Accutron Pro

Technical Operations Manual

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VENTILATION
MONITORING STATION

Accutron
PRO
series

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Accutron
INSTRUMENTS

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The documentation found within this manual is to provide users of our products with technical information pertaining to the installation, maintenance and setup of the product.

It is forbidden to use any Accutron documentation for any other purpose which may be detrimental to the interests of Accutron Instruments INC.

Revision	Date	Changes to Document
v0.9.3	N/A	Original release coinciding with Accutron Pro rollout
v0.9.4	01/03/2022	Revised for chapter structure and formatting, updated models.
1.0.0	30/08/2022	Revised for release of Pro V2.0 and new formatting.
1.0.1	12/10/2022	Revised for IDM sensor design changes.

PLEASE NOTE: The newest revision of this manual will be available online at accutroninstruments.com. If you require any assistance in configuring your new Accutron Pro Device, please call our technicians at +1-705-628-0814 or email us at info@accutroninstruments.com.

The Manual

Refer to this manual for proper installation, operation, setup and maintenance of the Accutron Pro.

Special attention must be followed to warnings and notices highlighted from the rest of the text to ensure it will stand out.

Warning: Failure to oblige with the necessary precautions can result in death, serious injury, and/or considerable damage to the product.

Note: Important information about the product or that part of the manual, helpful hints, and or troubleshooting advice.

- These instructions do not claim to cover all details or variations in equipment, or to provide for every possible contingency that may arise during installation, operation, setup and maintenance.
- For further information or to resolve issues not covered in the manual, consult the Accutron Technical Service Team.
- The contents of the manual shall not become part of or modify any prior or existing agreement, commitment or relationship.
- The warranty contained in the contract between parties is the sole warranty of Accutron Instruments INC.

IMPORTANT: All specifications are subject to change without notice. Ensure your manual is up to date, the version number can be found on the front page of the manual. If you are unsure, please consult the Accutron Technical Service Team.

Table of Contents

Introduction

Thank you for choosing Accutron Instruments for your monitoring needs. This manual will review the setup and operating procedures of your Accutron Pro device and accessories.

The Accutron Pro is a true IIOT (Industrial Internet of Things) device. This unit offers system builders unprecedented flexibility for instrument cluster interfacing, both to Industrial DCS as well the World Wide Web. The Accutron Pro is designed to be easy to use and intuitive in its application. It provides a host of "most wanted features" in a single stand-alone product.

Unlike previous gateway and webserver combos, the Accutron Pro is all in one, combining a universal multi-protocol gateway (Modbus RTU & TCP, EtherNet/IP etc.), and integrated webserver that can display user settings for PC browsers or Smartphones. The Accutron Pro can connect Modbus devices, as well as Accutron Bus devices.

The FlowTrax Pro is the next generation of ultrasonic time-of-flight airflow monitoring, powered by the Accutron Pro. Install procedures are similar to that of previous Accutron airflow monitoring products, but newly designed hardware and software provide more accurate and reliable data, with a much more user-friendly interface.

As new features are added, Accutron Pro firmware may easily be upgraded. This can be done remotely over the network, or locally by a technician. Simply go to our website: www.accutroninstruments.com and download the latest version available. Within minutes you can flash your device underground from your office and you will be up to date with the latest version of the Accutron Pro.

If you have any suggestions on improvements of this product, please share it with us. We value your input. This product was designed to be user friendly, and we are actively looking on how we can improve our products to satisfy our customers.

Section 1: General Information

1.1 Safety Guidelines

This device should only be set up and operated in conjunction with this manual. Qualified personnel are only authorized to install and operate this equipment in accordance with established safety practices and standards.

1.2 Information about your Accutron Pro

When you first receive your Accutron Pro device, ensure you record the following information shown below. If you need to contact Customer Service, this information will allow us to provide you more efficient service. This information is located on the inside of the unit enclosure cover, or with the provided paperwork on delivery.

Table 1: Accutron Pro System Information

Accutron Pro
Part Number:
Serial Number:
MAC Address:

Section 2: Specifications

2.1 Accutron PRO Series

2.1.1 Accutron PRO - Panel Mounted

CPU: ARM® 32bit MCU

Connections: 5x Pluggable Screw terminal blocks
RJ45 - Ethernet Port

Input Power: Terminal blocks: 20 VDC to 48 VDC

PoE Compatibility: 48V IEEE 802.3af, Mode A & B
IEEE 802.3at (Type 2)

Power Consumption: 100mA @ 24VDC (2.4 Watts)

Interfaces:

Ethernet: Modbus TCP, HTTP
EtherNet/IP^{TM} - Allan Bradly (Optional Version)

2x RS-485: Modbus RTU

Accutron Bus: 5-wire (M12 - 5 pin connector) Accutron Pro Series Sensor Bus

2x 4-20mA outputs: Non-loop powered (4 wire transmitter)

2x Dry Contacts: 50V AC/DC, 1A Max.

WIFI (Optional): IEEE 802.11 b/g/n, Client Mode (WPA2)

Signaling: Status LED (Power, Accutron Bus, Relay1, Relay2)
128 x 128 pixels OLED Color Display Menu with Status Messages

Programming: Local Navigation Buttons
Web Interface

Factory IP (Default): 192.168.1.100

Mounting: 35mm Din rail mounted

Datalogging:

Frequency: Increment in seconds - User Selectable

Memory: 8 GB microSD card

Accessibility: Web Interface downloadable

Environmental:

Temperature Rating: -40˚C to + 80˚C

Humidity Rating: ≤95 % (25°C, non-condensing)

Protection Rating: IP20

Note: Supported web browsers, Firefox v52+, Chrome v57+, Microsoft Edge v80+, Internet Explorer is not supported.

2.1.2 Accutron PRO - Transmitter

Enclosure:

Material: Fiberglass

Approvals: NEMA 4x, IP66, CE, CSA, cULus, ROHS

Display: OLED - Accutron Bus

Power Terminal: 3x Terminal

Conduit Connections: 3x 1/2" NPT
                         1x RJ45 - IP65 Connector
                         1x M12-5pin A-Coded Female Connector

Power Consumption: 15mA @ 24VDC (0.15 Watts) - Display

2.2 Accutron Bus Devices

2.2.1 FlowTrax PRO

Airflow Set limit: 1 FlowTrax Transducer Pair

2.2.1.1 FlowTrax PRO - Drift/Tunnel/Raise

Installation:

Face to Face: (Sensor Separation)	1.0 to 18.0 meters
Connections:	1x M12-5pin A-Coded Female Connector 1x M12-5pin A-Coded Male Connector
Mounting:	1/4" Threaded insert - CCTV Type Compatible
Alignment Assistance:	Laser Alignment Function (Tap On/Off)

Signalling: LED Heartbeat Status
Dual-colour LED - Misalignment Indicator

Measured Variable:

Airflow Velocity Range:	-40.0 to 40.0 m/s (bi-directional)
Velocity Accuracy:	±0.05 m/s @10 meters
Velocity Resolution:	0.01m/s @ 10 meters
Volumetric Airflow:	Measured Velocity x User defined Area
Temperature Range:	-50 to 80°C
Temperature Accuracy:	±2.0 °C

Environmental:

Temperature Rating:	-50 to 80 °C
Humidity Rating:	0-100% (Condensing)
Protection Rating:	IP69K - Hermetically Sealed
Area Classification:	Corrosion Resistant

Power Consumption: 200mA @ 24VDC (4.8 Watts)

Ultrasonic Frequency: 50kHz

2.2.1.2 FlowTrax PRO - Primary/ Main Fan

Installation:

Face to Face: (Sensor Separation)	1.0 to 13.0 meters
Connections:	1x M12-5pin A-Coded Male Connector
Mounting:	Ball/Socket Assembly 2x Stainless Steel Mounting Brackets (Optional)

Signalling: LED Heartbeat Status

Measured Variable:

Airflow Velocity Range:	-40.0 to 40.0 m/s (bi-directional)
Velocity Accuracy:	±0.05 m/s @10 meters
Velocity Resolution:	0.01m/s @ 10 meters
Volumetric Airflow:	Measured Velocity x User defined Area
Temperature Range:	-50 to 80°C
Temperature Accuracy:	±2.0 °C

Environmental:

Temperature Rating:	-50 to 80 °C
Humidity Rating:	0-100% (Condensing)
Protection Rating:	IP69K - Hermetically Sealed
Area Classification:	Corrosion Resistant

Power Consumption: 200mA @ 24VDC (4.8 Watts)

Ultrasonic Frequency: 50kHz

2.2.1.3 FlowTrax PRO - Long Range

Installation:

Face to Face: (Sensor Separation)	6.0 to 35.5 meters
Connections:	1x M12-5pin A-Coded Female Connector 1x M12-5pin A-Coded Male Connector
Mounting:	1/4" Threaded insert - CCTV Type Compatible
Alignment Assistance:	Laser Alignment Function (Tap On/Off)

Signalling: LED Heartbeat Status
Dual-colour LED - Misalignment Indicator

Measured Variable:

Airflow Velocity Range:	-40.0 to 40.0 m/s (bi-directional)
Velocity Accuracy:	±0.05 m/s @10 meters
Velocity Resolution:	0.01m/s @ 10 meters
Volumetric Airflow:	Measured Velocity x User defined Area
Temperature Range:	-50 to 80°C
Temperature Accuracy:	±2.0 °C

Environmental:

Temperature Rating:	-50 to 80 °C
Humidity Rating:	0-100% (Condensing)
Protection Rating:	IP69K - Hermetically Sealed
Area Classification:	Corrosion Resistant

Power Consumption: 200mA @ 24VDC (4.8 Watts)

Ultrasonic Frequency: 30kHz

2.2.2 ClimaTrax PRO

Installation:

    Connections: 1x M12-5pin A-Coded Female Connector
                                 1x M12-5pin A-Coded Male Connector

    Mounting: Mounting Tabs

Signalling: LED Status Light

Measured Variable:

    Temperature:

Range:	-40 to 85°C
Accuracy:	±0.8°C
Resolution:	0.01°C
Drift:	<0.02°C/Year (Long Term Drift)

    Relative Humidity:

Range:	0-100% (non-condensing)
Accuracy:	±1.8%
Resolution:	0.7%
Drift:	<0.25% RH/Year (Long Term Drift)

    Pressure:

Range:	30-200 kPa
Accuracy:	±0.15 kPa
Resolution:	0.01 kPa
Drift:	<0.1 kPa/Year (Long Term Stability)

    Air Density (Calculated):

Range:	0.29 - 2.20 kg/m^3
Resolution:	0.001 kg/m^3

Wet Bulb (Calculated):

        Range: -40 to 85°C

        Accuracy: ±0.8°C

        Resolution: 0.01°C

Mass Flow (Calculated):

        Accuracy: ±0.1 kg/m$^3 \cdot$ s (Dimensional Analysis Requires)

        Resolution: 0.001 kg/m$^3 \cdot$ s

Environmental:

        Temperature Rating: -50 to 80°C

        Humidity Rating: 0-100% (non-condensing)

        Area Classification: Corrosion Resistant

Power Consumption: 15mA @ 24VDC (0.15 Watts)

2.2.3 GLOBE PRO

Installation:

        Connections: 1x M12-5pin A-Coded Female Connector
                                1x M12-5pin A-Coded Male Connector

        Mounting: Mounting Tabs

Signalling: LED Status Light

Measured Variable:

        Temperature:

                Range: -40 to 80°C

                Accuracy: ±0.2°C

Resolution: 0.05°C

Drift: <0.05°C/Year (Long Term Drift)
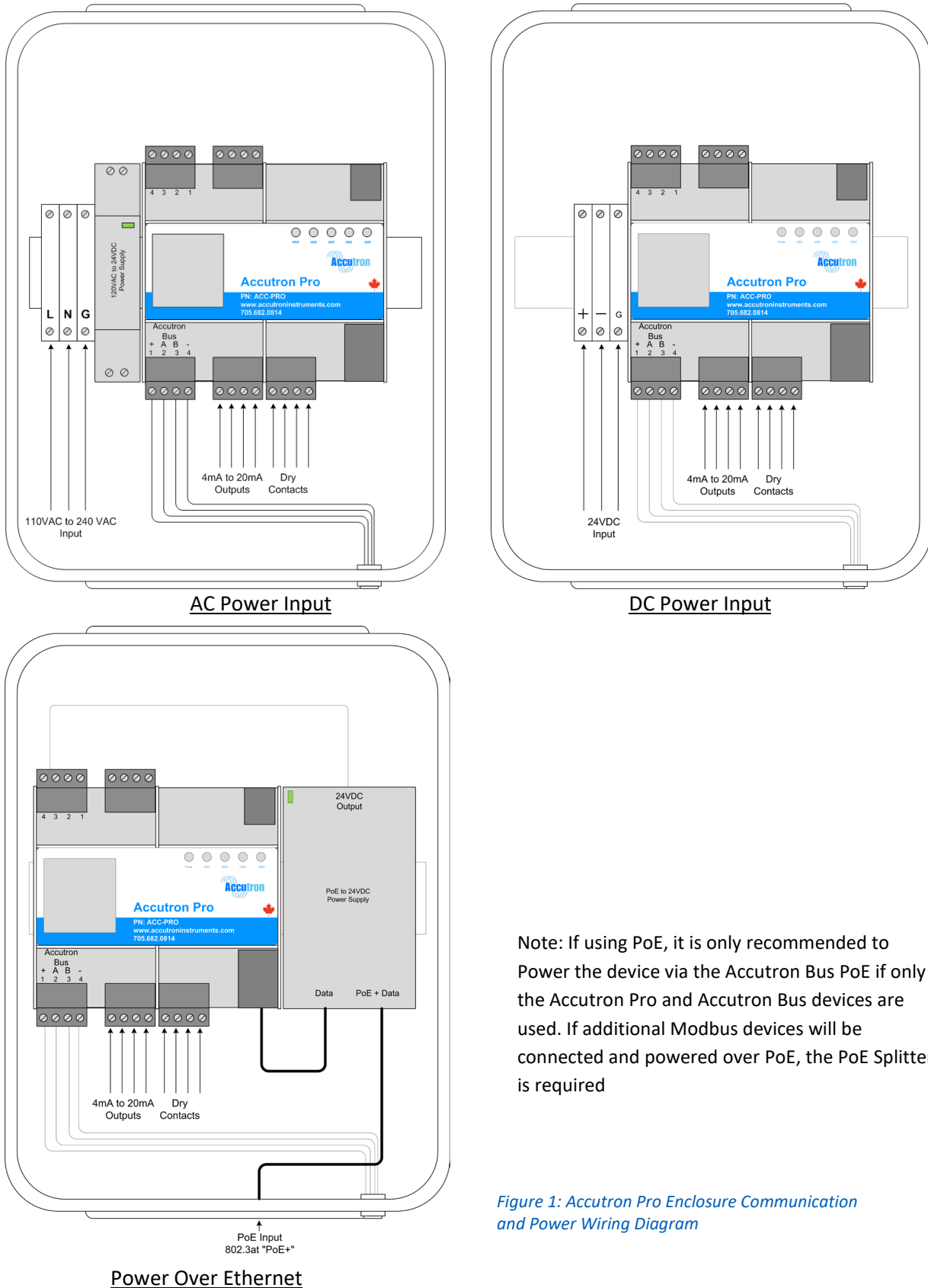
WBGT (*Calculated):

Range: -40 to 80°C

Accuracy: ±0.2°C

Resolution: 0.05°C

Drift: <0.05°C/Year (Long Term Drift)

Environmental:

Temperature Rating: -40 to 60°C

Humidity Rating: 0-100% (Condensing)

Area Classification: Corrosion Resistant

Power Consumption: 10mA @ 24VDC (0.10 Watts)

Section 3: Communication & Power Wiring Diagram

AC Power Input

DC Power Input

Power Over Ethernet

Note: If using PoE, it is only recommended to Power the device via the Accutron Bus PoE if only the Accutron Pro and Accutron Bus devices are used. If additional Modbus devices will be connected and powered over PoE, the PoE Splitter is required

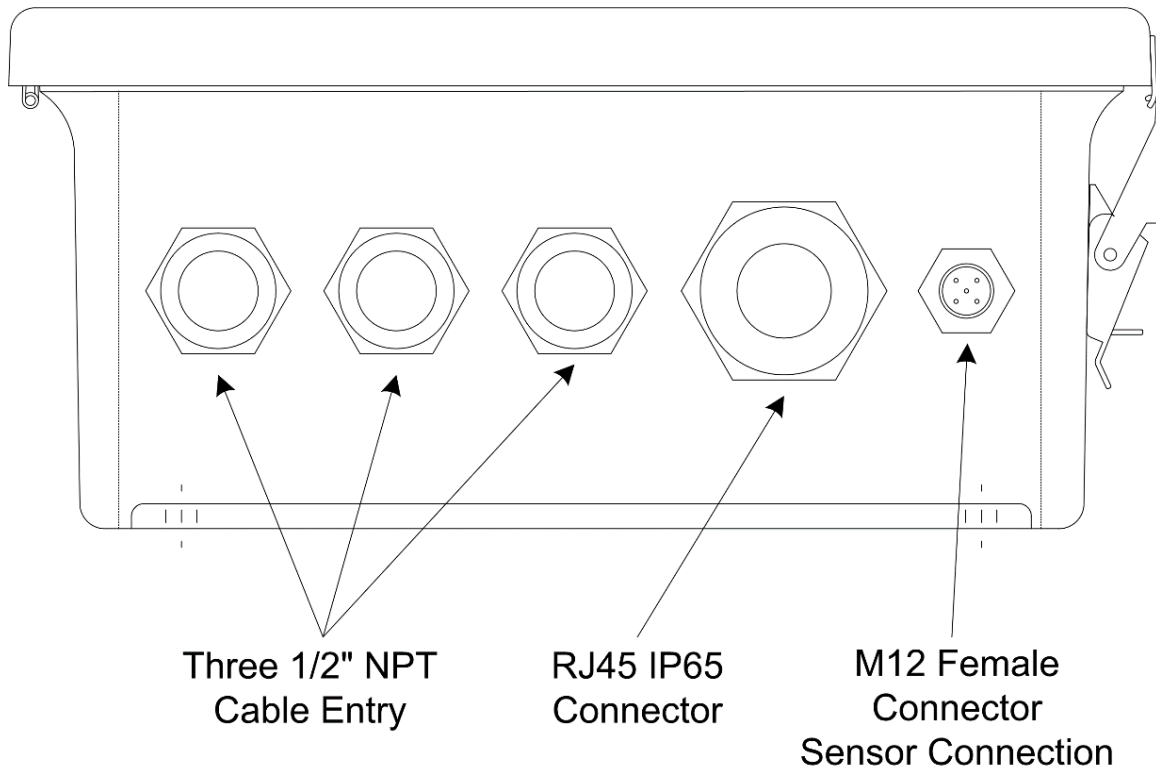*Figure 1: Accutron Pro Enclosure Communication and Power Wiring Diagram*

