

# DTM-152

## Digital Teslameter Operations Manual



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## 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-152 Digital Teslameter is the latest product of Group3 that boast a touch screen interface to operate the DTM. Instead of mechanical switches and buttons that are still being used on the older versions to operate the unit, the DTM-152 display is touchscreen-based so setting the unit to user's specification is quick and easy. The digital readout now shows not just the field reading but the temperature of the sample at the same time.

Another new feature of the DTM-152 is its data logging capability where user can now 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 particular session such as field mapping of a magnet.

Also, a new feature is the Graph function of the DTM-152. Users can now see the behavior of a particular 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 over a period of time. The time and field range are configurable depending on the user's preferences.

Lastly, the DTM-152 now can be monitored and controlled over a network, thanks to the built –in Ethernet connectivity and our custom-built LabView VI that comes with this unit. Applications such as synching the timing of a robot arm when mapping the field of a magnet makes this an important and useful feature.

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-152 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	TOGGLE Button	Touch to change the DTM range
9	FILTER Button	Touch to turn ON/OFF the filter. Lights up a green color when ON.
10	ZERO Button	Touch to set the reading to Zero. A green color indicates current unit.
11	RESET Button	Touch to reset the unit.
12	UNIT Button	Touch to choose either Gauss or Tesla.
13	Channel, Range & Filter	Indicates the Channel/Axis, current range and filter status
14	Field Indicator	Shows the measured magnetic field and temperature reading
15	Maximum Field Indicator	Shows the maximum field measured
16	Temperature Indicator	Shows the temperature of the sample as measured from the probe head
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



### 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

### CONNECTIVITY

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

## SPECIFICATIONS OF DTM-152 SYSTEM

### Specifications of DTM-152 with LPT-141 or MPT-141 Hall Probe.

<b>Measurements</b>	field value and time-varying (ac) component of field			
<b>Field ranges</b>	0.3 0.6 1.2 3.0 tesla full-scale, 3 6 12 30 kilogauss full-scale, with polarity indication maximum calibration field $\pm 2.2$ tesla, $\pm 22$ kilogauss			
<b>Resolution</b>	DC mode with digital filtering ON:  1 in 600,000 of bipolar span as shown on front panel display.			
	range	display resolution		
		gauss	tesla	
	0.3 tesla	0.001	0.0000001	
	0.6 tesla	0.01	0.000001	
	1.2 tesla	0.01	0.000001	
	3.0 tesla	0.01	0.000001	
<b>Resolution</b>	DC mode with digital filtering OFF, and AC mode:  1 in 120,000 of bipolar full-scale span in display:			
	range	display resolution		serial/GPIB resolution
		gauss	tesla	gauss
	0.3 tesla	0.05	0.000005	0.001
	0.6 tesla	0.1	0.00001	0.01
	1.2 tesla	0.2	0.00002	0.01
	3.0 tesla	0.5	0.00005	0.01
	20-bit digitizing of field reading.			
<b>Accuracy</b>	DTM-152 with LPT-141 or MPT-141 probe: $\pm 0.01\%$ of reading $\pm 0.006\%$ of full-scale max. at 25°C			
<b>Temperature Stability</b>	DTM-152 with LPT-141 or MPT-141 probe: calibration: $\pm 10$ ppm of reading/°C max. zero drift: $\pm (1 \text{ microtesla} + 0.0003\% \text{ of full-scale})/\text{°C max.}$  add -3ppm/°C for each meter of probe cable			
<b>Time stability</b>	$\pm 0.1\%$ max. over 1 year			
<b>Measurement rate</b>	10 measurements per second			
<b>Response time</b>	Full-scale change of displayed field reading settles to within resolution in less than 0.3 second (filtering off - see below)			
<b>Peak hold mode</b>	Displays maximum field since mode entered or reset. Peak hold is implemented digitally with zero sag or decay.			
<b>Display</b>	Touchscreen, soft key navigation, simulated 7-character, 7-segment alphanumeric display			
<b>Tabs</b>	HOME: <ul style="list-style-type: none"> <li>• <b>Field and Temperature reading</b> in simulated 7-segment display</li> <li>• Field Unit in either <b>GAUSS</b> or <b>TESLA</b> indicated by GREEN backlight</li> <li>• <b>FILTER</b> is set to ON by default as indicated by a GREEN backlight, press to turn OFF.</li> <li>• Press <b>RESET</b> button to do a power cycle and reset the unit.</li> <li>• Press <b>ZERO</b> button to zero any stray field.</li> </ul>			

