AMI

AUTOZEROING MERCURY INDICATOR

USER MANUAL

Pioneer Road Faringdon Oxfordshire SN7 7BU
Tel: 01367 241675 Fax: 01367 242491
www.shawcity.co.uk service@shawcity.co.uk

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INTRODUCTION

AMI is a single-point sampling analyser for Mercury vapour built into a fibreglass reinforced polyester housing. The instrument is microprocessor controlled with a large two-line information display. A sample of air is pumped continuously into the sample unit where it is analysed by a dual-beam spectro-photometer using the 254 μM (U.V.) wavelength for detection.

Two preset alarm limits are provided at 10 μg/M^3 and 25 μg/M^3 (Occupation Exposure Limit). Indication is provided on the front panel of all conditions. Three relays for remote alarm signalling are provided for alarm, service required (fault) and audible signal.

Very high stability of performance is provided by the control system which incorporates an automatic zeroing feature. Approximately every five hours the system initiates a short period of testing, which includes verifying and adjusting (if required) the zero of the instrument. This will ensure that long term drift of the instrument is eliminated.

Description of Controls and Indicators

FRONT PANEL	**Lamp**	**Indicates**
	POWER	AC power on
	HEALTHY	System correct-no faults
	SERVICE	Fault - type indicated on display panel
	WARN	Levels exceed 10 μg/M^3
	ALARM	Levels exceed 25 μg/M^3

BUTTON

	RESET	Clears messages from display and mutes a audible alarm relay
	TEST	Shows test data on display
	ZERO	Manually starts a zeroing cycle

DISPLAY

Two line backlit display.
Top line gives status information.
Bottom line shows current Mercury concentration.
See “Operation” section of manual for more details on other displayed messages.

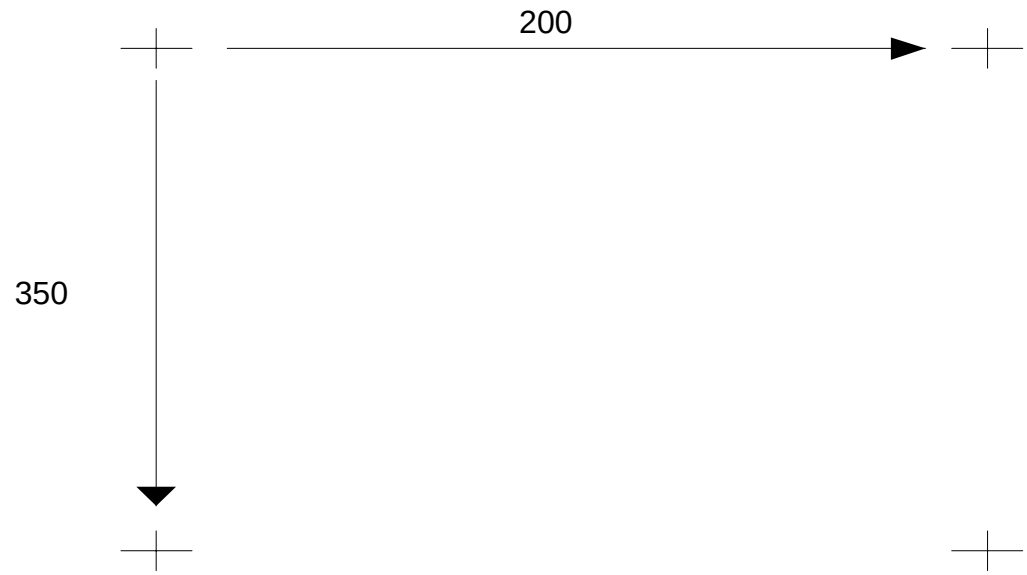
OTHER OUTPUTS

Analogue 1	0-10V DC (0-200 µg/M^3)
Analogue 2	4-20 mA (0-200 µg/M^3)
Alarm Relay*	Level exceeds 25 µg/M^3
Fault Relay*	Energised when fault exists
Audible Relay*	Any alarm or fault energises relay

