



TELEGAN

gas monitoring

AUTOFIM II AND AUTOFIM II GC

Operating Manual

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**HALMA
GROUP
COMPANY**

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IMPORTANT SAFETY NOTES

The Autofim II and Autofim II GC are designed for safe use in hazardous atmospheres. To maintain this safety, operators and service engineers **MUST** observe these safety rules:

OPERATING ALWAYS operate with the Lower Body fitted correctly and firmly fastened.

SERVICING ALWAYS make sure that ALL three sinters, the Glow Plug, and the Thermocouple are fitted correctly, and are secure.

Pay particular attention to the Exhaust Sinter Assembly which is regularly removed for Flame Chamber inspection.

The sinters act as flame arresters and are essential for safe operation in hazardous areas.

LIMITATION OF USE IN HAZARDOUS AREAS

DURACELL MN1400 alkaline primary cells may be used (subject to their continued T4 temperature rating).

Do NOT use other primary cells or Ni Cad rechargeable cells without confirmation of their temperature rating under internal short circuit conditions.



1 introduction

The Autofim II range of portable Flame Ionisation Monitors provide a unique combination of state of the art operational performance with ease of use. Two versions are available, the standard Autofim II, and the Autofim II GC which additionally incorporates a comprehensive gas chromatography facility. Both instruments use many common parts including the body casings, electronics, hydrogen supply cylinder and battery pack. The Autofim II range is intrinsically safe and certified for use in Class IIC explosive atmospheres.

A range of accessories are available for Autofim IIs which are designed to complement their usefulness and extend their areas of operation.

All Autofim IIs incorporate a Flame Ionisation Detector and are very sensitive to almost all organic gases and vapours. Measurement at concentrations as low as 0.1 parts per million by volume in air is possible. The Autofim II GC enables separation of a mixture of substances for qualitative identification and quantitative measurement of concentration.

1.1 THE FLAME IONISATION DETECTOR (FID).

The FID employs a hydrogen flame, burning in an excess of air and surrounded by an electrostatic field, with provision for the introduction of a sample into the flame. The conductivity of the flame is low in the absence of organic substances due to low concentrations of the electrons and ions produced by the burning hydrogen. A small current is observed to flow in the electrostatic field. However, the conductivity of the flame greatly increases in the presence of organic substances due to increased production of electrons and carbon-containing ions. Then an increase of current proportional to the rate of sample introduction, and the concentration of the sample is observed.

The FID is most sensitive to oxidisable carbon-containing substances. Examples are alkanes, alkenes, alkynes and aromatic hydrocarbons. There is less sensitivity to oxidised carbon-containing substances. Examples are aldehydes, ketones, and carboxylic acids. There is also less sensitivity to organic substances containing heteroatoms. Examples are halogenated hydrocarbons which contain fluorine, chlorine and/or bromine atoms, alcohols, ethers and esters which contain oxygen, sulphur and/or phosphorus atoms, and amines, amides and nitriles which contain nitrogen atoms. However, despite their less intrinsic sensitivity many substances can yet be determined with the FID. The FID is insensitive to carbon dioxide, carbon disulfide, carbon monoxide, nitrogen, nitrogen oxides, oxygen and water.

Therefore, the FID responds differently to different substances. Every FID is factory calibrated using methane. Thus, when responding to an unknown substance, the measurement observed is the concentration of methane equivalent to the concentration of the unknown substance.

Each Autofim II features a large Numeric Read-out which normally displays the sample concentration in volumetric parts per million (ppm) methane in air.

If a Response Factor and/or a Dilution Factor have been applied to this read-out by the user, then these values are flashed continuously alongside the factored Numeric Read-out. Analogue information is provided by a Bar Graph with three ranges. This bar graph is scaled into three decades where the lower decade is linear and the middle and upper decades are logarithmic. The bar graph measurement ranges are 0-100 ppm, 0-1,000 ppm and 0-10,000 ppm methane in air full scale reading.

The measurement is also available as an audible tone rising in pitch with increasing sample concentration.



1 introduction

1.2 GAS CHROMATOGRAPHY.

The Autofim II GC offers two modes of operation. The first mode is the measurement of the total concentration of organic gases and vapours present in a mixture, as discussed previously. This is Survey Mode Operation.

The second mode is the qualitative identification and quantitative measure of the concentration of specific substances in a mixture.

This is the Gas Chromatograph (GC) Mode of Operation. This mode separates the mixture into its specific components. A sample of the mixture is injected into the hydrogen carrier gas and moved through a column of tubing containing liquid/solid materials which physically interact with the components of the mixture. Since some components interact with the liquid/solid materials more readily than other components, each component of the mixture travels through the column at a different speed and reaches the detector at a different time. Thus, each component can be qualitatively identified by the time required to reach the detector and quantitatively measured by the FID response.

A trace of FID response with respect to time is known as a chromatogram. Separated components appear in the chromatogram as well resolved 'bell-shaped' peaks. Each Autofim II GC is supplied with a typical chromatogram of a hydrocarbon mixture obtained at the time of its manufacture.

Various column types are available for analysing different ranges of compounds

The time between detection of a component measured at the maximum FID response, and the injection of the sample of the mixture, is the retention time of a component. Retention time varies with the length of the column, the type and state of material contained in the column, the flow rate of the carrier gas and the temperature of operation.

Of these variables, ambient temperature is the least controlled in most field applications. The retention time of a component decreases as the

ambient temperature increases and conversely increases as the ambient temperature decreases. To achieve the highest degree of performance, the retention time of a standard should be obtained at the beginning of any work. Empirical testing is required for every substance of interest to be detected at the ambient temperature(s) expected.

The FID response is proportional to the concentration of a component which reaches the detector at any moment in time.

An integration method to determine the area under the peak of each component is recommended. The sum of the concentrations represented by the peak areas is equal to the sample concentration.

Analysis of the results can be obtained either by computer program or manually.

The Integrat Personal Computer (PC) program provides comprehensive analysis facilities.

For manual interpretations, the most commonly used integration methods are triangular approximation, and the cut and weigh method. The sample concentrations may be related to the peak area as -

$$\begin{aligned} & \text{(sample concentration)} \\ & = \text{(constant)} \times \text{(peak area)} \end{aligned}$$

where the constant of proportionality must be empirically determined. Direct proportionality is ordinarily observed over a large range of concentration.

Triangular approximation requires that two straight lines be extended through the inflection points of the peak, one on each side of the peak. The two lines intersect one another at the retention time and each line intersects the baseline to form a triangle. The peak area then equals one-half the height, times the base of the triangle.

The cut and weigh method requires that the peak be cut out of the chromatogram, or a reproduced copy of the chromatogram and weighed. Then the weight of the peak, divided by the area density of the paper, equals the peak area.



1.3 APPLICATIONS.

The Autofim IIs can be used to detect the presence, and measure the concentration of most toxic, potentially flammable, organic gases and vapours. There are numerous possible applications. A brief list of examples include:

- Monitoring for compliance with health and safety laws and regulations.
- Location of fugitive emission from gas or volatile fuel distribution and transmission lines and equipment.
- Location of biogenerated gases, most commonly methane, at landfill sites.
- Discovery of emissions from hazardous waste sites.
- Tracking of migratory emissions into surrounding enclosed spaces such as buildings, basements, ducts, underground tunnels (but not mines as yet).
- Detection of accelerant residues from such as gasoline, alcohol, and acetone, during forensic investigation.



2 specifications

Ranges:	0-100 ppm, 0-1000 ppm, 0-10000 ppm. Auto Ranging or manual selection.		
Display:	Digital Readout with moving bar graph on a three decade expanded Scale with Backlight facility. Maximum Resolution 0.1% of Full Scale		
Output:	Infra-red to RS232/Fibre Optic Interface.		
Input:	Infra-red link connection for external devices.		
Minimum detectable limit:	0.05 ppm Methane		
Accuracy:	Within 10% of reading		
Response delay time:	2 Seconds approximately.		
Fuel (and carrier gas):	Hydrogen (Commercial Purity) Enclosed replaceable, refillable cylinder, or Enclosed replaceable, disposable cylinder.		
Replaceable batteries:	6 'C' size Cells. <i>DURACELL</i>		
Operation times:	Hydrogen	Refillable	Disposable
	Surveying mode	45 Hours	30 Hours
	G.C. mode	30 Hours	20 hours
	Electrical		
	Primary cells	<i>18</i> - 40 Hours.	
Visual indicators:	Correct Detector Flow, Battery condition, Flame condition, Time, and Date.		
Alarm concentration range:	0 - Full Scale (Audio Threshold)		
Flame-out indication:	Interrupted Audio Tone	<i>150°C FLAME OUT</i>	
<i>MIN 20</i> <i>RUNNING 35-40</i> Sounder:	Tone Pitch Varying with Sample Concentration Level. Adjustable Volume		
Instrument weight:	Autofim II	approximately 4.2 kg.	
	Autofim II GC	approximately 4.5 kg.	
Instrument dimensions (mm):	225 high, 135 wide, 370 long.		
Safety classifications:	EN; EEx ib IIC T4 and EEx d IIC T4 FM; (to be obtained) Class I, Groups A,B,C and D, Division 1 hazardous areas.		
Operating conditions:	Temperature	0°C to +40°C	
	Relative Humidity	30 - 90% non-condensing	



3 general data

Detector flows:	Sample	600 to 700 ml/min.
	Hydrogen	
	Survey Mode:	15 ml/min.
	Chromatograph Mode:	Approximately 23 ml/min. (dependant upon column type).
Hydrogen cylinders:	Refillable	
	Water Capacity:	0.4 litres.
	Maximum Charge Pressure:	3000 psi. (210 Bar).
	Normal Charge Pressure:	1800 psi (127 Bar).
	Hydrogen consumption with the above cylinder	
	Survey Mode:	approximately. 34 psi/hour.
	Chromatograph mode:	approximately. 52 psi/hour.
	Disposable	
	Water Capacity:	1 litre
	Maximum Charge Pressure:	500 psi. (35 Bar).
	Hydrogen consumption with the above cylinder	
	Survey Mode:	approximately. 15 psi/hour.
	Chromatograph Mode:	approximately. 23 psi/hour.
Hydrogen quality:	Commercial Grade.	
	Less than 1 ppm hydrocarbon content.	
Detector flame level:	Approximately 2 to 3 ppm.	
	(Dependent upon hydrocarbon content of Hydrogen used).	
Supply voltage range:	6.5 V.dc. minimum - 10 V.dc. maximum	
Glow plug details:	Fox Standard Long or Scorpion Type S1 (both modified).	

3.1 STANDARD ACCESSORIES:

Carry Case
Shoulder Strap
Extensible Probe Handle
Tee Probe Assembly
Hydrophobic and Dust Filter
RS232/Fibre Optic Interface
The Carry Case will accept all standard accessories, spare batteries and a spare hydrogen cylinder.

3.2 ADDITIONAL ACCESSORIES:

Range Extender (10:1 Diluter)
Carbon Filter
Various Probe ends
I.S. Data Logger.
Computer Analysis Program for Gas Chromatography

For a full detailed list see Sales Price Lists.



4 controls

4.1 The Autofim II Top Panel incorporates the following indicators and controls:

PRESSURE GAUGE

for hydrogen regulator supply.
Monitors the pressure between the high pressure hydrogen cylinder valve and the regulator input.
If the cylinder valve is turned on, the gauge indicates the pressure in the hydrogen cylinder.
If the cylinder valve is turned off, the gauge indicates the residual pressure in the regulator supply system.

ON-OFF SWITCH - hydrogen flow.
Controls the flow of low pressure hydrogen from the regulator to the instrument. Used as a temporary stop valve to conserve fuel.

DISPLAY PANEL

A Liquid Crystal Display is used to instruct and inform the operator during use of the instrument.

MEMBRANE PRESS SWITCHES

An ON/OFF Press Switch, and seven multi-function Soft Keys provide the operator with control of all software facilities and operations.

4.2 The Autofim II GC Top Panel has an additional section with the following items:

SURVEY/CHROMATOGRAPH SWITCH

In the Survey mode the hydrogen is only fed direct to the detector system. When switched to the Chromatograph mode, the hydrogen also flows through the chromatograph system, acting as the carrier gas. Thus the consumption of hydrogen is increased in this mode.

Note that the Autofim II GC is correctly calibrated in PPM only when in the Survey mode.

DO NOT USE THE CHROMATOGRAPH MODE FOR NORMAL SURVEYING.

BACKFLUSH/INJECT KNOB

Controls the position of the eight port valve.
Reverses the flow through the chromatograph column and switches the sample loop connections.

SAMPLE PRESS BUTTON

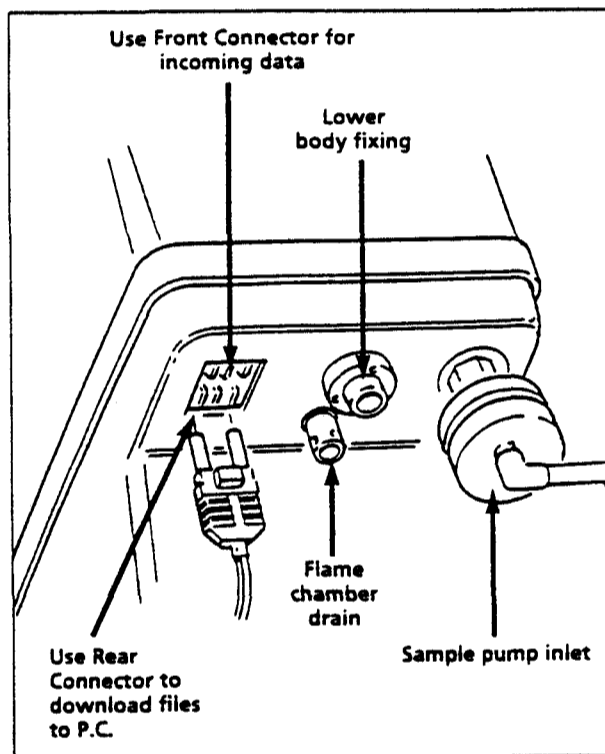
Feeds additional sample from the pump through

the chromatograph sample loop. The technique is to position the handprobe to give the largest signal on the display (and/or sounder) and depress the Sample Button for approximately 5 seconds to fill the sample loop with fresh sample.

SEPTUM

For sample injection direct into the chromatograph sample loop using a syringe. Allows analysis of oxygen depleted or devoid samples. Septa can become contaminated. Replace at periodic intervals with spares provided.

4.3 The Autofim II and Autofim II GC both have a communications panel forming an undershelf at one end, protected from direct rain by the extended Upper Body. It has the following items mounted under it:



INFRA-RED COMMUNICATIONS SOCKET

A four way socket for bi-directional linking to data-loggers, computers, and external devices such as bar code readers. The connections are as follows:

- Data Output Pair > Outgoing Data
- < Incoming Handshake
- Data Input Pair < Incoming Data
- > Outgoing Handshake

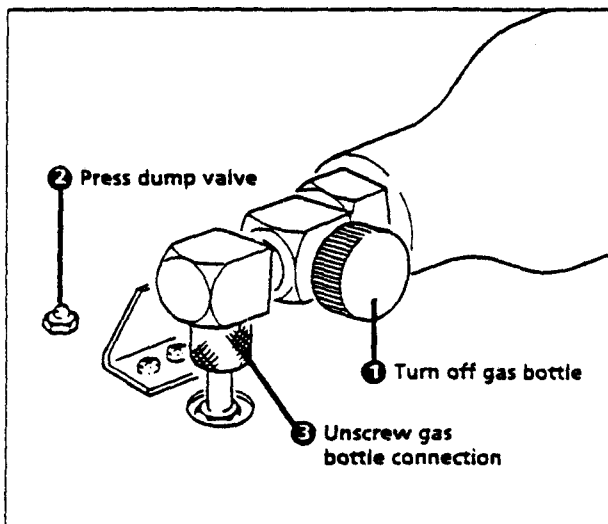
**SAMPLE PUMP INLET**

A quick release coupling designed to accept the dust and water Double Filter fitted to the Hand probes, and the Range Extender.

LOWER BODY FIXING

An Allen Key operated fixing provides safe closure of the Lower Body.

4.4 Certain controls are available only when the Lower Body is removed. These controls must only be accessed when in a safe area.

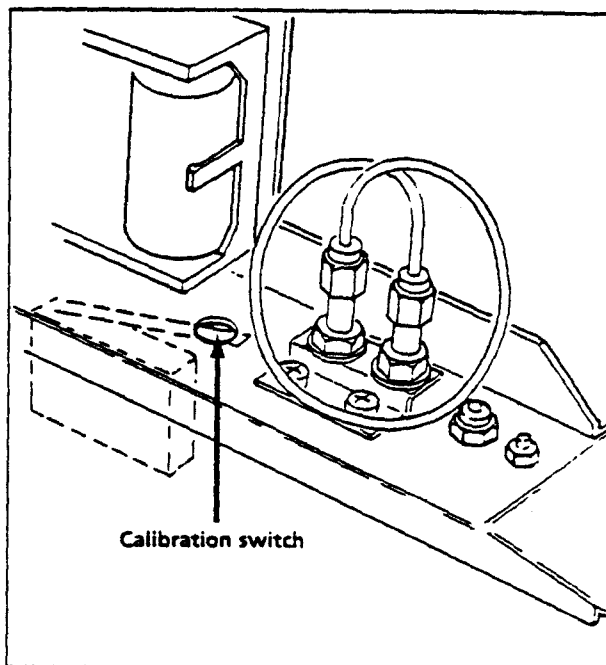
**HYDROGEN DUMP VALVE**

(Refillable hydrogen cylinders only)

To facilitate quick removal of the refillable hydrogen cylinder, a push button Dump Valve is provided to reduce the residual hydrogen pressure in the system to zero by dumping to atmosphere. Make sure the cylinder valve is turned off before operating this control. No attempt should be made to remove the refillable cylinder when the system is pressurised.

IMPORTANT:

Do NOT operate in a confined space.

**CALIBRATION SWITCH**

To provide security of calibration, access to this switch is by removal of the calibration seal. This switch must be operated (using a suitable probe) before the instrument can be re-calibrated. See Software Section.

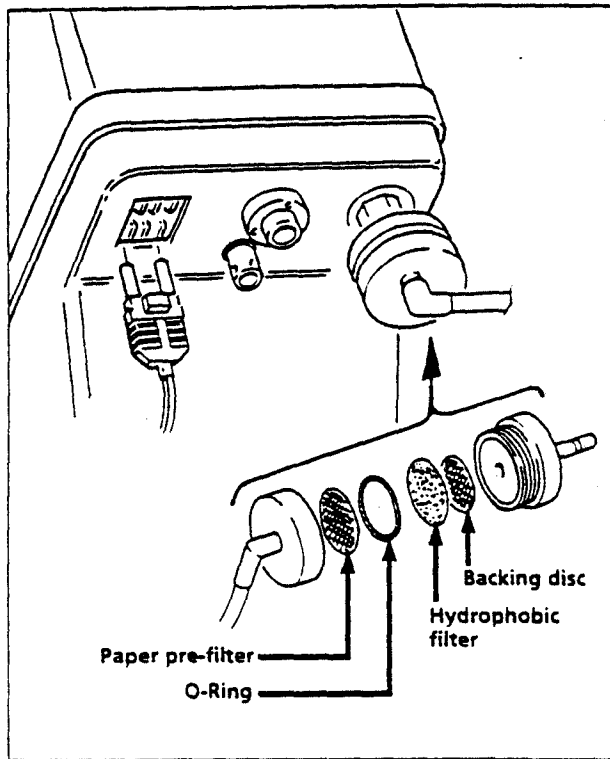
PROCESSOR RESET SWITCH

In the event of a software failure, momentary operation of this switch will reset the micro-processor.

Some operational settings return to their default state, but all recorded data is retained.



5 sample inlet system



5.1 DOUBLE FILTER ASSEMBLY.

The Inlet Filter Assembly connects to the Autofim IIs with a quick-disconnect fitting on the filter base. A 5mm right angle adapter screws into a 5mm mating thread in the filter cover, to provide the termination for the Handprobe tubing.

The filter assembly contains two separate filters. A primary dust filter and a secondary hydrophobic filter. When correctly installed the hydrophobic filter will prevent water from entering the instrument.

The dust filter must be replaced when it is dirty. Daily or hourly replacement may be necessary in excessively dirty environments.

The hydrophobic filter, should require less frequent changing as it is partially protected by the dust filter. If the sample pump has difficulty maintaining the controlled flow even with a new dust filter, or there is evidence of damage, change the hydrophobic filter.

5.2 TELESCOPIC HANDPROBE ASSEMBLY.

The Telescopic Handprobe Assembly comprises the Telescopic Handprobe and a length of P.T.F.E. tubing fitted to the right angle adapter connected to the Sample Filter Assembly. The tubing is connected to the handprobe by inserting into a 5mm push-in adapter, thus facilitating rapid tubing replacement.

The Telescopic Handprobe Assembly has a 5mm O.D. stainless steel straight inlet tube. This may be used on its own, or as a suitable mounting for various probes which incorporate a 5mm push-on adapter.

The length of the handprobe may be set and locked anywhere between the limits of 450mm and 1000mm (1 metre).

5.3 PROBES.

Various types of probe are available;

- **TEE PROBE**
This is the probe provided with the instrument and is used for most walking surveys. Provides a survey swathe of 150mm width.
- **CUP PROBE**
Intensifies the signal when its flexible skirt is pressed against a surface. Contains rubber, thus not suitable for some hydrocarbons.
- **ROLLER PROBE**
Combats the effect of wind. For use on relatively smooth surfaces such as pavements. Contains rubber, thus not suitable for some hydrocarbons.
- **STRAIGHT PROBE EXTENSION**
A 5mm diameter 'quick connect' 330mm extension for accessing difficult small holes.
- **BORE HOLE PROBE**
A 1000mm two piece probe for inserting into ground bore holes.



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6.1 PREPARATION.

6.1.1 REFILLABLE HYDROGEN CYLINDER:

With the instrument in a SAFE AREA, remove the Lower Body with the Allen Key provided.

Turn on the high pressure hydrogen supply valve fully. Confirm there is sufficient fuel remaining. Do not allow the pressure to fall below 20 Bar (280 psi) during use.

Check that all 6 Duracell batteries are correctly installed with their positive terminal (gold end) nearest the Top Panel and Carry Handles.

Replace the Lower Body - confirm it is secure.

6.1.2 DISPOSABLE HYDROGEN CYLINDER:

With the instrument in a SAFE AREA, remove the Lower Body with the Allen Key provided.

With the instrument resting on its handles, rotate the adapter horizontally to allow insertion of the hydrogen cylinder. Gently screw the cylinder into the adapter, taking care not to 'cross thread' the connection. Do not use force, finger tightness is sufficient. Rotate the adapter and cylinder assembly horizontally until it fits snugly in the instrument chassis.

Confirm there is sufficient fuel remaining. Do not allow the pressure to fall below 5 Bar (75 psi) during use.

Check that all 6 Duracell batteries are correctly installed with their positive terminal (gold end) nearest the Top Panel and Carry Handles.

Replace the Lower Body - confirm it is secure.

6.2 START UP:

Switch on the hydrogen flow. For the Autofim II/GC instrument, ensure that the Survey/Chromatograph switch is in Survey mode.

Press the ON/OFF switch until the display appears.

After a short delay the display will change to the ignition screen and cycle through the automatic ignition sequence.

When the detector flame ignites, the screen will change to display the automatic offset adjustment sequence. The display then switches

to the measurement screen. Allow 15 minutes for the instrument to stabilise before resetting the zero level.

Once the ignition sequence is completed, the pump speed should stabilise and the screen display indicate Flow Control OK. This flow condition is important for all applications. If the display continuously indicates Flow Control ERROR then check for dirty inlet filter elements, a blocked probe, or a blocked flame chamber exhaust sinter.

If the display screen clears when the glow plug is operating, then the batteries should be replaced as soon as possible.

6.3 SETTING FOR TRUE AMBIENT LEVEL.

All ambient air has a background level of hydrocarbons. Even the cleanest atmospheric air has about 2 parts per million by volume. When surveying for moderate to high levels, or when surveying for changes of level, setting the instrument zero to the background level is acceptable.

When monitoring for low levels and particularly when checking their variations over a series of surveys, setting the Autofim IIs to a true zero is recommended as standard practice and can be carried out as follows:

- After ignition allow the Autofim II to stabilise by running for 15 minutes.
- Partially fill a clean sample bag with hydrocarbon free air from a pressurised container.
- Insert the handprobe into the bag, wait until the instrument scale reading is stable for 10 seconds, then follow the screen menu sequence to reset zero (see Software Section).
- Check that the reading remains at zero as the sample bag deflates.
- Remove the handprobe from the sample bag BEFORE it deflates completely.

See sales price list for suitable canisters of hydrocarbon free air and sample bags.



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6.4 SHORT TERM SHUTDOWN.

Press the ON/OFF switch until the display changes to the shut-down screen.

Wait until the time displayed on the shut-down screen has counted down to zero before switching off the hydrogen.

When the countdown reaches zero, the instrument sounds a warning and automatically switches off.

6.5 LONG TERM SHUTDOWN.

Press the ON/OFF switch until the display changes to the shut-down screen.

Wait until the time displayed on the shut-down screen has counted down to zero before switching off the hydrogen.

When the countdown reaches zero, the instrument sounds a warning and automatically switches off.

With the instrument in a SAFE AREA, remove the Lower Body.

Then;

For REFILLABLE HYDROGEN CYLINDER:

Turn off the high pressure hydrogen supply valve fully.

Replace the Lower Body.

For DISPOSABLE HYDROGEN CYLINDER:

Gently swing the adapter and cylinder assembly away from the chassis. Detach and remove the cylinder by unscrewing it from the adapter (anticlockwise direction).

6.6 IMPORTANT ADDITIONAL FEATURES:

SAMPLE PUMP TURN-OFF (LATCHED):

This is a safety feature so that when the Autofim IIs monitor a sample which approaches or exceeds the lower explosive limit (LEL), the increase in detector flame temperature is sensed by the thermocouple and the sample pump is switched off. With no sample flow through the detector, the flame will extinguish. A warning message will be displayed, and a continuous audio tone will sound.

The Autofim II will remain in this safe condition until the operator "unlatches" the instrument by pressing any of the multi-function press switches on the top panel to restart, or the ON/OFF switch to shut the instrument down completely.

SAMPLE PUMP TURN-OFF (BACK UP):

If the thermocouple fails to operate the Latched Sample Pump turn-off when the sample approaches or exceeds the LEL, then a back-up system operates. If the flame chamber body temperature rises above a pre-set level, then a thermal switch will "open circuit" and isolate the sample pump motor from its electrical supply until the body temperature reduces again.

In this condition the Autofim II will repeatedly attempt to re-ignite as the electrical circuits are still active. The thermal switch will close again when the body temperature is low enough and the sample pump will restart allowing normal ignition.

The back-up sequence will repeat as long as the dangerous sample condition exists.

6.7 OPERATION IN CHROMATOGRAPHY MODE:

The Autofim II GCs which have the facility to operate in this mode have an additional 4 features not seen on the standard instrument. These are:-

- A Survey/Chromatograph switch.
- A Backflush/Inject knob.
- A sample button.
- A septum.

These additional features allow the user to access the internal chromatography column and introduce a sample into it.

6.7.1 START UP PROCEDURE:

To set up the instrument and allow it to stabilise fully, follow instructions 6.1 to 6.3. For normal surveying purposes the Backflush/Inject knob should always be in the Backflush position and the Survey/Chromatograph switch in Survey mode.



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6.7.2 TAKING A SAMPLE:

There are 2 ways in which a sample can be introduced into the instrument (not the column at this stage).

- The first is to use the sample button. With the Sample Probe in clean air, depress the button for 5 seconds. The instrument's pump speed will increase, causing an internal sample loop to be flushed out. When the button is released, the pump speed will return to normal, but the sample loop will be filled with the clean air. To take the sample, the probe should now be introduced into the area under investigation (i.e. a stack containing a solvent vapour mixture) and the "sample button" depressed again for 5 seconds. On this occasion when the pump speed returns to normal after the button has been released, the sample loop will be filled with the sample mixture under investigation. This mixture can now be injected onto the column (see section 6.7.4).
- The second method is to use the 20ml syringe provided. This method can allow a sample to be obtained remotely (away from the instrument) or if the sample is oxygen deficient. The sample can be taken easily by placing the tip of the syringe into the area under investigation and completely filling the 20ml available. The needle, also provided, can now be placed on the end of the syringe and introduced into the "septum" to allow access to the internal sample loop. Approximately half the syringe volume (10ml) can be injected into the instrument, most of which will be used to flush out the sample loop (as seen earlier with the "sample button") which will again be filled with the sample of interest. The mixture can now be injected into the column (see section 6.7.4).

Please note that samples can be taken using either method with the Survey/Chromatograph switch in either Survey or Chromatograph mode.

6.7.3 CHROMATOGRAPH MODE:

With the sample stored in the loop and ready for analysis the instrument must now be put into Chromatograph mode by following the software menu system and selecting the appropriate position for the Survey/Chromatograph switch. When in this position there will be an increase in instrument response on the display as some of the hydrogen fuel will be directed through the chromatographic column and into the detector. This hydrogen will act as a "carrier gas" to carry the sample mixture along the column (a long stainless steel tube packed with granular material). This action will allow separation of the components of the mixture as they progress at different rates through the granular material.

The separation generally occurs in the order of the boiling points (BP) of the individual components, with the lowest BP material (highest volatility) passing onto the detector first. If two materials have very similar BPs, for example Xylene (138-144°C) and Ethylbenzene (136°C), separation will probably not occur and the materials will enter the detector at the same time (co-elute). However, it is important to run the mixtures on the column to ascertain whether separation will occur, rather than just comparing the boiling points.

6.7.4. SAMPLE INJECTION:

With the sample now stored in its sample loop and the instrument set in Chromatograph mode, it is important to analyse the mixture within 30 minutes of taking the sample otherwise it may be lost by diffusion from the loop.

At this point it is necessary to prepare the instrument by following the screen menu procedure (see Software Section), to enable you to obtain a chromatography trace of your sample mixture.