- **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
- 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
- Field reading 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

#### 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 resting, zeroing, filtering, etc. are available in this tab.

<b>Analog outputs</b>	<p>dc output - instantaneous field analog:  full-scale output: <math>\pm 3V</math> nominal  source impedance: <math>1000\Omega</math>  accuracy: <math>\pm 10\%</math>  bandwidth: 3kHz at -3dB, rolloff 3-pole 60dB/decade</p> <p>ac output - rectified analog of time-varying (ac) field:  frequency response: 8Hz to 3kHz at -3dB points  time-constant: 0.2 seconds  average responding, delivers rms value of sinusoidal field  full-scale output: 3V nominal  source impedance: <math>1000\Omega</math>  accuracy: <math>\pm 12\%</math></p>
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**Memory backup** user-entered data storage for 30 days with power off.

#### Power source

##### Model No. GSM36B12

Input: 100-240VAC, 50/60Hz, 0.9-0.45A

Output: 12V , 3A, 36W Max.max 15V, 0.35A rms

Power fuse on processor board: 1 amp anti-surge 5 x 20mm

**Data Log** Via USB, data log file 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** 5.8 kg,

**Shipping Weight** 12.5Kg (includes power pack, mounting cheeks and hard case)

**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

## 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-152 must be used with a Group3 Hall probe. Probe models LPT-141, LPT-231, MPT-141, or MPT-231 are the most suitable for use with the DTM-152. 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-152 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.

## DISPLAY MAP

### A. HOME Tab

Default Setting:


**Filter ON, TESLA unit, Range 3.0T**

- Shows the Field, Temperature, and MAX field reading
  - To Zero the field, press "ZERO"
  - To change unit to Gauss, press "GAUSS"
  - To change range, Press "TOGGLE".

#### Range Operation

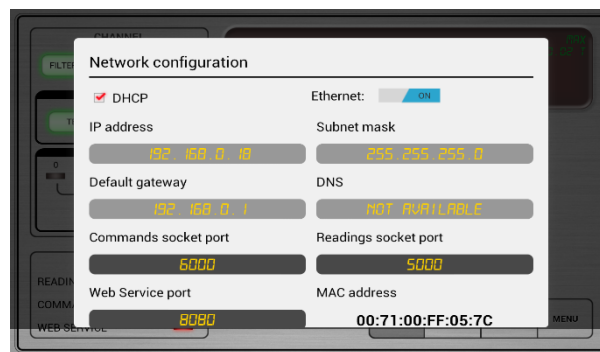
	Range	Standard Probe	High Sensitivity Probe
4.	Range 0	0.3T	0.03T
5.	Range 1	0.6T	0.06T
6.	Range 2	1.2T	0.12T
7.	Range 3	3.0T	0.3T

## NETWORKING: USING DTM-152 LABVIEW VI

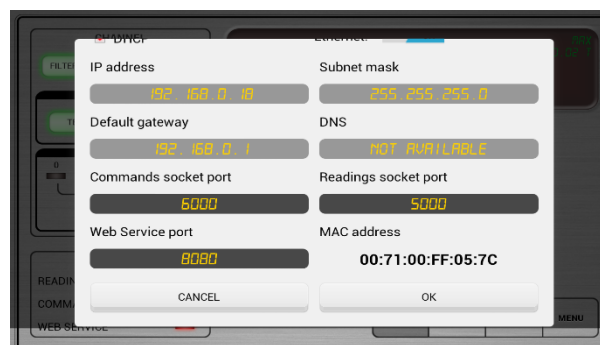
- Attach Ethernet connector RJ45 to the port found at the rear of unit marked  to connect to the local network or router.
- Ethernet communication is automatically set to ON and DHCP when a network is detected using the Ethernet port.



- To manually input a static 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.



- Touch and slide your finger upwards on the screen to show the rest of the window.





