

SEC 3120 Universal Transmitter

Dual-Sensor Display



Instruction and Operation Manual

P/N 1580281 Rev B

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Sensor Electronics Corporation

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Our quality and service are uncompromising. We back each of our products with a two-year warranty on all materials and workmanship. We offer technical support, user training and on-site service and maintenance of equipment to meet the needs of our customers.

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CHEMICAL SENSOR ELEMENTS

FUSES AND BATTERIES.

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CONVENTIONS

The following conventions are used in this manual.



Warning Statement – Consult this manual when this symbol is found on the product or in any related documentation.



VDC (DC Voltage)

AC



or DC Voltage

1. REVISION HISTORY

Rev	ECO	Description of Change	Page
A	000317	MANY CHANGES DUE TO APPROVAL UPDATE	All
B	000336	Update to meet IEC/CSA 60079-29-1 Formatting Changes Add EOL Section	All

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3. GENERAL DESCRIPTION

SEC 3120 Dual-Sensor Display

The SEC 3120 Dual transmitter is designed to interface with two sensors and can be used with the SEC 5000 IREvolution®, SEC Millenium®, SEC Signature® infrared gas sensors, SEC 3000, and SE C3300 toxic gas detectors, or SEC Sample Draw system. The SEC Sample Draw system uses both inputs.

The SEC 3120 is a multi-microprocessor based intelligent transmitter continuously monitoring information from the gas sensor(s). The LCD of the SEC 3120 displays the gas concentration(s) and sensor status(s). The SEC 3120 has one (1) "Alarm" LED and one (1) "Status" LED. The SEC 3120 also has three (3) magnetic switches located around the circumference of the unit. This manual will describe the operation and use of the SEC 3120 transmitter.

Features

- *Explosion Proof*
- *Back lighted LCD Display*
- *Low Cost*
- *Plug and play toxic, oxygen and combustible gas sensors*
- *Self-check system*
- *4-20 mA sensor pass-thru output*
- *RS-485 Interface (Isolated), as a Modbus RTU Slave*
- *Optional alarm and fault relays*
- *Optional LCD heater for cold applications*
- *Optional Data card for datalogging*
- *Non-intrusive programming*
- *Non-intrusive calibration*
- *Removable, non-volatile, time stamped data logging*
- *Digital communication link to SEC Gas Detectors*
- *Multi-port housing for easy installation*
- *2 Inputs for 2 SEC gas detectors*

4. APPROVALS / CERTIFICATIONS

North American (c/us) Certificate:	Class I, Division 1, Groups B, C, D, T5 Class I, Zone 1, AEx d IIC Gb
IECEx (International) Certificate:	Ex (d) IIC, T5 Gb; IECEx CSA 13.0026

The SEC 3120 is approved to the standards shown in the approvals certificates. To maintain compliance with these standards, install the SEC 3120 per the following instructions and precautions.

5. SPECIFICATIONS

The following specifications are for the SEC 3120 display only. Consult the appropriate sensor manuals for their specifications.

For use with (up to two):

- SEC 3000 and 3300 Toxic and Oxygen gas sensors
- SEC 5000 IREvolution infrared sensors
- SEC Millenium infrared sensors
- SEC Sample Draw System (uses both inputs)

Environmental:

The SEC 3120 Dual Sensor Display can be installed in indoor, outdoor, and wet locations. The housings have ingress protection ratings of IP66. Pollution degree 2 and Overvoltage category II

Operating Temperature (Ta) and Humidity Rating:

-40° to +40°C (-40 to +104° F) when equipped with the optional LCD heater

0° to +40°C (32° to +104°F) when not equipped with the LCD heater.

The unit will operate below this temperature, but at a reduced function, specifically the LCD may become illegible or damaged.

0 to 99% RH (non-condensing)

Altitude / Elevation:

IEC 61010-1 certified to 2000 meters.

5.1.Mechanical

Construction:

Epoxy Coated Aluminum

Dimensions: (See drawing 3120-XXX for details)

Height: 5 Inches (128 mm)

Width: 5 inches (128 mm)

Depth: 4.8 inches (122 mm)

Weight: (2.8 kg)

Conduit Entry:

Three (3) 3/4 inch NPT



For hazardous location installations seals must be installed within 18 inches of conduit entries.

5.2.Electrical

Mains Supply (Operating Voltage):

24 VDC $\overline{\text{---}}$ Nominal (Range: 18 to 32 Vdc) measured at the detector head

Current Draw: (without sensors)

Average: 250 mA (Peak: 500 mA)

Input, Sensor (Digital):

0-5 V, Sensor Electronics Corp. (SEC) Proprietary, Single-Wire, Digital signal from the sensor.

This signal is used by the sensor to communicate status and gas data and is used by the display to initiate sensor calibration and query status.

Output (Analog):

4-20 mA (Source Type), max 1000 ohm load at 24 Vdc supply voltage.

The 4-20 mA output is provided by the sensor and is passed through the SEC 3120 display. The display can be located at any point in the sensor's output loop. Consult the appropriate sensor manual for 4-20 installation requirements.

Output (Digital):

RS485 LAN (isolated) MODBUS RTU Slave, compatible with Modicon Modbus Specification PI-MBUS-300 Rev. J. Refer to SEC Modbus Technical Sheet (SEC P/N 1580282) for specific configuration and use information.

Output (Relays):

Three (3) Alarms: Low, Mid High. One (1) Fault

Rated for 8 Amps, 30 VDC or 120VAC $\overline{\text{---}}$

Real Time Clock Battery:

The SEC 3120 uses a real time clock that runs on a 3V, 1220 battery.

6. UNIT INSTALLATION



Warning – If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



¹Warning – Do not open when energized or when an explosive atmosphere is present.



ADVERTISSEMENT - GARDER LE COUVERCLE BIEN FERME TANT QUE LES CIRCUITS SONT SOUS TENSION

Device Location:

The first step in the installation process is to establish a mounting location for the SEC 3120 transmitter and gas sensor(s). The most effective number and placement of sensors vary depending on the conditions of the application. Select a sensor location that is typical of the atmosphere to be monitored or close to the anticipated source of a dangerous gas. When determining where to locate gas sensors the following factors should be considered.

- What are the characteristics of the gas that is to be detected? Is it lighter or heavier than air? If it is lighter than air the sensor should be placed above the potential gas leak. Place the sensor close to the floor for gases that are heavier than air. Note that air currents can cause a gas that is heavier than air to rise. In addition, if the temperature of the gas is hotter than ambient air or mixed with gases that are lighter than air, it could also rise.
- How rapidly will the gas diffuse into the ambient air? Select a location for the sensor that is close to the anticipated source of a gas leak.
- Wind or ventilation characteristics of the immediate area must also be considered. Movement of air may cause gas to accumulate more heavily in one area than in another. The detector should be placed in the areas where the most concentrated accumulation of gas is anticipated. For outdoor applications with strong wind conditions, it may require the sensors to be mounted closer together and on the downwind side, to the anticipated area of a gas leak. Also take into consideration for indoor applications, the fact that many ventilation systems do not operate continuously.
- The sensor(s) should be accessible for maintenance.
- Excessive heat or vibration can cause premature failure of any electronic device and should be avoided if possible.
- Follow all national and local installation codes and practices.

When installing, make sure power is off when connecting the sensor, field, and relay wiring to the appropriate terminal blocks. DO NOT turn the power back on until the 3100 is secured to the housing using all four hex head screws.

¹Mounting:

Mount the SEC 3120 to rigid wall (wood based or stronger) or bulkhead structures using 1" or longer fasteners with a minimum 3/16" diameter. Mounting unit to drywall (wallboard, plasterboard, etc.) or similar material is not recommended.

¹Wiring:

Wire insulation for relay contacts should have a minimum breakdown voltage of twice that of the working voltage of the signal. E.g., 110v lines should have a minimum insulation breakdown voltage of 220v, 240v signals should have a minimum insulation breakdown voltage of 480v.

Wire insulation should be temperature rated for greater than 100°C.

Use copper conductors only on all terminal blocks.

Wire Sizing (Power):

0 to 500 feet wire length; recommend wire gauge size 16 AWG

501 to 1000 feet wire length; recommend wire gauge size 14 AWG

Safety Interrupt (mains circuit breaker):

A circuit breaker or interrupt switch for overcurrent protection rated for 30 watts located in the mains supply circuit is recommended. It should be located near the device it is protecting and labeled.

To minimize the length of exposed conductor, strip wires to 3/8 inch. Tin the exposed wire with solder to increase durability.



Protective bonding is provided by an internal screw location for connection of a grounding wire. Installation of this wire should include the use of a locking feature (i.e., locking washer).

Conduit:



¹For hazardous location installations seals must be installed within 18 inches of conduit entries.

The SEC 3120 has three (3) 3/4" NPT threaded ports for mounting and wiring the sensor(s) and transmitter into a permanent installation. All 3/4" NPT threads must pass L1 thread/plug gauge.

Field wiring connections are made on the backside of the SEC 3120 printed circuit board (PCB). For connection details refer to Figure 2.

Shielded cable is recommended. Wiring should be installed in metal conduit with no other cabling in the same conduit.

Power Supply:

The SEC 3120 must be powered using a power supply rated for CAN/CSA C22.2 No. 61010-1-12 and ANSI/UL 61010-1 OR a class 2 power supply as defined in Canadian Electrical Code C22.1 Section 16-200 and/or National Electrical Code article 725.121.

Refer to IEC 60079-29-2 for guidance on safe installation, use, and maintenance of this equipment.

7. OPTIONAL FEATURES

The SEC 3120 offers 3 options. A relay option for signaling alarm/faults, a data card option for logging gas occurrences, alarms/faults, and an LCD heater option for applications where the temperature goes below 2°C.

7.1. Relay Option

The SEC 3120 offers an option for 3 alarm relays (low, mid, and high) and one fault relay. These relays are rated for 8 Amps 30 VDC/250 VAC.

When the transmitter sees that the gas concentration of the sensor has exceeded the low, mid, or high threshold, the low, mid, and/or high relay will be toggled on.

If the transmitter sees that the sensor is in a fault or has become disconnected, the fault relay will toggle. For more information on the different ways the relays can be configured, see Section 11.3 “Relay Settings”.

7.2. Data Card Option

The Data Card Option of the SEC 3120 uses a MMC card to log different events to help track and changes or sensor behavior. See below for events that get logged:

1. **Gas Change Events-** When a gas level rises or falls according to a pre-determined delta (change) threshold, a gas record is entered into the log by the SEC 3120, containing the timestamp and gas level at the time of the event.
2. **Alarm Events-** When a gas level rises and triggers one of the alarms (low, medium, high) or when a sensor fault is detected, an alarm event is recorded along with a timestamp, the alarm type, and the gas level at the time of the event.
3. **Calibration Events-** When the user performs a calibration operation, a timestamp and calibration indicator is recorded.
4. **Parameter Change Events-** When the user changes settings on the SEC 3120, a change event recorded is recorded along with a time stamp and the SEC 3120 parameters.
5. **Sensor Warm-up Events-** When either the SEC 3120 or a sensor head is replaced and enters the warm-up operation, a sensor warm-up event is entered along with a timestamp and all the new sensor and SEC 3120 parameters.
6. **Memory Card Events-** Whenever the SEC Memory Card is removed or inserted, this event is recorded in the log along with all sensors, SEC 3120, and card unit serial number parameters to indicate a possible change in SEC 3120 unit data, to help prevent confusion from different SEC 3120 units using the same Memory Card at different times.

7.3. Heater Option

A heater option is available for SEC 3120 transmitters that are going into cold climates. This is a closed loop heater that heats the LCD screen. It will turn on when the temperature drops below approximately 2°C and will turn off when the temperature rises above approximately 3°C.

This option ensures that the LCD will be readable, even at cold temperatures.

To conform to the performance standard 60079-29-1, the 3120 must have all 3 features and be used with the SEC Millenium Hawk 0-100%LEL Methane gas detector.

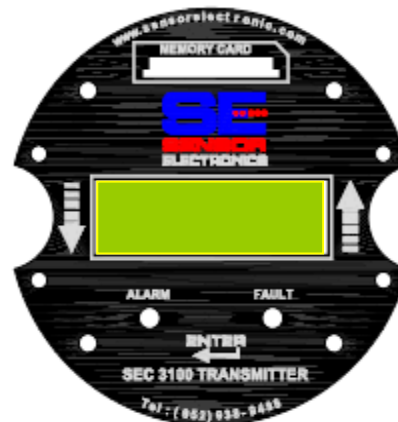
For more information regarding any features, contact SEC.

8. USER INTERFACE

User Inputs – Magnetic Switches:

The SEC 3120 has three (3) magnetic switch pickups on the Display PCB. The picture below shows the locations of the magnetic switches labeled UP, DOWN and ENTER. Placing a magnet near one of the switches will cause the following operations to occur.

Switch	Operation
ENTER	Enter Menu Mode, Selects a menu to Enter
UP	Moves up through Menu selections
DOWN	Moves down through Menu selections

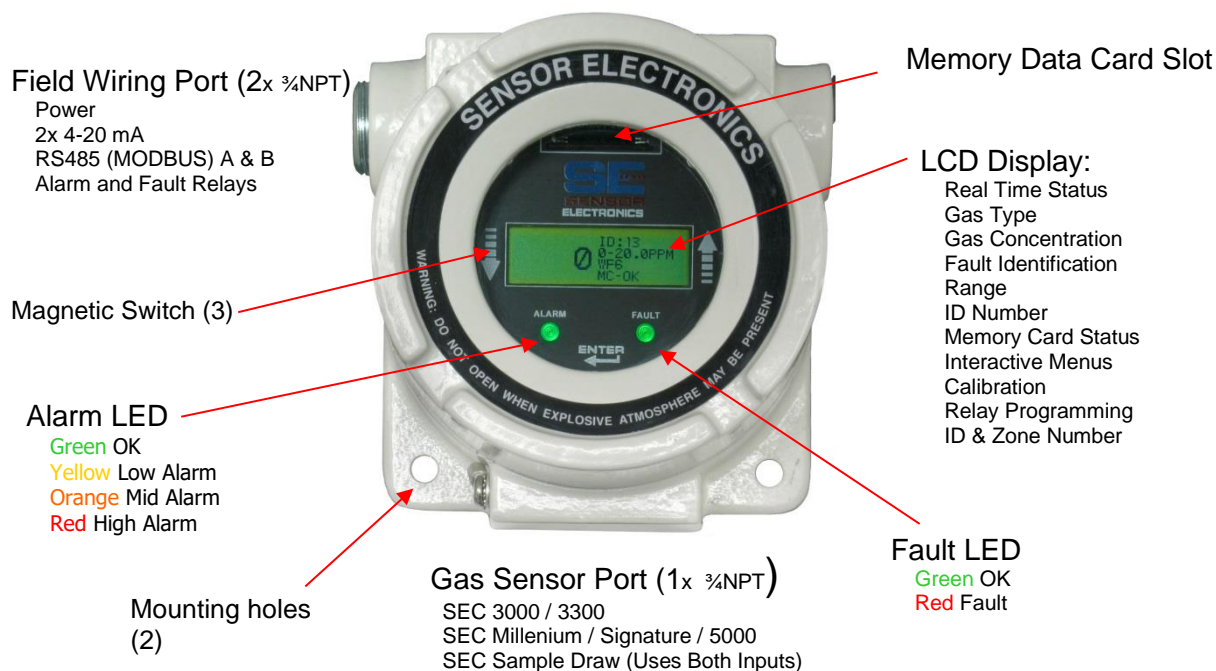


LED Indicators:

There are two multi-color LEDs that indicate Alarm and Fault status. The Alarm LED indicates the current alarm status individually for each sensor, regardless of the Relay Mode. The alarm state LEDs toggle indication for each sensor along with the sensor information display. When sensor one information is displayed, the alarm-state LEDs indicate the alarm status for sensor one. When sensor two's information is displayed, the alarm-state LEDs indicate the alarm status for sensor two. The color of the Alarm LED indicates the **Alarm level; Low Alarm = Yellow, Mid = Amber and High = Red**. The fault state LED toggles with the sensor information display as well, except when a SEC 3120 Transmitter unit fault exists. In fault condition, this LED is Red.

