Accutron IS

Technical Operations Manual

V2024.07.04

ACCIS-IECEX-SYS-001
ACCIS-IECEX-TXD-001-DR
ACCIS-IECEX-TXD-001-FN

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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.

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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 at info@accutroninstruments.com.

Table of Contents

Section 1: General Information

1.1 The Manual

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

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.

1.1 Safety Guidelines

Warning notices must be observed to ensure personal safety as well as that of others, and to protect the product and the connected equipment.

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.

Warning: This product can only function properly and safety if it is correctly transported, stored, installed, setup, operated and maintained.

Note: Always use product in accordance with specifications.

1.2 Information about your system

When you first receive your Accutron IS unit, be sure to record the following.

Table: 1.0 – Accutron Pro System Information

Accutron IS
Part Number (located behind door):
Serial Number (located behind door):
Code Version (located behind door):

Note: If you need to contact Customer Service, this information will be beneficial.

1.3 Accutron IS Series Specifications

Connections:	Screw terminal Block Type
Transducers:	3 ½" (Dia.) X 9 1/8" (L)
Display Readout:	16 Characters LCD display.
	Each digit is 0.57" (H) X 0.24" (W)
Power Consumption:	< 3.3 watts
Input Power:	10.8 - 12.6VDC
Modbus Input Power:	3.5 – 5.88 VDC
4-20 mA Input Power:	8.0 – 28.0 VDC
Display Units:	M/S, CFM, KCFM, M**3/S, FPM
Temperature range:	-40° to +60° Celsius
Accuracy:	2% FS or ± 0.05 M/S (whichever is greater)
Output type:	4-20mA
Output modes:	Normal, Reverse, or Split (used for bi-directional measurements)
Fault/Alarm Output:	(Not available)
Sensor cables:	100 feet STD (sensor-to-box). Custom cables up to 500ft.
Connectors:	Stainless Steel, with O-ring seals. IP68 rated.
Sensor Mounting:	Industrial CATV pan and tilt mount (non-aluminum)
Tunnel sizes:	Can accommodate a face-to-face distance of 70 feet.
Programming:	User interface onboard using navigation buttons.
Max Airflow:	0 to 40 m/s and higher (essentially no practical upper limit)
	Bi-directional
Enclosure Torque Requirements:	4.5 nm (40 in-lb)

Power Supply port parameters (J1): Ui = 12.6V, Ii = 2.5A, Ci = 0uF, Li = 0uH
Isolated Modbus port parameters (J3): Ui = 5.88V, Ii = 3.25A / 0.5A thermal, Ci =0.3uF, Li = 0uH
Isolated 4-20mA Output port parameters (J2): Ui = 28V, Ii = 2 A / 106mA thermal, Ci = 1uF, Li = 5uH, Pi = 0.65W

1.4 IS Certification Details

Certification:

IECEx QPS 21.0003X, IECEx MSC 21.0005X, QPS 21ATEX5001X

Standards:

IEC 60079-0:2017(Edition:7.0) - Explosive atmospheres - Part 0: Equipment - General requirements

IEC 60079-11:2011(Edition:6.0) - Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"

Markings:

Ex ia I Ma

-40°C ≤ Tamb ≤ 60°C

Section 2: Installation

2.1 System Explanation

The Accutron airflow sensors are compact and reliable instruments, especially designed for measuring airflows in mining environments. The Accutron IS Drift System is for airflow measurements in mine drifts whereas the Accutron IS Fan System is for measuring the flow output of large mining fans. Each system consists of an Indicating Transmitter, cabling and two "ultrasonic sensor" assemblies.

The ultrasonic sensor assemblies are installed in the drift diagonally (one further upstream than the other) with an "imaginary line" between them intersecting the airflow at a typical angle of 120 degrees.

Ultrasonic pulses are sent back and forth between the transducers across the drift, traveling through the air current. Let "$\mathbf{T_{A-B}}$" be the time taken for the signal to travel from Transducer **A** to Transducer **B**, and "$\mathbf{T_{B-A}}$" be the time taken for the pulse to travel from Transducer **B** to **A**. The control unit accurately measures the time-of-flight for each direction. The difference between the measured times ($\mathbf{T_{A-B} - T_{B-A}}$) is directly proportional to the airflow. In the case of no moving air, $\mathbf{T_{A-B}}$ equals $\mathbf{T_{B-A}}$ and there is no time difference because there is no airflow.

The Accutron IS first internally computes the average velocity of the air in Meters/Sec. In order to obtain air volumes, the area of the drift is entered into the settings menu (during programming), along with your selection of measurement units. The system then displays air volumes in the units selected. Common units used in mining applications are KCFM and M**3/S, other units may also be displayed to measure the air velocity (Meters/ sec, Feet / Min).

After installation in the drift, measurements are made (area, baseline distance, Face-to-face distance). Using the navigation buttons, these parameters are entered into the unit.

These parameters are retained in non-volatile Flash memory in the Accutron. Whenever the Accutron powers up, this information is automatically reloaded.

The system can easily measure air velocities in excess of 1,000,000 cfm with a precision better than any other conventional methods, as well as low velocity conditions (i.e., 1m/s). In addition, since the system can sample across the entire drift, readings are more representative than "single point" measurements. The Accutron considers that there is a "distribution profile" for the air in the drift, making it superior to other types of measurement methods for fixed installations.

2.2 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 minimum airflow on the sides (Figure A). We should try to avoid locations where the airflow is concentrated in one of the corners (Figure B).

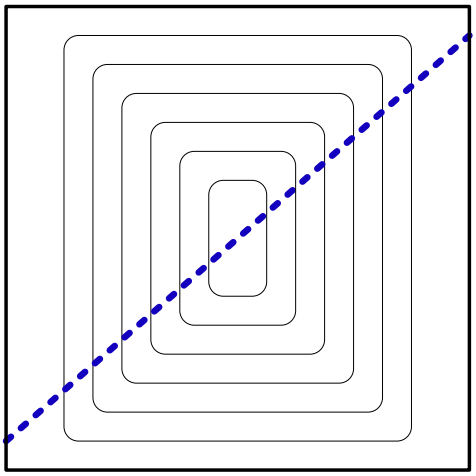


Figure A

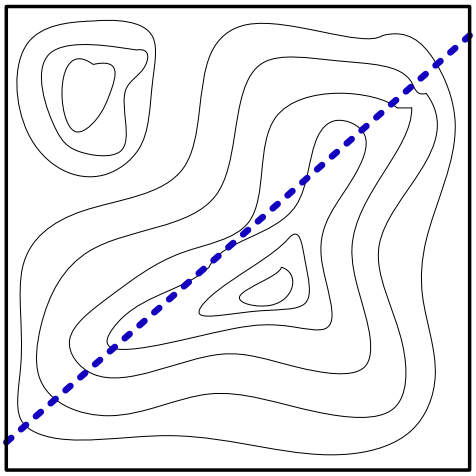


Figure B

The imaginary line between the Accutron sensors works like a "virtual pitot tube" and all flow measurements occur along this line. In practice, best results are produced 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 it as a suitable location.

Note: If we need to measure airflow in a less-ideal location. We may need to manually adjust the calibration correction factor to give accurate flow readings. In this case, the instrument would be calibrated against a handheld anemometer.

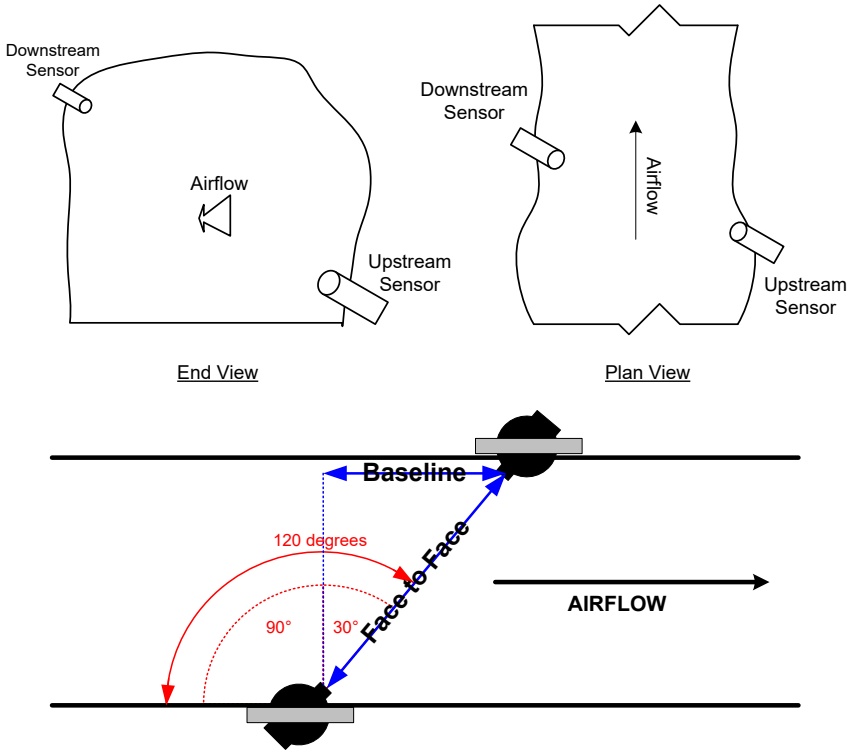
2.3 Mounting the Display

When planning to mount the control unit, you must take into consideration the availability of the power source, the 4-20mA output signal (i.e., PLC connection), and the sensor cable lengths. In most cases the control box is mounted on the wall in an electrical room. Extended sensor cable lengths are available for distances greater than 100 feet.

2.4 Mounting the Sensors

When planning a mounting location for the wall mount sensors, we recommend mounting one sensor near the top of the drift or duct and the other sensor located near the bottom downstream from the first on the opposite side, with an “imaginary line” between them intersecting the airflow at a typical angle of 120 degrees.

