



**Product Name: HMS-5000 Hall Effect Measurement System with variable temperature from 80K to 350K**

– Manual version: ver 5.01–

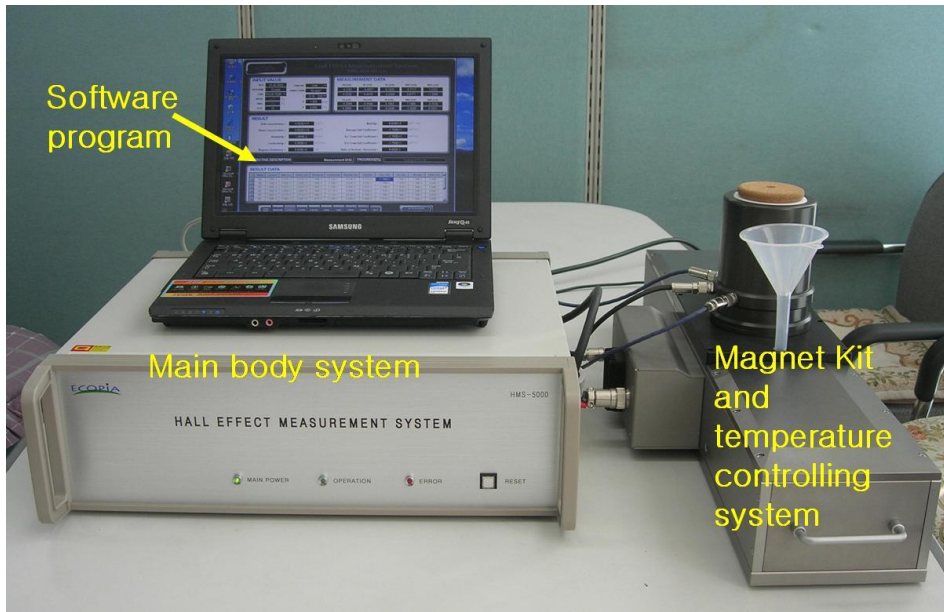
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    - 5) Pour Liquid Nitrogen into Funnel.
    - 6) Start to measure.
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# 1. Hardware installation.

1) HMS5000 consists of.

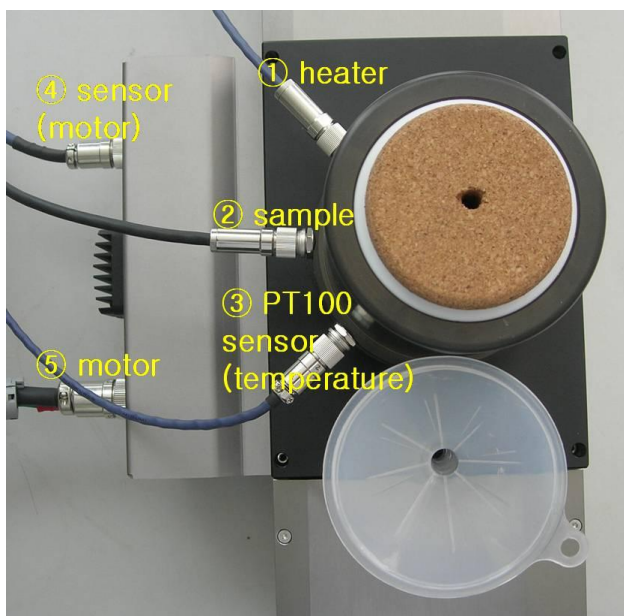


< Pic# 1. HMS5000 system full set view >

HMS5000 system mainly consists of “Main body System”, “Magnet Kit and temperature controlling system” and “software program”

2) Cable connections.

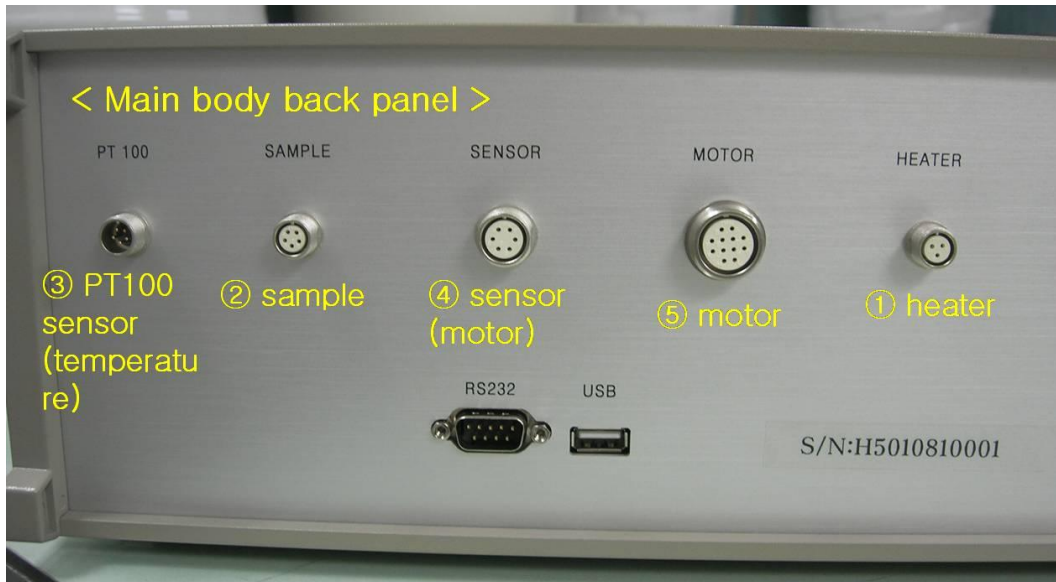
First of all, you need to connect many cables successfully as below images.



< Pic#2 LN2 tank top view >

You need to take care ①,②,③ cable connectors are water-proof but the other side of ①,②,③ cable connectors are non-water proof. Water proof connectors are little longer than the other side connectors.

The reason why we use wafer-proof connectors for connecting to LN2 tank is for more safety issue. Because, LN2 tank surface will be dewy , whenever measuring in low temperature.



< Pic#3. Cable connectors in main body’s back side panel >

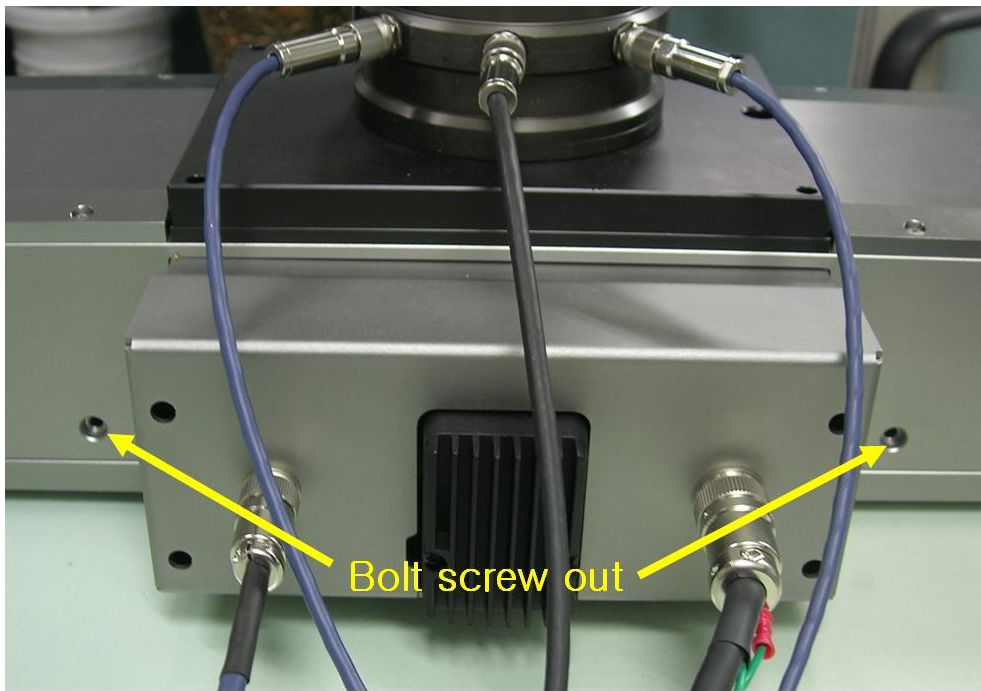


< Pic#4. Cables were successfully connected to >

And, either USB or RS232 cable also must be connected between your computer and main body system’s back panel’s connector.

And, “voltage rate switch” also must be selected as per your electrical environment.

3) Bolt screw in and out , to lock in and lock out magnet



< Pic#5. both sides bolt must be screw out to move magnet >

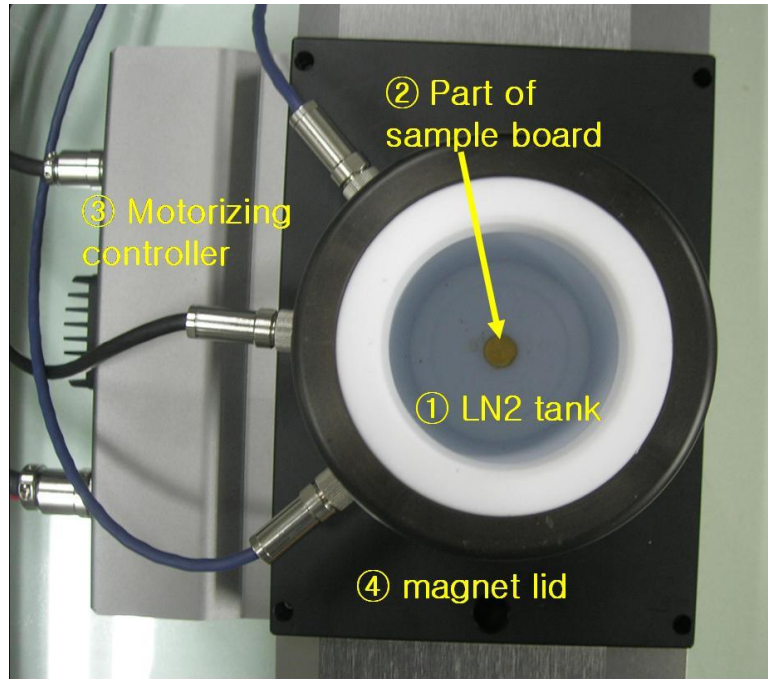
As shown in above image, you have to screw bolt out.

Both of bolt must be screw in and firmly fixed , in order to prevent the magnet from moving on both sides out of control in a process of shipping. Please screw bolt in whenever you move magnet for long journey. If not, magnet move left and right sides out of control and it may be the reason of shorter magnet life time , and magnet may be broken or not operated by serious shockness.

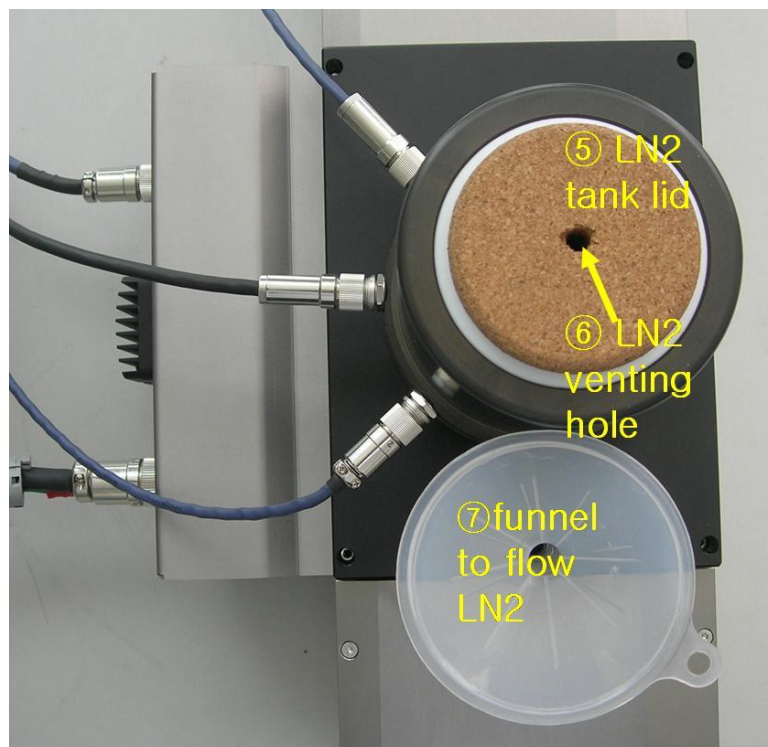
And, if the magnet is not standing on initial position, push “RESET” button in the main body system’s front panel. If so, magnet comes to initial position automatically. Magnet is ready to run successfully.

#### 4) LN2 tank and sample board construction.





< Pic# 6. LN2 tank top view and it's construction >



< Pic#7. LN2 tank lid and funnel >

Above image is to show top view of LN2 tank with magnet kit.

LN2 must be poured into “① LN2 tank” to test in variable temperature. And, it can make it possible to maintain LN2 temperature during test.

