TELEDYNE
GAS MEASUREMENT INSTRUMENTS
Everywhereyoulook™

First Responder 3XR

User Handbook

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GMI aim to notify customers of relevant changes in the product operation and maintain this handbook up to date. In view of the policy of continuous product improvement there may be operational differences between the latest product and this handbook.

This Handbook is an important part of the First Responder 3XR product. Please note the following points:

- It should be kept with the instrument for the life of the product.
- Amendments should be attached.
- This Handbook should be passed on to any subsequent owner/user of the instrument.
- Although every care is taken in the preparation of this Handbook it does not constitute a specification for the instrument.

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DISPOSAL ADVICE

When no longer in use, dispose of the instrument carefully and with respect for the environment. GMI will dispose of the instrument without charge if returned to the factory.

SAFETY

- The instrument must be regularly serviced and calibrated by fully trained personnel in a safe area.
- The rechargeable battery pack must only be charged in a safe area.
- The battery pack must be exchanged in a safe area and fitted correctly before use. Never use damaged battery packs or expose to extreme heat. See Chapter 5: OPERATOR MAINTENANCE.
- Only GMI replacement parts should be used.
- If the instrument detects gas, follow your own organisation's procedures and operational guidelines.
- The combustion chamber is a flameproof assembly and must not be opened in the presence of a flammable atmosphere.
- First Responder (3XR) instruments are certified as:
  Ex iad IIB T3 -4°F≤Tamb≤122°F (-20°C≤Tamb≤50°C).

  SIRA03ATEX2448X II 2 G.
- This equipment is designed and manufactured to protect against other hazards as defined in paragraph 1.2.7 of Annex II of the ATEX Directive 94/9/EC.

Any right of claim relating to product liability or consequential damage to any third party against GMI is removed if the warnings are not observed.

AREAS OF USE

Exposure to certain chemicals can result in a loss of sensitivity of the flammable sensor. Where such environments are known or suspected it is recommended that more frequent response checks are carried out. The chemical compounds that can cause loss of sensitivity include Silicones, Lead, Halogens and Sulphur. Do not use instrument in potentially hazardous atmospheres containing greater than 21% Oxygen. The enclosure material is polypropylene and must not be exposed to environments which are liable to result in mechanical or thermal degradation or to damage caused by contact with aggressive substances. Additional protection may be required in environments where the instrument enclosure is liable to damage.

STORAGE, HANDLING AND TRANSIT

The batteries in the rechargeable pack contain considerable energy and care should be taken in their handling and disposal. Battery packs should be removed if the instrument is stored for longer than 3 months. The instrument is designed to handle harsh environments. The sensing elements are sealed to IP54 and the rest of the instrument to IP64. If not subject to misuse or malicious damage, the instrument will provide many years of reliable service. The instrument contains electrochemical sensors with a life of 2 years. Under conditions of prolonged storage the sensors should be removed. The sensor contains potentially corrosive liquid and care should be taken when handling or disposing of the sensor, particularly when a leak is suspected.

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INTRODUCTION

First Responder 3XR (FR 3XR) is the combination instrument for all aspects of the gas utilities industries including: first call and emergency response.

Fig. 1-1 First Responder 3XR

The instrument is a highly adaptable, four button portable gas detector which is designed to provide measurement of LEL and Volume flammable gas for leak detection and general safety monitoring.

The FR 3XR also features a parts per million (ppm) flammable range for increased sensitivity to smaller leaks.

The FR 3XR is equipped with both audible and visual alarms and a 'Geiger' indication for the ppm flammable range.

The FR 3XR also features Carbon Monoxide (CO) and Oxygen (O_2) ranges.

The FR 3XR includes the following ranges:

- 0 - 1000 ppm Methane
- 0 - 100% LEL
- 0 - 100% Volume Gas
- 0 - 1000 ppm Carbon Monoxide
- 0 - 25% Oxygen

The FR 3XR can be used with a selection of accessories. For a list of accessories supplied with the instrument, and additional accessories, see Chapter 7 ACCESSORIES.

The main features of the instrument are:

- Rugged polypropylene case, sealed to IP54 rating and suitable for outdoor use.
- Four button operation allowing the user access to all features.
- LCD, with backlighting, which displays the current gas readings together with operational and status information.
- Audible and visual alarms with pre-set alarm levels.
- Datalogging.
- Daily Bump test requirement.
- Directly interfaces with the GMI Mobile Bump / Calibration Station.

GENERAL INFORMATION

The FR 3XR contains four modes of operation:

- Gas Leak Outdoors (GLO)
- Gas Leak Indoors (GLI)
- Purge (PUR)
- Sweep (SWP)

Ranges and features available are mode dependent.

Ranges of Operation

The instrument calibration gas is shown on the instrument service label.

Methane, 0 - 1000 ppm

(GLO, GLI and SWP Modes)

This range displays Methane gas parts per million (ppm) content up to 999 ppm. When selected, PPM is displayed in the top right corner of the LCD.

The display resolves to 5 ppm. The analogue bar graph follows in 40 ppm steps. Fig. 2-1 illustrates the ppm display.

Fig 2.1 ppm Range

LEL, 0 - 100%

(GLO, GLI and SWP Modes)

The LEL range indicates the explosibility of the flammable gas in the sample. This is displayed as a percentage of the lower explosive limit (LEL) of the gas.

When selected, LEL is displayed in the top right corner of the LCD. From 0 to 10% LEL, the digital display resolves to 0.1% LEL. From 10 to 100% LEL, the digital display resolves to 1% LEL. The analogue bar graph follows in 4% steps. Fig. 2-2 illustrates the LEL display.

Fig 2.2 LEL Range

Volume Gas, 0 - 100%

(All modes)

This range displays the total volume of flammable gas with respect to air.

When selected, GAS is displayed in the top right corner of the LCD. The digital display resolves to 1%. The analogue bar graph follows in 4% steps. Fig. 2-3 illustrates the Volume Gas display.

Fig 2.3 Volume Gas Range

Carbon Monoxide, 0 - 1000 ppm
(GLO, GLI and SWP Modes)

This range displays the parts per million (ppm) Carbon Monoxide (CO) content up to 999 ppm. When selected, CO is displayed in the top right corner of the LCD.

The digital display resolves to 1 ppm CO. The analogue bar graph follows in 40 ppm steps. Fig. 2-4 illustrates the Carbon Monoxide display.

The Carbon Monoxide sensor should be operated at normal atmospheric pressure conditions and has a normal operating life of two years.

