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PART NO. DESCRIPTION ADDITIONAL INFORMATION
MECHANICAL PEN DRIVING ASSEMBLIES

2000SPM.....	PRESSURE MOVEMENT	PRESSURE RANGE
2000STM.....	TEMPERATURE MOVEMENT	TEMPERATURE RANGE AND CAPILLARY LENGTH

ELECTRICAL PEN DRIVING ASSEMBLIES

2000SEM.....	COMPLETE MOTOR, GEARBOX AND POTENTIOMETER ASSEMBLY
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PNEUMATIC SPARES

2000S 770R	COMPLETE SINGLE TERM PROPORTIONAL PNEUMATIC MECHANISM
2000S 770RV	CONTROLLER MAIN VALVE AND INDICATING TRANSMITTER VALVE
2000S 770TX	COMPLETE 3-15PSI TRANSMITTER PNEUMATIC MECHANISM
2000S 770F	1/4BSP IN LINE FILTER
2000S 770G	PNEUMATIC INPUT / OUTPUT CHECK GAUGE
2000S 770PP	NEOPRENE 1.2mm ¹ CONNECTING PIPE
	SUPPLIED IN 1.5mm LENGTHS

ENCLOSURE SPARES

2000SCL.....	REPLACEMENT LOCK	
2000SCW.....	REPLACEMENT WINDOW.....	PERSPEX OR POLYCARBONATE
2000SCD.....	COMPLETE REPLACEMENT DOOR INCLUDING HINGE, LOCK, WINDOW & DUTY PLATE.....	INSTRUMENT SERIAL No.



HILLCREST
ENGINEERING
INSTRUMENTATION
LTD

TDS1353

INSTRUCTIONS - 2000 RANGE



P R E F A C E

The following set of instructions and illustrations shows and explains the operation of both mechanical and electrical recorders. Certain instrument configurations will combine the two, therefore it will be necessary to refer to both mechanical and electrical sections as required.

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2000ST/STP TEMPERATURE / PRESSURE RECORDERS

1. RECEIPT OF RECORDERS

The temperature recorder together with its charts and keys (which are attached to one of the mounting studs) is dispatched in a protective wrapping which should preferably be replaced after inspection as protection until the recorder is installed.

The pens are enclosed within a container packed within the instrument.

The capillary tubing between the bulb and the recorder is coiled for despatch purposes. Immediately prior to installation this tubing must be uncoiled. This must be done carefully to avoid twisting or kinking.

2. INSTALLATION

Location

The site chosen should preferably be free from dust, corrosive fumes, vibration and extremes of temperature. The instrument is suitably compensated against normal ambient temperature variations but when mounted in extremes of temperature the zero adjustment may need altering.

Mounting

The recorder can be surface or flush panel mounted in a vertical position.

For surface mounting: Use the three brackets at the rear of the case.

Drill three holes in the panel of the size and at the centres given in figure 7.

Fit a screw (maximum major diameter 1/4" (6.35mm)) in the top hole.

Locate the instrument on this screw and fit two similar screws through the remaining brackets.

For flush panel mounting: make a panel cut out to the dimensions given in figure 7.

Drill three holes and slot two to the cut-out edge as shown.

Remove the nuts and washers from the studs projecting from behind the case flange, pass the recorder through the cut out and re-fit the washers and nuts to secure the instrument.

Installation should be carried out by an experienced engineer. Instruments may require a zero adjustment due to disturbance during transit. This can be carried out at any known process condition. On mechanical instruments simply adjust the knurled disc, figure 1B (page 7). Electrical instruments are normally adjusted at the zero line on the chart by the zero potentiometer on the circuit board labelled zero with the correct input value applied. (See Installations, Electrical recorders page 16)

3. CONNECTIONS

Electrical clock recorder

The electrical clock is available for use on either 110v or 220/240v 50/60Hz supply. (Mechanical recorders only. See page 16 for electrical recorders.) To connect the clock proceed as follows:-

Remove the chart plate by slackening the three retaining screws and lifting the plate by passing the screw heads through the large end of the keyhole slots. Pass three core cable through the cable gland and connect the live and neutral wires to the terminal block marked with the appropriate supply voltage. Connect the earth wire to the earthing tag. Replace the chart plate taking

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care not to damage the pen in any way. It may be necessary to seal the cable gland depending on the type of cable used.

Spring clock recorder

Remember to wind the clock before fixing it in its location. If it will not start automatically a slight rotation of the case will start the clock. Once the recorder is installed and this procedure has been followed the clock should not require such assistance again.

