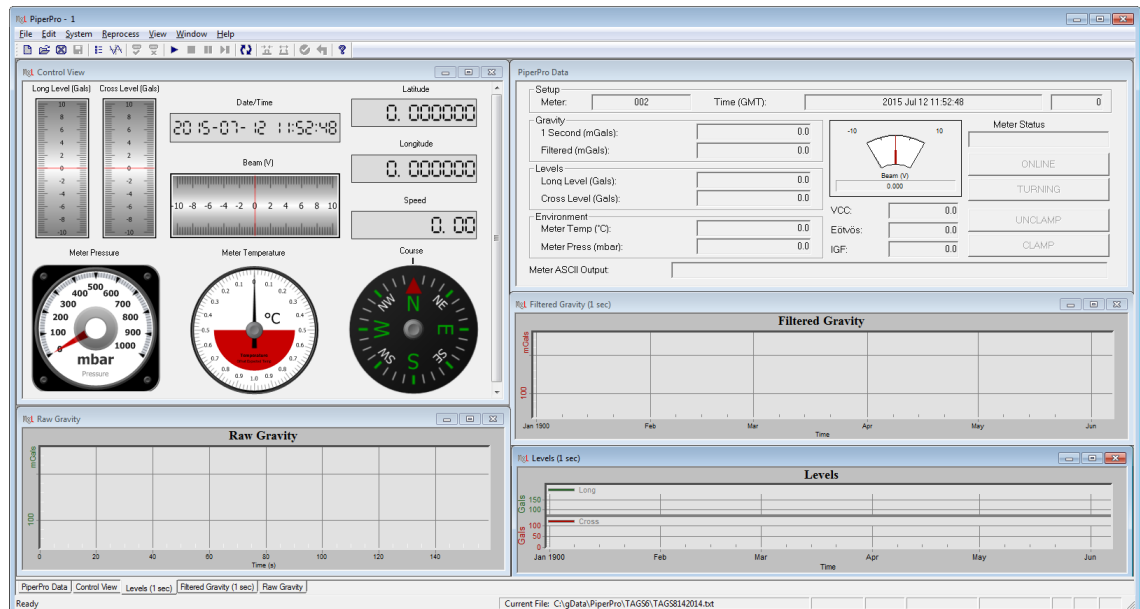


# TAGS PiperPro Processing Software Manual



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*Applicable Products*

*Micro-g LaCoste: TAGS-7 Turnkey Airborne Gravity System 7*

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## 1. INTRODUCTION

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## Overview

This is the operator's manual for the Micro-g LaCoste TAGS-7 PiperPro Processing Software. The software provides sophisticated data collection and processing. Post-processing is done using MGL's AGSys or client's own processing software.

For operation of the TAGS-7 gravity meter hardware, refer to the appropriate hardware user's manual.

## System Requirements

PiperPro runs on any computer with the following minimal standards:

Operating System:	Windows 7 and newer
Free Hard Drive Space:	1 GB or greater
RAM:	2 GB or greater
Processor:	Intel™ i3 or greater (AMD also works with similar standards)
Processing Speed:	2 GHz or greater

## Conventions

Dialog box menus, commands, dialog box titles, labels and options are bolded text in the user instructions. WARNING and IMPORTANT notes are highlighted in red.





## 2. INSTALLATION

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## PiperPro Software

Licensed users of PiperPro can download the latest PiperPro software (PiperPro.exe) from:

<http://www.microglacoste.com/PiperPro/>

After installation, check that the files listed in Table 2-1 are present on the local machine. If you do not have all the listed files and/or directories once PiperPro is installed, please contact Micro-g LaCoste.

**Table 2-1 Installation Files**

Filename	Description
Program Files\PiperPro\readme.txt	Overview of installation procedures.
Program Files\PiperPro\PiperProHelp.pdf	This document.
Program Files\PiperPro\bin\PiperPro.exe	Main application.
gInfo\PiperProDisplay.ini	Configuration information for PiperPro.exe.
Program Files\PiperPro\License.txt	Standard software licensing information.

## Installation Procedure

### NOTE

Before beginning installation, be sure to uninstall any previous version of PiperPro.

Double click the Install application (PiperPro\_Setup.exe).

- Follow the displayed instructions.
- It is highly recommended that you accept ALL default settings.
- Double click on the newly installed PiperPro program icon.
- Select "generate" when prompted.
  - This creates a SysChk.bin file that is unique to this computer.
  - Note where it is located on your local hard drive.
  - Email this SysChk.bin to Micro g at: [info@microglacoste.com](mailto:info@microglacoste.com)

- Wait for us to send you PiperProPWInfo.bin. This usually takes less than 24 hours during a normal business week.

**NOTE**

The SysChk.bin files are unique for each computer, so please send one file at a time.

- Upon receipt of PiperProPWInfo.bin, manually copy the file into the newly created gInfo. (Usually c:\gInfo).
- Double click on the PiperPro program icon.
  - Select Install. (May not be required if password is recognized automatically)
  - You may be asked to point to the PiperProPWInfo.bin file on your local hard drive.

**IMPORTANT**

Due to details in the software protection of PiperPro, if at any time the user adds or removes hardware from the computer, it may be necessary to obtain a new password file by following the above steps.

- Next, create the directory c:\gData\PiperPro if it does not already exist.
  - This is the default location for all PiperPro data.

You are now ready to run PiperPro.



### 3. SYSTEM SETTINGS

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## Local Configuration File

### Local .ini File

All processing parameters for the loaded data are stored in the local PiperPro.ini file located in the same folder as the data. Changes to this .ini file only affect the data in that folder when reprocessed.

### NOTE

To save the processing parameters changes to the PiperPro.ini file, select **Save** from the **File** menu. Note that the settings are automatically saved when processing starts (Select **Start** from the **Reprocess** menu).

## Modify System Setting Parameters

The processing parameters may be modified from the **System** menu and clicking **Settings**. (or **F3**). There are three tab pages (Setup, Calibration and Corrections) contained in the **System Settings** dialog.

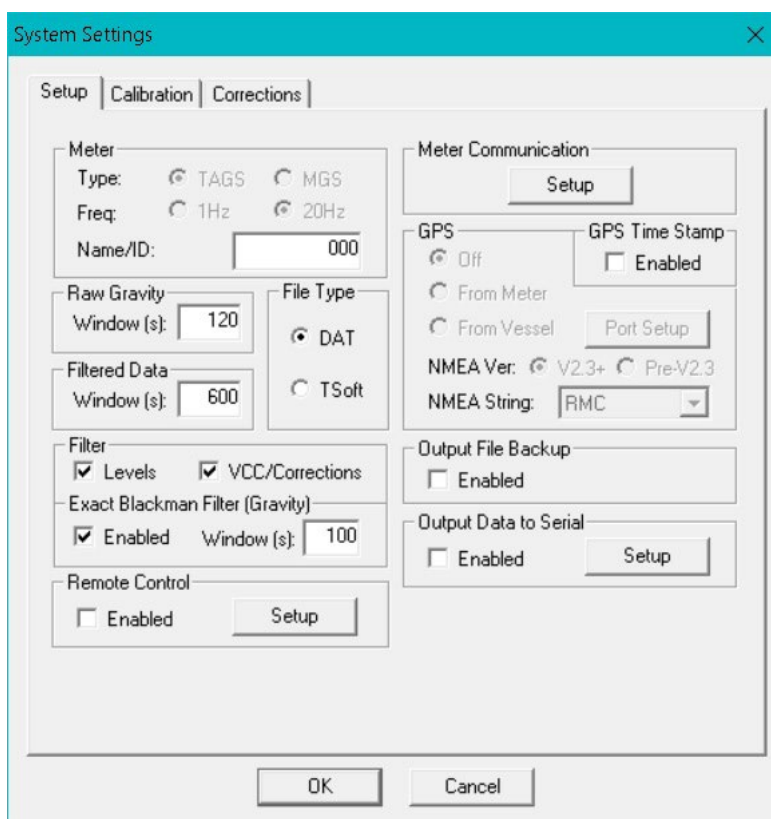


Figure 3-1 System Settings Dialog: Setup Tab Page

## Setup Tab

The **Setup** tab page configures the instrument setup parameters. Refer to Table 3-1 for a description of each of the setup parameters. Figure 3-1 shows the **Setup** tab page.

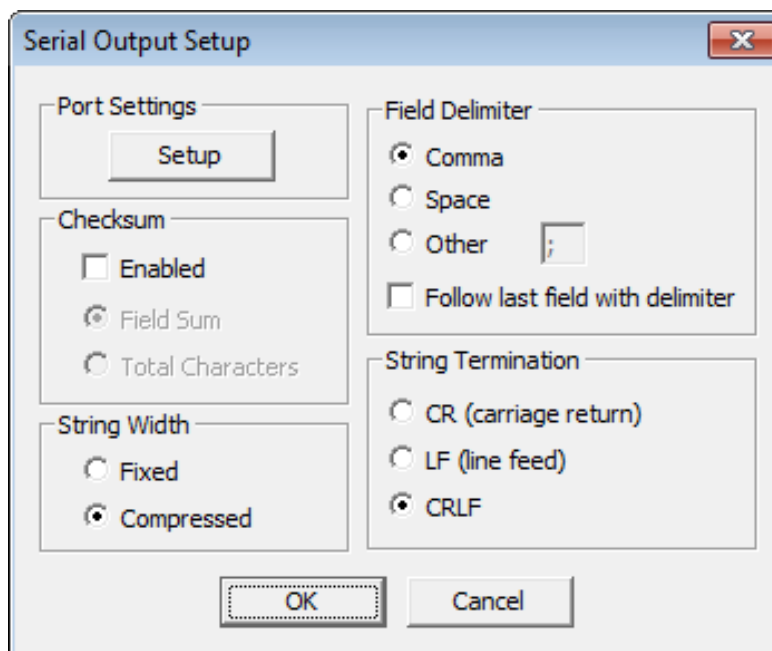
**Table 3-1 System Settings Dialog: Setup Tab Page Parameters and Descriptions**

Section	Parameter	Description
Meter	Type:	Click to select the Meter type that is running, TAGS-7
	Freq	Click to select the Frequency. TAGS-7 runs at 20Hz only.
	Name/ID	Serial number of the meter.
Raw Gravity	Window(s)	Total seconds plotted for raw gravity. After this total has been reached, graphs scroll horizontally.
Filtered Data	Window(s)	Total seconds plotted for one second data plots. After this total has been reached, graphs scroll horizontally.
Filter	Levels	Checking the <b>Levels</b> box enables a 20Hz to 5 second filter on the levels data. If this is disabled, the levels are filtered to 1 Hz data instead. (This is only a graphical filter. This filter is not applied to recorded data in files.
	Exact Blackman Filter (Gravity)	Checking the <b>Exact Blackman Filter (Gravity)</b> box enables a FIR (Finite Infinite Response) Exact Blackman filter on the 1 Hz gravity data. Refer to <a href="#">Appendix B</a> for the QC filter computation.
	Window (s)	The window text field is the filter length for the Exact Blackman Filter.
File type	Dat or TSoft	Select the output file type. The Dat files are comma delimited ASCII files that can be read using a spreadsheet application. TSoft files are tab delimited files, with detailed header and can be imported into the TSoft reprocessing software.
Meter Communication	Setup	Click the Setup button to configure communication settings.
GPS	Off	If no GPS is connected.
	From Meter	NA for TAGS-7
	From Vessel	NA for TAGS-7

Section	Parameter	Description
GPS Time Stamp	Enabled	Click to enable the GPS Time Stamp. If the GPS Time Stamp is enabled, the software looks for the GPS timestamp from the meter instead of using the PC clock. Otherwise, the PC clock is used for the initial data time stamp.
Output file Backup	Enabled	Click <b>Enabled</b> to send the backup file to another location.
Output Data to Serial	Enable	Click <b>Enabled</b> to send data to an external location through the serial port. Click the Setup button to configure communication settings and data format. Refer to the <a href="#">Serial Output Section</a> for additional information.