Fig 2.4 Carbon Monoxide Range

Oxygen, 0 -25%
(GLI and PUR Modes)

This range displays the % Oxygen (O_2) content of the sample. When selected, O_2 is displayed in the top right corner of the LCD. The digital display resolves to 0.1% O_2 from 0 to 21%, and 1% O_2 from 21% to 25%. The analogue bar graph follows in 4% steps. Fig. 2-5 illustrates the Oxygen display.

The Oxygen cell has an expected life of two years.

Fig. 2-5 Oxygen Range

Alarms

Alarms can have both audible and visual indications active. The audible alarm is rated up to 85 dB(a) at 1ft. (0.3m) approximately. The visual alarm is a red LED indicator which protrudes from the instrument top plate, allowing viewing from any angle above the top plate.

Note: It is the responsibility of the user to ensure that the alarm levels, where set in the instrument, are appropriate for the safe operation and legal requirements for the country / industry in which the unit is being used.

The alarms table, illustrated in Fig. 2-6, shows the 4 instrument modes and the gas ranges, alarm levels and alarm indicators for each mode.

Mode	Range	Hi	Lo	Audible	Visual
GLO	CO	20ppm	-	×	×
GLI	LEL	20%	-	✓	✓
	O_2	23.5%	19.5%	✓	✓
	CO	20ppm	-	✓	✓
PUR	-	-	-	-	-
SWP	CO	20ppm	-	×	✓
	PPM - 'Geiger'	-	-	✓	✓

Fig 2.6 Alarms Table

All alarms are non-latching. When an alarm level is exceeded, the activated, audible and visual alarm indicators are mode and range dependent. The audible and visual alarms will automatically cancel once the alarm condition has cleared.

Alarms can be acknowledged in all modes. This means that the audible and visual alarms can be suspended allowing the user to view gas readings in other ranges. Alarms are acknowledged by a double press of SWEEP ALARM. If, after 60 seconds, the gas detected still exceeds the alarm level, the audible and visual alarms will be re-activated.

Datalogging

The FR 3XR provides the user with four datalogging functions: automatic, session, BarHole and manual.

The total number of data logs, that can be stored in the instrument memory, will be approximately 1000. When the memory is full, the oldest data log will be overwritten.

The Mobile Bump / Calibration Station uploads the data logs from the instrument memory to the van's computer.

Note: Datalogging is disabled when the pump is OFF.

Automatic Datalogging

The instrument has automatic datalogging enabled in GLI and SWP modes and is confirmed by the 'STORE' flag being displayed, as illustrated in Fig. 2-7.

Fig. 2-7 Automatic Datalogging Enabled

During automatic datalogging, every 10 seconds, the instrument stores the values of all gas ranges (in the current mode), together with time, date and GPS data. An alarm log is automatically generated when a gas alarm is first detected.

Session Datalogging

A session is defined as either: the time when the instrument is switched ON, until the instrument is switched OFF, or, from switch ON until the user switches to a different mode of operation.

The instrument automatically logs the following information during each session:

- Date
- ON / OFF time
- Maximum / minimum gas readings
- Short / long term exposures
- Mode of operation

BarHole Datalogging

The instrument has BarHole datalogging in GLO mode. The instrument stores LEL and Volume GAS readings (sustained (SUS) and peak (PK)), together with time, date and GPS location.

There are no alarms and pump control will be disabled during BarHole datalogging.

The user can initiate BarHole datalogging by a double press of MAN LOG. Double press again at any time during the test to stop and exit BarHole datalogging.

Note: The pump must be on and LEL range selected (<5%) before BarHole datalogging can be initiated.

When BarHole datalogging has been initiated, the instrument will sample for 15 seconds. During this time the BarHole number and STORE will be displayed. The BarHole number and gas range will alternate as illustrated in Fig. 2-8.

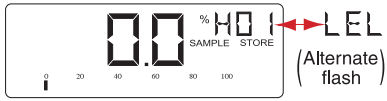

Fig. 2-8 BarHole Datalogging

On completion, the user will be audibly alerted.

Single press **RANGE** to view the SUS and PK readings, as illustrated in Fig. 2.9.

Fig. 2-9 Sustained & Peak Readings

To exit BarHole datalogging, double press **MAN LOG**. Double press again to start a new BarHole data log. The next BarHole data log can only commence when the LEL reading is less than 5%.

The BarHole number displayed will start at ‘H01’ and will auto increment to ‘H99’ during each log, then wrap-around to ‘H01’ again.

Manual Datalogging

The instrument has manual datalogging enabled in GLO, GLI and SWP modes. The instrument stores the values of all gas ranges in the current mode, together with time, date and GPS location.

The user can initiate manual datalogging with a single press of MAN LOG. 'STORE' will flash on the display and the user audibly alerted when the log has been stored.

Batteries

Rechargeable Battery Pack

The GMI rechargeable battery pack provides approximately nine hours operational life, from fully charged, at ambient temperature of 20°C (68°F). An indication of the battery condition is displayed after power on and during warm-up, with status shown as either OK or LO. If LO condition is displayed, a maximum battery operational life of 90 minutes remains. During operation the 'BAT' flag is displayed when approximately 30 minutes operating time is left at normal temperatures. The instrument will then turn off. The Mobile Bump / Calibration Station also acts as the charger for the battery pack. See Rechargeable Battery Pack in Chapter 5 OPERATOR MAINTENANCE.

Construction

The instrument is housed in a tough, impact resistant, moulded case made of polypropylene.

The top panel is protected by a stainless steel top plate incorporating a toughened glass LCD cover.

The battery pack is attached to the main instrument body by means of two stainless steel hexagonal screws.

The instrument is sealed against dust and water to IP54. The instrument sensors are protected from dust and water by membrane and cotton filters, when using probe handle assembly (GMI Part No. 12481). Other probes with associated filters are available as accessories.

Filters

The minimum requirement is a cotton particulate filter and a hydrophobic filter. These filters, incorporated in the probe handle assembly, are available from GMI. Filters must be checked at frequent intervals and where appropriate changed to ensure a clean sample path. See Filter Replacement in Chapter 5 OPERATOR MAINTENANCE.

Liquid Crystal Display (LCD)

The LCD shows the current gas readings in both analogue and digital form together with operational and status information. The display is protected by toughened glass. Backlighting is provided to enable the display to be seen under low ambient light conditions.

Before Use Checks

The following checks should be carried out before use:

- The instrument is clean and in good condition.
- The battery pack has sufficient power left for the intended use of the instrument.
- The filters are clean and in good condition.
- The sample line and any accessories are in good condition and leak free.
- All gas ranges are operational and zeroed correctly.
- The calibration is still valid.
- Service is not required.

