USER'S MANUAL

FOR

CIRCULAR CHART RECORDER

MODEL : MTR-600/2

INTRODUCTION:

MTR-600 IS A MICROCONTROLLER BASED INTELLIGENT CIRCULAR CHART RECODER. THE UNIT FEATURES TWO ANALOG INPUTS, SIXTEEN CHARACTER BY ONE LINE BACKLIGHTED LCD DISPLAY. **MTR-600** UNIT HAS STEPPER MOTOR FOR THE CHART AND PEN MOVEMENT. **MTR-600** UNIT HAS NONVOLATILE MEMORY FOR STORAGE OF PARAMETERS AND STORAGE OF CALIBRATION DATA, BATTERY BACKED CLOCK TO COMPUTE THE POWER OFF TIME, SELECTION OF INPUT TYPE, PROGRAMMABLE CHART DURATION AND PROGRAMMABLE LOW AND HIGH POINT IN ENGINEERING UNITS FOR THE PEN LIMITS ON THE CHART.

THE RECORDER ON POWER ON MOVES THE PEN TO ZERO POSITION. IT THEN MOVES THE CHART AHEAD WITH RESPECT TO THE TIME ELAPSED DURING POWER OFF. IT THEN MOVES BOTH THE PENS TO THE RESPECTIVE POSITION ON THE CHART AS PER THE ANALOG INPUT.

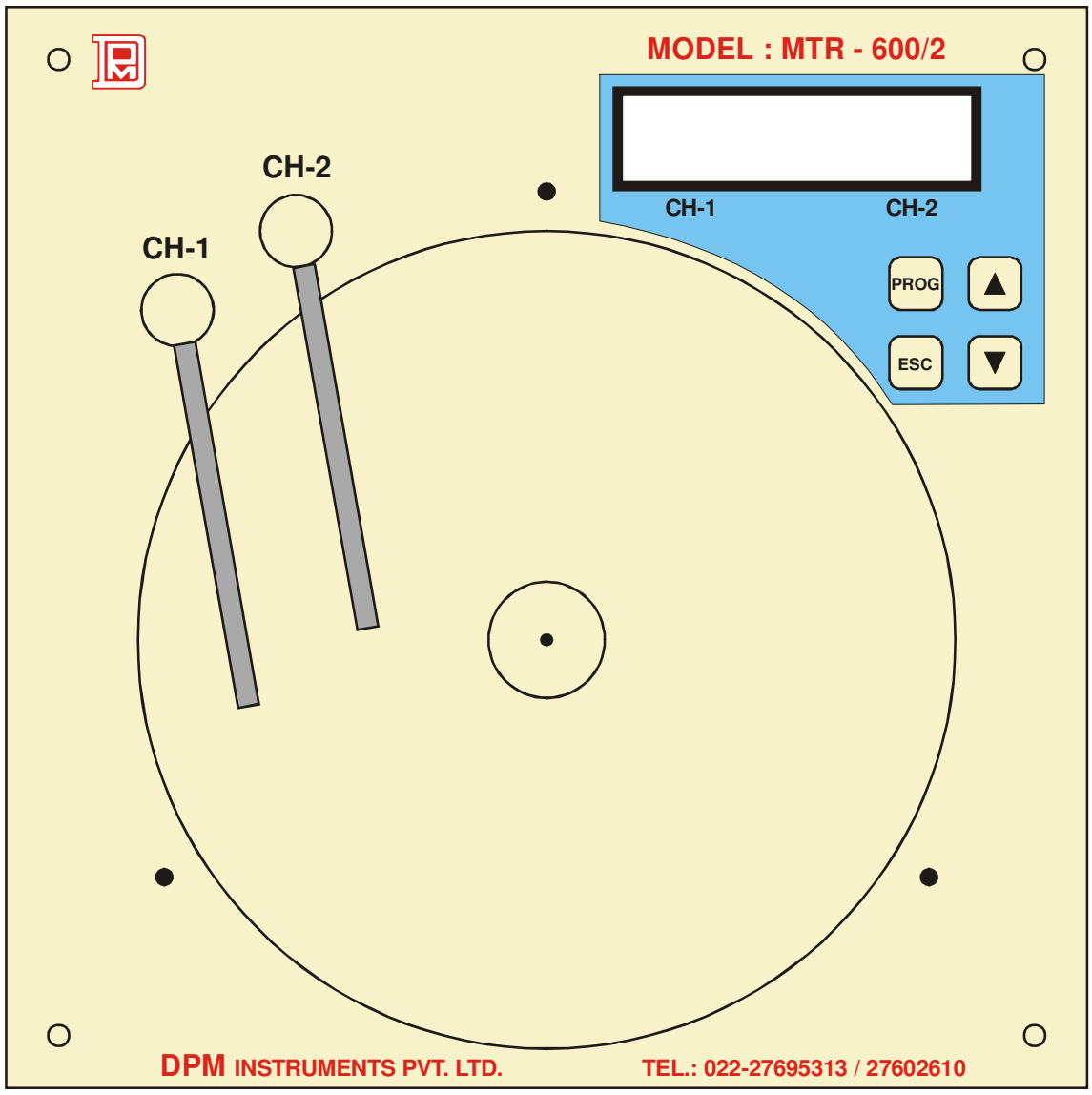
THE RECORDER READS ON THE DISPLAY THE VALUE OF THE TWO ANALOG INPUTS IN ENGINEERING UNITS AS CALIBRTATED. THE ANALOG INPUTS CAN BE SET EITHER FOR A LINEAR INPUT, OR RTD, OR THERMOCOUPLE (J,K,R,S,T). THE RECORDER IS LINEARISED FOR THE RTD, J, K, R, S AND T INPUTS. THE RECORDER CAN BE CALIBRATED BY KEYS ON THE FRONT. FOR A LINEAR INPUT THE RECORDER CAN BE CALIBRATED TO A RANGE OF **–0999 TO +8999** UNITS, WITH PROGRAMMABLE DECIMAL POINT POSITION.

