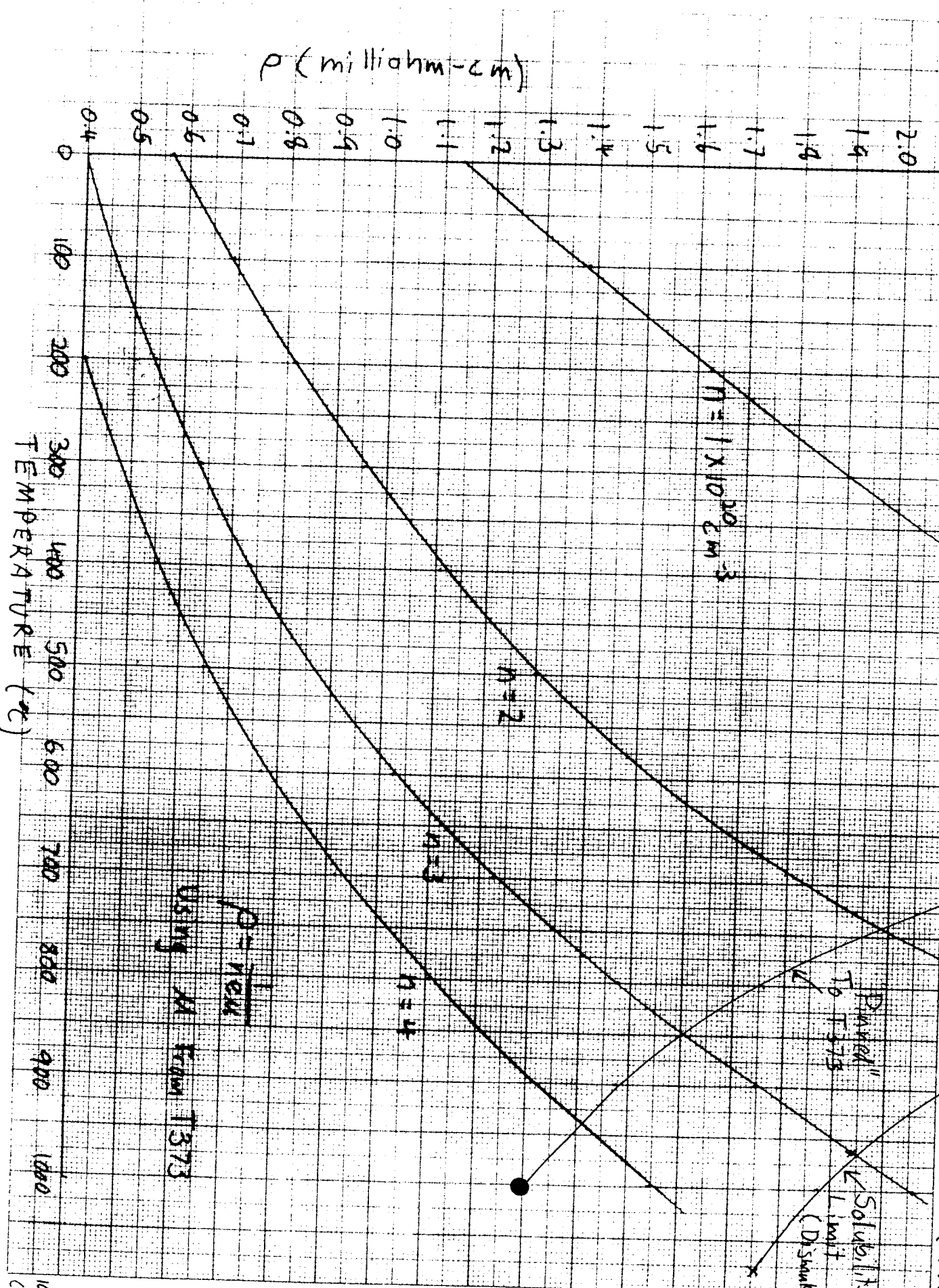
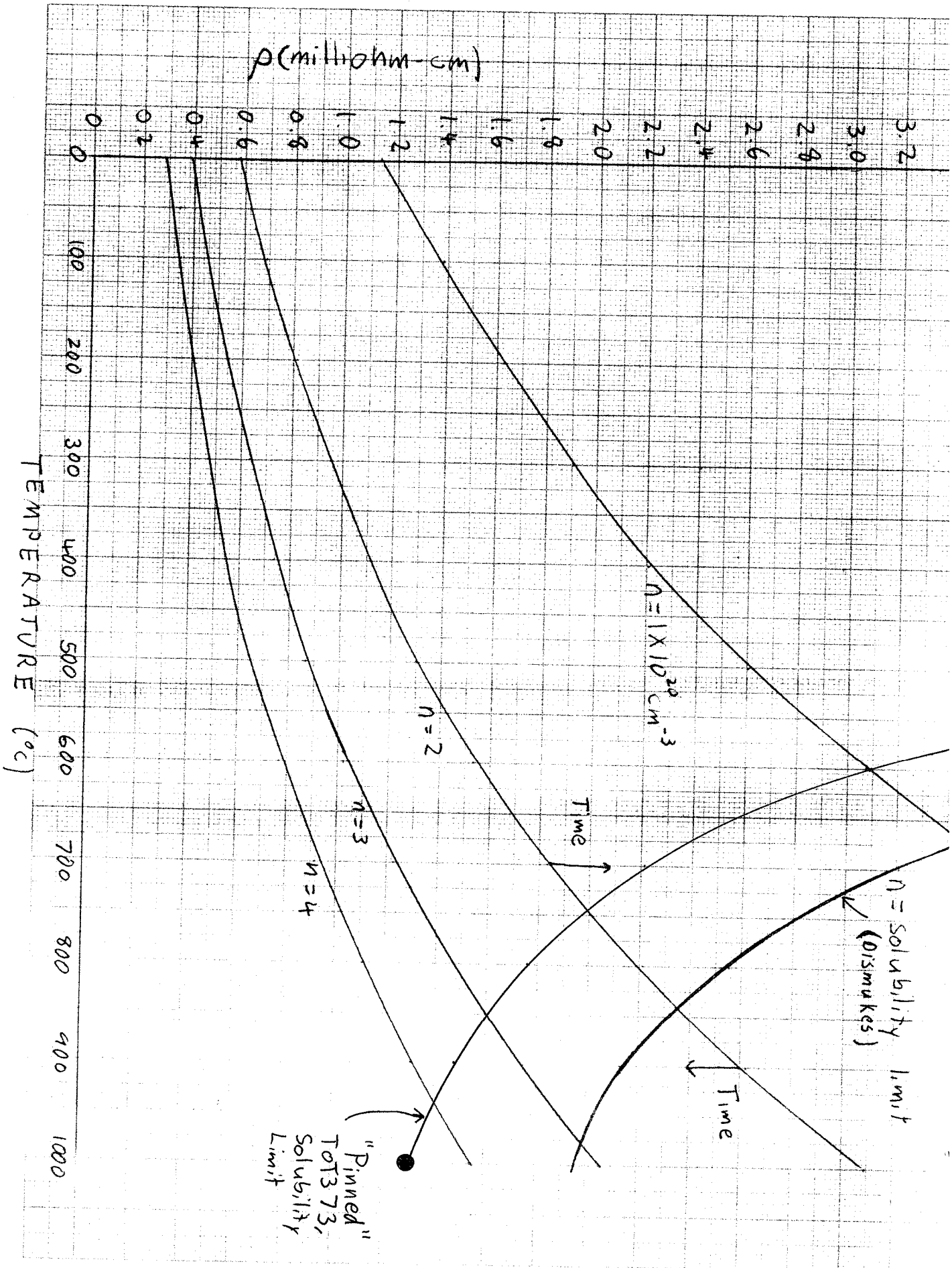


