

# User's Manual **Model DX-180**

## Digital Gaussmeter

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## CHAPTER 1 INTRODUCTION

### 1.0 GENERAL

This chapter provides an introduction to the Dexing Model 180 Gauss/Tesla meter. The Model DX-180 was designed and manufactured in Beijing of China by Dexing Magnet Tech.Co.,Ltd. The Model DX-180 is an extremely highly accurate and high resolution intellectualized gaussmeter well suited for field work. It features:

- Resolution to  $5\frac{3}{4}$  Digits VGA

- Accuracy of direct current measurement: readings \*  $\pm 0.30\%$  range\*  $\pm 0.50\%$  (for DC)

- A maximum / minimum value/ peak values/ gorge value hold / screen locked

- Basic resolution: 0.00001mT

- Data storage (Auto / Manual) / stored data read

- Auto-zero, automatic, manual selecting range

- Probe auto calibration/ auto memory operation mode

- RS232 Serial Interface/ data communication/ BNCInterface

- Display unit can be gauss, tesla, A/M or Oe

- Zero setting, Relative measurement mode

- Measurement graphical display, Local self-mapping, Communication baud rate adjustable

- Threshold settings and alarm

- Date, time, temperature Settings/ brightness display

- Dozens of basic Optional Probe or custom probe (Standard 0.78mm ultra-thin consistency probe)

If you have just received your new Model 180, please proceed to Chapter 2 and become familiar with the installation instructions. Complete and detailed instrument and probe operational information is contained in Chapter 3. Chapter 4 contains details on remote operation using the Serial Interface. Details on accessories and probes are provided in Chapter 5. Optional parts are contained in Chapter 6. maintenance is contained in Chapter 7. Appendix A is a glossary of terminology. Appendix B provides units for magnetic properties.

It is welcome to annotate this manual. Though we have done our best to maintain the correctness of the manual, there is a possibility to have errors. When you report a specifically error, please give out a brief description dedicate the Chapter, illustration, table, Paragraph. We will appreciate that you send this annotation to Dexing Magnet Tech.Co.,Ltd.



Figure 1-1 DX-180 Glass/Tesla meter Front Panel

## 1.1 PRODUCT DESCRIPTION

The Fully Digital Model 180 Gauss/Tesla meter is well suited to meet these requirements with extremely high accuracy and very high resolution in the magnetic testing application. It integrates varieties of the latest high-tech digital technology, with Measuring range from DC to the AC magnetic field 2.5KHZ. it can auto zero, and auto range. Hold Mode is selectable from maximum value, minimum value, and peak and valley values. Instrument can simultaneously measure and display six kinds of parameters. Units of measure is selectable from Gauss, Tesla, A / M or Oe. The Gauss Meter takes with RS-232C interface and it is standard designed and produced in accordance with ISO-9000. Bright VGA color graphics, excellent self-mapping function, full menu operation, 5 3/4-bit readings, high-resolution of 1 / 600000 make your measurements in high magnetic fields aware of 0.0001mT weak outlook changes. The gauss meter gets the largest range of 100KG (10T) and has large-capacity data storage and storage-data storage reading and querying in time-sequence. Professional graphics software can draw the chart, according to the magnetic field strength. The Gauss Meter equipped with Optional remote control systems. Our products are mainly sold in institutes of measurement, research institutes, universities and research departments of major companies

### ***High accuracy, high resolution***

combined with high accuracy digital instrument and high accuracy digital hall probe, DX-180 Gaussmeter makes its accuracy up to  $\pm 0.05\% \pm 0.005\%$ , basic resolution to 0.00001mT, and then it comes up to the top level of the field measuring world.

### ***High Intelligence, multifunction***

DX-180 Gaussmeter has multifunctions such as measuring the direct current and AC Magnetic Field, max /min / peak/valley values hold on / locking layout, and data Storage (manual /automatic) / data reading, Excellent graphics and self-test pattern display function, probe autocorrection, automatic memorize the operation mode. AUTO-ZERO, automatic / manual adjust range, threshold setting and alarm-reporting. Show temperature and time and brightness self-setting, Display Unit Optional: Gauss/Tesla, A/M or Oe.

### ***Automation***

The DX-180 has a variety of interface features that are compatible with automated test configurations. The RS-232C Serial Interface can perform nearly every function of the instrument front panel. Two analog voltages and an alarm relay facilitate automation without a computer. At the same time, DX-180's monitoring analog output cases to provide supplementary automation capabilities and an optional remote control system without the use of PC.

### ***Conformity***

The DX-180 has strong stability and conformity. The conformity can reach 0.1% (stable magnetic field).

### ***Probe***

The DX-180 is delivered with Dexing all serial one-dimensional transverse and Axial probe. Probes are factory calibrated for accuracy and interchangeability. Calibration data is loaded into a PROM located in the probe connector so that it does not have to be entered by the user.

## **1.2 SPECIFICATIONS**

### **1.2.1 General Measurement**

Number of Input: 1

Update Rate: 3 readings per second on display; up to 18 readings with serial interface

Probe Compatibility: Dexing serial probes,

Probe Features: Linearity Correction, Auto Probe Zero

Connector: 15 pin D style

### **1.2.2 DC Measurement**

DC Accuracy:  $\pm 0.05\%$  of reading  $\pm 0.005\%$  of range

DC Range: 0-30T (300kG)

DC Temp. Coefficient:  $\pm 0.01\%$  of reading / $^{\circ}\text{C}$

DC measurement Resolution: 0.0001G (0.00001mT)

### 1.2.3 AC Measurement

DC Accuracy:  $\pm 1\%$  of reading  $\pm 0.5\%$  of range  
 Frequency range: 2Hz-100 kHz  
 DC Range: 0-3T (30kG)  
 DC Temp. Coefficient:  $\pm 0.03\%$  of reading / $^{\circ}\text{C}$   
 DC measurement Resolution: 0.01G (0.001mT)

CAUTION: Measuring In the great or Minimal-scale needs replace probe!! !

### 1.2.4 Front Panel

Display Type: 320 \* 240 Color LCD Screen  
 Display Units: Gauss (G), Tesla (T)  
 Oerster (Oe), Meter/Amps(M/A)  
 Keypad: 14 key membrane  
 Front Panel Features: Intuitive operation, display prompts



Figure 1-2 line 5,6 displays the peak Readings

### 1.2.5 Interfaces functions

RS-232C Capabilities:  
 Baud: 19200, 57600, 115200  
 Connector: 9 pin D style (DB), DCE configuration (direct connected to PC)  
 Monitoring Analog Output (BNC):  
 The output stage: real-time analog voltage output  
 Output range:  $\pm 3\text{V}$   
 Output ratio:  $\pm 3\text{V}$  corresponding to  $\pm 3\text{T}$  (30kG)  
 Accuracy: the probe-related  
 Load capacity: Minimum load resistance 1k (short-circuit protected)  
 Connector: coaxial cable connector (BNC)



## 1.2.6 General

Ambient Temperature: 15 – 35 °C at rated accuracy. 0 °C – 40 °C with reduced accuracy.

Power Requirement: 220 VAC (+5%, -10%), 50 or 60 Hz, 20 watts

Size: 320mm W × 110 mm H × 287 mm D, half rack (12.5 × 4.3 × 11.3 inches)

Weight: 4 kilograms

## 1.2.7 Ordering Information

### Part Number Description

#### Instrument

DX-180 the Model DX-180 Gauss/Tesla meter

#### Accessories Included:

ModelCHD801F regular digital slim transverse hall probe with range of 0-10T(0-100Kg)

\*220-10 220VAC power wire \* calibration certification

\*Man-DX-180 model DX-180 Gauss/Tesla Meter User's Manual

one

\*RS232-DCE9 9 pin RS232 direct Communication Cable \* Warranty one

#### Accessories Available:

RS232-USB RS232 TO USB 2.0 interface transferorIEEE485 one

Dexing zero-Gauss Chamber one

Dexing Gauss Professional Drawing software one

Dexing Remote Control System one

## 1.3 SAFETY SUMMARY

Observe the following general safety precautions during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Dexing Magnet Tech.Co.,Ltd. assumes no liability for customer failure to comply with these requirements.

Please read carefully the following general safety precautions during all phases of operation, service, and repair of this instrument. The instrument should be operated by Professional who are familiar with **shock hazard** and can deal with the damage made by **shock hazard**. When the instrument is in function of all phases of measuring or control, any other circuit may carry with danger voltage what means that r.m.s values of AC voltage is greater than 30V, and that peak voltage is greater than 42.4V, or that AC voltage is greater than 60V, and may cause the **shock hazard** accident. The danger voltage can appear on the box of DX-180, the cable plug, the cable receptacle, sensor metal shell, measuring fixture, or any place of any instruments that connect to DX-180.

The Model DX-180 protects the operator and surrounding area from electric shock or burn, mechanical hazards, excessive temperature, and spread of fire from the instrument. Environmental conditions outside of the conditions below may pose a hazard to the operator and surrounding area.

- Temperature: 5 – 40°C.
- Maximum Relative Humidity: 80% for temperatures up to 31 °C decreasing linearly to 50% at 40°C.
- Power supply voltage fluctuations not to exceed  $\pm 10\%$  of the nominal voltage.

### Ground The Instrument

To minimize shock hazard, connect instrument chassis and cabinet to an electrical ground. The instrument is equipped with a three-conductor AC power cable; either plug it into an approved three-contact outlet or use a three-contact adapter with the grounding wire (green) firmly connected to a ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet safety standards of the state.

### Do Not Operate In an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes. It is a safety hazard.

### Keep Away From Live Circuits inside the Instrument

Operating personnel must not remove instrument covers. Refer component replacement and internal adjustments to qualified maintenance personnel. Do not replace components with power cable connected. To avoid injuries, always disconnect power and discharge circuits before touching them.














### Do Not Substitute Parts or Modify Instrument

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to an authorized Dexing Magnet Tech.Co.,Ltd. representative for service and repair to ensure that safety features are maintained.

### Do Not Place Conductive Probes against Exposed Electrical Circuits

Some Gauss/Tesla meter probes are equipped with conductive sheaths. Keep these probes away from live electrical circuits.

## 1.4 SAFETY SYMBOLS

	Direct current (power line).		Equipment protected throughout by double insulation or reinforced insulation (equivalent to Class II of IEC 536 - see Annex H).
	Alternating current (power line).		Caution: High voltages; danger of electric shock. Background color: Yellow; Symbol and outline: Black.
	Alternating or direct current (power line).		Caution or Warning - See instrument documentation. Background color: Yellow; Symbol and outline: Black.
	Three-phase alternating current (power line).		Fuse.
	Earth (ground) terminal.		
	Protective conductor terminal.		
	Frame or chassis terminal.		
	On (supply).		
	Off (supply).		

## CHAPTER2    INSTALLATION

### 2.0 GENERAL

This chapter provides general installation instructions for the Model DX-180 Gauss/Tesla meter. Inspection and unpacking instructions are provided in Paragraph 2.1. Repackaging for shipment instructions are provided in Paragraph 2.2. An definition of rear panel controls is provided in Paragraph 2.3-2.7. Finally, an initial setup and system checkout procedure is provided in Paragraph 2.8.