The instrument is now ready to accept the sample onto the column which will be done using the Backflush/Inject knob. The usual



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position for this knob is "Backflush" which will only allow the hydrogen "carrier gas" to pass in a reverse direction through the column i.e. backwards. This is done to keep the column clear of previous samples.

When you are ready to inject the sample, first check that your instrument is set up correctly, and you have opened a log file for the results. Turn the Backflush/Inject knob to the "Inject" position to start the chromatographic record, and the sample will immediately enter the column. The carrier gas will have changed direction (now going forward) to carry the mixture to the detector, separating the individual components as it does so.

When the analysis process complete the Backflush/Inject knob should be returned to the backflush position (reversing the direction of the hydrogen carrier gas) and run for a further 1.5 times the total inject time while still in chromatography mode (follow screen 'countdown'). This will enable any high boiling point materials not carried all the way through the column during the analysis to be flushed backwards off the column. When this is complete select 'New Log' to take another chromatographic record or 'Exit' when the Survey/Chromatograph switch can be returned to the 'Survey' position to resume 'total' hydrocarbon monitoring.

During the analysis as the individual components are sequentially passed into the detector (flame chamber) a trace will be displayed on your display screen as the instrument digital display monitors the response as the peaks occur.

During GC analysis it is important not to have the Autofim II's sample input near any sources of hydrocarbons. These

would be detected simultaneously with components coming off the column and would give "false" peaks on your record.

The actual column in the instrument is at ambient temperature and is neither insulated nor heated in any way. It is important to note that the time in which individual components travel along the column is affected by temperature, i.e. the warmer the column is, the more rapidly they will progress down the column. Therefore identical samples run in winter and summer months will give slightly different traces although it must be stressed that the order in which the components are detected will not change.

6.7.5 BACKGROUND NOISE:

The lower limit of 'peak' recognition is governed mainly by the level of background noise of the ambient air supply to the Autofim II i.e. small local variations in hydrocarbon concentration. The background noise effect can often be reduced by fitting an additional carbon cloth filter disc between the paper and hydrophobic filters in the filter housing (section 5.1). These are available in packs of 5 (Ref.No: 47457).

To reduce the background variations still further, a number of options are available. If the ambient air is reasonably clean (less than 5ppm hydrocarbons in air) it may be used to fill a bag large enough to provide a homogeneous supply for the duration of the test (remembering that the pump rate of the Autofim II is approximately 1 litre per minute) or the bag can be filled from a compressed air cylinder.

Alternatively a Calibration Unit (Ref. No: 44519) can be used in conjunction with a compressed air cylinder.



7 calibration

It is recommended that Autofim IIs are recalibrated every 6 months, or more frequently if subjected to extreme conditions of storage or use.

Research Engineers operates a Service Scheme which includes recalibration with certified standard concentration samples of methane in air, (with a certificate to confirm the fact issued with each instrument).

Provision is made in the design of the instruments to allow user calibration if required. To aid this task Research Engineers has available two types of calibration device.

Calibration Unit. Ref.No. 44519.

For connection to a standard high pressure calibration gas cylinder (provided by the user). It incorporates a pressure reducing valve, a flow restricter, a shut-off valve and a sampling tube.

Calibration Kit. Ref.No. 46770.

A fully portable kit comprising a small sample cylinder containing 200 ppm methane in air calibration gas, with an assembly comprising a valve (manual adjustment), flow meter and flexible sample tube.

When calibrating using either of the above devices, reference should be made to the 'Setting For True Ambient Level' paragraphs in this manual.

Calibration should always be carried out in clean air. If any doubt exists then the above method of confirming true zero should be used for maximum accuracy.

Calibration Adjustment.

(In the CONTROLS section).

Calibrate only in a SAFE AREA as this control requires removal of the Lower Body for access.



8 maintenance procedures

8.1 INSTRUMENT LAYOUT AND CONSTRUCTION.

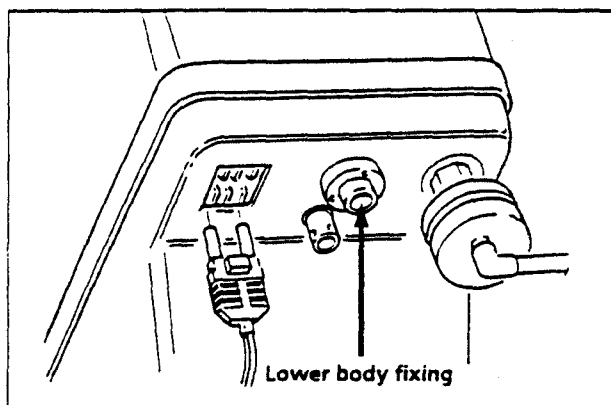
For component locations refer to the fold-out picture at the beginning of the 'Controls' section (Section 4).

Case Construction; Upper Body, Top Panel, Handles, Lower Body and fixings.

The instrument case is moulded in conductive Polypropylene, and is in two parts.

The upper body contains the operational components and the printed circuit boards. It locates around the top panel. At each end of the top panel are protective carrying handles which also serve as hooks for the shoulder strap clips.

The lower body forms a quick release intrinsically safe cover for components requiring regular attention.



8.2 LOWER BODY REMOVAL AND REPLACEMENT.

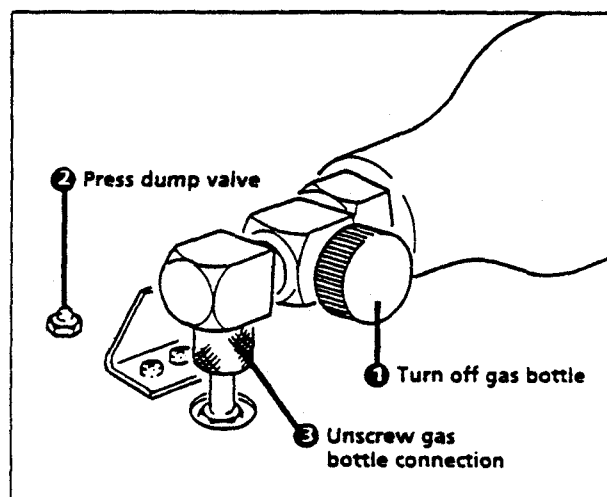
The lower body may be removed to gain access to the hydrogen valve and cylinder, the chromatograph column (when fitted), and the battery cells. This is conveniently achieved by turning the Autofim II upside-down so that it rests on the handles. Unscrew the safety fixing (near the centre of the communications panel) using the Allen Key provided, and lift upwards, rotating the lower body moulding off the spring location at the other end.

SAFETY NOTE: This must only be done in a SAFE AREA as the certification requires that the lower body is firmly secured for intrinsic safety.

To replace the lower body reverse the procedure.

8.3 CHANGING A HYDROGEN CYLINDER.

Select a well ventilated area in which to work. Confirm that all safety requirements are met.



Refillable Cylinder.

- Remove the Lower Body (see 8.2).
- Turn off the green high pressure hydrogen stop valve fully (hand tight only).
- Depress the Dump Valve to remove any residual hydrogen from the system.
- Unscrew the knurled ring nut on the regulator adapter. (Note that it has a left hand thread).
- Remove the hydrogen cylinder.
- Confirm the 'O' ring in the regulator adapter is not damaged. Replace if necessary.
- Insert the replacement hydrogen cylinder in the cradle bracket and locate it on the regulator adapter.
- Hand tighten the knurled ring nut.
- Replace the Lower Body (see 8.2).

Disposable Cylinder.

- Remove the Lower Body (see 8.2).
- Gently swing the adapter and cylinder assembly away from the chassis.
- Detach and remove the cylinder by unscrewing it from the adapter (anticlockwise direction).
- Locate the replacement cylinder in the adapter taking care not to 'cross thread' the connection.



8 maintenance procedures

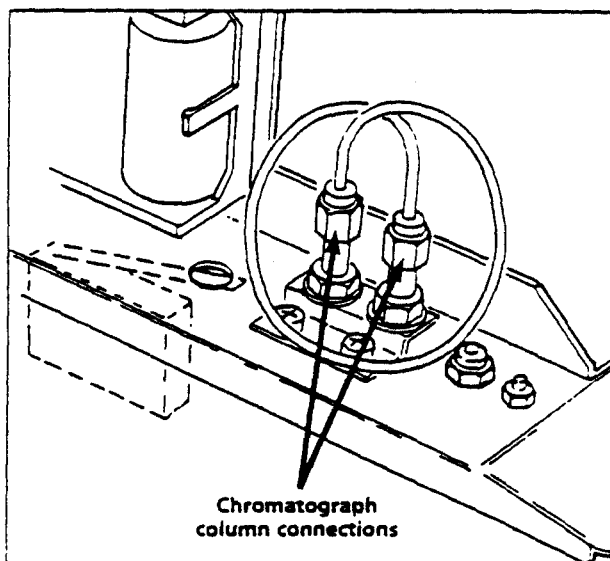
- Gently screw into the adapter (clockwise direction) until resistance is felt. Do not over tighten.
- Swing the adapter and cylinder assembly back into the chassis.
- Replace the Lower Body (see 8.2).

8.4 REPLACING BATTERIES.

Always use identical cells at any one time. The instrument will accept either primary or rechargeable cells.

Confirm that the particular batteries chosen are suitable for intrinsically safe operation.

- Confirm the instrument is switched off.
- Remove the Lower Body (see 8.2).
- Remove the used cells from their individual holders.
- Taking care to ensure correct cell polarity (as shown by the legends on the holders), insert one cell into each holder. All cells have the same orientation and should have their positive terminal nearest to the Top Panel.
- Replace the Lower Body (see 8.2).



8.5 CHROMATOGRAPH COLUMN CONNECTIONS.

Use a $7/16$ " A/F spanner to unscrew the column fittings. The columns are constructed from $1/8$ " diameter tubing and are terminated with 'Swageloc' adapters. Use only the minimum

force needed to seal the connections when tightening.

8.6 UPPER BODY REMOVAL AND REPLACEMENT.

- Remove the Lower Body (see 8.2).

Refillable hydrogen cylinder:

- Confirm that the hydrogen supply is shut off and that no residual hydrogen remains in the system. This will be shown by the Top Panel pressure gauge indicating zero. Double check by depressing the Dump Valve and confirm that no more gas escapes.
- Remove all battery cells.
- With the instrument standing on its handles, and with one hand cradled around the Top Panel to support the Upper Body unscrew the four M3 screws holding the Upper Body to the Tray Assembly.
- Carefully separate the instrument from the Upper Body.

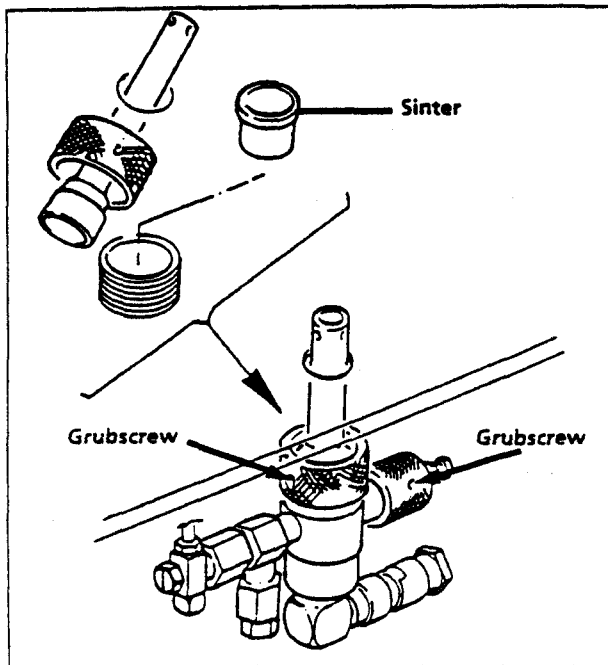
Disposable hydrogen cylinder:

- Remove the disposable hydrogen cylinder (see 8.3.a.)
- Remove all battery cells.
- With the instrument standing on its handles, and with one hand cradled around the Top Panel to support the Upper Body unscrew the four M3 screws holding the Upper Body to the Tray Assembly.
- Carefully separate the instrument from the Upper Body.

To replace the Upper Body, reverse the above procedures taking care not to snag any components, pipes, or wiring looms as the Upper Body is lowered onto the Tray Assembly.



8 maintenance procedures

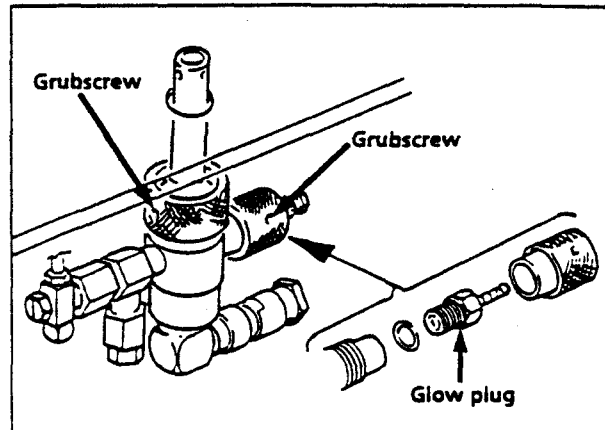


8.7 FLAME CHAMBER EXHAUST SYSTEM.

The exhaust from the Flame Chamber passes through the Exhaust Sinter Housing and the Flame Chamber Drain before dispersing to the atmosphere. Burning hydrogen in air generates water vapour. Some of this water vapour will condense and form water droplets which will drip from the lower edge of the Flame Chamber Drain during normal operation. Periodic inspection of these components is recommended. The procedure is as follows:

- Remove the Lower Body (see 8.2).
- Remove the Upper Body (see 8.6)
- Slacken the Exhaust Sinter Clamp Ring grub screw using the Allen key provided.
- Unscrew the Exhaust Sinter Clamp Ring.
- Lower the Clamp Ring/Exhaust Pipe, and withdraw the Exhaust Sinter downwards and out of the Flame Chamber.
- Tilt the withdrawn items to one side to clear the Flame Chamber and remove from the chassis.

Reverse the procedure to replace the exhaust system.



8.8 IGNITION GLOW PLUG INSPECTION AND REPLACEMENT.

- Remove the Lower Body (see 8.2).
- Remove the Upper Body (see 8.6).
- Slacken the glow plug Clamp Ring grub screw using the Allen key provided.
- Unscrew the Clamp Ring to remove the glow plug and its housing from the flame chamber.
- Carefully withdraw the glow plug from its housing taking care not to damage the exposed element.
- If the element shows signs of corrosion or damage, replace the glow plug. Before fitting a new glow plug check that its element has been lightly 'teased' out to improve ignition. Make sure that the glow plug is of the correct grade (see *Data Section of the manual*).
- Reverse the procedure to replace the glow plug and its housing.
- Replace the Upper and Lower Bodies (see 8.2 and 8.6).

Replacement Glow Plug kits are available, Order No. 47532.



9 trouble-shooting procedures

PROBLEM	ACTION, CAUSE	REMEDY
'Controlled Flow' continuous ERROR.	Check if Battery volts below 6.5V <i>7.0V</i> Check for restricted sample line, filter, probe	Replace batteries. Find source of restriction. Clear blockage or replace dirty filter element.
Flame will not light	Check: Sample flow. H ₂ Pressure above 280 psi (20 bar)? <i>75 psi (5 bar)</i> H ₂ Valve(s) open? Column connections	See above. If not, replace H ₂ refillable cylinder. <i>(Disposable cylinder).</i> Open if closed. Seal if leaking. Always allow at least 3 minutes for H ₂ flow to scavenge the supply system after changing H ₂ cylinder.
High or unstable ambient background level	Check whether contamination is external or internal	External: The unit is working! Internal: Allow to run in clean air for an extended period. In extremis, the Flame Chamber and associated piping will require decontamination. Consult supplier.
Sample pump will not run	Battery low? Over-temperature switch operated, and latched Faulty electronics	Change batteries. Remove inlet from high level source, then unlatch electronics by pressing any soft key. Return for repair.
No ignition – Pump speed slow but 'Controlled Flow OK'	Exhaust sinter blocked or saturated with water	Replace or dry out exhaust sinter.
Flame will not light again after a previous session of operation	Glow plug wet. (H ₂ flame burning in air produces heat and water)	Remove excess moisture from plug by blowing blowing. Replace plug To help prevent this happening, when shutting down always follow screen instructions and allow one minute of hydrogen flow after the Sample Pump has stopped.
Persistent 'flame-out' when taking sample with no overrange of reading.	Oxygen depleted sample	Use Range Extender to dilute the sample with ambient air.



10 using ancillary equipment

10.1 MONITORING ENCLOSED SPACES.

To maintain accuracy of readings, the oxygen level in a sample monitored by the Autofim II should not be less than 90% of the normal ambient level (ie. the sample should contain not less than 19% Oxygen). No problems should occur when surveying in the open air, however when monitoring samples from enclosed spaces such as bore holes on landfill sites, the sample could be oxygen deficient. To alleviate this effect, use can be made of the extreme sensitivity of the FID to allow dilution of the sample with ambient air, provided it is done in a controlled manner. If a dilution ratio of 10:1 is used, it becomes possible to monitor samples containing no oxygen at all.

The Research Engineers Range Extender provides this facility.

10.2 RANGE EXTENDER MEASUREMENT TECHNIQUES.

Before using the Range Extender it is recommended that you read the separate publication entitled; 'The Range Extender - Its Use and Calibration'.

The majority of samples (such as those from bore holes venting to atmosphere) are taken from points at atmospheric pressure. Under these conditions, the Range Extender may be used in the normal manner by noting the reading with the sample inlet in the area being monitored.

The dilution action of the Range Extender relies on the pressure drop across the ambient air filter assembly to induce a lower level of sample flow through its own filter assembly and adjustable restrictor. Thus for correct operation it is necessary to have equal pressures at both the ambient air inlet and the sample inlet. If the sample inlet is in a stack or containment vessel, then this condition may not be met. Under these circumstances, the following sampling technique is recommended:

First zero the instrument with both inlets in clean air. If this is difficult, remove the Range Extender and set zero using a standard Filter Assembly. Replace the Range Extender, insert the

sample inlet into the point to be monitored. Wait until the reading registers a maximum on the display, then withdraw the sample inlet from the monitor point and back into ambient pressure conditions. Take the reading as the sample in the sample line is drawn into the instrument.

If the pressure at the sampling point is below ambient pressure, this will reduce the sample flow (giving a low reading), and will reverse the flow if the sample inlet is at a lower pressure than that existing at the mixing junction in the Range Extender. A simple water manometer test will show if this is so, in which case recourse will have to be made to a pumped sample line.

10.3 CARBON FILTER APPLICATIONS

Using a carbon sample line filter provides a quick method of determining whether a hydrocarbon indication found during a surveying session is methane or not.

Sample the location first with the standard paper and hydrophobic filter, then substitute a filter body containing an additional carbon cloth element and re-sample.

If the reading taken with the carbon filter is noticeably lower than the first reading, then the sample monitored is not methane. The lower the carbon filter reading is relative to the standard filter reading, the heavier the components of the sample will be.

In certain instances, where only methane is to be monitored, a carbon filter may be used permanently in the sample line but the following points should be noted;

- Certain types of carbon filter introduce a noticeable response lag when surveying. The Research Engineers carbon filter system keeps this to a minimum.
- The sample 'zero' level presented to the Autofim II will vary according to the average contamination of the carbon filter which will slowly adsorb or desorb hydrocarbons in its attempt to balance with the current ambient levels.

Software Operation

To accompany instruments fitted with 'G65....' and subsequent software issues.

Issue:A 2nd. April 1997.

set-up menu ... section MT9

Option 2 - DayTime Display. The screen location of the clock/calendar is now time shared with the file name during logging. Hence if the clock/calendar is 'On' and a log file is opened the file name will alternate with the time display. If the time display is 'Off' a continuous display of the file name will be shown during logging.

Option 3 - Set up F-Index. Selection of this option will restart the filing system index and loose all directory information. For factory use only. This process is automatically run when the 'Delete All Files' option is selected in MT3 and if it is required to re-initialise the filing system then 'Delete All Files' should be used.

Option 4 - Softwar(e) Testing. Selection of this option will run the 'file open' routine. For factory use only. This process is included in the 'New Log' option of MT3 and the 'Chromatograph' function of MT5.

Option 5 - EEPROM Test. Selection of this option displays a 4 option selection screen. The options enable display & test of the EEPROM. Select option 1 - Display n_vol SRAM to view data held in the non volatile memory of the instrument. This data includes the calibration setting, screen brightness control, pump flow settings, flame temperature limits etc. A second screen of this data can be viewed by pressing one of the left-hand four keys. The second screen displays the addresses of the 25 file system index pages. Each index page (of flash memory) can hold the index data for 10 files.

data logger menu ... section MT3

Option 2 - New Log. The revisions to the log file system enable files to be referred to by a name as well as by number. This name consists of up to 18 alphanumeric characters including spaces. Note the file name is not downloaded to a PC when the file content is downloaded and is internal to the instrument. Refer to section ... MT4.

Option 3 - Read Log. The read log function now provides an option to select the log to read by name or number. If select by number is chosen, the procedure follows that shown in the manual page **MT3.3**.

If select by name is chosen, the display will show the 'Log File Selection' screen. This screen displays 10 file names and indicates by an arrow a selected file. The file number of the selected file is shown at top right of the screen. Use the 'Next Page' & 'Prev. Page' keys to switch to alternate pages of the file name index, there are 25 pages of 10 files. Use the up & down arrow keys to select a file within a page. The 'Abort' key returns the system to the menu. When the desired file has been located

press the 'S' key to select and view it. The 'Read File' screen now displays the file name after the file number.

Option 4 - delete Log - delete single log. The read log function now provides an option to select the log to read by name or number. If select by number is chosen the procedure follows that shown in the manual page **MT3.4**.

If select by name is chosen the display will show the 'Log File Selection' screen. This screen displays 10 file names and indicates by an arrow a selected file. The file number of the selected file is shown at top right of the screen. Use the 'Next Page' & 'Prev. Page' keys to switch to alternate pages of the file name index, there are 25 pages of 10 files. Use the up & down arrow keys to select a file within a page. The 'Abort' key returns the system to the menu. When the desired file has been located press the 'S' key to select and delete it.

Option 4 - delete Log - delete all of a type. The log types selection menu shown in the manual on page **MT3.5** has been changed to name the log types, rather than refer to log type numbers.

Option 4 - delete Log - delete all logs. The function 'delete all logs', as described on page **MT3.6**, erases the whole of the flash memory area. This operation is irreversible and now deletes not only the log files but also the filing system index pages. When the erasure is complete the index pages are re-written and prepared for the entry of new file data. In the event of a fault in the filing system, it can be restarted by the 'delete all logs' command.

Option 5 - log to IBM PC. The function 'log to IBM PC', as described on page **MT3.7**, has been revised to enable the instrument to download a file to a PC in a format suitable for receipt by the 'Terminal' program of 'Windows 3.1x' or the 'Hyperterminal' program of 'Windows '95'. The file so produced is now compatible with a spreadsheet program using the CSV (comma separated value) format or the 'Integraf' analysis package using a GAS (integraf compatible) format.

A chromatography file can be downloaded either as a xxxxxxxx.GAS file for subsequent analysis by the 'Integraf' software, or as a xxxxxxxx.CSV file for spreadsheet analysis. This flexibility enables a chromatograph of any duration to be examined in a spreadsheet should the limited span of the Integraf package be inconvenient. As soon as a chromatograph log file is selected to be downloaded, the screen text changes to offer the user a choice of GAS or CSV download formats. Ensure the chosen format matches the file type entered with the file name on the PC.

Note that the download software supplied with previous issues of the instrument software, for installation on the PC, is no longer required, the built in 'Windows' application packages being used instead.

Before downloading log files prepare & connect the interface kit 47921:

1) Preparation of Optical/RS232 Interface unit:

The Optical/RS232 interface unit translates data sent from the output port of the AutoFIM II via a fibre optic cable, to standard electrical signals suitable for the RS232 serial port of an IBM PC or compatible.

Remove the plastic lock screw from the battery compartment door and open.
Fit a 9V. PP3 battery in the battery compartment, re-close and replace screw

2) Connection of PC to AutoFIM II:

Connect the interface box to the communications port of the PC by means of the 9 way 'D' type connector, and to the AutoFIM II by means of the fibre optic cable provided in the kit. Refer to the illustration in the AutoFIM II operating manual on page 8 and check that the fibre optic cable is plugged into the rear connector on the instrument.

Note: If the serial port of the PC is fitted with a 25 way plug, a 9 to 25 way adapter will be required (not supplied).

3) Switch On the interface and note that the green LED is illuminated. If the red LED comes on or if neither LED is illuminated the battery should be replaced. To maximise battery life switch the interface Off after file transfer - do not leave On when not in use.

Prepare PC to receive the log file from the AutoFIM:

1) Windows 3.1x procedure.

From the Program Manager double click on the 'Accessories' icon to bring up the 'Accessories' window. In the 'Accessories' window double click on the 'Terminal' icon to bring up the terminal window.

The first time the terminal program is used to input AutoFIM log files, it will need to be set up. Click on 'Settings' and from the pull down menu which then appears click on 'Communications'. Select 19,200 baud, 8 data bits, 1 stop bit, none parity, hardware flow control, and 'Com1' or 'Com2' as appropriate to the connection used. Finally click on OK to close the communications settings window. Now click on 'File' in the windows menu bar and 'Save as' in the resulting pull down menu. Enter a name for the terminal settings file e.g. AUTOFIM and click on OK to save the set-up as AUTOFIM.TRM.

On subsequent use of the Windows Terminal program choose 'File' then 'Open', select the file 'AUTOFIM.TRM' and OK and the terminal program communication parameters will be set up as above.

Having set up the PC terminal program, a file can now be downloaded:

Click on 'Transfers' from the Windows menu bar and 'Receive text file' from the drop down menu. Choose a directory and file name and enter in the receive text file window. Note that for files intended to be read by a spreadsheet program the file type '**.CSV**' must be used and for chromatography files intended to be analysed by the 'Integraf' program '**.GAS**' is the required file type. Always enter the file type as part of the file name then click on OK. The button bar at the bottom of the terminal window will now carry the message - 'Receiving: xxxxxx.GAS/CSV' and the PC is awaiting the log file. On receipt of the file the text will appear in the terminal window. When the text stops running into the window at the end of the file click on the 'Stop' button at the bottom of the terminal window to close the PC file.

2) Windows '95 procedure.

Use the mouse pointer and click left to select the 'Start' button, bottom left of the window. From the pop-up menu select 'Programs', the top item. and from the 'Programs' pop-up menu select 'Accessories'. From the 'Accessories' pop up menu select 'Hyperterm' with the mouse pointer and left click to open the 'Hyper Terminal' window. At the 'Hyper Terminal' window double click the 'Hypertrm' icon which will open the 'New Connection - Hyper Terminal ' window. Give a name to the terminal settings file e.g. Autofim and select an icon for the settings file, then click on OK. In the 'Phone Number' window select the appropriate port either Com1,2,3 or 4 depending on the PC's port usage and click on OK. In the COMx properties window set the port's communication settings at Bits per second - 38,400, Data bits - 8, Parity - None, Stop bits - 1, and Flow control - Hardware, then click on OK. The bottom left button of the window now says 'Connected'. Click on the transfer item from the menu bar and from the drop down menu select 'Capture text'. Enter the desired file path and name to 'File' e.g. 'c:\path\file name.CSV'. Note that for files intended to be read by a spreadsheet program the file type '.CSV' must be used and for chromatography files intended to be analysed by the 'Integraf' program '.GAS' is the required file type. Always enter the file type as part of the file name then click on the 'Start' button to begin capture. Start the file download from the AuoFIM. The incoming text will scroll down the PC screen until the file transfer is complete. Now reselect 'Transfer' and 'Capture text' from the menu bar and drop down menu. Alongside 'Capture' will be an option to 'Stop' capture. Click on 'Stop' to terminate the file transfer.

To prepare AutoFIM II for log file download:

Referring to page **MT3.7** of the AutoFIM software manual, selection of the 'Log to IBM PC' menu option brings up the Baud rate selection menu. Note that at all baud rates the communications parameters are set to 8 data bits, one stop bit, and no parity. A maximum rate of 19,200 Bd. is available for use with 'Terminal' or 38,400Bd. for use with 'Hyperterm'.

After setting the baud rate the file to be read is selected by either name or number. If select by number is chosen the procedure follows that shown in the manual page **MT3.7**.

If select by name is chosen the display will show the 'Log File Selection' screen. This screen displays 10 file names and indicates by an arrow a selected file. The file number of the selected file is shown at top right of the screen. Use the 'Next Page' & 'Prev. Page' keys to switch to alternate pages of the file name index, there are 25 pages of 10 files. Use the up & down arrow keys to select a file within a page. The 'Abort' key returns the system to the menu. When the desired file has been located and the PC is prepared to receive the file, press the 'S' key to select it.

After selection of the file the display reads 'Downloading to PC..... ' as the data is output from the Autofim.

new log (file) ... section MT4

Selection of 'New log' (MT4) brings up the 'Log File Name Entry' screen which allows entry of an 18 character alphanumeric file name. If a file name is not entered it will default to a 3 digit number. Left and right arrow keys provide access to the character positions. Up and down arrow keys scroll the selected letter or number and a pair of

keys selects letters or numbers. Press the 'S'elect key when the file name is correctly entered. The next screen to appear is 'The maximum number of readings in log file' screen. This is a provision for a future development, just press 'S'elect to continue and bring up the 5 option menu (MT4).

Option 1 - new log - [timed intvl] The number of readings per second, minute or hour is selected as described in the manual on page MT4.2. The next screen is the 'Start new log file' summary screen which now reports the file name as well as the file number. After entry of any note reference as described on page MT4.3 the screen 'Set duration for auto logging' appears as described on page MT4.2.

Option 2 - log on demand The 'Start new log file' summary screen will appear and reports the file name as well as the file number. After entry of any note reference as described on page MT4.4 the measurement screen will re-appear with the data logger active.

