
ABBAY ELECTRONIC CONTROLS

DESIGN ♦ MANUFACTURE ♦ CONSULTANCY

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M021P

MODULATING PUMP CONTROLLER
FOR HEATING SYSTEM CONTROL
(OEM COPY)

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1.

INTRODUCTION

- 1.1. The M021P is a modulating temperature controller. Its function is to regulate the final flow temperature out of a heat exchanger by regulating the flow rate through the primary of the same heat exchanger. It does this by modulating the voltage applied to the pump which circulates water through the primary of the heat exchanger. The general principle is illustrated in the appendix.
- 1.2. Consequently, the M021P is not a "Safety Control" but is nonetheless designed and approved to the prevalent standard of EN 60730-1 which includes electromagnetic compatibility (EMC).
- 1.3. In order to obtain the best possible performance out of any system, the M021P is a PID¹ controller with OEM² adjustable P term. The P term is adjusted by means of the "GAIN" potentiometer, RV1.
- 1.4. For most applications setting RV1 to the minimum position gives acceptable performance. Response speed may however be improved by increasing RV1 setting. It should however be born in mind that some systems may be more prone to oscillate with a higher gain setting.
- 1.5. In order to prevent the pump from stalling (or possibly due to some other factors in the system design) it is necessary to define a minimum pump voltage. The bias potentiometer, RV3, is used for this purpose. Refer to page 7 for procedure on setting the minimum pump speed.

¹ Proportional, Integral, and Differential or Derivative.

² Original Equipment Manufacturer

2.

CONNECTIONS

2.1 The M021P is equipped with two blocks of screw terminals; one for high voltage (mains) interface and the other for low voltage isolated interface.

2.2 The following detail the connections which have to be made to the M021P.

2.3 High Voltage (TB1 - 5 Way)

2.3.1 **Pins 1&2** are the contacts of an on-board change-over relay. The common pin is connected internally to permanent live and is not available externally. Thus pin 1 (normally closed) is live in the relay's normal state. When the external flow switch connection to the board is closed the relay gets powered and changes over to the energised state making pin 2 live instead of pin 1. Such an arrangement facilitates the possibility of being able to automatically disable the boiler during a demand session and prevent undesirable stirring of the cylinder contents.

2.3.2 **Pin 3** is the connection to the pump in the primary circuit of the heat exchanger. The voltage on this pin is phase modulated according to the requirement sensed by the error amplifier on the M021P.

2.3.3 **Pins 4&5** are the mains power (Neutral and Live respectively) to the board.

2.4 Low Voltage (TB2 - 5 Way)

2.4.1 **Pins 1&2** are the sensing thermistor connections.

2.4.2 **Pin 3** is 0V for external use.

2.4.3 **Pins 4&5** are the connections for the flow switch.

- 2.5 There is also an optional pin header, TB3. Normally, temperature range is preset with an on-board preset potentiometer, RV2. When the OEM requires it, a 3 way pin header is inserted in place of RV2 thus allowing temperature range control via a remotely mounted potentiometer.



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3.

SPECIFICATIONS

Supply:-

Voltage	230	Volts
Tolerance	+10, -15	%
Frequency	50/60	Hz
Earthing ³	N/A	

Ambient:-

Temperature	60	°C
Humidity	90	%RH
(No condensation)		

Power Consumption:- (Excluding all peripherals)

Maximum	2	VA
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Protection Fuse:-

Nominal ⁴	T2A
Maximum ⁴	T3A

Contacts Rating:-

Maximum ⁴	3	A
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Temperature Range:-

OEM Specifiable.

Default	40 - 60	±3	°C
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³ Earthing should be suitably provided on the appliance by the OEM. The control itself does not need an earth.

⁴ The whole board is protected with a 20 mm fuse, FS2. The value is marked on as T2A and is factory fitted as T2A. The relay contacts and tracks are rated for a 3A current. Therefore, if the OEM requires it, it is recommended that the fuse rating may be changed to an appropriate value no greater than T3A. In this case, the new value must be printed onto a permanent sticker which must be affixed to the board so as to cover the "T2A" already there.



