

YSI *incorporated*



## Operations Manual



## BODANALYST

Software That Makes BOD Testing  
Easier, More Efficient, and More Accurate



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# SECTION 1 INTRODUCTION

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BOD Analyst software™ for Windows™ (BOD Analyst software) is a Windows-based PC software accessory to the YSI 5000 and 5100 Dissolved Oxygen Instruments. Once you have defined your particular BOD application in the software, it will be able to control the YSI 5000/5100 Dissolved Oxygen Instrument and help to automate your BOD readings. At your signal, the software will collect each DO reading from the YSI 5000/5100 Dissolved Oxygen Instrument, match initial and final dissolved oxygen readings, perform all of the necessary calculations, and generate a report.

The program is very easy to learn and use. Most applications will require only a couple of hours to set up. Setup includes installing the YSI 5000/5100 Dissolved Oxygen Instrument, installing the program on to your PC, and defining your application. Once that is accomplished, you will only need a few minutes each morning to define exactly what you intend to do that day.

## 1. 1 INSTALLING THE YSI 5000/5100 DO INSTRUMENT

---

Your RS232 connectors are "D" shaped and have two rows of pins with a total of either 9 or 25 male contacts. Occasionally a PC will have the connectors labeled with "RS232", "IOIOI", "COM1", "COM2", etc. You may already have a device connected to an RS232 port. Typical devices include; a mouse, modems or printers. The program will need to know which communications port will be used for the YSI 5000/5100 DO Instrument. If you don't know, don't worry! Just plug it into any 9 or 25 pin connector. If the program cannot communicate with the YSI 5000/5100 DO Instrument, simply change the **COM port** field from **Setup, Communication Setup**. See **Section 11, Customizing Your Program** for detailed instructions.

If the RS232 connector on your PC has 25 pins, you will need to 9-25 adapter. Plug one end of the cable into the PC. Plug the other end into the YSI 5000/5100 DO Instrument.

## 1.2 INSTALLING YSI BOD ANALYST SOFTWARE ON YOUR PC

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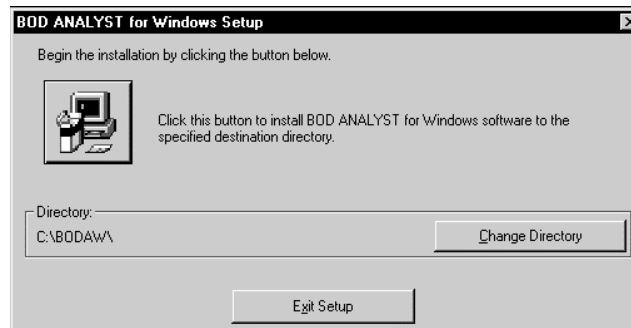
1. In Windows, close all programs that are currently running including any toolbars.
2. Place the BOD Analyst software CD in your CD-ROM drive. The setup program will start. If the setup program does not start, you will have to manually start the setup program. For Windows 95 and 98 choose [Start]; [Run] from the Start Bar.

Follow the instructions on the screen and the installation program displays the following box:



Click **OK** to proceed.

The installation program will then display the following screen. Click the button with the picture of a computer to begin the installation.



From this point, the installation program prompts you to place the BOD Analyst software disks in the disk drive. Simply follow the instructions on the screen to complete the installation. Upon completion of the installation, a program group with a BOD Analyst software icon will be setup. The program group will be located in the **Start, Programs** menu.

### 1.2.1 STARTING THE PROGRAM

---

Click on the BOD Analyst software icon that was set up in the installation program. The BOD Analyst software bench sheet screen will be displayed.



**BOD ANALYST for Windows**

**BOD ANALYST for Windows (C:\BODAW\Data\Data.mdb)**

File Read Setup Trending Utilities Help

New Bottle New Sample Mark Unmark Check Print

Friday, 08/13/1999

Sample Date: / / Seed Correction: Notes: Bottle Notes:

Incubation Period: / / Technician:

|    | Sample Name | Bottle # | Sample Volume (ml) | Seed Volume (ml) | Initial DO (mg/l) | Final DO (mg/l) | O2 Depl. (mg/l) | Seed Corr (mg/l) | BOD (mg/l) | Final BOD (mg/l) |
|----|-------------|----------|--------------------|------------------|-------------------|-----------------|-----------------|------------------|------------|------------------|
| 1  |             |          |                    |                  |                   |                 |                 |                  |            |                  |
| 2  |             |          |                    |                  |                   |                 |                 |                  |            |                  |
| 3  |             |          |                    |                  |                   |                 |                 |                  |            |                  |
| 4  |             |          |                    |                  |                   |                 |                 |                  |            |                  |
| 5  |             |          |                    |                  |                   |                 |                 |                  |            |                  |
| 6  |             |          |                    |                  |                   |                 |                 |                  |            |                  |
| 7  |             |          |                    |                  |                   |                 |                 |                  |            |                  |
| 8  |             |          |                    |                  |                   |                 |                 |                  |            |                  |
| 9  |             |          |                    |                  |                   |                 |                 |                  |            |                  |
| 10 |             |          |                    |                  |                   |                 |                 |                  |            |                  |

The Bench sheet is the main form of the BOD Analyst software. From the bench sheet all functions of BOD Analyst software are found. A day's batch is retrieved into the bench sheet so the DO readings can be taken, the BOD's calculated, the criteria applied to the tests, and the Final BOD stored. Data is stored in a Microsoft Access database, by default the database is data.mdb. The current database is displayed in parentheses in the BOD Analyst software title bar. BOD Analyst software allows multiple databases that are created and accessed through the **File** menu. See **Section 9.3, Understanding Data Files** for more information.

## 1.3 QUICK START GUIDE

After installation you must accomplish the following steps in order to start reading your dissolved oxygen readings. These steps are listed as a general guideline to introduce you to the program.

### Step 1: Review BOD Analyst software default settings

When you first use BOD Analyst software some settings are defaulted to the most common settings. These settings can be changed to user specified setting. For example, the bottle volume is set to 300ml. You may want to review these settings before getting started. The following tables summarize all the settings and the menu option to change them.

#### General Settings

Menu: Setup, General  
More Information: General Setup Form

| Settings                      | Value |
|-------------------------------|-------|
| Derive Initials               | Off   |
| Blank Compensation            | Off   |
| Do you predilute your bottles | Off   |

|                        |        |
|------------------------|--------|
| Volume of bottles (ml) | 300    |
| Dilution Unit          | ml     |
| Seed Added to          | Bottle |
| Report Font            | Arial  |

**YSI Instrument Parameters Form**

Menu: Setup, YSI Instrument Parameters Form  
 More Information: YSI Instrument Parameters Form

| <u>Settings</u>            | <u>Value</u> |
|----------------------------|--------------|
| Technique                  | Manual       |
| Stabilize timeout          | 300 secs.    |
| Sample Hold Time           | 10 secs.     |
| Sample change (mg/L)       | 0.05         |
| Blank Hold Time secs.      | 5            |
| Blank change               | 0.02         |
| Initial low temp           | 16           |
| Initial high temp          | 24           |
| Final low temp             | 18           |
| Final High temp            | 22           |
| Supersaturation            | 9.09         |
| Bottle Numbers             | On           |
| Barcode reader (5100 only) | Off          |

**Communications Setup**

Menu: Setup, Communications Setup  
 More Information: Communications Settings Form

| <u>Settings</u> | <u>Value</u> |
|-----------------|--------------|
| COM port        | Com1:        |
| Baud Rate       | 9600         |

**Criteria Setup**

Menu: Setup, Criteria  
 More Information: BOD Criteria Setup

| <u>Settings</u>                                  | <u>Value</u> |
|--------------------------------------------------|--------------|
| Maximum Dilution Blank Oxygen Depletion (mg/l)   | 0.2          |
| Maximum Initial Dissolved Oxygen (mg/l)          | 9.7          |
| Minimum Final Dissolved Oxygen (mg/l)            | 1.0          |
| Apply Take 2 leave 1 Rule                        | On           |
| Minimum (Initial DO - Final DO) (mg/l)           | 2.0          |
| Remove Depletion caused by Seed                  | Off          |
| Minimum Oxygen Depletion % for Seed Tests (mg/l) | Disabled     |
| Maximum Oxygen Depletion % for Seed Tests (mg/l) | Disabled     |
| Use Seed that was closest to 50% depletion       | On           |
| Minimum Seed Correction Factor (mg/l)            | 0.6          |
| Maximum Seed Correction Factor (mg/l)            | 1.0          |
| Minimum Standard Test BOD (mg/l)                 | 163          |
| Maximum Standard Test BOD                        | 237          |
| Check Coefficient of Variation                   | Off          |

|                                     |      |
|-------------------------------------|------|
| Coefficient of Variation Limit      | 0.35 |
| Apply Criteria after Final Readings | On   |

### Step 2: Setup Samples

Next, you have to setup the Samples you run in the BOD Analyst software. BOD Analyst software by default has the DilBlank, Seed, and Standard Samples setup. From the Main Menu, choose **Setup, Samples** to add your samples and review the default samples. See **Section 2, Samples** for more information.

### Step 3: Setup a Batch

From the bench sheet, enter a sample date, then press **Tab**, or use the pull down menu to assign a date. The Build Batch form will then be displayed. The build batch form is used to specify the samples and their dilutions for the batch.

| Sample Name | Dilutions (ml) |     |     |   |   | Seed    |     |
|-------------|----------------|-----|-----|---|---|---------|-----|
|             | 1              | 2   | 3   | 4 | 5 | Name    | Qty |
| DilBlank    | 300            | 300 |     |   |   | No Seed |     |
| Raw         | 10             | 15  | 20  |   |   | No Seed |     |
| Final       | 300            | 300 | 300 |   |   | No Seed |     |
| Primary Eff | 50             | 75  | 100 |   |   | No Seed |     |
| Dairy       | 5              | 8   | 10  |   |   | No Seed |     |
|             |                |     |     |   |   |         |     |
|             |                |     |     |   |   |         |     |
|             |                |     |     |   |   |         |     |
|             |                |     |     |   |   |         |     |
|             |                |     |     |   |   |         |     |
|             |                |     |     |   |   |         |     |
|             |                |     |     |   |   |         |     |
|             |                |     |     |   |   |         |     |
|             |                |     |     |   |   |         |     |

The table on the Build Batch form describes the batch. Select the samples you want for the batch by selecting the sample from the Choose Samples listbox and use the > button. After all samples are added to the table, click OK and the batch will be setup.

### Step 4: Read Initials

You are now ready to read initial DOs. Select Read, Initials from the Main Menu. Follow the prompts on the YSI 5000/5100 Instrument or the PC to read your initial values. All data is automatically saved.

### Step 5: Read Finals

Five days later, restart the BOD Analyst software. Select the **Sample Date** to load the batch. Select **Read, Finals** from the Main Menu. Follow the prompts on the YSI or the PC to read your final values. BOD Analyst software will calculate Final BODs, “mark” bottles that do not meet the criteria, and save the data.

## SECTION 2 SAMPLES

---

### 2.1 WHAT IS A "SAMPLE?"

---

With YSI's BOD Analyst software you can organize your work by sample. A sample is anything for which you want to know the BOD. Samples for BOD can be taken from various points in your wastewater treatment system or environmental water:

|                   |                                 |
|-------------------|---------------------------------|
| Raw               | north plant effluent            |
| Clarifier Tank #2 | combined sewer overflow #17     |
| CBOD effluent     | Green River upstream of outfall |

Samples can also come from industries or other large polluters:

|                   |           |
|-------------------|-----------|
| Dairy farm        | refinery  |
| ABC metal plating | army base |

In the BOD Analyst software, Samples also include some things that are done only in support of the other measurements:

|                     |                       |
|---------------------|-----------------------|
| Seed control sample | dilution water blanks |
| GGA standard        | distilled water blank |

In the BOD Analyst software, a "Sample" is not just the name of the stuff for which you want to know the BOD, but also all the information about how you measure the BOD for that Sample. Specifically, a Sample definition includes the following information: a name; a description; the dilutions that you usually run for that Sample; whether or not the Sample is seeded, and if so, how and whether or not the Sample is a CBOD. You define Samples in the BOD Analyst software on the Sample Form. The Sample Form is accessed from the menu by selecting **Setup, Samples**. A Sample for "north plant effluent" would look something like this:

The screenshot shows the 'Sample Setup' dialog box with the following fields and controls:

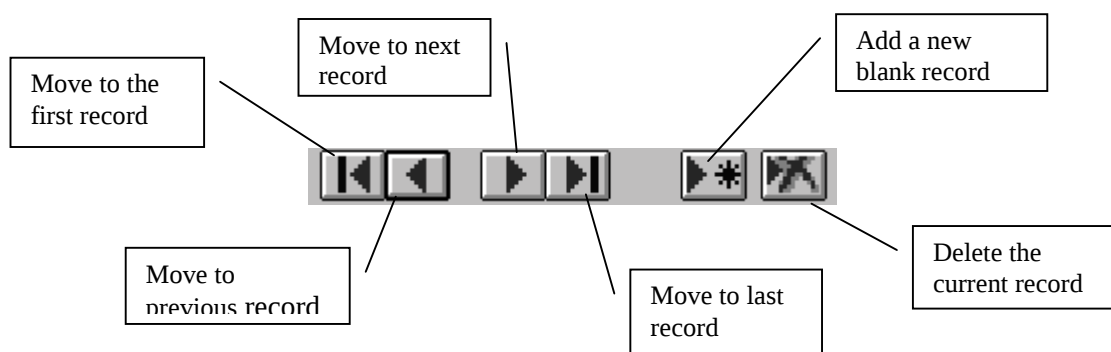
- Navigation Buttons:** First, Previous, Next, Last, Add New, Delete.
- Sample Name:** N C Effluent
- Description:** North Plant, CBOD, seeded
- Dilution Setup:**
  - Number of Bottles (Dilutions) for Sample: 2
  - Pre-dilution Ratio: 1
  - Dilution 1: 150, Dilution 2: 275, Dilution 3: (empty), Dilution 4: (empty), Dilution 5: (empty)
  - Note: Dilutions are in ml
- Options:**
  - Standard: ☐
  - Dilution Blank: ☐
  - Used as Seed: ☐
  - CBOD: ☒
  - Decimal Points: 0
- Seed:**
  - Seed Control Sample Name: Influent
  - Seed Quantity in ml: 3
- QC Settings:**
  - Upper Control Limit: (empty)
  - Upper Warning Limit: (empty)
  - Lower Warning Limit: (empty)
  - Lower Control Limit: (empty)
- Buttons:** OK, Cancel

In this example, there are two dilutions: 150ml and 275ml. This Sample is seeded with 3ml of material taken from the Influent.

## 2.2 USING SAMPLE SETUP

---

The **Sample Setup Form** is used to add new Samples to the database or to change old ones. The Sample Setup Form is accessed from the menu by selecting **Setup, Samples**. Sample Setup information is used as defaults when adding a sample to a day's batch. For example, we setup Influent with three dilutions of 5, 8, and 10 ml and no seeding. Every time the Influent Sample is added to a batch, three dilutions of 5, 8, and 10 ml will be setup saving time and data entry errors. The dilutions and number of bottles can be changed for any batch using the main bench sheet screen. Use the button bar to navigate, add, and delete samples. Changes to samples are automatically saved.



## 2.3 ADDING A NEW SAMPLE

---

To add a new Sample, select **Setup / Samples** from the Menu. Click the **Add New** button from the toolbar. A blank Sample Setup form will be displayed. Simply fill out the fields for the new sample. Changes are automatically saved.

The following paragraphs describe each of the fields on the form.

**Sample Name:** Sample names can be up to 15 characters long. Names longer than 13 characters are shortened when displayed on the YSI 5000/5100 Instrument. You may use upper and lower case characters in a name. When it is necessary to abbreviate a name, lower case letters will be eliminated before upper case letters. Keep in mind that editing a Sample name will cause the new name to appear even on reports of old data. For example, if you edited the Sample, "clarifier," and changed its name to "secondary," when you print a report of a Batch that included a BOD of the "clarifier," the Sample name would be reported as "secondary." Therefore, be careful to only edit a Sample name when the new name is just a different name, and not an entirely different Sample.

**Description:** You can have up to 50 characters to describe the Sample. The Sample name is often descriptive enough by itself and you do not need to fill in this field. However, sometimes a description is helpful. For example, a Sample name like "**W C s Efflnt**" may need a description like "**West plant CBOD seeded effluent.**"

**Dilution Setup:** You can have up to 5 dilutions for any Sample. On the General Setup Form, the **dilution unit** field allows you to choose to express your dilutions in milliliters (ml) or in percent (%). If you change dilution units on the General Setup Form, all of the dilutions in each of your Samples will be changed automatically to reflect the new units. Dilutions can have up to two places after the decimal point and three before it, however, on the YSI 5000/5100 Instrument display, more characters for the dilution may mean fewer characters for the Sample name. So, try to keep your dilutions to 3 or 4 characters or less (e.g. **300, 120, 75, 2.5**).

**Seed control sample name:** This field is used to indicate the name of the seed control sample. Simply choose the sample to be used as Seed control from the pull down list. Choose '**No Seeding**' from the pull down list for Samples that are not seeded. Only Samples that have the **Used as Seed** field selected will appear on the list. Note that you will have to define your seed control samples before you can define any seeded Samples. Often a plant's effluent is seeded with material from the plant's influent. First define a Sample called "Influent." When you are ready to define a Sample for the effluent, the seed control sample, "Influent" will be available for selection. The next section is devoted to the topic of seeding.

**Seed Qty in ml:** Sets the quantity of seed material used for this Sample. The interpretation of this field depends on the seeding method that you have selected on the General Setup Form. If you have chosen to add seed directly to each bottle, then the number in this field represents the number of milliliters of seed material in each seeded bottle. If you have chosen to add seed material to the dilution water, then the number represents the number of milliliters of seed material in each liter of the dilution water that is used for seeded Samples. In this case the field will appear as **Qty (ml/L):**.

**Standard:** Treat sample as a GGA standard test. Standard tests have the Minimum and Maximum Standard Test criteria applied to the tests.

**Dilution Blank:** Treat sample as a dilution blank test. Only the depletion is calculated for these tests. The **Maximum Dilution Blank Oxygen Depletion** criteria is applied to Dilution Blank Tests

**Used as Seed:** The sample can be used as a seed. With Used as Seed checked, a seed correction will be calculated for the sample.

**CBOD:** If the Sample is a CBOD, check the box. This has absolutely no affect on the calculations. It is only so that CBOD can be indicated on reports.

