SCINTREX
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CG-6 Autograv™ Gravity Meter

Operation Manual

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Chapter 1 **Instrument Overview**

Figure 1-1 The CG-6 Autograv™ Gravity Meter

The CG-6 Autograv™ is an automated gravity meter that has a worldwide measurement range of over 8,000 mGals and a reading resolution of 0.0001 mGal. This enables the user to operate in both detailed micro-gravity surveys and large scale regional or geodetic surveys.

Accurate measurements are taken by simply pressing a key, and under most field conditions it takes under one minute to carry out a reading. Additional measurement cycles can also be selected if required. The CG-6 Autograv™ obtains a reading by processing a continuous series of 0.1 second samples. The reading, with selected corrections applied, is displayed on the LCD screen directly in mGals. The acquired data is stored and can be downloaded at a later time.

The gravity sensor, electronics and batteries are integrated into a single self-contained instrument housing.

Protection from changes in ambient temperature and atmospheric pressure is achieved by sealing the CG-6 Autograv™ sensing element in a sealed temperature-stabilized chamber. The broad operating temperature range of -40°C to +45°C enables the operator to use the CG-6 Autograv™ in most environments. A high temperature version of the meter with an operating temperature range of -40°C to +55°C is also available.

Internal tilt sensors constantly supply the CG-6 Autograv™ with tilt information in order to correct, in real time, measurements taken on unstable ground.

Leveling of the CG-6 Autograv™ is made simple by two LED-illuminated arrows on the console which show the direction that the operator needs to rotate the tripod screws.

The two internal Li-ion rechargeable batteries provide sufficient power to operate the CG-6 Autograv™ throughout a normal survey day.

An external optional tablet computer allows the user to easily setup the CG-6 Autograv™ and store the setup settings as well as plan and store the survey points. The tablet computer is pre-loaded with the LynxLG software that allows the user to quickly set up and plan the upcoming survey, remote recording and continuous monitoring of both gravity and tilt signals, and gives access to maps among its many functions.

A cold weather kit (p/n 888405) is recommended for operating in ambient temperatures below -20°C.

Other available accessories include a Seco backpack (p/n 140220) and the trident gradient tripod (p/n 101370004).

Chapter 2 **Getting Started**

Chapter Layout

Chapter	Description
1. Overview	Description of the instrument
2. Getting started	Introduction to the manual and description of the instrument's components.
3. Setting up	Setup of your CG-6 Autograv™ for a survey.
4. Operation	Operating your CG-6 Autograv™ during a survey.
5. Maintenance	How to maintain and troubleshoot your CG-6 Autograv™.
6. Reference	Technical specifications, instrument parts list and warranty information.

Symbols

 **Important**	Indicates an important topic, particular attention should be paid to this section.
 **Note**	Denotes information of particular interest to the user.

Actions, such as press, enter and edit are described in *italics*. Keypad buttons are **bolded**. Menu items are **BOLDED** and in capital letters.

Unpacking the Instrument

The CG-6 Autograv™ is packed in a padded case (with the batteries stored separately and packaged individually to comply with IATA transport safety regulations) in order to protect the instrument during shipment and transportation to the field.

Important: During shipment, the batteries must be removed from the instrument and stored separately. If you have just received your CG-6 Autograv™, the batteries will have a charge of approximately 30% and be disconnected from the instrument.

Figure 2-1 The CG-6 AutogravTM Gravity Meter and its transportation case

Important: During shipment, the batteries must be removed from the instrument and stored separately. If you have just received your CG-6 Autograv™, the batteries will have a charge of approximately 30% and be disconnected from the instrument.

1. Press the red pressure release valve located in the front of the transportation case.

2. *Pull* up the tab of a link lock and *turn* the tab counter-clockwise to unfasten the lock

from the keeper plate.

3. *Repeat* step **2** for the other link locks.

Figure 2-2 Location of the pressure release valve on the transportation case

4. *Open* the CG-6 Autograv™ transportation case by lifting the lid.

5. *Remove* the CG-6 Autograv™ from the transportation case by *pulling* directly upward on the handle and visually *inspect* for any physical damage that may have occurred during transportation.

Important: The CG-6 Autograv™ transportation case has a shockwatch monitor affixed to the side of the shipping box. Inspect the monitor and if the vial is red please contact Scintrex Limited immediately. Please refer to “When to ship the unit” on page 6-5.

Figure 2-3 Shockwatch monitor

Overview of the Components

The following picture shows an overhead view of the all the components that are supplied with a standard CG-6 Autograv™ in its transportation case.

Figure 2-4 The CG-6 Autograv™ and its components

Overview of the Console and Keypad

Figure 2-5 shows a top view of the instrument Control Console. It is comprised of a display, a GPS/Bluetooth Antenna, and a keypad module which has a keypad for operating the instrument and LED arrows for levelling..

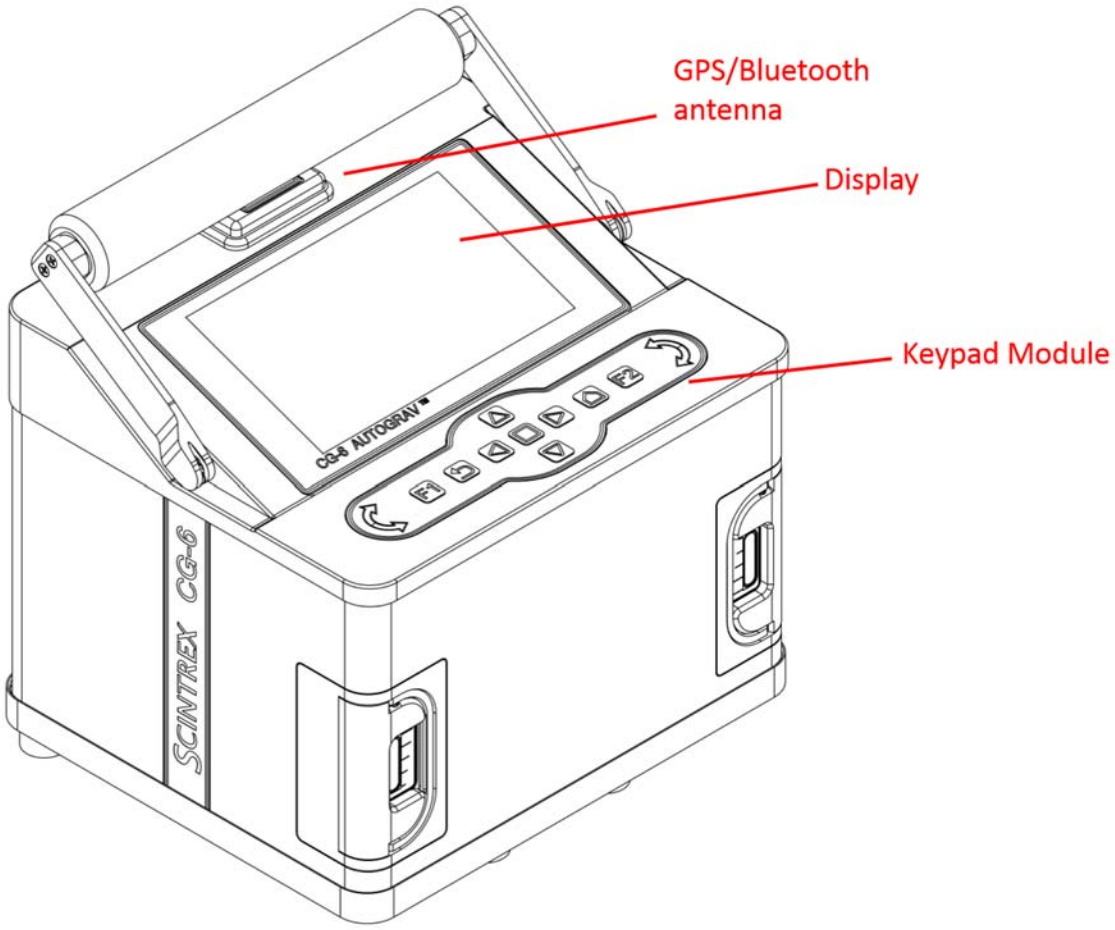

Figure 2-5 The CG-6 Autograv™ Console

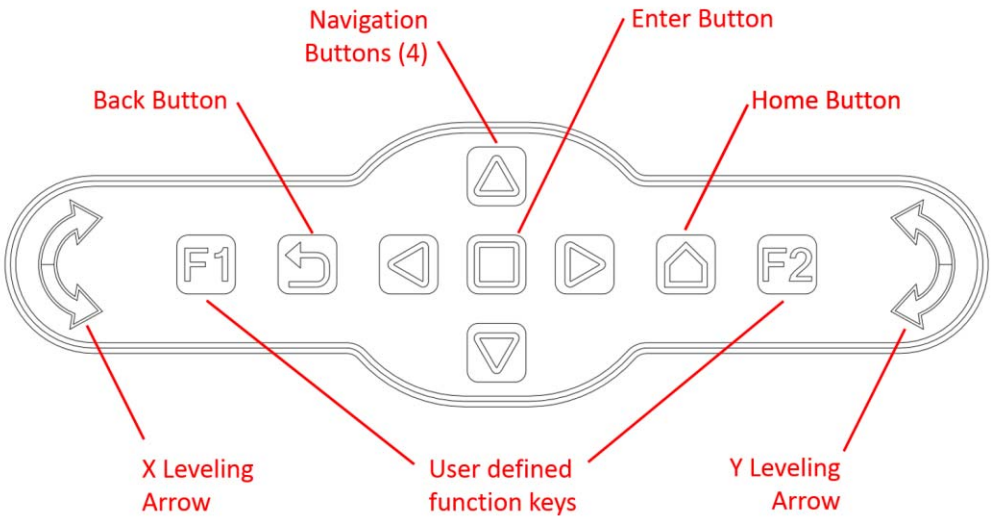

Figure 2-6 The CG-6 Autograv™ Keypad Module

The leveling arrows indicate the direction to turn the tripod leveling screws. The left-hand side arrow refers to the left-hand leveling screw and right-hand side arrow refers to the right-hand leveling screw. The right hand screw adjusts X and Y levels simultaneously, whereas the left hand screw only adjusts the X level.

Note: While both tripod screws can be rotated simultaneously for coarse leveling, it may be more effective for fine leveling to adjust the Y level with the right-hand screw first, then adjust the X level with the left-hand screw.

You can navigate between the menu items located at the bottom of the screen by using the **Navigation, Home, Back, F1 and F2 Buttons**. In any screen, *move* the cursor either to **BACK** or **CANCEL** and *press* the **Enter** button, or press the **Back** button to go back to the previous screen. Press the **Home** button to go to the home screen.

Starting up the CG-6 Autograv™

Starting-up the CG-6 Autograv™ for the first time, or after it has been turned off for more than 24 hours, requires the following steps and waiting periods.

Powering up the CG-6 Autograv™. Please refer to the section entitled: Powering up the CG-6 Autograv™ below

Warm-up period: after you power up the CG-6 Autograv™, it takes approximately one hour to reach the operating temperature.

Stabilization period: the instrument takes 24 hours to stabilize after you power up.

Setting up the instrument for field operations: after the stabilization period your CG-6 Autograv™ is ready for field use., Refer to the next chapter (Setting up Your CG-6 Autograv™) For details on instrument setup

Powering up the CG-6 Autograv™

The CG-6 Autograv™ can be powered either by:

• The 15V DC external power supply, or

Figure 2-7 Connecting the power supply to the CG-6 Autograv™

• The two internal Smart Batteries supplied with the CG-6 Autograv™.

Figure 2-8 The CG-6 Autograv™ and batteries

If the batteries are in place when the external power supply is connected, the power supply will power the unit and also charge the batteries if necessary. When the batteries are fully charged the supply powers the unit so that the batteries maintain their full charge. Charging takes approximately 4 hours if the batteries have been fully discharged. Both batteries are charged simultaneously.

Note: When the CG-6 Autograv™ is powered by two batteries both discharge at the same rate.

Charging the CG-6 Autograv™ Batteries

In addition to being charged in-situ in the CG-6 Autograv™ , batteries can also be charged with the Smart Battery Charger (p/n 400209):

Figure 2-9 The CG-6 Autograv™ Gravity Meter and the battery charger

Overview of the Main Screen

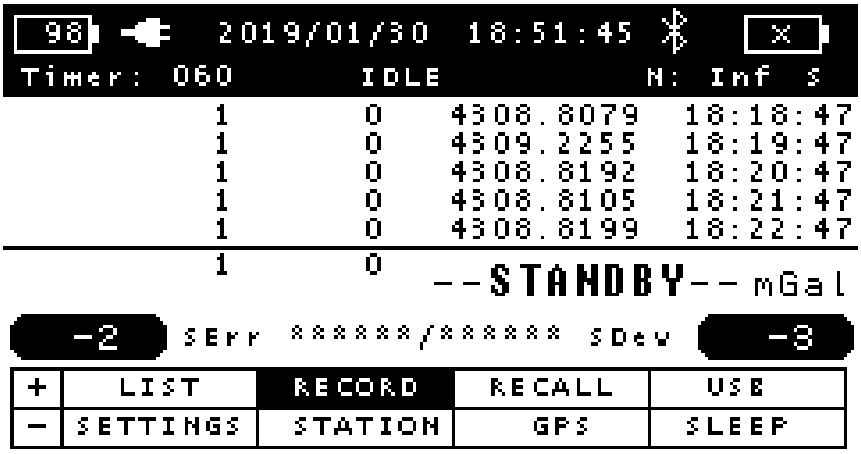

Figure 2-10 CG-6 AutogravTM main screen: Idle mode

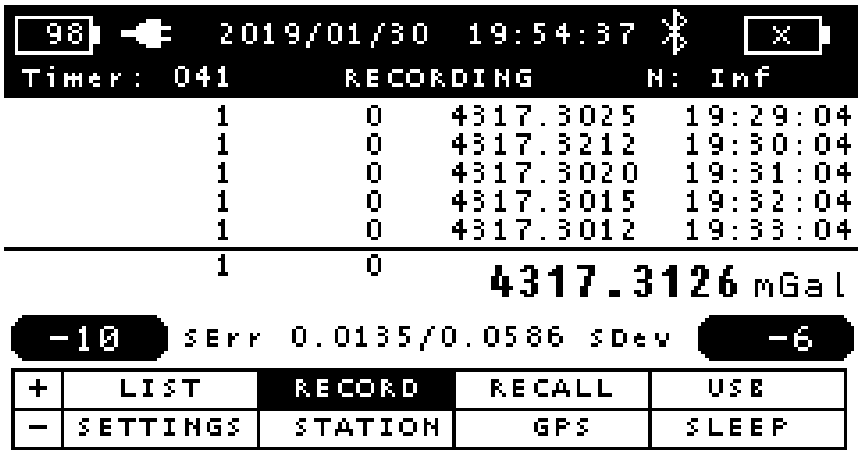

Figure 2-11 CG-6 Autograv™ main screen: Recording mode

The upper part of the main screen indicates percentage of charge in each battery, date and time, timer (the remaining measure length of current cycle in seconds, counts down during recording), meter status (whether it is IDLE or RECORDING) and number of cycles, N, programmed for a reading.

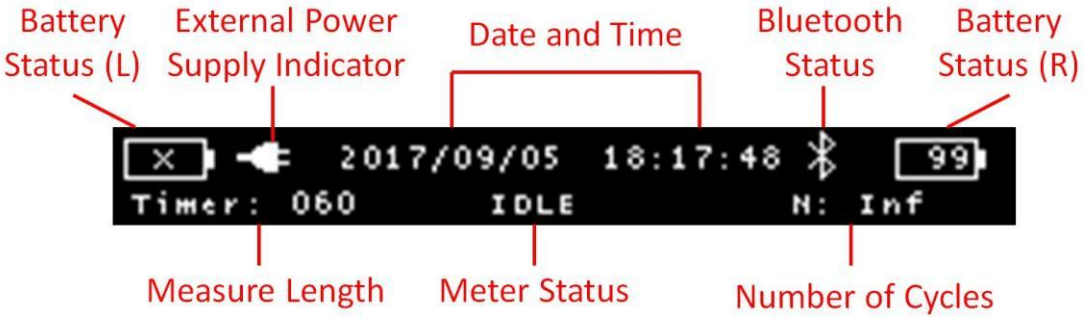

Figure 2-12 Main screen: upper part

In the middle part of the screen previous readings are displayed in order with the oldest reading at the top of the list. The station name, line number, reading value and time at the end of the reading are displayed. These readings have already been stored in the memory.

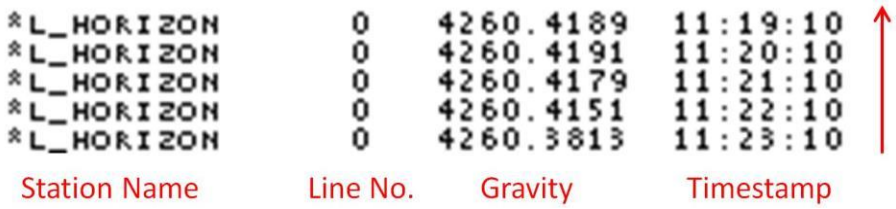

Figure 2-13 Main screen: middle part

Displayed below the solid horizontal line are the current station and its sequence in the list of stations, the line number, and below these are the reading value in mGals, SDev (the standard deviation of the samples used to calculate the reading) and SErr (the standard error which is equal to the standard deviation divided by the square root of the number of current samples $SErr = {SDev}/{\sqrt{N}}$.) When the meter is in idle mode the gravity reading value is replaced by "STANDBY" and the SErr and SDev values by *****

The inclination of the X axis in arcseconds is displayed on the left-hand-side and the inclination of the Y axis in arcseconds is displayed on the right-hand-side.

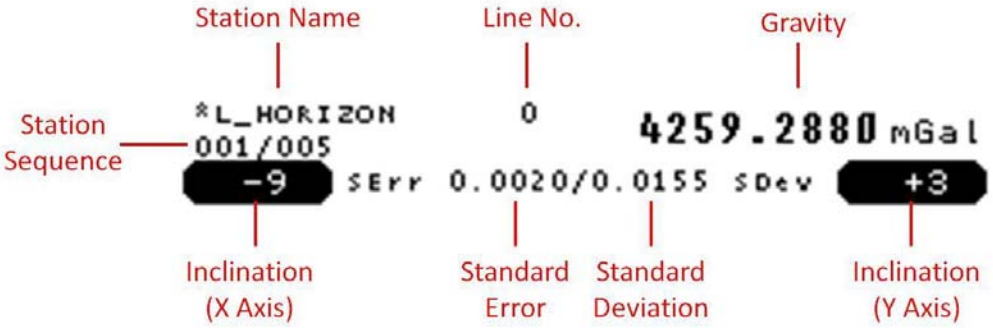

Figure 2-14 Main screen: lower part

Placed at the bottom part of the screen are the menu items that perform the most frequently used tasks.

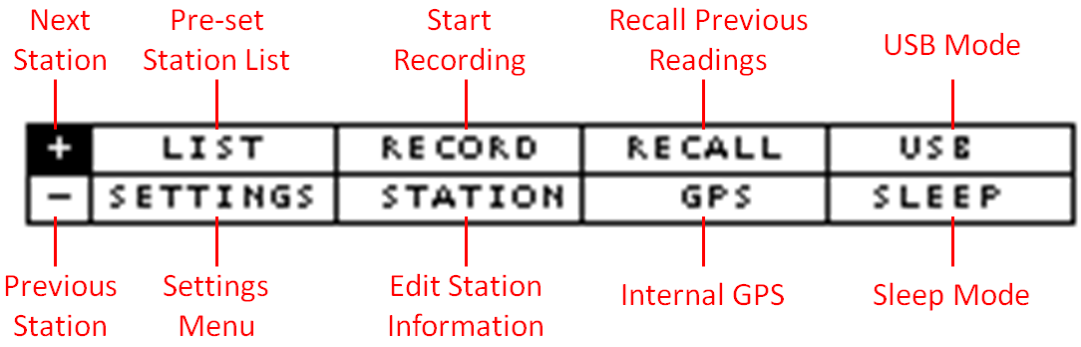

Figure 2-15 Main screen menu

Basic Operations

Navigating the Menus

Use the navigation buttons to move the cursor. *Press* the **Enter** button to confirm your selection or enter the submenu.

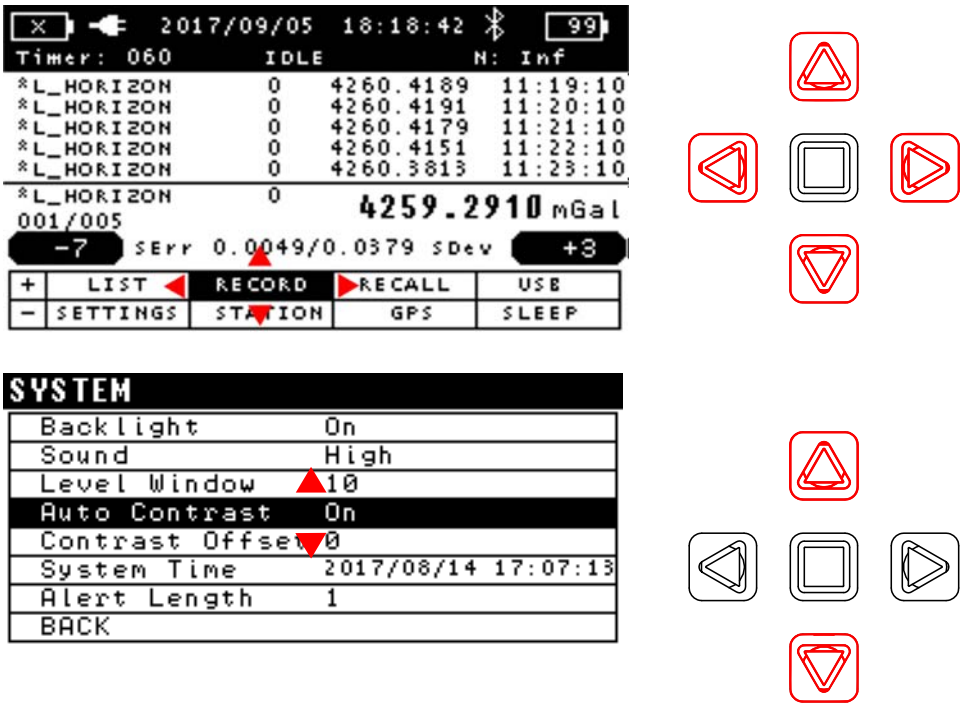

Figure 2-16 Navigating the menus

Taking Readings

The meter has two modes of operation:
RECORDING: Used for recording readings. In this mode the filtered gravity reading is displayed on the main screen as shown in Figure 2-11.
IDLE: Intended for use when the meter is being moved. It reduces the settling time at the next station by stabilizing the electronics during transport. In this mode the gravity reading is replaced by the word “STANDBY” on the main screen as shown in Figure 2-10

To switch the operating mode between ***RECORDING*** and ***IDLE*****:** place the cursor on **RECORD** in the main screen and *press* the **Enter** button.

