

# **ABET II STANDARD**

## **USER INSTRUCTIONS**



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# Welcome

Lafayette Instrument Co has been dedicated to designing creative products to meet the rigorous standards of quality, flexibility and ease of use expected by our customers for over 65 years. The original ABET (Animal Behavior Environment Test) System met those requirements for over 10 years. **ABET II** was released nearly 8 years ago and became **ABET II Standard** with the release of **ABET II Touch**. Both share a wealth of significant improvements in environment set-up, schedule design and the execution of schedules as well as the most advanced data handling of any competitive product. This manual focuses on the **Standard** aspects of the software for all users. A separate supplemental manual is provided for **Touch** users as well as application specific manuals when running standard touch protocols.

## Software and Hardware Installation

A printed copy of the ***ABET II Behavioral Scheduling and Data Acquisition Software & Hardware Installation Guide*** should have been included with the ABET II Software disk.

This guide includes:

- Uninstalling Old ABET Software and Drivers
- Installing ABET II Software
- Installing NI PCI-DIO Drivers from Disk
- Windows New Hardware Installation
- Appendix A - Installation of Interface Components
- Appendix B - Component I/O Wiring Guidelines
- Appendix C - Installation with BNC Hardware
- Appendix D - Adjusting Virtual Memory
- Appendix E - Installing Graphviz (Optional)

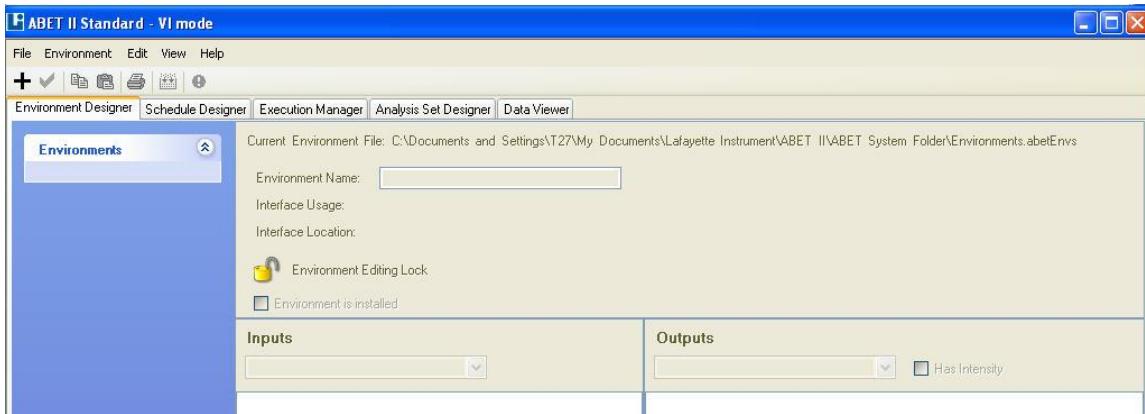
## Running ABET II without Hardware

Hardware refers to the computer interface, chamber components and other devices that ABET II is designed to control. When no hardware is present a virtual interface is available for running and testing schedules. Inputs may be simulated with a mouse click and the state of each output is clearly displayed. The virtual interface does not have the response time of a hardware interface, brief pulses or critical timing elements may not be seen with the virtual interface, nevertheless, this is a useful tool for learning how to create an ABET II schedule and for early development of new schedules. Use this feature to work through the training tutorials on your office computer independent of the hardware. If hardware is available, feel free to substitute input and output labels that fit your environment. The Virtual Interfaces in Preferences use

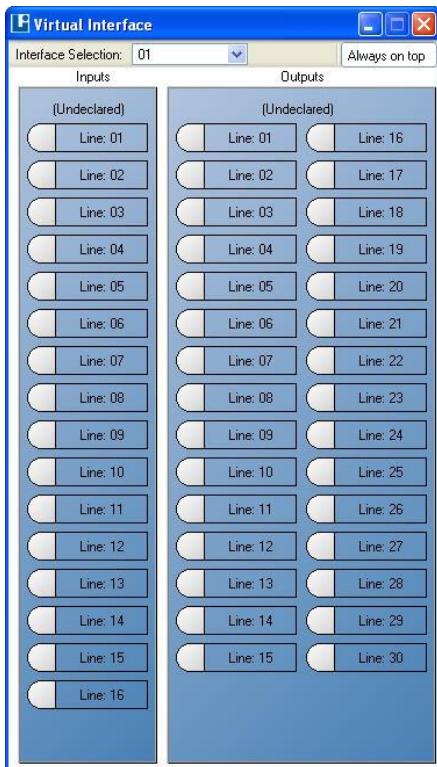
# Getting Started

## Opening ABET II

Once ABET II has been installed on your computer simply click the associated Icon on the desk top. The top menu bar (File, Environment, Edit, View and Help), tools bar and tabs shown below will be displayed. Each of these will be explained in detail as needed.



If ABET II was installed without a hardware interface, the Virtual Interface shown below will also be displayed. Click the windows “-“ box to temporarily minimize this image. If hardware was installed, but you prefer to switch to a virtual interface for purposes of working through the tutorials follow the instructions below.

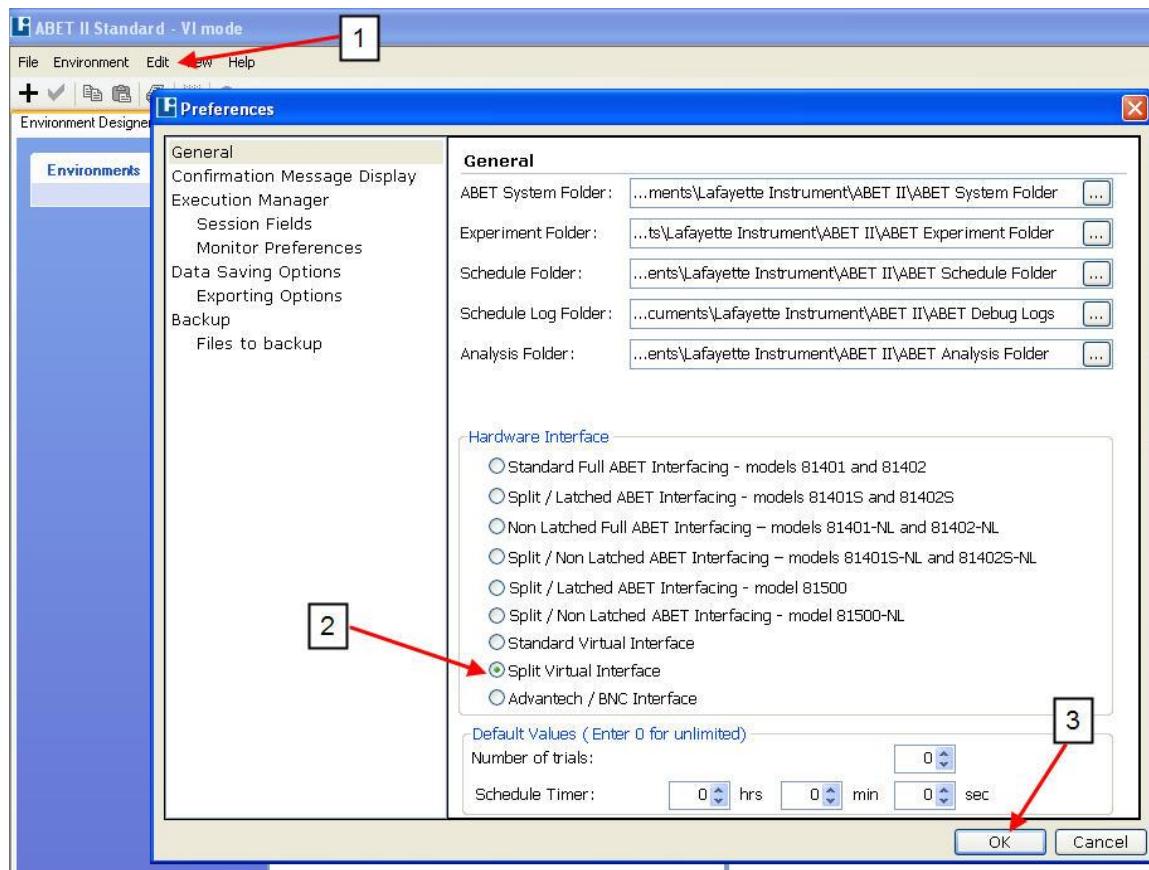


# Getting Started

Skip to the next session if you have a virtual interface or wish to work with connected hardware. If using connected hardware you may adapt any input or suitable output for the virtual devices used in the tutorials.

## Switching to a Virtual Interface

1. Click Edit on the Menu and select Preferences from the menu list.
2. On the Preferences Window Click Split Virtual Interface.
3. Click OK

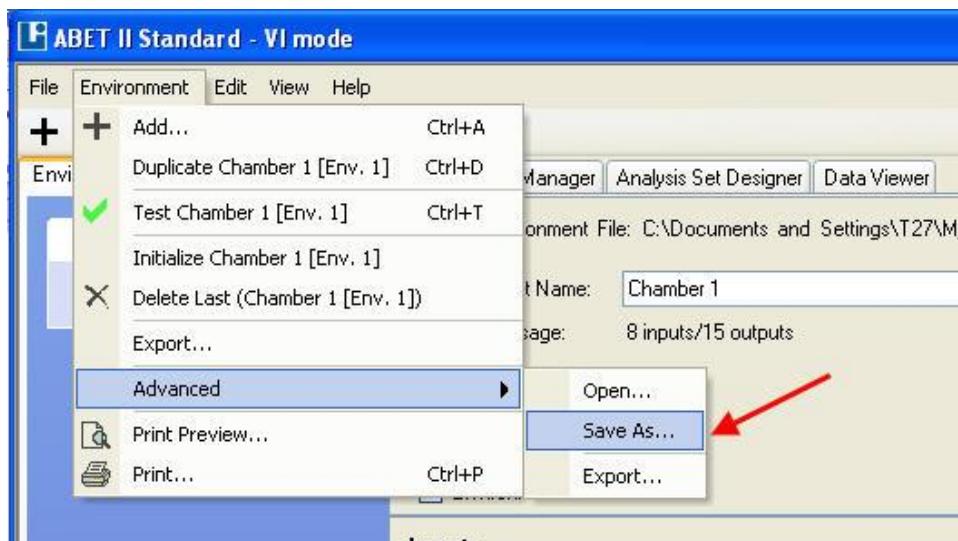


# Environment Designer

## Environment Designer



The first time you click the ABET II Icon the active tab should be the Environment Designer. If your software does not open to this tab, simply click on it as shown above. Note, the second item on the menu line will reflect the tab selected, Environment Designer, Schedule Designer, Execution Manager, Analysis Set Designer or Data Viewer. If you purchase a computer from Lafayette Instrument Co an environment configuration may have already been loaded. This file may be saved with a Click Environment>Advanced>Save As shown below and name the file being saved. You can now change the environment for the tutorial if you like and return to the saved file (Environment>Advanced>Open) when needed



## The Environment Menu

- Add Use this selection to add the first Environment.
- Duplicate Use this to duplicate any selected/highlighted Environment listed.
- Test Use this to test the Environment Selected.  
See [[Testing Environments](#)].
- Initialize **Caution** this item will remove all defined Inputs and Outputs from the environment displayed.
- Delete Last Only the last chamber on the list may be deleted at any one time
- Export Produces an archive copy of the Environment Configuration

# Environment Designer

## The Environment Menu – con’t

- Advanced      Three new selections are provided on the Advanced Menu.
  - Open -- Allows you to open any environment within the ABET II System Folder.
  - Save As -- Saves the environment file as a different name in the ABET II System Folder by default. An alternative location may be selected.
  - Export (Saves the current environment to any location on the computer)

**Note:** ABET II automatically creates the default environment configuration file Environments.abetEnvs the first time you set up your system. This is all you need to do if the environment and/or environment labels remain the same for all users in the lab.

The above features will permit multiple users to have individual environment configurations on a single lab computer if desired. It will also allow you to easily plug the interface into different test chambers for different experiments. For transferring files from one computer to another we recommend the Backup/Restore features discussed in the Advanced Features section of the manual.

- Print Preview
- Print              Prints a copy of the Environment Configuration

## Defining the first Environment

Select the “+” tool from the tools menu bar as shown to open the Add Environment form.



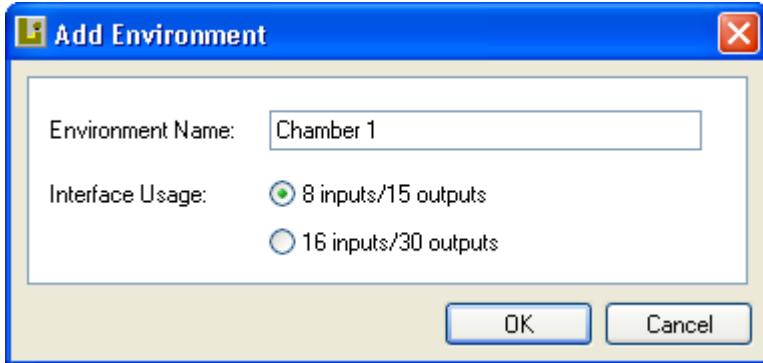
You may also click Environment on the top menu line followed by Add Environment.

Enter a name for the environment and indicate the appropriate I/O configuration for the hardware interface and I/O Block being used.

**Note:** For purposes of this manual, a split interface with 8 Inputs and 15 Outputs is assumed. Hardware details are provided in Appendix A. See [[Appendix A](#)] for hardware connections and other configurations.

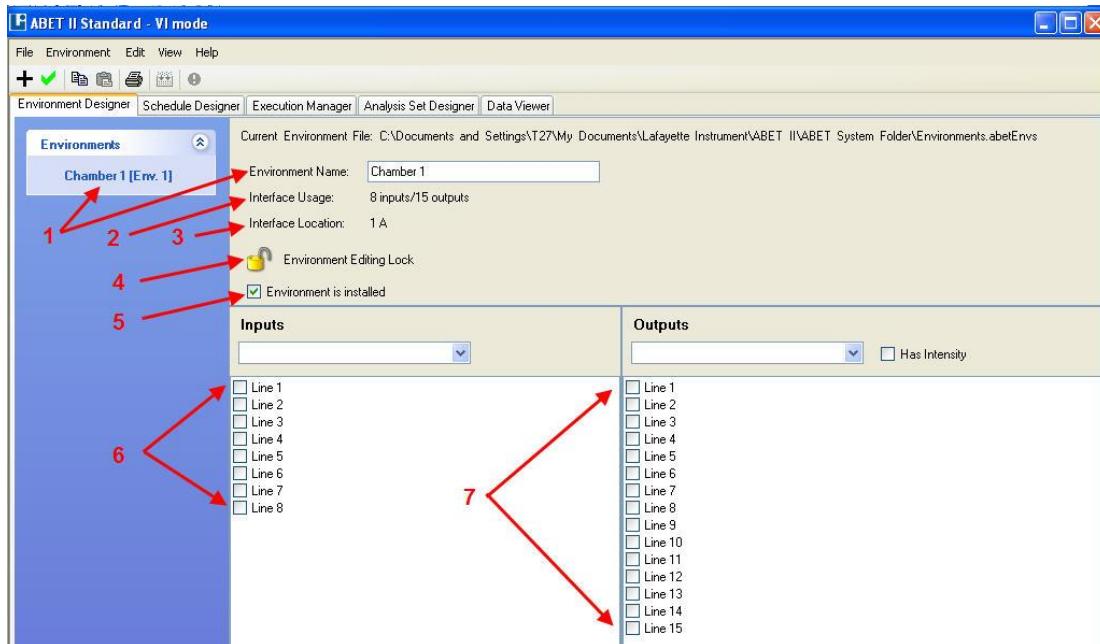
Chamber 1, Chamber 2, etc. will be used but any label may be applied.

# Environment Designer



Click OK after completing the Add Environment form. The screen now displays

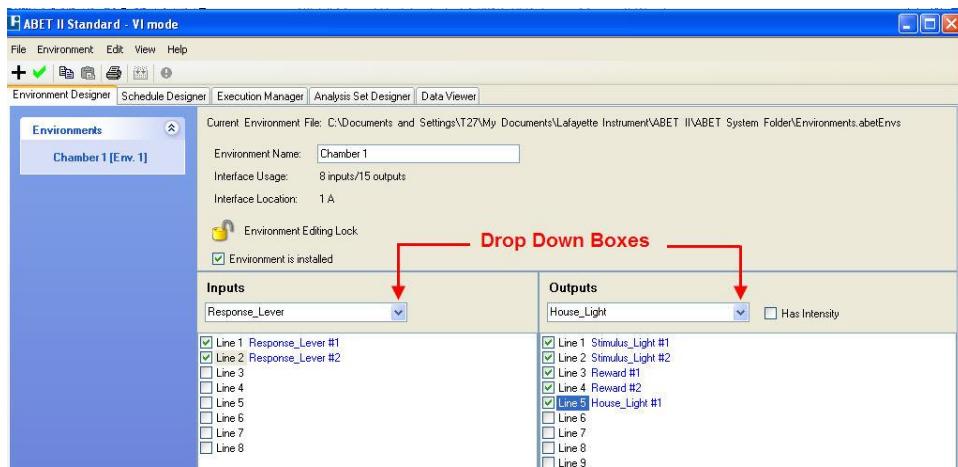
1. The Environment Name you assigned
2. The Interface Usage
3. The Interface Location
4. The Environment Editing Status. Simply click on the lock to change from unlocked to locked once the configuration is complete.
5. The Installed Status. Click to change. A disabled or otherwise unwanted chamber may be taken out of service by simply unchecking the box.
6. The input lines available in this Environment.
7. The output lines available in this Environment.



# Environment Designer

## Adding Chamber Components

Add Input and Output Labels and click the Line number that represents the physical wiring of chamber devices to the terminals on the I/O Block. The lines assigned are arbitrary if using a Virtual Environment. Spaces are automatically filled in with an underline. At this point we recommend generic labels. Schedule specific or user specific *aliases* may be defined in the Schedule Designer. For example, the labels Response\_Lever, Stimulus\_Light, and Reward are used here while Left\_Lever, Right\_Lever, and Pellet will be used when working with the Schedule Designer. Other suitable aliases might include Correct\_Response, Drug\_Lever, FR\_Lever, etc. Any combination of generic and alias labels may be used when constructing the conditions and actions of the schedule. This lets you define the schedule with the labels most meaningful to the test schedule, not some arbitrary or programmer defined label that must be learned by the user.



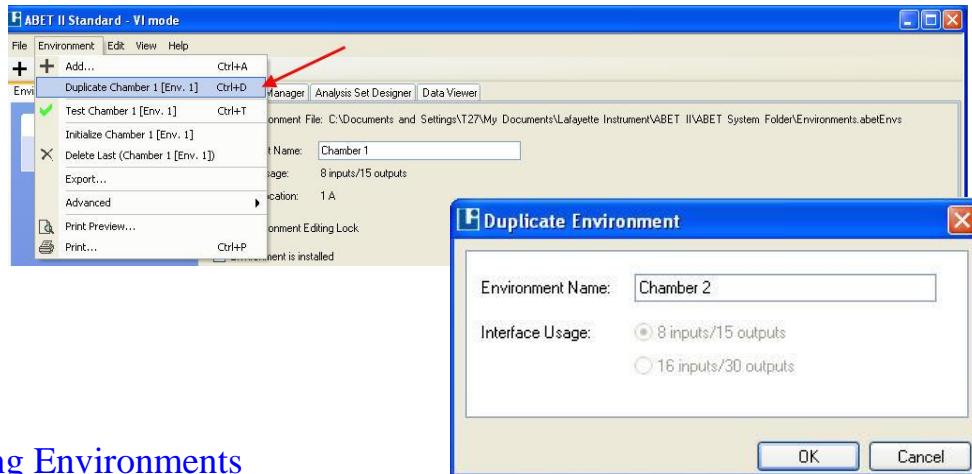
Check **Has Intensity** for those LIC products with light intensity or color options, tone intensity or tone frequency selection. These devices are controlled by three lines with 7 binary selections, 001, 010, 100, etc. When this option is checked the output label is assigned to the first line in a predetermined set of three lines. A modular connector is provided for many of these devices. Do not connect other devices to the terminal screws associated with the same output lines when the modular connector is used.

**Note:** To generate a new label simply click in the Input or Output box and type over or edit the previous label if present. As labels are added they become available in a convenient drop down box as indicated above. The same label may be used repeatedly. Each time it will be automatically numbered sequentially. It is best not to change these labels once they have been used in a schedule, but they can be moved to different “Lines” should a hardware input or output become defective. [See Moving Chamber Components below.](#)

# Environment Designer

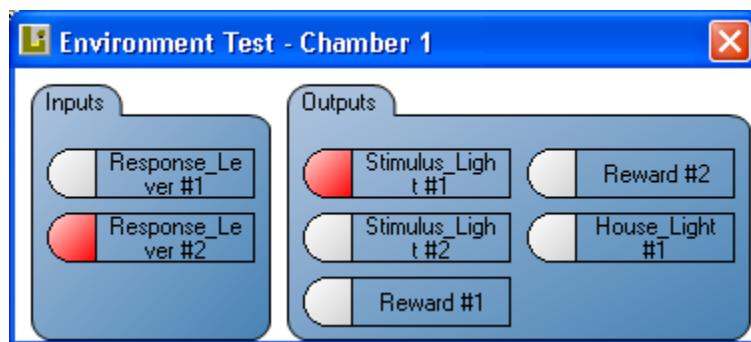
## Adding Additional Environments

Environments, if different, may be added individually repeating the process above. Identical environments may be quickly configured. Select “**Duplicate**” from the Environment Menu. Any chamber may be duplicated. The duplicate selection will always display the environment that is currently open/displayed. Only the last environment may be deleted. At any time select “[Test Environment](#)” to confirm that the assigned components are properly functioning.



