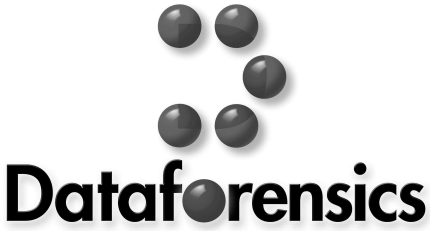
PLog V3.1

An Integrated Digital System for Subsurface Exploration Data Collection and Borehole Log Generation

User's Manual


Dataforensics

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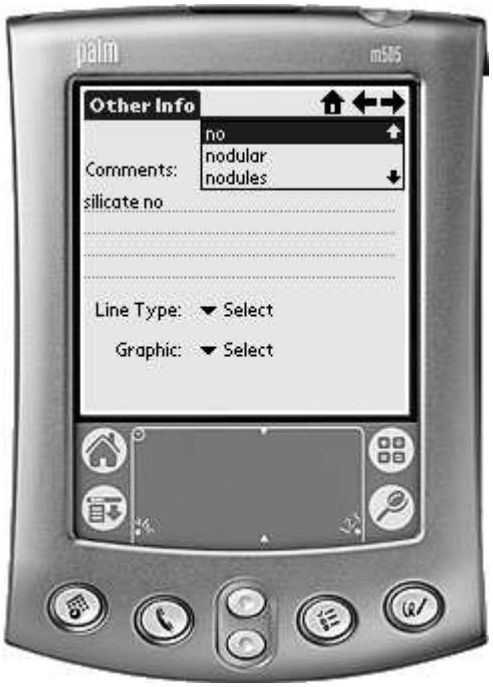
New Features in PLog version 3.1

Predictive Text
Similar to technology used in mobile phones; as you enter text PLog provides a list of words that the user can select that match your terminology to greatly increase your data entry speed.



More Streamlined and Robust Navigation
Users can navigate from any module to any other module with the tap of a list. Users can go from inputting SPT sample information to describing a soil layer by simply selecting from the navigation list.

Customizable Descriptions
Users can choose to add, remove or reorder any option in any list in PLog. There is also a PC-based tool that enables you to easily configure PLog. You can choose to hide or show description components based on your project or company's requirements. For example, if you are never required to describe hydrochloric acid reaction, you can hide that component so your field personnel never even know its there.

Classifications for AASHTO, USCS, Modified Burmister and BSI
Depending on your project requirements, PLog can be configured to include description terminology based on any of these systems.

AGS 3 Compliant
PLog is AGS 3 Compliant.

Customize Default Options for Boreholes and Samples
PLog can be configured to populate default values for boreholes and samples. If your company always logs SPT samples as "S-", configure PLog to pre-populate this value so all you have to do is enter the number. Do this for Boreholes, SPT Samples, Thin Wall Samples, Other Samples and Rock Samples.

Also, set the default sampling interval, such that PLog can automatically increment the sample depth the specified interval with the click of a button.

Text Macro
Users can record a text string that can be used over and over again. This is particularly useful for comments at the end of any description or other remarks that are non-standard but are encountered routinely on an individual site.

GPS Support
PLog can read GPS coordinates from any NMEA compliant GPS. Simply plug the GPS in to your PDA and PLog can record your location automatically.

I. Introduction

PLog is an integrated digital system that facilitates the generation of geotechnical borehole logs by digitally managing the entire workflow process from field data collection via a personal digital assistant to a desktop database for persistent storage of all borehole log data to a direct interface with LD4 for generating boring logs.

PLog ensures consistent and complete data is collected by providing a standard set of choices and inputs for the user to select. Following field data collection, personnel synchronize the PDA with the Microsoft Access database on a desktop computer, which facilitates importing data into LD4 for borehole log generation.

The entire system can be divided into three modules: the field data collection module, the conduit module and PLog database module. Each of these modules and a tutorial for their use, as appropriate, is described herein.

The field data collection module requires a Palm Operating System based personal digital assistant (PDA) with Palm OS version 3 or 4. The PLog PDA software provides engineers and geologists a tool for rapidly documenting subsurface exploration data.

The conduit module consists of a software application that requires no user interaction once it is installed. The conduit simply transfers the data between the PLog PDA application and the PLog database on the desktop computer.

The final module of the PLog system is the PLog database that stores the imported PLog data on your PC. The LD4 boring log program consults this database to import data into a LOGDRAFT project file.

This PLog user's manual outlines the installation of the system and the operation of each of these modules. The user's manual highlights the capabilities of the PLog system and provides a tutorial for using the entire software package. Throughout the user's manual, the key symbol shown here emphasizes key points that should be noted carefully by the user.

II. Installation

Handheld System Requirements

The handheld software requires a Palm Operating System based PDA with Palm OS version 3.5 or later. For PDAs with earlier versions of the Palm Operating System, visit the Palm website at http://www.palm.com/support/downloads/ to download updates. The PDA should have at least 4 MB of RAM for data storage.

Desktop System Requirements

The desktop modules of PLog run on computers with Windows 2000 or Windows XP operating systems. The desktop computer must have the Palm Desktop software installed before installing the PLog system. The minimum hardware requirements are a Pentium III 500 MHZ processor and 128MB of RAM.

Installation Procedure

PLog contains two installation packages. The server installation only installs the two databases which all users synchronize. The PLog.mdb file is the database where all field data is stored. The library.mdb file is the database that allows the user to configure all the lists in PLog.

The client installation installs the appropriate files on each users local computer and configures the ODBC data source to point to the databases installed during the server installation.

🗝 **The server installation places the PLog Microsoft Access database in the desired location for further use during the client installation. Typically, this database should be installed on a server or in a shared directory so all PLog users can connect to the same PLog database. The server installation should only be performed once.**

The first step in using PLog is to install the server components of PLog from the installation disk. The client components should be installed after the successful completion of the server components. PLog comes with two self-installers that administers the client and server installation process for the user. The server installation process is as follows:

1. Turn on the computer.

2. Insert the PLog installation CD and run the PLogServer.exe file from the PLog server setup folder.
3. Follow the instructions on the screen.

The client installation process is as follows:

1. Turn on the computer.
2. Connect the HotSync cradle to the computer.
3. Verify the Palm Desktop software is installed. If it is not installed, install the Palm Desktop software that was provided with the PDA or go the Palm website and download the software. This software includes the HotSync program that enables transferring data to and from the PDA. Without this software, data cannot be transferred from the PDA to the personal computer and the PLog system will not operate correctly.

🗝 **If PLog will be used with multiple Windows logins on the same computer, it is important to ensure that the Palm Desktop has been installed for all users. Also, be sure to select the option in PLog for installing for all users.**

4. Insert the PLog installation CD and run the PLogClient.exe file.
5. Follow the instructions on the screen.
6. After the setup program has terminated, place the PDA in the HotSync cradle and press the HotSync button on the cradle to begin synchronization. This will install the handheld software onto the PDA for the selected user(s).

By default, the client self-installer places the handheld software in the c:\Program Files\PLog for future installation by additional users. Users can install the handheld software at a later time by using the procedure to install any handheld application as described below.

1. Open the Windows Explorer.
2. Locate the c:\Program Files\PLog directory.
3. Double click the PLog_release.prc
4. Place the PDA in the HotSync cradle and press the HotSync button.

For additional help in installing handheld software, refer to the user's manual that came with the PDA.

III. PLog Handheld Software Overview

Attributes of various data entities are collected during a subsurface exploration. It is helpful to define terminology such as "entities" and "attributes".

- Entities: *Entities* are defined as objects about which data is being collected. For example Boreholes, Samples, Stratigraphy Layers are *entities.*

- Attributes: *Attributes* are properties of *entities.* For example properties such as color, consistency and moisture are *attributes* of the SPT Sample *entity.*

Having defined the above terms, Figure 3-1 highlights various data entities and relationships between them.

The solid arrows define data flow from "parent" entities to "child" entities. Each parent entity can have many "child" entities. For example, a Project can have many Boreholes; a Borehole can have many Soil Samples and so on.

However, each child entity belongs to only one specific parent entity. For example, each Borehole belongs to a specific Project and each Sample belongs to a specific Borehole. These relationships are maintained by the software itself and do not require the user's attention.

Each entity shown in Figure 3-1 contains "Browse" form where the user can view all records input for each entity. Each entity also has one or more forms where users can add or edit data associated with the particular entity. Each entity shown in level 3 of Figure 3-1 has a corresponding entity on the Borehole Summary Form shown in Figure T2-2.

