

You are now logged out.

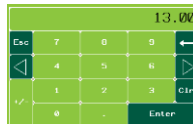
The **Primary Toolbox** window allows you to update the utilities costs, make changes to the date, time, Message Center and Company Name, automatic on/off times, along with the time to dashboard, and water wash timer (if equipped).



**Changing Date and Time**  
Touch the dark green field with the date.

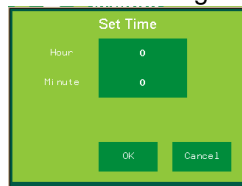


Touch the dark green field next to Month, Day or Year.



Type the new information in the pop-up keyboard.  
Touch enter to return to Set Date window.

Touch the dark green field with the time.



Touch the dark green field next to Hour or Minute



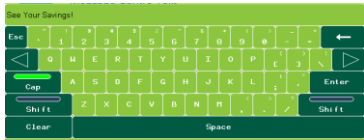
Type the new time using the pop-up keyboard.  
Touch enter to return to Set Date window.

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

## Changing Message Centre Text



*Touch* the dark green field to change Message Centre Text.



*Type* new text using the pop-up keyboard.

*Touch* Enter to save or ESC to cancel and return to the Primary Toolbox window.

## Changing Company Name



*Touch* the dark green field to change Company Name.



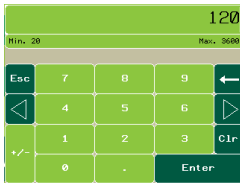
*Type* new Company Name using the pop-up keyboard.

*Touch* Enter to save or ESC to cancel and return to the Primary Toolbox window.

## Changing Time to Dashboard



*Touch* the dark green text box to adjust the number of seconds before TruFlow view changes back to Dashboard window.



*Type* the new setting (in seconds) using the pop-up keyboard.

*Touch* enter to return to Primary Toolbox window.

## Changing Language to French



*Touch* the dark green box besides French to switch to the French language.

## Setting up and changing the Energy Reduction Goal and utilities costs.

The Energy Reduction Goal is set by you. It is the percentage of energy you 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 to slow down the exhaust fan(s) and makeup air. Setting up your Energy Reduction Goal and setting guidelines for staff to turn down or off appliances is key to getting the most savings.



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

### Change Reduction Goal

Touch the dark green text box.

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

Touch Enter to return to Energy Goal Setup window.

### Change Gas Cost

Touch the dark green field.

Type the gas cost based on \$/thm (\$/1,000,000 btu's) using the pop-up keyboard.

Touch Enter to return to Energy Goal Setup window.

### Change Electricity Cost

Touch the green text box.

Type the electricity cost based \$/KWH using the pop up key board.

Touch Enter to return to Energy Goal Setup window.



## Change Air Conditioning Cost



Touch A/C icon when the kitchen makeup air is cooled.

When summer mode is selected on the Power window, additional electricity costs will be included in the energy usage calculations for air conditioning.



Touch A/C icon to de-select air conditioning if none is available.

## Change Time-of-Use Electricity

### Time-of-Use Electricity Rate

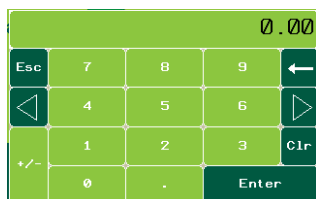


Touch the checkbox if your electricity rate increases during peak periods of the day.

When Time-of-Use Electricity is selected, additional setup options become available.



Touch the dark green field besides Cost.



Type the rate based on \$/kWH using the pop-up keyboard.

Touch enter to return to Energy Goal Setup window.



Touch up/down icons to change the hour and minute of day the peak electrical rate starts.



Touch up/down icons to change the hour and minute of day the Peak electrical rate ends.



Touch AM/PM icon to adjust time of day.



Touch the Primary Toolbox icon to exit Energy Goal Setup window.

## Setting the automatic Start/Stop Times



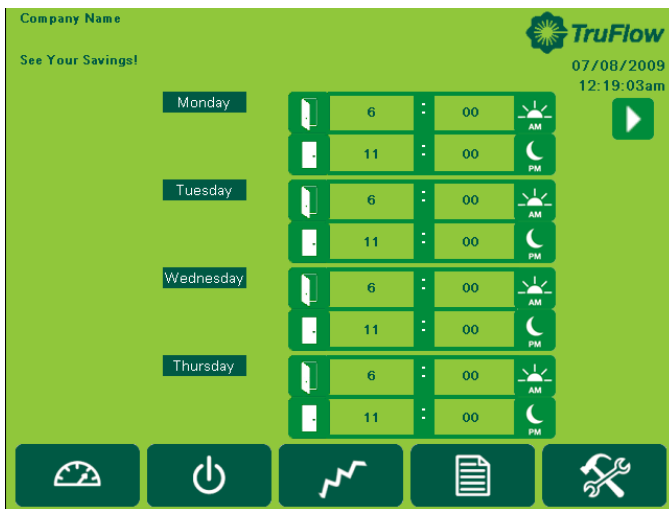
The automatic schedule is useful if you would like your exhaust system, external lights, appliances and motor starters to turn on and off at a set time each day. You can set up a different automatic start and stop time for each day of the week on each kitchen and motor starter. You will need to set an automatic start/stop time 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.



If your TruFlow also controls your motor starters you will need to touch the Hood ON/OFF Schedule bar after touching the Automatic Schedule icon.



*Touch* the light green fields next to the open door to set the hour and minute for the exhaust system to turn on. The first field is for the hour (6 in the example) and the second field is for minute (00 in the example).



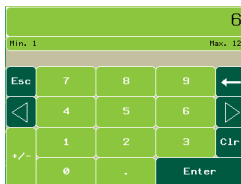
Using the pop-up keyboard, *type* the number for the time. *Touch* enter to return to the Automatic Schedule window.



*Touch* the am/pm icon change.



*Touch* the light green field next to the closed door to set the hour and minute for the exhaust system to turn off. The first field is for the hour (11 in the example) and the second field is for the minute (00 in the example).



Using the pop-up keyboard, *type* the number for the time. *Touch* enter to return to the Automatic Schedule window.



*Touch* the am/pm icon to change.



*Touch* the next page icon to set the times for Friday, Saturday and Sunday.

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

## Setting the automatic on/off times for exhaust fans running on motor starters.

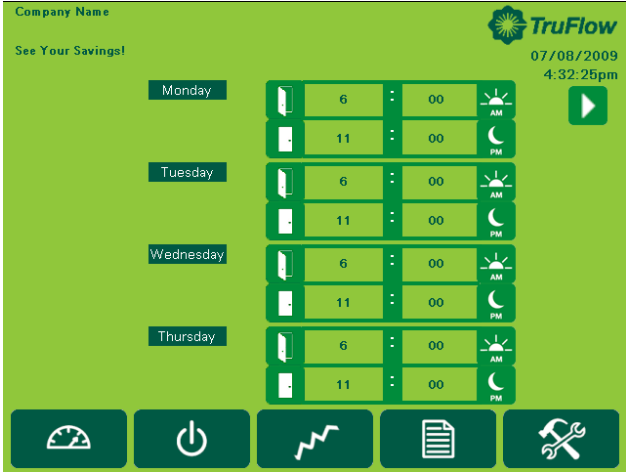
**Motor Starters Schedule**

Touch the **Motor Starters** bar to switch to the Motor Starters Schedule window.

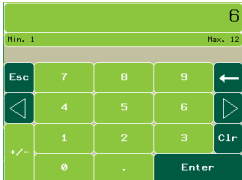
Touch the motor starter button to turn on or off the automatic schedule.



Touch the **motor starter** bar you would like to .set up a schedule for. Your motor starters will be name at the time of startup (i.e. Dishwasher rather than M1).



Touch the light green fields next to the open door to set the hour and minute for the motor starter to turn on. The first field is for the hour (6 in the example) and the second field is for minute (00 in the example).



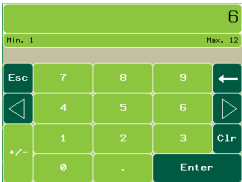
Using the pop-up keyboard, *type* the number for the time. Touch **enter** to return to the Motor Starters Schedule window.



Touch the **am/pm** icon to change.



