TELEDYNE
ANALYTICAL INSTRUMENTS
Everywhereyoulook™

OPERATION AND MAINTENANCE MANUAL FOR

FALCON GC

P/N M
DATE 07/30/19

DANGER

Toxic and/or flammable gases or liquids may be present in this monitoring system.

Personal protective equipment may be required when servicing this instrument.

Hazardous voltages exist on certain components internally which may persist for a time even after the power is turned off and disconnected.

Only authorized personnel should conduct maintenance and/or servicing. Before conducting any maintenance or servicing, consult with authorized supervisor/manager.

Warranty

This equipment is sold subject to the mutual agreement that it is warranted by us free from defects of material and of construction, and that our liability shall be limited to replacing or repairing at our factory (without charge, except for transportation), or at customer plant at our option, any material or construction in which defects become apparent within one year from the date of shipment, except in cases where quotations or acknowledgements provide for a shorter period. Components manufactured by others bear the warranty of their manufacturer. This warranty does not cover defects caused by wear, accident, misuse, neglect or repairs other than those performed by Teledyne or an authorized service center. We assume no liability for direct or indirect damages of any kind and the purchaser by the acceptance of the equipment will assume all liability for any damage which may result from its use or misuse.

We reserve the right to employ any suitable material in the manufacture of our apparatus, and to make any alterations in the dimensions, shape or weight of any parts, in so far as such alterations do not adversely affect our warranty.

Important Notice

This instrument provides measurement readings to its user, and serves as a tool by which valuable data can be gathered. The information provided by the instrument may assist the user in eliminating potential hazards caused by his process; however, it is essential that all personnel involved in the use of the instrument or its interface be properly trained in the process being measured, as well as all instrumentation related to it.

The safety of personnel is ultimately the responsibility of those who control process conditions. While this instrument may be able to provide early warning of imminent danger, it has no control over process conditions, and it can be misused. In particular, any alarm or control systems installed must be tested and understood, both as to how they operate and as to how they can be defeated. Any safeguards required such as locks, labels, or redundancy, must be provided by the user or specifically requested of Teledyne at the time the order is placed.

Therefore, the purchaser must be aware of the hazardous process conditions. The purchaser is responsible for the training of personnel, for providing hazard warning methods and instrumentation per the appropriate standards, and for ensuring that hazard warning devices and instrumentation are maintained and operated properly.

Teledyne Analytical Instruments, the manufacturer of this instrument, cannot accept responsibility for conditions beyond its knowledge and control. No statement expressed or implied by this document or any information disseminated by the manufacturer or its agents, is to be construed as a warranty of adequate safety control under the user's process conditions.

Safety Messages

Your safety and the safety of others is very important. We have provided many important safety messages in this manual. Please read these messages carefully.

A safety message alerts you to potential hazards that could hurt you or others. Each safety message is associated with a safety alert symbol. These symbols are found in the manual and inside the instrument. The definition of these symbols is described below:

GENERAL WARNING/CAUTION: Refer to the instructions for details on the specific danger. These cautions warn of specific procedures which if not followed could cause bodily Injury and/or damage the instrument.

CAUTION: HOT SURFACE WARNING: This warning is specific to heated components within the instrument. Failure to heed the warning could result in serious burns to skin and underlying tissue.

WARNING: ELECTRICAL SHOCK HAZARD: Dangerous voltages appear within this instrument. This warning is specific to an electrical hazard existing at or nearby the component or procedure under discussion. Failure to heed this warning could result in injury and/or death from electrocution.

Technician Symbol: All operations marked with this symbol are to be performed by qualified maintenance personnel only.

No Symbol

NOTE: Additional information and comments regarding a specific component or procedure are highlighted in the form of a note.

STAND-BY: This symbol indicates that the instrument is on Stand-by but circuits are active.

CAUTION:

THE ANALYZER SHOULD ONLY BE USED FOR THE PURPOSE AND IN THE MANNER DESCRIBED IN THIS MANUAL.

IF YOU USE THE ANALYZER IN A MANNER OTHER THAN THAT FOR WHICH IT WAS INTENDED,

UNPREDICTABLE BEHAVIOR COULD RESULT POSSIBLY ACCOMPANIED WITH HAZARDOUS CONSEQUENCES.

This manual provides information designed to guide you through the installation, calibration and operation of your new analyzer. Please read this manual and keep it available.

Occasionally, some instruments are customized for a particular application or features and/or options added per customer requests. Please check the front of this manual for any additional information in the form of an Addendum which discusses specific information, procedures, cautions and warnings that may be specific to your instrument.

Manuals do get misplaced. Additional manuals can be obtained from Teledyne at the address given in the Appendix. Some of our manuals are available in electronic form via the internet. Please visit our website at: www.teledyne-ai.com.

Additional Safety Information

DANGER
COMBUSTIBLE GAS USAGE
WARNING

This is a general purpose instrument designed for use in a non-hazardous area. It is the customer's responsibility to ensure safety especially when combustible gases are being analyzed since the potential of gas leaks always exist.

The customer should ensure that the principles of operating of this equipment are well understood by the user. Misuse of this product in any manner, tampering with its components, or unauthorized substitution of any component may adversely affect the safety of this instrument.

Since the use of this instrument is beyond the control of Teledyne, no responsibility by Teledyne, its affiliates, and agents for damage or injury from misuse or neglect of this equipment is implied or assumed.

WARNING: ***HYDROGEN GAS IS USED IN THIS INSTRUMENT AS A FUEL AND PERHAPS AS A CARRIER GAS. HYDROGEN IS EXTREMELY FLAMMABLE. EXTREME CARE MUST BE USED WHEN WORKING AROUND GAS MIXTURES CONTAINING FLAMMABLE GASES.***

A successful leak check was performed at TAI on the sample system of this instrument prior to calibration, testing and shipping. Ensure that there are no leaks in the fuel supply lines before applying power to the system.

Always purge the entire system before performing any maintenance and always leak check the system after removing any tubing or fittings on the sample system. See the procedures for purging and leak checking this instrument on the following pages.

WARNING: ***THIS INSTRUMENT IS DESIGNED TO BE OPERATED IN A NONHAZARDOUS AREA. THE ANALYZER USES HYDROGEN GAS AND/OR OTHER COMBUSTIBLE GASES IN ITS OPERATION. THIS EQUIPMENT, IF NOT USED AND MAINTAINED PROPERLY CAN BE AN EXPLOSION HAZARD. THE ANALYZER, DEPENDING ON THE APPLICATION, MAY ALSO USE TOXIC GASES. IT IS THEREFORE, THE CUSTOMER'S RESPONSIBILITY TO ENSURE THAT PROPER TRAINING AND UNDERSTANDING OF THE PRINCIPLES OF OPERATION OF THIS EQUIPMENT ARE UNDERSTOOD BY THE USER. SINCE THE USE OF THIS INSTRUMENT IS BEYOND THE CONTROL OF TELEDYNE, NO RESPONSIBILITY BY TELEDYNE, ITS AFFILIATES AND AGENTS FOR DAMAGE OR INJURY RESULTING FROM MISUSE OR NEGLECT OF THIS INSTRUMENT IS IMPLIED OR ASSUMED. MISUSE OF THIS PRODUCT IN ANY MANNER, TAMPERING WITH ITS COMPONENTS OR UNAUTHORIZED SUBSTITUTION OF ANY COMPONENT MAY ADVERSELY AFFECT THE SAFETY OF THIS INSTRUMENT.***

CAUTION: **WHEN OPERATING THIS INSTRUMENT, ALL COVERS SECURELY FASTENED. THE GAUGES MUST BE IN PROPER WORKING ORDER. DO NOT OVERPRESSURIZE THE SYSTEM.**

READ THIS MANUAL BEFORE OPERATING THE INSTRUMENT AND ADHERE TO ALL WARNINGS INCLUDED IN THIS MANUAL.

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Introduction

Teledyne Analytical Instruments Falcon GC is an ultrafast programmed temperature gas chromatograph consisting of:

- Heated split/splitless injection port including septum purge and 350°C maximum operating temperature.
- Inlet accepts gas or liquid syringe injections or optionally an automated gas or liquid sample valve.
- One or two column modules, for simultaneous detection on two individual column types, and one or two detector modules.
- Plug and play, precalibrated and individually programmed temperature column modules, enabling dual simultaneous analysis on the same sample, using different separation media and temperature profiles for maximum selectivity.
- Touchscreen user interface panel.

The Falcon GC uses a Windows equipped PC in conjunction with the Chromperfect software. The computer connection can be made through a shared ethernet cable via TCP. The ethernet connection from PC to GC can either be direct or through a network.

This manual presents the standard operating procedure for the general use of the Falcon GC. You should have a general working knowledge of the Chromperfect software, as well as the Falcon GC

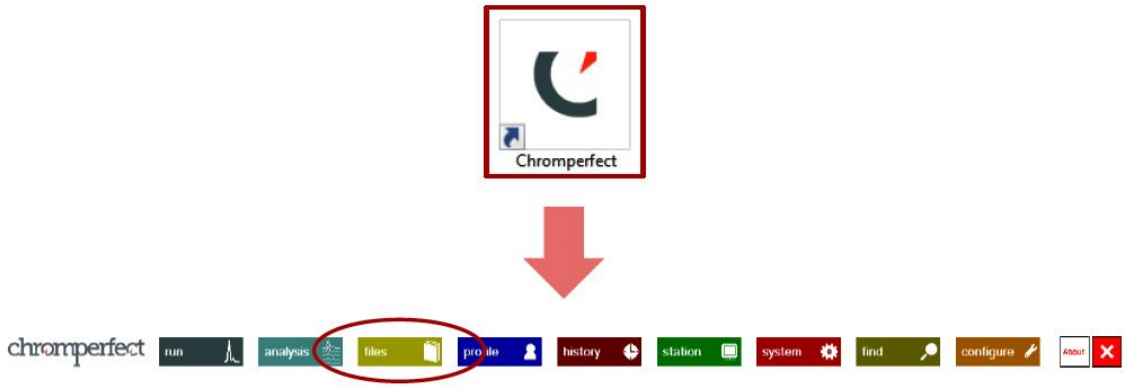
before using this guide. Since this is a general SOP, more specialized methods such as ASTM D7798 or D3710 will require additional instruction not present in this document. This guide does not include instruction on the operation of the Palarus or Talon autosamplers.

Preparation

2.1 Chromperfect File Types

There are generally four key Chromperfect files that must work together in order to ensure the effective operation of the Falcon GC. Depending on the application, you may only need two or three of these files. In some cases, even more files may be necessary. A method file (.met) and a setpoint file (.mfl) are required for every application. Two additional common file types are a calibration file (.cal) and a formatted report file (.fmt). The folder destination for these files will vary from user to user. Before getting started, check to make sure that the method files have the correct pathnames defined for the files mentioned above.

This can be done by opening the method file in the File Editor Tab. Click the "C" Chromperfect icon to open the Chromperfect banner and then click on "Files".

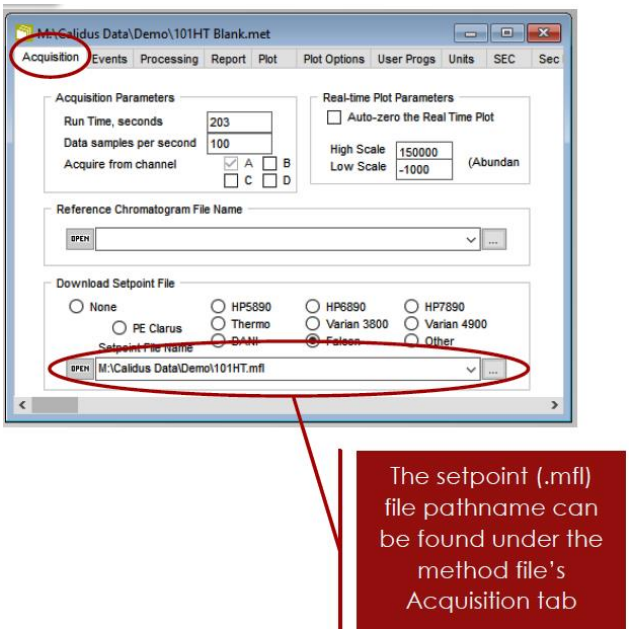


Here, click File→Open→Method and then click the "…" icon to search for your method file.

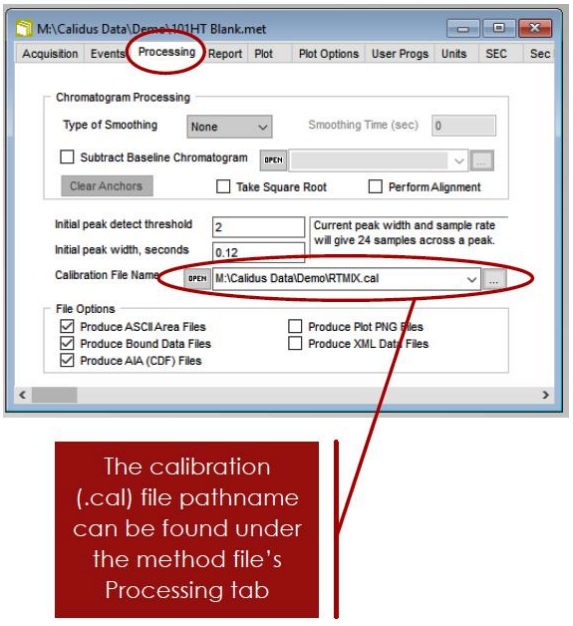
Note: Depending on the current settings a pop-up window might automatically open along with the File Editor program. If that happens, just click Method *from that window and then click the "…" to select your method file.*

With the method file now open, click through the tabs to make sure that all of your files are properly linked with the correct pathname. Please note that your method may not require all these file types.

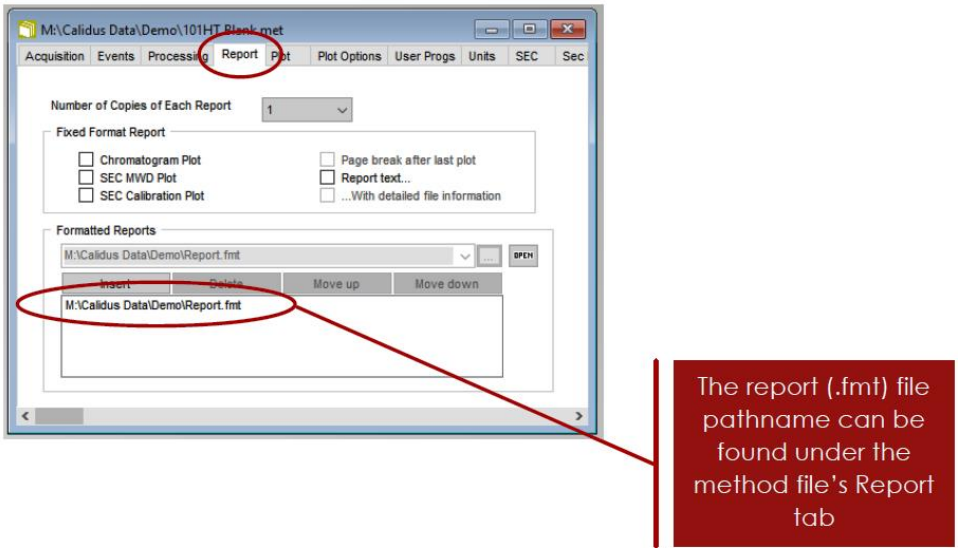
1. Click on Acquisition.



2. Click on Processing.



3. Click on Report.



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Installation

3.1 Preparation

Installation of the Falcon GC will require:

- **Carrier Gas**
  - Typically H_2, but may also be He or N_2 in special circumstances.

Note: Hydrogen and air must be supplied if the instrument is equipped with an FID (Flame Ionization Detector) or FPD (Flame Photometric Detector).

  - All gases should be ultra high purity (99.9995% pure) or better.
  - Hydrogen carrier gas is typically supplied from a hydrogen generator or gas cylinders.
  - Carrier gas must be regulated down to **60-80 psi** before entering the GC.
- **Zero Air**
  - Must be hydrocarbon and moisture free.
  - Air is typically supplied from a zero air generator and compressor or gas cylinders.
  - Zero air must be regulated down to **80-90 psi** before entering the GC.
- **Tubing, Nuts, and Ferrules**
  - Connections and tubing are supplied with the Falcon Startup Kit.
  - Gas connections to the GC require **1/16" stainless steel tubing.**
    - 1/16" Valco internal nuts and ferrules for carrier gas and FID fuel.
    - 1/16" Swagelock external nut and ferrule for air input.

