QUICKSTART GUIDE

MODEL 4020

Total Hydrocarbon Analyzer

GETTING STARTED

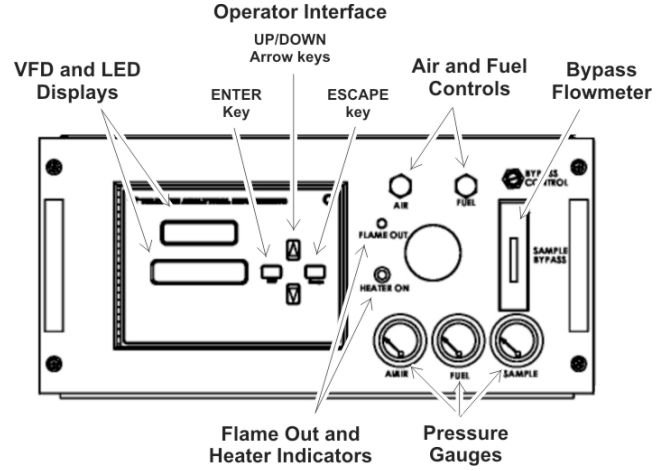
Teledyne Analytical Instruments Model 4020 Total Hydrocarbon Analyzer is a versatile instrument designed to measure the quantity of hydrocarbons present in a positive pressure sample as equivalent methane.

This Quickstart Guide is designed to get you set up and operating your Teledyne Analytical Instruments Analyzer quickly. It shortcuts the details so you can install and use your new analyzer with a minimum of fuss. This Quickstart Guide should be used in conjunction with the Instruction Manual that shipped with your instrument. Only necessary features to get you operational are discussed in this guide. Many of the advanced features of this analyzer are not described so you should refer to the Instruction Manual to get the most from your analyzer.

CAUTION: **IT IS VITALLY IMPORTANT THAT YOU READ AND UNDERSTAND ALL THE SAFETY AND HAZARD WARNINGS PUBLISHED IN THE ACCOMPANYING INSTRUCTION MANUAL. THIS INSTRUMENT USES HYDROGEN GAS AS A FUEL AND HAS POTENTIALLY LETHAL VOLTAGES INSIDE THE CASE.**

Front Panel (Operator Interface)

Take a minute to familiarize yourself with the analyzer's interface. The standard 4020 Total Hydrocarbon Analyzer is housed in a sheet steel enclosure designed for mounting in a 19" equipment rack or cabinet. All controls and displays are accessible from the front panel. The operator interface consists of four buttons for operating the analyzer, LED and Vacuum Fluorescent (VFD) display screens, plus gas controls, pressure gauges, bypass flowmeter and LED indicators.



Control Keys:

The ENTER key is context-sensitive and functions differently depending on the task:

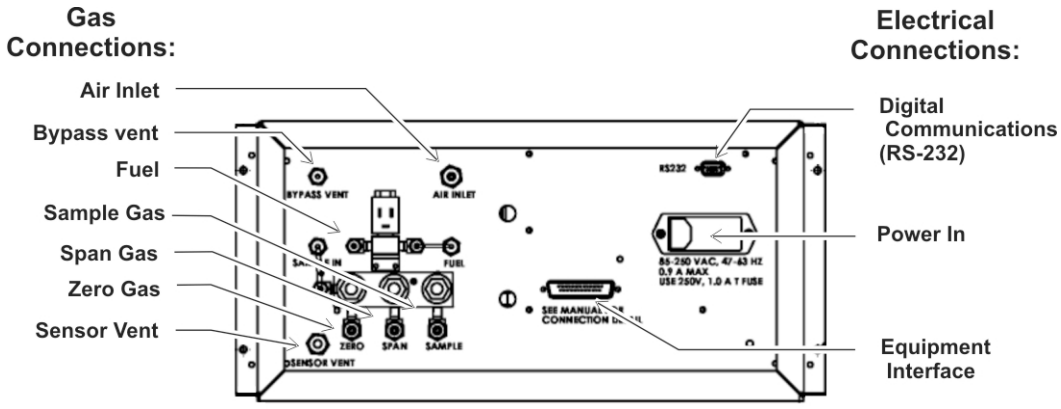
1. When the selected option is a function on the MAIN MENU screen *(Setup Mode*), the function name appears with an arrow next to it. The ENTER key is used to activate the function. The next screen for that function or sub function will appear on the VFD.
2. If the selected option is a modifiable item, the UP or DOWN keys are used to increment or decrement the item to the value or action you want. The ENTER key is then used to accept the value and move you to the next field to continue programming.
3. When the last field is entered, ENTER takes you to the next screen in the process, or if the process is completed, ENTER takes you back to the ANALYZE screen (*Analyze Mode*).

