FCO750
LEAK DETECTOR

USERS GUIDE

Please read carefully before using.

Manufactured by:

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## REVISION RECORD

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<th>Summary of changes</th>
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<td>1</td>
<td>31/03/05</td>
<td>First Release</td>
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<tr>
<td>2</td>
<td>20/05/05</td>
<td>Updated for x750A01: New coarse leak test type. Enhanced external fail function. Test i/o always enabled.</td>
</tr>
<tr>
<td>3</td>
<td>05/12/05</td>
<td>Updated for x750A02: Data logger. Real-time-clock. Up to 16 steps for each product. Improved barcode &amp; serial number support.</td>
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<tr>
<td>5</td>
<td>05/07/07</td>
<td>Updated for x750A04: Supports the optional enhanced data logger. Input bank 1-4 may be programmable. BCD 100/200 may be user defined inputs and outputs. Feedback inputs are checked after the test outputs A-H are activated.</td>
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<tr>
<td>5a</td>
<td>20/09/07</td>
<td>Clarified the use of programmable inputs 1-4.</td>
</tr>
<tr>
<td>6</td>
<td>05/11/07</td>
<td>Updated for x750A05: Input bank 1-4 now fully programmable, no fixed functions. Added combos 3 &amp; 4, and input/output bank options for multi-jig feature. Added End On Fail and External Fail options to blockage and coarse leak tests. Added feedback timeout. New Input/Output test type.</td>
</tr>
<tr>
<td>6a</td>
<td>06/10/08</td>
<td>Air Quality requirement added to recommendations. Test item recommendations added.</td>
</tr>
<tr>
<td>6b</td>
<td>24/10/08</td>
<td>Test item recommendations amended</td>
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<tr>
<td>7</td>
<td>27/05/09</td>
<td>Updated for x750A06. Czech and Russian language support. Three scales for mL/m. Blockage &amp; Coarse tests can disable the pressure tolerance check at the end of fill. Serial ports now support 8 data bits plus parity. When a barcode reader supplies a serial number the instrument will not start until a serial number is scanned. Additional control of printed output.</td>
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<tr>
<td>7a</td>
<td>01/12/09</td>
<td>Minor corrections.</td>
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<tr>
<td>8</td>
<td></td>
<td>Updated for x750A07. Offset is now set in the selected leak units. The ramp test may test peak pressure or final pressure. Separate Prefill Stage and Prefill Regulator outputs. New Auto Prefill function. Improved support for Zebra printers. Allow variable length barcode serial numbers. Off button may be enabled/disabled.</td>
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<tr>
<td>9</td>
<td>02/12/10</td>
<td>Updated for x750A08. Engineering units are now in test data. New mb/s leak units. New programmable inputs: zero the pressure transducer &amp; active high reset. New programmable output bank for feedback result status.</td>
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<td>10</td>
<td>12/12/11</td>
<td>Updated for x750A09. Pressure Correction may be disabled for the dump test. Blockage test has pressure correction and continuous fill options. Added mbar l/s leak units. Now has three cc/m ranges. Added calibration due notice to the MEWS system. Added A.Z. Delay to global settings. The use of regulator 2 in test data is more flexible. Programmable pneumatic outputs are now in the Outputs menu. The remote control option has been renamed Start/Reset and enhanced. Alter Product no longer has the barcode option.</td>
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<tr>
<td>10a</td>
<td>11/01/12</td>
<td>Added ‘M’ to the warning system codes to match the instrument messages.</td>
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SAFETY NOTES AND RECOMMENDATIONS

PLEASE READ CAREFULLY

1. Read these instructions and this users guide carefully.

2. This equipment requires a 24V DC power supply that must be appropriately fused.

3. Always unplug the equipment from the power supply before servicing.

4. Do not use the equipment near water. In the event of a spillage onto the instrument remove the power supply to minimise the risk of damage.

5. The air supply should be connected via an emergency shut off valve located close to the instrument.

6. The air supply must not exceed that specified on the instrument or in the Test Certificate.

7. **Filters must be fitted to the air supply to remove oil and water that can damage pneumatic components. The filters should be periodically checked and drained as necessary. Failure to do so may invalidate the Guarantee.**

   The instrument air quality must be better than ISO8573.1 Class 1-4-2. This equates to:
   
   Particle = < 0.1 micron, Dew-point = < 3°C, Oil = < 0.1 mg/m³ (0.1 ppm)

   The filter kit (Part number M1706) supplied by Furness Controls consists of a particulate filter and a coalescing filter. This will remove solid particles to 0.01 microns and oil concentration down to 0.01 ppm. Neither of these will remove water vapour and an airline drier or desiccant filter (Part number M1737) is required for this.

8. Nylon air supply pipes must be kept away from hot areas as this can weaken the pipe.

9. Ensure that blanking plugs on unused pilot air outputs are pushed in fully before applying air.

10. The air supply must be turned off before carrying out any work on the pneumatic system.

11. If in doubt about any aspect of safety with the equipment then contact Furness Controls BEFORE proceeding.
General Description

The FCO750 is an advanced multi-function air/gas leak detector suitable for complete component and sub-assembly testing.

A typical leak test pressurises the test component, then detects a pressure change using a sensitive differential pressure transducer. The instrument has internal valves to control the different stages of the test, with user-defined times for each stage. At the end of the test time the pressure change is compared to programmable limits to give a pass or fail result.

Test results are clearly displayed on the front panel lamps and display and can also give electrical outputs, be printed, logged by a computer, or logged internally to be uploaded to a computer later.

Notable features are:

- Clear graphical display and simple to use front panel controls.
- Display modes include large text, instantaneous graphs and trend graphs.
- Retains up to 300 sets of test configurations for different products or components. Each configuration may be given a meaningful title.
- Continuous or batch testing. A batch status display screen shows the batch progress with pass and fail counters.
- Bar code scanner support. A bar code may be used to select the product test parameters, enter a serial number to be included with results for printing or logging, and to start or reset the instrument.
- Programmable inputs and outputs. The standard settings may be extended or replaced with user defined configurations for flexible jig and PLC interfacing.
- Communications options for PC or PLC connection include RS232, RS485, USB and LAN. Communications may be used for configuration and data logging.
- Maintenance Early Warning System to aid planned maintenance.
- Email facility. The FCO750 may be configured to send an email over the optional LAN if a fault or maintenance warning occurs.
- Data Logger able to store 10,000 typical results locally for later access from a computer.
- Optional enhanced data logger with 256MB internal memory with the potential to store millions of results. Data may be exported to a USB memory stick.
**Housing**

The FCO750 is housed in a steel bench-top case having two extending front feet that allow the case to be tilted so that the front panel can be seen more easily. Case extensions are available to allow the FCO750 to be mounted in a 19” x 3U rack housing.

**Front Panel**

The front control panel houses the main display, status lamps, and control buttons. The front panel may also be fitted with an optional calibration port and up to two optional pressure controls.

**Display**

The illuminated Liquid Crystal Display may show 8 lines of 40 characters, 4 lines of 20 larger characters as well as graphical data. The display is used to program the instrument, and to show operational status and result values when testing.

**Result Lamps**

Three lamps on the front panel show the result of each test:

- The red fail+ lamp indicates that the test failed with a positive leak. If the optional second fail level is exceeded then the lamp flashes.

- The green pass lamp indicates that the test has passed.

- The red fail- lamp indicates that the test failed with a negative leak. If the optional second fail level is exceeded then the lamp flashes.

A gross leak detected during stabilisation is indicated by the fail+ and fail- lamps together.
Push buttons

'START' The green button will start the leak test provided the remote control option has been set to N. See the program data menu for details.

'RESET' The red button will reset the instrument if a test cycle is running.

UP & DOWN These are used move through the menu lists, and to alter numeric data or menu options.

ENTER The centre button is used to select menu options and enter data into memory.

LEFT / BACK This is used to return back to a menu heading and move the cursor left when setting data.

RIGHT This is used to move the cursor right when setting data.

? / HELP The help button is used at the main runtime displays to allow the operator to select the product to test, to access the User Action menu and other help information.

F1 / F2 These buttons are used for extra functionality. When they are used within the menu system they are labelled on screen.

Power/Standby Button
There is a 1½ second delay when turning off to avoid accidentally switching the instrument off. Note that this puts the instrument into a standby state; the power is not removed from the rear connectors. Operation of this button may be disabled via the security menu.

Pressure Control (optional)
One or two optional precision pressure or vacuum regulators may be fitted to control the test pressure. The regulator is set using the pressure control knob on the front of the instrument. The pressure is displayed on the main display whilst the instrument is in standby. The pressure may be checked to be within a set tolerance before allowing a test to start. If out of tolerance the display will show either "LOW" or "HIGH" and a fault condition will occur.

Calibration Port
The self-sealing calibration port allows for easy checking of the instruments calibration without the need to connect into the test lines. The calibration port is intended for use with the FCO210 Microcalibrator. The same port can also be used to measure the test pressure during the fill operation using a calibrated pressure instrument. Pushing the connection plug into the port connects the calibration equipment. The button on the top of the port must be pressed to release the plug. Plugs can be obtained from Furness Controls or their distributors, part No A4667.

USB Port
The front panel USB port may be used to connect a PC for data collection, instrument configuration, etc. Note that a device driver for the USB port may need to be installed on the PC.
**Rear Electrical Connections**

**Optional USB socket for enhanced data logger**

**Rear Electrical Connections**

**Optional additional inputs/outputs**

**Optional additional communications**

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**24V Power Connector**

The external 24V DC supply connects via this 2 way detachable screw-terminal. The Instrument is protected against reverse polarity and has an internal auto-resetting fuse. The Furness Controls 24V supply is grounded. If a different supply is used it must be grounded.

**Input Terminals**

The input terminals are used for jig interfacing and when the instrument is configured for remote control. The terminal block is detachable. The inputs may be wired for active high or active low operation for easy interfacing to a PLC or other control system. The standard instrument has twelve user-programmable inputs, with an option for an additional twelve.

**Output Terminals**

The active high outputs may be used for results and status indication and jig control etc. The terminal block is detachable. The instrument has sixteen outputs as standard with an option for an additional sixteen. All outputs are user-programmable for a wide range of applications.

**RS232 Plug**

The 9-way RS232 plug can be used for printout, to connect a bar code scanner, or to allow the instrument to be set-up, controlled, and results to be collected from a remote computer or PLC.

**RS485 (optional)**

The RS485 interface allows the instrument to be set-up and controlled and for results to be collected from a remote computer or PLC. RS485 is a multi-drop interface allowing a number of instruments to share the same communications link. This is unavailable for use when the LAN is selected.
**USB socket (optional)**
The enhanced data logger can export logged data to a USB memory stick via this socket. Plug in a memory stick and choose Export Logged Data from the data logger menu.

**LAN (optional)**
The LAN (Local Area Network) interface allows the instrument to be set-up and controlled and for results to be collected from a remote computer or PLC. This is unavailable for use when the RS485 interface is selected. The use of the LAN interface requires detailed network knowledge and is documented separately from this user guide.

### Rear Pneumatic Connections

![Rear Pneumatic Connections Diagram]

**"Test -", "Test +" Ports**
The 'Test -' and Test +' ports are female 1/8" BSP threaded to allow for a variety of connector types. Connections to these ports must be made using suitable sealing compounds to obtain leak tight joints. The 'Test +' port is connected to the test item or test jig. It may be necessary to connect a volume to the 'Test -' port (also known as the reference port) to optimise the test cycle.

**Air Supply Port**
*External filtering must be provided. See “Safety notes and recommendations”*
The air supply port is used to operate the instruments internal valves. It accepts 6mm O/D tubing. Clean dry air is required at a pressure of between 5bar (72PSI) and 10bar (145PSI).

**Regulator Supply**
*External filtering must be provided. See “Safety notes and recommendations”*
When the optional internal pressure regulator is fitted the regulator supply pressure should be at least the test pressure maximum rating plus 1 bar, and not more than 16 bar for standard instruments. The regulator supply port accepts 6mm O/D tubing. For vacuum instruments this is the vacuum supply port.
**Regulated Air Out**
When the optional internal pressure regulator is fitted, this is its regulated output. The regulated air out port accepts 8mm O/D tubing. The connection is normally linked to the regulated air in port if only the leak detectors internal regulator is to be used. Alternatively, a vacuum pump can be fitted between the regulated air out port and the regulated air in port, or external pressure sources may be switched in.

**Regulated Air In**
*External filtering must be provided. See “Safety notes and recommendations”*
This is the test pressure supply port. Clean dry air is required at a pressure that must not exceed the maximum test pressure rating. The regulated air in port accepts 8mm O/D tubing.

**Jig Pilot (P1)**
This is primarily intended to provide pilot air to control jig clamps, usually via a 5-port valve and an air cylinder. The port accepts 4mm O/D Nylon tubing. The jig pilot is activated at the start of a test and deactivated when the test is reset after the vent time. The instrument may be configured to use a sensor to detect jig closure. There is also an adjustable timer to allow time for the jig to close before applying test pressure. See the I/O Configuration / inputs menu. If a Jig Pilot is not required then the pneumatic output may be programmed for other uses.

**Vent Pilot (P2)**
The vent pilot port accepts 4mm O/D tubing and provides pilot air for an external vent or exhaust valve. This is active during the test cycle. An external spool valve is required for the venting function to be implemented. In standby and at the end of a test the output is turned off causing the test item to be vented. This pneumatic output may be programmed for other uses if a vent pilot is not required.

**P3, P4, P5 (optional)**
These three optional pneumatic outputs may be programmed for a variety of applications. Some of these ports may not be available if used for internal valves, e.g. for functions such as air saving or dual regulator selection.
**METHODS OF LEAK DETECTION**

**Differential Pressure Drop**

The test item (or the test item plus a reference volume if the test item has a large volume) is filled to a set pressure/vacuum for sufficient time for the pressure/vacuum to become stable. The pressure supply valve is then closed, and the test item and reference are connected to the two sides of the differential pressure module.

Any leak will cause a pressure difference across the differential pressure module and the resulting output is used to display the leak. A leak on the Test -ve port will show as a -ve leak.

Leaks may be displayed as a flow reading rather than differential pressure. The FCO750 measures the leak as a pressure drop and then calculates the flow reading. The calculation relies on the test volume being known as well as the pressure drop in a given time. Alternatively a known leak can be connected to the test item and the volume automatically calculated from this value. The advantage of using flow readings is that the test time is not so important (a minimum of 0.3 seconds is recommended). As many leak specifications are written in flow units it is easier to verify actual readings against the specification. Flow conversions are carried out when the leak units are set to CC/S, CC/M, CC/H, CMMS, mL/M, L/M, or mbLs.

**Dump Test**

This is a variation of the differential pressure drop test that is used to test sealed items with a test jig forming a chamber around the test piece. Additional valves are required for this test.

Initially a charge (dump) volume is prefilled to a known pressure. When the test is started, the charge volume is first isolated from the pressure source, and then connected to the test chamber before performing a standard differential pressure drop test.

The actual test pressure depends upon the prefill pressure and the relative volumes of the charge pressure and test chamber. If the test piece has a gross leak the test pressure will not be as expected which is detected by the pressure tolerance check. Smaller leaks are detected by the differential pressure drop test.

Variations in the prefill pressure may be compensated for to allow a more sensitive gross leak check. Note that when compensation is enabled the displayed test pressure is the compensated value, not the measured value.

The pneumatic configuration for a dump test is shown on page 78.
**Bell System**

The bell or collection chamber is used to enclose the test item or a particular part of it. The test item is then continuously pressurised during the test cycle from a separate pressure source.

The bell chamber is connected to the "Test -" port of a standard pressure drop leak detector.

If the test item leaks, the air will be captured within the bell and the pressure in it will increase. The pressure increase will be shown on the display as a positive leak reading.

By applying a low pressure to the bell from the leak detector the integrity of the bell can be checked. If a seal is damaged or missing the FCO750 it will show as a negative leak reading.

Since both positive and negative fail levels can be set on the FCO750, the system guarantees that every test is valid.

**Blockage Test**

This test does not use the differential pressure sensor, but checks the actual pressure in the test item. There are two options for the blockage test:

1) The test item is pressurised to the required level and then isolated from the source. During the test, the pressure must fall below a pre-set level to indicate that the product is not blocked. A second fail level may be used to check that the flow was not too great indicating a large (gross) leak.

2) For some test items the pressure may be lost too quickly to be able to discriminate with method 1. In this case we have an option to continue filling during the test stage so that a back-pressure test is performed.

**Coarse Leak Test**

This test does not use the differential pressure sensor, but checks the actual pressure in the test item. The test item is pressurised to the required level and then isolated from the source. Test pressure readings are shown relative to the starting pressure. A pressure drop is shown as a positive leak. There are separate fail levels for positive and negative leaks.

**Auto Prefill**

The auto prefill function is useful where the test item is slow to fill or has a restriction in the fill path. It may also be used as a cost-effective way of testing at different pressures without manual adjustment or an auto-regulator. Auto prefill may be used with differential pressure leak tests, blockage tests and coarse leak tests.