- Falcon CS units require 1/8” tubing with a Swagelock external nut and ferrule for air (1/8” tubing is **NOT included** in the Falcon GC Startup Kit).
- 1/16” Valco internal nuts and ferrules must also be used for SAMPLE IN and SAMPLE OUT on gas sample valves and liquid sample valves.
- *Optional: 1/16” Swagelock external brass nuts and ferrules for split vent and septum purge vent.*

- **Ethernet Cable**
  - Used for TCP/IP communication directly from a PC to the GC or from the GC to LAN.
- **Power Supply**
  - 100-240VAC Power Source, 50-60Hz, either 240W or 320W.
  - Auxiliary valve heating or sample valves require auxiliary power cables that must be plugged into the control panel or utility panel, respectively.
  - Appropriate power supplies and cables are always supplied with the Falcon GC.
- **Wrenches**
  - Wrenches are supplied with the Falcon Startup Kit.
  - 1/4” for internal nuts.
  - 5/16” for external nuts.
  - 7/16” for external 1/8” nuts.

3.2 Setup/Installation

The Falcon GC is shipped with all the materials needed to install and prepare the system for operation (Calibration Samples excluded). Carefully unpack the unit and inspect it for damage. Immediately report any damage or shortages to the shipping agent.

The Falcon GC is a general-purpose instrument and as such is designed with (non-sealed) enclosures. The GC can be operated within temperatures ranging from 32ºF to 100ºF but for best results ambient T should be within 60-80ºF. In areas outside these temperatures, auxiliary

heating/cooling may need to be supplied. Avoid locating the instrument where extreme vibration may occur.

3.2.1 User Connections

Connect the appropriate tubing and cables according to the Control Panel and Utility Panel diagrams located on the top of the instrument and the right side of the instrument. See Figure 3-1 .

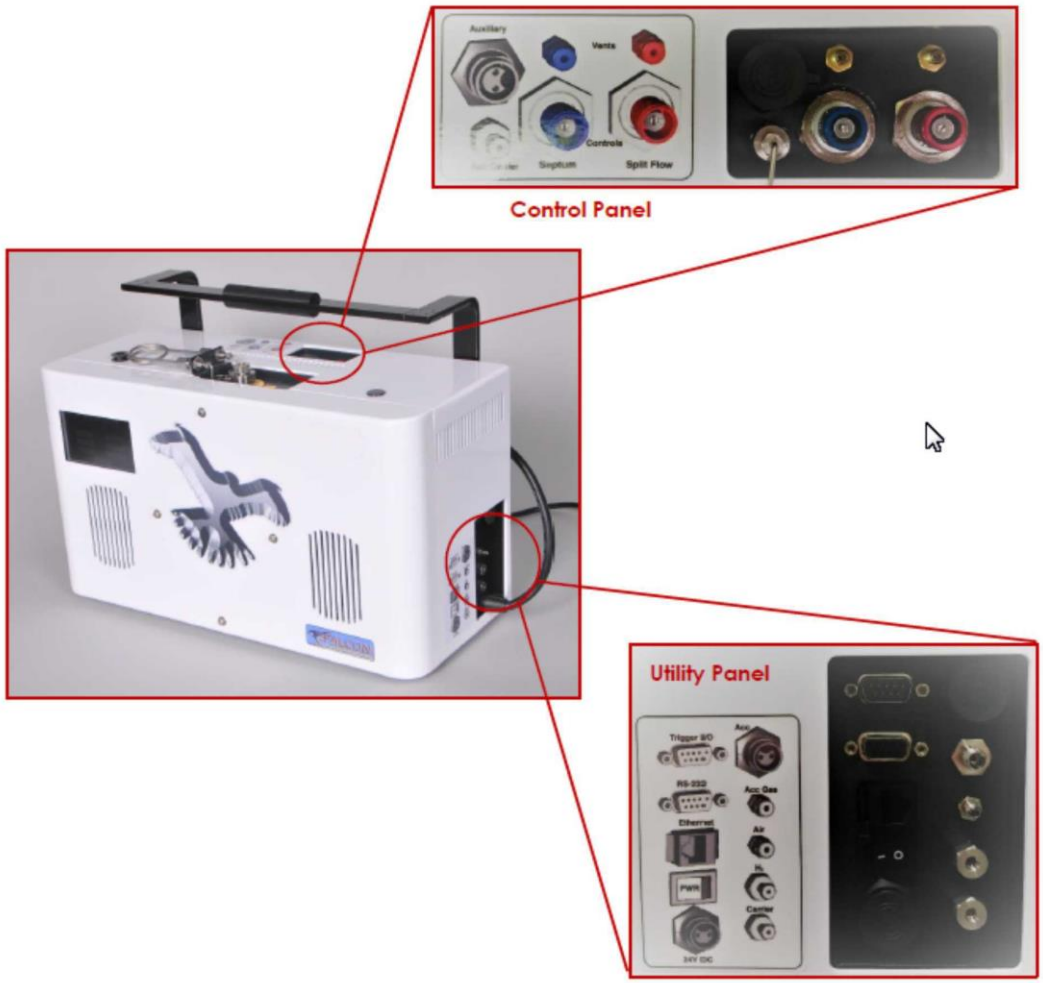


Figure 3-1: Instrument Connections

3.3 Configuring the Falcon GC

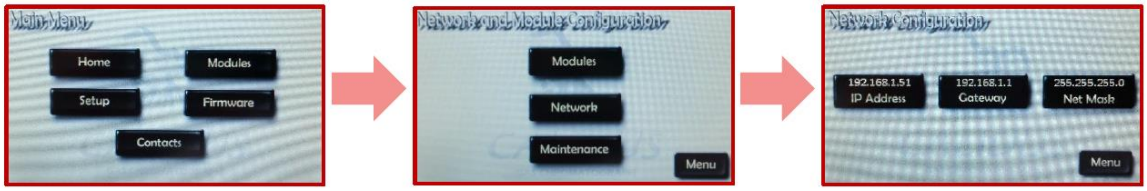
To properly use the Falcon GC you must connect the GC to a Windows PC. This connection can be made through a shared ethernet

cable via TCP/IP. The ethernet connection from PC to GC can either be direct or through a network.

3.3.1 Setting the Falcon GC's IP Address

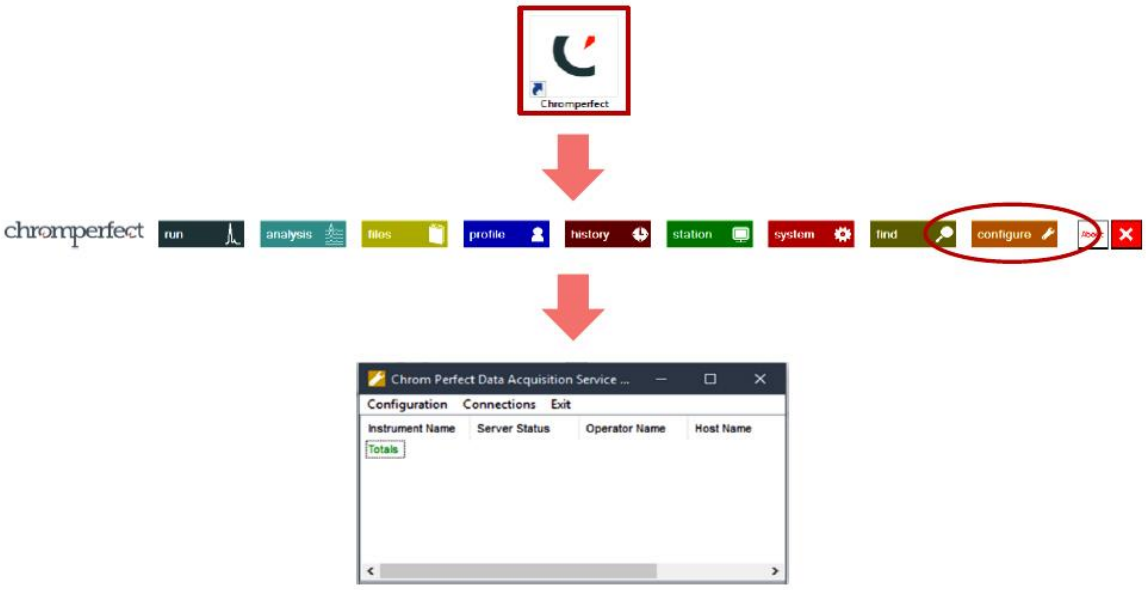
To set the IP address, first, turn on the GC using the power toggle switch on the Utility Panel.

On the Falcon touch screen press Menu→Setup→Network to access the network options. From here you can view or change the GC's IP Address, Gateway, or Net Mask by pressing on their respective icons.

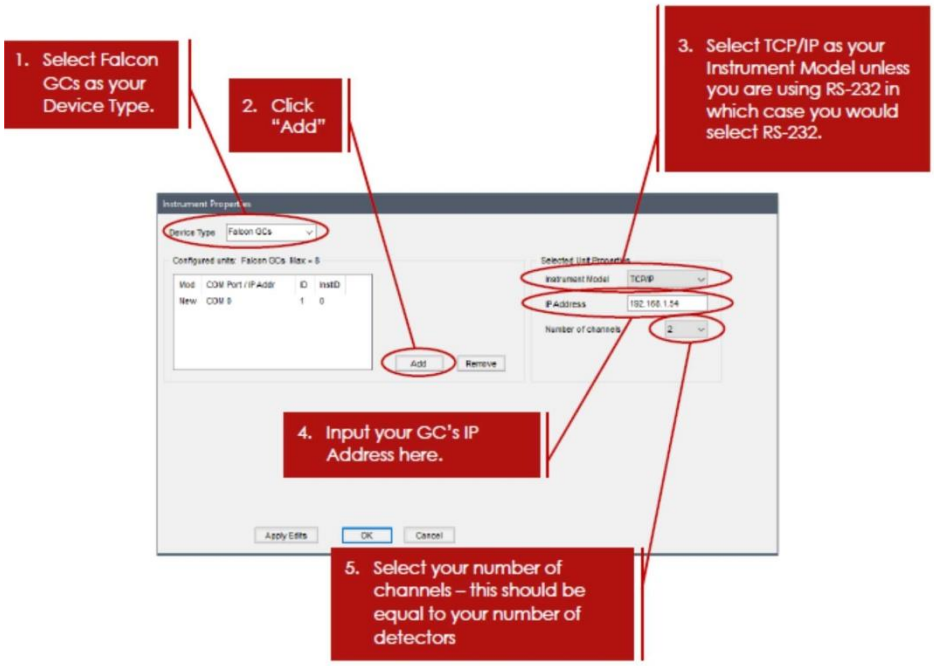


3.4 Configuring Chromperfect

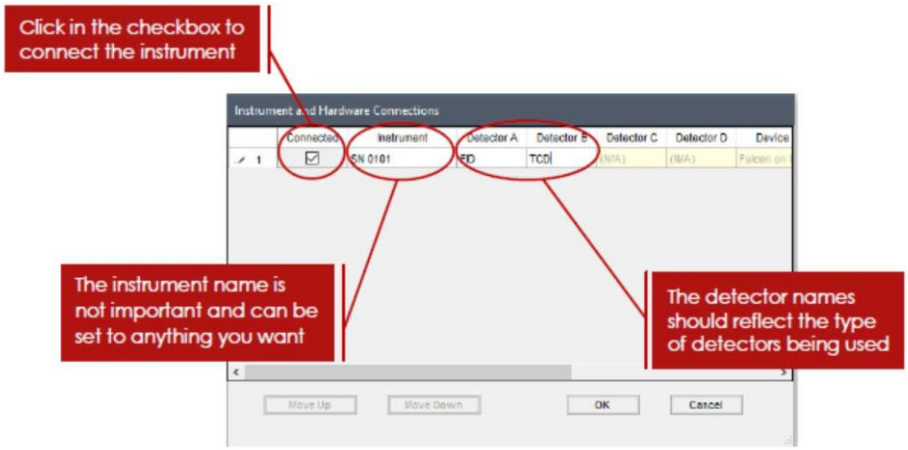
1. Click on the "C" Chromperfect icon to open the Chromperfect banner
2. Then click on Configure to open the configuration window.



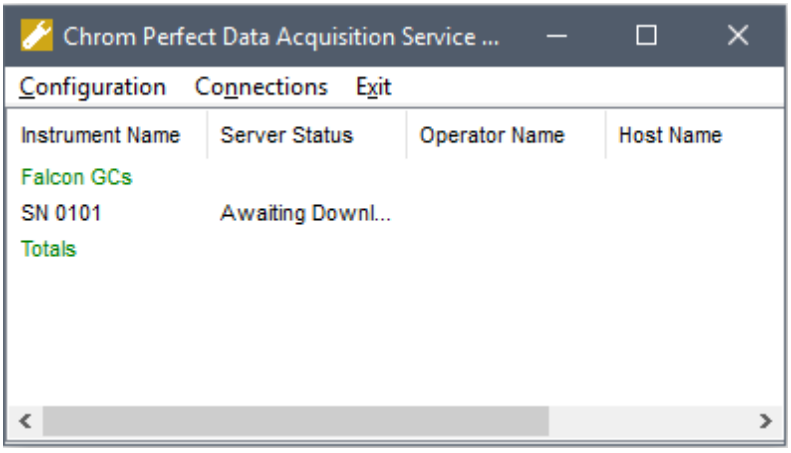
3. Click on Configuration at the top left of this new pop up window. This will open the instrument properties pop-up window.



4. After you have entered all the relevant information as seen above, click on Apply Edits to apply your changes. Notice that the small window where it says Mod and COM Port/IP Addr will update with your current settings.
5. Click OK. A new pop-up window will appear with the title of Instrument and Hardware Connections. Fill out the new pop-up window as shown below:



6. Click OK to confirm your changes. This should prompt yet another pop-up window to appear.



In this window you should notice that the Server Status indicates "Awaiting Download". If the Server Status does not display "Awaiting Download" then check to make sure that you have input the correct IP addresses into both Chromperfect and the GC. Check to make sure that ethernet cable is properly wired into both the PC and the GC. Please note that if you are making a direct connection from the GC to the PC (without LAN), then you must give the PC a static IP Address.

3.5 The Chromperfect Selection Tab

Now that the instrument has been configured, you should be ready to claim the instrument. This ensures that only the specific PC that you are using will communicate with the GC.

3.5.1 Claiming the Instrument and Setting the Data Directory

1. Click on the "C" Chromperfect icon to open the Chromperfect banner

2. Then click on click on Run to open the Chromperfect Run or Data Acquisition tab.

The Run screen will open with a yellow background. If you already had the Run screen open and your background is cyan instead of yellow, then you must click the "Selection" tab on the far right-hand side of the screen.

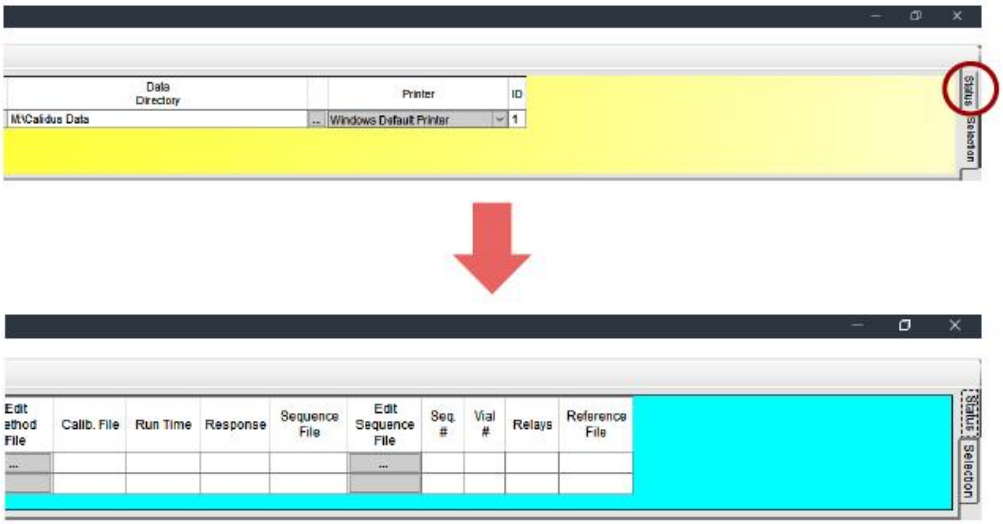
3. Now, in the Run screen with the yellow background, you must first claim the instrument by clicking the Claim button underneath the column labeled Control. This should cause the empty cells to the left of the Claim button to auto-fill.

   You can also change the data directory from this screen by clicking on the "…" icon under the Data Directory column. The data directory pathname determines where the Chromperfect-created chromatograms will be stored.

