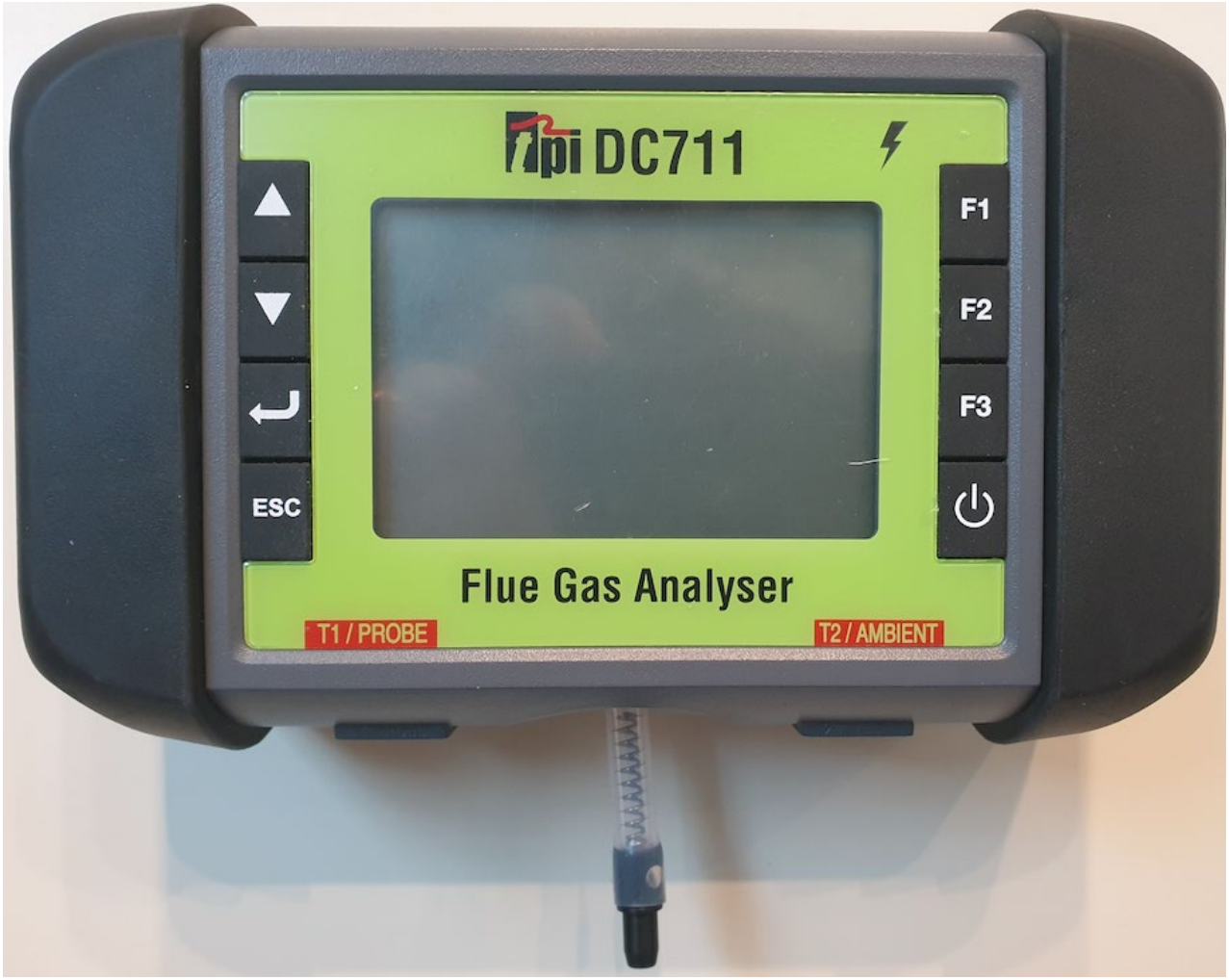
Smart Flue Gas Analyzer

DC711



Contents

Introduction

Thank you for purchasing TPI brand products. The DC711 Flue Gas Analyzer is a state of the art, easy to use analyzer designed not only to display and calculate the required readings from a flue but also to cover most of the other measurements associated with combustion.

If your DC711 model is compatible with the FREE, subscription FREE, TPI View app., then please download that by scanning the QR Code below: -

The FREE App.

Download on the App Store

GET IT ON Google Play

You can connect your View enabled DC711 by searching & choosing it from the List and the DC711 will enter Remote Control Mode.

Once connected to TPI View you can control your View enabled DC711 on the app, remotely, and take advantage of all the enhanced features the View app has to offer such as Job Management, GPS tagged Reports and the ability to e-mail and share the reports.

General Overview

The following guidelines will help prevent damage to your sensors:

Always use the mini pump filter when testing flue gases. Periodically check and replace the mini pump filter as needed.
Always make sure the in-line filter / water trap is installed properly. Periodically check and replace the in-line filter as needed.
Always remove water or condensation from the inside of the in-line filter / water trap assembly prior to performing tests.
Always use the optional oil filter when performing tests on oil burning equipment unless you are using the DC711 with an NO sensor fitted. Do not use the oil filter on the DC711 with NO sensor fitted because the oil filter will filter out Nitric Oxide (NO).
Never over saturate your sensors by performing tests on equipment with gas levels beyond the capability of your analyzer.
Always keep the water trap / filter assembly clean & dry and replace the internal filter as necessary.

This manual will guide you through the functions of the DC711 which will give you many years of reliable service.

Your DC711 Flue Gas Analyzer comes complete with the following standard accessories, as a minimum: -

- DC711 Analyzer
- Soft Carrying Case - 1 each
- Flue Temperature Sampling Probe - 1 each
- In-Line Filter / Water Trap installed on Flue probe - 1 each
- Disc water filter installed in water trap - 1 each
- Spare In-Line Filter - 1 each
- Ambient Air Temperature Probe - 1 each
- USB “C” Charger Cable - 1 each
- Mini Pump Protection Filter Assembly - 1 each
- Instruction Manual

Kit options & Upgrades

In addition to the standard accessories there are various kit options and upgrades available such as NO sensor addition or replacing the standard CO sensor with a HIGH CO sensor, as well as a Bluetooth Printer and many more essential accessories and consumables.

These can be viewed by visiting your local regions websites listed below: -

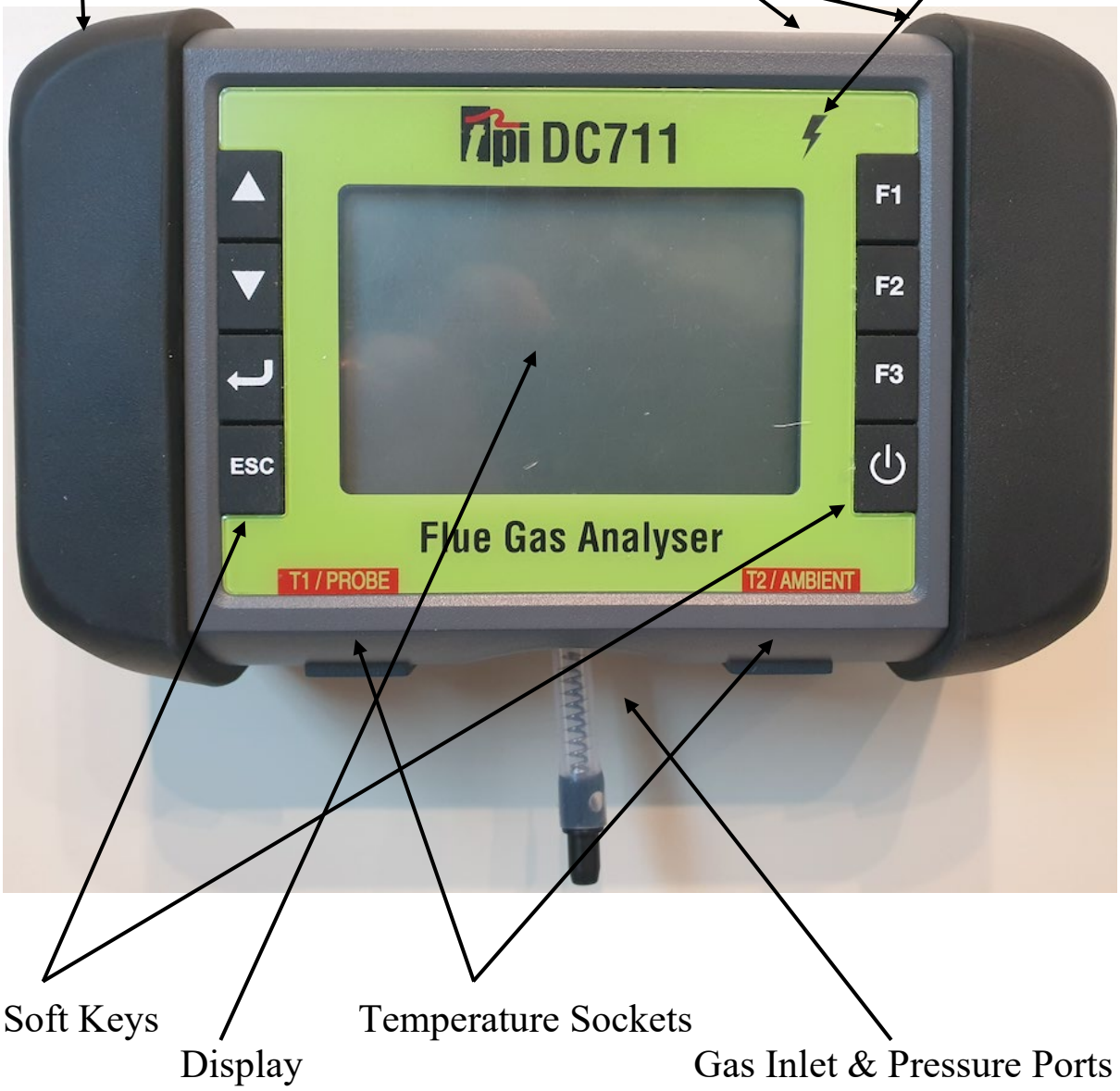
https://www.tpieurope.com/flue-gas-analyzers/dc711-flue-gas-analyzer/

https://www.testproductsintl.com/gas-detection/combustion-efficiency-analyzers/

https://www.tpicanada.com/gas-detection/combustion-efficiency-analyzers/

Instrument Overview

Front View



Instrument Overview

Soft Keys

On/Off Key used to turn the analyzer on and off
PLEASE NOTE: If gas is present in the analyzer, then the Off function may be disabled to avoid sensor saturation.

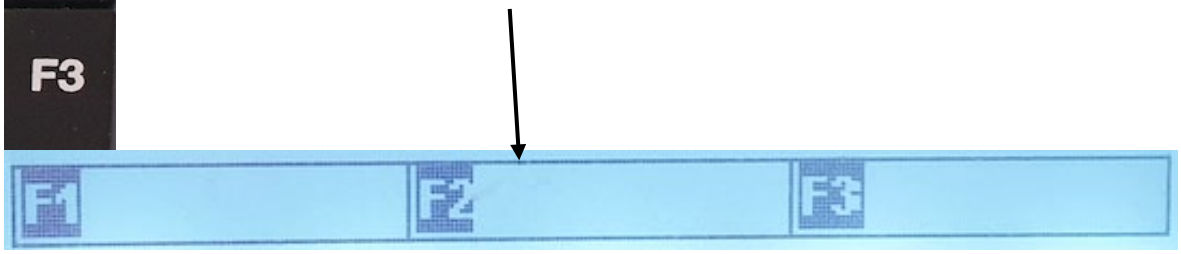
Up & Down Arrow Keys used to move to up and down any highlightable lists on the screen.

Up Arrow key is also used to zero the pressure display when in Flue Gas analzyer mode.

Enter Key used to select a highlighted menu option and enter that function.

