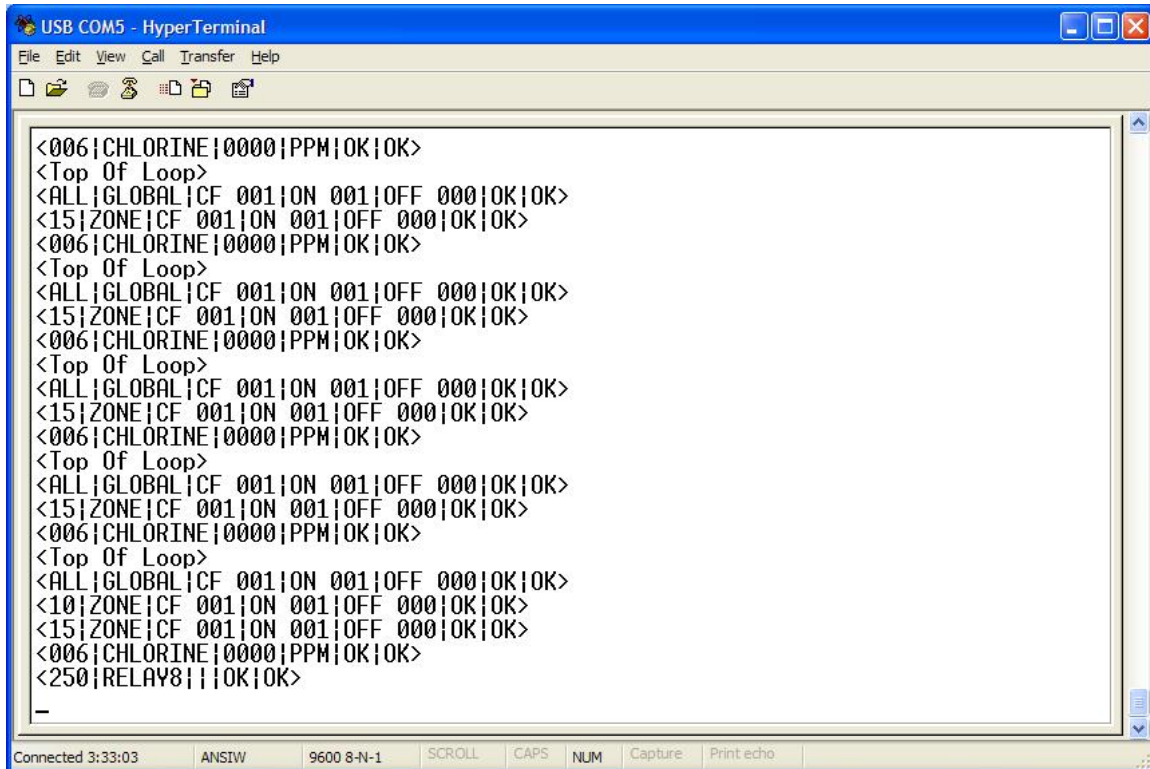


SEC 3500 OI- StatCast RS232 Gas Status Text Broadcast Configuration Manual



The image shows a HyperTerminal window titled "USB COM5 - HyperTerminal". The window contains a series of RS232 broadcast configuration commands. The commands are as follows:

```
<006|CHLORINE|0000|PPM|OK|OK>  
<Top Of Loop>  
<ALL|GLOBAL|CF 001|ON 001|OFF 000|OK|OK>  
<15|ZONE|CF 001|ON 001|OFF 000|OK|OK>  
<006|CHLORINE|0000|PPM|OK|OK>  
<Top Of Loop>  
<ALL|GLOBAL|CF 001|ON 001|OFF 000|OK|OK>  
<15|ZONE|CF 001|ON 001|OFF 000|OK|OK>  
<006|CHLORINE|0000|PPM|OK|OK>  
<Top Of Loop>  
<ALL|GLOBAL|CF 001|ON 001|OFF 000|OK|OK>  
<15|ZONE|CF 001|ON 001|OFF 000|OK|OK>  
<006|CHLORINE|0000|PPM|OK|OK>  
<Top Of Loop>  
<ALL|GLOBAL|CF 001|ON 001|OFF 000|OK|OK>  
<15|ZONE|CF 001|ON 001|OFF 000|OK|OK>  
<006|CHLORINE|0000|PPM|OK|OK>  
<Top Of Loop>  
<ALL|GLOBAL|CF 001|ON 001|OFF 000|OK|OK>  
<10|ZONE|CF 001|ON 001|OFF 000|OK|OK>  
<15|ZONE|CF 001|ON 001|OFF 000|OK|OK>  
<006|CHLORINE|0000|PPM|OK|OK>  
<250|RELAY8|||OK|OK>
```

The status bar at the bottom of the window shows: "Connected 3:33:03", "ANSIW", "9600 8-N-1", "SCROLL", "CAPS", "NUM", "Capture", and "Print echo".