3.6 The Chromperfect Status Tab

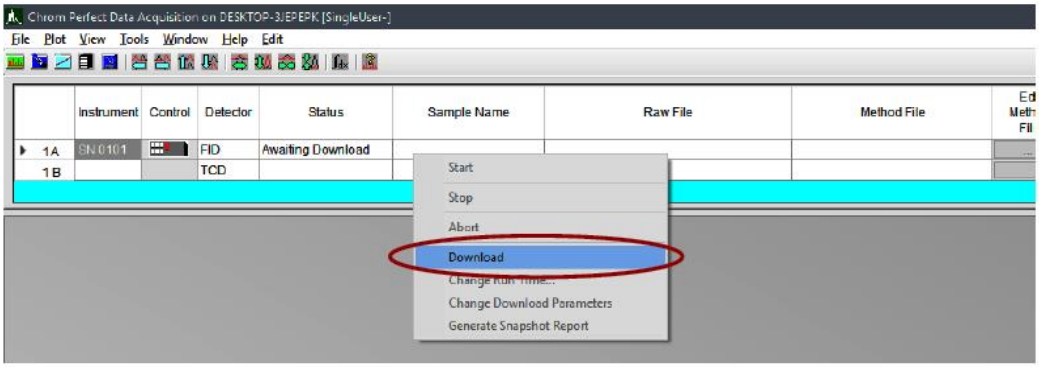
Now that the instrument has been claimed you should be ready to download a method file to the instrument. This download can be made in the Status Tab in the Run or Data Acquisition window. As shown previously, the method file can have several other file types linked to it. The most important of those linked files is the setpoint file. Downloading the method file to the GC is how the Falcon gets its setpoint information.

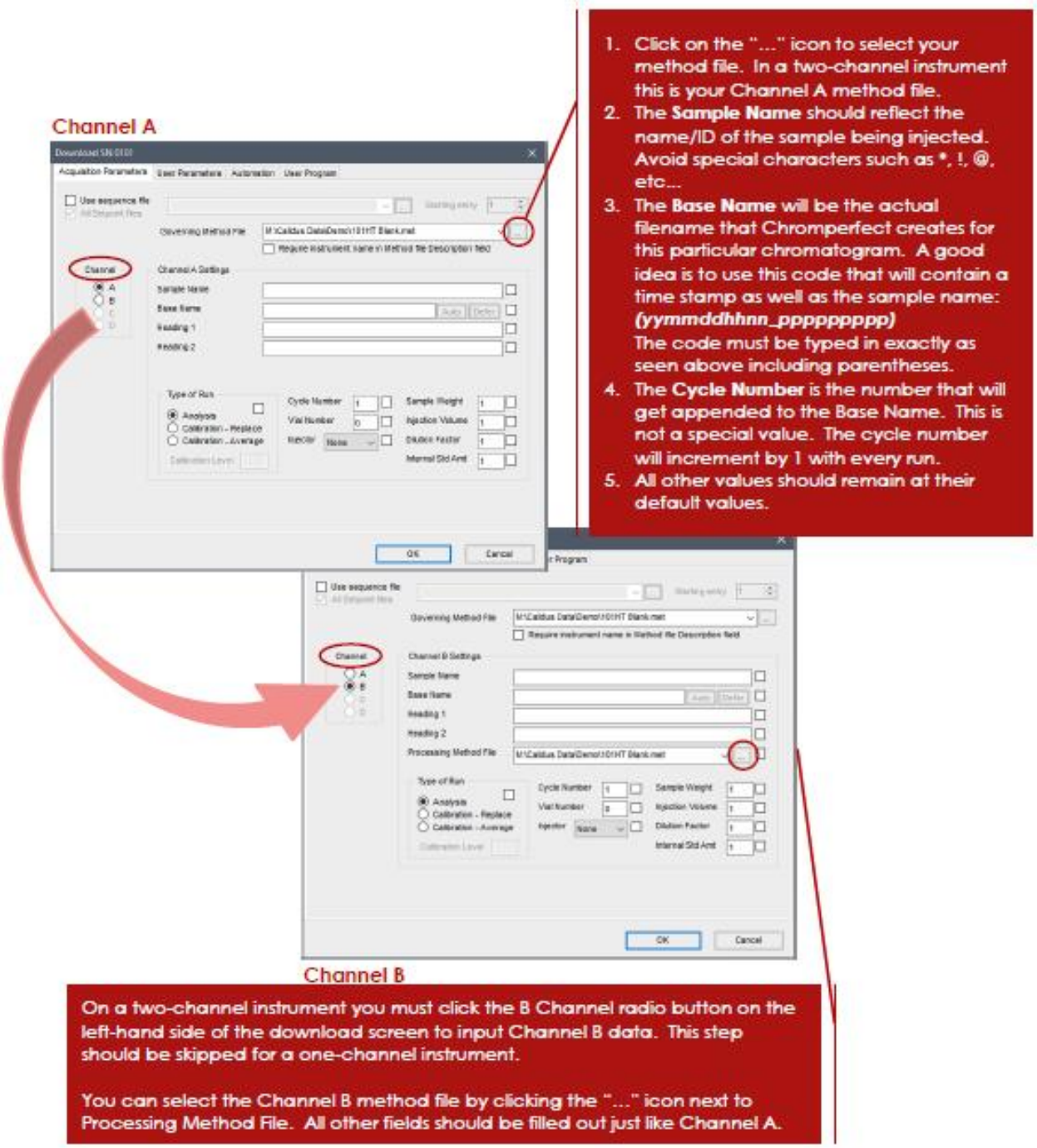
You can get to the Status Tab from the Run window opened in the previous step. Simply click on the Status tab on the right-hand side of the screen after you've claimed the instrument. You should notice that the background changes from yellow to cyan.



3.7 Downloading a Method File

Right-click anywhere in the white Excel-like fields at the top of the screen and then select "Download" from the list of options. This should open the download screen.





After inputting the information into the download screen click OK to download the method file to the GC. .If any changes are made to the Setpoint file, they must be downloaded to the GC to take effect.

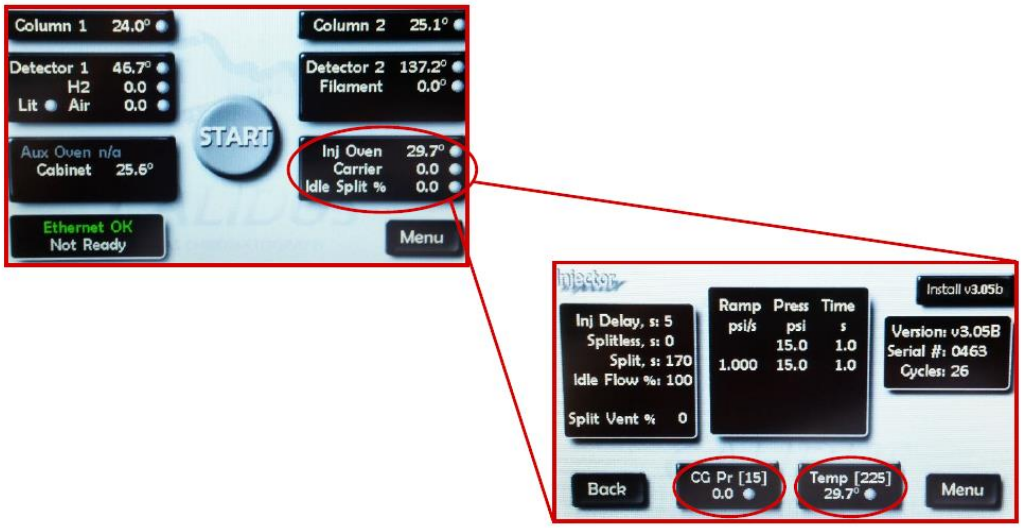
Operation

4.1 Starting the GC

4.1.1 Turning on the GC Modules

Now that the method file has been downloaded to the GC you are ready to activate the Falcon modules and heat the instrument.

From the home screen on the Falcon touch screen, simply touch each module icon individually and turn on their temperature and pressure controllers. Press “Back” to return to the home screen from each module. The order is not important as long as you turn on the injector oven module and carrier gas first. Conversely, you can also access each module by pressing Menu→Modules.



From the home screen you should be able to monitor the current temperature or pressure of each module. You will know the setpoint has been reached when the indicator next to the specific temperature or pressure turns green. Yellow is below the setpoint and red is over setpoint.

4.1.2 Lighting the FID

If you have an FID module you must ignite the FID before you can start a run.

Caution: ***Make sure you read and understand all the cautions and warnings at the front of this manual before proceeding.***

Once all the modules have reached their setpoints, access the FID module (Detector 1 or Detector 2) from the home screen by pressing the appropriate button on the Falcon touch screen. Press on the “Not Lit” icon to light the GC. You should see the air pressure drop to its ignition level and then hear a slight “pop” from the FID as the flame ignites. After several seconds the status of the FID should change from “Not Lit” to “Lit”.

Note: The "Lit" status does not necessarily indicate that the flame is lit or not. The "Lit" status merely refers to the fact that you have gone through the process of lighting the flame.

You should always check to see if the FID is actually lit. One way to check if the flame is lit is to hold some reflective material such as a mirror or wrench over the FID exhaust vent. If the flame is lit, condensation will form on the reflective surface.

4.1.3 Activating the TCD Filament

If you have a TCD module installed in the Falcon GC, you must activate the TCD filament before you can start a run. Once all the modules have reached their setpoints, access the TCD module (Detector 1 or Detector 2) from the home screen by pressing the appropriate button on the Falcon touch screen. Press the “Filament” icon to start heating the filament.

4.1.4 Starting a Run

Now that all of the temperatures and pressures of the GC are at their setpoints, you can start the GC. You can start a run one of two ways:

1. **With the Falcon touch screen**
   From the home screen press the green Start button. If the button is not green then there are still some modules that have yet to reach their setpoints. Check to make sure that any FID flames are lit.
2. **With the Chromperfect software:**
   From the Run window, under the Status tab, right-click anywhere in the white Excel-like fields and select start.

The Falcon is now in operation mode.

4.2 Calibration

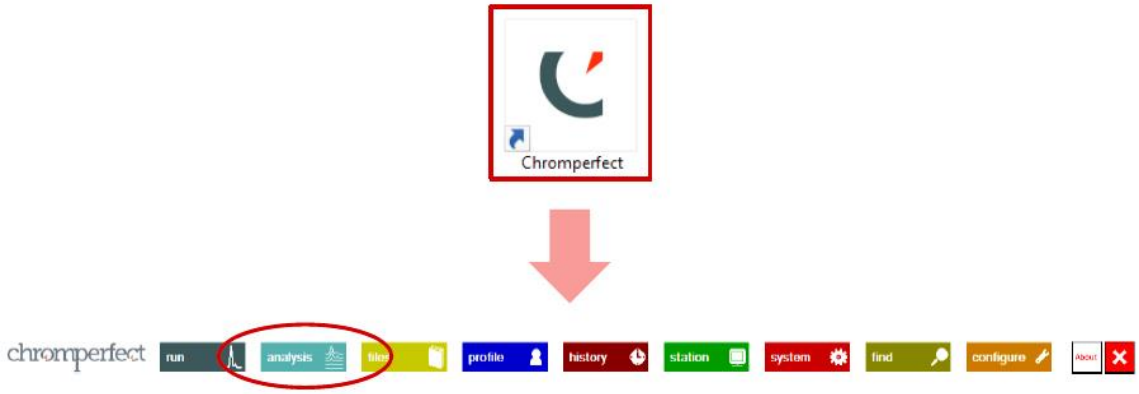
4.2.1 The Calibration File

A calibration file is shipped with your GC. However, there may be instances where you need a new calibration file or you want to update your current calibration file.

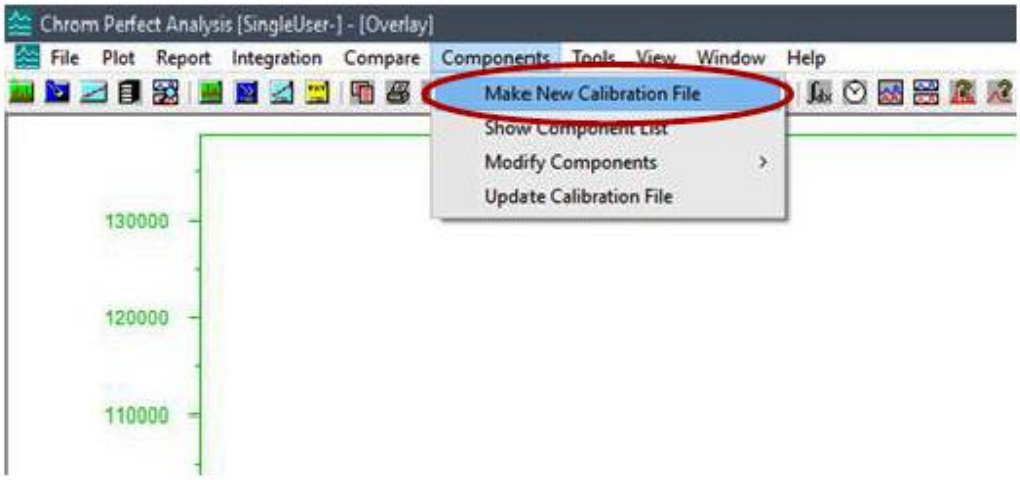
4.2.2 Creating a New Calibration File

First, make sure that you have a chromatogram that you would like to use to create your calibration file. If you have a two-channel instrument, these steps are the same for both channels and you should create two separate calibration files.

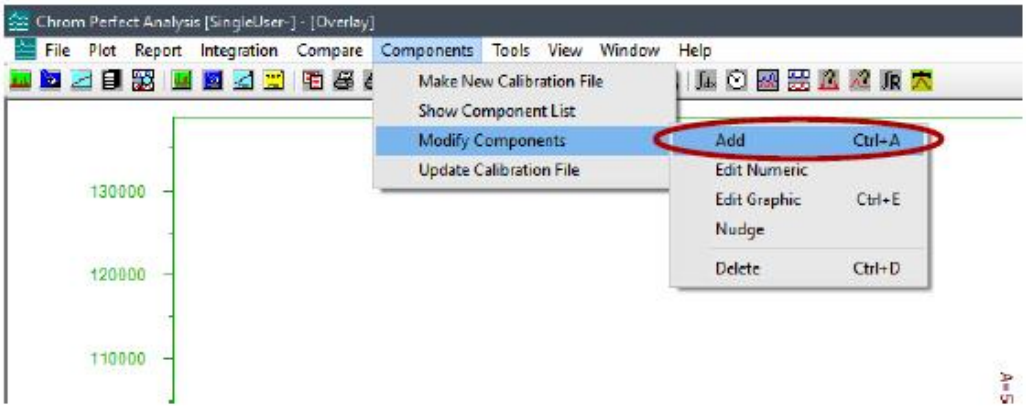
Click the “C” Chromperfect icon to open the Chromperfect banner and then click on “Analysis”.



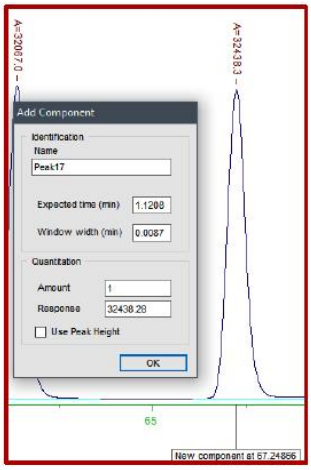
1. 1. Click File→Open and then click the "…" icon to search for and open the chromatogram you wish to calibrate with.
2. Click Components→Make New Calibration File
    a. Unless you had a previous calibration file applied to that chromatogram there is no notification from Chromperfect that you have made a new calibration file; the new file is created "behind the scenes"
    b. If there is currently a calibration file associated with the chromatogram that you have chosen, then you may be asked to overwrite the current calibration file. If that is okay, click "yes".