**Decimal Points:** The number of Decimal Points the final BOD for the sample should be calculated to. Default is 0.

**Pre-dilution:** (The pre-dilution option is only shown when the General Setup Form option is checked). Very strong samples sometimes require dilutions that would be difficult to make in one step. In these cases, a sizeable quantity of sample is first diluted to a ratio that will make the final dilutions practical. In the BOD Analyst software, we call this ratio the pre-dilution. For example, if you add 10ml of your dairy farm sample to a 1000ml volumetric flask and then fill the flask with dilution water, we call that a pre-dilution of 100. It is sometimes referred to as a serial dilution. Some people find it easier to adjust for the strength of each sample with the pre-dilution while keeping the final dilutions constant for all samples. Seed control samples, and blanks cannot be pre-diluted.

**Quality Control:** Used in the trending graph function to display Quality Control Limits on the graph for the sample.

## 2.4 CHANGING A SAMPLE

---

Use the button bar to move to the sample (record) you want to change. Edit the fields as required. Changes are automatically saved. Keep in mind that editing a Sample name will cause the new name to appear even on reports of old data. For example, if you edited the Sample, "clarifier," and changed its name to "secondary," when you print a report of a Batch that included a BOD of the "clarifier," the Sample name would be reported as "secondary." So, only edit a Sample name when the new name is just a different name for the same thing and not an entirely different Sample.

## 2.5 NAMING SAMPLES

---

When recording BODs by hand, many people develop very brief abbreviations for their samples to save time and aggravation. With the BOD Analyst software, this is no longer necessary. We recommend that you try to use Sample names that are as close as possible to normal, everyday English. For example, in naming an upstream river sample, why say **MU**, when you could say **Mad R Upstr** ?

The Sample name can be up to 15 characters long. The full Sample name will always appear on the PC and on all reports. However, the YSI 5000/5100 Dissolved Oxygen Instrument's display is limited to a total of 13 characters for both the dilution and the Sample name. But do not hesitate to use long names. The program will automatically abbreviate them in an intelligent fashion. Let's look at a couple of examples.

Suppose that we do BODs for 2 plants, north and south, and that we run CBODs and full BODs on the effluents from each plant. Let's further suppose that for each of the samples we run a 100 ml dilution (among others, of course). The idea is to name the samples such that when they appear on the YSI 5000/5100 Dissolved Oxygen Instrument display it is easy to distinguish them. There are many good ways to do it. Putting an **N** or an **S** at the beginning of the names would group Samples from the same plant together on the alphabetical Sample List. Let's name them as follows:

**N C Effluent**  
**S C Effluent**

**N Effluent**  
**S Effluent**

Now let's see how these names would appear on the YSI 5000/5100 Dissolved Oxygen Instrument display:

**NCEffluent 100i**  
**Enter Bot#:0**

**N Effluent 100i**  
**Enter Bot#:0**

**SCEffluent 100i**  
**Enter Bot#:0**

**S Effluent 100i**  
**Enter Bot#:0**

You can find a detailed description of the abbreviation algorithm in the next section. The only thing that you need to remember is that characters at the end of the name will be the first to go.

### 2.5.1 ABBREVIATION ALGORITHM

---

The abbreviation algorithm is simple. It attempts to remove the least important characters first, removing one at a time until there is room for the dilution and the new abbreviated name. It starts at the end of the Sample name and moves back. The program removes characters in this order:

- Spaces
- Punctuation
- double, lower case letters
- lower case vowels
- lower case consonants
- upper case vowels
- upper case consonants
- Truncate to 8 characters

## 2.6 DELETING A SAMPLE

---



Keep in mind that when you remove a sample, its name will remain in the database so that future reports of old data will have sample names. For example, if you decide that you no longer need to do BODs on your "clarifier," you can delete it and it won't appear on the Sample list. If you later want a report of a batch that included a BOD of the "clarifier," it will still appear on the report.

To delete a sample, move to the record using the button bar and click the



button.

## SECTION 3 SEEDING SAMPLES

---

### 3.1 WHY SEED?

---

Seeding is necessary when there are not enough bacteria present in the sample. A small amount of seed material that is known to have adequate bacteria is added to the bottle along with the aliquot and dilution water.

Seeding is most often necessary with an effluent sample that has been chlorinated. The seed material can come from the plant's influent, from some intermediate point in the process, or from commercially available seed packets.

If you don't seed at all, then you can ignore this section, but be sure that you do not fill in the **Seed Control Sample Name** or seed **Qty (ml)** fields on any Sample Setup Form.

### 3.2 SEED CONTROL SAMPLE

---

In a seeded sample both the sample and the seed contribute to the depletion. Since it is the BOD of the sample that is of interest, we must remove the effect of the seed material in our calculations. To determine this compensation, you must run several dilutions of the seed material itself. This is called the "seed control sample." The sample name of the seed control sample must be indicated in the **Seed control sample Name** field on the sample setup form. Sometimes the seed material is taken from a sample that is already being tested for BOD, typically the influent. In these cases, enter **Influent** in the **Seed control sample Name** field. Sometimes there are seeded samples for which the CBOD is to be determined, and others for which the full BOD is to be determined. In these cases, it may be necessary to have two seed control samples of the same material, one a CBOD and the other a full BOD.

Seed control samples cannot be pre-diluted. (Neither can blanks)

### 3.3 SEEDING METHODS

---

You may choose one of two seeding methods, adding seed material to each bottle that is to be seeded, or adding seed material to the dilution water.

If you choose to add seed material directly to each BOD bottle, the quantity of seed material is expressed in milliliters (ml). If you choose this method, you must put the same quantity of seed material in each of the dilutions of the same sample. However, if you have more than one seeded sample, each sample may have a different quantity of seed.

If you choose to add seed material to the dilution water, you must first mix the seed material with dilution water and use the mix to dilute all of your seeded sample dilutions. Note that the amount of seed material in each bottle depends on the amount of dilution water in the bottle. The quantity of seed material is expressed in milliliters per liter. Typically, the same seeded dilution water is used for all seeded samples.

If you seed directly to the bottle, the amount of seed material in each bottle will simply be the seed quantity. If you seed the blank water, the amount of seed material in each bottle depends on how much dilution water is in that bottle. Note therefore, that your choice of method will affect the calculations.

You may, after some time, decide that it would be best to change your seeding method. You can change the seeding method on the **Seed added to:** field on the General Setup Form. Furthermore, because the units for the seed quantity are different for the two methods (ml of seed material in each bottle vs. ml/L of seed material in dilution water), you must adjust the seed quantity for each of your seeded samples to reflect the new method.

**NOTE:** The BOD Analyst software shows only one method of adding seed. Therefore, when you change the method used for seeding, all previously taken batches will be translated to reflect the current method. This is for display purposes only and **WILL NOT** affect your data.

## SECTION 4 SAMPLE GROUPS

---

### 4.1 WHAT IS A "SAMPLE GROUP"?

---

A Sample Group is a set of samples. For brevity, we often refer to Sample Groups as simply Groups. You will want to define a Group for every set of samples that you do frequently. Groups allow you to bring a number of samples into a Batch quickly and easily.

A Group definition includes a name, a description, and the sample names of the group. You will want to list the Samples in a Group in the same order that you typically measure them.

Since Groups do not appear on any report, there is no need to keep a permanent record of them. So, unlike Samples, when you delete a Group, it is gone forever.

### 4.2 THE GROUP SETUP FORM

---

The Group Setup form is used to add, edit and delete groups. Select **Setup / Groups** from the Main Menu to access the Group Setup form.

Group Setup

First Previous Next Last Add New Delete

Group Name Mon & Tue

**Choose Samples**

- DilBlank
- Standard
- Seed
- Influent
- Effluent
- Clarifier
- CSO#1
- CSO#2
- Dairy Farm
- Effluent-C
- Seed-C
- Piave R. dn
- Piave R. up

> >> < <<

**Samples in Group**

- Seed
- Influent
- Effluent

OK Cancel

### 4.3 ADDING A GROUP

---

 From the Group Setup form, click the **ADD NEW** button. A blank form will be displayed. Enter the Group Name and choose the samples from the Group (see the section below for more information on choosing groups). Changes are automatically saved. Samples will be added to the batch in the order they appear in the Group. The build batch form allows you to reorder the samples. An unlimited number of samples can be in a batch.

**NOTE:** The dilution blank sample is automatically added when you build a batch. Therefore, you do not need to add the dilution blank sample to any group.

## 4.4 CHOOSING SAMPLES FOR GROUPS

---

The **Choose Samples** list displays all available samples. The **Samples in Group** list displays the samples that are in the Group. Use the transfer buttons described below to add or remove samples from the Group.



Transfer all selected samples from the Choose Samples list to the Samples in Group list.



Transfers all samples from the Choose Samples list to the Samples In Group list.



Removes all selected samples from the Samples in Group list



Removes all samples from the Samples in Group list.

## 4.5 EDITING A GROUP

---

Use the button bar to move to the Group that you want to edit. Change the **Samples in Group** list as required. The Group name can also be changed at anytime with no effect on historical data. Changes are automatically saved.

## 4.6 DELETING A GROUP

---



Use the button bar to move to the Group that you want to delete. Click the [Delete] button. You will be asked if you are sure, click Yes to delete the group.



## SECTION 5 BATCHES

---

### 5.1 WHAT IS A "BATCH?"

---

A Batch is all initial DOs that are done on any one day, along with their corresponding final DOs. Because there is only one Batch per day, we can refer to a Batch by the Sample Date.

It is very important that the date on your computer is correct. The date when you read the initials and the date when you run the finals set the incubation period for the batch. If the date on the computer is incorrect, the BOD Analyst software may not calculate the BODs correctly.

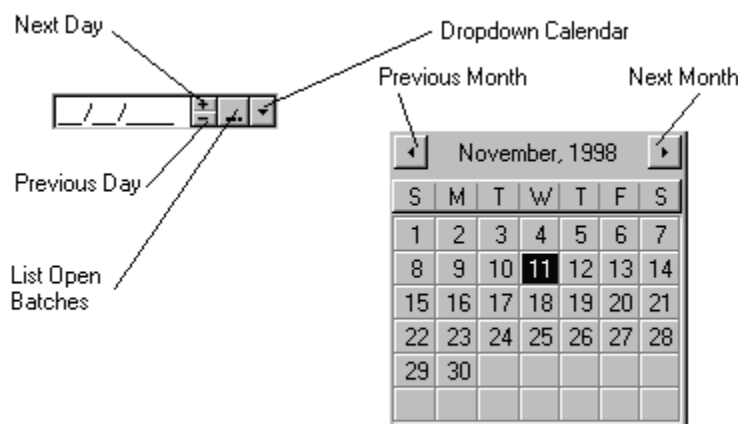
There are several safeguards built into the program to help you avoid making a mistake. The date and the day of the week are displayed in the upper right hand corner of the screen at all times.

A Batch must be self-contained. That is, if there are any seeded Samples in the Batch then the corresponding seed control samples must also be present. When a batch is built, a warning message will be displayed and the batch will not be built if this condition exists. Once the batch is built, you can delete the seed control sample from the bench sheet.

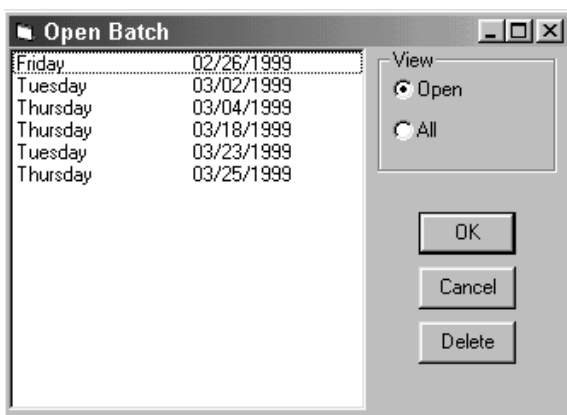
### 5.2 LOADING A BATCH

---

To load a batch into the Bench Sheet enter a date into the Sample Date field. If a batch for the day has been started, it will be retrieved into the Bench Sheet. If no batch is found for the day the Build Batch Form will be displayed allowing you to load a Bench Sheet with a new batch. Dates can be entered in mm/dd/yy or mm/dd/yyyy format. Alternatively, you can use the dropdown calendar to select a date.



To select a batch that is not yet complete, click the **List Open Batches** button . A form will open displaying batches, within the last 33 days, that have no finals taken. Simply select the date from the list and click OK. For a display of all batches, click the **All** option button.



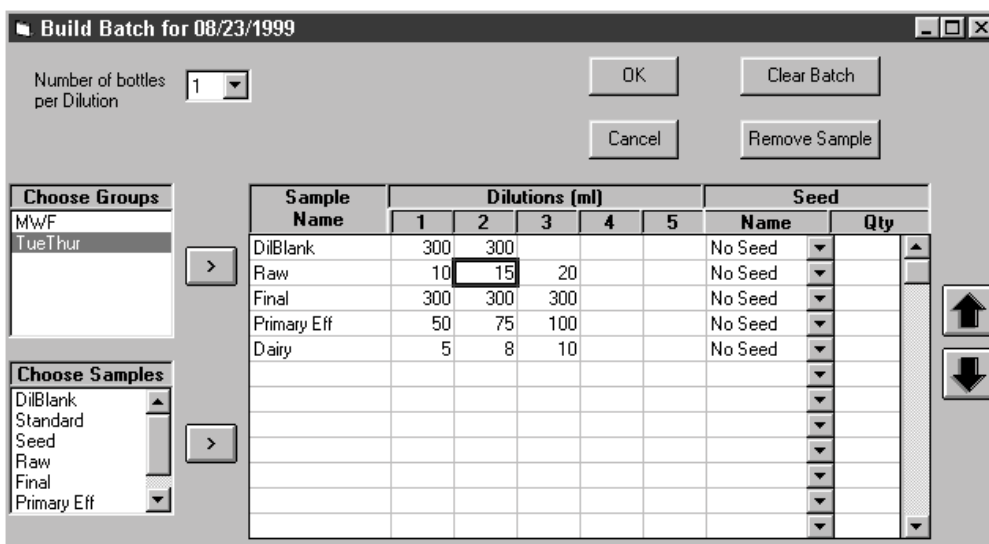
The Open Batch dialog box shows a list of batches with their dates. The 'View' section has radio buttons for 'Open' (selected) and 'All'. There are 'OK', 'Cancel', and 'Delete' buttons at the bottom.

| Day      | Date       |
|----------|------------|
| Friday   | 02/26/1999 |
| Tuesday  | 03/02/1999 |
| Thursday | 03/04/1999 |
| Thursday | 03/18/1999 |
| Tuesday  | 03/23/1999 |
| Thursday | 03/25/1999 |

The Open Batch Form can also be used to delete a batch. Select the batch to be deleted and click [Delete]. You will be asked for confirmation before deletion.

### 5.3 THE BUILD BATCH FORM

From the bench sheet, when a **Sample Date** is entered that has no batch setup for it, the build batch form will be displayed. The build batch form is used to specify the samples and their dilutions for the batch.



The Build Batch for 08/23/1999 dialog box includes a 'Number of bottles per Dilution' dropdown set to 1. It has 'OK', 'Clear Batch', 'Cancel', and 'Remove Sample' buttons. On the left, there are 'Choose Groups' and 'Choose Samples' lists. The main table lists samples with their dilutions and seed information.

| Sample Name | Dilutions (ml) |     |     |   |   | Seed    |     |
|-------------|----------------|-----|-----|---|---|---------|-----|
|             | 1              | 2   | 3   | 4 | 5 | Name    | Qty |
| DilBlank    | 300            | 300 |     |   |   | No Seed |     |
| Raw         | 10             | 15  | 20  |   |   | No Seed |     |
| Final       | 300            | 300 | 300 |   |   | No Seed |     |
| Primary Eff | 50             | 75  | 100 |   |   | No Seed |     |
| Dairy       | 5              | 8   | 10  |   |   | No Seed |     |
|             |                |     |     |   |   |         |     |
|             |                |     |     |   |   |         |     |
|             |                |     |     |   |   |         |     |
|             |                |     |     |   |   |         |     |
|             |                |     |     |   |   |         |     |
|             |                |     |     |   |   |         |     |

The table on the Build Batch form describes the batch. Each line in the table is a Sample. Sample Names appear in the first column. There are 5 columns for the Samples' dilutions. Use the mouse or the arrow keys to move through the table. To change the dilutions for any sample, move to the dilution and enter a new number. To remove a dilution from the sample, simply clear the dilution field. The Seed Name and Seed Qty columns describe the Seed for the sample.

## 5.4 WORKING WITH BATCHES

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### 5.4.1 STEPS TO BUILDING A BATCH

---

Add the samples for the batch by:

1. Click on a group in **Choose Groups** and then  click to add all the samples for the group to the batch. You can also drag and drop the group onto the batch to add the samples to the batch.

**OR**

Click on a sample in the Choose Samples and then click  to add that sample to the batch. You can also drag and drop the sample onto the batch.

2.   Use to change the order of the samples. Simply click on a row and then use the arrow buttons to move that sample up or down in the batch.
3. Edit the dilutions and Seed information as necessary.
4. Click the OK button. The batch will be loaded into the bench sheet and will be ready for initial DOs to be read.

### 5.4.2 REMOVING A SAMPLE

---

To remove a sample from the build batch table, move the cursor anywhere on the sample row in the table and click the Remove Sample button.

### 5.4.3 CLEARING THE BATCH

---

To remove all samples from the batch, click the Clear Batch button. This will give you a clean slate from which you can build your batch. Alternatively, use the Delete button on the open batch form.

### 5.4.4 ADDING MORE THAN 5 DILUTIONS

---

In some cases, a sample will require more than five (5) dilutions. From the build batch screen there is no way to enter more than 5 dilutions. To handle this situation, first build the batch with 5 dilutions. Then use the Add Bottle button on the bench sheet to add more bottles (dilutions) to a sample. BOD Analyst software allows you to run duplicate or triplicate bottles for each dilution. Use the **Number of Bottles per dilution** field on the **Build Batch** screen to run duplicates. For example, with this field set to 2, for each dilution two (2) bottles will be setup for the batch.