Editing Values of Variables

Choosing a Value from a Selectable List

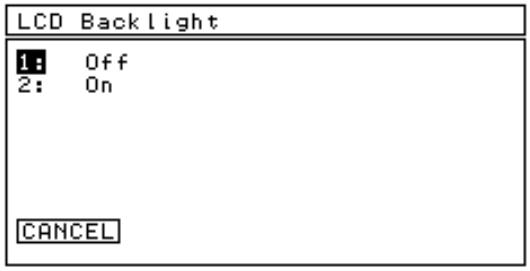

Figure 2-17 Choosing a value from a selectable list

To choose a value from a selectable list, simply *move* your cursor to the desired entry and *press* the **Enter** button.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Entering a Value with Onscreen Keypad

Some variables need to be edited with onscreen keypad. Depending on the type of the variable, the onscreen keypad can either be numeric or alphanumeric.

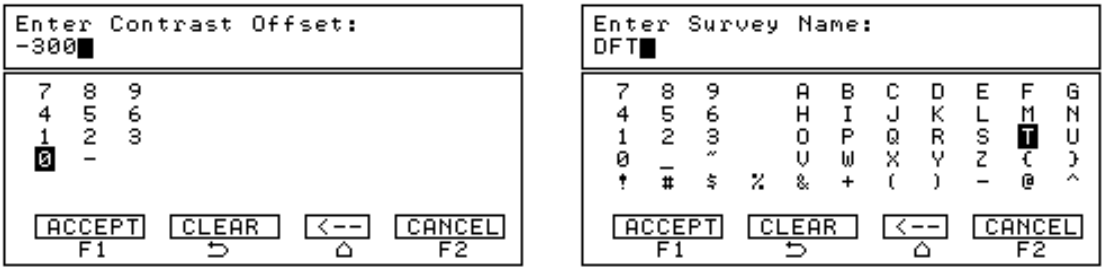

Figure 2-18 Onscreen keypad: numeric and alphanumeric

To type a character into the field, *move* the cursor to the desired character and *press* the **Enter** button.

To erase the last character in the field, move the cursor to "**<--**" using either:

- the **Navigation** buttons

or

- the **Home** button

and *press* the **Enter** button.

To clear the entire field, move the cursor to "**CLEAR**" using either:

- the **Navigation** buttons

or

- the **Back** button

and *press* the **Enter** button.

To accept the value in the field, move the cursor to "**ACCEPT**" using either:

- the **Navigation** buttons

or

- the **F1** button

and *press* the **Enter** button.

To exit this screen without changes, *move* the cursor to "**CANCEL**" using either:

- the **Navigation** buttons

or

- the **F2** button

and *press* the **Enter** button.

Putting the CG-6 Autograv™ into/out of Sleep Mode

The CG-6 Autograv™ can be put into sleep mode when the main display and leveling arrows will be shut off. However, the meter itself will still remain on power.

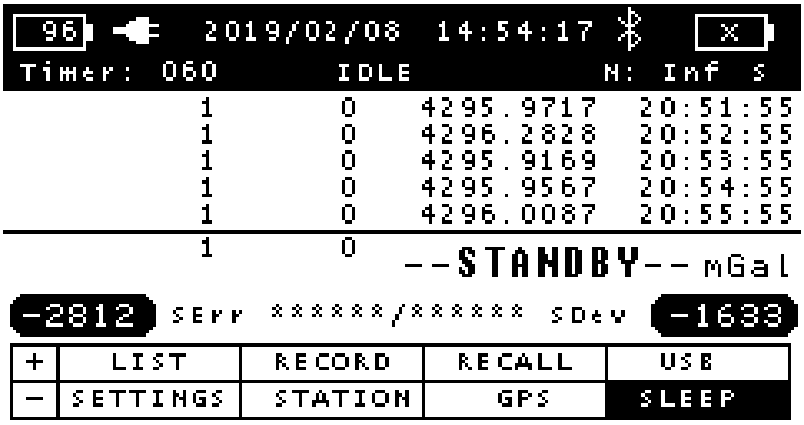

Figure 2-19 The main screen ready for sleep mode

From the main screen, *move* your cursor using the **Navigation Buttons** to **SLEEP** and *press* the **Enter** button.

Note: Once the CG-6 Autograv™ is in sleep mode, pressing any button will wake it up.

Chapter 3 **Setting up Your CG-6 Autograv™**

The CG-6 Autograv™ has an optional tablet computer (p/n 888030) that allows the user to quickly set up and plan a survey using the pre-loaded LynxLG software. Please refer to LynxLG Acquisition Software Manual (p/n 115370003) for more details on setup with the tablet computer.

Note: You can operate the CG-6 Autograv™ either with or without the optional tablet computer (p/n 888030). The CG-6 Autograv™ has software and a user interface that enables it to operate as a fully functional autonomous gravity meter. The tablet mode gives you more flexibility and allows you to remotely operate your CG-6 Autograv™ and access more advanced functions such as positional station maps for real-time navigation, station/route import capabilities (KML, GPX, Delimited ASCII), creation of simple Bouguer maps and graphs.

Settings Menu

From the main screen, *move* your cursor to **SETTINGS** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

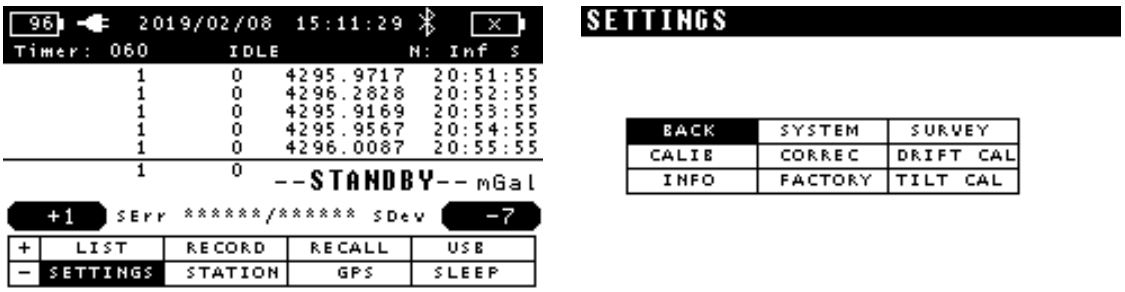

Figure 3-1 The settings screen

System Settings

To access the System settings screen, *move* your cursor to **SYSTEM** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

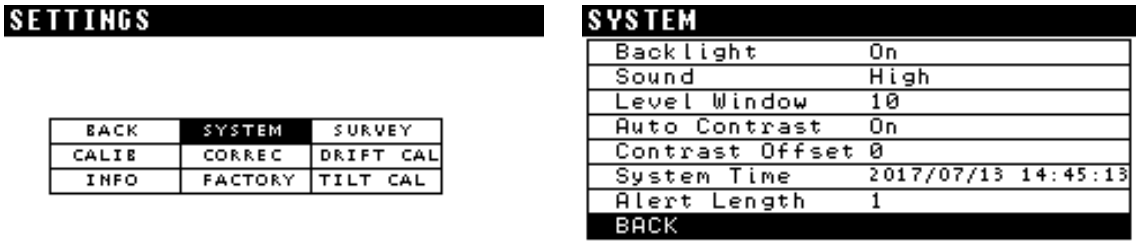

Figure 3-2 The system screen

Turning on and off the Screen Backlight

The backlight of your screen can be set to ON or OFF. To adjust the backlight, *move* the cursor to **Backlight** (image below on the left) and press the **Enter** button. The screen on the right will appear:

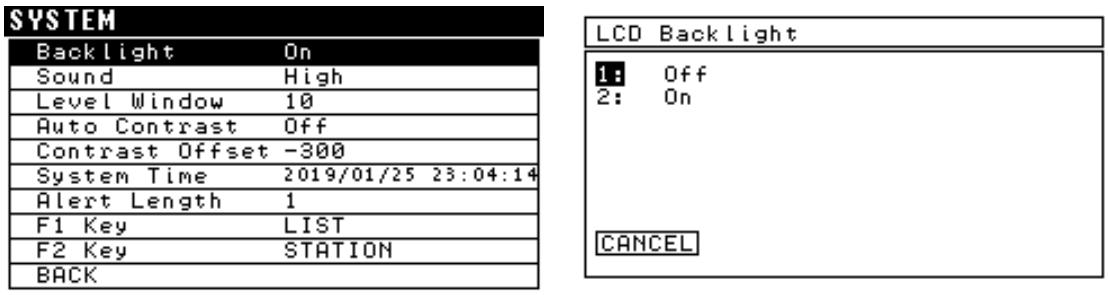

Figure 3-3 The backlight screen

The backlight can be set to **On** or **Off**. *Move* your cursor to either 1 or 2 and *press* the **Enter** button.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Adjusting the Buzzer Volume

The volume of the buzzer can be set to either low, medium, high or disabled. To adjust the volume, move the cursor to **Sound** (image below on the left) and press the **Enter** button. The screen on the right will appear:

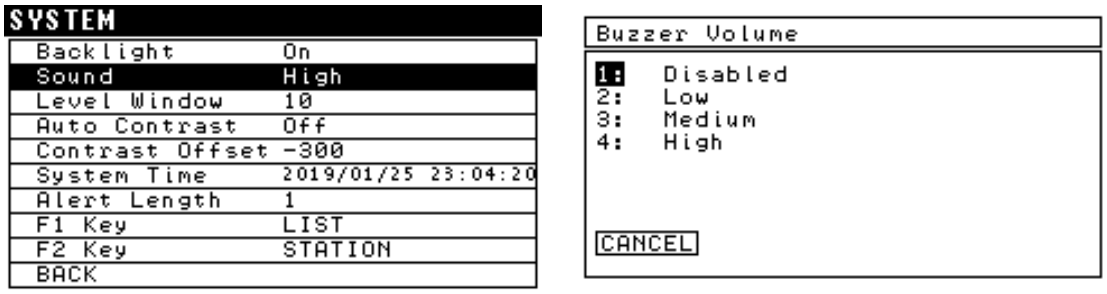

Figure 3-4 The buzzer volume screen

Move the cursor to your desired volume and *press* the **Enter** button.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Adjusting the Level Window

Note: The level window size is the threshold under which the leveling arrows will appear as green. For instance, if level window is set to 10 arseconds, then once the tilt of one of the axes is within ± 10 arcseconds, then the leveling arrow for this axis will appear green.

To adjust the level window size, *move* the cursor to **Level Window** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

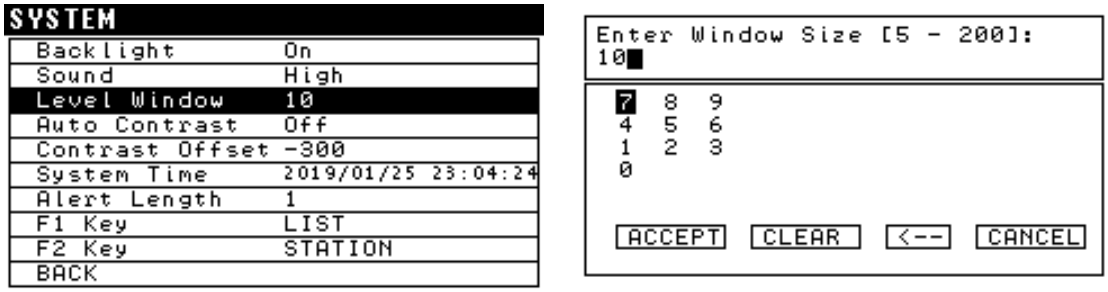

Figure 3-5 The level window size editing screen

Enter the desired window size with the onscreen keypad as described in the section "Entering a Value with Onscreen Keypad" on page 2—13.

Turning Screen Auto Contrast on/off

The automatic adjustment of the contrast of your screen can be set to ON or OFF. The auto contrast function should generally be left on at all times. The contrast will automatically be adjusted based on the LCD screen temperature. This is convenient when you are operating in field conditions where the amount of sunshine and ambient temperature can vary throughout the day. To turn the auto contrast on or off, move the cursor to **Auto Contrast** (image below on the left) and press the **Enter** button. The screen on the right will appear:

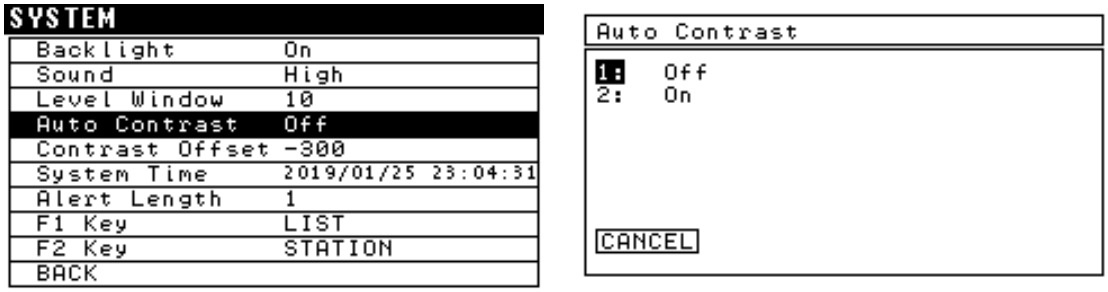

Figure 3-6 The auto contrast screen

To set the auto contrast to **On** or **Off**. *Move* the cursor to either 1 or 2 and *press* the **Enter** button.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Note: The auto contrast function should generally be left on at all times. The contrast will automatically be adjusted based on the LCD screen temperature.

Adjusting the Screen Contrast Offset

In conjunction with an automatic adjustment of the contrast of your screen (see previous section), you can also adjust the contrast offset (i.e. the intensity), the higher the value, the darker your screen is. To *edit* the value of the contrast offset, *move* the cursor to **Contrast Offset** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

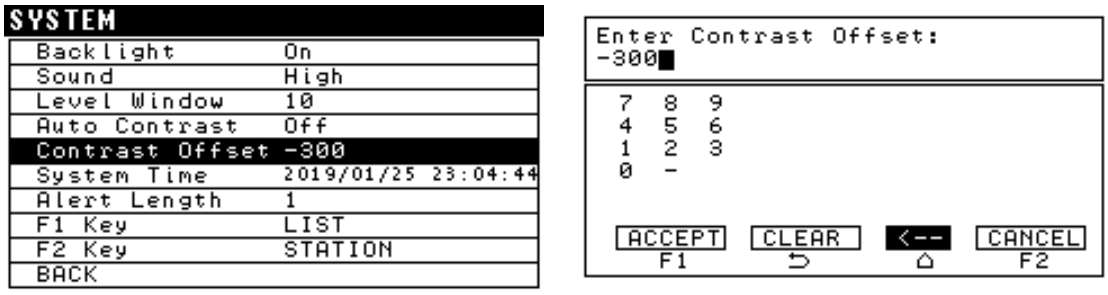

Figure 3-7 The contrast offset editing screen

The contrast offset can be set to any value between -500 and +1000.

Enter the desired contrast offset with the onscreen keypad as described in the section "Entering a Value with Onscreen Keypad" on page 2—13

Note: If you enter a very high contrast offset value, you screen will be very dark.

Adjusting the System Date and Time

Note: You can either enter system date and time manually, or synchronize them with GPS.

Manually Entering System Date and Time

To adjust the value of your system time, *move* the cursor to **System Time** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

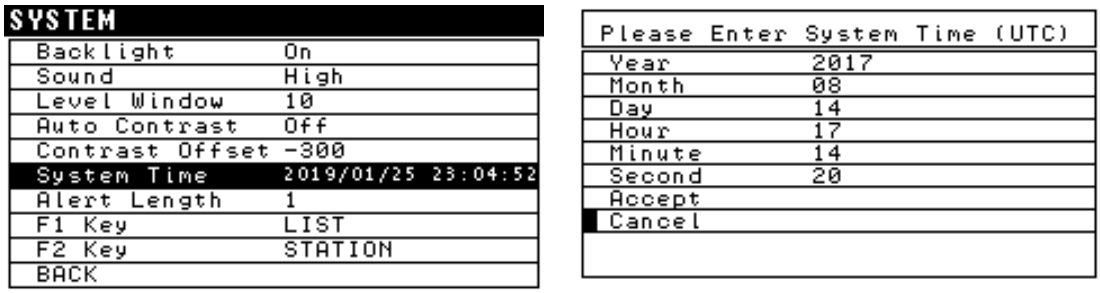

Figure 3-8 The system time editing screen

To enter the year, *move* the cursor to Year
(image below on the left) and *press* the **Enter** button. The screen on the right will appear:

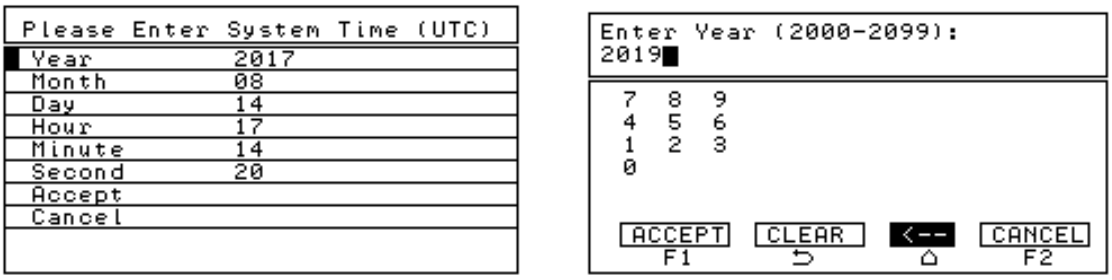

Figure 3-9 The system time editing screen

Enter the value of year with the onscreen keypad keypad as described in the section "Entering a Value with Onscreen Keypad" on page 2—13.

Repeat the same procedure for adjusting the month, day, hour, minute and second.

To accept the new value of system time, *move* the cursor to **Accept** (on the left hand screen in Figure 3-9) and *press* the **Enter** button

Updating System Date and Time with Built-in GPS

From the main screen, *move* your cursor to **GPS** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

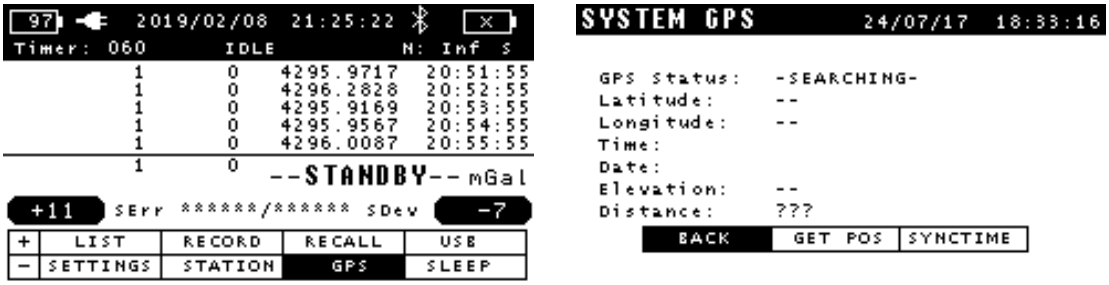

Figure 3-10 The GPS screen

Note: The GPS status may first appear as "SEARCHING". To improve the signal reception, relocate your CG-6 Autograv™ to a place with exposure to the open sky.

Once the GPS connection is established, GPS status will become "LOCKED". Latitude, Longitude, Time, Date and Elevation and Distance fields will automatically be populated

Move your cursor to **SYNCTIME** and *press* the **Enter** button. System time is then synced with the Built-in GPS.

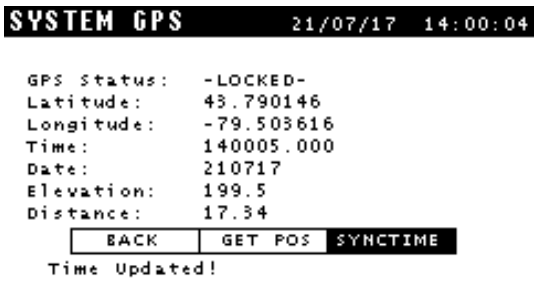

Figure 3-11 GPS time synced

Adjusting the Alert Length

The alert length (seconds) is the duration that the leveling arrows will flash light purple to indicate that the reading is done. To *edit* the value of the alert length, *move* the cursor to **Alert Length** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

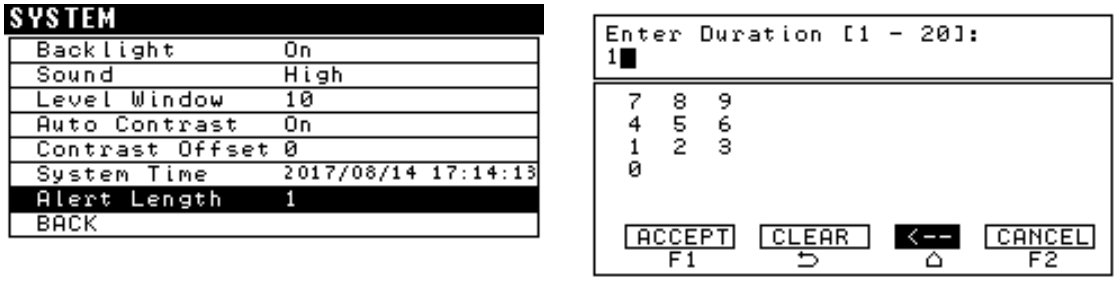

Figure 3-12 The alert length editing screen

The alert length can be set to any value between 1 second and 20 seconds.

Enter the desired alert length delay value, with the onscreen keypad as described in the section **"**Entering a Value with Onscreen Keypad**"** on page 2—13.

Assigning shortcuts to the F1 and F2 buttons

User defined shortcuts to main screen menu items can be assigned to the F1 and F2 buttons by the user.

