

# DTM-333

## Digital Teslameter Operations Manual



**Made in New Zealand**

**Group3 Technology Ltd.**  
2 Charann Place, Avondale  
Auckland 1026 , New Zealand

PO Box 71-111, Rosebank, Auckland 1348, New Zealand

Phone: +64 9 828 3358

Fax: +64 9 828 3357

Email: [sales@group3technology.com](mailto:sales@group3technology.com)

Web: <http://www.group3technology.com>

## INTRODUCTION

Thank you for purchasing and using a Group3 Digital Teslameter. We hope you will join the many thousands of users worldwide who are enthusiastic about our products.

The DTM-333 is a 3-Axis, 3-Channel Digital Teslameter product of Group3. It uses the same technology with that of a DTM-133 but in a 3-channel, 3-axis configuration. On top of that the external mechanical switches have now been upgraded to give users the ease of operating it using the touch screen interface of a robust 7-inch industrial tablet. It runs on a Group3 custom-made android-based app which gives a smooth and user-friendly operation that boast a touch screen interface to operate the DTM.

Another feature of the DTM-333 is its data logging capability where user can do their data gathering on the DTM itself and saves the output CSV file on to an external memory drive such as a USB drive or hard disk. This eliminates the need for a separate computer terminal and software to do a data log of a session such as field mapping of a magnet.

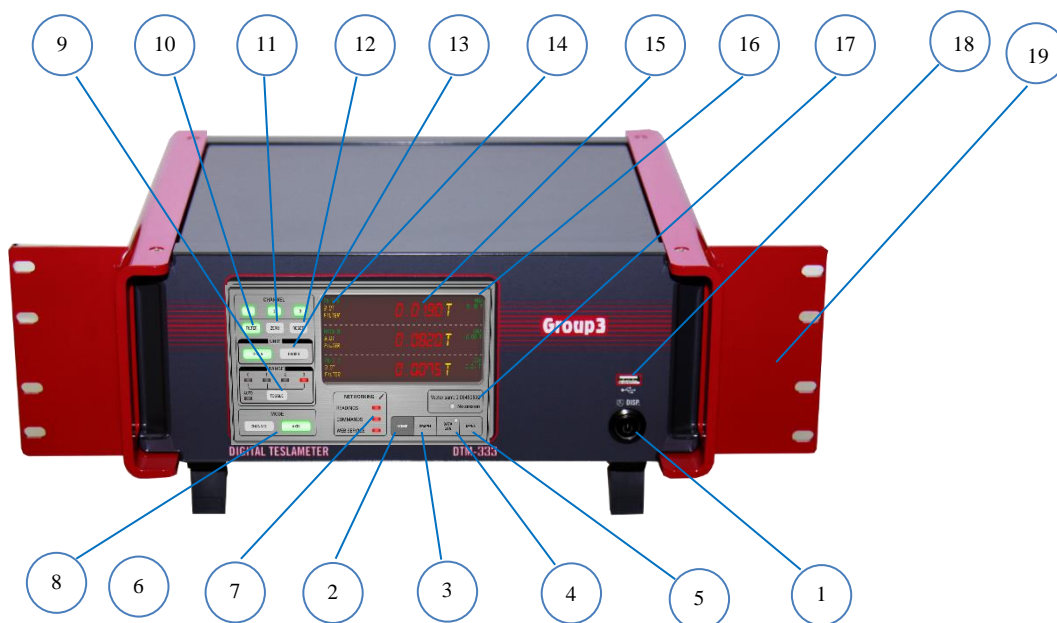
The DTM-333 also boast of a graphical display of all 3 axis/channel simultaneously. Users can see the behavior of a session instead of just looking at the field reading. The graphical display lets the user monitor visually if there are sudden or abrupt changes in the field of any of the three fields over a period. The time and field range are configurable depending on the user's preferences. The vector sum of the 3 fields is calculated and shown on the HOME tab and at the GRAPH tab.

Using a custom-built 3DT-132 probe is the perfect probe to measure fields in three directions (axis mode) simultaneously. If each unit will be use separately or individually as in channel mode, three (3) MPT-132 or LPT-132 probes can also be use.

Group3 has been designing and building magnetic field measuring equipment since 1983. We are constantly upgrading our products and support documentation. We welcome input from our customers, so if there are aspects of the instrument which you particularly like, or which you would like to see improved, please contact your Group3 supplier (see back page for a complete list) or Group3 directly with your suggestions to [sales@group3technology.com](mailto:sales@group3technology.com).

The Group3 website, [www.group3technology.com](http://www.group3technology.com) contains details of all our products. This site is regularly updated, so check it from time to time to learn about recent developments.

## DTM-333 Digital Teslameter Features



### FRONT PANEL

1	Power Button	Press to turn ON and OFF the unit
2	HOME Tab	Touch to show the Main Readings screen
3	GRAPH Tab	Touch to show and access Graph and configure controls
4	DATA LOG Tab	Touch to do data logs and change Date/Time
5	MENU Tab	Touch to access the DTM's manual controls
6	NETWORKING	Touch to access Ethernet networking controls
7	LED Buttons	Touch to turn ON/OFF the Readings/Commands/Web Service controls
8	MODE Button	Touch Channel to operate individual DTM or Axis to operate all 3 DTMs
9	TOGGLE Button	Touch to change the DTM range
10	FILTER Button	Touch to turn ON/OFF the filter. Lights up a green color when ON.
11	ZERO Button	Touch to set the reading to Zero. A green color indicates current unit.
12	RESET Button	Touch to reset the unit.
13	UNIT Button	Touch to choose either Gauss or Tesla.
14	Channel, Range & Filter	Indicates the Channel/Axis, current range and filter status
15	Field Indicator	Shows the measured magnetic field and temperature reading
16	Maximum Field Indicator	Shows the maximum field measured
17	Session Indicator	A GREEN light shows when an ongoing session. Otherwise, LED is in RED
18	USB Port	Insert your USB Drive or memory stick to save data log files
19	Mounting Cheeks	Panel mounting to a 19" rack. (optional)



### REAR PANEL

1	DC Input Socket	Attach the supplied DC Power supply and lock to secure the power plug.
2	Analogue Output	Attach BNC connector to get analogue output
3	Hall Probe Socket	Attach the probe plug into this socket and secure using 2 jackscrews
4	Ethernet Port	Attach Ethernet jack (RJ45) to communicate with LabView interface
5	USB Port	Additional USB port for memory drives

### CONNECTIVITY

**Ethernet Port** Unit has a built-in Ethernet port for communication over network

The DTM-333 Digital Teslameter offers accurate measurement of magnetic flux density, with direct digital readout in tesla or gauss. The instrument is robust, solid and the probes are easy to use. The DTM-333 has been engineered to withstand the severe electrical interference produced by high voltage discharge.