The ESCAPE key takes you back to the previous screen.

If you do not wish to continue a function, you can abort the session by escaping. Escaping a function takes the analyzer back to the previous screen, or to the ANALYZE screen, depending on the nesting level of screens in the function you are moving out of.

Rear Panel

At the rear panel you make the gas and electrical connections to the instrument.



- **AC Power Inlet:** Port for connecting power cable.
- **Gas Connections:** Sample and calibration gas inlets, sensor vent, air and fuel inlet.

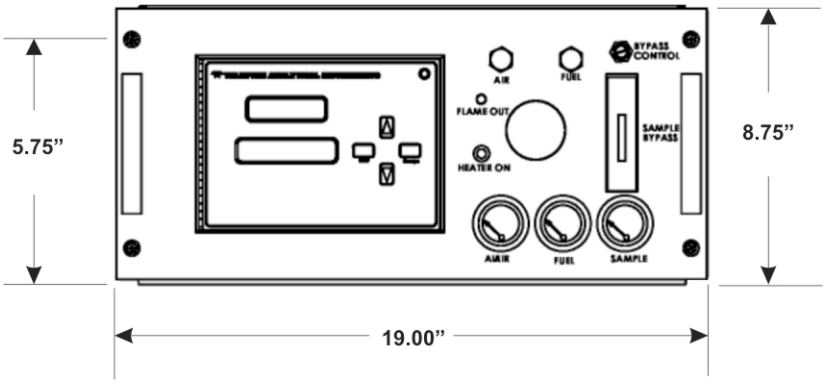
- **Equipment Interface** The Equipment Interface Connector passes the various signals to and from the analyzer. Refer to the Instruction manual that shipped with your instrument for a complete list of input/output signal connections handled through this connector.

SETUP AND INSTALL

Mount the Analyzer

The Model 4020 is for general purpose areas. It is designed with non-sealed enclosures. Install in an area where the ambient temperature does not fall below 32ºF nor rise above 100ºF.

For installation, select an indoor location that is vibration-free, clean, and close to an AC power source (120 or 240 VAC 50/60 Hz depending on your instrument). The instrument is designed for either wall or rack mounting.



Whichever mounting method is chosen, make sure there is sufficient access room in front to be able to slide the analyzer out of its enclosure to perform instrument maintenance.

Gas Connections

Note: Read all cautions contained in the Instruction manual before installing sample system.

Gas connections to the instrument are made at the 1/8"or 1/4" stainless steel tube fittings provided on the rear panel. Note that the Purge and Sensor Vent fittings are 1/4" while all other gas connections are 1/8".

Prior to installing any tubing (except vent lines), decontaminate the tubing by heating with a small torch while passing nitrogen through the tube.

You will need the following gases:

- Fuel: 40% H_2 and 60% N_2.

Note: For applications where the sample gas is hydrogen, the sample gas doubles as the fuel for combustion and is diluted with nitrogen. Connect a nitrogen source (40 psig) to the fuel inlet port.

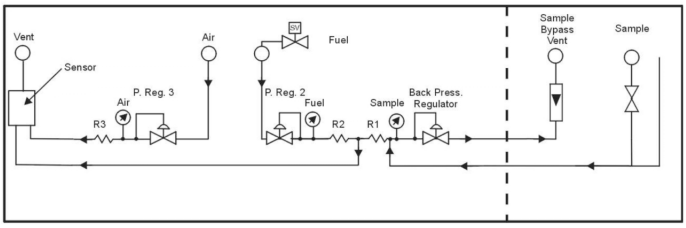
- Air for combustion: Water-pumped (low hydrocarbon) compressed air.
- Zero gas: A cylinder of the parent (or background) gas, containing less than 10% hydrocarbon impurity full scale on the narrowest range used for analysis.
- Purge gas (N_2 or other inert gas)
- Span gas: A cylinder of the parent gas with a specified (see Appendix: Specifications) amount of methane to standardize the sensitivity setting of the analyzer.

Gas Regulation: All gas cylinders must be equipped with oil-free, dual stage metallic diaphragm regulators. For sample gas, an oil-free, metallic diaphragm regulator must be installed at the sample point when possible.