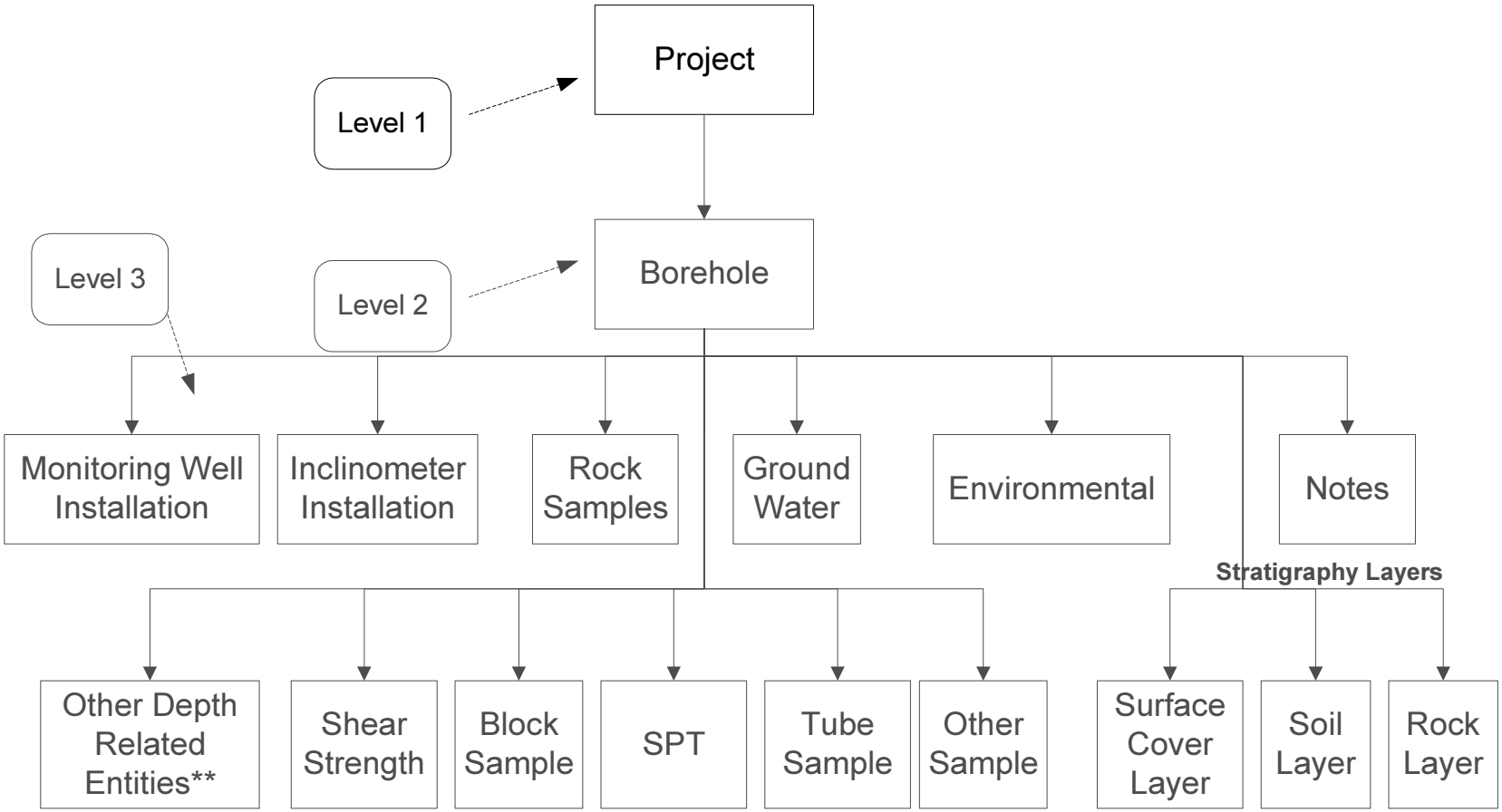


Figure 3-1 – PLog Data Hierarchy

**Other depth related entities include modules that can be added to PLog, that have depth as their key such as Advancement Method, Hole Diameter, Casing Diameter, Chiselling, Water Added.

IV. PLog Handheld Software Structure

The PLog handheld application has been designed to aid data entry in the field. Each entity in Figure 3-1 has a Browse form that provides the user quick access to information regarding the entity. Each entity has many Attribute forms that allow the user to store attributes of the entities and navigate between various points of the software.

Attributes of each entity are stored in a record. Each entity has a Browse form, which lists all relevant records currently present in the database for the respective entity. Using options available in these forms, the user can create new or edit/delete existing records for the respective entity.

The application starts at Level 1 of the data hierarchy with the Project entity (See Figure 3-1). The first form encountered by the user is the Browse Projects form. Initially, the Project List is empty and the only option available to the user is to create a new Project record. Once a new Project record is created, various attributes for the Project entity can be stored in the database using the relevant Attribute forms.

Besides storing various attributes for each entity, Attribute forms also allow the user access to Browser forms for "parent" and "child" entities if they exist. Then the user navigates between different levels by moving from the parent entity to the child entity or vice versa.

For example, having created a new Project record in the Browse Projects form, the user can store information about the specific Project like project name, project number, location. Having entered these values, the user can then navigate to the Browse Boreholes form and create a new Borehole record for this project. Thus, the user switches levels and goes from the parent entity (Project) to the child entity (Borehole).

The program structure is consistent throughout the entire data hierarchy. The flow between forms is straightforward and easily familiarized.

V. Features

The following list enumerates salient features of the PLog handheld application.

- Direct digital entry
- Structured database for data archival and retrieval
- Maintains relational links between data entities
- Uses lists, buttons and check-boxes to minimize text input
- Every list in the software is definable by the end user. PLog uses lookup lists for typical attributes that may need to be modified on the PDA or on the PC such as personnel names, equipment descriptions, drilling methods, etc. PLog has a second type of list called a user defined list, which can only be modified on the PC. These lists are all the other lists in the software primarily used in soil and rock descriptions (major constituent, minor constituent, color, moisture….), which field personnel should generally not be modifying.
- Attribute forms facilitate consistent and complete data entry
- Browse forms provide efficient access to data
- Provides lookup lists for typical attributes of a boring such as driller name, logger name, boring type, county, drilling company, drill rig description, SPT method, drilling method, and coring method. Lookup lists allow the user to input the values once and then select them from a list, such that text input is minimized on the device.
- User-friendly, efficient and reliable
- PLog data can be imported into an LD4 project file for generating boring log reports. In the opposite direction, LD4 sampler, stratigraphy and well construction symbols can be imported into PLog lookup lists.

VI PLog Conduit Overview

The PLog conduit transfers the application's data during synchronization (HotSync) of the handheld device with the PLog database on a desktop computer. There are three options for transferring data between the PDA and the desktop computer:

- Synchronize the databases
- Handheld overwrites desktop
- Desktop overwrites handheld

Synchronize the databases

All borehole log data entered or edited on the PDA since the previous synchronization is uploaded to the desktop database. Next, all data in the lookup list tables are uploaded to the desktop and any additional records in the lookup list tables of the PLog desktop database are downloaded to the PDA. Consequently, after synchronization the PDA will always contain the most up to date list of values from the lookup list tables. This is the synchronization method that should be used predominantly.

With this method, if a HotSync is partially completed (i.e. there is an error log produced that tells you PLog conduit encountered errors), you will need to correct the problem and synchronize again using the handheld over desktop option.

Handheld overwrites desktop

All borehole log data and lookup list data stored in the PDA is transferred to the PLog database on the desktop computer. Any records that have been previously uploaded to the desktop are overwritten with the values from the PDA.

🗝 **Consequently any edits of the previously uploaded records from this PDA on the desktop will be lost.**

Desktop overwrites handheld

All data in the lookup list tables on the PDA is first deleted. Then records in the lookup list tables on the desktop computer are downloaded to the PDA. This

synchronization method would be used if undesirable records are present in the lookup lists on the PDAs and they need to be removed from all PDAs.

🗝 **The field data for the borehole logs is not affected by this synchronization method.**

VII. PLog Database Overview

The geotechnical subsurface data recorded in the PLog system is stored in a relational database format on both the handheld device and the desktop computer. On the desktop computer, the data is stored in a Microsoft Access relational database. This database serves as a central repository, which can be used to archive and retrieve all geotechnical subsurface data that the firm has collected with the PLog system. Each entity (project, borehole, SPT sample, etc.) has its own table in the Access database. Individual records are stored within each table for the respective data entity.

For example, the Project entity has the Project table associated with it. The Project table has individual records for each project that has been entered. Thus, each project is associated with a specific record and collectively these records are stored in the Project table of the Microsoft Access database.

Similarly, the Borehole entity has a Borehole table associated with it. The Borehole table has individual records for each borehole that has been input. Accordingly, each borehole in a project has an individual record, which is stored collectively in the Borehole table. Because each borehole belongs to a specific project, there exists a relationship between these entities, which is maintained by the relational database. Accordingly, each record in the Borehole table is associated with a specific record in the Project table, thereby maintaining the relationship that exists between the Project and Borehole entities.

Examples of the relationships are as follows. If a project record is deleted, then all records associated with the deleted project must be deleted. Therefore, all records with a Project ID matching the Project ID of the deleted project are deleted from each table below the project in the hierarchy. On the other hand, if a project record is updated, then all records associated with the project must be updated. Accordingly, all records with a Project ID matching the Project ID that was updated are updated from each table below the project table in the hierarchy.

Similar relationships are maintained by the relational database throughout the data hierarchy inherent to subsurface exploration data. This is a key feature of the PLog integrated system. Once such a centralized relational database is implemented on an office server or desktop computer, relevant subsurface exploration data can be exported from the database and imported into the data processing package (LD4) for generation of borehole logs.

More information on relational databases is available in a variety of text books such as Elmasri & Navathe *Fundamentals of Database Systems* or computer books such as *Microsoft Access 2002 for Dummies*.

🗝 **Someone with a solid understanding of relational database concepts should serve as the database administrator for the PLog system.**

VIII. Software Tutorial

These tutorials assume the PLog system has been installed on the PDA and desktop computer, and that the LD4 boring log software package is present. Additionally, the user should be familiar with the concept of entering data into the PDA using either the on-screen keyboard or the Graffiti writing area. If the user needs assistance for entering text data see the documentation provided with the PDA.