The method is to apply a pressure that is larger than the required test pressure, normally via a restriction. When the pressure reaches the set prefill pressure level, the pressure source is disconnected. The fill stage allows any residual test line pressure to finish filling the test item; this is important when the test item has a restricted fill path since the measured pressure during the prefill stage may be quite different from the final test pressure.
**INSTALLATION**

**General**
Unpack the instrument carefully and check for transit damage. If there is any damage please report it immediately.

Check that all the necessary fittings are present as shown on the packing sheet

**Location**
The leak detector should be
- close to the test item to keep the test pipes as short as possible.
- installed away from any sources of temperature change; e.g. heaters and draughts.
- positioned away from high power machines such as welders.
- positioned in an area free from vibration.

**Pneumatics**

*External filtering must be provided. See “Safety notes and recommendations”*
Supply air should be dry and clean. Contamination by oil and water from the air supply will damage the instrument and invalidate the guarantee. Drain off any water from an air line tapping point before connecting the instrument. Disconnect the instrument during periods of factory shutdown and drain the air line before reconnection.

i) Connect a clean air supply of 5-10 bar to the Air Supply Port. This supply is always required to operate the internal valves.

ii) Connect a clean dry air supply at the test pressure to the Regulated Air In port. If the optional internal regulator is fitted then the regulated air in port is normally connected to the regulated air out port, and the test supply air is connected to the regulator supply port at a pressure of at least 1 bar above the maximum test pressure.

iii) The item to be tested or the test jig needs piping to the "+" Test port. If a reference volume is being used this must be piped to the "+" Test port, otherwise the port must be blanked. For commissioning and self-checking, you must be able to blank the ports using the blanking caps provided. For vacuum tests it is recommended that the test port should be protected with a vacuum filter (part number M1049) – this is supplied loose with instruments supplied specifically for vacuum tests.

iv) If the test item requires venting after a test, then connect a vent valve between the test item and the test port, with the valve being driven from the VENT PILOT (recommended for large volumes and or high pressure).

v) If the jig is to be operated by the instrument controlled air supply, connect it to the JIG PILOT port. If this port is not used then it should be blanked off with a plug.

NOTE: All connections to the 'Test +' or the 'Test -' ports must be leak tight. Metal to metal connections should be sealed using a known good sealing compound, not P.T.F.E. tape. The
tubing used must be metal or thick walled nylon. For small components up to 50cc it is helpful to use smaller diameter tubing, e.g. 4mm or 3/16” o.d.. Do not use push-in type fittings on the test lines as they are unreliable and may leak.

**Test Item**

The condition of the test item and its sealing arrangement will directly affect the reliability and repeatability of all leak test results.

- The test item must be clean and free of any water or loose dirt.
- Test items must be at a stable temperature. This may necessitate storage at the test area prior to testing to allow it to settle to ambient conditions.
- All seals onto the test item must be rigid as any flexing during the test will change the test volume and give false leak readings.
- The test item must be clamped in a way that prevents distortion of the test piece.

**Electrical Supply**

Connect a suitably fused 24V DC supply to the instrument. The instrument must be connected in compliance with all local electrical regulations.

DO NOT SWITCH ON YET.

**Electrical Control**

To ease commissioning the instrument can be run from the front panel push buttons. The Remote Control option in the Functions menu must be set for the appropriate control inputs (see Remote Control in Menu Details).

Once the leak detector is operating satisfactorily it may then be connected to a different controller if required.

**Electrical Outputs**

The outputs are active high transistors (i.e. switching the positive supply). The current per output must not exceed 120mA.

If it is necessary to have mains operated lamps or any other high voltage or heavy current device, the outputs should be used to drive external relays.

**Wiring Considerations**

**Electrical Interference**

Ignition transformers, arc welders, mechanical contact relays and solenoids are all common sources of electrical noise in an industrial environment and therefore the following guidelines must be followed:

Noise generating devices such as those listed should be mounted in a separate enclosure. If this is not possible, separate them from the instrument by the largest distance possible.

Provide separate cable runs for communication lines, inputs and outputs. If they run parallel,
there should be as much separation between the groups as possible.

RS232 and RS485 connections must use shielded cable. This will reduce the level of electrical noise induction on the wires. Lead lengths should be kept to a minimum. The shield should be grounded at one end only.

**Inductive loads**

When inductive loads such as relays or solenoids are switched off, they can produce a very large negative voltage spike (over a thousand volts!). If the cable feeding the inductive load is bundled with other cables, the voltage can be induced into the other cable and can cause unpredictable results. It is very important that any inductive load is suppressed to prevent these voltages being generated.

The transistor outputs from the FCO750 are fitted with suppression diodes and it is not necessary to add further suppression to the inductive load. However, if an inductive load is being activated from a PLC or another relay, then suppression must be fitted. This is usually achieved by fitting a diode in parallel with the load as shown.

![Inductive load suppression diagram](image-url)
BASIC OPERATION

The FCO750’s settings may be viewed or set using the front panel buttons via a menu system. The main menu consists of:

- **BATCH SETTINGS** Configure batch control, or disable it for continuous testing.
- **PRODUCT DATA** Identify the product to test and define the test steps to perform.
- **TEST DATA** Specify the type of test to perform and define its timings, levels and limits.
- **CALCULATE VOLUME** Only when flow units are selected, calculate the volume of the test piece & fittings.
- **GLOBAL SETTINGS** Instrument configuration settings that apply to the whole instrument and may affect all product or test data.
- **I/O CONFIGURATION** Program the electrical inputs and outputs, pneumatic outputs, and timer functions.
- **FBUS SETTINGS** This menu is used to define the communications port and settings to be used for Fbus communications.
- **PRINTER SETTINGS** When printed results are required, this menu is used to configure the printer port and define what data is to be printed.
- **BARCODE & SERIAL No.** This menu is used to configure the port to use for a barcode reader and define how to use the barcode. The serial number settings are also in this menu since they may depend on the barcode.
- **WARNING SYSTEM** Set the limits for the maintenance early warning system, and view the latest values.
- **SECURITY** You may set a pass code to lock the menu settings to stop unauthorised changes.
- **TIME & DATE** Only where a real-time-clock is fitted, view or set the current time and date.
- **DATA LOGGER** This menu allows you to enable/disable the data logger, choose the data to log, and erase logged data.
- **UTILITIES** Contains various utilities for calibration, diagnostics, copying & printing data etc.
**Menu Navigation**

Press the **ENTER** button from the normal operator display to show the main menu:

The **UP** and **DOWN** buttons scroll the highlight bar through the list. Press **ENTER** to select the highlighted menu option. Press **BACK** to exit back to the main operator display. Some of the items shown here may not be visible depending on system settings.

The menu list is longer than the display. When the highlight bar reaches the bottom of the display the list moves up. If there are more items off the top or bottom of the display, arrows are shown in the left side of the list.

The **RIGHT** button turns page mode on/off. When page mode is enabled the ‘>>’ symbol is displayed at the top-right of the box and the **UP** and **DOWN** buttons move a page at a time. Page mode is cancelled automatically after two seconds.

Settings may be protected by a security code. When security is enabled it is possible to view the settings but you will be prompted to enter the security code if you try to alter settings.

If you select the Product Data or Test Data menus you must first choose a product. Use the **UP** or **DOWN** buttons to select from the list and press **ENTER**. Alternatively you may enter a test or product number directly via the F2 button, labelled **JUMP**.

When you press **ENTER** a list of parameters is displayed with their settings, e.g.

<table>
<thead>
<tr>
<th>TEST DATA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST I/D</td>
<td>TEST 002</td>
</tr>
<tr>
<td>TYPE</td>
<td>LEAK</td>
</tr>
<tr>
<td>REGULATOR 2</td>
<td>NO</td>
</tr>
<tr>
<td>CHK. STANDBY PR.</td>
<td>YES</td>
</tr>
<tr>
<td>TEST PR.</td>
<td>500mB</td>
</tr>
<tr>
<td>PRESS. TOL.</td>
<td>10%</td>
</tr>
<tr>
<td>+FAIL 1</td>
<td>50.0 CC/M</td>
</tr>
<tr>
<td>-FAIL 1</td>
<td>50.0 CC/M</td>
</tr>
<tr>
<td>PILL</td>
<td>10.00 SEC</td>
</tr>
<tr>
<td>STAB</td>
<td>10.00 SEC</td>
</tr>
<tr>
<td>TEST</td>
<td>10.00 SEC</td>
</tr>
<tr>
<td>VENT</td>
<td>10.00 SEC</td>
</tr>
<tr>
<td>OFFSET</td>
<td>0.0 CC/M</td>
</tr>
</tbody>
</table>

Press **UP/DOWN** to scroll through the parameter list for this menu.

Press **ENTER** to alter the value of the current selection or press **BACK** to exit back to the menu list.

When you press **ENTER** a pop-up window lets you edit the data. If security is enabled you will be prompted for a pass code first.

When editing data, **UP** and **DOWN** change the selection. For text and numeric data the **LEFT** and **RIGHT** buttons are used to select a different digit/character.

Press **ENTER** to save the changes or press **Esc.** (F1) to exit without saving changes.
**Text Entry**

The FCO750 has a number of menus that have text to enter, e.g. Test I/D, Product I/D etc. When editing text you will see a display like this:

![Text Entry Display](image)

The text to edit is within the double-lined box with its title above. Initially the first character in the edit box blinks to show that it is selected (in this case, the first T of TEST 002). The up, down, left, and right buttons move a blinking cursor around the characters shown at the left of the display. Press the centre (enter) button to replace the selected character in the edit box with the character under the cursor. The edit box selection automatically advances to the next character. Press ↵ (F2) to save and exit, or Esc. (F1) to escape without saving changes.

**SYM.** changes the characters available for selection between uppercase letters, lowercase letters and accented letters. The ▶ and ◀ symbols are used to move the selection point in the edit box without changing the text. Unwanted text can be removed by entering blank spaces.
Menu Navigation Diagram
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**PRINTED SETTINGS**
- **PORT**
- **BAUD RATE**
- **PARITY**
- **AUTOCOUNT FEED**
- **MARGIN**
- **BLANK LINES**
- **SEND EOL**
- **SEND ON**
- **SEND AS**
- **TEXT FOR LINE 1-4**
- **DATE**
- **TIME**
- **PRODUCT ID**
- **PRODUCT No.**
- **BATCH ID**
- **SERIAL No.**
- **TEST COUNTER**
- **PRODUCT RESULT**
- **TEST ID**
- **RESULT**
- **PRE-FILL**
- **PRESSURE**
- **LEAK**

**BARCODE & SERIAL No.**
- **PORT**
- **BAUD RATE**
- **PARITY**
- **TYPE**
- **PRODUCT START**
- **PRODUCT LENGTH**
- **SERIAL No. START**
- **SERIAL No. LENGTH**
- **SERIAL No. MASK**
- **START ON SCAN**
- **SCAN ON FAIL**
- **SERIAL No. TYPE**
- **PREFIX**
- **SERIAL No.**

**WARNING SYSTEM**
- **LATEST VALUES**
- **LIMITS**

**SECURITY**
- **LOCK**
- **PASS CODE**
- **OFF BUTTON**

**TIME/DATE**
- **DATE**
- **TIME**

**DATA LOGGER**
- **EXPORT LOGGED DATA**
- **ERASE DATA**
- **FILE NAME**
- **LOG DATA Y/N**
- **LOG ON**
- **DATE**
- **TIME**
- **PRODUCT ID**
- **PRODUCT No.**
- **BATCH ID**
- **SERIAL No.**
- **TEST COUNTER**
- **PRODUCT RESULT**
- **TEST ID**
- **RESULT**
- **PRE-FILL**
- **PRESSURE**
- **LEAK**

**UTILITIES**
- **SET ZERO PRESSURE**
- **CALIBRATE PRESSURE**
- **CALIBRATE D.P.**
- **CALIBRATION DUE**
- **PRINT DATA**
- **COPY PRODUCT DATA**
- **COPY TEST DATA**
- **INITIALISE DATA**
- **MONITOR I/O**
- **CHECK OUTPUTS**
- **CHECK BARCODE**
- **FLASH UPDATE**

---

* **NOT FOR ENHANCED LOGGER**

---

* **ENHANCED LOGGER OPTION**

---

* **LOGGED DATA OPT**

---

* **MONITOR I/O**

---

* **CHECK BARCODE**

---

* **FLASH UPDATE**
Main Operator Displays

When the instrument is testing products the display is normally left indicating the status and results of the test. If the operator is allowed to select the product to test then the UP and DOWN buttons increase or decrease the product number. The ? function button also allows product selection from a list of named products, or direct entry of a product number.

There are various alternative views that may be selected using the LEFT and RIGHT buttons:

**DETAILED DISPLAY**
- Shows the most information during and at the end of the test. The left window shows the current status with progress bars for each stage of the test. The right window shows the result information for each step as it proceeds, and holds the final step until reset. The Status Line at the bottom of the display is used to show warning messages etc. When there are no status messages it may be used to show counters, scanned barcode, serial number etc.

![Detailed Display Example](image1)

**LARGE DISPLAY**
- Shows only information for each stage of the test as the test proceeds but with much larger characters.

![Large Display Example](image2)

**INSTANTANEOUS GRAPHICAL DISPLAY**
- Shows graphs of the pressure and leak values as each step proceeds. The pressure graph is scaled over the pressure tolerance for leak tests, or the pressure fail levels for blockage and ramp tests. The leak graph is scaled between the negative and positive fail1 levels. Basic information is shown for each stage of the test on the top line of the display.

![Instantaneous Graphical Display Example](image3)
RESULT TREND GRAPH
- Shows a graph of the last 150 results scaled between the fail levels. If the test consists of more than one step, the F1 button allows you to view all steps as they occur or to monitor a specific step. The graph is always plotted from zero, so typical leak and blockage tests might look like this:

![RESULT TREND GRAPH](image1.png)

BATCH DISPLAY
- Shows the status of the current batch. If batch control is not used then the number of tests is unlimited.

![BATCH DISPLAY](image2.png)
The FCO750 allows you to test in batches. When the required number of tested items has been reached the instrument will display “BATCH COMPLETE” on the status line and stop testing. A runtime screen shows batch counters and status. An electrical or pneumatic output may be programmed to operate when the batch is complete.

If you do not test in batches set the batch quantity to zero.

The batch menu has ‘operator’ security status… see the security menu.

**[RESET BATCH]**
- This resets the counters to zero and clears the Batch Complete status ready to start the next batch. You will be prompted for confirmation. If you do not use batch control, this may be used to simply reset the counters.

**BATCH I/D**
- You may assign a text identification of up to 16 characters for the batch.

**QUANTITY**
- Enter the batch size.
- To disable batch control, set to zero - the batch size is then unlimited.

**COUNT ON**
- The batch size may be for all items tested, or only items that passed the test.
- Options: RESULT, PASS

**AUTO START**
- This is normally only used for servicing or repeatability tests. Once the first test is started, subsequent tests will automatically be started until the batch is complete or Reset is pressed.
PRODUCT DATA MENU

Identify the product to test and define the test steps to perform. When you select the menu you must select the product to view/edit from a list.

PRODUCT I/D
- You may assign a text identification of up to 16 characters to the product.

BARCODE I/D
- When a barcode reader is used for product selection you may enter up to 16 characters that the barcode must successfully match for the product to be selected. The ‘wild card’ characters shown below may be used to match variable numeric or alphabetic characters. Any other characters must match exactly.
- The ‘wild card’ characters are:
  - # 0 to 9 or # required
  - & A-Z or & required (upper or lower case is accepted)
  - ? A character is required but the actual character is not checked.
  - Space Character position is not checked

NUMBER OF STEPS
- Set the number of steps required to test the product.
- A product may have up to sixteen different tests applied.

DELAY
- This is a time delay between steps to allow for jigging changes etc. The delay time is common to all steps.
- The delay may be set from 0.00 to 99.99 seconds.

STEP 1 → 16
- Select the test to be used for each of the number of steps set above.
- When the list of tests is presented the F2 function button allows you to enter a test number directly and F1 allows you to edit the data for the selected test.

CONTINUE ON
- When there is more than one step, define the conditions required to continue to the next step. If the condition is not met the instrument will fail the product and terminate the test.
- Options: RESULT, PASS, FAIL 1, PASS/FAIL 1, FAIL, START
TEST DATA MENU

This menu is used to define the test pressure, fail levels, timings etc. for each test. Up to 300 different tests can be defined. When you enter the menu you may select the test to view/edit from a list.

TEST I/D
- You may assign a descriptive text identification of up to 16 characters to each test.