OPERATION

Instrument Features

The FR 3XR front plate features a panel of four operating buttons, a backlit LCD screen, a visual alarm LED and an infrared communication port.

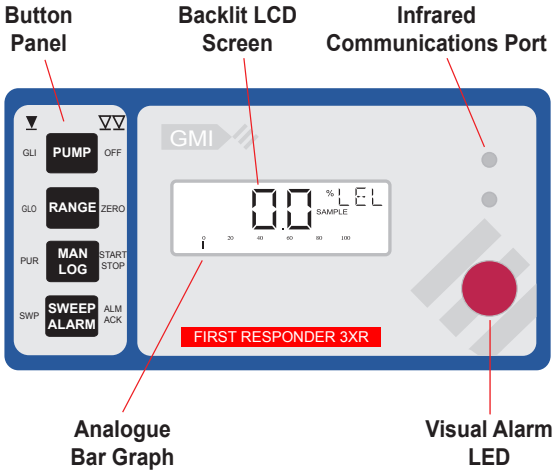

Fig. 3-1 Instrument Front Plate

Button Panel

The FR 3XR button panel features four operating buttons, as shown in Fig. 3-2.

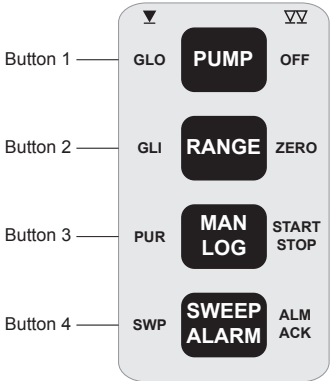

Fig. 3-2 Button Panel

Typically each button has two functions, accessed with either a single or a double press. Button function is dependent on the operating mode of the instrument.

The FR 3XR has four operating modes, GLO, GLI, PUR and SWP. Each accessed by switching the instrument ON with buttons 1, 2, 3 and 4 respectively.

Refer to '**Switching Modes**' section, for details of switching modes when the FR 3XR is switched on.

Warm Up Sequence

After switching the instrument on, in any operating mode, a warm up sequence is initiated.

Fig. 3-3 is an example of a warm up sequence:

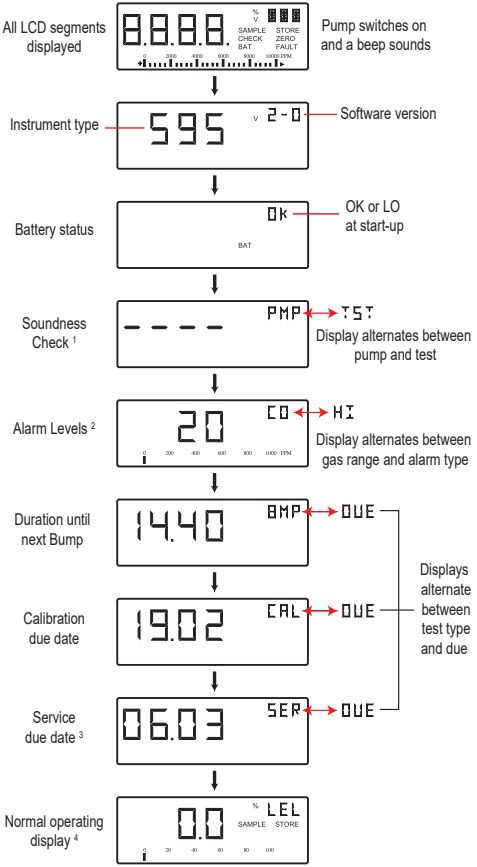

Fig. 3-3 Warm Up Sequence

1 - The soundness check is only initiated the first time the instrument is switched on after a successful bump test.

2 - The alarm levels displayed will vary depending on which operating mode was selected at switch on. See alarms table, Fig. 2-6 for alarm level details. The display of the alarm levels can be bypassed, to the next stage of the warm up sequence, by pressing any button.

3 - The service due date is only displayed when the date of the next service is within 30 days of the current date.

4 - The 'STORE' flag will be present in GLI and SWP modes, indicating automatic datalogging is being undertaken. The 'STORE' flag will flash in GLO and PUR modes, indicating a GPS signal is detected.

Bump Due Features

During warm up, the instrument will indicate on the display when the next bump test is due. This will be displayed as hours and minutes, as illustrated in Fig. 3-4.

Fig. 3-4 Bump Test Due

The bump test interval is daily, and is required the first time the instrument is switched on after 6am.

If the bump test is overdue (display shows 00:00), the instrument will automatically switch OFF.

Calibration Date Features

During warm up, the instrument will indicate on the display when the next calibration is due. This will be displayed as day and month, as illustrated in Fig. 3-5.

Fig. 3-5 Calibration Due Date

The calibration interval is 4 weeks.

If calibration is overdue, the instrument will automatically switch OFF.

Service Date Features

During warm up, the instrument will indicate on the display when the next service is due (only when the date of the next service is within 30 days of the current date). This will be displayed as day and month, as illustrated in Fig. 3.6.

Fig. 3-6 Service Due Date

The service interval is 1 year.

If service is overdue, to continue using the instrument, the user must acknowledge the message by pressing PUMP.

Modes of Operation

GLO Mode (Gas Leak Outdoors)

This mode is intended for outdoor use.

Alarms are active for the CO range only. The alarm will only be indicated on the LCD and will be non-latching.

Switching ON

Press and hold PUMP to turn ON the instrument in GLO mode. The pump will switch on and the instrument will go through the warm up sequence.

Switching OFF

Double press PUMP to switch the instrument OFF.

Gas Ranges

The following gas ranges can be selected in GLO mode:

- ppm
- LEL / Vol GAS (LEL and Vol GAS auto-range)
- CO

When first switched on LEL will be selected. To change the range, single press RANGE. Each single press will cycle through the gas ranges shown above.

If the CO alarm activates when viewing a gas range other than CO, the display will alternate between that gas range and CO, as illustrated in Fig. 3-7.

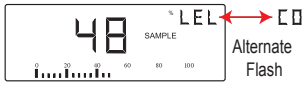

Fig. 3-7 CO Alarm Indication

If the CO alarm activates in the CO range, the display will alternate between CO and HI, as illustrated in Fig. 3-8.

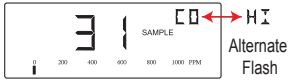

Fig. 3-8 CO Alarm Indication

Note: If a CO alarm occurs, follow your company procedure.

Note: The CO alarm is disabled during BarHoling.