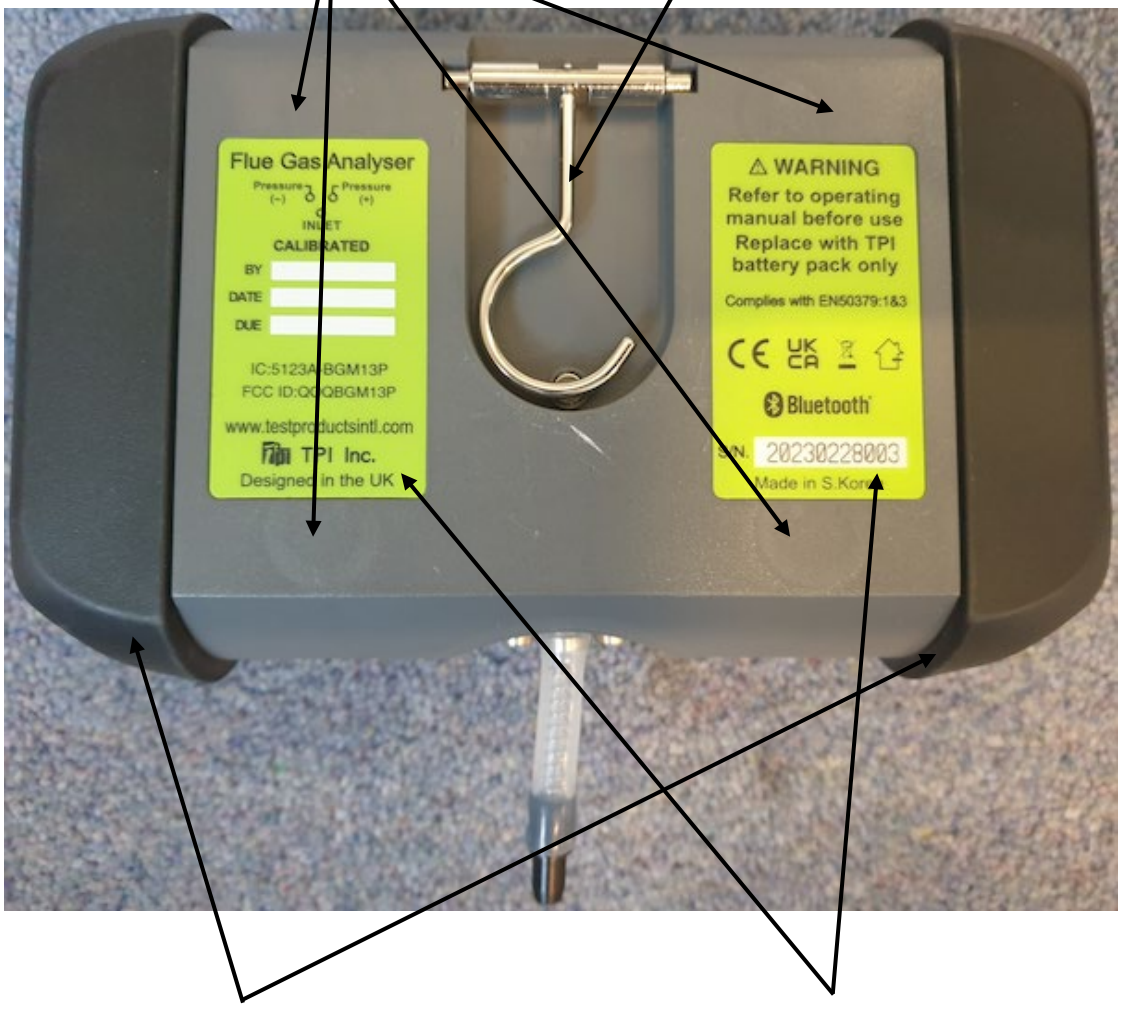
Escape key is used to back out of various functions.

Function Keys actions will change depending on the screen the DC711 is in. These will be displayed at the bottom of the screen and change accordingly.



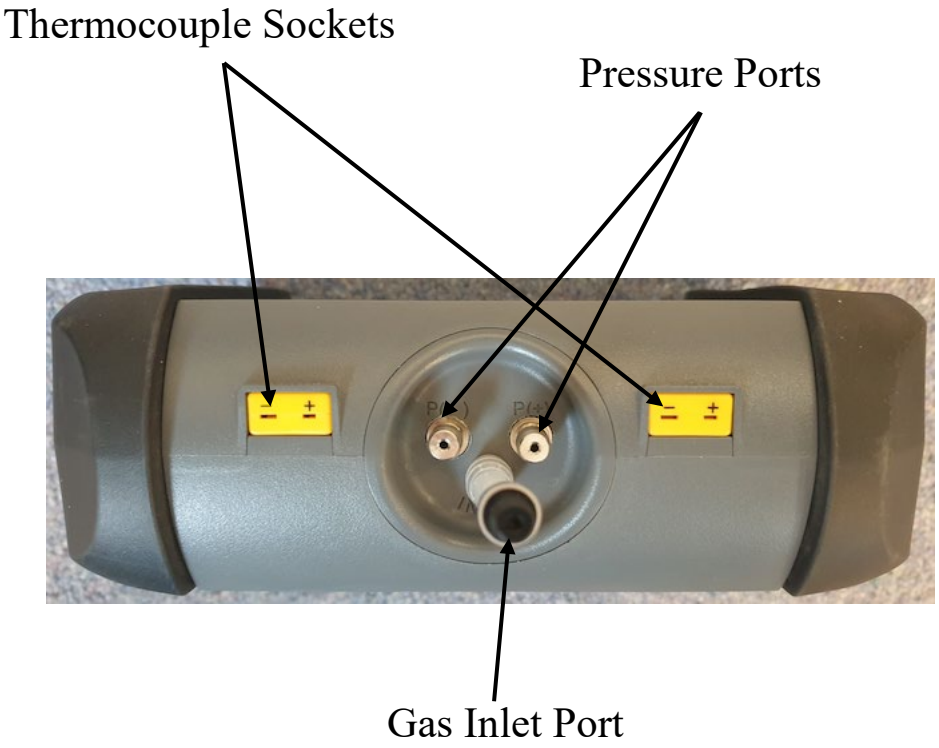
Instrument Overview

Back View

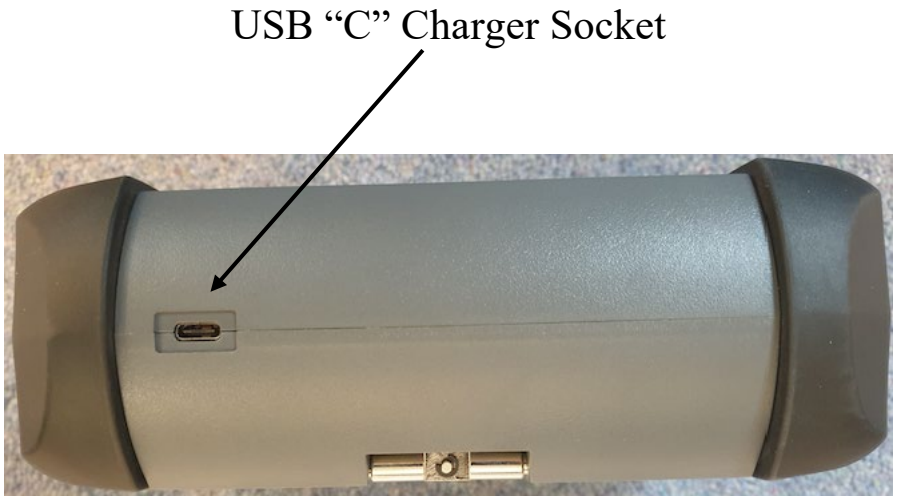


Instrument Overview

Bottom View



Top View



Basic Analyzer Functions

Charging

Plug the USB “C” cable into the USB “C” charger socket.
While charging the charge indicator light will illuminate RED

Once charging is complete the charge indicator light will illuminate GREEN

Turning ON

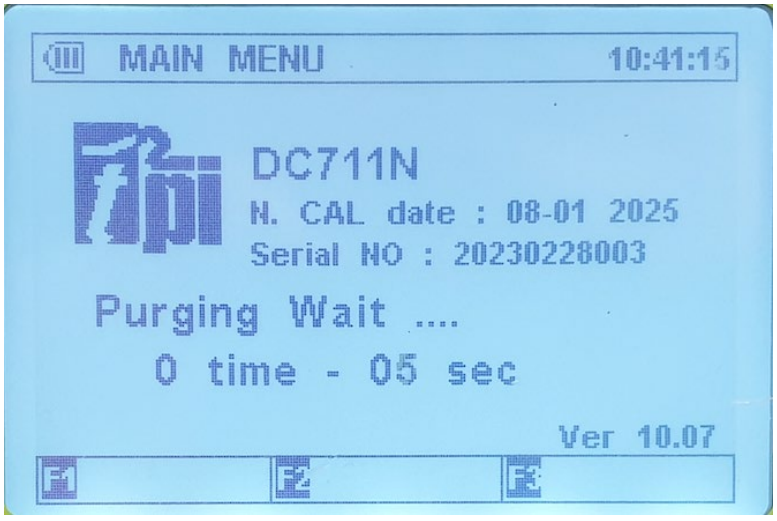
***Always**: - Before turning on please ensure that **ONLY** the in-line pump protection filter is connected to the Gas Sample Port. This in-line pump protection filter **MUST** be fitted to the instrument at all times!!*

Please **DO NOT** have the gas sampling probe attached at this point. The gas sampling probe needs be fitted to the DC711 only at the point where combustion analysis begins.

Press and hold the ON/OFF key down for approximately 3 seconds. The DC711 will beep and the initial start-up screen will be displayed.

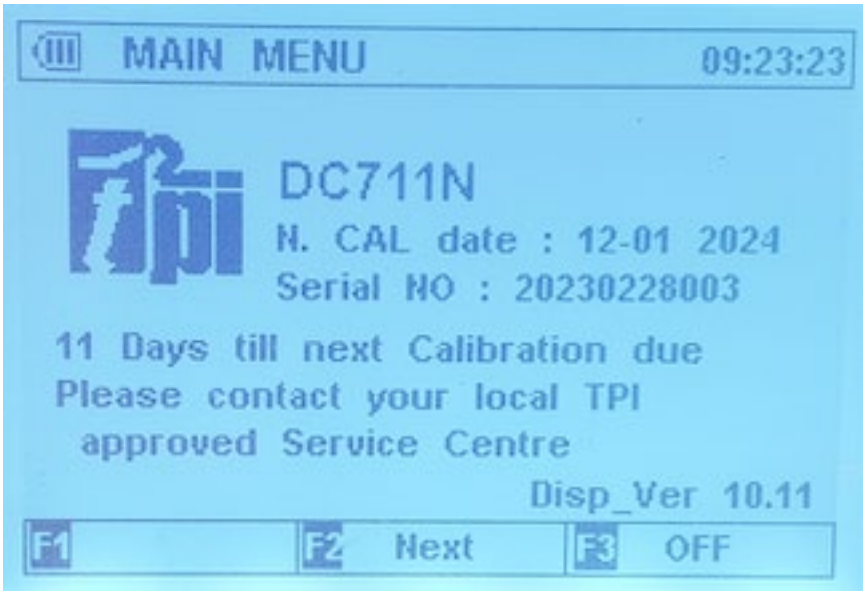
The initial start-up screen displays the following information:

- Battery Level
- Date & Time
- Model
- Next Calibration Due Date
- Serial Number
- Firmware Version



Calibration Due Date Messages

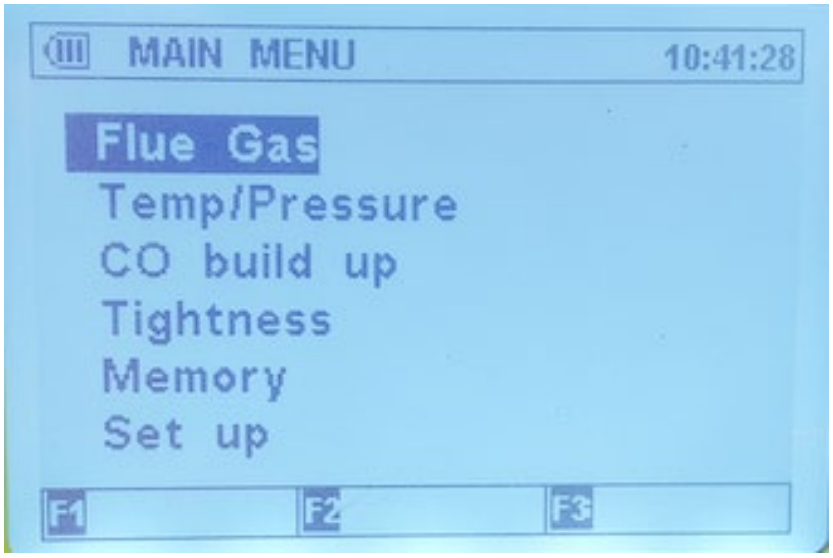
As the Annual Next Calibration Due Date Approaches or is Overdue one of the following screens may appear: -



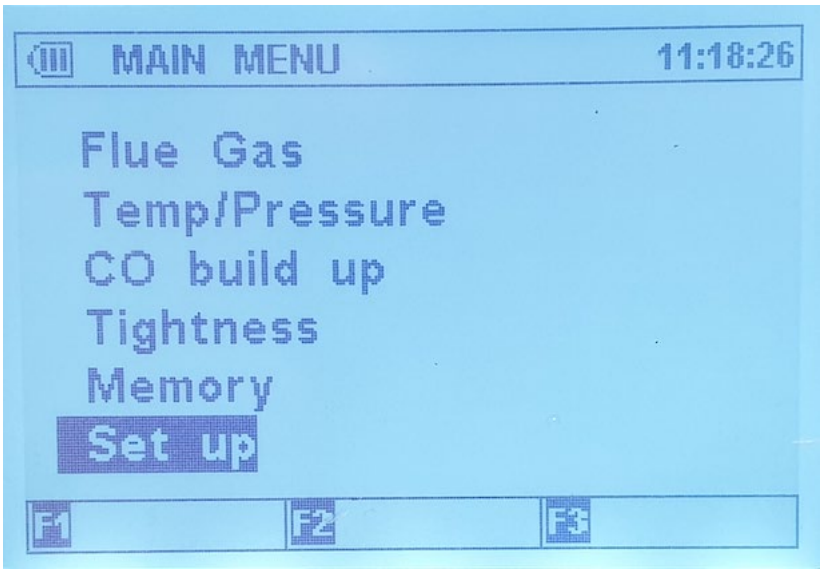
Choosing “Next” will move you onto the Main Menu Screen as displayed below.
Please Note: In the UK, it is a requirement of BS7967 that an FGA is within calibration and used in conjunction with the manufacturer’s instructions therefore it is NOT recommended that “Next” be chosen by the user if the Calibration is Overdue. Doing so will contravene the requirements of BS7967.