TYPE
- Define the type of test to perform.
- Options:
  - LEAK: Checks that components do not leak more than an acceptable level. The test item is pressurised, and then isolated from the pressure source and allowed to stabilise. Once stabilised a leak is indicated by a pressure loss. This pressure loss is automatically converted to a flow reading if flow units are selected in the test data menu.
  - BLOCKAGE: Checks that components are not blocked more than an acceptable level and do not have too great a leak. The test item is pressurised, and then isolated from the pressure source. The level of flow is determined by checking the test pressure after a pre-set time. If the pressure is above the FAIL HIGH level then a blockage is indicated. If the pressure is below the FAIL LOW level a gross leak failure is indicated. Set the FAIL LOW level to zero disable the gross leak check. If the flow is too large to discriminate with this method it is possible to continue filling during the test stage and perform a back-pressure test.
  - PERMFILL: Permanent Fill is not really a test – it simply applies the pre-set pressure to the test item until the instrument is reset. It can also be used in a sequence of tests with continue on start.
  - RAMP: In many areas of manufacture there is a need to measure the pressure at which a device actuates, e.g. pneumatic cylinders, pneumatic valves, pressure switches, pressure relief valves and oil seal fault pressures. An external needle valve is used to generate a pressure ramp (rising or falling). At the point of actuation the volume in the test item starts to increase which causes a change in the rate of the pressure ramp. The ramp test detects this change and checks the pressure against upper and lower limits. This test can also be used with pressure switches where an external input is used to determine the actuation point.
  - DUMP: This is a variation of the LEAK test for use with sealed items. A test jig forms a chamber around the test piece. A reference volume is prefilled to a set pressure. When the test is started the reference volume is disconnected from the air supply and connected to the test chamber. The resulting pressure applied to the test piece is checked to detect gross leaks, and then a differential pressure drop leak test is made. Any variations of the prefill pressure may be compensated for, giving a more sensitive gross leak check.
  - COARSE LEAK: This is similar to the blockage test, but measures pressure decay relative to the fill pressure. The test item is pressurised, and then isolated from the pressure source. The level of leak is determined by checking the test pressure decay after a pre-set time. Pressure decay is shown as a positive leak. Positive and negative fail limits may be checked. The fill pressure is checked
against the pressure tolerance to ensure a valid starting pressure.

- **INPUT/OUTPUT:** This activates the step outputs and test-programmable outputs and checks the feedback inputs. The test time is used as an adjustable delay after which the external fail input is checked. This test may, for example, be used to actuate electrical or pneumatic features of a test component and check correct actuation via sensors. There is no measured value with for this test. The test result is determined by the feedback timeout and external fail status.

The rest of the test data settings depend upon the type of test selected and are detailed for each test type…

**Leak test parameters**

**LEAK UNITS**
- Choose the engineering units for the leak display. The FCO750 can display the leak in either pressure units, pressure rate units or flow units. See the specification table on page 91 for available units.

**PRESSURE UNITS**
- Choose the engineering units for the pressure display. See the specification table on page 91 for available units.

**AUTO PREFILL**
- Only displayed if prefill is enabled in the Global Settings menu.
- The auto prefill function is useful where the test item is slow to fill or has a restriction in the fill path. It may also be used as a cost-effective way of testing at different pressures without manual adjustment or an auto-regulator.
- Options:
  - NO: auto prefill is not used.
  - INT: auto prefill uses the standard internal fill valve to fill the test item.
  - EXT: auto prefill uses an external valve to fill the test item. The valve should be operated by the prefill stage output.

**REGULATOR 2**
- Selects the second internal regulator (if fitted), or an external regulator. Electrical or pneumatic outputs may be programmed to select an external regulator.
- Options:
  - NO: regulator 1 is used for the test.
  - YES: regulator 2 is used for the test
  - PREFILL: regulator 2 is used for prefill, regulator 1 is used for fill.
  - FILL: regulator 1 is used for prefill, regulator 2 is used for fill.

**CHECK STANDBY PRESSURE**
- Disable or enable pressure tolerance checking in standby. This is normally enabled, but may be disabled for vacuum tests with air saving, or jigging configurations where the test pressure is not applied in standby. The pressure tolerance is still checked at the end of the stabilisation time to ensure a valid test.
- Options: No, Yes
**PREFILL PRESSURE**

- Only displayed if enabled in the Global Settings menu.
- The prefill function can be used to fill large components quickly, or to over-fill flexible components to improve the stabilisation time.
- **For standard prefill**, the prefill pressure is used in conjunction with the prefill tolerance for tolerance checking and as the setpoint when an automatic regulator is fitted. An electrical or pneumatic output may be programmed to select the pressure source: the prefill regulator output is active during standby. The prefill function is disabled if the prefill time is zero, see below.
- **For auto prefill**, this is used to detect when to stop filling. Tolerance checking at standby must be disabled for auto prefill.

**PREFILL TOLERANCE**

- Only displayed if enabled in the Global Settings menu.
- **For standard prefill**, this is used to check that the prefill pressure is within tolerance.
- **For auto prefill**, the initial pressure may be higher or lower than the desired pressure depending if it is a vacuum or pressure test or possibly upon the result of a previous test if used in a sequence. To ensure that the item fills towards the required pressure rather than farther away from it, the prefill stage will end if the pressure moves from the initial pressure in the wrong direction by more than the prefill tolerance.

**TEST PRESSURE**

- Set the nominal test pressure. This is used in conjunction with the tolerance setting to ensure that the applied test pressure is within the test specification.

**PRESSURE TOLERANCE**

- Sets the pressure tolerance for fault indication and the levels at which gross fail will be indicated during stabilisation. If 100.0% is set, the test will not gross fail even if all of the test pressure is lost.

**+FAIL 1 and -FAIL 1**

- These set the positive and negative levels at which the instrument will indicate a fail for leak tests. When the measured leak exceeds the set level the appropriate fail lamp will be illuminated on the instruments front panel and the FAIL and “+FAIL 1” or “-FAIL 1” signals are activated.

**+FAIL 2 and -FAIL 2**

- Only displayed if enabled in the Global Settings menu
- The second fail levels are used when it is helpful to distinguish between marginal and serious failures for leak tests.
- When used, these set the higher positive and negative levels at which the instrument will indicate a failure. When the measured leak exceeds the set level the appropriate front panel fail lamp will flash and the FAIL and “+FAIL 2” or “-FAIL 2” signals are activated.

**PREFILL TIME**

- Only displayed if enabled in the Global Settings menu
- **For standard prefill**, this sets the time that the prefill regulator signal is enabled before the fill pressure is set. The signal is turned off at the end of the prefill time. The prefill regulator signal may be used to select an alternative pressure regulator. When set to zero, the prefill function is disabled.
• **For auto prefill**, this is a limit that should be set to the maximum allowable time to prefill. Prefill will end when the prefill pressure is reached or when the prefill time expires if the pressure is not reached. Set to zero to disable the time limit.

**VENT PREFILL TIME**
- Only displayed if enabled in the Global Settings menu
- If standard prefill was used then the test piece may be vented before the applying the fill pressure. Set to zero if you do not want to vent the prefill pressure.
- This is not used with auto prefill.

**FILL TIME**
- Sets the time that the test pressure is applied for before the fill valve is closed and the stabilisation timer is started. This time should be sufficient to allow the component to be filled to the required pressure. Typically you should adjust the fill time to about 30% more than the time taken to fill to the required pressure.

**STAB. TIME**
- Sets the time that the test item is allowed to stabilise for after the fill pressure has been removed before the leak test is started. With a known good test item and starting each test cycle with the item vented, set the stabilisation time to the shortest that will give a PASS result with either zero reading or a small repeatable reading.

**TEST TIME**
- Set the required test time. For pressure drop leak units the test time determines the leak fail level, e.g. 5 Pa in 3 seconds. For flow leak units the test time should be set to give a stable reading, typically 2-4 seconds. Note that long test times can lead to the transducer exceeding its range and a fail will be given.

**VENT TIME**
- The vent time should be set if an external vent valve is fitted to the system. The time must be long enough to allow the pressure in the test item to decay to a safe level to ensure that the test item is not unclamped while pressurised.

**TEST VOLUME**
- Only displayed when flow units are selected in the Global Settings menu.
- The FCO750’s leak test measures differential pressure. In order to display the leak correctly in flow units, e.g. cc/min, the instrument needs to know the volume of the test item in cc. The maximum volume is 99.9999 litres.

**OFFSET**
- This value is deducted from any leak readings.
- This should only be used to remove repeatable leak offsets. A typical use is for reducing cycle times, where a repeatable offset is present at the end of a test due to not allowing a component long enough to fully stabilise. Offset is described in more detail in a separate section later in this guide.
- Note that if leak units are changed then the offset must be re-learnt.

**TRACK FILTER**
- The filter value for the offset tracking system controls how the instrument responds to variations in consecutive readings. Low filter values will allow the instrument to track rapid changes in offset drift but will be affected by variations caused by leaks, large
filter values will only track slow changes in offset but will be affected less by leaks. A value of five is suitable for most applications.

- Set to zero to disable offset tracking.
- The offset tracking system is described in a separate section later in this guide.

**TEST O/P A-H**

- For each of up to eight outputs, define when the output is active.
- Options:
  - **OFF**: The output is not activated for this test.
  - **ON**: The output is active for the whole of the test
  - **STANDBY**: The output is only active whilst the test is selected but has not been started. The output is deactivated when the test is started.
  - **TEST**: The output is only active once the test is started.

**FEEDBACK A-H**

- Define which feedback inputs are required before the test is allowed to run. The feedback signals will typically be used to indicate correct positioning of the jig.
- Each of up to eight possible inputs may be selected on (1) or off (0), e.g. to wait for inputs A and C the setting will be “10100000”.
- Feedback is checked after the test outputs A-H have been activated, but before the vent output.
- Note that the feedback inputs must be configured in the I/O Configuration menu.

**FEEDBACK TIMEOUT**

- The default feedback timeout is set to 0.0 which disables the timeout function. The instrument will display “Awaiting Feedback” until the correct feedback is applied or the test is reset.
- When the feedback inputs are not used for jigging they may be used to check signals from test components. If the correct feedback is not supplied within the feedback timeout period then the test ends with a FEEDBACK FAIL result.

**EXTERNAL FAIL**

- Allows an external signal, for example a pressure switch, to be monitored during the test. An External Fail result is given if the signal is not in the expected state during the stabilisation period.
- Note that the input function must be defined in the i/o configuration menu.
- Options:
  - **NO**: External fail is not used for this test.
  - **ON**: The input is expected to be active during the stabilisation time.
  - **OFF**: The input is expected to be inactive during the stabilisation time.
  - **CHANGE**: The input is checked at standby and is expected to change state before the stabilisation stage starts.
Blockage test parameters

PRESSURE UNITS
- Choose the engineering units for the pressure display. See the specification table on page 91 for available units.

AUTO PREFILL
- Only displayed if prefill is enabled in the Global Settings menu.
- The auto prefill function is useful where the test item is slow to fill or has a restriction in the fill path. It may also be used as a cost-effective way of testing at different pressures without manual adjustment or an auto-regulator.
- Options:
  - NO: auto prefill is not used.
  - INT: auto prefill uses the standard internal fill valve to fill the test item.
  - EXT: auto prefill uses an external valve to fill the test item. The valve should be operated by the prefill stage output.

REGULATOR 2
- Selects the second internal regulator (if fitted), or an external regulator. Electrical or pneumatic outputs may be programmed to select an external regulator.
- Options:
  - NO: regulator 1 is used for the test.
  - YES: regulator 2 is used for the test
  - PREFILL: regulator 2 is used if auto prefill is enabled.
  - FILL: regulator 2 is used for the test.

CHECK STANDBY PRESSURE
- Disable or enable pressure tolerance checking in standby. This is normally enabled, but may be disabled for vacuum tests with air saving, or jigging configurations where the test pressure is not applied in standby. The pressure tolerance may be checked at the end of the fill time to ensure a valid test.
- Options: No, Yes

PRESSURE CORRECTION
- Pressure correction may be enabled to help compensate for variations in fill pressure to give a more sensitive test. When this is enabled the pressure value displayed during test will be the compensated value. Pressure correction should be disabled if it necessary to display the actual pressure rather than a compensated value.
- Options: NO, YES.

CONTINUOUS FILL
- When this is enabled the fill valve remains active during the test time. This allows a back-pressure test to be performed in cases where the flow is too high for the blockage test to discriminate adequately when the pressure source is removed.
- Options: NO, YES.
CHECK FILL PRESSURE
• Disable or enable pressure tolerance checking at the end of the fill time. This is normally enabled to ensure a valid test but may be disabled if the flow rate is too high to maintain the pressure.
• Options: No, Yes

END ON FAIL
• Blockage tests normally test against the fail levels at the end of the test time. This feature enables testing against the fail levels during the test time: the test will end immediately if the test fails.
• Options: No, Yes

PREFILL PRESSURE
• Only used with auto prefill and only displayed if auto prefill is used.
• This is used to detect when to stop filling. Tolerance checking at standby must be disabled for auto prefill.

PREFILL TOLERANCE
• Only used with auto prefill and only displayed if auto prefill is used.
• The initial pressure may be higher or lower than the desired pressure depending if it is a vacuum or pressure test or possibly upon the result of a previous test if used in a sequence. To ensure that the item fills towards the required pressure rather than farther away from it, the prefill stage will end if the pressure moves from the initial pressure in the wrong direction by more than the prefill tolerance.

TEST PRESSURE
• Set the nominal test pressure. This is used in conjunction with the tolerance setting to ensure that the applied test pressure is within the test specification.

PRESSURE TOLERANCE
• Sets the pressure tolerance for fault indication. Set 100.0% to disable.

FAIL HIGH
FAIL LOW
• This test may be used with positive pressure or vacuum and assumes that the pressure will fall in magnitude towards zero for both. The FAIL HIGH level checks for a blockage and the FAIL LOW level checks for a gross leak. Set FAIL LOW to zero to disable the gross leak check.

![Diagram of test pressure and failure levels](image)
**PREFILL TIME**
- Only used with auto prefill and only displayed if auto prefill is used.
- This is a limit that should be set to the maximum allowable time to prefill. Prefill will end when the prefill pressure is reached or when the prefill time expires if the pressure is not reached. Set to zero to disable the time limit.

**FILL TIME**
- Sets the time that the test pressure is applied for before the fill valve is closed and the stabilisation timer is started. This time should be sufficient to allow the component to be filled to the required pressure. If the pressure is out of tolerance at the end of the fill time then the test ended immediately with a pressure gross result and a pressure result value of zero.

**TEST TIME**
- Sets the time that the pressure is allowed to leak from the test item after the fill pressure has been removed. The pressure is compared to the fail levels at the end of this time (unless the End On Fail option is enabled).

**VENT TIME**
- Set the required vent time to allow the test item to vent through an external vent valve. This should be set long enough to ensure that the test item is not unclamped while pressurised.

**TEST O/P A-H**
- For each of up to eight outputs, define when the output is active.
- Options:
  - OFF: The output is not activated for this test.
  - ON: The output is active for the whole of the test
  - STANDBY: The output is only active whilst the test is selected but has not been started. The output is deactivated when the test is started.
  - TEST: The output is only active once the test is started

**FEEDBACK A-H**
- Define which feedback inputs are required before the test is allowed to run. The feedback signals will typically be used to indicate correct positioning of the jig.
- Each of up to eight possible inputs may be selected on (1) or off (0), e.g. to wait for inputs A and C the setting will be “10100000”.
- Feedback is checked after the test outputs A-H have been activated, but before the vent output.
- Note that the feedback inputs must be configured in the I/O Configuration menu.

**FEEDBACK TIMEOUT**
- The default feedback timeout is set to 0.0 which disables the timeout function. The instrument will display “Awaiting Feedback” until the correct feedback is applied or the test is reset.
- When the feedback inputs are not used for jigging they may be used to check signals from test components. If the correct feedback is not supplied within the feedback timeout period then the test ends with a FEEDBACK FAIL result.
**EXTERNAL FAIL**

- Allows an external signal, for example a pressure switch, to be monitored. An External Fail result is given if the signal is not in the expected state at the end of the test time.
- Note that the input function must be defined in the i/o configuration menu.
- Options:
  - NO: External fail is not used for this test.
  - ON: The input is expected to be active at the end of the test time.
  - OFF: The input is expected to be inactive at the end of the test time.
  - CHANGE: The input is checked at standby and is expected to change state before the test time ends.

**Permfill test parameters**

**PRESSURE UNITS**

- Choose the engineering units for the pressure display. See the specification table on page 91 for available units.

**REGULATOR 2**

- Selects the second internal regulator (if fitted), or an external regulator. Electrical or pneumatic outputs may be programmed to select an external regulator.
- Options:
  - NO: regulator 1 is used for the test.
  - YES: regulator 2 is used for the test
  - PREFILL: not intended for use with this test type. Regulator 1 will be used.
  - FILL: not intended for use with this test type. Regulator 2 will be used.

**CHECK STANDBY PRESSURE**

- Disable or enable pressure tolerance checking in standby. This is normally enabled, but may be disabled for vacuum tests with air saving, or jigging configurations where the test pressure is not applied in standby.
- Options: No, Yes

**TEST PRESSURE**

- Set the nominal test pressure. This is used in conjunction with the tolerance setting to ensure that the applied test pressure is within the test specification.