### 2.1 INSPECTION ANDUNPACKING

Inspect shipping containers for external damage, and damage (apparent or concealed) or partial loss of shipment. If damage or loss is apparent, please notify the shipping agent immediately.

Open the shipping containers. A packing list is included with the system to simplify checking that the instrument, probe(s), accessories, and manual were received. Please use the packing list and the spaces provided to check off each item as the instrument is unpacked. Inspect for damage. Be sure to inventory all components supplied before discarding any shipping materials. If there is damage to the instrument in transit, be sure to file proper claims promptly with the carrier and insurance company. Please advise Dexing Electronic devices of such filings. In case of parts or accessory shortages, advise Dexing immediately. Dexing cannot be responsible for any missing parts unless notified within 10 days of shipment.

### 2.2 REPACKAGING FORSHIPMENT

If it is necessary to return the Model DX-180, probe(s), or accessories for repair or replacement,

The original packing material should be retained for reshipment. Please packet the instrument with protecting bag, and use the original packing filler to protect, repackage them in original packing box, and tied up with nylon belts, and paste the shipping label and "FRAGILE" label.

Because of their fragility, Dexing probes are shipped in special cardboard and foam boxes. These boxes should be retained for storage of probes while the Gauss/Tesla meter is not in use. The same box can be used to return probes to Dexing for recalibration or repair.

## 2.3 REAR PANEL DEFINITION

This paragraph provides a description of the Model DX-180 rear panel connections. The rear panel consists of: 1) the line input assembly, safe subassembly, 2) RS232 Connector, 3) Monitor the analog output BNC connector, 4) Probe Input Connector. Please read paragraph 2.3-2.7 then proceed to Paragraph 2.8 for the initial setup and system checkout procedure. Rear panel connector pin-out details are provided in Chapter 7 – Service.

**CAUTION:** Verify AC Line Voltage shown in the fuse holder window is appropriate for the intended AC power input. Also remove and verify the proper fuse is installed before plugging in and turning on the instrument.

**CAUTION:** Always turn off the instrument before making any rear panel connections. This is especially critical when making probe to instrument connections.



Figure 2-1 Dexing DX-180 Gauss/Tesla Meter 's Rear panel

## 2.4 Line Voltage and Fuse Verification

To verify proper line voltage selection look at the indicator in the window on the fuse drawer of the line input assembly. Line voltage should be in the range shown in the specifications listed on the back of the instrument. See Figure 2-2. The Model DX-180 includes a three-conductor power cord. Line voltage is present across the outer two conductors. The center conductor is a safety ground and connects to the instrument metal chassis.

For safety, plug the cord into a properly grounded three-pronged receptacle or adapter that meets the safe standard of the state.

The fuse must be removed to verify its value, refer to the procedure. Use slow-blow fuses of the value specified on back of the instrument.

The power switch turns the instrument On and Off and is located in the line input assembly on the instrument rear. When I is raised, the instrument is On. When O is raised, the instrument is Off.

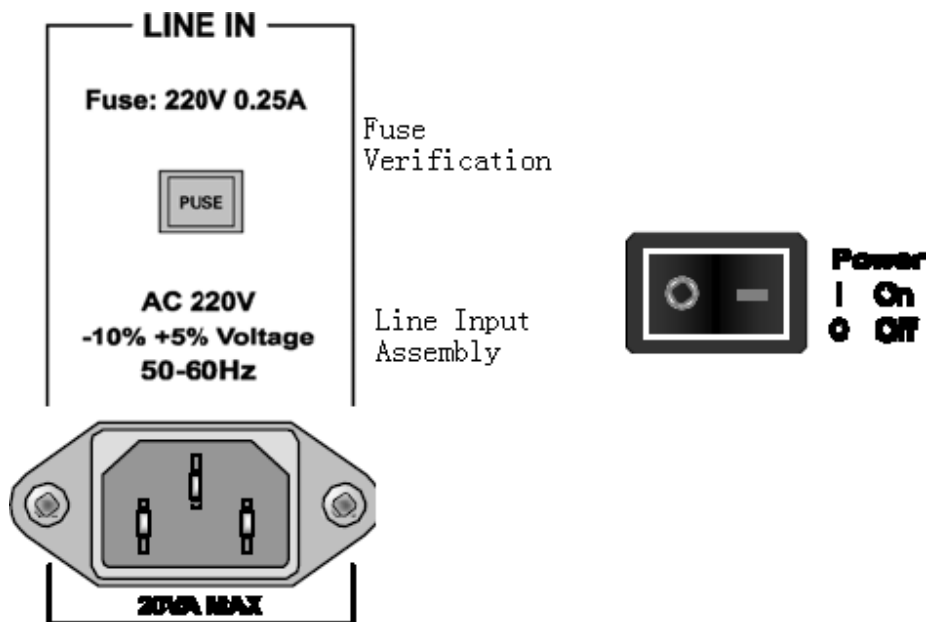


Figure 2-2 A:Line Input Assembly and Fuse Verification(Left rear panel)  
B:Power Switch (low left of the front panel)

## 2.5 PROBE INPUT CONNECTION

**WARNING:** Some probes used with the Gauss/Tesla meter have conductive parts. Never probe near exposed live voltage. Personal injury and damage to the instrument may result.

**CAUTION:** Always turn off the instrument before making any rear panel Probe Input connections.

Dexing instrument should always go with the Dexing serial Hall probes. Never use any other kind of probes in order of avoiding instrument and probe damage. Dexing probes plug into the 15 pin D-style connector on the Model DX-180 rear panel. Turn the instrument off and plug the power cord out of the power input receptacle before attaching a probe. Avoiding bending the contact pin, straightly and gently insert the probe input connector into the rear panel connector. For reliability, please use thumbscrews attached to the probe connector to tighten connector to unit on the rear panel. Thumbscrews can ensure cable safe and avoid disturbance.

When power is turned on, the instrument reads parameters from probe memory. The probe is ready to use. No parameters need to be entered into the Model DX-180. However, the Zero Probe function should be performed the first time a probe is used with the instrument and periodically during use.

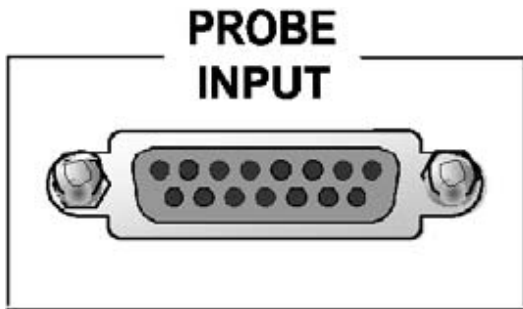


Figure 2-3 PROBE INPUT Connector

## 2.6 Monitoring AnalogOutput(BNC)

DX-180 using the BNC jack provides analog output with signals in the center conductor and land as shell. Monitor the analog output is proportional to the magnetic field strength of the analog signal; refer to Chapter 3 for more information to monitor the operation of the analog output.

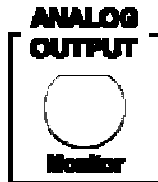


Figure 2-4 Monitor analog output BNC Connector

## 2.7 RS-232CONNECTION

The Model DX-180 has a 9 pin D-Subminiature plug on the rear panel for serial communication, and DCE configuration. it can connect to PC by 9 pin serial port through the direct cable, or by 25 pin serial port through the 9 pin to 25 pin cable. Find more information about Serial cable connection in chapter 7.

DX-180 has as optional accessory RS232 to USB 2.0 interface transfer that will transfer the DX-180 serial port to USB, along with it the windows driver in the installation disk. For more information please see in chapter 5.

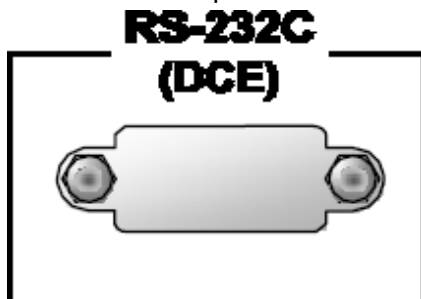


Figure 2-4 RS-232 (DTC) Connector

## 2.8 INITIAL SETUP AND SYSTEM CHECKOUTPROCEDURE

The following procedure is an initial instrument setup and checkout procedure. The intent of this procedure is to verify basic operation of the unit before beginning use for measurements.

1. Ensure the power switch is in the off (O)position.

**CAUTION:** The probe must be connected to the rear of the unit before applying power to the Gauss/Tesla meter. Damage to the probe may occur if connected with power on.

2. Plug in the probe connector to 15 pin PROBE INPUT. Use thumbscrews totighten connector tounit.

3. Ensure any other rear panel connections (SERIAL I/O or ANALOG OUTPUTS)are connected before applying power to theunit.

4. Check window in fuse drawer for proper voltagesetting.

5. Plug line cord into receptacle. Plug the other end of the line cord into an approved three-contact outlet or use a three-contact adapter with the grounding wire (green)firmly connected to a ground (safety ground) at the poweroutlet.

**NOTE:** For best results, the instrument and probe should warm up for at least 15 minutes before

zeroing the probe, and at least 30 minutes for rated accuracy.

6. DX-180 provides two zeroingmode:

Relative zero-field mode: Place the probe in the zero gauss chamber and press the front panel **MENU** key, and through the up/down key to entry the check-zero-interface. The display below appears:

```

Dc Mode
Pleass put the probe Vertical
to the ground
zero value :+0.3621mT
survey value :+0.3658mT
Save&Exit      Exit
```

Adjust till the **Sav&Exit** turns yellow, and press the front panel **Enter**, and that will accomplish the zero-check automatic.

Eliminating geomagnetism mode: put the probe horizontal, perpendicular to geomagnetic field, and press the front panel **MENU** key, and through the up/down key to entry the check-zero-interface. Adjust till the **Sav&Exit** turns yellow, and press the front panel **Enter**, and that will accomplish the zero-check automatic.

Never move the probe in the process of check-zero which followed by a return to the normal display.

**NOTE:** If the unit has performed well to this point, the unit is functioning properly. The thickness of the probe has little influence to testing accuracy while testing the uniform magnetic field, however while testing non-uniform magnetic field, because of magnetic field loss, the measurement will be more accuracy when the hull instrument is closer to the material surface. Using the thin probe is suggested.

Once this abbreviated checkout procedure is successfully completed, the unit is ready for normal operation. Please proceed to Chapter 3 for further operational information.

## CHAPTER3 OPERATION

### 3.0 GENERAL

This chapter describes Model DX-180 Gauss/Tesla meter operation. The front panel controls are described in Paragraph 3.1. Paragraphs 3.2 thru 3.9 describe the various front panel functions in detail. Finally, Paragraph 3.10 provides probe handling considerations.

### 3.1 DEFINITION OF FRONT PANELCONTROLS

This paragraph provides a description of the front panel controls on the Model DX-180.



Figure 3-1 DX-180 Gauss/Tesla Meter's Front Panel

#### 3.1.1 Front PanelKeypad

The keys on the front panel are defined as follows. Note the following are abbreviated descriptions of each key. A more detailed description of each function is provided in subsequent paragraphs.

