

# **GEOSYSTEM<sup>®</sup> LD4**

**Drilling Log Drafting Module  
for GEOSYSTEM<sup>®</sup> for Windows**

## **CUSTOMIZATION GUIDE**

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**APPENDIX A. LD4 MATH**

**APPENDIX B. LD4 CALCULATED FIELDS**

# 0. Introduction and Cookbook

The Customization Guide is intended for users who would like to design their own report forms. The material discussed in the Guide is not covered under the free technical support clause of the package's license agreement (see the "Help!" chapter for more information on technical support options).

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**Tip:** If you don't have the time to create or modify your own reports, consider having GEOSYSTEM Software design your form for you (there is a small charge for doing this). For guidelines on submitting forms for customization, refer to the "Help!" chapter in the User's Guide.

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This manual doesn't need to be read like a book, front to back; rather, it is organized by task. The following list presents some of the more common LD4 customization tasks, along with references to the appropriate section of the manual.

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## ***0.1 Data Entry Form Modification***

- **How do I make room for entering more characters into a particular data entry field?** If your data entry field is part of the Project Data window or Source Data window (see Section 2.6 and Section 2.7 in the User's Guide), then refer to Section 1.3 (page 8). Otherwise, refer to Section 1.4 (page 13).

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## ***0.2 Report Form Modification***

- **How do I add a groundwater symbol to my report?** See Section 4.11.6 (page 177).
- **How do I add a new column of data to the table on my report?** See the tutorial given in Section 8.1 (page 197).
- **How do I change the fonts used on my report?** See Section 2.5 (page 44). (Check out the Head/Footing and Table tab discussions.)

- **How do I add something to the top or bottom of my report?** Firstly, you'll need to add a data entry field so that you can enter the data that you'll be printing: see Section 1.3 (page 6) for instructions on doing this (you may also want to look at the tutorial given in Section 1.3.1). After you have a place where you can enter the data, you'll need to add the data to your report form: see Chapter 3 (page 57).

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### ***0.3 Upgrading From LOGDRAFT III (MS-DOS Drilling Log Program)***

- **Why don't my LD4 reports look like those printed with my MS-DOS LOGDRAFT III program?** See Chapter 6 (page 187).

# 1. Data Entry Forms

While you're entering data into a project file LD4 displays a *data entry screen* similar to the one shown below. The prompts and data entry fields that you see on the screen (such as "Boring No.:" prompt below) are determined by a *data entry form*: this form must be modified if you want to add a new data entry field to your screen or change the width of an existing field.

The screenshot shows the GEOSYSTEM for Windows interface with the following data entry fields:

\*\*\*\*\* Monitoring Well Installation \*\*\*\*\*

Boring No.: **HW-1** Elevation: **557.6** Datum: **assumed**

Location: **See Attached Drawing**

Driller: **ACE Drilling** Logged By: **B.P. Loyne**

Drilling Method: **Hollow-stem auger** Drill Date: **Feb. 23, 1993**

Depth to Water> at first check: **32** after 24 hrs.: **45**

1) Depth **0.3** Sample No. \_\_\_\_\_ Sample Type **C** Sample Length (in) \_\_\_\_\_ N-Value \_\_\_\_\_ Water Content \_\_\_\_\_

Plastic Limit \_\_\_\_\_ Liquid Limit \_\_\_\_\_ UBSSr ID **CH** Soil symbols **C** Type of shear test \_\_\_\_\_ Shear strength \_\_\_\_\_

Description \_\_\_\_\_ Monitor Well Installation Schematic **CQUER**

Notes **Flush-munt cover**

2) Depth **0** Sample No. **C-1** Sample Type **C** Sample Length (in) **18** N-Value \_\_\_\_\_ Water Content \_\_\_\_\_

Plastic Limit \_\_\_\_\_ Liquid Limit \_\_\_\_\_ UBSSr ID **CH** Soil symbols **C** Type of shear test \_\_\_\_\_ Shear strength \_\_\_\_\_

Description **Dirty SANDY CLAY, red, brown, fine to medium grained, sandy, with rock** Monitor Well Installation Schematic **CASED**

Report: CORLOG Figure \_\_\_\_\_ Page \_\_\_\_\_ Vertical scale: 75 Invention

Description: CAW34

Units: Metric

Figure 1.1 -- Data Entry Screen

Data entry forms include all of the prompts and settings necessary to enter data for a project, divided into four sections:

Section	Used For
Project Data	Data entry fields for data common to the entire project such as the project number, the client's name, etc. (See Section 2.6 in the <u>User's Guide</u> .)
Source Data	Data entry fields for data about a single source, such as the boring's number, the location of the boring, the date the boring was started, etc. (See Section 2.7 in the <u>User's Guide</u> .)
Tabulated Data	Data with multiple readings taken per source. For boring log this is subsurface information: depths, sampling intervals, material descriptions, etc. (See Section 2.9 in the <u>User's Guide</u> .)
Form Settings	Contains a list of settings that LD4 uses to understand your form.

**Table 1.1 -- Parts of a Data Entry Form**

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## 1.1 Data Entry Fields

The whole purpose of a data entry form is to provide you with places to enter your data. These places are called *data entry fields*. Every data entry field has a *name*, a *width* and a *type*.

### **Field Names**

LD4 has a built-in list of names for all of the common data taken in a geotechnical investigation: when you're adding a new data entry field to a form try to give your new field one of the names from LD4's built-in list. (All of LD4's "add a new data entry field" screens show this list.) If you're adding a new field that LD4 doesn't have on its list you'll need to make up a name for the new field. LD4 has strict rules on the names you can use for a data entry field -- they are:

1. The new field can't have the same name as a data entry field that you've already added to the form. You can use the same name for fields in different places on the form: for example, you can have a field on the Project Data screen called **LOCATION** and a field on the Source Data screen called **LOCATION**, but don't, as this will just get confusing.

You also can't use a field name that LD4 has already reserved for its own purposes. LD4 will always let you know if you try to use one of these.

2. Field names always start with a letter.
3. The rest of the field name can be any combination of letters and numbers.

4. You may not have a space anywhere in the name. Many of LD4's suggested names use an underscore in place of a space, for example, **WELL\_ID**, **FILL\_NOTES** and **GS\_REMARKS**.

As examples, **BLOWS1** and **BLOWS\_1** are acceptable field names while **1BLOWS** and **BLOWS 1** are not.

### ***Field Widths***

LD4 needs to know the number of characters that you expect to type into each data entry field. The program uses this information for various purposes such as determining how wide a table column on a report needs to be to display data from a given data entry field.

### ***Field Types***

In addition to the standard one-liner type of data entry field, LD4 also has a couple of special fields. The most common of these is the *paragraph* field, which allows you to enter more than one line of text (see Section 2.5.3 in the [User's Guide](#)). Several other special types of field are used only on the table section of the data entry form.

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## ***1.2 Creating and Modifying Data Entry Forms***

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**Caution:** Hard disk failures happen! If you modify or create a data entry form, be sure to save a copy of the modified form onto a floppy disk or tape drive.

---

### **To modify a data entry form:**

1. From LD4's opening screen click on the **Entry Forms** tab then double-click on the report you want to modify.

**or**

1. Open up a project then open a source that uses the form you want to change (see Section 2.4 in the [User's Guide](#) and Section 2.7.2 in the [User's Guide](#)).
2. Choose **Tools > Data Entry Forms...**

**or**

1. Click on the  button at the lower-right of the LD4 data entry screen (see Section 2.5 in the [User's Guide](#)).

### **To create a new data entry form:**

1. Following the steps given above, open up a data entry form that is similar to the form that you want to create.
2. From Data Entry Form Designer choose **Entry Form > Save As** and type in the name you've chosen for your new form

or

1. From LD4's opening screen click on the **Entry Forms** tab.
2. Enter a name and description for your new data entry form then click on **OK**. If a form with that name doesn't already exist, LD4 will create a new, blank version.

or

1. While editing an existing data entry form choose Entry Form > Create from Scratch

### 1.3 Project and Source Data

After a data entry form has been opened or created, clicking on the Project Data or Source Data tabs displays a screen similar to the one shown below:

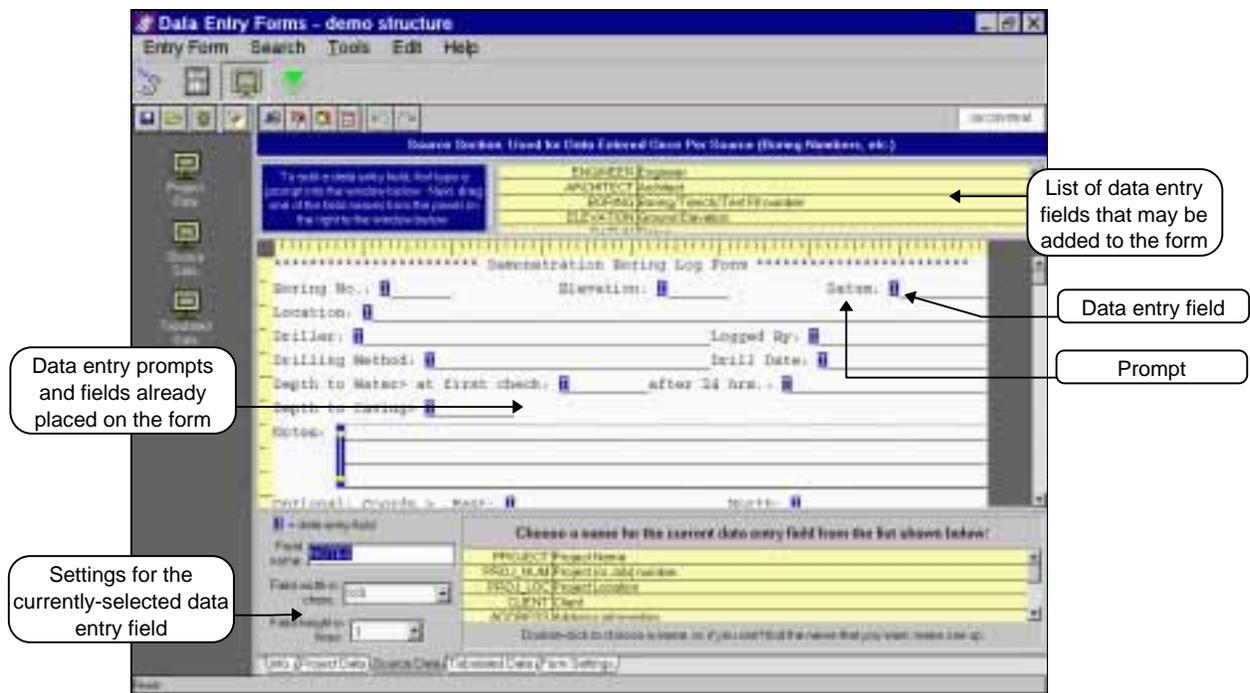


Figure 1.2 -- Source Data Modification Screen

- The Project Data screen sets up data entry fields for data common to the entire project (such as the project number, the client's name, etc.), while the Source Data screen sets up data entry fields for data about a single source (such as the boring's number, the location of the boring, the date the boring was started, etc.).

- Because the project data entry screens and source heading data entry screens look similar, LD4 uses the same process to modify both project and source heading sections.

**To add a data entry field to the Project or Source Data screens:**

1. Follow the directions given in Section 1.2 to open up the data entry form that you want to modify.
2. Click on either the **Project Data** or **Source Data** tabs -- remember that the Project Data screen is for entering data about the entire project while the Source Data screen is for entering data about a single source.
3. In the window where the entry prompts and fields are shown (this is the window with the rulers on the top and left side), find a place where you can put your new data entry field.
- In the form designer, existing data entry fields look like this:  If you find one that extends all the way to the right side of the screen, it's probably taking up too much space (if you don't tell LD4 how wide a data entry field is to be the program extends the field all the way to the right side of the screen). You can try, for example, putting your new data entry prompt half-way between the start of the existing field and the right side of the screen, *even though LD4 shows the existing data entry field taking up that space.*
4. Move the mouse to the place you've picked for your new data entry field then click the left mouse button. (If you were trying to place your new field in the middle of an existing field and the field *needed* the space where you tried to put the new field, LD4 won't let you continue; you'll need to find another place to put your new field such as a completely blank line.)
5. Type in a prompt that will tell you during data entry what kind of data is to be entered. For example, if you're adding a data entry field for entering boring numbers your prompt would be something like

**Boring Number:**

6. In the list of data entry fields that may be added to the form (this is the yellow box in the upper-right corner of the screen), locate the field that you want to add, click the left mouse button on it then, *while holding the mouse button* down, drag the mouse downwards until it is directly to the right of the prompt that you added in the previous step.

**or**

If the list didn't show anything similar to the data entry field you want to add, make up a name for the new field (see Section 1.1 for guidelines) then move the mouse just to the right of the prompt you added and click the left mouse button. Type in an @ sign, followed by the name which you invented. (For example, @DRILL\_ROD).

7. As noted earlier, LD4 automatically extends your field all the way to the right side of the screen. If you know that the field doesn't need to be that wide, change the **Field width in chars.** setting for the new field (you can find this setting in the Data Entry Field Properties panel at the bottom of the screen -- see Figure 1.3).

- If you want to be able to enter more than one line of data into your new data entry field, change the **Field height in lines** setting of the Data Entry Field Properties panel.

#### To modify a data entry field on the Project or Source Data screens

- Follow the directions given in Section 1.2 to open up the data entry form that you want to modify.
- Click on either the **Project Data** or **Source Data** tabs. (Remember that the Project Data screen is for entering data about the entire project while the Source Data screen is for entering data about a single source.)
- In the window where the entry prompts and fields are shown (this is the window with the rulers on the top and left side) locate the field that you want to modify. Remember, data entry fields are represented like this:  \_\_\_\_\_. Since all the data entry fields look the same, LD4 pops up a small window listing the field's name when you move the mouse cursor over the blue box at the start of the field: use this to help you find the field you want to modify.
- Once you've found the field, move the mouse over the blue box at the start of the field and click the left mouse button.
- LD4 responds by displaying the data entry field's properties at the bottom of the window. Information for a typical field is shown below:



**Figure 1.3 -- Data Entry Field Properties**

- Note: to make room for entering more characters into the field, change the **Field width** to a larger number.

#### To modify a prompt:

- Follow the directions given in Section 1.2 to open up the data entry form that you want to modify.
- Click on either the **Project Data** or **Source Data** tabs. (Remember that the Project Data screen is for entering data about the entire project while the Source Data screen is for entering data about a single source.)
- In the window where the entry prompts are shown (this is the window with the rulers on the top and left side) locate the text that you want to modify then click the left mouse button on it.

**To move a field or prompt on the Project or Source Data screens:**

1. Follow the directions given in Section 1.2 to open up the data entry form that you want to modify.
2. Click on either the **Project Data** or **Source Data** tabs.
3. In the window where the entry prompts are shown (this is the window with the rulers on the top and left side) locate the prompt or data entry field that you want to move then click the left mouse button on it.
4. *While holding the left mouse button down*, drag the item to its new location.

**To delete a field or prompt from the Project or Source Data screens:**

1. Follow the directions given in Section 1.2 to open up the data entry form that you want to modify.
2. Click on either the **Project Data** or **Source Data** tabs.
3. In the window where the entry prompts are shown (this is the window with the rulers on the top and left side) locate the prompt or data entry field that you want to move then click the left mouse button on it.
4. Choose Edit > Cut Field or Prompt or Edit > Delete Field or Prompt.

---

### 1.3.1 Step by Step Instructions for Adding North, East and Station Fields

LD4's profile plotting facility includes an option to produce profiles that show the spaces between borings as proportional to the actual distances between the borings. In order to accomplish this, a data entry form needs at least one data entry field for entering the boring's coordinate. Typical forms have three coordinate fields: northing, easting and station number. The steps below show how these fields are added to a data entry form.

1. Following the directions given in Section 1.2, open up the data entry form that you want to modify.
2. There are three different places on a data entry form where a new field may be placed: the **Project Data** tab, the **Source Data** tab or the **Tabulated Data** tab. Since project data is information about the entire project and tabulated data is for data that can be taken more than once per boring (such as "depth" or "N-value"), that leaves us with the **Source Data** tab: click on this tab.
3. In the window where the entry prompts are shown (this is the window with the rulers on the top and left side), find the bottom of the existing data entry prompts and fields, and, on the first blank line below, click the left mouse button with the cursor in the first column.
4. Type **Optional - Coords> East:**
5. In the dictionary at the top of the screen, locate the entry called **EAST**. Click the left mouse button with the cursor on this entry and, *while holding the mouse button down*, drag the mouse to just past the ":" of the line of text that you typed in step 4, then release the mouse button. This should show a blue box just to the right of "East:" : if the box doesn't show up, try this step again and make sure to drag the cursor to the right of the ":" before letting up on the mouse button.
6. Move the mouse cursor 10 spaces or so to the right of the blue box then click the left mouse button. Make sure that the cursor is on the same row as the text you entered in the previous steps before clicking on the button.
7. Type **North:**
8. In the dictionary at the top of the screen, locate the entry called **NORTH**. Click the left mouse button with the cursor on this entry and, *while holding the mouse button down*, drag the mouse to just past the ":" of the line of text that you typed in step 7, then release the mouse button. This should show a blue box just to the right of "North:" : if the box doesn't show up, try this step again and make sure to drag the cursor to the right of the ":" before letting up on the mouse button.
9. Move the cursor to the first column of the next row then click the left mouse button.
10. Type **(for profiles) > Station:**

11. In the dictionary at the top of the screen, locate the entry called **STATION**. Click the left mouse button with the cursor on this entry and, *while holding the mouse button down*, drag the mouse to just past the “:” of the line of text that you typed in step 10, then release the mouse button. This should show a blue box just to the right of “Station:” : if the box doesn’t show up, try this step again and make sure to drag the cursor to the right of the “:” before letting up on the mouse button.
12. LD4 must be told to use the data entered into the new fields when plotting profiles (this process is covered in detail in Section 1.5): start by clicking on the **Form Settings** tab.
13. Locate the prompt that says **Select the source field that accepts easting or offset coordinates** then click on the “...” button to the right of the data entry field below the prompt.
14. You should be able to find “EAST” in the drop-down dictionary: click on it. (If you don’t find “EAST”, consider selecting Entry Form > Abandon Changes and starting from step 1.)
15. Click on the “...” button below **Select the source field that accepts northing coordinates** and click on “NORTH”
16. Click on the “...” button below **Select the source field that accepts station number coordinates** and click on “STATION”.
17. Select Entry Form > Exit.

## 1.4 The Table Section

After a data entry form has been opened, clicking on the Tabulated Data tab displays a screen similar to the one shown below:

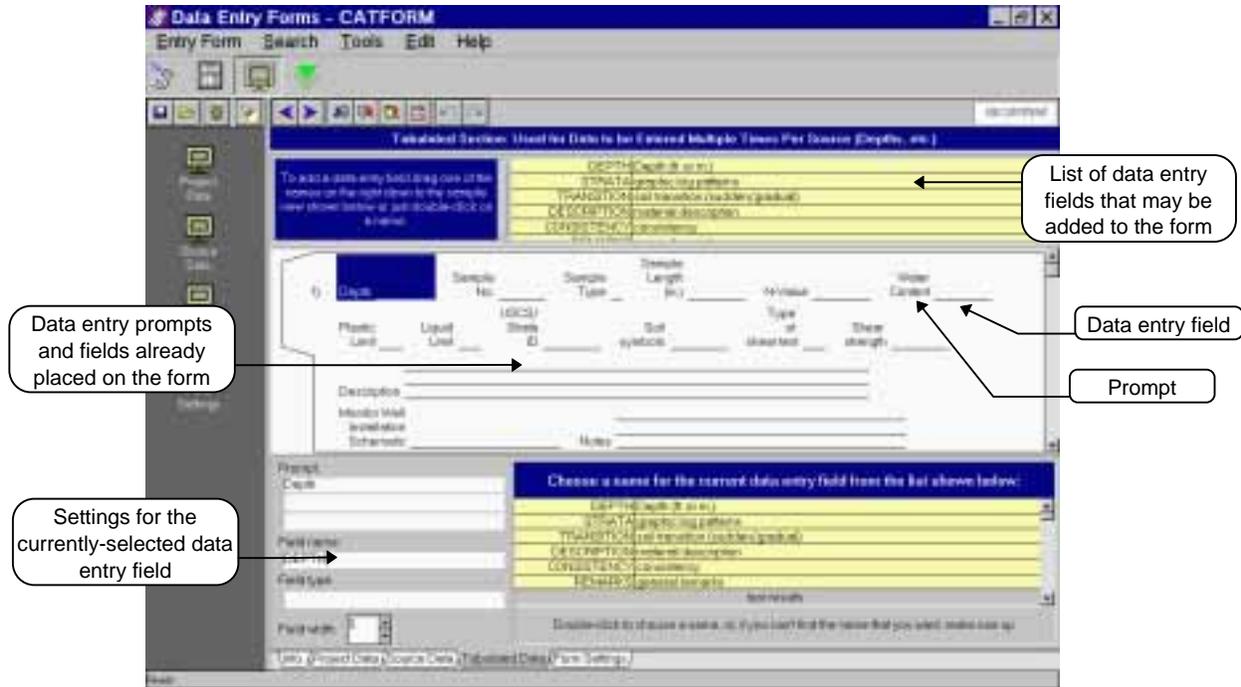


Figure 1.4 -- Tabulated Data Modification Screen

Remember that the *tabulated data* part of the data entry form is for data with multiple readings taken per source. For a boring log this is composed of subsurface data: depths, sampling intervals, material descriptions, etc. (See Section 2.9 in the [User's Guide](#).)

### To add a new data entry field to the tabulated data portion of a data entry form:

1. Follow the directions given in Section 1.2 to open up the data entry form that you want to modify.
2. Click on the **Tabulated Data** tab.
3. In the list of data entry fields that may be added to the form (this is the yellow box shown in the upper-right corner of the screen), locate the field that you want to add, click the left mouse button on it then, *while holding the mouse button down*, drag the mouse over the section of the screen that shows the data entry prompts and fields already placed on the form (see Figure 1.4).

4. While you're dragging the new data entry field, LD4 indicates the position where the new field will be placed with an arrow. When the arrow is in the right position, release the mouse button.

Once you've released the mouse button the new field will be placed on the form. The current field settings panel (discussed in Section 1.4.1) will show LD4's initial guess at the type and size of your new data entry field.

**To modify an existing data entry field on the tabulated data portion of a data entry form:**

1. Follow the directions given in Section 1.2 to open up the data entry form that you want to modify.
2. Click on the **Tabulated Data** tab.
3. In the section of the screen that shows the data entry prompts and fields already placed on the form (see Figure 1.4), move the mouse cursor over the field that you want to modify then click the left mouse button.

LD4 displays the Current Field Settings panel, discussed in Section 1.4.1.

- Tip: to make room for entering more characters into the field, change the **Field width** setting to a larger number.

**To remove an existing data entry field from the tabulated data portion of a data entry form:**

1. In the section of the screen that shows the data entry prompts and fields already placed on the form (see Figure 1.4), move the mouse cursor over the field that you want to modify then click the left mouse button.
2. Select Edit > Delete Field or Edit > Cut Field.

**To change the data entry field order:**

1. In the section of the screen that shows the data entry prompts and fields already placed on the form (see Figure 1.4), move the mouse cursor over the field that you want to modify then click the left mouse button.
2. *While holding the left mouse button down*, drag the field. While you're dragging the field LD4 displays an arrow indicating where the field would be placed when you release the mouse button: when the arrow's in the position that you want the field to move to, release the mouse button.

### 1.4.1 The Field Settings Panel

The field settings panel (shown below) determines how a particular data entry field appears and what data can be accepted in the field. The panel is active whenever you add or modify a data entry field on the tabulated data section of the form.



**Figure 1.5 -- Field Settings Panel**

- The **Prompt** field gives you three lines of text to put to the left of your data entry field. Use these lines to describe the data that you will typing into the field. If a particular set of measurement units are to be used with the data (for instance, a sampling length field that to be entered in centimeters) be sure to add the units to your prompt. As an example, a good prompt for the sampling length field would be:

**Sample  
Length  
(in. or cm.)**

Note the “in. or cm.”: if you expect to be entering data in different units (e.g., inches and centimeters or pcf and kg/cm<sup>3</sup>) depending upon the dimension units setting associated with the project (as discussed in Section 2.2.1 in the [User's Guide](#)) make sure to that your prompt reflects the units that you expect for both dimension units settings.

- **Field name** allows you to choose a new name for your data entry field. (See Section 1.1.1 for guidelines on data entry field names.) You can also select a name from the list of names (shown on the right of the panel) by clicking on it.
- **Field type** allows you to have select some special types of fields from a list.

If you leave **Field type** blank you get a one-line data entry field that accepts any type of text. The following table shows some other selections available:

Type	Used For	Used With Field Named
<b>PARAGRAPH</b>	Creates a data entry field that holds more than one line of text; typically used for soil description and remarks columns.	Typically, if you have a field named <b>DESCRIPTION</b> , <b>WELL_NOTES</b> , <b>REMARKS</b> , <b>STRATA_DESC</b> or <b>MTESTS</b> , you should set the field's type to be <b>PARAGRAPH</b> .
<b>STRATA</b>	Creates a field for selecting stratigraphy symbols -- see Section 2.9.3 in the <u>User's Guide</u> .	<b>STRATA</b>
<b>STRATA_ID</b>	Automatically selects stratigraphy patterns based upon a soil's USCS classification. Note: when using a STRATA_ID field you should also have a field of type STRATA -- see Section 4.2.1 of the <u>User's Guide</u> .	<b>USCS</b>
<b>STRATA_DESC</b>	Descriptions entered into this field automatically change the legend description for the stratigraphy symbols that are printed at the same depth.	<b>DESCRIPTION</b>
<b>SAMPLERS</b>	Creates a field for selecting symbolic representations of sampler types -- see Section 2.9.4 in the <u>User's Guide</u> .	<b>SAMP_TYPE</b>
<b>WELL_ID</b>	Creates a field for selecting sections of a monitoring well schematic -- see Section 2.9.6 in the <u>User's Guide</u> .	<b>WELL_ID</b>
<b>PIPES</b>	Creates a field for selecting the second and third pipe to go in a monitoring well schematic. (See Section 2.9.6 in the <u>User's Guide</u> for an example of a three-pipe monitoring well.) This field isn't needed unless you'll be drawing monitoring wells with more than one pipe installed.	<b>PIPE2</b> and <b>PIPE3</b>
<b>WELL_DESC</b>	Descriptions entered into this field automatically change the legend description for the monitoring well section that is at the same depth.	<b>WELL_DESC</b>
<b>YN</b>	Creates a field that accepts yes/no answers	<b>TRANSITION</b> (for selecting between sudden and gradual stratigraphy transitions)
<b>MISC</b>	Creates a field for selecting items from the MISC graphic symbols library. Included for backwards compatibility purposes.	(not normally used)

Table 1.2 -- Field Types

You can also use **Field type** to set up a field whose contents depends upon an equation: for example, if you want to have a field for plasticity index that is automatically filled in when the liquid and plastic limit fields are entered, the plasticity index's field type would be **LL-PL**.

Fields that use an equation such as **LL-PL** are useful for checking results during data entry. If this capability isn't needed, you can eliminate the calculated field from your data entry form and still print the results on your reports: LD4 has the ability to print the results of equations on boring logs, etc. so you can set up your report form to print the results of calculating **LL-PL** (see Section 4.6).

Another common data entry field that can use a **Field type** equation is the **NVALUE** field, which can be set up to automatically display the results of adding the second and third blow counts. Assuming you've set up fields called **BLOWS1**, **BLOWS2** and **BLOWS3**) by setting the **NVALUE**'s "Field type" to

**BLOWS2+BLOWS3**

This automatically calculates N-values; however, if you get into a situation where the third blow count couldn't be determined (for example, with an N-value of **50/3"**) the user can override the program's calculated N-value by typing in **50/3"**. LD4 won't change the **50/3"** unless the user types in a new value for either **BLOWS2** or **BLOWS3**.

You can also set up a field that utilizes a popup picklist, which would allow you to choose during data entry from a list of available selections. This option is covered in Section 1.4.2.

- The **Field width** prompt allows you to choose a maximum width in characters for data entered into that field. Each field's width should be set as small as possible in order to make efficient use of the space available on the data entry screen. As a default, LD4 suggests a field width of five characters -- this is sufficient for most numeric data. The following table lists the widths suggested for some common fields:

Field	Field Name	Width	Why
Stratigraphy patterns	<b>STRATA</b>	<b>5</b>	this gives a maximum of 5 soil patterns per entry because soil pattern names are all one character
Sampler type	<b>SAMPLERS</b>	<b>1</b>	the as-shipped sampler names are all one character
Monitor well construction field	<b>WELL_ID</b>	<b>13</b>	well sections have names that the program limits to 13 characters
Second & third well pipes column	<b>PIPES2</b> and <b>PIPES3</b>	<b>8</b>	pipe names have a maximum of 8 characters
Atterberg limits	<b>PL, LL</b> and <b>PI</b>	<b>2 or 4</b>	use 2 characters if you are rounding your values to the nearest whole number or 4 characters if you are rounding to 1 decimal place
Grain size distribution data	<b>PER10, PER40, PER200</b> , etc.	<b>2 or 4</b>	use 2 characters if you are rounding your values to the nearest whole number or 4 characters if you are rounding to 1 decimal place

**Table 1.3 -- Suggested Field Widths**

---

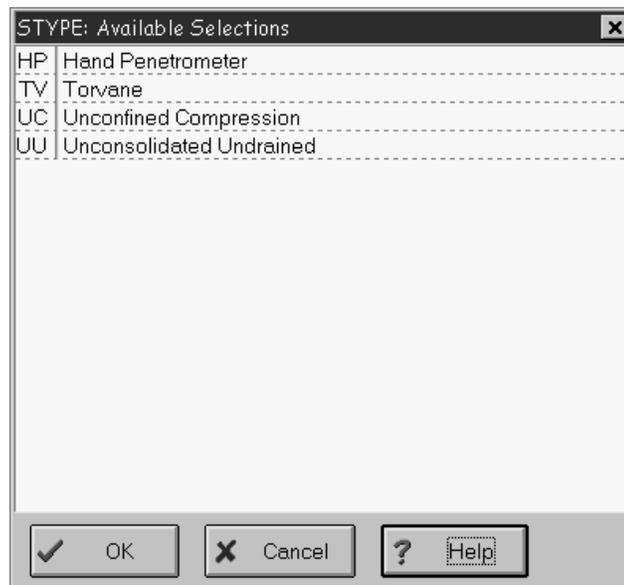
### 1.4.2 Step by Step Instructions for Adding a Miscellaneous Tests Data Entry Field

“LEGPROFA” (one of the profile forms shipped with LD4) includes a column for plotting miscellaneous laboratory testing data. Because most custom data entry forms don’t have a miscellaneous data entry field, you’ll probably need to add a new data entry field to take full advantage of the form.

1. Follow the directions given in Section 1.2 to open up the data entry form that you want to modify.
2. There are three different places on a data entry form where a new field can be placed: on the **Project Data** tab, the **Source Data** tab or the **Tabulated Data** tab. Since project data is information about the entire project and source data is for data taken once per boring, this leaves us with the **Tabulated Data** tab (because you’ll want to be able to enter more than one miscellaneous test result per boring): click on this tab.
3. Locate “MTESTS” in the dictionary at the top-right of the screen: click the left mouse button with the cursor on this entry and, *while holding the left mouse button down*, drag the entry into the middle of the screen, past the last data entry prompt already shown. You should see an up-arrow just past the prompt -- when it is in the correct position, let up the mouse button.
4. LD4 suggests that the new data entry field be made 20 characters wide. “LEGPROFA” was designed for a 10 character wide field so (for the sake of demonstration -- it doesn’t really matter how wide the field is) we need to adjust the field’s width: locate the **Field width** prompt at the bottom of the screen and change the number from **20** to **10**.
5. Choose Entry Form > Exit.

### 1.4.3 Picklists

Several common table entry fields require specific data such as shear test method codes (**HP** for hand penetrometer, **TV** for torvane, **UU** for unconsolidated undrained, etc.) or casing selection (**NX**, **BX**, etc.). You'll want to make sure that data entry in these fields is limited to applicable values so that, for example, **QZ** can't be entered as a shear test method. LD4 supports this through *picklist* data entry fields, which are fields that A) restrict data entry to a specific set of choices and B) at the user's request, pop up a menu of available choices.



**Figure 1.6 -- Shear Test Method Picklist**

**The user must select between the HP, TV, UC and UU test method codes**

Picklists are stored in the same files as your legend information so you might want to review Chapter 4 in the [User's Guide](#) before proceeding. (As an aside: there's no major reason why picklists are a part of legend files -- picklists don't show up on hardcopy legend printouts -- but it does make transferring files to another computer somewhat easier.)

To set up a data entry field to use a picklist, follow the directions given below:

1. Open a project file.
2. Choose [Legend](#) > [Edit the Default Legend](#). If this selection isn't available then you've created a custom legend for the project: you should choose [Legend](#) > [Revert to the Default Legend](#) (so that the modifications you'll be doing are to the default legend and consequently affect all future projects), then select [Legend](#) > [Edit the Default Legend](#).
3. Select [Legend](#) > [Add a New Legend Table](#).

4. Select "List of items for popup menu during data entry".
5. As a name for the list, enter a one-word abbreviation that describes how the list will be used (e.g., **SHEAR** for a list of shear test types or **CASING** for a list of casing types). Make a note of the abbreviation -- you'll need it later.
6. LD4 will display a standard data entry screen (similar to the one shown below) with cards holding **Item** and **Description** prompts. In the **Item** fields, enter the picklist codes that you want to type in during data entry (e.g., **HP**, **TV**, etc. for shear test method codes). In the **Description** fields, enter a short description -- the description will appear on the popup picklist menu. *Picklists do not appear on printed legends* so you don't need to be too careful with how the descriptions are worded.

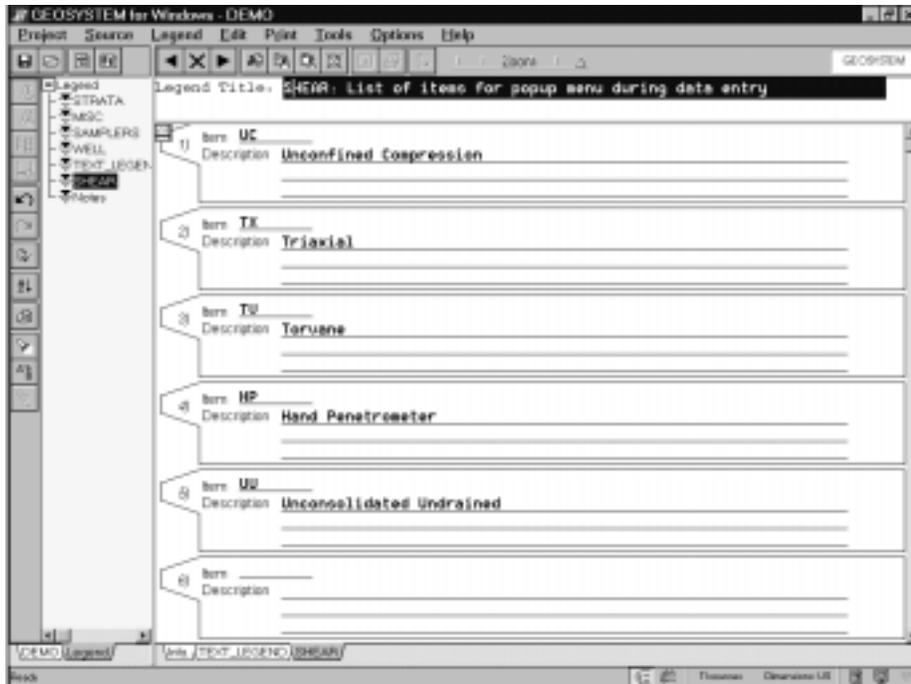


Figure 1.7 -- Picklist Setup

7. After the picklist entries have been added, select **Tools > Data Entry Forms** then (if it isn't automatically opened), open the data entry form to be modified.
8. Click on the **Tabulated Data** tab then, if you haven't yet done so, add the data entry field that will use the picklist. (See Section 1.4 for instructions.) When asked for the **Field type**, enter the abbreviation that you used in Step 5.
9. Save the data entry form and open the data entry screen for a boring that uses the form: you should see your new data entry field accompanied on the right by a button. Clicking on the button should show a menu of selections.

You can change or add selections with **Legend > Edit the Default Legend**.

---

## 1.5 Form Settings

The data entry form editor's Form Settings screen controls some basic settings about the form. Clicking on the Form Settings tab displays a screen similar to the one shown below:

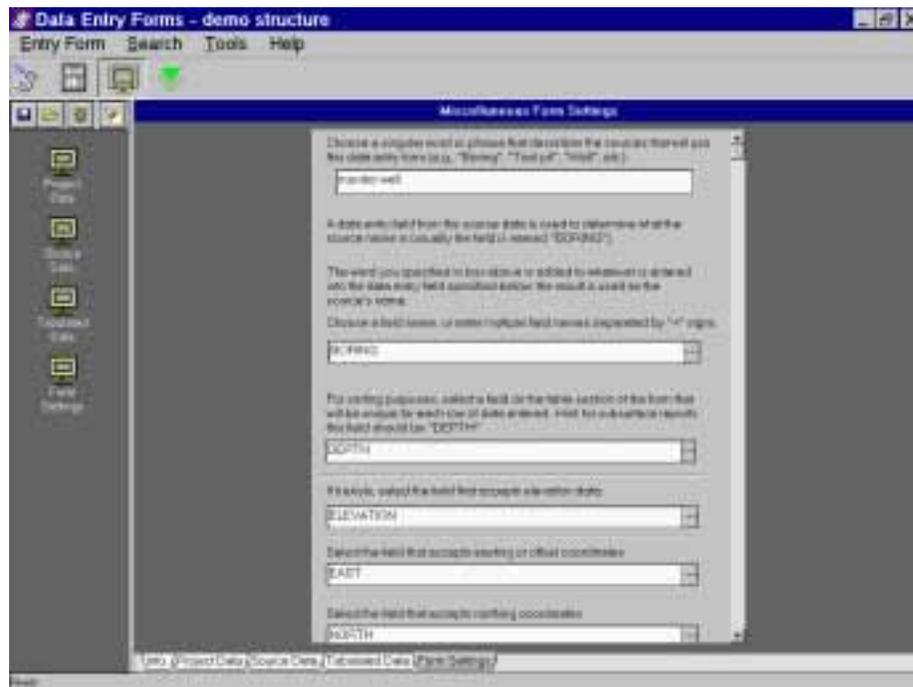


Figure 1.8 -- Form Settings

Field	Use
Singular word or phrase that describes the sources that will use this data entry form (e.g., "Boring", "Test pit", "Well", etc.)	Provides LD4 with a generic name for all of the sources that use the data entry form. For example, if the form was designed for entering data for test pits the phrase <b>Test pit</b> would all cause the program to call all of the sources using the data entry form "Test Pits". Commonly, <b>Boring</b> is used.
Enter the name of a source data entry field that can be used to get each source's name (normally, this is <b>BORING</b> ); multiple field names may be used by separating each with a "+" sign.	This is the name of the source field into which the source's name will be entered. For each source, LD4 lists the contents of this field in the Sources panel on the data entry screen (see the Source Data Modification screen discussed in Section 1.3 and also Section 2.5 of the <u>User's Guide</u> ). Normally the name would be <b>BORING</b> ; however, you can also list multiple fields by separating them with a + sign (for example, <b>BORING+STATION</b> causes LD4 to combine the contents of the <b>BORING</b> and <b>STATION</b> fields to get the source's name).
For sorting purposes, select a field on the form's tabulated data section that will be unique for each row of data entered.	LD4 automatically sorts the tabulated section of the source (see the Tabulated Data screen discussed in Section 1.4) on the field you specify at this prompt -- typically, select <b>DEPTH</b> as the sort field so the program orders your data by increasing depth.
If it exists, select the source data field that accepts elevation data	This is the field on the Source Data Modification section (discussed in Section 1.3) which is used to determine the boring's elevation when drawing elevation-adjusted profiles: normally <b>ELEVATION</b> .
Select the source data field that accepts easting or offset coordinates	This is the field on the Source Data Modification section that will be used for entering the source's east or offset coordinate. Normally this field is called <b>EAST</b> , however, leave this field blank if you are not entering the physical coordinates of your sources.
Select the source data field that accepts northing coordinates	The field on the Source Data Modification section where the source's north coordinate will be entered. Normally this is called <b>NORTH</b> , however, leave this field blank if you are not entering the physical coordinates of your sources.
Select the source data field that accepts station number coordinates	The field on the Source Data Modification section where the source's station number (and possibly, station offset) will be entered. Normally this is called <b>STATION</b> ; however, leave this field blank if you are not entering the physical coordinates of your sources.
On plan views you may want to represent sources that use this data entry form with a unique type of symbol: if so, enter the symbol name below...	Used to distinguish sources using this data entry form on plan views -- for instance, if the form is used to enter test pit data, a graphic symbol can be drawn in the MISC symbols library (see Chapter 9) that represents only test pits; when LD4 draws a plan view it will use that symbol to represent all test pits.

Table 1.4 -- Miscellaneous Form Settings

## 2. Report Forms

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**Users upgrading from LOGDRAFT III:** Please read the section on LOGDRAFT III report compatibility (see Chapter 6) before modifying a report you've designed with your old program.

---

When you're ready to produce a printout from your project LD4 takes the data you've entered into the project and places it onto a blank report form; the result is then sent to the printer or to an AutoCAD .DXF file. The blank report form that is used comes from a *report form file*. Different report form files produce different printouts: you may have one report form for printing boring logs, another for printing monitoring well logs and still another for summarizing your testing data. LD4 displays a list of available report forms in the Form Settings dialog shown when you get ready to print something (see Chapter 3 in the [User's Guide](#).)

## 2.1 Types of Reports

LD4 report forms are divided into a number of basic types which are discussed and shown in the following sections.

### 2.1.1 Single-Source Subsurface Log

Single-source reports are used for showing boring logs, monitoring well installations, rock coring logs, etc. These reports present a representation of the conditions encountered during a subsurface exploration, *scaled vertically with respect to depth*.

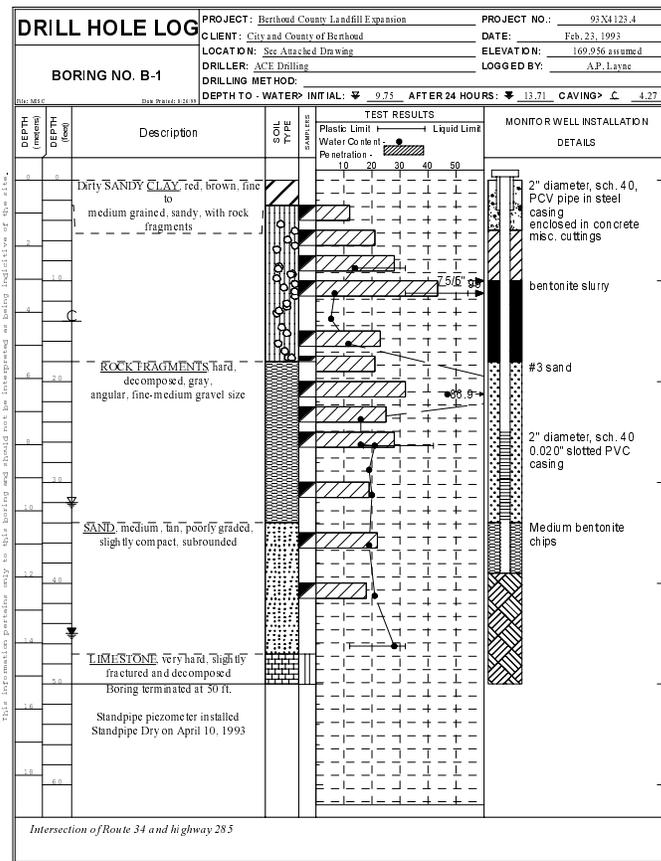


Figure F 1aa PAGE 1 of xxx LAYNE ENGINEERS  
**Figure 2.1 -- Single Source Subsurface Log**

### 2.1.2 Multi-Source Subsurface Report

Multi-source subsurface reports are also commonly called *profiles*. These reports show multiple borings on a single page, again scaled with respect to depth; they can optionally place each boring scaled with respect to its elevation and station or north/east location.

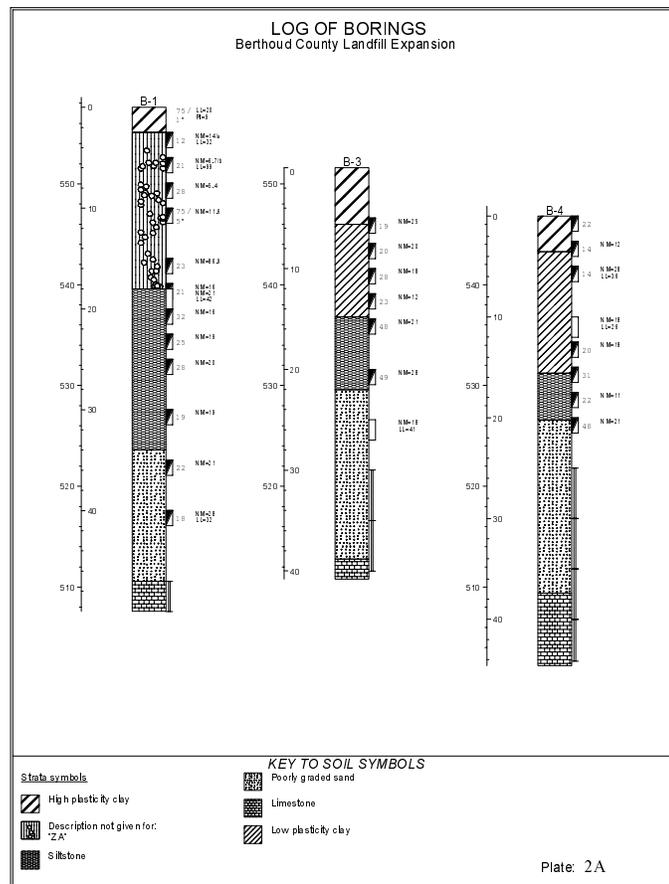


Figure 2.2 -- Multiple Source Subsurface Report

### 2.1.3 Single Source Data Summary

A single source data summary lists data entered into a single source folder, meaning that one report is generated for boring selected for printing. The data are listed in a tabular format that is not scaled with respect to depth.

- The *project summary* forms discussed in Section 2.1.6 are just single source data summaries that are automatically generated by LD4.

### 2.1.4 Multiple Source Data Summary

A multi-source data summary can potentially list data from a number of different source folders on the same page; otherwise, is identical to a *single source data summary*.

