TOTALFLOW
Technical Bulletin130

Peak find and calibration of a BTU 8000

Totalflow Technical Bulletin

Version 1.0, Revision AA (20 June 2005)

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1. Purpose

This document describes the "Peak Find" and Calibration process for a BTU 8000.

Description

Time and contaminants can eventually cause the peaks on your GC module to drift. The rate of deterioration can vary from site to site and unit-to-unit dependent upon many factors: the gases you are running through the unit; the protection you provide against liquids; the amount of external filtering you provide. If your BTU8000 has drifted there are three basic steps to getting it recalibrated.

1- Run the startup self-diagnostics

2- Perform manual peak find

3- Calibrate the unit

Running Self-Diagnostics

Shut the BTU8000 off for 30-40 seconds. When you power back up, connect with BTUMMI and go to the Startup Log. A series of self-diagnostics will be running. Initially the heater will come up and heat the GCM (GC Module) to its default set point of 140° F. Other modules, the PRM (Pressure Regulator Module), the SSM (Stream Select Module) and the GCM (Gas Chromatograph Module) will be tested following the initial GCM warm up. ***All modules should pass all tests.*** The only failures that can be ignored are "high pressure" failures of unconnected streams. If a module should fail, run self-diagnostics a few more times to determine that failures are repeatable. Repeatable failures should be reported to our Customer Service Phone Support (1-800-442-3097 press "1", then "2").

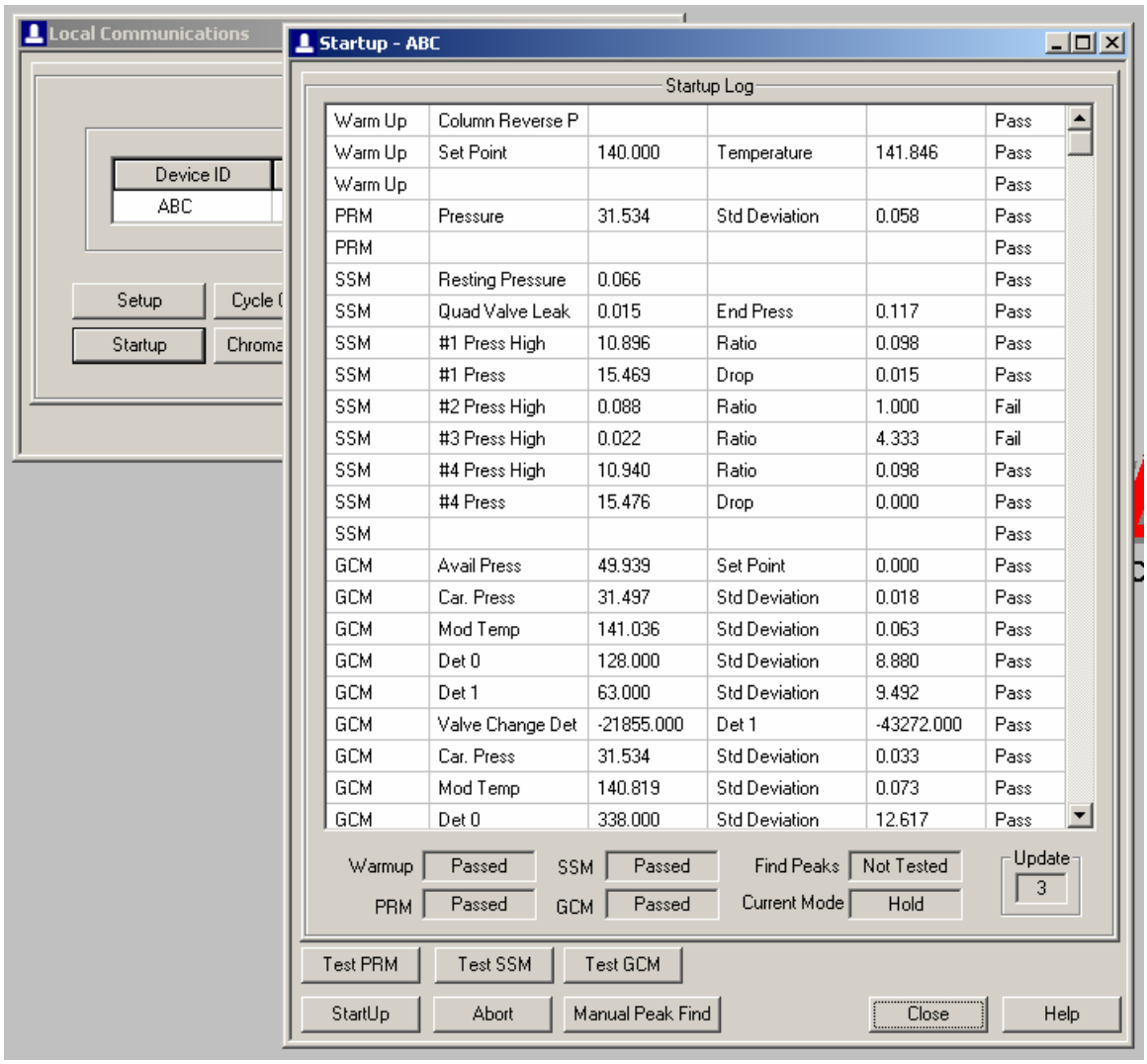
Below is a list of things that could cause self-diagnostics to fail:

- Make sure that a jumper is placed between pins 3 & 4 of the RS232 connector in the power condulet box (the round one). If a modem or other equipment is connected to the RS232 port (in lieu of the jumper) make sure it is turned on.

- Make sure that your carrier gas is set properly (75 PSI for non-manifold units, 90 PSI for manifold units). Also check that any connected streams are set to 15 PSI (± 1 PSI).

- Battery voltage should be between 14-15VDC if adequate AC power is available. Solar powered units will probably be about 13.85VDC. Check that sufficient wire gauge is used. Keep wiring as short as possible and use 12AWG. If more than 50 feet away you should use 10AWG.

