

CO80

Combustion Gas Analyzer

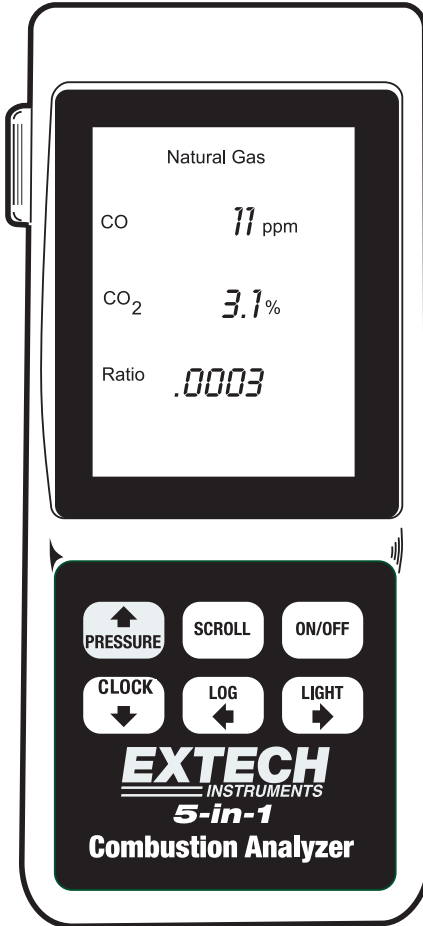


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1. Introduction

Thank you for your purchase of the Extech CO80. This instrument has been specifically developed to provide the many functions required by the modern boiler service engineer and to assist with compliance to existing and future legislation.

The CO80 now offers five tools in one instrument:

1. Flue Gas Combustion Analyser.
2. Differential Manometer.
3. Differential Thermometer.
4. Real time Carbon Monoxide Gas Leak Detector.
5. Gas Leak Detector.

In addition, there is a user selectable choice of fuels, temperature and pressure measurements.

This manual will take you through the functions and operations of the CO80 that will give you many years of reliable service.

Please also contact our technical support team at (781) 890-7440 x 200 or support@extech.com for additional information.

WARNING

This instrument is not designed to be used in continuous operation, nor is it to be used as a safety alarm.

It is designed to assist the heating engineer in diagnosing the correct installation or maintenance of heating appliances.

Full visual inspections of those appliances will be necessary, and other procedures should be adopted as appropriate.

2. Instrument Overview

2.1. Standard Items

Your CO80 kit comes supplied with the following items as standard:

- a) CO80 flue gas analyser
- b) Sample/thermocouple probe, with 2.5 meters of tubing and cable
- c) Filter/water trap
- d) Battery charger
- e) 2 off silicon tubing for pressure reading
- f) Soft carrying case

2.2 Options

2.2.1. Leak Detection Capability

This sensor option is fitted inside the instrument, enabling the CO80 to detect flammable gas leaks.

Once the gas leak screen has been cleared in order to view other screens and measurements, the thirty second purge period will be to be reactivated in order to perform other gas leak checks.

2.2.2. Air/Liquid/Surface Probe

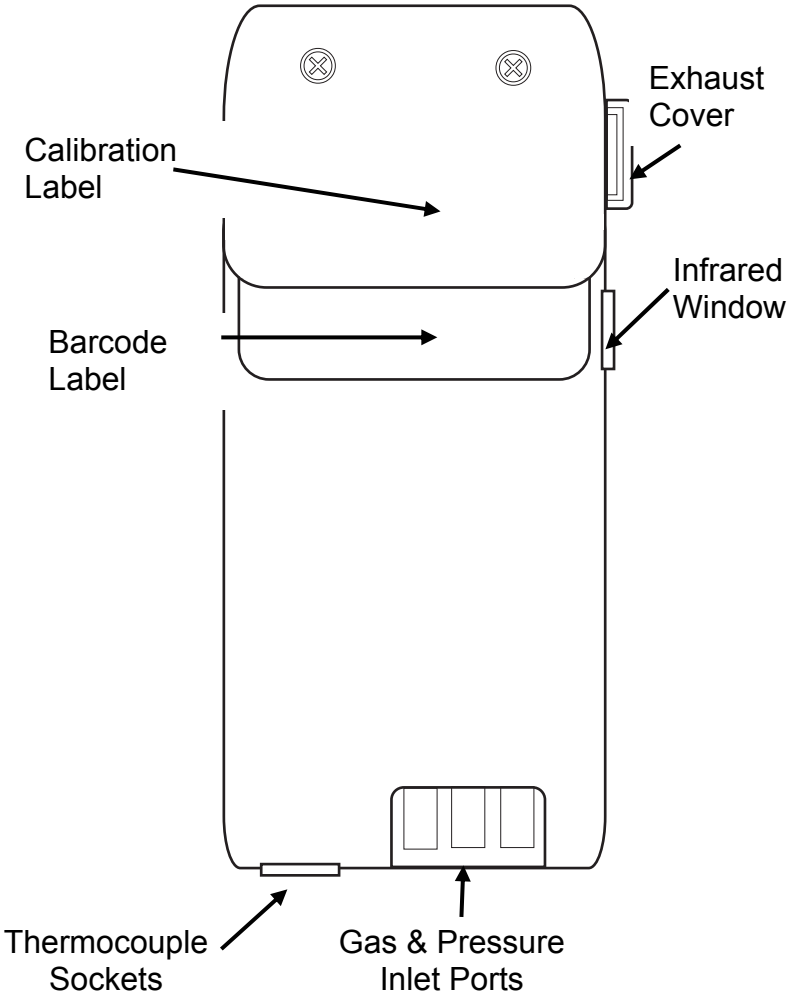
See Appendix A for specification details, **Display 4** in Section 2.6 to see readings, and Sections 2.9 and 3.2 for connection.

Additional options include a protective rubber boot, an infra red printer, a hard carry case and an IrDA converter.

2.3 Front View



2.4 Back View



2.5 Keypad



The straightforward membrane keypad comprises 6 keys, where a single touch will have the following functions:



Turns the instrument ON or OFF. Note that the instrument will automatically switch off if not used for a period of 15 minutes (*see 4.2 for additional information*)



Scrolls through up to 8 displays, depending on options taken (*see 2.6*).



Used to reset the pressure to ambient levels. Activates the Tightness Test



Displays the clock and is used to scroll through saved reports— keeping this held down for 2 seconds activates the soundness test.



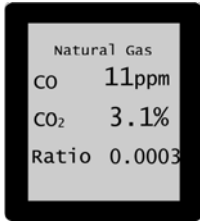
Logs and prints sets of readings, or logs and downloads up to 50 sets of combustion analysis and 25 CO room test readings to a PC (*see 4.6*).