**Auto Resetting*

Specification

Range:	2-200 µg/M^3
Linearity:	+/- 2% over range
Accuracy:	+/-5% of reading or +/- 1 digit (whichever the greater)
Repeatability:	+/- 2% of reading or +/- 1 digit (whichever the greater)
Warm-up Time:	5 minutes
Response Time: (No Sample Line Fitted)	T90 is 5 seconds
Temperature Range:	Operational 0 to 35º C Storage -10 to 50º C
Humidity:	0 - 95% RM (non-condensing)
Zero Drift:	Less than 2 µg/M^3
Auto-zero Cycle:	Every 5 hours
Alarm Set Points:	Warn:: 10 µg/M^3 Alarm:: 25 µg/M^3
Relays (3):	Volt free changeover contacts rated at 2 Amp 240V AC
Outputs:	1 0-10V DC in 10K 2 4-20 mA into 500 Rmax (current source)
Power Requirements:	90-250V AC (auto selection) at 1 Amp
Frequency:	47-55 Hz
Cabinet Size:	400 mm (H) x 200 mm (D) x 300 mm (W)
Cabinet Weight:	10.0 kg



CONNECTION DETAILS

INSTALLATION

General

Qualified personnel should carry out the installation of the AMI. It should be installed in areas away from direct sunlight and free from mechanical vibration.

A location close to the required sample point should be chosen with access for service and maintenance.

Mounting

Standard threaded brass inserts M8*15 in the rear panel for direct wall mounting from behind the cabinet.

The unit is to be mounted vertically and securely and in a position which allows the door to be fully opened. The clearance for door opening is 520 mm. The door is hinged on the right side.

Also ensure access is available at the top and bottom for pipework and electrical entries.

If mounted outdoors locate in position sheltered from weather.

If mounted indoors **do not** locate close to heating system or pipework.

Electrical Supply

The AMI requires an AC supply between 90 and 250V AC. This supply should be from a switched and fused supply (2 Amp).

The AMI has auto supply voltage selection, so provided supply is within stated range, the instrument unit will operate correctly.

The base of the cabinet has 2 pre-drilled holes, size M20, for cable gland entry. Inside the cabinet there are DIN rail mounted field terminals for cable connection. The AC line supply terminal is fitted with
20 mm fuse and isolator. Fuse rated at 1 Amp.

The cabinet **MUST** be earthed via the AC supply earth conductor.

The electrical installation should be carried out by a qualified electrician and comply with local electrical safety codes and laws.

DO NOT POWER THE EQUIPMENT UNTIL COMMISSIONED BY A QUALIFIED PERSON. Shawcity will normally provide the services of a commissioning engineer. The guarantee may be invalidated if not commissioned by Shawcity Limited.

Output Connections

Two linear DC analogue outputs are available:

1. 0-10 V DC into a minimum of 10K
2. 4-20 mA current loop in a maximum resistance of 500R

These outputs will track the AMI displayed Mercury concentrations.

Sample Pipework

1. Sample inlet to connect to sample pipework to required sample location.
2. Exhaust to carry sample to safe location.
3. Zero gas inlet to connect zero filter housing.

All connections are 6 mm O.D.

This pipework must be either stainless steel or PTFE to ensure non-absorption of Mercury vapour. Any pipework installed must be protected from damage and MUST be terminated at the sample point with the supplied end of line filter. The AMI and the end of line filter are provided with 6 mm O.D. stainless steel compression fitting. For best stability and performance, the AMI and the sample point should be at similar temperature and humidity.

Contact Shawcity if sampling is required from areas with high humidity.

Maximum sample line length is 15 metres (50 ft).

Sample Exhaust Pipework

The exhaust should not be allowed to discharge into clean (Mercury free) areas. Up to 6 metres (20 ft) of 6 mm tube can be used on the exhaust to pipe to a suitable well-ventilated location.