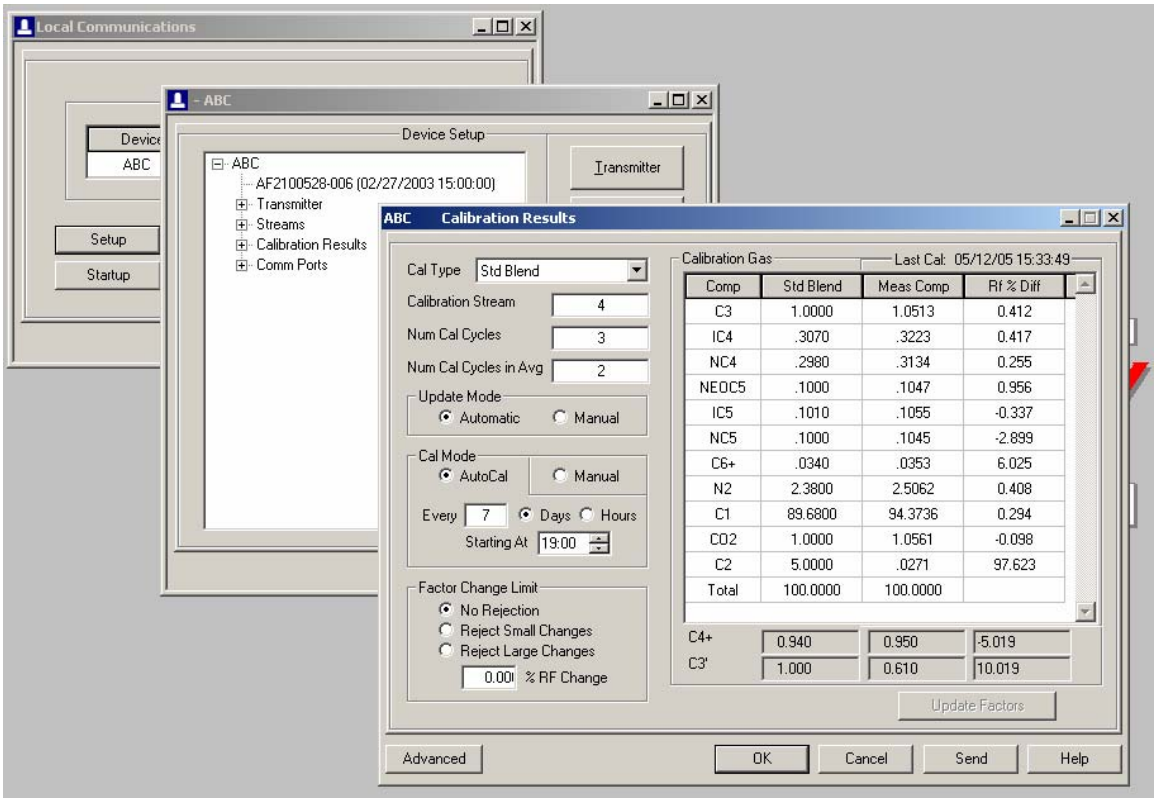
- Perform a good visual inspection on the unit. Loose connectors, un-removed vent caps, broken wires, obvious physical damage can all cause problems.



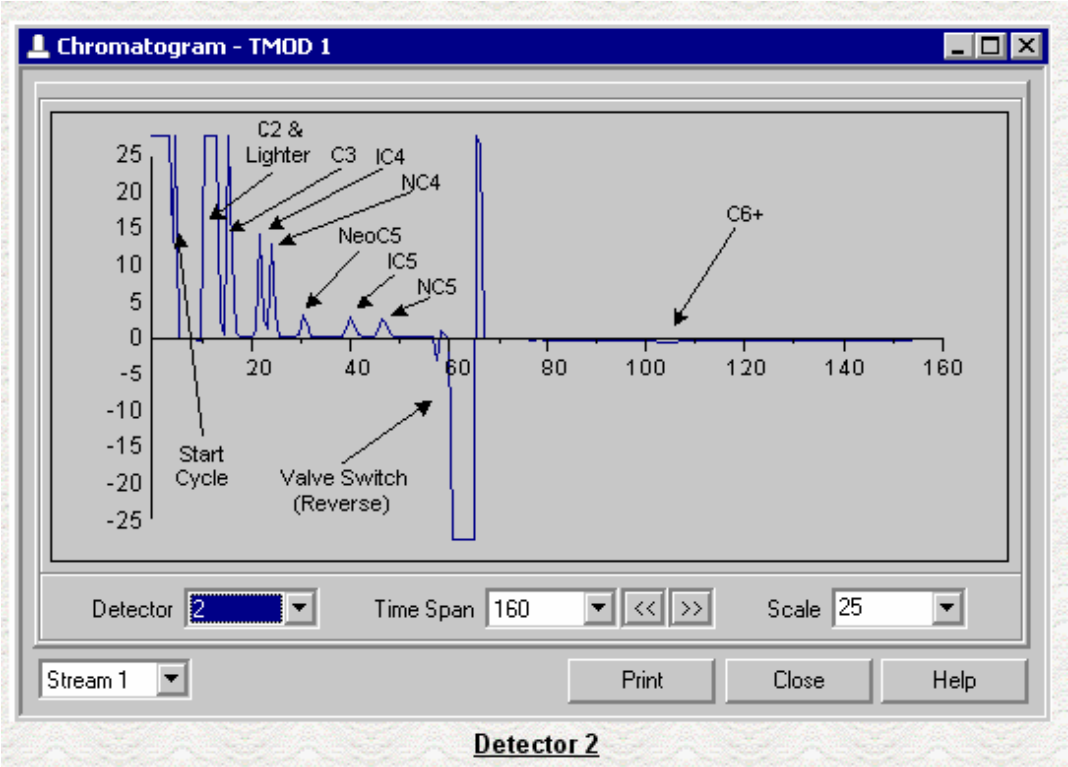
When your self-diagnostics have completed, all modules should have passed. Here you can see that all modules have passed and that streams 2 and 3 were not connected.

