Duct 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.

2. Other Limits.

THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Manufacturer does not warrant against damages or defects arising out of improper or abnormal use or handling of the Products; against defects or damages arising from improper installation (where installation is by persons other than Manufacturer), against defects in products or components not manufactured by Manufacturer, or against damages resulting from such non-Manufacturer made products or components. Manufacturer passes on to Buyer the warranty it received (if any) from the maker thereof of such non-Manufacturer made products or components. This warranty also does not apply to Products upon which repairs have been affected or attempted by persons other than Manufacturer or pursuant to written authorization by Manufacturer. This warranty also does not apply to any product provided by the Buyer and mounted by the Manufacturer to Products.

3. Exclusive Obligation.

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.

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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 probe. 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.

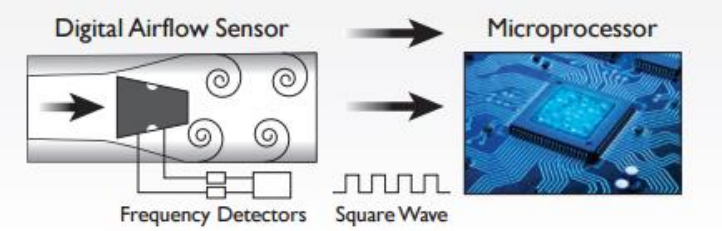


Figure 1

To provide an accurate measurement of the airflow velocity inside a duct, the VTD system provides multiple sensing points distributed throughout the duct. The sensors are mounted on traverse probes where the number of probes and quantity of sensors on each probe is based on the duct size and shape. The individual sensor signals are sent from each probe to the VTD transmitter where they are processed to provide an average airflow velocity rate for the duct. The transmitter calculates the average airflow volume rate based on the duct 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 VTD Duct Airflow Transmitter is factory-configured for 3000 FPM (15.24 m/s), which is appropriate for the majority of duct airflow measurement applications. If a higher full-scale velocity range is required, contact the factory prior to placing the order. The full-scale airflow volume range for the transmitter analog output can be configured to any value using the VTG3 Insight software.

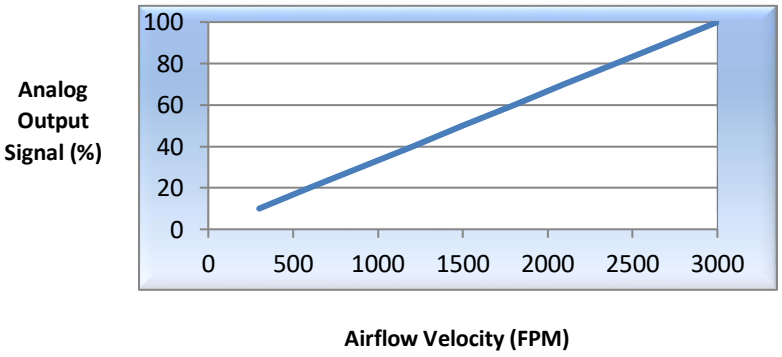


Figure 2

1.3 Model Code

VTD □□-□□-□□-□□-□□

DUCT SHAPE
1 = Round
2 = Rectangular
3 = Flat Oval

PROBE MATERIAL
1 = Aluminum/ABS
2 = CPVC & ABS
3 = 304SS
4 = High Temp SS (350°F / 177°C Max)

PROBE QUANTITY
1 = 1 Probe
2 = 2 Probes
3 = 3 Probes
4 = 4 Probes

SENSORS PER PROBE
1 = 1 Sensor per Probe
2 = 2 Sensors per Probe
3 = 3 Sensors per Probe
4 = 4 Sensors per Probe

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

ENCLOSURES
0 = Standard Transmitter, Standard Probe
1 = NEMA 4X Transmitter, Standard Probe
2 = Standard Transmitter, NEMA 4X Probe
3 = NEMA 4X Transmitter, NEMA 4X Probe
4 = Standard Transmitter, NEMA 4X Probe w/Purge
5 = NEMA 4X Transmitter, NEMA 4X Probe w/Purge

CABLE LENGTH *(Ref Note 2)*
0 = 10' (3.0m)
1 = 25' (7.6m)
2 = 50' (15.2m)
3 = 75' (22.9m)
4 = 100' (30.5m)

PROBE LENGTH *(Ref Note 3)*
xx = Inches (04-72)

Model Code Notes:

1. The following information shall be provided with order so the Transmitter can be factory-configured:
   Device Tag Number
   Analog Output Full Scale Range
   Analog Output Signal Type
   Duct Size (Diameter or Height and Width)
   Internal Duct Lining/Insulation Thickness
2. One cable is provided with each probe. Contact factory if cables longer than 100' are required. Cable type provided is based on the Enclosure Selection per table below.

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

3. Maximum length for CPVC and High-Temp SS Probe Material is 60".
4. When Option D (Internal Transmitter Display) is selected, the Remote Display cannot be used.

Model Code Example:

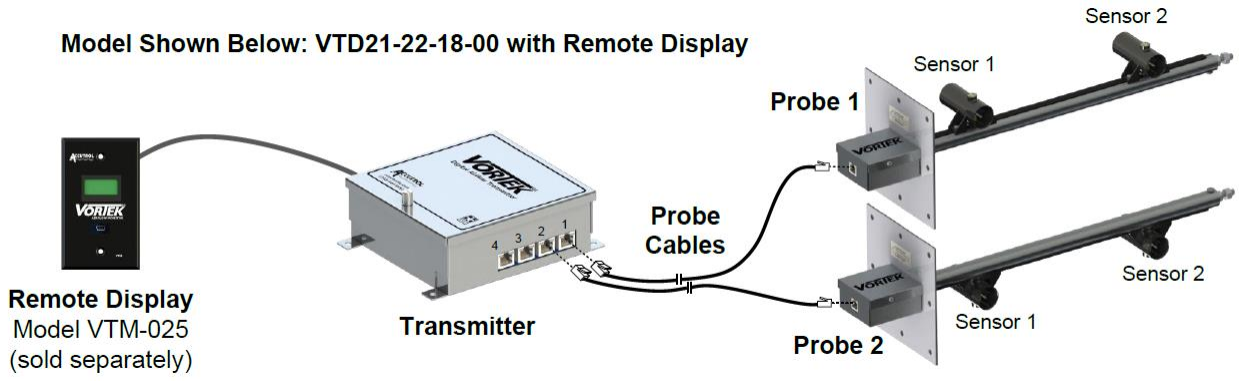


Figure 3

SECTION 2 - SPECIFICATIONS

PERFORMANCE	
Accuracy	
Individual Sensors	+/-2% of reading
System Accuracy	+/-3% of reading
	Specified accuracy based on meeting the minimum probe installation guidelines and operating within the velocity range of 375-3000 FPM.
Repeatability	+/- 0.1% of reading
Sensor FS Range	Factory Default is 3,000 FPM (15.24 m/s) (software configurable)
ENVIRONMENTAL	
Operating Temperature	
Aluminum Probe	-20° to 140° F (-29° to 60° C)
CPVC Probe	-20° to 140° F (-29° to 60° C)
304SS Probe	-20° to 200° F (-29° to 93° C)
304SS High Temp Probe	-20° to 320° F (-29° to 160° C)
Transmitter	-20° to 150° F (-29° to 66° C)
Display (optional)	-4° to 158° F (-20° to 70° C)
Storage Temperature	
Probes 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 Probes with up to 4 Sensors per Probe (16 Sensors Max)
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	Plenum rated cables provided with standard enclosures
	Outdoor rated cables with waterproof plug provided with NEMA 4X enclosures
	Power Input: Plenum rated, 14AWG, 2-conductor stranded fire alarm type, 0-75°C
	Cable recommended - Windy City Wire 76179630 or equivalent
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	
Insertion Probes	
Standard	Aluminum bar, galvanized steel mounting plate, polycarbonate/ABS plastic sensor
CPVC	CPVC plastic bar, 304SS mounting plate, polycarbonate/ABS plastic sensor
304SS	304SS bar, 304SS mounting plate, 303SS sensor
Enclosures	
Standard	Transmitter: Aluminum Alloy 5052-H32, 16 Gauge
	Probe Electronics: Galvanized Steel, 18 Gauge
Optional	Transmitter: NEMA 4X Polycarbonate Plastic
	Probe Electronics: NEMA 4X Polycarbonate Plastic

EMC AND SAFETY

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 Exposed to the Air Stream

Model Code Material Designator		**(1)**	**(2)**	**(3)**	**(4)**
Item	Description	**Aluminum**	**CPVC & ABS**	**304 SS**	**High Temp SS**
1	Duct Gasket	Neoprene	Neoprene	Neoprene	Neoprene
2	Probe	Aluminum	CPVC	304 SS	304 SS
3	VorTek Shroud	Polycarbonate	Polycarbonate	304 SS	304 SS
4	VorTek Shedder	ABS	ABS	303 SS	303 SS
5	VorTek Saddle	Polycarbonate	CPVC	304 SS	304 SS
6	Sensor Hardware	Plated Steel	N/A	304 SS	304 SS
7	Sensor Tubing	Polyurethane	Polyurethane	Polyurethane	304 SS
8	Support Stud & Nuts	Plated Steel	Plated Steel	304 SS	304 SS
9	Filler Strip	EPDM	N/A	N/A	N/A