Capillary tubing

Route the tubing carefully between the bulb and recorder so that it is not subjected to large temperature changes and ensure that it is supported in cleats. It is essential that any bends in the tubing are not less than 50mm in radius and **UNDER NO CIRCUMSTANCES MUST THE TUBING BE CUT.**

Location of bulb

Locate the bulb of the instrument where it will be subject to the true temperatures of the medium to be measured. Remember to allow for temperature gradients within the medium. With instruments allowing variable immersion depth, experimental variations in position by the user will assist in locating the optimum position of the bulb. Ensure that the full length of the sensitive portion is immersed in the medium at all times. Where the medium is corrosive the bulb must be immersed within a pocket to avoid direct contact with the medium.

When inserting the bulb into a pocket ensure that air gaps are kept to a minimum and if practical use heat transfer compounds to maximise response and reduce the lagging effect.

It is important to prevent the bulb from being

twisted when securing it in its location. To do this hold it steady with grips on the upper end of the bulb.

If a pocket is supplied with the instrument this should be securely installed before the bulb is inserted. The thermal response of a pocket bulb can be improved by filling the intervening space with a suitable heat transfer compound. The choice of filling depends on the materials and the operating temperature.

4. MAINTENANCE

The instrument should be kept clean and treated with care. Inspect the bulb periodically in circumstances where there is a risk of corrosion. Any evident corrosion should preferably be removed non-abrasively. Any contamination should also be removed.

If a pocket is fitted this should be subject to the same inspection and treatment procedure for corrosion and contamination as the bulb. Inspect the capillary tubing regularly for corrosive or mechanical damage.

5. PRESSURE CONNECTIONS

Pressure connections for measuring systems are 1/4NPT or BSP female. An appropriate stud coupling to suit mating pipework will be required. Observe manufacturers recommended tightening torques.

6. CALIBRATION

IMPORTANT NOTE: Mechanical instruments require the linkages to form a parallelogram. If the instrument has been tampered with, damaged or overloaded then the parallelogram will require rectification. See page 7 figure 1.

Calibration will be virtually impossible if the parallelogram rule is not implemented.

Calibration adjustments

Three main adjustments are provided for calibration purposes:-

'Zero adjustment' to correct the lowest reading.

'Coarse and fine span adjustment to correct the highest reading.

'Linearity' adjustment to correct mid-point reading.

These measurement positions are shown in figure 1.

(Note: Full calibration should be carried out by experienced personnel)

Zero adjustment

Any error in the pen reading checked against a known and steady temperature can be corrected by means of the zero adjustment.

Span adjustment

Coarse span adjustment involves unclipping the clevis and locating on another hole. A shift of one hole position will produce a large change in span. (Ensure that the joint between the clevis and the pen arm is free from friction). User calibration will usually only require slight span and zero adjustments.

Linearity

Linearity is corrected by slackening the two screws on the pen arm as shown.

Example: If at mid-point the instrument is

reading 1 division low, raise the relative position 10 divisions, re-tighten the screws on the pen arm and then adjust the zero to the correct mid-point position. Re-check at zero and at FSD. Repeat as necessary.

7. SPARES

See full spares list page 22.

The only user changeable spares available for the instruments are the pens (red, green, blue), charts, clocks (electric, clockwork), pressure systems and temperature systems. The latter may require an experienced engineer / electrician to replace.

Pen adjustment

To replace the pen simply hold the coloured ink cartridge with finger and thumb and slide off the pen arm, then slide the new pen onto the arm.

NOTE: On replacement of fibre tip pens it is imperative that the correct pressure is obtained between the fibre nib and the chart. This can vary due to environmental conditions particularly in high humidity applications.

To achieve the correct pressure slight bending of the pen arm is required either to increase pressure where it is lacking or vice versa. A good guide for setting the correct pressure is to gently nudge the pen upwards and observe whether or not the pen returns to its original position. A new fibre tip pen usually requires gentle rubbing of the nib before installation.