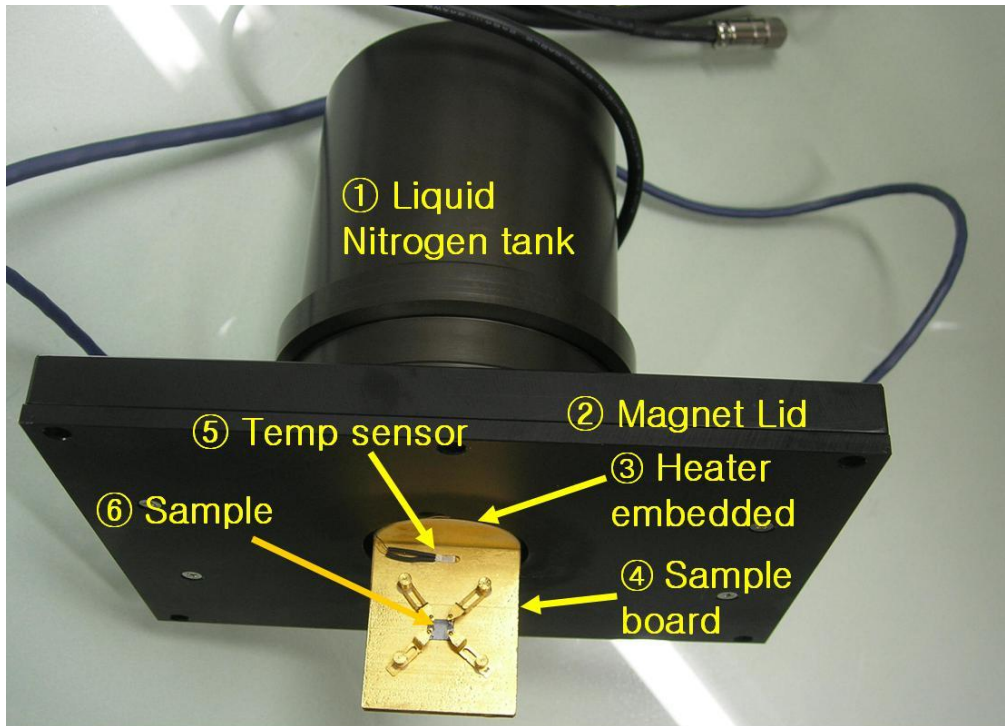
“ ② part of sample board” is top end of sample board. Sample board was made of “Oxygen-free bronze” shank and it was coated by gold.

Oxygen-free bronze is very good to respond for temperature variation very fast. And, coated-gold can prevent sample board from getting rusty.

“ ③ **motorizing controller**” is to make it possible to move magnet left and right side automatically during test.

“ ⑤ **LN2 tank lid**” should be closed as above image right after pouring LN2, in order to keep LN2 for longer time. If not, LN2 does boil and evaporate faster.

“ ⑦ **Funnel**” is to make it possible to flow LN2 into square type LN2 tank which is centered on both round magnet.



< Pic# 8. LN2 tank , Magnet Lid integrated with sample board >

Above image is to show sample board, magnet lid and LN2 tank. And, those are not detachable each other. Please do not try to take it to pieces by force.

“③ **Heater**” was embedded in sample board inside. It can make it possible to raise the temperature goes up by getting signal from electrical power.

And, “ ④ **sample board**” is heated by heater and cooled down by LN2.

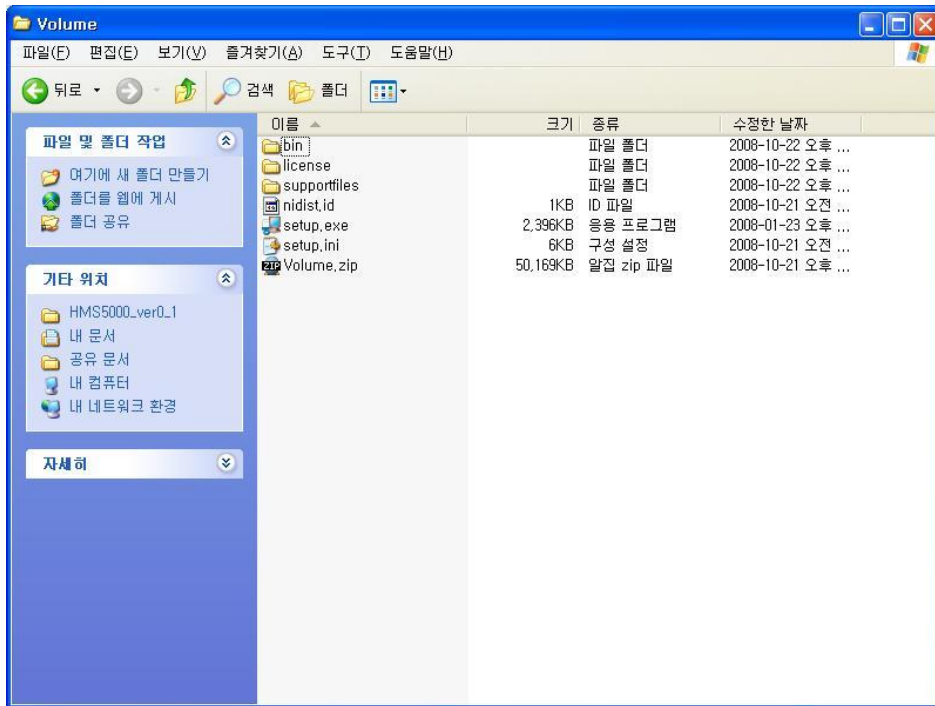
“ ⑤ **Temperature sensor**” reads temperature currently on the real time basis, and send signal to main body system.

“⑥ **sample**” must be mounted on sample board successfully. It is very important process. If sample mounted on sample board loosely, connection between each probe tip and sample’s four point edge may be disconnected during test , esp in low temperature.

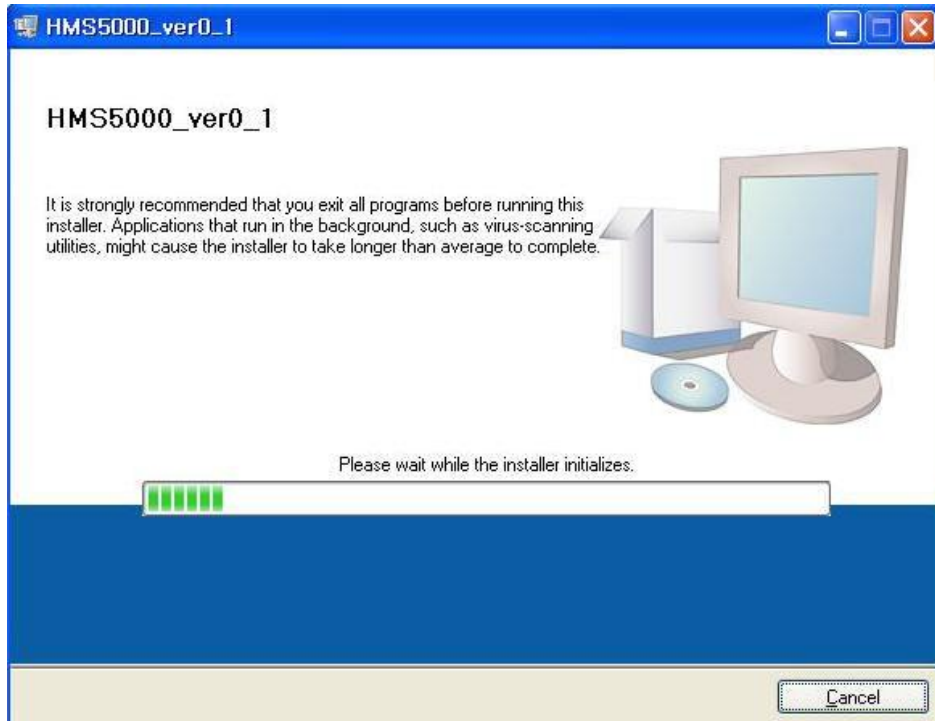
So, please try to check each connection was successfully done.

If you finished all the cable connections, voltage rate switch selection, USB/RS232 connection and mounting sample on board, you can power main body system on.

## 2. S/W program installation.

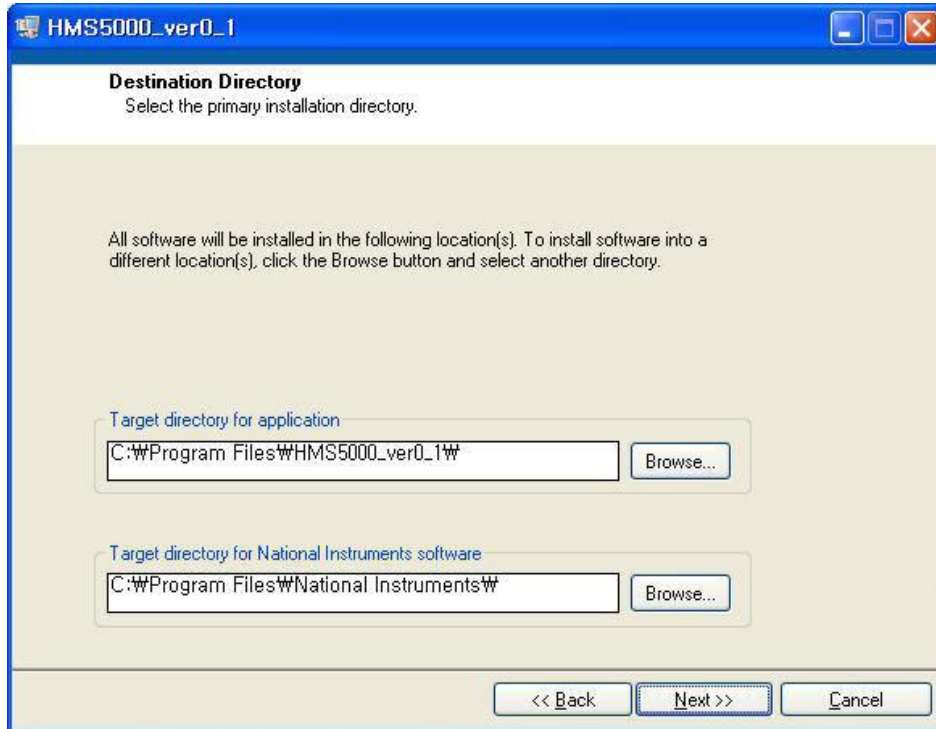


Click “setup.exe” file to start HMS5000 installation program.

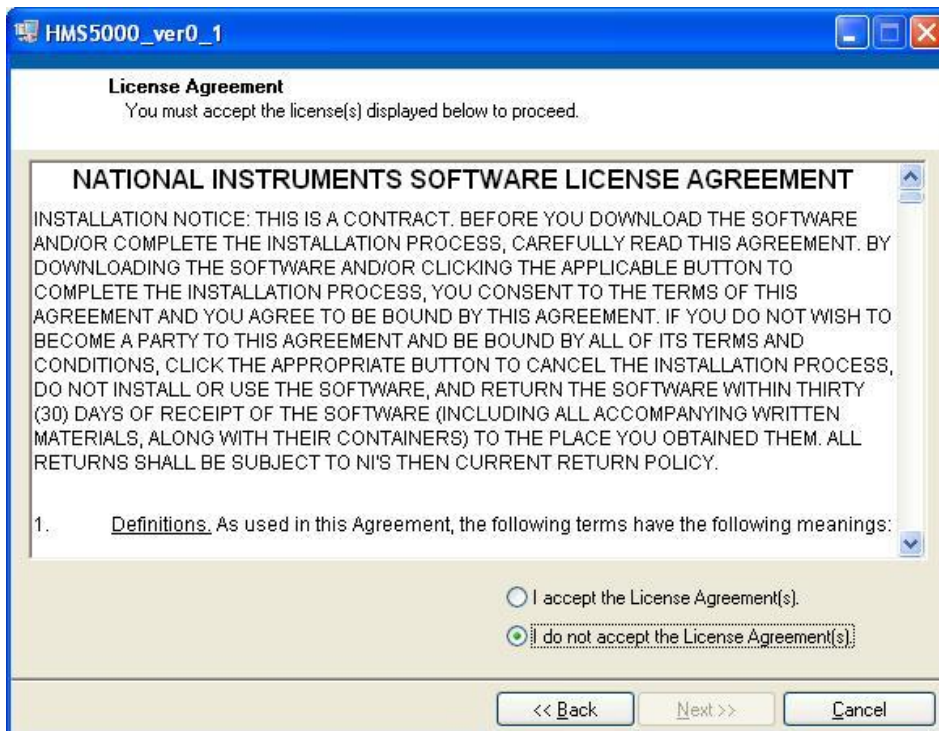


It automatically goes on as above.