Touch the light green field next to the closed door to set the hour and minute for the motor starter to turn off. The first field is for the hour (11 in the example) and the second field is for the minute (00 in the example)



Using the pop-up keyboard, *type* the number for the time. Touch **enter** to return to the Motor Starter Schedule window.



Touch the **am/pm** icon to change.



Touch the **next page** icon to set the times Friday, Saturday and Sunday.

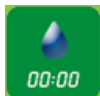
Repeat these steps for each motor starter you want to automatically turn on and off.

If you want a motor starter set on an automatic on/off schedule to stay turned off on a particular day, set the on and off times to the same. For example, if you are not open Sundays and do not want the motor starters on, set Sunday's opening and closing time to 12:00 a.m.

Touch **OK** to return to the Automatic Schedule window.

## Optional Water Wash Sequence(s) setup.

If your hoods are equipped with a water wash system, you can adjust 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. A different setting can be set for up to three different water wash systems as long as they are connected to the TruFlow control panel. These settings are adjusted by your Spring Air Systems authorized service technician at the time of startup; however you can adjust them as needed.



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

System Name	Sequence 1		Sequence 2		Sequence 3	
	Delay	Wash	Delay	Wash	Delay	Wash
	(Sec)	(Sec)	(Sec)	(Sec)	(Sec)	(Sec)
Kitchen 1	120	120	0	0	0	0



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.

Touch enter to return to the Water Wash Timer window.

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

Touch OK to return to the Primary Toolbox window.



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

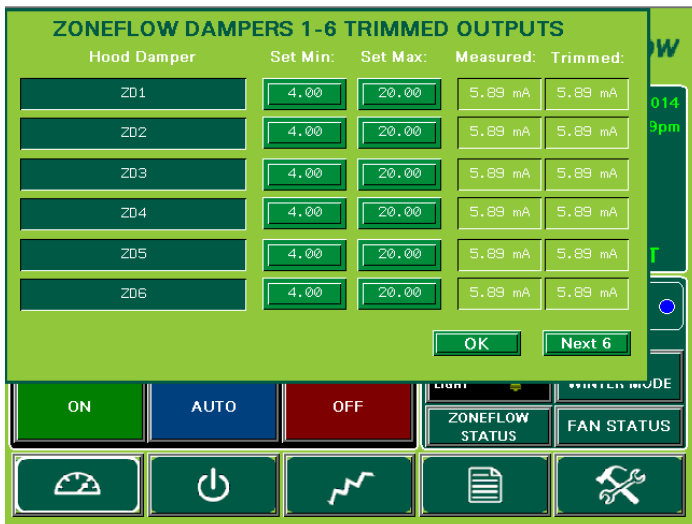
A blinking water drop will show on the Dashboard window when the wash sequence is running. The number in the water drop indicates which number sequence is currently running.

# Zoneflow Status



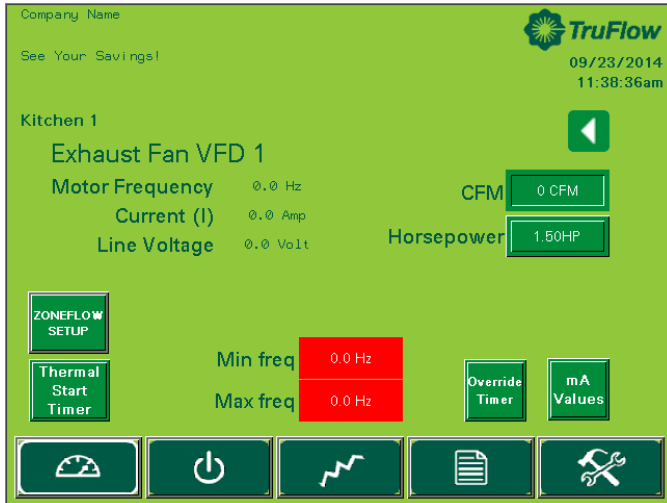
*Zoneflow Status Screen*

From the Dashboard screen, *touch* the Zoneflow Status icon. A new screen will appear showing Zoneflow Dampers 1-6 Trimmed outputs. First column shows damper name, second and third columns allow manual trimming for minimum and maximum set value. Fourth column shows the measured value from the J-couples and PID control. Fifth column shows what is being sent to Zoneflow damper. All numerical values are MA values. 4 MA represents closed damper and 20 MA represents open damper. On shutdown, normal position for Zoneflow dampers are 100% open, 20 MA. Also on a surface fire trip, the Zoneflow dampers will fully open at 20 MA. When system is set to override, the zoneflow dampers go to maximum set value.



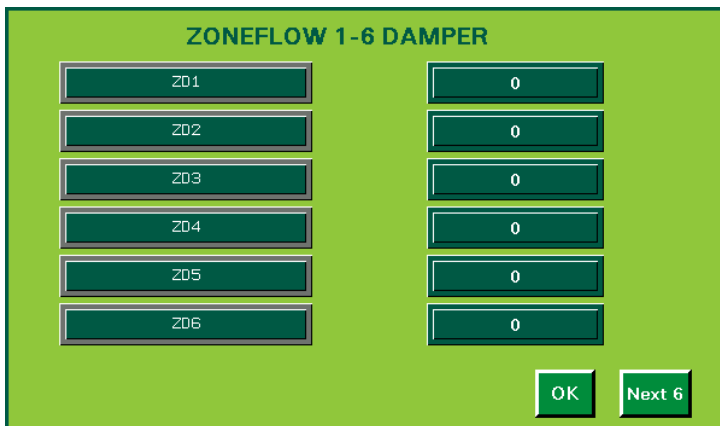
*Zoneflow Dampers*

# Zoneflow Dampers



*Zoneflow Dampers*

Zoneflow Damper setup is accessed from the fan status screen. When fan is not running and the service technician has logged into administration screen. CFM for each damper damper is entered on the damper screen. Each Truflow systems are capable of controlling 12 dampers. They are identified as ZD1 through ZD-12. Individual names can be assigned by touching ZD # and inputting required description. CFM's can be entered or edited by touching the box to the right of each ZD - # damper



## Zone Flow Dampers and Thermal Start

When Zone Flow dampers are used, the thermal start function of the system needs to be set up for each individual hood damper. This is done by accessing the setup screen of the system. Touching the SET POINTS icon activates a pop-up screen for the Zone Flow dampers.

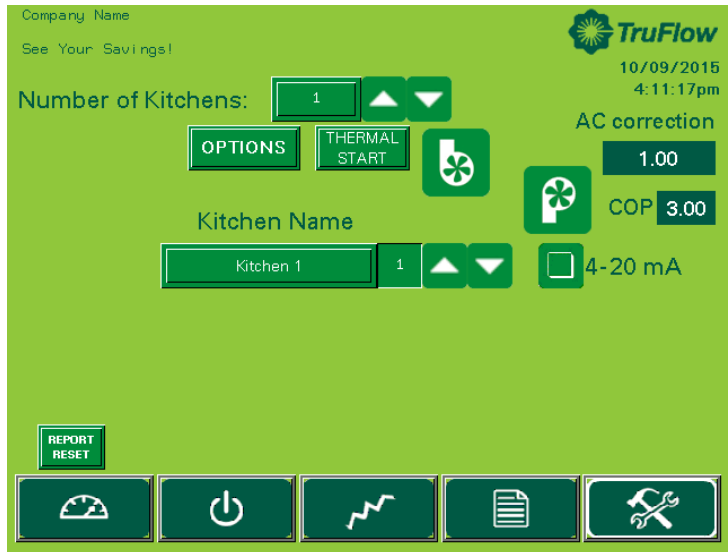


Figure 1

Each damper has to be set to activate the thermal start feature for each Zone Flow damper. By touching the small blank rectangle beside the larger boxes all dampers are selected. See Fig 2. Descriptions should be added in the new Labels boxes beside each damper to identify the individual Zone Flow dampers.

The first box will default to a value of 70. These values should be set to the same value as the SV value of the corresponding PXR temperature sensor. The Thermal Start is triggered based on the sensed temperature against a scaled alarm from the SV value. Any hood can trigger the Thermal Start/AUTO Start. The Thermal Start will be active for a maximum of 4 hours once triggered. It can be reset only by selecting the system ON from the dashboard.