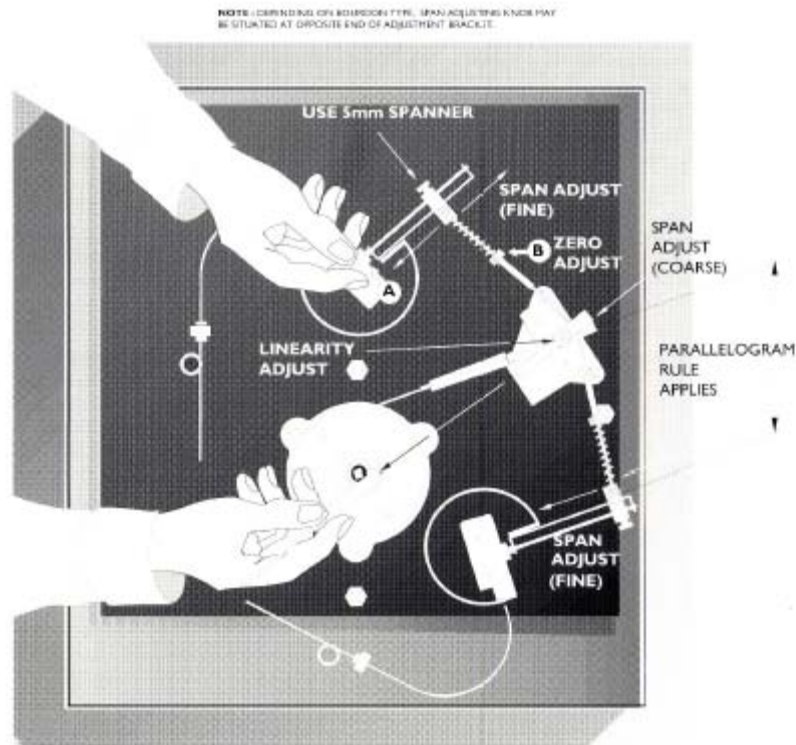


figure 1

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7 7 0 R R E C O R D E R

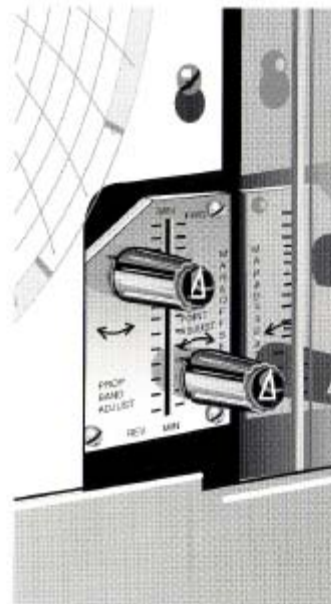
1. CALIBRATION

Instruments are supplied calibrated to national standards and provided that only the zero adjustments described in installation are made, the calibration should be unaffected.

Recalibration

Recalibration should be carried out by experienced personnel with suitable equipment traceable to national standards. If in doubt refer to the manufacturer.

2. CONNECTIONS



Connections to the 770R and the 770RTX are 1/4" BSP. A good, clean and constant supply pressure of 20-30 PSI, 1.5-2 BAR is required.

Output pressure is 3-15PSI, 0.2-1.0BAR.

3. INSTRUCTIONS FOR USE

The 770R is a single term proportional pneumatic controller. All controllers are supplied from the manufacturer in either forward or reverse mode. Refer to the manufacturer for conversion from forward to reverse.

The controller comes set up to give a control output signal of 9PSI. However, virtually all applications will not operate at 9PSI. The controller will require an offset value. To achieve this we suggest that the process must be under normal load and initially at a midpoint of operation ie. 50°C process temperature 100°C. From this both proportional band and offset can be adjusted. As the process stabilises, the oscillations can be damped out by adjusting the proportional band, the bigger the oscillation, the lower the proportional band is adjusted. Now the necessary offset can be adjusted out. For this adjustment the chart plate needs to be removed. Slacken the three retaining screws, remove the chart and then carefully slide out the chart plate. Replace the chart. For inexperienced operators a small piece of chart can be removed to fully expose adjustment controls, figure 2.

Any offset can now be corrected by rotating the adjusting barrel A, figure 2. NB. Adjust with care and allow the process to rise and

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fall slowly until the measured value coincides with the set point. The direction of rotation will depend upon how the process is configured ie. orientation of controller to end mover.

For ON/OFF or alarm applications simply adjust the mechanism to minimum proportional band, raise or lower the set point to the required position, then raise or lower the process to the alarm condition. Then proceed to adjust the barrel A to trigger

the alarm. If it is not possible to raise or lower the actual process then mechanical instruments can, with care, be pushed manually into position, see B, figure 2.

A setting guide can be obtained by monitoring the output gauge. For example at control point an output pressure is obtained ie. 9PSI.