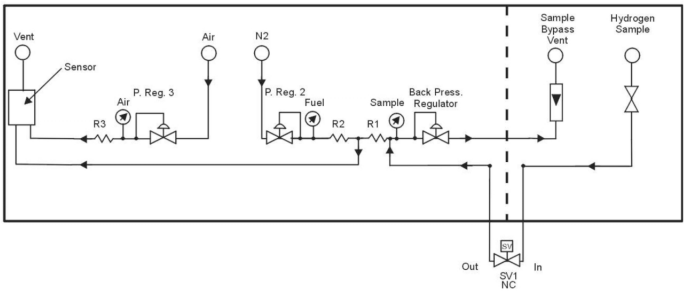
1. Connect the sample gas to the SAMPLE IN port.
2. If required, connect a vent line to SENSOR VENT port and exhaust to atmospheric pressure. If a vent line is required, the installation must include a drop-out pot to collect the water that is formed by the burning of the hydrogen fuel. The vent line must be constructed so that water and dirt cannot collect in it.
3. Connect a separate vent line to the BYPASS VENT port.
4. Connect calibration gases to their respective ports.
5. Connect the fuel source.
6. Connect the air source.
7. Set the regulators on the sample and calibration gases to 30 psig. The sample inlet pressure must be capable of supplying at least a 1 SCFH bypass flow.

A typical sample system for an instrument without the optional AutoCal feature is shown below. The top figure is for applications where the sample gas is not hydrogen. The lower diagram is used when hydrogen is the sample gas and is also used as the fuel. Refer to Section 1 of the Instruction Manual for a sample system with the AutoCal feature.

Sample Gas Other Than Hydrogen



Hydrogen as Sample Gas



Electrical Connections

CAUTION: READ ALL SAFETY INFORMATION REGARDING ELECTRICAL HAZARDS ASSOCIATIED WITH THIS INSTRUMENT BEFORE MAKING ELECTRICAL CONNECTIONS.

All electrical connections are made at the rear panel. The Model 4020 requires either 120 or 240 VAC 50/60 Hz AC power for operation.

1. **Main Power:**
   Connect primary input power cord.
   Insert the power cord into the power cord receptacle. Make sure the proper grounded cord is used.

2. **Equipment Interface Cable:**
   Connect the Equipment Interface Cable to the rear panel of the analyzer.
   The Equipment Interface Cable carries various input and output signals. A full list of

these signals is given in the table below. Refer to the Instruction Manual for additional information.

pin #	Description	pin #	Description
1		26	
2		27	
3	+ Range ID 4-20 ma	28	Alarm 1 C Contact
4	- Range ID 4-20 ma	29	Network -
5	+ Output 4-20 ma	30	Remote Sensor +
6	- Output 4-20 ma	31	Remote Thermistor
7	- Output 0-1 v	32	Exhaust Solenoid Hot
8	+ Range ID 0-1 v	33	Sample Solenoid Hot
9	Remote Zero +	34	Range 4 Contact/ not used
10	Remote Span +	35	Range 4 Contact/not used
11	Remote Zero -	36	Alarm 3 NC Contact
12	Remote Span -	37	Alarm 3 NO Contact
13	Network +	38	Range 1 Contact
14	Remote Thermistor	39	Range 2 Contact
15	Zero Solenoid Return	40	Calibration Contact
16	Span Solenoid Return	41	Calibration Contact
17	Span Solenoid Hot	42	Alarm 2 NC Contact
18	Range 3 Contact	43	Alarm 2 NO Contact
19	Range 3 Contact	44	Alarm 2 C Contact
20	Alarm 3 C Contact	45	Alarm 1 NC Contact
21	Range 1 Contact	46	Alarm 1 NO Contact
22	Range 2 Contact	47	Remote Sensor -
23	- Range ID 0-1 v	48	Exhaust Solenoid Return
24	+ Output 0-1 v	49	Zero Solenoid Hot
25		50	Sample Solenoid Return

3. **Digital Communications:**
   Install the RS-232 cable to the port on the rear panel. Connect the other end to your digital device. Refer to the Instruction Manual for specifics regarding the digital implementation used in the Model 4020 Analyzer.

BASIC OPERATION

After the analyzer has been installed with gas and electrical connections but prior to powering up the unit make sure you have:

- Installed the unit correctly
- Checked the gas connections for leaks

When the instrument is first turned on, a self-diagnostic test will take place followed by the appearance of analysis screen. After the analyzer has come to equilibrium (approximately two hours after first powering up) the instrument is ready to be configured and calibrated for your process.