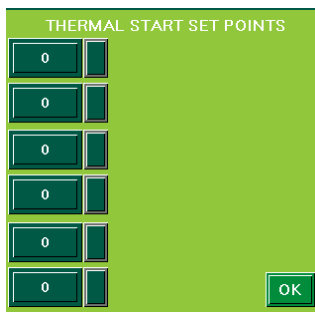


Figure 2

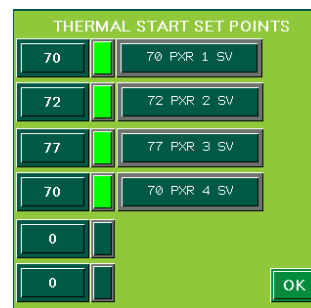
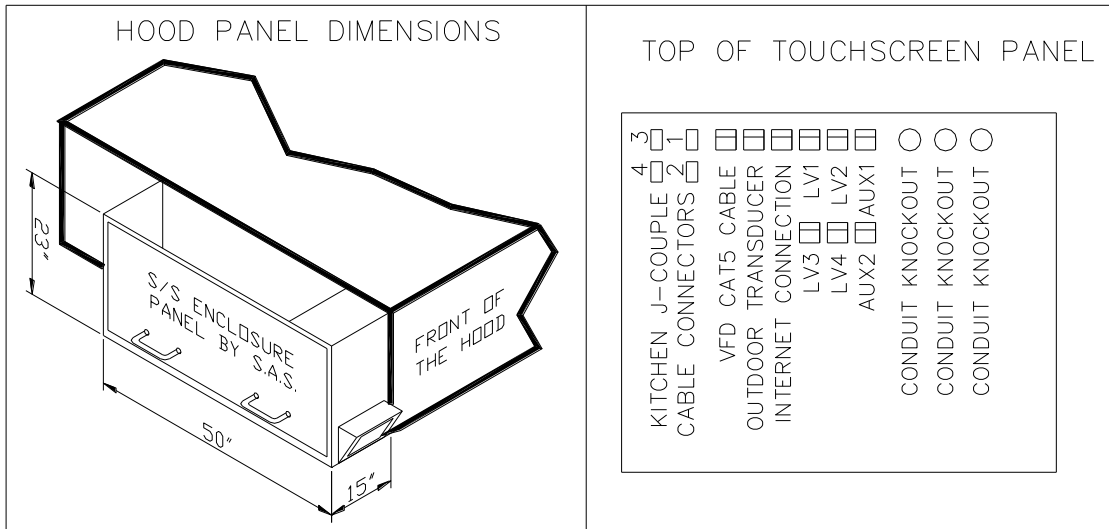


Figure 3

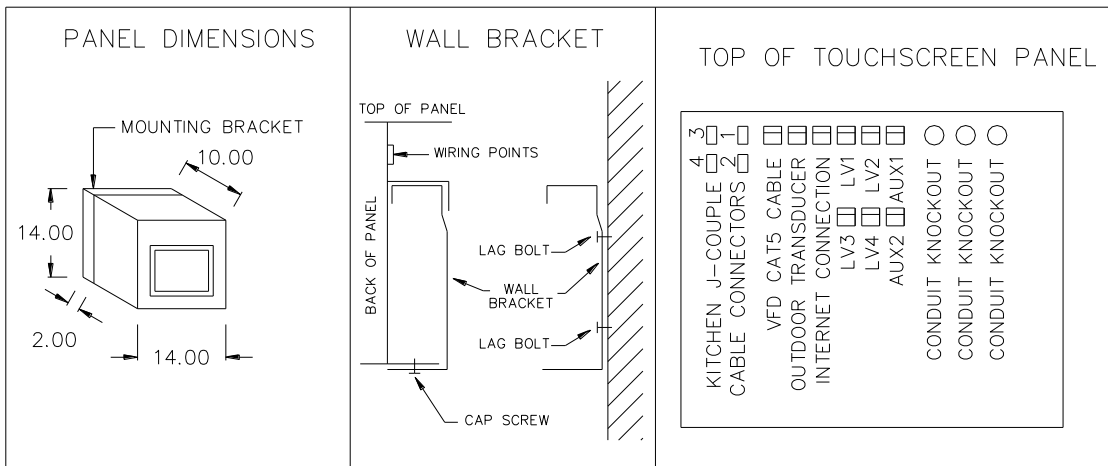
APPENDIX A.  
TruFlow stainless steel enclosures dimensions

Hood mounted.



*TRUFLOW enclosure, hood mounted*

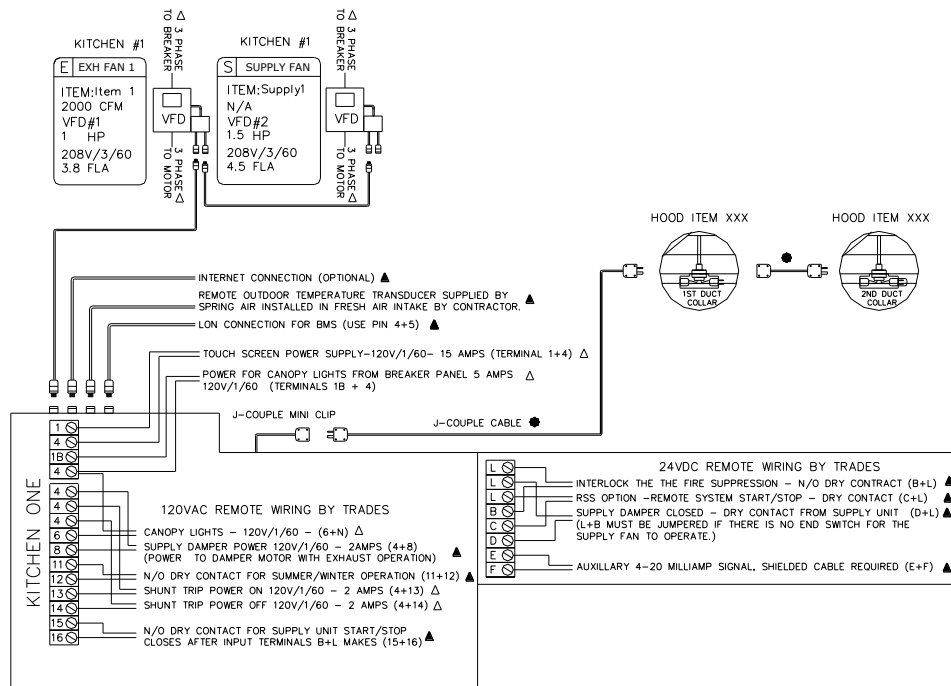
Wall Mounted.



