# OPERATING GT5000 TERRA FTIR GAS ANALYZER QUICK GUIDE

Requires that the Hazmat Application Library located in the folder C:\Identification Tool _ SNxxxxx has been loaded into the Calcmet EASY or EXPERT software

Check the GT5000 & Calcmet manuals for full user instructions
or contact local representative or Gasmet

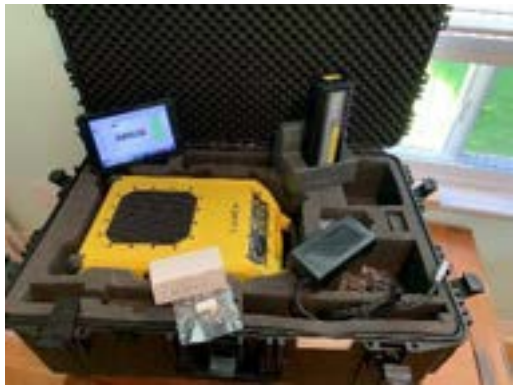
**Gasmet Technologies**

**Tel : 1-866-685-0050**

**sales@gasmet.com**

# GT5000 Terra Portable FTIR multi-gas Analyzer Components





GT5000 Terra

Gasmet Sample Probe with
1. Teflon Tubing (white) recommended for sampling
2. Tygon tubing (Clear) recommended for background measurement

Li-ion Battery

AC Power Pack

Gasmet Tablet

Gasmet USB Stick – All manuals, software and documentation And HASP Keys

# BATTERY HATCH & POWER CONNECTION

~ 3Hrs. Battery Life & 4 Hrs. Recharge time

Door Closed

AC Power inlet

Battery

# GT5000 Front Panel

Quick connections for gas lines

- Purge air in
- Sample out
- Sample in
- Zero gas in

USB Cable port

Power button & sets mode of communication with Tablet


Battery status indicator

1. **Remove rubber dust protection from GT5000 front panel**
2. **Apply Power**
3. **Attach Sample Connector (Tubing & Probe) to Sample In**
4. **Turn the Power Button to the desired communication mode**
5. **Open Calcmet on Tablet (or laptop)**

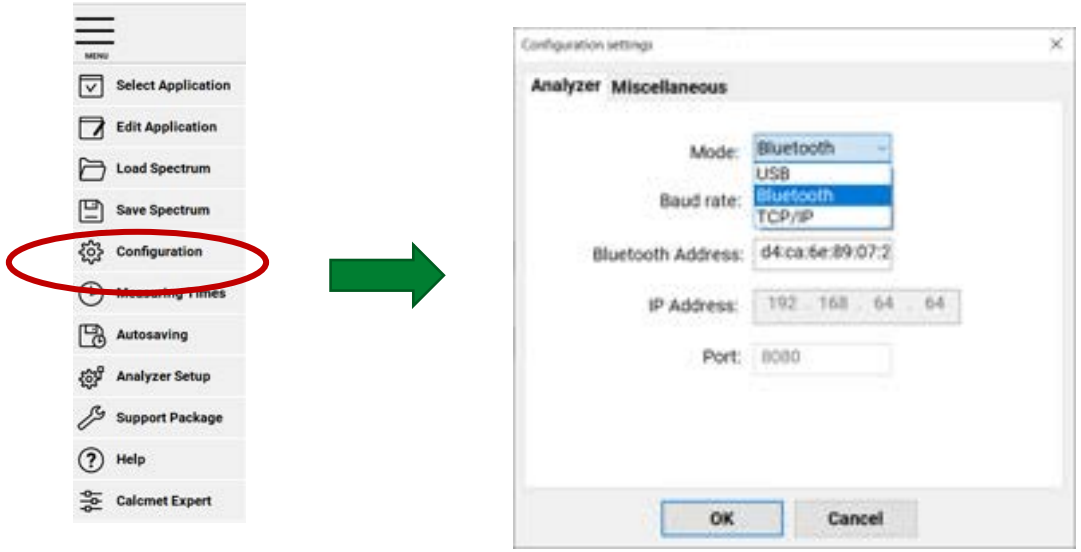
# GT5000 & Calcmet EASY Communication Settings


GT5000 Setting

1. Turn Control switch to communication mode
   - **Cable**
   - **Wifi**
   - **Bluetooth** **(default)**

2

Calcmet EASY Setting (no action required unless troubleshooting a communication issue)




**2. In Calcmet EASY**

Choose the GT5000 Mode of Operation

Default setting is Bluetooth

# Running Calcmet™ EASY on Gasmet Tablet

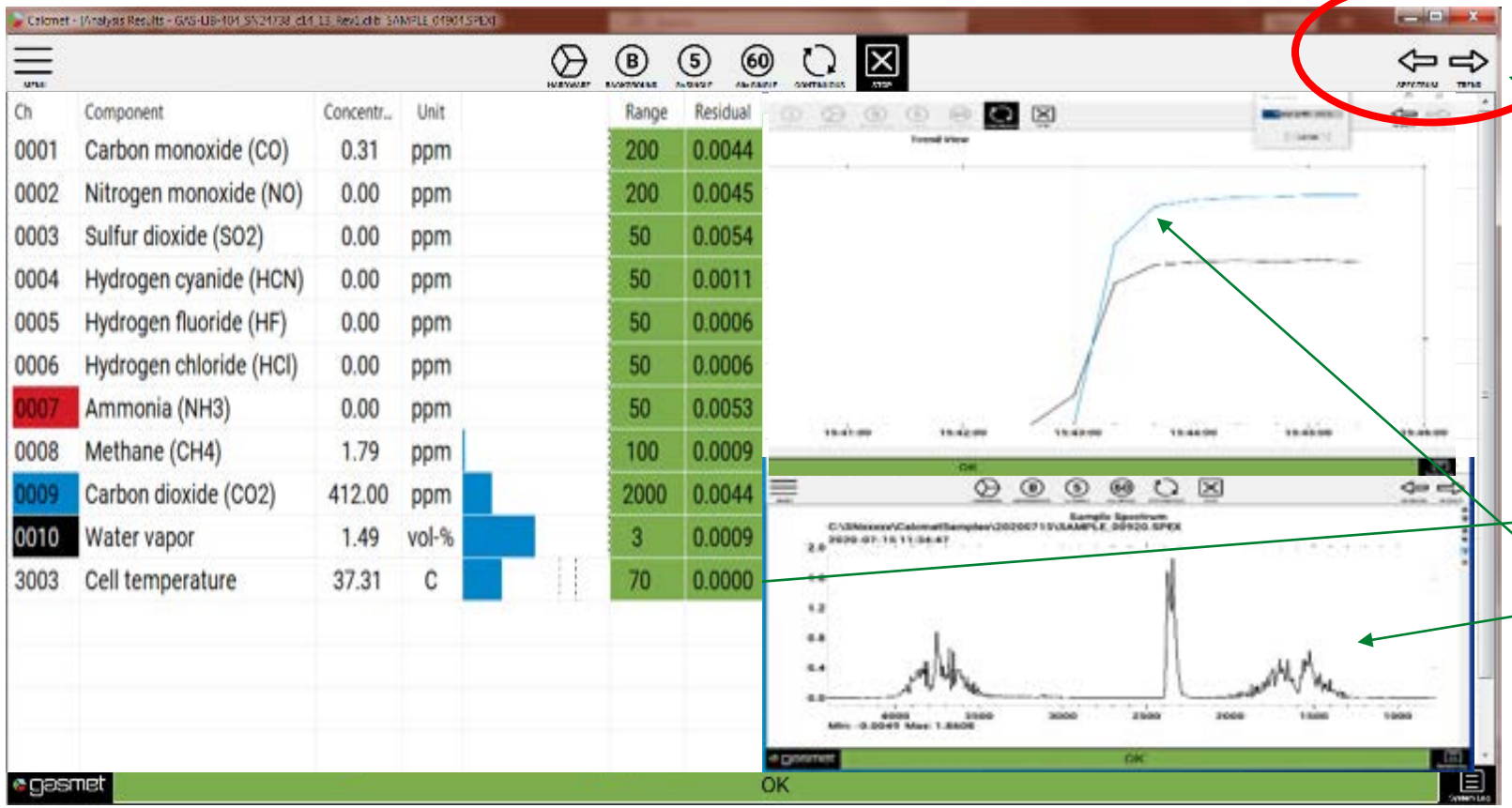

Calcmet - [Analysis Results - HAZMAT_Application.CUB: 1969-12-31 16:00:00]

MENU | IDENTIFY | HARDWARE | BACKGROUND | 5s SINGLE | 60s SINGLE | CONTINUOUS | STOP

| Ch | Component | Concentration | Unit | Range | Residual |
|---|---|---|---|---|---|
| 0001 | Carbon monoxide (CO) | 0.00 | ppm | 200 | 0.0000 |
| 0002 | Nitrogen monoxide (NO) | 0.00 | ppm | 200 | 0.0000 |
| 0003 | Sulfur dioxide (SO2) | 0.00 | ppm | 50 | 0.0000 |
| 0004 | Hydrogen cyanide (HCN) | 0.00 | ppm | 50 | 0.0000 |
| 0005 | Hydrogen fluoride (HF) | 0.00 | ppm | 50 | 0.0000 |
| 0006 | Hydrogen chloride (HCl) | 0.00 | ppm | 50 | 0.0000 |
| 0007 | Ammonia (NH3) | 0.00 | ppm | 50 | 0.0000 |
| 0008 | Methane (CH4) | 0.00 | ppm | 100 | 0.0000 |
| 0009 | Carbon dioxide (CO2) | 0.00 | ppm | 2000 | 0.0000 |
| 0010 | Water vapor | 0.00 | vol-% | 3 | 0.0000 |
| 3003 | Cell temperature | 0.00 | C | 70 | 0.0000 |

