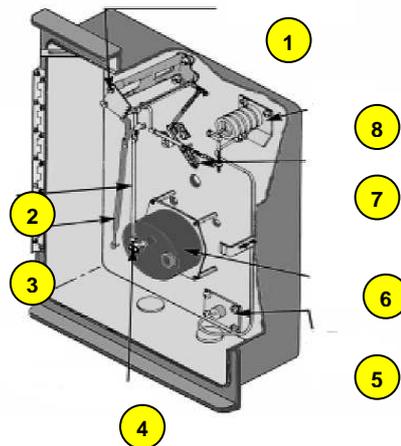




## **CRYOGENIC TANK SERVICES - CHART RECORDER MANUAL**

### **Pressure Chart Recorder / Temperature Chart Recorder / Dual Recorder**

**Portable Mechanical Chart Recorder for the accurate measurement and recording of Pressure or Temperature.**



#### **Basic Breakdown:**

- |                          |                   |
|--------------------------|-------------------|
| 1) Pen Mount             | 2) Pen Arm        |
| 3) Pen Arm               | 4) Chart Hub Clip |
| 5) S.P Connection        | 6) Chart Clock    |
| 7) DPU Torque Tube Shaft | 8) S.P Element    |

#### **Features:**

- Pressure Recorders available in either Barg or PSIG scales
- Available from 6 Barg to 2,000 Barg / 100 PSIG to 30,000 PSIG.
- Temperature Recorders standard range of -20°C to +60°C, 0-50°C and 0-100°C
- Dual Pressure & Temperature or Pressure & Pressure recorders
- Available from 20 Barg & -20°C to +60°C or any configuration using 100% charts.
- Accurate to 1% of Full Scale Deflection.
- Temperature Limits -40°F/°C to +180°F (+8°C)
- Mechanical dual clock mechanism available in 2-hour/8-hour and 24-hour/7-day durations.
- Bespoke Stainless Steel watertight case.
- Extended rubberised feet for greater stability.
- Top-mounted carry handle for easy portability.
- Designed with the maintenance engineer in mind.
- Low cost servicing.
- Robust construction.

#### **Typical Overall Dimensions**

60 cms x 37 cms x 21 cms

#### **Typical Approximate Weight**

9 kgs



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## BASIC OPERATING INSTRUCTIONS FOR FREE STANDING CHART RECORDERS

We can offer three kinds of Free Standing Chart Recorder - Temperature / Pressure and Dual. They are very fragile and susceptible to rough handling. Everything inside the case is mechanical, even the clock.

Every Chart Recorder is calibrated before leaving our premises.

Inside the Chart Recorder there will be a key for winding the Chart Recorder Clock and a spare pen.

- When connecting a Pressure Chart Recorder to a test the first thing to connect would be the hose.  
**Make sure the hose assembly is the correct working pressure.**
- Spin the hose connection onto the male connection of the Chart Recorder FINGER TIGHT ONLY.
- Pulse the pump if it is tank fed or turn on the mains water supply making sure you are not producing a pressure.
- When the hose assembly is empty of air, water will start to drip gently from the Chart Recorder connection.  
Using **TWO** appropriate spanners one on the hose connection the other on the Chart Recorder adaptor gently nip the fittings tight.
- The clock inside the Chart Recorder is a Swiss made highly accurate piece of equipment, very fragile and must be treated with respect.  
Most clocks when wound fully will run for a minimum of seven days. The most common mistake made is over winding the clock, when this happens the clock will stop and will not turn the chart. Once the clock is wound the chart should be installed.
- Open the door of the Chart Recorder, look to the top left-hand side and you will see a lever, gently lift the lever and the pen arm will lift off the back plate.  
In the center of the Chart Recorder fixed to the clock you will see a connection for the paper to slip over, slip the paper over this connection, turn the paper to the point you want the pen to start and gently slide the retainer back.  
Now the paper should be in place, around the edge of the paper you will see small slips for the paper to run under, gently slide the paper under each one until all are used.

Gently tap the side of the chart recorder to make sure it is starting on zero. If the chart recorder is on zero, the chart recorder is now ready to receive pressure.



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## BASIC OPERATING INSTRUCTIONS FOR FREE STANDING CHART RECORDERS

- All paper has a grain, so a common thing to look for when testing is that the pen has not got stuck, so every now and then tap the side of the chart recorder gently to make sure the pen is free running.

**SAFETY NOTE:** Make sure recorder being used is fit for purpose and covers the test pressure required – The main issue with pressure recorders is due to the operator “over-pressurising” the recorder which results in the pressure element being stretched and thus beyond repair and a new one is required.

Temperature Chart Recorders are basically the same except you do not connect a hose to it: on the back of a Temperature Chart Recorder you will find a capillary tube. This is a fine rigid stainless steel tube filled with gas and covered with a spiral cover.