Illustration of typical mine drift installation



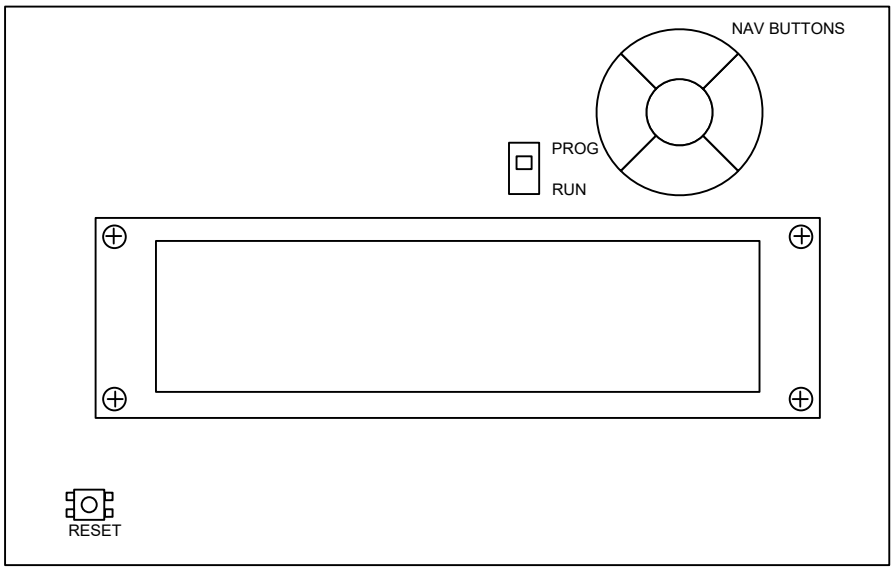
Once the mounting brackets are installed, thread the sensors onto the mounts and align them at each other using the pan/tilt adjustment on the bracket.

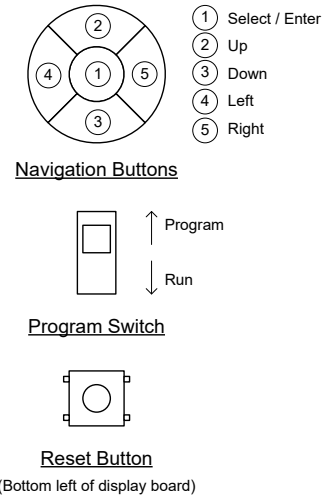
2.5 Connecting the Sensor Cables

A common mistake made is improperly installing the sensor cables. These must be threaded all the way to ensure proper functionality.

Section 3: Programming

3.1 Navigation Buttons





- To program the settings the programming switch must be in the **PROG** position.
    - As of V.4.03.IS leave the switch in RUN position and just press the center button.
- The LED display will show CONFIG.
- There are 5 buttons. Up, down, left, right, and Select/Enter.
- Use the up and down buttons to select a specific menu or option.
- To change a value, press Select/Enter to enter Edit mode. Up/Down will increment or decrement your value. Left/Right will let you shift the cursor to the side. The numbers cycle through 0-9 including a period for decimal values. Press the Select/Enter button again to exit the edit mode.
- To save and run, keep navigating through the menu until you reach the main menu. There, you will be able to select either SAVE/RUN or UNDO/RUN. Press the Select/Enter button.
- The display will read SWTCHOFF. Return the programming switch into the **RUN** position.

3.2 Programming Datasheet

Before programming the Accutron IS, it is a good idea to record the parameters in the following form. The form should also be filed for future reference.

Menu Option		Default Setting	New Setting Entered
Configuration Menu			
(1A)	Flow units	A (M/S)	
(1B)	Linear units	A (Meters)	
(1C)	Face to face distance	0.0	
(1D)	Baseline distance	0.0	
(1E)	Cross section area	0.0	
(1F)	Air flow direction	A (Normal sign)	
(1G)	Zero flow cut-off	0.0	
(1H)	Instrument full scale	1000.0	
(1I)	4-20mA over range	A (Saturate/Clipping)	
(IJ)	Obstruction/fault timeout in minutes	100 (disabled)	
(1k)	4-20mA mode	A (0V 0% 2V 100%)	
(1L)	Moving average	15	
Advanced Menu			
(2A)	Calibration Correction	1.0	
*(2B)	Noise filter	0	
*(2C)	Wave detection low threshold	20	
*(2D)	Wave detection high threshold	70	
*(2E)	Dynamic range limiting factor	10	
*(2F)	Hysteresis length	10	
(2G)	XDUC Gain	D (4)	
(2H)	Moving average type	B (First reading)	
*(2I)	Alternate updates	B (Enabled)	
*(2J)	Envelope Mask	0	
Modbus Menu			
(3A)	Address	1	
(3B)	Baud Rate	B (19200)	
(3C)	Parity	A (None)	
(3D)	Stop Bits	A (1)	

Note: Indicates parameters that should be left at default.