**PR. TOLERANCE**

- Sets the pressure tolerance for fault indication. Set 100.0% to disable.

**VENT TIME**

- The vent time should be set if an external vent valve is fitted to the system. The time must be long enough to allow the pressure in the test item to decay to a safe level to ensure that the test item is not unclamped while pressurised.
**TEST O/P A-H**

- For each of up to eight outputs, define when the output is active.
- Options:
  - **OFF**: The output is not activated for this test.
  - **ON**: The output is active for the whole of the test
  - **STANDBY**: The output is only active whilst the test is selected but has not been started. The output is deactivated when the test is started.
  - **TEST**: The output is only active once the test is started

**FEEDBACK A-H**

- Define which feedback inputs are required before the test is allowed to run. The feedback signals will typically be used to indicate correct positioning of the jig.
- Each of up to eight possible inputs may be selected on (1) or off (0), e.g. to wait for inputs A and C the setting will be “10100000”.
- Feedback is checked after the test outputs A-H have been activated, but before the vent output.
- Note that the feedback inputs must be configured in the I/O Configuration menu.

**FEEDBACK TIMEOUT**

- The default feedback timeout is set to 0.0 which disables the timeout function. The instrument will display “Awaiting Feedback” until the correct feedback is applied or the test is reset.
- When the feedback inputs are not used for jigging they may be used to check signals from test components. If the correct feedback is not supplied within the feedback timeout period then the test ends with a FEEDBACK FAIL result.
Ramp test parameters

PRESSURE UNITS

- Choose the engineering units for the pressure display. See the specification table on page 91 for available units.

REGULATOR 2

- Selects the second internal regulator (if fitted), or an external regulator. Electrical or pneumatic outputs may be programmed to select an external regulator.
  - Options:
    - NO: regulator 1 is used for the test.
    - YES: regulator 2 is used for the test
    - PREFILL: not intended for use with this test type. Regulator 1 will be used.
    - FILL: not intended for use with this test type. Regulator 2 will be used.

PEAK VALUE

- The ramp test has the option to use either the peak pressure value that was reached before the test ends, or the final pressure value.
  - Options:
    - No: the measured pressure at the end of the test is used for the comparison against fail limits.
    - Yes: the peak pressure is latched and used for the comparison against fail limits. This is more useful for test items that cause the pressure to fall when they actuate.

SENSITIVITY

- At the start of the test the pressure ramp rate is measured. A change or ramp rate or an external signal triggers the end of the test. A sensitivity of 100% will latch any deviation from the initial ramp. A sensitivity of 1% will require the ramp to almost flatten before latching occurs.
- Set the sensitivity to zero to disable the slope check and only use the external signal (typically a switch contact). The state of the external signal is checked at the start of the test, and the test ends when the signal changes state.

FAIL HIGH

- Set the maximum pressure level. If the latched pressure is above this level then a +fail is indicated.

FAIL LOW

- Set the minimum pressure level. If the latched pressure is below this level then a -fail is indicated.

HOLD OFF

- Sets the time delay after the test has started to allow valves to actuate and the pressure ramp to start. This time is normally very short, typically 0.1 second.
**TEST TIME**

- Sets the maximum time that the test is allowed to run for. Normally the test is terminated when the ramp trigger level is reached, but if the component is faulty this may not occur. Typically set to twice the normal time required to test a good part.

**VENT TIME**

- The vent time should be set if an external vent valve is fitted to the system. The time must be long enough to allow the pressure in the test item to decay to a safe level to ensure that the test item is not unclamped while pressurised.

**TEST O/P A-H**

- For each of up to eight outputs, define when the output is active.
- Options:
  - **OFF**: The output is not activated for this test.
  - **ON**: The output is active for the whole of the test
  - **STANDBY**: The output is only active whilst the test is selected but has not been started. The output is deactivated when the test is started.
  - **TEST**: The output is only active once the test is started

**FEEDBACK A-H**

- Define which feedback inputs are required before the test is allowed to run. The feedback signals will typically be used to indicate correct positioning of the jig.
- Each of up to eight possible inputs may be selected on (1) or off (0), e.g. to wait for inputs A and C the setting will be “10100000”.
- Feedback is checked after the test outputs A-H have been activated, but before the vent output.
- Note that the feedback inputs must be configured in the I/O Configuration menu.

**FEEDBACK TIMEOUT**

- The default feedback timeout is set to 0.0 which disables the timeout function. The instrument will display “Awaiting Feedback” until the correct feedback is applied or the test is reset.
- When the feedback inputs are not used for jigging they may be used to check signals from test components. If the correct feedback is not supplied within the feedback timeout period then the test ends with a FEEDBACK FAIL result.

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**Dump test parameters**

This is the same as a standard leak test except for the use of prefill. These parameters are displayed for the dump test even if prefill is disabled in the Global Settings menu.

**PRESSURE CORRECTION**

- Pressure correction is normally enabled to compensate for variations in prefill pressure – this allows for a more sensitive test. This can be disabled to aid commissioning or if it necessary to display the actual pressure rather than a compensated value.
- Options: NO, YES.
**PREFILL PRESSURE**
- This defines the nominal pressure for the reference volume and is used to compensate the test pressure for variations in the applied prefill pressure.
- The prefill pressure is used in conjunction with the prefill tolerance for tolerance checking and as the setpoint when an automatic regulator is fitted.
- A prefill output is provided to connect the pressure source to the reference volume. This is active during standby, and turned off after the jig delay and prefill timers. Traditionally, the jig or vent output is used to isolate the pressure source from the reference volume, but the FCO750’s prefill output provides a more flexible solution.

**PREFILL TOLERANCE**
- This is used to ensure that the prefill pressure is valid for the test.
- At standby, if the pressure is out of tolerance then test can not be started. This check may be disabled on a test by test basis for situations where the pressure is not applied at standby, e.g. vacuum tests with air saving.
- A tolerance check is also made just before the pressure dump occurs at the fill stage. If the pressure is out of tolerance here then a Pressure Gross result is given.
- Set to 100% to completely disable the tolerance check.

**PREFILL TIME**
- This is normally only used for vacuum tests with air saving to allow time for the reference volume to be filled. It is usual for positive pressure tests to fill the reference volume in standby so no additional prefill time is required.

**STAB. PREFILL TIME**
- The test requires a small period of time for the isolation valve to operate before the fill stage is started. Systems with long pipes or slow valves may need more time for the valve to operate; other systems may require time for the pressure to stabilise after isolation.
- There is a preset minimum delay of 0.2s after the prefill output is turned off. The delay may be increased with the Stab Prefill Timer. Note that the delay will be the greater of 0.2s and the stab prefill time.

**TEST PRESSURE**
- Set the nominal test pressure which will depend upon the reference pressure, reference volume, and test chamber volume. This is used in conjunction with the pressure tolerance setting to check for gross leaks. Note that the test pressure reading is compensated for variations in actual prefill pressure from nominal prefill pressure to achieve a more sensitive test. The test pressure displayed is not the actual pressure, but the compensated pressure.

**PRESSURE TOLERANCE**
- Sets the pressure tolerance for the level at which gross fail will be indicated during stabilisation.
Coarse Leak test parameters

PRESSURE UNITS
- Choose the engineering units for the pressure display. See the specification table on page 91 for available units.

AUTO PREFILL
- Only displayed if prefill is enabled in the Global Settings menu.
- The auto prefill function is useful where the test item is slow to fill or has a restriction in the fill path. It may also be used as a cost-effective way of testing at different pressures without manual adjustment or an auto-regulator.
- Options:
  - NO: auto prefill is not used.
  - INT: auto prefill uses the standard internal fill valve to fill the test item.
  - EXT: auto prefill uses an external valve to fill the test item. The valve should be operated by the prefill stage output.

REGULATOR 2
- Selects the second internal regulator (if fitted), or an external regulator. Electrical or pneumatic outputs may be programmed to select an external regulator.
- Options:
  - NO: regulator 1 is used for the test.
  - YES: regulator 2 is used for the test.
  - PREFILL: regulator 2 is used if auto prefill is enabled.
  - FILL: regulator 2 is used for the test.

CHECK STANDBY PRESSURE
- Disable or enable pressure tolerance checking in standby. This is normally enabled, but may be disabled for vacuum tests with air saving, or jigging configurations where the test pressure is not applied in standby. The pressure tolerance is still checked at the end of the fill time to ensure a valid test.
- Options: No, Yes

CHECK FILL PRESSURE
- Disable or enable pressure tolerance checking at the end of the fill time. This is normally enabled to ensure a valid test but may be disabled if the flow rate is too high to maintain the pressure.
- Options: No, Yes

END ON FAIL
- Coarse Leak tests normally test against the fail levels at the end of the test time. This feature enables testing against the fail levels during the test time: the test will end immediately if the test fails.
- Options: No, Yes

PREFILL PRESSURE
- Only used with auto prefill and only displayed if auto prefill is used.
- This is used to detect when to stop filling. Tolerance checking at standby must be disabled for auto prefill.
**PREFILL TOLERANCE**
- Only used with auto prefill and only displayed if auto prefill is used.
- The initial pressure may be higher or lower than the desired pressure depending if it is a vacuum or pressure test or possibly upon the result of a previous test if used in a sequence. To ensure that the item fills towards the required pressure rather than farther away from it, the prefill stage will end if the pressure moves from the initial pressure in the wrong direction by more than the prefill tolerance.

**TEST PRESSURE**
- Set the nominal test pressure. This is used in conjunction with the tolerance setting to ensure that the applied test pressure is within the test specification.

**PRESSURE TOLERANCE**
- Sets the pressure tolerance for fault indication. Set 100.0% to disable.

**+FAIL**
- Sets the pressure level at which the instrument will indicate a positive fail. Note that pressure decay indicates a positive leak.

**-FAIL**
- Sets the pressure level at which the instrument will indicate a fail in the negative leak region. This should be set as a positive value.

**PREFILL TIME**
- Only used with auto prefill and only displayed if auto prefill is used.
- This is a limit that should be set to the maximum allowable time to prefill. Prefill will end when the prefill pressure is reached or when the prefill time expires if the pressure is not reached. Set to zero to disable the time limit.

**FILL TIME**
- Sets the time that the test pressure is applied for before the fill valve is closed. This should be sufficient to allow the component to be filled to the required pressure. If the pressure is out of tolerance at the end of the fill time then a gross leak is indicated.

**TEST TIME**
- Sets the time that the pressure is allowed to leak from the test item after the fill pressure has been removed. The pressure decay is compared to the fail levels at the end of this time (unless the End On Fail option is enabled).

**VENT TIME**
- Set the required vent time to allow the test item to vent through an external vent valve. This should be set long enough to ensure that the test item is not unclamped while pressurised.
**TEST O/P A-H**

- For each of up to eight outputs, define when the output is active.
- Options:
  - **OFF**: The output is not activated for this test.
  - **ON**: The output is active for the whole of the test
  - **STANDBY**: The output is only active whilst the test is selected but has not been started. The output is deactivated when the test is started.
  - **TEST**: The output is only active once the test is started

**FEEDBACK A-H**

- Define which feedback inputs are required before the test is allowed to run. The feedback signals will typically be used to indicate correct positioning of the jig.
- Each of up to eight possible inputs may be selected on (1) or off (0), e.g. to wait for inputs A and C the setting will be “10100000”.
- Feedback is checked after the test outputs A-H have been activated, but before the vent output.
- Note that the feedback inputs must be configured in the I/O Configuration menu.

**FEEDBACK TIMEOUT**

- The default feedback timeout is set to 0.0 which disables the timeout function. The instrument will display “Awaiting Feedback” until the correct feedback is applied or the test is reset.
- When the feedback inputs are not used for jigging they may be used to check signals from test components. If the correct feedback is not supplied within the feedback timeout period then the test ends with a FEEDBACK FAIL result.

**EXTERNAL FAIL**

- Allows an external signal, for example a pressure switch, to be monitored. An External Fail result is given if the signal is not in the expected state at the end of the test time.
- Note that the input function must be defined in the i/o configuration menu.
- Options:
  - **NO**: External fail is not used for this test.
  - **ON**: The input is expected to be active at the end of the test time.
  - **OFF**: The input is expected to be inactive at the end of the test time.
  - **CHANGE**: The input is checked at standby and is expected to change state before the test time ends.
**Input/Output test parameters**

**TEST TIME**
- Just sets a time delay between the start and end of the test.

**TEST O/P A-H**
- For each of up to eight outputs, define when the output is active.
  - Options:
    - OFF: The output is not activated for this test.
    - ON: The output is active for the whole of the test
    - STANDBY: The output is only active whilst the test is selected but has not been started. The output is deactivated when the test is started.
    - TEST: The output is only active once the test is started

**FEEDBACK A-H**
- Define which feedback inputs are required before the test is allowed to run. The feedback signals will typically be used to indicate correct positioning of the jig.
- Each of up to eight possible inputs may be selected on (1) or off (0), e.g. to wait for inputs A and C the setting will be “10100000”.
- Feedback is checked after the test outputs A-H have been activated.
- Note that the feedback inputs must be configured in the I/O Configuration menu.

**FEEDBACK TIMEOUT**
- The default feedback timeout is set to 0.0 which disables the timeout function. The instrument will display “Awaiting Feedback” until the correct feedback is applied or the test is reset.
- When the feedback inputs are not used for jigging they may be used to check signals from test components. If the correct feedback is not supplied within the feedback timeout period then the test ends with a FEEDBACK FAIL result.

**EXTERNAL FAIL**
- Allows an external signal, for example a pressure switch, to be monitored. An External Fail result is given if the signal is not in the expected state at the end of the test time.
- Note that the input function must be defined in the i/o configuration menu.
  - Options:
    - NO: External fail is not used for this test.
    - ON: The input is expected to be active at the end of the test time.
    - OFF: The input is expected to be inactive at the end of the test time.
    - CHANGE: The input is checked at standby and is expected to change state before the test time ends.
CALCULATE VOLUME

This menu allows the FCO750 to calculate volume automatically, based on a known leak. A leak test on a known good item must be run with the approximate test volume and the calibrated leak attached. The result of this test should be recorded for reference purposes. The Calibrate Flow Procedure section of this guide gives full details of the use of this menu.

When you enter the menu you must first select the test to use from a list. The test must be a leak or dump test with leak units set for flow (e.g. cc/m).

TEST
• Shows a reminder of the test that you selected.

CAL. LEAK
• Enter the value of the external known calibration leak.

DISPLAY
• Enter the value of the displayed leak result previously recorded.

OK
• The calculated test volume is displayed and you are given the option to save this value. 'OUT OF RANGE' will be displayed if the figures are not usable.
• Options: No, Yes.
GLOBAL SETTINGS MENU

These settings are common to all products and all tests.

LANGUAGE
- Set the language for display and print-out messages.
- Options: ENGLISH, FRENCH, GERMAN, ITALIAN, SPANISH, POLISH, CZECH, RUSSIAN. (Note that Russian is not yet translated but Cyrillic symbols are available for user-entered text such as product descriptions etc.)

OPERATION
- Set the instruments operating mode.
- Options:
  - STANDARD: This is the setting for normal operation.
  - STEP: In step mode the programmed timers are overridden and the instrument pauses at each stage, i.e. Fill, Stab, Test. Press the ENTER button to advance to the next stage, or press RESET to end the test.

PRODUCT
- Select the product data to be used from a list of named and numbered products. This will be overwritten if the operator, BCD input or barcode input, changes the product.

ALTER PRODUCT
- Enable the operator or the BCD inputs, or a barcode scan to select the product data to be used for testing.
- Options:
  - NO: The product to test can only be selected from the Product entry above. This can be pass-code protected if required.
  - FRONT PANEL: The front panel may be used to select the product to test when the instrument is at standby. Press the ‘?’ function button and choose Select Product, and then choose from the list of named products. Alternatively, the UP/DOWN buttons will increase or decrease the selected product number.
  - BCD INPUT: Product selection is made from the external BCD inputs.

LEAK DISPLAY RESOLUTION
- The FCO750 has a 4-digit display for the leak value, which may give too much resolution for some applications. To reduce the apparent resolution you may set this parameter to the number of digits to round to, e.g. set to 5 for the leak reading to round to the nearest 5 digits.

PRESSURE DISPLAY RESOLUTION
- The FCO750 has a 4-digit display for the pressure value, which may give too much resolution for some applications. To reduce the apparent resolution you may set this parameter to the number of digits to round to, e.g. set to 10 for the pressure reading to round to the nearest 10 digits.
**PERSISTENT MENUS**
- Enable or disable the persistent menu feature.
- Options:
  - No: Each time a menu is entered the first menu entry is displayed.
  - Yes: Menu positions are remembered each time they are entered.