THE RECORDER CAN BE PROGRAMMED FOR THE LOW AND HIGH RANGE OF THE PEN LIMIT AS PER THE CHART. THE LOW RANGE AND THE HIGH RANGE CAN BE PROGRAMMED FROM –999 TO +8999 UNITS. THE RECORDER CAN BE SET FOR THE CHART DURATION OF **8 HOURS, OR 24 HOURS OR 7 DAYS**. ALL THE PROGRAMMED PARAMETERS ARE STORED IN A NONVOLATILE MEMORY AND REMAIN INTACT EVEN IN POWER OFF CONDITION.

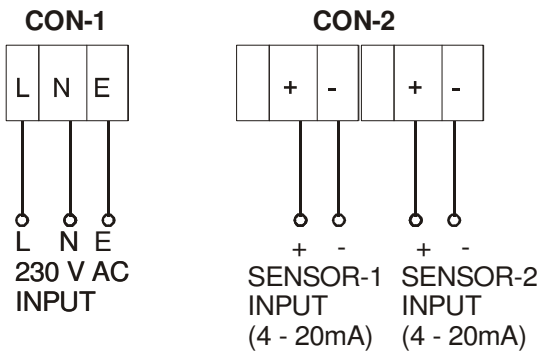
SPECIFICATIONS:

- MICRO CONTROLLER BASED INTELLIGENT UNIT.
- TWO ANALOG INPUTS
- STEPPER MOTOR FOR THE CHART AND PEN MOVEMENT.
- WIRE COMPENSATED CIRCUIT FOR RTD.
- PROGRAMMABLE INPUT SELECTION FROM EITHER LINEAR INPUT, OR RTD PT100 INPUT, OR THERMOCOUPLE INPUT (J, K, R, S, T)
- BUILT IN COLD JUNCTION COMPENSATION FOR THERMOCOUPLE INPUT.
- CALIBRATION OF ANALOG INPUT BY KEYPAD.
- CALIBRATION RANGE FOR LINEAR INPUT FROM –0999 TO +8999 UNITS.
- PROGRAMMABLE DECIMAL POINT POSITION FOR LINEAR INPUT.
- FOR RTD PT100, J TYPE, T TYPE SENSOR - TEMPERATURE RESOLUTION – 0.1 DEG CELCIUS
- FOR K TYPE, R TYPE, S TYPE SENSOR – TEMPERATURE RESOLUTION 1 DEG CELCIUS.
- PROGRAMMABLE CHART DURATION FOR 8 HOURS OR 24 HOURS OR 7 DAYS.
- PROGRAMMABLE LOW AND HIGH RANGE FOR THE PEN LIMITS ON CHART IN ENGINEERING UNITS.
- AUTO MOVEMENT OF CHART FOR POWER OFF CONDITION ON RESTORE OF POWER.
- BUILT IN ZERO POSITION SENSOR FOR PEN.
- SIXTEEN CHARACTER BY ONE LINE BACKLIGHTED LCD DISPLAY.
- FOUR KEY KEYPAD FOR PROGRAMMING AND CALIBRATION.
- NON-VOLATILE MEMORY FOR PARAMETER STORAGE DURING POWER OFF.
- POWER SUPPLY – 230V AC 50Hz.
- DIMENSIONS – 96(W) X 96(H) X 130(D) mm.
- PANEL MOUNTING TYPE – PANEL CUTOUT 92 (W) x 92 (H) mm.

FRONT PANEL



CONNECTION DIAGRAM



FRONT PANEL DESCTIPTION:

FRONT PANEL CONSITS OF:

FOUR KEYS –

PROG	-	TO ENTER PROGRAM OR CALIBRATION MODE.
UP ARROW	-	TO INCREMENT THE PARAMETER VALUE DURING PROGRAMMING.
DOWN ARROW	-	TO DECREMENT THE PARAMETER VALUE DURING PROGRAMMING AND TO DISPLAY THE COLD JUNCTION TEMPERATURE.
ESC	-	TO END THE CALIBRATION MODE.

DISPLAY: SIXTEEN CHARACTER BY ONE LINE BACKLIGHTED LCD DISPLAY.

POWER UP STATUS:

THE CIRCULAR CHART RECORDER WHEN CONNECTED TO MAINS SUPPLY – THE DISPLAY OF THE RECORDER FOR TWO SECONDS READS **" DPM INSTRUMENTS "**

AFTER TWO SECONDS THE DISPLAY READS **"MOVE P1 TO ZERO"**. DURING THIS TIME THE PEN # 1 IS BEING MOVED TO ZERO POSITION.

AFTER THE PEN # 1 HAS REACHED TO ZERO POSITION, THE DISPLAY READS **"MOVE P2 TO ZERO"**. DURING THIS TIME THE PEN # 2 IS BEING MOVED TO ZERO POSITION.

AFTER THE PEN # 2 HAS REACHED TO ZERO POSITION, THE DISPLAY READS **"MOVE CHART "**. DURING THIS TIME THE CIRCULAR CHART IS BEING MOVED FORWARD, WITH RESPECT TO THE TIME ELAPSED DURING POWER OFF. THIS IS TO ENSURE THAT THE CHART MOVES ONE COMPLETE ROTATION IN THE DESIRED AMOUNT OF TIME.

THEN THE DISPLAY READS THE ACTUAL PROCESS VALUE FOR INPUT # 1 AND INPUT # 2.