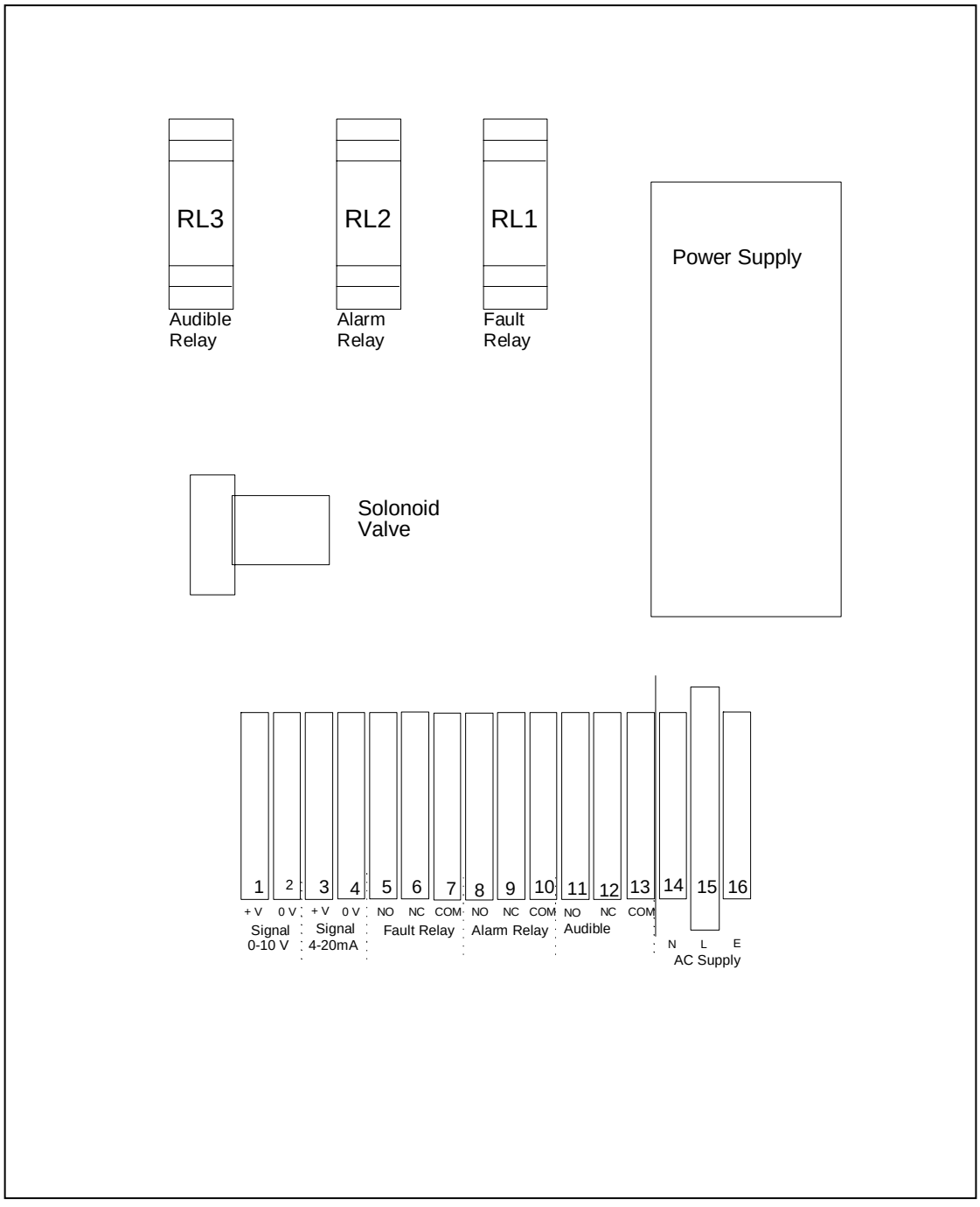
Zero Gas Inlet

An activated charcoal filter fitted inside the zero filter housing protects the zero gas inlet. The zero filter housing MUST be connected at all times to the zero gas inlet. This housing is normally connected directly on the zero gas inlet. If the AMI is installed in an atmosphere where the Mercury concentration is continuously higher than 25 $\mu g/M^3$ the replaceable zero filter element will require frequent replacement (weekly). Up to 6 metres (20 ft) of tubing can be added to enable air to be taken from a clean area. This tubing must be stainless steel or PTFE.

Commissioning

After installation or re-location the AMI will require commissioning by qualified engineer. Please contact Shawcity to arrange this commissioning visit.

Internal Electrical Connections



OPERATION

Warm-Up Sequence

When power is connected, the unit will take five minutes to stabilise and during this time, various messages will appear on the display, together with an indication of the time remaining. The message sequence is shown on page 11. At the end of this time the unit commences an autozeroing sequence.

Auto-zeroing Sequence

After initial warm-up, and every five hours thereafter, this sequence will allow the unit to sample Mercury-free air via the zero gas inlet and set the instruments zero. This sequence lasts approximately 36 seconds and the time remaining is shown on the lower line of the display. The top line will follow the sequence shown on page 12. At the end of this time, the instrument will then be in normal operational mode.