Turns the back light on/off and records the pressure for the soundness test and the temperature in the pressure test

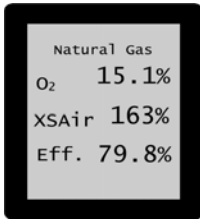
2.6 Display

There are eight standard displays on the CO80, although several of the displays have multiple functions and options. These depend upon the probes connected and menu selected.



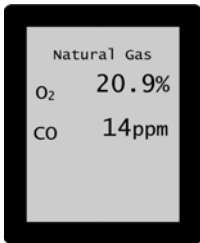
Display 1

CO in ppm, carbon dioxide in %, and ratio of the 2 gases – use this screen to provide an instant “health check” of the boiler.



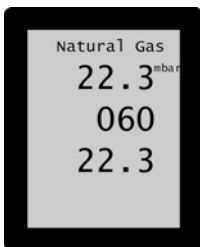
Display 2

Oxygen, excess air and combustion efficiency all in % - use this screen to display how efficiently the boiler is working.



Display 3

Displays oxygen in %, and carbon monoxide in ppm – use this screen to identify any CO gas leaks and concentration levels.

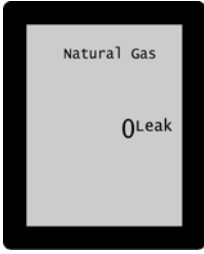


Display 4

Displays the positive and negative pressure (selected by connecting to the appropriate inlet).

Display 4 options also include a tightness test count-up timer and logging of the temperature during pressure test, dependent on mode and connections (*see Section 5*).

2.6 Display (continued)



Display 5

This is displayed **only** when the leak sensor option has been specified. It indicates approximate concentrations of flammable gas (See 2.2.1).



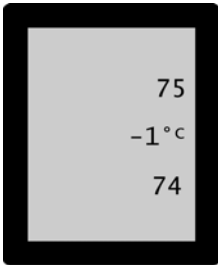
Display 6

Time (24 hours), day, month and year.



Display 7

Provides information on the CO levels for the room test. Pressing & holding the "Log" starts the test and the display alternates between the elapsed time period in minutes and the maximum CO in ppm for that minute.

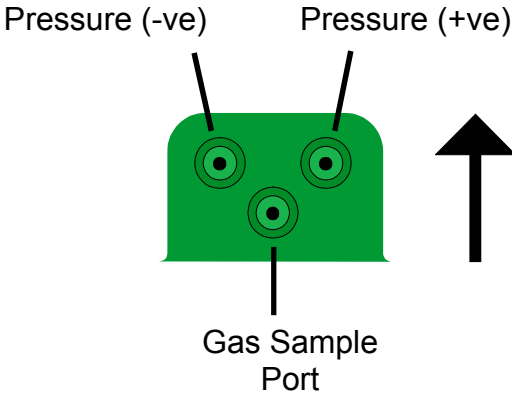


Display 8

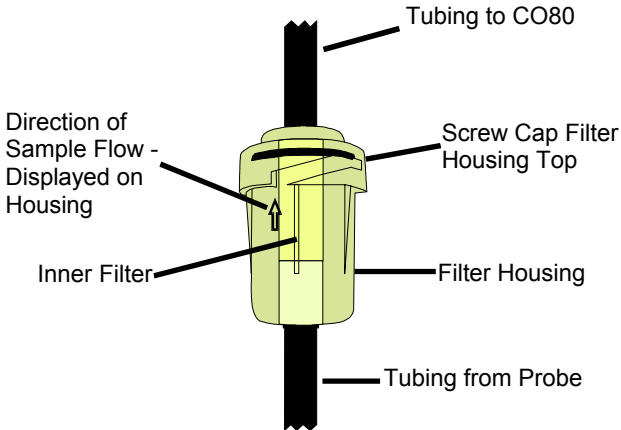
Provides temperature information. The outlet (flue) temperature is displayed on the top of the screen and the inlet at the bottom, with the difference between the two displayed in the middle.

2.7. Inlet Ports

There is one gas sample port and two pressure ports on the base of the instrument, to which 5 mm ID silicone tubing can be connected by push fitting. The use of these ports is also identified on the information label on the base of the instrument.



2.8 Filter/Water Trap

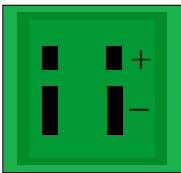


2.8 Filter/Water Trap (continued)

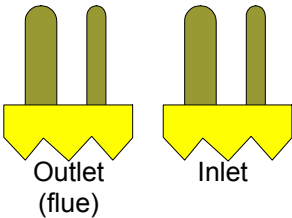
The combined filter/water trap is used in-line between the probe and the instrument. To change the filter, unscrew the filter-housing cap, remove the old filter and replace. Emptying the water trap is advisable whenever water is seen to be accumulating.

Filters should be changed every two months under normal operation or sooner if there is clear indication of contamination. Should the filters become soaked in water, these can be reused if left to dry fully. Filters **must** be used at all times – failure to do so shall invalidate any warranty.

2.9 Thermocouple Socket (Type-K)



The CO80 accepts a standard type-K thermocouple connection for both Inlet and Outlet.



WARNING

There is only one correct way around to connect the thermocouple. Forcing the connector into the socket the wrong way around may result in damage to the instrument and will invalidate any warranty.

2.10 Infrared Window

The infrared window allows communication with a compatible infrared printer, or to a PC with a suitable infrared port. The instrument window is located on the left-hand side of the instrument next to the gas exhaust.

To operate effectively, there must be a clear line of sight between the instrument infrared window, and the PC or printer infrared window. The two windows should be not more than three feet apart when in PC mode and 12" when in printer mode.

3. Setting Up

3.1 Power

The unit may be powered in 2 ways.

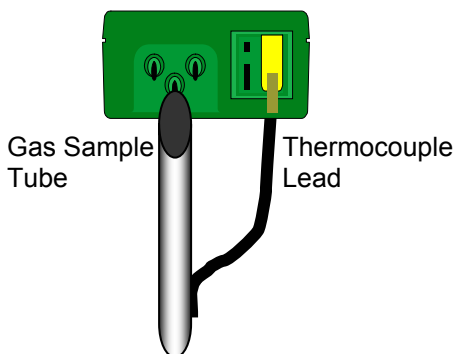
- (a) By using the integral rechargeable Ni-MH batteries. Overnight charging using the BGS101 charger will give a minimum of 6 hours continuous use (excluding leak detection option). The unit does not have to be switched on to charge the batteries, but if it is, after 15 minutes the instrument will automatically switch off whilst charging continues.
- (b) Direct from the mains using the BGS101 battery charger. Following use after a full charge, when there is approximately 30 minutes operational life remaining, a battery symbol will appear in the bottom right hand corner of the display:
When on charge, the above symbol will flash only if the instrument



has been switched on then off with the charger connected.