Table 1

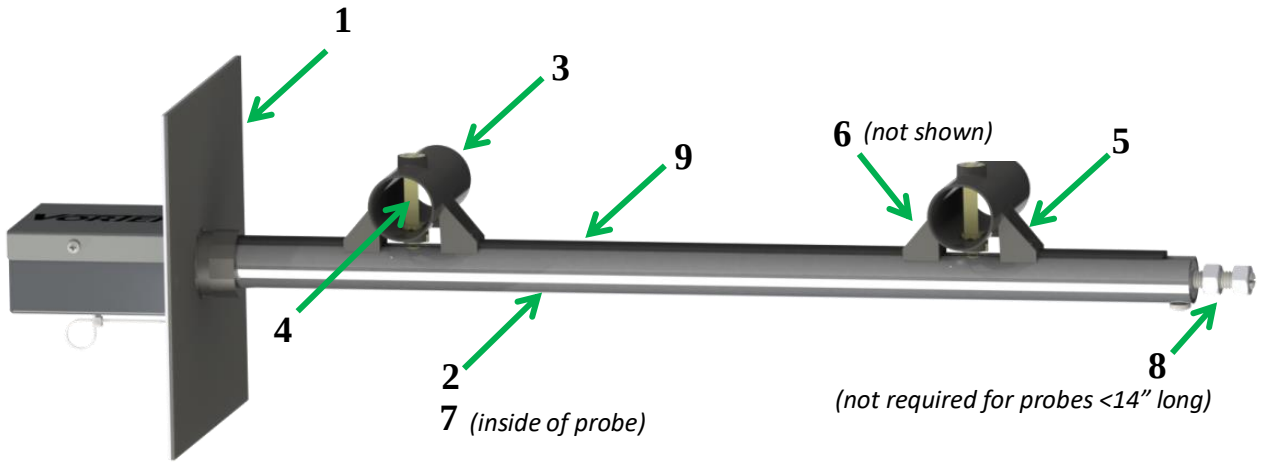


Figure 4

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.

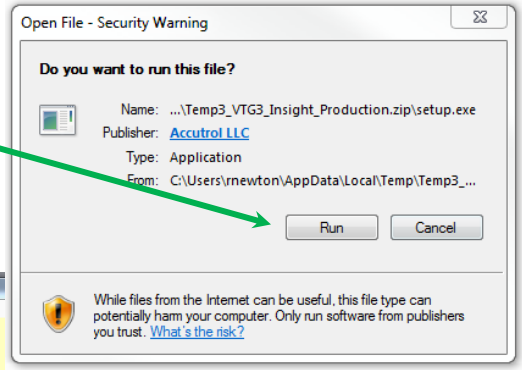
3.1 Minimum Requirements for PC

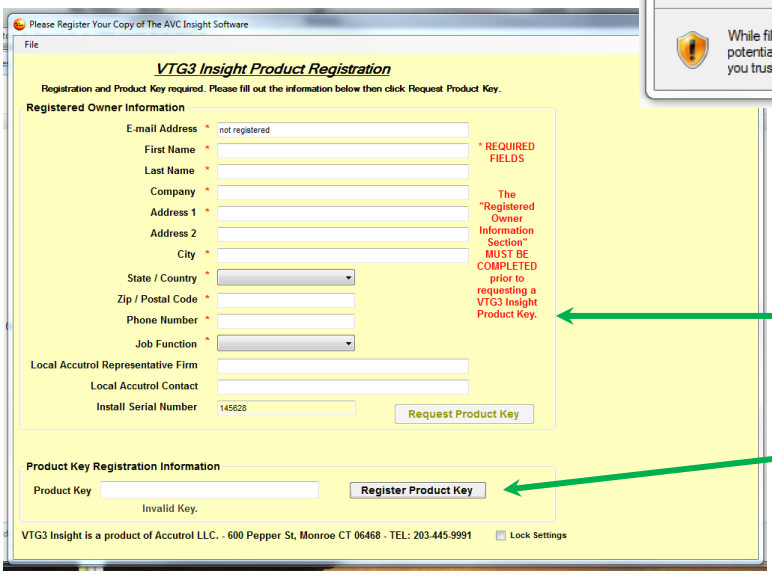
- PC or Tablet with Windows Version 7 or 10
- USB 2.0 Port
- Screen Resolution 1280 x 768 or greater suggested
- USB Cable

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.*

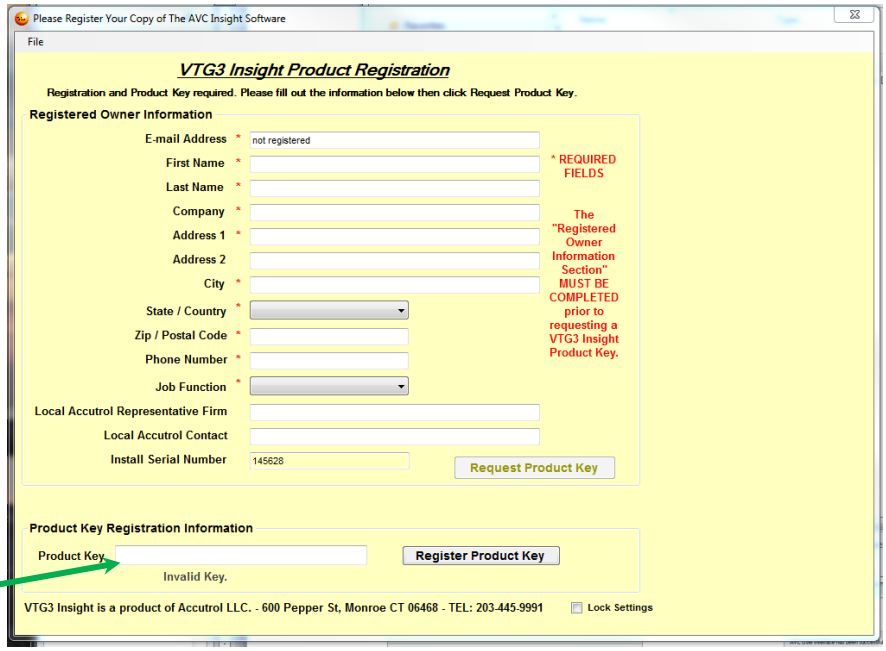
3.3 Insight Software Product Registration

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.

Paste Product Key Here



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.

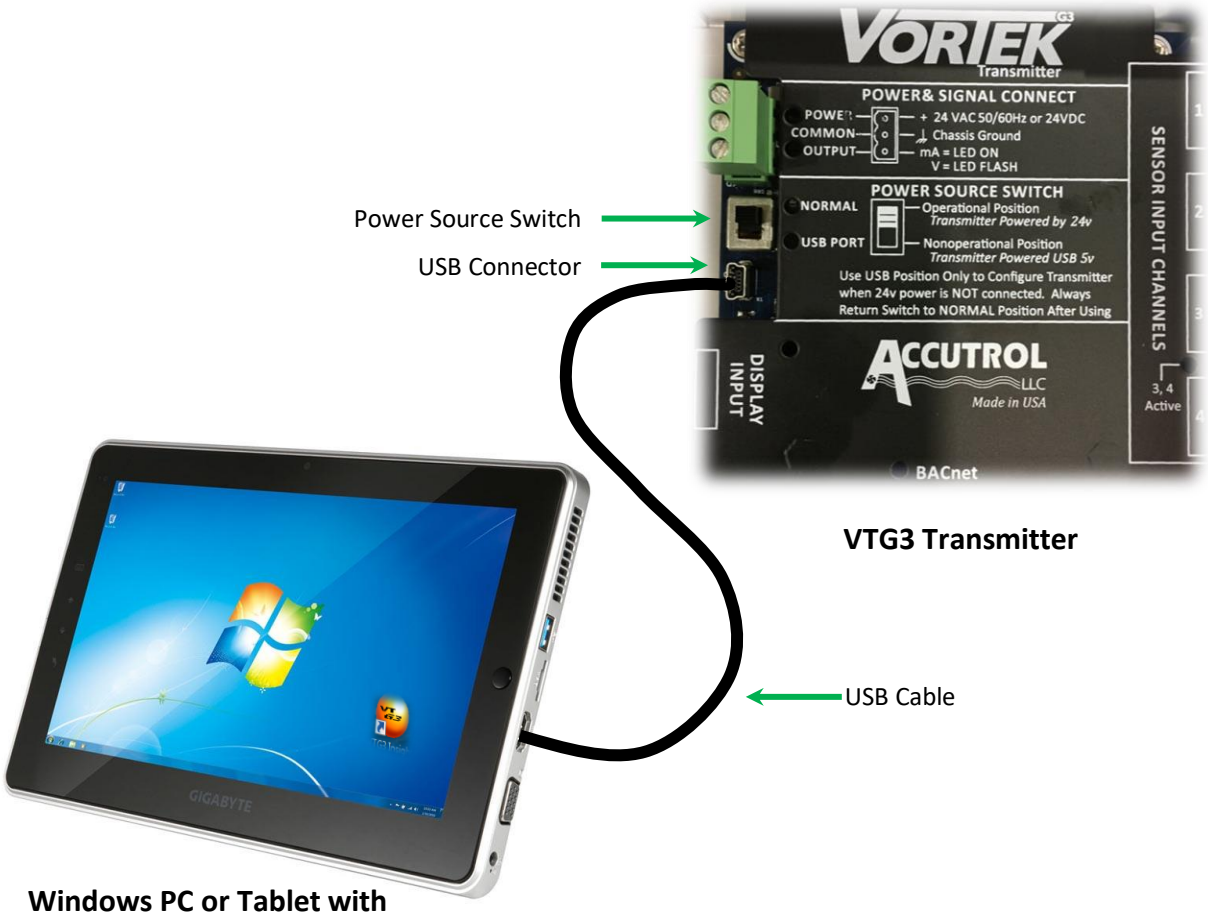
Note: *VTG3 Insight will attempt to update itself with the latest released version of software each time it is initiated when the computer is connected to the internet. If you do not wish to update, you will be given a choice to not update each time.*

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 24v 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 24v 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.