RESISTIVITY VS. Temperature With Fixed Carrier Concentration



$$\rho = \frac{1}{ne\mu}$$

Using data from T373



MOBILITYMAXIMUM*****MINIMUM MAG TIME= 375 SECK1= 4
 1.39570E+001 1.793E+001 1.04950E+001

MAXIMUM MINIMUM
 +2.44990E-002 CM^3/C +1.2329E-002CM^3/C

TEST COMPLETED

SiGe E40RN THICKNESS= .1 DATE IS 42087
 N-typeVACUUM= .00001 TIME IS 1510
 TEMPERATURE= 791.8E+000 1000/T(K)= .939 T/C=5.85E-002
 TIME TO TEMP= 150.0E-002 HRS
 STAB CRITERION=450.0E-007 STD DEV = .000
 HEATER POWER= 172.69 W V= 35 I= 4.934

J L	nV READING	AMPS	
1 1	-2.16023E-004	.2037	3.188 x 10 ⁻³
2 1	+1.08283E-003	.2037	
1 2	-1.01303E-003	.2033	3.174 x 10 ⁻³
2 2	+2.77978E-004	.2034	
3 1	-7.95227E-004	.2035	3.218 x 10 ⁻³
4 1	+5.14330E-004	.2035	
3 2	-5.82113E-004	.2038	3.174 x 10 ⁻³
4 2	+7.11498E-004	.2038	

Handwritten calculations:
 1.442×10^{-3}
 1.449×10^{-3}
 1.449×10^{-3}
 1.442×10^{-3}
 3.188×10^{-3}
 $\rho = 1.446 \times 10^{-3} \pm 0.004 \times 10^{-3} \Omega\text{-cm}$

J L	VOLTS APPL.	OHMS	POWER
1 1	+ .8957	.001	.182
1 2	+ .8957	.005	.182
2 1	- .8842	.005	-.180
2 2	- .8842	.001	-.180
3 1	+ .7759	.004	.158
3 2	+ .7759	.003	.158
4 1	- .7771	.003	-.158
4 2	- .7771	.003	-.158

RESISTIVITY	RATIO	F	SIGMA	
1.1022E-003	4.7	80E-002	9.0728E+002	(OHM-CM)^-1
1.2668E-003	3.9	84E-002	7.8939E+002	(OHM-CM)^-1
1.4775E-003	1.4	96E-002	6.7682E+002	(OHM-CM)^-1
1.3140E-003	1.4	96E-002	7.6104E+002	(OHM-CM)^-1
AVG RHO	STD DEV	AVG SIGMA	MEAN + STD DEV	MEAN - STD DEV
1.29013E-003	6.687E-005	7.75119E+002	8.17489E+002	7.36924E+002

***** HALL MEASUREMENT AC/BD *****

POWER=	nV READING	CURRENT	DELTA V
.1866495188	+5.06604E-005	+2.032E-001	
	+4.53617E-005	+2.032E-001	-5.30010E-006
	+5.06632E-005	+2.032E-001	
	+5.45292E-005	+2.032E-001	+3.70580E-006
	+5.09837E-005	+2.032E-001	

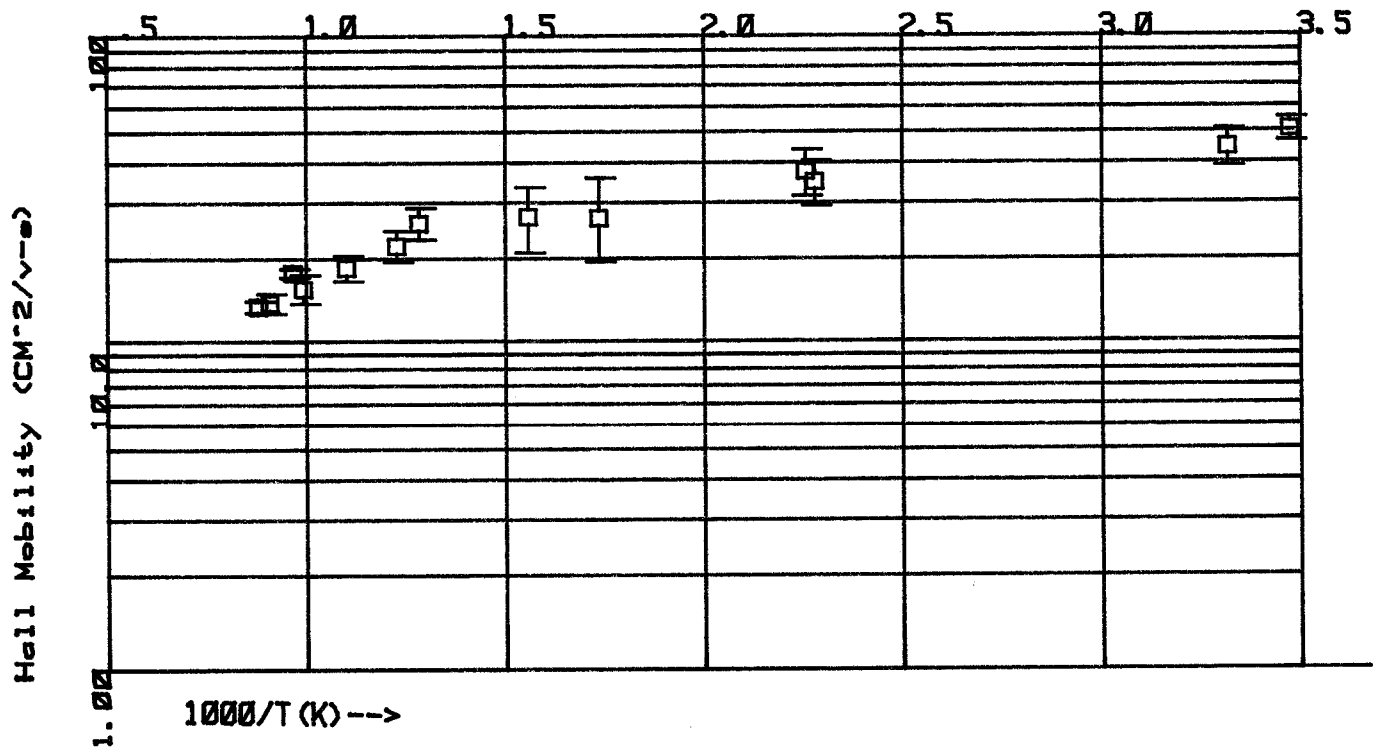
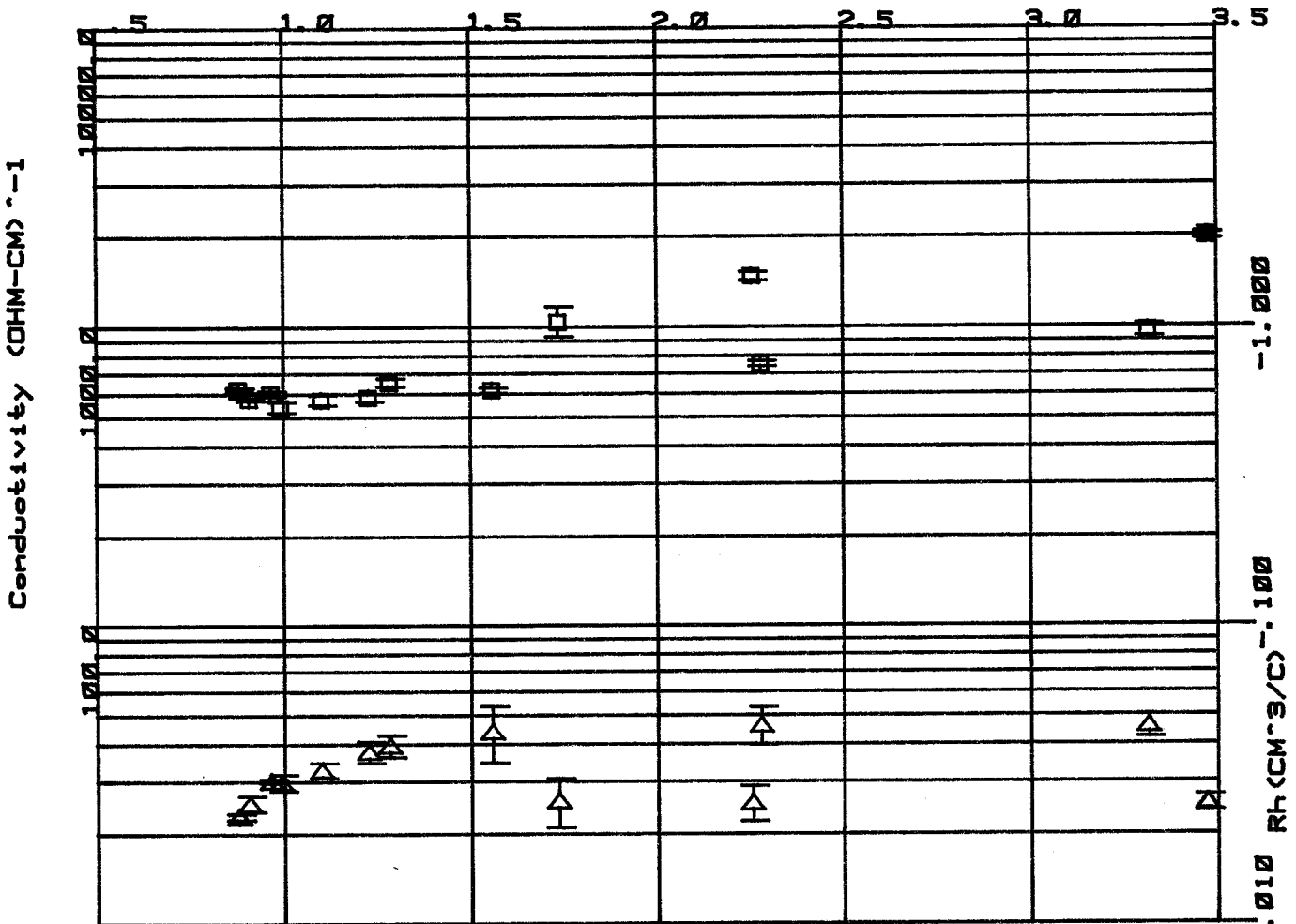
$\approx 26 \mu\Omega$