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M021POEM.APN
Rel. 1.3 3 July 1995

Thermistor:-

AEC's THP103N

<u>External Potentiometer:-</u>	10	k Ω
Tolerance	± 20	%

Flow Switch:- Volt-free, normally open.
Closed for flow.

Mechanical Details:-

Board Size	120 x 80	mm
Maximum Height	35	mm
Mounting	4 x 4 mm	Holes
Holes Pitch Rectangle	110 x 70	mm



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PROCEDURE FOR SETTING MINIMUM PUMP SPEED

To ensure that the pump is never run at an r.p.m. which is likely to result in stalling the OEM must ensure that a minimum voltage is set as follows.

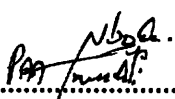
PUMP SETUP PROCEDURE	
1	CONNECT A RESISTOR OF NOMINAL VALUE 2.4k Ω ACROSS THE THERMISTOR INPUTS
2	SET "TEMP" POTENTIOMETER TO MINIMUM POSITION
3	MAKE SURE A PUMP OR A RESISTIVE LOAD OF 10k Ω 6W IS ACROSS THE PUMP OUTPUT.
4	CONNECT A TRUE RMS DVM ACROSS THE PUMP OR RESISTIVE LOAD
5	POWER THE BOARD. THE DVM WILL INDICATE THE OUTPUT VOLTAGE.
6	ADJUST THE "BIAS" POT TO SET REQUIRED MINIMUM VOLTAGE. ⁵

⁵ The minimum pump voltage is factory set to 80 V.

DECLARATION

I declare that the information provided above is true and that all the tests have either been carried out by myself or under my supervision.

The control has been tested and certified to comply with relevant sections of EN60335. Third party certificates of independent tests will be supplied on request.


.....
Eur.Ing PETER A. BODE
Engineer In-Charge



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APPENDIX

1. HYDRAULIC PRINCIPLE
2. TYPICAL PERFORMANCE CURVES
3. WIRING DIAGRAM
4. IDENT LAYOUT
5. THERMISTOR DETAILS



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FROM BOILER



**PRIMARY
STORAGE
CYLINDER**

TO BOILER

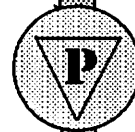


**HEAT
EXCHANGER**

DHW OUT

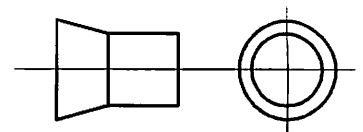


COLD MAINS



**TYPICAL HYDRAULIC SYSTEM
FOR M021P
MODULATING PUMP CONTROLLER**

DRG. NO. M021-HS		ISS: -		X	1	ALL RESISTORS 0.25W 5% ALL ZENERS 0.5W ALL DIMENSIONS IN mm DIM'S TO 1DP= ±0.1 mm DIM'S TO 2DP= ±0.02 mm ANGLES TO ±0.5° SCALE = 100% UNLESS STATED OTHERWISE
TITLE : - HYDRAULIC SYSTEM FOR M021P					P	
DATE: -		X	05/01/95	MATL. NOT APPLICABLE		
05/01/95		P				
DESIGNER: P. A. BODE			DRAWN: P. A. BODE			
CHECKED: -			SCALE: NOT SCALED			
APPROVED: -						