### Serial Output Setup

Under the **System** menu select the **System Settings** option to access the **Setup** tab page where data can be configured to be sent to an external location. In the **Output Data to Serial** section, click **Enable** then click **Setup** to access the **Serial Output Setup** dialog (Figure 3-2). Refer to Table 3-2 for a description of each of the output options.



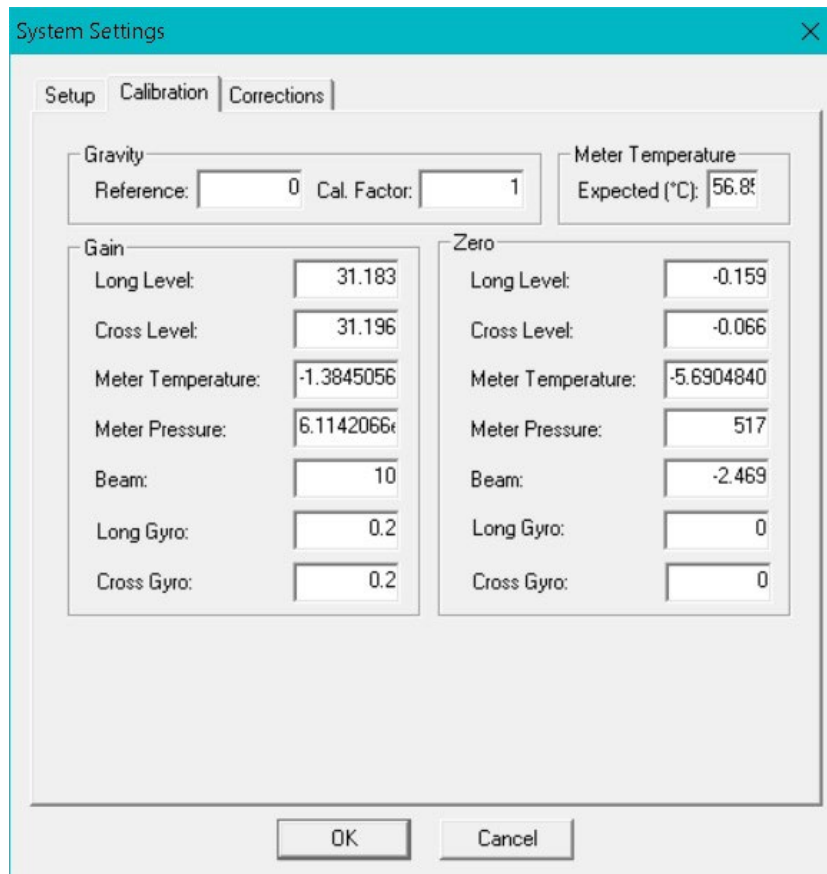
**Figure 3-2 Serial Output Setup Dialog**

**Table 3-2 Serial Output Setup Table Description**

Option	Description
Port Settings	Click <b>Setup</b> and configure the port settings.
Checksum	Choose a checksum option.
String Width	Choose a string width.
Field Delimiter	Choose a field delimiter.
String Termination	Choose a string termination.

### Calibration Tab

The **Calibration** tab page shows the current calibration of the meter. The calibration factors change if the meter is serviced and/or altered. Figure 3-3 shows the **Calibration** tab page. The calibration parameters are described in Table 3-3.

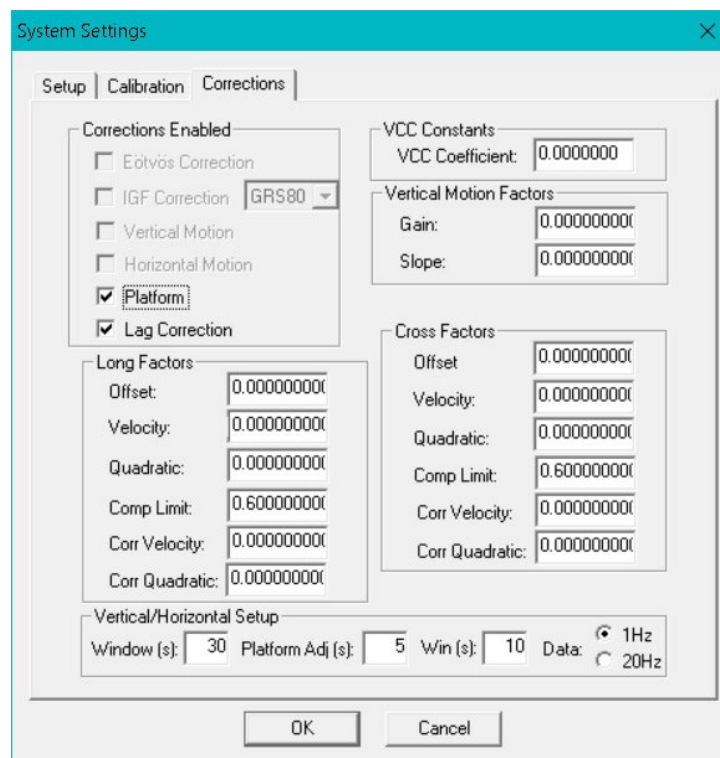


**Figure 3-3 System Settings Dialog: Calibration Tab Page**

**Table 3-3 System Settings Dialog: Calibration Tab Page Parameters and Descriptions**

Section	Parameter	Description
Gravity	Reference	This is an offset for gravity. Add the absolute value here for your location to offset the incoming gravity. This is required for IGF correction.
	Cal Factor	The calibration to convert the input gravity value into mGals.
Meter Temperature	Expected (°C)	The expected meter temperature for the current instrument. If the meter temperature is not within $\pm 1/2$ degree C, then a warning pops up during data acquisition.
Gain / Zero	Long/Cross Level, Meter Temperature, Meter Pressure, Beam, Long Gyro, Cross Gyro	These are the calibration factors used to convert the raw input values into their correct units.

**Corrections Tab**



**Figure 3-4 System Setting Dialog: Corrections Tab Page**

Use the **Corrections** Tab page to enable Eötvös and/or IGF (International Gravity Formula, GRS80) correction and set the VCC coefficient level. Figure 3-4 shows the **Corrections** tab page. The TAGS-6 corrections are done post processing.

#### *Eötvös Correction*

Eötvös correction in milliGal:

$$E_{corr} = 7.503 v \cos(\lambda) \sin(\alpha) + 0.004154 v^2$$

*Where:*

*v = ship's speed in knots*

*λ = latitude*

*α = ship's course heading (0° is due north, 90° is due east)*

#### *IGF Correction*

International Gravity Formula, GRS80:

$$g = 978032.67715 \frac{1 + 0.001931851353 \sin^2 \lambda}{\sqrt{1 - 0.00669438002290 \sin^2 \lambda}}$$

*Where:*

*λ = latitude*

*g is in milliGal*

#### *VCC Coefficient Level*

$$VCC = Beam \cdot LongLevel \cdot VCC \text{ Coefficient}$$

*Where:*

*Beam = Meter beam position*

*LongLevel = meter long level*

*VCC Coefficient = VCC Coefficient entry in the Corrections tab page.*

*(To access, select Settings under the System menu.)*



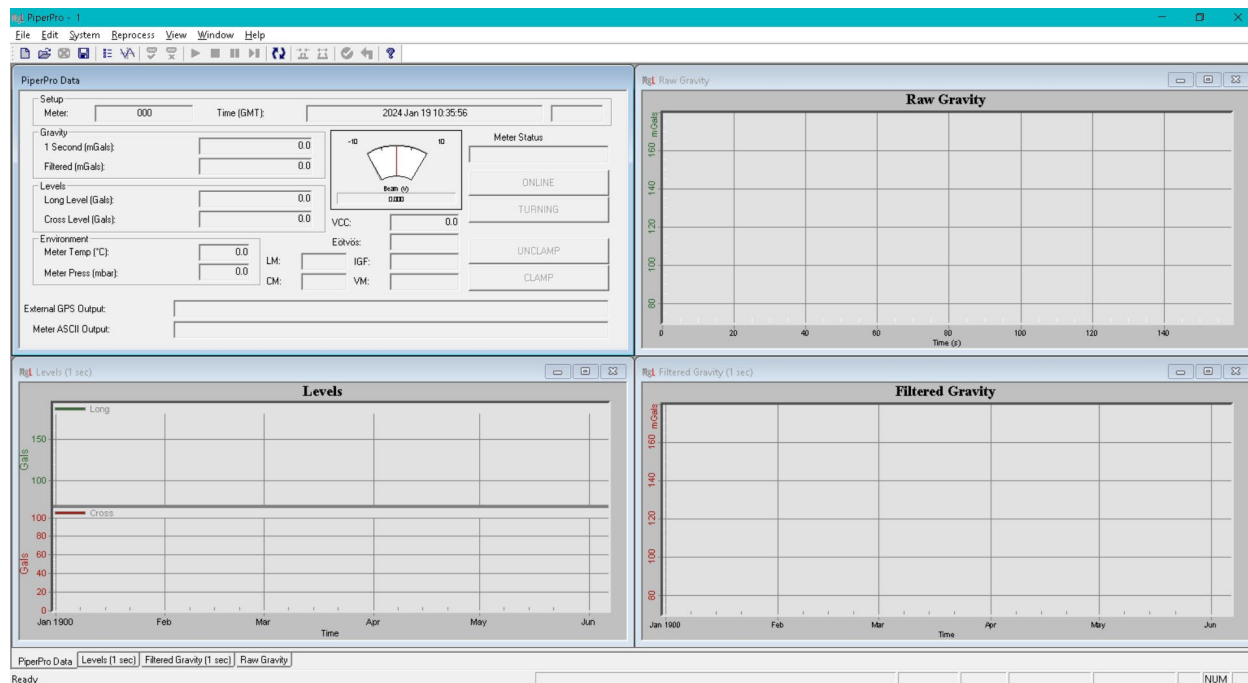
## 4. PIPERPRO MAIN WINDOW AND VIEWS

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## PiperPro Main Window



**Figure 4-1 Example PiperPro Main Window with Several Views Selected**

The main **PiperPro-1** window (Figure 4-1) always displays the **PiperPro Data** view (Figure 4-2). It is the main view used to convey meter status and cannot be closed.