- Start the PLog application by tapping the PLog icon from the desktop of the PDA shown in Figure 8-1. This opens the *Browse Projects* form that lists the Projects that have been entered on this PDA. You are now ready to begin the first tutorial.

Figure 8-1. PDA Desktop Environment

Tutorial 1: Transferring LD4 Legend Settings to PLog

Before using PLog you'll want set up PLog's stratigraphy, sampler type and well construction lookup lists so that they mirror the lists that you use on LD4's data entry screens (see Sections 2.9.3, 2.9.4 and 2.9.6 in the LD4 User's Guide).

- Start LD4 then open a project.

🗝 **PLog's stratigraphy, sampler type and well construction lists will be initialized from the legend file used by the project that you open.**

- Select 'Tools'->'Export Legend to PLog'.

- After the export process has completed, synchronize PLog (Tutorial 9).

🗝 **Because PLog's stratigraphy, sampler type and well construction lists are controlled by the legend used by the currently opened project file, you should repeat the preceding steps whenever you change this legend.**

Tutorial 2: Creating a New Project Record

Upon initial installation of the PLog handheld application, the Project list in the *Browse Projects* form will have no project records (*Figure T1-1*), thus the only option available to the user is to create a new project record. Once a project has been input, the user may edit or delete the project and any associated records.

🗝 **Deleting a project record deletes all boreholes, soil samples, ground water table, rock samples, monitoring well information, inclinometer information, notes, and stratigraphy layers with the selected Project Number (All entities below project in the data hierarchy, Figure 3-1).**

Figure T1-1. Browse Projects Form

Figure T1-2. Project Summary Form

- Press the 'New' button on the *Browse Projects* form. This opens the first Attribute form for projects, the *Project Summary* form, which allows the user to begin entering the relevant attributes for the Project entity (*Figure T1-2).*

🗝 **If you inadvertently create a new record for any data type and you want to exit the data entry form, go to the menu and choose discard current record. It will delete the current record.**

🗝 **The unique identifier for a project is its Project Number. Many projects can be stored on a PDA simultaneously; however they must have their own unique number. This number must also *exactly* match the project number that you've entered into the LD4 project file into which you'll be importing your project's PDA data.**

- After entering the project number, project name, and project location select the 'Add/Edit Project Info' button. This opens the *Project Information* form in Figure T1-3, which allows the user to input additional attributes for the project

such as datum description, coordinate system, project engineer and project manager.

- Input and select the appropriate attributes.

Figure T1-3. Project Information Form

- After entering the appropriate information, select the home button to return to the Project Summary form.

Because a new project record was just created, the number of boreholes in this project is listed as zero. Now the user can press the 'Browse Boreholes' button to access the Browse Boreholes form, where the user can create borehole records for this specific project.

Tutorial 3: Creating a New Borehole Record

After successfully creating a new project record you are ready to create a new borehole record. If there are no boreholes present in the specific project (*Figure T2-1*), the only options the user has are to create a new borehole record or to return to the Project Summary Form by selecting the button at the top of the screen. If a borehole record has been created, the user may edit or delete the borehole records and any associated levels in the hierarchy.

🗝 **The basics of navigation with the PLog system are as follows. To move up a level in the data hierarchy, select the 'Home' button . Navigating down a level in the hierarchy occurs when a button is selected. For example, selecting the 'Browse Boreholes' on the *Project Summary* screen navigates from the Project level to the Borehole level. To navigate within a data hierarchy the 'Left' and 'Right' arrow buttons are used . If the arrows are available, the left arrow navigates back a form within the level and the right arrow navigates forward within the level. Examples of this navigation are shown later in this tutorial.**

🗝 **The unique identifier for a borehole is the combination of its project number and the borehole number. Accordingly, in two different projects the user can have boreholes with the same number (i.e. project 2002-1111 borehole B-1, and project 2002-1112 borehole B-1).**

🗝 **Deleting a borehole record deletes all soil samples, the ground water table, rock samples, monitoring well information, inclinometer information, notes, and stratigraphy layers with the selected Project Number and Borehole Number (All entities below borehole in the data hierarchy, Figure 3-1).**

- Press the New Button in the Browse Boreholes form, the user creates a new borehole record and can access Attribute forms for the Borehole entity (*Figure T2-2, T2-3, T2-4*). Here, the user can document attributes for the specific borehole and have access to other Browse forms for entities such as Soil Samples, Stratigraphy Layers, Ground Water Table, etc. **If there are no options in the list shown on Figure T2-2, Hotsync the PDA to download all lists to the PDA.**

🗝 **When a new borehole record is created, if a previous borehole record is present on the PDA, the values in the lookup lists for the current borehole will be populated with the values from the previous record. However, the user must still input the location, date and time, as well as refusal and termination information.**

- Input the Borehole Number.

🗝 **PLog can be configured to populate the default values for the hole ID For example, the user may want B- to populate as the default value for each Hole ID, so all they have to input is the number. Refer to Tutorial 12 for more details on configuring the Default information.**

Figure T2-1. Browse Boreholes Form

Figure T2-2. Borehole Summary Form

- Select the 'Borehole Info' item. This displays the *Borehole Information* form in Figure T2-3 where the user can select which attributes to input.

- Select the 'General Info' button. This displays the *General Info* form shown in Figure T2-4. To select the current date and time, tap the 'Get Date/Time'

button. If the date and time is something other than the current time, tap the box that says 'input' to the right of date to select the date. Similarly, tap the box that says 'input' to the right of time to select the time. Select the values for Driller Name and Engineer Name from the popup lists.

🗝 **If no values are listed in the Driller Name and Engineer Name lists or the necessary value is not present, the user must add the values in the lookup list. This process is described in the next step.**

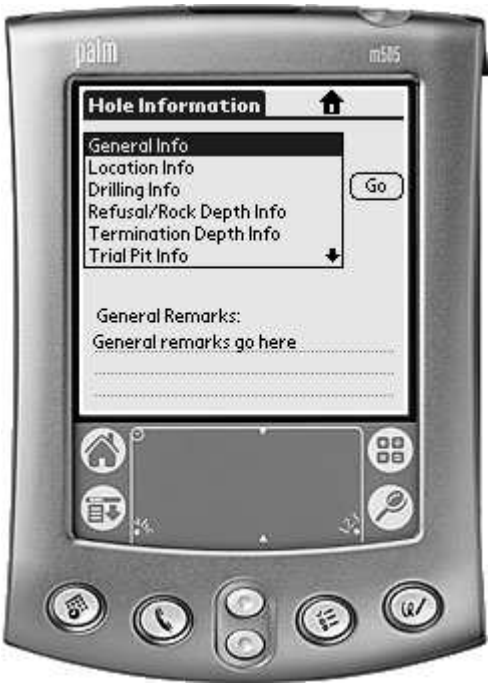


Figure T2-3. Hole Information Form

Figure T2-4. General Info Form

- Select the menu button on the bottom left side of the screen or tap the 'General Info' text at the top of the screen to display the menu.

- Select 'Modify Driller Name'. This opens the *Browse Driller* form shown in Figure T2-5.

- Select the 'New' button to add a new driller name into the Driller lookup list. This opens the *Input Driller Name* form in Figure T2-6 where the user can input the name. Enter the driller's first and last name and then select the 'OK' button. The driller's name that was just input should appear in the list. To

return to the *General Info* form, select the 'Home' button or to input the engineer's name select the 'Right Arrow' button.

- Repeat the same procedure for the logger's name.

- Repeat the same procedure for the boring type.

🗝 **The procedure just performed added a record into the Driller lookup list and the Logger lookup list. This allows the user to input common values once and then select these values from lists each subsequent time, such that text input on the device is minimized.**

🗝 **By now, you may have noticed that there are two ways to access the *Browse Driller*, *Browse Logger, Browse Boring Type* forms. You can select the 'Modify Driller Name' from the menu and then you can use the 'Right Arrow' button to access the *Browse Logger* form or you can simply select the 'Modify Logger Name' from the menu. This is an example the navigation within a hierarchy level using the left and right arrow buttons discussed previously.**

Figure T2-5. Browse Driller Form

Figure T2-6. Input Driller Name Form

Now that you have input the driller's name and the engineer's name return to the *General Info* form by selecting the 'Home' button on either the *Browse Driller* or *Browse Engineer* or *Browse Boring Type* forms. You can now select the driller, logger and boring types you just entered or others if they are present.

- Select the driller's name, engineer's name and boring type from the popup lists.
- Select the orientation of the borehole. If it is vertical, select the vertical push button, if it inclined select the inclined push button and then enter the angle of inclination.

- Next, select the 'Right Arrow' button to continue inputting attributes of the borehole. This opens the *Boring Location Info* form shown in Figure T2-7. Here the user may need to add values into the County popup list as well. Repeat the procedure outlined above for the driller name. Select the 'Modify County' from the menu to go to the *Browse County* form and create a new county name.

- Return to the *Boring Location Info* form using the 'Home' button and select the value from the county popup list and input the other attributes. If there is not an offset for the current station, unselect the 'Offset' checkbox.

- Select the 'Right Arrow' button, which opens the *Drilling Info* form shown in Figure T2-8 where the user can select values from the popup lists. If no values are present, the user must input values into the lookup list for each of the five popup lists. The procedure for entering values is identical to the previous libraries we have discussed. Select the 'Modify Drilling Company from the menu and perform the appropriate input. Then repeat the procedure for each of the five lists.