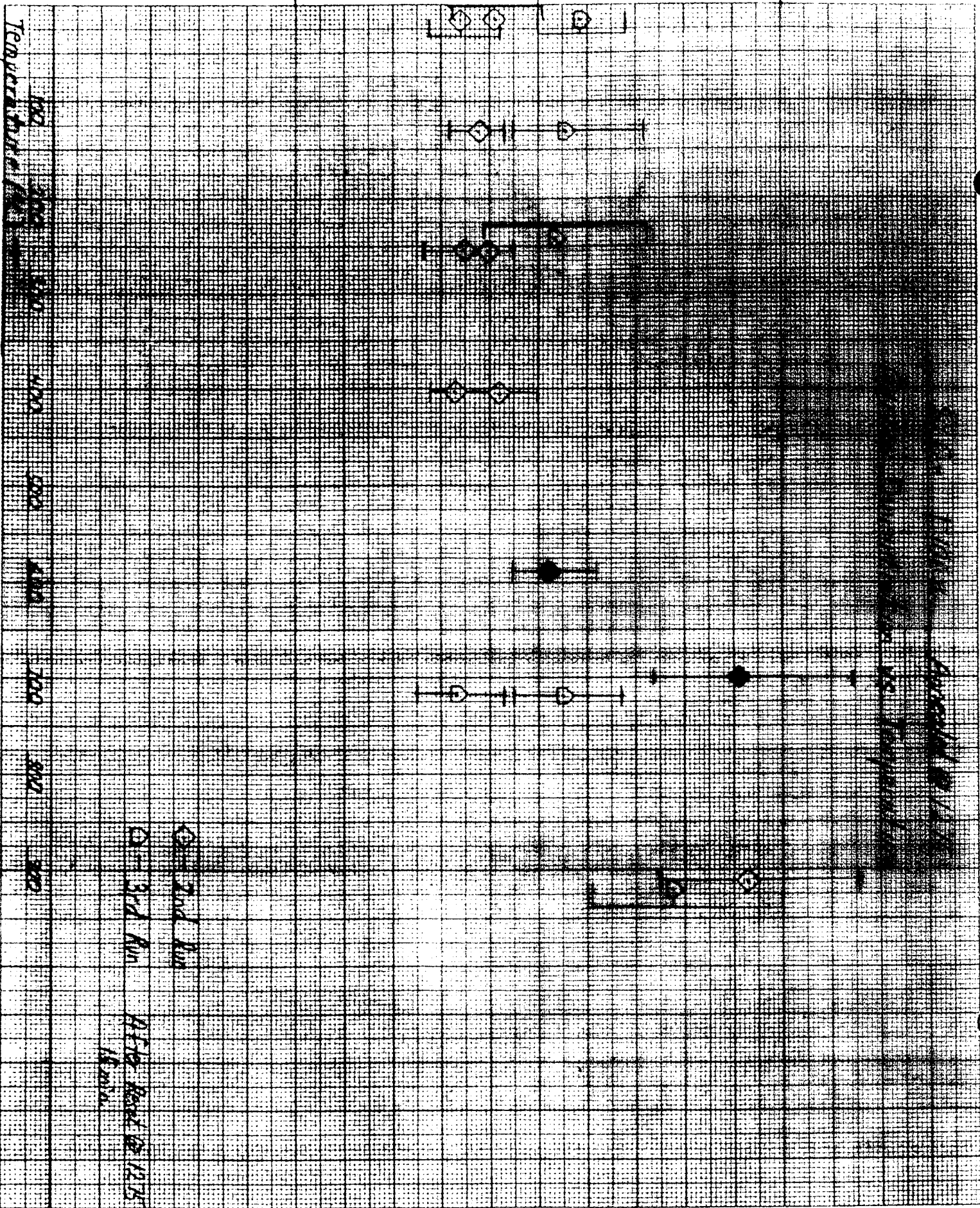
HALL CONSTANTS	MAG FIELD	
-2.64990E-002 CM^3/C	+9.8410E+002GAUSS	
-1.85690E-002 CM^3/C	-9.8200E+002GAUSS	
POWER=	- .1881460427	
nV READING	CURRENT	DELTA V
+6.42415E-005	-2.032E-001	
+6.71057E-005	-2.032E-001	+3.53420E-006
+6.29015E-005	-2.032E-001	
+5.74093E-005	-2.032E-001	-5.37480E-006
+6.26667E-005	-2.032E-001	