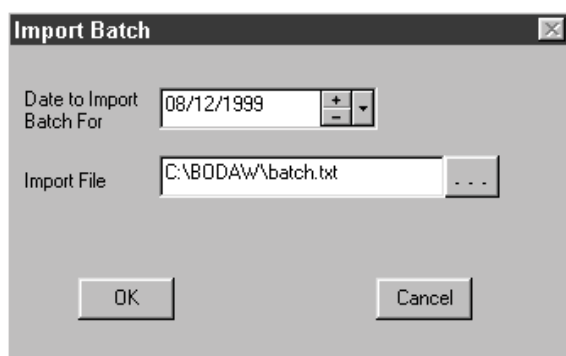
### 5.4.5 IMPORT BATCH

---

This feature allows you to setup a batch by importing a text file created in another system (i.e. a LIMS). The LIMS needs to build a file with the sample names followed by an optional serial number, one pair per line. Sample names in the file must *exactly* match sample names defined in BOD Analyst software (however, Sample names are not case sensitive). For example, if the sample name in the import text file is raw and the Sample is defined in BOD Analyst software as Raw, they would still match. The Raw sample would then be added to the batch according to how the Sample was setup in BOD Analyst software. See **Section 2.2, Using Sample Setup** for more information. The text file has the following format: columns 1 through 12 for the Sample Name, columns 14 through 21 for the Serial Number. Here is an example import file:

| Column 1<br>↓ | Column 14<br>↓ |
|---------------|----------------|
| Sample1       | serno          |
| Raw           | 000456         |
| Final         | 000457         |

If the Serial Number is included in the import file, the serial number in the file will override the serial number that would be generated by BOD Analyst software. To import a batch, select **Utilities, Import Batch** and the Import Batch form will be displayed.



Select the date to be imported and enter the Import File Name. The ... button allows you to browse for the import file. Click OK and the batch will be setup.

## 5.5 THE BENCH SHEET

---

The Bench Sheet is the main form of the BOD Analyst software. From the Bench Sheet all functions of BOD Analyst software are found. A day's batch is retrieved into the Bench Sheet so the DO readings can be read, the BODs calculated, the criteria applied to the tests, and the Final BOD stored.

### 5.5.1 DATA ENTRY

---

Data is entered from the keyboard in a spreadsheet fashion or read from the YSI 5000/5100 DO Instrument. Data to be entered includes the bottle number, amount of sample used, amount of seed used, initial dissolved oxygen reading and final dissolved oxygen reading. For each test the

dilution oxygen depletion, seed correction factor and BOD are calculated automatically. For each set of tests having the same sample name, a Final BOD is found by averaging BODs for the sample. When tests are checked for validity, the Final BOD is automatically recalculated using only those tests that meet the criteria.

### 5.5.2 MARKING/UNMARKING

---

Tests can be checked for validity using limits set in Criteria Setup. Tests are checked against limits after final readings have been complete (if the Apply Criteria after final readings) or by clicking the CHECK button. Tests that do not meet the criteria are automatically "marked" as unacceptable. Marked data are shown on the screen with a green background. Tests may also be marked and unmarked independently of the criteria using the MARK and UNMARK buttons. Upon marking, Final BOD values are recalculated using only the unmarked tests.

## 5.6 READING INITIAL DO'S

---

Select **Read / Initials** from the Main Menu. This will connect to the YSI 5000/5100 DO Instrument and begin reading in the Initial DOs. As the DOs are read from the YSI 5000/5100 DO Instrument the data will be stored in the Bench Sheet.

## 5.7 ADD A BOTTLE

---



Click the NEW BOTTLE button to insert a bottle into the current sample after the current row. You may need to add a bottle if you setup the wrong number of dilutions when you built the batch or you need more than five dilutions for the sample.

## 5.8 ADD A SAMPLE TO THE BATCH

---



Click the NEW SAMPLE button to add a new sample into the batch. You may need to add a sample if you forgot to add the sample when you built the batch. The following form is displayed:

**New Sample**

Select Sample To Add

- Standard
- Seed
- N C Effluent

**Dilution Setup**

Number of Bottles (Dilutions) for Sample: 3

|            |    |
|------------|----|
| Dilution 1 | 10 |
| Dilution 2 | 10 |
| Dilution 3 | 10 |
| Dilution 4 |    |
| Dilution 5 |    |

**Seed**

Seed Control Sample Name: No Seeding

Seed Quantity in ml: 0

OK Cancel

Select the sample to add from the list and the number of dilutions and the dilution volumes will be read from the sample setup. Edit the Sample's dilutions and Seeding information if required and click OK. Changing the dilution and seeding information on this form only changes it for this batch. The sample and its bottles will be added to the end of the batch.

## 5.9 MARKING A BOTTLE

---



This button marks tests independently of the current criteria. If a test is marked, it is not used in the final BOD calculation. The ability to mark or unmark records enables the user to make judgement calls in selecting or rejecting BODs. Tests are automatically marked as unacceptable when data is changed. To manually mark a test that meets the current criteria, move the cursor to the row and select the MARK button. The test will be removed from the final BOD calculation.

## 5.10 UNMARKING A BOTTLE

---



Removes the marked condition for the current row. If the current row is marked (manually or automatically) the UNMARK button adds the test back into the final BOD Calculation.

## 5.11 CHECK CRITERIA

---



Calculates the BODs and checks the criteria for all bottles. Marks bottles that do not meet criteria. Please note: if the **Apply criteria after Finals** on the Criteria Setup form has a check mark, the criteria will automatically be applied. If you want to check the criteria manually at any time, click this button.

## 5.12 FIELD DESCRIPTIONS

---

**Sample Date:** Enter the sample date. When the sample date is entered, any previous entries are retrieved.

**Incubation Period:** The date range of the BOD incubation period. The start date of the incubation period is set when Initial DOs are read. The end date is set when finals are read.

**Seed Correction:** Shows the amount of seed correction in mg/l DO per ml of seed used. All samples that are set as **Use as Seed** in sample setup that are in the batch will be listed. As you move in the bench sheet the current Seed will be highlighted. For example if your Effluent sample is seeded with Influent, when the cursor is moved to the Effluent sample, the Influent Seed Correction factor in the list will be highlighted.

**Technician:** Used to identify the person responsible for the validity of laboratory test data. Up to twenty-five characters can be used to indicate the employee's social security number, name or initials.

**Notes:** Used for any miscellaneous notes for the entire batch.

**Bottle Notes:** This field allows entry of bottle specific notes. As the cursor is moved around the bench sheet the notes for the current bottle will be displayed. This allows users to enter the pH of the bottle if it is required by the state.

## 5.13 COLUMN DESCRIPTIONS

---

**Sample Name:** Identifies the sample.

**Bottle #:** The number of the BOD bottle used for incubation.

**Pre Dil:** The pre-dilution ratio for the bottle. Very strong samples sometimes require dilutions that would be difficult to make in one step. In these cases, a sizeable quantity of sample is first diluted to a ratio that will make the final dilutions practical. Sometimes a pre-dilution is called a serial dilution. In the BOD Analyst software, we call this ratio the pre-dilution. For example, if you add 10 ml of your dairy farm sample to a 1000 ml volumetric flask and then fill the flask with dilution water, enter 100 (1000/10) for the Pre Dil ratio. The Pre Dil ratio defaults to 1. This column appears only if the “**Do you predilute your bottles?**” field in General Setup is checked.

**Sample Volume (ml or %):** The sample volume in milliliters or % in the BOD bottle. Use the Dilution Unit field in General Setup to choose whether to enter this number in ml or %.

**Seed Volume (ml):** The seed volume in milliliters introduced into the BOD bottle. If the field is left blank, Seed Vol defaults to zero.

**Init DO (mg/l):** The amount of dissolved oxygen at the beginning of the incubation period measured in milligrams per liter.

**Final DO (mg/l):** The amount of dissolved oxygen at the end of the incubation period measured in milligrams per liter.

**O<sub>2</sub> Depl (mg/l):** The amount of dissolved oxygen as mg/l consumed during the incubation period. If blank compensation is turned on, the depletion calculation will remove the depletion due to the Blank Water. This field is automatically calculated:

$$= (\text{NormFactor} * (\text{InitDO} - \text{FinalDO})) - (\text{BlankComp per ml} * \text{Blank Water in Sample})$$

**Seed Factor (mg/l):** Used to correct the BOD test for oxygen depletion resulting from the presence of seed. Seed correction per ml is derived from seed control tests, then multiplied by the amount of seed used in the test, as shown below. If there is no seed used in the test the seed factor is zero. The seed factor will also be shown as zero if all seed tests are marked as unacceptable. This can produce invalid results for tests that use seed.

$$\text{Seed Factor} = \text{Seed Correction per ml} * \text{Seed Vol}$$

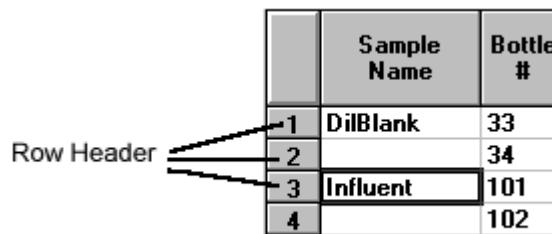
**BOD (mg/l):** The calculated BOD for the bottle.

**Final BOD (mg/l):** Calculated by averaging the BODs of all dilutions for a sample that have not been marked as unacceptable.

## 5.14 DELETING A BOTTLE

---

To remove a bottle from a batch, click on the row header and press the delete [del] key. To select multiple bottles for deletion, click on the row header and drag the mouse to highlight multiple rows. With the rows highlighted, press DELETE and all the highlighted rows will be removed from the batch. The DilBlank Sample cannot be deleted from a batch.



|   | Sample Name | Bottle # |
|---|-------------|----------|
| 1 | DilBlank    | 33       |
| 2 |             | 34       |
| 3 | Influent    | 101      |
| 4 |             | 102      |

## SECTION 6 TAKING INITIAL DO READINGS

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### 6.1 ENTERING BOTTLE NUMBERS

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#### 6.1.1 USING THE YSI 5000/5100 DO INSTRUMENT

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Just after selecting **Read / Initials** from the menu, the YSI 5000/5100 DO Instrument display will look like this:

Begin taking  
Initials?

To begin taking measurements, press CONFIRM. You will then move onto the bottle number prompt for either the first bottle in a new Batch, or the next bottle to be done in an interrupted Batch. Here is the bottle number prompt for an Effluent Sample.

Effluent 60 i  
Enter bot#0

The top line of the display will show the Sample name and dilution of the next bottle to be read. There will also be an "i," in the top line indicating that you are working on initial DOs. There will be a prompt for the bottle number in the bottom line. After you enter the bottle number, the program will display the DO as follows. This data will also be displayed on the Read YSI form.

Effluent 60 i  
7.74 mg/L B#551

You can enter bottle numbers one digit at a time using the up and down arrow keys, pressing CONFIRM after each digit. One and two digit bottle numbers need leading zeros. (Enter "007," not "7.") Since each digit starts at 0, it is easier to enter a "7" by pressing the down key three times. To enter the bottle number, 294, enter "2" for the first digit. Press the up arrow key twice,

Effluent 60 i  
Enter bot#2

then press CONFIRM.

Effluent 60 i  
Enter bot#20

To enter "9" for the second digit, press the down arrow key once,

Effluent 60 i  
Enter bot#29

then press CONFIRM.

Effluent 60 i  
Enter bot#290

To enter "4" for the last digit, press the up arrow 4 times, then CONFIRM. The SKIP button is used like backspace during bottle number entry. Before pressing CONFIRM on the last digit, pressing SKIP will move you to the previous digit so you can change it with the UP and DOWN button. After the last digit of the bottle number is entered, the program will continue reading dissolved oxygen.

Effluent 60 i  
8.36 mg/L B#295

When the reading is stable, press CONFIRM. The program will store the reading, display a brief message and then prompt for the next bottle number.

All the pertinent information is on the YSI 5000/5100 DO Instrument display. The top line of the display has remained the same. The DO reading and the bottle number are in the bottom line. This will help you keep track of where you are in the Batch. When the DO reading is stable, press CONFIRM. The program will store the reading and then go on to the bottle number prompt for the next bottle in the Batch. Typically, you will start with the first bottle in the Batch and continue all the way through the Batch, entering bottle numbers and storing DO readings in turn. As you go along the bottle numbers and DO readings will be added to the Bench Sheet. Below is an example of this screen about halfway through a Batch.

BOD ANALYST for Windows [C:\BODAW\Data\Data.mdb]

File Read Setup Trending Utilities Help

Tuesday, 09/01/1998

New Bottle

Sample Date

Incubation Period

Reading Initials for 08/31/1998

YSI 5100

Effluent

7.78 STBL B#278

Detail

Sample Name Effluent

Bottle # 278

D.O. 7.78 Stable

Temperature 24.6

Skip UP DOWN Confirm Cancel

| Sample |               |     |        |      |      |       |      |      |        |
|--------|---------------|-----|--------|------|------|-------|------|------|--------|
| 1      | Influent      | 004 | 0.00   | 0.00 | 7.45 | 1.01  | 7.45 | 0.00 | 223.50 |
| 2      |               | 015 | 10.00  | 0.00 | 7.45 | 3.33  | 7.45 | 0.00 | 223.50 |
| 3      |               | 011 | 15.00  | 0.00 | 7.45 | 5.00  | 7.45 | 0.00 | 149.00 |
| 4      | Effluent      | 223 | 50.00  | 3.00 | 7.83 | 16.67 | 7.83 | 0.00 | 46.98  |
| 5      |               | 421 | 100.00 | 3.00 | 7.86 | 33.33 | 7.86 | 0.00 | 23.58  |
| 6      |               | 278 | 150.00 | 3.00 |      | 50.00 |      | 0.00 | 0.00   |
| 7      | Effluent Dupl |     | 50.00  | 3.00 |      | 16.67 |      | 0.00 | 0.00   |
| 8      |               |     | 100.00 | 3.00 |      | 33.33 |      | 0.00 | 0.00   |
| 9      |               |     | 150.00 | 3.00 |      | 50.00 |      | 0.00 | 0.00   |
| 10     | Land o Lakes  |     | 10.00  | 3.00 |      | 3.33  |      | 0.00 | 0.00   |

Test is valid

You can also move between dilutions (bottles) without going through the batch sequentially. The **SKIP**, **UP**, and **DOWN** buttons can be used to navigate through the batch.

|             |                                                    |
|-------------|----------------------------------------------------|
| <b>SKIP</b> | Moves to the next bottle (dilution).               |
| <b>UP</b>   | Moves to the first dilution of the previous sample |
| <b>DOWN</b> | Moves to the first dilution of the next sample     |

Note: The **SKIP**, **UP**, and **DOWN** buttons provide different functions when entering bottle numbers and will NOT move to a different dilution.

When you have finished all of the bottles in a Batch, the program will display the following on the YSI 5100 DO Instrument :

Initial Reads  
Complete

You will then be returned to the Bench Sheet.

### 6.1.2 USING THE BARCODE WAND

---

The barcode wand can ONLY be used with the YSI 5100 DO instrument. You can choose one of two ways to use the barcode wand. If the **Barcode reader** field on the YSI Instrument Parameters Form is set to **required**, then the program will require barcode bottle number entry during both initial and final DOs. Furthermore, the program will not accept bottle numbers from the YSI 5100 DO Instrument keys or from the PC keyboard. If the **Barcode reader** field on the General Setup Form is set to **on**, then the program will ask for bottle numbers only during initials and will accept bottle numbers from the YSI 5100 DO Instrument keys and the PC keyboard. See Bar Coding in the **Section 11, Customizing Your Program**.

If you want to use the barcode wand for initials only, then be sure to set the **Barcode reader** field on the YSI Instrument Parameters Form to **on**. The program will prompt for bottle numbers in the same way as described in "Entering Bottle Numbers With the YSI 5100 DO Instrument Keys." When you see the "Enter bot #0" prompt, scan the label on the bottle and the program will accept the barcode input and then go on to reading DO. The program will also accept input from either the YSI 5100 DO Instrument or the PC keyboard.

If you want to require that the barcode wand be used for both initials and finals, then be sure to set the **Barcode reader** field on the YSI Instrument Parameters Form to **required**. The program will prompt for bottle numbers in this way for initials:

Effluent 60 i  
Scan bottle

During final DOs, the program will use the bottle number that was entered during initials in the prompt, as follows:

Effluent 60 f  
Scan bottle# 551

You do not have to do the final DOs in the same order as you did the initials. If want to do some other bottle number than the one for which the prompt appears, simply scan that other bottle, and the program will jump to that bottle in the Batch.

### 6.1.3 USING A PC KEYBOARD

---

You can use the PC keyboard to enter the bottle numbers on the benchsheet before beginning initial readings, or use the keyboard to enter the bottle numbers as you work. You may use the number keys on your PC any time you see the "Enter bot #0\*\*" prompt on the YSI 5000/5100 DO Instrument. Type in a three-digit number and click CONFIRM. The program will accept the bottle number and go on to reading DO. Remember that one and two digit bottle numbers need leading zeros. (Enter "007", not "7.")

In fact, you can use the PC keyboard for all YSI 5000/5100 DO Instrument key inputs. The buttons displayed on the Read YSI form correspond to the keys on the YSI 5000/5100 DO Instrument.

### 6.1.4 DUPLICATE BOTTLE NUMBERS

---

Occasionally it is necessary to have two or more bottles with the same bottle number. This will not cause any trouble as long as you can keep them straight. The program will warn you before accepting a repeated bottle number.

Effluent 60 f  
Another B#551?

If you really intend to have a duplicate bottle number, then press CONFIRM. If not, press SKIP and the program will take you back to bottle entry.

## 6.2 AUTO STABILIZATION

---

Let's suppose that you have set the **Technique:** field on the YSI Instrument Parameters Form to **manual**. When you are reading DO and the reading meets your stabilization criteria (also set on the YSI Instrument Parameters Form), the program will notify you that the reading is stable as follows.

Effluent 60 i  
7.74 STBL B#551

If a change in the reading is greater than the stability criteria, then the "STBL" display will go away. With **Technique** set to **manual**, the program will store the reading whenever you press CONFIRM, whether the reading is stable or not. If instead, you set the **Technique:** field to **dual**, the program will wait to store the reading until both the reading is stable and you've pressed CONFIRM. The order is not important. If the reading is stable before you press CONFIRM, then you will see the "STBL" display above until you press CONFIRM. If you press CONFIRM before the reading is stable, then the program will store the reading as soon as it becomes stable.

The fastest and easiest way is to set **Technique:** to **auto**. After the bottle number is entered the program will store the reading as soon as it is stable. Entering the bottle number then, is an implied confirmation of the soon to be stable reading.

## 6.3 ALARMS

---

Alarms are provided for temperature and supersaturation.

You can specify a range of temperatures for initial DOs and a different range of temperatures for final DOs. Just before storing a reading the program will check the temperature. If it is outside the range, then the program will display a warning message on the YSI 5100 DO Instrument, for example

**Temp 24.3 high  
Store anyway?**

If you do not want to store the reading, press SKIP and you can take steps to remedy the situation. If you want to store the reading anyway press CONFIRM.