TESTS ON MOZIP

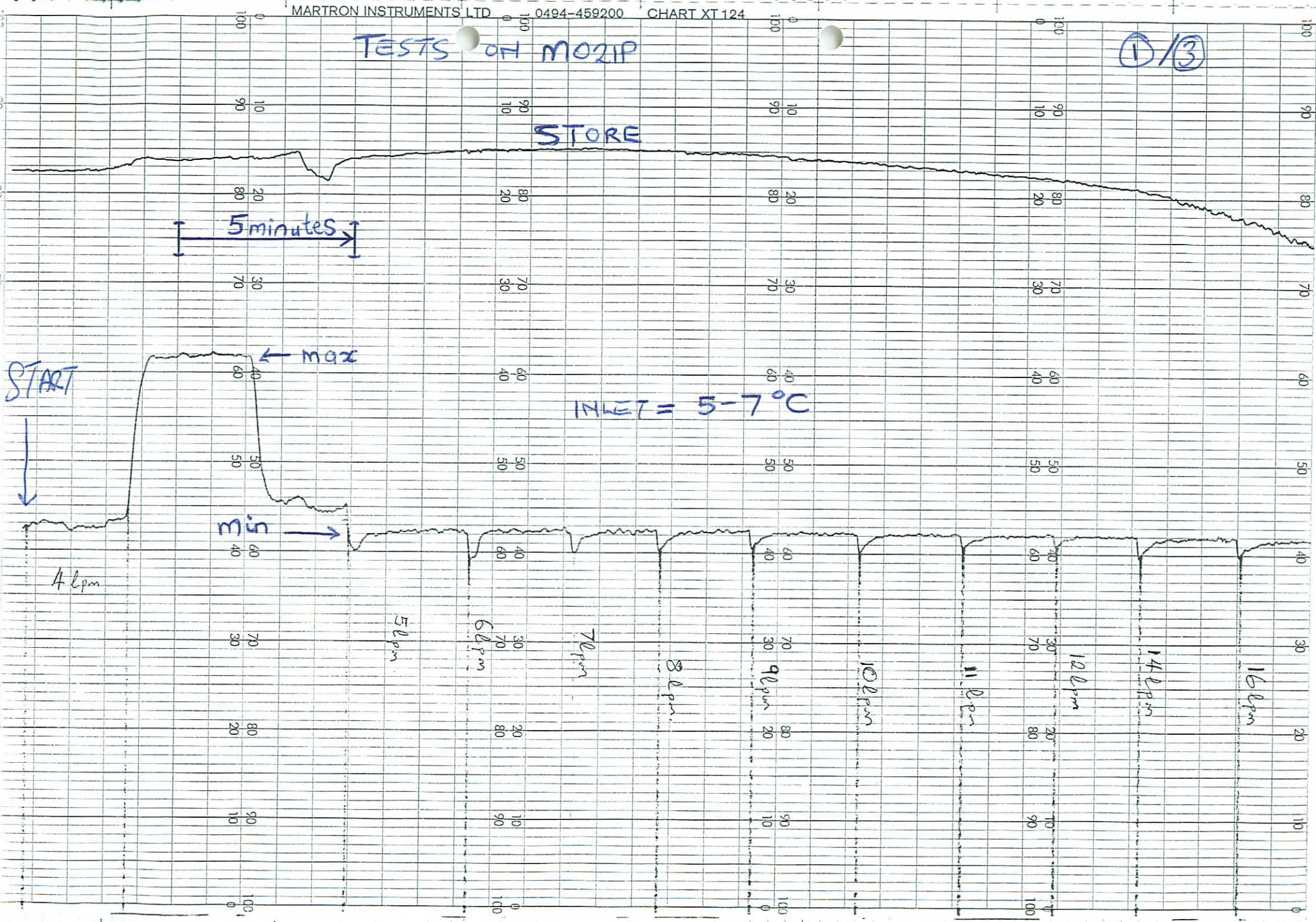
①/③

STORE

5 minutes

START

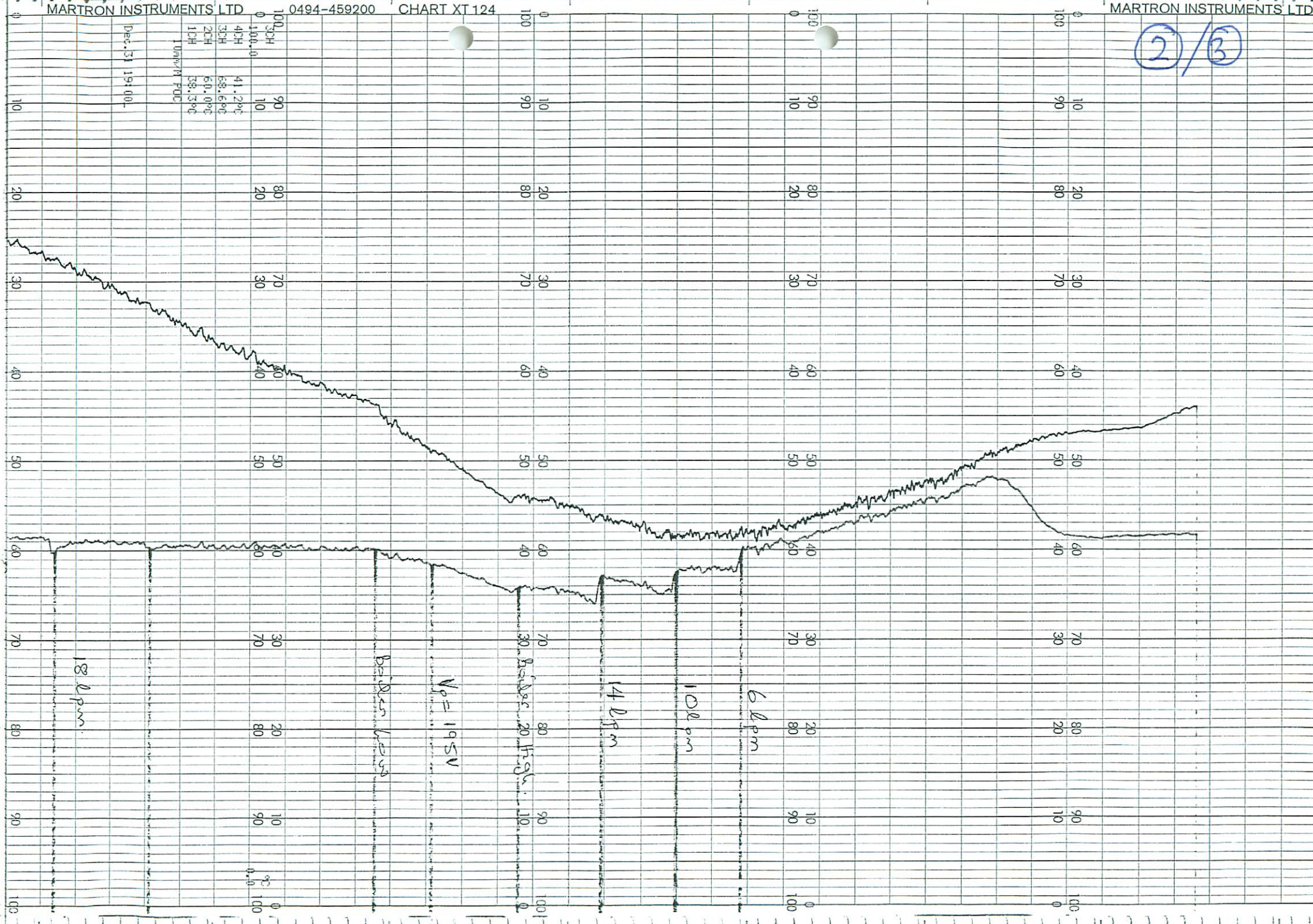
INLET = 5-7°C



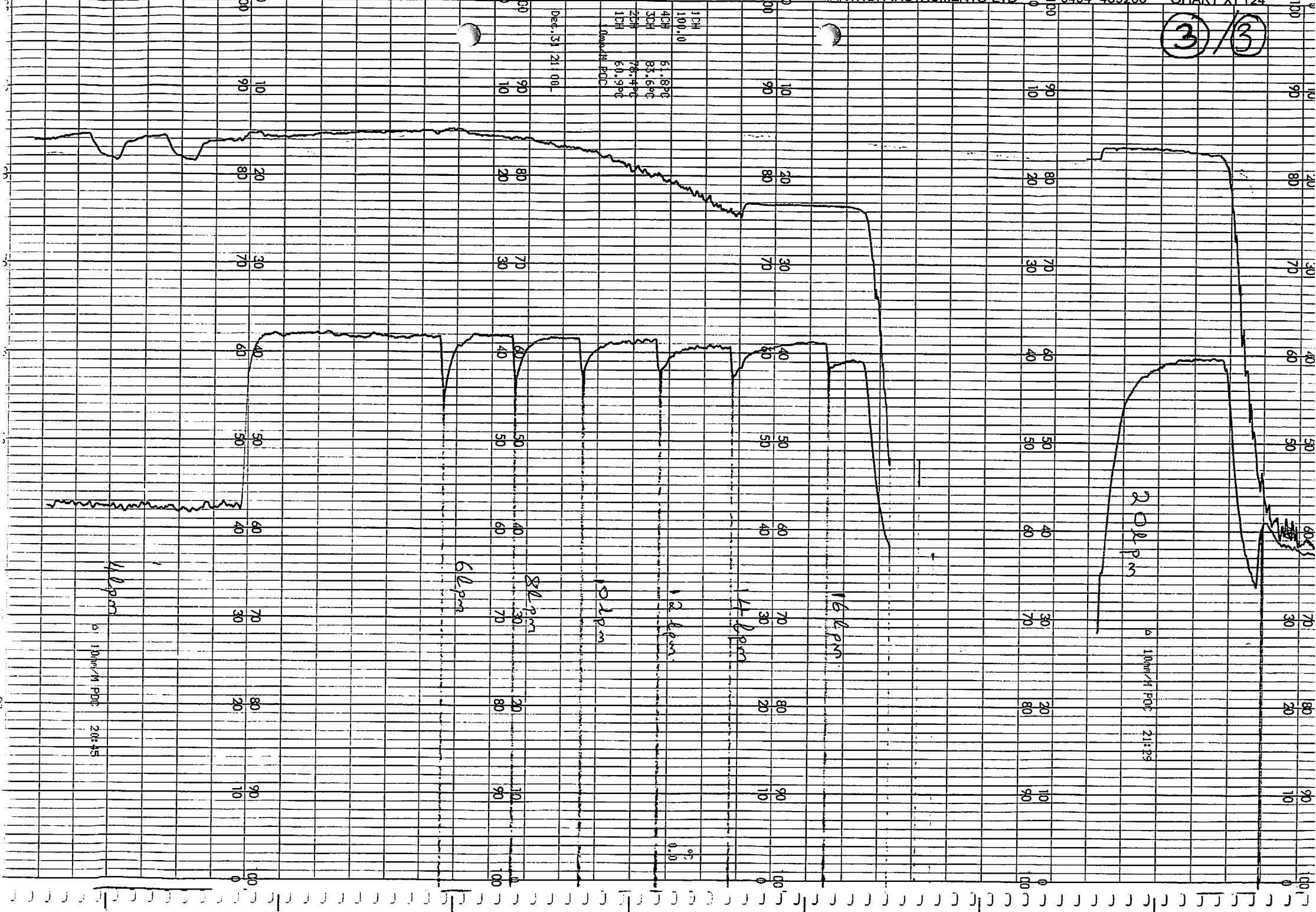