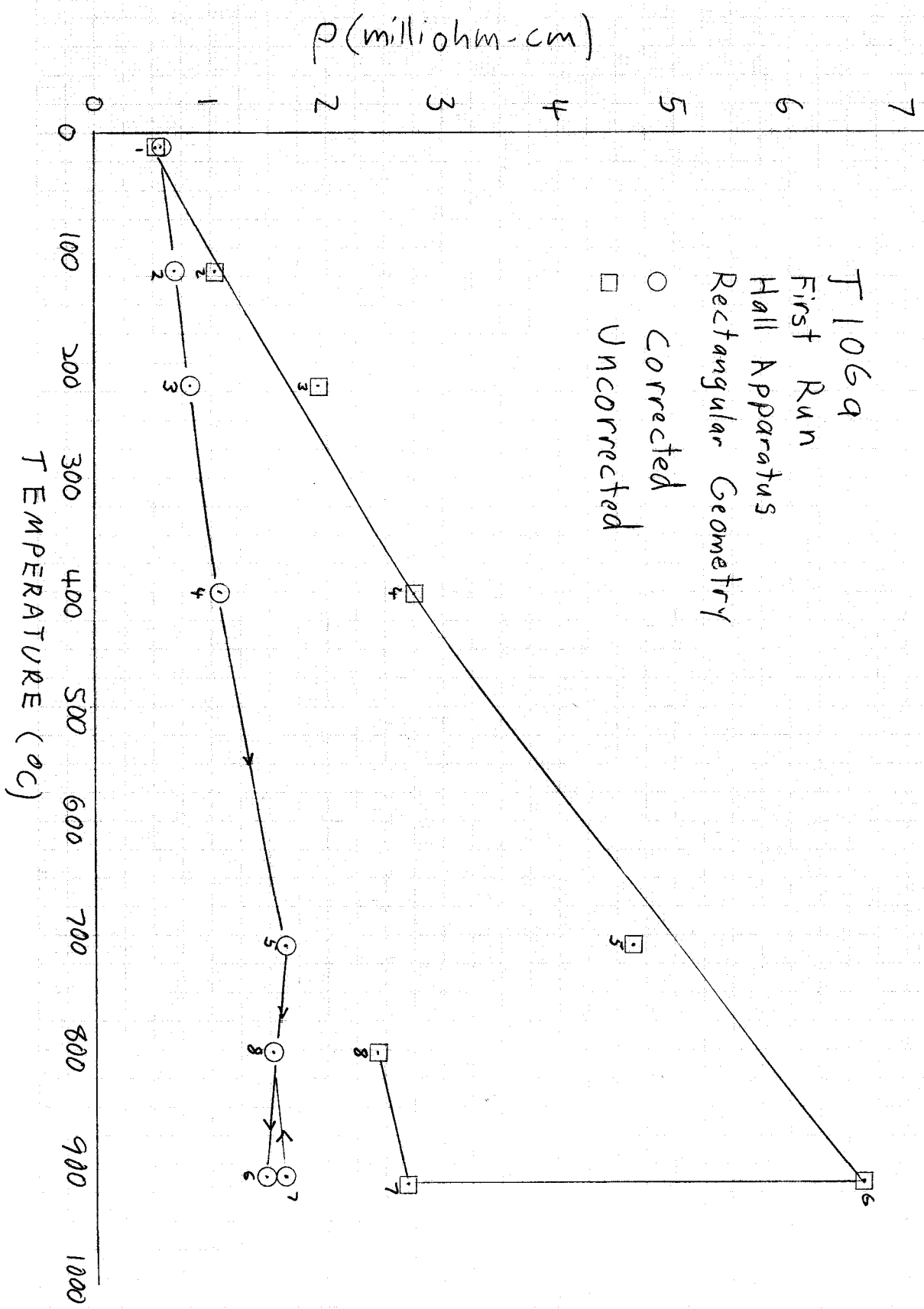
HALL CONSTANTS	MAG FIELD
-1.74440E-002 CM^3/C	+9.9710E+002GAUSS

HALL DATA SiGe T373

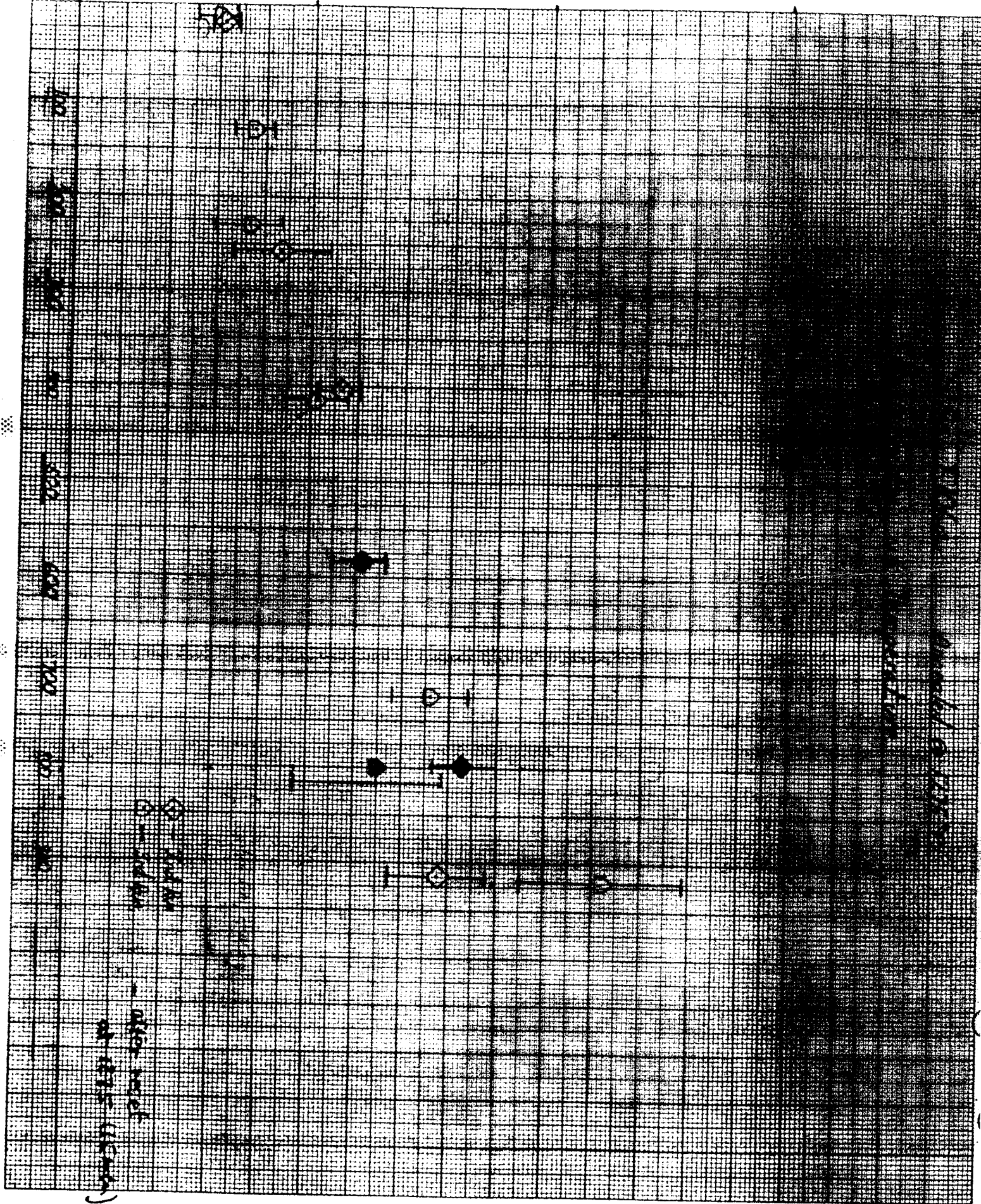
I. T. @ 1200: 30 min: AIR COOL







10/87
 CBV



D-2731M
 D-2731M

D-2731M + 2731 (mean)