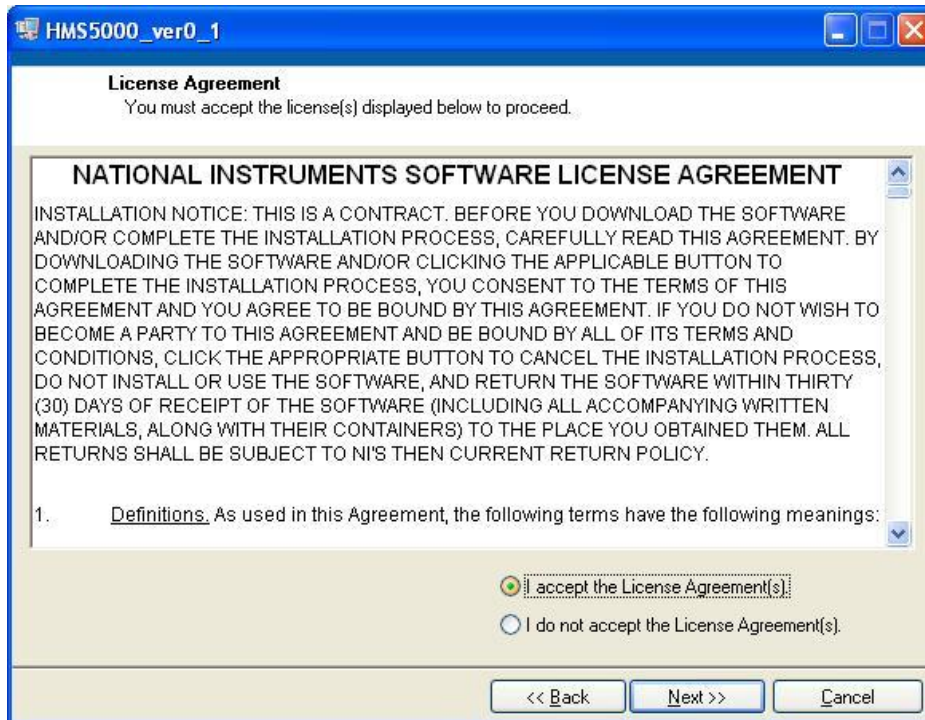




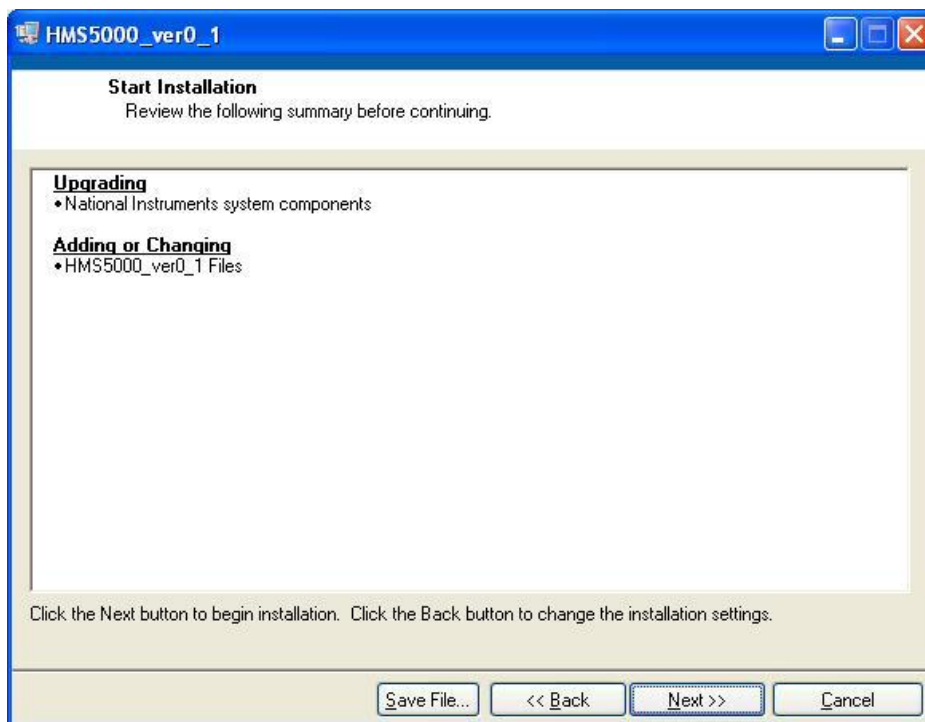
Click "Next" button.



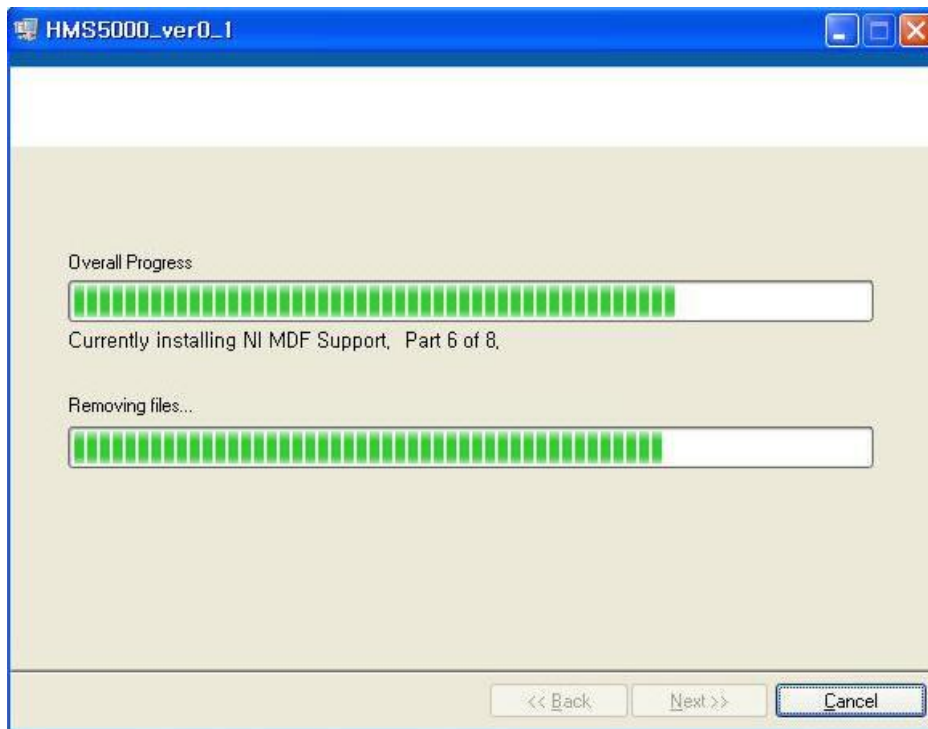
Click " I accept the License Agreement(s)".



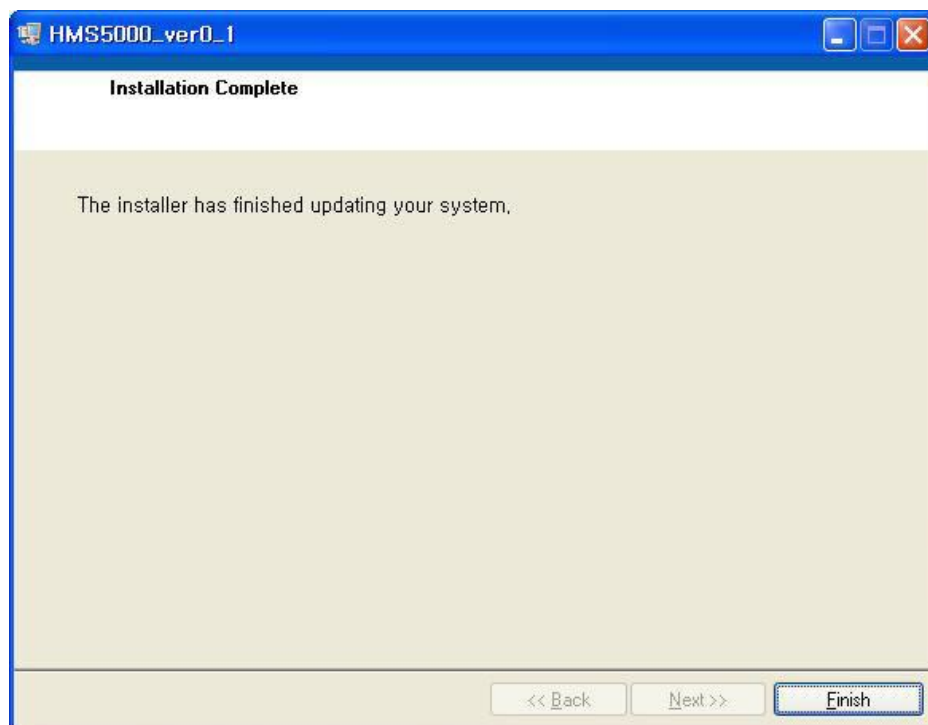
Click "Next" button.



Click "Next" button.



It is installing program files.



Click "Finish". Installation process was finished.

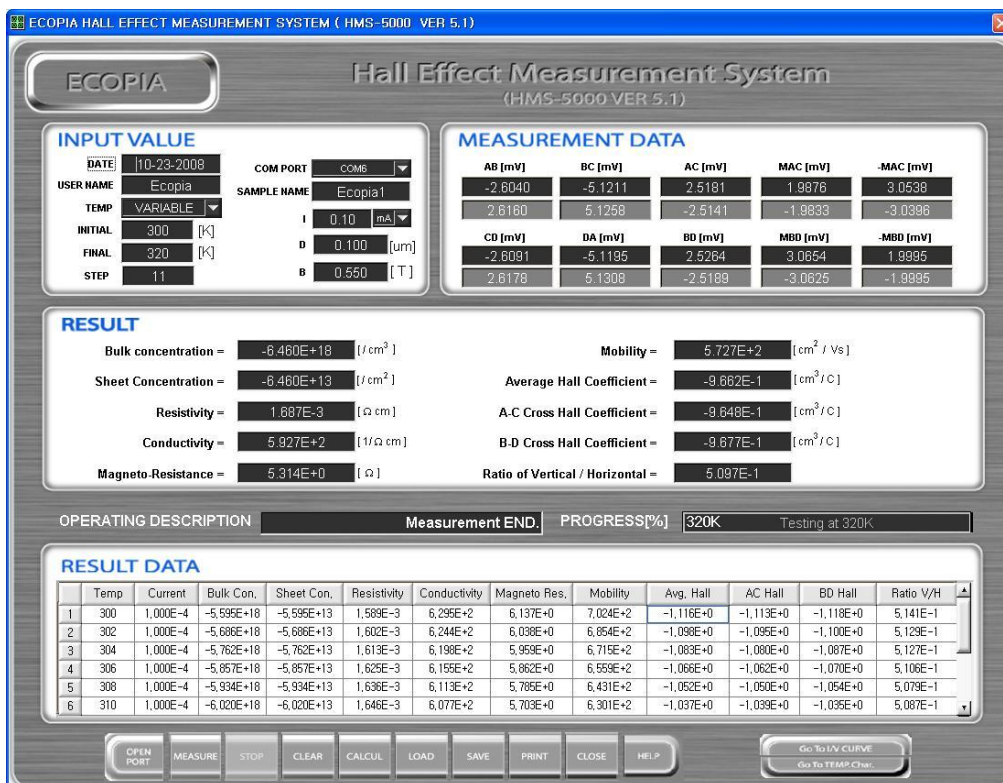


Click “Restart” and before that, please save the data in advance that is on operating.

### 3. How to measure

#### 1) The first main page of hall effect measurement system

If all the hardware connections and s/w program was successfully installed, start to open measurement page. And, you will see how to measure in variable temperature range by our selecting randomly 300K ~ 320K temperature range.



< Pic# 1. Initial test page >

Above pic#1) is to show initial measurement page.

#### (1) Input value

**INPUT VALUE**

DATE: 10-23-2008

USER NAME: Ecopia

TEMP: ROOM TEMP.

INITIAL: 300 [K]

FINAL: 300 [K]

STEP: 1

COM PORT: COM1

SAMPLE NAME: COM1

I: 1.00 uA

D: 0.100 [um]

B: 0.510 [T]

< Pic#2. COM PORT selection >

Pic#2 is to show selecting COM PORT by pull-down menu bar. It is automatically selected but if not, click COM6 except for COM1.

**INPUT VALUE**

DATE: 10-23-2008

USER NAME: Ecopia

TEMP: ROOM TEMP.

INITIAL: ROOM TEMP.

FINAL: VARIABLE

STEP: 1

COM PORT: COM6

SAMPLE NAME: Ecopia1

I: 1.00 uA

D: 0.100 [um]

B: 0.510 [T]

< Pic#3, TEMPERATURE selection and temp range set up >

You can select “ROOM TEMP” or “VARIABLE TEMP” as per your test purpose.

**INPUT VALUE**

DATE: 10-23-2008

USER NAME: Ecopia

TEMP: VARIABLE

INITIAL: 300 [K]

FINAL: 320 [K]

STEP: 11

COM PORT: COM6

SAMPLE NAME: Ecopia1

I: 0.10 mA

D: 0.100 uA

B: 0.510 nA

< Pic# 4. Input current >

“ I “ means **input current** value. You can fill it from 1nA to 20mA as per the sample’s electrical properties. If it is too high resistive sample, you will have to fill it lower, on the other hand, if it is high conductivity sample, input current must be 10mA or 15, or higher.



“D” is doped – sample thickness layer. You have to know it in advance by testing with your ellipsometer or other instruments.

“B” is magneto flux density. We usually offer 0.55Tesla magnet but it may be little stronger or little weaker. It will be range of 0.57T ~ 0.53T and we will test and label actual magneto flux density in magnet kit before shipment.

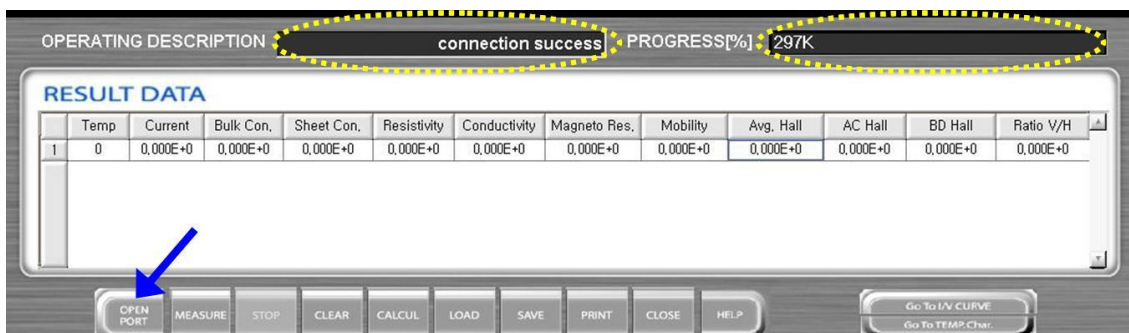
This is because our permanent magnet is very sensitive to air gap between both round magnet.

“INITIAL” and “FINAL” means variable temperature set-up range in which user likes to test. Limit temperature of “INITIAL” is 80K and “FINAL” temp is 350K.