②/③

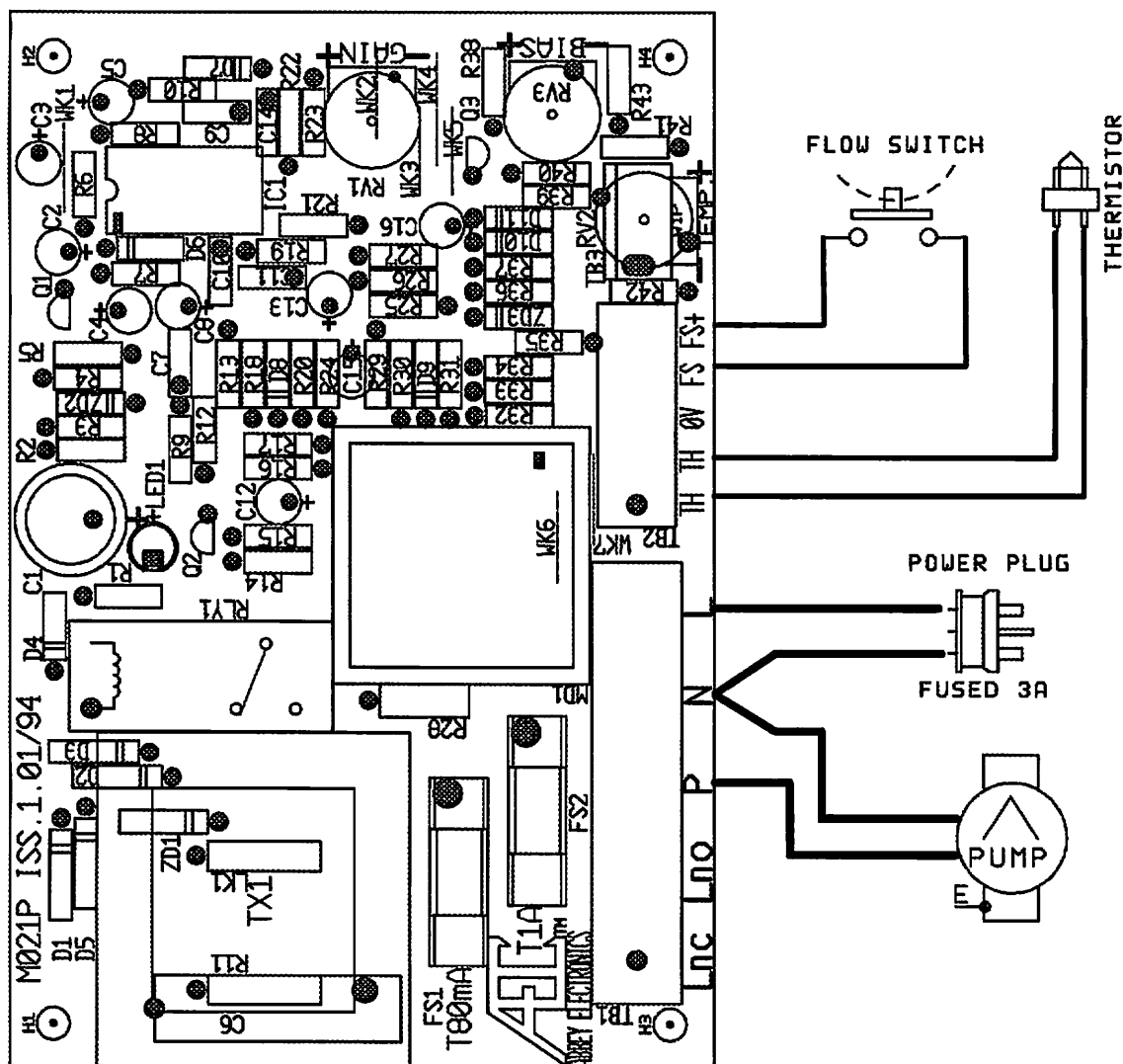
Dec. 31 19:00

4CH 41.2°C
3CH 68.6°C
2CH 60.0°C
1CH 38.3°C
10mV/100°C



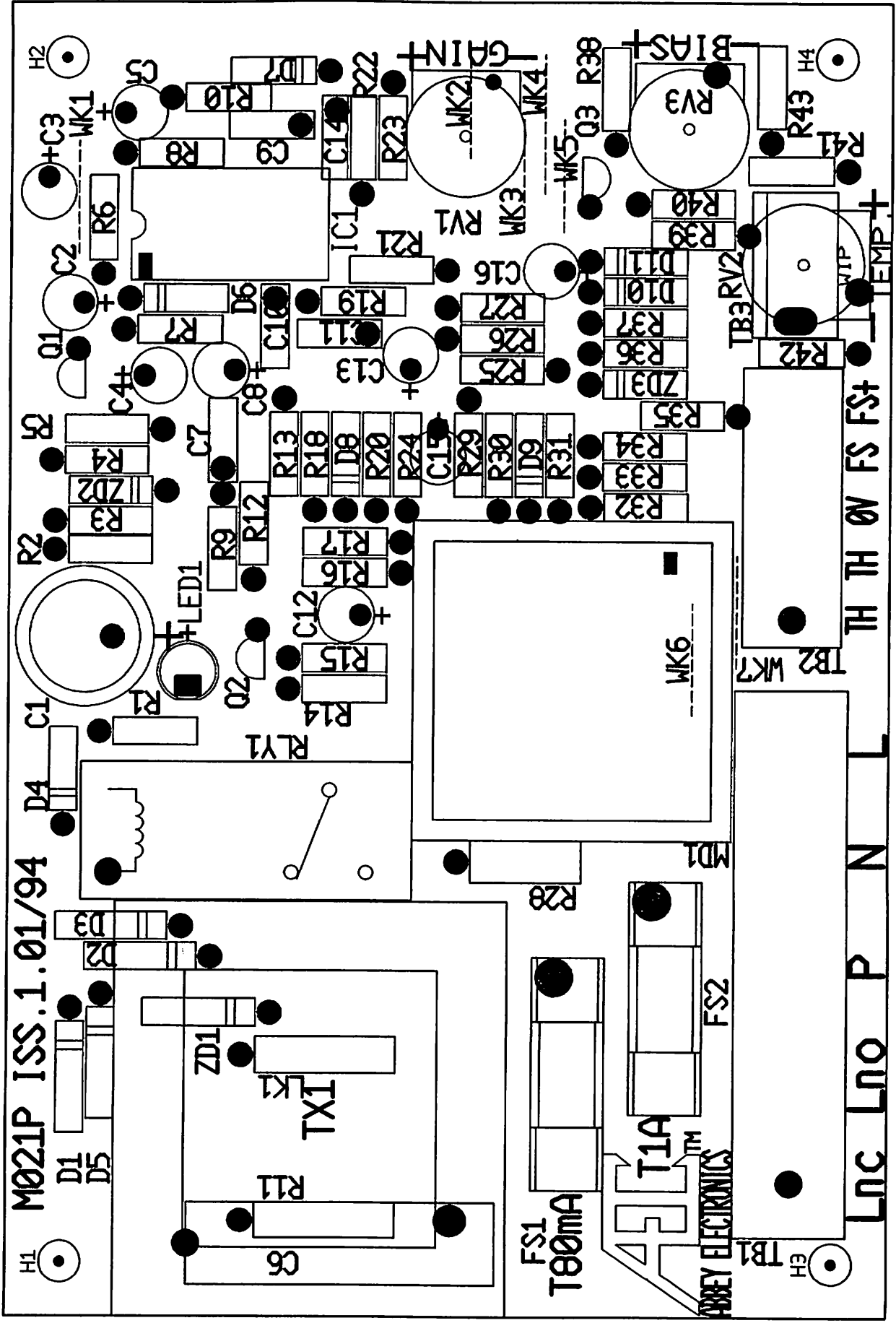
3/3





DRG. NO. X021WDG		ISS:-	X	1	ALL RESISTORS 0.25W 5% ALL ZENERS 0.5W ALL DIMENSIONS IN mm DIM'S TO 10P= ±0.1 mm DIM'S TO 20P= ±0.02 mm ANGLES TO ±0.5° SCALE = 100% UNLESS STATED OTHERWISE
TITLE : - WIRING DIAGRAM FOR M021P					
DATE:-	X	26/4/94	MATL.		
26/4/94	P				
DESIGNER: P. A. BODE		DRAWN: P. A. BODE			
CHECKED:-		SCALE:			
APPROVED:-					

ALL RESISTORS 0.25W 5%
ALL ZENERS 0.5W
ALL DIMENSIONS IN mm
DIN'S TO 10P= ±0.1 mm
DIN'S TO 20P= ±0.02 mm
ANGLES TO ±0.5°
SCALE = 100%