Figure T2-7. Boring Location Info Form

Figure T2-8. Drilling Info Form

- Select the appropriate values from each popup list. You have completed entering the borehole information necessary prior to drilling and now are ready to enter information about soil samples, rock samples, ground water table, stratigraphy, notes, a monitoring well installation and an inclinometer installation.

- Select the 'Home' button to return to the *Borehole Information* form.

- Select the 'Home' button to return to the *Borehole Summary* form shown in Figure T2-2. Now you are ready to enter information about soil samples, rock samples, ground water table, etc.

Proceed through these steps once the boring has met refusal and/or has been terminated.

- When the auger reaches refusal navigate to the *Borehole Information* form shown in Figure T2-3 and select the 'Refusal/Rock Depth Info' option. This opens the *Refusal Info* form shown in Figure T2-9.

- Input the appropriate values, select the date and time.

- If the boring is being terminated at the refusal depth, i.e. no rock coring is performed, verify the 'Boring Completed at Same Depth' checkbox is selected otherwise unselect the checkbox.

- If any delays were encountered during drilling select the 'Delays Encountered' checkbox and input the information about the delays in the field.

- To return to the *Borehole Information* form, select the 'Home' button.

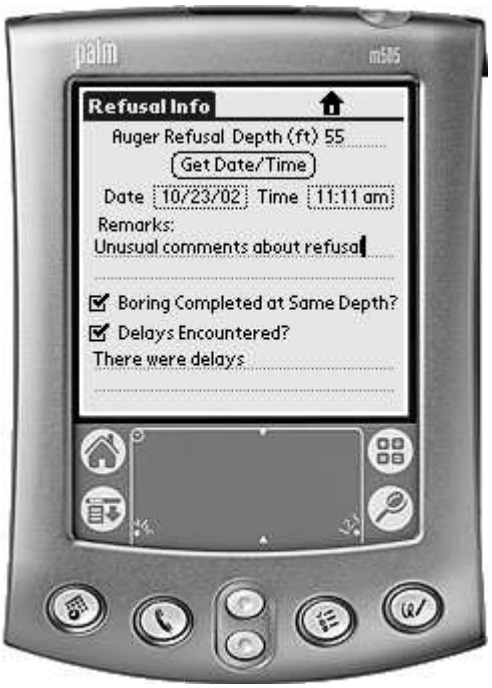


Figure T2-9. Refusal Info Form

- For cases where refusal is met, rock coring is performed and then the borehole is terminated, navigate to the *Hole Information* form shown in Figure T2-3 and select the 'Termination Depth Info' option. This opens the *Termination Info* form in Figure T2-10.

- Input the appropriate values, select the date and time and if delays were encountered, select the 'Delays Encountered' checkbox and input the information about the delays.

➢ Select the 'Home' button to return to the *Borehole Information* form.

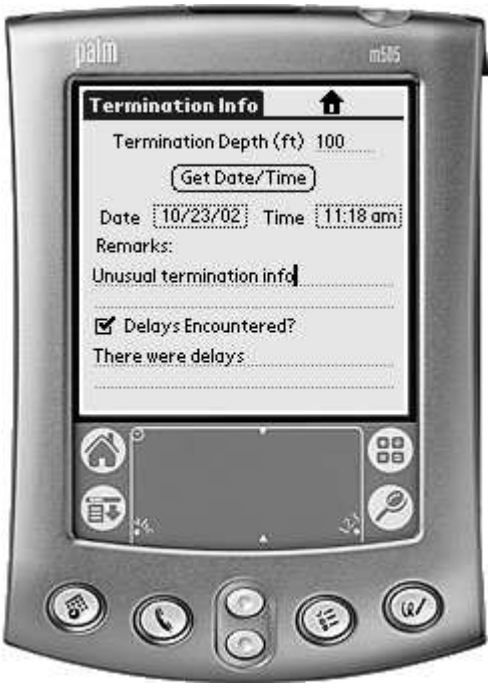


Figure T2-10. Termination Info Form

🗝 **Each boring must be terminated at some depth. If this value is not inputted, LD4 will plot the boring incorrectly.**

Tutorial 4: Creating New Depth Related Entities…

After successfully creating a borehole record and accessing the Attribute forms for the specific borehole, the user can enter information about soil samples (SPT, Thin Wall Samples, Other Samples, Block Samples), rock samples, ground water conditions, drilling notes and environmental measurements and many measurements included in various other modules.

The procedure for entering data in any of these entities is identical to that in project and borehole. The first time you enter one of these entities within a borehole, you will only have the option of creating a new record. When creating a new record you must always enter the values that identify the record. Once a record has been entered you may edit or delete the record.

The primary key for soil samples, rock samples, notes, and environmental measurements, is the combination of project number, borehole number, and depth. For groundwater measurements the key is project number, borehole number and date/time. For environmental samples and shear strength measurements, the primary key is extended one additional attribute so multiple measurements can be performed at the same depth. For example, you may record the water level during drilling, at completion of drilling and a static level, all of which have the same depth, but obviously the time intervals are much different.

Navigation within each of these entities is identical as well, where the user selects the 'Left Arrow' to move forward a screen, the 'Right Arrow' to move back a screen and the 'Home' button to move up a level in the hierarchy.

🗝 **PLog can be configured to populate default values for the sample IDs of SPT Samples, Thin Wall Samples, Other Samples, and Rock Samples. For example, the user may want S- to populate the default value for each SPT sample so all they input is the number each time a new sample record is created. Refer to Tutorial 11 for more details on configuring the Default Sampling information.**

Creating a new SPT Sample

Select 'SPT Sample' from the navigation list on the Hole Summary form and click 'Go' (Figure T3-1) or use the navigation hyperlink as shown in Figure T3-2 to navigate to the SPT Module.

Figure T3-1 – Hole Summary Form

Figure T3-2 – Navigation Hyperlink

Figure T3-3 – Browse SPT Form

Figure T3-4 –SPT Form

🗝 **Each item shown in the navigation list is a separate module where various types of data can be recorded. Modules that are not needed for your specific data collection requirements can be disabled using the PLog Configuration tool. See tutorial 10 for more details. To disable a module select the borehole summary options list and select the Hidden checkbox field for the appropriate list options.**

- Add a new SPT record.
- Input the depth and sample ID. Note you can use the sample depth increment button ⊞ to increment the depth the specified default sampling interval. If you have not setup the default sampling interval, refer to Tutorial 12
- Input your blow counts for each interval. The software will automatically assign a penetration depth for each interval, however it will only be saved if a blow count is entered for the respective interval. For example, in Figure T3-4, if a blow count is not input for the 4th interval, the 6" penetration for the 4th interval will not be saved.
- The software will automatically calculate your N-value for you as well.

Tutorial 5: Adding a Monitoring Well or Slope Inclinometer Installation

After successfully creating a borehole with samples, stratigraphy, ground water table and notes, a slope inclinometer or monitoring well may be installed. The procedure for inputting both is identical therefore only the monitoring well installation procedure is described herein.

- Navigate to the *Borehole Summary* form as shown in Figure T2-2. To input data about a monitoring well installation select the 'Well Installation' option.

- This opens the *Monitoring Well* form in Figure T4-1. You must input the Monitoring Well Number before proceeding to the construction or materials selection.

🗝 **If a Monitoring Well number is not present, it is assumed that the user does not want to enter any data for the monitoring well and is prompted to delete the current monitoring well record. To delete the record select 'Yes' otherwise select 'No' and input the appropriate number.**

Figure T4-1. Monitoring Well Form

Figure T4-2. Construction Info Form

- Select the 'Construction' button to input information about the well construction. This opens the form seen in Figure T4-2.

- Select New and input the Top depth, bottom depth and description of the interval such as Slotted pipe, Bentonite seal, Top cap, etc. and then click 'OK'.

- Select the Home button to return to the Monitoring Well Form in Figure T4-1.

- Select the 'Materials' button to begin inputting information about the materials used during the well construction. This opens the *Mon. Well Materials* form shown in Figure T4-3. Now you are ready to either input values into the libraries for well construction or select the values currently in the libraries.

- Select the 'Select Casing' button. This opens the *Browse Casing* form shown in Figure T4-4. Here the user can add a new Casing or simply select a Casing from the lookup list if Casing are present. We will assume there are no Casing in the lookup list for this example.

Figure T4-3. Mon. Well Materials Form

Figure T4-4. Browse Casing Form

- To input a new Casing, select the 'New' button from the *Browse Casing* form. This opens the *Casing Info* form shown in Figure T4-5.

- Input the appropriate values and select the 'OK' button.

- Upon returning to the *Browse Casing* form shown in Figure T4-6, additional options are present. The user may edit, delete or select the Casing. To select the Casing for this installation, click the 'Select' button.