Manual Peak Find

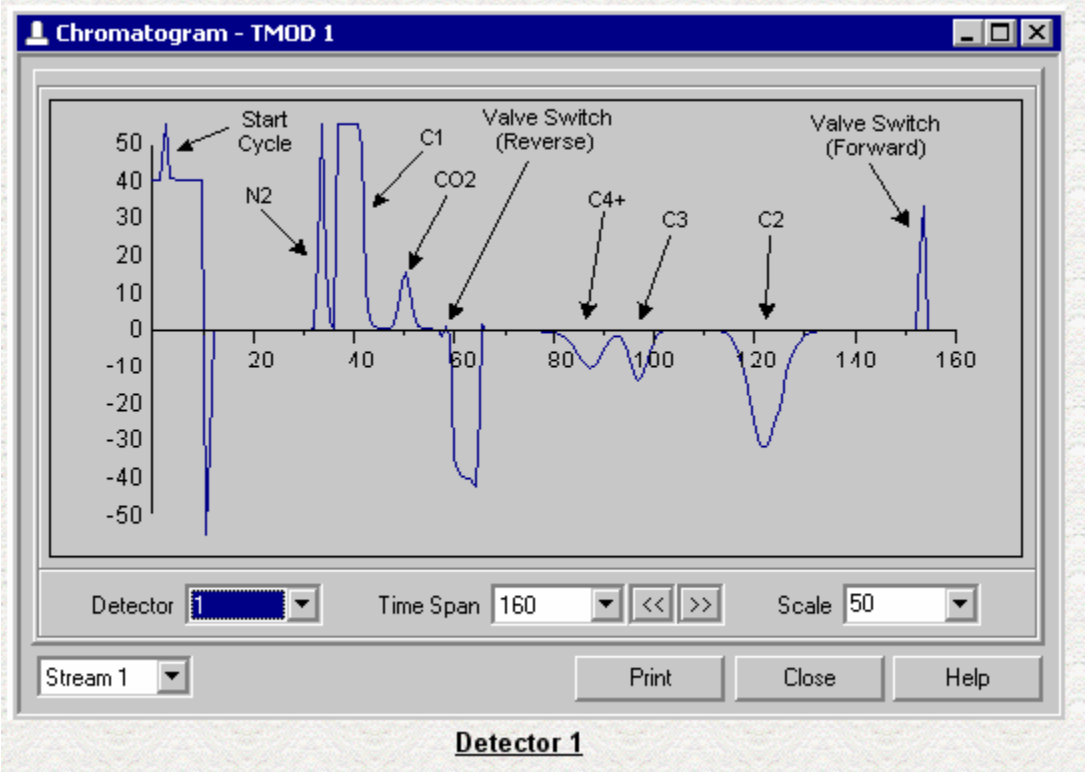
Before we get too carried away with doing a “Manual Peak Find”, let’s look at our standard blend setup and a couple of Chromatograms from the BTUMMI online help files. These chromatograms reflect our standard blend. Custom blends will produce different chromatograms.



Take particular notice of the mole percentage of the three pentanes (~ .1000%) and the two butanes (~ .3000%). These components can be easily identified on the Detector #2 chromatogram. Notice the three similar “bumps” for the three pentanes, also the two “rabbit ears” formed by the two butanes. The “rabbit ears” are about three times taller than the “bumps”. This is to be expected when you look at our standard blend.



Looking at the two chromatograms you will find that detector #2 has eight (8) peaks (C2 and lighter, C3, IC4, NC4, neoC5, IC5, NC5 and lastly C6+), while detector #1 has six (6) peaks (N2, C1, CO2, C4+, C3 and finally C2).

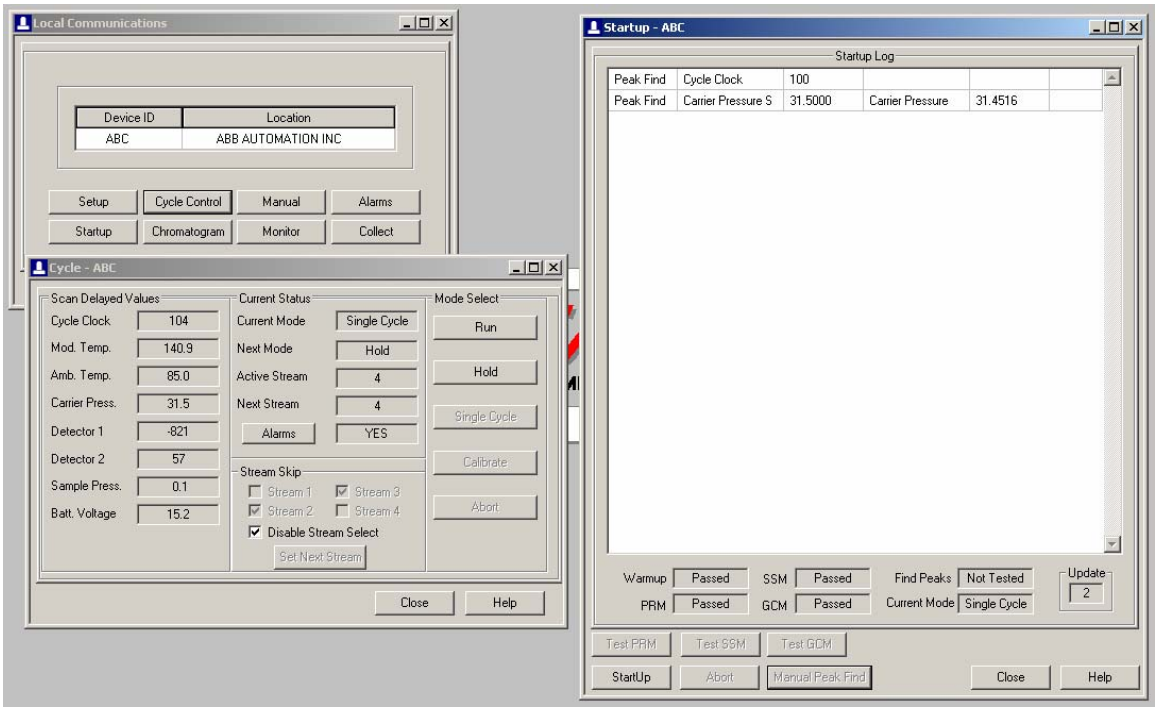


Key components are CO2 (detector #1) and NC5 (detector #2). These key components should fall between 40 and 50 seconds on the chromatograms. In the above chromatograms, CO2 is right on 50 seconds, while NC5 is about 46-47 seconds.