**Ac/Dc** Selects AC magnetic field and DC magnetic field

**Units** Changes display units among gauss, tesla, A/M, Oe. Gauss (G) is used in the cgs system, tesla(T) is used in the SI system, where 1 T = 104 G. A/M as Amps per Meter, Oe means Oster.

**Range** Selects a manual field measurement Autorange or three-range.

**Save** used to store the data through the set way.

▲ ▼ Toggles between various settings shown in the display and increments /



decrements a numerical display. It can display as up, down key, and also left, right key.

**Menu** used to open the menu.

**Max/Min** turns the peak reading measuring feature on and off. Capture and display the highest or lowest field readings, and hold on the interface.

**Zero** Used to zero or null effects of ambient low level fields from the probe.

**Enter** Accepts changes to parameter setting.

**Relative** Relative mode button, recording the relative value.

**Reset** peak reading resets. Clears current peak reading.

### 3.1.2 Front Panel Display

In normal operation, with graphic display, color LED provides current magnetic reading Range, AC and DC magnetic field selection, zero-trigger and relative value-trigger, peak-reset on the top row and current magnetic readings, unit as well as N/S polarity (indicated by plus or minus) on the 2nd row with wide highlight attribute and maximum on the third row and minimum m on the fourth row and date, temperatures in the instrument and probe point(needed to be probe with temperature sensor).



Figure 3-2 DX-180 Gauss/Telsa Meter Front Panel Display Definition

### 3.1.3 General Keypad Operation

Human interface with the instrument is provided by the 10 buttons that comprise the front panel keypad. Most operations can be performed through the front-panel keypad and monitored by watching the color front panel display.

There are three basic keypad operations:

1. **Direct Operation:** The following key functions occur upon pressing the key: **AC/DC**, **Menu**, **Zero**, **Enter**, **Relative**, **Reset**.
2. **Itinerant Operation:** The following functions will display a selection of settings immediately upon **Units**, **Range**, **Save** and **Max/Min**.
3. **Setting Selection:** Pressing the **Menu** key will enter the menu interface.

## 3.2 AC/DCkey

AC and DC measurement mode selection

In AC mode, it displays the true RMS and frequency values (Hz) of AC magnetic field.

## 3.3 Units

The Model DX-180 displays magnetic field values in gauss (G), tesla (T), Amps/Meter(A/M) orOster(Oe).

## 3.4 RANGE

Pressing the **Range** key toggles the range between the Auto Range mode and the three Handle mode.

DX-180 Gaussmeter(gears) resolution	0-300G	0-3kG	0-30Kg	0-300Kg (30T Type) 0.001kG
	0.001G	0.00001kG	0.0001kG	

## 3.5 Save

Pressing the **Save** key stores the data. Gaussmeter can store and send to PC 70 testing items of data, and when it exceeds, deletes the previous data. Data was inquired in a group of 50 items. Data Storage mode can be random (save once press the **Save** key) or auto-save interval in a setting time. Mode-setting is determinate in Menu ->Save option.

## 3.6 Menu (single directionmovement)

DX-180 provides flexible human-machine interaction. It contains powerful functions and easy accessibility in the menu. When setting Time, threshold, just move the cursor keys transversely.

## 3.7 Max/Min

turns the peak reading measuring feature on and off. Capture and display the highest or lowest field readings, and hold on the interface.

Gear 1: Maximum/Minimum/CSSmax/CSSmin Holding.

Gear 2: interface locked.

Gear 3: interface unlocked.

### 3.8 Zero

**Zero key.** Put current magnetic field to Zero. (not count into the system).It is general used at the beginning of the test.

**Note:** check-zero Mode in the menu will be count into the system.

### 3.9 Enter

Ensure operation key. Accepts changes to parameter setting.

### 3.10 Relative

Relative mode button to record the relative values (the value before zero + the current test value)

### 3.11 Reset

The **Max/Min Reset** key clears the hold value. The hold value is also reset upon power up of DX-180.

### 3.12 ▼▲ ◀▶

Toggles between various settings shown in the display and increments/decrements a numerical display.

Time	时间设定	
Cal	厂家校正	
Threshold	阈值设定	
Brightness	高度调节	GRAPH 绘图
Save	存储设定	Zero 校零设定
Uart	波特率设定并发数据	Exit 退出

Figure 3-3 DX-180 Gauss/Tels Meter menu sketch

## 3.13 Menufunction-describing

### 3.13.1 Timesetting

Press **Enter**, and use ◀▶ to move the Red cursor from left to right, and through the ▼▲ key to adjust the date and time. After confirmation move the cursor to Exit and press Enter to exit, that will finish the timesetting.

### 3.13.2 Calcheck

Only for the manufactory (with password to enter)

### 3.13.3 Threshold valuesetting

Press ◀▶ to move the Red cursor from left to right, and through the ▼▲ key to select the input data. it is accurate to 0.01mT. After setting the Range, move the cursor to Exit and press Enter to exit, that will finish the Threshold setting. Out of range will cause the alarm.

### 3.13.4 Brightnesssettings

Press Enter to enter, press the ▼▲ key regulator box values to achieve the desired brightness, press Enter to withdraw.

### 3.13.5 Savesetting

Save Timing

Press **Enter** key to enter the interface, then use the ▼▲ key to set time interval of 1-60s for save data. The time interval is adjustable in 1-60s. Press **Enter** to exit.

Random Save

Press **Enter** key to ensure, every time pressing the **Save** key on the front panel will cause a one time data save operation.

Review

It will display the latest 70 items it got. The fiftieth item is the last item DX-180 saved. The items are arranged by its time. Press Enter to exit.

**Note:** when it is less than 70 items, consecutive save the data and provide view. After finishing 70 items it will start a new group of item saving. Last group items will be cleaned from the display. Last group items are stored in the memory system. It can be send to PC to inquiry or draw, or to professional Drawing software developed by Dexing to inquiry or draw pictures.

### 3.13.6 UART baud rate select and send data.

Press **Enter**, and through the **▼▲** key to select the baud rate(the baud rate should be the same with the PC serial port's baud rate). Press **Enter** to start sending data. Ending the transmitting will cause a hint: transmit over. Press **Enter** to exit.

### 3.13.7 Zero-checkmode

As described in 2.7.

### 3.13.8 Graph DrawingMode

Unique Gauss Meter storage auto-mapping mode, Ahead of world-class, DX-180 can be observed through the graphical interface, trends in the magnetic field, change the situation. Sub-real-time mapping and historical drawing two modes selectable magnetic field is divided into three ranges (30mT, 300mT, 3000mT).

Real-time Drawing: After selecting the range, it displays changes in the magnetic field real time, press **Enter** to exit.

Historical drawing: After selecting the range, it mapping according to the previous 70 items.

Monitor analog output

DX-180 used BNC connector to provide Monitor analog output in the post-panel. The BNC connector take the signal as the core line, the grand as shell. Monitor analog output voltage range is of  $\pm 3.0V$ , and corresponding, the magnetic field range is of  $\pm 3.0T$  ( $\pm 30kG$ ). Monitor analog output voltage are not affected by display units. BNC connector body shell and chassis electrical have connection, but may range potentials, short-circuit between the BNC connector body shell and chassis may affect the analog output accuracy, or cause equipment damage.

## 3.14 PROBECONSIDERATIONS

To avoid damage and for best results during use, the probes have a number of handling and accuracy requirements that must be observed. Changing probes is discussed in Paragraph 3.10.1. Probe handling is discussed in Paragraph 3.10.2. Probe operation is discussed in Paragraph 3.10.3. Finally, accuracy considerations are provided in Paragraph 3.10.4.

### 3.14.1 ChangingProbes

DX-180 use Dexing series thin digital probes. A 512-byte Electrically Erasable Programmable Read Only Memory (EEPROM) is included in each probe. The EEPROM stores specific information that the Gaussmeter requires for operation. The information includes serial number, probe sensitivity, and field compensation data. DEXING has been

checked before delivery, so there is no need to check again after a new DEXING probe with the same type has been plugged in. In other words, the probe has replaceability.

**CAUTION:** The probe must be connected to the rear of the instrument before applying power to the Gaussmeter. Probe memory may be erased if connected with power on. To change probes, first turn power off, remove the existing probe, and then plug in the new probe. When power is restored, the characteristics of the new probe are downloaded to the gaussmeter memory. Normal operation may continue after the new probe offset is nulled using the Zero Probe operation.

If the instrument is powered up with no probe attached, the following message is displayed.

NO PROBE
----------

### 3.14.2 ProbeHandling

Although every attempt has been made to make the probes as sturdy as possible, the probes are still fragile. This is especially true for the exposed sensor tip of some transverse probes. Care should be taken during measurements that no pressure is placed on the tip of the probe. The probe should only be held in place by securing at the handle. The probe stem should never have force applied. Any strain on the sensor may alter the probe calibration, and excessive force may destroy the Hall generator.

**CAUTION:** Care must be exercised when handling the probe. The tip of the probe is very fragile. Stressing the Hall sensor can alter its calibration. Any excess force can easily break the sensor. Broken sensors are not repairable.

Avoid repeated flexing of the stem of a flexible probe. As a rule, the stem should not be bent more than 45° from the base. Force should never be applied to the tip of the probe. On all probes, do not pinch or allow cables to be struck by any heavy or sharp objects. Although damaged or severed cables can be repaired, please understand that probes are not always repairable.

When probes are installed on the gaussmeter but not in use, the protective tubes provided with many probes should be placed over the probe handle and stem in order to protect the tip. When the gaussmeter is not in use, the probes should be stored separately in some type of rigid container.

### 3.14.3 ProbeOperation

In the DC mode of operation, the orientation of the probe affects the polarity reading of the gaussmeter.

**NOTE:** For best results, the instrument and probe should warm up for at least 5 minutes before zeroing the probe, and at least 30 minutes for rated accuracy. The probe and the zero gauss chamber should be at the same temperature.

If the exact direction of the magnetic field is unknown, the proper magnitude is determined by turning on **Max Hold** and slowly adjusting the probe. As the probe turns and the measured field rises and falls, its maximum value is held on the display. Make note of the probe orientation at the maximum reading to identify the field orientation.

**N pole: + (display) S pole :-( display)**

### 3.14.4 Probe Accuracy Considerations

**NOTE:** Probe readings are dependent upon the angle of the sensor in relation to the magnetic field. The farther from 90° the angle between the probe and the field, the greater the percentage of error.

**NOTE:** For best results, the instrument and probe should warm up for at least 5 minutes before zeroing the probe, and at least 30 minutes for rated accuracy. The probe and the zero gauss chamber should be at the same temperature. The user must consider all the possible contributors to the accuracy of the reading. Both the probe and gaussmeter have accuracy specifications that may impact the actual reading. The probe should be zeroed before making critical measurements. The zero probe function is used to null (cancel) out the zero offset of the probe or small magnetic fields. Probe temperature can also affect readings. Please keep it in the temperature of 20°C while it is functioning. Probe readings are dependent on the angle of the sensor (Hall sensor) in relation to the magnetic field. Maximum output occurs when the flux vector is perpendicular to the plane of the sensor. This is the condition that exists during factory calibration. The greater the deviation from orthogonality (from right angles in either of three axes), the larger the error of the reading. See Figure 3-3. Tolerance of instrument, probe, and magnet must be considered for making critical measurements. The accuracy of the gaussmeter reading is better than  $\pm 0.05\%$  of reading. Absolute accuracy readings for gaussmeters and Hall probes is a difficult specification to give, because all the variables of the measurement are difficult to reproduce. For example, a 1° error in alignment to the magnetic field causes a 0.15% reading error. Finally, the best probes have an accuracy of  $\pm 0.15\%$ . This implies that the absolute accuracy measurement of a magnetic field is not going to reliably be better than  $\pm 0.05\%$  under the best of circumstances, and more likely to be 0.15% to 0.20%.