It is common to collect a sample in cold weather that is over 10 mg/L. While a 10 mg/L sample is not supersaturated at low temperatures, it is at 20 °C. If such a sample is placed in the incubator, it is likely that it will outgas and cause erroneously high BOD. The supersaturation alarm will warn you that the reading is above the value that you have specified. It indicates that there is a risk of supersaturation. The warning is as follows:

**Supersaturated  
Store anyway?**

If you do not want to store the reading, press SKIP and you can take steps to remedy the situation. If you want to store the reading anyway press CONFIRM.

All of the alarm settings are on The YSI Instrument Parameters Form. See **Section 11.5** for detailed instructions.

## 6.4 DERIVED INITIAL DOS

---

If you have checked the **Derive initials** field on the General Setup Form, then the program will automatically derive initial DOs for you whenever it can. You can always write over a derived initial DO by simply storing a measured reading to that bottle. Let's go back to the batch that we were working with and let's start just after we've stored our **blanks**.

**BOD ANALYST for Windows (C:\BODAW\Data\Data.mdb)**

File Read Setup Trending Utilities Help

New Bottle New Sample Mark Unmark Check Print Tuesday, 03/30/1999

Sample Date: 03/30/1999 Seed Correction: Influent (9) 0.0 Notes: Influent Initials are derived

Incubation Period: 03/30/1999 Technician: spd

|   | Sample Name | Bottle # | Pre Dil | Sample Volume (ml) | Seed Volume (ml) | Initial DO (mg/l) | Final DO (mg/l) | O2 Depl. (mg/l) | Seed Corr (mg/l) | BOD (mg/l) | Final BOD (mg/l) |
|---|-------------|----------|---------|--------------------|------------------|-------------------|-----------------|-----------------|------------------|------------|------------------|
| 1 | DilBlank    | 231      | 1.00    | 300.00             | 0.00             | 8.51              |                 |                 |                  |            |                  |
| 2 |             | 556      | 1.00    | 300.00             | 0.00             | 8.47              |                 |                 |                  |            |                  |
| 3 | Influent    | 218      | 1.00    | 6.00               | 0.00             |                   |                 |                 |                  |            |                  |
| 4 |             | 253      | 1.00    | 12.00              | 0.00             |                   |                 |                 |                  |            |                  |
| 5 |             | 742      | 1.00    | 18.00              | 0.00             | 8.62              |                 |                 |                  |            |                  |

Now, we will want to measure only one of the dilutions of the Influent Sample and derive the other two. There is less experimental error if you measure the strongest dilution. You will have to enter bottle numbers for all three dilutions. So, you will enter the bottle number for the first dilution, SKIP past its DO reading, enter the bottle number for the second dilution, SKIP past its DO reading, enter the bottle number for the third dilution, and finally store a DO reading. After initials are complete, the remaining initials that have not been read will be derived. In our example, the 6 and 12 ml Influent dilutions were derived (8.53 and 8.58).

**BOD ANALYST for Windows (C:\BODAW\Data\Data.mdb)**

File Read Setup Trending Utilities Help

New Bottle New Sample Mark Unmark Check Print Tuesday, 03/30/1999

Sample Date: 03/30/1999 Seed Correction: Notes: Initials are derived

Incubation Period: 03/30/1999 Technician: spd

|   | Sample Name | Bottle # | Pre Dil | Sample Volume (ml) | Seed Volume (ml) | Initial DO (mg/l) | Final DO (mg/l) | O2 Depl. (mg/l) | Seed Corr (mg/l) | BOD (mg/l) | Final BOD (mg/l) |
|---|-------------|----------|---------|--------------------|------------------|-------------------|-----------------|-----------------|------------------|------------|------------------|
| 1 | DilBlank    | 231      | 1.00    | 300.00             | 0.00             | 8.51              |                 |                 |                  |            |                  |
| 2 |             | 556      | 1.00    | 300.00             | 0.00             | 8.47              |                 |                 |                  |            |                  |
| 3 | Influent    | 218      | 1.00    | 6.00               | 0.00             | 8.53              |                 |                 |                  |            |                  |
| 4 |             | 253      | 1.00    | 12.00              | 0.00             | 8.58              |                 |                 |                  |            |                  |
| 5 |             | 742      | 1.00    | 18.00              | 0.00             | 8.62              |                 |                 |                  |            |                  |

Test is valid

You can proceed through the rest of the batch measuring DOs for only the strongest dilutions for each Sample.

You don't have to derive initial DOs for every Sample in the Batch. For instance, you may derive initials for only those Samples that are not required by your NPDES permit. All you need to do is skip all those dilutions that you want to be derived and measure all the dilutions that you don't want derived.

You can measure more than one of the dilutions for any Sample. The program will use the average of the measured dilutions in deriving the initial DOs for any remaining dilutions.

In deriving initial DOs, the program considers all of the constituents of a bottle. For example, the Sample, **Clarifier**, has only two constituents, the undiluted sample collected from the clarifier, and dilution water.

## 6.5 CORRECTING MISTAKES

If you have finished reading the initial DOs and notice mistakes use the bench sheet to correct the mistakes. The bench sheet allows you to correct most mistakes by simply moving to the field and editing the data. You can change the Bottle Number, Sample Volume, Seed Volume and Initial DO providing it is still the same day that Initials were taken.

You can also retake all the readings or one bottle. Select **Read / Retake Initials** and choose either **All bottles** or **This bottle** from the menu. **All bottles** will start at the beginning of the batch and retake each bottle. **This bottle** will only read the current bottle. The current cell in the bench sheet sets the current bottle. In the example below, Influent sample bottle #229 is the current bottle.

|               | Sample Name   | Bottle # | Sample Volume (ml) | Seed Volume (ml) | Initial DO (mg/l) | Final DO (mg/l) | Dil % | O2 Depl. (mg/l) | Seed Factor (mg/l) | BOD (mg/l) | Final BOD (mg/l) |
|---------------|---------------|----------|--------------------|------------------|-------------------|-----------------|-------|-----------------|--------------------|------------|------------------|
| 1             | Influent      | 190      | 5.00               | 0.00             | 7.80              |                 | 1.67  | 7.80            | 0.00               | 397.80     |                  |
| 2             |               | 220      | 10.00              | 0.00             | 7.81              |                 | 3.33  | 7.81            | 0.00               | 199.15     |                  |
| 3             |               | 229      | 15.00              | 0.00             | 8.12              |                 | 5.00  | 8.12            | 0.00               | 138.04     |                  |
| 4             | Effluent      | 155      | 50.00              | 3.00             | 7.87              |                 | 16.67 | 7.87            | 0.00               | 40.14      |                  |
| 5             |               | 156      | 100.00             | 3.00             | 7.83              |                 | 33.33 | 7.83            | 0.00               | 19.97      |                  |
| 6             |               | 157      | 150.00             | 3.00             | 7.80              |                 | 50.00 | 7.80            | 0.00               | 13.26      |                  |
| 7             | Effluent Dupl | 222      | 50.00              | 3.00             | 7.66              |                 | 16.67 | 7.66            | 0.00               | 39.07      |                  |
| 8             |               | 223      | 100.00             | 3.00             | 7.71              |                 | 33.33 | 7.71            | 0.00               | 19.66      |                  |
| 9             |               | 224      | 150.00             | 3.00             | 7.64              |                 | 50.00 | 7.64            | 0.00               | 12.99      |                  |
| 10            | DilBlank      | 013      | 300.00             | 0.00             | 7.81              |                 |       | 7.81            |                    | 6.64       |                  |
| Test is valid |               |          |                    |                  |                   |                 |       |                 |                    |            | 0.85             |

## SECTION 7 TAKING FINAL DO READINGS

### 7.1 SELECTING A BATCH

From the main bench sheet window, simply enter the sample date for the batch you would like to take readings for. Alternatively, click the **List Open Batches** button (See **Section 5.2, Loading a Batch** for more information) to select a batch that is not yet complete. The batch will be displayed. Below is an example of a batch ready for final DOs to be read.

|    | Sample Name | Bottle # | Pre Dil | Sample Volume (ml) | Seed Volume (ml/l) | Initial DO (mg/l) | Final DO (mg/l) | O2 Depl. (mg/l) | Seed Factor | BOD (mg/l) | Final BOD (mg/l) |
|----|-------------|----------|---------|--------------------|--------------------|-------------------|-----------------|-----------------|-------------|------------|------------------|
| 1  | Influent    | 1        | 1.00    | 6.00               | 0.00               | 11.52             |                 | 11.52           | 0.00        | 576.00     |                  |
| 2  |             | 2        | 1.00    | 12.00              | 0.00               | 11.21             |                 | 11.21           | 0.00        | 280.25     |                  |
| 3  |             | 723      | 1.00    | 18.00              | 0.00               | 11.53             |                 | 11.53           | 0.00        | 192.17     |                  |
| 4  | Effluent    | 133      | 1.00    | 75.00              | 3.00               | 11.51             |                 | 11.51           | 0.51        | 44.01      |                  |
| 5  |             | 794      | 1.00    | 150.00             | 3.00               | 11.39             |                 | 11.39           | 0.34        | 22.10      |                  |
| 6  |             | 855      | 1.00    | 225.00             | 3.00               | 10.54             |                 | 10.54           | 0.17        | 13.83      |                  |
| 7  | DilBlank    | 006      | 1.00    | 300.00             | 0.00               | 10.90             |                 | 10.90           |             |            |                  |
| 8  |             | 364      | 1.00    | 300.00             | 0.00               | 11.14             |                 | 11.14           |             |            |                  |
| 9  | Standard    | 736      | 1.00    | 300.00             | 0.00               | 10.71             |                 | 10.71           | 0.00        | 10.71      |                  |
| 10 |             | 444      | 1.00    | 300.00             | 0.00               | 10.28             |                 | 10.28           | 0.00        | 10.28      |                  |

### 7.2 AT THE YSI 5100 DO INSTRUMENT

Select **Read/Finals** from the BOD Analyst software Main Menu. The YSI 5000/5100 DO Instrument display will look like this:

Begin taking  
finals?

To begin taking measurements, press CONFIRM. A typical display during finals would be:

Effluent 60 f  
1.58 mg/L B#551

Your Technique for Auto Stabilize setting affects how the BOD Analyst software responds to your input.

- Auto:** The YSI 5000/5100 DO Instrument will automatically store the DO reading when the reading becomes stable.
- Dual:** After the reading is stable, press CONFIRM to store the reading.
- Manual:** Press CONFIRM to transfer the current DO reading from the YSI 5000/5100 DO Instrument. The YSI 5000/5100 DO Instrument will display STBL when the reading becomes stable.
- None:** Press CONFIRM to store the current reading. The YSI 5000/5100 DO Instrument will not display STBL.

There is very little difference between taking final DOs and taking initials. The YSI 5000/5100 DO Instrument menu is the same. The "i" in the display has been replaced with an "f". The alarms work in exactly the same way.

Pressing CONFIRM will start the auto-stabilization routine. Otherwise, autostabilization works the same way for final DOs as it does for initials. Alarms and the YSI 5000/5100 DO Instrument menu work in the same way as for initial DOs. See **Section 6, Taking Initial DOs** for a detailed explanation of The YSI 5000/5100 DO Instrument menu, alarms, and auto-stabilization.

The BOD for each bottle (dilution) and Sample is calculated as you go along. However, the calculations for some Samples depend on the results of others. For example, one cannot calculate the BOD of a seeded sample until the final DO for the seed has been performed.

If you need to correct a final DO reading that has been stored, you can retake final DO readings just as you were able to do for initial DOs. To do this, load the batch into the bench sheet and select **Read / Retake Final**. An example of the bench sheet Screen after completing finals is shown below.

**BOD ANALYST for Windows (C:\BODAW\Data\Data.mdb)**

File Read Setup Trending Utilities Help

New Bottle
 New Sample
 Mark
 Unmark
 Check
 Print
 Tuesday, 09/08/1998

Sample Date: 09/05/1998
 Seed Correction: Influent 0.767
 Notes:

Incubation Period: 09/06/1998
 Technician:

|   | Sample Name | Bottle # | Sample Volume (ml) | Seed Volume (ml) | Initial DO (mg/l) | Final DO (mg/l) | Dil % | O2 Depl. (mg/l) | Seed Factor (mg/l) | BOD (mg/l) | Final BOD (mg/l) |
|---|-------------|----------|--------------------|------------------|-------------------|-----------------|-------|-----------------|--------------------|------------|------------------|
| 1 | Influent    | 1        | 5.00               | 0.00             | 8.63              | 4.77            | 1.67  | 3.86            | 0.00               | 231.60     | 230              |
| 2 |             | 2        | 8.00               | 0.00             | 8.54              | 2.44            | 2.67  | 6.10            | 0.00               | 228.75     |                  |
| 3 |             | 3        | 10.00              | 0.00             | 8.60              | 0.87            | 3.33  | 7.73            | 0.00               | 231.90     |                  |
| 4 | Effluent    | 4        | 50.00              | 1.00             | 8.22              | 5.22            | 16.67 | 3.00            | 0.77               | 13.40      | 9.6              |
| 5 |             | 54       | 100.00             | 1.00             | 8.29              | 4.77            | 33.33 | 3.52            | 0.77               | 8.26       |                  |
| 6 |             | 67       | 150.00             | 1.00             | 8.14              | 3.78            | 50.00 | 4.36            | 0.77               | 7.19       |                  |
| 7 | DilBlank    | 8        | 300.00             | 0.00             | 8.31              | 8.22            |       | 0.09            |                    |            |                  |
| 8 |             | 98       | 300.00             | 0.00             | 8.33              | 8.21            |       | 0.12            |                    |            |                  |

Test is valid

### 7.3 CORRECTING MISTAKES

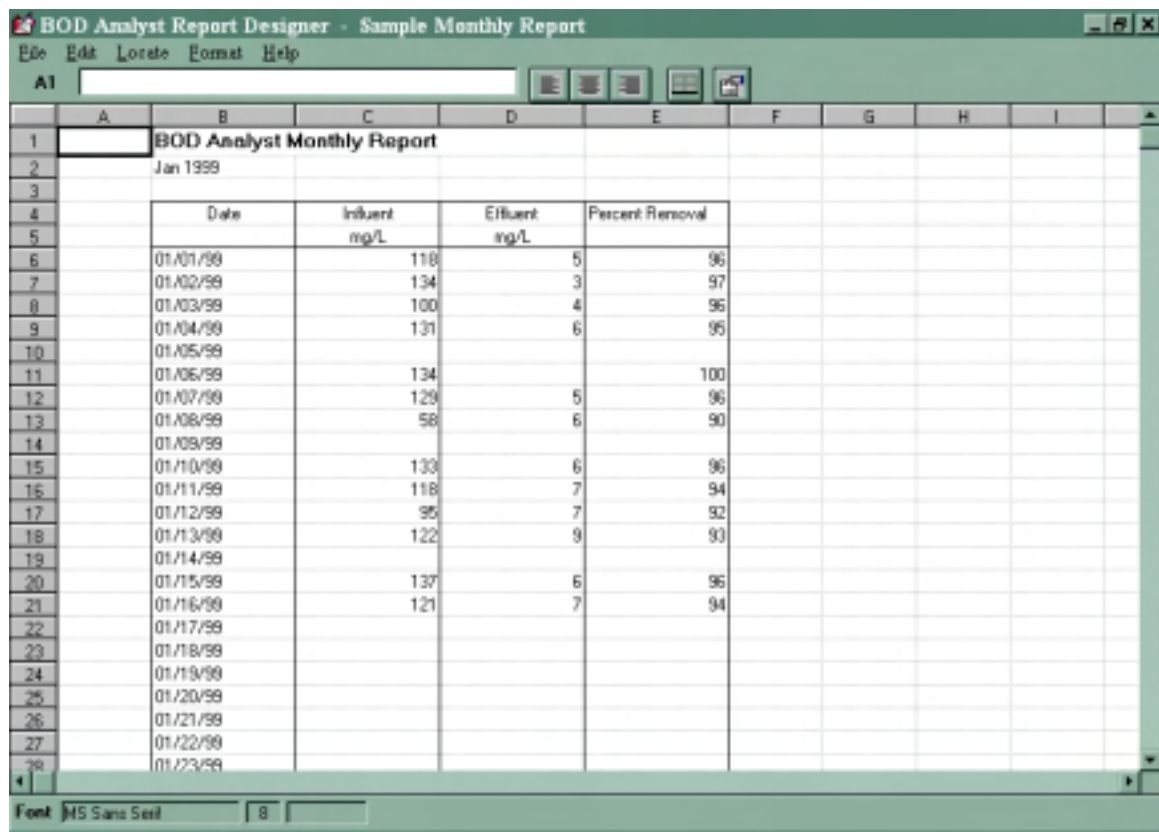
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If you have finished reading the final DOs and notice mistakes, you can use the bench sheet to correct the mistakes just as you did with the initials. The bench sheet allows you to correct the Final DO providing that the incubation period is between 4 and 7 days. You can also retake all the readings or one bottle. Select **Read / Retake Finals** and choose either **All bottles** or **This bottle** from the menu. **All bottles** will start at the beginning of the batch and retake each bottle. **This bottle** will only read the current bottle. The current cell in the bench sheet sets the current bottle.

## SECTION 8 REPORTS

Under the **File** menu, you will find the **Print Daily Bench Sheet** and **Print Everything Report** options. The **Print Daily Bench Sheet** will print your bench sheet data for the batch you have selected. The **Print Everything Report** will print all data for the selected batch.