Varying carrier pressure will move the key components with respect to time. ***Increasing carrier pressure will make them come out more quickly (move them to the left), while reducing carrier pressure will make them come out more slowly (move them to the right).*** In the above example I might increase carrier slightly (0.5-1psi) to get CO2 to come out a bit quicker. However, my main concern is that a peak not be "chopped off" by the reversing valve at 60 seconds. Both of these key components (CO2 and NC5) look safe in these examples.

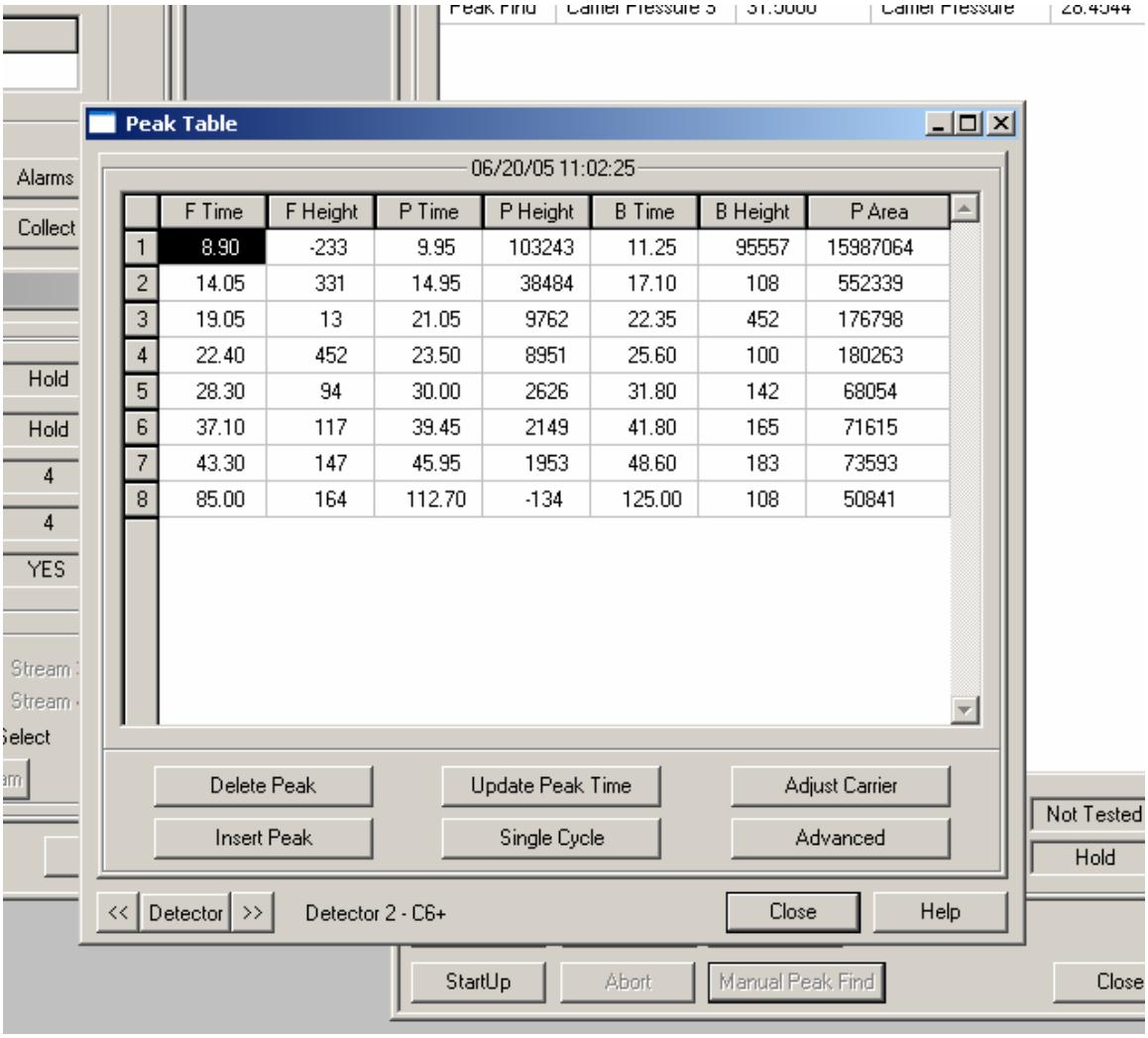
With that in mind, lets proceed to actually "doing" a manual peak find.

When the self-diagnostics have successfully completed you are ready to do a manual peak find. If possible open both the "Startup Log" and "Cycle Control". Make sure that the unit is in "Hold Mode". If your unit has gone into "Run Mode", you can put it in "Hold" from Cycle Control. At the bottom of the Startup Log is a button labeled "Manual Peak Find", hit it. A warning will be displayed. Hit "Find Peaks". It may take up to 20 seconds, but eventually you will see "Next Mode" go to "Single Cycle" and the "Cycle Clock" will start to advance.



