VORTEK G3

Fan Array Airflow Monitors
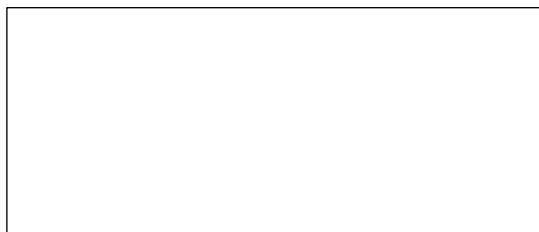
Manufactured by:

ACCUTROL LLC

21 Commerce Drive
Danbury, CT 06810
USA

Accutrol Representative:

Member of
BACnet International

LIMITED WARRANTY

Accutrol LLC, having its principal place of business at 21 Commerce Drive, Danbury, CT USA ("Manufacturer") warrants its VTG3 Products (the "Products") as follows:

1. Limited Warranty.

Manufacturer warrants that the Products sold hereunder will be free from defects in material and workmanship for a period of thirty-six (36) months from the date of purchase. If the Products do not conform to this Limited Warranty during the warranty period (as herein above specified), Buyer shall notify Manufacturer in writing of the claimed defects and demonstrate to Manufacturer's satisfaction that said defects are covered by this Limited Warranty. If the defects are properly reported to Manufacturer within the warranty period, and the defects are of such type and nature as to be covered by this warranty, Manufacturer shall, at its own expense, furnish, replacement Products or, at Manufacturer's option, replacement parts or services for the defective Products. Shipping and installation of the replacement Products or replacement parts shall be at Buyer's expense.

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THIS WARRANTY IS EXCLUSIVE. The sole and exclusive obligation of Manufacturer shall be to repair or replace the defective Products in the manner and for the period provided above. Manufacturer shall not have any other obligation with respect to the Products or any part thereof, whether based on contract, tort, and strict liability or otherwise. Under no circumstances, whether based on this Limited Warranty or otherwise, shall Manufacturer be liable for incidental, special, or consequential damages.

4. Other Statements.

Manufacturer's employees or representatives' ORAL OR OTHER WRITTEN STATEMENTS DO NOT CONSTITUTE WARRANTIES, shall not be relied upon by Buyer, and are not a part of the contract for sale or this limited warranty.

5. Entire Obligation.

This Limited Warranty states the entire obligation of Manufacturer with respect to the Products. If any part of this Limited Warranty is determined to be void or illegal, the remainder shall remain in full force and effect.

TABLE OF CONTENTS

SECTION 1 - INTRODUCTION

The VorTek^{G3} (VTG3) airflow measurement system is the only true digital airflow velocity sensing system on the HVAC market. Unlike pressure-based and temperature-based airflow measurement sensors, the vortex shedding airflow sensor provides a direct measurement of the airflow velocity rate. The measurement provided by the vortex shedding sensor is immune to the effects of temperature, pressure and humidity. Also, the measurement signal is not amplitude-based and cannot drift over time, therefore recalibration is never required.

1.1 Theory of Operation

The vortex shedding digital airflow sensor contains a small shedder bar which generates vortex shedding pressure pulses as air flows through the sensor. The pressure pulses are converted to electronic pulses by detectors located at the end of each sensor. Because the vortex shedding frequency is directly proportional to the airflow velocity; regardless of temperature, pressure, or humidity, the VTG3 sensor is capable of providing an extremely accurate and repeatable signal over a wide operating range. Figure 1 illustrates the sensor signal path.
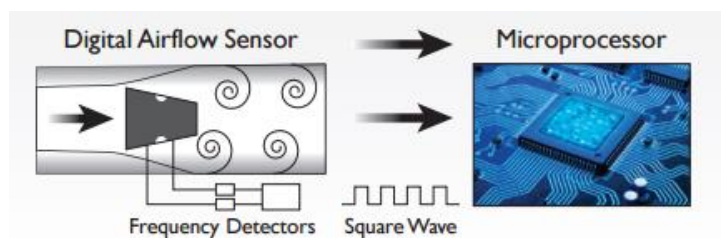

Figure 1

Each VTF sensor is mounted on a small airfoil shaped pedestal which is designed to not impede fan performance while providing an accurate and repeatable measurement of the airflow velocity at the fan inlet. The individual signals are sent from each sensor to the VTF transmitter where they are processed to provide an average airflow velocity rate for the fan inlet. The transmitter calculates the average airflow volume rate based on the fan inlet size, and provides an analog output signal for connectivity to any BAS control device. For network communications an optional EIA-485 port supporting BACnet MS/TP is provided.

1.2 Operating Range

The full-scale range of the VTFA Fan Array Airflow Transmitter is factory-configured for 12000 FPM (60.9m/s), which is appropriate for the majority of fan inlet measurement applications. The full-scale airflow volume range for the transmitter analog output can be configured to any value using the VTG3 Insight software.
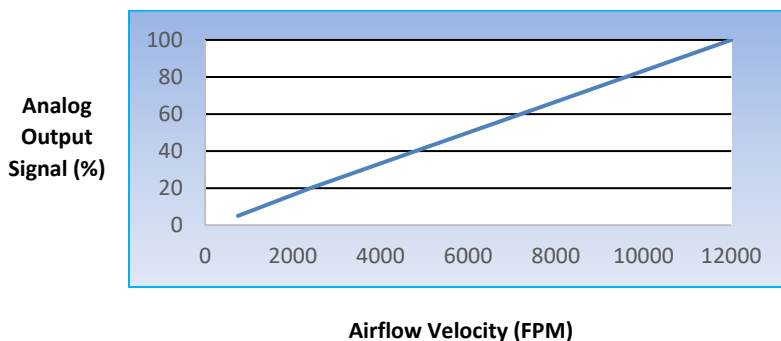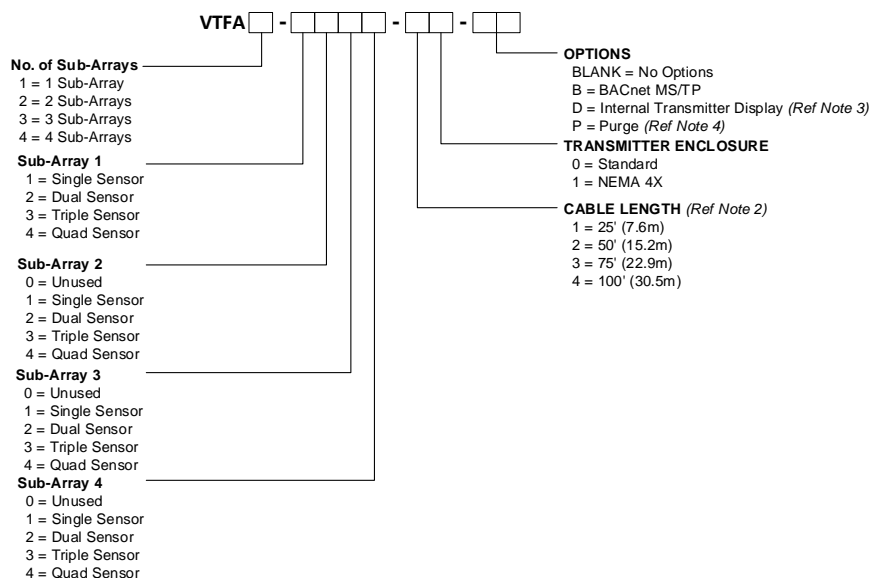

Figure 2

1.3 Model Code

No. of Sub-Arrays
1 = 1 Sub-Array
2 = 2 Sub-Arrays
3 = 3 Sub-Arrays
4 = 4 Sub-Arrays

Sub-Array 1
1 = Single Sensor
2 = Dual Sensor
3 = Triple Sensor
4 = Quad Sensor

Sub-Array 2
0 = Unused
1 = Single Sensor
2 = Dual Sensor
3 = Triple Sensor
4 = Quad Sensor

Sub-Array 3
0 = Unused
1 = Single Sensor
2 = Dual Sensor
3 = Triple Sensor
4 = Quad Sensor

Sub-Array 4
0 = Unused
1 = Single Sensor
2 = Dual Sensor
3 = Triple Sensor
4 = Quad Sensor

OPTIONS
BLANK = No Options
B = BACnet MS/TP
D = Internal Transmitter Display *(Ref Note 3)*
P = Purge *(Ref Note 4)*

TRANSMITTER ENCLOSURE
0 = Standard
1 = NEMA 4X

CABLE LENGTH *(Ref Note 2)*
1 = 25' (7.6m)
2 = 50' (15.2m)
3 = 75' (22.9m)
4 = 100' (30.5m)

1.4 Model Code Notes:

1. The following information should be provided with order so the Transmitter can be factory-configured:

    Device Tag Number
    Analog Output Full Scale Range
    Analog Output Signal Type
    # of Fans in Array
    Fan Inlet Size (measured at the smallest diameter of the inlet)

2. One cable is provided with each Sensor Electronics Enclosure. Contact factory if cables longer than 100' are required. Cable terminations are based on the Transmitter Enclosure Selection per table below.