Data Summary for Project 93X4123.4								
Source	Loc.	Depth	Material Description	Sample Number	PL	N-Value		
MW-1	North:6000 East:2300	0	Dirty SANDY CLAY, red, brown, fine to medium grained, sandy, with rock fragments	C-1				
		2.5		S-1	13	32	12	
		5		S-2			21	
		7.5		S-3			28	
		10		S-4			18	
		15		S-5			23	
		17.5		S-6			21	
		18		C-2	ROCK FRAGMENTS, hard, decomposed, gray, angular, fine-medium gravel size	17	42	
		20						32
		22.5		S-8			25	
		25	S-9			28		
		30	S-10			19		
		34		SAND, medium, tan, poorly graded, slightly compact, subrounded				
		35	S-11			22		
		40	S-12		12	32	18	
47	R-1	LIMESTONE, very hard, slightly fractured and decomposed						
50								
		Boring terminated at 50 ft. Standpipe piezometer installed Standpipe Dry on April 10, 1993						
MW-2	North:6000 East:15,140	0	Dirty CLAY, red, brown, fine to medium grained, sandy, with rock fragments	C-1				
		2.5		S-1	13	32	12	
		5		S-2			21	
		7.5		S-3			28	
		10		S-4			18	
		15		S-5			23	
		17.5		S-6			21	
		18		C-2	ROCK FRAGMENTS, hard, decomposed, gray, angular, fine-medium gravel size	17	42	
		20						32
		22.5		S-8			25	
		25	S-9			28		
		30	S-10			19		
		34		SAND, medium, tan, poorly graded, slightly compact, subrounded				
		35	S-11			22		
		40	S-12		12	32	18	
47	R-1	LIMESTONE, very hard, slightly fractured and decomposed						
50								
		Boring terminated at 50 ft. Standpipe piezometer installed Standpipe Dry on April 10, 1993						
B-2	North:7000 East:4200	0	CLAY, very stiff, silty, brown and olive gray, some sand, trace gravel	S-1		26		
		5		S-2		39		
		7.5		S-3		48		
		10		Very dense, heterogeneous, wet, gray, SILT and SAND, trace gravel, occasional sandy silt seams				
		12.5	S-4		19			
		14.6	S-5		15			
20	S-6	ROCK FRAGMENTS, medium, gray, fine gravel size, silty clay, some sand		22				

Figure 2.3 -- Multi-Source Data Summary

### 2.1.5 Multiple Source Graph

A multi-source graph report shows graphs of data from more than one boring, scaled by depth. Multiple source graphs are different from profiles: each boring on a multiple source graph is plotted in the same graph, whereas on a profile that uses graphs, each boring gets its own graph.

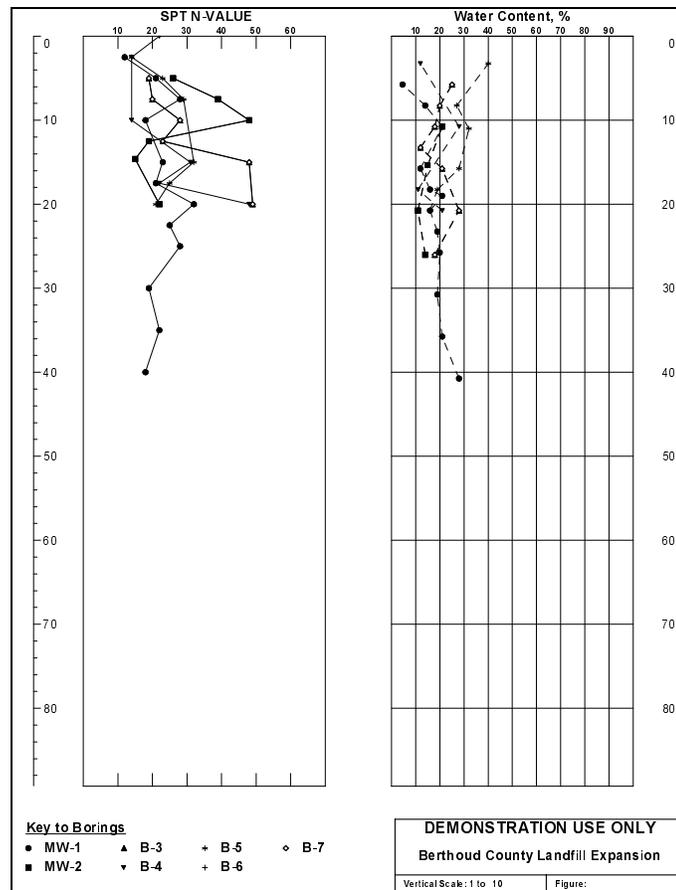


Figure 2.4 -- Multi-Source Graph

### 2.1.6 Project Summary

Project summary forms are special forms that are automatically generated by LD4 to show *all* of the data entered into a given source folder. These forms are useful in checking entered data against an original driller's log.

DATA SUMMARY														
File name: misc			Current Date: 8/23/99			Time: 3:43 PM								
***** Demonstration Boring Log Form *****														
Boring No.: B-1			Elevation: 169.956			Datum: assumed								
Location: See Attached Drawing			Driller: ACE Drilling			Logged By: A.P. Layne								
Drilling Method: Hollow-stem auger			Drill Date: Feb. 23, 1993			Depth to Water> at first check: 9.75			after 24 hrs.: 13.71			Drill Rejection (Y=Yes)?:		
Depth to Caving> 4.27			Notes: Intersection of Route 34 and highway 285											
Optional: Coords.> East: 2300			North: 6000			Station: 10000+0								
Depth	Sample No.	Sample Type	Sample Length (in.)	N-Value	Water Content	Plastic Limit	Liquid Limit	USCS/ASTM ID	Soil Symbols	Type of shear test	Shear strength	Description	Monitor Well Installation Schematic	Notes
0				75/1*			20	SP-SH	C	TV	3.7	Silty SAND, <u>fine</u> , red, brown, fine to medium grained, sandy, with rock fragments	CASED	2" diameter, sch. 40, PVC pipe in steel casing
0.76	S-1	F	45.7	12	14/w	13	32		EA	UU	.23			
1.52	S-2	F	45.7	21	8.7/b	32	99			VS	1.2	CONCRETE CUTTINGS		included in concrete misc. cuttings
2.28	S-3	F	45.7	28	5.4					UC	1.4	BENTONITE		bentonite slurry
3.04	S-4	F	45.7	75/5*	11.0					TV	2.3			
3.80	S-5	F	45.7	23	86.9							SOIL FLUORENOLITE, hard, decomposed, clay, angular, fine-medium gravel size	SAND	#3 sand
4.56	S-6	F	45.7	21	16									
5.32	S-7	F	45.7	17	42									
6.08	S-8	F	45.7	32	16									
6.84	S-9	F	45.7	25	19									
7.60	S-10	F	45.7	28	20					UC	2.4		SLOTTED	2" diameter, sch. 40, 8,020" slotted PVC casing
9.14	S-11	F	45.7	19	19									
10.68	S-12	F	45.7	22	21					SP	1	SAND, medium, tan, poorly graded, slightly compact, subrounded		PELLETS Medium bentonite chips
12.22	S-13	F	45.7	22	21					HP	3.2			
13.76	S-14	F	45.7	18	28	12	32			L		LIMESTONE, very hard, slightly fractured and decomposed		
15.30	S-15	V	31.4											
16.84										TV	4			
Standpipe piezometer installed Standpipe Dry on April 10, 1993														
Project: Berthoud County Landfill Expansion														
Project No.: 93X4123.4														
Client: City and County of Berthoud														
Profiles drawn by/approved by: RAL														

Figure 2.5 -- Project Summary

## 2.1.7 Symbol Legend

Symbol legend forms are used to draw legends of the symbols utilized in a batch of reports. See Section 3.2.3 in the User's Guide and Chapter 4 in the User's Guide for details on how legends are drawn.

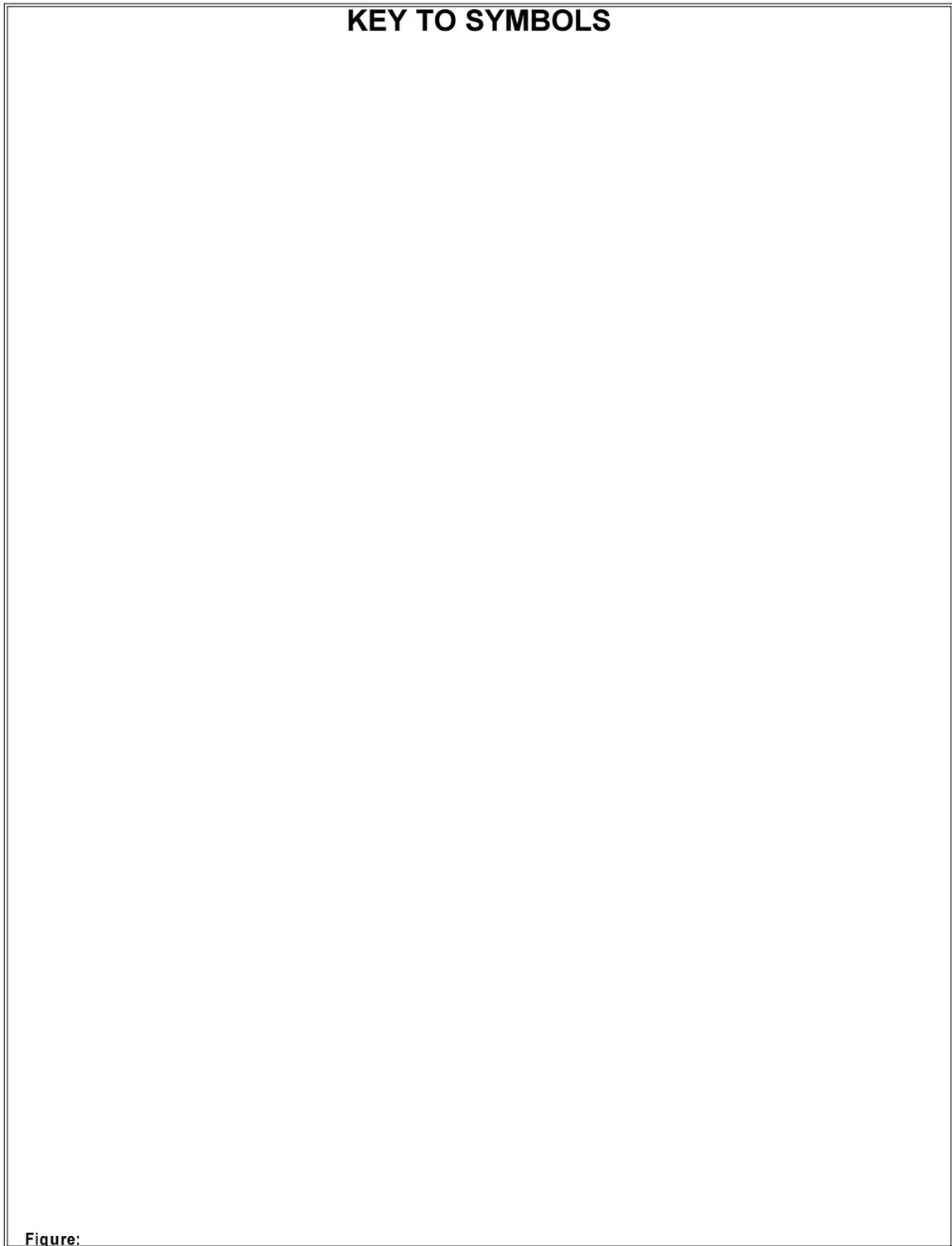
KEY TO SYMBOLS					
Symbol	Description	Symbol	Description	Symbol	Description
<u>Strata symbols</u>					
	Low plasticity clay		Silty gravel		Auger
	High plasticity clay		Well graded gravel		California sampler
	Silt		Silty clayey gravel		No recovery
	Elastic silt		Silty sand and gravel		Rock core
	Description not given for: "ZA"		Inorganic silts and clays		
	Silty sand		Fill		
	Limestone		Well graded gravel and sand		
	Basalt (or generic rock)	<u>Misc. Symbols</u>			
	CL fraction		Water table during drilling		
	Paving		Water table at boring completion		
	Well graded sand with silt	<u>Soil Samplers</u>			
			Standard penetration test		
<u>Notes:</u>					
1. Exploratory borings were drilled on 12-15-00 using a 4-inch diameter continuous flight power auger.					
2. No free water was encountered at the time of drilling or when re-checked the following day.					
3. Boring locations were taped from existing features and elevations extrapolated from the final design schematic plan.					
4. These logs are subject to the limitations, conclusions, and recommendations in this report.					
5. Results of tests conducted on samples recovered are reported on the logs.					
<u>Figure:</u>					

Not part of the form -- filled in at print time

Figure 2.6 -- Symbol Legend Report

- The report shown in Figure 2.2 has a legend on it; however, that report isn't a symbol legend form. In contrast to Figure 2.2, a symbol legend form only shows a legend -- it doesn't show data from any particular boring.

- Symbol legend forms only provide the basic outline of the printed legend. The symbols that are included on the printed legend aren't determined until LD4 prints the reports for which the legend will be drawn. (LD4 gets the descriptions for those symbols, along with a set of *legend notes* from a *legend file* associated with the project being printed.) A typical symbol legend form is shown on the following page: note that the area between the title and the bottom of the page is used at print time by LD4 to fill in the actual symbols used by the reports just printed.



**Figure 2.7 -- Typical Legend Form**

## 2.2 Sections of a Typical Report Form

For the purposes of editing, a LD4 report form is divided into a number of different parts, as shown in the figure below.

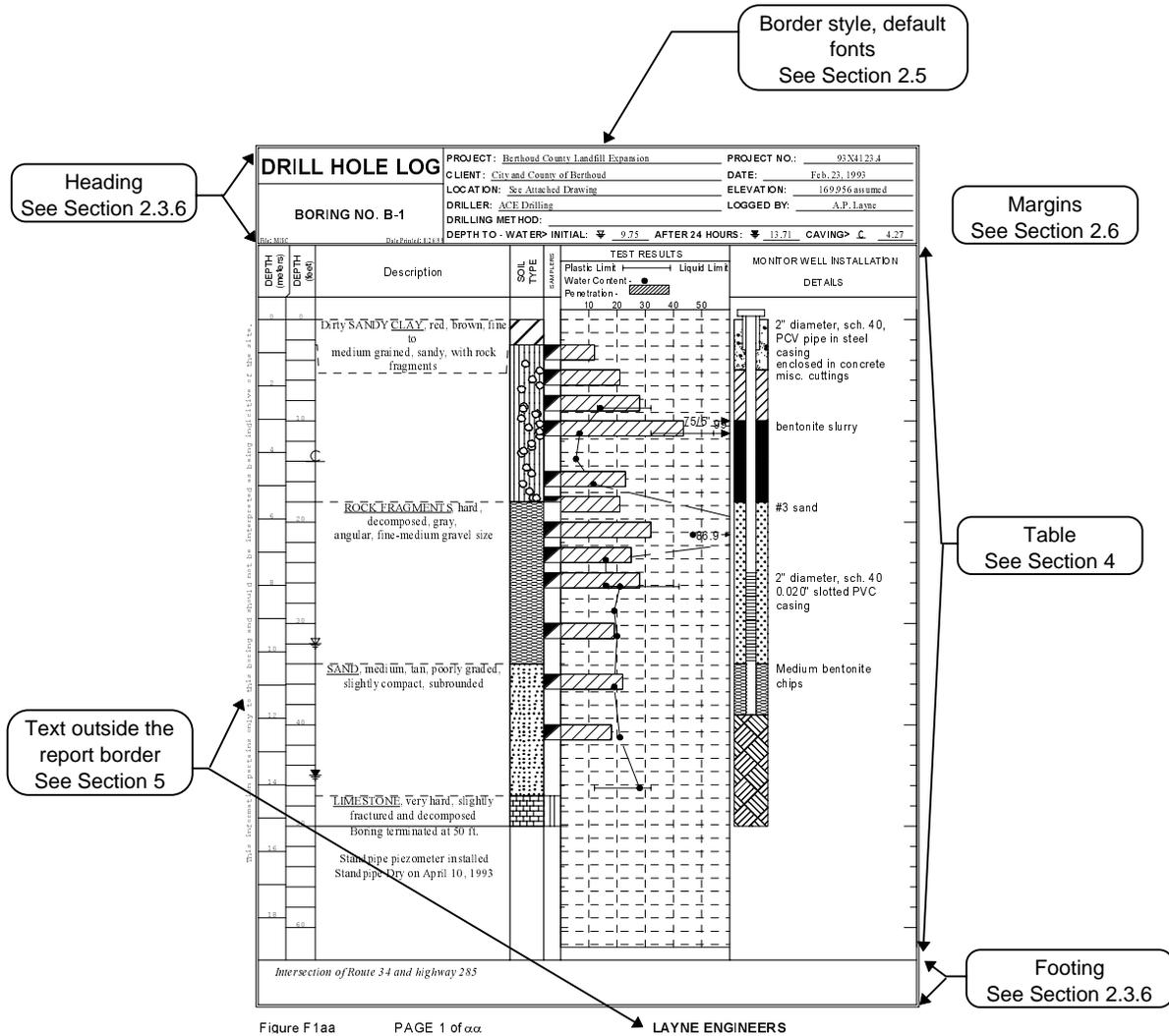


Figure 2.8 -- LD4 Boring Log Report

The following sections discuss the different parts of a typical report form.

---

### 2.2.1 Report Heading and Footing

LD4's heading and footing editor is used to modify basically all of the report form but the table section (see Figure 2.8). The report's heading and footing section usually lists various data on the project (such as the project number) along with the drilling location and conditions (such as the station number, method of drilling and sampling, driller's name, etc.)

- While the *table* created for one style of report form isn't generally interchangeable with the table created for another style of report (because, for example, a boring log's table section shows data scaled by depth while a summary report's table section just shows a list of data) the options available for the *heading* and *footing* portions of the report are identical for all of LD4's different report styles.

Typically the heading on the first page of each boring's report includes detailed information concerning the project, boring location, drilling method, groundwater depths, etc. If the log runs over to a second page you don't need to repeat most of that information so the heading on the second page and subsequent pages omits all but the most basic information. (You can see an example of this in Figure 2.8 -- note that most of the first page's heading is omitted from the second page, leaving more room for the second page's subsurface table.) LD4 allows you to set up report forms so that the heading and footing shown on the first page of a boring log are different than the heading and footing shown on subsequent (or continuation) pages, as shown in the two-page boring log report in Figure 2.9). Both versions of the report (the first page version and the subsequent page version) are stored in a single report form file.

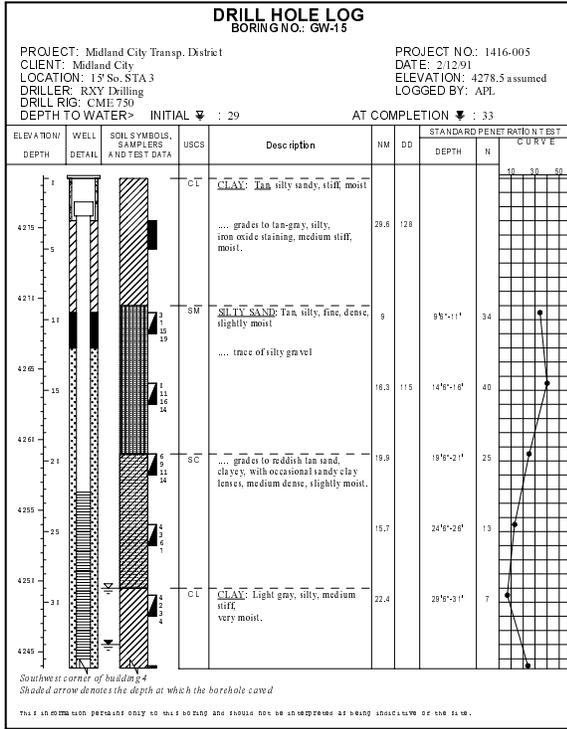


Figure PAGE 1 of ... DEMONSTRATION USE ONLY

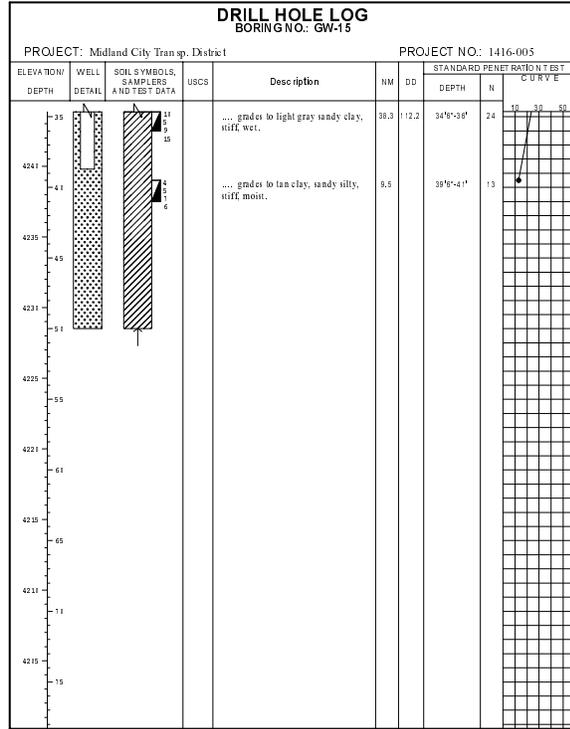


Figure PAGE 2 of ... DEMONSTRATION USE ONLY

Figure 2.9 -- Report Form with Different First and Subsequent Pages

The following table lists when LD4 uses the subsequent page heading and footings and when it returns to using the first page heading and footing.

<b>Report Style</b>	<b>Uses Subsequent Page Heading and Footing</b>	<b>Returns to First Page Heading and Footing</b>
<b>Subsurface Report</b>	After the first page of each boring.	When printing the first page of each boring.
<b>Subsurface Profile</b>	Never	Every page uses the First Page heading and footing. Since LD4 doesn't continue borings that run off the bottom of a profile, there is no option to set up a subsequent page heading and footing for the report.
<b>Single-Source Data Summary</b>	After the first page of each boring.	When printing the first page of each boring.
<b>Multi-Source Data Summary</b>	After the first page printed	Never. After the first page of the summary is printed, subsequent pages all use the "subsequent page" heading and footing.
<b>Multi-Source Graph</b>	Never	Every page uses the First Page heading and footing. Since LD4 doesn't continue borings that run off the bottom of a profile, there is no option to set up a subsequent page heading and footing for the report.

**Table 2.1 -- Uses of the *Subsequent Page* Heading and Footing Sections**

### 2.2.2 Report Tables

When you work with a report form's *table*, the options that are available to you depends upon the style of report you're editing.

Report Style	Table is Used For
<b>Subsurface Report</b>	Reporting subsurface data. The table is always scaled in terms of "x" feet of physical boring per inch of page space or "x" meters of physical boring per centimeter of page space. Typically, a subsurface report's table includes a strata layer descriptions, sampling information, a stratigraphy column, a monitoring well schematic, etc.
<b>Subsurface Profiles</b>	Reporting subsurface data. Again, tables are scaled in terms of "x" feet/meters of physical boring per inch or centimeter of page space. Even though a profile form can be used to draw more than one boring on a page, the same table definition is used to draw each boring. Typically, a profile report's table includes a column to show the stratigraphy of each boring; optionally, a symbolic representation of the boring's sampling intervals and sampling types, testing data and even graphs may be added.
<b>Multi-Source Graph</b>	Graphing subsurface data. Tables are scaled in terms of "x" feet/meters of physical boring per inch or centimeter of page space. The table tells LD4 what data items are to be graphed. Multi-source graph tables can't include any kind of stratigraphy representations, or print any text: they can only print graphs.
<b>Summaries</b>	Includes only text. Summary tables aren't scaled; each row of the summary table just picks off where the last row left off. You can't add stratigraphy columns, graphs, sampling types or monitoring well schematics to the either a single or multiple-source data summary's table.

**Table 2.2 -- Uses for the Table Section**

---



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## 2.3 Useful Concepts

The following sections provide some background material necessary before discussing the report form editing process.

---

### 2.3.1 Fonts

For hardcopy reports, LD4 supports the full range of Windows *TrueType* fonts: these are fonts that look the same whether they are displayed on the screen or printed on a printer. LD4 doesn't support built-in, downloadable or cartridge printer fonts *unless* an equivalent TrueType font is supplied by the printer manufacturer. By not supporting printer fonts LD4 ensures maximum portability between different hardware configurations.

- If a report form requiring a given font is moved to a computer that doesn't have that font installed, LD4 won't complain. Instead, the program will attempt to select an appropriate substitute. The report form may also be modified without having the font available -- LD4 will keep track of the missing font and will begin using it once the form is moved back to the original computer.

The following figure lists some fonts that are common to **all** versions of Windows (additional combinations of fonts may be found on many computers).

Font Name	Sample
Arial	Windows is a computer virus with a user interface
Times New Roman	Windows is a computer virus with a user interface
Courier New	Windows is a computer virus with a user interface

**Table 2.3 -- Built-in Windows Typefaces**

- In addition, if you have Adobe's ATM (Adobe Type Manager) program you can use the Type-1 Postscript fonts that are included with software such as Adobe's Illustrator program. However, incompatibilities have been found between LD4 and ATM in printing text that has been rotated from horizontal: if you have WindowsNT or Windows2000 you're better off using the operating system's built-in ability to convert Type-1 fonts to TrueType.



- If you'll using the report form to generate reports in AutoCAD .DXF format (see Section 3.2.7 in the [User's Guide](#)) you should fixed-space fonts for *everything*. AutoCAD versions 13 and older and IntelliCAD98 do not support TrueType fonts so LD4 makes substitutes a fixed-space CAD equivalent. Optionally, you can make up the form using proportionally spaced fonts then save a copy (see Section 2.4) of the form that you can modify to only use fixed-space fonts.

---

### 2.3.2 Measurement Units

Table column widths, page sizes, well construction pipe diameters and many other dimensions may be changed as part of the report form editing process. LD4 uses either inches or centimeters for all dimensions; this choice is set through the Windows Control Panel (Section 1.3 in the [User's Guide](#) gives directions on changing the setting). You may switch between measurement systems at any time -- the next time you edit a report form, LD4 will convert all of your old measurements into the new system.

---

### 2.3.3 Colors

Many parts of a LD4 report form may be *designed* in color; however, if the printer that is used to produce the actual report doesn't support color, Windows will decide how best to represent the color using just black and white. Often times the results may be undesirable. It's best to design your report to only use black colors unless you will be using a color printer exclusively.

If your printer does support color you still may want to stick with black-and-white. Color printouts take longer to print and are typically more expensive to produce. Additionally, if you will be exporting the report to an AutoCAD-compatible .DXF file, note that the export facility supports a limited range of colors.

---

### 2.3.4 Paper Sizes

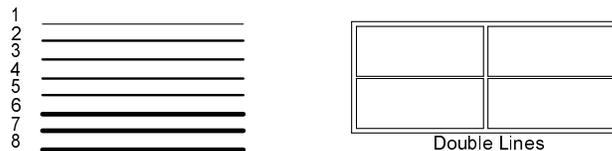
When setting up a report form, there are two paper sizes to consider: the *as-designed* page size, and the *as-printed* page size. While reports may be printed on any paper size, during the process of designing a report form you must select a single paper size. This selection determines the as-designed page size: for the purpose of designing the form, the boundaries of the report page are set to the as-designed size.

When it's time to print the form, LD4 prints on the paper that is chosen through the standard Windows print setting dialog (you can display this dialog just before printing by selecting Print > Printer Setup). By changing the print setting, the user can select a different *as-printed* page size. If the size of paper that was used to design the form doesn't match the size of paper on which the form is being printed, the program scales the as-designed form up or down to fit the as-printed paper. This allows the same form to be printed on letter-sized paper on a laserprinter and on an electrostatic plotter on 11x17" paper.

---

### 2.3.5 Line Weights and Colors

LD4 report borders, table columns, etc. are composed of vertical and horizontal lines -- LD4 allows you to specify the *weight* and color of these lines.



**Figure 2.11 -- Line Weights**

- Line *weights* are given in units of 1/300th of an inch: a **1** weight line is 1/300" thick; an **8** weight line is 8/300" thick.

---

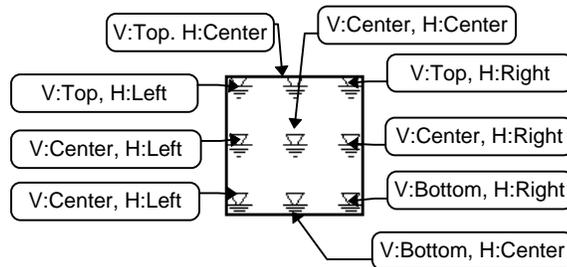
**Note:** If you print your report at a resolution less than 300 dots-per-inch (dpi) the differences between, for example, a **1** and **2** weight line will not be noticeable.

---

- Additionally, many lines may be drawn as "double", meaning two parallel weight-1 lines.
- Note that due to current Windows limitations, all dotted and dashed lines are drawn as a 1 weight.

### 2.3.6 Justification

Most of the items placed on a LD4 report form are *justified*, meaning that they are horizontally left, right or center aligned, and vertically top, bottom or center aligned. The diagram below shows the effect of various justification selections on a groundwater symbol:



**Figure 2.12 -- Effects of Justification Selections**  
 (“V” for Vertical; “H” for Horizontal)

- Justification is always relative to the nearest item to the left, right, top and bottom of the item being justified; the nearest item may be another item of text, a line, a graphical symbol, etc.
- When working on the report’s heading and footing, you can also select “None” for the *vertical* justification: the item you’re placing is drawn at the bottom of the row where it was placed.
- In the report’s heading and footing, “None” *horizontal* justification draws the item in the horizontal position that you placed it.

---

### 2.3.7 Report Form Versioning

As a sort of “undo” option that lasts between editing sessions, whenever a report form is saved, LD4 also saves several previous copies of the form. If you find that you’ve made a mistake the last time you edited a form and you aren’t sure exactly what you did, you can return the form to the state it was in before you started your last editing session.

#### To revert a report form back to a previous version:

1. If you just want to get rid of any changes that you have made during the current editing session, just choose Report > Abandon Changes. If you want to go back to a version of the form *older* than the one that you are currently editing, choose Report > Revert to Previous Version and proceed to Step 2.
  - > If Revert to Previous Version isn’t available, then you are either A) editing a new form (which of course doesn’t have any previous versions), or B) editing a LOGDRAFT III compatible form. LOGDRAFT III compatible forms can’t store previous versions -- if you would like to use the versioning capability, select Sections > Form Settings and turn off the **LOGDRAFT III compatible form** box.
2. LD4 will display a dialog listing the previous versions of this form that are available, in order from newest to oldest. (The dates and times shown for each version represent when the form was saved with that version.) To go back to a previous version, double-click on an entry in the list.
  - > Note that once you go back to a previous report form version any versions created *after* that version are lost, including the one on which you were working. *However*, this doesn’t become permanent until you either save the form (using Report > Save) or exit (Report > Exit). This provides one “trick” that can be used to keep both an older and newer report version: after reverting to a prior version, choose Report > Save As and save the form under a new name. The original (newest) copy stays saved under the report’s original name and the older version is saved under a newer name.

Copies of the earlier report form versions are saved in the same file as the current report form, so they take up some file space. Typically, this isn’t a problem, as the total report form file -- with backup copies -- is usually smaller than 32K bytes; however, if you would like to save some file space (perhaps because you will be e-mailing the form) or just to finalize your work, you can discard the previous form copies by selecting Report > Strip Previous Revisions. While this can’t be undone, you can recover the revisions by selecting Report > Abandon Changes immediately.

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## 2.4 Creating and Modifying Report Forms

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**Caution:** Hard disk failures happen! If you modify a report form, be sure to save a copy of the modified form onto a floppy disk or tape drive.

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### To modify a report form:

1. From LD4's opening screen click on the Reports tab then double-click on the report you want to modify.

**or**

1. Open up a project then preview a report on-screen (see Chapter 3 in the User's Guide).
2. Choose Report > Change How This Form Looks...

**or**

1. Click on the  button at the lower-right of the LD4 data entry screen (see Section 2.5 in the User's Guide).

### To create a new report form:

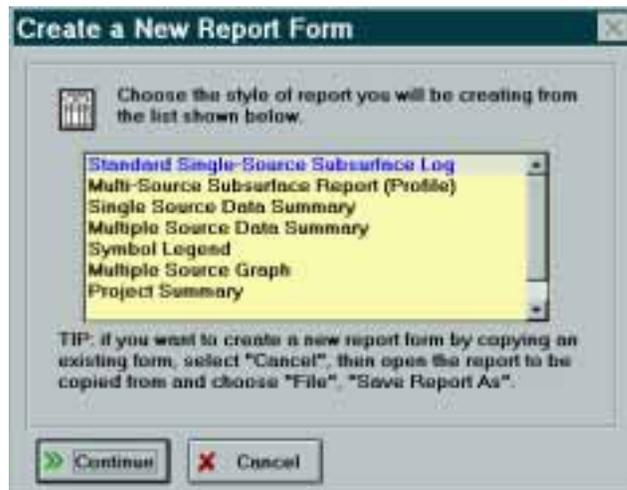
1. Choose an existing report form that looks similar to the form you want to create, then open it for modifications by following the steps above.
2. From Report Form Designer choose Report > Save As and type in the name you've chosen for your new form

**or**

1. From LD4's opening screen click on the Reports tab.
2. Enter a name and description for your new report form then click on **OK**. If a form with that name doesn't already exist, LD4 will create a new, blank version.

**or**

1. While modifying an existing report form choose Report > Create from Scratch.
2. Enter a name and description for your new report form.  
➤ See Appendix B in the User's Guide for guidelines on naming your new report form.
3. From the Create a New Report Form dialog (Figure 2.13) select the type of form you want to create.



**Figure 2.13 -- New Report Form Dialog**

➤ See Section 2.1 for a discussion of the various report types.

4. When editing a report form, LD4 looks up the data entry form associated with the report form to figure out what data entry fields are available to be printed on the report (see Section 2.7). From the Data Entry Form dialog, choose the data entry form that you'll be using with projects to be printed with your new report.

Rather than editing whole report form at once, LD4 has separate facilities for editing the report's heading and footing, for editing the report's table section and for placing small items of text anywhere on the page, including outside the report's border. These facilities are discussed in the following sections.

---

## **2.5 The Form Settings Dialog**

The Form Settings dialog contains options that affect the entire report form such as the form's border style and the default font styles. Choosing Sections > Form Settings displays the Form Settings dialog -- since the dialog is tabbed, the following sections discuss each tab in detail.

### 2.5.1 The Report Tab



Figure 2.14 -- The Form Settings "Report" Tab

- **Style of report** lists the report's type -- see Section 2.1. This setting may not be changed once the form has been created.
- **Form size** -- LD4 reports are designed to fit within a certain page size (see Section 2.3.2). Keep in mind that just because you're designing a report for a given paper size it doesn't mean that you have to print the report on that size paper. LD4 will adjust your report form to fit any physical paper size.
- **Orientation** -- LD4 reports can be in either *portrait* orientation, which means the top of the report runs along the short side of the paper, or *landscape*, which means that the top of the report runs along the long side of the paper.
- **LOGDRAFT III compatible form** -- check this setting only if you'll be using the form with the old MS-DOS LOGDRAFT program. When you save a report that uses this setting the report loses all color and TrueType font selections and all new reporting options not supported with LOGDRAFT III.

### 2.5.2 The Border Tab



Figure 2.15 -- The Form Settings Border Tab

The Border tab allows you to specify the thickness of the border drawn around your report -- you can also choose a double-line border (see the example in Figure 2.16).

- Checking the **Include company name in bottom center of border** box adds the name of your company to the bottom center of the border (again, see the example in Figure 2.16). Note that the company name included in the border is coded into the license file created when you licensed the software: if your company name changes, contact GEOSYSTEM Software for an updated license module.

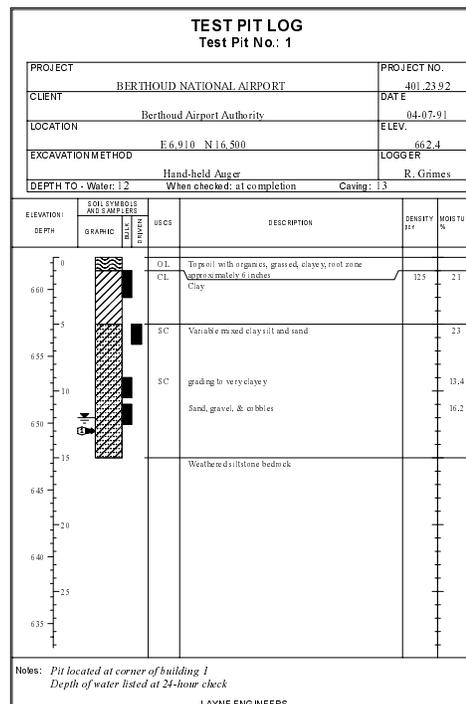


Figure 2.16 -- Report with Double-Line Border and Company Name

### 2.5.3 The Head/Footing Tab



Figure 2.17 -- The Form Settings Head/Footing Tab

The Head/Footing tab determines the font that the program uses when you add text or a data to the heading or footing of a report form. You can always choose a different typeface or font size for anything that you put onto the form -- the Head/Footing tab just determines the font that will be used if you don't choose something different.

- Checking the **Underline the user's data** option adds underlines to every data entry field that you print in the report's heading or footing, similar to the figure shown below:

LOCATION: See Attached Drawing

Figure 2.18 -- Underlined Data Entry Field

(The boring log shown in Figure 2.1 includes a number of fields printed with an underline.)

Once again, the underline option is just a default: you can still tell LD4 omit the underline from any single item that you add to the report (see Section 3.6).

- Choosing the **titles and data will be located within boxes** option provides an effect like the one shown below:

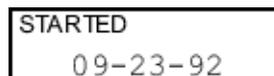


Figure 2.19 -- Boxed Title and Data Field

Again, this effect is just a default that can be changed for any individual item added to the form (see Section 3.6).

## 2.5.4 The Table Tab



Figure 2.20 -- The Form Settings Table Tab

The Table tab determines the font that the program uses for the captions shown above the report's table, as well as the data printed in the table. You can always choose a different typeface or font size for anything that you place on the form: the Table tab just determines the font that will be used if you don't choose something different for any individual table column's title or data.

## 2.5.5 Additional Form Settings for Profiles

When editing a profile form, the Form Settings dialog includes an extra tab, shown below.

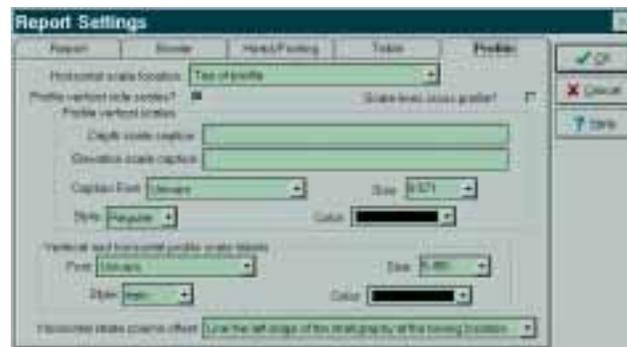


Figure 2.21 - Form Settings Profile Tab

- **Horizontal scale location:** This selection takes effect when plotting horizontally scaled profiles (see Section 5.3.2 in the [User's Guide](#)). You can have the program draw a distance scale at the top or the bottom of the profile table section, or to omit the scale altogether.

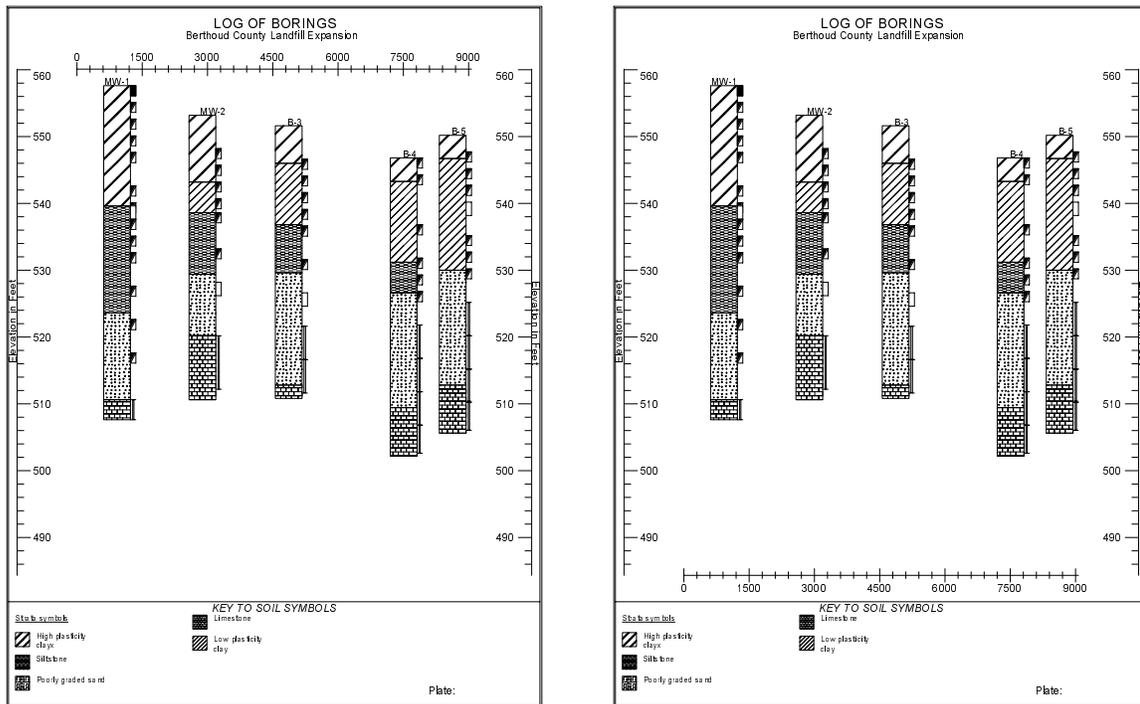


Figure 2.22 -- Profiles with Scale at Top and Bottom

**Note:** If you're trying to add annotations to a profile for a project that doesn't have boring location coordinates (as discussed in Section 5.4.8 of the [User's Guide](#)), you may want to choose the option to drop the horizontal scale. Otherwise, the scale will display your "fake" boring coordinates.

- **Depth scale caption and Elevation scale caption:** All profiles have scales, showing either depth or elevation, on each side of the subsurface area. Both elevation and depth scales have captions that are printed on the side of the scale ("Elevation in Feet" in Figure 2.22): these captions are entered at the **Depth scale caption** and **Elevation scale caption** prompts.

**Note:** When printing a profile the user can choose between scales in meters and scales in feet (see Section 5.1 in the [User's Guide](#)). Since you don't know when designing the profile form which units will be used for the side scales, leave off the measurement units from your scale captions. (For example, instead of entering **Depth in feet** for your depth scale caption, enter **Depth in.**) When the profile is printed, LD4 will add the appropriate units to the end of the caption.

If you want LD4 to insert the scale units somewhere in the *middle* of your caption, use **feet** or **meters** to mark where you want the units to go. For example, **Depth in feet, MSL** will print out as "Depth in feet, MSL" or "Depth in meters, MSL", depending, of course, on the user's choice for the profile's vertical scale.

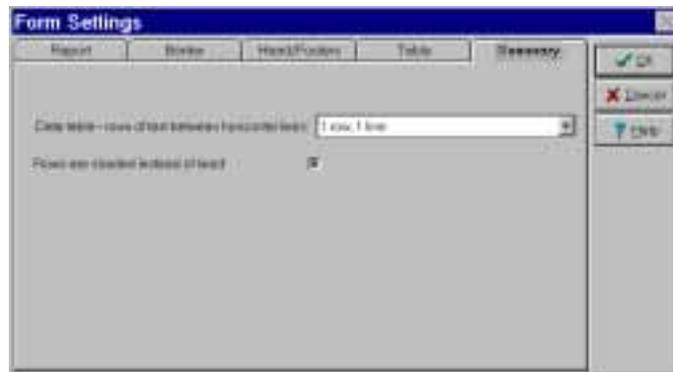
- **Horizontal strata column offset:** This prompt allows you to choose how where LD4 will place borings on horizontally scaled profiles. Three options are available: “No offset” starts plotting each boring’s information flush with the boring’s horizontal coordinate, “Center soil graphic column at the boring location” plots each boring so that the center of the graphic soil column is at the boring’s horizontal coordinate and “Line the left edge of the soil graphic at the boring location” plots each boring so that the left-hand side of the soil log column is at the boring’s horizontal coordinate.

The **Horizontal strata column offset** option is provided so that profiles showing data or symbols on the left side of the boring’s soil graphic column can have the soil graphic column printed at the boring’s horizontal coordinate, rather than having the boring data on the left of the soil column start at the boring’s horizontal coordinate with the soil column to the right of that.

---

### 2.5.6 Additional Form Settings for Data Summaries

When editing either a single-source or multi-source summary form (see Sections 2.1.3 and Section 2.1.4) the Form Settings dialog includes an extra tab, shown below:



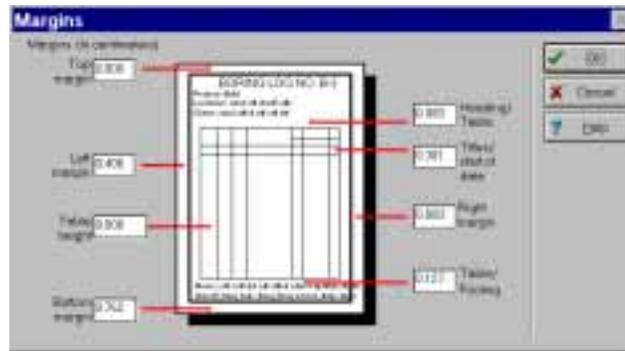
**Figure 2.23 - Report Setting Summary Tab**

- The **Data table - rows of text between lines** selection allows you to have horizontal lines drawn between rows on the summary’s table, one line per source if you want to draw a line between each boring on a multi-source summary or one line every X table rows as an aid to reading the table.
- If you’ve chosen to draw lines on the table you can substitute greenbar-style shading by checking the **Rows are shaded instead of lined** box.

---

## 2.6 Margins

Choosing Sections > First Page Margins or Sections > Subsequent Page Margins displays the Margins dialog, shown below.



**Figure 2.24 -- Report Margins Dialog**

The Margins dialog allows you to adjust the size of the blank space on the top, bottom, left and right side of the report; additionally, you can adjust the height of the tabulated area of the report.

- For most forms you'll want to provide a margin on the left or right edge for binding the report into a spiral or three-hole punch binder. If you'll be printing logs on the front **and** back of the paper, set up the left margins of the *First Page Form* to be 0.25" (0.64 cm.) then set up the **right** margin of the *Subsequent Page Form* to be 0.25" (again, 0.64 cm).

If you'll just be printing on one side of the page, set up the left margins for both forms to be 0.25" (0.64 cm.).

---

**Note:** Inkjet printers use a paper handling method that renders a large section on the left edge of *portrait*-oriented reports unusable (on *landscape*-oriented reports, a section along the top edge of the report is lost). If you'll be printing on an inkjet you may have to use trial-and-error to get your margins correct.

---

- The **Heading/Table** margin is the blank space between the bottom of the report's heading and the horizontal line above the report's table titles. Similarly, the **Table/Footing** margin is the blank space between the end of the report's table and the top of the first title in the report's footing.

---

**Note:** Providing a *negative* heading/table margin drops the heading down into the table's title block.

---

- The **Titles/Start of data** margin allows you to specify a blank vertical space between the bottom of the table's title block and where the program starts printing the table's data.

---

**Note:** For boring logs and other subsurface reports, if you choose to have a “continue” symbol shown in the stratigraphy or monitoring well columns (see Section 4.6.4 and Section 4.13), LD4 requires a minimum Titles/Start of data margin of 0.15 inches (0.38 cm). If you select a smaller margin, LD4 will override your selection when the report form is printed.

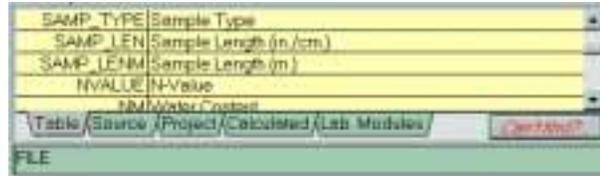
---

- The **Table height** measurement is useful for creating boring logs that show, for example, exactly 60 vertical feet per page. To do this:
1. Figure out the vertical scale you’ll be printing with (see Section 3.2.4 in the User’s Guide) -- this will be “X” feet or meters per vertical inch or cm.
  2. Figure your table height: if you want “Y” feet on a single page and your scale is “X” feet per inch, your table height will be “Y/X” inches.
  3. Open the Report Margins dialog for the report you’ll be printing with and enter the number you figured in the previous step into the **Table height** field. (The border of the dialog will say either “Margins (in inches)” or “Margins (in centimeters)” -- make sure to use the correct measurement units.)