“STEP” means actual testing point. In Pic#4, we filled “11” and “INITIAL” temp is 300K and “FINAL” temp is 320K. If so, our system will measure at 300K, 302K, 304K,,,,, 318K and 320K. It measures 11 number of point at each 2K interval variation.

< Pic#5. complete input value >

## (2) Open port



< Pic# 6 click “OPEN PORT” >

If you filled all menu in input value, you have to click “OPEN PORT” to see if connection is successful.

Above Pic# 6 is to show “**connection success**” and you can also see currently real-time temperature in progress. It now indicates 297K. If it reach to 300K, the system will start to run , after system wait **3 seconds** of maintaining time at 300K.

If you see “**connection fail**”, you need to check hardware(cable) connections.

If you see “**connection success**”, click “**MEASURE**” button, and it starts to run successfully.

### (3) Measure



< Pic# 7. It is testing and reads raw data >

It is testing now and it reads and displays raw data, Vab, Vbc, Vac, Vcd, Vda, Vbd.



< Pic# 8. Magnet system is inserting Magnet N to S >

Now, magnet system is inserting **magnet N to S automatically** by motorizing system. And then right after that, system reads and displays data of **MAC and MBD**.



< Pic# 9. Magnet system is inserting Magnet S to N >

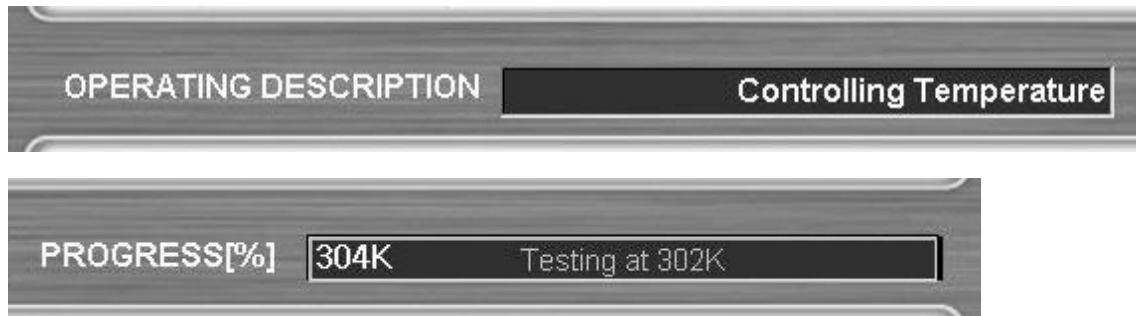
Now magnet system is inserting **magnet S to N automatically** by motorizing system. And then right after that, system reads and display data of **-MAC and -MBD**.



< Pic# 10. Measurement END >

Measurement was finished and you can see below “MEASUREMENT DATA” in Pic#12, “RESULT” in Pic#12.

(4) Raising temperature automatically by heating up sample board.



< Pic#11. The system is raising temperature >

If the system finish measurement at the first step temperature, system raise temperature automatically by **heating up bronze sample board** to reach to next step temperature. The system starts to repeat measuring process when it goes on to the next goal temperature.

(5) Test results

MEASUREMENT DATA				
AB [mV]	BC [mV]	AC [mV]	MAC [mV]	-MAC [mV]
-2.6040	-5.1211	2.5181	1.9876	3.0538
2.6160	5.1258	-2.5141	-1.9833	-3.0396
CD [mV]	DA [mV]	BD [mV]	MBD [mV]	-MBD [mV]
-2.6091	-5.1195	2.5264	3.0654	1.9995
2.6178	5.1308	-2.5189	-3.0625	-1.9995

< Pic#12, “MEASUREMENT DATA”. It is raw data >

Pic# 12 is to show raw data and these values are based on calculating below “RESULT” values such as bulk concentration, mobility, resistivity and so on.

And, in the first row of black color box, system applied **forward current**. In the second row of gray color box, on the other hand, system applied **reverse current**.

And, you can also see whether **ohmic contact** is good or not ,by taking a look at absolute values of each pair(forward and reverse value). Now in Pic#12, please see **Vab**. Each values are “-2.6040” and ”2.6160”, and absolute values of each other are very similar.

So you can see ohmic contact is good.

RESULT			
Bulk concentration =	-6.480E+18 [1/cm <sup>3</sup> ]	Mobility =	5.727E+2 [cm <sup>2</sup> / Vs]
Sheet Concentration =	-6.480E+13 [1/cm <sup>2</sup> ]	Average Hall Coefficient =	-9.662E-1 [cm <sup>3</sup> / C]
Resistivity =	1.687E-3 [Ω cm]	A-C Cross Hall Coefficient =	-9.648E-1 [cm <sup>3</sup> / C]
Conductivity =	5.927E+2 [1/Ω cm]	B-D Cross Hall Coefficient =	-9.677E-1 [cm <sup>3</sup> / C]
Magneto-Resistance =	5.314E+0 [Ω]	Ratio of Vertical / Horizontal =	5.097E-1

< Pic# 13. "RESULT" >

After final test, it displays

Bult concentration,

Sheet concentration,

Resistivity, Conductivity,

Magneto-Resistance,

Mobility,

Average Hall Coefficient, A-C Cross Hall Coefficient, B-D Cross Hall Coefficient,

Ratio of Vertical/ Horizontal

RESULT DATA												
	Temp	Current	Bulk Con.	Sheet Con.	Resistivity	Conductivity	Magneto Res.	Mobility	Avg. Hall	AC Hall	BD Hall	Ratio V/H
1	300	1.000E-4	-5.595E+18	-5.595E+13	1.589E-3	6.295E+2	6.137E+0	7.024E+2	-1.116E+0	-1.113E+0	-1.118E+0	5.141E-1
2	302	1.000E-4	-5.686E+18	-5.686E+13	1.602E-3	6.244E+2	6.038E+0	6.854E+2	-1.098E+0	-1.095E+0	-1.100E+0	5.129E-1
3	304	1.000E-4	-5.762E+18	-5.762E+13	1.613E-3	6.198E+2	5.959E+0	6.715E+2	-1.083E+0	-1.080E+0	-1.087E+0	5.127E-1
4	306	1.000E-4	-5.857E+18	-5.857E+13	1.625E-3	6.155E+2	5.862E+0	6.559E+2	-1.066E+0	-1.062E+0	-1.070E+0	5.106E-1
5	308	1.000E-4	-5.934E+18	-5.934E+13	1.636E-3	6.113E+2	5.785E+0	6.431E+2	-1.052E+0	-1.050E+0	-1.054E+0	5.079E-1
6	310	1.000E-4	-6.020E+18	-6.020E+13	1.646E-3	6.077E+2	5.703E+0	6.301E+2	-1.037E+0	-1.039E+0	-1.035E+0	5.087E-1

< Pic# 14. "RESULT DATA" >

In Pic# 14. "RESULT DATA", it shows Temp and Current as well as RESULT values in Pic# 13.

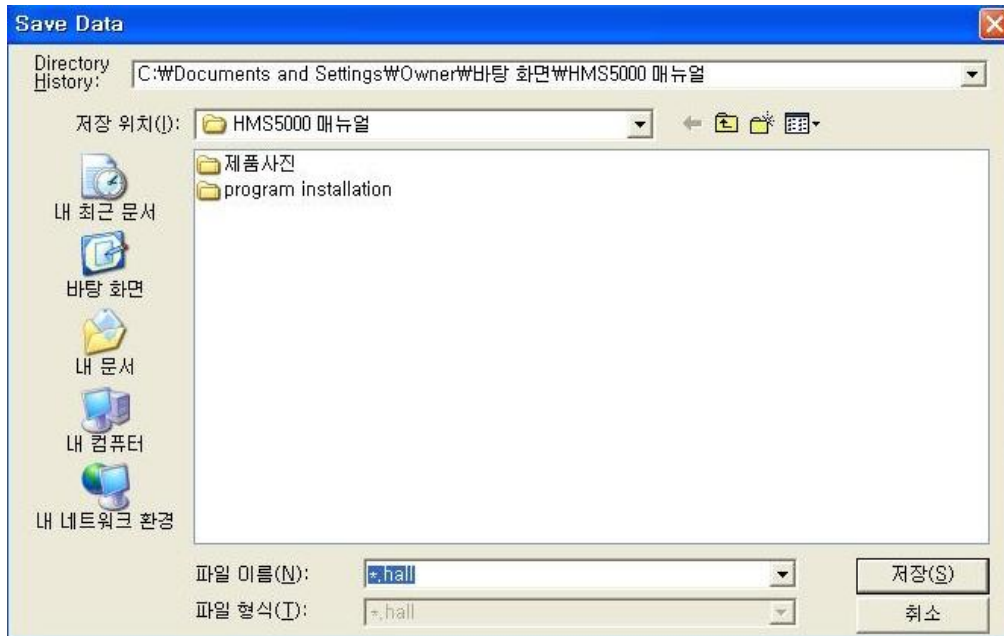
(6) SAVE the measured data.

If you finished all test process, click "SAVE" button below.



< Pic# 15. menu bar in the first main page >

It can save data as below.



< Pic# 16. save data window >

And, saved data can be transformed to excel file by opening saved data file(~ .hall) in excel file.

(7) LOAD menu.

If you like to see existingly saved data in the first test page, click “LOAD” menu in Pic# 15.

(8) CALCUL menu.

If you made a mistake to fill incorrect D (doped sample thickness layer), or incorrect B(Magneto flux density), you don't have to re-measure again.

Please just fill actually correct D or B in input value, and then click “CALCUL” button. If so, system calculate it automatically.

2) The second page

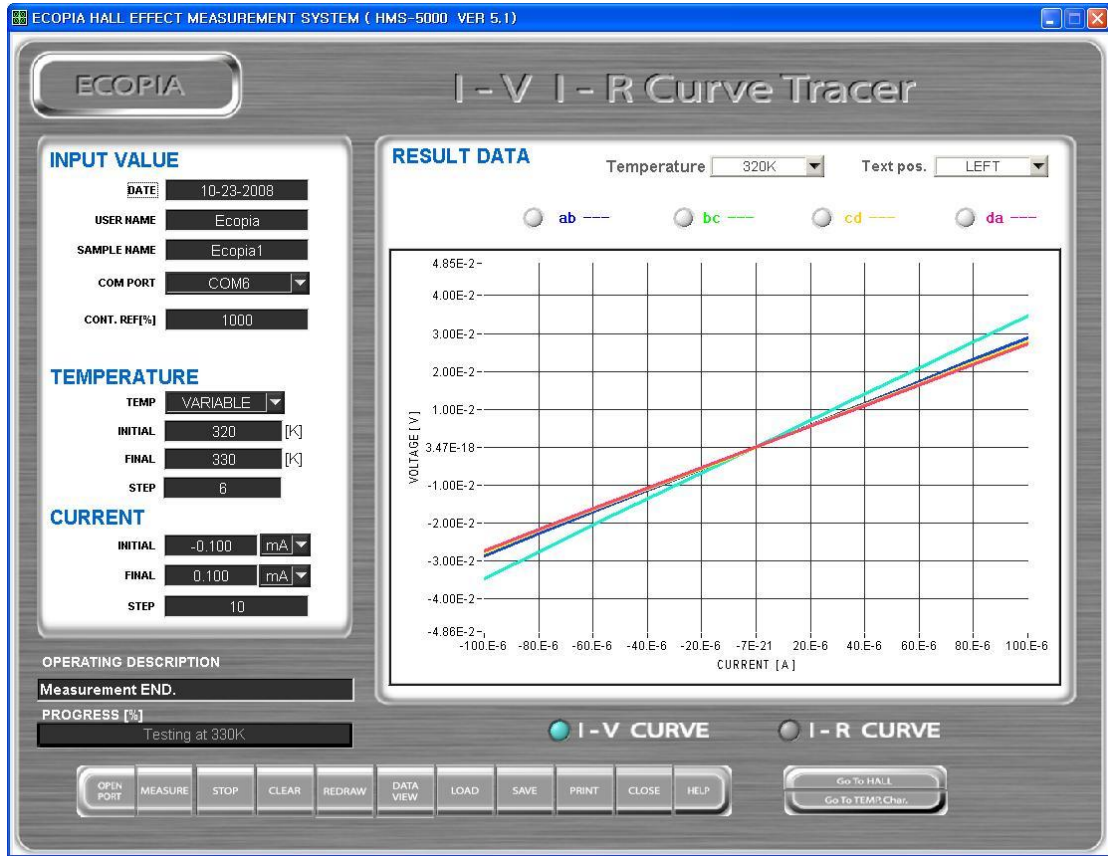
(I/V, I/R measurement and graph plotting)

If you like to see I/V, I/R plotting graph, click “Go To I/V CURVE” as below.





< Pic# 1. Click “Go To I/V CURVE” >



< Pic#2. I/V, I/R Curve Tracer page >

**INPUT VALUE**

DATE: 10-23-2008

USER NAME: Ecopia

SAMPLE NAME: Ecopia1

COM PORT: COM6

CONT. REF[%]: 1000

**TEMPERATURE**

TEMP: VARIABLE

INITIAL: 320 [K]

FINAL: 330 [K]

STEP: 6

**CURRENT**

INITIAL: -0.100 mA

FINAL: 0.100 mA

STEP: 10

< Pic# 3. Input value of I/V, I/R page >

“CON.REF(%)” is percentage of the ratio between horizontal and vertical resistance values. If vertical resistance is 10ohm and horizontal resistance 20ohm, “CON.REF(%)” is 200%.

Limit is 1000%, and if actual tested percentage is higher than 1000%, the system says “contact fail” in “ OPERATING DESCRIPTION”.