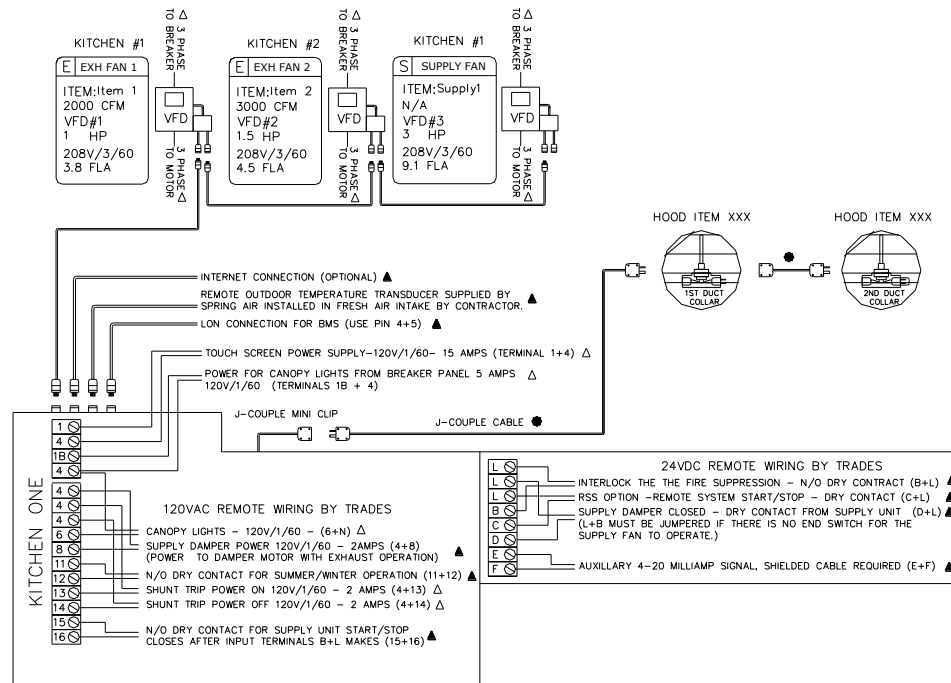
*TRUFLOW enclosure wall mounted*

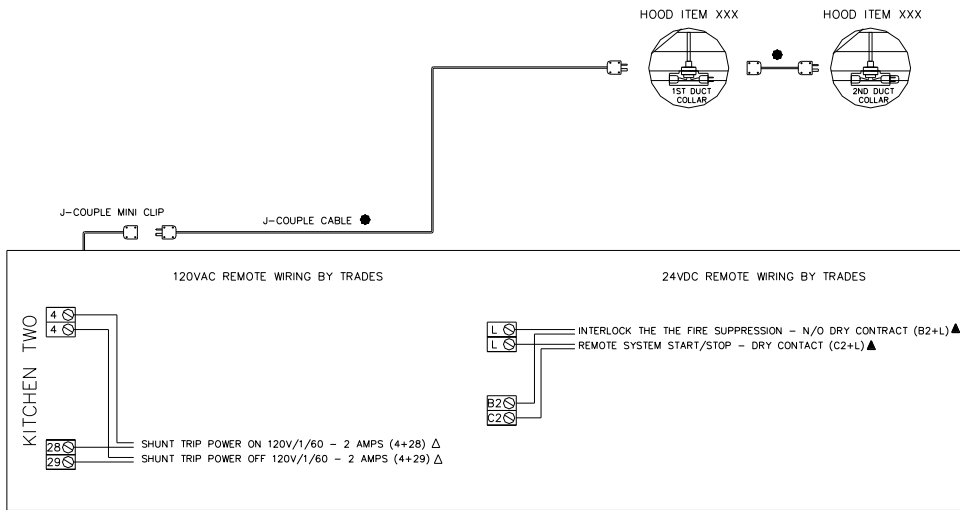


APPENDIX B.  
Remote Wiring

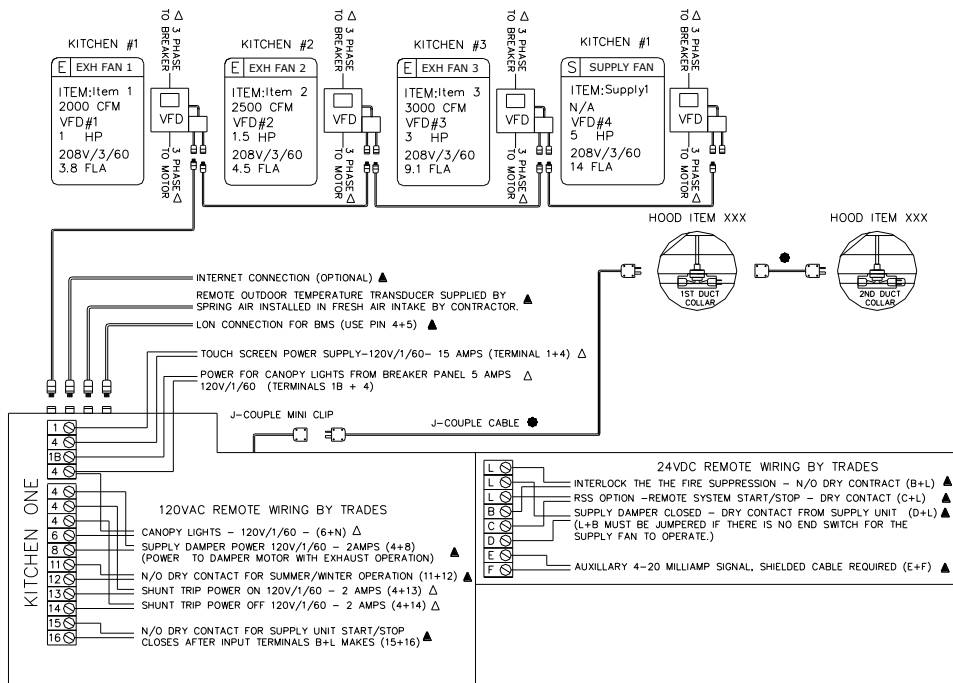


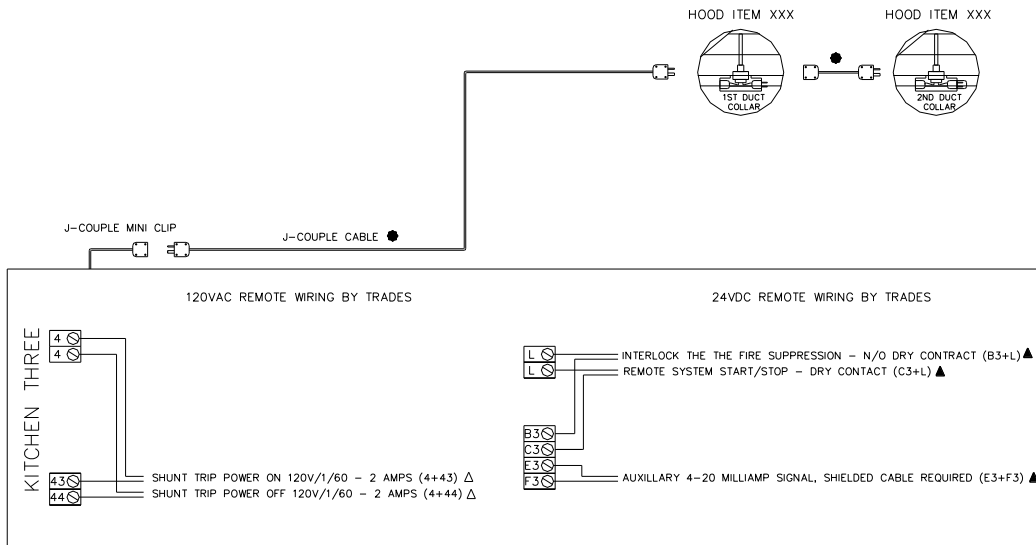
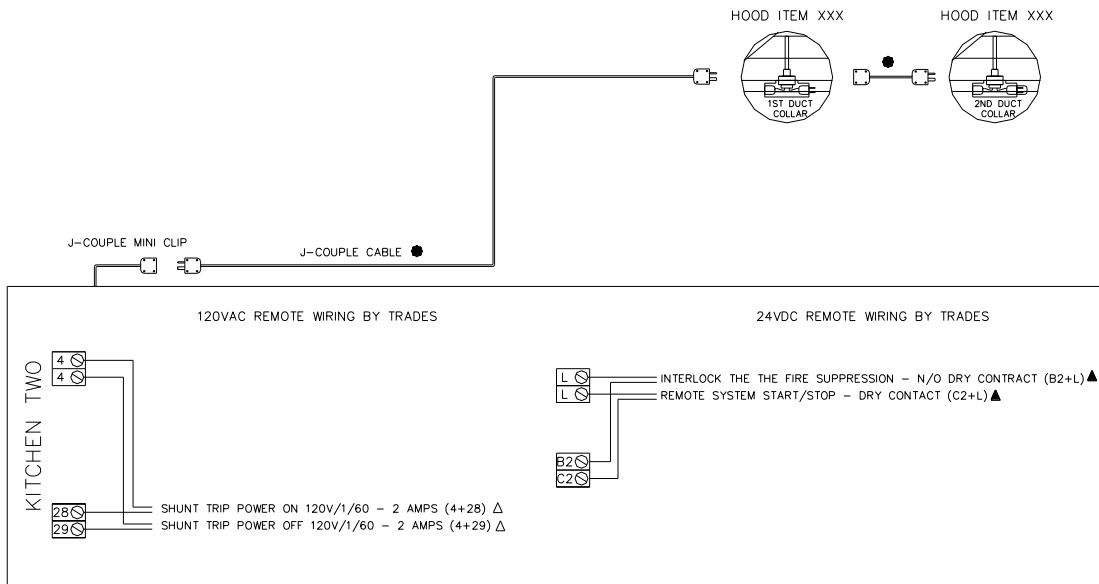
*TRUFLOW Remote Control wiring schematic One Kitchen*





*TRUFLOW Remote Control wiring schematic Two Kitchens*



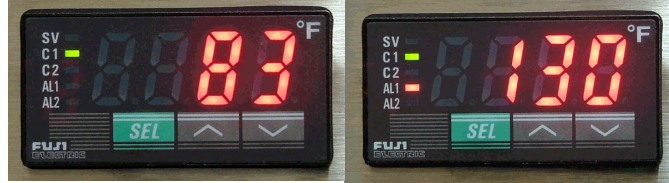


*TRUFLOW Remote Control panel wiring schematic Three Kitchens*

APPENDIX C  
PXR Factory Setup

	Set Point (SV parameter) - Factory setting ONE Duct Collar
SV=70	Press SEL once. Use V and ^ 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.