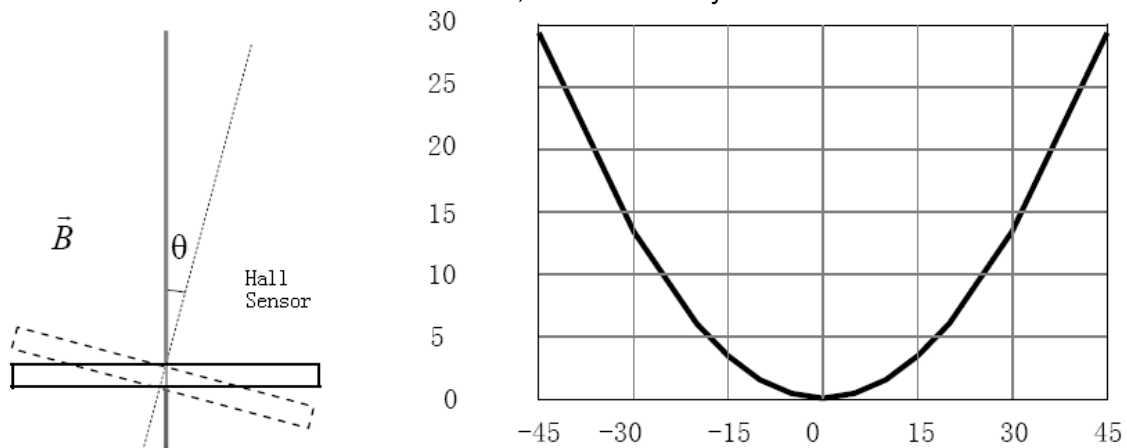


Figure 3-4 Effect Of Angle On Measurements

**Note:**

- 1) The high-precision measurement of the magnetic should consider the environment interference, and the stability of laboratory power supplies.
- 2) If test the objects in multi-point magnetic intensity, you should keep the probe fixed, measured things moving.

## **CHAPTER4 REMOTEOPERATION**

### **4.0 GENERAL**

The Model DX-180 is equipped with an RS-232C serial computer interface. The interface allows computer automation of field measurement data collection and data saving and data drawing with the specific software.

### **4.1 SERIAL INTERFACEOVERVIEW**

The serial interface used in the Model DX-180 is commonly referred to as an RS-232C interface. RS-232C is a standard of the Electronics Industries Association (EIA) that describes one of the most common interfaces between computers and electronic equipment. The RS-232C standard is quite flexible and allows many different configurations. The remainder of this paragraph briefly describes the key features of a serial interface that are supported by the instrument. A customer supplied computer with similarly configured interface port is required to enable communication

#### **4.1.1 PhysicalConnection**

The Model DX-180 has a 9 pin D-Subminiature plug on the rear panel for serial communication. The original RS-232C standard specifies 25 pins but both 9- and 25-pin connectors are commonly used in the computer industry. Many third party cables exist for connecting the instrument to computers with either 9- or 25-pin connectors. Paragraph 6.4 gives the most common pin assignments for 9- and 25-pin connectors. Please note that not all pins or functions are supported by the Model DX-180.

The instrument serial connector is the plug half of a mating pair and must be matched with a socket on the cable. If a cable has the correct wiring configuration but also has a plug end, a "gender changer" can be used to mate two plug ends together.

The letters DCE near the interface connector stand for Data Communication Equipment and indicate the pin connection of the directional pins such as transmit data (TD) and receive data (RD). Equipment with Data Terminal Equipment (DTE) wiring can be connected to the instrument with a straight through cable. As an example, pin 2 of the DCE connector holds the transmit line and pin 2 of the DTE connector holds the receive line so the functions complement, and pin 3 of the DCE connector holds the receive line and pin 3 of the DTE connector holds the transmit line so the functions complement. It is likely PC piece of equipment is wired in the DTE configuration of 9 pins with D type. the equipment will be available for use with straight through cable.

It is likely both pieces of equipment are wired in the DCE configuration. In this case pin 3 on one DCE connector (used for transmit) must be wired to pin 2 on the other (used for receive). Cables that swap the complementing lines are called null modem cables and



must be used between two DCE wired devices. Null modem cables can also be use between two DTC wired devices. Null modem adapters are also available for use with straight through cables.

The instrument uses drivers to generate the transmission voltage levels required by the RS-232C standard. These voltages are considered safe under normal operating conditions because of their relatively low voltage and current limits.

#### 4.1.2 HardwareSupport

The Model DX-180 interface hardware supports the following features. Asynchronous timing is used for the individual bit data within a character. This timing requires start and stop bits as part of each character so the transmitter and receiver can resynchronized between each character. Half duplex transmission allows the instrument to be either a transmitter or a receiver of data but not at the same time. Communication speeds of 19200, 57600 or 115200 baud are supported. The Baud rate is the only interface parameter that can be changed by the user.

DX-180 does not support hardware handshaking. Hardware handshaking is usually used to avoid conflict in a string of data sources, and ensure that the data receiver is ready before data delivery. In the remote operation of this instrument, the appropriate software timing works instead of hardware handshaking. User program must be involved to the overall responsibility for flow control and timing.

#### 4.1.3 CharacterFormat

A character is the smallest piece of information that can be transmitted by the interface. Each character is 10 bits long and contains data bits and bits for character timing. The instrument uses 8 bits for data. One start bit and one stop bit are necessary to synchronize consecutive characters. Parity is a method of error detection. One parity bit configured for odd parity is not included in each character.

**Table 4-1. DX-180 Serial Interface Specifications**

ConnectorType:	9-pin D-style Female
ConnectorWiring:	DCE
VoltageLevels:	EIA RS-232C Specified
TransmissionDistance:	50 feet maximum
TimingFormat:	Asynchronous
TransmissionMode:	Half Duplex
BaudRate:	19200,57600,115200
Handshake:	Softwaretiming
CharacterBits:	1 Start, 8 Data, , 1Stop
Parity:	none
Terminators:	CR(0DH)
Command Rate:	10 commands per secondmaximum

#### 4.1.4 Changing BaudRate

To use the Serial Interface, you must first set the Baud rate of the Model DX-180. Press **Enter** key, and use the **up**, **down** key to choose the Uart option, press **Enter** key, it will display the following screen.

```
baudrate: 115200
```

Press the ▲ or ▼ keys to cycle through the choices of 19200, 57600, or 115200 Baud. Press **Enter** to accept the new number and send data. Repress **Enter** to return to menu display. Press the ▲ or ▼ keys to Exit state, and the press **Enter** to return to the main interface. Choices of Baud are 19200, 57600 and 115200. Default Baud before delivery is 115200.

#### 4.1.5 TroubleShooting

##### ***New Installation with communication failures***

1. Check instrument baudrate
2. Make sure transmit (TD) signal line from the instrument is routed to receive (RD) on the computer and vice versa. (Use a null modem adapter if not).

##### ***Old Installation No Longer Working***

1. Power instrument off then on again to see if it is a soft failure.
2. Power computer off then on again to see if communication port is locked up.
3. Verify that baud rate has not been changed on the instrument during a memory reset.
4. Check all cable connections.

##### ***Intermittent Lockups***

1. Check cable connections and length.

## CHAPTER5 ACCESSORIES

### 5.0 GENERAL

This chapter provides lists of Model DX-180 Gaussmeter accessories. Accessories are described in Paragraph 5.1. Probes are described in Paragraph 5.2. Helmholtz coils are described in Paragraph 5.3. Finally, reference magnets are described in Paragraph 5.4.

### 5.1 ACCESSORIES

Accessories are devices that perform a secondary duty as an aid or refinement to the primary unit. A list of accessories available for the Model DX-180 is as follows:

Model	Description
Model-CHD801F	Conventional digital ultra-thin transverse Hall probewith measuring rangeof10T(100kG) one
220-10	3-pin 220V single-phase ACpower cord one
RS232-DCE9	Straight-through 9-pin RS-232C serial communication cable one
MAN-DX-180	DX-180 User Manual one Calibrationcertificates one Warranty one

Table 5-1 DX-180 accessories

At the same time, users can select for DX-180 accessory of \*RS232-USB to change RS232interfacetoUSB2.0orIEEE485interfaceincaseofUSBbuscontrolusing,which will upgrade the PC controlled equipment. \*Optional Gauss Meter professional mapping software promotes to data storage and rendering of professionalcharts.

Dexing Magnet Tech.Co.,Ltd. reserve the right to change the foregoing accessory Specification without notice.

### 5.2 CABLE

DX-180 is delivered with 232-C9 straight through cable.

### 5.3 Rittal

Through the use of cabinets to install components, DX-180 can be a standard 19-inch standard rack mounted chassis way inside.

## CHAPTER 6 Optional parts

### 6.0 General

This chapter provides general optional parts of Dexing Electronic deice Inc. full series of stardard probes are provided in Paragraph 6.1. Zero-Gauss Chamber is provided in Paragraph 6.2. Professional Gaussmeter save-and-drawing software is provided in 6.3. Finally, Remote control system is provided in 6.4.

### 6.1 Dexing Electronic deices Inc. series standardprobes

GaAs Hall probes is one of our company's high-tech products, which has the smallest package size of the domestic like products, and which has features of excellent Magnetic linearity, excellent consistency, and a small temperature drift and so on. The package size and electrical performance parameters reach the international top level. It overcomes the flaws of the large volume as the old products, magnetic attenuation, low accuracy, negative magnetic linearity caused by remote distance from the measuring point, only one-sided measurement, poor fixed, easy to damage and other defects. Its Axial two-dimensional radial diameter of the probe can be 0.9mm, and the axial diameter of three-dimensional probe can be achieved 1.2mm. the probes has been the world's smallest package size of the probe, can they can meet the special needs of scientific research in national defense area.

#### **Characteristics and correct choice of probe**

It is necessary to correct calibrate the measuring range for choosing a suitable Gauss meter probe in our research and production. Improper use may lead to low accuracy detection, or worse, expensive costs. Dexing Electronic deices Inc. provides complete lines of STANDARD PROBES that can use in variety of Magnetic measurements applications. Dexing probes have been calibrated by Dexing Electronic deices Inc. Its accuracy and interchangeability are good guarantee for measure. If you have any other questions, please contact us. our experts can guide you with the probe choosing. Dexing can also custom design a probe to meet your specific application requirements.