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Intended Audience

This document is written for plant maintenance personnel or those personnel who will configure and/or collect continuous gas level and status text streams from the SEC 3500 OI, using the StatCast Feature.

Purpose

This document describes the StatCast RS232 Text Output Feature of the SEC 3500 OI, beginning with version 2.1. It will describe how to configure it, establish the best balance of performance vs. reasonable data update rate, and what the format of the text data broadcast stream is. This feature is very similar to the output that can be obtained from the SEC Supervision Plus monitoring system, yet enhanced, more configurable and more efficient for Modbus-based SEC Gas Monitor networks.

Overview

StatCast is not a new feature to the SEC product line, however it is a new addition to the SEC 3500 Operator Interface (OI) Panel, when used with SEC 3100 Gas Transmitters and Relay Modules.

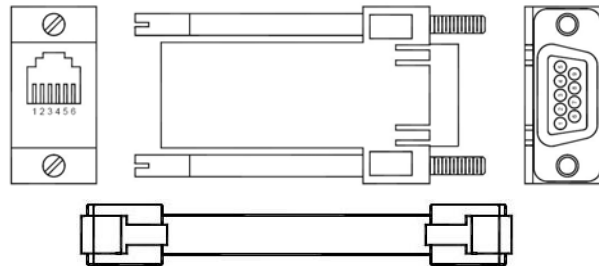
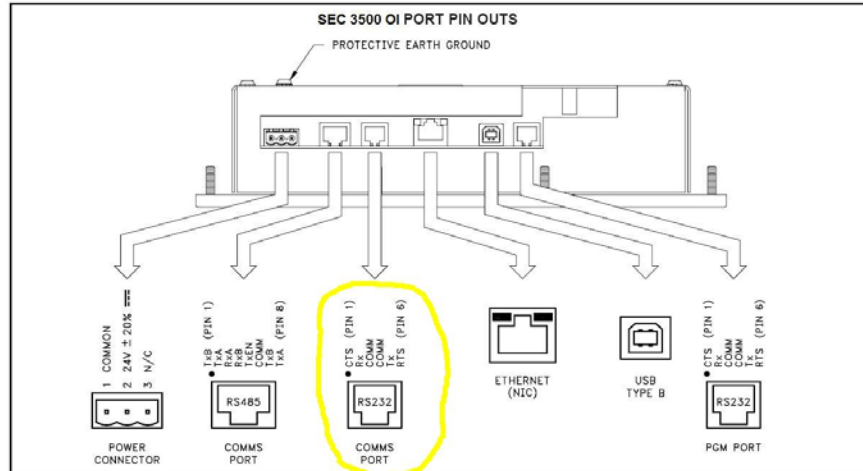
StatCast is a broadcast server built into the SEC 3500 OI Panel Software starting in version 2.1. It broadcasts Sensor, Zone and Global gas level and status records continuously as formatted text over a standard RS232 Serial Port. Virtually any terminal can capture this text, or application such as Microsoft HyperTerminal. Database applications may desire to capture the broadcast to monitor ambient gas levels and provide trending, as well as track alarm events.

StatCast provides Plant Floor Maintenance with the ability to configure which data to broadcast, how fast, how many records per scan, and at what baud rate. Plant Maintenance can decide to enable or disable the feature, and determine the appropriate balance of data update rate vs. performance impact on the Gas monitoring loop of the SEC 3500 with real time on-screen parameters, so that when it is finally established, there are no hidden performance hits or unexpected or unplanned excessive data latency.

In short, the customer is in control, and in the driver's seat. So let's dive in and examine more about this feature and how to use it!

Physical Link- RS232

The physical link for the RS232 Text Output Broadcast is a single RS232 Serial connection, using a full 6-wire 6pin modular RJ12 jack, off the back off the SEC 3500 OI Unit, labeled “RS232”. RTS/CTS hardware flow control is provided, as well as baud rates programmable from 1200 to 19200. The frame can be programmed to either 7 or 8 data bits, 1 or 2 stop bits, and parity set to none, odd or even. These parameters are configurable from the StatCast Configuration screen in the 3500 OI v2.1 or higher. Input is not accepted, broadcast output only provided. **See the following diagrams:**



3500 OI RS232 to a PC

Connections			
oi: RJ12	Name	PC: DB9	Name
4	COMM	1	DCD
5	Tx	2	Rx
2	Rx	3	Tx
	N/C	4	DTR
3	COM	5	GND
	N/C	6	DSR
1	CTS	7	RTS
6	RTS	8	CTS
	N/C	9	RI

Normal Functional Operation

When the StatCast Feature is properly configured ¹ and enabled, it will continuously broadcast all enabled record categories and gas levels, at the top of every gas detector scan loop of the 3500 OI. Ideally, this would be a burst of all gas levels and rollup status collected during the foregoing cycle; however this depends on how StatCast is configured. StatCast broadcasts the latest data it contains in the panel (3500 OI) database. There is a delay between the detector's measurements and when it reaches the broadcast stream, which will vary depending on configuration of the StatCast feature, the number of detectors on the loop, etc., however it will at the very least, be a delay of 2 seconds or more.