Enclosure Selection	Type of Cable Provided	Cable End Terminations
0	Outdoor Rated	Standard RJ45 / Waterproof RJ45
1	Outdoor Rated	Waterproof RJ45 / Waterproof RJ45

3. When Option D (Internal Transmitter Display) is selected, the Remote Display cannot be used.

4. Purge option requires a connection to a clean and dry instrument air supply 20psi ± 2psi.

Model Code Example:

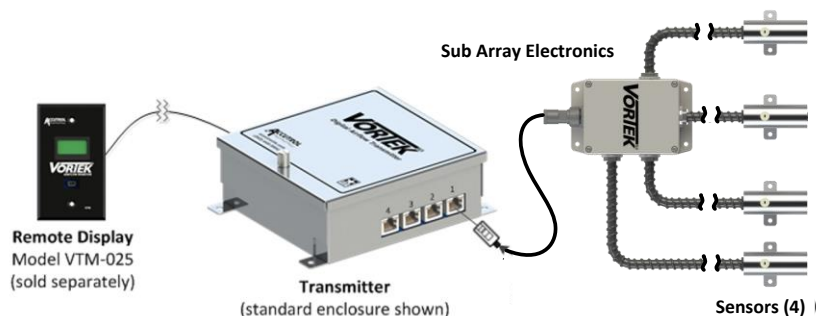### Model Shown Below: VTFA1-4000-10

Remote Display
Model VTM-025
(sold separately)

Transmitter
(standard enclosure shown)

Sub Array Electronics

Sensors (4)

Figure 3

SECTION 2 - SPECIFICATIONS

PERFORMANCE	
Accuracy	
Individual Sensors	+/-2% of reading
System Accuracy	+/-5% of reading (Installed accuracy expected when installation meets guidelines)
	+/- 0.1% of reading
Repeatability	
Sensor FS Range	Factory Default is 12,000 FPM (60.9 m/s) (software configurable)

ENVIRONMENTAL	
Operating Temperature	
Fan Sensor	-20° to 140° F (-29° to 60° C)
Transmitter	-20° to 150° F (-29° to 66° C)
Display (optional)	-4° to 158° F (-20° to 70° C)
Storage Temperature	
Sensors and Transmitter	-40° to 150° F (-40° to 66° C)
Display (optional)	-22° to 176° F (-30° to 80° C)
Humidity	
Sensors	Non-condensing
Transmitter	0 to 90% non-condensing

ELECTRICAL	
Input Power	24VAC +/- 20% 50-60Hz, 2.4 VA with no options, 4.8 VA with display & BACnet options
	24VDC +/-10%, 1 W with no options, 3 W with display & BACnet options
Inputs	1 to 4 Sensors per Sub Array, (16 Sensors Max per Xmtr)
Output	0-20mA, 4-20mA, 0-10v, 2-10v, 0-5v or 1-5v (software configurable)
	12-bit Resolution
	Capable of driving 1K ohm load
Configuration Port	USB 2.0, Isolated Connector
USB Power Switch	Selects alternate power source for configuration when main power is not available
	Draws 5v power from USB configuration port
Status Indicators	LED Status Indicators for; Power, Output, Configuration Port, Power Source Switch, Sensor Input Channel 3 and 4, Display and BACnet Communications
I/O Terminal Block	3 position vertical pluggable screw terminal block, screw access on top, 12-30 AWG
Cables	Outdoor rated cables with waterproof ends connected to NEMA 4X electronics.
Network Com Port	EIA 485 2-wire BACnet MS/TP
(Optional)	Galvanically Isolated
	Data Rates 9600, 19200, 38400, 57600, 76800 and 115200
	1/8 Unit Load Receiver Input Impedance
	Network bias and EOL Termination not provided within the Transmitter
Display (Optional)	Remote mount or transmitter mount
	Liquid Crystal Display, 2 lines x 8 characters with white LED backlight
	Includes USB Configuration Port

MATERIALS OF CONSTRUCTION	
Fan Sensors	Aluminum shroud and base, ABS plastic sensor, galvanized steel mounting plate
Enclosures	
Standard	Transmitter: Aluminum Alloy 5052-H32, 16 Gauge
	Probe Electronics: NEMA 4X Polycarbonate Plastic
Optional	Transmitter: NEMA 4X Polycarbonate Plastic

Emissions   EN 55011:2009+A1:2010, FCC Part 15:2017, ICES-003 Issue 6,
EN61000-3-2:2014, EN61000-3-3:2013
Immunity   EN61326-1:2013, EN61000-4-2:2009, EN61000-4-3:2006+A1:2008+A2:2010
EN61000-4-4:2012, EN61000-4-5:2006, EN61000-4-6:2009, EN61000-4-8:2010
EN61000-4-11:2004
Safety   EN61010-1:2010

2.1 Materials Installed in the Fan Inlet(s)

Item	Description	Material
1	VorTek Shroud	Aluminum
2	VorTek Shedder	ABS
3	VorTek Sensor Base	Aluminum
4	Flexible Conduit	PVC
5	Mounting Hardware	Plated Steel
6	Gasket	EPDM

Table 1
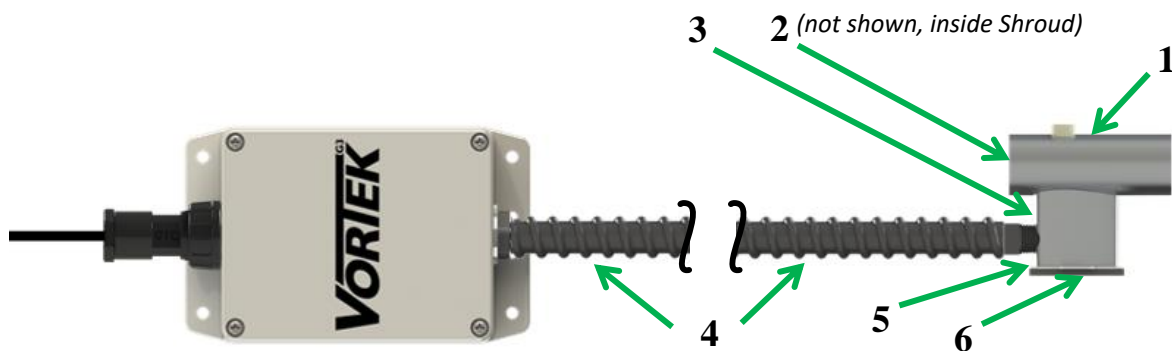
Figure 4

SECTION 3 – VTG3 INSIGHT - USER INTERFACE SOFTWARE & CONFIGURATION

Using a PC you can communicate directly with the transmitter using the VTG3 Insight Configuration Software. All that's required is a Windows PC or Tablet with a USB Port, a USB Cable and the VTG3 Insight Software.

3.1 Minimum Requirements for PC

- PC or Tablet with Windows Version 7 or 10
- USB 2.0 Port
- Screen Resolution 1280 x 768 or greater suggested
- USB Cable

3.2 Installing the VTG3 Insight Software

Before starting the installation process, close any programs running on the computer.

1. Download the **VTG3 Insight Software** from http://www.accutrolllc.com.

2. Go to the download folder of your PC and extract the files, then execute the Setup File.

3. Select Run to install the applications.

4. Complete the Product Registration Form then select "Request Product Key".
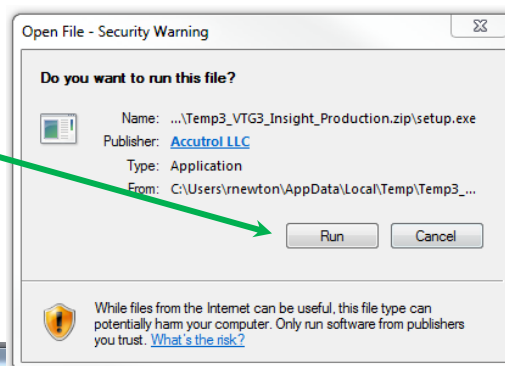
Fill in all fields required on the blank form.

This button initiates the email to request the key from Accutrol from your device.