## **FEATURES**

Measures magnetic fields over four ranges up to 3 tesla with polarity indication; resolution up to 1 part in 6,000. Range selection is manual or by selectable auto-ranging.

Used with special miniature Hall probe - easy to attach to magnet pole or other hardware. Probe holders are available as optional accessories.

Accuracy and temperature specifications include total system performance, probe and instrument. This is the only meaningful indication of measurement accuracy. Probe is calibrated, with field characteristics stored in memory chip contained in cable plug.

Accuracy is better than  $\pm 0.03\%$  for the complete system, probe and instrument.

Temperature coefficient is better than 100ppm/ $^{\circ}\text{C}$  for the overall system.

Accuracy is verified against nuclear magnetic resonance (NMR) standard.

Probe calibration is verified at many field points on every probe, and a printed calibration table is supplied with every probe.

Peak hold is implemented digitally, has zero sag.

Digital filtering of the displayed field reading suppresses short-term fluctuations. The filtering characteristic is non-linear; small field variations within a narrow window centered on the currently displayed value are filtered; large field changes are displayed immediately. Filter window and time-constant may be changed. Filtering can be switched at the Home Tab display.

With digital communications, each channel of the DTM-333 can deliver 30 readings per second.

An analog output gives instantaneous field value (0 to 9 kHz), not corrected for probe non-linearity.

Mounting cheeks can be ordered to mount in a 19" rack.

## SPECIFICATIONS OF DTM-333 SYSTEM

### Specifications of each Channel / Axis of DTM-333 with LPT-130 or MPT-132 Hall Probe.

**Measurements** magnetic field density in tesla or gauss

**Field ranges** 0.3 0.6 1.2 3.0 tesla full-scale,  
3 6 12 30 kilogauss full-scale,  
with polarity indication and selectable autoranging  
maximum calibrated field  $\pm 2.2$  tesla,  $\pm 22$  kilogauss

**Resolution** 1 in 12,000 of bipolar span with digital filtering on

Range	Display resolution	
	Gauss	Tesla
0.3	0.5	0.00005
0.6	1	0.0001
1.2	2	0.0002
3.0	5	0.0005

**Accuracy** DTM-333 with 3DT-132 probe:  
 $\pm(0.03\%$  of reading +  $0.03\%$  of full-scale) max. at  $25^{\circ}\text{C}$

**Temperature stability** DTM-333 with LPT-130 probe:  
calibration: -100 ppm of reading/ $^{\circ}\text{C}$  max.  
add -3ppm/ $^{\circ}\text{C}$  for each meter of probe cable  
zero drift:  $\pm(8$  microtesla +  $0.0015\%$  of full-scale)/ $^{\circ}\text{C}$  max.

**Temperature stability** DTM-333 with 3DT-132 probe:  
calibration: -100 ppm of reading/ $^{\circ}\text{C}$  typical  
-140 ppm of reading/ $^{\circ}\text{C}$  max.  
add -3ppm/ $^{\circ}\text{C}$  for each meter of probe cable  
zero drift:  $\pm(15$  microtesla +  $0.0010\%$  of full-scale)/ $^{\circ}\text{C}$  typical  
 $\pm(40$  microtesla +  $0.0015\%$  of full-scale)/ $^{\circ}\text{C}$  max.

**Time stability**  $\pm 0.1\%$  max. over 1 year

**Measurement rate** 30 fully corrected measurements per second

**Display rate** 10 display updates per second

**Response time** full-scale change of field reading settles to within resolution in  
less than 0.2 second (filtering off - see below)

**Peak hold mode** displays maximum field since mode entered or reset -  
peak hold is implemented digitally with zero sag or decay

**Display** Touchscreen, soft key navigation, simulated 7-character, 7-segment alphanumeric display

**Tabs** HOME:

- **Field reading** display of all 3 Axis or Channel in simulated 7-segment display
- Field Unit in either **GAUSS** or **TESLA** indicated by GREEN backlight
- When on **Channel Mode**, each channel can be set individually. On **Axis Mode** (default), all three channels are operated simultaneously.
- **FILTER** is set to ON by default as indicated by a GREEN backlight, press to turn OFF.
- Press **RESET** button to do a power cycle and reset the unit.
- Press **ZERO** button to zero any stray field.
- **Maximum Field, Filter, Mode** and **Range** status are displayed inside the readings display.
- **SESSION** indicator lights up GREEN when there is a session running. Graph can be zoomed in or out if a session is in progress.
- Displays the number of **Out of Range** readings in that session

- **Vector Sum** shows the value in real time when there is a session running
- Range indicator is lit in RED. Press the **TOGGLE** button to select the range.
- **Networking** – LAN port available. Communicates with any Windows PC using DHCP.

**GRAPH:**

- Graphical representation of field on 3 channels/axis
- Field readings of all 3 channels/axis including maximum field
- Configuration button to set time frame, offsets and zeroing
- **SESSION** indicator lights up GREEN when there is a session running. Graph can be zoomed in or out if a session is in progress.
- Displays the number of **Out of Range** readings in that session
- **Vector Sum** shows the value in real time when there is a session running

**DATA LOG:**

- Set the sample number and sample rate
- Displays the memory capacity information when a USB memory stick / drive is inserted
- Display the Time/Date and is configurable by pressing the time/date text
- Multiple session is available

**MENU:**

- Master functions as well as other control features such as resetting, zeroing, filtering, etc. are available in this tab.

**MODE**

Operate in Axis (default) or Channel Mode.