There are ten other selectable views available to the user:

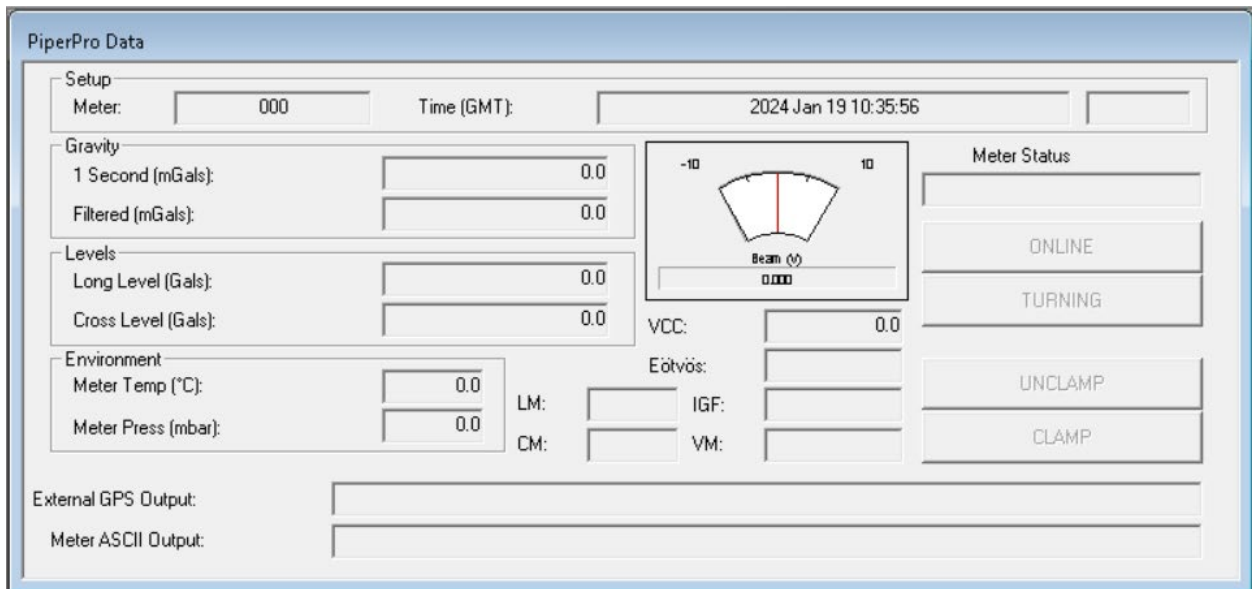
- Raw Gravity
- Filtered Gravity
- Environment
- Levels
- Corrections
- Feedback
- Gyros
- Lag Corrections
- Controls
- Navigation Plot

Under the **View** menu, click on the desired view to toggle the view On/Off. Figure 4-1 shows an example setup of the PiperPro main window with several views selected.

PiperPro main window remembers and displays the last selected views and their positions.

Use the **Window** menu, to choose **Cascade** or **Tile** layout style.

### PiperPro Data View



**Figure 4-2 PiperPro Data View**

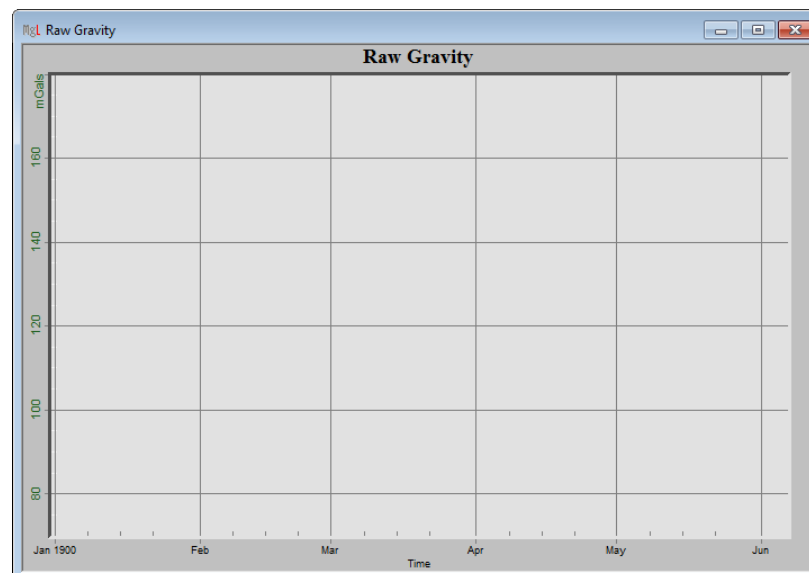
Figure 4-2 shows an example of the **PiperPro Data** view. Refer to Table 4-1 for description of the **PiperPro Data** view parameters.

**Table 4-1 Parameter Description of PiperPro Data View**

Section	Parameter	Description
Setup	Meter Time (GMT)	Shows the meter number and the current time (GMT).
Gravity	Filtered (mGals)	Provides information about the current filtered gravity value (mGals)
Levels	Long Level	Displays the current long and cross

Section	Parameter	Description
	Cross Level	level position values.
Environment	Meter Temp (°C) Meter Press (mbar)	Shows the current meter temperature and pressure.
Meter ACSII Output	Meter ACSII Output	Displays the raw serial string acquired from the meter.
Meter Status	Meter Status	This displays meter status information: ONLINE, TURNING, UNCLAMP, CLAMP
	ONLINE TURNING UNCLAMP CLAMP	Use the system buttons to communicate with the meter. The meter can be placed in TURNING or ONLINE mode or the operator can CLAMP or UNCLAMP the meter.
	Beam	The current beam position is given and shown on the dial.
	VCC	Calculated VCC cross coupling.
	Eötvös	The Eötvös correction.
	IGF	The IGF correction.

### Raw Gravity View

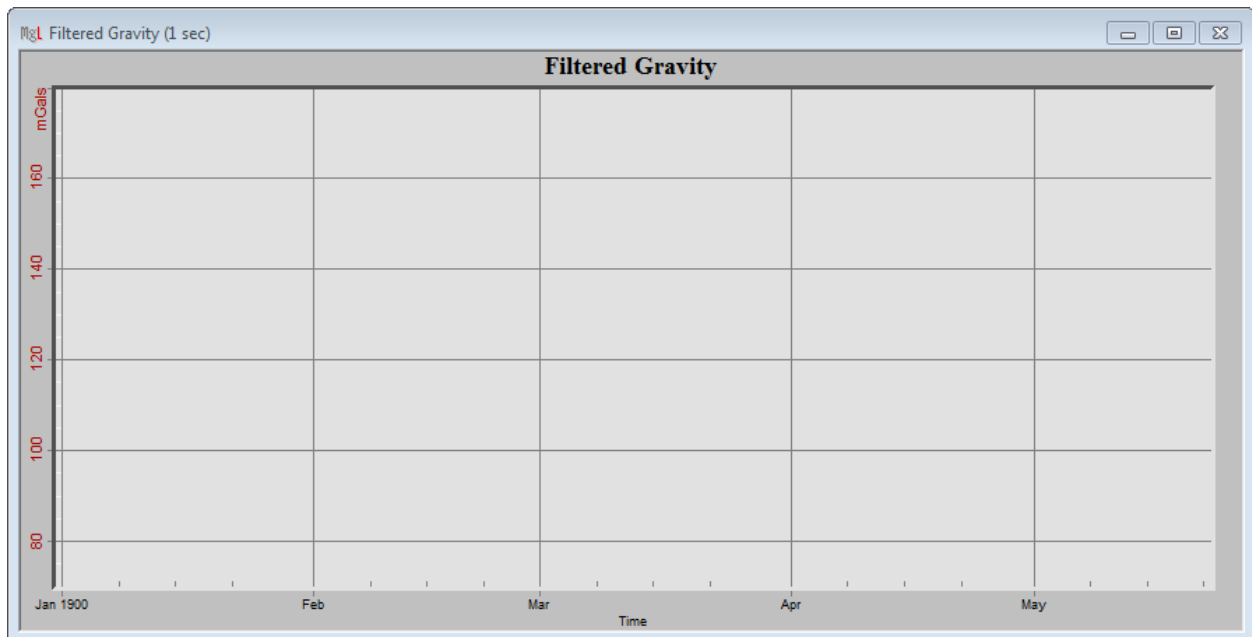


**Figure 4-3 Raw Gravity View**

The **Raw Gravity** view (Figure 4-3) displays the raw 1 Hz or the 20 Hz gravity as it was received from the meter. The graph automatically scrolls after a set amount of time passes.

The **Raw Gravity** view time range is set on the **Setup** tab page of the **System Settings** dialog in the **Window(s)** parameter of the **Raw Gravity** section. To access click **Settings** under the **System** menu.

### Filtered Gravity View



**Figure 4-4 Filtered Gravity View**

The **Filtered Gravity** view (Figure 4-4) displays the corrected gravity data. The graph automatically resizes to fit all the data across the graph. The data fit time range is set in the **Window (s)** parameter in the **Filtered Data** section on the **Setup** tab page in the **System Settings** dialog. Click **Settings** under the **System** menu. The graph scrolls when the data exceeds the set range.

### Environment View

The **Environmental** view (Figure 4-5) displays the environmental data received from the meter, which includes meter temperature and pressure, beam position and VCC calculations.

The data fit time range is set in the **Filtered Data Window (s)** parameter on the **Setup** tab page of the **System Settings** dialog. Click **Settings** under the **System** menu.