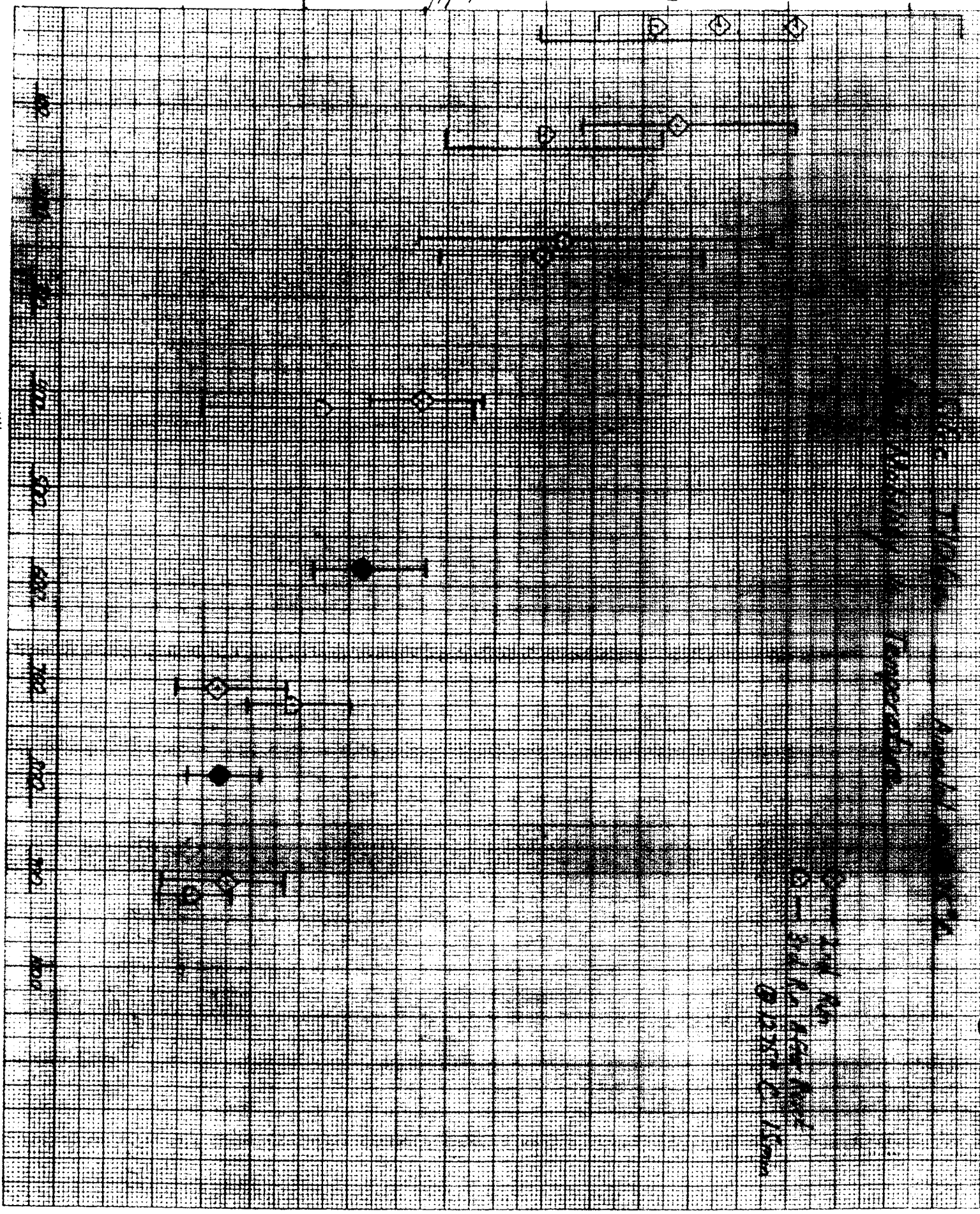
0 10 20 30 40 50 60 70 80 90 100

100 110 120 130 140 150

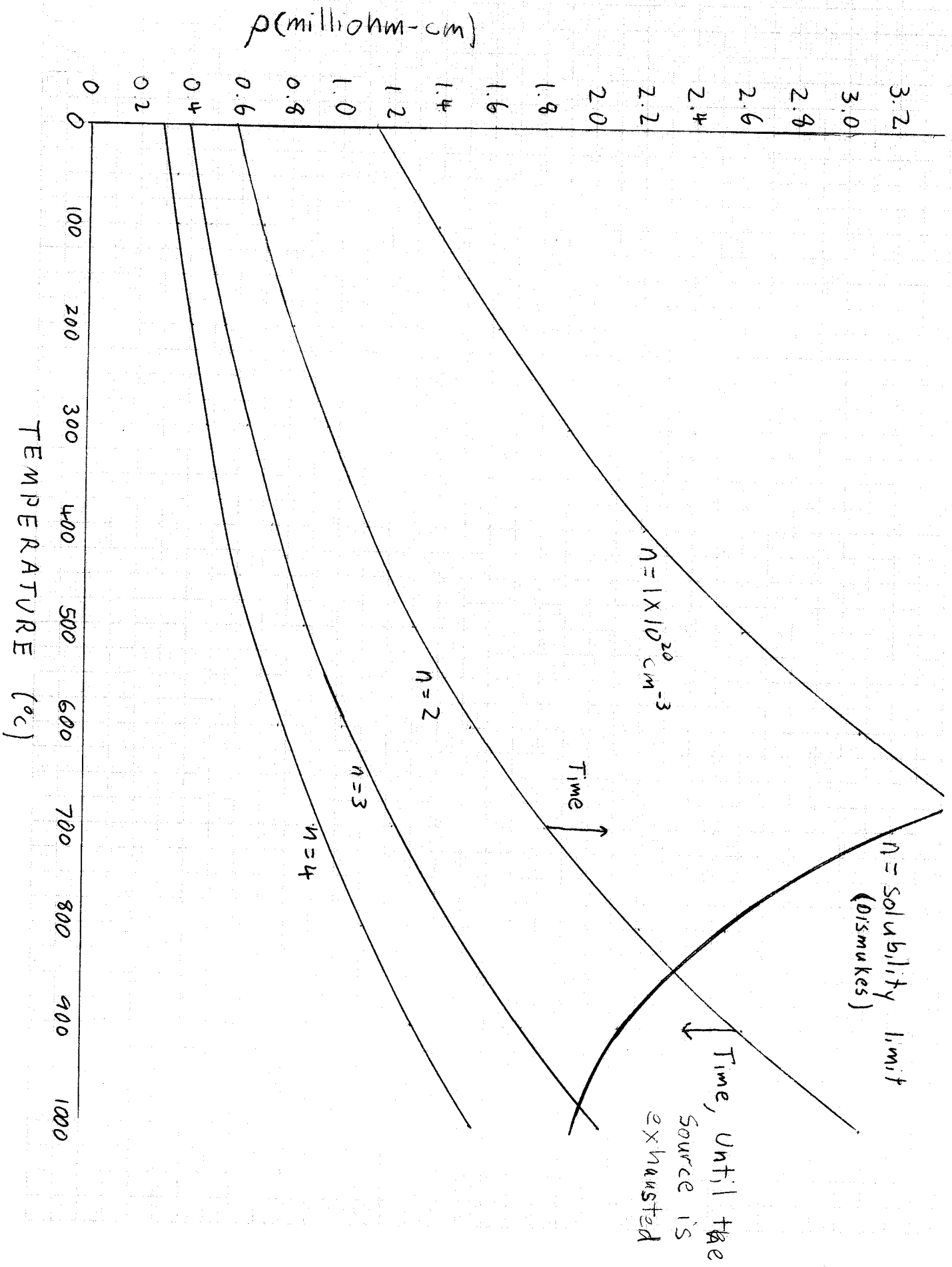
Time

Temperature

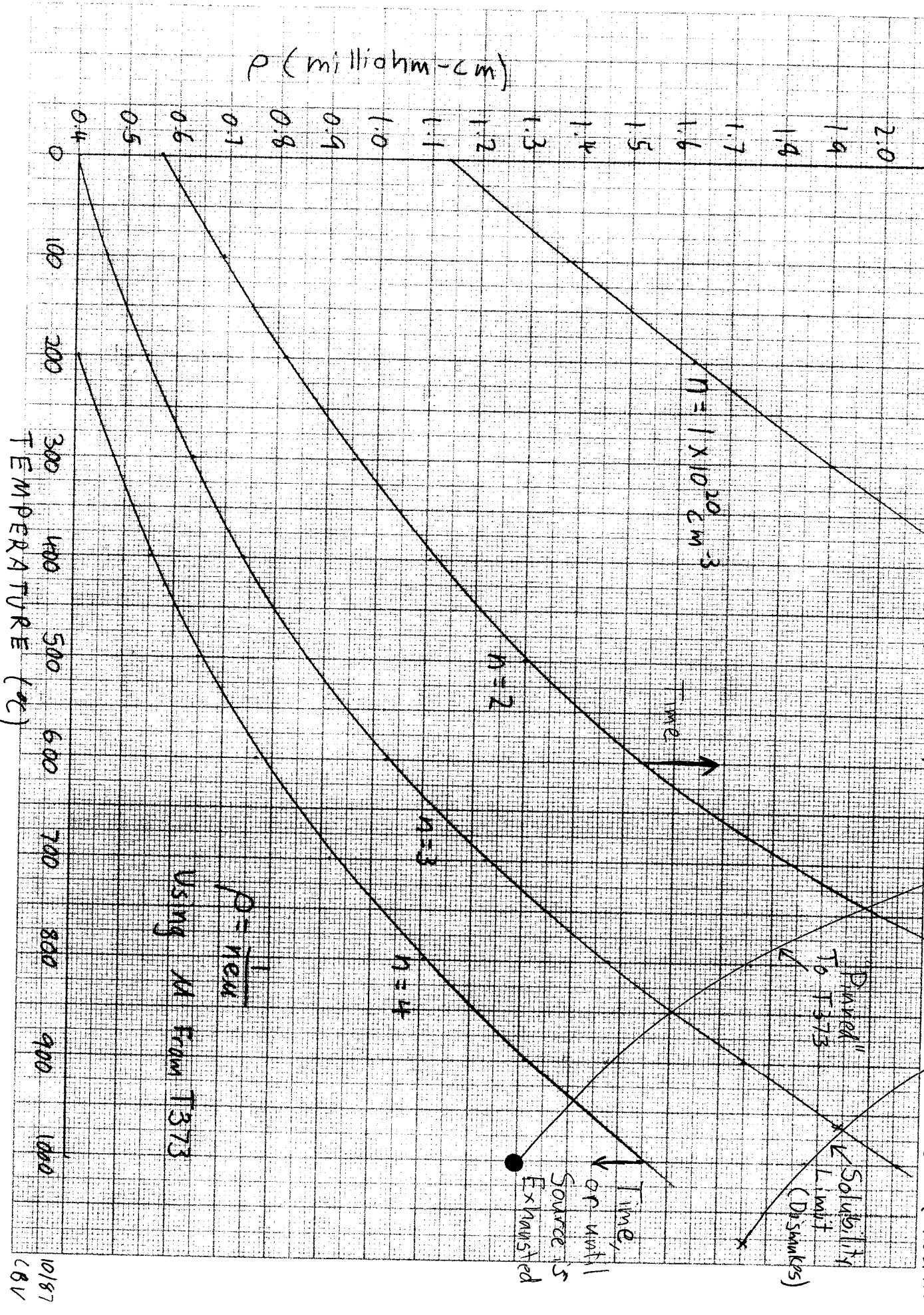
Hall Mobility, μ , (cm²/Vs) → 10 20 50 100 200