Normal Operation

Air is continuously sampled via the sample inlet. The bottom line of the display shows Mercury concentrations in $\mu g/M^3$. The top line of the display will be blank. This operation will continue until either an alarm or a fault condition arises.

Alarm Operation

1. First level warn set at 10 $\mu g/ M^3$

   During normal operation, if Mercury vapour levels exceed 10 $\mu g/M^3$ the WARN lamp will illuminate. No other action will take place and this alarm is self-cancelling after the concentration drops below 10 $\mu g/ M^3$.

2. Second level alarm set at 25 $\mu g/ M^3$

   When the Mercury concentration exceeds 25 $\mu g/ M^3$ the following action will take place:

   a) ALARM lamp illuminates
   b) ALARM relay energises
   c) AUDIBLE relay energises
   d) DISPLAY top line shows “IN ALARM”

The audible relay may be cancelled at any time by operating the RESET button. (Even when level exceeds 25 $\mu g/ M^3$)

Fault Operation

The AMI continuously monitors for correct operation, but should problems arise then one of three fault messages will appear:

1 PUMP FAILURE
2 LAMP FAILURE
3 SERVICE REQUIRED

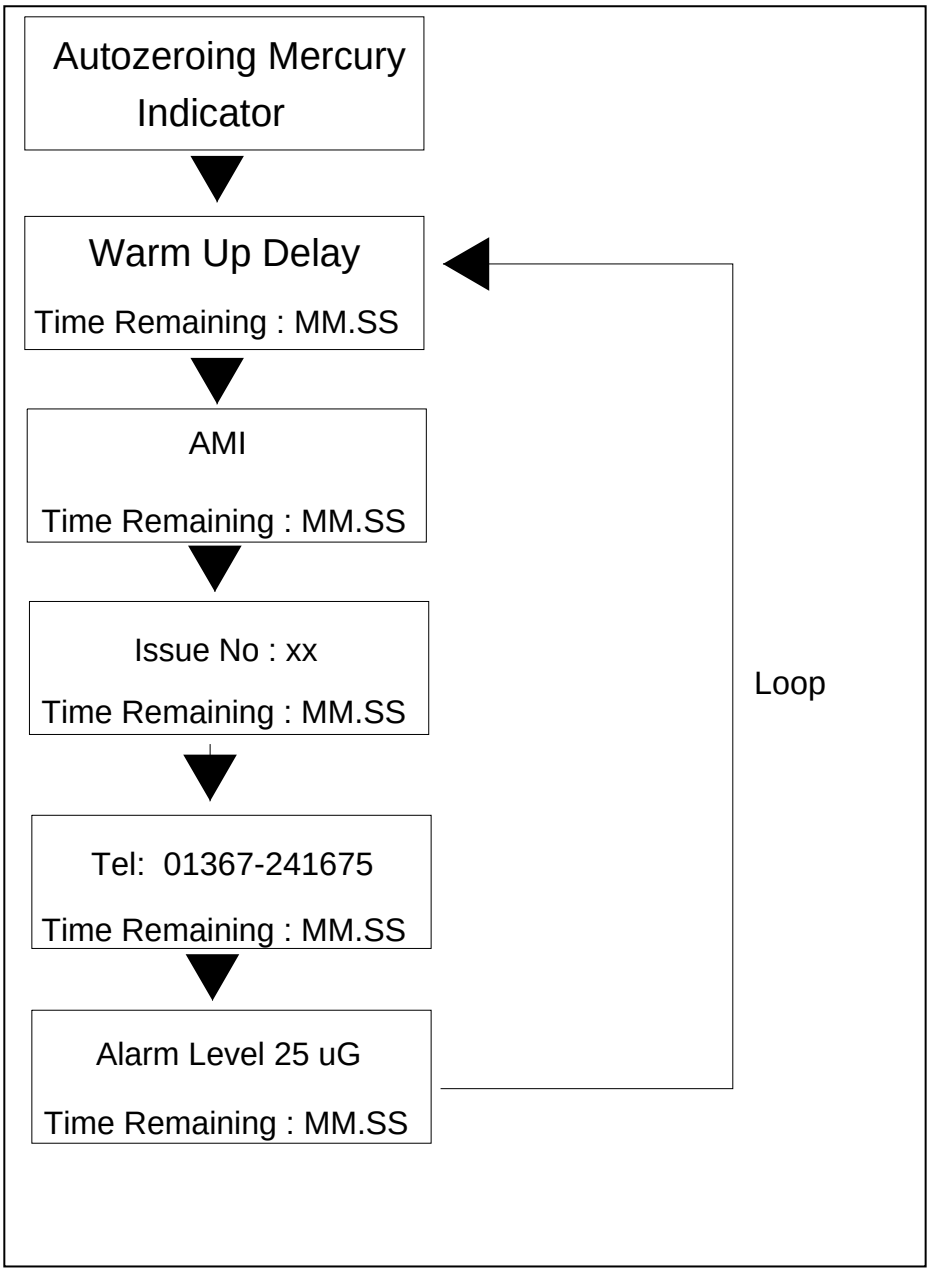
Also the fault relay and audible relay will be energised, the SERVICE lamp illuminated and to confirm the fault, the HEALTHY lamp will be extinguished.

