

# KT-10 Plus Magnetic Susceptibility Meter Addendum

with



Version 1.3



**Terraplus**  
Geophysical Equipment Supplier



Phone: (905) 764-5505  
Fax: (905) 764-8093  
Web: <http://www.terraplus.ca>

This document is in addition to the KT-10 manual and it is intended to provide operational information specific to the KT-10 Plus features. For general KT-10 operating instructions, please consult the KT-10 manual.

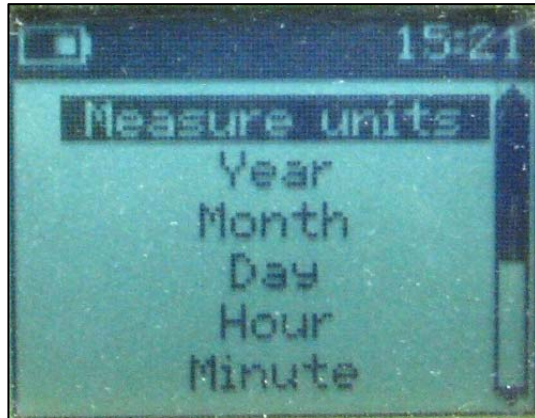
The KT-10 Plus unit has been developed to allow calibration to specific Ore types for quick recognisance in the field. It can be used for sample selection, core analysis and grade control. With the ability to use three different calibration curves, one of which is preloaded from the factory, users have a flexible user friendly instrument suitable for several different applications. The two other curves are open for end users to input their own calibration values into for use in the local environment. At the end of this guide you will find recommendations for sample preparation for site specific calibrations procedures.

On power up, KT-10 Plus units will be denoted by the + symbol after the name of the instrument, seen below in Figure 1. Upgrading existing KT-10 units to KT-10 Plus units can be easily done through the internet in just a few minutes and is outlined on page 9.



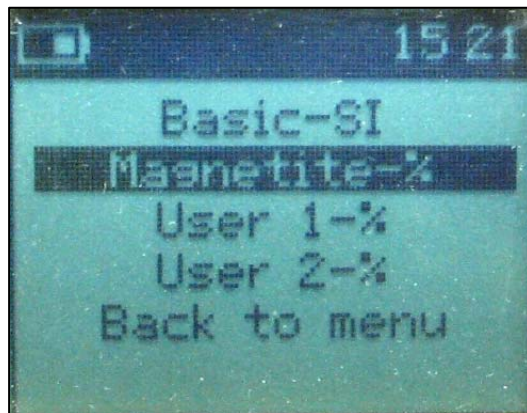
**Fig. 1: KT-10 Plus Start up screen**

The KT-10 Plus has an increased range of operation (10 SI) and the option to select different output units (SI or %); this is located in the setup menu. From the main menu select the *setup* option and the following menu will be presented.



**Fig. 2: Setup menu**

When, *measure units*, has been selected, a list of calibration tables will be presented, which can be seen below in Figure 3. The first one, *Basic-SI*, is used for normal KT-10 operation, with the stored readings recorded in SI units. The next three selections are tables which can be used for concentration output. The first table in the list is for *magnetite* concentration which comes preloaded from the factory.



**Fig. 3: KT-10 Plus unit's selection menu**

*User 1* and *User 2* remain open to be populated with calibration data for local conditions but have the magnetite data populated temporarily. The process to load a calibration curves will be outlined starting on Page 6. To begin using the preloaded calibration table, select it from the list and return to the main menu. The KT-10 Plus will remember the last table selection made on restart. Starting any of the measurement routines will now show the calibration table loading up, with the name of the table being used presented just before entering the measurement screen.