**Analog output**

instantaneous field analog:  
 full-scale output:  $\pm 3V$  nominal  
 source impedance: 1000 $\Omega$   
 accuracy:  $\pm 10\%$   
 bandwidth: 9kHz at -3dB, rolloff 3-pole 60dB/decade

**Memory backup**

user-entered data stored indefinitely in non-volatile memory

**Power source  
(per channel)**

ac: min 8V, 0.75A rms  
 max 15V, 0.35A rms  
 dc: min 10V, 0.5A dc  
 max 19V, 0.2A dc  
 (because a switch-mode regulator is used, input current falls as the voltage rises)  
 ac line input plugpack supplied.  
 Power fuse on processor board: 1 amp anti-surge 5 x 20mm

**Data Log**

Via USB, data log of 3 axis, 3 channel saved in CSV format

**Enclosure**

All metal, with tilt stand on bench models, mounting cheeks on rack

**Dimensions**

350 (L) x 320 (W) x 150 (H, including feet ) mm ,

**Instrument Weight  
(case)**

7.0 kg, , shipping weight 14Kg (includes power pack, mounting cheeks and hard

**Ambient field**

Maximum operating field for electronics package:  
 10 millitesla with single-range probe,  
 0.5 millitesla with multi-range probe.

**Temperature range**

0 to 50°C operating, absolute maximum temperature of probe 60°C

Probes standard sensitivity transverse types: LPT-130, MPT-132, 3DT-132  
high sensitivity transverse types: LPT-230, MPT-230

Digital data format ASCII input commands and output responses  
Commands requests for field values; setting and inspection of display and control modes; field measurement triggering;  
entry of numerical  
values; setting units, output data format, and filter characteristics; test commands.

## ORDER CODES

### DTM-333-NS

#### Recommended Probes:

3- Axis Probe: **3DT-132 , 3DT-230**

Individual Probes: **MPT-132 , MPT230 , LPT-130 , LPT-230**

### Probes

Four ranges, standard 2 meter cable

**LPT-130** | standard sensitivity

**MPT-132** | probes

**LPT-230** | high sensitivity

**MPT-230** | probes

Single range probes: add range suffix **-03, -06, -12, -30**.

Special probe cable lengths: add length suffix **-Xm** or **-Xs**,

for **X** substitute cable length in meters, 30 max.

**m** denotes unshielded cable, **s** denotes shielded cable.

Example: LPT-130-2m

### Accessories

Part No. 17000112

3-Axis Probe Holder for MPT-132 / MPT-230

Part No. 17000163

Panel Mount Plates (mounting cheek plates)

## CONNECTING THE HALL PROBE

### Before handling the probe, please read the following:

Group3 Hall probes are built to be as robust as possible for a small, precision device. However, it is most important that certain precautions be taken when handling and installing probes so that they are not damaged or destroyed, and to preserve their accurate calibration.

Mount the probe head so there is no pressure which will tend to bend or depress its ceramic rear surface. If the probe head is clamped, make sure the surface in contact with the ceramic is flat and covers the whole of the ceramic surface. Do not apply more force than is required to hold the probe in place. Any strain on the ceramic will alter the probe's calibration, and excessive force will destroy the Hall element inside. When the probe head is mounted, the cable should be clamped firmly nearby so it cannot be torn away from the probe head if accidentally pulled. The flexible section adjacent to the probe head can be carefully folded to allow the cable to come away in any direction but avoid repeated flexing of this section.

Keep the cable out of the way of foot traffic. Do not pinch the cable or drop sharp or heavy objects on it. A severed cable cannot be re-joined without altering the probe's performance and requires factory repair and re-calibration.

The DTM-333 must be used with a Group3 Hall probe. Probe models 3DT-132 (3-axis), 3DT230 (3-Axis), LPT-130, LPT-230, MPT-132, or MPT-230 are the most suitable for use with the DTM-333. The probe may be one supplied with your teslameter, or it may have been obtained separately. In any case, calibration is preserved when probes are exchanged between instruments.

The standard probe cable length is 2 meters. Probes with non-standard cable lengths up to 30 meters may be ordered from your Group3 supplier. The cable used for Group3 probes is shielded to reduce pickup of induced noise from external sources. Such noise may reduce the accuracy of the instrument, cause malfunctioning, or in extreme circumstances even result in damage to the internal circuitry.

## ANALOG OUTPUT

An analog output signal is available at the rear of the teslameter. This output is the Hall probe signal amplified to 3 volts full-scale and gives an indication of the instantaneous field value from dc to 9kHz (-3dB), with a roll-off of 60dB/decade above 9 kHz. Field direction is indicated by the output voltage polarity. There is a small zero offset (10 millivolts maximum), arising from the probe zero-field output and amplifier offsets. The output impedance is 1000 ohm with a 1nF capacitor to common for noise filtering.

The cable connector required is a standard BNC connector.  
The analog output is not corrected for linearity errors.

### pin signal

Outer	ground
Inner	dc output

## GROUNDING

All parts of the teslameter's metal case are connected together to form an integral electric shield around the circuitry inside. When the probe connector is plugged into the teslameter and the retaining screws are tightened, the probe connector case and the teslameter case are connected together and form an integral shield around the circuitry inside. The cable shield is added to the case shield and extends protection from electrical interference almost up to the probe head.

Because there is an internal connection between teslameter circuit common and the probe connector case, when the probe connector is engaged, and the retaining screws tightened the teslameter circuit common will be connected to the case. Do **not** make an additional connection between circuit common and the case at any point. Such additional connection will form a ground loop and may introduce errors in the measured field value.

The shielding provided with the above arrangement should be sufficient protection against EMI in most cases, especially when the probe cable is shielded. Sometimes it may be found helpful to ground the teslameter case to a good electrical ground point. Connection can be made to the case by inserting an appropriate lug or terminal under the head of one of the rear panel fixing screws.



## INSTALLATION TECHNIQUES FOR ELECTRICALLY NOISY ENVIRONMENTS

The DTM-333 is a precision electronic measuring device. Because of the nature of the measurements it is asked to do, it is frequently exposed to conditions that are considerably worse than are normally encountered by precision instruments. Therefore, the teslameter has been carefully engineered to be as immune as possible to sparks and other forms of interference through the use of several kinds of power input filtering and a special high-isolation switchmode power module built into its circuitry. The design has been verified by extensive testing, using high energy sparking in close proximity to both the teslameter instrument case and the probe. Nevertheless, due care should always be taken when installing the teslameter system.