M021P ISS.1.01/94

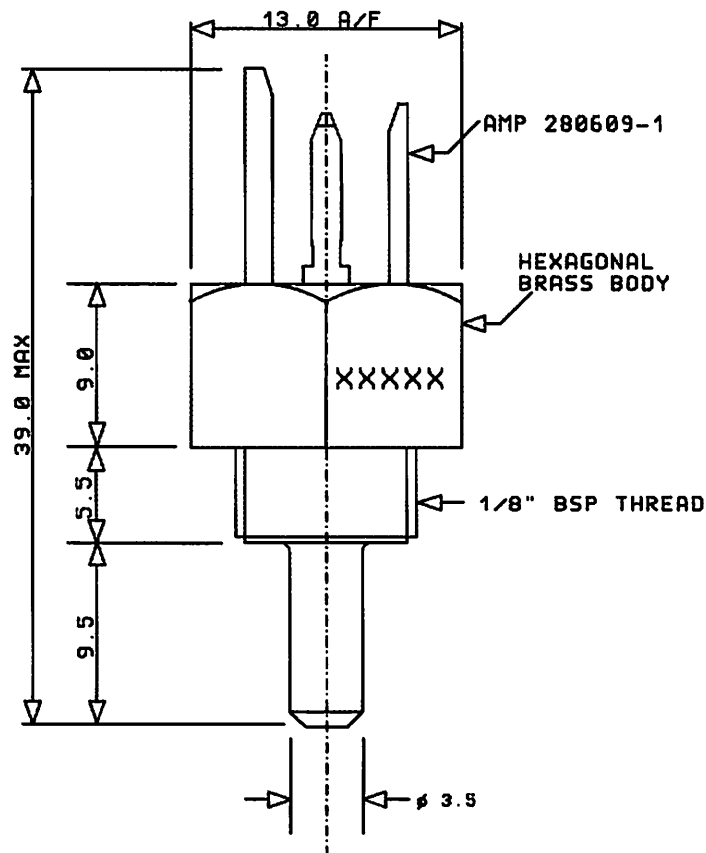
FS1
T80mA

ABBEY ELECTRONICS
T1ATM
FS2

LNC LNO P N L

R-T CURVE FOR THP103N R25=10k										
(-)		3.438	3.620	3.812	4.016	4.234	4.464	4.708	4.966	5.249
T	0	1	2	3	4	5	6	7	8	9
0	3.266	3.104	2.950	2.806	2.668	2.540	2.418	2.302	2.192	2.088
10	1.990	1.897	1.809	1.726	1.646	1.571	1.500	1.432	1.368	1.307
20	1.249	1.194	1.142	1.092	1.045	1.000	.9574	.9166	.8778	.8408
30	.8058	.7722	.7404	.7098	.6808	.6532	.6268	.6016	.5776	.5546
40	.5326	.5118	.4918	.4726	.4544	.4368	.4202	.4042	.3888	.3742
50	.3602	.3468	.3340	.3216	.3098	.2986	.2878	.2774	.2674	.2580
60	.2488	.2400	.2316	.2234	.2158	.2082	.2012	.1942	.1876	.1813
70	.1751	.1693	.1637	.1582	.1530	.1480	.1432	.1385	.1341	.1298
80	.1256	.1216	.1178	.1141	.1105	.1071	.1038	.1006	.0975	.0945
90	.0916	.0888	.0862	.0836	.0811	.0787	.0764	.0742	.0720	.0699
100	.0679	.0660	.0641	.0623	.0605	.0588	.0571	.0556	.0540	.0525

AMP CONNECTOR:-
FEMALE ---> 280590
CRIMPS ---> 182198-1



ELECTRICAL SPECIFICATION

PART No.	THP103N
THERMISTOR	VISHAY CURVE 1, R25=10k
TIME CONSTANT	<= 5 Seconds in Water.
INS. RESISTANCE	>= 100 MΩ
FLASH VOLTAGE	>= 2.5 kV
ID MARKING (XXXXXX)	103U1

MATERIAL :- BRASS (ANTI-DEZINCIFICATION)		SCALE :- NOT SCALED	
ALL RESISTORS 0.25W 5% ALL DIMENSIONS IN mm DIMENSIONS TO 10P = ±0.1 mm DIMENSIONS TO 20P = ±0.05 mm DIMENSIONS TO 30P = ±0.02 mm SCALE = 100%			
UNLESS STATED OTHERWISE			
NOTES(*):-			
CHECKED	DESIGNER	APPROVED	
	P. A. BODE	P. A. BODE	
ISS.	DATE: 11/11/91	THERMISTOR PROBE	
X = 3	26/4/94	TITLE :- (SOLID BRASS)	
P = ?	?		
ORG. NO.	THP103N		