	2 <sup>nd</sup> 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 V to decrease parameter set value. Set P = 28 and then press SEL.
[=0	Press V to next parameter, integral time, [. Press SEL and set value to 0. Press SEL.
d=0	Press V to next parameter, derivative action time, d. Press SEL and set value to 0. Press SEL.
hys=0	Press V to next parameter, hysteresis, hys. Press SEL and set value to 0. Press SEL.
CTrL=PID	Press V three times to next parameter, Control algorithm, CTrL. Press SEL and check that the setting is PID. If is not use the V and ^ to set to PID and then press SEL.
P-n2=2	Press V three times to next parameter, input type code, P-n2. Press SEL and adjust setting to 2. Press SEL.
P-SL=55	Press V to next parameter, Lower limit of input range, P-SL. Press SEL and adjust setting to 55. Press SEL.
P-SU=200	Press V to next parameter, Upper limit of input range, P-SU. Press SEL and adjust setting to 200. Press SEL.
ALN1=1	Press V 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.

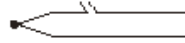


	3 <sup>rd</sup> Block Parameters
	Press SEL and hold for about 5 seconds until P-n1 appears on the display. Release SEL.
P-n1=3	Press SEL again to set the Control Action, P-n1. Use the ^ and V to adjust the value to 3. Press SEL.
SV-L=55	Press V to next parameter, Lower limit of SV, SV-L. Press SEL and adjust setting to 55. Press SEL.
SV-H=120	Press V 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 V until AT appears on display. Press SEL and set the Auto-tuning to 1. using V and ^. Press SEL.
AL1=90	Press V 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 		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)

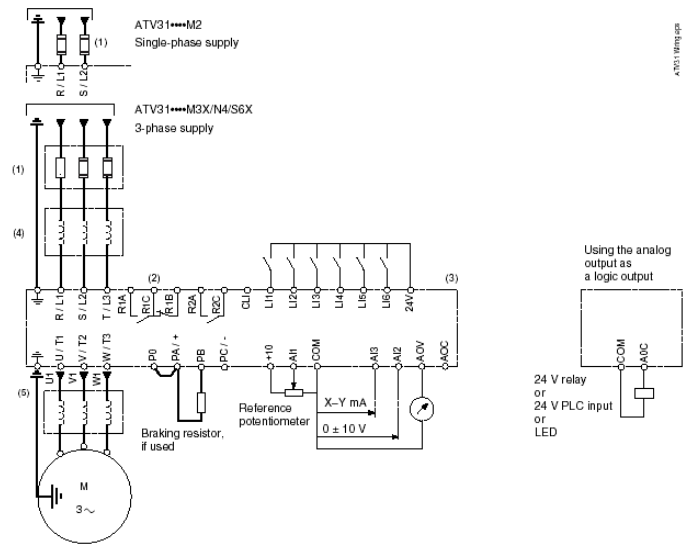
• 4-20mA DC

Over-range		OFF or less than 4mA (Note)
Under-range		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.

APPENDIX F  
 Technical Specification for Locating Drives

DRIVE TECHNICAL SPECIFICATIONS FOR LOCATING DRIVE PANELS

**Table 2: Environment**

Degree of Protection	<ul style="list-style-type: none"> <li>• IP20 without protective vent cover, NEMA 1, UL open type.</li> <li>• IP21 on wiring terminals</li> <li>• IP31 and IP41 all other areas</li> <li>• 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).</li> </ul>
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)

**⚠ 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](http://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 H 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.

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

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 I  
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.

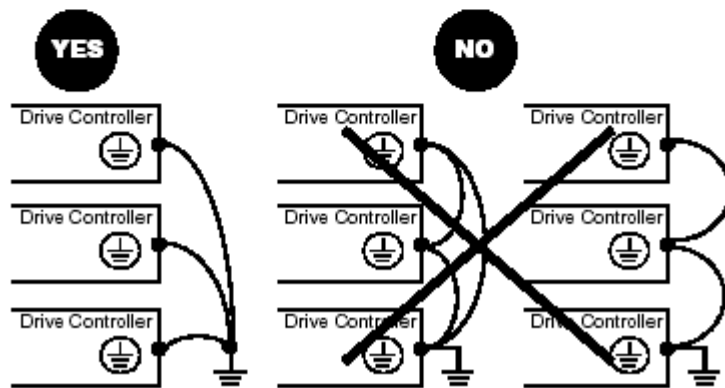
**⚠ DANGER**

**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.

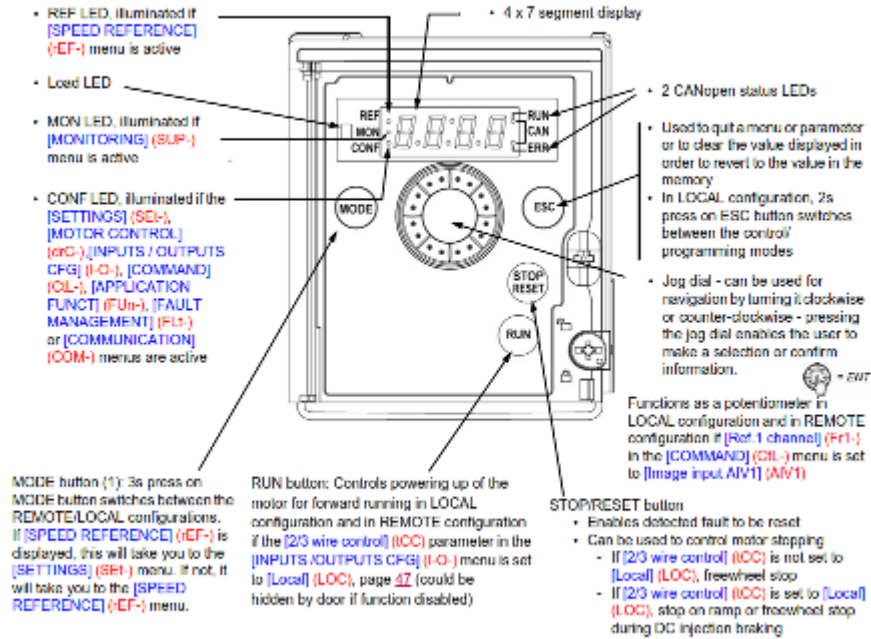
Ground multiple drive controllers as shown in the figure below. Do not loop the ground cables or connect them in series.



APPENDIX J  
Starting the Drive Manually

**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 K  
HOW TO OVERRIDE THE DRIVE

This feature is useful when the communication between the PLC and the drive is lost. It can also be useful if when HMI experiences power failure for any reason.



- 1) Locate the Tele drive(s) and disconnect all the CAT5e connection at the “Y-splitter”.
- 2) Turn the screw, located in the centre right of the drive, to unlock position. This turn is only about a quarter turn.



- 3) Locate the Green terminal blocks.
- 4) Find LI5 terminal on the green terminal blocks. There should be a wire jumper from LI3 to LI5.

LI5 terminal

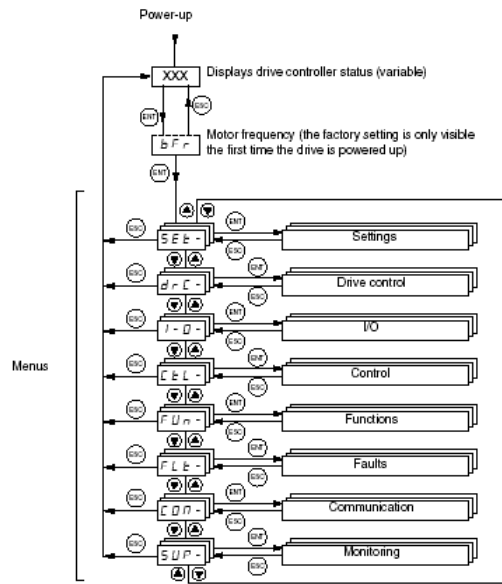
- 5) Disconnect wire from LI5 ONLY.