LCD Screen:

The LCD screen is a grayscale display with a 5/8 inch by 2-inch viewing area. It displays the gas type, range, measured gas concentration and status information for each sensor and the display unit. It has a contrast potentiometer that is accessible behind the faceplate on the Display PCB positioned just above the LCD display. The front faceplate must be removed to access it. This potentiometer allows the user to increase or decrease the display contrast, making it more visible under varying ambient light conditions and personal user preference.



9. INITIAL STARTUP

When power is applied to the SEC 3120, it enters its power up sequence (approximately sixty seconds), followed by the sensor warm-up mode which can take between one and five minutes depending on the sensor(s). At the end of the warm-up period with no faults present, the SEC 3120 automatically enters the normal operating mode.

If a fault is present after warm-up, the LCD and the Fault LED will indicate the fault. See your specific sensor's manual for warm-up and fault current value meanings (less than 4 mA).

NOTE: If the SEC 3120 unit is set to operate two sensors in the 'Identical' Role and they are not identical in gas type, range, or units, then the SEC 3120 unit will display a fault and indicate that the *Sensors Are Not Identical*, and the fault relay on the SEC 3120 unit will be engaged.

Initial Power Up Screen Sequence of the SEC 3120

SEC 3120 TRANSMITTER -STARTING UP FROM BRWN (SOFT RESET) 005	'BRWN' – Brown Out Reset (or 'SOFT RESET' shown on bottom line for a software reset) '005' – Counts down to '000' second startup delay
SEC 3120 TRANSMITTER VER X.YY.RRRR 005 08/10/2010 21:15:33	'VER' refers to the Firmware version installed in the display.
SEC 3120 TRANSMITTER VER X.YY.RRRR 003 -INIT ROM FROM RAM	'INIT ROM FROM RAM' – permanent parameters transferred from either 'ROM' to NVRAM or from NVRAM to ROM, or 'ROM' and 'RAM' are 'IDENTICAL'.
SEC 3120 TRANSMITTER VER X.YY.RRRR -BOOT SENSOR SYSTEM	'BOOT SENSOR SYSTEM' – Starting up sensor controllers

SEC 3120 TRANSMITTER
INIT MEMORY CARD ...

Success

S1	SENSOR	ID: XXX / YYY
	INIT	0-WAITING
S2		WAITING

S1	SENSOR	ID: XXX / YYY
	WARMUP	0-WAITING
	-ENT- TO	WAITING
S2	ABORT	

S1	SENSOR	ID: XXX / YYY
	UPLOAD	0-WAITING
S2		WAITING

'INIT MEMORY CARD' – Memory card system
Initializing.
'SUCCESS' or 'FAILURE' will show after a few seconds.

'S1' or 'S2' alternates and identifies that the displayed
data is for either Sensor 1 or Sensor 2.
'ID: XXX' refers to the user assigned ID for Sensor 1.
'ID: YYY' refers to the user assigned ID for Sensor 2.

'SENSOR WARMUP' – indicates that the given sensor
(S1 or S2) is warming up.

'SENSOR UPLOAD' – Sensor is uploading its
parameters to The 3120.

10. NORMAL OPERATION

In the normal operating mode, the 4-20 mA signal levels correspond to the detected gas concentration. The transmitter continuously checks for and displays system faults or initiation of calibration and automatically changes to the appropriate mode.

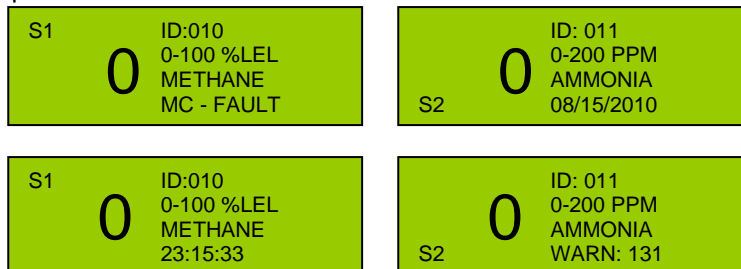
The 4-20 mA output ports of the SEC 3120 are non-isolated current source(s), passed through from the attached sensor(s). Their output values are defined by the associated sensor manual(s) (4 – 20 mA normal gas levels, less than (<) 4 mA indicates a status condition such as warm-up, calibration, or a sensor fault).

Normal Operation Screen



In normal operating mode actual gas concentration will be displayed on the left of the screen. The right side of the screen will display the ID #, Range, Gas Type and Status. The bottom line will scroll through the MC (memory card) status, Date, Time and, if a sensor has a warning code, will display 'WARN: xxx' where 'xxx' is a cell code #.

Example:



The normal display screen will toggle between sensor one and sensor two information at a rate of approximately once every two to three seconds. The alarm and fault LEDs indicate the alarm/fault status for the current sensor displayed at any given time as well. The operator may choose to advance the information displayed to the next sensor's information by selecting either the UP or DN switches. Doing so will immediately toggle the normal display screen information for the sensor not currently displayed (i.e., If display is currently showing sensor one (S1) information, then sensor two (S2) information will be immediately displayed, whereas if the display is currently showing sensor two (S2) information, then selecting UP or DN switch will cause sensor one (S1) information to immediately be displayed). If the 3120 unit is in single sensor mode, then the display will NOT change, and the S1 or S2 indicators will NOT show on the LCD display.

If the attached sensor(s) detect a fault or warning, it will be displayed on the screen in decimal. See sections 21 and UNIT STATUS FLASH CODES22 for more information on error and warning codes.

Note: If the SEC 3120 cannot communicate with a sensor, either on sensor 1 or sensor 2 it will indicate sensor fault on the one it cannot communicate with. Check the wiring and the +24VDC of the sensor if this occurs.

11. SETUP – CONFIGURATION OPERATION

Once the SEC 3120 is powered up it may have to be configured to run correctly based on the system in which it is intended to be operated. For example it will have to be set up based on whether it has one or two sensors attached, how the alarm relays are intended to operate and the network settings and ID will have to be set for the ModBus communication.

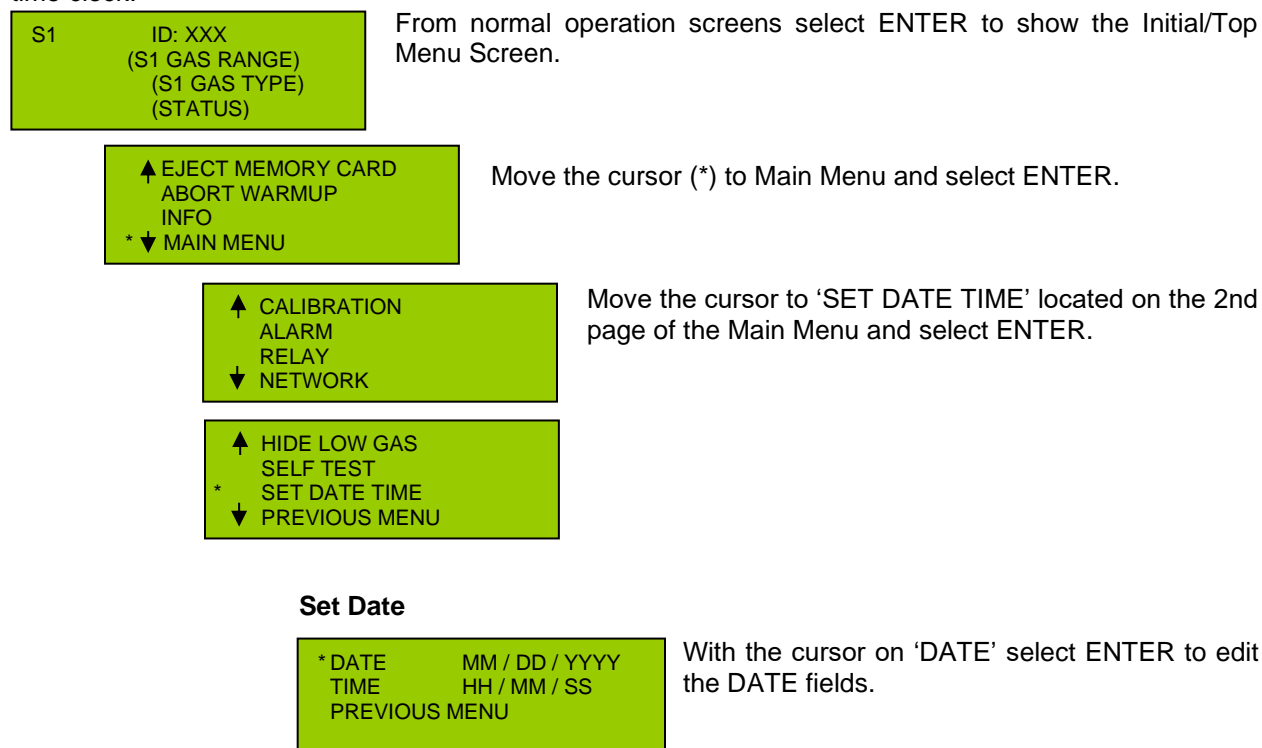
11.1. Required Sequence for Changes to Configuration

There is a very important order to setting Network IDs, sensor and network ID modes/roles and bus line settings. It should be done as follows:

1. Verify that the SEC 3120 Unit is offline (turn Modbus mode to 'OFF')
2. Delete this unit from the SEC 3500 HMI or equivalent device if it was previously online or 'discovered'. Consult the SEC 3500 manual for details.
3. Change the Sensor Role to either Identical or Unique to unlock subsequent adjustments.
4. Set the relay control Latching, Delay and Logic (AND, OR, Sensor 1 or Sensor 2).
5. Assign the Sensor Mode – Identical, Unique, or Single
6. Set Alarm Thresholds and Activation Modes.
7. Set the Network ID mode – Unique or Identical.
8. Set the Network and Zone IDs.
9. Set the RS485 Modbus line settings.
10. Place the SEC 3120 and its sensors 'online' by activating it on the RS485 Modbus network.

11.2. Date and Time

Entering this menu will allow the operator to set the date, time and day of the week of the SEC 3120 real time clock.



*DATE: * MM / DD / YYYY
TIME: HH / MM / SS
PREVIOUS MENU

Use the UP and DOWN switches to choose the month, day or year to edit and select ENTER

*DATE: * MM / DD / YYYY *
TIME: HH / MM / SS
PREVIOUS MENU

Use the UP and DOWN switches to set the value and select ENTER.
(Edit **Month** is shown in figure.)

*DATE: MM * DD / YYYY
TIME: HH / MM / SS
PREVIOUS MENU

Use the UP and DOWN arrows to move between month, day, and year.
(Day)

*DATE: MM / DD * YYYY
TIME: HH / MM / SS
PREVIOUS MENU

(Year)

*DATE: MM / DD / YYYY *
TIME: HH / MM / SS
PREVIOUS MENU

You must move cursor to the right of the year and select ENTER to exit changing the date and be able to move on to setting the time or moving to the previous menu.

Set Time

DATE MM / DD / YYYY
*TIME HH / MM / SS
PREVIOUS MENU

Select ENTER to edit the TIME field.

DATE: MM / DD / YYYY
*TIME: *HH / MM / SS
PREVIOUS MENU

Use the UP and DOWN switches to choose the hour, minutes, or seconds to edit and select ENTER.

DATE: MM / DD / YYYY
*TIME: *HH / MM / SS *
PREVIOUS MENU

Use the UP and DOWN switches to set the value and select ENTER (edit hour is shown in figure).

DATE: MM / DD / YYYY
*TIME: *HH / MM / SS
PREVIOUS MENU

Use the UP and DOWN arrows to move between hours, minutes, and seconds.

(Hours)

DATE: MM / DD / YYYY
*TIME: HH * MM / SS
PREVIOUS MENU

(Minutes)

DATE: MM / DD / YYYY
*TIME: HH / MM * SS
PREVIOUS MENU

(Seconds)

DATE: MM / DD / YYYY
* TIME: HH / MM / SS *
PREVIOUS MENU

You must move cursor to the right of the seconds and select ENTER to exit changing the hour and be able to move on to the previous menu.

DATE: MM / DD / YYYY
TIME: HH / MM / SS
* PREVIOUS MENU

ENTER on 'PREVIOUS MENU' to exit changing the date and time and return to the Main Menu.

* SAVE CHANGES
ABORT CHANGES

ENTER on 'SAVE CHANGES' to keep the new settings or 'ABORT CHANGES' to cancel them. Either choice will return to the Main Menu.

↑ HIDE LOW GAS
SELF TEST
SET DATE TIME
* ↓ PREVIOUS MENU

ENTER on 'PREVIOUS MENU' to return back to the Initial / Top Menu.

11.3. Relay Settings – Latching, Delay and Control Logic

The Relay Menu is found in the Main Menu.

S1 ID: XXX
(S1 GAS RANGE)
(S1 GAS TYPE)
(STATUS)

From normal operation screens select ENTER to show the Initial/Top Menu Screen.

↑ EJECT MEMORY CARD
ABORT WARMUP
INFO
* ↓ MAIN MENU

Select ENTER on MAIN MENU.

Relay Menu (Selected from the Main Menu)

↑ CALIBRATION
ALARM
* RELAY
↓ NETWORK

Move the cursor to RELAY and select ENTER to open the relay menu.

Latching:

Each relay; Low, Mid, High and Fault; can be individually configured to latch when it is activated. Setting a relay to 'latch' will cause it to remain activated after the condition that activated the relay has cleared. This causes the user to acknowledge the activation to clear any alarms. See the end of this section on how to do this.

NOTE: As required by 60079-29-1 performance standard, the default LATCH setting for the HIGH alarm is LATCHING.

Delay:

Delay can also be applied to the activation (ON) or deactivation (OFF) of the individual relays. The delay can be up to 255 seconds for each setting. If a delay is set to the relay activation (ON DELAY) the alarm or fault associated with that relay will not be triggered until after the alarm condition has remained for the duration of the delay. Similarly, if a delay is applied to the deactivation (OFF DELAY) the alarm will remain engaged for the number of seconds beyond when the alarm condition has cleared. Use caution when applying ON DELAY to the activation of alarm relays as an unsafe atmosphere may be present for up to 255 seconds prior to any alarms being activated.

Setting Relay Latching and Delay Conditions – set individually for each alarm/fault relay

* ↑ LOW
MID
HIGH
↓ FAULT

Move the cursor to the desired alarm (LOW, MID, HIGH or FAULT) and select ENTER.