Note: When selecting the Register Product Key button, the information provided will be copied to the clipboard and Insight will attempt to generate an email using your default Email Program. If a default Email program has not been configured you will need to manually generate an email addressed to requestsoftwarekey@accutrolllc.com and paste the clipboard information into the body of the email. The Installation Serial Number is unique to the computer which it was installed on. Therefore, the Registration Key will only function on this one computer. If you require the software to be installed on more than one computer, a request for each computer must be generated separately.

3.3 Insight Software Product Registration

Once you have received the Product Key from Accutrol, you will need to do the following to activate the software.

1. Open the VTG3 Insight application by using the desktop shortcut or go to the Start Menu and select Programs > VTG3 Insight.

2. Copy the product key provided on the email from Accutrol, paste it into the "Product Key" field provided at the bottom of the form then click on the "Register Product Key" button.

3. You will now be able to use the VTG3 Insight Software on your computer. If you have any problems, contact Accutrol LLC at 203-445-9991.

Note: VTG3 Insight will attempt to update itself with the latest released version of software each time it is initiated when the computer is connected to the internet. If you do not wish to update, you will be given a choice to not update each time.
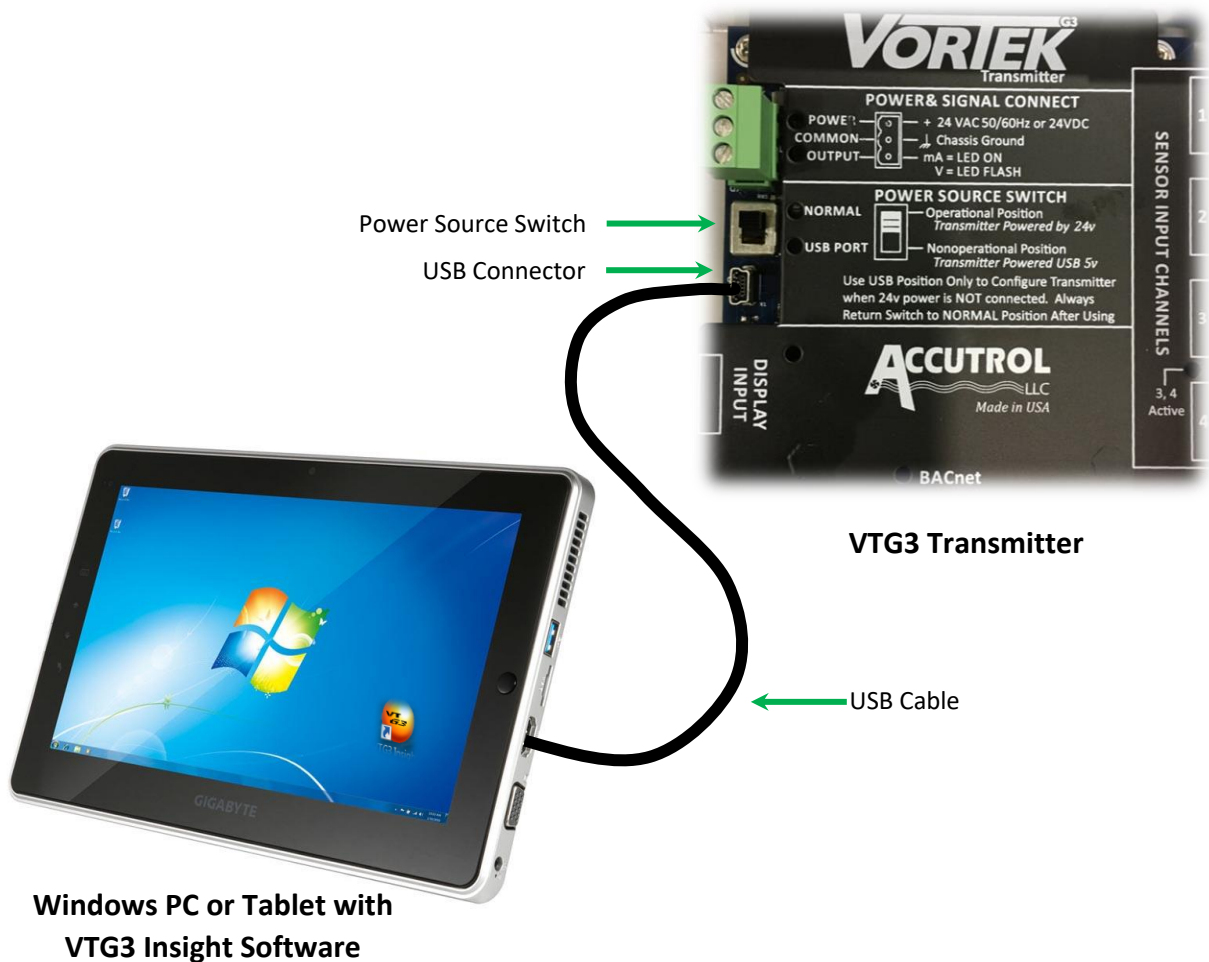
3.5 Connecting the PC to the Transmitter

If the transmitter is wired and powered by an external 24 v power source, simply connect the USB cable from the computer to the transmitter USB port.

If the transmitter is not yet powered by the external 24 v power source, the transmitter can be temporarily powered by the 5 VDC supplied from the USB port of the computer. This is a convenient feature for configuring the VTG3 BACnet parameters or checking the transmitter configuration prior to having the 24 v power source connected. To power the transmitter from the 5v USB supply, move the Power Source Switch to the "USB Port" position and attach the USB cable from the computer to the transmitter USB port. The "USB Port" LED should be illuminated to indicate the transmitter is being powered from the 5 VDC USB port. Open the VTG3 Insight Program and you will have access to view the configuration and make any changes required. After completing the configuration, save any changes that have been made and then close Insight. Now disconnect the USB cable from the transmitter then return the Power Source Switch to the "Normal" position.

Note: If the Power Source Switch is left in the "USB Port" position, the transmitter will not operate properly when power is supplied by the BMS 24v input power connection. Therefore, it's important to return the Power Source Switch to the "NORMAL" position.

Power Source Switch →

USB Connector →

VTG3 Transmitter

← USB Cable

Windows PC or Tablet with
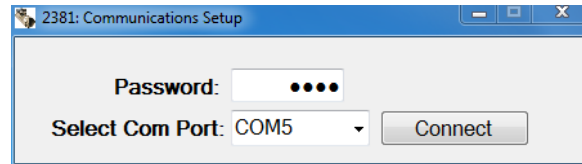**VTG3 Insight Software**

3.6 Using VTG3 Insight Software

To open the VTG3 Insight application, double click on the desktop shortcut or select VTG3 Insight from the Start Menu.

Select the appropriate COM port for the transmitter then select Connect.

Note: *If you're not sure which COM port your computer is using for the VTG3 transmitter, then disconnect the USB cable and view the drop-down list noting the COM ports that are included in the list. Now reconnect the USB cable and view the drop-down list. The new COM port added to the bottom of the list is the correct COM port.*

3.6.1 VTG3 Insight Dashboard

The VTG3 Insight Dashboard is the primary screen for accessing the parameters and viewing the real-time performance of the VTG3 airflow monitor. The Dashboard provides an intuitive graphical user interface that is easy to understand and provides access to the majority of field-configurable parameters with one click. The diagram below identifies the different objects of the dashboard followed by brief descriptions of each provided on the following pages.

