

G450 / G460
Bump-test and Calibration Procedures



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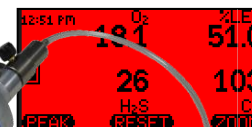
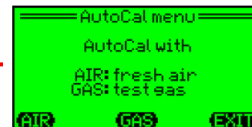
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G450 / G460 Calibration

Slide 1

Bump Test (Manual Procedure)

- Make sure the instrument is located in fresh air, turn on, and allow to warm up
- Note readings, and perform fresh air zero if necessary
- Attach calibration adapter; instrument will display "AutoCal menu"
- Press "Exit" to show normal gas reading screen
- Flow gas to sensors; alarms should activate, and readings should stabilize at expected values (if sensors fail to respond properly, instrument should be calibrated before further use)
- Turn off gas, remove cal adapter and allow readings to stabilize at fresh air values



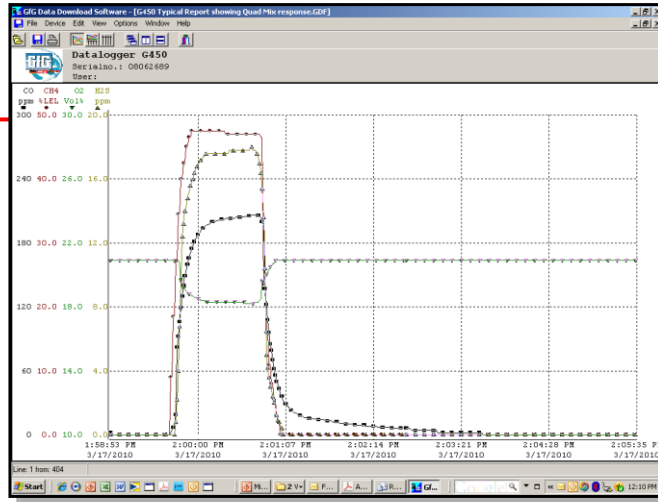
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Slide 2

Bump Test

- *Response of sensors to Quad Mix (graphs)*
- *Readings recorded while instrument operated in normal gas reading mode*
- *Simultaneous response to all four gases, as well as match between cal gas concentrations and readings*



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Slide 3



Bump Test

- *Response of sensors to Quad Mix (table)*
- *Readings recorded while instrument operated in normal gas reading mode*
- *When a sensor is in alarm readings are recorded in red*

Date Time	CO ppm	CH4 %LEL	O2 Vol%	H2S ppm	Event	Signal
3/17/2010 1:59:36 PM	0	0.0	20.9	0.0		OFF
3/17/2010 1:59:37 PM	0	0.0	20.9	0.0		OFF
3/17/2010 1:59:38 PM	0	0.0	20.9	0.0		OFF
3/17/2010 1:59:39 PM	2	9.0	20.9	0.0		OFF
3/17/2010 1:59:40 PM	4	9.0	20.9	0.0		OFF
3/17/2010 1:59:41 PM	7	18.5	20.9	0.0		OFF
3/17/2010 1:59:42 PM	11	18.5	20.9	0.0		OFF
3/17/2010 1:59:43 PM	19	27.8	20.9	0.8		OFF
3/17/2010 1:59:44 PM	82	27.8	20.9	2.2		OFF
3/17/2010 1:59:45 PM	92	34.5	20.9	4.0		OFF
3/17/2010 1:59:46 PM	106	34.5	20.7	6.8		OFF
3/17/2010 1:59:47 PM	119	40.0	19.6	9.8		OFF
3/17/2010 1:59:48 PM	130	40.0	19.4	12.4		OFF
3/17/2010 1:59:49 PM	140	42.5	19.2	13.2		OFF
3/17/2010 1:59:50 PM	149	42.5	19.1	14.0		OFF
3/17/2010 1:59:51 PM	153	45.0	19.0	14.2		OFF
3/17/2010 1:59:52 PM	160	45.0	18.9	14.8		OFF
3/17/2010 1:59:53 PM	166	46.5	18.8	15.2		OFF
3/17/2010 1:59:54 PM	171	46.5	18.8	15.6		OFF
3/17/2010 1:59:55 PM	175	47.5	18.7	15.8		OFF
3/17/2010 1:59:56 PM	178	47.5	18.7	16.0		OFF
3/17/2010 1:59:57 PM	181	47.5	18.6	16.4		OFF
3/17/2010 1:59:58 PM	184	47.5	18.6	16.6		OFF
3/17/2010 1:59:59 PM	186	47.5	18.5	16.8		OFF
3/17/2010 2:00:00 PM	188	47.5	18.5	17.0		OFF
3/17/2010 2:00:01 PM	189	47.5	18.5	17.0		OFF
3/17/2010 2:00:02 PM	191	47.5	18.4	17.2		OFF
3/17/2010 2:00:03 PM	193	47.5	18.4	17.2		OFF
3/17/2010 2:00:04 PM	194	47.5	18.4	17.4		OFF