**Fig. 4: Lookup tables loading**

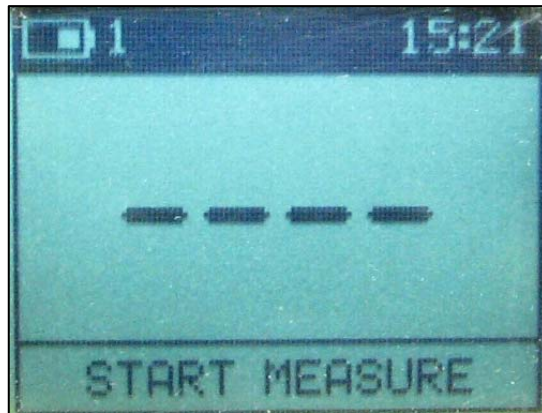


**Fig. 5: Lookup Table loading complete**

When the measurement screen is displayed, shown in Figure 6, you will notice a number in the upper left hand corner of the display. This shows the operator which of the calibration tables is loaded into memory.

- 1 = Magnetite**
- 2 = User 1**
- 3 = User 2.**

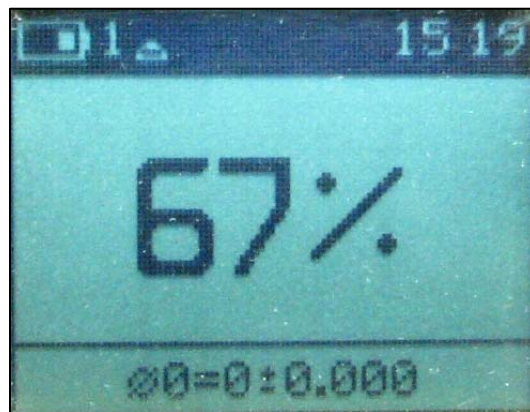
When **Basic SI** is used, no number is present on the display and you will not see the table loading process, the KT-10 will go directly to the measurement screen.



**Fig. 6: Start Measure Screen with calibration Table Loaded**

The process to take a reading can be found in the KT-10 manual starting in chapter 3.4 and also in the quick guide.

When a calibration curve has been used, the values are presented to the user in percent with average and standard deviation on the bottom line, which can be seen below in Fig. 7.




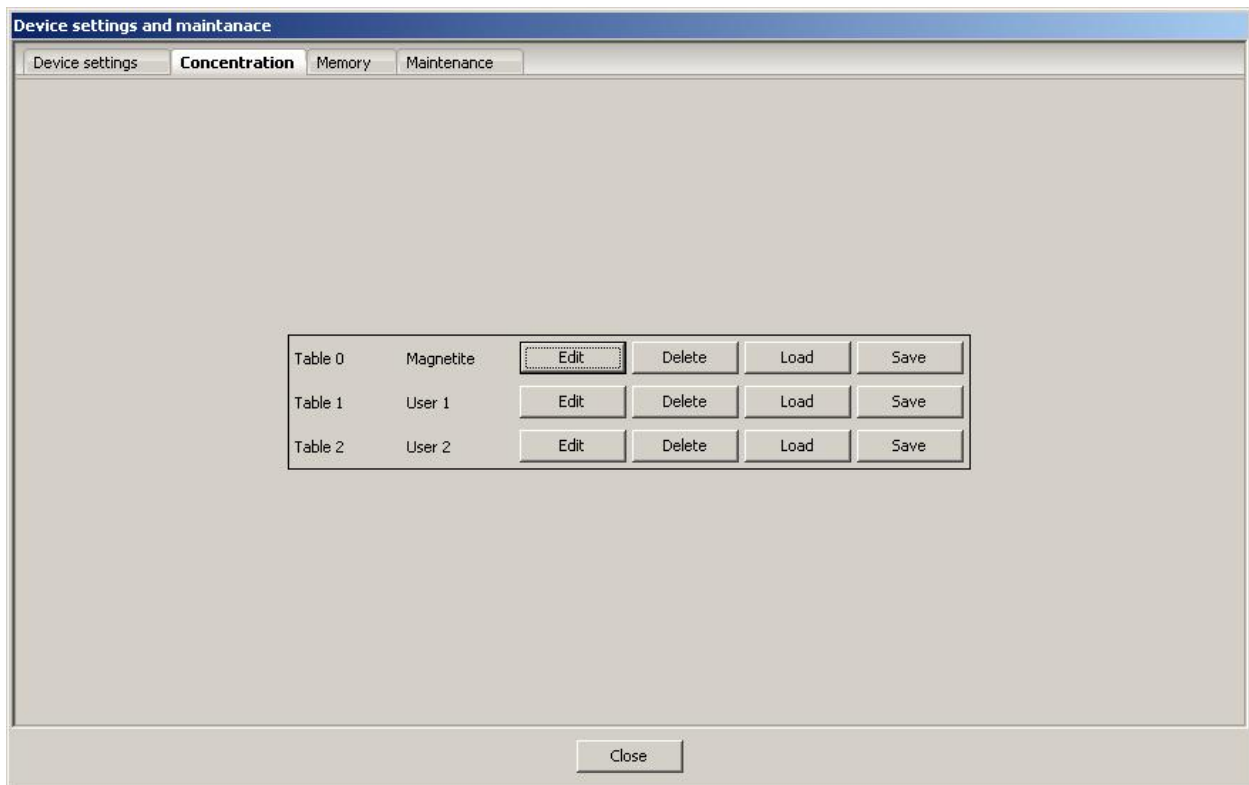
**Fig. 7: Calibrated Percentage Display**