5. Press OK to save your settings and exit the dialogue box.

Once activated, user can access and control the DTM remotely using the Group3 DTM-152 LabView Virtual interface. See separate manual on "How to install DTM-152 LabView VI".

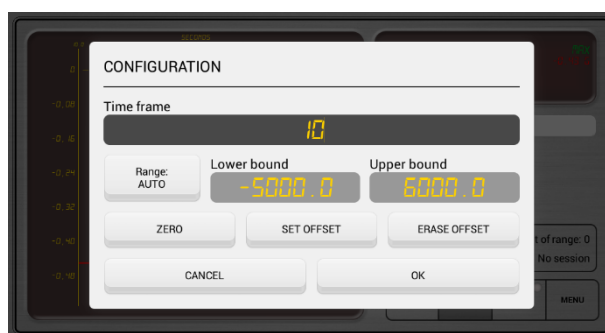
## B. GRAPH

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).

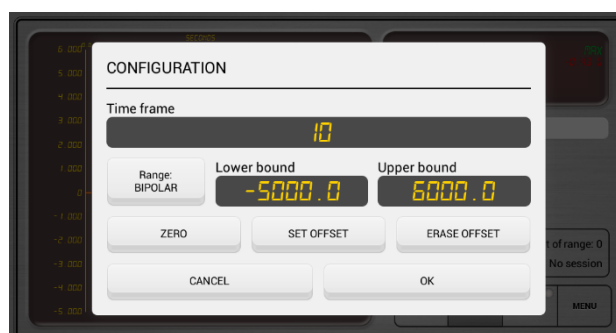


Configuring the Graph Settings

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.

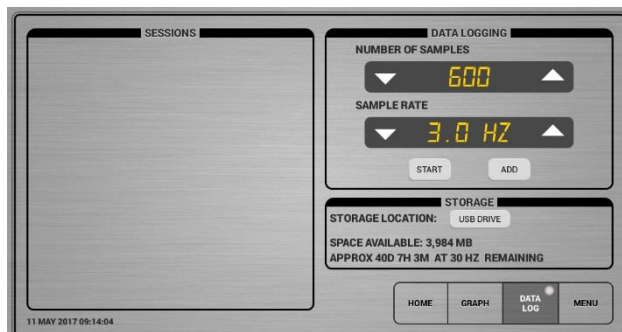


7. User can erase the offset that was added to return to the original field reading.
8. Press OK to save and exit the configuration dialogue box or press Cancel to exit without saving the configured settings.

## C. DATA LOG

The DTM-152 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 needs 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 4GB of memory can save around 40 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.

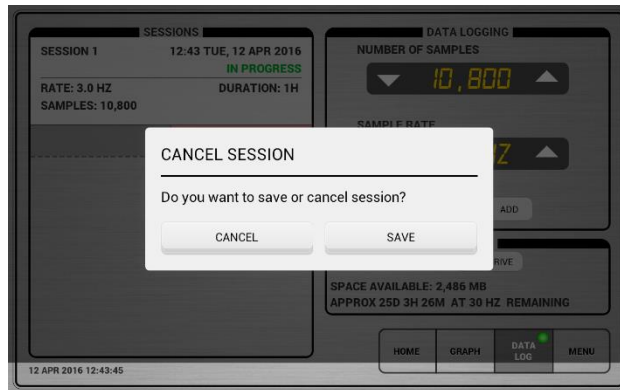
### C.1. HOW TO ACQUIRE DATA USING DATA LOGGING

1. Attach a memory stick or hard drive to any of the unused USB ports where data can be saved. **CAUTION: Do not remove USB memory stick/hard drive while system is reading the disk as it will cause the unit to freeze. In case it does, you will need to re-start the unit by turning OFF and ON the power.**
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 2-second press on the active session and press "CANCEL". It will ask you if you want to "SAVE" the halted session or "CANCEL" the session completely.





- If you want to run multiple sessions, just select the parameters and press “ADD”.