3.2 Probe Selection

The instrument is equipped with a standard sample and temperature probe, enabling the instrument to measure and display combustion efficiency. It is of stainless steel construction, and is supplied with 8 feet of sample tubing and cable.



The pistol grip probe is connected to the gas sample port and thermocouple socket, as shown, for combustion monitoring.

The sample probe assembly includes the inline filter (*see section 2.8*) and this must be used in the vertical position.

The additional air, surface and liquid temperature probe, if used, is connected into the thermocouple socket marked outlet (flue) at the base of the unit.

For pressure measurement, the ports are to be connected using the supplied 5 mm internal diameter silicon tubing to the positive and/or negative ports as required.

4. Taking Combustion Readings

4.1 Summary Procedure

1. Ensure batteries are charged, or instrument is connected to a mains supply (see 3.1).
2. Ensure water trap is empty (see 2.8).
3. Switch on, select fuel, temperature and pressure scales, printer/PC selection if modification is required (see 4.3).
4. Take flue readings (see 4.5).
5. Save, print, review or send data (see 4.6).
6. Empty water trap.
7. Switch off (see 4.7).

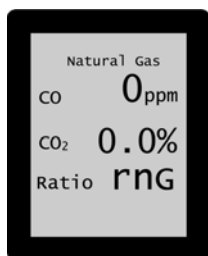
4.2 Switching On

Attach the appropriate probe and the filter/water trap, ensuring that the assembly is fitted in-line in the right direction (see 2.8).

Important: The instrument should be calibrated in outside (clean) ambient air.

Press and hold “**On/Off**” to activate the unit. The pump will be heard working, and a countdown of 30 seconds will begin. “**Purge**” will be displayed in the bottom left hand corner. Ensure the gas exhaust outlet is not obstructed.

During this countdown, the oxygen cell will be calibrated to ambient air conditions. At the end of the countdown sequence, the following will be displayed:



The CO and CO₂ readings should read zero in outside ambient air. “**rnG**” (range) is displayed against “**Ratio**” if the CO₂ reading is less than 0.5%.

4.3. Scale Selection

Only during the 30 second purge period on power-up can the user alter the fuel, pressure, temperature and communication settings. Should the user wish to use another setting during operation, the power must be recycled and the changes made during the second purge on power-up cycle.

Should no alternations occur during the power-up purge period, the last used settings shall automatically be reapplied.

4.3.1. Fuel Selection

During the power-up purge period, the last fuel selected will appear at the top of the display. To change the fuel press and hold down the “**Scroll**” button, which scrolls through the following 5 available fuels as follows:

Natural Gas
LPG
Light Oil
Heavy Oil
Fuel 1

Release the “**Scroll**” button when the fuel to be selected is displayed. By default “Fuel 1” is factory set for measurement when coal is used as the boiler fuel.

4.3.2. Temperature Selection

During the power-up purge period, the press and hold “**Light**” to display the current temperature scale setting. Either “**C**” or “**F**” will be displayed.

Press and hold “**Light**” until the required temperature scale is display. Allow the purge period to end to retain settings.

4.3.3 IR Output Mode Selection

The output mode for the infrared window can be selected for two formats:

PC = for a personal computer and Extech IR printers.

HP = for Hewlett Packard IR printers.

During the countdown sequence, press and hold the “**Log**” to display either **PC** or **HP** alternating on the screen. Release the “**Log**” button when the appropriate output mode to be selected is displayed. **MOST APPLICATIONS WILL USE THE PC MODE.**

4.3.4 Pressure Settings

To review or alter the pressure scale during the power-up purge period, press and hold down the “**Pressure**” button, which scrolls through the following 5 available fuels as follows:

bAR (mbar)

PSI (pounds per square inch)

nnG (mm of water column)

inG (inches of water column)

Release the “**Pressure**” button when the pressure to be selected is displayed and allow the purge period to end in order to save this setting.

4.5 Flue Readings

After completing steps 4.1 to 4.3.4, the instrument should now be ready to take combustion readings.

WARNING

Ensure that the combined filter/water trap hangs in a vertical position whilst readings are being taken, and particularly if water is visibly present. Failure to comply with this may result in damage to the instrument

4.5 Flue Readings (Cont.)

The time the gas sample takes to pass over the gas sensors from the flue is approximately 10 seconds, and a further period of time should be allowed for the readings to stabilise (approximately an additional 5 seconds).

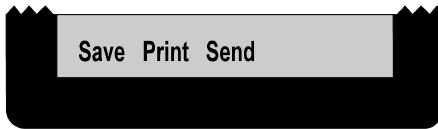
WARNING

If the CO concentration exceeds a level of 2,000 ppm, a continuous series of 'alarm beeps' will be heard. The probe should be immediately withdrawn from the flue, and the probe detached from the instrument. The instrument should be run in outside ambient air until CO and CO₂ readings return to zero.

4.6. Reports

Once a stable set of readings is displayed on the screen of the CO80, the next step is to save (or log) this data to the internal memory in the instrument for future output to a printer, or download to a PC or laptop computer. (See appendix D for details on how to communicate with a PC.)

The CO80 saves 50 combustion reports and 25 CO room test reports. When the memory is full and a new reading is taken, the oldest report is overwritten. By pressing the “**LOG**” button, the following will be displayed in the bottom left hand corner of the screen:



4.6.1 Saving a Report

Keeping hold of the “**Log**” key for two seconds will save the last report once a “beep” is heard. With “**Save**” flashing on the display, press and hold down the “**Log**” button for approximately 2 seconds - the instrument will save a full set of readings to the next available memory location. The CO80 will “beep” to confirm that the report has been saved.

4.6.2 Printing the Last Saved Report

See Appendix D for instructions on configuring the printer.

To print the last report, press the “**Log**” button followed by the “**Scroll**” button. The “**Print**” display at the bottom of the screen will now flash.

Press and hold the “**Log**” key for two seconds until a “beep” is heard and the last report will be printed.

The printer must be turned on with its IR port pointing at the IR port of the CO80 (see 2.10 for additional information) in order for the printing to commence.

Note: It is possible to review a report on the display by printing without linking to the printer or PC.

The printout has provision for writing in customer and appliance details.

The header can easily be configured to provide the name and contact details of the boiler service engineer (see section 5.4).