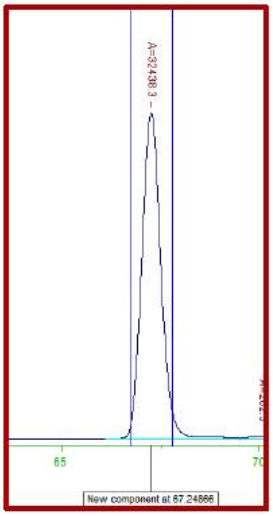


3. Now with the new calibration file created, go to Components→Modify Components→Add



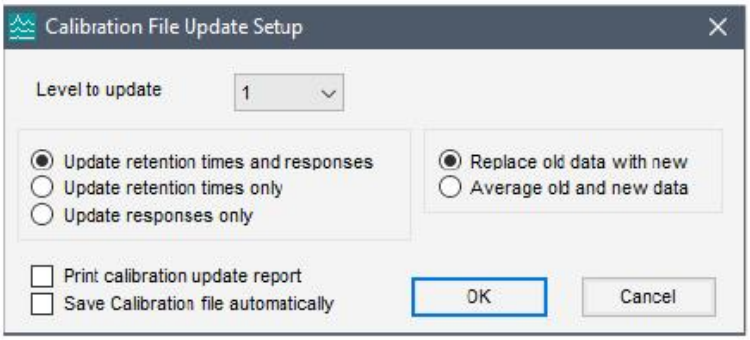
4. Left-click the component you wish to identify
5. Right-click to confirm that the component you have selected is correct.
6. A small window should appear. Here you can fill in the Peak Name as well as the Amount. Click OK when done.
7. You can move the expected retention time window by clicking and dragging the blue guidelines. You can also click and drag the "New component" tag at the bottom of the peak to move the centerline of the peak. It is not recommended to adjust these default values.
8. Right-click to confirm that everything is correct. The peak name will now appear above the peak.
9. Repeat steps 4-8 until you have identified all the peaks in your calibration.
10. Press escape on the keyboard or click "Close" on the small operation assistant window.
11. Click File→Save Calibration and then click the "…" icon to name your file and save it into your desired folder
12. Make sure to change the calibration file pathname in the method file so that your new calibration file is used.





4.2.3 Updating a Current Calibration File

1. Click the "C" Chromperfect icon to open the Chromperfect banner and then click on "Analysis".
2. Open the chromatogram that you would like to update the calibration file with.
3. Click on Components→Update Calibration File.



4. You can choose whether you would like update retention times, responses, or both. You can also choose whether you would like to average these new responses with the old calibration responses or if you would like to replace the old data altogether. When you are satisfied with your choices, click OK.
5. Click File→Save Calibration and then click the "…" icon to name your file and save it into your desired folder

Maintenance & Troubleshooting

WARNING: ***DANGEROUS HIGH VOLTAGES EXIST INSIDE THIS INSTRUMENT.***

BEFORE STARTING ANY OF THESE MAINTENANCE AND TROUBLESHOOTING PROCEDURES, READ THE CAUTIONS AND WARNINGS INCLUDED IN THE SECTION TITLED "ADDITIONAL SAFETY WARNINGS". PAY SPECIFIC ATTENTION TO THE PROCEDURES FOR REMOVAL OF INTERNAL INACCESSIBLE SHOCK HAZARDS. IF THE INSTRUMENT MUST BE TURNED ON DURING ANY OF THESE MAINTENANCE AND TROUBLESHOOTING PROCEDURES, BE CAREFUL AND WORK WITH THE ONE HAND RULE:

Work with one hand only.

Keep the other hand free without contacting any other object. This reduces the possibility of a ground path through the body in case of accidental contact with hazardous voltages.

CAUTION: **MANY OF THE ELECTRICAL PARTS WITHIN THE ANALYZER ARE SUSCEPTIBLE TO DAMAGE FROM ELECTROSTATIC DISCHARGE (ESD). USE ESD SAFE PROCEDURES WHEN HANDLING OR WORKING WITH ELECTRONIC COMPONENTS.**

5.1 Troubleshooting

Columns

Problem:

Each column, if operated within the proper temperature limits, should have a lifetime of 1 year+. TAI recommends having spare columns on hand in case of emergencies. Over time you may experience a changes in the column phase or column hardware.

Effects:

Tailing peaks
Fronting peaks
Retention time shift
Runaway temperature or faulty temperature reading (hardware failure)

Solution:

The column may need to be replaced. Please refer to the column change guide if that is the case. In the case of tailing, fronting, or retention time shifting it may be possible to flush the column with solvent to clear out any pollutants or "heavy" material. This should be done while the column has been removed from the GC. In the case of a hardware failure, or persistent poor performance, you will have to ship the column back to Teledyne for refurbishment

Detectors (FID)

Problem:

The FID may fail to light or the flame may go out due to fluctuations in air or H2 pressures

Effects:

Chromatogram is produced with no peaks on the FID channel

Solution:

Turn off the Hydrogen and Air to the detector and repeat the "Ignite" process. You should hear a single pop. Multiple pops may indicate that the flame is lighting and extinguishing alternately. You can check

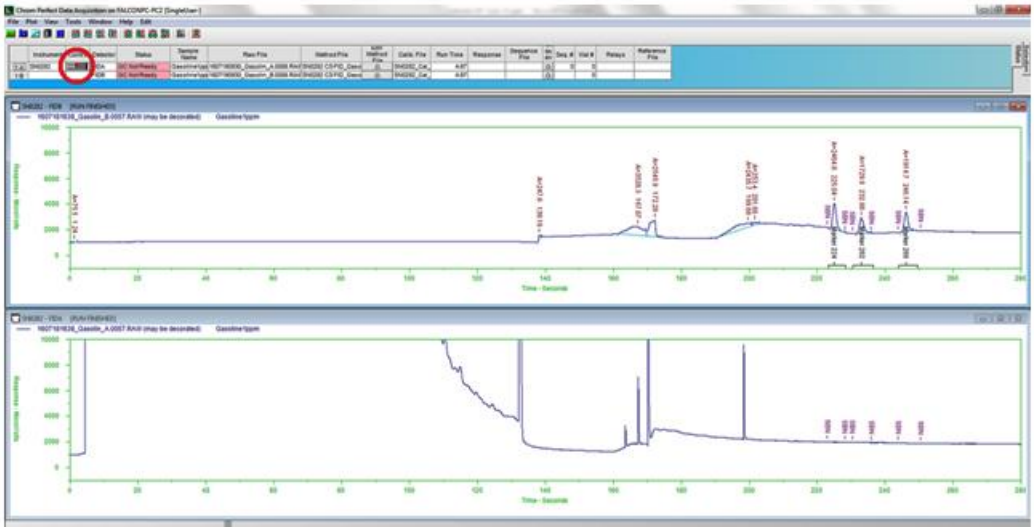
if the flame is lit by holding a reflective surface over the FID exhaust and examining for condensation. Check with a flow meter to ensure that the Air (ignite) Pressure, the Air (Run) Pressure and the Hydrogen Pressure values are consistent with those found in your Data Package shipped with the instrument.

5.2 Adjusting FID Pressures

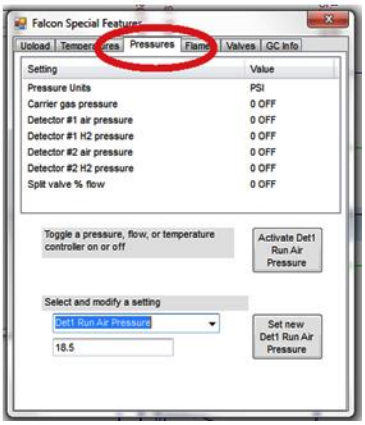
To adjust the pressure of in the FID please follow the steps described below.

Note: For Ambient and N_2 Carrier Gas applications, the settings below may be different. Refer to the Tech Note provided with the specific instrument.

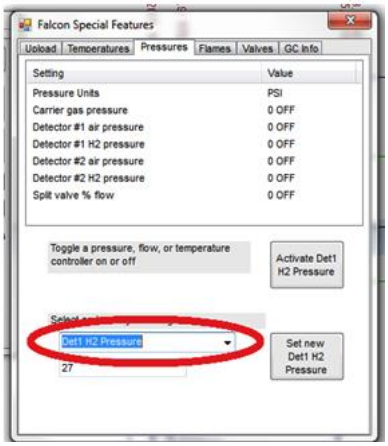
1. Turn off the H_2 and air flow to the FID. If carrier gas is N_2 adjust the flow to 5psi.
2. Click "Remote" on the Chromperfect screen.



3. Select the "Pressures" tab.



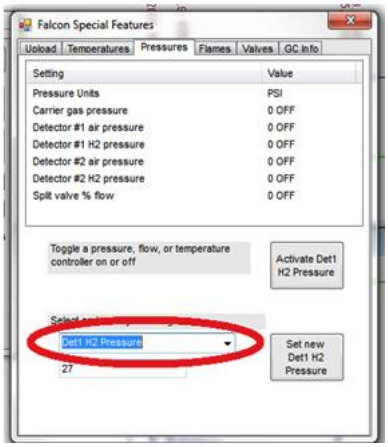
4. Select "Det1 H2 Pressure" from the dropdown menu. Then click "Activate" to turn on the H_2 flow.



5. Adjust flow to 15mL/min with carrier gas flow included.
   i. Connect a flow meter to the FID exhaust port. Click the Activate button to turn on the FID H_2 flow. If the total flow is below 15mL/min, enter a new value in the text box and click Set New Pressure. Continue this process until a flow of 15mL/min is found*.
   ii. Record this value.

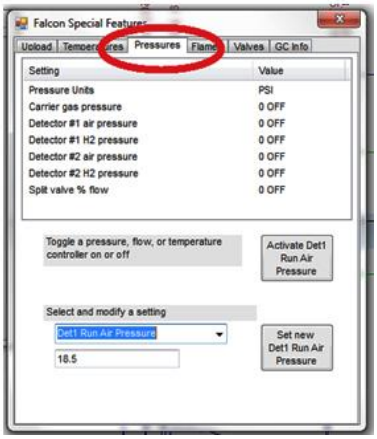
   * If the unit is hot the flow of the carrier gas must be subtracted from the total. For example if the air and H_2 on the FID are turned off and the flow through the flow meter is 2mL/min, an H_2 flow of 15mL/min will give a total flow of 17mL/min.

Select “Det1 Ign Air Pressure” from the dropdown menu.



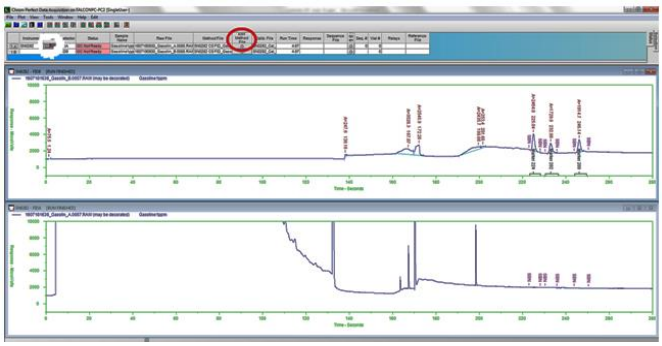
6. Adjust the flow until it is at 65mL/min.
   i. With the FID H_2 flow off adjust the IGN Air pressure until a flow of 65mL/min is obtained.
   ii. Record this value

7. Select “Det1 Run Air Pressure” from the dropdown menu.

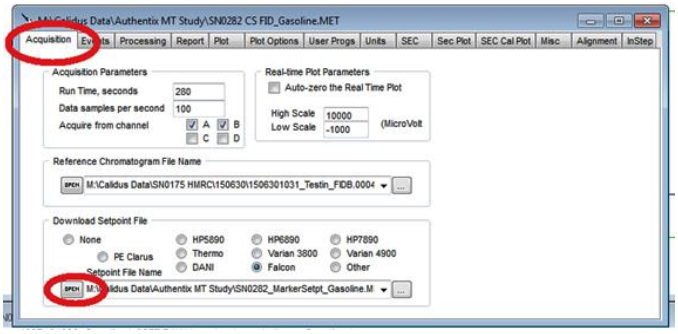


8. Adjust the flow until it is at 150mL/min.
   i. With the FID H2 flow off adjust the pressure until a flow of 150mL/min is reached.
   ii. Record this value.

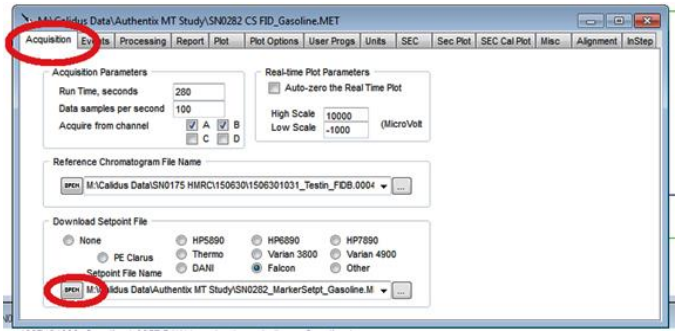
9. Select “Edit Method File” from the Chromperfect screen.



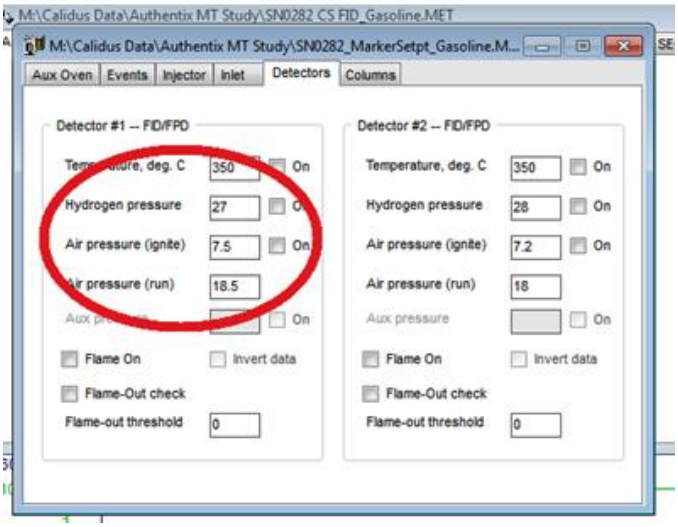
10. Select the “Acquisition” tab from the edit method screen.



11. Open the Setpoint file.



12. Select the “Detectors” tab and change the pressure values to the new values you recorded.



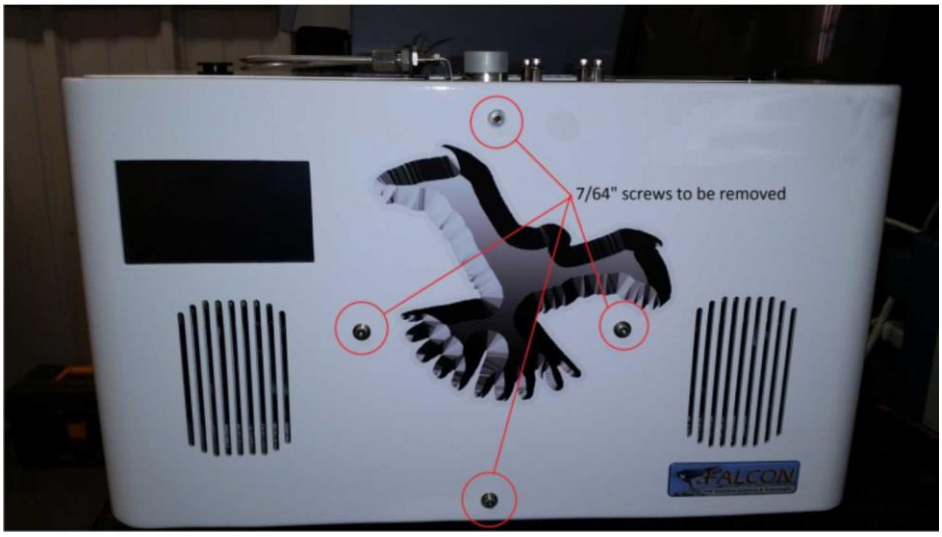
13. Close and save all screens and download the changes to the GC.

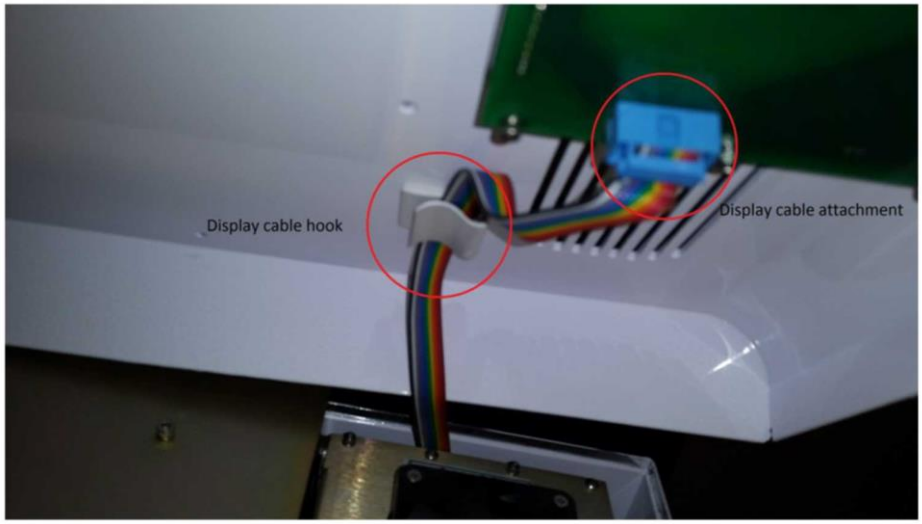
5.3 Outer Case Removal

To remove the outer case to expose the internal components, please follow the steps outlined below.

