SEC3120 Transmitter

Dual-Sensor Display

Instruction and Operation Manual

P/N 1580281 Rev A

Sensor Electronics Corporation

Sensor Electronics Corporation (SEC) designs and manufactures innovative fixed system gas detection equipment, for combustible gases, oxygen, carbon dioxide and toxic gases.

Commitment

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.

Gas Detection Service

Individually designed maintenance packages are available for specific customer needs. Service begins with verification of the system installation that includes an initial system check and calibration. We then offer customer training programs (on-site and at factory) to insure that technical personnel fully understand operation and maintenance procedures. When on-the-spot assistance is required, service representatives are available to handle any questions or problems immediately.

WARRANTY

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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

Revision History

Rev	ECO	Description of Change	Page
A	000317	MANY CHANGES DUE TO APPROVAL UPDATE	ALL

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1. GENERAL DESCRIPTION

SEC3120 Dual-Sensor Display

The SEC3120 Dual transmitter is designed to interface with two sensors and can be used with the SEC5000 IREvolution®, SEC Millenium®, SEC Signature® infrared gas sensors or SEC3000 and SEC3300 toxic gas detectors. The SEC3120 is a multi-microprocessor based intelligent transmitter continuously monitoring information from the gas sensor(s). The LCD of the SEC3120 displays the gas concentration(s) and sensor status(s). The SEC3120 has one (1) "Alarm" LED and one (1) "Status" LED. The SEC3120 also has three (3) magnetic switches located around the circumference of the unit. This manual will describe the operation and use of the SEC3120 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*
- *Non-intrusive programming*
- *Non-intrusive calibration*
- *Removable, non-volatile, time stamped data logging*
- *Optional IS barrier*
- *Digital communication link to SEC Gas Detectors*
- *Multi-port housing for easy installation*

2. APPROVALS / CERTIFICATIONS

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

The SEC3120 is approved to the standards shown in the approvals certificates. To maintain compliance to these standards, install the SEC3120 per the following instructions and precautions.

3. SPECIFICATIONS

The following specifications are for the SEC3120 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 Signature Series infrared sensors

Environmental:

The SEC3120 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.

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.

Electrical:

Mains Supply (Operating Voltage):
24 VDC $\overline{}$ 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 SEC3120 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 ⌒

Real Time Clock Battery:
The SEC 3120 uses a real time clock that runs on a 3V, 1220 battery.

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4. 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.

⚠ [1]**Warning** – 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 SEC3120 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.

[1]Mounting:

Mount the SEC3120 to rigid wall (wood based or stronger) or bulkhead structures using 1" or longer fasteners with a minimum 3/16" diameter. Mounting to drywall (wallboard, plasterboard, etc.) or similar material is not recommended.

[1]Wiring:

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. Solder tin the exposed wire 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:

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

The SEC3120 has three (3) ¾" NPT threaded ports for mounting and wiring the sensor(s) and transmitter into a permanent installation. All ¾ NPT threads must pass L1 thread/plug gauge.
Field wiring connections are made on the backside of the SEC3120 printed circuit board (PCB). For connection details refer to Figure 1.
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.

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

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Figure 1

BACK VIEW OF SEC3120
SEC3120 WIRING

5. USER INTERFACE

User Inputs – Magnetic Switches:
The SEC3120 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 in close proximity to 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
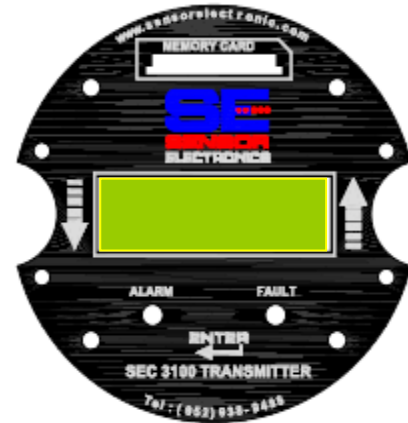
LED Indicators:
There are two multi-color LEDs that indicate Alarm and Fault status. The Alarm LED indicates the current alarm status individually for each sensor, regardless of the Relay Mode. The alarm state LEDs toggle indication for each sensor along with the sensor information display. When sensor 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 SEC3120 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.