**FILL ON FAIL**
- This feature may be used to search for a leak by supplying air when a leak test fails.
- Options: No, Yes

**ENABLE FAIL 2**
- A second set of positive and negative fail levels may be enabled for applications that need to distinguish between marginal and bad failures.
- Options, No, Yes.
  - No: The second levels are not used and hidden in the test data menu.
  - Yes: The second levels are enabled for all tests.

**ENABLE PREFILL**
- The prefill function can be used to fill large components quickly, or to over-fill flexible components to improve the stabilisation time.
- Options:
  - No: Prefill is disabled and the settings are hidden in the test data menu.
  - Yes: Enables a prefill pressure, prefill timer and vent prefill timer to be set in each test.

**LEAK E.O.T.**
- Normally the leak value is displayed during the test time. You may choose to only display the final leak reading at the end of the test time.
- Options: No, Yes.

**LEAK DISPLAY**
- Choose the display format of the leak reading.
- Options:
  - C.Z. Centre Zero - positive and negative leaks are displayed.
  - L.H.Z. Left Hand Zero only shows positive leak readings. Negative leaks will be displayed as zero, although the negative fail levels are still active. It is often less confusing for the operator if only +ve leaks are displayed, e.g. if a slight -ve reading is registered due to instability, the display still shows as zero.

**RESET ON PASS**
- Options:
  - No: You must reset the test before a new test can be started. The test result is held until reset.
  - Yes: automatically resets to 'Ready' if a Pass occurs. The result is held for the Reset Delay time before being cancelled. You may start a new test at any time.
**RESET ON FAIL**
- Options:
  - **No**: You must reset the test before a new test can be started. The test result is held until reset.
  - **Yes**: automatically resets to 'Ready' if a Fail occurs. The result is held for the Reset Delay time before being cancelled. You may start a new test at any time.

**RESET DELAY**
- When automatic Reset On Pass or Reset On Fail is used the result lamps and outputs are held active at the end of a test for the time set here, then they are automatically cancelled. If you do not want to automatically cancel the lamps and outputs then set the time to zero.

**A.Z. DELAY**
- The differential pressure measurement always takes a zero reference point at the start of the test stage of a leak test. There are some rare applications that require a little more time to settle after the internal valves are operated. This setting allows the default auto-zero timing to be extended for those applications. Set to zero for default instrument operation.

**STATUS LINE**
- The bottom line of the display is used for status indication. You can choose what is displayed for normal operation.
  - **Blank**: the status line is unused.
  - **Counters**: shows pass and fail counters.
  - **%Counters**: show pass and fail counters as a percentage
  - **Barcode**: shows the last scanned barcode
  - **Serial No.**: shows the current serial number.

**DISPLAY CONTRAST**
- Adjust the display for differing viewing angles or conditions.
- Options: Number from 1 to 16
I/O CONFIGURATION MENU

These settings are generally for interfacing to automatic jigging. The standard instrument has 16 electrical outputs, 12 electrical inputs and two pneumatic outputs. There are purchase options for an additional 16 electrical outputs + 12 inputs, and for an additional 3 pneumatic outputs. All of these inputs and outputs can be user-programmed according to the application. The input/output configuration is common to all tests.

There are sub menus for:

- Inputs
- Outputs
- Functions

**Inputs**

The FCO750 has 12 electrical inputs as standard. There is purchase option to increase this to 24 inputs. The inputs are programmable in banks of four. The first four inputs default to basic remote control functions but may be reprogrammed as required.

**START/RESET**

- Options:
  - **Front Panel**: The front panel start/reset buttons are enabled and the external start/reset inputs are disabled. Start and Reset signals may also be provided by Fbus Communications or a barcode reader.
  - **Remote Control**: The front panel start and reset buttons are disabled and external start/reset inputs must be used. The default configuration assigns inputs 1-4 for basic functions, using input 1 for reset and input 2 for start. Start and Reset signals may also be provided by Fbus Communications or a barcode reader.
  - **Disabled**: Start or Reset is not allowed from the front panel buttons or the remote control inputs. Start and Reset signals can only be provided by Fbus Communications or a barcode reader.
  - **Both**: The front panel start/reset buttons are enabled at the same time as the remote control start/reset inputs. Start and Reset signals may also be provided by Fbus Communications or a barcode reader.

**VENT SENSOR**

- When a vent valve with a position sensor is used, the FCO750 can monitor the sensor to ensure that the valve has operated before running a test.

- Options:
  - **No**: The sensor is not monitored.
  - **Yes**: When the vent output is activated the instrument will wait for an external signal. If a signal is not received within 0.4s a fault is reported. The default configuration assigns inputs 1-4 for basic functions, using input 4 for the vent sensor.

**JIG SENSOR**

- The FCO750 can monitor a switch (or other sensor) that is incorporated into a jig clamp to only allow the test item to be pressurised when the jig is closed.

- Options:
No: The jig sensor is not monitored.

Yes. After the FCO750 activates the jig output it will wait for a signal before continuing. The default configuration assigns inputs 1-4 for basic functions, using input 3 for the jig sensor.

**JIG DELAY**

- After the jig pilot is operated there is a programmable time delay before the test starts to allow jig mechanisms to actuate. If the jig sensor is used then the delay starts after the contact is sensed.
- Options: Number from 0.00 to 9.99 seconds.

**INPUT BANKS 1-4, 5-8, 9-12, 13-16, 17-20, 21-24**

- The FCO750’s electrical inputs are configurable for many functions. To simplify the task of setting up the FCO750, groups of related functions may be assigned to the physical inputs in banks of four. Note that inputs 1-4 default to basic remote control functions but they may be reprogrammed for other purposes if required. The diagram below shows how any of the input banks may be ‘connected’ to the instrument’s input functions:

- Options:
  - **UNASSIGNED**
    The bank is not used.
  - **BCD X1**
  - **BCD X10**
  - **BCD X100**
    For product selection by BCD inputs, assign an input bank to use for each
BCD digit required.
- Four binary coded inputs are required to represent each decimal digit of the product. Although binary can represent values 0 to 15 with 4 bits, Binary Coded Decimal only uses values 0-9 for each decimal digit.
- If you have less than 100 products then you do not need to assign an input bank for the BCD X100 digit. If you have less than 10 products then you do not need to assign an input bank for the BCD X10 digit.
- The BCD inputs are in 8-4-2-1 order, for example if inputs 5-8 are configured for BCD X1 then input 5 is BCD 8, input 6 is BCD 4, input 7 is BCD 2 and input 8 is BCD 1.
- The BCD inputs must be enabled for use by setting Alter Product in the Global Settings menu.

- **FEEDBACK A-D**
- **FEEDBACK E-H**
  Each test may be set to check for a feedback signal from the jigging or test item before it is allowed to run. When feedback signals are required, assign the input bank(s) to use. If you have less than five feedback signals you only need assign one bank.

- **USER I/P A-D**
- **USER I/P E-H**
  Signals that do not naturally form a bank may be grouped into one or two user-defined banks. The individual User Inputs A-H are configured below.

- **JIG START**
  The multi-jig function uses this bank to select the product and start testing. The multi-jig function is described in a separate section of this guide.

- **JIG RESULT RESET**
  The multi-jig function uses this bank to reset the latched result outputs. The multi-jig function is described in a separate section of this guide.

- **BASIC FUNCTIONS**
  Four inputs are configured for the basic remote control functions of: RESET, START, JIG SENSOR and VENT SENSOR.

**USER I/P A-H**
- Define the usage of each of the eight programmable inputs functions. These are only used if an input bank is assigned for User I/P A-D or E-H.
- Options:
  - **UNASSIGNED**
    The input is not used.
  - **EXTERNAL FAIL**
    This may be used, for example, to monitor an external pressure switch during a leak test.
  - **RAMP**
    The ramp test may optionally detect an external pressure switch.
  - **LEARN OFFSET**
    This input may be used instead of the “user action” menu when using the offset feature. See the “offset and auto tracking” section of this guide.
  - **BCD 100**
    This may be useful when an entire input bank is not available for the BCD X100 digit. Any spare single input may be used for the 100 selection.
- **BCD 200**
  This may be useful when an entire input bank is not available for the BCD X100 digit. Any spare single input may be used for the 200 selection.

- **SET ZERO PRESSURE**
  Zero the pressure transducer when the instrument is at standby. You must ensure that pressure is removed before using this.

- **JIG SENSOR**

- **VENT SENSOR**
  These may be useful when the Basic Functions bank is programmed for alternate use.

- **START RESET**
  These may be used for remote control when the Basic Functions bank is programmed for an alternate use. Reset is fail-safe active low.

- **RESET+**
  This active high reset input is for applications that require it. This is not normally recommended.
**Outputs**

**OUTPUT BANKS 1-8, 9-16, 17-24, 25-32**

- The FCO750’s electrical outputs are configurable for many functions. To simplify the task of setting up the FCO750, groups of related functions may be assigned to the physical outputs in banks of eight. Note that two banks are fitted as standard. There is a purchase option for enhanced i/o for an additional two banks. Any output bank can be linked to any function block.

- Options:
  - **UNASSIGNED**
    The bank is unused.
  - **BASIC FUNCTIONS**
    The eight outputs are configured for the normal basic needs of the leak detector, i.e. READY, FAULT, PRODUCT PASS, PRODUCT FAIL, JIG, VENT, REG2, PREFILL.
  - **EXTENDED RESULTS**
    Used when individual step result outputs are required as well as product pass and fail: PASS, +FAIL 1, +FAIL 2, -FAIL 1, -FAIL 2, PRESSURE GROSS, PRESSURE HIGH, PRESSURE LOW.
  - **BCD 01-99**
    Two BCD digits for the BCD value of the selected product – may be used to verify that BCD inputs have been read correctly. Note that the outputs are in
the order 80-40-20-10-8-4-2-1.

- **BCD X100**
  When 100 or more products are required this provides the x100 BCD digit. Note that the outputs are in the order x-x-x-x-x-200-100 where ‘x’ is an unused input.

- **STEP OUTPUTS 1-8**
  Each of the product steps 1 through 8 has a unique output.

- **TEST O/P A-H**
  The states of outputs A to H are programmed in each test for specific jig control in each set of test data. These need to be enabled in the Global Settings menu.

- **USER O/P A-H**
  The function of each of the eight outputs can be selected from a list. This may be used for special functions or where jigging requires an output combination that is not met by the predefined banks.

- **PASS/FAIL 1-4**
  Used for multiple part testing. The results of steps 1 to 4 are latched until reset. There are four pass outputs, A-D and four fail outputs E-H.

- **PASS/FAIL 5-8**
  Used for multiple part testing. The results of steps 5 to 8 are latched until reset. There are four pass outputs A-D and four fail outputs E-H.

- **STEP OUTPUTS 9-16**
  Each of the product steps 9 through 16 has a unique output.

- **JIG RESULTS**
  The multi-jig function latches the product pass and product fail results for each jig. There are four pass outputs A-D and four fail outputs E-H. The multi-jig function is described in a separate section of this guide.

- **FEEDBACK RESULT STATUS**
  When the feedback inputs are used it can be helpful to have an indication of which of the A-H signals are in error.

**USER OUTPUT A-H**
- Define the usage of each of the eight programmable functions. These are only used if the User Programmed function block is chosen for use by an output bank.
- Options: See the output function list on page 55.

**PNEUMATIC OUTPUTS 1-5**
- Define the usage of each of the pneumatic outputs. The standard instrument has two pneumatic outputs with build options for up to five pneumatic outputs. These may be used internally for some options, or made available via rear panel ports.
- Options: See the output function list on page 55.
Functions

TIMER 1
TIMER 2
- There are two general-purpose timers that may be used for jigging functions, e.g. to operate a stamp. When triggered, the timer generates an output signal for the time period set here. The output signal can be selected for use by the programmable pneumatic or electrical outputs.
- Options: 0.00 to 9.99 seconds.

TIMER 1 TRIGGER
TIMER 2 TRIGGER
- Define the output / event / function that starts the timer.
- Options: See the output function list on page 55.

COMBO x FUNCTION (where x is 1, 2, 3, or 4)
- There are four combinational outputs that may be used for jigging functions. These apply a logical function to two signals from the Common Output Function List to give a new output signal. The combo function block should be considered a having two inputs and one output. The inputs to the function are chosen below. The output can be selected for use by the programmable pneumatic or electrical outputs. The combo function can be selected from:
  - OR output active if either input 1 OR input 2 is active
  - AND output active if both input 1 AND input 2 are active
  - NOR output inactive if either input 1 OR input 2 is active
  - NAND output inactive if both input 1 AND input 2 are active

COMBO x INPUT 1
COMBO x INPUT 2 (where x is 1, 2, 3, or 4)
- Define the signals to input to the combo function.
- Options: See the output function list on page 55.
### Common Output Function List

<table>
<thead>
<tr>
<th>Function</th>
<th>Output Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNASSIGNED</td>
<td>PRESSURE GROSS</td>
</tr>
<tr>
<td>ON</td>
<td>TEST O/P A</td>
</tr>
<tr>
<td>VENT</td>
<td>TEST O/P B</td>
</tr>
<tr>
<td>JIG</td>
<td>TEST O/P C</td>
</tr>
<tr>
<td>REGULATOR 2</td>
<td>TEST O/P D</td>
</tr>
<tr>
<td>PREFILL REGULATOR</td>
<td>TEST O/P E</td>
</tr>
<tr>
<td>READY</td>
<td>TEST O/P F</td>
</tr>
<tr>
<td>PREFILL STAGE</td>
<td>TEST O/P G</td>
</tr>
<tr>
<td>FILL STAGE</td>
<td>TEST O/P H</td>
</tr>
<tr>
<td>STABILISATION STAGE</td>
<td>WARNING SYSTEM</td>
</tr>
<tr>
<td>TEST STAGE</td>
<td>END OF TEST</td>
</tr>
<tr>
<td>FAULT</td>
<td>TIMER 1</td>
</tr>
<tr>
<td>PRESSURE LOW</td>
<td>TIMER 2</td>
</tr>
<tr>
<td>PRESSURE HIGH</td>
<td>COMBO 1</td>
</tr>
<tr>
<td>PRODUCT RESULT</td>
<td>COMBO 2</td>
</tr>
<tr>
<td>PRODUCT PASS</td>
<td>COMBO 3</td>
</tr>
<tr>
<td>PRODUCT FAIL</td>
<td>COMBO 4</td>
</tr>
<tr>
<td>RESULT</td>
<td>AIR SAVE</td>
</tr>
<tr>
<td>PASS</td>
<td>BATCH COMPLETE</td>
</tr>
<tr>
<td>PASS/FAIL1</td>
<td>CALIBRATION CHECK *</td>
</tr>
<tr>
<td>FAIL</td>
<td>VENT P2 **</td>
</tr>
<tr>
<td>+FAIL 1</td>
<td>FILL P2 **</td>
</tr>
<tr>
<td>-FAIL 1</td>
<td>BCD 100</td>
</tr>
<tr>
<td>+FAIL2</td>
<td>BCD 200</td>
</tr>
<tr>
<td>-FAIL 2</td>
<td></td>
</tr>
</tbody>
</table>

* only applies to x750C
** only applies to x750S02

Note that when a Fail 2 output is active the associated Fail 1 output is also active. Gross fails activate the Fail 2 outputs. Pressure Gross also activates all +Fail and –Fail outputs.
The FCO750 can communicate with a computer/PLC using the Fbus protocol. Application software is available from Furness Controls such as Cmax or the FCS432 Fbus utility.

The fbus protocol is documented separately from this user guide.

Select the Fbus communications port and configure it to match the computer/PLC that the FCO750 is to be connected to.

**PORT**
- Note that a port might not be listed if the optional hardware is not fitted or if the port is already selected for use in the Printer Settings menu.
- Options:
  - **DISABLED**: Fbus communications is not available.
  - **RS232**: Uses the 9 way D rear panel connector.
  - **USB**: Uses the front panel connector.
  - **RS485**: (optional) uses the rear screw terminal connector.
  - **LAN**: (optional) uses the local area network connector.

**I/D NUMBER**
- Assign a unique identification number to this instrument for Fbus communications in the range 01 to 99.

**BAUD**
- The baud rate is the speed that data is sent via the serial ports. The baud rate must be the same on the FCO750 and device being connected. When using the LAN the baud rate must match the configuration of the LAN adaptor. This is not used for USB.
- Options: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200.

**PARITY**
- Select the number of data bits and type of parity error checking to use when sending data via the RS232, RS485 and LAN ports. Parity is not used for the USB port.
- The parity setting must be the same on the FCO750 and device being used. When using the LAN the parity must match the configuration of the LAN adaptor.
- Options:
  - **8,NONE**: 8 data bits and no parity.
  - **7,ODD**: 7 data bits plus odd parity.
  - **7,EVEN**: 7 data bit plus even parity.
  - **8,ODD**: 8 data bits plus odd parity.
  - **8,EVEN**: 8 data bits plus even parity.
- Note that extended symbols/characters require 8 data bits. European characters are a subset of code page 1252. Cyrillic characters are a subset of code page 1251.
- Generally, 8 data bits with no parity is preferred for use with older instruments that do not support 8 bits plus parity. Only use 7 data bits when compatibility with older instruments is necessary and parity is required and you do not use extended characters.
PRINTER SETTINGS MENU

Select the printer port and configure it to match the printer that the FCO750 is to be connected to. The printed output may also be useful for simple PLC or computer interfacing.