The audible relay can be muted at any time by operation of the RESET button. All other indication will remain until the fault is cleared. After the fault is removed the display will clear

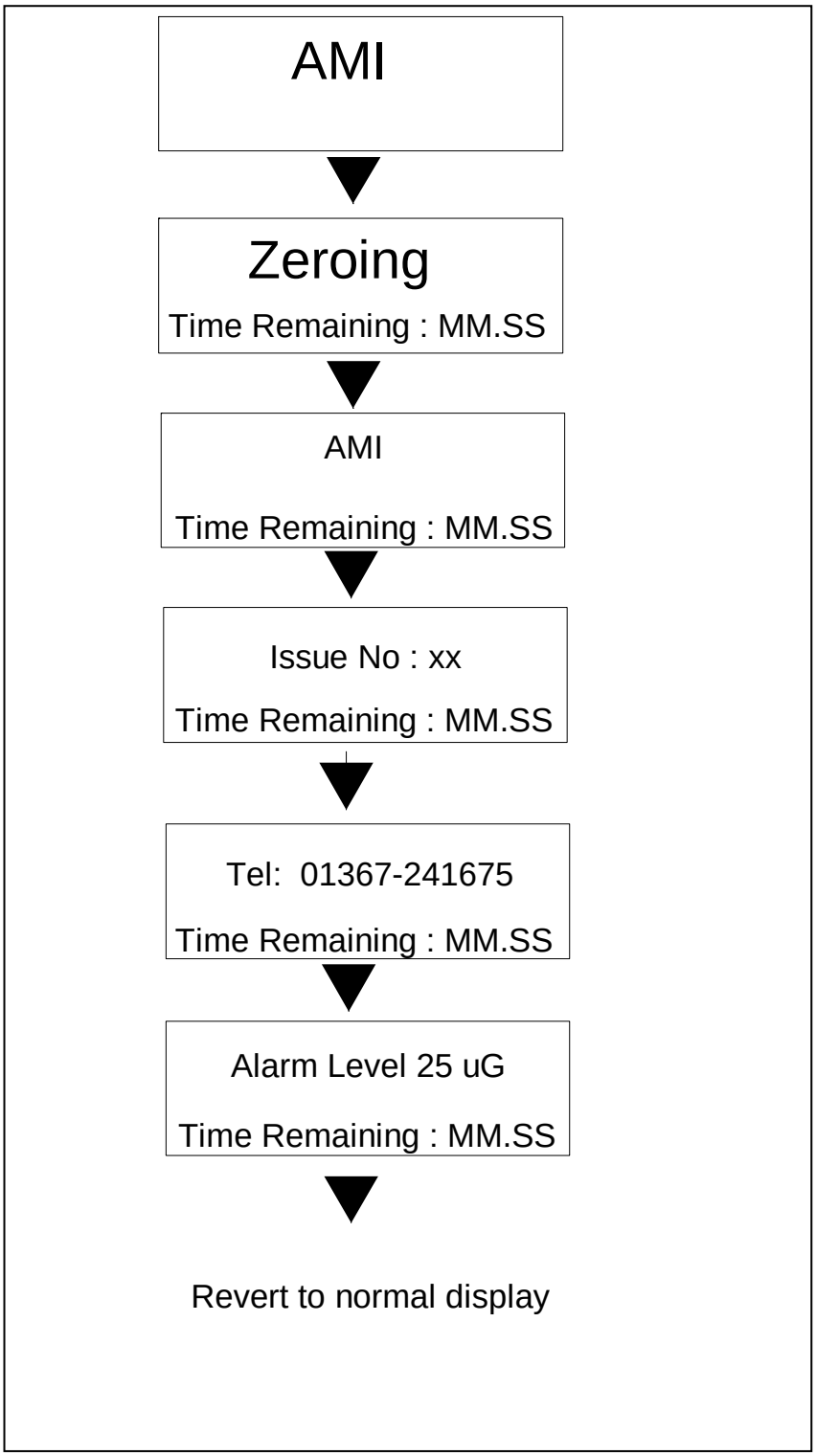
Identification and repair of faults is in the Testing/Maintenance section of the manual.