The teslameter and its probe must be protected from any chance of receiving a direct hit by a high voltage discharge. The probe should have shielded cable if the meter is to be used in an electrically noisy environment. The cable shield is an RFI screen, not a high current path, so if there is any possibility of an arcing discharge hitting the probe area, then the probe head and part or all of the cable must be enclosed in a metal tube (nonmagnetic near the probe head) or shielded in some other way.

The probe cable should be routed away from any power, high current or high voltage wiring. It should be shielded from any capacitively coupled noise effects. If the cable runs close to any section of the apparatus that could be subjected to a very rapid change of potential when a spark discharge occurs, then the probe cable may need additional shielding to prevent capacitive coupling of the noise.

The retaining jack screws designed to hold the probe connector onto the teslameter must be screwed up finger tight, as they form part of the electrical connection of the shield system. The woven braid of the probe cable is terminated to the probe connector case. The retaining screws then connect the probe connector case to the teslameter case.

The teslameter itself should be sited in a sheltered location, where it will not be exposed to spark discharges or radiated or capacitively coupled noise. The teslameter case is made of metal for shielding reasons. However, of necessity it is less than perfect, as apertures have to be left in the case for the display and various connectors etc. The unit is a precision measuring device, and should be treated with care, not subjected to adverse environmental conditions.

The plugpacks supplied with each teslameter should be plugged in to a clean mains power supply. Noise on the mains will work its way through the transformers and disturb the teslameter. Simple mains filters are readily available if there is only one mains supply for the whole machine. Route the low voltage lead away from high current or high voltage wiring. Ideally cut the low voltage lead to the minimum length required for the installation and re-connect the plug to it.

# Operation Guide

## GETTING STARTED

1. Unpack the DTM unit from the hard case that comes with the unit. **Caution!** Unit weights 7.0 KG. Package includes the following
  - a. DTM unit
  - b. Power supply
  - c. USB memory stick with copy of Operations Manual
  - d. Mounting cheeks for 19" rack (optional)
2. If unit is to be mounted to a 19" rack, attach the mounting cheeks (optional).
3. If unit is to be installed as a bench unit, lay the DTM-333 in a safe and secure way. Make sure that the DTM is at least 2 meters away from the magnet.
4. Insert the three probe plugs into probe sockets at the back of DTM unit. If user is going to use a 3DT probe model, insert the probes to its corresponding DTM channel. If individual probes are to be use, mark the probes appropriately, example: CH1, CH2, CH3.
5. Attach the Ethernet jack to the Ethernet port at the back if the unit is to be monitored or operated remotely using a Windows PC.
6. Connect power supply plug and lock.
7. Press Power button to turn ON the display. Group3 logo will be shown on display while the unit boots up for about 30 seconds.



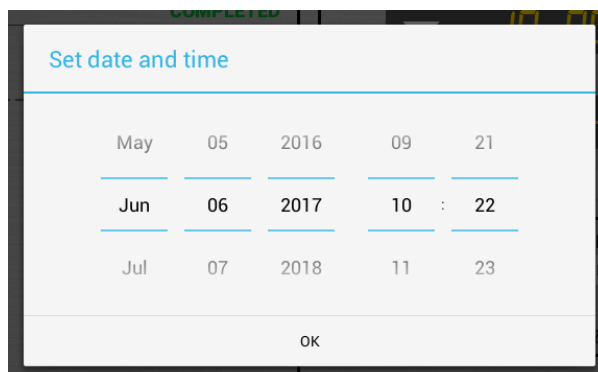
8. A notification will be displayed requesting user to enter date and time of the system. Press OK.



### Setting the Time

*Note: The time and date is entered manually unless the unit is connected to the network (see page for Networking). User can also update the date and time setting at a later time by following the procedure on page 16 of this guide.*

1. After pressing OK, the Date and Time Setting window appears.



2. Press the desired date and time and a dialogue screen appears. Alternatively, slide your finger to scroll to the desired date and time and press OK to continue.

The HOME page screen should look like this.



Your DTM-333 is now ready to use.

## WARNING!!!

**If no probe is plugged to the DTM, a warning message will appear that indicates “No Probe detected”. Turn off power and UNPLUG power supply and attach the required probe.**



## IMPORTANT!

**DO NOT PLUG OR UNPLUG THE PROBE WHILE THE UNIT IS ON, OTHERWISE THE UNIT MAY NOT FUNCTION CORRECTLY, AND MAY DAMAGE/CORRUPT THE TESLAMETER'S CALIBRATION.**

# DISPLAY MAP

## A. HOME Tab

### Default Setting:


**AXIS Mode, Filter ON, TESLA unit, Range 3.0T, Networking ON**

- Display shows the Field, Temperature, and MAX field reading
- In Axis mode, zeroing, resetting, unit and range changing will controls all 3 teslameters simultaneously. In Channel mode, each channel can be operated individually.
- To Zero the field, press "ZERO"
- To change field unit to Gauss, press "GAUSS"
- To change range, Press "TOGGLE".

### Range Operation

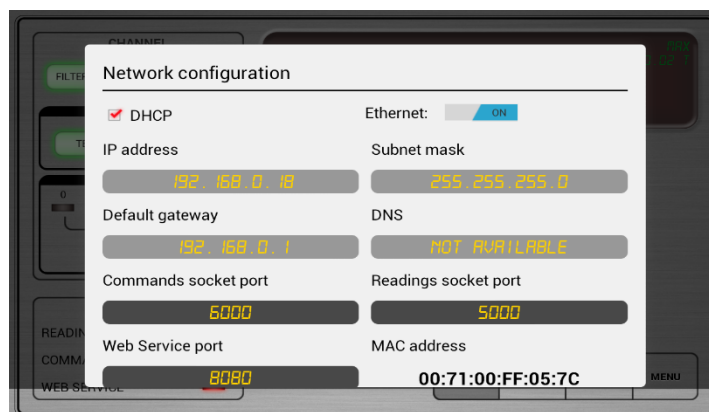
Range	Standard Probe	High Sensitivity Probe
Range 0	0.3T	0.03T
Range 1	0.6T	0.06T
Range 2	1.2T	0.12T
Range 3	3.0T	0.3T