Option 3 - log & barcode - reserved for future use

Option 4 - log & ext. log - reserved for future use

Option 5 - not used - reserved for future use

chromatography menu ... section MT5

Option 1 - chromatograph. Selection of 'Chromatograph' (MT5) brings up the 'Log File Name Entry' screen which allows entry of an 18 character alphanumeric file name. If a file name is not entered it will default to a 3 digit number. Left and right arrow keys provide access to the character positions. Up and down arrow keys scroll the selected letter or number and a pair of keys selects letters or numbers. Press the 'S'elect key when the file name is correctly entered. The next screen to appear is 'The maximum number of readings in log file' screen. This is a provision for a future development, just press 'S'elect to continue and bring up a new 5 option menu which permits selection of a time base for the chromatograph operation.

The 'Integraf' software package will handle a maximum of 3,600 inject cycle readings. If readings are taken at the rate of 4 per second this represents an inject time of 15 minutes. If the rate at which readings are taken is reduced to 2 per second 30 minutes of inject cycle data can be analysed. Whilst the inject cycle is running the AutoFIM screen will show 240 seconds of trace at 4 readings per second or 480 seconds of trace at 2 readings per second. Selection of the maximum Integraf time span is effectively controlling the rate at which the AutoFIM takes readings.

Integraf time span:	15	30	45	60	75	minutes
AutoFIM reads @	0.25	0.50	0.75	1.0	1.25	second intervals
AutoFIM shows	4	8	12	16	20	minutes in screen width

Note that backflush times are always 1.5 times the inject time.

After selection of a suitable time base for the chromatograph run the 'Start new log file' summary screen will appear. This screen now reports the file name as well as the file number. After entry of any note reference as described on page **MT5.2** the screen text appears:

Ensure the Survey/Chromatograph switch
is set to the Chromatograph position
& sample is in sample loop.
Ensure sample probe is in stable ambient
conditions - ready for base line setting
Press any key to continue

The sample should now be introduced to the sample loop and the probe placed in clean air ready for the zero level check which is activated by operation of any key. After the zero level has been re-checked the screen text changes to:

Zero checked..... Now switch from
BACKFLUSH
to
INJECT
to start chromatograph run.

Refer to page **MT5.3** where the Backflush/Inject switch is illustrated and further explanation is given.

Option 2 - Review Trace. On selection of review trace the option is provided to select the file by name or number. If select by name is chosen the display will show the 'Log File Selection' screen. This screen displays 10 file names and indicates by an arrow a selected file. The file number of the selected file is shown at top right of the screen. Use the 'Next Page' & 'Prev. Page' keys to switch to alternate pages of the file name index, there are 25 pages of 10 files. Use the up & down arrow keys to select a file within a page. The 'Abort' key returns the system to the menu. When the desired file has been located press the 'S' key to select and view it. The file number will alternate with the file name on the review trace screen (**MT5.7**).

Option 4 - Delete Log. Refer to section **MT3** - option 4 above.

Option 5 - Log to IBM PC. Refer to section **MT3** - option 5 above and note that a chromatography file can be downloaded either as a xxxxxxxx.GAS file for subsequent analysis by the 'Integraf' software, or as a xxxxxxxx.CSV file for spreadsheet analysis. This flexibility enables a chromatograph of any duration to be examined in a spreadsheet should the limited span of the Integraf package be inconvenient. As soon as a chromatograph log file is selected to be downloaded, the screen text changes to offer the user a choice of GAS or CSV download formats. Ensure the chosen format matches the file type entered with the file name on the PC.

c:\msworks\g65manu.wps

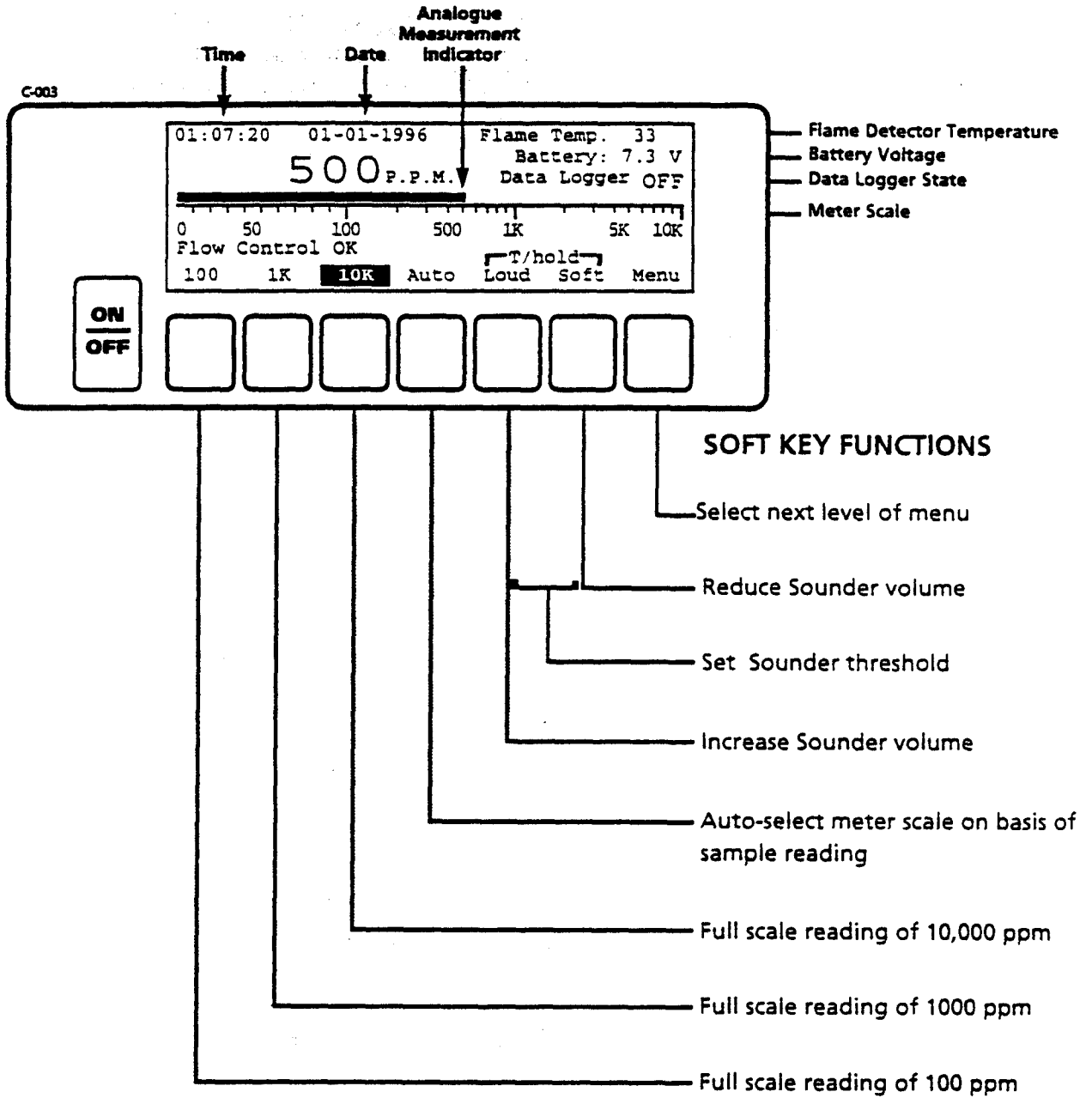


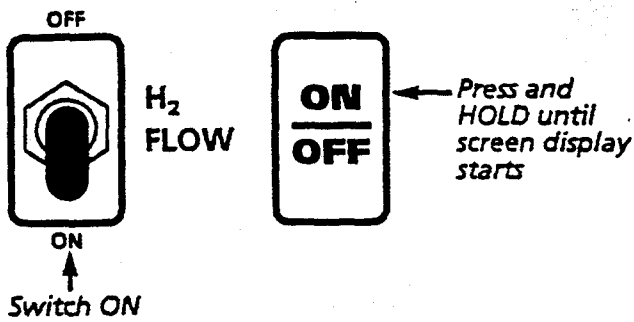
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measurement screen





switch on

CHROMATOGRAPH



SURVEY

For instruments fitted with a Gas Chromatograph facility, the Survey/Chromatograph switch should be left in the SURVEY position until the instrument is to be used to perform a Chromatograph

A-001 S1

Software revision: A
 Last calibrated: 01-01-1995
 * Flow * Date: 01-01-1996
 * OK * Time: 01:00:13
 Temperature: 23 C
 Battery voltage: 7.5 0
 AUTO start-up or....
 Press any switch to access Set-up Menu

□ □ □ □ □ □ □

← Screen will display

← For Set-up Menu - refer to Section MT9

M-001 S2

Check that Hydrogen cylinder and switch are both ON

Light-up cycle # 1

Glow Plug OK

Flame Temp. C

□ □ □ □ □ □ □

← After a short delay to allow the sample pump speed to stabilise, the screen will change to

The instrument will automatically cycle through the light up procedure until the FIM is lit and a stable flame is detected.

F-001 S3

Offset adjust setting

Zero level check

x10 Range

x1 Range

□ □ □ □ □ □ □

← When the F.I.D. has lit, screen will display

Whilst this screen is shown, the instrument automatically adjusts internal offsets and sets the initial zero level.

C-003 S4

01:07:20 01-01-1996 Flame Temp. 33 C
 Battery: 7.3 V
 0.0 P.P.M. Data Logger OFF

0 50 100 500 1K 5K 10K

Flow Control OK

100 1K 10K Auto T/hold Loud Soft Menu

□ □ □ □ □ □ □

← Then changes to Measurement Screen

The unit is now ready for use



switch off



← Press and HOLD until FIM shutdown procedure screen appears

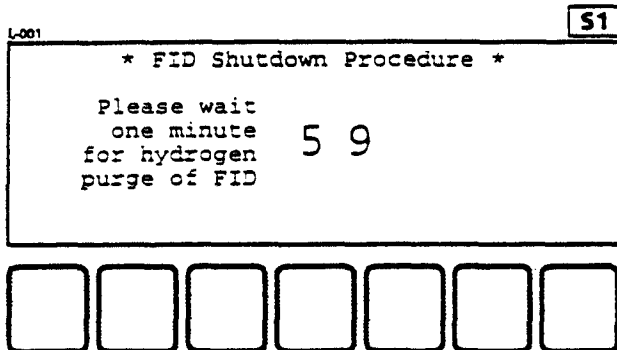
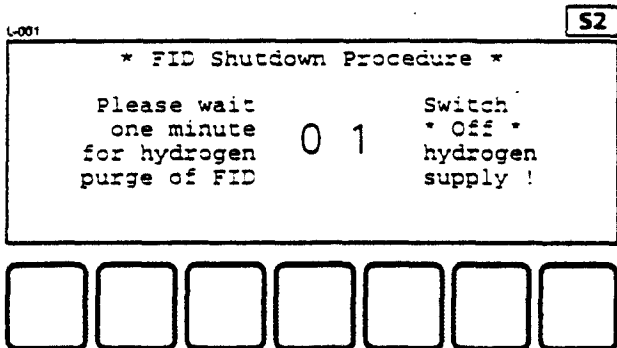
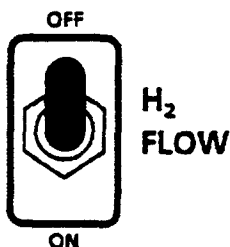


Figure counts down from 60 to 01 (seconds)



When the countdown reaches 01, an audible warning sounds and the message **Switch off Hydrogen Supply** appears

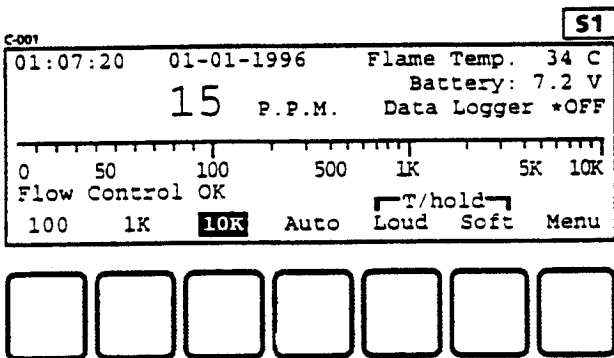


Switch off hydrogen supply at cylinder valve for long term shutdown

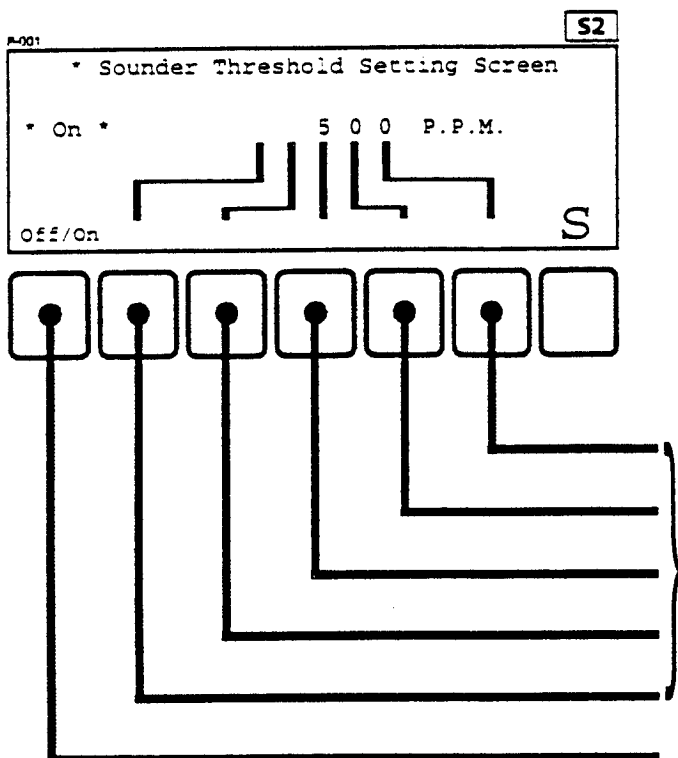


set sounder threshold

This function allows the user to preset the reading at which the sounder will automatically activate.



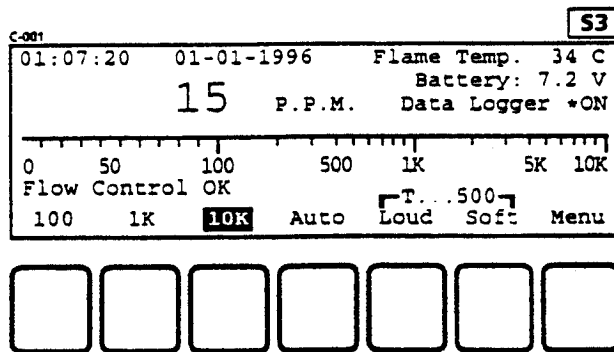
Press Loud and Soft simultaneously for T/hold function



Screen will display Sounder Threshold setting screen.

Press relevant soft key(s) to 'roll' figures to the required threshold level.

Press Off/On soft key to set sounder threshold to * On * then

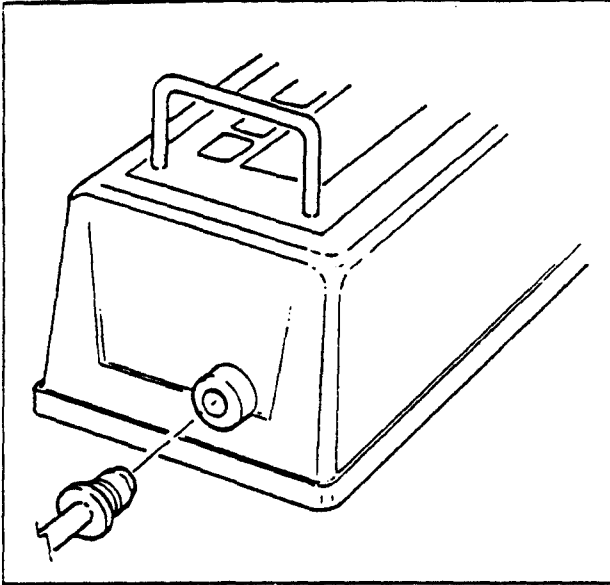


Press S

Measurement screen will display preset Threshold Sounder figure, e.g. T...500 This figure indicates that the Sounder will activate at 500 ppm or above.



headphones



If it is found necessary to use headphones, the socket adaptor fits into the end of the instrument case as illustrated.



using the menus

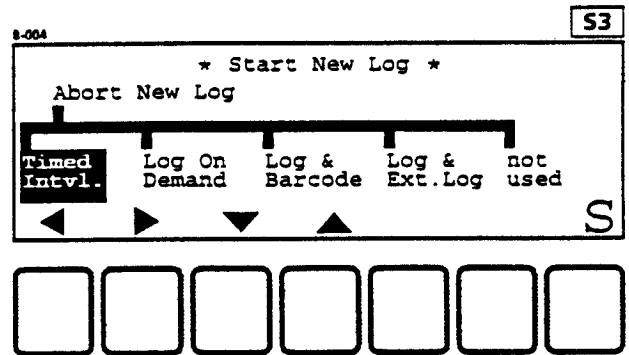
The Logger System and other software functions are accessed and controlled by a **Menu Tree** of options.

The Manual is divided into sections, each of which describes the functions available from one of the on-screen menus.

The complete **Menu Tree Guide** is shown on the first page of each section and the on-screen menus are designated MT1, MT2 and so on.

The route to the on-screen menu covered in the section is indicated by a *thickened line* in the Menu Tree at the front of the section.

Graphic explanation is given on each page, covering the function and use of each menu option.



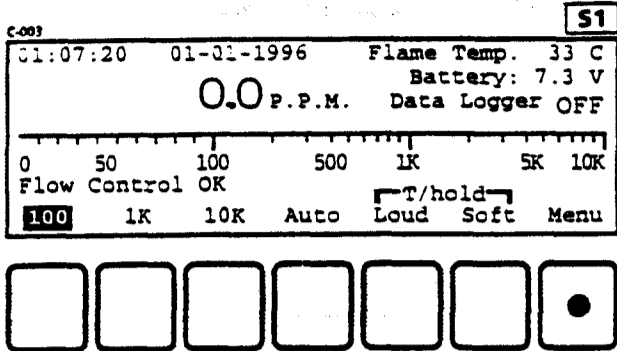
Screen displays are illustrated as shown above.

Each function is highlighted as applicable, and the reference number at the top right hand corner allows the user to repeat menu sequences by moving back through the system, e.g. from S4 to S1.

Soft key functions are indicated by the on-screen labels above the keys.



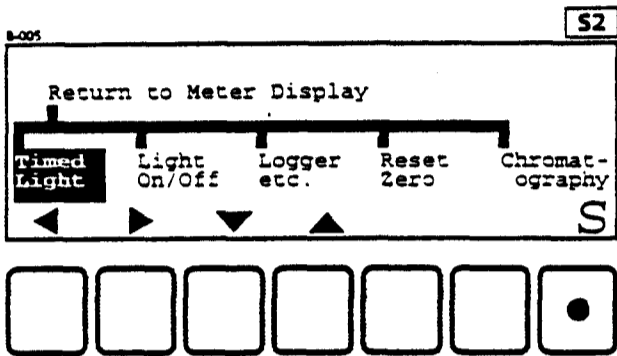
menu system access



Press MENU

to open first level menu

Note: If Data Logger is ON, turn to next page for option to switch OFF



Screen will highlight Timed Light

Press ◀ or ▶ ▼ ▲

to select Menu Option required. Highlighter will move across the options.

Press S

to enter selected menu option.

For further details on individual menu options, refer to relevant MT section



to switch logger off

This function allows logger to be turned OFF as required.

With logger OFF, readings will be displayed but will not be recorded in memory.

S1

C-001
01:07:20 01-01-1996 Flame Temp. 34 C
Battery: 7.2 V
15 P.P.M. Data Logger *ON

0 50 100 500 1K 5K 10K
Flow Control OK
100 1K **10K** Auto T/hold Loud Soft Menu

While data is being logged, screen will display
Data Logger ON

To switch Data Logger OFF
or access Menu System

Press MENU

S2

K-001
Data Logger * ON *
Please select:
Continue----Logging----Terminate

Screen will display
Continue—Logging—Terminate
EITHER

Press CONTINUE

to proceed with other menu functions with
logger ON

Display will change to Menu S4
OR

Press TERMINATE

to turn logger OFF

S3

C-005
00:34:54 01-01-1996 Flame Temp. 33 C
Battery: 1.1 V
50.4 P.P.M. Data Logger OFF

0 0.5 1.0 5 10 50 100
Flow Control OK
100 1K 10K Auto T/hold Loud Soft Menu

Display will return to measurement screen
with Data Logger OFF

Machine is now running with
Data Logger OFF

S4

B-005
Return to Meter Display
Timed Light Light On/Off Logger etc. Reset Zero Chromatography

Screen will highlight
Timed Light

Press ◀ or ▶ ▼ ▲

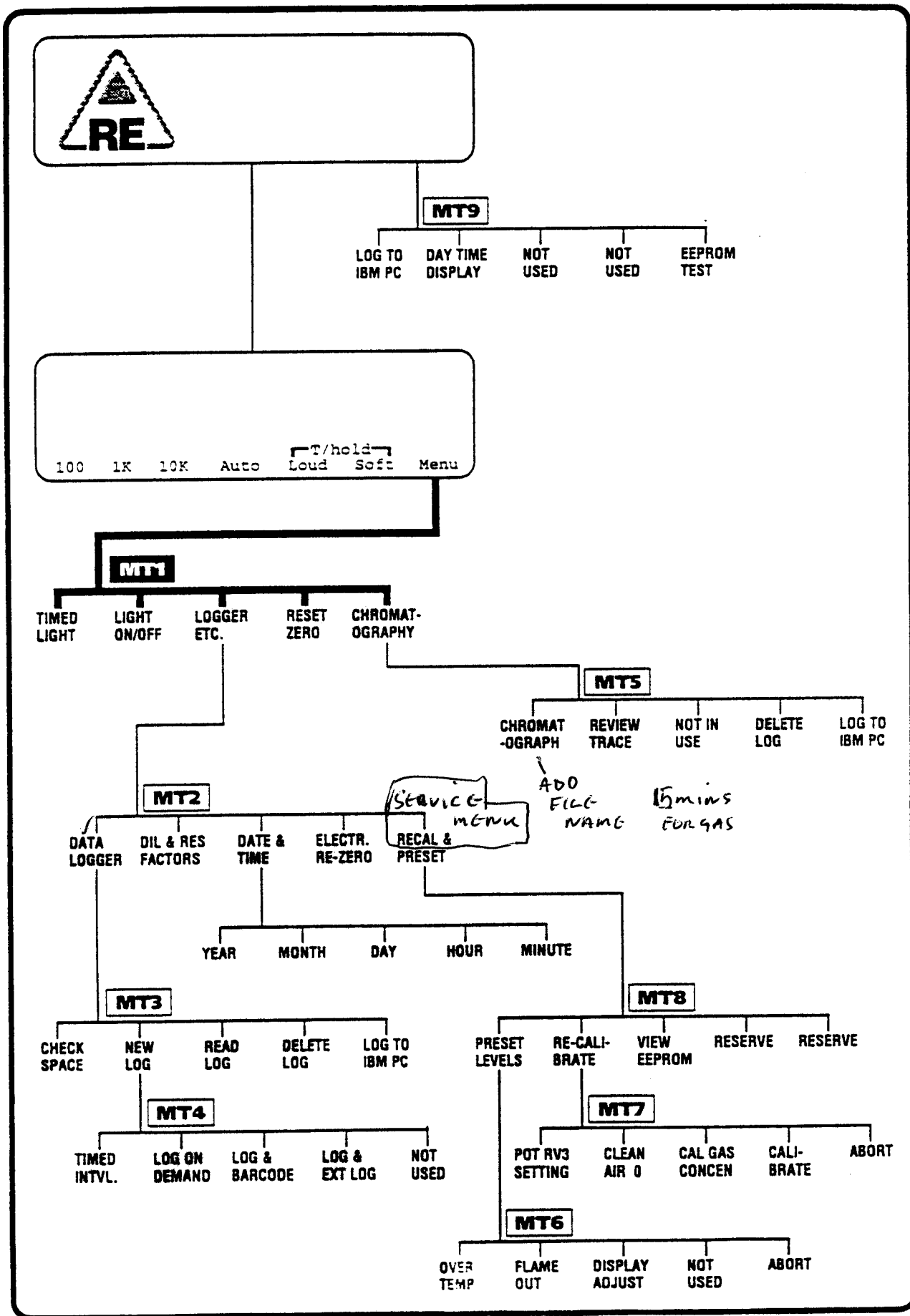
to select a menu option
then

Press S

to continue...



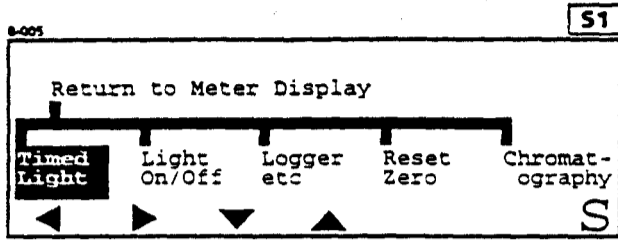
menu





backlight

The screen backlight can be switched on permanently, or switched on for 8-second periods.

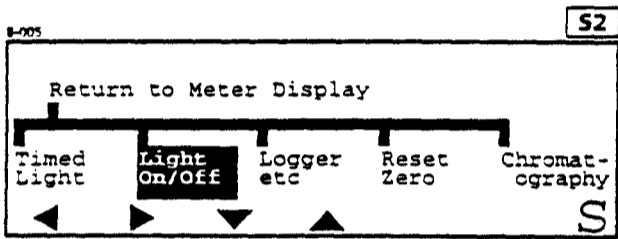


TO SWITCH BACKLIGHT ON FOR 8 SECONDS

Highlight Timed Light

Press **S**

Display will return to measurement screen and backlight will stay on for 8 seconds.

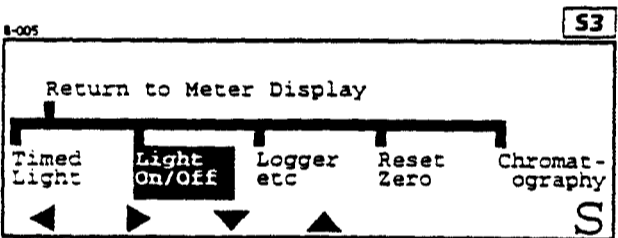


TO SWITCH BACKLIGHT ON

Highlight Light On/Off

Press **S**

Screen backlight will stay ON



TO SWITCH BACKLIGHT OFF

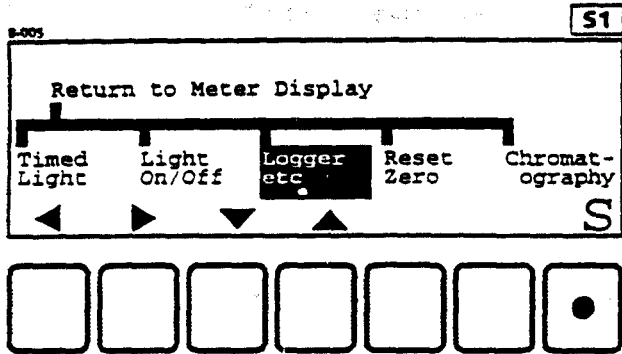
Highlight Light On/Off

Press **S**

Screen backlight will switch OFF



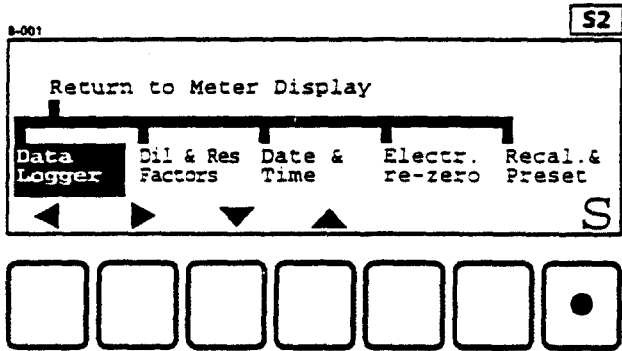
logger etc



Press ►

to highlight Logger etc then

Press S



Screen will highlight Data Logger

Press ◀ or ▶

to select menu option

Highlighter will move across the scale.

Press S

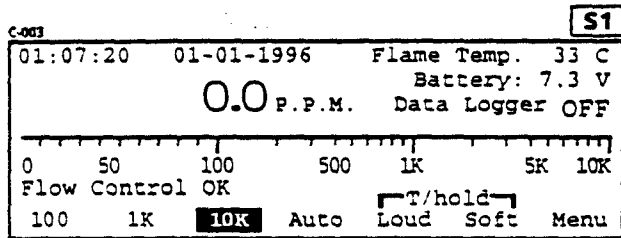
to enter selected menu option

Refer to
Section MT3
for description of these
menu options.



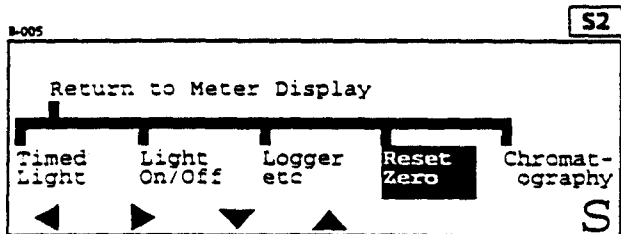
reset zero

This function allows the instrument to be reset to zero to correct for zero drift. If Reset Zero fails to zero the instrument, then electrical re-zero should be used (see Section MT2).