1. Turn on Tablet
2. Double Tap Calcmet Icon with Stylus or Finger
3. Wait 10-20 secs for Calcmet EASY screen
   (last application library used will automatically load _ Default is Hazmat_Application)

# Calcmet EASY Software




**Left & Right arrows move between screens**

| Views |
| --- |
| Results |
| Spectrum |
| Trend |
| Residual |
| Background |

**Five different screens available**
(each screen is separate not as shown above)

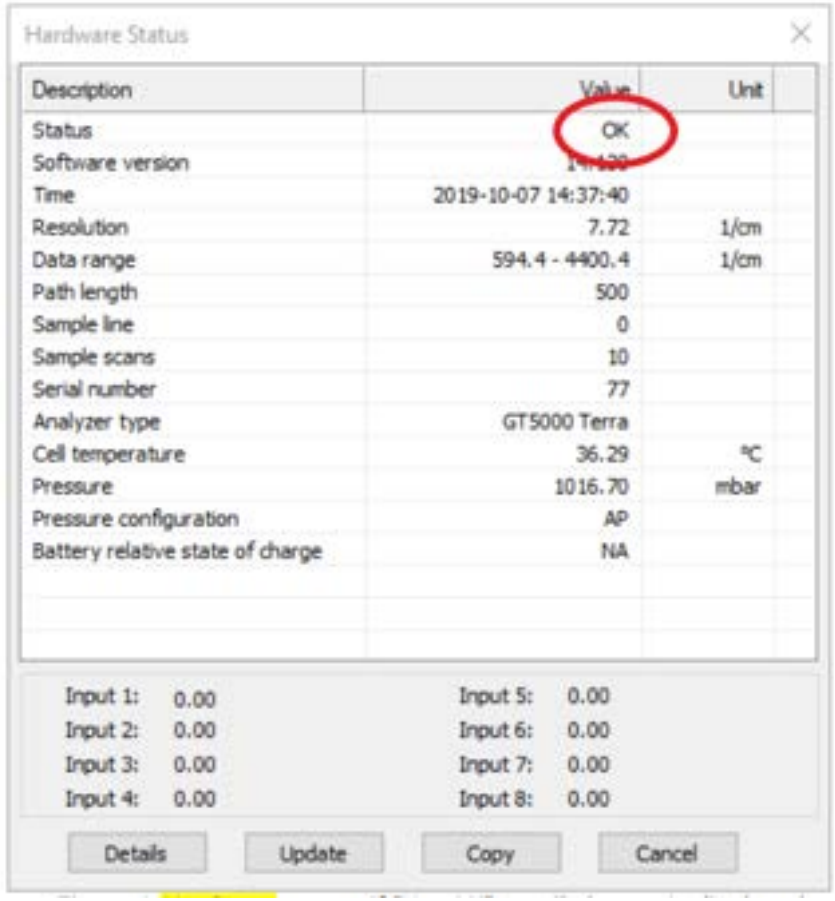
# Check Hardware Status

## Click Hardware

HARDWARE

Checks that the analyzer is ready to measure
'Hardware status is **OK**' is displayed
if analyzer is ready to measure.

If 'Hardware status is Not OK' is displayed
Click on Details. Contact Gasmet or representative if Status 'OK'
cannot be displayed after waiting further warm-up time.




If error occurs after clicking Hardware, check settings according to slide
"**GT5000 & Calcmet EASY Communication Settings** "

# Verify GT5000 is functioning correctly



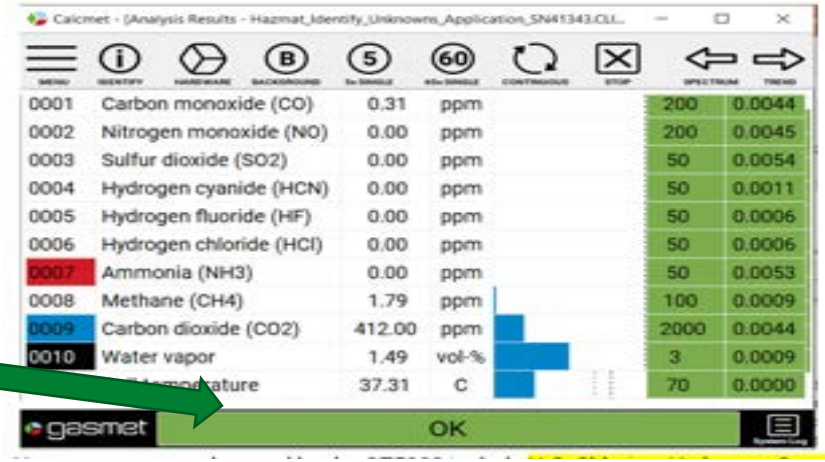
1. Connect the sampling line with probe to the **Sample IN** port on the analyzer front panel.

2. One single measurement where the **pump is not activated** can be taken by clicking 5 or 60

3. Start a continuous measurement where pump is automatically started by clicking CONTINUOUS

4. Continuous measurement starts, and results are updated to the screen at end of each cycle.

5. Check that OK is displayed

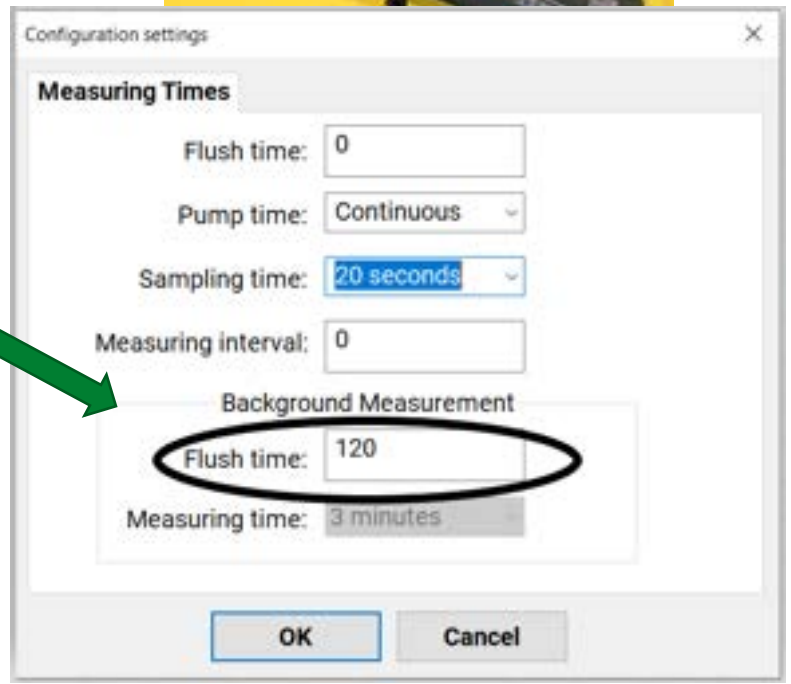


# Background measurement

1. Connect 5.0 purity nitrogen ($N_2$) gas to **Zero gas** inlet on the analyzer front panel. Depending on the regulator for the zero gas bottle following flush times are recommended.


2. Flush Time setting (Menu → Measuring Times)

When ($N_2$) gas flow is 1 - 3 l/min set Flush time = 120 (secs)




3. Click **Background** .


The GT5000 will automatically proceed to the perform background. Time clock will show Flush Time then count down the preset 3 mins background time. At completion of background a new screen as shown next page will be displayed.

