

STRIP CHART RECORDERS

INSTRUCTION MANUAL

MODELS:

RO 101, 1 PEN, 100mm
RO 102, 2 PEN, 100mm
RO 201, 1 PEN, 200mm
RO 202, 2 PEN, 200mm

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GENERAL

This manual covers all recorder models. The 200mm models have an internal calibrate mode that is not incorporated in the 100mm models.

BASIC PERFORMANCE

Total inaccuracies, from any source (non-linearity, deadband, etc.), are less than 0.5%. The 12 selectable input sensitivities, plus attenuator, allow you to set full scale ranges anywhere from 1 mV to 25V.

FEATURES

All models are extremely compact in size and very competitively priced. They also have built-in override event markers. 200mm models have an internal calibration voltage for setting special ranges.

SPECIFICATIONS

Full Scale Span	1, 2, 5, 10, 20, 50mV and 0.1, 0.2, 0.5, 1.0, 2.0, 5.0 V
Chart Speeds	1, 2, 5, 10, 20, 30 cm/hr & cm/min
Response time	Less than 0.5 seconds full scale
Power	12 to 15 volts, AC or DC (wall adapter supplied)
Pen Type	Disposable fiber tip
Paper Length	50 Feet (15 meters)

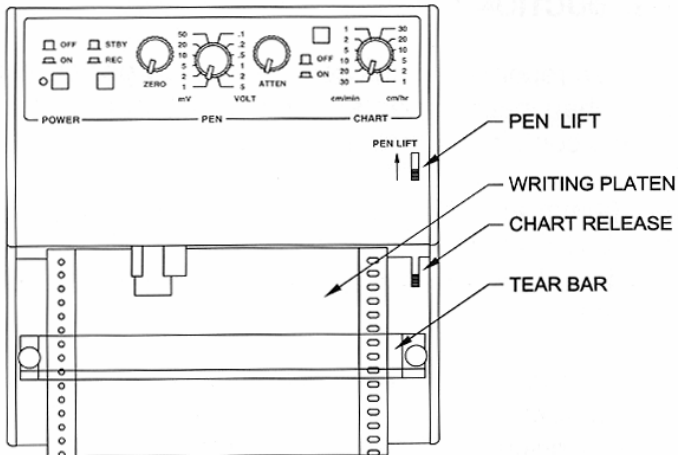
INTRODUCTION

Your new recorder comes complete with a power pack, one roll of chart paper*, pen(s) and instruction manual. Save shipping container for possible future shipment.

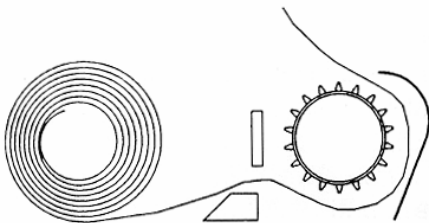
The 100mm and 200mm chart recorders described herein have been designed for reliable long life and simple operation. This manual contains basic information for quick reference.

The only operational difference between all models is the CAL feature on the 200mm models. Explanations, technical discussions, and calibration procedures apply to all models.

* The chart paper is shipped inside new recorders.



RECORDER - TOP VIEW



PAPER PATH - INTERNAL SIDE VIEW


LOADING PAPER

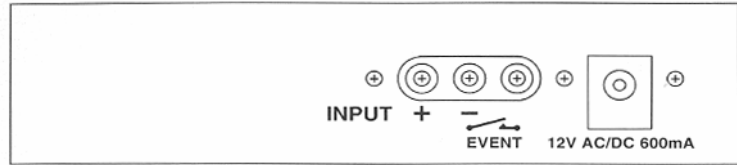
1. Push **PEN LIFT** back (up) and remove pen (s).
2. Push **CHART RELEASE** back.
3. Tilt **WRITING PLATEN** forward.
4. Feed end of paper under and around sprockets (see diagram).
5. Drop paper roll into chamber.
6. Close (tilt back) **WRITING PLATEN**.
7. Feed paper under **TEAR BAR**.
8. Pull **CHART RELEASE** forward.
(If paper is not aligned with sprockets adjust paper before pulling release.)

INSTALL PEN

1. With **PEN LIFT** back (up) gently slide back of pen body into pen holder and push until pen stops.
2. Pull **PEN LIFT** forward to lower pen.

REAR PANEL

- + Signal Input Positive
- Signal Input Negative
-  Override Event Marker

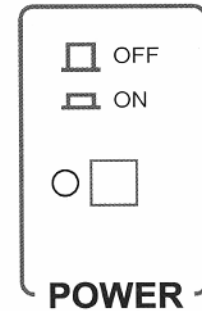


POWER - 12 to 15 volts AC or DC at 600ma
(current drain is less as pen speed decreases)

POWER SWITCH

Main power switch to recorder.