Main Menu

Once the Purge Period has elapsed or “Skip” is pressed the Main Menu will be displayed.



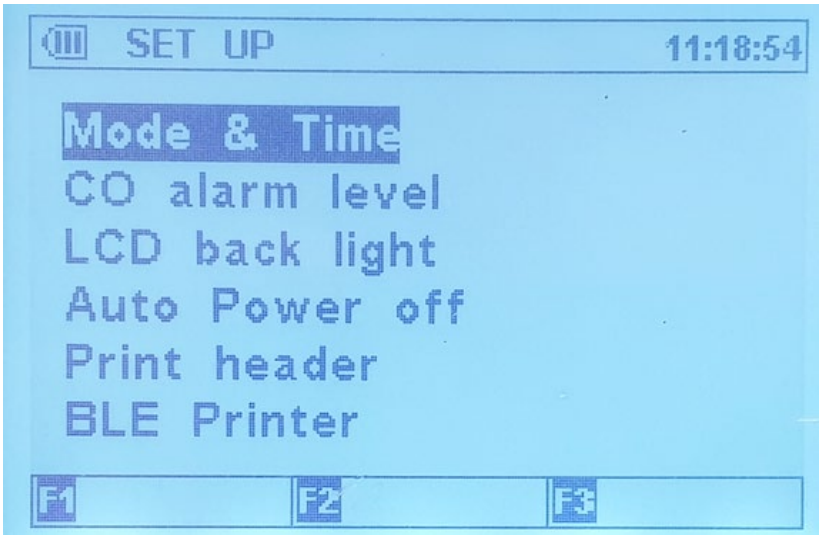
If this is the first time you are turning the DC711 on, we suggest you head over to the “Set-Up” section to investigate the options as described below. Press the Up or Down Arrow Keys, to highlight “Set up” then press the “Enter” key.



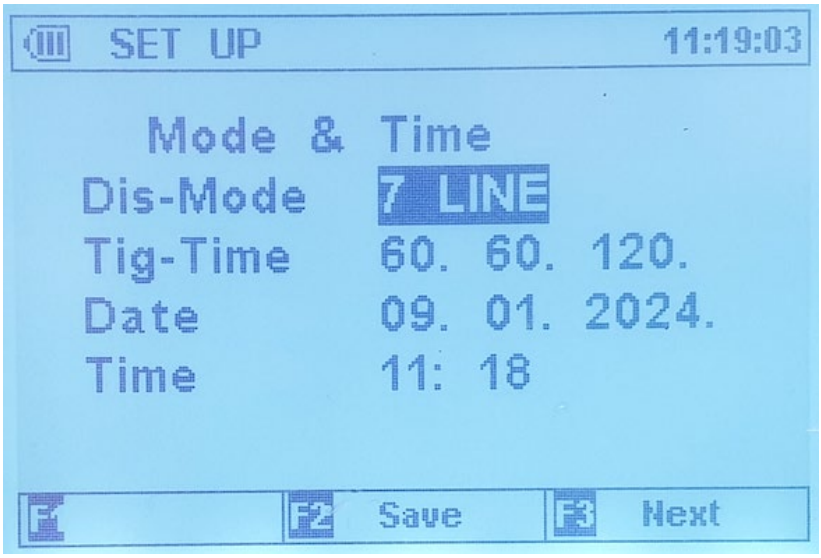
Set Up Menu

Mode & Time

Entering the Set Up Menu will display the following: -

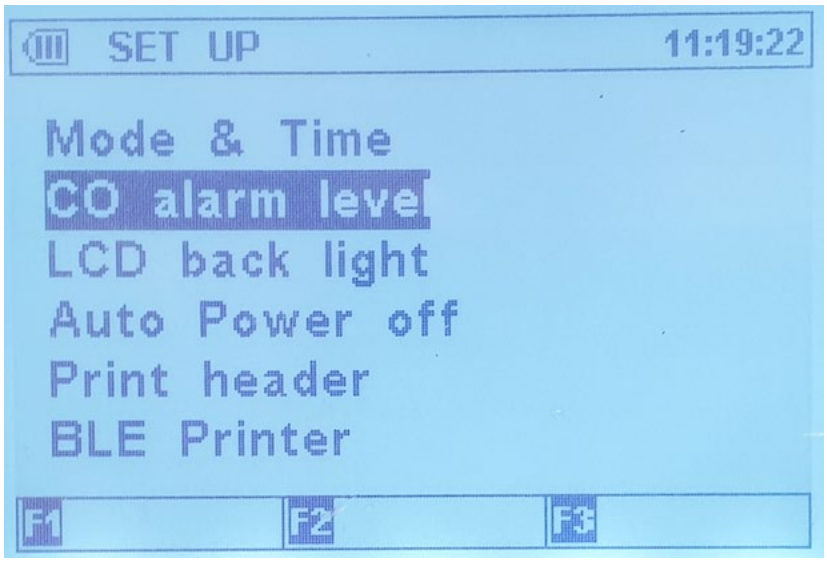


Entering “Mode & Time” will display the following where you can toggle the Display Mode between 7 & 4 Line, adjust the timings for the Let By, Stabilisation & Tightness Pressure Test as well as adjusting the Date & Time



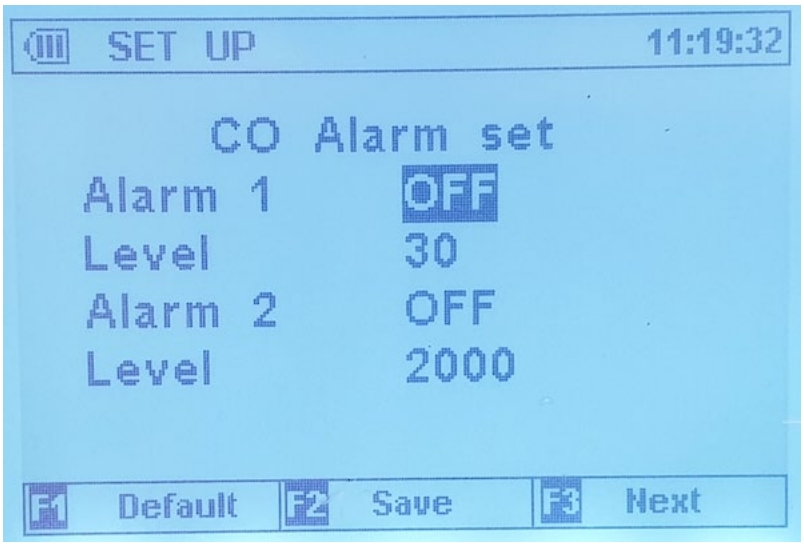
Set Up Menu

CO alarm level



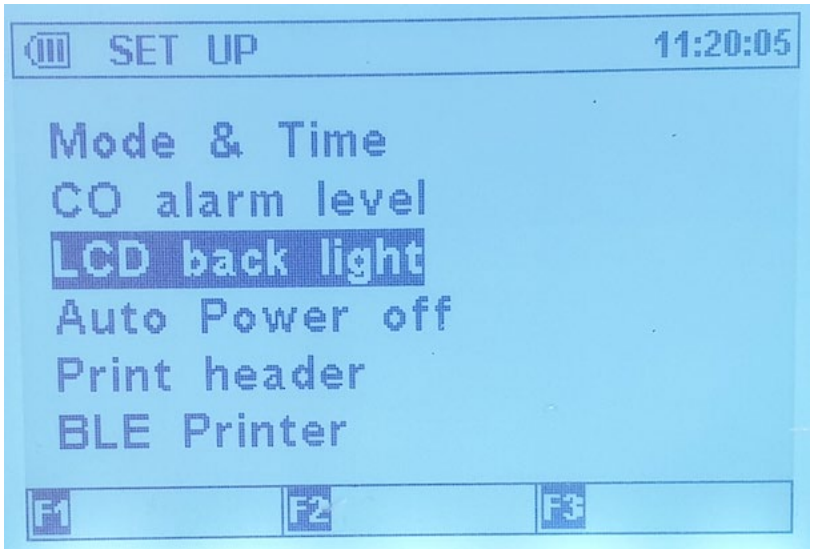
Entering “CO alarm level” will display the following where you can toggle the ambient and High CO alarms On & Off, as well as adjusting the default levels to suit your testing requirements

Alarm 1 is the ambient CO alarm and Alarm 2 is the High CO alarm for combustion tests.

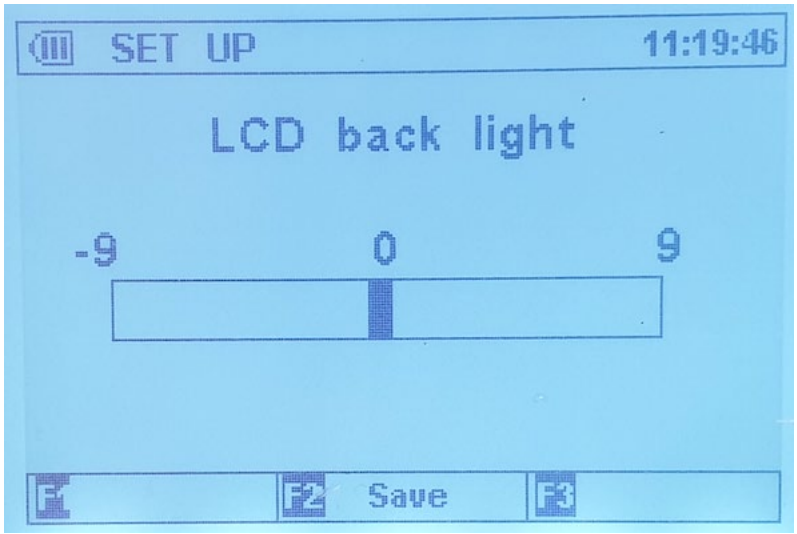


Set Up Menu

LCD back light

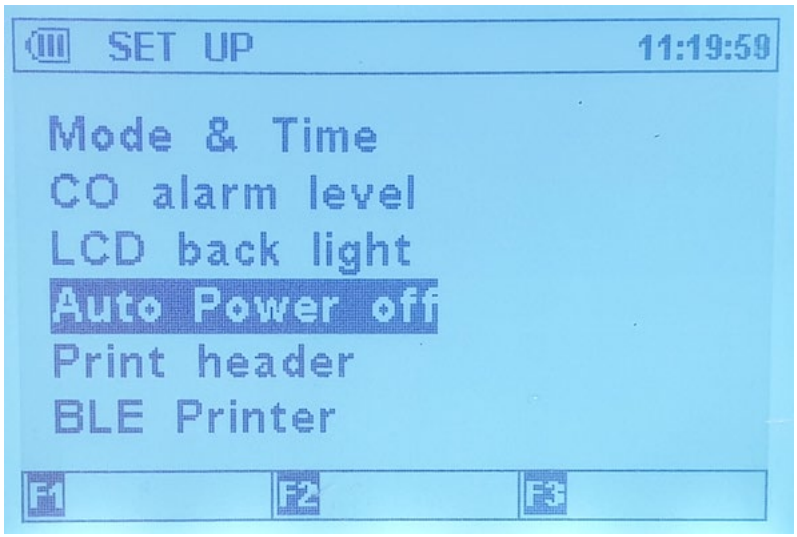


Entering “LCD back light” will display the following where you can adjust the LCD backlight level. Higher levels of backlight will reduce battery life.

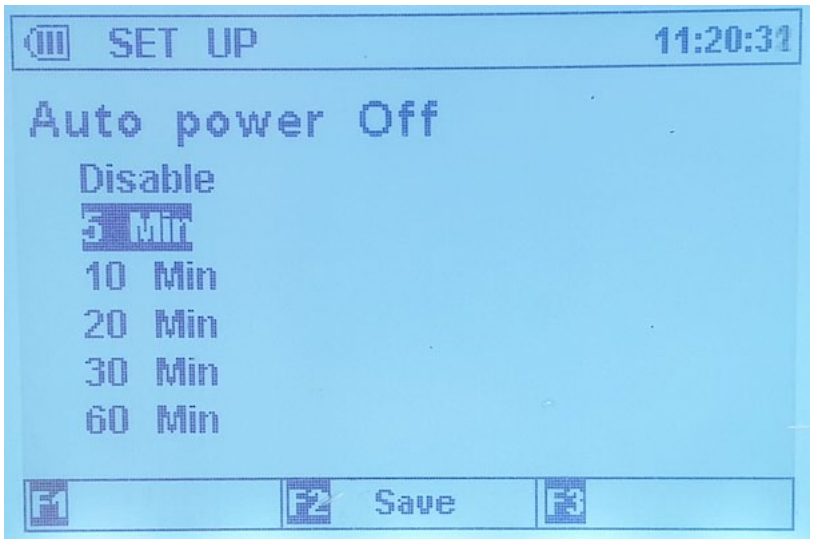


Set Up Menu

Auto Power Off

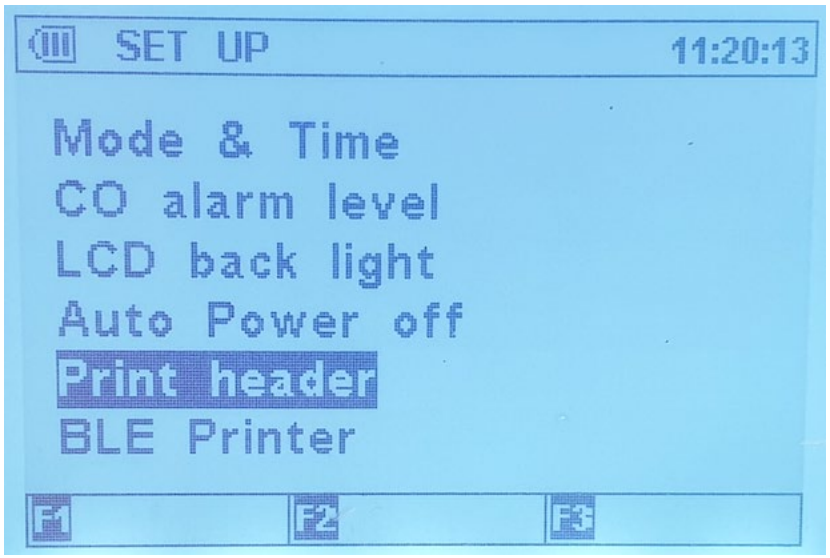


Entering “Auto Power off” will display the following where you can disable the Auto power off or change the Auto power off time.