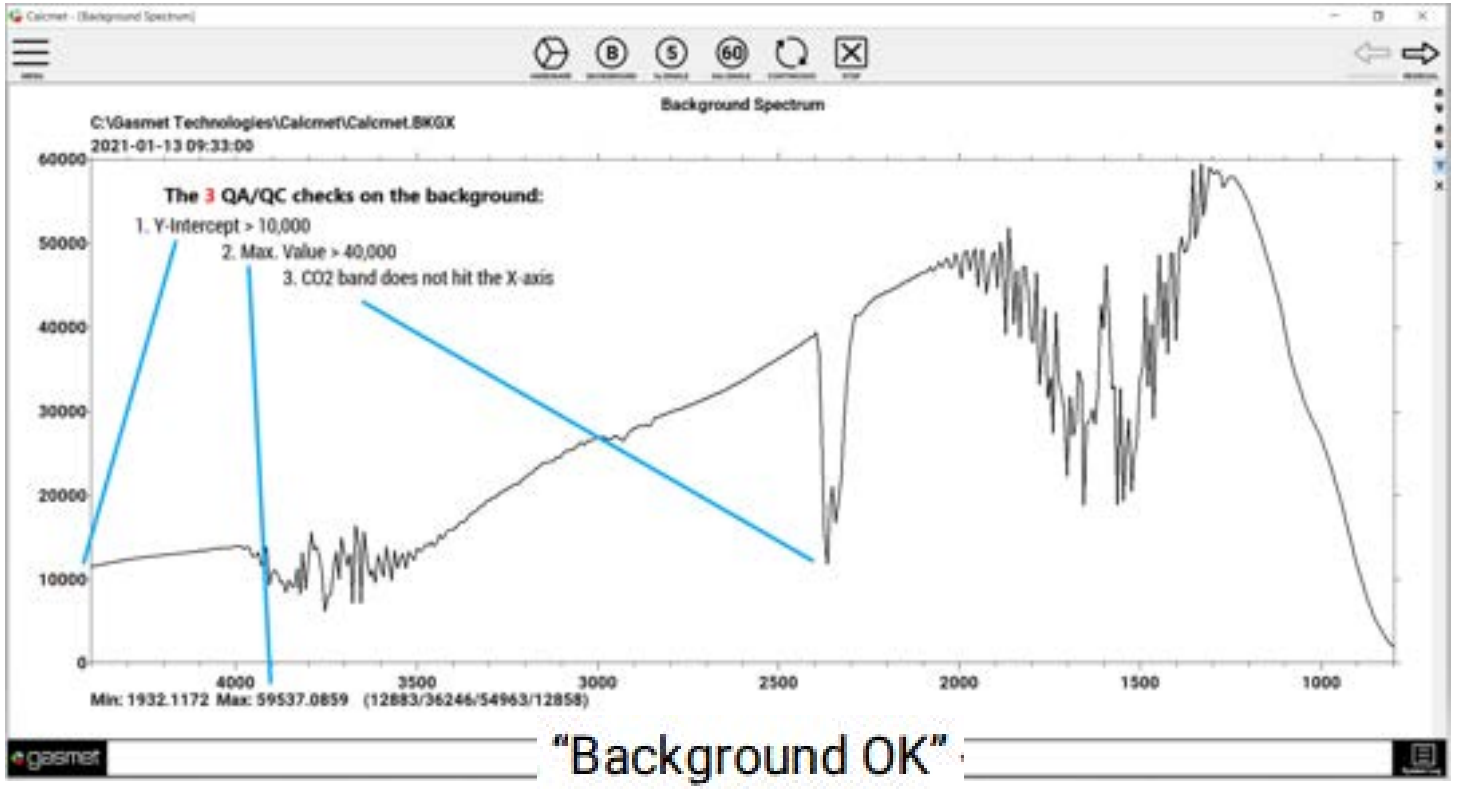
**Immediately Turn off Nitrogen zero gas.**

# CHECKING BACKGROUND

Check these two parameters :

1). **Max value _ Pass if reading > 40,000**
2). **Y-intercept _ Pass if reading > 10,000**

**Contact Gasmet or your representative if there is a Fail for either above parameters.**




3). **The CO2 band should not reach the x-axis. (refer line 3.above)**

**If this fails _ Repeat Background but first check following :**

a. **Is ($N_2$) gas turned on & contain pressure ?**
b. **Is ($N_2$) gas connected to GT5000 zero gas connector ?**

This message is displayed if background successful

# Taking Measurements



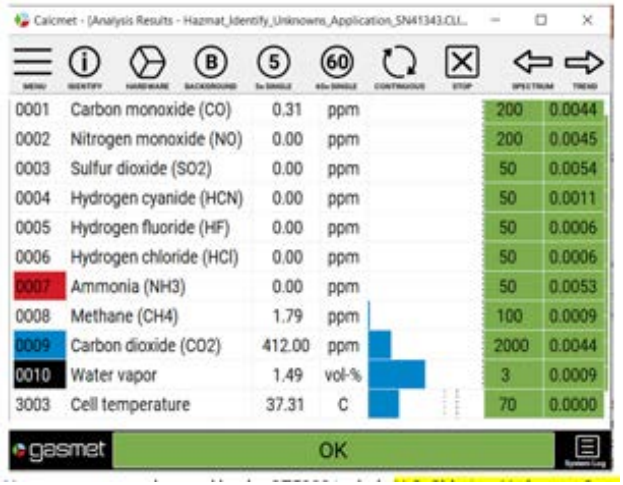
1. Connect the sampling line with probe to the **Sample IN** port on the analyzer front panel.

2. Start a continuous measurement started by clicking 

the GT5000 sample pump should start.

3. Continuous measurement starts, countdown clock appears counting from down from 20s .

4. At completion of 20s the gas readings or Analysis Results will be updated for all gases. Example :



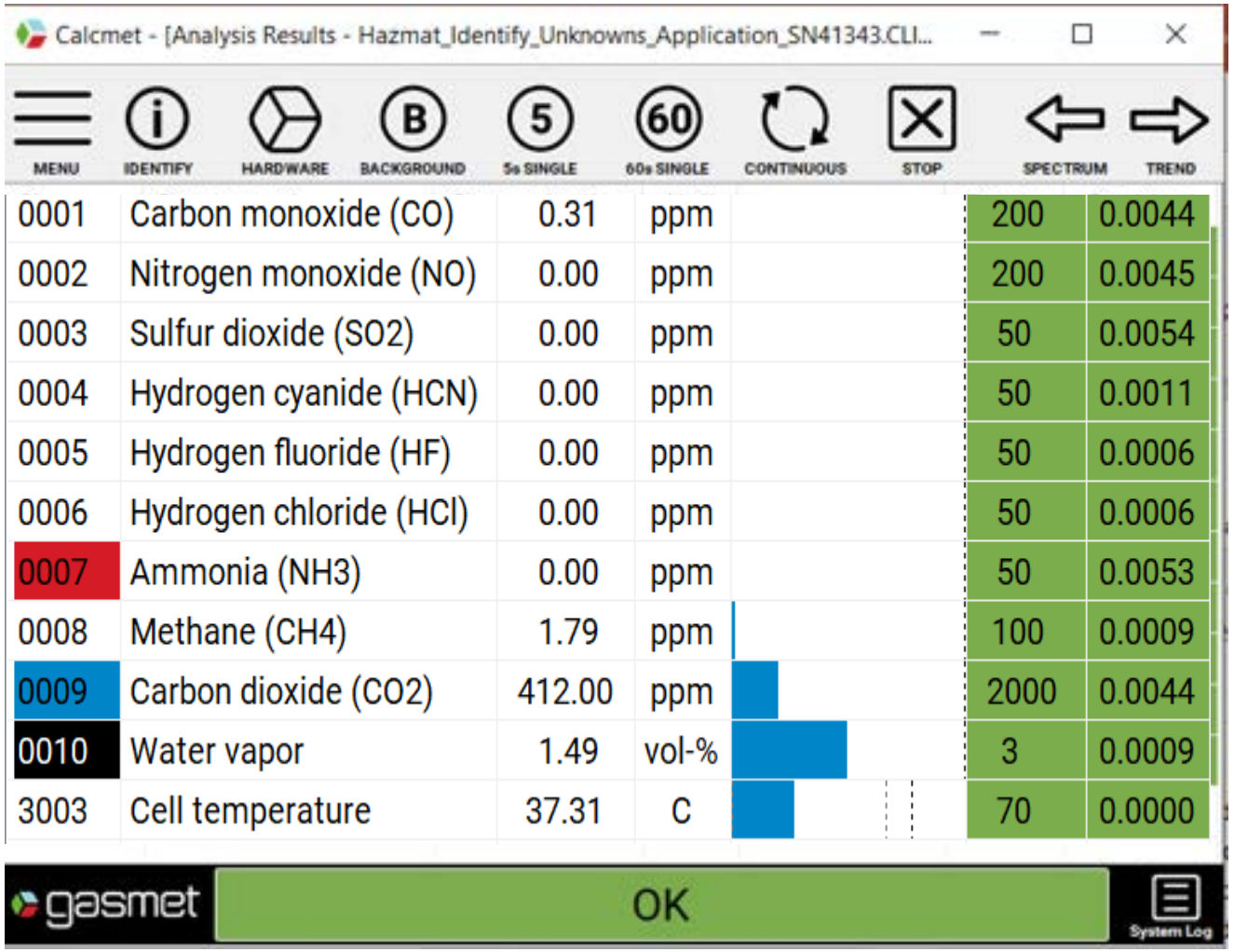

By clicking 

or 

One single measurement where the pump is not activated will be taken. Used in special sampling situations.

# Interpreting Analysis Results (1)






# ALL-CLEAR

Calcmet Software is reporting air sample is normal, no toxic gases have been detected .

What is normal for ambient air ?