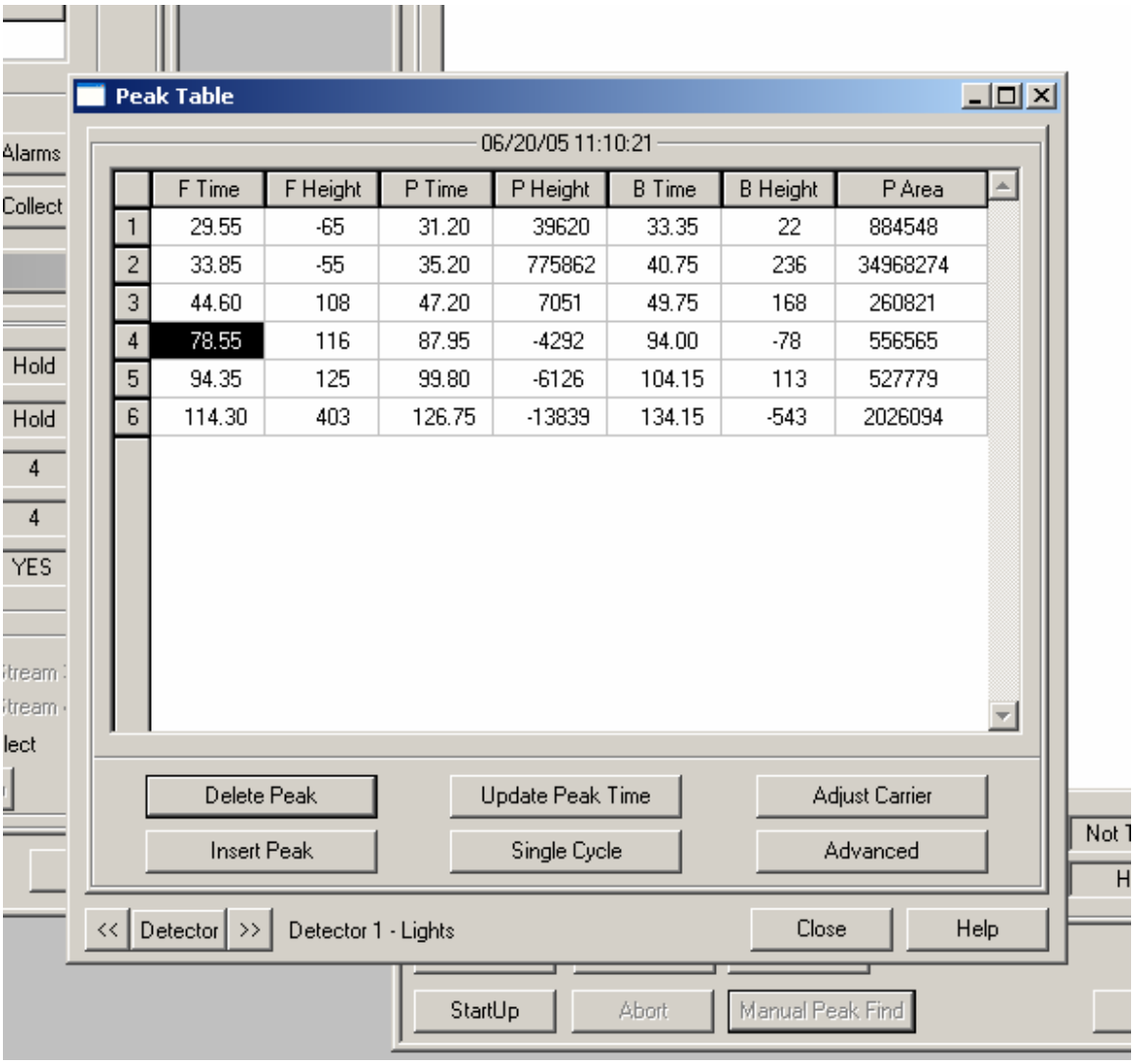
When a single peak find cycle completes (about 3 minutes) you will be shown a Peak Table. Detector #2 will be displayed. You can select Detector #1 with the arrows at the bottom of your screen. ***Detector #1 MUST have six (6) peaks. Detector #2 MUST have eight (8) peaks.*** If either detector has more peaks than you must determine the "false" peak and delete them. Should a detector have fewer peaks than required you will have to insert the "missing" peak.

Let's do a peak find…



You can see that we have the required eight (8) peaks on detector #2. NC5 (one of our key components) is at 45.95 seconds. This is good (again, between 40 and 50 seconds). Also look at the peak areas (P Area column). Do you see the three pentanes and the two butanes? IC5 and NC5 (176798 and 180263 respectively) are the "rabbit ears" and the three pentanes, neoC5, IC5 and NC5 (68054, 71615 and 73593 respectively). If the manual peak find had returned nine (9) peaks you would have had to determine which was in error and delete it. ***Suppose you were using a custom blend that does not contain neoPentane (neoC5).*** Seven (7) peaks would have been returned and you would need to insert the missing neoPentane peak. To insert the missing neoC5 peak you would highlight the IC5 peak and hit the "Insert Peak" button. A new row for the missing neoC5 peak would be created just above IC5. The only entry you need to make is for "P Time". Enter a "P Time" about 8-10 seconds earlier than the IC5 peak. Look again at my peak times. I have all the components and you can see that IC5 comes out at 39.45 seconds. Neo-pentane comes out about 10 seconds earlier (30.00 seconds).

Now hit the little double arrow in the lower left corner and we'll take a look at detector #1 peaks (the lights).