↑ LOGIC MODE
↓ PREVIOUS MENU

* ↑ LATCH 'NORMAL'
ON DLY XXX
OFF DLY XXX
↓ ENERGIZED YES / NO

Within the LOW, MID, HIGH and FAULT pages the user can set:

- the relay latching style **
- the on delay in seconds (0-255)
- the off delay in seconds (0-255)
- the energized state (NO = relay not energized until activated {resembles normally open contact action}, YES = relay energized until activated {resembles normally closed contact action})

NOTE: The fault relay is set to energized by default. This is so if the device loses power, the relay toggles and indicates to the unit's power has been lost. For this to work, the fault relay must be utilized by being wired to a light, horn, or some other indicator.

** Latching Mode:

- Normal = relays do not latch.
- Latching = relays remain activated until forced reset.
- Audible = relays can be silenced by user (forced off).

* ↓ PREVIOUS MENU

ENTER on 'PREVIOUS MENU' to return to the Relay Menu and choose to permanently save or abort the changes.

* SAVE CHANGES
ABORT CHANGES

ENTER on 'SAVE CHANGES' to retain new settings or 'ABORT CHANGES' to cancel them. Either choice will return to the Relay Menu.

Logic:

A key feature in the SEC 3120 is the Sensor Role because only one set of relays is provided to service both attached sensors. Therefore, in determining the sensor mode, a decision regarding how the relays will be used must be considered and a decision concerning what relay mode is used must be made. Below is a list of possible relay modes:

- **Sensor One** – All alarm relays are determined exclusively from the alarm status of sensor one. The fault relay is engaged by either a sensor one fault condition or an SEC 3120 unit fault condition. Alarm and fault states of sensor two will NOT cause any relays to be engaged. This relay mode is commonly used in conjunction with the Single Sensor Role and must be set PRIOR to setting the Single Sensor Role.
- **Sensor Two** – All alarm relays are controlled exclusively from the alarm status of sensor two. The fault relay is engaged by either a sensor one fault condition or an SEC 3120 unit fault condition.

Alarm and fault states of sensor one will NOT cause any relays to be engaged. CAUTION: Sensor Two relay logic must not be used when the sensor mode is SINGLE.

- **Logical AND** – All alarm relays are controlled by the logical AND condition of BOTH sensors one and two states. This means that for a low-alarm relay to be engaged, BOTH sensors must be reporting low relay alarm states (gas levels above the low alarm threshold). For a mid-alarm relay to be engaged, BOTH sensors must be reporting at least mid-relay alarm states. For a high-alarm relay to be engaged, BOTH sensors must be reporting high alarm states. This relay mode is best utilized in the Identical Sensor Role and should be set PRIOR to setting the Identical Sensor Role. The fault relay will engage if EITHER sensor is reporting a fault condition, or if the SEC 3120 unit is in a fault state. CAUTION: AND or SENSOR TWO relay logic must not be used when the sensor mode is SINGLE.
- **Logical OR** – All alarm relays are controlled by the logical OR condition of BOTH sensor one and sensor two states. This means that for a low-alarm relay to be engaged, EITHER sensor may be reporting a low relay alarm state. For a mid-alarm relay to be engaged, EITHER sensor may be reporting a mid-relay alarm state. For a high-alarm relay to be engaged, EITHER sensor may be reporting a high alarm state. This relay mode is commonly utilized in the Unique Sensor Role and should be set PRIOR to setting the Unique Sensor Role. The fault relay will engage if EITHER sensor is reporting a fault condition, or if the SEC 3120 unit is in a fault state.

Setting Relay Logic –

↑ CALIBRATION
ALARM
* RELAY
↓ NETWORK

Move the cursor to RELAY and select ENTER to open the relay menu.

* ↑ LOW
MID
HIGH
↓ FAULT

Move the cursor to LOGIC MODE on the 2nd page of the RELAY menu and select ENTER.

* ↑ LOGIC MODE
↓ PREVIOUS MENU

* MODE 'value'
PREVIOUS MENU

Select ENTER with the cursor on MODE to choose the relays' logic. Use the UP and DOWN switches to choose the desired logic option:

- SENSOR ONE; relays respond to sensor one alarm states only.
- SENSOR TWO; relays respond to sensor two alarm states only.
- AND; relays will activate only when both sensor alarm states are at the same action level.
- OR; relays will activate when either sensor's alarm state is active.

MODE 'value'
* PREVIOUS MENU

ENTER on 'PREVIOUS MENU' to return to the Relay Menu and choose to permanently save or abort the changes.

* SAVE CHANGES
ABORT CHANGES

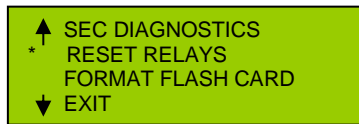
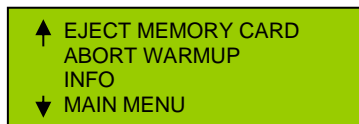
ENTER on 'SAVE CHANGES' to retain new settings or 'ABORT CHANGES' to cancel them. Either choice will return to the Relay Menu.

↑ LOGIC MODE
* ↓ PREVIOUS MENU

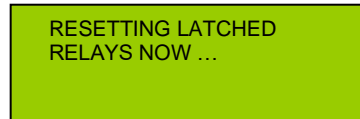
ENTER on 'PREVIOUS MENU' to return to the Main Menu.

11.3.1. Resetting Latched Relays

The Reset Relays Menu will allow the operator to reset latched relays. Latched relays will be indicated by a blue flashing Alarm LED.



Select ENTER and any latched relays will be reset.
The following will be briefly displayed (for about three seconds):



11.4. Sensor Mode – Single, Unique, or Identical

The SEC 3120, unlike the SEC 3100, communicates with two sensors allowing for simultaneous gas measurement, display, transmission, and storage. This capability opens new opportunities for how sensors can be configured to work together in varying roles. The following is a brief look at the three configurations for the two sensor connectors:

- **Single Mode** – In this mode, the SEC 3120 unit will only communicate / display / log information from a single sensor connected to the sensor 1 connector (see **Error! Reference source not found.**). Any device attached to the sensor 2 connector is ignored. A key feature in this mode is when no sensor is attached to the 2nd connector the SEC 3120 does not signal a 'sensor missing' fault. In this mode the display mimics the behavior of the SEC 3100 yet retains the advanced features of the SEC 3120. The Single Sensor Mode will default the Modbus Network ID mode to 'Single' and change all screens to disallow changing of sensor two parameters or displaying information for a second sensor.



CAUTION: Prior to setting the Sensor Mode to 'SINGLE' the relay logic should be configured to only respond to sensor one or logic OR.

- **Identical Mode** – In this mode, the SEC 3120 will require two sensors to be attached to the sensor connector terminals. Both sensors must be of the same device type, measure identical gas types and identical gas value ranges. The distinguishing feature of this mode is if one sensor is not connected or if both sensors are not identical an error screen will be displayed, a UNIT FAULT will be issued, and the fault relay will be engaged.

This mode is commonly used for redundancy- such as two oxygen sensors used to ensure that the actual oxygen levels are truly at the same appropriate value before triggering the associated alarms. In this example the relay mode should be configured in the AND logical configuration for this method to work as described.

Relay logic modes for Sensor 1, Sensor 2 or logic OR are not prevented in the Identical sensor mode if the user would prefer to configure the relay mode as such. For example, if the user wants added security, one could choose logic OR, or if one sensor is faulty the relay mode may be set to the other sensor until repair/replacement can occur.

- **Unique Mode** – In this mode, the SEC 3120 will communicate with two sensors attached to the sensor connector terminals. The two sensors can be of different sensor types, different gas types, different concentration ranges or could be identical but in different locations. Modbus IDs may be set to different values or to the same value (if not using an SEC 3500 HMI). The relay mode may be set to any configuration. This sensor role allows the SEC 3120 to consolidate two sensors to only one transmitter and allows logging of both sensor values to a single storage device. In this mode the SEC 3120 will indicate a fault/warning if one sensor is not attached. It will not indicate a fault if the sensors are not identical.

The sensor mode in which the SEC 3120 Digital Transmitter operates is chosen by the user and is a key decision that must be made before deploying or changing the sensing/monitoring plan. The choice will be determined by how many sensors are deployed, what gases are measured and how that data is captured.

Change Sensor Mode

S1 ID: XXX
(S1 GAS RANGE)
(S1 GAS TYPE)
(STATUS)

Select ENTER to show the Initial/Top Menu Screen.

↑ EJECT MEMORY CARD
ABORT WARMUP
INFO
* ↓ MAIN MENU

Select ENTER on MAIN MENU.

↑ CALIBRATION
ALARM
RELAY
* ↓ NETWORK

Scroll down to NETWORK and select ENTER.

NETWORK ID MENU
* MODBUS SETTINGS
PREVIOUS MENU

Scroll down and select ENTER on MODBUS SETTINGS to bring up the Modbus Settings Menu.

↑ ONLINE YES / NO
* SENSORS (MODE) *
NET ID (MODE)
↓ 485 BUS MENU

Scroll down and select ENTER on SENSORS. Use the UP/DN switches to change the value to one of three possible modes:

- IDENT – where two sensors have the same gas, range and type and are used in a redundant mode,
- UNIQUE – where two sensors have completely different gas, range, or types,
- SINGLE – where only ONE sensor is attached to the sensor one plug.



CAUTION: Only one edit is retained when leaving this menu. When making changes to the 'MODBUS SETTINGS' menu, exit to the 'SAVE CHANGES' screen for each field being changed.

* ↓ PREVIOUS MENU

Scroll down to bring up the next page of the Modbus Settings Menu. Select ENTER on PREVIOUS MENU to return the screen to the Network Menu.

NETWORK ID MENU
* MODBUS SETTINGS
PREVIOUS MENU

Scroll down to PREVIOUS MENU and select ENTER to return the screen back to the Main Menu.

* SAVE CHANGES
ABORT CHANGES

Select ENTER on SAVE CHANGES to return the screen back to the Main Menu Screen.

↑ CALIBRATION
ALARM
RELAY
* ↓ NETWORK

Scroll down to Page 2 of the Main Menu Screen.

↑ HIDE LOW GAS
SELF TEST
SET DATE TIME
* ↓ PREVIOUS MENU

Scroll down to and select ENTER on PREVIOUS MENU to return the screen to the Initial/Top Menu Screen.

↑ EJECT MEMORY CARD
ABORT WARMUP
INFO
* ↓ MAIN MENU

Scroll down to bring up Page 2 of the Initial/Top Menu Screen.

↑ SEC DIAGNOSTICS
RESET RELAYS
FORMAT FLASH CARD
* ↓ EXIT

Scroll down to and select ENTER on EXIT to return the screen to the Normal Operating Display.

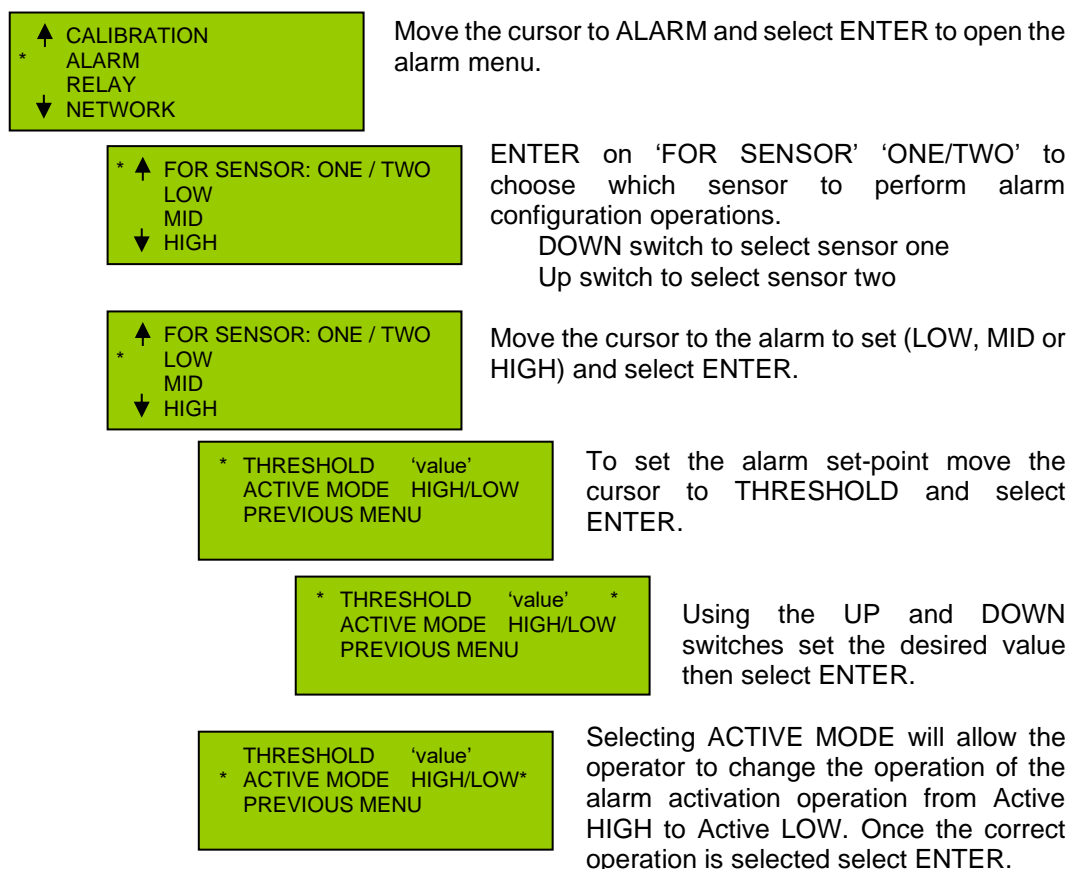
11.5. Alarm Settings – Threshold Values and Active Mode

In the 'ALARM' menu the user can set the thresholds for the Low, Mid and High alarms for both sensors. The default values for these settings are as follows:

Alarm	Threshold
Low	20% of Full Scale
Mid	40% of Full Scale
High	60% of Full Scale

The 'Active Mode' of each alarm set point can also be changed in this menu. An Active High setting will trigger the alarm when the gas concentration is rising and crosses the threshold set point. An Active Low setting will trigger the alarm when the gas concentration is falling and crosses the threshold set point. The user can also change the "MUTE ON WARN" setting. This setting determines how the transmitter acts when the attached sensor goes into a warning (only applies to SEC 5000 IREvolution, SEC 3300, SEC Millenium Hawk, and SEC Sample Draw system). The default for this setting is "NO" meaning that if the unit goes into a warning but still senses gas, the transmitter relays will activate (LEDs will also change) and communicate to the SEC 3500 when an alarm threshold has been met. Turning the setting "YES" will keep the transmitter relays from activating and the LEDs from changing color when the unit is in a warning.

Alarm Menu (Selected from the Main Menu)



- HIGH activates the alarm on a rising gas level.
- LOW activates the alarm when the gas level falls below the alarm set point.

THRESHOLD 'value'
ACTIVE MODE HIGH/LOW
* PREVIOUS MENU

ENTER on 'PREVIOUS MENU' to return to the Alarm Menu and choose to save or abort the changes.

* SAVE CHANGES
ABORT CHANGES

ENTER on 'SAVE CHANGES' to retain the new settings or 'ABORT CHANGES' to discard them.

▲ FOR SENSOR: ONE / TWO
* LOW
MID
▼ HIGH

Move cursor down to show next alarm sub menu.

* ▼ MUTE ON WARN YES/NO
PREVIOUS MENU

ENTER on 'MUTE ON WARN' to change how the transmitter acts when a sensor goes into a warning. Using up or down the value can be changed from YES to NO.