Switching Pump OFF / ON

Single press **PUMP** to switch the pump OFF.

Press again to switch the pump ON.

Zero PPM Range

The ppm flammable range can be manually zeroed.

To zero, double press **RANGE**. This should be carried out in fresh air.

Acknowledge Alarms

A double press of SWEEP ALARM will acknowledge the CO alarm for 60 seconds.

Manual Datalogging

To perform a manual datalog, single press MAN LOG.

BarHole Datalogging

To perform a BarHole datalog, double press MAN LOG.

Double press again to stop the BarHole test at any time.

Summary of GLO Button Operation

GLO	Single Press	Double Press	Press & Hold
PUMP	Toggles Pump OFF / ON	Instrument OFF	Instrument ON
RANGE	Next Range	Zero PPM Range	-
MAN LOG	Manual Log	BarHole Log Start / Stop	-
SWEEP ALARM	-	Acknowledge Alarm	-

Fig. 3-9 GLO Button Operation

GLI Mode (Gas Leak Indoors)

This mode is intended for indoor use.

Alarms are active for the LEL, O_2 and CO ranges.

When an alarm is activated, the instrument display will automatically change to the alarming range.

Alarms will be audible, visible and non-latching. There will also be a visual confidence signal (every 8 seconds) to indicate alarms are enabled, but only operates when the pump is running.

Switching ON

Press and hold RANGE to turn ON the instrument in GLI mode.

The pump will switch on and the instrument will go through the warm up sequence.

Switching OFF

Double press PUMP to switch the instrument OFF.

Gas Ranges

The following gas ranges can be selected in GLO mode:

- ppm
- LEL / Vol GAS (LEL and Vol GAS auto-range)
- O_2
- CO

When first switched on LEL will be selected. To change the range, single press RANGE. Each single press will cycle through the gas ranges shown above.

Switching Pump OFF / ON

Single press PUMP to switch the pump OFF.

Press again to switch the pump ON.

Zero PPM Range

The ppm flammable range can be manually zeroed.

To zero, double press RANGE. This should be carried out in fresh air.

Acknowledge Alarms

A double press of SWEEP ALARM will acknowledge an alarm for 60 seconds.

If more than one gas alarm threshold has been exceeded, a double press of SWEEP ALARM is required to acknowledge each alarm.

Automatic Datalogging

Automatic datalogging is continually activated in this mode (when the pump is running).

'STORE' will be visible on the display when auto datalogging is activated, as illustrated in Fig. 3-10.

Fig. 3-10 Automatic Datalogging

Manual Datalogging

To perform a manual datalog, single press MAN LOG.

Summary of GLI Button Operation

GLI	Single Press	Double Press	Press & Hold
PUMP	Toggles Pump OFF / ON	Instrument OFF	-
RANGE	Next Range	Zero PPM Range	Instrument ON
MAN LOG	Manual Log	-	-
SWEEP ALARM	-	Acknowledge Alarm	-

Fig. 3-11 GLI Button Operation

PUR Mode (Purge)

This mode facilitates the purging of pipework / installations and measures Volume Methane and O_2 only.

There are no alarms or confidence signal in this mode.

Switching ON

Press and hold MAN LOG to turn ON the instrument in PUR mode. The pump will switch on and the instrument will go through the warm up sequence.

Switching OFF

Double press PUMP to switch the instrument OFF.

Gas Ranges

The following gas ranges can be selected in PUR mode:

- Vol GAS
- O_2

When first switched on Vol GAS will be selected. To change the range, single press **RANGE**. Each single press will cycle through the gas ranges shown above.

The display will alternate between the gas range and 'PUR', as illustrated in Fig. 3-12.

(Alternate Flash)

Fig. 3-12 Purge Mode

Switching Pump OFF / ON

Single press **PUMP** to switch the pump OFF.

Press again to switch the pump ON.

Zero Vol GAS Range

The Volume Gas range can be manually zeroed if the gas reading is between -5% and +5% Vol GAS.

To zero, double press **RANGE**. This should be carried out in fresh air.

Note: Negative Volume Gas readings are displayed to -10%, thereafter, '-EEE' is displayed.

Summary of PUR Button Operation

PUR	Single Press	Double Press	Press & Hold
PUMP	Toggles Pump OFF / ON	Instrument OFF	-
RANGE	Next Range	Zero Vol GAS Range	-
MAN LOG	-	-	Instrument ON
SWEEP ALARM	-	-	-

Fig. 3-13 PUR Button Operation

SWP Mode (Sweep)

This mode is used for rapid leak detection.

Alarms are active for the CO range only and are non-latching. When a CO alarm is activated, the instrument display will automatically change to the CO range.

Only the visual alarm will be present in this mode (i.e. no audible alarm or confidence signal).

Switching ON

Press and hold SWEEP ALARM to turn ON the instrument in SWP mode. The pump will switch on and the instrument will go through the warm up sequence.

Switching OFF

Double press PUMP to switch the instrument OFF.

Gas Ranges

The following gas ranges can be selected in SWP mode:

- ppm
- LEL / Vol GAS (LEL and Vol GAS auto-range)
- CO

When first switched on ppm (flammable) will be selected. To change the range, single press RANGE. Each single press will cycle through the gas ranges shown above.

Pump Operation

The pump has three speeds: Normal, Hi-speed and off.

To change the pump speed, single press PUMP. Each single press will cycle through the pump speeds.

Hi-speed mode is only available in the ppm flammable range and is displayed by a fast flash of 'SAMPLE'.

Zero PPM Range

The ppm flammable range can be manually zeroed.

To zero, double press RANGE. This should be carried out in fresh air.

'Geiger' Alarm

The 'Geiger' style alarm provides an audible and visual indication of the ppm concentration of gas.

The 'Geiger' audible alarm is muted by default; to activate single press SWEEP ALARM. When activated, press again to mute the audible alarm.

The display will alternate between 'PPM' and 'Aud', as illustrated in Fig. 3-14.

(Alternate Flash)

Fig. 3-14 Geiger Alarm

Acknowledge Alarms

A double press of SWEEP ALARM will acknowledge the CO alarm for 60 seconds.

Automatic Datalogging

Automatic datalogging is continually active in this mode (when the pump is running).

'STORE' will be visible on the display when auto datalogging is activated, as illustrated in Fig. 3-15.

Fig. 3-15 Automatic Datalogging

Manual Datalogging

To perform a manual datalog, single press MAN LOG.