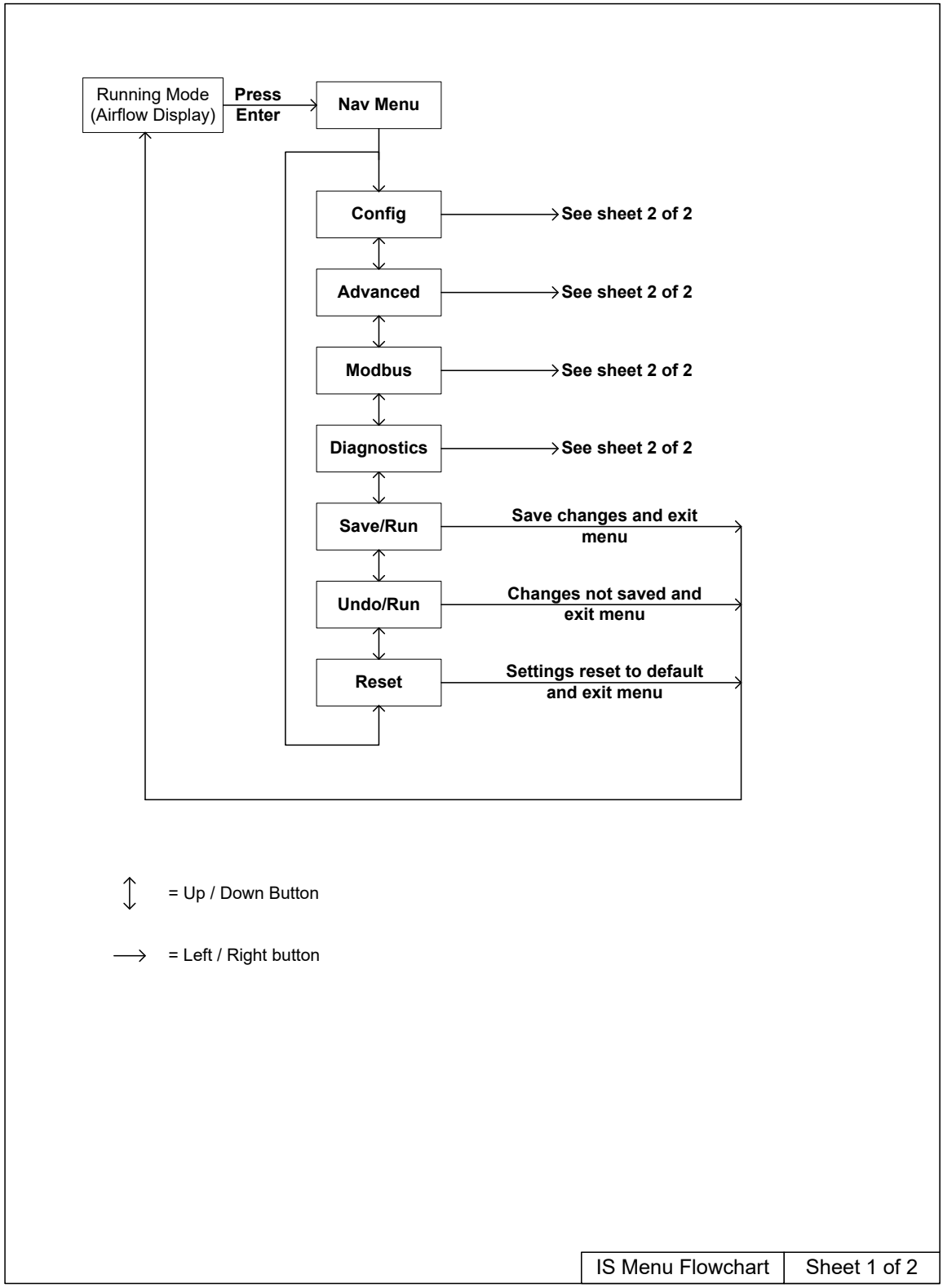
3.3 Auto Range Feature

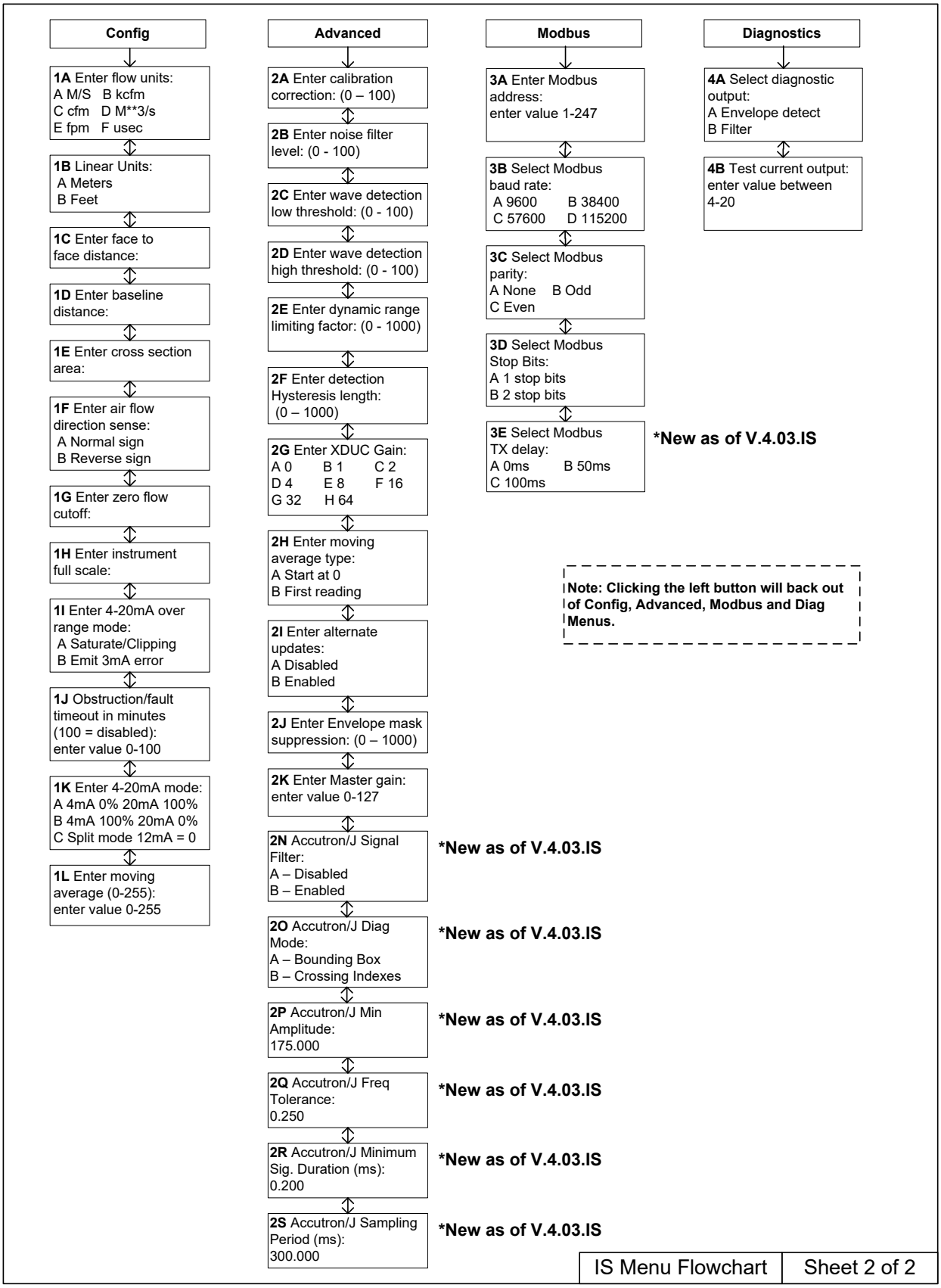
The Accutron IS comes with a unique feature called auto ranging. It is a quick and easy way to install your setup without measuring your face-to-face distance. To use this feature, you must do the following:

1. Make sure that all cables and wires are attached and safely secured.
2. Power the Accutron IS.
3. To start the auto range function, enter a value of 0 in the face-to-face menu. This will force the Accutron IS to begin auto ranging.
4. Save the settings and restart the system.
5. Upon restart, the display will read “Accutron”, followed by the software version.
6. The display will now read “RANGE0-0” while the transducer sensors receive and send signals from one another. The display will change depending on the distance.
7. Once the distance has been determined, the display will now be displaying the airflow readings.

Note: The auto range feature works best in non-gusty conditions. To skip auto-range, power on or reset the unit with the program switch in the PROG position to enter the configuration menu.

3.4 Menu Flow Chart




Config
1A Enter flow units:
A M/S B kcfm
C cfm D M**3/s
E fpm F usec
1B Linear Units:
A Meters
B Feet
1C Enter face to face distance:
1D Enter baseline distance:
1E Enter cross section area:
1F Enter air flow direction sense:
A Normal sign
B Reverse sign
1G Enter zero flow cutoff:
1H Enter instrument full scale:
1I Enter 4-20mA over range mode:
A Saturate/Clipping
B Emit 3mA error
1J Obstruction/fault timeout in minutes (100 = disabled):
enter value 0-100
1K Enter 4-20mA mode:
A 4mA 0% 20mA 100%
B 4mA 100% 20mA 0%
C Split mode 12mA = 0
1L Enter moving average (0-255):
enter value 0-255
Advanced
2A Enter calibration correction: (0 – 100)
2B Enter noise filter level: (0 - 100)
2C Enter wave detection low threshold: (0 - 100)
2D Enter wave detection high threshold: (0 - 100)
2E Enter dynamic range limiting factor: (0 - 1000)
2F Enter detection Hysteresis length:
(0 – 1000)
2G Enter XDUC Gain:
A 0 B 1 C 2
D 4 E 8 F 16
G 32 H 64
2H Enter moving average type:
A Start at 0
B First reading
2I Enter alternate updates:
A Disabled
B Enabled
2J Enter Envelope mask suppression: (0 – 1000)
2K Enter Master gain:
enter value 0-127
2N Accutron/J Signal Filter:
A – Disabled
B – Enabled
*New as of V.4.03.IS
2O Accutron/J Diag Mode:
A – Bounding Box
B – Crossing Indexes
*New as of V.4.03.IS
2P Accutron/J Min Amplitude:
175.000
*New as of V.4.03.IS
2Q Accutron/J Freq Tolerance:
0.250
*New as of V.4.03.IS
2R Accutron/J Minimum Sig. Duration (ms):
0.200
*New as of V.4.03.IS
2S Accutron/J Sampling Period (ms):
300.000
*New as of V.4.03.IS
Modbus
3A Enter Modbus address:
enter value 1-247
3B Select Modbus baud rate:
A 9600 B 38400
C 57600 D 115200
3C Select Modbus parity:
A None B Odd
C Even
3D Select Modbus Stop Bits:
A 1 stop bits
B 2 stop bits
3E Select Modbus TX delay:
A 0ms B 50ms
C 100ms
*New as of V.4.03.IS
Diagnostics
4A Select diagnostic output:
A Envelope detect
B Filter
4B Test current output:
enter value between 4-20
Note: Clicking the left button will back out of Config, Advanced, Modbus and Diag Menus.
IS Menu Flowchart
Sheet 2 of 2

Enter Tag Number :	Enter the Tag Number desired. This option is mostly used if you want to identify which unit you are working with. It is simply text information.
[1A] Enter flow units : A M/S B kcfm C cfm D M**3/s E fpm F usec	Press the letter that corresponds with the desired unit. M/S (meters per second) is the default.
[1B] Linear Units : A Meters B Feet	Choose the desired unit of measurement "Meters" is selected by default. If "Feet" is selected, then every option will be calculated in feet.
[1C] Enter face to face distance : 0.0 Feet	This is the distance between the faces of the two sensors. By default, the distance is 0.0. This causes the instrument to enter the "auto range" mode when it is first powered on. This value can also be physically measured and entered manually.
[1D] Enter baseline distance : 0.0 Feet	This is the horizontal distance between the two sensors. By default, this value is the same as the face-to-face. This value is physically measured and will always be less than the face to face distance.
[1E] Enter cross section area : 0.0 Cubic Feet	Enter the cross sectional area of the section between the two sensors.
[1F] Enter airflow direction sense: A Normal sign B Reverse sign	Selecting the Reverse sign multiplies the value on the display by –1. Use this option if you would like to receive positive values instead of negative values.

[1F] Enter airflow direction sense: A Normal sign B Reverse sign	Selecting the Reverse sign multiplies the value on the display by –1. Use this option if you would like to receive positive values instead of negative values.
[1G] Enter zero flow cutoff : 0.0 kcfm	Zero flow cut off allows you to select a specific range of measurements. For example if you are working in kcfm and enter a value of 100, and your full scale setting is 500, your measurement range will now be 100-500 kcfm as opposed to 0-500 kcfm.
[1H] Enter instrument full scale : 1000 kcfm	This is the full-scale reading of the instrument in the units selected. Flow readings greater than this will result in a "*" to appear in the right most display indicating that you have exceeded your full scale range.
[1I] Enter 4-20mA over range mode: A Saturate / Clipping B Emit 3mA error	Selecting **A**, if the flow exceeds full-scale, the mA output will saturate at 20mA. Selecting **B**, if the flow exceeds full-scale, the instrument will output 3mA indicating that the full scale or max airflow has been exceeded.
[1J] Obstruction/fault timeout in minutes (100 = disabled): 100	Obstruction/fault allows the instrument to output the last known good reading in the event there is something blocking the signal between the two sensors for example a large vehicle. The value can be selected from 0-99 minutes. Once the time has elapsed the unit will output a 0.3V error.
[1K] Enter 4-20mA mode : A 4mA 0% 20mA 100% B 4mA 100% 20mA 0% C Split mode 12mA 0%	A (Normal mode) 4mA corresponds to minimum airflow. (20mA max) B (Reverse mode) 4mA corresponds to maximum airflow. (20mA min) C (Split mode) 12mA corresponds to 0 airflow, 4mA to max negative, and 20mA to max.

[1L] Enter moving average (0 - 255) : 0	In most cases the measured airflow is slightly turbulent, by averaging the readings, the analog output will behave in a smoother rate of change allowing for a better representation of airflow in the measured area.

Advanced Menu

[2A] Enter calibration correction: 1.0	The calibration correction allows for a correction factor to be entered in the case of difficult applications. It is calculated by dividing the expected reading / actual reading.
[2B] Enter noise filter level: 0 value (0-100)	The noise filter is a provision for dealing with extreme noise. Normally it is set to 0.
[2C] Enter wave detection low threshold: 20 value (0-100)	This option is used to specify the lower wave detection threshold in order to properly detect the ultrasonic signal. In almost all cases this value should be left at 20.
[2D] Enter wave detection high threshold: 70 value (0-100)	This option is used to specify the upper wave detection threshold in order to properly detect the ultrasonic signal. In most cases this value should be left at 70.
[2E] Enter dynamic range limiting factor: 10 value (0-1000)	Places a limit on how much weak signal noise may be expanded (digitally amplified). It prevents over amplification of noise in the absence of a valid signal.
[2F] Enter detection hysteresis length: 10 value (0-1000)	This option determines the minimum acceptable length of the waveform. Default is 50 units.

[2G] Enter XDUC Gain: A 0 B 1 C 2 D 4 E 8 F 16 G 32 H 64	This option sets the Transducer signal gain. In cases where the two sensors are separated by a long distance the gain should be set higher. The default gain is 4 = 0-20ft separation, 8 = 20-30ft, 16 = 30-40ft, 32 = 40-50ft and 64 = 50-60ft.
[2H] Enter moving average type: A – Start at 0 B – First Reading	Upon powering up this will select whether to start the averaging at 0, (the airflow reading will slowly ramp up to the actual reading) or using the first reading registered by the instrument
[2I] Enter alternate updates: A – Disabled B – Enabled	Consult an Accutron Representative before changing. Default is Enabled.
[2J] Enter Envelope mask suppression: 0 (0 – 1000)	Consult an Accutron Representative
[2N] Accutron/J Signal Filter: A – Disabled B – Enabled	This option enables or disables different signal processing. This can be used in noisy environments.
[2O] Accutron/J Diag Mode: A – Bounding Box B – Crossing Indexes	Diagnostics PC display option.
[2P] Accutron/J Min Amplitude: 128.000	Filter amplitude adjustment (128 to 400)
[2Q] Accutron/J Freq Tolerance: 0.250	Frequency tolerance adjustment.