As soon as you disconnect the wire, the drive should run to set maximum speed. If you have more than one drive, repeat the steps for other drives.

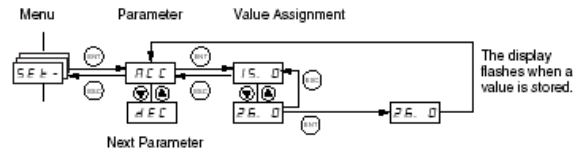
Once you have completed service, reconnect the wire to LI5. This should shut down the drive.

In case the drives do not run at maximum or shut itself down, contact Spring Air Systems Service immediately.

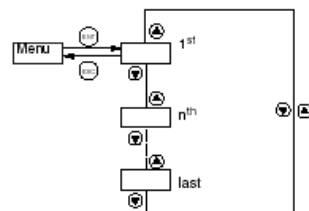
APPENDIX L  
 Accessing the Drive Program Menu



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 M  
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 –bFr will display, select ENT and set value to 60 Hz.
[ SEt ]	<b>Press ENT ↓ or scroll down to SEt press ENT to enter <u>Settings Menu</u>.</b>
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 ]	<b>Press ESC twice ↑ or scroll up to drC press ENT to enter <u>Drive Control Menu</u>.</b>
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 ]	<b>Press ESC twice ↑ or scroll up to CTL press ENT to enter <u>Control Menu</u>.</b>
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 ]	<b>Press ESC twice ↑ or scroll up to IO press ENT to enter <u>I/O Menu</u></b>
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 ]	<b>Press ESC twice ↑ or scroll up to FUn press ENT enter <u>Application Function Menu</u></b>
SA1 = nO	Press ↓ or scroll down SA1 press ENT, SA2 will display, press ENT again and set value to nO. Press ENT
[ FLt ]	<b>Press ESC 3 times ↑ or scroll up to FLt press ENT to enter <u>Fault Menu</u></b>
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 <b><u>Communication Menu</u></b>
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 –bFr will display, select ENT and set value to 60 Hz.
[ SEt ]	Press ENT ↓ or scroll down to SEt press ENT to enter <b><u>Settings Menu.</u></b>
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 <b><u>Drive Control Menu.</u></b>
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 <b><u>Control Menu.</u></b>
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 <b><u>I/O Menu</u></b>
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 ]	<b>Press ESC twice ↑ or scroll up to FUn press ENT enter <u>Application Function Menu</u></b>
SA1 = nO	Press ↓ or scroll down <b>SA1</b> press ENT, SA2 will display, press ENT again and set value to nO. Press ENT
[ FLt ]	<b>Press ESC 3 times ↑ or scroll up to FLt press ENT to enter Fault Menu</b>
Atr = yes	Press ↓ or scroll down <b>Atr</b> press ENT, set value to yes. Press ENT
tAr = Ct	Press ESC ↓ or scroll down to <b>tAr</b> press ENT, set value to Ct. Press ENT
drn = yes	Press ESC ↓ or scroll down to <b>drn</b> press ENT, set value to yes. Hold ENT for 3 sec.
[ CON ]	<b>Press ESC twice ↑ or scroll up to CON press ENT to enter <u>Communication Menu</u></b>
AdCO =1-8	Press ENT ↓ or scroll down to <b>AdCO</b> 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 <b>bdCO</b> press ENT, set value to 500. Press ENT
FCS	Under <b>drC</b> parameter block set to InI to return VFD to factory settings.

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



APPENDIX N  
Drive Maintenance and Troubleshooting

**PRECAUTIONS**

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

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

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

## 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
<b>LD F</b> Serial link failure CANopen	Loss of communication between drive controller and communication device or remote keypad.	<ul style="list-style-type: none"> <li>• Check the communication bus.</li> <li>• Refer to the product-specific documentation.</li> </ul>
<b>EP F</b> External fault	User defined	User defined
<b>LF F</b> Loss of 4-20 mA follower	Loss of the 4-20 mA reference on input AI3	Check the connection on input AI3.
<b>DB F</b> Overvoltage during deceleration	<ul style="list-style-type: none"> <li>• Braking too rapidly</li> <li>• Overhauling load</li> </ul>	<ul style="list-style-type: none"> <li>• Increase the deceleration time.</li> <li>• Install a braking resistor if necessary.</li> <li>• Activate the brA function if it is compatible with the application. Refer to the <i>ATV31 Programming Manual</i>.</li> </ul>
<b>DHF</b> Drive overload	<ul style="list-style-type: none"> <li>• Drive controller or ambient temperature are too high.</li> <li>• Continuous motor current load is too high.</li> </ul>	Check the motor load, the drive controller ventilation, and the environment. Wait for the drive controller to cool before restarting.
<b>DL F</b> Motor overload	<ul style="list-style-type: none"> <li>• Thermal trip due to prolonged motor overload</li> <li>• Motor power rating too low for the application</li> </ul>	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
<b>DP F</b> Motor phase failure	<ul style="list-style-type: none"> <li>• Loss of phase at drive controller output</li> <li>• Downstream contactor open</li> <li>• Motor not connected</li> <li>• Instability in the motor current</li> <li>• Drive controller oversized for motor</li> </ul>	<ul style="list-style-type: none"> <li>• Check the connections from the drive controller to the motor.</li> <li>• If a downstream contactor is being used, set OPL to OAC. Refer to the <i>ATV31 Programming Manual</i>, FLt- menu.</li> <li>• 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.</li> <li>• Check and optimize the UFr (page 32), UnS (page 35), and nCr (page 35) parameters and perform auto-tuning (page 36).</li> </ul>
<b>DS F</b> Overvoltage during steady state operation or during acceleration	<ul style="list-style-type: none"> <li>• Line voltage too high</li> <li>• Line supply transients</li> </ul>	<ul style="list-style-type: none"> <li>• Check the line voltage. Compare with the drive controller nameplate rating.</li> <li>• Reset the drive controller.</li> </ul>
<b>PH F</b> Input phase failure	<ul style="list-style-type: none"> <li>• Input phase loss, blown fuse</li> <li>• 3-phase drive controller used on a single phase line supply</li> <li>• Input phase imbalance</li> <li>• Transient phase fault</li> </ul> <p><i>Note: This protection only operates with the drive controller running under load.</i></p>	<ul style="list-style-type: none"> <li>• Check the connections and the fuses.</li> <li>• Disable the fault by setting IPL to nO. Refer to the <i>ATV31 Programming Manual</i>.</li> <li>• Verify that the input power is correct.</li> <li>• Supply 3-phase power if needed.</li> </ul>
<b>SL F</b> Serial link failure Modbus	Loss of connection between drive controller and communication device or remote keypad.	<ul style="list-style-type: none"> <li>• Check the communication connection.</li> <li>• Refer to the product-specific documentation.</li> </ul>

### 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"> <li>• Loss of phase at drive controller output</li> <li>• Downstream contactor open</li> <li>• Motor not connected</li> <li>• Instability in the motor current</li> <li>• Drive controller oversized for motor</li> </ul>	<ul style="list-style-type: none"> <li>• Check the connections from the drive controller to the motor.</li> <li>• If a downstream contactor is being used, set OPL to OAC. Refer to the <i>ATV31 Programming Manual</i>, FLT-menu.</li> <li>• 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.</li> <li>• Check and optimize the UFr (page 32), UnS (page 35), and nCr (page 35) parameters and perform auto-tuning (page 36).</li> </ul>
<p><i>O S F</i> Overvoltage during steady state operation or during acceleration</p>	<ul style="list-style-type: none"> <li>• Line voltage too high</li> <li>• Line supply transients</li> </ul>	<ul style="list-style-type: none"> <li>• Check the line voltage. Compare with the drive controller nameplate rating.</li> <li>• Reset the drive controller.</li> </ul>
<p><i>P H F</i> Input phase failure</p>	<ul style="list-style-type: none"> <li>• Input phase loss, blown fuse</li> <li>• 3-phase drive controller used on a single phase line supply</li> <li>• Input phase imbalance</li> <li>• Transient phase fault</li> </ul> <p><i>Note: This protection only operates with the drive controller running under load.</i></p>	<ul style="list-style-type: none"> <li>• Check the connections and the fuses.</li> <li>• Disable the fault by setting IPL to nO. Refer to the <i>ATV31 Programming Manual</i>.</li> <li>• Verify that the input power is correct.</li> <li>• Supply 3-phase power if needed.</li> </ul>
<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"> <li>• Check the communication connection.</li> <li>• Refer to the product-specific documentation.</li> </ul>