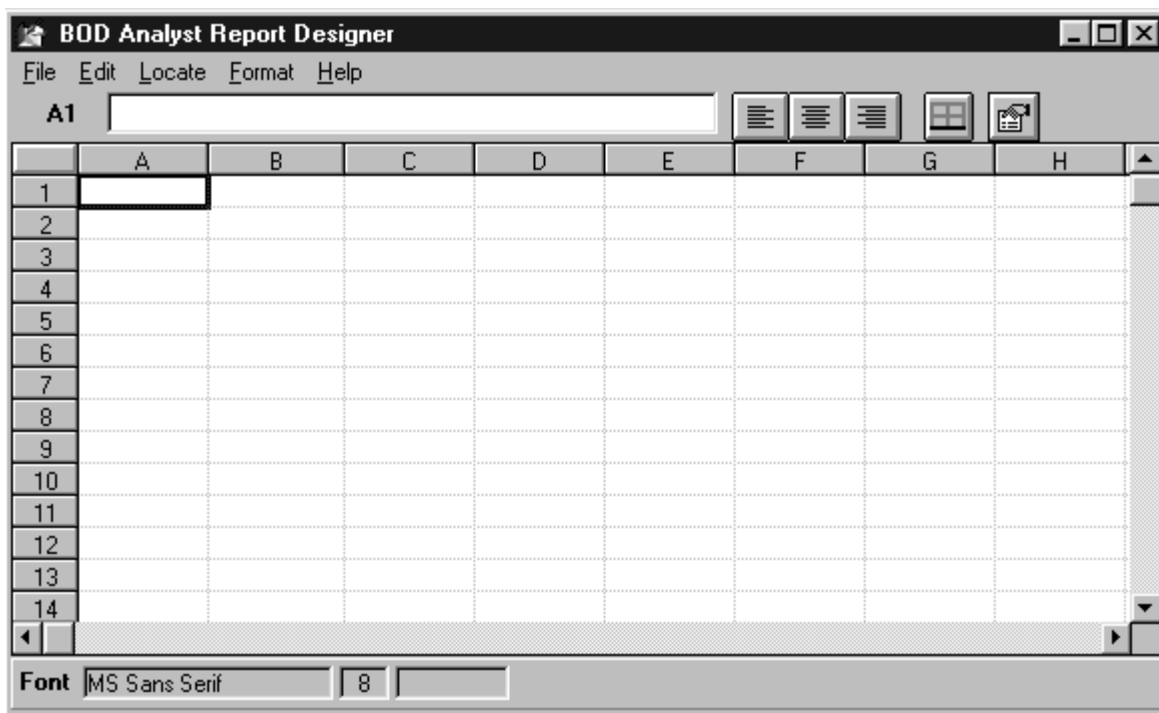
To open a sample report, select **Open** from the **File** menu. Open the **Data** folder, and highlight the **Sample.mdb** file and choose **OK**. In the **Trending** menu, choose **Report**, and then select **Design**. Under the **File** menu, choose **Open** and then the file called **Sample Monthly Report**. Opening this file will display a sample report pictured below. If no data is displayed in the report, under the **File** menu, select **Report dates**. Change the start date to 01/01/99, and the end date to 01/31/99 and choose **OK**. The sample report will look similar to the screen below.



|    | A | B                                 | C                | D                | E               | F | G | H | I |
|----|---|-----------------------------------|------------------|------------------|-----------------|---|---|---|---|
| 1  |   | <b>BOD Analyst Monthly Report</b> |                  |                  |                 |   |   |   |   |
| 2  |   | Jan 1999                          |                  |                  |                 |   |   |   |   |
| 3  |   |                                   |                  |                  |                 |   |   |   |   |
| 4  |   | Date                              | Influent<br>mg/L | Effluent<br>mg/L | Percent Removal |   |   |   |   |
| 5  |   |                                   |                  |                  |                 |   |   |   |   |
| 6  |   | 01/01/99                          | 118              | 5                | 96              |   |   |   |   |
| 7  |   | 01/02/99                          | 134              | 3                | 97              |   |   |   |   |
| 8  |   | 01/03/99                          | 100              | 4                | 96              |   |   |   |   |
| 9  |   | 01/04/99                          | 131              | 6                | 96              |   |   |   |   |
| 10 |   | 01/05/99                          |                  |                  |                 |   |   |   |   |
| 11 |   | 01/06/99                          | 134              |                  | 100             |   |   |   |   |
| 12 |   | 01/07/99                          | 129              | 5                | 96              |   |   |   |   |
| 13 |   | 01/08/99                          | 58               | 6                | 90              |   |   |   |   |
| 14 |   | 01/09/99                          |                  |                  |                 |   |   |   |   |
| 15 |   | 01/10/99                          | 133              | 6                | 96              |   |   |   |   |
| 16 |   | 01/11/99                          | 118              | 7                | 94              |   |   |   |   |
| 17 |   | 01/12/99                          | 95               | 7                | 92              |   |   |   |   |
| 18 |   | 01/13/99                          | 122              | 9                | 93              |   |   |   |   |
| 19 |   | 01/14/99                          |                  |                  |                 |   |   |   |   |
| 20 |   | 01/15/99                          | 137              | 6                | 96              |   |   |   |   |
| 21 |   | 01/16/99                          | 121              | 7                | 94              |   |   |   |   |
| 22 |   | 01/17/99                          |                  |                  |                 |   |   |   |   |
| 23 |   | 01/18/99                          |                  |                  |                 |   |   |   |   |
| 24 |   | 01/19/99                          |                  |                  |                 |   |   |   |   |
| 25 |   | 01/20/99                          |                  |                  |                 |   |   |   |   |
| 26 |   | 01/21/99                          |                  |                  |                 |   |   |   |   |
| 27 |   | 01/22/99                          |                  |                  |                 |   |   |   |   |
| 28 |   | 01/23/99                          |                  |                  |                 |   |   |   |   |

## 8.1 REPORT DESIGN

The report designer is used to setup spreadsheet type reports. Daily values and monthly summary values from BOD Analyst software samples can be placed into the spreadsheet. After placement, normal spreadsheet formulas can be used to calculate sums, averages, etc. of the placed BOD Analyst software data. Formatting of the report is done through familiar spreadsheet functions to change fonts, borders and cell colors, etc.



### 8.1.1 USING REPORT DESIGN

Report design works very much like a basic spreadsheet program. Move to a cell and enter the text, numeric data, or a formula in the cell. The menu allows you to save, retrieve, print, format, etc. the spreadsheet in any manner you like.

Use the **Locate** menu option to place BOD Analyst software data into the spreadsheet.

**Locate/Sample** places daily values for a selected sample in the spreadsheet at the current cell. When the report date range is changed the data is automatically updated to reflect the new date range.

### 8.1.2 SPREADSHEET NAVIGATION

Primarily, the mouse is used to move around the spreadsheet. To move to a cell (i.e. make it the active cell) simply click on that cell. To select a block of cells, click on a cell and drag the mouse to select multiple cells (selected cells appear in black). With a block of cells selected, you can then change the font, border, color, etc. of all selected cells with a single command.

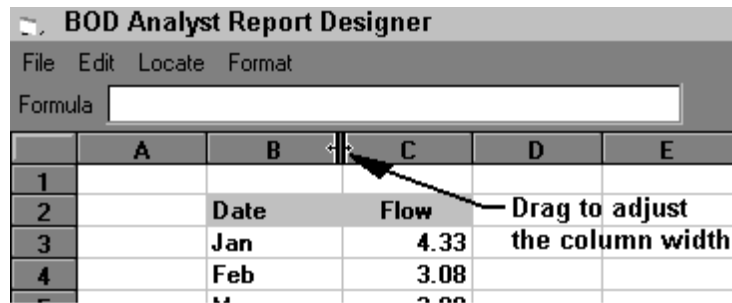
The following table displays the keystrokes used to move in the spreadsheet.

| <b>Key</b>      | <b>Action</b>                                       |
|-----------------|-----------------------------------------------------|
| Up Arrow        | Move up one row                                     |
| Down Arrow      | Move down one row                                   |
| Right Arrow     | Move right one column                               |
| Left Arrow      | Move left one column                                |
| Shift+arrow key | Extends selection in direction of arrow key         |
| PgUp            | Move one page up                                    |
| PgDown          | Move one page down                                  |
| Ctrl+PgUp       | Move one page left                                  |
| Ctrl+PgDown     | Move one page right                                 |
| Home            | Move to first cell in the current row               |
| End             | Move to the last cell in the current row with data  |
| Ctrl+Home       | Move to cell A1 (upper left corner of spreadsheet)  |
| Ctrl+End        | Move to last row and last column that contains data |
| Shift+Space     | Selects current row                                 |
| Ctrl+Space      | Selects current column                              |
| Enter           | Move right one column                               |

### 8.1.3 RESIZING COLUMNS AND ROWS

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To resize a column, move the mouse pointer between the columns as shown below. The mouse pointer will change and you can then drag the mouse left to shrink the column or right to enlarge the column. To adjust the row height, move the mouse pointer between the row headers. The mouse pointer will change and you can then drag the mouse down to enlarge the row or up to shrink the row.



**Note:** To resize multiple columns at one time, select all the columns by clicking and dragging the mouse on the column headers. With the columns selected, resize one of the selected columns and all the selected columns will be sized the same. The same method can be used to resize multiple rows at one time.

#### 8.1.4 COPYING DATA

---

You can copy data to and from cells using the familiar Clipboard method. Also, you can drag and drop data to copy a selected block of cells. The method you use determines whether only the data or all of the data, formulas and formatting characteristics are copied.

When you copy data from one cell to another, the data from the cell you copied replaces the data in the cell you are pasting into. For example, if cell A1 contains the value 4, if you copy and paste it into cell B3, the contents of cell B3 are replaced by the value 4. The same applies when copying a block of cells.

**To copy format (cell color, border, justification, etc), formulas and data:**

Select the cells you want to copy with the mouse.

Press and hold down the CTRL key

Position the mouse pointer over the edge of the selection so that the arrow pointer appears.

Press the left mouse button and drag the cells.

Release the left mouse button when the pointer is over the new location for the copied cells.

**To copy only data:**

Select the cells you want to copy with the mouse.

Press CTRL-C (or select **Edit/Copy** from the menu) to copy data to the clipboard.

Click on the destination cell and press CTRL-V (or select **Edit/Paste**) to paste data from the clipboard.

#### 8.1.5 MOVING DATA

---

You can move data to and from cells using the familiar cut and paste Clipboard method. Also, you can drag and drop data to move a selected block of cells. The method you use determines whether only the data or all of the data, formulas and formatting characteristics are copied.

**To move format (cell color, border, justification, etc), formulas and data:**

Select the cells you want to copy with the mouse.

1. Position the mouse pointer over the edge of the selection so that the arrow pointer appears.
2. Press the left mouse button and drag the cells.

- Release the left mouse button when the pointer is over the new location for the copied cells.

**To move only data:**

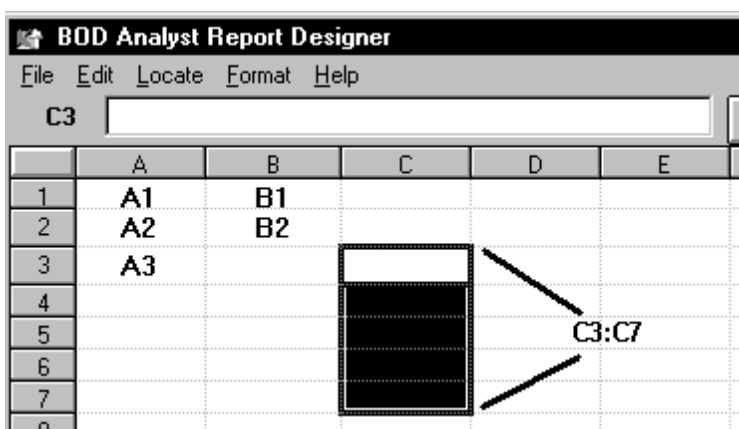
- Select the cells you want to move with the mouse.
- Press CTRL-X (or select **Edit/Cut** from the menu) to cut data to the clipboard.
- Click on the destination cell and press CTRL-V (or select **Edit/Paste**) to paste data from the clipboard.

### 8.1.6 USING FORMULAS

---

You can define formulas (math expressions) for cells. The formulas can use cell references to calculate values depending on the contents of other cells. To enter a formula for the current cell, simply click on the formula textbox and enter the formula.

To refer to other cells in formulas type in the column header Letter and then the row number. For example, to refer to the cell that is in the first column (A) and the first row (1) use A1'. The second column, second row is referred to as B2. To refer to a block of cells, use the start cell then the colon : then the stop cell. For example, to refer to cells A1, A2, A3, and A4 enter A1:A4. The following screen illustrates cell references.



The following table lists the operations available as math expressions.

| <u>Operator</u> | <u>Description</u> | <u>Example</u> |
|-----------------|--------------------|----------------|
| +               | Addition           | A1 + B2        |
| -               | Subtraction        | A1 - B2        |
| ^               | Exponentiation     | A1 ^ B2        |
| *               | Multiplication     | A1 * B2        |
| /               | Division           | A1 / B2        |
| &               | Logical And        | A1 & B2        |
|                 | Logical Or         | A1   B2        |
| :               | Creates a range    | A1: B2         |

### 8.1.7 FUNCTIONS IN FORMULAS

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#### General Functions

**ABS(A1)** The absolute value of the cell is returned.

**ISEMPTY(A1)** If A1 is empty then a 1 is returned. If A1 is not empty then a zero is returned.

**MAX(A1:A31)** Returns the maximum value for the cell range.

**MIN(A1:A31)** Returns the minimum value for the cell range

**NEG(A1)** Changes the sign of the value. For example, NEG (-15) = 15.

**NOT(A1)** If A1 is zero then a 1 is returned. If A1 is not zero then a zero is returned.

**SUM(A1:A31)** Returns the total for the cell range

**GMEAN(A1:A31)** Returns the Geometric Mean for the cell range. Values of 0 are ignored.

**COUNT(A1:A31)** Returns the total the number of values for the cell range

### 8.1.7 IF STATEMENTS

---

As in any spreadsheet program, IF Statements may be entered as formulas. The syntax is simply:

**IF(*Condition*, *TrueResult*, *FalseResult*)**

*Condition* is the test which will be either true or false, *TrueResult* is the expression which determines what to display if the *Condition* is True, and *FalseResult* is the expression which determines what will be displayed if the *Condition* is False. For example, consider the following statement:

IF(D5>120,E5,F5)

This statement says “if the value in cell D5 is greater than 120, then display the value in cell E5, otherwise (else), display the value of cell F5”.

*TrueResult* and *FalseResult* may be cell references, numeric values, numeric expressions (calculations) or other IF Statements. Cell references may be anchored using the dollar sign ( \$ ).

### 8.1.8 BOD ANALYST SOFTWARE FUNCTIONS

---

The following functions are those used by BOD Analyst software when statistical information or dates are located in the spreadsheet. They are explained here in detail for clarification and to allow advanced users to perform less typical analyses or to make modifications to formulas placed by BOD Analyst software.

**VAR(VarNum, Offset, future, future, future, future, future)**

Returns the daily value for a sample. This formula is automatically built when **Locate/Sample** is used.

**VarNum** The sample number.

**Offset** The offset from the start date of the report. For example, if the start date is 1/1/99 and the offset is 1, the value from 1/1/99 will be returned. If the offset is 2, the value from 1/2/99 will be returned and so forth.

**Future** OPTIONAL, Not Used.

**VARWO(VarNum, Offset, future, future, future, future, future)**

Returns the daily value for a sample when data is found. See Print Data only when it occurs example in Locating Data on the Report later in this section. This formula is automatically built when **Locate/Sample** is used.

**VarNum** The sample number.

**Offset** The offset from the start date of the report. For example, if the start date is 1/1/99 and the offset is 1, the value from 1/1/99 will be returned. If the offset is 2, the value from 1/2/99 will be returned and so forth.

**Future** OPTIONAL. Not Used.

**DATE(Offset, Format, Interval)**

Returns a date. The easy way to place this function is to use **Locate/Date**.

**Offset** Sets the number of intervals from the start date of the report

**Format** Format for the date. Common formats:

|          |          |
|----------|----------|
| mm/dd/yy | 01/01/99 |
| mmm      | Jan      |
| mmm yyyy | Jan 1999 |

**Interval** The interval of time used with the Offset to calculate the date to print. Values are:

|    |                                  |
|----|----------------------------------|
| 1  | Days                             |
| -1 | Print the end date of the report |
| 3  | Months                           |
| 4  | Current Date                     |

**DWO(VarNum, Offset, FormatStr)**

Returns a date only when data occurs for the sample specified by VarNum.

**VarNum** The sample to search to decide what day to print for.

**Offset** Sets the number of days from the start date of the report

**FormatStr** Format for the date. Common formats:

|          |          |
|----------|----------|
| mm/dd/yy | 01/01/99 |
| mmm      | Jan      |
| mmm yyyy | Jan 1999 |

### 8.1.9 MONTHLY FUNCTIONS

---

Monthly functions return summary values for a sample for a specified month. The VarNum parameter sets the sample to be used. The Offset sets the month to be retrieved relative to the specified report start date. For example, with a report start date of 1/1/99, in Offset of 1 would define January, 2 February, etc.. The easy way to place these functions is to use **Locate/Monthly Summary**.

**MSUM(VarNum, Offset)**

Return the Monthly total for the sample.

**MAVG(VarNum, Offset)**

Return the Monthly Average for the sample.

**MMA(VarNum, Offset)**

Returns the monthly maximum for the sample.

**MMIN(VarNum, Offset)**

Returns the monthly minimum for the sample.

**MDEV(VarNum, Offset)**

Returns the standard deviation of the data in the specified month.

**MAOT(VarNum, Offset)**

Returns the "average over time" which totals the data for the month and divides by the number of days in month instead of the number of values found. For example, if you enter rainfall only on days it occurs and leave other days blank, MAOT will give you the average rainfall per day. MAVG would give you the average rainfall for days that it rained.

**MGMN(VarNum, Offset)**

Returns the geometric mean of the values for the specified sample found for the month.

**MNOS(VarNum, Offset)**

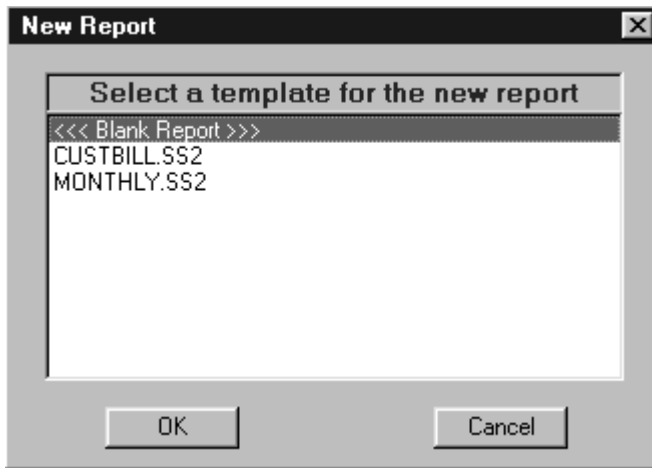
Returns the number of samples found for the month for the sample.

### 8.1.10 WORKING WITH REPORT FILES

---

In the **File** menu you will find standard functions such as: **New, Open, Save, Save As, Print, Page Setup, Exit**. You will also find an item for deleting reports.

Select **File, New** to clear an open document from the screen and open a new document. If an open document has been modified the user will be asked if changes are to be saved prior to closing the file and removing it from the screen. The following form appears allowing selection of a template to start the new spreadsheet.