To assign a shortcut to the **F1** button *move* the cursor to **F1 Key** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

Move the cursor to the desired shortcut function and *press* the **Enter** button.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

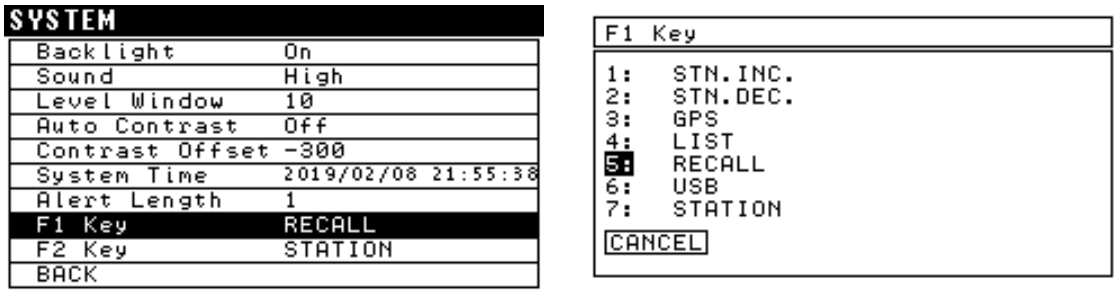

Figure 3-13 Assigning a shortcut to the F1 button

Follow the same procedure to assign shortcut to the F2 button

Survey Settings

To access the Survey screen, *move* your cursor to **SURVEY** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

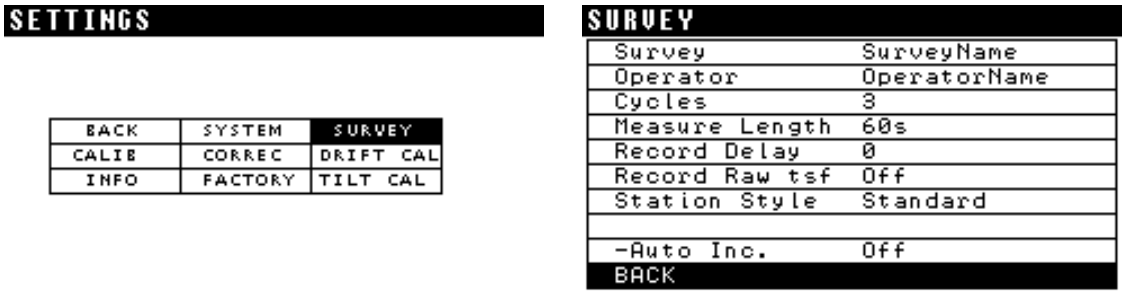

Figure 3-14 The survey settings screen

Editing the Survey Name

To *edit* the survey name, *move* the cursor to **Survey** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

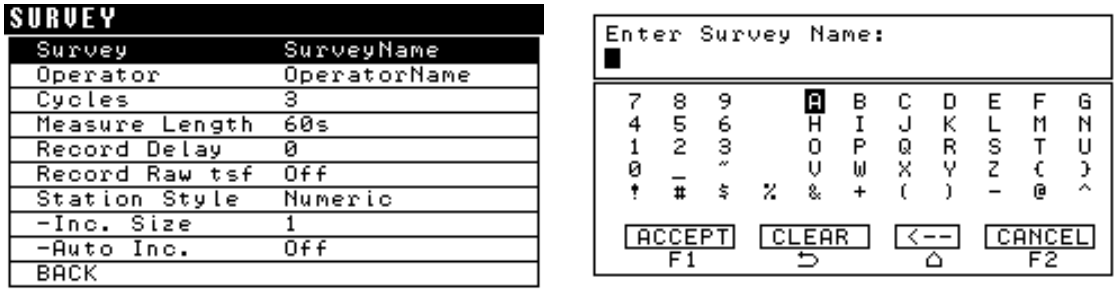

Figure 3-15 The survey name editing screen

The survey name can be any combination of up to 31 alphanumeric characters.

Enter the desired alert length delay value with the onscreen keypad as described in the section **"**Entering a Value with Onscreen Keypad**"** on page 2—13.

Editing the Operator Name

To *edit* the operator name, *move* the cursor to **Operator** (image below on the left) and *press* the **Enter** button. The screen on the right will appear will appear:

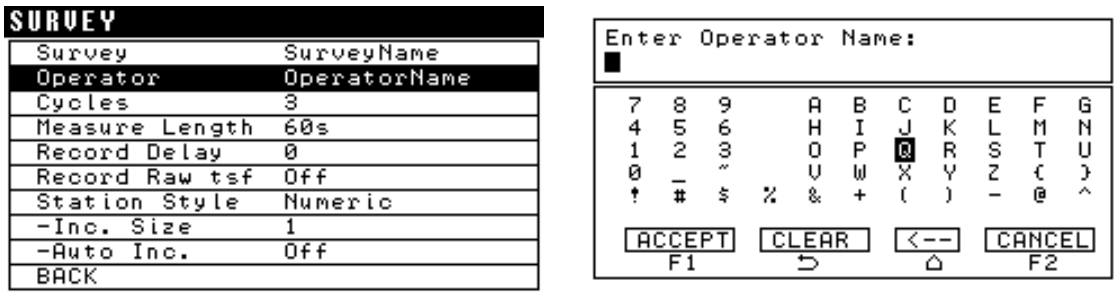

Figure 3-16 The operator name editing screen

The operator name can be any combination of up to 31 alphanumeric characters.

Enter the desired operator name with the onscreen keypad as described in the section "Entering a Value with Onscreen Keypad" on page 2—13.

Adjusting the Number of Cycles

To adjust the number of Measurement Cycles at your station, *move* the cursor to **Cycles** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

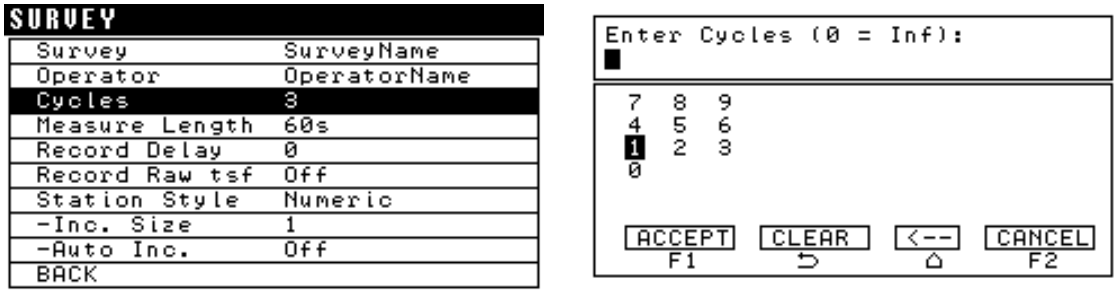

Figure 3-17 The cycles screen

Note: The Number of Cycles is the number of times you successively repeat a Measurement Cycle at a given station. It can be any value you choose between 1 and a large number of your choosing. A number of cycles equal to 0 is considered as infinite, meaning that the gravity meter is configured in cycling mode and will measure until the reading process is manually stopped by the user.

Enter the desired number of cycles with the onscreen keypad as described in the section "Entering a Value with Onscreen Keypad" on page 2—13.

Adjusting the Measurement Cycle Length

To adjust the length of each Measurement Cycle, *move* the cursor to **Measure Length** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

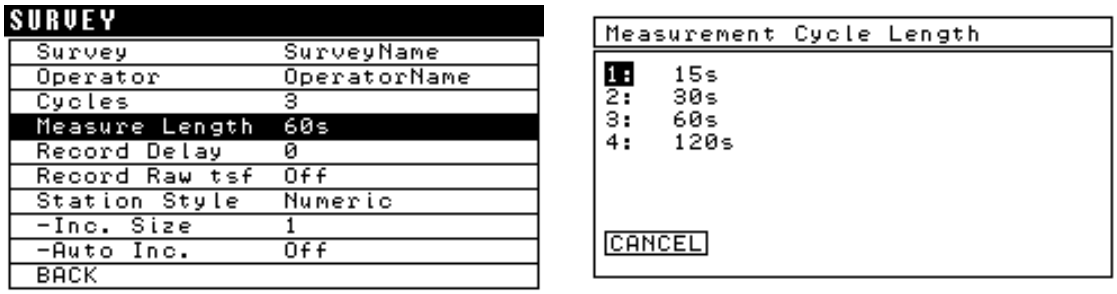

Figure 3-18 The measure length screen

The Measurement Cycle Length can be set to 15 seconds, 30 seconds, 60 seconds or 120 seconds. Move the cursor to the desired selection and *press* the **Enter** button.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Adjusting the Record Delay

You can enter a record delay value, in seconds, which will delay the start of the recording of data. This is convenient when operating in the field or during a drift calibration test when you want to delay the start of a reading.

To *edit* the value of the record delay, *move* the cursor to **Record Delay** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

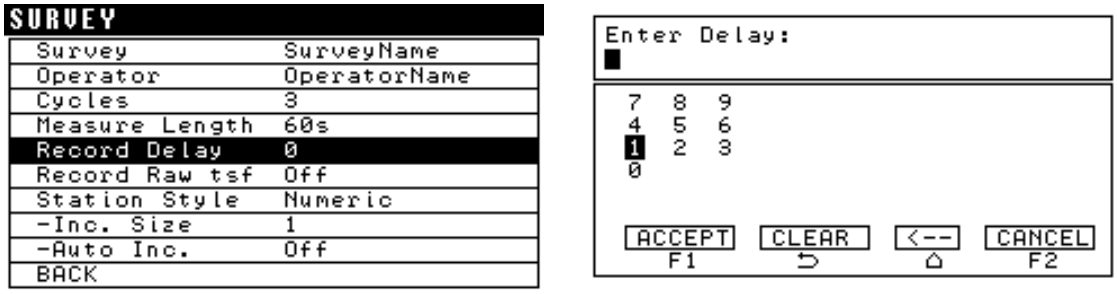

Figure 3-19 The record delay editing screen

The record delay can be set to any value between 0 and a large number of your choosing.
Enter the record delay value with the onscreen keypad as described in the section "Entering a Value with Onscreen Keypad" on page 2—13.

Enabling/Disabling Raw TSF File Recording

You can choose to enable or disable the recording of the raw. tsf file (in addition to the filtered .dat data file, which is always recorded).

Move the cursor to **Record Raw tsf** and *press* the **Enter** button. The following screen will appear:

To turn the Record Raw tsf feature on or off, move the cursor to **Record Raw tsf** (image below on the left) and press the **Enter** button. The screen on the right will appear:

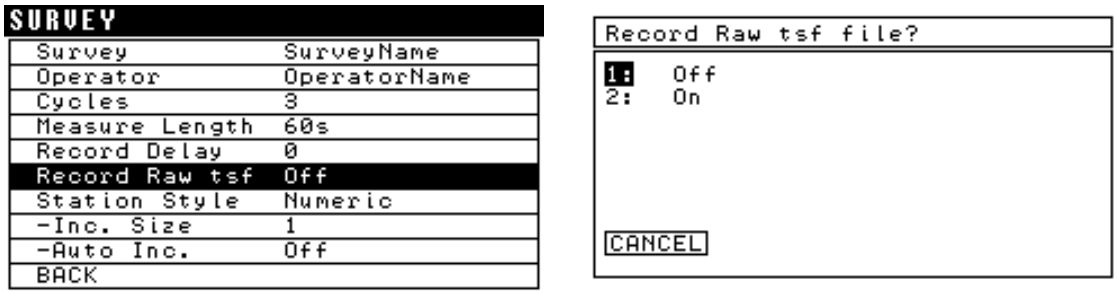

Figure 3-20 The tsf recording screen

Move your cursor to either 1 or 2 and *press* the **Enter** button.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Changing the Station Style

To *change* the station style, *move* the cursor to **Station Style** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

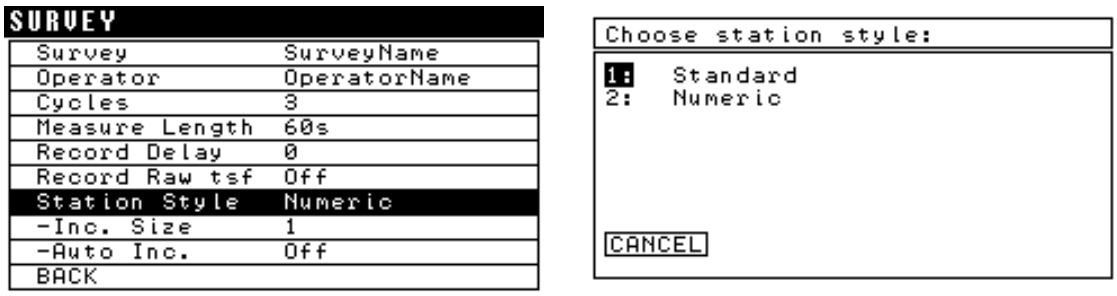

Figure 3-21 The station style editing screen

The Station Style can either be **Standard**, i.e. any alphanumeric name or **Numeric**, i.e. a number. *Move* your cursor to either 1 or 2 and *press* the **Enter** button.

Depending on the station style you choose, the survey menu will look slightly different, as illustrated in the figure below.

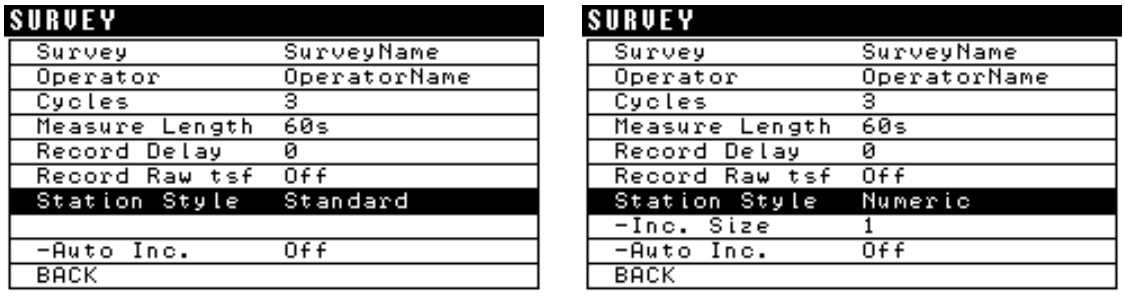

Figure 3-22 Station Style: Standard vs. Numeric

As you will notice, the “Inc. Size” parameter only appears when station style is numeric.

Adjusting the Increment Size (Numeric Station Style Only)

To edit the increment size, *move* the cursor to **-Inc. Size** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

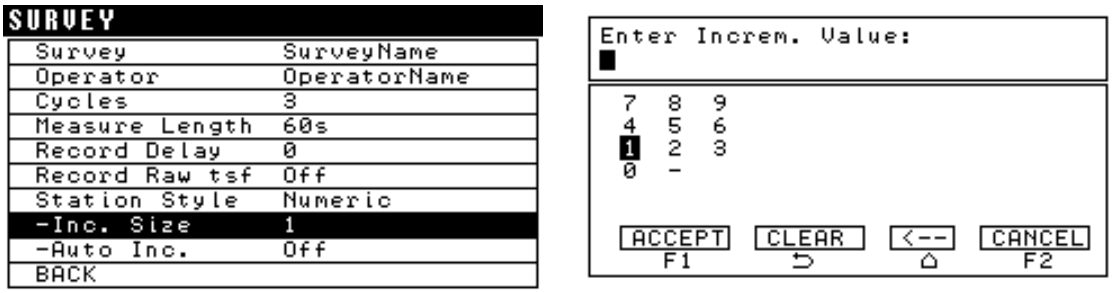

Figure 3-23 The increment size screen

Enter the increment size with the onscreen keypad as described in the section **“**Entering a Value with Onscreen Keypad” on page 2—13.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Enabling/Disabling Auto Station Increment

The Auto station increment function will automatically assign your CG-6 to the next station after all measurement cycles at the current station are completed.

In numeric station style, the new station name would be the value of the current station plus the increment size.

In standard station style, the new station name would be the next station in the pre-set list of stations. The station latitude, longitude, elevation and line number will also be updated accordingly.

To enable or disable auto station increment, *move* the cursor to **–Auto Inc** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

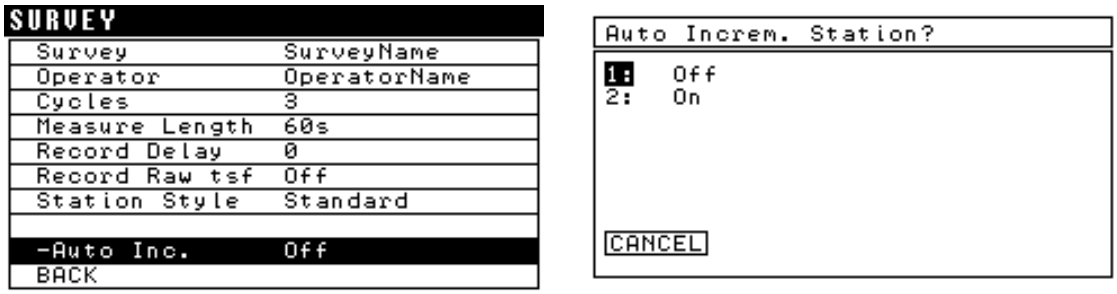

Figure 3-24 The automatic increment screen

Move your cursor to either 1 or 2 and *press* the **Enter** button.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Viewing and Changing the Calibration Parameters

From the Settings screen *move* your cursor to **CALIB** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

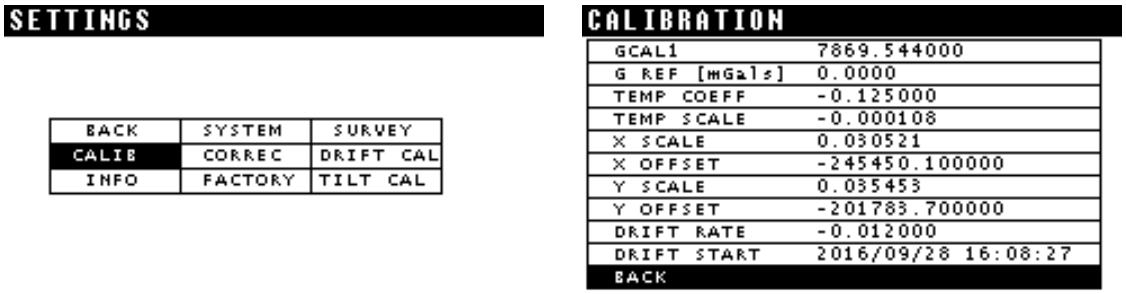

Figure 3-25 The instrument parameter screen

Important: The instrument parameters are unique to each CG-6 Autograv™ Gravity Meter and are set at the Scintrex Concord Plant:

- The **TEMP COEFF** and **TEMP SCALE** should not be changed by the operator under normal circumstances
- **GCAL1** should only be changed if the CG-6 Autograv™ has been recalibrated
- **DRIFT RATE** will be changed after a drift calibration test.
- **DRIFT START** can be changed at any time, but usually after a drift calibration test
- **X SCALE, X OFFSET, Y SCALE, Y OFFSET** will be changed after a tilt calibration test
- **G REF** can be changed as required at any time

Changing the GCAL1 Gravity Meter Constant

To *edit* the GCAL1 gravity meter constant, *move* the cursor to **GCAL1** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

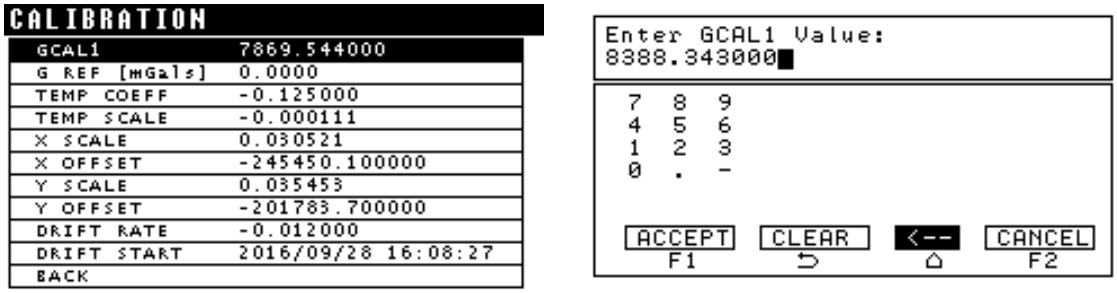

Figure 3-26 The GCAL1 editing screen

The GCAL1 value is set at the factory and should not be changed under normal circumstances.

If however, you choose to recalibrate your CG-6 Autograv™, the new GCAL1 value can be entered with the onscreen keypad as described in the section **"Entering a Value with Onscreen Keypad"** on page 2—13.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Changing the Gravity Reference Value

To *edit* the gravity reference value, *move* the cursor to **G REF** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

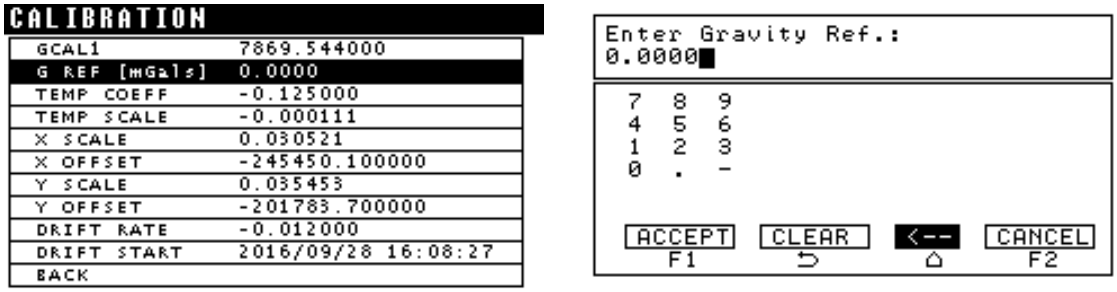

Figure 3-27 The gravity reference value editing screen

The gravity reference value can be any number between 0 and 8000, in mGals, and is subtracted from your current reading.

Enter the new gravity reference with the onscreen keypad as described in the section **"Entering a Value with Onscreen Keypad"** on page 2—13.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Changing the Temperature Coefficient Parameter

Important: TEMP COEFF should not be changed by the operator under normal circumstances.

To *edit* the temperature coefficient parameter, *move* the cursor to **TEMP COEFF** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

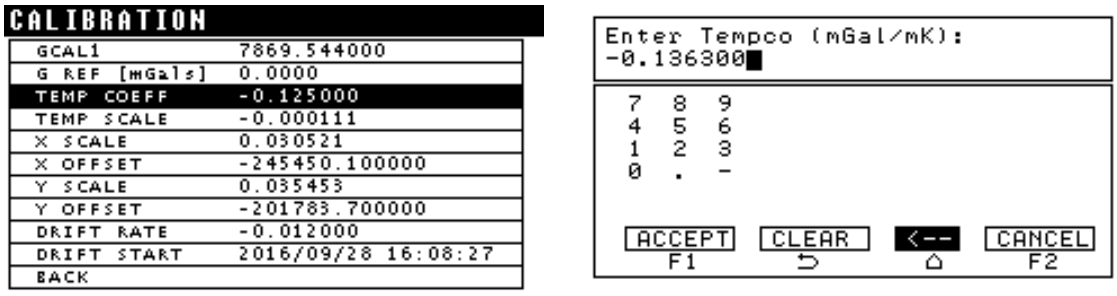

Figure 3-28 The temperature coefficient editing screen

The temperature coefficient is a negative number between -0.1 and -0.2.

Enter the new temperature coefficient with the onscreen keypad as described in the section "Entering a Value with Onscreen Keypad" on page 2—13.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Changing the Temperature Gain (TEMP SCALE)

Important: TEMP SCALE should not be changed by the operator under normal circumstances.