## NETWORKING: USING A NETWORK-CONNECTED WINDOWS PC

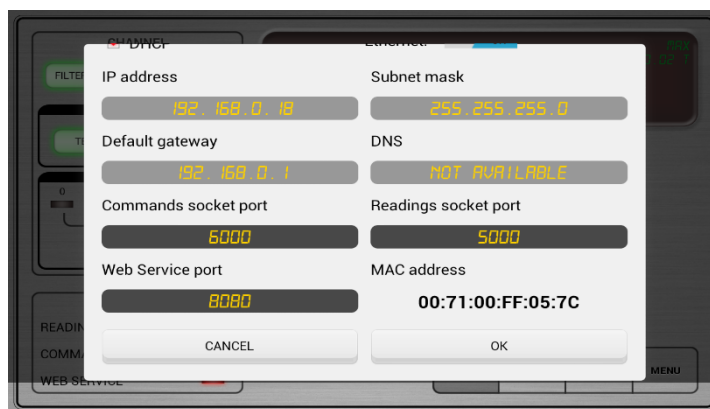
1. Attach Ethernet connector RJ45 to the port found at the rear of unit marked  to connect to the local network or router.
2. Ethernet communication is automatically set to ON and DHCP as default when a network is detected using the Ethernet port.



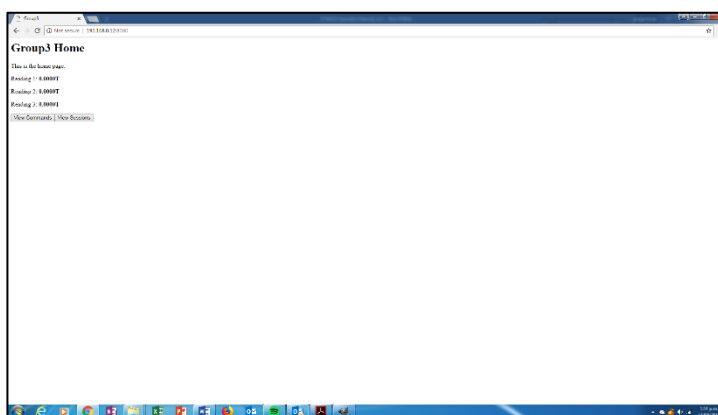
3. Take note of the IP address. To manually input the IP address of your computer, de-select DHCP and input the desired IP address. Change the values of the Default Gateway and DNS to 0.0.0.0 .



4. Touch and slide your finger upwards on the screen to show the rest of the window. Press OK to exit.



5. In your network-connected PC, open your web browser such as Google Chrome and in the URL window, type the IP address followed by the web service port number 8080. Example, 192.168.0.36:8080



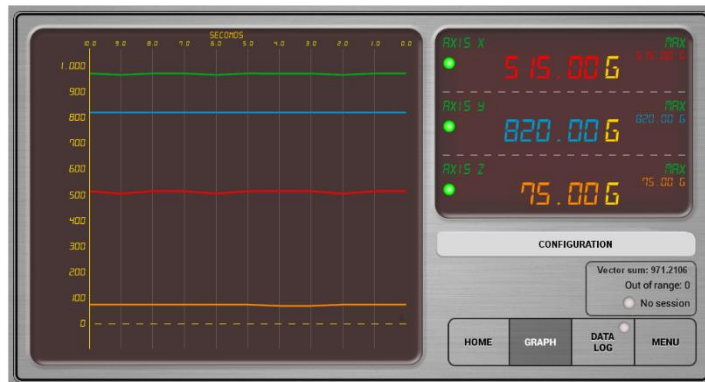
6. From this page, user can send commands to the DTM-333 to get information in real time as well as change its settings.

List of Commands:

Command	Function	Description
<b>IZ</b>	Get zero	<i>Get the currently active zero offset</i>
<b>IY</b>	Get Window	<i>Get the currently active window in which digital filtering occurs</i>
<b>IJ</b>	Get filter factor	<i>Get the current filter factor applied to field readings</i>
<b>F</b>	Get field reading	<i>Get a current field reading from the DTM</i>
<b>V</b>	Get triggered field reading	<i>Get a trigger field reading from the DTM</i>
<b>P</b>	Get peak hold value	<i>Get a peak reading from the DTM</i>
<b>ID</b>	Get digital filtering status	<i>Get the current digital filtering status: on or off</i>
<b>IR</b>	Get range selection	<i>Get the currently selected range: 0.3 (0), 0.6 (1), 1.2 (2) or 3.0 (3) Tesla</i>
<b>D</b>	Set digital filtering	<i>Turn digital filtering on or off</i>
<b>G</b>	Set general function	<i>Set General Function to AC (A) or DC (D)</i>
<b>M</b>	Set send mode	<i>Turn continuous DTM data output on or off</i>
<b>F</b>	Set unit symbol	<i>Set the unit symbol to Tesla (T) or Gauss (G)</i>
<b>J</b>	Set filter factor	<i>Set the filter factor for field readings</i>
<b>K</b>	Set sampling interval	<i>Set the number of seconds between consecutive readings</i>
<b>EZ</b>	Erase zero correction	<i>Erase the current zero correction value</i>
<b>SU</b>	Set include unit symbol	<i>Turn the inclusion of Tesla (T) or Gauss (G) unit symbols on or off</i>
<b>EP</b>	Erase peak hold	<i>Erase the current peak hold value</i>
<b>EO</b>	Erase offset	<i>Erase the current offset value</i>
<b>SZ</b>	Set Zero	<i>Set the zero offset for the currently selected range</i>
<b>R</b>	Set range	<i>Set the range selection to Tesla range 0.3 (0), 0.6 (1), 1.2 (2) or 3.0 (3)</i>
<b>Y</b>	Set window	<i>Set the window within digital filtering occurs</i>
<b>EL</b>	Erase scale factor	<i>Erase the current scale factor</i>
<b>X</b>	Cancel simulated Field and temp	<i>Cancel any simulated field and temperature readings</i>
<b>SB</b>	Set auto ranging	<i>Turn auto ranging ON or OFF</i>
<b>Z</b>	Set current value as zero	<i>Set the current field value as zero offset for selected range</i>