**This capillary must be treated with the utmost care to make sure the inner liner is not fractured.**

- To connect the capillary tube to the test piece, gently unwind the tube making sure that it is not kinking. Tape the bulb to the test piece.
- Make sure the capillary tube cannot be damaged by standing on it.

Dual Recorders are basically the same as above but incorporates two ranges either “Pressure and Temperature” or “Pressure and Pressure”. Making sure the correct charts are used or simply using a 100% blank chart the only difference is obviously there is two pen arms instead of one.

**SAFETY NOTE:** Make sure when using the Dual Pressure recorder that the correct connection is used as using the wrong one can result in the element being “over-pressurised”.

### GENERAL NOTES:

- All paper has a grain. When damp, paper stretches, a chart when damp instead of being round can become oval: **it is imperative that the chart stays dry.**
- Always put the cap back on the pen when the test is finished – this will avoid the pen ink leaking and drying resulting in it needs to be replaced.
- During operation operator can GENTLY tap recorder on the side in case pen arm is stuck.

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## MAINTENANCE AND CALIBRATION INSTRUCTIONS

### **Pressure Recorder Maintenance:**

Our recorders require no maintenance other than replacement of the chart, replenishment of the ink, winding of the spring-wound chart clock and occasional calibration (we recommend once a year but if continuously used then it's upto customers discretion). The operator should periodically check the door seal for wear and the pressure fittings for tightness.

### **Pressure Recorder Calibration:**

To calibrate the pressure pen and associated linkage, proceed as follows:

1. Adjust the static range arm and drive arm at precisely the same distance from the back of the case.
2. Place static drive link in the fourth hole from the pen shaft of the range arm
3. Adjust static pressure linkage to form 90deg angles between the drive link (see following drawing) and pivot points of the associated linkage, as follows:
  - a) Apply 50% static pressure, center the thumb nut on the drive arm, and arrange the static linkage.
  - b) Set a 90deg angle between the drive arm and the link. Tighten the clamp block screw.
  - c) Vary the length of the link to get a 90deg angle between the range arm and the link.
  - d) Slip the range arm on the pen shaft to 50% on the chart.
4. Release the pressure and reset the pen to zero indication, using the pen zero adjust screw for fine adjustment (10% or less). For major adjustments (more than 10%), loosen the range arm lock screw, slip the pen to zero on the chart, and retighten the lock screw.