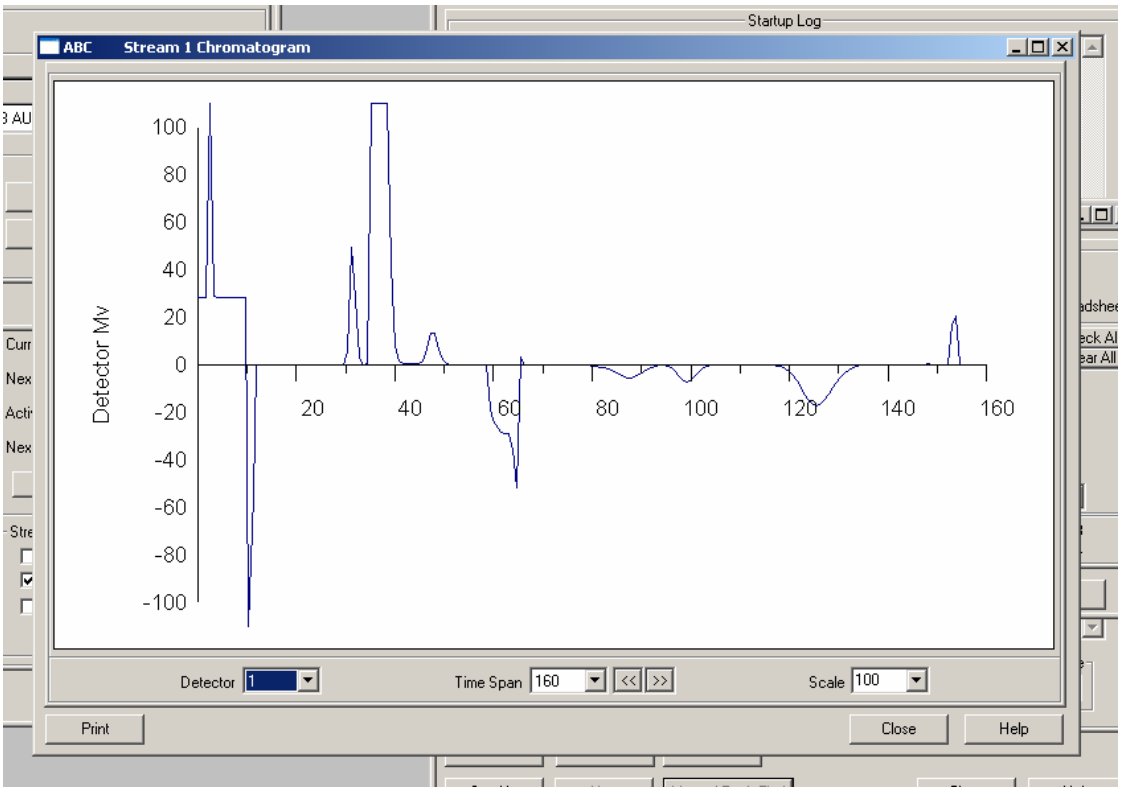


I have the required six (6) peaks and notice that our key component, CO2, comes out at 47.20 seconds. That's between 40 and 50 seconds, right where we need it.

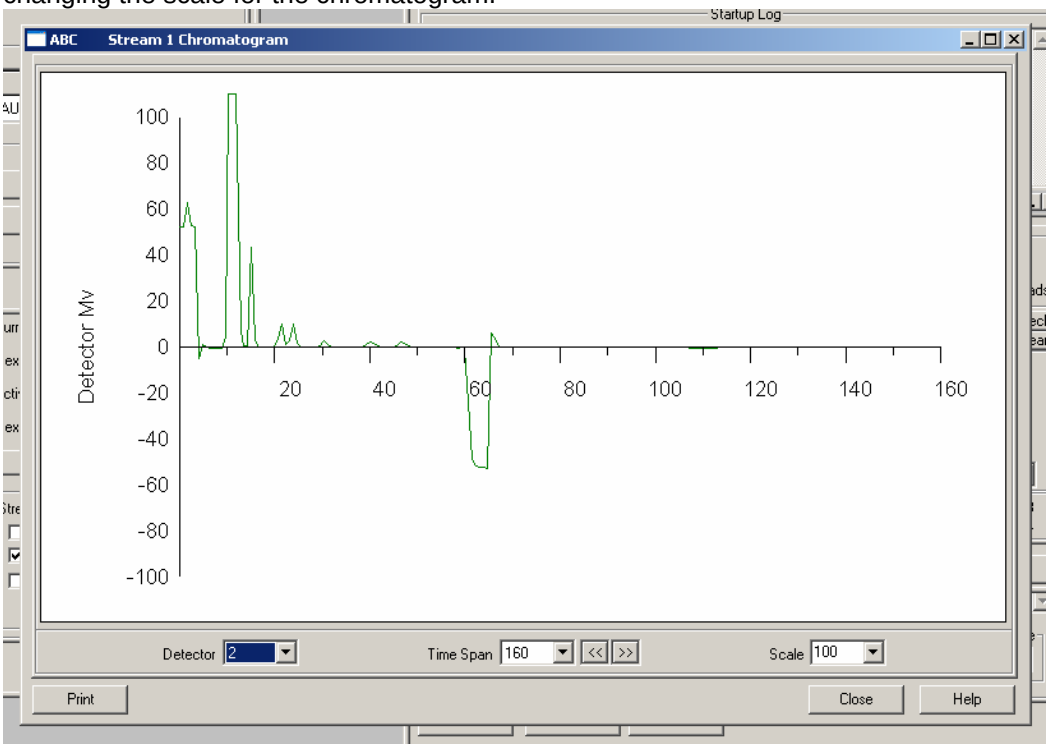
So I have a good peak find. Now hit the button, "**Update Peak Time**" to send the new table to the analyzer. ***Don't forget this step.***

Had our key components come out at times other than between 40 and 50 seconds, we would have had to **Adjust Carrier** to move them into range. Increasing carrier pressure pushes the peaks out faster (earlier in time). Lowering carrier pressure slows the peaks down. They come out a bit later.

Let's look at a couple of chromatograms and see what things are looking like.