1. Remove ALL Connections From Side Panel.
   Make sure that ALL connections from the side panel of the GC are disconnected and removed.

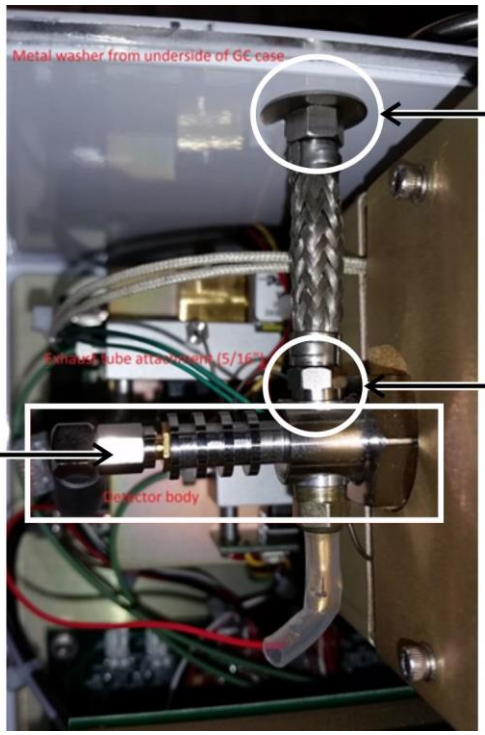
2. Front Cover Removal
   i. Remove 4 bolts circled in red using a 7/64” hex driver.
   ii. Lean case lid forward and disconnect display cable. Slide cable out from under hook.
   iii. Set case lid aside.





3. Disconnect Detector Exhaust Tubes.
   i. Unscrew black top cap from on top of case.
   ii. Slide metal washer out from underside of the case.
   iii. Using a 5/16” wrench unscrew the exhaust tube from the detector body. Brace the detector body while unscrewing to ensure that it does not move.

Unscrew knurled plastic cap from top of GC



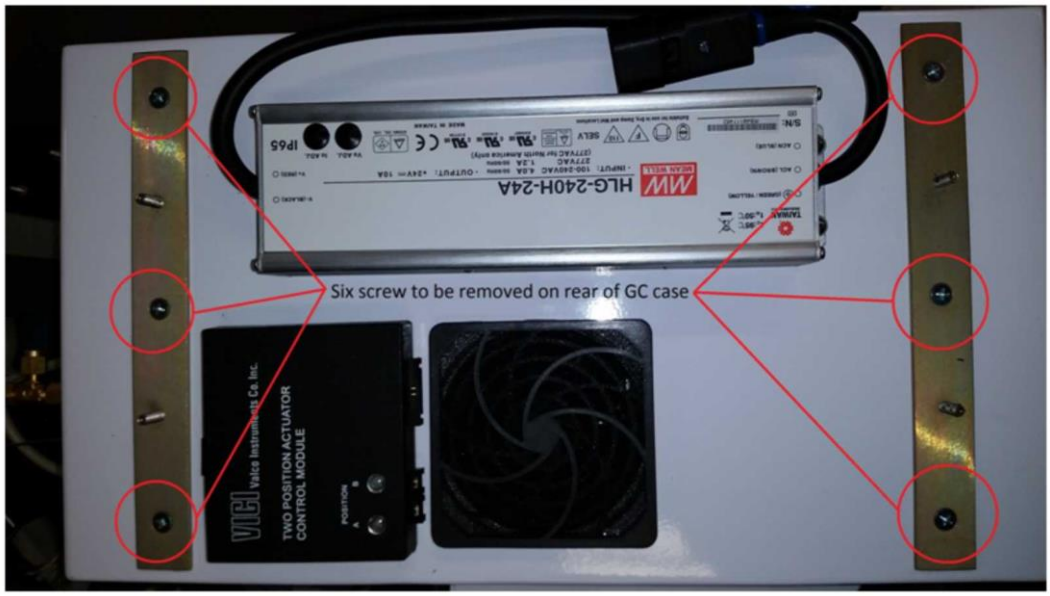
Metal washer from underside of GC case

Exhaust tube attachement (5/16")

Detector Body

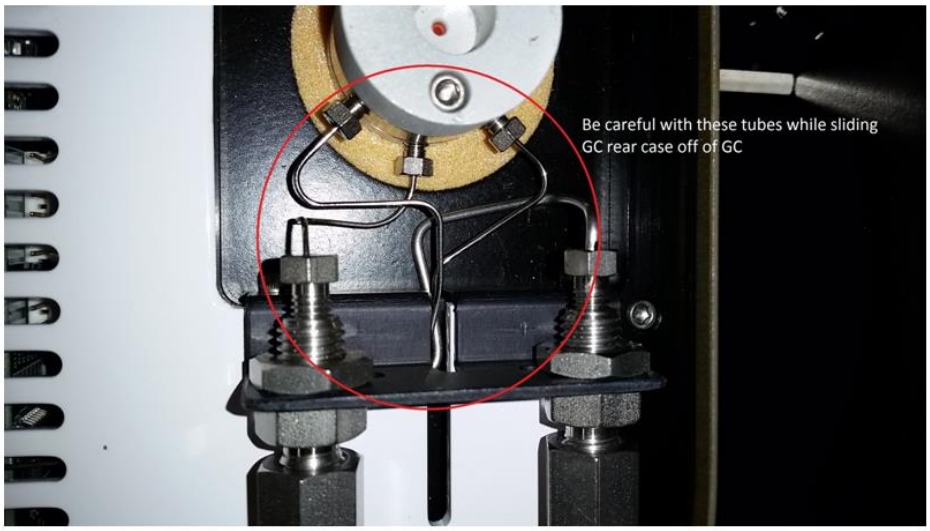
4. Removing Rear Case
   i. Remove the handle from the rear of the GC by unscrewing the 4 knobs and lifting handle free.
   ii. Unscrew 6 screws on the back of the GC and remove the rails the screws were in.
   iii. Carefully lift the rear case off of the GC by gently pulling upwards while the GC rests on its front. Take care not to pull any tubes loose from around the inlet manifold.

Note: If the case fan attached to the back of the GC enclosure has knurled thumb screws, remove all four thumb screws and unplug and remove the fan before taking the case off.



iv. Check Tubing when Removing GC Case

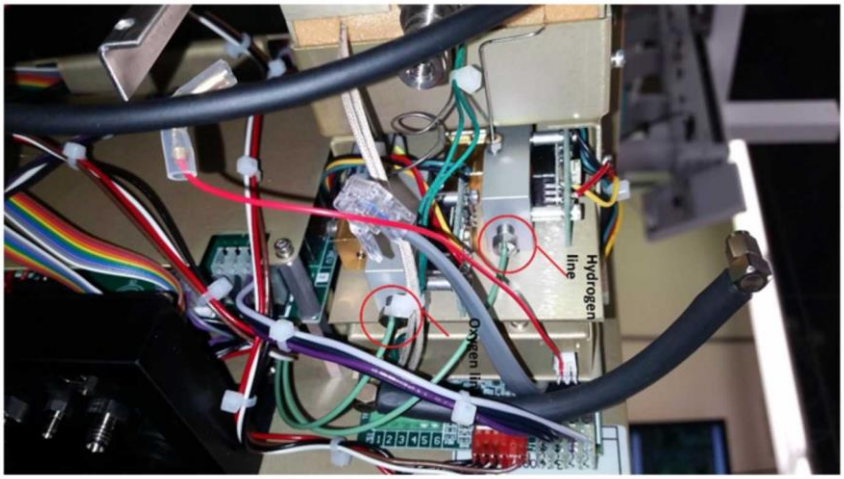
Note: If the case does not easily slide free, push down lightly on these tubes to ensure they are below the gap in the case. Do not try and force the case off. If everything is correctly removed the case should slide off easily.



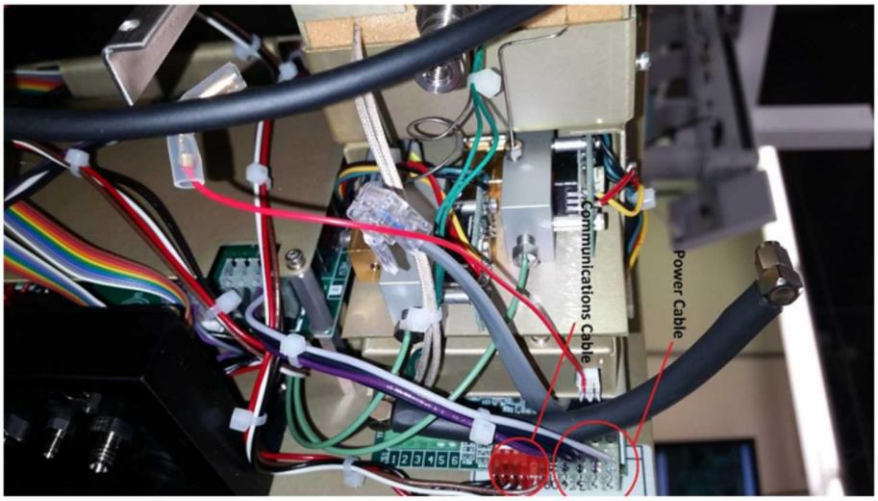
5.4 FID Removal

1. Disconnecting the Flow Restrictor
   i. Using a 1/4” and a 3/16” wrench on the fitting for the flow restrictor, disconnect the nut from the FID inlet fitting and gently remove the flow restrictor.

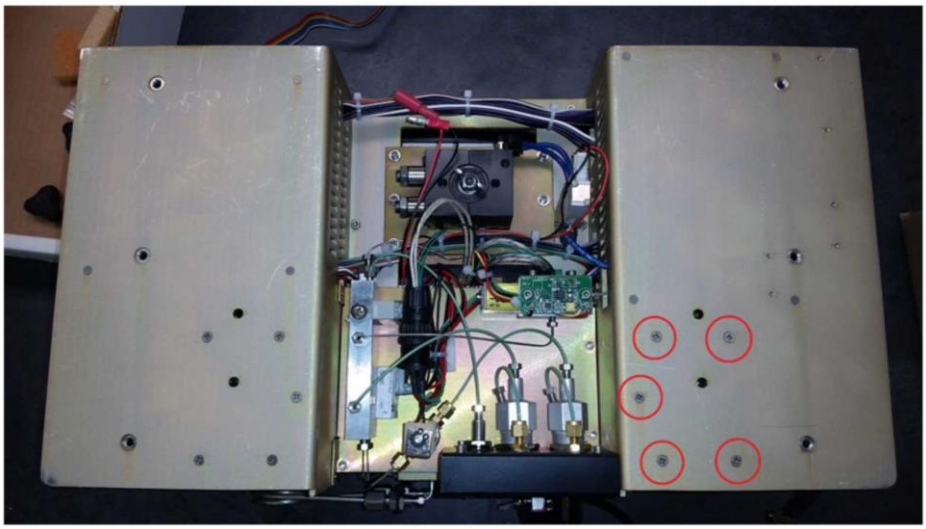
2. Remove hydrogen and air lines from the FID.
   i. Using a ¼” wrench unscrew both the hydrogen and air lines connecting the FID manifolds to the GC.
   ii. The coaxial cable to the collector may be disconnected to aid removal.



3. Disconnect Power and Communication Cables.
   i. Grasp the colored connector and pull it to the right until it is free from the pins.
   ii. Do NOT pull on the wires to free the connectors.

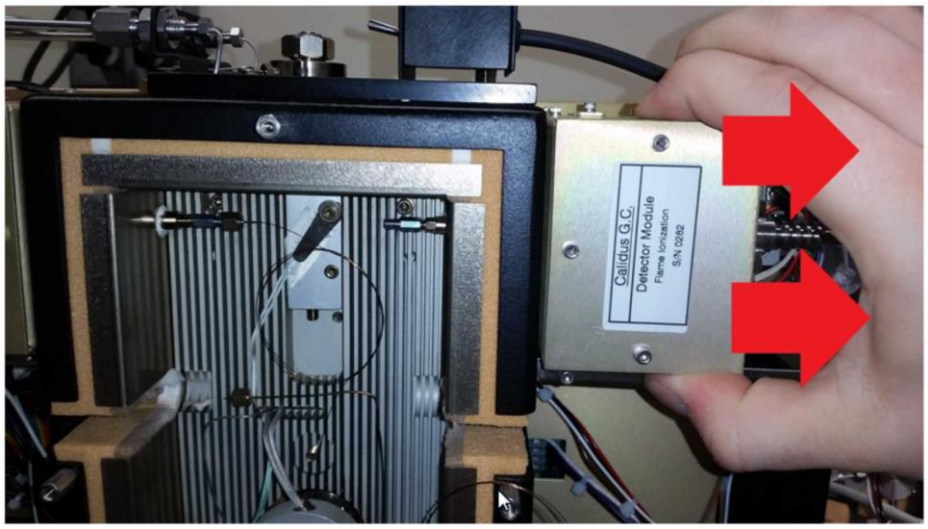


4. Remove Detector Screws.
   i. Gently set the GC on its front so that you will have access to screws on the back of the chassis.
   ii. Using a Phillips-Head screwdriver remove the 5 detector mounting screws from the chassis of the GC.



5. Separating the FID
   i. After everything has been disconnected, grasp the FID oven body and gently slide it away from the oven. There may be an FID installed on the other side of the GC as well.
   ii. The FID should slide free easily. Do NOT pull on the FID if there is resistance. Check for any connections still attached to the FID.
   iii. Take care to preserve the insulating foam ring around the body of the FID against the injector oven. This will need to be put back in place upon new FID installation.

Note: When re-installing the FID, be sure to cap or plug the sample inlet fitting so that foam debris does not enter the end fitting.

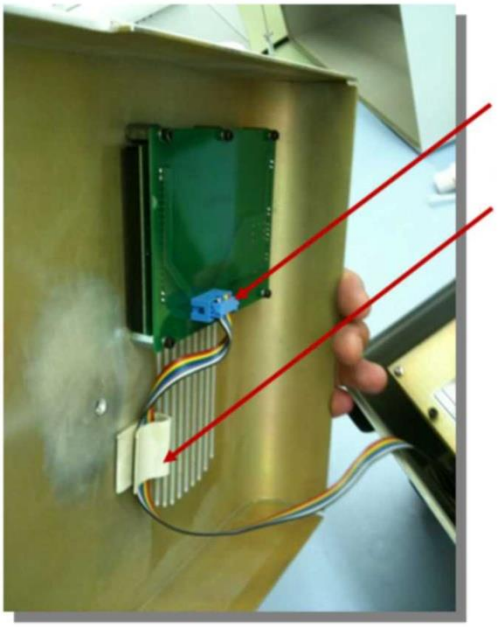


Note: The above picture shows the FID installed on Channel 2. Typically all IGDL units have the FID installed on channel 1 (to the left of the oven) thus the FID would be pulled the opposite way.

5.5 Column Module Installation

1. Remove the front cover by removing the 4 screws on the front panel.

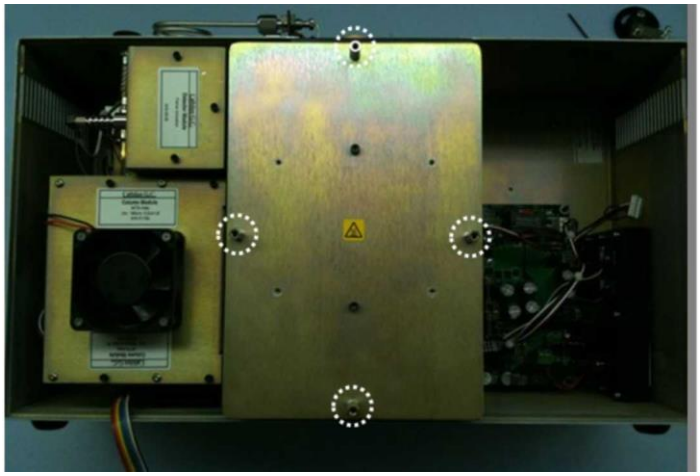
2. Remove front cover and ribbon cable.



Carefully remove the front cover and unplug the ribbon cable from the touch screen display.