Figure 2: Accutron Pro Module Wiring Diagram
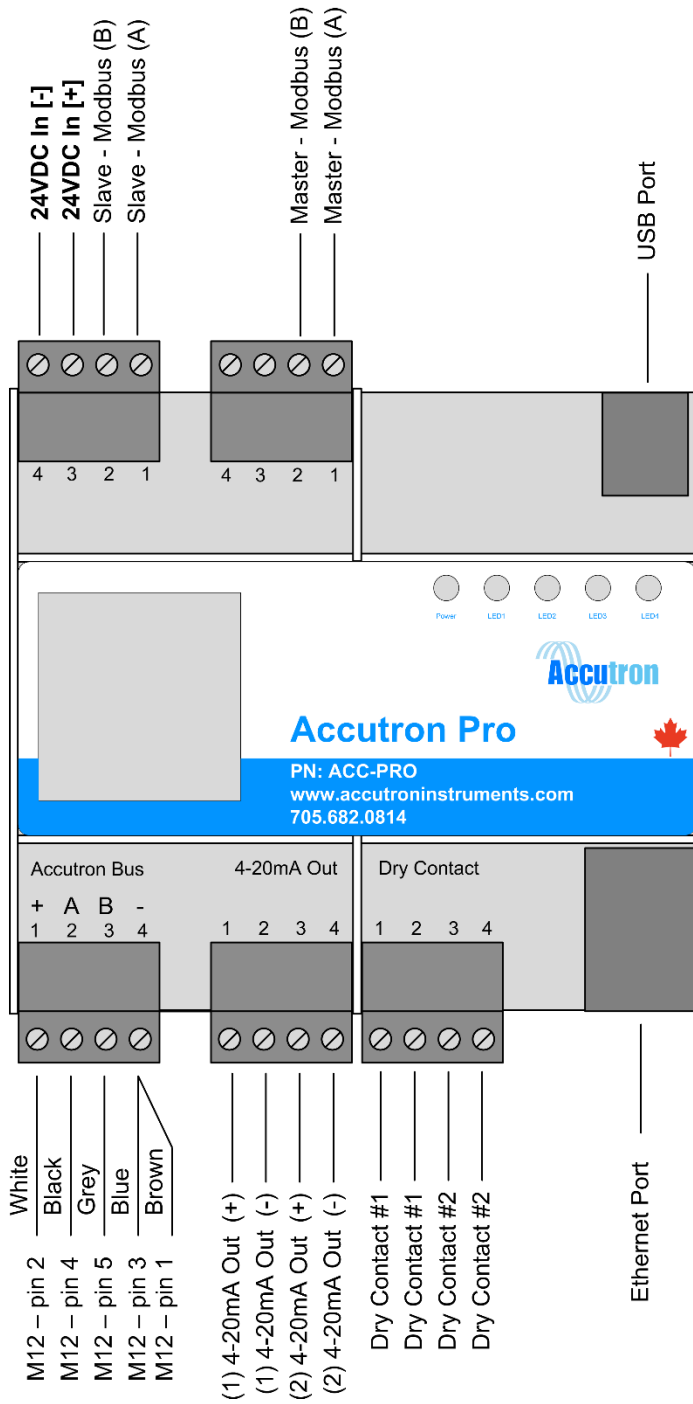
4-20mA Notes:
Non-loop powered (4 wire transmitter)

Contact Notes:
Voltage Max: 50V (AC peak or DC)
Current Max: 1A
On Resistance: 0.15Ω Typical

3.1 Connection Entry Diagram

Three 1/2" NPT
Cable Entry

RJ45 IP65
Connector

M12 Female
Connector
Sensor Connection

Bottom View

Figure 3: Accutron Pro Connection Entry Diagram
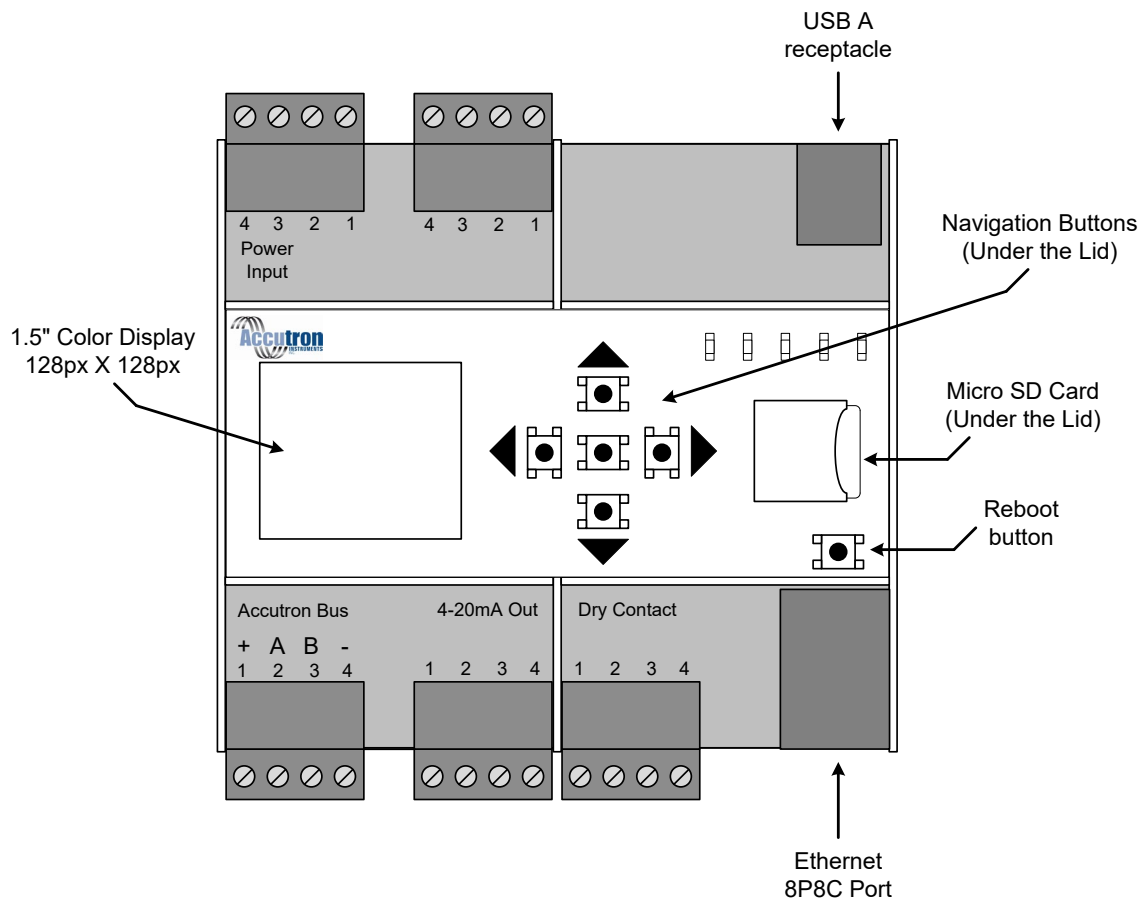
Section 4: Inside the Enclosure

Figure 4: Accutron Pro Module - Inside the Enclosure

LED Indicators: Power and 4 user settable LEDs

Micro SD card: The Micro SD card can be inserted and removed from underneath the lid of the enclosure.

Navigation Buttons: Press and hold the center navigation button to enter the menu.

Color Display: Main display for navigating unit options.

Reboot button: Reboots device. Settings are not lost.

Section 5: Initial Setup

Your Accutron Pro device is shipped with factory settings, as shown in Appendix B. When you first receive your device, it is recommended to power the device up and familiarize yourself with operation, as well as configure your network settings.

Your Accutron Pro may be powered with either 24 VDC, PoE, or 110-240 VAC. It is important to VERIFY YOUR INPUT POWER before powering on your device. If your device is the standalone Accutron Pro module, you will need to supply it with 24 VDC to the indicated pins OR PoE. If it is enclosed in a NEMA 4X box, you will need to supply either 24VDC, PoE or 110-240 VAC to the indicated terminal blocks. Note: Supplying your device with the incorrect power requirement may result in damage to your device as well as harm to the operator.

5.1 Boot Up and Discovery Mode

Once your device is connected to power, it will begin to boot up. You should see that the green power LED is lit, indicating the device is properly powered. After a few seconds, you will see the blue Accutron Wave. The device will take about 30-60 seconds to boot. The device will display the current software version before finishing its boot cycle and entering 'Discovery Mode'. When in discovery mode, the Accutron Pro will attempt to discover every accessory connected on the Accutron Bus. If you have FlowTrax Pro airflow transducers connected to the Accutron Pro, they will begin sending ultrasonic bursts. If nothing is connected to the bus, the Accutron Pro will remain in discovery mode. While in discovery mode, the menu can still be accessed to configure the device.

5.2 Navigating the Menu

Under the lid, the Accutron Pro has a keypad used for navigating the menus. Pressing on the center button will bring up the Main Menu (figure 5). The top, bottom, left and right navigation keys can be used to navigate the menu, and the center key is used to select the highlighted menu item. Menu items can also be accessed by pressing the right button where there is a '>' symbol beside the item name. The left button can be pressed any time to return to the previous menu.
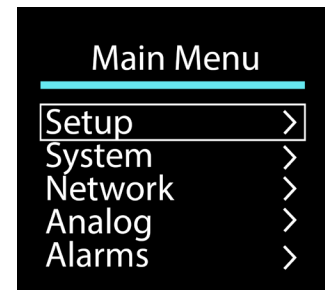
Figure 5: Accutron Pro Module Main Menu Screen

5.3 Changing IP Settings

From factory, the device IP should be set to manual mode, with an IP address of **192.168.1.100**. The following section will explain how to change this.

From the main menu, enter the Network menu. From here, navigate to '**Wired Mode**' and set this to manual. Return to the Network mode and navigate to '**Wired IP Address**'. Here you can set the desired IP address of the device. Once you set the address, press the center button to confirm. You will see a '**Saved**' message, confirming that the IP was set. Return to the Network menu and navigate to **'Apply Settings'**, at the bottom of the network menu. Enter this menu, then click the center button. The screen will go blank and then a cursor will flash on the top left. After some time, the system will reboot. (Figure 6).
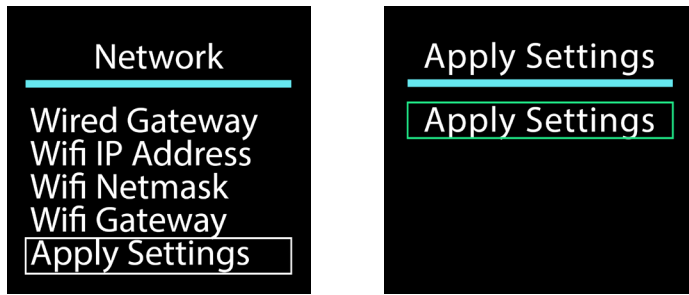
Figure 6: Reboot System Menu

Once the device reboots, return to the Network menu and select '**Wired Info**'. You should see your newly entered IP address shown here (figure 7).
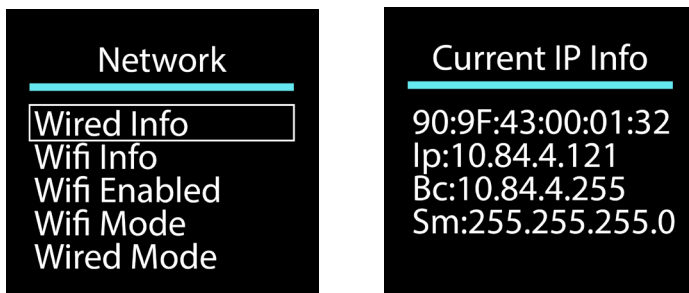

Figure 7: Current IP Info Menu

DHCP:

If you wish to automatically set your IP address using DHCP, enter the '**Network menu'**, navigate to '**Wired Mode**', and select '**DHCP**' (figure 8). Press the center button to confirm. Then back out to the Network menu and scroll to the bottom to enter the '**Reboot System**' menu. Once in this menu, press the center button to confirm. The screen will go blank and display a cursor at the top left. After several seconds, the device will reboot. After rebooting your device, return to the Network menu and select '**Wired Info'**. You should see your newly assigned IP address shown here.
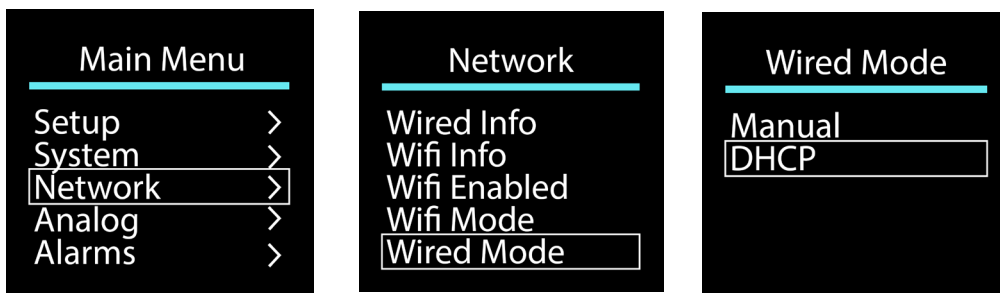

Figure 8: Setting the Wired IP Mode

Once your network settings are configured, it is recommended to install the device and Transducers to determine what your face to face and baseline settings will be. If you already know what these will be, you can skip to Section 7 to continue configuring your device at the surface before installing it.

Section 6: Installation

Note: During installation, be sure to record the exact values of the baseline of the Transducers. If possible, the face to face should be recorded as well. This will be further explained below. These values will assist with configuring the device later.

It is recommended that you bring a laser range finding device, or tape measurer, to measure out your baseline values after installation.

6.1 Mounting the Transmitter Box

Note: When mounting the transmitter box avoid mounting near medium/high voltage, as this may result in unwanted noise.

When mounting the transmitter, it is important to select a location that will allow you to connect to the FlowTrax Pro transducers. You should also consider the accessibility of required power (POE, 110-240 VAC, 24VDC.) as well as any communication output connections such as to PLC or network.

6.2 Mounting the Transducers

6.2.1 Choosing a Location

The best location to install the instrument is in a straight section of tunnel that is at least 3 tunnel widths long. In such a section, the airflow distribution will be well behaved with a maximum airflow in the center and with lower airflow on the outside. Locations where airflow is concentrated in the corners should be avoided. If a corner application is selected; do an audit of the airflow profile and select the best representation of the airflow distribution that best reflects the actual flow.

The imaginary line between the Accutron FlowTrax Pro Transducers works like a "virtual pitot tube" and all flow measurements occur along this line. In practice, best results are displayed when this "imaginary line" passes through the center of the tunnel, slicing through the airflow distribution profile in a representative way.

It is also a good idea to carry out and record a 9-point manual airflow survey to verify the airflow distribution and identify a suitable location.

6.2.2 User Parameter Inputs & Measurements

In order to ensure your Accutron Pro Airflow Monitoring system is providing accurate results, it is important to properly measure the three key user input parameters:

Face to Face: This is the distance from one Transducer face to the other. This can be left at '**0**' to have the system automatically determine the face-to-face distance. If you can accurately measure this during installation with a laser range finding tool, then it is recommended to use the measured value.
Baseline: This is the distance between the two Transducers, parallel to the flow.
Flow Area: This is the cross-sectional area of the area being monitored. If the area is not constant, such as a diverging fan, the cross-sectional area at the midpoint of the two Transducers can be used. If Airflow Volume is not needed, this setting can be left at 0.

6.2.3 Calculating the Baseline

It is recommended that the airflow Transducers be installed such that the face-to-face vector intersects the direction of flow at an angle between 30 and 60 degrees. This can be achieved by installing the Transducers with the proper baseline. The baseline is the separation downstream between the two Transducers. See Figures 9 to 11 for reference.
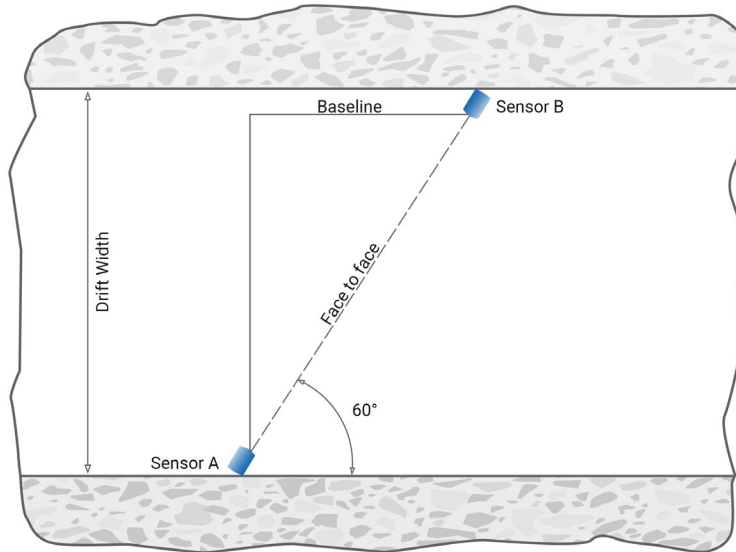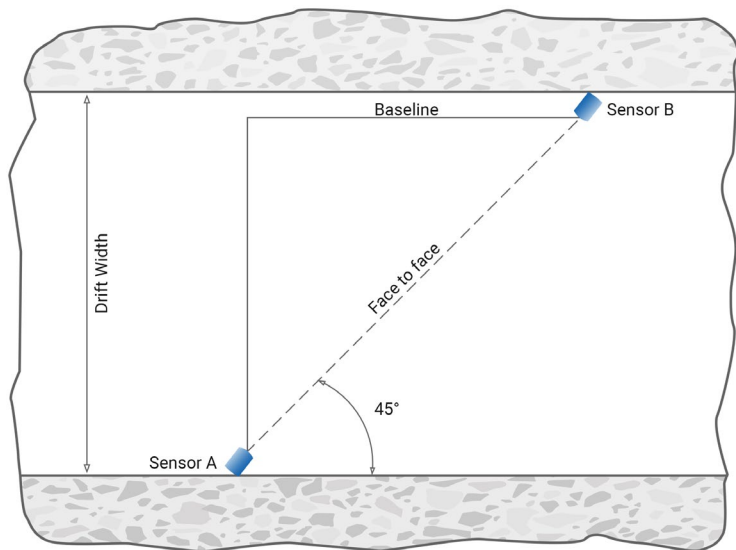

Figure 9: Space Conserving Configuration

Figure 10: Ideal Configuration
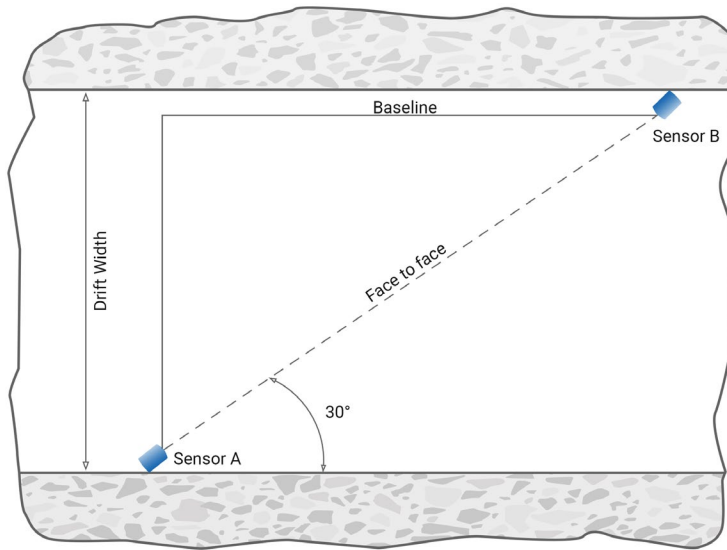
Figure 11: Better in High Velocity Applications

6.2.4 Calculations

To Find Angle from Baseline and Face to Face:

$$Angle = cos^{-1}\frac{Adj}{Hyp}$$

$$Angle = cos^{-1}\frac{Baseline}{FF}$$

To Find Baseline from diameter and desired angle

$$Adj = opposite \times \tan(90 - angle)$$

$$Baseline = dia. \times \tan(90 - des.\,angle)$$

Diameter from baseline and face to face

$$b = \sqrt{c^2 - a^2}$$

$$diameter = \sqrt{FF - baseline^2}$$

Please refer to the applicable section below for your Transducer Type installation.

6.2.5 Drift Transducers

When mounting the transducers to the wall, it is recommended that one be installed near the ceiling of the tunnel and the other located downstream near the bottom of the drift (figure 12). The distance downstream between the two Transducers is called the baseline. It is recommended that the baseline be set such that the face-to-face vector between the two Transducers is between 30-60 degrees to the airflow, ideally 45 degrees.