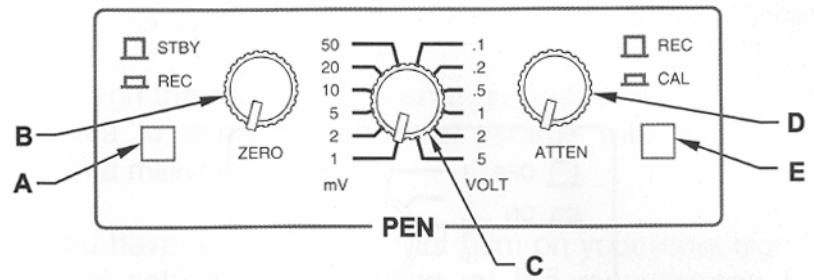
NOTE: When power is first turned on, there will be a delay of about 1 second to allow power supplies to settle before power is applied to the pen. Pen will then jump to appropriate position.



PEN DRIVE

A. STBY/RECORD

In **STANDBY** position the input circuit is grounded internally to allow accurate setting of pen zero position. The input signal to the recorder is disconnected in standby mode.



B. ZERO

ZERO knob adjusts starting position on chart. Can be set anywhere on chart.

C. mV/VOLT

Input range switch sets full scale range of input signal.

Attenuator switch must be in full counterclockwise position for calibrated ranges to be accurate.

D. ATTEN

ATTENUATOR has no effect in switched (full CCW)

position. As knob is turned clockwise input sensitivity is reduced to allow special input ranges.

E. REC/CAL

Permits calibration check on all ranges. Custom ranges may be set with this reference. See page 8.

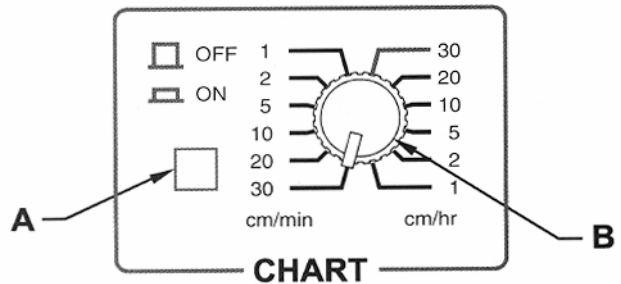
CHART DRIVE

A ON/OFF

Turns power on and off to chart drive without effecting pen drive. (Main recorder power must be turned on for chart power to work.)

B CHART DRIVE RANGES

12 chart speeds from 30cm per minute to 1 cm per hour are crystal controlled for chart drive accuracy.



OPERATING TIPS

1. Although the recorder is "overrange protected", it is not a good idea to apply a high input voltage with the range switch in a millivolt position.
2. If you have a small amount of hum on your input signal the GAIN setting on the bottom of the recorder can be adjusted to reduce sensitivity.
3. If you don't know where your true zero is, push the STBY (standby) switch. This will disconnect your input signal while grounding the recorder's internal input. You can then see the recorder true zero.
4. Zero may be set anywhere set anywhere on the Chart. (e.g. center zero for bi-directional signals)

SPECIAL FEATURES

1. CAL (Internal Calibration on 200mm recorders only)*

At any input range a voltage is internally connected to drive the pen to full scale. This is a convenient way to quickly check calibration. You can also custom calibrate a full scale range using the calibration voltage and the attenuator.

EXAMPLE:

- A. You want to calibrate the recorder for 120mV full scale.
- B. Set input range to 100mV (next more sensitive range) and push REC/CAL to CAL position.
- C. Using the formula below set the pen, by turning the ATTN knob, to 83% of full scale (166 mm).

$$\frac{100\% \text{ fs}}{120\text{mV}} = 83\% \text{ (166 mm on 200mm charts)}$$

- D. Return REC/CAL switch to Record. Recorder is now calibrated for 120 mV full scale.

2. EVENT MARKER - OVERRIDE

Shorting the EVENT terminal on the rear panel to signal minus momentarily will put a short spike on the pen trace.

3. OVERRANGE PROTECTION

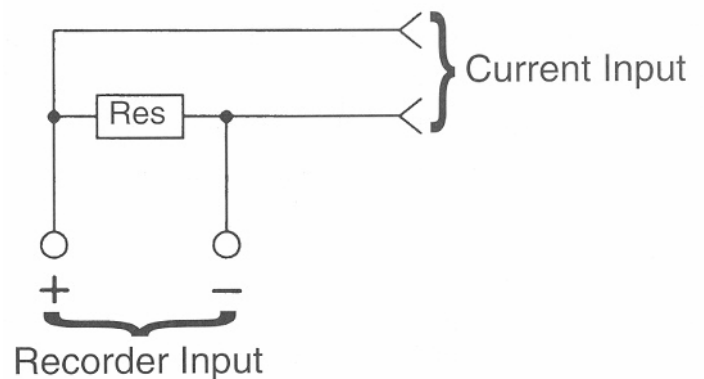
Regardless of the input voltage, the pen will only travel a small distance below zero and above full scale. This protects the recorder from damage during overrange.