THIS IS THE MAIN MENU OF THE RECORDER UNIT. THE RECORDER UNIT CAN BE PROGRAMMED FOR THE LOWER AND UPPER RANGE OF THE PEN LIMITS IN ENGINEERING UNIT. THE INPUT TYPE CAN BE SET EITHER LINEAR, OR RTD PT100 OR J, K, R, S T THERMOCOUPLE. FOR LINEAR INPUT THE DECIMAL POINT POSITION IS PROGRAMMABLE AS PER THE USER REQUIREMENT. THE CALIBRATION OF THE INPUT CAN BE DONE BY KEYS. IF THE INPUT TYPE IS CHANGED THEN THE CALIBRATION IS TO BE PERFORMED AGAIN.

INPUT TYPE	**RANGE**
LINEAR	-0999 TO +8999 WITH PROGRAMMABLE DECIMAL POINT.
RTD PT100	-50.0 TO 450.0 DEG CEL.
J THERMOCOUPLE	-50.0 TO 700.0 DEG CEL
K THERMOCOUPLE	-50 TO 1350 DEG CEL
R THERMOCOUPLE	-50 TO 1750 DEG CEL
S THERMOCOUPLE	-50 TO 1750 DEG CEL
T THERMOCOUPLE	-50.0 TO 350.0 DEG CEL

DISPLAY OF COLD JUNCTION TEMPERATURE:

THE RECORDER REC-600 HAS BUILT IN COLD JUNCTION TEMPERATURE INPUT FOR THERMOCOUPLES. THE CJC TEMPERATURE CAN BE READ ON THE DISPLAY AS

PRESS THE **DOWN ARROW** KEY CONTINOUSLY TILL THE DISPLAY READS **"CJC : 30.2 C"**
PRESS THE **ESC** KEY TO RETURN BACK TO THE MAIN MENU.

PROGRAMMING OF THE PEN LIMITS (LOW AND HIGH RANGE):

STEP NO.	KEY PRESSED	DISPLAY	DESCRIPTION
1.	**SET**	**50.0 102.3**	PRESS THE SET KEY TILL THE DISPLAY READS
		Lo-R 1: -50.0	THE DISPLAY READS THE MESSAGE **"Lo-R 1:"** FOR LOW RANGE OF PEN # 1. RELEASE THE SET KEY.

THE DISPLAY READS THE LOW POINT POSITION (ZERO END VALUE OR LOW RANGE) OF PEN # 1 ON THE CHART. PROGRAM THE LOW POINT POSITION OF THE PEN # 1 AS PER THE CHART. TO PROGRAM THE LOW POINT POSITION (LOW RANGE) PRESS THE UP OR DOWN ARROW KEYS.

2.	**SET**	**Hi-R 1: 50.0**	PRESS THE SET KEY AND RELEASE. THE DISPLAY READS THE MESSAGE **"Hi-R 1:"** FOR HIGH RANGE OF PEN # 1.

THE DISPLAY READS THE HIGH POINT POSITION (OUTER END VALUE OR HIGH RANGE) OF PEN # 1 ON THE CHART. PROGRAM THE HIGH POINT POSITION OF THE PEN # 1 AS PER THE CHART. TO PROGRAM THE HIGH POINT POSITION (HIGH RANGE) PRESS THE UP OR DOWN ARROW KEYS.

3.	**SET**	**Lo-R 2: -50.0**	PRESS THE SET KEY AND RELEASE THE DISPLAY READS THE MESSAGE **"Lo-R 2:"** FOR LOW RANGE OF PEN # 2.

THE DISPLAY READS THE LOW POINT POSITION (ZERO END VALUE OR LOW RANGE) OF PEN # 2 ON THE CHART. PROGRAM THE LOW POINT POSITION OF THE PEN # 2 AS PER THE CHART. TO PROGRAM THE LOW POINT POSITION (LOW RANGE) PRESS THE UP OR DOWN ARROW KEYS.

4.	**SET**	**Hi-R 2: 50.0**	PRESS THE SET KEY AND RELEASE. THE DISPLAY READS THE MESSAGE **"Hi-R 2:"** FOR HIGH RANGE OF PEN # 2.