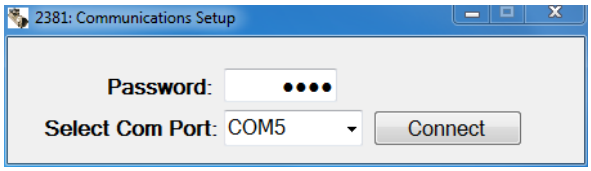
Note: If the Power Source Switch is left in the "USB Port" position, the transmitter will not operate properly when power is supplied by the BMS 24v input power connection. Therefore, it's important to return the Power Source Switch to the "NORMAL" position.



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.

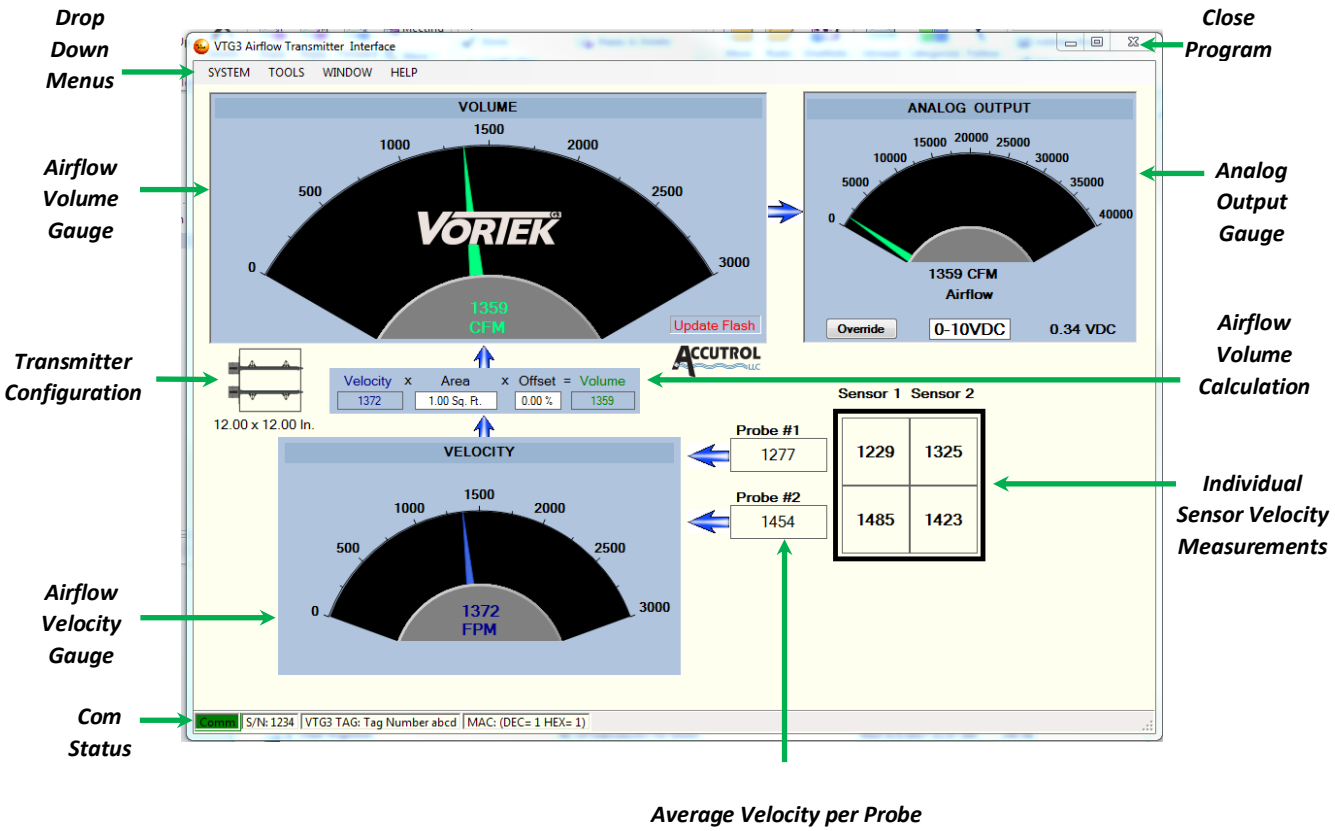
Select the appropriate COM port for the transmitter then select Connect.



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.*

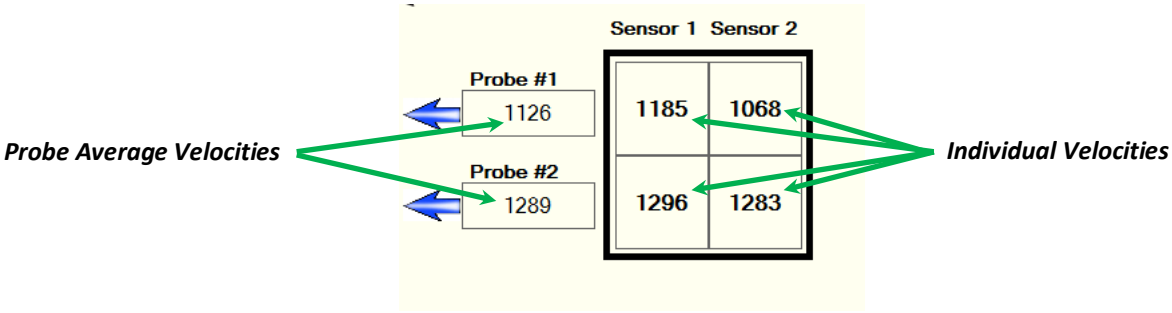
3.6.1 VTG3 Insight Dashboard

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.



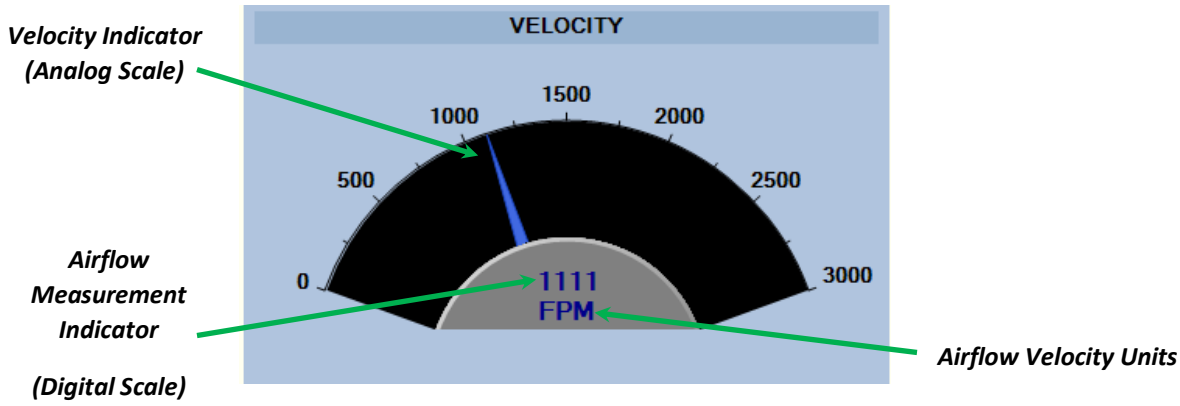
3.6.2 Sensor Velocity Measurements

This area of the dashboard displays the real-time sensor velocity measurement of each sensor and the average velocity measurement of each probe. The example shown below is an application with 2 probes, each with 2 sensors, which is a 2x2 VTD probe configuration.



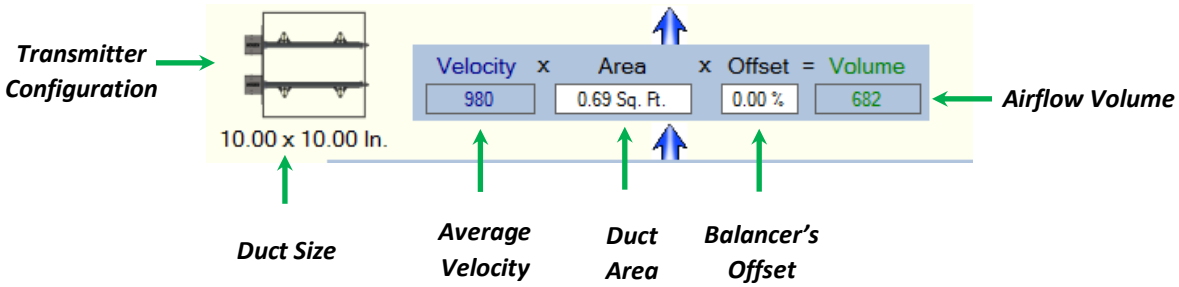
3.6.3 Velocity Gauge

The Velocity Gauge provides an indication of the average velocity for the Probe Array.