Warm Up Sequence

This sequence repeats via the loop until the time remaining = 0:00 at which point *autozeroing* starts



Auto-zeroing Sequence



TESTING AND MAINTENANCE

Routine Testing

This should be carried out regularly (typically once per month) to test correct operation.
Press and hold the RESET button, then press and hold the TEST button. Continue to hold both buttons. This will start the test routine.

The measured value displayed on the second line will slowly increase in value and will continue to rise whilst both buttons are held down.

The correct operation of both WARN and ALARM can be observed including associated relay operation. After releasing buttons the lamps and alarm relay will auto-reset.

Test Button

Operation of the test button will show on the top line of the display three system values as shown:

REF: 107 ACT : 108 SIG : 012

These values may be required in identifying certain faults.

Routine Maintenance

The only routine maintenance required is to change the end of line dust filter and the zero filter element. The frequency of change will depend on site conditions, but we would recommend both are changed every month until a clear pattern of site conditions is established.

Changing End of Line Dust Filter

The filter element is a cylindrical shape and is accessed by unscrewing the top of the filter housing. Ensure that the new filter element is fitted correctly in the centre of the housing.

Changing the zero filter

The filter element is accessed by unscrewing the top of the filter housing. When fitting the new filter, ensure a correct seal in the housing.

Safety Note

As the old dust and zero filters may be contaminated by Mercury, gloves should be worn whilst changing them. Dispose of the filters in a safe manner.

DO NOT INCINERATE OLD FILTERS.

Fault Identification and Rectification

Pump Failure

Two possible causes for this fault are:

1. Blocked end of line filter
2. Pump stalled

Check sample lines and end of line filters (change if necessary) to ensure free-flow.
If sample line and filter are correct, then pump is stalled or stopped. This will require the changing of the sample module.

Please refer to the next section of this manual for more details.

Lamp Failure

This unlikely failure can only be rectified by changing the sample module.

Please refer to the next section of this manual for more details.

Service Required

The system has detected signals being outside the normal range of operation. This may only require resetting of some internal adjustments, but as these adjustments may alter the calibration, it is not normally disclosed to unauthorised personnel. If this message occurs, operate the TEST button and note down the four values on the display. Call the Shawcity service department on 01367 241675 for advice and guidance.

CALIBRATION

(See diagram on page 16)

As the AMI is designed as a fixed instrument, Shawcity have a service exchange programme to meet this requirement. Downtime is minimised to a few minutes whenever calibration is required.

Procedure

a) Check the exchange samples module has a valid calibration date.

b) Switch AMI off.

c) Open front cabinet door and identify the existing Sample module.

d) Swing the sample module out. It is hinged on the left side.

e) Identify the two sample tubes and connector on the rear of the sample module.

f) With care, remove the tubing and remote the 'D' connector from the rear of the module.

g) The module is now ready to remove. Slip up and out the two pins in the hinges, and lift out the old module.

Installing New/Calibrated module

h) Place new module so that hinge pins can be reinserted. Check that module moves easily on hinges.

i) Reconnect the 'D' connector into the socket on the rear of the module.

j) Identify the inlet tube and push onto inlet connector.