[2R] Accutron/J Minimum Sig. Duration (ms): 0.600	Minimum valid signal duration.
[2S] Accutron/J Sampling Period (ms): 300.000	Signal sampling period.

Modbus Menu

[3A] Enter Modbus address: Enter value 1-247	Enter a Modbus Slave address for this device.
[3B] Select Modbus port baud rate: A - 9600 B - 19200 C - 57600 D - 115200	Select the baud rate for RS485 output.
[3C] Select Modbus parity: A None B Odd C Even	Set the Modbus parity for this device.
[3D] Select Modbus Stop Bits: A 1 stop bits B 2 stop bits	Set the Modbus Stop bits for this device.
[3E] Select Modbus TX delay: A 0ms B 50ms C 100ms	Delays the response time of this device to Modbus request.

Diagnostics Menu

[4A]Select diagnostic output: A – Envelope Detect B – Filter	This option selects the diagnostic mode. In use, a PC can be used to display the sonic-analog signals showing quality, amplitude, and noise for troubleshooting.
[4B] Test current output: Enter a value between 4 and 20	Forces a known 4 – 20 mA output when a value is entered and the center button is pressed. Value resets to airflow output once the menu is exited.

Section 4: Modbus

The RS485 interface in the Accutron IS is optically isolated from the rest of the unit. This is why an external source of 5VDC is required.

Note: Do not poll faster than every 500ms.

The default Modbus RS485 settings are:

Modbus Address: 1 (3A)

Baud Rate: 19200 (3B)

Parity: None (3C)

Stop Bits: 1 (3D)

These settings can be changed using the navigation buttons located on the main circuit board. Refer to the flow chart on page 14. Under the diagnostics menu, sections 3A, 3B and 3C all deal with adjusting the Modbus settings.5.1 Boot Up and Discovery Mode

4.1 Modbus Register

To change unit ID, go into your menu under Diag, option 3A. To change your baud rate, go to Diag, option 3B. To change parity, go to Diag, option 3C.

Register Addr.	#	Description	Type	R/W	Comment
40001	0,1	Airflow reading	float	Read only	
40003	2	Airflow reading	int	Read only	0.1 unit precision
40004	3	Flow units	unit	Read only	See below for more details
40005	4,5	4-20mA output	float	Read only	
40007	6	4-20mA output	int	Read only	0.001 unit precision
40008	7	Error code	unit	Read only	See below for more details

Flow Units (Register 40004)

- 0 = m/s
- 1 = kcfm
- 2 = cfm
- 3 = m*3/s
- 4 = fpm
- 5 = usec

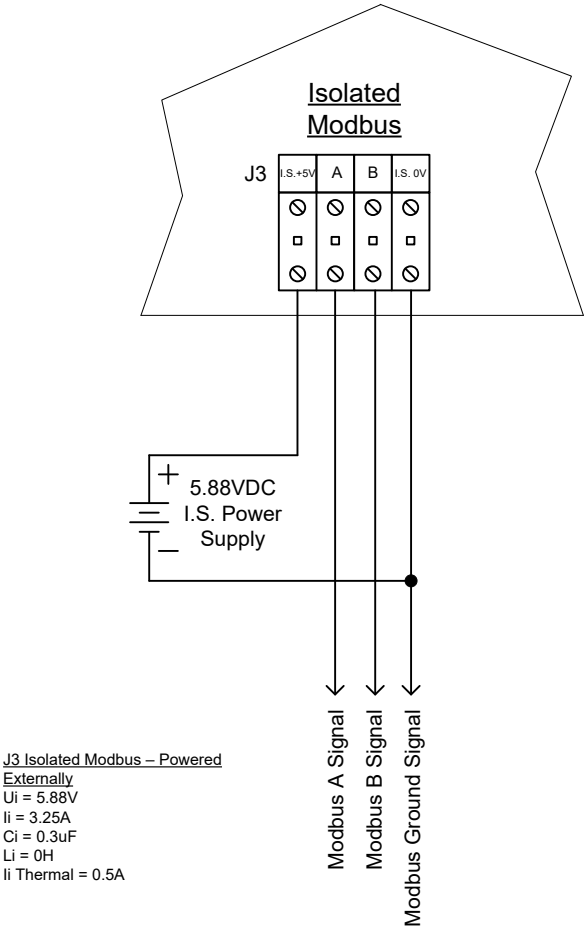
Error code (Register 40008)

- 0 = good reading
- 10 = obstruction. Check sensors
- 20 = above full scale

Airflow Reading (40003), and 4-20mA output (40007)

The range for these registers is from -32768 to 32767. Anything greater than these values will default to the maximum.

4.2 Modbus Connection



J3 Isolated Modbus – Powered Externally
Ui = 5.88V
Ii = 3.25A
Ci = 0.3uF
Li = 0H
Ii Thermal = 0.5A

Section 5: Troubleshooting

5.1 Frequently Asked Questions

A) Why am I not seeing anything on the display?

- Check power connections. When the instrument powers on for the first time, it should read "ACCUTRON" followed by the code version before entering run mode.
- Ensure that the Accutron was not damaged in any way during shipping. If this is the case, please contact your supplier.

B) The Accutron IS powers on but I am not getting any readings.

- Make sure all cables are connected.
- Make sure both transducers are aligned and are alternately snapping (making a slight clicking sound every second).

C) Both my transducers are not snapping, what could be the problem?

- Make sure each transducer is attached to the main unit via the cables and tightly connected.

D) Why is the auto range face-to-face value different from what I measured?

- This is not a problem. Sometimes the unit may be off by +/- 10cm. This places the incoming waveform close to the center of the acquisition window for digital processing. Differences in this measurement (+/- 10cm or greater) have no effect on accuracy or the reading. If the unit does not function properly, then enter your measurement.

E) What should I set the full-scale setting to?

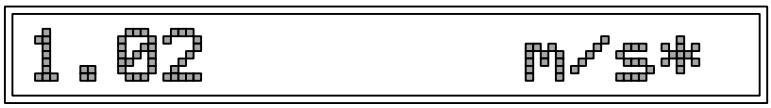
- We recommend setting the full-scale to twice the maximum amount expected, but you have the option to enter whatever value you think is right.

F) Why am I getting readings that differ from what they should be?

- Re-measure the tunnel cross-sectional area and the baseline distance and verify that it matches with the values inside the Accutron IS settings.
- Check to see if the sensors are placed on a bend or a corner. (Placing the sensors on a corner can cause inaccuracies with the readings)
- The calibration correction, in the **Advanced Menu**, may be used to make any adjustments according to a 9-point manual survey.

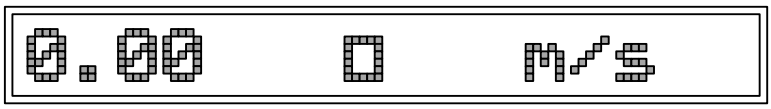
G) What does the star (*) mean at the end of my display?

- The star indicates that the reading is currently over the full-scale limit. You may want to verify if this is the case. If so, you can adjust the full-scale limit to a higher value.



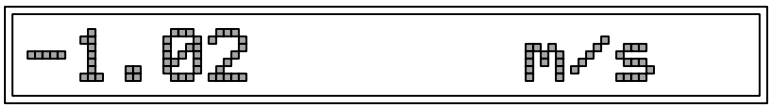
H) What does the square (donut) mean in the middle of the display?

- The donut means that the instrument is rejecting readings acquired because there is a problem (could be an obstruction like a vehicle parked between both sensors).
- Check to see if there is an obstruction between both sensors.
- Make sure both sensors are aligned properly.
- Make sure both transducers are attached to the main unit with cables.
- Check to see if the cables are tightly connected.



I) 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 at the far-left hand side of the 16-digit display indicates this. Also, the 4-20mA split mode can be used to pass this information to a PLC. In the configuration menu this can be changed to show a positive value.