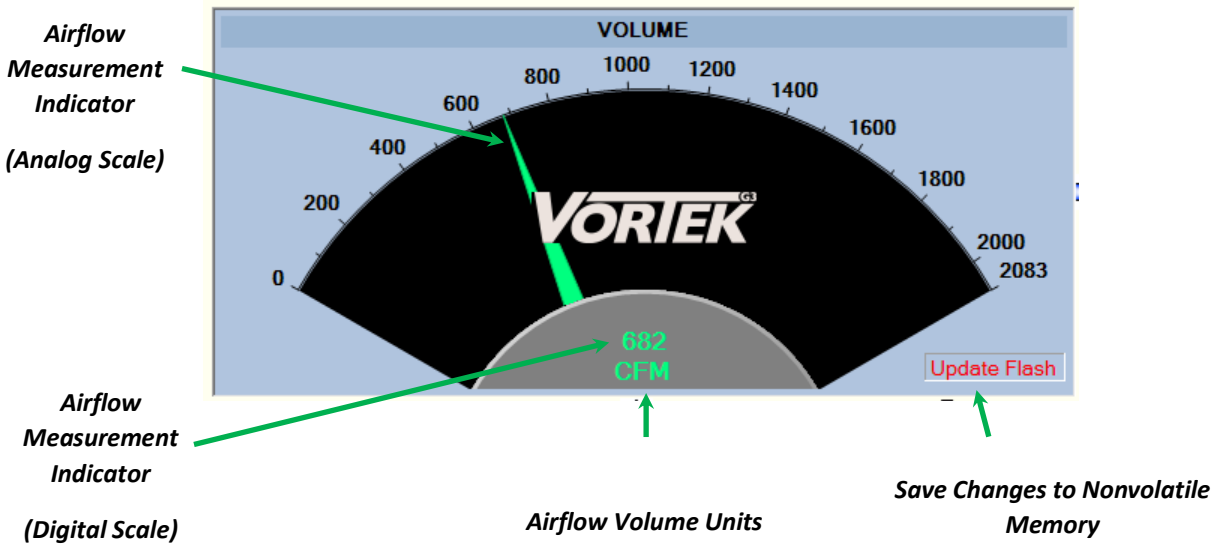
3.6.4 Volume Calculation Block

The Volume Calculation Block shows the real-time data that are used to derive the Airflow Volume measurement. The "Transmitter Configuration" window can be accessed by double-clicking on the "Probe Configuration" or "Area" box. The "Balancer Volume Offset" window can be accessed by double-clicking on the "Offset" box.



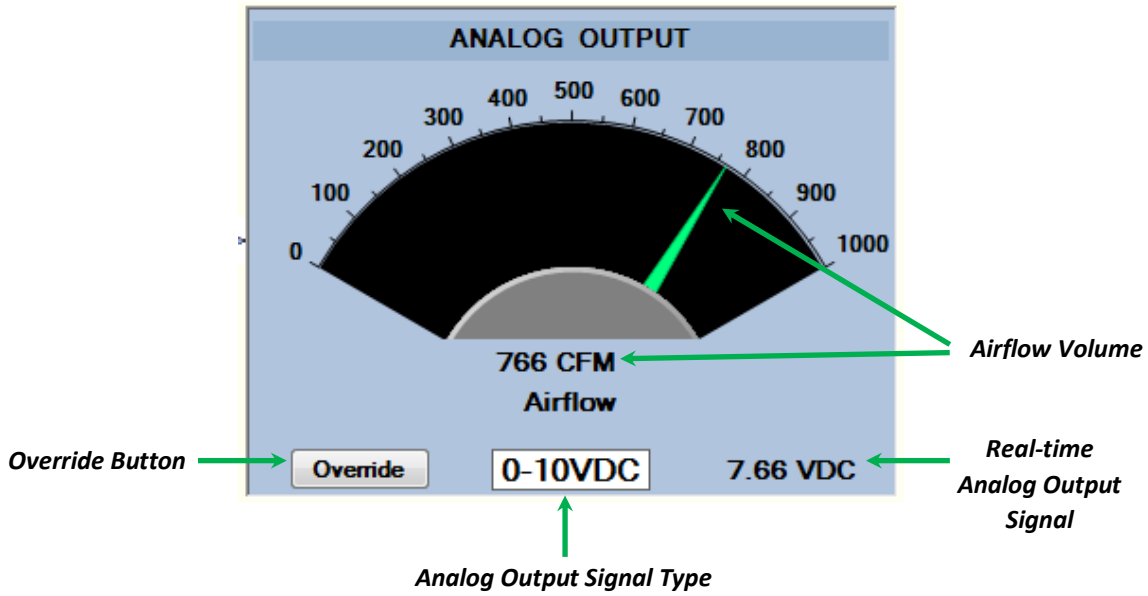
3.6.5 Airflow Volume Gauge

The Airflow Volume Gauge provides an indication of the real-time airflow volume measurement in the duct. This reading is derived from the average velocity, internal duct area and Balancer offset.



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.



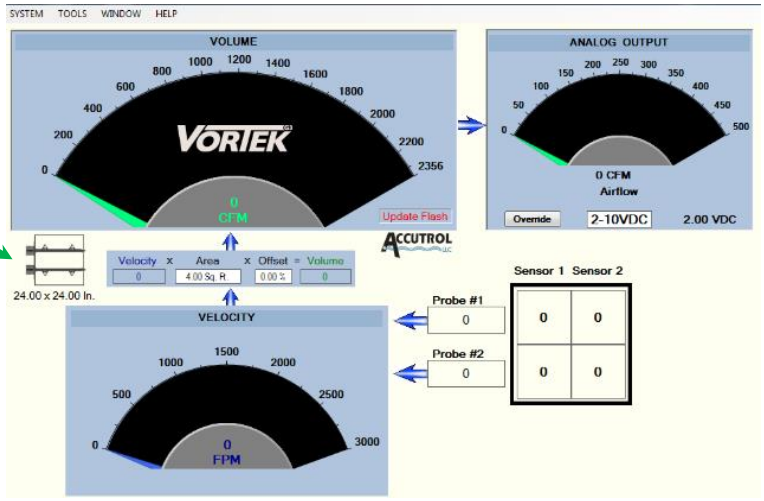
3.6.7 Configuration Window

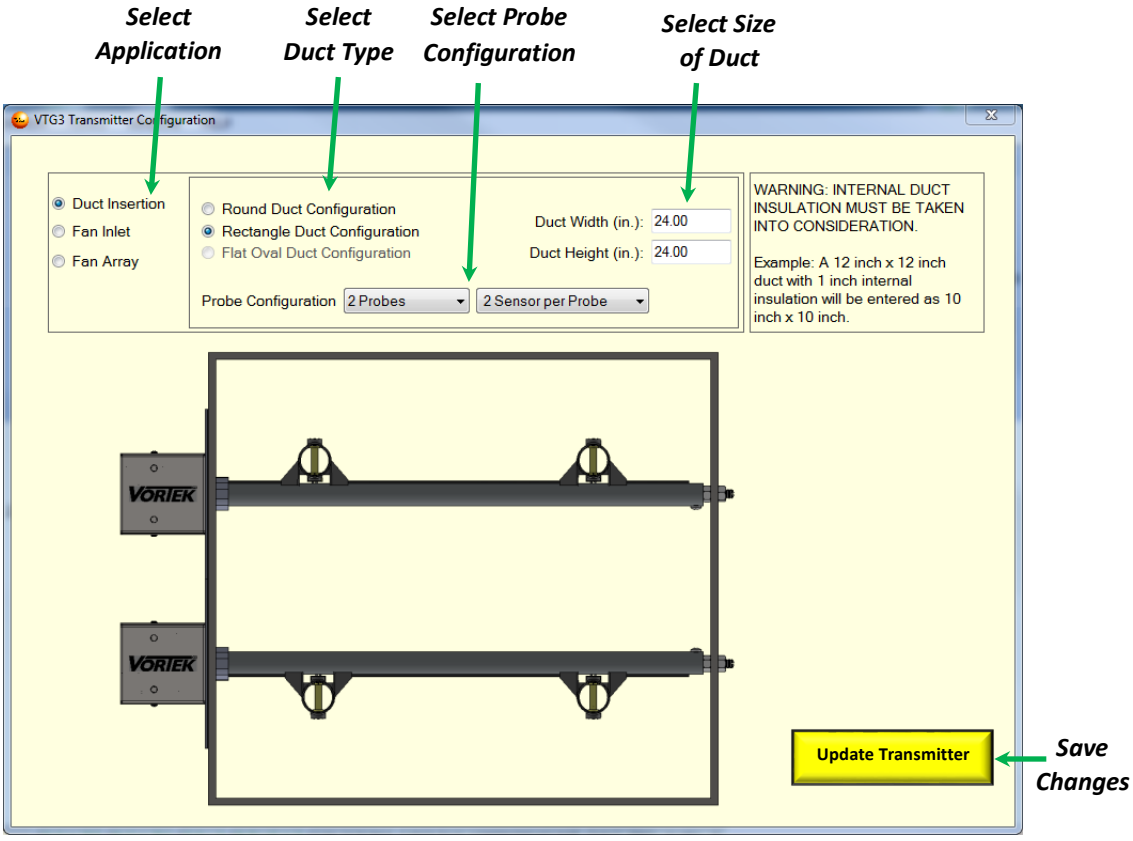
Each VTD transmitter is factory-configured; therefore field configuration should not be required. However if for some reason the transmitter configuration needs to be modified, it can be done using the VTG3 Insight Configuration Window.