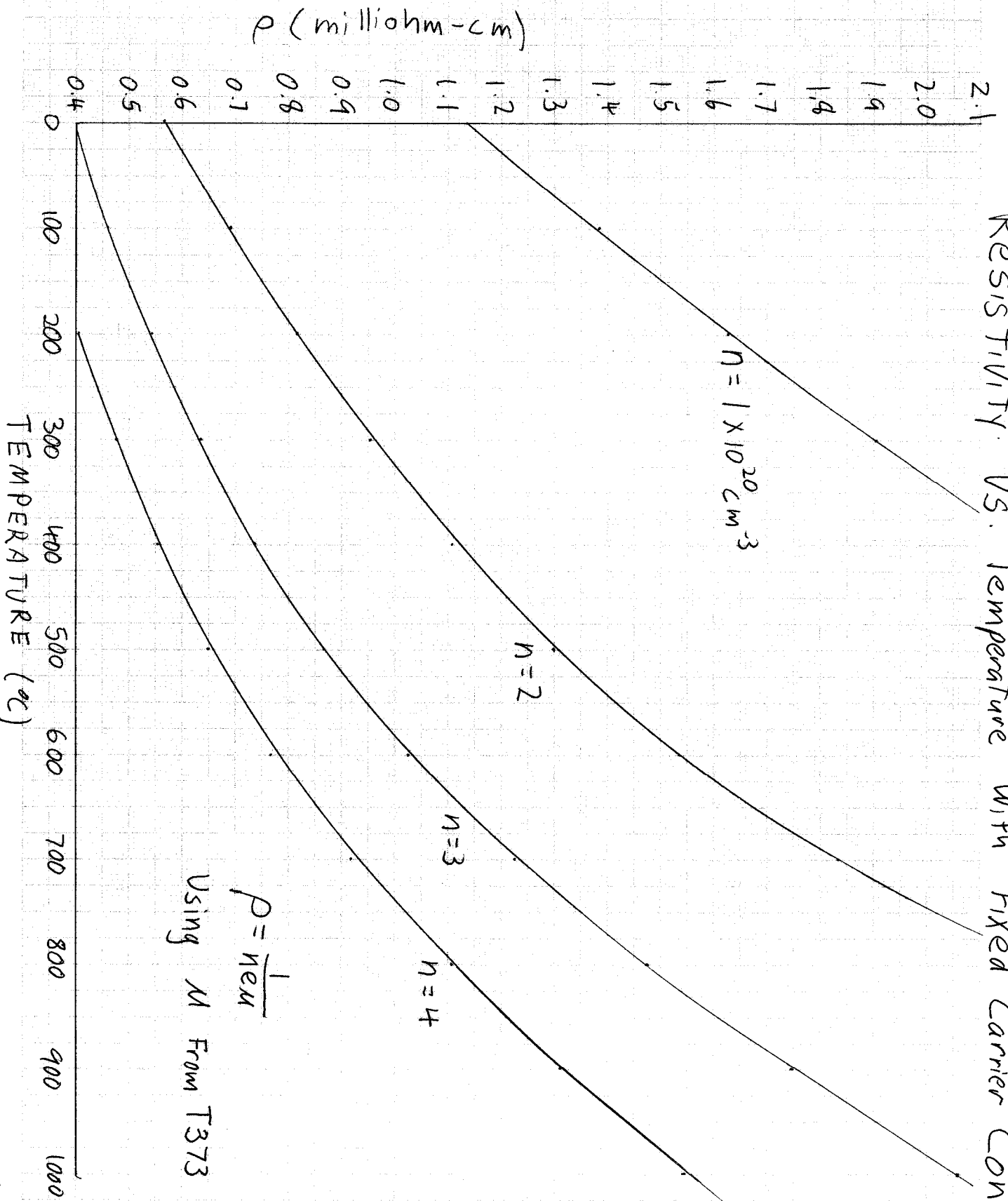
Legend:
 ○ — 3.1% Fe
 ● — 3.1% Fe
 ◇ — 3.1% Fe
 ○ — 3.1% Fe