▼ MUTE ON WARN YES/NO
* PREVIOUS MENU

ENTER on 'PREVIOUS MENU' to return to the MAIN MENU

11.6. Network ID (Sensor / Display Network Identities)

The SEC 3120 may be addressed on Modbus at a specific network ID, as any other Modbus compliant device does. However, it may also be accessed using two network device IDs, one for each sensor if that is how it is configured. When communicating with the SEC 3500 versions less than 4.0.0, one device ID must be assigned sequentially for each sensor attached, allowing the SEC 3500 to depict two separate sensors and treat them as individual SEC 3100 transmitters. In version 4.0.0 and higher, the SEC 3500 will support a single network ID for all sensors attached to the SEC 3500 and display all relevant information as a single transmitter, a dual-sensor hub. Likewise, Modbus compliant Master devices may choose to communicate with the SEC 3120 Transmitter using a single network ID. Switching between these modes can be very tricky when legacy (versions older than 4.0.0) SEC 3500 HMI panels are the master.

The SEC 3120 Modbus Network ID Modes are:

- **Legacy 3100 Mode** – This is not a mode that is selected directly by the user interface menus however, this mode can be set by the SEC 3500 HMI for communication with older legacy SEC 3500 HMI Panels. It is not a mode that should be intentionally set for use with Modbus Master's other than legacy SEC 3500 HMI Panels. In this mode, network IDs are forced to be assigned sequentially for two sensors attached to each SEC 3120. Sequential IDs can be assigned in UNIQUE mode if desired, but in Legacy 3100 mode sequential IDs are forced.
- **Unique Mode** – This mode can be used for any Modbus Master or SEC 3500 HMI version. In this mode, Modbus Network IDs can be assigned to both sensors of any valid value, and do not have to be sequential. When communicating with an SEC 3500 of a version less than 4.0.0 however, the network IDs should be set sequentially in this mode.
- **Single Mode** – This mode can be used for any Modbus Master or for an SEC 3500 HMI Panel version 4.0.0 or higher. In this mode, only one Modbus Network ID is assigned to the SEC 3120 Transmitter and all sensor information for all sensors attached is accessible.

Change Network ID Mode

▲ EJECT MEMORY CARD
ABORT WARMUP
INFO
* ▼ MAIN MENU

From the Initial/Top menu screen, move the cursor down to MAIN MENU and select ENTER.

↑ CALIBRATION
 ALARM
 RELAY
 * ↓ NETWORK

Move the cursor down to the NETWORK Menu and select ENTER.

* NETWORK ID MENU
 MODBUS SETTINGS
 PREVIOUS MENU

Select ENTER on MODBUS SETTINGS to bring up the Modbus Settings Menu Page 1 Screen

↑ ONLINE YES / NO
 SENSORS UNIQUE
 * NET ID UNIQUE *
 ↓ 485 BUS MENU

The operator may change the Modbus Network ID mode by moving the cursor to NET ID selecting ENTER and using the UP/DN arrows to change the value to one of two modes:

- UNIQUE – where two sensors have different Modbus network ID and zone values and can be addressed independently on Modbus network,
- SINGLE – where one or both sensors share a single Modbus network ID and zone ID and either sensor is accessed by this network ID.



CAUTION: Only one edit is retained when leaving this menu. When making changes to the 'MODBUS SETTINGS' menu exit to the 'SAVE CHANGES' screen for each field being changed.

↑ ONLINE NO
 SENSORS IDENT
 * NET ID SINGLE
 ↓ 485 BUS MENU

Scroll down to the 2nd page of the Modbus Settings Menu.

* ↓ PREVIOUS MENU

Select ENTER on PREVIOUS MENU to return the screen to the Network Menu.

* NETWORK ID MENU
 MODBUS SETTINGS
 PREVIOUS MENU

Scroll down to and select ENTER on PREVIOUS MENU to return the screen back to the Main Menu Screen.

* SAVE CHANGES
 ABORT CHANGES

Select ENTER on SAVE CHANGES to return the screen back to the Main Menu Screen.

↑ CALIBRATION
 ALARM
 RELAY
 * ↓ NETWORK

Scroll down to bring up Page 2 of the Main Menu Screen.

↑ HIDE LOW GAS
 SELF TEST
 SET DATE TIME
 * ↓ PREVIOUS MENU

Scroll down to PREVIOUS MENU and select ENTER to return the screen to the Initial/Top Menu Screen.

↑ EJECT MEMORY CARD
 ABORT WARMUP
 INFO
 * ↓ MAIN MENU

Ready for next operation.

Set the Network and Zone IDs

↑ EJECT MEMORY CARD
ABORT WARMUP
INFO
* ↓ MAIN MENU

From the Initial/Top menu screen, cursor down to the Main Menu and select ENTER.

↑ CALIBRATION
ALARM
RELAY
* ↓ NETWORK

Move the cursor down to the NETWORK menu and select ENTER.

* NETWORK ID MENU
MODBUS SETTINGS
PREVIOUS MENU

Select ENTER on NETWORK ID MENU.

* FOR SENSOR: ONE/TWO *
ID XXX
ZONE YYY
PREVIOUS MENU

If the ID mode (see Modbus settings menu) is not set to 'Single' and Sensor Role (see Modbus settings menu) is not set to 'Single', then you may change the ID and Zone number for either sensor one or two by choosing the sensor number. Select ENTER on 'FOR SENSOR' item, and use the UP/DN arrows to change between ONE and TWO. Otherwise, if ID mode or Sensor Role is set to 'Single' all changes will be made with SENSOR ONE displayed.

FOR SENSOR: ONE/TWO
* ID XXX *
ZONE YYY
PREVIOUS MENU

To set the ID of each sensor move the cursor to ID and select ENTER. The IDs of the sensors may be set in the range 1-254, however they cannot be set to the same value.

Note: Be sure to assign the sensor an ID number not shared by any other sensors in the HMI's network.

FOR SENSOR: ONE/TWO
* ID XXX *
ZONE YYY
PREVIOUS MENU

To set the Zone of each sensor move the cursor to ZONE and select ENTER. The ZONE can be set in the range 1-254. **Note:** If being used with a SEC 3500, only zones 1-16 can be used.

FOR SENSOR: ONE
ID 13
ZONE 3
* PREVIOUS MENU

Scroll down and select ENTER on PREVIOUS MENU to return to the Network Menu Screen.

NETWORK ID MENU
MODBUS SETTINGS
* PREVIOUS MENU

Scroll down to and select ENTER on PREVIOUS MENU to return to the Main Menu.

* SAVE CHANGES
ABORT CHANGES

ENTER on 'SAVE CHANGES' to return to the Main Menu.

↑ CALIBRATION
ALARM
RELAY
* ↓ NETWORK

Scroll down to Main Menu page 2.

↑ HIDE LOW GAS
SELF TEST
SET DATE TIME
* ↓ PREVIOUS MENU

Scroll down to PREVIOUS MENU and select ENTER to return the screen to the Initial/Top Menu.

↑ EJECT MEMORY CARD
ABORT WARMUP
INFO
* ↓ MAIN MENU

Ready for next operation.

11.7. ModBus Settings

The SEC 3120 Digital Transmitter can speak to various devices that communicate using standard 16-bit Modbus and every version of the SEC 3500 HMI using its various proprietary protocols. (For more details, see the SEC 3120 16-bit Modbus Technical Sheet, SEC P/N 1580282) Based on the Modbus register address and function code combinations provided in queries to the Transmitter by a Modbus Master, it can determine whether it is communicating with a standard Modbus device or an SEC 3500 HMI and further distinguish which HMI protocol is appropriate. The SEC 3120 communicates over RS485 as a Modbus RTU Slave (compatible with Modicon Modbus Specification PI-MBUS-300 Rev. J) and does not perform any bus-management functions.

Configuring SEC 3120 RS485 Bus Parameters

Since the SEC 3120 implements Modbus RTU over RS485, bus communication parameters can be changed to accommodate various line configurations for other Modbus compliant Masters (compatible with Modicon Modbus Specification PI-MBUS-300 Rev. J). SEC 3500 HMI Panels communicate using SEC standard RS485 (or default) configuration parameters, as shown below, since they provide the most reliable compromise for speed, distance, and error tolerance:

- **Baud Rate:** 9600
- **Parity:** None
- **Stop Bits:** 2
- **Data Bits:** 8

The default parameters (485 Bus Settings Menu Item SEC-DEFAULT) shown above are mandatory for the SEC 3500 and are the recommended parameters. However, a different Modbus compliant Master used in place of the SEC 3500, such as a Modbus Ethernet Gateway, may choose to use a different configuration. The Most common alternative configuration is as follows (485 Bus Settings Menu Item SEC-ALTERNATE):

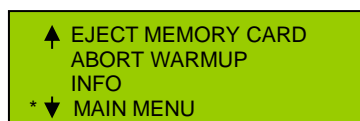
- **Baud Rate:** 9600
- **Parity:** None
- **Stop Bits:** 1
- **Data Bits:** 8

The operator may choose to completely configure the communication configuration by setting custom settings (485 Bus Settings Menu Item SEC-CUSTOM):

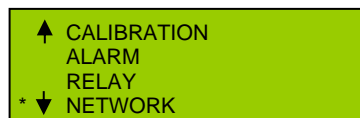
- **Baud Rates:** 1200, 2400, 4800, 9600, 19200, 38400
- **Parity:** None, Odd, or Even
- **Stop Bits:** 1 or 2
- **Data Bits:** 8 or 9

Though the parameters are customizable, the total frame of bits cannot exceed ten (not including the start bit), hence 8 data bits with 2 stop bits will be valid, but parity cannot be used. Likewise, 8 data bits with parity is valid with only 1 stop bit. Nine data bits can only be valid with one stop bit and no parity. Though the operator may create a configuration greater than ten total bits, the transceivers by default will adapt a replacement frame that remains ten bits in length and will resemble the most common frame format.

Activating ModBus Communication - Put the SEC 3120 Unit Online or Offline



Scroll down to MAIN MENU and select ENTER.



Move the cursor down to the NETWORK menu and select ENTER.

*
NETWORK ID MENU
MODBUS SETTINGS
PREVIOUS MENU

Select ENTER on MODBUS SETTINGS to bring up the Modbus Settings Menu.

* ↑ ONLINE YES / NO *
 SENSORS UNIQUE
 NET ID UNIQUE
* ↓ 485 BUS MENU

The operator can place the unit actively on RS485 bus, or take it off by moving the cursor to ONLINE, selecting ENTER and using the UP/DN arrows to change the value between YES and NO.

* ↑ ONLINE YES
 SENSORS IDENT
 NET ID SINGLE
* ↓ 485 BUS MENU

Scroll down to the Modbus Settings Menu Page 2.

* ↓ PREVIOUS MENU

Select ENTER on PREVIOUS MENU to exit the Modbus Settings Menu and return to the Network Settings Menu Screen.

NETWORK ID MENU
MODBUS SETTINGS
* PREVIOUS MENU

Scroll down to and select ENTER on PREVIOUS MENU to return to the Main Menu Screen.

*
SAVE CHANGES
ABORT CHANGES

Select ENTER on SAVE CHANGES. The screen will return to the Main Menu.

↑ CALIBRATION
 ALARM
 RELAY
* ↓ NETWORK

Scroll down to Main Menu Page 2.

↑ HIDE LOW GAS
 SELF TEST
 SET DATE TIME
* ↓ PREVIOUS MENU

Scroll down to and select ENTER on PREVIOUS MENU to return to the Initial/Top Menu Screen.

Set RS485 ModBus Line Settings (Data Bits, Stop bits, Parity and BAUD)

↑ EJECT MEMORY CARD
ABORT WARMUP
INFO
* ↓ MAIN MENU

Scroll down to MAIN MENU and select ENTER.

↑ CALIBRATION
ALARM
RELAY
* ↓ NETWORK

Move the cursor down to the NETWORK menu and select ENTER.

NETWORK ID MENU
* MODBUS SETTINGS
PREVIOUS MENU

Select ENTER on MODBUS SETTINGS to bring up the Modbus Settings Menu.

RS485 Bus Settings Menu

↑ ONLINE YES / NO
SENSORS UNIQUE
NET ID UNIQUE
* ↓ 485 BUS MENU

The operator may change the Modbus RS485 settings by selecting ENTER on 485 BUS MENU. The following sub-menu will show:

485 Bus Default Settings

* COMM- DEFAULT
COMM- ALTERNATE
COMM- CUSTOM
PREVIOUS MENU

The operator can set the 485 bus to communicate using SEC DEFAULT line values by moving the cursor to COMM-DEFAULT and selecting ENTER. The default values are 9600 baud, 8 data bits, no parity and 2 stop bits. The following display is shown:

DEFAULT COMM PARAMS
F BITS: 8 S BITS: 2
PAR: N RATE: 9600
-ENT- TO CONTINUE

This is just an informational box to indicate what the settings are. The operator may select ENTER to return to the 485 bus menu.

485 Bus Alternate Settings

* COMM- DEFAULT
COMM- ALTERNATE
COMM- CUSTOM
PREVIOUS MENU

The operator can set the 485 bus to communicate using SEC ALTERNATE line values by moving the cursor to COMM- ALTERNATE and selecting ENTER. The alternate values are 9600 baud, 8 data bits, no parity and 1 stop bit. The following display is shown:

ALT. COMM PARAMS
F BITS: 8 S BITS: 1
PAR: N RATE: 9600
-ENT- TO CONTINUE

This is just an informational box to indicate what the settings are. The operator may select ENTER to return to the 485 bus menu.

485 Bus Custom Settings Menu

```
COMM- DEFAULT
COMM- ALTERNATE
* COMM- CUSTOM
PREVIOUS MENU
```

The operator can set the 485 bus to custom communication settings by moving the cursor to COMM- CUSTOM and selecting ENTER. The following screen will show:

```
* ↑ DATA BITS EIGHT *
STOP BITS TWO
PARITY NONE
↓ BAUD RATE 9600
```

The operator may change the data bits by moving the cursor to DATA BITS and select ENTER, then using the UP/DN arrows to change the value to either 'EIGHT' or 'NINE'.

```
↑ DATA BITS EIGHT
* STOP BITS TWO *
PARITY NONE
↓ BAUD RATE 9600
```

The operator may change the stop bits by moving the cursor to STOP BITS and select ENTER, then using the UP/DN arrows to change the value from either 'ONE' or 'TWO'.

```
↑ DATA BITS EIGHT
STOP BITS TWO
* PARITY NONE *
↓ BAUD RATE 9600
```

The operator may change the parity checking by moving the cursor to PARITY and select ENTER, then using the UP/DN arrows to change the value from 'NONE', 'ODD' or "EVEN".

```
↑ DATA BITS EIGHT
STOP BITS TWO
PARITY NONE
* ↓ BAUD RATE 9600 *
```

The operator may change the baud rate by moving the cursor to BAUD RATE and select ENTER, then using the UP/DN arrows to change the value to one of {1200, 2400, 4800, 9600, 19200 and 38400}.

```
* ↓ PREVIOUS MENU
```

Return to the 485 bus menu and save the changes by moving the cursor to the next screen and select ENTER.

```
COMM- DEFAULT
COMM- ALTERNATE
COMM- CUSTOM
* PREVIOUS MENU
```

Scroll down to PREVIOUS MENU and select ENTER to return to the Modbus Settings Menu Screen.

```
NETWORK ID MENU
MODBUS SETTINGS
* PREVIOUS MENU
```

Scroll down to PREVIOUS MENU and select ENTER to return to the Main Menu Screen.

```
* SAVE CHANGES
ABORT CHANGES
```

Select ENTER on SAVE CHANGES to return to the Main Menu Screen.