To offset the control point adjust the barrel, figure 2A as required.

Finally the set point may require slight

adjustment at operating temperature, depending on the control valve and its construction ie. whether it has a linear flow pattern will depend on how much final trimming is required. Slight proportional band adjustment may be necessary but this is unlikely.

4. MAINTENANCE

The 770R is designed to be virtually maintenance free. Its air output has no user serviceable components and only under conditions of poor air supply will need any cleaning. A simple clean should be all that is necessary. This is done by disconnecting the air supply pipe and applying some cleaning fluid. Cleaning fluids which leave lubricating traces are ideal (degreasing agents are not suitable eg. Trichloroethane).

For optimum performance a cleaner like petroleum spirit (lighter fluid) or methylated spirits should be used. Ensure that all safety procedures are adhered to. Disconnect the output pipe and reconnect the supply. This

will flush away any deposited materials from the output valve. Any problems of stickiness or sluggishness in the mechanism should now have been cured. If not refer to the manufacturer. An external 1/4" BSP line filter is screwed into the power supply port. This can be removed and cleaned with the same type of cleaner.

Other problems normally encountered are due to pipework leaks, either external or internal.

To replace either of the pens simply hold the coloured section of the stem, slide off and slide on the new pen.

5. APPLICATIONS

The 770R, due to its design is capable of moving quite large volumes of air. It can help to avoid the necessity for positioners in some circumstances.

Obviously this is dependant on a number of conditions which vary from process to process ie. diaphragm size, length of run, pipe diameter etc.

770RTX INDICATING TRANSMITTER

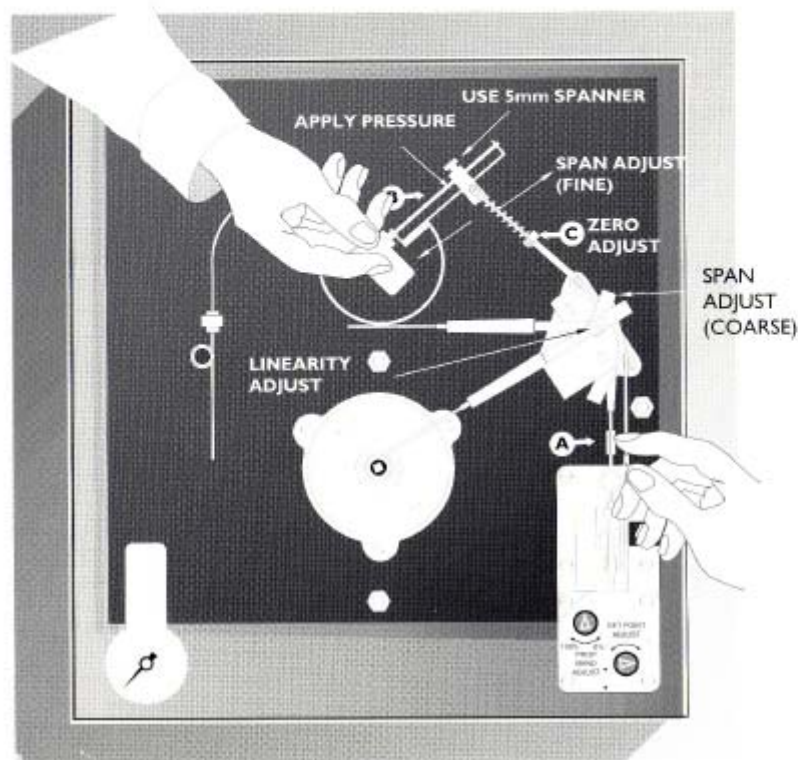
This instrument uses the same principles and components as the 770R controller and the measured value calibration is as in figure 2 page 9. **NOTE:** Do not adjust the centre screw, figure 3 as this is factory set.

Normally the instrument will require only a zero adjustment to give the required output relative to measured value.

Instruments may require zero adjustment on installation, NB. Allow the instrument to stabilise for a few minutes and then adjust the plastic adjusting knob to give the correct output. If the instrument is out of zero range then place a screwdriver in the slot and

adjust the appropriately labelled coarse zero, figure 3. Long term operation may necessitate a slight span adjustment to the transmitted output. Instruments which are fitted with secondary regulators can be easily adjusted for span by increasing or decreasing the supply pressure ie. increasing supply will increase span etc.

This will necessitate rotation of the regulator adjusting knob and then making the appropriate pressure adjustment. Ensure to return the adjustment knob to its original position.