Down Tunnel View   Top View

Figure 12: Ideal Transducer Installation
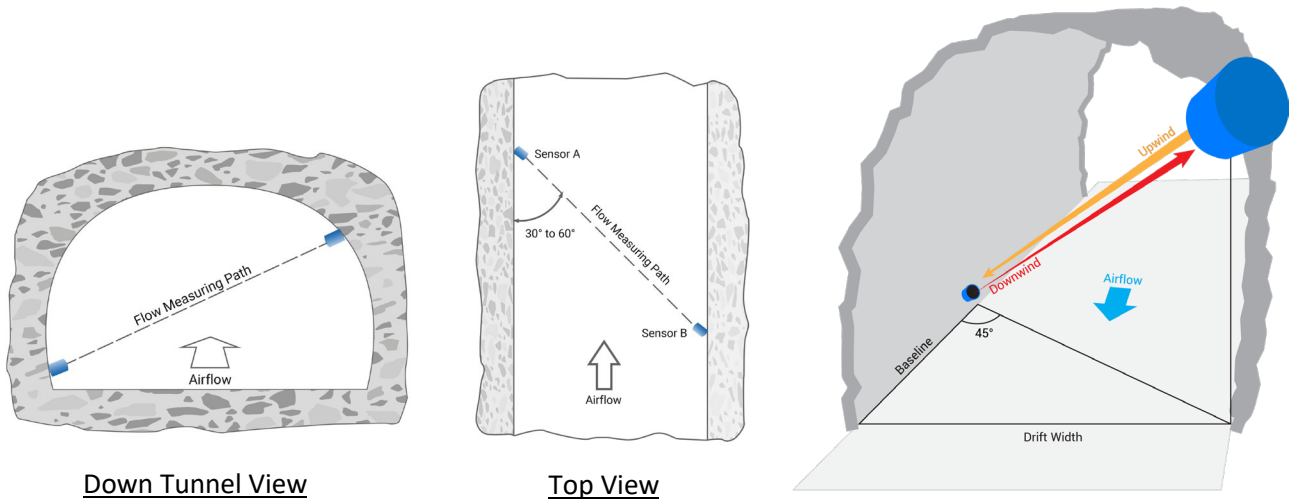
Alternatively, for a less intrusive setup, the Transducers can be fitted near the top of the drift (figure 13). This is not recommended as it does not sample a true cross section of the airflow, but this can still provide repeatable measurements so long as the drift has generally uniform airflow.
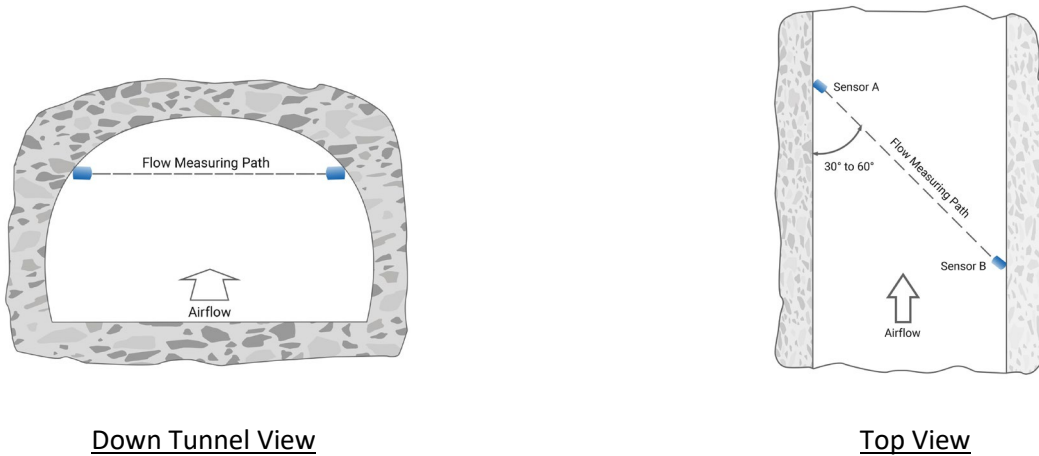

Down Tunnel View   Top View

Figure 13: Less Intrusive Transducer Installation

Once the mounts are installed, thread the Transducers onto the mounts and point them at each other using pan/tilt adjustment on the mount. Once power is run to the unit these Transducers can be aligned properly using the *Laser Alignment*. The laser can be activated by double tapping the Transducer, or through the local menu of the transmitter or the Accutron Pro Webpage.

6.2.6 Fan/IDM Transducers

Mounting the fan or IDM Transducers follows a similar method as the drift system. For the Fan Transducers, ensure that the angle between the Transducers and the airflow is between 30 and 60 degrees; 45 degrees is recommended. For the IDM Transducers, ensure that the angle between the Transducers and the airflow is between 30 and 45 degrees. Please note, the IDM mounts do not allow for an angle greater than 45 degrees and therefore the baseline (Z = Baseline, see Figure 14) cannot be greater than the radius of the duct.

The Fan Transducers are supplied with a Ball and Socket mounting assembly and may also include custom manufactured Mounting Brackets. IDM Transducers are supplied with a similar but smaller set up. It is important that the Transducers are mounted on opposite sides of the duct to measure a proper cross section of the flow.

The Transducer can be removed from the ball and socket assembly without disrupting the Transducer alignment. There is *no laser alignment* built into the Fan or IDM Transducers, but a laser sight such as a laser level or rangefinder is recommended to assist with aligning the transducers. If this is not available, the Transducers can also be aligned by looking straight through the ball and socket mount and ensuring the opposing Transducer is fully visible.
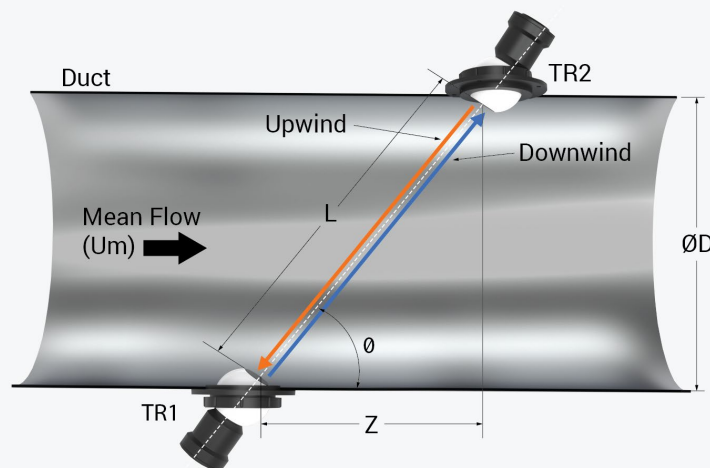

Figure 14: Fan/IDM Transducer Installation where L = Face to Face and Z = Baseline

6.2.7 Long Range Transducers

Mounting Long Range Transducers follows the same procedures as mounting the drift transducers. Note that the maximum face to face distance of the Long-Range transducers is 33.5m (110 feet).

Section 7: Device Setup

There are two methods for configuring your new Accutron FlowTrax Pro airflow monitor: On the device itself, or remotely through the web interface.

7.1 At the Device

During normal operations, the transmitter will display the measured airflow velocity or calculated airflow volume on the screen. If no airflow transducers are connected to the Accutron Bus, or if the transducers do not have a clear signal to each other, then the screen may show '**Discovery Mode'**.

The FlowTrax Pro can be configured through the transmitter module by using the 5 navigational buttons. The Main Menu can be accessed by pressing the middle button when the Accutron Pro is in normal operation. The main menu can be navigated with the top and bottom buttons, to go up and down through the menu. Either the center button or the right button can be used to select a menu item, when a '>' symbol is displayed on the right. This indicates you are progressing further into a submenu. You can navigate back to a previous submenu by pressing the left button. Pressing the left button on the Main Menu screen will exit the menu. Once you have reached a final submenu, there will no longer be '>' symbols next to the menu items. This indicates a variable of the system that can be configured. To configure a variable, select it with the center button. Some menus may bring up a further list of options that can be selected, such as '**Velocity Units**, and other items may bring up an option to specify a number, such as '**Face to Face**'. To select an option from a list, use the Up and Down navigational buttons to highlight the desired option, and select it with the Center button. You will see a green rectangle around the item that is selected. To set your number, use the Up and Down navigational numbers until you see your desired number, and confirm this with the center button. You will see a "saved" message displayed at the bottom of the screen indicating your setting was accepted. If you do not wish to change your settings, you can simply back out of the menu with the left button, without pressing the center button to confirm.

There are three key parameters to configure to ensure your system is properly reading airflow:

- **Face to Face**: This is the distance from one Transducer face to the other. This can be left at '**0**' to have the system automatically determine the face-to-face distance.
- **Baseline**: This is the distance between the two Transducers, parallel to the flow.
- **Flow Area**: This is the cross-sectional area of the area being monitored. If the area is not constant, such as a diverging fan, the cross-sectional area at the midpoint of the two Transducers can be used. If Airflow Volume is not needed, this setting can be left at 0.

These are found in the main menu, under Setup > Airflow Setup.

7.2 Menu Options

- Setup
  - Airflow Setup
    - Face to Face - Sets the face-to-face distance between the two airflow monitors. Leave this at 0 for auto face-to-face ranging.
    - Baseline - Sets the downstream distance of the two airflow monitors
    - Flow Area - Specifies the cross-sectional area of the flow for volumetric flow rate output
    - Flow Direction - If the airflow is negative, use this to make it positive
    - Moving Average Size - Used the smooth out the readings
    - Multiplier - Sets a calibration factor to adjust airflow readings
  - Transducer Setup
    - Clear Tilt Alarm - Used to clear system of any tilt alarms.
    - RX Gain Step – recommended to set at 4, can be increased if signals are weak
    - Filtering mode - Change the filtering mode between hardware or JFilter. Unless otherwise specified by an Accutron technician, leave this set on JFilter.
    - JFilter Min Amplitude - 500 to 700 recommended
    - JFilter Min Duration - 0.15 to 0.30 recommended
    - A Align Laser - Toggles alignment laser for transducer A
    - B Align Laser - Toggles alignment laser for transducer B
    - A Identify - Sets transducer A to identify mode. This will cause the LED on the transducer to blink and cycle colors to help identify each transducer.
    - B Identify - Sets transducer B to identify mode. This will cause the LED on the transducer to blink and cycle colors to help identify each transducer.
  - Data Log Setup
    - Log Interval (s) - Sets the time interval in seconds for data logging frequency
- System
  - Display Mode - Set the main screen display to Velocity or Volume
  - Velocity Units - Set velocity units to m/s or ft/s
  - Temperature Units - Set temperature units to degrees C or F
  - Distance Units - Set distance units to m or f
  - Pressure Units - Set pressure units to kPa, mb, or inHg
  - Volume Units - Set volume units to m^3/s, ft^3/s, CFM or KCFM
- Network
  - Wired Info - Displays network information such as MAC address and device IP for wired connections
  - WiFi Info - Displays network information such as MAC address and device IP for wireless connections
  - WiFi Enabled - Enables or disables wireless network capabilities
  - WiFi Mode - Sets device wireless behavior. Leave this set to **Client**

- Wired Mode - Sets how the wired device IP is configured. Setting this to DHCP will allow the device to automatically set an available IP, if your network is configured for DHCP.
- Wired IP Address - Sets the IP address of the device when wired to the network
- Wired Netmask - Sets the netmask address of the device when wired to the network
- Wired Gateway - Sets the gateway address of the device when wired to the network
- WiFi IP Address - Sets the IP address of the device when using WiFi
- WiFi Netmask - Sets the netmask address of the device when using WiFi
- WiFi Gateway - Sets the gateway address of the device when using WiFi
- Apply Settings - Resets module and applies the new network settings. This must be selected after changing any network settings for the changes to take effect.

➢ Analog
  ➢ Channel 1
    - Output Variable
      - Airflow Velocity m/s
      - Airflow Velocity ft/s
      - Airflow Velocity ft/min
      - Airflow Volume m^3/s
      - Airflow Volume CFM
      - Airflow Volume KCFM
      - Airflow Volume ft^3/s
      - Mass Airflow Kg/s
      - Temperature F (Sensor A)
      - Temperature F (Sensor B)
      - Temperature C (Sensor A)
      - Temperature C (Sensor B)
      - Modbus Variable Name - Any additional Modbus device variables configured on the Accutron Pro will be displayed here
    - Minimum (4mA) - Minimum value specified in output to be set at 4 mA
    - Maximum (20mA) - Maximum value specified in output to be set at 20 mA
    - Clip to Range - Pro will output the min and max mA values when the variables are at their min/max or beyond. If this is not selected than the Pro will output an error signal of 3.5mA when the variables go beyond their set values.
    - Value Override – Forces a specific value through the analog channel for testing.
  ➢ Channel 2
    - Same Options as Channel 1
➢ Alarms
  ➢ Relay 1
    - Input Variable
      - Airflow Velocity m/s
      - Airflow Velocity ft/s

- Airflow Velocity ft/min
- Airflow Volume m³/s
- Airflow Volume CFM
- Airflow Volume KCFM
- Airflow Volume ft³/s
- Mass Airflow Kg/s
- Temperature F (Sensor A)
- Temperature F (Sensor B)
- Temperature C (Sensor A)
- Temperature C (Sensor B)
- Transducer Tilt Alarm On/Off
- Modbus Variable Name - Any additional Modbus device variables configured on the Accutron Pro will be displayed here
- Trigger Value – Sets the target value to activate the relay
- Dead Band – Sets a range +/- of the target value to hold the current relay state.
- Direction
  - Increasing
  - Decreasing
  - Boolean – True/False
- Enabled
  - Disabled
  - Enabled

- Relay 2
  - Same Options as Relay 1
- Modbus
  - RTU Settings - This menu allows you to configure the Modbus RTU settings of your Accutron Pro Device
    - Baud Rate - Allows you to set the Modbus Baud Rate from 110 to 115200
    - Slave ID - Set the Slave ID of the Modbus device
    - Data Bits - Set data bits to 7 or 8
    - Stop Bits - Sets stop buts to 1 or 2
    - Parity - Set parity to None, Even or Odd
  - TCP Settings - This menu allows you to configure the Modbus TCP settings of your Accutron Pro Device
    - Slave ID
    - TCP Port
- Exit - Selecting this will return you to the Accutron Pro Home Screen

Section 8: Accutron Pro Web Interface

The Accutron Pro Web Interface allows you to remotely configure and monitor your Accutron device. To access the web server, ensure you are on a device connected to the same network as your Pro, and navigate to the Pro's IP address. The IP Address can be found in Setup>Network>IP Address. The default IP Address is 192.168.1.100.

8.1 Configuring your Computer's IP Address

8.1.1 Windows 10

Right-click on the network icon on the right side of the task bar and select 'Open Network and Internet Settings'. From this window, click 'Change connection properties' Click 'Edit' under IP assignment, and set you IP settings as shown (Figure 15). Note that the IP address can be any number in the format 192.168.1.xxx, other than 192.168.1.100.
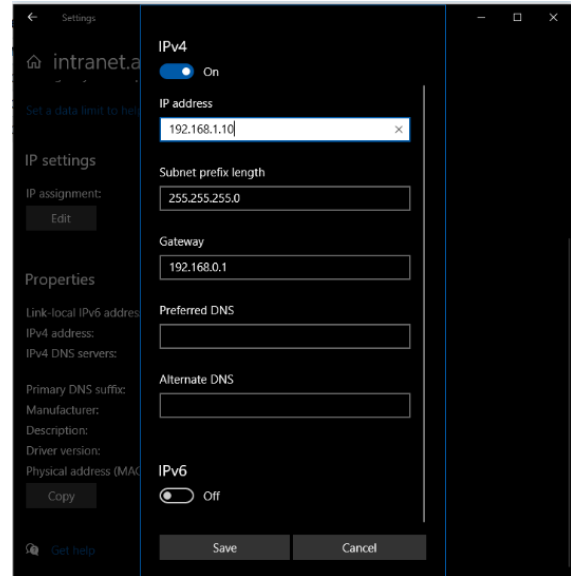
8.1.2 Windows 7/ Windows 10 Alternative

From the Control Panel, open the Network and Sharing Center. If you are in category view, this will be under Network and Internet. Click on 'Change Adaptor Settings' on the left menu. Right click on your appropriate network connection. This will open a new window. Here, look for 'Internet Protocol Version 4 (TCP/IPv4) and double click on it. Set your IP settings to manual and enter the settings shown in Figure 16.
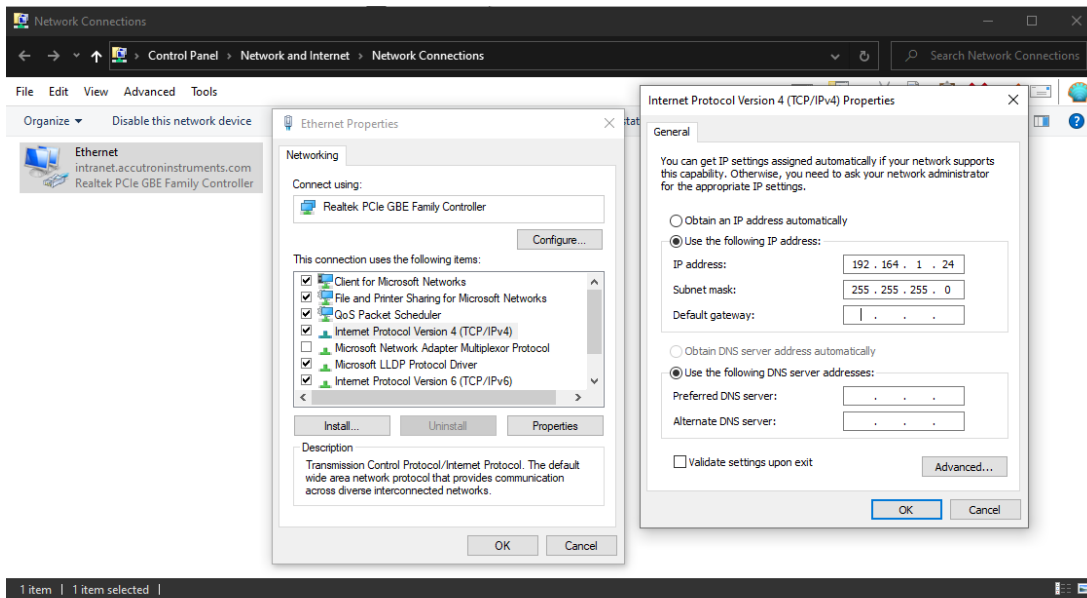

Figure 15: Windows 10 IP Configuration

Figure 16: Windows 7/10 IP Configuration

8.2 The Dashboard

When Connecting to the Accutron Pro Web Interface, you will be greeted with the Dashboard screen (figure 17). Depending on what devices are connected to the Pro, this screen may appear slightly different. The dashboard provides you with an overview of your Accutron Pro device, and displays the variables currently being read, and if there are any errors present.