12. SENSOR CALIBRATION

If the user is going to perform a span calibration, a zero calibration is **REQUIRED** to be performed first.

Calibration Menu (Selected from the Main Menu)

```
* ↑ CALIBRATION
    ALARM
    RELAY
    ↓ NETWORK
```

ENTER to select the calibration menu.

```
* ↑ SELECT SENSOR ONE/TWO
    ZERO
    SPAN
    ↓ CAL. VAL  2.50
```

ENTER on 'SELECT SENSOR' 'ONE/TWO' to choose which sensor to perform calibration operations.

DOWN switch to select sensor one

Up switch to select sensor two

12.1. Zero Cal

```
↑ SELECT SENSOR ONE/TWO
*  ZERO
    SPAN
    ↓ CAL. VAL  2.50
```

To Zero the sensor, move the cursor to ZERO and select enter.

```
ZERO CAL 'present gas value'
SENSOR      ONE / TWO
↓ PREV.  -ENT-  START
```

Apply clean air (N2 for an oxygen sensor) and wait for the 'present gas value' to indicate a stable value.
Select ENTER.

The following screens will be displayed.

```
ZERO CAL
SENSOR ONE
1. WAIT FOR START
   -ENT- TO ABORT
```

```
ZERO CAL
SENSOR ONE
1. IN PROGRESS
   -ENT- TO ABORT
```

```
ZERO CAL
SENSOR ONE
1. COMPLETE
   DONE, STOPPING...
```

```
SETTING CAL. DATE
SENSOR ONE
1. WAIT FOR START
   -ENT- TO ABORT
```

```
SETTING CAL. DATE
1. IN PROGRESS
```

ZERO CAL
SENSOR ONE
1. RECORDING CAL DATA

ZERO CAL.
1. COMPLETE

DONE, STOPPING...

↑ SELECT SENSOR ONE/TWO
* ZERO
SPAN
↓ CAL. VAL 2.50

Once complete the SEC 3120 will return to the calibration menu. The sensor has been successfully zeroed if no faults are indicated.

12.2. Span Cal (and Calibration Value)

↑ SELECT SENSOR ONE/TWO
ZERO
SPAN
* ↓ CAL. VAL 2.50

Arrow down to CAL. VAL to verify the span gas calibration value matches the concentration of the span calibration gas on hand. If not, select Enter and the following screen will appear.

↑ SELECT SENSOR ONE/TWO
ZERO
SPAN
* ↓ CAL. VAL 2.50 *

Using the Up and Down arrows will allow the operator to change the calibration gas value of the sensor to match the calibration gas used to span the sensor. Once the correct value is displayed select ENTER.

* SAVE CHANGES
ABORT CHANGES

ENTER to select 'SAVE CHANGES' to send the calibration gas value to the sensor, or 'ABORT CHANGES' to return to the previous screen.

The Following screens are displayed:

SET CALIBRATION VAL.
1. WAIT FOR START

SET CALIBRATION VAL.
1. IN PROGRESS

SET CALIBRATION VAL.
1. COMPLETE

DONE, STOPPING...

↑ SELECT SENSOR ONE/TWO
ZERO
* SPAN
↓ CAL. VAL 2.50

To Span calibrate the sensor, move the cursor to SPAN and select ENTER.

SPAN CAL 'present gas value'
SENSOR ONE / TWO
↓ PREV. -ENT- START

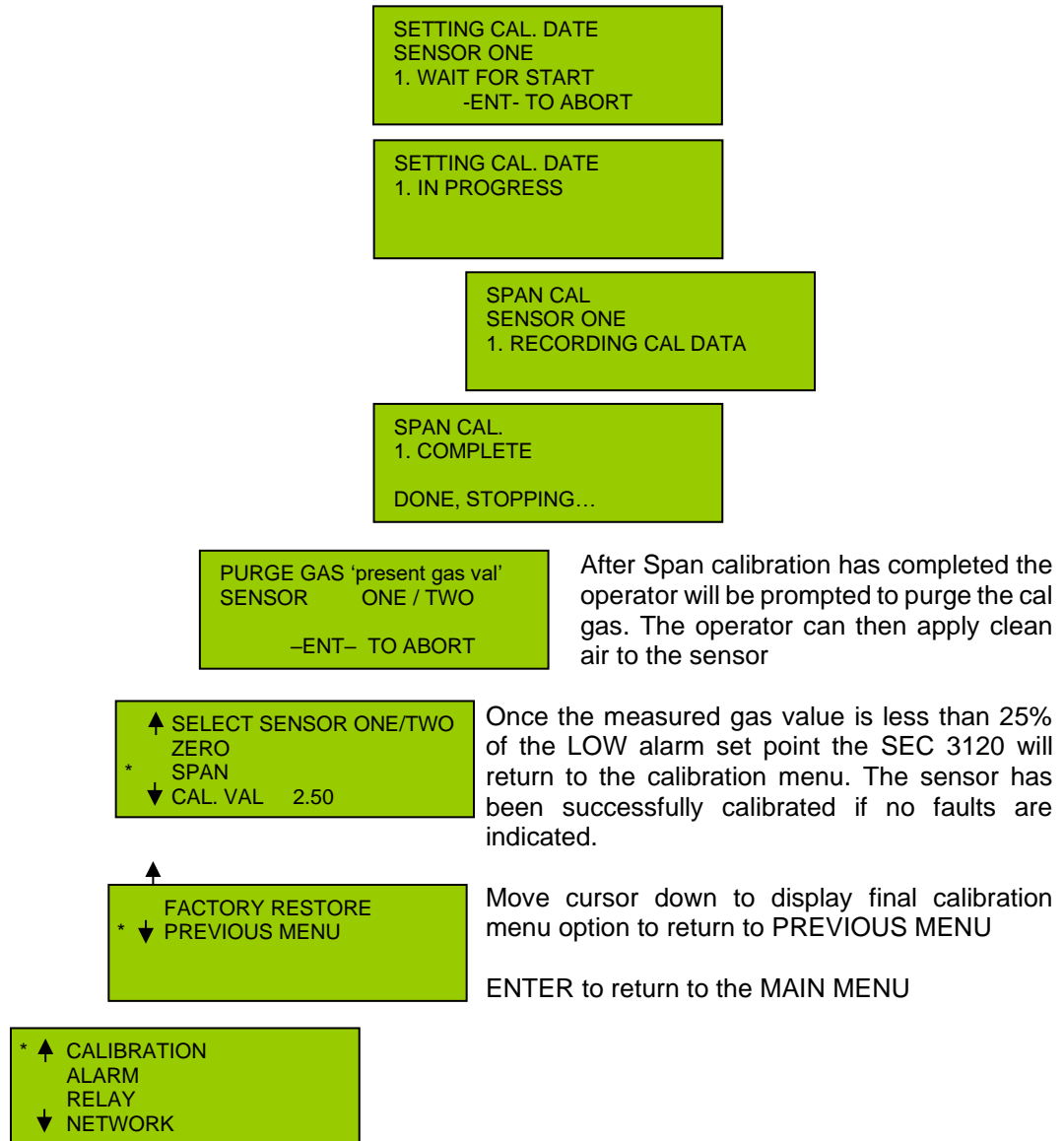
Apply calibration gas and wait for the 'present gas value' to indicate a stable value.
Select ENTER.

The following screens will be displayed.

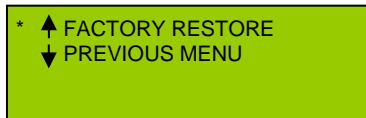
SPAN CAL
SENSOR ONE
1. WAIT FOR START
-ENT- TO ABORT

SPAN CAL
SENSOR ONE
1. IN PROGRESS
-ENT- TO ABORT

SPAN CAL
SENSOR ONE
1. COMPLETE
DONE, STOPPING...



12.3. Factory Restore

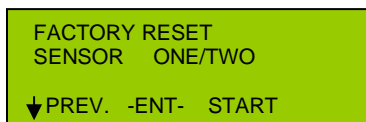


The FACTORY RESTORE menu will allow the user to restore the sensor to factory defaults. This is convenient if a user mis-calibrates a sensor and wants to revert to its original calibration. Refer to the table below for a list of SEC products and software revisions that contain this function.

Product	Software Revision
SEC Millenium	27 or newer
SEC Evolution	21 or newer
SEC 3000	8.7 or newer
SEC Sample Draw	9.3 or newer

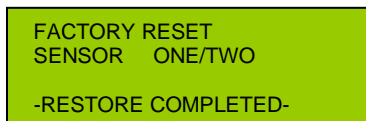
Each sensor can be factory restored individually by selecting either sensor one or sensor two as when doing a zero/span calibration.

Selecting Enter on FACTORY RESTORE will display the following:



Using arrow down will bring the user back to the previous page.

Selecting Enter will issue the factory restore command to sensor one or sensor two depend on which had been selected. The display will briefly show the following:



After this the sensor that was restored will go through the warmup sequence again

13. DIAGNOSTIC FUNCTIONS

The Diagnostics Menu will allow the operator to command the SEC 3120 to reboot, toggle the LEDs (typically 'Locator Mode' with alternating flashing red/green alarm/fault lights), and toggle the individual relays on and off to verify operation.

```
↑ EJECT MEMORY CARD
  ABORT WARMUP
  INFO
↓ MAIN MENU
```

```
↑ * SEC DIAGNOSTICS
  RESET RELAYS
  FORMAT FLASH CARD
↓ EXIT
```

Reboot System

```
* REBOOT SYSTEM
  TOGGLE LEDS ON/OFF
  TOGGLE RELAYS
  PREVIOUS MENU
```

By selecting ENTER with the cursor on REBOOT SYSTEM the operator will command the SEC 3120 to reboot. This action results in the SEC 3120 Transmitter being rebooted and normal power up initialization will occur.

Toggle LEDs (Locator)

```
REBOOT SYSTEM
* TOGGLE LEDS ON/OFF
  TOGGLE RELAYS
  PREVIOUS MENU
```

The toggle LEDs function (typically referred to as 'Locator Function') is normally generated by the SEC 3500 operator interface. It can be used at the SEC 3120 to function as a lamp test. Selecting ENTER will turn the Locator on. The Alarm and Fault LEDs will flash red and green alternately.

Selecting ENTER again will turn the Locator function off.

Toggle Relays

```
REBOOT SYSTEM
TOGGLE LEDS
* TOGGLE RELAYS
  PREVIOUS MENU
```

Selecting ENTER will display the toggle relays menu.

```
* ↑ LOW ON/OFF
  MID ON/OFF
  HIGH ON/OFF
↓ FAULT ON/OFF
```

The user can select the desired relay to test and toggle its activation ON or OFF using the UP and DOWN switches.

```
* ↓ PREVIOUS MENU
```

ENTER on 'PREVIOUS MENU' to return to the Diagnostics Menu.

14. SELF-TEST MENU

The self-test function will make the sensor generate a 4-20mA current into the SEC 3120 from 4mA to 20mA (0-fullscale). In the self-test mode, the SEC 3120 outputs are fully functional. The SEC 3120 will display the rising gas level, the 4-20 mA output will increase to 20 mA, the relays will activate and the RS485 information will be transmitted to the control system.

```
▲ HIDE LOW GAS
* SELF TEST
  SET DATE TIME
▼ PREVIOUS MENU
```

Move the cursor to SELF TEST and select ENTER to open the self-test menu.

```
* ON SENSOR: ONE/TWO/BOTH
  CANCEL REQUEST
  ABORT TEST
  START SELF TEST
```

The self-test can be run on sensor 1, sensor 2 or both sensors simultaneously.

During the self-test the display will be normal with the exception that the bottom line will indicate that the self-test is being run.

Example:
Self-test running on both sensors.
SELF TEST will display

```
S1      ID: 001
10.4    0-100  %LEL
        METHANE
        SELF TEST
```

In the status line for the given sensor under test, if only sensor one is in self-test, then the SELF TEST will only appear for SENSOR one. Otherwise, if it is sensor two, then the status line will only appear for SENSOR two. If both sensors are in self-test in the example above, then as the display toggles between sensor one and two, the status line will remain indicating SELF TEST for both sensor display updates.

Once the unit reaches full scale the SEC 3120 automatically returns to normal, and the SELF TEST status will be removed from the display for that sensor.

15. INFO MENU CONTENTS

Using the UP and DOWN magnetic switches move the cursor to the desired field.

↑ EJECT MEMORY CARD
ABORT WARMUP
* INFO
↓ MAIN MENU

Entering the INFO menu will display the initial Info Menu

* UNIT INFO
SENSOR INFO
PREVIOUS MENU

Selecting Enter at 'UNIT INFO' displays the information for the SEC 3120 Display, Dual Head Transmitter.

SEC 3120 TRANSMITTER
VER: X.YY.RRRR
UNIT SN: 000035641
-ENT- TO EXIT

'VER' is the SEC 3120 software version number.

'UNIT SN' is the SEC 3120 unit serial number.

UNIT INFO
* SENSOR INFO
PREVIOUS MENU

Selecting Enter at SENSOR INFO displays the information for both sensors.

SENSOR INFO DISPLAY
IN: 003 SECONDS
PRESS
-ENT- TO EXIT

'003' counts down to '000' seconds

	-S1 DDD-	-S2 EEE
TYP:	XXX	YYY
FW:	XX.X	YY.Y
SN:	XXXXX	YYYYY

'DDD' – Device ID for sensor 1

'EEE' – Device ID for sensor 2

TYP: Sensor type

(00 is a SEC3000, 32 is SEC Millennium)

FW: Version of sensor software.

SN: Sensor serial number.

To exit the 'info' screen select 'ENTER'. The info screen will timeout after ~30s and return to the previous screen

UNIT INFO
SENSOR INFO
* PREVIOUS MENU

Select PREVIOUS MENU to go back to the initial menu screen.

16. HIDE LOW GAS

The Hide function allows the operator to not display the gas reading (will always show 0) until the Low Alarm threshold is exceeded. All outputs will function as normal when the Hide mode selected is YES.

* ↑ HIDE LOW GAS
SELF TEST
SET DATE TIME
↓ PREVIOUS MENU

By selecting ENTER at HIDE LOW GAS, the operator can choose to hide or not hide gas levels below the low threshold. The following screen will appear:

HIDE LOW GAS:
* YES / NO *
PREVIOUS MENU

By selecting ENTER on YES/NO the user may change the value using the UP/DN arrows. After selecting ENTER after setting the value, the operator may move the cursor to PREVIOUS MENU and select ENTER to go back to the main menu after choosing to SAVE or ABORT the changes.

* SAVE CHANGES
ABORT CHANGES

17. DATA LOGGING (OPTIONAL)

The SEC 3120 Unit provides event data logging to a flash card. The type of card used is MMC (MultiMedia Card). This flash card can be read by any personal computer that can read a FAT16 format file system, like cards from digital cameras and other portable devices. It should NEVER be formatted by a personal computer, rather be formatted by the SEC 3120 unit itself under the Initial/Top Menu item "Format Flash Card". Data can be read directly from the flash card or copied to a personal computer. The file is a text file containing comma separated data values, one event per line. The text file ("SEC3120.TXT") will be the only file on the flash card, and currently will NOT be allowed to grow beyond 16MB (this is considered the memory card "full now" state). After the data is archived from the flash card, it can be re-formatted to start storage over. A flash card will typically not become full for many years.