## Testing Environments

The Inputs and Outputs are easily tested once an environment has been defined. Select the environment to be tested from the left column. Click the test icon (the green check mark) from the Tool Bar Menu or Test Chamber from the pull down menu. The 28 V DC Power Supply connected to the interface must be turned on at this point. Generate an Input (response) in the Chamber being tested. A momentary red pulse will appear as shown for Response\_Lever #2 below even if the lever is held. Use two people if necessary to view the computer screen while depressing the lever or activating other input devices (nose pokes, photo beam breaks, chain pulls, etc.) Outputs may be toggled on and off by clicking in the box containing the output label. In this example Stimulus\_Light #1 has been turned ON and will remain on in the chamber until the same label is clicked a second time to turn the output off. Pulsed devices such as 80209 Pellet Dispensers must be turned OFF before they can be turned ON again although there is no visible or auditory change when turned OFF. Any output left on when the Environment Test Window is closed will be automatically turned OFF

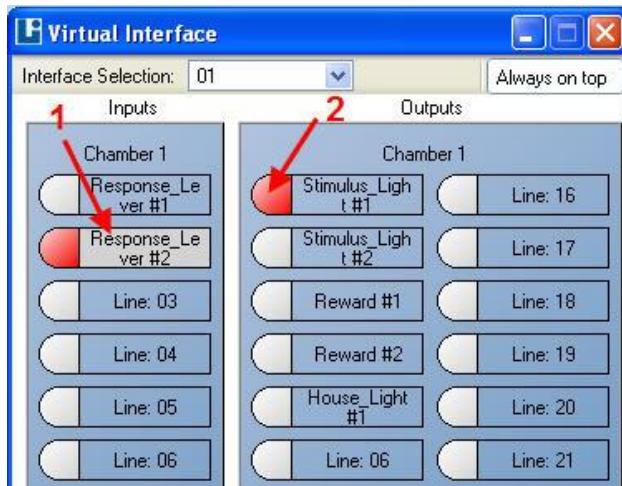


**Warning! Do not leave outputs ON if using components from other manufacturers that cannot tolerate a continuous ON state.**

## Environment Test with Virtual Interface

# Environment Designer

Use the same Test Screen shown above. Click the Response Button (1) on the Virtual Interface below to activate an “input” pulse below and on the test screen shown above. Click the Output Button on the Test Screen above to toggle an “output” on the Virtual Interface below (2) ON and OFF.

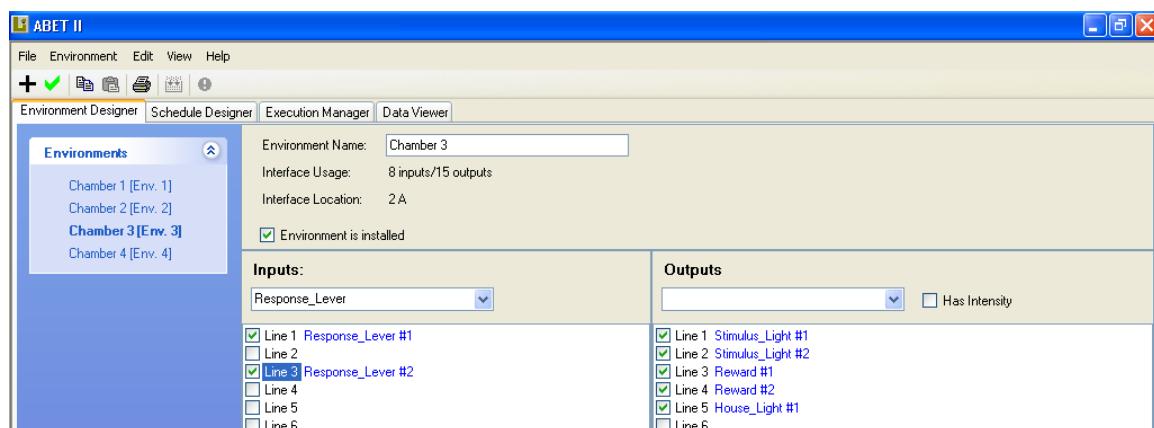


## Moving a Chamber Component

This is particularly helpful if a data line becomes defective in the middle of a study. Simply remove the device from the defective line at the terminal connection on the I/O Block and connect it to any available line. Proceed as follows:

1. Open ABET II and click the Environment to modify. (Unlock if Locked)
2. Click the green check box associated with the OLD Line connection to remove the link.
3. Click the pull down menu and select the label to be reassigned.
4. Click the check box of the NEW Line connection to reassign it.

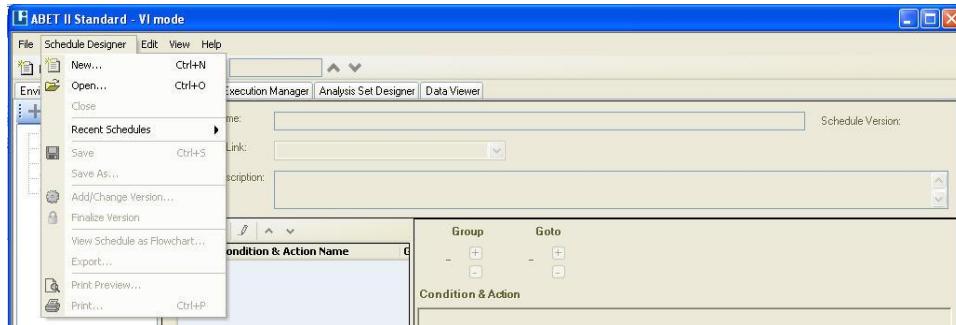
In the window below Response Lever #2 was moved from line 2 to line 3 for Chamber 3. No “programming” or other schedule change is needed.



# Schedule Designer

## The Schedule Designer Menu

Click the Schedule Designer Tab followed by Schedule Designer on the Top Menu Bar to reveal the Schedule Designer Menu as shown.



- **New** Shortcut Ctrl+N. Use this selection to create a new Schedule.
- **Open** Shortcut Ctrl+O. Use this selection to open an existing Schedule.
- **Close** No Shortcut Use this selection to close an open Schedule
- **Recent Schedules** A quick look up of recently opened schedules.
- **Save** Shortcut Ctrl+S
- **Save as** No Shortcut
- **Add/Change Version** Build upon core schedules or create parameter specific versions
- **Finalize Version** Lock a schedule prior to data collection so that it cannot be modified during a study.
- **View Schedule as a Flow Chart** A copy of Graphviz ([www.graphviz.org](http://www.graphviz.org)) is required. Installation instructions are provided with the ABET II Disk
- **Export** Produces an archive copy of the Schedule detail.
- **Print Preview** No Shortcut
- **Print** Shortcut Ctrl+P

# Schedule Designer

## The Schedule Designer Workspace

At least one environment must be defined before a schedule can be designed. The schedule labels for hardware inputs and outputs will be based on the environment selected. Click the Schedule Tab to reveal a blank workspace. This is the one and only screen used for developing all schedules. There are several key areas in this workspace that will be covered over the course of the tutorial section as they are introduced into the schedule designing process.

1. Tool Bar (from left to right)
  - New Schedule
  - Open Schedule
  - Close Schedule
  - Save Schedule
  - Print Schedule
  - Edit Summary Items
  - Check Schedule for Errors
  - Submit Error Diagnostics to LIC
  - Search Schedule Conditions and Action
2. Schedule Information
  - Schedule Name
  - Environment Link
  - Schedule Description
3. Schedule Features \*\*
  - Aliases
  - Arrays
  - Lists
  - Variables
  - Virtual Inputs
4. Group | Condition & Action Name | Goto \*\*\*
5. Group & Goto Assignment Boxes
6. Condition & Action Code Display Box
7. Condition & Action Description Display Box

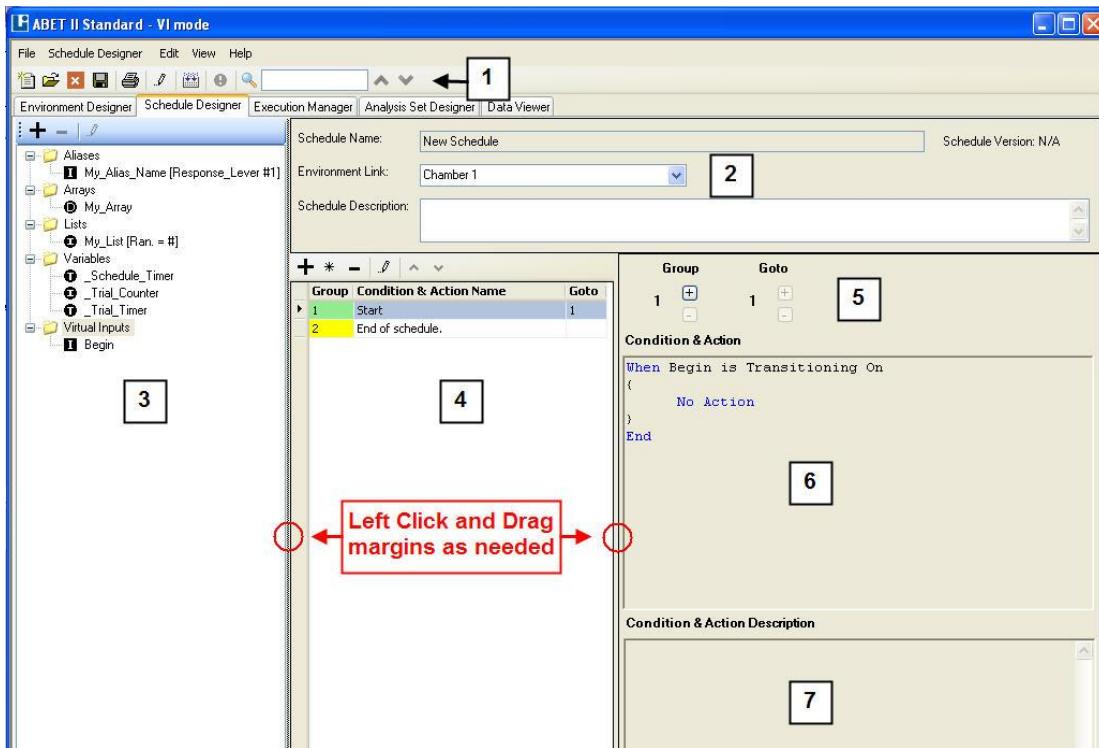
\*\* **Note:** A right click over each item folder produces an Add New form. An alternative option is to select/highlight the desired feature and click the “+” symbol at the top of the workspace.

\*\*\* **Note:** A right click over the workspace produces a list of the tools. An alternative option is to simply select the tool icon at the top of this workspace.

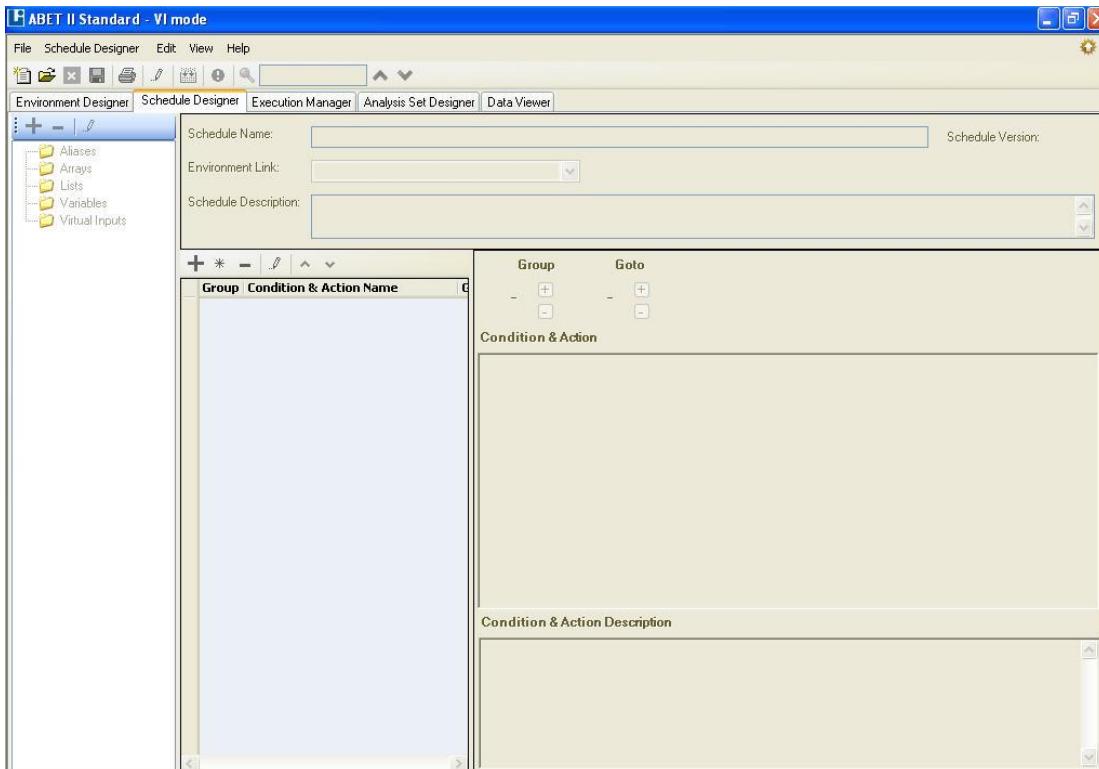
The image that follows has had some items activated to enhance the image.

# Schedule Designer

## Schedule Designer Workspace:



## Blank Schedule Designer Workspace



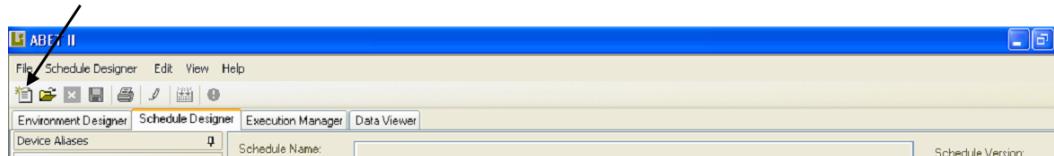
## Tutorial #1

### Creating and Running a Schedule

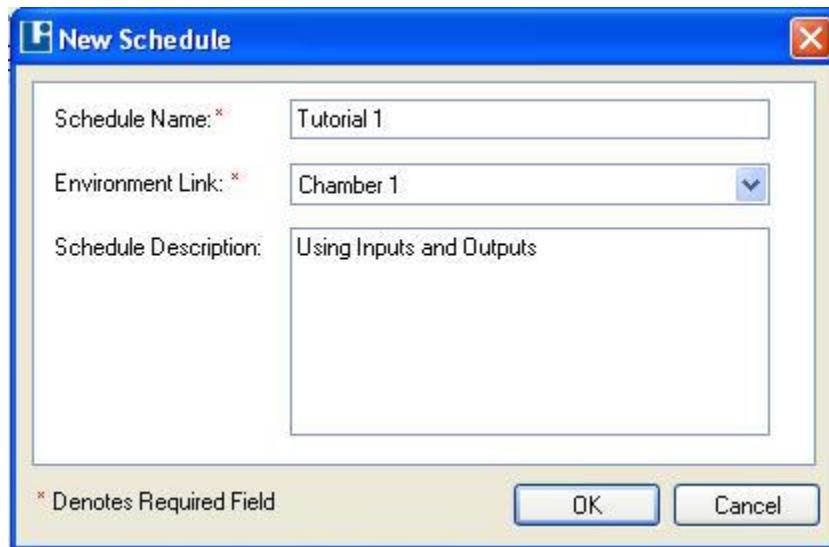
This Tutorial is divided into two parts. The first part introduces you to many but not all of the features of the Schedule Designer. More advanced features will be introduced in additional tutorials and in the Advanced Features section of this manual. The second part introduces the Execution Manager and its features.

#### Creating a New Schedule

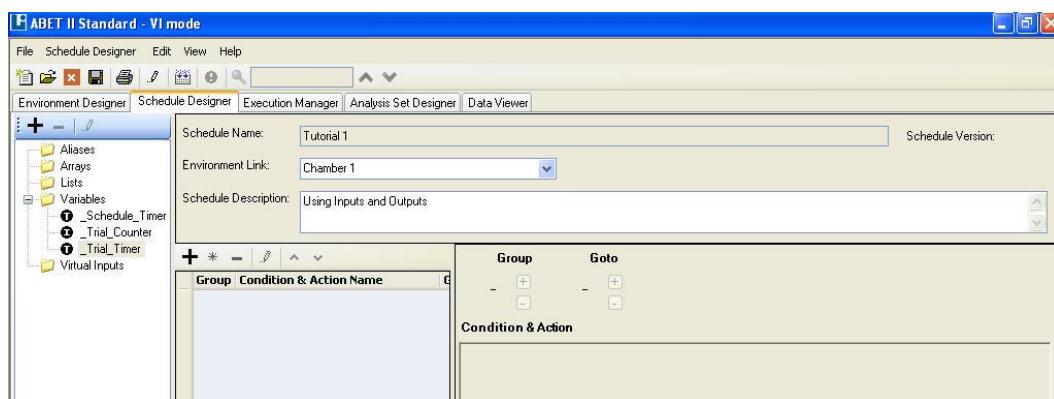
Click the **New Schedule** Icon (see arrow), select **New Schedule** from the Schedule Designer pull down menu or use the **Ctrl+N** hot key to open the New Schedule window



Enter a schedule name and select an environment on which to build the schedule. The Schedule Description is optional.



After filling in the fields above click OK to return to the Schedule Designer workspace below.



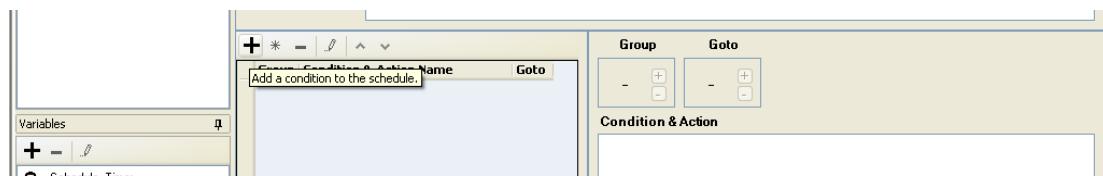
## Tutorial #1

### Creating and Running a Schedule

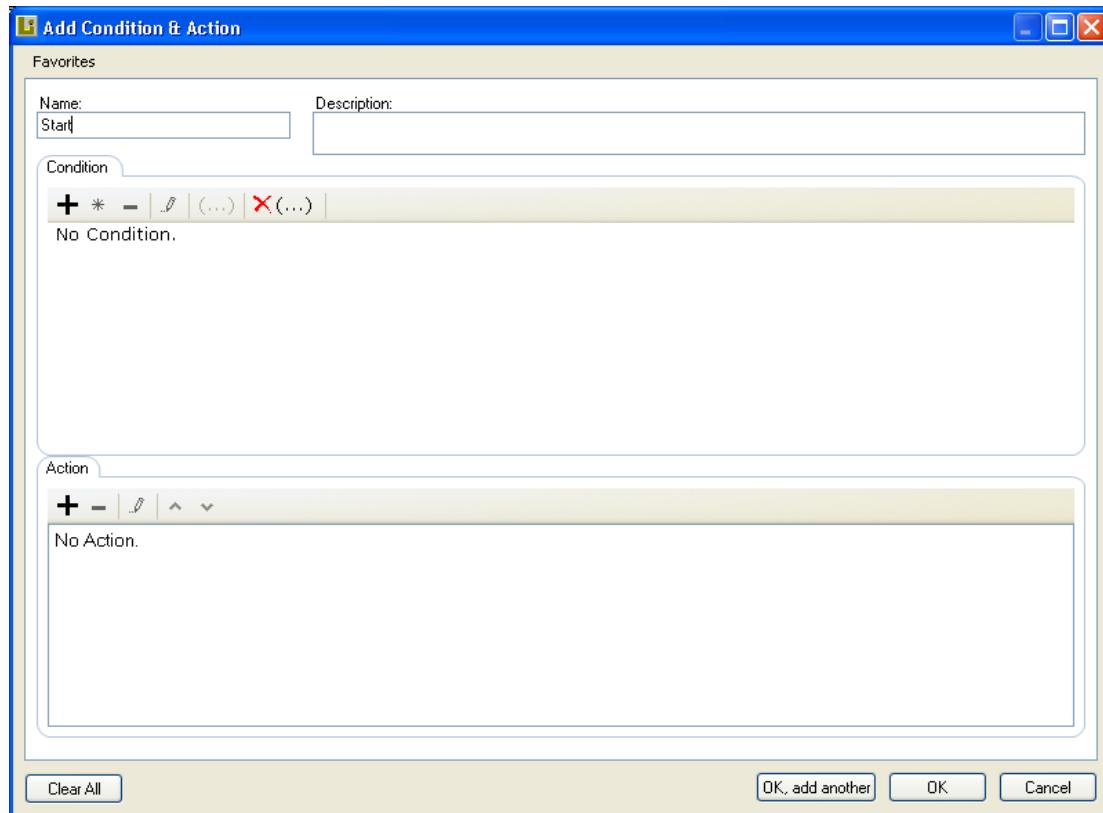
#### Creating a Condition

Schedules are made up of one or more conditions that can be organized into one or more groups. Each condition consists of two parts. The first part looks for any change in either the internal (computer software) or external (test chamber or other device connected to the hardware interface) environments. The external environment sends signals to the schedule in the form of switch closures, beam breaks, or other means compatible with the defined inputs of the environment. The internal environment consists of counter values, timer values, the status of outputs, etc. For more information go to [[How ABET II processes Conditions and Groups](#)] in the Advanced Features section of this manual. Additionally please review the use of Activated versus Transition On for Latched and Non-Latched hardware (interfaces). Go to [[Working with Non-Latched Hardware](#)] in the Advanced ABET II Features, Tools and Concepts section of this manual.

To Create the first Condition for this Schedule, click the “+” as shown.



This will open the “Add Condition & Action” Window shown below:



## Tutorial #1

### Creating and Running a Schedule

**Enter a name for the condition.** The label "Start" has been used to label this condition. Short names are recommended. A common name with extension may be useful to designate parts of a common group. The additional description field is optional. The first condition in a schedule may be returned to as many times as needed and is often used for start-up tasks or initiating trials.