From Measurement Screen

Press MENU

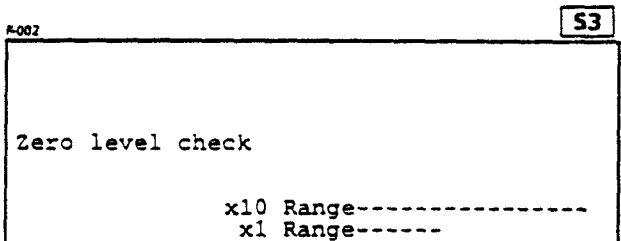


Screen will highlight Timed Light

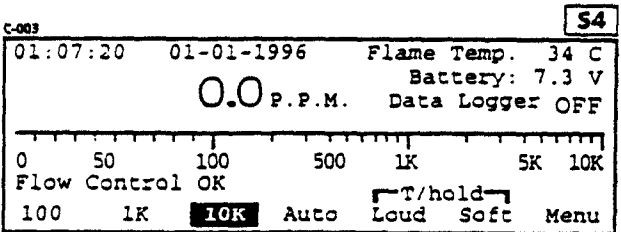
Press ▶

to highlight Reset Zero

Press S



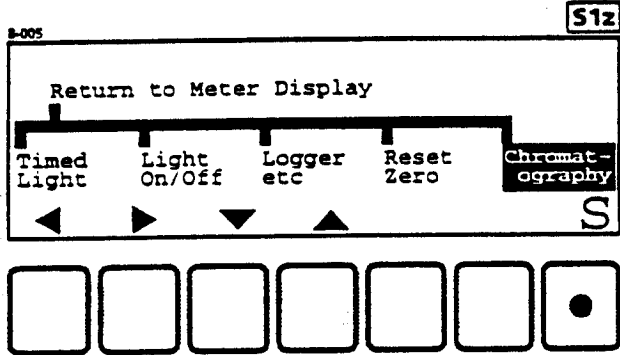
The instrument will carry out Reset Zero procedure automatically



When Reset Zero procedure is complete, the instrument will return to Measurement Screen



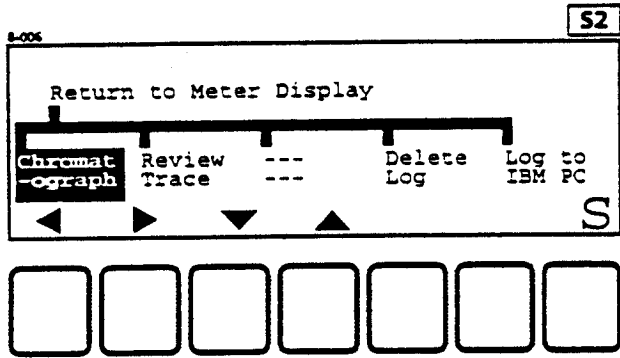
chromatography



Press ▶

to highlight Chromatography

Press S

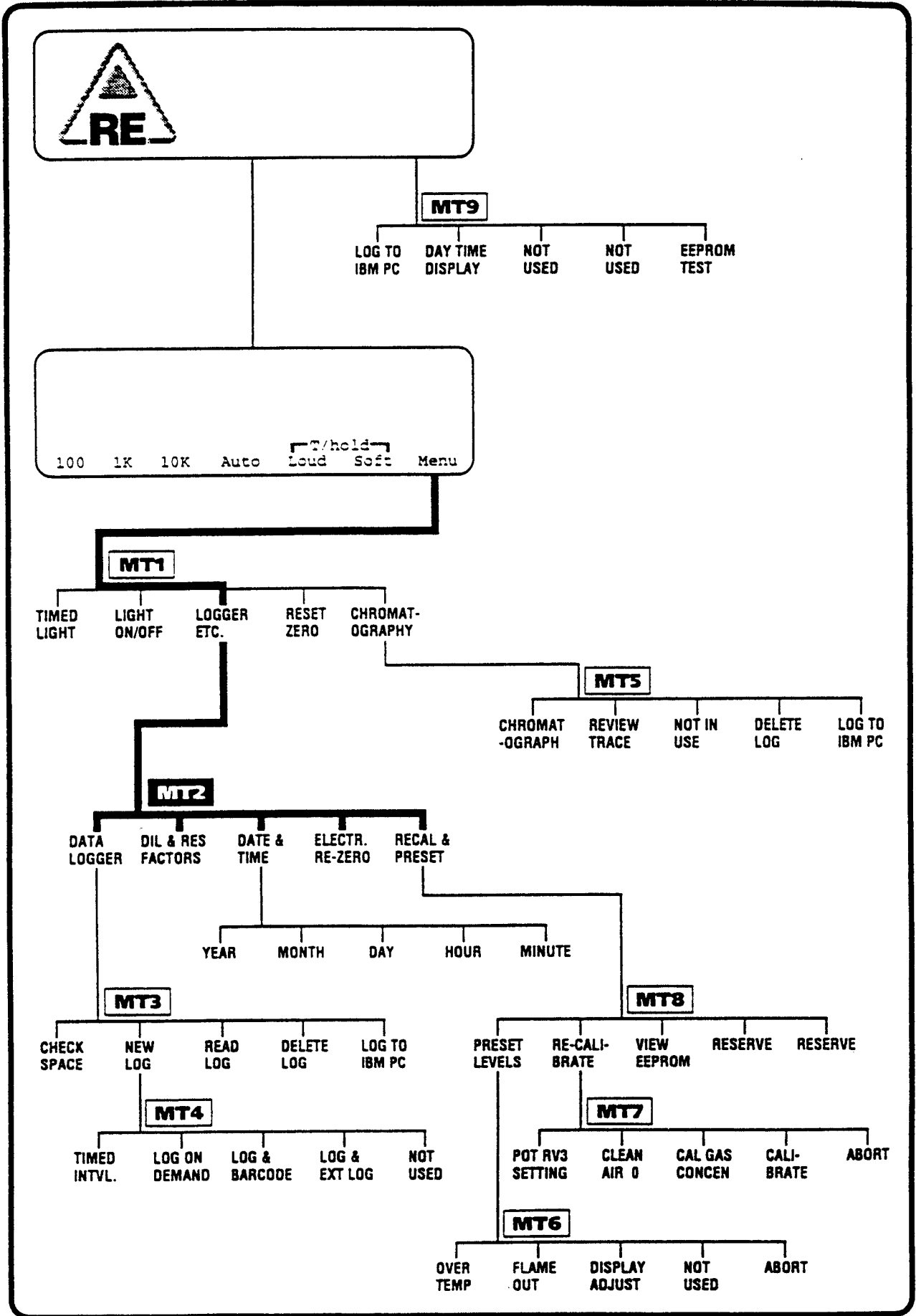


The display will change to the Chromatography Menu

Refer to
Section MT5
for description of these
menu options.

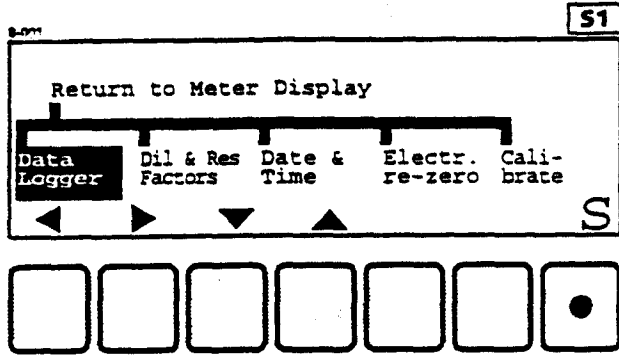


logger etc



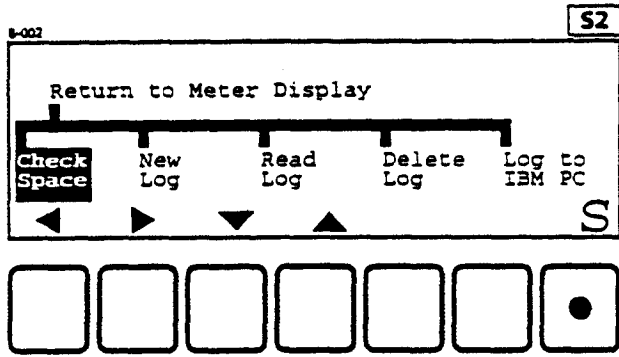


data logger



Highlight Data Logger

Press S



Screen will highlight Check Space

Press ◀ or ▶

to select menu option required.
Highlighter will move across the menu.

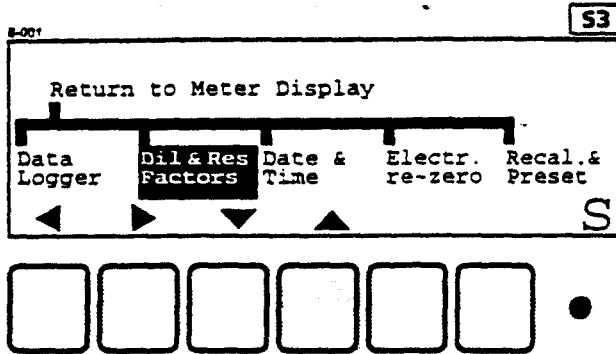
Press S

to enter selected menu option

The Data Logger menu functions
are fully described in
Section MT3

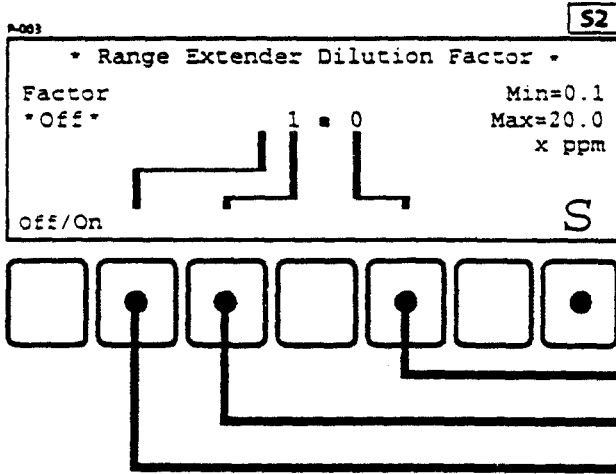


dilution and response factors



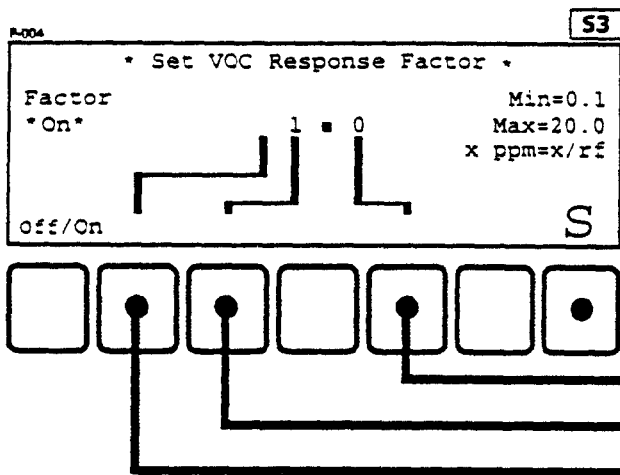
From Logger etc screen will highlight Data Logger
Move highlighter to Dil & Res Factors

Press S



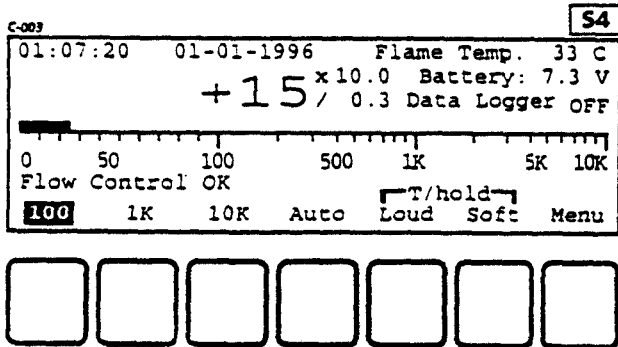
Screen will display Range Extender Dilution Factor with Factor OFF
Switch Factor ON if required.

Scroll figures to required dilution factor



Press S to proceed
Screen will display Set VOC Response Factor
Switch Factor ON if required

Scroll figures to required dilution factor



Press S to proceed
The flashing indicators of response and dilution factors replace the normal indication of ppm to alert the user that the digital display has had the response and dilution factors applied.



set date and time

Select the Date & Time option from the Logger etc menu MT2

8-003 S1

Date 01-01-1996 Time: 01:15:57

Start clock

Year Month Day Hour Minute

◀ ▶ ▼ ▲

S

◻ ◻ ◻ ◻ ◻ ◻ ◻

8-003 S2

Date 01-01-1996 Time: 01:15:57

Start clock

Year **Month** Day Hour Minute

◀ ▶ ▼ ▲

S

◻ ◻ ◻ ◻ ◻ ◻ ◻

8-003 S3

Date 01-01-1996 Time: 01:15:57

Start clock

Year Month **Day** Hour Minute

◀ ▶ ▼ ▲

S

◻ ◻ ◻ ◻ ◻ ◻ ◻

8-003 S4

Date 01-01-1996 Time: 01:15:57

Start clock

Year Month Day Hour Minute

◀ ▶ ▼ ▲

S

◻ ◻ ◻ ◻ ◻ ◻ ◻ ●

8-003 S5

01:15:57 01-01-1996 Flame Temp. 33 C

Battery: 7.3 V

0.0 P.P.M. Data Logger OFF

0 50 100 500 1K 5K 10K

Flow Control OK T/hold

100 1K 10K Auto Loud Soft Menu

◻ ◻ ◻ ◻ ◻ ◻ ◻

Press ◀ or ▶

to highlight one of:

YEAR

MONTH

DAY

HOUR

MINUTE

Seconds will be zeroed when Hour/Minute has been entered

as required.

Press ▲ or ▼

to change the Date or Time figure selected above

When correct Date and Time has been entered

Press ◀ or ▶

to scroll highlighter round to Start clock

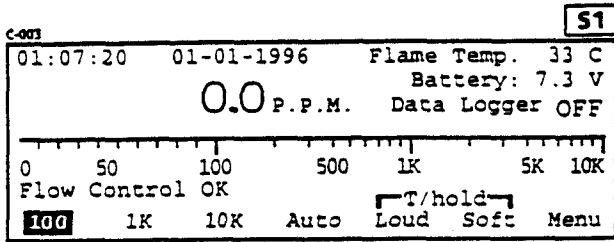
Press S

Display will return to Measurement Screen



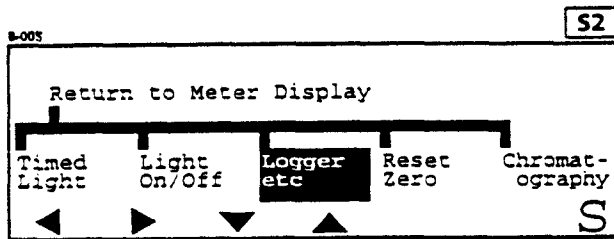
electrical re-zero

Electrical re-zero should be used in extreme ambient conditions if normal re-zero fails to result in a zero reading



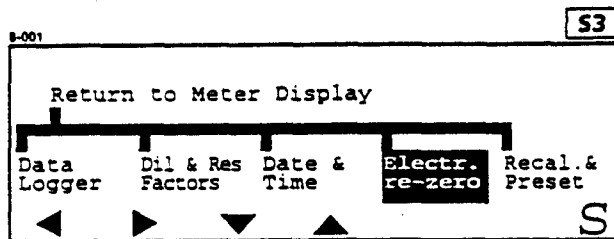
From Measurement Screen

Press MENU



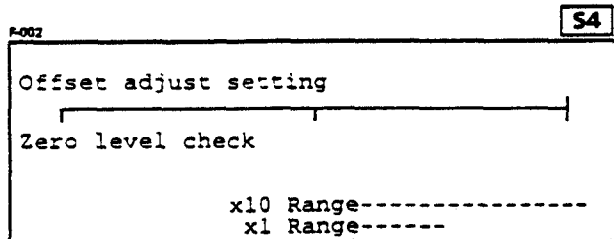
Screen will highlight Timed Light
Move highlighter to Logger etc

Press S



Screen will highlight Data Logger
Move highlighter to Electr. re-zero

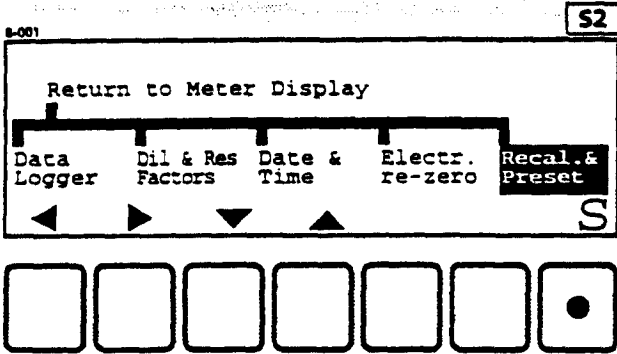
Press S



Screen will display Offset adjust setting and carry out electrical re-zero procedure automatically.
When electrical re-zero is complete, the machine will return to Measurement Screen.

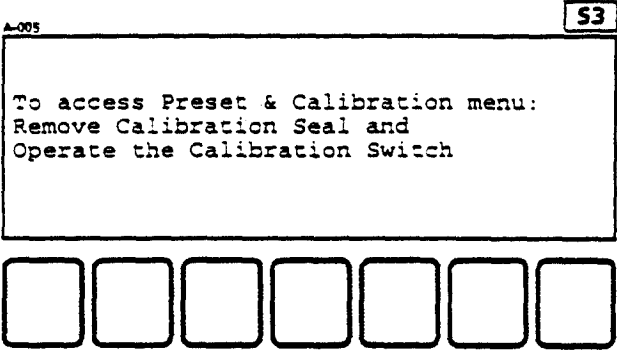


recalibrate and preset

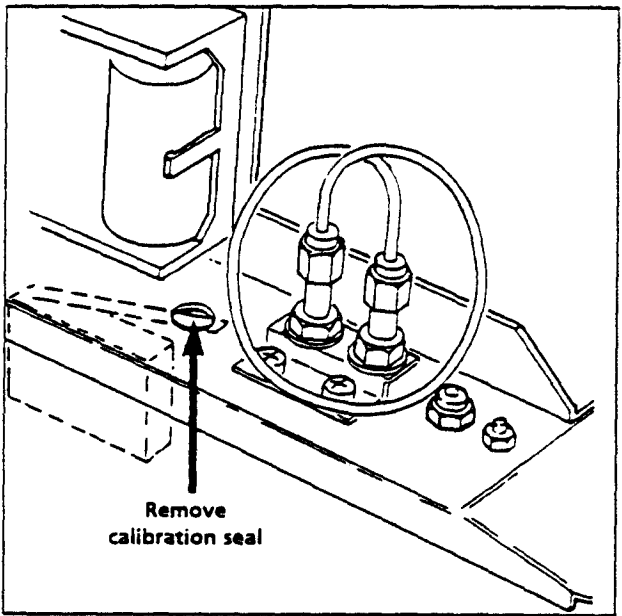


Move highlighter to Recal. & Preset

Press S



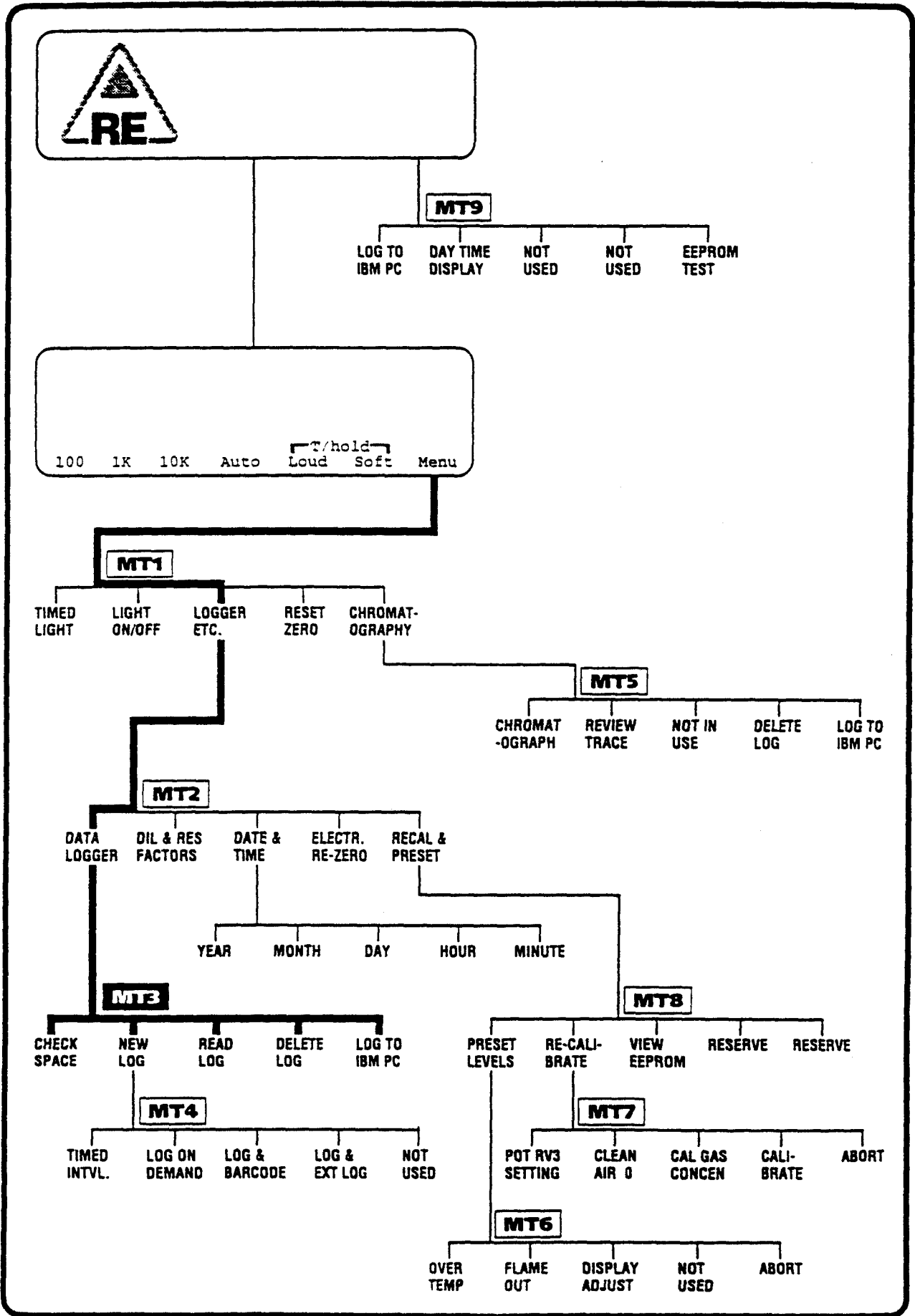
Follow instructions on the screen. Refer to illustration.



Refer to Section MT8



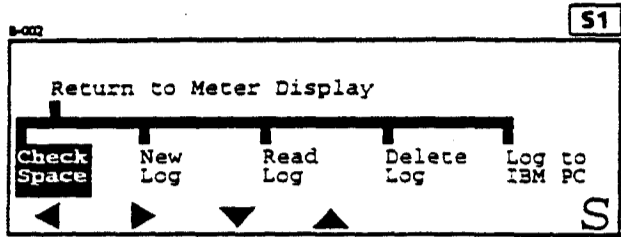
data logger





check space new log

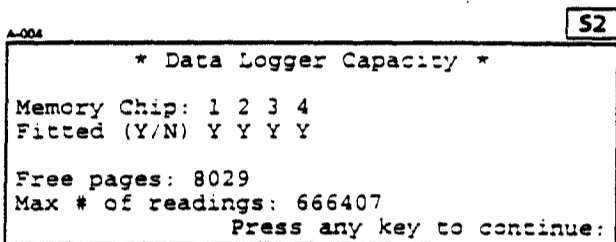
This facility allows the user to check space available in data logging memory.



After selection of Data Logger option from previous menu, screen will highlight Check Space

Press **S**

to view Data Logger capacity

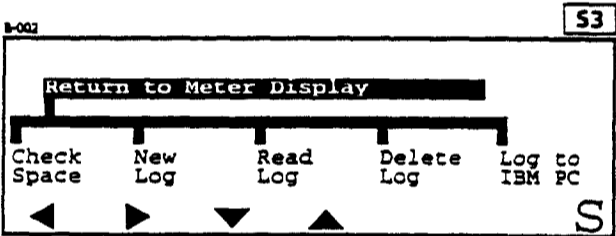


Screen will change to Data Logger Capacity

The screen detects and reports the presence of up to 4 flash memory chips, then checks for unused pages (256 bytes) of memory

Press any key

to continue



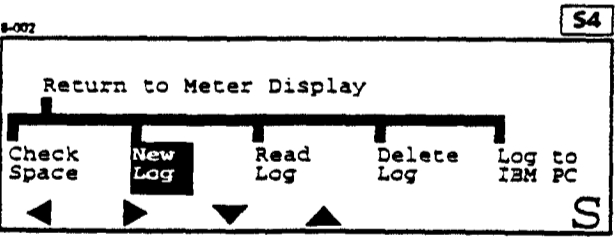
Screen will highlight Return to Meter Display

Press **S**

or

Press **▼** and **▶**

to highlight New Log



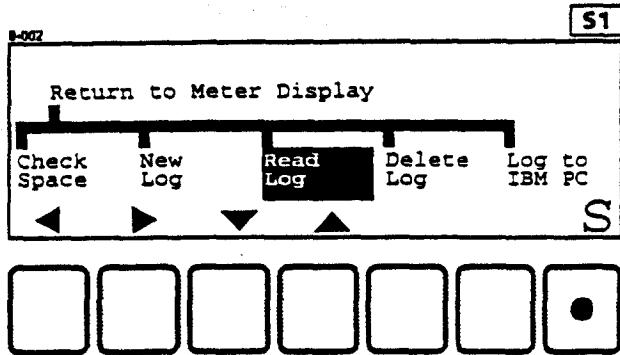
Press **S**

to enter New Log menu and refer to section MT4



read log

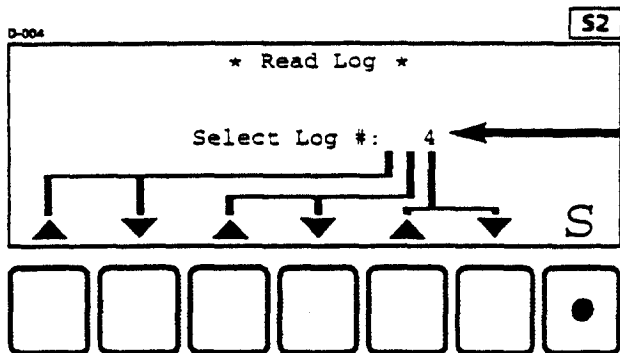
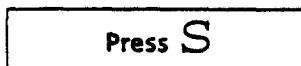
This facility allows the user to read a log file held in memory.



To highlight Read Log



to move highlighter to Read Log then

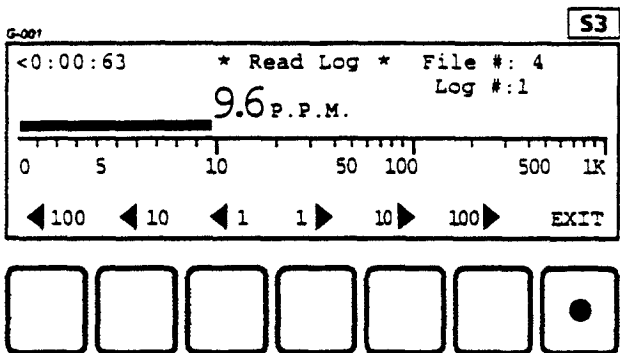


Screen will change to Read Log

To select Log file number



as applicable to each digit.

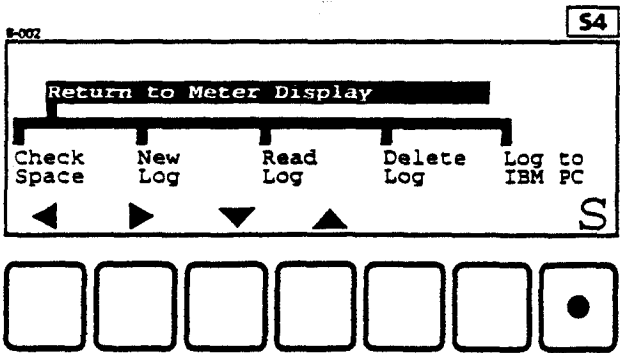


Screen will display Read Log and indicate log file number and log number.



to move forward and backward in the log file by 1, 10 or 100 records

To return to menu



Screen will highlight Return to Meter Display



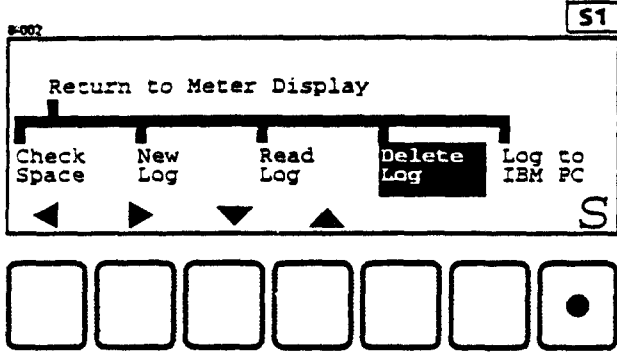
to continue and return to Meter Display, or ↓ and → to highlight Read Log and repeat read log procedure



delete log delete single log

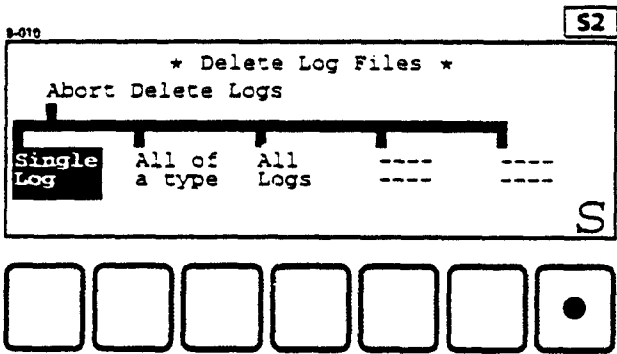
This facility allows the user to delete a Log File from the memory.

To delete a series of Log Files, this sequence must be followed for each deletion required.