A typical set of readings is indicated on the right:

EXTECH INSTRUMENTS.	
781-890-7440	

Combustion Appliance	
Test Report	

Customer	-----
-----	-----
-----	-----
Appliance	-----
-----	-----
Ref.	-----
-----	-----
Flue Gases	
-----	-----
Log.....	2
Date.....	14:53,29/09/2002
Fuel:	NATURAL GAS
O2 (%).....	20.9
CO (ppm).....	11
CO2 (%).....	3.1
Ratio (CO/CO2).....	0.0003
Temp (C)	263
Efficiency (%).....	70.1
Excess Air (%).....	37
-----	-----

4.6.3 Printing Any Saved Report

To print any saved report, press the “**Log**” button followed by the “**Scroll**” button. The “**Print**” display at the bottom of the screen will now flash.

Pressing “**Pressure**” will scroll up through the saved reports by number, pressing the “**Clock**” button will scroll the saved reports down a number.

Select the report you wish to print and press and hold the “**Log**” key for two seconds until a “beep” is heard. The required report will be printed.

The printer must be turned on with its IR port pointing at the IR port of the CO80 (see 2.10 for additional information) in order for the printing to commence.

4.6.4. Deleting the Last Report

The CO80 saves 50 combustion reports and 25 CO room test reports. When the memory is full and a new reading is taken, the oldest report is overwritten.

To delete the last logged report, press the “**Log**” key. Pressing the “**Pressure**” key will show the last report saved and “**del**” will flash. Keeping hold of the “**Log**” key for two seconds will delete the last report once a “beep” is heard. Display 1 will now be displayed once the report has been deleted.

4.6.5. Deleting All Reports

Pressing “**Log**” then the “**Scroll**” key twice displays the screen “**ALL 50**”. Pressing “**Pressure**” now brings up a flashing “**del**” under “**ALL 50**”. Press and hold the “**Log**” key for two seconds until a “beep” is heard, when all 50 combustion reports will be deleted.

4.6.6. Sending a Report

Press the “**Log**” key and the “**Scroll**” key twice and “**Send**” will flash on the display. Press and hold the “**Log**” key for two seconds until a “beep” is heard, when all 50 combustion reports will be sent either to the printer or PC. The display will automatically revert to the Display 1, as shown in Section 2.6.

WARNING

“Sending” all saved sets of readings when in HP mode, will result in all 50 memory locations printing out, which will take approximately one hour.

4.7. Switching Off

The CO80 has been designed to provide maximum protection to its components by purging the sensors upon shutdown. If the unit is left for 15 minutes, the unit will automatically switch off if the CO reading is below 20 ppm. However, if there is more than 20 ppm CO present, the instrument will continue to purge the sensor with clean air until the reading falls below 20 ppm before turning itself off.

4.7.1 In Normal Mode

When all appropriate readings have been taken, the probe should be removed from the flue, and the unit switched off by pressing the “**On/Off**” key. The close down routine purges unwanted flue gases from the instrument, extending its operational life, and prepares the instrument for the next set of measurements.



The instrument will commence a 30-second purge routine, such that after 7 seconds, the display will look as shown

4.7.2 Power Off In High CO Levels

If the unit is turned “**OFF**” after the carbon monoxide sensor has been exposed to high levels of CO gas, the display will show the following, with the number “**30**” flashing:



In this mode, the unit continues to pump clean air past the CO sensor. As soon as the CO level falls below 20 ppm the unit will automatically start its 30-second countdown and then turn off.

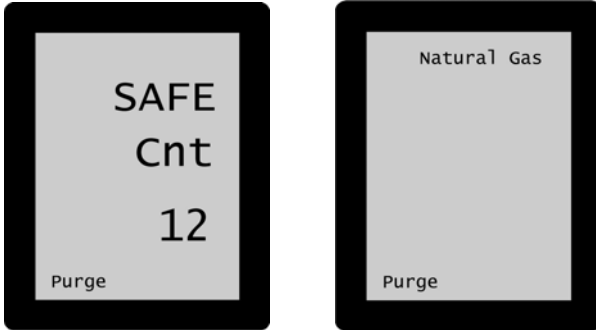
Whilst this display is shown, the “**On/Off**” key can be pressed to return to the previous screen.

4.7.3 Power Off During CO Room Test

See Section 5.5.2 to activate the CO Room test.

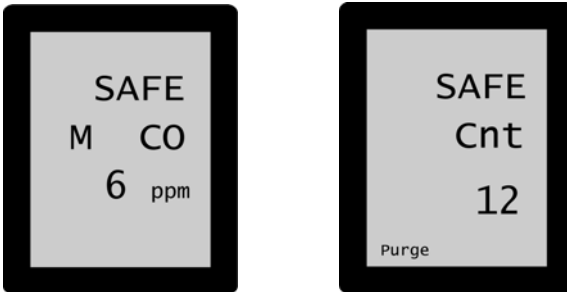
Note: Power cannot be turned off in this mode without printing/saving the stored readings for that report.

Pressing the “On/Off” key during the CO room test alternates the following two screens every second:



4.7.3. Turning Off During CO Room Test (Cont.)

To turn the power off in this mode, press the “On/Off” button to return to the CO room test displays, as shown below.



Pressing the “Log” key brings the “Save, Print, Send” menu at the bottom of the screen. Press “Scroll” for “Print” to flash. Press and hold “Log” to send the readings to an IR printer - readings are automatically saved in the memory. Only now can pressing the “On/Off” key turn off the power.

5. Other Functions

5.1 Taking Pressure Readings

To conserve battery life, the pump automatically turns off when Display 4 is selected under all conditions except when the CO room test feature is activated.

For pressure readings under 10 mbar, the display has a resolution of two decimal places and for measurements over 10 mbar, the resolution is one decimal place.

Depending on the probes connected and the options selected, there are various different pressure readings that can be taken using the CO80

5.1.1. Standard Pressure Readings

Press “**Scroll**” to select Display 4. Pressing the “**Pressure**” button once automatically calibrates the CO80 to atmospheric pressure.

5.1.1.1. Standard Pressure Readings (Cont.)

Four bars (----) will initially appear on the display, which will change to 0.00 mbar (or selected pressure scale) once calibrated to atmosphere. The instrument is now ready to take pressure readings.



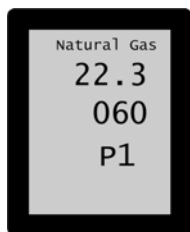
For **gauge** pressure, connect one length of silicon tubing supplied to the ‘Pressure (+)’ port (see 2.7).

For **differential** pressure, connect the two supplied lengths of silicon tubing to both the ‘Pressure (+)’ and ‘Pressure (-)’ ports. The difference in the readings is displayed and logged (if required).