To *edit* the temperature gain parameter, *move* the cursor to **TEMP SCALE** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

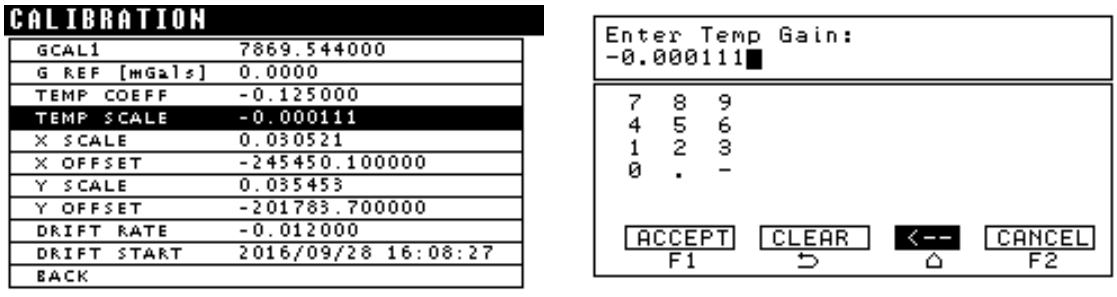

Figure 3-29 The temperature gain editing screen

Enter the new temperature gain with the onscreen keypad as described in the section "Entering a Value with Onscreen Keypad" on page 2—13.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Changing the Tilt Sensor Constants

Note: Normally the new tilt sensor constants will be entered automatically when you perform the Level Calibration Test as described later in this chapter. The steps below enable you to manually change the tilt sensor constants if you need to.

The tilt sensor constants consist of X Scale, X Offset, Y Scale and Y Offset.

To *edit* these constants, *move* the cursor to the corresponding field (images below on the left) and *press* the **Enter** button. The screens on the right will appear:

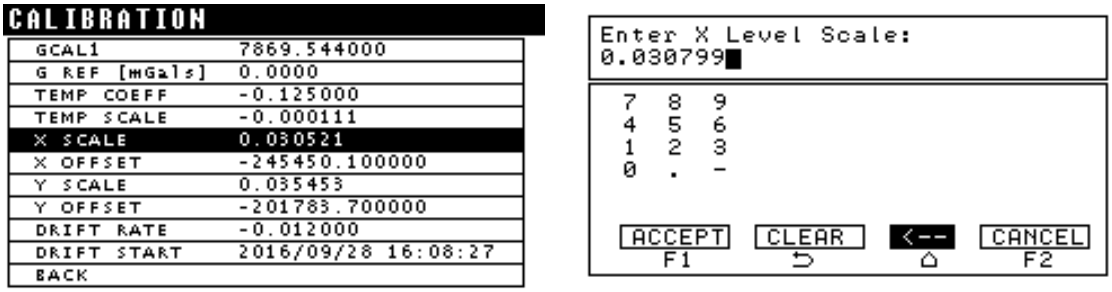

Figure 3-30 The X Level Scale editing screen

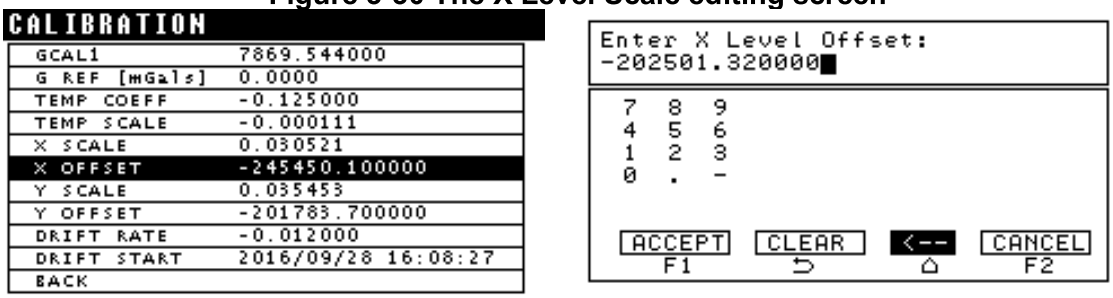

Figure 3-31 The X Level Offset editing screen

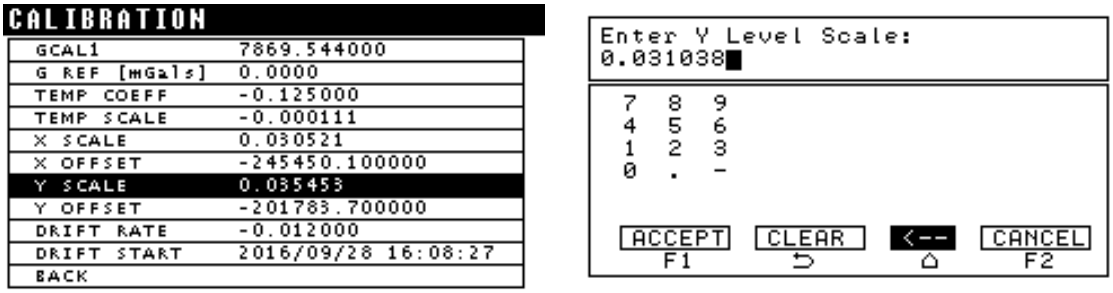

Figure 3-32 The Y Level Scale editing screen

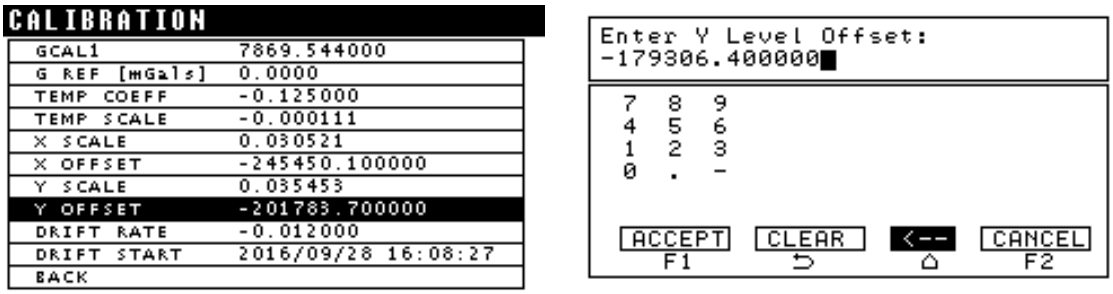

Figure 3-33 The Y Level Offset editing screen

Use the onscreen keypad to enter the new new value as described in the section "Entering a Value with Onscreen Keypad" on page 2—13.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Changing the Drift Rate

Important: Changing the drift rate or the drift start time will result in a step in your data.

Note: Normally the new drift rate will be entered automatically when you perform the Drift Calibration Test as described later in this chapter. The steps below enable you to manually change the drift rate if you need to.

To *edit* the value of your drift rate, *move* the cursor to **DRIFT RATE** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

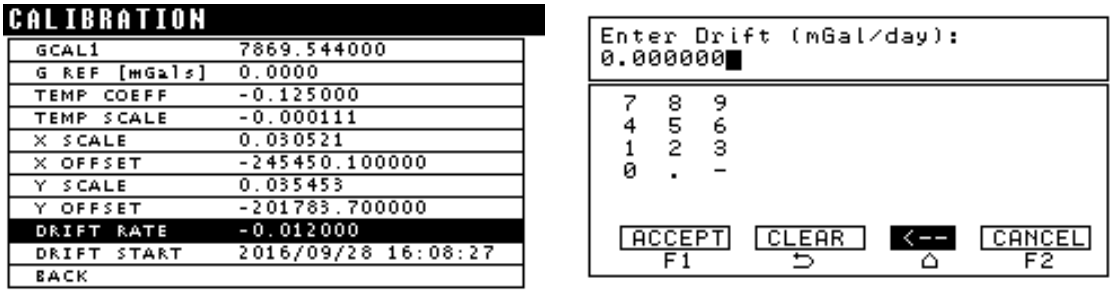

Figure 3-34 The drift rate editing screen

Enter the new drift rate with the onscreen keypad as described in the section **"**Entering a Value with Onscreen Keypad**"** on page 2—13.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Changing the Drift Start Time

The drift start time is the moment in time from which the drift of your CG-6 Autograv™ is compensated, and can be any date between now and the past.

Note: You can manually synchronize the drift start time in Julian Time using the tablet computer. See LynxLG software manual (p/n 115370003) for more details.

To *edit* the value of your drift start time, *move* the cursor to **DRIFT START** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

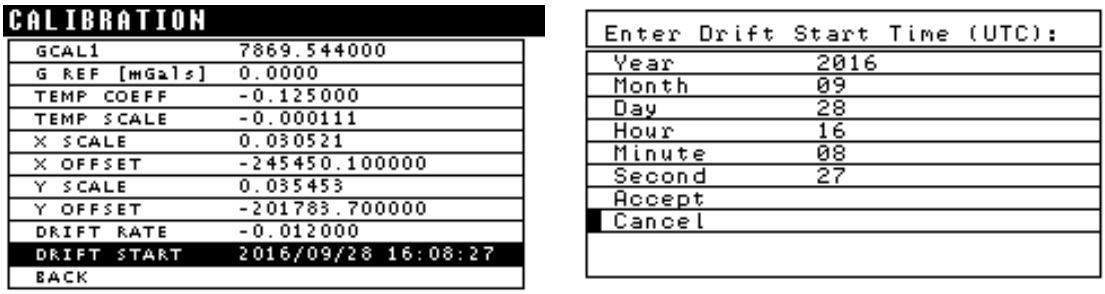

Figure 3-35 The drift start time editing screen

To enter the year, *move* the cursor to **Year** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

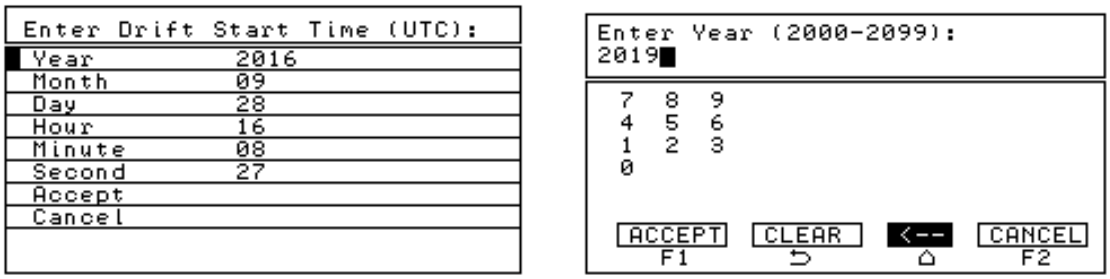

Figure 3-36 The year editing screen

Enter the year with the onscreen keypad as described in the section **"**Entering a Value with Onscreen Keypad" on page 2—13.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Repeat the same procedure for adjusting the month, day, hour, minute and second.

Instrument Corrections

You can enable or disable temperature, drift, earth tide or tilt corrections in your CG-6 Autograv™.

From the Settings screen *move* your cursor to **CORREC** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

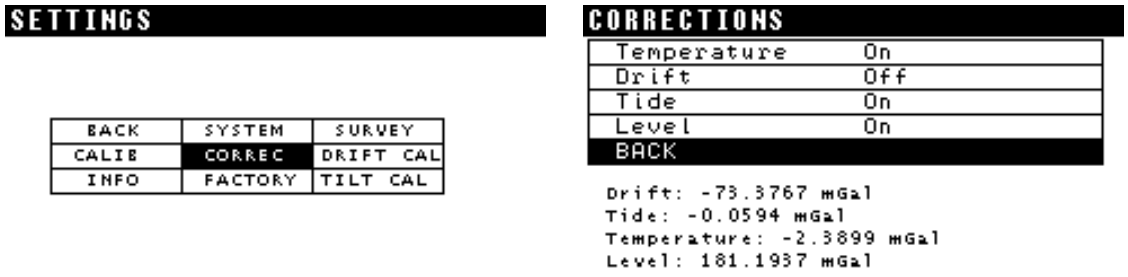

Figure 3-37 The instrument corrections screen

Enabling/Disabling Temperature Correction

To *enable or disable* the temperature correction, *move* the cursor to **Temperature** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

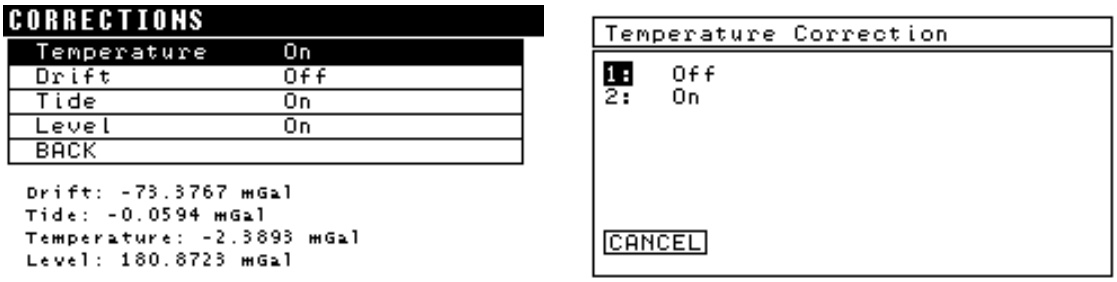

Figure 3-38 The temperature correction screen

To set the temperature correction to **On** or **Off**. *Move* your cursor to either 1 or 2 and *press* the **Enter** button.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Enabling/Disabling Drift Correction

To *enable or disable* the drift correction, *move* the cursor to **Drift** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

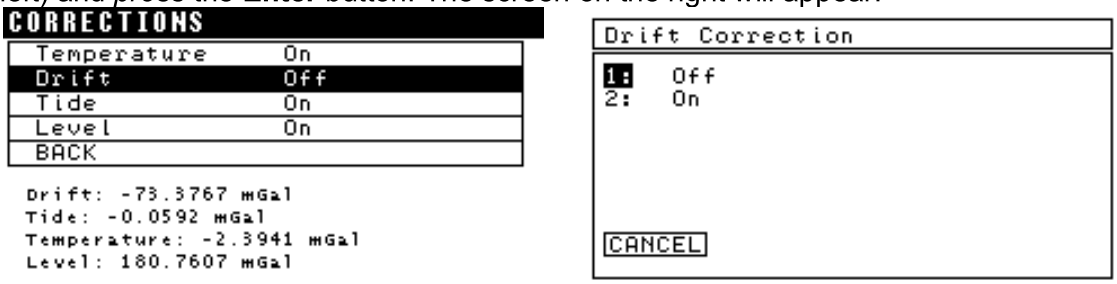

Figure 3-39 The drift correction screen

To set the drift correction to **On** or **Off**. *Move* your cursor to either 1 or 2 and *press* the **Enter** button.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Enabling/Disabling Tide Correction

To *enable or disable* the tide correction, *move* the cursor to **Tide** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

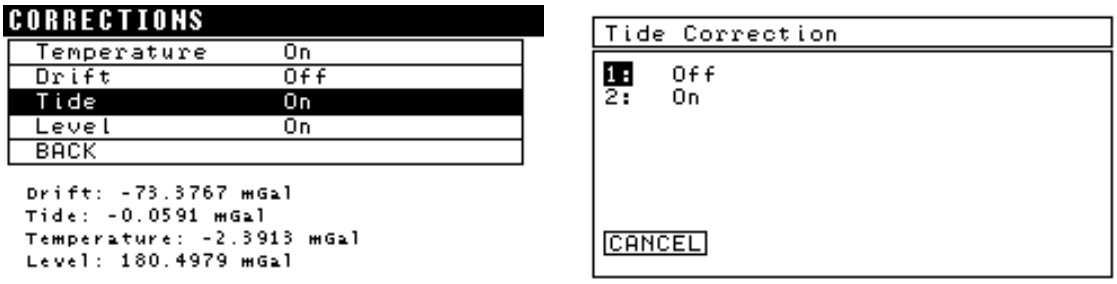

Figure 3-40 The tide correction screen

To set the tide correction to **On** or **Off**. *Move* your cursor to either 1 or 2 and *press* the **Enter** button.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

Enabling/Disabling Tilt Correction

To *enable or disable* the tilt correction, *move* the cursor to **Level** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

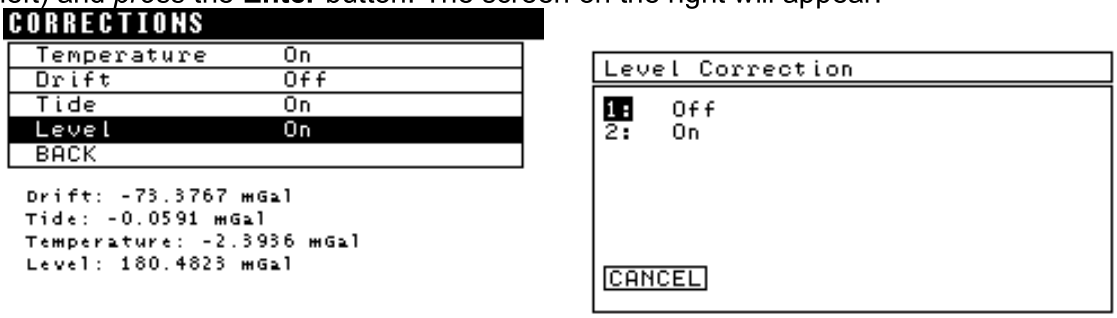

Figure 3-41 The tilt correction screen

To set the tilt correction to **On** or **Off**. *Move* your cursor to either 1 or 2 and *press* the **Enter** button.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** button

To return to the Settings screen either:

- *move* the cursor to **BACK** and *press* the **Enter** button

or

- *press* the **Back** button

Performing a Drift Calibration Test

From time to time, you may want to adjust the drift compensation rate of your CG-6 Autograv™.

Important: Your CG-6 Autograv™ must be in the idle mode, i.e. data recording must be stopped before you can perform a drift calibration test. Furthermore, the measure length should be set to 60 seconds and the number of cycles should be set to a minimum of 240 cycles (i.e. 4 hours of drift calibration test) and preferably overnight.

To access the drift calibration test screen, *move* your cursor to **DRIFT CAL** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

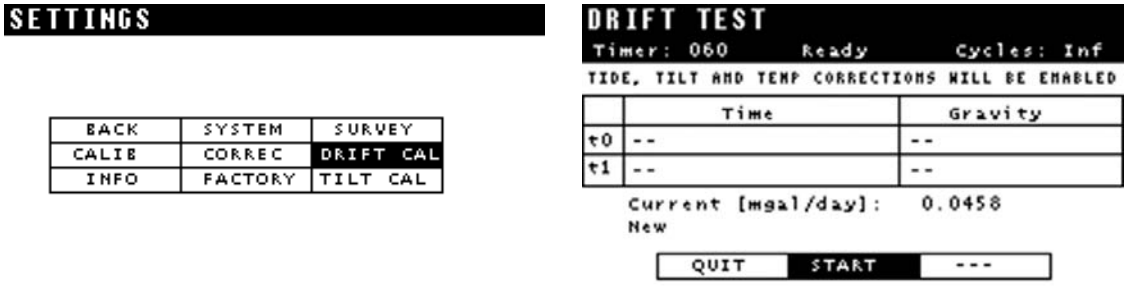

Figure 3-42 The drift calibration test screen: before started

Level your CG-6 Autograv™ as per Leveling the CG-6 Autograv™ on page 4-5. Once the leveling arrows are both green, you can proceed with the drift calibration.

To start the drift calibration test, *move* your cursor to START and *press* the **Enter** button (screen on the left). The CG-6 Autograv™ is now in the drift calibration test mode. The screen on the right will appear:

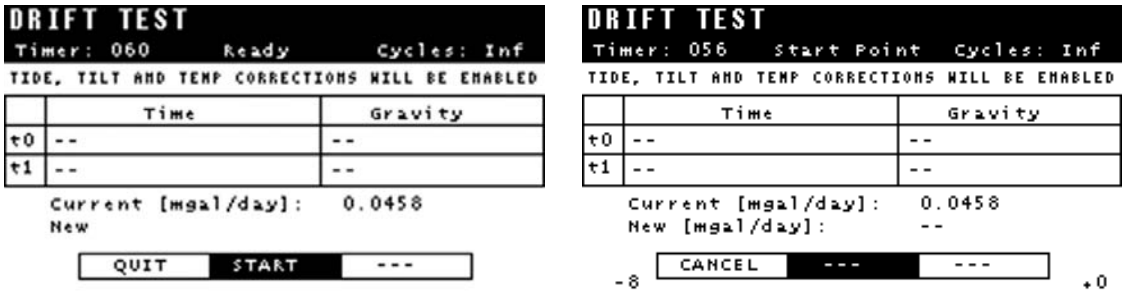

Figure 3-43 The drift calibration test screen: test in progress

Once the first cycle is completed, the following screen will appear:

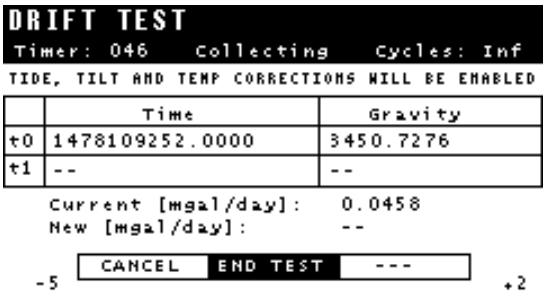

Figure 3-44 The drift calibration test active screen: first cycle completed

To *terminate* the drift calibration test, you can either let your CG-6 Autograv™ complete the drift calibration test by itself after having completed the number of cycles, or *move* the cursor to END TEST and press the **Enter** button.

The following screen will appear:

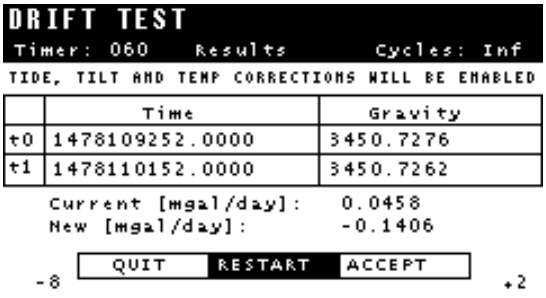

Figure 3-45 The drift calibration test screen: test completed

The new drift rate is illustrated below the current drift rate. To accept your new drift rate, *move* the cursor to ACCEPT and press the **Enter** button. The following screen indicates that your new drift has been updated.

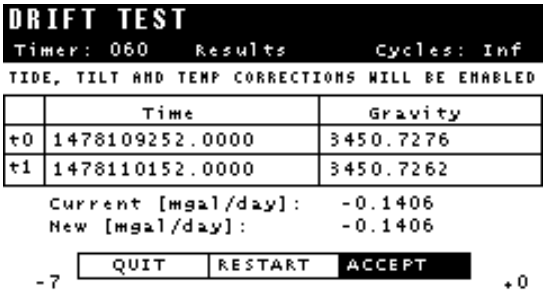

Figure 3-46 The drift calibration test screen: accepting new result

If you choose to not accept your new drift rate, *move* the cursor instead to QUIT and press the **Enter** button.