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 duct size figure and double click to select.



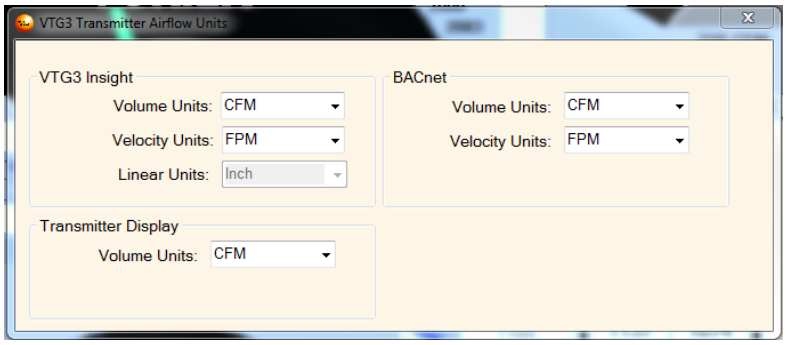


4 After saving changes, close the window and verify your changes appear on the Dashboard.

5 When there is airflow in the duct, you should the sensors reporting velocity values.

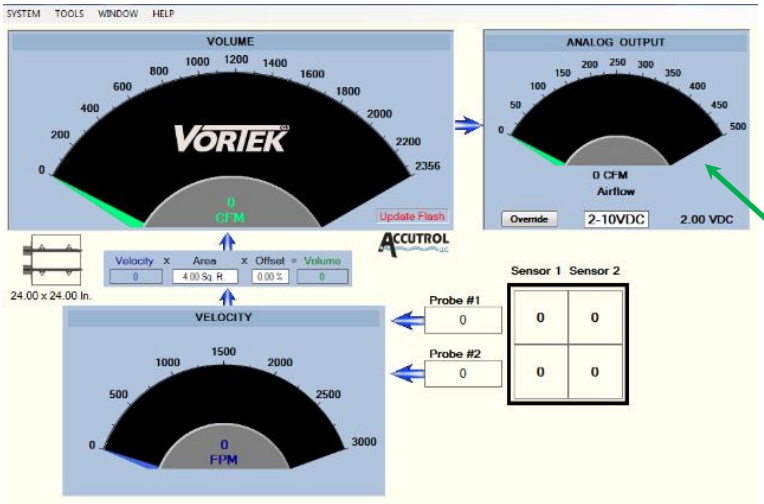
3.6.8 Units of Measurement

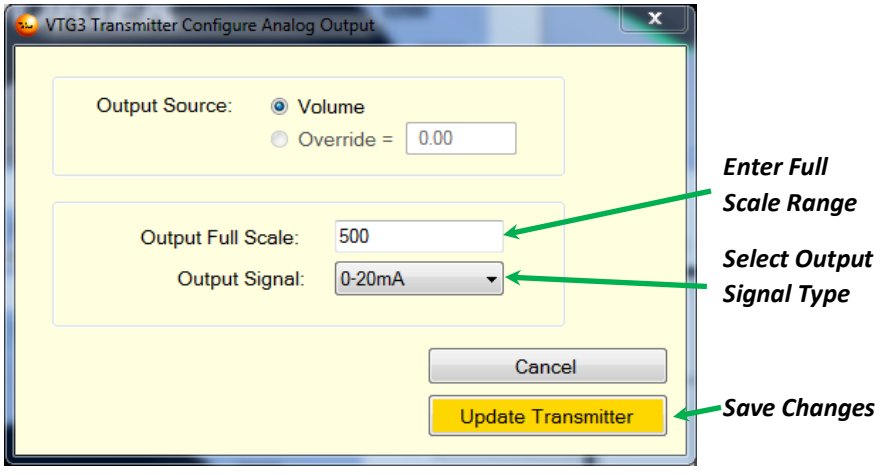
To change the Units of Measurement, double-click on the bottom of the Airflow Volume Gauge to open the window shown below. Select the appropriate units for the application and save changes before closing the window.



3.6.9 Analog Output Configuration

To open the Analog Output Configuration Screen, double-click on the Analog Output Gauge.

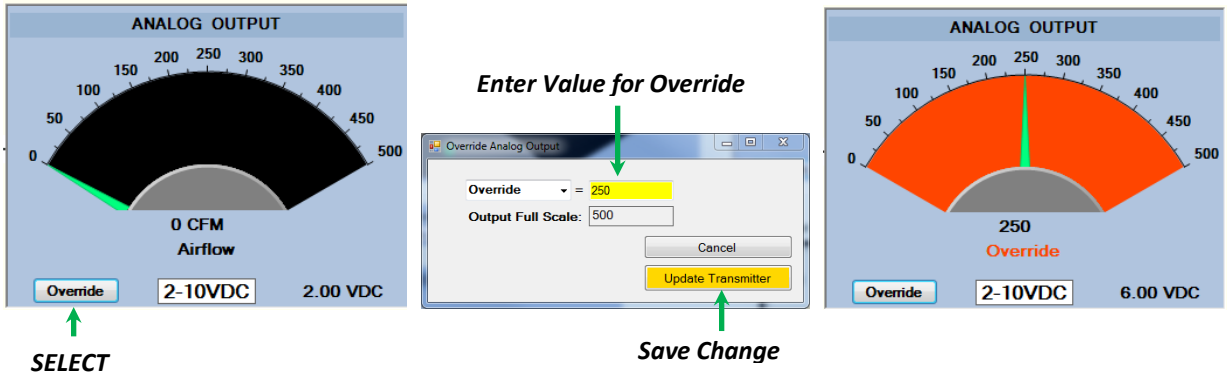




Enter the appropriate Full Scale and Output Signal Type required for the application, then save changes when complete.

3.6.10 Analog Output Override

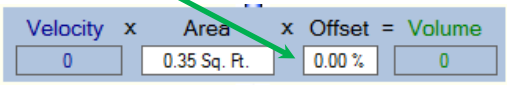
The transmitter's Analog Output can be overridden, which is a useful feature to verify the analog output signal is reaching the receiving device (BMS controller) at the expected signal level. To open the Override window, select the "Override" button located at the lower left of the Analog Output Gauge. Enter the value you would like the analog output signal to be driven to. Select Update Transmitter to save change.

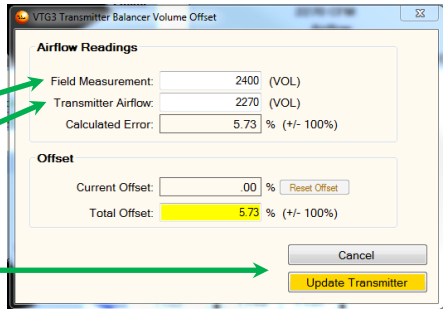


The example show above will result in the Analog Output Signal reading 6.00 VDC which is 50% of the full scale output signal, as indicated on the Analog Output Gauge above on the right. Note that the gauge face is orange to indicate that the analog output signal is being overridden. Be sure to release 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.

			Parameter By Model Type		
Point	**Object Description**	**Present Value Type**	**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 probe from the duct 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
2282	**C**	**VTD Installation and Operation Manual**
Section	**Description of Change**	
3.2 INSTALL	ADDED NEW NOTE TO BETTER DESCRIBE INSTALL PROCESS	
2312	D	**VTD Installation and Operation Manual**
Section	**Description of Change**	
Appendix B-F	Submittal DOCS changed	
2602	F	**VTD Installation and Operation Manual**
Section	**Description of Change**	
Cover	Updated version up from D to F (should have been E instead of D)	
Page iii	Added Options appendix g	
Page 4	Added EMC and safety section	
Appendix G	Added appendix g on different product options	

APPENDIX B: RECOMMENDED MINIMUM PROBE PLACEMENT GUIDELINES

PROBE INSTALLATION

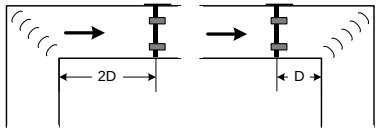
To optimize performance, it is always best to locate duct insertion probes with as much distance from upstream obstructions, transitions, elbows etc…as possible. The examples shown below are provided as a minimum guideline only. If the application provides a greater distance of straight duct run than shown below, the probe should be installed to maximize the distance from upstream obstructions.

1. Match the device TAG ID to the HVAC design documents as required to ensure the probe is installed per the design requirements.
2. Select optimum location in the duct for probe installation. Be sure the location selected has enough clearance to insert and extract probe from duct after equipment from all trades has been installed.
3. Install the probes into the duct by following the appropriate set of instructions provided on the following pages.