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IMPORTANT NOTE: Span adjustment will require only a very small supply change. Normal setting should be 20PSI. Where a secondary regulator is not fitted, span adjustment is as follows.

Retransmission linearity adjustment

To correct a linearity error it will be necessary to increase or decrease the connecting rod length from the pen / pointer mechanism. To do this unlock the knurled nut and then turn the top link as shown in figure 3.

NOTE: Shortening the effective length will

raise the midscale retransmitted output. A 6BA screw passes through the valve operating stem. Adjusting the screw to move the connecting link to the centre will increase the transmitted output span and vice versa. See figure 3. Note that this calibration should only be carried out by an experienced instrument engineer as it requires the removal of the baseplate by the three 6mm stainless steel nuts. Maintenance of the 770RTX is as the 770R controller.

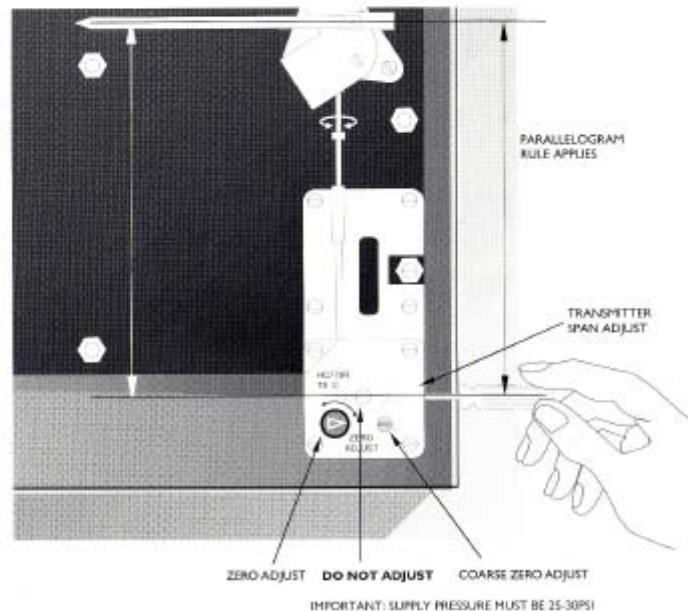


figure 3

2000STPA DIFFERENTIAL OR ABSOLUTE ALARM UNIT

FOR TEMPERATURE, PRESSURE, HUMIDITY (RECEIVER) RECORDERS IDEAL FOR CONTENTS ALARM, HIGH OR LOW TEMPERATURE / PRESSURE ALARM ETC

The NZ2000STPA alarm features

1. Suitable for hazardous areas providing failsafe operation.
2. Simple alarm setpoint.
3. Provides permanent record of setpoint
4. Minimum installation requirements.
5. Operates over a wide supply range, typically 1 -10 BAR
6. Switching tolerance close to digital type can be obtained (dependant upon pressure switch spec.).
7. Totally non interacting setpoint making multiple product processing simple.
8. Can be configured in forward or reverse mode for failsafe applications.
9. Flow compensation for long pipework runs.
10. Output 0.5-1.2 BAR.

The 2000STPA unit's adjustments are simple. Figure 4A is the main regulating unit which controls the maximum output pressure. This is set to correspond with the required actuation and pressure range of the pressure switch chosen. To set the main regulator first pull the setting knob out and then turn clockwise to increase output pressure or anticlockwise to decrease output pressure. Ensure the knob is locked back in position after setting.