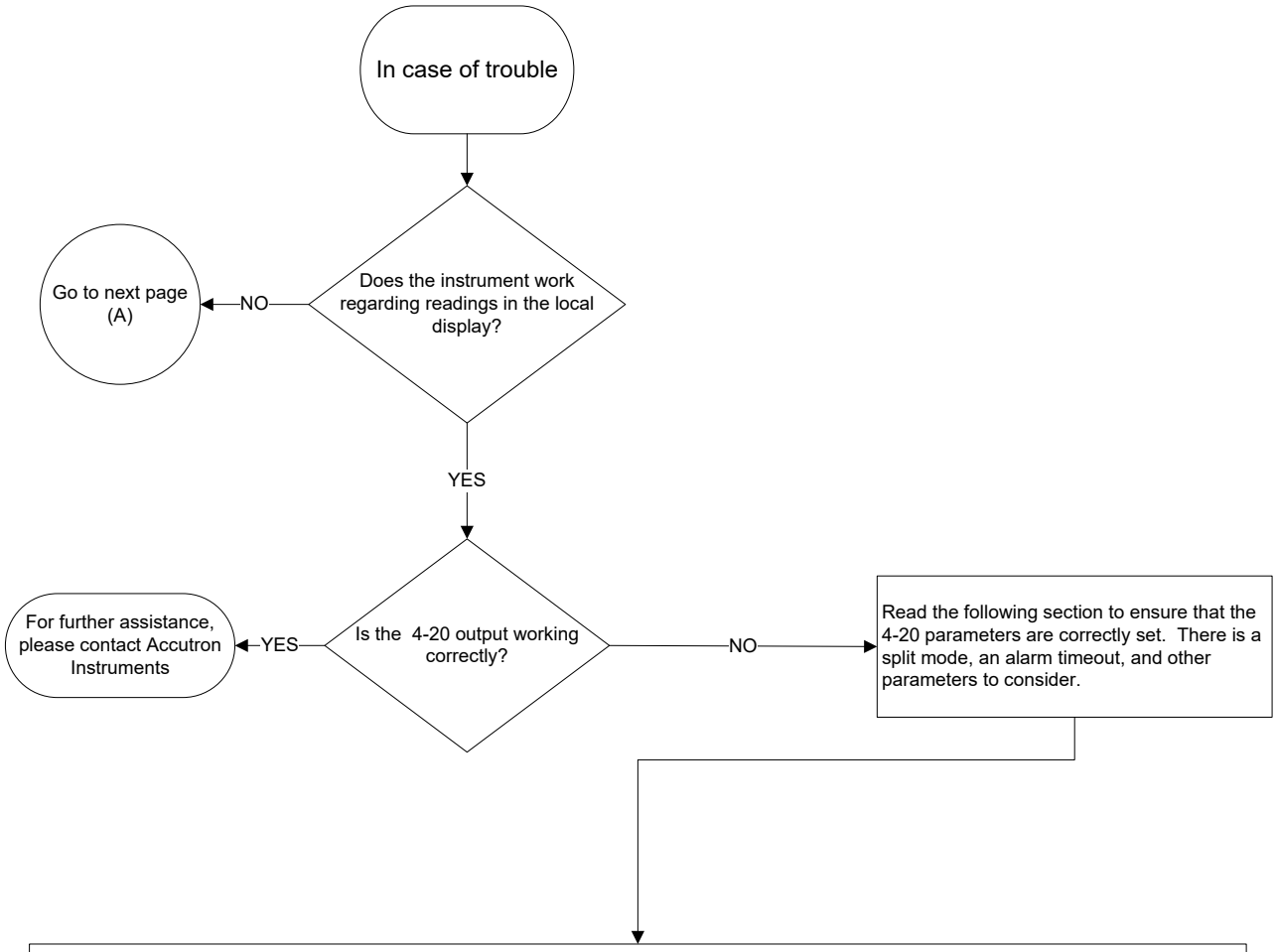
J) What is the difference between the 4-20mA normal/reverse/split mode?

Normal: Airflow of 0 will output 4mA while airflow reaching instrument full-scale will output 20mA.

Reverse: Airflow of 0 will output 20mA while airflow reaching instrument full scale will output 4mA.

Split: Airflow of 0 will output 12mA (half the distance between 4mA and 20mA). Positive airflow reaching instrument full-scale will output 20mA while the negative value of instrument full-scale will output 4mA.

5.2 Troubleshooting Flowchart



The 4-20 instrumentation output transmits the instrument reading on the 4-20 output. The full scale for the 4-20 is the "instrument full scale" setting programmed via The navigation buttons.

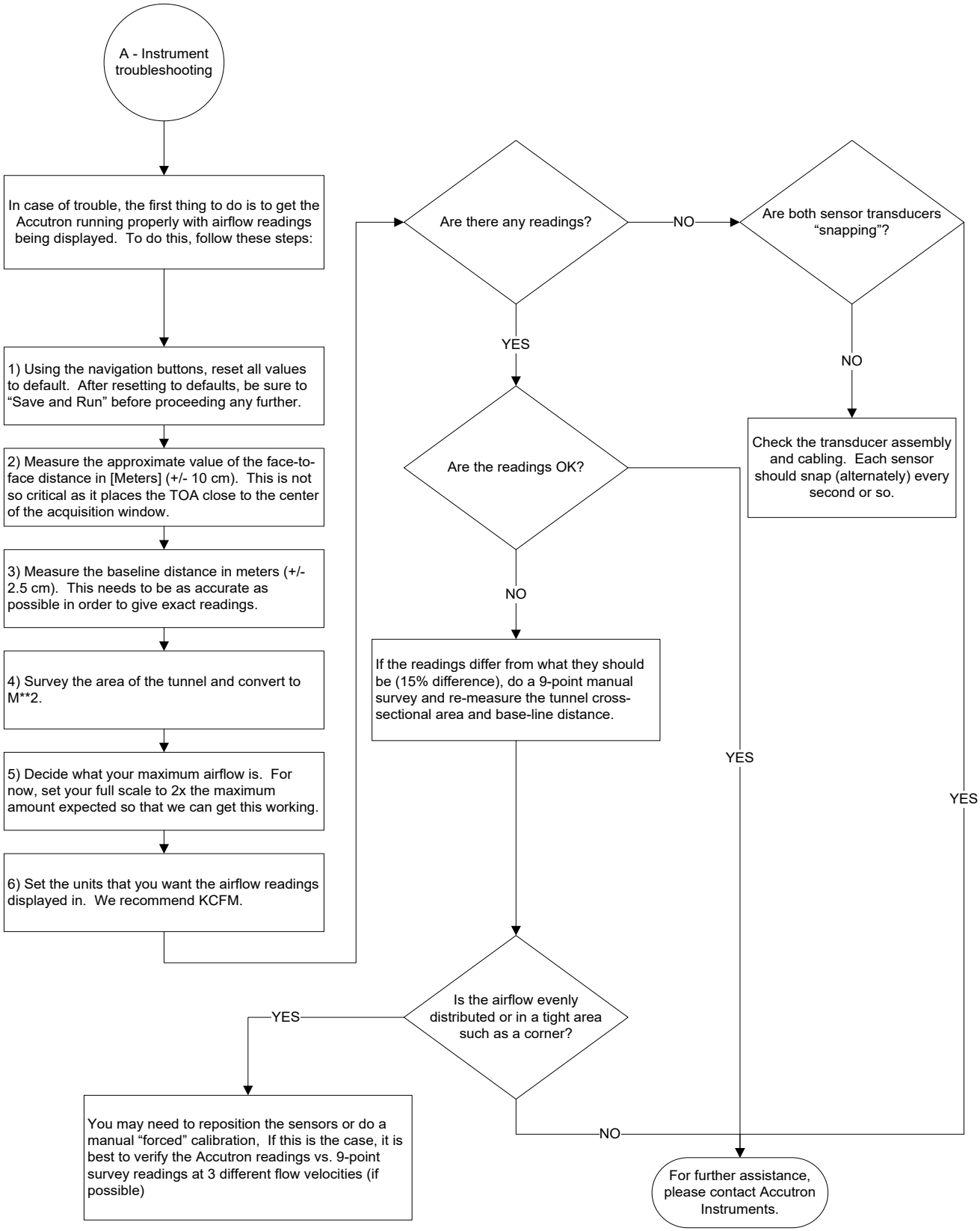
The 4-20 output also has the following features:

4-20 alarm timeout: This is used to give an alarm output if the instrument stops giving valid airflow readings. An alarm is indicated by sending a mA ouptut (less than 4mA) and care must be taken not to confuse this as a "zero airflow" condition.

Faults can be due to the following:
1) Sensor misalignment (Sensor was bumped or moved)
2) Vehicle or other obstruction in the ultrasonic beam
3) Actual airflow is greater than the full-scale setting
4) Fault with the Accutron (possibly a damaged transducer)

ON/OFF selection via menu: The 4-20 alarm timeout time is settable in minutes. If a "100 minute timeout" is specified, this feature is "turned off" and the behavior is:

The Accutron transmits whatever reading is on the 4-20 output. In case of fault, the last reading is transmitted on the 4-20output.

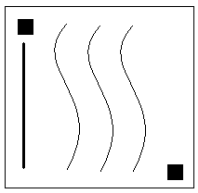

A - Instrument troubleshooting
In case of trouble, the first thing to do is to get the Accutron running properly with airflow readings being displayed. To do this, follow these steps:
1) Using the navigation buttons, reset all values to default. After resetting to defaults, be sure to "Save and Run" before proceeding any further.
2) Measure the approximate value of the face-to-face distance in [Meters] (+/- 10 cm). This is not so critical as it places the TOA close to the center of the acquisition window.
3) Measure the baseline distance in meters (+/- 2.5 cm). This needs to be as accurate as possible in order to give exact readings.
4) Survey the area of the tunnel and convert to M**2.
5) Decide what your maximum airflow is. For now, set your full scale to 2x the maximum amount expected so that we can get this working.
6) Set the units that you want the airflow readings displayed in. We recommend KCFM.
Are there any readings?
NO
Are both sensor transducers "snapping"?
YES
NO
Check the transducer assembly and cabling. Each sensor should snap (alternately) every second or so.
Are the readings OK?
YES
NO
If the readings differ from what they should be (15% difference), do a 9-point manual survey and re-measure the tunnel cross-sectional area and base-line distance.
Is the airflow evenly distributed or in a tight area such as a corner?
YES
You may need to reposition the sensors or do a manual "forced" calibration, If this is the case, it is best to verify the Accutron readings vs. 9-point survey readings at 3 different flow velocities (if possible)
NO
For further assistance, please contact Accutron Instruments.

Appendix A

Glossary

Autorange: An automatic function that measures the face-to-face distance. This distance should be accurate to ± 6 inches and does not affect the accuracy of the instrument.

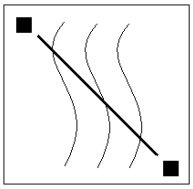
Baseline distance: The distance of the two sensors in the direction of the airflow. (Top view of two sensors)



CFM: Cubic feet per minute.

Dynamic range limiting: In normal operation, analog signals are processed mathematically to produce the "math curve". The math curve represents the envelope of the total received acoustic energy.

Face-to-face distance: The distance between the two sensors facing each other. (Top view of two sensors)



FPM: Feet per minute.

Hysteresis: The lag between making a change, such as increasing power to the transducers, and the response or effect of that change.

KCFM: Cubic feet per minute X 1000.

M/S: Meters per second.

M3/S:** Cubic meters per second.

Snapping: In operation, the sensor transducers are energized alternately to transmit an ultrasonic pulse. You can hear a "click" when it does this. We refer to this as "snapping"

Transducer:	The sensor that sends and receives ultrasonic signals.
Ultrasonic:	Of or relating to acoustic frequencies above the range audible to the human ear.
Usec:	This is one of the available flow display units, used for laboratory testing only.
Zero flow cutoff:	A feature of the Accutron that forces the instrument to "set to zero" any flow readings that are less than this amount.

Equations

Calibration correction: Correction = Reading you want / Reading you are receiving.

Error percentage:

In the case of perfect symmetry in the airflow distribution between the two sensors, the accuracy of the Accutron IS is dependent on how accurately the transit times can be measured.