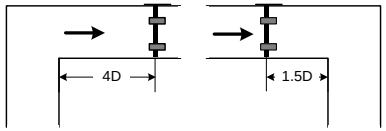
Recommended Minimum Probe Placement Guidelines for VorTek Duct Insertion Probes

Duct Elbows

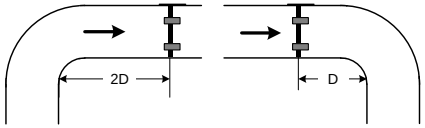
Elbows with Turning Vanes



Elbows with No Turning Vanes

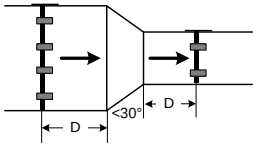


Radius Elbows

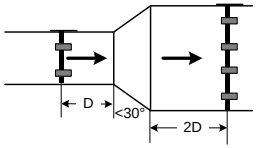


Duct Transitions

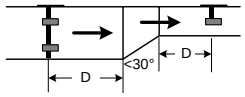
Reducing Transition



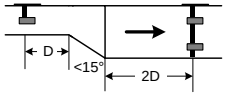
Expanding Transition



Reducing Offset Transition

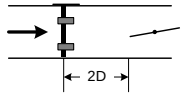


Expanding Offset Transition



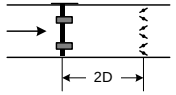
Dampers

Probe Upstream of Single Blade Damper

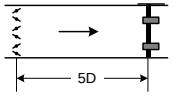


Probe Downstream of Single Blade Damper

Probe Upstream of Opposed Blade Damper

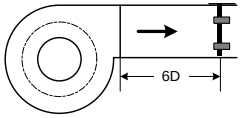


Probe Downstream of Opposed Blade Damper

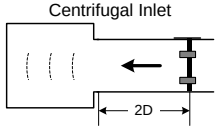


Ducted Fans

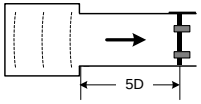
Centrifugal Discharge



Centrifugal Inlet

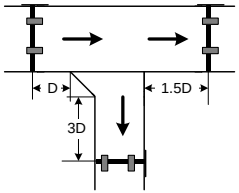


Vane Axial Discharge

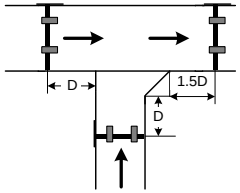


Duct Junctions

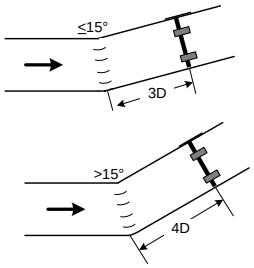
Supply Junction



Return Junction



Angle Fittings



Key

Round Duct: "**D**" = Diameter

Rectangular & Oval Duct: "**D**" = (W + H) / 2

Airflow Probe:

Airflow Direction:

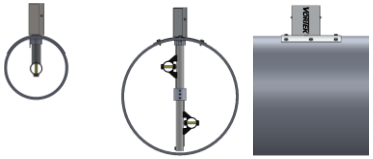
APPENDIX C: PROBE INSTALLATION, ROUND DUCT APPLICATIONS

PROBE INSTALLATION - Round Duct Applications

⚠ ***WARNING:*** *Use eye protection, cut-resistant gloves and clothing suitable for working with sheet metal. Failure to do so may result in personal injury.*

Each probe will require either one or two holes to be drilled into the duct for installation. Probes 13" and less require only one hole which is referred to as the Insertion Hole. Probes 14" and greater include a threaded stud at the probe end which requires an additional hole referred to as the Receiving Hole. Reference Table 1 to determine the hole drilling requirements for your application. Reference Table 2 for the recommended probe/sensor density based on the duct size. For ducts with internal lining or insulation, the probes provided have been manufactured to accommodate the insulation thickness.

1 X 1 **1 X 2**



1. Mark the duct where probe is to be inserted.
2. Drill the Insertion Hole per Table 1.
3. Insert Probe into Hole.
4. Position Probe per Airflow Direction Arrow.
5. Secure Probe to Duct by installing #10 Tek-Screws into the mounting plate holes.

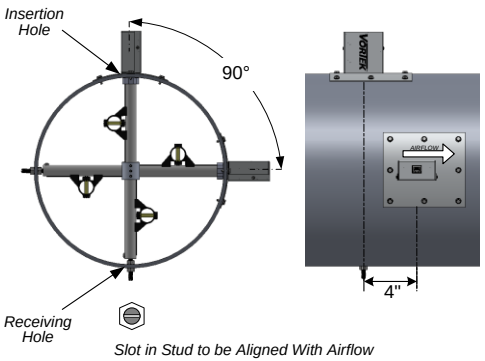
Probe Length		Insertion Hole Diameter		Receiving Hole Diameter	
inches	mm	inches	mm	inches	mm
3 to 6	76 to 152	2.5	64	*Not Required*	
7 to 13	178 to 330	3.5	90	*Not Required*	
≥ 14	≥ 356	3.5	90	.312	8

Table 1

Duct Diameter		Probe Configuration (probe qty X sensors/probe)
inches	millimeters	
3 to 6	76 to 152	1 X 1
8 to 12	203 to 305	1 X 2
14 to 28	356 to 711	2 X 2
30 to 52	762 to 1321	2 X 4
54 to 72	1372 to 1829	3 X 4

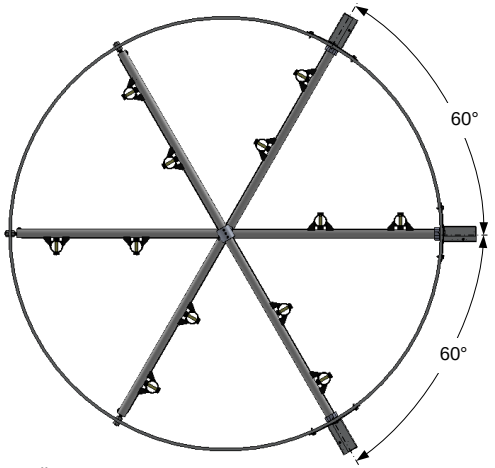
Table 2

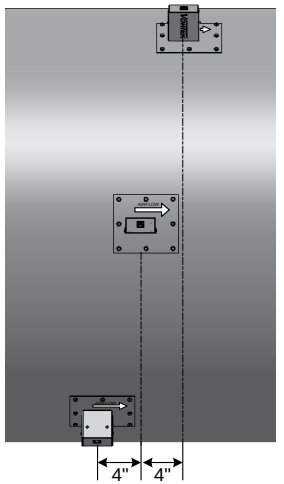
2 X 2



Slot in Stud to be Aligned With Airflow

3 X 4





1. Mark the duct where the center of the Probe 1 Insertion Hole is to be located.
2. Measure the circumference of the duct and mark a straight line extending from the center of the Insertion Hole around the circumference of the duct.
3. Locate and mark the center of the Receiving Hole by measuring ½ the Circumference of the duct from the center of the Insertion Hole.
4. For applications with two probes, Probe 2 shall be located 90 degrees from Probe 1 with a 4" offset.
   Mark the duct where the center of the Probe 2 Insertion Hole is to be located and repeat steps 2 and 3.
5. For applications with three probes, each probe shall be located 60 degrees from the next with a 4" offset.
   Mark the duct where the center of the Probe 2 Insertion Hole is to be located and repeat steps 2 and 3.
   Mark the duct where the center of the Probe 3 Insertion Hole is to be located and repeat steps 2 and 3.
6. Drill the required holes (Reference Table 1) and install each probe with the threaded stud extending through the Receiving Hole.
7. Position each probe so the Airflow Direction Arrow is aligned with the airflow direction in the duct.
8. Secure the mounting plate of each Probe using #10 Tek-Screws. For probes 14" and longer, secure the threaded stud using the locknuts provided.

NOTES:

1. Be sure the location selected has enough clearance to insert and extract probe from duct after equipment from all trades has been installed.
2. Tek-Screws provided by others.

APPENDIX D: PROBE INSTALLATION, RECTANGULAR DUCT APPLICATIONS

PROBE INSTALLATION - Rectangular Duct Applications

⚠ ***WARNING:*** *Use eye protection, cut-resistant gloves and clothing suitable for working with sheet metal. Failure to do so may result in personal injury.*

Each probe will require either one or two holes to be drilled into the duct for installation. Probes 13" and less require only one hole which is referred to as the Insertion Hole. Probes 14" and greater include a threaded stud at the opposite end which requires an additional hole referred to as the Receiving Hole. Reference Table 1 to determine the hole size requirements for your application.

Before proceeding, confirm the probes provided are correct for the application (Reference Figure 1 & Table 2). The Insertion Side of the duct "H" is where the probes are to be installed and the other side of the duct "W" should be the same as the probe length for probes ≥14". For ducts with internal lining or insulation, the probes provided have been manufactured to accommodate the insulation thickness.