*NOTE: For critical applications an external calibration source should be used.

4. CURRENT RECORDING

Current inputs can be recorded as easily as voltage by placing the appropriate resistor value across the + and input terminals.

$$\text{Resistance in ohms} = \text{Voltage} / \text{Current}$$



Example: For 0 to 1 ma (.001 Amp) full scale

set recorder to 0.1 Volt / current 1 ma (.001 Amp) = 100 ohm resistor

CARE AND MAINTENANCE

1. Cap pen when not in use.
2. Do **NOT** oil any moving parts.
3. Clean all surfaces with water or alcohol only.
4. Fresh ink and small pieces of paper can get under TEAR BAR. Remove thumb screws at both ends and clean tear bar with alcohol or water.

CALIBRATION

All adjustments are clearly labeled on bottom panel. The adjustments and procedures are identical for all recorder models, with the exception of the CAL function adjustment, which is on 200mm recorders only.

PRESET

Load paper, install pen, switch ATTEN off (full CCW), switch STBY/REC to STBY, switch REC/CAL to REC, turn chart off, switch INPUT RANGE to 10mV, and turn POWER on. Turn ZERO full ccw (off scale on left side) and LOW LIMIT adjustment (bottom of recorder) full cwo Next, turn ZERO full cw (off scale on right side) and turn HIGH LIMIT adjustment full ccw. Over-range protection is now disabled so recorder can now be calibrated.

Allow recorder to warm up 10 minutes.

GAIN

Set ZERO to the approximate center of chart. Turn GAIN adjustment (bottom of recorder) clockwise until pen "buzzes". Next, turn adjustment counter clockwise until buzzing stops plus a few degrees. Turn ZERO control so pen moves over the full chart. If buzzing occurs at any point, turn GAIN adjustment a few more degrees counter clockwise.

OFFSET

ZERO pen to zero on chart. Set OFFSET adjustment for minimum shift while switching input range between the 50 mV and 0.1 Volt position. Note that there will usually remain some zero shift when switching between the most sensitive ranges.

SPAN

Put STBY/REC switch in STBY. Zero pen on chart. Connect an accurate 10mV source to recorder input. Switch to REC. Adjust SPAN control (bottom of recorder) so pen reads full scale. Return to STBY. Switch back and forth between REC and STBY while adjusting the ZERO and SPAN controls until both zero and full scale are on appropriate lines. All ranges are now calibrated.

REC/CAL (Model 201 and 202 only)

Put STBY/REC switch in STBY. Set range switch to 10 mV. Zero pen on chart. Set REC/CAL switch to CAL. Adjust CAL control on bottom of recorder to move the pen to the 100% mark on the chart. (NOTE: SPAN must be adjusted before CAL is adjusted.)

LOW LIMIT

Set STBY/REC switch to STBY. Turn zero control full counter clockwise. Turn LOW LIMIT adjustment on bottom of recorder to move pen approximately half way between the sprocket and the left hand edge of the chart on the paper.

HIGH LIMIT

Set STBY/REC switch to STBY. Turn zero full clockwise. Turn HIGH LIMIT adjustment on bottom of recorder to move pen approximately half way between the right hand sprocket and the right hand edge of the chart on the paper.

REPEAT CALIBRATION FOR CHANNEL 2 IF REQUIRED. Your recorder should now be fully calibrated.

TROUBLE SHOOTING

PEN DRIFTS AND/OR "BUZZES"

No input - input is in REG mode with no connection to the input terminals.

WARRANTY

All Ross Recorders are warranted for a period of 2 years from the date of purchase, to meet published specifications. Warranty replacement or repair will be at manufacturers discretion. Warranty excludes paper and pens.

PEN "BUZZES" WITH STABLE INPUT OR IN STBY MODE Servo GAIN too sensitive -see page 10.

PEN "PEGS" TO EITHER END

Switch to STBY - if ZERO control works, your input signal is too high for range setting or has a large zero offset.

PAPER "JAMS" - DOESN'T FEED

Paper is not rolled up tight or is at the end of the roll. Paper may have loosened during transportation. If paper supply roll is rolled loosely paper will not feed properly.

PAPER RUNS AT ANGLE

Paper is not aligned on sprockets. Release chart release and shift paper on sprockets.

CHART PAPER AND PENS

Paper and pens may be ordered from Topac or instrumentsonline.com as follows:

Part No RO 1101 100mm paper (50ft/15m) 4 roll pkg

Part No RO 1201 200mm paper (50ft/15m) 4 roll pkg

Part No 1001 Pen, black/short (4/pkg)

Part No 1002 Pen, blue/short (4/pkg)

Part No 1003 Pen, red/short (4/pkg)

Part No 2001 Pen, black/long (4/pkg)

Part No 2002 Pen, blue/long (4/pkg)

Part No 2003 Pen, red/long (4/pkg)

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