The StatCast broadcast is present at the RS232 output whenever the primary 3500 OI Operator gas detection summary screens ² are displayed, with some exceptions. ³ During those exceptions, broadcasts are paused or stopped. Broadcasts resume when a primary 3500 OI Operator gas detection summary screen is displayed, or the screen saver is displayed.

Therefore, as a rule of thumb, if the 3500 OI is not being manually (or remotely) manipulated, is sitting on the main screen or the screen saver, and the StatCast feature is properly configured and enabled, then the StatCast broadcast is present at the RS232 port.

The output can be configured as a burst of all status and gas levels measured in the foregoing gas detection scan loop, or broken up into a sliding-window of a fixed number of records per scan-loop to maintain gas detection scan loop responsiveness and performance, absent of increasing StatCast RS232 baud-rate to a suitably high speed. The sliding window can be configured from as few as one record output per scan, to ALL records (271) per scan. Regardless of the configuration method, whatever record is output, that record *will contain the most currently known, or up to date value* in the 3500 database. See the diagram on the following page to illustrate the two primary methods.

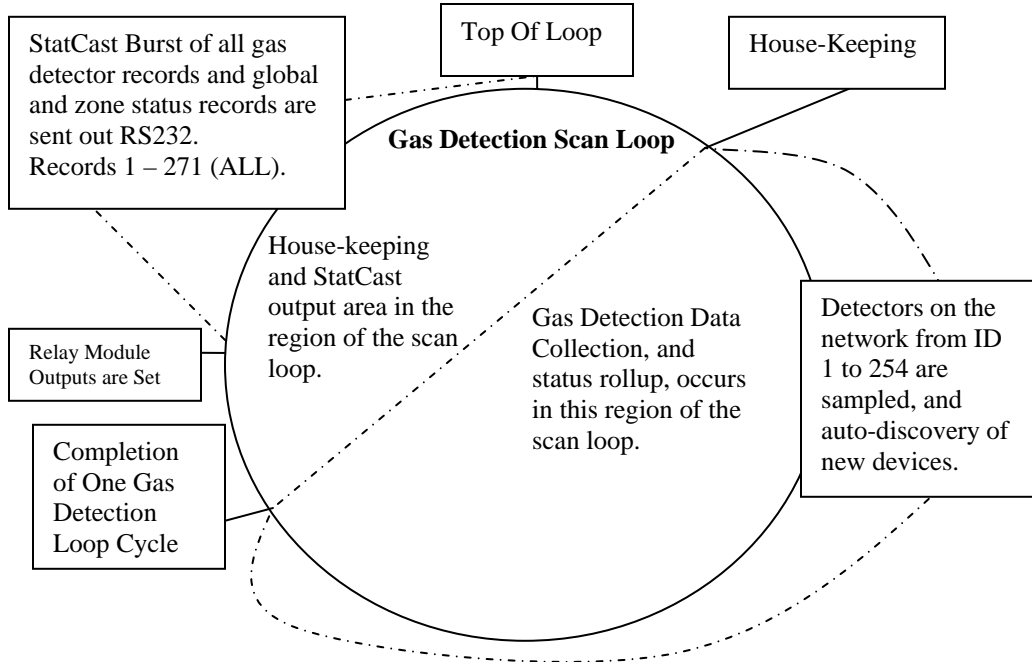
StatCast ONLY broadcasts known devices: it does not broadcast records for devices that have not been discovered and brought online. Once a device has been brought online and is in the panel database, it will have a record broadcast whether online or not until the device is deleted from the database. Therefore, even if ALL records are chosen for broadcast, ONLY the records related to valid and known devices are broadcast.

¹ Port parameters (baud rate, stop bits, data bits, parity) MUST be saved before they become active-including first time configuration. In fact, before the timing impact can be properly measured, these parameters must be saved first, if never previously saved.