## B. GRAPH Tab

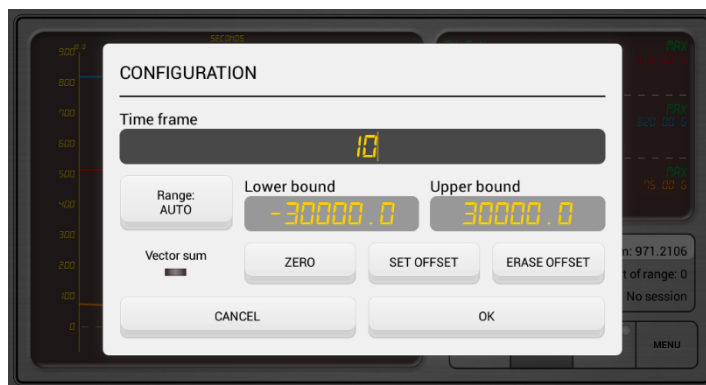
The graph displays the reading in real time and can be configurable to auto scaling, unipolar or bipolar field. The graph window also shows if there is a current data log session as well as a counter for out of range readings (if on unipolar and bipolar). This feature is handy to users that would like to visually see any fluctuation in the field reading over a period of time. The field reading of each channel/axis is colour coded to easily distinguished one teslameter to another.



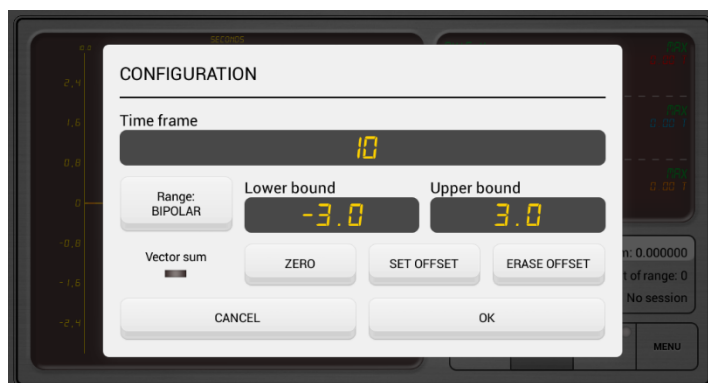
Pinch and Zoom – When a session is in progress, user can change the time scale by doing a pinch and zoom gesture on the graph.

### Configuring the Graph Settings

1. Press the CONFIGURATION button.

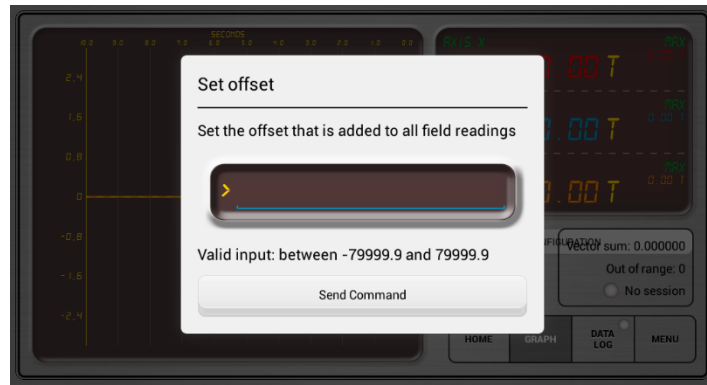


2. Set the time frame as desired.
3. Press the Range button to select AUTO, UNIPOLAR or BIPOLAR scaling.
4. Selecting the AUTO scaling range hides the option to set the lower and upper bounds. Selecting the UNIPOLAR scaling range hides the lower bound while selecting BIPOLAR scaling range gives you the option of setting the lower and upper bounds.



5. User can also set the readings to ZERO to clear residual fields.

6. User can also set an offset if user needs to add or subtract a field value to set as benchmark field.

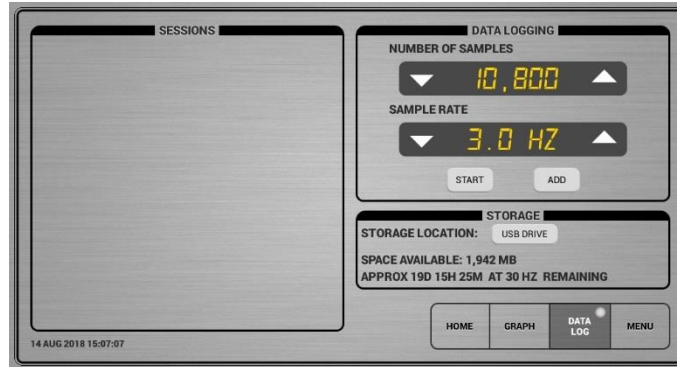


7. User can erase the offset that was added to return to the original field reading.
8. Press OK to save and exit the configuration dialogue box or press Cancel to exit without saving the configured settings.

## C. DATA LOG Tab

The DTM-333 has the capability to data log a field measurement session. This feature makes field measurement quite easy and eliminates the use of additional computer and specialized software to do the operation. All the user need is a USB memory stick (at least 4 GB and max 256 GB) to save the file. The data is stored as a CSV file which user can manipulate using MS Excel. User is informed of how much data the USB stick can hold based on the sampling quantity and rate.

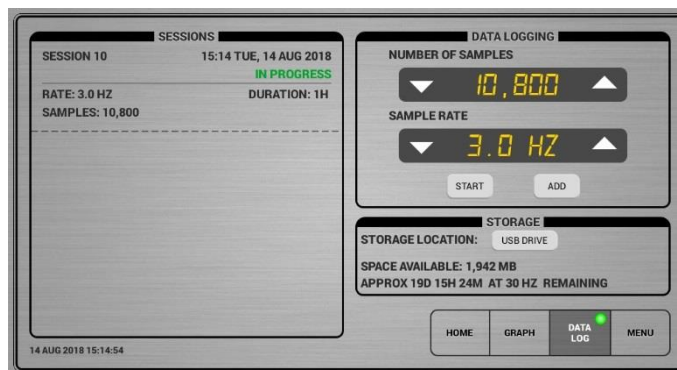
Sample: A 2GB of memory can save around 20 days' worth of data at 30 samples/seconds (Hz).



- Sampling rate and number of samples can be adjusted either by using the UP arrow or DOWN arrows or by pressing the value and a dialogue box appears to input the desired value.