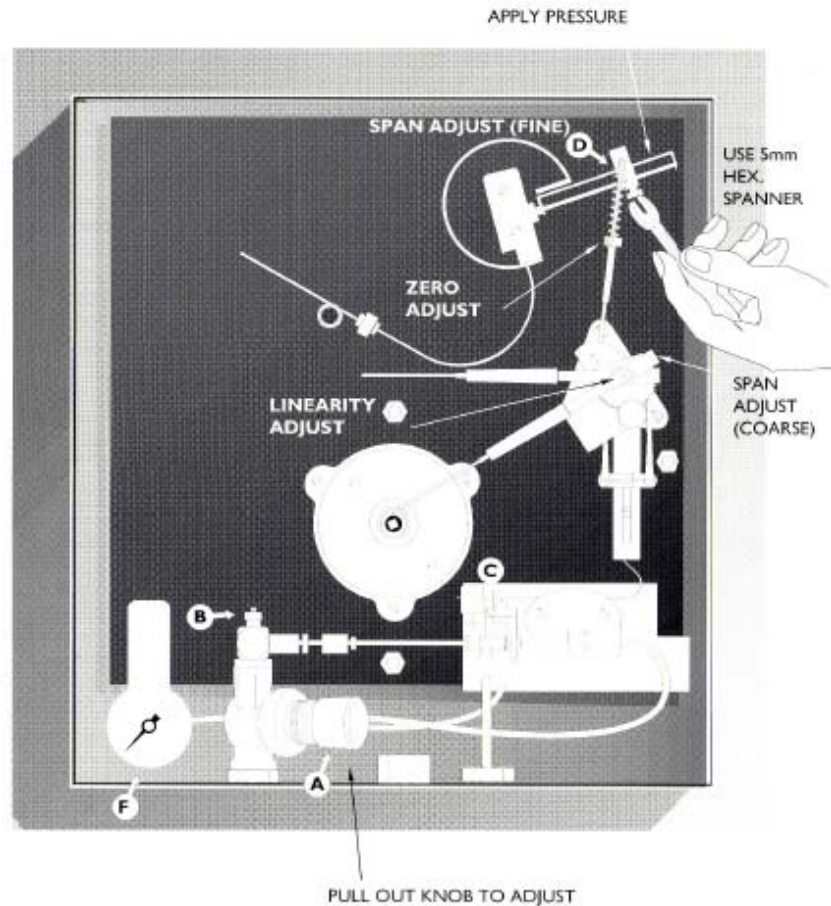
To set the alarm point it is suggested that customers who are not familiar with the 2000STPA unit first install the instrument and test the alarm operation by adjusting the alarm set point arm, figure 4, as follows:- When the set point arm (blue) is above the recording pen by 1 division it should produce either ON or OFF condition depending upon the configuration specified. Moving the

setpoint arm below the recording pen will reverse the condition. Note: Allow sufficient time for the system to charge up. The pressure gauge figure 4F is provided for an approximation of output condition. Do not use this gauge as a test gauge relative to the chosen pressure switch. **Note:** If a high specification pressure switch is chosen then a gauge of similar specification will need to be connected for initial set up. If factory set operation will not produce the required operation refer to the following adjustments. Adjusting the instrument regulator closer to the pressure switch actuation will decrease hysteresis. **Note:** Maximum output should be set to 1.2 BAR (15PSI).

Figure 4B is the instrument flow regulator.

Note: This is factory set to produce satisfactory alarm operation with moderate lengths ie. 20 metres between instrument and pressure switch. Longer pipe runs should be in smaller bore diameter pipe. However by increasing the flow rate long pipe runs can be catered for (or larger bore pipe on existing installations as air volume is the decisive factor.) **Note:** Flow regulation can also be used to delay reset on a self resetting system to prevent hunting. For example a failsafe alarm on rise system will require the system to recharge the pipework etc. to reset. By reducing the flow rate the system will take longer to recharge producing the required delay. Note: Each individual system will invariably require trimming. Adjustment is simple. Slacken the locknut and screw the centre slotted screw clockwise to reduce flow or anticlockwise to increase flow.

Figure 4C is the switching or blow off point



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adjustment. This is supplied factory set when the two pens coincide either as a rising or falling alarm as specified on ordering. Rough transit may necessitate a slight adjustment which requires slackening the locknut and winding the nozzle towards or away from the beam depending on the configuration ie forward or reverse acting. See figure 4. Applications which have rate of change such as exothermic reactions may require an increase in flow as previously described in figure 4B adjustments as this will increase the response of the alarm.

Note: When the system is fully connected conditions can easily be simulated by manually raising or lowering the recording pen, figure 4D (red pen). Only move the

recording pen $\pm 20\%$ maximum to avoid damage. Final trimming of this system can now be carried out.

MAINTENANCE

Providing the instrument has a good, clean, dry air supply the system should be maintenance free. Long term operation will produce slight carbonising at the nozzle, figure 4C. This can be removed with a small brush and methylated spirit or petroleum spirit (lighter fluid). If the air quality is poor it may be necessary to purge some cleaner through the nozzle via the air supply pipe.

Note: Observe all relevant safety procedures whilst using flammable cleaners.

SAFE AREA

NON SAFE CONTACTS

SUPPLY 0.5 - 1.0 BAR

6mm OD PIPE
(4mm BORE)

HAZARDOUS AREA



OUTPUT 0.5 - 1.2 BAR

IS SAFE PRESSURE SWITCH