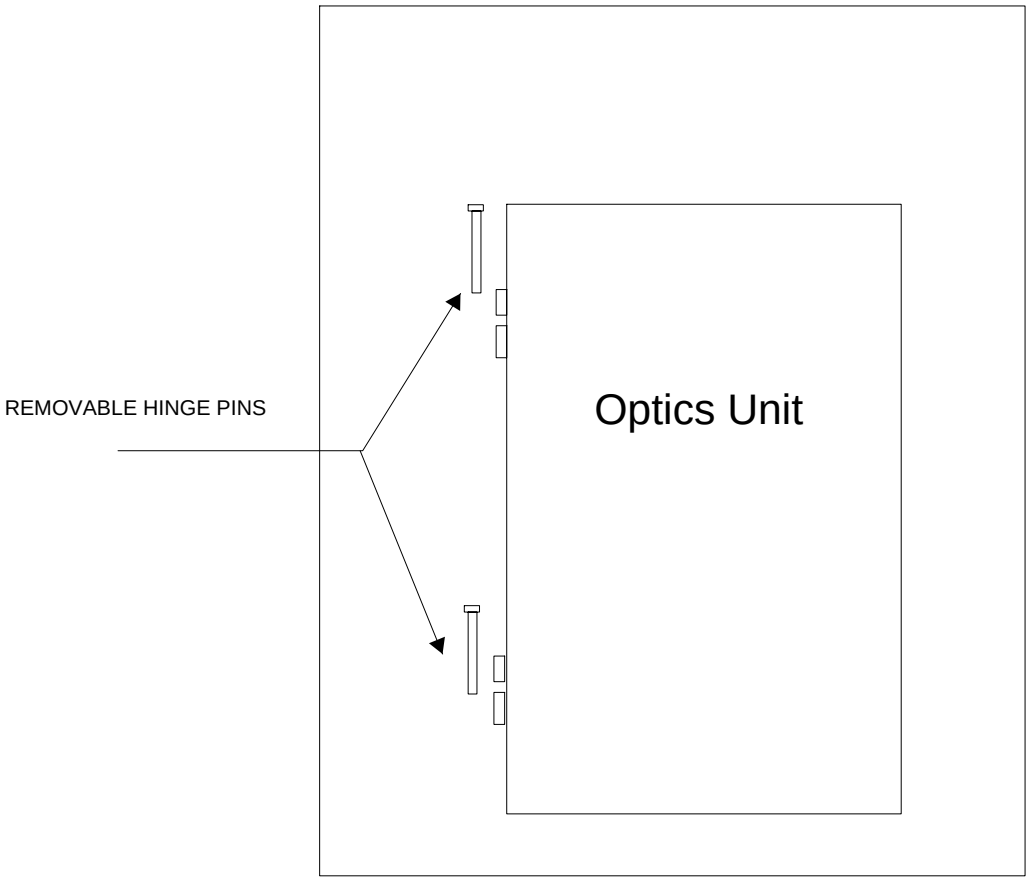
k) Identify the outlet tube and push onto outlet connection.

Swing back the sample module, making sure not to trap tubing. Close front panel door and restore power.

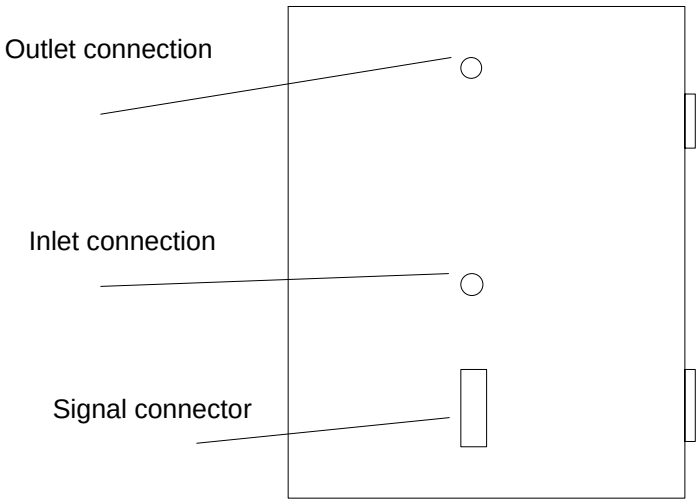
The unit will go through the warm-up procedure (5 minutes) and then should auto-zero.

If a "Pump Failure" message appears at any time, check the internal tubing as it may be trapped by the sample module.

View with door



Rear view of Optics Unit



SPARE PARTS LIST

Description	Part No.
Dust filter (recommended to be replaced monthly)	900-430
Dust filter (pack of ten)	900-410
Charcoal filter (recommended to be replaced annually)	900-432
Empty filter housing (for charcoal or dust filter)	900-427
Exchange calibrated sampling module supplied with new pump, new lamp, new charcoal filter complete, new dust filter complete a certificate of calibration and module replacement instructions.	900-500R
New calibrated sampling module	900-500