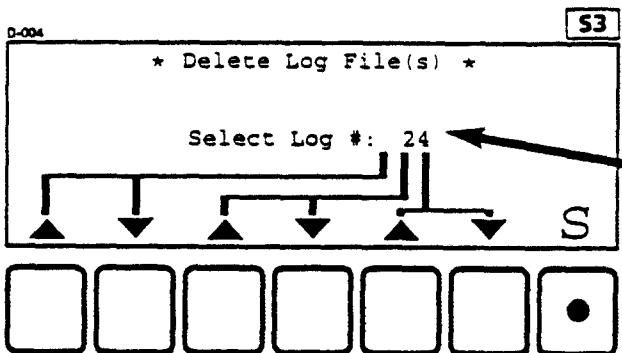
Screen will highlight
Delete Log

Press S



Screen will display
Single Log

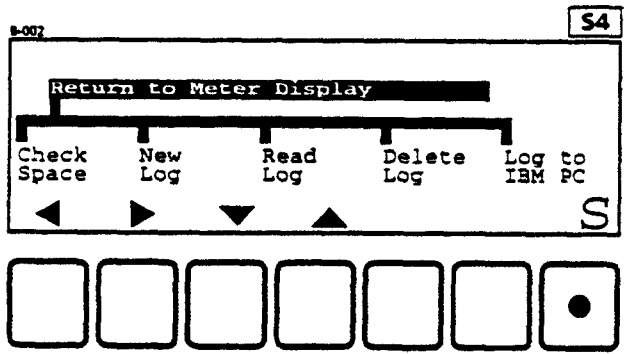
Press S to continue



Screen will change to Delete Log File(s)

Press ▲ or ▼ to change each digit as required until correct log file number is indicated

Press S
Log File will be deleted



When file has been deleted, screen will highlight
Return to Meter Display

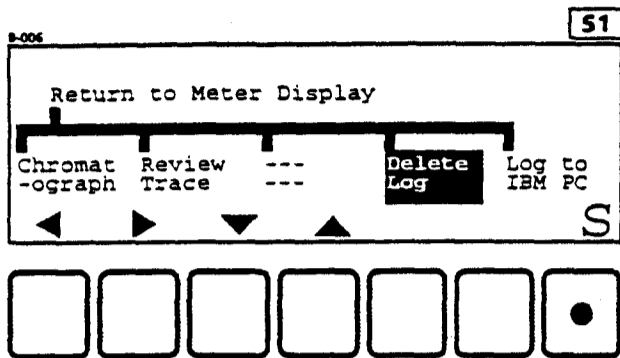
Press S to continue and return to meter display, or

Press ▼ or ▶ to highlight Delete Log and repeat deletion procedure



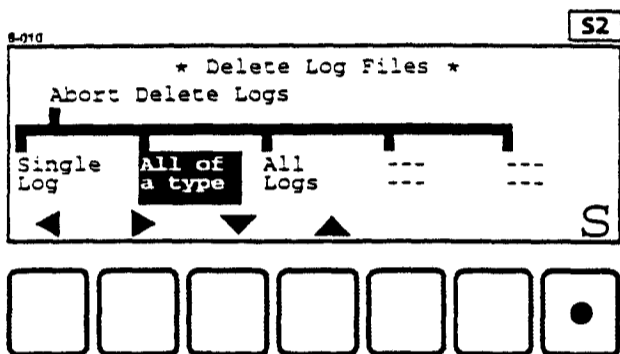
delete log delete all of a type

- Type 1 = Timed Interval Log Files
- Type 2 = Log on Demand Log Files
- Type 3 = Chromatography Log Files



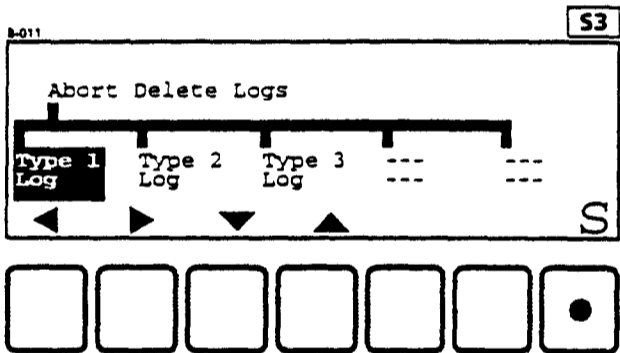
Highlight Delete Log

Press S



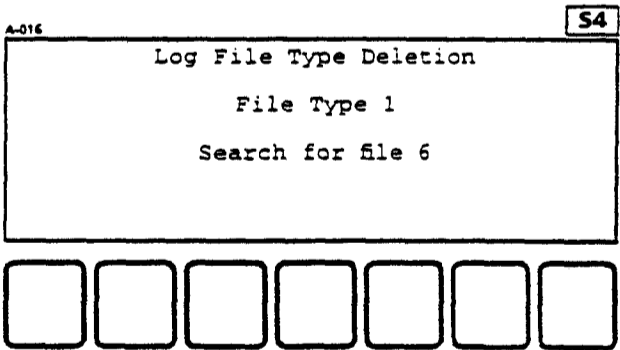
Screen will highlight
Single Log
Move highlighter to
All of a type

Press S



Move highlighter to
Select Type 1, Type 2 or Type 3 as required

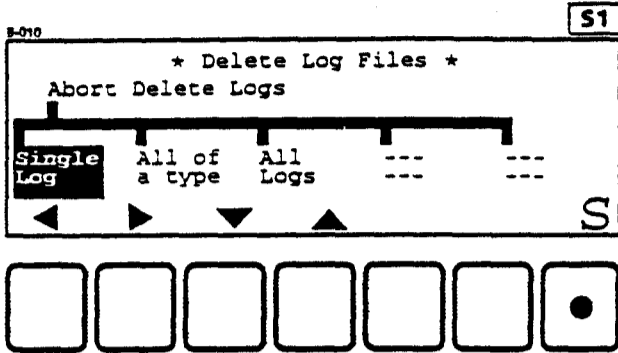
Press S



File deletion is automatic from this point.
When file deletion is complete, screen will
return to
Data Logger menu (S1)



delete log delete all logs



TO DELETE ALL LOGS:

From the Data Logger menu (MT3) Delete Log option

Highlight Delete Log

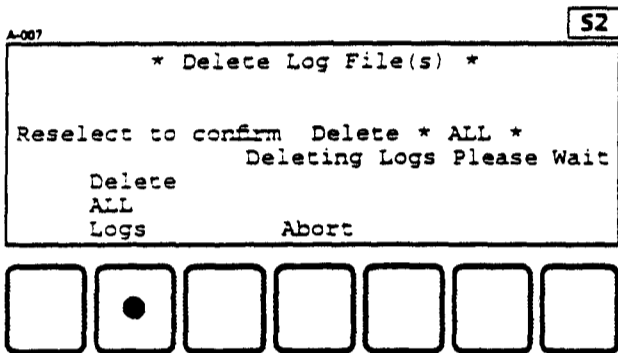
Press S

Screen will highlight

Single Log

Move highlighter to All Logs

Press S



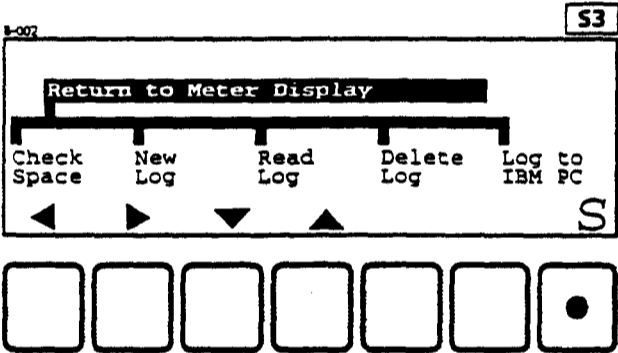
Screen will prompt:

Reselect to confirm Delete * ALL *

Press Delete ALL Logs

at either command* screen will return to menu display.

* At Delete command, screen change will not occur until file deletion is completed.



Press S

to continue

or

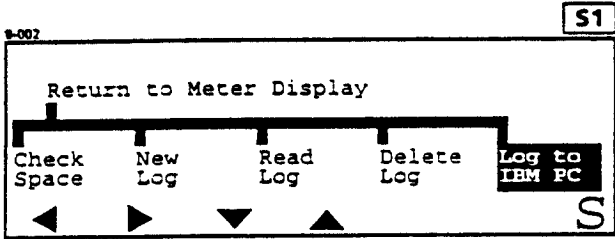
Press ▼ ◀ or ▶

to access logger menu.



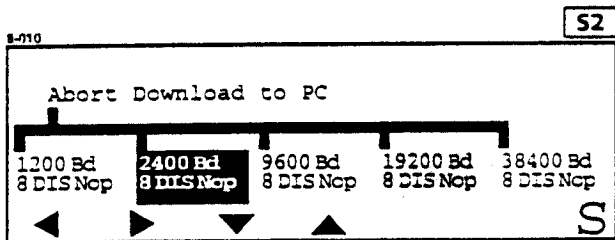
log to IBM PC

This facility allows the user to download log files to an IBM PC or compatible



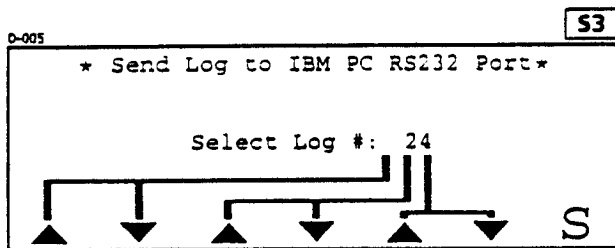
to highlight

Log to IBM PC



Connect the RS232/Fibre optic interface box between the Autofim and the PC and switch on.

Run the R. E. download program on the PC Highlight the baud rate to match the setting on the PC



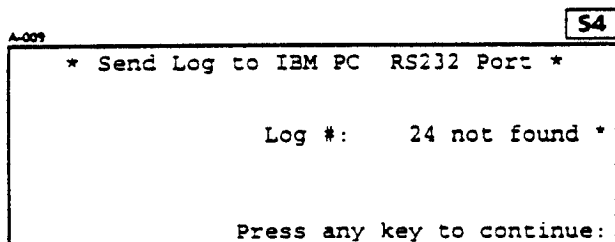
Screen will display Send Log to IBM PC RS232 Port

Press ▲ or ▼ as applicable to select the Log File to be downloaded.

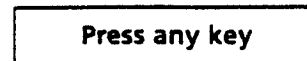
When the PC is ready to receive the file



to download.



If the Log File entered in S3 was invalid, the not found warning message will appear

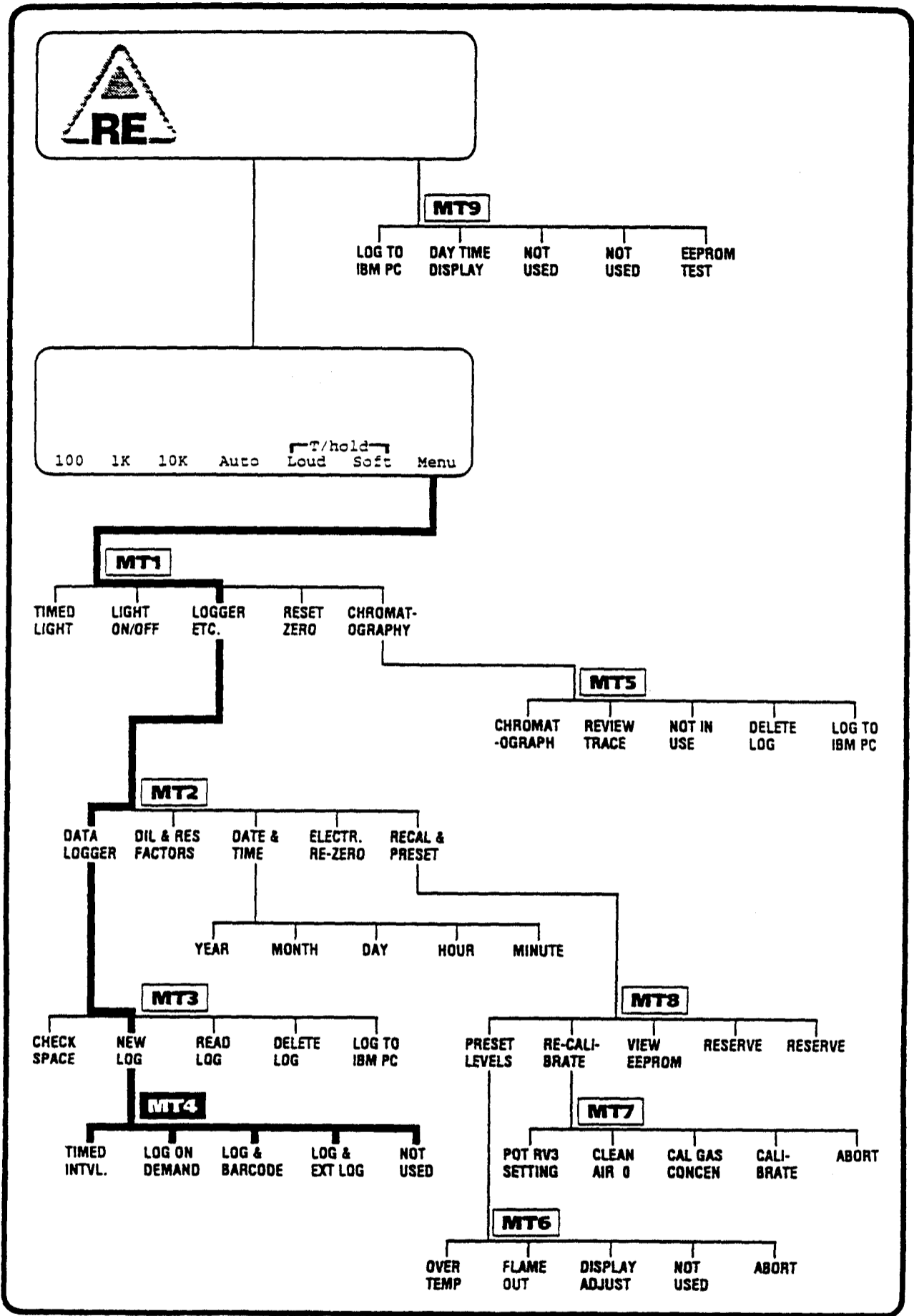


to continue.

Screen will return to S1



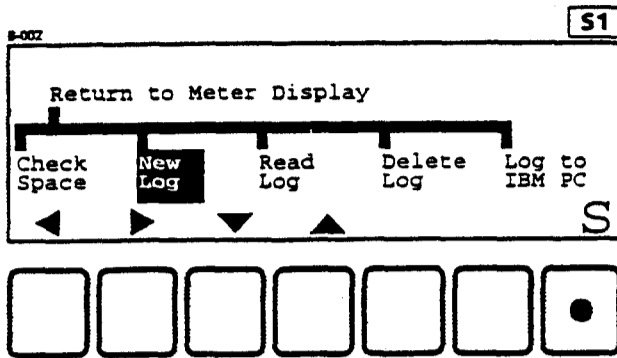
new log





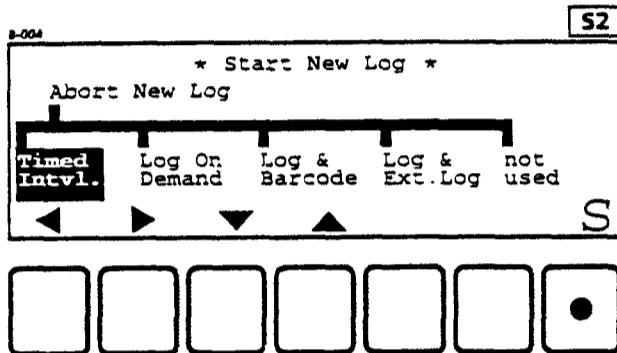
new log - [timed intvl] - 1

This function starts a new log file



On the Data Logger menu MT3 move the highlighter to New Log

Press S



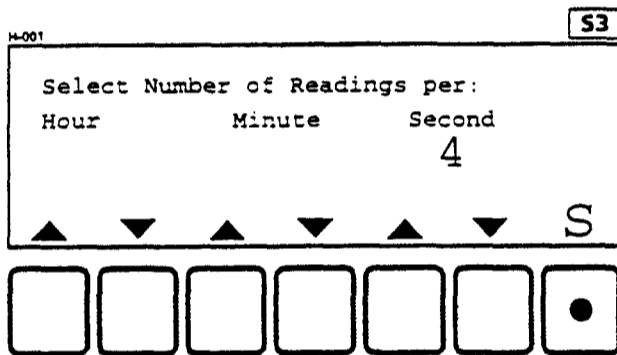
Screen will highlight Timed Intvl

Press ◀ or ▶

To move the highlighter across the menu and turn to following pages OR

Press S

to select Timed Intvl logging



Screen will display

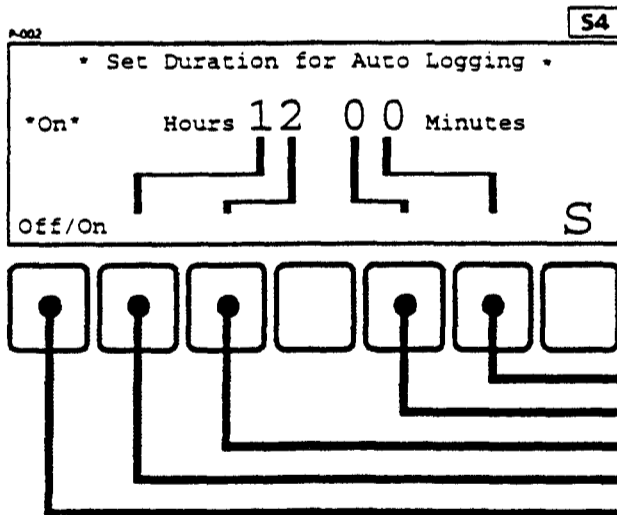
Select Number of Readings per:

Press ▲ or ▼

to change rate of reading per hour, minute or second as required.

Options are: HOUR : 1, 2, 4, 10, 20, 30
 MINUTE : 1, 2, 4, 10, 20, 30
 SECOND : 1, 2, 4

Press S



Screen will display

Set Duration for Auto Logging

EITHER

set time period and switch timer On

OR

switch timer Off

Press relevant soft keys to 'roll' figures to the required time period

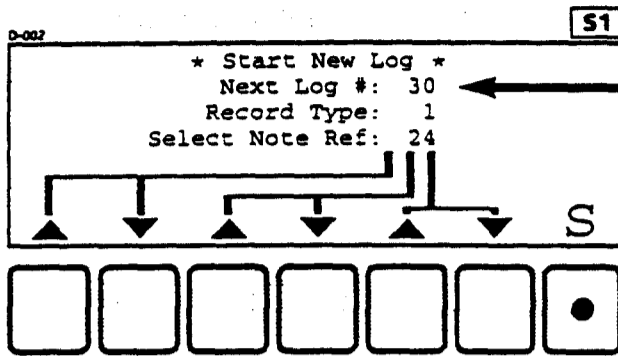
Press S

Press to switch timer On or Off



new log - [timed intvl] - 2

continued from previous page



Screen will change to Start New Log

The next Log # will be automatically allocated by the instrument and should be noted by the user.

* The Note Ref refers to a number which the user may choose to refer to written notes taken in conjunction with the log file.

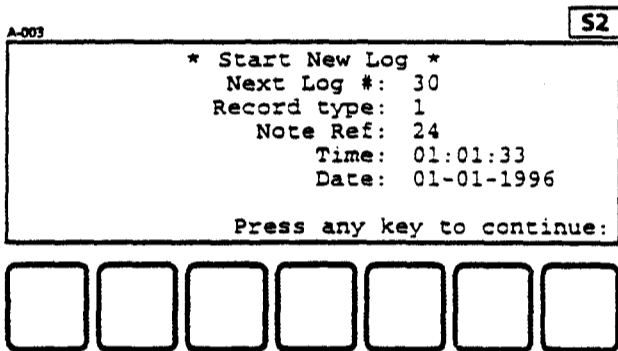
To change each digit as required



until correct Note Ref. is indicated

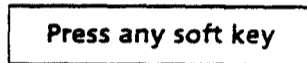


to continue

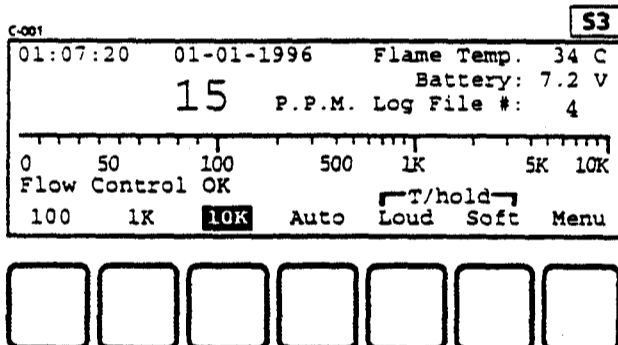


Screen will display the header information for the new log file

Note the log file number



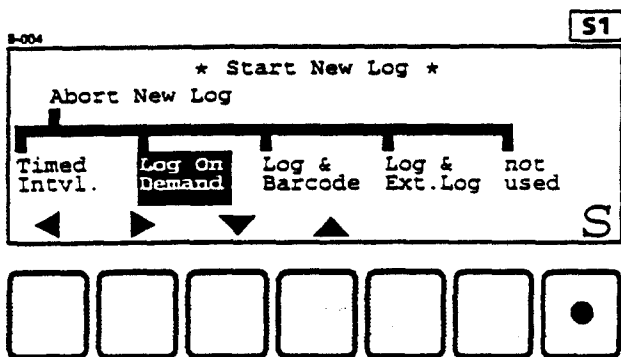
to continue



Display will return to Measurement Screen with Data Logger ON and Log File # shown

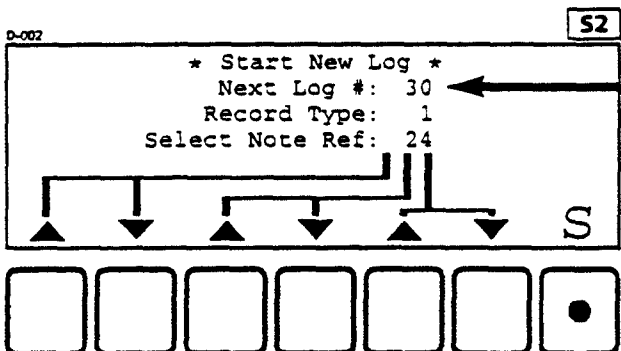


log on demand (1)



Use ◀ ▶ soft keys to highlight Log On Demand

Press S



Screen will change to Start New Log

The next log # will be automatically allocated by the instrument and should be noted by the user.

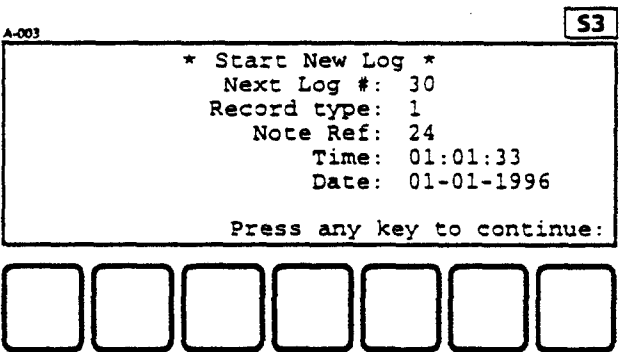
* The Note Ref refers to a number which the user may choose to refer to written notes taken in conjunction with the log file.

To change each digit as required

Press ▲ or ▼

until correct number is indicated

Press S



Screen will display the header information for the new Log File

Note the Log File Number

Press any key

to continue...



log on demand (2)

When log on demand logging is active, the Loud and Soft soft keys change function to Hold and Log.

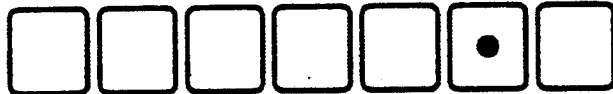
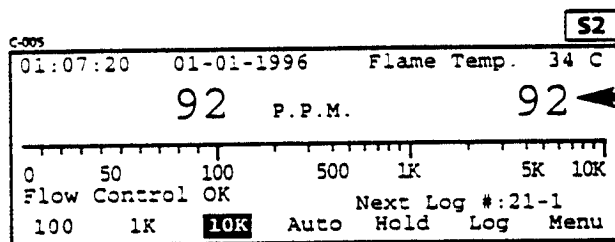
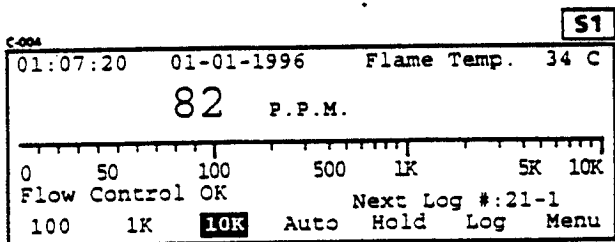
With Hold and Log on the measurement screen:

Press HOLD

to retain a specific reading on screen then

Press LOG

to log that specific reading to the log file

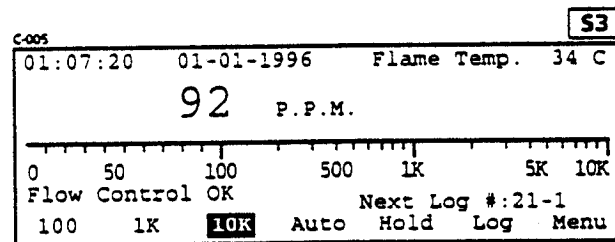


Press HOLD

P.P.M. figure to the left of the screen will be copied to the right

To log the right hand number

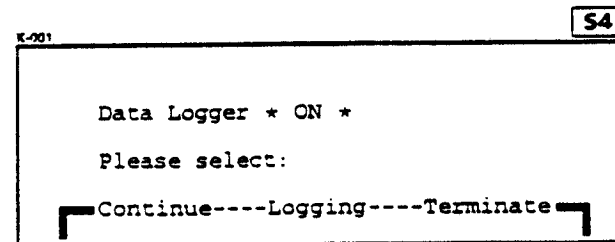
Press LOG



Right hand number will be cleared from the screen and stored in the Log File.

To close the Log on Demand log file

Press MENU



To continue in Log on Demand

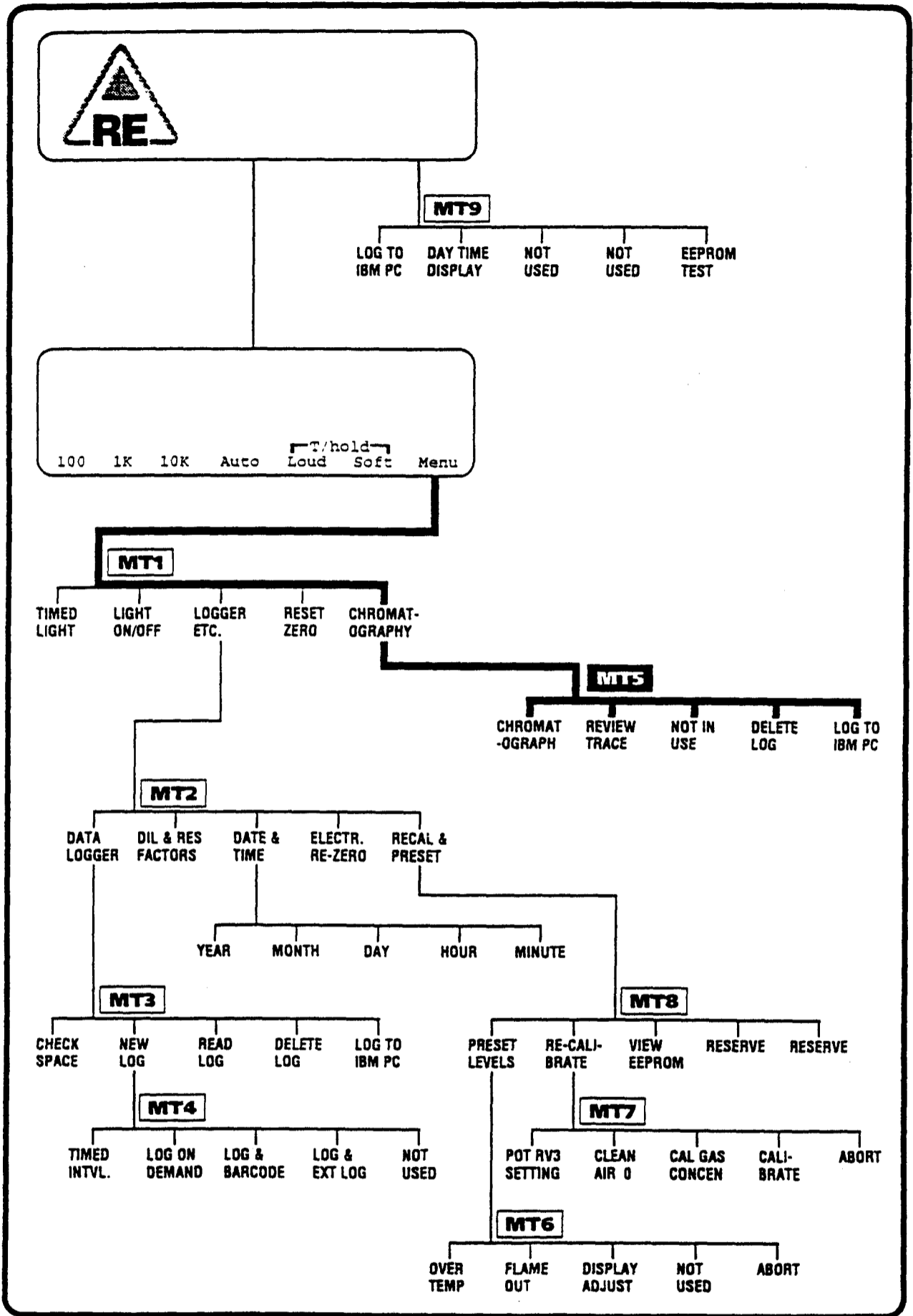
Press CONTINUE

To close the Log on Demand log file

Press TERMINATE

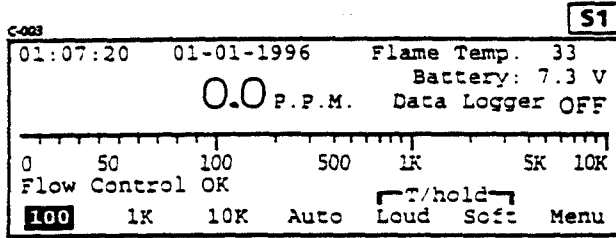


chromatography





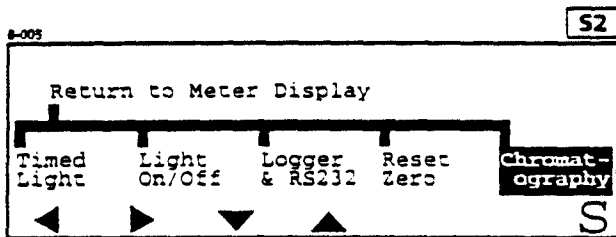
chromatograph



From Measurement Screen



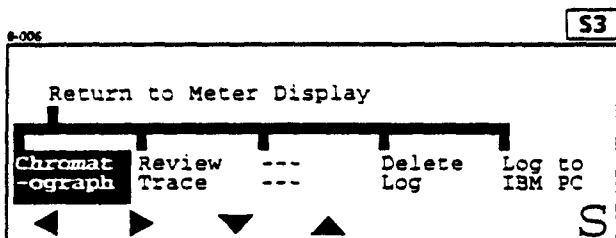
Press MENU



Screen will highlight Timed Light
Move highlighter to Chromatography.