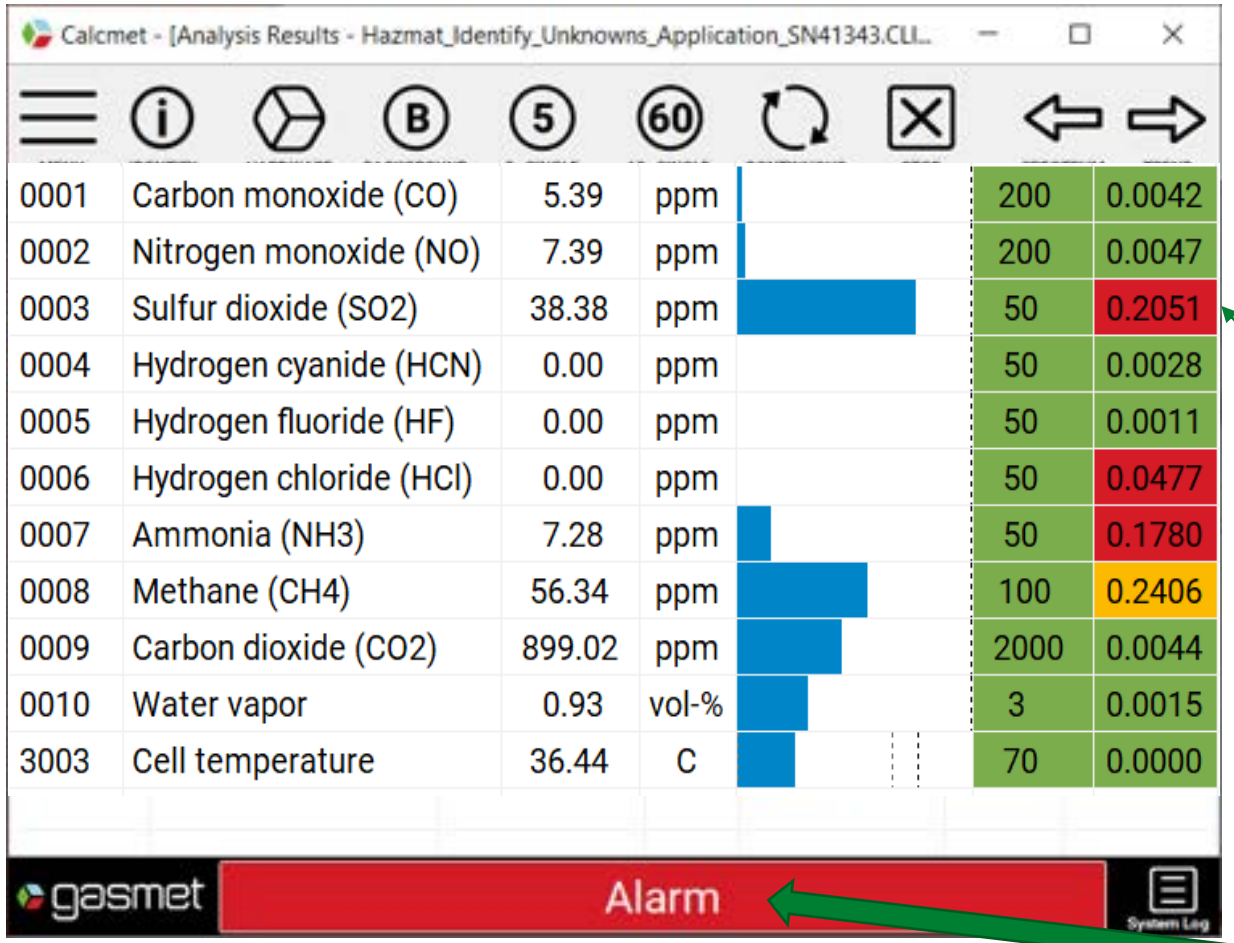
1. **Carbon Dioxide** : 400+ ppm (indoors can range 500 – 1000 ppm)
2. **Methane**: ~ 2 ppm

3. **Water Vapor** : 0.5 – 3 v/v% depending on ambient temperatures
4. Other gases should be ~0 ppm

Over 5,000 gases are detectible by the GT5000. Refer final page for gases not detected by the GT5000 gas analyzer

# Interpreting Analysis Results (2)






## Unknown Gas

Calcmet Easy Software is reporting air sample is not normal and one or more toxic gases *have been detected* .

Residual Column turns from **Green** to **Yellow** or **Red** for one or more gases
AND
**ALARM** Condition

# Identify the Unknown Gas (or Vapor)



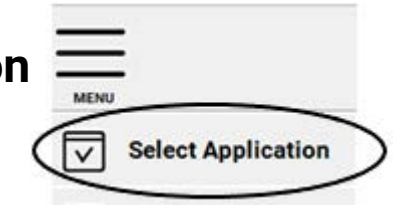

**IDENTIFY** function automatically searches Gasmet reference library ( > 400 gases) and reports gas or gases it identifies with gas concentrations.

The NIST/EPA library (with >5,000 gases) can also be searched if activated. [Refer Appendix 8]

# To Add Identified gases into the Hazmat Library Part 1.



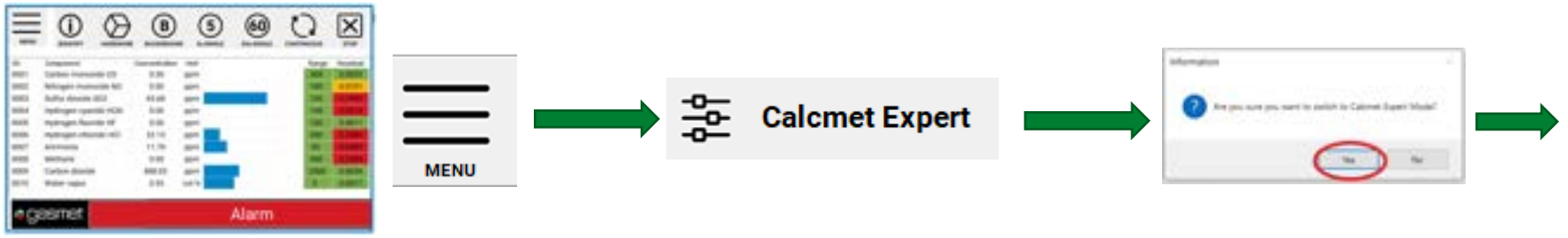
**1. Re-Load  Hazmat Application**



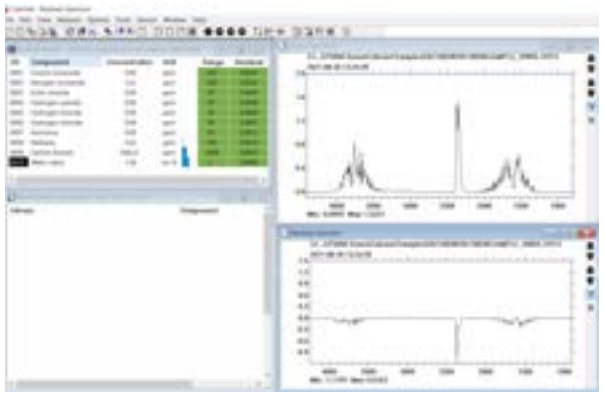

i. Browse → C:\Identification Tool_SNxxxxx
ii. Open Folder, locate Hazmat.CLIB
iii. Hazmat Application will load on Tablet. (10 gases)

(x=serial number of GT5000)

## 2. Move from Calcmet EASY  to EXPERT




Calcmet EASY Screen view



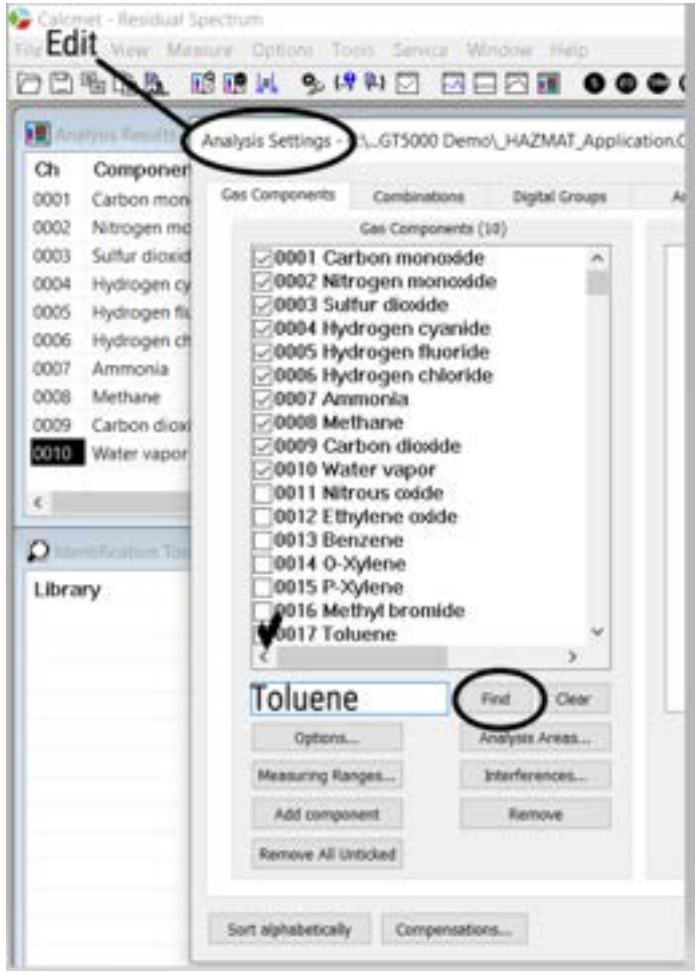
Calcmet EXPERT Screen view

Identified Gas(es) must be found in Gasmet Reference library to add it to HAZMAT application library. It is not possible to gases found in NIST Library to the Hazmat library

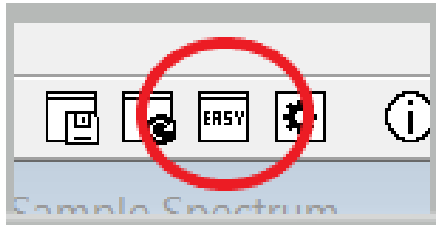
# To Add Identified gases into the Hazmat Library Part 2