### C.1. HOW TO ACQUIRE DATA USING DATA LOGGING

1. Attach a memory stick or hard drive to any of the unused USB ports where data can be saved.
2. Select the sampling rate and number of samples. The software will automatically calculate how much data that can be stored on external memory and the time it can run the data.
3. Press "START" to start the session. The Green LED on the DATA LOG Tab indicates an ongoing session.



4. You can STOP the recording session at any time by doing a quick press on the active session and press "CANCEL". It will ask if you want to "SAVE" the halted session or "CANCEL" the session completely.





### MULTIPLE SESSION

If you want to run multiple sessions, just select the parameters and press "ADD". User will be asked for the date and time the session will start. Session details will be displayed in the screen.



### To Change System DATE and TIME

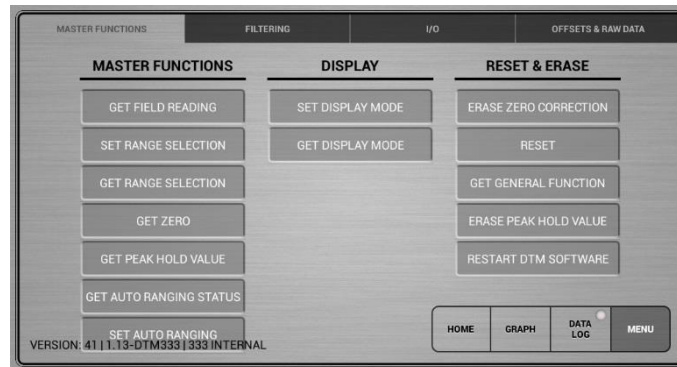
In case you need to change the date and time setting, press the date and time" and display will pop up to change the date and time.

## D. MENU

The MENU Tab is where the rest of the controls of the DTM are located.

- MENU is subdivided into 5 pages.
  - MASTER FUNCTIONS
  - FILTERING
  - I/O
  - SIMULATIONS
  - SCALE & CALIBRATION

### D.1. MASTER FUNCTIONS TAB



#### MASTER FUNCTIONS COLUMN

- GET FIELD READING – Press to get the current field reading of a channel.
- SET RANGE SELECTION – Press to set the field range of a channel.
- GET RANGE SELECTION – Press to get the current range of a channel.
- GET ZERO – Press to get the current zero offset of a channel.
- GET PEAK HOLD VALUE – Press to get the peak hold value of a channel.
- GET AUTO RANGING STATUS – Press to get the auto ranging status of a channel.
- SET AUTO RANGING – Press to set a channel to auto ranging.

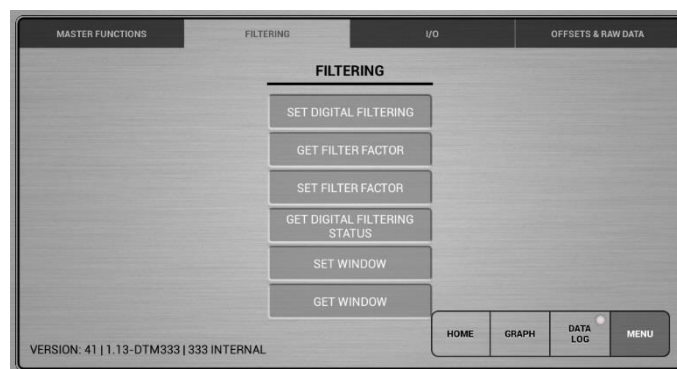
#### DISPLAY COLUMN

- SET DISPLAY MODE – Press to set show current display mode of a channel to either Hold (H) or Normal (N).
- GET DISPLAY MODE – Press to get the current display mode of a channel in either Hold (H) or Normal (N).

#### RESET & ERASE COLUMN

- ERASE ZERO CORRECTION – Press to erase the ZERO correction value of a channel added by user.
- RESET – Press to reset the system of the DTM unit.
- GET GENERAL FUNCTION – Press to show current function of a channel either in DC or AC.
- ERASE PEAK HOLD VALUE – Press to erase the peak hold value of a channel.
- RESTART DTM SOFTWARE – Press to power cycle the DTM unit.

## D.2. FILTERING TAB



### FILTERING COLUMN

- SET DIGITAL FILTERING – Press to set the digital filtering of a channel to ON or OFF.
- GET FILTER FACTOR – Press to get the current filter factor of a channel to the field reading.
- SET FILTER FACTOR – Press to set the filter factor of a channel.
- GET DIGITAL FILTERING STATUS – Press to get the filtering status in either ON (1) or OFF (0) of a channel.
- SET WINDOW – Press to set window of a channel within digital filtering occurs.
- GET WINDOW – Press to get the currently active window of a channel in which digital filtering occurs.

### DIGITAL FILTERING

The teslameter software includes a digital filtering algorithm which is enabled by default as indicated by the green backlight. Filtering is useful for smoothing out small fluctuations in the field reading. When filtering is enabled, the FILTER indicator is lit.

In order to speed up the response to large field changes when filtering is on, a window is set to define a band about the current displayed field value. Filtering will only occur while the unfiltered field value remains within the window. If the field value changes rapidly enough, the filtered field reading will not be able to follow fast enough to keep the unfiltered value within the window, and filtering is temporarily disabled. This allows the field reading to follow large rapid field changes, while providing good filtering of constant or slowly varying fields.

The default window width is 20 resolution increments on each side of the displayed field reading, for a total window width of 40 increments.

The digital filter performs the following computation:

$$F(\text{new}) = F(\text{old}) + \frac{F - F(\text{old})}{J}$$

where  $F(\text{old})$  is the previous field reading display  
 $F(\text{new})$  is the updated field reading display  
 $F$  is the most recent unfiltered field reading  
 $J$  is the filter factor.