As The Memory Card Fills Up

When a flash card crosses 80% full (approximately 12 MB), the memory card status will change from "MC-OK" to "MC-FULL", warning the user to copy the contents off to a permanent storage location and reformat the card to start storage over. The SEC 3120 will continue to log data to the flash card until it reaches 100% full. At that time, the status will change to "MC-FULLNOW" indicating that there is no more room to store data. At this point data storage has STOPPED and events may be lost that would otherwise be stored. If the card is removed and reinserted, the SEC 3120 may eventually display the status as "MC-FAULT", indicating a memory card fault. The card MUST be formatted at this point.

How Long It May Take to Fill a Memory Card

The shortest period to fill a memory flash data card is approximately 200 – 300 hours. To accomplish this unreasonable feat gas levels must be constantly changing beyond 5% of sensor range and alarm events and other related events must be persistently changing at a highly sustained rate. It is unlikely that this could ever happen under normal circumstances, since alarms would be sounding, and intervention would be absolutely necessary. If sensor(s) are properly calibrated, and normal maintenance is performed, the memory card will probably not fill up for ten years or more. Since the operating environment determines the amount of data and frequency for storage, the time it takes to fill a data card will differ for each installation.

Flash Card Removal and Formatting

Removing a data flash card should not occur without selecting the first Top Menu Item "Eject Flash Card". This prepares the flash card for removal by writing any data cached in memory out to the file system and ensures the file system on the data flash card is not corrupted. Formatting a data flash card allows the card to start over and re-capture space. Caution should be exercised to ensure that any data needed is archived first since this process will erase all data. The file system will be re-started and prepared as if it was from the factory. Just select the Menu Item on the second page of the Top Menu "Format Flash Card" to begin the process.

Data Log File Contents

Events such as a 5% gas level change, alarm state change, sensor warm-up, calibration, system power on, sensor fault or parameter changes are logged and stored. Data from normal operation is NOT recorded when gas levels do not change beyond a 5% band. Here is the data log format (SEC Filename: "SEC 3120.TXT"):

LOG FILE EVENT ENTRY FORMAT:

tt,mm/dd/yyyy,HH:MM:SS,ID- vv

Where:

tt	= type, 00 - 99
mm	= month, 1 - 12
dd	= day, 1 - 31
yyyy	= year, 2000 - 2099
HH	= hours, 0 - 23
MM	= minutes, 0 - 59
SS	= seconds, 0 - 59
ID-	= Sensor number (S1, S2 or BB for both)
vv	= variable data depending on tt

Log Entry Type Table (tt):

Log Entry Type Code (tt)	Description
00	Boot/Power up- 3120 Unit Information Event
01	Sensor Warm-up: New Sensor/Sensor removed and replaced Event
02	Parameter Changes Made Event
03	Alarm High-Level Triggered Event
04	Alarm Mid-Level Triggered Event
05	Alarm Low-Level Triggered Event
06	Change in Gas Level > 5% of Sensor Range Event
07	Sensor Fault/Missing/Not Identical Detected Event
08	Sensor Calibrated Event
09	Flash Cleared/Restarted Event
10	Self-Test Initiated by Operator Event
11	Self-Test Concluded by Operator Event
12	Self-Test Aborted by Operator Event
13	Sensor Cell Warning Event
14	3120 Unit Role Change Event
99	Flash Card Re-Inserted Event

Log Entry Data Format For Each Type Table (vv):

Log Entry Type Code (tt)	Log Entry Event Name <i>Log Variable Data Format (vv)</i>
00	3120 Boot/Power Up Event <i>Preamble,BB- US,FWVerMaj.Min.Rev</i>
01	Sensor Warm-up Event <i>Preamble,ID- US,FWVerMaj.Min.Rev</i>
02	Parameters Changed Event <i>Preamble,ID- NID,ZID,SSN,STP,CD,CV,RNG,LOW,MID,HI,GU,GN</i>
03	Alarm High-Level Triggered Event <i>Preamble,ID- Gas Value Float</i>
04	Alarm Mid-Level Triggered Event <i>Preamble,ID- Gas Value Float</i>
05	Alarm Low-Level Triggered Event <i>Preamble, ID- Gas Value Float</i>
06	Change in Gas Level Event <i>Preamble, ID- Gas Value Float</i>
07	Sensor Fault Event <i>Preamble,ID- (SSC,SEC)/SMT</i>
08	Sensor Calibration Event <i>Preamble,ID- CALTXT</i>

09	Flash Cleared Event <i>Preamble, BB- "Memory Card Cleared."</i>
10	Self-Test Initiated Event <i>Preamble, ID- "Self Test Started."</i>
11	Self-Test Concluded Event <i>Preamble, ID- "Self Test Concluded."</i>
12	Self-Test Aborted Event <i>Preamble, ID- "Self Test Aborted."</i>
13	Sensor Cell Warning Event <i>Preamble, ID- CWC</i>
14	3120 Unit Role Change Event <i>Preamble, BB- RLM, SHR</i>
99	Flash Card Re-inserted Event <i>Preamble, BB- US, DVID, FWMaj, Min, Rev, RLM, SHR</i> - S1: NID, ZID, SSN, STP, CD, CV, RNG, LOW, MID, HI, GU, GN - S2: NID, ZID, SSN, STP, CD, CV, RNG, LOW, MID, HI, GU, GN
Parameter Variables:	
Variable	Variable Description
<i>Preamble</i>	tt, mm/dd/yyyy, HH:MM:SS
tt	Log Entry Type Code
mm	Month value (01 – 12)
dd	Day of month (01 – 31)
yyyy	Year (2000 – 2099)
HH	Hours (24 hour format, 00 – 23)
MM	Minutes (00 – 59)
SS	Seconds (00 – 59)
S1-	Literal text for sensor one (S1-)
S2-	Literal text for sensor two (S2-)
BB-	Literal text for both sensors (BB-)
ID-	Replaced with literal text (S1-, S2- or BB-) based on sensor(s) reporting on
US	3120 Unit Serial Number
DVID	Disk Volume ID
FWMaj	Firmware Major Version Number
Min	Firmware Minor Version Number
Rev	Firmware Revision Version Number
RLM	Relay Logic Mode (0 = first, 1 = second, 101 = AND, 102 = OR)
SHR	Sensor Head Role (0 = Identical, 1 = Unique, 2 = Single Sensor)
NID	Network ID
ZID	Network Zone ID
SSN	Sensor Serial Number
STP	Sensor Type Code (see sensor manual for codes)
CD	Sensor Last Calibration Date
CV	Calibration Value (Float)
RNG	Sensor Range Value (Float)
LOW	Alarm Low threshold Point (Float)
MID	Alarm Mid threshold Point (Float)
HI	Alarm High threshold Point (Float)
GU	Gas Units Name (4 text characters)
GN	Gas Name (8 text characters)
(SSC, SEC)/SMT	Either (Sensor Status Code, Sensor Error Code values) OR Sensor Fault Message Text
SSC	Sensor Status Code (see sensor manual for code values)
SEC	Sensor Error Code (see sensor manual for code values)
SMT	Literal text: "Sensor Missing!", or "Sensors Not Identical!"
CALTXT	Literal text: "Zeroed." or "Spanned."
CWC	Sensor Cell Warning Code (see sensor manual for code values)

17.1. Formatting the Flash Card (Selected from the Initial / Top Menu, Page 2)

The Flash Card may be re-formatted by the operator using the SEC 3120.

(WARNING: ALL contents WILL be lost!)

↑ EJECT MEMORY CARD
ABORT WARMUP
INFO
↓ MAIN MENU

↑ SEC DIAGNOSTICS
RESET RELAYS
* FORMAT FLASH CARD
↓ EXIT

Select ENTER and Flash Card Format Screen will be displayed:

- FORMATTING FLASH -
PLEASE WAIT ...

-ENT- TO ABORT

CARD FORMAT
COMPLETE ...

↑ SEC DIAGNOSTICS
RESET RELAYS
FORMAT FLASH CARD
* ↓ EXIT

Select ENTER on 'EXIT' to remove the Initial / Top menu and restore the Normal operation display.

18. WORKING WITH SEC 3500 HMI

The SEC 3120 Digital Transmitter is supported by the SEC 3500 HMI, most effectively beginning with HMI version 3.5.28 and Transmitter version 1.2.264. SEC 3500 HMI versions prior to 4.0.0 treat the SEC 3120 as one or two individual SEC 3100 single digital transmitters, having separate icons, separate command and control, etc. This requires the SEC 3120 to have sequential Modbus network IDs, one assigned for each physical sensor attached to it. If the SEC 3500 HMI or its operator attempts to;

- “Discover” an SEC 3120 with a single network ID with a sensor role other than single, or
- change from dual network IDs to a single network ID with a sensor role other than single with an already “discovered” and online SEC 3120, or
- change the network ID of SEC 3120 sensor two to a network ID that is not the next sequential value of sensor one,

the SEC 3120 device may cause the SEC 3500 HMI to get caught in a constant loop attempting to communicate with both sensors, lose information about the SEC 3120, or any other related corruption issue.

Therefore, it is crucial that if a SEC 3120 is not configured for ‘Single’ Sensor Role, its Modbus Network ID be configured as ‘Unique’ with sequentially assigned IDs if it is intended to be used with an SEC 3500 HMI Panel with software versions prior to 4.0.0.

Careful network planning is necessary before deployment concerning Sensor Roles, Modbus Network ID mode, Relay Mode, etc. Paramount would be the consideration of the use of an SEC 3500 HMI Panel as the Modbus Master;

- If used in the initial deployment, then the Sensor Role for each SEC 3120 must be decided and the correct Modbus Network ID mode defined so that if sequential network IDs are needed to support a dual sensor SEC 3120, the assignment of network IDs is planned in advance. Take special care when mixing SEC 3100 Digital Transmitters with SEC 3120 Dual Digital Transmitters on the same Modbus Network to avoid overlap or potential future overlap as upgrades in the future may occur.
- Plan for future additions and upgrades- the Modbus Network may add more SEC 3120 Digital Transmitters, replacement of SEC 3100 Single Digital Transmitters with SEC 3120 Dual Digital Transmitters, and SEC 3120 Digital Transmitters that may initially start out as Single Sensor Role configurations may be upgrade to dual sensor roles through the addition of additional sensors to the Transmitters.
- Make sure that there are enough gaps in the Network ID value planning to accommodate the initial deployment as well as future upgrades.
- If a complete overhaul of the Modbus Network ID layout is planned, it is probably easier to just delete all devices at the SEC 3500 HMI Panel and then reconfigure all devices first before rediscovering the changes at the SEC 3500 HMI Panel.

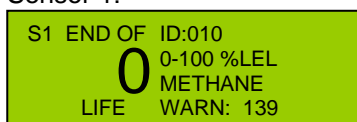
Caution: Do not mix an SEC 3500 HMI with ANY other Modbus Master of any type! Bus contention, poor performance and corruption can result. If other Modbus gateways are needed in addition to an SEC 3500 HMI, then utilizing the SEC 3500 HMI Panel’s Ethernet Modbus Slave Interface as a gateway interface as a better solution for capturing the sensor data to another network bus or higher-level software management function.

19. UL 2075 EOL (END-OF-LIFE) NOTIFICATION

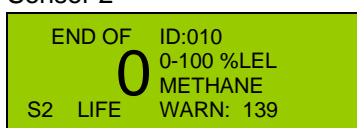
Per the requirement of UL 2075, second edition, revision date 08/04/2023, a UL 2075 approved product is required to have an End-Of-Life notification after no longer than 10 years of use.

When the SEC 3120 is paired with a 0-100%LEL Methane SEC Millenium Hawk gas detector, a EOL notification, warning 139, is displayed after the detector has been running for 10 years. This lets the user know it is time to replace the sensor. See below for what an example of what this looks like:

Sensor 1:



Sensor 2



NOTE: If the sensor is functioning properly, it will still read gas correctly to prevent an unsafe condition. The notification will stay active until the sensor is replaced.

Once this warning is displayed, the sensor is required to be replaced to comply with the UL 2075 standard.

20. FIGURES

Figure 1 – Overall Layout

Figure 2 – SEC 3120 Wiring

Figure 3 – SEC Sensor Separation Kit

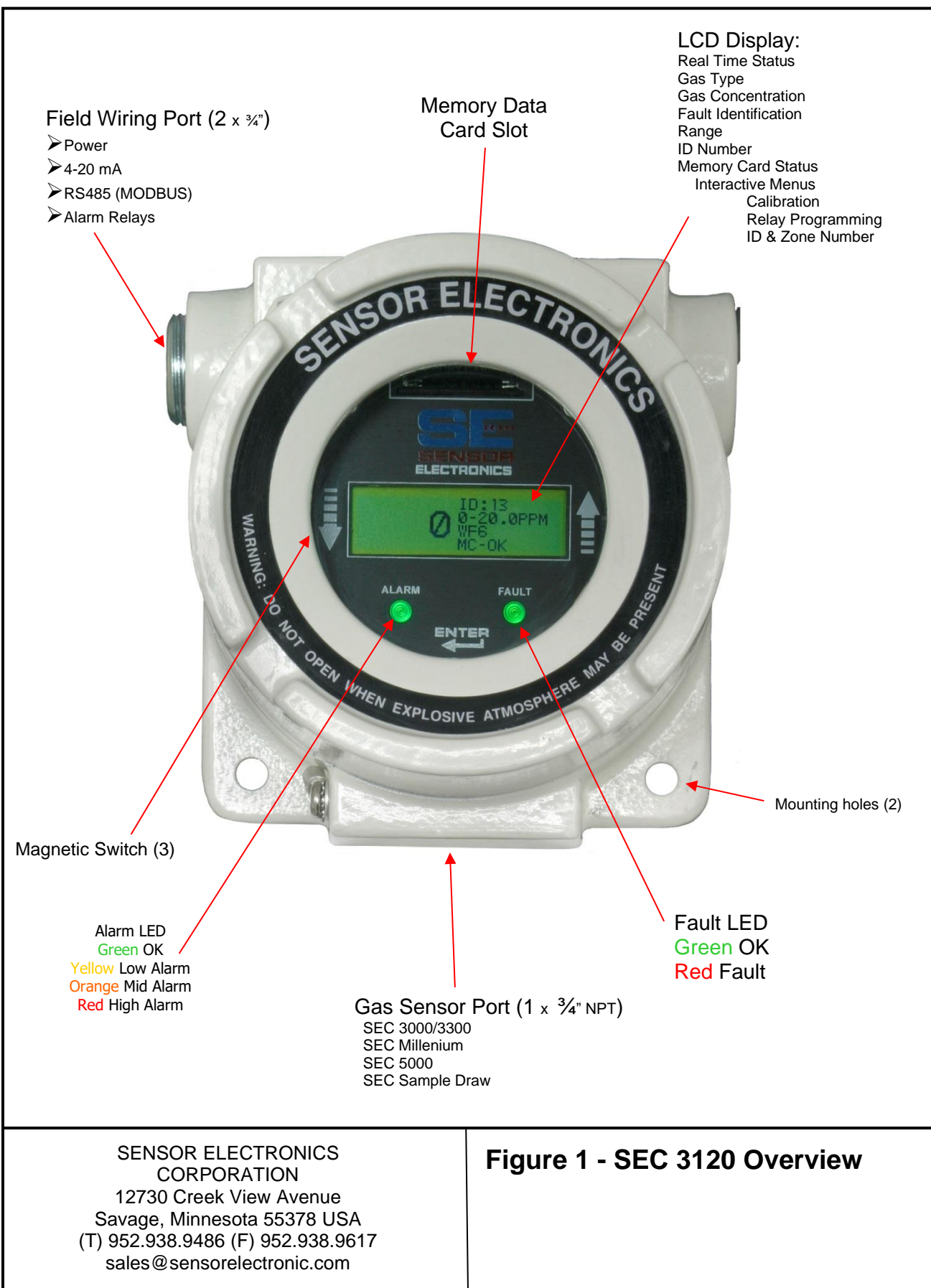
Figure 4 – Mounting SEC 3120 and SEC Millenium

Figure 5 – Mounting SEC 3120 and SEC 3000

Figure 6 – Mounting SEC 3120 and SEC 5000 Short

Figure 7 – Mounting SEC 3120 and SEC 5000 Tall

NOTE: Figures 4-8 show 2 sensors of the same kind mounted on the 3120 together as an example. The 3120 can be used with 1 sensor, or 2 sensors of any kind, they do not have to be the same type of sensor. For example, a 3120 can be used with a SEC 5000 sensor mounted on the side and a SEC 3000 mounted on the bottom.