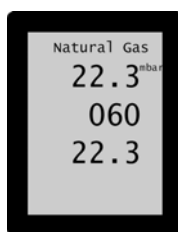
To record the pressure, press and hold “**Clock**” - a counter will commence and “**P1**” is displayed at the bottom of the screen. Press and hold “**Light**” until a “beep” is heard and the bottom display alternated between the “dropped” reading and “**P1**”.

5.1.1. Standard Pressure Readings (Cont.)

Note: Only when a pressure has been “dropped” can it be logged into memory.



Display alternates between "P1" and the "dropped" pressure when single pressure reading is made



Once the required pressure reading has been dropped, press and hold “**Log**” to save the report to memory. To print the report, follow the procedures detailed in 4.6: Reports.

5.1.2. Tightness Test

The CO80 has been developed to conform with the UK document “Tightness Testing and Purging of Domestic Sized Gas Installations” (IGE/UP/1B). This includes the logging of pressure at the start and the end of the test period, as well as recording the time periods in between.

To activate the Tightness Test, scroll into Display 4 and remove all temperature probes. Press the “**Pressure**” key to calibrate the pressure to ambient conditions and connect the CO80 to the meter or appliance that requires pressure testing.

Press and hold the “**Clock**” key until the CO80 “beeps” - the counter is now reset to 0 seconds and counting automatically starts in one second intervals. “**P1**” is displayed at the bottom of the screen.

This display shows 1 minute and 3 seconds since the start of the test, which is commenced by pressing and holding the “**Pressure**” key.

Note: The pressure timer is displayed as minutes : seconds e.g. 010 = 10 seconds; 201 = 2 minutes 01 seconds; 1159 = 11 minutes 59 seconds

Connect the silicon tubing to the Pressure (+) Inlet Port (see 2.7) and to the test point on the meter. After turning the inlet valve off, the live pressure should be displayed on the top of the display (in the example below, 23.2 mbar).

After the required stabilisation time period (60 seconds) has been achieved, press and hold the “**Light**” key - this “drops” the live pressure at that particular time to the bottom of the screen. The display alternates between “**P1**” and the “dropped” pressure (see example 5.11 for an example).



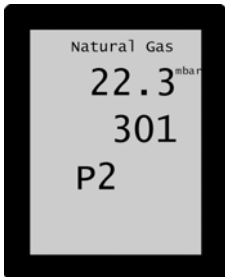
After the test period has been achieved, press and hold “**Light**” again to clear the alternating display of “**P1**” and the “dropped” pressure reading. A solid “**P2**” is displayed at the bottom of the screen.

Press and hold “**Light**” for the second time to “drop” the second (end of test) pressure to the bottom.

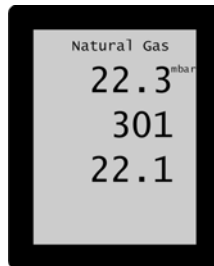
After 3 minutes and 6 seconds (displayed as 306 – 3 minutes and 6 seconds), the “start” and “finish” results are the same

The display will alternate between the “**P2**” and the “dropped” pressure for this part of the test.

5.1.2. Soundness/Tightness Test (Cont.)



Display alternates between “**P2**” and the “dropped” pressure when single pressure reading is made



Once the second required pressure reading has been dropped, press and hold **“Log”** to save the report to memory.

If a mistake is made during the tightness test then it can be reset by pressing and holding the **“Clock”** key.

The start pressure and finish pressure and time interval are now ready to transfer to the logging memory. To do this press and hold the **“Log”** key whilst the pressure page is displayed – the Tightness Test is stored in the next available free memory report.

To print the report, follow the procedures detailed in 4.6: Reports. A typical report is shown on the right.

----- EXTECH INSTRUMENTS. 781-890-7740 -----
Combustion Appliance Test Report -----
Customer ----- -----
Appliance -----
Ref. -----
Tightness Test -----
Log... ..27 Date 11:45 5/10/2002 P1 Start (mbar)22.3 M2 Stop (mbar)22.3 Time Period.... ..2:01 -----

5.1.2. Soundness/Tightness Test (Cont.)

The time interval between the two readings is printed as minutes : seconds. The results are retained permanently in the logging memory until they are deleted or overwritten.

Should any other screens be scrolled to whilst performing the tightness test, upon re-entry to the **Pressure** screen (*display 4*), any Tightness Test commenced will be resent. The above will have to be repeated.

Should **“Light”** be pressed and hold once the timer has been activated by pressing and holding the **“Clock”** button, the “dropped” pressure will be recorded as:

P1→P2 →P2→ P1→P2 etc

5.1.3. Pressure and Temperature Readings

For some types of boilers (for example, oil boilers), the temperature readings need to be displayed with the pressure readings in order to assist with the boiler set up.

If no temperature probes are connected, no temperature readings are displayed, unless a reading has already been stored on the outlet setting (*see below*).

To have both flow and return readings, two thermocouples must be connected (*see section 2.9*).

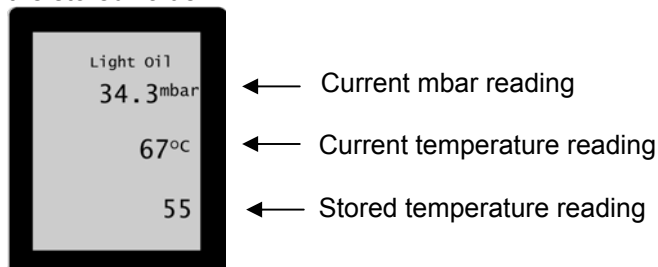
To measure and store the outlet (Flue) temperature, connect the thermocouple to the outlet port (*see section 2.9*).

Place the probe thermocouple at the required location and press “**Light**” until a beep is heard – the current value reading is stored at the bottom of the display.

The stored value can be overwritten at any time by pressing and holding the “**Light**” key twice until “beeps” are heard.

5.1.3. Pressure and Temperature Readings (Cont.)

The first press deletes the stored value, the second stores the new value. The temperature probe does not need to be connected in order to delete the stored value.



Note: The back light will stay on until the “**Light**” button is pressed again – do this to save battery life.

5.2 Taking Efficiency Readings

CO80 is factory set to calculate gross (G) rather than nett (N) combustion efficiencies. To confirm this, whilst displaying efficiency (see *Display 2*) hold down the “**Light**” key and either a G or N will appear in the first position on the efficiency line.

To change from gross to nett efficiency, or vice versa, hold down the “**Light**” key as above for 2 seconds (beep sounds) until the required parameter “**G**” or “**N**” is displayed.

Connect the thermocouple to the Outlet (Flue) connection, select the required fuel type, insert the probe in the flue (with the water filter attached) and the efficiency measurement shall be displayed in around 10 seconds.