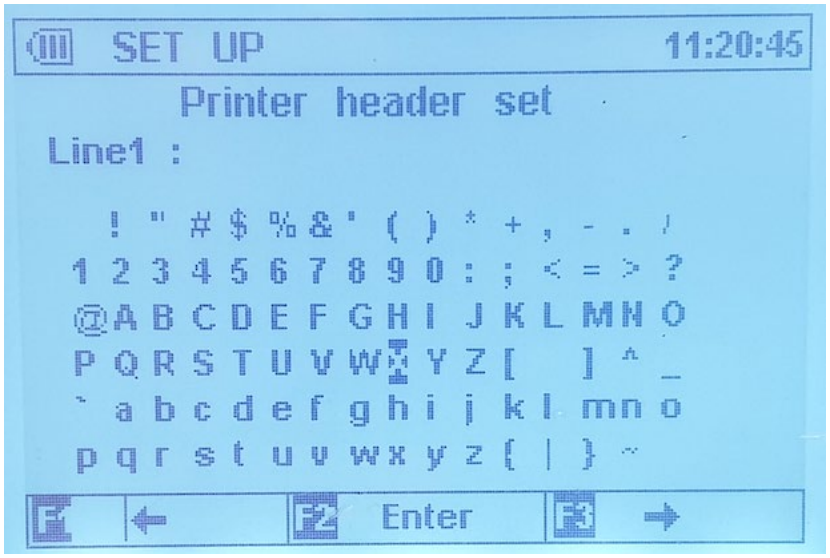


Set Up Menu

Print header

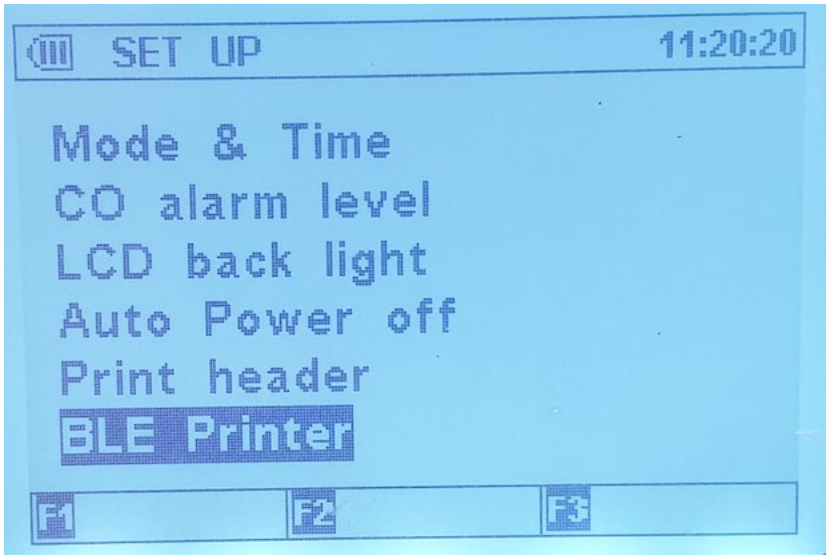


Entering “Print header” will display the following where you can add or edit the details that will print out at the top of each report when using the optional A741BT printer and direct printing from the analyzer.

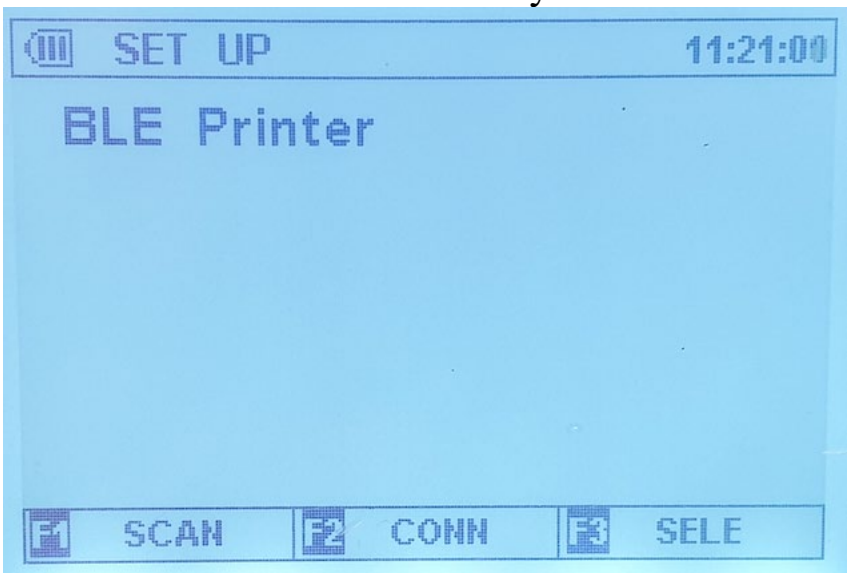


Set Up Menu

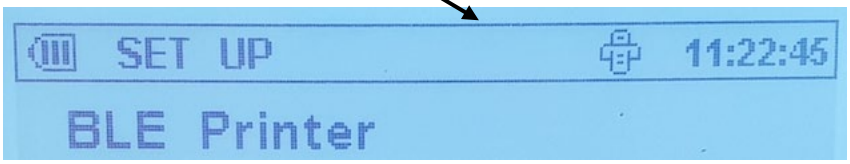
BLE Printer



Entering “BLE Printer” will display the following where you can scan and pair available optional A741BT Bluetooth Printer to your DC711.



When paired and connected the Printer Icon will display.



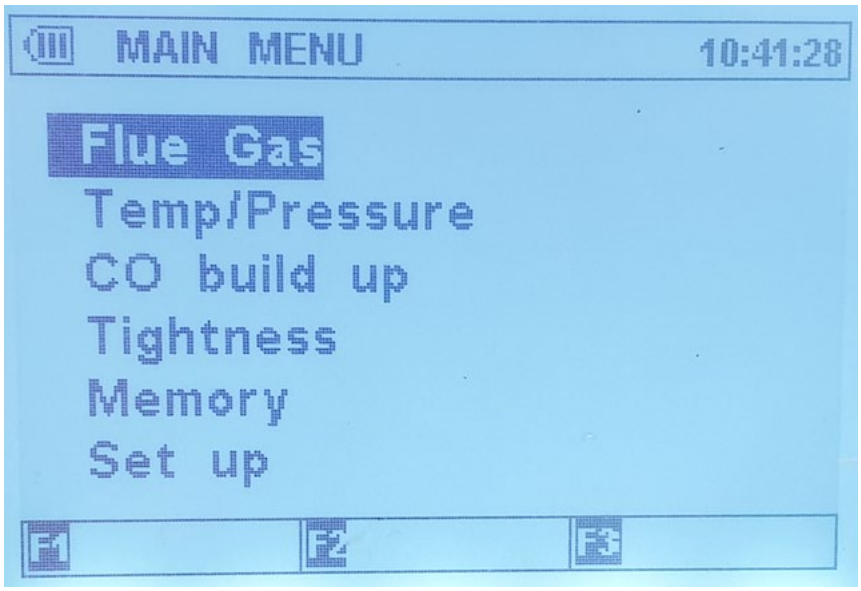
You only need to pair once. Each time a paired A741BT is switched on it will automatically connect and display the Printer Icon.

Main Menu

Pressing the “Esc” key repeatedly will return you to the Main Menu.

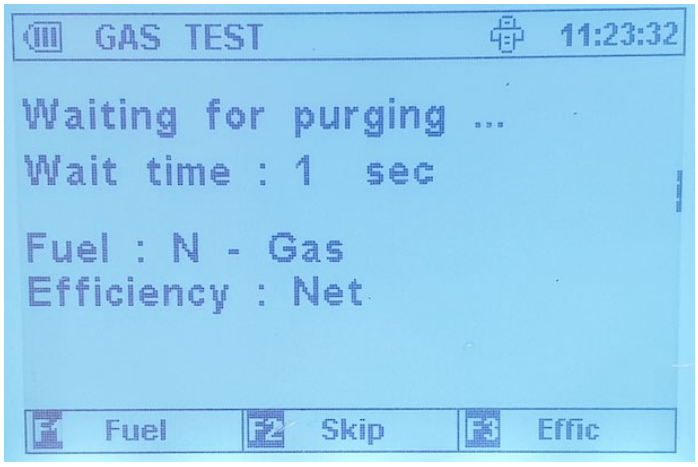
Using the Up and Down Arrow Keys will highlight the different functions.

Pressing the Enter Key will select the highlighted function.

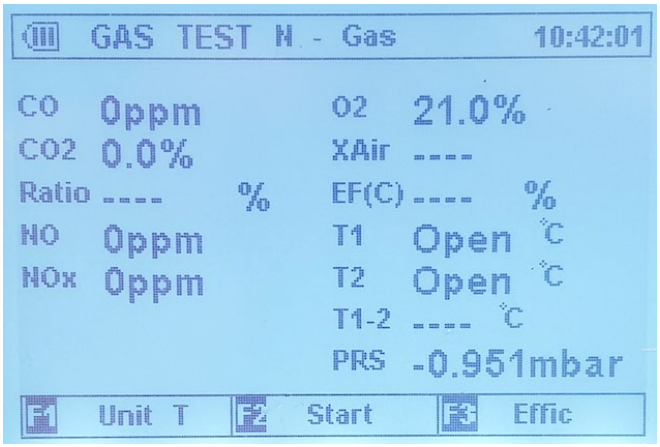


Flue Gas

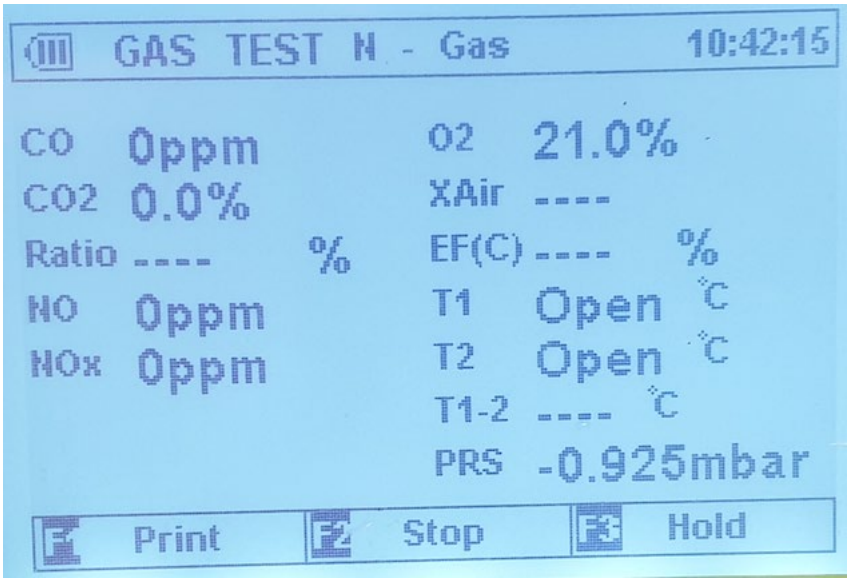
Entering the Flue Gas function will start the Purge Period.
During this period you can press the “F1” key to cycle through the various Fuel Options or the “F3” key to cycle through the various Efficiency options or the “F2 Key” to skip, if displayed. **Note: Gross efficiency is used in the USA**



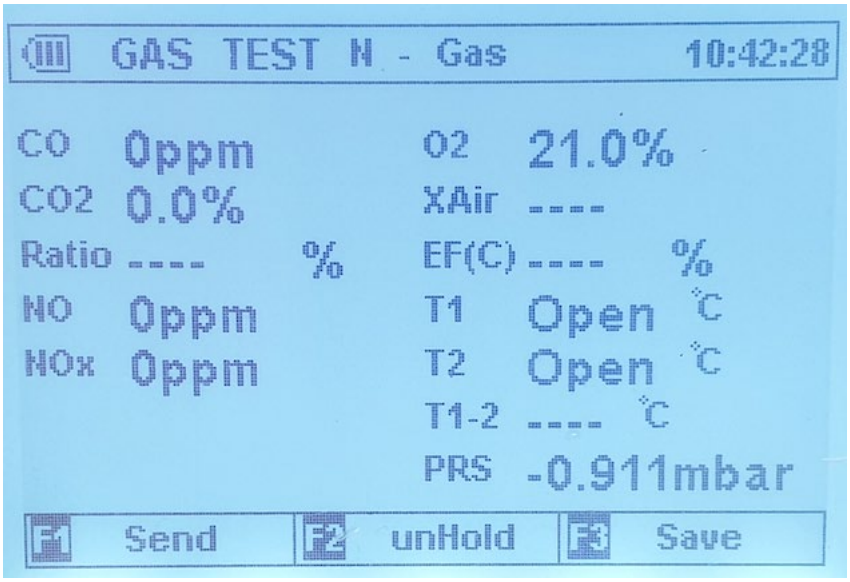
Once the Purge Period is complete the DC711 will display the Gas Test Screen including NO and NOx (if fitted).