“STEP” in current above also can be set up as mentioned in “STEP” of temperature.

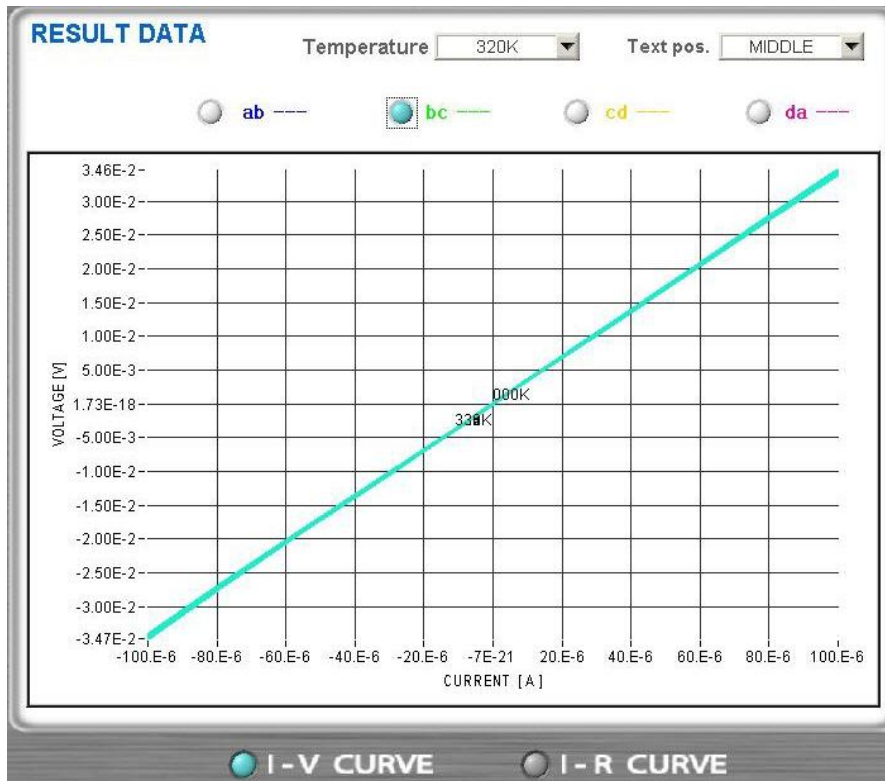


< Pic#4, menu button in I/V, I/R curve tracer page >

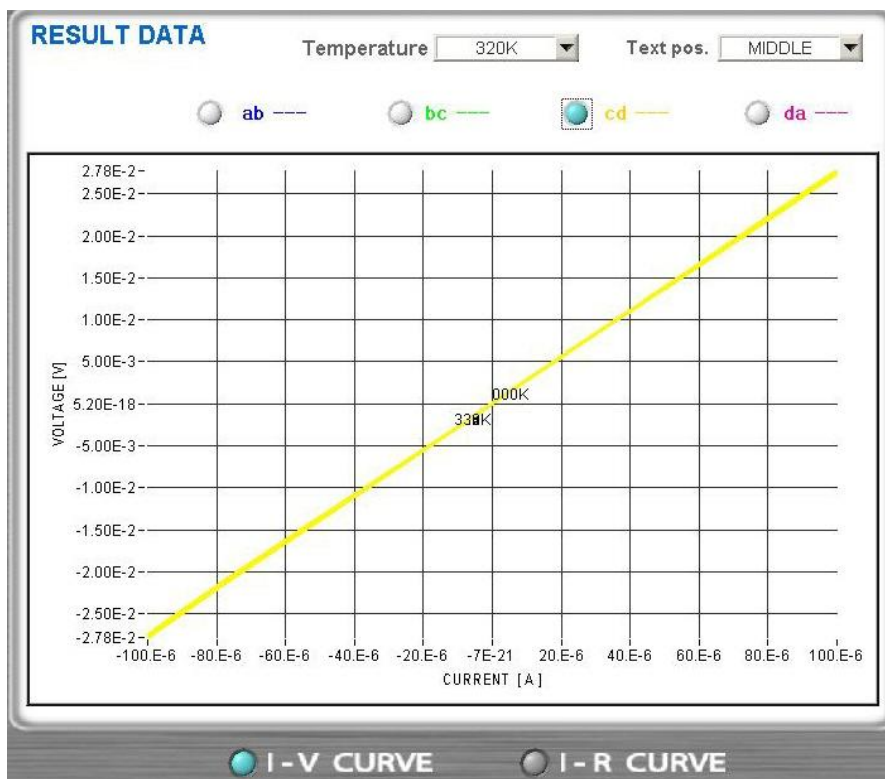
Click “MEASURE” button if you filled all in input value, temperature range and current in I/V, I/R page.

Or, if you just like to see measured data in the first main page, click “I-V curve” and click “ab ---“. You can see each a to b plotting graph in variable temp.

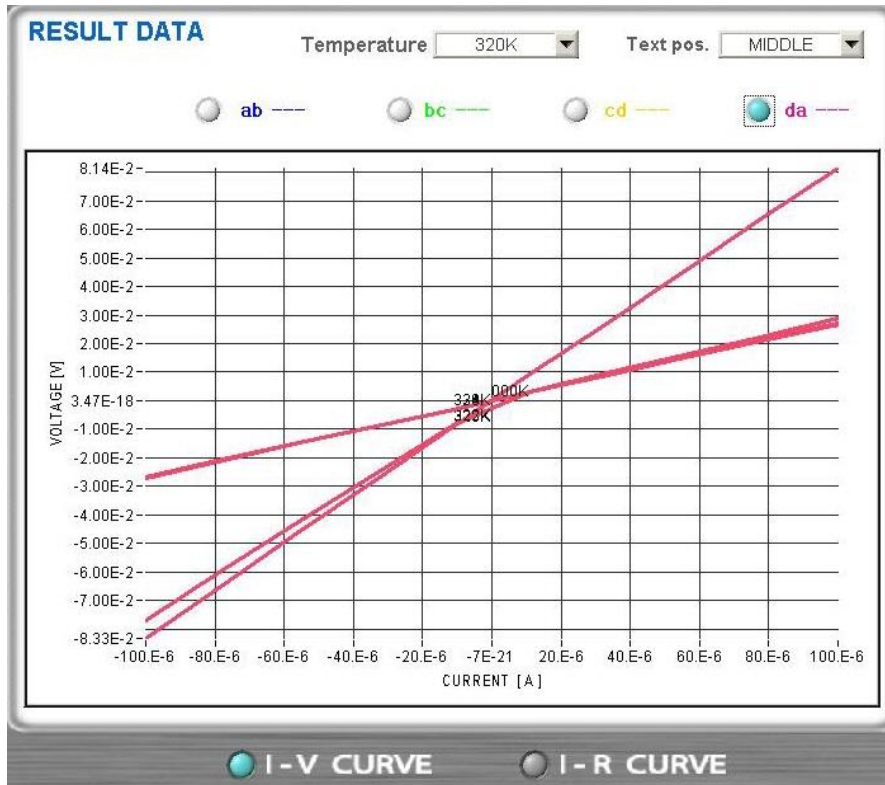




< Pic#6. b to c plotting graph in variable temperature >



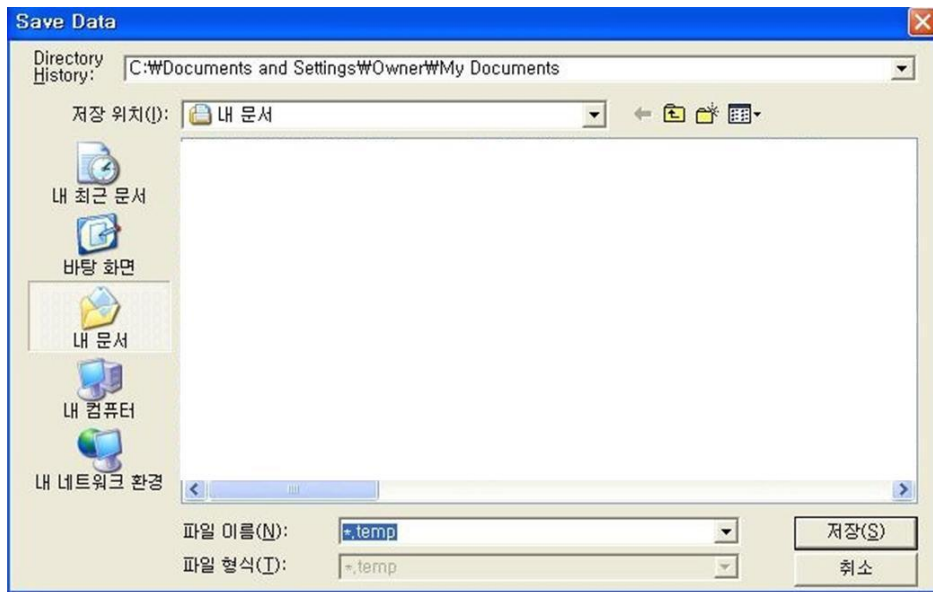
< Pic#7 c to d plotting graph in variable temperature >



< Pic#8. d to a plotting graph in variable temperature >

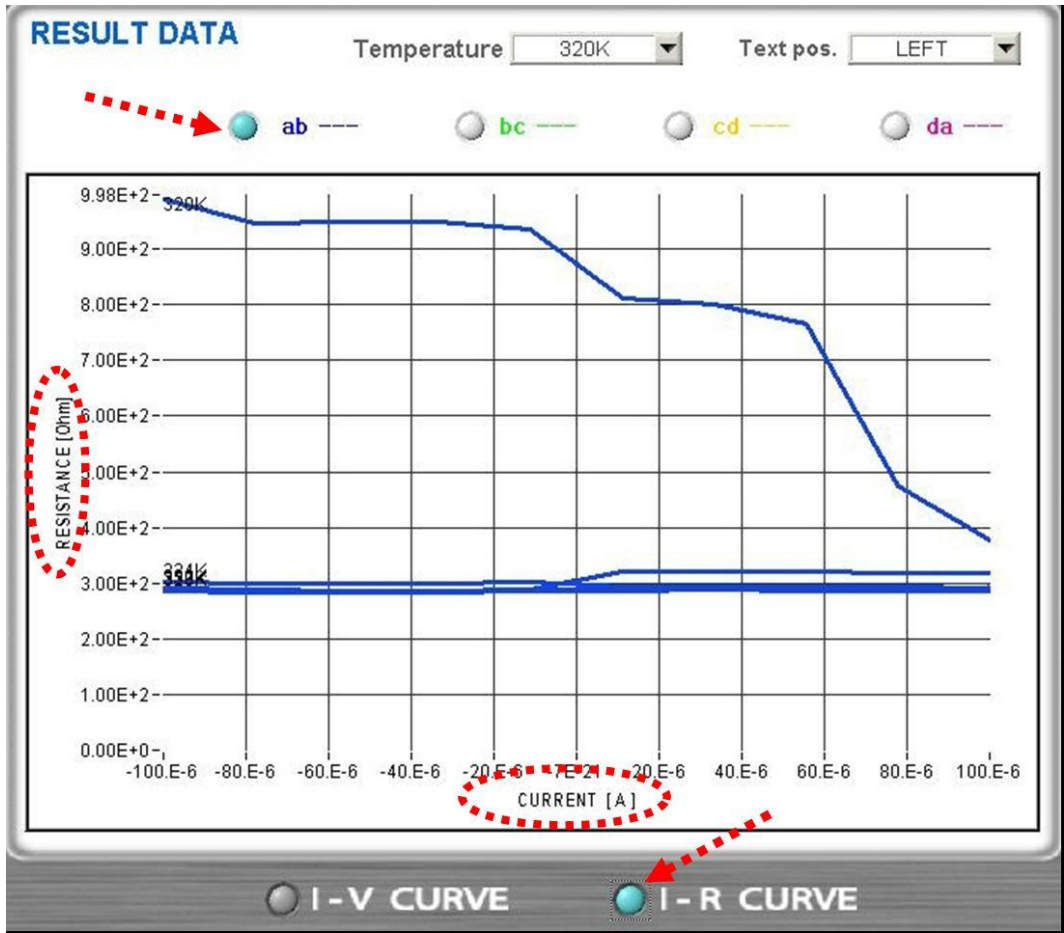
If you like to save the data, click “SAVE” menu button.

And, it saves in “~.temp”. Extension name must be “.temp”.



< Pic#9. I/V. I/R save data window >





< Pic# 10. I/R plotting graph in variable temperature >

And, you also can see I/R plotting graph of “a to b”, “b to c”, “c to d” and “d to a” in variable temperature by just clicking “ab”, “bc”, “cd”, “da” in above pictures.

And, if you’d like to save I/R tested data, click “SAVE” menu bar. It can save as below image.