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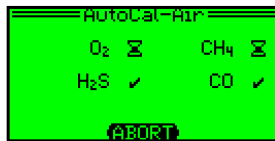
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Slide 4



Manual AutoCal

- **AutoCal allows instrument to be “Fresh air” or “Calibration” (span) adjusted if needed**



AIR - AutoCal® with fresh air
GAS - AutoCal® with test gas
EXIT - Back to main menu



Attach Cal Cap to Enter Fresh Air and Span “AutoCal”

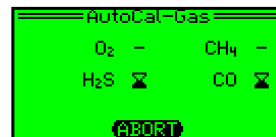
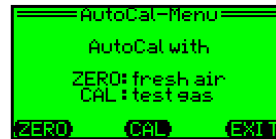


Attach cal cap to unit;
 instrument automatically
 enters “AutoCal” menu

Choose ZERO or
 CAL and apply gas
 (if calibrating), e.g.
 an H₂S/CO mix.

Adjustment is
 automatic

Display shows when
 cal adjust has been
 successfully
 completed



Can also enter "AutoCal" mode by pushing "Reset" and "Zoom" buttons at same time

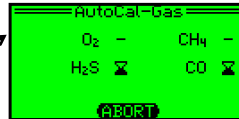


Push "Reset" and "Zoom" at same time; instrument automatically enters "AutoCal" menu

Choose ZERO or CAL and apply gas (if calibrating), e.g. an H₂S/CO mix.



Adjustment is automatic



Display shows when AutoCal adjust has been successfully completed



Calibration gas concentrations

- Best to use the default cal gas concentrations
- Default GfG concentrations used to calibrate instrument:
 - 200 ppm CO
 - 20 ppm H₂S
 - 50% LEL methane (CH₄)
- If you use different concentrations you must change instrument settings!



What should you do if you fail AutoCal adjustment?

- AutoCal adjusts all of the sensors that can be adjusted based on the calibration gas being used
- The display will show an "Error" for any sensors that were not successfully adjusted
- The most common reasons for failing AutoCal adjustment are:
 - Forgetting to attach the cal adapter
 - Forgetting to turn on the flow of gas
 - Empty calibration gas cylinder
 - Wrong cylinder / wrong concentration(s) in calibration gas
 - Gas has expired dating and is no longer usable
- Before giving up, check the gas and fittings and try again

```
AutoCal-Menu
AutoCal with
ZERO: fresh air
CAL: test gas
[ZERO] [CAL] [EXIT]
```

```
AutoCal-Gas
O2 - CH4 -
H2S [X] CO [X]
[ABORT]
```

```
AutoCal report
H2S Error
CO OK
O2 OK
CH4 OK
[DETECT]
```



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What if you check the gas and fittings but still fail AutoCal adjustment?