Add identified gas to HAZMAT Application Library

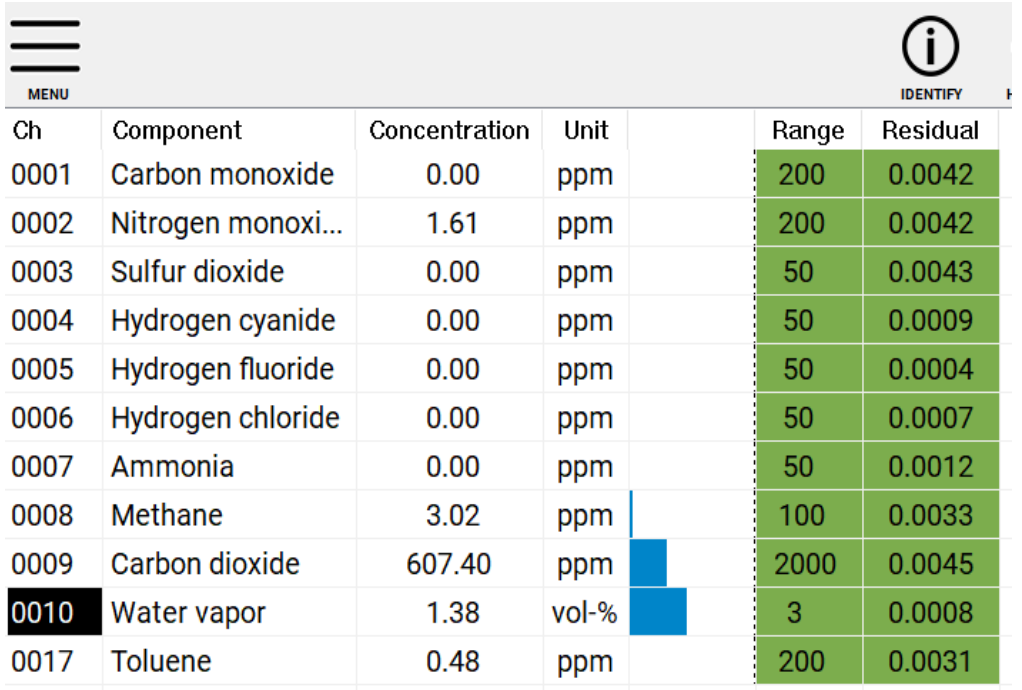



Calcmet EXPERT Screen view




Return to Calcmet EASY

Locate **EASY** on Icon tray




| Ch | Component | Concentration | Unit | Range | Residual |
|---|---|---|---|---|---|
| 0001 | Carbon monoxide | 0.00 | ppm | 200 | 0.0042 |
| 0002 | Nitrogen monoxi... | 1.61 | ppm | 200 | 0.0042 |
| 0003 | Sulfur dioxide | 0.00 | ppm | 50 | 0.0043 |
| 0004 | Hydrogen cyanide | 0.00 | ppm | 50 | 0.0009 |
| 0005 | Hydrogen fluoride | 0.00 | ppm | 50 | 0.0004 |
| 0006 | Hydrogen chloride | 0.00 | ppm | 50 | 0.0007 |
| 0007 | Ammonia | 0.00 | ppm | 50 | 0.0012 |
| 0008 | Methane | 3.02 | ppm | 100 | 0.0033 |
| 0009 | Carbon dioxide | 607.40 | ppm | 2000 | 0.0045 |
| 0010 | Water vapor | 1.38 | vol-% | 3 | 0.0008 |
| 0017 | Toluene | 0.48 | ppm | 200 | 0.0031 |

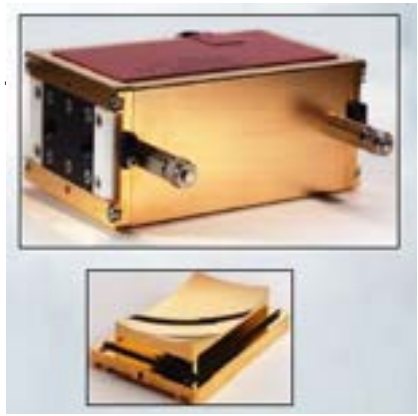
Calcmet EASY Screen view

HAZMAT Application now includes identified gas (Example – Toluene)

Refer Appendix 9 for creating new Application Libraries

# Shutting Down – GT5000

It is very important to flush the gas cell after the completion of the sampling event resident corrosive gases from adversely effecting the gas cell mirrors.



**Step 1**: Take GT5000 to a location with Clean Ambient Air.

**Step 2**: Measure continuously  this clean ambient air for at least 3 – 5 mins.

**Step 3**: Exit it from Calcmet Software


Calcmet Software will display following “friendly reminder message” (assuming Step2 is completed) , chose Ignore


**Step 4:**  Remove Sample Lines from GT5000 and return Rubber Dust Cover onto sampling ports

# Tips when Measuring (1)

- Typical warm up time is 15 – 30 mins. when cell temperature stabilizes
- Hardware status can be checked to see when cell temperature has stabilized

- The response time of the instrument is typically between 45 and 120 seconds depending on the gas  measurement time

- When you start measurement at  a new sample point, let the analyzer run for minimum of 1 – 3 minutes so that the gas sample is representative

- The internal volume of the sample cell is ~ 500 ml
- The internal pump operates at ~ 2 lpm

# Tips when Measuring (2)

- **NEVER let water droplet and other liquids enter the sampling cell.**
- Always have the sample probe attached
- The handheld probe includes a PTFE filter, periodically checked and replace if necessary.
- If the sample gas is warmer than the sample cell, ensure that moisture in the sample does not condense inside the analyzer when the gas cools down.
- Allow the analyzer to warm to ambient temperature when moving from cool to warm.
- Use Hardware status to view  cell temperature to verify the GT5000 is ready to use..

# Troubleshooting Communication Issues

**Tablet displays Error Code 121 Cannot Open Com Port**

1. Check GT5000 Control Switch set to Bluetooth (refer page 5 of this guide)

2. Press Hardware Status – If Status Table displayed, communication is successful Recommend trying this step several times to check if loss of communication is temporary

3. Exit Calcmet software on Tablet and Restart Calcmet Software. (Calcmet automatically pairs with the GT5000 at start-up. After Calcmet re-starts try step # 2 above.)

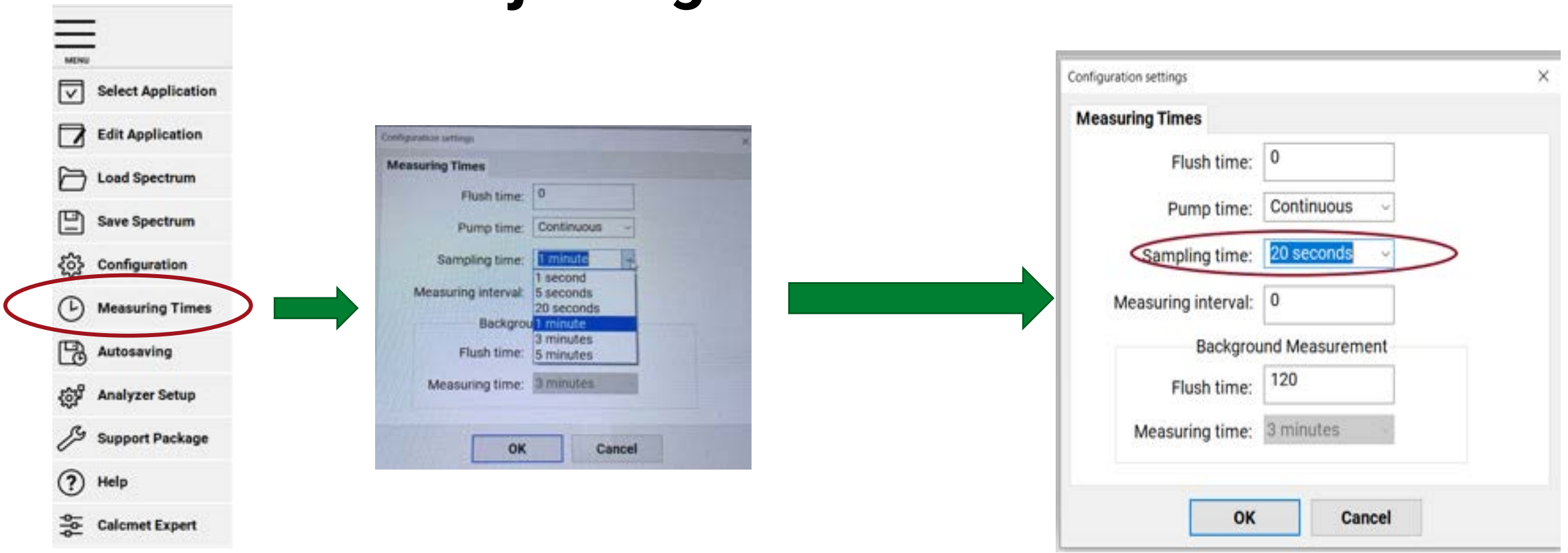
4. Reload the Application Library on Tablet


i.Browse → C:\Identification Tool_SNxxxxx
ii. Open Folder, locate Hazmat.CLIB
iii. Application will load on Tablet.