Labels around the device:

Field Wiring Port (2x ¾NPT)
Power
2x 4-20 mA
RS485 (MODBUS) A & B
Alarm and Fault Relays

Magnetic Switch (3)

Alarm LED
Green OK
Yellow Low Alarm
Orange Mid Alarm
Red High Alarm

Mounting holes (2)

Gas Sensor Port (1x ¾NPT)
SEC 3000 / 3300
SEC Millenium / Signature / 5000

Memory Data Card Slot

LCD Display:
Real Time Status
Gas Type
Gas Concentration
Fault Identification
Range
ID Number
Memory Card Status
Interactive Menus
Calibration
Relay Programming
ID & Zone Number

Fault LED
Green OK
Red Fault

6. Initial Startup

When power is applied to the SEC3120, 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 SEC3120 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 your SEC3120 unit is set to operate two sensors in the 'Identical' Role and they are not identical in gas type, range or units, then the SEC3120 unit will display a fault and indicate that the *Sensors Are Not Identical*, and the fault relay on the SEC3120 unit will be engaged.

Inital Power Up Screen Sequence of the SEC3120

SEC3120 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
SEC3120 TRANSMITTER VER X.YY.RRRR 005 08/10/2010 21:15:33	'VER' refers to the Firmware version installed in the display.
SEC3120 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'.
SEC3120 TRANSMITTER VER X.YY.RRRR -BOOT SENSOR SYSTEM	'BOOT SENSOR SYSTEM' – Starting up sensor controllers

SEC3120 TRANSMITTER INIT MEMORY CARD ... Success	'INIT MEMORY CARD ....' – Memory card system Initializing. 'SUCCESS' or 'FAILURE' will show after a few seconds.

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

S1   SENSOR   ID: XXX / YYY
     WARMUP   0-WAITING
   -ENT-   TO   WAITING
S2   ABORT
	'SENSOR WARMUP' – indicates that the given sensor (S1 or S2) is warming up.

S1   ID: XXX / YYY
     SENSOR   0-WAITING
     UPLOAD   WAITING
S2
	'SENSOR UPLOAD' – Sensor is uploading its parameters to The 3120.

7. 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 SEC3120 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

S1   ID: XXX
     0   (S1 GAS RANGE)
        (S1 GAS TYPE)
        (STATUS)
	ID: YYY
	   0 (S2 GAS RANGE)
	       (S2 GAS TYPE)
	S2 (STATUS)

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:

S1   ID:010
   0   0-100 %LEL
       METHANE
       MC - FAULT
	ID: 011
	   0 0-200 PPM
	      AMMONIA
	S2 08/15/2010

S1   ID:010
   0   0-100 %LEL
       METHANE
       23:15:33
	ID: 011
	   0 0-200 PPM
	      AMMONIA
	S2 WARN: 131

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.

8. Setup – Configuring Operation

Once the SEC3120 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.
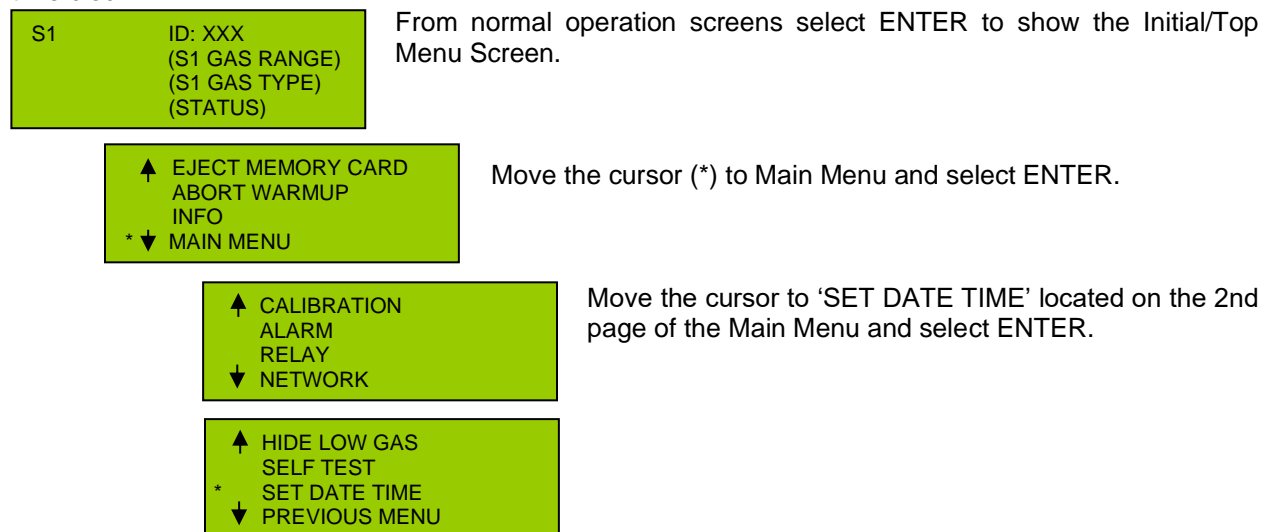
8.1.   Required Sequence for Changes to Configuration