**PORT**
- Note that a port might not be listed if the optional hardware is not fitted or if the port is already selected for use in the Fbus Settings menu.
- Options:
  - **DISABLED**: Printing is not available.
  - **RS232**: Uses the 9 way D rear panel connector.
  - **USB**: Uses the front panel connector. Note that this will **not** drive a USB printer because the FCO750 is a USB peripheral device, however it may be useful to print-out to a PC or PLC.
  - **RS485**: (optional) uses the rear screw terminal connector.
  - **LAN**: (optional) uses the local area network connector.

**BAUD**
- The baud rate is the speed that data is sent via the serial ports. The baud rate must be the same on the FCO750 and device being connected. When using the LAN the baud rate must match the configuration of the LAN adaptor. This is not used for USB.
- Options: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200.

**PARITY**
- Select the type of parity error checking to use when sending data via the RS232, RS485 and LAN ports. Parity is not used for the USB port.
- The parity setting must be the same on the FCO750 and device being used. When using the LAN the parity must match the configuration of the LAN adaptor.
- Options:
  - 8,NONE: 8 data bits and no parity.
  - 7,ODD: 7 data bits plus odd parity.
  - 7,EVEN: 7 data bits plus even parity.
  - 8,ODD: 8 data bits plus odd parity.
  - 8,EVEN: 8 data bits plus even parity.
- Note that extended symbols/characters require 8 data bits. European characters are a subset of code page 1252. Cyrillic characters are a subset of code page 1251.

**AUTO LINE FEED**
- Set for compatibility with printers that add spacing between lines of print, or for printing to a PC.
- Options:
  - YES: At the end of every print line the FCO750 sends a line-feed. If the printer also has auto line-feed turned on it will print double-spaced. This is the usual setting for connection to a PC.
  - NO: The FCO750 does not send a line-feed at the end of a line. If the printer does not add a line feed then all lined of print are printed on top of each other.

**MARGIN**
- Allows custom printed data to be positioned horizontally on the paper, for example to line up labels. Up to 60 character spaces may be inserted.
**BLANK LINES**
- Prints a number of blank lines after custom printed result data. This allows results from consecutive tests to be separated and can also be used to align labels when using a label printer. Up to 20 blank lines may be added.

**SEND EOF**
- When a PC or PLC is capturing printed data from the FCO750 it may be useful to add an “End Of File” character at the end of the printed data. The EOF character may be represented as <Ctrl Z>, 0x1a, chr$(26) etc.
- Options: NO, YES.

**SEND ON**
- Determines the conditions that allow the data to be printed at the end of a test.
- Options:
  - **RESULT**: The data is printed at the end of the test.
  - **PASS**: The data is only printed if the test resulted in a pass.
  - **FAIL**: The data is only printed if the test resulted in a fail.

**SEND AS**
- Selects the fixed format or custom format for the printed data.
- Options:
  - **FIXED**: the data is sent in a single line of ASCII code in a set format consisting of step number, result, pressure value, and leak value for each step. CR is always sent, with LF and EOF optional, as configured.

<table>
<thead>
<tr>
<th>Step</th>
<th>Pass/Fail</th>
<th>Test Press. T. P Units</th>
<th>Leak</th>
<th>Leak Units</th>
<th>Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>01, P</td>
<td>0.400, kPa</td>
<td>-0.1, PA</td>
<td>CR LF EOF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

  - **CUSTOM 1**: This allows the printed result to be customised using the settings below. The print-out consists of a header block followed by up to sixteen step results, then an optional footer block and optional blank lines. Each value is preceded by a label, e.g. “DATE 2009-05-26”.
  - **CUSTOM 2**: As for Custom 1, but without the labels, e.g. “2009-05-26”. This is useful for programmable printers that process the printed output before printing.
  - **ZPL II FORM**: This is for use with Zebra® printers using the ZPL II® language. The printer must be configured to use a predefined form. The FCO750’s printed output supplies the data to fill in the form. The custom settings below determine which values are sent to the form.

The following menu entries define the custom format.

**Header section:**

**LINE 1 → 6**
- Up to six lines of user defined text may be added to the printed header (or footer).
- Options: Enter a line of text (up to 16 characters long).
- If the first character of any line is a backslash ‘\’ then the next character is used for additional control of printed output. This is rarely necessary but may help with unusual printing requirements. This limits the text line to 14 characters.
- The rest of the text line is only printed if the result is Pass.
- The rest of the text line is only printed if the result is Fail.
- The rest of the text line appears in the footer instead of the header.
- The rest of the text line is only printed in the footer if the result is Pass.
- The rest of the text line is only printed in the footer if the result is Fail.

A backslash anywhere else in the text ends the line without adding a CR. This allows two or more lines to be concatenated. If you need to print a backslash use two: “\".

The following menu entries all have Yes/No options to determine whether the value is printed or not.

**SEND LINE 1→6**
Choose any combination of the six user defined text lines

**DATE**
Only if a real-time-clock is fitted

**TIME**
Only if a real-time-clock is fitted

**PRODUCT I/D**
From the Product Data menu

**PRODUCT No.**
The product number

**BATCH I/D**
From the Batch Settings menu

**SERIAL No.**
From the bar code scanner or internal serial number.

**TEST COUNTER**

**PRODUCT RESULT**

**Step Section, repeated for all steps**

**TEST I/D**
From the Test Data menu

**TEST No.**
The test number

**RESULT**
Step result, e.g. PASS, -FAIL 1, +FAIL 1, GROSS, INVALID

**PREFILL**
Prefill pressure and engineering units

**PRESSURE**
Test pressure and engineering units

**LEAK**
Leak value and engineering units

**Footer section:**
Any of the text lines 1-6 may be placed here instead of the header using special characters at the start of the text line. This is rarely necessary but may help with unusual printing requirements. The optional blank lines will be after this section.
The barcode reader may be used for automatic product selection and/or logging of a serial number with test results. The barcode scan may be used to start the test automatically. If the barcode reader does not supply a serial number then a simple sequential serial number may be generated by the FCO750. Note that if the serial number is to be provided by a barcode the instrument will not start a new test until a serial number has been scanned.

Product or serial number information may be extracted from barcodes of up to 64 characters in length. Larger barcodes may be scanned, but anything after the 64th character is discarded. An ASCII Carriage Return character terminates the barcode.

Barcodes **STARTFC** and **RESETFC** may be used to start and reset the instrument.

Note that there is a Check Barcode utility available in the utilities menu that may be helpful when configuring the barcode reader.

### Barcode Settings

**PORT**
- Note that a port might not be listed if the optional hardware is not fitted. Although all ports are available for selection the barcode reader would usually be connected to the RS232 port.
- Options:
  - **DISABLED**: The barcode reader is not available.
  - **RS232**: Uses the 9 way D rear panel connector.
  - **USB**: Uses the front panel connector. Note that this is unlikely to be useful with barcode reader because the FCO750 is a USB peripheral device, however it may be useful with a PC or PLC.
  - **RS485**: (optional) uses the rear screw terminal connector.
  - **LAN**: (optional) uses the local area network connector.

**BAUD**
- The baud rate is the speed that data is sent via the serial ports. The baud rate must be the same on the FCO750 and device being connected. When using the LAN the baud rate must match the configuration of the LAN adaptor. This is not used for USB.
- Options: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200.

**PARITY**
- Select the type of parity error checking used when sending data via the RS232, RS485 and LAN ports. Parity is not used for the USB port.
- The parity setting must be the same on the FCO750 and device being used. When using the LAN the parity must match the configuration of the LAN adaptor.
- Options:
  - **8,NONE**: 8 data bits and no parity.
  - **7,ODD**: 7 data bits plus odd parity.
  - **8,EVEN**: 7 data bits plus even parity.
  - **8,ODD**: 8 data bits plus odd parity.
  - **8,EVEN**: 8 data bits plus even parity.
TYPE
• Select the type of data to read from the barcode. Note that if the barcode is to provide a serial number then the Serial Number Type (see Serial Numbering below) must be set to ‘Barcode’.
• Options:
  o **Serial No:** Extract only a serial number from the barcode. This is stored with the result data for printing or data collection.
  o **Product:** Extract a product identifier from the barcode. If the product identifier matches the barcode i/d of a product, then that product is selected for use.
  o **Combined:** The barcode contains both a product identifier and a serial number.
  o **Separate:** Product identifier and serial number are separate barcodes. There must be no ambiguity between the barcode data.
    ▪ If a product identifier is scanned that matches the barcode i/d of a product, then that product is selected for use.
    ▪ If a serial number is extracted that matches the serial number mask then it will be used for the next test. Start On Scan applies to the serial number when separate barcodes are used.
  o **Paired:** Product identifier and serial number are separate barcodes that must be scanned as pairs. There must be no ambiguity between the barcode data.
    ▪ A valid product code MUST be scanned before a serial number code is accepted.
    ▪ If a product identifier is scanned that matches the barcode i/d of a product, then that product is selected for use.
    ▪ If a serial number is extracted that matches the serial number mask then it will be used for the next test. Start On Scan applies to the serial number when separate barcodes are used.

PRODUCT START
• Define the position of the first character of the product i/d within the barcode text.
• Options: 1 to 64.

PRODUCT LENGTH
• Define the length of the product i/d within the barcode text.
• Options: 0 to 16.

SERIAL No. START
• Define the position of the first character of the serial number within the barcode text.
• Options: 1 to 64.

SERIAL No. LENGTH
• Define the length of the serial number within the barcode text.
• When the serial number mask is blank the serial number length is the number of characters required for the serial number; too few characters are invalid, too many are truncated.
• When a mask is used the serial number length is a maximum length, not a required length. This allows a variable length serial number to be used, up to a maximum of 20 characters, although the mask is limited to 16 characters. The mask can be used to set the minimum length.
• Options: 0 to 20.
**SERIAL No. MASK**
- The scanned serial number may be checked against a mask pattern to validate it. Any fixed characters in the serial number should be entered in the mask – these must be matched exactly. The ‘wild card’ characters shown below may be used to match numeric or alphabetic characters. If the scanned serial number is not validated it is rejected.
- The ‘wild card’ characters are:
  - # 0 to 9 or # required
  - & A-Z or & required (upper or lower case is accepted)
  - ? A character is required but the actual character is not checked.
  - Space Character position is not checked

**START ON SCAN**
- When the expected barcode data has been read the instrument can be commanded to automatically start a test.
- Options: No, Yes.

**SCAN ON FAIL**
- When a product fails, a custom fail code may be entered into the result data for communications, printing, or data logging. This may be used to identify a specific reason for the failure. The instrument will prompt the operator to scan a fail code.
  - The fail code must be a two-digit number which replaces the Product Result.
  - Codes 00 and 10 are reserved for Product Pass and Product Fail respectively, so you should not use these.
  - If the instrument is reset when waiting for the fail code to be scanned the default Product Fail code 10 will be used.
- Options: No, Yes.
**Serial Numbering**

A serial number may be included in test results for printing or data logging. The serial number may be provided from a barcode scanner or from an auto-incrementing counter. When the auto-incrementing counter is used it may have a fixed prefix, defined in this menu, or the barcode scanner can provide the prefix.

**SERIAL No. TYPE**

- Options:
  - **AUTO ON RESULT**: The six digit serial number is automatically incremented after every result and appended to a prefix.
  - **AUTO ON PASS**: The six digit serial number is automatically incremented after every pass and appended to a prefix.
  - **BARCODE**: The barcode scanner provides the entire serial number. The six digit counter is not used.

**PREFIX**

- This is used with the auto-incrementing counter. Up to sixteen characters may be added to the front of the serial number. Trailing space characters are not included in the serial number.

**SERIAL No.**

- This is the auto-incrementing number. You may set the initial value, and thereafter it will be incremented after each test according to the Serial No. Type setting.
The Maintenance Early Warning System (MEWS) may be used to aid planned maintenance. When a warning occurs it is shown on the status line of the display and an electrical output may be used to drive an external warning lamp or connect to a PLC for example. If the LAN option is fitted it is possible to configure and email to be sent when a MEWS alarm occurs.

Choose a sub-menu to set the view the latest values or set the limits:

- **LATEST VALUES**
  Any warnings that are currently active will flash.
  - **Cycle Count**: the number of test cycles since this counter was last reset. It is normally only reset after the instrument’s internal valves have been serviced.
  - **Latency**: This is the time taken for the internal valves to operate. Air supply pressure will affect this, as well as aging. As the valves age the latency time increases – this can be used to warn that servicing is required.
  - **Leak Zero**: The leak transducer is sensitive and it’s zero point may shift if it is overloaded. The instrument is able to tolerate this to a large degree, but eventually may stop with a fault. MEWS may be used to give a warning before the instrument fails.
  - **Logged Data**: This may be used to warn that the data logger memory is nearly full so that the data may be off-loaded.
  - **Calibration Due**: it is recommended that the calibration of this instrument is checked annually, or as often as your quality system demands. This value is a display of the number of days left before calibration is due. If the value is negative then calibration is over-due.

- **LIMITS**
  - **Cycle Count**
  - **Latency** set in seconds.
  - **Leak Zero** set as a percentage of the fault level.
  - **Logged Data** set as a percentage of memory capacity.
  - **Calibration Due** set how many days’ notice is required in advance of the calibration is due date. The calibration due date is set in the Utilities menu.

- **WARNING CODES**
  When a warning is shown on the display one of the following codes is given:
  - **M01**: Cycle Count
  - **M02**: Latency
  - **M03**: Leak Zero
  - **M04**: Logged Data
  - **M05**: Calibration Due
SECURITY MENU

The FCO750 may be configured to stop unauthorised changes to the test parameters. If you select this menu when the instrument is locked you will be asked to enter the security code before continuing.

LOCK
- Lock or unlock data entry. When locked you will be asked for a security code before changing data. When unlocked you are reminded each time you exit the menu system.
  - Options:
    - NO, unlocked
    - SUPERVISOR, all settings are locked.
    - OPERATOR, all settings locked except those that an operator requires, e.g. the batch control menu.

SECURITY CODE
- Allows the user to set a personal security code.
- Options: 4 digit numeric password from 0000 to 9999.
- If the code is forgotten it can be checked or changed via Fbus communications, or by Furness Controls service personnel.

OFF BUTTON
- This allows the off button to be enabled or disabled.
- Options:
  - NO: The off button is disabled. The instrument can only be powered down by removing the external power.
  - YES: The off button is enabled and the instrument may be shut down.
TIME & DATE

Older instruments may not have a real-time-clock fitted in which case this menu is not displayed. When available, the date and time may be included in printed and logged results.

**DATE**
- The date is set in the format yyyy-mm-dd.

**TIME**
- The time is set in 24 hour format as hh:mm:ss
The FCO750 has a built-in data logger that may be used to log test results locally rather than using a computer to log each result. The logged data may then be transferred from the instrument to a computer at a more convenient time.

The standard data logger has over 400,000 characters of storage. Most of the logged data is stored in a compressed format so the resulting output may be much larger than this. The number of results that can be stored depends upon the number of steps required to test the product and what information is logged. The Fbus Utility software may be used to upload the logged data to a PC via the usual serial/USB/LAN ports. Alternatively, the data may be printed.

There is a purchase option for an enhanced data logger that has 256MB of storage. This is capable of storing millions of typical results. The enhanced logger adds a USB socket to the rear panel that is used to export the logged data to a USB memory stick since it is impractical to use the serial ports for this amount of data.

The logged data is output in standard CSV format suitable for reading with a spreadsheet or database. Each record of logged data comprises a single header section followed by result data for each of the steps required to test the product. Each line of the resulting CSV data contains one record.

When the data logger memory is full the instrument will stop logging. The MEWS warning system may be used to notify when the data logger memory is nearly full so that the data can be removed before the logger fills. See the Warning System menu.

The data logger menu allows you to enable and disable the data logger, choose what data to log, and erase the logged data.

**[EXPORT LOGGED DATA] (optional)**
- When the enhanced data logger option is fitted, this is used to copy the logged data to a USB memory stick. The memory stick should be plugged in to the instrument before selecting this option. When the data has been successfully transferred you are given the option to erase the data from the instrument. If the file already exists on the memory stick then the data will be appended to the file.

**[ERASE DATA]**
- When you select this option you will be prompted for confirmation before all logged data is erased.

**FILE NAME (optional)**
- When the enhanced data logger option is fitted data exported to a memory stick is saved with the file name entered here with a “.CSV” extension. The file name should only contain upper case letters, numbers, or the underscore characters. Do not use spaces within the file name.
**LOG DATA**
- Options:
  - **NO:** disable the data logger.
  - **YES:** log results.