Summary of SWP Button Operation

SWP	Single Press	Double Press	Press & Hold
PUMP	Toggles Pump Normal / Hi / Off	Instrument OFF	-
RANGE	Next Range	Zero PPM Range	-
MAN LOG	Manual Log	-	-
SWEEP ALARM	'Geiger' Alarm On / Off	Acknowledge Alarm	Instrument ON

Fig. 3-16 SWP Button Operation

Switching Modes

To switch to a different mode of operation, firstly, double press PUMP to initiate instrument switch OFF. Secondly, as the display indicates 'OFF' , as illustrated in Fig. 3-17, press the button which corresponds to the mode required. The instrument will now switch to the selected mode.

Fig. 3-17 Instrument Switching OFF

Soundness Check

The instrument requires to have a soundness check to verify both the instrument and probe are not leaking.

The soundness check is only initiated the first time an instrument is switched on after a successful Bump Test.

During the warm up sequence, the display will indicate a soundness check is required by alternating between PMP and TST, as illustrated in Fig. 3-18.

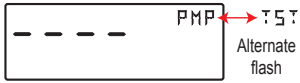

Fig. 3-18 Soundness Check Required

At this point the user will block the gas inlet.

On completion of the soundness check, the display will indicate a PASS, as illustrated in Fig. 3-19.

Fig. 3-19 Soundness Check Pass

Press any button to proceed.

The soundness check should take no longer than 30 seconds to indicate a PASS.

If the soundness check doesn't indicate PASS, the test will wait until a button is pressed. When pressed, FAIL will be displayed for 5 seconds. The instrument will automatically switch OFF, as illustrated in Fig. 3-20.

Fig. 3-20 Soundness Check Fail

Auto Switch Off

To preserve battery life, the FR 3XR automatically switches OFF, after 30 minutes, if there hasn't been any button presses.

Automatic switch off occurs in all modes, except for GLI.

Operator Messages / Fault Flags

Various messages can appear on the LCD screen to indicate instrument status.

‘SAMPLE’

This indicates that the pump is running and the instrument is sampling. Will fast flash when pump is set to Hi-speed.

‘OFF’

This indicates that the instrument is about to switch off. A single button press, whilst ‘OFF’ is displayed, will change the instrument’s mode of operation.

‘SAMPLE FAULT’

This indicates a problem with the instrument’s flow due to the sample path being blocked, water ingress, a blocked filter or pump failure.

The pump will switch off (not in GLI mode). The sample path should be checked and PUMP pressed to clear sample fault and re-start the pump.

‘CHECK ZERO’

This indicates that there may have been a zero shift due to the presence of gas. Switch off the instrument and switch on again in fresh air.

‘ZERO FAULT’

This indicates that the zero is out-with its calibration limits. Switch the instrument off and then on again in fresh air. If the fault does not clear, return the instrument for servicing.

'BAT'

This indicates that the batteries will soon require recharging. At this point there will be approximately 30 minutes left in the battery pack, although this figure will vary depending on battery manufacturer, temperature conditions, usage etc.

'BAT FAULT'

This indicates that the battery pack should be recharged or replaced immediately.

When 'BAT FAULT' flashes, approximately 1 minute of battery power remains.

'STORE'

This flag is displayed when the instrument is datalogging. When 'STORE' is flashing a GPS location is being received.

'EEEE'

'EEEE' is displayed if the measurement rises above 1000 ppm (instrument over range).

'-EEE'

'-EEE' is displayed if the measurement drifts excessively negative (Vol GAS reading more negative than -10%).

'1'

This message can only appear during warm-up and indicates that a calibration data error has been detected. The instrument should be returned for servicing.

PROBES

The FR 3XR instrument is equipped to accept the following probes and associated accessories:

Standard Probe and Handle Assembly

Part No.	Description
12393	31ins. (80cm.) Plastic Probe - Solid End
12481	Probe Handle Assembly - incl. filters
12712	Clear Sample Line x 4ft 10ins. (1.5 Metres) approx.

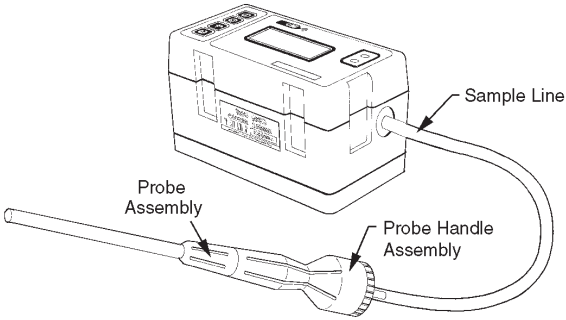

Fig. 4-1 Instrument / Standard Probe

Swan Neck Probe / Bellows Probe (Optional)

Part No.	Description
13561	Probe Handle Assembly incl. Sample Line
42183	Filter Assembly (Water)
42184	Filter Assembly (Dust)
13562	Probe Handle Adaptor
13655	Swan Neck Probe c/w Shroud
13563	Bellows Probe

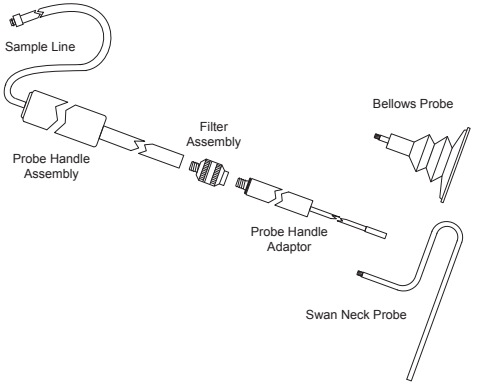

Fig. 4-2 Swan Neck / Bellows Probes

For a comprehensive list of accessories supplied with the instrument, and additional accessories available, see Chapter 7 ACCESSORIES.

For examples of various probe applications, see Appendix B APPLICATIONS.

OPERATOR MAINTENANCE

Replacing the Battery Pack

The following procedure should be carried out in a safe area:

1. Using a 4mm Hex Driver, loosen the two instrument base screws.

Fig. 5-1 Loosen Instrument Base Screws

2. Remove the battery pack.

Fig. 5-2 Remove Battery Pack

3. Insert new battery pack.
4. Fasten base screws.
5. Check the instrument switches on and works to specification.

Recharging the Battery Pack

The battery pack should be recharged in the following situations:

- 'BAT' or 'BAT FAULT' message is displayed.
- The instrument will not switch on.
- The pump will not switch on.

It is recommended that the battery pack is fully discharged on a regular basis (once every three months). The batteries can be charged on the instrument but the instrument itself should be switched off. Regular complete discharge will keep the battery pack in good condition.