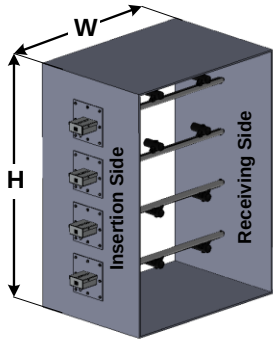


Figure 1

Insertion Side of Duct (H) Inches	Duct Width (W) (Bar Length) 4	6	8	9,10	11,12	13-18	19-24	25-30	31-36	37-42	43-48	49-54	55-60	61-66	67-72
4	1x1	1x1	1x1	1x1											
6	1x1	1x1	1x1	1x2	1x2	1x2	1x2	1x3	1x3	1x3	1x4	1x4			
8	1x1	1x1	1x2	1x2	1x2	1x2	1x2	1x3	1x3	1x3	1x4	1x4	1x4	1x4	1x4
9,10	1x1	1x1	1x2	1x2	1x2	1x2	1x2	1x3	1x3	1x3	1x4	1x4	1x4	1x4	1x4
11,12		2x1	2x1	2x1	1x2	2x2	2x2	2x3	2x3	2x3	2x3	2.x3	2x3	2.x3	2x4
13-18		2x1	2x1	2x1	2x2	2x2	2x2	2x3	2x3	2x3	2x3	2x4	2x4	2x4	2x4
19-24		2x1	2x1	2x1	2x2	2x2	2x3	2x3	2x3	2x3	2x4	2x4	2x4	2x4	2x4
25-30		3x1	3x1	3x1	3x2	3x2	3x2	3x3	3x3	3x3	3x4	3x4	3x4	3x4	3x4
31-36		3x1	3x1	3x1	3x2	3x2	3x2	3x3	3x3	3x3	3x4	3x4	3x4	4x4	4x4
37-42		3x1	3x1	3x1	3x2	3x2	3x2	3x3	3x3	3x3	3x4	3x4	4x4	4x4	4x4
43-48		4x1	4x1	4x1	3x2	3x2	4x2	4x3	4x3	4x3	4x4	4x4	4x4	4x4	4x4
49-54		4x1	4x1	4x1	4x2	4x2	4x2	4x3	4x3	4x3	4x4	4x4	4x4	4x4	4x4
55-60		4x1	4x1	4x1	4x2	4x2	4x2	4x3	4x3	4x4	4x4	4x4	4x4	4x4	4x4
61-66		4x1	4x1	4x1	4x2	4x2	4x3	4x3	4x4	4x4	4x4	4x4	4x4	4x4	4x4
67-72		4x1	4x1	4x1	4x2	4x2	4x3	4x3	4x4	4x4	4x4	4x4	4x4	4x4	4x4

Table 2

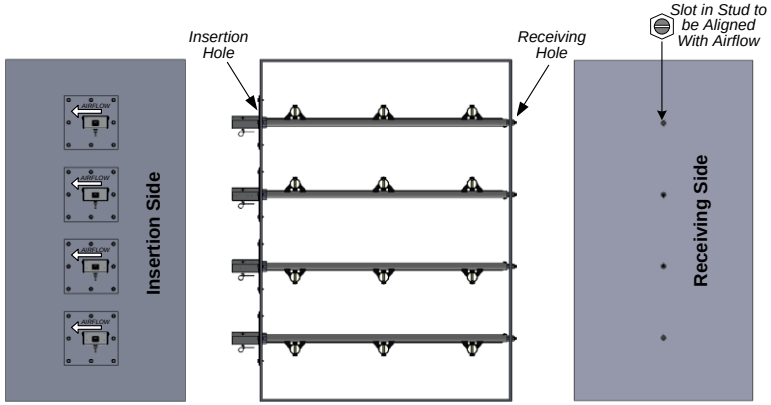


Figure 3

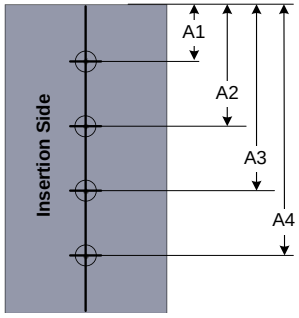


Figure 2

The duct hole locations A1-A4 are based on the quantity of probes and the size of the duct "H" on the insertion side.

To determine A1-A4 for the application, reference the device schedule and probe tag. Single probe applications require A1 only, 2-probe applications require A1 & A3, 3-probe applications require A1, A2 & A3 and 4-probe applications require A1, A2, A3 and A4.

1. Identify the Insertion Side of the duct and draw a straight line perpendicular to the edges of the duct extending edge-to-edge per Figure 2.
2. Mark the center of each Insertion Hole location A1-A4 per Figure 2.
3. Repeat the above steps on the opposite side of the duct to mark the corresponding Receiving Holes.
4. Drill the required holes in the positions marked. Reference Table 1 for the hole sizes.
5. Install each probe through the insertion hole until the threaded stud extends through the Receiving Hole.
6. Position each probe so the Airflow Direction Arrow is aligned with the airflow direction in the duct.
7. Secure the mounting plate of each Probe to the duct using #10 Tek-Screws.
   For probes 14" and longer, secure the threaded stud on the Receiving Side using the locknuts provided.

Probe Length		Insertion Hole Diameter		Receiving Hole Diameter	
inches	mm	inches	mm	inches	mm
3 to 6	76 to 152	2.5	64	*Not Required*	
7 to 13	178 to 330	3.5	90	*Not Required*	
≥ 14	≥ 356	3.5	90	.312	8

Table 1

NOTES:

1. Be sure the location selected has enough clearance to insert and extract probe from duct after equipment from all trades has been installed.
2. Tek-Screws provided by others.
3. For 2-Probe applications with duct "H" between 12 and 16", the 2 probes are factory-mounted onto a single plate.

APPENDIX E: PROBE INSTALLATION, FLAT OVAL DUCT APPLICATIONS

PROBE INSTALLATION – Flat Oval Duct Applications

⚠ ***WARNING:*** *Use eye protection, cut-resistant gloves and clothing suitable for working with sheet metal. Failure to do so may result in personal injury.*

Each probe will require either one or two holes to be drilled into the duct for installation. Probes 13" and less require only one hole which is referred to as the Insertion Hole. Probes 14" and greater include a threaded stud at the opposite end which requires an additional hole referred to as the Receiving Hole. Reference Table 1 to determine the hole size requirements for your application.

Reference Figure 1: Before proceeding, confirm the probes provided are correct for the application. The Insertion Side is where the probes are to be installed over the flat "F" area. The "D" dimension should be the same as the probe length for probes ≥14". For ducts with internal lining or insulation, the probes provided have been manufactured to accommodate the insulation thickness.

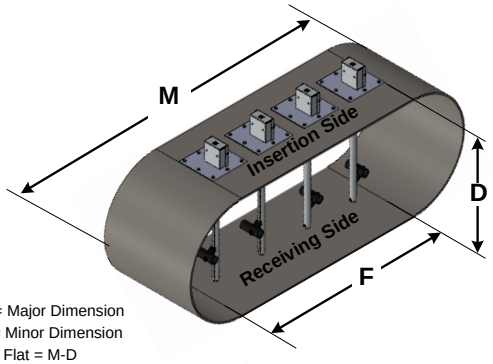


Figure 1

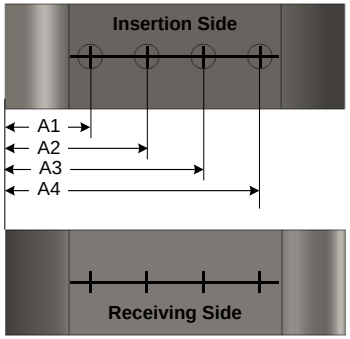


Figure 2

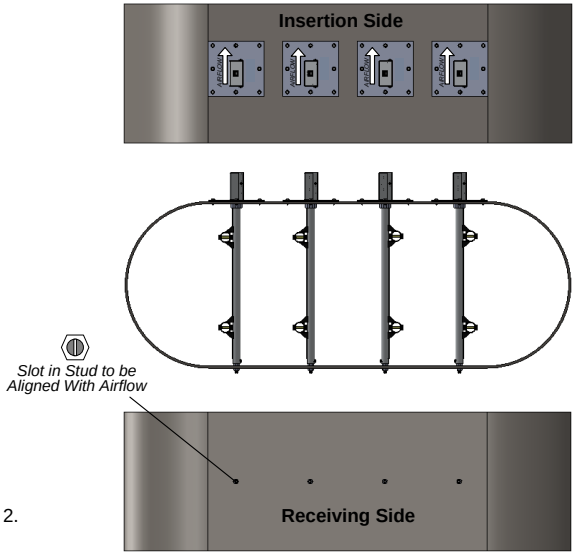


Figure 3

The duct hole locations A1-A4 are based on the quantity of probes and the Major Duct Dimension "M" on the insertion side.

To determine A1-A4 for the application, reference the device schedule and probe tag. Single probe applications require A1 only, 2-probe applications require A1 & A3, 3-probe applications require A1, A2 & A3 and 4-probe applications require A1, A2, A3 and A4.

1. Identify the Insertion Side of the duct and draw a straight line perpendicular to the edges of the duct extending edge-to-edge per Figure 2.
2. Mark the center of each Insertion Hole location A1-A4 per Figure 2.
3. Repeat the above steps on the opposite side of the duct to mark the corresponding Receiving Holes.
4. Drill the required holes in the positions marked. Reference Table 1 for the hole sizes.
5. Install each probe through the insertion hole until the threaded stud extends through the Receiving Hole.
6. Position each probe so the Airflow Direction Arrow is aligned with the airflow direction of the duct.
7. Secure the mounting plate of each Probe to the duct using #10 Tek-Screws. For probes 14" and longer, secure the threaded stud using the locknuts provided.