#### Characteristics

- 1) GaAs Hall sensor is the key component of Gauss Meter. then the activeregion (test-sensitive area) size has become the key. the smaller magnetic strength tested, the more accurate calculation it has. The fact that our Hall sensor's active area diameter is only 0.10 -0.15mm, greatly increases the measurement accuracy. It is particularly important in the non-uniform magnetic field. the size of the magnetic sense area also affects the spatial resolution of magnetic measurements.
- 2) GaAs Hall sensor's magnetic linearity is the lifeblood of gauss meter measurement accuracy. Dexing probes have the stability with minimal 0.1uV linear output. linearity (0-3T) full-scale maintained at the level of  $\pm 0.05\%$  Merit . Temperature drift  $<0.03\%$ / $^{\circ}\text{C}$ .
- 3) probe Packaging Technology and size are the key for the performance of Gauss

Meter. Because of this characteristic with large magnetic attenuation gradient, the closer to the magnetic signal, the more ensureable of the accuracy, so we use the latest technology which makes the probe only 0.2mm after soft-packaging, and after metal hardware closure which makes the probe only 0.5mm, and that size of probe reached the world advanced level.

A small imbalance voltage. due to Hall sensor is a four pole equivalent circuit of the bridge device, the bridge in any of the four arms of a minor deviation, it will cause imbalance in the bridge, semiconductor technology, materials, uniform, etc. will be have resulted in the absence of an external magnetic field signal output, which is unbalanced voltage or offset voltage. We can minimize it to less than 0.2mV of the international standards.

A good temperature coefficient of sensitivity and low power consumption and good stability, consistency, and to 15,000 hours of reliability testing laid the new generation of high-performance probe a solid foundation.

#### *Range*

Dexing's Hall probe is designed to measure the scope of coverage of 3 to 5 orders of magnitude. Beyond the normal range, we will have a special method of measurement, but it will lose accuracy. Select the correct probe type to ensure optimal performance of the required measuring range.

- 1) High-sensitivity Hall sensor probe is a common measurement for the width of conventional magnetic field, its high-accuracy range up to 30KG, while low-end high-precision can be measure 0.001G, it can also work in super-scope, but not as a measurement accuracy.
- 2) Ultra-high sensitivity of the sensor probe, for the marginal areas and in different areas of the planet detection, can be detected 0.0001G. it is an efficient ultra-high sensitivity sensor.

#### *Orientation*

Location and characteristics of target detection is the key to determine the use of horizontal, axial, flexible, two-dimensional, three-dimensional probe.

- 1) Horizontal probe is usually a thin rectangular. It has been successfully used in various types of magnetic field, magnetic material on the surface measurements, and a small gap, or general open field measurements. Dexing's CHD800F series are just this type.
- 2) Axial probe is usually cylindrical, its applications include the measurement ring magnet center charged with, solenoids, surface field-testing, and the general magnetic field sensor. 1AHD801 Series can be selected according to the length detection.
- 3) Flexible probes for flexible epoxy resin, and they are not so strongly protected, easy to damage, but with the ultra-thin of only 0.20mm, which makes best use of narrow-gap and other measurement applications. Such as MHD802F.
- 4) Two-dimensional, three-dimensional probes are usually cylindrical, they are used to measure two-dimensional, three-dimensional magnetic field and space equipment, magnetic field, 2AHD801 series, 3AHD801 series can be chosen according to the length.

#### *The frequency and durability*

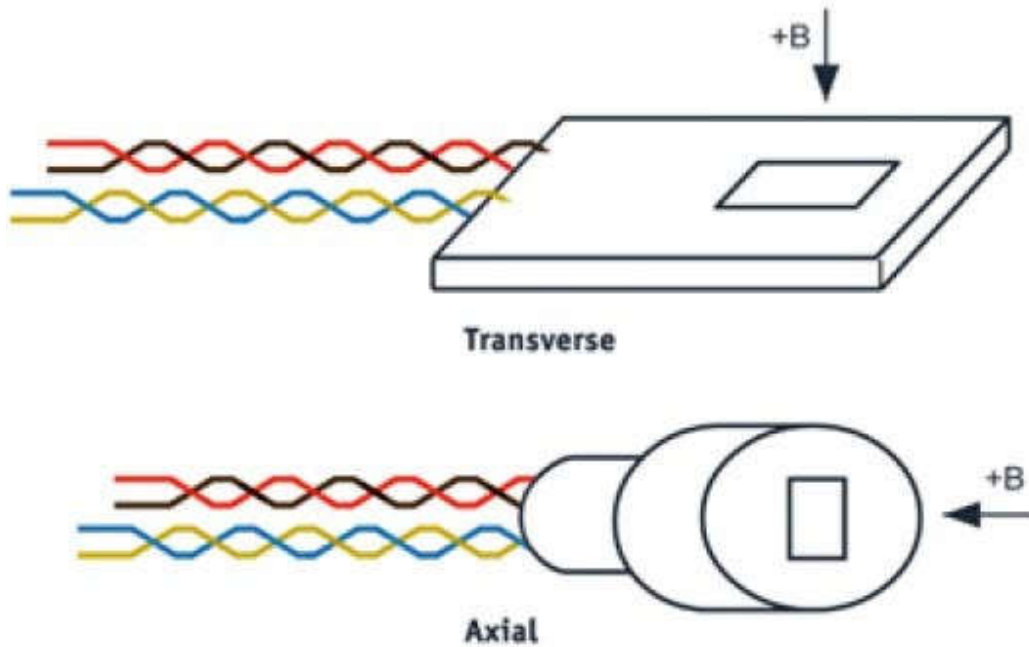
Hall probe is also suitable for the direct measurement is not a static field or on a regular basis exchange, but the customer should select the appropriate probe to reach the best performance.

- 1) Metal Packaging probe is the best choice for DC and low frequency AC. because they offer the best protection of delicate, brass is the best choice out of all non-ferrous metals, but when its up to more than 800Hz, the exchange environment

will produce eddy current effect, which will lead to a certain error.

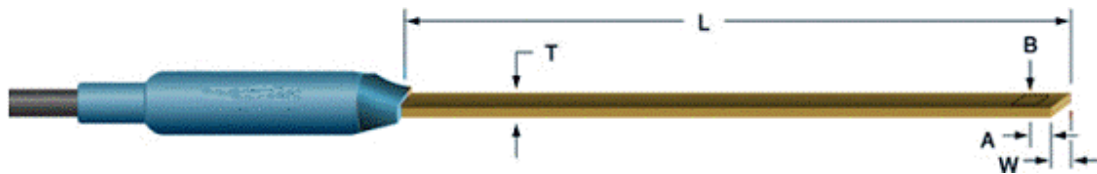
- 2) Non-metallic package is the preferred choice for high-frequency exchange environment, but fragile.

Schematic diagram of lateral and axial:



B: Magnetic field direction

#### Horizontal Gauss Meter probe

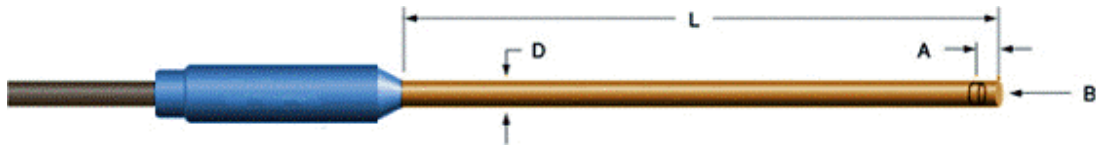


\*Length, shape, custom-made upon request

\*Can be installed inside the probe temperature sensor, or gold-plated

\*Delivery is in 1-4 weeks (non-stock cases) excluding value-added tax and shipping freight.

\*Customers are welcome to inquiry by phone or E-mail.

**Axial Gauss meter probe**

\*Length, shape, custom-made upon request.

\*Can be installed inside the probe temperature sensor, or gold-plated.

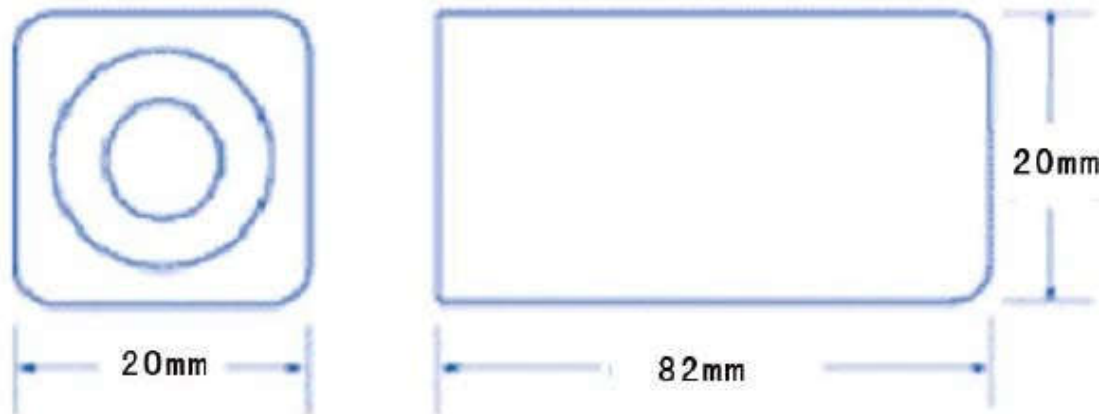
\*Delivery is in 1-4 weeks (non-stock cases) excluding value-added tax and shipping freight.

\*Customers are welcome to inquiry by phone or E-mail.

## 6.2 Dexing Magnet Tech.Co.,Ltd. Zero gausschamber

Zero gauss chamber commonly used in adjusting the probe, the probe is located in a relative zero magnetic field environment and thereby to detect the magnetic field relative to the zero value.

### Zero gauss chamber



## 6.3 Dexing Magnet Tech.Co.,Ltd. Gauss Meter Professional mappingsoftware

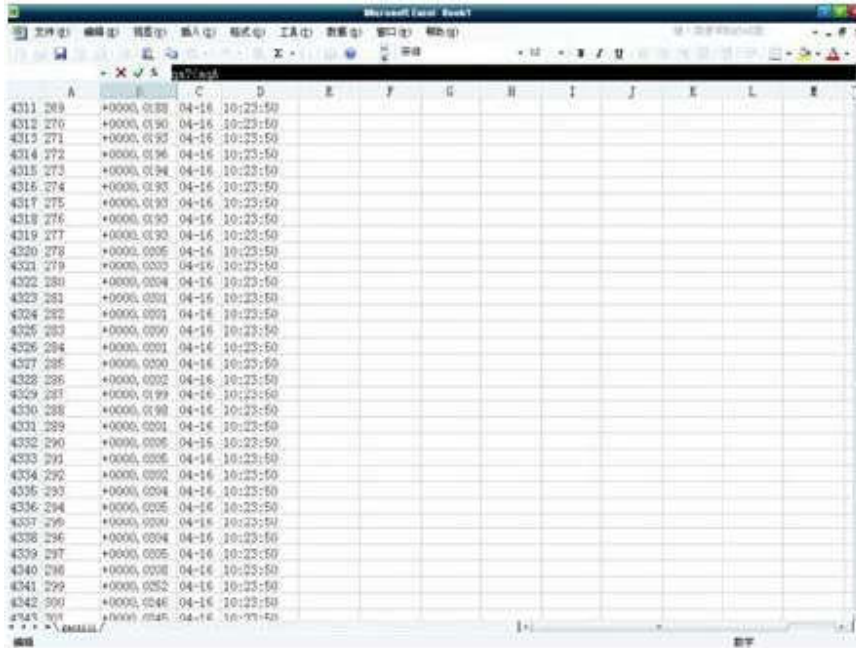
Dexing specially designed the multi-px-1 mapping software that is suitable for Gauss Meter for measuring, storage and mapping.