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 SEC3120 Unit is off line (turn Modbus mode to 'OFF')

2. Delete this unit from the SEC3500 HMI or equivalent device if it was previously online or 'discovered'. Consult the SEC3500 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 SEC3120 and its sensors 'online' by activating it on the RS485 Modbus network.

8.2.   Date and Time

Entering this menu will allow the operator to set the date, time and day of the week of the SEC3120 real time clock.

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
```

Move the cursor (*) to Main Menu and select ENTER.

```
▲  CALIBRATION
   ALARM
   RELAY
▼  NETWORK
```

Move the cursor to 'SET DATE TIME' located on the 2nd page of the Main Menu and select ENTER.

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

Set Date

```
* DATE      MM / DD / YYYY
  TIME      HH / MM / SS
  PREVIOUS MENU
```
With the cursor on 'DATE' select ENTER to edit the DATE fields.

```
* 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.

8.3.   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 in order to clear any alarms.

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 })

** 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 SEC3120 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 SEC3120 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 SEC3120 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 SEC3120 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 SEC3120 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.

Resetting Latched Relays (Selected from the Initial / Top Menu, Page 2)

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

```
  ▲ EJECT MEMORY CARD
    ABORT WARMUP
    INFO
  ▼ MAIN MENU
```

```
  ▲ SEC DIAGNOSTICS
  *   RESET RELAYS
    FORMAT FLASH CARD
  ▼ EXIT
```
Select ENTER and any latched relays will be reset.
The following will be briefly displayed (for about three seconds):

```
RESETTING LATCHED
RELAYS NOW ...
```

8.4. Sensor Mode – Single, Unique or Identical

The SEC3120, unlike the SEC3100, communicates with two sensors allowing for simultaneous gas measurement, display, transmission and storage. This capability opens up 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 SEC3120 unit will only communicate / display / log information from a single sensor connected to the sensor 1 connector (see Figure 1). 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 SEC3120 does not signal a 'sensor missing' fault. In this mode the display mimics the behavior of the SEC3100, yet retains the advanced features of the SEC3120. 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 SEC3120 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 SEC3120 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 SEC3500 HMI). The relay mode may be set to any configuration. This sensor role allows the SEC3120 to consolidate two sensors to only one transmitter and allows logging of both sensor values to a single storage device. In this mode the SEC3120 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 SEC3120 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 exactly 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.

8.5.   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 Low = 20% full scale, Mid = 40% of full scale and 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 SEC5000 Evolution and SEC3300). 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 SEC3500 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)

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

Move the cursor to ALARM and select ENTER to open the alarm menu.

```
* ↑  FOR SENSOR:  ONE / TWO
     LOW
     MID
  ↓  HIGH
```

ENTER on 'FOR SENSOR' 'ONE/TWO' to choose which sensor to perform alarm configuration operations.
    DOWN switch to select sensor one
    Up switch to select sensor two

```
  ↑  FOR SENSOR:  ONE / TWO
*    LOW
     MID
  ↓  HIGH
```

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

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

To set the alarm set-point move the cursor to THRESHOLD and select ENTER.

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

Using the UP and DOWN switches set the desired value then select ENTER.

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

Selecting ACTIVE MODE will allow the operator to change the operation of the alarm activation operation from Active HIGH to Active LOW. Once the correct operation is selected select ENTER.