1	DATE	USER_NAME	SAMPLE_NAME	DELAY_TIME	CONT_REF	TEMP_INITIAL	TEMP_FINAL	TEMP_STEP	I_INITIAL	I_FINAL	I_STEP
2	10-18-2008	Ecopia	Ecopia1	1.00E-01	1000	326	330	3	-1.00E-03	1.00E-03	5
3											
4	NO	TEMP	I	Vab	Vbc	Vcd	Vda	Rab	Rbc	Rcb	Rda
5	1	326	-1.00E-03	-1.24E+00	-9.94E-01	-1.25E+00	-1.11E+00	1.24E+03	9.94E+02	1.25E+03	1.11E+03
6	2	326	-5.00E-04	-6.20E-01	-4.97E-01	-6.24E-01	-5.58E-01	1.24E+03	9.95E+02	1.25E+03	1.12E+03
7	3	326	0.00E+00	-4.72E-05	-3.72E-05	-2.09E-05	-2.70E-05	1.24E+03	9.95E+02	1.25E+03	1.12E+03
8	4	326	5.00E-04	6.16E-01	4.94E-01	6.19E-01	5.55E-01	1.23E+03	9.87E+02	1.24E+03	1.11E+03
9	5	326	1.00E-03	1.25E+00	1.00E+00	1.25E+00	1.13E+00	1.25E+03	1.00E+03	1.25E+03	1.13E+03
10	6	328	-1.00E-03	-1.24E+00	-9.90E-01	-1.24E+00	-1.11E+00	1.24E+03	9.90E+02	1.24E+03	1.11E+03
11	7	328	-5.00E-04	-6.18E-01	-4.95E-01	-6.21E-01	-5.55E-01	1.24E+03	9.91E+02	1.24E+03	1.11E+03
12	8	328	0.00E+00	-1.24E-04	-4.54E-05	5.56E-06	-2.00E-05	1.24E+03	9.91E+02	1.24E+03	1.11E+03
13	9	328	5.00E-04	6.14E-01	4.92E-01	6.16E-01	5.52E-01	1.23E+03	9.83E+02	1.23E+03	1.10E+03
14	10	328	1.00E-03	1.25E+00	9.98E-01	1.25E+00	1.12E+00	1.25E+03	9.98E+02	1.25E+03	1.12E+03
15	11	330	-1.00E-03	-1.23E+00	-9.85E-01	-1.24E+00	-1.10E+00	1.23E+03	9.85E+02	1.24E+03	1.10E+03
16	12	330	-5.00E-04	-6.15E-01	-4.93E-01	-6.18E-01	-5.52E-01	1.23E+03	9.86E+02	1.24E+03	1.11E+03
17	13	330	0.00E+00	-1.09E-04	-4.22E-05	1.69E-07	-1.25E-05	1.23E+03	9.86E+02	1.24E+03	1.11E+03
18	14	330	5.00E-04	6.12E-01	4.89E-01	6.13E-01	5.50E-01	1.22E+03	9.79E+02	1.23E+03	1.10E+03
19	15	330	1.00E-03	1.24E+00	9.93E-01	1.24E+00	1.11E+00	1.24E+03	9.93E+02	1.24E+03	1.11E+03
20											
21											

< Pic# 11. I/V, I/R saved data in excel >

Click “DATA VIEW” menu. You can see all tested data in I/V, I/R page in text file.

I-V DATA VIEW												
DATE	User Name	Sample Name	Initial Temp.	Final Temp.	Temp Step	Initial Current	Final Current	Current Step				
10-23-2008	Ecopia	Ecopia1	320K	330K	006	1.000E-04	1.000E-04	010				
No.	Temperature	Current	Vab	Vbc	Vcd	Vda	Rab	Rbc	Rcd	Rda		
001	320K	-9.999E-05	9.886E-02	3.418E-02	2.747E-02	8.333E-02	9.886E+02	3.418E+02	2.747E+02	8.333E+02		
002	320K	-7.778E-05	7.367E-02	2.632E-02	2.115E-02	6.453E-02	9.472E+02	3.383E+02	2.719E+02	8.296E+02		
003	320K	-5.556E-05	5.276E-02	1.877E-02	1.508E-02	4.596E-02	9.496E+02	3.378E+02	2.714E+02	8.273E+02		
004	320K	-3.333E-05	3.167E-02	1.122E-02	9.005E-03	2.757E-02	9.500E+02	3.367E+02	2.701E+02	8.270E+02		
005	320K	-1.111E-05	1.041E-02	3.769E-03	3.042E-03	9.138E-03	9.367E+02	3.392E+02	2.737E+02	8.225E+02		
006	320K	+1.111E-05	9.031E-03	3.818E-03	3.056E-03	9.156E-03	8.128E+02	3.436E+02	2.751E+02	8.240E+02		
007	320K	+3.333E-05	2.671E-02	1.148E-02	9.235E-03	2.732E-02	8.012E+02	3.445E+02	2.770E+02	8.195E+02		
008	320K	+5.556E-05	4.255E-02	1.904E-02	1.531E-02	4.540E-02	7.659E+02	3.427E+02	2.755E+02	8.173E+02		
009	320K	+7.778E-05	3.693E-02	2.600E-02	2.138E-02	6.349E-02	4.748E+02	3.420E+02	2.749E+02	8.163E+02		
010	320K	+9.999E-05	3.777E-02	3.415E-02	2.745E-02	8.144E-02	3.777E+02	3.415E+02	2.745E+02	8.144E+02		
011	322K	-9.999E-05	2.900E-02	3.429E-02	2.754E-02	7.701E-02	2.900E+02	3.429E+02	2.754E+02	7.701E+02		
012	322K	-7.778E-05	2.235E-02	2.640E-02	2.120E-02	5.939E-02	2.873E+02	3.394E+02	2.726E+02	7.636E+02		
013	322K	-5.556E-05	1.592E-02	1.883E-02	1.512E-02	4.237E-02	2.865E+02	3.389E+02	2.721E+02	7.627E+02		
014	322K	-3.333E-05	9.512E-03	1.127E-02	9.040E-03	2.538E-02	2.854E+02	3.380E+02	2.712E+02	7.614E+02		
015	322K	-1.111E-05	3.208E-03	3.769E-03	3.057E-03	8.527E-03	2.887E+02	3.409E+02	2.751E+02	7.674E+02		
016	322K	+1.111E-05	3.560E-03	3.815E-03	3.063E-03	3.187E-03	3.204E+02	3.433E+02	2.757E+02	7.674E+02		
017	322K	+3.333E-05	1.072E-02	1.150E-02	9.250E-03	9.648E-03	3.215E+02	3.448E+02	2.775E+02	7.674E+02		
018	322K	+5.556E-05	1.778E-02	1.907E-02	1.534E-02	1.600E-02	3.200E+02	3.433E+02	2.760E+02	7.674E+02		
019	322K	+7.778E-05	2.484E-02	2.665E-02	2.141E-02	2.234E-02	3.193E+02	3.426E+02	2.753E+02	7.674E+02		
020	322K	+9.999E-05	3.190E-02	3.422E-02	2.747E-02	2.669E-02	3.190E+02	3.422E+02	2.747E+02	2.669E+02		
021	324K	-9.999E-05	3.032E-02	3.438E-02	2.761E-02	2.688E-02	3.032E+02	3.438E+02	2.761E+02	2.688E+02		
022	324K	-7.778E-05	2.333E-02	2.646E-02	2.125E-02	2.069E-02	3.000E+02	3.402E+02	2.732E+02	2.661E+02		
023	324K	-5.556E-05	1.664E-02	1.888E-02	1.516E-02	1.475E-02	2.995E+02	3.398E+02	2.728E+02	2.656E+02		
024	324K	-3.333E-05	9.943E-03	1.130E-02	9.058E-03	8.905E-03	2.983E+02	3.389E+02	2.717E+02	2.672E+02		
025	324K	-1.111E-05	3.344E-03	3.794E-03	3.061E-03	2.974E-03	3.009E+02	3.414E+02	2.755E+02	2.676E+02		
026	324K	+1.111E-05	3.263E-03	3.824E-03	3.065E-03	2.979E-03	2.936E+02	3.441E+02	2.758E+02	2.681E+02		

< Pic# 12. DATA VIEW window >

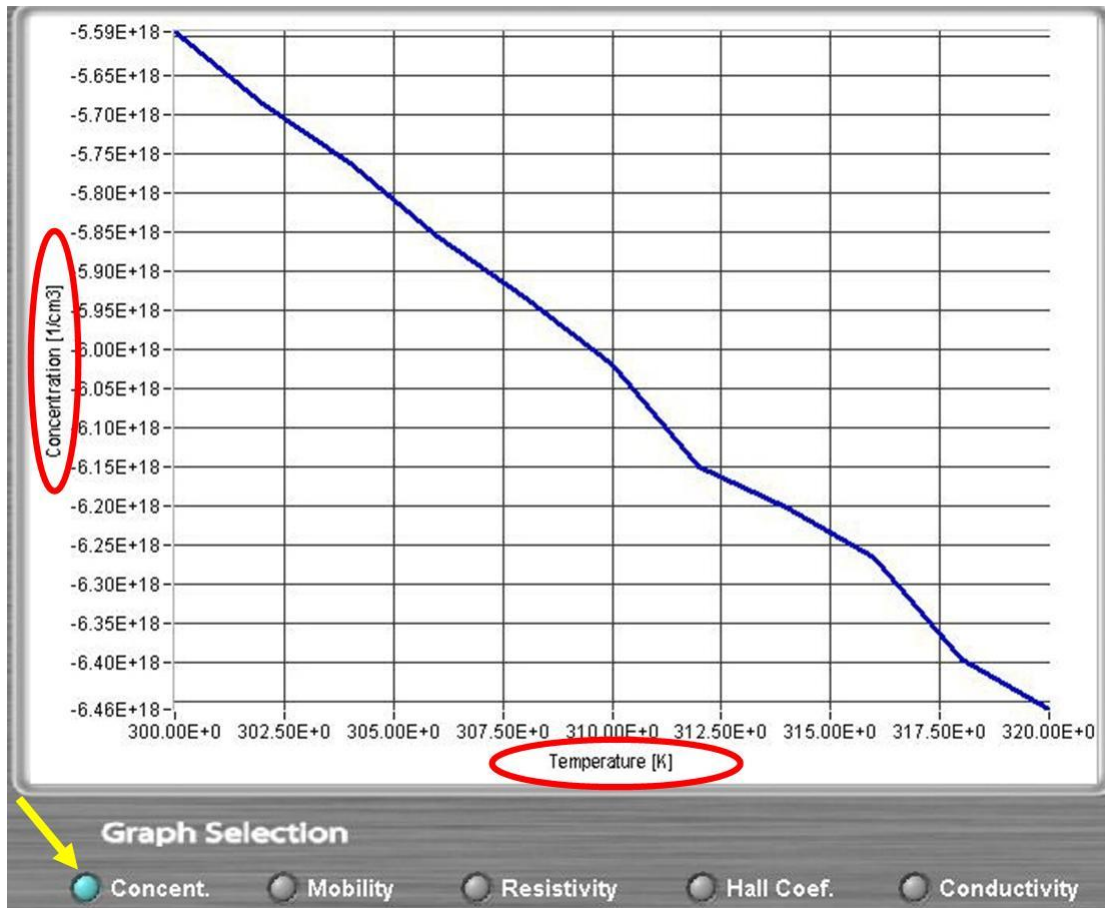
### 3) The third page

( Graph plotting of temp versus carrier concentration, mobility, resistivity, conductivity, hall coefficient )

If you finished test in the first main page, click “Go To TEMP Chart” as below.