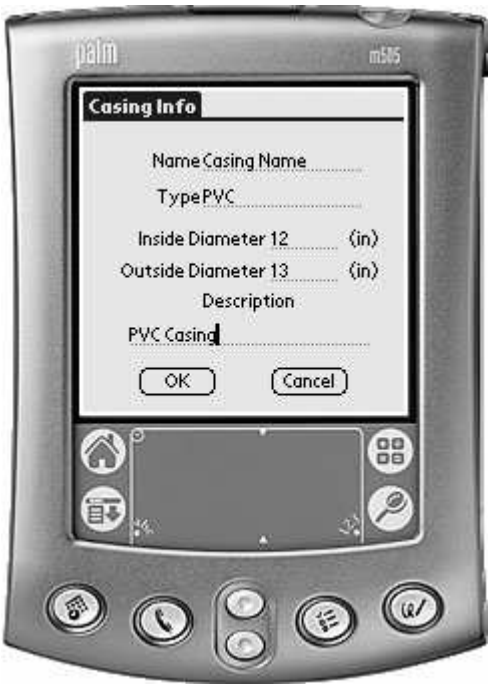


Figure T4-5. Casing Info Form

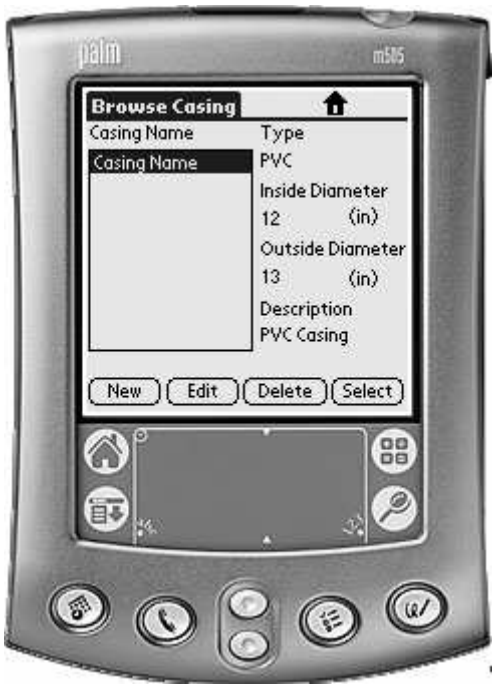


Figure T4-6. Browse Casing Form (with Select Option)

- Repeat the same procedure for plugs, caps, screens and sand pack.

Tutorial 6: Copying Soil and Rock Descriptions

Soil or rock descriptions created within PLog can be copied to facilitate data entry in the PDA. Descriptions for SPT Samples, Bulk Samples, Block Samples and Thin Wall Samples are identical to the description for Soil Stratigraphy, so they can be copied to Soil Stratigraphy to streamline field data input. The following procedure describes how to copy descriptions into Soil or Rock Stratigraphy from the Soil or Rock Samples that have been classified. PLog allows you to copy descriptions from samples within the current borehole as well as within previously created boreholes.

- Create a new soil or rock layer from the Browse Stratigraphy form.
- After inputting the depth information, click the Viewer or Sample Viewer button as shown in Figure T5-1. This opens the form in Figure T5-2 and shows you all the current SPT, Bulk, Block or Thin Wall Samples that have been classified.
- Select the type of description that you would like to copy from the list at the top of the screen.
- Select the checkbox next to the description you would like to copy and then click the 'Copy Description' button. You can scroll up and down using the scroll buttons at the lower right or at the bottom of the PDA.

Figure T5-1. – Consistency Form

Figure T5-2 – Sample Viewer Form

🗝 **Note that copying the description populates the lists with the appropriate values, which can then be modified by selecting other items in the list. For example, a particular SPT description may classify the soil as Dense, but for the stratigraphy a range of consistency descriptors (Dense to Very dense) may be needed. The description that was just copied into stratigraphy can be modified by selecting options from the lists just as for a new layer.**

Copying the Previous SPT, Thin Wall or Rock Sample Description

Additionally, descriptions for the previous soil or rock sample may be copied to the current soil or rock sample within the same borehole. For example, if a SPT sample is obtained and a description is created and then a second SPT sample is obtained, which is located in the same soil strata. Instead of re-classifying the soil by selecting the options from each list again, the description can be copied by selecting the 'Copy Previous Sample Description' button provided prior to beginning the soil or rock classification.

🗝 **Only the previous description within SPT can be copied to the current SPT sample. Descriptions for Thin Wall Samples cannot be copied into SPT.**

Figure T5-3. – Copy Previous Sample Description Button

🗝 **PLog can also be setup such that descriptions can be entered only for samples, or only for stratigraphy. The default setting is for both as seen in this tutorial. To modify where users can describe soils or rocks in the PDA software see tutorial 9.**

Tutorial 7: Copying Sampling Intervals

This capability is useful for scenarios where the sampling intervals are predetermined to be the same for each borehole. PLog allows you to copy the sample ID and sample depth for all SPT Samples, Thin Wall Samples, Other Samples, Block Samples and Rock Samples from any borehole in the current project to the current borehole.

- Once you have logged the samples for your first borehole and begin your next borehole, from any browse sample form (SPT, Thin Wall, Other, Block, Rock) or from the borehole summary form, select the Copy Sampling Intervals option from the menu. This opens the form shown in Figure T6-1.

- Choose the borehole from which you would like to copy the sampling intervals and click the select button. This will copy the sample ID and depth for SPT Samples, Thin Wall Samples, Other Samples, Block Samples and Rock Samples from the selected borehole to the current borehole.

🗝 **If there are samples present in the current borehole, PLog will not allow you to copy the sampling intervals.**

Figure T6-1 – Copy Sampling Intervals

Tutorial 8: Text Macro

This capability is useful for scenarios where non-standard text is used repeatedly during a site investigation. For example, a non-standard description may be input repeatedly in the comments at the end of a soil or rock description, such as "silicate nodules encountered occasionally". Text macros are considered a lookup list and thus can be configured on the PDA or using the PLog Configuration Tool.

- To add a text macro on the PDA from any form where data can be input, activate the menu and select 'Create Text Macro'. This opens the form shown in Figure T7-1.
- Add a new macro and input the desired text to be re-used. Click the home button to return to the previous form.
- Select the field where you want the text macro value to be stored.
- Activate the menu and choose the 'Run Text Macro' option. Select the macro to run and choose run as shown in Figure T7-2. If the text macro can be stored in the field, it will appear in the previously selected field; otherwise a message will be presented to the user describing the problem.

Figure T7-1 – Creating a Text Macro

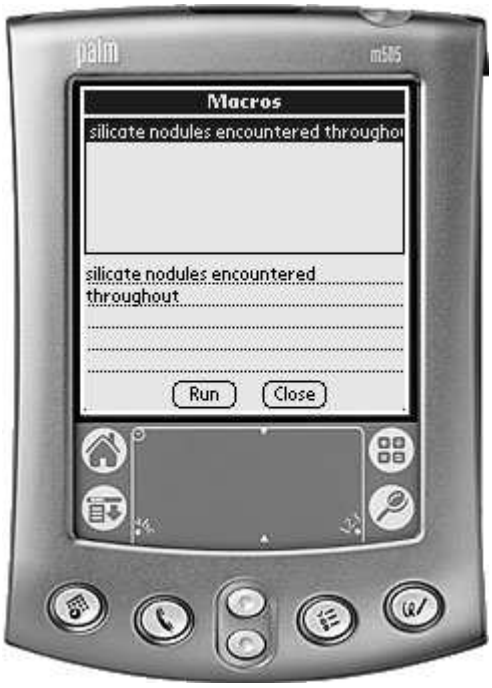


Figure T7-2– Running a Text Macro

Tutorial 9: Synchronizing PLog (Conduit)

After the user has collected subsurface exploration data, it should be transferred to the PLog database on a regular basis to minimize the potential loss of data if the PDA device were to be lost, stolen or damaged. Once the data has been synchronized with the PLog database on the desktop computer the user can generate boring logs using LD4.

Synchronization Types

There are three types of synchronization supported by PLog:

- Synchronize the databases
- Handheld overwrites desktop
- Desktop overwrites handheld

The 'Synchronize the databases' will be used for 99% of the synchronizations. Only when the user has a unusual circumstance should the one way synchronization be performed. The 'Synchronize databases' option provides the following synchronization scheme. First the values in the lookup list tables such as boring type, county, driller, logger, etc. are uploaded to the desktop database. Then, the values in the lookup list tables on the desktop database are downloaded to the device to ensure any new values input on the desktop are present on the device. **Lastly, only new or records modified since the previous synchronization are uploaded to the desktop database**. If the PDA contains records that were previously synchronized and have been modified on the device since the last synchronization, the records in the desktop database are updated with the values in the PDA. If records have been previously uploaded and have not been modified on the PDA, then these records remain unchanged in the desktop database. **If data is modified in LD4, it will not be downloaded to the device.**

The 'Handheld overwrites desktop' option uploads all values in the lookup list and non-lookup list tables to the desktop. The records on the handheld take precedence over the records in the desktop, so any records on the desktop and the PDA will be updated in the desktop database based on the values in the PDA.

The 'Desktop overwrites handheld' deletes the records in the lookup list tables on the PDA and then downloads the records currently in the desktop database. This should

be used when unwanted values are present in the lookup list tables and should be deleted.

🗝 **Note: Only lookup list tables are downloaded to the device. Non-lookup list tables are never downloaded to the device.**

Synchronizing the PDA

To initiate the data transfer, the following procedure is required.

1. Place the PDA in the HotSync cradle.
2. Press the HotSync button on the cradle.
3. Verify that no errors occur during the data transfer. If errors occur, the HotSync error log will prompt the user to read the log. View the log and verify that errors are associated with the PLog application. If errors are not associated with the PLog application, disregard the error messages. If errors are associated with PLog, repeat the above procedure.

Changing the Synchronization Type

1. Click the HotSync Manager Icon located in the system tray (at the lower right of the screen in Windows next to the clock).
2. Select the 'Custom' option. This activates the form shown in Figure T8-1.