  – HIGH activates the alarm on a rising gas level.
  – LOW actives 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 it 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

8.6. Network ID (Sensor / Display Network Identities)

The SEC3120 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 it is so configured. When communicating with the SEC3500 versions less than 4.0.0, one device ID must be assigned sequentially for each sensor attached, allowing the SEC3500 to depict two separate sensors and treat them as individual SEC3100 transmitters. In version 4.0.0 and higher, the SEC3500 will support a single network ID for all sensors attached to the SEC3500 and display all relevant information as a single transmitter, a dual-sensor hub. Likewise, Modbus compliant Master devices may choose to communicate with the SEC3120 Transmitter using a single network ID. Switching between these modes can be very tricky when legacy (versions older than 4.0.0) SEC3500 HMI panels are the master.

The SEC3120 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 SEC3500 HMI for communication with older legacy SEC3500 HMI Panels. It is not a mode that should be intentionally set for use with Modbus Master's other than legacy SEC3500 HMI Panels. In this mode, network IDs are force to be assigned sequentially for two sensors attached to each SEC3120. 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 SEC3500 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 SEC3500 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 SEC3500 HMI Panel version 4.0.0 or higher. In this mode, only one Modbus Network ID is assigned to the SEC3120 Transmitter and all sensor information for all sensors attached are 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 PREVIOIUS 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 SEC3500, only zones 1-16 can be used.

```
     FOR SENSOR:  ONE
     ID             13
     ZONE            3
*    PREVIOUS MENU
```
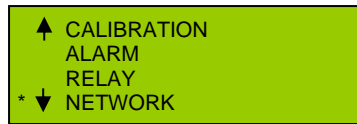
Scroll down and select ENTER on PREVIOUS MENU to return to the Network Menu Screen.

```
     NETWORK ID MENU
     MODBUS SETTINGS
*    PREVIOUS MENU
```
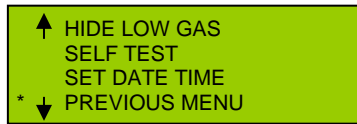
Scroll down to and select ENTER on PREVIOUS MENU to return to the Main Menu.

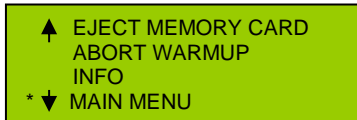```
* SAVE CHANGES
   ABORT CHANGES
```

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.

8.7.   ModBus Settings

The SEC3120 Digital Transmitter is capable of speaking to various devices that communicate using standard 16-bit Modbus and every version of the SEC3500 HMI using its various proprietary protocols. (For more details, see the SEC3120 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 is able to determine whether it is communicating with a standard Modbus device or an SEC3500 HMI and further distinguish which HMI protocol is appropriate. The SEC3120 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 SEC3120 RS485 Bus Parameters

Since the SEC3120 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). SEC3500 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 SEC3500 and are the recommended parameters. However, a different Modbus compliant Master used in place of the SEC3500, 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 SEC3120 Unit Online or Offline

```
  ▲  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.

```
* ▲  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.

9. Sensor Calibration

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

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 SEC3120 will return to the calibration menu. The sensor has been successfully zeroed if no faults are indicated.

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…
```

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

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

```
SPAN CAL
SENSOR ONE
1. RECORDING CAL DATA
```

```
SPAN CAL.
1. COMPLETE

DONE, STOPPING…
```

```
PURGE GAS  'present gas val'
SENSOR        ONE / TWO

            –ENT–  TO ABORT
```

After Span calibration has completed the operator will be prompted to purge the cal gas. The operator can then apply clean air to the sensor

```
▲ SELECT SENSOR ONE/TWO
   ZERO
*  SPAN
▼  CAL. VAL      2.50
```

Once the measured gas value is less than 25% of the LOW alarm set point the SEC3120 will return to the calibration menu. The sensor has been successfully calibrated if no faults are indicated.

```
* ▼ PREVIOUS MENU
```

Move cursor down to display final calibration menu option to return to PREVIOUS MENU

ENTER to return to the MAIN MENU

```
* ▲ CALIBRATION
     ALARM
     RELAY
  ▼  NETWORK
```

10.   Diagnostic Functions

The Diagnostics Menu will allow the operator to command the SEC3120 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 SEC3120 to reboot. This action results in the SEC3120 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 SEC3500 operator interface. It can be used at the SEC3120 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.