---

## 2.7 The Report's Data Entry Form

Oftentimes when you're modifying a LD4 report form you'll be presented with a list of data entry fields, such as the one below:



**Figure 2.25 -- Dictionary**

These lists, called *dictionaries*, give the names of data entry fields that are used to enter subsurface, boring and project data. You can print out what's entered into these fields on a report, use them in mathematical equations, use them to determine the lengths of sampling intervals, etc. To build this list, LD4 needs to know what items of information will be entered into your project files (so that you only try to print data that you can actually enter). Recall from Chapter 1 that LD4 uses a file called a *data entry form* to determine what prompts and data entry fields will be shown to the user when he's entering data into his project. LD4 also uses a data entry form file to determine the names shown in a dictionary list.

LD4 uses a single data entry form file to figure out what items of data will be available for printing with projects that use that data entry form. While you're editing a report form LD4 doesn't know what projects will be printed with the form so it can't figure out which data entry form will be used with those projects: you give the program this information by associating a particular data entry form with each report form.



When you're modifying a report form, if you can't find a data entry field's name in the dictionary you probably have the wrong data entry form associated with your report. Follow the directions given below to make sure LD4 uses the data entry form that you'll be using with projects to be printed with your report form:

**To figure out what data entry form is associated with a report:**

1. Open the report form for modification (see Section 2.4): the opening information screen specifically lists the data entry form associated with the report.

**To change the data entry form associated a report:**

1. Choose Sections > Data Entry Form.

**or**

1. Click on the **Can't find** button displayed at the bottom of any dialog that shows a dictionary.



### 3. Editing the Report's Heading and Footing

A report form's heading is the section of the form between the top of the page and the report's table; the report's footing is the section between the bottom of the report's table and the bottom of the page.

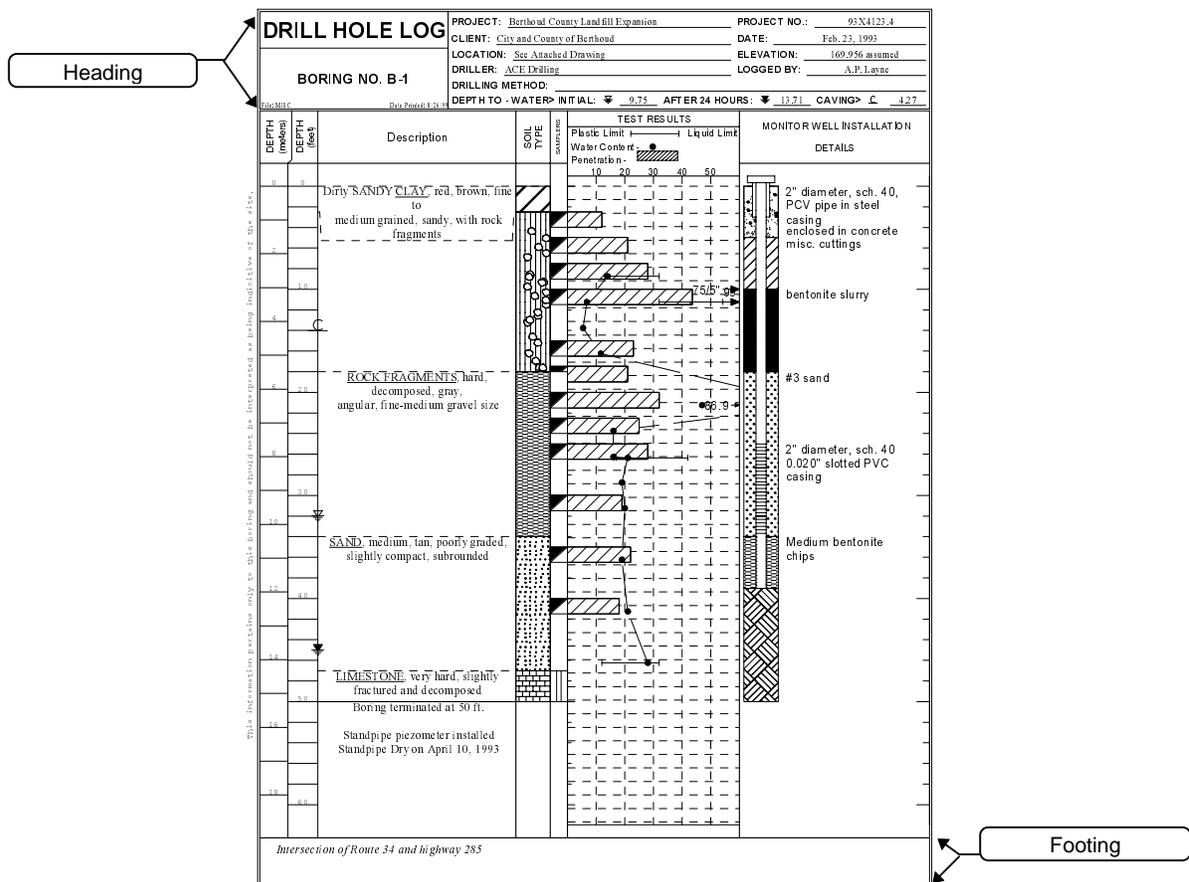


Figure F1aa PAGE 1 of αα LAYNE ENGINEERS

Figure 3.1 -- Report Heading and Footing

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### 3.1 The Report Heading / Footing Editor

Change your report's heading or footing by choosing [Sections > First Page Heading](#), [Sections > First Page Footing](#), [Sections > Subsequent Page Heading](#) or [Sections > Subsequent Page Footing](#) -- this brings up the Report Heading/Footing editor.

- When you're creating a report form from scratch, begin by working with the "First Page Heading" and "First Page Footing" section. **Until you make the first modification to the "Subsequent Pages" heading or footing, these sections of the *subsequent page* form remain identical to what you've set up for the *first page* form.** Until you change the subsequent page's heading or footing LD4 applies any changes you make to the first page heading/footing to the subsequent page as well.

Subsequent page heading and footing sections are usually just stripped-down versions of the first page heading and footing (see Figure 2.8 for a good example -- notice that much of the information from the first page's heading isn't repeated on the second page). Leaving your "subsequent page" form modifications until after you've completed the first page heading and footing means that you can just delete items from the subsequent page heading/footing until you've removed all the unnecessary information.

As long as the heading or footing on the first page form is identical to the heading or footing on the subsequent page form, if you make a change to the first page heading/footing the same change will be made to the subsequent page form. **Once you make your first modification to the subsequent page heading or footing, future changes made to the first page form's heading/footing will no longer be automatically copied to the subsequent page form.**

- You can return a subsequent page heading or footing so that it matches the first page version by opening up the first page heading or footing and selecting [Special > Make Subsequent Pages Identical](#).

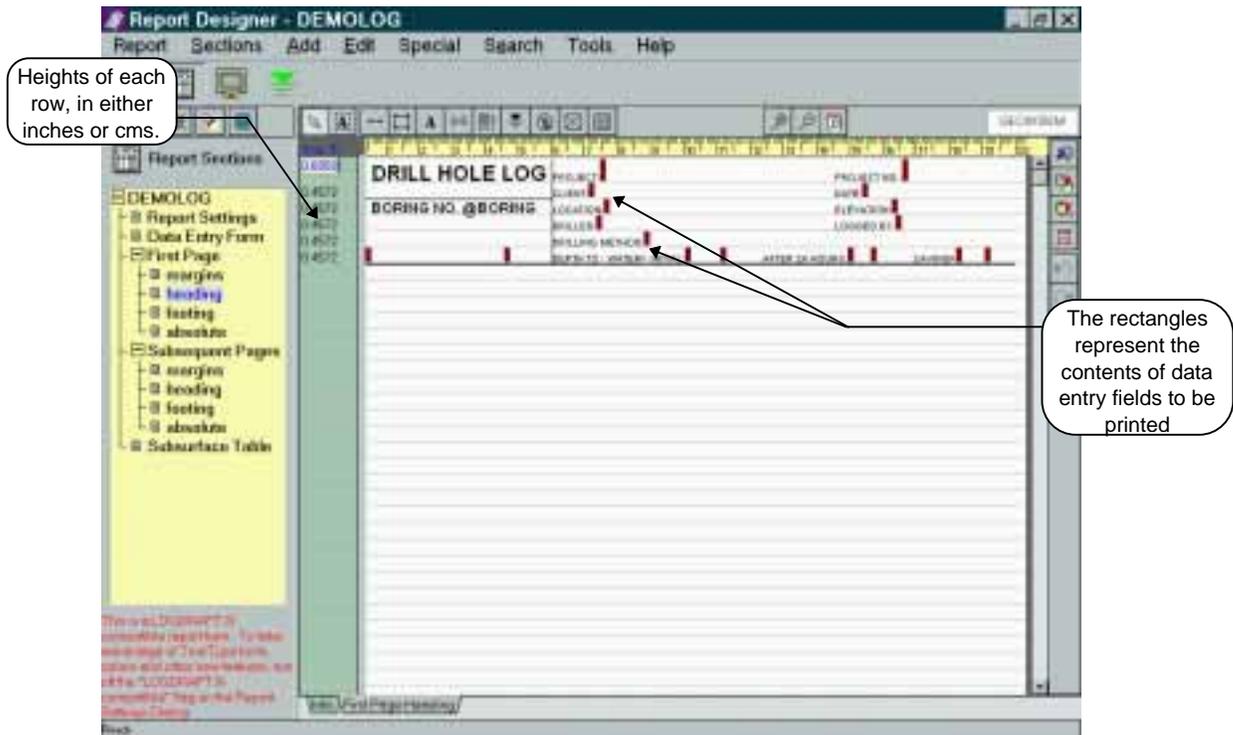


Figure 3.2 -- Report Heading/Footing Editor

- The heading and footing sections are divided into columns -- the width of each column depends upon the **Default font for titles** that you've selected from the **Head/Footing Form Settings** tab (see Section 2.5.3). When you place something onto a report's heading or footing, it always shifts to the nearest character column.

### 3.2 Drawing Horizontal and Vertical Lines

You can draw horizontal or vertical lines in your report's heading or footing. The screenshot in Figure 3.4 shows a report form that utilizes a number of different lines.

**To draw a line on the heading or footing of your report:**

1. Open the report heading or screen (see Section 3.1).
2. Choose Add > Lines.
3. In the Line Properties dialog, choose the weight and color of the line to be drawn.



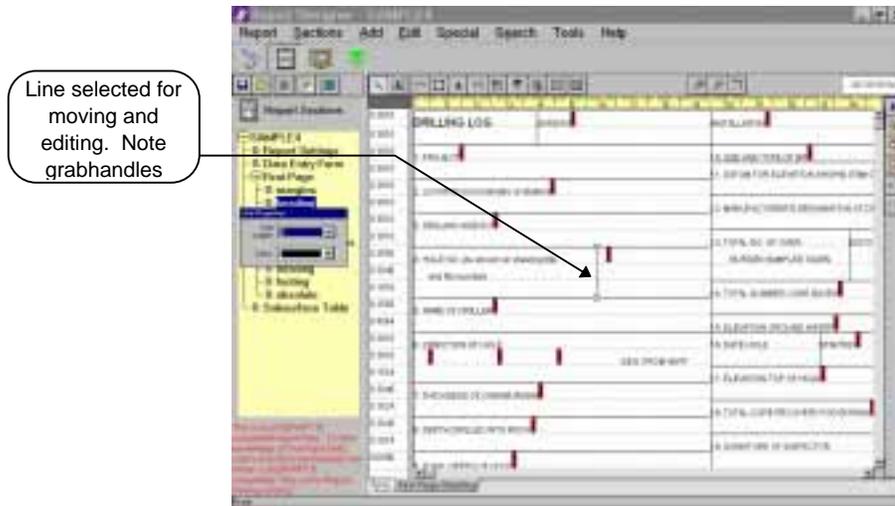
**Figure 3.3 - Line Properties Dialog**

4. Move the mouse to the row and column where the line will start then click the left mouse button.
5. Move the mouse to the row and column where the line will end then click the left mouse button.

**Note:** Vertical lines always “snap” to the nearest character column, as do the left and right ends of horizontal lines. If you change the size of the **Default font for titles** the relative locations of the report's lines will shift around. (For example, if you halve the default font size, a given vertical line will be twice as close to the left-hand report margin.)

**To extend or shrink a line that you've already drawn:**

1. *Make sure that the  button is down* then move the mouse cursor over the line and click the left mouse button: “grabhandles” should appear at either end of the line.
2. Press the left mouse button with the mouse over the grabhandle at the end of the line to be moved then, *while holding the button down*, drag the mouse to shift the line end.

**Figure 3.4 -- Line Selected for Modification****To delete a line:**

1. *Make sure that the  button is down* then move the mouse cursor over the line and click the left mouse button: “grabhandles” should appear at the end-points of the line.
2. Select Edit > Delete.

**To change a line's weight or color:**

1. *Make sure that the  button is down* then move the mouse cursor over the line and click the left mouse button. The “grabhandles” shown in Figure 3.4 should appear along with the Line Properties dialog shown in Figure 3.3.
2. The dialog shows the current weight and color for the line: once you've made your changes, click anywhere on the report form to see the result.

---

### **3.3 Drawing Rectangles**

LD4 also includes a tool for drawing rectangles on the heading or footing of a report.

**To draw a rectangle on the heading or footing of your report:**

1. Open the report heading or footing screen (see Section 3.1).
2. Choose Add > Rectangles.
3. Check the Line Properties dialog (Figure 3.3) to make sure that the correct line weight and color are selected.
4. Move the mouse cursor to the location for the top-left corner of the rectangle then press the left mouse button.
5. *While holding the left mouse button down* move the mouse cursor to the location for the bottom-right corner of the rectangle then release the left mouse button.
  - Once you've drawn a rectangle LD4 treats it as four separate lines so you can delete or move an edge of the rectangle without affecting the other edges.

---

### **3.4 Inserting and Deleting Rows**

**To delete an entire row from the report heading or footing:**

1. Open the report heading or footing screen (see Section 3.1).
2. Click the mouse *in the row height column* on the row that you want to delete, then choose Edit > Delete Row.

**To insert a row into the report's heading or footing:**

1. Open the report heading or footing screen (see Section 3.1).
2. Click the mouse *in the row height column* on the row that will be immediately *below* your new row, then choose Edit > Insert Row.

Note that you don't need to go through this procedure if you'll be adding a new row below the last row that has something on it -- just use the blank row that's already there.

### 3.5 Adding Text and Data Entry Fields

You can add plain text or the contents of a data entry field to the heading or footing your report form. Many times you'll want to do both at once: In the example below,

**Project No.: 99a123.012**

the "Project No." part remains constant for every report you print, while the "99a123.012" was typed into a data entry field -- when setting up your report form the "Project No.:" part and the data entry field printout are added at the same time.

**To print text or a data entry field in a report's heading or footing:**

1. Open the report heading or footing screen (see Section 3.1).
2. Choose **Add > Text**.
3. Move the mouse cursor to the row and column where the text is to be located then click the left mouse button. LD4 responds by displaying the Text and Data dialog.



**Figure 3.5 -- Text and Data Dialog**

4. Enter any kind of static text into the **Text** field. (In the example discussed earlier, **Project No.** would be in the **Text** field.)

You can insert *type symbols* such as Greek letters, the degree symbol, etc., into the **Text** field by pressing function key F9 -- see Section 2.5.1 in the [User's Guide](#) for details.

5. The **User-entered or calculated data** field is for selecting a data entry field whose contents will be printed. The *dictionary* below the field lists the data entry fields available for printing. In the example discussed in the beginning of the section, **PROJ\_NUM** (the name of the data entry field used for entering project numbers) would be entered into the **User-entered or calculated data** field.
  - The **Source** and **Project** dictionary tabs select different types of data entry fields: **Source** data entry fields contain data about a single boring, test pit, etc., while **Project** fields contain data about the entire project (such as the Project Number).

The **Calculated** tab lists information that LD4 comes up with on its own without data entry. Examples include the current date and time, the name of the project, etc., as well as figure and page numbers, which are discussed in Section 3.15.

- One of the most useful fields listed on the **Calculated** tab is BORINGEND: this field lets you print the depth to the bottom of the boring *without adding a data entry field*. LD4 automatically calculates the boring termination depth based upon the depth entered into the last data entry card: that value is placed into BORINGEND. If you use the Text and Data dialog to add the text **Boring terminated at:** and place **BORINGEND** into the **User-entered or calculated data** field, your reports will show the boring termination depth.

Double-click on a field listed in the dictionary to include that field in your report. If you also entered something into the **Text** field, the data entry field will be printed just to the right of the **Text** field's contents.

6. **Before closing the dialog**, check the **Title and Data Settings** dialog (this is a second dialog that is always displayed when you're adding a piece of text or a data entry field to the report form). The current settings of this dialog determine where your new items will be printed, as well as the font used to print them. This dialog is discussed further in Section 3.6.
7. Clicking on the **Place** button adds the new title and/or data to the report form.

### 3.6 The Text and Data Settings Dialog

The Text and Data Settings Dialog affects the appearance of any new item placed onto the report's heading or footing section: the current font and justification settings showing in the dialog are attached to the new item.



Figure 3.6 -- Title and Data Settings Dialog

- When you click on the **Place** button (see Section 3.5) the new text/data field added to the report are assigned the font and justification settings displayed in the Text and Data Settings dialog.
- If you don't change them, the font selections given to the newly added text/data field are those chosen in the **Head/Footing** tab of the Form Settings dialog discussed in Section 2.5.

Also, the font for *all* text or data fields that are using the default font selections can be changed by modifying the font selections on the **Head/Footing** tab of the Form Settings dialog.

- If you change the font selections from the default values the new selections remain in effect for any text/data field added to the report in the future: to get back to the default selections, click on the **Reset** button.
- The **Justify** settings allow you, for example, to center an item of text vertically within a rectangle. The figure below shows the effect of some common **Justify** settings:

ENGINEER/ARCHITECT:	ALV	CASING	SAMPLER
DRILLING FOREMAN:	M. KASTLE	TYPE:	BY 6/
SUPERVISOR:	C. SHERN	SIZE, I.D.:	100mm 50mm

Figure 3.7 -- Justify Settings Example

ENGINEER/ARCHITECT, DRILLING FOREMAN, MUD INSPECTOR, etc. were set up with “V: Center, H: None” title justify. Look at the screen-dump of the report form’s heading shown below: the “H: None” horizontal justification setting ensures that ENGINEER/ARCHITECT, DRILLING FOREMAN and MUD INSPECTOR print out at the horizontal location where they were placed on the report form.

ENGINEER/ARCHITECT	DATE	SAMPLER
DRILLING FOREMAN	TYPE	
MUD INSPECTOR	SIZE ID	

**Figure 3.8 -- Previous Example Report Design Screen**

In contrast, notice in the printed version that CASING and SAMPLER are centered vertically and horizontally while in the report design they are aligned to the left. This demonstrates the effect of the “V: Center, H: Center” justification, which centers the item both vertically and horizontally within its surrounding borders.

See Section 2.3.6 for a further discussion of justification.

- Checking the **Box title and data** selection overrides the justification selection -- instead, LD4 automatically selects “V:Top, H:Left” justification for the title and either “V:Bottom, H:Center” or “V:Center, H:Right” justification for the data field, depending upon the height of the box in which the items are being placed. The overall effect is shown below:

STARTED
09-23-92

**Figure 3.9 -- Boxed Title and Data Field**

---

### 3.6.1 Boxed Titles Split onto Two Lines

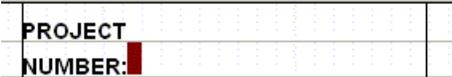
Sometimes a boxed title is split onto two lines:



**Figure 3.10 -- Two-Line Boxed Title**

LD4 doesn't officially support this; however, there is a way to get the same effect:

1. Place the second line of the title on the row below the first line. Attach your data field to the bottom title, and make sure that both title lines are inside the same box. The figure below shows how our example would be set up on two rows (the shaded rectangle represents the data entry field printout added with the bottom title):



**Figure 3.11 -- Two-Line Title Setup**

---

### 3.6.2 Underlining Options

Data entry fields printed in the heading or footing of a boring log are sometimes underlined (traditionally, so they could be completed by hand); to duplicate this effect with LD4 choose either “underlined, left justify” or “center over underline” from the **Underline** field on the **Data Text and Data Settings** tab.

**LOCATION:** See Attached Drawing

**LOCATION:** See Attached Drawing

**Figure 3.12 -- "Underlined, Left Justify" and "Center Over Underline"**

- When an underlined data entry field printout is added to the report’s heading or footing, the underline extends to the right until it hits something (either another title or data item, a vertical line or the right side of the form). If you’d like to cut the underline short (for example, to leave some blank space between the underline and a title on the right), draw a vertical line where you want the underline to end. Make sure before drawing the line to make the weight of the line “invisible” so that it doesn’t actually show up on the form (see Section 3.2). Alternatively, you can add a title consisting of a single ^ (caret) symbol where you want the underline to stop: LD4 doesn’t draw the ^ symbol, but it does serve to stop the underline from continuing. The figure below shows the effect of adding a ^ title to stop the underline:

**DRILLER:** ACI Drilling      **LOGSHEET BY:** A. P. Lister

**Figure 3.13 -- Caret Used to Stop Underline**

---

### 3.6.3 The “Plot Last” Option

The **Plot last** checkbox on the Title and Data Settings dialog is reserved for those very rare items for which LD4 won’t have a value until it’s done plotting the entire report page (such as a list of the boring numbers for all of the borings plotted on a profile).

- Checking **Plot last** when printing a normal data entry field causes no noticeable effect -- the field will just be printed after everything else on the page.

---

### 3.6.4 Right-Aligning a Column of Text

ROCK STRENGTH (MPa)		
R0	Extremely weak	<1
R1	Very weak	1-5
R2	Weak	5-25
R3	Medium strong	25-50
R4	Strong	50-100
R5	Very strong	100-250
R6	Extremely strong	>250

**Figure 3.14 -- Right-Aligned Column of Numbers**

To produce a right-aligned column of text similar to the column of numbers in the example shown above, follow these steps:

1. Draw a vertical line at the position where the right-edge of the column should be. Make sure that the line extends from the row that has the first text item to be aligned to the row that has the last text item to be aligned. (See Section 3.2 for line drawing instructions.)
2. Make the line weight "invisible".
3. Make the "H:" justification for each text item to be aligned "H: right" (see Section 3.6). Typically, "V: none, H: right" is chosen. This right-aligns all of the text against the line that you drew in Step 1. Since the line's weight is "invisible", when the report is printed you get a nicely aligned column of text without the line showing what the text had been aligned against.

---

---

### **3.7 Modifying and Deleting Text and Data**

Text and data placed into the heading or footing of a report can be modified or deleted:

**To change a text item or data field already placed in a report's heading or footing:**

1. Open the report heading or footing editor (see Section 3.1).
2. Locate the title or data field to be modified. Data entry fields, logos, groundwater symbols and everything else that isn't a simple piece of text is represented on-screen by a magenta rectangle: if you move your mouse over the rectangle LD4 will pop up a hint window listing the item represented by the rectangle.

---

**Note:** The hint window shown over data items sometimes lists a shorthand notation for what's being printed.

---

3. With the mouse over the item to be modified, click the left mouse button: this displays the Title and Data Modification dialog shown in Figure 3.5.

If the data item to be printed is something besides a data entry field (for instance, a groundwater symbol or a logo) you'll need to click on the **Edit...** button to modify the data item.

**To change the font for a text or data item:**

1. Follow the steps given in the previous list.
2. The Text and Data Settings dialog (see Section 3.6) lists the fonts used for the text item and/or data that you've selected for modification: use these to change to your desired font(s). (See Section 2.3.1 for a discussion of fonts.)
3. Click on the **Place** button.

**To delete a title or data field already placed in a report's heading or footing:**

1. Follow the instructions for modifying a title or data field (above): this displays the Title and Data Modification dialog shown in Figure 3.5.
2. Click on the **Delete** button.

**To move a title or data field already placed in a report's heading or footing:**

1. Open the report heading or footing editor (see Section 3.1).
2. Locate the title or data field to be modified. Data entry fields, logos, groundwater symbols and everything else that isn't a simple piece of text is represented on-screen by a magenta rectangle: if you move your mouse over the rectangle LD4 will pop up a hint window listing the item represented by the rectangle.

---

**Note:** The hint window shown over data items sometimes lists a shorthand notation for what's being printed.

---

3. With the mouse over the item to be modified, click the left mouse button and, *while holding the button down*, drag the item to its new location.

---

### **3.8 Changing the Font for Multiple Items**

**To change the font, size or color for multiple items simultaneously:**

1. Open the report heading or footing screen (see Section 3.1).
2. Click on the  button.
3. Use the left mouse button to draw a rectangle around the items that you want to modify.
4. Use the Text and Data Settings dialog (discussed in Section 3.6) to make your changes. Note that if a field on the dialog is **blank** it means that the items you selected for modification use at least two different settings for that field.
5. Click on the **OK** button to make the change, or **Reset** to change all of the settings back to the defaults chosen through the **Head/Footing** tab of the Form Settings dialog discussed in Section 2.5.

---

**Note:** If you want to change the font used by **all** of the text or data placed on the heading or footing of a report form, see Section 2.5.

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### 3.9 Adding Logos and other Pictures

Logos and other pictures drawn using the Windows "Paint" program, digitized with a scanner or created with publishing program such as Adobe's Illustrator may be added to the heading or footing of a report form.

- Picture and logo files must be in the standard Windows .BMP format -- if you are using an illustration program it should provide a means to write this type of file. For compatibility, LD4 also supports the black and white .PCX format used by LOGDRAFT III.
- If you have purchased any of the GEOSYSTEM for Windows laboratory testing modules, you may have received a custom .BMP logo file that is shown on your lab. testing reports. **Note that this file is encrypted so that it cannot be edited** (illustration programs will display "static" if the file is opened); LD4, however, can still use the logo.
- .BMP files may be color; however, note that color pictures don't plot very well on a black-and-white printer. (Sometimes, due to bugs in Windows' printer drivers, color pictures may not print at all on black-and-white printers.)
- LD4 plots all picture files at a resolution of 300 pixels per inch: if your paint program says that your picture is 600 pixels wide by 300 pixels tall, you'll get a 2 inch by 1 inch picture on your printout.

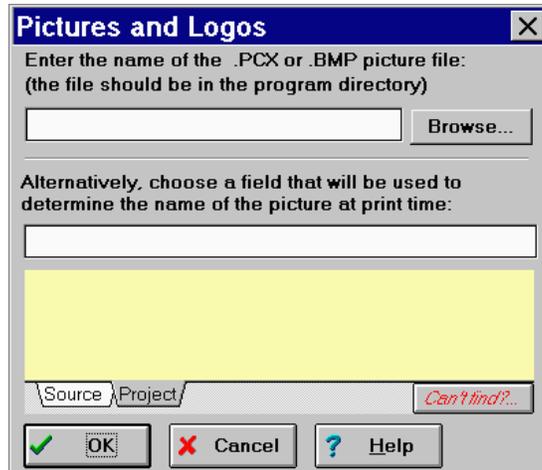
If your paint program reports your picture size in inches or centimeters, the measurement is meaningless as far as LD4 is concerned (remember, LD4 measures in *pixels*, not in inches); however, if the paint program *also* gives the picture's resolution (in dots per inch) you can multiply the resolution by the picture dimensions (in inches) then divide by 300 to get the size of the picture when printed on an LD4 report.

**To add a logo or picture to the heading or footing of your report:**

1. Open the report heading or footing editor (see Section 3.1).
2. Choose Add > Picture.
3. LD4 displays the Text and Data Settings dialog discussed in Section 3.6. Make sure to set the **Justify** selection correctly: A picture placed with a “None” vertical justification (see Section 2.3.6) will print at the bottom of the current row; if you’re drawing the picture inside a rectangle, choosing “V: Center, H: Center” will center the picture inside the picture. (For a further discussion of the effects of various justification selections, refer to Section 3.11.)

**Note:** If your picture file has a great deal of whitespace at the top, left, bottom or right LD4 may not correctly justify the picture because the program treats the whitespace as part of the picture. To correct the problem, use a picture editor to crop the picture so that there is approximately the same amount of whitespace on the top, bottom, left and right sides of the picture.

4. Move the mouse to the location where you want the logo to appear then click the left mouse button. This displays the Pictures and Logos dialog, shown below:



**Figure 3.15 -- Pictures and Logos Dialog**

5. From the dialog enter the name of your logo file into the top prompt. **Do not** enter the path to the file or the file’s extension; e.g., instead of

**R : \LD4 \MYLOGO .BMP**

enter

**MYLOGO**

**Note:** Picture files must be placed into the hard disk subdirectory in which LD4 is stored. (See Section 8.1.1 for instructions on finding this directory.)

Alternatively, instead of showing the same picture on every report printed with the form, the report can be designed so that a different picture is selected for each boring printed. This is useful for showing a picture or map of each drilling site.

**To choose during data entry which picture will be drawn on the report form:**

1. First off, you need a data entry field where you can type the name of the picture should be displayed. Use the techniques discussed in Section 1.3 to add a field to the data entry form that you'll be using: if you want to choose the picture on a project-by-project basis, add the field to the data entry form's "Project" section; otherwise, add it to the "Source" section.
2. Next, follow steps 1-4 in the previous section.
3. At the **Alternatively, choose the name of the field that will be used to determine the name of the picture at print time** prompt enter the name of the data entry field you added in step 1.

**Note:** Optionally, you don't need to add a new field. Instead, you can give your pictures the same name as the boring on which they will be used (e.g., **B-1.BMP**, **B-2.BMP**, etc.) then enter **BORING** into the **Alternatively, choose the name...** prompt.

If you have a site map that changes on a project-by-project basis, save your site map using the project number as the picture filename (e.g., **99-0132a.BMP**) and enter **PROJ\_NUM** into the **Alternatively, choose the name...** prompt.

- Note that you may place the picture file into either in the program's directory or in the .GEO directory that stores your project file.
- During the report design process, if you select Report > Preview naturally LD4 won't be able to show a logo on your report because the name of the logo file won't be known until the report form is combined with data from a specific project file.

### 3.10 Adding A Symbols Legend

If you're building the kind of symbol legend form discussed in Section 2.1.7, after you've drawn the form's border, added a title to the top of the page and maybe added a figure number, the next step is to add the actual legend to the page. The legend itself is almost always added to the report form's heading section.

**To add a legend to a new legend report form:**

1. Open the report heading or footing screen (see Section 3.1).
2. Choose Add > Legend.
3. LD4 displays the Text and Data Settings dialog discussed in Section 3.6. Set the **Font**, **Size**, **Color** and **Style** according to how you'd like to format the descriptions printed next to each symbol on the legend. (See the sample legend shown in Figure 2.6 for an example of how the descriptions are printed.)

**Ignore the Justify prompt:** Legends are always printed starting at the top-left of whatever available whitespace surrounds them.

4. Point the mouse at the top-left corner of the area where you want the legend to be printed then click the left mouse button. LD4 responds by displaying the dialog pictured below:



Figure 3.16 -- Legend Dialog

5. Set the **Symbol column title** and **Description column title**: These allow you to choose the captions for each column of symbols printed on the legend. (In the sample legend shown in Figure 2.6 "Symbol" is the title above the column of symbols and "Description" is the title above the descriptions.)

If want to save space on the form (and avoid stating the obvious) you can leave both of these fields blank.

6. Set the **Number of columns:**, which allows you to tell LD4 how many columns of symbols can be fitted onto one legend page (for this prompt, a “column” is a symbol and its corresponding description.) The legend in Figure 2.6 was designed for three columns: Notice that as a result, many of the descriptions can fit only one or two words on a line. This prompt also has an (**auto**) selection that will let LD4 make the decision on how many columns will be fitted to a single page -- this is the recommended setting.
7. Set the **Symbol square dimension:**, which determines the dimension of one side of the squares in which soil and rock patterns are drawn. The stock legend form shipped with LD4 uses 0.4 inch (1 centimeter) symbol squares.
8. Set the **Omit the legend notes?** selection: optionally, legends can include a set of notes on the first page of the legend. If you’ll be including a legend on the same page as a boring log or profile (this option will be discussed shortly), there isn’t enough room on the page to include the notes -- check **Omit the legend notes?** to leave them off the report.
9. Set the **To limit the legend to only particular groups of symbols...** field: a normal legend report includes **all** of the symbols used on the boring logs, profiles, etc., just printed (e.g., soil patterns, groundwater symbols, sampler symbols, monitoring well sections, etc.). You can use this field to limit what **classes** of symbols appear on the legend. To see what classes of symbols can be printed on a legend, open a project file and click the **Legend** tab on the bottom of the left panel on the data entry screen or, if **Legend** isn’t available, choose **Legend > Edit the Default Legend**. The classes of symbols are listed on the left panel and are usually “STRATA” (the soil and rock symbols), “MISC” (groundwater, caving, seepage, etc. symbols), “SAMPLERS” and “WELL” (“Notes” is not a symbol class).

If you want to include multiple classes, enter the names of all of the classes that you want to print; separate each name with a semicolon; for example, **STRATA;WELL**.

The normal use for this option is to limit the legend so that it only shows soil and rock symbols (by entering **STRATA** into the field) or only soil, rock and sampler symbols (by entering **STRATA;SAMPLERS**). This is most useful when including a legend onto the same page as a boring log or profile.

10. Skip the **If you would like to always take the symbol descriptions from a particular symbol key file** field: normally when you print a legend LD4 gets the descriptions printed next to the each symbol on the legend from the *legend file* associated with the project being printed. (Refer to Chapter 4 in the *User’s Guide* for a discussion of how a legend file is associated with a given project.) This selection is strictly for backwards compatibility.
11. Finally, click **OK** to add the legend to the report form.

You can also add a legend to a boring log or profile form. (Typically, instead of presenting a complete key to all of the symbols used on that report, legends on boring log or profile forms only show one type of symbol such as a legend showing the types of samplers used in the boring.) As an example, the sample profile form called LEGPROFA includes a legend showing descriptions for the soil/rock symbols used on the profile.

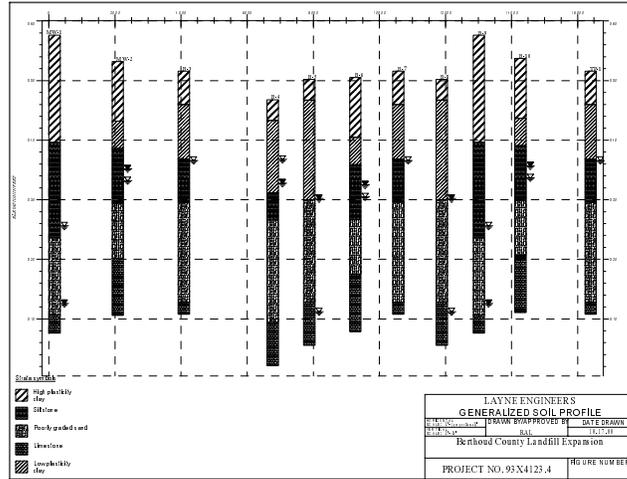


Figure 3.17 -- Profile with Stratigraphy Legend in Lower Left

To add a legend to a boring log or profile form:

1. Open the report heading or footing editor (see Section 3.1).
2. **Keep in mind that legends utilize all of the blank page space surrounding them.** If, for example, you only want the legend to extend one-half of the way to the right side of the page, draw a vertical line in the column where you want the legend to stop. (If you don't want the line you've drawn to show up on your printed reports, select "invisible" as the line's weight as discussed in Section 3.2.)

The sample profile PLNPROFB includes a legend of the soil/rock symbols used on the report: as you can see from the figure below, the legend has been included inside an (invisible) rectangle so that some space is left between the plan rectangle (denoted by dashed lines) and the legend on the left, and the legend and the title block on the right; without the rectangle the legend would start just to the right of the plan box and run all the way to the title block on the right.

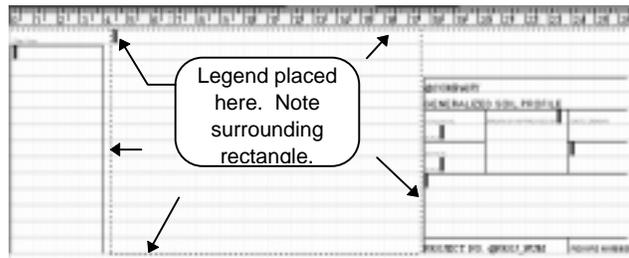


Figure 3.18 -- Footing Design Screen showing Legend Placement

3. Choose Add > Legend.
4. LD4 displays the Text and Data Settings dialog discussed in Section 3.6. Set the **Font**, **Size**, **Color** and **Style** according to how you'd like to format the descriptions printed next to each symbol on the legend. (See the sample legend shown in Figure 2.6 for an example of how the descriptions are printed.)

5. Point the mouse at the top-left corner of the area where you want the legend to be printed then click the left mouse button.
6. Set the **To limit the legend to only particular groups of symbols...** field to the type of symbols that you want to print on the legend. (Typically, if you're adding a legend to a profile, you'll enter either **STRATA** or **STRATA; SAMPLERS**.)

To see a list of all types of symbols that can be printed on a legend, open a project file and click the **Legend** tab on the bottom of the left panel on the data entry screen or, if **Legend** isn't available, choose Legend > Edit the Default Legend. The classes of symbols are listed on the left panel and are usually "STRATA" (the soil and rock symbols), "MISC" (groundwater, caving, seepage, etc. symbols), "SAMPLERS" and "WELL" ("Notes" is not a symbol class).

If you want to include multiple classes, enter the names of all of the classes that you want to print; separate each name with a semicolon; for example, **STRATA;WELL**.

7. Finally, click **OK** to add the legend to the report form.
  - **Tip:** A report may be set up the report to just print the legend notes, *without showing any symbols*, by entering **NOSYMBOLS** into the **To limit the legend to only particular groups of symbols...** field and making sure that the **Omit the legend notes** box is unchecked. This is a handy method for creating a per-project set of notes that may be included on profile reports.

### 3.11 Adding a Single Graphical Symbol

Single graphical symbols may be placed into your report's heading or footing. This is useful, for example, in showing keys to symbols used in the subsurface portion of the log.

- > Graphical symbols are taken from the symbol libraries discussed in Chapter 9, which also gives instructions on drawing new symbols.

**Note:** This section contains instructions for placing a single symbol into a report's heading or footing section. If you're looking to place a symbol into the scaled subsurface table of a report see Section 4.11.6.



Figure 3.19 -- Groundwater Symbols Key

SAMPLE IDENTIFICATION	
	OPEN END ROD
	THIN WALL TUBE
	UNDISTURBED SAMPLE
	SPLIT SPOON
	DISTURBED SAMPLE

Figure 3.20 -- A Sampler Key

To add a graphic symbol to the heading or footing of a report:

1. Open the report heading or footing screen (see Section 3.1).
2. Choose **Add > Symbols**.
3. LD4 uses the **Justify** setting of the Title and Data Settings dialog to figure out where to draw the symbol. The figure below shows the effects of the setting (vertical justification is listed first then horizontal):

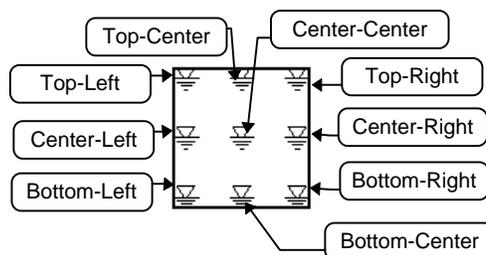


Figure 3.21 -- Justify Setting for Symbols

Change the **Justify** setting as needed ("V: None, H: None" sets the symbol so that it sits at the bottom of the row on which it is placed.)

4. Move the mouse to the location where you want the symbol to appear then click the left mouse button.
5. From the **Symbol library** prompt on the “Place a symbol” dialog choose the file that holds the symbol you want to add to the form. The following table lists the symbol files shipped with the stock program:

Symbol Library	Usage
<b>MISC</b>	Holds groundwater, caving and miscellaneous symbols
<b>STRATA</b>	Holds the patterns used to represent soil and rock in the stratigraphy column
<b>SAMPLERS</b>	Holds the symbols used to visually represent sampler types
<b>PIPES</b>	Holds the symbols used to display well top caps and pipes

**Table 3.4 -- Symbols Libraries**

5. In the **Symbol** box, select the symbol that you want to display. Tip: Clicking on the “...” button displays the symbols stored in the symbol library that you’ve chosen.
6. Click on the **Symbol size and color** tab.
7. Enter the width and height of the symbol -- if you leave the **Width** and **Height** prompts blank LD4 will draw the symbol at the size in which it was originally designed.
8. Click **OK** to place the symbol onto the form.

---

---

### 3.12 Adding Formatted Text

LD4's most complex reporting option is its Formatted Text facility, which can be used for:

- Combining text and data. For example

**Page 1 of 2**

combines some static text ("Page" and "of") with the sequential number of the page currently being printed ("1"), and a count of the total number of pages to be printed ("2").

- Formatting numeric data before printing. This is useful, for example, in printing

**Elevation: 132.40m**

With LD4's Formatted Text options you can ensure that 2 digits are always printed to the right of the decimal point for elevations, even if data entry personnel sometimes enter elevations to three decimal places and at other times enter only one decimal place.

- Adding text to a report form that only shows up on certain pages of a printout, or when a given condition is satisfied. For example, you might want to include

**Boring Continues**

on boring logs that extend over multiple pages. Obviously, "Boring Continues" should be omitted from the final page of each boring log.

---

The Formatted Text facility can also be used to format text added to the report form's table. Section 4.6.2 covers this option in detail.

---

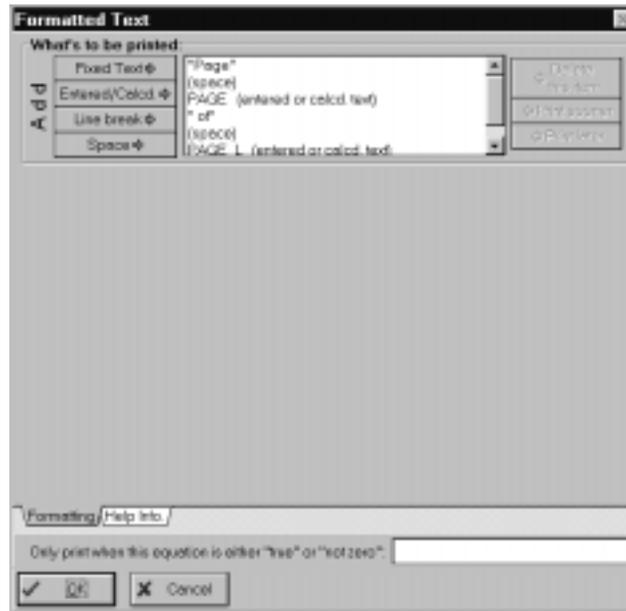
If you're just looking to print a simple data field, possibly with a title printed to one side, such as

**Project: Berthod National Airport**

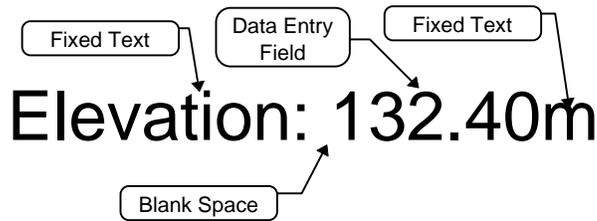
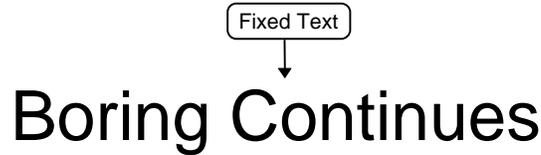
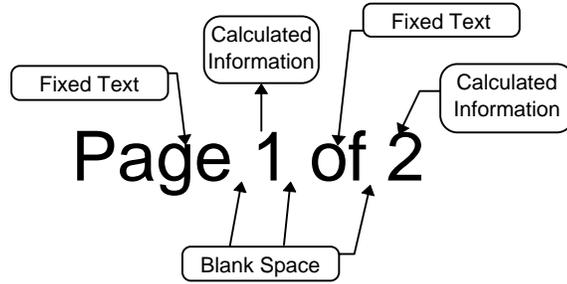
refer to the instructions given in Section 3.5. If, however, you need to combine multiple data entry fields into a single piece of text, reformat what's typed into a data entry field prior to printing, only print a piece of text under certain conditions, or any combination of these options, proceed with the following steps.

**To add formatted text to the heading or footing of a report:**

1. Open the report heading or footing editor (see Section 3.1).
2. Choose **Add > Formatted Text**.
3. LD4 displays the Text and Data Settings dialog discussed in Section 3.6. Set the **Font, Size, Color, Style, Justify** and **Underline** options according to how you'd like the new text to appear.
4. Move the mouse cursor to the row and column where the text is to be located then click the left mouse button. LD4 responds by displaying the Formatted Text dialog.

**Figure 3.22 -- Formatted Text Dialog**

5. To use the dialog, break the text you want to print into pieces. Each piece represents either: A) a section of text that never changes (*fixed text*), B) a blank space, C) a line break or D) the contents of a data entry field or equation calculation (*entered or calculated text*). The figure below shows how this is done for each of the formatting examples discussed earlier:

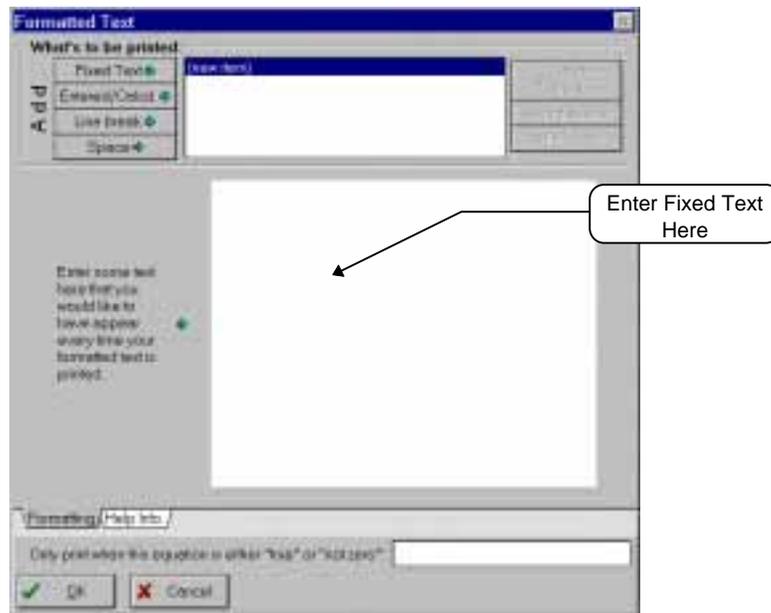


**Figure 3.23 -- Formatted Text Samples**

- In the first example, “Page” and “of” are fixed text because they remain the same on every page of every report printed. “1” and “2” are calculated items because LD4 determines their value on each report page based upon the current page count and the count of the total number of pages to be printed.
- In the second example, “Boring Continues” is fixed text: Although LD4 can be set up to decide to print “Boring Continues” based upon whether or not the page is the last page to be printed for the boring, if it’s printed, the text always remains the same.

- In the third example, “Elevation” and “m” are fixed text while the “132.40” was typed into a data entry field.
6. To add each fixed text or data entry field piece that you obtained by breaking up your text in the previous step, click on one of the **Add** buttons in the top-left of the dialog:

**To add a piece of fixed text (i.e., something that will not change):** Click on the **Fixed text** button. The dialog changes to show a field where you can type in the text.



**Figure 3.24 -- Formatted Text Dialog, Fixed Text Entry**

After you've typed in the fixed portion of the text, choose one of the **Add** buttons to continue, or click on **OK**.

To add the contents of a data entry field, a page or figure number: Click on the **Entered/Calcd.** button. The dialog will change to show a dictionary where you can choose the field you want to print.