On the left side of the screen below the Accutron logo, there is a navigation bar. This is used to navigate through the Pro Web Interface
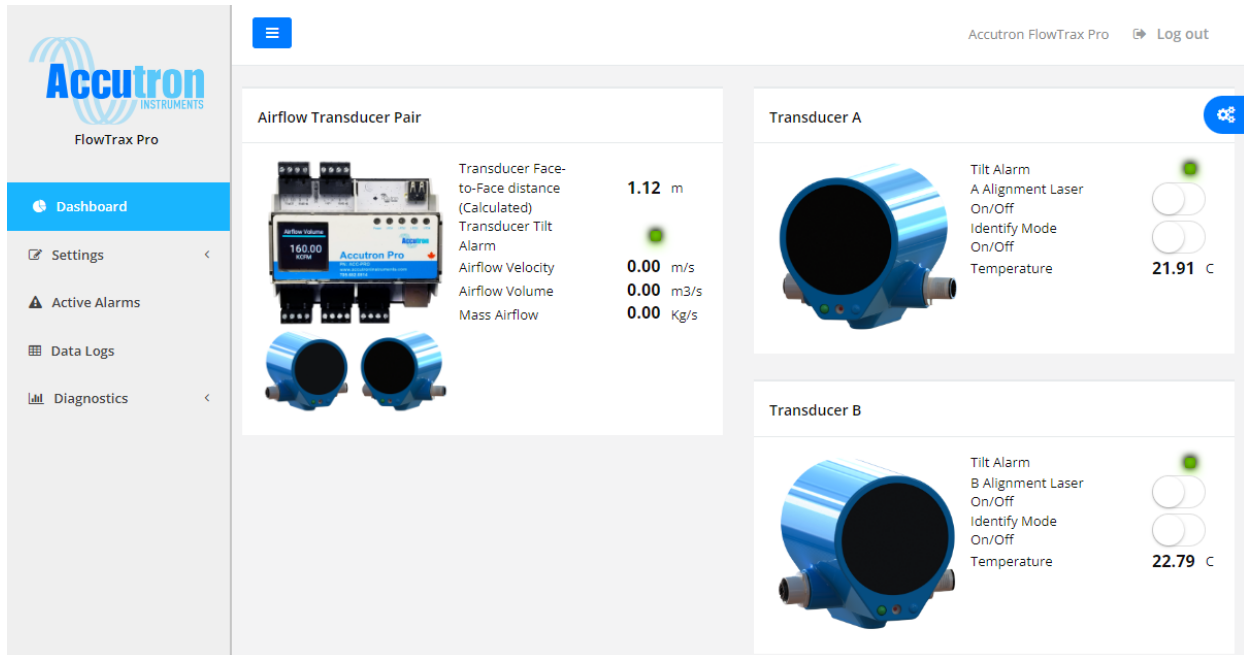

Figure 17: Accutron Pro Web Interface - Dashboard

8.2.1 Available Devices Panel

Clicking on the blue and white gear icon on the top right of the webpage will expand the '**Available Devices**' panel (figure 18). This panel is used to enable/disable which devices are shown on the dashboard. If you have any accessories connected to the Accutron Pro Bus, or if you have Modbus devices connected to the Accutron Pro, they will be shown in this panel. You can toggle them on to have them displayed on the dashboard. Click the On/Off switches between each device name to toggle them from being shown on the dashboard. You must click on the blue '**Save**' button at the top when finished for the settings to take effect.
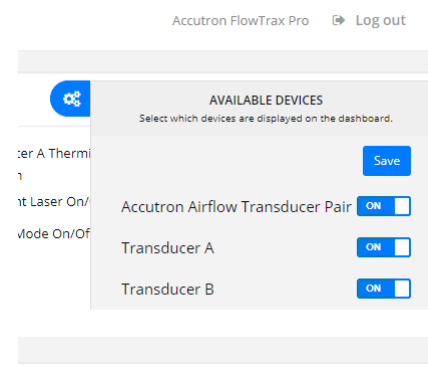

Figure 18: Available Devices Panel

8.3 Settings

Clicking on the Settings Tab will expand the settings menu. Clicking one of these settings items will then bring you to that page.

8.3.1 System

The System page (figure 19) is where your Accutron Pro device unit settings can be configured. The same System settings which can be accessed on the device using the navigation buttons can also be accessed in the Pro Web Server.
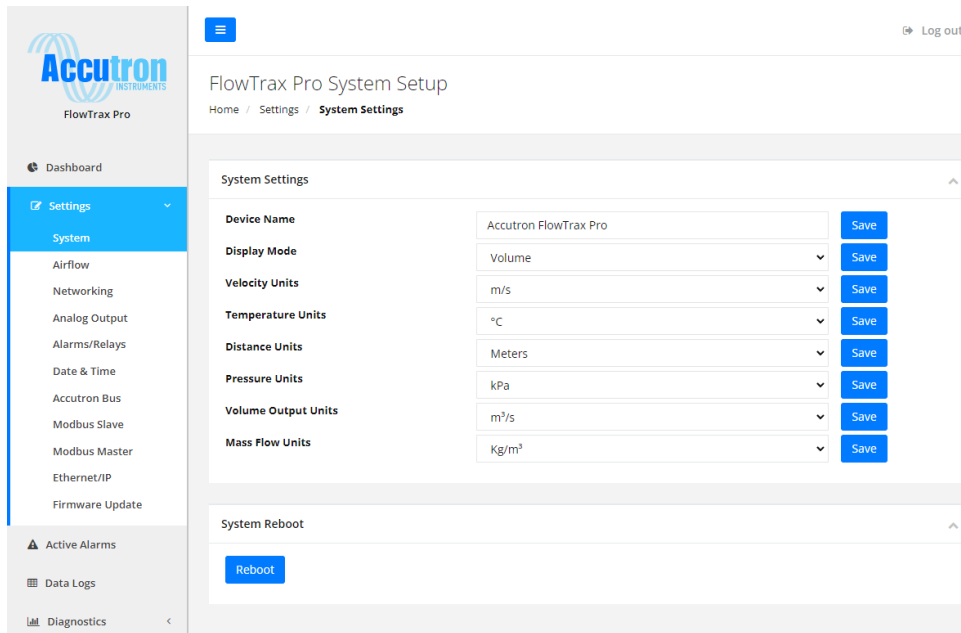
Figure 19: Accutron Pro Web Interface - Setup Page

Figure 20: System Settings Options

Figure 20 shows which settings may be configured on this page. In the first field labelled 'Device Name', you can configure the system's device name. This is the name that is displayed at the top of the web page on the dashboard page, which can help identify which system you are connected to.

'Display Mode' configures what is shown on the Pro Module display, as well as the external green display. This can be configured between volume and velocity. The units these are displayed in can be configured with the options below.

'Velocity Units' specifies which units the system will use for velocity. This can be configured between ft/s and m/s.

'Temperature Units' specifies which units the system will use for temperature. This can be configured between Celsius and Fahrenheit. This changes the temperature units displayed on the dashboard, as well as the external display, for compatible airflow sensors and any ClimaTrax Pro probe accessories connected to the system.

'Distance Units' specifies which units the system will use for distance. This will be applied to the user input options on the Pro for face-to-face distance, baseline distance, as well as area. This can be set to meters or feet.

'Pressure units' specifies the units used for displaying pressure, if a ClimaTrax Pro probe accessory is connected to the system. This will be displayed on the dashboard, as well as the green external display if present in the system.

'Volume Output Units' specifies the units used for displaying volume. If the system display mode is set to volume, then the displayed volume will be in the units specified here. This can be set to m3/s, ft3/s, CFM or KCFM.

'Mass Flow Units' specifies the units used for displaying the mass flow on the dashboard. This can be set to Kg/m3 or lb/ft3. Note that the mass flow is only available if a ClimaTrax Pro probe accessory is present on the system.

Note that the system settings only configure what the system will display for units. This is visible on the dashboard of the web browser, on the Pro module display, as well as the external green display. These units do not change how data is output from the Pro over Modbus or EtherNet/IP. All units are available under different registers or addresses, which are covered in the communications section.

8.3.2 Airflow

Airflow Setup

The Airflow page is where your Accutron Pro airflow measurement settings can be configured (figure 21).

Airflow Setup

Face to Face Distance (User)	m 0.00	Save
Transducer Baseline Distance	m 0.00	Save
Cross Sectional Area	m² 1.00	Save
Airflow Direction	Normal ⌄	Save
Filter Type	Accutron JFilter ⌄	Save
JFilter Min. Amplitude	700	Save
JFilter Min Duration	0.30	Save
Transducer Gain	1	Save
Moving Average Size	10	Save
Airflow Multiplier	1.00	Save

Figure 21: Airflow Setup Options

➢ **Face to Face Distance (User)** – This can be used to manually set the face-to-face distance of the transducers. If this is left at 0, the system will automatically determine the face-to-face distance. The system's units are shown in the grey box to the left of the inputted number.

➢ **Transducer Baseline Distance** – This is used to set the baseline distance between the two Accutron FlowTrax Pro Transducers. It is important that this value is accurate and true to the actual baseline of the installed Transducers, as this will have an impact of the accuracy of the measured airflow velocity. The system's units are shown in the grey box to the left of the inputted number.

➢ **Cross Sectional Area** - This is used to set the cross-sectional area of the area being monitored. If the area is not constant, such as a diverging fan, the cross-sectional area at the midpoint of the two Transducers can be used. If Airflow Volume is not needed, this setting can be left at 0. The system's units are shown in the grey box to the left of the inputted number.

➢ **Airflow Direction** – This lets you change your systems default airflow output between either '**Normal**' or '**Reversed**'. If your system is reading a negative airflow when you expect it to read a positive, this setting can be used to swap the system's airflow output direction.

➢ **Filter Type** - This lets you select the type of filtering used by the system. The default is '**Accutron JFilter**'. It is recommended to leave this as is, unless otherwise instructed by an Accutron technician.

➢ **JFilter Min. Amplitude** – This sets the minimum amplitude that the Accutron JFilter will look for. This is further explained in System Diagnostics, below. It is recommended to leave this as is, unless otherwise instructed by an Accutron technician.

➢ **JFilter Min Duration** – This sets the minimum signal duration that the Accutron JFilter will look for, within the '**JFilter Min. Amplitude**'. This is further explained in System Diagnostics, below. It is recommended to leave this as is, unless otherwise instructed by an Accutron technician.

➢ **Transducer Gain** – This is used to control the sensitivity of the Transducers. The system default is 4. Setting this higher will provide better readings at a distance, but this will also increase any noise present in the readings.

➢ **Moving Average Size** – This is used to set the amount of airflow readings to average for the airflow output. This helps smooth the system's output from any sporadic spikes or drops in airflow reading. The system default is 10, which means the system will take 10 airflow readings and average these values to provide an airflow velocity. This is a moving average, so once the system as taken as many measurements as the moving average size is set to, then each new reading will replace the oldest reading in the sample set.

➢ **Airflow Multiplier** – This is used as a type of calibration factor to bias the system's airflow readings. We do not recommend changing this value from 1 in an ideal configuration, as your system should be outputting an accurate velocity value. This can be used to bias readings in cases where a survey may yield a different value for volumetric flow than what the Pro is outputting, due to changing area in the drift, roughness, etc. The multiplier is a linear value that directly scales the velocity output of the Pro.

Each setting must be saved, by clicking the blue '**Save**' button, for the settings to take effect.

Transducer A/B Settings

This section is used to interact with the Accutron FlowTrax Pro Transducers.

Transducer A Settings

A Alignment Laser On/Off

Identify Mode On/Off

Clear Tilt Alarm

Transducer B Settings

B Alignment Laser On/Off

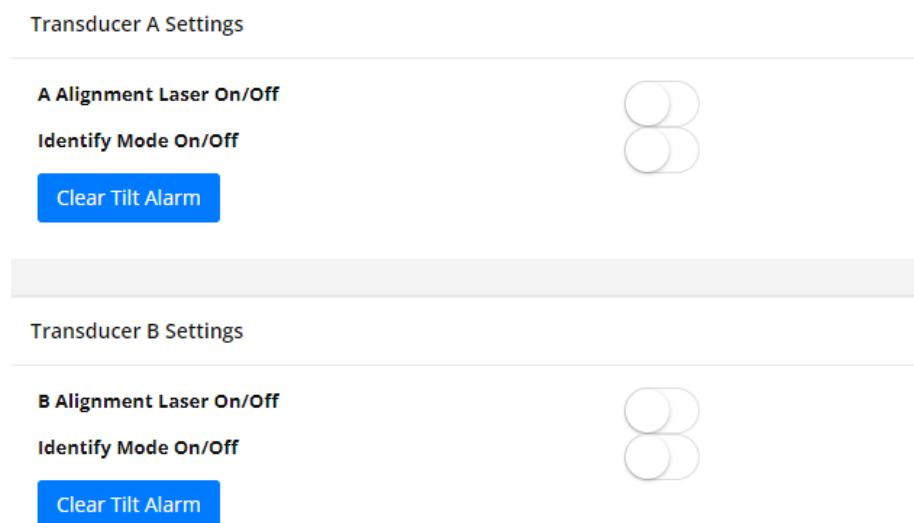**Identify Mode On/Off**

Clear Tilt Alarm

Figure 22: Transducer Settings

The '**Alignment Laser On/Off**' switch is used to toggle the alignment laser on each transducer (Note: This can also be done through the menu on the physical system, or by firmly double tapping on the back of the transducer).

The '**Identify Mode On/Off**' switch is used to toggle Identify Mode on each transducer. When this is enabled, the LED on the transducer will begin flashing red and green. This is used to identify which transducer is which.

The blue '**Clear Tilt**' button is used to clear the tilt alarm on that transducer. The tilt alarm is activated when a transducer is physically knocked out of alignment. If the accelerometer within the transducer detects a dramatic change in position, this will trigger the tilt alarm and send a notification on the system. The led on the sensor will blink red and green, and the Tilt Alarm light on the Web interface Dashboard page will be red. If the system is equipped with the NEMA 4X enclosure with LCD Display, a notification on this display will be visible as well.

8.3.2 Networking

The Networking Settings page (figure 23) allows you to configure the networks settings for your Accutron Pro, such as the IP address, netmask, and gateway. You can also configure Wi-Fi settings and access available Wi-Fi networks on this page.
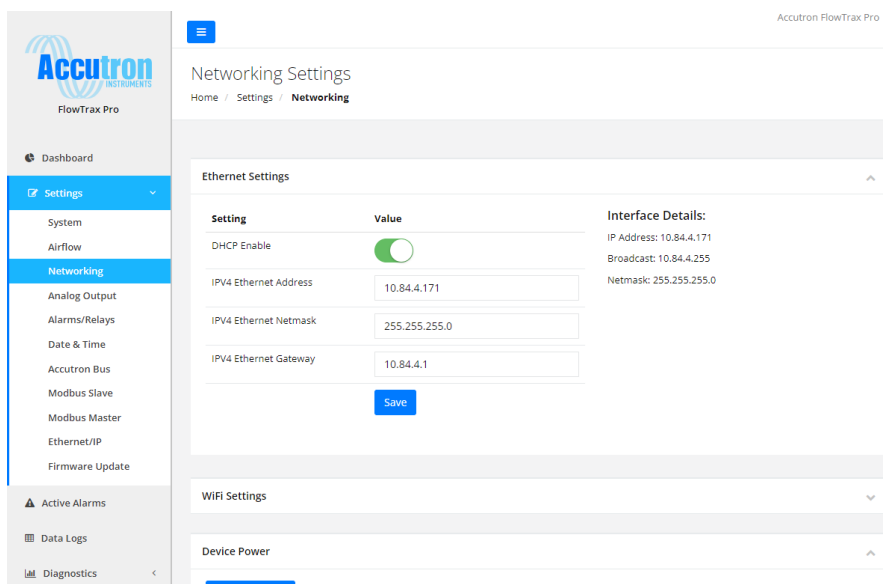

Figure 23: Networking Settings

Changing your IP Address:

To manually enter your IP address, make sure the '**DHCP Enable**' button is disabled (button is on the left and no green is visible). Then enter your desired IPv4 settings in each line. Once done, click the blue '**Save**' button. Wait a few seconds for the settings to take effect, and then click on the blue '**Reboot Device**' button at the bottom. Once the device is back online, you should be able to access it at the new IP address, if you are on the same network.

If you wish to automatically set your IP address using DHCP, toggle the '**DHCP Enable**' button. Your manual IP Settings will still be visible in the fields below, but your actual IP Address will be displayed on

the right, under '**Interface Details**'. When setting to DHCP, you may need to reboot your device with an ethernet cable connected to your network for an IP address to be properly assigned. This can be done by clicking the blue '**Reboot Device**' button. After rebooting your device, return to the Network menu on the physical device and select '**Wired Info'**. You should see your newly entered IP address shown here. Enter this in your browser and you should reconnect to the Accutron Pro Web Interface.

WiFi Settings

If your Accutron Pro system is equipped with a Wi-Fi antenna, you can connect to available Wi-Fi networks figure 24). To begin, make sure the systems Wi-Fi is enabled, by toggling the '**Enabled**' button in Wi-Fi Settings. Make sure the '**Mode**' is set to '**Client**'. Then click the blue '**Scan Wifi Networks**' button. After a few moments, you will see a list of all the available networks you can connect to. Click the network you wish to join from that list. It will open a prompt on the right asking for a Passphrase. Type in the Passphrase and click '**Connect**'.
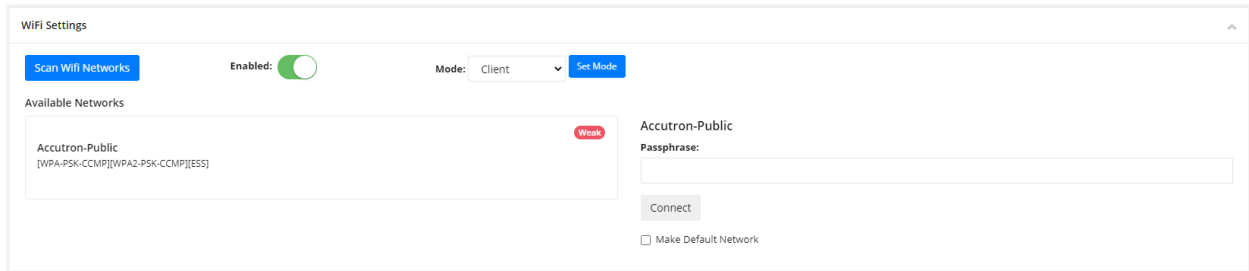

Figure 24: Wi-Fi Settings

8.3.3 Analog Output

The Analog Output screen allows you to manage the analog outputs on your Accutron Pro Device (figure 25). On this page you can set the variable to be output on each Analog Output channel by clicking the
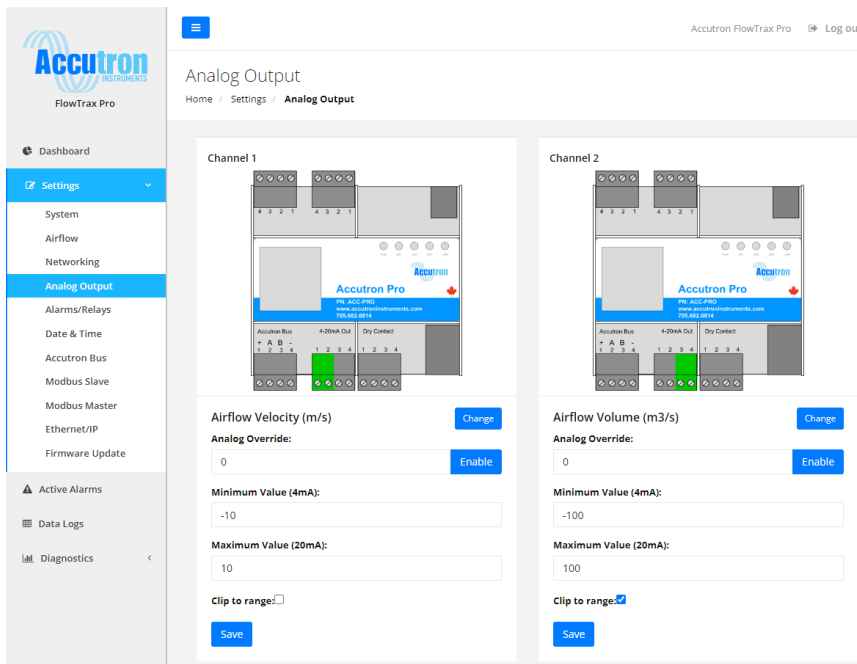

Figure 25: Analog Output Settings

blue button labelled "Change". You can also set the minimum and maximum values to be read at 4mA and 20 mA. The units of the values are independent of the system units. Each unit for each measured variable is available to output over analog. This provides flexibility between the displayed system units and what is required at the PLC. With the "Clip to range" option selected (with the box is checked) the Pro will output the min and max mA values when the variables are at their min/max or beyond. If the box is not selected (unchecked) than the Pro will output an error signal of 3.5mA when the variables go beyond their set values.