**LOG ON**
- Determine the conditions that cause the data to be logged.
- Options:
  - **RESULT:** The data is always logged.
  - **PASS:** The data is only logged if the product result is pass.
  - **FAIL:** The data is only logged if the product result is fail.

The following menu entries all have Yes/No options to determine whether the value is logged or not.

**Header section:**
- **DATE:** Only shown if a real-time-clock is fitted
- **TIME:** Only shown if a real-time-clock is fitted
- **PRODUCT I/D:** From the Product Data menu
- **PRODUCT No.:** The product number
- **BATCH I/D:** From the Batch Settings menu
- **SERIAL No.:** From the bar code scanner
- **TEST COUNTER**
- **PRODUCT RESULT**

**Step Section, repeated for all steps**
- **TEST I/D:** From the Test Data menu
- **TEST No.:** The test number
- **RESULT:** Step result
- **PREFILL:** Prefill pressure and engineering units
- **PRESSURE:** Test pressure and engineering units
- **LEAK:** Leak value and engineering units
UTILITIES MENU

This menu contains features and functions that are outside the scope of normal operation, typically for commissioning and diagnostic purposes. When security is locked this entire menu is locked and you will be prompted for the pass code to enter.

SET ZERO PRESS.

- It is possible for the zero point of the test pressure transducer to drift over time or with large temperature changes. This allows any drift that may occur to be corrected.
- Options:
  - **NO**: Exit with no change.
  - **YES**: Correct the zero offset.
    Before selecting **YES**, **TURN OFF THE AIR SUPPLY TO THE FCO750**.
The instrument should have been switched on for at least 15 minutes.

CALIBRATE PRESS.

- Normal calibration is carried out at the factory and the information is stored securely in the instrument. This information cannot be altered. However this menu allows up to ±10% adjustment for field recalibration. Since the original calibration is not changed it can be reset as required.
  - Initially the pressure reading is displayed flashing. Use the **UP** and **DOWN** buttons to change the reading to match your calibration device, and then press **ENTER** to continue.
  - The resulting percentage change from original calibration is then displayed and may be edited. Set to zero to use the original factory calibration.
  - Press **ENTER** again to finish.

CALIBRATE D.P.

- Normal calibration is carried out at the factory and the information is stored securely in the instrument. This information cannot be altered. However this menu allows up to ±10% adjustment for field recalibration. Since the original calibration is not changed it can be reset as required.
  - Initially the differential pressure reading is displayed flashing. Use the **UP** and **DOWN** buttons to change the reading to match your calibration device, and then press **ENTER** to continue.
  - The resulting percentage change from original calibration is then displayed and may be edited. Set to zero to use the original factory calibration.
  - Press **ENTER** again to finish.

CALIBRATION DUE

- Set the date that the next calibration check is due. This should be set each time the instrument is calibrated so that the MEWS system can give advance warning of when the next calibration is due.
PRINT DATA

- This allows the instruments settings to be printed. Note that this menu option will not appear if the printer port is disabled in the Printer Settings menu.

- Options: Sub menu:
  - PRODUCT DATA
  - TEST DATA
  - GLOBAL SETTINGS
  - I/O CONFIGURATION
  - PRINTER SETTINGS
  - COUNTERS
  - LOGGED DATA (not available for the enhanced logger)
  - SYSTEM INFORMATION

- Press enter to print the data. For Product Data and Test Data you are able to select the range to print.

COPY PRODUCT DATA.

- The settings in one product can easily be replicated into other products. This allows for faster setting up if many products use similar settings.
  - Select the product to copy from and the product to copy to, then choose OK, or press BACK to exit.
  - Note that the first character of the product i/d of the copied data is changed to ‘*’ to indicate that the data is not the original version and should be edited.

COPY TEST DATA.

- The settings in one test can easily be replicated into other tests. This allows for faster setting up if many tests use similar settings.
  - Select the test to copy from and the test to copy to, then choose OK, or press BACK to exit.
  - Note that the first character of the product i/d of the copied data is changed to ‘*’ to indicate that the data is not the original version and should be edited.

INITIALISE DATA

- This is used to reset all data menu settings back to factory default values. You will be prompted for confirmation before any data is changed.

- Options: NO, YES.

MONITOR I/O

- This allows the status of the instruments electrical inputs and outputs to be checked live. The display shows the inputs and outputs in banks. 0 means inactive, 1 means active. Note that the standard instrument does not have all of the displayed inputs and outputs fitted – there is a build option for enhanced i/o.

- Inputs are grouped in banks of four.
- Outputs are grouped in banks of eight.
- Refer to the I/O Configuration menu settings for signal usage.
- Press the Esc. button to exit.
**CHECK OUTPUTS**

- This allows each of the instruments outputs to be activated and deactivated when the instrument is not testing. The display is similar to that above for Monitor I/O except that you can edit the outputs. The inputs are displayed to show any interaction.
  - Use the **UP** and **DOWN** buttons to select an output, indicated by a flashing digit.
  - Press the **ENTER** button to toggle the selected output on/off.
  - Press the **Esc.** button to exit the check. All outputs are turned off when you exit.

**CHECK BARCODE**

When a barcode reader is used it can be a little complex to configure. This utility helps by displaying the scanned data along with the extracted product / serial number information. A function button allows you edit the settings directly from this utility.

**FLASH UPDATE**

- This initiates a product firmware upgrade by downloading the new firmware from a PC using the RS232 or USB port. You will be prompted for confirmation before the update is initiated.
- Options:
  - **NO**: Exit with no changes.
  - **YES**: Restarts the FCO750 in Flash Update mode. Once this procedure is started the instrument is commanded from the RS232 / USB port. To cancel Flash Update mode you must remove power from the instrument, or command it from the RS232.

<table>
<thead>
<tr>
<th>MONITOR I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INPUTS</strong></td>
</tr>
<tr>
<td>1-8 0000 0000</td>
</tr>
<tr>
<td>9-16 0000 0000</td>
</tr>
<tr>
<td>17-24 0000 0000</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
**Control/Status Outputs**

This detachable tension clamp terminal block accepts wire sizes from 0.08mm² to 1.0mm² and requires a small flat bladed screwdriver (2.5mm max.) to insert and remove wires. Note that there are no screws - the screwdriver blade is simply pushed in to release the tension clamp.

<table>
<thead>
<tr>
<th>Output</th>
<th>Default Use</th>
<th>Programmed Function</th>
<th>*Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ready</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>2</td>
<td>Fault</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>Product Pass</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>4</td>
<td>Product Fail</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>Jig</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>6</td>
<td>Vent</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>7</td>
<td>Reg2</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>8</td>
<td>Prefill</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>9</td>
<td>Step Pass</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>10</td>
<td>+Fail 1</td>
<td></td>
<td>26</td>
</tr>
<tr>
<td>11</td>
<td>+Fail 2</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>12</td>
<td>-Fail 1</td>
<td></td>
<td>28</td>
</tr>
<tr>
<td>13</td>
<td>-Fail 2</td>
<td></td>
<td>29</td>
</tr>
<tr>
<td>14</td>
<td>Pressure Gross</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>15</td>
<td>Pressure High</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>16</td>
<td>Pressure Low</td>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>

The outputs are user-programmable so the default setting shown may be changed if required.

* The second connector is not fitted as standard. There is a purchase option for enhanced i/o that provides an additional 12 inputs and 16 outputs if required.

The transistor outputs switch the positive supply connected to the ‘+’ pin to give an active high signal. They require a DC power supply between the + and 0V pins to operate; this is typically the same power supply as the main instrument supply, but could be separate when it is necessary to switch a higher or lower voltage.

The voltage between the + and 0V pins must be within the range of 12 to 45VDC. Ensure correct polarity. Each output can source up to 120mA. If higher voltage or current is required use an external relay.
**Control Inputs**

This detachable tension clamp terminal block accepts wire sizes from 0.08mm² to 1.0mm² and requires a small flat bladed screwdriver (2.5mm max.) to insert and remove wires.

<table>
<thead>
<tr>
<th>COM</th>
<th>0V</th>
<th>24V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common connection for all inputs</td>
<td>Internally connected to power connector 0V pin</td>
<td>Internally connected to power connector 24V pin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input</th>
<th>Default Use</th>
<th>Programmed Function</th>
<th>*Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reset</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>Start</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>Jig Sensor</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>Vent Sensor</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>The inputs are user-programmable so the default setting shown may be changed if required.</td>
<td></td>
</tr>
</tbody>
</table>

* The second connector is not fitted as standard. There is a purchase option for enhanced i/o that provides an additional 12 inputs and 16 outputs if required.

The opto-coupled inputs can be connected to active high or active low circuits since the common can be either the positive or negative supply. The 24V DC instrument supply would typically be used for the input circuits, however any DC supply from 5V to 24V could be used.

Note that the reset input is fail-safe so that it must be made before instrument can start when remote control is enabled (I/O Configuration menu). See the input connection method diagrams in the Interfacing section of this guide.
**RS232 Output**

Note: RS232 connection to the instrument must be made using screened cable with the screen connected to a metallic shell of the 'D' connector at the instrument end.

<table>
<thead>
<tr>
<th>PIN</th>
<th>INPUT/OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No connection</td>
</tr>
<tr>
<td>2</td>
<td>Rx receive (input)</td>
</tr>
<tr>
<td>3</td>
<td>Tx Transmit (output)</td>
</tr>
<tr>
<td>4</td>
<td>DTR Data Terminal ready (output)</td>
</tr>
<tr>
<td>5</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>No connection</td>
</tr>
<tr>
<td>7</td>
<td>RTS Request to send (output)</td>
</tr>
<tr>
<td>8</td>
<td>CTS Clear to send (input)</td>
</tr>
<tr>
<td>9</td>
<td>No connection</td>
</tr>
</tbody>
</table>

**Typical Printer Connections**

<table>
<thead>
<tr>
<th>FCO750 D Connector</th>
<th>PRINTER D Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-way</td>
<td>25-way</td>
</tr>
<tr>
<td>3</td>
<td>Tx</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
</tr>
<tr>
<td>8</td>
<td>CTS</td>
</tr>
</tbody>
</table>

Many serial printers use the DTR line to control data flow as shown here, however you should check the printer’s specification.

**Typical Computer Connections**

<table>
<thead>
<tr>
<th>FCO750 D Connector</th>
<th>COMPUTER D Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-way</td>
<td>25-way</td>
</tr>
<tr>
<td>2</td>
<td>Rx</td>
</tr>
<tr>
<td>3</td>
<td>Tx</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
</tr>
<tr>
<td>7</td>
<td>RTS</td>
</tr>
<tr>
<td>8</td>
<td>CTS</td>
</tr>
<tr>
<td>* 4</td>
<td>DTR</td>
</tr>
<tr>
<td>* 6</td>
<td>DSR</td>
</tr>
</tbody>
</table>

* These are not required but are normally made in a crossover cable. This type of cable is often referred to as a “Null Modem” cable.
It is also common to use a 3 wire cable with the handshake lines looped back at each end:

<table>
<thead>
<tr>
<th>FCO750 D Connector</th>
<th>COMPUTER D Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-way</td>
<td>25-way</td>
</tr>
<tr>
<td>2 Rx</td>
<td>2 Tx</td>
</tr>
<tr>
<td>3 Tx</td>
<td>3 Rx</td>
</tr>
<tr>
<td>5 GND</td>
<td>7 GND</td>
</tr>
<tr>
<td>4 DTR</td>
<td>5 CTS</td>
</tr>
<tr>
<td>8 CTS</td>
<td>6 DSR</td>
</tr>
<tr>
<td>* 1 CD</td>
<td>8 CD</td>
</tr>
<tr>
<td>* 6 DSR</td>
<td>20 DTR</td>
</tr>
</tbody>
</table>

* These are not required but can be connected to make the cable the same both ends when connecting to a 9-way computer port.
**RS485 Output (optional)**

Note: RS485 connection to the instrument must be made using screened cable with the screen connected to the chassis of the computer/PLC.

View looking at rear panel

<table>
<thead>
<tr>
<th>PIN</th>
<th>INPUT / OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>GND</td>
</tr>
<tr>
<td>4</td>
<td>RX B</td>
</tr>
<tr>
<td>3</td>
<td>RX A</td>
</tr>
<tr>
<td>2</td>
<td>TX B</td>
</tr>
<tr>
<td>1</td>
<td>TX A</td>
</tr>
</tbody>
</table>

5-way screw terminal

**Typical RS485 Connections**

Multi-drop 4 wire RS485 system showing adaptors to connect to the RS232 ports of a PC and other Furness Controls equipment.

The K2-TB adaptor uses screw terminals instead of a 9-way D connector to simplify the wiring.

Devices should be connected using screened twisted pair cable, which has at least two twisted pairs. Either the screen or an additional wire can be used to connect the ground pins. Cables can be either looped in and out of the connectors, or terminal boxes can be used to allow a spur to be taken from the main cable to each device.
Connecting a Vent Valve

VENT VALVE

V1, V2 = MO1308

Pneumatic Outputs
P1 (Jig) P2 (Vent)
P3 P4 P6

Air Supply
Min. 5 bar Max. 10 bar

Regulator Supply
Regulated Air In
Regulated Air Out

4mm O/D

TEST ITEM

REFERENCE ITEM
Configuring for a Dump Test

- Ideally, the dump volume should be equal to the test volume.
- If a reference volume is used it must be vented to atmosphere after each test.
- Keep the effective volume of the jig with the test item in place to a minimum.
- The diagram above shows the conventional dump test method with the Jig output controlling V2. An alternative method uses the prefill output to operate V2. This arrangement refills the dump volume during the vent time and so may achieve a faster test in some cases. This method is also necessary for vacuum dump tests using air-saving since the reference volume can not be charged at standby. Pneumatic output P1 can be reprogrammed for use as the prefill output if required. Note that the sense of the prefill output is reversed compared to the jig output. This can be overcome by swapping the ports of V2, or using the Combo function to invert the sense of the prefill signal.
Electrical input connection methods

ACTIVE HIGH CIRCUITS

ACTIVE LOW CIRCUITS
Control Input Circuits

Separate buttons:
Note that the reset input is fail-safe and must therefore use a normally closed switch.

If these signals are supplied from a PLC the Ready signal can be used to check that the start and reset signals have been actioned, otherwise the minimum timings below should be observed.

Single Switch:
The start signal is permanently connected and the instrument is controlled by the reset input. The reset input is fail-safe so the position shown is for the reset state. The switch needs to be in the start position for the whole of the test. At the end of the test the switch may be returned to the reset position. This method can not use the auto-reset or continue-on-start features.
Connecting to a PLC

**PLC WITH ACTIVE HIGH I/P**

- FCO7xx
- INTERNAL +24V DC
- CONNECT THE OUTPUT SUPPLY AS APPROPRIATE
- +
- OP
- 0V

**PLC**
- +24V DC
- I/P
- 0V

**PLC WITH ACTIVE LOW I/P**

- FCO7xx
- INTERNAL +24V DC
- CONNECT THE OUTPUT SUPPLY AS APPROPRIATE
- +
- OP
- 0V

- PLC
- +24V DC
- I/P
- 0V

**Outputs can be connected together as shown to give an 'OR' function.**
**Multi-Jig Function**

The FCO750 has the capability of working with up to four test jigs. This multi-jig mode is automatically enabled if any of the programmable input banks is configured for Jig Start signals. When multi-jig mode is enabled, the normal remote start signal is not used.

The four Jig Start inputs are used to simultaneously select a product number and start testing. Product selection is in groups of four, i.e. the four Jig Start inputs will select products 1-4, 5-8, 9-12 and so on. The group of four that is used is determined by the product number in the global settings menu which may be any value within the group of 4.

The product pass/fail result is latched for each jig and can be programmed to provide electrical outputs that may be used for pass/fail lamps at each jig. Associated with this is a bank of inputs labelled “Jig Result Reset” that may be used to reset the latched results for each jig. It is recommended that the Jig Result Reset signals are provided by normally closed sensors that open when they detect the presence of the test components such that the latched results are automatically reset when the test item is removed from the jig.

The Global Settings menu allows the FCO750 to be used in manual reset or auto reset mode. In either mode the latched jig results for the current jig are cleared if the reset button is pressed. In auto reset mode the front panel lamps are automatically cancelled after the reset delay, but the latched jig results are not cleared until reset is pressed, the jig result reset signal is applied, or a new test is started on that jig.

**EXAMPLE 2 JIG SYSTEM**

![Diagram of a 2-jig system with FCO750, Jig Results Output Bank, Jig Result Reset Inputs, Jig Start Inputs, and Reset Input connections.](image-url)
CALIBRATE FLOW PROCEDURE

Pressure Drop to Flow Calculation

When leaks are displayed as a flow reading rather than differential pressure, the FCO750 measures the leak as a pressure drop and then calculates the flow reading. The calculation relies on the test volume being known as well as the pressure drop in a given time.