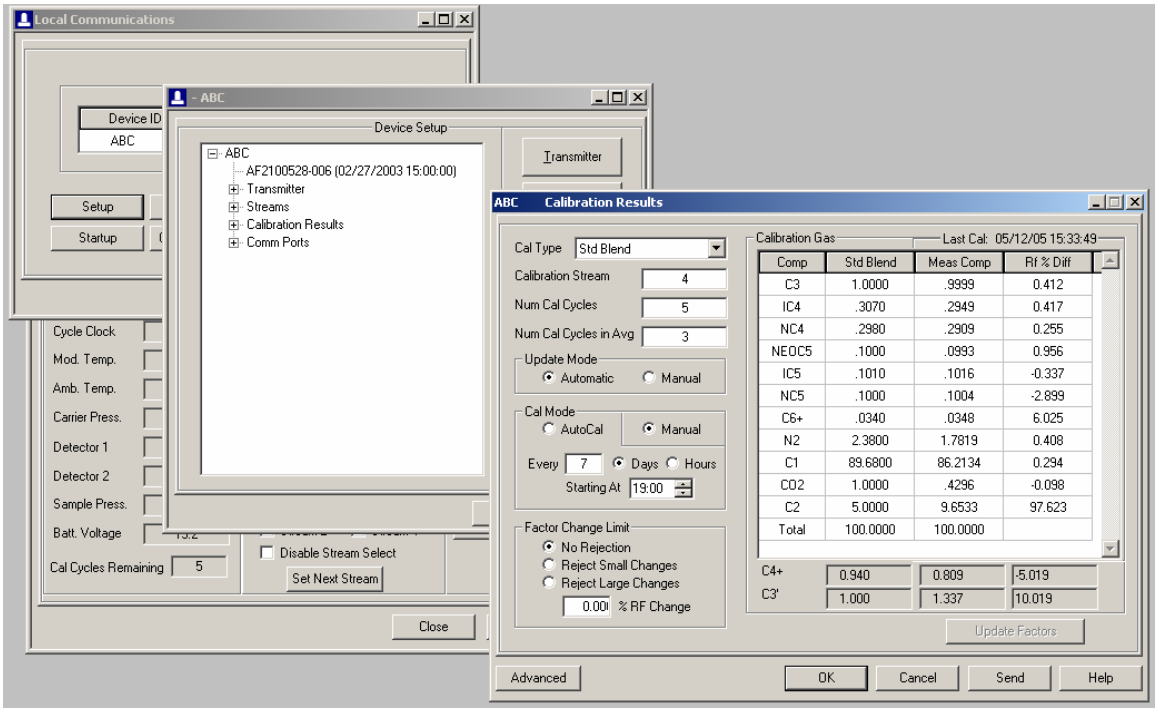
Ignoring switching noise, we have six (6) peaks on detector #1. Compare where these peaks are coming out to the peak table we generated for detector #1. Also look at the chromatogram for detector #2 (below) and compare it with the earlier peak table results for detector #2. You can barely make out the peak for C6+ at about 110 seconds… but its there. It could be blown up by changing the scale for the chromatogram.



Calibration

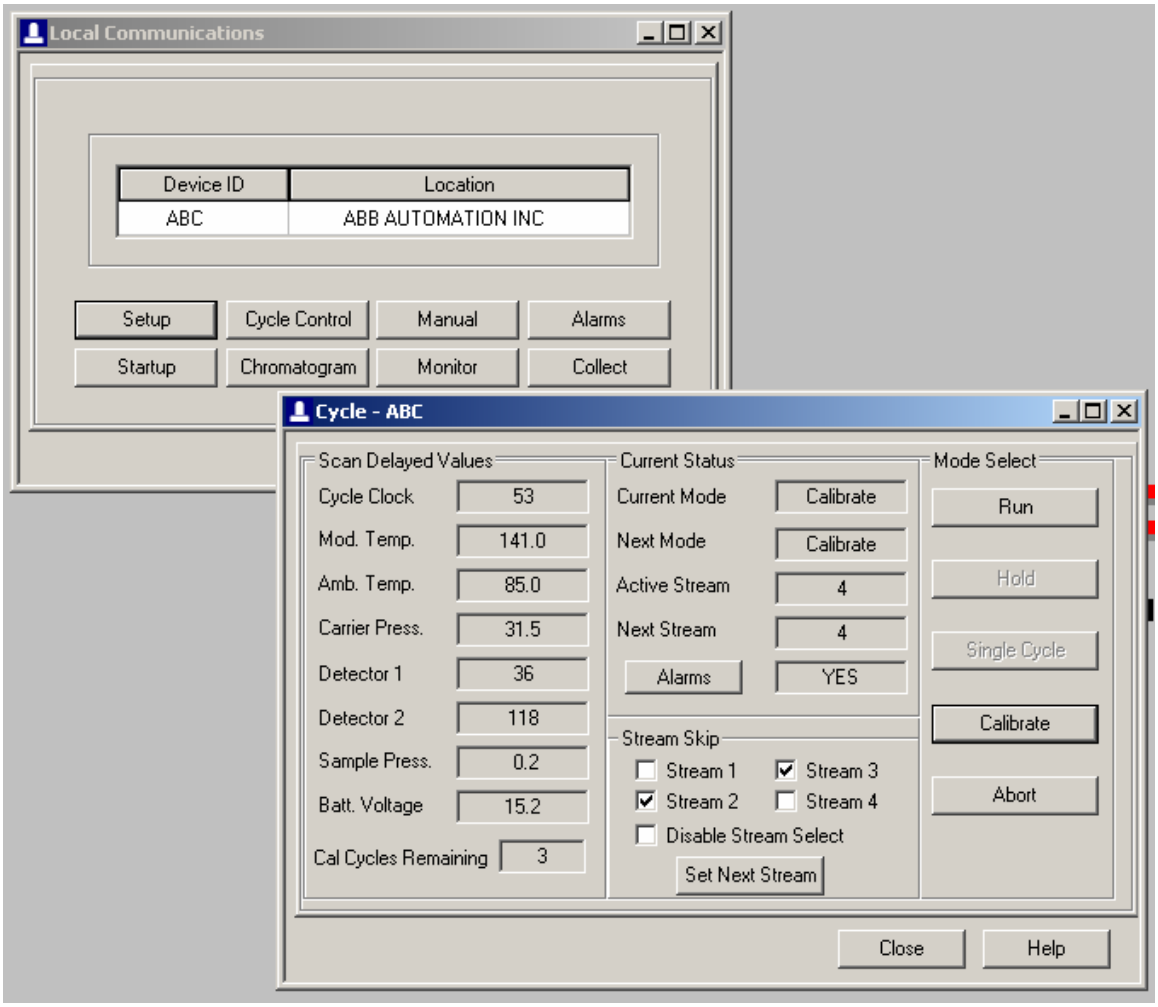
Now we're ready for the final step, calibration. ***Calibrating to an old or invalid peak table does no good.*** But we have just generated an updated and valid peak table and are ready to calibrate to it.