The accuracy of the instrument is 2% of full-scale or the instrument reading $\pm$ 0.05M/S; whatever is greater.

Example: If full scale is 100 KCFM, the error is 2% X 100 KCFM = 2 KCFM.

Accutron IS Drift Replacement Parts List – Mine Drift Airflow Sensor

Item	QTY	Part number and Ordering information
1	1	ACCIS-IECEX-TXD-001-DR Accutron IS Drift Transducer. Replacement sensor/transducer for the Accutron IS Drift Air Flow Meter.
2	1	ACCIS-CAB-STD-ASY Standard Accutron 100 foot cable assembly pre-assembled with connectors.
3	1	ACCIS-IECEX-SYS-001 Accutron IS Drift/Fan indicating transmitter. • 16 Digit LCD display, NEMA 4x enclosure • 12 VDC powered • 0-2V analog output • Isolated RS485 Output
4	1	ACCIS-WALMT-SS-ASY • Stainless steel wall mount • Pan/tilt

Accutron IS Fan Replacement Parts List – Mine Fan Airflow Sensor

Item	QTY	Part number and Ordering information
1	1	ACCIS-IECEX-TXD-001-FN • Accutron IS Fan Transducer. Replacement sensor/transducer for the Accutron IS Fan Air Flow Meter.
2	1	ACCIS-CAB-STD-ASY Standard Accutron 100 foot cable assembly pre-assembled with connectors.
3	1	ACCIS-IECEX-SYS-001 Accutron IS Drift/Fan indicating transmitter. • 16 Digit LCD display, NEMA 4x enclosure • 12 VDC powered • 0-2V analog output • Isolated RS485 Output

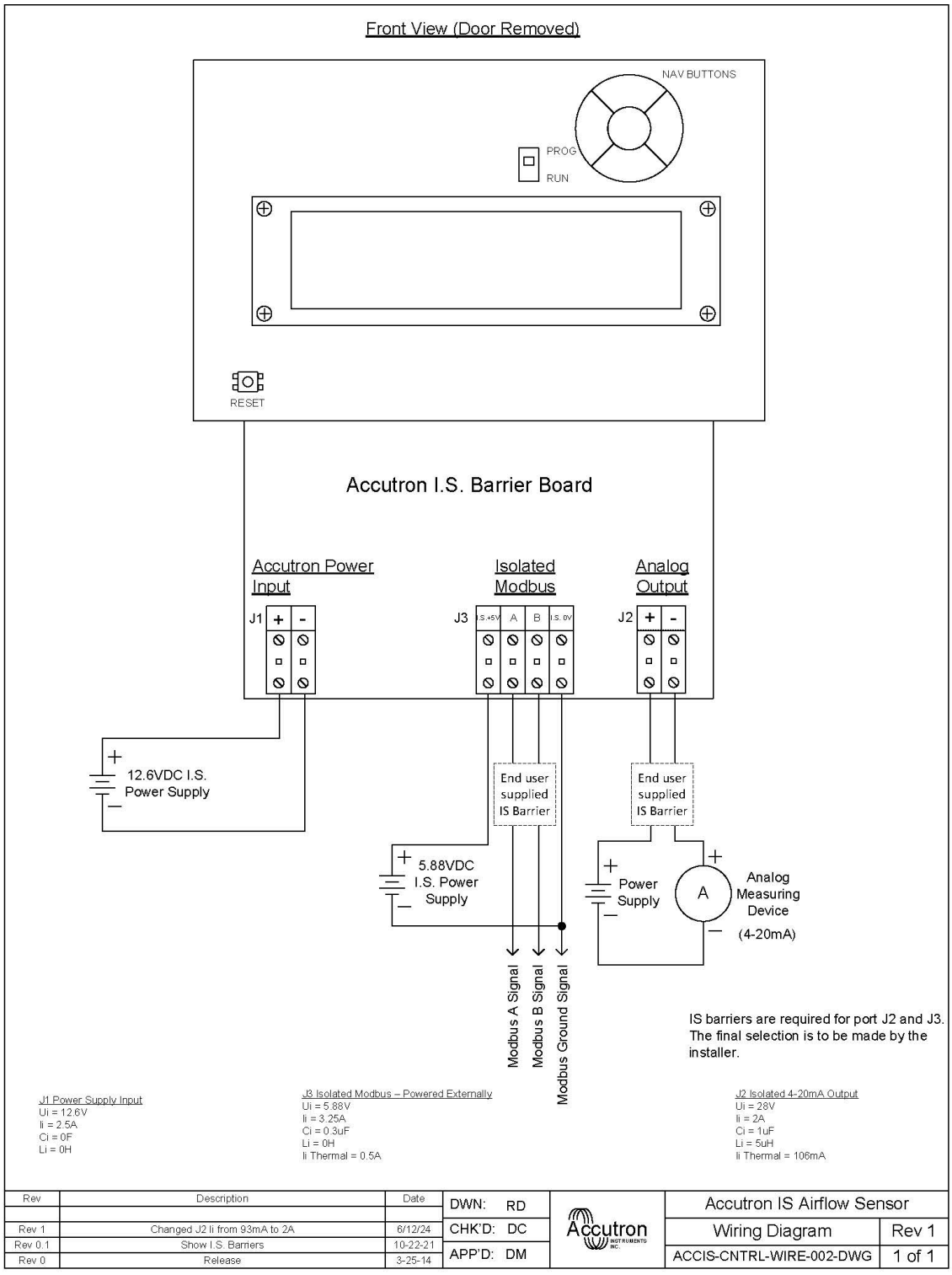
Accutron IS Drift component checklist

- ❑ Indicating Transmitter – Qty (1)
- ❑ 100’ cables w/ IP68 rated connectors – Qty (2)
- ❑ Ultrasonic Transducers – Qty (2)
- ❑ Mounting Brackets with Pan & Tilt adjustment – Qty (2)

Accutron IS Fan component checklist

- ❑ Indicating Transmitter – Qty (1)
- ❑ 100’ cables w/ IP68 rated connectors – Qty (2)
- ❑ Ultrasonic Transducers – Qty (2)
- ❑ Beveled stainless steel mounting plates w/ Ball & Socket – Qty (2)

Appendix B – Diagrams

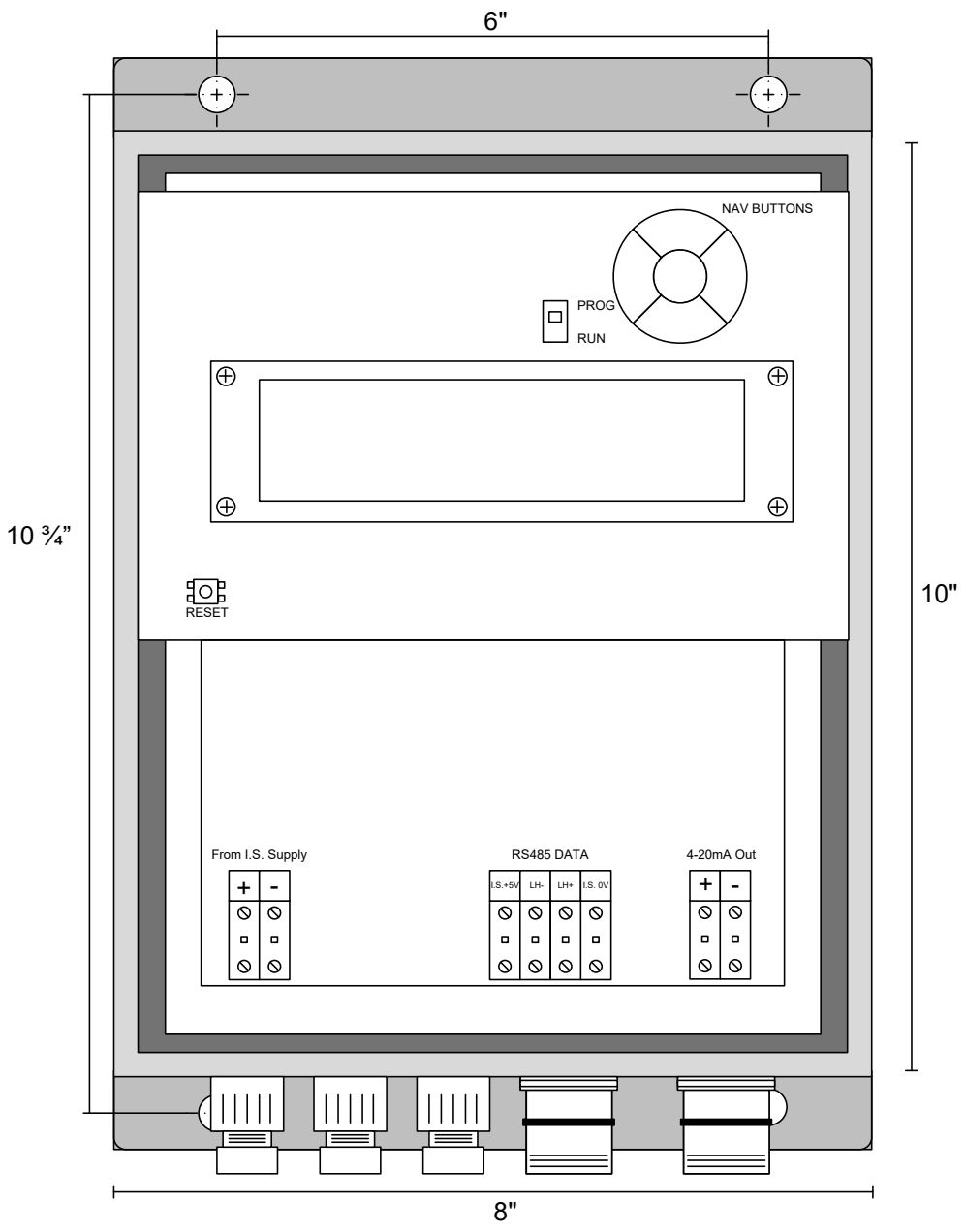


Rev	Description	Date
Rev 1	Changed J2 Ii from 93mA to 2A	6/12/24
Rev 0.1	Show I.S. Barriers	10-22-21
Rev 0	Release	3-25-14