**NOTE:**

**To Change DATE and TIME**

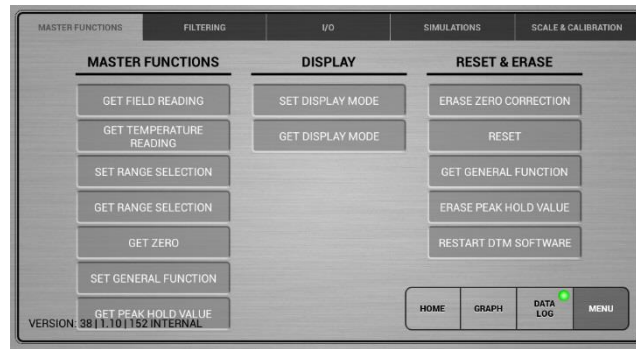
In case you need to change the date and time setting, press the date and time” and display will pop up to change the date and time.

## 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 PAGE



#### MASTER FUNCTIONS COLUMN

- GET FIELD READING – Press to get the current field reading.
- GET TEMPERATURE READING – Press to get the temperature reading.
- SET RANGE SELECTION – Press to set the field range.
- GET RANGE – Press to get the current range of the unit.
- GET ZERO – Press to get the current zero offset.
- SET GENERAL FUNCTION – Press to set the function either DC or AC.
- GET PEAK HOLD VALUE – Press to get the peak hold value.

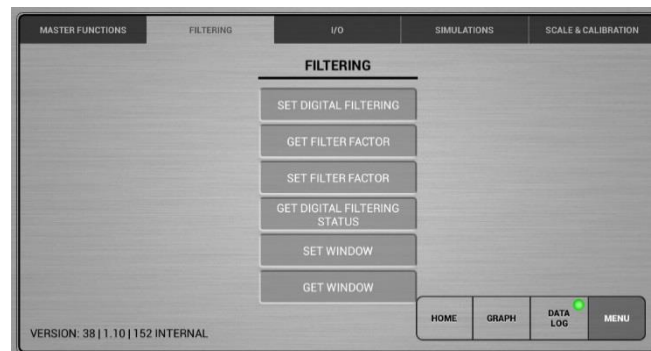
#### DISPLAY COLUMN

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

#### RESET & ERASE COLUMN

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

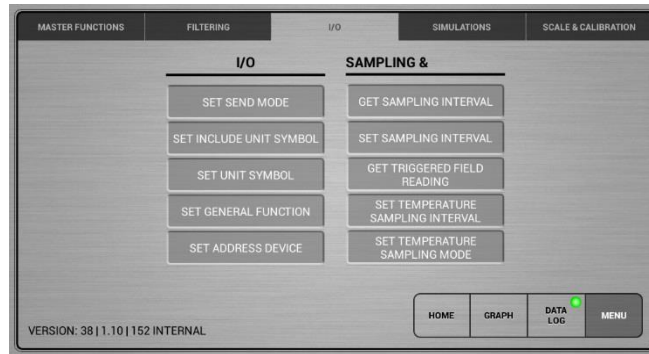
### D.2. FILTERING PAGE



### FILTERING COLUMN

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

### D.3 I/O PAGE



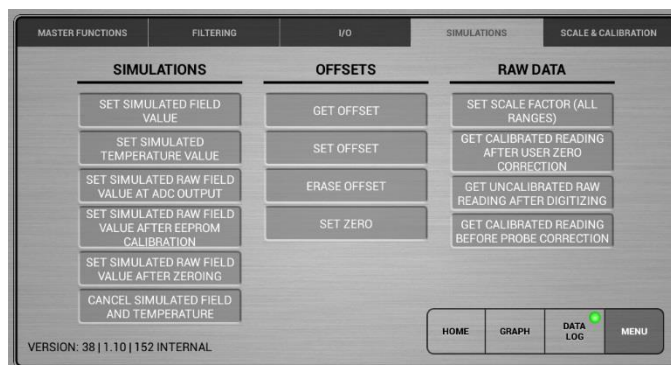
### I/O COLUMN

- SET SEND MODE – Press to set DTM continuous data output to ON (1) or OFF (0).
- SET INCLUDE UNIT SYMBOL – Press to turn the inclusion of Tesla (T) or Gauss (G) symbol on or off
- SET UNIT SYMBOL – Press to set the unit to either Tesla (T) or Gauss (G).
- SET ADDRESS DEVICE – Press to set the DTM remote address (0 to 11).