Available Output Options

- **Transducer A/Temperature (unit)**: Provides the temperature reading of Transducer A in the selected unit.
- **Transducer B/Temperature (unit):** Provides the temperature reading of Transducer B in the selected unit.
- **Airflow Transducer Pair/Airflow Velocity (units)**: Provides the current airflow velocity in the units selected. This is unaffected by the system units settings. This may be set to m/s, ft/s, or ft/min.
- **Airflow Transducer Pair/Airflow Volume**: Provides the current airflow volume in the units selected. This is unaffected by the system units settings. This may be set to m3/s, CFM, KCFM, or ft3/s.

If you have a Climatrax Pro probe accessory on your system, you will see an additional list of available items that the analog ports may be set to output, such as probe temperature, humidity, pressure, wet bulb and air density**.** Below this, if you have any other devices that are connected and remapped by the Pro, those variables will be available in this list as options to output over analog.

8.3.4 Alarms and Relays

This page appears similar to the Analog Output screen and allows you to configure the two relay output channels on the Pro (Figure 26). Like the Analog Output, the desired parameter to trigger the relay may
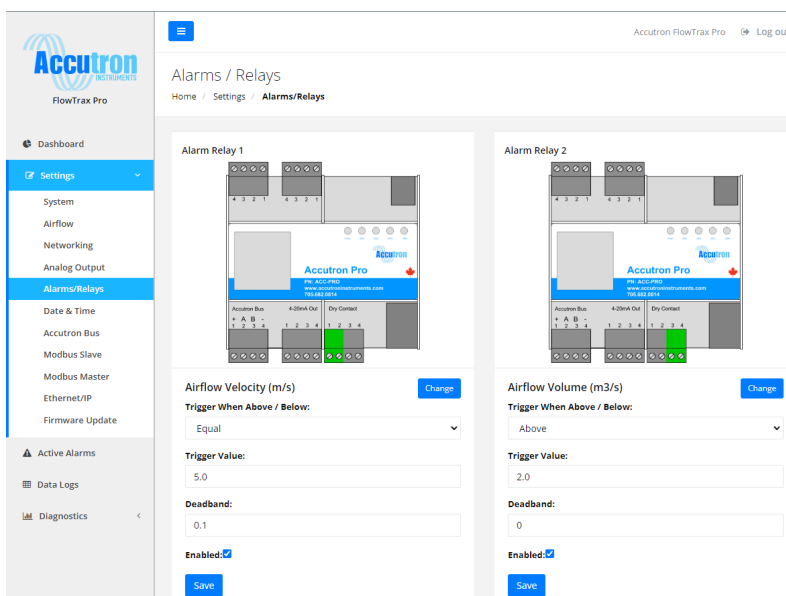

Figure 26: Alarm and Relay Configuration

be set by clicking the blue "Change" button. The "Trigger When Above/Below" setting allows you to configure if the relay will trigger either above, below, or at your trigger value. The "Trigger Value" setting allows you to set what the trigger value will be. Depending on your set trigger parameter, the units of the trigger value will be based on what the Pro device is set to in previous menus. The "Deadband" setting allows you to set a dead band for your relay trigger value. The relay will trigger at the exact trigger value if the proper conditions are met and will stay active while the variable is within the trigger value +/- the dead band value, depending on the trigger condition. For example, if the relay is configured to trigger when the airflow is above 5.0, with a dead band of 0.1, then the relay will trigger once the airflow reaches 5 (the units depend on what the system units are set to). The relay will stay active while the airflow remains at or above this value and will disable once the airflow drops below 4.9. The "Enabled" check box allows you to easily activate or deactivate the alarm relay. Click the blue "Save" button to save the settings. The same output options are available as the Analog Outputs, with the addition of the '**Transducer Tilt Alarm**'. This can be mapped to a relay output by setting the trigger parameter to '**Equal**', the trigger value to 1, and the dead band to 0. When a transducer tilt alarm is triggered, this will cause the relay to activate, and will remain active until the transducers are realigned and the alarm is cleared.

8.3.5 Date and Time

This page allows you to configure the date and time settings on your Accutron Pro (figure 27). This information is used for time stamping data logs.

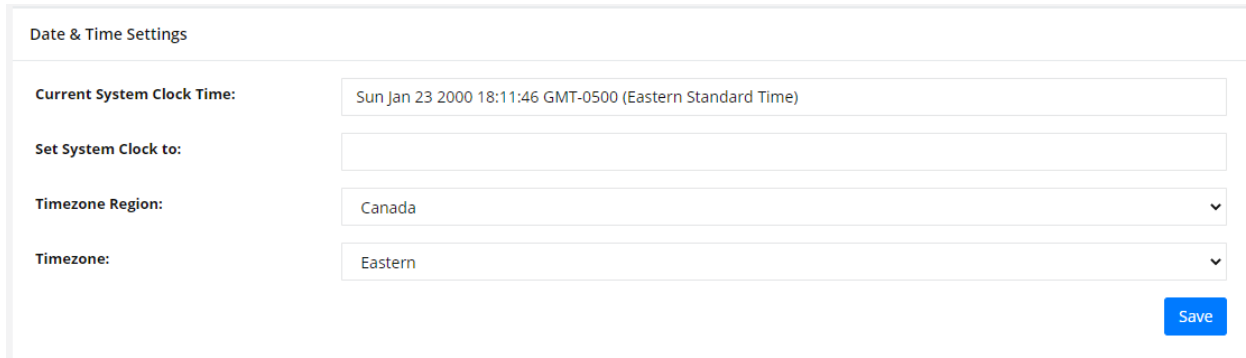| Date & Time Settings	
Current System Clock Time:	Sun Jan 23 2000 18:11:46 GMT-0500 (Eastern Standard Time)
Set System Clock to:	
Timezone Region:	Canada
Timezone:	Eastern

Save

Figure 27: Date and Time Settings

8.3.6 Accutron Bus

This page allows you to see all of the Accutron devices working in conjunction with your transducers, such as the Climatrax Pro probe. From here you can change the name of your device as its shown on the dashboard or delete it from the registry.

Accutron Bus

Home / Settings / **Accutron Bus**

Accutron Climate Probe Pro 0 [Refresh] [Delete]

Accutron Climate Probe Pro 0 [Rename]

Variable	Register	Value
Temperature	40017	22.10C
Relative Humidity	40019	44.24%
Air Pressure	40021	982.13mb
Wet Bulb	40023	14.54C

8.3.7 Modbus Slave

This page is used to configure Modbus RTU & TCP Slave settings. The Modbus Register Map can be found on this page. More details are provided in the section 9 below.

8.3.8 Modbus Master

This page is used to configure the Pro as a Modbus Master. More details are provided in the section 10 below.

8.3.9 EtherNet/IP

This page displays the configuration settings for EtherNet/IP. You can also find a list of available registers and their input assembly description on this page. More details are provided in the section 11 below.

8.3.10 Firmware Update

This page allows you to upload firmware updates to your Pro System remotely. Select the firmware update file (Provided from Accutron) and click on the corresponding update button of which device you would like to update. **It is recommended that you consult with an Accutron technician before attempting a firmware update. Incorrectly updating the device firmware could result in permanently locking up your system, requiring it to be sent back to Accutron Instruments for repair/replacement.**

8.4 Active Alarms

The Active Alarms page displays any system alarms that have not been dismissed. This will display any incidents of the transducers being misaligned, as well as when relays are tripped. The alarms can be dismissed by clicking the red '**Dismiss**' button. All active alarms can be easily dismissed by clicking '**Dismiss All**' at the bottom of the list.
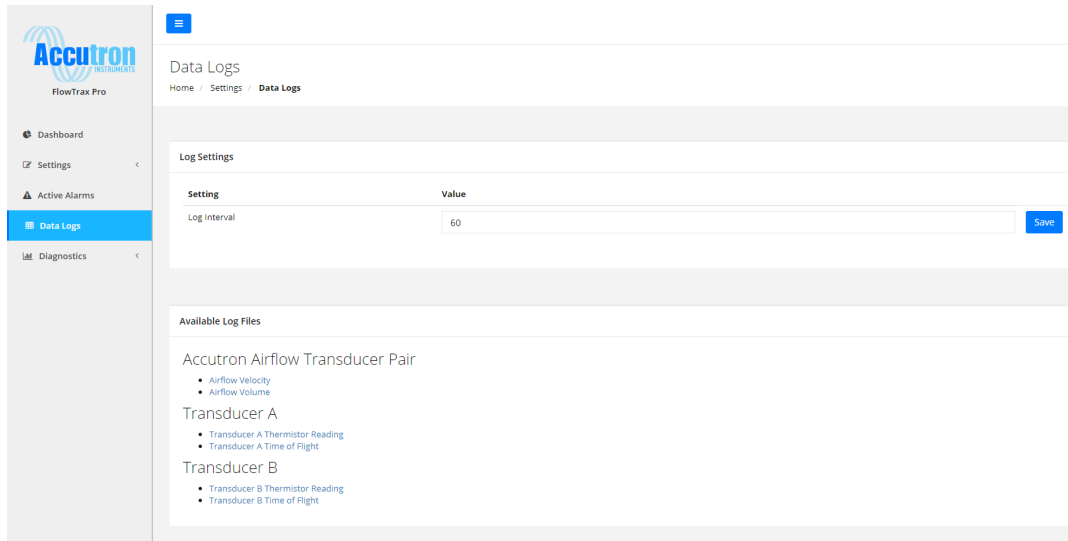
8.5 Data Logs

Figure 28: Data Logs Web Page

The Data Logs page (figure 28) allows you to view the data logs stored on the system, as well as control the log interval and enable/disable what parameters you wish to store (figure 29). The System must be reset after changing the data log interval for the setting to take effect. Note: The system can not log files faster than it can measure them. The Accutron Bus records airflow measurements every 2 seconds, and Modbus sample rates are based on user configuration.
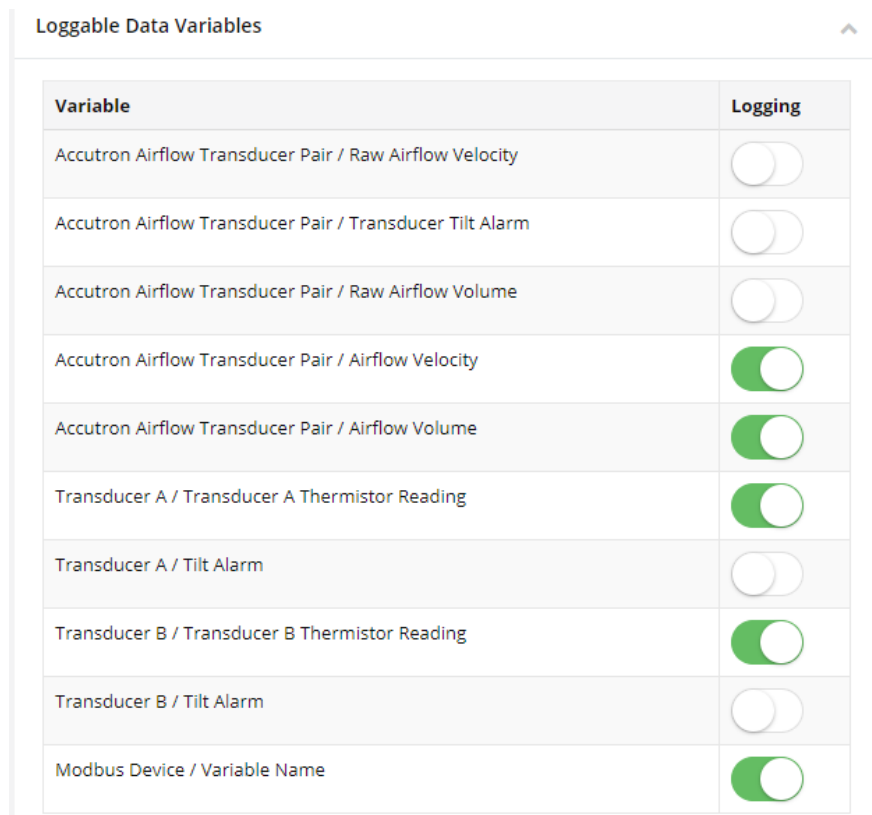

Figure 29: Toggling Desired Data to be Saved

Under '**Loggable Data Variables**', the desired data variables can be enabled or disabled by toggling the switch buttons next to the variable name.

Stored Log Files can be downloaded by right-clicking on the blue text under '**Available Log Files**' and selecting '**Save link as…**'. This will open a new window, prompting you to save the log file as a '.csv' file (figure 30), which can be viewed in a program such as Microsoft Excel.
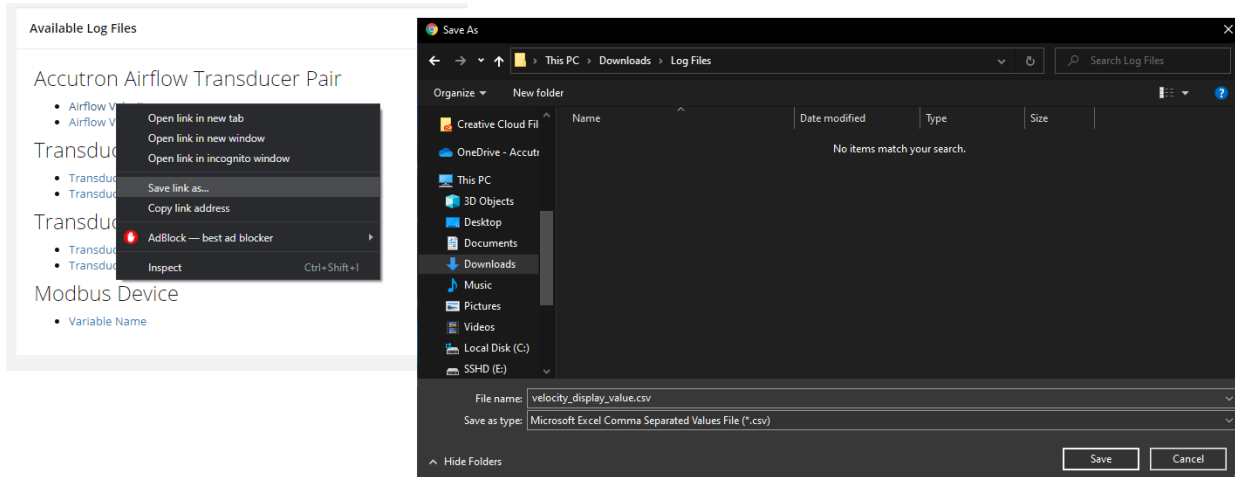

Figure 30: Saving a Data Log File

Data logs are kept in monthly intervals, for a maximum of two months. The current month's data logs are available to download through the webpage, and last month's data can be extracted from the SD Card on the Pro Module. It is recommended to power down the Pro before removing the SD Card. Logs roll over at the start of each month.

8.6 Diagnostics

The Diagnostics tab allows you to access the '**Airflow Waveforms**' and '**System Statistics**' diagnostics pages.

8.6.1 Airflow Waveforms

The Airflow Waveforms page allows you to run system diagnostics and obtain waveform samples of the system. This helps identify any issues with the install, such as issues with the gain settings or if noise is present. **It is recommended to consult with an Accutron Technician if diagnostics are required.**

8.6.2 System Statistics

This displays various system statistics such as system uptime, as well as many system variables. This is mainly used for advanced system troubleshooting by Accutron Technicians.

Section 9: Modbus Slave Settings

Click on '**Settings'** to open the settings menu, and then click '**Modbus Slave**' to open the Modbus Slave Settings screen (figure 31).
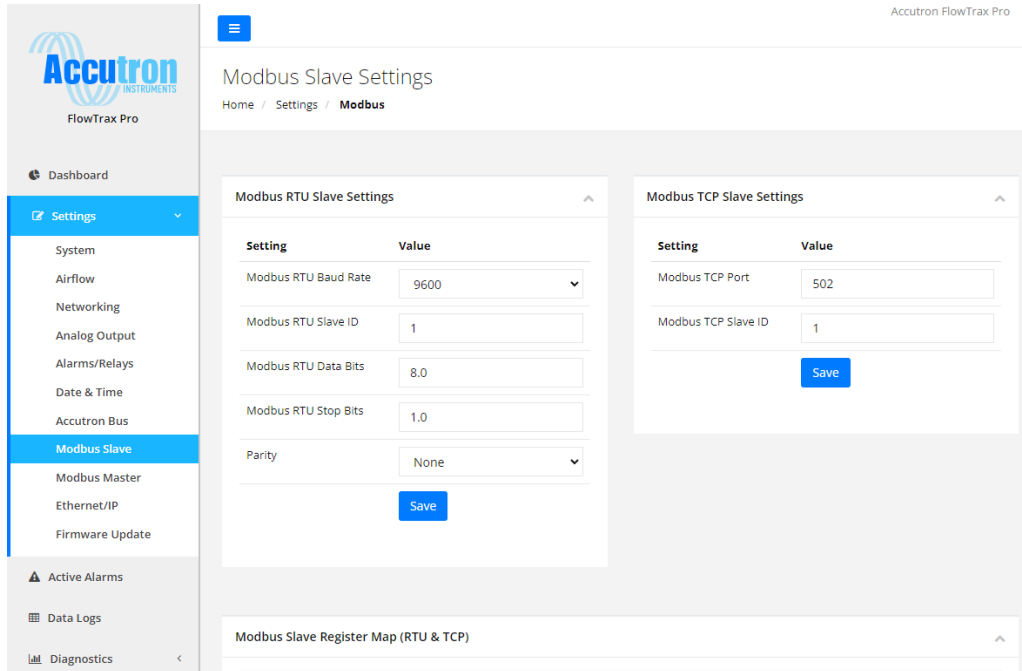

Figure 31: Modbus Slave Settings

Here you can configure the Modbus RTU Slave settings and the Modbus TCP Slave settings.

Under the Modbus RTU Slave Settings, you can configure:

➢ Modbus RTU Baud Rate
➢ Modbus RTU Slave ID
➢ Modbus RTU Data Bits
➢ Modbus RTU Stop Bits
➢ Modbus RTU Slave Parity

Under Modbus TCP Slave Settings, you can configure:

➢ Modbus TCP Port: TCP port number, default is 502
➢ Modbus TCP Slave ID: Slave ID, default is 1.

The '**Modbus Slave Register Map (RTU&TCP)'** shows what each register on the Accutron Pro is mapped to (Table 2).