11.   Selt-Test Menu (Selected from the Main Menu)

The self-test function will make the sensor generate a 4-20mA current into the SEC3120 from 4mA to 20mA (0-fullscale). In the self-test mode the SEC3120 outputs are fully functional. The SEC3120 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 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 SEC3120 automatically returns to normal and the SELF TEST status will be removed from the display for that sensor.

12. 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 SEC3120 Display, Dual Head Transmitter.

```
SEC3120 TRANSMITTER
VER:  X.YY.RRRR
UNIT SN: 000035641
   -ENT- TO EXIT
```

'VER' is the SEC3120 software version number.
'UNIT SN' is the SEC3120 unit serial number.

```
  UNIT INFO
* SENSOR INFO
  PREVIOUS MENU
```

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

```
  UNIT INFO
  SENSOR INFO
* PREVIOUS MENU
```

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

13. 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
```

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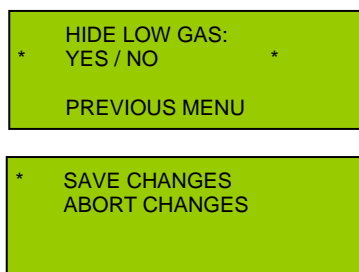
By selecting ENTER on YES/NO the user may change the value using the UP/DN arrows. After selecting ENTER after setting the value, the operator may move the cursor to PREVIOUS MENU and select ENTER to go back to the main menu after choosing to SAVE or ABORT the changes.

14.   Data Logging (Optional)

The SEC3120 Unit provides event data logging to a flash card. This flash card can be read by any personal computer that can read a FAT16 format file system, similar to cards from digital cameras and other portable devices. It should NEVER be formatted by a personal computer, rather be formatted by the SEC3120 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.

Note: You cannot use a memory card formatted by an SEC3120 in an SEC3100 Unit! You may, under certain circumstances, use a memory card formatted by an SEC3100, however the SEC3120 will consider it full when it approaches the SEC3100 file size limitation of 4MB. It is best to reformat such a card to make more use of its capacity.

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 SEC3120 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 SEC3120 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 of time 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 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: "SEC3120.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):

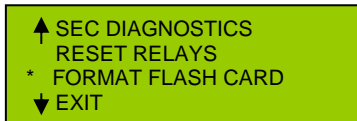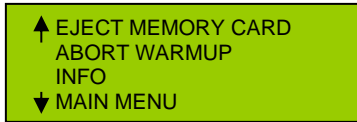| Log Entry Type Code (tt)	Description
00	Boot/Power up- 3120 Unit Information Event
01	Sensor Warm-up: New Sensor/Sensor removed and replaced Event
02	Parameter Changes Made Event
03	Alarm High-Level Triggered Event
04	Alarm Mid-Level Triggered Event
05	Alarm Low-Level Triggered Event
06	Change in Gas 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 *Log Variable Data Format (vv)*
00	**3120 Boot/Power Up Event** *Preamble,BB- US,FWVerMaj.Min.Rev*
01	**Sensor Warm-up Event** *Preamble,ID- US,FWVerMaj.Min.Rev*
02	**Parameters Changed Event** *Preamble,ID- NID,ZID,SSN,STP,CD,CV,RNG,LOW,MID,HI,GU,GN*