### SAMPLING COLUMN

- GET SAMPLING INTERVAL – Press to get the current number of seconds between consecutive readings.
- SET SAMPLING INTERVAL – Press to set the number of seconds between consecutive readings.
- GET TRIGGERED FIELD READING – Press to get a triggered field reading from the DTM
- SET TEMPERATURE SAMPLING INTERVAL – Press to set the interval of temperature sampling in seconds.
- SET TEMPERATURE SAMPLING MODE – Press to turn temperature sampling ON or OFF.

### D.4 SIMULATIONS PAGE



### SIMULATIONS COLUMN

- SET SIMULATED FIELD VALUE – Press to replace a measured field reading with a simulated value
- SET SIMULATED TEMPERATURE VALUE - Press to replace a measured temperature reading with a simulated value
- SET SIMULATED RAW FIELD VALUE AT ADC OUTPUT – Press to set simulated raw field value after EEPROM calibration.
- SET SIMULATED RAW FIELD VALUE AFTER ZEROING – Press to set the simulated raw field value after zeroing
- CANCEL SIMULATED FIELD AND TEMPERATURE – Press to cancel field and temperature simulated values.

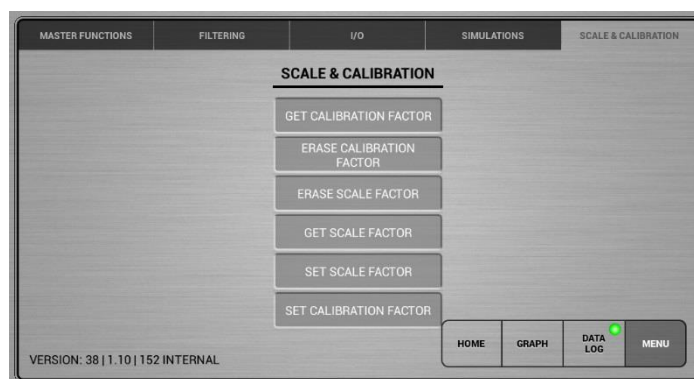
### OFFSETS COLUMN

- GET OFFSET – Press to get the current offset field value
- SET OFFSET - Press to set an offset field value that is added to all field readings
- ERASE OFFSET – Press to erase the user offset field value
- SET ZERO – Press to set the current field reading to zero

### RAW DATA COLUMN

- SET SCALE FACTOR (ALL RANGES) – Press to set the actual scale factor to apply to field readings for all ranges (negative or positive)
- GET CALIBRATED READING AFTER USER ZERO CORRECTION - Press to get a calibrated reading after probe correction and user zero correction.
- GET UNCALIBRATED RAW READING AFTER DIGITIZING – Press to get the uncalibrated raw reading from the ADC (after digitizing).
- GET CALIBRATED READING BEFORE CORRECTION – Press to get a calibrated reading before probe correction (after DTM internal calibration)

## D.5 SIMULATIONS PAGE



### SCALE AND CALIBRATION COLUMN

- GET CALIBRATION FACTOR – Press to get the current calibration factor as a mantissa and exponent
- ERASE CALIBRATION FACTOR – Press to erase the calibration factor
- ERASE SCALE FACTOR – Press to erase the set scale factor
- GET SCALE FACTOR - Press to get the current scale factor applied to field readings
- SET SCALE FACTOR – Press to set the current scale factor to make the current field reading equal to the entered value
- SET CALIBRATION FACTOR – Press to set the calibration factor for field readings to the currently selected field range

## E. MAINTENANCE

### USB PORT

- The USB port can only be use for attaching a memory drive such as a USB stick or external hard drive to save sessions. It is not to be use 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 the unit.
- 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 doing a reset, 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 8
- BNC connector was added to replace the MOLEX connector and its pin assignments on page 6.

**Changes to v.1.4 130421**

- Removed item no. 5 on REAR PANEL parts identification on page 3. DIP switches are not required for this model.
- Caution added to Data Logging on page 11 when removing the USB memory stick or hard drive.

**Changes to v.1.5 01022023**

- Adjusted the layout of the manual.



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