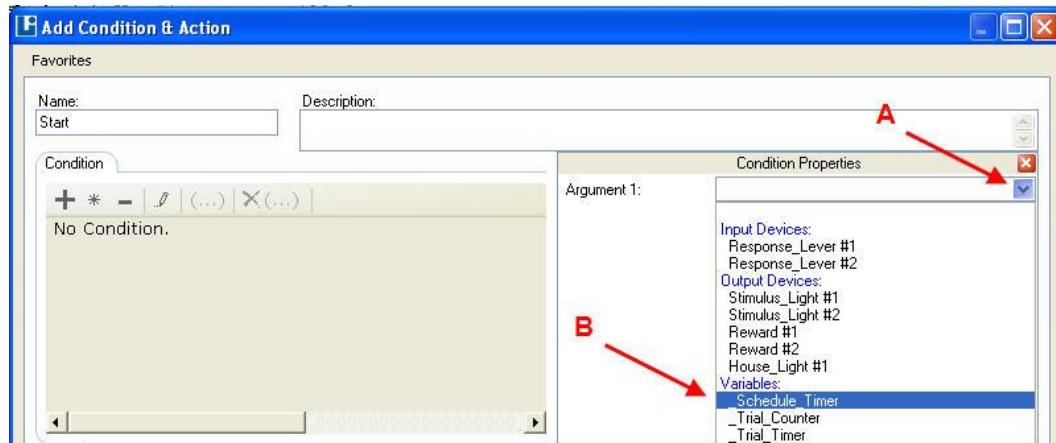
#### Defining the Condition

The following tools are available on the Condition Tab:

- Plus (+): Add/Define new Condition Properties
- Star (\*): Insert additional Condition Properties anywhere in a compound argument
- Dash (-): Remove a line from the Condition Tab that has been highlighted
- Pencil: Edit the Condition Properties for a line that has been highlighted
- Parenthesis (...): Conditions may be nested with their logical operators;  
e.g. When (\_Schedule\_Timer >=1  
And (Response#1 = Transition On  
Or Response#2 = Transition On)) \*  
End
- X Parenthesis X(...): Remove Parenthesis

Click (+) on the Condition Tab and proceed as follows:

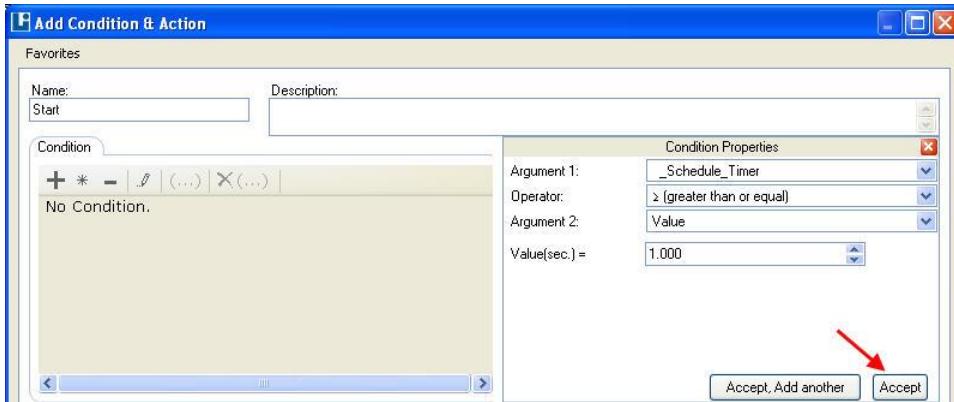
1. **Argument 1:** Click the pull down list (A) and select **Schedule\_Timer** (B) from the Input Devices, Output Devices or Variables that could be used. For advanced schedules this list will contain all your user defined Variables, Aliases and Lists. The next line appears automatically.



2. **Operator:** Select [greater than or equal]. The next line appears automatically
3. **Argument 2:** Click the pull down list and select **Value** The next line appears automatically
4. **Value(sec)=** A default value of 1.000 seconds is displayed. You can use the up/down arrows to toggle this value in seconds, click in the space and edit, or highlight the default value and type over it. For this tutorial the value has been left at 1 second.
5. **Accept:** You may edit any of the above steps as needed. Click **Accept** or type **Ctrl-S** when you are satisfied with your selections. You may return to any selection as many times as needed to complete this form. You may also reopen the Properties form at any time by selecting/highlighting the Condition and clicking the Edit Icon on the Condition Tab.

## Tutorial #1

### Creating and Running a Schedule

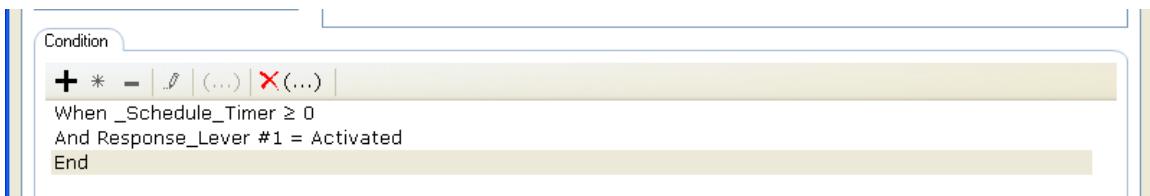


**Accept, Add another:** This option is used for any set of multiple arguments connected by logical operators AND or OR. A simple example might be:

```
When _Schedule_Timer >=1  
And (Response#1 = Transition On  
End
```

To add a second condition simply click **Accept, Add another**, the “+” tool, or type **Shift-Ctrl-S** and select the Logical Operator AND. For example, add the operator AND, and the Argument 1: frame will automatically appear. Proceed as above to add a single response to the condition.

Now the schedule could be loaded and “run” from the computer, but would not “start” or advance to the next condition until the animal is loaded and the technician presses a lever or other response button. Highlight the second condition and click the “-“ tool to delete the second condition for now. It is actually better to use the **Start Timer on First Input** feature in the Execution Manager to achieve the same result.



**Note:** The **Add Parenthesis** and **Remove Parenthesis** Icons on the Condition Tab are activated when multiple arguments are selected/highlighted in the Condition Tab so that complex arguments may be nested as need. Complex arguments are covered in the Advanced Features section of the manual, [[Advanced Features, Tools and Concepts of ABET II](#)].

\* The screen shots show usage of ‘Activated’ for the ‘state’ of the input, i.e. Response\_Lever #1. However in the text above we used ‘Transition On’. The explanation for why and when to use these to qualifiers can be found in [[Working with Non-Latched Hardware](#)] in the Advanced ABET II Features, Tools and Concepts section of this manual. The usage of Transition On works equally well with both types of interface hardware, Latched and Non-Latched, and so should be used for this tutorial.

## Tutorial #1

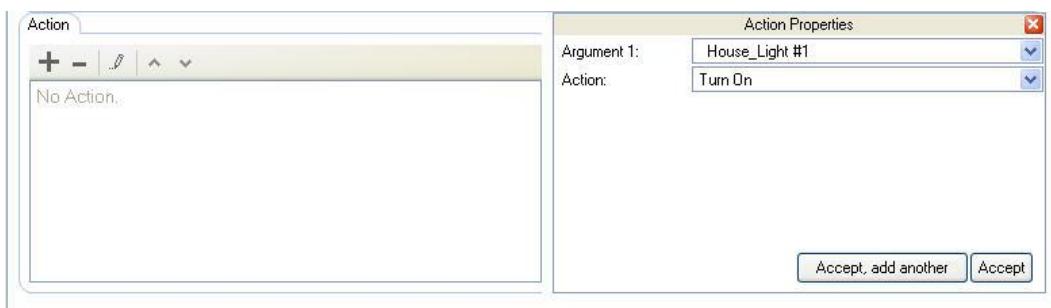
### Creating and Running a Schedule

#### Defining the Action

The second tab on the **Add Condition & Action** window is used to define the Action that occurs when the arguments in the Condition tab are satisfied. The Action Properties are assigned in the same way as the Condition Properties. Click “+” to open the Action Properties window and complete the form as follows:

1. **Argument 1:** Click the pull down list and select **House\_Light #1** or any output that you would like to turn ON at the start of the schedule using the label that you assigned when configuring the environment. The next line appears automatically.
2. **Action:** The list of options will change with the object class in Argument 1; e.g. outputs, variables, timers, etc. For an output such as the house light the options include:
  - **Turn On** – The Output remains ON until turned OFF by another Condition or the Schedule ends.
  - **Turn Off** – The Output remains OFF until turned ON by another Condition.
  - **Pulse** – Set pulse time (to Constant) in milliseconds. Ideal for most Reward Dispensers or other pulsed devices. ABET II times a single pulse with no additional action needed. Other options include Pulse to a Variable value or a List value.
  - **Pulse for Count** - Use to send multiple pulses. Set the number of pulses, pulse time (ms) and inter-pulse time (ms). Ideal for foot shock or multiple rewards.
  - **Flash for time** – Similar to **Pulse for Count**. Instead of counting a number of pulses this allows you to set the total stimulus Duration (ms), as well as the Flash ON time (ms) and Flash OFF time (ms).
  - **Start Flash** – A one step set up for a flashing stimulus. Set Flash ON time (ms) and Flash OFF time (ms). The flashing output continues to flash until the Schedule ends or a Stop Flash action is given by another Condition.
  - **Stop Flash** – Turns OFF a flashing light. It can also be used to abort the “Flash for Time” action.

Select **Turn On** from the Action List.



3. **Accept:** Click **Accept** or type **Ctrl-S** when you are satisfied with your selections. You may revisit any selection in the Action Properties window as many times as needed to complete this form. You may also reopen the Action Properties window at any time by clicking the Edit Icon on the Action Tab.
4. (Optional) Click **Accept Add another** or type **Shift-Ctrl-S** if a second stimulus output is available. Set it up to flash for 30 seconds (30000 ms).

## Tutorial #1

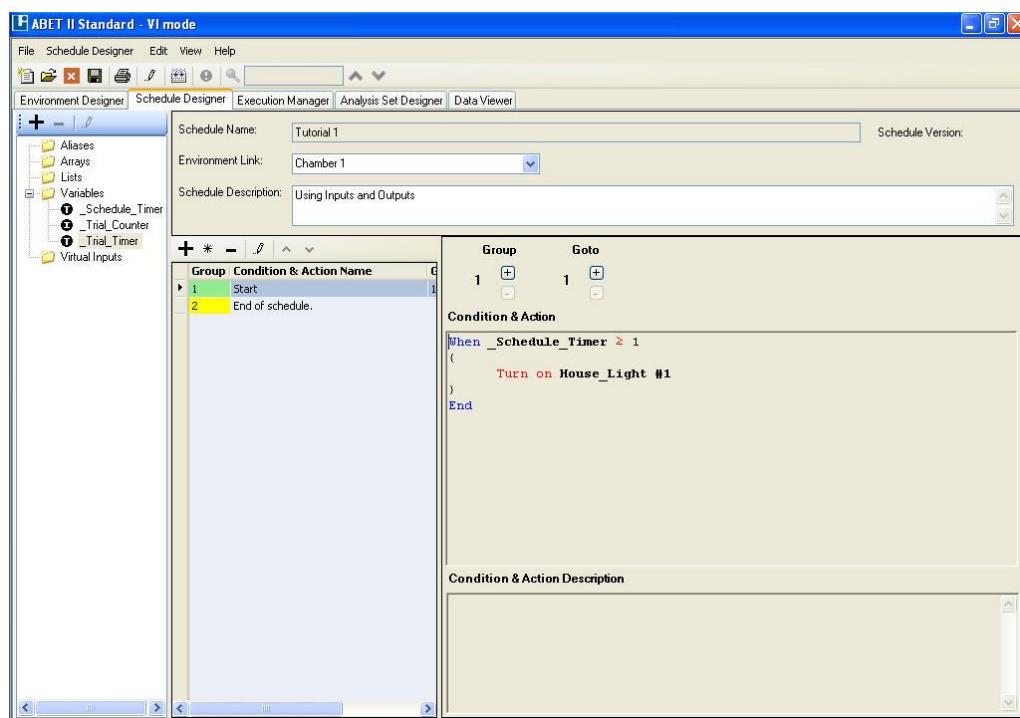
### Creating and Running a Schedule

**Note:** If in Step 4 above you clicked **Accept, add another**, the condition as written will be added to the “Condition & Action Name” list as before, however the **Add a Condition & Action** window will remain open with all entries preserved. This is an extremely useful feature if you are creating several almost identical conditions. You can simply **change the name**, edit just the detail to change and click **OK, add another** as many times as needed. You can also click **Clear All** for a blank Condition & Action form.

#### 5. Click **OK** to close the **Add a Condition & Action** window

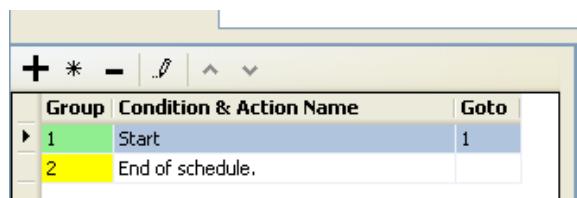
**Note:** A number of shortcuts are listed at the bottom of the Add a Condition & Action form. They allow you to add the feature listed to an action as needed without closing the form and returning to the master workspace.

The condition name is now displayed in the center of the Schedule Designer work space. Highlight the Start Condition if necessary to display the Condition & Action code detail as well as any text that you entered in the Description area of the “Add Condition & Action” window.



### Condition & Action Tool Bar

A tool bar is provided for working with Conditions after they have been added to the schedule list. As you can see many of these symbols are common to several areas to make it easier to learn and use ABET II.



## Tutorial #1

### Creating and Running a Schedule

- Plus = Add/Define a new Condition & Action.
- Star = Insert a new Condition & Action above the Condition & Action that is highlighted when the star is clicked. Like the Plus tool, this will open a blank “Add Condition & Action” form.
- Dash = Remove the Condition & Action that has been highlighted.
- Pencil = Edit the Condition & Action that has been highlighted.
- Up Arrow = Move the highlighted Condition & Action up on the list.
- Down Arrow = Move the highlighted Condition & Action down on the list.

**These tools will be used as we progress with the completion of the schedule.**

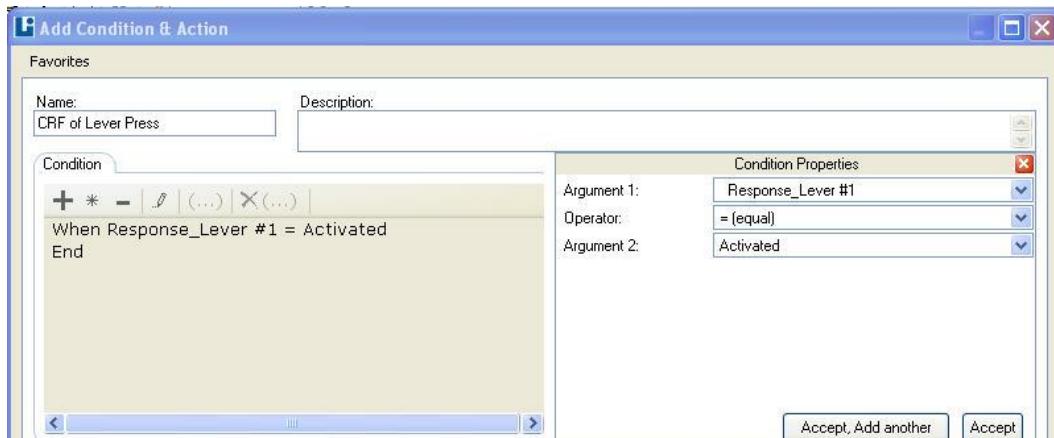
### Adding a Second Condition

Adding a second condition to this schedule follows the same procedure described above. Start by clicking the “+” tool above the **Group|Condition & Action Name|GoTo** work space (#4 described on page 18 and shown on page 19).

We will add a condition to pulse a stimulus light for 1 second and a reward device for 50 ms for each response. This will simulate a CRF Schedule of reward with a Pellet Dispenser.

The following steps are required.

1. Define the Condition as shown:

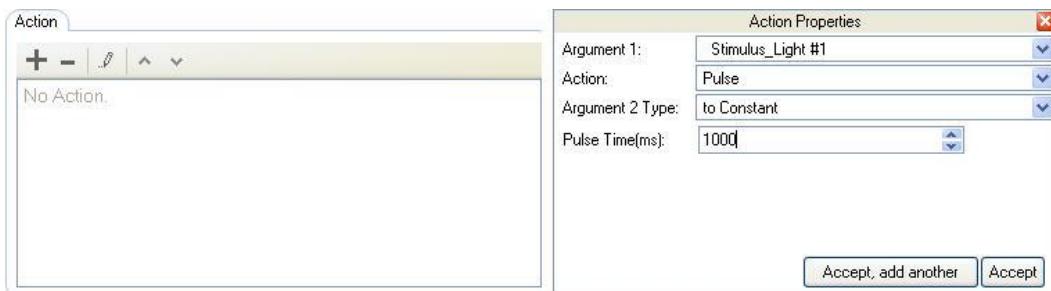


The screen shots show usage of ‘Activated’ for the ‘state’ of the input, i.e. Response\_Lever #1. However earlier we discussed using ‘Transition On’. The explanation for why and when to use these to qualifiers can be found in [[Working with Non-Latched Hardware](#)] in the Advanced ABET II Features, Tools and Concepts section of this manual. The usage of Transition On works equally well with both types of interface hardware, Latched and Non-Latched, and so should be used for this tutorial.

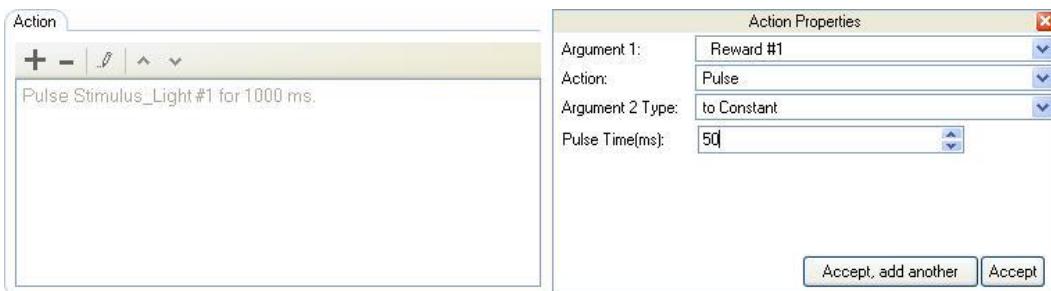
## Tutorial #1

### Creating and Running a Schedule

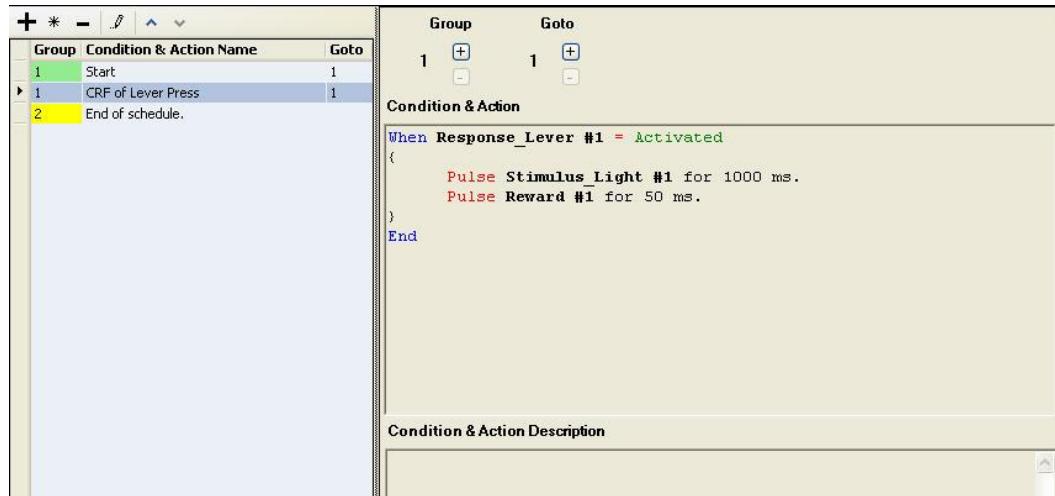
2 Define the first Action as shown:



3 Add a second Action as shown:



Click **OK** and check that the second condition contains the following. Use the Pencil tool if needed to reopen the condition and edit as needed. When satisfied proceed to the next section.



#### Notes on using the Pulse Action:

The pulse action above is just another feature that simplifies programming with ABET II. For short time intervals such as activating a pellet dispenser use Pulse. A pulse of 50ms is ideal for the Lafayette Instrument Co. and Campden Instruments dispensers. The pulse value may be set to a constant as shown above as well as to a variable or list value.

## Tutorial #1

### Creating and Running a Schedule

The pulse action is designed for relatively short intervals. For other timing needs we will use a variable timer that can be Started, Stopped or Reset with separate Actions. This will be covered in Tutorial #3.

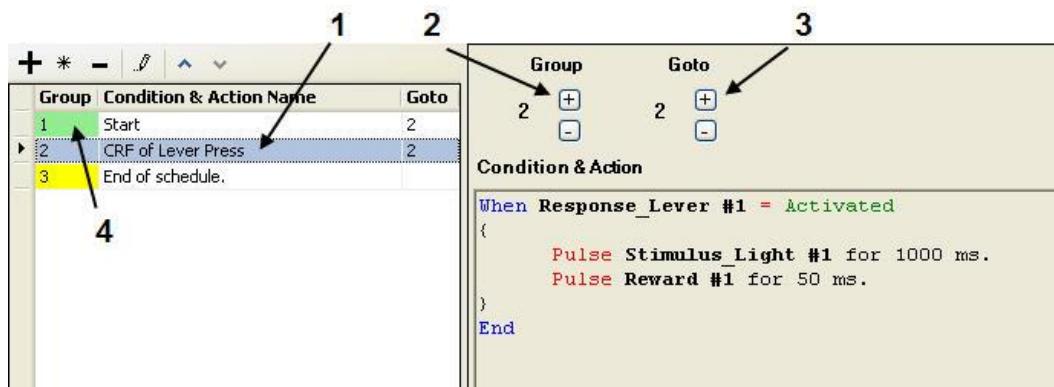
#### Groups and the Goto Function

Only one group is active at a time; however all the conditions in the same group are processed “simultaneously”. Transition to a new group is prioritized from the top down, however the transition does not take place until each condition in the group requiring an action is executed. This is an important concept to remember when organizing multiple conditions in a group. The number of conditions that can be created is virtually unlimited; however prudent use of all the ABET II features and good programming logic will keep the number to a minimum.

If the schedule Tutorial 1 was run as shown, it would not complete the task as anticipated. This is because each time a condition is satisfied, the action argument is executed, and the Goto directs the schedule to either remain in the same group or to transfer control to a new group. It is also important to remember that ABET II time stamps and stores every action that occurs while the schedule is running. If left as written, Tutorial 1 would continuously cycle in the Start condition repeating each action and storing the data elements perhaps several times each millisecond (depending on the speed of the processor). This would not only create an inordinate amount of useless data, it would also prevent the system from ever recording a response and issuing a pulse to the stimulus light and reward device.