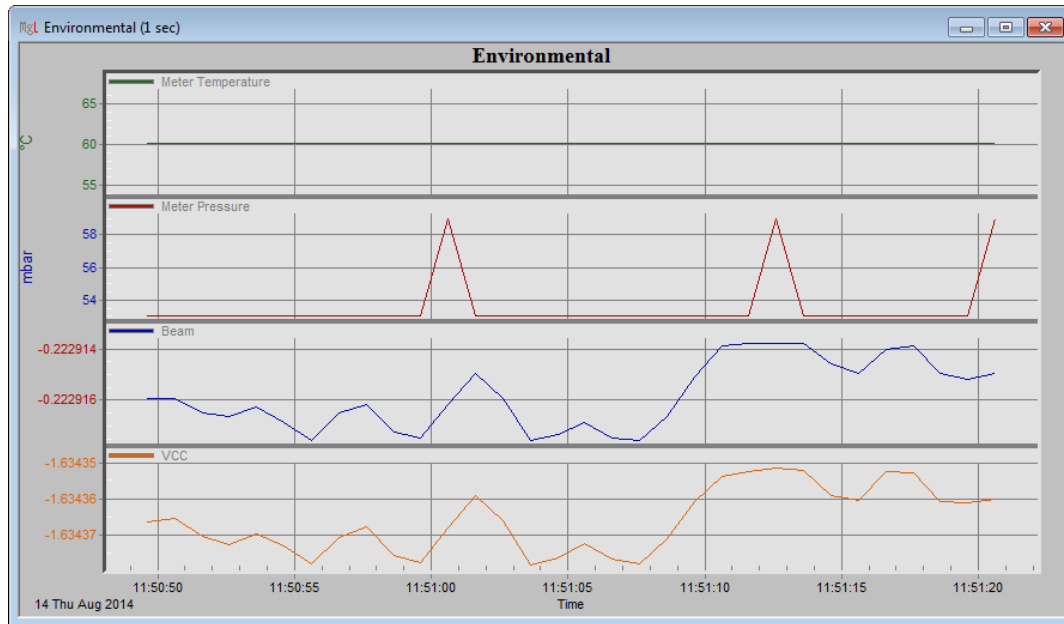


Figure 4-5 Environment View

### Levels View

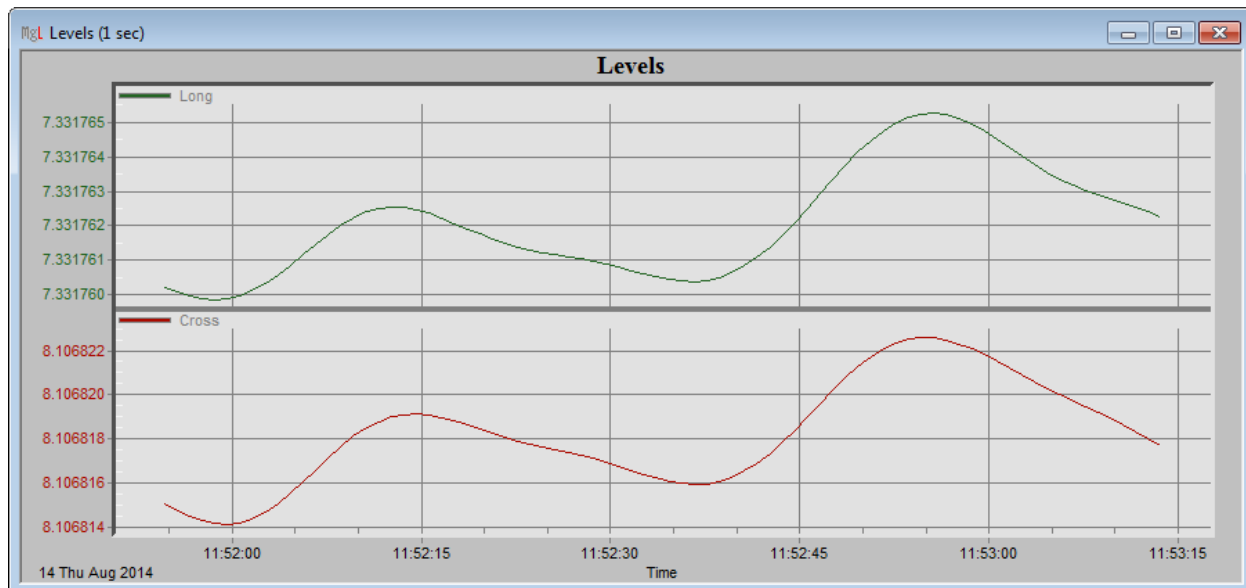
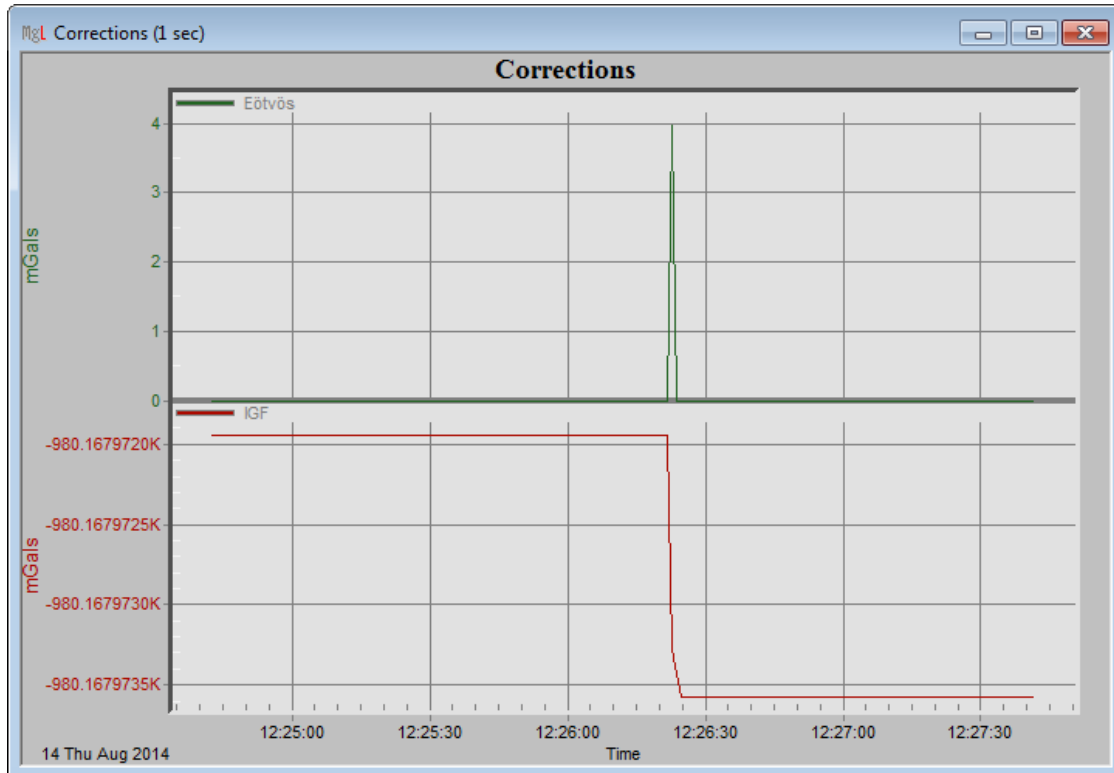


Figure 4-6 Levels View

The **Levels** view (Figure 4-6) displays the level data received from the meter, which includes long level and cross level. The levels data fit time range is set in the **Window (s)** parameter in the **Filtered Data** section on the **Setup** tab page in the **System Settings** dialog. Click **Settings** under the **System** menu.

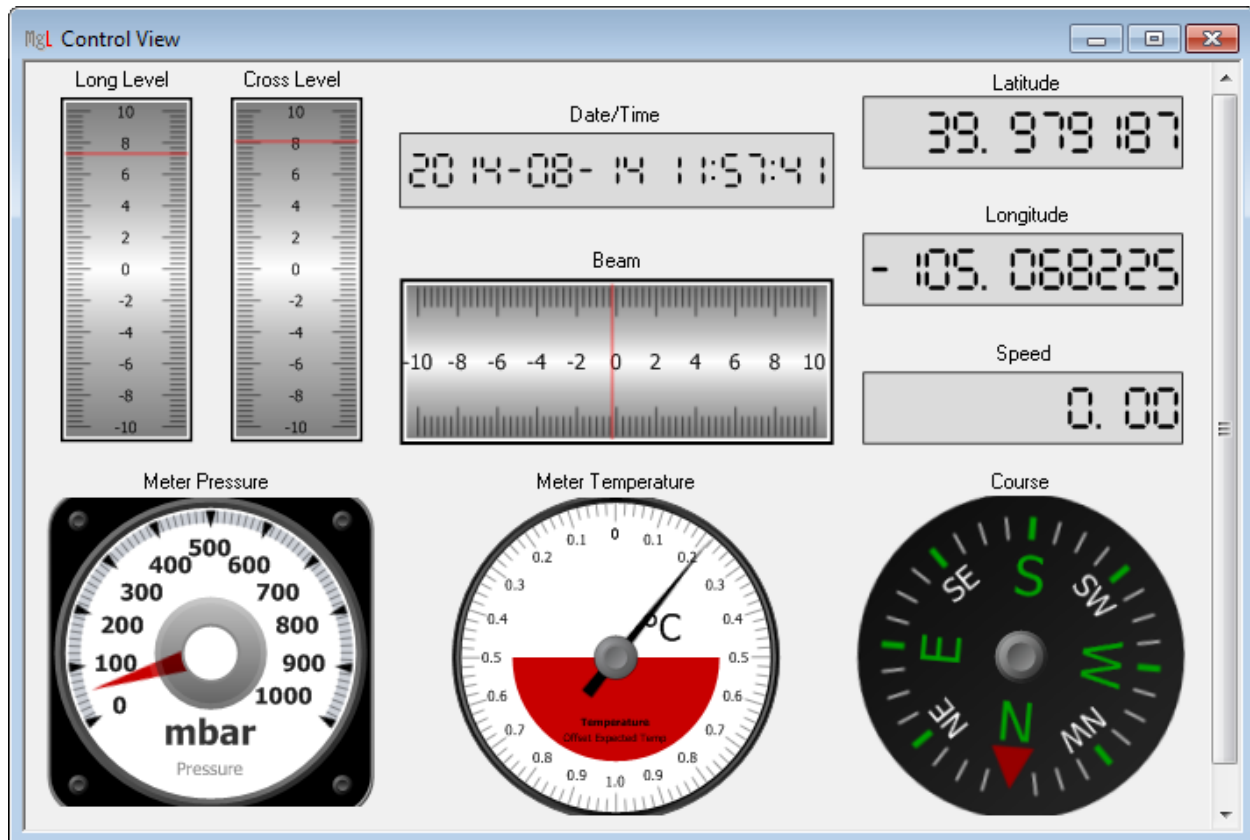
### Corrections View



**Figure 4-7 Corrections View**

The **Corrections** view (Figure 4-7) displays the Eötvös and IGF data corrections received from the meter. Enable corrections from the **Corrections** tab page under the **System Settings** dialog. Click **Settings** under the **System** menu.

## Controls View



**Figure 4-8 Controls View**

The **Controls** view (Figure 4-8) shows real time meter status in a more visual type display. Certain fields may not update, depending on your GPS status.

## Navigation Plot View

The **Navigation Plot** (Figure 4-9) plots the current run latitude and longitude on a graph so you can see what your course has been. The latitude and longitude max/min can be set using the lower text boxes or set to be automatic. In order to update the min/max, click **Update**. The navigation plot will not update if there is no GPS input or the meter is stationary.