The data stored on the KT-10 will be in percent with average and standard deviation values for each group of readings.

## GeoView Software Interface

GeoView is used to access the data stored on the KT-10 and KT-10 Plus units but it also provides access to the settings and calibration curves used in the instrument. To view, delete, load or save the calibration curves from the unit, connect your KT-10 Plus

to the PC and start Geoview. Press the  settings icon to have the following window open where you will find a concentration tab. If there is no concentration tab, then the instrument connected to Geoview must not be a KT-10 Plus.



**Fig. 8: Settings Dialog Window**

In the concentration tab, you will find the three tables used on the instrument. Pressing the *Edit* button will open the window shown in figure 9. In this window you can fill in the name for the calibration table along with the 12 points for the calibration table.

The table name can be edited so that it is easier to distinguish from the others on the unit and should not be longer than 11 characters. You can also edit the percentage and SI reading columns in the table. In the example below, **Point 1** is for 1 percent and has the assigned value of  $26.0 \times 10^{-3}$  SI units.

Point	[SI]	[%]
#1:	26.0	1.0
#2:	134.0	5.0
#3:	281.0	10.0
#4:	621.0	20.0
#5:	1038.0	30.0
#6:	1565.0	40.0
#7:	2250.0	50.0
#8:	3176.0	60.0
#9:	4500.0	70.0
#10:	6545.0	80.0
#11:	10125.0	90.0
#12:	18000.0	100.0

**Fig. 9: Concentration Table Window**

When building a table for use in the KT-10 Plus, you do not need to have all 12 points for reference. Smaller tables can be used but they must follow the following format.

Tables must be padded with zeroes when all values are not being used. The absolute position of the table is not important, but it cannot contain zeroes in the middle of the table as this will end the table at the point where the zeroes are and the higher concentrations values will not be seen by the unit.



**Concentration table**

Table name:

Point	[SI]	[%]
#1:	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>
#2:	<input type="text" value="134.0"/>	<input type="text" value="5.0"/>
#3:	<input type="text" value="1038.0"/>	<input type="text" value="30.0"/>
#4:	<input type="text" value="4500.0"/>	<input type="text" value="70.0"/>
#5:	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>
#6:	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>
#7:	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>
#8:	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>
#9:	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>
#10:	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>
#11:	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>
#12:	<input type="text" value="0.0"/>	<input type="text" value="0.0"/>

**Fig. 10: Alternative Concentration Table**

In the above table, the range from 5 % to 70 % has been included in only three points. Please note that any values above and below this table will produce questionable output.