- To avoid accidentally using the wrong cal gas, or zeroing the instrument in the presence of contaminants;
- AutoCal has a maximum permitted change in adjustment between one fresh air zero, or one span calibration and the next
- If the change between the zero or span setting exceeds this maximum, the instrument will not properly adjust
- In this case you will need to perform a single-sensor calibration on the sensor or sensors that have failed to calibrate properly



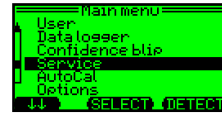
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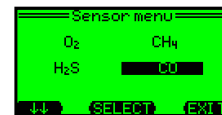
Single sensor calibration procedure (part 1)

- Use single sensor calibration procedure whenever you need to calibrate one sensor at a time
- Press and hold "Reset" button to show the "Main Menu" then chose "Service"
- For "Security Code" use "1100" as the password
- Choose "Sensors" then select the sensor that you intend to calibrate



Make sure to use "1100" as password.

"1100" is a special password that allows a wider maximum calibration adjustment window.



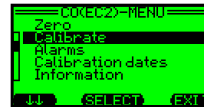
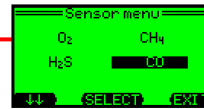
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Single sensor calibration procedure (part 2)

- A screen will show the menu choices for the selected sensor
- If the sensor needs to be fresh air adjusted choose "Zero"
- If the sensor does not need to be fresh air adjusted choose "Calibrate"



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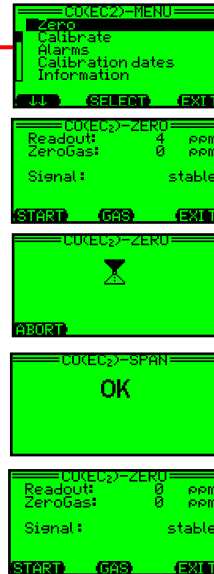
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Single sensor calibration procedure (part 3)

- To perform a fresh air zero:
 - Make sure the sensor is exposed to fresh, contaminant free air
 - Make sure to remove the cal adapter if you are using the surrounding air to adjust the sensor
 - The "Zero" screen will show the current reading
 - Press "Start" to begin the fresh air adjustment
 - An "OK" indicates when the procedure is complete, after which the screen returns to the "Zero" screen

You MUST save the results of the fresh air or calibration adjustment or they will not be saved to the instrument's memory!



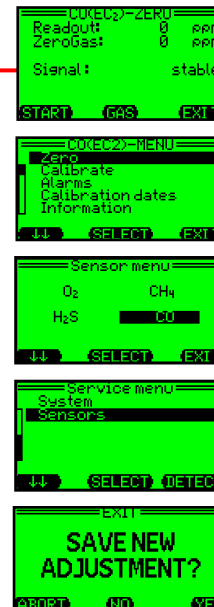
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Saving single-sensor "Zero" and "Calibration" results (part 4)

- If you do not deliberately save the results, after a few minutes the instrument will return to normal operation and the results will not be saved!
- Press "Exit" to save the results and return to normal operation
- Each time you press "Exit" you move up one level in the instrument program
- The final screen will ask whether you want to "Save new adjustment?"
- Press "Yes" to update the instrument memory



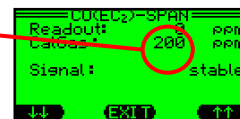
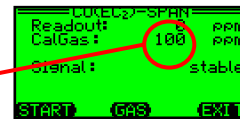
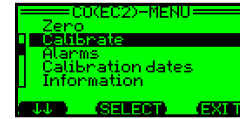
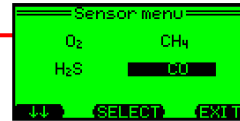
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Single sensor calibration procedure (part 5)

- To perform a span Calibration:
 - Choose the sensor to be calibrated
 - Choose "Calibrate" from the menu
 - Make sure the calibration adapter, calibration gas and regulator are attached to the instrument
 - The "Span" calibration screen shows the "CalGas" concentration that the instrument will use to adjust the sensor
 - Verify the concentration of gas in the cylinder matches the "CalGas" value
 - If needed, you can adjust the "CalGas" value by selecting "Gas" then using the arrow (↑↑ or ↓↓) buttons to change the concentration
 - Press "Exit" after you finish adjusting the "CalGas" concentration