NOTES:

1. Be sure the location selected has enough clearance to insert and extract probe from duct after equipment from all trades has been installed.
2. Tek-Screws provided by others.

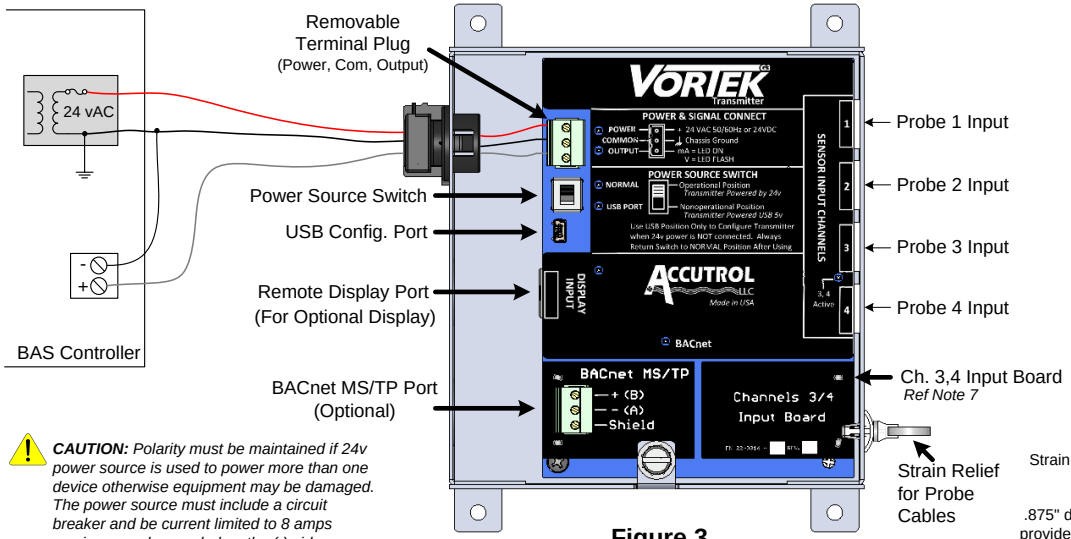
Probe Length		Insertion Hole Diameter		Receiving Hole Diameter	
inches	mm	inches	mm	inches	mm
3 to 6	76 to 152	2.5	64	*Not Required*	
7 to 13	178 to 330	3.5	90	*Not Required*	
≥ 14	≥ 356	3.5	90	.312	8

Table 1

APPENDIX F: TRANSMITTER INSTALLATION

TRANSMITTER INSTALLATION

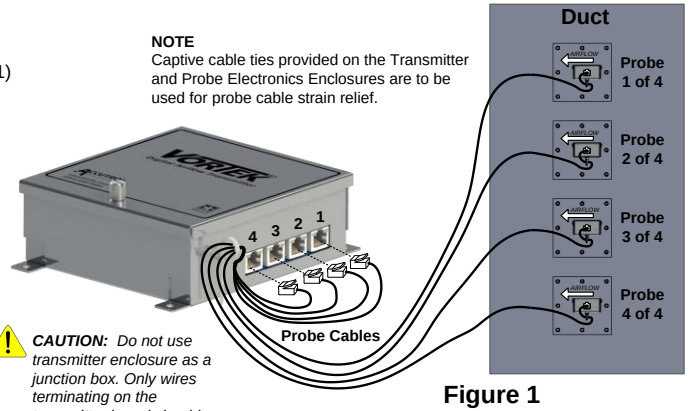
1. Select an easily accessible location to install the transmitter within the range of the Probe Cables that have been provided. Provide clearance to remove the cover and easily access the connectors and field connections.
2. Using the four 0.20" diameter holes located on the transmitter enclosure, secure 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 probe to the corresponding probe input channel on the transmitter using the cables provided (Reference Figure 1)



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.*

Figure 3

NOTE
Captive cable ties provided on the Transmitter and Probe Electronics Enclosures are to be used for probe cable strain relief.



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

Figure 1

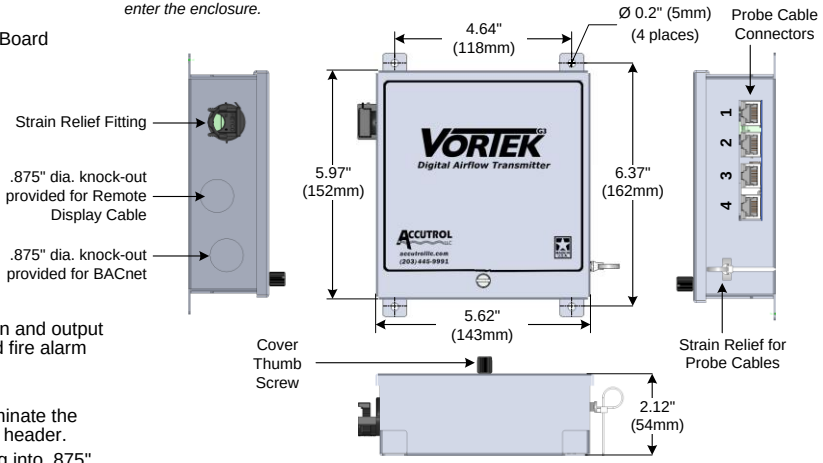


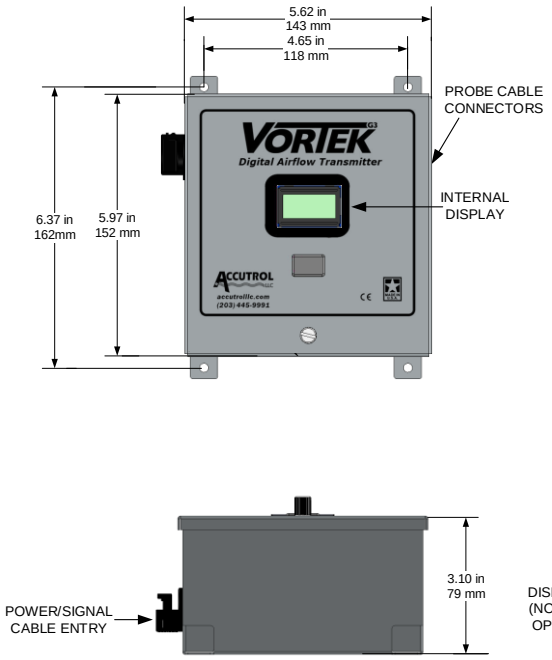
Figure 2

TRANSMITTER WIRING

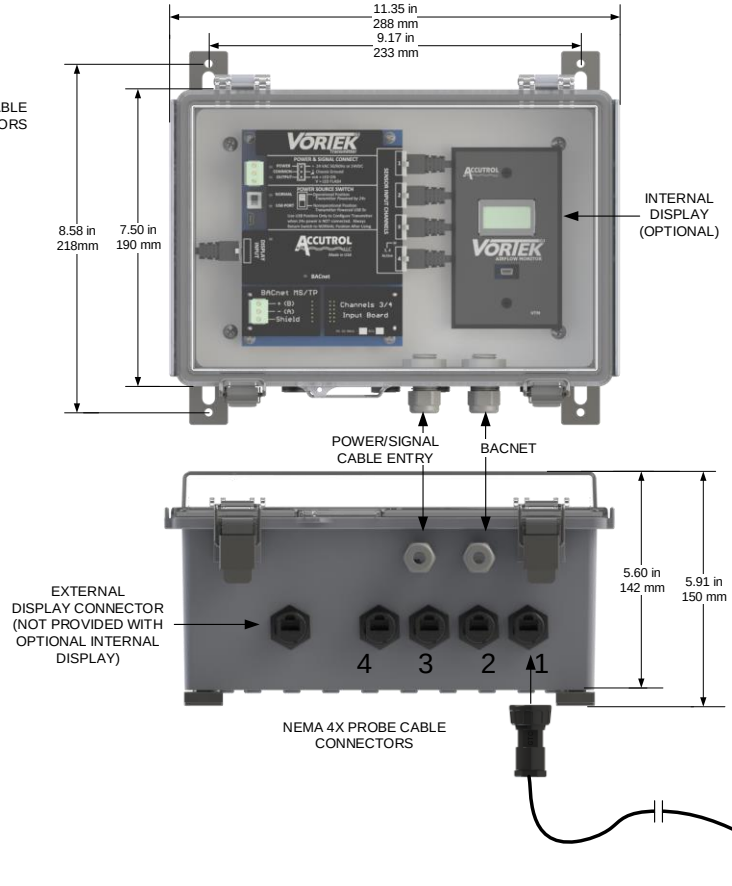
1. Loosen the thumb screw located on the transmitter enclosure cover and remove cover.
2. Run 3-conductor cable from the field controller to the transmitter through the strain relief fitting.
3. Remove the terminal block from the power/signal header, loosen the three screws and terminate the power, common and output signal wires in the terminal block per markings. It is recommended to use plenum rated, 14AWG, 2-conductor stranded fire alarm type, 0-75CCable for the Power Input – Windy City Wire 76179630 or equivalent
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 and 4 probes. Applications with 1 or 2 probes do not require this board.

APPENDIX G: OPTIONS

TRANSMITTER WITH OPTIONAL DISPLAY



NEMA 4X (IP66) TRANSMITTER WITH OPTIONAL DISPLAY



NEMA 4X PROBE WITH OPTIONAL PURGE