You are now returned to the Settings screen.

Once your drift calibration test has been completed, a drift file (with extension .drift) is automatically created. To retrieve this file, please refer to Retrieving Your Data on page 4-7 for more details. The following caption illustrate the drift file in the memory of your CG-6 Autograv™:

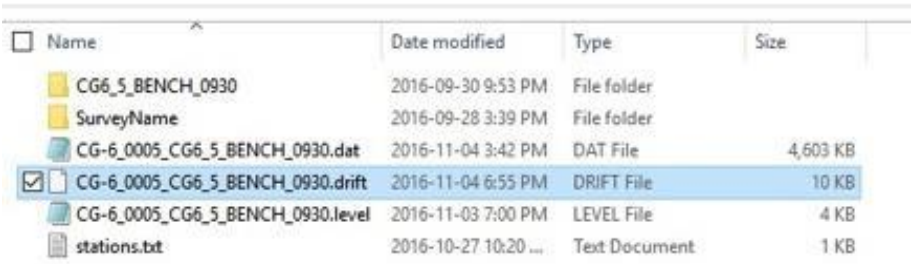

Figure 3-47 The drift file under root folder

The following image illustrates a typical drift file:

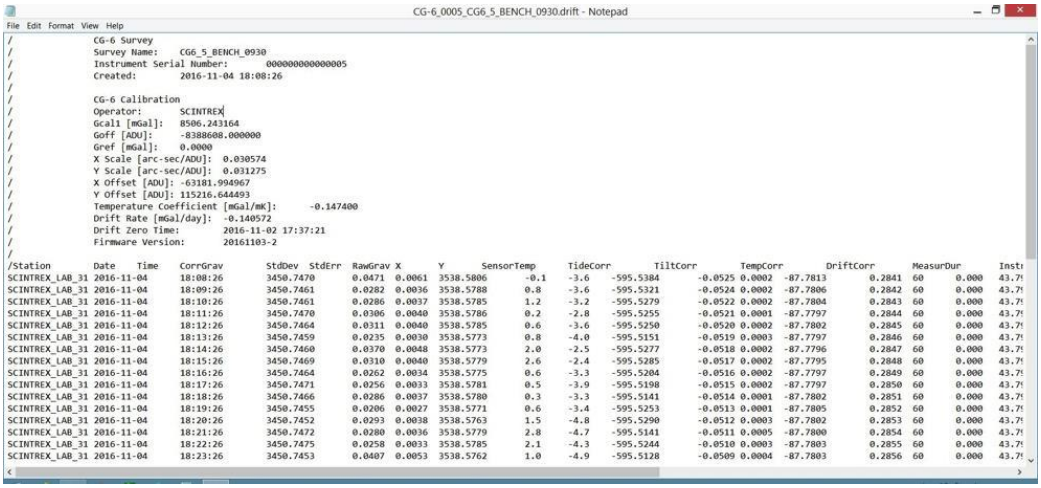

Figure 3-48 The drift file

Performing a Level Calibration Test

From time to time, you may want to adjust the scale and offset values of your CG-6 Autograv™ tilt sensors.

Important: Place your CG-6 Autograv™ on a stable surface and ensure the meter is in idle mode, ie. data recording must be stopped. Set the measure length to the recommended

value of 30 sec (other measure times can be used if preferred).

To access the Tilt test screen, *move* your cursor to **TILT CAL** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

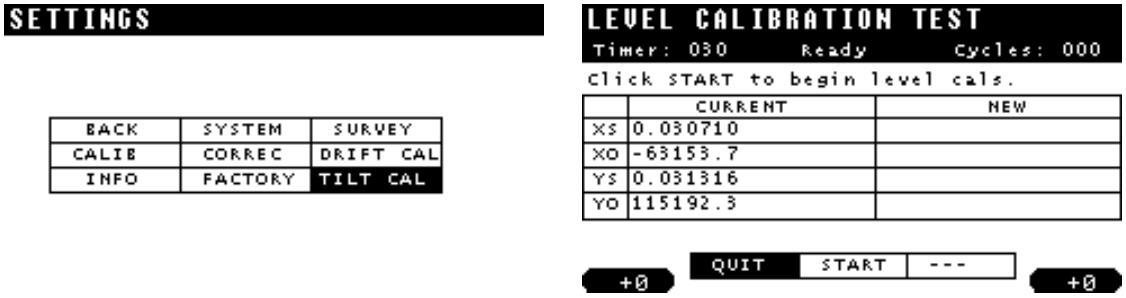

Figure 3-49 The level calibration test screen

Level your CG-6 Autograv™ as per Leveling the CG-6 Autograv™ on page 4-5. Once the leveling arrows are both green, you can proceed with the tilt test.
Move your cursor to **START** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

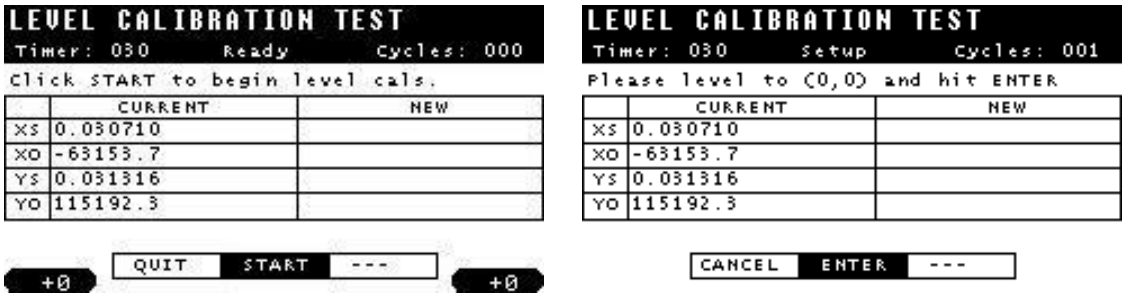

Figure 3-50 The level calibration test screen in setup mode

Level your CG-6 Autograv™ to 0 arcseconds on X and Y and *press* the **Enter** button. The following screen will appear:

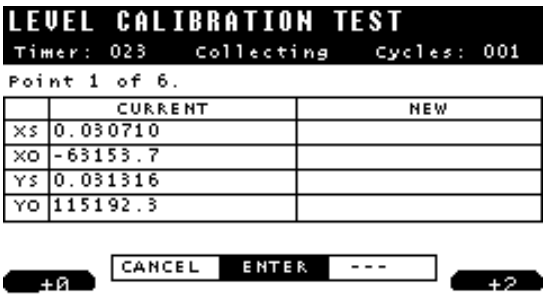

Figure 3-51 The level calibration test screen in collecting mode, point 1

Your CG-6 Autograv™ is now collecting data. At the end of the cycle (30 seconds), the following screen will appear:

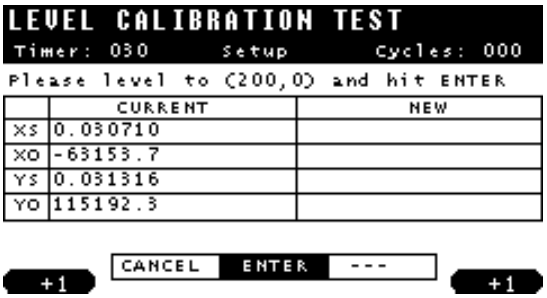

Figure 3-52 The level calibration test screen at the end of the point 1

Follow the prompts for the following level settings:
(200, 0), (-200, 0), (0, 200), (-200, 0) and (0, 0).

At the end of the reading at (0, 0) the following screen will appear:

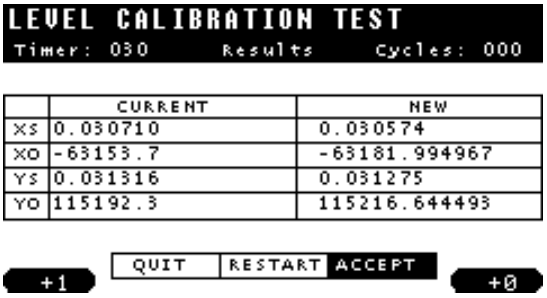

Figure 3-53 The level calibration test screen at the end of point 6

To accept the new tilt offset and scale values, *move* the cursor to **ACCEPT** and *press* the **Enter** button.

To exit without accepting the new tilt offset and scale values, move the cursor to **QUIT** and *press* the **Enter** button.

To restart the level calibration test, move the cursor to **RESTART** and *press* the **Enter** button.

Once your level calibration test has been completed, a level calibration file (with extension .level) is automatically created. To retrieve this file please refer to Retrieving Your Data on page 4-7 for more details. The following images illustrates the level calibration file in the memory of your CG-6 Autograv™:

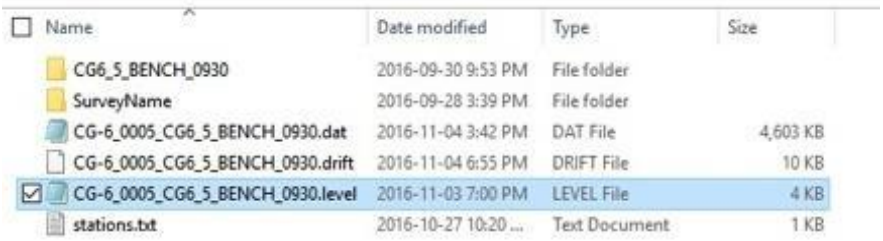

Figure 3-54 The level calibration file under root folder

The following caption illustrates a typical drift file:

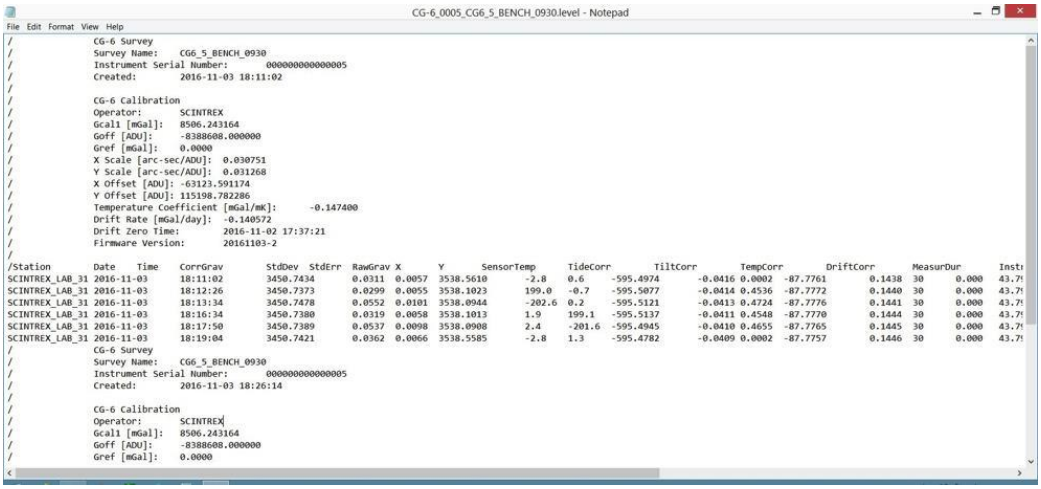

Figure 3-55 The level calibration file

System Information

To access the system information screen, *move* your cursor to **INFO** and *press* the **Enter** button. The following screen will appear:

Figure 3-56 The system information screen

The system information screen displays the following: serial number of your CG-6 Autograv™ , the firmware version, the percentage of memory in use and the sensor temperature (in degrees C) and its deviation from set point (in mK). The range of the deviation from set point is ±1000mK.

Important: The factory menu is only accessible to Scintrex engineers.

Setting up the Pre-set List of Stations

To view the preset list of stations navigate to the main screen and *move* your cursor to **LIST** (image below on the left) and *press* the **Enter** button. The screen on the right which contains the preset station list will appear:

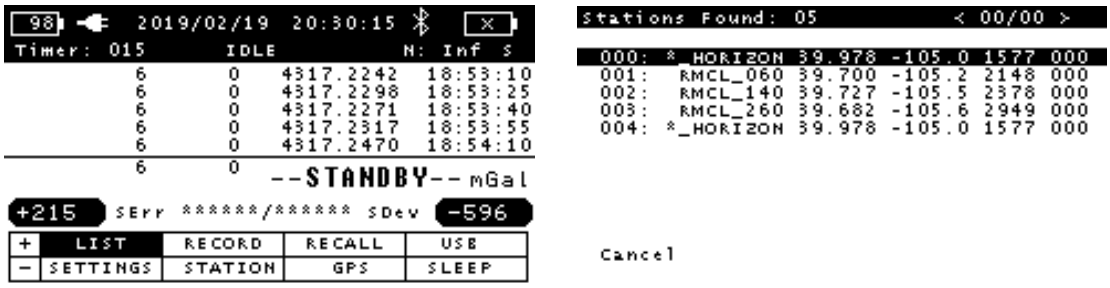

Figure 3-57 Pre-set list of stations

The pre-set list of stations is stored in a file named "**stations.txt**" under the root folder of your CG-6 Autograv™ Gravity Meter. You can view and edit this file by activating USB mode on your CG-6 Autograv™ Gravity Meter and *Connecting* your USB-A to USB-B cable (p/n 200239) between the USB-B connector on your CG-6 Autograv™ and any UBS-A connector on your laptop or tablet computer.

To access USB mode navigate to the main screen and *move* your cursor to **USB** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

Figure 3-58 Entering USB Mode

Important: Your CG-6 Autograv™ must be in the idle mode, ie. data recording must be stopped before you can start USB Device Mode.

Your CG-6 Autograv™ will then appear as a mass storage device on your computer. You can now easily perform file operations like using a USB flash drive. The stations.txt file will appear in the root directory as shown in the image below.

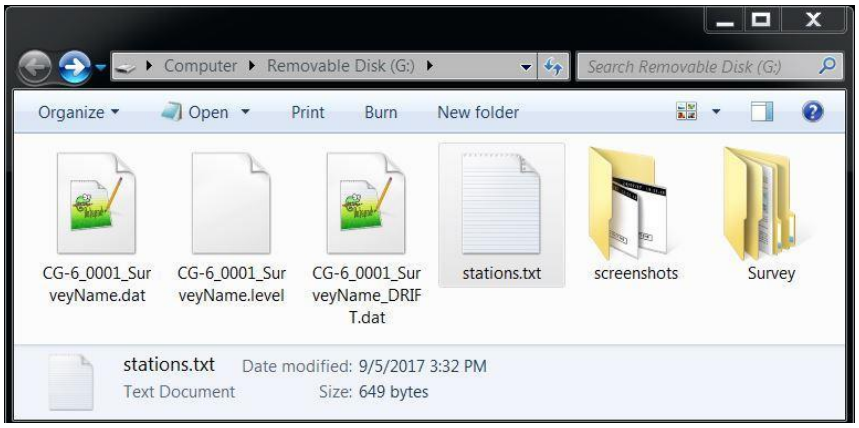

Figure 3-59 stations.txt file in USB mode

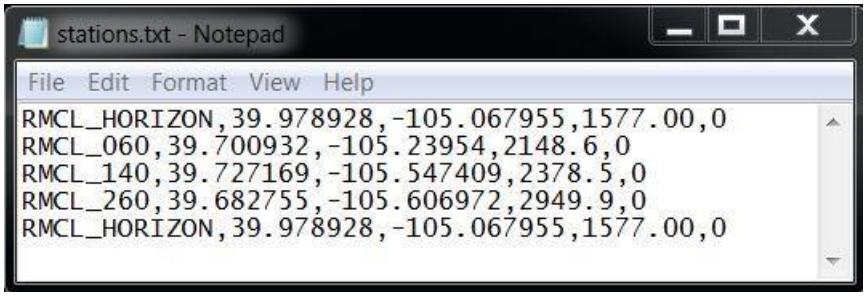

Figure 3-60 Default stations.txt file

stations.txt file can hold up to 1000 stations. It supports 3 formats:

- StationName,Latitude,Longitude,Elevation,Line
- StationName,Latitude,Longitude,Elevation
- StationName

Changes to stations.txt file will be reflected in “LIST” menu after your CG-6 is disconnected from the USB connection.

Note: The pre-set list of stations is only available in the standard station mode. The list can be viewed in the numeric station mode, but cannot be selected.

You have now completed the setup of your CG-6 Autograv™.

Chapter 4 **Operating the CG-6 Autograv™ in the Field**

By now you have familiarized yourself with your CG-6 Autograv™ and have properly configured it for your upcoming survey.

This chapter reviews the basic steps required to carry out a survey. They include the following:

- Designating a station under standard station style
- Designating a station under numeric station style
- Enter Location Information with Built-in GPS
- Taking a measurement with the CG-6 Autograv™
- Recording the data collected with the CG-6 Autograv™
- Recalling the data collected with the CG-6 Autograv™
- Retrieving the data collected with the CG-6 Autograv™

Designating a Station under Standard Station Style

Note: Please refer to the previous chapter on how to choose the standard station style.

Using the "+/-" buttons

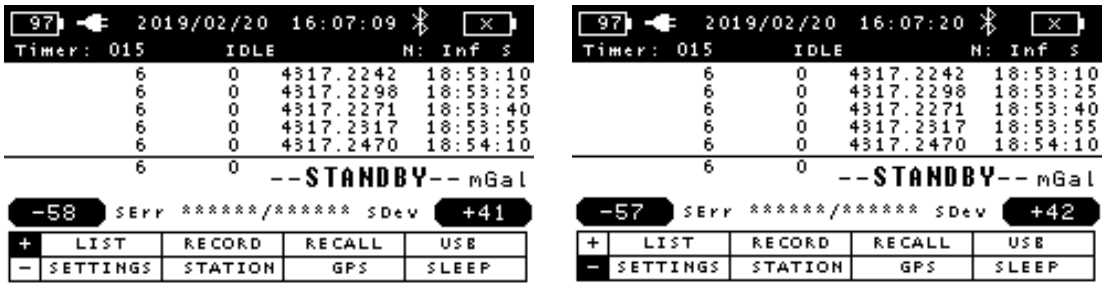

Figure 4-1 "+/-" Buttons under standard station style

You can scroll through your stations in the pre-set station list with the **+** and – buttons located on the left side of the screen. To scroll through your stations, *move* your cursor using the **Navigation Buttons** to either the **+** field or the **-** field and *press* the **Enter** button.

Selecting from the Pre-set Station List

From the main screen, *move* your cursor to **LIST** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

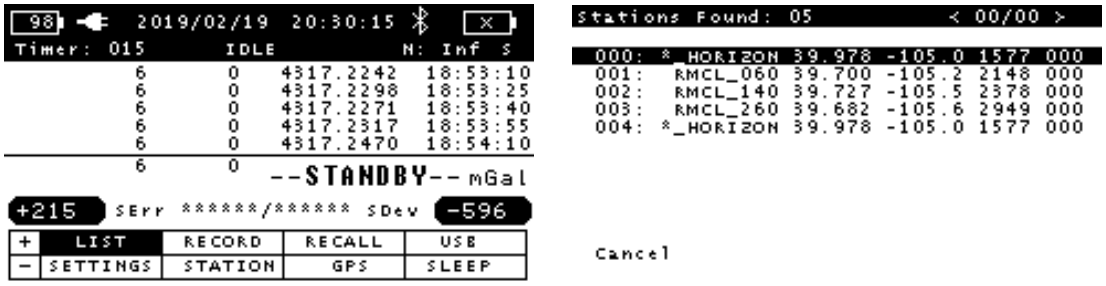

Figure 4-2 Station list screen

To choose a given station, *move* your cursor to the selected station and *press* the **Enter** button. You will then be returned to the main measurement screen.

To exit this screen without changes either:

- *move* the cursor to **CANCEL** and *press* the **Enter** button.

or

- *press* the **Back** or **Home** button

Note: The pre-set list of stations is stored in the “stations.txt” file stored under the root folder of your CG-6 Autograv™ Gravity Meter. To modify this list please refer to “"Setting up pre-set list of stations" in the previous section.

Note: The pre-set list of stations is only available under the standard station style. The list can be viewed under the numeric station style, but cannot be selected.

Manually Enter Station Info

From the main screen, *move* your cursor to **STATION** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

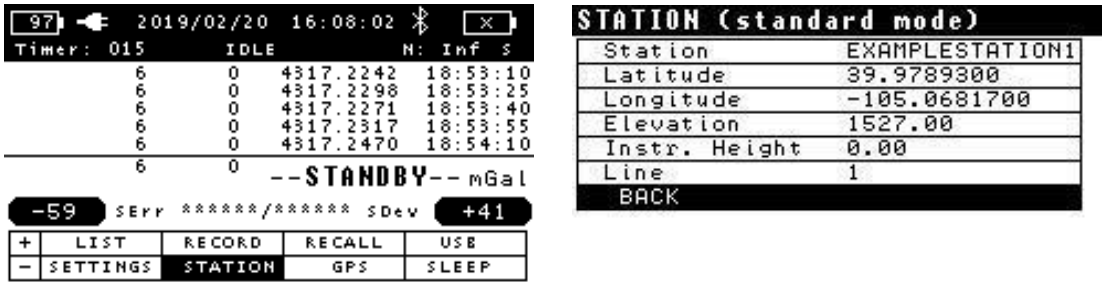

Figure 4-3 Station screen under standard station style.

From this screen, you can manually enter the station name, latitude value, longitude value, elevation value, and the instrument height value; used for the free air correction during the processing stage, as well as the line number.

Designating a Station under Numeric Station Style

Note: Please refer to the previous chapter on how to choose the numeric station style and increment size.

Using the "+/-" Buttons

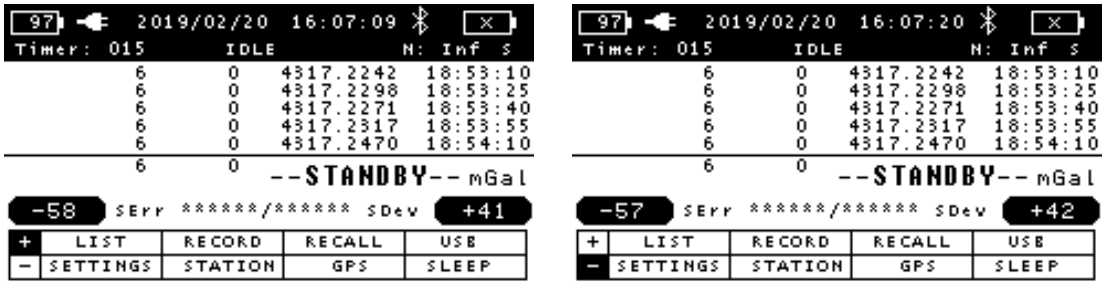

Figure 4-4 "+/-" buttons in numeric mode

You can increment and decrement your station number with the **+** and **-** buttons located on the left side of the screen. To increment or decrement your station number, *move* your cursor using the **Navigation Buttons** to either the **+** or **-** field and *press* the **Enter** button.