(x=serial number of GT5000)

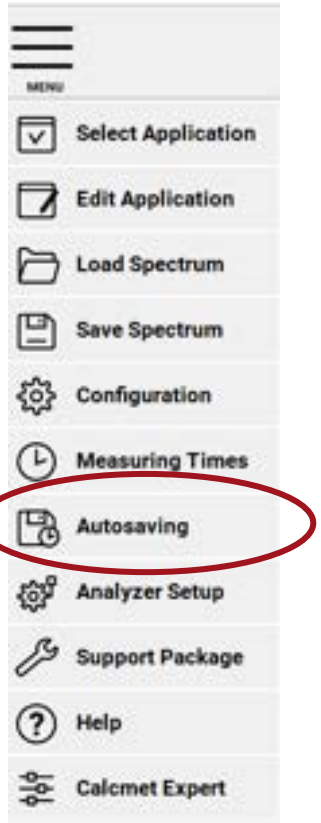
(After reloading Application Library re-try step # 2 above)

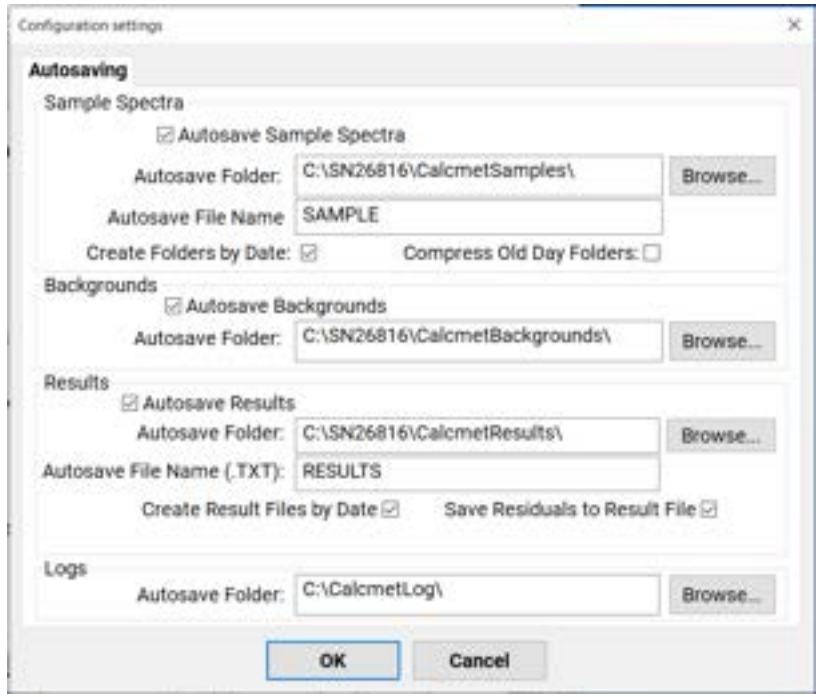
# Adjusting Measurement Time




There maybe occasions when the measuring (Called sampling time in software) should be changed from the default of 20 seconds. The 3 common measurement time settings are 5s, 20s & 60s.
60s is recommended when seeking lowest detection levels and leaving the GT5000 stationary for longer term monitoring. 5s is recommended if the GT5000 is being used for leak detection.

# Saving Data – Calcmet Easy Settings




Check that Saving is activated per check marks in the box as shown

Note saving location for the files that are stored
These include :
1.Text File
2. Spectra File
3. Background File
4. Log File

C:\SN26816 will change according to the serial number of your GT5000

# Saved Data (1) – Results File

**All measured samples will be stored as a text file.**

**Location of saved files is C:\SNxxxxx\CalcmetResults\Date (Date = when measurements taken)**

**Text file can be imported into EXCEL® using import wizard.**

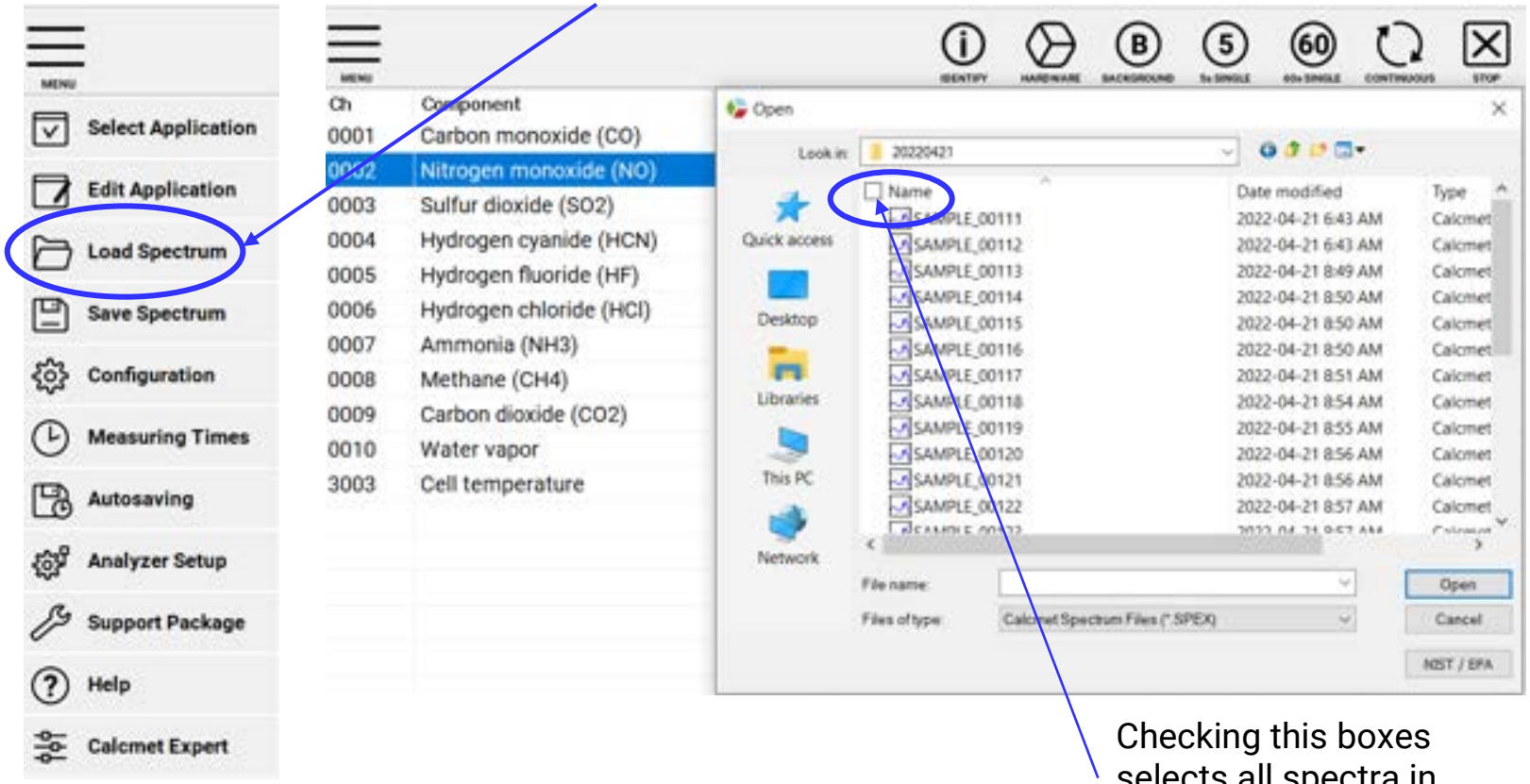
| Date | Time | SpectrumFile | LibraryFile | Water | Unit | Residua | Carbon | Ur | Residu | Met | Ur | Resi | Nitr | Un | Resic | Carbon | Uni |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020-05-01 | 9:27:39 PM | C:\SN26816\Calcme | GAS-LIB-402_SN26816_c | 0.44 | vol-% | 0.0004 | 834.57 | ppm | 0.0013 | 1.58 | ppm | 0.0014 | 0.23 | ppm | 0.0013 | 1.89 | ppm |
| 2020-05-01 | 9:28:58 PM | C:\SN26816\Calcme | GAS-LIB-402_SN26816_c | 0.8 | vol-% | 0.0005 | 760.07 | ppm | 0.0012 | 1.66 | ppm | 0.0015 | 0.18 | ppm | 0.0009 | 1.8 | ppm |
| 2020-05-01 | 9:29:20 PM | C:\SN26816\Calcme | GAS-LIB-402_SN26816_c | 1.06 | vol-% | 0.0005 | 705.12 | ppm | 0.0013 | 1.26 | ppm | 0.0017 | 0.25 | ppm | 0.001 | 1.61 | ppm |
| 2020-05-01 | 9:29:41 PM | C:\SN26816\Calcme | GAS-LIB-402_SN26816_c | 1.09 | vol-% | 0.0006 | 704.13 | ppm | 0.0013 | 1.28 | ppm | 0.0018 | 0.25 | ppm | 0.0011 | 1.48 | ppm |
| 2020-05-01 | 9:30:03 PM | C:\SN26816\Calcme | GAS-LIB-402_SN26816_c | 1.1 | vol-% | 0.0005 | 709.55 | ppm | 0.0013 | 1.49 | ppm | 0.0017 | 0.26 | ppm | 0.0011 | 1.51 | ppm |
| 2020-05-01 | 9:30:25 PM | C:\SN26816\Calcme | GAS-LIB-402_SN26816_c | 1.1 | vol-% | 0.0006 | 712.02 | ppm | 0.0013 | 1.49 | ppm | 0.0018 | 0.26 | ppm | 0.0011 | 1.51 | ppm |
| 2020-05-01 | 9:31:16 PM | C:\SN26816\Calcme | GAS-LIB-402_SN26816_c | 1.1 | vol-% | 0.0005 | 711.24 | ppm | 0.0012 | 1.31 | ppm | 0.0017 | 0.26 | ppm | 0.0011 | 1.54 | ppm |
| 2020-05-01 | 9:31:37 PM | C:\SN26816\Calcme | GAS-LIB-402_SN26816_c | 1.1 | vol-% | 0.0006 | 701.64 | ppm | 0.0013 | 1.46 | ppm | 0.0018 | 0.26 | ppm | 0.0011 | 1.5 | ppm |
| 2020-05-01 | 9:31:59 PM | C:\SN26816\Calcme | GAS-LIB-402_SN26816_c | 1.1 | vol-% | 0.0006 | 696.42 | ppm | 0.0011 | 1.45 | ppm | 0.0017 | 0.26 | ppm | 0.0011 | 1.54 | ppm |
| 2020-05-01 | 9:32:21 PM | C:\SN26816\Calcme | GAS-LIB-402_SN26816_c | 1.1 | vol-% | 0.0007 | 700.85 | ppm | 0.0013 | 1.49 | ppm | 0.0018 | 0.25 | ppm | 0.0011 | 1.48 | ppm |
| 2020-05-01 | 9:32:42 PM | C:\SN26816\Calcme | GAS-LIB-402_SN26816_c | 1.1 | vol-% | 0.0006 | 705.73 | ppm | 0.0012 | 1.29 | ppm | 0.0018 | 0.26 | ppm | 0.0011 | 1.56 | ppm |