Average Volumes for each monitored fan inlet
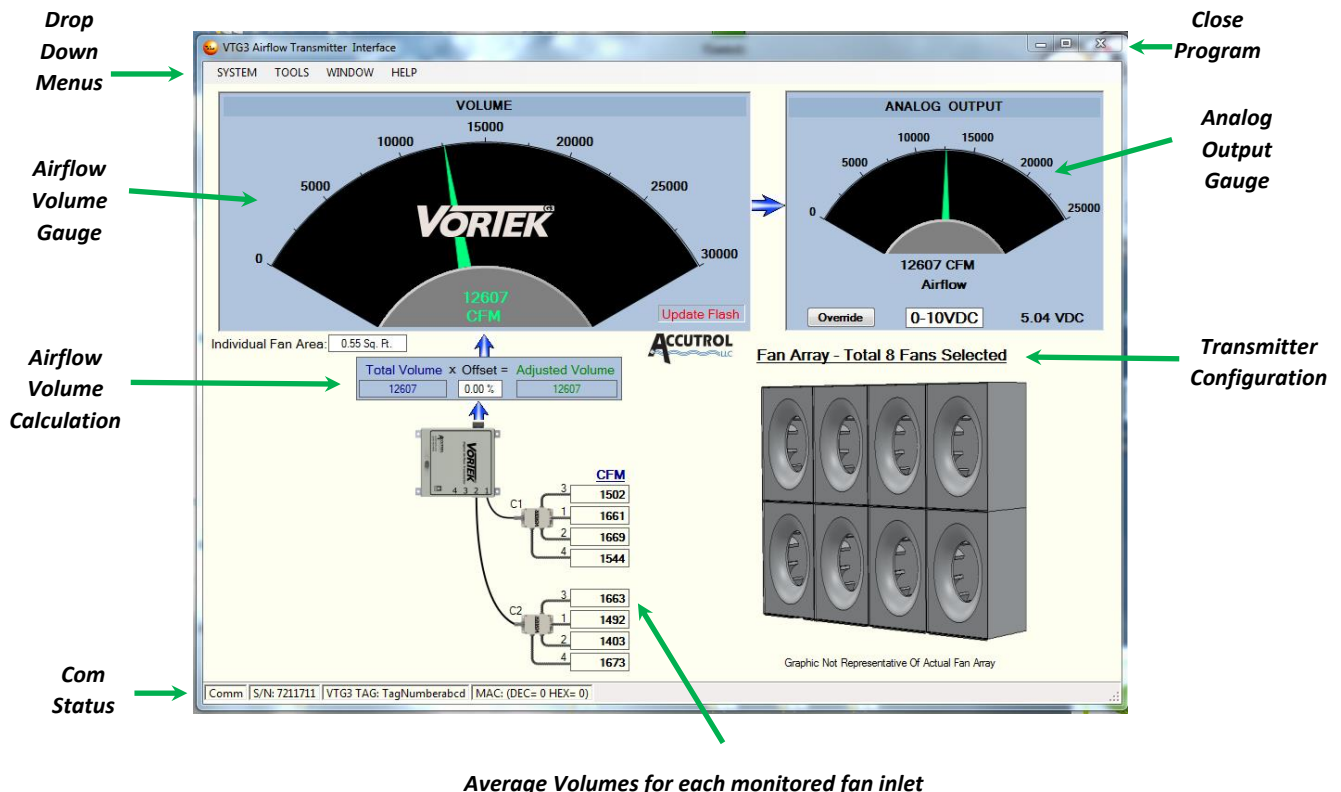
3.6.2 Sensor Volume Measurements

This area of the dashboard displays the real-time sensor volume measurement of each fan inlet. The example shown below is an application with 2 sub arrays, each with 4 sensors, which is a VTFA2-4400 configuration.

> **Note**: The diagram below always shows 4 boxes per sub array, even if all 4 sensor ports are not being used. In operation, if the number of boxes with active values does not match the number of sensors connected, the fans may be off.
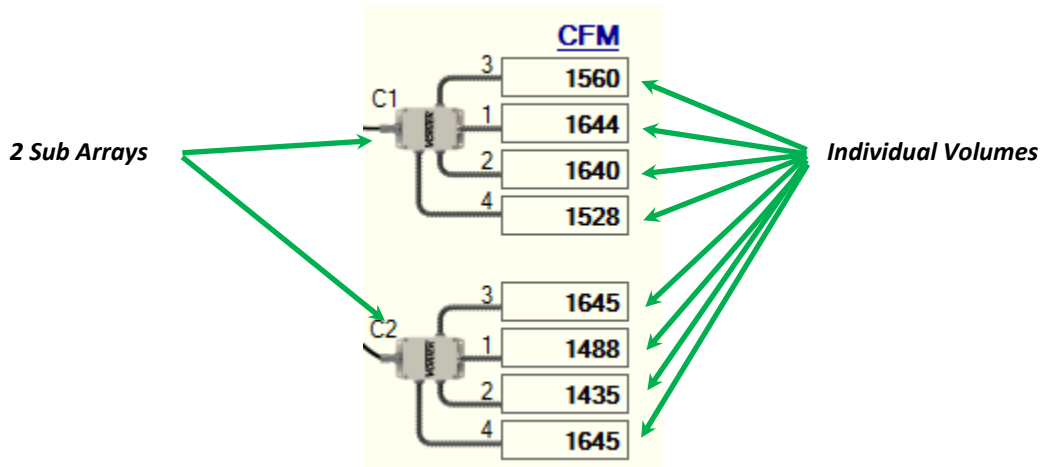
3.6.3 Volume Calculation Block

The Volume Calculation Block shows the real-time Airflow Volume measurement. The "Balancer Volume Offset" window can be accessed by double-clicking on the "Offset" box. The Individual Fan Area value can be adjusted by double-clicking on the Fan Array diagram and adjusting the individual fan diameter.
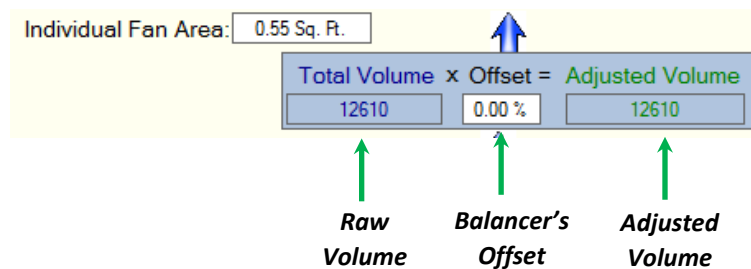
3.6.5 Airflow Volume Gauge

The Airflow Volume Gauge provides an indication of the real-time total airflow volume measurement for the fan array. This reading is derived from summing all of the monitored fans and multiplying it by the Balancer offset adjustment just below this Airflow Volume Gauge.
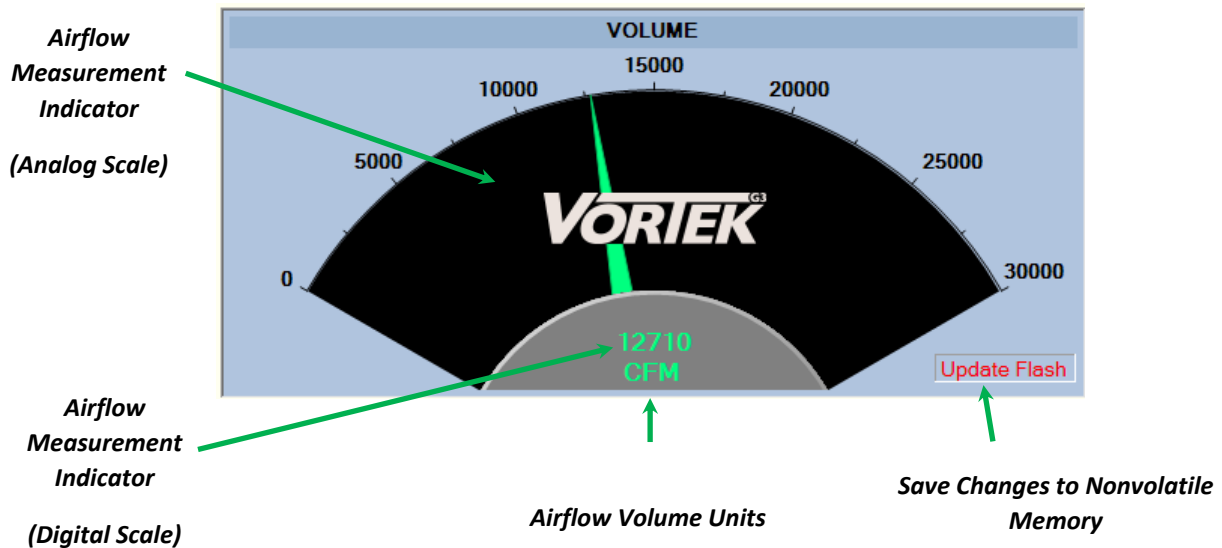
3.6.6 Analog Output Gauge