Figure 3.25 -- Formatted Text Dialog, Entered/Calcd. Selection

- Select a data entry field to print by double-clicking on a selection in the dictionary. (Dictionaries are discussed in Section 2.7.)
- You can also have the program print the results of a calculation (which is useful, for example, for converting units -- **ELEVATION\* .3048** converts an elevation from US to SI units): Type your equation into the field at the bottom of the **What to print** panel.
- Click on the **It is a number** selection to print the contents of a data entry field or a calculation in a fixed format. For example, you can make sure when printing elevations that they are always printed with two digits to the right of the decimal.. To format your data as a number, click on the **It is a number** checkbox.

LD4 responds by showing two new prompts: **Digits to the left of the decimal** and **Digits to the right of the decimal**. The **Digits to the left of the decimal** prompt is useful when adding formatted text to the table portion of a report: By filling in a number in this prompt, then choosing Center horizontal justification, you get a column of numbers that are lined up, like this:

1.4  
0.9  
13.0  
-2.0  
0

(This list was formatted with 2 digits to the left of the decimal).

When adding a formatted text item to the report's heading or footing, usually the **Digits to the left of the decimal** field is left blank.

Similarly, use the **Digits to the right of the decimal** to maintain a consistent number of digits to the right of the decimal point. Numbers that are entered with less than the requisite number of digits are padded with zeros; e.g., **10** printed with a format of 2 digits to the right of the decimal shows as **10.00**.

Numbers with more than the requisite count of digits are rounded; e.g., **3.14159** printed with three digits to the right of the decimal is **3.142**.

---

**A note on rounding:** Computerized arithmetic is inexact. If you enter an elevation of **1000.25** the computer may actually store it as 1000.249999999... When such a number is rounded to a single decimal place the result becomes 1000.2, not 1000.3 as you would expect from 1000.25. There's very little that can be done about this, with one exception: *If you know that you'll always be entering your data to, for example, 2 decimal places, add 0.005 to the number you're trying to print.* For example, when printing "ELEVATION-DEPTH" and entering ELEVATION and DEPTH to a maximum of 2 decimal places (e.g. **1923.25 feet**), print "(ELEVATION-DEPTH)+0.005". In our original example, if 1000.25 was stored by the computer as 1000.249999999..., adding 0.005 before printing makes the number 1000.254999999, which when printed at one decimal place correctly rounds to 1000.3.

---

- To convert a measurement entered in *decimal* feet to one in *feet and inches*, choose the **It is a measurement in ft. and in.** checkbox: this prints, for example, a measurement of **10.5** feet as **10' 6"**.
- LD4 also includes a handy formatting for printing material descriptions in the subsurface portion of a profile: Since there's seldom room enough to print the entire description, you can choose the **It is the first sentence of a description** checkbox to only print the first sentence of each description.

- The **Print the text even if this is missing** is important if you are combining the contents of two or more data entry fields for printing: if nothing was entered into one of the fields, the other field will still be printed.

As an example, if you set up a formatted text item to print "Elevation: *(some elevation)*m." and the user neglected to enter an elevation, without the **Print the text even if this is missing** selection, nothing would print. With the selection chosen, **Elevation: m.** would be printed.

After you've selected the field or equation to be printed, choose one of the **Add** buttons to continue, or click on **OK**.

### 3.12.1 Specifying Which Report Pages will Show the Formatted Text

Sometimes it's handy to have a piece of text show up on a report only if certain conditions are met: one example would be the "Boring Continues" message, which obviously should not be printed on the last page of the report.

The **Only print when this equation is "true" or "not zero"** field at the bottom of the formatted text dialog is used to enter an equation that LD4 will evaluate before adding the text item to the report page currently being printed: if the equation evaluates to true or any number besides 0 the text item will be printed on that page.

- If you want your text to print on every page printed using the report form, leave this field blank.

Some useful control equations:

Equation	Usage
<b>RESUMED?</b>	Does not print the text on the first page of each boring log
<b>RESUMED?=0</b>	Prints the text only on the first page of each boring log
<b>CONTINUE?</b>	Prints the text on every page of a boring log but the last
<b>CONTINUE?=0</b>	Prints the text only on the last page of each boring's report

**Table 3.5 -- Useful Formatted Text Control Equations**

Appendix A covers LD4's math equations; Appendix B provides a list of LD4's built-in values such as RESUMED?.

---

### 3.12.2 Step by Step Instructions for the "Page 1 of 2" Example

1. Open the report heading or footing screen (see Section 3.1).
2. Choose **Add > Formatted Text**.
3. LD4 displays the Text and Data Settings dialog discussed in Section 3.6. Set the **Font, Size, Color, Style, Justify** and **Underline** options according to how you'd like the new text to appear.
4. Click on the **Data** tab and then choose "No underline" from the **Underline** box.
5. Move the mouse cursor to the row and column where the text is to be located then click the left mouse button.
6. Click on the **Fixed text** button.
7. Type **Page** into the **Enter some text here that you would like to have appear...** field.
8. Click on the **Space** button (we want a space to appear between **Page** and the current page number).
9. Click on the **Entered/Calcd.** button.
10. Click on the **Calculated** dictionary tab.
11. Click on **PAGE** in the dictionary. **PAGE** is the name of a calculated data item that when printed shows the number of the report page being generated, starting at 1 for the first page *of the current boring*. (The number starts over at 1 when the next boring is started.)
12. Click on the **Fixed text** button.
13. Type  **of** into the **Enter some text here that you would like to have appear...** field. (Put a space before "of".)
14. Click on the **Space** button.
15. Click on the **Calculated** dictionary tab.
16. Click on **PAGE\_L** in the dictionary. (**PAGE\_L** is the total count of pages that will be printed for the current boring log.)
17. Click on the **OK** button.

---

### 3.12.3 Step by Step Instructions for the "Boring Continues" Example

1. Open the report heading or footing screen (see Section 3.1).
2. Choose Add > Formatted Text.
3. LD4 displays the Text and Data Settings dialog discussed in Section 3.6. Set the **Font, Size, Color, Style, Justify** and **Underline** options according to how you'd like the new text to appear.
4. Click on the **Data** tab and then choose "No underline" from the **Underline** box.
5. Move the mouse cursor to the row and column where the text is to be located then click the left mouse button.
6. Click on the **Fixed text** button.
7. Type **Boring Continues** into the **Enter some text here that you would like to have appear...** field.
8. Type **CONTINUE?** into the **Only print when this equation is "true" or "not zero"** prompt.  

(Note: If, instead of printing "Boring Continues", you would like to print "Boring Continued", the equation to enter would be **PAGE>1.**)
9. Click on the **OK** button.

---

### 3.12.4 Step by Step Instructions for the Formatted Elevation Example

1. Open the report heading or footing screen (see Section 3.1).
2. Choose **Add > Formatted Text**.
3. LD4 displays the Text and Data Settings dialog discussed in Section 3.6. Set the **Font, Size, Color, Style, Justify** and **Underline** options according to how you'd like the new text to appear.  
Make sure to click on the **Data** tab and then choose "No underline" from the **Underline** box.
4. Move the mouse cursor to the row and column where the text is to be located then click the left mouse button.
5. Click on the **Fixed text** button.
6. Type **Elevation:** into the **Enter some text here that you would like to have appear...** field.
7. Click on the **Space** button.
8. Click on the **Entered/Calcd.** button.
9. From the dictionary (see Section 2.7), click on the **Source** tab then select "ELEVATION".
10. Click on the **It is a number** checkbox.
11. Enter **0** for the **Digits to the left of the decimal** (this lets you print as large an elevation as is necessary).
12. Enter **2** for the **Digits to the right of the decimal** (which ensures that all elevations will be printed with two digits on the right of the decimal -- an elevation entered as 123.4 would be printed as 123.40).
13. Click on the **Fixed text** button.
14. Enter **m.** into the **Enter some text here that you would like to have appear...** field.
15. Click on the **OK** button.

### 3.13 Adding a Plan View to a Profile

LD4 can draw plan views on profile reports and multi-source graphs.

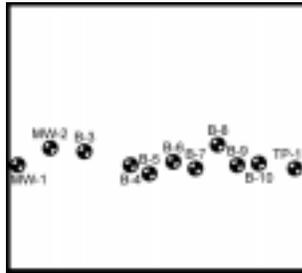


Figure 3.26 -- Plan View

#### To add a plan view to a report:

1. Open the report heading or footing editor (see Section 3.1).
2. Plan views are drawn inside a boundary defined by the closest line on top, left, right and bottom around where the plan object is placed. Because of this you will need to begin by drawing a rectangle around the area where the plan view will be shown. (Try looking at how the plan was added to the footing of the PLNPROFB report -- you will find it inside a rectangle drawn at the left-hand corner of the footing.)

Choose Add > Rectangles.

3. Check the Line Properties dialog (Figure 3.3) to make sure that the correct line weight and color for the border are selected.
4. Move the mouse cursor to the row and column where top-left of the plan view will be located then click the left mouse button. **While holding the button down**, move the mouse to the row and column of the bottom-right side of the plan view then release the mouse button.

> **Note:** LD4 draws all plan views as *squares*. If the bounding box around the plan isn't square, then out of that rectangle the program will only use an area corresponding to the largest square that can be fitted inside the rectangle.

5. Choose Add > Plan View. **Note:** if this menu selection is not shown then you are not editing a profile or multi-source graph report.
6. LD4 displays the Text and Data Settings dialog discussed in Section 3.6. Set the title **Font**, **Size**, **Color** and **Style** options according to how you'd like the labels printed next to each boring to appear.

- When you have the font selection correct, move the cursor to somewhere inside the box you drew in Step 4, then click the left mouse button. LD4 displays the Plan View dialog, shown below:

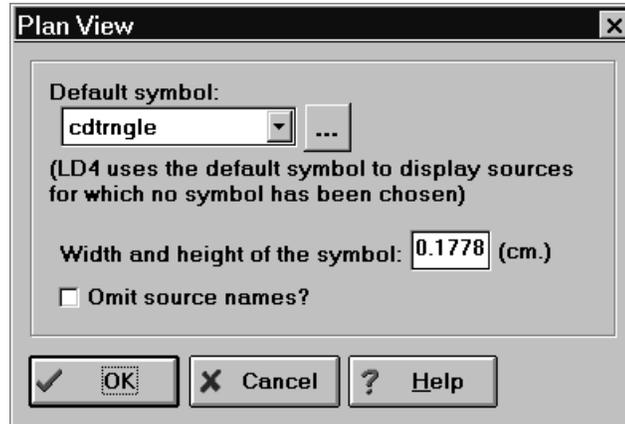


Figure 3.27 -- Plan View Dialog

- Select a symbol to be used to represent the borings plotted on the plan. Note that this will be just a default selection -- it can be overridden by changing a setting on the data entry form used by the borings plotted on the profile. Refer to the plan view symbol discussion in Section 1.5 for more information.
- Enter the size of the symbol: The **Width and height of the symbol** gives the length of one side of an imaginary square drawn around the symbol. (PLNPROFB uses symbols sized 0.07 inches (0.1778 cm.) square.)
- If you want to just draw symbols representing each boring, without labeling the symbols with the boring numbers, check the **Omit source names** box.
- Click on the **OK** button to finish.

---

### 3.14 Checkboxes

Checkboxes like the one shown below can be added to any report's heading or footing:

**Drill Not Angled:**

**Figure 3.28 -- Checkbox**

- Each checkbox is associated with a data entry field entered into the project being printed. While drawing the report LD4 looks up that field -- if a number besides 0 was typed into the field then LD4 X's out the box.

As an example, the project's boring log data entry screen could have a field like **Groundwater encountered (Y/N)?**: a **Y** entered into that field gives the field a non-zero value (**Y** is the same as **1** as far as the program is concerned). If you have a checkbox cued off of that data entry field the box will be checked. An **N** entered into the field gives the field a zero value (**N** is the same as **0** as far as the program is concerned) so the box won't be checked; also, leaving the field blank has the same effect as entering an **N** or **0**.

- You can also cue the checkbox off of more complex equations: a couple of examples are listed below:

**DRILL\_ANGLE<>90** can be used to X a checkbox called "Angled Drilling?".

**IFE(1,WDEPTH1)=0** can be used to X a checkbox called "Groundwater not encountered?" -- when nothing is entered into the "Groundwater depth" data entry field, the box will be checked. (Entering *anything* into the field will cause the box to not be checked.)

Appendix A provides a discussion of **IFE()** and other LD4 math functions that you may find useful when setting up a checkbox.

**To add a checkbox**

1. LD4 draws the "X" inside the checkbox based upon whether or not the contents of a particular data entry field is 0: if you haven't yet added a data entry field for entering the checkbox field, see Section 1.3 for instructions on doing so. (Tip: usually the field is added to the data entry form's "Source" section so that you can enter data for the field once per boring.)
2. Open the report heading or footing editor (see Section 3.1).
3. Choose Add > Checkbox.
4. The Title and Data Settings dialog determines the font that will be used for the title printed next to the checkbox: see Section 3.4 for instructions on setting this up.
5. Once you have the correct font selected for the checkbox title click the left mouse button at the position where the checkbox is to be placed: this displays the Checkbox dialog shown below.



**Figure 3.29 -- Checkbox Dialog**

6. At the **Message to be printed next to the checkbox** prompt type the title that you want to appear to the left of the checkbox.
7. At the **The box will be checked when the following equation is true** prompt enter the data entry field or equation that you want to use to control whether or not the checkbox checked.
  - Leaving this prompt blank causes the checkbox to always be drawn without an X, which can be useful if you need to have a checkbox on your report that will be filled in by hand.
8. Optionally, enter the width and height of the checkbox. If you leave both fields blank the program will choose an optimal size for you.
9. Click on the **OK** button.

---

---

### 3.15 Figure Numbers

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**Note:** To add a “Page 1 of 2” type of message to a report, refer to Section 3.12.

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**To add a “Figure x” type message to a report:**

1. Open the report heading or footing editor (see Section 3.1).
2. Choose Add > Text.
3. The Title and Data Settings dialog determines the font that will be used for the title printed next to the checkbox: see Section 3.4 for instructions on setting this up.
4. Once you have the correct font selected for the checkbox title click the left mouse button at the position where the text is to be placed.
5. Enter **Figure** at the **Text** prompt: This is the text that will be printed to the left of the figure number.
6. Click on the **Calculated** dictionary tab then locate and click on “FIGURE” in the dictionary list.
7. Click on the **OK** button.

---

The previous instructions add a figure number that only changes on a boring-by-boring basis: all of the pages printed for a given boring log show the same figure number (refer to Section 3.2.5 in the User's Guide for instructions on entering the actual figure numbers.) You may want instead to have figure numbers that change for each page printed; e.g., Figure B-1a for B-1's first page, B-1b for the second page, etc. To do this, substitute “TPAGE” for “FIGURE” in Step 6 above then enter the starting figure number into the **Page** prompt as discussed in Section 3.2.5 in the User's Guide.

---

### 3.16 Shaded Rectangles

To add shading to any rectangular area of the report heading or footing:

1. Begin by opening the report heading or footing editor (see Section 3.1).
2. When shading is added to a form LD4 shades up to the nearest line above, below and to the left and right of the shading object. Because the shading extends to the nearest lines around the shading object, make sure that the area to be shaded is inside of a box drawn with either the line tool (see Section 3.2) or the rectangle tool (see Section 3.3).

In the example below, placing a shade item right underneath “CONTRACT NO.” shades the entire rectangle around it.

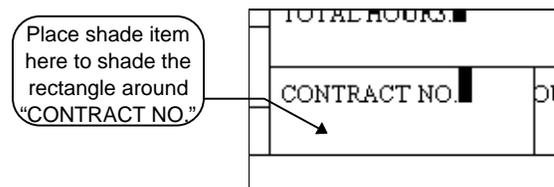


Figure 3.30 -- Shade Item Placement

1. Once the rectangle's drawn choose Add > Shade.
2. Move the mouse cursor to the rectangle to be shaded then click the left mouse button: this displays the shading dialog shown below.

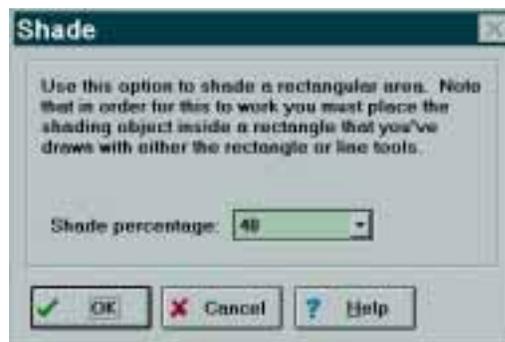
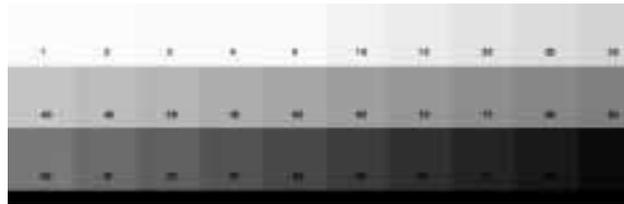


Figure 3.31 -- Shade Dialog

3. Choose a shading percentage: 0 percent is no shade, 100 is full black (the gradient in-between isn't linear -- Figure 3.32 shows the available shading percentages), then click on the **OK** button.



**Figure 3.32 -- Available Shading Percentages**

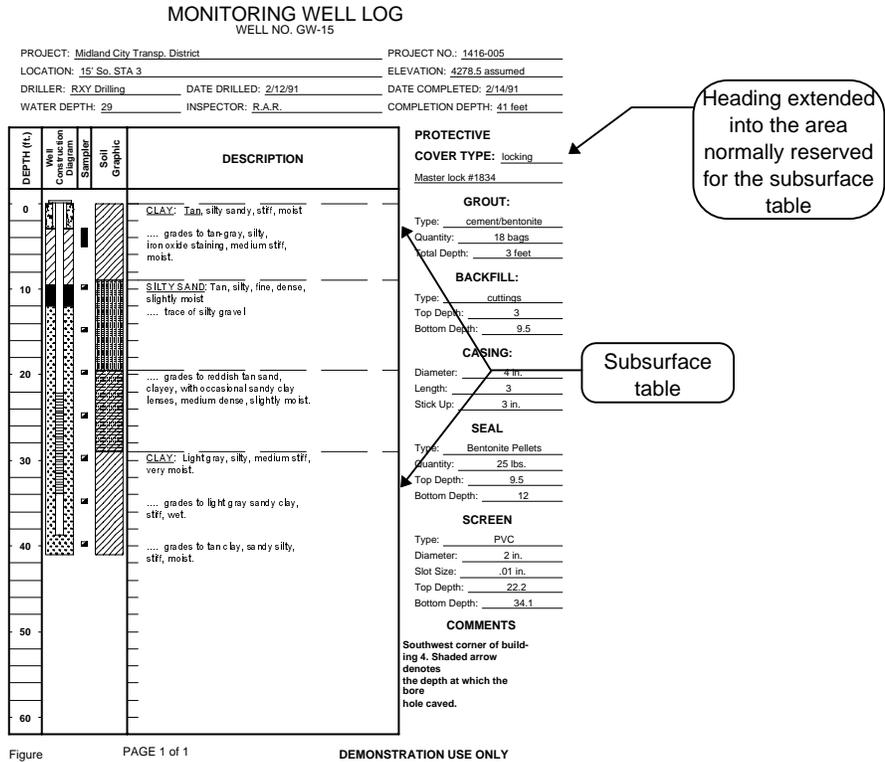
- **Tip:** You can obtain an effect like the one below by placing a 100% shade into a rectangle then placing a white-colored text item, justified "V: center; H: center" into the same rectangle.



**Figure 3.33 -- Inverted Colors**

### 3.17 Shifting the Table Into the Heading Section

Normally, a report form's table section extends from the left-hand margin to the right-hand margin. The table for SAMPLE3 is different: the heading section of the report form extends down the right side of the subsurface table.



Heading extended into the area normally reserved for the subsurface table

Subsurface table

Figure 3.34 - "SAMPLE3" Report Form



## 4. Editing the Report's Table Section

A report form's table is the section of the form where, for subsurface reports such as boring logs, data are shown scaled by depth; for data summaries, the table is where rows of data are listed. (Refer to Table 2.2 for a discussion of how tables are used for different report formats.)

Change your report's table by choosing Sections > Table -- this brings up the Report Table editor.

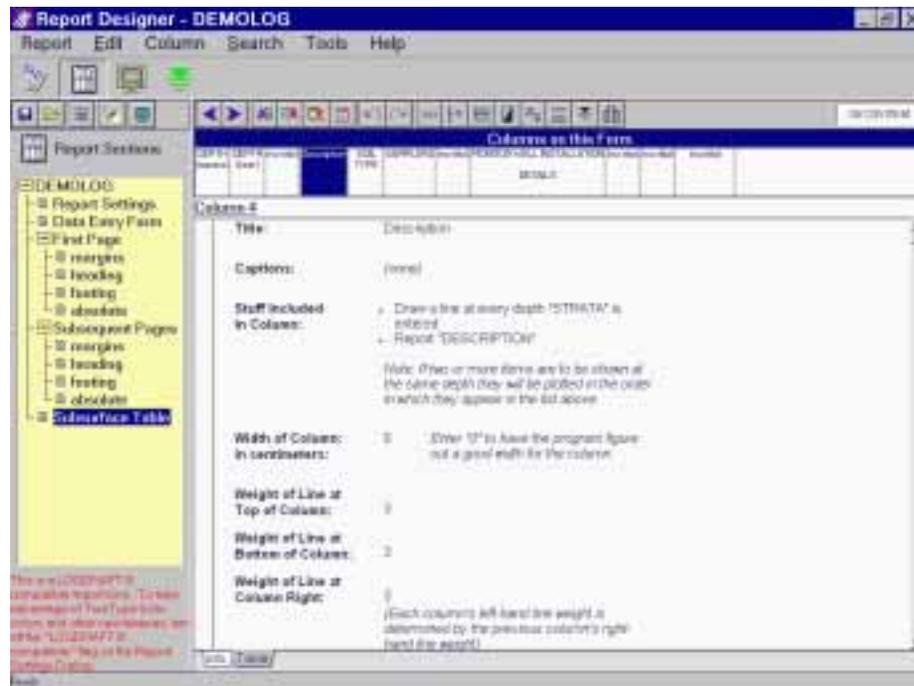


Figure 4.1 -- Report Table Editor

Table columns are composed of a *title block* (which holds one or more titles above each column) and the items that are actually printed within the column (such as a scale bar, material description, monitoring well schematic, etc.). The following sections discuss inserting, modifying and deleting columns and editing the information contained within each column.

---

---

## 4.1 Adding, Modifying and Deleting Table Columns

### To select a table column for modifying:

1. Open the Report Form editor by choosing Tools > Report Forms.
2. Choose Sections > Table.
3. The Report Table editor includes a grid listing the titles of all of the columns already placed on the table (directly underneath the "Columns on this Form" bar): to modify a given column, click on the column's title in the grid. (If the column is untitled, you may need to guess at its location in the grid: columns that don't have a title are listed in the grid as **(no title)** .)

### To insert a new table column:

1. **To insert a new column somewhere within the set of columns already added to the report:**  
Following the instructions above, select the existing table column that is to be immediately to the right of the new column.
2. Choose Edit > Insert Column.
  
1. **If you will be adding the new column to the right of the last column already on the table.**  
LD4 always maintains a blank column on the right-hand side of the table which can be modified to create a new table: Clicking on the right-most entry in the column titles grid discussed above opens a fresh column which can be modified (and creates a new blank column to the right of *it* which, if never modified, will be removed when the report form is saved).

### To delete an entire column:

1. Follow the instructions given for selecting a table column for modification.
2. Choose Edit > Delete Column.

## 4.2 A Column's Borders

LD4 allows you to specify the thickness of the line drawn at the top, right and bottom side of each column. The left column line is of course the previous column's right-side line. LD4 gets the thickness of the left-hand border for the left-most column by duplicating the right-most column's "right-hand" line width -- this gives a balanced appearance to the column. The figure below shows some different combinations of border thicknesses:

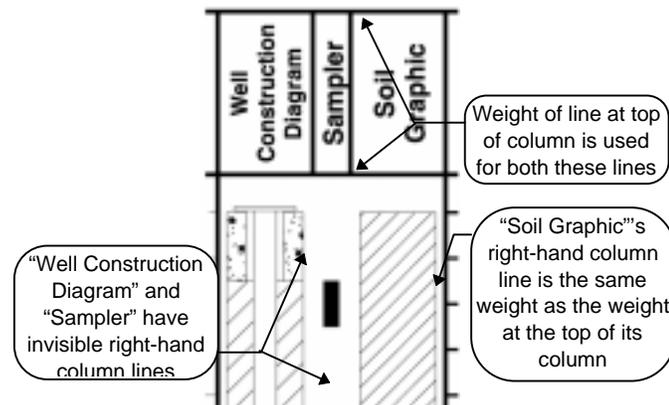


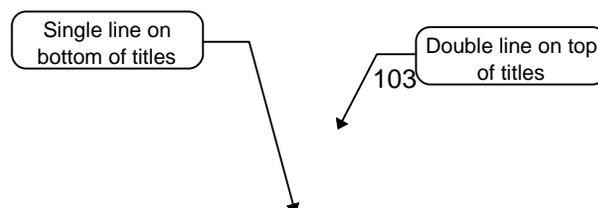
Figure 4.2 -- Column Borders

➤ The table created for a subsurface profile report doesn't have column borders.

### To modify a report table column's borders:

1. Following the directions given in Section 4.1, select the desired table column for modification.
2. To change the weight of the line drawn at the top of the column, click on the blue link shown immediately to the right of **Weight of Line at Top of Column** (this link will either be a number, the words "(double lines)" or "(no line)": This displays a combo box in place of the link. Drop down the combo box and choose a different line weight.
3. To change the weight of the line drawn on the bottom of the column, click on the blue link shown immediately to the right of **Weight of Line at Bottom of Column**: LD4 displays a combo box in place of the link which can be dropped down to choose a different line weight.
4. To change the weight of the line drawn on the right side of the column, click on the blue link shown immediately to the right of **Weight of Line at Column Right**: LD4 displays a combo box in place of the link which can be dropped down to choose a different line weight.

➤ **Tip:** If you'd like to have a double line at the top of the table title block but only a single line at the bottom of the title block, as shown in Figure 4.3, you can't just set the table's top line width to "(double lines)": doing this causes the program to draw double lines at the top *and* the bottom of the table title block.



DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% RI
b	c	d	
0		Clayey SAND, about 80% fine sand, about 20% fines of medium plasticity	
2			

Figure 4.3 -- Report Table

1. Instead, set the table's top line width to the width you want to have used for the line drawn at the *bottom* of the title block.
2. Next, draw a double line across the page *at the bottom of the page's heading*. (Refer to Section 3.2 for instructions)
3. Make sure that the *heading/table separation* is 0. (See Section 2.6.) LD4 will place the line you drew at the bottom of the heading directly across the top of the table.

**If your table has a solid right-hand line but you don't want a left-hand line, do the following:**

1. Edit your report form, go to the table, then go to the last column on the table.
2. Add a new column to the right of the last column. (This column will be the one LD4 uses to determine the thickness of the left-most line on the table.)
3. Make the width of the new column 0.001 (inches or cms.).
4. Make the top, bottom and right line weights 0.

This results in a table that is open on the left, closed on the right.

### 4.3 Column Titles

Each column on an LD4 report table can have one or more titles above. Columns can also share titles. The example below shows the first two columns sharing the “Sample Number and Run Length” title, and all six columns sharing the “Sampling Data” title.

Sampling Data					
Sample Number And Run Length		N-Value	NM	PL	LL
S-1		12	14 / a	13	32
S-2		21	6.7 / b	32	99

Figure 4.4 -- Table Column Titles

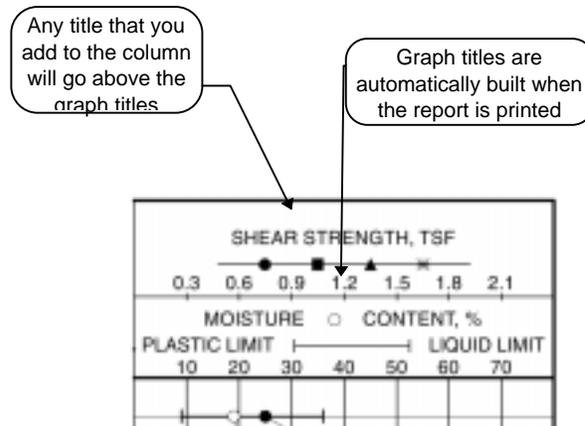
Two points on this example:

- If you do not enter a title for a given column it will share the title of the column to its left. The second-most column on the example (this is the column with the sampler symbols and scale bars) has a blank title, so it shares the first column’s title (“Sample Number and Run Length”).

If you really want a blank column title -- i.e., to prevent LD4 from sharing the previous column’s title -- enter a caret (^) as the column’s title. LD4 will remove the caret prior to printing the report, leaving a blank title block.

- Titles shown *above* the lowest column title (e.g., “Sampling Data” in the example) are called “captions”. LD4 has a slightly different method for setting these up.

Note that the titles placed above graphs, such as the one shown below, are automatically built. You do not need to do anything in order for these titles to appear: LD4 automatically adds the graph scale and legend to the column title when the report is printed. Any title that you *do* place into the column is moved above the graph scale and legend.



**Figure 4.5 -- Automatically Generated Graph Titles**

**To modify a column's title:**

1. Following the directions given in Section 4.1, select the desired table column for modification.

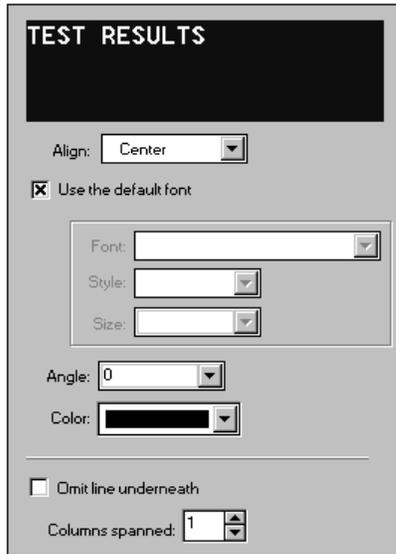
It's important to choose the correct column: if you want to modify the title directly above the table, click on the column grid entry that lists that title. If you want to modify a title above the lowest one, you'll need to go to the left-most column that uses that title. (To modify the "Sampling Data" title shown in Figure 4.4 you would select the "Sample Number and Run Length" column for modification, since it is the left-most column to use that title.)

2. Once you have the correct column selected, **if you will be modifying the lowest title**, click on the blue link shown to the right of the word **Title** in the middle of the screen. (The link should show the column's title, or, if the column doesn't have a title, it will show **(none)**.)

Links for column titles above the lowest are shown to the right of the word **Captions**, again, to edit a title, click on the link.

**If you want to add a new title above one that already exists**, choose [Add](#) > [Add Column Caption](#).

3. Once the appropriate title has been chosen, LD4 will bring up the title properties page, shown below.



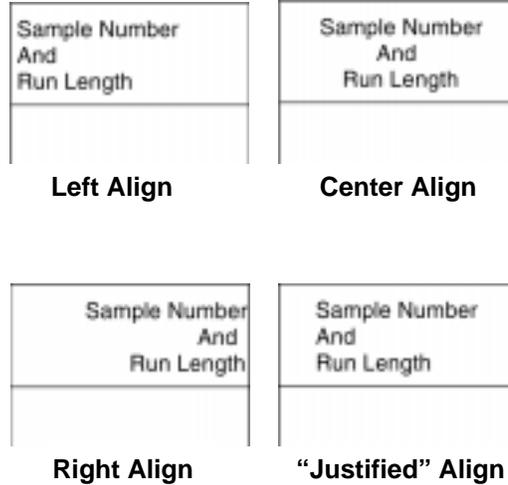
The screenshot shows a dialog box titled "TEST RESULTS" with the following controls:

- Align:** Center (dropdown)
- Use the default font
- Font:** (dropdown)
- Style:** (dropdown)
- Size:** (dropdown)
- Angle:** 0 (dropdown)
- Color:** (dropdown, currently black)
- Omit line underneath
- Columns spanned:** 1 (spinner)

**Figure 4.6 -- Title Properties Page**

4. Enter the column's title into the top field of the dialog (where "TEST RESULTS" is shown in the preceding figure). **If you want the title to be spread over multiple lines, press the Enter key at the end of each line.** (For example, to have the title "TEST RESULTS" printed on two lines, enter **TEST**, press the Enter key then enter **Results**.)
  - Note that you can insert *type symbols* such as Greek letters, the degree symbol, etc., into the title by pressing function key F9 -- see Section 2.5.1 in the [User's Guide](#) for details.
5. LD4 always centers the title vertically. You will need to choose a horizontal justification for the title from the selection box next to the **Align** prompt.

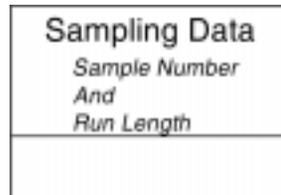
The following figures demonstrate the effect of various Align settings:



**Figure 4.7 -- Effects of Align Settings on Column Titles**

- “Justified” text left-justifies the title, then centers the result within the column.
  - When a title is rotated 90 degrees, instead of always being centered vertically, the title is always centered horizontally (look at the “N-value” column in Figure 4.4); the align selection is applied in the vertical direction so that a “Left” alignment means that the title is flush with the bottom of the column title block and “Right” alignment means that the title is flush with the top of the column title block.
6. Next, if you want the title to print with the font selected through the **Default font for column titles** panel on the Form Settings dialog (discussed in Section 2.5.4), make sure the **Use the default font** setting is checked. Leaving this setting checked is a good idea -- that way you can change the font for all of your column’s titles at once by changing the settings in the **Default font for column titles** panel.  
  
If you want to change the font, uncheck the **Use the default font** setting then make only the changes that you need: if you leave the **Font**, **Style** or **Size** boxes blank they will continue to use the selection chosen in the **Default font for column titles** panel.
  7. Select the angle for the title at the **Angle** prompt. Note that the rotation angle is counter-clockwise, so that a title rotated 90 degrees appears like the “N-value” title shown in Figure 4.4.
  8. If the title is one above the lowest title level (i.e., it was created with the Add > Add Column Caption selection) then there are two more settings.

The **Omit line underneath** selection determines whether or not a horizontal line is drawn dividing the current title from the one immediately below. This technique can be used for producing column titles that use more than one font, as shown below (“Sampling Data” is a larger font and “Sample Number and Run Length” is italicized): Divide the titles up by font then enter the lowest half (“Sample Number and Run Length” in the example) as the column title and use Add > Add Column Caption to enter the upper half (in the example, this is “Sampling Data” in the example below) and change its font accordingly.



**Figure 4.8 -- Column Title Using Two Fonts**

9. Finally, if the caption will span multiple columns, change the **Columns spanned** setting. (For example, in Figure 4.4, the “Sampling Data” caption spans six columns.)
10. Clicking anywhere else on the screen or adding anything else to the column will finalize your selections.
  - **Tip:** When choosing the height for the block used for a *caption* title (e.g., any title above the lowest), LD4 allocates just enough vertical space to fit the title. If you want more vertical space (so that the title has some whitespace on top and bottom), press **Enter** after the last line of the title then enter a caret (^). When the title is placed at the top of the column, LD4 removes the caret and leaves a blank line. (If you want *more* blank space, just press **Enter** several times before typing the caret.) For example, to get some whitespace at the top and bottom of a caption that reads “ELEVATION IN FEET”, enter it as:

```

ELEVATION IN FEET
^
^
^

```

### 4.3.1 Including Data in a Column Title

You can also place the results of calculations or data entry fields into column titles. For example, this is useful for placing the ground surface elevation at the top of an elevation scale column, as shown below.

Elevation
169.956
555

**Figure 4.9 -- Data Placed in a Column Title**

To include the results of an equation or data entry field as part of a title, place a @ in front of the field name or equation. For example, to include the surface elevation as part of the title above an elevation scale column, the title would be entered like this:

**Elevation**  
**@ELEVATION**

The "Elevation" is just text: it will appear on every report. When LD4 sees the "@ELEVATION" it substitutes whatever was entered into the ELEVATION data entry field *for the boring being printed*. If the user entered 169.956 into B-1's "ELEVATION" field, when LD4 prints the elevation scale column title for B-1's report, the title comes out as

ELEVATION  
169.956

If you want to add text on the right of a data entry field, make sure to place a space between the data entry field's name and the text. For example, to add the letters "MSL" after the elevation:

**ELEVATION**  
**@ELEVATIONMSL**

doesn't work: LD4 will look for a data entry field called "ELEVATIONMSL". Instead, enter the title as:

**ELEVATION**  
**@ELEVATION MSL**

which will produce titles like:

ELEVATION  
169.956 MSL

### 4.3.2 Using the “#” and “]” Symbols to Underline Data in a Column Title

Once you’ve placed some data into a column title, you may want to have it underlined -- simulating a “fill in the blank” report like the example shown below.

Approximate Ground Elev.	557.6
Drill Rig:	CME-850
Date Drilled:	2/23/97
Total Boring Depth:	50
Dirty SANDY CLAY, red, brown, fine to medium grained, sandy, with rock fragments	

Figure 4.10 -- Title with Underlined Data

To underline data placed into a column title:

1. Follow the instructions given earlier for placing a data entry field into a column title (e.g., enter @ then the field name).
2. To the right of the data entry field's name -- at the spot where you want the underline to complete -- place either a ] or a #. Use the ] symbol if you want the item to be centered (like “557.6”, “2/23/97” and “50” in the example); use the # symbol if you want the item to be left-justified (like “CME-850” in the example).

The example was produced by setting up the column title as follows:

```
Approximate Ground Elev. @ELEVATION ]
Drill Rig: @DRILL_RIG #
Date Drilled: @BDATE ]
Total Boring Depth: @BORINGEND ]
```

---

---

## 4.4 Choosing the Width of a Table Column

When a new column is added to a report's table, LD4 automatically selects a width for that column: First, the software makes the column wide enough so the title above the column fits. Next, LD4 considers the items that will be included in the column -- perhaps a scale bar, a material description, a monitoring well schematic, etc., -- and tries to make sure that the column will be wide enough to accommodate those items. Finally, if the sum of the widths for *all* of the columns on the table are too wide or narrow to fit on the report page (taking into account the left and right margins discussed in Section 2.6), LD4 will widen or narrow each column until the whole thing fits.

There are situations where you may want to choose your own width for a particular column. For example, when you create a column to show stratigraphy symbols (instructions for doing so are given in Section 4.6.4), LD4 chooses a default column width of 0.4 inches (1 cm.), which makes for fairly wide symbols: Many people prefer a 0.3 inch (.76 cm.) wide stratigraphy column.

### To change a column's width:

1. Following the directions given in Section 4.1, select the table column to be modified.
2. On the screen you'll see the text **Width of Column in centimeters** or **Width of Column in inches**: To the right of this is a blue link listing the current column width. (If you haven't chosen a width for this column, the link will show "0".) Click on the link to select a new column width.
3. **If you want to want to return to having the program choose the column's width**, change the column width back to 0.

Note that it is possible to make a table's column width *too* wide, so that LD4 can't fit the report on the page. If you do this, LD4 will issue a warning message ("The sum of the column widths exceeds the width of the form") and the table will run off the right side of the page.

---

## 4.5 Plotting Order

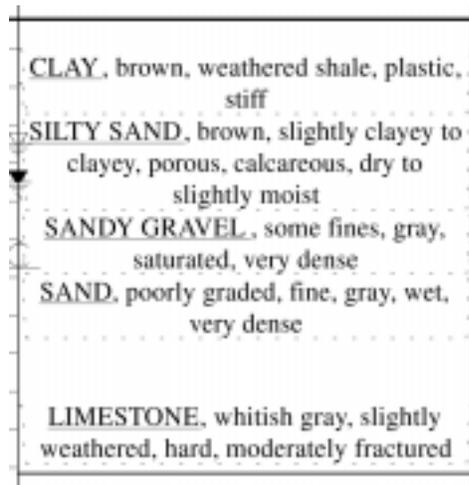
Before creating a new column of data, take a moment to consider the order in which the items that occupy the column (lines, text, graphs, etc.) will be plotted: when LD4 uses the report form to plot an actual boring log, if there are two items that need to be plotted at the same depth -- common in the case where a stratigraphy transition line is to be plotted and the description for the new stratigraphy printed -- the item that was added first to the report form will be plotted first.

As an example, a column that has the following two items in it:

Report "DESCRIPTION"

Draw a line at every depth "STRATA" is entered

produces the following effect:



**Figure 4.11 -- Text Drawn First**

Note that the transition lines bend below the bottom of the soil description, making the description look as if it is for the layer *above* that denoted by the transition lines. Rearranging the column to:

Draw a line at every depth "STRATA" is entered

Report "DESCRIPTION"

gives the results we were looking for:

CLAY, brown, weathered shale, plastic, stiff
SILTY SAND, brown, slightly clayey to clayey, porous, calcareous, dry to slightly moist
SANDY GRAVEL, some fines, gray, saturated, very dense
SAND, poorly graded, fine, gray, wet, very dense
LIMESTONE, whitish gray, slightly weathered, hard, moderately fractured

Figure 4.12 -- Lines Drawn First

- If items have been added to a column in the wrong order (like our first example), the situation may be easily remedied: use the table editor to view the problem column (see Section 4.1) then, in the **Stuff Included in Column** section of the screen, click on the first item that is out of order and choose Edit then either Move Item Up (if you want the item printed sooner than other items located at the same depth) or Move Item Down (if you want the item printed later than other items located at the same depth).

## 4.6 Printing Data in a Report's Table

While a report's table section can show scale bars, stratigraphy graphics and monitoring well schematics, most of the information placed on the table is text: words and numbers. (*Summary* report tables *only* show text because, since they aren't scaled by depth, they don't include scale bars, stratigraphy graphics, etc.) Any text to be placed onto a report's table (except for the labels on a scale bar) is added using the facilities discussed in this section.

- LD4 incorporates a number of options for formatting text placed onto the report's table, and even (on scaled reports such as boring logs and profiles) allows you to choose the depth where the text will appear. These options are discussed later in this section.

### To add text to a report table:

1. Prior to printing a data entry field on a report you should have modified the data entry form used by the report (see Section 2.7) so that you can actually enter the data that you want to print. (For example, if you want to include a column for printing sample numbers, your data entry form must include a place to enter -- sample numbers!) Refer to Section 1.4 for instructions on adding the field to a data entry form.
2. Once you have a place to enter the data you want to print, follow the directions given in Section 4.1 to select the table column where you want to print the data entry field's contents.
3. After selecting the appropriate table column, choose Add > Add User Entered Data, Equations, etc.: This displays the dialog shown below.



Figure 4.13 -- Column Text Dialog

4. At the **Print what?** prompt enter the name of the data entry field that you want to print: You can also use the dictionary below the prompt to pick the field.
  - If you can't find your data entry field in the dictionary then either A) You didn't follow step 1, or B) The data entry form that is associated with this report is not the one to you added the new data entry field -- see Section 2.7.

Note that you can also enter equations into the **Print what?** prompt: For example, entering **LL-PL** will print plasticity index values at all depths where LL and PL data were entered.

- **Note:** If LD4 reports zeros mixed in with your valid equation results, use the “Only print this item where a specific field is not blank” selection on the **Print when** tab. For the **Field**, choose one of the items in your equation -- this causes the program to only print the results of your equation at depths where you've entered data for that field.

The reason this is required is that LD4 may calculate a valid result for an equation *even if one or more of the data entry fields used in the equation were left blank* because sometimes the program automatically substitutes zeros for the blank values. For example, in the equation **SAMP\_REC/SAMP\_LEN**, if “SAMP\_LEN” was **18** and no value was entered into the data entry field named “SAMP\_REC”, LD4 would report the result of the equation as 0/18=“0”. To avoid this, use the **Print when** tab to tell the program to only print the results of the equation when the “SAMP\_REC” field is not blank.

5. Click on the **Justification** tab and use the **Horizontal justification** box to choose whether the printed data will be aligned along the left or right sides of the column or horizontally centered in the column.
6. If you do nothing else, the new field will be printed with the font that you selected from the **Table** tab on the Form Settings dialog discussed in Section 2.5.4. If you want to use a different font, click on the **Font** tab, uncheck the **Use the default font?** selection then select a font and size for printing the new field. (See Section 2.3.1 for a discussion on font selection.)
7. If you're adding the text to a column where it could potentially wind up print on top of something (lines or perhaps stratigraphy symbols) you may want to click on the **Font** tab and check the **Erase the area underneath the item** box. When this box is checked LD4 erases anything that may be under the text.
8. If you want to rotate the text, similar to the example shown below, click on the **Font** tab and check the **Rotate the text 270 degrees** box.

level
water loss/level
FULL RETURN
RETURN

**Figure 4.14 -- Table Column with Rotated Data**

Note that rotated text can be more trouble than it's worth: A) LD4 will not wrap rotated text onto multiple lines to fit within any particular vertical interval, B) the program will chop the text in the middle of a word if the word runs below the bottom of the table and C) it is possible to enter more lines of text than will fit within the left and right column boundaries.

9. Click on the **OK** button to complete the process.

The instructions above cover the bare minimum number of steps necessary to add a new item to a table column. LD4 incorporates quite a few bells and whistles that you can use to customize how, when and where the text is printed -- these options are covered in the following sections.

---

#### 4.6.1 *Adjusting the Vertical Location of Text*

When plotting a report that is scaled vertically by depth (such as a boring log or a profile), normally LD4 plots text on the report's table at the depth listed on the data entry card where the text was entered. (Enter a liquid limit value on a data entry card listing a depth of 5 meters and LD4 plots the top of the liquid limit value at a depth corresponding to 5 meters. )

- Text added to a subsurface report's table is placed vertically on the report using the following formula:

$$(\text{ACTUAL DEPTH ASSOCIATED WITH TEXT}) / (\text{CHOSEN VERTICAL SCALE})$$

This means that the text will move vertically if the user chooses a new *vertical scale* (vertical scales are covered in Section 3.2.4 of the [User's Guide](#)).

- When you add a text column to a *summary report*, LD4 doesn't worry about vertical scaling: the program just makes sure that data entered on the same row of the data entry screen all print on the same row of the summary's table.

Oftentimes when plotting data on a boring log, aligning the data so the top of the data is at the entered depth isn't quite what you'd want: as an example, sampling data such as the sample type, sample length, recovery, etc. are usually presented vertically centered within the sampling interval. Another example: USCS classifications are usually vertically centered between the top and bottom of the soil layer with the classification.

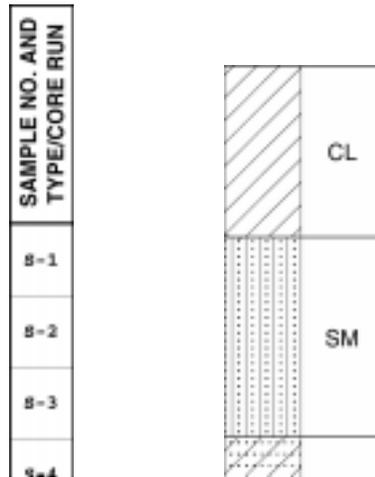


Figure 4.15 -- Centering Sampling Data and Soil Classifications

Some other vertical adjustments are also possible:

- Normally text is plotted so that the top of the text is at the depth where the data was taken; however, LD4 can be set up to plot a piece of text so that the *bottom* of the text is at the depth where the data was taken. This is useful for producing effects like the one shown below, where the depth on the right side of the column is *above* the line:

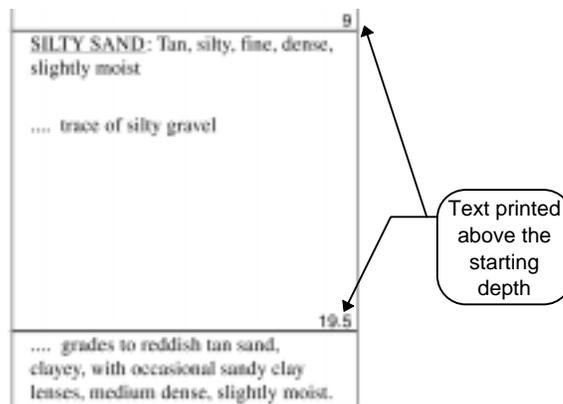


Figure 4.16 -- Data Printed Above Entered Depth

- LD4 also can plot text at some specified depth *below* where the data are taken: this is useful for plotting sampling data *at the end* of the sampling interval. In the figure below, the black boxes in the left-hand column represent the sampling interval: note that the data on the right (listing the sample number, blow count, density and moisture content) are shown at the end of the sampling interval.