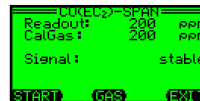
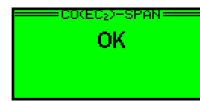
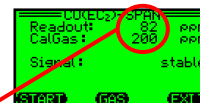
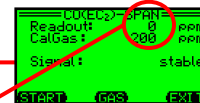
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Single sensor calibration procedure (part 6)

- To perform a span Calibration:
 - The "Readout" shows the current sensor reading
 - Open the regulator valve to begin flowing gas to the sensor
 - The "Readout" number will begin to rise as the sensor responds to the gas
 - Press "Start" to begin the calibration adjustment
 - The "Span" calibration screen will show an hour-glass icon while the sensor is being adjusted, then an "OK" message when the adjustment is complete
 - Press "Exit" to return the instrument to normal operation.
 - Remember to "Save" the new adjustment or the results of the calibration will not be updated to the instrument memory



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DS-400 Docking Station for daily bump check and / or periodic calibration



- **Standalone operation:**
 - **No computer required!**
- **Docking station controlled by instrument's control buttons:**
 - **Push "Test" for Bump Test**
 - **Push "Cal" for Auto Cal**
 - **Push "Cancel" to charge only**

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DS-404 Multi-inlet Docking Station for bump check and periodic calibration



- **Inlets for 4 cylinders of gas**
- **Automatic Bump and Cal for 5, 6 and 7 channel instruments**
- **Supports:**
 - **Quad mix (O₂, LEL, CO, H₂S)**
 - **5-mix with SO₂**
 - **5-mix with CO₂**
 - **Isobutylene**
 - **HCN**
 - **NO₂**
 - **And other individual gases**

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Using DS400 Docking Station for daily bump check and / or periodic calibration



- **Standalone operation: DS-400 does not require connection to an external computer**
- **Test results and other messages displayed on instrument LCD**

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Using DS-400 Docking Station for daily bump check and / or periodic calibration

- **Using DS-400 allows instrument to record "Bump Test" as specific event in instrument's memory**
- **It is possible to set a "Bump Test Due" date in the instrument's memory**
- **Only way to reset next "Bump Test Due" date is by means of DS-400 Docking Station**



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Using DS-400 Docking Station for daily bump check and / or periodic calibration



- **Make sure DS-400 attached to test gas and power**
- **Make sure the instrument is located in fresh air, turn on, and allow to warm up**
- **Note instrument readings, and perform fresh air zero if necessary**
- **Place instrument in DS-400**
- **Docking station controlled by instrument's control buttons:**
 - **Push "Test" for Bump Test**
 - **Push "Cal" for Auto Cal**
 - **Push "Cancel" to charge only**

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How to do bump test

- **Make sure instrument turned on**
 - **Best if instrument allowed to warm-up at least 5 minutes before bump test**
- **Make sure Docking Station plugged in and connected to gas**
 - **Higher inlet is for fresh air**
 - **Lower inlet is for span gas**
- **Place instrument in Docking Station**
- **Instrument display will indicate status and results of test**



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How to do bump test

- *After 10 second count-down; Docking Station automatically performs bump test*
- *Instrument screen shows a check mark besides each sensor as bump check completed*
- *If instrument is not removed from Docking Station; 5 minutes after test completed instrument automatically turns off and goes into charging mode*



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DS400 Docking Station

- **Bump-Test includes:**
 - Visual alarm function
 - Audible alarm function
 - Time for activation to alarm 1
 - Time for activation to alarm 2
 - Time to t50
- **Calibration Test Includes:**
 - Fresh air zero adjustment
 - Span calibration adjustment
- **All test results:**
 - Stored to instrument memory
 - Stored to flash memory card in Docking Station



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What to do if instrument fails bump test

- **Red color warning screen and message indicates bump test failed**
- **This means instrument needs to be "Autocal" adjusted before further use**
- **Remove instrument from Dock, and press "Reset" (center) control button to clear alarm message**
- **Place instrument back in Dock**
- **Before end of count down press Autocal button**



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Questions?



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