Manually Enter Station Info

From the main screen, *move* your cursor to **STATION** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

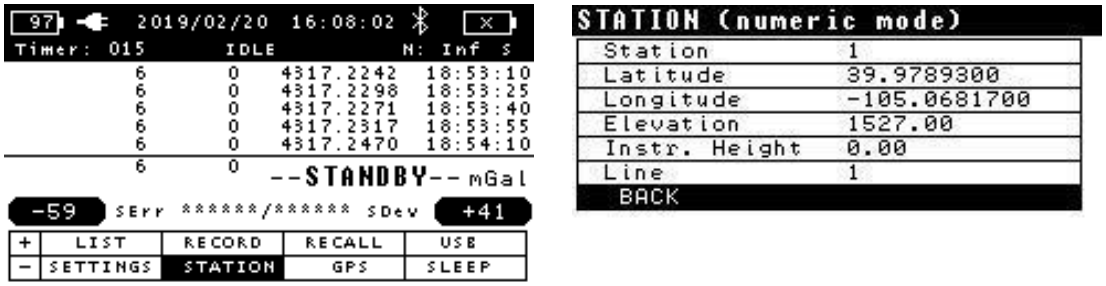

Figure 4-5 Station screen in numeric mode

From this screen, you can manually enter the station number, latitude value, longitude value, elevation value, and the instrument height value, used for the free air correction during the processing stage, as well as the line number.

Enter Station Location Information with Built-in GPS

Note: You can skip this step if you chose standard station style and the latitude, longitude and elevation are already stored in the pre-set station list.

From the main screen, *move* your cursor to **GPS** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

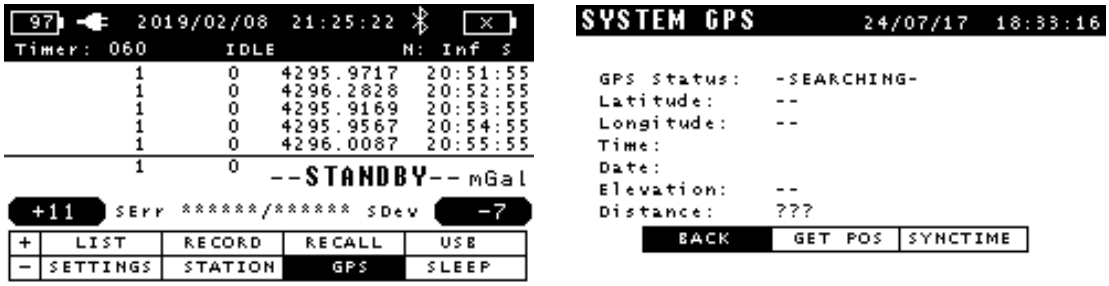

Figure 4-6 The GPS screen

The GPS status will first appear as “SEARCHING”. Once a sufficient number of satellites is obtained, the Latitude, Longitude, Time, Date and Elevation and Distance fields will automatically be populated. The Distance field, in meters, refers to the distance between the current GPS coordinates and the station coordinates.

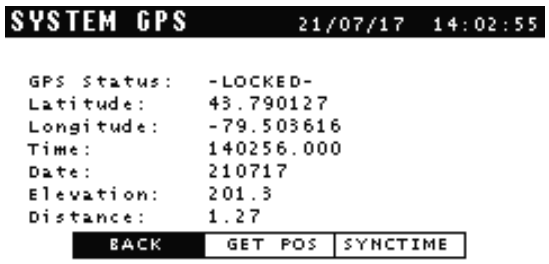

Figure 4-7 The GPS active screen

You can update the latitude, longitude and elevation of your current station by *moving* your cursor to **GET POS** and *pressing* the **Enter** button. The following screen will appear.

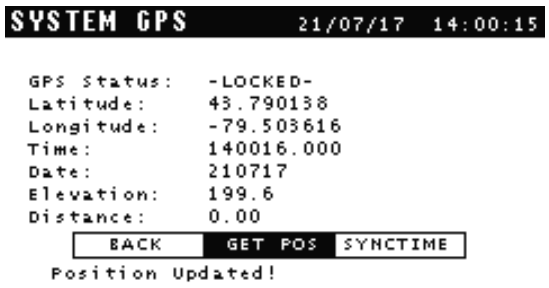

Figure 4-8 The GPS screen with locked position

Now the latitude, longitude and elevation of your current station is updated with the GPS readings. You may go to the Station screen to double check.

Taking a Measurement with the CG-6 Autograv™

Placing the CG-6 Autograv™ on its Tripod

Place the CG-6 AutogravTM on its tripod as illustrated below.

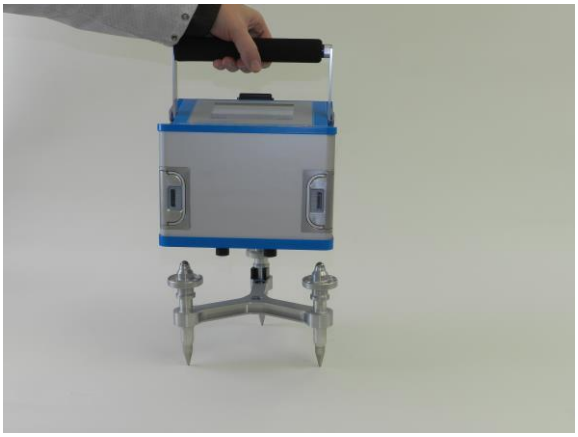

Figure 4-9 Placing the CG-6 AutogravTM on its tripod

Leveling the CG-6 Autograv™

The CG-6 Autograv™ provides two types of read-outs useful for leveling the instrument. The first is a digital reading of the X and Y level displayed in arcseconds on the screen. The second is a set of two leveling arrows, which describe the direction required to rotate the adjustable screws of the leveling tripod in order to level the instrument.

When the instrument is first placed on the tripod, the level arrows will likely be red or orange, depending on how far the instrument is off-level. To level the instrument, rotate the adjustable knobs on the tripod in the direction indicated by the arrows until the lights turn green. The user may observe the numerical levels on the screen in order to gauge the amplitude of rotation required to reach level.

Depending on the requirements for a given survey, the user may select the acceptable range (the range that turns the leveling arrows green) for the level correction via the menu screen, as described in “Adjusting the Leveling Window” on page 3-3.

The level window size is the threshold under which the leveling arrows will appear as green. For instance, if level window is set to 10 arseconds, then once the tilt of one of the axes is within ± 10 arcseconds, then the leveling arrow for this axis will appear green.

Figure 4-10 Leveling arrows

Important: You should level the Y axis first, then level the X axis.

Taking a Measurement

From the main screen, *move* your cursor to **RECORD** and *press* the **Enter** button. The word “RECORDING” will appear in the upper part of the screen as shown in Figure 2-10 and Figure 2-11.

Note: The fastest and easiest way to move the cursor to the record button from any screen is to *press* the **Home** button

Note: Setting a short record delay (typically 5 sec) will allow the small disturbance caused by *Pressing* the **Enter** button to dissipate before data recording starts.

Note: The duration of the Measurement is Number of Cycles* Measurement Cycle Length. If this has not yet been set up, please refer to Adjusting the Measurement Cycle Length and Adjusting the Number of Cycles on pages 3—11 and 3—11

Recalling Your Data

You can recall previously recorded data under the current survey name. It will appear sequentially.

From the main screen, *move* your cursor to **RECALL** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

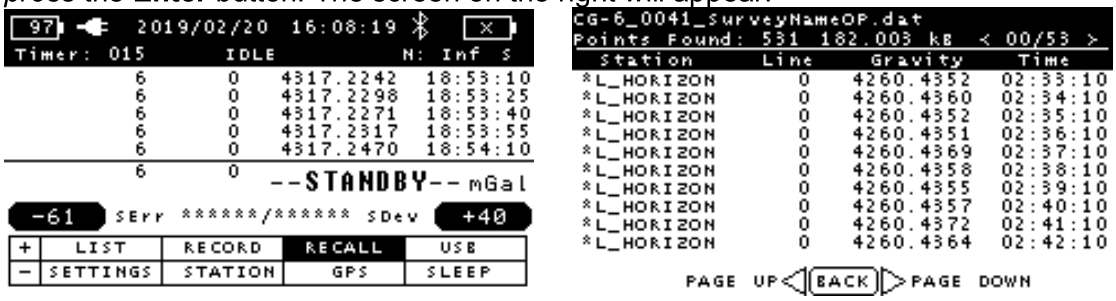

Figure 4-11 The data recall screen

To recall recorded data under a different survey name, go to **SETTINGS\SURVEY** and enter the survey name you would like to recall data from. Accept the change and go back to the **RECALL** screen, you will see the data recorded under this survey name. If the survey name you entered has never been used, you will see a blank list.

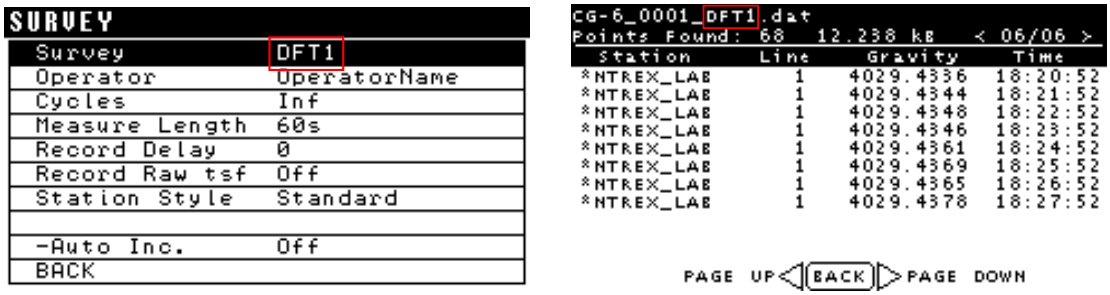

Figure 4-12 Recalling data under a different survey name

To exit this screen, *press* the **Enter** button.

Note: The maximum number of readings, N_{max}, that you can recall from a survey is approximately 500. If the total number of readings in a survey exceeds this limit then the last N_{max} readings will be available for recall.

Retrieving Your Data

Connect your External USB Cable (p/n 128370053) between the USB port on your CG-6 Autograv™ and any UBS connector on your laptop or tablet computer.

Figure 4-13 The CG-6 AutogravTM USB port

To access USB mode navigate to the main screen and *move* your cursor to **USB** (image below on the left) and *press* the **Enter** button. The screen on the right will appear:

Figure 4-14 The USB screen

Important: Your CG-6 AutogravTM must be in the idle mode, i.e. “STANDBY” displayed before you can start USB Device Mode.

Your CG-6 AutogravTM will then appear as a mass storage device on your computer as illustrated below. You can easily transfer files to your computer like using a USB flash drive.

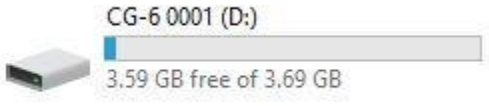

Figure 4-15 The CG-6 AutogravTM as a mass storage device on your computer

The file structure of your CG-6 Autograv™ is illustrated by the diagram below.

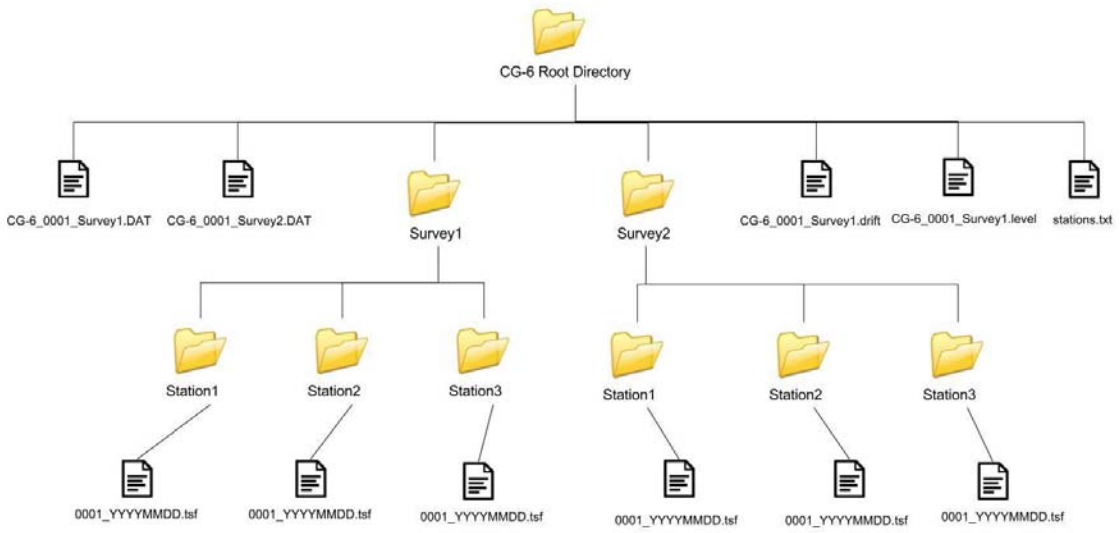

Figure 4-16 File structure of a CG-6 AutogravTM

Filtered Data File (.DAT)

Filtered data file stores the filtered gravity readings and other measurements (standard deviation, X/Y levels, sensor temperature, etc.) at the frequency specified by the measurement cycle length you selected (30s, 60s or 120s).

After you start data recording, a new line of readings will be written to the filtered data file each time the measurement cycle length is reached.

The filtered data file is stored under the root directory of your CG-6 Autograv™, with file name:

\CG-6_XXXX_SurveyName.DAT

XXXX is the last 4 digits of the meter's serial number.

Here is an example of a filtered data file.

```
/       CG-6 Survey
/       Survey Name:    Survey1
/       Instrument Serial Number:   000000000000001
/       Created:    2016-11-12 20:28:29
/
/       CG-6 Calibration
/       Operator:   Scintrex
/       Gcal [mGal]:    8272.719000
/       Goff [ADU]: -8388608.000000
/       Gref [mGal]:    0.0000
/       X Scale [arc-sec/ADU]:  0.030730
/       Y Scale [arc-sec/ADU]:  0.030434
/       X Offset [ADU]: -81115.000000
/       Y Offset [ADU]: -177456.140000
/       Temperature Coefficient [mGal/mK]:  -0.123380
/       Drift Rate [mGal/day]:  -0.012000
/       Drift Zero Time:    2016-01-01 02:02:02
/       Firmware Version:   20161103-2
/
/Station    Date    Time    CorrGrav    StdDev  StdErr  RawGrav X   Y   SensorTemp  TideCorr    TiltCorr    TempCorr    DriftCorr   MeasurDur   InstrHeight LatUser LonUser ElevUser    LatGPS  LonGPS  ElevGPS Corrections|
Station1    2016-11-12  21:17:29    3001.0900   1.7756  0.2292  2990.0484   6.1 -14.8   109.8599    -0.1067 0.0030  11.1483 3.8016  60  0.000   43.800000   -79.500000  200.00  43.790184   -79.503983  202.4   01010
Station1    2016-11-12  21:18:29    2999.9948   1.6411  0.2119  2984.2397   6.8 -14.0   146.5525    -0.1067 0.0029  15.8618 3.8016  60  0.000   43.800000   -79.500000  200.00  43.790146   -79.503960  202.4   01010
Station1    2016-11-12  21:19:29    2998.9803   1.5173  0.1959  2978.8696   5.7 -14.6   180.5399    -0.1067 0.0031  20.2174 3.8016  60  0.000   43.800000   -79.500000  200.00  43.790092   -79.503807  198.9   01010
Station1    2016-11-12  21:20:29    2998.0425   1.3973  0.1804  2973.9080   6.2 -15.5   211.8597    -0.1067 0.0032  24.2412 3.8016  60  0.000   43.800000   -79.500000  200.00  43.789948   -79.503899  195.9   01010
Station1    2016-11-12  21:21:29    2997.1769   1.2940  0.1671  2969.3262   6.8 -14.6   240.8033    -0.1067 0.0029  27.9594 3.8017  60  0.000   43.800000   -79.500000  200.00  43.789845   -79.503960  195.1   01010
Station1    2016-11-12  21:22:29    2996.3788   1.1974  0.1546  2965.0915   6.8 -15.4   267.5533    -0.1067 0.0032  31.3940 3.8017  60  0.000   43.800000   -79.500000  200.00  43.789833   -79.504013  194.9   01010
Station1    2016-11-12  21:23:29    2995.6396   1.1055  0.1427  2961.1791   6.7 -15.9   292.3273    -0.1067 0.0036  34.5672 3.8017  60  0.000   43.800000   -79.500000  200.00  43.790016   -79.504150  193.1   01010
Station1    2016-11-12  21:24:29    2994.9568   1.0230  0.1321  2957.5636   7.4 -14.4   315.1401    -0.1067 0.0027  37.4998 3.8017  60  0.000   43.800000   -79.500000  200.00  43.790108   -79.503983  190.9   01010
Station1    2016-11-12  21:25:29    2994.3222   0.9429  0.1217  2954.2215   5.4 -14.3   336.2179    -0.1067 0.0028  40.2074 3.8017  60  0.000   43.800000   -79.500000  200.00  43.790222   -79.504189  186.9   01010
Station1    2016-11-12  21:26:29    2993.7404   0.8708  0.1124  2951.1368   6.4 -13.7   355.7598    -0.1067 0.0027  42.7103 3.8017  60  0.000   43.800000   -79.500000  200.00  43.790112   -79.504250  185.4   01010
Station1    2016-11-12  21:27:29    2993.2015   0.8062  0.1041  2948.2855   6.7 -12.4   373.7533    -0.1066 0.0024  45.0226 3.8017  60  0.000   43.800000   -79.500000  200.00  43.790092   -79.504250  186.4   01010
Station1    2016-11-12  21:28:29    2992.7066   0.7442  0.0961  2945.6549   6.9 -12.0   390.3661    -0.1066 0.0021  47.1583 3.8017  60  0.000   43.800000   -79.500000  200.00  43.790119   -79.504089  196.9   01010
Station1    2016-11-12  21:29:29    2992.2460   0.6840  0.0883  2943.2218   6.6 -13.2   405.7340    -0.1065 0.0024  49.1308 3.8017  60  0.000   43.800000   -79.500000  200.00  43.790127   -79.504051  201.6   01010
```

Figure 4-17 Sample Filtered Data File from a CG-6 AutogravTM

Raw TSF File (.tsf)

A raw tsf file is a file that keeps the raw readings during your measurement. Each line of the file has

- a time stamp
- 10 raw gravity readings (ADC unit)
- raw X and Y level readings (ADC unit)
- raw temperature reading (ADC unit)
- tide correction (mGal)
- a status bit

If Record Raw tsf is enabled, a new line of readings will be appended to the file each second during your recording.

Raw tsf files are organized by surveys, stations and dates, with the file path below.

\SurveyName\StationName\XXXX_YYYYMMDD.tsf

CG-6 will automatically create a new raw tsf file when a new survey or station is selected or when the clock passes midnight during recording.

Here is a sample raw tsf file.

```
[DATA]
2016 11 16 23 36 36 -2245049 -2245059 -2245055 -2245072 -2245190 -2245409 -2245551 -2245402 -2245028 -2244796 -141733 -258357 -5476970 -0.093668 0
2016 11 16 23 36 37 -2245196 -2245172 -2245109 -2244718 -2244389 -2244405 -2244674 -2244942 -2245095 -2245162 -141780 -258322 -5477117 -0.093667 0
2016 11 16 23 36 38 -2245016 -2245019 -2245210 -2245185 -2245154 -2245129 -2245104 -2245074 -2245043 -2245023 -141793 -258331 -5477021 -0.093666 0
2016 11 16 23 36 39 -2245140 -2245151 -2245133 -2245021 -2245030 -2245055 -2245084 -2245095 -2245097 -2245112 -141821 -258314 -5477013 -0.093665 0
2016 11 16 23 36 40 -2245042 -2245041 -2245049 -2245044 -2245096 -2245094 -2245094 -2245091 -2245078 -2245059 -141788 -258290 -5477015 -0.093664 0
2016 11 16 23 36 41 -2245006 -2245024 -2245045 -2245052 -2245019 -2245009 -2245028 -2245057 -2245052 -2245019 -141779 -258328 -5476893 -0.093663 0
2016 11 16 23 36 42 -2245380 -2245419 -2245405 -2245240 -2244907 -2244607 -2244824 -2244868 -2245066 -2245273 -141768 -258344 -5476945 -0.093663 0
2016 11 16 23 36 43 -2245169 -2245229 -2245216 -2245143 -2245078 -2245079 -2245137 -2245186 -2244885 -2245052 -141667 -258340 -5477030 -0.093662 0
2016 11 16 23 36 44 -2245055 -2245021 -2245013 -2245011 -2245023 -2245066 -2245125 -2245183 -2245250 -2245119 -141704 -258227 -5476920 -0.093661 0
2016 11 16 23 36 45 -2245443 -2245513 -2245502 -2245397 -2245230 -2245057 -2244927 -2244858 -2244829 -2244811 -141720 -258339 -5476971 -0.093660 0
2016 11 16 23 36 46 -2245388 -2244755 -2244700 -2244649 -2244644 -2244717 -2244877 -2245101 -2245317 -2245426 -141660 -258222 -5476928 -0.093659 0
2016 11 16 23 36 47 -2245098 -2245126 -2245149 -2245099 -2245082 -2245048 -2245003 -2244985 -2245008 -2245054 -141734 -258417 -5477033 -0.093658 0
2016 11 16 23 36 48 -2245047 -2245047 -2245035 -2245150 -2245169 -2245184 -2245170 -2245122 -2245071 -2245047 -141712 -258250 -5477077 -0.093657 0
```

Figure 4-18 Sample Raw TSF File from a CG-6 AutogravTM

Drift Calibration (.drift) and Tilt Calibration (.level) file

A drift calibration file or tilt calibration file will be recorded during your drift calibration test or tilt calibration test. They have the same format as the filtered data file (.DAT), and can be found under your CG-6 root directory. They come in the following file names.

\CG-6_XXXX_SurveyName.drift
\CG-6_XXXX_SurveyName.level

Pre-set Stations File (stations.txt)
This is where the pre-set station list is stored. You can add, remove or modify pre-set stations by editing this file. Please refer to the "Setting up the Pre-set List of Stations" section at the end of Chapter 3.