#### Editing Group & Goto settings

1. Highlight the “CRF” condition if it is not already displayed with a blue background.
2. Change the Group value for this condition to “2” by clicking the plus for **Group**. **Note**, as soon as the condition is assigned to Group “2” the End of Schedule Group automatically changes to Group “3”.
3. Change the Goto Value for the “CRF” condition to “2”



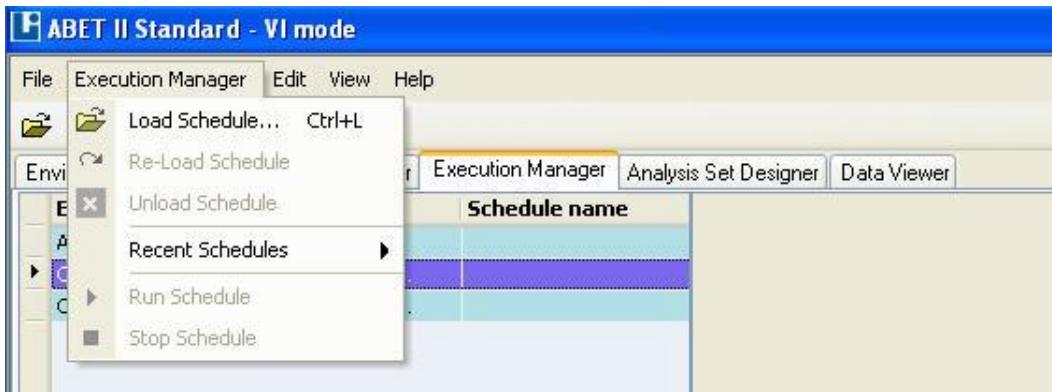
4. Highlight the Start Condition and change the Goto to Group “2”.
5. The final display should now appear as shown above with a complete schedule that begins in Group 1, turns ON a House Light, transitions to group two and waits for a response. Each response pulses a stimulus light and a reward device. The schedule remains in this state or group until the schedule is ended. A separate command to turn the house light OFF is not required as ABET II automatically turns all outputs OFF at the end of a schedule.

## Tutorial #1

### Creating and Running a Schedule

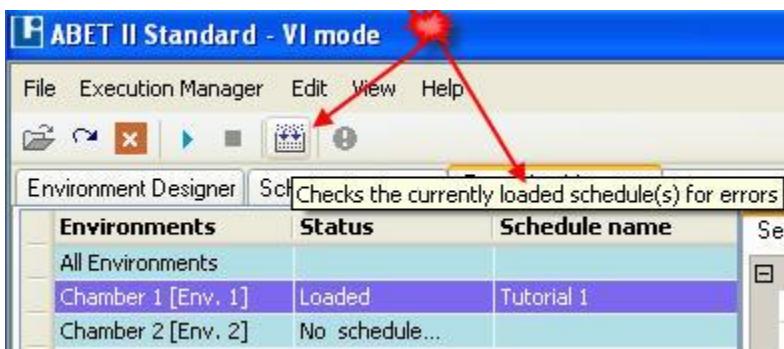
#### The Execution Manager

The Execution Manager tab and pull down menu are used to run schedules and collect data.



- Load Schedule      Loads a single environment, all environments, or selected environments with the same or separate schedules.
- Reload Schedule      Reruns a loaded schedule. Session variables are retained but may be changed/updated by the user before starting/running the schedule.
- Unload Schedule      Removes a schedule from the environment. Note: A loaded schedule cannot be edited. A new schedule cannot be loaded until the previous schedule is unloaded.
- Recent Schedules      A shortcut to the most recently loaded schedules
- Run Schedule      Active only after a schedule is loaded. Same as the **Play** Icon
- Stop Schedule      Active only after a schedule is “running”. Same as **Stop** Icon.

Each of the above functions is also represented along the tool bar except for the **Recent Schedules** option. In addition the tool bar offers a direct path to an error check feature as shown below. This does not check for logic errors. It is a check that the schedule being loaded is compatible with the environment configuration. For new installations this is generally not an issue. This check is made automatically each time a schedule is loaded. If there are errors they will appear at the bottom of the window. Use this tool to recheck as corrections are made.

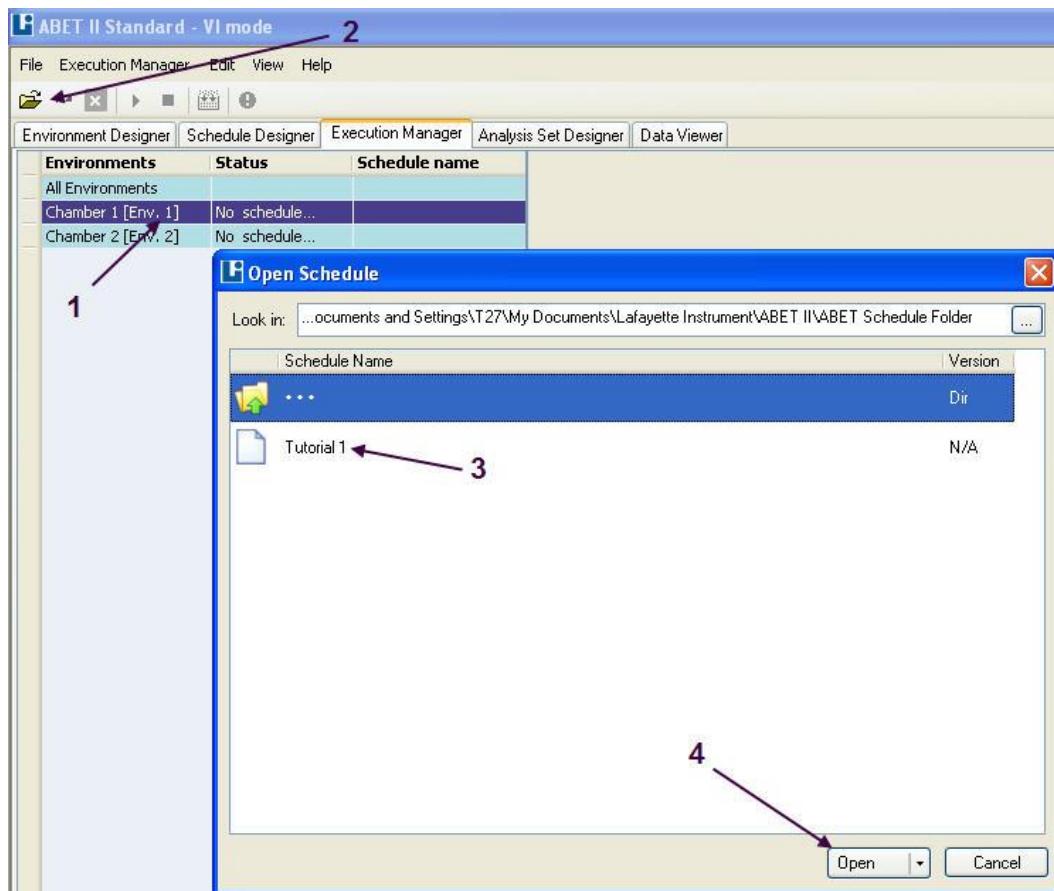


## Tutorial #1

### Creating and Running a Schedule

#### Loading a Schedule:

- 1) Click/Highlight Chamber 1. Multiple chambers may be loaded with the same schedule by selecting “All Chambers” at the top of the list.
- 2) Click the Load Schedule Icon. Other options include using “Load Schedule” from the pull down menu or the Ctrl+L shortcut.
- 3) Select Tutorial 1 from the Open Schedule Window
- 4) Click Open to complete this task.



**Note:** By default the Environments/Status list is ordered by Environment Number. These can be resorted in ascending or descending order by Environment Name or Schedule Name by clicking in the “Environments” or “Status” label boxes respectively.

The Chamber Status has now been updated to reflect the loaded schedule. The right hand portion of the window contains several new tables under the Session Tab. Each table may be contracted or expanded with the small +/- box to the left of the table heading.

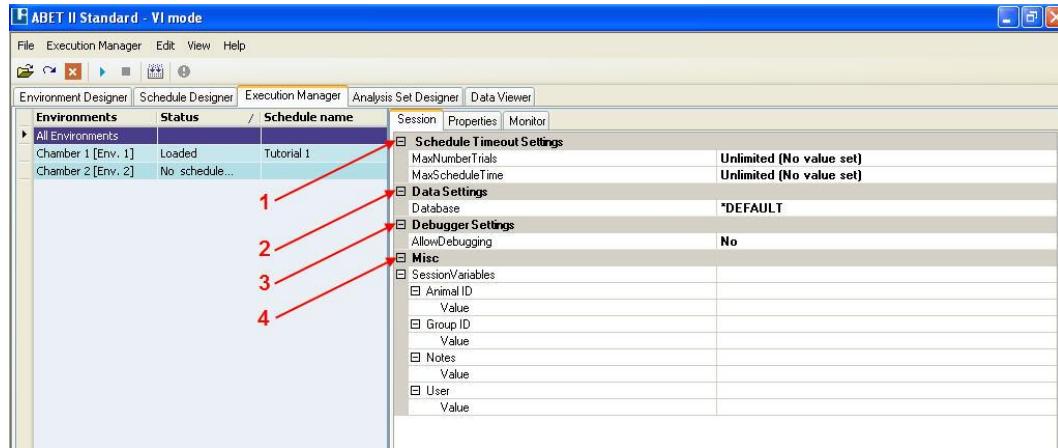
The Session Tab is covered next. The Properties and Monitor tabs will be covered later in the manual.

## Tutorial #1

### Creating and Running a Schedule

#### The Session Tab

The session tab is found on the right side of the screen and is divided into several sections or tables as shown and detailed below.



1. **Schedule Timeout Settings:** A maximum number of trials to run and/or a maximum schedule time to run may be entered after the schedule is loaded. These settings run concurrent with any schedule **Goto** that transitions to the **End of Schedule** as part of a Condition Action. The factory defined variable “Trial\_Counter” must be used in the schedule and incremented for the Max\_Number\_Trials function to work. These settings will be used in later tutorials and may be left set to **Unlimited** for the present session. The default value may be changed with a **Preference** setting. See [[Preferences - General](#)]
2. Database Settings. A **Default** file is provided automatically and appears as shown automatically. Once additional databases are created, this space will be blank with a pull down tool and menu on the right. In this case a database file must be selected before a schedule session may be run. Creating and operating multiple databases is covered in the advanced section of the manual.
3. Debugger Settings. See “[Using the ABET II Debugger](#)” for details. Leave this setting at “No” for now.
4. Session Variables. Data may be entered in the value cells that will become a part of the permanent data file. A few factory labels are provided. These may be deleted, edited, and added to via the system preferences utility. See [Preferences](#) for more information.

## Tutorial #1

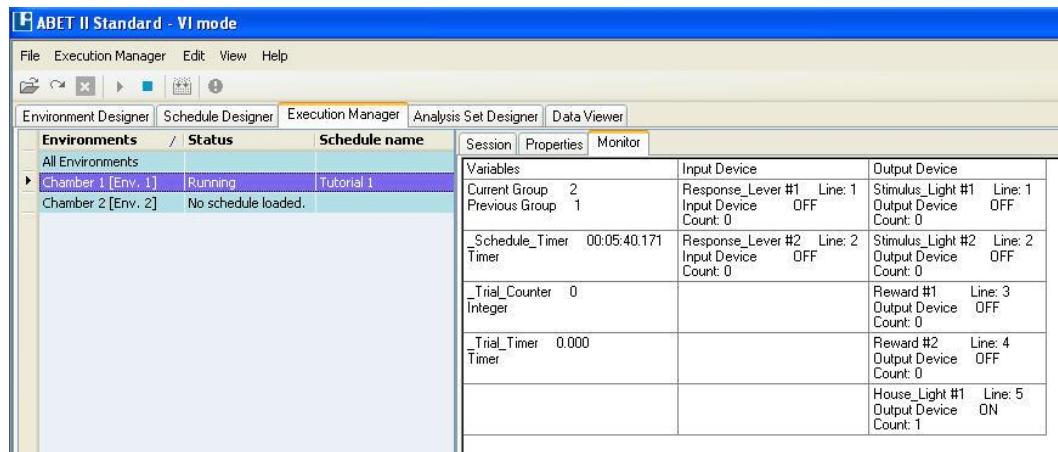
### Creating and Running a Schedule

#### Running the Schedule

Execute the schedule by selecting “Run Schedule” from the pull down menu or clicking the **Play/Run** Icon. It may take a few seconds for ABET II to compile and load the schedule and initialize a new session record in the database. The **Stop** Icon and menu selection is now active, the Environment Status has switched from **Loaded** to **Running** and the right hand section of the window has switched to the **Monitor** tab. If an error occurs a window will appear at the bottom of the screen with additional information. See [[Run Time Errors](#)] in the advanced features section of this manual for details.

#### The Monitor Tab

The schedule should now be running successfully with a monitor window as shown below.

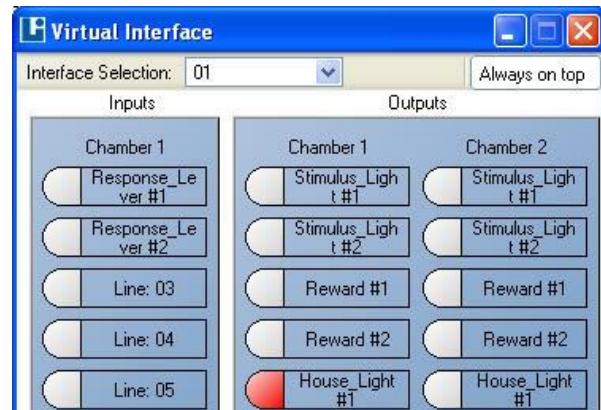


**Variables:** The Current Group is displayed as Group 2. When a transition is made between groups, the Current Group value is shown in “Previous Group” and the Current Group updated. The Schedule\_Timer is updated in decimal seconds. The display of user defined variables is optional and will be covered in subsequent sections.

**Input Device:** All inputs defined in the Environment Manager are listed. Since update is not in real time, a burst of responses may only register one ON/OFF cycle.

**Output Device:** All outputs defined in the Environment Manager are listed. Since update is not in real time, the cycling of a flash output, for example, will be slower than the actual flash rate seen in the environment. Note that the status of the House\_Light#1 above is ON.

If you are running with hardware the “House Light” should be on. If running a VI (Virtual Interface) it will appear as shown here.



## Tutorial #1

### Creating and Running a Schedule

Depress the response lever several times or click the Response\_Lever symbol on the VI to simulate a response. Each response will pulse the stimulus light for 1 second and the reward for 50 ms. VI times may be different. You will also see these actions reflected on the Monitor tab of the Execution Manager, but again this is not in real time. Only with several rapid responses may the status of the Stimulus Light and Reward change to ON. Example displays are shown below.



### Ending a Schedule Session

You may end a session manually at any time by clicking the **Stop** icon on the Tool Bar or selecting **Stop** from the Execution Manager pull down menu. Stop is irreversible. Data up to that point will be saved.

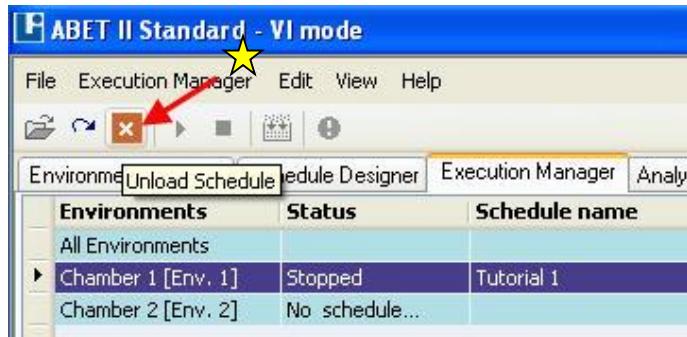
**Reload:** As soon as Tutorial 1 has timed out (finished), the status line is updated. The RUN Icon is no longer active, but the Reload Icon (curved arrow) is. To run Schedule Tutorial 1 again, simply click Reload followed by Run, or use the associated selections on the Execution Manager pull-down menu.



## Tutorial #1

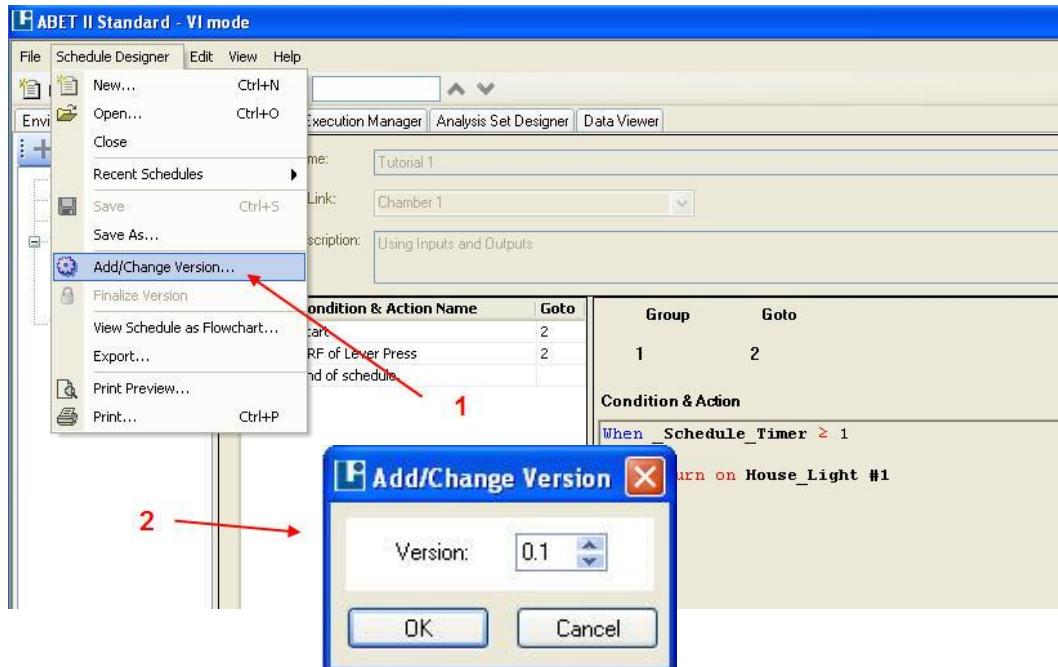
### Creating and Running a Schedule

**Unload:** If you want to change schedules, you must “Unload” the currently loaded schedule. Simply click the Unload Icon (X in a red box) as needed. You can view a currently loaded schedule, by clicking the Schedule Designer tab and opening the schedule in the “Read Only” mode.



**Note:** If you open a schedule in the Schedule Designer that is loaded it will open in the **Read Only** mode and all editing tools will be removed. To make schedule changes, you must first **Unload** the schedule in Execution Manager and then **Open** it in Schedule Designer.

An optional approach to editing a schedule that is running is to open in **Read Only** mode and then change the version number. Select **Add/Change Version (1)** from the Schedule Designer Menu and click **OK (2)** to accept the new version number. This will automatically activate the editing tools. Changes will be saved to the new version only and will leave the original schedule unchanged.

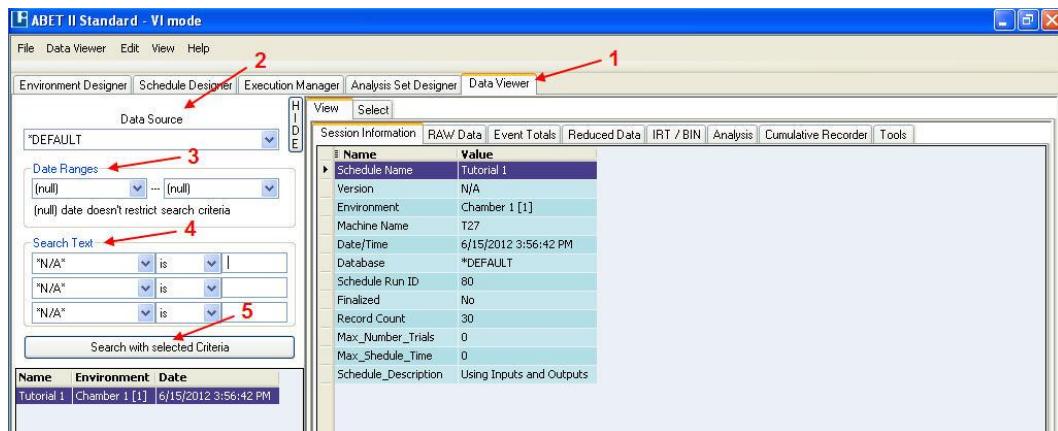


## Tutorial #1

### Creating and Running a Schedule

#### The Data Viewer Tab

- 1 Click the **Data Viewer** tab to reveal the mostly blank screen below. The Session List will have one or more sessions listed depending how many times you ran the Tutorial 1 Schedule. As this list is populated you may order the list by Name, Environment or Date/Time by simply clicking on the header.
- 2 **Data Source.** The Data Viewer allows you to draw data from one or all databases. If multiple databases are used, select All Connections or the specific database desired. In this case the Default database is selected.
- 3 **Date Ranges.** The sessions to select may be filtered by the date run. For present purposes this has been left at (null).
- 4 **Search Text.** Up to three filters may be used to select files based on Schedule Name, Environment, Version, Subject ID or other Session Variable defined prior to running the schedule. These are detailed in a later section. See note at end of this section and [Data Viewer Detailed Information](#).
- 5 **Search with Selected Criteria.** Click this bar with no search criteria specified. Each schedule run and entered into the database will be listed with the Schedule Name, Environment and Date & Time. Click the Name, Environment or Date Fields to sort on that field. Information displayed on the right will be for the highlighted session.



**Session Information:** The first tab displays the following information along with those session variables that have been filled. Blank session variables will not be displayed.

Schedule Name:	Tutorial 1
Environment:	Chamber 1 [1]
Machine Name:	(Allows you separate data when multiple computers are networked to a common database.)
Date/Time:	The Date and Time the Schedule was started.
Database:	Default
Schedule Run ID:	(Generated by ABET II to link elements in the database to this record)
Finalized:	A Finalized Schedule is locked and cannot be changed
Record Count	The number of entries in the Raw Data List. Note the label Unknown may appear until the Raw Data Tab has been clicked and the data scanned.
Max_Number_Trials	The value of this session property when used
Max_Schedule_Time	The value of this session property when used
Schedule Description	Any optional descriptions entered for this schedule

## Tutorial #1

### Creating and Running a Schedule

#### The RAW Data Tab

Click the RAW Data tab. Each Row of this table contains the time stamp of each individual schedule event. Events may be identified by and/or sorted by an event ID, Event Name, Item Name (a sub group within the same Event Name) or Group ID. Variable Values are also provided.