Before we do a manual calibration we need to check setup and make sure that a couple of things have been set properly. Have we correctly entered the calibration blend from the calibration bottle? And does it come out to 100%? If it comes close to 100% add or subtract any minor difference to/from the largest component (usually methane or C1).



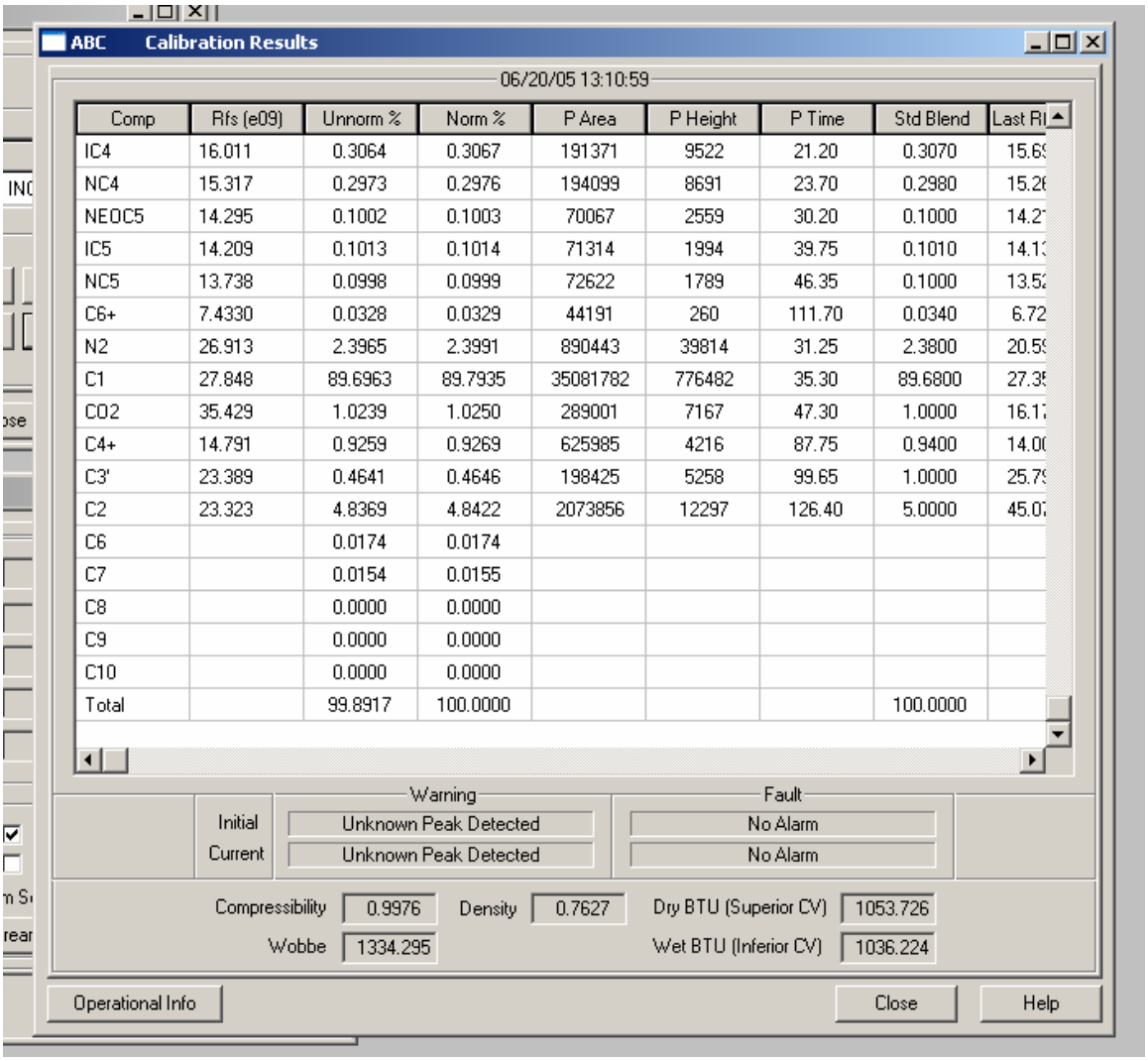
Also make sure that "No Rejection" is selected in the "Factor Change Limit" box. This will ensure that our manual calibration is taken by the analyzer.

Now you're ready to go to the "Cycle Control" window and initiate the Calibration cycle. You should still be in "Hold" mode after doing the peak find.



Hit the “Calibrate” button. “Next” and “Current” modes will change to “Calibrate” and your cycle clock will start to increment. A small box will open up below “Batt. Voltage” and show you how many cycles are remaining before the calibration cycle is complete. Remember, each cycle is generally defaulted to 3 minutes (180 seconds). If you setup calibration to run 5 cycles it will take 15-20 minutes to complete.

When calibration is complete the analyzer will return to “Hold” mode. Now you need to review Calibration Results and make sure that your un-normalized total is close to 100%. It should probably be within a 0.5% although our official specifications are a bit looser (±2.0%). To collect Calibration Results go to “Collect”, check View and Calibration Results. Hit the “Collect” button. Within a few moments you should have the Calibration Results displayed on your screen.



Here my un-normalized % is 99.8917. Very tight. Also note that every component represented in by Standard Blend is closely matched in the Un-norm% column. CAUTION: It is possible to see a very close un-normalized total and have one or more of the lower concentration components missing completely from the results. (i.e. if C6+ was missing completely and all the rest of the components were OK, you could have an un-normalized total of 99.97% which would, under other circumstances be an excellent result.)

If your un-normalized total is further out than 2% you should call our Totalflow Customer Service number (1-800-442-3097 press “1” then “2”) and get assistance.