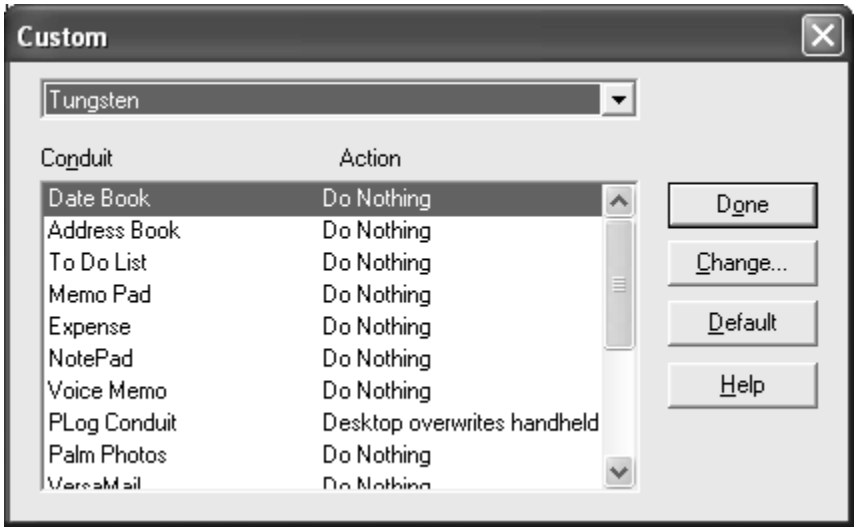


Figure T8-1

3. Double click the PLog conduit from the list. This activates the dialog shown in Figure T8-2.

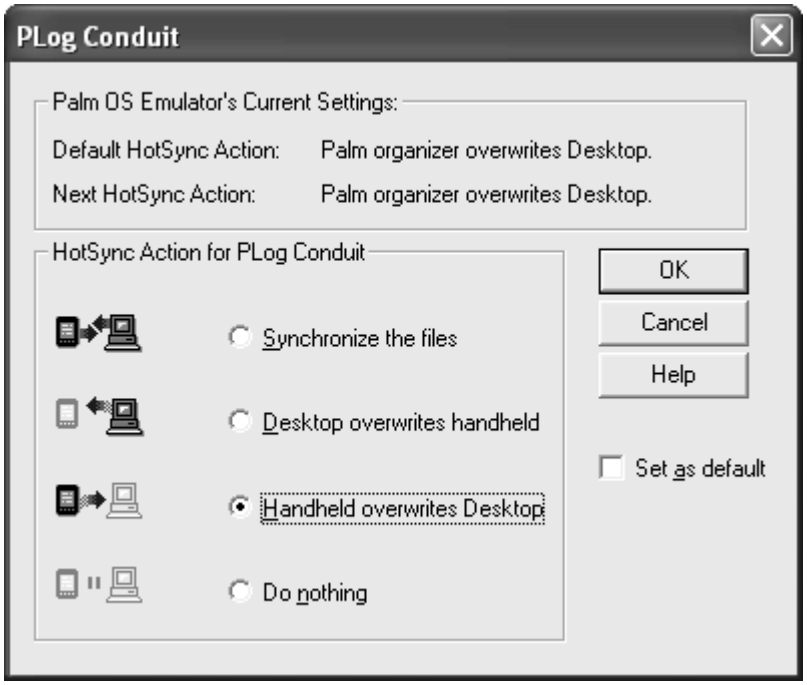


Figure T8-2

4. Change the HotSync option by selecting the desired option and clicking Ok. If you want to set HotSync to always perform the particular action, choose the 'Set as default' checkbox before clicking OK.

Tutorial 10: Importing PLog Data Into LD4

After performing the HotSync (synchronization) with the PLog database, all the entries from the PDA should be in the tables in the PLog database. Each entity in the hierarchy of Figure 1 has values that are stored in separate tables, i.e. project, borehole, SPT sample, Thin Wall sample, etc have their own tables.

Once the PDA data is in the PLog database, it must be imported into LD4.

- Start LD4.

- LD4 imports PLog data one project at a time, so the next step is to create or open an LD4 project file for one of the projects stored in your PLog database.

🗝 **If you are creating a new LD4 project file to hold data imported from PLog, after creating the project in LD4 click on 'Project Data' in the left-hand navigation panel, then enter the correct project number at the 'Project No.' prompt. *This number must exactly match the project number that you've used for the project within PLog* .**

- Select 'Tools'->'Import PLog Data'.

🗝 **Remember that LD4 imports PLog data for one project at a time; you need to repeat the procedure above for every project that has new PLog data.**

🗝 **If you re-import a boring from PLog into LD4, the import process will overwrite any changes you might have made to the boring data between PLog imports.**

Tutorial 11: Configuring Lists in PLog

There are three types of lists in PLog: lookup lists, user defined lists and system defined lists. The user can modify all values in lookup lists on the PDA as well as using the PLog configuration tool. User defined lists allow users to modify list options only in the PLog configuration tool. System defined lists only allow users to hide or show options in the lists such as adding or removing modules in the PLog software.

Lookup Lists

As discussed earlier in Tutorials 2 and 4, the users of the PDA application can setup the necessary lookup lists on the PDA. These values are then transferred to the lookup list tables in the PLog Configuration Tool after synchronization. A second option for configuring the lookup list tables is to add entries into the lookup list tables within the PLog Configuration Tool. Then, prior to deploying the system in the field, each PDA should be synchronized such that the lookup list tables will be transferred to the PDAs.

The following lookup lists can be configured in the PLog Configuration Tool, which will be transmitted to the PDA upon synchronization:

- Driller name
- Logger name
- Datum
- Coordinate system
- Project Engineer name
- Project Manager name
- Boring type
- County
- Drilling company
- Drill rig description
- SPT method
- Drilling method
- Coring method
- Abandonment method
- Casing
- Plugs
- Caps
- Screen
- Sand pack
- Grout
- Text Macro List

To enter values into any of the aforementioned tables perform the following procedure. Start the PLog application on the PC. This application is located on the start menu->programs->PLog->PLog. Then choose the List Configuration Menu or

the Lists button at the upper left. Enter a username and password. The password is dataforensics. You must enter a username and a password.

- Once you start the application, the form shown in Figure T10-1 should appear. Select the desired lookup list from the Select List pull-down list and click the Add button (Ctrl+A on the keyboard) and enter the appropriate value(s). You can continue adding new values until you click the save or cancel button. Selecting the cancel button will not save any values that have been added.

- To edit an existing value select the cell of the value to be modified and change it to the desired value. Values in the grid will turn red indicating they have been modified from their previous state. To revert the values to their previous state, select the cancel button. To accept the modified values, select the save button.

- To delete a value, select the desired row(s) in the grid and either select the delete button or use the delete key on the keyboard.

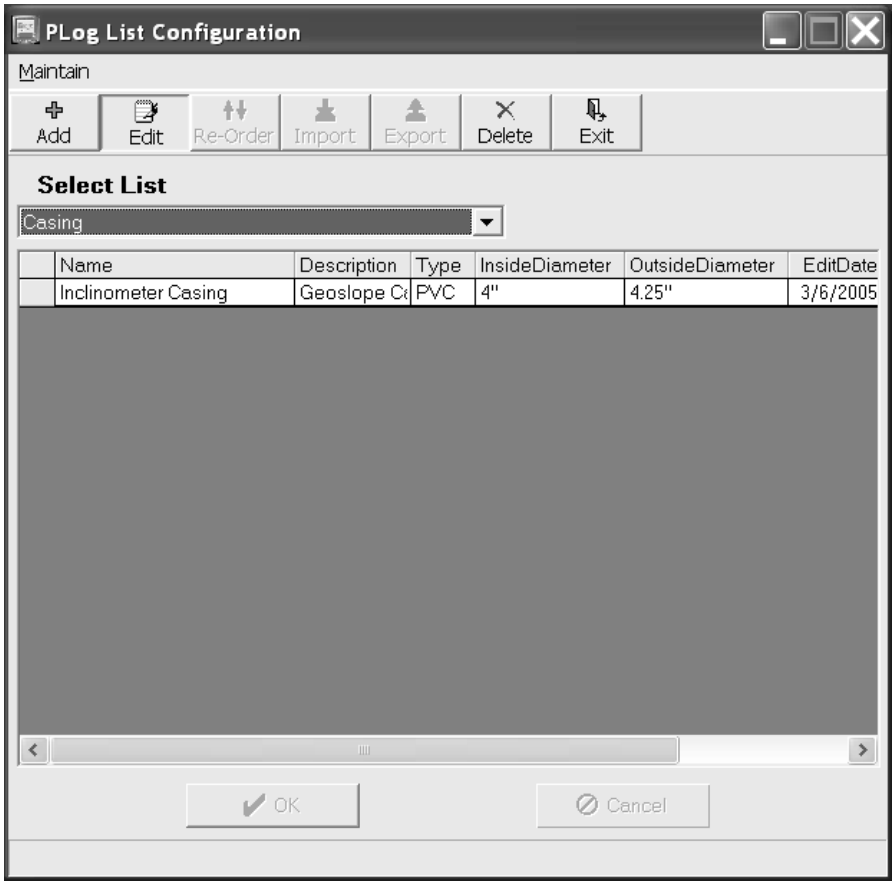


Figure T10-1 – Adding Values to a Lookup List

🗝 **If you are synchronizing the PDA with the 'Synchronize database' option, the appropriate records must be deleted from the lookup list on all PDAs as well as from the lookup list tables in the PLog Configuration Tool. Alternatively, the lookup list values can be deleted in the PLog Configuration Tool and the change synchronization options to 'Desktop overwrites handheld'. This will set the lists on all PDAs exactly as they appear in the PLog Configuration Tool.**

Once you have completed entering the data into all the desired lists, HotSync the PDAs using either the desktop overwrites handheld or synchronize the databases option. The values from the lookup list tables should be on the PDA following synchronization.