5.3 Clock

To view the time and date, press the **“Clock”** button, or **“Scroll”** to Display 6.

To change the clock settings, stay in display 6 and press and hold the **“Clock”** button for approximately 2 seconds.

The CO80 will emit a ‘beep’, and the first digit of the time will flash, as will the **“Time/Date”** icon at the bottom of the display. In this mode, the keys on the keypad have the following alternative functions:

- **“Pressure”** button increments the first digit up by one.
- **“Clock”** button to decrease the first digit by one.
- **“Light”** button will move the next display digit.
- **“Log”** button will move the previous display digit.
- **“Scroll”** button will fix the amended time and date, and return the screen to Display 7 (CO room test).

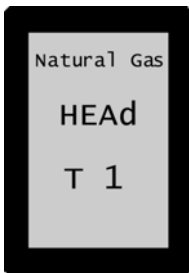
5.4 Header Settings

The header comprises of two lines, each with 24 characters. Line one holds characters 1 through to 24, line two holds characters 25 through to 48. Factory settings are as follows:

EXTECH INSTRUMENTS
781-890-7440

5.4.1. Changing the Header Characters

To change the characters individually, for example, to the end user company name and contact telephone number, press the **“Log”** button, and then hold down the **“Clock”** button for approximately 2 seconds until the instrument ‘beeps’. The following display will be shown (if the Extech header as shown above is the current reading):



“E” denotes the first letter of EXTECH in the first character position. Pressing the **“Light”** and **“Log”** buttons scrolls forward and backwards through the 48 character positions.

By pressing the “**Pressure**” and “**Clock**” button, the character will increment up or down respectively through the character set, as laid out in Appendix B.

To fix the new header, press the “**Scroll**” button, and the screen will return to the Display 1 as shown in section 2.6.

Assigning characters is achieved in a way similar to amending the time and date (see 5.3 - *Clock*).

5.4.2. Setting your Security Code

There is an optional security code for the first line of your header. If you do not enable the security code, the header can be changed as detailed in 5.4.

To enable the security code, a four-digit code must first be chosen. Press and hold the “**Clock**” button until a “beep” is heard – the first of the time digits will now flash. Move down until the first digit of the year flashes, and enter the code ‘7777’ in the year field.

This notifies the CO80 that the security code is about to be entered. The first ‘time’ digit will now flash.

WARNING

Once a security code has been entered it cannot be changed. You will need to keep this code safe, as the top line of the header cannot be changed without it. If you forget or lose your security code and need to change the top line of header, the unit will have to be returned to Extech and a charge will be incurred for clearing the memory.

Enter the four-digit code you have chosen in the time field, and confirm this by entering the same code in the date field. This code will be saved to memory. The code will not be accepted unless the time and date fields are the same.

A two-tone beep will sound once a valid code has been accepted and the top line of the header will be protected next time the unit is switched on.

5.4.3. Changing a Security Coded Header

To change the top line of the header the four-digit code must be available. If you do not have a security code please refer to 5.4.1. If the code has been lost or forgotten please contact Extech Gas Monitoring.

To enable alteration of the user header top line, first press and hold the “**Clock**” key until a beep is heard and the first time digit flashes. Select the year fields and enter the code 7553 then move up to enter your security code XXXX into the month field. Press the “**Scroll**” key to confirm. If the code is valid a two-tone beep will sound and the top line of the header as in 5.4.1 may now be changed.

The previous settings of the Time and Date are unaffected by these changes, as an invalid year code means that changes are ignored.

5.5 Taking Carbon Monoxide Readings

The CO80 is able to pin point areas of CO leakage, as well as ambient room levels in accordance to the forthcoming British standard, currently in draft form as BS7967: Code of Practice for Measurement of Carbon Monoxide and Carbon Dioxide in Buildings and from Gas-Fired Appliances by use of Electronic Portable Combustion Gas Analysers.

5.5.1 CO Spot Leak Detection

Ensure that the unit is switched on whilst in outside ambient air and use Display 1 or 3 to confirm that ambient CO levels are at 0. Connect the sample probe to the CO80 (see 2.7) and move the probe slowly around the appliance to find the exact source of CO or CO₂ leakage, using display 1 and/or 3.

5.5.2 CO Room Test Mode

Ensure that the unit is switched on whilst in outside ambient air. Follow the appropriate procedures of BS7967, in accordance with the manufacturer's instructions or with any Benchmark or similar codes of responsibility. Scroll through the menus until Display 7 is on the screen.



Pressing & holding the “**Log**” starts the CO room test. A reading is taken every minute for 30 minutes.

As soon as the test has commenced, a log number will automatically be generated. The sequence follows on from the last report number. Once more than 25 reports are stored, the next CO report overwrites the oldest stored report.

The display alternates between the following two screens every second:



← Denotes CO Room test is in progress.

← Indicates how many one-minute readings have taken place (in this case twelve).



← Indicates that the maximum CO readings are in progress.

← Value of CO in parts per million (ppm).

5.5.2 CO Room Test Mode (Cont.)

After 15 minutes, a “beeper” sounds for one minute – if the readings are stable (i.e. fallen to zero) up to this point, it **may** be allowable to stop the CO room test for that appliance at this moment (refer to legislation and/or appliance manufactures instructions).

After 30 minutes, the CO80 emits a sound that indicates the required timing period has finished and the maximum CO value in ppm is recorded and displayed.

Note: Pressing and holding “**Log**” anytime during the test will start a new report.

<p>Warning</p> <p>The previous readings will not be stored to memory until it has been printed.</p>
--

To print press “**Scroll**” until the “**Print**” flashes. Press and hold “**Log**” until a beep is heard – the last activated report will print. This report is now

saved and can also be printed at a latter time. To print the previous results, refer to 4.6.3.

Refer to 4.7.3 to switch off the CO80 during CO room test.

5.5.3 Printing the Last CO Report

Press the **“Log”** key activate the **“Save/Print/Send“** menu. Press **“Scroll”** until the **“Print”** flashes. Press and hold **“Log”** until a beep is heard – the last activated report should now be transmitted via the IR port and the information display on the screen.

WARNING

During the CO room test, the CO80 cannot be used for combustion analysis (displays 1 and 2), as these could severely alter the CO readings and render them useless.

5.5.4 Deleting the Last CO Report

To delete the last report or current report if a log is in progress, whilst in the CO display screen , press the **“Log”** key, followed by the **“Scroll”** key so that the **“Save”** icon is flashing.

Press the **“Pressure”** key so **“del”** flashes on the bottom line. To delete the last CO log press and hold the **“Log”** key whilst **“del”** is flashing.

To cancel the delete log request, either press the **“Pressure”** key followed by **“Scroll”** or **“Light”** key to select the next logging function.