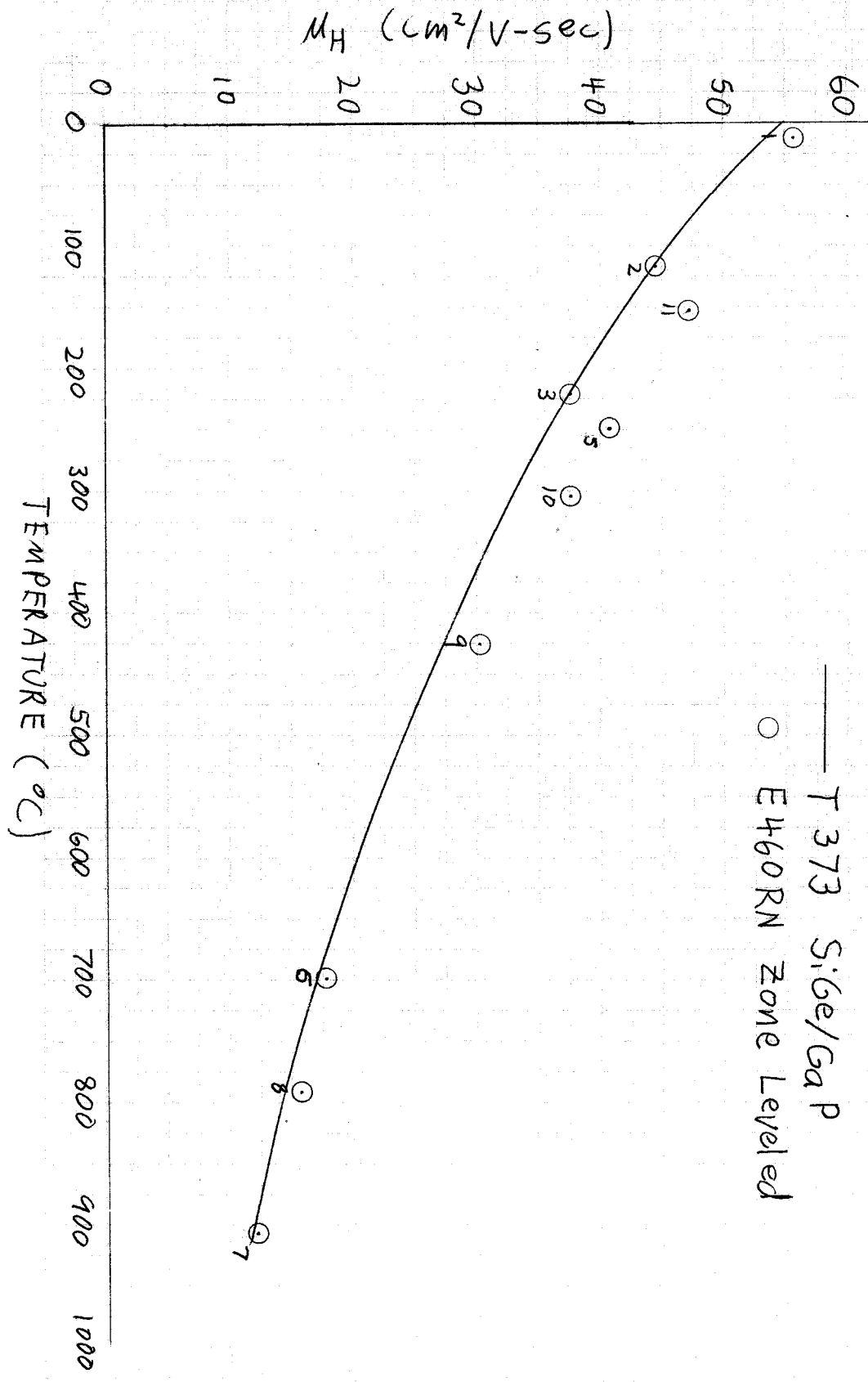


RESISTIVITY VS. Temperature, With Fixed Carrier Concentration

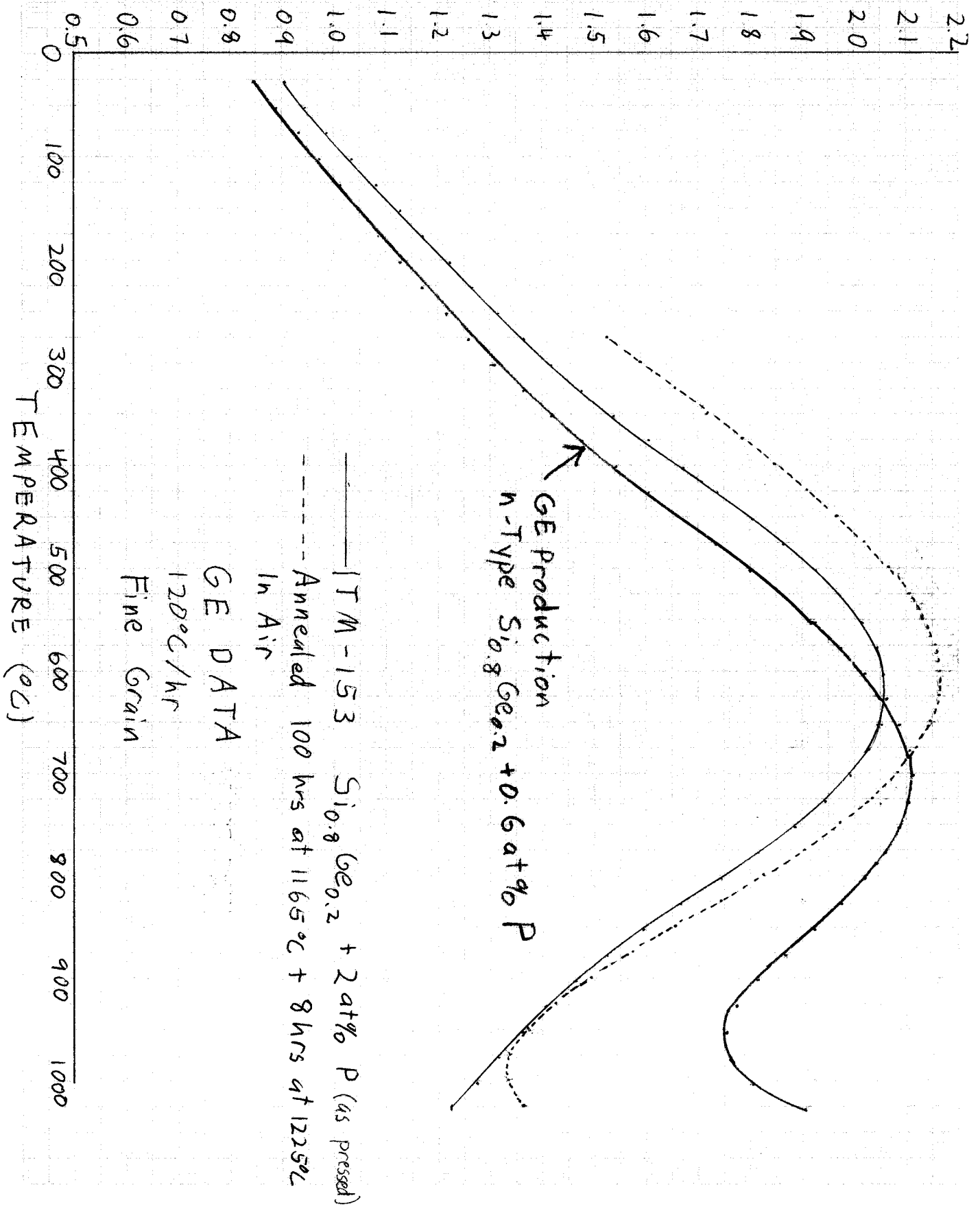


Resistivity VS. Temperature with Fixed Carrier Concentration

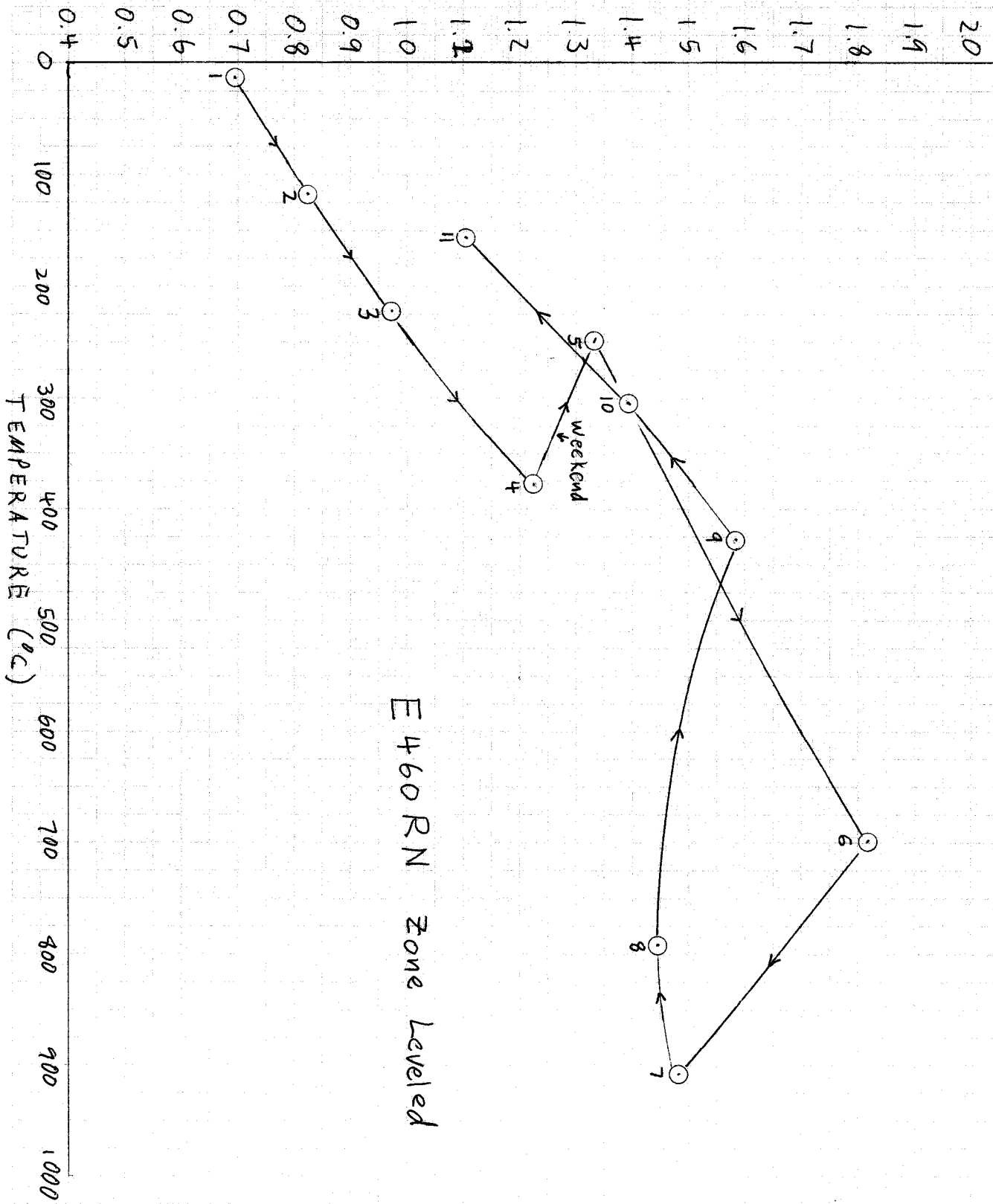




ρ (milli-ohm-cm)



ρ (milliohm-cm)



E460RN Zone Leveled

E 460RN
Zone Levelled SiGe

	T °C	P	n	M	
	4/17/87				
1	13.5	0.6957 ± 2.6%	1.615 ± 9.2%	59.56	
2	116.8	0.8263 ± 2.9%	1.698 ± 5%	44.49	
3	221.5	0.9712 ± 3.4%	1.714 ± 16%	37.5	
4	377.1	1.225 ± 2.6%			
5	249.8	1.330 ± 1.0%	1.147 ± 4.1%	40.89	4/20/87
6	699.5	1.819 ± 0.1%	1.934 ± 3.1%	17.74	
7	908.2	1.482 ± 0.2%	3.44 ± 11%	12.2	
8	791.8	1.446 ± 0.3%	2.75 ± 2.5%	15.70	
9	426.7	1.584 ± 0.1%	1.303	30.2	
10	307.8	1.391 ± 0.8%	1.21	37.08	
11	153.5	1.105 ± 1.6%	1.196	47.2	

Dismukes Final Report

Equilibrium Phosphorus Concentration

T °C	n_{eq} cm^{-3}
670	1
844	2
962	3

$$n_{eq} = A e^{-B/T}$$

~~$$B = 2.293 \times 10^{-4}$$~~

$$A =$$

$$A = 100.8$$

$$B = 4356.6$$

$$n = 100.8 e^{-4356.6/T} \times 10^{20}$$

$$E_a = 0.375 \text{ eV}$$

Sauvages & Rowe data in reasonable agreement, where relevant

This gives a H.T. resistivity much higher than is observed.

Use TECO's value for $\rho_{T=1000^\circ\text{C}}^{T373}$ to determine a new prefactor, but keep same activation energy as given above

$$\rho_{1000^\circ\text{C}}^{T373} \text{ (From TECO's Data)} = 1.3 \text{ milliohm-cm}$$

$$\Rightarrow n(1000^\circ\text{C}) = 4.754 \times 10^{20} \text{ cm}^{-3}$$

$$\Rightarrow n = 145.3 e^{-0.375/RT}$$

Smoothed Data

T	μ	$\frac{1}{T}$	$T^{3/2}$	μ
0	55.0		4511	0.0182
100	45.2		7204	0.0221
200	38.4		10287	0.0260
300	32.8		13716	0.0305
400	28.2		17459	0.0355
500	24.0		21492	0.0417
600	20.3		25794	0.0493
700	17.0		30351	0.0588
800	14.1		35148	0.0709
900	11.9		40174	0.0840
1000	10.1		45420	0.0990

$\frac{1}{\mu} = 0.01208 + 1.360 \times 10^{-6}$

Significant deviations

$$\mu_H^{-1} = \mu_{res}^{-1} + \mu_{e-p}^{-1} + \mu_7^{-1}$$

$$\mu_7^{-1} = \mu_H^{-1} - (0.01208 + 1.36 \times 10^{-6} T^{3/2})$$