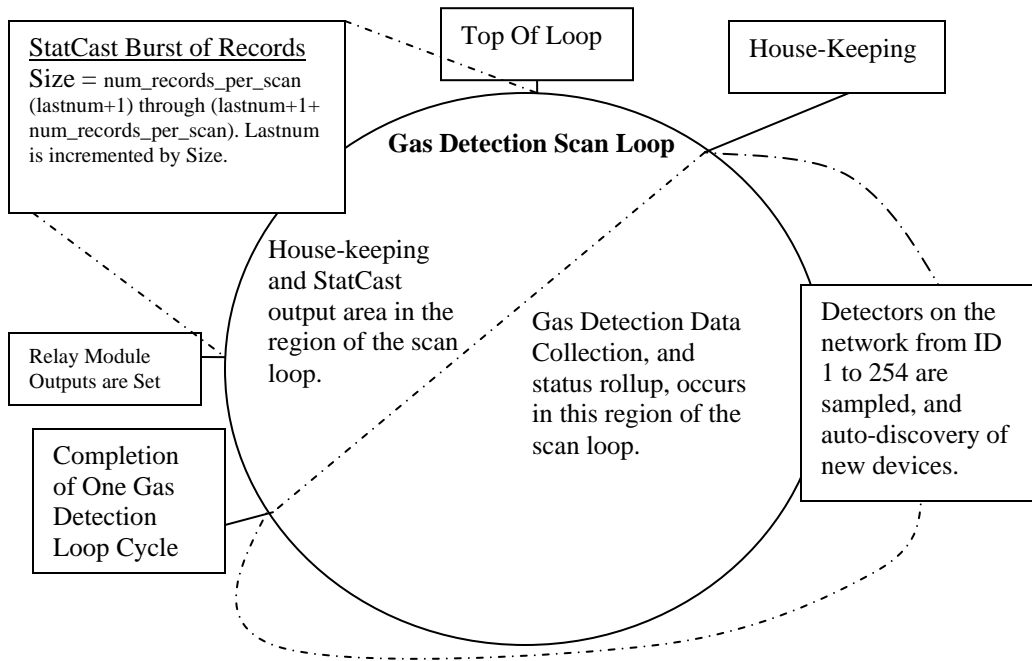
² Those screens are; Home Zone or main screen, Zone, Bus or Alarm summary screens, Device Selection screens, Sensor Summary screen, and all Relay Module Screens.

³ Exceptions are; Sensor Configuration Screens (alarm threshold, alarm parameters, relay parameters), Calibration, Network ID and name change screens, diagnostics, manual override screens, manual device discovery, 3100 clock set screen, maintenance screens, other 3500 configuration screens, menu screens, etc.

Full burst of everything per gas detection scan loop:



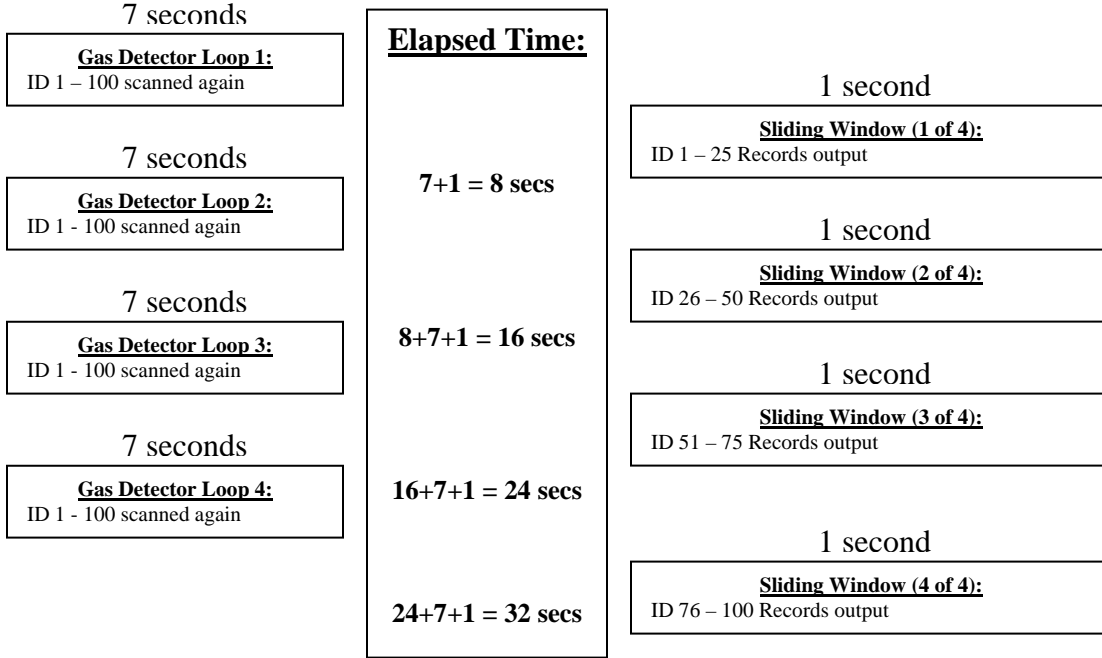
Sliding-Window Burst per gas detection scan loop:



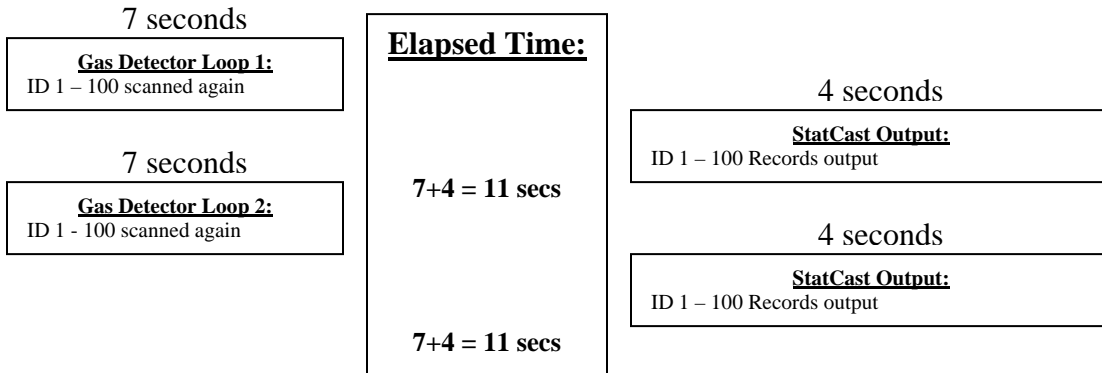
Therefore, if the number of records (size) to be sent per gas detection scan loop is 50 for example, and there are 100 detectors on the bus, it would require two full gas detector scans to output all gas level and status records.

Reasonable broadcast times should be held to no longer than 2 seconds, that way only one sensor gas detection interval is missed per scan loop (essentially, every other sample, since the SEC 3000 sensor outputs a gas value every 1.65 seconds), worse case. This is accomplished primarily by adjusting the number of records broadcast per gas detection scan loop.

Example Scan Loop (100 gas detectors) with a Sliding Window (25 Records):



Example Scan Loop (100 gas Detectors) without a Sliding Window (100 records):



Of course there is another way to avoid either the excessive data latency (24 seconds) shown in the sliding window example previously, or the missed gas detection period (4 seconds) in the full burst shown in the immediate previous example; and that is to increase the baud rate, and add line repeaters as needed. This can be accomplished using the configuration utility to change rates, adjust record count and try and measure before committing a final configuration. In the above example, a baud rate of 19,200 would decrease the time in the full burst example from 4 seconds to 2 seconds, and a baud rate of 38,400 with multiple line repeaters (if the distance is long) would reduce that to an acceptable delay of only 1 second.

Of course a compromise could be made, by increasing the baud rate from 9600 to 19200 (1 second per window burst of 50 records), and setting a sliding window of 50 records, producing a latency of only 2 scans or 7 seconds for the entire set. In this manner, the gas detection loop is hardly impacted (1 seconds, quite acceptable), and the added latency to acquire a full StatCast set is only 7 seconds.

The formatted output of StatCast is discussed in the next section, and configuration of StatCast in the section following that.

Data Record Format

Data is output to the RS232 port in formatted text, in a record format. There is one record per status item. A status item may be;

- (1) **Global Status-** i.e. status of highest alarm/fault level of all zones, including a tally of all devices configured on the bus, a tally of all devices on line, and a tally of all the devices that are off-line.
- (2) **Zone Status-** i.e. status of highest alarm/fault level of all devices within the given zone, including a tally of all devices configured in the given zone, a tally of all zone devices on line, and a tally of all zone devices that are off-line.
- (3) **Device Status-** i.e. Current gas level and alarm status of the current device.

There is one record for each status item; hence there will be one record for global status, and sixteen (16) records for each of the sixteen zones. There is also one record for each device, therefore up to 254 records for 254 configured devices (actual number will depend on the number of actual configured devices for the bus). This gives a possibility of up to 1 Global + 16 Zones + 254 Device records = 271 total possible records (if all three categories are selected for output). There is also one (not counted) Top of Loop indicator record to indicate the beginning of a new scan.

All records are delimited by angle brackets < >, and terminated with carriage return/line feed characters, so that one record appears per line on a standard RS232 terminal or applications such as Windows HyperTerminal. There are six (device) or seven (global or zone) fields within a record, each separated by a pipe character (vertical bar) |:

<A|B|C|D|E|F|G>

- A = ID: Is either "ALL" for global status, 1-16 for zone status, or 1-254 for Device ID.
- B = NAME: "GLOBAL" for global status, "ZONE" for zone status, "RELAY8" for an 8 coil relay module, "RELAY16" for a 16 coil relay module, "AIM" for analog interface module, or a gas name abbreviation for gas sensor (such as "Chlorine" or "Methane"⁴).
- C = VALUE: For global or zone status, this will be the number of devices configured for the entire bus (global) or zone (format: "CF 000"), for Relay modules this will be empty ||, for AIM and gas detectors this will contain the value (gas detectors, this will be the formatted gas level, precision set to scale of sensor range; AIM this will be the analog voltage level).
- D = UNITS: For global or zone status, this will be the number of devices online either for the entire bus (global) or the zone (format "ON 000"), for Relay

⁴ Note: during sensor power-up, it may be empty, appearing as two || symbols with no space.

modules this will be empty ||, for Gas detectors this will be the Gas Units (i.e. “ppm”⁵).