Press the “F1” Key to toggle between Celsius & Fahrenheit or the “F3” Key to cycle through the Efficiency options.
Press the “F2” Key to start the pump and the following options will be available: -
“F1” will send the Live Readings to the Printer, if connected
“F2” will stop the pump running but please note this may not be available if the CO level is above 10 ppm.
Press the “Up Arrow” key to zero the pressure reading.



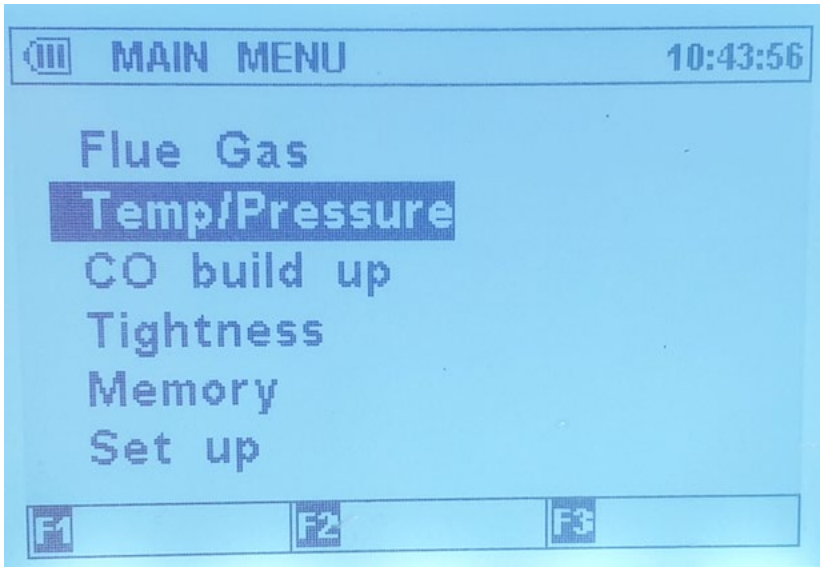
"F3" will Hold the readings on the screen and open up the following options: -



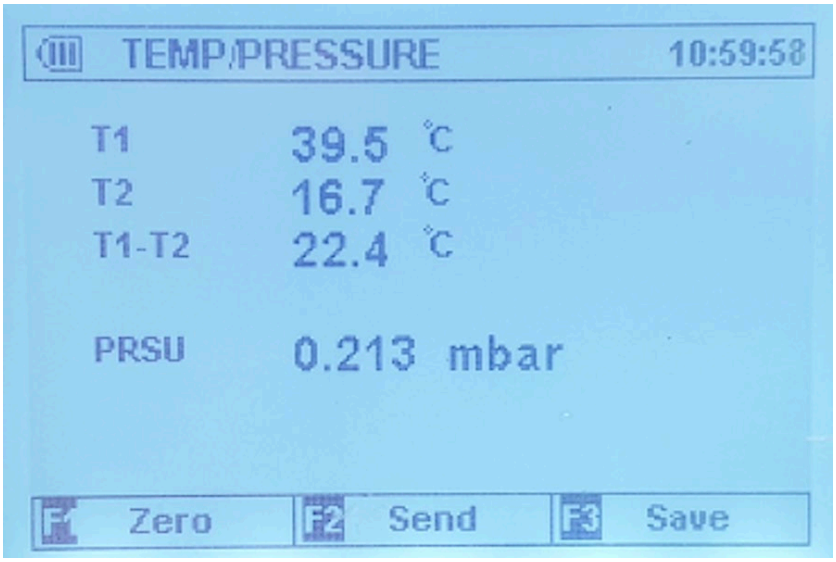
"F1" will send the Held Readings to the Printer, if connected
"F3" will allow you to save the Held Readings in the Memory
"F2" will unHold the readings and return to Live Readings

Temp/Pressure

Press the “Enter” key to bring up the Temperature & Pressure Screen



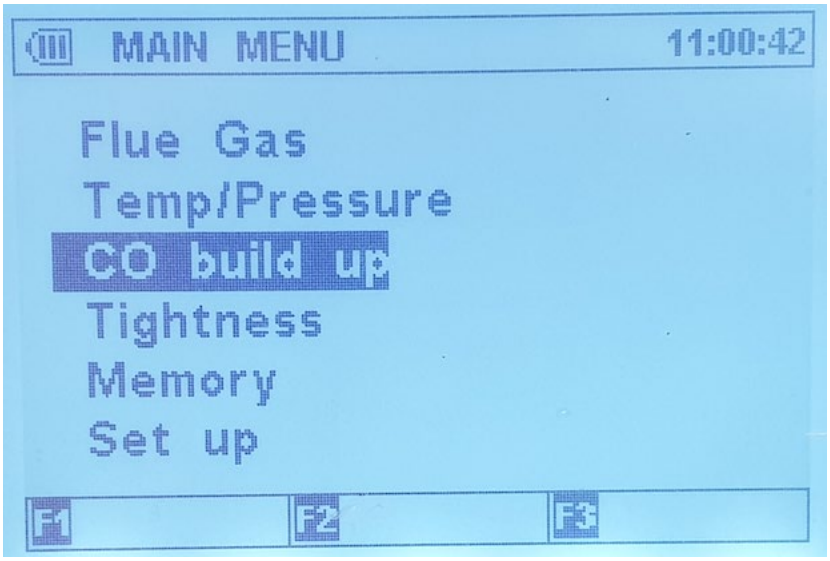
On this screen you can view the Temperature in T1, T2 and the differential between both as well as the Live Pressure.



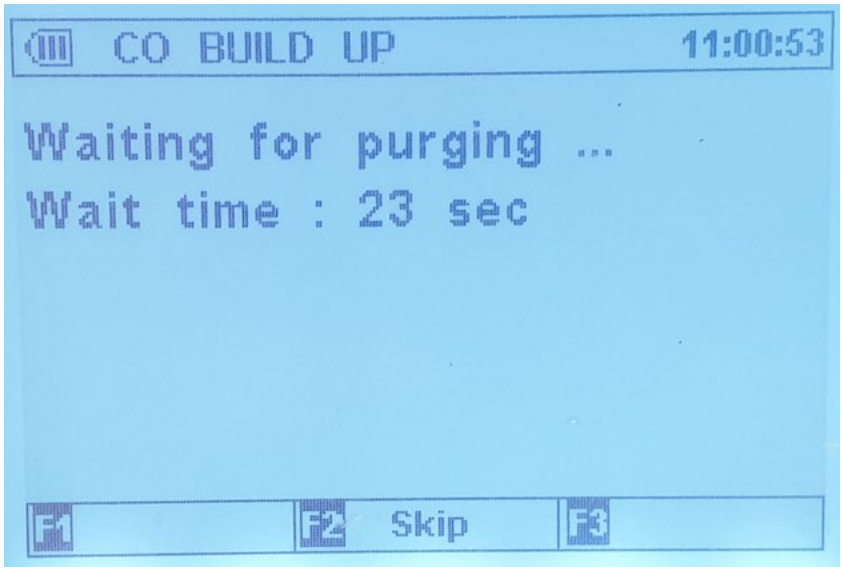
“F1” will Zero the Live Pressure Reading
“F2” will allow you to Send the Live Readings to the Printer, if connected
“F3” will allow you to Save the Live readings to the Memory.

Ambient Air CO Build Up

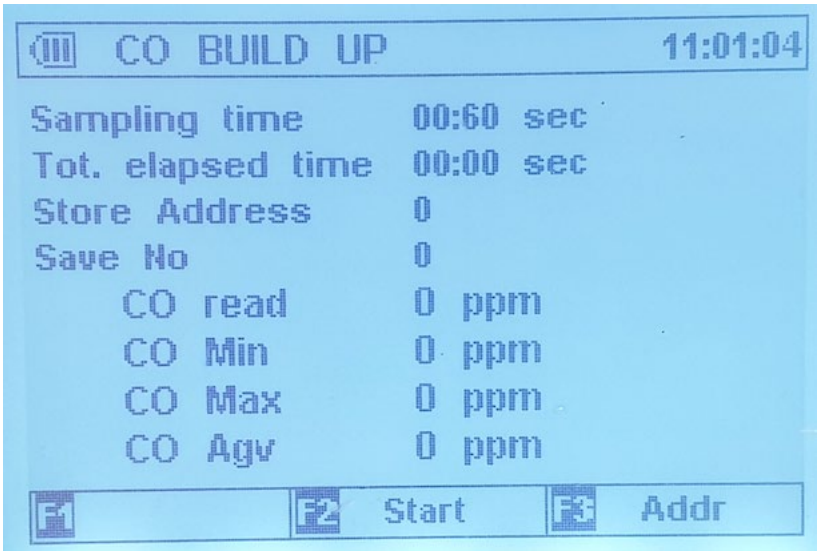
Press the “Enter” Key to bring up the CO build up Screen



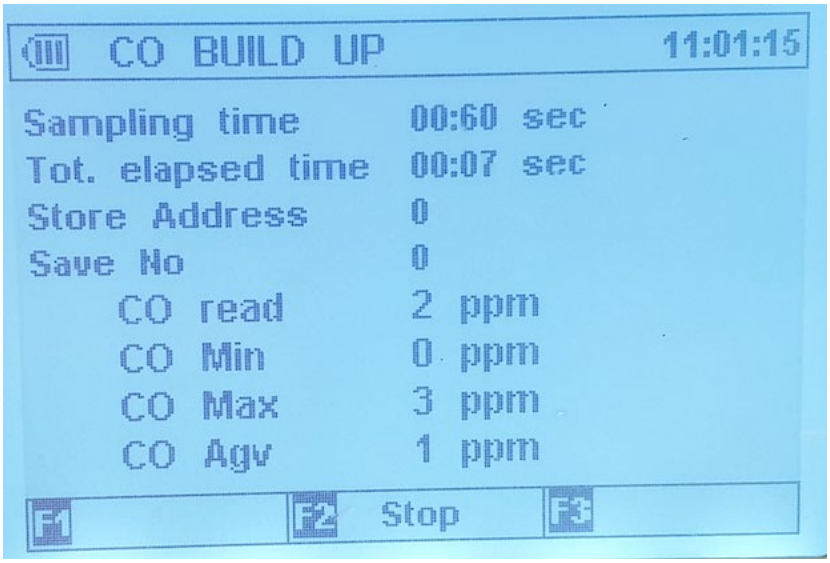
Entering the CO Build Up function will start the Purge Period.
During this period you can press the “F2 Key” to skip, if displayed.



Once the Purge Period is complete the following screen is displayed where you can start the Ambient Air CO Build Up Test.
Press the “F3” Key to change the Storage Address if required.
Press the “F2” Key to Start the Test



At any time during the test, you can press the “F2” Key to Stop the Test.

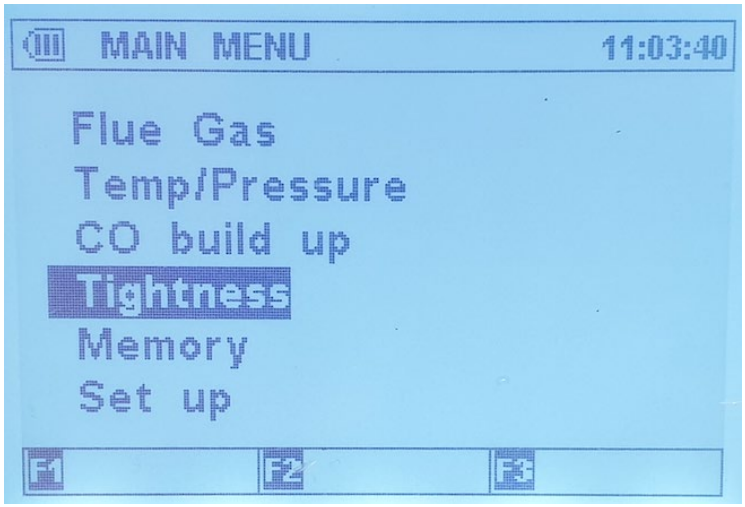


As long as the test has run for longer than 60 seconds the report will be available to Print immediately by pressing the “F1” Key or be saved automatically to the chosen Storage Address for output later.