The following calculation can be used to convert between flow specifications and pressure drop per unit time specifications as follows:

\[
\frac{(V + Y) \times DP/min}{101325} = \text{cc/min}
\]

Where

- \( V \) = Volume of test component + jig + pipework (in cm³)
- \( Y \) = Internal Volume of leak detector (in cm³).
- \( DP/min \) = Measured differential pressure/minute (in Pascals/min)
- 101325 = Standard atmospheric pressure in Pascals.

This formula can be transposed to determine the test time and fail level as follows:

\[
\text{D.P. per min} = \frac{\text{cc/min} \times 101325}{V + Y} \quad \text{and} \quad \text{D.P. per sec} = \frac{\text{D.P. per min}}{60}
\]

The FCO750 can automatically calculate the volume from a known applied leak. There are three steps required to calibrate the FCO750 to show leakage in flow units.

1. Set up a good test item in a leak tight test system.
2. Set a known leak on the test system.
3. Calibrate the instrument to display the known leak.

Setting up a Leak Tight System.

- Connect a known leak tight test item to the Test Port.
- Connect an FCO210 Microcalibrator either to the front panel calibration port (if fitted) or via a 'tee' in the Test Circuit. Turn the Isolation Valve of the FCO210 to CLOSE.
- Set the Leak Units to cc/min, cc/hr or mm³/S as required.
- Ensure that the test has the test pressure level, fill and stabilisation times and the approximate volume set up for the test item connected. Set the test time to a suitable time to give a stable leak reading; this will vary from 1 second for very small volumes to several seconds for volumes of 1 litre and above. The time will also depend on the size of the leak set in proportion to the test volume, small leaks on large volumes will need longer times and large leaks on small volumes will need shorter times.
- Run the test several times, starting with the test item fully vented each time or with a new test item each time if the item does not give consistent results, for example moulded plastic parts. Adjust the Fill and stabilisation times as necessary and cure any leaks to give a zero or acceptably small leak reading. Fit an identical leak tight test item to the Reference port, if necessary, to reduce the overall cycle time.
**Set a Known Leak.**
- Having set up a leak tight test item, select the 'PRODUCT DATA' menu and set the Fill time to not less than 30 seconds.
- Start the instrument and let it go into the fill condition.
- Set a leak using the Microcalibrator. Any leak will do, but it is preferable to use a leak that is approximately the same as the fail level for the test component. Do not use leaks of less than 20 digits of the leak range chosen, and preferably not less than 50 digits, otherwise the calibration will be inaccurate. Do not use large leaks on small volumes that cause the pressure drop to exceed the full scale of the instrument in less than the set test time. Make a note of the leak set. e.g. leak = 5.0 cc/min. or 60 cc/hr.

**Calibrate the Instrument.**
- When a known leak is set, reset the fill time to its original value.
- Run the test as normal, starting with the test item fully vented. At the end of the test a flow reading should be displayed.
- Select the 'CALCULATE VOLUME' menu and press the **ENTER** button.
- Select the test that you wish to modify.
- Adjust the CAL. LEAK value to match the value of the external calibrator leak e.g. 5.0 cc/min.
- The DISPLAY value shows the leak reading that was recorded in the last test or zero if a test was not completed. Change this if required to be the same as FCO750 leak reading.
- Select OK and press **ENTER**. The volume of the test item, test pipe and jig is calculated and displayed. You are asked to confirm that you want to save the new volume to update the Test Data.
- It may be necessary to repeat this procedure to confirm the volume calculation if the original estimate of the test volume was considerably in error or if greater accuracy is required.
- If the Microcalibrator is to be removed from the test port in normal use, then volume of the Microcalibrator calibrator and its connecting tubes should be subtracted from the volume entered.
OFFSET & AUTO TRACKING

General Description
The normal method of testing items is to pressurise them to the required test pressure then to allow them to stabilise to eliminate any pressure changes caused by adiabatic heating, component movement, and temperature differences between the test object and ambient. This means that when the test phase is entered, only leaks in the test item will cause a pressure change and leak tight items will give zero pressure change. Although this gives the most repeatable and accurate results, the total cycle time can be quite long with some plastic test items taking over five minutes to totally stabilise.

To reduce the time required to test, the test phase can be entered before the test item has fully stabilised. If the pressure offset due to instability is repeatable from one test item to the next it can be deducted from the total pressure change leaving just the pressure change due to a leak using the OFFSET parameter.

Auto offset tracking allows this method to be used even when a slow drift in the transient occurs due to variations in the surrounding temperature or production rate etc. The FCO750 tracks any variation in the offset over a number of tests by digitally filtering all leak readings below the fail limit. This allows the instrument to determine whether any changes in readings are due to drift or leaks.

As the rate of drift experienced at any test site is dependent on the test item, its surroundings and the rate of production, the digital filter can be varied to allow the leak detector to be optimised for any application. Each leak test can have the tracking function disabled or adjusted to compensate each step of a product independently for drift.

Using Auto Offset Tracking
Although the auto offset tracking system can significantly reduce the time required to test components, the technique is only suitable for components that have repeatable stabilisation characteristics from one test item to the next. It is important to establish the suitability of the product for the technique and to obtain a master leak tight component that can be used to learn the offset value for the test system on a regular basis.

Initially the instrument should be set up as standard with both Offset and Track Filter set to zero in the Test Data menu to disable them. The fill stabilisation and test times for the test item must first be established. Even if the instrument is to be used with cc/m or cc/h etc, it is necessary to initially commission the instrument using Pascals, as this will ensure that a test time is used that will provide enough resolution for the leak.

Use a leak tight component, and vent it between successive tests. Reduce the stabilisation time until an offset of approximately 5% of full scale (100Pa on a 2kPa instrument) is displayed at the end of the test time. This will probably cause the instrument to fail, but this is OK as the next stage is to remove the offset. The test item must be allowed to recover between tests and hence should be vented for at least a minute between every test cycle.

When the minimum stabilisation time has been established, leave the leak tight test item
vented for at least five minutes. Once the test item is back at the same conditions as the normal production items, press the ‘?’ help button, enter the "USER ACTION" menu and set "LEARN OFFSET" to "YES". When the next test is started, the leak detector will measure the pressure offset caused by the reduced stabilisation time and, provided it is less than 40% of the instrument’s full scale differential pressure, store it in the appropriate test number.

The track filter should now be set so that the instrument will remove any signal caused by slow changes of ambient conditions. A value of 5 is a good starting point to be small enough to cater for most temperature changes experienced in a factory environment, yet large enough to prevent the masking of consecutive leaks.

At least ten production items should now be tested and the variation between tests monitored. If the variation is too great and it is not caused by genuine leaks in the products, then the stabilisation time should be increased until the variation is acceptable. When the stabilisation time is altered, the offset will need to be re-learnt.

If during production, there is significant temperature variation causing rapid drift in the stability curve of one test item to the next and the instrument is unable to track the change, then the track filter value should be reduced.

**Production Procedure**

Once the initial setting up procedure has been completed and the required fill, stabilise and test times have been established, it should only be necessary to learn the offset whenever a new batch of test components are started or if there is a break in production.

Fit a master leak tight test component. This must be of the same construction as the normal production items and must be stored at the same conditions as the production items. The item must not be tested more than once without allowing time for it to relax back to the same conditions as an untested component (normally greater than five minutes).

The learn phase can be initiated from the instrument front panel or by an external switch contact. When an external switch is used it should be closed whilst the START button is pressed.

The digital filter is reset when the product is changed.
PROBLEM: INSTRUMENT DISPLAYS “LOW” AND WILL NOT START.

Cause: The pressure regulator is set too low, or the air supply pressure is too low.
Action: Ensure the air line is on. Check the pressure regulator is set correctly.

PROBLEM: THE INSTRUMENT DISPLAYS “** WARNING: Mnn **”

Cause: There is a Maintenance Early Warning System alert.
Action: ‘nn’ is a number that indicates the cause of the warning. Check the Warning System section of this manual for details or look in the instrument’s Warning System menu where the active warnings will flash. The instrument may require a service, or it may be time to export data from the data logger.

PROBLEM: INSTRUMENT FAILS ALL TEST ITEMS.

Cause: Every item is leaky, the jig is leaking, the connections from the FCO750 to the test item are leaking or the instrument has an internal leak.
Action: Blank the instrument and run a test. If the test passes, then the external pipe work or test item may be leaky. Isolate parts of the test jig and leak test until the leak is found. If the instrument fails the self check, then it will require servicing.

Cause: The test item is not being allowed to stabilise.
Action: Check that the fill and stabilisation times are long enough to allow the item to stabilise. If in doubt, start with long times and then reduce them.

Cause: The leak test parameters are too stringent.
Action: Ensure that the test timer and level are realistic. Flexible items will give more variation in results than rigid items.

PROBLEM: INSTRUMENT PASSES ITEMS WITH LARGE LEAKS.

Cause: The test tolerance is set too wide which allows the test pressure to decay during stabilisation time, leaving no pressure to test with.
Action: Set the tolerance for the pressure to a suitable level (e.g. 10%).

PROBLEM: INSTRUMENT PASSES ALL ITEMS.

Cause: The pressure tolerance is set too large, and the jig has a large leak, or the test pressure is turned to zero.
Action: Set a pressure tolerance of about 10%. This will then detect large leaks and errors in the pressure setting.

Cause: The instrument is not being connected to the test item.
Action: Check that the instrument is piped to the jig, and if an exhaust valve is being used, check that it is operating.
PROBLEM: THE RESULTS ARE UNSTABLE.

Cause: There is an intermittent leak on the test system.
Action: Do not use push-in air line fittings on the test line. Blank the instrument and perform a self check to ensure the FCO750 is OK.

Cause: The test system has flexible components.
Action: Use rigid nylon tubing or metal tubing to eliminate flexing in the test pipes.

Cause: The test item or jig has a "trapped volume".
Action: Re-test a component without venting it. If the results are repeatable, then either the stabilisation time needs extending or any restricted volumes in the test item or jig need to be eliminated.

Cause: Variable external factors are affecting the test.
Action: Check that there are no heat sources affecting the test item (even overhead heaters have been known to cause problems). Other external factors are: operator handling, vibration on the test bench, and fluctuations in airline pressure.

PROBLEM: INCORRECT TEST PRESSURE DISPLAYED.

Cause: The pressure was zeroed in the commissioning menu when a pressure was applied.
Action: Use the commissioning menu to reset the pressure zero.

PROBLEM: RS232 (or RS485, USB, LAN) NOT IN PORT SELECTION LIST.

Cause: The port is already in use by another feature, e.g. printer barcode or fbus communications, or it is a build option that is not fitted.
Action: Check that the port is not selected for use elsewhere.
Check that the port is physically fitted.
A number of error messages can be displayed in the event of a system or hardware failure.

MESSAGE:  **LEAK ZERO FAULT**  
Indicates that the zero output of the leak transducer is beyond the automatic zero limits. The transducer assembly requires re-zeroing; if this is beyond adjustment look for damage or contact your supplier.

MESSAGE:  **PR. ZERO FAULT**  
Indicates that the zero output of the pressure transducer is beyond the allowable 7.5% limit when attempting zero using the Calibrate Pressure menu. This is often simply an indication that the air supply had not been turned off when zeroing. If this is not the case then the transducer assembly requires re-zeroing; if this is beyond adjustment look for damage or contact your supplier.

MESSAGE:  **F.V. STUCK OFF**  
The Fill Valve may be stuck in the de-energised position. Check that air is available to drive the valve. If the instrument has been unused for a long period, an air supply of above 7 Bar may be required to initially activate the internal valves.

MESSAGE:  **F.V. STUCK ON**  
The Fill Valve may be stuck in the energised position. Contact your supplier.

MESSAGE:  **T.V. STUCK OFF**  
The Test Valve may be stuck in the de-energised position. Check that air is available to drive the valve. If the instrument has been unused for a long period, an air supply of above 7 Bar may be required to initially activate the internal valves.

MESSAGE:  **T.V. STUCK ON**  
The Test Valve may be stuck in the energised position. Contact your supplier.

MESSAGE:  **P.V. STUCK OFF**  
The Pressure Valve may be stuck in the de-energised position. Check that air is available to drive the valve. If the instrument has been unused for a long period, an air supply of above 7 Bar may be required to initially activate the internal valves.

MESSAGE:  **P.V. STUCK ON**  
The Pressure Valve may be stuck in the energised position. Contact your supplier.

MESSAGE:  **V.V. STUCK ON**  
The External Vent Valve may be stuck in the energised position, or the optional valve sensor may not be fitted or is broken. Check the I/O Configuration menu.

MESSAGE:  **V.V. STUCK OFF**  
The External Vent Valve may be stuck in the de-energised position, or the optional valve sensor may not be fitted or is broken. Check the I/O Configuration menu.
MESSAGE: **DATA CORRUPT** + menu type
The data for the displayed menu has been corrupted. Re-enter the data for the menu. If the User Calibration is corrupt, check the Utilities Menu for Calibrate Pressure, Calibrate D.P. and Set Zero Pressure. Data corruption may indicate severe electrical interference.

MESSAGE: **ADC FAULT**
This indicates a fault in the analogue to digital conversion. Contact your supplier.

MESSAGE: **DATAFLASH FAULT**
The memory used to store settings may be faulty. Contact your supplier.

MESSAGE: **BCD I.P. FAULT**
BCD inputs are enabled in the Global Settings menu and the inputs are set to an invalid BCD value. You can check the inputs using the Utilities menu. Note if no connections are made to the BCD inputs, this will show the BCD input fault, as test number zero is invalid.
**SPECIFICATION**

---

### Pressure Ranges

<table>
<thead>
<tr>
<th>Default Range</th>
<th>Alternative Pressure units</th>
</tr>
</thead>
<tbody>
<tr>
<td>±99.99 mb</td>
<td>1.450psi, 9.999kPa, 40.14inWC, 75.00mmHg, 1020mmWC</td>
</tr>
<tr>
<td>±200.0 mb</td>
<td>.2000bar, 2.901psi, 20.00 kPa, 80.29inWC, 150mmHg, 2039mmWC</td>
</tr>
<tr>
<td>±999.9 mb</td>
<td>.9999bar, 14.50psi, 99.99kPa, 401.4inWC, 750mmHg</td>
</tr>
<tr>
<td>-1.000 to +4.000 bar</td>
<td>4000mb, 58.02psi, 400.0kPa, 1606 inWC, 3000mmHg</td>
</tr>
<tr>
<td>-1.000 to +8.000 bar</td>
<td>8000mb, 116.0psi, 800.0kPa, 3212inWC, 6001mmHg</td>
</tr>
<tr>
<td>-1.00 to +9.999 bar</td>
<td>9999mb, 145psi, 999.9kPa, 4014inWC, 7500mmHg</td>
</tr>
<tr>
<td>-1.00 to +30.00 bar</td>
<td>203.1psi, 1400kPa, 5620inWC</td>
</tr>
<tr>
<td></td>
<td>435.1psi, 3000kPa</td>
</tr>
</tbody>
</table>

### Leak Ranges

<table>
<thead>
<tr>
<th>Default Range</th>
<th>Alternative DP units</th>
<th>Flow Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>200.0 Pa</td>
<td>2.000mb, 20.39mmWC, 0.8029inWC, 20.00Pa/S, 0.2000mb/S</td>
<td>99.99cc/s, 99.99cc/min, 99.99cc/min,</td>
</tr>
<tr>
<td>2.000 kPa</td>
<td>2000Pa, 20.00mb, 203.9mmWC, 8.029inWC, 200.0Pa/S, 2.000mb/S</td>
<td>999.9cc/hr, 999.9cc/min, 999.9ml/h,</td>
</tr>
<tr>
<td>20.00 kPa</td>
<td>200.0mb, 203.9cmWC, 80.29inWC, 2.000kPa/S, 20.00mb/S</td>
<td>9.999ml/h, 4.999ml/m, 0.9999mlbl/s</td>
</tr>
</tbody>
</table>

Calibration Accuracy ........................................ 10% to 100% range: < ±(1% of reading +1 digit)
........................................................................... 0 to 10% range: < ±(0.1% of range +1 digit)
........................................................................... (20kPa model = < ±(1% range + 1 digit)
Fluid Compatibility........................................ Air and non corrosive gasses.
Temperature Limits......................................... 0-70°C storage, 0-40°C working.
Internal test volume................................. 10cc (11cc if calibration port fitted).
Outputs..................................................... Transistor outputs (active high)
.......................................................... 12VDC - 45VDC, 120mA.
Inputs........................................................ Opto coupled, 5V to 24V DC. Can be wired active high or low.
Supply Voltage......................................... 24V DC ± 10% at < 0.5A
Supply Pressure........................................ 5 to 10 bar.
Regulated Air In........................................ 16 bar maximum, except for the 30 bar range which is a special build that accepts 35 bar maximum.
Program Data Retention............................... > 10 Years in non-volatile memory.
Weight...................................................... 9kg
**DIMENSIONS**

*Bench Mounted Case*

![Diagram of Bench Mounted Case with dimensions 360.0 x 366.0 x 181.9 x 146.7 x 331.4 x 302.8]
Rack Mounted Case
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