After the data has been collected and transferred into Geoview, you will see the additional information showing when the calibration curves have been used. In the information column, the curve number is provided for each readings and is populated for any mode used with a calibration curve, seen below for scanner and measure modes, where calibration curve 1 (magnetite) was used.


Id	Time	Kappa/Conc.	Average +/- std	Information	Voice note	Latitude	Longitude	Altitude
146	5:24:54 PM			Scanner Curve:1				
147	5:25:13 PM	67%		Curve:1				
148	5:25:25 PM	67%		Curve:1				
149	5:25:36 PM	67%		Curve:1				
150	5:25:47 PM	67%		Curve:1				
151	5:25:59 PM	65%	66.6 +/- 0.894	Curve:1				
152	5:26:41 PM	4076 [10-3SI]						
153	5:26:56 PM	4081 [10-3SI]						
154	5:27:07 PM	4016 [10-3SI]						
155	5:27:18 PM	4014 [10-3SI]						
156	5:27:28 PM	4065 [10-3SI]	4050 +/- 32.57					

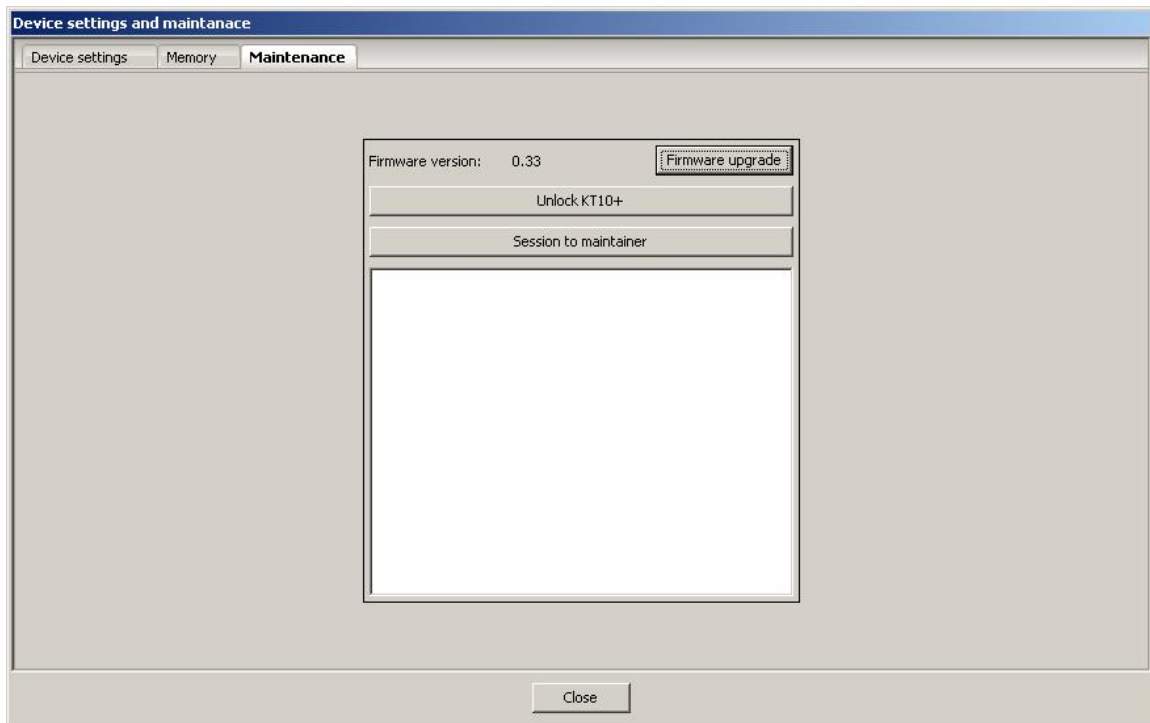
**Fig. 11: KT-10 Plus data view**



## Upgrade Process

To upgrade to a KT10 Plus, you must contact Terraplus and provide the unit serial number. After payment has been verified you will receive an email with an unlock code that will enable the KT-10 Plus features. The KT-10 must have firmware version 0.37 or greater installed, if not please upgrade the firmware through Geoview so you can proceed with unlocking your KT-10. Connect your KT-10 to the PC and start Geoview Version.