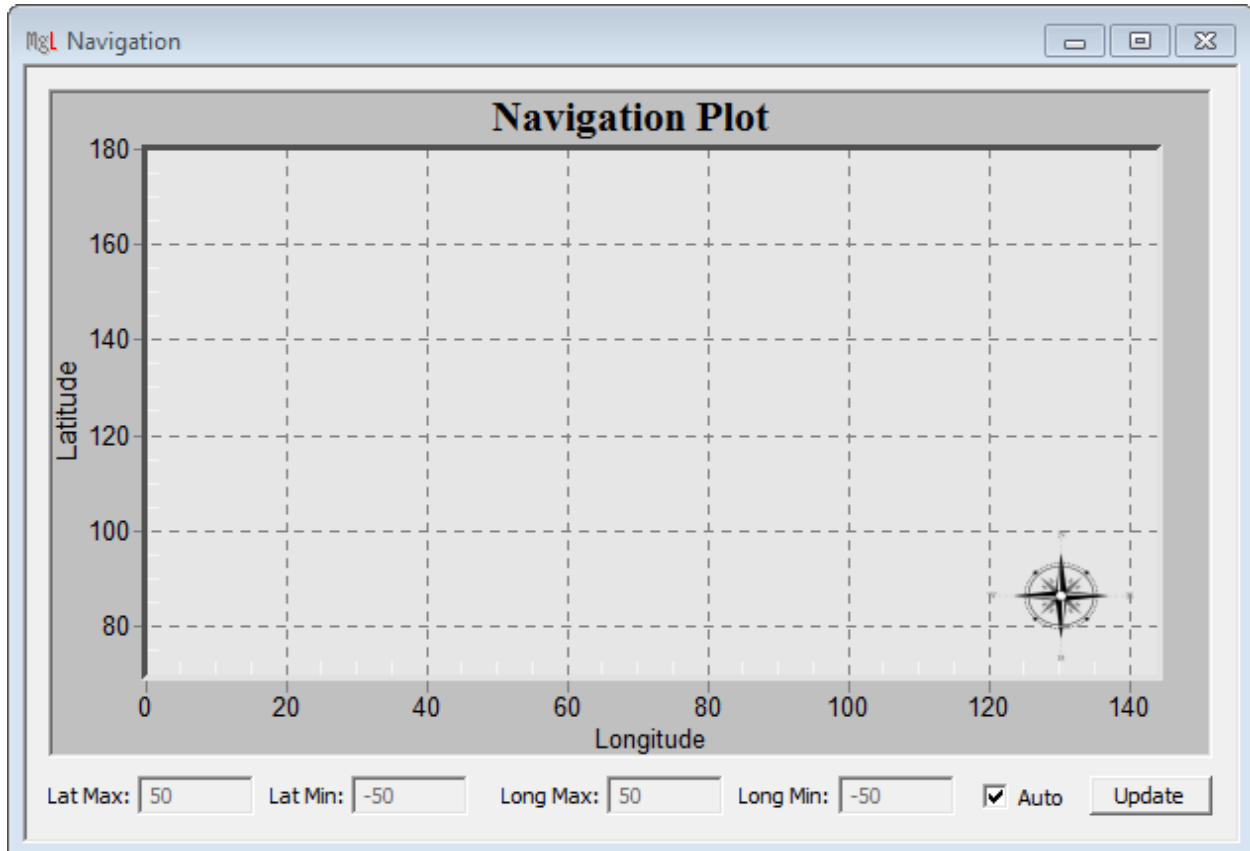


Figure 4-9 Navigation Plot View

## Modifying The Views

### Reset All Graphs

Selecting Reset All Graphs under the View menu, clear and resets all graphs. Resetting the view(s) only clears the view, it does not clear the data from the data files or filters.

Every view can also be cleared and reset by unselecting and reselecting the view from the **View** menu.



## Customize Graph Style

The graphic appearance can be customized by double clicking on the graph to bring up the customization dialog. Figure 4-10 shows an example **Gravity Customization** dialog. To display the default configuration, simply close the graph and reopen it from the **View** menu.

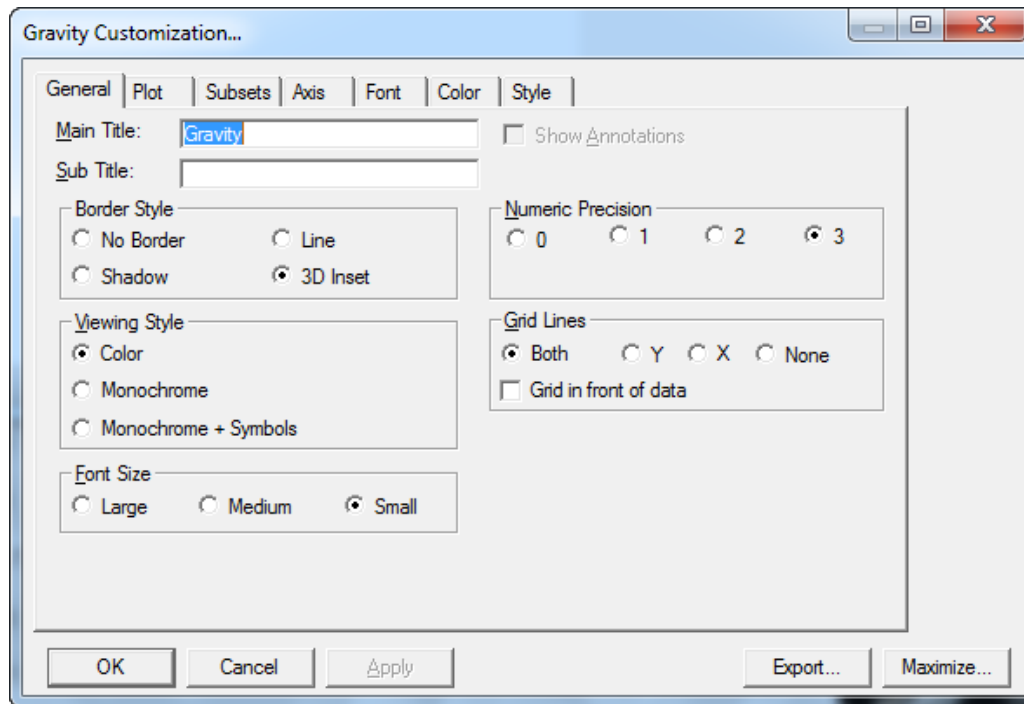


Figure 4-10 Gravity Customization Dialog

### IMPORTANT

Viewing many graphic displays can slow down data processing. Typically not an issue for the supplied laptops, however, user supplied laptops must meet or exceed specifications of the supplied laptops.

If your system does NOT have a good graphics card (>32mb on-board memory) or the system is running slower than anticipated, minimize the number of open views.

For a full screen view of the graph, click the **Maximize** button in the bottom right corner of the **Gravity Customization** dialog. To close the maximize view, press the **Esc** key.

To export the view, click the **Export** button in the bottom right corner of the **Gravity Customization** dialog. Select the file type, destination and size then click **Export**.

### Modify Y-Axis

To customize the y-axis for each graphic, from the **System** menu select **Graphics**. In the **Graphics Setup** dialog set the Max and Min range for each graphic. Refer to [Section 07 Additional Menu Options, "Graphics"](#) for detailed information.



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Before acquiring new data, open the program and make sure the system settings are set correctly for the meter as well as for the user preferences. From the System menu select the Settings option. Once the acquisition has started, most of these settings cannot be changed.

---

**IMPORTANT** The time on the PC Clock must be set to Coordinated Universal Time (GMT), not local time, with daylight savings disabled.

---

To acquire new data:

- From the **File** menu select **New**.
- Then select the directory for the data to be stored when prompted and the filename if you have a TAGS-7 instrument.
- If **Output File Backup** is enabled in the **Setup** tab of the **System Settings** dialog, you will be asked to select the secondary backup location and filename.

## Directory Selection

It is recommended that you create a different directory for each new acquisition especially if parameters change. The newly created directory not only stores the data, but it also stores a new, local PiperPro.ini file.

This local PiperPro.ini file must accompany the data if it is moved (or archived) because it contains the settings for that particular acquisition. The default directory used at Microg LaCoste for storing all the data directories is C:\gData\PiperPro. This directory can be created by the user after installation if it does not already exist.

## Acquiring Data

Once a directory and file have been selected, PiperPro begins receiving data and updating the view windows. At this point, the system is storing data.

---

**IMPORTANT** TAGS-7 data is stored in a user specified file and only one file is appended to for the entire survey.

---

The TAGS-7 meter outputs raw data at 20Hz. PiperPro also records raw data (\*.txt file) at 20Hz. In addition, PiperPro also records 1Hz data (.DAT or .TSF file).

The .DAT files are comma delimited plain ASCII files that can be read using a spreadsheet application. Whereas the .TSF(TSoft) files are tab-delimited files that have a detailed and specific header and can be imported into the TSoft reprocessing and analysis software.

## Reset Graphs

Once the data is deemed acceptable, the meter should be set to **Online**. Once data is being acquired, reset all the graphs views by selecting **Reset Graphs** under the **View** menu.

## Data Files

The raw data (\*.txt files) is stored every time new data is acquired from the meter. The text output files (.DAT or .TSF) are also updated once every second.

## TAGS-7 Timing

### Meter Data

The TAGS-7 meter outputs data at a rate of 20Hz. A data packet is a serial ASCII string sent from the TAGS-7 meter that contains meter data such as Gravity, Temperatures, Levels, etc. You can view the raw ASCII string in the **Meter ASCII Output** located in the **PiperPro Data** window.

### GPS Synchronization

The TAGS-7 timing box is equipped with a GPS unit. This GPS unit synchronizes with the onboard rubidium clock if connected to an external antenna and a valid GPS signal is attained. Once a GPS lock is attained, PiperPro can then synchronize the onboard rubidium clock to the GPS clock. To do this select Synchronize Clock in System.

In order for PiperPro to check for a GPS time stamp during acquisition, the **Enabled** check box must be checked in the **GPS Time Stamp** section. This option is found in the **Setup** tab page accessed by selecting **Settings** under the **System** menu. If checked, PiperPro checks for a valid GPS signal from the

---

timing box when starting the acquisition of new data. A warning will pop up if a valid GPS signal is not received. If a valid signal is not received, the software automatically uses the PC clock for the time stamp.

### GPS Data

No GPS data is directly sent to PiperPro through the serial port to the system computer. However, the meter data string contains a GPS timestamp that is used to timestamp the data. In order to get a valid timestamp, the GPS must be synced. Otherwise, the timestamp will just be an incrementing time starting from a default time stored in the timing unit.