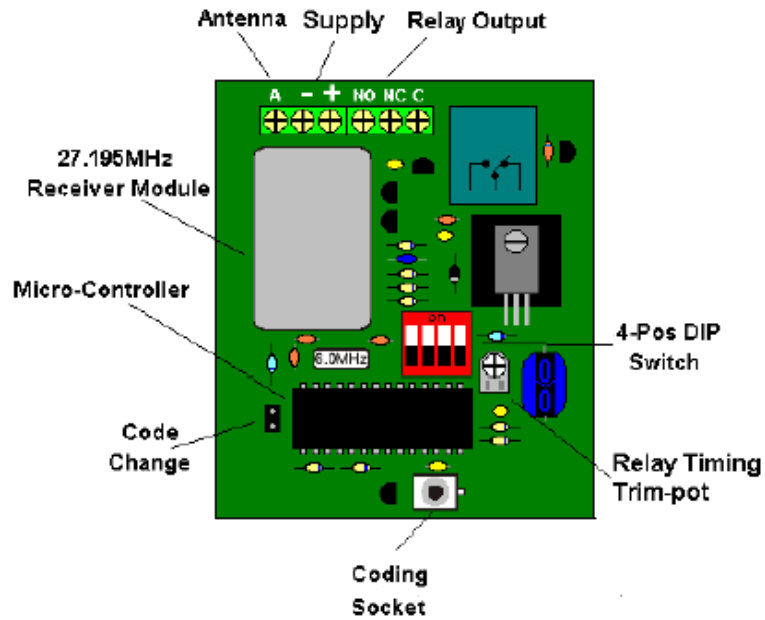
# Remote Switch System 1 Installation Guide

**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:

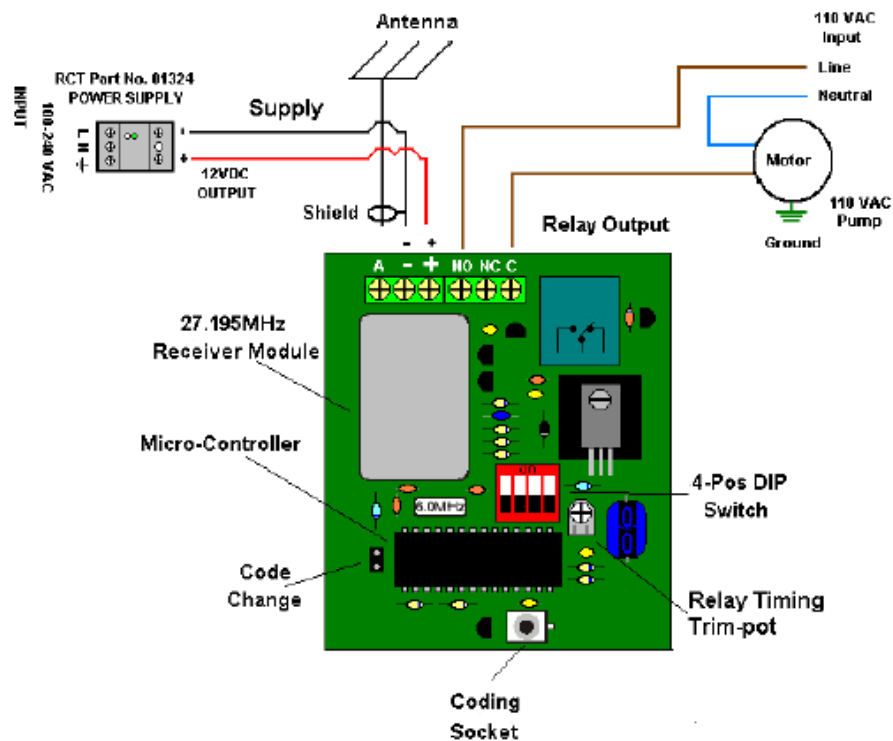
1. Supply Connections
2. Antenna Connections
3. 4 Position DIP Switch
4. Relay Timing Trim-pot
5. Coding Socket
6. Code Change Pins
7. Relay Connections



## 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:

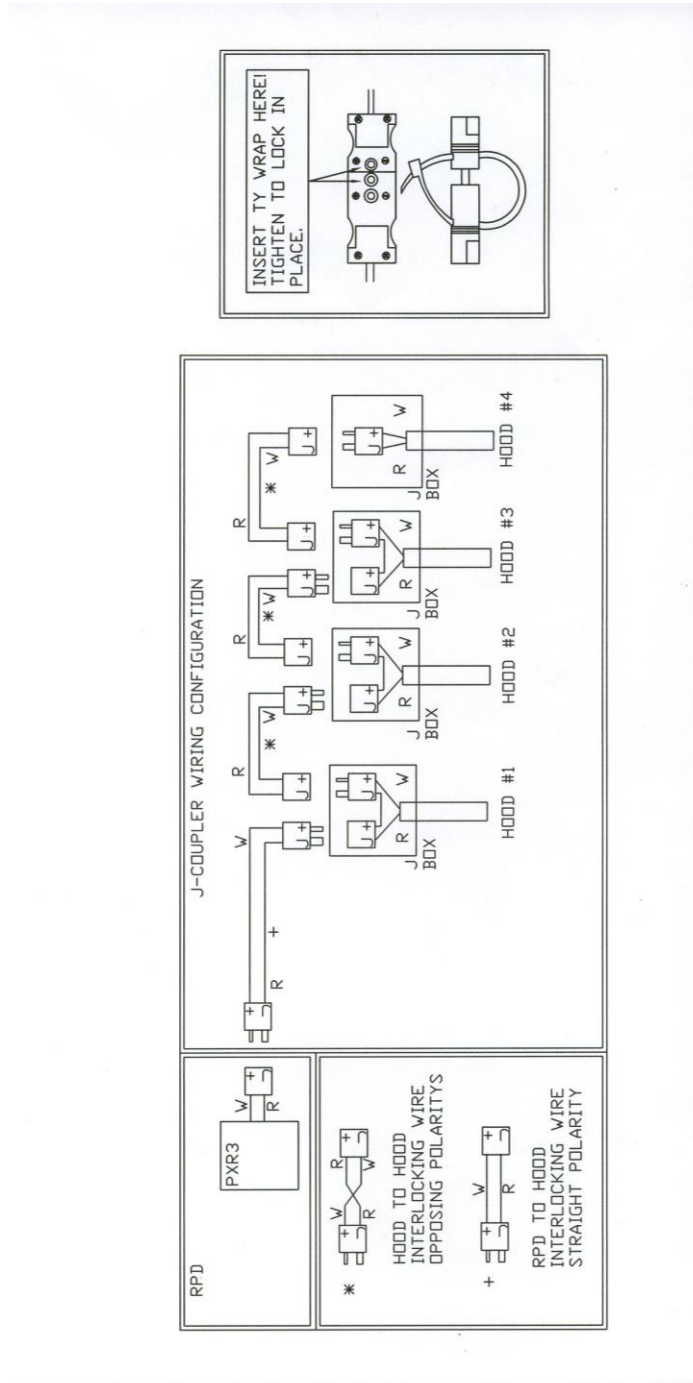
1. Apply 12VDC to the receiver (See Receiver Installation Instructions)
2. Momentarily short the two code change pins marked with the symbol "CC" on the receiver. This will randomly change the current security code of the receiver. (Skip this step if adding additional transmitters to an existing system.)
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 P  
 J-Coupler Remote Factory Supplied Cable



APPENDIX Q  
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.

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.