- E = DEVICE STATUS: For global or zone status, this will be the number of devices offline either for the entire bus (global) or the zone (format “OFF 000”), for relay modules, this will be “OK”, “OFFLINE”, or “OFFWARN” (for not responding properly and suspect). For Gas Detectors this can additionally be “LOWALRM”, “MIDALRM”, “HIALRM”, “FAULT”, “MISSING” (for missing sensor), “INIT” (for sensor or device initialization), “CALIB” (sensor is being calibrated or user is in the calibration menu), or “SELF TEST” (sensor is in self test mode⁶).
- F = LINE STATUS: For global and zone records, this will actually be field E above, STATUS: with the following contents: “OK”, “LOWALRM”, “MIDALRM”, “HIALRM”, or “FAULT”. For Devices, this will be the Mod-Bus Line/Loop status: “OK” or “LB” for line break detected.
- G = LINE STATUS: For global and zone records only (“OK” or “LB”, as in field F above). For devices, this field and pipe symbol will NOT be present.

Examples:

Top Of Loop/Scan Indicator Message:

<Top Of Loop>

Global Status Message:

OK Message (123 devices configured, 120 online, 3 offline, rollup status OK, line status OK):

<ALL|GLOBAL|CF 0123|ON 0120|OFF 0003|OK|OK>

MID Alarm rollup:

<ALL|GLOBAL|CF 0123|ON 0120|OFF 0003|MIDALRM|OK>

Fault Alarm rollup (higher than HI alarm):

<ALL|GLOBAL|CF 0123|ON 0120|OFF 0003|FAULT|OK>

Zone Status Message:

OK Message (zone ID #5, 11 devices configured, 7 online, 4 offline, rollup status OK, line status OK):

<05|ZONE|CF 0011|ON 0007|OFF 0004|OK|OK>

High Alarm rollup:

<05|ZONE|CF 0011|ON 0007|OFF 0004|HIALRM|OK>

⁵ See Note [4] previously.

⁶ The “SELF TEST” indicator will be *inserted before* the alarm status: **both** will be included!

Relay Module Status Message:

OK Message (Device ID #250, 8 coil relay module, rollup status OK, line status OK):

<250|RELAY8||OK|OK>

Offline Message:

<250|RELAY8||OFFLINE|OK>

Offline Warning Message: (Occurs when it is not responding, but net yet declared offline):

<250|RELAY8||OFFWARN|OK>

Gas Detector (through 3100) Module Status Message:

OK Message (Device ID #6, chlorine sensor, range >= 100, 284 PPM level, rollup status OK, line status OK):

<006|CHLORINE|0284|PPM|OK|OK>

MID alarm Message:

<006|CHLORINE|0845|PPM|MIDALRM|OK>

Power-up Init Message:

<006||0000||INIT|OK>

Sensor Init Message:

<006|CHLORINE|0000|PPM|INIT|OK>

Sensor Span Calibration Message:

<006|CHLORINE|0983|PPM|CALIB|OK>

Sensor Zero Calibration Message:

<006|CHLORINE|0000|PPM|CALIB|OK>

Sensor Removal or Missing Message:

<006|CHLORINE|0000|PPM|MISSING|OK>

Sensor Self Test Message:

<006|CHLORINE|1734|PPM|SELF TEST|HIALRM|OK>

OK Message (Device ID #10, chlorine sensor, range < 10, 0.84 PPM level, rollup status OK, line status OK):

<010|Chlorine|0.84|ppm|OK|OK>

OK Message (Device ID #15, chlorine sensor, range < 100, 10.3 PPM level, rollup status OK, line status OK):

<015|Chlorine|10.3|ppm|OK|OK>

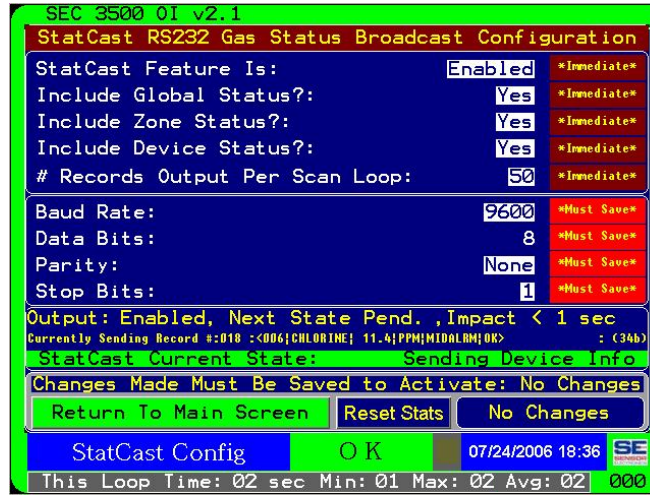
Offline Warning Message (Occurs when it is not responding, but net yet declared offline):