---

### NOTE

A GPS lock can take up to 20 minutes depending on location, so it is best to obtain a valid lock before starting acquisition.

---

## Graphics

The user can:

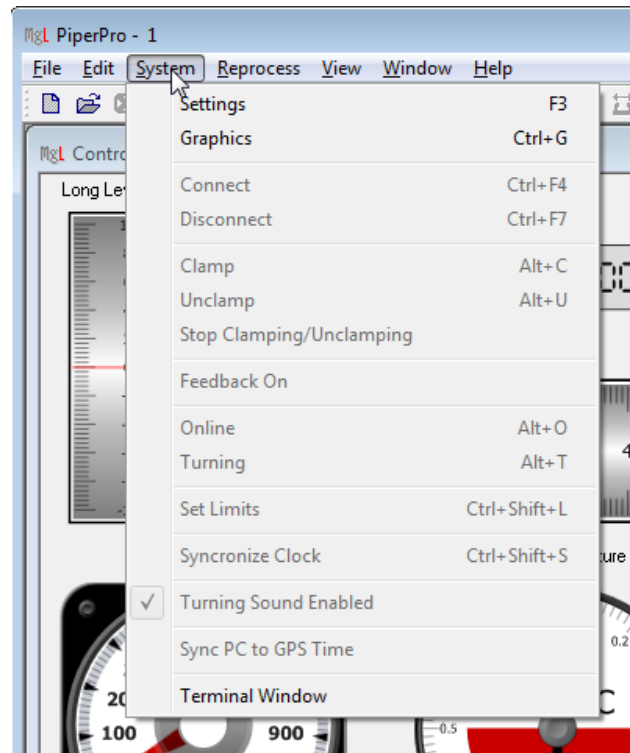
- Change the graphics settings.
- Update the graphing windows by closing and reopening the graphic window.
- Manipulate the graphs and locations.

While data is being received, the user can change the graphics by selecting the **Graphics** options available in the **System** menu. Figure 5-1 shows an example of the **System** menu. [Refer to Section 07 Additional Menu Options "Graphics"](#) for additional information and example dialog.

To modify the graphic appearance, double click on any individual graph in the **PiperPro** main window. [Refer to Section 04 PiperPro Main Window And View "Customize Graph Style"](#) for additional information.

## Hardware Communication

### Communicate With Meter



**Figure 5-1 System Menu Selection List**

Refer to Figure 5-1 to see list of options available under the **System** menu. The user can:

- Connect/Disconnect
- Clamp/Unclamp the meter
- Stop Clamping/Unclamping
- Set Feedback On
- Synchronize Clock/Use Internal Clock
- Set mode Turning/Online
- Sync Pc to GPS Time
- Set Microprocessor Time

The meter sends out a status line to inform TAGS-7 of its current status. PiperPro automatically enables and disables options based on the status of the meter.

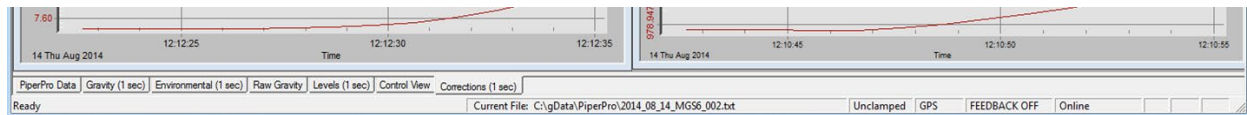


### View Meter Status

Status of the meter can be viewed from the status bar or from the **PiperPro Data** window.

### Status Bar

The status bar, shown in Figure 5-2, can display a variety of status indicators and is located in the bottom frame of the **PiperPro** main application window.



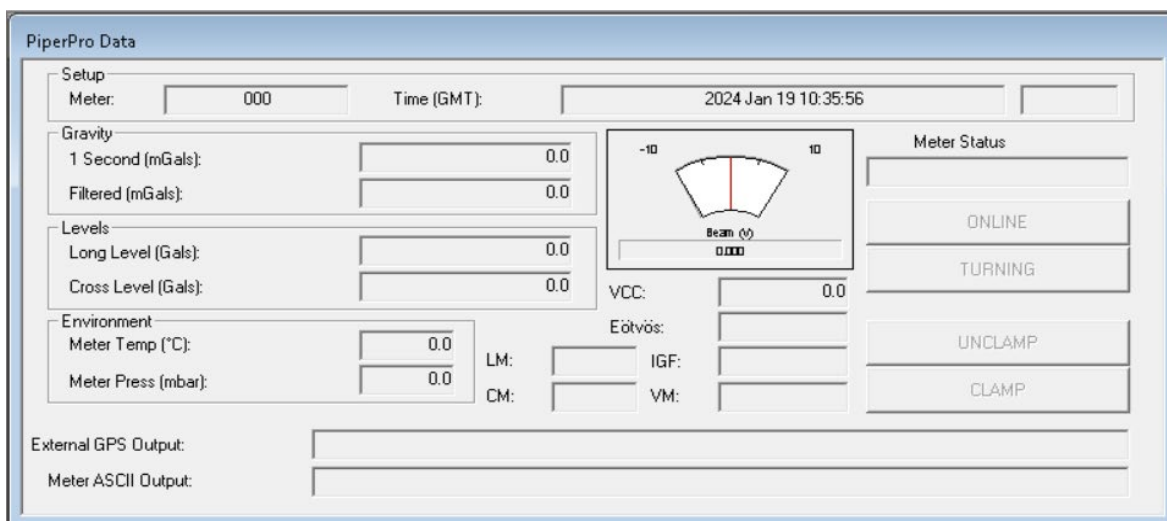
**Figure 5-2 Status Bar**

The status bar can display the following information:

- The current open file.
- Whether the meter is clamped or unclamped.
- Whether data is synced to GPS.
- Whether the data is set to Online or Turning.
- Whether Feedback is On or Off.

### PiperPro Data Window

The meter status is also indicated in the **PiperPro Data** window. Refer to Figure 5-3.



**Figure 5-3 Meter Status Displayed in PiperPro Data Window**





## 6. POST-PROCESSING

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This section describes how to reprocess data that has already been acquired. Acquiring data in real time is discussed below.

## Starting PiperPro and the Global .ini File

Start PiperPro by double clicking on the PiperPro icon. The **PiperPro** main window shown in Figure 6-1 will appear.

### NOTE

No data is loaded at this point. Any changes made in **Settings** affect the global .ini file. If you change and save any settings at this point, the software will warn you that you are making a global change that affects all future data acquisition.

Refer to [Section 03 System Settings "Local .ini File"](#) for more information.

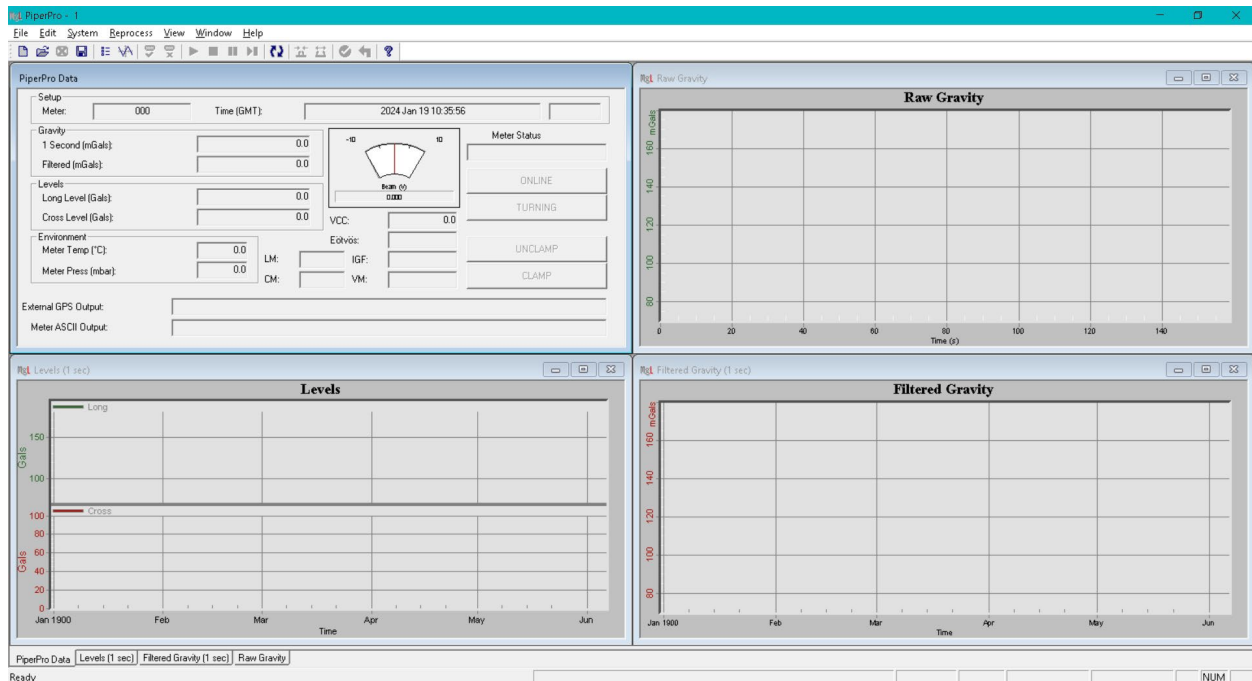
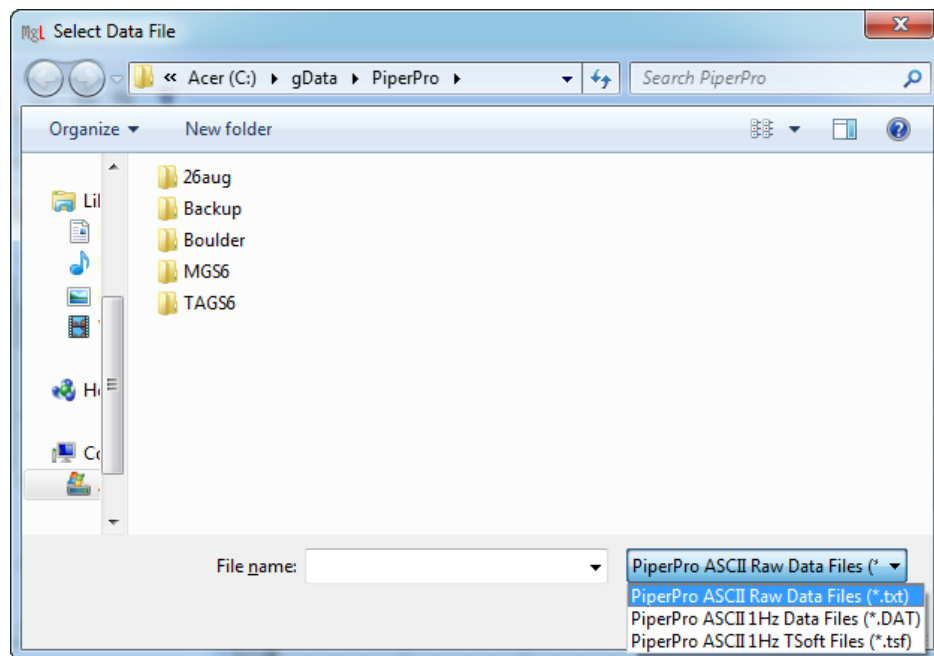


Figure 6-1 Open Project File

## Loading Existing Data

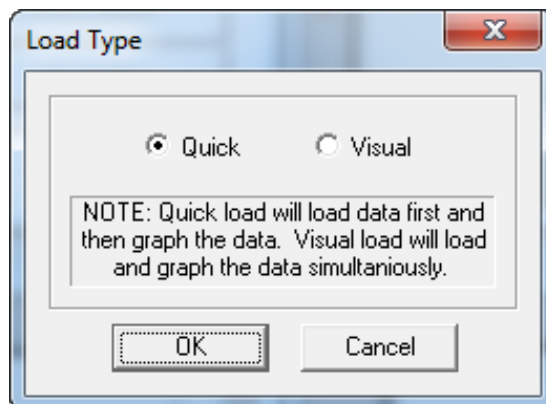
To load existing data:

- Select “generate” when prompted.
  - This creates a SysChk.bin file that is unique to this computer.
- From the File menu select Load.
  - The Select Data File dialog opens. Refer to Figure 6-2.