9.1 Modbus Register Map

Base unit mapping

Table 2: Modbus Registers

Register	Device/Data Point	Type	Size (Bits)	Size (Registers)	Read/Write
40000	FlowTrax/Airflow Velocity (m/s)	Float32	32	2	Read/Write
40002	FlowTrax/Airflow Velocity (ft/s)	Float32	32	2	Read/Write
40004	FlowTrax/Airflow Velocity (ft/min)	Float32	32	2	Read/Write
40006	FlowTrax/Airflow Volume (m3/s)	Float32	32	2	Read/Write
40008	FlowTrax/Airflow Volume (CFM)	Float32	32	2	Read/Write
40010	FlowTrax/Airflow Volume (KCFM)	Float32	32	2	Read/Write
40012	FlowTrax/Mass Airflow (Kg/s)	Float32	32	2	Read/Write
40014	FlowTrax/Mass Airflow (lb/s)	Float32	32	2	Read
40016	Transducer A/Temperature (C)	Float32	32	2	Read

Register	Device/Data Point	Type	Size (Bits)	Size (Registers)	Read/Write
40018	Transducer B/Temperature (C)	Float32	32	2	Read
40020	Transducer A/Temperature (F)	Float32	32	2	Read
40022	Transducer B/Temperature (F)	Float32	32	2	Read
40048	FlowTrax/Transducer Face-to-Face distance (Calculated) (m)	Float32	32	2	Read
40050	Analog (4-20mA) Output/Analog Channel 1 Output (mA) (mA)	Float32	32	2	Read
40052	Analog (4-20mA) Output/Analog Channel 2 Output (mA) (mA)	Float32	32	2	Read
40054	Accutron FlowTrax Pro/Airflow System Heartbeat	Int16	16	1	Read/Write
40055	FlowTrax/Flow Velocity (x100) (m/s)	Int16	16	1	Read
40056	FlowTrax/Flow Velocity (x100) (ft/s)	Int16	16	1	Read
40057	FlowTrax/Flow Velocity (x10) (ft/min)	Int16	16	1	Read
40058	FlowTrax/Flow Volume (x100) (m3/s)	Int16	16	1	Read

Register	Device/Data Point	Type	Size (Bits)	Size (Registers)	Read/Write
40059	FlowTrax/Flow Volume (x10) (CFM)	Int16	16	1	Read
40060	FlowTrax/Flow Volume (x100) (KCFM)	Int16	16	1	Read
40061	FlowTrax/Mass Airflow (x10) (Kg/s)	Int16	16	1	Read
40062	FlowTrax/Mass Airflow (x10) (lb/s)	Int16	16	1	Read
40063	Transducer A/Temperature (x100) (C)	Int16	16	1	Read
40064	Transducer B/Temperature (x100) (C)	Int16	16	1	Read
40065	Transducer A/Temperature (x100) (F)	Int16	16	1	Read
40066	Transducer B/Temperature (x100) (F)	Int16	16	1	Read
41000	Accutron FlowTrax Pro/System Error Code	Int16	16	1	Read/Write
41001	Accutron FlowTrax Pro/Modbus Master Device Error Code	Int16	16	1	Read
41002	Accutron FlowTrax Pro/Accutron Bus Device Error Code	Int16	16	1	Read

Register	Device/Data Point	Type	Size (Bits)	Size (Registers)	Read/Write
41003	Accutron FlowTrax Pro/System Communications Heartbeat	Int16	16	1	Read

Additional Devices

Additional devices slave registers will be added after the base unit mapping in the 40000 range, in the order that the device was added or auto discovered. The Modbus Slave Registers are dynamic, after adding a device to the Accutron bus, or to the Modbus Master page, reload this page to see the changes. 41000 registers provide error checking as 16-bit arrays (Table 3). The error definitions are as such:

Table 3: Additional Devices

On Demand (1 read)	41001	Diagnostics (16 bits)	Definition
Bit	0	4-20mA #1 fault (over / under range)	Out of Range = 1
Bit	1	4-20mA #2 fault (over / under range)	Out of Range = 1
Bit	2	Relay #1 triggered	On =1 ; Off=0
Bit	3	Relay #2 triggered	On =1 ; Off=0
Bit	4	First Airflow Set - Tilt sensor A	On =1 ; Off=0
Bit	5	First Airflow Set - Tilt sensor B	On =1 ; Off=0
Bit	6	First Airflow Set - Signal Loss	On =1 ; Off=0
Bit	7	Not Used	
Bit	8	Not Used	
Bit	9	Not Used	
Bit	10	Not Used	
Bit	11	Not Used	
Bit	12	Not Used	
Bit	13	Bus Error	On =1 ; Off=0
Bit	14	Discovering	On =1 ; Off=0
Bit	15	Modbus Master Error	Loss of Device = 1 ; Good = 0
	41002	Modbus Master Diagnostics (16 bits)	
Bit	0	Device 1	Loss of Device = 1 ; Good = 0
Bit	1	Device 2	Loss of Device = 1 ; Good = 0

Bit	2	Device 3	Loss of Device = 1 ; Good = 0
Bit	3	Device 4	Loss of Device = 1 ; Good = 0
Bit	4	Device 5	Loss of Device = 1 ; Good = 0
Bit	5	Device 6	Loss of Device = 1 ; Good = 0
Bit	6	Device 7	Loss of Device = 1 ; Good = 0
Bit	7	Device 8	Loss of Device = 1 ; Good = 0
Bit	8	Device 9	Loss of Device = 1 ; Good = 0
Bit	9	Device 10	Loss of Device = 1 ; Good = 0
Bit	10	Device 11	Loss of Device = 1 ; Good = 0
Bit	11	Device 12	Loss of Device = 1 ; Good = 0
Bit	12	Device 13	Loss of Device = 1 ; Good = 0
Bit	13	Device 14	Loss of Device = 1 ; Good = 0
Bit	14	Device 15	Loss of Device = 1 ; Good = 0
Bit	15	Device 16	Loss of Device = 1 ; Good = 0
	41003	**Accubus Diagnostics (16 bits)**	
Bit	0	Device 1	Loss of Device = 1 ; Good = 0
Bit	1	Device 2	Loss of Device = 1 ; Good = 0
Bit	2	Device 3	Loss of Device = 1 ; Good = 0
Bit	3	Device 4	Loss of Device = 1 ; Good = 0
Bit	4	Device 5	Loss of Device = 1 ; Good = 0
Bit	5	Device 6	Loss of Device = 1 ; Good = 0
Bit	6	Device 7	Loss of Device = 1 ; Good = 0
Bit	7	Device 8	Loss of Device = 1 ; Good = 0
Bit	8	Device 9	Loss of Device = 1 ; Good = 0
Bit	9	Device 10	Loss of Device = 1 ; Good = 0
Bit	10	Device 11	Loss of Device = 1 ; Good = 0
Bit	11	Device 12	Loss of Device = 1 ; Good = 0
Bit	12	Device 13	Loss of Device = 1 ; Good = 0
Bit	13	Device 14	Loss of Device = 1 ; Good = 0
Bit	14	Device 15	Loss of Device = 1 ; Good = 0
Bit	15	Device 16	Loss of Device = 1 ; Good = 0

Section 10: Modbus Master Settings

This page (figure 32) is used to configure the Pro as a Modbus Master. When the Pro operates as a Master, the values from the Slave Devices can be viewed on the Dashboard webpage. The Pro will also remap the Slave Modbus RTU devices over to Modbus TCP.

Click the '**Settings'** button to expand the menu. Click '**Modbus Master'**. Here you can configure your devices Modbus RTU Master settings such as baud rate, data pits, stop bits and parity bits.
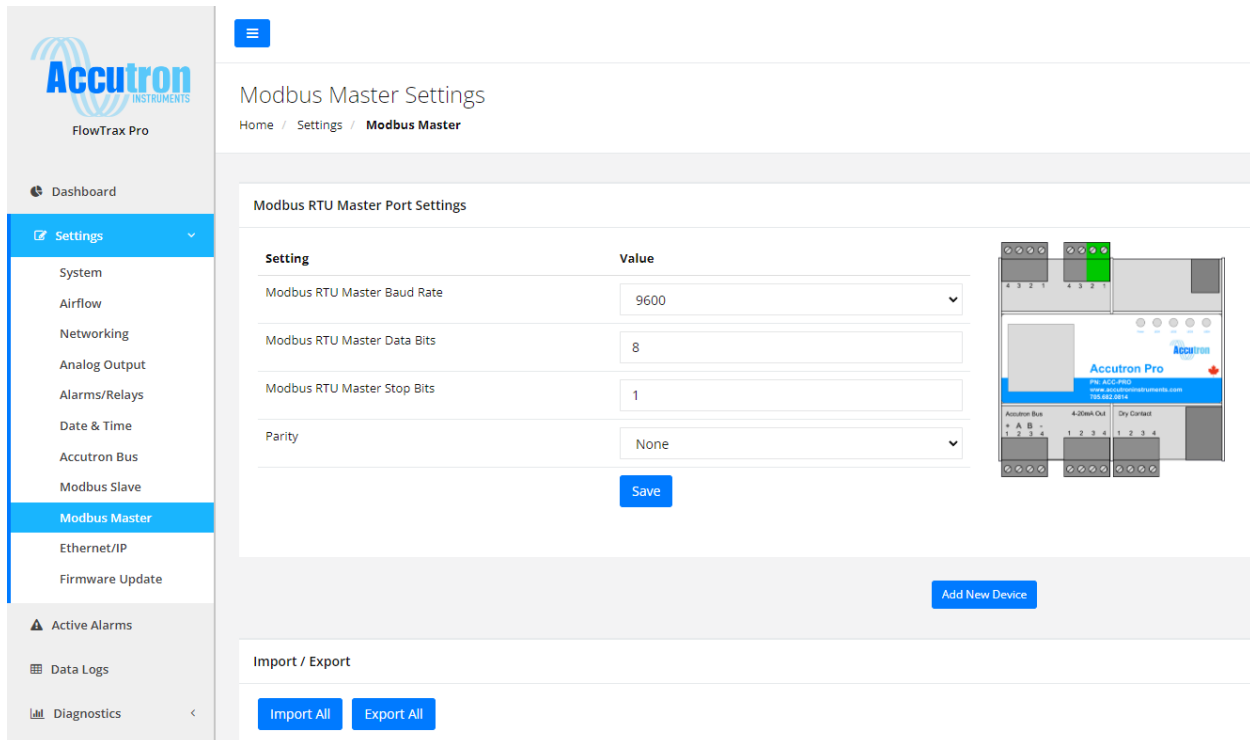

Figure 32: Modbus Master Settings

Here you can configure the Modbus RTU Master Port settings to match those of the Modbus Slave RTU devices connected to the Pro.

Under the Modbus RTU Master Port Settings, you can configure:

- ➢ Modbus RTU Baud Rate
- ➢ Modbus RTU Data Bits
- ➢ Modbus RTU Stop Bits
- ➢ Modbus RTU Slave Parity

Click '**Add New Device'** to begin adding new Modbus Slave devices. The New Modbus Device window will appear with entry fields for device description, Modbus address and update interval (figure 33).
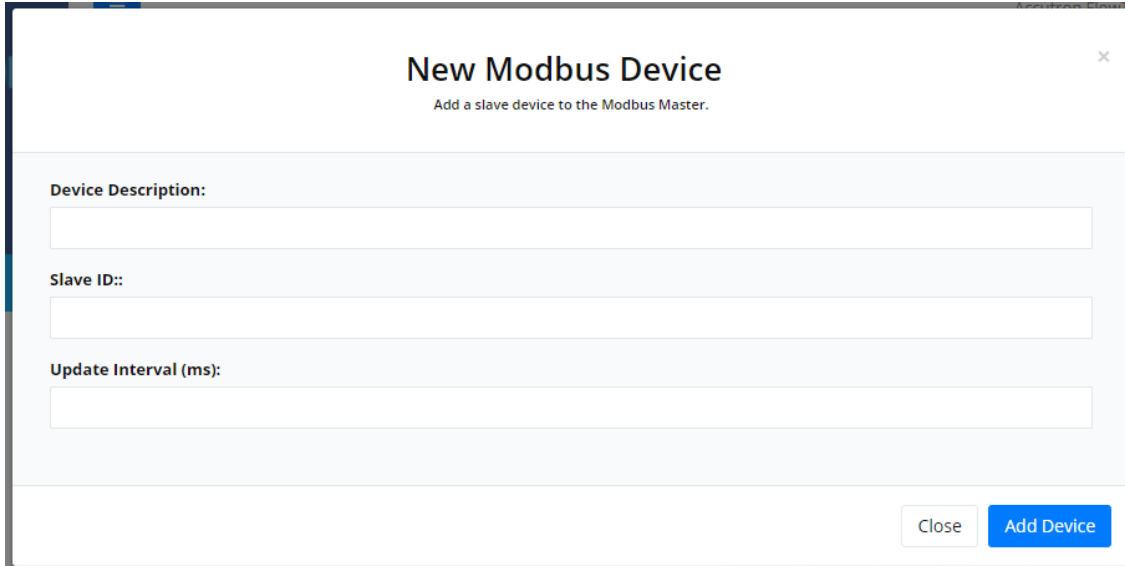
Figure 33: Adding a New Modbus Device

Device Description: Name giving to the device

Slave ID: Modbus Address set on the device.

Update Interval: 1000 ms is the recommended minimum

Clicking add will save the device and give the option to add register information in the next window (figure 34).
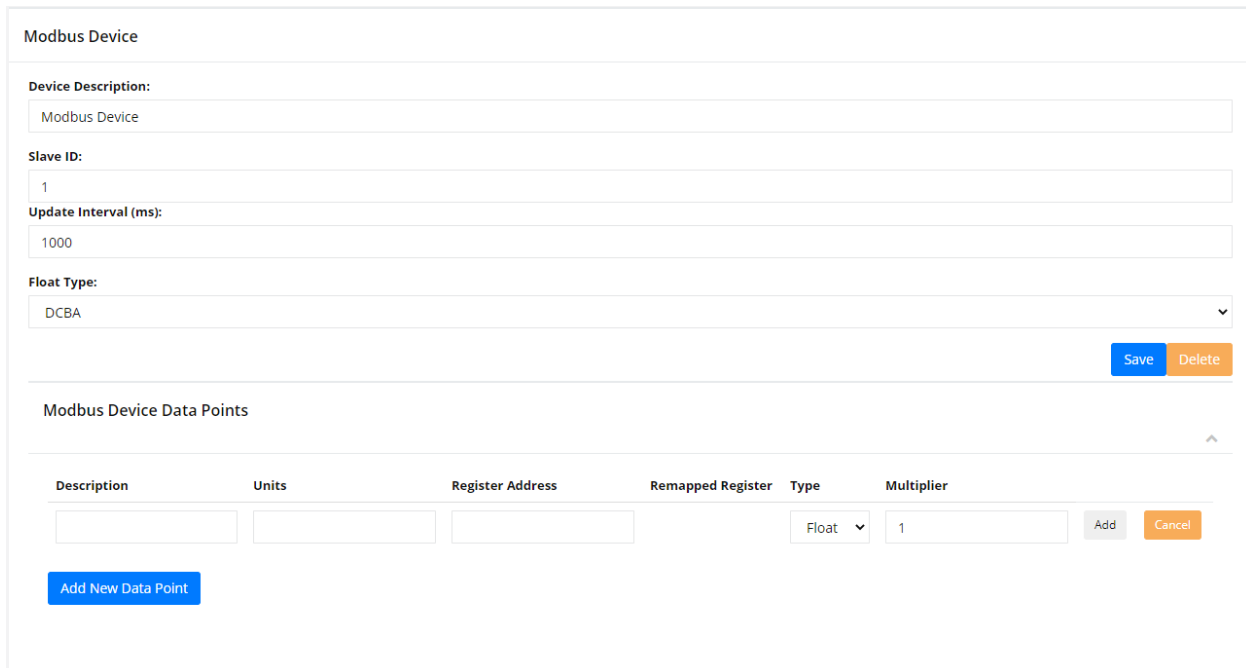

Figure 34: Defining a Modbus Device and Registers

Type in the blank fields or click '**Add New Data Point**' to add the devices Modbus registers information (figure 34).

Description: Enter a description of the register. (ex Temperature…)

Unit: Enter engineering units (ex mA, °C…) this field can be left blank.

Register: Modbus Register to read. (ex: 40001)

Type: Select the Modbus data type (Integer, Unsigned Integer, Float 32)

Float32 byte ordering can be changed by the "Float Type" drop down selector.

Multiplier: use this to scale the value

Fill in the fields and click '**Save Device'** to save changes. When saved the 'Remapped Register' field will be automatically filled in with the next available register and added to the Modbus Slave Register map. This field cannot be edited.
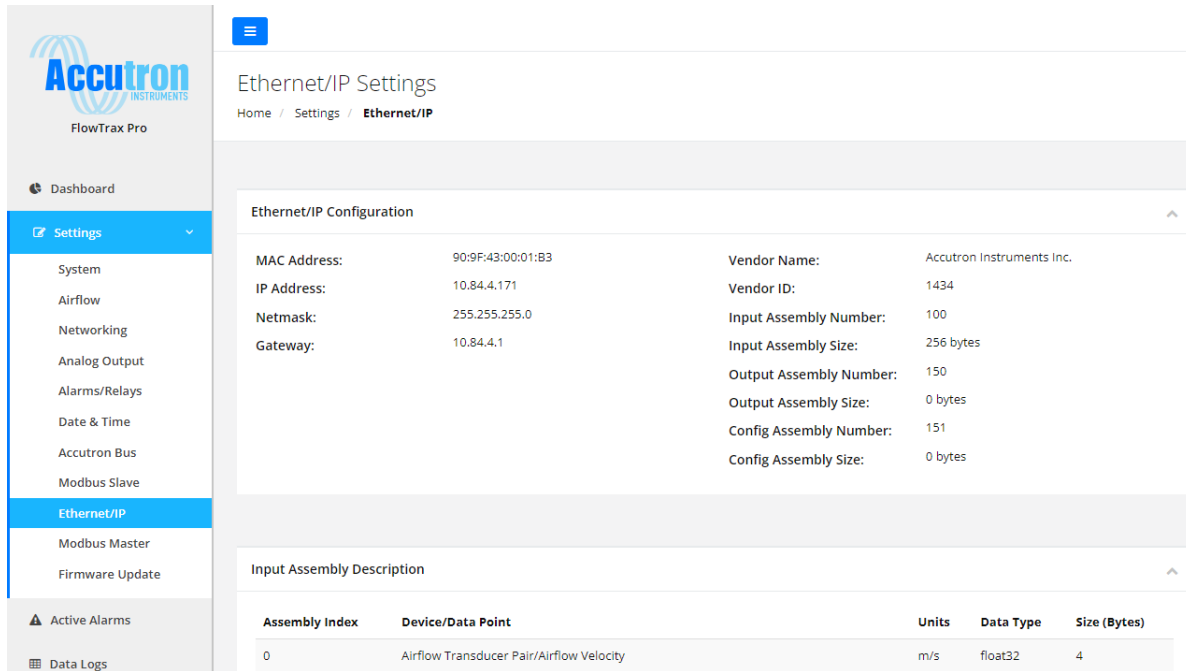

Figure 35: Modbus Device Data Points

Optionally you can import the Modbus template exported from another Pro device by clicking import. Simply fill in the Slave ID and Device Tag then click Save Device.

NOTE: The 'Units' section MUST be filled out when defining a new data point. If you wish to have a unitless data point, then press the spacebar once to insert a blank space.

Section 11: EtherNet/IP

The EtherNet/IP webpage (figure 35) will bring up the EtherNet/IP settings you need to configure your PLC with your Accutron Pro for EtherNet/IP communications, as well as the Assembly Index (table 4). Note that this option is only available for EtherNet/IP equipped devices. If you do not see this page on your device and require EtherNet/IP communications, please contact Accutron Instruments.