<015|Chlorine|10.3|ppm|OFFWARN|OK>

Offline Message (Occurs when it is declared offline and failing to respond to pings):

<015|Chlorine|10.3|ppm|OFFLINE|OK>

SEC 3500 OI StatCast Configuration Utility



The SEC 3500 OI StatCast Configuration Utility, shown above, allows plant floor maintenance personnel to configure the StatCast Feature. To access this utility, simply logon as user “maint”, select the |supervisor menu|Configuration|StatCast Config| sub-menu. This utility allows configuration and measurement of impact on the gas detection scan loop, so that the proper balance of data latency and responsiveness can be achieved according to the user’s criteria.

In the above screen-capture, there are colored indicators to the right of each user-selectable feature. Where the indicator shows dark red text “*Immediate*”; values changed with this notation take effect immediately as the parameter is changed. It does NOT indicate that the value is saved permanently if the panel were powered down incorrectly though.⁷ These parameters, will take effect at the very next StatCast cycle (which may be a sliding window partial output). Changes made to these are immediately noticed at the “Impact” measurement status label.⁸



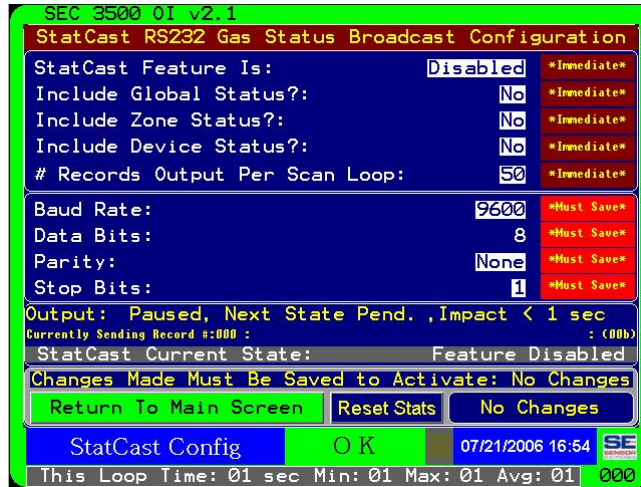
Right-side indicators shown in lighter red text “*Must Save*” indicate that they MUST be saved⁹ in order to take effect, and for the “Impact” status label to accurately show measurements based on the new RS232 line parameters.

⁷ Any time an operator or panel (SEC 3500 OI) user desires to remove power from the panel, the “**Safely Power Down HMI**” menu item should be performed and follow all instructions before doing so, to insure all data is safely stored in non-volatile ROM. If this is not done, it is possible to lose changes made and data collected in the past six minutes.

⁸ NOTE: It is crucial that baud rate values shown are saved to be active for impact measurements shown to be accurate.

⁹ The “No Changes”/”Save Now” button must be pressed for any RS232 line parameters to take effect. This will cause the panel to reboot.

When SEC 3500 OI version 2.1 is first installed, the feature is disabled, and the screen appears as follows:

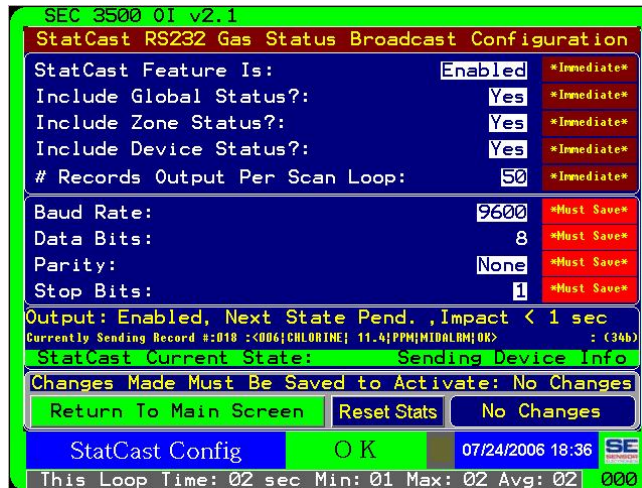


The very first thing that **MUST** be done, is to set the Baud Rate, Data Bits, Parity and Stop Bit settings, and save them by pressing the “No Changes”/”Save Now” button, even if what is shown is the desired parameters, since they have **NOT** been set and activated for the RS232 port. Once the panel resets and the maintenance operator returns to this utility, the feature settings in the topmost group of “Immediate” values may be changed. The first decision to consider before enabling the StatCast feature is whether or not the global and zone status records should be sent. These can be individually set. Also, the device status should be set to “Yes” so that gas levels will be included in the stream.

Take note of the current gas detection loop statistics shown at the bottom of the screen; this is what any analysis should be based on, regarding additional tolerable delay once the StatCast feature is enabled. Only the maintenance operator can determine what is proper for such implementation. The loop statistics can be reset and restarted by pressing the “Reset Stats” button, located above the alarm status indicator (shown above as “OK”).