**Figure 6-2 Select Data File: File Extension Selection**

- Navigate to the desired directory.
  - Select the file for the desired day.
  - The file extensions vary depending upon the system and data. Figure 6-2 shows an example selection drop down list.
- The Load Type dialog shown in Figure 6-3 appears.
  - Select the load type (Quick or Visual). Then click OK.
  - Refer to the Load Types section below for additional information.
- The Selection Configuration File browser dialog opens.
  - Navigate to the desired directory.
  - Select the \*.ini file for the current configuration file.



**Figure 6-3 Load Type Dialog**

## Load Types

There are two different ways of loading and processing files.

### *Quick*

**Quick** load loads and processes the entire data set that you select and then graphs the data. This is the quickest way of loading and processing the data.

### *Visual*

**Visual** load loads and graphs the data simultaneously. This is a much slower approach, but it allows the user to see all the data in detail as it is processed.

## Post Processing Data

To start loading and re-processing data, select **Start** from the **Reprocess** menu.

If **Quick** load was selected, then all the data is initially loaded before the graphs and windows are updated.

If **Visual** load was selected, then the processing can be stopped or paused at any time, and the user-set parameters can be changed at any time.

The user can change any parameters by selecting **Settings** from the **System** menu (or **F3**). Refer to [Section 03 System Settings "Modify System Setting Parameters"](#) for more information. To begin processing again, select **Start** from the

**Reprocess** menu (or **F5**). The load type cannot be changed once the file has begun processing. To change load type, reload the file by selecting **Load** from the **File** menu.

During a Visual Load, the user can pause by selecting **Pause** from the **Reprocess** menu. The user can then select **Start** (to restart the process) or **Step** (to step through the process) from the **Reprocess** menu.

### Clearing Graph Data

Every graph can be closed and reopened from the **View** menu. Closing and reopening a graph view clears the data from the graph window. You can also clear all data from all graph windows by selecting **Reset All Graphs** under the View menu.

### Customizing Graph Data

The graphs can also be customized by clicking anywhere on the graph to bring up the customization dialog. [See Section 04 PiperPro Main Window And Views "Customize Graph Style"](#) for detailed information.

Each graphs y-axis can also be customized from within the **Graphics Setup** dialog. To access the **Graphics Setup** dialog, select **Graphics** from the **System** menu. These values are also saved to the \*.ini text project file. [See Section 07 Additional Menu Options "Graphics"](#) for additional details and an example dialog.

To reset the graph after customizations, the user can simply close the graph and reopen it.

### **IMPORTANT**

Viewing many graphic displays can significantly slow down data processing.

If your system does NOT have a good graphics card (>32mb on-board memory) or the system is running slower than anticipated, minimize the number of open views.





## 7. ADDITIONAL MENU OPTIONS

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## File

### *New*

The **New** option creates a new project file from the current System | Settings. Once an output directory has been selected, all the project files are created and data acquisition begins.

### *Load*

The **Load** option loads an existing file. The user can choose Quick load or Visual load. The Quick load loads the entire selected data set and then graphs the data. This is the quickest way of loading the data. The Visual load loads and graphs the data simultaneously. This is a much slower approach, but loads everything sequentially.

### *Close*

The **Close** option closes an opened file. Upon closing, the main PiperPro.ini file is reloaded.

### *Save*

The **Save** option saves the current file. PiperPro warns the user if they are saving over the main PiperPro.ini file that is located in the software installation directory.

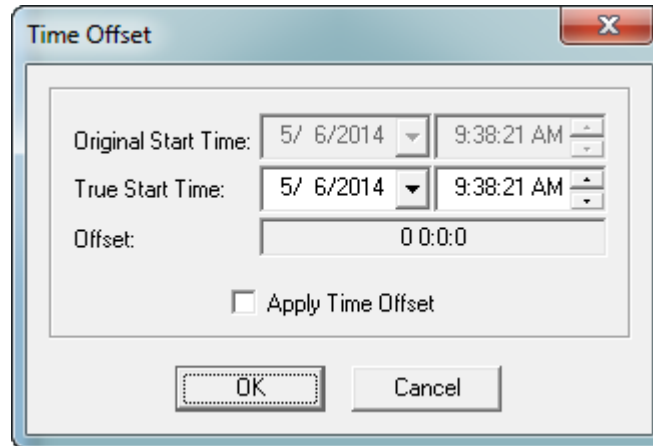
### *Exit*

The **Exit** option exits the program.

## Edit

### *Time Offset*

The **Time Offset** option allows application of a time shift in the event that the computer time was not set to the correct time. To calculate the offset, change the **True Start Time** to the correct time (the time that should have been). Check the time offset as listed in the grayed edit box. If the time offset is correct, check the **Apply Time Offset** option to make the time offset effective during processing. This option only pertains to reprocessing of data. Refer to Figure 7-1.



**Figure 7-1 Time Offset Dialog**

### *Processing Rate*

The **Processing Rate** sets the processing rate. This option only pertains to reprocessing of data. Some computers are slower and thus the software allows for more reprocessing time to reduce the chances of a computer crash or system overload.

## **System**

### *Settings*

The **Settings** option allows changes to any of the system settings including **Setup**, **Calibration** and **Corrections**. These settings are unavailable during real-time acquisition, but can be altered before acquisition and reprocessing.

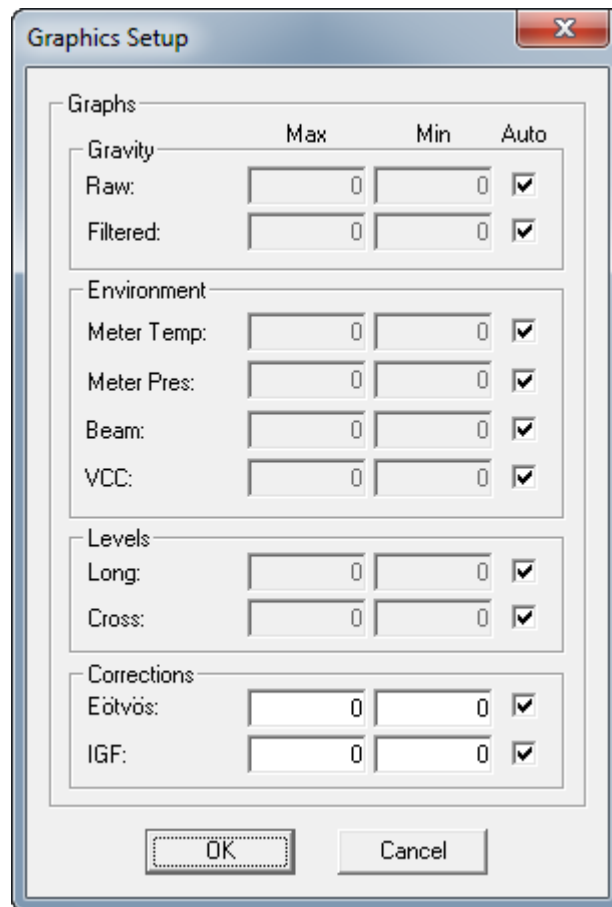
### *Graphics*

The **Graphics** option opens the **Graphics Setup** dialog which allows customization of the y-axis scale for the **Raw Gravity**, **Gravity**, **Environment**, **Levels** and **Corrections** graphs. Each graph can be set up independently to either be auto-scaled or user-scaled.

Figure 7-2 shows an example of the **Graphics Setup** dialog. These values can be saved to the \*.ini file so the user does not have to reload them each time they start a new acquisition or reprocess the data.

The graphic style is modified in the customization dialog for each graph. Access the customization dialog by double clicking

on the graph. Refer to [Section 04 PiperPro Main Window And Views, "Customize Graph Style"](#) for more information.



**Figure 7-2 Graphics Setup Dialog**

*Connect*

For this release, connect is automated feature. It is placeholder for a future usability feature.

*Disconnect*

Disconnects and closes the file. Currently this is a placeholder for a future usability feature.

*Clamp*

The **Clamp** option clamps the meter.

*Unclamp*

The **Unclamp** option unclamps the meter.

*Stop Clamping/Unclamping*

The **Stop Clamping/Unclamping** option tells the meter to stop clamping or unclamping.

*Feedback On*

By default always on in order for the meter to work.

*Online*

The **Online** option tells the meter that you are online. This is the ideal mode for acquiring data.

*Turning*

The **Turning** option tells the meter that you are turning. This mode is usually used while the aircraft/ship is turning and is not on a stable and direct path.

*Set Limits*

The **Set Limits** option tells the meter to set its internal limits.

*Synchronize Clock*

The **Synchronize Clock** option tells the meter to synchronize the onboard clock with the GPS clock. Once synchronization is achieved, the meter outputs a timestamp with the ASCII serial data string. This only pertains to TAGS-6 systems. .

*Turning Sound Enabled*

On the TAGS-7 system, an audible sound (beep) is heard while in turn mode.

*Sync PC to GPS Time*

If you have valid GPS and administrator rights to set the computer time, this will sync the computer clock to the GPS time.

*Terminal Window*

In the Terminal window, (Figure 7-3) type commands to be sent to the meter in the text box, then click **Send**. The **Disconnect**

button disconnects the serial port connection. The **Exit** button closes the **Terminal** window and disconnects from the serial port if necessary.