The '<<< Blank Report >>>' selection loads a completely blank file. The other selections load a spreadsheet file to start your new document with. For example, choosing Custbill.ss2 will load a file with all the text, borders, and statistics setup for creating a bill for a customer. Use **Locate, Sample** to place your data in the report and the report is complete.

To add a template to the list, simply copy the "SS2" file from your data directory to the BOD Analyst software directory. For example, if you have a spreadsheet you want to add as a template, simply find it's filename (i.e. "4.SS2") and copy it to the BOD ANALYST SOFTWARE directory. That spreadsheet will then appear on the template list.

**File, Open** closes the current spreadsheet and opens an existing spreadsheet. When **Open** is selected the user is presented with a list of previously created reports. This list displays the report titles, not a list of the file names. Select the title of the report you want to open with a single click, then click OK. Double clicking on a report title will also open the report.

Save the open report document by selecting **File, Save**. If the report is currently Untitled the user will be prompted to enter a report title of up to 50 characters.

**Save As . . .** saves the open report document but preserves the document originally opened. When **Save As** is selected the user is automatically prompted for a new report title. *Save As can be used to copy an existing report. Simply open the report to be copied then select Save As to rename it with a new title.* The Original report file is closed thus preserving it from any modifications made to the new report.

To delete an existing report select **File, Delete**. The user is presented with a list of existing report titles. Highlight the title of the report to be deleted and click OK. Double clicking on a report title will also delete the report.

The **Report Dates** item on the **File** menu changes the report date range while designing the report.

Select **Print** from the **File** menu to print the open report. Selecting **Print** will open the print options dialog where the user selects what to print and can enter new start and end dates for the report. The report will automatically re-calculate immediately prior to printing.

Click **Exit** on the **File** menu to close the open report document and exit report design. If an open document has been modified the user will be asked if changes are to be saved prior to exiting.

## 8.2 EDIT MENU FUNCTIONS

---

To cut numbers, data values or text within the currently selected cells to the clipboard, use **Cut** from the **Edit** menu. Formulas and format settings will NOT be cut. Data values that have been cut from cells containing formulas will reappear the next time the spreadsheet calculates itself. In order to remove formulas along with their resulting values or to reset cell formatting, use **Clear** on the **Edit** menu instead of **Cut**. See Copying Data and Moving Data for more information.

Use **Copy** to copy currently selected numbers, results of functions (data values) and text to the clipboard. Formulas and formatting will NOT be copied. In order to copy formulas along with their resulting values or to copy cell formatting, use the method explained in Copying Data and Moving Data.

**Paste** places items in the clipboard to the current cell. If the data in the clipboard originated in a range of cells, it will be pasted in a similar range of cells. For example, if text was copied from three rows and two columns, it will be pasted into three rows and two columns using the currently selected cell as the upper left-hand corner.

**Edit, Clear** removes all data, formulas, and formatting from the currently selected cells.

To force the report to recalculate, select **Calculate** from the **Edit** menu. Calculation of the report occurs automatically when the report is opened or saved, after a formula is entered or edited and immediately prior to printing.

Formulas may be edited in a number of ways. First select the cell with the formula to be edited. Then do one of the following:

- Click the mouse pointer into the Formula Edit Box.
- Select **Formula** on the **Edit** menu.
- Press the F4 function key.

Edit the formula as needed.

**Insert Row** inserts an entire row above the current cell. All formulas are automatically adjusted.

**Insert Column** inserts an entire column before (to the left of) the current cell. All formulas are automatically adjusted.

Use **Edit, Delete Row** to delete the current row and **Edit, Delete Column** to delete the current column.

## 8.3 LOCATING DATA ON THE REPORT

---

### 8.3.1 LOCATING DAILY DATA

---

**Locate, Sample** is used to place daily sample values on the spreadsheet. It builds a formula that the spreadsheet uses during calculations to retrieve data from the BOD Analyst software database. It places the column starting at the current cell. When **Locate, Sample** is selected the following dialog appears:

The Locate Sample Formula dialog can also be opened by clicking on the Locate Sample button,



The fields on the Locate Sample Formula form are as follows:

**Sample:** Select the sample to locate.

**Decimal Places:** The number of digits to show behind the decimal point.

**Print Data only when it occurs:** Skips days with no data. The example below illustrates how to use this field.

| <u>Print Data Leaving Blanks</u> |             |              |              | <u>Print Data only when it occurs</u> |              |             |              |
|----------------------------------|-------------|--------------|--------------|---------------------------------------|--------------|-------------|--------------|
| <u>Day</u>                       | <u>Date</u> | <u>Var A</u> | <u>Var B</u> | <u>Date</u>                           | <u>Var A</u> | <u>Date</u> | <u>Var B</u> |
| Thu                              | Jan 01      |              | 1            | Jan 02                                | 15           | Jan 01      | 1            |
| Fri                              | Jan 02      | 15           |              | Jan 05                                | 4            | Jan 06      | 8            |
| Sat                              | Jan 03      |              |              | Jan 07                                | 2            | Jan 08      | 6            |
| Sun                              | Jan 04      |              |              | Jan 09                                | 5            |             |              |
| Mon                              | Jan 05      | 4            |              |                                       |              |             |              |
| Tue                              | Jan 06      |              | 8            |                                       |              |             |              |
| Wed                              | Jan 07      | 2            |              |                                       |              |             |              |
| Thu                              | Jan 08      |              | 6            |                                       |              |             |              |
| Fri                              | Jan 09      | 5            |              |                                       |              |             |              |

**Place Date beside data:** Places the corresponding date in the column next to the located data.

**Date Format:** Sets the format (i.e. 12/31/99, Dec 31, etc.) for the date column.

**Place Data Across:** Locates data horizontally in a row.

| Place Data Across OFF |         | Place Data Across ON |        |        |        |        |        |        |        |
|-----------------------|---------|----------------------|--------|--------|--------|--------|--------|--------|--------|
| Date                  | Eff BOD | Date                 | Aug 01 | Aug 02 | Aug 03 | Aug 04 | Aug 05 | Aug 06 | Aug 07 |
| Aug 01                |         | Eff BOD              |        |        | 4      | 7      | 6      | 9      | 4      |
| Aug 02                |         |                      |        |        |        |        |        |        |        |
| Aug 03                | 4.00    |                      |        |        |        |        |        |        |        |
| Aug 04                | 7.00    |                      |        |        |        |        |        |        |        |
| Aug 05                | 6.00    |                      |        |        |        |        |        |        |        |
| Aug 06                | 9.00    |                      |        |        |        |        |        |        |        |
| Aug 07                | 4.00    |                      |        |        |        |        |        |        |        |

**Sample Name:** Check the sample name box to have the sample name appear as a column heading.

**Units:** Check the units name box to display the units as a column heading.

**Display XX values:** Sets the number of values to be placed.

### 8.3.2 LOCATING WEEKLY SUMMARY DATA VALUES

**Locate, Weekly Summary** is used to place one or a series of weekly summary statistics on the spreadsheet. It builds a formula that the spreadsheet uses during calculations to retrieve data from the BOD Analyst software database. It places the values starting at the current cell.

The fields on the Locate Weekly Stat window are:

**Sample Name:** Select the name of the sample to use.

**Statistic:** Choose the statistic to be calculated from the daily sample values.

**Locate Statistic for [XX] Weeks:** Enter the number of weeks you want the statistic to be calculated. The first week will be calculated beginning on the Start Date of the report and ending on the last day of the week as defined in the Week Definition. Each week thereafter will follow the Week Definition.

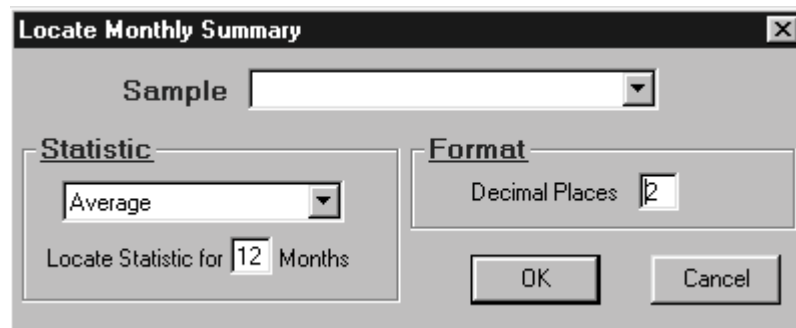
**Display [X] Decimal Places:** Enter the number of digits to be displayed after the decimal point.

**Week Definition:** Select the way weeks are to be divided.

### 8.3.3 LOCATING MONTHLY SUMMARY DATA VALUES

---

**Locate, Monthly Summary** is used to place one or a series of monthly summary statistics on the spreadsheet. It builds a formula that the spreadsheet uses during calculations to retrieve data from the BOD Analyst software database. Values are placed starting at the current cell.



**Sample:** Select the sample to summarize.

**Statistic:** Sets the summary statistic to use.

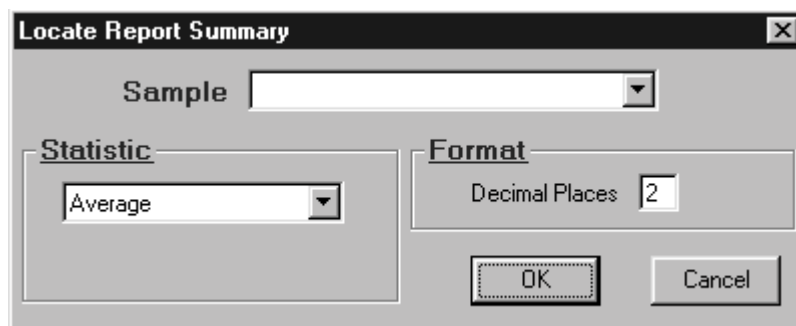
**Locate Statistic for [XX] Months:** Sets the number of values to place. For example, to place 12 monthly averages, enter 12.

**Decimal Places:** The number of digits to show behind the decimal point.

### 8.3.4 LOCATING REPORT SUMMARY DATA VALUES

---

**Locate/Report Summary** is used to place a summary statistics on the spreadsheet. The statistic specified is calculated using all values found from the Start Date to the End Date of the report. It builds a formula that the spreadsheet uses during calculations to retrieve data from the BOD Analyst software database.



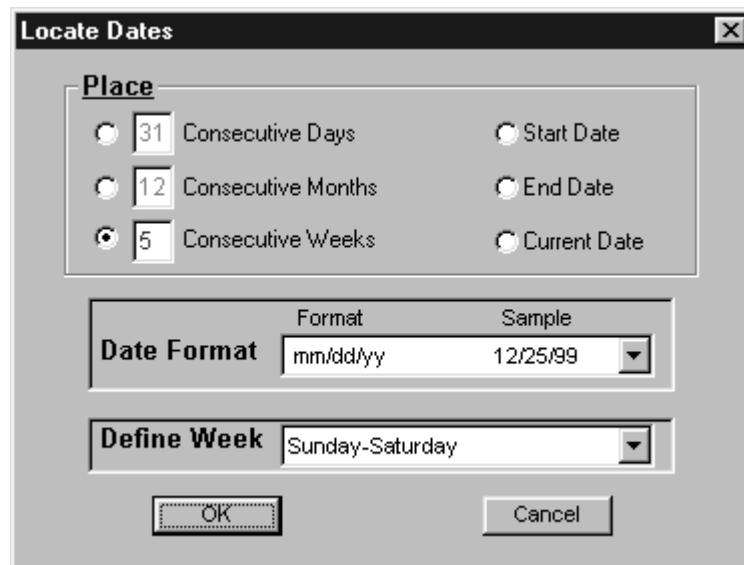
**Sample:** Select the sample to summarize.

**Statistic:** Sets the summary statistic to use.

**Decimal Places:** The number of digits to show behind the decimal point.

### 8.3.4 LOCATING DATES ON THE REPORT

As well as placing dates along side data values while using **Locate, Sample**, formulas for dates can be located on the report using the **Locate, Date** feature. This feature offers a wider range of formatting choices in that the dates can be placed weekly and monthly as well as daily. Formulas that result in displaying the Start Date, End Date and the Current Date are also available choices.



The 'Locate Dates' dialog box is shown. It has a title bar with a close button. Inside, there is a section titled 'Place' with three radio button options: '31 Consecutive Days', '12 Consecutive Months', and '5 Consecutive Weeks'. The '5 Consecutive Weeks' option is selected. To the right of these are three more radio button options: 'Start Date', 'End Date', and 'Current Date'. Below this is a 'Date Format' section with a 'Format' field showing 'mm/dd/yy' and a 'Sample' field showing '12/25/99'. At the bottom is a 'Define Week' section with a dropdown menu showing 'Sunday-Saturday'. There are 'OK' and 'Cancel' buttons at the bottom.

**[XX] Consecutive Dates:** Places the specified number of consecutive dates on the spreadsheet beginning on the start date of the report.

**[XX] Consecutive Months:** Places the specified number of consecutive months (the first of each month) on the spreadsheet.

**[XX] Consecutive Weeks:** Places the specified number of consecutive weeks (the last day of each week as specified in the Define Week field) on the spreadsheet.

**Start Date:** Places the start date of the report in the current cell.

**End Date:** Places the end date of the report in the current cell.

**Current Date:** Places the current date in the selected cell.

**Date Format:** Select the format in which to display the specified dates.

**Define Week:** Specify the beginning and ending days of the week.

## 8.4 FORMATTING CELLS

---

The BOD Analyst software Report Designer offers great flexibility in formatting cells. All formatting is accomplished using the items on the **Format** menu. This menu also provides for the insertion of page breaks.

**Format, Font** opens the font dialog with which font settings can be changed for the current cell or an entire block of cells. Settings for font color are ignored here. The background color and foreground color (font color) are set using **Format, Cell Colors**.

To toggle the cell type between text and numeric, use **Format, Cell**. When OK is selected on the Format Cell dialog, the settings are applied to all selected cells. If **Text** is selected as the Cell Type, checking the **Multiline Edit** box causes text to wrap to multiple lines in a single cell as shown in the example below. The row height must be able to accommodate the number of rows required if multiline edit is selected. With Multiline Edit off, text overlaps to the cell to the right if that cell is empty.

|    | A                       | B | C                     | D | E |
|----|-------------------------|---|-----------------------|---|---|
| 14 |                         |   |                       |   |   |
| 15 |                         |   |                       |   |   |
| 16 | Multiline Edit<br>is ON |   | Multiline Edit is OFF |   |   |
| 17 |                         |   |                       |   |   |
| 18 |                         |   |                       |   |   |

Borders can be specified by choosing **Borders** from the **Format** menu. Select which borders are to be drawn for the selected cell or group of cells and click the OK button.

**Note:** Borders and the grid are not the same thing. The grid cannot be changed and is not printed. Borders are always printed.

Cell Colors are changed using the **Cell Colors** item of the **Format** menu. Set the background or foreground color by clicking the appropriate SET COLOR button. An example of the new settings is presented at the bottom of the dialog.

Page breaks are added and deleted using the **Format** menu. **Row Page Break, Add** sets a page break on the current row. When printing the spreadsheet, the row containing the page break is the first row printed on the new page. The row header of the row containing the page break will have a red border. **Row Page Break, Remove** removes an existing row page break. You must move to the row containing the page break to remove it. **Col Page Break, Add** sets a page break at the current column. When printing the spreadsheet, the column containing the page break is the first column printed on the next page. The column header of the column containing the page break will have a red border. **Col Page Break, Remove** removes a column page break. You must move to the column containing the page break to remove it.

## 8.5 OBTAINING HELP WHILE DESIGNING REPORTS

---

The help menu provides access to context sensitive help while designing a report. The help system can also be activated by simply pressing the F1 function key.

## 8.6 PRINTING REPORTS

---

Trend reports may be printed without entering the report design mode by selecting **Report, Print** from the **Trending** menu. This functionality allows the user to select multiple reports to be printed in a batch print job. Simply click on the titles of the reports you want to print, set the Start Date and the End Date and click the OK button. A message saying “Finished printing selected reports” will appear after all of the reports have been sent to the printer. Printer settings may be changed using the SETUP PRINTER button.

## SECTION 9 KEEPING YOUR DATA SAFE

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### 9.1 DATE

---

The BOD Analyst software depends on the correct date to do its calculations and manage the data. The current date on your computer is displayed in the upper right hand corner of BOD Analyst software. If the date is incorrect, exit BOD Analyst software and correct the date in windows (click on the Date/Time icon in the Control Panel).

### 9.2 HARDCOPIES

---

No computer is perfect, and once in a great while, a failure will cause data to be lost. You will probably want to keep a paper copy of your work at all times. When you are finished taking initial and/or final DOs, select **File/Print Daily Bench Sheet**.

### 9.3 UNDERSTANDING DATA FILES

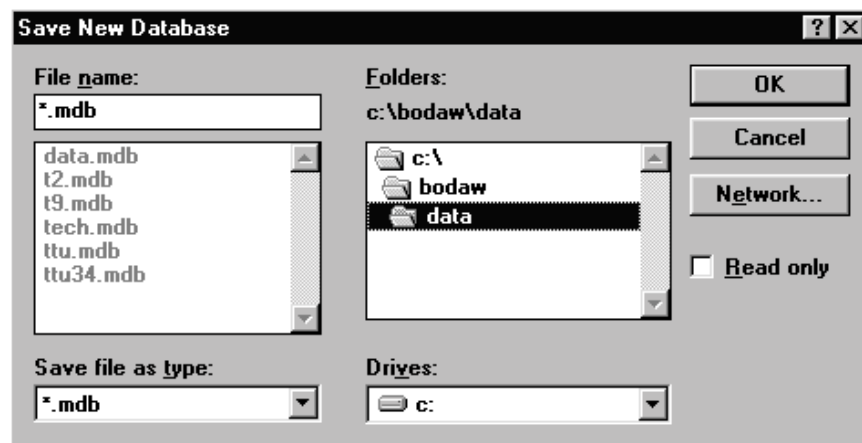
---

Data is stored in a Microsoft Access database. The default database name is data.mdb. When you start BOD Analyst software, the data.mdb database is automatically opened. It is stored in the data subdirectory under the BODAW directory (if BOD Analyst software was installed to the default directory). The current database is shown in parentheses on the Application Title Bar.



BOD Analyst software allows you to have any number of databases, but you can only have one opened at a time. You may need multiple databases to track BODs from more than one facility or you need to run tests on the same day for different incubation periods.

To create a new database, select **File, New** and the following form will be displayed.



Enter in a file name for the new database. The filename must follow DOS naming conventions (8 character maximum, cannot contain special characters, etc...). Click OK and the new database

will be created and opened. You must setup your samples and groups just as you did with the default database.