The Analog Output Gauge displays the airflow volume on a gauge that has the same full scale range as the Analog Output Signal. In addition to displaying the airflow volume, this gauge also shows the signal type and the real-time output signal that corresponds to the airflow volume. Double-clicking on the gauge will open the Analog Output Configuration window.
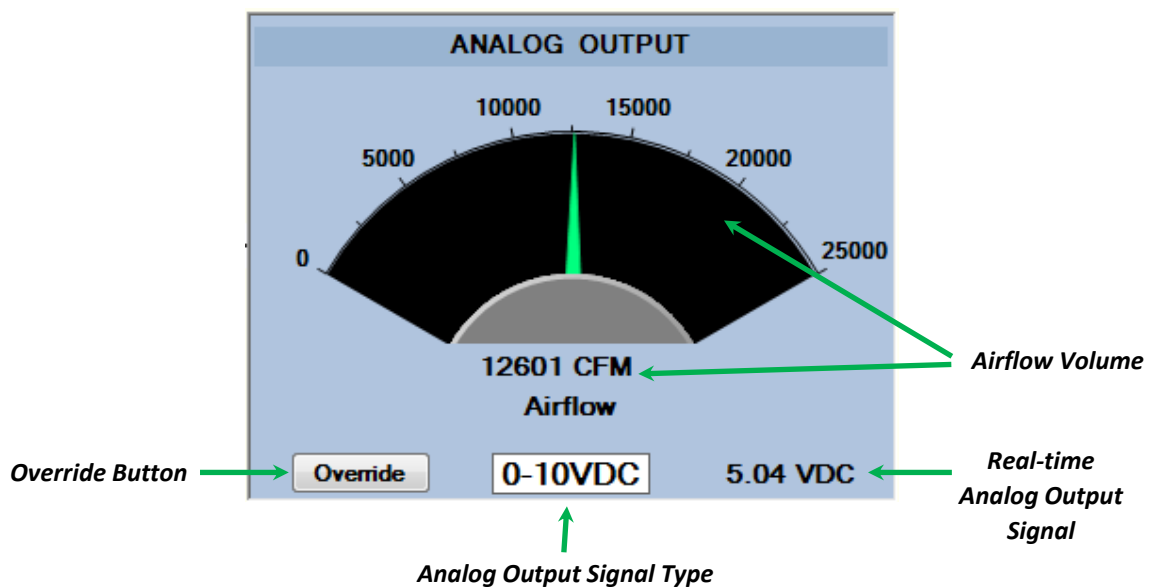
3.6.7 Configuration Window

Each transmitter is factory-configured; therefore, field configuration should not be required. However, if for some reason the transmitter configuration needs to be modified, it can be done using the VTG3 Insight Configuration Window.

1. Apply power and connect the USB cable per Section 3.5.

2. Select the Com port.

3. If the transmitter configuration shown on the dashboard does not match your application, move the cursor to this area and double click to select.

Select Application   *Select # of Fans in Array*   *Select Diameter of Fan Inlets*   *Select Full Scale Transmitter Range*

Save Changes
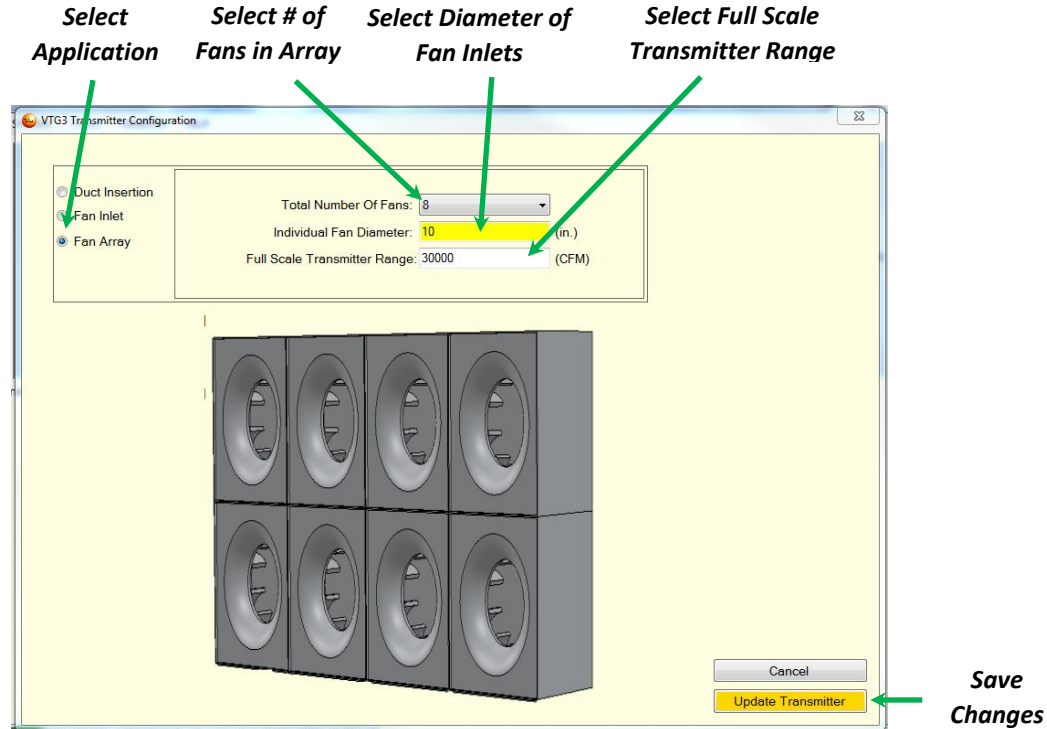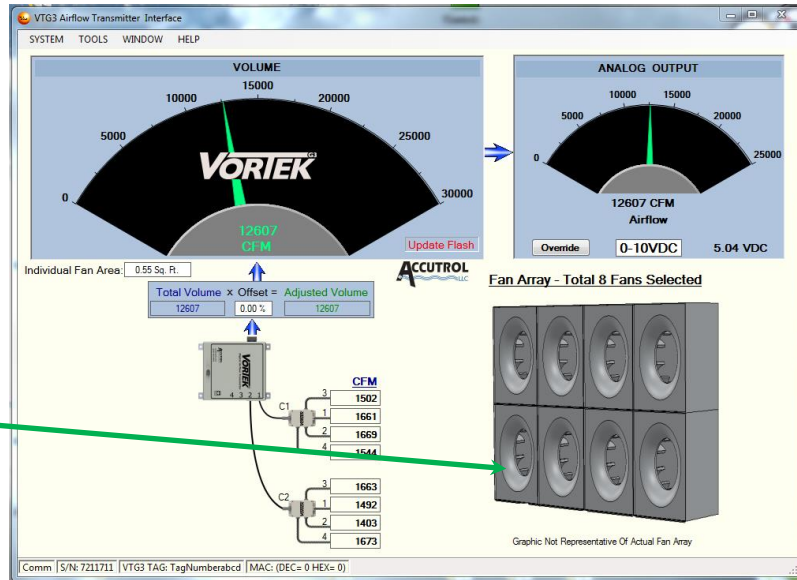
4. After saving changes, close the window and verify your changes appear on the Dashboard.
5. When there is airflow in the duct, you should the sensors reporting volumes.

3.6.8 Units of Measurement

To change the Units of Measurement, double-click on the bottom of the Airflow Volume Gauge to open the window shown below. Select the appropriate units for the application and save changes before closing the window.
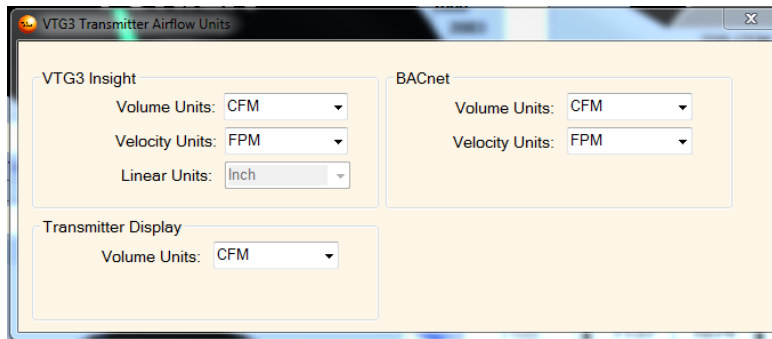
3.6.9 Analog Output Configuration