5.5.5 To Print all CO reports

Whilst in the CO menu and whilst there is no current CO room measurement running, press **“Log”** and **“Scroll”** twice until the **“Send”** icon flashes. Press and hold **“Log”** until a beep is heard and 25 reports shall be printed.

WARNING

Sending all saved sets of readings when in HP mode, will result in all 25 memory locations printing out, which will take up to one hour.

5.5.6. To Delete all CO Room Test Reports

Whilst in the CO menu and whilst there is no current CO room measurement running, press “**Log**” and “**Scroll**” twice until the Send icon flashes. Press the “**Pressure**” key so that the icon “del” flashes – press and hold the “**Log**” key until a beep is heard. All reports will be deleted and the message “**Memory Empty**” will be display should any report be printed without new readings being taken.

To cancel the del log request either press the “**Pressure**” key again or press the scroll key to select the next logging function.

5.6 Differential Temperature Measurement

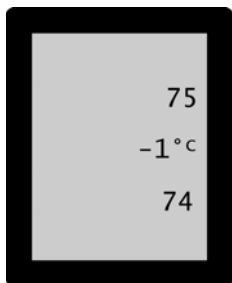
The CO80 allows for two thermocouples for differential measurement that is used, for example, to measure the heat loss between the flow and return pipes on a boiler (refer to manufacturers instructions and/or current legislation for the maximum permissible differences between the two).



5.6.1 Differential Thermometer Set up

Scroll through to Display 8. Connect the probes as detailed in 2.9. If no CO room test is being conducted, the pump should automatically be turned off if both thermocouples are connected.

The inlet display is the bottom of the two measurements, with the outlet (Flue) measurement display on the top. The difference between the two is shown in the middle.



- ← Outlet (Flue) Temperature
- ← Difference between Inlet/Out Temperature
- ← Inlet Temperature

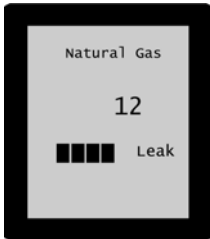
To save, record or print the differential measurements, see Reports in 4.6.

5.7 Gas Leak Detection

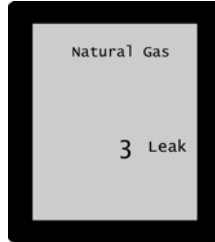
Flammable gas leak detection can only be activated if this option is specified at the time of purchase. Press “**Scroll**” until display five is activated (see page 9) . Upon entering this screen, the CO80 will commence a thirty second purge of the flammable gas sensors.

Warning

Do not subject the CO80 to any flammable gas during the thirty second purge period, as this will affect any future readings until the power is reset.



The display will change after the 30 purge period (left) to ppm level indicator once activated (right)



Once the purge period has finished, an audible alarm is activated and the display reverts to the above right. Connect a length of the silicon tubing provided as part of the package or the thermocouple combustion probe to the sample port (see section 2.7). Place the end of the sample tube at the area of inspection.

Any increase in the density of leaked flammable gas beyond 20 ppm will increase the pitch of the crescendo alarm, as well as modifying the display. The digits will modify to reflect the change in density as per below:

Indication Level	Flammable Gas Concentration
0	20 – 100 ppm
1	100 – 1,000 ppm
2	1,000 – 10,000 ppm
3	> 10,000 ppm

6. Calibration and Service

It is recommended that the unit be calibrated annually. Please consult with Extech Instruments for further details at 781-890-7440 or support@extech.com. The consumable parts for the instrument are:

- Filter elements
- Silicon tubing
- Oxygen cell
- CO cell

The cells are contained within the instrument and are not user replaceable.

WARNING

Replacement or attempted replacement of the oxygen and carbon monoxide cells by any other party other than a trained Extech official service partner will invalidate any outstanding warranty.

7. Guarantee

Your new CO80 is guaranteed free from defects in materials and workmanship for a period of two years from date of purchase, provided that:

- The product has been used only for its intended purpose, and not been subjected to damage by misuse, or wilful or accidental damage.
- The product must not have been tampered with or repaired by anyone other than a trained and certified Extech Instruments official service partner.
- Should the serial number on your CO80 be tampered with in any way, then the guarantee will be considered null and void.

This guarantee does not affect your statutory rights.

Appendix A Specifications

1. Instrument

Operating temperature range	-10°C to 50°C (14°F to 122°F)
Battery	Rechargeable Ni-MH. Life >6 hours
Charger input voltage	115V or 230V; 50/60Hz AC
Fuels	Natural Gas, LPG, Heavy Oil, Light Oil and Coal
Display	Back lit LCD
Dimensions	160 x 70 x 50mm (6.3" x 2.8" x 2")
Weight	500g (1.1 lbs.)
Protective Casing	Rubber boot
Conforms to	BS7927
Reports	50 combustion analysis 25 CO room test
Options	Protective rubber boot IR link to PC (Windows 98 or higher)

2. Probes

Standard Efficiency Probe

Insertion length	250mm (9.9") with adjustable depth gauge
Maximum temperature	800°C (1472°F)
Construction	Pistol grip with stainless steel shaft
K-type thermocouple	Accuracy +/- 1°C + 0.3% of reading
Hose length	2500mm (9.9')

3. Options

Air/Surface/Liquid Probe

Construction:	Handgrip with stainless steel shaft, and protective cover
K-Type Thermocouple:	Accuracy +/- 0.3%, +/- 1°C
Temperature range	-50°C to +400°C (-58°F to +752°C)

4. Options (cont.)

Gas Leak Sensor

Gas Leak Sensor: 20 – 10,000 ppm
 Printer: Extech 1500

5. Gases

	Range	Resolution	Accuracy
Oxygen	0-25%	0.1%	+/- 0.3%
Carbon monoxide	0-10,000 ppm	+/-1ppm	<100ppm; +/- 5ppm >100ppm; +/- 5%
Carbon dioxide (Calculated)	0 - 25%		
CO/CO ₂ ratio	0 - 0.9999		
Gas leak sensor (option)	20-10,000 ppm		
CO alarm	Level - factory set		

6. Draught/Pressure Measurement

Tightness Test	Timer count up from 0 (zero) to 99 minutes 59 seconds for gas tightness test to comply with (IGE/UP/1B)
----------------	---

mbar Scale

Range	-100 mbar to + 100 mbar
Resolution	0.1 mbar (0 to +/-100 mbar) 1 mbar (+/-10 to +/-100 mbar)
Accuracy	+/- 0.5% of reading calibration at +50mbar (equivalent to +/- 2.5 mbar)