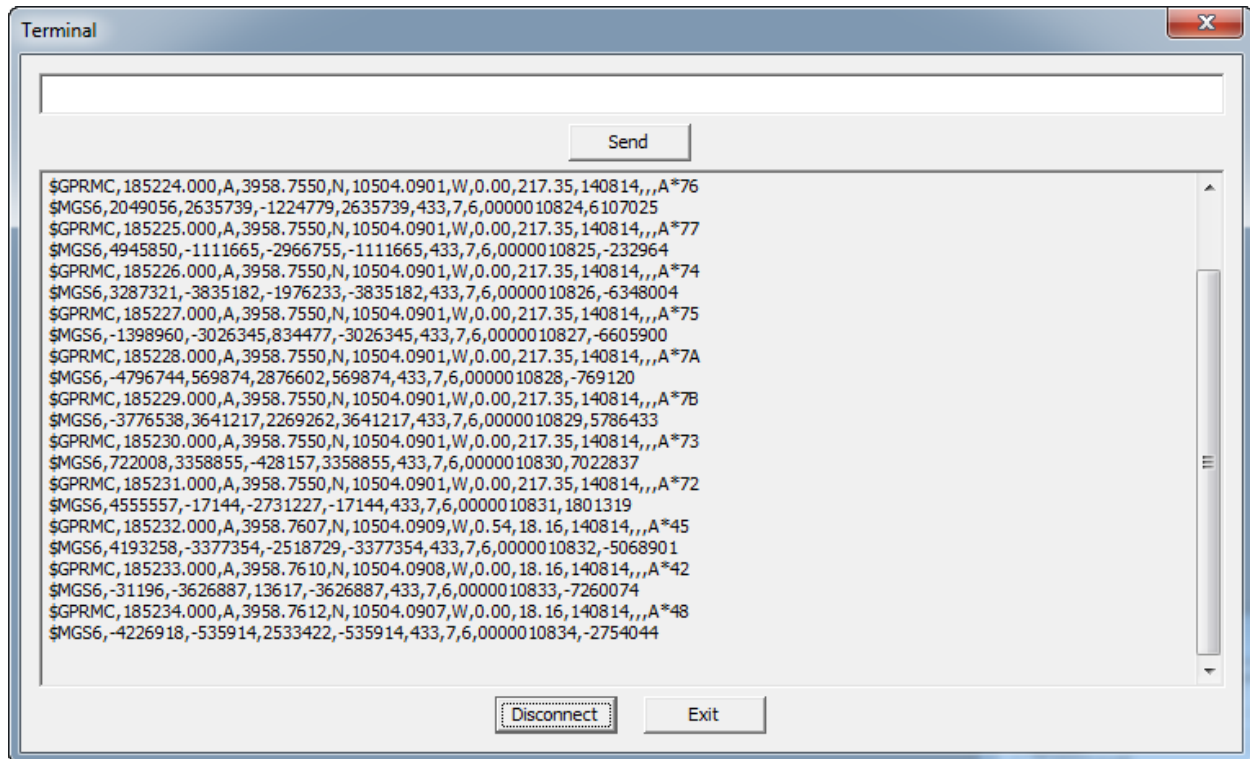


Figure 7-3 Terminal Window

## Reprocess

### Start

The **Start** option starts the processing in both post-processing and real-time acquisition.

### Stop

The **Stop** option stops all processing in post-processing or real-time acquisition mode.

### Pause

The **Pause** option pauses processing and can only be used in post-processing mode.

*Step*

The **Step** option processes data step-by-step in post-processing mode only.

**View**

The **View** menu allows all available graphs to be opened, closed or reset. If the graph is currently visible, there is a check mark next to the graph in the **View** menu list. Detailed description about the graphs can be found in [Section 04 "PiperPro Main Windows And Views"](#).

*Raw Gravity*

Toggles Raw Gravity graph Open/Close.

*Gravity*

Toggles Gravity graph Open/Close.

*Environment*

Toggles Environment graph Open/Close.

*Levels*

Toggles Level graph Open/Close.

*Corrections*

Toggles Corrections graph Open/Close.

*Controls*

Toggles Control View Open/Close.

*Navigation Plot*

Toggles Navigation Plot Open/Close.

*Reset All Graphs*

Resets all graphs.

*Toolbar*

Toggles Toolbar ON/OFF.



### *Status Bar*

Toggles Status Bar ON/OFF.

### *Full Screen*

Toggles Full Screen mode ON/OFF.

## **NOTE**

When in full screen mode and the **Status Bar**, **Tool Bar**, and **Menu** are not visible they can be enabled by pressing the **F12** key.

## **Window**

The Windows menu lets user change the display style and also lists the currently open views.

### *Cascade*

Displays the selected graphs in cascade mode.

### *Tile*

Displays the selected graphs in tile mode.

## **Help**

### *PiperPro Help*

Opens the PDF version of this manual.

### *About PiperPro*

Opens the **About PiperPro** dialog showing the current PiperPro version information.

### *Update Firmware*

## **WARNING**

Only use this option under the direction of a Microg LaCoste engineer.

A firmware upgrade is sent when required . (MGL) engineer. Follow the installation procedure under the direction of a Microg LaCoste engineer.

Clicking on **Update Firmware** brings up the **PIC32 Bootloader Application v1.2** dialog. Refer to Figure 7-4.



**Figure 7-4 PIC32 Bootloader Application V1.2 Dialog**

1. Click **Connect**.
2. Then click **Load Hex File**.
  - Select the upgrade firmware file in the displayed browser window.
  - Then click **Open**.
3. Click **Erase Program Verify**.
4. Click **Run Application**.
  - The Update Firmware program will automatically close upon completion.

*Clear Error Log File*

The **Clear Error Log File** option clears the error log.



## 8. GENERAL INFORMATION

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## License Information

Licensed users of PiperPro are entitled to three install platforms with the Main License. Additional installations, including support, are purchased one seat at a time directly from Micro-g LaCoste. If your institution or company requires PiperPro Processing software to run on more than three platforms, please contact Micro-g LaCoste directly or visit our website, [www.microglacoste.com](http://www.microglacoste.com), for more information.

## Support

### Contact

Questions concerning the operation of the PiperPro Processing software and any problems using PiperPro please contact Customer Service at [info@microglacoste.com](mailto:info@microglacoste.com).

Expect a response via email or phone call within forty-eight hours of your inquiry.

### Support Request

Provide complete detailed information to help us respond with a more accurate and timely response. Include software release version (select **About PiperPro** under the **Help** menu), a scenario description and list of steps to recreate the problem.

## Maintenance

Periodically Micro-g LaCoste posts an upgrade "patch" for the PiperPro Processing software on the website. These patches are posted without notification so check back every few weeks to get the latest patch if applicable.





## **APPENDIX A DATA RECORD FIELDS**





Table A1 lists the TAGS-7 data records information. Marine or airborne specific fields contain zero when not applicable to the specific meter type. For Example: The Speed data field is only applicable to marine gravity systems. This field contains zero for airborne gravity systems.

Refer to Section 03 of the manual for configuring system settings. Refer to Section 05 for additional data specific information.

User specified fields include:

- Specifying the delimiter character
- Checksum added to the end of the string.
- String can be fixed with or compressed with all spaces removed.
- Carriage return and /or line feed character(s) can also be added to the end of the string.

*Example:*

```
$MGS6,2015,7,23,14,56,35,0,1119710.5368,145921.2662,100,
5476.8483,88.99315,88.99315,55.905,7.796,3.345607,6378.68
3406,0.000,-980167.954,39.978940,-
105.068153,136.700,0.000,158,0,300044
```

**Table A-1 TAGS-7 Data Record Fields**

<b>DATA FIELD</b>	<b>FIELD LENGTH</b>	<b>UNITS</b>	<b>FILTERING</b>
ID	comma delimited	"\$MGS6"	N/A
Year	delimited	YYYY	N/A
Month	delimited	MM	N/A
Day	delimited	DD	N/A
Hour	delimited	HH	N/A
Minute	delimited	MM	N/A
Second	delimited	SS	N/A
Millisecond	delimited	SSS	N/A
Raw Gravity	delimited	Milligal	20Hz FIR (fixed)
Corrected Gravity	delimited	Milligal	20Hz FIR (fixed)
Filter Window	delimited	Seconds	N/A
Filtered Corrected Gravity	delimited	Milligal	Variable Length FIR (user editable)
Long Level	delimited	Gals	20Hz FIR (fixed)
Cross Level	delimited	Gals	20Hz FIR (fixed)
Meter Temperature	delimited	DEGREES C	20Hz FIR (fixed)
Meter Pressure	delimited	mbar	20Hz FIR (fixed)
Beam	delimited	V	20Hz FIR (fixed)
Vcc	delimited		N/A
Eotvos Correction	delimited	Milligal	N/A
IGF Correction	delimited	Milligal	N/A
Latitude	delimited	DD, +N	N/A
Longitude	delimited	DD, +E	N/A
Course	delimited	DEGREE	N/A
Speed	delimited	KNOTS	N/A
Status (TAGS/TAGS-6)	delimited	Integer	N/A
Timer	delimited	Milliseconds	N/A
Checksum (Optional)	delimited	Integer	N/A



## **APPENDIX B QC FILTER COMPUTATION**



## Overview

The Turnkey Airborne Gravity System-7 (TAGS-7) is the latest generation of dynamic gravity meters available from Microg LaCoste. The TAGS-7 User Manual provides succinct procedures for:

Assume the QC filter is set to  $L$  seconds (usually 120 or 180 seconds). The FIR filter will be  $2L+1$  seconds long, with a nominal cutoff period of  $2L$  seconds.

First, calculate the weights for an ideal FIR low-pass filter with cutoff at  $2L$  seconds, length  $2L+1$ :

$$f(k) = \frac{1}{L} \operatorname{sinc}\left(\frac{1}{L}(k-1-L)\right), \quad k = 1, 2L+1$$

The sinc function is defined as

$$\operatorname{sinc}(t) = \begin{cases} \frac{\sin(\pi t)}{\pi t}, & t \neq 0 \\ 1, & t = 0 \end{cases}$$

Next, calculate the weights for an Exact Blackman window of length  $2L+1$ . The equation for the window weights is

$$w(k) = a_0 + a_1 \cos\left(\frac{2\pi(k-L-1)}{2n}\right) + a_2 \cos\left(\frac{4\pi(k-L-1)}{2n}\right), \quad k = 1, 2L+1$$

$$a_0 = \frac{7938}{18608}$$

$$a_1 = \frac{9240}{18608}$$

$$a_2 = \frac{1430}{18608}$$

Apply the window function to the filter weights:

$$F(k) = w(k)f(k), \quad k = 1, 2L+1$$

Finally, normalize so that the sum of the filter weights is 1:

$$G(k) = \frac{F(k)}{\sum_{i=1}^{2L+1} F(i)}$$

$G(k)$  is the final filter to be applied by convolution