DWN:	RD
CHK'D:	DC
APP'D:	DM

Accutron IS Airflow Sensor	
Wiring Diagram	Rev 1
ACCIS-CNTRL-WIRE-002-DWG	1 of 1

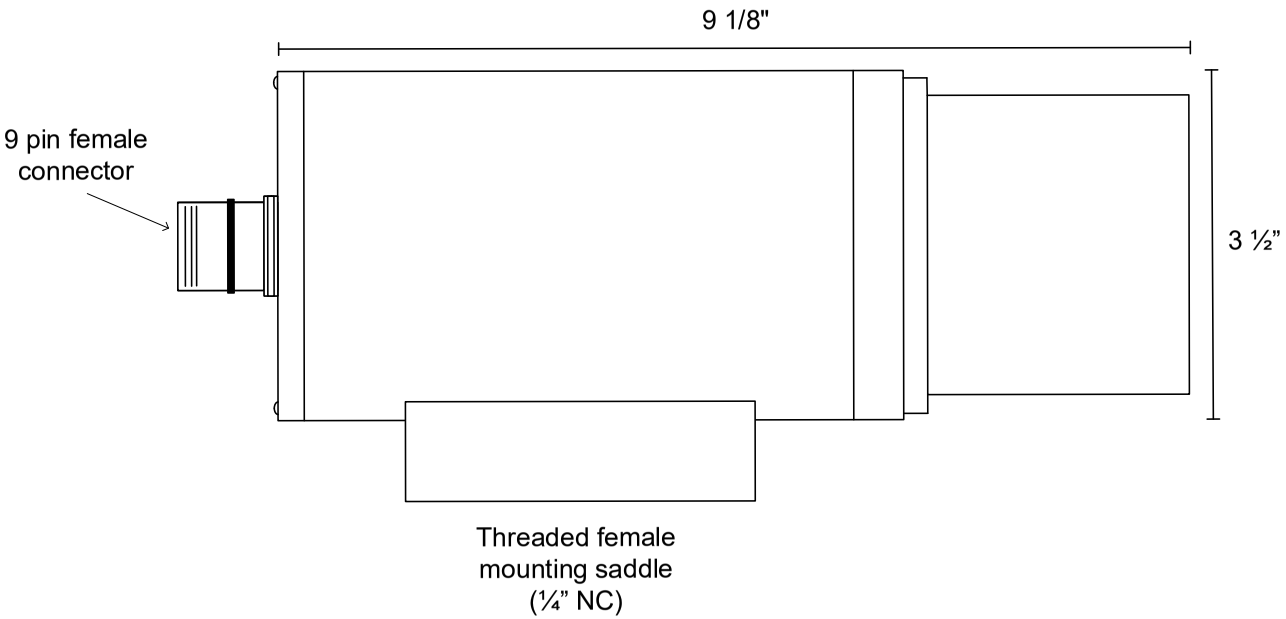
Front View (Door Removed)



1 inch = ———— Depth = 5"

REV	Description	Date MM-DD-YY	ECO
Rev B	Drawn to Scale	07-13-12	
Rev A	Release	07-12-10	

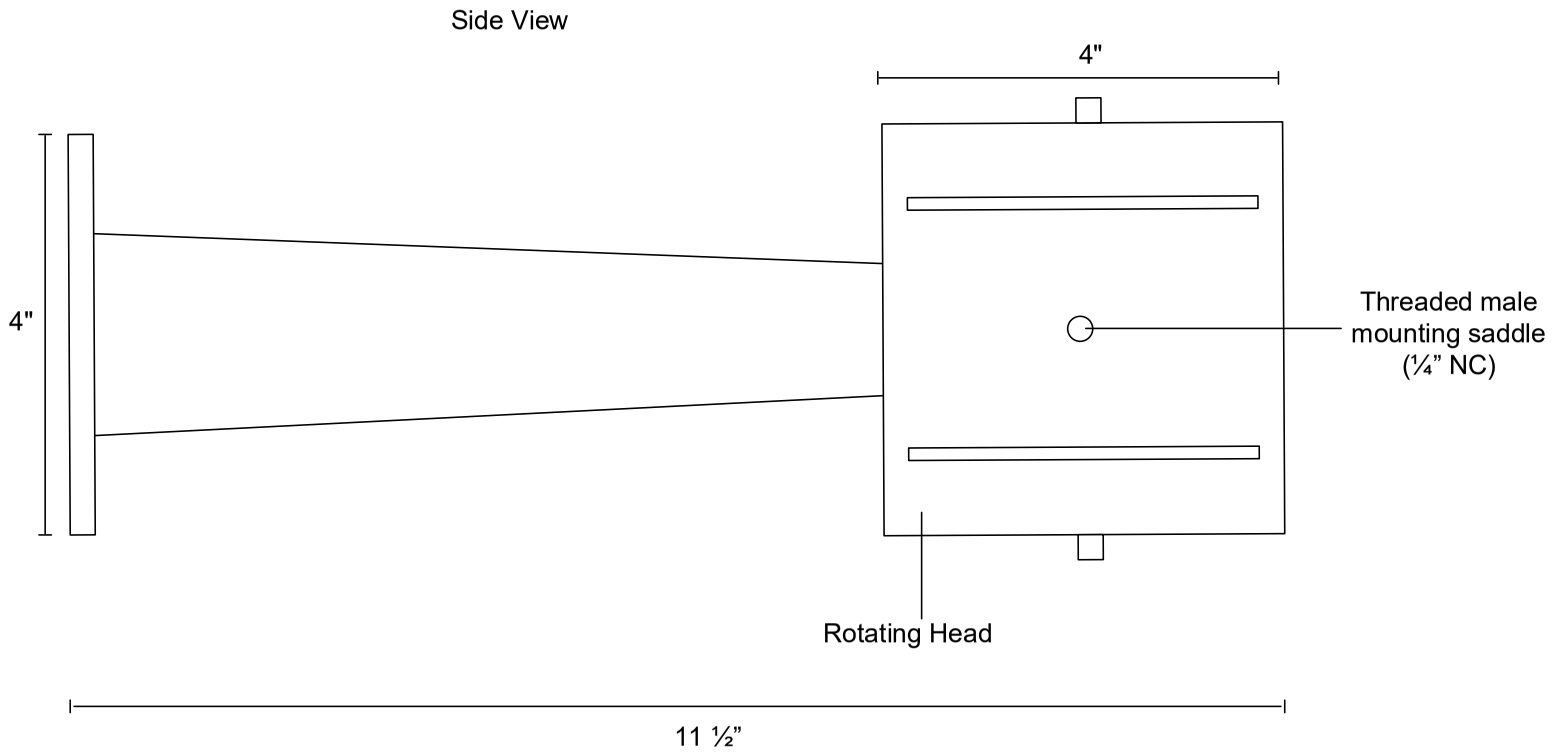
ACCIS-CNTRL-DEM-002-DWG	
Accutron IS Airflow Sensor	July 2012
Dimension Diagram	Rev B



1 inch = ————

REV	Description	Date MM-DD-YY	ECO
Rev B	Drawn to Scale	07-13-12	
Rev A	Release	07-12-10	

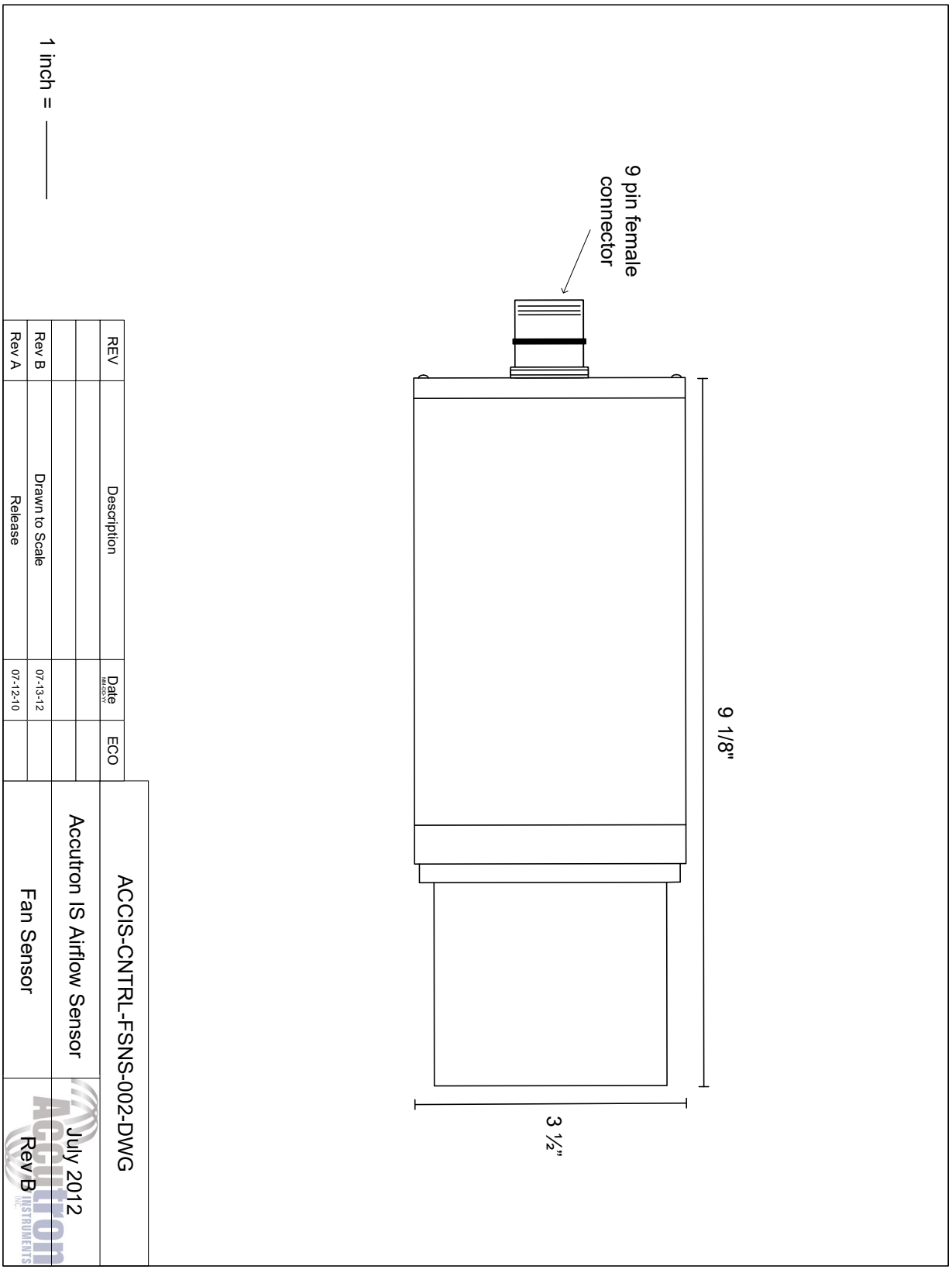
ACCIS-CNTRL-DSNS-002-DWG	
Accutron IS Airflow Sensor	July 2012
Drift Sensor	Rev B