	D1-3I	35	132	24
	D1-4	23	124	18

**Figure 4.17 -- Data Offset Below Entered Depth**

- When ruled lines are drawn down a column, (like, for example, in Figure 4.18, where the horizontal lines are drawn spaced 1/2 cm. apart) instead of drawing data at the depth where the readings were taken (which would possibly place the text on top of one of the lines) LD4 can be set to automatically center the text between the nearest two horizontal lines that are below the depth where the readings were taken.

D E P T H	Casing blows per half meter	SAMPLE					BLOWS PER 0.15 METERS ON SAMPLER			
		DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	0 -	0.15	0.30	0.45-
							0.15	0.30	0.45	0.60
	5									
	10									
	12									
		3.00-3.45	1	0.45	0.13	88	3	4	5	6
		4.00-4.45	2	0.45	0.23	88	7	8	9	10
5										

**Figure 4.18 -- Text Placed Between Ruled Lines**

The table below lists all of the available vertical placement options:

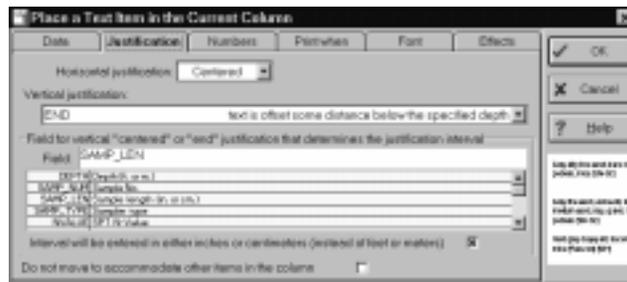
Selection	Usage
<b>NORMAL</b>	This is the default selection: The top of the text is printed starting at the depth where the item was entered.
<b>ABOVE</b>	The opposite of "Normal": The bottom of the text is at the depth where the item was entered. (See Figure 4.16.)
<b>CENTERED</b>	Text is centered within some interval underneath the depth where the item was entered. Useful for centering sampling data within the sampling interval and centering USCS classifications between the top and bottom of the soil layer having the classification. (See Figure 4.15.)
<b>ABS. CENTERED</b>	Same as "CENTERED", but text printed with this option does not shift downwards to avoid overprinting something already printed on the page.
<b>END</b>	Text is shifted some specified distance below the depth where the item was entered. Useful for showing sampling data at the end of the sampling interval. (See Figure 4.17.)
<b>RULED</b>	Text is centered between horizontal lines that are drawn at even intervals down the page -- this is useful, for example, for centering sampling data between lines drawn every 1/2 inch. (See Figure 4.18.)

**Table 4.6 -- Vertical Justification Options**

To adjust the vertical location of text printed on a scaled subsurface report such as a boring log:

➤ See Section 7.1.1 for details on placing boring numbers, elevations, etc. above the stratigraphy column on a profile report.

1. Follow the instructions given at the start of Section 4.5 to add the text to the report column.
2. While the **Place a Text Item in the Current Column** dialog is still displayed, click on the **Justification** tab and select a vertical location option from the **Vertical justification** box.



**Figure 4.19 -- Selecting a Vertical Justification**

3. For **CENTERED** and **ABS\_CENTERED** placement, you'll need to enter the vertical interval over which the data are to be centered into the **Field for "centered", "end" or "ruled" justification that determines the justification interval** box. This may be a number (for instance, **24** centers the data over a two foot sampling interval) but more commonly the name of a data entry field such as **SAMP\_LEN** is used so that each item of data to be printed can be given a different centering interval. (Consider a sample that could only be driven 6 inches: if all sampling data are centered over a 24 inch interval, data for the 6 inch sample would be shown far below the bottom of the actual sample. By requiring the user to enter the length of each sampler into a data entry field, then using the results of that data entry field to calculate the centering interval, sampling data are always shown centered over the actual sampling interval.)

➤ Note that the vertical interval is specified in terms of inches, feet, centimeters or meters of *drilling*, **not** in terms how much *paper* is taken up when the interval is printed on a drilling log.

For centering USCS classifications between the top and bottom of the soil layer having the classification, enter

**NXT (USCS , DEPTH) -DEPTH**

as the vertical interval. (See Appendix A for a discussion of the NXT() function.)

- You can also center text vertically at the exact depth where the data were taken: enter **0** as the vertical justification interval.
- For “end” placement, enter the vertical offset *from the depth where data were taken to where the bottom of the text is to appear on the printout*. While this offset may be entered as a number, it is usually entered as the name of a data entry field used to enter sampling lengths (e.g., **SAMP\_LEN**).

Again, this offset is specified in terms of drilling depths, not in terms of how much paper is taken up when the interval is printed on a drilling log.

- For “ruled” placement, enter the vertical distance between ruled lines into the **Field for "centered", "end" or "ruled" justification that determines the justification interval** field. Again, this is measurement is in terms of the distance between the lines on paper. (Section 4.10.4 gives instruction on adding the actual ruled lines.)

4. For “centered”, “abs. centered” or “end” placement, if you expect that you will be entering your intervals in inches or centimeters (which is typical when entering sampling intervals), make sure that **Interval will be entered in terms of inches or centimeters...** box is checked. (If you are using the **NXT (USCS , DEPTH) -DEPTH** equation to center USCS classifications, do not check the box.)

5. Typically when LD4 prints something on a boring log's table section, the program will automatically shift the item downwards to avoid overprinting something (such as another piece of text) already printed on the table. Because shifting the text means that it will be printed below where it should appear, you can stop the adjustment by checking the **Do not move to accommodate other items in the column** box (on the **Justification** tab.)
6. Click on the **OK** button when you're through selecting the font, horizontal justification, etc. for the text.

---

Note: If you'll be using the "above" vertical justification option to place depths above, for example, lines drawn at stratigraphy transition intervals, make sure that the data that you're adding to the report column is listed *above* the horizontal line item in the **Stuff Included in Column** list. If it isn't, click on the text item (*single-click*) then choose Edit > Move Item Up until it is.

---



---

#### 4.6.2 Formatting Printed Data

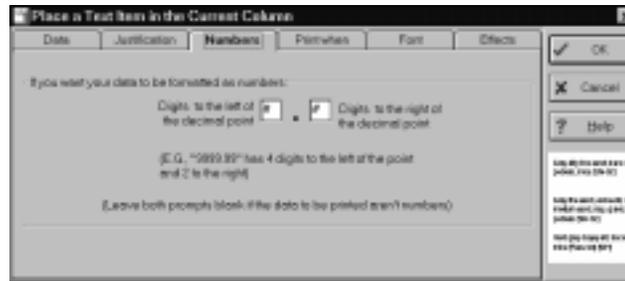
LD4 includes a sophisticated facility for printing text, including:

- Adding titles to the text (i.e., printing "NM=30" instead of just printing "30", which can be handy for printing test results on a profile since profiles don't have column titles).
- Formatting numeric data to show a specific number of digits to the right of the decimal point: e.g. "10", and "11.235" can be printed as "10.00" and "11.24" by having the program print the data with two digits to the right of the decimal point.
- Printing multiple data entry fields on the same row: for example, if blow counts are entered into four data entry fields (one data entry field for the blow count from each 6 inch/15 cm. drive interval), they may be combined to print as "XX-XX-XX-XX".

**To format data to be printed on a report's table as a number:**

1. Prior to printing a data entry field on a report you should have modified the data entry form used by the report (see Section 2.7) so that you can actually enter the data that you want to print. (For example, if you want to include a column for printing sample numbers, your data entry form must include a place to enter -- sample numbers!) Refer to Section 1.4 for instructions on adding the field to a data entry form.
2. Once you have a place to enter the data you want to print, follow the directions given in Section 4.1 for selecting the table column where you want to print the data entry field.
3. After selecting the appropriate table column, choose Add > Add User Entered Data, Equations, etc.: This displays the dialog shown in Figure 4.13.

- Click on the **Numbers** dialog tab. This displays the dialog shown below:



**Figure 4.20 -- Formatting Text as Numbers**

- At the **Digits to the left of the decimal point** prompt, enter the number of digits that you expect to print on the left side of the decimal point. Note that this field doesn't actually change how LD4 prints your data -- it merely helps the program to decide how wide the table column needs to be in order to accommodate your data.
- At the **Digits to the right of the decimal point** prompt, enter the number of digits that you want to have appear on the right side of the decimal point. Entering **0** causes the program to print your data as whole numbers, without a decimal point.

**To apply any other changes to user-entered data besides simply formatting the data as numbers:**

If you want to apply any other changes to your data before printing *besides numeric formatting*, such as adding titles to the text ("NM=30") or printing multiple data entry fields on the same row (31-23-18-21), follow these instructions:

- Once you have a place to enter the data you want to print, follow the directions given in Section 4.1 for selecting the table column where you want to print the data entry field.
- After selecting the appropriate table column, choose **Add > Add User Entered Data, Equations, etc.:** This displays the dialog shown in Figure 4.13.
- On the **Data** tab, click on the **Formatted** button: This displays the Formatted Text dialog discussed in Section 3.12. Refer to the instructions given here for directions on determining how your data will be formatted.

The following sections provide instructions for setting up the blow count and "NM=" examples.

***Step by step formatting instructions for adding "NM=" before natural moisture data:***

1. Follow the instructions given in Section 4.6.2 for getting the Formatted Text dialog displayed: once the dialog is showing, click on the **Fixed text** button.
2. Enter **NM=** into the **Enter some text here that you would like to appear...** field.
3. Click on the **Entered/Calcd.** button.
4. You should have named your natural moisture data entry field "NM": locate "NM" in the **What to print** dictionary and click on it.
5. Click on the **OK** button.

***Step by step formatting instructions for printing four blow counts on one line:***

1. Follow the instructions given in Section 4.6.2 for getting the Formatted Text dialog displayed: once the dialog is showing, click on the **Entered/Calcd.** button.
2. You should have named your blow count data entry fields "BLOWS1", "BLOWS2", "BLOWS3" and "BLOWS4": locate "BLOWS1" in the **What to print** dictionary and click on it.
3. Click on the **Fixed text** button.
4. Enter a - into the **Enter some text here that you would like to appear...** field. (The "-" will separate the first and second blow count.)
5. Click on the **Entered/Calcd.** button.
6. Click on "BLOWS2" in the **What to print** dictionary.
7. Click on the **Fixed text** button.
8. Enter a - into the **Enter some text here that you would like to appear...** field.
9. Click on the **Entered/Calcd.** button.
10. Click on "BLOWS3" in the **What to print** dictionary.
11. Click on the **Fixed text** button.
12. Enter a - into the **Enter some text here that you would like to appear...** field.
13. Click on the **Entered/Calcd.** button.
14. Click on "BLOWS4" in the **What to print** dictionary.
15. Click on the **OK** button.

***Step by step instructions for printing a key at depths where a particular test was performed***

This sequence is handy for setting up a report column indicating depths where consolidation, shear or grain-size tests have been performed by printing a short abbreviation at these depths (“SH” for shear, “CS” for consolidation, etc.).

1. If you’ve licensed the GEOSYSTEM for Windows lab. test module for the test that you want to list, the lab. module will enter a flag into the project database at depths where you entered data for that type of test -- this flag is in the form of a calculated field.

If you don’t have the GEOSYSTEM for Windows lab. test module for the test that you want to show, you’ll need to have a field on the tabulated portion of the data entry form where you can enter either A) data for that test (e.g., a **Shear Test Result:** field) or B) a **Y** at depths where that test was performed (e.g., **Shear Test Performed (Y=yes, blank=no):**). Refer to Section 1.4 for instructions on adding the field.

2. Follow the instructions given earlier getting the Formatted Text dialog displayed: Once the Formatted Text dialog is showing, click on the **Fixed text** button.
3. In the **Enter some text here that you would like to appear...** field, enter the code that you would like to have printed (e.g., “SH” for shear, etc.).
4. Click on the **OK** button to closed the Formatted Text dialog.
5. Click on the **Print when** tab.
6. Select “Print this item only at depths where a specific data entry field is not empty”.
7. If you’ve licensed the GEOSYSTEM for Windows lab. module for the test that you want to report, click on the **Lab. Modules** dictionary tab, then double-click on one of the following entries:

**DIDMECH** for a mechanical grain size test

**DIDHYD** for a hydrometer test

**DIDCONS** for a swell-consolidation test

**MAXDENS** for a Proctor test

**LL** for an Atterberg limits test

**DIDSHEAR** for a shear test

If you haven’t licensed the appropriate GEOSYSTEM for Windows lab. module, locate in the dictionary the data entry field that you added in Step 1 and double-click on it.

---

#### 4.6.3 *Selecting Which Data Will be Printed*

Usually, when you want to print a data entry field on a report’s table you want to print the contents of that field at every depth where the user entered some data. (For example, if you’ve set up a table column to print natural moistures, and the user enters natural moisture data at 2, 4 and 6 meter depths, you want to print all three moisture values.) However, there are some special cases where you will want only print *some* of the data that’s been entered.

As an example, suppose you've set up a table column to print the depths at which samples were taken. If you follow the instructions given in Section 4.5 to print the **DEPTH** data entry field, your table column will show quite a few more depths than you want because LD4 will print the depths of *all* subsurface data entered for the boring: in addition to the sampling depths, you'll get the depths of stratigraphy transitions, monitoring well installation depths, etc.

To compensate for this, LD4 includes some options for deciding exactly *which* data will be printed.

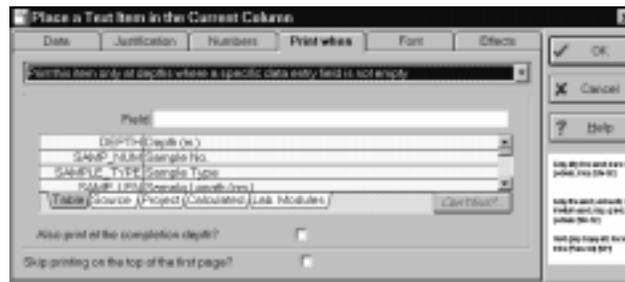
- **Print Always** This is the default selection: if you enter 4 depths, LD4 prints 4 depths.
- **Print this item only at depths where a specific data entry field is not empty** This option is the one that you would use to restrict printing data to only those depths that correspond to the start of sampling intervals.
- **Print this item only at depths where a specific field is empty** This option is useful for ensuring that your data doesn't overprint something already printed in the column.
- **Print this item at depths entered into another data entry field** This option is used for printing groundwater depths and "date checked" notes entered into the source data section of the boring log data entry screen. Since data entered here aren't automatically associated with subsurface depths, you need to have a data entry field for entering a depth for each item that you want print on the subsurface table. (If you want to print the groundwater "date checked", you'll need to have a field for entering the depth where this will be printed -- obviously for the groundwater "date checked" you'll want to use the groundwater depth field. )

This option can also be used for automatically adding a "Boring Terminated" message to the bottom of a column of material descriptions -- you can use the calculated field called "BORINGEND" as the depth where the message will be printed.

- **Don't print unless something else is printed on the same row:** Only available on summary reports (see Section 2.1). This allows you to exclude data such as depths from a report unless they occur in conjunction with some other data on the same report line. Similar to "Print this item only at depths where a specific data entry field is not empty", but you don't have to specify a data entry field -- you're telling LD4 to exclude the item unless *anything* else is available for printing on the same row.

**To limit which data will be printed in a report column:**

1. Follow the instructions given at the start of Section 4.5 to add the text to the report column.
2. While the "Place a Text Item in the Current Column" dialog is still displayed, click on the **Print when** tab.



**Figure 4.21 -- Limiting Which Data Will be Printed**

3. Make a selection from the box at the top of the dialog -- see the list at the beginning of this section for an explanation of the selections.
4. If your selection involved only printing data at depths where another data entry field was empty/not empty or at depths specified by another field: use the dictionary shown in the middle of the dialog to select the field that needs to be empty/not empty or that will be used to specify your depths.
  - If (rather than printing your data only at depths where another data entry field was not blank) you want to print your data at depths where the data in another data entry field is *not zero*, enter this equation into the **Field** prompt: **INZ(1, fieldname)**, where “fieldname” is the name of the field that will control whether or not your data is to be printed. (Appendix A covers INZ() as well as a number of other LD4 math functions.)
5. If you're using the “Print this item only at depths where a specific field is/is not empty” selections, you can also choose to have the program print the value that was entered for that item at the boring termination depth by checking the **Also print at the bottom-of-boring depth?** box. This option is exclusively used for printing depths: for example, if you have a column to print sampling depths, by checking this box you can also print the boring termination depth at the bottom of the column -- if the box is left unchecked, the termination depth won't print in the column (because the column is printing only depths corresponding to sampling intervals, and no sample is taken at the boring termination depth).
 

(Note that you could accomplish the same effect by adding another item to the report column that prints DEPTH, choosing to only print DEPTH at depths entered into another data entry field, and choosing **BORINGEND** as the field that determines the depth where the item is to be printed.)
6. The **Print when** tab includes one more selection useful when printing depths: Consider the case where a column has been set up to print the depths of stratigraphy transitions. Since the first stratigraphy interval begins at 0 meters, the first depth printed in the column will be “0”, which isn't very useful. Checking the **Skip printing on the top of the first page?** box causes the program to not print whatever you're trying to print if it was entered into the first data entry card (e.g., at a depth of “0”).
7. If you're printing stratigraphy transition depths, you may want to use an effect similar to the one shown below:



Figure 4.22 -- Stratigraphy Depths

To get effect of vertically centering the depths within the horizontal transition lines, click on the **Justification** tab, choose “Centered” as the **Vertical justification** then enter 0 at the **Field** prompt.

Finally, click on the **Effects** tab and check the **Vertically centered over lines drawn at the same depth** tab.

***Step by step instructions for adding a “Boring Terminated” message to the bottom of a material description column***

1. Follow the directions given in Section 4.1 for selecting the material description column.
2. After selecting the appropriate table column, choose **Add > Add User Entered Data, Equations, etc.**
3. Click on the **Formatted** button.
4. Click on the **Fixed text** button.
5. Enter **BORING TERMINATED** into the **Enter some text here...** field.
6. If you want to print the depth of the bottom of the boring, enter **BORING TERMINATED AT** instead of **BORING TERMINATED** then: click on the **Space** button, then click on the **Entered/Calcd.** button, enter **BORINGEND** into the **What to print** box, click on the **Space** button, click on the **Fixed text** button then enter **Ft.** (or **M.**, depending upon whether the report form will be used for printing data taken in US or SI units).
7. Click on the **OK** button.
8. Click on the **Print when** tab.
9. Choose “Print this item only at depths entered into another data entry field”.
10. Enter **BORINGEND** into the **Depths specified by** field.
11. Select the justification and font that you want for the note then click on the **OK** button.

***Step by step instructions for printing the depths of stratigraphy transitions or the beginning of sampling intervals***

1. stratigraphy:printing transition depthsFollow the directions given in Section 4.1 for selecting the material description column.
2. After selecting the appropriate table column, choose Add > Add User Entered Data, Equations, etc.
3. Enter **DEPTH** into the **Print what?** field.
4. Click on the **Print when** tab.
5. Choose “Print this item only at depths where a specific data entry field is not empty”.
6. LD4 will need some method of figuring out which depths will be printed. If you’re printing stratigraphy transition depths you can tell the program to look at the data entry field where you’re choosing the patterns to be shown in the “Graphic Log” report column (normally this field is named **STRATA**): choosing **STRATA** at **Field** prompt will cause LD4 to print out the depths where you’ve selected strata patterns for your “Graphic Log” column.

If you don’t include a “Graphic Log” column on your report, obviously you won’t be selecting strata patterns so you’ll need to have some other field that LD4 can look at to decide when to print depths. One alternative is to have LD4 print out the depths where you’ve entered material descriptions (enter **DESCRIPTION** at the **Field** prompt); a second alternative, if you’ve followed the directions given in Section 4.10 for adding a Transition prompt to your data entry form (so that you can draw horizontal lines at stratigraphy changes), is to choose **TRANSITION** at the **Field** prompt..

If you want to print the starting depths for sampling intervals, at the **Field** prompt you’ll need to enter the name of one of the data entry fields you use for entering sampling data: **SAMP\_LEN** (the sampling length data entry field), **SAMP\_TYPE** or **SAMPLE\_TYPE** (the sample type data entry field) or **SAMP\_NUM** all usually work. Use the dictionary shown below the **Field** prompt to pick out one of these fields.

7. Select the justification and font that you want for the note then click on the **OK** button.

***Plotting sample numbers in bold if the corresponding sample was sent to a lab***

This example utilizes many of LD4's printing options to print the numbers of any samples that were sent to the lab in bold face type.

1. First off, you need to add a data entry field to the Tabulated Data section of the data entry form that you'll be using (Section 1.4 provides directions for doing this). Name the new field **LAB\_SAMPLE**, use **Lab sample (Y=Yes, blank=No)?** as the prompt, make it 1 character wide, and choose **YN** as the field type. (Naturally, you'll also need a data entry field for entering sample numbers.)
2. Open your report form (see Section 2.4) then follow the directions given in Section 4.1 for selecting report column where you want to print sample numbers.
3. After selecting the appropriate table column, choose Add > Add User Entered Data, Equations, etc.
4. Enter **SAMP\_NUM** at the **Print what?** prompt.
5. Click on the **Justification** tab.
6. Choose "CENTERED" for the **Horizontal justification**.
7. Click on the **Print when** tab.
8. Choose "Print this item only at depths where a specific field is empty".
9. Choose **LAB\_SAMPLE** from the dictionary -- if **LAB\_SAMPLE** isn't listed, review Step 1.
10. Click on the **Font** tab and choose a non-bold face. (Uncheck the **Use the default font** box then select "Regular" as the **Style**.)
11. Click on the **OK** button.
12. Choose Edit > Copy Table Object.
13. In the **Stuff Included in Column** section of the screen, you should now have two entries labeled "Report SAMP\_NUM": click on one.
14. Click on the **Print when** tab and change the selection to "Print this item only a depths where a specific data entry field is not empty."
15. Click on the **Font** tab and choose a bold face. (Uncheck the **Use the default font** box then select "Bold" as the **Style**.)

#### 4.6.4 Text Effects

The “Place a Text Item in the Current Column” dialog has a tab labeled **Effects** that provides a couple of specialized options for printing text in a report table column.

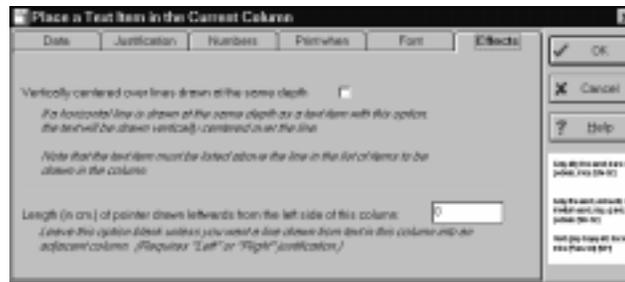


Figure 4.23 -- Effects Tab

- The **Vertically centered over lines drawn at the same depth** option is used to produce effects like the one shown below. Normally, LD4 will *never* overlap two items (such as the first horizontal line and the “30.39m.” text); the only way around this is to check **Vertically centered over lines drawn at the same depth** box. (An example of how this option is used is given in Section 4.6.3.)



Figure 4.24 -- Stratigraphy Depths

- The **Length of pointer drawn leftwards from the left side of this column** option produces the effect shown below:

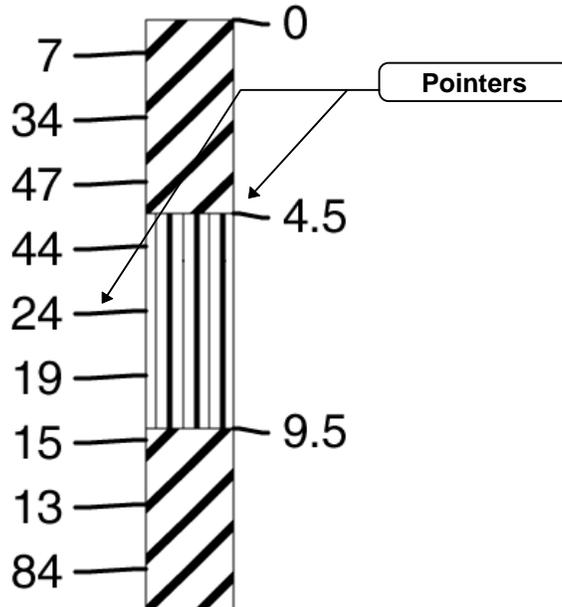


Figure 4.25 -- Pointers

Pointers are used to locate data such as the blow counts and stratigraphy depths in the figure above.

- In order to use the pointer option, the data being printed must be either left or right justified (see Section 4.5).

---

## 4.7 Adding a Stratigraphy Column

A *stratigraphy* column provides a graphic representation of the stratigraphy layers encountered during drilling.



**Figure 4.26 -- Stratigraphy Column with "Continued" and Drill Rejection Symbols**

**To add a stratigraphy column to a report's table:**

1. Before adding the column, you need to make sure that you have a field on the table section of your data entry form where you can select stratigraphy patterns during data entry. If you haven't yet done so, add two data entry prompts to the table section of the data entry form you'll be using (see Section 1.4 for instructions):

Prompt:            **USCS**  
                          **Classification**

Field name:            **USCS**

Field type:            **STRATA\_ID**

Field width: 5

(The first step adds a field for entering USCS classifications -- when a classification is entered, LD4 will automatically look up an appropriate set of stratigraphy patterns for that classification. If you don't enter USCS classifications, skip the step.)

The second field that needs to added to the table:

Prompt:               **Strata**  
                           **Symbols**  
 Field name:           **STRATA**  
 Field type:           **STRATA**  
 Field width: 5

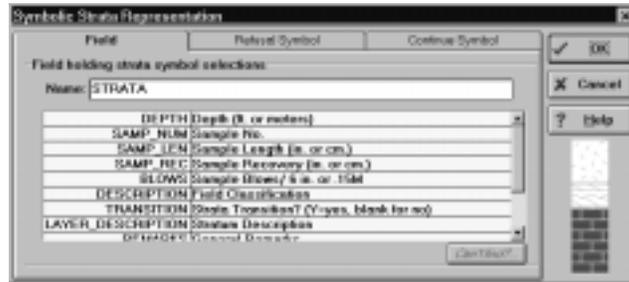
(This is the prompt where you'll be entering the stratigraphy patterns.)

- You may want to add one more field: Figure 4.26 shows a “drill rejected” symbol at the bottom of the column. In order to show a drill rejection symbol you need to have a data entry prompt on the Source Data Window where you can indicate -- once per boring -- whether or not the drill rejection symbol should be shown. Using the instructions given in Section 1.3, open your data entry form, click on the Source Data tab then add the following prompt:

**Drill Rejection Encountered (Y=Yes)?**

To the right of the prompt, drag the **REJECT** entry from the dictionary at the top of the screen.

- Following the directions given in Section 4.1, select the table column where you want to add the stratigraphy representation.
- Select **Add > Add Symbolic Representation of Soil/Rock Layers**. This displays the Symbolic Strata Representation dialog shown below:



**Figure 4.27 -- Symbolic Strata Representation Dialog**

- Enter **STRATA** at the **Name** prompt.
- If you chose to add a drill rejection symbol at the bottom of the boring, click on the **Refusal symbol** tab, check the **Include the option to show a “drill refusal” symbol at the end of the boring?** box then type **REJECT** into the **Name:** field.
- If you would like to have a “continued” symbol to appear at the top and bottom of the stratigraphy column if the boring runs over to multiple pages (this symbol is shown on the top of the column in Figure 4.26), click on the **Continued symbol** tab and check the selection box.

- Selecting the option to include the continue symbol causes the program to create a 0.25 inch (0.64 cm.) gap at the top and bottom of the report table so that the symbol has a place to appear.

8. Click on the **OK** button.

---

**Tip:** When you create a stratigraphy column that is less than 0.4 inches (1 cm.) wide, LD4 will automatically *compress* the stratigraphy patterns drawn in the column so that more of the pattern fits into the space -- this allows complex or wide patterns to still be readable at column widths as small as 0.2 inches (0.5 cms).

---

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#### **4.8 Adding Sampler Symbols to a Table Column**

In the interest of brevity, many reports, instead of listing each sample's type (e.g., "BAG SAMPLE", "SPLIT SPOON", etc.) show a small symbol intended to represent the sample type. A typical sampler symbols column is shown below:



**Figure 4.28 -- Typical Sampler Symbols Column**

**To add a sampler symbols column to a report:**

1. Before adding the sampler symbols, you need to make sure that you have fields on the table section of your data entry form so that, during data entry you can A) select the type of sampler used, and B) enter the length of the sampler (LD4 plots sampler symbols so that the length of the symbol is proportional to the length of the actual sampling interval). If you haven't yet done so, add two data entry prompts to the table section of the data entry form that you'll be using (see Section 1.4 for instructions):

Prompt:               **Sample  
                          Type**

Field name:           **SAMP\_TYPE**

Field type:           **SAMPLERS**

Field width: **1** (the default sample symbol names are 1 character long)

This field allows you to specify the type of sampler taken. Note that LD4 has an option to use just a single type of symbol (for example, a black square) for showing all of the sampling intervals: If you want to use this option, you can omit the SAMP\_TYPE field.

The second field that needs to be added to the table:

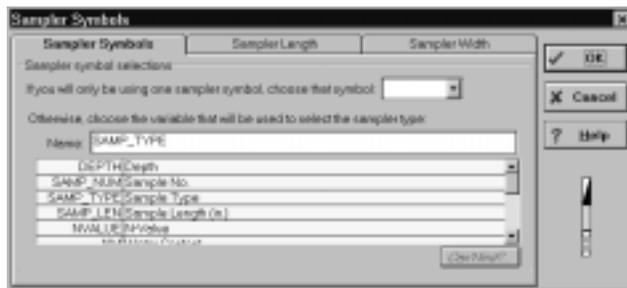
Prompt:               **Sample  
                          Length  
                          (in. or cm.)**

Field name:           **SAMP\_LEN**

Field type:           (blank)

Field width: **5**

2. Following the directions given in Section 4.1, select the table column where you want to add the sampler symbols.
3. Select Add > Add Symbolic Representation of Sampler Types. This displays the Sampler Symbols dialog shown below:



**Figure 4.29 -- Sampler Symbols Dialog**

4. If you want to use a single type of symbol to represent all of the sampling intervals taken, choose the symbol from the **If you will only be using one sampler symbol, choose that symbol:** field. Otherwise, leave this prompt blank.
5. If you want to select the type of sampler taken for each sampling interval, enter **SAMP\_TYPE** into the **Otherwise, choose the variable that will be used to select the sampler type:** field.
6. Click on the **Sampler length** tab.

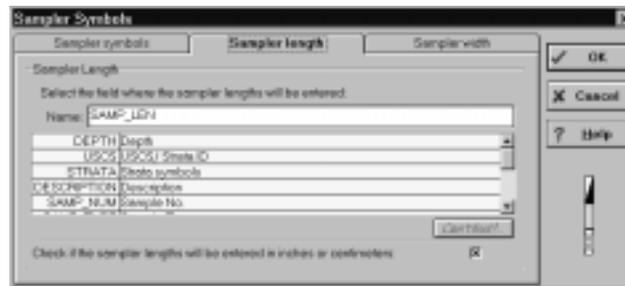


Figure 4.30 -- Sampler Length Tab

7. Enter **SAMP\_LEN** into the **Select the field where the sampler lengths will be entered:** field.
8. If you will be entering your sampling lengths in inches or centimeters (as opposed to entering them in feet or meters), check the **Check if the sampler lengths will be entered in inches or centimeters:** box.

### 4.9 Adding a Scale of Depths or Elevations to a Table

LD4 supports several different scale bar types:

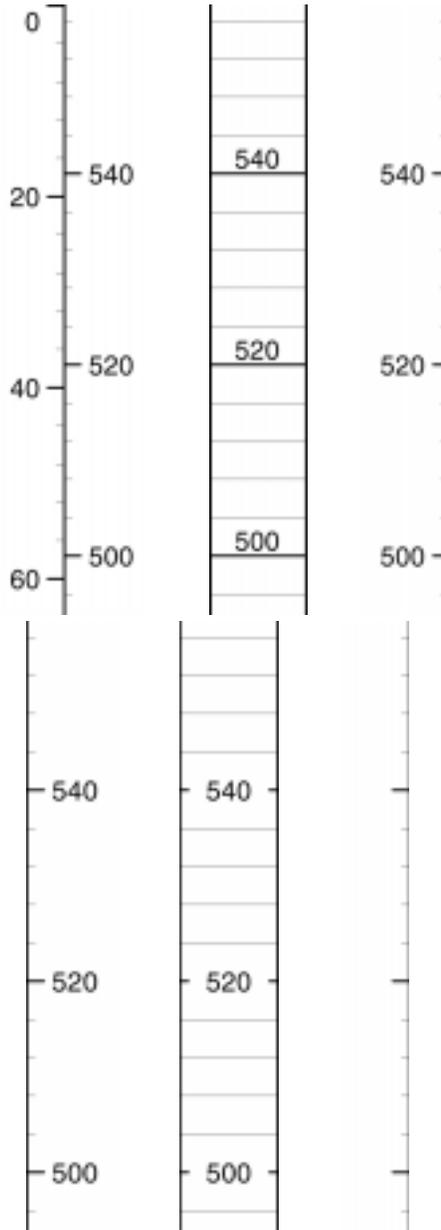
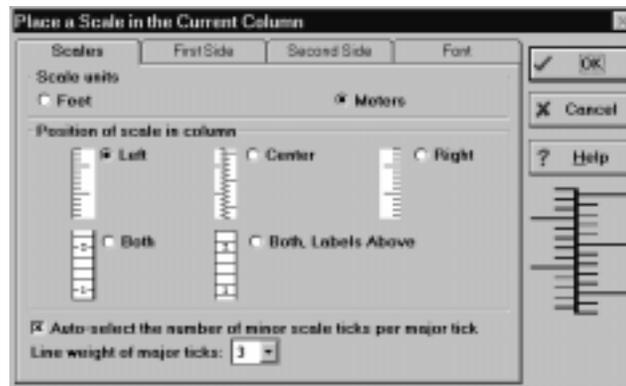


Figure 4.31 -- Scale Types

- Any scale bar may be set up to show either depth below ground level or elevation, in either meters or feet. The units used (meters or feet) don't depend upon what units were used when entering your project's data: if you entered your drilling depths in feet your report can still include a scale of depths in meters -- LD4 does the conversion from feet to meters for you.
- Scale bars may also be configured to omit the numbers normally plotted every five tick marks (as shown in the last example).
- If a scale bar is placed in the center of a table column, it (the scale) can be configured to show depths on one side of the bar and elevations on the other.

**To add a scale bar to a report's table:**

1. Following the directions given in Section 4.1, select the table column where you want to add the scale bar.
2. Select **Add > Add Depth and/or Elevation Scale**: this displays the Symbolic Strata Representation dialog shown below. (If you don't see this menu selection, you're probably trying to add a scale bar to a summary report, which, because the report's table is not scaled vertically by depth, doesn't support scales.)



**Figure 4.32 -- Scale Dialog**

3. The first choice to make is whether the scale will be in feet or meters: remember that the scale bar doesn't care whether or not your drilling data was taken in feet or meters. Click on either "Feet" or "Meters" in the **Scale units** box.
4. Next, choose the type of scale to be printed:
  - Left** places the scale bar along the left edge of the column with the scale ticks extending rightwards.
  - Right** places the bar on the column's right edge with the scale ticks extending leftwards.

**Both** draws tick marks from the left side of the column across to the right side of the column, except for the tick marks where depth or elevation labels will be printed. Tick marks at depths where labels will be printed are split in the middle to make room for the labels.

**Both, Labels Above** is similar to **Both**, except that *all* tick marks are drawn from the left to the right of the column (the labels are drawn above their respective tick marks).

**Center** splits the column down the center and draws one scale bar to the left of the split and a second on the right. (The first example at the start of this section is a centered scale.)

5. The **Auto-select the number of minor scale ticks per major tick** box requires a little explanation. When a new scale is added to a report form, LD4 asks for the number of minor (i.e., small) ticks that will be drawn between each labeled (or major) tick. Typically, for a scale showing feet you would choose 5 minor tick marks between each scale label and one scale label per inch so, for example, when printed on a report scaled at 5 feet per vertical inch, a scale tick is printed for each foot of boring. If the same scale is printed with a vertical scale of 3 feet per inch, one scale tick represents 3/5 of a foot which isn't very handy. What you really want is to have 3 scale ticks per inch with a 3 feet per inch scale (making each scale tick represent 1 foot of boring); similarly, at a scale of 4 feet per inch, you want 4 scale ticks per inch.

Checking **Auto-select the number of minor scale ticks per major tick** causes LD4 to ignore your selection for the number of scale ticks per vertical inch in favor of its own selection.

6. The **Line weight of major ticks** selection allows you to select the weight of the labeled scale ticks. Typically, scales are set up to use weight 3 lines.
7. Next, click on the **First side** tab. (For **Center** scale types, this tab determines what kind of scale (depth or elevation) is shown on the left-hand of the two scale bars; for all other scale types, this tab determines the kind of scale printed in the whole column.)

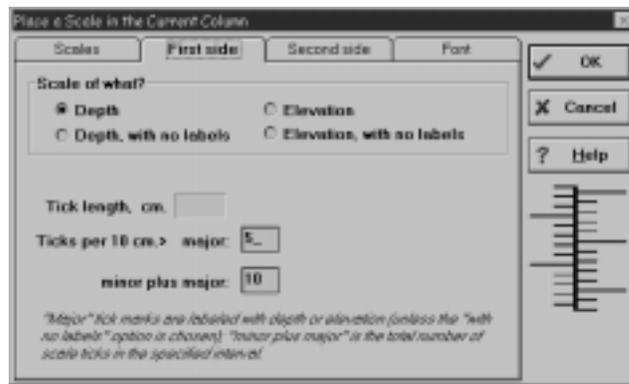


Figure 4.33 -- "First side" Scale Dialog

8. In the **Scale of what?** box, select what will go on the scale bar's labels (depth or elevation). If you choose **Depth, with no labels** or **Elevation, with no labels** LD4 will plot just the scale ticks.

9. Optionally, you can select the length of the tick mark that LD4 draws at labeled scale intervals by entering a measurement into the **Tick length** field. (LD4 uses half this length to draw the tick marks in-between the labeled intervals.)

If you leave the field blank, or enter **0**, LD4 will select a tick length that is appropriate for the size of font that you select for the scale labels (the larger the font size, the longer the scale ticks).

- **Tip:** You can “trick” the program into creating scales that don’t use tick marks by choosing **0.001** as the length of the scale’s ticks. (You can’t use **0.000** because this causes the program to pick its own tick length.)

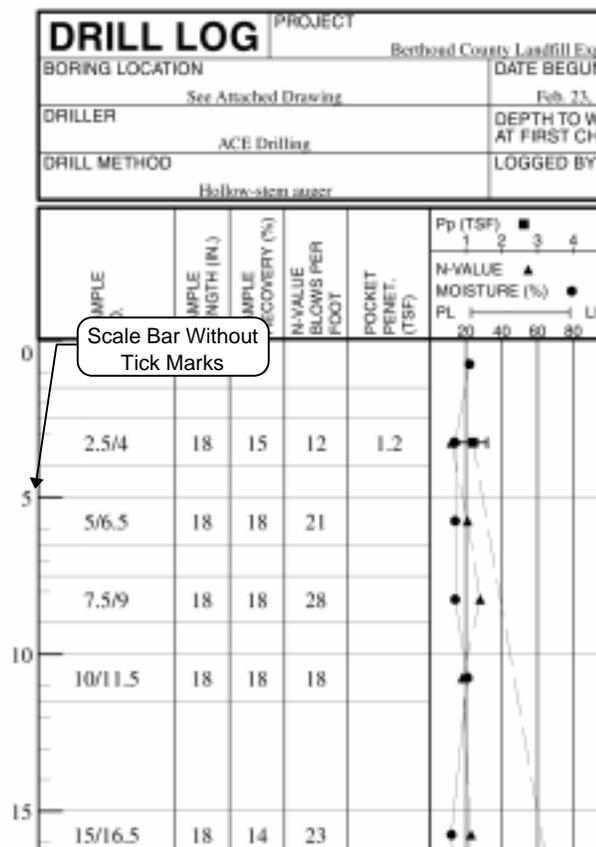


Figure 4.34 -- Scale Bar Without Tick Marks

10. Next, enter the number of labeled scale intervals per 2 inches (for scales in feet) or 10 cms. (for scales in meters) into the **major:** field. (If you have chosen a to draw the scale without showing labels, **major:** only selects how many of the longer scale ticks will be drawn in the interval.)
11. At the **minor plus major:** field enter the number of unlabeled scale tick marks PLUS the number of labeled scale tick marks that will be drawn within the interval (either every 2 inches or 10 centimeters).
- LD4 limits the major and minor scale tick counts to whole numbers.

- If you don't want smaller tick marks drawn in between your labeled scale ticks, set the number of minor ticks to 0.
12. If your scale type is "Center", click on the **Second side** tab and repeat the previous steps for the scale bar to be shown on the right half of the column.
  13. Finally, if you want your scale labels to be drawn in a different font than the one chosen as the default font (see Section 2.5.4), click on the **Font** tab, uncheck the **Use the default font** box and choose a different font.

You can use a scale to draw tick marks on the side of a column used for presenting other data, similar to the example shown below.

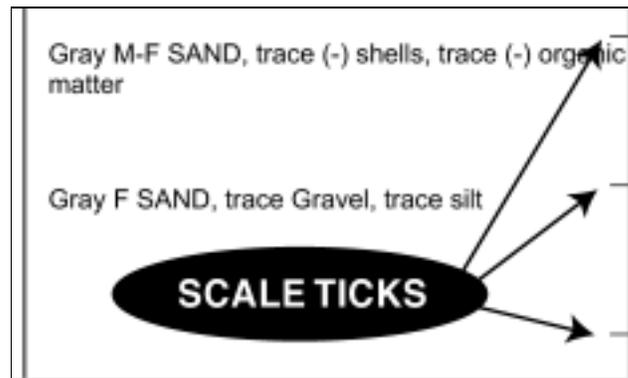


Figure 4.35 -- Scale Ticks in a Description Column

**To get this effect:**

1. Add a scale to the column.
2. Choose to place the scale on the right side of the column.
3. For the **First side** of the scale, choose a scale of "Depth, with no labels".
4. Choose the length of the tick marks.
5. At the **Ticks per 10 cm.> major** or **Ticks per 2 in.> major** prompt, select the number of ticks you want displayed.
6. Choose 0 minor ticks.

---

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#### **4.10 *Placing Horizontal Lines Across a Column***

A common addition to the subsurface table of a drilling log report is a series of horizontal lines to denote stratigraphy transitions, sampling intervals, boring termination depths, etc.

- Horizontal lines may be solid, dotted or dashed, may be of differing line weights (see Section 2.3.5), and may be colored.
- Horizontal lines can only be drawn across a single table column at a time. If, for example, you want your lines to extend across two columns then you must add the same type of horizontal line to each column.
- When adding a new horizontal line item to a column, keep in mind that the order in which you add drawing objects to a column does matter. For example, when adding stratigraphy transition lines to a column where material descriptions will be printed, add the transition lines to the column before adding the material descriptions.

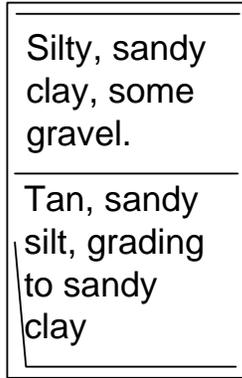
Conversely, if you're using the "Above" vertical justification option to place text above a line, as discussed in Section 4.6.1, the order is reversed: add the text to the column first, then the lines.

Refer to Section 4.5 for instructions on rearranging the order in which items are printed in a column.

Following is a list of the different horizontal line drawing options supported by LD4:

1. **LD4 can draw a horizontal line at each depth where data was entered for a particular data entry field.**

This is useful for drawing horizontal lines across soil transition lines -- LD4 draws a transition line at every depth where you choose a new soil pattern combination.

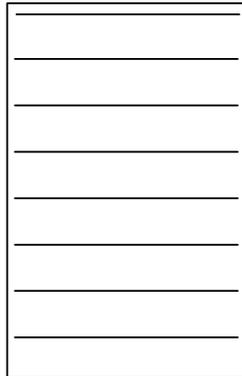


**Figure 4.36 -- Soil Transition Lines**

Refer to Section 4.10.1 for instructions on setting this option up.

2. **Horizontal lines can be drawn across a column at even vertical intervals of "X" depth units.**

This option can be used, for instance, to draw a horizontal line across the column for each five feet of boring. Note that since the vertical intervals for this type of line are specified in scaled depth units the actual vertical distance between successive horizontal lines will depend upon the vertical scale chosen for the report. (See Section 3.2.4 in the User's Guide for a discussion of the effect the vertical scale choice has on a subsurface log.)

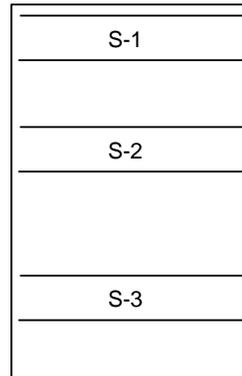


**Figure 4.37 -- Horizontal Lines Drawn at Regular Intervals**

Refer to Section 4.10.4 for instructions on setting this option up.

3. **Horizontal lines can be drawn to delineate the top and bottom of sampling intervals.**

This option draws a horizontal line at the start of each sampling interval and a horizontal line at the end of each sampling interval.



**Figure 4.38 -- Horizontal Lines Used to Delineate Sampling Intervals**

Refer to Section 4.10.2 for instructions on setting this option up.

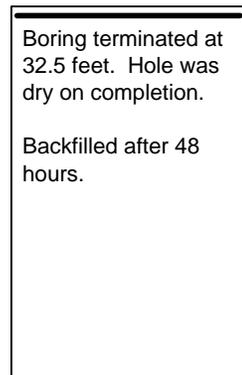
4. **Horizontal lines can be drawn across a column at evenly spaced vertical intervals, measured in either inches or centimeters.**

This option gives results similar to option 2, but, since the intervals are specified in terms of inches of paper, the distance between the lines does not depend upon the report's vertical scale.

Refer to Section 4.10.4 for instructions on setting this option up.

5. **A single horizontal line can be drawn at a specific depth.**

This option can be used to indicate the boring termination depth, the caving depth, etc.

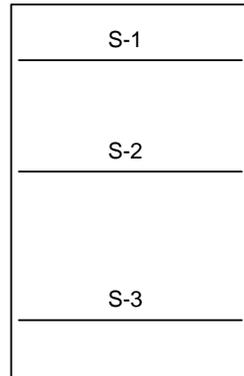


**Figure 4.39 -- Single Horizontal Line Drawn at Boring Termination**

Refer to Section 4.10.5 for instructions on setting this option up.

6. **Horizontal lines can be drawn offset below specific depths.**

This option takes a depth and draws a horizontal line at some specific offset below that depth. As an example, this option can be used to draw a line at the bottom of a sampling interval.