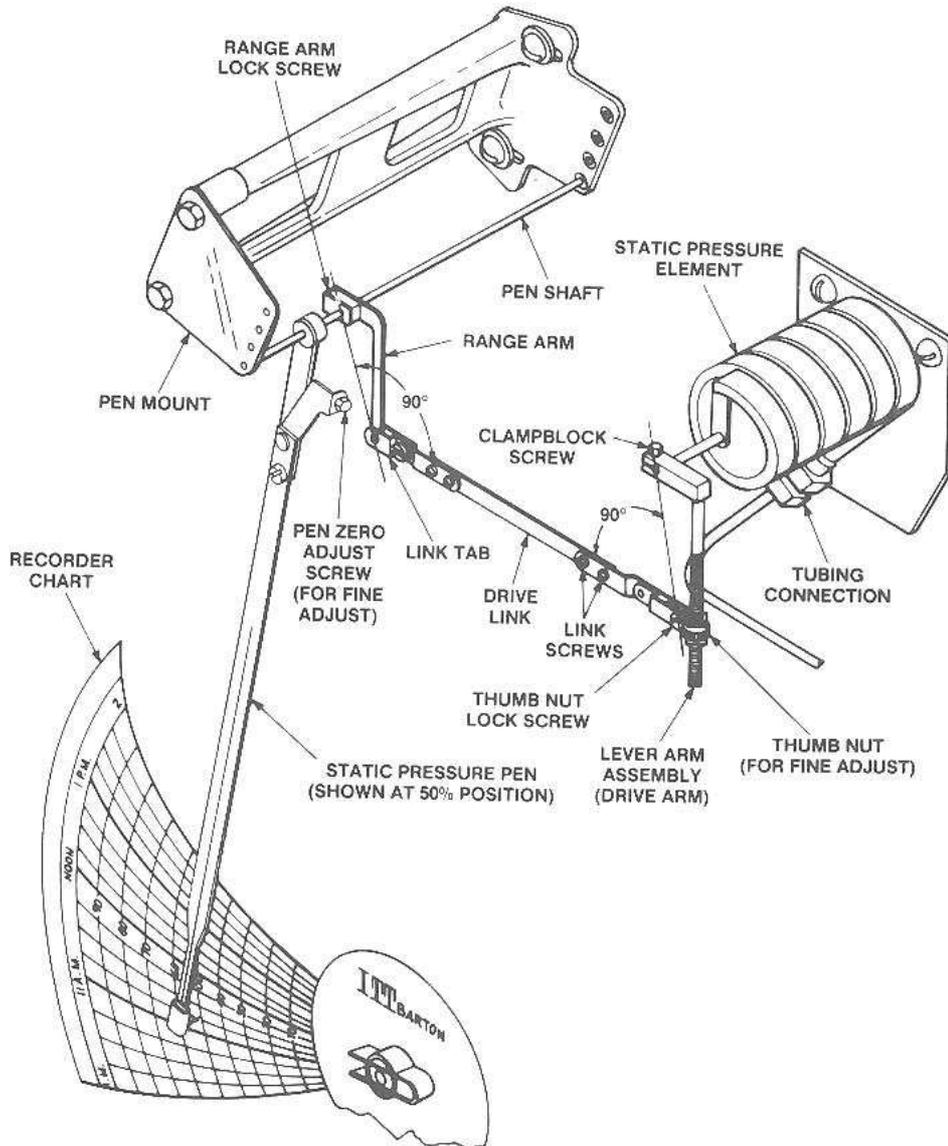
### **IMPORTANT:**

It may be necessary to raise or lower the pivot point of the drive link on the range arm, as in step 3. If counter clockwise movement of the thumb nut (step 5) does not increase the span sufficiently, move the pivot pin up to the next pivot hole, if clockwise movement of the thumb nut does not decrease the span sufficiently, move the pivot pin down to the next pivot hole.

5. Apply 100% pressure and the pen. If the pen is slightly under-ranged, turn the drive arm thumb nut counter clockwise, if the pen is slightly over-ranged, turn the drive arm thumb nut clockwise.
6. Repeat zero and 100% adjustment until calibration at these two points is achieved.
7. Apply 50% pressure and observe the pen indication.
  - a) If the pen indicates high or low, adjust the drive link to make a correction approximately 40 times the error – in the direction of the error.
  - b) Reset the pen to the 50% line by slipping the pen shaft at the range arm pivot point.
  - c) Reapply 50% pressure and observe the pen indication.
  - d) Repeat this step (7), as necessary.
8. Release pressure and reset the pen to zero indication, using pen zero adjust screw for precise adjustment.
9. Repeat steps 4 through 8 until calibration of zero, linearity, and span (0%, 50% and 100% indication) is achieved.
10. Assure that range arm lock screws, thumb nut lock screw, and link screws are tight.
11. Unlock the recorder hub clip and remove the temporary calibration chart.
12. Replace the chart plate by sliding it into the chart plate retainer brackets and engaging each side into the chart plate latches.



## Static Pressure Pen Calibration Breakdown Drawing:



### **Temperature Recorder Maintenance:**

Again our recorders require no maintenance other than what has been identified on the pressure recorder side. However additional care should be taken with the capillary tubing to ensure no damage or kinking as it is the whole capillary, not just the bulb that reads the temperature.

### **Temperature Recorder Calibration:**

Follow same steps as the pressure recorder.

## TROUBLESHOOTING

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PROBLEM	SOURCE	PROBABLE CAUSE	CORRECTIIVE ACTION
Low or No Indication	Excessive residue formation on Temperature Bulb	Heating conductivity of temperature bulb is impaired	Remove from service and clean element
	Mechanism	Loose links or movements	Tighten or replace
		Out of calibration	Recalibrate
		Corrosion or dirt in mechanism	Clean or replace
		Pen arm loose	Tighten
	Loss of Fill	Capillary cracked, kinked or broken	Replace temperature bulb
	Element	Defective element	Replace element
	Tubing	Loose connection	Tighten connections
		Tubing plugged	Clear tubing
Pen arm	Pen arm bent	Straighten or replace pen arm	
High Indication	Mechanism	Loose links or movements	Tighten or replace
		Out of calibration	Recalibrate
Erratic Indication	Mounting	Excessive vibration	Secure the means of mounting
	Mechanism	Linkage dragging or dirty	Adjust or clean
		Excessive pen pressure on chart	Adjust
No Chart Rotation	Chart Drive	Clock motor not wound	Wind chart drive
		Defective drive	Replace drive
	Chart Hub Lock	Lock not latched	Latch hub lock
		Hub is either too far forward or too far back	Adjust and turn chart to check
	Chart Paper	Either damp or creased so stops pen from moving	Change chart paper
Pen not working	Blob of Ink on Chart Paper	Pen is missing cap	Put a cap on
	No Ink	Pen has run dry	Replace Pen
Wrong Chart Speed	Chart Hub Lock	Lock not latched	Latch hub lock
	Chart Drive	Wrong chart drive	Replace with proper chart drive
		Wrong chart drive selection	Select correct one