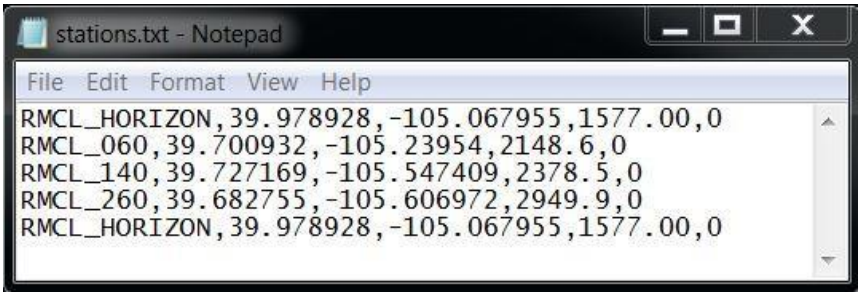

Figure 4-19 Sample Pre-set Stations File from a CG-6 AutogravTM

Chapter 5 **Maintenance and Troubleshooting**

Firmware Upgrade

Important: Read before Proceeding

Upgrading the firmware may result in the loss of calibration constants in your CG-6 Autograv™ Gravity Meter. Make sure you have these constants properly backed up beforehand.

Make sure your CG-6 Autograv™ Gravity Meter has proper power supply during the entire upgrade process.

What you need to upgrade your firmware

- Your CG-6 Autograv™ Gravity Meter
- The supplied Windows tablet or any Windows PC with Bluetooth capability
- Hex file of the new version of CG-6 firmware
- LynxLG processing software (pre-installed in the supplied Windows tablet), **or**

  CG-6 Firmware Updater software, downloaded from https://scintrexltd.com/support/product-software-updates/

Preparing to upgrade your firmware

To perform the firmware upgrade, a Bluetooth connection between your CG-6 Autograv™ Gravity Meter and the tablet or PC needs to be established.

Note: **T**his guide is prepared under Windows 7 environment. The interfaces might be different if you use a different version of Windows operating system.

Click the Bluetooth icon in the taskbar. *Choose* “Add a Device” in the menu, as illustrated below.

Figure 5-1 Adding a Bluetooth device

Alternatively you can find “Add a Bluetooth device” in Control Panel.

Figure 5-2 Adding a Bluetooth device from the Control Panel

Choose your CG-6 gravity meter from the list of devices and *click* “Next”

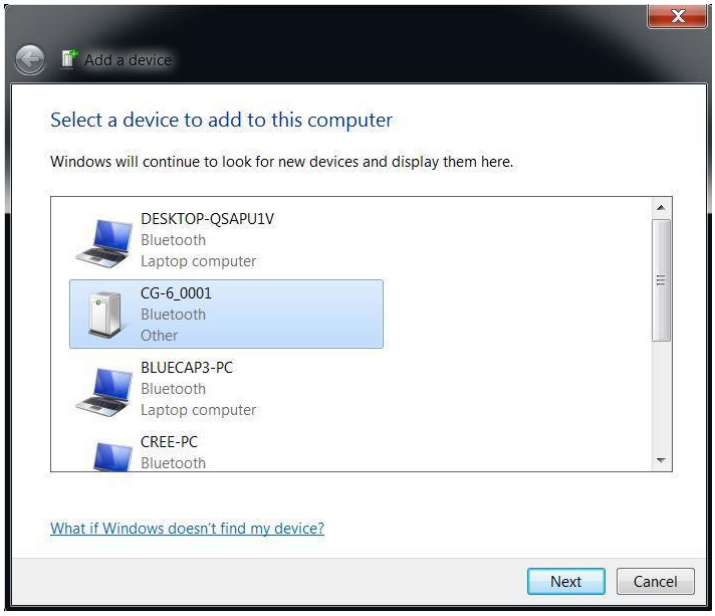

Figure 5-3 Selecting a Bluetooth device

You will see the screen illustrated below after your CG-6 Autograv™ Gravity Meter has been successfully added to the list of Bluetooth devices. *Click* Close.

Figure 5-4 Bluetooth device successfully added

Click “Show Bluetooth Devices” in the Bluetooth menu and you should see your CG-6 Autograv™ Gravity Meter in the devices list. *Right click* the CG-6 icon and *select* “Properties”.

Figure 5-5 Bluetooth device properties

Note: The four digits after “CG-6” in device name indicate the serial number of your unit, which will be different from 0001.

Under the “Hardware” tab *find* the COM port number (in this example it is COM3). Please keep record of this COM port number to be used in future steps.

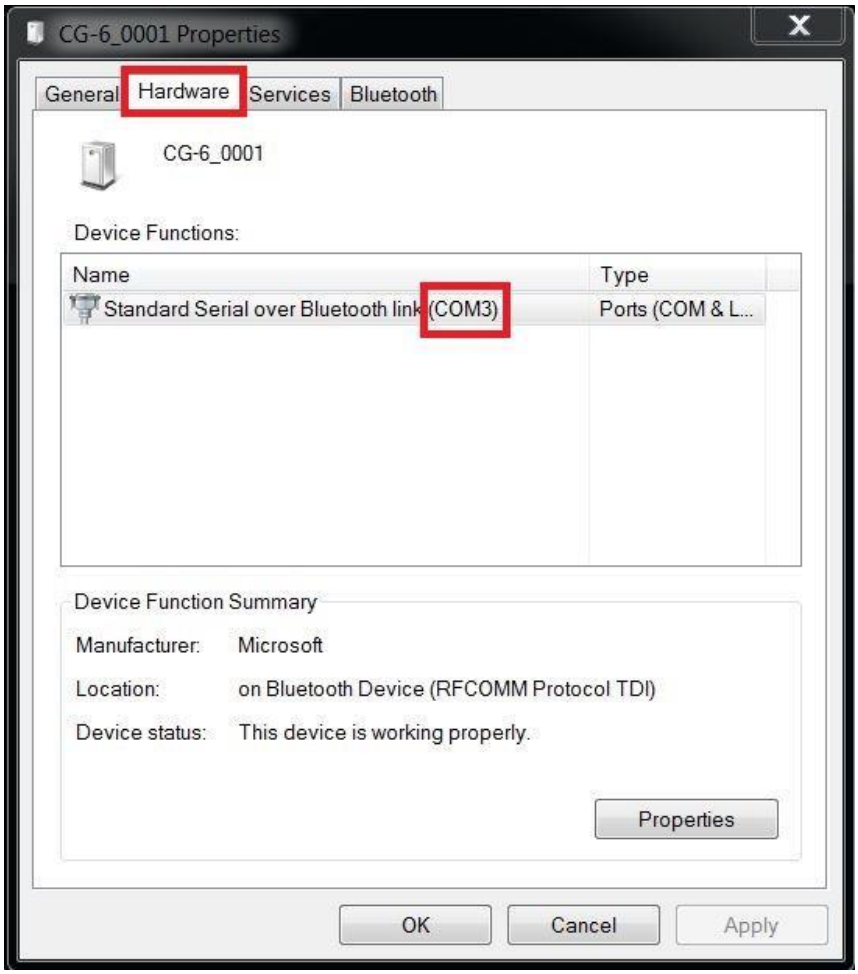

Figure 5-6 Bluetooth device COM port

Upgrading CG-6 Firmware with LynxLG Software

Note: If you do not have access to LynxLG processing software, please proceed to the next section titled “Upgrading the CG-6 Firmware with CG-6 Firmware Updater Software”

Backup Calibration Constants

Launch LynxLG software. *Click* “Settings” button on the main screen.

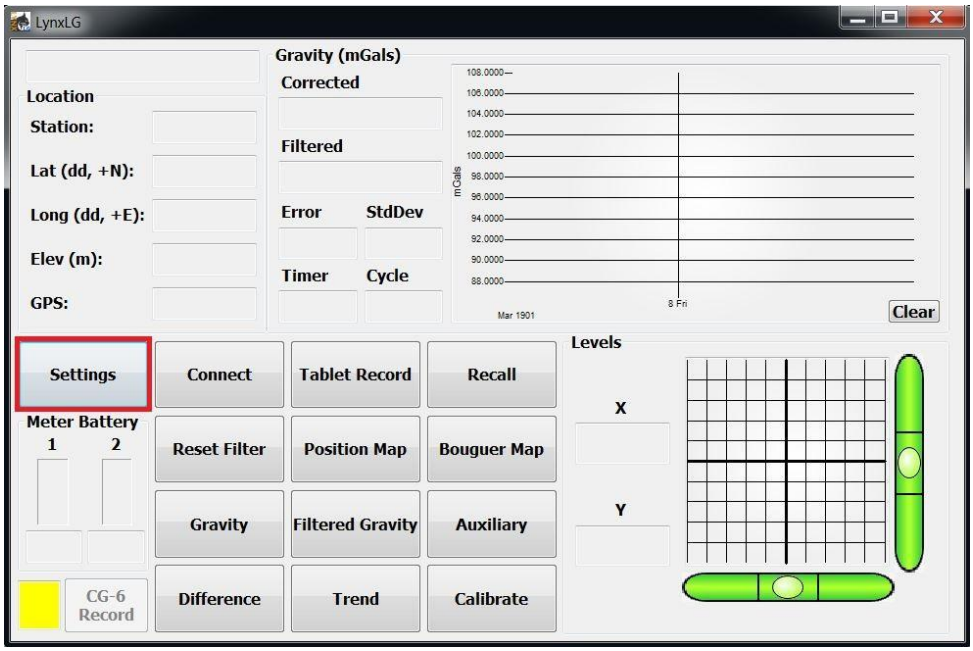

Figure 5-7 The LynxLG software main screen

Go to “Calibration” tab and *click* “Get/Set Factors”, as illustrated below.

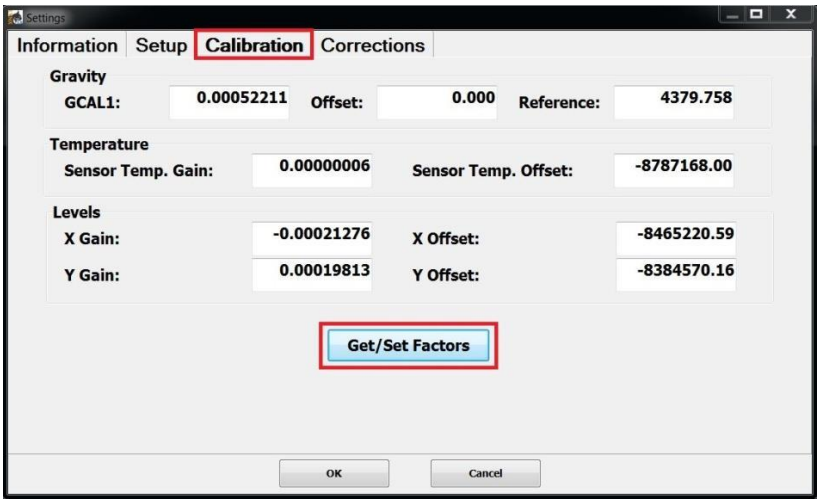

Figure 5-8 The LynxLG software calibration screen

Click the “Get” buttons to synchronize CG-6 calibration constants to LynxLG as illustrated below. Make sure to click “OK” to save these changes.

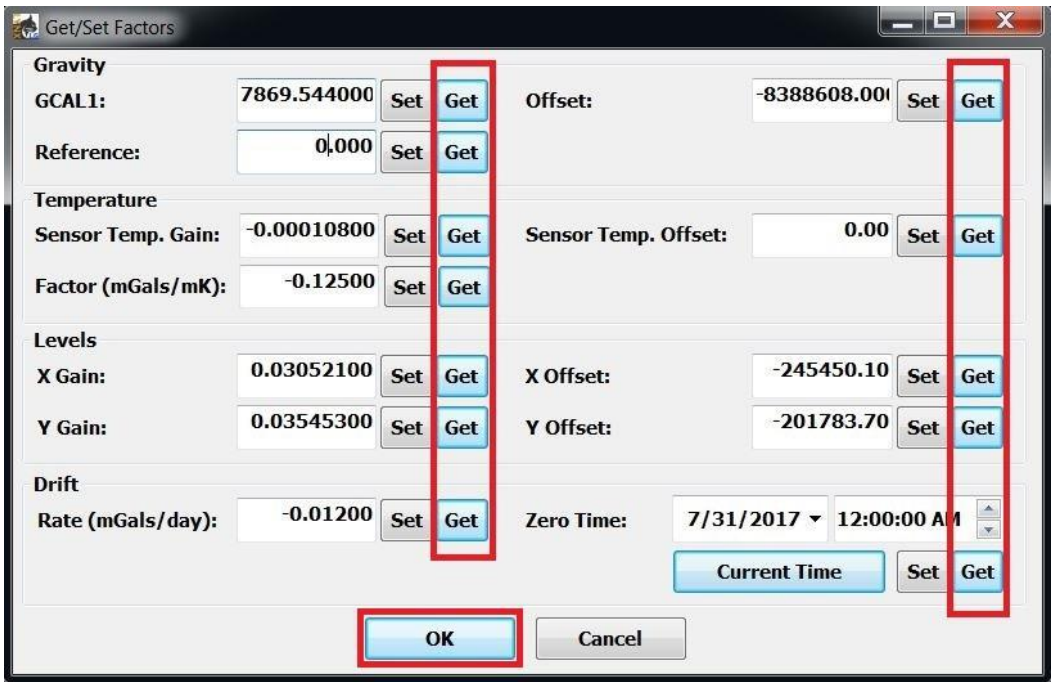

Figure 5-9 The LynxLG software “Get/Set Factors” screen

Update Firmware

Return to the main LynxLG software screen as illustrated below. *Click* the LynxLG icon on the top-left corner and *select* “Upgrade Firmware” from the menu.

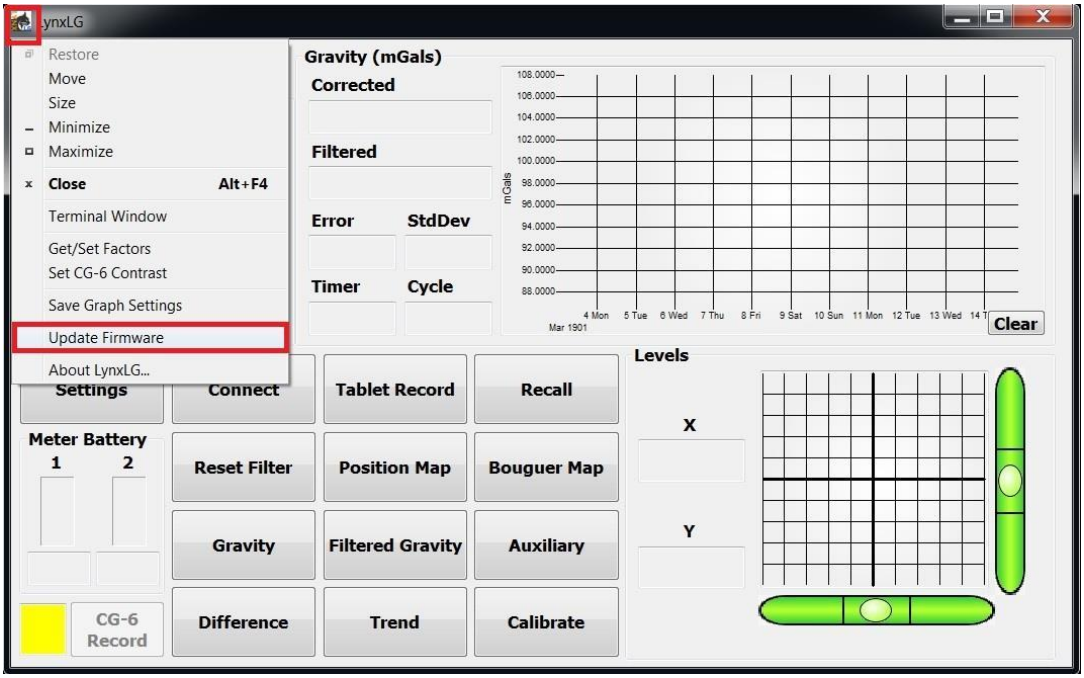

Figure 5-10 Update firmware pull-down menu

Click “Yes” and “OK” in the next two message boxes illustrated below.

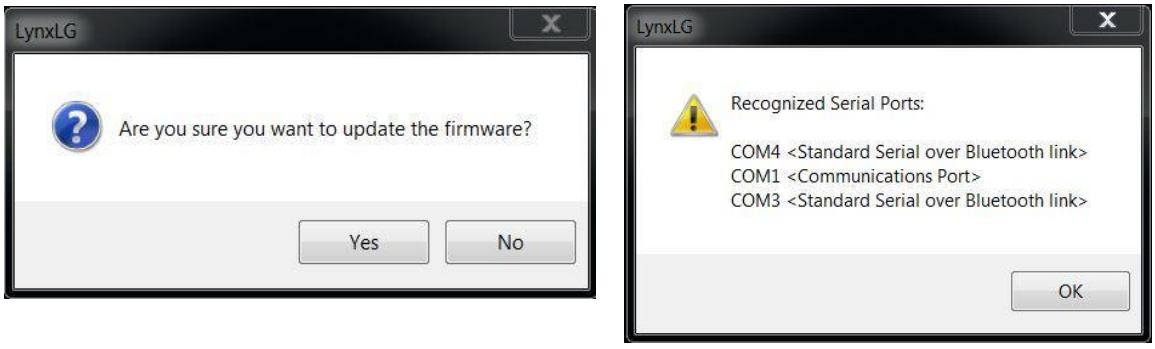

Figure 5-11 Confirming the firmware update

Configure the port setup, as illustrated below. *Use* the COM port that was assigned to your CG-6 Autograv™ Gravity Meter (refer to the "Preparation" section if you are unclear). The Baud Rate should be set to 115200, Data Bits to 8, Parity to None and Stop Bit to 1. *Click* "OK"

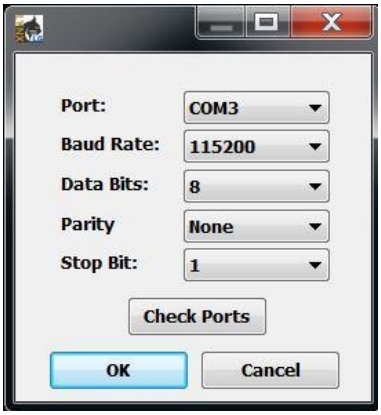

Figure 5-12 COM port configuration

Your CG-6 Autograv™ Gravity Meter will now enter **firmware upgrade mode** as illustrated below.

Figure 5-13 The CG-6 in upgrade mode

Important: Should the upgrade prove to be unsuccessful and your CG-6 Autograv™ Gravity Meter is stuck in the screen illustrated above, *perform* a power-cycle (disconnect and reconnect all batteries and power cord) to restart your CG-6 Autograv™ Gravity Meter normally.

In the LynxLG software you will see the screen as illustrated below. Make sure that the correct COM port and baud rate have been selected. *Click* “Connect”.

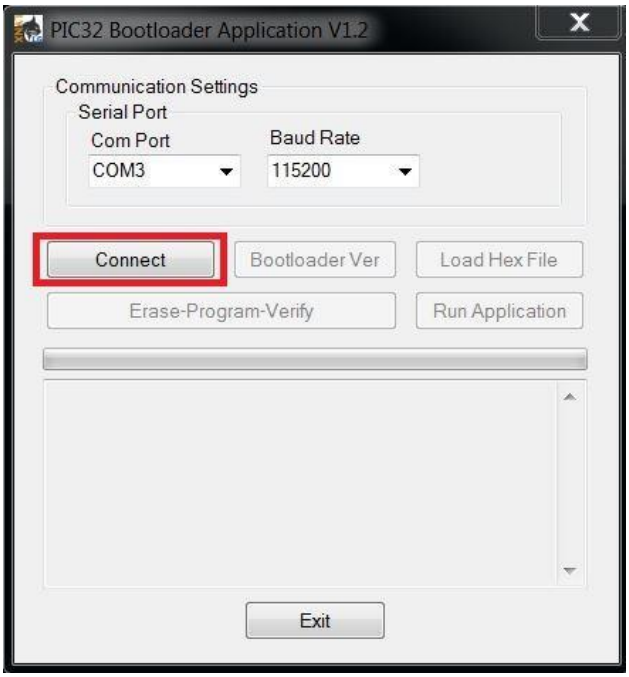

Figure 5-14 Connecting the CG-6 with LynxLG Bootloader

After having successfully connected, *click* “Load Hex File”, as illustrated below.

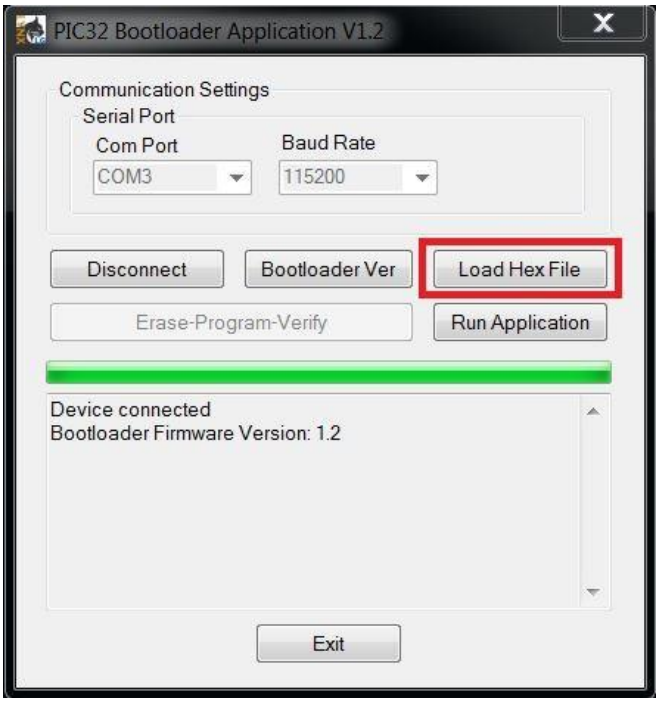

Figure 5-15 Loading the hex file with the LynxLG Bootloader

Select the *.hex file you would like to flash, as illustrated below.