THE DISPLAY READS THE HIGH POINT POSITION (OUTER END VALUE OR HIGH RANGE) OF PEN # 2 ON THE CHART. PROGRAM THE HIGH POINT POSITION OF THE PEN # 2 AS PER THE CHART. TO PROGRAM THE HIGH POINT POSITION (HIGH RANGE) PRESS THE UP OR DOWN ARROW KEYS.

5.	**SET**	**50.0 102.3**	PRESS THE SET KEY AND RELEASE.

THE RECORDER RETURNS TO MAIN MENU. THIS COMPLETES THE PROGRAMMING OF THE PEN LIMITS FOR PEN # 1 AND PEN # 2 AS PER THE CIRCULAR CHART.

PROGRAMMING OF THE DECIMAL POINT POSITION, INPUT TYPE AND CHART DURATION:

4.	**SET**	**Hi-R 2: 50.0**	IN STEP 4 ABOVE PRESS THE SET KEY AND DO NOT RELEASE TILL THE DISPLAY READS.
5.	**SET**	**In – 1: Lin**	RELEASE THE SET KEY. THE DISPLAY READS THE MESSAGE **"In – 1:"** FOR INPUT # 1 TYPE .

PRESS THE UP OR DOWN ARROW KEY TO SELECT THE INPUT TYPE # 1. THE INPUT TYPES ARE: **LIN** FOR LINEAR, **RTD** FOR RTD PT100, **J T/C** FOR J TYPE THERMOCOUPLE, **K T/C** FOR K TYPE THERMOCOUPLE, **R T/C** FOR R TYPE THERMOCOUPLE, **S T/C** FOR S TYPE THERMOCOUPLE OR **T T/C** FOR T TYPE THERMOCOUPLE.

NOTE IF THE INPUT TYPE HAS BEEN CHANGED THEN THE RECORDER NEEDS TO BE RECALIBRATED.

6.	**SET**	**In – 2: Lin**	PRESS AND RELEASE THE SET KEY. THE DISPLAY READS THE MESSAGE **"In – 2:"** FOR INPUT # 2 TYPE .

PRESS THE UP OR DOWN ARROW KEY TO SELECT THE INPUT TYPE # 2.

7.	**SET**	**DP – 1: 0.00**	PRESS AND RELEASE THE SET KEY. THE DISPLAY READS THE MESSAGE **"DP – 1:"** FOR DECIMAL POINT POSITION FOR INPUT # 1.

IF THE INPUT # 1 TYPE SELECTED IS **LIN,** THEN THE DECIMAL POINT USED IN THE ENGINEERING UNIT IS SET OVER HERE. FOR A LINEAR INPUT OF A **RANGE –50.0 TO +200.0**, PROGRAM THE **DECIMAL POINT POSITION AS 0.0**. PRESS THE UP OR DOWN ARROW KEY TO SET THE DECIMAL POINT POSITION. FOR THE OTHER INPUT TYPES THE DECIMAL POINT POSITION IS FIXED INTERNALLY AS PER THE RANGE OF THE INPUT.

8.	**SET**	**DP – 2: 0.00**	PRESS AND RELEASE THE SET KEY. THE DISPLAY READS THE MESSAGE **"DP – 2:"** FOR DECIMAL POINT POSITION FOR INPUT # 2.

PRESS THE UP OR DOWN ARROW KEY TO SET THE DECIMAL POINT POSITION FOR INPUT # 2.

9.	**SET**	**CHART DUR: 24Hr**	PRESS AND RELEASE THE SET KEY. THE DISPLAY READS THE MESSAGE **"CHART DUR:"** FOR CIRCULAR CHART DURATION (MOVEMENT IN ONE ROTATION).