0.133. Go to the settings icon  and then to the maintenance tab, which can be seen below, you will see the button ***Unlock the KT-10+***.



**Fig. 12: Maintenance Menu to Unlock KT-10 Plus Features**

Press the button and enter the code you received via email into the new window that opens, seen below in Figure 13, and then press **OK**. You will receive a confirmation that your unit has been successfully unlocked.



**Fig. 13: Unlock Code Entry Window**



**Fig. 14: Unlock Successful**

You are now ready to begin using the KT-10 Plus features.

## **Recommendations for KT-10 Plus Calibrations**

The Calibration Curves are based on the relation between the measured susceptibility and the real concentration of minerals of specific type. The calibration consists of creating a numerical table or function that will cover all different concentrations in an ideal type of sample. The KT-10 Plus comes with calibration for ideal magnetite.

### **Recommendations materials for the calibration process**

1. KT-10 plus
2. Five plastic bags approx size 8" x 8" or bigger
3. Five samples of local specific mineral or rock at varying concentrations.
4. A PC with text editor and KT-10 console or Geoview

### **Sample preparation**

The user must prepare the samples in a consistency and geometry as to eliminate the deviations caused by geometry factors or unsuitable shapes. The calibration sample shape must conform to the expected or common shape of future real samples that will be measured in production. The closer the calibration sample compares to real samples measured the better the precision of measurement will be.

In the case that the most common sample in your location are rocks and you do not wish to crush them every time prior to measurement, then it is recommended to have samples with minimum size of 4" x 4" X 1.5" thick. In places where the most common mineral is in fine gravel or sand form, it is recommended that it be poured into a plastic bag 8" x 8" and form like a pillow shape about 2" thick.

### **Calibration samples selection.**

Calibration method expects to cover wide range of local concentration profile. For better interpolation, we recommend samples with concentration from minimum (subsoil) to maximum available in mine or pit. User can define five points of conversion for the table and a suitable selection of calibration points can increase precision on a focused range. As one such example, let's assume your site has an iron concentration of approximately 30% and this concentration covers about three quarters of the reserves. There are also small spots with concentration close to 45% which is local maximum. The calibration can be set as follows

Concentration	Purpose
<5%	zero sample
25%	
30%	local average concentration
40%	
45%	local maximum

**Figure 15: Calibration Selection Table**

**Calibration table**

When you have the 5 calibration samples, with known concentrations determined by any other independent method such as chemical assay, XRF, etc. and the samples are in suitable form and geometry to reflect future local measurement in situ, you are then ready to perform the five susceptibility measurements for calibration and creating the relation table. The following table is to be used only as an example.

Concentration	Susceptibility
<5	$0.15 \times 10^{-3} \text{SI}$
25	$0.20 \times 10^{-3} \text{SI}$
30	$0.32 \times 10^{-3} \text{SI}$
40	$0.35 \times 10^{-3} \text{SI}$
45	$0.38 \times 10^{-3} \text{SI}$

It is recommended to perform multiple measurements on each sample and use the average value with standard deviation. Next user must transfer the table into the KT-10 plus. This can be done with Geoview following the steps starting on page 6.

Format is – Susceptibility in  $\text{SI} \times 10^{-3}$  and concentration in percent

0.15	5
0.20	25
0.32	30
0.35	40
0.38	45

Then all that must be done is to enter the set up menu to select the output in concentration and the measurements on production samples can begin.