Figure 36: EtherNet/IP Settings

EtherNet/IP Instance Settings:

Vendor Name:	Accutron Instruments Inc.
Vendor ID:	1434
Input Assembly Number:	100
Input Assembly Size:	256 bytes
Output Assembly Number:	150
Output Assembly Size:	0 bytes
Config Assembly Number:	151
Config Assembly Size:	0 bytes

Table 4: EtherNet/IP Assembly Index:

Assembly Index	Device/Data Point	Units	Data Type	Size (Bytes)
0	Airflow Transducer Pair/Airflow Velocity	m/s	float32	4
4	Airflow Transducer Pair/Airflow Velocity	ft/s	float32	4
8	Airflow Transducer Pair/Airflow Velocity	ft/min	float32	4
12	Airflow Transducer Pair/Airflow Volume	m3/s	float32	4
16	Airflow Transducer Pair/Airflow Volume	CFM	float32	4
20	Airflow Transducer Pair/Airflow Volume	KCFM	float32	4
24	Airflow Transducer Pair/Mass Airflow	Kg/s	float32	4
28	Airflow Transducer Pair/Mass Airflow	lb/s	float32	4
32	Transducer A/Temperature	C	float32	4
36	Transducer B/Temperature	C	float32	4
40	Transducer A/Temperature	F	float32	4
44	Transducer B/Temperature	F	float32	4

Assembly Index	Device/Data Point	Units	Data Type	Size (Bytes)
48	Airflow Transducer Pair/Transducer Face-to-Face distance (Calculated)	m	float32	4
52	Analog (4-20mA) Output/Analog Channel 1 Output (mA)	mA	float32	4
56	Analog (4-20mA) Output/Analog Channel 2 Output (mA)	mA	float32	4
60	Accutron FlowTrax Pro/Airflow System Heartbeat		int16	2
62	Airflow Transducer Pair/Flow Velocity (x100)	m/s	int16	2
64	Airflow Transducer Pair/Flow Velocity (x100)	ft/s	int16	2
66	Airflow Transducer Pair/Flow Velocity (x10)	ft/min	int16	2
68	Airflow Transducer Pair/Flow Volume (x100)	m3/s	int16	2
70	Airflow Transducer Pair/Flow Volume (x10)	CFM	int16	2
72	Airflow Transducer Pair/Flow Volume (x100)	KCFM	int16	2
74	Airflow Transducer Pair/Mass Airflow (x10)	Kg/s	int16	2
76	Airflow Transducer Pair/Mass Airflow (x10)	lb/s	int16	2
78	Transducer A/Temperature (x100)	C	int16	2

Assembly Index	Device/Data Point	Units	Data Type	Size (Bytes)
80	Transducer B/Temperature (x100)	C	int16	2
82	Transducer A/Temperature (x100)	F	int16	2
84	Transducer B/Temperature (x100)	F	int16	2
86	Accutron FlowTrax Pro/System Error Code		int16	2
88	Accutron FlowTrax Pro/Modbus Master Device Error Code		int16	2
90	Accutron FlowTrax Pro/Accutron Bus Device Error Code		int16	2
92	Accutron FlowTrax Pro/System Communications Heartbeat		int16	2

Note that the system error output registers are formatted the same as the Modbus registers. See Table 3 at the end of section 9 for the error definitions.

As with Modbus registers, any registers added from remapped devices will appear at the bottom of this list. If you have additional devices connected to your Accutron Pro, please see the EtherNet/IP webpage for a full list of device registers available.

Section 12: Troubleshooting

1) **Why am I not seeing anything on the display?**
   a) Check power connections.
   b) Verify that the Green LED is lit.
   c) Ensure that the Accutron was not damaged in any way during shipping. If this is the case, please contact your supplier.

2) **What does the negative sign (-) mean on the display?**
   One of the important features of the Accutron is the ability to measure bi-directional airflows. A negative sign on the display is used to indicates this. This can be changed to show a positive value by changing the 'Airflow Direction' setting in the setup menu.

3) **Why am I getting a 4-20mA output of 3.5mA?**
   A 3.5mA output indicates the variable attached to the corresponding 4-20mA output is above the 'maximum' setting or below the 'minimum' setting. To disable this, enable the 'clip to range' option.

4) **What does the red / green light on the Transducer mean?**
   If the transducers are powered up correctly, the LED will be lit green. Each time a transducer sends out a pulse, this LED will flash orange.
   If the LED is blinking red/green this can indicate that the transducer was bumped out of alignment. Verify that the transducers are aligned and clear any tilt alarms in the system.
   This can also indicate that the transducer was left in identify mode. Verify this by checking on the web interface dashboard and see if the identify mode is enabled on any of the transducers.

5) **What does Bus Error mean?**
   Bus Error refers to the Accutron Bus. This error indicates one of the devices on the bus is not communicating. Ensure there is power to all connected Accutron Bus devices.

6) **What does Signal Loss / Transducer Signal Loss mean?**
   Signal Loss means that the instrument is rejecting readings acquired because there is a problem. This could be an obstruction like a vehicle parked between both sensors. If there is no physical obstruction, try increasing the system gain settings.

7) **I have everything connected and aligned properly, why am I not getting any airflow readings on my system?**
   Verify your system gain settings. Ensure that the gain setting is set to at least 4. If your sensors are father apart, you can try increasing the gain setting. Verify your face-to-face and baseline settings are set correctly.

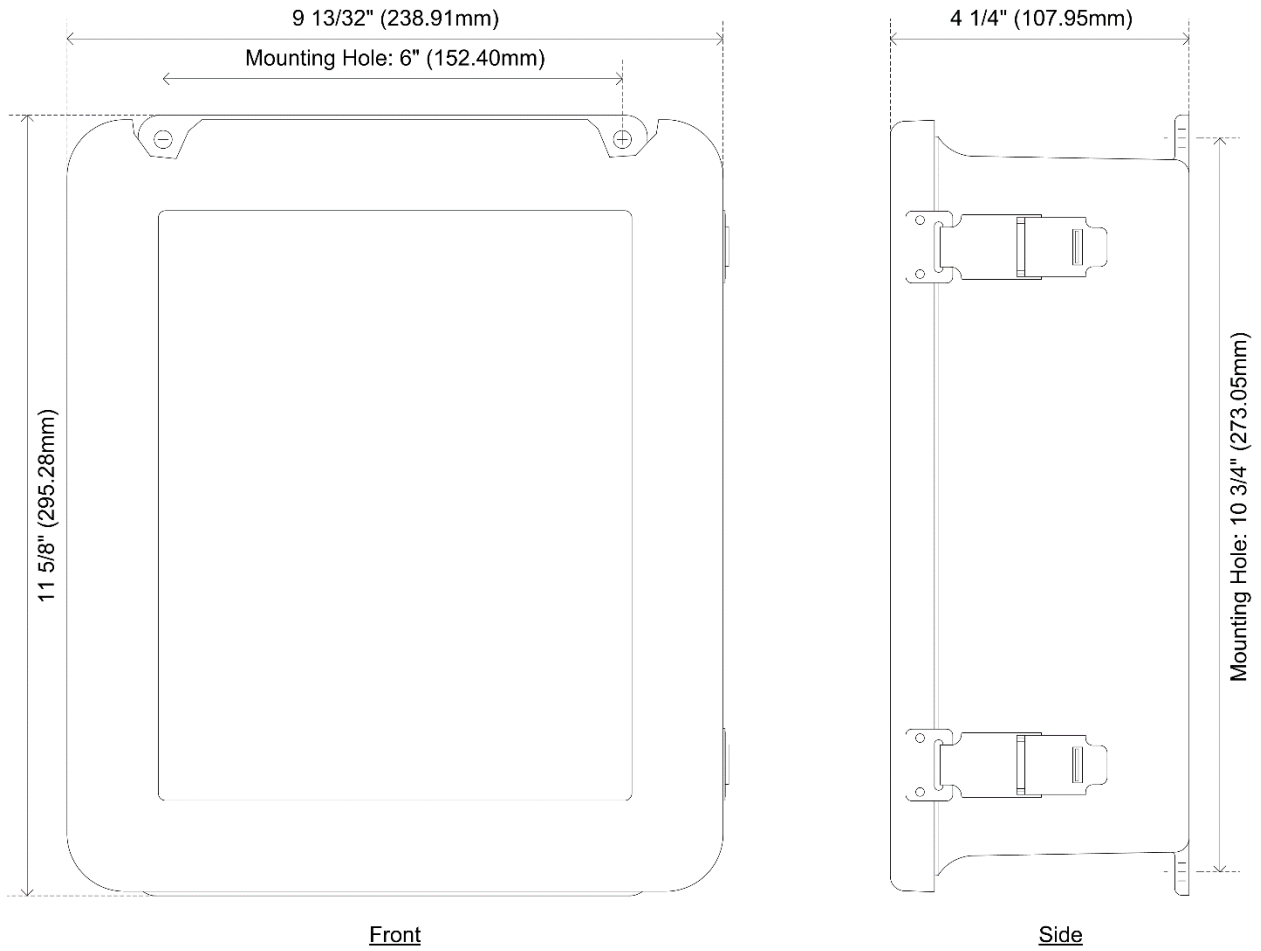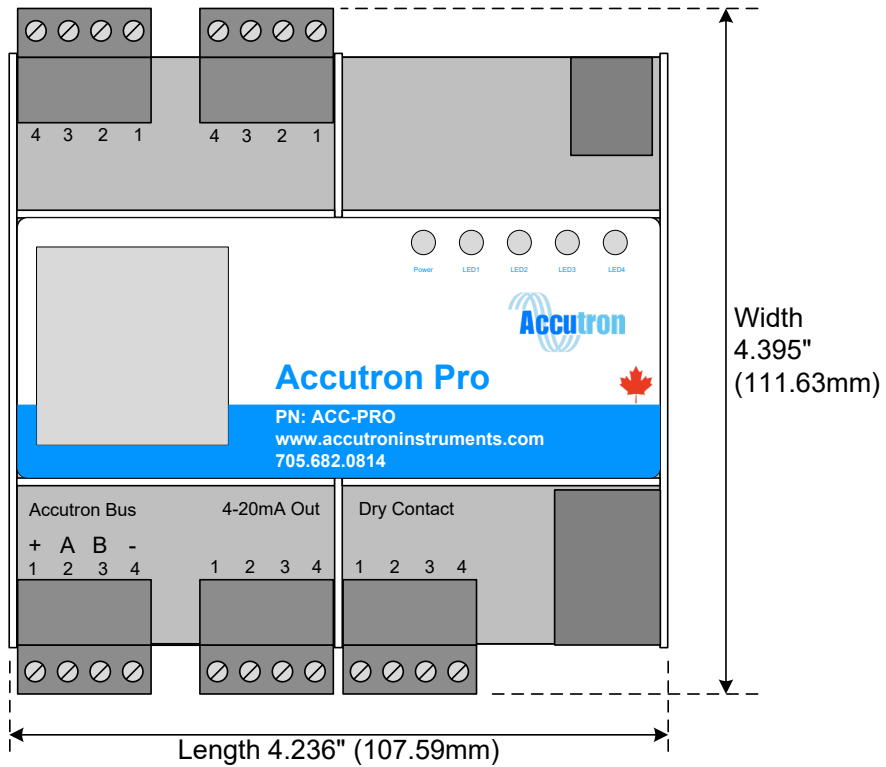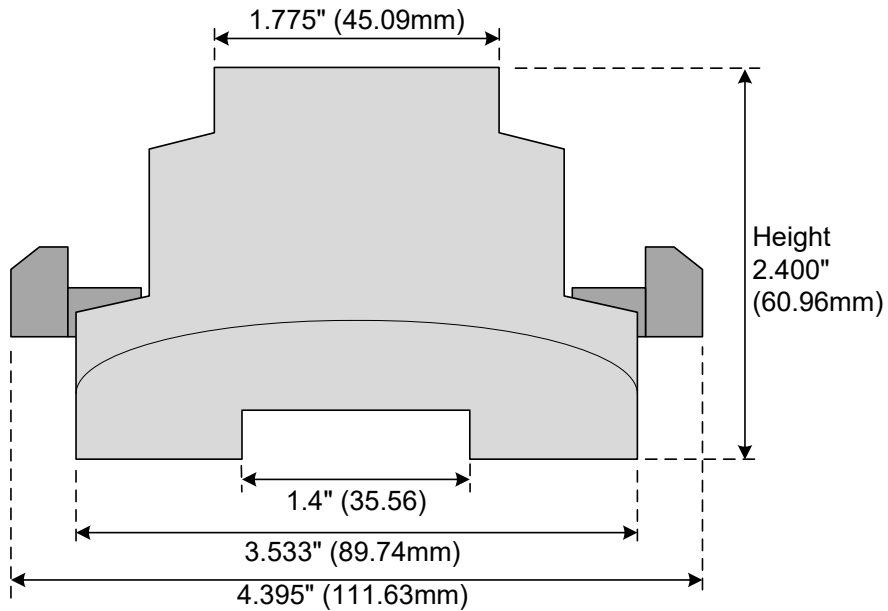# Appendix A: Drawings & Dimensions

Transmitter Enclosure

Figure 37: Transmitter Enclosure Dimensions

Accutron Pro Module

Width 4.395" (111.63mm)

Length 4.236" (107.59mm)

Top View

1.775" (45.09mm)

Height 2.400" (60.96mm)

1.4" (35.56)

3.533" (89.74mm)

4.395" (111.63mm)

Side View

Figure 38: Accutron Pro Module Dimensions
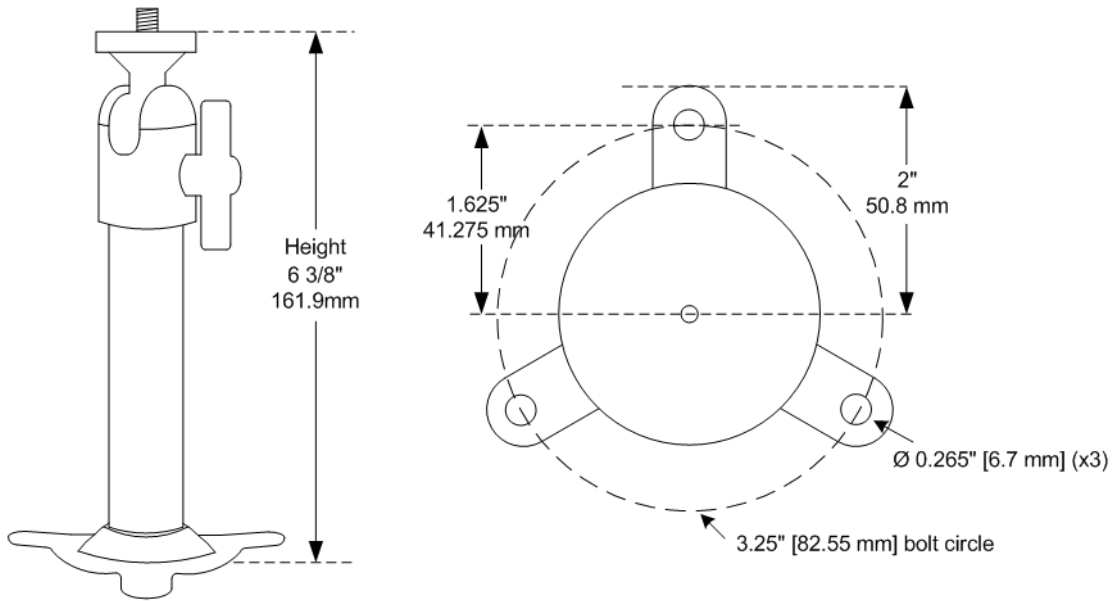
Drift Transducer Mount

Figure 39: Drift Transducer Mount

Tri-Foot Base (4"/101.6mm outside diameter with three 0.265"/6.7mm holes on a 3.25"/82.5mm bolt circle
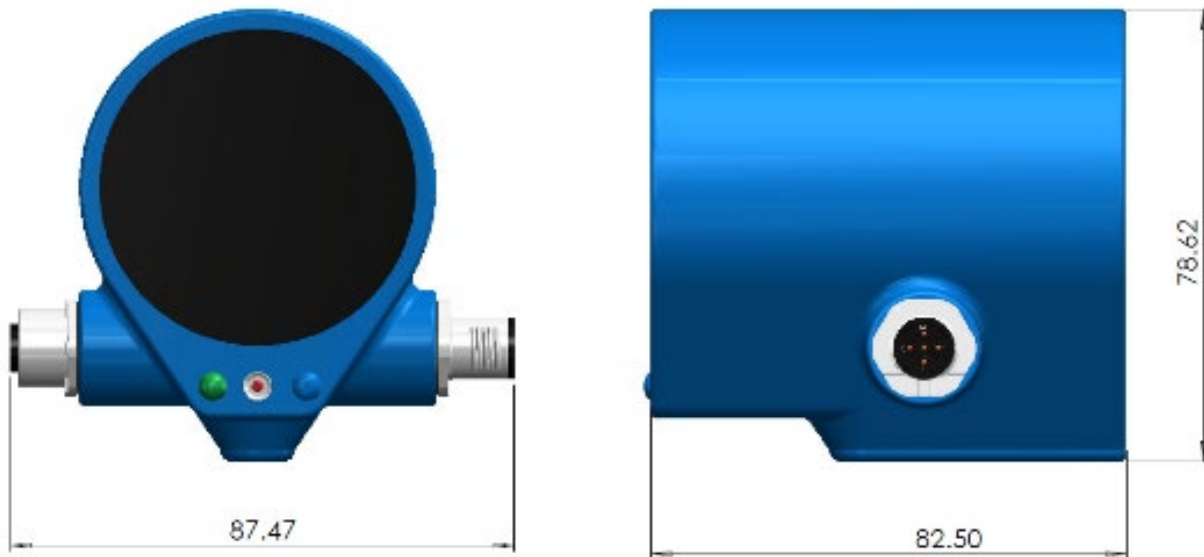
Drift Transducer

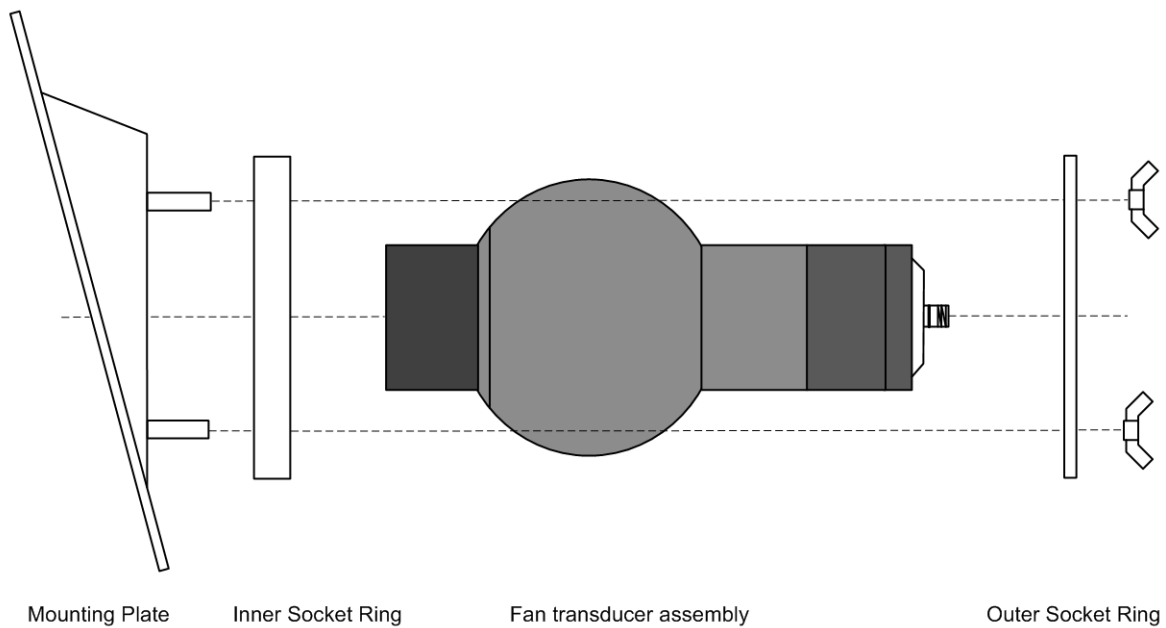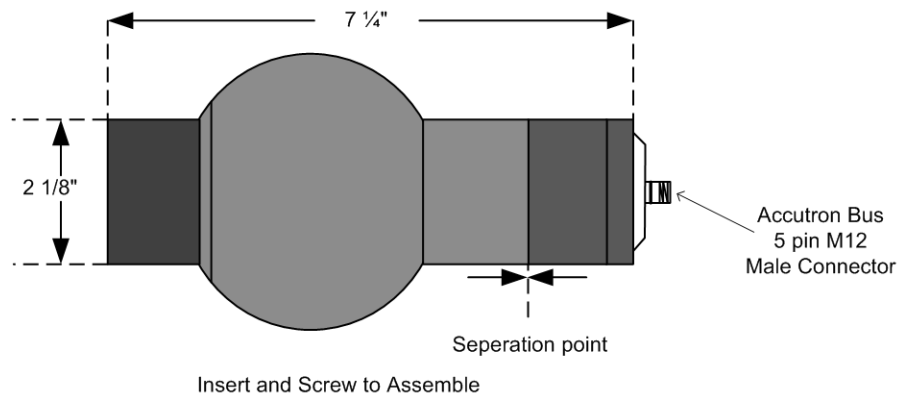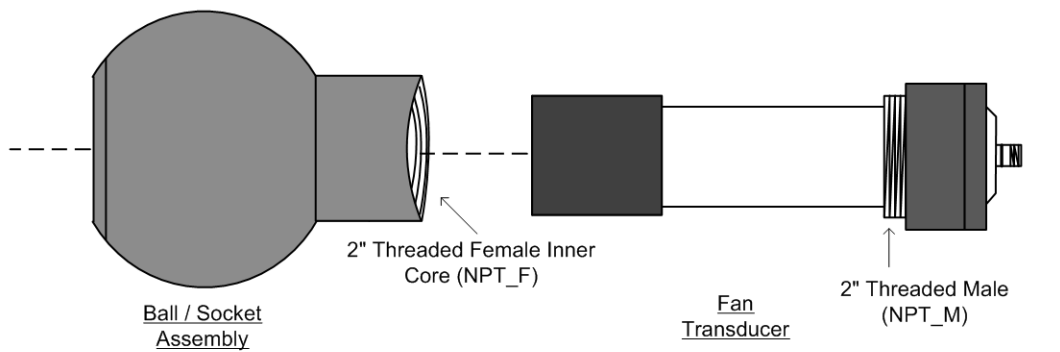*Figure 40: Drift Transducer Dimensions in mm*