To open an existing database select **File, Open** and select the database. Click OK and the database will be opened.

BOD Analyst software data files can be located anywhere (i.e. the local drive, network drive). In a network environment, two workstations CAN have the same data file open. **If two users open the batch for 8/30/1999 at the same time, the user who leaves the batch last will overwrite the changes the other user made.**

## 9.4 BACKUP

---

Printing a Bench sheet every time you finish a run of initials or finals will insure that you will always have at least the raw data from which you could do the calculations by hand. However, a computer failure could also destroy your configuration information (your Samples with their dilutions etc., and your Sample Groups). To guard against such a failure you should backup your BOD Analyst software files at least every week. The following files should be backed up:

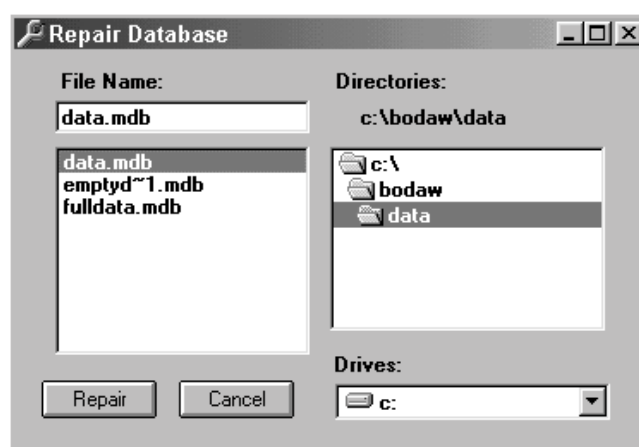
| <u>File</u> | <u>Description</u>                                 |
|-------------|----------------------------------------------------|
| Data.Mdb    | Default database                                   |
| \Reports    | Subdirectory where all spread report formats exist |

Note: If you have created other databases you SHOULD backup those “.mdb” files also. See the previous section for more information.

## 9.5 REPAIR

---

The BOD Analyst software database can become corrupt if the program is closed unexpectedly because of a power outage or computer hardware problem. The Repair function rebuilds and compacts (removes unused space) the database.



Select your datafile and click Repair.

## SECTION 10 GRAPHING

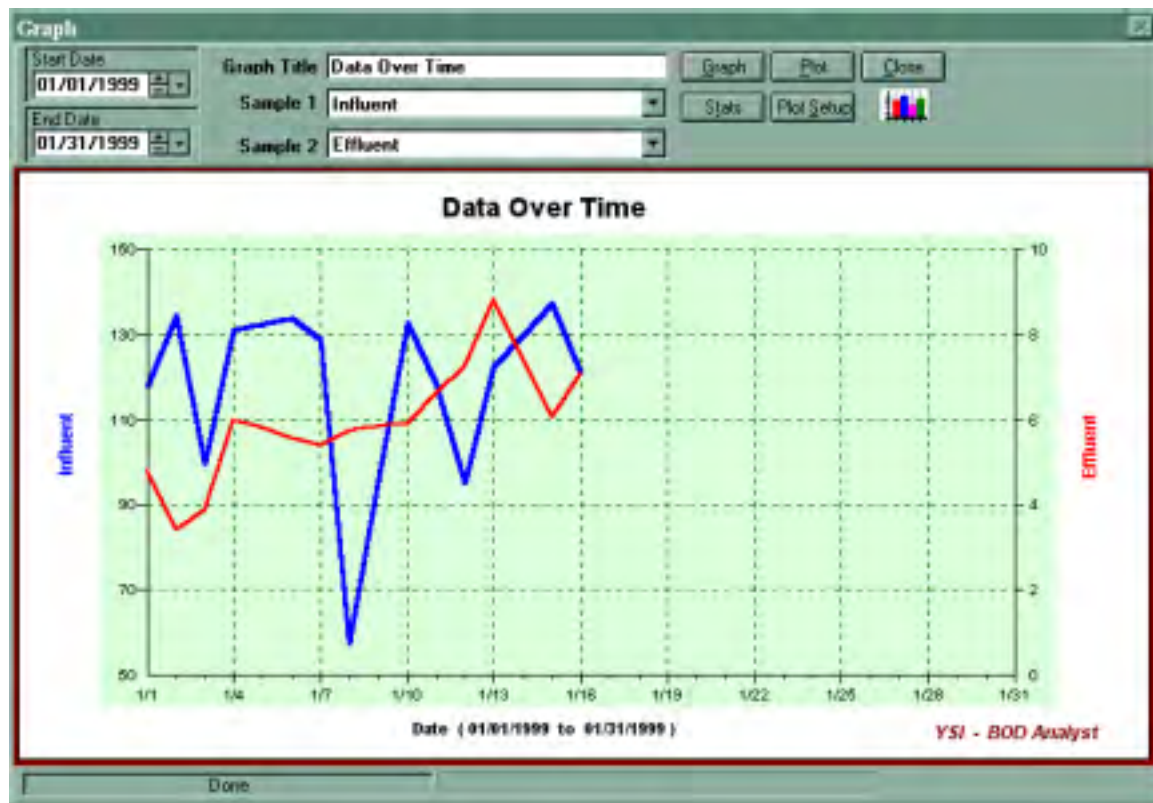
---

### 10.1 INTRODUCTION

---

The graphing function provides the ability to produce time series type (Data vs. Time) graphs. Up to two samples may be displayed at the same time, each on its Y-axis.

To open a sample graph, select **Open** from the **File** menu. Open the **Data** folder, and highlight the **Sample.mdb** file and choose **OK**. In the **Trending** menu, select **Graph**. To display the sample graph, change the Start date to 01/01/99 and the End date to 01/30/99. Choose a topic from the Sample 1 list (such as Influent), and the Sample 2 list (such as Effluent), and then choose **Graph**. A sample graph will appear. The following screen is similar to the sample graph that you will see.



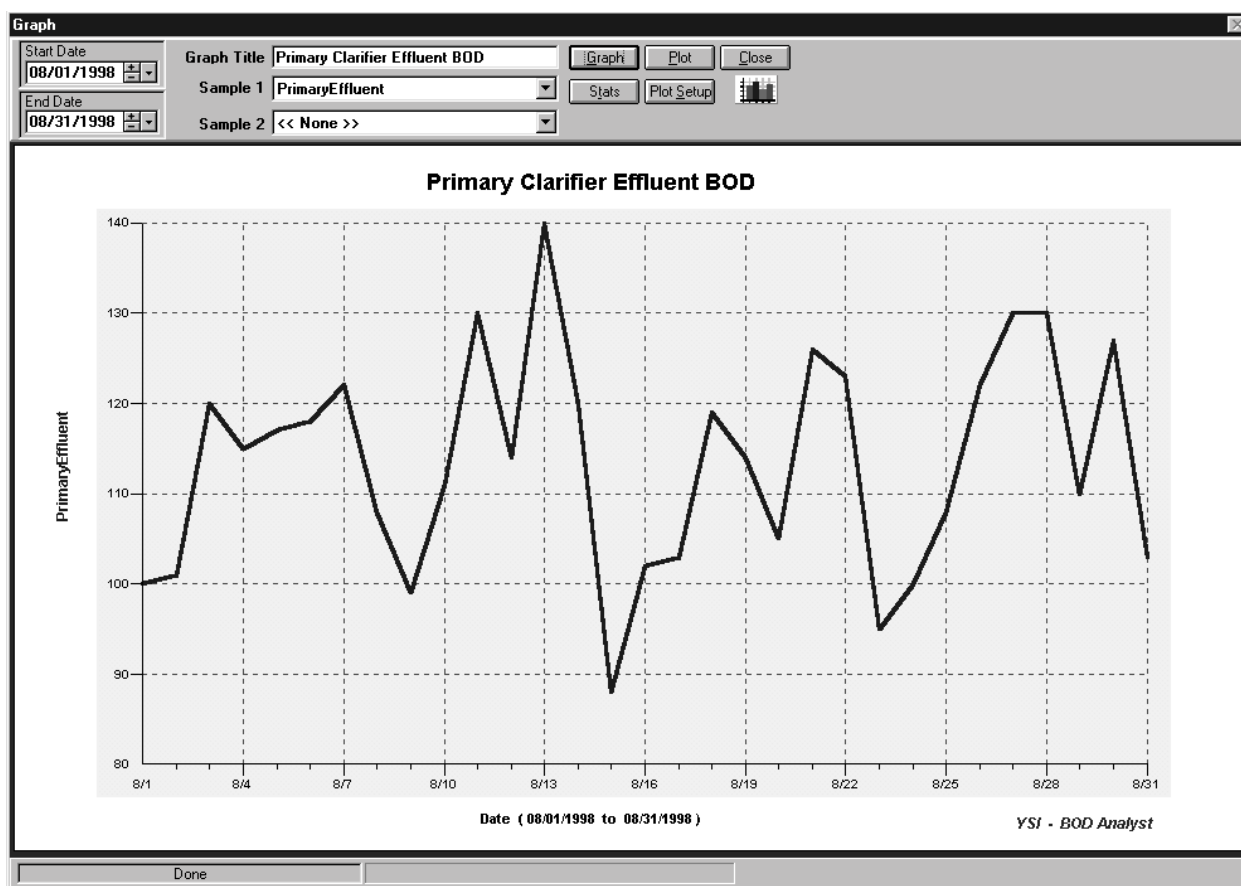
To generate a new graph, select **Graph** from the **Trending** menu. Edit the Start Date, End Date and Graph Title fields as desired. Select the names of one or two samples to be displayed and click the GRAPH button. The following screen is an example of a typical graph.

### 10.2 GRAPH SETTINGS

---

The date range of the graph is set or changed by editing the **Start Date** and the **End Date** fields.

To change the title displayed at the top of the graph, edit the **Graph Title** field.



**Sample 1** and **Sample 2** are the fields in which the sample names are selected. If one sample name is selected the left y-axis will be used. If two samples are selected, both axis will be used, Sample1 on the left and Sample 2 on the right. The data line and the axis label are color coordinated when in color mode. When black and white printing mode is selected, the second sample (using the right axis) will use a dashed line and a series of dashes are added to the right axis title.

Whenever any of the settings change, the GRAPH button text will turn red and a message will appear in the status bar in the lower left corner saying “Settings have changed, click [GRAPH] to update”. These are indications that the currently displayed graph does not accurately depict all of the settings shown above it. Simply click the GRAPH button to update the graph.

### 10.3 PRINTING A GRAPH

Plotting a graph is accomplished by clicking the PLOT button. Use PLOT SETUP to select a different printer or to change the orientation of the graph. A graph will fill an entire page in landscape orientation and will fill the bottom half of the page in portrait orientation.

If you are plotting the graph on a black and white printer, the Color Toggle button, , should be black and white as shown here. If you have a color printer, click on the Color Toggle button to change to a more colorful graph. The bar graph on the Color Toggle button will have color bars when in color mode. Clicking on the Color Toggle button changes settings on the graph to suit

differences between printing in color or black and white.

## 10.4 GETTING STATISTICAL INFORMATION ABOUT SAMPLES

After creating a graph as described above, click on the STATS button to display the Stat Sheet. This tabbed dialog displays statistical information for each of the variables on the graph. To display a statistic, click on the corresponding Plot check box. Statistics can be selected to be plotted on the graph for Sample 1 only, but statistical information will be displayed on the Stat Sheet for both samples.

**Stat Sheet**

**PrimaryEffluent** | **Standard**

# Values = 31

Minimum = 88.00 ☐ Plot

Maximum = 140.00 ☐ Plot

Mean = 113.55 ☐ Plot

**Quality Control**

UCL = 146.00 ☐ Plot

UWL = 133.00 ☐ Plot

QC Mean = 108.25 ☐ Plot

LWL = 83.00 ☐ Plot

LCL = 70.50 ☐ Plot

**Standard Deviation**

Variance = 148.99

StdDev,  $\sigma$  = 12.21

Multiply Standard Dev by  $\pm 2$  and  $\pm 3$

Mean +  $3\sigma$  = 150.17

Mean +  $2\sigma$  = 137.96 ☐ Plot

Mean -  $2\sigma$  = 89.14

Mean -  $3\sigma$  = 76.93

**Precision**

Mean x 3.27 = 371.31 ☐ Plot

Mean x 2.51 = 285.01 ☐ Plot

**OK** **Cancel**

To select statistical lines to be plotted on the graph, click on the Plot checkbox next to the statistics you want to show then click the OK button.

The default values for the four lines displayed by the **Standard Deviation ( $\sigma$ )** section are the Mean  $\pm 2\sigma$  and the Mean  $\pm 3\sigma$ . The 2 and 3 can be changed in the two fields above the resulting values.

The **Precision** section multiplies the Mean by standard Shewhart factors. These factors may also be changed if needed.

The values shown in the **Quality Control** section are values that have been entered in the QC fields of the Sample Setup.

## SECTION 11 CUSTOMIZING YOUR PROGRAM

---

The BOD Analyst software is flexible enough to handle the wide variety of ways that people do their BODs. Some things are very simple and are little more than matters of personal preference. This section outlines the advanced settings that can be used and specified in the YSI BOD Analyst for Windows. For others, flexibility is essential because what works well in one application will give poor results in another. You make your choices on several forms under the Setup Menu.

### 11.1 THE BARCODE SCANNER

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The barcode scanner can ONLY be used with the YSI 5100 DO instrument. The primary purpose of the barcode scanner is to eliminate human error. Depending on exactly how you do your BODs, it may or may not save you time. At the YSI Instrument Parameters Form you can set the barcode scanner to be required, on, or off. The following table describes each setting.

| Setting  | Description                                                                                                                   |
|----------|-------------------------------------------------------------------------------------------------------------------------------|
| Required | Bottle numbers MUST be scanned in. No entry from the YSI 5100 Dissolved Oxygen Instrument or the computer keyboard            |
| On       | Bottle numbers can be scanned in, entered from the YSI 5100 Dissolved Oxygen Instrument or entered from the computer keyboard |
| Off      | Bottle numbers CANNOT be scanned in. Entry is done from the YSI 5100 Dissolved Oxygen Instrument or the computer keyboard.    |

### 11.2 AUTO-STABILIZATION

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The program can automatically monitor the DO reading for stability. You set the criteria for stability based upon your own needs. You can also tell the program when and how to store the reading once it is stable. The biggest advantage is that you no longer have to make a decision about stability for every single reading. The program will make the decision for you based upon your criteria, leaving you free to do other things. This feature can save you time because readings are stored as soon as they are stable. Your BOD results will be more consistent because every reading is subject to the same criteria.

There are two basic stability criteria, hold time and change. For example, let's assume that the hold time is 10 seconds and the change is 0.05 mg/L. If, in the most recent 10 seconds, the minimum reading and the maximum reading do not differ by more than 0.05mg/L, the reading is considered to be stable. Note that the hold time will be the minimum time that it takes to get a reading. The program allows you to define one set of criteria for blanks and another set for all other samples.

After storing a reading to one bottle, be sure that you move the DO probe to the next bottle immediately. The probe can be equilibrating to the solution while you are entering the bottle

number.

The auto-stable routine starts immediately after the bottle number is entered. You can choose exactly how and when a stable reading will be stored; we refer to this as the auto-stabilization technique. The fastest way is to store the reading as soon as your stability criteria are met. Entering the bottle number (by any method) is an implied confirmation that you are ready for the reading to be stored as soon as it is stable.

You can require that the stability criteria are met and that you have pressed CONFIRM before storing the reading. The order does not matter. If you press CONFIRM before the criteria are met, the program will wait and then store the reading as soon as it is stable. If the criteria are met before you press CONFIRM, then the program will display **STBL** on the YSI 5000/5100 DO Instrument and then store the reading when you press CONFIRM.

You can choose to store the reading whenever you press CONFIRM, regardless of the stability criteria. The program can display **STBL** on the YSI 5000/5100 DO Instrument display when the criteria are met if you choose.

All of the settings for the auto-stable feature are on The YSI Instrument Parameters Form. See the section of the same name for detailed instructions.

## 11.3 THE CRITERIA FORM

BOD testing is complicated due to the number of criteria that tests must meet for acceptance. The BOD Analyst software checks tests for compliance with these criteria as they are defined in the Criteria Setup. Default values for criteria are based on values recommended in *Standard Methods for the Examination of Water and Wastewater*, 20<sup>th</sup> Edition. Values may be edited to meet requirements of state or other regulating agencies.

| BOD Criteria Setup                         |                                     |
|--------------------------------------------|-------------------------------------|
| <b>General</b>                             |                                     |
| Maximum Dilution Blank Depletion (mg/l)    | 0.2                                 |
| Maximum Initial Dissolved Oxygen (mg/l)    | 9.2                                 |
| Minimum Final Dissolved Oxygen (mg/l)      | 1                                   |
| Minimum (Initial D.O. - Final D.O.) (mg/l) | 2                                   |
| Remove Depletion caused by Seed            | <input type="checkbox"/>            |
| <b>Seed Criteria</b>                       |                                     |
| Minimum Seed Correction Factor (mg/l)      | 0.6                                 |
| Maximum Seed Correction Factor (mg/l)      | 1                                   |
| Min Oxygen Depletion % for seed test (%)   | 40                                  |
| Max Oxygen Depletion % for seed test (%)   | 60                                  |
| Use Seed that was closest to 50% depletion | <input checked="" type="checkbox"/> |
| <b>Standard Bottles Criteria</b>           |                                     |
| Minimum Standard Test BOD (mg/l)           | 163                                 |
| Maximum Standard Test BOD (mg/l)           | 237                                 |
| <b>Options</b>                             |                                     |
| Check Coefficient of Variation             | <input type="checkbox"/>            |
| Coefficient of Variation Limit             | 0.35                                |
| Apply Criteria after final readings        | <input checked="" type="checkbox"/> |
| <div>OK</div> <div>Cancel</div>            |                                     |

### Maximum Dilution Blank Oxygen Depletion (mg/l)

Maximum acceptable value for Initial DO minus Final DO in the dilution-blank test. This criterion is checked only for Dilution Blank samples. The default value is 0.2 mg/l.

**Maximum Initial Dissolved Oxygen (mg/l)**

The maximum acceptable value for the Initial DO. This is checked for all tests. The default value is 9.7 mg/l.

**Minimum Final Dissolved Oxygen (mg/l)**

The minimum acceptable value for the Final DO. This is checked for all tests. The default value is 1.0 mg/l.

**Minimum (Initial DO - Final DO) (mg/l)**

The minimum acceptable value for oxygen depletion. This is checked for all tests except the Dilution Blank tests. The default value is 2.0 mg/l.