PSI Scale

Range	-1.4 PSI to +1.4 PSI
Resolution	0.001 PSI (0 to +/-1.400 PSI)
Accuracy	+/- 0.5% of reading calibration at +0.7PSI (equivalent to +/- 0.004 PSI)

5. Draught/Pressure Measurement (Cont.)

Inches Water Gauge Scale

Range	-40 inWG to +40 inWG
Resolution	0.01 inWG (0 to +/-10 inWG) 0.1 inWG (+/-10 to +/-40 inWG)
Accuracy	+/- 0.5% of reading calibration at +20 inWG (equivalent to +/- 0.10 inWG)

mm Water Gauge Scale

Range	-1000 mmWG to + 1000 mmWG
Resolution	0.1 mmWG (0 to +/-100 mmWG) 1 inWG (+/-100 to +/-1000 mmWG)
Accuracy	+/- 0.5% of reading calibration at +500 mmWG (equivalent to +/- 2.5 mmWG)

Appendix B Header Character Set

The following is the list of characters available to include in the printer header (see 5.4):

SP	0	A	N
!	1	B	O
"	2	C	P
#	3	D	Q
\$	4	E	R
%	5	F	S
&	6	G	T
'	7	H	U
(8	I	V
)	9	J	W
*	:	K	X
+	;	L	Y
,	<	M	Z
-	=		
.	>		
/	?		
	@		

Note: SP denotes a "Space".

Appendix C Trouble Shooting Guide

Problem	Cause	Remedy
Unit does not turn on	Batteries are flat	Recharge batteries or run on mains
+ - shown on display, or unit unexpectedly turns off	Low batteries	Recharge batteries
O ₂ reading " Lo " after stabilising in clean air	O ₂ sensor failed	Contact Extech
" High " shown on display	Over-range reading	Remove probe from gas source immediately and allow unit to run in clean air for 5 minutes
Ratio reads " rnG "	CO or CO ₂ reading is zero. Unable to calculate	Probe is not in the flue/appliance not running
Battery life shorter than expected	Back light or leak detector has been used excessively	Turn off back light when not required
" CAL " shown on display	Calibration required	Contact Extech
" Prob " displayed	Instrument calibrated whilst probe in flue	Turn off instrument. Turn back on with probe outside flue
Continuous alarm sounds	Excessive levels of CO	Remove probe from flue, and allow unit to run in clean air for 5 minutes

Appendix C Trouble Shooting Guide (Cont.)

Negative temperature reading	Thermocouple plug is reversed in socket	Remove thermocouple plug and ensure wider pin is inserted into wider socket
Cannot change header	Forgotten or lost security number	Contact Extech
Inaccurate pressure readings	Instrument has been switched to pressure screen whilst connected to a pressure source	Disconnect pressure tubing from instrument and re-zero pressure to atmosphere (see Section 5.1)
Cannot turn instrument off	High level of carbon monoxide still being detected by the sensor	Allow unit to run in clean air until 30 second countdown starts

Appendix D Communicating with a PC

(The CO 80 requires the purchase of the optional IR to RS232 adaptor (P/N: 589230) for communication with a PC to be possible.)

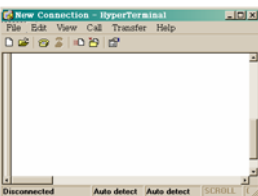
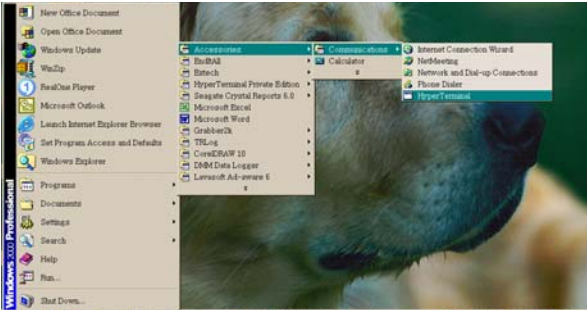
The CO80 communicates to a PC thru a communications program. The most commonly used program is Hyperterminal which comes standard on any PC equipped with a Windows operating system.

Port settings must be set as follows to allow the CO80 to send data streams to the PC.

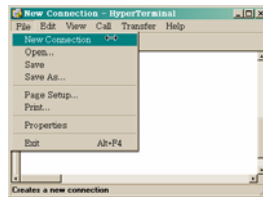
- Bits Per Second: 9600
- Data Bits: 8 Bits
- Parity: None
- Stop Bits: 1
- Flow Control: XON/OFF

Setting up a Hyperterminal Session

Access Hyperterminal through the Start button on your control bar.



1. Hyperterminal screen opens



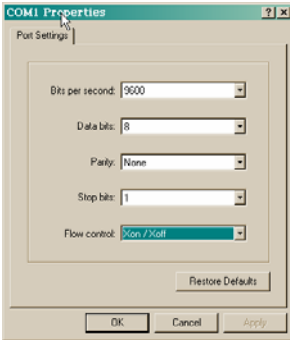
2. Setup new connection



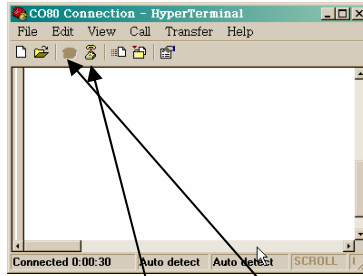
3. Choose a name
This setup can be recalled for all future connections.



4. Select your COM port



5. Choose PORT settings



6. Hang Up Call
The PC is now ready to receive Transmissions from the CO80.

Appendix E Setting Up the Printer

The settings on the printer might be different than the settings required for the CO80 to communicate with the Extech 7831811 printer.

Open the paper roll compartment of the printer and locate the dip switch. The switch will be in the bottom of the compartment next to the telephone jack. For communication to be possible the settings must be as follows:

	1	2	3	4	5	6	7	8
OFF								
ON	■				■			

See printer manual for more detailed information on the printer settings.

Warranty

EXTECH INSTRUMENTS CORPORATION warrants this instrument to be free of defects in parts and workmanship for three years from date of shipment (a six month limited warranty applies on sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, contact the Customer Service Department at (781) 890-7440 ext. 210 for authorization or visit our website at www.extech.com (click on 'Contact Extech' and go to 'Service Department' to request an RA number). A Return Authorization (RA) number must be issued before any product is returned to Extech. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. Extech specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Extech's total liability is limited to repair or replacement of the product. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.

Calibration and Repair Services

Extech offers complete repair and calibration services for the products we sell. For periodic calibration, NIST certification or repair of an Extech product, call customer service for details on services available for that product. Extech recommends that calibration be performed on an annual basis to ensure calibration integrity.



Support Hotline (781) 890-7440

Tech support: Ext. 200; Email:
support@extech.com

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