To open the Analog Output Configuration Screen, double-click on the Analog Output Gauge.
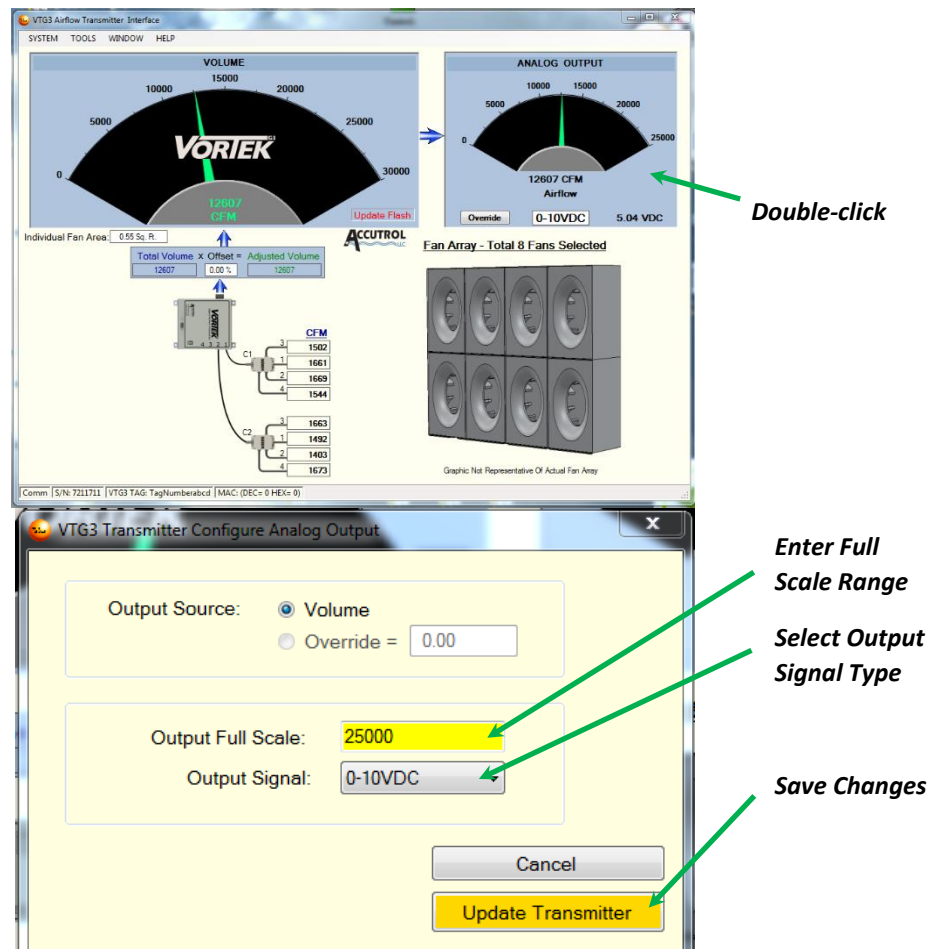
Enter the appropriate Full Scale and Output Signal Type required for the application, then save changes when complete.

3.6.10 Analog Output Override

The transmitter's Analog Output can be overridden, which is a useful feature to verify the analog output signal is reaching the receiving device (BMS controller) at the expected signal level. To open the Override window, select the "Override" button located at the lower left of the Analog Output Gauge. Enter the value you would like the analog output signal to be driven to. Select Update Transmitter to save change.
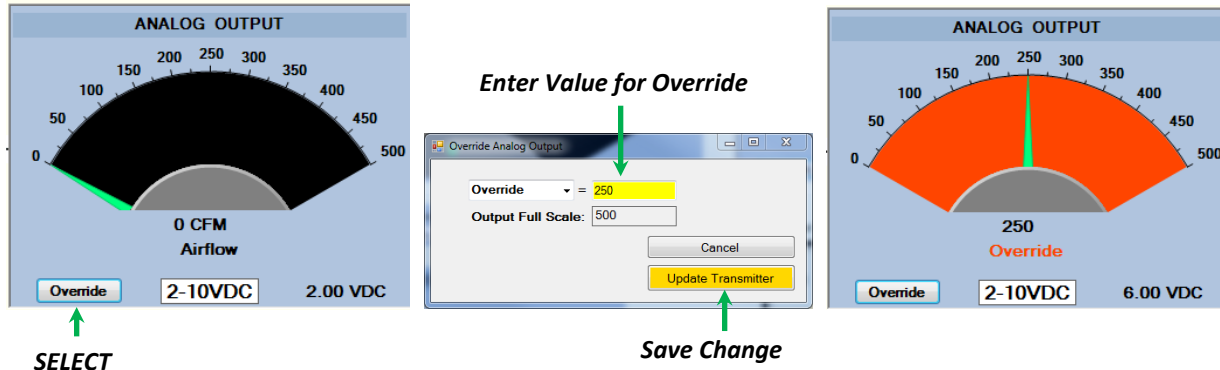
The example shown above will result in the Analog Output Signal reading 6.00 VDC which is 50% of the full scale output signal, as indicated on the Analog Output Gauge above on the right. Note that the gauge face is orange to indicate that the analog output signal is being overridden. Be sure to release the Analog Output to "Normal" before disconnecting from the transmitter.

3.6.11 Balancer Volume Offset

Adjustments can be made when working with the Balancing contractor to correlate the measured airflow volume with an external field measurement device. To open the Balancer Offset Window, double-click on the "Offset" box located in the Volume Calculation Block on the Dashboard.
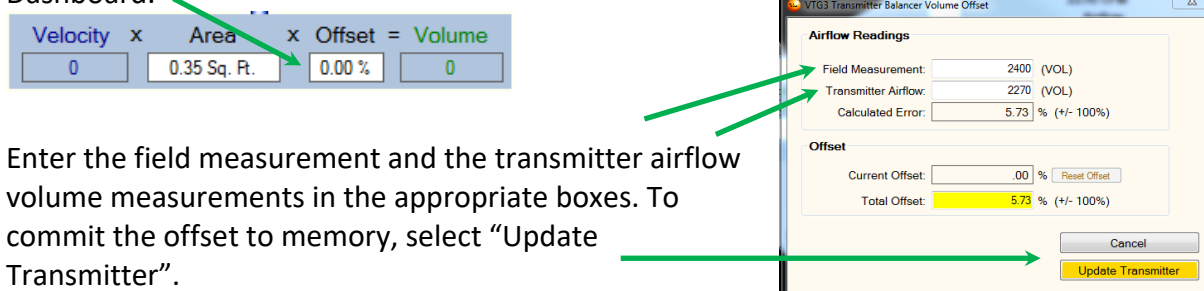
Enter the field measurement and the transmitter airflow volume measurements in the appropriate boxes. To commit the offset to memory, select "Update Transmitter".

SECTION 4 – BACNET OPTION

BACnet® is a standard data communication protocol designed specifically for building automation and control networks. The Accutrol VTG3 Transmitter uses the BACnet MS/TP (Master-Slave/Token Passing) protocol which is a type of MAC layer implemented using the EIA-485 signaling standard. The performance of the MS/TP network is heavily influenced by the network traffic load, the assignment of MS/TP node addresses and the network configuration parameter *Nmax_info_frames*. Additionally, it is imperative the physical network layer is properly configured (cabling, EOL terminations, bias, etc...) and is verified to be reliable otherwise the network performance can be compromised.

4.1 BACnet Objects

The Accutrol VTG3 Transmitter product family supports a collection of BACnet-visible objects. The table on the following page defines the visible objects for each model of the VTG3 Transmitter Product Family which includes models; VTD for Duct Applications, VTF for Fan Inlet Applications, and VTFA for Fan Array Applications.

All objects discovered may not be active in every application.

		Present Value Type	Parameter By Model Type		
Point	Object Description		VTD	VTF	VTFA
DE ###	Device Instance	Write	###	###	###
AI1	Airflow Volume	Read	Volume	Volume	Volume
AI2	Airflow Velocity	Read	Velocity	Velocity	N/A
AI3	Flash Writes Remaining	Read	Note 1	Note 1	Note 1
AI4	Airflow Channel 1 – Sensor 1	Read	Velocity	Velocity	Volume
AI5	Airflow Channel 1 – Sensor 2	Read	Velocity	Velocity	Volume
AI6	Airflow Channel 1 – Sensor 3	Read	Velocity	Velocity	Volume
AI7	Airflow Channel 1 – Sensor 4	Read	Velocity	Velocity	Volume
AI8	Airflow Channel 2 – Sensor 1	Read	Velocity	Velocity	Volume
AI9	Airflow Channel 2 – Sensor 2	Read	Velocity	Velocity	Volume
AI10	Airflow Channel 2 – Sensor 3	Read	Velocity	Velocity	Volume
AI11	Airflow Channel 2 – Sensor 4	Read	Velocity	Velocity	Volume
AI12	Airflow Channel 3 – Sensor 1	Read	Velocity	Velocity	Volume
AI13	Airflow Channel 3 – Sensor 2	Read	Velocity	Velocity	Volume
AI14	Airflow Channel 3 – Sensor 3	Read	Velocity	Velocity	Volume
AI15	Airflow Channel 3 – Sensor 4	Read	Velocity	Velocity	Volume
AI16	Airflow Channel 4 – Sensor 1	Read	Velocity	Velocity	Volume
AI17	Airflow Channel 4 – Sensor 2	Read	Velocity	Velocity	Volume
AI18	Airflow Channel 4 – Sensor 3	Read	Velocity	Velocity	Volume
AI19	Airflow Channel 4 – Sensor 4	Read	Velocity	Velocity	Volume
AI20	Number of Fans	Read	N/A	N/A	Value
AV1	Unsubscribed COV Interval	Write	Sec	Sec	Sec
AV2	Airflow Volume Measurement Adjust	Write	%	%	%
BV1	Write to Flash	Write	Note 1	Note 1	Note 1
MSI1	Airflow Volume Units	Write	1=CFM 2=CMS 3=CMM 4=CMH 5=LPS 6=LPM	1=CFM 2=CMS 3=CMM 4=CMH 5=LPS 6=LPM	1=CFM 2=CMS 3=CMM 4=CMH 5=LPS 6=LPM
MSI2	Airflow Velocity Units:	Write	1=FPM 2=MPM 3=MPS	1=FPM 2=MPM 3=MPS	N/A

Notes:

1: Writing a value of (1) to the BACnet Object BV1 will cause the transmitter to copy the active configuration stored in volatile memory (RAM) and write it to nonvolatile memory (FLASH). Reference Section 4.1.1 for a detailed description.