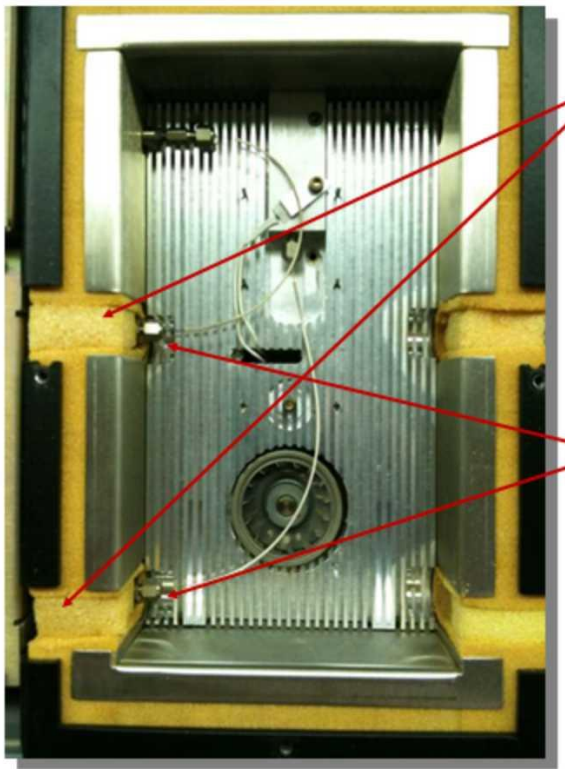
Slide the ribbon cable out from under the fold-down clip and set the front cover aside.

3. Remove the SPU oven lid by unscrewing the 4 hex stand-offs circled below.



4. Remove the foam oven plugs by gently pulling them straight up and out of their slots.
5. Disconnect the column transfer tubes from the column module using a 1/4" open ended wrench on the hex nut and a 3/16" open ended wrench on the column end hex union. Be sure to hold the column end hex union firmly so it doesn't twist the column end while loosening the nut.

Note: If your transfer tubes are fused silica and you're using graphitized vespel ferrules, the ferrules can be re-used if not badly deformed.

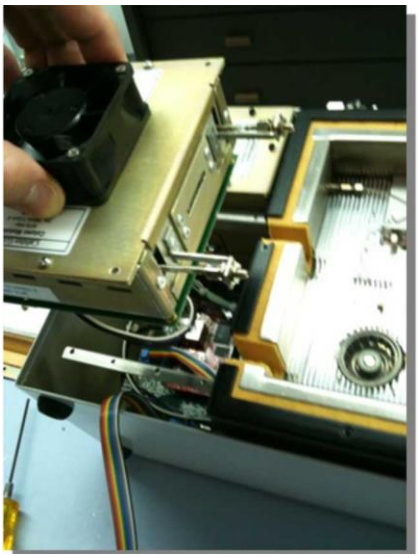


Remove the foam oven plugs by gently pulling them straight up and out of their slots.

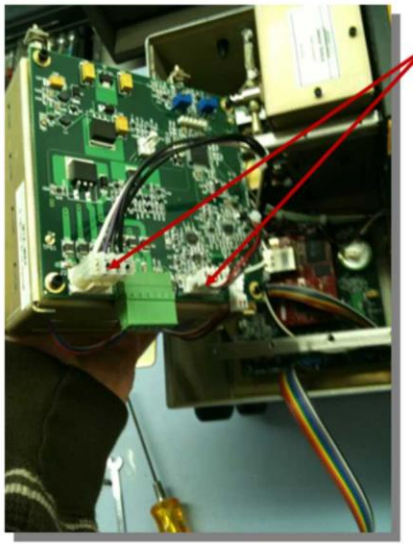
Disconnect the column transfer tubes from the column module using a 1/4" open ended wrench on the hex nut and a 3/16" open ended wrench on the column end hex union. Be sure to hold the column end hex union firmly so it doesn't twist the column end while loosening the nut.

6. Remove the 4 column module mounting screws shown circled in the picture with a 3/32" hex driver.

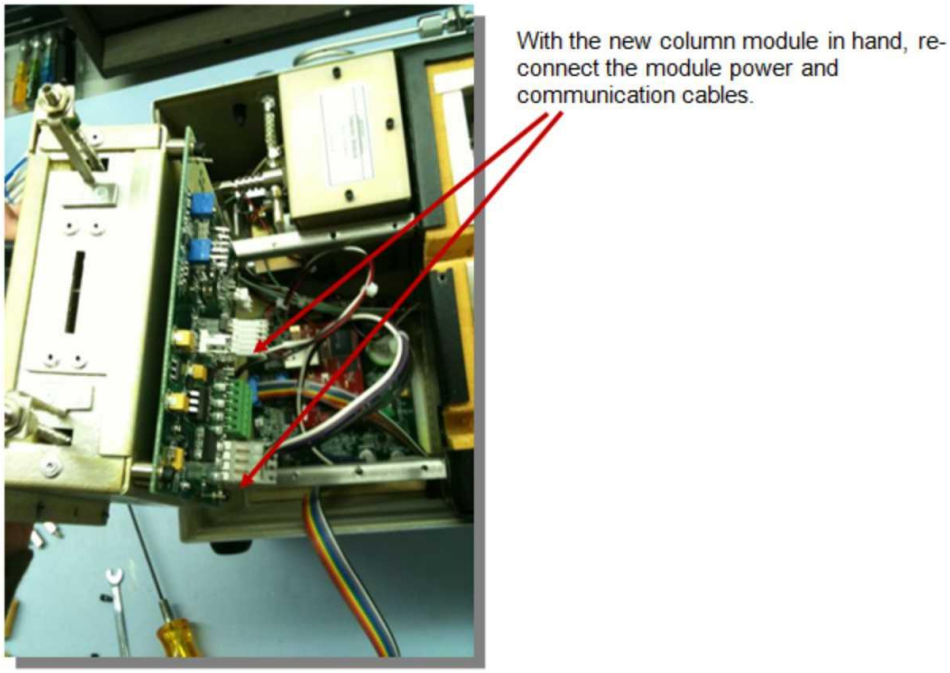
7. Remove the column module from the instrument by grasping the black cooling fan and lifting straight up and out of the slots.



8. Gently rotate the column module upside down and unplug both the power and communication cables from the module PCB.



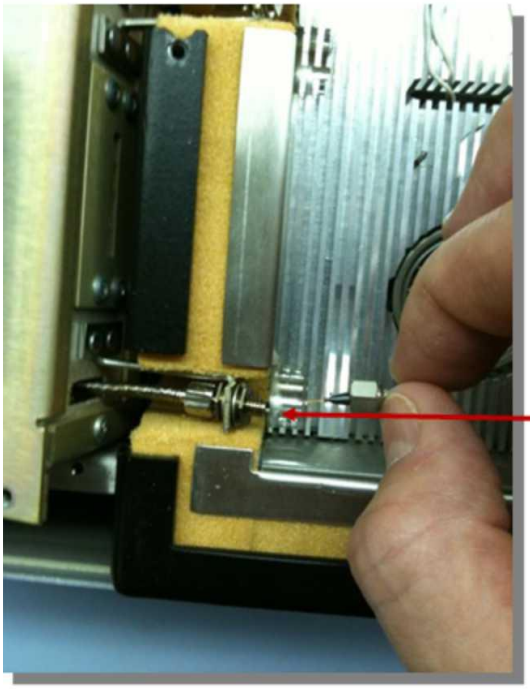
9. With the new column module in hand, re-connect the module power and communication cables.



10. Insert the column module between its mounting brackets and press it about half way down into position.

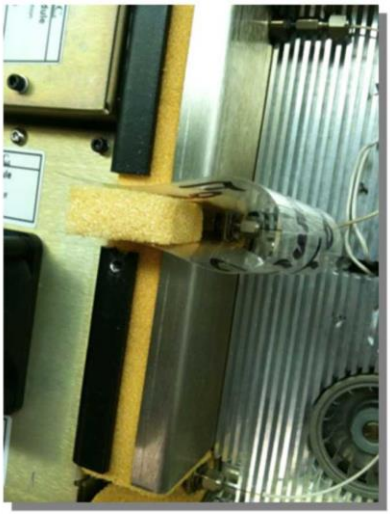
Note: Inserting it half-way rather than all of the way allows for easier re-connection of the transfer tubes.

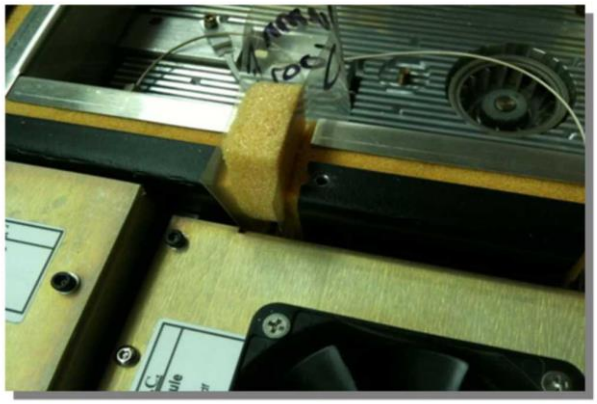
11. Re-connect the transfer tubes to the column end fittings. If using fused silica tubes, be sure to insert the fused silica into the fitting until you "feel" it stop against the bottom of the fitting. Tighten the hex nut with the 1/4" wrench while holding the column hex union with a 3/16" wrench until snug. Do not over tighten.



12. Press the column module down into its fully seated position on the mounting brackets. Attach the column module to the brackets with the screws that were removed in Step 6 using a 3/32" hex driver.
13. Fold a thin, flexible plastic strip into a "U" shape and insert it sideways above the column end fitting inside the slot as shown. Insert a foam plug in between the plastic ends and slide the foam plug down snug with the column end connection.

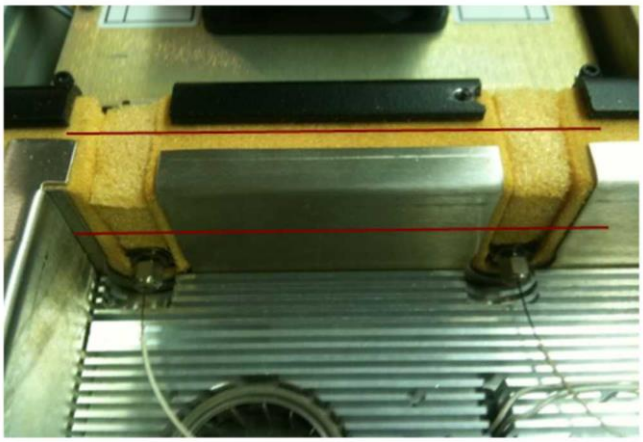
Note: The plastic strip acts a "shoehorn" to enable the foam plug to slide easily and tightly against the column end connection thereby minimizing air leakages. It is used to protect the edges of the column plugs.



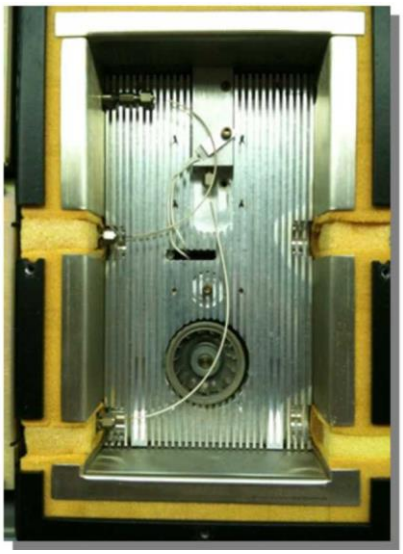


14. Gently holding the top of the foam plug with a finger, slowly pull the plastic plug tool out from between the oven insulation and foam plug making sure that the foam plug stays snug against the column end fitting at the bottom.

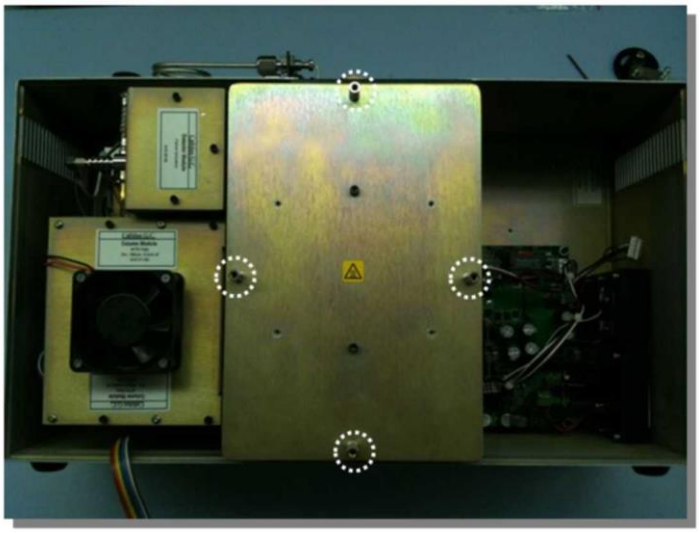
15. After inserting both column slot plugs, they should look like the above with the inside and top edges flush with the SPU oven insulation (red lines).



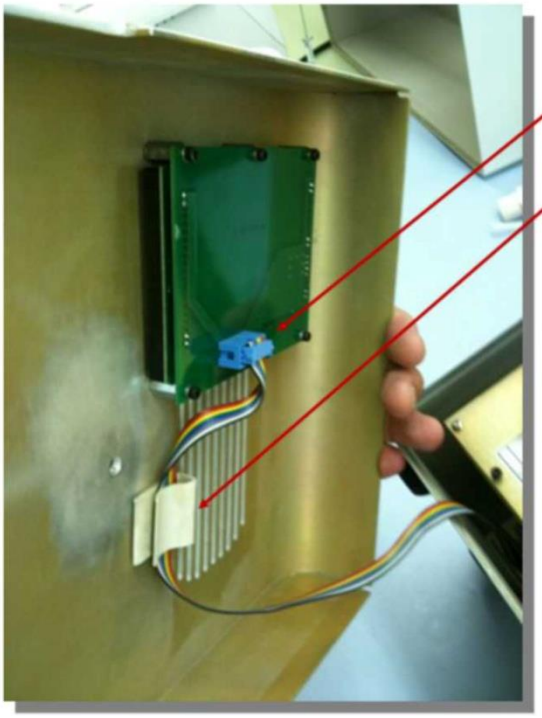
16. With the SPU top still removed, power on the instrument and activate the carrier gas. (Since the touch screen display is still disconnected, the carrier gas can be activated in Chromperfect in the instrument “Special Features” box under the “Pressures” tab.) Leak check all connections in the oven for leaks.



17. Reattach the SPU oven lid using the 4 hex stand-offs circled in the picture below.



18. With the instrument turned OFF, carefully reattach the ribbon cable to the touch screen display.
19. Slide the ribbon cable under the hold-down clip. See the picture below.



Step 18: With the instrument turned OFF, carefully reattach the ribbon cable to the touch screen display.

Slide the ribbon cable under the hold-down clip.

20. Replace the front on the unit using the 4 screws removed in Step 1.

Installation is complete. After powering up the instrument, all of the column's information can be viewed either from the touchscreen display in the “Column Module” screen or in under the “GC Info” tab of the “Special Features” box in Chromperfect.

5.6 Replacing the Glow Plug

Caution: ***If the unit is on and at operating temperature the glow plug will be very hot. It should NOT be touched without proper precautions. If the unit is off and near room temperature the glow plug will be at a safe temperature and can be touched without tools or gloves.***

1. Remove the red wire that connects the glow plug to the FID board near the base of the FID. This can be done by lightly pulling on the rubber sleeve covering the metal end of the glow plug wire.