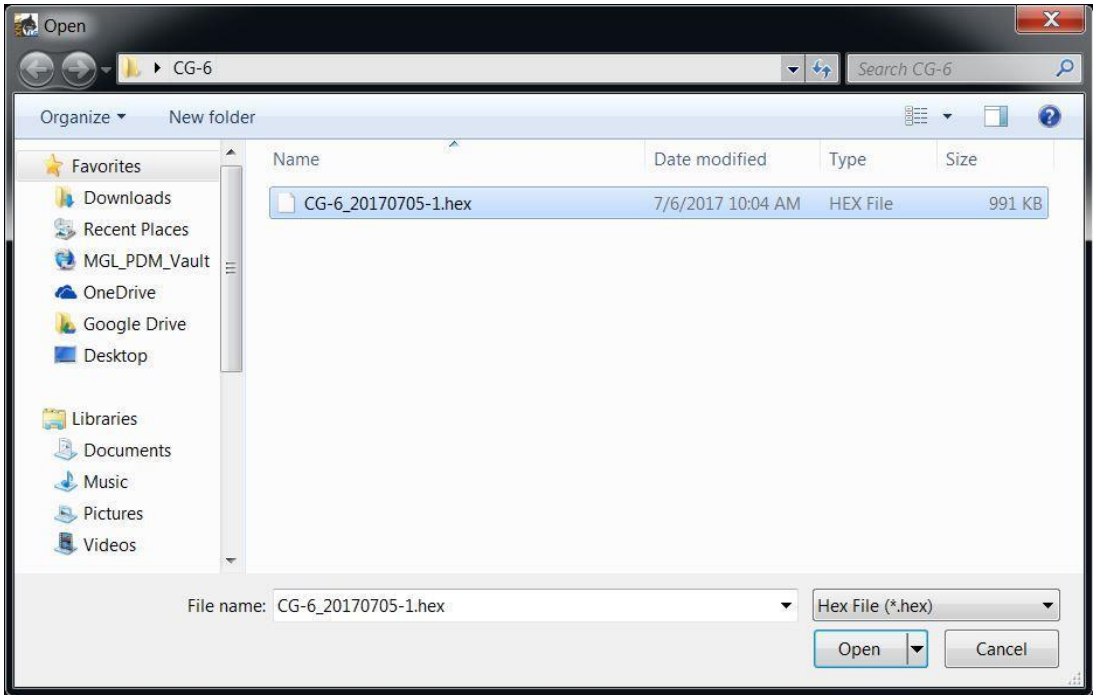

Figure 5-16 Selecting the hex file with the LynxLG Bootloader

After loading the hex file, *click* “Erase-Program-Verify”, as illustrated below.

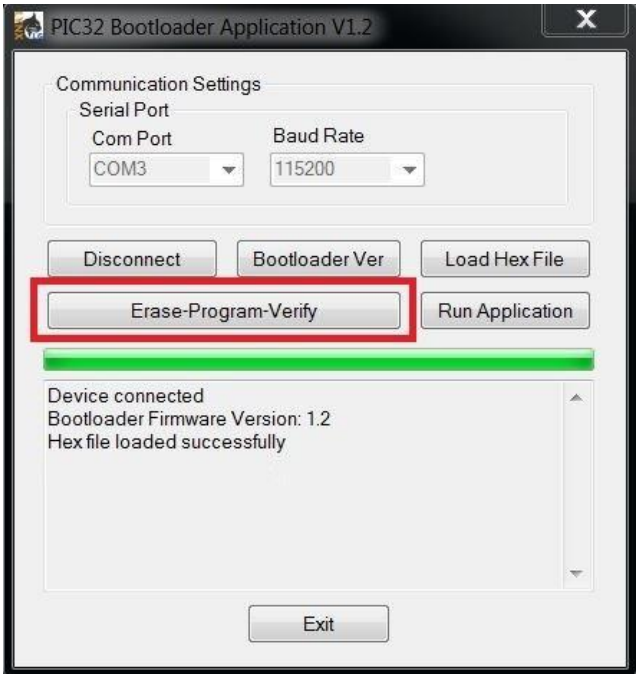

Figure 5-17 Verifying the program with the LynxLG Bootloader

Wait until the successful completion of erase, program and verify (this might take several minutes). Then *click* “Run Application”, as illustrated below.

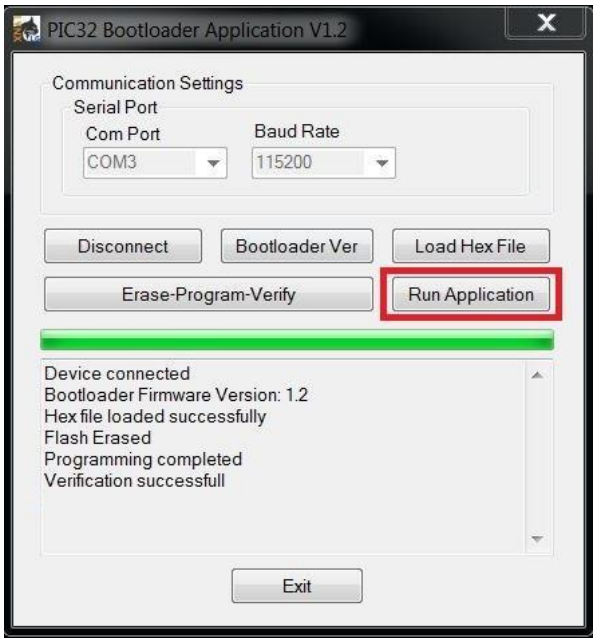

Figure 5-18 Upgrade Firmware with LynxLG Bootloader

Your CG-6 Autograv™ Gravity Meter should quit the firmware upgrade mode and run the newly upgraded firmware.

Restore Calibration Constants

Go back to Settings\Calibration Tab\Get/Set Factors window, as illustrated below. *Click* all “Set” buttons to synchronize all calibration constants from LynxLG back to your CG-6 Autograv™ Gravity Meter.

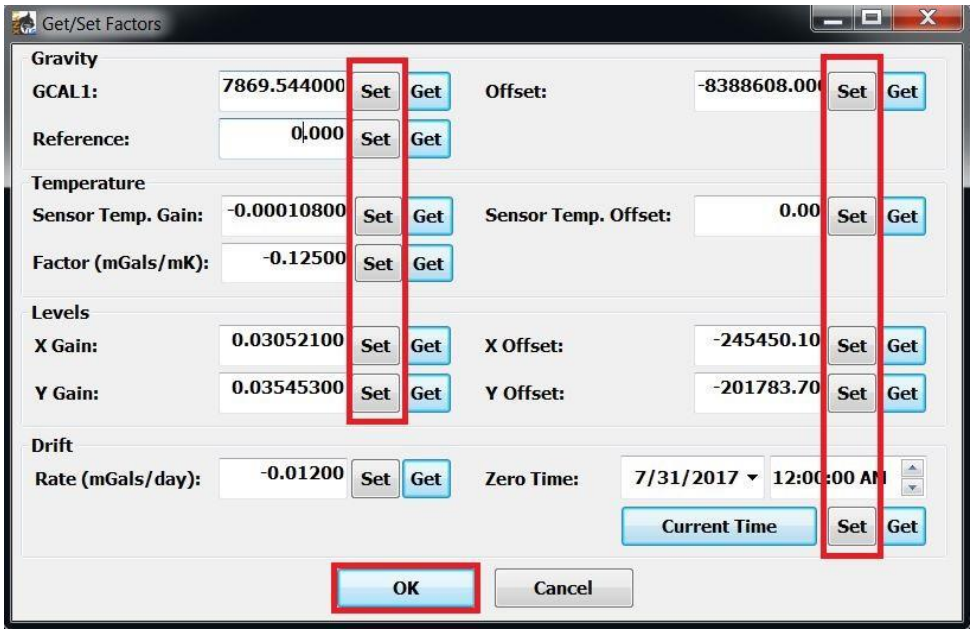

Figure 5-19 The LynxLG software "Get/Set Factors" screen

Note: All above illustrated captions are examples. The constants of your CG-6 Autograv™ Gravity Meter will be different.

Upgrading the CG-6 Firmware with CG-6 Firmware Updater Software

Backup Calibration Constants

On your CG-6 Autograv™ Gravity Meter *go* to the "SETTINGS\CALIB" screen, as illustrated below. Write down all calibration constants. You may type them in a text file, write them down on paper or simply take a picture of the screen.

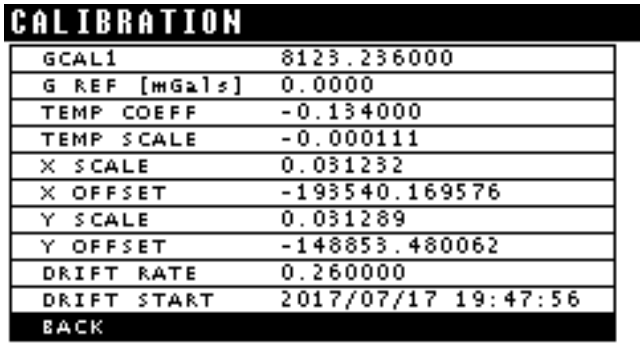

Figure 5-20 The CG-6 Calibration screen

Download and Install CG-6 Firmware Updater Software

Download CG-6 Firmware Updater software installer from the following link:
https://scintrexltd.com/support/product-software-updates/

Launch the installer and follow the prompts to complete the installation.

Update Firmware

Launch CG-6 Firmware Updater Software. It has the same interface as the built-in firmware upgrade functionality in LynxLG. Simply refer to "Upgrade Firmware" section of "Upgrading CG-6 Firmware with LynxLG Software" and follow the same steps.

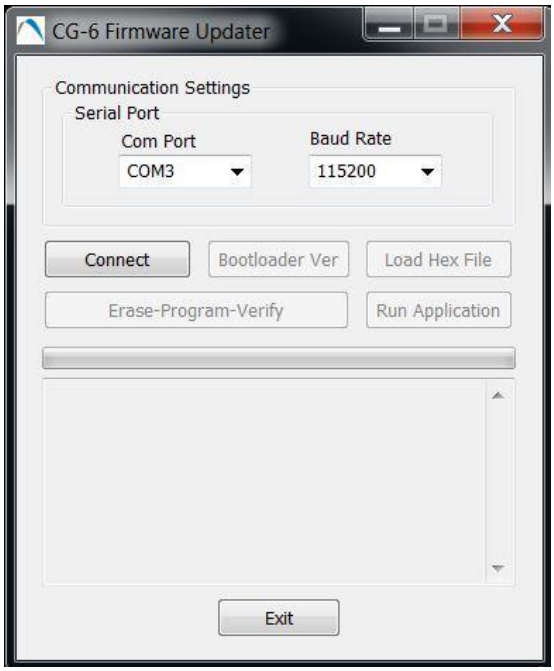

Figure 5-21 CG-6 Firmware Updater main screen

Restore Calibration Constants

On your CG-6 Autograv™ Gravity Meter *go* to the “SETTINGS\CALIB” screen, as illustrated below. Edit each entry with the previously recorded values.

CALIBRATION

GCAL1	8123.236000
G REF [mGals]	0.0000
TEMP COEFF	-0.134000
TEMP SCALE	-0.000111
X SCALE	0.031232
X OFFSET	-193540.169576
Y SCALE	0.031289
Y OFFSET	-148853.480062
DRIFT RATE	0.260000
DRIFT START	2017/07/17 19:47:56
BACK	

Figure 5-22 The CG-6 Calibration screen

Note: All above illustrated captions are examples. The constants of your CG-6 Autograv™ Gravity Meter will be different.

Troubleshooting

Important: Care must be exercised in handling your CG-6 Autograv™ Gravity Meter. Excessive shocks and vibrations should be avoided.

Despite the fact that your CG-6 Autograv™ is a very reliable instrument, there can be circumstances where problems may occur. The following table lists some of these problems and their attempted solution. However, please do not hesitate to contact us. See “Warranty and Repair” for the office information.

Problem	Possible Cause	Possible Solution
CG-6 Autograv™ will not power up.	Battery is depleted or meter is not plugged into AC.	Plug in Power Supply (p/n 128370015) and/or install a fully charged battery.
	Battery is not fully seated in instrument.	Firmly but carefully push on the battery caps to ensure they are fully seated in the battery compartment.
Battery is not charging and discharging in the normal manner - e.g. charges more quickly than normal and has reduced capacity.	Battery calibration has been lost.	Insert battery into any slot of the Smart Battery Charger (p/n 400209). Light will change from flashing green to solid green.
Reading appears to be out of range or reading is close in value to GCAL1 and ERR/SD is low.	Sensor may be sticking.	Gently tap the front panel underneath the CG-6 Autograv™ name with your finger several times.
Data does not transfer.	USB-B to USB-A cable is not connected between CG-6 Autograv™ and PC.	Connect Cable. See Retrieving Your Data. Power cycle your CG-6 Autograv™ by disconnecting all batteries and the power cord and then reconnecting.

Chapter 6 **Reference Information**

CG-6 Autograv™ Technical Specifications

Tablet computer and CG-6 Autograv™ specifications are subject to change without notice

Sensor Type	Fused quartz using electrostatic nulling
Reading Resolution	0.1 microGal
Standard Deviation	<5 microGal
Operating Range	World-wide (8,000 mGal without resetting)
Residual Drift	<20 microGal/day
Uncompensated Drift	<200 microGal/day
Range of Automatic Tilt Compensation	±200 arcseconds
Tares	Typically <5 microGal for shock up to 20G
Automated Corrections	Tide, instrument tilt, temperature, drift
Data Output Rate	User selectable up to 10 Hz
GPS Accuracy	2.5m typical accuracy
Touch-Free Operation	Handheld Tablet Computer with Bluetooth
Battery Capacity	2 x 6.8 Ah (10.8V) rechargeable lithium smart batteries. Full day operation at 25°C (77°F)
Power Consumption	5.2 Watts at 25°C (77°F)
Operating Temperature	-40°C to +45°C (-40°F to 113°F) Optional high temp version to +55C (131°F)
Digital Data Output	USB and Bluetooth
Dimensions	21.5 cm (H) x 21 cm x 24 cm (8.5 in x 8.2 in x 9.4 in)
Weight	5.2 kg (11.5 lbs) including batteries
Standard System Contains	CG-6 Autograv™ Gravity Meter CG-6 Tripod 2 Rechargeable Smart Batteries Battery Charger Power Supply and USB Cable Transportation Case Shoulder Strap User Manual Quick Start Guide Carrying Bag Plug Adaptor Kit Spare Parts Kit
Shipping weight and dimensions	97cm x 60 x 55 (H) (38in x 24 x 22 (H)), 26 kg, (60 lb).

Available Options and Accessories	High-Temperature (HT) Meter Upgrade Tablet computer + accessories LynxLG Software 12V External Power Supply Cable Cold Weather Kit Seco Backpack Spare Meter Batteries Spare Tablet Computer Batteries Trident Gradient Tripod Spare Battery Holder Assembly Extended Legs Tripod

Location of the CG-6 Autograv™ Sensor

The following picture shows the location of the CG-6 Autograv™ sensor.

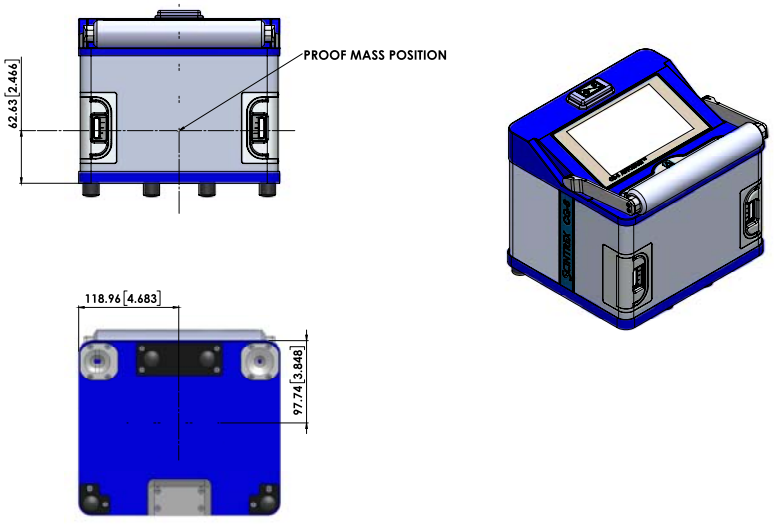

Figure 6-1 The CG-6 AutogravTM sensor location

Instrument Parts List

CG-6 Autograv™ Standard Accessories

Item Description	Part Number
CG-6 Autograv™ includes:	101370002
CG-6 Autograv	129370505
Meter Tripod	126370138
Battery Pack (x2)	0221029M
Battery Holder Assembly (x2)	126370501
AC to DC Power Supply	128370055
Smart Battery Charger	400209
External USB Cable	128370053
Spare Parts Kit	888025
Kit Plug Adaptor	400128
CG-6 Quick Start Guide	115370002
Flash Drive with CG-6 Product Manuals	888407
CG-6 Carrying Bag	888012
CG-6 Shipping Case Assembly	888016

CG-6 Autograv™ Optional Accessories

Item Description	Part Number
Tablet Computer	888030
10-hour tablet computer battery	400020
Smart Battery	0221029M
Seco Backpack	140220
Battery Holder Assembly	126370501
Cold weather kit	888405
12V External Power Supply Cable	128370060
Extended Legs Tripod	867209
Trident Gradient Tripod & Shipping Case Assembly	101370004

Assembling the Batteries

Because of stringent IATA regulations, the CG-6 Autograv™ batteries must be shipped in individual packing, with a charge of no more than 30%. Before you can power up your CG-6 Autograv™, a minimal amount of assembly is required to attach the battery holder assembly (p/n 126370501) to the smart batteries (p/n 0221029M). The following picture illustrates the assembly procedure:

Note: If you procure CG-6 batteries from source other than Scintrex, you will have to cut off the pull tab as illustrated below and cover with a piece of 3M 3850 packing tape or similar thin tape.

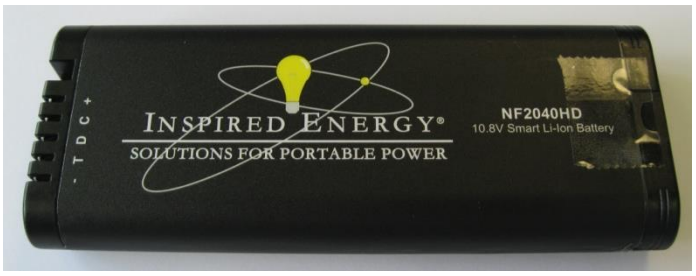

Figure 6-2 Removing the pull tab and covering with tape

Note: The Allen screwdriver illustrated in the fourth frame below is supplied with the CG-6 Spare Parts Kit (p/n 888025).

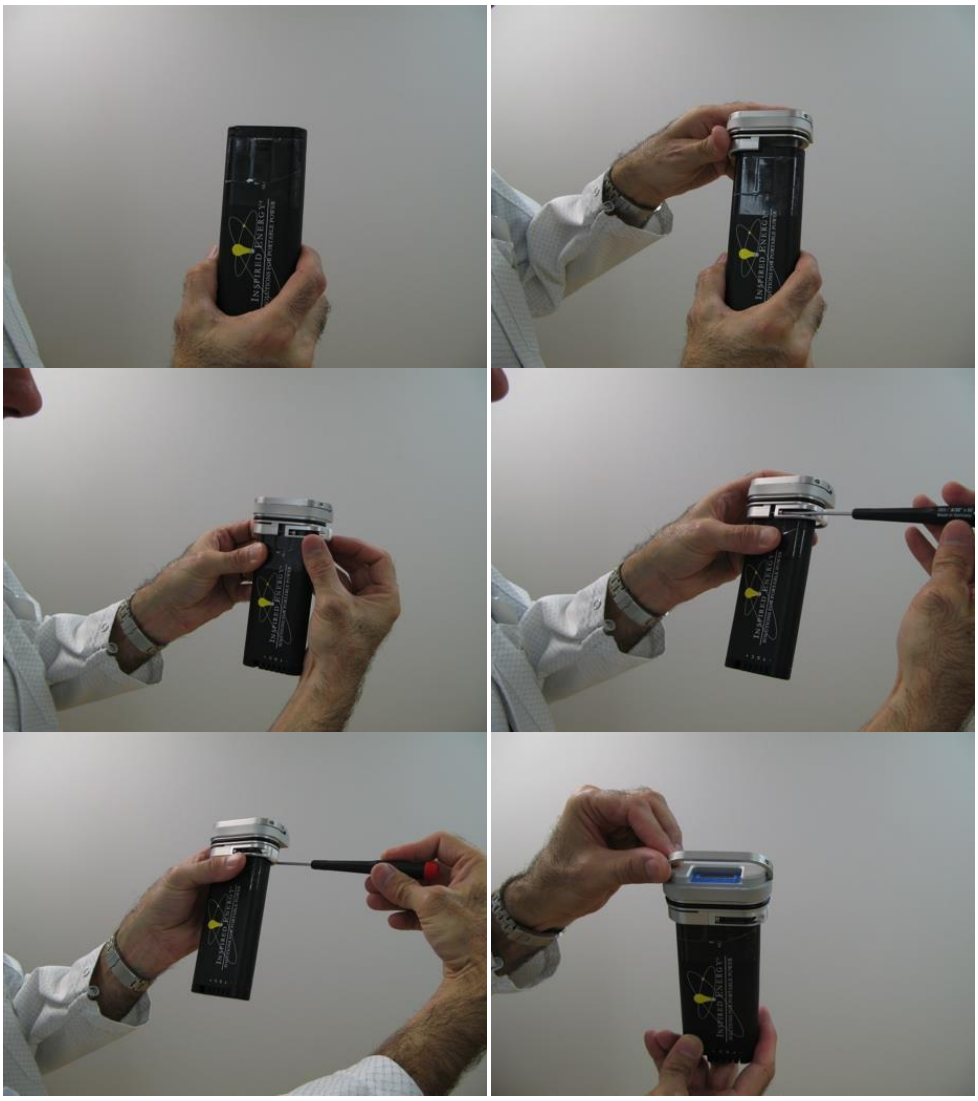

Figure 6-3 Assembling the battery packs

Important: The battery cap assembly handle must be on the side of the battery where its logo is located, as per the last frame above.

Warranty

All Scintrex equipment, with the exception of consumable items, is warranted against defects in materials and workmanship for a period of one year from the date of shipment from our plant. Should any defects become evident under normal use during the warranty period, Scintrex will make the necessary repairs free of charge.

This warranty does not cover damage due to misuse or accident and may be voided if the instrument console is opened or tampered with by persons not authorized by Scintrex.

Repair

When to ship the unit

Please do not ship your instrument for repair until you have communicated the nature of the problem to our Customer Service Department by e-mail, telephone, facsimile or mail. Our Customer Service Department may suggest certain simple tests or steps for you to do, which may solve your problem without the time and expense involved in shipping the instrument back to Scintrex for repair. If the problem cannot be resolved, our personnel will request that you send the instrument to our plant for the necessary repair.

Description of the problem

When you describe the problem, please include the following information:

- The symptoms of the problem,
- How the problem started,
- If the problem is constant, intermittent or repeatable,
- If constant, under what conditions does it occur,
- Any printouts demonstrating the problem

Shipping instructions

No instrument will be accepted for repair unless it is shipped prepaid. After repair, it will be returned collect, unless other arrangements have been made with Scintrex. Please mention the instrument's serial number in all communications regarding equipment leased or purchased from Scintrex.

Instruments should be shipped to:

SCINTREX Limited
222 Snidercroft Road
Concord, ON, Canada
L4K 2K1
Telephone: +1 905 669 2280
Fax: +1 905 669 9899

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