Prior to using the instrument you must:

- Turn the power on and allow the analyzer to warm up.
- Activate the support gases (Auto Cal option only)
- Verify operation of the flame guard circuit.
- Set the parameters for your application.
  - Set the three analysis ranges for analysis.
  - Activate and set the alarms.
- Calibrate the instrument.

Additional configuration parameters are available to tailor the instrument to your particular application. Refer to the Instruction Manual for specific information on setting of additional system parameters.

Modes of Operation

There are two modes of operation, *Analysis Mode*, and *Setup Mode*. Analysis mode is the default mode and is where you view the concentration data, alarm information and other data and messages relating to the analysis.

The *Setup Mode*, is where you will setup the parameters for analyzer. It is entered by pressing the ESCAPE key which toggles between Analysis and Setup modes. The item that is adjacent to the arrow on the screen as shown in the figure is the item that is currently selectable by pressing the ENTER key.

Warm-Up Operation and Regular Operation

1. Turn the power switch ON. In a few moments, the measurement screen will appear at the front panel.
2. Allow 2 hours for the instrument to warm-up. A countdown will display on the screen.

DO NOT attempt to ignite the flame during the warm up countdown.

Activating the Support Gases (Auto Cal Option)

1. Set the air tank regulator to 30 psig.
2. Adjust the instrument air regulator until the air pressure gauge reads the recommended air pressure.
3. Set the sample gas tank regulator to 30 psig (or a pressure which matches the sample pressure) and adjust the instrument sample regulator until its (sample) pressure gauge reads the recommended sample pressure.
4. Open the zero and span gas cylinder valves and set the regulators to 30 psig or to match the sample pressure.
5. Observe that the instrument sample pressure gauge still reads the recommended sample pressure and that the bypass flowmeter reads from 0.5 to 1.0 SCFH.
6. Open the main valve on the tank and set the fuel tank pressure regulator to 30 psig (or to match sample pressure).
7. Open the secondary fuel valve slowly until it is wide open.

Note: adjust fuel settings only when the red LED (flame failure light) is off.

Flame Ignition

The Model 4020 will automatically attempt a flame ignition sequence following the warm-up period which has been preset at the factory. If the ignition process fails, the instrument will attempt to ignite the flame five times. If it continues to fail after the fifth attempt, a flame failure message will appear on the display. If this occurs refer to Section 5 in the Instruction Manual.

Verification of the Flame Guard Circuit

You should always verify operation of the Flame Guard Circuit. This is a safety feature that shuts down the fuel flow should the flame extinguish. To check this circuit:

1. While the flame is ignited, turn off the fuel at the supply cylinder.

2. Observe the fuel pressure gauge on the analyzer control panel as it decays until fuel is nearly exhausted. When the gauge reading reaches near zero, the flame will be extinguish as the fuel solenoid shuts off the fuel supply. The analyzer will automatically try to re-ignite. After 5 attempts, it will display: flame failure, check air, fuel and the flame failure LED will be on.
3. Open the fuel cylinder supply valve and re-ignite the flame by pressing the UP and DOWN keys simultaneously.

Default Parameters

Below is a listing of the default parameters used in configuring your instrument:

Range/Application: Refer to the data sheet on the application page found in the appendix of this manual

Range: Manual

Alarm Relays: Defeated, 0.00%, HI, SAFE

Zero: Auto, every 0 days, at 0 hours

Span: Auto, every 0 days, at 0 hours

Password: TAI

These parameters may or may not be appropriate for your application. The next three sections will guide you through setting up the analysis ranges, setting the alarms, and calibration.

Define the Analysis Ranges

The Manual range-switching mode allows you to select a single, fixed analysis range. It then allows you to redefine the upper and lower limits, for the range.

1. **Select MANUAL or fixed range:**

   1. Scroll to the Range function using the UP/DOWN keys. Press ENTER to activate the RANGE function.
   2. Press ENTER again to move to the **Auto/MAN** field.
   3. Use the UP/ DOWN keys to toggle between Auto and Manual. Press ENTER to select **Man**.