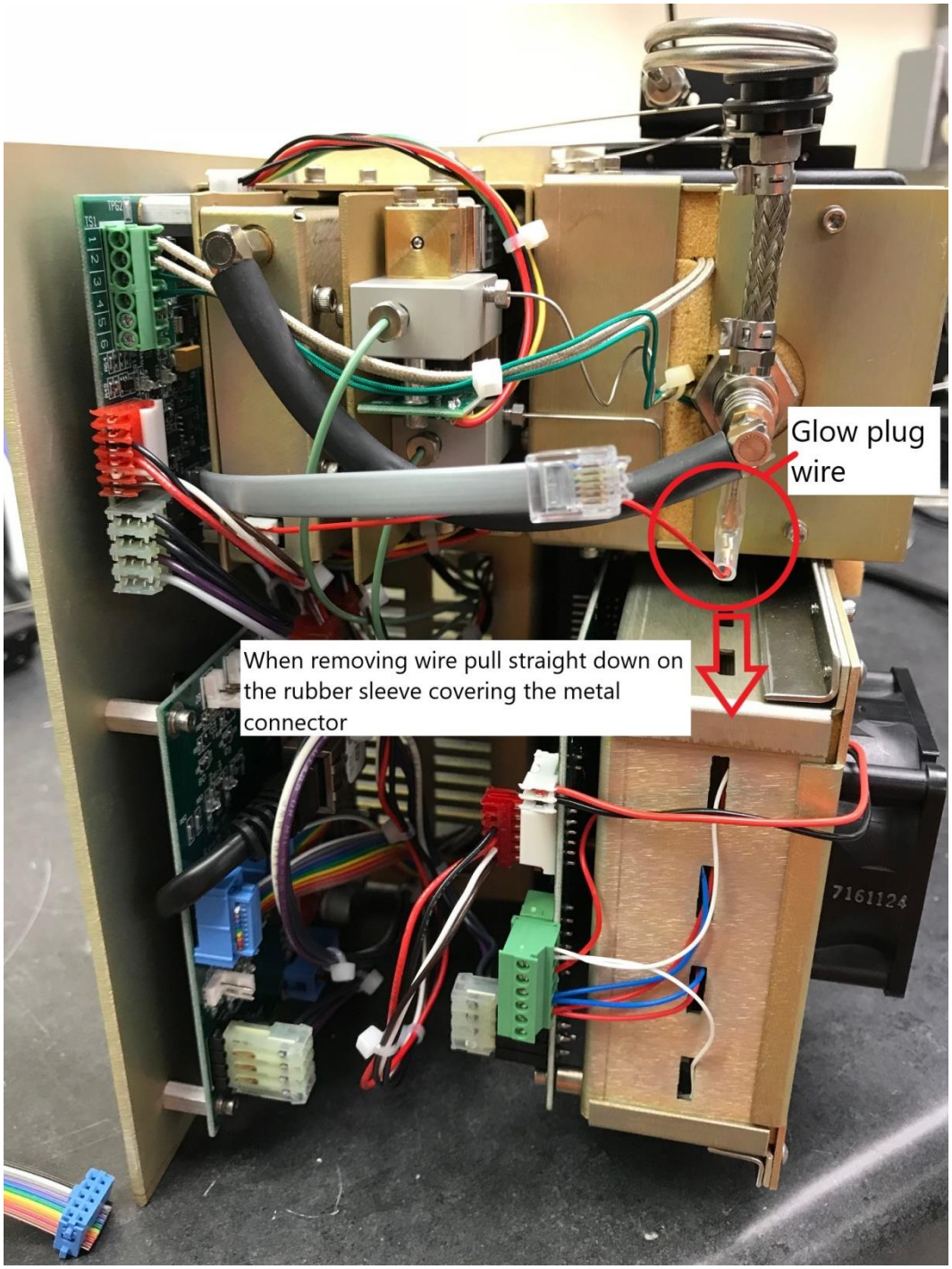


Figure 5-1: Glow Plug Wire

2. With glow plug wire removed, the glow plug can be removed from the FID body. Using a 5/16" wrench loosen the glow plug until it comes free of the FID body. Do NOT try to pull the glow plug from the FID body. When it is fully unscrewed the glow plug should come away freely.

3. Place the copper washer and glow plug shim onto the new glow plug. The copper washer should be placed on the glow plug first, followed by the metal shim.

4. Insert the new glow plug into the FID body and tighten ¼ turn past snug.

5. Re-attach glow plug wire.

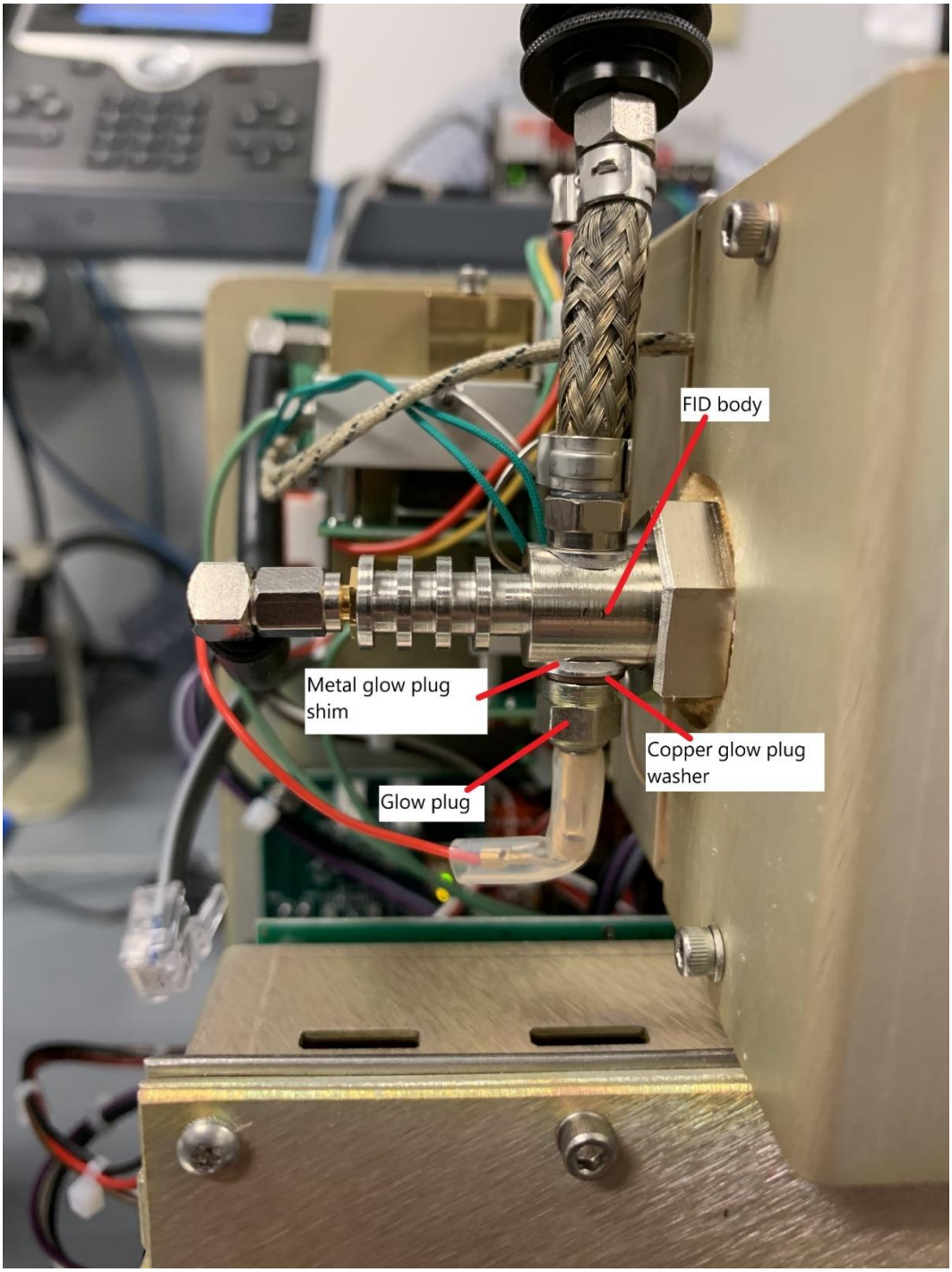


Figure 5-2: FID Diagram

Appendix

A.1 Specifications:

A.2 Recommended Spare Parts List

Qty.	P/N	Description

IMPORTANT: Orders for replacement parts should include the part number and the model and serial number of the system for which the parts are intended.

Send orders to:

TELEDYNE INSTRUMENTS

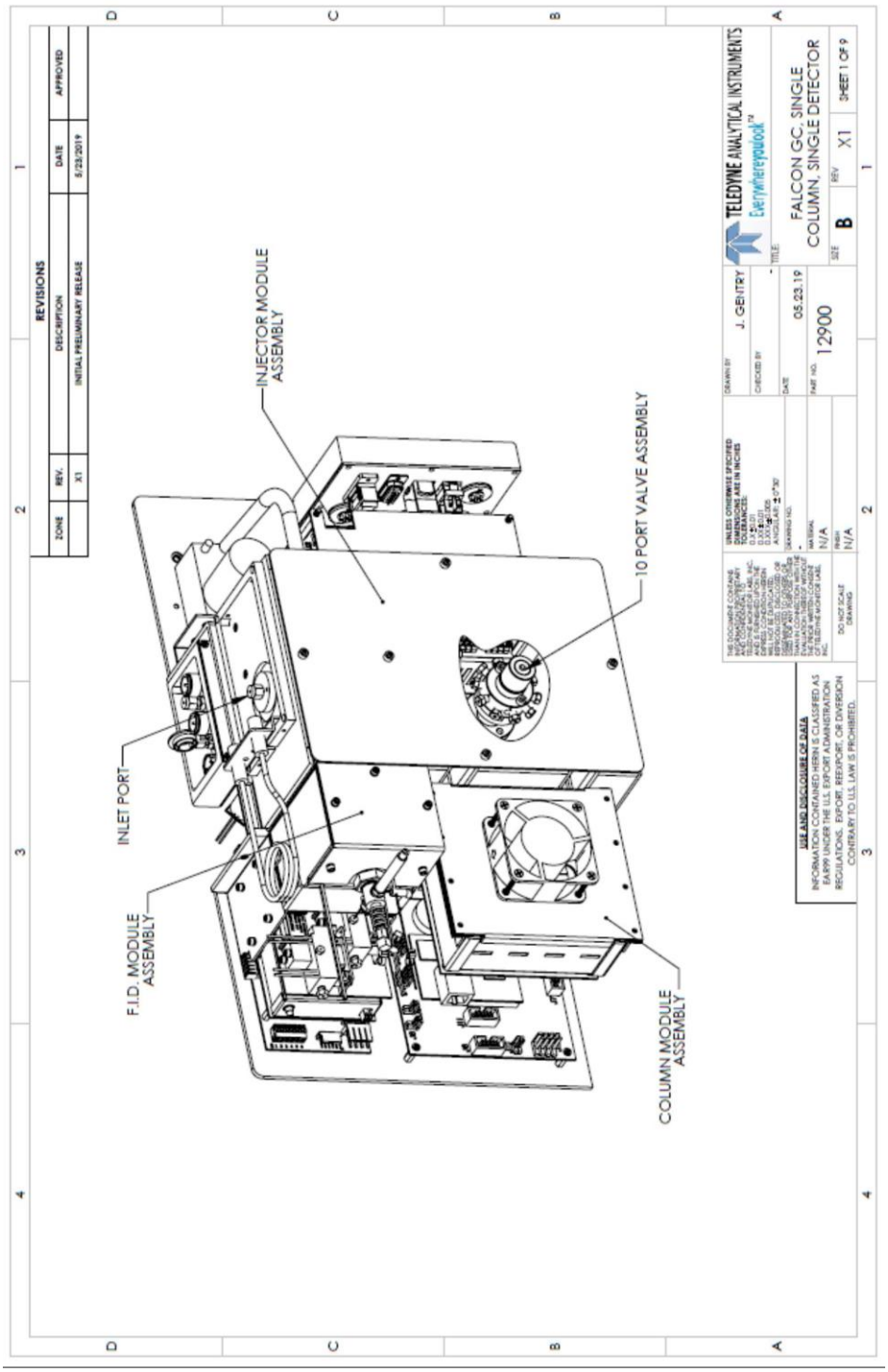
Analytical Instruments

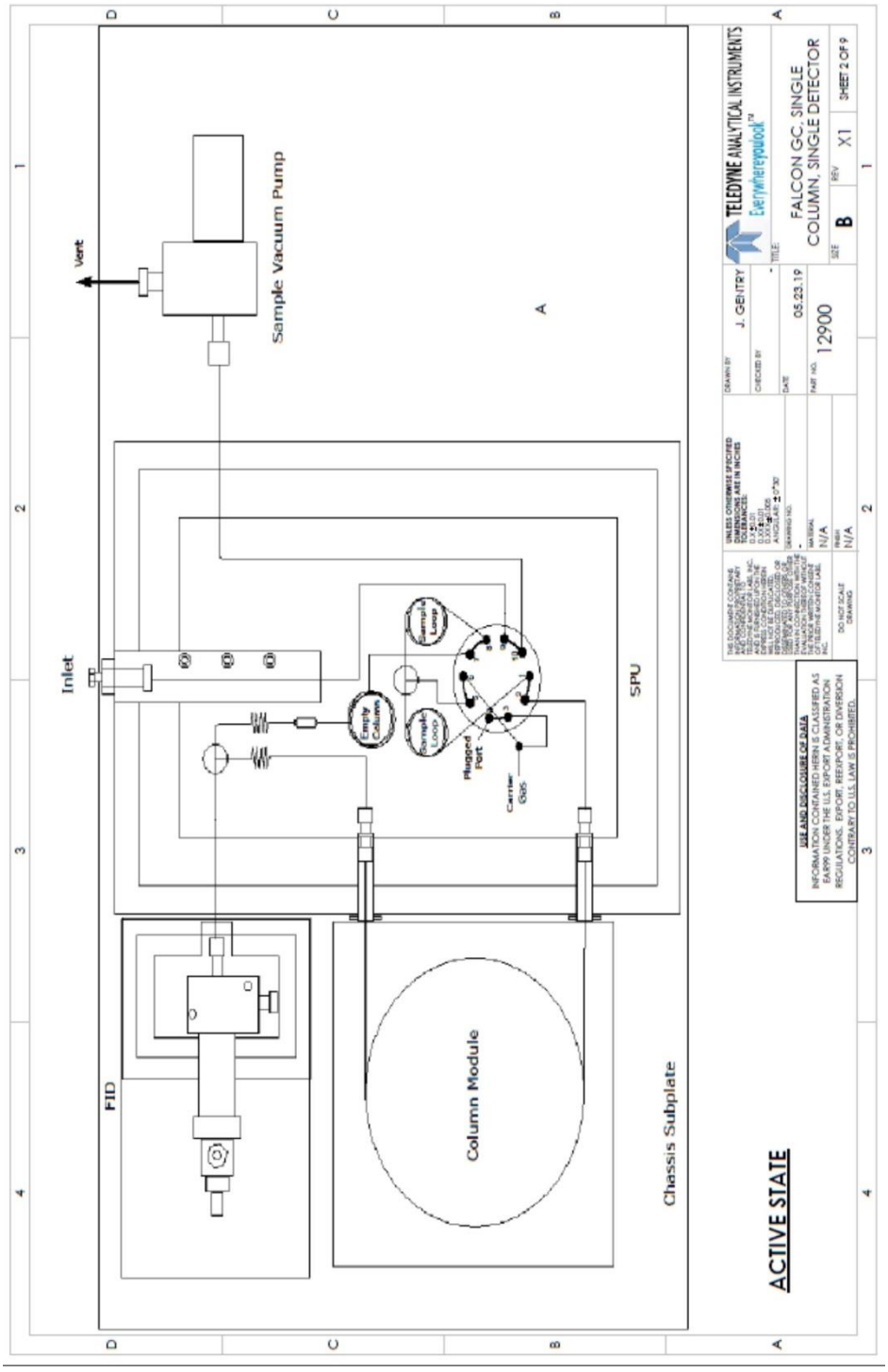
16830 Chestnut Street
City of Industry, CA 91748

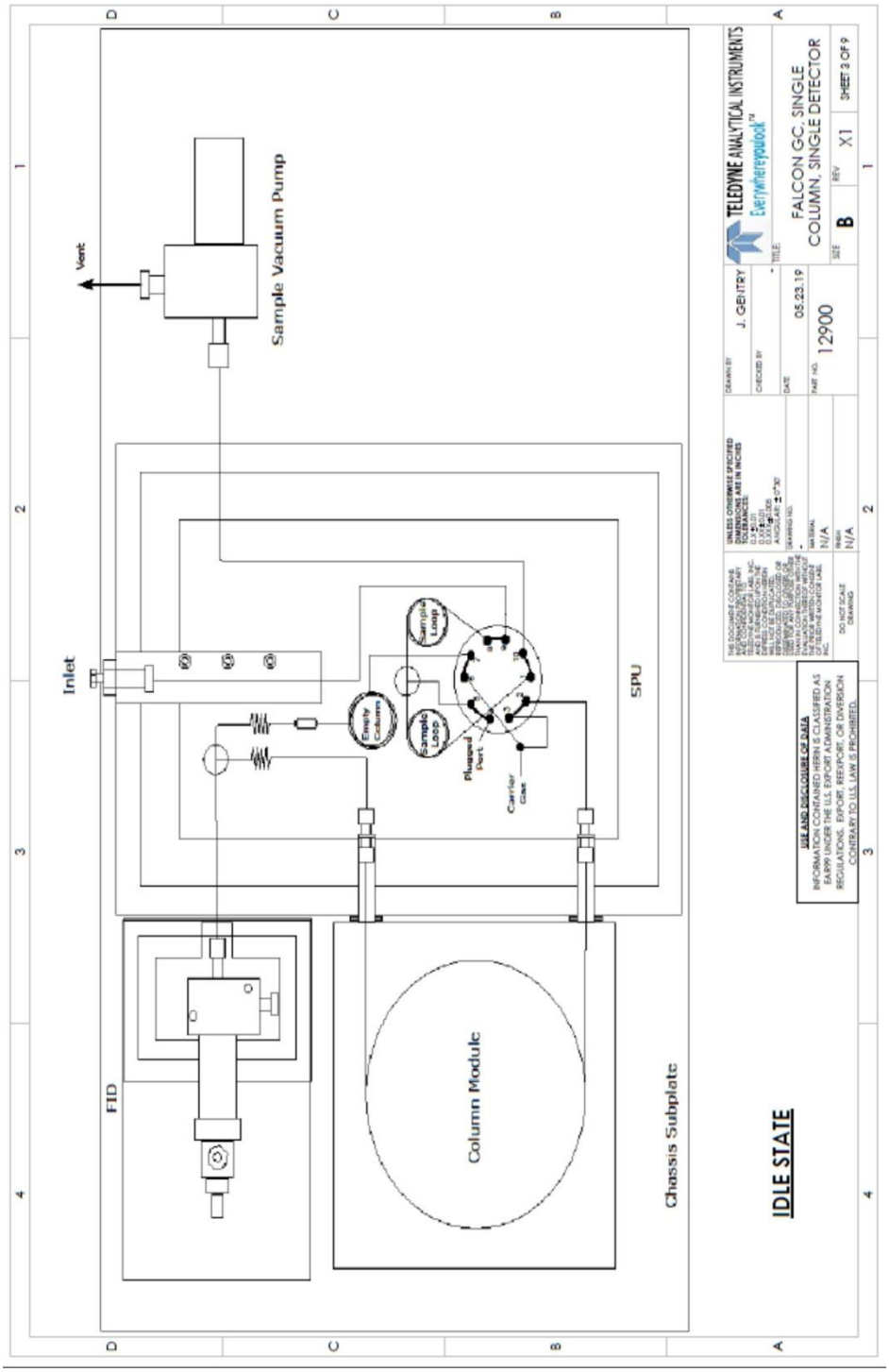
Telephone: (626) 934-1500
Fax: (626) 961-2538