Probe Filter Replacement

Probe Handle Assembly - Part No. 12481

Hydrophobic and cotton particulate filters in the probe handle minimise the danger of water and dust ingress.

Caution: The instrument should never be switched on without suitable filters installed.

If a blockage occurs the 'SAMPLE FAULT' indicator is displayed. Check the sample line and probe handle for blockage. Press **PUMP** to clear the 'SAMPLE FAULT' message. Replace the filter(s) if the message does not clear.

To replace the filter(s), proceed as follows:

1. Unscrew the probe handle assembly.

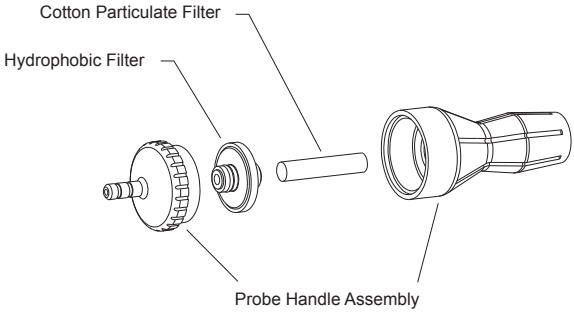

Fig. 5-3 Filter Assembly

2. Remove the cotton particulate filter and discard.
3. Remove the hydrophobic filter.
4. Clean the probe handle to make sure that it is free from dirt and water.
5. Fit a new cotton particulate filter.
6. Fit the hydrophobic filter. The yellow label on the filter fits against the yellow label on the probe handle.
7. Reassemble the probe handle assembly.

Probe Handle Assembly (Option) Part No. 13561

Fitting of an in-line filter assembly to the probe handle, as shown in Fig. 5-4, will minimise the danger of water and / or dust ingress.

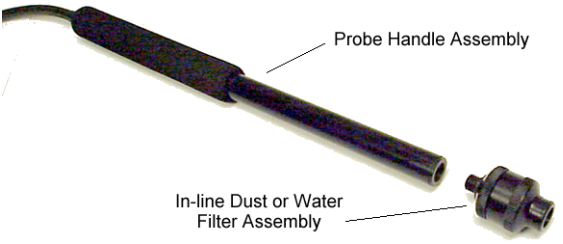

Fig. 5-4 Probe Handle and In-line Filter Assembly

Caution: The instrument should never be switched on without suitable filters installed.

If a blockage occurs the 'SAMPLE FAULT' indicator is displayed. Check the sample line and filter assembly for blockage. Press PUMP to clear the 'SAMPLE FAULT' message. Replace the filter if the message does not clear.

In-line Dust Filter (Accessory)

To replace the Dust Filter in the Dust Filter Housing Assembly, proceed as follows:

1. Unscrew the Filter Housing Assembly (Fig. 5-5).

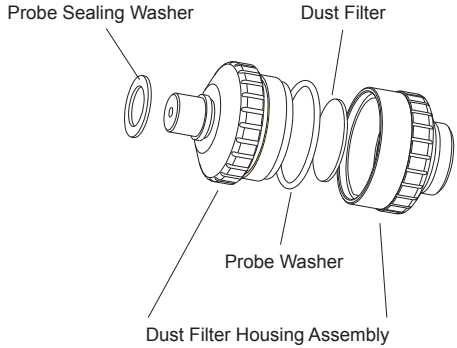

Fig. 5-5 Dust Filter Assembly

2. Remove Dust Filter, then discard.
3. Check Probe Washer and Probe Sealing Washer for signs of damage or wear and replace if necessary.
4. Fit new Dust Filter.
5. Reassemble the Filter Housing Assembly.

In-line Water Filter (Accessory)

To replace the Hydrophobic Filter in the Water Filter Housing Assembly, proceed as follows:

1. Unscrew the Filter Housing Assembly (Fig. 5-6).

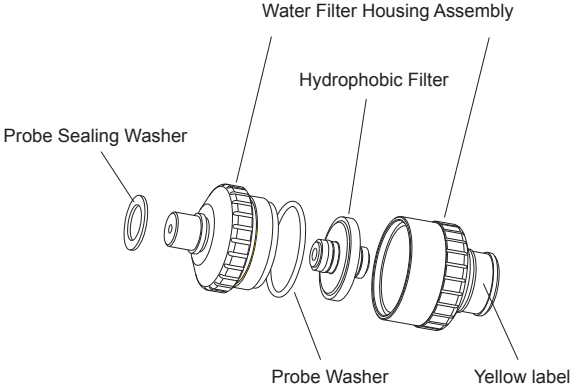

Fig. 5-6 Water Filter Assembly

2. Remove Hydrophobic Filter, then discard.
3. Check Probe Washer and Probe Sealing Washer for signs of damage or wear and replace if necessary.
4. Fit new Hydrophobic Filter.

   Note: The filter should be installed with the yellow label on the filter facing the yellow label on the housing flange.
5. Reassemble the Filter Housing Assembly.

Flue Probe Coalescing Filter Assembly (Accessory) - Part No. 42215

A coalescing filter is fitted in the filter bowl and housing assembly to minimise the danger of water ingress.

Caution: The instrument should never be switched on without suitable filters installed.

If a blockage occurs the 'SAMPLE FAULT' indicator is displayed. Check the sample line, probe handle and coalescing filter for blockage. Press PUMP to clear the 'SAMPLE FAULT' message. Replace the filter(s) if the message does not clear.

To replace the filter(s), proceed as follows:

1. Carefully unscrew the bowl from the filter housing and empty any water which may have collected.

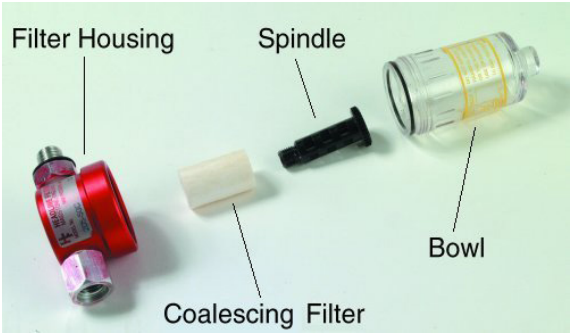

Fig. 5-7 Coalescing Filter Assembly

2. Unscrew the spindle from the filter housing then remove and discard the coalescing filter.
3. Using a dry cloth, clean the bowl, housing and spindle to make sure that they are free from dirt and water.
4. Fit a new coalescing filter to the spindle then replace in the filter housing.
5. Replace the bowl and tighten to secure.

MOBILE BUMP / CALIBRATION STATION

The GMI Mobile Bump / Calibration Station provides a quick, simple and reliable method of bump testing or calibrating the FR 3XR instrument.