**Remove Depletion caused by Seed**

For the Minimum (Initial DO – Final DO) should the Depletion caused by Seed be removed before the criteria is applied. With the field checked, if the depletion is 2.2 mg/l but 0.4 mg/l of the depletion was caused by seed, the bottle will be marked since the depletion due to the sample is 1.8 mg/l (2.2 – 0.4).

**Minimum Oxygen Depletion % for Seed Tests (%)**

The minimum percentage depletion for Seed tests. Percentage depletion is defined as  $\text{Final DO} / \text{Initial DO} * 100$ . Checked for samples that are used as Seed only. This criterion is not checked if left blank. If used, a typical value is 40.

**Maximum Oxygen Depletion % for Seed Tests (%)**

The maximum percentage depletion for Seed tests. Percentage depletion is defined as  $\text{Final DO} / \text{Initial DO} * 100$ . Checked for samples that are used as Seed only. This criterion is not checked if left blank. If used, a typical value is 60.

**Use Seed that was closest to 50% depletion**

For the entire Seed sample find the bottle (dilution) that is closest to 50% depletion. Mark all other bottles in the sample.

**Minimum Seed Correction Factor (mg/l)**

The minimum acceptable value of the seed correction factor. The value checked is not the seed correction per ml. It is the actual seed correction used in BOD calculations derived by multiplying the seed correction per milliliter by the amount of seed used in the test. This is checked for any test using seed. The default value is 0.6 mg/l.

**Maximum Seed Correction Factor (mg/l)**

The maximum value of the seed correction factor. This is checked for any test using seed. The default value is 1.0 mg/l.

**Minimum Standard Test BOD (mg/l)**

The minimum acceptable value of BOD for tests with the sample name Standard. The default value is 163 mg/l (or, 200 minus 37).

**Maximum Standard Test BOD**

The maximum acceptable value of BOD for tests with the sample name Standard. The default value is 237 mg/l (or, 200 plus 37).

### Check Coefficient of Variation

Calculates a Coefficient of Variation (CV) for all dilutions in a sample and checks that value against the CV limit. If the CV limit is exceeded, the lowest concentration dilution is removed from the average and the CV is calculated for the remaining dilutions and the CV is checked again. This process is repeated until the calculated CV is within limit or only one bottle remains.

### Coefficient of Variation Limit

The maximum acceptable CV for sample BOD data. This number is typically the CV of GGA standard tests performed by your laboratory. Default is 0.35.

### Apply Criteria after Final Readings

If checked, each bottle is automatically checked against the criteria when the Final DO readings are complete. Alternatively, the CHECK Button on the Bench sheet form can be used to check all bottles at any time.

## 11.4 THE GENERAL SETTINGS FORM

You can bring up the General Settings Form by selecting **Setup / General** from the Main Menu. The form is used to set the normalization factors and other options.

**General Setup Form**

**Normalization factors**

|   | Days | Normalization Factor |
|---|------|----------------------|
| 1 | 4    | 1.13                 |
| 2 | 5    | 1.00                 |
| 3 | 6    | 0.91                 |
| 4 | 7    | 0.85                 |
| 5 | 8    | 0.81                 |
| 6 | 20   | 1.00                 |
| 7 |      |                      |
| 8 |      |                      |
| 9 |      |                      |

**Options**

- Derive Initials ☒
- Blank Compensation ☐
- Do you pre dilute your bottles ☒

**General**

- Volume of bottles (ml)
- Dilution unit
- Seed added to
- Report Font

OK

**Normalization Factors** - The program will multiply all depletions by the normalization factor for the day of the final DO. For the typical 5 day BOD, enter the pair (5, 1.00). If you perform 20 day or 7 day BODs, enter either (20, 1.00) or (7, 1.00). Up to 20 pairs can be entered, with days ranging 1 to 99, and factors ranging 0.00 to 2.00. If you want to estimate a 5 day BOD from finals done on the 4th or 6th day, enter pairs like (4, 1.13) or (6, 0.91).

**Derive initials:** You do not need to measure initial DOs for every dilution. The program can derive the initial DO of a dilution based on the initial DO of another dilution of the same sample, the initial DO of the blank, and the initial DO of any seed or spike that may be present. If you want to use this feature, check the **Derive initials** option. Just skip over the dilutions that you

want the program to derive. You must measure at least one dilution for each Sample. It is best to measure the strongest dilution. If you measure more than one dilution for a Sample, the program will use a weighted average of the measured dilutions to derive the others. The default value is unchecked (off).

**Blank compensation:** You may compensate your BODs for the depletion of your blanks by checking this field. This is common in the United Kingdom. The default setting is unchecked (off). You can change this field at any time

**Do you predilute your bottles:** Very strong samples sometimes require dilutions that would be difficult to make in one step. In these cases, a sizeable quantity of sample is first diluted to a ratio that will make the final dilutions practical. Sometimes a pre-dilution is called a serial dilution. In the BOD Analyst software, we call this ratio the pre-dilution. Some people find it easier to adjust for the strength of each sample with the pre-dilution while keeping the final dilutions constant for all samples. When this box is checked, the Pre Dil column will appear on the bench sheet allowing for entry of the ratio (ie 2 would be a 2:1 ratio). If this box is not checked, the Pre-dil column will be hidden on the bench sheet and no pre-dilution will be allowed.

**Volume of bottles (ml):** The vast majority of wastewater laboratories in the U.S. use 300 ml bottles. Any value is legal. You can change this field at any time. The default value is **300**.

**Dilution unit:** Some people like to think of their dilutions as percent (%), others prefer to think of dilutions as the number of milliliters of sample in a BOD bottle (**ml**). Use the pull down list to make your selection. You can change this at any time. Default value is **ml**.

**Seed added to:** This field describes the seeding method that you use. If you do not seed any samples then you may disregard this field. If you add seed material directly to each bottle, then set the field to **Bottle**. If you add seed material to the dilution water, then set the field to **Blank**. It is important to understand how this field affects the seed **Qty:** field on the Sample Form. The quantity of seed when adding seed material directly to a bottle must be expressed in milliliters. When adding seed material to the dilution water, the seed quantity must be expressed in milliliters per liter. See the section “Seeding Method” for a detailed description.

**Report Font:** Sets the font for the Daily Bench Sheet Report and the Everything Report. The choices are Arial, MS Sans Serif, Tahoma, and Times New Roman. If your reports are not printing correctly it maybe that your printer does not support the selected font. Therefore, choose a different font. The default is **Arial**.

## 11.5 THE YSI PARAMETERS FORM

---

This form is used to describe how the program will work with the YSI 5000/5100 DO Instrument. To get to the form, select **Setup / YSI 5000/5100 Dissolved Oxygen Instrument**. You can change any of the fields on this form at any time.

**YSI Instrument Parameters**

**Auto Stabilization**

Technique:

Stabilize Timeout (Secs.):

Sample Hold Time (Secs.):

Sample Change (mg/l):

Blank Hold Time (Secs.):

Blank Change (mg/l):

**Temperature Alarms**

Initial Low Temp Limit:

Initial High Temp Limit:

Final Low Temp Limit:

Final High Temp Limit:

Supersaturation:

**Options**

Bottle Numbers: ☒

Barcode Reader:

OK Cancel

**Technique:** This field describes exactly how and when a stable reading will be stored. There are four legal values, **Auto**, **Dual**, **Manual**, and **None**. **Auto** will start the auto-stable routine immediately after the bottle number is entered and will store the reading as soon as your stability criteria are met. This is the fastest way. **Dual** is similar. It will start the auto-stable routine immediately after the bottle number is entered but will wait until the stability criteria are met, and you've pressed CONFIRM before storing the reading. The order does not matter. If you press CONFIRM before the criteria are met, the program will wait and then store the reading as soon as they are met. If the criteria are met before you press CONFIRM, then the program will display **STBL** on the YSI 5000/5100 DO Instrument and then store the reading when you press CONFIRM. **Manual** will store the reading whenever you press CONFIRM, regardless of the stability criteria. It will, however, display **STBL** on the YSI 5000/5100 DO Instrument display when the criteria are met. **None** will turn the feature off. The default value is **Manual**.

**Stabilize timeout:** This field is the maximum time in seconds that the program will wait for the reading to become stable. If the reading hasn't met your stability criteria by this time, the program will store the reading anyway. Legal values are 5 through 500. The default value is 300.

**Sample hold time:** This is the hold time in seconds for Samples other than blanks. For a more detailed explanation see the "Auto-stabilization" section above. Legal values are 1 through 300. The default value is 10.

**Sample change:** This is the change in mg/L that is allowed during the hold time for a stable reading. This field is for all Samples other than blanks. Legal values are 0.01 through 20. The default value is 0.05.

**Blank hold time:** This is the hold time in seconds for blanks only. For a more detailed explanation see the "Auto-stabilization" section above. Legal values are 1 through 300. The default value is 5.

**Blank change:** This is the change in mg/L that is allowed during the hold time for a stable reading. This field is for blanks only. Legal values are 0.01 through 20. The default value is 0.02.

**Initial low temp:** If the temperature of your initial DO is below this temperature (in °C) the program will display a warning message at the YSI 5000/5100 DO Instrument before the reading is stored. Legal values are **0** through **99.9**. The default value is **16**.

**Initial high temp:** If the temperature of your initial DO is above the temperature (in °C) the program will display a warning message at the YSI 5000/5100 DO Instrument before the reading is stored. Legal values are **0** through **99.9**. The default value is **24**.

**Final low temp:** If the temperature of your final DO is below this temperature (in °C) the program will display a warning message at the YSI 5000/5100 DO Instrument before the reading is stored. Legal values are **0** through **99.9**. The default value is **18**.

**Final high temp:** If the temperature of your final DO is above the temperature (in °C) the program will display a warning message at the YSI 5000/5100 DO Instrument before the reading is stored. Legal values are **0** through **99.9**. The default value is **22**.

**Supersaturation:** If the DO reading is above this value the program will display a warning message at the YSI 5000/5100 DO Instrument before the reading is stored. Legal values are **1** through **20** mg/L. The default value is **9.09**.

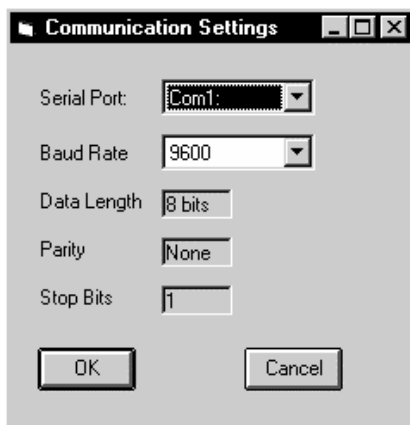
**Bottle numbers:** Some people do not use bottle numbers, but use some other way to keep track of which bottle is which (marked racks, for instance). If you leave the checkbox unchecked, the program will not ask for bottle numbers. The default setting is **checked** or **on**.

**Barcode reader:** Setting this field to **on** will allow you to use the optional barcode wand to enter bottle numbers. When the YSI 5100 Dissolved Oxygen Instrument prompts “Enter Bot# 0”, simply scan the bottle number. Bottle number entry is only necessary during initials. During finals, the user is asked only to confirm bottle numbers entered during the initials. Setting the field to **Required** will force the user to use the barcode reader during both initials and finals. During initials the YSI prompts “Scan Bottle” and will wait until a barcode is scanned. During finals the YSI will prompt for you to scan the bottle. For example, if the current bottle is 213, the YSI prompts, “Scan Bot 213” and will wait until 213 is scanned. This may provide more reliable results. Even with this field set to **on**, you may use the wand during finals. **Required** just makes it mandatory. If you do not use the barcode reader, set the field to **off**. The default setting is **on**.

## 11.6 THE COMMUNICATIONS SETUP FORM

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This form is used to set the communications settings. Select **Setup / Communications Setup** to display the form.



**Comm port:** The program can communicate to the YSI 5000/5100 DO Instrument through either communications port 1,2,3, or 4. In this field, indicate the communications port you will use to connect to the YSI 5000/5100 DO Instrument. On newer computers, com1: is typically used. If the program is unable to initialize communications with the YSI 5000/5100 DO Instrument, then come back to this form and try a different port.

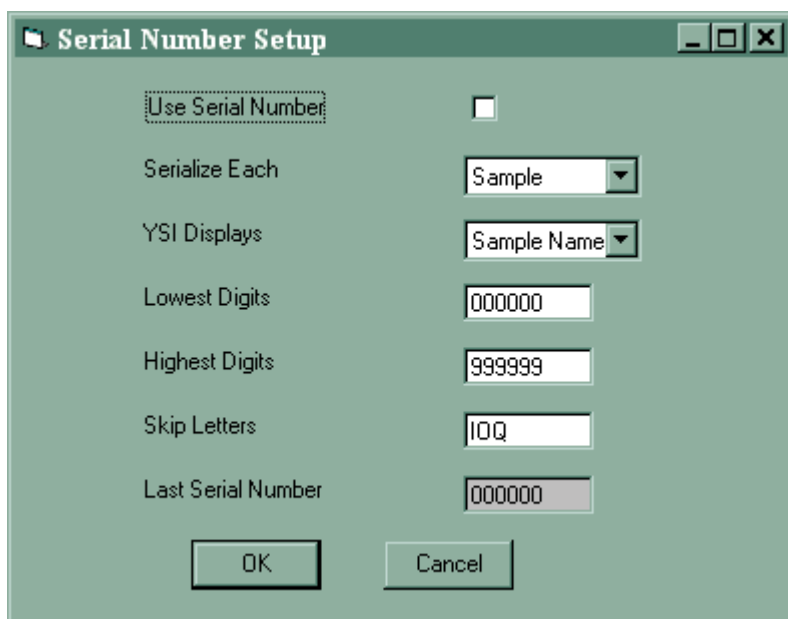
**Baud rate:** This is the baud rate for the com port that is hooked to the YSI 5000/5100 DO Instrument. The default value for both the YSI 5000/5100 DO Instrument and the BOD Analyst software is **9600**. 9600 is the default and will work for almost all applications, but for long cable lengths or noisy environments, a slower baud rate may be more reliable, though it will slow the system response. We recommend that you use the highest reliable baud rate. Legal values are **9600, 4800, 2400, 1200, 300, and 110**. See your YSI 5000/5100 Dissolved Oxygen Instrument manual for more information on how to set it's baud rate. The baud rate set here and the YSI 5000/5100 Dissolved Oxygen Instrument's baud rate **MUST** be the same.

Note: Data Length, Parity, and Stop Bits are shown for informational purposes only and cannot be changed.

## 11.7 SERIAL NUMBERS

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Serial Numbers can be used to uniquely define a particular BOD test. It is important to understand the difference between Samples and Serial Numbers. A typical sample may be called Effluent with dilutions of 100, 150 and 200 ml, and 3 ml of seed added to each bottle. Suppose a laboratory is testing the Effluent Sample one day and the program assigns a serial number of 328. Normally the Serial Numbers increment, therefore the next sample would be number 329. The next day, the Effluent sample would be run again but the serial number would be different. While Sample Names are used over and over, a new serial number is assigned for each new BOD test. The Serial Numbers Setup Form is used to specify how the program should implement serial numbers. Select **Setup / Serial Numbers** from the Main Menu.



**Use Serial Number:** Sets whether the program will assign Serial Numbers. The default is off.

**Serialize Each:** The program can assign a new serial number to each bottle or each sample. The default is Sample.

**YSI Displays:** The YSI can display the Sample name or serial number when taking readings. The default is Sample Name.

**Lowest Digits:** Used in conjunction with the **Highest Digits** field to specify how the software will increment the serial number. With these fields you specify the range of each digit. Each field is 8 digits long. Each digit can be an alpha character, a numeric character, or an alpha-numeric character. Since each digit is set independently, you can even mix character types. The order of characters is:

0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ

**Skip Letters:** Characters listed will not be used in the serial number.

**Last Serial Number:** Displays the Last Serial Number that was assigned by the software. This field is read only.

The Serial Number will be displayed when reading the initial and final DO on the computer. On the bench sheet the current Serial number is displayed on the status bar at the bottom of the bench sheet.

|   | Sample Name | Bottle # | Sample Volume (ml) | Seed Volume (ml) | Initial DO (mg/l) | Final DO (mg/l) | O2 Depl. (mg/l) | Seed Corr (mg/l) | BOD (mg/l) | Final BOD (mg/l) |
|---|-------------|----------|--------------------|------------------|-------------------|-----------------|-----------------|------------------|------------|------------------|
| 1 | DilBlank    | 284      | 300.00             | 0.00             | 7.45              |                 |                 |                  |            |                  |
| 2 |             | 564      | 298.00             | 0.00             | 7.47              |                 |                 |                  |            |                  |
| 3 | Raw         | 732      | 10.00              | 0.00             | 7.52              |                 |                 |                  |            |                  |
| 4 |             | 345      | 15.00              | 0.00             | 7.54              |                 |                 |                  |            |                  |

Test is valid

010022

Serial Number for  
RAW 10 bottle

## SECTION 12 CONTACT INFORMATION

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For any questions regarding PC6000 software, or any YSI equipment, please contact YSI Technical Support at (800) 897-4151 or e-mail at [support@ysi.com](mailto:support@ysi.com). For ordering YSI equipment or accessories, please see your YSI dealer, or the contact information below.

1700/1725 Brannum Lane  
Yellow Springs, Ohio 45387 USA  
(800) 765-4974 (937) 767-7241  
FAX: (937) 767-9320  
Website: <http://www.ysi.com>  
E-mail: [info@ysi.com](mailto:info@ysi.com)

## SECTION 13 ACCESSORIES

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### INSTRUMENTS

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- ❑ 5000-115 Oxygen Instrument, Digital, Lab-115V
- ❑ 5100-115 Oxygen Instrument, Digital, Lab with SOUR software – 115V

### PROBES

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- ❑ 5010 BOD Probe, Self-Stirring, 5 ft.
- ❑ 5010-J BOD Probe, Self-Stirring, 5 ft.
- ❑ 5010-K BOD Probe, Self-Stirring, 5 ft.
- ❑ 5010-L BOD Probe, Self-Stirring, 5 ft.
- ❑ 5010-W Wine Bottle Probe, Self-Stirring, 5 ft.

### INSTRUMENT ACCESSORIES

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- ❑ 5015 Bar Code Scanner (YSI 5100 DO Instrument ONLY)
- ❑ 052021 RS232 Cable, DB9
- ❑ 059160, Label set, barcode, waterproof, self-adhesive, 1000 per pack (YSI 5100 DO Instrument Only)

Y S I *incorporated*



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