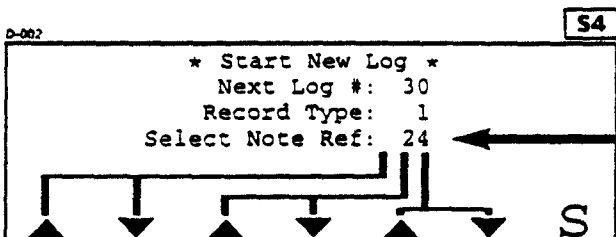
Press S



Screen will highlight Chromatograph.



Press S



Screen will change to Start New Log to open a log file to store the results

To change each digit as required



Press ▲ or ▼

until required Note Number is indicated

Press S

continue...



chromatograph

A-003 S1

```

* Start New Log *
  Next Log #: 30
  Record type: 1
  Note Ref: 24
  Time: 01:01:33
  Date: 01-01-1996

  Press any key to continue:
  
```

From previous page, screen will display
Start New Log
 Note the new log file number

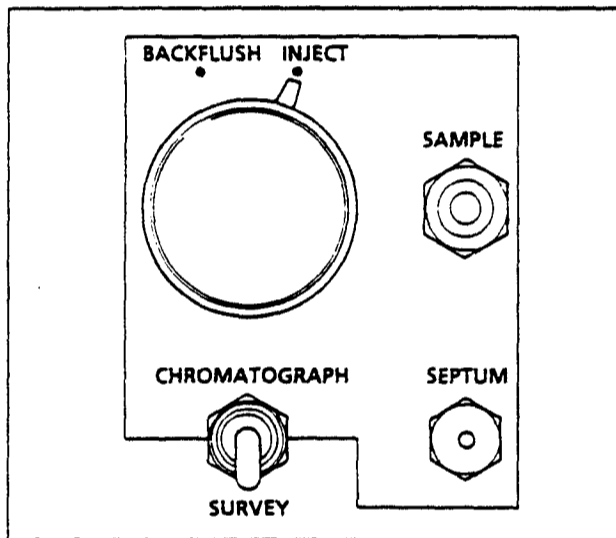
Press any key to continue

A-008 S2

```

Ensure the SURVEY/CHROMATOGRAPH switch
is set to the CHROMATOGRAPH Position
Fill the Sample Loop...
Then switch from:
  BACKFLUSH
to:
  INJECT
to start chromatograph run
  
```

Fill the sample loop by injecting specimen
 into Septum, or press sample button.
 Before switching from Backflush to Inject,
 ensure that the sample probe is in clean air



Switch from Backflush to Inject and the
 Chromatograph Measurement screen will
 appear.

Trace direction →

← 240 seconds →

F-002 S3

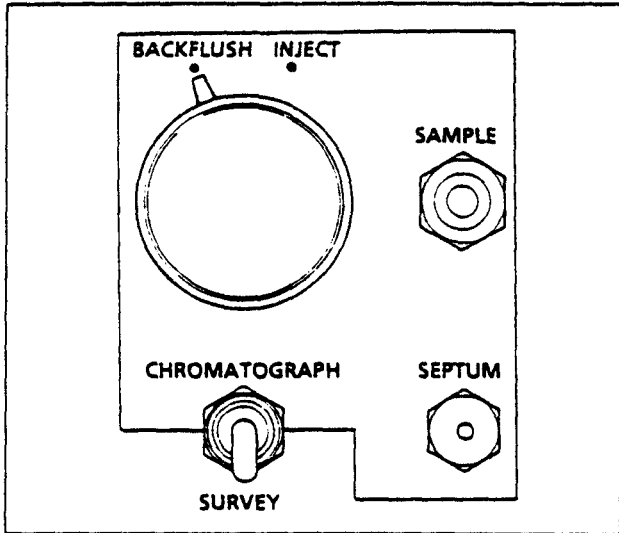
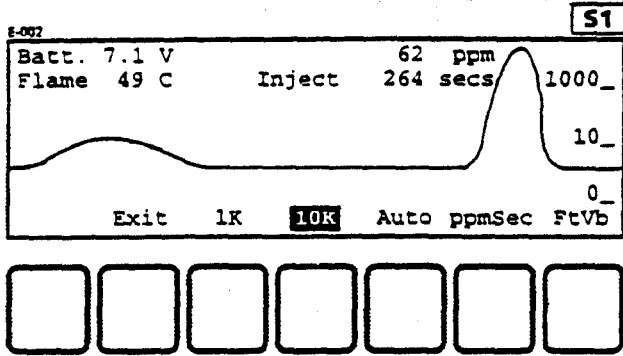
```

Batt. 7.1 V      62 ppm
Flame 49 C      Inject 20 secs  1000_
                                     10_
                                     0_
Exit 1K 1OK Auto ppmSec FtVb
  
```

Chromatograph trace will appear on the
 left hand side of the screen and travel
 across to the right.
 Chromatograph trace logging time will
 appear on the screen (*inject ... seconds*).
 Wait until the Chromatograph is
 completed.
 The instrument takes 4 readings per second
 and displays 1 reading per second.
 The screen is 240 pixels wide, thus at any
 point in time, 240 seconds of results are
 visible.

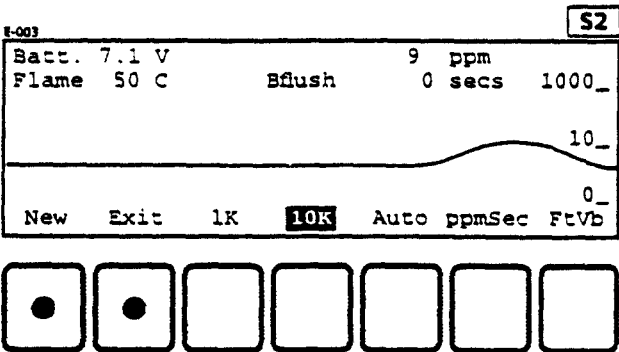


chromatograph



When the inject cycle is complete, switch from INJECT to BACKFLUSH.

The backflush time will start at 1½ times the inject time and count down to zero.



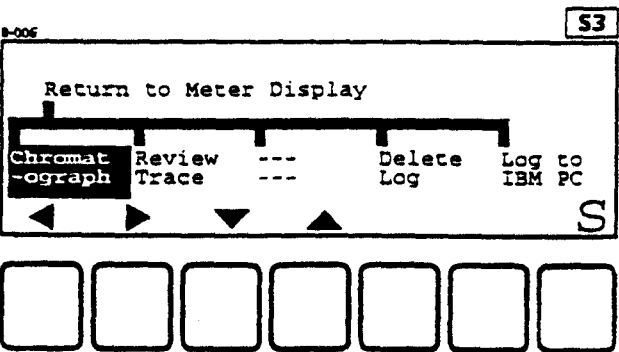
When the backflush time has counted down to zero, the backflush cycle is complete.

Press EXIT

soft key to return to the Chromatography menu and close the log file

OR

Press NEW

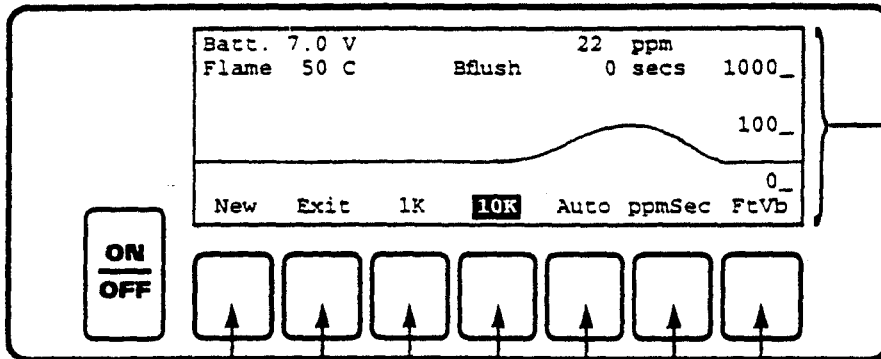


soft key to start a new log file for another Chromatograph run.



measurement screen

1-003



The measurements are shown on a Vertical Lin/Log/Log scale, either:
 Zero 10 100 ppm
 1000 ppm full scale
 OR
 Zero 100 1000 ppm
 10K ppm full scale

SOFT KEY FUNCTIONS:

ON
OFF

Switch Batt. & Flame display ON / OFF

Switch ppm and secs, display ON / OFF

Automatic ranging between 1K and 10K ppm ranges

10K range

1K range

} Manual

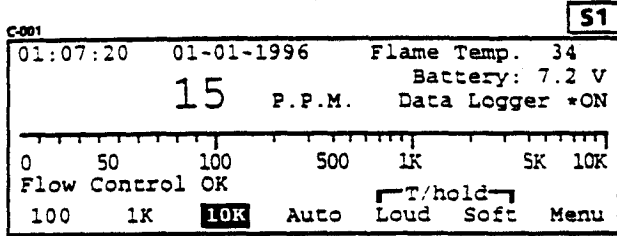
Return to Chromatography Menu screen

Available in Backflush mode only. Start New Log



review trace

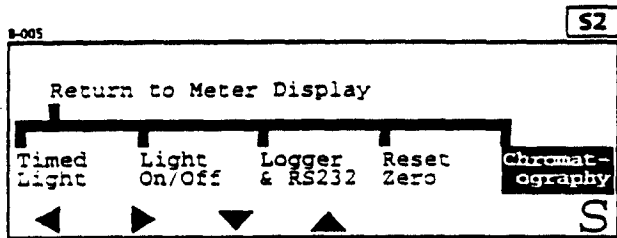
This function allows the user to review a Chromatography trace previously recorded in the log.



From Measurement Screen



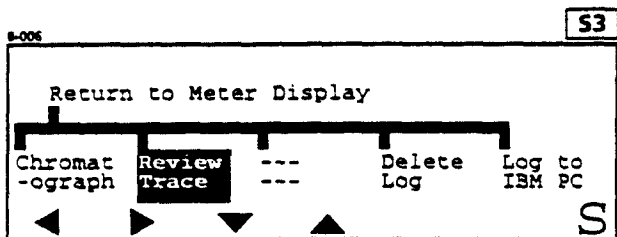
Press MENU



Screen will highlight Timed Light
Move highlighter to Chromatography.



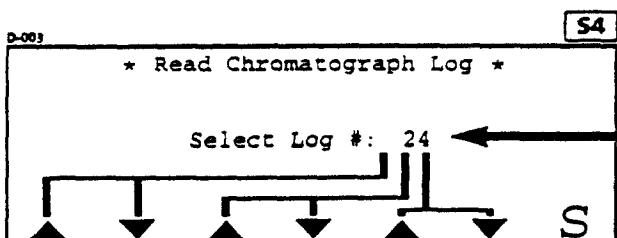
Press S



Screen will highlight Chromatograph
Move highlighter to Review Trace



Press S



Screen will change to Read Chromatograph Log

Press ▲ or ▼

To change each digit as required until correct Log file number is indicated

Press S

required trace will display on next screen

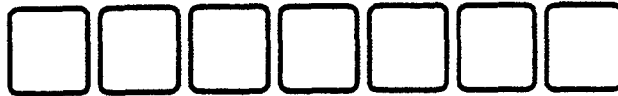
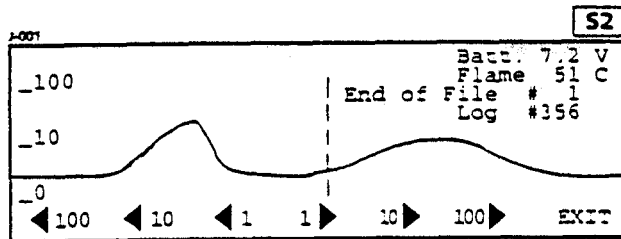
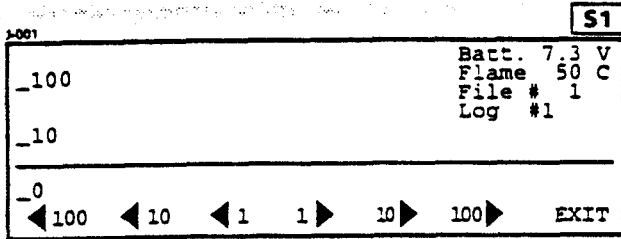




review trace

Use the soft keys to move forwards and backwards in the file

Press ◀ 100, ◀ 10, ◀ 1 and 1 ▶, 10 ▶, 100 ▶



Note: (i) It is not possible to move back if the first log is shown on the extreme right hand edge of the screen.

(ii) It is not possible to move forward if the last log is shown on the extreme left hand edge of the screen.

(iii) The backflush part of the Chromatograph will be displayed compressed in time by a factor of 4.

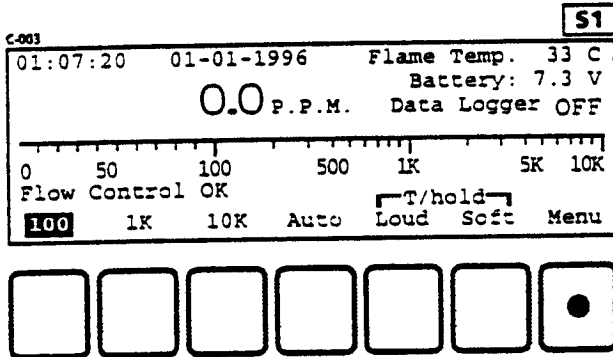
e.g. When reviewing the trace, the display is compressed in time by a ratio of 4 : 1, thus 16 minutes of backflush record will be displayed as a single screen width of 4 minutes.

Press EXIT

to return to the menu.

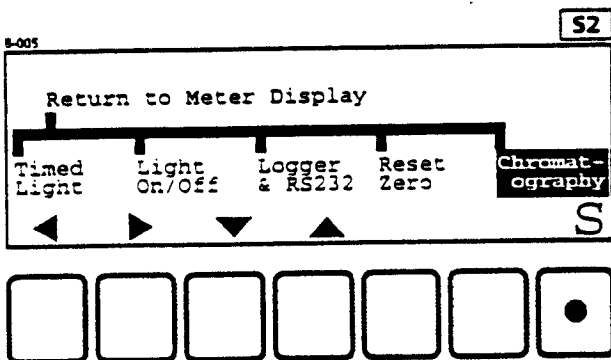


delete log
delete single log



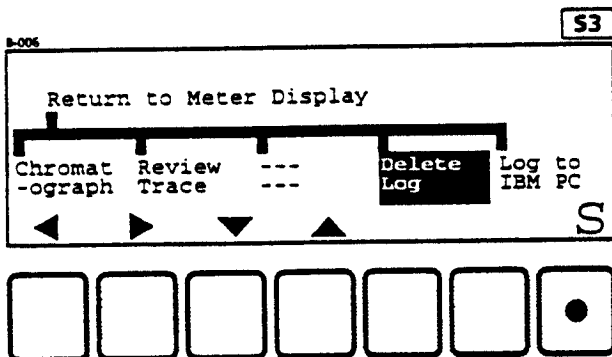
From Measurement Screen

Press MENU



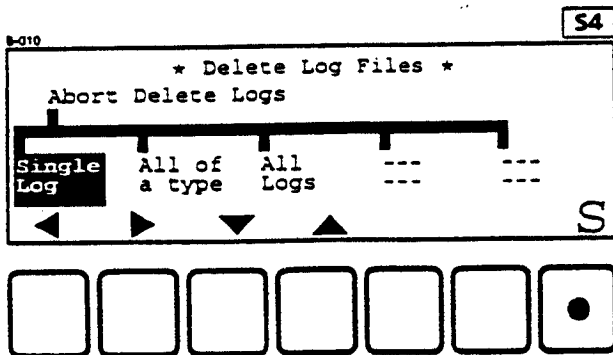
Screen will highlight
Timed Light
Move highlighter to
Chromatography.

Press S



Screen will highlight
Chromatography.
Move highlighter to
Delete Log

Press S

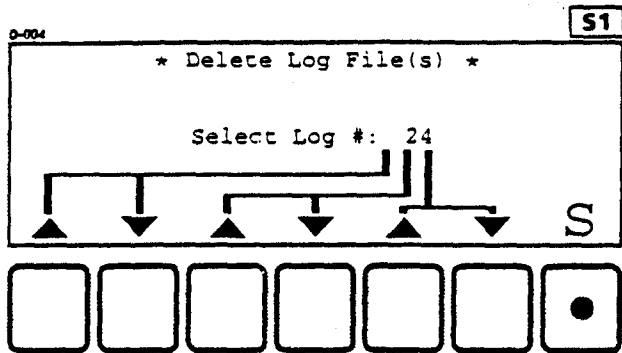


Screen will highlight
Single Log

Press S continue...



delete log
delete single log

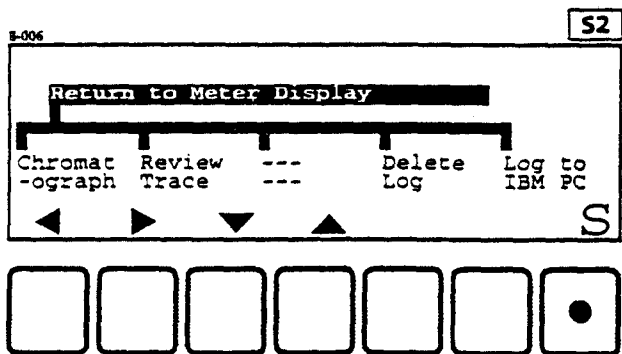


Screen will change to
Delete Log File(s)

Press ▲ or ▼ to change each
digit as required until correct file number
is indicated

Press S

Log file will be deleted.



When deletion is complete, screen will
highlight Return to Meter Display

Press S

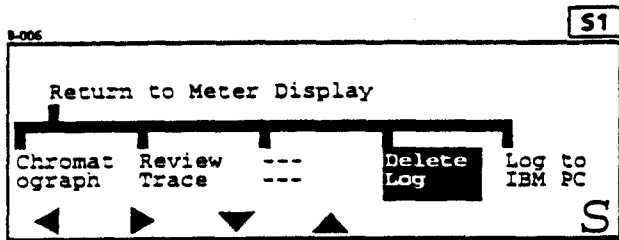
to return to Meter Display

To repeat the single log deletion
procedure, turn back to page 5.8, S3 and
follow the sequence through again.



delete log delete all of a type

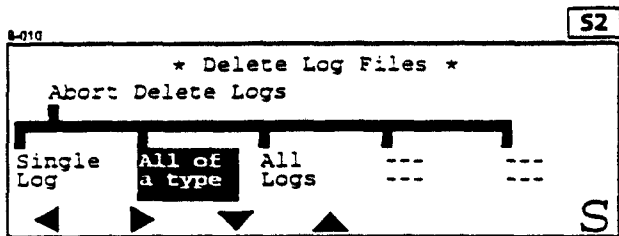
- Type 1 = Timed Interval Log Files
- Type 2 = Log on Demand Log Files
- Type 3 = Chromatograph Log Files



Highlight Delete Log



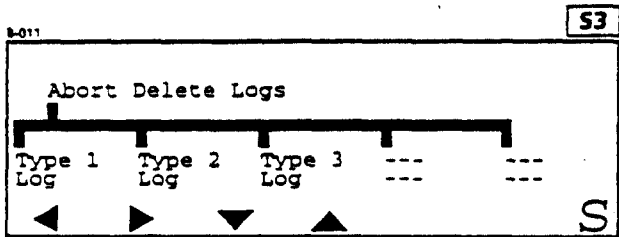
Press S



Screen will highlight
Single Log
Move highlighter to
All of a type



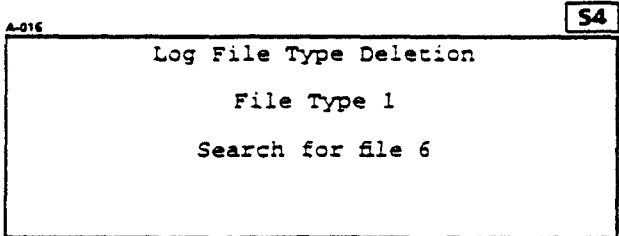
Press S



Select Type 1, Type 2 or Type 3 as required



Press S

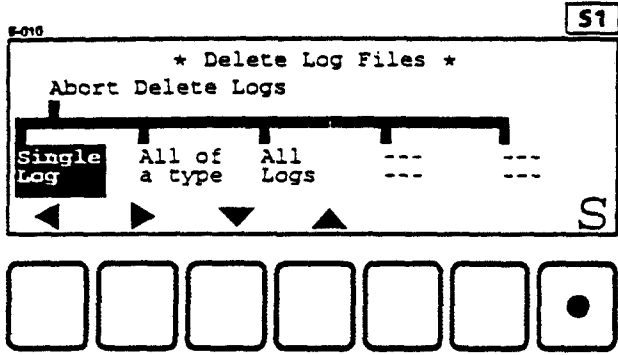


File deletion is automatic from this point.
When file deletion is complete, screen will return to
Chromatography menu (S1)





delete log
delete all logs



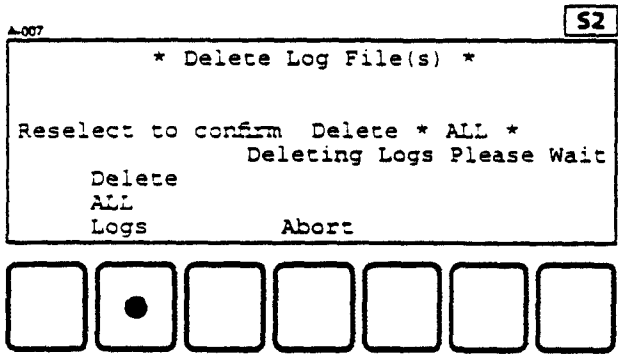
Highlight Delete Log

Press S

Screen will highlight Single Log

Move highlighter to All Logs

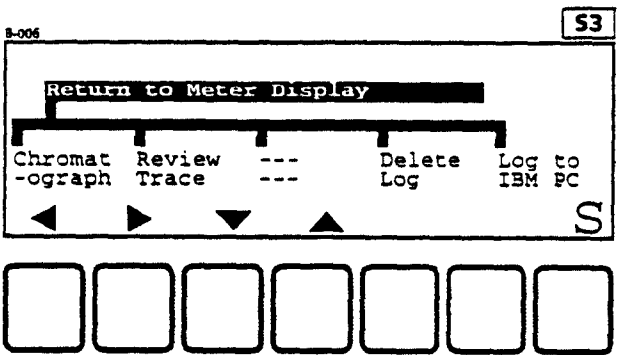
Press S



Screen will prompt:

Reselect to confirm Delete * ALL *

Press DELETE ALL LOGS

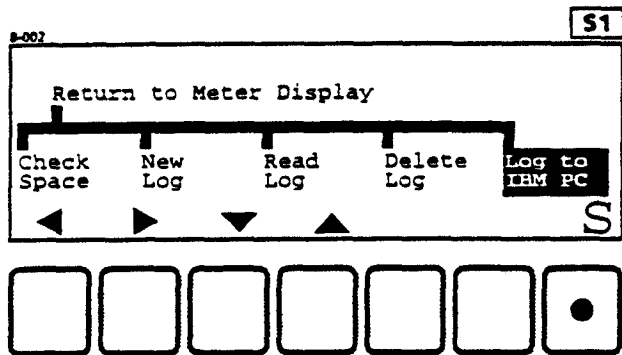


When deletion is complete, the screen will automatically return to the Chromatograph menu.



log to IBM PC

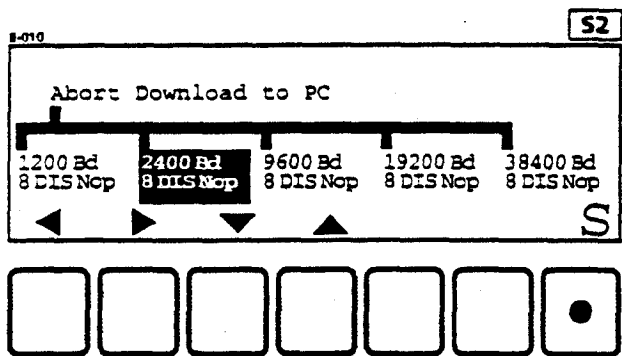
This facility allows the user to download log files to an IBM PC or compatible



Press ▶

to highlight
Log to IBM PC

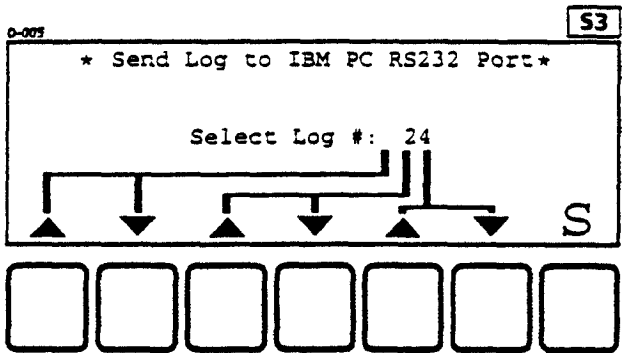
Press S



Connect the RS232/Fibre optic interface box between the Autofim and the PC and switch on.

Run the R. E. download program on the PC
Highlight the baud rate to match the setting on the PC

Press S



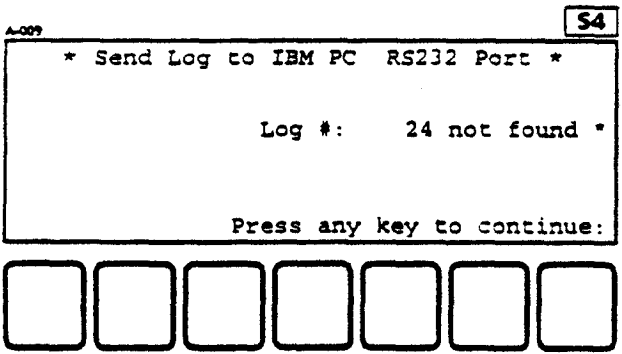
Screen will display
Send Log to IBM PC RS232 Port

Press ▲ or ▼ as applicable to
select the Log File to be downloaded.

When the PC is ready to receive the file

Press S

to download.



If the Log File entered in S3 was invalid, the not found warning message will appear

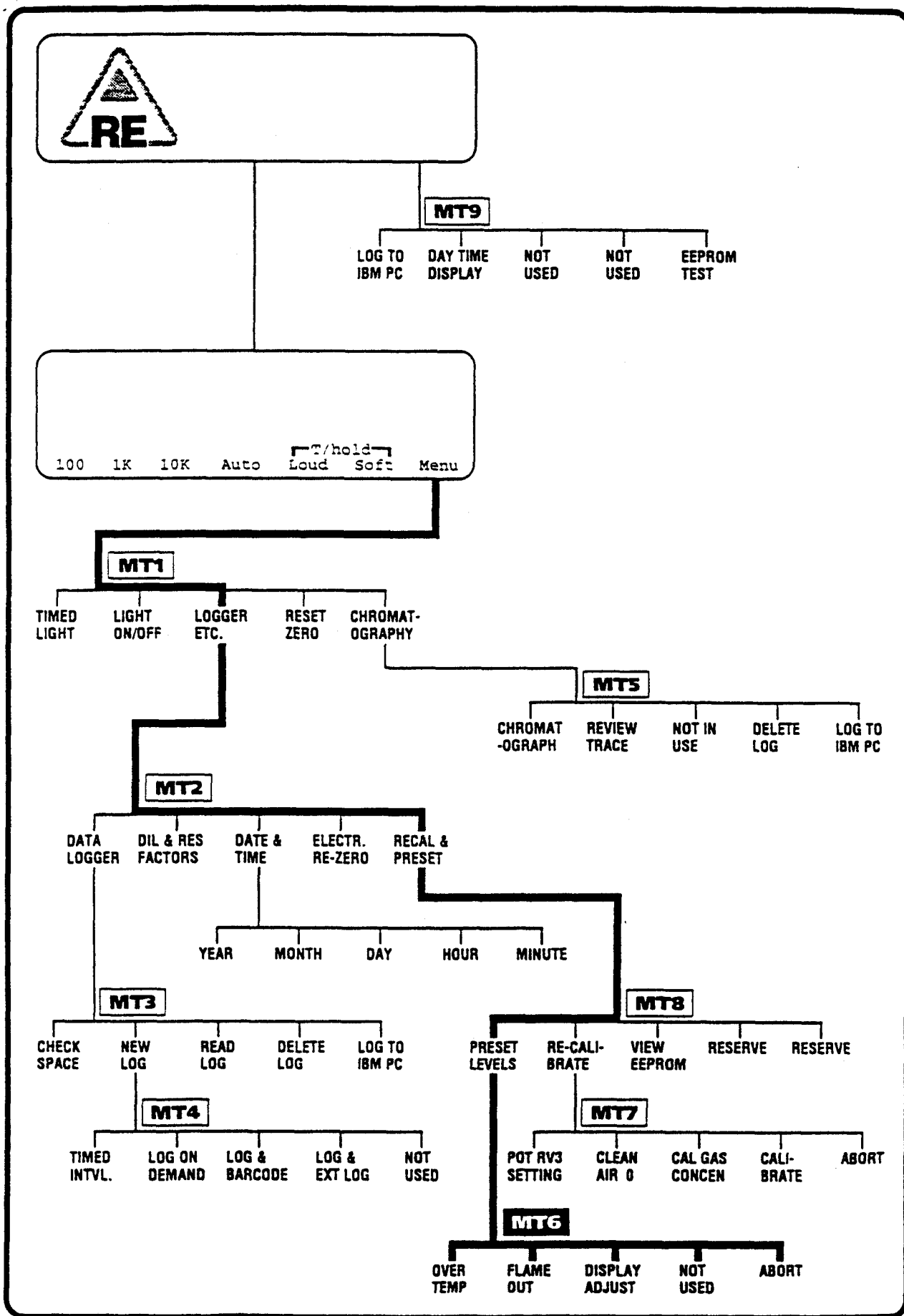
Press any key

to continue.