Session Information									RAW Data	I/O Totals	IRT / BIN	Stored Data	
Evnt_Time	Evnt_ID	Evnt_Name	Item_Name	Group_ID	Num_Args	Arg1_Name	Arg1_Value	Arg2_Name	Arg2_Value	Ar	Ar	Ar	Ar
0	0	Schedule Startup Event	(SYSTEM)	0	0	Value		0					
0.043	1	Condition Event	Start	0	0								
0.043	3	Output On Event	Stimulus_Light #1	0	0								
0.043	11	Flash Output Start Event	Stimulus_Light #2	0	2	On-Time		0.5	Off-Time				
0.043	21	Group Change Event	Group Change	0	1	New Group		2					
30	1	Condition Event	Wait	2	0								
30	21	Group Change Event	Group Change	2	1	New Group		3					
30.001	16	Variable Event	_Schedule_Timer	3	1	Value		30.001					
30.001	16	Variable Event	_Trial_Timer	3	1	Value		0					
30.001	9999	Schedule Shutdown Event	(SYSTEM)	3	0								

#### Copying or Exporting Raw Data:

Highlight part or all of the table using standard Windows techniques (Click for a single row, Shift Click/Arrow Down/Page Down for connected rows, Ctrl+Click for non-continuous rows. The shortcuts Ctrl+A can be used for “Select All” and Ctrl+C for copy. Use the right click function on your mouse to produce a menu of options for copying or exporting this data. Copy/Paste produces a tab delimited text. Export produces a saved file in .csv or .txt formats with or without session information.

Select all rows Ctrl+A  
 Copy all rows  
 Copy selected rows Ctrl+C  


---

 Export all rows to file with Session Info  
 Export all rows to file  
 Export selected rows to file with Session Info  
 Export selected rows to file  


---

 Refresh Data

Session Information									RAW Data	I/O Totals	IRT / BIN	Stored Data	
Evnt_Time	Evnt_ID	Evnt_Name	Item_Name	Group_ID	Num_Args	Arg1_Name	Arg1_Value	Arg2_Name	Arg2_Value	Ar	Ar	Ar	Ar
0	0	Schedule Startup Event	(SYSTEM)	0	0	Value		0					
0	16	Variable Event	_Schedule_Timer	0	1	Value		0					
0.052	1	Condition Event	Start	0	0								
0.052	3	Output On Event	Stimulus_Light #1	0	0								
0.052	11	Flash Output Start Event	Stimulus_Light #2	0	2	On-Time		0.5	Off-Time				
0.052	21	Group Change Event	Group Change	0	1	New Group		2					
7.6	16	Variable Event	_Schedule_Timer	2	1	Value		7.6					
7.6	16	Variable Event	_Trial_Timer	2	1	Value		0					
7.6	9999	Schedule Shutdown Event	(SYSTEM)	2	0								
7.6	16	Variable Event	_Schedule_Timer	2	1	Value		7.6					
7.6	16	Variable Event	_Trial_Timer	2	1	Value		0					

## Tutorial #1

### Creating and Running a Schedule

#### The Event Totals Tab

Click the **Event Totals** tab to view the total number of occurrences of each **Event\_Name** in the Raw Data sheet. For Tutorial 1 this includes the Variable Events, Group Change Event, Output On Event, Input Events, Pulse Output Event, Condition Event and Pulse Output Event. Note that even though Response Lever #2 was never used in the Tutorial 1 schedule, a count of these responses is automatically recorded should they occur.

A screenshot of a software interface showing the 'Event Totals' tab selected. The table contains the following data:

Evt_ID	Evt_Name	Item_Name	Alias_Name	Count
16	Variable Event	_Schedule_Timer		1
16	Variable Event	_Trial_Timer		1
21	Group Change Event	Group Change		2
3	Output On Event	House_Light #1		1
2	Input Event	Response_Lever #1		17
2	Input Event	Response_Lever #2		3
7	Pulse Output Event	Reward #1		17
1	Condition Event	Start		1
7	Pulse Output Event	Stimulus_Light #1		17

#### The Reduced Data Tab

1. Click the Reduced Data Tab to open the following screen that will be blank at the beginning. This selection allows you to select any sub set of the Raw Data display based on one or more Items And/Or Events.

A screenshot of the 'Reduced Data' tab. The interface includes a 'Run Query' button (3), a 'Reduced Data' tab (1), and a 'Query Builder' section on the left. The 'Query Builder' section has three dropdown menus: 'Item / Alias' (2), 'Event' (bottom), and 'Event Definition' (top). The 'Event' dropdown is expanded, showing items like 'Condition Event', 'Group Change Event', etc. The 'Item / Alias' dropdown is also expanded, showing items like '(SYSTEM)', '\_Schedule\_Timer', '\_Trial\_Counter', etc. A red arrow points to the 'Response\_Lever #1' item in the 'Item / Alias' list.

## Tutorial #1

### Creating and Running a Schedule

2. Click **Response Lever #1** on the Item/Alias List. Use the Shift Key to select a range of items or the Ctrl Key Click for individual selections on the same list. Data can also be reduced by one or more Events. The Boolean operators AND and OR can also be used to combine both Item/Alias and Event selections.
3. Click **Run Query** to populate the right side of the screen with the Event Time and all other information related to the selection made in Step #2.

### **IRT/BIN, Analysis, Cumulative Recorder and Tools Tab**

The four remaining tabs are introduced and explained later in this manual.

#### **IRT/BIN Tab**

An easy to use query for Inter-Response Times and/or the BIN distribution of IRT Times is provided. This feature is detailed in following Tutorial.

#### **Analysis Tab**

An analysis set must be developed before an Analysis can be run on collected data. The Analysis Set Designer is covered in Tutorial #6. Refer to the Table of Contents for the page number or [[Click Here](#)] to go directly to the start of Tutorial #6.

Additional Analysis information is provided in the Advanced Features Section of this manual. Refer to the Table of Contents for the page number or [[Click Here](#)] to skip to this page.

#### **Cumulative Recorder Tab**

The Cumulative Recorder Tab is covered in Tutorial #7. Refer to the Table of Contents for the page number or [[Click Here](#)] to go directly to the start of Tutorial #7.

#### **Tools Tab**

The Tools Tab is covered in the Advanced Features section of this manual. Refer to the Table of Contents for the page number or [[Click Here](#)] to skip to this page.

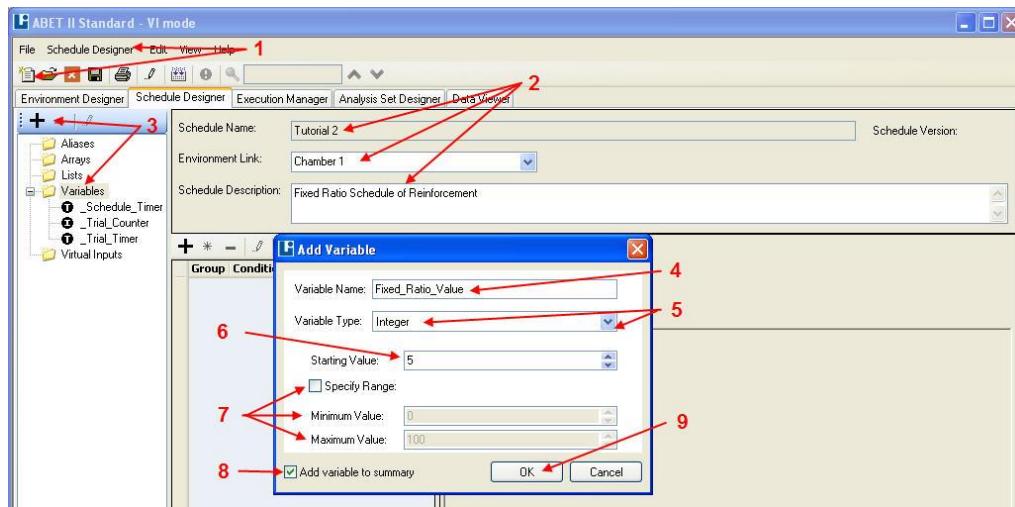
## Tutorial #2

### Building a Fixed Ratio Schedule

#### Building a Fixed Ratio (FR) Schedule

In this tutorial we will introduce using Variables and Aliases. Any schedule can be constructed in a number of different ways to accomplish the same outcome. We encourage you to experiment with ABET II to get a better feel for all its capabilities. As new Tutorial exercises are introduced, screens shown previously may not be repeated. Please refer back to earlier tutorials if needed.

1. Use the New Schedule Icon, **New** from the Schedule Designer pull-down menu, or the **Ctrl+N** short cut to open the **New Schedule** window (Shown in Tutorial 1).
2. Enter Schedule Name: **Tutorial 2** and Environment Link **Chamber 1** as well as an optional Schedule Description if you like such as, **Fixed Ratio Schedule of Reinforcement** as shown.



#### Defining a Counter Variable

3. Highlight **Variables** and Click the “+” Icon to open the **Add Variable** window as shown.
4. Enter a Variable Name. This name will be used to construct Condition arguments and will appear in data displays and files. Recommended: Fixed Ratio Value. Spaces will automatically be filled in with an underscore.
5. Select the Variable Type **Integer** from the pull down list. Other options include:
  - **Integer** is used primarily for counters. Use a Decimal if decimal math will be required.
  - **Decimal** is used for most interval values in schedules (fixed interval), inter-trial intervals, reward or punishment times, trial times, etc.
  - **Boolean** is used as a schedule, trial, or response flag. Evaluates True or False.
  - **Timer** includes default variables \_Schedule\_Timer and \_Trial\_Timer; however, you may add as many timers as needed to properly execute your schedule.
6. Enter a starting value for the Fixed\_Ratio\_Value. The value 5 was used here.
7. It is possible to limit the range of any Variable that may be changed by the user, by animal responses or by schedule conditions. Leave this empty for now. When needed simply check the **Specify Range** box and enter appropriate values. Applications include the limit of reward volume, drug delivery, shock intensity, maximum ratios or intervals, etc.
8. Check the **Add variable to summary** box if you want this value in the summary data display line while the schedule is running.
9. Click **OK** when satisfied with your entries. To edit any variable simply highlight the variable to be edited and click the Pencil **Edit** Icon. The Variable Type cannot be edited. Use the Delete “-“ Icon and re-enter the Variable Name with the correct Variable Type.

## Tutorial #2

### Building a Fixed Ratio Schedule

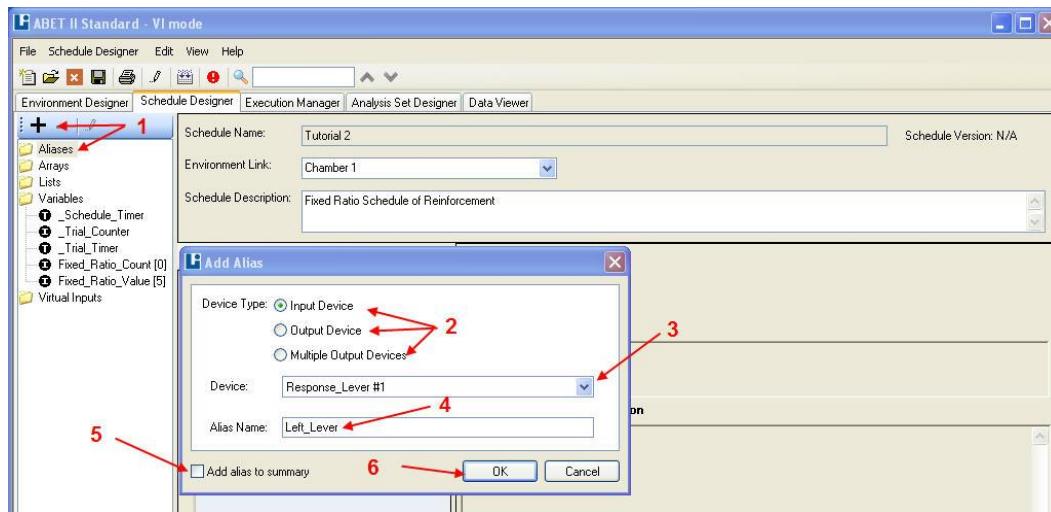
#### Adding a Second Variable

Repeat the above steps to add a second integer variable with variable name **Fixed\_Ratio\_Count** and a starting value of zero (0). This schedule will increment the count of this second variable and compare it to the value of the first variable. An alternative FR Schedule could be built that uses a single FR variable only that is decremented with each response until the value is zero (0). This technique is illustrated later in the tutorial.

#### Using the Aliases Feature

Using an Alias for Inputs and Outputs defined by the Environment Manager is strictly optional, but at times it can simplify schedule construction and clarify data files. So instead of Response #1 and Response #2 you might prefer Correct and Incorrect, Drug and Saline, FR and VR, or some other labels appropriate to your current schedule. This is also useful for sorting data and data analysis when balancing for a potential right/left bias. To use this feature proceed as follows.

1. Click (highlight) the Aliases Folder and the “+” Icon above the folders list to open the **Add Alias** window as shown.
2. Select **Input** or **Output** Device. A third choice **Multiple Output Devices** is a unique feature of ABET II. It allows you to assign a single variable name to multiple outputs. This is particularly useful if sending coded “tags” to other equipment for programmable shock amplitude, displaying stimulus patterns, or any multiple line control. LIC products with light intensity or color options, tone intensity or tone frequency selection are controlled by three lines with 7 binary selections, 001, 010, 100, etc. These may be controlled with an Alias or with the **Has Intensity** feature. Go to [[Using the Intensity Control Option](#)] in the Advanced Features Section of this manual for additional information.
3. Use the Device pull down menu to select the Environment Device to be assigned to this Alias.
4. Enter an Alias Name. This name will be used to construct Condition arguments and will appear in data displays and files. This lesson will use Left\_Lever, for Response\_Lever #1 and Right\_Lever for Response Lever #2.
5. Click the optional **Add alias to summary** box if desired. It has been left unchecked here.
6. Click **OK** when satisfied with all entries.



## Tutorial #2

### Building a Fixed Ratio Schedule

#### Completing the Fixed Ratio Schedule

In Tutorial 1 each group contained only one condition, but any number of conditions may be placed in the same group and will be acted upon “simultaneously”. The placement of the condition in a group does govern the order of execution. The transition to another group will be determined by the first condition that is satisfied as True at any given snapshot of the active group; however, the actions of **all True** conditions will be executed prior to switching groups. Go to [[How ABET II Processes Conditions and Groups](#)] in the Advanced Tools, Features and Concepts section of the manual for additional information.

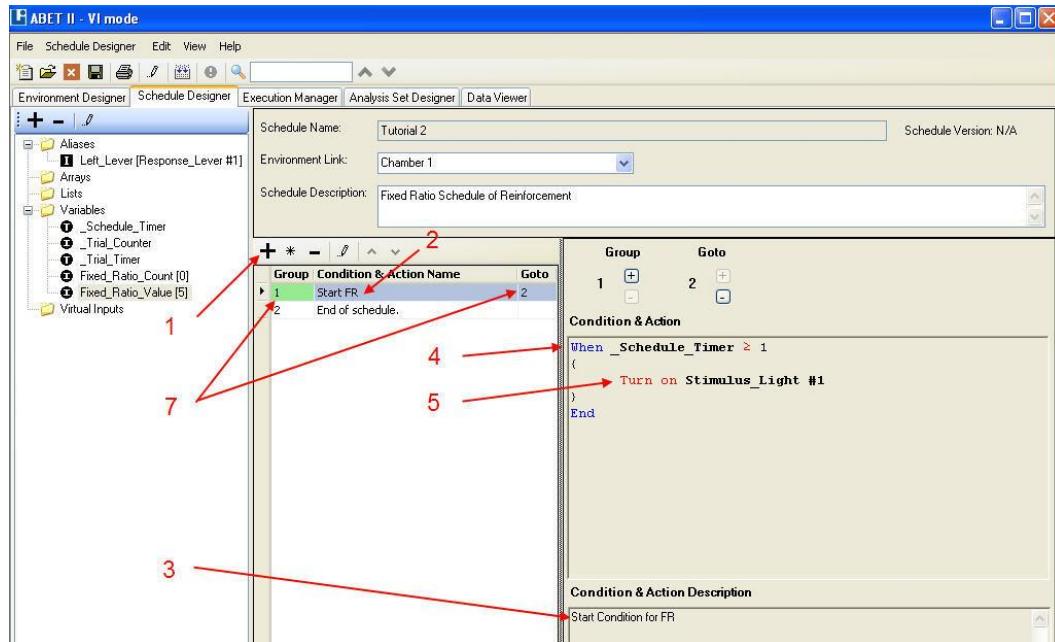
#### Build the first Condition

The Add Condition & Action form is not shown. The results are shown below. If using a retractable lever simply add a second **Turn On** action in Step 5 for the Lever Operate line.

1. Click the “+” icon to create the first Condition.
2. Assign a name to the condition. {Start FR} (If you prefer you can simply number your steps using FR 010, FR020, FR 030 etc. By using increments of 10 it is easy to insert new conditions if desired later in the schedule development process).

Add an optional Description { Start Condition for FR } This is particularly useful if using numbered steps.

3. Add the Condition Argument {Schedule\_Timer  $\geq$  0}
4. Add the Condition Action {Turn on Stimulus\_Light #1}
5. Click **OK (not shown)**
6. Place in Group 1 Goto Group 2

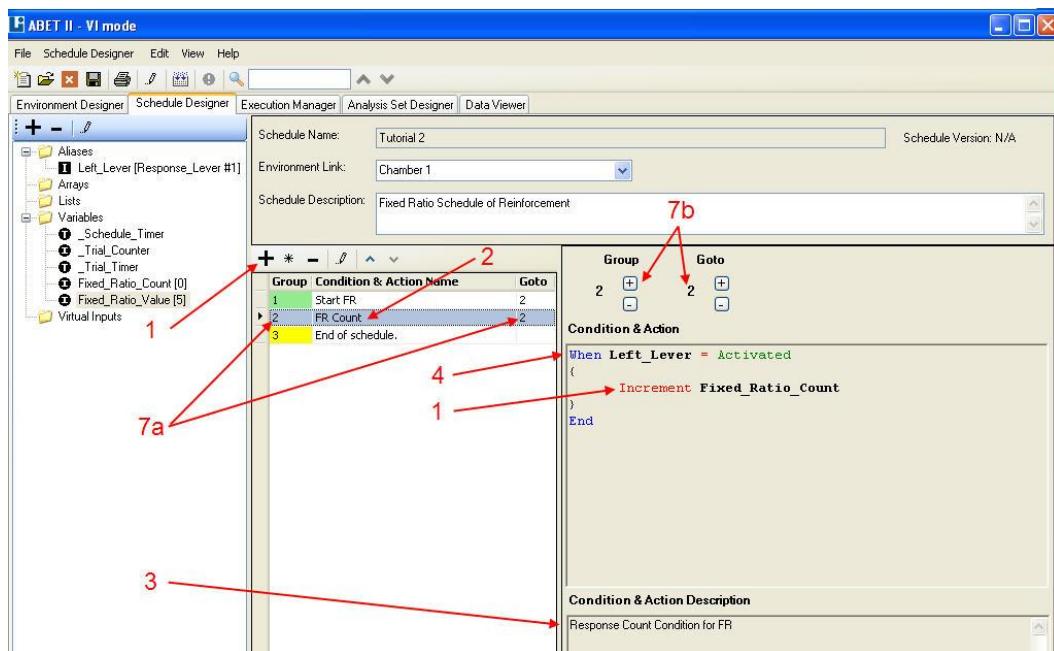


## Tutorial #2

### Building a Fixed Ratio Schedule

#### Build the Second Condition – Response Count

1. Click the “+” icon to open the **Add Conditions & Actions** form.
2. Assign a name to the condition. {FR Count}
3. Add an optional Description { Response Count Condition for FR }
4. Add the Condition Argument { Left\_Lever #1 = Transition On } Note, Argument 1 (Left\_Lever) was taken from the Alias List not the Input List; however, either one will work equally well.
5. Click **OK (not shown)**
6. Place in Group 2 Goto Group 2



The screen shots show usage of ‘Activated’ for the ‘state’ of the input, i.e. Left\_Lever #1. However earlier we discussed using ‘Transition On’. The explanation for why and when to use these to qualifiers can be found in [\[Working with Non-Latched Hardware\]](#) in the Advanced ABET II Features, Tools and Concepts section of this manual. The usage of Transition On works equally well with both types of interface hardware, Latched and Non-Latched, and so should be used for this tutorial.

## Tutorial #2

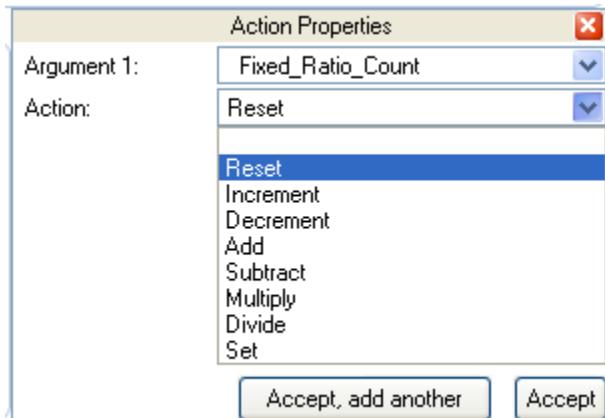
### Building a Fixed Ratio Schedule

#### Build the Third Condition – FR Evaluation

```
When Fixed_Ratio_Count = Fixed_Ratio_Value
{
    Pulse Reward #1 for 50 ms
    Reset Fixed_Ratio_Count
}
End
```

Place in Group 2 Goto Group 2

#### Variable Actions introduced for the Fixed Ratio Schedule,



**Reset:** Variables are defined with a “Starting Value”. In many cases this is zero, but it can be any value selected when the variable is defined. The **Reset** Action resets the value of the variable selected in Argument 1 to the “Starting Value”.

**Increment:** Increment increases the value of an integer or decimal variable selected in Argument 1 by the integer value of “1”. To increment by a decimal value see the **Add** action below.

**Decrement:** Decrement decreases the value of an integer or decimal variable selected in Argument 1 by the integer value of “1”. To decrement by a decimal value see the **Subtract** action below.

**Add:** The **Add** function is designed to add a Constant, Variable or List Value to the value of the variable selected in Argument 1.

**Subtract:** The **Subtract** function is designed to subtract a Constant, Variable or List Value from the value of the variable selected in Argument 1.

**Multiply:** The **Multiply** function is designed to multiply the value of the variable selected in Argument 1 by a Constant, Variable or List Value.

**Divide:** The **Divide** function is designed to divide the value of the variable selected in Argument 1 by a Constant, Variable or List Value.

**Set:** The **Set** function provides for 5 selectable Argument 2 Types.

## Tutorial #2

### Building a Fixed Ratio Schedule

**Set to Constant:** Changes the value of the variable selected in Argument 1 to the value defined in the Action Properties Window.

**Set to Random Constant:** Changes the value of the variable selected in Argument 1 to a random value between the “Min” and “Max” values entered in the Action Properties Window.

**Set to Variable:** Changes the value of the variable selected in Argument 1 to the value of the variable selected in Argument 2. The two variables must be of the same variable type.