THE CHART DURATION CAN BE SET EITHER FOR EIGHT HOURS (8 Hr), OR FOR TWENTY FOUR HOURS (24 Hr) OR FOR SEVEN DAYS (7 DY). THIS IS TO BE SET AS PER THE CHART USED. IF THE DURATION SELECTED IS **8 Hr,** THEN THE CHART ROTATES ONE COMPLETE REVOLUTION IN EIGHT HOURS. IF THE DURATION SELECTED IS **24 Hr,** THEN THE CHART ROTATES ONE COMPLETE REVOLUTION IN TWENTY FOUR HOURS. IF THE DURATION SELECTED IS **7 DY,** THEN THE CHART ROTATES ONE COMPLETE REVOLUTION IN SEVEN DAYS.

10.	**SET**	**50.0 102.3**	PRESS THE SET KEY AND RELEASE.

THE RECORDER RETURNS TO MAIN MENU. THIS COMPLETES THE PROGRAMMING OF INPUT TYPE, DECIMAL POINT POSITION AND THE CHART DURATION.

CALIBRATION OF THE INPUT # 1 AND INPUT # 2:

THE CALIBRATION OF THE INPUT IS DONE BY THE FRONT KEY PAD. THE CALIBRATION TO BE DONE BY A PROPER CALIBRATOR. THE CALIBRATION IS TO BE DONE AT TWO POINTS – ONE NEAR TO LOW POINT (ZERO INPUT) AND THE OTHER ANYWHERE ABOVE 50 PERCENT OF THE FULL SCALE INPUT. THE UNIT CALIBRATION TO BE CROSS CHECKED ONCE IN A SIX MONTHS.

STEP NO.	**KEY PRESSED**	**DISPLAY**	**DESCRIPTION**
10.	**SET**	**CHART DUR: 24 Hr**	IN THE STEP 10 ABOVE AFTER PROGRAMMING THE CHART DURATION PRESS THE SET KEY AND DO NOT RELEASE THE **SET** KEY TILL THE DISPLAY READS
11.	**SET**	**CAL Lo 1 003.2**	NOW RELEASE THE SET KEY. THE DISPLAY READS THE MESSAGE **"CAL Lo 1"**

FOR LOW POINT CALIBRATION OF INPUT # 1.

THE RECORDER IS NOW READY FOR LOW POINT CALIBRATION OF THE INPUT # 1. THE LOW POINT CALIBRATION IS TO BE DONE NEAR OR AT ZERO INPUT VALUE (ZERO READING). APPLY THE CORRESPONDING SIGNAL FROM THE CALIBRATOR TO THE INPUT # 1.

THE DISPLAY NOW READS THE VALUE OF INPUT # 1 IN ENGINEERING UNITS AS PER THE SIGNAL APPLIED ON THE INPUT. IF THE DISPLAY IS NOT READING THE ENGINEERING UNITS AS PER THE SIGNAL APPLIED ON THE INPUT, THEN PRESS THE UP OR DOWN ARROW KEY TO ADJUST THE READING ON THE DISPLAY AS PER THE SIGNAL APPLIED.

PRESSING THE UP OR DOWN ARROW KEY, THE ZERO OFFSET FACTOR IS CHANGED IN THE MEMORY. HENCE BE CAREFUL AND SURE BEFORE PRESSING THE UP OR DOWN ARROW KEYS. DO NOT CALIBRATE FOR A INPUT VALUE WHICH IS NEGATIVE.

12. **SET** **CAL Hi 1 000.0** PRESS AND RELEASE THE SET KEY.
THE DISPLAY READS THE MESSAGE **"CAL Hi 1"**
FOR HIGH POINT CALIBRATION OF INPUT # 1.

THE RECORDER IS NOW READY FOR HIGH POINT CALIBRATION OF THE INPUT # 1. THE HIGH POINT CALIBRATION IS TO BE DONE ABOVE FORTY PERCENT OF THE INPUT RANGE. APPLY THE CORRESPONDING SIGNAL FROM THE CALIBRATOR TO THE INPUT # 1.

THE DISPLAY NOW READS THE VALUE OF INPUT # 1 IN ENGINEERING UNITS AS PER THE SIGNAL APPLIED ON THE INPUT. IF THE DISPLAY IS NOT READING THE ENGINEERING UNITS AS PER THE SIGNAL APPLIED ON THE INPUT, THEN PRESS THE UP OR DOWN ARROW KEY TO ADJUST THE READING ON THE DISPLAY AS PER THE SIGNAL APPLIED.