The effective time constant of the filter is dependent upon both the rate at which field measurements are made and the value of  $J$ , according to the formula:

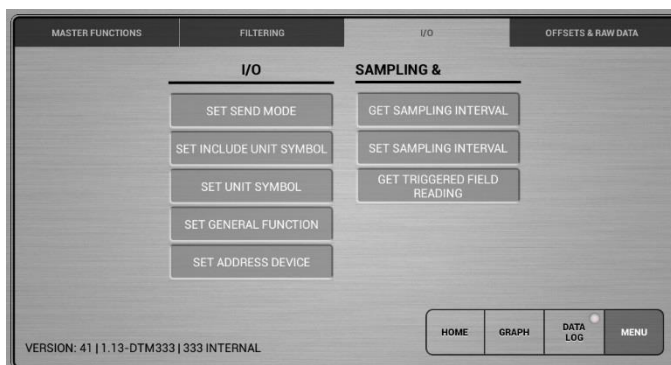
$$T = P / \ln[J/(J-1)]$$

where  $T$  is the filter time constant

$P$  is the period between field measurements.

Field measurements are made at a fixed rate of 30 per second, so  $P = 0.033$ . With the default value of  $J = 8$ , the filter time constant is 0.25 seconds. This gives a cut-off frequency in the displayed field reading of 0.64Hz.

### D.3 I/O TAB



#### I/O COLUMN

- SET SEND MODE – Press to set DTM continuous data output of a channel to ON (1) or OFF (0).
- SET INCLUDE UNIT SYMBOL – Press to turn the inclusion of Tesla (T) or Gauss (G) symbol of a channel ON or OFF.
- SET UNIT SYMBOL – Press to set the field unit of a channel to either Tesla (T) or Gauss (G).
- SET GENERAL FUNCTION – Press to set the function of a channel to either AC or DC.
- SET ADDRESS DEVICE – Press to set the DTM remote address of channel to (0 to 11).

#### SAMPLING COLUMN

- GET SAMPLING INTERVAL – Press to get the current number of seconds between consecutive readings of a channel.
- SET SAMPLING INTERVAL – Press to set the number of seconds between consecutive readings of a channel.
- GET TRIGGERED FIELD READING – Press to get a triggered field reading of a channel from the DTM.

### D.4 OFFSETS & RAW DATA TAB



#### OFFSETS & RAW DATA PAGE

- GET CALIBRATED READING AFTER USER ZERO CORRECTION – Press to get calibrated reading after probe correction and user zero correction of a channel.
- GET UNCALIBRATED RAW READING AFTER DIGITIZING – Press to get an uncalibrated raw reading from the ADC (after digitizing) of a channel.
- GET CALIBRATED READING BEFORE PROBE CORRECTION - Press to get the calibrated reading before probe correction (after DTM internal calibration) of a channel.
- SET ZERO – Press to set the zero offset for the currently selected range

## DISPLAY MESSAGES

### No Probe

The message **noProbE** is displayed if the Hall probe is disconnected from the instrument. While the message is visible, all key functions are disabled.

### Over-range

The message **o'rAnGE** appears if the field to be measured exceeds the instrument's input capacity.

To clear the over-range message, select a higher range or reduce the magnetic field at the probe, or both if necessary.

During over-range, all key operations are locked out, except for range selection.

If autoranging is selected, steady over-ranging will occur only when full-scale of the highest range is exceeded.

If a single-range probe is in use, no range changing can occur.

### Overflow

The message **o'FLo** is displayed if the computed value of the field reading exceeds the capacity of the display.

In overflow, the instrument is not over-ranged, but rather the computed reading is too large to be displayed.

However, if over-ranging occurs at the same time as overflow, then the over-range message is displayed preferentially.

If the overflow message appears on a DTM-333, it can usually be cleared by reloading defaults. Otherwise, please contact the supplier of the teslameter.

### Error 1

This indicates that the main circuit board has no calibration eeprom chip and cannot be used with this software version.

## USB PORT

- The USB port can only be used for attaching a memory drive such as a USB stick or external hard drive to save sessions. It is not to be used for accessing the serial output of the DTM.

## TURNING OFF THE UNIT

- Before turning the unit off, make sure that data logging session has stopped or has been saved.
- Press the Power button to turn off display. Take note that the 3 channels of the DTM is still powered ON.
- UNPLUG the power supply connector at the back of the unit to completely turn OFF the unit.

## TROUBLESHOOTING

- **Display shows no probe** – Press the power button to turn off the display. **Unplug the power from the socket.** Disconnect the probe plug and check that no pins are bent. Check too that the socket is not damaged. Re-insert the plug when no abnormality seen on plug. Tighten the jackscrew to the unit and turn on unit again.
- **Display shows "Bad Cal"** – call or email Group3 for support
- **Display freezes or hangs up** – Turn off the power by pressing the power button to re-start the unit. **Unplug the power from the socket.** Check if previous settings are still retained. Re-enter if necessary.
- **Display shows erroneous data** – If field readings shows abnormality or that readings on each range is different or inconsistent, go to the MENU page and under the RESET & ERASE column, press the RESET button. All previous settings entered would return to default and user settings must be re-entered.
- **ALL OTHER ERRORS** – if unit is still misbehaving or not operating correctly after unplugging/plugging the power plug, kindly contact Group3 through our website [www.group3technology.com/service](http://www.group3technology.com/service) or email [service@group3technology.com](mailto:service@group3technology.com) for advice.

## LIMITED WARRANTY

Group3 Technology Ltd. (hereinafter called the Company) warrants instruments and other products of its manufacture to be free from defects in materials and workmanship that adversely affect the product's normal functioning under normal use and service for a period of one year from the date of shipment to the purchaser.

The obligation of this warranty shall be limited to repairing or replacing, at the discretion of the Company and without charge, any equipment which the Company agrees is defective as set out above within its warranty period. The Company will reimburse lowest freight rate two-way charges on any item returned to the Company's factory or any authorised distributor or service centre, provided that prior written authorisation for such return has been given by the Company.

This warranty shall not apply to any equipment which the Company determines to have become defective owing to mishandling, improper installation, alteration, negligence, inadequate maintenance, incorrect use, exposure to environmental conditions exceeding specifications, or any other circumstance not generally acceptable for equipment of a similar type.

The Company reserves the right to make changes in design without incurring any obligation to modify previously manufactured units. No other warranties are expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. The Company is not liable for consequential damages.

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Changes to v1.3. 210720

- Additional instruction on using static IP where default gateway and DNS should have values of 0.0.0.0 on page 12
- BNC connector was added to replace the MOLEX connector and its pin assignments on page 7.



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