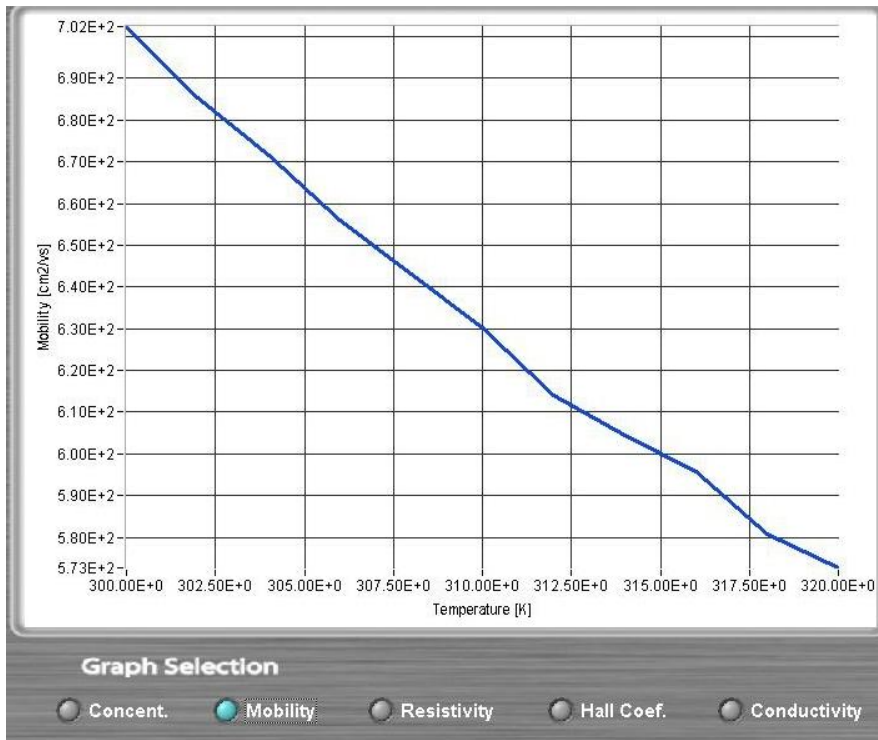


< Pic#1. click “Go To TEMP Chart” menu button >

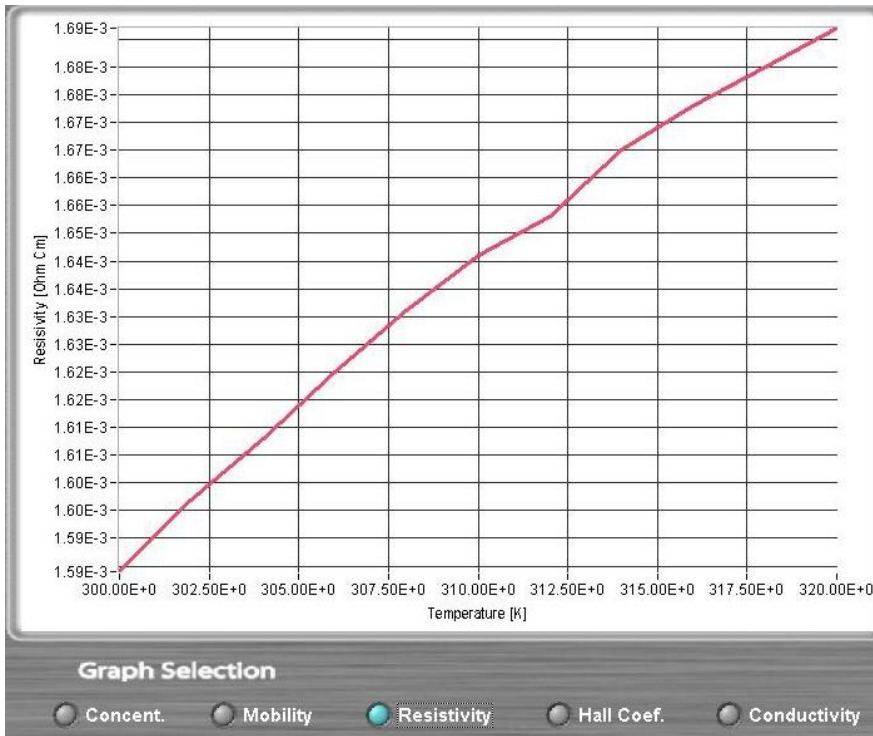


< Pic# 2. Temperature versus Carrier concentration graph >

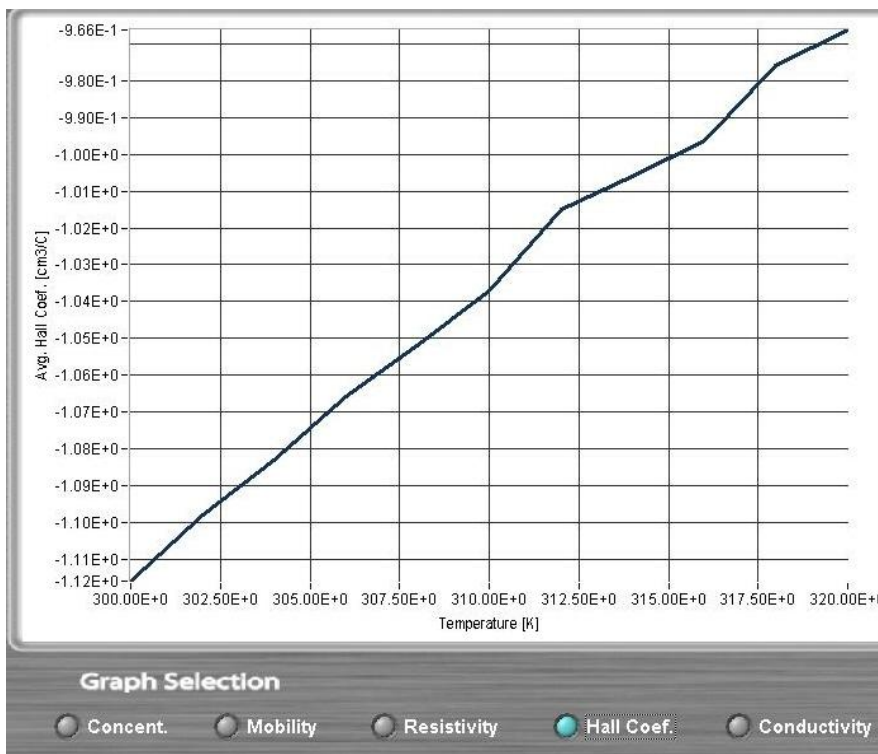
Click “Concentration” button in Pic#2 and graph plot as above.



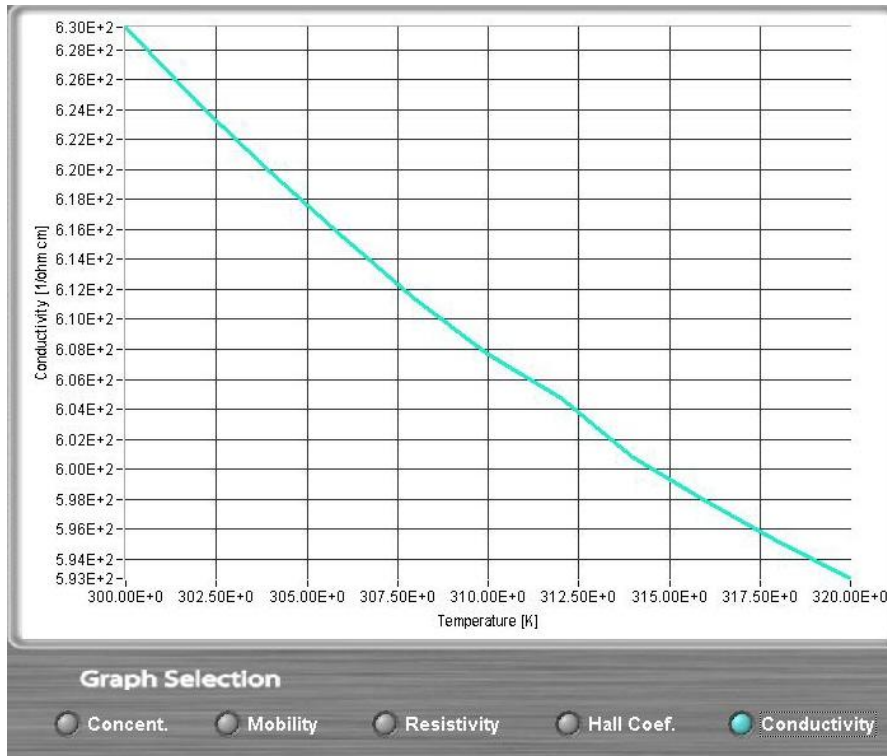
< Pic# 3. Temperature versus mobility graph >



< Pic# 4. Temperature versus Resistivity graph >



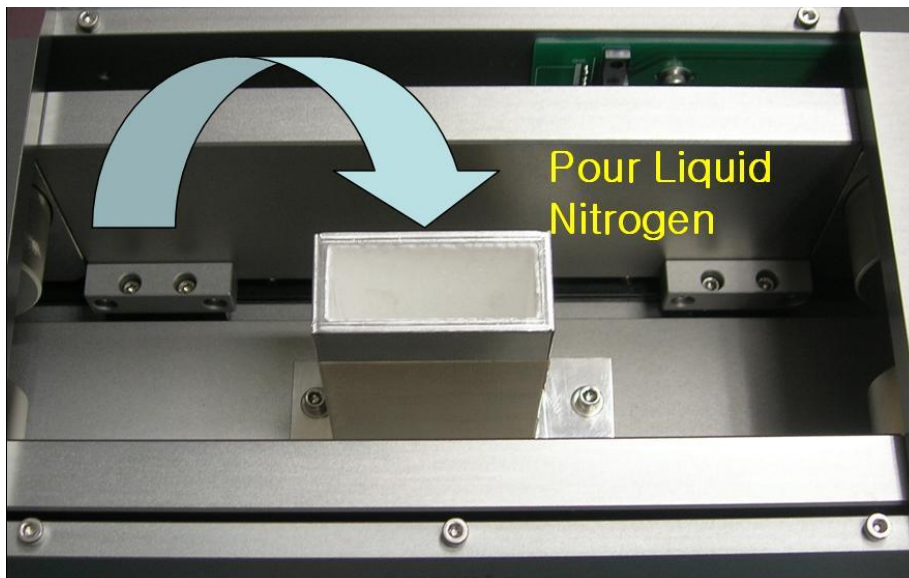
< Pic# 5. Temperature versus Hall Coefficient graph >



< Pic# 6. Temperature versus conductivity graph >

#### 4) Test in Low temperature by using Liquid Nitrogen (important)

(1) Pour Liquid Nitrogen fully into square LN2 tank

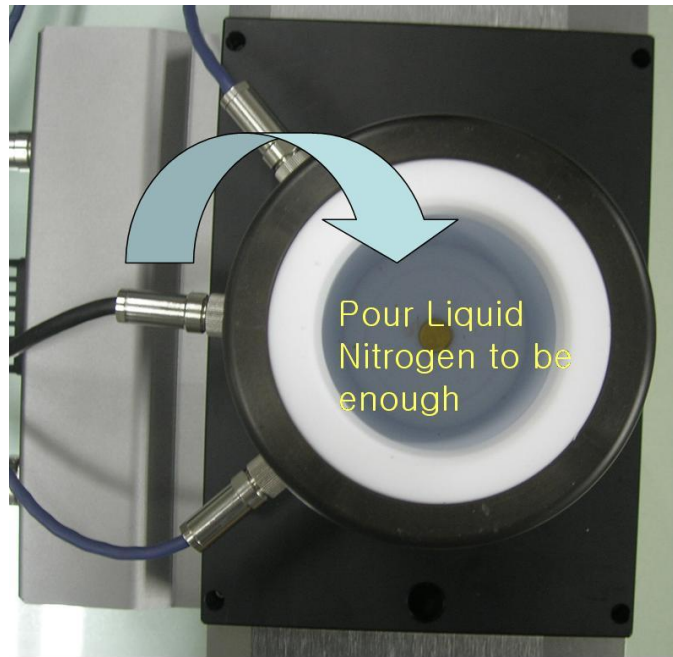


< Pic# 1. Pour Liquid Nitrogen >

(2) Close magnet lid integrated with LN2 tank and sample board.

(3) Pour Liquid Nitrogen to be enough and close LN2 tank lid





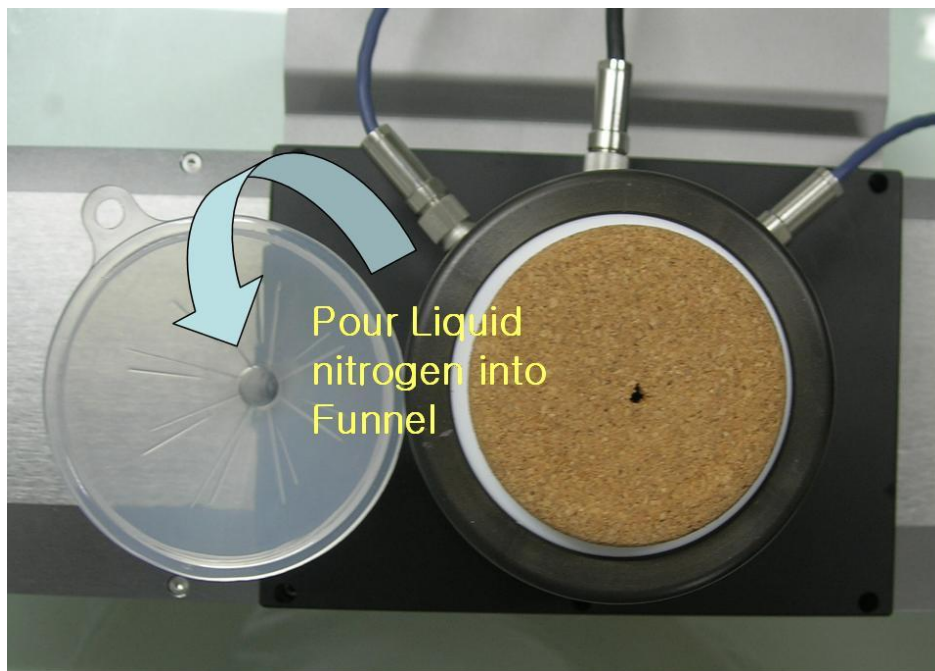
< Pic#2. Pour Liquid Nitrogen into round LN2 tank >

(4) Click “COM PORT” before starting to measure.

In the first measurement page of s/w, click “COM PORT”. If it shows “connection success”, the system is trying to read currently temperature and it indicates currently temperature in “Progress(%)”,

You can see temperature goes down step by step in “Progress(%)”.

(5) Pour Liquid Nitrogen into Funnel.



< Pic# 3. Pour Liquid nitrogen into Funnel >



If you like to measure at very low temperature, for example, from 80K or 90K temperature, you have to pour about 100ml Liquid Nitrogen into funnel at one time. And, you will have to repeatedly pour more than 2 to 3 times at one or two minutes interval.

It flows down into square LN2 tank which is centered on both round magnet.

This process is not only to reach to low goal temperature but also to keep not-dewy status in square LN2 tank.

And, these process of pouring LN2 is always substantially needed to measure at lower temperature than room temperature.

**(6) Start to measure.**

If temperature of sample reach to goal , by above LN2 pouring process, click “MEASURE” button. It starts to measure sample at variable temperature.

**(7) Tip (Important)**

i) Liquid Nitrogen may be dangerous if it is contacted to skin or clothes. So, please pay more attention to this during test.

ii) When you try to change sample to measure another sample, you have to dry the sample board and sample. To do that, do not try to take out the sample board with magnet lid from square type LN2 tank.

It will make the sample board with sample be dewy if taking it out of square LN2 tank. Without taking out sample board with sample, just set up **330K in initial and 330K in final** and **set up 3 step** and **measure it**. If so, the system will raise the temperature and measure at 330K in three times for 1~3 minutes. After this test, you can see sample board with sample be dried.

**For Further Information, please contact:**

**Bridge Technology**  
**PO Box 9275**  
**Chandler Heights, AZ 85227**  
**Tel: 480-988-2256**  
**Cell: 480-242-6703**  
**Fax: 480-452-0172**  
**Email: [sales@bridgetec.com](mailto:sales@bridgetec.com)**  
**Web: [www.bridgetec.com](http://www.bridgetec.com)**

The AMP55T "GUIDE" is standard on HMS-5000-AMP55T Series Systems shipped after May 2013.