Fan Transducer

Ball / Socket
Assembly

2" Threaded Female Inner
Core (NPT_F)

Fan
Transducer

2" Threaded Male
(NPT_M)

7 ¼"

2 1/8"

Accutron Bus
5 pin M12
Male Connector

Seperation point

Insert and Screw to Assemble

Mounting Plate   Inner Socket Ring   Fan transducer assembly   Outer Socket Ring

Figure 41: Fan Transducer Dimensions in inches

Stainless Steel Sensor Mounting Plate

12" (304.8 mm)

10" (254 mm)

Ø 1/2" Mounting Holes (X4)

Supplied Ø 6.75" Inner & Outer Socket Ring

Supplied Bolts and Wing Nuts 1/4" 20 UNC 2" Long

B

A

12" (304.8 mm)

10" (254 mm)

Customer Specified Radius

Detail B

15 DEGREE ELEVATION ANGLE

Detail A

Recommended Duct Cutout

Ø 1/2" Mounting Holes (X4)

10" (254 mm) C / C

8" (203.2 mm)

5" (127 mm) Typ
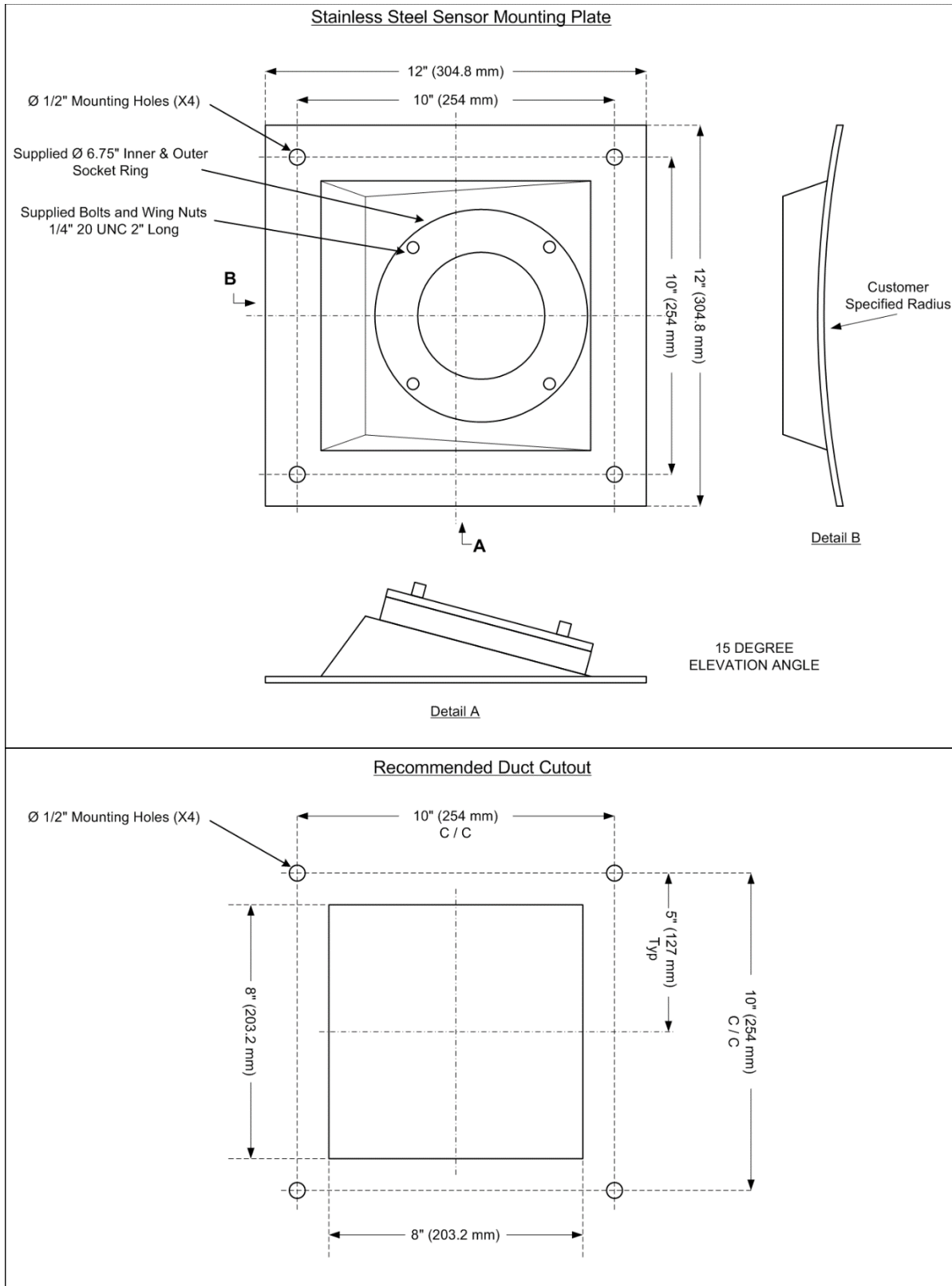
10" (254 mm) C / C

8" (203.2 mm)

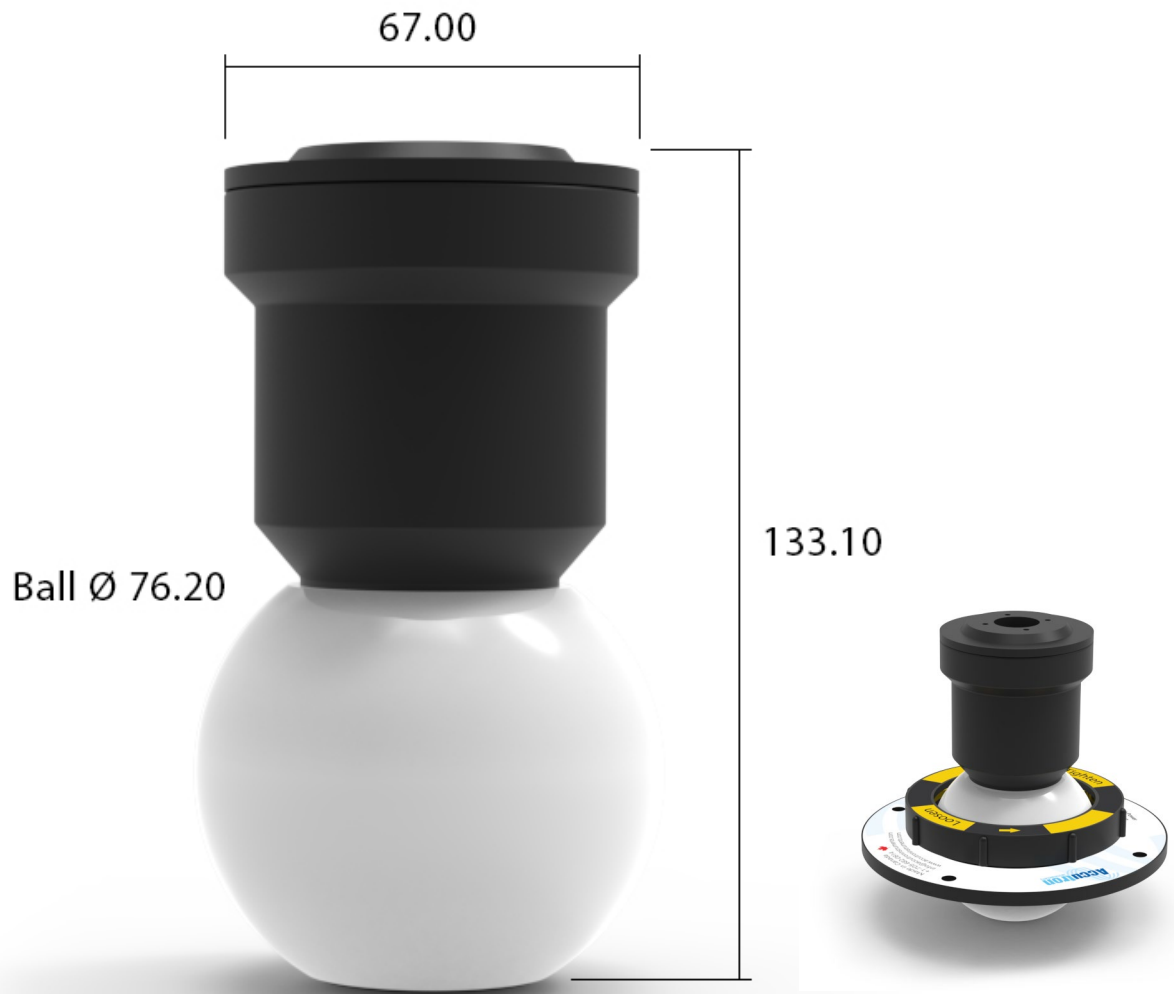*Figure 42: Stainless Steel Sensor Mounting Plate*

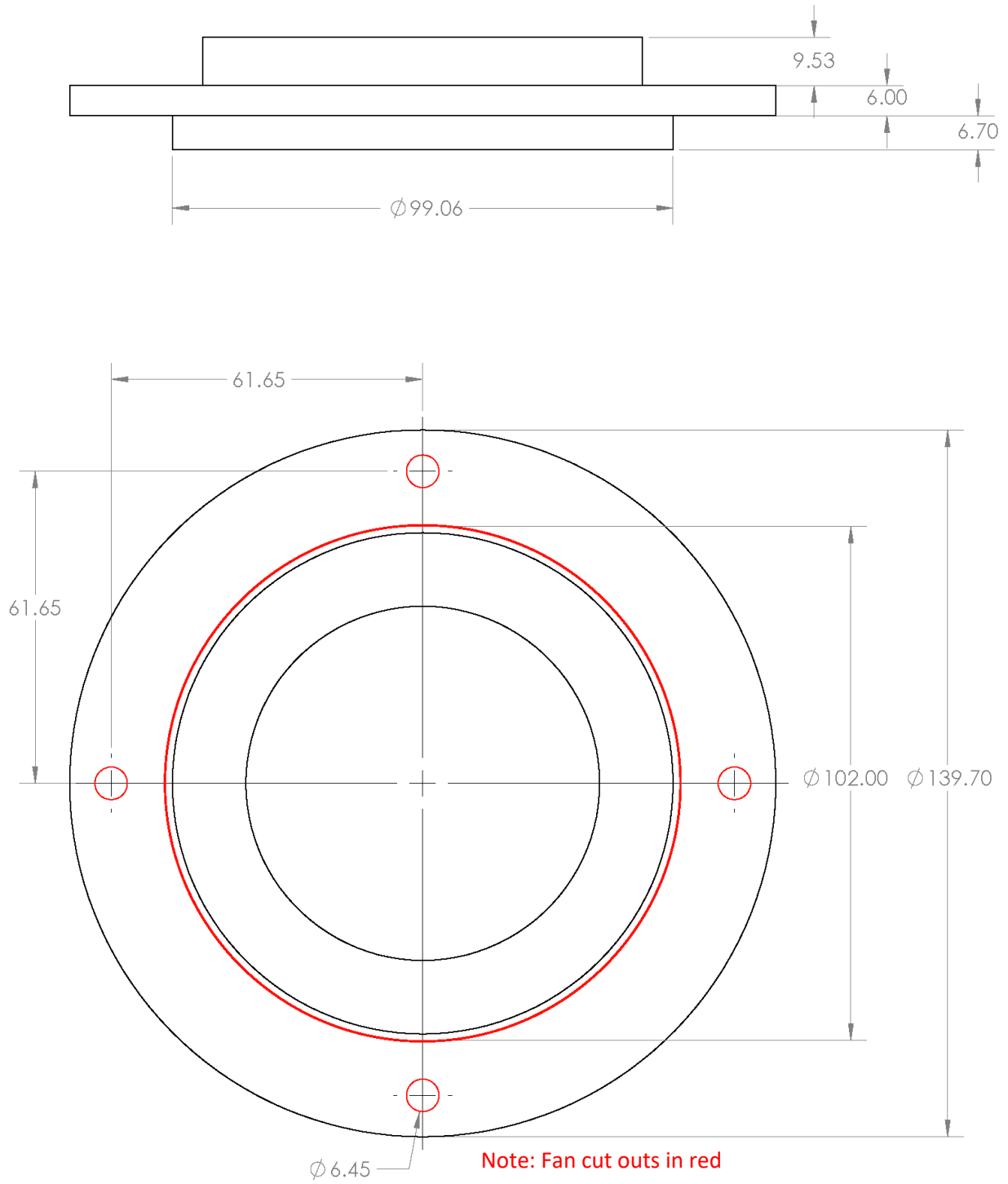*Figure 43: IDM Sensor Dimensions in mm*

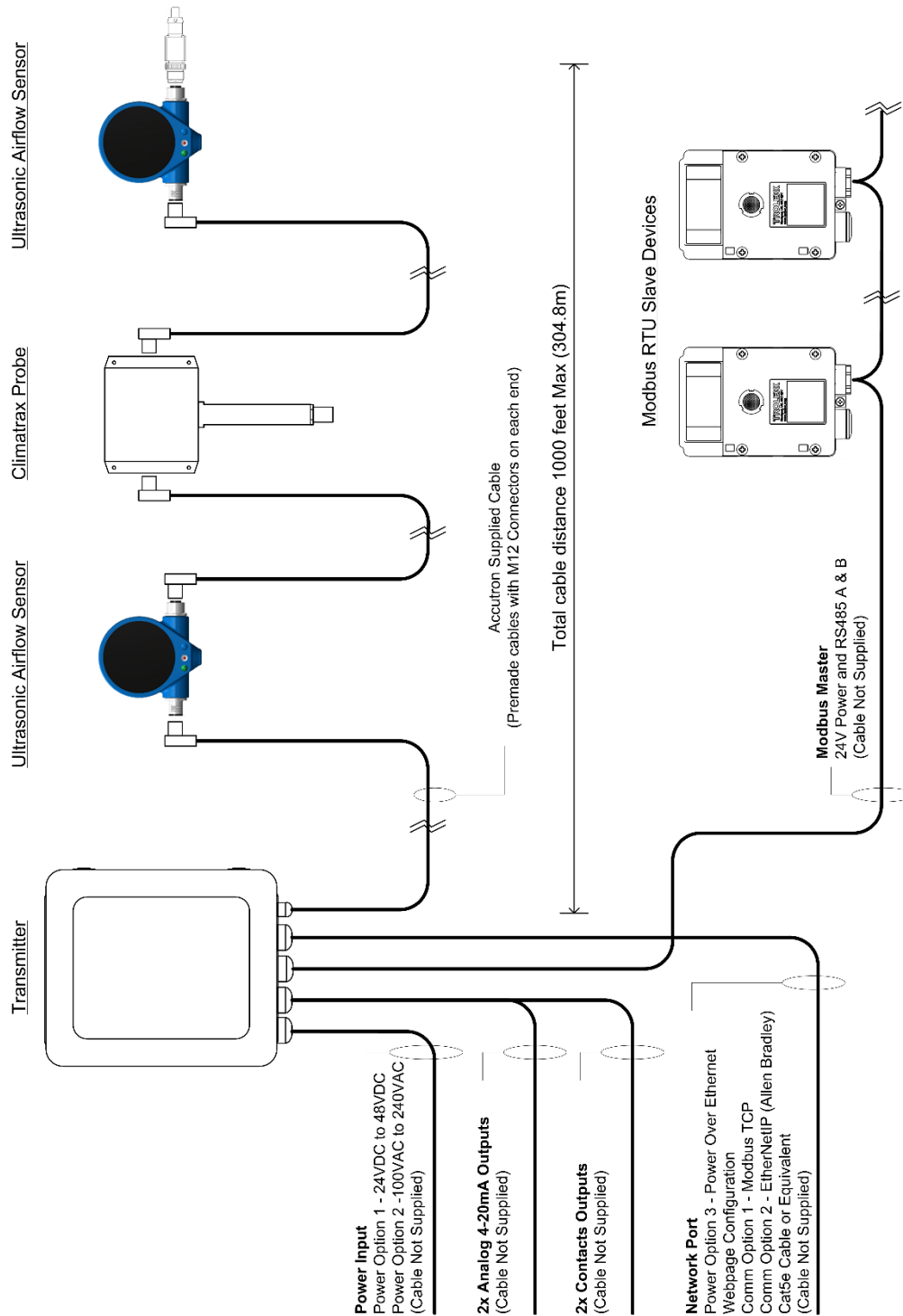*Figure 44: IDM Sensor Mount Dimensions in mm*

A.1 System Wiring Diagram

Figure 45: System Wiring Diagram

Appendix B: System Defaults

Setup > Airflow Setup	
System of measure	metric
Velocity units	m/s
Volume units	M3/s
Display mode	velocity
Flow Direction	normal
Moving Average	10
Analog > Channel 1	
Output Variable	Airflow Velocity
Minimum (mA)	-10
Maximum (mA)	10
Clip to range	off
Alarms > Relay 1	
Input Variable	Airflow Velocity
Trigger value	5
Deadband	0.1
Direction	increasing
Enabled	off
Modbus > RTU Settings	
RTU baud rate	9600
RTU slave ID	1
RTU data bits	8
RTU stop bits	1
RTU parity	None

Setup > Transducer Setup	
RX gain step	4
Filter mode	J filter
J Filter min Amp	700
J Filter Min Dur	0.3
Analog > Channel 2	
Output Variable	Airflow Volume
Minimum (mA)	-100
Maximum (mA)	100
Clip to range	on
Alarms > Relay 2	
Input Variable	tilt
Trigger value	1
Deadband	0
Direction	boolean
Enabled	off

Network	
Wired mode	Manual
Wired IP Address	192.168.1.100
Wired netmask	255.255.255.0
Wired gateway	192.168.1.1
Wifi enabled	Off
Wifi IP	192.168.2.100
Wifi netmask	255.255.255.0

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