03	**Alarm High-Level Triggered Event** *Preamble,ID- Gas Value Float*
04	**Alarm Mid-Level Triggered Event** *Preamble,ID- Gas Value Float*
05	**Alarm Low-Level Triggered Event** *Preamble, ID- Gas Value Float*
06	**Change in Gas Level Event** *Preamble, ID- Gas Value Float*

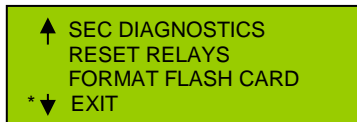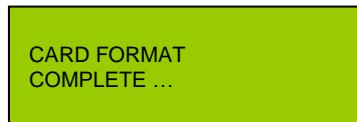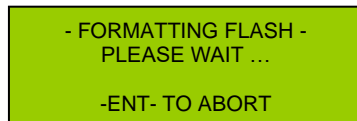|	
07	**Sensor Fault Event** *Preamble,ID- (SSC,SEC)/SMT*
08	**Sensor Calibration Event** *Preamble,ID- CALTXT*
09	**Flash Cleared Event** *Preamble,BB- "Memory Card Cleared."*
10	**Self-Test Initiated Event** *Preamble,ID- "Self Test Started."*
11	**Self-Test Concluded Event** *Preamble,ID- "Self Test Concluded."*
12	**Self-Test Aborted Event** *Preamble,ID- "Self Test Aborted."*
13	**Sensor Cell Warning Event** *Preamble,ID- CWC*
14	**3120 Unit Role Change Event** *Preamble,BB- RLM,SHR*
99	**Flash Card Re-inserted Event** *Preamble,BB- US,DVID,FWMaj.Min.Rev,RLM,SHR* * - 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**
Preamble	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)

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

The Flash Card may be re-formatted by the operator using the SEC3120.
(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.

15. Working With the SEC3500 HMI

The SEC3120 Digital Transmitter is supported by the SEC3500 HMI, most effectively beginning with HMI version 3.5.28 and Transmitter version 1.2.264. SEC3500 HMI versions prior to 4.0.0 treat the SEC3120 as one or two individual SEC3100 single digital transmitters, having separate icons, separate command and control, etc. This requires the SEC3120 to have sequential Modbus network IDs, one assigned for each physical sensor attached to it. If the SEC3500 HMI or its operator attempts to;

- "Discover" an SEC3120 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 SEC3120, or

- change the network ID of SEC3120 sensor two to a network ID that is not the next sequential value of sensor one,

the SEC3120 device may cause the SEC3500 HMI to get caught in a constant loop attempting to communicate with both sensors, lose information about the SEC3120, or any other related corruption issue.

Therefore, it is crucial that if a SEC3120 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 SEC3500 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 SEC3500 HMI Panel as the Modbus Master;

- If used in the initial deployment, then the Sensor Role for each SEC3120 must be decided and the correct Modbus Network ID mode defined so that if sequential network IDs are needed to support a dual sensor SEC3120, the assignment of network IDs is planned in advance. Take special care when mixing SEC3100 Digital Transmitters with SEC3120 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 SEC3120 Digital Transmitters, replacement of SEC3100 Single Digital Transmitters with SEC3120 Dual Digital Transmitters, and SEC3120 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 SEC3500 HMI Panel and then reconfigure all devices first before rediscovering the changes at the SEC3500 HMI Panel.