**Set to Array:** Changes the value of the variable in Argument 1 to an Array value.

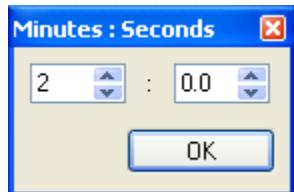
**Set to List:** Changes the value of the variable selected in Argument 1 to either the value of the list variable or to the value of the index number for the list variable. Get Next Value or Get Next Index selects a new list item according to the properties of selection used to define the list. Using the index in place of the value is particularly useful when trying to match items in prearranged multiple lists. You can draw the index randomly from one list while maintaining the matched pairs in separate sequential lists that do not change.

## Running the Fixed Ratio Schedule

With the running of the Fixed Ratio Schedule two more features of the Execution Manager will be introduced. Begin by Loading the “Tutorial 2 Schedule” as described in Tutorial 1, [Loading a Schedule](#) substituting “Tutorial 2” for “Tutorial 1” in Step 3.

## Using Max\_Schedule\_Time

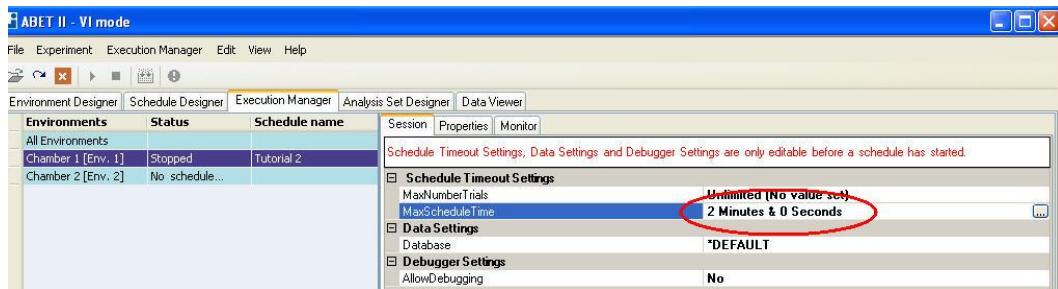
1. Click the Session Tab if not already activated
2. Locate the Find **MaxScheduleTime** under the Schedule Timeout Settings heading. The current setting is **Unlimited**. You can run schedules for unlimited periods of time using the Run and Stop icons as needed. For this example, click in the [No value set] cell.
3. The above click will reveal the radio button on the right hand edge of the column. Click this button to open the Minutes:Seconds box shown below.



Select the desired schedule time (2 minutes for this example) and click “OK” to close this window and enter the value in the Schedule Timeout Settings cell shown next. Click the “X” in the upper right corner to cancel this operation.

## Tutorial #2

### Building a Fixed Ratio Schedule



This schedule will now run for 2 minutes. In other schedules it will be possible to have a schedule condition and action with Goto **End of Schedule** that terminates the schedule prior to the Max\_Schedule\_Time if desired. You can also terminate on Max\_Number\_Trials when the \_Trial\_Counter Variable is appropriately incremented as an action to the condition that defines a trial.

#### [Max\\_Schedule\\_Time -- Alternative Entries](#)

Schedule times may also be entered directly in the Max\_Schedule\_Time cell. Simply highlight [No value set] and enter any of the follow to obtain the various times.

Entry	Value Set
3	3 Seconds
90	1 Minute & 30 Seconds
600	10 Minutes
3:0	3 Minutes & 0 Seconds
3 M	3 Minutes & 0 Seconds
3 Minute	Same
3 Minutes	Same
3 M 15 S	3 Minutes & 15 Seconds
3 Min 15 Sec	Same
3 Minute 15 Second	Same
3 Minutes 15 Seconds	Same

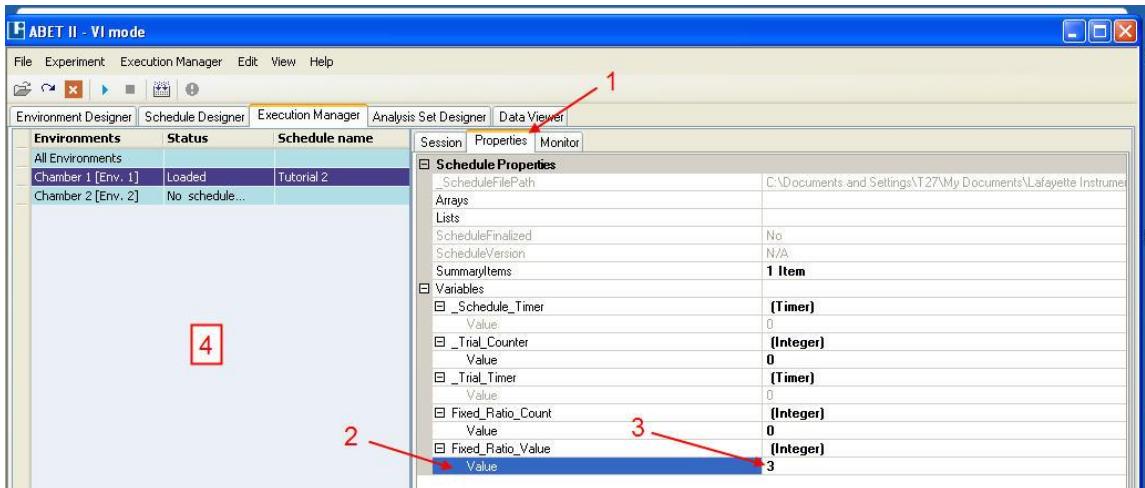
#### [Using the Properties Tab](#)

The Properties Tab lets you change the value of any variable value prior to executing the schedule. To illustrate this feature, we will change the Fixed\_Ratio\_Value from 5 to 3.

1. Click the **Properties Tab**
2. Click the **Value** Row under the Fixed\_Ratio Value label in either column to highlight the Fixed\_Ratio\_Value Label as shown.
3. Click in the value column and highlight or delete the variable value **5** and change it to **3**.
4. Click anywhere outside the cell or press Enter to accept the new value.

## Tutorial #2

### Building a Fixed Ratio Schedule



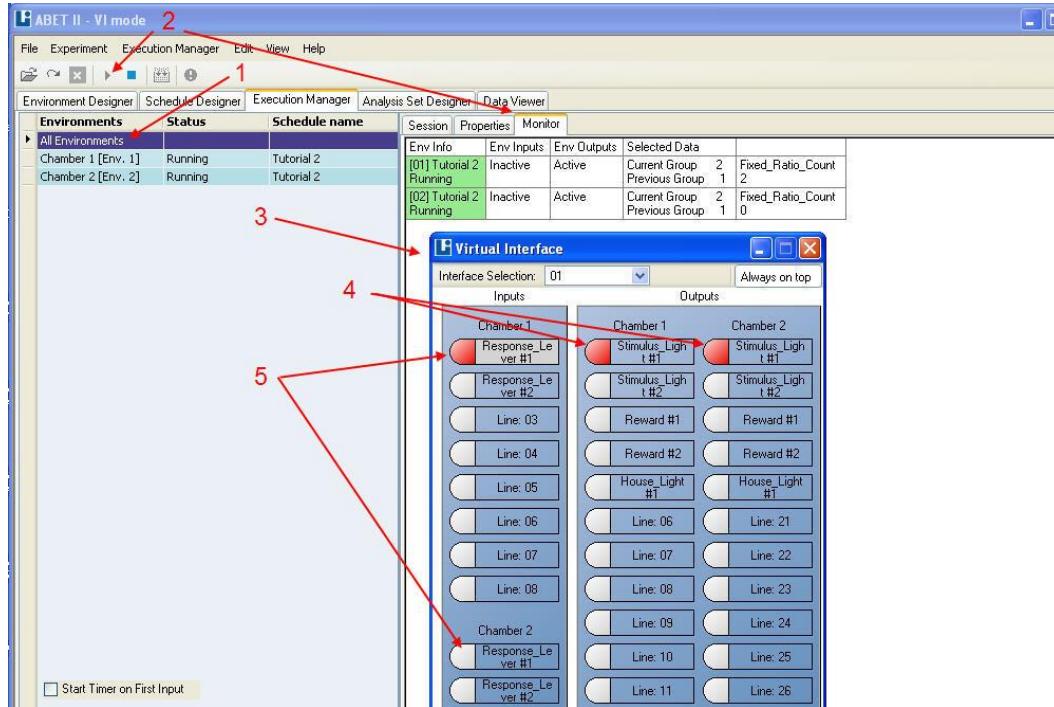
### All Environments Feature

1. Click All Environments, File Open and select Tutorial 2. In the example below both Chamber 1 and Chamber 2 have been loaded.
  - All Environments allows you to load a common schedule; enter max\_schedule\_time and/or max\_number\_trials; select a common database; update variable properties; and run multiple chambers with single entries. You can of course select a single chamber if one item needs to be changed and return to **All Environments** before clicking **Run**.
  - A single line monitor is generated when the all environments line is highlighted. The Input Devices, Output Devices, Aliases and user variables selected with the **Add to Summary** list will be displayed in the order specified in [\[Preferences - Execution Manager - Monitor Preferences\]](#)
2. To obtain a real time display of response count and reward count on a summary line, simply add a counter variable to the appropriate Action instructions. Counters limited to a specific group, trial time, or condition may also be added, but this is not mandatory. Any count can be easily extracted from the raw data or reduced data tabs, copied to Excel, or exported to a suitable statistical package. A Count Analysis Item may also be added to a data analysis set. See [\[Instance Counts\]](#) in the Analysis Set Designer section for additional information.
3. Click the **Play** Icon to reveal the Summary Monitor Screen.
4. If running with Virtual Environment the Virtual Interface image will also appear (Note, it may be necessary to click on the bottom tool bar to restore the VI to the image as shown)
5. The Stimulus Light Output for each chamber will appear ON.

## Tutorial #2

### Building a Fixed Ratio Schedule

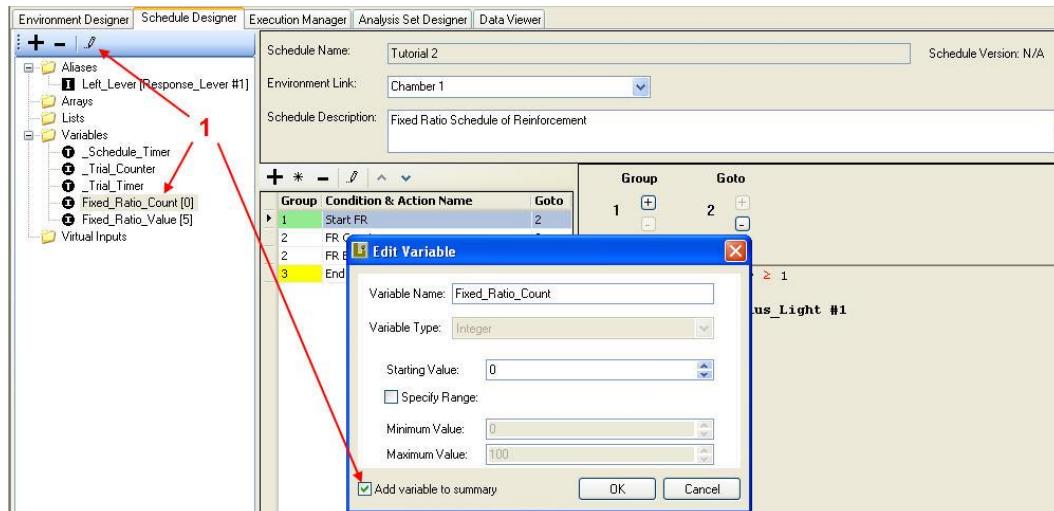
6. Click the Response Lever button for Chamber 1 and Chamber 2 to increment the Fixed\_Ratio\_Count. After 3 or 5 responses depending on the settings of Fixed\_Ratio\_Value the Reward #1 Output will flash and the Fixed\_Ratio\_Count will reset to zero. Because the display is not instantaneous, the last value of the ratio may never appear on screen, but can be verified in the raw data display.



### Editing the Single Line Monitor Display

The summary items on the Single Line Monitor can be edited from a number of different locations.

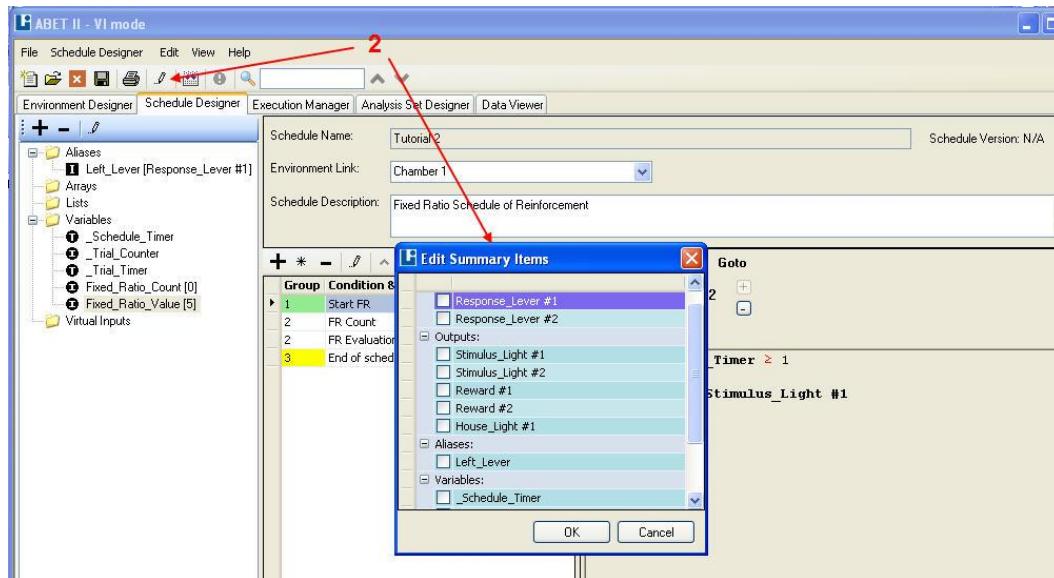
- When in the Schedule Designer, highlight an individual variable and click the edit icon. Check or uncheck the **Add variable to summary** option to change the setting created when the variable was first defined.



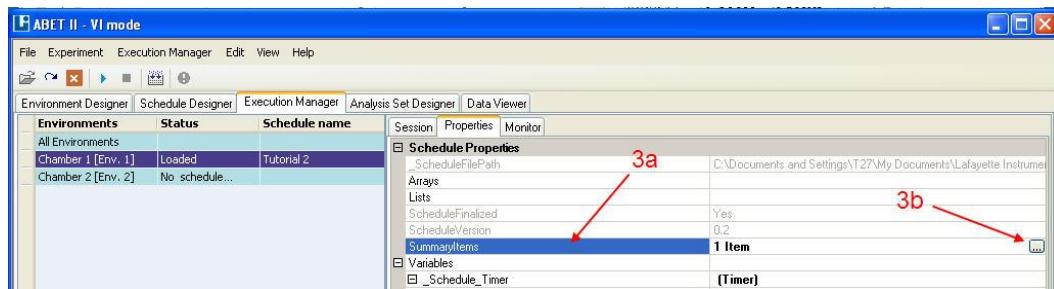
## Tutorial #2

### Building a Fixed Ratio Schedule

2. Click the Edit Icon at the top of the Schedule Designer window to reveal the Edit Summary Items table. This table lists all Inputs, Outputs, Aliases and Variables. Use the scroll bar to see all Items. Edit as needed and click **OK**.



- 3a Summary Items may also be edited in the Execution Manager from the Properties tab. Click anywhere on the **SummaryItems** Row to reveal the radio button.  
 3b Click this button to open the same **Edit Summary Items** table shown in method #2 above.

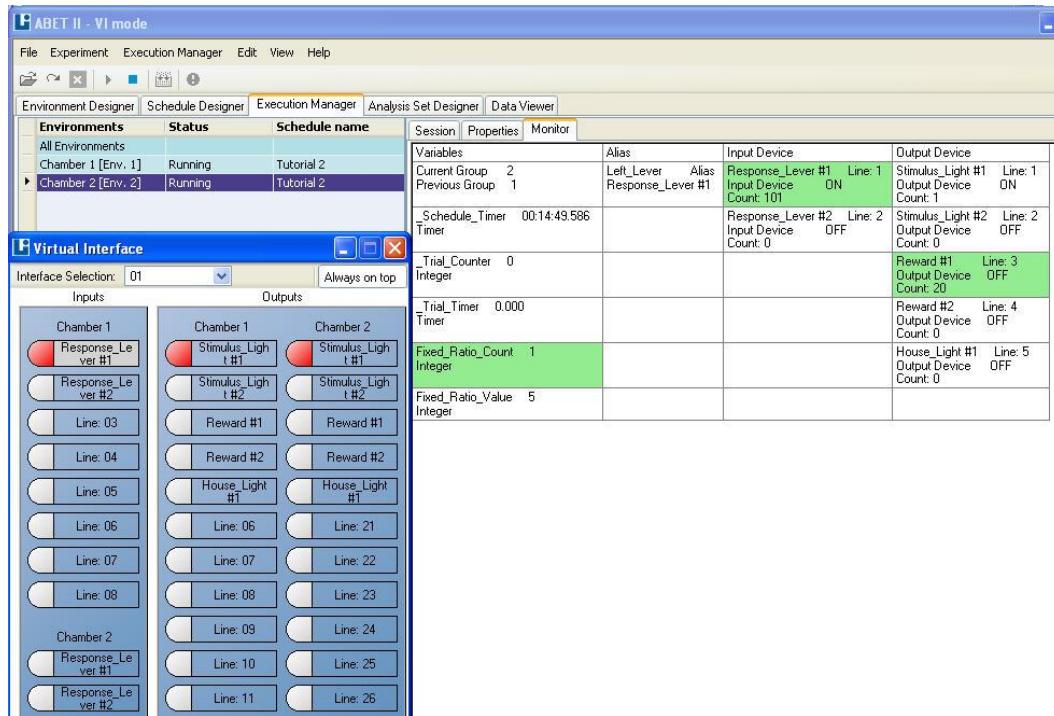


**Note:** Changes from the schedule manager are saved with the schedule, however changes from the Execution Manager are not saved unless part of an Experiment file. You can reload a schedule and the changes will be retained, but if a schedule is removed from the environment and re-loaded, it will revert back to the default schedule settings or Experiment settings.

## Tutorial #2

### Building a Fixed Ratio Schedule

#### The Single Chamber Display



This image shows all Variables, Aliases, Input Devices and Output Devices associated with Chamber 2. Individual cells will be highlighted when they are active; however since this is not in real time, some short events may not be highlighted.

Run Tutorial 2 a number of times using different schedule times as well as different ratios. Be sure to generate responses either from the virtual interface or from connected hardware as an animal might respond. Use slow, medium and fast response to get a distribution of inter-response times.

The schedule will automatically terminate at the Max\_Schedule\_Time set previously. If you followed the tutorial, this will be in 2 minutes.

#### Analyzing the Tutorial 2 Data – Displaying IRT's and BINS

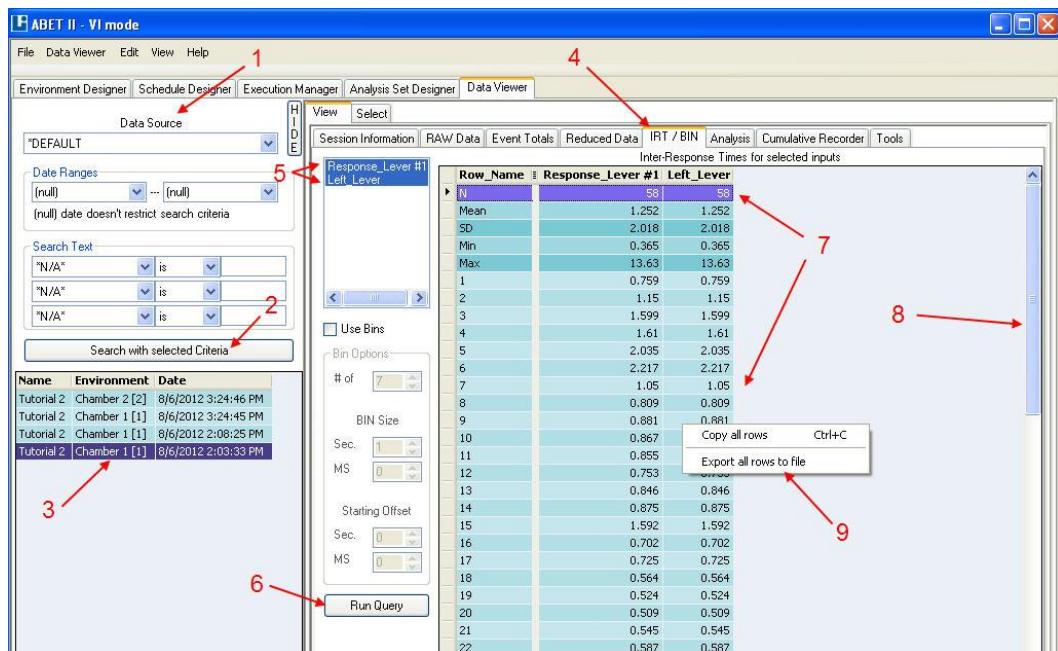
Select the Data Viewer tab as you did in Tutorial 1.

- Find the **Data Source** cell and use the pull down menu to select a single database or leave the setting at “All Connections”. Using Date ranges and Search Text will be covered in the Advanced Features Section of the manual.

## Tutorial #2

### Building a Fixed Ratio Schedule

2. Click **Search with selected Criteria** with no additional criteria at this time. A listing of all schedule runs in the database will appear. By default these are sorted by Date & Time with the most recent on top, however you can click the Name, Environment, or Date fields to resort as needed.
3. Highlight one of the Tutorial 2/FR Schedule runs. Note the Session Information appears immediately although not shown in this illustration.
4. Click the **IRT/BIN Tab**. The window will be blank at this time.
5. Select the input or inputs for which you want Inter-Response Times. In this case either the Environment Label Response\_Lever #1 or the Alias Left\_Lever can be used. Use the Shift or Ctrl key to highlight both as illustrated even though the data for each is the same.
6. Click **Run Query** to calculate all values.



7. The following information is provided for the Inter-Response Times:
  - N      The total number of response IRT's. This will be one less than the total number of responses.
  - Mean    The arithmetic mean of the IRT values.
  - SD      The Standard Deviation of the IRT values
  - Min     The Minimum IRT value in the list.
  - Max    The Maximum IRT value in the list.
  - The first IRT value in the list followed by each additional IRT for N number of rows.
8. A horizontal scroll bar is provided to view the entire list of IRT values.
9. **Optional:** Right Click to reveal this box and copy or export the IRT data as needed.