T	μ_7	$\frac{1}{T}$	$\ln T$
273	unreliable	3.666	5.609
373	↓		
475			
573			
673			
773		2757	1.294×10^{-3}
873	475.4	1.145	6.772
973	183.0	1.028	6.880
1073	90.60	0.932	6.978
1173	57.77	0.853	7.067
1273	39.76	0.7855	7.149

$\mu = 1.30 \times 10^{17} T^{-5}$
 $\mu = 0.4782 e^{0.485 eV / kT}$
 $E_a = 0.485 eV$

10/26/87

T1069,
N-Type SiGe/GaP
odd shaped piece

	T °C	P _{old} milli2-cm	P _{new}	Ave n _{old} $\times 10^{20}/\text{cm}^3$	$\mu = \frac{1}{P_{\text{new}} n_{\text{old}}^{\text{ave}}}$ $\text{cm}^2/\text{V}\cdot\text{s}$	Q _{old}	
	First	Run	7/15/87				
1	12.0	0.5139 ± 2.5%	0.5624 ± 8.6%	2.042 ± 19%	54.3 ± 28%		
2	120.2	1.025 ± 16%	0.6988 ± 3.6%	2.286	39.07		
3	221.1	1.925 ± 18%	0.8334 ± 3%	2.606	28.7		
4	402	2.746 ± 24%	1.057 ± 2.2%	2.799	21.1		
5	709.4	4.644 ± 34%	1.628 ± 1.9%	2.338 ± 12%	16.4 ± 14%		
6	915.5	6.604 ± 32%	1.483 ± 1.5%	4.127 ± 45%	10.2 ± 47%		
7	919.9	2.682 ± 25%	1.644 ± 4.1%	2.31 ± 18%	16.4 ± 22%		
8	801.8	2.434 ± 22%	1.555 ± 3.2%	2.39 ± 11%	16.8 ± 14%		
	Second	Run	7/22/87				
9	13.9	0.6250 ± 9.4%	0.6507 ± 5.5%	1.760	54.5		
10	131.4	0.7012 ± 11%	0.8355 ± 5.3%	1.675 ± 2.3%	44.60 ± 8%		
11	196.8	0.7233 ± 11%	0.9835 ± 4.8%	—	—		
12	256.2	0.8738 ± 24%	1.010 ± 1.5%	1.807	34.2		
13	406.6	1.125 ± 7.6%	1.219 ± 1.1%	1.716 ± 10%	29.8 ± 11%		
14	714.1	2.310 ± 24%	1.742 ± 0.9%	1.88 ± 33%	19.1 ± 34%		
15	918.1	NG					
16	796.9	2.834 ± 26%	1.6919 ± 0.7%	2.448 ± 9.8%	15.07 ± 14%		
17	799.9	1.659 ± 8%	1.8439 ± 0.7%	2.846 ± 35%	11.89		
18	587	1.218 ± 9.4%	1.449 ± 0.4%	2.068	20.83		
	3rd	Run	Reset at 1275°C	7/30/87			
19	13.4	0.5851 ± 13%	0.6245 ± 1.6%	2.127 ± 4.4%	47.0 ± 6%		
20	130.3	0.7482 ± 11%	0.7850 ± 4.9%	2.23 ± 11%	35.7 ± 16%		
21	242.4	0.8983 0.730 ± 19%	0.8983 ± 1.8%	2.067	33.6		
22	414.5	1.005 ± 13%	1.282 ± 1.9%	2.803	17.4		
23	13.5	0.6783 ± 21%	0.730 ± 1.9%	1.752	48.8		
24	721.6	1.5217 ± 11%	1.969 ± 0.2%	2.00	15.9		
25	920.9	2.240 ± 15%	1.731 ± 4.1%	2.92 ± 27%	12.3		
	925.0 801.2	Some sort of failure beyond this point					