**Figure 4.40 -- Lines Drawn at the Bottom of Sampling Intervals**

Refer to Section 4.10.3 for instructions on setting this option up.

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#### 4.10.1 *Drawing Stratigraphy Transition Lines*

A common use of the option to draw a horizontal line across a column at each depth where a particular data entry field is completed is to draw stratigraphy transition lines. These lines are typically placed in the material description column: at every depth where a new soil or rock layer was encountered, the program draws a horizontal line.

- > As you can see from the bottom-most line in Figure 4.36, LD4 will bend the lines downward to accommodate any extra-long descriptions that may intrude into the space where the line is supposed to appear. (The left end of the line is always located at the correct depth.)

LD4 may or may not bend the right ends of a transition line back upwards to the correct depth, depending upon whether or not the next column to the right also has a horizontal line to be drawn at the same depth.

**To draw transition lines in a given report column:**

In order to draw these lines, LD4 needs to be able to figure out the depths of the various layers encountered. If your report features a stratigraphy column (discussed in Section 4.7) then you're all set: you can tell the program to draw a transition line at each depth where a new set of stratigraphy symbols was chosen.

- LD4 gets the depths for each line by looking at the contents of the **Depth** data entry field in each card where it finds a new entry in the **Strata Patterns** field.

If you don't have a stratigraphy column or if you'd like to be more selective as to when the transition lines are drawn, first you'll need to add a new data entry field to the subsurface table so that you can flag the depths where you want transition lines to be drawn. Following the instructions given in Section 1.4, add a new field to the table section of the data entry form you'll be using:

Prompt:   **Stratigraphy  
Transition  
(Y=Yes, Blank=No)**

With this prompt you can draw a solid line when anything at all is entered into the field. Optionally, if you would like to choose between a solid and a dotted or dashed line so that you can denote whether the transition was sudden or gradual, enter the following prompt instead:

Prompt:   **Stratigraphy Transition  
(Y=Sudden, N=Gradual,  
Blank=None)**

No matter what you chose for the prompt, enter the rest of the information below:

Field name: **TRANSITION**  
Field type: **YN**  
Field width: **1**

Whether you want to draw the transition lines at depths where you've selected a new stratigraphy pattern or where you enter something into a "Transition" field, continue with the directions below:

1. Follow the directions given in Section 4.1 for selecting the table column where you want to add the lines.
2. Select Add > Add Horizontal lines
3. Draw a line at every depth where a given data entry field is filled in. Choose "Draw a line at every depth where a given data entry field is filled in" from the **Type** box. LD4 displays the dialog shown in Figure 4.41:

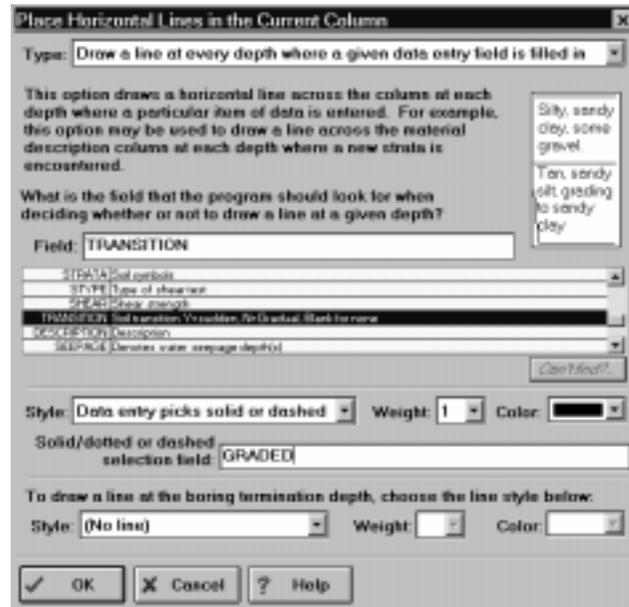


Figure 4.41 -- Line Insert Dialog

4. You want to set up your form so that a horizontal line is drawn across the column every time a new soil or rock layer starts:
  - If you want to draw the lines at every depth where you select a new set of stratigraphy patterns, enter **STRATA** into the **Field** prompt.
  - If you want to draw the lines at depths where you entered something into a “Transition” prompt, enter **TRANSITION**.
  - A third option is to draw a horizontal line at every depth where you’ve entered a material description -- to use this option, enter **DESCRIPTION** into the **Field** prompt.
5. At the **Style** prompt, select the style of line that to be drawn. **If you’re going to be using the “sudden or gradual” transition prompt discussed earlier, select either “Data entry picks solid or dashed” (if you want the gradual transition line to be dashed) or “Data entry picks solid or dotted” (if you want the gradual transition line to be dotted).**
6. Next, at the top **Weight** and **Color** prompt, select the thickness and color of the lines (note that all the lines drawn need to be the same weight and color) -- refer to Section 2.3.5 for an introduction to LD4’s line weight scheme. (Typically, transition lines are weight 1 or 2.)
7. If you’ve chosen the “Data entry picks solid or dashed” or “Data entry picks solid or dotted” selections, at the **Solid/dotted or dashed selection field** prompt enter the name of the data entry field where a **Y** or **1** will be entered for solid lines and a **N**, **0** or nothing will be entered for dashed or dotted lines. (If you’re adding stratigraphy transition lines, this field’s name will be **TRANSITION**.)

- Tip: Rather than plotting sudden/gradual transition lines, you can have LD4 plot solid/dotted lines in a description column so that at depths where you've entered a material description but no stratigraphy change a dotted line will appear above the description; at depths where you've entered a material description *and* a new set of stratigraphy patterns a solid line will appear above the description. Do this by entering **IFE (1, STRATA)** at the **Solid/dotted or dashed selection field** prompt.
8. Most reports also include a horizontal line drawn at the boring termination depth. Since you won't be choosing a new set of stratigraphy patterns at the end of the boring, the horizontal line setups discussed so far won't produce a horizontal line at the bottom of the boring. To add it, choose anything but "(No line)" as the **Style** in the **To draw a line at the boring termination depth...** section of the dialog, then select a weight and color for the boring termination line. Typically, boring termination lines are drawn with a thicker line -- usually a weight 3.

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#### 4.10.2 Drawing Lines to Denote the Sampling Intervals

When presenting the results of tests performed on samples taken from a boring it's helpful to draw horizontal lines at the top and bottom of the sampling intervals then center the test results within the two lines (see Figure 4.38).

##### To draw lines delimiting the top and bottom of sampling intervals in a given report column:

To draw sampling interval lines on a report, LD4 needs to be able to figure out the lengths of each sampling interval, meaning that you need to have a data entry field to enter sampling lengths. If you haven't yet done so, follow the instructions given in Section 1.4 to add a new field to the table section of the data entry form you'll be using:

Prompt: **Sample  
Length  
(in. or cm.)**  
Field name: **SAMP\_LEN**  
Field type: (leave this field blank)  
Field width: 5

Once you have your data entry field, continue with the steps below:

1. Follow the directions given in Section 4.1 for selecting the table column where you want to add the lines.
2. Select Add > Add Horizontal lines

- Choose "Draw a pair of lines showing sampling intervals" from the **Type** box. LD4 displays the following dialog:

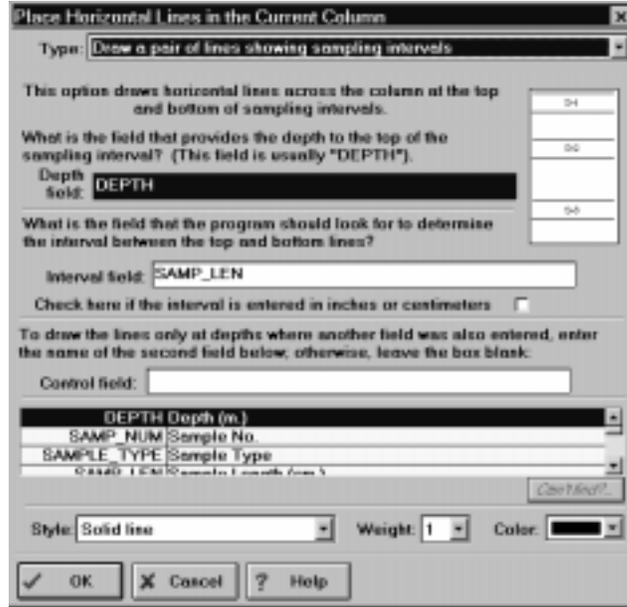


Figure 4.42 -- Line Insert Dialog

- At the **What is the data entry field that provides the depth to the top of the sampling interval?** prompt, enter **DEPTH**. (On data entry cards where a sampling length is entered, LD4 will check the **Depth** data entry field to determine the depth of the top of the sampling interval.)
- At the **What is the data entry that the program should use to determine the interval between the top and bottom lines?** prompt, enter **SAMP\_LEN**. (LD4 will look at the data entry field named **SAMP\_LEN**: on data entry cards where this field has been filled in, the program will take the contents of the field (e.g., **18**) to be the length of a sample that starts at the depth entered into the field selected in the previous step.)
- Check the **Check here if the interval is entered in inches or centimeters** box if you will be entering sampling lengths in inches or centimeters; if you'll be entering sampling lengths in feet or meters, leave the box unchecked.
- Typically, **Control field** is left blank. The option is used only if you don't want LD4 to draw the sampling interval lines for *every* sample taken. This is useful, for example, in a table column reporting RQD values -- since rock coring lengths are entered into the same data entry field as soil sampling lengths, without some way to distinguish between rock and soil sampling, LD4 would draw sampling interval lines in your RQD column for the soil samples as well.

To fix this (e.g., to avoid drawing sampling interval lines in an RQD column for soil samples) you need to enter an expression into **Control field** that is true (or evaluates to any number but 0) only at depths where you want the program to draw the lines. A typical equation would be something like

**SAMP\_TYPE="R"**

which is true at depths where you choose the sample type named "R" . Another possibility is

**IFE (1, RQD)**

which evaluates to 1 at depths where something was entered into the RQD data entry field -- thus the program only draws the lines at depths where A) a sampling length was entered and B) an RQD value was entered. Finally,

**IFE (1, RQD) =0**

evaluates to 1 at depths where an RQD value was *not* entered, so LD4 will draw the lines at depths where A) a sampling length was entered and B) an RQD value was not entered. This option would be useful for drawing the sampling interval lines only in report table columns devoted to listing soil sampling data.

- The LD4 Math Appendix provides a comprehensive discussion of the equations used above.
8. Finally, at the **Style** selection, choose between drawing solid, dashed or dotted lines, then choose a **Weight** and **Color** for the lines. (Section 2.3.5 provides a discussion of line weights and colors.)
- A common reporting option is to draw test results centered vertically between the top and bottom sampling interval lines. Once you've added the lines to a table column, refer to Section 4.6.1 for instructions on how to print the test results with a "CENTERED" vertical justification.

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### 4.10.3 Drawing Lines At the Bottom of Sampling Intervals

LD4 has a line drawing option similar to the one used to draw horizontal lines at the top and bottom of bottom of sampling intervals, except only the bottom line (showing the end of the sampling interval) is drawn (see Figure 4.40 for a sample). The steps necessary for adding these types of lines are identical to those discussed in Section 4.10.2

- A common reporting option is to draw lines denoting the end of sampling intervals; test results are listed just above the lines. To do this, refer to Section 4.6.1 for instructions on how to print the test results with an "END" vertical justification, *then* add the lines to the column.

#### 4.10.4 Drawing Evenly Spaced Horizontal Lines

Some boring log forms feature ruled horizontal lines as an aid to filling in the forms by hand, like this fragment taken from the State of Connecticut Department of Transportation boring log report:

D E P T H	Casing blows per half meter	SAMPLE				BLOWS PER 0.15 METERS ON SAMPLER				
		DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	0 -	0.15	0.30	0.45-
							0.15	0.30	0.45	0.60
	5									
	10									
	12									
		3.00-3.45	1	0.45	0.13	88	3	4	5	6
		4.00-4.45	2	0.45	0.23	88	7	8	9	10
5										

**Figure 4.43 -- Text Placed Between Ruled Lines**

LD4 has two options for drawing ruled lines: A) the lines may be drawn a fixed vertical distance apart -- for example, every 0.2 vertical inch of paper, or B) the lines may be drawn for every "X" feet or meters of drilling (e.g., draw a line at intervals of 1 foot).

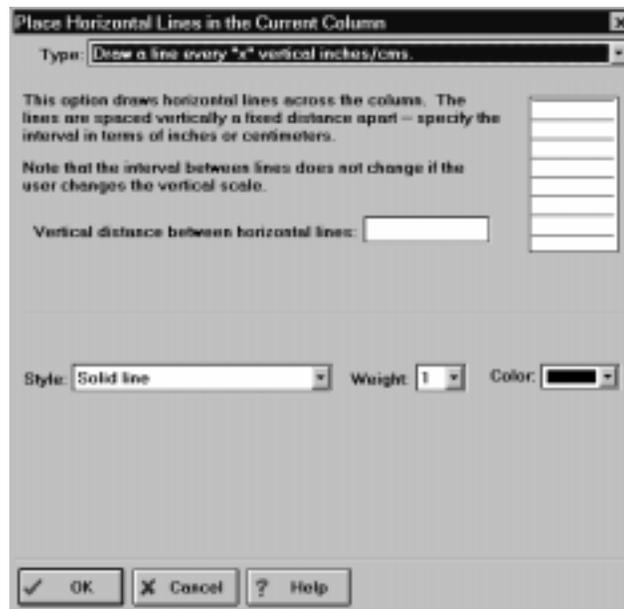
- If you use option A, the vertical distance between the lines remains the same, regardless of the vertical scale at which the log is printed. This means that if the scale is changed, the drilling distance represented by two consecutive lines changes: lines 0.2 inches apart on a log using a vertical scale of 5 feet per inch represents 1 foot of drilling (0.2 inches \* 5 feet/inch); the same lines on a log using a vertical scale of 10 feet per inch represents 2 feet (0.2 inches \* 10 feet/inch). Because of this, option A is typically used on reports designed to be printed with a specific vertical scale.

When centering text within ruled lines (like the text in Figure 4.43) the ruled lines are always designed to be a fixed vertical distance apart.

- Because option B specifies the distance between ruled lines in terms of drilling distance, as the vertical scale is changed, so does the distance between the ruled lines.

**To add ruled lines to a column:**

1. Follow the directions given in Section 4.1 for selecting the table column where you want to add the lines.
2. Select **Add > Add Horizontal lines**
3. Choose either “Draw a line every "x" vertical inches/cms.” (for option A) or “Draw a line every "x" scaled depth units” (for option B) from the **Type** box. LD4 displays the following dialog:



**Figure 4.44 -- Line Insert Dialog**

4. Enter the desired **Vertical distance between horizontal lines**: remember that if you chose “Draw a line every "x" vertical inches/cms.”, this measurement is in terms of distance on paper; if you chose “Draw a line every "x" scaled depth units”, then the measurement is in terms of drilling distance.
5. Finally, at the **Style** selection, choose between drawing solid, dashed or dotted lines, then choose a **Weight** and **Color** for the lines. (Section 2.3.5 provides a discussion of line weights and colors.)
  - A common reporting option is to draw test results centered vertically between the nearest two ruled lines. Once you’ve added the lines to a table column, refer to Section 4.6.1 for instructions on how to print the test results with a “RULED” vertical justification.

#### 4.10.5 Drawing a Horizontal Line at a Specific Depth

Many report forms draw a thick horizontal line across the entire report table at the boring completion depth. LD4 includes an option to draw a line at this depth or at any depth (such as a groundwater or caving depth) typed into a data entry field in the source data section of the data entry screen.

To draw a horizontal line at a specific depth, such as the boring completion depth:

1. Follow the directions given in Section 4.1 for selecting the table column where you want to add the lines.
2. Select Add > Add Horizontal lines
3. Choose "Draw a line at a single depth" from the **Type** box. LD4 displays the following dialog:

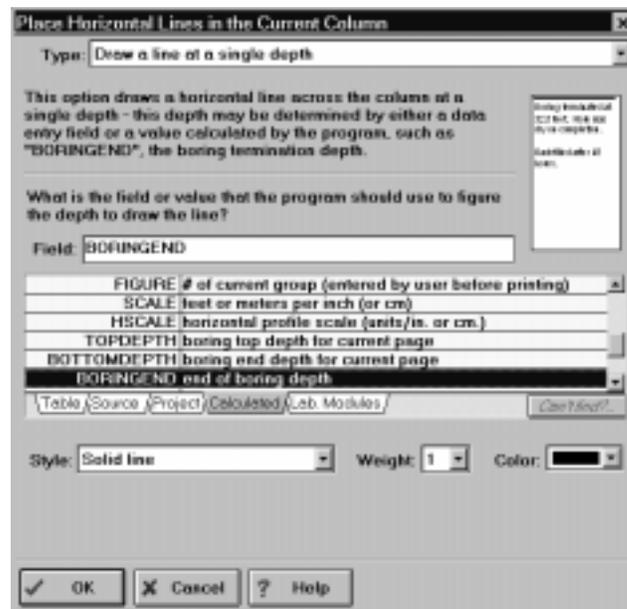


Figure 4.45 -- Line Insert Dialog

4. At the **Field** prompt, enter the name of the data entry field where you want the program to get the depth at which the line is to be drawn. (To draw a line at the boring completion depth, enter **BORINGEND**.)
5. At the **Style** selection, choose between drawing a solid, dashed or dotted line, then choose a **Weight** and **Color** for the line. (Section 2.3.5 provides a discussion of line weights and colors.)

### 4.11 Adding a Graph to a Report's Table

You can graph one or more items of data in any column of a LD4 subsurface report's table. The *vertical* scale on an LD4 graph is always "Depth" just like any other item on the subsurface table. Each item being graphed can have its own *horizontal* scale, or two or more items can share the same horizontal scale. Figure 4.46 shows a column where four items are being graphed: notice the different graphing options. Also note that the "Penetration", "Water Content" and "Plastic Limit"/"Liquid Limit" graphs share a common horizontal scale while the "Shear Test" graph uses a different scale.

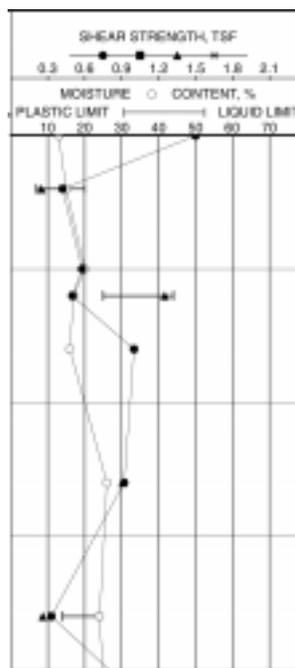


Figure 4.46 -- Graph Column Example

- Each report table column can graph an unlimited number of different items (p/I/I values, water contents, shear test results, etc.). *However*, every item that will be graphed must be added to the column separately. Instead of telling LD4 "draw a graph of PL/LL values, water contents and shear test results", you must add three separate items to the column: A) a graph of PL/LL values, B) a graph of water contents and C) a graph of shear test results.

- Note that the order in which graphs are added to a column is important. If three graphs are added to the same table column, the key (which identifies the marker used to graph the data, as well as the horizontal graph scale) of the graph added last will appear on top of the graph keys listed in the column's title block. (For example, Figure 4.46 was created by first adding a graph of plastic and liquid limit to a table column, then adding a graph of moisture contents and a graph of shear test results to the same column.) So, when creating a table column containing graphs of multiple results (Atterberg limits, water contents, etc.) add the graphs in bottom-to-top order from how you want their corresponding keys to appear in the column title block.

If, after adding a number of graphs to a column, the order appears to be incorrect; e.g., the graph titles are out of order, refer to Section 4.5 for directions on rearranging the column.

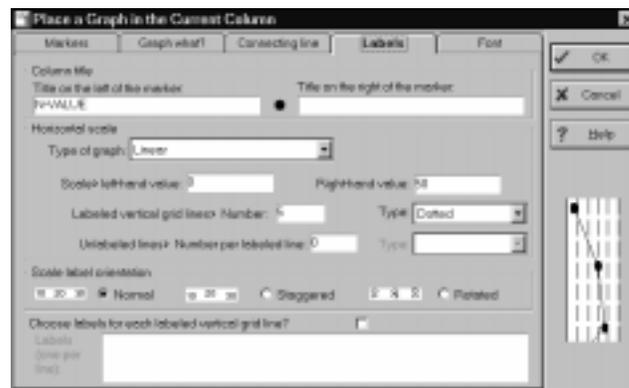
**To add a graph to a report's table:**

1. Before adding the graph, you need to make sure that you have a data entry field on the table section of your data entry form so that you can type in the data to be graphed. If you haven't yet done so, add the field to the data entry form that you'll be using (see Section 1.4 for instructions). For graphs of bracketed items (for instance, brackets showing PL and LL values like the example below) you'll need data entry fields for the left-hand *and* right-hand data values.



**Figure 4.47 -- Graph Bracket**

2. Follow the directions given in Section 4.1 to select the table column where you want to add the graph.
3. Select Add > Add Graph of Data vs. Depth.
4. From the following dialog, click on the **Labels** tab. (The **Graph what?** and **Markers** tabs are covered in following sections.)



**Figure 4.48 -- Add Graph Dialog, Markers Tab**

5. In the title block at the head of the graph column it is customary to place a key indicating what marker was used for the item to be graphed. (In Figure 4.46, the keys say “SHEAR STRENGTH, TSF”, “MOISTURE CONTENT, %” and “PLASTIC LIMIT” -- “LIQUID LIMIT”.) LD4 allows you to place some text both to the left and right of the marker in the title -- in the following graph key, **PLASTIC LIMIT** was entered into the **Title on the left of the marker** field and **LIQUID LIMIT** was entered into the **Title on the right of the marker** field:

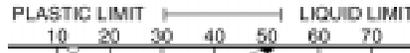


Figure 4.49 -- Graph Key Using Left and Right Labels

Enter a title into either or both data entry fields.

- LD4 draws the left marker title flush against the left side of the column: if you want to make some space between the left column border and the start of the title, add some spaces at the start of the left title text. For example, the graph title below was created by placing 12 spaces in front of **MOISTURE** in the **Title on the left of the marker** field:



Figure 4.50 -- Centered Graph Key

- LD4 won't draw a key in the column title for that graph if a title isn't entered into *either* the **Title on the left of the marker** or **Title on the right of the marker** fields. (If the graph requires a scale, the scale will still be drawn).
- “User-selectable marker” graphs (discussed later) do not support a title on the right of the marker.
- Multi-source graph reports don't support titles at the top of the graph column because multi-source graphs use different markers to denote the same data item depending upon which boring is being plotted. Instead, a graph key is added to the form's heading or footing -- see Section 7.3.2 for instructions.

6. LD4 supports two horizontal graph scaling options: linear and semi-log (both scaled linearly in the vertical direction relative to drilling depth). Select one of the two graphing options at the **Type of graph** prompt.

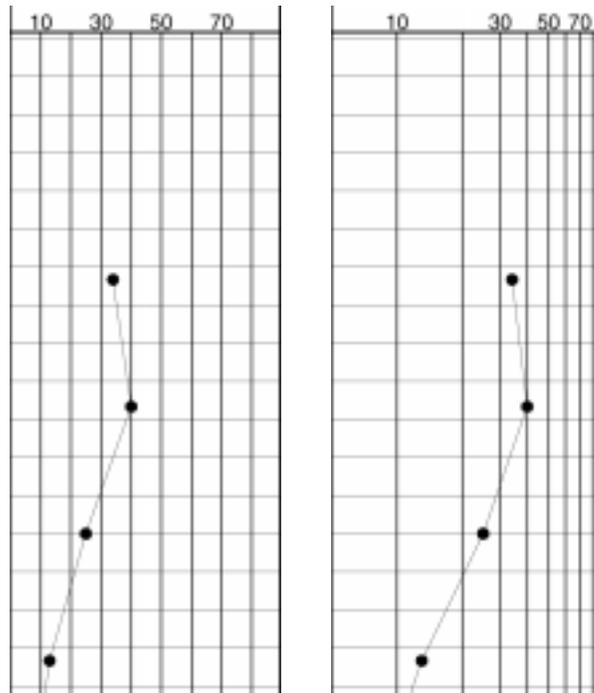
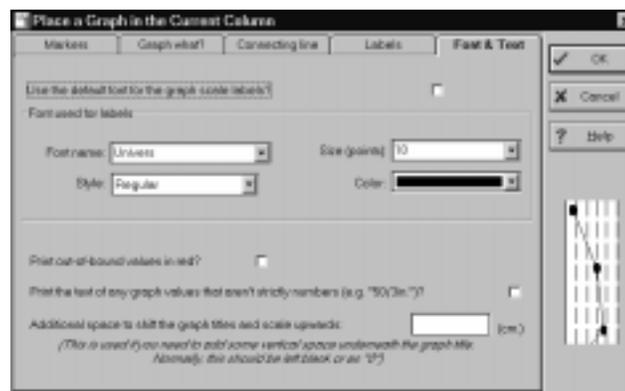


Figure 4.51 -- Linear and Semi-Log Graphs

7. At the **left-hand value** prompt enter the scale value at the left side of the column: for most geotechnical applications (graphing N-values, shear test results, moisture contents, etc.), this should be 0.
8. At the **Right-hand value** prompt enter the numeric value that would cause a marker plotted on the graph to show up on the right side of the column. (For N-value, natural moisture and Atterberg limit graphs, 70 or 80 is common.)
- > Note: if you've already added a graph to the column, LD4 will suggest using the same left and right-hand values as the previous graph. If you enter different values LD4 will plot a new graph scale above the previous graph's key at the top of the column. (In Figure 4.46, the shear test values graph was added with 2.4 as the right-hand graph values, while the previous graphs in the column -- the moisture and Atterberg limits graphs -- both used 80 as the right-hand value.)
9. **For linear graphs**, next enter the number of labeled vertical lines into the **Labeled vertical grid lines> Number** field. (For example, a typical graph extending from 0 on the left side to 70 on the right side would have 6 labeled grid lines -- 10, 20, 30, 40, 50 and 60; "0" would be on the left side of the column and "70" would be on the right side.)

10. At the **Type** box you can select the type of line that will be used for the labeled vertical grid lines. In addition to dotted, dashed and solid lines, LD4 offers a “tick marks” option that will draw tick marks at even intervals across the graph instead of drawing vertical lines down the length of the graph column.
11. At the **Unlabeled lines > Number per labeled line** field, select the number (and type) of lines that will be drawn in-between each labeled vertical graph line. (Because many LD4 graphs are placed in relatively narrow table columns, it is normal to have 0 unlabeled lines in-between each labeled line.)
12. In the **Scale label orientation** box, select a presentation method for the horizontal scale that is plotted at the top of the graph.
13. Refer to the instructions in Section 4.11.5 if you would like to use the **Choose labels for each labeled vertical grid line** option to further customize the presentation of the graph’s horizontal scale labels (for instance, by changing the numeric labels into the “FR”, “SW”, “MW”, “HW” and “XW” labels on SAMPLE20’s “Weathering” graph.)
14. Click on the **Font & Text** tab to change the typeface used for the graph scale labels.



**Figure 4.52 -- Add Graph Dialog, Font Tab**

When a graph is added to a column, LD4 uses the font chosen for the column’s titles to draw the graph’s scale labels (see Section 4.3 for information on this selection); you can select a different font by unchecking the **Use the default font for graph scale labels?** box. (It’s common to select a smaller point size for a graph’s scale labels to avoid having the labels overprint each other.)

15. The **Print out-of-bound values in red** option highlights the text printed next any marker that would fall off the right side of the graph by printing it in red, like the example shown below:



**Figure 4.53 -- Out-of-Bound Marker**

Without the **Print out-of-bound values in red** selection, the value still prints ("89" in the example above) -- it just prints in black instead of red.

15. As noted in the previous step, LD4 prints out the values of any data to be graphed which would fall past the right side of the column. The **Print the text of any graph values that aren't strictly numbers** option does the same for any value to be graphed that wasn't entered as just a numeric value. *This option is very handy for indicating SPT refusal.* on an SPT graph that ranges horizontally from 0 to 70, normally a blow count of 50/3" (since it doesn't fall off the right side of the graph) would just show a marker at 50; there would be no indication of refusal. With the **Print the text of any graph values that aren't strictly numbers** box checked, 50/3" appears above the graph marker.



**Figure 4.54 -- Graph Marker with Text**

With the option selected, markers placed on the graph for any value that wasn't entered as just a number will show the value entered above the marker.

- For this option to work, the values to be graphed must *start out* with a number -- for example, 50/5". Values that don't start out with a number won't print at all: **SPT=50/5"** will not be graphed.

16. Entering a measurement into the **Additional space to shift the graph titles and scale upwards** box shifts the graph scale and title in column title block upwards by that amount. This is necessary on very rare occasions to make additional room for some custom text placed into the title block with the "Absolute placement" facility discussed in Chapter 5.

LD4 supports five basic graph types, as shown in the table below. Further setup instructions for each type are given in the sections listed in the table.

<b>Graph Type</b>	<b>Description</b>	<b>Covered In</b>
<b>Bargraph</b>	Graphs data as a series of bars. Bars may be filled with a solid or hatch pattern, or left unfilled.	Section 4.11.3
<b>Brackets</b>	Brackets are designed to show a minimum to maximum range. Typically they're used to present Atterberg plastic and liquid limit data.	Section 4.11.4
<b>Discrete Markers</b>	Graphs data as a series of circles, squares, triangles, etc. Each reading graphed may be connected to the next deeper reading by a line.	Section 4.11.1
<b>User-Selectable Markers</b>	Similar to the "Discrete Markers" graph, but, instead of using a single symbol to graph all readings, uses a symbol selected during data entry for each reading to be graphed. Normally used to plot shear test results by using a different symbol to represent each possible shear test type (e.g., a square represents a torvane test, a circle represents an unconfined compression test, etc.)	Section 4.11.2
<b>Multi-Source Graphs</b>	These graphs show the data from multiple borings on a single table. A special type of report form (called a multi-source graph report) must be created to use this type of graph.	Section 7.3

**Table 4.7 -- Types of Graphs**

### 4.11.1 Discrete Marker Graphs

Discrete marker graphs use a symbol from the MISC graphical symbols library (such as a filled circle or square, a diamond, triangle, etc.) to denote the data being graphed.

1. Begin by following the steps listed at the start of Section 4.11. After setting up the **Labels** and **Font & text** tabs, click on the Markers tab.
2. In the **Graph data as** box select "Discrete markers".
3. In the **Marker** box, select the type of marker to be used to graph the data.
  - You can omit the marker and just draw a line between successively deeper test values by selecting the "No marker - line only" selection.
4. In the **Size** box, select the size of the resulting marker. (.5 scale, the normal selection, draws the graph markers 1/2 the of the size at which they were designed.)
5. Click on the **Graph what?** tab.

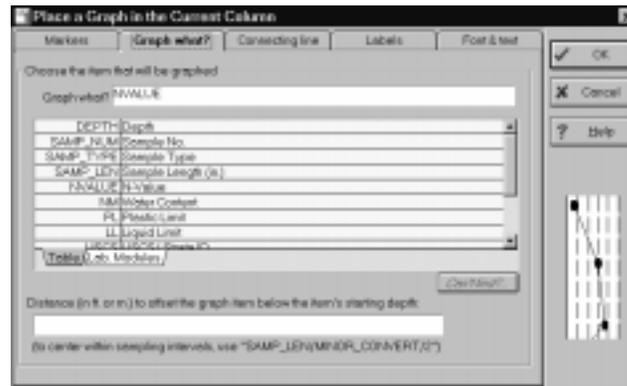
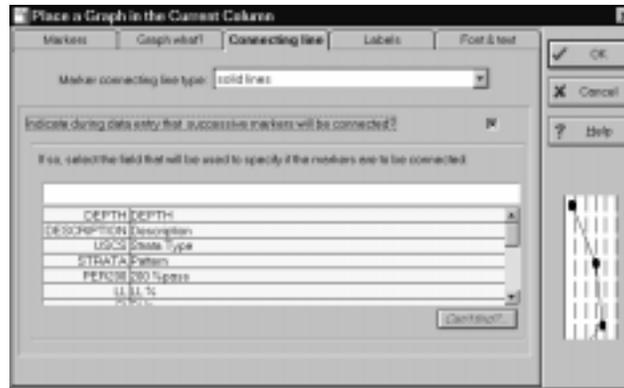


Figure 4.55 -- Add Graph Dialog, Graph What? Tab

6. At the **Graph what?** prompt, enter the data entry field to be graphed.
7. When graphing values obtained from soil or rock samples it's customary to vertically center each marker halfway between the top and bottom of the corresponding sampling interval: to do this, enter **SAMP\_LEN/MINOR\_CONVERT/2** into the **Distance (in ft. or m.) to offset the graph item below the item's starting depth** field.
  - "MINOR\_CONVERT" is initialized to "12" when plotting projects taken in feet/inches and "100" when plotting SI projects -- this has the effect of converting the sampling length from inches to feet and from centimeters to meters. The "MINOR\_CONVERT" inches-to-feet and centimeters-to-meters part of the equation is required because the vertical offset is supposed to be given feet or meters, not in inches or centimeters.

8. Optionally, you can choose to connect successively deeper markers with a line: to do this, click on the **Connecting line** tab.



**Figure 4.56 -- Add Graph, Connecting Line Tab**

9. Select the type of line to be used in the **Marker connecting line type**.
10. You may want to avoid connecting successively deeper markers if a discontinuity lies between the depths where the two data values were taken. To do this you'll need to add a field to your data entry card to select depths where lines are not to be drawn: refer to Section 1.4 for instructions on adding the field; give the field the name **DISCONTINUITY**, the field type should be **YN**.

After adding the new data entry field, return to the "Place a Graph in the Current Column" dialog and check the **Indicate during data entry that successive markers will be connected** box. Next, enter the name of the discontinuity data entry field (it should be called **DISCONTINUITY**) into the **If so, select the field that will be used to specify if the markers are connected** box.

### 4.11.2 User-Selectable Marker Graphs



Figure 4.57 -- Add Graph Dialog, User-Selectable Markers Tab

When graphing data that may be obtained from a variety of different testing methods (like, for example, shear test results) it's useful to have the data marker indicate the type of test used to produce the result. For example, on a graph of shear test results, triaxial shear results may be plotted as a triangle, unconfined compression results show as squares, etc. To plot this type of graph, you need to have *two* entry fields per data entry card: one to select the type of test the second for entering the test result.

1. Begin by following the steps listed at the start of Section 4.11. After setting up the **Labels** and **Font & text** tabs, click on the **Markers** tab.
2. In the **Graph data as** box select "User-selectable markers".
3. In the **Size** box, select the size of the resulting marker. (.5 scale, the normal selection, draws the graph markers 1/2 the of the size at which they were designed.)
4. At the **Field used to select the marker type** box, select the name of the data entry field that you'll be using to specify the type of test performed. (When graphing shear tests, this should be **STYPE**.)
5. At the **For each symbol, enter the symbol ID, followed by a "," and the symbol name:** prompt you'll need to establish a data entry shorthand for specifying the types of markers that will be used to graph your data (e.g., "use a square marker to indicate vane shear tests", etc.).

Each type of test to be graphed will need a specific code that can be typed into your "type of test" data entry field, along with a graph marker (e.g., square, triangle, circle, etc.) to be associated with that test type. In the box, you'll need to enter (one per line) the code that you'll use to specify a test type (e.g., "TV" for torvane, "HP" for hand penetrometer, etc.), followed by a comma then the name of a symbol from the MISC graphical symbols library that is to be used when plotting data for that particular test type (Chapter 9 covers LD4's graphical symbols libraries in detail). (You can find the names of LD4's graph markers by clicking on the "..." button.)

Following is a typical configuration for a graph of shear test values:

**HP, FCIRCLE**

**TV, FSQUARE**

**UC, FTRANGLE**

**UU, \***

**CU, DIAMONDP**

This sets up the graph so that, for example, if **uc** is entered as the type of test performed, a filled triangle will be plotted in the graph.

6. Click on the **Graph what?** tab.
7. At the **Graph what?** prompt, enter the data entry field that will be graphed.
8. When graphing values obtained from soil or rock samples it is customary to vertically center each value's marker halfway between the top and bottom of the sampling interval. To do this, enter **SAMP\_LEN/MINOR\_CONVERT/2** into the **Distance to offset the graph item below the item's starting depth** field.

### 4.11.3 Bargraphs

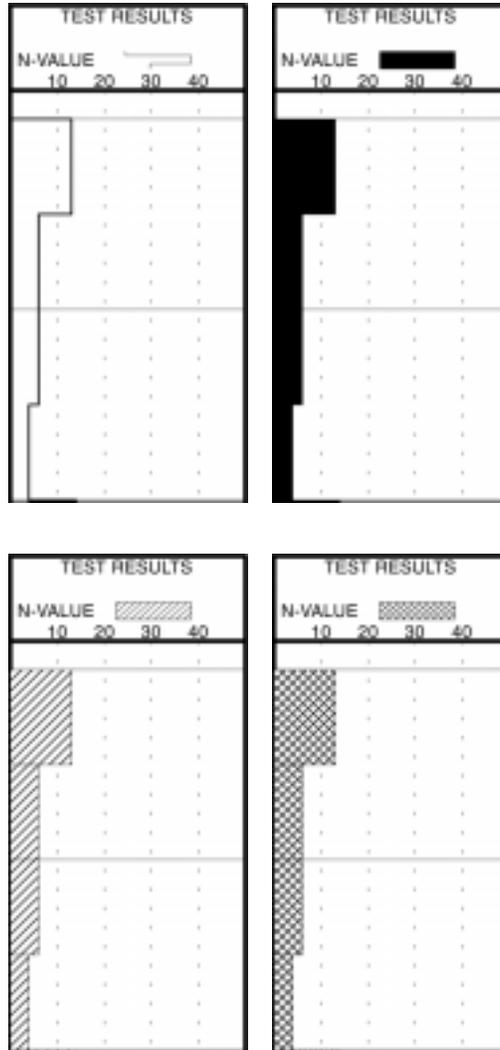
1. Begin by following the steps listed at the start of Section 4.11. After setting up the **Labels** and **Font & text** tabs, click on the **Markers** tab.



Figure 4.58 -- Add Graph Dialog, Bargraph Markers Tab

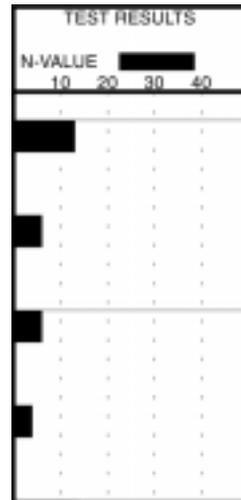
2. In the **Graph data as** box, select "Bargraph".

- Choose the type of fill for the bargraph at the **Fill type** box. The available fill selections are shown below:



**Figure 4.59 -- Bargraph Fill Selections**

- With "Filled", "Hatched" and "Cross-Hatched" graphs, you have the option of either drawing each bar down to the depth of the next reading to be graphed, or of making the height of the bar proportional to the length of the sample from which the test reading was taken. All of the samples above show the bars being drawn down to the depth of the next reading, while the following figure shows a bargraph drawn so that the height of each bar is proportional to the length of the corresponding test sample.



**Figure 4.60 -- Graph with Proportional Bar Heights**

If the graph is to use proportional bar heights, you will need a data entry field (on the tabulated data portion of the data entry form to be used) where the heights of each bar can be entered. Since typically the bar heights are proportional to the length of the soil sampling intervals, if you already have a data entry field available for entering sample lengths, no further change is necessary. Otherwise, add a data entry field to the table section of the data entry form that you'll be using (see Section 1.4 for instructions) so that you can enter the sample lengths.

Once the data entry field is in place, enter the name of the field (this will usually be **SAMP\_LEN**) into the **Bar height in ft. or m.** field.

LD4 expects that the bar heights will be given terms of feet or meters of drilling. If you will be entering sampling lengths in inches or centimeters you must use an equation to convert the lengths to feet or meters: adding **/MINOR\_CONVERT** after the name of the data entry field causes the sampling lengths to be converted from inches or centimeters to feet or meters.

For example, since most reports will use the data entry field named **SAMP\_LEN** to enter the sampling lengths (and graph bar heights) the equation entered into the **Bar height in ft. or m.** field will be **SAMP\_LEN/MINOR\_CONVERT**. (For a discussion of the "/MINOR\_CONVERT" part of the equation, see the Customization Guide's Appendix A.)

5. At the **Graph what?** prompt, enter the data entry field that will be graphed.
  - The **Distance (in ft. or m.) to offset the graph item below the item's starting depth field** is seldom used with bargraphs -- for information on this field, see Section 4.11.1.

---

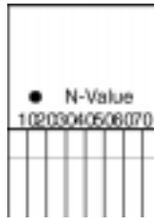
#### 4.11.4 Brackets

For paired test results such as plastic and liquid Atterberg limit values, you'll want to graph the data as brackets.

1. Begin by following the steps listed at the start of Section 4.11.
  - **Tip:** In the graph's title area, LD4 draws the sample bracket to fit the width of the column, minus the space taken up by the left and right bracket labels. To make the bracket narrower, add spaces before the left bracket label and add "^^" signs after the right bracket label; e.g., **LL^^^**.
2. After setting up the **Labels** and **Font & text** tabs, click on the **Markers** tab.
3. In the **Graph data as** box select "Brackets".
4. Click on the **Graph what?** tab.
5. In the **Left** field, enter the name of the data entry field where you'll be entering the bracket left-side (e.g., minimum) values: for Atterberg limit graphs, this will be **PL**.
  - If you're used to entering plasticity index instead of plastic limit, set the left bracket item to **(LL-PI)**.
6. In the **Right** field, enter the name of the bracket right-side data entry field -- this should be **LL** for Atterberg limit graphs.
7. When graphing values obtained from soil or rock samples it is customary to vertically center each value's marker halfway between the top and bottom of the sampling interval. To do this, enter **SAMP\_LEN/MINOR\_CONVERT/2** into the **Distance to offset the graph item below the item's starting depth** box.
8. You can select the type of horizontal line used to draw the bracket by clicking on the **Connecting line** tab and using the **Bracket line type** box.

### 4.11.5 Custom Graph Labels

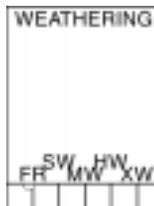
Normally LD4 places a label above every “labeled grid line”: a graph extending from 0 to 70 with 6 labeled vertical lines will have “10”, “20”, “30”, “40”, “50” and “60” as scale labels at the top of the column. If the column is relatively narrow, the labels may overlap each other like in the following example.



**Figure 4.61 -- Graph with Inadequate Scale Space**

There's three options for dealing with this situation: 1) dropping every other graph line by halving the number of labeled vertical lines, 2) selecting a smaller point size for the label's text or 3) dropping every other label, while retaining the lines. To drop the labels, you'll need to tell LD4 which labels actually should be drawn by using LD4's custom graph scale labels option.

One other use for setting up a graph with custom labels would be for a rock weathering graph such as the one included in SAMPLE20. SAMPLE20's weathering graph, instead of showing numbers at the top of each labeled vertical line, shows text (“FR”, “SW”, “MW”, “HW”, “XW”). During data entry, a 0 is entered into the “Weathering” field to indicate FR weathering, 1 is entered to indicate SW weathering, etc. The graph's title looks like this:



**Figure 4.62 -- Custom Graph Scale Labels**

#### To customize a graph's scale labels:

1. First set up the graph by following the directions given in Section 4.11.
2. Next, click on the **Labels** tab of the “Place a Graph in the Current Column” dialog.
3. Check the **Choose labels for each labeled vertical grid line** box.

4. In the field below, enter the labels that you want to have plotted, one label per line. *If you want to have a label omitted*, leave the line blank. For example, if you want to plot a graph ranging from 0 on the left to 80 on the right while omitting every other label, enter

**0**

(leave this line blank)

**20**

(leave this line blank)

**40**

and so on.

- *You may elect to either enter labels just for the interior grid lines or for the interior grid lines plus the left and right edges of the graph.* If you enter two more labels than there are interior grid lines, LD4 will place the first label against the left edge of the column and the last label against the right edge of the column.
  
- LD4 also supports non-linear graphs: if you enter **0, 1, 5, 50, 100, 500** as graph labels, the program will do the work of figuring out where to plot, for example, a test result of 7.

---

#### 4.11.6 Step by Step Example: Adding an N-value Graph

This section provides instructions for adding an SPT N-value graph to a report table; with slight modification, you can also use these instructions to add a natural moisture or Atterberg limit graph, or even add all three graphs to the same column.

1. Before using a data entry field on a report form you must modify the data entry form used by the report (see Section 2.7) so that it includes the field to be used. Refer to Section 1.4 for instructions the following data entry field:

Prompt:                **SPT**  
                               **N-value**  
 Field name:            **NVALUE**  
 Field type:            (leave blank)  
 Field width: 5

2. Now that you have a field for enter N-value data, edit the report form (Tools > Report Forms) then follow the directions given in Section 4.1 for selecting the table column where you want to add the graph.
3. After selecting the appropriate table column choose Add > Add Graph of Data vs. Depth.
4. Select "Discrete markers" in the **Graph data as** box.
5. Select "Circle" in the **Marker** box.
6. Click on the **Graph what?** tab.
7. Enter **NVALUE** into the **Graph what?** field.
8. Enter **SAMP\_LEN/MINOR\_CONVERT/2** into the **Distance (in ft. or m.) to offset the graph item below the item's starting depth** field.
9. Click on the **Labels** tab.
10. Enter **SPT N-value** into the **Title on the left of the marker** field.
11. Select a "Linear" graph type.
12. Enter **0** into the **Scale> Left-hand value** box.
13. Enter **80** into the **Right-hand value** box.
14. Enter **7** into the **Labeled vertical grid lines> Number** box.
15. Click on the **OK** button.

---

#### 4.11.7 Step by Step Example: Creating a Graph of Shear Test Results

1. When entering each shear test result you'll also need to enter a code indicating the test method used to produce the result (torvane, hand penetrometer, etc.). Rather than memorizing the codes you can set up a picklist of test methods: to do this, open a project file then choose **Legend > Edit the Default Legend**. If this selection isn't available then you've created a custom legend for the project -- you should choose **Legend > Revert to the Default Legend** so that the modifications you'll be doing will affect all future projects, then select **Legend > Edit the Default Legend**.

2. Select **Legend > Add a New Legend Table**.

3. Select "List of items for popup menu during data entry".

4. As a name for the list, enter **STYPE**.

5. In the data entry cards for the table that pops up, enter the code for each test (into the **Item** field) then a short description:

Item: **HP** Description: **Hand Penetrometer**

Item: **TV** Description: **Torvane**

Item: **UC** Description: **Unconfined Compression**

Item: **UU** Description: **Unconsolidated Undrained**

6. Since the graph will use a different marker for each test method (e.g., hand penetrometer tests will be shown on the graph as circles, torvane tests will be shown as triangles, etc.) you'll need a key indicating which marker belongs with which test method. You can either place the key at the bottom of the boring log form by using the techniques discussed in Section 3.11 (add a filled circle symbol to the footing; next to it, add the text "=Hand Penetrometer"; to the right, add a filled square symbol, next to that add the text "=Torvane", etc.) or you can modify the legend page so that it includes a description for each graph marker.

To modify the legend page, click on "MISC" in the list of legend tables shown on the left side of the screen.

Next, locate the data entry card that has "FCIRCLE" next to the **Symbol(s)** prompt. If you can't find one, locate the first blank card then type **FCIRCLE** into the data entry field to the right of **Symbol(s)**. In the **Description** field, type **Hand Penetrometer**.

Locate or create a card for "FTRANGLE" then type **Torvane** into the **Description** field.

Locate or create a card for "FSQUARE" then type **Unconfined Compression** into the **Description** field.

Finally, locate or create a card for "\*" then type **Unconsolidated Undrained** into the **Description** field.