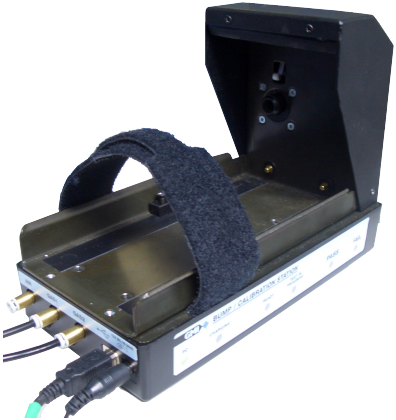

Fig. 6-1 Mobile Bump / Calibration Station

The Mobile Bump / Calibration Station can be used for:

- A Bump Test of alarm set-points and sensor response.
- Full Calibration of the instrument.
- Charging of the instrument battery pack.
- Uploading datalogs from the instrument to the van's computer.

To operate, the Mobile Bump / Calibration Station must be connected to the van's computer. The software running on the van's computer automatically controls the delivery of gas to the instrument.

Main Features

The main features of the station, are illustrated in Fig. 6-2.

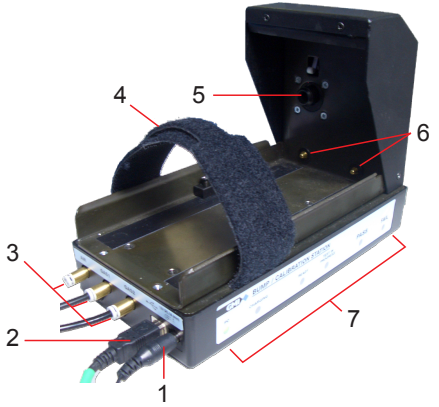

Fig. 6-2 Main Features

1. Power Supply
2. Computer Connection
3. Gas Inlet Adaptors
4. 'Velcro' Straps
5. Gas Delivery Nozzle
6. Charging Contacts
7. Status LED's

Calibration Gases

Calibration Gas Setup

Gas is supplied to the Mobile Bump / Calibration Station from Gas Cylinders and Demand Flow Regulators.

The labels on the gas cylinders and the tubing are colour coded as follows:

- Yellow - Vol Gas (100% Methane)
- Blue - LEL / CO / O_2 (Combi Gas)

Fig. 6-3 100% Methane Gas Setup

Calibration Gas Connection

Connect the Demand Flow Regulator to the gas cylinder by screwing the valve firmly into the top of the cylinder, as illustrated in Fig. 6-4.

Note: Do not over-tighten the valve.

Fig. 6-4 Attach Regulator Valve to Gas Cylinder

Make sure that the cylinder contains enough gas to complete the bump test / calibration. The pressure gauge on the Regulator Valve, after fitting, gives a clear indication of this.

Operation

Before bump testing or calibrating, ensure that:

- Gas is connected.
- The van's computer is switched on and software is running.
- The power supply is switched ON.

Confirmation that power is ON and the software is running is indicated by the illuminated green 'PC' LED on the front of the station, as illustrated in Fig. 6-5.

Fig. 6-5 Power ON & Software Running

At this point, the van's computer will have 2 software 'TABS' active in the taskbar, as illustrated in Fig. 6-6.

Fig. 6-6 Software Running

Note: The test software will auto-start when the van's computer is switched ON.

If a bump test or calibration is due, the software will automatically control testing, when the instrument is powered on, in the Mobile Bump / Calibration Station.

Bump Testing

The FR 3XR MUST be bump tested daily to ensure the alarm set-points and sensor response are functioning. If a bump test is overdue, the instrument will automatically switch OFF.

To perform a bump test follow the procedure below:

1. Ensure the 'PC' LED is illuminated and gas is connected.
2. Insert the instrument onto the Mobile Bump / Calibration Station. Ensure the instrument locates correctly onto the gas delivery nozzle. Use the two 'Velcro' straps to secure the instrument. When located correctly, the 'READY' amber LED will illuminate on the station, as illustrated in Fig. 6-7.

Fig. 6-7 Instrument Ready

3. Switch ON the instrument by pressing and holding any of the four instrument buttons. The bump test will now begin and the 'TEST IN PROGRESS' amber LED will illuminate on the station, as illustrated in Fig. 6-8.

Fig. 6-8 Test In Progress

4. On completion of the test, the instrument switches off. A 'PASS' is indicated by the green LED, illustrated in Fig. 6-9.

Fig. 6-9 PASS Indication

Alternatively, a 'FAIL' is indicated by the red LED, illustrated in Fig. 6-10.

Fig. 6-10 FAIL Indication

5. The instrument can now be removed from the station. The test result status LED will now turn off.

Note: If the Bump Test fails, the instrument will not operate.

Calibration

The FR 3XR has been calibrated for a particular gas mixture. When the calibration due date expires the instrument will automatically switch off. The instrument by default has to be calibrated every 4 weeks.

The procedure for calibrating the FR 3XR on the Mobile Bump / Calibration Station is identical to the Bump Testing procedure.

Note: The Mobile Bump / Calibration Station automatically detects if a bump test or calibration is due, and performs the required test accordingly.

Charging

The Mobile Bump / Calibration Station is also used to charge the instrument providing power is supplied.

To charge, insert the instrument onto the Mobile Bump / Calibration station. Ensure the instrument locates correctly against the two charging contacts. Use the two 'Velcro' straps to secure the instrument. When located correctly the 'CHARGING' green LED will flash on the station, as illustrated in Fig. 6-11.

Fig. 6-11 Instrument Charging

Charging will take place at a high charge rate for up to 5 hours. At the end of this period, the station will switch to trickle mode and supply a top-up charge indicated by the 'CHARGING' green LED continuously ON. Charging is deemed to be completed at this stage.

Note: The trickle mode will remain on until the instrument has been removed.

Uploading Datalogs

Software on the van's computer allows datalogs to be quickly uploaded and presented.

To upload the instruments stored datalogs, to the van's computer, insert the instrument into the Mobile Bump / Calibration Station and switch ON.

Note: If a Bump Test is due, datalogs will not be uploaded.