Let By/Tightness Test

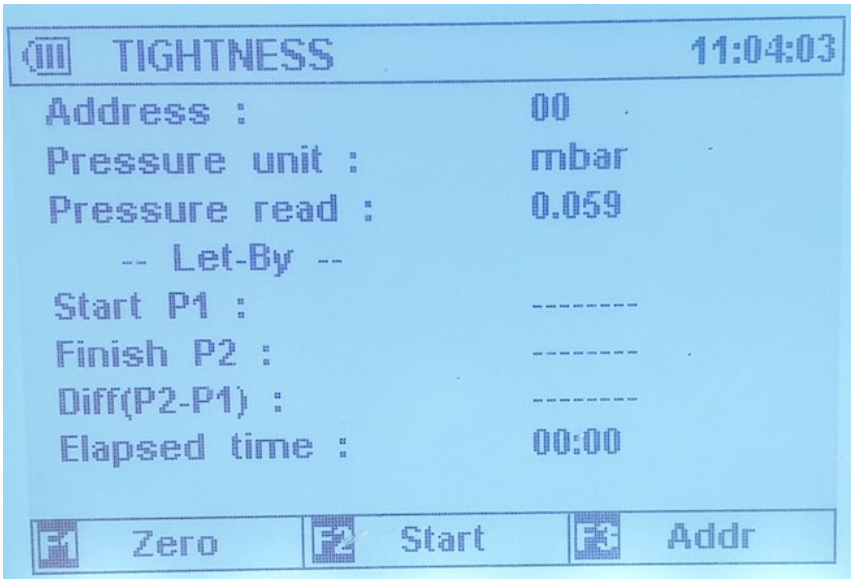
NOTE: The Let By/Tightness test is used mainly in Europe.

Press the “Enter” key to bring up the CO build up Screen



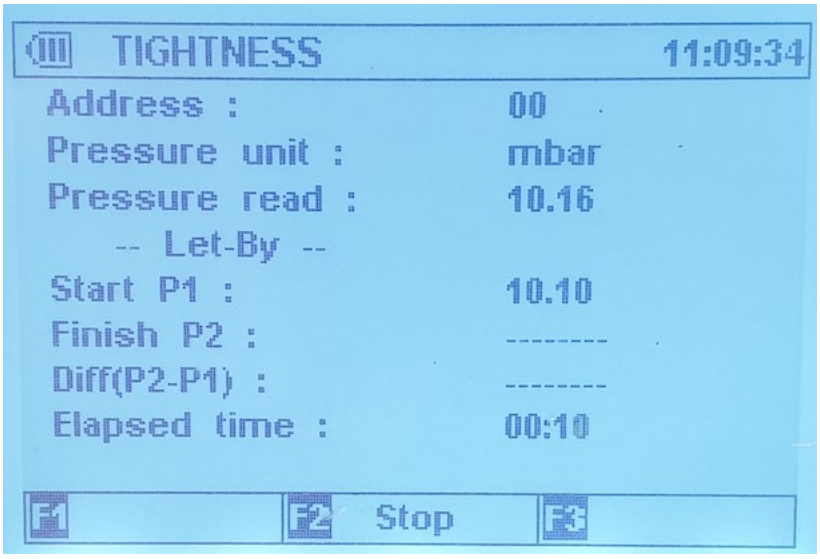
Press the “F1” Key to Zero the pressure, if required, before attaching the pressure hose.
Press the “F3” Key to change the Storage Address if required.

The test starts with the Let By section so please apply the required pressure which will be displayed as “Pressure read” value.

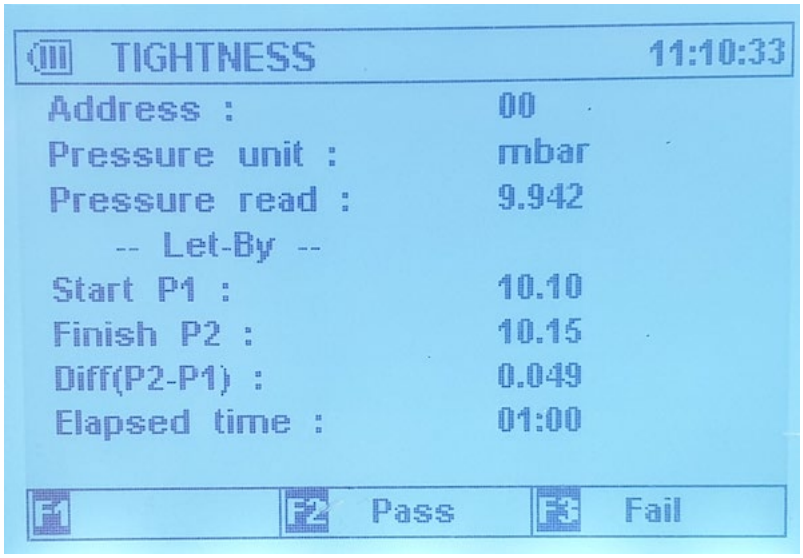


Press the “F2” Key to Start the Test

The Let By section of the test will start to count up and complete after 60 seconds.

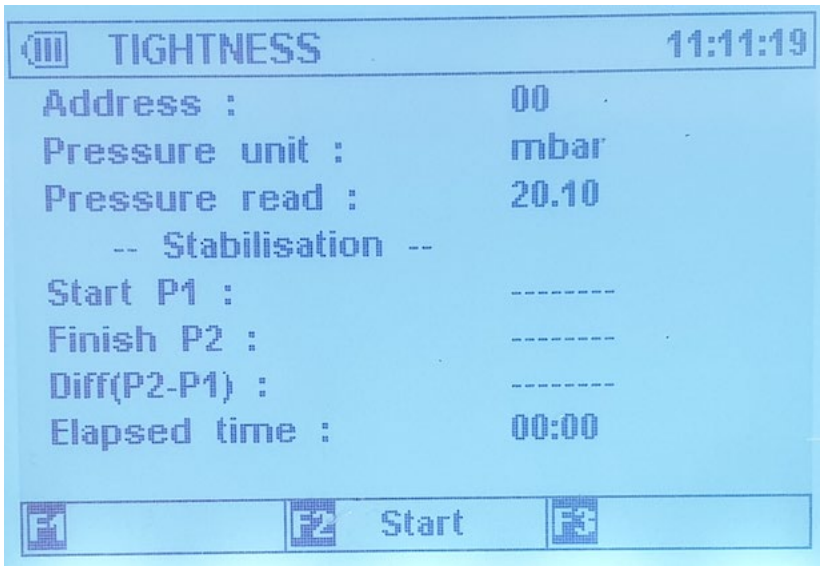


Once the 60 seconds have elapsed the Start, Finish & Difference pressure will be displayed with option for you to Pass or Fail the test at this stage.

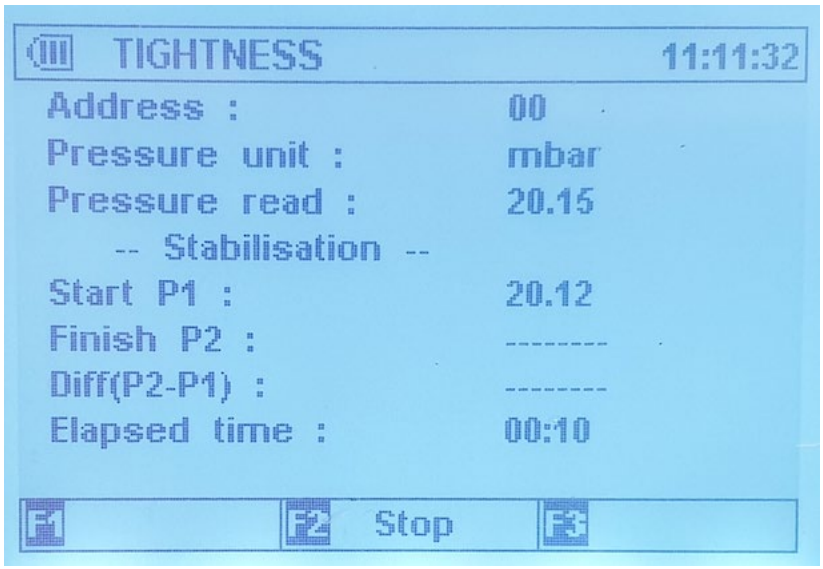


Press the “F3” Key to Fail the test or
Press the “F2” Key to Pass this section of the test and move onto the Stabilisation section.

The test continues with the Stabilisation section so please apply the required pressure which will be displayed as “Pressure read” value

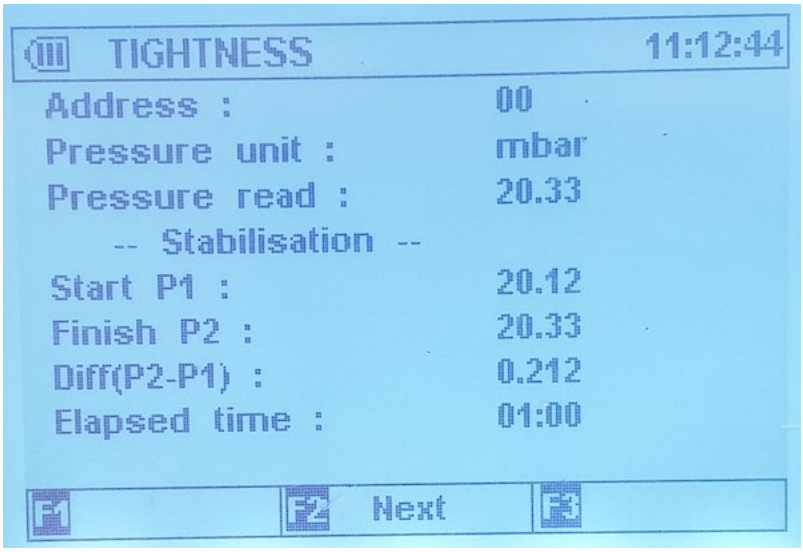


Press the “F2” Key to Start the Stabilisation section of the Test

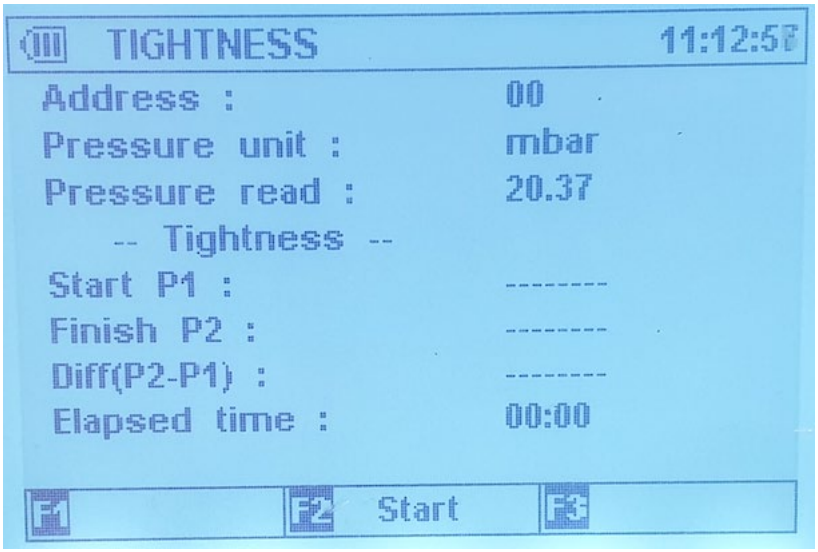


The Stabilisation section of the test will start to count up and complete after 60 seconds.

Once the 60 seconds have elapsed the Start, Finish & Difference pressure will be displayed with option for you to continue the test.

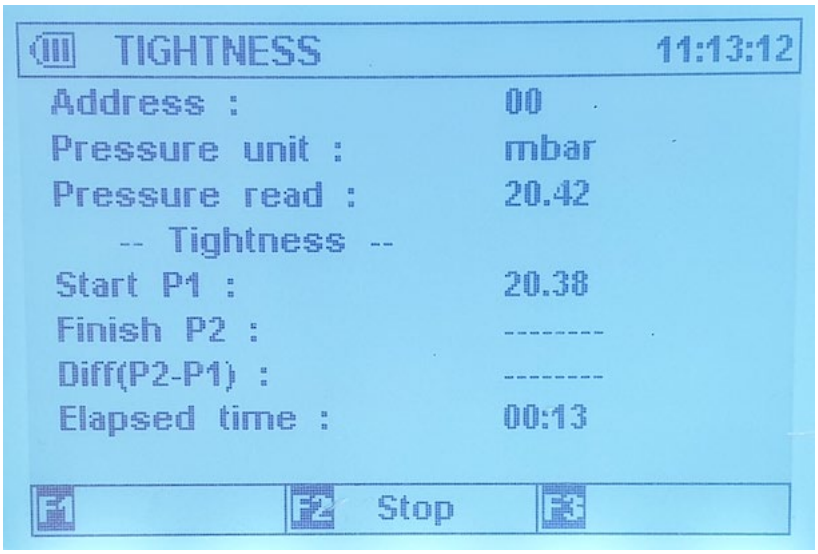


Press the “F2” Key to move onto the Tightness section of the test.