Screen will return to S1



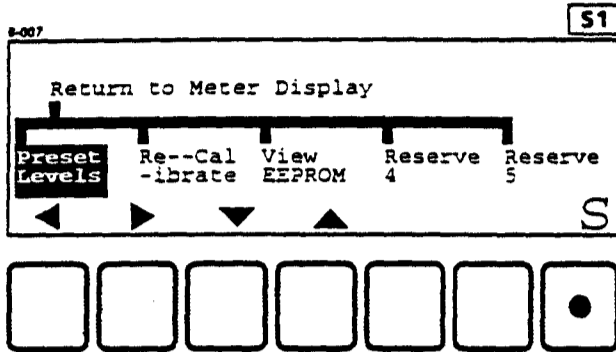
preset levels





over temp

This function allows the user to set a temperature at which the instrument will shut down for safety reasons and is only accessible after removal of the calibration seal and operation of the calibration micro switch.



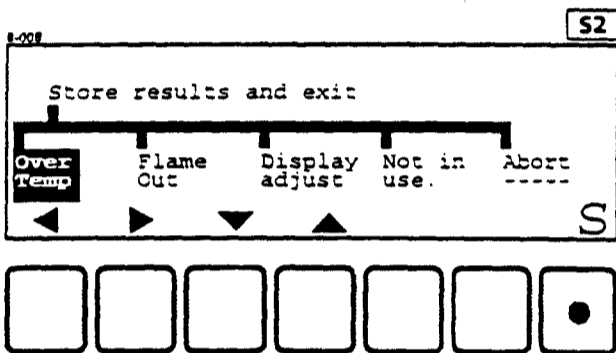
Working down the Menu Tree to MT6 through:

Logger etc

Re-cal & Preset

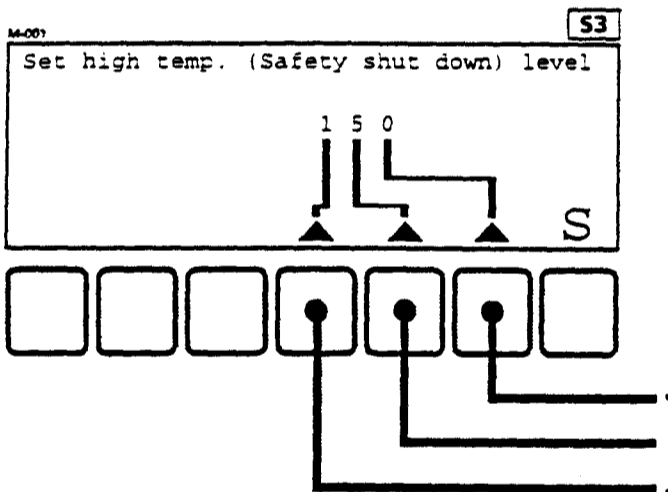
Screen will highlight Preset Levels

Press S



Screen will highlight Over Temp

Press S



IMPORTANT:
The maximum permitted temperature is 175°C

Press relevant soft keys to 'roll' figures to set the required Over Temp figure

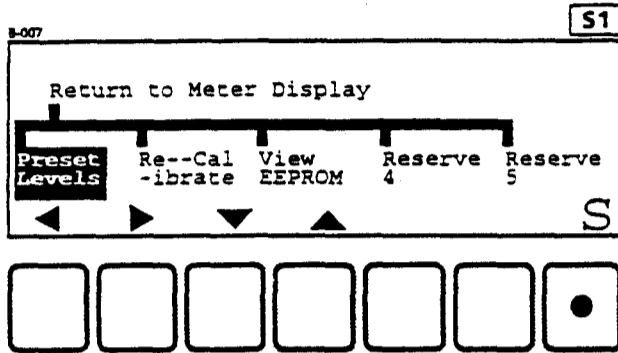
Press S

to continue



flame out

This function is only accessible after removal of the calibration seal and operation of the calibration micro switch and allows the user to set the temperature below which the hydrogen flame in the F.I.D. is assumed to be extinguished. If this occurs, the instrument will attempt to relight.



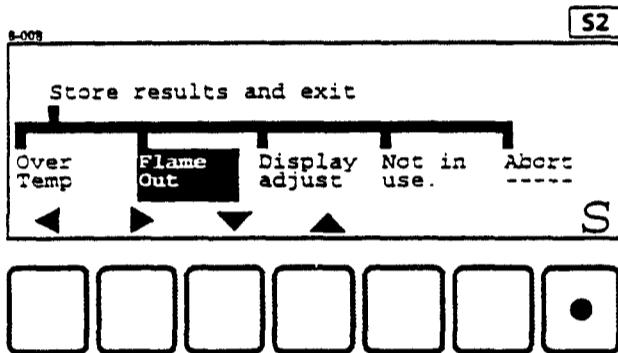
Working down the Menu Tree to MT6 through:

Logger etc

Re-cal & Preset

Screen will highlight Preset Levels

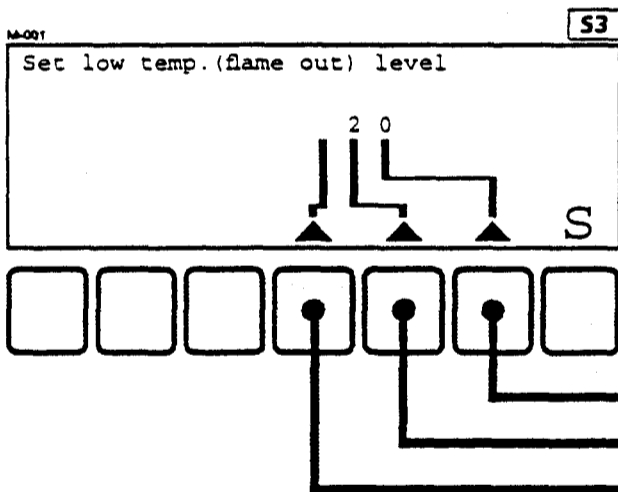
Press S



Screen will highlight Over Temp

Move highlighter to Flame out

Press S



Press relevant soft keys to 'roll' figures to the required Flame Out level

Press S

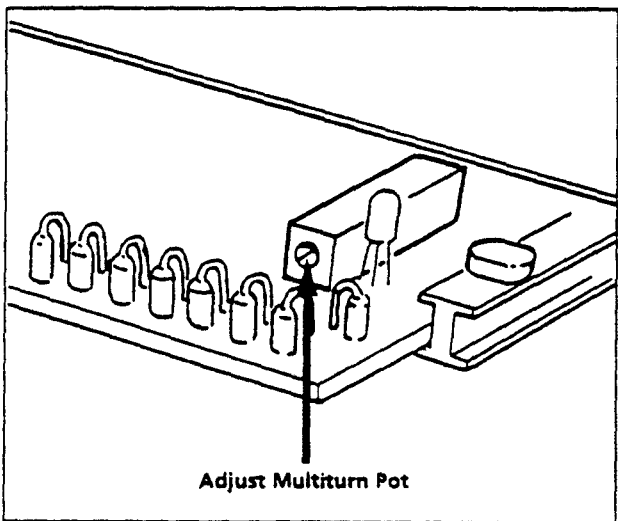
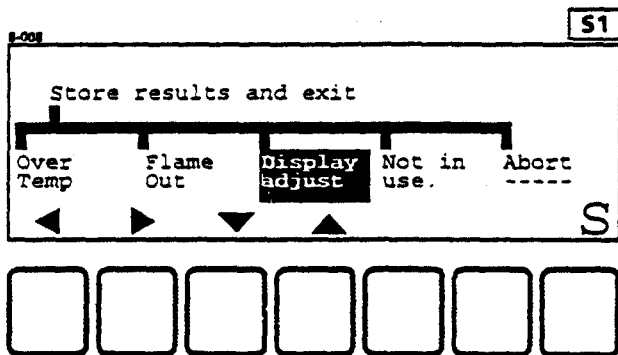
to return to S2



display adjust

This function is only accessible after removal of the calibration seal and operation of the calibration micro switch and allows the adjustment of the contrast of the display screen for best visibility.

This can only be correctly done if the ambient temperature reading is accurate.



Working down the Menu Tree to MT6 through:

- Logger etc
- |
- Re-cal & Preset
- |
- Preset Levels

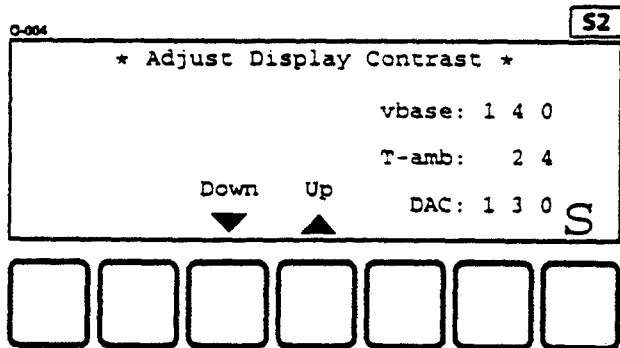
Screen will highlight

Over Temp

Move highlighter to

Display adjust

Adjust ambient temperature reading using Multiturn pot, as illustrated, to match TIAmb. reading to room temperature



Use ▼ ▲ keys to adjust display contrast for optimum legibility

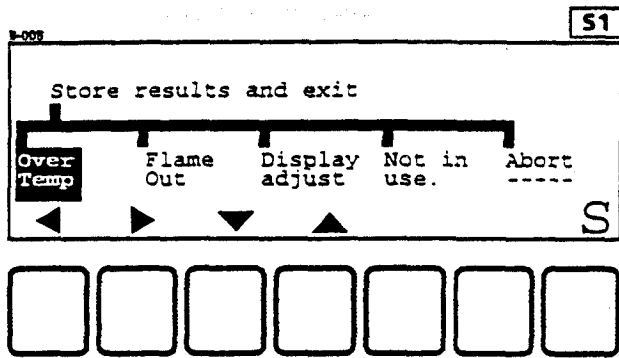
Press S

to return to menu S1

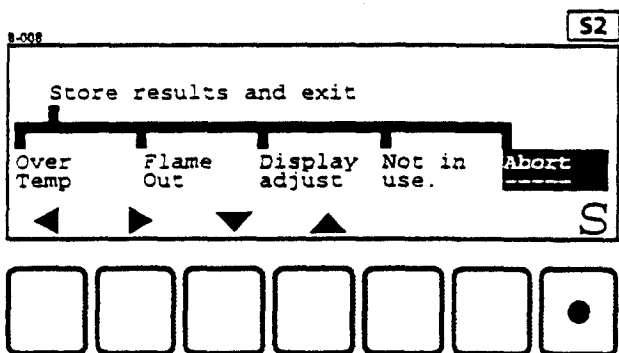


store results and exit abort

These functions allow the modified settings to be stored to the non-volatile memory of the instrument, or via ABORT leaves the current settings unchanged.

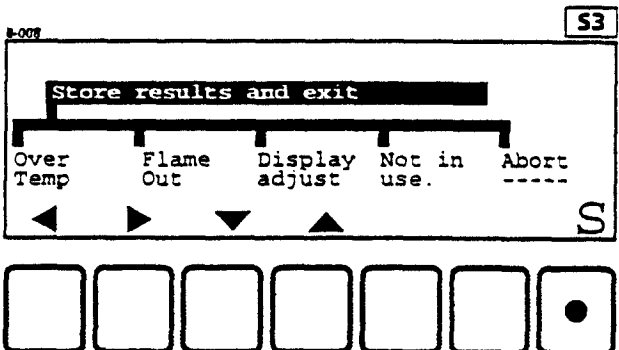


From Preset Levels, screen will display Over Temp



EITHER
move highlighter to Abort
to leave current settings unchanged

Press S

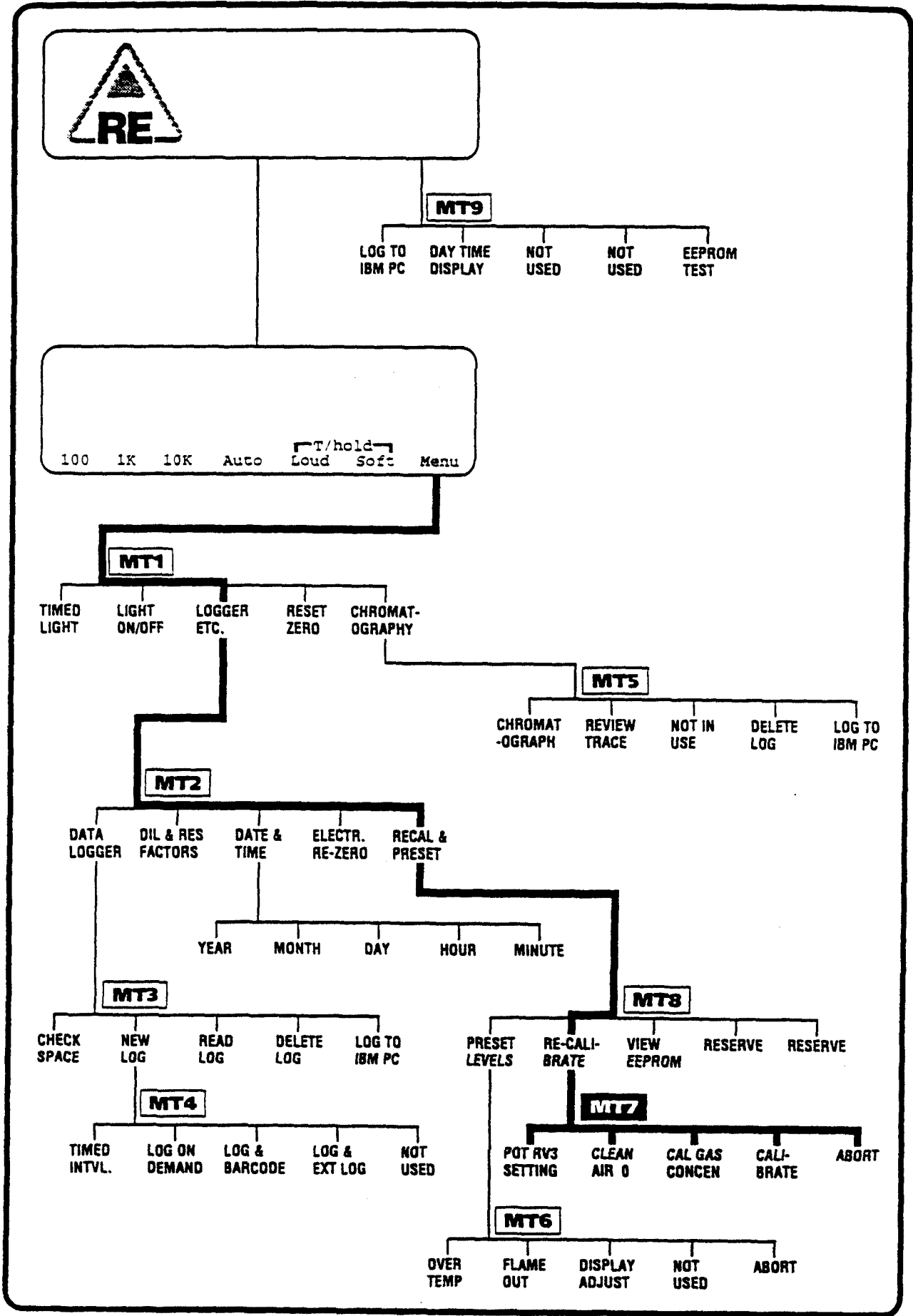


OR
move highlighter to Store Results and exit,
to store modified value to non-volatile memory

Press S



re-calibrate

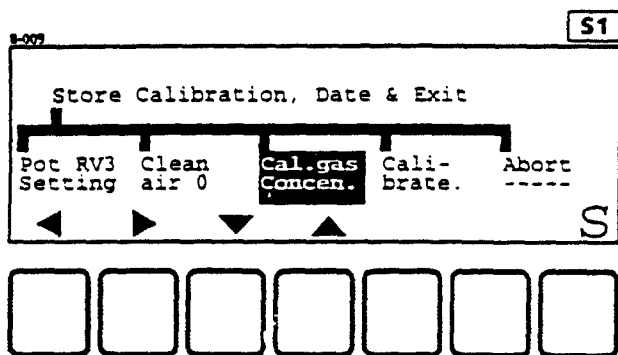




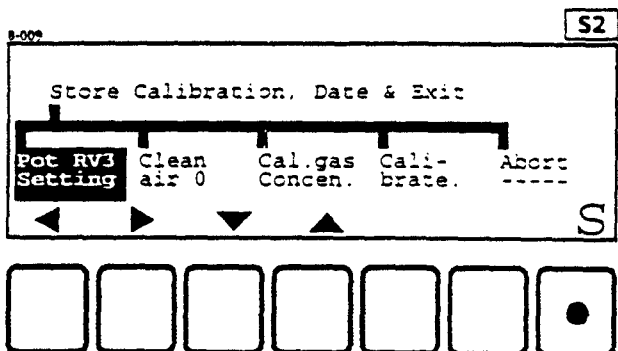
pot RV3 setting

This function is provided to allow periodic recalibration of the instrument.

Note: It will not normally be necessary to make this adjustment in order to calibrate the instrument.

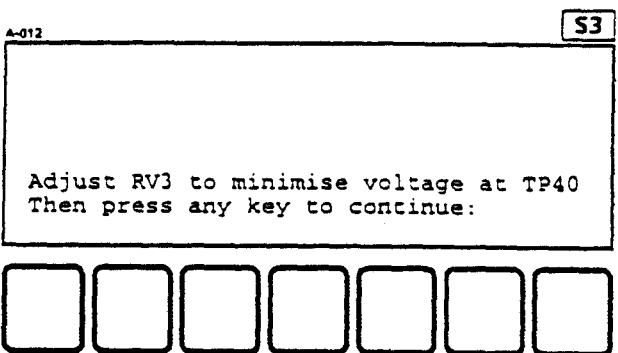


From MT8 Option 2 screen will highlight Cal. gas Concen.

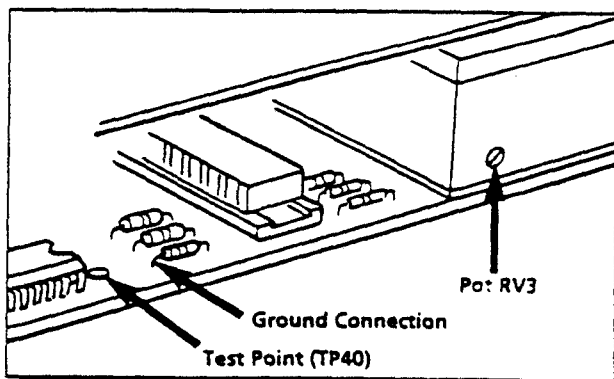


Move highlighter to Pot RV3 Setting

Press S

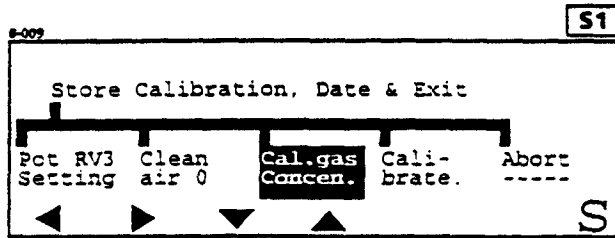


Follow instructions on the screen and refer to illustration.



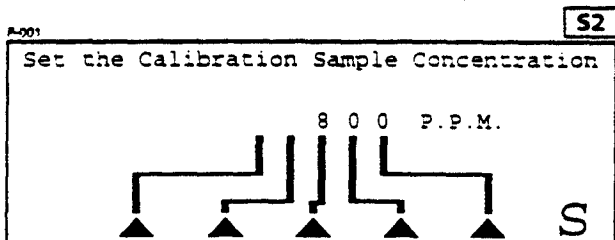


calibration gas concentration and clean air 0



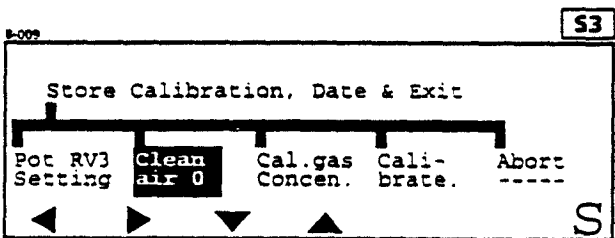
From MT8, Option 2 screen will display MT7 with Cal. gas Concn. highlighted

Press **S**



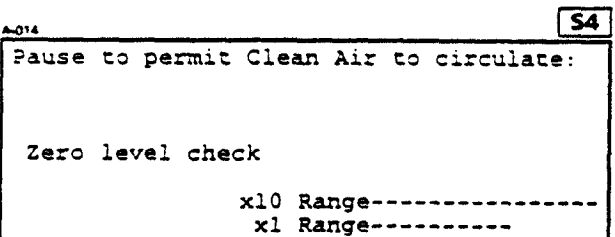
Using soft keys, scroll figures to value of sample concentration

Press **S** to continue



Prior to recalibration, it is necessary to zero the instrument on Clean air
Screen will highlight Clean air 0

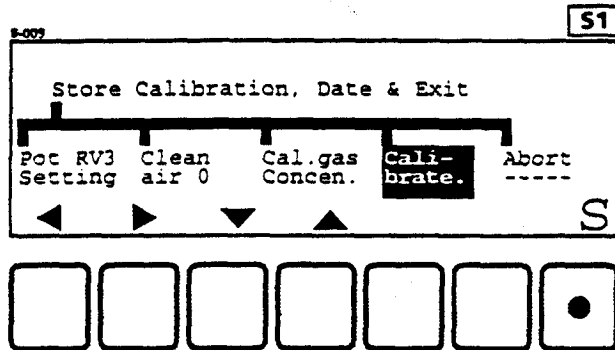
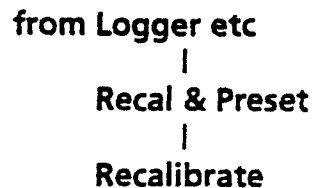
Press **S**



Place the probe into a source of clean air while the instrument performs a zero level check

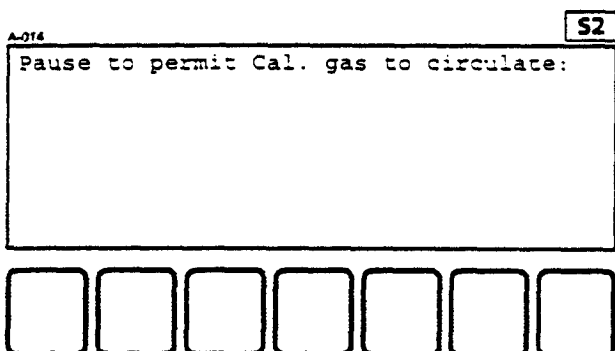


recalibrate

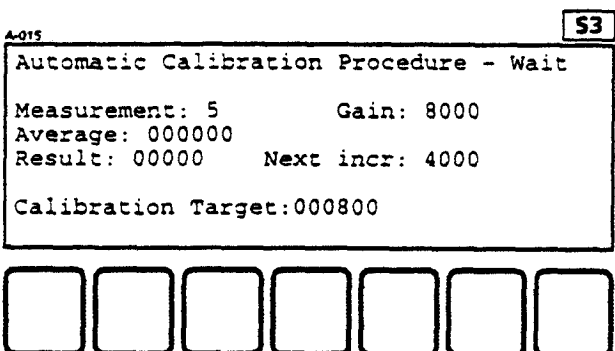


At the end of Clean Air 0 function, screen will highlight Calibrate

Press S



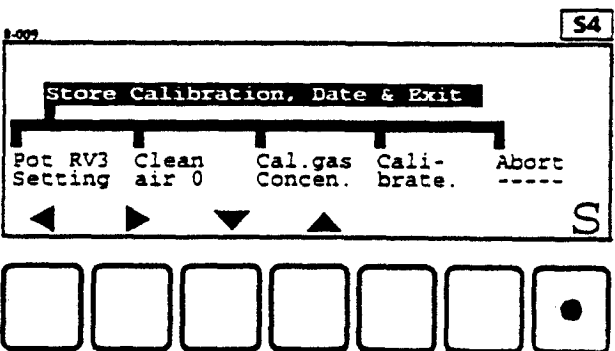
Select the 10K ppm range and follow screen instructions



Automatic calibration procedure will adjust gain iteratively until result matches calibration target.

Press any key

to return to Calibration Menu



Screen will highlight Store Calibration, Date & Exit

Press S

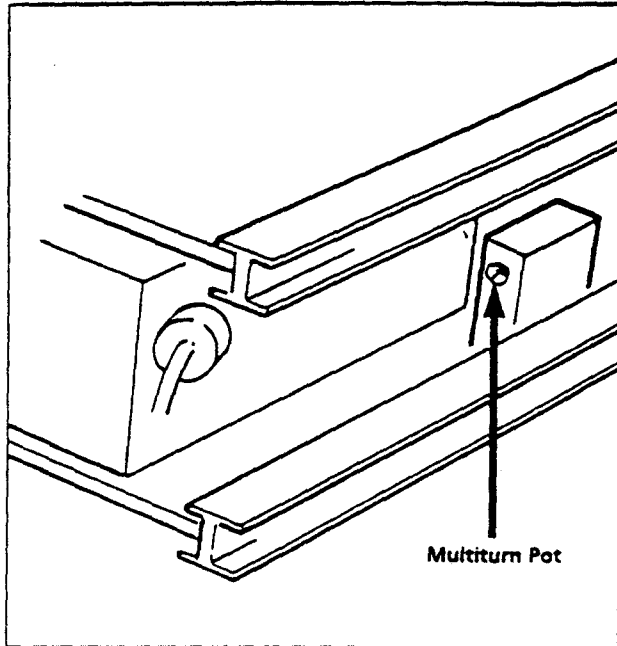
to store calibration data and date and to exit to MT8

To exit the calibration function without storing the new calibration constant, highlight Abort and

Press S



linearity adjustment procedure



Measurement Linearity is controlled by the bias voltage applied to the F.I.M.

This voltage may be adjusted by means of the Multiturn Pot illustrated.

After calibration (e.g. at 800 ppm), check the linearity by introducing a sample at, for example, 8000 ppm. The reading shown should be within $\pm 10\%$, i.e. 800 ppm or better.

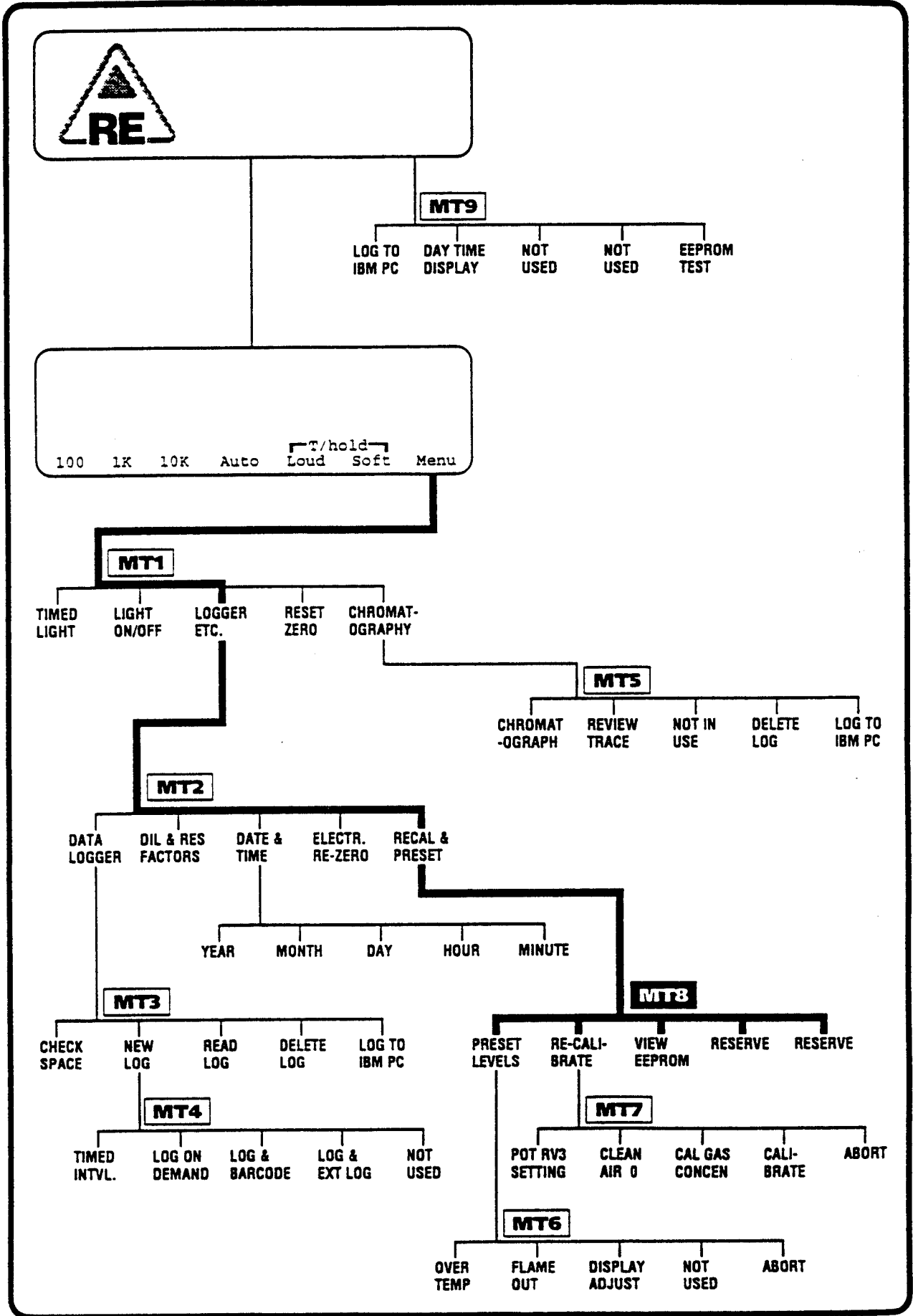
If the result is outside these limits, adjust the multiturn pot to give a reading as close to 8000 ppm as possible.