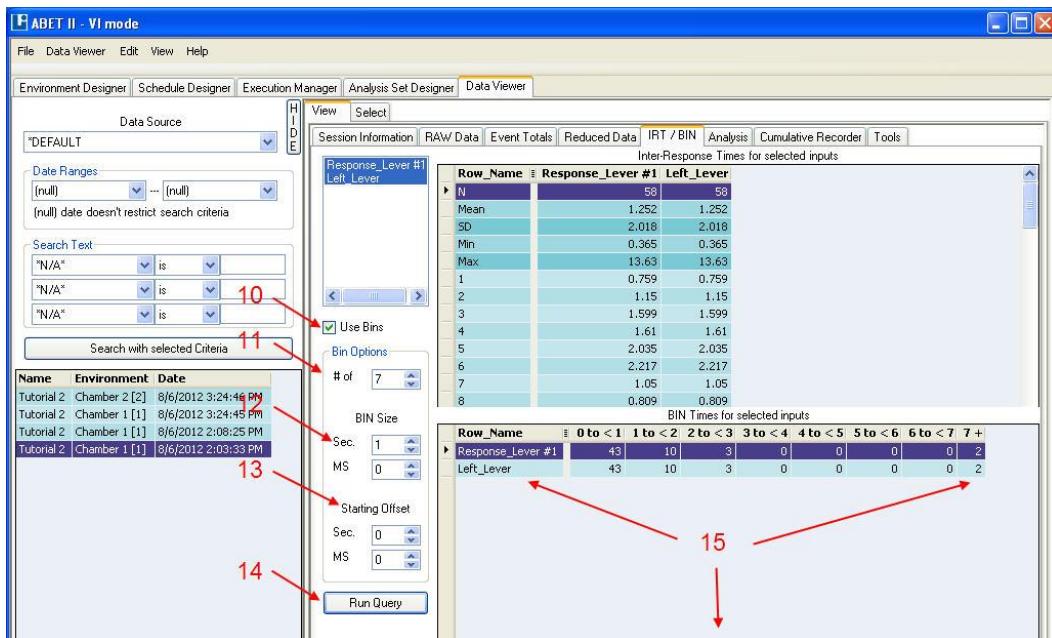
#### Placing the IRT Data in BINS

The ABET II Data Viewer is designed to automatically provide IRT Data. At the same time it will place the IRT's in user defined bins if desired.

## Tutorial #2

### Building a Fixed Ratio Schedule

10. Check the **Use Bins** box.
11. Enter the number of bins (**# of**) desired, 7 for this example.
12. Enter the incremental time for each bin (**BIN Size**). 1 second is used for this example.
13. A Starting Offset may also be added if desired, but was not used in this illustration.
14. Click **Run Query**
15. The BIN data is displayed below the IRT data. A slider bar will be provided if needed to view hidden data. Adding up all the BIN counts should equal N above. In this example there were 43 response IRT's less than 1 second, 10 IRT's between 1.000 and 1.999 seconds, 3 between 2.00 and 2.999 seconds and so on.



### Printing Schedules

ABET II offers several methods for reviewing and sharing schedules. Click Schedule Designer and open Tutorial 2. In this view you can click individual conditions and view the detail. To view the entire schedule details click **Print Preview** on the Schedule Designer tab to reveal the Schedule Name and Description; the Environment Link with details; the Conditions and Actions including Group, Name, Goto, Condition and Action information; the Aliases with Alias Name, Alias Type and the associated Device; and Variable information with Name, Type and Value.

## Tutorial #2

### Building a Fixed Ratio Schedule

ABET II - Schedule																																								
<b>Schedule Name:</b> Tutorial 2																																								
<b>Schedule Description:</b> Fixed Ratio Schedule of Reinforcement																																								
<b>Environment Link:</b> Environment 1																																								
Name: Chamber 1 Usage: 8 inputs/15 outputs Location: 1.A Installed: Yes																																								
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 2px;">Inputs</th><th style="text-align: center; padding: 2px;">Outputs</th><th style="text-align: center; padding: 2px;">Outputs with Intensity</th></tr> <tr> <th style="text-align: center; padding: 2px;">Line</th><th style="text-align: center; padding: 2px;">DescriptionLabel</th><th style="text-align: center; padding: 2px;">Line(s)</th><th style="text-align: center; padding: 2px;">DescriptionLabel</th></tr> </thead> <tbody> <tr> <td style="text-align: center; padding: 2px;">1</td><td style="text-align: center; padding: 2px;">Response_Lever #1</td><td style="text-align: center; padding: 2px;">1</td><td style="text-align: center; padding: 2px;">Stimulus_Light #1</td></tr> <tr> <td style="text-align: center; padding: 2px;">2</td><td style="text-align: center; padding: 2px;">Response_Lever #2</td><td style="text-align: center; padding: 2px;">2</td><td style="text-align: center; padding: 2px;">Stimulus_Light #2</td></tr> <tr> <td style="text-align: center; padding: 2px;"></td><td style="text-align: center; padding: 2px;"></td><td style="text-align: center; padding: 2px;">3</td><td style="text-align: center; padding: 2px;">Reward #1</td></tr> <tr> <td style="text-align: center; padding: 2px;"></td><td style="text-align: center; padding: 2px;"></td><td style="text-align: center; padding: 2px;">4</td><td style="text-align: center; padding: 2px;">Reward #2</td></tr> <tr> <td style="text-align: center; padding: 2px;"></td><td style="text-align: center; padding: 2px;"></td><td style="text-align: center; padding: 2px;">5</td><td style="text-align: center; padding: 2px;">House_Light #1</td></tr> </tbody> </table>					Inputs	Outputs	Outputs with Intensity	Line	DescriptionLabel	Line(s)	DescriptionLabel	1	Response_Lever #1	1	Stimulus_Light #1	2	Response_Lever #2	2	Stimulus_Light #2			3	Reward #1			4	Reward #2			5	House_Light #1									
Inputs	Outputs	Outputs with Intensity																																						
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_Trial_Timer	Timer	0.000																																						
Fixed_Ratio_Count	Integer	0																																						
Fixed_Ratio_Value	Integer	5																																						

Click the **Print** Icon to print a copy of the schedule. This information provides everything you would need to reproduce this schedule. Future tutorials may be presented in this format with detail provided only for new features or tools. Options for the print preview include Full Screen, One Page, Two Pages, and Multiple Pages. You can also change the Zoom level for better viewing.

**Note:** Use Export on the Schedule Designer menu to create a .pdf file of the schedule document.

**Schedule Building Tip:** If possible, organize your schedule in a spreadsheet similar to the Conditions and Actions section of this printout before creating conditions with the Schedule Designer. Knowing in advance what you want to do and being able to view the schedule flow in this manner will result in better schedules with fewer bugs. This technique will be used in future Tutorials.

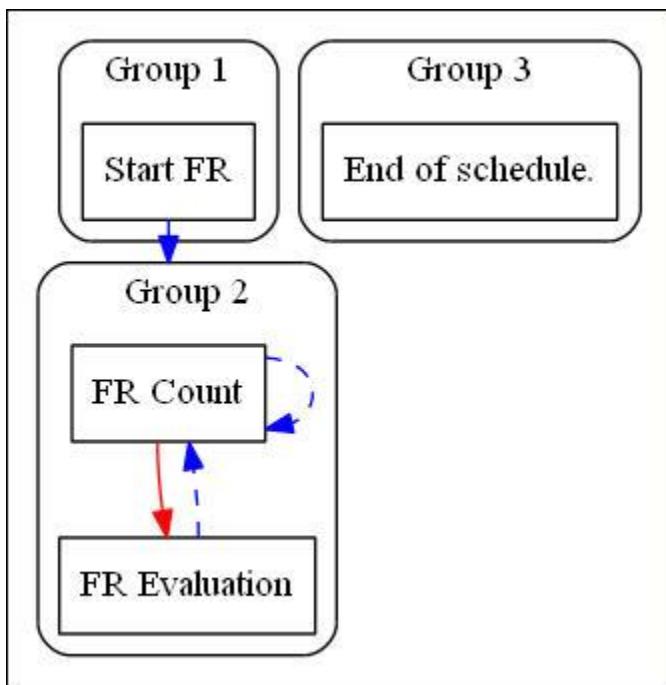
## Schedule Flow Charts

Schedules may also be displayed as a flow chart. The freeware application Graphviz is required. Instructions for downloading this application are provided in Appendix E. For a simple schedule like this FR it is very small as shown below, but this option may be useful in the future.

Click **View Schedule as Flowchart...** on the **Schedule Designer** Menu

Tutorial #2  
Building a Fixed Ratio Schedule

Click **View Flowchart**



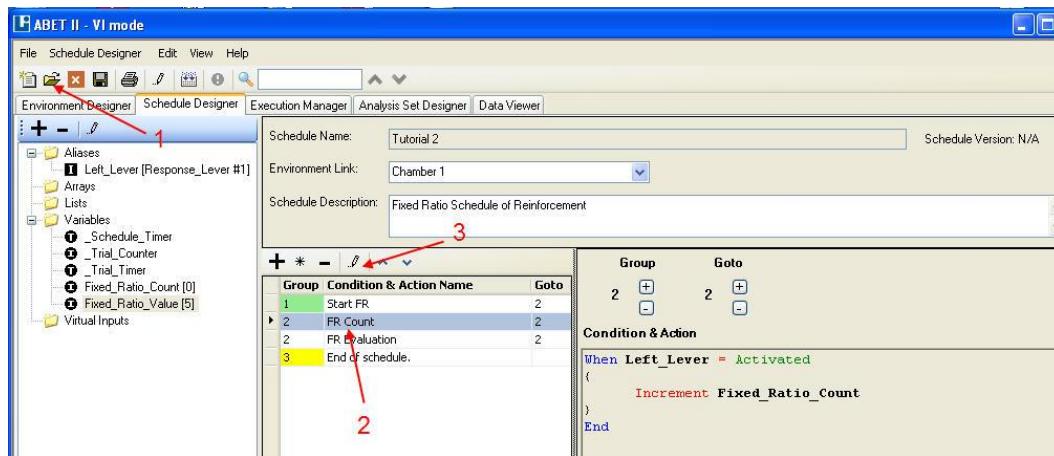
## Tutorial #2

### Building a Fixed Ratio Schedule

#### Editing the FR Schedule

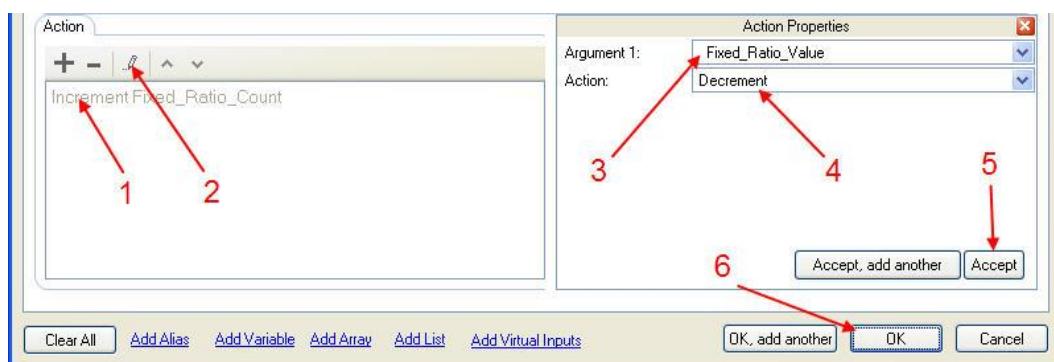
An alternative to the FR schedule that is functionally identical to the schedule used above will be used to illustrate schedule editing and the Version Feature. In this version the Fixed Ratio Value starts at the default value or the value set in the **Properties** tab prior to running the schedule. The value is decremented by 1 each time a response is detected. When the value is 0, a reward is delivered and the value is **Reset** to the starting value. This schedule will run continuously unless a Max\_Schedule\_Time is entered prior to starting.

1. Begin by opening Tutorial 2 in the Schedule Designer.
2. Highlight the FR Count Condition
3. Click the Edit Pencil icon



Locate the Action Tab on the Edit Condition & Action window.

1. Highlight the action statement in the Edit Condition & Action window.
2. Click the Edit Pencil on the Action Tab
3. Change Argument 1: from Fixed\_Ratio\_Count to Fixed\_Ratio\_Value
4. Change the Action from Increment to Decrement
5. Click Accept
6. Click OK



Repeat the above for the FR Evaluation Condition changing Argument 1 from Fixed\_Ratio\_Count to Fixed\_Ratio\_Value, the Operator from equal to less than or equal, Argument 2 from Fixed\_Ratio\_Value to Value, and the value to zero (0). Edit the second action for the FR Evaluation Condition to reset Fexed\_Ratio\_Value.

## Tutorial #2

### Building a Fixed Ratio Schedule

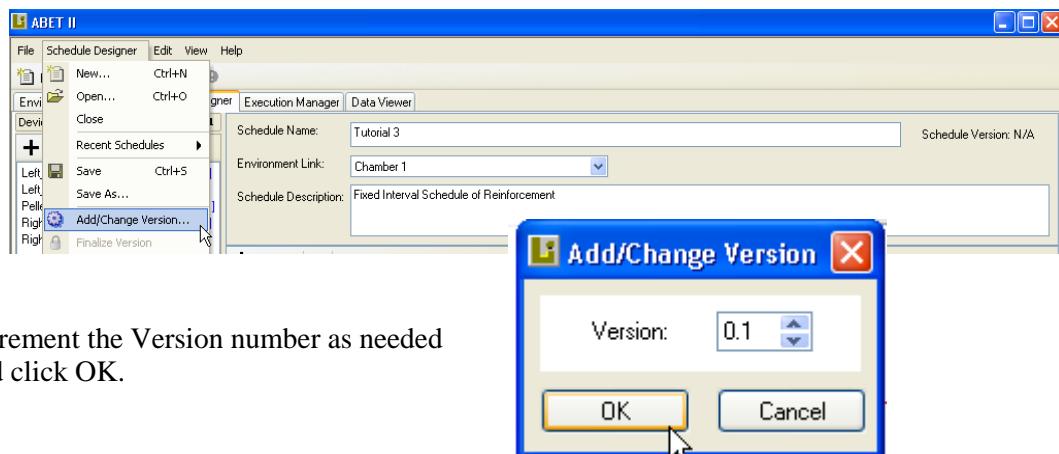
The final result of the above editing should appear as follows:

Conditions and Actions:

Group	Name	Goto	Condition	Action
1	Start FR	2	When Schedule_Timer ≥ 1	Turn on Stimulus Light #1
	Start Condition for FR			
2	FR Count	2	When Left_Lever = Activated	Decrement Fixed_Ratio_Value
	Response Count Condition for FR			
2	FR Evaluation	2	When Fixed_Ratio_Value ≤ 0	Pulse Reward #1 for 50 ms. Reset Fixed_Ratio_Value
3	End of Schedule	-		

## Using Versions

Although you could save this new schedule by selecting **Save As** from the Schedule Designer menu, you can also simply save it with a version number. This feature is helpful while adding to or modifying a new schedule. It allows you to keep one version while testing additional versions. Unwanted versions can always be removed from the folder using Windows Explore. Or, you may want to simply have multiple versions of the same schedule with perhaps different default values for the variables or a left lever/right lever version of the same schedule. Again, these can be managed with version numbers instead of changing the name. To version any schedule simply select the “Add/Change Version” item on the Schedule Designer Menu as shown.



Increment the Version number as needed  
and click OK.

The versioned schedule will now appear on  
the schedule list with a modified Icon and version number.

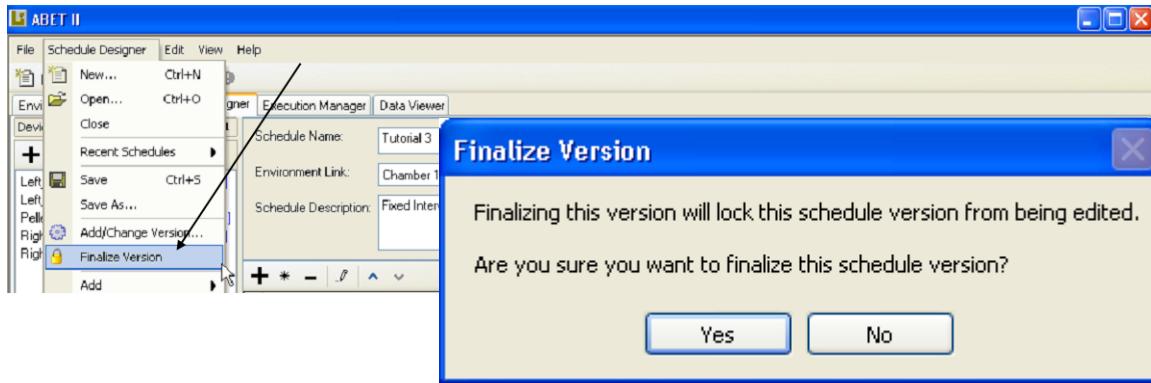


## Tutorial #2

### Building a Fixed Ratio Schedule

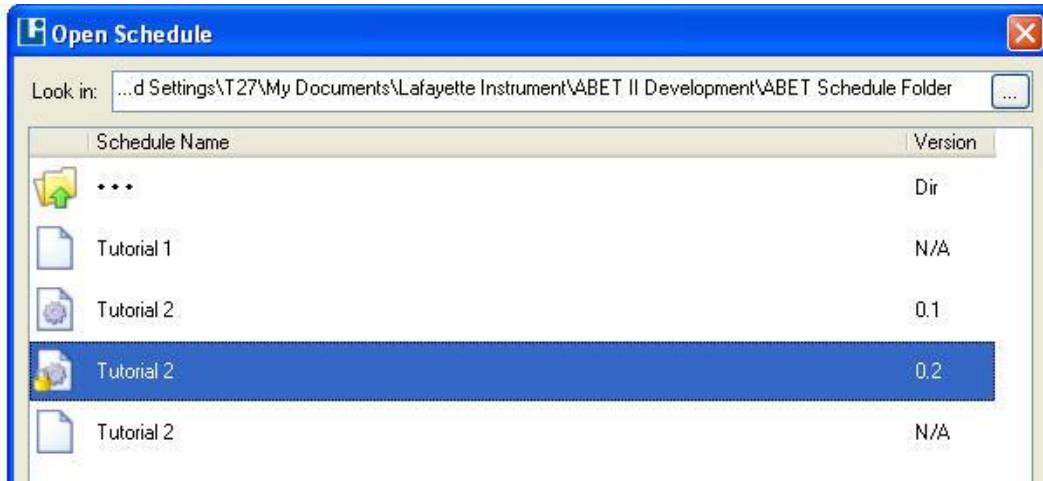
#### Finalize Version

Schedules should be finalized before running any actual experiments. The finalized version is locked to preserve the integrity of the experiment and the data collected. A copy of the environment configuration and the schedule conditions and actions is saved with the data file for validation. Changes can still be made when needed, but a new schedule name or version number must be assigned. To finalize any schedule simply make sure it has a version number and is **Open** in the Schedule Designer. Select **Finalize Version** on the Schedule Designer Menu as shown.



Click **Yes** to confirm your selection:

The Schedule will now appear on the Open Schedule list with a small Lock in the lower left corner of the version icon as shown below.



Run at least one session using a finalized or locked schedule. Tutorial 3 was actually used for the following illustrations.

## Tutorial #2

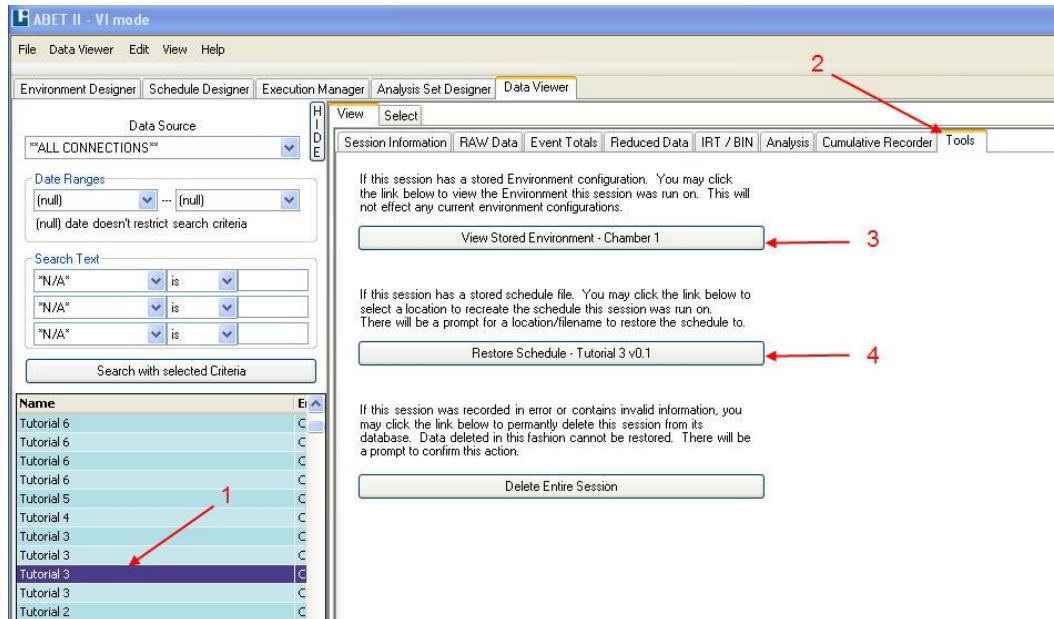
### Building a Fixed Ratio Schedule

#### Using the Data Viewer Tools associated with a locked schedule

One obvious benefit of running a locked schedule once an experiment is started is that inadvertent changes cannot enter the experiment. A second benefit of running locked schedules is that the data file contains backups of the Environment and the Schedule should the originals ever be lost.

#### View Stored Environment

1. To restore a schedule simply open the session file in the Data Viewer
2. Click the Tools Tab



3. Click View Stored Environment to produce a printout similar to the following.

**ABET II - Environments**

**Environment-1:**

Name:	Chamber 2
Usage:	8 inputs/15 outputs
Location:	1 B
Installed:	Yes

Inputs		Outputs		Outputs with Intensity	
Line	Description/Label	Line	Description/Label	Line(s)	Description/Label
1	Response_Lever #1	1	Stimulus_Light #1		
2	Response_Lever #2	2	Stimulus_Light #2		
		3	Reward #1		
		4	Reward #2		
		5	House_Light #1		

The Restore Schedule tool is very similar and described on the next page.