2. **Select a range to define or change:**

   1. The next screen prompts you to select a range: R1, R2 or R3. Press ENTER to highlight the Range field.

2. Use the UP/DOWN keys to choose R1, R2 or R3. Then press ENTER to accept the displayed range. The arrow will move to the line for defining that particular range. If you don't need to adjust the range setting, ESCAPE back to the *Analyze Mode* and note that it is using the fixed range you entered.

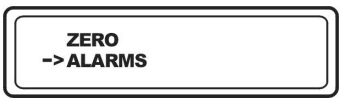
3. **To define or change the range setting:**
    1. Use the ENTER key to move to the value you want to change to define the range you want to work with.
    2. Use the UP/DOWN keys to cycle the numbers up or down for each digit.
    3. Use the ENTER key to move to the next character placeholder in the number field.
    4. When the last digit has been entered, press ENTER again to accept the value or ESCAPE to abort the numerical entry.

Use this same procedure to select and define all ranges.

Set the Alarms

The Model 4020 is equipped with two concentration alarms and a system failure alarm relay. The system failure alarm is of a fixed configuration. The concentration alarms are fully adjustable and can be set as high or low alarms. The default configuration for the concentration alarms is "defeated" so to use the alarms, you have to first activate them.

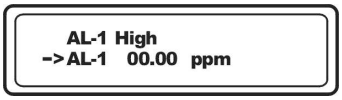
1. **Activate the concentration alarms:**
    5. Scroll to the ALARM function using the UP/DOWN keys.



    6. Enter the ALARM function by pressing ENTER.
    7. The next alarm screen allows you to activate or defeat alarm 1. Press ENTER to move to the **Active/Defeat** field.
    8. Use the UP/DOWN keys to toggle between **Active** and **Defeat**. Select **Active** and press ENTER.

2. **Select the Alarm type:**
    1. Move the arrow to the next function (**High/Low**).
    2. Use the UP/DOWN keys to toggle between **High** and **Low**. Press ENTER to make your selection and move to the next selection.

3. Enter or change the setpoint:



1. The next screen allows you to change the alarm setpoint. Press ENTER to move to the setpoint field.
2. Use the UP/DOWN keys to increase or decrease the value of the setpoint. Then press ENTER to accept the setpoint.

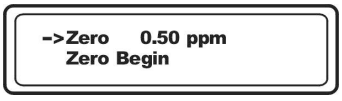
Repeat the above procedure for Alarm 2.

Calibration

The analyzer is calibrated using zero and span functions. Calibration gases should be connected to the instrument as described in the Setup and Install section.

Zero Calibration:

1. Open valve for zero gas and set the regulator to 30 psig.
2. From the MAIN MENU, scroll down to the ZERO function.
3. Press ENTER to activate the ZERO function. The next screen will prompt you to select either manual or automatic Zero calibration. Select **Man**.
4. The next screen allows you to enter the concentration in ppm hydrocarbon (methane equivalent) of your zero gas.



5. With the arrow adjacent to **Zero (**as shown above, press ENTER to activate the sub function.
6. Use the UP/DOWN keys to increment or decrement the concentration value until the known value of your zero gas concentration is displayed. Then press ENTER.
7. Press the DOWN key once to move the arrow down one line to the text **Zero Begin**.
8. Press ENTER to start the calibration.
9. After the zero calibration has finished, close the zero gas valve and proceed to span calibration.

Span Calibration:

Span calibration is identical to the zero calibration above except that the screens display a Span function instead.

1. Open the span gas cylinder and set the regulator to 3o psig.
2. From the MAIN MENU, scroll down to the SPAN function.

3. Press ENTER to activate the SPAN function. The next screen will prompt you to select either manual or automatic span calibration. Select **Man**.
4. The next screen allows you to enter the concentration in ppm hydrocarbon (methane equivalent) of your span gas.
5. With the arrow adjacent to **Span,** press ENTER to activate the sub function.
6. Use the UP/DOWN keys to increment or decrement the concentration value until the known value of your span gas concentration is displayed. Then press ENTER.
7. Press the DOWN key once to move the arrow down one line to the text **Span Begin**.
8. Press ENTER to start the calibration.
9. After the span calibration has finished, close the span gas valve.

Analysis Mode

After calibration, switch back to sample gas. Make sure the sample regulator is set to 30 psig. If necessary, use the ESCAPE key repeatedly to return to the *Analysis Mode*. The Model 4020 is now ready for operation.

The setup described in this guide represents a bare minimum of the capabilities of your analyzer. Please refer to the Instruction Manual to find out how to use the advanced features to setup and program the instrument to your particular application and needs.