Caution: Do not mix an SEC3500 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 SEC3500 HMI, then utilizing the SEC3500 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.

APPENDIX A.   Supplement – Certification Listed Data

SUPPLEMENT – SEC3120 Dual Display:
CAUTIONS AND INSTALLATION RECOMMENDATIONS

The following supplement contains data and statements required by the approval certificate of this product. No changes are allowed without certification review. This supplement must be included with the manual(s) for this product.

⚠ Under high temperature (+40°C) and high power operation (8A relay current) housing temperatures may be high. Use caution when handling the SEC3120.

Approvals / Certifications

North American (c/us) Certificate: Class I, Division 1, Groups B,C,D, Temp T5 (Pending)
IECEx (International) Certificate: Ex (d) IIC, T5 Gb (Pending)

The SEC3120 is approved to the standards shown in the approvals certificates. In order to maintain compliance to these standards install the SEC3120 per the following instructions and precautions.

Specifications

The following specifications are for the SEC3120 display only. Consult the appropriate sensor manuals for their specifications.

Environmental:

The SEC3120 Dual Sensor Display can be installed in indoor, outdoor and wet locations. The housings used have ingress protection ratings of IP66. Pollution degree 2 and Overvoltage category II

Operating Temperature and Humidity Rating:
-40° to +40°C (-40 to +104° F) at 0 to 99% RH (non-condensing)

Altitude / Elevation:
IEC 61010-1 certified to 2000 meters.

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: 4.55 lbs (2.0 kg)

Conduit Entry:
Three (3) 3/4 inch NPT

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

Electrical:

Mains Supply:
Operating Voltage:
24 VDC ━━━ 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 SEC3120 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 ⌣

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Unit Installation and Maintenance

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

Mounting:

Mount the SEC3120 to rigid wall (wood based or stronger) or bulkhead structures using 1" or longer fasteners with a minimum 3/16" diameter. Mounting to drywall (wallboard, plasterboard, etc.) or similar material is not recommended.

Wiring:

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.

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

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. Solder tin the exposed wire to increase durability.
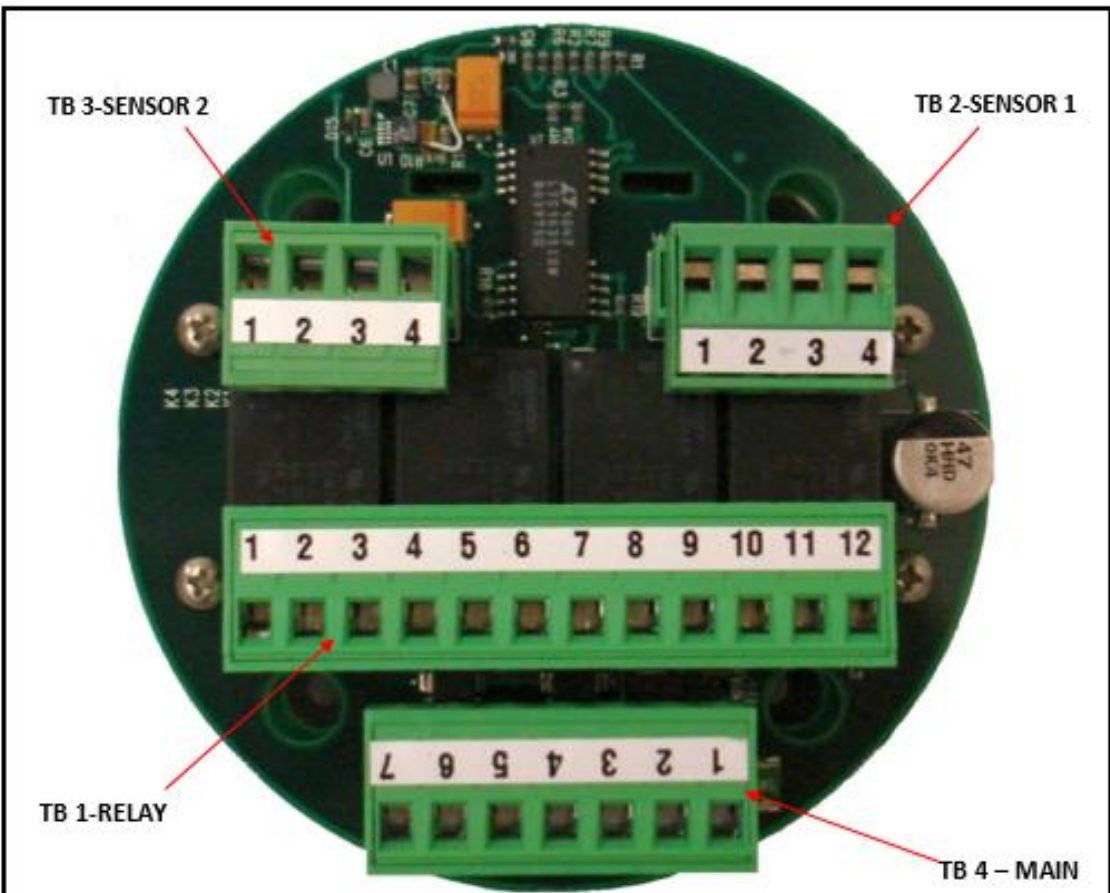
⏚ Protective bonding is provided by an internal screw location for connection of a grounding wire. Installation of this wire should include the use of a locking feature (i.e. locking washer).

Conduit:

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

TB 3-SENSOR 2

TB 2-SENSOR 1

1 2 3 4

1 2 3 4

1 2 3 4 5 6 7 8 9 10 11 12

7 6 5 4 3 2 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

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Figure 1
BACK VIEW OF SEC 3120
SEC 3120 WIRING