User Defined Lists

PLog is configured with a default set of list values that are used for describing soil, rock, rock discontinuities, groundwater measurements, etc. These lists are called user defined lists and they can be modified by the user in the configuration tool.

For example, certain companies do not use the terminology for fat clay or lean clay. These options can be hidden or deleted in the configuration tool such that they are not shown on the PDA. Options can be reordered, such that the most common choices are located near the beginning of each list. Lastly, users may want to add new list items. All of these tasks can be performed on the desktop and upon synchronization, the appropriate list values are downloaded to every PDA using the PLog system.

The following user defined lists can be configured in the PLog Configuration Tool, which will be transmitted to the PDA upon synchronization:

Color Conjunction List
Color Shade List
Depositional Environment List
Drilling Notes List
Graphic List
Groundwater Measurement Type List
Igneous Rock List
Metamorphic Rock List
Primary Color List
Rock Bedding Angle List
Rock Crystal Grain Size
Rock Discontinuity Infilling List
Rock Discontinuity Persistence List
Rock Discontinuity Planarity List
Rock Discontinuity Roughness List
Rock Discontinuity Surface Appearance List
Rock Discontinuity Type List
Rock Formation List
Rock Granular Grain Size List

Rock Local Name List
Rock Structure List
Rock Structure Thickness List
Secondary Color List
Sedimentary Rock List
Shear Strength Blade List
Shear Strength Test Type List
Shear Strength Vane List
Soil Angularity List
Soil Bedding Thickness List
Soil Cementation List
Soil Discontinuity Spacing List
Soil Gradation List
Soil Grain Size List
Soil HCl Reaction List
Soil Major Constituent List
Soil Minor Constituent List
Soil Minor Percent List
Soil Moisture List
Soil Odor List
Soil Organic Consistency List
Soil Plasticity List
Soil Sampler Type List
Soil Secondary Major Constituent List
Soil Structure List
Soil USCS List
Soil Weathered Rock List
SPT Sampler Type List
Strata Detail List
Surface Cover Layer List
Well Description List
Well Graphic List

There is also a set of user defined lists that have values associated with each list item. For example, PLog can determine the consistency or relative density of a soil based on the SPT N-value. Therefore, the Soil Coarse Consistency and Soil Fine Consistency lists have a maximum value associated with a particular list option. Very loose – max value = 4. If there is no maximum value for a particular record, leave the cell blank. Very dense does not have a maximum value because anything greater than 50 is very dense. The values in Soil Coarse Consistency and Soil Fine Consistency must be ordered by increasing density i.e. very loose, loose, medium dense, dense, very dense otherwise determining the consistency/relative density from the SPT will be calculated incorrectly.

The Rock Joint Spacing, Rock Moisture, Rock Strength and Rock Weathering all have associated values with a particular record as well. This allows PLog to calculate the RMR based on the associated value for these lists combined with RQD.

The following user defined lists have associated values that can be configured in the PLog Configuration Tool, which will be transmitted to the PDA upon synchronization:

Rock Joint Spacing List
Rock Moisture List
Rock Strength List
Rock Weathering List
Soil Coarse Consistency List
Soil Fine Consistency List

Users can add, edit, and delete values in these lists just as in the lookup lists. Additionally, users can reorder the values in the list by selecting the reorder button as shown in Figure T10-2.

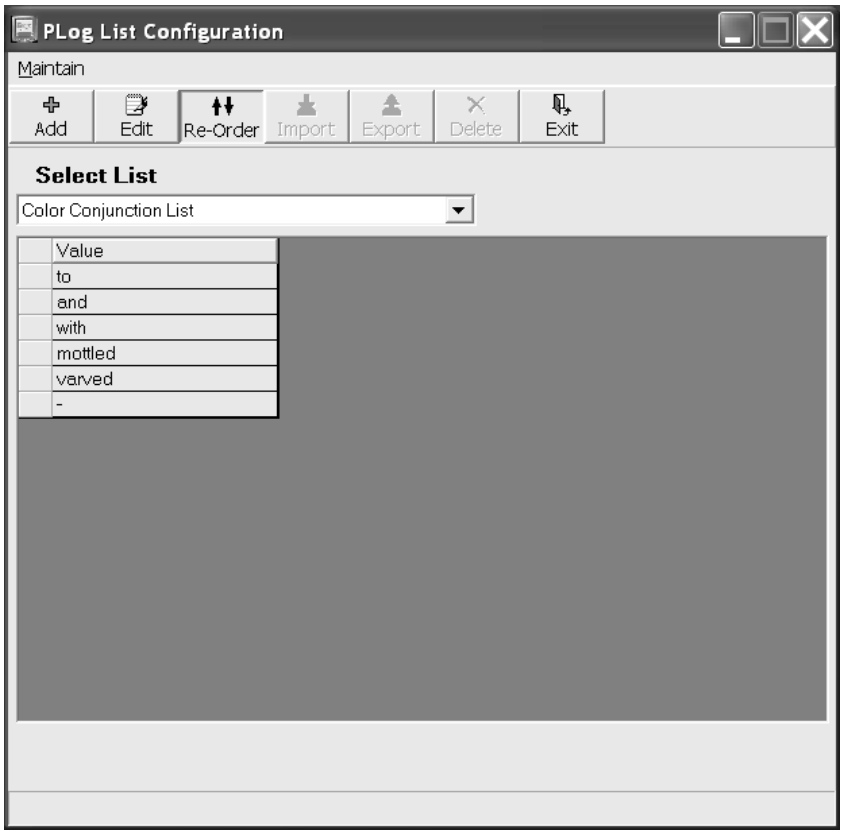


Figure T10-2 – Reordering List Options

- To reorder the list values, select the row to move and drag it to the appropriate position. Once you are finished reordering the list options, click the edit button to revert to the edit mode.

Once you have completed modifying or entering the data into all the desired lists, HotSync the PDAs using either the desktop overwrites handheld or synchronize the databases option. The values from the user defined list tables should be on the PDA following synchronization.

System Defined Lists

PLog is configured with a default set of modules activated within the system. However users can add or remove the desired modules depending on their data collection requirements. For example, certain companies do not need to use the Texas Cone Module, therefore they can disable it such that it is not shown on the PDA. Similar to user defined lists, users can hide/show or reorder the values in system defined lists. However, users cannot add or edit values in these lists.

The following system defined lists can be configured in the PLog Configuration Tool, which will be transmitted to the PDA upon synchronization:

Borehole Options List - Reorder, hide/show the modules available on the Borehole Information Form shown in Figure T2-3.

Borehole Summary List – Reorder, hide/show the modules available on the Hole Summary Form shown in Figure T2-2

Soil Description Form Ordering – Reorder, hide/show the forms used in describing soils

Rock Description Form Ordering – Reorder, hide/show the forms used in describing rock layers

Rock Sample Form Ordering – Reorder, hide/show the forms used in describing rock samples

Discontinuity Description Form Ordering – Reorder, hide/show the forms used in describing discontinuities

Soil Description Options – Turn off/on the options used in describing soils

Rock Description Options - Turn off/on the options used in describing rocks

Discontinuity Description Options - Turn off/on the options used in describing discontinuities

Tutorial 12: Configuring Other Settings on the PDA

As discussed in Tutorial 6, PLog can be configured to allow the user to record soil and rock descriptions for samples or layers or both depending on how your company logs. Some companies log soil sample descriptions, others log soil layer descriptions, and others log sample descriptions and then copy the sample descriptions to layers. PLog can be configured to accommodate all of these styles of field logging. Even if you log sample descriptions in the field, most companies generate boring log reports based on stratigraphy (or layers).

To enable or disable where descriptions can be input, go to the 'Browse Projects' form on the PDA.

- Select the Configuration Menu and choose the 'Modify Description Options' menu option.

- To enable Soil Sample Descriptions select the checkbox as shown in Figure T11-1. To disable Soil Sample Descriptions, uncheck the checkbox.

- To enable Soil Layer Descriptions verify the checkbox is selected as shown in Figure T11-1. To disable Soil Layer Descriptions, uncheck the checkbox.

Figure T11-1. Soil Description Options

The list shown at the bottom of the screen in Figure T11-1 allows the user to enable or disable components used in the soil description. To enable a component, select the item it from the active fields list and choose enable. To disable soil description components select the item and choose disable.

The same procedure described above, applies to configuring Discontinuity Descriptions and Rock Descriptions. Change the item selected at the upper right to Rock to modify the rock descriptions and choose Discontinuity to modify the Discontinuity Descriptions.

Tutorial 13: Configuring Default Sampling Options

The default sampling options tells PLog if default values should be populated for a sample tag (prefix), if there is a default sampling interval, if the user should be able to record the sample date and time, if the user should be allowed to input a bottom depth to override the bottom depth determined by the SPT based on the amount of penetration of the sampler.