Having made this adjustment, it will be necessary to re-check the calibration at 800 ppm. Check the reading again and adjust as necessary.

This sequence must be repeated until 800 and 8000 readings are within specified limits.



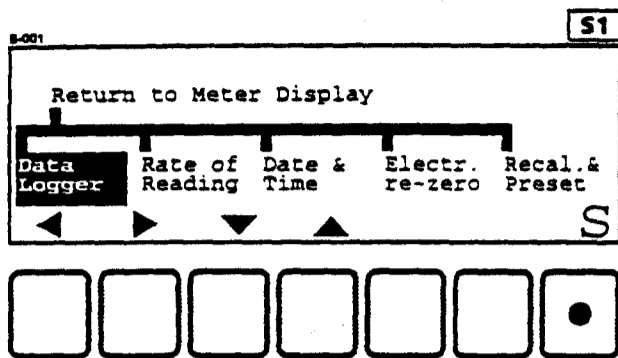
recal and preset





access to recalibration and preset levels

This function allows periodic calibration and service adjustments to be made



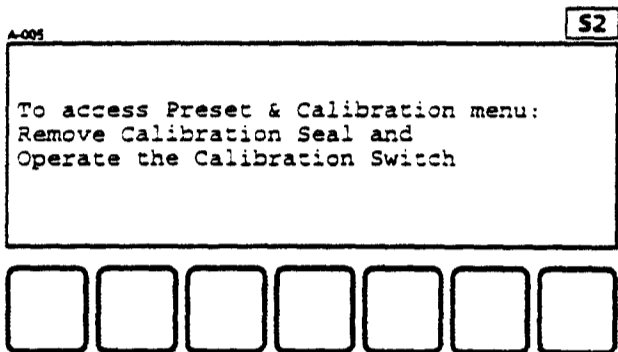
From Main Menu

|
Logger etc

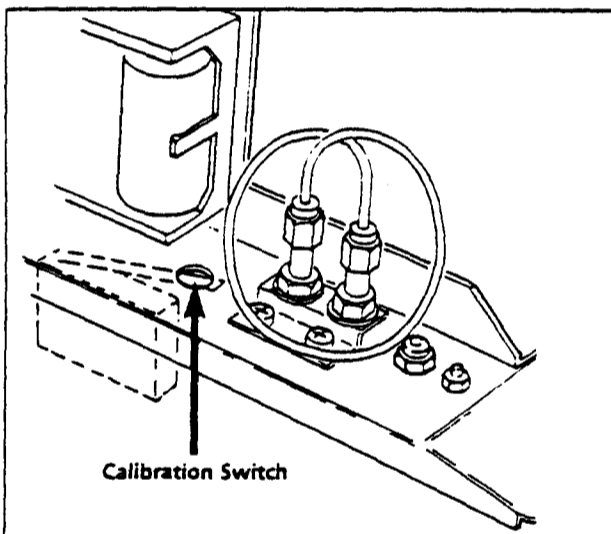
screen will highlight Data Logger

Move highlighter to Recal & Preset

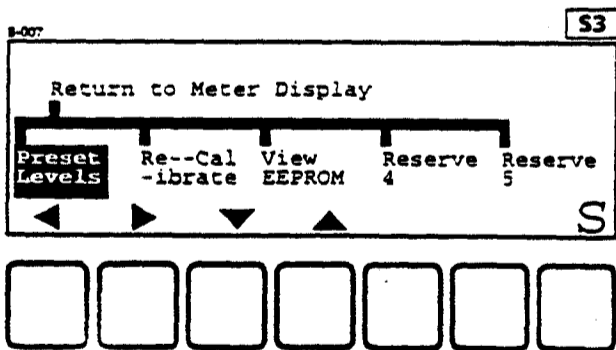
Press S



Follow instructions on the screen and refer to illustration.



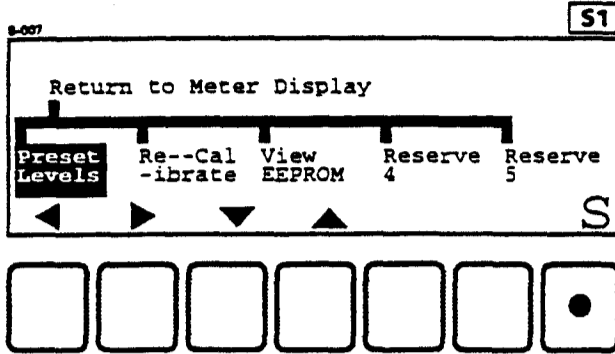
Remove calibration seal,
operate calibration switch



After operation of calibration switch,
screen will display menu shown.



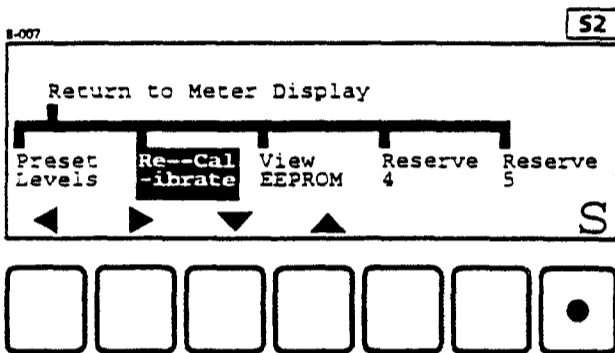
**preset levels
recalibrate
view EEPROM**



Screen will highlight
Preset Levels

Press S

Refer to MT6



Screen will highlight
Preset Levels
Move highlighter to
Re-calibrate

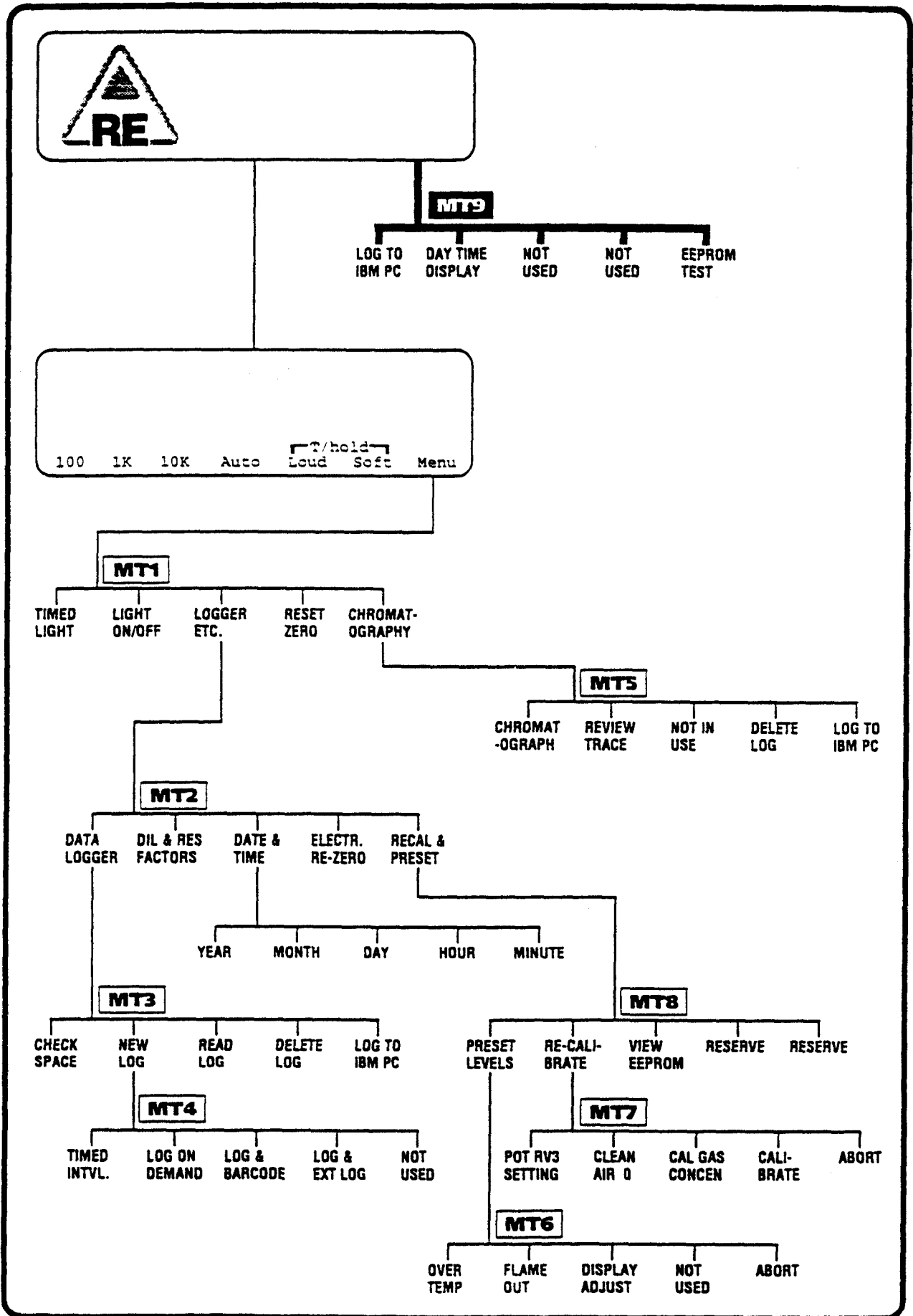
Press S

Refer to MT7

'View EEPROM'
is a function applicable to
factory service only



set-up menu





log to IBM PC

The instrument will automatically proceed to the light-up routine a few seconds after switch on unless a key is operated to access the set-up menu shown below.

A-001 S1

```

Software revision: A
Last calibrated: 01-01-1995
* Flow * Date: 01-01-1996
* OK * Time: 01:00:13
Temperature: 23 C
Battery voltage: 7.5 0
AUTO start-up or....
Press any switch to access Set-up Menu

```

B-012 S2

Exit Menu...Light the F.I.M.

Log to IBM PC	Day Time Not Display Used	Not Used	EEPROM Test
------------------	------------------------------	-------------	----------------

S

●

To download stored log files to an IBM PC without lighting the F.I.M.

Highlight

Log to IBM PC

Press S

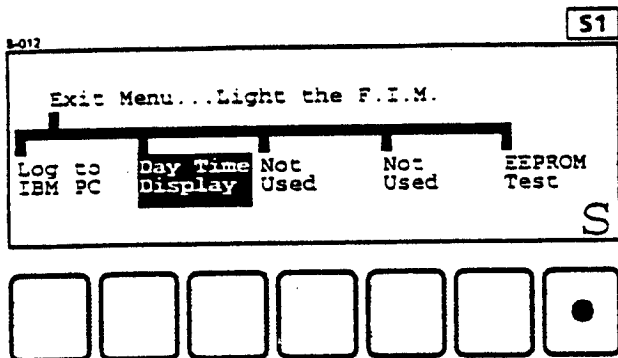
Refer back to page MT3.7 and follow relevant instructions.

After completing the download, press ON/OFF switch to shut down the Autofim.

'EEPROM Test'
is a function applicable to
factory service only

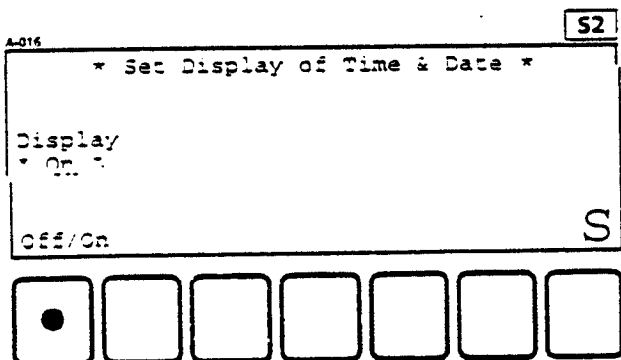


day time display start up



Move highlighter to
Day Time Display

Press S



This screen provides the facility to switch
the display of Time and Date ON or OFF in
the Measurement Screen.

Press to switch ON or OFF as required.

Press S

to return to Menu

Press ▲

to move highlighter to Exit Menu
With Exit Menu...Light the FIM
highlighted

Press S

to start light-up routine



Licence

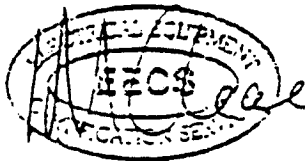
Number M4035

I hereby authorise

TELEGAN GAS MONITORING LIMITED
The Fleming Centre
Fleming Way
Crawley
West Sussex
RH10 2NN

to reproduce the licensed marks specified in Schedule 1 of this Licence on electrical equipment defined in the Certificates listed in Schedule 2 of this Licence, subject to compliance with the rules of the EECS Conformity Assurance Programme Licensing Scheme for Certified Explosion Protected Electrical Equipment.

This Licence is valid until 18 June 2001 unless previously suspended or revoked in accordance with the rules of the Scheme.



I M CLEARE
DIRECTOR
18 June 1998



Electrical Equipment Certification Service
Health and Safety Executive
Harpur Hill, Buxton, Derbyshire, SK17 9JN, United Kingdom
Tel: 01298 28000 Fax: 01298 28244



The use of the Accreditation Mark indicates accreditation in respect of those activities covered by the accreditation certificate number 020



Licence

Number M4035

Schedule 1

Marks which may be applied by the Licensee

Note: The Marks are described in the terms and conditions of the EECS Quality Assurance Guide (P042)

For Group II equipment, the BASEEFA Mark

Explosion protection concepts for which the Licensee has been assessed

Flameproof (d)
Intrinsic safety (ib)

Equipment Types for which the Licensee has been assessed

Note: The Equipment Types are given in Appendix C of the EECS Quality Assurance Guide (P042)

Instrumentation, measurement and control equipment

Schedule Number M4035/1/1

Dated 18 June 1998



Electrical Equipment Certification Service
Health and Safety Executive
Harpur Hill, Buxton, Derbyshire, SK17 9JN, United Kingdom
Tel: 01298 28000 Fax: 01298 28244



The use of the Accreditation Mark indicates accreditation in respect of those activities covered by the accreditation certificate number 020



Licence

Number M4035

Schedule 2

Apparatus certificates for equipment on which the Licensee is authorised to reproduce the licensed marks.

Group II

Ex 96D2237

Ex 96Y1238

Schedule Number M4035/2/1

Dated 18 June 1998



Electrical Equipment Certification Service
Health and Safety Executive

Harpur Hill, Buxton, Derbyshire, SK17 9JN, United Kingdom
Tel: 01298 28000 Fax: 01298 28244



The use of the Accreditation Mark indicates accreditation in respect of those activities covered by the accreditation certificate number 020.

Ex

Ex

British Approvals Service for Electrical
Equipment in Flammable Atmospheres



Change of Certificate Holder

THIS IS TO CERTIFY THAT CERTIFICATE NUMBERS Ex 96D2237 and Ex 96Y1238

Formerly held by

RESEARCH ENGINEERS LIMITED
Orsman Road
London
N1 5RD

Are now deemed to be held by

TELEGAN GAS MONITORING LIMITED
The Fleming Centre
Fleming Way
Crawley, West Sussex
RH10 2NN

File No: EECS 4035/35/001



I M CLEARE
DIRECTOR EECS
18 June 1998



Electrical Equipment Certification Service
Health and Safety Executive
Harpur Hill, Buxton, Derbyshire, SK17 9JN, United Kingdom
Tel: 01298 28000 Fax: 01298 28244



The use of the
Accreditation Mark
indicates accreditation
in respect of those
activities covered by
the accreditation
certificate
number 020.

Ex

Ex



Change of Marking Registration

THIS IS TO CERTIFY THAT THE HOLDER OF EECS LICENCE M4035

TELEGAN GAS MONITORING LIMITED
The Fleming Centre
Fleming Way
Crawley
West Sussex
RH10 2NN

Is authorised to amend the certification marking and the relevant drawings detailing the marking information with respect to the Electrical Equipment covered by the certificates issued to the above Company as listed in Schedule 2 of the Licence, with respect to the information stated below. No other change may be made.

Delete: Research Engineers and logo

Insert: Telegan Gas Monitoring
Incorporating Research Engineers and logo
Crawley England

FILE REFERENCE: EECS 4035/35/001



I M CLEARE
DIRECTOR EECS
18 June 1998



Electrical Equipment Certification Service
Health and Safety Executive
Harpur Hill, Buxton, Derbyshire, SK17 9JN, United Kingdom
Tel: 01298 23000 Fax: 01298 23244



The use of the Accreditation Mark indicates accreditation in respect of those activities covered by the accreditation certificate number 020.

British Approvals Service for Electrical
Equipment in Flammable Atmospheres



Certificate of Assurance

1

2

BAS No. Ex 96Y1238

3 This certificate is issued for the electrical apparatus:

FLAME IONISATION MONITOR

4 Manufactured and submitted for certification by:

RESEARCH ENGINEERS LTD
of London, N1 5RD

5 This electrical apparatus and any acceptable variation thereto is specified in the Schedule to this Certificate and the documents therein referred to.

6 BASEEFA being an Accredited Certification Body in accordance with EN45011 certifies that the apparatus has been found to comply with the requirements of:

BS EN50 014: 1993 + Amd 1
BS EN50 018: 1995

and has successfully met the examination and test requirements recorded in confidential Report number:

95(C)0660 dated 8 October 1996 and 95(C)0220/1 dated 8 October 1996

7 The apparatus marking shall include the code:

EEx d IIC T4

8 The manufacturer of the electrical apparatus referred to in this certificate, has the responsibility to ensure that the apparatus conforms to the specification laid down in the Schedule to this certificate and has satisfied routine verifications and tests specified therein.

File No: EECS 0880/02/003

Sheet 1 of 3

This certificate is granted subject to the general conditions of the Electrical Equipment Certification Service. It does not necessarily indicate that the apparatus may be used in particular industries or circumstances. Representation of equipment as "Certified" is valid only when the number of this certificate is given on the relevant EECS Manufacturing Licence or Verification Certificate.



I M CLEARE
DIRECTOR

8 October 1996



Electrical Equipment Certification Service
Health and Safety Executive
Harpur Hill, Buxton, Derbyshire, SK17 9JN, United Kingdom
Tel: 01298 23000 Fax: 01298 23244



Certificate of Assurance BAS No. Ex 96Y1238

APPARATUS DESCRIPTION

The Flame Ionisation Monitor comprises a Flame Ionisation Unit to the drawings listed below mounted in a Flame Ionisation Monitor type 47720 to Certificate Ex 96D2237.

DRAWINGS

<u>Number</u>	<u>Sheet</u>	<u>Issue</u>	<u>Date</u>	<u>Description</u>
* 3-47721	1	1	7.8.96	General Assembly
* 3-47721	2	2	5.7.96	General Assembly
* 3-47729	1	1	7.8.96	Certification Label
3-47800	1	1	17.9.96	Flame Chamber ES Assembly
4-47810	1	1	17.9.96	Flame Chamber ES
4-47808	1	1	17.9.96	Sample Inlet Adaptor
4-47809	1	1	17.9.96	Flame Tube Adaptor
4-47802	1	1	17.9.96	Glow Plug Adaptor
4-47812	1	1	17.9.96	Thermocouple Adaptor
4-47811	1	1	17.9.96	Chamber and Adaptor Assembly
4-47815	1	1	17.9.96	Inlet Sinter Body
4-47816	1	1	17.9.96	Inlet Sinter Body Assembly
4-47805	1	1	17.9.96	Exhaust Sinter Body
4-47806	1	1	17.9.96	Exhaust Sinter Body Assembly
4-47311	1	2	29.7.96	Adaptor Cap
4-47807	1	1	17.9.96	Exhaust Sinter Cap
4-47819	1	1	17.9.96	Thermocouple Cap
4-47803	1	1	17.9.96	Glow Plug Insulator
4-47879	1	1	17.9.96	Material Specification
4-47804	1	1	17.9.96	Glow Plug Connector
4-47801	1	1	17.9.96	Glow Plug Cap
4-47832	1	1	17.9.96	Needle Tube
4-47813	1	1	17.9.96	Thermocouple Holder
4-47814	1	1	17.9.96	Thermocouple Assembly
4-47828	1	1	17.9.96	Electrode Assembly ES
4-47818	1	1	17.9.96	Electrode Insulator

British Approvals Service for Electrical
Equipment in Flammable Atmospheres



Schedule

Certificate of Assurance BAS No. Ex 96Y1238

<u>Number</u>	<u>Sheet</u>	<u>Issue</u>	<u>Date</u>	<u>Description</u>
447829	1	1	17.9.96	Insert
447827	1	1	17.9.96	Studding

Note The drawings marked thus * are also associated with Certificate Ex 96D2237.

BASEEFA List Keywords

2MONITOR



British Approvals Service for Electrical
Equipment in Flammable Atmospheres

Flameproof Certification Release From Pressure Testing

Release from individual pressure test is granted to:-

RESEARCH ENGINEERS LTD
of London, N1 5RD

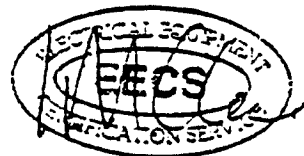
In pursuance of Clause 16.2 of BS EN50 018: 1995, I hereby grant release from the obligation to apply individual mechanical pressure tests to all apparatus covered by BASEEFA Certificate No Ex 96Y1238 and Supplementary Certificates thereto.

The following is not included in this release and must be subject to a routine pressure test.

Flame chamber and adaptor assembly to drawing 4-47811.

The release is conditional upon the maintenance of adequate quality control and inspection during production, to ensure compliance with any specified or implied conditions of certification.

The release is valid until 7 October 1999 unless earlier revoked or suspended.



File No: EECS 0880/02/003

I M CLEARE
DIRECTOR EECS
8 October 1996

This certificate is issued under NACCB accreditation No. 020



Electrical Equipment Certification Service
Health and Safety Executive
Harbour Hill, Buxton, Derbyshire, SK17 9JN, United Kingdom
Tel: 0298 262111 Fax: 0298 795114 Telex: 668113 RLSD G



British Approvals Service for Electrical
Equipment in Flammable Atmospheres



Certificate of Conformity

BAS No. Ex 96D2237

- 1
 - 2
 - 3 This certificate is issued for the electrical apparatus:
FLAME IONISATION MONITOR TYPE 47720
 - 4 Manufactured and submitted for certification by:
RESEARCH ENGINEERS LTD
of 11/31 Orsman Road, London, N1 5RD
 - 5 This electrical apparatus and any acceptable variation thereto is specified in the Schedule to this Certificate and the documents therein referred to.
 - 6 BASEEFA being an Approved Certification Body in accordance with Article 14 of the Council Directive of the European Communities of 18 December 1975 (76/117/EEC) certifies that the apparatus has been found to comply with harmonised European Standards:
EN50 014 (1977) + Amd 1 to 5
EN50 020 (1977) + Amd 1 to 5
- and has successfully met the examination and test requirements recorded in confidential Report number:
95(C)0220 dated 27 September 1996
- 7 The apparatus marking shall include the code:
EEx ib IIC T4
 - 8 The manufacturer of the electrical apparatus referred to in this certificate, has the responsibility to ensure that the apparatus conforms to the specification laid down in the Schedule to this certificate and has satisfied routine verifications and tests specified therein.
 - 9 This apparatus may be marked with the Distinctive Community Mark specified in Annex II to the Council Directive of 16 January 1984 (Doc 84/47/EEC). A facsimile of this mark is printed on sheet 1 of this certificate.

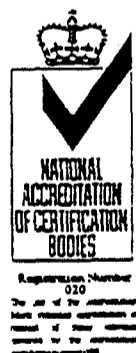
File No: EECS 0880/02/003

Sheet 1 of 5

This certificate is granted subject to the general conditions of the Electrical Equipment Certification Service. It does not necessarily indicate that the apparatus may be used in particular industries or circumstances. Representation of equipment as "Certified" is valid only when the number of this certificate is given on the relevant EECS Manufacturing Licence or Verification Certificate.



I M CLEARE
DIRECTOR
8 October 1996



Electrical Equipment Certification Service
Health and Safety Executive
Harpur Hill, Buxton, Derbyshire, SK17 9JN, United Kingdom
Tel: 01298 28000 Fax: 01298 28244



Certificate of Conformity BAS No. Ex 96D2237

APPARATUS DESCRIPTION

The Flame Ionisation Monitor Type 47720 is a portable instrument designed to detect and measure the presence of flammable gases in the air. The instrument comprises battery powered electronics mounted on several printed circuit boards (pcbs), a hydrogen cylinder, a battery pack and a separately certified Flame Ionisation Chamber.

The battery pack contains six alkaline C size cells, Duracell Type MN1400, held in a pcb mounted holder. The pcbs, flame chamber and hydrogen cylinder, together with all the necessary pipe fittings, are assembled to form a sub-assembly that is enclosed in a plastic housing with a window for the LCD display. The housing comprises two part plastic mouldings which are fastened together using anti-tamper fixings. The apparatus is fitted with connectors designed to take fibre optic cable for the purpose of data transmission link to an RS232 interface unit located in the safe area.

DRAWINGS

Number	Issue	Date	Description
*3-47721 Sheet 1	1	7.8.96	General Assembly
*3-47721 Sheet 2	2	5.7.96	General Assembly
*4-47729 Sheet 2	2	9.9.96	Main Label
BASEFA03.DSN	1	7.8.96	Block Diagram
BASEFA02.DSN	1	7.8.96	Interconnection Diagram
47830.DSN	1	1.5.96	Battery board circuit
47830	1	26.6.96	Battery board safety parts list
47830.CS	1	8.5.96	Battery board component layout
47830.C10	1	8.5.96	Battery board track layout
47860.DSN Sheet 1	1	16.7.96	Mother board circuit diagram
47860.DSN Sheet 2	1	17.6.96	Mother board circuit diagram
47860.DSN Sheet 3	1	16.7.96	Mother board circuit diagram
47860.DSN Sheet 4	1	30.4.96	Mother board circuit diagram
47860 Sheets 1 & 2	1	19.7.96	Mother board safety parts list
47860.CS	1	25.7.96	Mother board component side legend

Ex

British Approvals Service for Electrical
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Schedule

Certificate of Conformity BAS No. Ex 96D2237

Number	Issue	Date	Description
47860.SS	1	16.7.96	Mother board solder side legend
47860.C1	1	16.7.96	Mother board component side track
47860.C10	1	16.7.96	Mother board solder side track
47840.DSN Sheet 1	1	16.7.96	Sounder & Display board circuit
47840.DSN Sheet 2	1	1.5.96	Sounder & Display board circuit
47840.DSN Sheet 3	1	16.7.96	Sounder & Display board circuit
47840	1	13.6.96	Sounder & Display board critical parts list
47840.CS	1	8.5.96	Sounder & Display board component side legend
47840.SS	1	8.5.96	Sounder & Display board solder side legend
47840.C1	1	8.5.96	Sounder & Display board component side track
47840.C10	1	8.5.96	Sounder & Display board solder side track
47844.DSN Sheet 1	1	27.9.95	FID(LV) Head board circuit
47844.DSN Sheet 2	1	9.5.96	FID(LV) Head board circuit
47844	1	9.5.96	FID(LV) Head board critical parts list
47844.CS	1	8.5.96	FID(LV) Head board component side legend
47844.SS	1	8.5.96	FID(LV) Head board solder side legend
47844.C1	1	8.5.96	FID(LV) Head board component side track
47844.C10	1	8.5.96	FID(LV) Head board solder side track

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Certificate of Conformity BAS No. Ex 96D2237

Number	Issue	Date	Description
47835.DSN Sheet 1	1	11.7.95	Processor board circuit
47835.DSN Sheet 2	1	30.4.96	Processor board circuit
47835.DSN Sheet 3	1	9.5.96	Processor board circuit
47835	1	9.5.96	Processor board critical parts list
47835.CS	1	6.7.95	Processor board component side legend
47835.SS	1	6.7.95	Processor board solder side legend
47835.C1	1	6.7.95	Processor board component side track
47835.C10	1	6.7.95	Processor board solder side track
47850.DSN Sheet 1	1	11.7.95	Fibre optic output board circuit
47850.DSN Sheet 2	1	18.7.96	Fibre optic output board circuit
47850	1	1.5.96	Fibre optic output board critical parts list
47850.CS	1	21.3.96	Fibre optic output board component side legend
47850.C1	1	21.3.96	Fibre optic output board component side track
47850.C10	1	21.3.96	Fibre optic output board solder side track
47855.DSN	1	1.5.96	Fibre optic input board circuit
47855	1	1.5.96	Fibre optic input board critical parts list
47855.CS	1	24.1.96	Fibre optic input board component side legend
47855.C1	1	24.1.96	Fibre optic input board component side track
47855.C10	1	24.1.96	Fibre optic input board solder side track

British Approvals Service for Electrical
Equipment in Flammable Atmospheres



Schedule

Certificate of Conformity BAS No. Ex 96D2237

Number	Issue	Date	Description
447849	1	7.8.96	FID Transformer assembly
447849	1	7.8.96	FID Transformer parts list
447326	2	12.6.96	Glow Plug Transformer

Note The drawings marked thus * are also associated with Certificate Ex 96Y1238

BASEEFA List Keywords

2MONITOR