### Characteristics

*\*Automatic saving data*

Mapping software can automatically put data into the software database, to facilitate the instant query.





*\*Extract data mapping*

Mapping software extracts data mapping support, so that useful data segment will be used to draw graphics.



*\*Mapping coordinates can select the range of data*

In order to accurately draw the detection of graphics, graphics software's axes, the y-axis and the x-axis can be arbitrarily set. Y is defined as: magnetic field intensity (mT) mT, X-axis is defined as: the data axis. You can measure the scope of data to set the Y-axis scale, so you draw graphics clearer, highest resolution graphics. Unique graphics concept, more convenient mapping mode, makes the magnetic measurement of the data more intuitive.

	A	B	C	D	E	F	G	H	I	J	K	L	M
4311	269	+0000.0188	04-16	10:23:50									
4312	270	+0000.0190	04-16	10:23:50									
4313	271	+0000.0193	04-16	10:23:50									
4314	272	+0000.0196	04-16	10:23:50									
4315	273	+0000.0194	04-16	10:23:50									
4316	274	+0000.0193	04-16	10:23:50									
4317	275	+0000.0193	04-16	10:23:50									
4318	276	+0000.0193	04-16	10:23:50									
4319	277	+0000.0193	04-16	10:23:50									
4320	278	+0000.0206	04-16	10:23:50									
4321	279	+0000.0203	04-16	10:23:50									
4322	280	+0000.0204	04-16	10:23:50									
4323	281	+0000.0201	04-16	10:23:50									
4324	282	+0000.0201	04-16	10:23:50									
4325	283	+0000.0200	04-16	10:23:50									
4326	284	+0000.0201	04-16	10:23:50									
4327	285	+0000.0200	04-16	10:23:50									
4328	286	+0000.0202	04-16	10:23:50									
4329	287	+0000.0199	04-16	10:23:50									
4330	288	+0000.0198	04-16	10:23:50									
4331	289	+0000.0201	04-16	10:23:50									
4332	290	+0000.0205	04-16	10:23:50									
4333	291	+0000.0205	04-16	10:23:50									
4334	292	+0000.0202	04-16	10:23:50									
4335	293	+0000.0204	04-16	10:23:50									
4336	294	+0000.0205	04-16	10:23:50									
4337	295	+0000.0200	04-16	10:23:50									
4338	296	+0000.0204	04-16	10:23:50									
4339	297	+0000.0205	04-16	10:23:50									
4340	298	+0000.0208	04-16	10:23:50									
4341	299	+0000.0252	04-16	10:23:50									
4342	300	+0000.0246	04-16	10:23:50									
4343	301	+0000.0245	04-16	10:23:50									

#### \*Database View

Graphics software support database view through access2003 and Excel2003 series versions.

#### \*Chart features such as printing and delivery

Charts can be printed by printing device, and through a variety of ways to send to the remote.

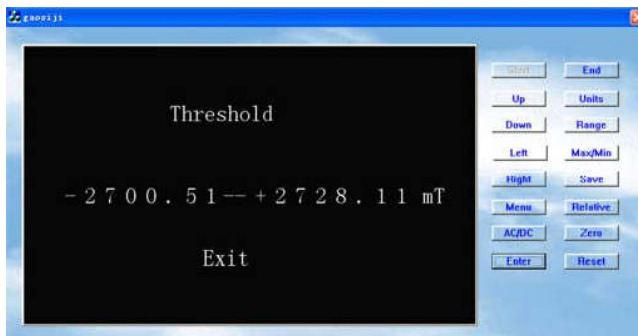
## 6.4 Gauss Meter Remote Control System (serial or USBport)

My company's independent R & D Gauss Meter remote control system is suitable for special magnetic environment, dangerous magnetic equipment, industrial control automation, automated testing, and assembly line production. Automaticity is International Advanced. It is well suited to our entire company model.

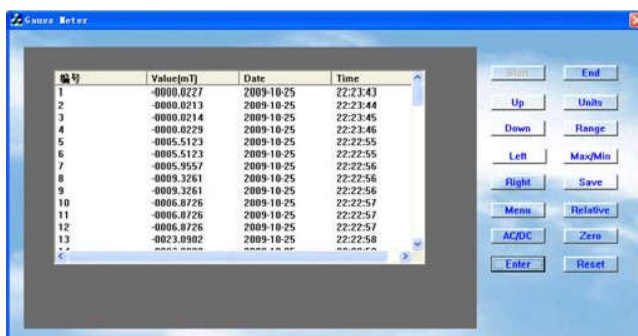
### Main testing interface



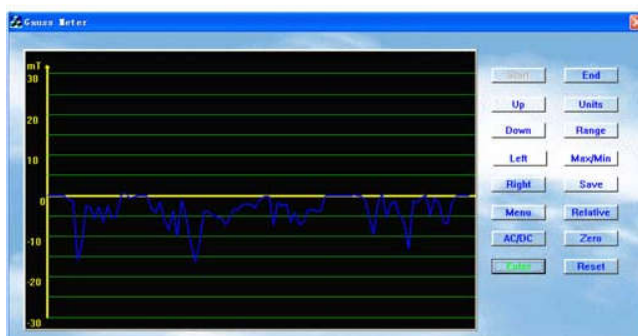
Industrial Control and settings



Data Reading



Historical data and real-time data



Historical data and real-time data mapping

Cable Control Distance: According to the distance between Gauss meter and the MainController

to select the baud rate frequency, the control distance of 300m.

Wireless Control Distance: According to the number of obstructions between the Main Controller and the Gauss meter to select the baud rate frequency, the control distance is 1500m

Note: This system can share a database with mapping software and draw diagrams.



## CHAPTER 7 SERVICE

### 7.0 GENERAL

This chapter provides general Maintenance and usage information for the Dexing Model DX-180 Gauss meter. General maintenance precautions are described in Paragraph 7.1, electrostatic discharge in Paragraph 7.2, fuse replacement in Paragraph 7.3, rear panel connector definitions in Paragraph 7.4, and Serial communication cable in Paragraph 7.5.

### 7.1 GENERAL MAINTENANCE PRECAUTIONS

Below are general safety precautions unrelated to any other procedures in this publication.

1. Keep away from live circuits.
2. Installation personnel and operation, maintenance and repair personnel shall observe all safety regulations at all times.
3. Turn off system power before making or breaking electrical connections. And AC power cord should pull out from the power supply input component on the rear panel after out.
4. Regard any exposed connector, terminal board, or circuit board as a possible shock hazard.
5. If a test connection to energized equipment is required, make the test equipment ground connection before probing the voltage or signal to be tested. Unauthorized organizations or individuals are strictly prohibited from opening instrument chassis of any form of maintenance, in order to ensure maximum personal safety and to maintain the safety performance of the instrument itself.
6. Do not install or service equipment alone. Do not reach into or adjust the equipment without having another person nearby capable of rendering aid.
7. If there is no power, verify the power cord is plugged into a live outlet and that both ends are securely plugged in. Next, check the fuse. Please refer to 6.3.
8. Before clean equipment, firstly, turn off the power, secondly, remove AC power cord and all the rear panel connections or cable from the corresponding components, adapters, or the connector.
9. Clean front and back panels and case with soft cloth dampened with a mild detergent and water solution to remove dust, grease, and other contaminants. Do not use aromatic hydrocarbons or chlorinated solvents to clean the Model DX-180. They may react with the plastic materials used in the controller or the silk screen printing on the back panel.

### 7.2 ELECTROSTATIC DISCHARGE

Electrostatic Discharge (ESD) may damage electronic parts, assemblies, and equipment. ESD is a transfer of electrostatic charge between bodies at different electrostatic

potentials caused by direct contact or induced by an electrostatic field. The low-energy source that most commonly destroys Electrostatic Discharge Sensitive (ESDS) devices is the human body, which generates and retains static electricity. Simply walking across a carpet in low humidity may generate up to 35,000 volts of static electricity. Current technology trends toward greater complexity, increased packaging density, and thinner dielectrics between active elements, which results in electronic devices with even more ESD sensitivity. Some electronic parts are more ESDS than others. ESD levels of only a few hundred volts may damage electronic components such as semiconductors, thick and thin film resistors, and piezoelectric crystals during testing, handling, repair, or assembly. Discharge voltages below 4000 volts cannot be seen, felt, or heard.

### 7.2.1 Identification of Electrostatic Discharge Sensitive Components

Below are various industry symbols used to label components as ESDS:



### 7.2.2 Handling Electrostatic Discharge Sensitive Components

Observe all precautions necessary to prevent damage to ESDS components before attempting installation. Bring the device and everything that contacts it to ground potential by providing a conductive surface and discharge paths. As a minimum, observe these precautions:

1. De-energize or disconnect all power and signal sources and loads used with unit.
2. Place unit on a grounded conductive worksurface.
3. Ground technician through a conductive wrist strap (or other device) using 1M series resistor to protect operator.
4. Ground any tools, such as soldering equipment that will contact unit. Contact with operator's hands provides a sufficient ground for tools that are otherwise electrically isolated.
5. Place ESDS devices and assemblies removed from a unit on a conductive work surface or in a conductive container. An operator inserting or removing a device or assembly from a container must maintain contact with a conductive portion of the container. Use only plastic bags approved for storage of ESD material.
6. Do not handle ESDS devices unnecessarily or remove from the packages until actually used or tested.

## 7.3 FUSE REPLACEMENT

Below is the procedure to remove and replace a line fuse. Test fuse with ohmmeter. Do

not rely on visual inspection of fuse.

**WARNING:** To avoid potentially lethal shocks, turn off controller and disconnect it from AC power before performing these procedures.

**CAUTION:** For continued protection against fire hazard, replace only with the same fuse type.

1. Turn power switch Off(O).
2. Remove instrument powercord.
3. Identify the fuse assembly just above the power input assembly on the instrument rearpanel.
4. Release the drawer holding the fuse. Remove existing fuse(s). Replacewith 220V/0.5A Slow-Blowfuse.
5. Re-assemble the drawer holding the fuse andTighten.
6. Connect instrument powercord.
7. Turn power switch On(I).

**NOTE:** Some DX-180 used for special purposes should use the 220V/0.25A Slow-Blow fuse.

### 7.4 REAR PANEL CONNECTORDEFINITIONS

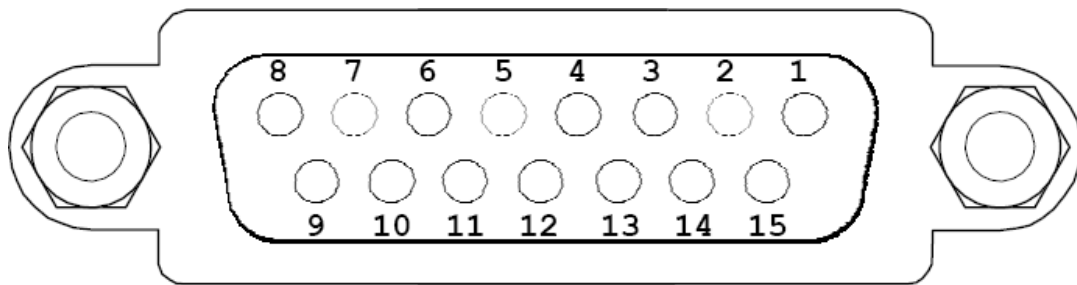
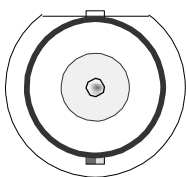


Figure 7- 1Probe Input on the rear panel



Pins	Describe
1	Voltageoutput V Centerconductor
2	Referenced ConnectorShell

Note:

There is electrical connection between BNC socket shell and chassis body. BNC socket shell and chassis body may not have the equal potential.