- To configure the sampling options, select the Configuration Menu-> Modify Sampling Options on the Browse Projects or any Browse form for the samples such as SPT, Thin Wall Sample, Other Sample or Rock Sample.

- The form show in Figure T12-1 should appear. Input the Default Sampling Interval, which allows the user to automatically increment the sample depth the specified default sampling interval simply by tapping the + button shown on the sample forms as shown in Figure T12-2.

- Input the Sample Tags or prefixes that will appear each time a new sample record is created. For example, in Figure T12-1 the SPT Sample tag is configured as S-. When a new SPT sample as shown in Figure T12-2 is created, S- will be the default value for this field. The same concept applies to thin wall samples, other samples, and rock samples.

Figure T12-1 – Sampling Options

T12-2 – New SPT Record Creation

Tutorial 14: General PLog Configuration

The general PLog configuration allow the user to select whether to utilize a logging style that is AGS 3 compliant for clients located in the United Kingdom predominantly or to utilize a logging system that follows standards from the United States. It also allows users to disable predictive text and configure a default hole ID similar to what was done for the Sampling Configuration.

- To configure the general options, select the Configuration Menu-> Modify PLog Configuration on the Browse Projects form. This opens the form shown in Figure T13-1.
- Select the appropriate version type for your style of logging US or UK/AGS.
- Enable or disable the predictive text.
- Input a value for the default value for the Hole ID tag (prefix). As seen in Figure T13-2, the value B- is populated for each new borehole created by default.

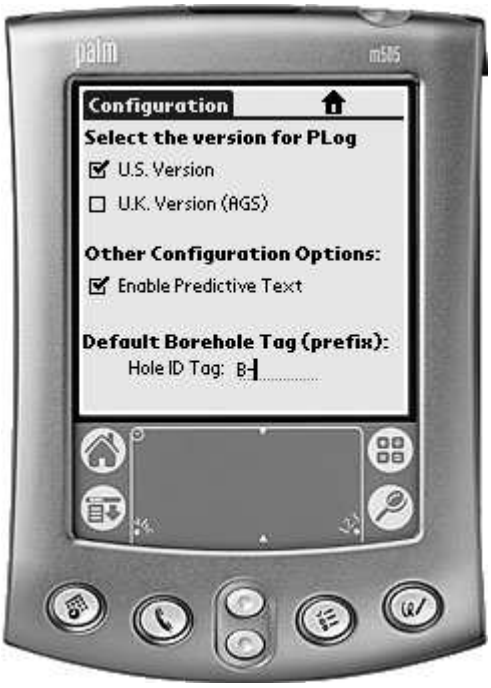


Figure T13-1 – PLog Configuration

Figure T13-2 – New Hole Record

Tutorial 15: GPS Configuration

In order to connect a NMEA compliant GPS with PLog, a connection on your PDA must be configured such that PLog can directly communicate with the GPS. Note, PLog does not post process any GPS data, it only records the data provided by the GPS; therefore the accuracy is whatever the GPS unit states.

- Start the Prefs (Preferences application) on the PDA.
- Select connection from the pull-down list at the upper right if you are using Palm OS 4.1 or earlier or from the 'Connection' option on the screen if you are running Palm OS 5 or later. This opens the form shown in Figure T14-1.
- Select the new button to add a new connection named GPS.
- Enter the name GPS as seen in Figure T14-2. Leave the other options as their default.
- Click details to open the form shown in Figure T14-3. Set the speed as 4,800 bps.
- Click OK to return to T14-2 and click OK to return to T14-1. The GPS connection is now configured. On the Location Info form in PLog (Figure T2-7), a button should appear that allows you to read the GPS coordinates directly.

Figure T14-1 - Connection Manager

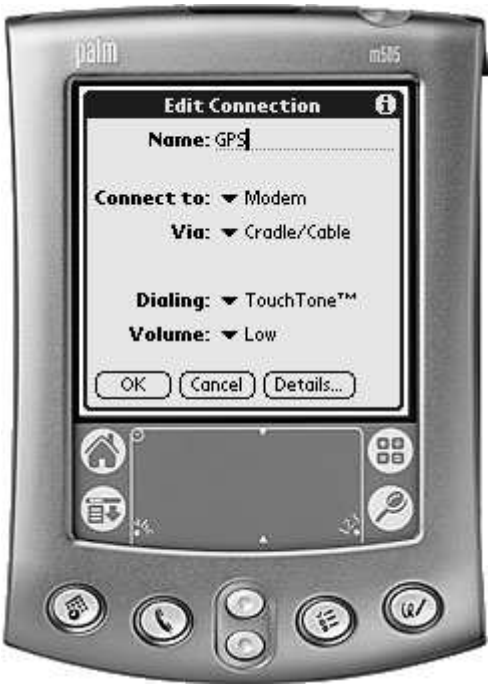


Figure T14-2 - Edit Connection

Figure T14-3 Connection Detail

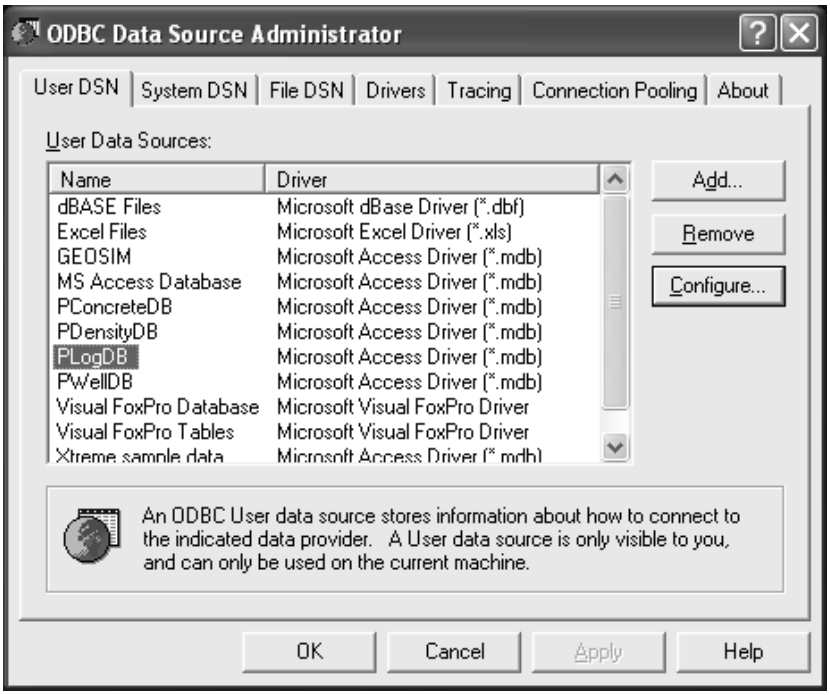
IX. Frequently Asked Questions

Why will my data not export into LD4?

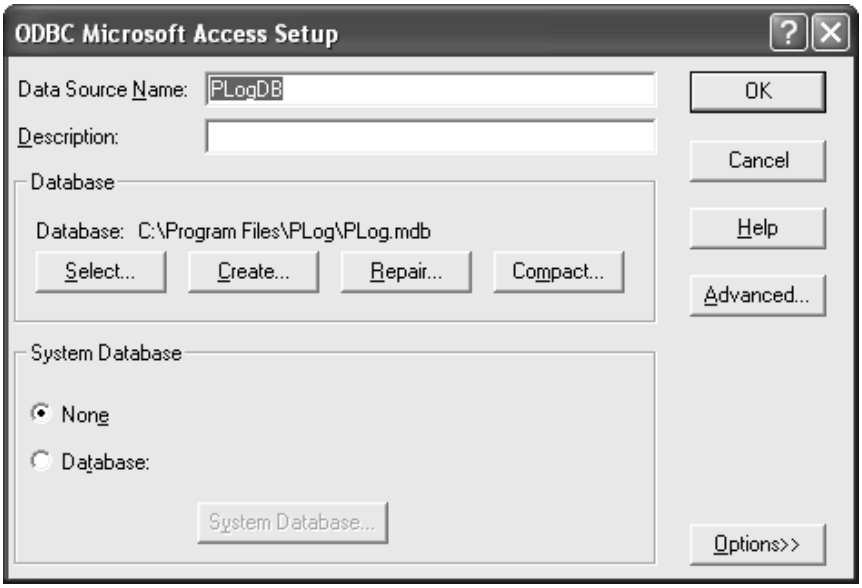
Check your project number! When you import PLog data into an open LD4 project file, the importer only imports PDA data with a project number that exactly matches the project number you've entered into LD4.

Why can I not upload my data?

During installation of the system, the user is prompted for selecting the location of the PLog database. If the PLog database has been moved, the ODBC connection must be modified as well. To do this go to the Start Menu->>Settings, Control Panel->>Administrative Tools->>ODBC Data Sources. You should see a PLogDB as a data source as shown in ODBC Data sources below. Double click the PLogDB in the list to configure the data source as shown in PLog Data Source.



ODBC Data Sources



PLog Data Source

The ODBC data source name must be PLogDB. To choose the location of the PLog.mdb file click select and navigate to the location of the PLog.mdb file on your computer or network. Click OK and try syncing the PDA again.

How do I configure the default sampling interval?
Please refer to the tutorial 12.

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X. References

Elmasri, R. & Navathe, S. (2000) *Fundamentals of Database Systems – Third Edition*, Addison Wesley Longman Inc., Reading, Massachusetts, 955 pp.