⚠ *CAUTION: Nonvolatile Flash memory has a limited number of Lifetime Write Cycles, therefore writing to Flash memory should be used only when necessary.*

In general the standard AI, AV, BV and MSI objects support required properties for those object types. Object_Name is writable with provision for 64-character maximum length names. BV Inactive_Text and Active_Text, and MSI State_Text are writable.

Standard object property values other than Present_Value shall respond as follows:

- Object_Identifier: generated automatically from request
- Object_Type: generated automatically from request
- Object_Name: writable
- Polarity: always NORMAL
- Units: Reference Table above, MSI1 and MSI2
- State_Text, Inactive_Text, Active_Text: writable
- Status_Flags: always {FALSE,FALSE,FALSE,FALSE}
- Event_State: always NORMAL
- Out_Of_Service: always FALSE

Objects; AI and AV shall support the COV_INCREMENT property which shall also be writable.

4.1.1 Save Active Configuration to Nonvolatile Flash Memory

The Accutrol VTG3 Transmitter has both volatile (RAM) and nonvolatile (Flash) memory. RAM memory does not have a limitation on the number of times it can be written, whereas Flash memory does. RAM memory is used by the transmitter to store and retrieve active values which are not retained when the power to the transmitter is lost. Values stored in Flash memory are copied to RAM memory during the power up sequence of the transmitter.

Writing a value of one (1) to the BACnet Object BV1 will cause the transmitter to copy the active configuration stored in volatile memory (RAM) into nonvolatile memory (Flash). Once values have been saved to nonvolatile memory they will retain their value through power cycles. Nonvolatile Flash memory has a limited lifetime number of write cycles which can be monitored via the BACnet Object AI3.

4.2 Unsubscribed COV

The AV1 object Present_Value shall specify an interval in whole seconds at which the transmitter shall periodically issue Unsubscribed COV Notifications as local segment broadcasts. An AV1 value of zero shall disable this behavior. When non-zero, the Unsubscribed COV shall also be issued if the Present_Value of any AI object changes by more than the COV_INCREMENT for the corresponding object. If COV_INCREMENT is zero for a given object, it shall also disable Unsubscribed COV for that object, even if AV1 is non-zero.

The VTG3 Transmitter includes a USB port which provides local connectivity for programing the Transmitter using the PC based software tool "VTG3 Insight" described in Section 3. For BACnet operation, the PC must be disconnected from the local USB port to avoid conflicts.

SECTION 5 – MAINTENANCE AND TROUBLESHOOTING

There is no recommended scheduled maintenance required for this product.
Below are some useful notes and troubleshooting tools.

Notes:

- *If you have more than one application operating on your PC along with Insight, the Insight Dashboard will appear to freeze until your cursor is within the frame of the dashboard and something is selected within the Insight frame.*

- *If some of the sensors don't show flow when the Insight window is active, it may be because the velocity is too low, too many sensors were chosen in the configuration window for what is installed, or you may have a sensor that is not functioning due to a blockage or erratic flow pattern. If everything is configured correctly, extract the Sensor from the fan inlet and inspect.*

Note: When all desired changes are made, it is good practice to select "Update Flash" as this will save all changes to the transmitter.

APPENDIX A: DOCUMENT REVISION HISTORY

Revision History		
ECN #	New Rev.	New Filename
2272	**A**	**VTFA Installation and Operation Manual**
Section	**Description of Change**	
Entire Document	First release	
2312	**B**	**VTF Installation and Operation Manual**
Section	**Description of Change**	
Appendix B-C	UPDATED TO MATCH SUBMITTAL DOC	
2602	**C**	**VTF Installation and Operation Manual**
Section	**Description of Change**	
Cover	Updated revision letter	
Page iii	Updated table of contents to include appendix	
Page 2	Added section note on purge from submittal	
Page 3	Added section from submittal on EMC and safety	
Appendix D	Added appendix d from submittal to include product options	

APPENDIX B: SENSOR INSTALLATION INSTRUCTIONS

SENSOR INSTALLATION

CROSS SECTION VIEW

Airflow

VORTEK
SENSOR

CONDUIT CLAMP

48" LONG PVC
FLEX TUBING
SHOULD BE SECURED.
REF STEP 7

FACTORY
PREFABRICATED
CABLE

Model: VTFA1-2000-10
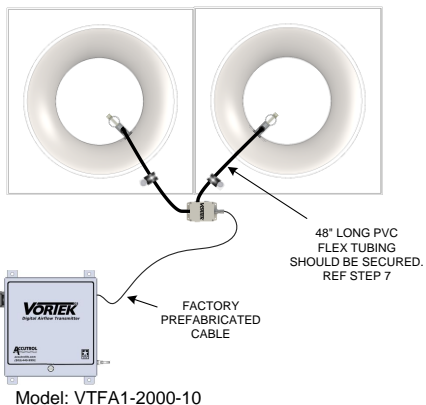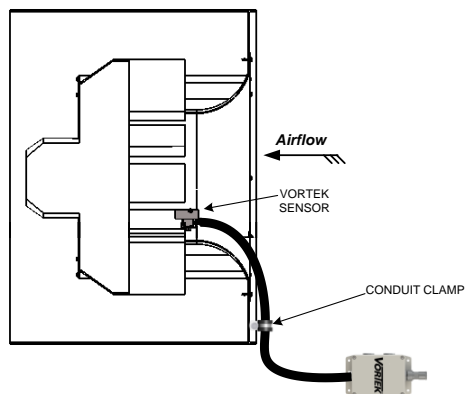
⚠️**CAUTION:** Only use the mounting hardware provided with the sensors and follow the instructions below, otherwise damage to the fan may result. If hardware is missing contact the factory.

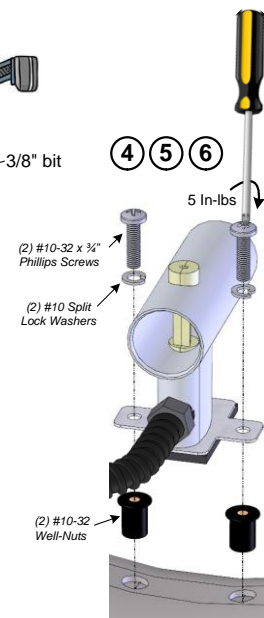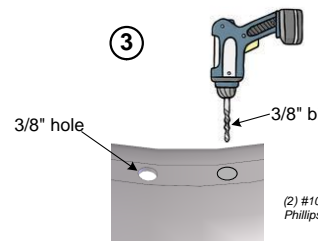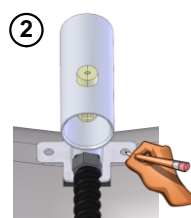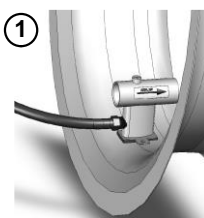**MOUNTING HARDWARE PROVIDED WITH EACH SENSOR:**
(2) #10-32 Well-Nuts with Threaded Inserts
(2) #10-32 x ¾" Long Phillips Screws
(2) #10 Split Lock Washers
(1) Conduit Clamp
(1) Screw, #10x½",SS,TEK

⚠️**WARNING:** Use safety glasses and cut-resistant gloves when installing sensors. Verify the circuit providing power to the fan is turned off and there is no power at the fan motor.

TOOLS REQUIRED:
Drill with a 3/8" Drill Bit
5/16" Hex Driver
#2 Phillips Screwdriver with Torque Indicator

1. Position the sensor into the throat of the fan inlet bell (smallest diameter) with airflow direction indicator facing towards the fan blades. Verify the fan blades will not come in close contact with the sensor and there are no obstructions in front of the sensor.

2. Using the sensor mounting bracket as a template, mark the inlet bell through the two mounting holes then remove the sensor.

3. Drill a hole at each location using a 3/8" diameter drill bit.

① ② ③

3/8" hole

3/8" bit

④⑤⑥

5 In-lbs

(2) #10-32 x ¾"
Phillips Screws

(2) #10 Split
Lock Washers

(2) #10-32
Well-Nuts

4. Insert the 2 well-nuts into the 3/8" diameter holes.

5. Place the sensor into the fan inlet bell and align the two holes in mounting bracket with the two well-nuts. Verify the airflow direction indicator on the sensor is pointing towards the fan blades.