TB 3-SENSOR 2

TB 2-SENSOR 1

TB 1-RELAY

TB 4-MAIN

TB 1 – RELAYS

- (12) FAULT (N.E.) N.C.
- (11) FAULT (N.E.) COMMON
- (10) FAULT (N.E.) N.O.
- (9) HIGH ALARM N.C.
- (8) HIGH ALARM COMMON
- (7) HIGH ALARM N.O.
- (6) MID ALARM N.C.
- (5) MID ALARM COMMON
- (4) MID ALARM N.O.
- (3) LOW ALARM N.C.
- (2) LOW ALARM COMMON
- (1) LOW ALARM N.O.

NC = NORMALLY CLOSED
NO = NORMALLY OPEN

TB 2 – SENSOR 1

- (1) WHITE (DATA/CAL)
- (2) BLUE OR GREEN (4-20 mA)
- (3) RED (+24 VDC)
- (4) BLACK (DC COMMON)

TB 3 – SENSOR 2

- (1) WHITE (DATA/CAL)
- (2) BLUE OR GREEN (4-20 mA)
- (3) RED (+24 VDC)
- (4) BLACK (DC COMMON)

TB 4 – MAIN

- (1) +24 VDC
- (2) 4-20 mA SENSOR 1
- (3) DC COMMON
- (4) RS485 DATA B
- (5) RS485 DATA A
- (6) ISOLATED COMMON
- (7) 4-20 mA SENSOR 2

SENSOR ELECTRONICS CORPORATION
12730 CREEK VIEW AVE
SAVAGE, MINNESOTA 55378
(T) 952.938.9486 (F) 952.938.9617
sales@sensorelectronics.com

Figure 2 – Back View of SEC 3120 Wiring

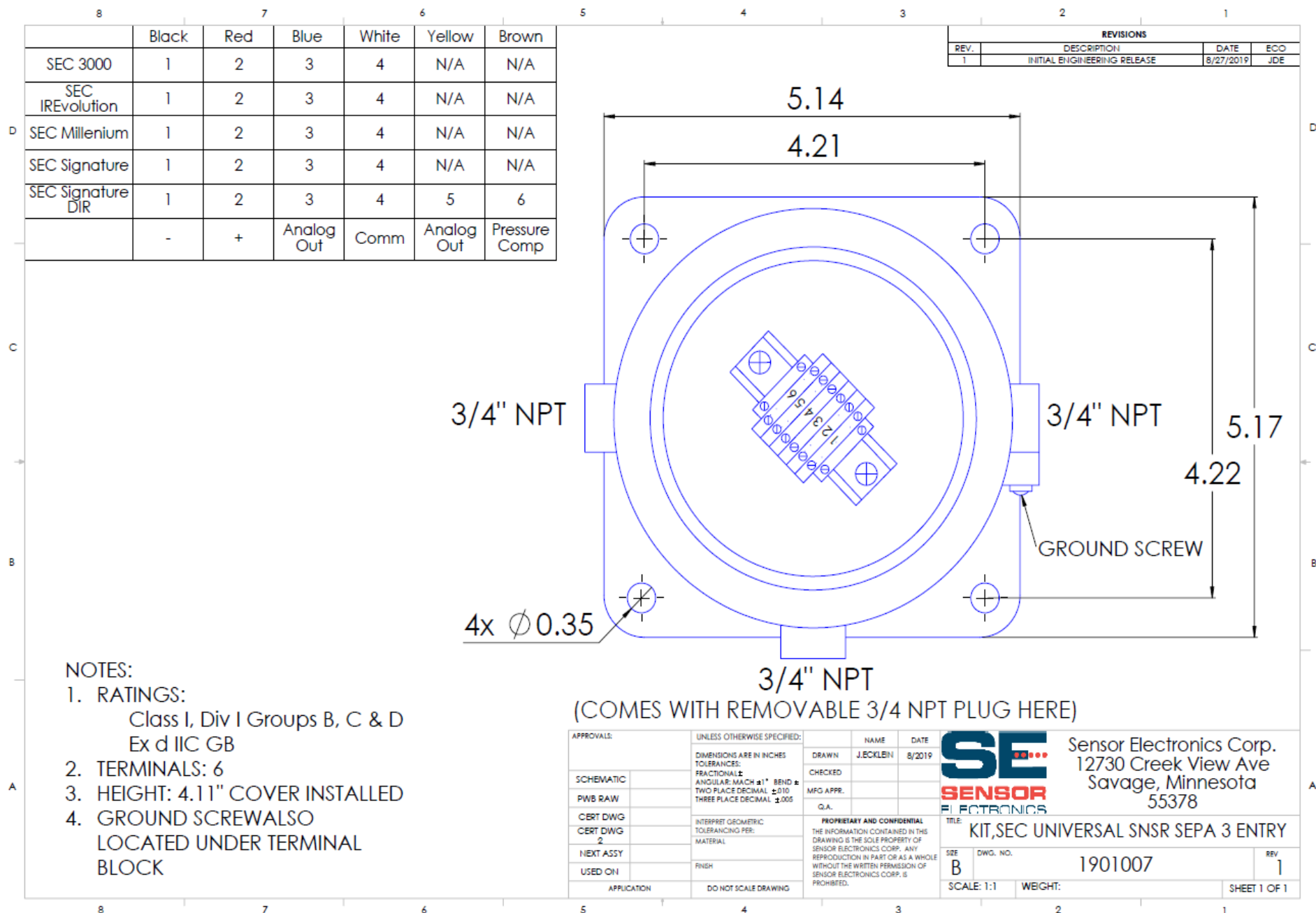


Figure 3 - SEC Sensor Separation Kit

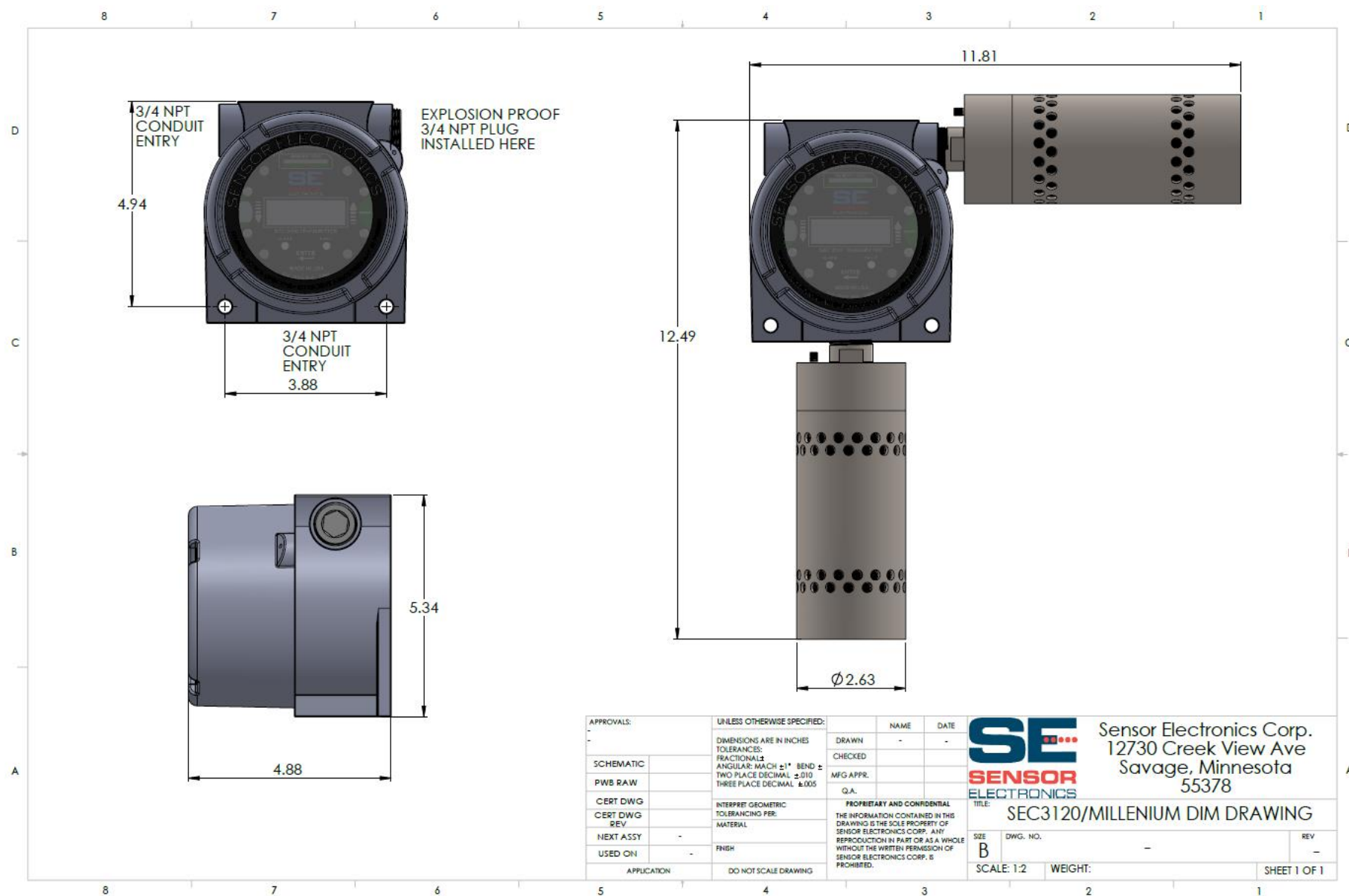
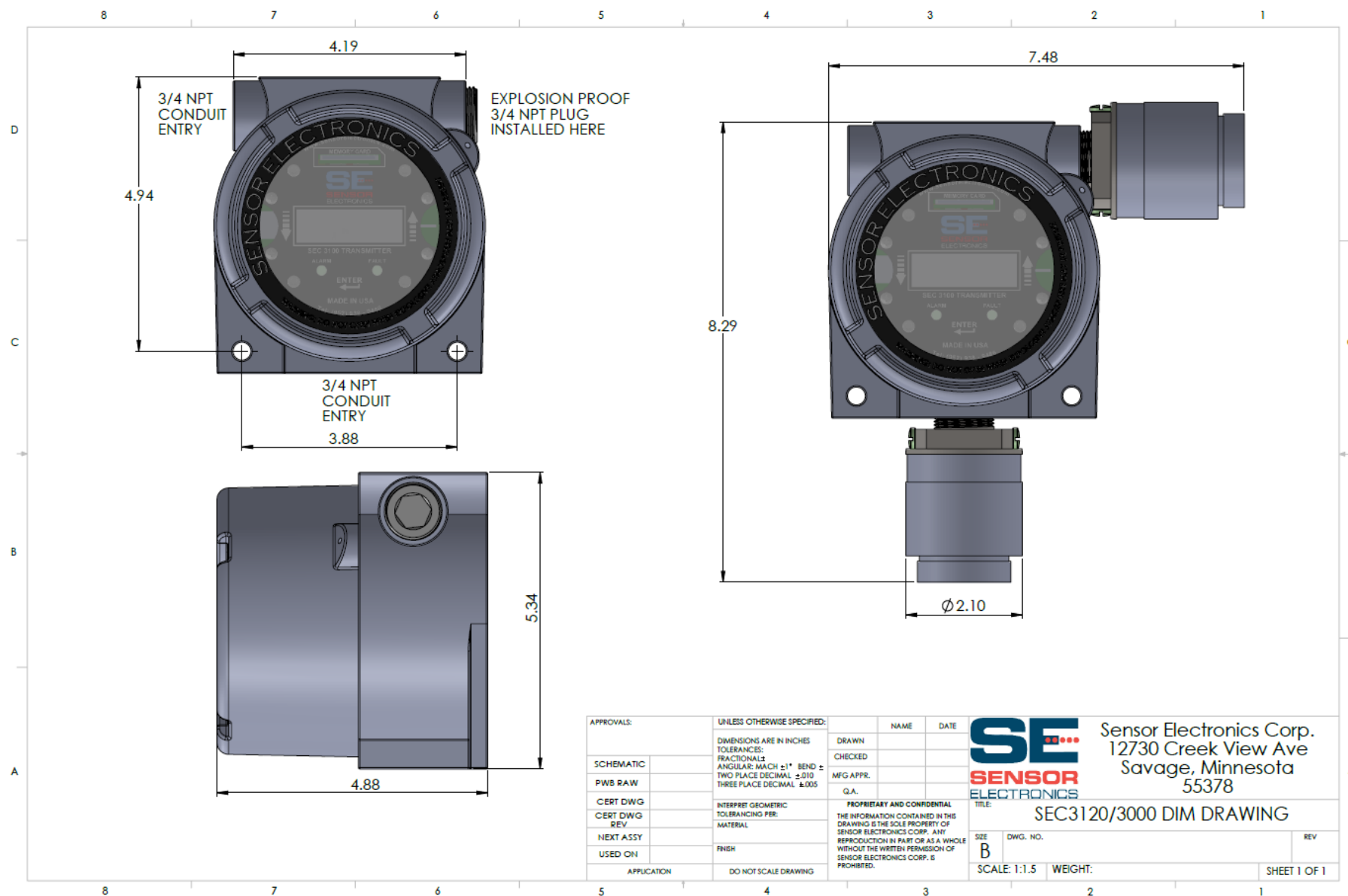