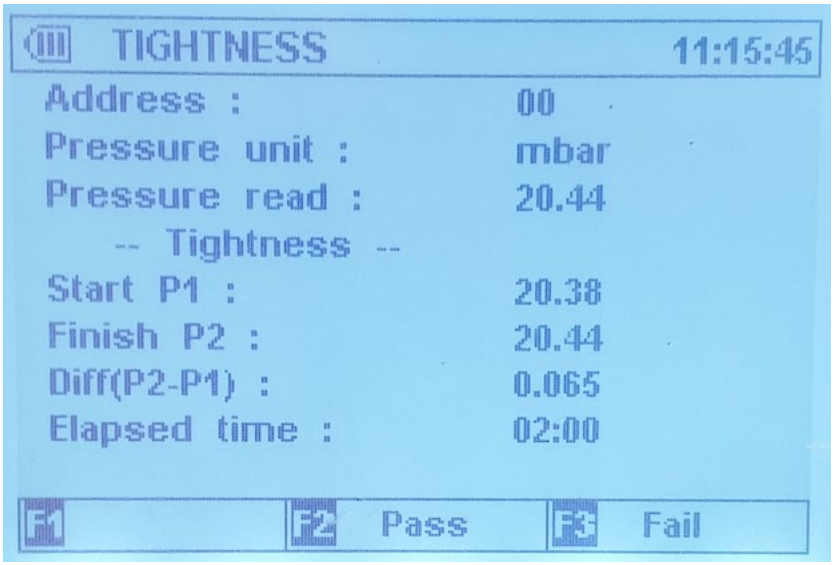


The test continues with the Tightness section so please apply the required pressure which will be displayed as “Pressure read” value.

The Tightness section of the test will start to count up and complete after 120 seconds.

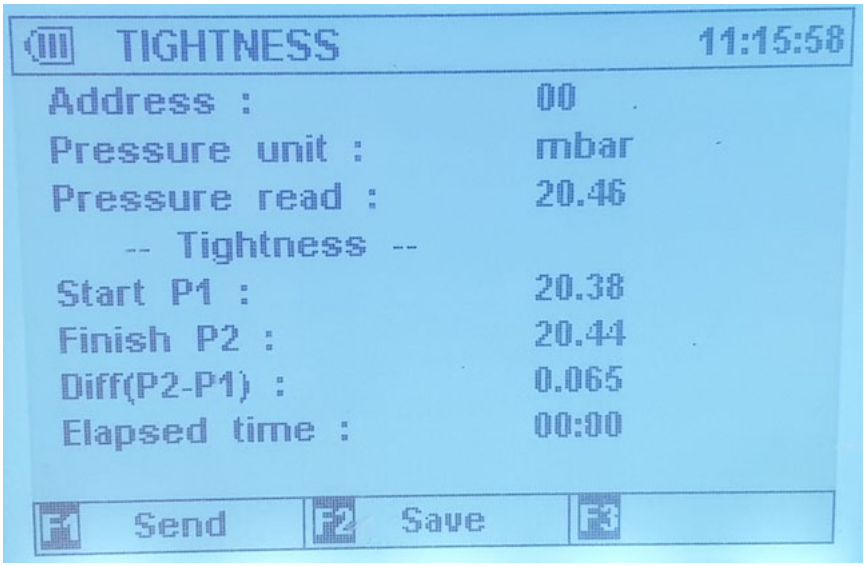


Once the 120 seconds have elapsed the Start, Finish & Difference pressure will be displayed with option for you to Pass or Fail the test at this stage.

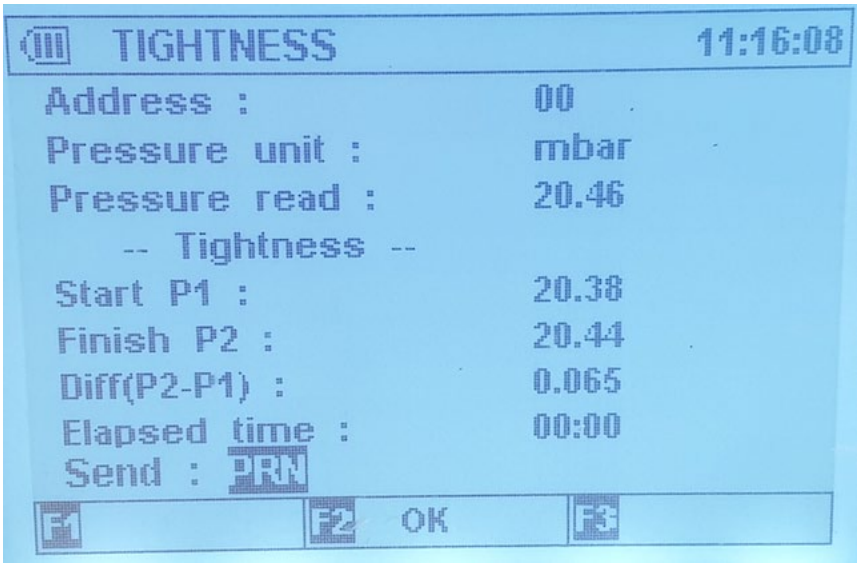


Press the “F3” Key to Fail the test or
Press the “F2” Key to finish the test and bring up the Save and Send options.

Press the “F2” Key to save the test to the chosen Storage Location.

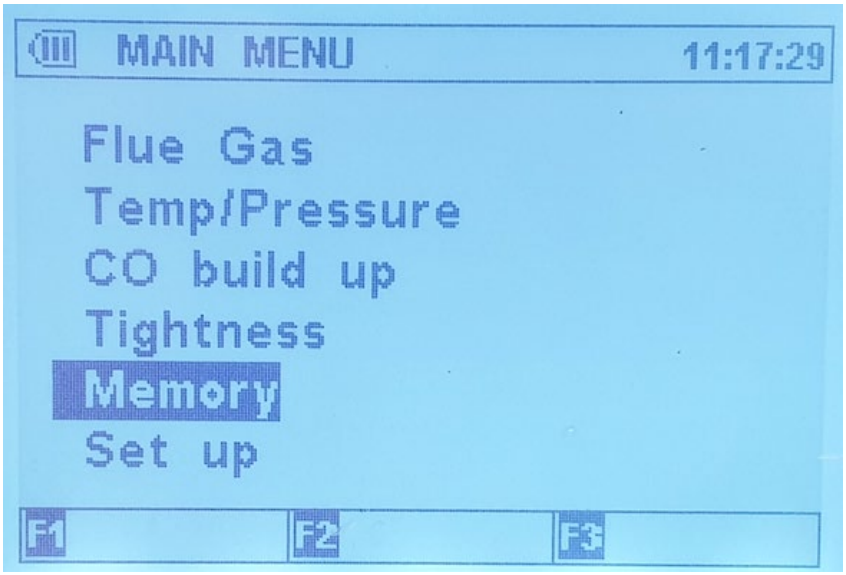


Press the “F1” Key to send the complete report to the Printer, if connected.

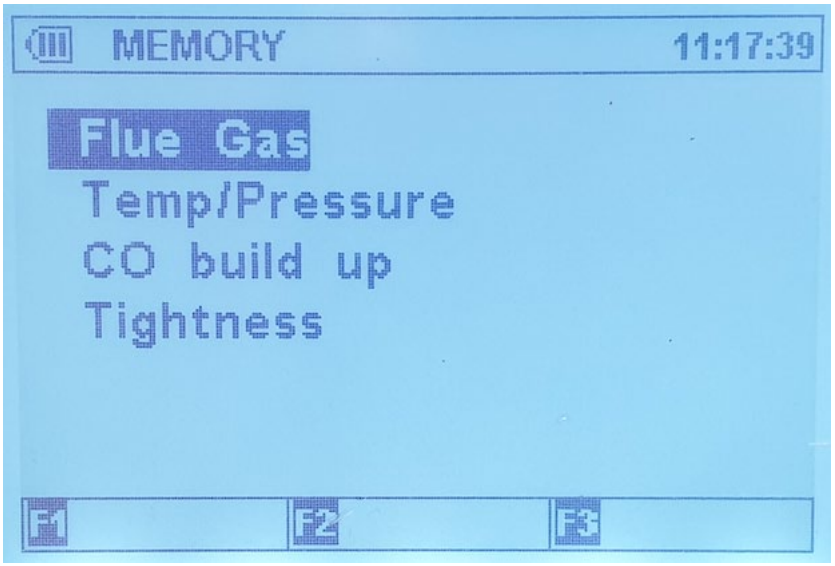


Memory

Press the “Enter” key to bring up the Memory Screen and options



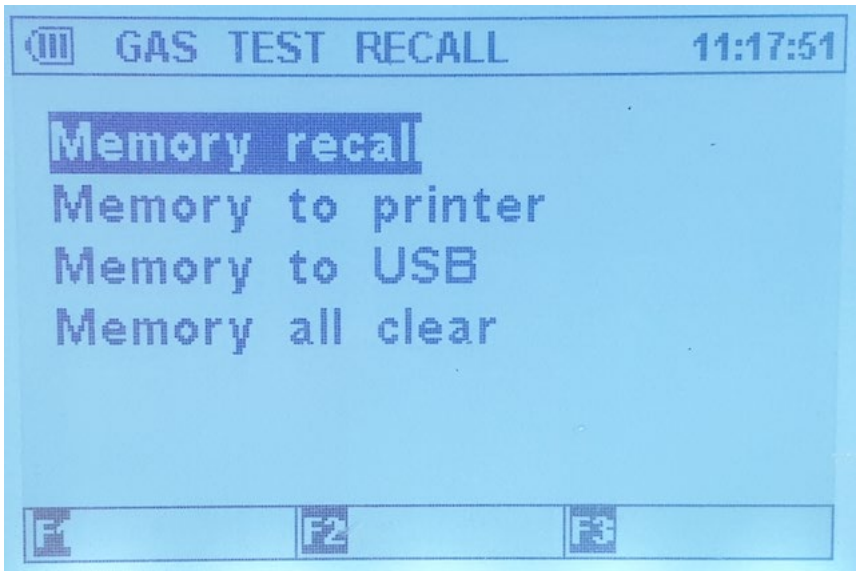
Use the Up & Down Keys to Highlight the section of the Memory you wish to examine.



Once the section required is Highlighted use the Enter Key to bring up the Memory options.

Use the Up & Down Keys to Highlight the option within the Memory you wish to perform.

Once the section required is Highlighted use the Enter Key to bring up the Memory options.



Icons

: When the Bluetooth printer is connected.
: When the AC adaptor is connected. (‘C’ type USB)
When the product is connected to PC. (‘C’ type USB)
: Battery full
: Battery 4/5
: Battery 3/5
: Battery 2/5
: Battery needs to be charged.

Specifications

DC711 Specifications	
Instrument	
Operating Temperature Range	14°F to +122°F (-10°C to +50°C)
Battery / Battery Life	Li-ion 3.7V / > 6 Hours
Charger Input	USB “C” type
Fuels	Natural Gas, LPG, Light Oil, Heavy Oil, Bituminous Coal, Anthracite Coal, Coke, Butane, Wood, Bagasse
Pressure Ranges	mbar, psi, inH2O, mmH2O, kPa, hPa, inHg, mmHg, mH2O
Display	Backlit Graphic LCD
Data Storage	100 sets of readings (30 sets for CO Build Up), multiple pages
Time and Date	24 Hour Real Time Clock
Dimensions	7.28” (185mm) x 4.92” (125mm) x 2.56” (65mm)
Weight	1.83lbs (830g)
Conforms to	EN50379 : Parts 1-3

Flue Temperature Probe	
Construction	Pistol Grip with Stainless Steel Shaft
Hose Length	8.2’ (2500mm)
Insertion Length	7.9” (200mm)
‘K’ Type Thermocouple Accuracy	+/- 0.3% of fullscale, +/- 2°F (1°C)
Maximum Temperature	1472°F (800°C)

Gases	Range	Resolution	Accuracy
Oxygen	0-25%	0.1%	+/- 0.3%
Carbon Monoxide (low)	0-10,000 ppm	1 ppm	(<100ppm) +/- 5 ppm (>=100ppm) +/- 5%
Carbon Monoxide (high)*	0-100,000 ppm	0.001%	>10,000ppm: +/- 10%
Nitric Oxide *	0-5000ppm	1 ppm	+/- 5ppm (<100ppm) +/- 5% (<1000ppm) +/- 10% (>1000ppm)
Carbon Dioxide	0-25%	0.1%	Calculated
CO/CO2 Ratio	0-0.999	0.001	Calculated
Combustion Efficiency	0-100%	0.1%	Calculated

* if fitted

Pressure Measurement	
Selectable Ranges	mbar, psi, inH2O, mmH2O, kPa, hPa, inHg, mmHg, mH2O
Range	– 150 mbar to + 160 mbar -15 kPa to + 15 kPa -60 inH2O to 60 inH2O
Resolution	0.001 mbar (0~9.999 mbar) 0.01 mbar (10.00~149.99 mbar)
Accuracy	+/- 0.5 mbar FSD

Temperature Measurement	
Input Type	K-Type thermocouple
Range	-58°F to 1832°F (-50°C to 1000°C)*
Resolution	1°F (1°C)
Accuracy	+/- (0.3% of rdg + 2°F) or +/- (0.3% of rdg + 1°C)

CALIBRATION & SERVICE

It is recommended that your analyzer be calibrated every 12 months. Please consult Test Products International for further details or send your analyzer to the address below for service.