ACCESSORIES

Accessories supplied with the FR 3XR instrument (part number: 44595R) are as follows:

Part Number	Description
42875	User Handbook
42806	Quick Operating Guide

Optional Accessories Available

Part Number	Description
13000	Rechargeable Battery Pack
42710	Carrying Case
12528	Carrying Harness
12451	Hex Driver (for base screws)
12481	Probe Handle c/w Filters
12393	31ins. (80cm.) Plastic Probe - Solid End
10077	Cotton Particulate Filters (Box of 10) x 2
12712	Clear Sample Line x 4ft 10ins. (1.5 metres) approx.
13561	Probe Handle Assembly
13562	Probe Adaptor Assembly (Use with 13563, 13655)
13563	Bellows Probe (Use with 13561)
13655	Swan Neck Probe c/w Shroud
42183	Water Filter Assembly c/w Filter (Use with 13561)

42184	Dust Filter Assembly c/w Filter (Use with 13561)
12688	Probe Adaptor (Sample Line to Handle)
13427	14in. (35cm.) Open End Plastic Probe
13413	Small Stainless Steel (Flue) Probe - Open End (Use with 12481)
42215	Coalescing Filter Assembly (Use with 13413)
75174	Coalescing Filter (Use with 42215)
12358	Hydrophobic Filter (Use with 12481, 42183)
42388	Dust Filter - Box of 20 (Use with 42184)
12379	Probe Sealing Washer (Use with 42183, 42184)
42235	Probe Washer (Use with 42183, 42184)

Note: For other sampling probes and accessories, and for calibration gases, contact GMI Ltd or a GMI approved distributor.

ADDITIONAL INFORMATION

Training

Training Courses are available on all GMI products.
Contact GMI Marketing Department for further details:
Tel: +44 (0) 141 812 3211
e-mail: gmi_sales@teledyne.com

Website

www.teledynegasandflamedetection.com

TYPICAL OPERATING PARAMETERS

Typical operating parameters are as follows:

Gas	Range	Resolution	Zero	Accuracy
ppm	0 to 1000 ppm	1 ppm	5%	Typically 20%
LEL	0 to 10%	0.1% 10 to 100%	+/- 0.5% 1%	2% +/- 1% LEL
Vol Gas	0 to 5% 5% to 100%	0.1% 1%	+/- 2%	1% +/- 1% Gas
CO	0 to 1000 ppm	1 ppm	+/-15 ppm	+/-15 ppm + 5% reading
O_2	0 to 21% 21% to 25%	0.1% 1%	+/- 0.5% n/a	+/- 0.5% + 3% reading +/- 0.5% + 3% reading

Note: **All the values above are at normal temperature and pressure. Humidity is between 0% and 95% RH (non-condensing). Pressure changes at the inlet and exhaust are minimised as they may cause transient changes in reading.**

Size

7.08'' (180mm.) x 3.74'' (95mm.) x 4.13'' (105mm)

Weight

3.75lbs. (1.7kg) with rechargeable batteries

Operating Temperature

-4°F to 122°F (-20°C to 50°C)

Humidity

0 - 95% RH

Construction

Moulded polypropylene case protected to IP54

Display

LCD containing:

Analogue display scaled 0 - 10, 0 - 100, 0 - 1000, 0 - 10000

4 digit digital display

3 character range indication

Operational flags

Sampling System

Standard Probe and Handle Assembly connected to instrument with sample line and uses instrument integral pump with flow fail sensor. The sample path is protected by the hydrophobic filter and automatic pump switch off.

Power Source

Rechargeable battery pack providing approximately 9 hours runtime from fully charged at 68°F (20°C).

APPLICATIONS

Plastic (Solid End) Probe

This probe is supplied with the FR 3XR and is designed for use with BarHole probing and below ground surface gas monitoring.

Fig. B-1 Solid End Probe

The solid end feature prevents blocking of the probe when detecting gas leaks in soft earth.

The Plastic Probe (Part No. 12393) is generally used with the Probe Handle Assembly (Part No. 12481), incorporating both Cotton and Hydrophobic Filters to prevent the ingress of water or dirt. The Sample Line (Part No. 12712) connects the probe handle to the instrument and allows the pump to draw the sample into the instrument analysing chamber.

The probe is manufactured from the a plastic material which is flexible and extremely robust. The probes wall thickness provides the flexible strength to withstand bending around a 50cm radius or sustaining damage to, or collapse of, the sampling path if accidentally stood on, by the operator.

Note: The Sample Line, Probe Handle Assembly and Filters are all supplied with the instrument. A longer probe, if required, is available as an accessory. Refer to Chapter 7 ACCESSORIES.

Bellows Probe

This probe is available as an accessory. The Bellows probe (Part No. 13563) provides a method of obtaining more consistent readings by reducing the effect of wind and air dilution.

Fig. B-2 Bellows Probe

The Bellows Probe is of stainless steel construction housed in a flexible rubber boot. It is generally used with the Probe Adaptor which connects to the Probe Handle Assembly (Part No. 13561). The Probe Handle incorporates a Sample Line (Part No. 12712) which is connected to the instrument and allows the pump to draw the sample into the instrument analysing chamber.

Note: This model of Probe Handle does not incorporate an in-line filter. A Water Filter Assembly (Part No. 42183) or Dust Filter Assembly (Part No. 42184) are available and can be fitted as an accessory, if required. Refer to Chapter 7 ACCESSORIES.

Swan Neck Probe

This probe is also available as an accessory.

Fig. B-3 Swan Neck Probe

The Swan Neck Probe (Part No. 13655) has a number of small balanced holes in the probe length to give increased coverage in surveys. To prevent damage to the probe and provide an unrestricted sample path, the probe is supplied with a shroud assembly incorporating two skids which prevent probe contact with the ground surface.

The Swan Neck Probe is of stainless steel construction and is generally used with the Probe Adaptor which connects to the Probe Handle Assembly (Part No. 13561). The Probe Handle incorporates a sample line which is connected to the instrument and allows the pump to draw the sample into the instrument analysing chamber.

Note: This model of Probe Handle does not incorporate an in-line filter. A Water Filter Assembly (Part No. 42183) or Dust Filter Assembly (Part No. 42184) are available and can be fitted as an accessory, if required. Refer to Chapter 7 ACCESSORIES.

Stainless Steel (Flue) Probe

This probe is also available as an accessory.

Fig. B-4 Flue Probe

When a flue sample is required, a Stainless Steel Open Ended Probe (Part No. 13413) with Coalescing Filter Assembly (Part No. 42215), incorporating Coalescing Filter (Part No. 75174), is generally used. The purpose of the filter assembly is to isolate any moisture which could affect the sample reading. The flue probe and coalescing filter assembly is generally used with the Probe Handle Assembly (Part No. 12481), incorporating both Cotton and Hydrophobic Filters, to prevent the ingress of dirt. The Sample Line (Part No. 12712) connects the probe handle to the instrument and allows the pump to draw the sample into the instrument analysing chamber.

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