Figure 7- 2 the rear panel analog monitor output BNC jack



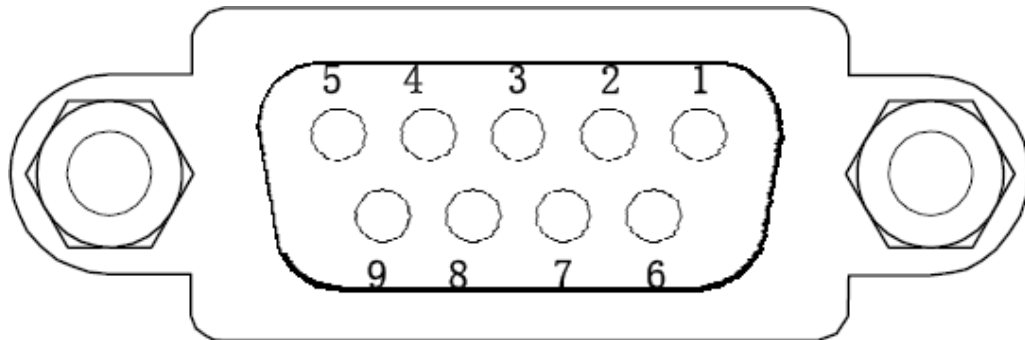


Figure 7- 3 Serial I/O Connector on the rear Panel

DX-180(DCE)		PC(DTE)			
DB-9F		DB-25M		DB-9M	
Pin No.	Description	Pin No.	Description	Pin No.	Description
1	No Connection	2	Tx	1	DCD
2	Transmit Data(Tx)	3	Rx	2	Rx
3	Receive Data(Rx)	4	RTS	3	Tx
4	No Connection	5	CTS	4	DTR
5	GND	6	DSR	5	GND
6	No Connection	7	GND	6	DSR
7	No Connection	8	DCD	7	RTS
8	No Connection	20	DTR	8	CTS
9	No Connection	22	Ring in	9	Ring in

Figure 7- 4 Serial I/O Connector Detail

## 7.5 Serial Interface CableWiring

DX-180 uses a serial straight-through cable (Annex RS232-DCE9) to connect the computer's 9-pin serial interface. Under the certain cable order, it Can also use the correct adapter to connect the computer's 25-pin serial interface.

The following are suggested cable wiring diagrams for connecting the Model DX-180 Serial Interface to Customer Personal Computers (PCs).

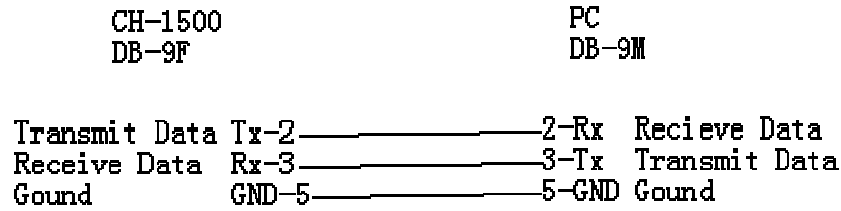


Figure 7- 5 DX-180 connect to PC 9 pin Serial I/O



## APPENDIX A UNITS FOR MAGNETIC PROPERTIES

Quantity	Symbol	Gaussian and CGS emu <sup>a</sup>	Conversion Factor, C <sup>b</sup>	SI and Rationalized mks <sup>c</sup>
Magnetic flux density, Magnetic induction	B	gauss (G) <sup>d</sup>	10 <sup>-4</sup>	tesla (T), Wb/m <sup>2</sup>
Magnetic Flux	φ	maxwell (Mx), G·cm <sup>2</sup>	10 <sup>-8</sup>	weber (Wb), volt second (V·s)
Magnetic potential difference, magnetomotive force	U, F	gilbert (Gb)	10/4π	ampere (A)
Magnetic field strength, magnetizing force	H	oersted (Oe), <sup>e</sup> Gb/cm	10 <sup>3</sup> /4π	A/m <sup>f</sup>
(Volume) magnetization <sup>g</sup>	M	emu/cm <sup>3h</sup>	10 <sup>3</sup>	A/m
(Volume) magnetization	4πM	G	10 <sup>3</sup> /4π	A/m
Magnetic polarization, intensity of magnetization	J, I	emu/cm <sup>3</sup>	4π × 10 <sup>-4</sup>	T, Wb/m <sup>2i</sup>
(Mass) magnetization	σ, M	emu/g	$\frac{1}{4\pi \times 10^{-7}}$	A·m <sup>2</sup> /kg Wb·m/kg
Magnetic moment	m	emu, erg/G	10 <sup>-3</sup>	A·m <sup>2</sup> , joule per tesla (J/T)
Magnetic dipole moment	j	emu, erg/G	4π × 10 <sup>-10</sup>	Wb·m <sup>l</sup>
(Volume) susceptibility	χ, κ	dimensionless emu/cm <sup>3</sup>	$\frac{1}{(4\pi)^2} \times 10^{-7}$	Henry per meter (H/m), Wb/(A·m)
(Mass) susceptibility	χ <sub>p</sub> , κ <sub>p</sub>	cm <sup>3</sup> /g, emu/g	$\frac{4\pi \times 10^{-3}}{(4\pi)^2 \times 10^{-10}}$	m <sup>3</sup> /kg H·m <sup>2</sup> /kg
(Molar) susceptibility	χ <sub>mol</sub> , κ <sub>mol</sub>	cm <sup>3</sup> /mol, emu/mol	$\frac{4\pi \times 10^{-6}}{(4\pi)^2 \times 10^{-13}}$	m <sup>3</sup> /mol H·m <sup>2</sup> /mol
Permeability	μ	dimensionless	4π × 10 <sup>-7</sup>	H/m, Wb/(A·m)
Relative permeability <sup>j</sup>	μ <sub>r</sub>	not defined	—	dimensionless
(Volume) energy density, energy product <sup>k</sup>	W	erg/cm <sup>3</sup>	10 <sup>-1</sup>	J/m <sup>3</sup>
Demagnetization factor	D, N	dimensionless	1/4π	dimensionless

**Table A-1. Conversion from CGS to SI Units**

Quantity	Symbol	Value (SI units)
Permeability of Vacuum	$\mu_0$	$4\pi \times 10^{-7} \text{ H m}^{-1}$
Speed of Light in Vacuum	$c$	$2.9979 \times 10^8 \text{ m s}^{-1}$
Permittivity of Vacuum	$\epsilon_0 = (\mu_0 c^2)^{-1}$	$8.8542 \times 10^{-12} \text{ F m}^{-1}$
Fine Structure Constant, $\mu_0 c e^2 / 2h$	$\alpha$ $\alpha^{-1}$	0.0073 137.0360
Elementary Charge	$e$	$1.6022 \times 10^{-19} \text{ C}$
Planck's Constant	$h$ $h = h/2\pi$	$6.6262 \times 10^{-34} \text{ J Hz}^{-1}$ $1.0546 \times 10^{-34} \text{ J s}$
Avogadro's Constant	$N_A$	$6.0220 \times 10^{23} \text{ mol}^{-1}$
Atomic Mass Unit	$1 \text{ u} = 10^{-3} \text{ kg mol}^{-1} / N_A$	$1.6605 \times 10^{-27} \text{ kg}$
Electron Rest Mass	$m_e$	$0.9109 \times 10^{-30} \text{ kg}$ $5.4858 \times 10^{-4} \text{ u}$
Proton Rest Mass	$m_p$	$1.6726 \times 10^{-27} \text{ kg}$ $1.0073 \text{ u}$
Neutron Rest Mass	$m_n$	$1.6749 \times 10^{-27} \text{ kg}$ $1.0087 \text{ u}$
Magnetic Flux Quantum	$\phi = h/2e$ $h/e$	$2.0679 \times 10^{-15} \text{ Wb}$ $4.1357 \times 10^{-15} \text{ J Hz}^{-1} \text{ C}^{-1}$
Josephson Frequency-Voltage Ratio	$2e/h$	$483.5939 \text{ THz V}^{-1}$
Quantum of Circulation	$h/2m_e$ $h/m_e$	$3.6369 \times 10^{-4} \text{ J Hz}^{-1} \text{ kg}^{-1}$ $7.2739 \times 10^{-4} \text{ J Hz}^{-1} \text{ C}^{-1}$
Rydberg Constant	$R_\infty$	$1.0974 \times 10^7 \text{ m}^{-1}$
Proton Moment in Nuclear Magnetons	$\mu_p / \mu_N$	2.7928
Bohr Magneton	$\mu_B = eh/2m_e$	$9.2741 \times 10^{-24} \text{ J T}^{-1}$
Proton Gyromagnetic Ratio	$\gamma_p$	$2.6752 \times 10^8 \text{ s}^{-1} \text{ T}^{-1}$
Diamagnetic Shielding Factor, Spherical H <sub>2</sub> O Sample	$1 + \sigma(\text{H}_2\text{O})$	1.0000
Molar Mass Constant	$R$	$8.3144 \text{ J mol}^{-1} \text{ K}^{-1}$
Molar Volume, Ideal Gas ( $T_0 = 273.15\text{K}$ , $p_0 = 1 \text{ atm}$ )	$V_m = RT_0/p_0$	$0.0224 \text{ m}^3 \text{ mol}^{-1}$
Boltzman Constant	$k = R/N_A$	$1.3807 \times 10^{-23} \text{ J K}^{-1}$
Stefan-Boltzman Constant	$\sigma = (\pi^2/60) k^4/h^3 c^2$	$5.6703 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$
First Radiation Constant	$c_1 = 2\pi hc^2$	$3.7418 \times 10^{-16} \text{ W m}^{-2}$
Second Radiation Constant	$c_2 = hc/k$	0.0144 mK
Gravitation Constant	$G$	$6.6720 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$

Table A-2. Recommended SI Values for Physical Constants

## APPENDIX B GLOSSARY OF TERMINOLOGY

**accuracy.** The degree of correctness with which a measured value agrees with the true value.<sup>2</sup>

**American Standard Code for Information Exchange (ASCII).** A standard code used in data transmission, in which

128 numerals, letters, symbols, and special control codes are represented by a 7-bit binary number as follows:

Bits					Col.	0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1	
b <sub>7</sub>	b <sub>6</sub>	b <sub>5</sub>	b <sub>4</sub>	b <sub>3</sub>	b <sub>2</sub>	b <sub>1</sub>	0	1	2	3	4	5	6	7
1	1	1	1	1	0	1	NUL	DLE	SP	0	'	P	@	p
0	0	0	0	0	0	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	0	0	1	STX	DC2	"	2	B	R	b	r
0	0	1	1	0	0	1	ETX	DC3	#	3	C	S	c	s
0	1	0	0	0	0	1	EOT	DC4	\$	4	D	T	d	t
0	1	0	1	0	0	1	ENG	NAK	%	5	E	U	e	u
0	1	1	0	0	0	1	ACK	SYN	&	6	F	V	f	v
0	1	1	1	0	0	1	BEL	ETB	'	7	G	W	g	w
1	0	0	0	0	0	1	BS	CAN	(	8	H	X	h	x
1	0	0	0	1	0	1	HT	EM	)	9	I	Y	i	y
1	0	1	0	0	0	1	LF	SS	*	:	J	Z	j	z
1	0	1	1	0	0	1	VT	ESC	+	;	K	[	k	(
1	1	0	0	0	0	1	FF	FS	,	<	L	~	l	~
1	1	0	1	0	0	1	CR	GS	-	=	M	]	m	)
1	1	1	0	0	0	1	SO	RS	.	>	N	^	n	
1	1	1	1	0	0	1	SI	US	/	?	O	_	o	DEL

**American Wire Gage (AWG).** Wiring sizes are defined as diameters in inches and millimeters as follows:

AWG Dia. In.	Dia.mm	AWG	Dia. In.	Dia.Mm	AWG Dia. In.	Dia. mm	AWG Dia. In.	Dia.mm
1	0.2893	7.348	11	0.0907	2.304	21	0.0285	0.7230
2	0.2576	6.544	12	0.0808	2.053	22	0.0253	0.6438
3	0.2294	5.827	13	0.0720	1.829	23	0.0226	0.5733
4	0.2043	5.189	14	0.0641	1.628	24	0.0207	0.5106
5	0.1819	4.621	15	0.0571	1.450	25	0.0179	0.4547
6	0.1620	4.115	16	0.0508	1.291	26	0.0159	0.4049
7	0.1443	3.665	17	0.0453	1.150	27	0.0142	0.3606
8	0.1285	3.264	18	0.0403	1.024	28	0.0126	0.3211
9	0.1144	2.906	19	0.0359	0.9116	29	0.0113	0.2859
10	0.1019	2.588	20	0.0338	0.8118	30	0.0100	0.2546
						40	0.00314	0.07987

**ampere.** The constant current that, if maintained in two straight parallel conductors of infinite length, of negligible circular cross section, and placed one meter apart in a vacuum, would produce between these conductors a force equal to 2 × 10<sup>-7</sup> Newton per meter of length.<sup>2</sup> This is one of the base units of the SI.

**ampere/meter (A/m).** The SI unit for magnetic field strength (H). 1 ampere/meter = 4π/1000 oersted

**analog output.** A voltage output from an instrument that is proportional to its input. From an instrument such as a digital voltmeter, the output voltage is generated by a digital-to-analog converter with a discrete number of voltage levels.

**B.** Symbol for magnetic flux density. See Magnetic Flux Density.

**baud.** A unit of signaling speed equal to the number of discrete conditions or signal events per second, or the reciprocal of the time of the shortest signal element in a character.<sup>2</sup>

**bit.** A contraction of the term "binary digit"; a unit of information represented by either a zero or a one.<sup>2</sup>

**Celsius (°C) Scale.** A temperature scale that registers the freezing point of water as 0 °C and the boiling point as 100°C under normal atmospheric pressure. Celsius degrees are purely derived units, calculated

from the Kelvin Thermodynamic Scale. Formerly known as "centigrade." See Temperature for conversions.

**deviation.** The difference between the actual value of a controlled variable and the desired value corresponding to the setpoint.<sup>1</sup>

**drift, instrument.** An undesired but relatively slow change in output over a period of time, with a fixed reference input.

*Note:* Drift is usually expressed in percent of the maximum rated value of the variable being measured.<sup>2</sup>

**electron.** An elementary particle containing the smallest negative electric charge. *Note:* The mass of the electron is approximately equal to 1/1837 of the mass of the hydrogen atom.<sup>2</sup>

**electrostatic discharge (ESD).** A transfer of electrostatic charge between bodies at different electrostatic potentials caused by direct contact or induced by an electrostatic field.

**error.** Any discrepancy between a computed, observed, or measured quantity and the true, specified, or theoretically correct value or condition.<sup>2</sup>

**gauss (G).** The cgs unit for magnetic flux density (B). 1 gauss =  $10^{-4}$  tesla = 1 Mx/cm<sup>2</sup> = line/cm<sup>2</sup>. Named for Karl Fredrich Gauss (1777 – 1855) a German mathematician, astronomer, and physicist.

**Greek alphabet.** The Greek alphabet is defined as follows:

Alpha	α	A	Iota	ι	I	Rho	ρ	P
Beta	β	B	Kappa	κ	K	Sigma	σ	Σ
Gamma	γ	Γ	Lambda	λ	Λ	Tau	τ	T
Delta	δ	Δ	Mu	μ	M	Upsilon	υ	Υ
Epsilon	ε	E	Nu	ν	N	Phi	φ	Φ
Zeta	ζ	Z	Xi	ξ	Ξ	Chi	χ	X
Eta	η	H	Omicron	ο	O	Psi	ψ	Ψ
Theta	θ	Θ	Pi	π	Π	Omega	ω	Ω

**ground.** A conducting connection, whether intentional or accidental, by which an electric circuit or equipment is connected to the earth, or to some conducting body of large extent that serves in place of the earth. *Note:* It is used for establishing and maintaining the potential of the earth (or of the conducting body) or approximately that potential, on conductors connected to it, and for conducting ground current to and from the earth (or of the conducting body).<sup>2</sup>

**hertz (Hz).** A unit of frequency equal to one cycle per second.

**IEEE.** Institute of Electrical and Electronics Engineers.

**Kelvin (K).** The unit of temperature on the Kelvin Scale. It is one of the base units of SI. The word "degree" and its symbol (°) are omitted from this unit. See Temperature Scale for conversions.

**Kelvin Scale.** The Kelvin Thermodynamic Temperature Scale is the basis for all international scales, including the ITS-90. It is fixed at two points: the absolute zero of temperature (0 K), and the triple point of water (273.16 K), the equilibrium temperature that pure water reaches in the presence of ice and its own vapor.

**line voltage.** The RMS voltage of the primary power source to an instrument.

**magnetic units.** Units used in measuring magnetic quantities. Includes ampere-turn, gauss, gilbert, line of force, maxwell, oersted, and unit magnetic pole.

**NBS.** National Bureau of Standards. Now referred to as NIST.

**National Institute of Standards and Technology (NIST).** Government agency located in Gaithersburg, Maryland and Boulder, Colorado, that defines measurement standards in the United States. See Standards Laboratories for an international listing.

**noise (electrical).** Unwanted electrical signals that produce undesirable effects in circuits of control systems in which they occur.<sup>2</sup>

**ohm (Λ).** The SI unit of resistance (and of impedance). The ohm is the resistance of a conductor such that a constant current of one ampere in it produces a voltage of one volt between its ends.<sup>2</sup>

**ppm.** Parts per million, e.g.,  $4 \times 10^{-6}$  is four parts per million.

**precision.** Careful measurement under controlled conditions which can be repeated with similar results. See repeatability. Also means that small differences can be detected and measured with confidence. See resolution.

**prefixes.** SI prefixes used throughout this manual are as follows:

<u>Factor</u>	<u>Prefix</u>	<u>Symbol</u>	<u>Factor</u>	<u>Prefix</u>	<u>Symbol</u>
$10^{24}$	yotta	Y	$10^{-1}$	deci	d
$10^{21}$	zetta	Z	$10^{-2}$	centi	c
$10^{18}$	exa	E	$10^{-3}$	milli	m
$10^{15}$	peta	P	$10^{-6}$	micro	$\mu$
$10^{12}$	tera	T	$10^{-9}$	nano	n
$10^9$	giga	G	$10^{-12}$	pico	p
$10^6$	mega	M	$10^{-15}$	femto	f
$10^3$	kilo	k	$10^{-18}$	atto	a
$10^2$	hecto	h	$10^{-21}$	zepto	z
$10^1$	deka	da	$10^{-24}$	yocto	y

**probe.** A long, thin body containing a sensing element which can be inserted into a system in order to make measurements. Typically, the measurement is localized to the region near the tip of the probe. **repeatability.** The closeness of agreement among repeated measurements of the same variable under the same conditions.<sup>2</sup>

**resolution.** The degree to which nearly equal values of a quantity can be discriminated.<sup>2</sup>

**display resolution.** The resolution of an instrument's physical display. This is not always the same as the measurement resolution of the instrument. Decimal display resolution specified as "n digits" has  $10^n$  possible display values. A resolution of n and one-half digits has  $2 \times 10^n$  possible values.

**measurement resolution.** The ability of an instrument to resolve a measured quantity. For digital instrumentation this is often defined by the analog to digital converter being used. A n-bit converter can resolve one part in  $2^n$ . The smallest signal change that can be measured is the full scale input divided by  $2^n$  for any given range. Resolution should not be confused with accuracy.

**root mean square (RMS).** The square root of the time average of the square of a quantity; for a periodic quantity the average is taken over one complete cycle. Also known as effective value.<sup>1</sup>

**RS-232C.** Bi-directional computer serial interface standard defined by the Electronic Industries Association (EIA). The interface is single-ended and non-addressable.

**semiconducting material.** A conducting medium in which the conduction is by electrons, and holes, and whose temperature coefficient of resistivity is negative over some temperature range below the melting point.<sup>2</sup>

**semiconductor.** An electronic conductor, with resistivity in the range between metals and insulators, in which the electric charge carrier concentration increases with increasing temperature over some temperature range. Note: Certain semiconductors possess two types of carriers, namely, negative electrons and positive holes.<sup>2</sup>

**setpoint.** The value selected to be maintained by an automatic controller.<sup>1</sup>

**serial interface.** A computer interface where information is transferred one bit at a time rather than one byte (character) at a time as in a parallel interface. RS-232C is a common serial interface.

**stability.** The ability of an instrument or sensor to maintain a constant output given a constant input.

**tesla (T).** The SI unit for magnetic flux density (B). 1 tesla =  $10^4$  gauss

**tolerance.** The range between allowable maximum and minimum values.

**Underwriters Laboratories (UL).** An independent laboratory that establishes standards for commercial and industrial products.

**unit magnetic pole.** A pole with a strength such that when it is placed 1 cm away from a like pole, the force between the two is 1 dyne.

**volt (V).** The difference of electric potential between two points of a conductor carrying a constant current of one ampere, when the power dissipated between these points is equal to one watt.<sup>2</sup>

**volt-ampere (VA).** The SI unit of apparent power. The volt-ampere is the apparent power at the points of entry of a singlephase, two-wire system when the product of the RMS value in amperes of the current by the RMS value in volts of the voltage is equal to one.<sup>2</sup>

**watt (W).** The SI unit of power. The watt is the power required to do work at the rate of 1 joule per second.<sup>2</sup>

Thank you for using DX-180 high-resolution high-precision Gauss Meter  
Dexing Magnet Tech.Co.,Ltd.