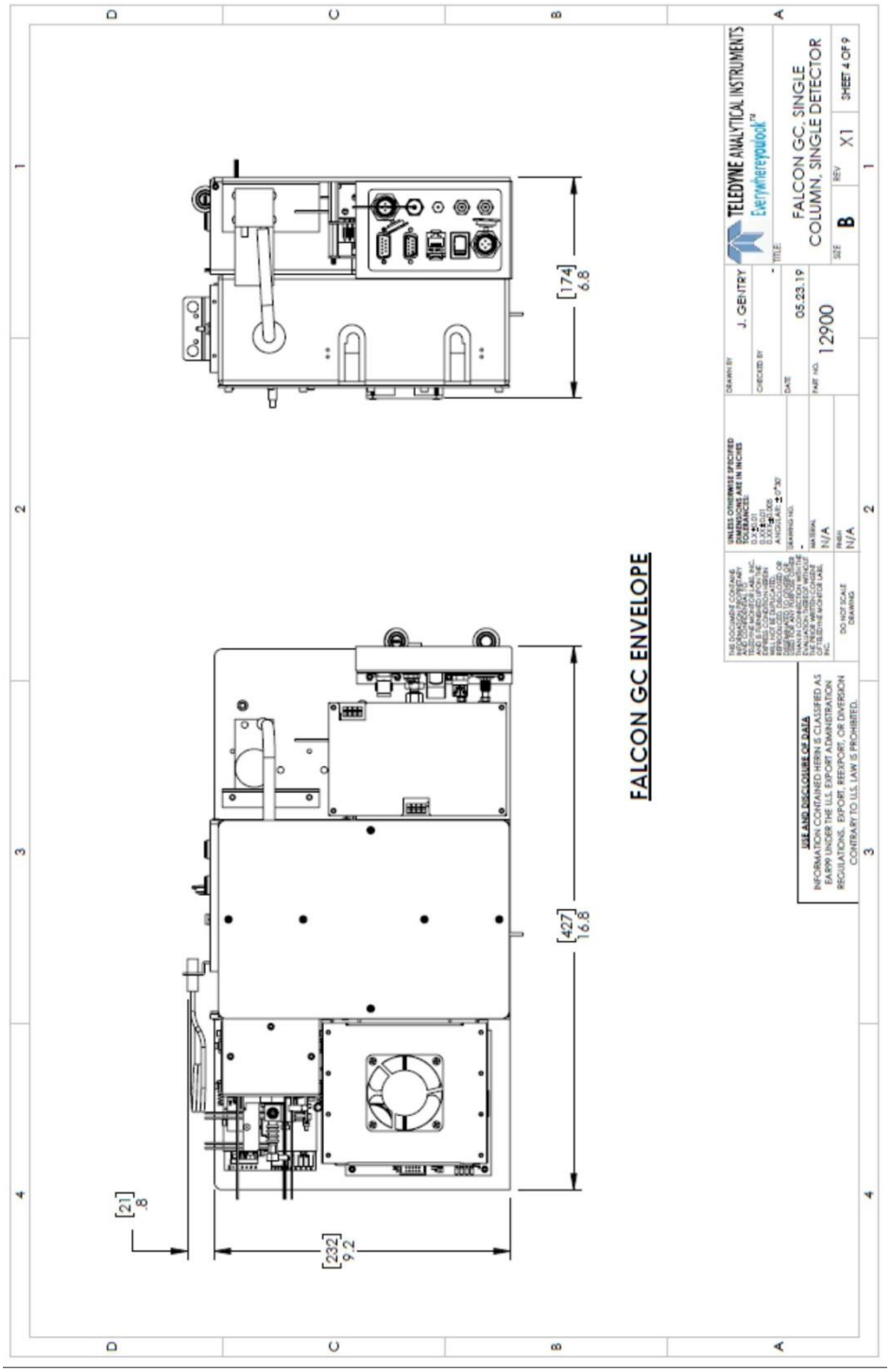
Web: www.teledyne-ai.com
or your local representative.
Email: ask_tai@teledyne.com

A.3 Drawings


INJECTOR MODULE ASSEMBLY
10 PORT VALVE ASSEMBLY
INLET PORT
F.I.D. MODULE ASSEMBLY
COLUMN MODULE ASSEMBLY
REVISIONS
ZONE
REV.
DESCRIPTION
DATE
APPROVED
X1
INITIAL PRELIMINARY RELEASE
5/23/2019
TELEDYNE ANALYTICAL INSTRUMENTS
Everywhereyoulook™
FALCON GC, SINGLE COLUMN, SINGLE DETECTOR
12900
B
X1
SHEET 1 OF 9


Vent
Sample Vacuum Pump
Inlet
SPU
FID
Column Module
Chassis Subplate
Sample Loop
Empty Column
Sample Loop
Flapped Port
Carrier Gas
TELEDYNE ANALYTICAL INSTRUMENTS
FALCON GC, SINGLE COLUMN, SINGLE DETECTOR
12900
ACTIVE STATE


Vent
Sample Vacuum Pump
Inlet
FID
Sample Loop
Empty Cavity
Sample Loop
Plugged Port
Carrier Out
SPLI
Column Module
Chassis Subplate
IDLE STATE
TELEDYNE ANALYTICAL INSTRUMENTS
Everywhereyoulook™
FALCON GC, SINGLE COLUMN, SINGLE DETECTOR
J. GENTRY
05.23.19
12900
B
X1
SHEET 3 OF 9


FALCON GC ENVELOPE
[174]
6.8
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16.8
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[232]
9.2
TELEDYNE ANALYTICAL INSTRUMENTS
FALCON GC, SINGLE COLUMN, SINGLE DETECTOR
J. GENTRY
05.23.19
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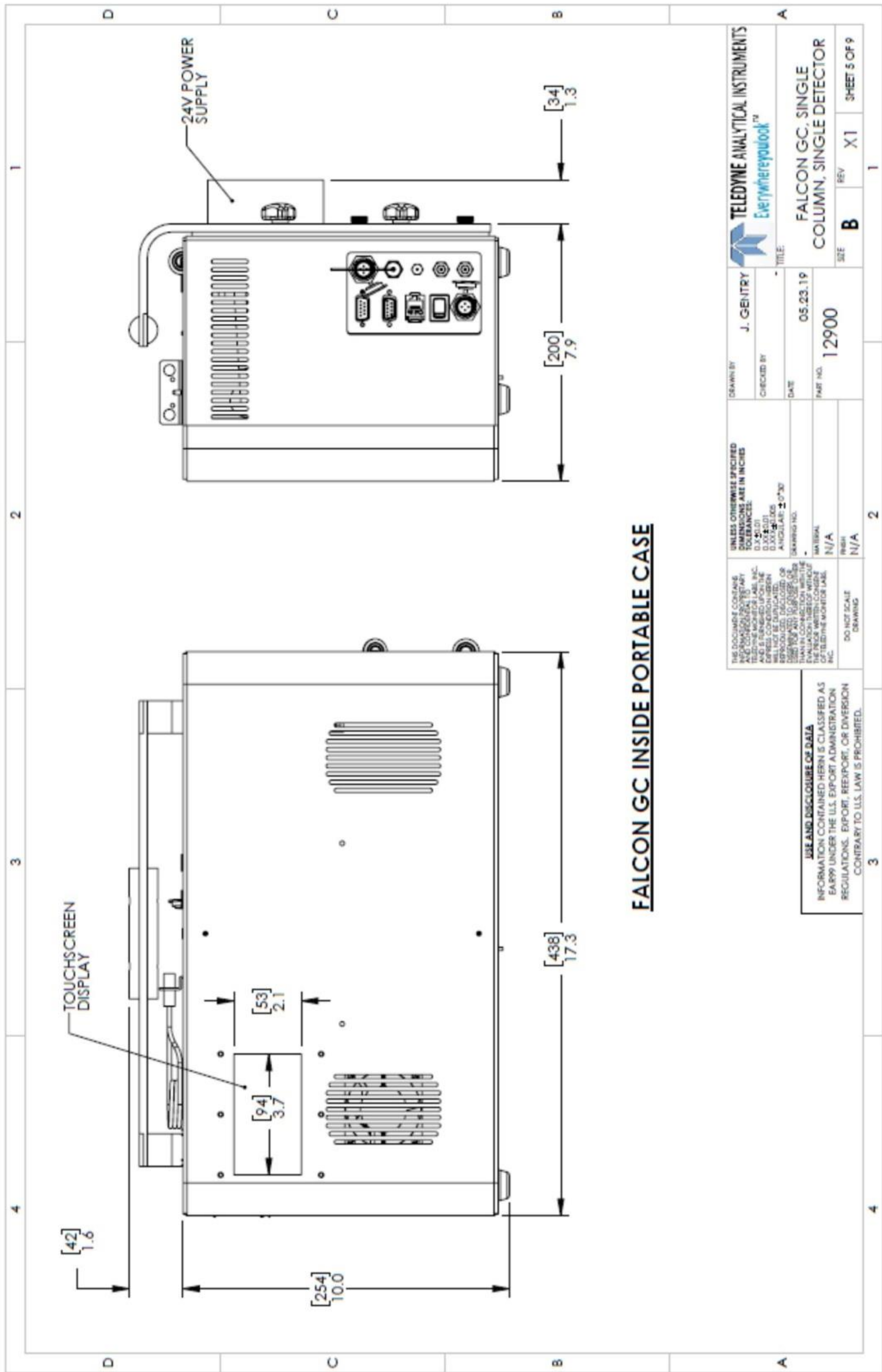
B
X1
SHEET 4 OF 9


24V POWER SUPPLY
TOUCHSCREEN DISPLAY
FALCON GC INSIDE PORTABLE CASE
[34] 1.3
[200] 7.9
[438] 17.3
[53] 2.1
[94] 3.7
[42] 1.6
[254] 10.0
TELEDYNE ANALYTICAL INSTRUMENTS
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FALCON GC, SINGLE COLUMN, SINGLE DETECTOR
B
X1
SHEET 5 OF 9
N/A
N/A
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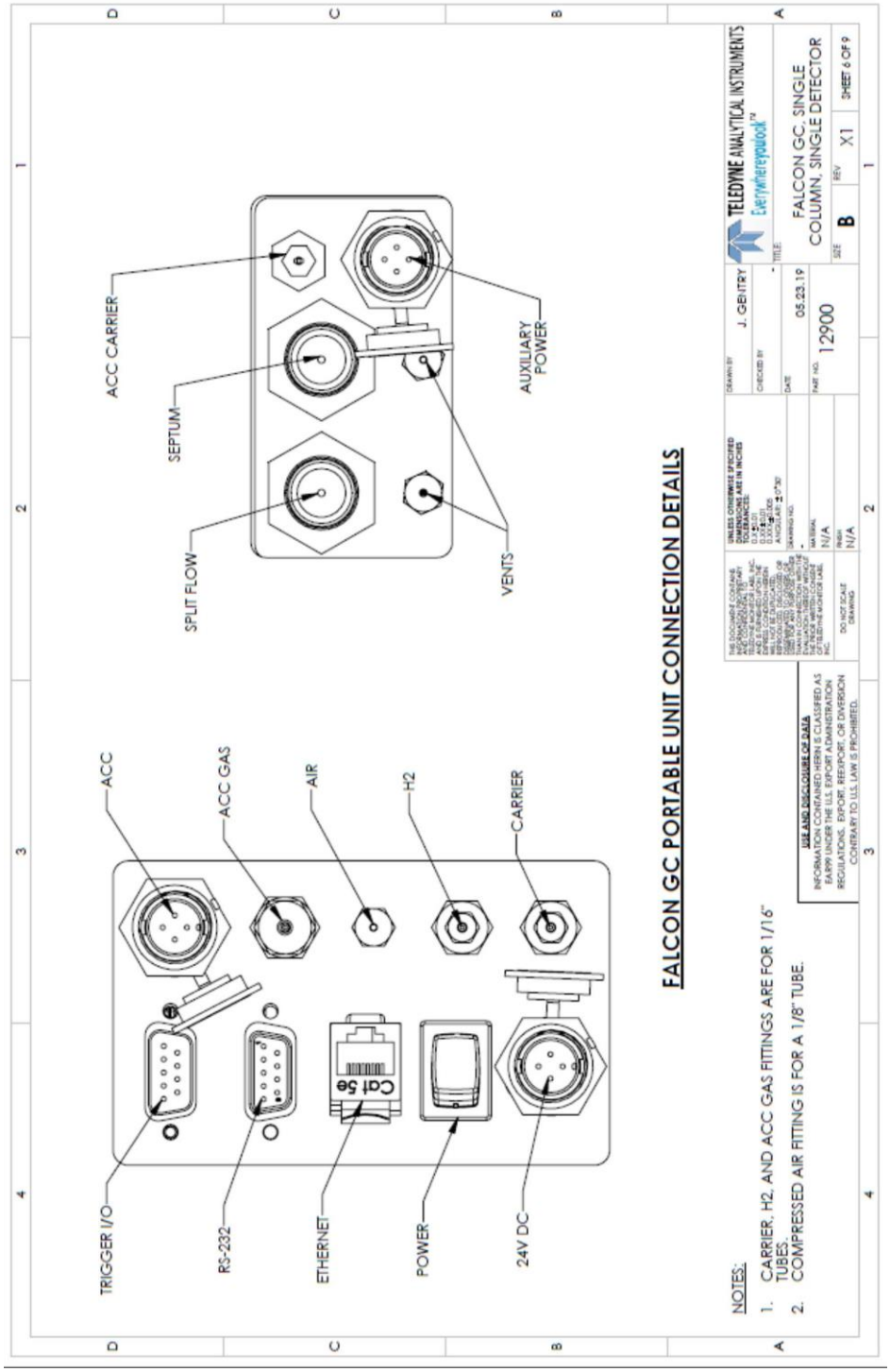
USE AND DISCLOSURE OF DATA
INFORMATION CONTAINED HERIN IS CLASSIFIED AS EAR99 UNDER THE U.S. EXPORT ADMINISTRATION REGULATIONS. EXPORT, REEXPORT, OR DIVERSION CONTRARY TO U.S. LAW IS PROHIBITED.


FALCON GC PORTABLE UNIT CONNECTION DETAILS
ACC CARRIER
SEPTUM
SPLIT FLOW
AUXILIARY POWER
VENTS
ACC
ACC GAS
AIR
H2
CARRIER
TRIGGER I/O
RS-232
ETHERNET
POWER
24V DC
Cat 5e
NOTES:
1. CARRIER, H2, AND ACC GAS FITTINGS ARE FOR 1/16" TUBES.
2. COMPRESSED AIR FITTING IS FOR A 1/8" TUBE.
TELEDYNE ANALYTICAL INSTRUMENTS
FALCON GC, SINGLE COLUMN, SINGLE DETECTOR
12900
B
X1
SHEET 6 OF 9