Figure 4 - Mounting SEC 3120 and SEC Millennium



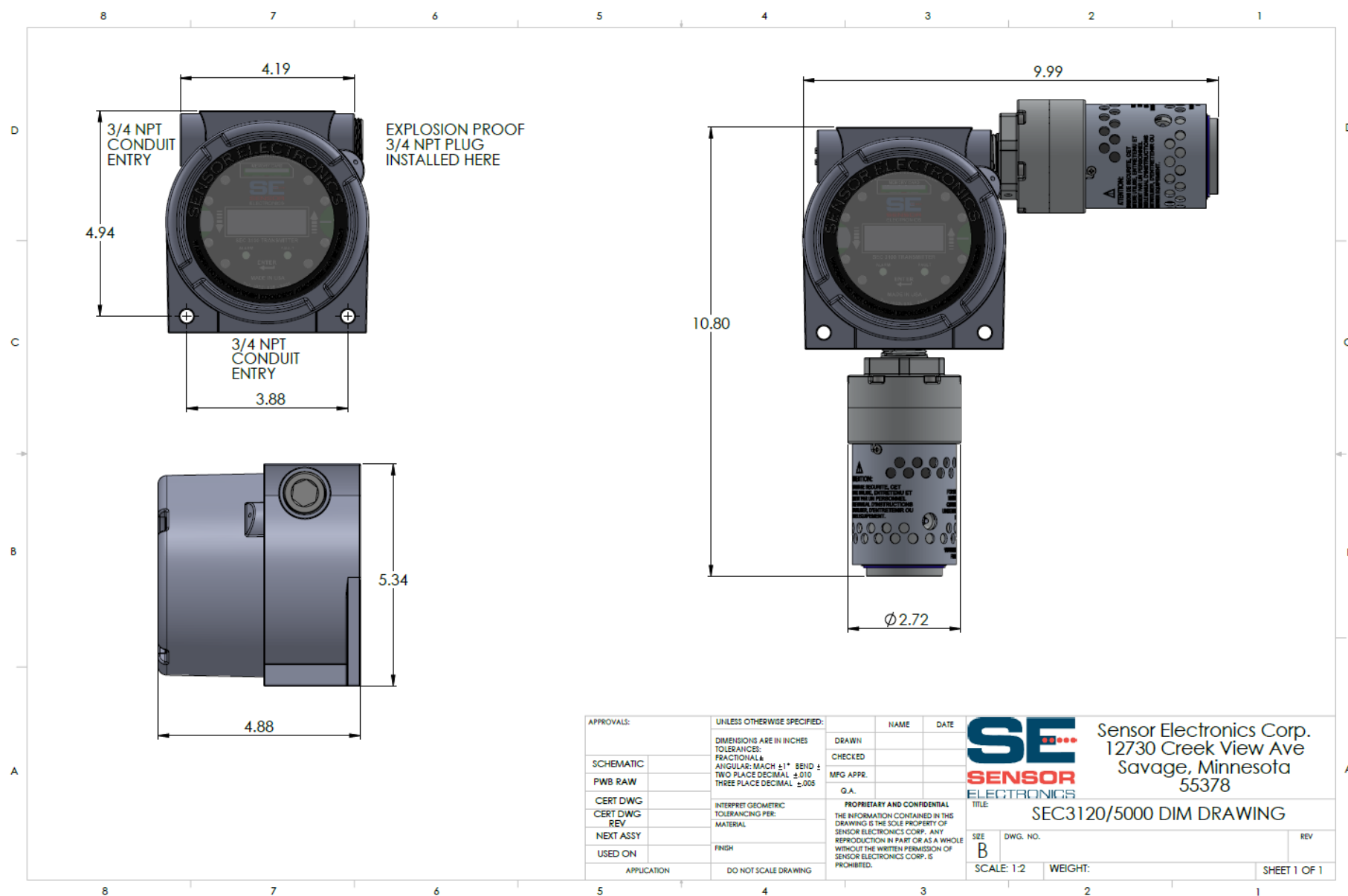


Figure 6 - Mounting SEC 3120 and SEC 5000

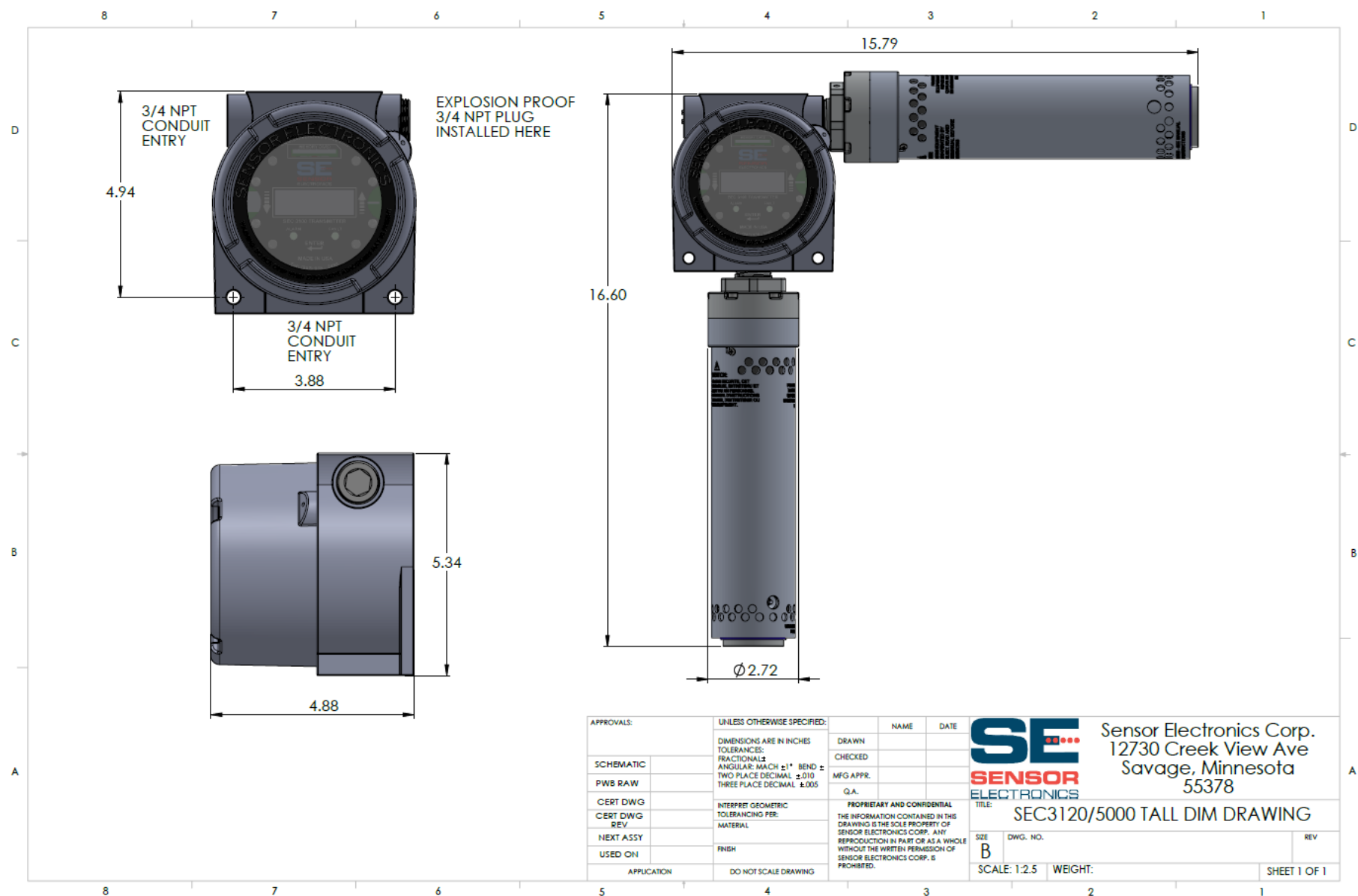


Figure 7 - Mounting SEC 3120 and SEC 5000 Tall

21. UNIT STATUS FLASH CODES

Flash Rate	Output Current	PC Reads (Hex)	Status Code (Dec)	Unit Status Label	Description
1	4-20ma	0x00	0	Unit Running	Unit is measuring gas and adjusting 4-20ma output accordingly.
2	2.2ma	0x02	2	Unit Zero Calibrating	Unit goes through its <i>zero calibration</i> procedure.
3	2.0ma	0x03	3	Unit Spanning	Unit goes through its <i>spanning</i> procedure.
4	0-20ma	0x04	4	Unit 4-20ma Calibrating	Unit goes through its <i>4-20ma-calibration</i> procedure. (Factory Only)
5	0.8ma	0x05	5	Unit Warm-up	Unit is warming up.
6	0.0ma	0x06	6	Power-up Fault	Unit has determined a <i>Power-Up</i> fault condition.
7	1.6ma	0x07	7	Calibration Fault	Unit has determined an error during <i>calibration</i> procedure.
8	NA	0x08	8	NA	Currently Not Used
9	0.0ma	0x09	9	Unit Fault	Unit has determined a <i>Unit_Fault</i> condition.
10	1.0ma	0x0a	10	Optics Fault	Unit has determined an <i>Optics_Fault</i> condition.
11	1.2ma	0x0b	11	Zero Drift Fault	Unit has determined a <i>Zero_Drift_Fault</i> condition.
12	0.0ma	0x0c	12	Configuration Fault	Unit has never been <i>Zeroed</i> , <i>Spanned</i> , <i>Source</i> calibrated, or E ² has a Header byte error.
13	1.4ma	0x0d	13	Hot Zero Calibration	Unit goes through its <i>Hot Temperature calibration</i> procedure. (Factory Only)
14	1.4ma	0x0e	14	Cool Zero Calibration	Unit goes through its <i>Cool Temperature calibration</i> procedure. (Factory Only)
15	4mA->20mA	0x0f	15	Self Test	Unit generates zero to full scale output (4-20mA & Norm Gas Level)
16	0.2ma	0x10	16	Reference Channel Fault	AGC Potentiometer reaches the minimum predetermined value during the unit AGC procedure.

17	0.4ma	0x11	17	Active Channel Fault	Balance Potentiometer reaches the minimum or maximum predetermined value during the unit Calibration procedure.
18	N/A	0x12	18	Power Fault	24VDC < 18 or 24VDC >32V
19	N/A	0x13	19	Comp Zeroing	
20	N/A	0x14	20	Comp Spanning	
21	N/A	0x15	21	Fixed 4mA	
22	N/A	0x16	22	Fixed 20mA	
23	3.4ma	0x17	23	Bad Cell	3300 ONLY: Unit has determined the electrochemical cell has gone bad
24	3.6mA	0x18	24	Flow Fault	SEC Sample Draw ONLY: Unit has detected flow is too high or too low

22. UNIT ERROR CODES

Error Code Label's	Error Code Value's	Error Code (Dec)	Error Code Description's	Unit Status
NO_ERROR	0x00	0	Unit is measuring gas and operating properly	Unit Running
ERR_EEPROM_HEADER_BYTE	0x01	1	EEPROM does not have correct header byte stored.	Configuration Fault
ERR_EEPROM_CHKSUM	0x02	2	Checksum byte from EEPROM does not match calculated checksum on latest EEPROM read..	Configuration Fault
ERR_NO_ZERO_YET	0x03	3	Unit has yet to be zero calibrated.	Configuration Fault
ERR_NO_SPAN_YET	0x04	4	Unit has yet to be spanned.	Configuration Fault
ERR_ZERO_VALUES	0x05	5	Zero values are out of specification limits.	Power-up Fault
ERR_420_CALIB1	0x06	6	When searching for >4vdc level during the 4-20ma calibration procedure, it was unsuccessful in the first three attempts.	Power-up Fault
ERR_420_CALIB2	0x07	7	When searching for the exact 4vdc level during the 4-20ma calibration procedure, it was unsuccessful in the first four attempts.	Power-up Fault
ERR_SIGNAL_HIGH	0x08	8	When the signal level is greater than 4.75vdc at the time it is read during the AGC procedure.	Zero Drift Fault
ERR_4VDC_REF_LOW	0x09	9	When the internal reference voltage is too low.	Unit Fault
ERR_4VDC_REF_HIGH	0x0A	10	When the internal reference voltage is too high.	Unit Fault
ERR_BAL_POT_MAX	0x0B	11	When the Balance digital potentiometer reaches the maximum predetermined value during the unit calibration procedure.	Calibration Fault
ERR_BAL_POT_MIN	0x0C	12	When the Balance digital potentiometer reaches the minimum predetermined value during the unit calibration procedure.	Calibration Fault

ERR_AGC_POT_MAX	0x0D	13	When the AGC digital potentiometer reaches the maximum predetermined value during the unit AGC procedure.	Optics Fault
ERR_AGC_POT_MIN	0x0E	14	When the AGC digital potentiometer reaches the minimum predetermined value during the unit AGC procedure.	Ref Channel Fault
ERR_SPAN_POT_MAX	0x0F	15	When the Span digital potentiometer reaches the maximum predetermined value during the unit span procedure.	Calibration Fault
ERR_SPAN_POT_MIN	0x10	16	When the Span digital potentiometer reaches the minimum predetermined value during the unit span procedure.	Calibration Fault
ERR_NO_HOT_ZERO_YET	0x11	17	Unit has yet to be zeroed while Hot.	Configuration Fault
ERR_NO_COOL_ZERO_YET	0x12	18	Unit has yet to be zeroed while Cool.	Configuration Fault
ERR_UNIT_TEMP_HIGH	0x13	19	Unit Temperature is over the specified upper limit.	Unit Fault
ERR_UNIT_TEMP_LOW	0x14	20	Unit Temperature under the specified lower limit.	Unit Fault
ERR_ANALYTICAL_RANGE	0x15	21	Insufficient Analog Range during spanning	Calibration Fault
ERR_NO_TABLE_YET	0x16	22	Unit has yet to down load a table via the PC and Comm_Link.	Configuration Fault
ERR_SPAN_NO_LONGER_VALID	0x17	23	Range has been changed	Cal Fault
ERR_SPAN_POT_OVERFLOW	0x18	24	Not enough Span pot room for temperature comp. (Span Gain too high)	Cal Fault
ERR_24VDC_LOW	0x19	25	24VDC too Low	Unit Fault
ERR_24VDC_HIGH	0x1A	26	24VDC too High	Unit Fault
PRESSURE_FAULT	0x1B	27	No Pressure Sensor Input	Unit Fault

FAULT_EXTERNAL	0x1C	28	LIM (Fault Version) Either input Active...External Fault Condition	Unit Fault
ERR_RD_PRES	0x1D	29	IREvolution. No response from MPL115A2	Unit Fault
ERR_NO_ZERO_TC_CONST	0x1E	30	SEC3300 balance temperature parameter not written.	
ERR_NO_COARSE_SPAN	0x1F	31	SEC3300 coarse span not yet written.	
ERR_NO_BIAS_VOLTAGE	0x20	32	SEC3300 bias voltage not yet written.	
ERR_NO_OFFSET	0x21	33	SEC3300 offset not yet available.	
ERR_NO_WARMUP_TIME	0x22	34	SEC3300 warmup time not yet written.	
ERR_NO_DAC_TRIM	0x23	35	SEC3300 DAC trim not yet performed.	
ERR_NO_CELL_TYPE	0x24	36	SEC3300 Cell type (ox or re) not yet written.	
ERR_COARSE_SPAN_OVERFLOW	0x25	37	SEC3300 coarse span pot overflow.	
ERR_NO_RANGE_VALUE	0x26	38	SEC3300 range value not yet written.	
ERR_NO_CAL_VALUE	0x27	39	SEC3300 cal value not yet written.	
ERR_VERSION	0x28	40	SEC3300 The version numbers of installed boards do not match.	Unit Fault
MEASURING_CH_DISABLED	0x29	41	Evo Rev 40+ , Evo Sample Draw... Unit Settings Error	Unit Fault
COUNTER_V_OUT_OF_RANGE	0x32	50	SEC3300 Cell Test Failure	Bad Cell

TEST_PULSE_AMPLITUDE_TOO_LOW	0x33	51	SEC3300 Cell Test Failure	Bad Cell
LOW_FLOW	0x34	52	SEC Sample Draw System detected the flow was less than 1/2 of target flow rate (cal val)	Flow Fault
HIGH_FLOW	0x35	53	SEC Sample Draw System detected the flow was greater than 2X target flow rate (cal val)	Flow Fault