6. Secure the sensor in place using mounting hardware supplied. Tighten the two screws to 5 inch-pounds.

7. In addition to serving as a signal conduit, the flexible tubing also provides a mechanical safety connection to prevent the sensor from getting pulled into the fan if it becomes disengaged. Pull the flexible conduit away from the fan inlet and secure it to a surface using the provided Conduit Clamp so it is not in the air stream and there is no slack in the tubing between the sensor and mounting hardware. Secure the Sensor Electronics Enclosure in place out of the airstream.

8. For multiple fan applications, repeat above steps for other fans.

APPENDIX C: TRANSMITTER INSTALLATION INSTRUCTIONS

TRANSMITTER INSTALLATION

1. Select an easily accessible location to install the transmitter within the range of the sensor cables that have been provided. Provide clearance to remove the cover and easily access the connectors and field connections.
2. Using the four 0.20" diameter holes located on the transmitter enclosure, secure the transmitter to mounting surface using (4) #8 or #10 Pan Head Screws. For sheet metal mounting surface, use sheet metal or tek screws, for plywood surface use coarse thread wood screws, for drywall surface, use drywall anchors with the appropriate screws.
3. Connect each sensor to the corresponding sensor input channel on the transmitter using the cables provided (Reference Figure 1)
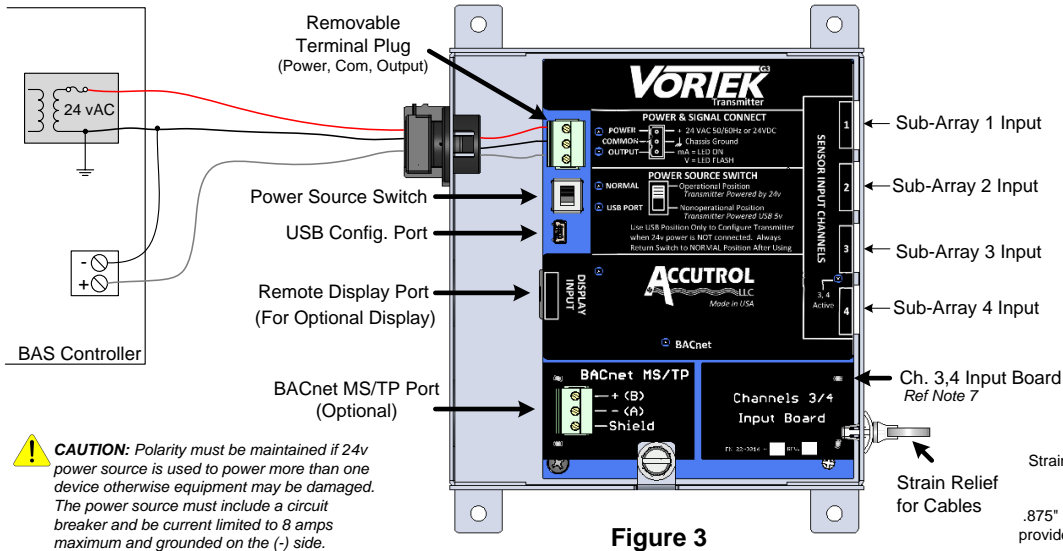
Figure 1
Model: VTFA 2-2200-10-00

Factory Cables

⚠️ **CAUTION:** Do not use transmitter enclosure as a junction box. Only wires terminating on the transmitter board should enter the enclosure.

Figure 3

Removable Terminal Plug (Power, Com, Output)

Sub-Array 1 Input
Sub-Array 2 Input
Sub-Array 3 Input
Sub-Array 4 Input

Power Source Switch
USB Config. Port
Remote Display Port (For Optional Display)
BACnet MS/TP Port (Optional)

24 vAC
BAS Controller

Ch. 3,4 Input Board *Ref Note 7*
Strain Relief for Cables

⚠️ **CAUTION:** Polarity must be maintained if 24v power source is used to power more than one device otherwise equipment may be damaged. The power source must include a circuit breaker and be current limited to 8 amps maximum and grounded on the (-) side.

Strain Relief Fitting

.875" dia. knock-out provided for Remote Display Cable

.875" dia. knock-out provided for BACnet

4.64" (118mm)
Ø 0.2" (5mm) (4 places)
Sensor Cable Connectors

5.97" (152mm)
6.37" (162mm)

5.62" (143mm)

Cover Thumb Screw
Strain Relief for Sensor Cables

2.12" (54mm)

Figure 2

TRANSMITTER WIRING

1. Loosen the thumb screw located on the transmitter enclosure cover and remove cover.
2. Run 3-conductor cable from the field controller to the transmitter through the strain relief fitting.
3. Remove the terminal block from the power & signal header, loosen the three screws and terminate the power, common and output signal wires in the terminal block per markings.
4. Tighten the terminal block screws, verify wires are secure and reconnect to the header.
5. If BACnet is required; run BACnet MS/TP cable into enclosure, remove terminal block from BACnet header and terminate the BACnet wires in the appropriate terminals. Tighten the terminal block screws, verify wires are secure and reconnect to header.
6. If Remote Display is required; remove knock-out located directly in line with the Display Port, install strain relief fitting into .875" dia. hole, run the factory cable provided with the Remote Display into the enclosure and plug cable into the Display Input Port.
7. The channel 3,4 input board is required for applications that have 3 or 4 sub-arrays. Applications with 1 or 2 sub-arrays do not require this board.
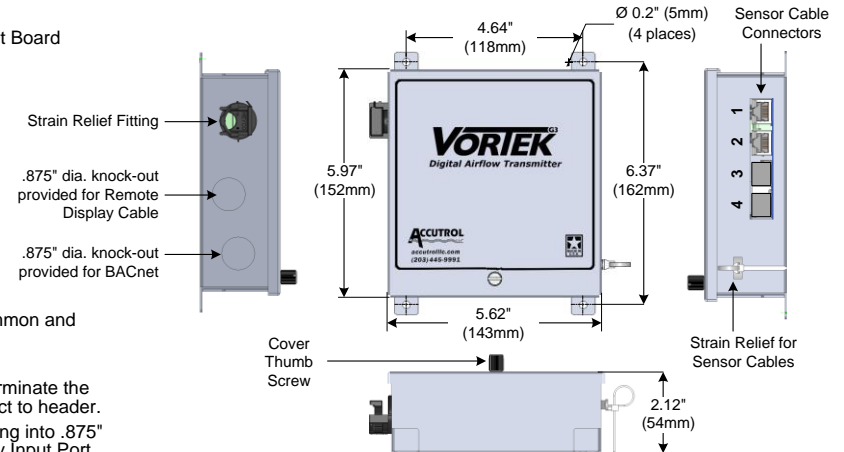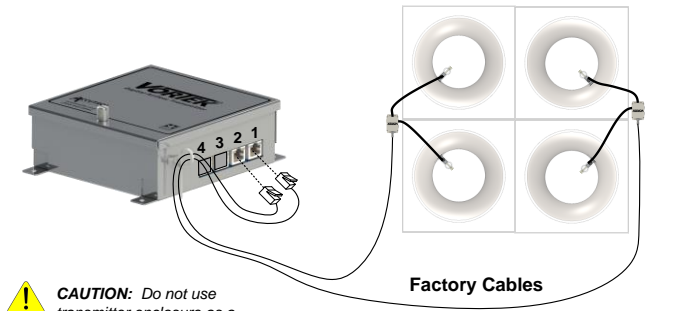
APPENDIX D: OPTIONS

TRANSMITTER WITH OPTIONAL DISPLAY

5.62 in
143 mm

4.65 in
118 mm

PROBE CABLE CONNECTORS

INTERNAL DISPLAY

6.37 in
162mm

5.97 in
152 mm

POWER/SIGNAL CABLE ENTRY

3.10 in
79 mm

NEMA 4X (IP66) TRANSMITTER WITH OPTIONAL DISPLAY

11.35 in
288 mm

9.17 in
233 mm

8.58 in
218mm

7.50 in
190 mm

INTERNAL DISPLAY (OPTIONAL)

POWER/SIGNAL CABLE ENTRY

BACNET

EXTERNAL DISPLAY CONNECTOR (NOT PROVIDED WITH OPTIONAL INTERNAL DISPLAY)

4   3   2   1

5.60 in
142 mm

5.91 in
150 mm

NEMA 4X PROBE CABLE CONNECTORS

NEMA 4X SENSOR WITH OPTIONAL PURGE

¼" Barbed Brass Fitting for Purge (Optional)

NEMA 4X FACTORY CABLE