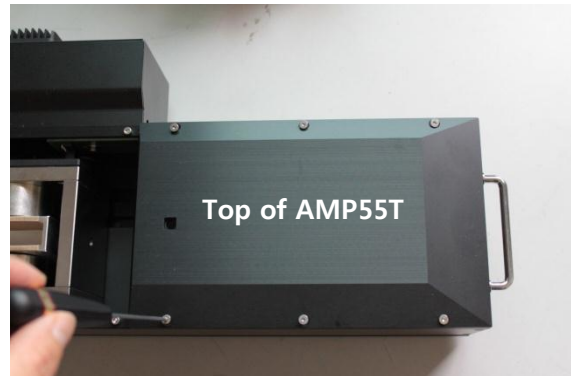
## AMP55T Guide Installation.



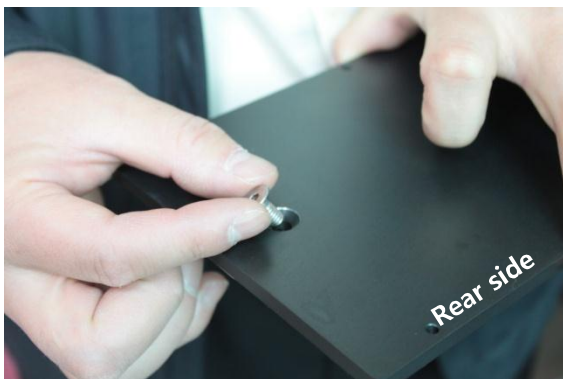
<Picture #1 Tools>

1. Prepare tools  
: 2 Guide poles, 2 Guide head screws,  
2 Long screws, 2 short screws,  
2mm wrench, 4mm wrench

2. Loosen a whole screw around the top of AMP55T.  
6 screws on each side(left and right).  
Then you can separate lid from AMP55T.



<Picture #2 AMP55T>



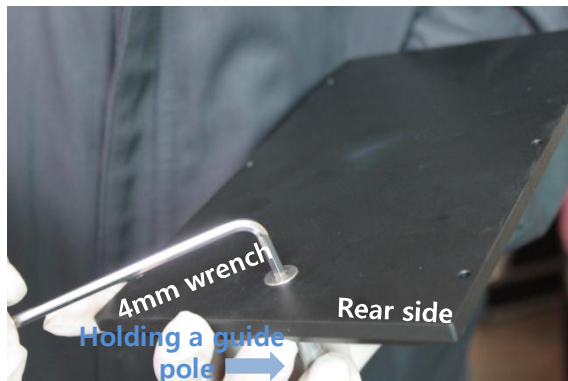
<Picture #3 AMP55T lid>

3. Put a short screw in the hole at the rear side of AMP55T lid.

4. Match a guide into a hole at the front side of AMP55T lid while you are holding a short screw with your finger at the rear side. Make sure that upper side of guide has to fold back and forth.



<Picture #4 AMP55T lid>

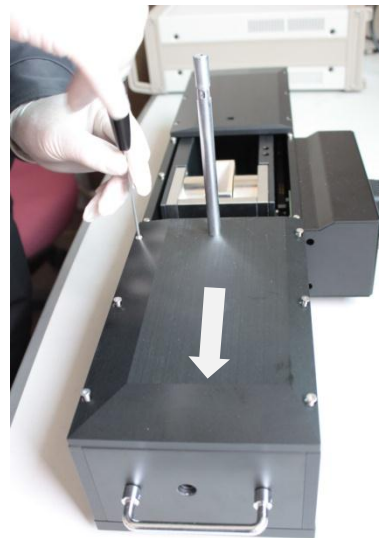


<Picture #5 AMP55T lid>

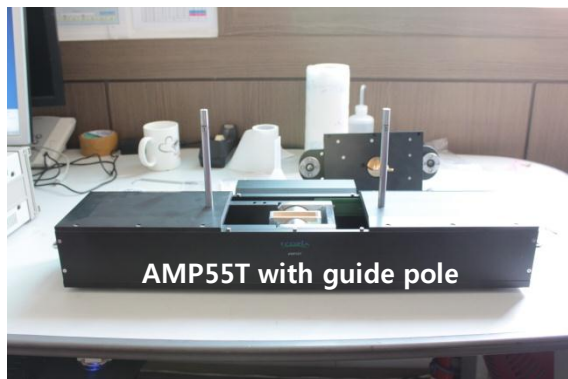
5. Tighten a short screw strongly to fix the guide pole with 4mm wrench while you are holding a guide pole with your hand.

6. Put a lid onto AMP55T and tighten 6 screws.

\* Push a lid to the outside as the Picture #6 when you are tightening screws.  
Then SH80350K will be fitted well.



<Picture #6 Put theAMP55T lid>



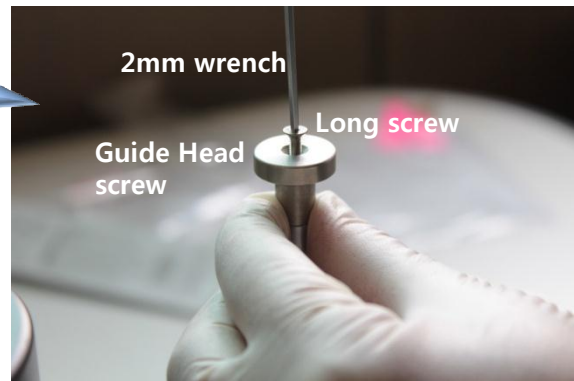
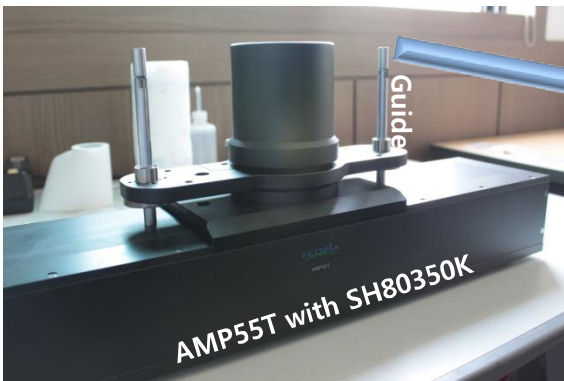
<Picture #7 AMP55T with guide>

7. Repeat No.2~6 on the opposite side of AMP55T.  
Make AMP55T as Picture#7.

8. Insert two guides pole into the hole at the SH80350K.  
Put down SH80350K slowly and match it with AMP55T.

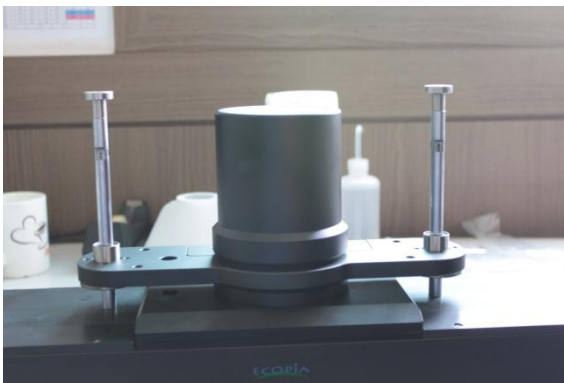


<Picture #8 Put down SH80350K>



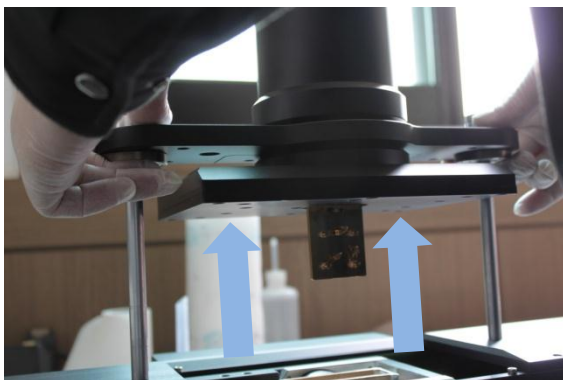
<Picture #9 Put both Guide head screw on the guide.>

9. Now you can see AMP55T and SH80350K is fitted well. Then put guide head screw on the guide and tighten a long screw with 2mm wrench.

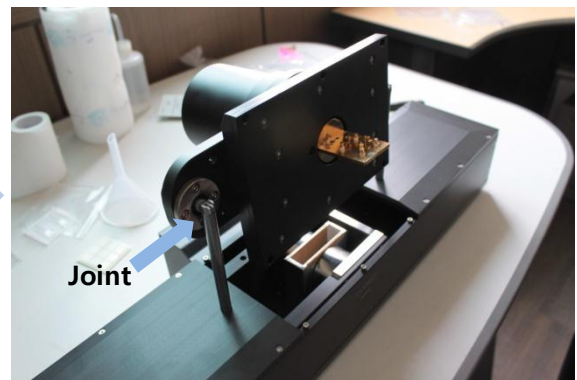


<Picture #10 Both guides installed well>

10. Both guides are installed well at the AMP55T. It will be very helpful to lift up SH80350K



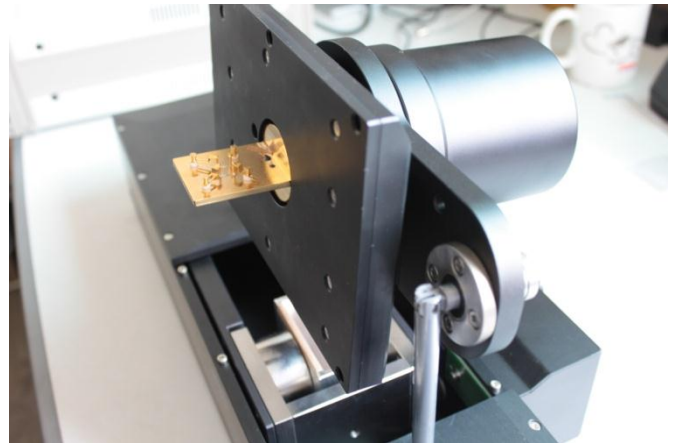
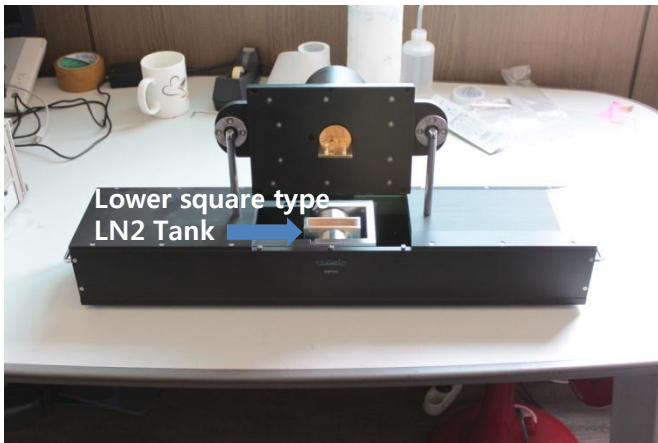
<Picture #11 Lift up SH80350K.>



<Picture #11-1 Folded SH80350K.>

11. Grab a handle to lift up SH80350K as Pic# 11. When you reach at the end of guide, give a little force to lift a joint and push SH80350K then it will be folded as Pic#11-1.





<Picture #12 Lifted up SH80350K.>



<Picture #13 AMP55T and SH80350K with Guide.>

※ Advantage of using Guide.

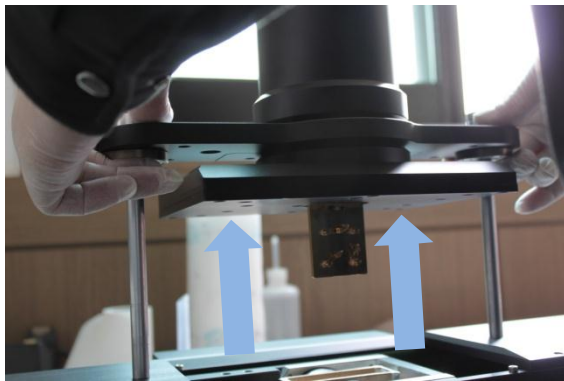
1. It is much easier and safer to contact a sample.
2. It is much easier to put sample board inside lower square type LN2 Tank.
3. You can protect sample board and clip from any clash when you put down SH80350K into lower square type LN2 Tank.
4. You don't have to put SH80350K on the desk, you can just keep it as Pic#12 so cables at the rear side never folded.

# Exchange SH80350K to RTSK-5000



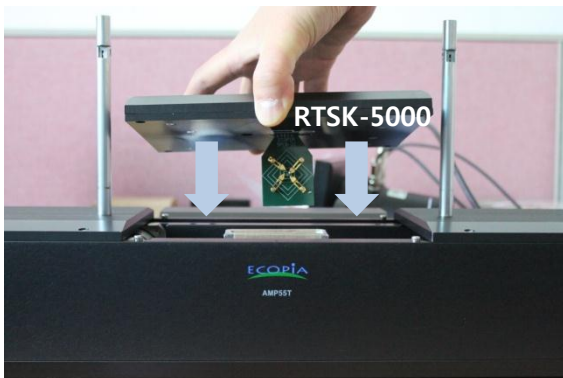
<Picture #1 Remove a Guide head screw>

1. Firstly, you have to Loosen a screw at the top of the guide.



<Picture #2 Remove SH80350K>

2. Lift up and remove the SH80350K and keep it in safety.



<Picture #3 Put down RTSK-5000>



3. Put down RTSK-5000 with your SPCB slowly into AMP55T.