7. Next we'll need to add the data entry fields: select **Tools > Data Entry Forms**.

8. Click on the **Tabulated Data** tab then, by following the instructions given in Section 1.4, add the data entry fields shown below:

First, if your data entry form doesn't have a field for entering sampler lengths, add one:

Prompt:           **Sample  
length  
(in. or cm.)**

Field name:           **SAMP\_LEN**

Field type:           (leave blank)

Field width: **5**

Next, add the shear test method field:

Prompt:           **Type  
of  
shear test**

Field name:           **STYPE**

Field type:           **STYPE**

Field width: **2**

- Note: the **STYPE** field type is the name of the list that we created in Step 4. Making the field type **STYPE** causes LD4 to show a popup list of shear test types during data entry. (Section 1.4.2 covers picklists in detail.)

Add the test result field:

Prompt:           **Shear  
strength**

Field name:           **SHEAR**

Field type:           (leave blank)

Field width: **5**

9. Now it's time to modify the report form. Select Entry Form > Exit then Tools > Report Forms and (if it doesn't automatically open), open the report form to be modified.
10. Follow the directions given in Section 4.1 for selecting the table column where you want to add the lines.
11. Select Add > Add Graph of Data vs. Depth.
12. From the **Graph data as:** box select "User-selectable markers".

13. At the **Field used to select the marker type** box, enter **STYPE** (this is the name of the data entry field where you'll be entering codes to indicate which shear test method was used).
14. At the **For each symbol, enter the symbol ID, followed by a “,” and the symbol name** box, enter the following (one entry per line):

**HP, FCIRCLE**  
**TV, FTRANGLE**  
**UC, FSQUARE**  
**UU, \***

➤ Note that the “HP”, “TV”, “UC” and “UU” are the codes that you set up in the legend picklist in step 5; the symbol names should match those you entered into the **Symbol(s)** prompt in Step 6.

15. Click on the **Graph what?** tab.
16. Enter **SHEAR** into the **Graph what?** field.
17. Enter **SAMP\_LEN/MINOR\_CONVERT/2** into the **Distance (in ft. or m.) to offset the graph item below the item's starting depth** field.
18. Click on the **Labels** tab.
19. Enter **Shear Test Results** into the **Title on the left of the marker** field. (The “right side” title isn't used for this type of graph.)
20. Choose “Linear” as the **Type of graph**.
21. Enter **0** for the left-hand scale value.
22. Enter **2.4** for the right-hand scale value. (If you've already added a grid to this column, you'll need to select a right-hand value that evenly divides by the number of vertical grid lines selected for the prior grid. In our example we'll be using 7 grid lines which, with 1 added to take into account the grid increment between the last grid line and the right side of the column, nicely divides 2.4:  $2.4/(1+7)$  gives 0.3 tsf per grid line.)
23. Enter **7** into the **Labeled vertical grid lines> Number:** field.
24. Click on the **OK** button to close the dialog.

---

### 4.12 Adding Groundwater, Caving, Seepage and Other Symbols to a Table Column

Commonly, the subsurface portion of drilling log forms features symbols indicating groundwater and caving depths like the examples shown below.

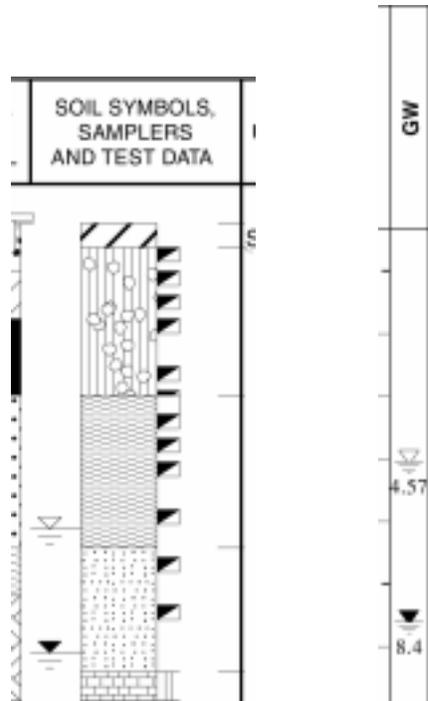


Figure 4.63 -- Groundwater Symbols

DEPTH (feet)	Description
	Dirty SANDY CLAY, red, brown, fine to medium grained, sandy, with rock fragments
20	ROCK FRAGMENTS, hard, decomposed, gray, angular, fine-medium gravel size
40	SAND, medium, tan, poorly graded, slightly compact, subrounded

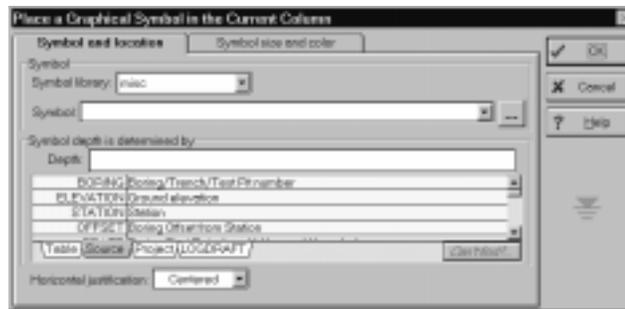
Figure 4.64 -- Groundwater and Caving Symbols Centered in a Column Border



Figure 4.65 -- Graphical Symbols Used to Indicate Seepage Depths

**To add a graphical symbol to the subsurface table:**

1. First off, if you haven't yet done so, you will need to provide a data entry field for entering the depth where the symbol is to be printed. If the symbol is to appear at only a single depth (such as the groundwater depth at first check, the depth to caving, the installation depth for a well pump, etc.), follow the directions given in Section 1.3 to add the field to the Source Data section of the data entry form you'll be using. Conversely, if the symbol can possibly appear at *multiple* depths within a single boring, follow the directions given in Section 1.4 to add the field to the Table section of the data entry form you'll be using.
2. Follow the directions given in Section 4.1 for selecting the table column where you want to add the lines.
  - You can center the symbols on the border between two columns (like the example shown in Figure 4.64) by placing the symbols in a column of their own that is 0.001 inch wide (see Section 4.4). Make the **Weight of Line at Column Right** for the symbol's column equal to (**no line**).
  - To produce a report where the groundwater symbols are attached to the left of a graphic log column (like the example shown in Figure 4.63), place the symbols in a column of their own immediately to the left of the graphic log column. Make the **Weight of Line at Column Right** for the symbol's column equal to (**no line**). When asked (see below), use one of the following symbols from the MISC library: "LWATER" or "LWATERNF". Set the symbol's **Horizontal justification** to "Right".
3. When the appropriate table column has been chosen, select Add > Add Graphical symbols -- this displays the dialog shown below.



**Figure 4.66 -- Graphical Symbols Dialog**

4. At the **Symbol library** prompt, select the library that holds the symbol you want to print. (Symbol libraries are covered in detail in Chapter 9.) All the symbols that are of interest (groundwater, caving and seepage) are in the "MISC" symbol library.

5. At the **Symbol** prompt, select the symbol that to be printed. (If you want to plot more than one symbol in the column -- for instance, a groundwater symbol to indicate depth at first check and second one to indicate depth after 24 hours -- you'll need to go through these steps for every symbol to be plotted.) If you're not sure as to which symbol you want to use, click on the "... button.
  - Typical groundwater symbol usage is: **WATER** for the depth first encountered, **WATER1** for the depth when checked after 24 hours, and **FWATER** for the final depth check.
  - If you want to use a symbol that LD4 doesn't yet have in its symbol libraries, consult Chapter 9 for instructions on drawing new symbols.
  
6. At the **Field** prompt, enter the name of the data entry field that will be used for finding the depth(s) at which the symbol is to be drawn (you should have added this field in Step 1). For symbols that are printed once per boring (such as groundwater and caving symbols), you can find the name of the appropriate field in the **Source** tab of the dictionary shown below the prompt. For symbols such as seepage that may be printed multiple times per boring, you can locate the name of the appropriate field in the **Table** dictionary tab.
  
7. By default, symbols are drawn at the size in which they were designed and are shown in black. If you want your symbol to appear in a different size or color, continue by clicking on the **Symbol size and color** tab.
 

To change the symbol width or height, enter a dimension into the **Width** and **Height** fields. Entering **0** into either field causes the program to plot the symbol in the size (for that dimension) at which the symbol was designed. Note that all the symbols in the program's symbol libraries were designed to plot at an appropriate size without the need for entering a custom **Width** or **Height**.
  
8. After printing a sample report *and* legend, you may need to make a final adjustment: if the symbol is printed with a **(not in table)** description next to it on the legend, refer to Chapter 4 in the User's Guide for instructions on entering your own description for the symbol. (Most symbols come from the MISC table discussed in Section 4.2.4 of the User's Guide).

### 4.13 Adding a Monitoring Well Schematic

LD4 subsurface reports (boring logs *and* profiles) can include a monitoring well schematic columns with up to three pipes per well, as shown in the example below.

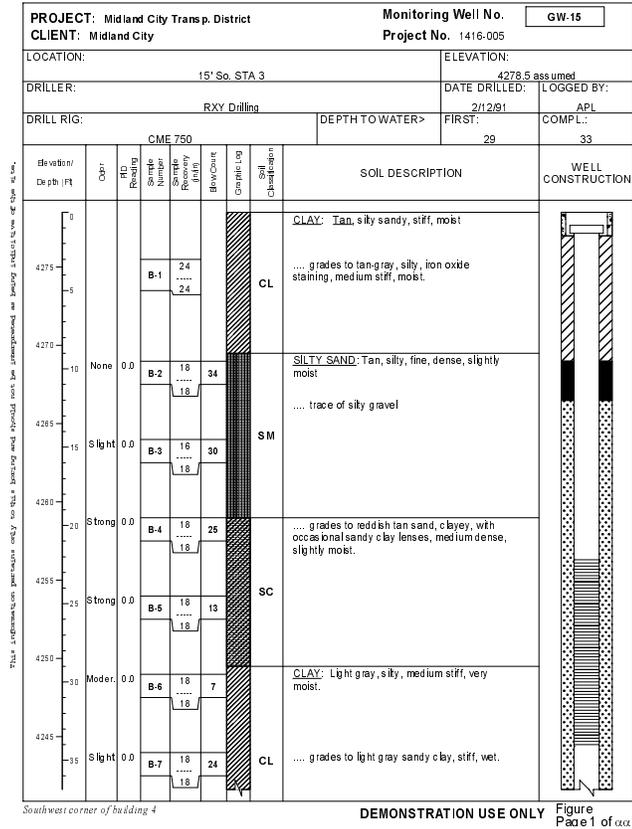


Figure 4.67 -- Example Monitoring Well Report

- The symbols used for the well backfill material are taken from the **STRATA** graphic symbols library. For instructions on modifying these symbols, refer to Chapter 9.
- The symbols used to draw the well pipes and top caps are taken from the **PIPES** graphics symbols file. It's a very easy matter to create your own specialized pipe symbols; again, refer to Chapter 9.
- The various combinations of backfill and pipe symbols available for the user to choose from are defined through the legend facility discussed in Chapter 4 of the User's Guide.

**To add a monitoring well column to a report form:**

1. Remember: in order to print something on your report you first must be able to enter data for it. If you haven't yet done so, follow the directions given in Section 1.4 to add a new field to the subsurface section of the data entry form you'll be using:

Prompt:                **Monitoring**  
                              **Well**  
                              **Schematic**  
 Field name:                **WELL\_ID**  
 Field type:                **WELL\_ID**  
 Field width: **13**

If you want to show multiple pipes, you'll need to add one or two more data entry fields (so that, for each well installation, you can pick symbols for the second and third pipes). For additional pipes (you can have a maximum of three pipes in the schematic), again follow the directions given in Section 1.4 to add one or two more entry fields (depending upon whether you want to have a maximum of two or three pipes in the schematic).

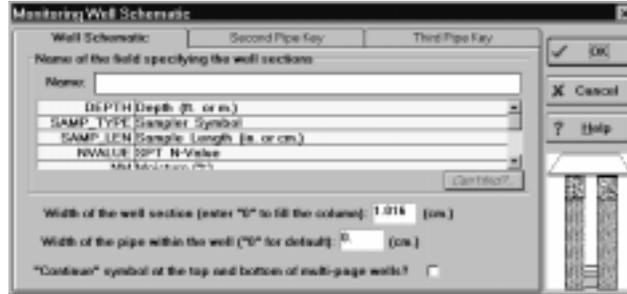
Prompt:                **Well**  
                              **Pipe**  
                              **No. 2**  
 Field name:                **WELL\_PIPE2**  
 Field type:                **PIPES**  
 Field width: **8**

and, if you want to have the option of adding a third pipe to a schematic:

Prompt:                **Well**  
                              **Pipe**  
                              **No. 3**  
 Field name:                **WELL\_PIPE3**  
 Field type:                **PIPES**  
 Field width: **8**

2. Next, follow the directions given in Section 4.1 for selecting the table column where you want to add the well schematic.

3. When the appropriate table column has been chosen, select **Add** > **Add Monitoring Well Schematic** -- this displays the dialog shown below.



**Figure 4.68 -- Well Schematic Dialog**

4. At the **Name** prompt, enter the name of the data entry field where the well sections are to be selected: This should be **WELL\_ID**.
5. In the **Width of the well section** field enter the width of the well schematic, or enter **0** to have the program select an appropriate width. By default (if you enter **0**), monitoring well diagrams featuring a single pipe are drawn 0.4 inches (1 cm.) wide. If you make your table column 0.5 inches (1.27 cm.) wide, LD4 will draw the well diagram in the center of the column with a 0.05 inch (1.2 mm) gap on the left and right of the diagram because the column width (0.5 inches) minus the schematic width (0.4 inches) gives 0.1 inches to be used as a margin -- 0.05 inch on each side of the schematic .

Similarly, if you don't select a well section width, two-pipe well diagrams are automatically drawn 0.5 inches (1.27 cm.) wide: making the column 0.6" wide (1.52 cm.) again gives a 0.05 inch gap on the on either side of the column. (Three-pipe well diagrams are drawn 0.6 inches (1.52 cm.) wide.)

6. Leave the **Width of the pipe within the well prompt** field as **0** to have the software select an appropriate width for the pipes drawn within the well; entering any other number draws the widest pipe section at that width.
7. LD4 can include a "continue" symbol at the bottom of the well schematic if the well will be continued onto the next page (you can see an example at the bottom of the well section in Figure 4.67). To include the symbol, make sure that the **"Continue" symbol at the top and bottom of multi-page wells** option is selection.
- **Note:** If you include a continue symbol as part of the monitoring well column, LD4 will shift the start of the subsurface table downward slightly to accommodate the symbol at the top of the well. The subsurface section will also be terminated slightly above the horizontal line drawn at the bottom of the table.

8. If you want the option to have a second pipe shown within some well schematics, click on the **Second pipe** tab then check the **Support for a second well pipe?** box and, at the **Name** prompt, enter the name of the data entry field where the second well pipe sections will be chosen (this should be **WELL\_PIPE2**, the name of the field you set up in step 1).
9. After setting up the second pipe, you can add the option to draw a third pipe by clicking on the **Third pipe** tab: Check the **Support for a third well pipe?** box then enter **WELL\_PIPE3** into the **Name** field.
  - Note that adding the *option* to show a second and third pipe in a well installation schematic doesn't require that the pipes be drawn in *every* well schematic: As long as the "Well pipe no. 2" and "Well pipe no. 3" data entry fields are left blank on every data entry card for a particular boring, the resulting report will show a well with just a single pipe.
  - You can place piezometer or pump symbols in your well columns through the option to insert graphics symbols as discussed in Section 4.11.6. As an example:

**To add a pump symbol to your well:**

1. Following the directions given in Section 4.11.6, add a pump symbol to the same column as the monitoring well schematic: Your dialog should have the following settings:
 

Symbol file:	<b>MISC</b>
Symbol:	<b>PUMP</b>
Depth:	<b>PUMP_DEPTH</b>
Horizontal justification:	<b>Centered</b>
2. If you haven't added a field for entering the depth to the pump in each boring, click on the **Can't find** button (below the **Depth** prompt in the "Place a Graphical Symbol in the Current Column" dialog). Choose **I have not added my item to a data entry form**, select the appropriate data entry form, then select **Data taken only once per boring**, then double-click on "PUMP\_DEPTH" in the following dictionary.
  - The SAMPLE15 report form uses the same technique add piezometer symbols.



- If your report form is tagged as being LOGDRAFT III-compatible, you will be limited to just 33 characters. If your text is longer than 33 characters you can either A) turn off the LOGDRAFT III compatibility option (see Section 2.5.1) or B) enter your information on multiple rows. If you opt for B), enter -1 as the horizontal and vertical coordinate in all rows that should be combined with the first row.
- To print the contents of a data entry field, enter an @ sign, followed by the name of the field that you want to print; for example, to print the boring number, type @BORING into the Text column.

You can also combine some fixed text with the contents of a data entry field: **Figure @FIGURE** prints the word "Figure", followed by whatever was selected as the current report's figure number. Another example: **Page @PAGE of @PAGE\_L** prints the page number of the current page and the number of pages to be printed; e.g., "Page 3 of 5".

- To place a logo or other picture somewhere on the report, enter @LOGO (*logoname*) into the Text column: *logoname* is the name of your picture file, without any extension. The file should be stored in the same directory as the program and can be a bitmap (e.g., a file ending in .BMP) or monochrome .PCX. Note that the horizontal and vertical coordinates given for the item (as discussed in the next step) are for the top-left corner of the logo.

Many of the sample forms (DEMOLOG for example) use @LOGO(@CNAME) -- instead of naming a specific picture file, the "@CNAME" part tells LD4 to use a logo appropriate for whoever is using the software. This allows GEOSYSTEM to design forms that may be used by many organizations; we couldn't do this if we used, for example, @LOGO (ALVENGINEERS) in the sample forms -- ALV Engineers would be happy with our forms while everyone else, stuck with ALV's logo, would be decidedly unhappy.

- LD4 has a rather convoluted syntax for placing a graphical symbol such as a groundwater symbol: you'll need to enter @symbolfile (*symbolname, width in inches, height in inches*).

*symbolfile* is the name of one of LD4's graphical symbol libraries: MISC, STRATA, SAMPLERS or PIPES, although MISC has most of the symbols that would be useful for directly placing somewhere on a report form. (Don't forget to put the @ sign before the symbol file name.)

*symbolname* is the name of the symbol to be plotted: you can get the names of the symbols stored in a particular library by using the symbol editor facility discussed in Chapter 9.

*width in inches* and *height in inches* are the desired width and height for the symbol. Note that this measurement is always in inches, regardless of whether or not the program's default measurement system is inches or centimeters.

An example: **@MISC (FWATER, .1, .1)** plots a 1/10" square groundwater symbol.

- **@DLINE** (*x1, y1, x2, y2, line weight*) draws a *line weight* thick line from (*x1,y1*) to (*x2,y2*). *line weight* should be a number from 1 to 9; the endpoint measurements are given from the top-left of the page and are always given in inches. (Again, don't forget to put the @ sign before the word DLINE.)
3. After entering the item to be printed, hit enter then type in the horizontal and vertical coordinates of the top-left corner of the item. When entering DLINEs, note that these coordinates are ignored -- you may safely leave them at 0; otherwise, these coordinates are from the top-left corner of the printable page.
  4. Next, select the typeface, size, style and color of the text to be plotted: DLINEs and graphical symbols ignore these selections.

**To delete a row from the Absolute Placement table:**

1. Click on the row number: this should highlight the entire row.
2. Select Edit > Delete.

One limitation of the absolute placement facility is that generally you can't use it facility to place subsurface table columns outside the border as was done with the scale on the right-hand side of the table in the example below.

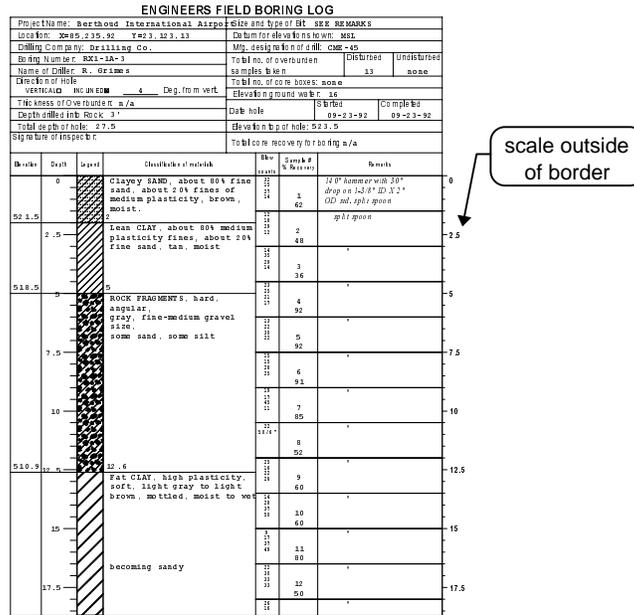


Figure 5.2 -- Scale Outside of Report Border

Instead, you'll need to:

1. Turn the border drawing option OFF (see Section 2.5.2)
2. Use the line drawing options discussed in Section 3.2 to draw border lines at the left, top, right and bottom of the heading and footing (leave as much blank space between the right border line and the right edge of the paper as you'll be taking up with your table column).
3. Set the "line after weight" for the column *before* the column that you want to be outside the border to be the weight of your border line
4. Set the last column's top, bottom and right line weights (e.g., the column that you want to have appear outside the report border) to 0.

## 6. Compatibility with LOGDRAFT III

Users upgrading from the MS-DOS LOGDRAFT III program can use their old LOGDRAFT report designs with LD4.

- When you received your LD4 upgrade, you should have received a document titled “LOGDRAFT III Upgrade Issues”: This document contains notes on problems that you might run into when using LOGDRAFT III-created report and data entry forms with LD4. An up-to-date copy of this document is also posted to the LD4 section of our web site ([www.geosystemsoftware.com](http://www.geosystemsoftware.com)).
- Initially, old report designs created with LOGDRAFT III won't be able to take advantage of the new features offered by LD4. If color or TrueType fonts are desired, open the Form Settings dialog (discussed in Section 2.5), click on the **Report** tab, and turn the “LOGDRAFT III compatible form” selection off. Once this is done the form will no longer be useable by the MS-DOS LOGDRAFT program.

LD4's report forms are located in the same hard disk subdirectory as LD4. If LD4 is used to modify a LOGDRAFT III report, the file must then be moved back to LOGDRAFT III's program directory before the report may be used with the older program: this can be done using the Windows File Manager or Explorer programs (move all the files that have the same name as the report, regardless of the file's extension). Once the modified report has been returned to the LOGDRAFT III program directory, start LOGDRAFT III, then select Format, Design from LOGDRAFT's opening menu. Next, select Edit, choose the form that has been modified with LD4, then Convert -- this converts the report form back to a LOGDRAFT III-useable format.

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## 6.1 LOGDRAFT III First and Page 2,3,4... Templates

Early versions of LOGDRAFT III required separate report forms for the first page of the report and the subsequent pages of the report if different degrees of information was to be shown (typically the first page listed much more information in the report's heading and footing). Later versions of LOGDRAFT (and continuing with LD4) added an option to combine both report pages into a single form; LD4 doesn't support the separate report form feature.

Because LD4 doesn't support separate report forms for the first and subsequent boring log pages, users with LOGDRAFT III report designs old enough to require separate forms for the first and subsequent pages will need to combine the forms into a single file.

### To combine separate LOGDRAFT III "First Page" and "Page 2,3,4..." report forms into a single file:

1. Using LOGDRAFT III (your MS-DOS drilling log program), choose Print, then Print again and select a project (any project will do) for printing.
2. From the "SELECT OUTPUT OPTIONS" screen, make a note of the **First Page Template** and **pages 2,3,4...** selections: these are the report forms that you will be modifying. (If the two selections are the same, e.g., "BORELOG", then you don't need to go through this procedure.)
3. Exit LOGDRAFT III and start your Windows LD4 package.
4. From the LD4 opening screen, choose Tools > Report Forms.
5. If LD4 doesn't show a report selection dialog, choose Report > Open. Once the report selection dialog has been shown, select the form that you noted was used as the **First Page Template** in LOGDRAFT III.
6. Choose Tools > Combine with Another Form.
7. Click on the **Continue** button.
8. From the following "Report Forms" dialog, click on the form that you noted was used as the **page 2,3,4...** form in LOGDRAFT III then click on the **OK** button.
9. On the form preview screen, click on the **1** and **2** buttons and make sure that the two pages look similar.
10. If everything looks copacetic, select Report > Exit; if you have any doubts, Report > Abandon Changes will reverse the procedure.

## 7. Notes on Specific Report Types

Most of the Customization Guide has focused on creating drilling log reports. LD4 also creates other types of reports: subsurface profiles, project summaries and legends. This chapter covers some specifics on creating these other types of printouts.

### 7.1 Subsurface Profiles

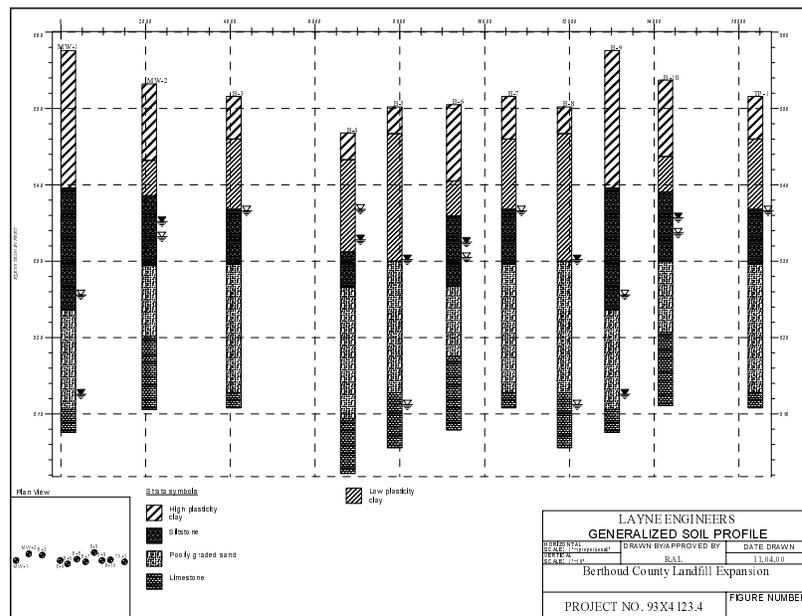


Figure 7.1 - Profile Report

*Subsurface profiles* are reports that can be used to show more than one boring per page. When you create the subsurface table for a profile report, you're telling the program how to draw a *single* boring: LD4 uses the same subsurface table entries to draw each boring. This involves using the Table section of the form (discussed in Chapter 4) to lay out the items that should be shown for a single boring on the profile. For example, LD4 drew Figure 7.1 from a report form whose subsurface table consisted of two columns: one column containing the boring number and the stratigraphy and the second column containing the groundwater symbols. LD4 then used the same two table columns to draw each boring.

As to *where* the borings are drawn, this is a decision that isn't made until the profile is actually printed. The same report form can be used to print borings that are elevation-adjusted and proportionally scaled horizontally, or evenly spaced horizontally and lined up vertically.

- The Form Settings dialog's **Profile** tab, discussed in Section 2.5.5, covers the settings used for changing the appearance of the profile's horizontal and vertical scales.

### ***Placing boring numbers, elevations, etc. above the top of each boring***

Profile reports typically add the boring number to the top of the stratigraphy column, as Figure 7.1 illustrates.

- Because they're centered over each boring, the boring number should be added to the center column of the columns on the report's table.
- To add boring numbers to a profile, use the Add User Entered Data, Equations, etc. facility discussed in Section 4.6: in the **Print what?** field, enter **BORING**. Select "Centered" as the **Horizontal justification**. Finally, click on the **Print when** tab, select "Print this item at depths entered into another data entry field" and, in the **Depths specified by** field, enter **TOP**.

### **To plot both boring numbers *and* elevations at the top of each boring on the profile:**

1. Use the table editor discussed in Section 4.1 to select the table column where you want to print the boring number and elevation (remember, this should be the center column of the set of columns on the table).
2. After selecting the appropriate table column, choose Add > Add User Entered Data, Equations, etc.
3. At the following dialog, click on the **Formatted** button.
4. Click on the **Entered/Calcd.** button.
5. In the **What to print** box, enter **BORING**.
6. Click on the **Line break** button.
7. Click on the **Entered/Calcd.** button.
8. In the **What to print** box, enter **ELEVATION**.
9. Click on the **OK** button.
10. In the "Place a Text Item in the Current Column" dialog, click on the **Justification** tab.
11. Select "Centered" as the **Horizontal justification**.
12. Click on the **Print when** tab.
13. Choose "Print this item at depths entered into another data entry field".

14. In the **Depths specified by** field, enter **TOP**.
15. Click on the **OK** button.
16. The boring number and elevation must be the first item listed in the **Stuff Included in Column** list. If it isn't, click on the entry then choose Edit > Move Item Up. Repeat this step until "Report \"%s\n%s\",BORING,ELEVATION" is the first item in the list.
17. Now there's two lines of text to be shown at the top of each boring: when a horizontal scale is plotted at the top of the profile (as shown in Figure 7.1) the boring number and elevation text is likely to run into the scale. To avoid this, select Sections > Form Settings, click on the **Profile** tab then change the **Horizontal scale location** to "Bottom of profile".

## 7.2 Creating a Project Summary

Depth	Sample No.	Sample Type	Sample Length (ft.)	Water Content	Plastic Limit	Liquid Limit	SPC/ Plastic Index	Soil Approx.	Description	Notes of Well Installation	Notes
0-3'	1-1						SP	C	CLAY, silty, brown, med. moist	CONCRETE	
3-4'	1-2						CL	S	brown, silty SAND with some gravel		
10-15'	1-3	SP	10	18	12.0	24.0	SP-SC				
14-20'	1-4							S	SAND, FRAGILE and SAND, fine gravel	SEPTIC TANK	
20	1-5	SP	10	15	10					STYROFOAM SLIT	
25	1-6	IS	10	10	10	10			END		
35	1-7	IV	10								
40.0											

Project: Berthoud County Landfill Expansion  
 Project No.: 92X1123.4  
 Client: City and County of Berthoud  
 Profiles drawn by/approved by: RAL

Figure 7.2 -- Project Summary

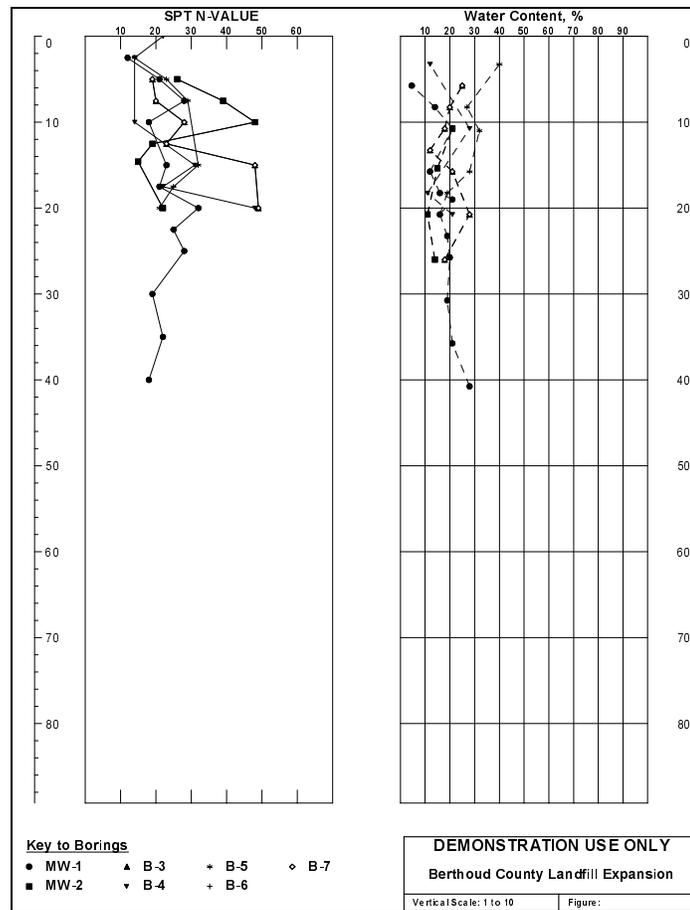
LD4 has a facility for listing every single item of data entered into a project. These reports, called *project summaries*, are useful for data entry checking and as hardcopy records.

### To set up a project summary:

1. From the LD4 opening screen choose **Tools > Report Forms**.
2. At the "Report forms" dialog, enter **PROJSUM** (this is the name of the report you'll be creating -- if the dialog already lists a form called "PROJSUM", choose a different name).
3. Enter **Project data summary** into the **Description** field then click on the **OK** button.
4. At the "Create a New Report Form" dialog, click on "Project Summary" then click on the **Continue** button.
5. Next, a data entry form selection dialog will be displayed. In order to summarize your project's data, LD4 needs to be told what kinds of data will be entered into your project file: this is accomplished by selecting on the data entry form that will be used with your project.
6. Click on the **Continue** button.

You now have a project summary form. This form isn't pretty, but, since it's now editable just like any other form you may want to change the form's fonts, drop some data or maybe remove the "greenbar" shading (see Section 2.5.6). When you're ready to use it, open your project, select **Print > Reports**, select the borings that you want to summarize, click on the **Report form** tab, click on the **Summaries** radio button then select your new form from the list.

### 7.3 Multi-Source Graphs



**Figure 7.3 -- Multi-Source Graph**

Multi-source graph reports have fairly limited uses because their subsurface table section can be used for showing only three things: scale bars, graphs and horizontal lines. You can't print text such as material descriptions on a multi-source graph: since the same table is shared by all the borings plotted on the report page, the descriptions would overprint each other. (Contrast this with a profile report: just like on a multi-source graph, borings on a profile share the same subsurface report table, but on a multi-source graph report the borings are all plotted in the same horizontal location on the page while on a profile report the borings are typically plotted horizontally arranged across the page.)

- The report shown in Figure 7.3 includes (from left to right): a scale bar, a graph, a blank column, a graph and a scale bar -- this basically covers everything which can be shown on a multi-source report's subsurface table.

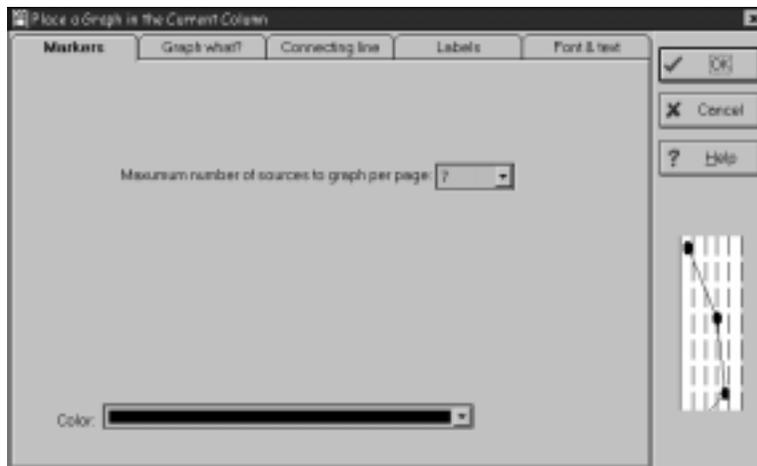
- A multi-source graph report's graphs use a different marker (circle, square, diamond, etc.) for each boring plotted. You do not have any control over which marker is associated with which boring.

### 7.3.1 Adding a Graph to a Multi-Source Graph Reports

When placing a graph onto a multi-source graph form, the procedure differs slightly from that discussed in Section 4.11:

**To add a graph to the table of a multi-source graph report:**

1. Begin by following the steps listed at the start of Section 4.11. Note that multi-source graphs don't have column titles so the **Column title** box will be disabled.
2. After setting up the **Labels** and **Font & text** tabs, click on the **Markers** tab: this displays a different view than is shown when setting up a regular boring log graph.



**Figure 7.4 -- Markers Tab for a Multi-Source Graph**

3. The **Maximum number of sources to graph per page** box selects how many borings will be plotted on the graph on a single page. If you include more than one graph on your form (like, for example, the report shown in Figure 7.3, which has graphs of N-values and water content), it's critical that you select the same number of sources for each graph that you add.
4. The **Color** box selects the color of the graph markers.
5. Continue by following the directions for setting up the **Graph what?** and **Connecting line** tabs given in Section 4.11.1.
6. After you've added the graph to the report's table section you'll need to add a key indicating which graph marker was associated with each boring on the report -- follow the instructions given in Section 7.3.2.

### 7.3.2 Graph Keys

On a multi-source graph the same data item is plotted with a number of different markers (circle, square, triangle, etc.): for each boring plotted in the graph, LD4 selects a different marker type. Looking at the graph, there's no way to tell which boring should be associated with which marker: to provide this key you'll need to add a graph key like the one below to the report's heading or footing section.

**Key to Borings**

• B-1	▲ B-4	+ B-6	◇ B-8
■ B-3	▼ B-5	+ B-7	

Figure 7.5 -- Multi-Source Graph Key

To add a graph key to a multi-source graph report:

1. Open the report heading or footing editor (see Section 3.1).
2. Choose **Add > Graph Key**.
3. LD4 displays the Text and Data Settings dialog discussed in Section 3.6. Set the **Font, Size, Color** and **Style** according to how you'd like to format the boring numbers that are printed next to each graph marker.

**Ignore the Justify prompt:** graph keys are always printed starting at the top-left of whatever available whitespace surrounds them.

4. Point the mouse at the top-left corner of the area where you want the graph key to be printed then click the left mouse button. LD4 responds by displaying the dialog pictured below:



Figure 7.6 -- Graph Key Dialog

5. In the **Title to be shown above the key** field, enter a short title. (The title appears directly above the key to symbols: in Figure 7.5 the title is "Key to Borings".)
6. Click on the **OK** button.

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## 7.4 Legend Forms

Many organizations have a very detailed legend page that provides (in addition to a key to symbols): definitions of terms, generalized notes and publication references. Typically, this type of legend never changes and the symbols on it are general enough to apply to any boring or project printed. Because the legend never changes it is recommended that the form be created with a word processor. Paste up any symbols necessary from the program's generic legend (as discussed in Section 4.3 in the User's Guide) then use a copier to make duplicates as needed.

Some legend reports include a plasticity chart on the legend to show the correlation between USCS classifications and PI/LL ranges. You can't "draw" this chart with LD4; however, you can still place the chart into the heading or footing of a legend report by using LD4's ability to insert arbitrary pictures onto a form.

**To include a plasticity chart on a legend report:**

1. Use your favorite graphics program to draw the chart or use a scanner.
2. Save the graphic as a Windows bitmap (.BMP). *Make sure to save the file to the hard disk directory where LD4 is installed.*
3. Use the Add > Pictures facility discussed in Section 3.9 to place the graphic into the heading or footing of your legend form.

## 8. Case Studies: Changing Data Entry and Report Forms

This chapter steps through a couple of common customization tasks from start to finish in order to provide a feel for how the overall data entry/report form editing process works.

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### ***8.1 Adding a Column of Data to a Report's Table***

Commonly, users are most interested in making slight modifications to existing log formats. This usually entails adding or deleting a column of data on the report's data table. The following section provides a step-by-step walkthrough of the operations necessary to add new column of data to a boring log form. (Deleting a column is simply a somewhat easier version of the same basic operation.)

For the example, we'll add a column of HNU values to the stock report form called SAMPLE1. We'll keep the stock SAMPLE1 format intact (so that we can create additional variations on the form) by saving the modifications into a new form called SAM1HNU. (While the directions below cover adding a column for HNU readings they may be easily adapted to adding any kind of data column to a report form's table.)

- The user must be able to do two things: enter the HNU values into a project file and print the values on the report. This means that a data entry form must be edited to add a HNU column to the data entry screen and a report form must be edited to add the HNU column to the hardcopy boring log form.

Since every **report form** uses a specific **data entry form** file to determine what data items are available to be included on the report, the new data entry form with the HNU data entry column should be created first so that when it comes time to create the new report form to print out the HNU data, the program will know that there is a field for entering HNU values that may be printed in the new report.

**To create a data entry form with a field for entering HNU readings:**

1. Choose Tools > Data Entry Forms.
2. If the software doesn't automatically display a form selection dialog, select Entry Form > Open.
3. Once the dialog is displayed, click on the **Sample Forms** button (SAMPLE1 is stored in the sample forms directory).
4. Double-click on "SAMPLE1".
5. To leave SAMPLE1 intact we'll be saving the modified form under a different name: choose Entry Form > Save As then type **SAM1HNU** as the form name. Enter a short description for the modified form into the **Description** box then click on **OK**.
6. Since HNU readings are data that may be entered more than once per boring the new data entry prompt will need to be placed in the tabulated data section of the entry form: click on the **Tabulated Data** tab.
7. We'll use the techniques covered in Section 1.4 to add the new field: locate the "HNU" entry in the yellow dictionary box (in the upper-right corner of the screen) then double-click on it. You should see a new HNU data entry field at the end of the sample data entry card shown in the middle of the screen.
8. Select Entry Form > Exit.

Now that the new data entry form is completed new projects can be created using the new form (by selecting Project > Default Data Entry Form): the new projects will include a data entry field where the user can enter HNU readings. However, there is no way to print out the readings because, while we've made space on the data entry screen for the HNU readings, we have not yet set up a hardcopy report form that will print out the new data. Continuing with the our example, we'll proceed as follows.

**To create a report form with a column for printing HNU readings:**

1. Choose Tools > Report Forms.
2. If the software doesn't automatically display a form selection dialog, select Report > Open.
3. Once the dialog is displayed, click on the **Sample Forms** button (SAMPLE1 is stored in the sample forms directory).
4. Double-click on "SAMPLE1".
5. Just like with the data entry form, we'll want to leave the SAMPLE1 report form intact, so we'll save our modified form to a new file: choose Report > Save As then type **SAM1HNU** as the report name. Enter a short description for the modified form into the **Description** box then click on **OK**.

6. Currently our report form uses the SAMPLE1 *data entry form* to figure out what data are available for printing (as noted in Section 2.7, LD4 looks at the data entry form to figure out what data entry fields are used -- the contents of these fields may be printed on your report form). The SAMPLE1 data entry form doesn't have a field for entering HNU readings (we added that field to the data entry form called SAM1HNU) so we won't be able to print HNU readings until we tell our new report form to look in the SAM1HNU data entry form file to get its list of data entry fields. Select Sections > Data Entry Form, click on "SAM1HNU" and then **OK**.
7. Before proceeding, you may want to see how the report currently looks: select Report > Preview. Since there may be more than one HNU reading per boring we'll print the data in the report's table section (this is where the "ELEVATION/DEPTH", "USCS" and "DESCRIPTION" titles are). Our new HNU column can be placed to the left of the "NM" column.
8. We're adding the HNU column to the report's table section so select Sections > Table.
9. Directly under the bar that says "Columns on this Form" you'll find a list of the report's columns: double-click on the column that says "NM".
10. Select Edit > Insert Column.
11. Click on word (**none**) (it will be shown underlined, in blue, just to the right of **Title:**).
12. In the Title Editor box (discussed in Section 4.3) enter **HNU**.
13. Make sure the **Align** box says "Center".
14. Select Add > Add User Entered Data, Equations, etc.
15. The yellow dictionary in the "Place a Text Item in the Current Column" dialog that pops up should have an entry for HNU -- click on it. (This dialog is discussed in detail in Section 4.6).
16. Click on the **OK** button.
17. Select Report > Exit.

Now we have the modified report form: to use it, open a project that was set up to utilize our new data entry form (using Project > Default Data Entry Form) enter some data, then select Print > Reports, choose the borings that you want to print, click on the **Report form** tab and click on "SAM1HNU".

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## ***8.2 Modifying a US-Units Form to Automatically Convert to Data to SI Units***

LD4 report forms can be set up to produce drilling logs in SI units (meters, kPa, kg, etc.), even if the original data were taken in US units (feet, psi, pounds, etc.). To produce a "unit conversion" report from a standard US unit boring log form, choose Tools > Report Forms then, if LD4 doesn't automatically open the report form that you want to modify, select Report > Open and choose your report form. Next, since you'll want to keep your original report form intact (and save the "unit conversion" form as a different file), select Report > Save As then select a new name for the form. You're giving the name to the form that converts from US to SI units so pick something appropriate like **US-SI-CONVERTER**.

This completes the procedure for creating a duplicate report form to work with; it's now time to make the changes necessary to report the data on the form in the new units you've selected. These changes can be split into two parts: heading/footering changes and data table changes (see Section 2.2 for a discussion of the parts of an LD4 report form). The following sections cover the actual changes required.

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### ***8.2.1 Changing a Report's Heading and Footing Section to Convert Units***

Heading/footering changes mainly consist of converting surface elevations and groundwater/caving depths from feet to meters. To do this you'll want to locate where these data are printed: take a moment to look over the heading and footing of a printed copy of your report and identify what data will need to be converted (again, this is usually elevations and depths to groundwater, caving, etc.).

Next, if you're familiar with the material covered in Chapter 3 you can select Sections > First Page Heading (if the data to be converted is in the report's heading) or Sections > First Page Footing. Next, move the cursor to the place where the data to be converted is shown (you're looking for a magenta box which, when you place the mouse cursor on top of it, displays a small hint window saying something like "ELEVATION" or "WDEPTH1" or "CDEPTH", etc.) then click on the box. You should get a popup dialog with the data that you're looking for in the **User-entered or calculated data** field.

If you're not that familiar with the material covered in Chapter 3 you can have the program guide you to the data to be converted: choose **Search > Find**. In the following dialog, you'll want to describe what you're looking for -- for the elevation data type in **ELEVATION**; for any kind of depth data (groundwater depths, etc.) just type in **DEPTH**. Clicking on the **Search** button displays a list of the things in your report form that contain your search phrase. Next, in the search results box look for listings that start with either "First page heading (data)" or "First page footing (data)". Start by double-clicking on the first match (you'll want to do the steps below for each listed match).

Whether you used the Search facility or manually located the item that you want to change, you should now have a "Text and Data" dialog open; in the **User-entered or calculated data** box you should see the name of a data entry field ("ELEVATION", "WDEPTH1", etc.). To convert the measurements that will be typed into this data entry field from feet to meters, change the **User-entered or calculated data** box to read **RND(fieldname\*.3048,2)**: "fieldname" should be whatever was in the **User-entered or calculated data** box when you began typing. (The "\*.3048" converts the measurement from feet to meters while the "RND(...,2)" part rounds the result to 2 decimal places.) As examples, **RND(ELEVATION\*.3048,1)** prints elevations entered in feet as elevations in meters, while **RND(WDEPTH1\*.3048,1)** does the same for groundwater depth measurements.

After entering the new equation, click the **Place** button then follow these same steps for any other report heading or footing data that may need to be changed.

---

### 8.2.2 Changing a Report's Table Section to Convert Units

After adding conversion factors to the report heading and footing the next step is to modify the report data table. To do this, select Sections > Table, which displays the Table editor discussed in Section 4.1. Go through each column of the table: for each column, begin by checking the column title (it's shown just to the right of the word **Title**) for units such as feet or TSF that will need to be changed. Typically you'll need to change the titles of scale, sampling length, blow counts and density table columns. You probably **won't** need to change the title of a column that contains a graph -- these titles are part of the graph and are discussed later.

- To change the column's title (again, it's shown, underlined, next to the **Title** prompt), click on it: LD4 will pop up a title editor box just to the right of the title.
- One often over-looked change: if you have a column titled **BLOWS/6"**, make sure to change it to something like **BLOWS/15 CM**. while **BLOWS per Foot** becomes **Blows per 30cm..**

When the title is correct, check each of the items listed next to **Stuff Included in Column** and follow the recommended procedures for that item given in the list below. When finished, proceed to the column on its right by clicking on the  toolbar button.

#### ***Converting "Scale of Depth" or "Scale of Elevation"***

1. Double-click on the "Scale of Depth" or "Scale of Elevation" **Stuff Included in Column** entry.
2. From the resulting dialog change the **Scale units** selection from "Feet" to "Meters".
3. Close the dialog by clicking on the **OK** button.