At this point, it is proper to enable the StatCast Feature, by changing the value at the top of the first set of parameters to “Enabled”. Immediately, StatCast will begin text output to the RS232 port. The impact measurement will display how many additional seconds ¹⁰ are impacting the gas detection loop as well as the loop statistics at the bottom of the screen will increase from the baseline noted in the above paragraph, by the amount shown by the impact measurement analysis. The states, current record output, and the actual contents of the last record buffer are displayed below the impact measurement analysis, as shown on the next page:

¹⁰ This value is granular to seconds, therefore if the value is just slightly less than 1 second, it will show “< 1 sec”, or if the value is between two whole numbers, then it will display the number followed by a plus sign such as “1+ secs”.



Using a baud rate of 9600 as a basis in the above example, we can see that by including the global status, zone status set, and device status set (gas levels and alarm status) in a sliding window of 50 records per StatCast output, the impact is less than one second. By examining the loop statistics at the bottom of the screen, we can see that the actual round trip time on average for gas detection with this configuration has added about one full second. The discrepancy indicates that the gas detection loop stats used for a baseline were probably showing a time between 1 and 2 seconds, so the addition of a fraction of a second causes the total loop statistics to crossover the next whole number to 2 seconds.

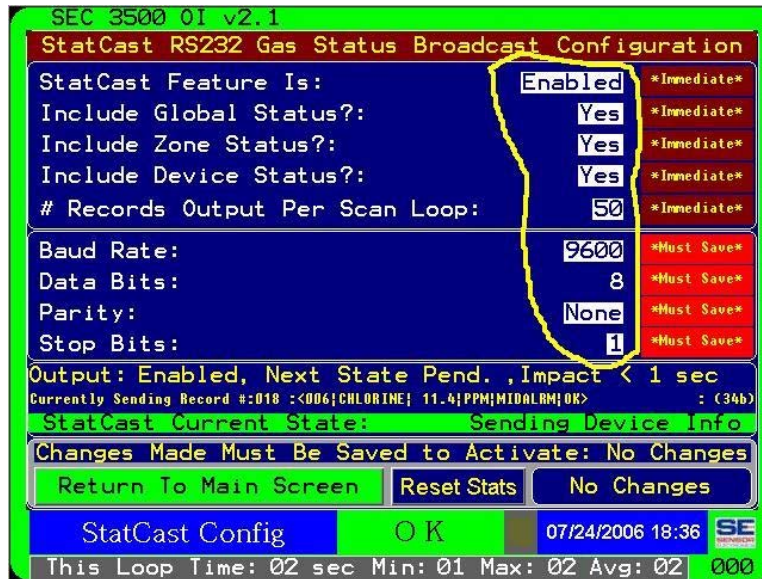
The sliding window size can be adjusted by selecting the item “# Records Output Per Scan Loop” and selected a value between 1 and ALL. A selection of “ALL” will burst all values per gas detection scan loop, and will typically have the highest impact measurement. If the impact is unacceptable either because the sliding window causes too much latency in data split across multiple gas detection scans, or because the impact time is too large AND all records are desired to be sent per gas detection loop, then baud rate should be increased. Remember when adjusting RS232 line parameters such as baud rate, they do not take immediate effect until they are saved.

Once the desired balance of impact and latency are achieved,¹¹ all settings should be saved permanently to non-volatile ROM by pressing the “No Changes”/“Save Now” button and allowing the panel to reset.

¹¹ **Impact** is the amount of time that immediately delays the start of the next gas detection data collection scan loop. **Latency** is the amount of additional accumulative time (not shown) required to gather an entire StatCast output of all desired records, measured in #scans required to capture all records multiplied by the total scan loop time - 1.

Other Interaction Description of StatCast Config Utility

A great deal of the functional aspects of the StatCast Configuration screen have already been discussed in previous sections, however there are some interactions the reader should be aware of:



When any of the above parameters are changed, the “Changes Made Must Be Saved to Activate:” label value and the “No Changes” button above will change from “No Changes” to “Save Now”, and the color will change to yellow on dark red; thus indicating that these values must be permanently saved to survive a loss of power to the panel.



When the maintenance operator is done and changes are saved, the green “Return To Main Screen” button may be pressed to return to the main zone home screen. If the maintenance operator is done using the panel, he/she should log out so that permissions fall back to the bottom operator level.



Keep in mind, that normal gas detection, relay module action and status rollup activity operates; therefore detectors may enter into alarm conditions, and the surrounding alarm status borders¹² of the screen as well as the alarm status indicator¹³ will change correspondingly. The Alarm Summary Screen can be immediately transported to be pressing the Alarm Status indicator.

¹² In the above example it will appear in green.
¹³ In the above example it will appear as “OK”.