**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.

## APPENDIX R

### Testing TruFlow after Running 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.

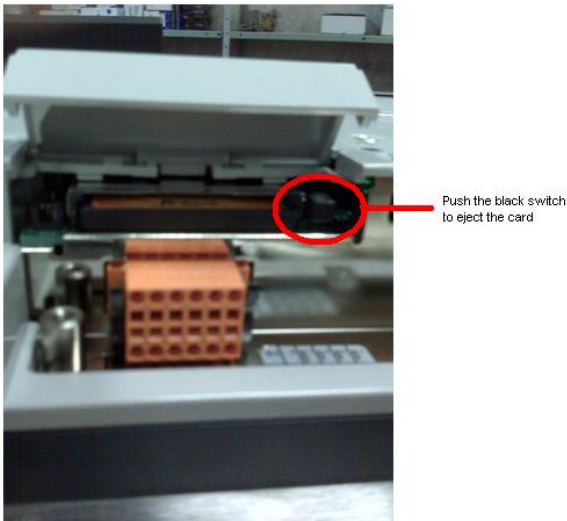
### KES Truflow units only

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 S

### Replacing the HMI Memory Card:

- 1) Open the TruFlow panel.
- 2) Locate the Card placement slot behind (back side) the Touchscreen.
- 3) Gently slide open plastic lid and pull from the bottom.
- 4) Push the black switch located beside the card (Shown in picture). At this point, the card should come out just enough so you can pull it out.



- 5) Pull out the card.
- 6) Insert the new card as shown in the picture to the left. Push in the card gently and close the lid.
- 7) Power down the Touchscreen for 30 seconds then turn it back on.
- 8) Write the location of TruFlow on the old card, store the old card in the plastic case the new card came in and return to Spring Air Systems.



**APPENDIX T**

Truflow Factory Setup:

Login as Administrator. If you do not have the Administrators 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 Model No.	
Number of Kitchens (1 to 4)	

SHADED AREAS TO BE COMPLETED BY STARTUP TECHNICIAN

Kitchen #1					
Total Exhaust CFM		4356			
Number of Hoods connected		2			
Number of Exhaust Drives Connected		1			
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					

Kitchen #2					
Total Exhaust CFM					
Number of Hoods connected					
Number of Exhaust Drives Connected					
Exhaust Drive 1	HP		Voltage		
Exhaust Fan 1	Manufacturer		Model No.		
Total Supply CFM					
Supply Fan Manufacturer			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 #3					
Total Exhaust CFM					
Number of Hoods connected					
Number of Exhaust Drives Connected					
Exhaust Drive 1	HP		Voltage		
Exhaust Fan 1	Manufacturer		Model No.		
Total Supply CFM					
Supply Fan Manufacturer			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 #4					
Total Exhaust CFM					
Number of Hoods connected					
Number of Exhaust Drives Connected					
Exhaust Drive 1	HP		Voltage		
Exhaust Fan 1	Manufacturer		Model No.		
Total Supply CFM					
Supply Fan Manufacturer			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					

Check these Truflow Panel Connections prior to startup		
Item	Description	Y / N
1	There is a 120V power supply to terminals 1 + 4 in Truflow panel	
2	The J-couple cable are plugged into the Truflow panel for each Kitchen	
3	The VFD CAT5 cable is connected from the VFD "Y" connector to the top of the panel labeled VFD.	
4	Additional VFD drive is connecting from the 1 <sup>st</sup> VFD "Y" connector to the 2 <sup>nd</sup> VFD "Y" connection.	
5	Outdoor Temperature Transducer is installing in a fresh air duct.	
6	CAT5 cable is connected from the Outdoor Temperature Transducer to the top of the Truflow panel labeled OUT	
7	Check that each fan disconnect switch is in on position and that each fan discharge is free and clear.	
8	Check that each VFD is powered with the display indicating RDY	

Truflow Panel Commissioning		
9	Turn power on to the Truflow panel from the breaker panel.	
10	Perform the Commissioning procedure as described on page 3 once screen has powered up.	

11	Turn on some or all of the appliances and check that the exhaust fan speeds up. 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.	
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	
	Set Thermal Start setting to same as Kitchen PXR set point	
31	From System Control screen turn canopy light off and on for each Kitchen. Check for 120V between terminal 4 + 6.	

Complete the Following			
12	Is Remote Start Stop selected RSS?		
13	Is Supply Averaging Board selected SAB?		
Exhaust Fans			
14	1 <sup>st</sup> Exhaust fan Min Frequency		1 <sup>st</sup> Exhaust fan Max Frequency
15	2 <sup>nd</sup> Exhaust fan Min Frequency		2 <sup>nd</sup> Exhaust fan Max Frequency
16	3 <sup>rd</sup> Exhaust fan Min Frequency		3 <sup>rd</sup> Exhaust fan Max Frequency
17	4 <sup>th</sup> Exhaust fan Min Frequency		4 <sup>th</sup> Exhaust fan Max Frequency
18	Exhaust fan rotation OK?		
Supply Units with VFD			
19	1 <sup>st</sup> Supply fan Min Frequency		1 <sup>st</sup> Supply fan Max Frequency
20	2 <sup>nd</sup> Supply fan Min Frequency		2 <sup>nd</sup> Supply fan Max Frequency
Supply Units with control signal			
21	1 <sup>st</sup> supply fan Min 4-20ma setting		1 <sup>st</sup> supply fan Max 4-20ma setting
22	2 <sup>nd</sup> supply fan Min 4-20ma setting		2 <sup>nd</sup> supply fan Max 4-20ma setting
23	Supply fan rotation OK?		

Comments:

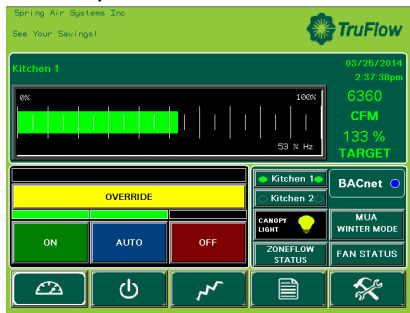
Service Technician: \_\_\_\_\_

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 PANEL.

1. Complete nos. 1-9 on the TruFlow Startup Report.




2. Touch to access the Primary  Toolbox window.


3.  Touch to log off.

4.  Touch to login on following the screen instructions.

5. Name: admin

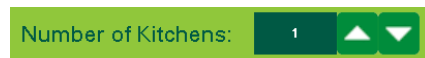
6. Password:

8.  Touch and then touch Close.

9.  Touch to access the Secondary Toolbox window.

10. Touch  to access the Kitchen Setup window.

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



12. 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.




NOTE: If communication message pop-up during the Kitchen Setup, clear them prior to continuing

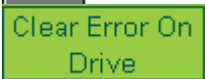
This  is a typical fault displayed on Operation Status Window after a MODbus, Comm Port or Comm fault.

To clear Message:



Touch the Operation Status window icon.

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

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

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

17. Once you have completed the Kitchen Setup Screen go to the Operation Status window and clear any communication errors again.

18. Return to the Primary Toolbox window.

19.  Touch to access the Energy Reduction Goal Setup Window.



20. Touch the dark green field next to Reduction Goal, and then press Enter.



21. Touch the dark green field next to Gas Cost, and then press Enter.



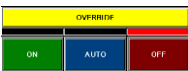
22. Touch the dark green field next to Electricity Cost, and then press Enter.



23. Touch to access the Kitchen Setup Window.



24. Touch on to put the Truflow in manual control.



25. Touch off to turn the fans off.

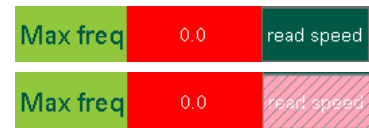
26. Return to the Secondary Toolbox Window.



27. Touch to access Kitchen 1 Drive window.



28. Touch “read speed” Max freq. The field will turn. When it is no longer pink return to the Power Window.



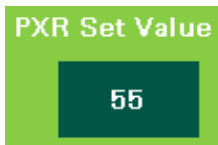
29. Continue with item 10 on the TruFlow Startup Report.

30. 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. Enter on the pop-up keyboard, then OK to exit.



31. Return to the Power Window.

32. Continue with item 13 on the TruFlow 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 on the PCL face. Press the light button on the front of the panel  and output O2 should be lit. When O2 is lit, terminal 6 should have 120V power. Press the light off and O2 should not be lit. When O2 powers terminal 6. 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 amp meter on 4+6 and measure for 120V when the light is pressed on and no 120V 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.