C:\SNxxxxx will change according to the serial number of your GT5000

# Saved Data (2) – Calcmet Sample Spectra



**It may be necessary to re-analyze measured test samples**
**Location of saved sample spectra files is C:\SNxxxxx\CalcmetSamples\Date (Sub-Folder when measurements taken)**
**These files can be Opened in Calcmet Software Advanced Mode**




Checking this boxes selects all spectra in the folder.

Re-analyzing the spectra can be used to further verify the results or using the **IDENTIFY** function on another test sample.

Calcmet will automatically re-analyze all the spectra selected and show the Trend View for all samples. Note : the last sample is shown when processing finishes.
Click on the trend view for Calcmet to load a specific sample spectra.

# Using the Trend Graph

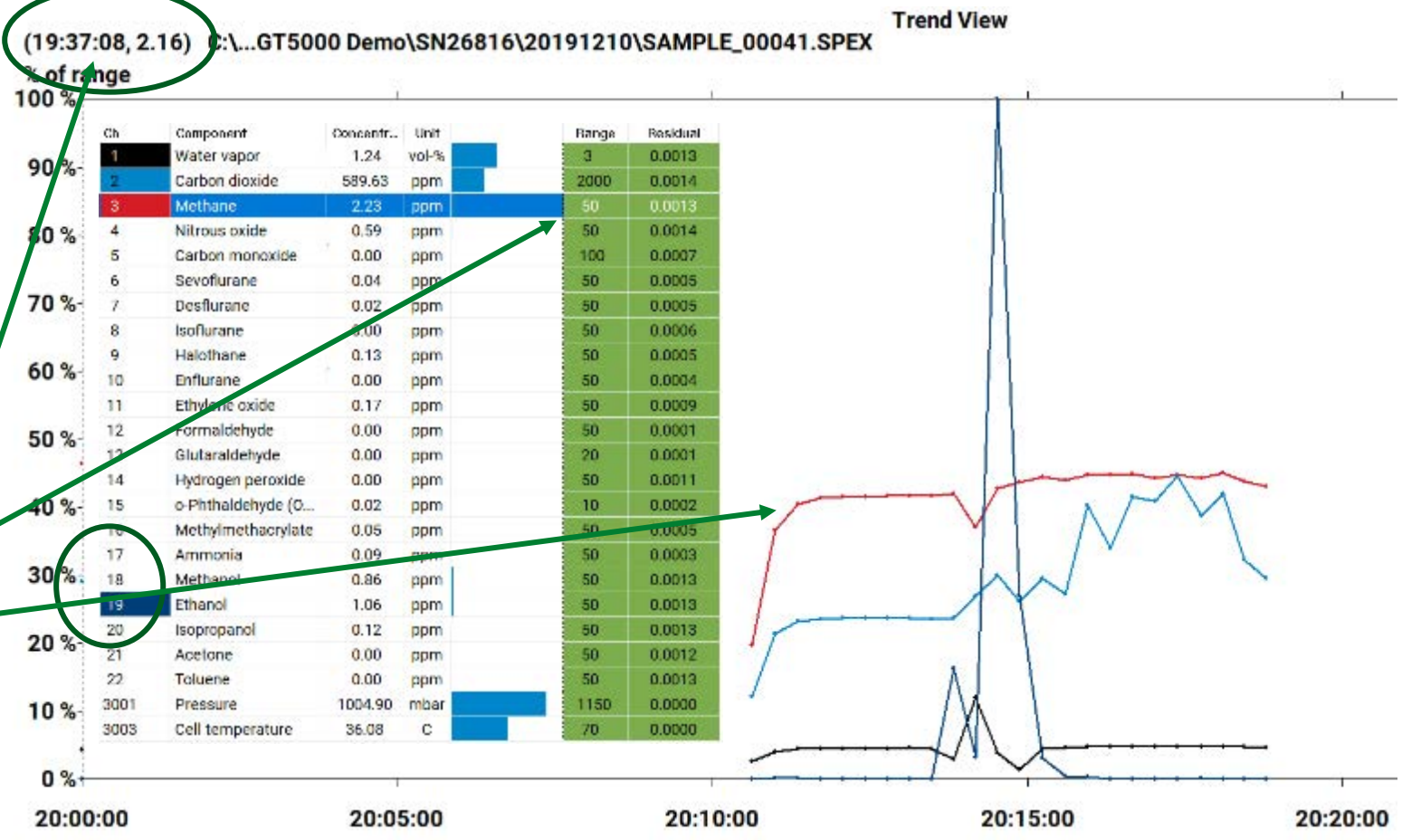


- Up to 15 Components can be plotted on the Trend Graph
- Click on **Ch** column and a color will appear for this gas on the Trend Graph
- The 100% Y-axis = gas measurement range.

Example :

- Red gas = Methane
- 100% = 50 ppm

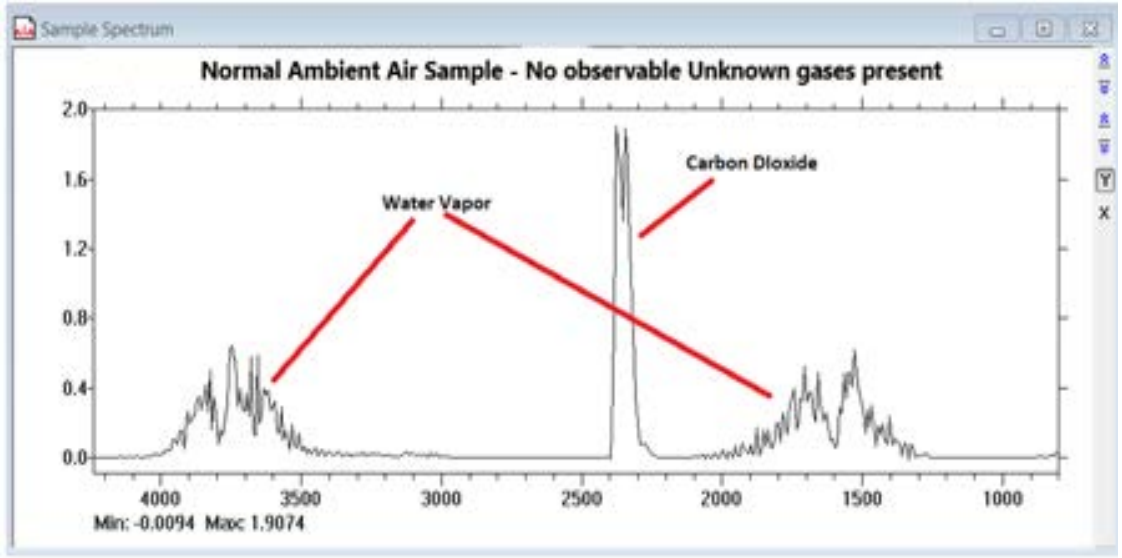
- Black component (always 1st gas clicked) shows time & gas concentration.



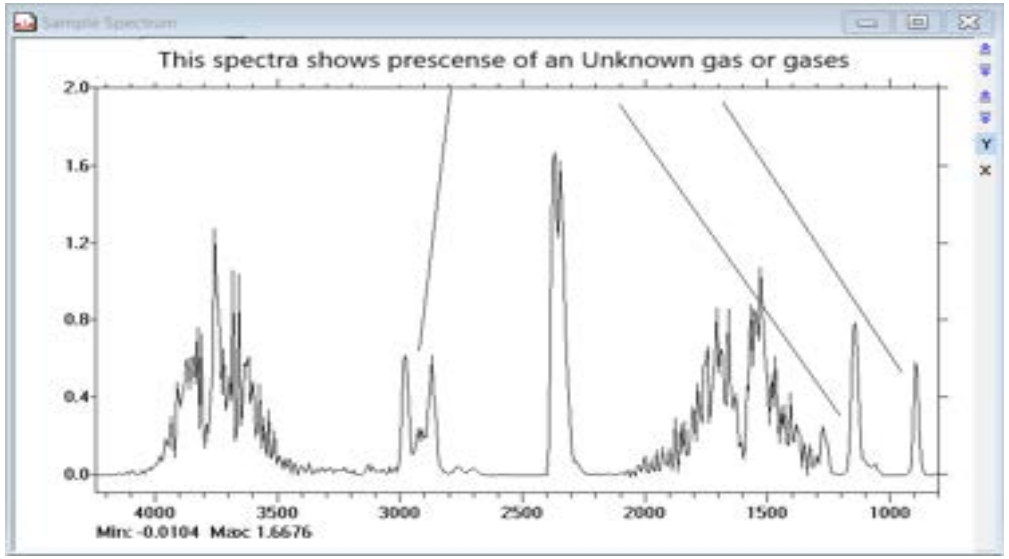
# Tips if Calcmet does not IDENTIFY any gases - 1



## A. Visual inspection of Spectra




Identify function will not find any Unknown gases and it is to be interpreted as a Clean Sample
(refer limitations statement on last page)




Visual inspection of spectra shows peaks not normal in clean ambient air indicating there is one or more Unknown gases present.
Run IDENTIFY function - If no gases found refer next page.