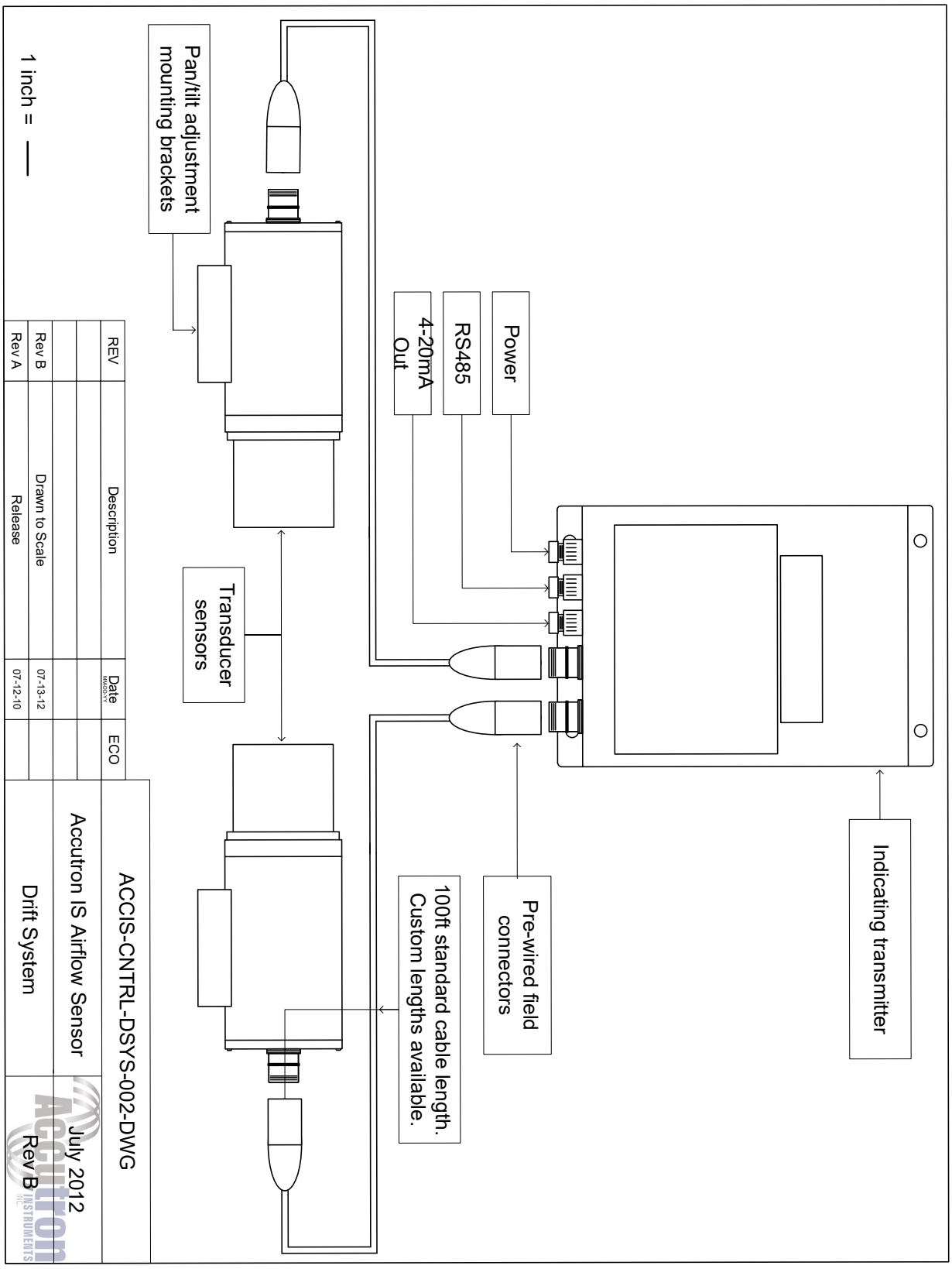


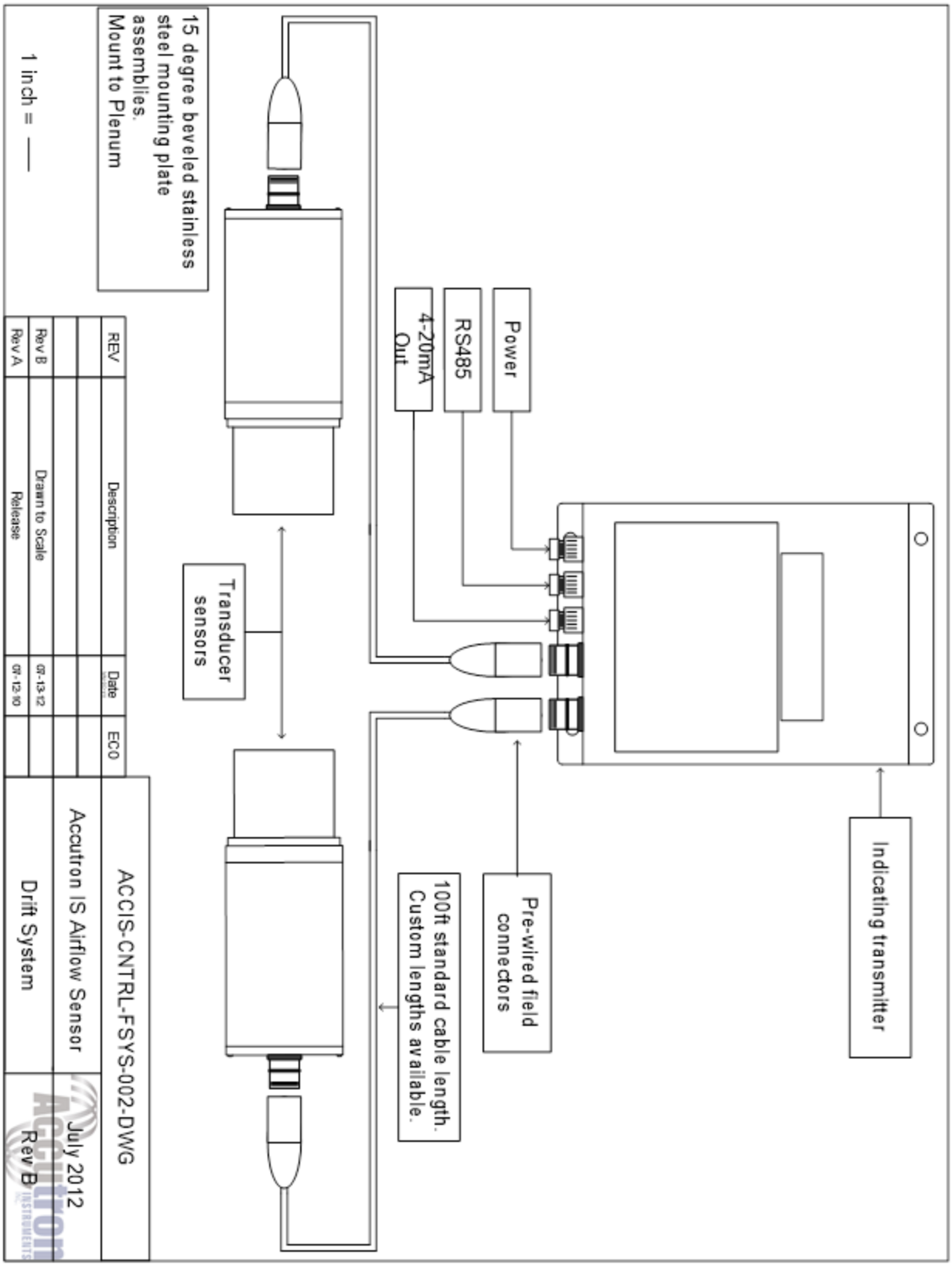
1 inch = ———

REV	Description	Date MM-DD-YY	ECO
Rev A	Release	07-16-12	

ACCIS-CNTRL-DSNS-002-DWG	
Accutron IS Airflow Sensor	July 2012
Drift Sensor Mount	Rev A


9 pin female connector
9 1/8"
3 ½"
1 inch = _____
REV
Description
Date
ECO
Rev B
Drawn to Scale
07-13-12
Rev A
Release
07-12-10
ACCIS-CNTRL-FSNS-002-DWG
Accutron IS Airflow Sensor
July 2012
Fan Sensor
Rev B


Indicating transmitter
Power
RS485
4-20mA Out
Pre-wired field connectors
100ft standard cable length. Custom lengths available.
Transducer sensors
Pan/tilt adjustment mounting brackets
1 inch = ___
REV
Description
Date
ECO
Rev B
Rev A
Drawn to Scale
Release
07-13-12
07-12-10
ACCIS-CNTRL-DSYS-002-DWG
Accutron IS Airflow Sensor
Drift System
July 2012
Rev B


Indicating transmitter
Power
RS485
4-20mA Out
Pre-wired field connectors
100ft standard cable length. Custom lengths available.
Transducer sensors
15 degree beveled stainless steel mounting plate assemblies. Mount to Plenum
1 inch = ___
REV
Description
Date
ECO
Rev A
Rev B
Drawn to Scale
Release
ACCIS-CNTRL-FSYS-002-DWG
Accutron IS Airflow Sensor
Drift System
July 2012
Rev B

Accutron INSTRUMENTS

V2024.07.04

ACCIS-IECEX-SYS-001
ACCIS-IECEX-TXD-001-DR
ACCIS-IECEX-TXD-001-FN

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