PRESSING THE UP OR DOWN ARROW KEY, THE GAIN FACTOR IS CHANGED IN THE MEMORY. HENCE BE CAREFUL AND SURE BEFORE PRESSING THE UP OR DOWN ARROW KEYS. DO NOT CALIBRATE FOR A INPUT VALUE WHICH IS NEGATIVE.

13. **SET** **CAL Lo 2 005.6** PRESS AND RELEASE THE SET KEY.
THE DISPLAY READS THE MESSAGE **"CAL Lo 2"**
FOR LOW POINT CALIBRATION OF INPUT # 2.

THE RECORDER IS NOW READY FOR LOW POINT CALIBRATION OF THE INPUT # 2. THE LOW POINT CALIBRATION IS TO BE DONE NEAR OR AT ZERO INPUT VALUE (ZERO READING). APPLY THE CORRESPONDING SIGNAL FROM THE CALIBRATOR TO THE INPUT # 2.

THE DISPLAY NOW READS THE VALUE OF INPUT # 2 IN ENGINEERING UNITS AS PER THE SIGNAL APPLIED ON THE INPUT. IF THE DISPLAY IS NOT READING THE ENGINEERING UNITS AS PER THE SIGNAL APPLIED ON THE INPUT, THEN PRESS THE UP OR DOWN ARROW KEY TO ADJUST THE READING ON THE DISPLAY AS PER THE SIGNAL APPLIED.

PRESSING THE UP OR DOWN ARROW KEY, THE ZERO OFFSET FACTOR IS CHANGED IN THE MEMORY. HENCE BE CAREFUL AND SURE BEFORE PRESSING THE UP OR DOWN ARROW KEYS. DO NOT CALIBRATE FOR A INPUT VALUE WHICH IS NEGATIVE.

14. **SET** **CAL Hi 2 000.0** PRESS AND RELEASE THE SET KEY.
THE DISPLAY READS THE MESSAGE **"CAL Hi 2"**
FOR HIGH POINT CALIBRATION OF INPUT # 2.

THE RECORDER IS NOW READY FOR HIGH POINT CALIBRATION OF THE INPUT # 2. THE HIGH POINT CALIBRATION IS TO BE DONE ABOVE FORTY PERCENT OF THE INPUT RANGE. APPLY THE CORRESPONDING SIGNAL FROM THE CALIBRATOR TO THE INPUT # 2.

THE DISPLAY NOW READS THE VALUE OF INPUT # 2 IN ENGINEERING UNITS AS PER THE SIGNAL APPLIED ON THE INPUT. IF THE DISPLAY IS NOT READING THE ENGINEERING UNITS AS PER

THE SIGNAL APPLIED ON THE INPUT, THEN PRESS THE UP OR DOWN ARROW KEY TO ADJUST THE READING ON THE DISPLAY AS PER THE SIGNAL APPLIED.

PRESSING THE UP OR DOWN ARROW KEY, THE GAIN FACTOR IS CHANGED IN THE MEMORY. HENCE BE CAREFUL AND SURE BEFORE PRESSING THE UP OR DOWN ARROW KEYS. DO NOT CALIBRATE FOR A INPUT VALUE WHICH IS NEGATIVE.

11.	**SET**	**CAL Lo 1 005.6**	PRESS AND RELEASE THE SET KEY. THE DISPLAY READS THE MESSAGE **"CAL Lo 1"** FOR LOW POINT CALIBRATION OF INPUT # 1.

NOTE: WE ARE BACK TO STEP # 11

15.	**ESC**	**50.0 102.3**	PRESS THE ESC KEY AND RELEASE.

THE RECORDER RETURNS TO MAIN MENU. THIS COMPLETES THE CALIBRATION OF THE INPUTS.

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