# Tips if Calcmet does not IDENTIFY any gases - 2



### B. Calcmet Identification Tool Settings

All Identification settings must be accessed in Calcmet EXPERT software (refer slide#16 to move from Calcmet EASY → EXPERT)

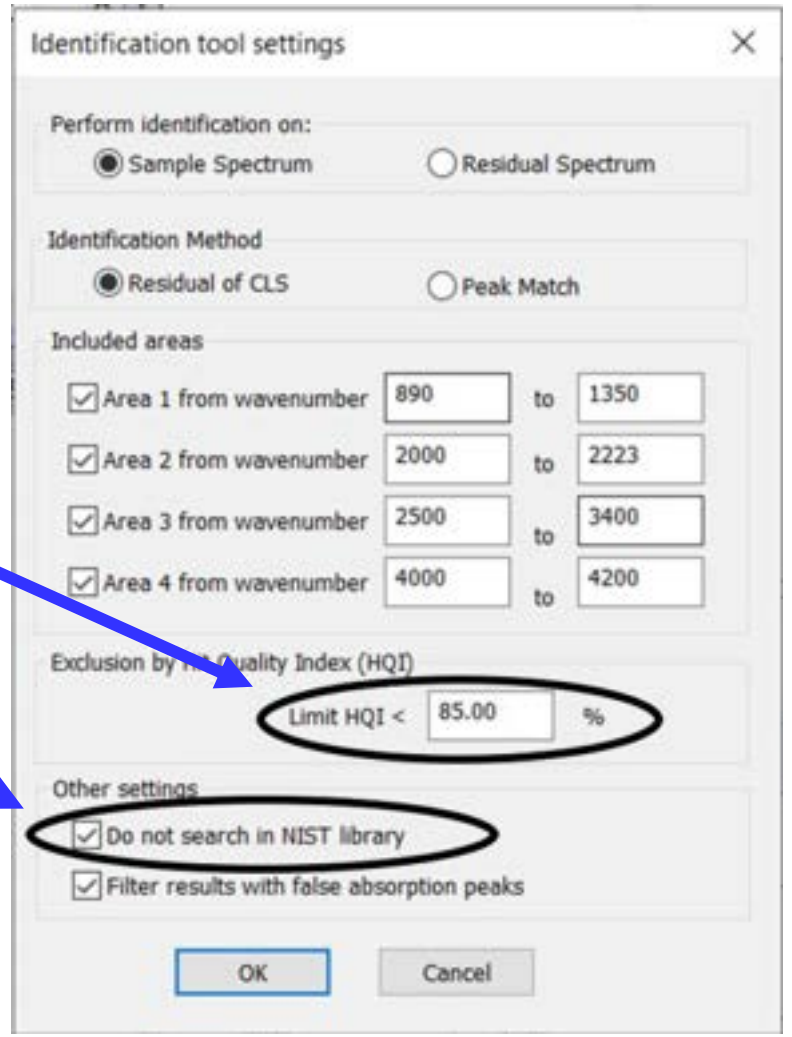
Suggestions if no gases identified :

1. Change "Limit HQI <" value to 60.00 and re-run the IDENTIFY function.

2. Uncheck "do not search in NIST Library" and re-run the IDENTIFY function.

3. Measure another sample or Open previously taken sample and re-run the IDENTIFY function.

If no success with identifying the Unknown it is possible that this component(s) is not in the reference library.
Suggest contact Gasmet or local representative.



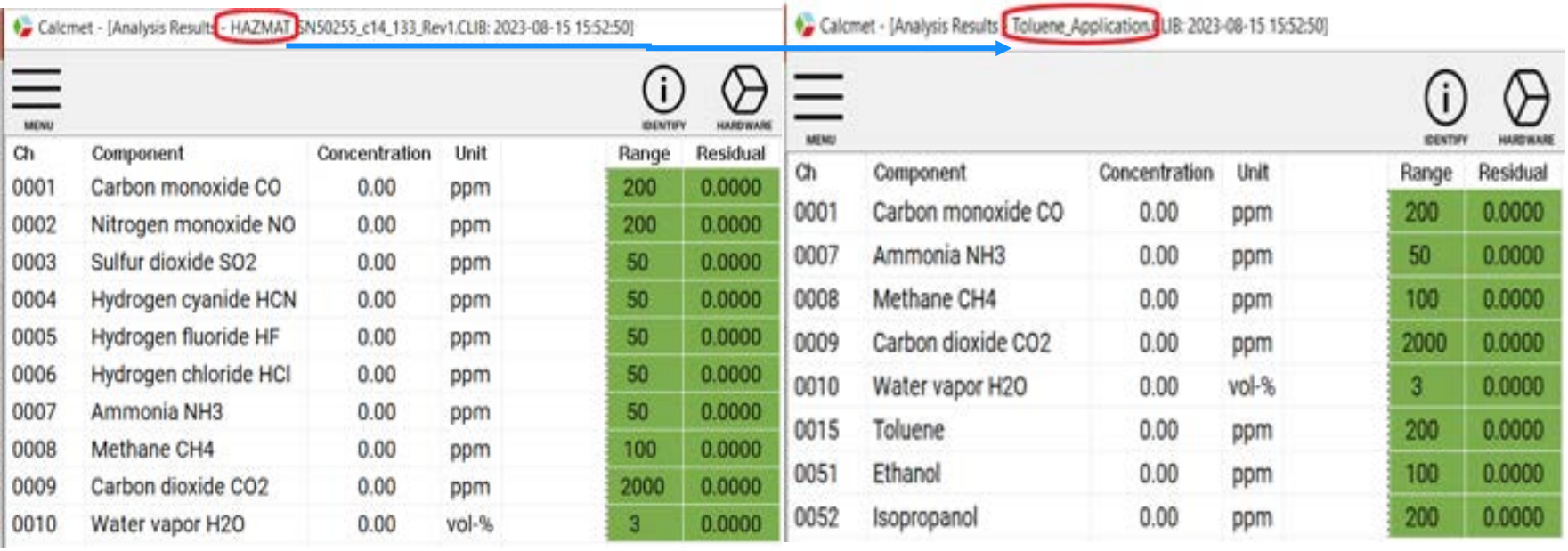
# Creating new Application Libraries

Gasmet recommends that the Hazmat Application Library be kept with the 10 original gases only.

To create new application libraries, (must be in Calcmet EXPERT Mode) – Referencing Slide #17, Use the follow steps to add and remove gases in the new application library :

1. Water Vapor, Carbon Dioxide, Methane and Carbon Monoxide must always be in the application.
2. Add the target gas or gases and any known other gases that maybe present in the sample such as solvents.
3. Remove any other gases from the application library that are not required.
4. Save New application : In Calcmet Expert : Options → Application → Create New Toluene_Application

Using the example of Toluene gas from slide #17 AND adding Ethanol & Isopropanol as known solvents used in the sampling area AND removing Gases NO, SO2, NCN, HCl & HF as not deemed present in the sampling area .
Note _ When choosing an Application Name - Spaces are not allowed, use an underscore for multiple word application library names




5. Press OK to create the new application library.

After 10 – 15 seconds the name of the application library will change from the original name “Hazmat” to new name “Toluene_Application”

(This is now a new permanent application library located in C:\Identification Tool_SNxxxxx Folder)

# About this document

The objective of this guide is to provide GT5000 Terra users a quick reference guide to get them familiar with the basic operation. It must be empathized that this guide does not replace the Model GT5000 Terra Operations manual or the Calcmet™ software manual that was supplied with the gas analyzer.

The steps outlined in this guide focuses on the Hazmat or Identification of Unknown(s) application where First Responders or Safety personnel encounter a mystery smell, odor, unlabelled container or chemical spill and need to identify the “Unknown” component.

When using the GT5000 Terra to accurately quantify identified gases, it is strongly encouraged that additional quality control steps be initiated to verify further support the gas analysis readings. These steps can be reviewed in the manual(s) or further discussion with your local Gasmet office or local representative.

To continued improvement and support of the Gasmet portable FTIR gas analyzer users we invite your feedback on this document and/or other Gasmet related matters.

**The FTIR gas measurement technology measures an extensive number of gases and vapors. However the following gases are not measured by the GT5000 - Nitrogen, Oxygen, Chlorine, Bromine, Fluorine, Neon, Helium, Argon, Krypton, Xenon, Radon, Mercury and $H_2S$ (Hydrogen Sulfide)**