TPI / Attn. Service
9615 SW Allen Blvd. Suite 104
Beaverton, OR 97005

The following consumable parts for the instrument are user replaceable:
In-Line Filter Element (pkg of 5): A762F
Water Block Filter: A794W
Mini Pump Protection Filter Assembly: A763

WARRANTY

Your DC711 Flue Gas Analyzer is guaranteed free from defects in materials and workmanship for 3 Years from the date of purchase except for the sensors which carry a 2 year warranty.

General Maintenance

All combustion analyzers use consumable items such as filters in the probes. These items are user serviceable and can be taken care of by the operator.
The consumable items that will require operator attention are the water trap / filter assembly, flue probe, pump protection filter, and ambient temperature probe.
The following maintenance checks should be performed before each combustion test to ensure that the filters are clean & dry and free from any dirt or moisture.

> **NOTE:** Failure to ensure filters are clean and dry may result in slow &/or inaccurate readings.

Check that the pump is running at OK and that the probe has no loss of integrity which could result in in-accurate readings.

Water Trap Check

Visually check the water trap for:

1. Cracks in the bowl.
2. Broken ears on the bowl where the lid locks on.
3. Broken ears on the lid.
4. Worn out o-ring on the lid.
5. Loose connection to the flue probe tubing.

Filter Check

Signs of dirty or water saturated filters may cause a slow pump and flow error to be displayed when the flue probe is connected, and measurements may take longer than normal.
If the particle filter is clean but saturated with water a replacement should be installed to ensure proper flow. The saturated filter can be left to dry and reused later.

Pump Operation Check

1. Turn the analyzer on. Wait until the analyzer has completed the initial purge and sensor check and is operating normally prior to proceeding to step 2.
2. With the pump running, cover the analyzer gas inlet port with your finger. The analyzer should display “Flow Error” and a rapid beeping should be heard.
3. If the analyzer does not beep and does not display “Flow Error” this may be an indication the flow sensor requires calibration, the pump is faulty, or there is an internal leak. Contact your local service centre for further advise.

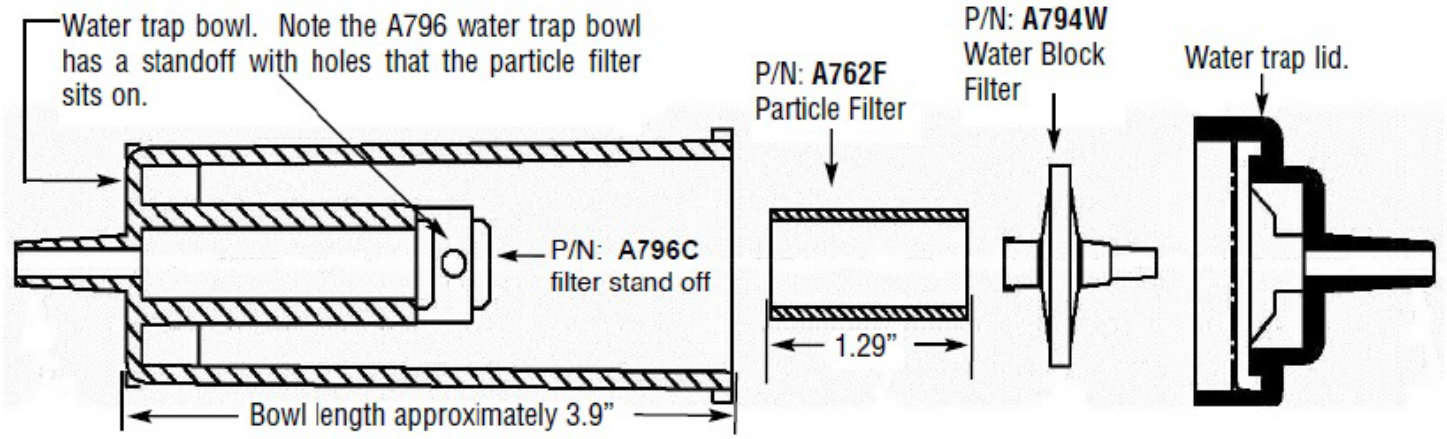
Flue Probe Integrity Check

NOTE: Perform this check AFTER performing the Pump Operation Check outlined above.

1. Turn the analyzer on. Wait until the analyzer has completed the initial purge and sensor check and is operating normally prior to proceeding to step 2.
2. Connect the flue probe assembly to the in-line pump protection filter which should be connected to the analyzer and the yellow thermocouple connector to input T1.
3. Navigate to “Flue Gas” screen and start the pump running. Check that the temperature is displayed OK and is approximately the ambient temperature. This indicates that the thermocouple is operating properly, and you may proceed to the next step to continue the test.
4. Cover the end of the flue probe with a small piece of tube and pinch the end closed. After a short period of time the analyzer should display “Flow Error” and a rapid beeping should be heard. If this happens the flue probe his operating properly and the integrity test is complete. If the analyzer does not display “Flow Error” this is an indication of a possible leak somewhere in the flue probe and you may proceed to the next step for further tests.
5. Pinch the hose below the handle of the flue probe. If the analyzer displays “Flow Error” there is a leak in the handle assembly and the probe may need to be factory serviced. If the analyzer does not display “Flow Error” proceed to the next step for further tests.

6. Pinch the hose between the analyzer and the water trap. If “Flow Error” still does not display there may be an internal leak, pump problem, or other issue and the analyzer may need to be factory serviced. If “Flow Error” is displayed there is a leak in the water trap assembly and the water trap assembly should be checked.

A796 Water Trap Parts



Exploded View of A796 Water Trap

The following consumable parts for the instrument are user replaceable:
Particle Filter Element (pkg of 5): A762F (see above)
Water Block Filter: A794W (see above)
Mini Pump Protection Filter Assembly: A763 (see below)

A763 Pump Protection Filter

Typical Test Locations

IMPORTANT: Prior to taking a sample, the device under test should be on and at operating temperature. **Putting the flue probe in the sample area prior to starting the device may cause saturation of the sensors due to the higher initial concentration of carbon monoxide that may be encountered upon start up.** If this happens, allow your analyzer to purge in fresh air until the carbon monoxide level returns to 0 ppm and the oxygen level returns to 20.9%. This may take more than an hour depending on how saturated the sensors are.

Drill a 1/4 inch hole into the flue of the device under test. For most applications, flue gas samples should be taken prior to the draft diverter or any other opening that allows room air to enter the system. This prevents room air from mixing with gases in the flue and diluting the test sample.

It is important to use manufacturers recommended test locations whenever possible.

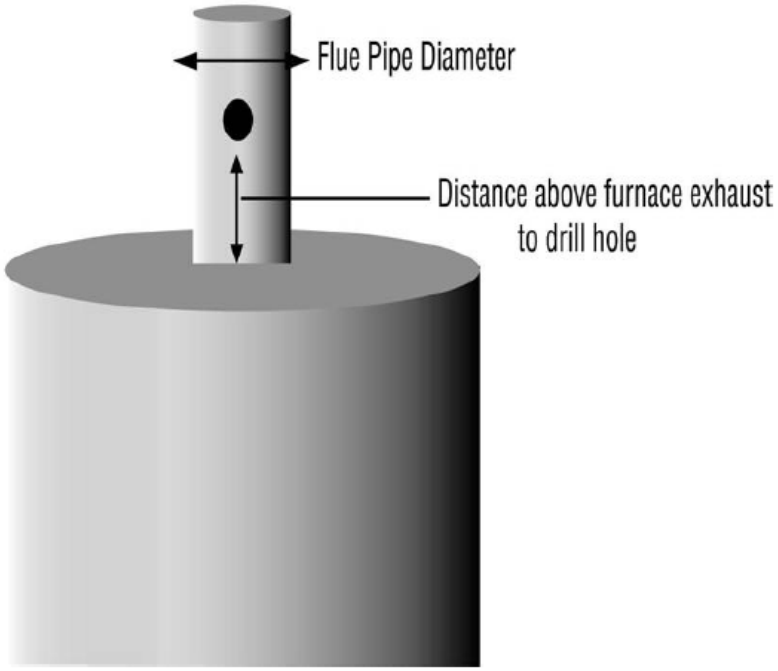
Refer to the figure below for calculating the sample hole location.

Flue pipe diameter x 1.5 = proper hole location

Example for a 4 inch flue:

4 inches x 1.5 = 6 inches

The hole should be drilled 6 inches above the furnace exhaust.



The figures on the following pages show typical test locations on commonly encountered equipment.

Typical Test Locations

Atmospheric Gas Fired Fan Assist Boiler / Furnace

Typical Test Locations

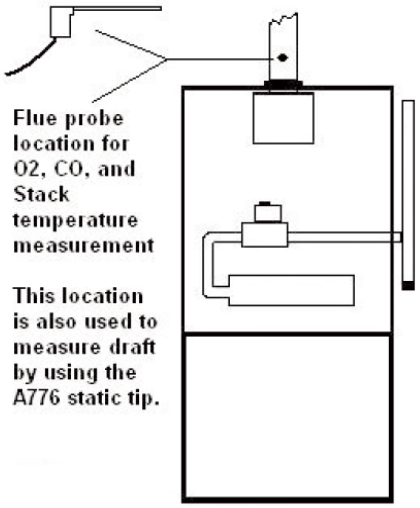


Figure 1

Condensing Boiler / Furnace

Typical Test Locations

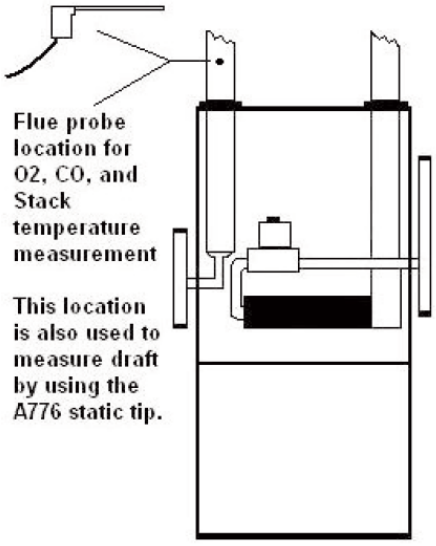


Figure 2

Atmospheric Forced Air Furnace

Typical Test Locations

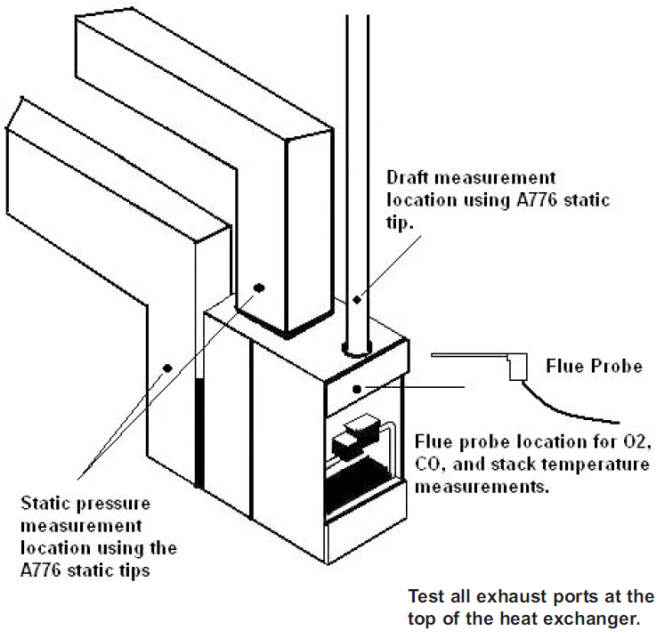


Figure 3

It is important to use manufacturers recommended test locations whenever possible.

Typical Test Results

Actual test results vary depending on the equipment under test. TPI recommends you check with the manufacturer of the equipment being tested to determine specific acceptable results.

Power Burners (Gas Fired)

Oxygen	3% to 6%
Carbon Monoxide	Less than 100ppm (air free)
Stack Temperature	300°F to 500°F
Draft	-0.15 inH2O

Power Burners (Oil Fired)

Oxygen	4% to 7%
Carbon Monoxide	Less than 100ppm (air free)
Stack Temperature	325°F to 625°F
Draft	-0.15 inH2O

Gas Fired Burners (Atmospheric / Fan Assist)

Oxygen	7% to 9%
Carbon Monoxide	Less than 100ppm (air free)
Stack Temperature	325°F to 500°F
Draft	-0.15 inH2O to -0.4 inH2O

Troubleshooting

The DC711 has the ability to inform you when there is an issue preventing normal operation.

Error Code	Possible Cause	Corrective Action
Flow Error	Clogged filters, water trap full of condensate, Internal pump blockage	Clean and/or replace filters. Empty water trap and allow the water block filter in the lid to dry out or replace it. Blow out flue probe. If none of the above clears the error, return analyzer to TPI for service.
Pump Error	Internal issue with the pump.	Return to TPI for service.
Purge Error	One or both of the sensors are failing self checks at start up. The analyzer may have been started in an area with CO present or the sensors are nearing the end of life.	Run the DC711 in fresh air with nothing connected to the inlet for 30 minutes. Shut the analyzer off and turn it back on to see if the error has cleared. If not, return the analyzer to TPI for service.

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www.tpi-thevalueleader.com

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