### **Converting “Report” items**

Most text items printed on the table don't need to be modified -- text such as sample numbers, material descriptions and blow counts don't depend upon measurement units.

- If you have depths buried in your material descriptions, such as **Encountered a boulder at 11.5 feet**, LD4 won't be able to automatically perform the conversion. Instead, you'll need to manually re-enter each such description in metric units.

For printed text that does depend upon a particular measurement system (such as sample or recovery lengths, densities, pressures or depths), you'll need to multiply the data by a conversion factor:

1. Double-click on the entry that you want to change (e.g., “Report SAMP\_LEN”).
2. When the “Place a Text Item in the Current Column” dialog comes up, if there's a button labeled **Edit...** next to the **Print what?** title then:
  - a) Click the **Edit** button.
  - b) At the top of the following dialog is a list of the data fields that are to be printed (they'll be followed by the phrase “(entered or calcd. text)”: for each field that needs to be converted, click on the field then add the requisite conversion factor at the end of the field name as it's listed in the **What to print** box. (For example, to convert sample lengths from inches to centimeters, change the **What to print** entry to read **SAMP\_LEN\*2.54**; to convert depths to meters, add **\*.3048** to the end of the box.)
 

Make sure that the **It is a number** box is checked and type an appropriate number of digits to the left and right of the decimal point into the **Digits left of the decimal** and **Digits right of the decimal** box and uncheck the **It is a measurement in ft. an in.** box.
  - c) Click on the **OK** button when finished, then **OK** again to close the previous dialog.

If there isn't an **Edit** button next to the **Print what?** title then:

- a) Add the requisite conversion factor to the end of the field name (to convert inches to centimeters, add **\*2.54**; to convert depths to meters, add **\*.3048**, etc.)
- b) Click on the **Numbers** tab.
- c) Enter an appropriate number of into the **Digits to the left of the decimal point** and **Digits to the right of the decimal point** fields (2 and 2 for centimeter measurements, 3 and 2 for depth measurements, etc.).
- d) Click on the **OK** button.

### ***Converting graphs***

Many items being graphed won't require any type of modifications: Atterberg limit data and moisture contents, for example, are unitless. (SPT N-values remain the same whether reported in blows/foot or blows/30 cm; however, if the marker used to plot the N-values is used in the column title next to something like **Blows/foot** you'll need to follow the procedures below.)

To change a graph item:

1. Double-click on the graph item that you want to change (e.g., "Graph of SHEAR").
2. Click on the **Graph what?** tab.
3. At the **Graph what?** field, tack on any conversion factor necessary to change your data's units (e.g., **\*16.02** to convert densities in PCF to densities in  $\text{kg/m}^3$ ).
4. Click on the **Labels** tab.
5. Check the **Title on the left of the marker** and **Title on the right of the marker** fields for any mention of units and change as needed.
6. You'll need to select a new scale for the graph that covers the range of values you can expect from your data after multiplying by the conversion factor. As a rough estimate, take the scale's current **Right-hand value** then multiply by your conversion factor. Next, round the estimate: if you're using a semi-log graph, try rounding to the nearest 10, 100 or 1000. If you're using a linear graph, multiply the **Right-hand value** by your conversion factor then try to pick a number that may be evenly divided by 1+ the number of labeled vertical grid lines (e.g., if the right-hand value, after multiplying by a conversion factor, is 90, and there's 9 labeled vertical grid lines, make the new right-hand value 100 because  $100/(1+9)$  gives a nice even 10 units per labeled grid line).
7. Click on the **OK** button.

### ***Converting everything else (monitoring wells, sampler symbols, etc.)***

No conversions are needed: LD4 will automatically convert depths and lengths to their metric equivalents.

## 9. Graphical Symbols

Graphical symbols are pictures that LD4 uses to draw groundwater symbols, stratigraphy patterns, sampler types, and monitoring well pipes. Related symbols are stored in *symbol libraries*: for example, all stratigraphy patterns are stored in a symbol library called STRATA. The table below lists the symbol libraries shipped with the program:

File	Used for
<b>SAMPLERS</b>	Sampler symbols
<b>STRATA</b>	Stratigraphy symbols
<b>PIPES</b>	Monitoring well pipes
<b>MISC</b>	Groundwater, seepage, caving and other miscellaneous symbols.

**Table 9.1 -- Graphical Symbol Libraries**

- Symbol libraries are stored on the hard disk in the same subdirectory as LD4, with a .CDT extension (for example, all of the stratigraphy patterns are stored in a file called STRATA.CDT). You can move a symbol library from one computer to another by copying the appropriate .CDT file.

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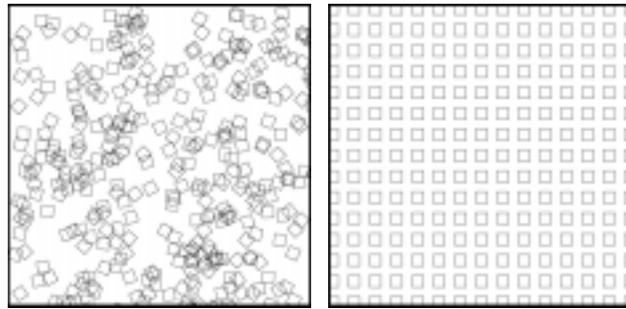
### 9.1 Types of Symbols

LD4 symbols fall into three broad categories: *pattern symbols*, which are used to draw the stratigraphy columns on boring logs and subsurface profiles, *well pipes and top caps*, which are used to draw parts of a monitoring well, and *single symbols*, which are symbols that can be used by themselves, such as groundwater and caving symbols, graph markers and sampler symbols. The basic requirements for each symbol type are covered in the following sections.

### 9.1.1 Pattern Symbols

Pattern symbols (or just *patterns*) are used individually or in combination to denote stratigraphy intervals on a boring log or subsurface profile. (Section 2.9.3 in the User's Guide provides a good discussion of how stratigraphy patterns are selected and used.) The set of stratigraphy patterns shipped with LD4 are included in the STRATA symbol library.

All patterns fall into two basic types: *randomly arranged* and *evenly spaced*. The difference between the two types is easily illustrated by drawing a stratigraphy pattern that looks like a square and plotting the pattern first as a randomly arranged pattern, then as an evenly spaced pattern:



**Figure 9.1 -- Random and Evenly Spaced Pattern**

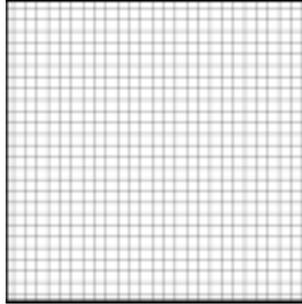
Both pictures were generated using the same symbol, consisting of a single square:

- When the symbol was set up to be randomly arranged, LD4 produced the left-hand picture by randomly placing the square around the area to be filled then rotating the square in different directions.

All randomly arranged patterns have a *coverage percentage* that determines how much of the area in which the pattern can be drawn will actually be covered by the pattern. In the example, the random pattern was produced with a coverage percentage of 50%.

- LD4 produced the evenly-spaced picture by drawing the square at the top left edge of the picture, shifting to the right, drawing the square again, shifting to the right, etc. until the right side of the column was encountered. Next, the program shifted downwards and started the procedure over again.

The amount that LD4 shifts to the right and downwards between symbols (which, for the square, is the amount of white space between symbols) is called the *horizontal* and *vertical symbol spacing*. If there were no space between the symbols, the square pattern would be drawn like this:



**Figure 9.2 -- Square Pattern Drawn with No Spacing**

LD4 simply prints each square directly to the right and bottom of previous squares.

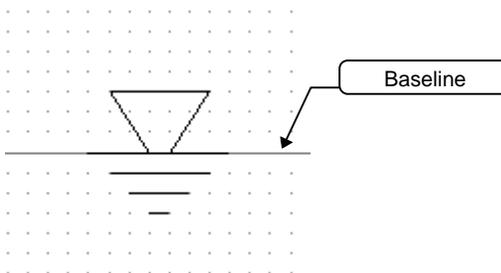
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### 9.1.2 Single Symbols

Single symbols are used to denote sampler types, groundwater and casing depths, drill rejection, etc. Single symbols are never combined like patterns are; they are always drawn by themselves.

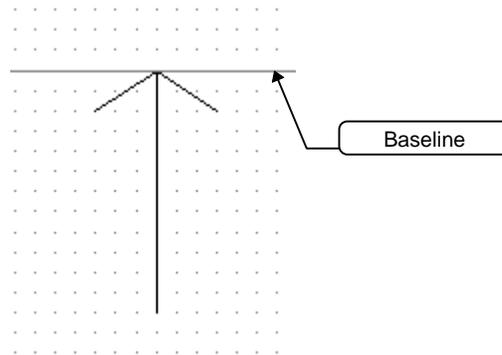
- Sampler symbols are stored in the SAMPLERS library; most other single symbols are stored in the MISC library.
- When a single symbol is drawn on the subsurface portion of a report, LD4 uses the symbol's *baseline* to determine where the symbol is to be placed vertically in relation to the requested depth for the symbol. If the symbol is to be centered vertically at the requested depth (like, for example, a groundwater symbol, which appears half above and half below the groundwater depth) the baseline is adjusted so that it is in the center of the symbol.

The following figure shows the design screen for a groundwater symbol: the baseline is the horizontal line going through the center of the symbol. When the symbol is printed on the subsurface portion of a report, the baseline will line up with the groundwater depth.



**Figure 9.3 -- Groundwater Symbol and Baseline**

In contrast, the drill rejection symbol, which is an upward-pointing arrow drawn at the end of the boring, has its baseline set at the top of the arrow: This causes the entire symbol to print below the boring termination depth.

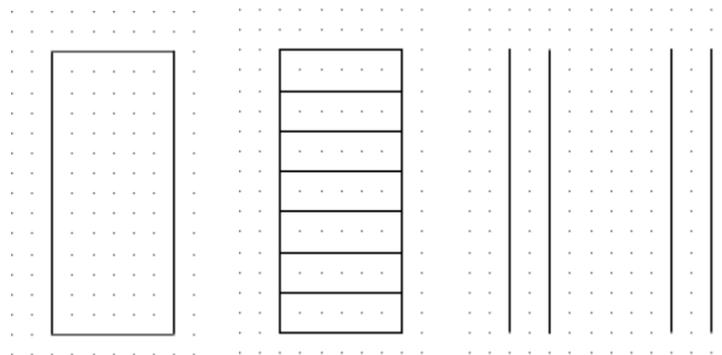


**Figure 9.4 -- Drill Rejection Symbol and Baseline**

### 9.1.3 Well Pipes and Top Caps

Well pipes and top caps are special types of single symbols that are stored in a library of their own: the library must be specifically marked as being for well pipes and top caps, and can store no other types of symbols.

- *Well pipes* are symbols that LD4 draws inside the backfill of a monitoring well schematic. The following figure shows a few of the well pipe symbols that are shipped with LD4:



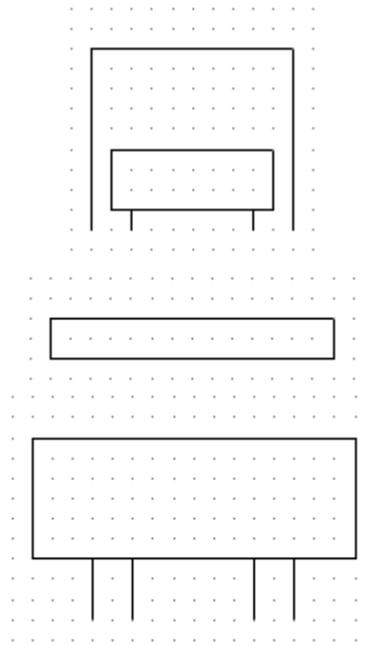
**Figure 9.5 -- Well Pipes: BLANKPVC, SLOTPVC and CASED**

When drawing a pipe inside of a well schematic, LD4 takes the chosen pipe symbol and lays it end over end from the top depth for that pipe installation to the bottom depth.

For cased well sections (sections where the pipe is shown inside a casing) the symbol designer includes **Width of the pipe** data entry field that should be filled in with the width of the interior pipe: this allows LD4 to draw pipes connected to the cased interval at the same width as the pipe within the cased interval.

For pipe sections that do not include casing, the **Width of the pipe** field may be left blank or 0.

- *Top caps* are symbols that are used at the top of the monitoring well schematic to denote various methods of capping the well. Several top cap symbols shipped with the software are shown in the following figure:



**Figure 9.6 -- Top Caps: RECESSED, FLUSH and PROTECT**

Top caps may or may not contain a section of pipe (in the figure above, RECESSED and PROTECT contain pipes). If the cap *does* contain a pipe, LD4 needs to know how wide the pipe is so that any pipes drawn below the top cap can be drawn at the same width as the pipe in the top cap (i.e., the pipe in the top cap may be *fitted* to the pipe below the cap). The symbol design screen for pipes and top caps contains a **Width of the pipe** data entry field that should be filled in when drawing top caps that include pipes.

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## 9.2 Symbol Names and Descriptions

Each symbol has a name associated with it: when adding a symbol to a report form or legend, you select the symbol by its name.

- A *pattern symbol's* name may only be one character in length so that you can combine multiple patterns in the same stratigraphy interval; e.g., **CE** indicates a combination of the C pattern and the E pattern.
- For historical reasons, all other symbols are limited to names that are less than nine characters in length.
- The comma symbol (',') may not be part of a symbol name.
- Upper and lower case names are identical: **WATER**, **water** and **wAtEr** all refer to the same symbol.
- Symbol names are optional: you may leave the name blank; however, if you do, you will not be able to use the symbol for any purposes.
- No two symbols *within the same symbol library* may have the same name (although you may have more than one symbol that was left unnamed). For example, you may not have two symbols in the STRATA symbol library called **c**; you may, however, have a **c** symbol in the STRATA library and a **c** symbol in the SAMPLERS library (this is the case with the stock set of symbol libraries shipped with LD4).
- Because LD4's one-character/eight character maximum name size doesn't provide much room for being descriptive, symbols also have descriptions. Use the symbol description to describe the general appearance of the symbol.

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### 9.3 Creating and Modifying Symbols

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**Caution:** Hard disk failures happen! If you modify or create a symbol library, be sure to save a copy of the modified library onto a floppy disk or tape drive.

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#### To modify a symbol:

1. From LD4's opening screen click on the **Symbols** tab then double-click on the symbol library that holds the symbol that you want to modify (see Table 9.1 for help in choosing the correct library).

**or**

Choose Tools > Modify Graphical Symbols...

**or**

Click on the  button at the lower-right of the LD4 data entry screen (see Section 2.5 in the User's Guide).

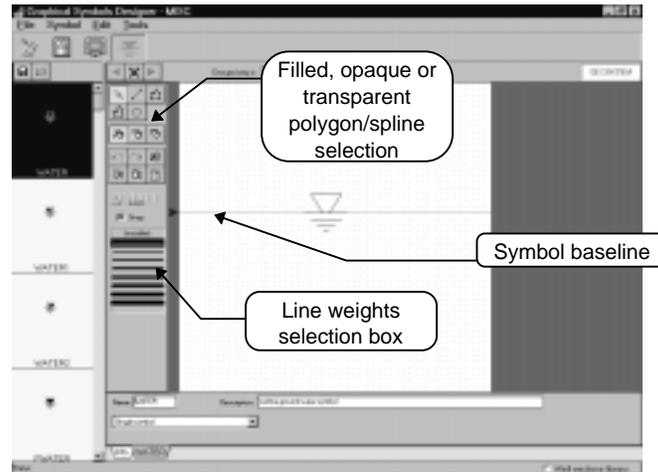
2. Double-click on the symbol in the selection box on the left side of the screen.

#### To create a new symbol:

1. If you will be adding the symbol to an existing symbol library, follow Steps 1 through 3 above. Otherwise (if you need to create a new symbol library): from LD4's opening screen, click on the **Symbols** tab then enter a name for the new symbol library that doesn't match the name of any of the existing symbol libraries. (You can also create a new symbol library by selecting File > New Symbol Library from the Symbol Editor.)
2. If you created a new symbol library in Step 1, make sure to set the **Well sections library** checkbox (at the bottom-right of the screen) *if the new library will hold well pipes and top caps*.
3. Choose Symbol > New.
4. Begin by entering a name and description for the new symbol, following the guidelines given in Section 9.2.
5. Next, select the type of symbol that you will be drawing (single, evenly spaced pattern or random pattern) from the box at the bottom left of the editing window (see Section 9.1).
6. Depending upon the type of symbol being created, choose the pipe width (see Section 9.1.3), horizontal and vertical spacing or coverage percentage (see Section 9.1.1).
7. Draw the symbol.
8. If you're drawing a single symbol, make sure that the symbol baseline is adjusted so that it is located where you want the centerline of the symbol to fall (see Section 9.1.2).
9. Refer to Section 9.5 for information on using the new symbol.

## 9.4 Drawing a Symbol

The symbol editor is shown below:



**Figure 9.7 -- Symbol Editing Screen**

Symbols are made up of lines, polygons, circles and splines, which the following sections provide details on drawing. Some basic notes:

- The symbol grid is initially set up so that one grid step is 1/50th of an inch: for users in the US this makes it easy to lay out the symbol using the 50th scale on an engineering ruler.

Changing the grid step (by entering a different number into the **One grid step is** field at the top of the screen) enlarges or shrinks the size at which the final symbol is drawn. For example, changing the grid step for the groundwater symbol from .02 inches to .04 inches doubles the size of the printed symbol.

Regardless of the grid step, LD4 limits the size of the grid to 50x50 dots.

- Normally, every point that you draw (line endpoints, the center of a circle, etc.) is “snapped” to the nearest grid point. If you want to be more precise in your drawing, uncheck the **Snap** box.
- You can modify a portion of the symbol (a line, for example) by clicking on it: this causes a number of “grabhandles” (small squares) to appear on the item. *One grabhandle will be in red*: dragging this handle around shifts the entire item.
- Aside from picking between filling polygons in black or white, there is no way to color the items that make up the symbol. *Single symbols* such as groundwater and caving symbols may have a color assigned to them when you add them to your report form.

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### 9.4.1 Basic Drawing Steps

This section lists some tasks that might be needed to modify an existing symbol. Sections to follow provide instructions on drawing new symbol elements.

- These instructions may be applied to multiple items at once by holding down the Shift key while you select items for modification. This can be useful, for example, in deleting multiple items or for changing the weight of a group of lines.

**To modify the weight of the lines used to draw a part of the symbol:**

1. Move the mouse cursor over the symbol part to be changed and click on the left mouse button: “grabhandles” should appear at various positions around the element.
2. Choose the desired weight from the line weight selection box.

**To delete a part of the symbol:**

1. Move the mouse cursor over the symbol part to be changed and click on the left mouse button: “grabhandles” should appear at various positions around the element.
2. Choose Edit > Delete.

**To modify the position of a part of the symbol:**

1. Move the mouse cursor over the symbol part to be changed and click on the left mouse button: “grabhandles” should appear at various positions around the element.
2. One grabhandle will be shown in red: click the left mouse button on this handle and, while holding the button down, move the part to its new position.

**To change the size or shape of a part of the symbol:**

1. Move the mouse cursor over the symbol part to be changed and click on the left mouse button: “grabhandles” should appear at various positions around the element.
2. Grabhandles around the exterior of the part (these are the handles on either end of a line, the handles on each vertex of a polygon and at four points around a circle) may be dragged to move that point on the part: click the left mouse button on the handle and, while holding the button down, move the handle to its new position.
  - Note that dragging a grabhandle *between* two polygon vertices actually creates a new vertex -- see Section 9.4.3.

### 9.4.2 Drawing Lines

Most graphical symbols are just a collection of straight lines, drawn one at a time. This section covers how to add a line to a symbol: see Section 9.4.1 for instructions on modifying an existing line.

**To draw a line:**

1. Begin by clicking on the line drawing button in the toolbar -- it looks like this: 
2. Lines have weights associated with them: LD4 provides eight different weights, along with an invisible line weight. Before drawing the line, make sure that the proper line weight is highlighted in the line weight selection box (see Figure 9.7).

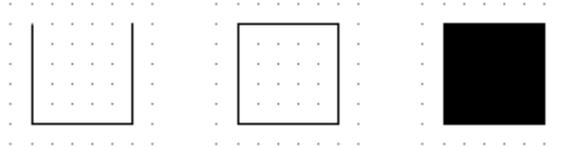
- Invisible lines are only useful when drawing evenly spaced pattern symbols: instead of figuring out an appropriate horizontal and vertical spacing for the symbol, you can draw an invisible vertical line off to the right of the symbol, spaced at the distance to where the next symbol should be plotted; similarly, an horizontal invisible horizontal line can be drawn below the symbol. Several of the stock STRATA patterns use this technique, including “D”, “M”, “N” and “[“.

Invisible lines are drawn in red on the symbol editing screen. They do not appear on hardcopies.

2. After selecting the line weight, move the mouse cursor to the location of the first point on the line then click and release the left mouse button.
  3. Move the cursor to the location of the second point on the line and again click and release the left mouse button.
- To abort the drawing process, press the right mouse button or the Esc key.

### 9.4.3 Drawing Polygons

You can add both “open” and “closed” polygons to a symbol -- the figure below illustrates the difference between an “open” and “closed” polygon:



**Figure 9.8 -- Open, Closed and Filled Closed Polygons**

Closed polygons can be transparent (like the middle picture), filled (like the picture on the right) or opaque. Opaque polygons look identical to the transparent polygon (the middle polygon in the figure above) except when the symbol is drawn on top of something that already appears on the report: the transparent polygon allows whatever was underneath the polygon to show through, while the opaque version doesn't.

This section covers how to add a polygon to a symbol: see Section 9.4.1 for instructions on modifying an existing polygon.

**To draw a polygon:**

1. Begin by clicking on the polygon drawing button in the toolbar -- it looks like this: 
2. The border of the polygon has a weight: before drawing the polygon, make sure that the proper weight is highlighted in the line weight selection box (see Figure 9.7). (The border of a filled polygon doesn't show through the fill so you can skip this step if the polygon that you'll be drawing will be filled.)
3. If you will be drawing a closed polygon, click either the filled, opaque or transparent button. (Again, refer to Figure 9.7.)
4. Move the cursor to one of the points to appear on the new polygon then click and release the left mouse button.
5. Move the cursor to the next point on the polygon and click and release the left mouse button again. Do this step for the rest of the points on the polygon.
6. If you are drawing a closed polygon you can either connect the last point back to the first point then choose Done from the small popup menu that appears. Alternatively, draw the last point then select Close to have the program close the polygon for you.

**To change a polygon to filled, opaque or transparent, or to change the weight of the line used to outline the polygon:**

1. Click the left mouse button with the cursor anywhere within the interior of the polygon: “grabhandles” should appear at each vertex of the polygon, halfway between each vertex and in the polygon’s center.
2. Click the new line weight or on either the filled, opaque or transparent buttons in the toolbar shown in Figure 9.7.

Once you’ve drawn a polygon you may find that in order to get the shape exactly right, the new polygon needs another vertex.

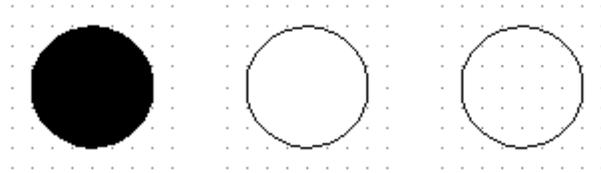
**To add a new vertex to a polygon:**

1. Click the left mouse button with the cursor anywhere within the interior of the polygon: “grabhandles” should appear at each vertex of the polygon, halfway between each vertex and in the polygon’s center.
2. Click the left mouse button on the grabhandle that appears *between* the two vertices closest to where you want to add the new vertex. While holding the mouse button down, drag the cursor to the location of the new vertex.
  - If a grabhandle doesn’t appear between the two closest vertices, then the gap between the vertices is too small for LD4 to fit in the middle grabhandle. The only way to correct this is to temporarily move the two vertices far enough apart for the central grabhandle to appear.

---

### 9.4.4 Drawing Circles

Circles are similar to polygons: they may be filled, opaque or transparent.



**Figure 9.9 -- Filled, Opaque and Transparent Circles**

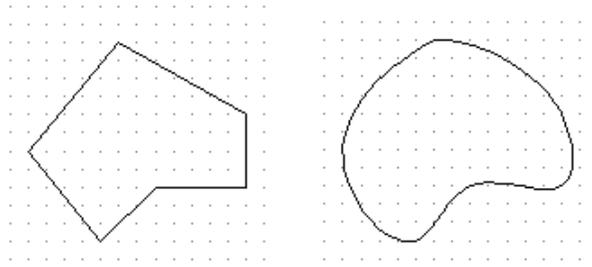
This section covers how to add a circle to a symbol: see Section 9.4.1 for instructions on modifying an existing circle.

**To draw a circle:**

1. Begin by clicking on the circle drawing button in the toolbar -- it looks like this: 
2. The border of the circle has a weight: before drawing the circle, make sure that the proper weight is highlighted in the line weight selection box (see Figure 9.7). (The border of a filled circle doesn't show through the fill so you can skip this step if the circle that you'll be drawing will be filled.)
3. Click either the filled, opaque or transparent button. (Again, refer to Figure 9.7.)
4. Move the cursor to where the center of the circle is to be located then click and release the left mouse button.
5. Move the cursor out to a point on the circumference of the circle and click and release the left mouse button again. If you have the snap function on LD4 will snap the circumference to the nearest grid point so you may not get quite the size circle that you were looking for. You can avoid this problem by unchecking the **Snap** box *after* you've drawn the circle's central point and before drawing the circumference point.

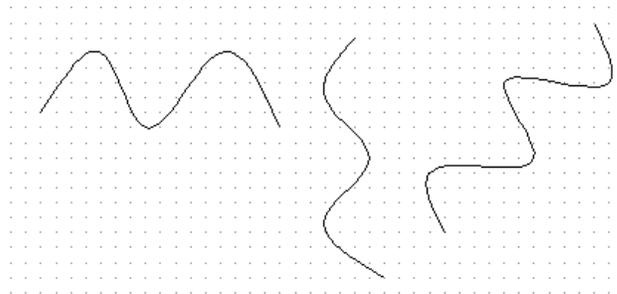
### 9.4.5 Drawing Splines

Splines are similar to polygons, except that instead of using straight lines to connect the vertices, splines use curves. Here is the same set of points drawn first as a polygon then as a spline:



**Figure 9.10 -- A Polygon and Spline Drawn Using the Same Set of Points**

Like polygons, splines don't have to be closed:



**Figure 9.11 -- Splines**

**To draw a spline:**

1. Begin by clicking on the spline drawing button in the toolbar -- it looks like this: 
2. Follow steps 2 onward as given in Section 9.4.3.

### 9.4.6 *Converting a Sequence of Lines to a Spline*

LOGDRAFT III (our MS-DOS based drilling log program) didn't support symbols with splines, so curves had to be approximated as a set of connected lines -- the resulting figure usually had a slightly blocky shape. LOGDRAFT III users upgrading to LD4 may want to smooth out some of their symbols by converting curves drawn as a sequence of connected straight lines into splines.

**To convert a sequence of connected lines into a spline:**

1. *While holding the Shift key down*, move your mouse cursor over each of the lines comprising the curve and click the left mouse button: "grabhandles" should appear around the lines as you click on them. (If you accidentally click on a line that should not be included, click on it again.)

It's important that you hold the Shift key down while clicking, otherwise you will only be able to select a single line.

2. Choose Tools > Make Spline from Selection.
3. LD4 will discard any lines that you choose which could not be included in the new curve (because they weren't connected to the lines that *were* included). If you lose some lines, or if the curve doesn't look right, use Edit > Undo to go back, then try the process again. Make sure that you only select a sequence of lines that are connected at their endpoints to one another.

---



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## 9.5 After You've Created a New Symbol

If you've created a new stratigraphy, sampler, backfill or pipe symbol you'll need to perform one more step before you can actually use the new symbol on a report. Menus of stratigraphy patterns, samplers and well construction sections presented during data entry are built from *legend files*: to include a new graphical symbol on one of these menus, you'll need to add the symbol to one or more legend files.

### To add a new symbol to a legend file:

1. Use LD4 to open up a project (you can't edit a legend until a project has been opened).
2. Once the project is open, if there's a **Legend** tab in the lower left of the screen, click on it. Otherwise, choose Legend > Edit the Default Legend.

Note that if project had a **Legend** tab then you will have to go through these same steps for each additional project which requires the new symbol.

From the left-hand panel, click on the name of symbol library where you added the new symbol, or, if you created a new symbol library, choose Legend > Add a New Legend Table and select your new symbol library from the subsequent dialog.

3. **If the symbol was not a well pipe:** find a blank data entry card (there's always one at the bottom of the list). On the blank card, click on the button next to **Symbols**.

You should be able to locate your new symbol in the list: When you do, click on it and then on the **OK** button.

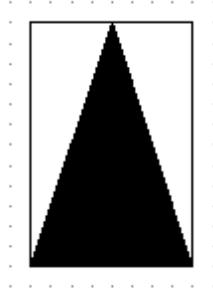
In the **Description** field, enter a description for the symbol: the description will appear on legend printouts if you used the symbol in a report.

**If the symbol was a well pipe:** You'll want to create at least one new well section that uses the pipe. Find a blank data entry card then enter an appropriate shorthand name into the **Well ID** field. Choose a backfill for the new section, then click on the button next to the **Pipe** prompt and select the new pipe. Finally, enter a description for the well section. (You can find a discussion of these prompts in Section 4.2.3 in the User's Guide.)

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## 9.6 Step by Step Instructions for Creating a New Sampler Symbol

This section presents instructions for creating the following new sampler symbol:



**Figure 9.12 -- New Sampler Symbol**

1. Start up LD4 then click on the **Symbols** tab.
2. We need to figure out which symbol library will be used to hold the new symbol: since the new symbol will be used to indicate a sampler type, double-click on the “SAMPLERS” selection in the left-hand panel.
3. From the following screen choose Symbol > New.
4. Next, we need to figure out a name for the new symbol. If you scroll through the symbol box on the left side of the screen you’ll notice that all of predefined symbols have one character names. LD4 doesn’t require this (except for stratigraphy symbols); because the data entry process involves choosing the type of each sample taken during a boring, the shorter names speed data entry.

Since we want to stick with the one character sampler name convention, we need to choose a character that isn’t already used by a sampler. No symbol in the SAMPLERS library is named “\*”, so type \* into the **Name** field then press Tab.

Next comes a description for the new symbol: when we set up the symbol’s legend entry, the description will help us to pick the symbol out of the list of symbols stored in the SAMPLERS library. Type **Upward-facing filled triangle** into the **Description** field.

5. LD4 needs to know what the symbol will be used for: will it be a random or evenly spaced stratigraphy pattern or a single symbol? The program should have guessed correctly that the new symbol will be a single symbol; however, if the box underneath the **Name** field doesn’t say “Single symbol”, change it.
6. Next we start drawing the symbol. This new symbol is similar to the symbol called “S” that is shipped with the software so to start with we’ll copy “S” to the clipboard then past it onto our new symbol.

Locate “S” in the list of symbols shown on the left side of the screen (it will be a simple opaque rectangle) and double-click on it.

7. Select Edit > Select All then Edit > Copy. Now we have a copy of “S” in the clipboard.
8. One of the tabs below the symbol editing area should be “\*”, the symbol we’re designing. Click on that tab.
9. You should now have the blank symbol editing window for our “\*” sampler symbol showing. Select Edit > Paste to copy the “S” symbol onto the new symbol.
10. Now that we have the rectangle, what’s left is to draw the triangle. Begin by clicking on the  button so that the triangle is filled.
11. Next, click on the polygon button: .
12. Make sure that the **Snap** setting is checked.
13. Move the mouse cursor to the lower left corner of the box then click and release the left mouse button.
14. Move the cursor to halfway between the left and right corners of the top of the box (this will be the top point of the triangle) then again click and release the left mouse button.
15. Move the cursor to the bottom right of the box and click and release the left mouse button.
16. From the small popup menu that appeared when you started to draw the polygon, choose Close: this draws a line from the last point we drew back to the first point we drew, closing the triangle.
17. Move the mouse cursor to the symbol baseline arrow (this is the small arrow on the left side of the grid). Click the left mouse button and, while holding the button down, drag the baseline so that it lines up with the top of the sampler symbol. This makes sure that the entire sampler symbol prints below the sampling depth.
18. Select File > Save and Exit
19. Now that the symbol has been drawn it must be added to LD4’s legend file before it can be used. From LD4’s opening screen, open any project.
20. Once the project is open, if there’s a **Legend** tab in the lower left of the screen, click on it. Otherwise, choose Legend > Edit the Default Legend.
21. We added the new symbol to the SAMPLERS symbol library so click on SAMPLERS in the left-hand panel.
22. Find a blank data entry card (there’s always one at the bottom of the list): on the blank card, click on the button next to **Symbols**.
23. You should be able to locate the new “\*” symbol in the list: when you do, click on it and then on the **OK** button.
24. In the **Description** field, type **Bag sample**.

## Appendix A -- LD4 Math

LD4 reports and summaries can use mathematical equations in a variety of situations. Equations can be as simple as, for example, converting sampling lengths from inches to feet, or as complex as one to automatically adjust SPT N-values depending upon whether they were taken above or below the waterline. This appendix discusses the general form of a LD4 equation and covers the many mathematical functions available through the software.

### ***User-Entered Data***

A printed report can include equations that use data entered into currently open project file. Recall from Section 1.1 that each data entry field has a name assigned to it: this name is what you use if you want to refer to the contents of the data entry field in an equation.

- If your equation is being used on the *table* section of a report (this is where the subsurface information is printed on a boring log or profile) it will have multiple values: for each data entry card filled in on the subsurface portion of the data entry screen, LD4 plugs the data from that card into your equation. For example, if you entered three rows on your data entry screen, with the **DEPTH** field being **0** on the first row, **1.5** on the second row and **5** on the third row, the equation **DEPTH\*12** in a column titled "Depth in Inches" on your boring log (the "\*" is the multiplication operator) will result in three values being printed: **0** will appear at the top of the column, **18** will appear at 1.5 feet and **60** will appear at 5 feet.

Equations used on a report's table section can also combine information entered into data entry cards with information entered into the source data entry section (this is the section at the top of the data entry screen used for typing in information about the boring, such as the boring number, elevation, etc.). A column titled "STRATUM ELEVATION" that uses the equation **ELEVATION-DEPTH** to report the elevations of the various layers encountered during drilling combines the "Elevation" source data entry field with each "Depth" entry in the subsurface data entry section.

- If your equation tries to either a) reference a non-existent data entry field or b) reference a data entry field the user didn't fill in, LD4 will *not report any result*. This means that, for example, with the "STRATUM ELEVATION" column discussed in the previous point if you don't enter an elevation that column will remain blank.

Similarly, if you try to include the contents of a data entry field in an equation and the user enters something besides a number, LD4 won't report a result: referring to our "STRATUM ELEVATION" example, if the user enters n/a as the boring's elevation, the "STRATUM ELEVATION" column will remain blank because the ELEVATION-DEPTH equation won't report any results.

### Mathematical Operators

Equations can add, subtract, multiply and divide with the +, -, \* (this is shift-8 on your keyboard) and / *mathematical operators*. Following are some examples:

<b>BLOWS2+BLOWS3</b>
<b>ELEVATION-DEPTH</b>
<b>SAMP_LEN/12</b>
<b>DEPTH* .3048</b>

**Table 9.2 -- Example Equations**

Multiplication is performed first, then division, addition and subtraction so  $1+4*3/6-2$  is 1.

### Comparisons

The < (less than), <= (less than or equal), > (greater than), >= (greater than or equal), = (equal) and <> (not equal) comparisons return numeric values: if the comparison is true, LD4 reports a 1; if the comparison is false, LD4 reports a 0. This is sometimes useful for applying part of an equation only if some condition is met. For example, the equation below adjusts SPT N-values by 10 percent if they were taken below the groundwater level:

$$\text{NVALUE} - 0.1 * \text{NVALUE} * (\text{DEPTH} \geq \text{WDEPTH1})$$

If **DEPTH** (the depth at which the N-value was taken) was greater than or equal to **WDEPTH** (the groundwater level) then the comparison (**DEPTH** ≥ **WDEPTH1**) is "1" and the equation is equivalent to

$$\text{NVALUE} - 0.1 * \text{NVALUE} * 1$$

If **DEPTH** is less than the groundwater level then the comparison is "0" and the equation is equivalent to

$$\text{NVALUE} - 0.1 * \text{NVALUE} * 0$$

i.e., just **NVALUE**.

➤ Another use for a comparison function is the equation

$$.15 * (\text{SAMP\_LEN} \geq 15) + \text{SAMP\_LEN} / 100 * (\text{SAMP\_LEN} < 15)$$

which can be used to vertically center the first blow count value (assuming that sampling lengths are given in centimeters).

- You can also compare items besides numbers: to compare a data entry field that isn't a number, place the item you're comparing it to inside of double-quotes. For example,

**DRILL\_RIG="CME-45"**

returns 1 if the drill rig used for the boring was a CME-45. (If you were to forget the quotes, LD4 would try to compare **DRILL\_RIG** to the value of **CME-45**; that is, the data entry field **CME** minus the number 45.) Similarly,

**DRILL\_RIG<>"CME-45"**

returns 1 if the drill rig *was not* a CME-45.

Non-numeric comparisons are handy when using the printout filters discussed in Section 3.2.1 of the User's Guide.

---

**Note:** Non-numeric comparisons can only be made using the equals (=) and not-equals (<>) comparisons -- comparisons such as **DRILL\_RIG<"CME-45"** or **DRILL\_RIG>="CME-45"** do not return values.

---

- *Date comparisons* are also handy for printout filters: to compare two dates, place **DATE()** around each:

**DATE(BDATE)<DATE("01/01/99")**

returns 1 if the boring was started (**BDATE**) before "01/01/99". If you'll be using an actual date such as 01/01/99 in the **DATE** function, place the date in quotes -- data entry fields such as **BDATE** should not be placed in quotes.

---

**Note:** LD4 interprets dates according to the date setting in the "International" (Windows 3.1) or "Regional Settings" (Windows95, 98 & NT) section of the Windows Control Panel. This setting determines whether LD4 treats "03/01/99" as March 1, 1999 or January 3, 1999.

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### ***Transcendental Functions***

Equations can also make use of a variety of built-in transcendental functions.

- **SIN**, **COS** and **TAN** (tangent) all accept angles in degrees; **ATN** (arc-tangent) returns angles in degrees. **TAN** will not report a result for 90 or 270 degrees. Although these functions are of limited use for geotechnical reports, one commonly used equation is

**DEPTH\*COS(DRILLING\_ANGLE)**

which converts a drilling interval for an angled boring into a true depth below surface.

- **SQR** calculates square-roots: **SQR(4)** returns 2. **SQR(-4)** returns nothing.
- **EXP** calculates  $e^x$ : **EXP(0)** returns 1. **LOG** calculates  $\ln(x)$  -- if "x" is less than or equal to 0 LD4 will not report a result.

### Other Math Functions

- **ABS** returns the absolute value of something: **ABS (-1)** and **ABS (1)** are both 1.
- **INT** basically removes the fractional part of a number: **INT (3.1415)** is 3. For negative numbers, **INT** is the largest whole number not greater than the argument: **INT (-3.1415)** is -4.

### **RND()**

**RND (A, B)** rounds the number **A** to **B** decimal places. **RND (3.141592654, 3)** is 3.142; **RND (4.5, 0)** is 4.

### **INZ() and ISZ()**

**INZ ()** and **ISZ ()** are a lot like the comparison functions discussed earlier: **INZ (returnval, equation)** returns the value **returnval** if **equation** is not equal to zero -- this is similar to **returnval \* (equation <> 0)**. **ISZ (returnval, equation)** returns the value **returnval** if **equation** is zero, which is similar to **returnval \* (equation = 0)**.

However, there's one big difference: the value of **returnval \* (field <> 0)** is 0 at depths where **field** was not entered, while **INZ (returnval, field)** does not return anything at those depths. This distinction is important in cases where you don't want to report the results of a calculation unless all of the fields used in the equation were actually entered. As an example, the "Print this item at depths entered into another data entry field" option of the "Place a Text Item in the Current Column" dialog (Section 4.6.3) can be used to only print an item on the report's table if the results of an equation is true:

**INZ (DEPTH, SAMP\_LEN >= 15)**

for instance, will print the item at its appropriate depth only where the sampling length was greater than or equal to 15 and will not print the item if the sampling length was less than 15, while

**DEPTH \* (SAMP\_LEN >= 15)**

will print the item at a depth of 0 when the sampling length was less than 15. This is because when the program evaluates **INZ (DEPTH, SAMP\_LEN >= 15)** at depths where the sampling length was less than 15, it doesn't get any kind of result back so it doesn't try to print anything, while when it evaluates **DEPTH \* (SAMP\_LEN >= 15)** at depths where the sampling length was less than 15 it gets a result of 0 and so prints the item at a depth of 0.

**IFE()**

**IFE(returnval, field)** returns result **returnval** only if the data entry field named **field** was filled in. One use for this function in the old MS-DOS LOGDRAFT III program was in the “Print this item at depths entered into another data entry field” option discussed for **INZ()**:

$$\mathbf{IFE(1, field)=0}$$

can be used to only print the item if **field** was **not** entered.

**NXT() and LST()**

**NXT(field, returnval)** provides the value of **returnval** on the first row after the current where a value was entered into **field**. This function is useful for vertically centering items on a graphic report: for instance, to vertically center a USCS classification between stratum changes (signified by the rows where the user enters something into the USCS field) on a graphic log, use

$$(\mathbf{DEPTH + NXT(USCS, DEPTH)}) / 2$$

as the depth at which the classification is to be printed. The expression above averages the depth at which the USCS value was entered and the next lower depth where a USCS value was entered.

- **NXT** won't return a result for data entry rows where **field** wasn't entered.
- If the expression **NXT(field, returnval)** is evaluated and there aren't more values entered for **field** below the current row then the function returns the largest possible value for **returnval**: for example, our example equation would center the last USCS entry between the depth where the last stratum started *and the boring termination depth*.

The following example may help clarify things:

Depth	USCS	End of strata depth: NXT(USCS,DEPTH)
0	CL	5
1		5
2		5
5	SM	7
7	ML	10 (returns the boring termination depth because no more USCS values were entered)
9		10
10 (boring termination depth)		10

**Table 9.3 -- Example NXT() Usage**

**LST(field,returnval)** provides the value of **returnval** on the first card *above* the current where the data entry field named **field** was filled in, as is illustrated in the following table:

Depth	USCS	Previous strata depth: LST(USCS,DEPTH)
0	CL	<i>(no result because no previous strata)</i>
1		0
2		0
5	SM	0
7	ML	5
9		7
10		7

**Table 9.4 -- Example LST() Usage**

### **LNO()**

**LNO()** returns the number of the data entry card currently being printed. Note that although nothing goes inside them you still need to include the parenthesis: use **LNO()** instead of **LNO**.

### **The MINOR\_CONVERT Field**

When you're printing sampling lengths you may want to report them in terms of feet or meters: if you're entering your sampling lengths in inches or centimeters you'll need to convert them. To report sampling lengths in feet when you've entered them in inches, you'll need to print **SAMP\_LEN/12**; for sampling lengths in meters when you've entered them in centimeters, you'll need to print **SAMP\_LEN/100**. Either formula ties you to one measurement system: if you have been entering your project data in US units and you change to SI units you'll need to edit your report form and change the **SAMP\_LEN/12** to **SAMP\_LEN/100**. To help with this, LD4 provides the **MINOR\_CONVERT** field.

When a report is printed, LD4 automatically sets **MINOR\_CONVERT** to be either 12 or 100, depending upon whether your project uses US or SI units (see Section 2.2.1 of the User's Guide). You can revise your report form to take advantage of this by printing **SAMP\_LEN/MINOR\_CONVERT** instead of **SAMP\_LEN/12** or **SAMP\_LEN/100** -- you'll get correct results for both US and SI projects because **MINOR\_CONVERT** becomes 12 when you're printing a US-unit project and 100 when you're printing a SI-unit project.

## Appendix B -- LD4 Calculated Fields

When printing a report, LD4 makes a number of fields available that may be printed or used in equations without requiring the user to enter any data. The table below summarizes the names and uses for these fields -- note that not all fields are available when printing every type of report: for example, the SCALE field, which stores the vertical scale used for printing the subsurface section of a drilling log, doesn't have a value when printing a data summary since summaries are not vertically scaled.

Field Name	Description
<b>RESUMED?</b>	Set to -1 if the page currently being plotted is not the first page of the report; in other words, is 0 when the first page of each boring log is plotted. Can be used to conditionally print some text only on subsequent pages of a report (e.g., "BORING CONTINUED").
<b>CONTINUE?</b>	Set to -1 if the page being plotted is not the last page of the boring log being plotted. Can be used to print "BORING CONTINUES" messages -- see Section 3.12.
<b>MINOR_CONVERT</b>	Initialized to "12" when plotting projects taken in feet/inches and "100" when plotting SI projects -- used when converting sampling lengths from inches to feet and from centimeters to meters.
<b>DT_TODAY</b>	Holds the current date, in "short" format (e.g., 10.02.00), as configured in the Windows "Regional Settings" Control Panel application.
<b>LONG_DATE</b>	Holds the current date, in "long" format (e.g., October 2, 2000) as configured in the Windows "Regional Settings" Control Panel application.
<b>CURRENT_TIME12</b>	Holds the current time in am/pm format
<b>CURRENT_TIME</b>	Holds the current time, in 24 or 12 hour format depending upon the "Regional Settings" application.
<b>COMPANY</b>	Contains the name of the organization which licensed the package.

<b>CNAME</b>	Contains the name of a logo file appropriate for the licensing organization.
<b>PAGE</b>	Holds a count of the number of pages plotted since the first page of the current boring log report. Resets to 1 at the start of printing for the next drilling log report.
<b>PAGE_L</b>	Holds a count of the total number of pages that will need to be plotted for the current drilling log.
<b>PAGE_T</b>	Similar to <b>PAGE</b> but is initialized based upon the <b>Page</b> field at the bottom of the drilling log data entry screen (see Figure 2.5.1 in the <u>User's Guide</u> ).
<b>TPAGE</b>	Similar to <b>PAGE_L</b> but starts with the value entered into the <b>Page</b> field at the bottom of the drilling log data entry screen; e.g., if this value is 5 and there are 3 pages to print, <b>TPAGE</b> will be 8.
<b>CPAGE</b>	Backwards compatibility. Holds the same value as <b>TPAGE</b> .
<b>FIGURE</b>	For drilling logs, test pits and monitoring wells, holds the value entered into the <b>Page</b> field at the bottom of the drilling log data entry screen (see Figure 2.5.1 in the <u>User's Guide</u> ). For profiles, holds the value entered into the <b>Starting Figure number</b> box on the <b>Report Form</b> tab of the Report Settings dialog.
<b>TOPDEPTH</b>	Changes for each page printed -- holds the depth that will be plotted at the top of the current page.
<b>BOTTOMDEPTH</b>	Holds the depth that will be plotted at the bottom of the current page.
<b>BORINGEND</b>	Holds the termination depth for the boring being plotted.
<b>SCALE</b>	Holds the user's vertical scale selection in either feet per inch or meters per centimeter.
<b>UNIT_LENGTH</b>	Holds 1 when plotting projects entered in feet/inches; 2/2.54 when plotting projects entered in meters/cms. Is used to determine a nice distance between successive horizontal grid lines on a graph.
<b>ABS_SCALE</b>	Holds the vertical scale in terms of feet per inches (even when the project being plotted was entered in meters). Used when LD4 expects a measurement in inches and the user will be entering the measurement in feet or meters of drilling.
<b>HSCALE</b>	Holds the horizontal scale chosen for profile plotting.

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