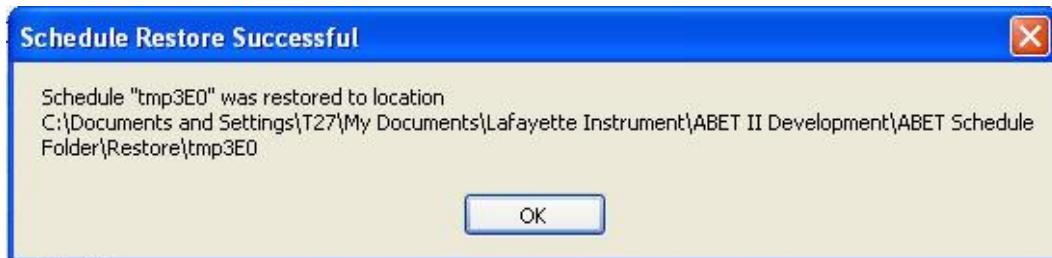
## Tutorial #2

### Building a Fixed Ratio Schedule

#### Restore Schedule

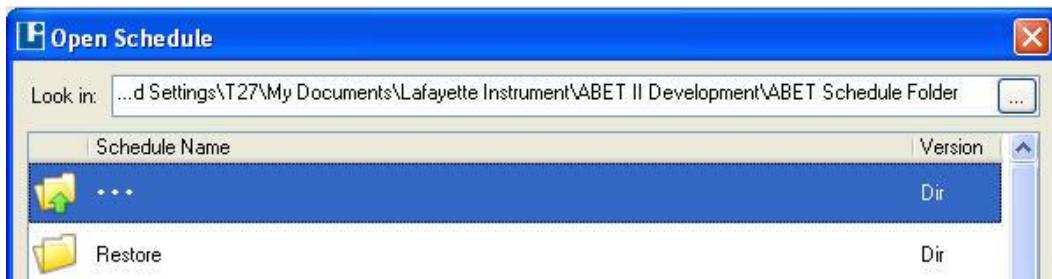
1. To restore a schedule simply open the session file in the Data Viewer
2. Click the Tools Tab
4. Click Restore Schedule

A message will appear indicating the location and name of a temporary file for the restored schedule.



Click OK and open the Schedule Designer Tab.

Click the Open tool, Open menu item or type a Ctrl+O Open short cut and note the presence of a Restore Folder.



Double click the folder to reveal the temporary file.



Click on the temporary file and the schedule detail will be loaded. This may be renamed and moved to the main schedule list with the Save As option.

## Tutorial #3

### Building a Fixed Interval Schedule

#### The Fixed Interval Schedule (FI)

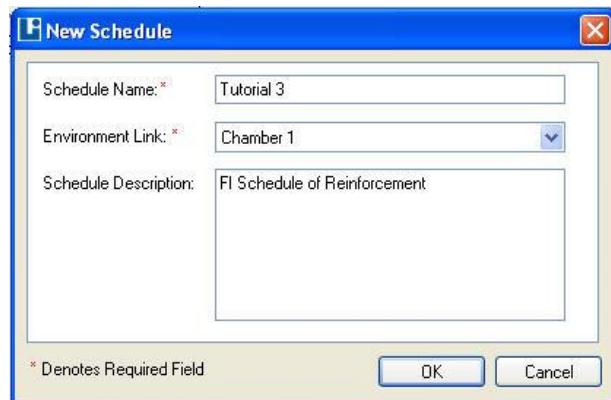
The Fixed Interval Schedule is designed to reward only the first response that occurs following a fixed interval of time instead of reinforcing a fixed number of responses as done in the FR Schedule. The Timer Variable will be introduced and used in place of the Counter Variable used for FR. A compound argument will be used for the first time with the Boolean **AND** operator. This tutorial will also demonstrate how to use the `_Trials_Counter` variable as a way to limit the maximum number of rewards. The Data Reduction Tab is described, as are additional tools available when running a finalized schedule.

**Schedule Building Tip:** New schedules may be built from scratch or may be edited from an existing schedule. This will save time defining aliases and variables that are common to all your schedules. Once you have defined all the aliases and variables that you are likely to use for most schedules, save a shell schedule that cannot be run, but that can be used as a common starting point for subsequent schedules. You will probably want to delete most conditions from the shell, but certainly save those conditions that may be useful. Simply open an existing schedule, change the Schedule Name, delete the Schedule Description and/or conditions as appropriate and save. To design a new schedule you can now open this shell schedule, change the Schedule Name and **Save As** under a different name. Finally, Edit and Add conditions as needed.

A spreadsheet description of the schedule is listed below and should be all you need to build the schedule. The actual schedule printout is provided after the last condition is completed. New concepts are introduced in detail.

#### Outline for the Fixed Interval Schedule

Group	Name	GoTo	Condition Argument	Actions	Comments
1	Start FI	2	When the Schedule Timer is > 1	Turn ON the Stimulus Light and Start a Timer	Waiting for 1 second assures time for some ABET II housekeeping tasks. For such a simple task one could use zero. A new Timer Variable is needed.
2	FI Evaluation	1	When the FI Timer is > than or = to an FI Value	Deliver a Pellet Reward, Increment the "trial" counter and Reset the FI Timer	A new Decimal Variable is needed for the FI Time. The Trial Counter is added so the schedule may be run for a Max Time or Max number of rewards.



Open a **New Schedule** and Enter the Schedule Name Tutorial 3, the Environment Link Chamber 1 and the Schedule Description FI Schedule of Reinforcement.

Click OK

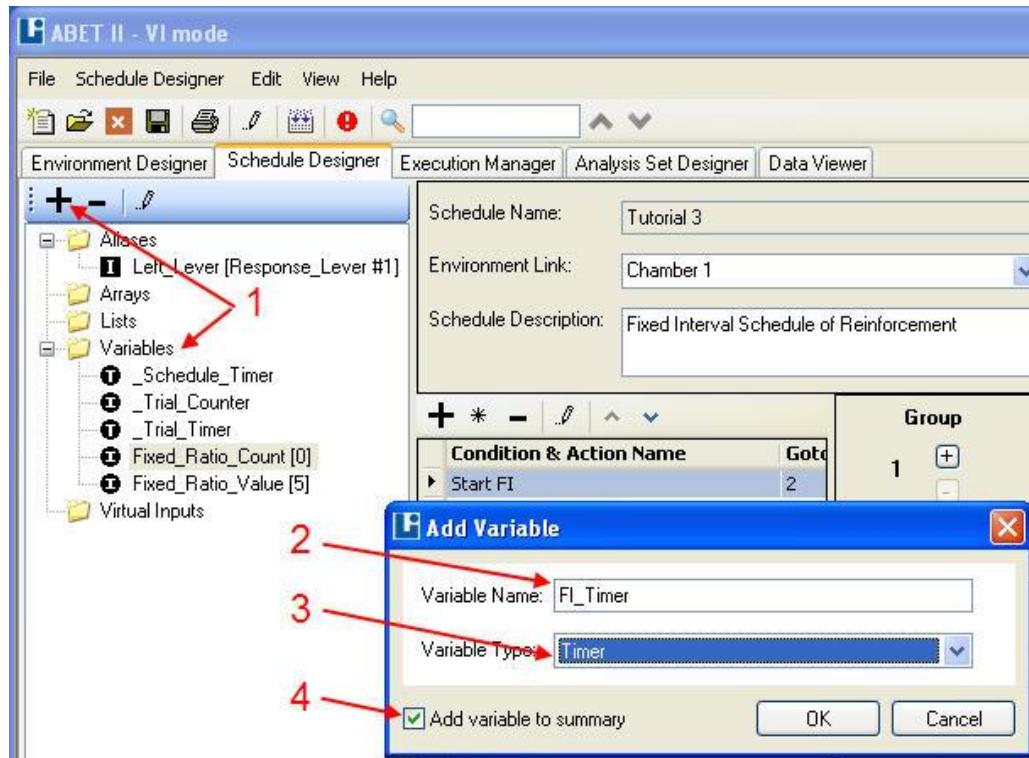
## Tutorial #3

### Building a Fixed Interval Schedule

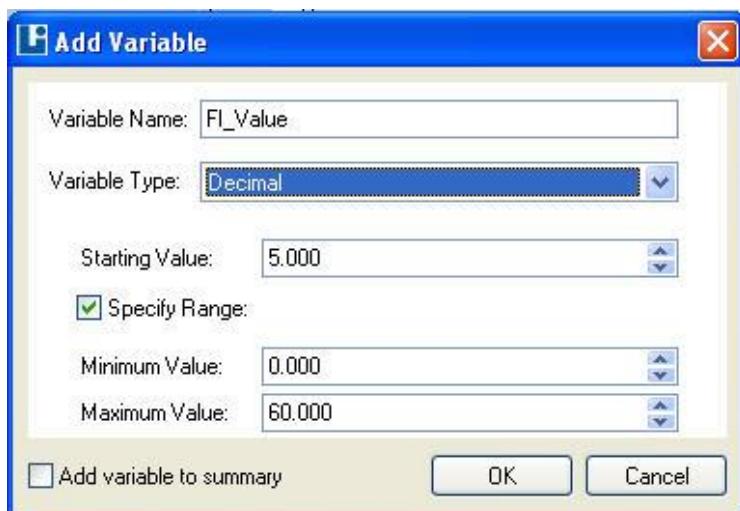
#### Defining and Using a Timer Variable

For the Fixed Interval Schedule two additional variables need to be defined. The following steps should be used to add a Timer Variable.

1. Highlight Variables and Click the Plus/Add tool to open the Add Variables window below.
2. Enter a Variable Name
3. Select the Variable Type as Timer
4. Check Add variable to summary if desired



A decimal variable is used to set the desired interval value. The process is identical to that for the Fixed\_Ratio\_Value except for the Variable Type. Select a starting Value of 5.0 (seconds).



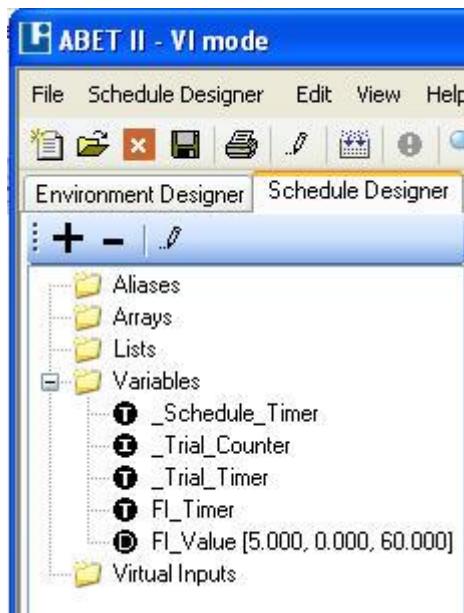
## Tutorial #3

### Building a Fixed Interval Schedule

#### The Variables List

As the variable list grows you will notice that the three system variables remain at the top of the list. All user defined variables follow in alphanumeric order. The symbol at the left of the variable name indicates the variable type.

T = Timer  
I = Integer  
D = Decimal  
B = Boolean



The default value and optional variable range are shown to the right of the label in brackets [ ]. In this sample screen capture the default value for the decimal FI\_Value is 0.000 seconds with a range from 0.000 to 60.000 seconds

**Tip:** When variables are used to control shock levels or drug delivery use variable limits to prevent anyone from inadvertently entering an excessive value via the Properties tab in the Execution Manager.

#### Using Favorites

Another useful feature of the ABET II Schedule Designer is **Favorites**. When building a new schedule you can still borrow conditions from other schedules; this technique is illustrated here for the FI Start condition.

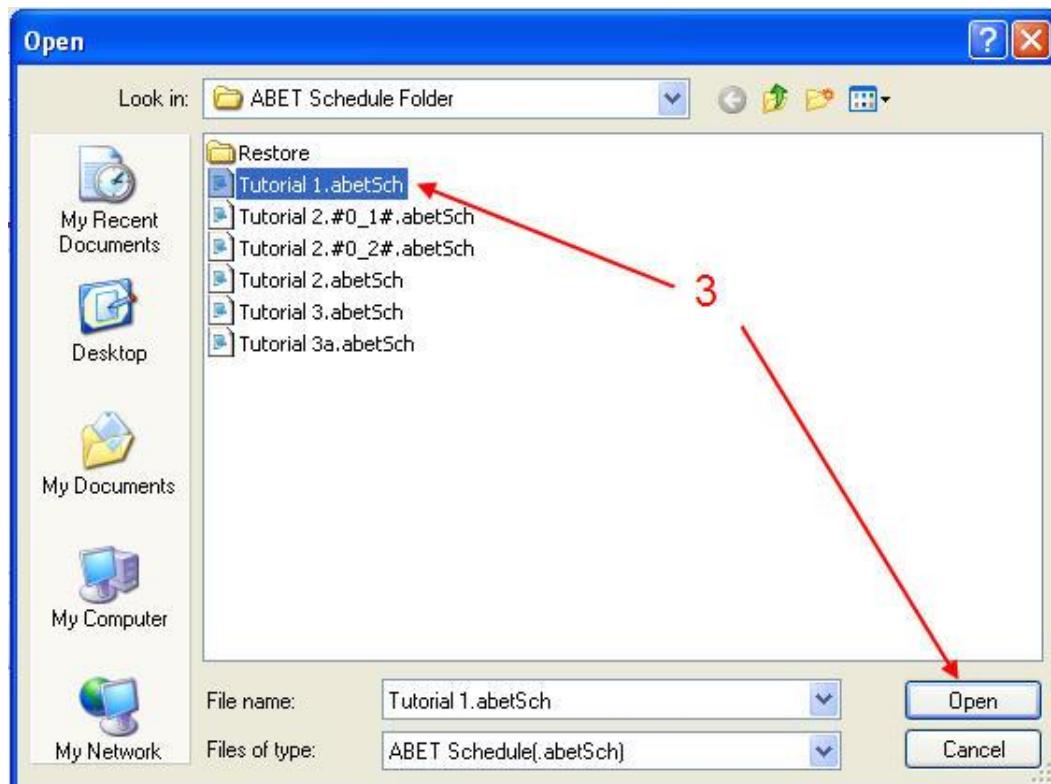
1. Click the Add “+” Icon to open the Add Condition & Action window.
2. Click the Favorites menu and select (Click) on Import from schedule.



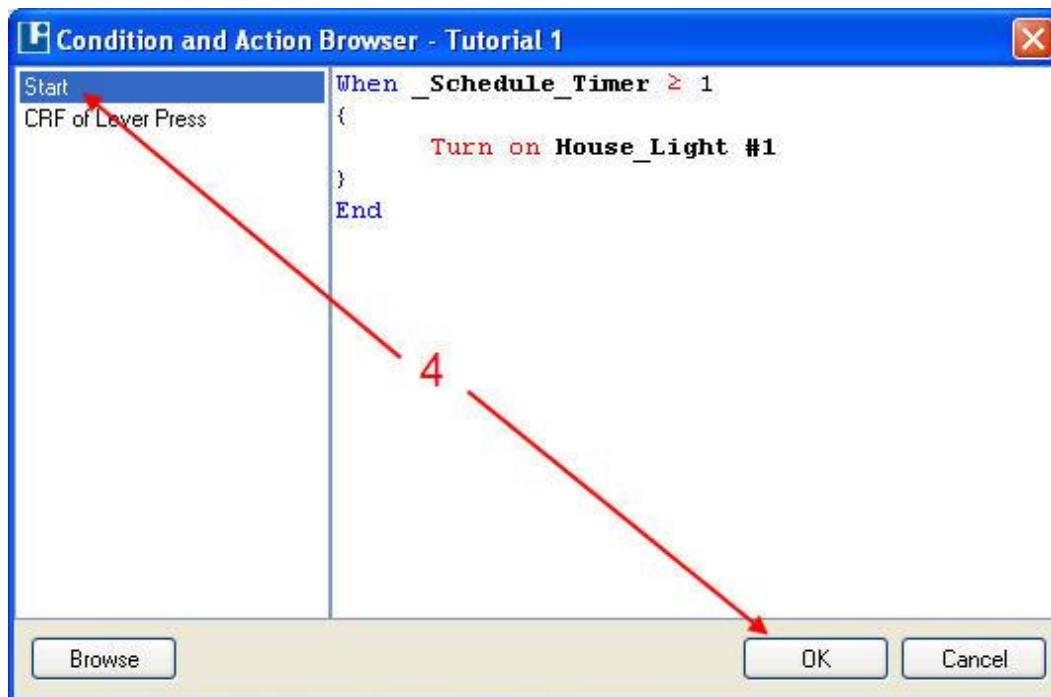
## Tutorial #3

### Building a Fixed Interval Schedule

3. This will Open the ABET Schedule Folder. Highlight the Tutorial 1.abetSch Schedule and Click **Open**.



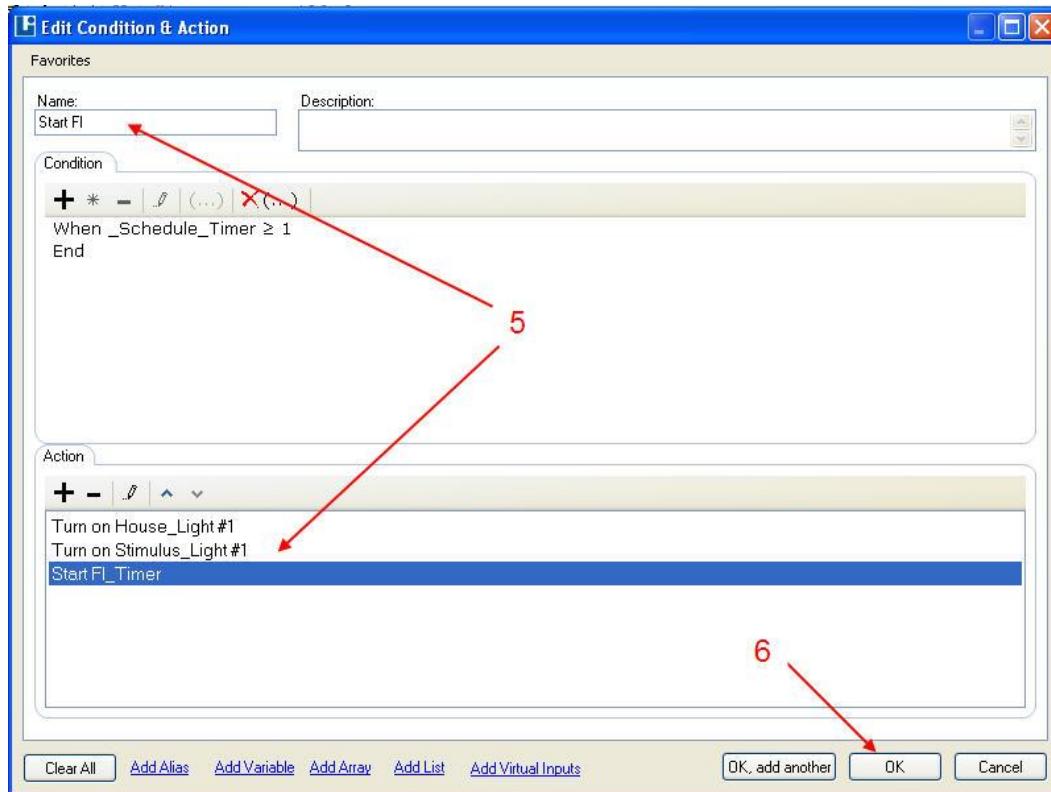
4. Highlight the Start Condition on the Condition and Action Browser – Tutorial 1 and click **OK**.



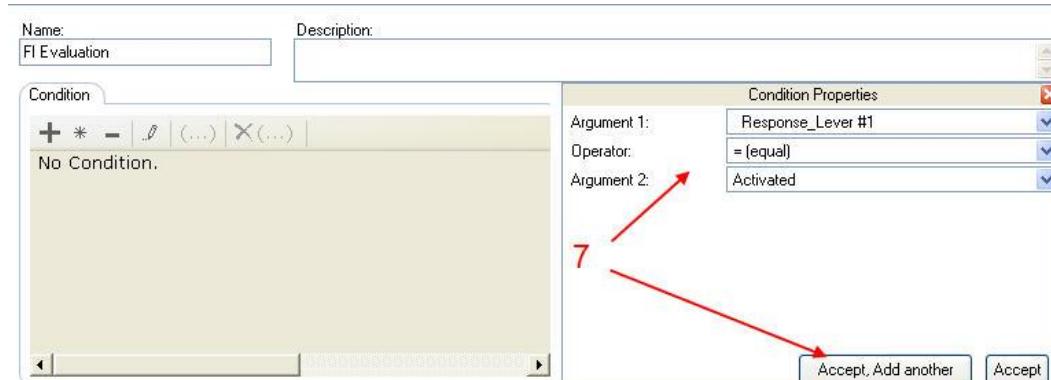
## Tutorial #3

### Building a Fixed Interval Schedule

5. The Condition detail will be listed in the Add Condition & Action window. Edit Name, Description and any other detail as needed. For this exercise the Name was changed to Start FI, and two Actions were added to turn on the Stimulus\_Light #1 and to Start the FI\_Timer
6. Click OK to return to the Schedule Designer tab.



7. Add the second condition – FI Evaluation starting with When Response\_Lever #1 or Left\_Lever equals Transition On. Click **Accept**, **Add another** to continue with a second argument. If you click **Accept** in error you can simply click the **Edit** (Pencil) Icon to return to the **Edit Condition & Action window**.

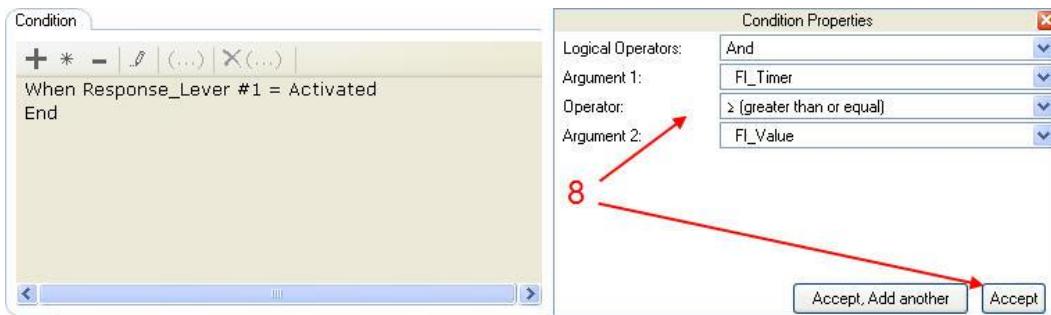


The screen shots show usage of ‘Activated’ for the ‘state’ of the input, i.e. Response\_Lever #1. However earlier we discussed using ‘Transition On’. The explanation for why and when to use these to qualifiers can be found in [[Working with Non-Latched Hardware](#)].

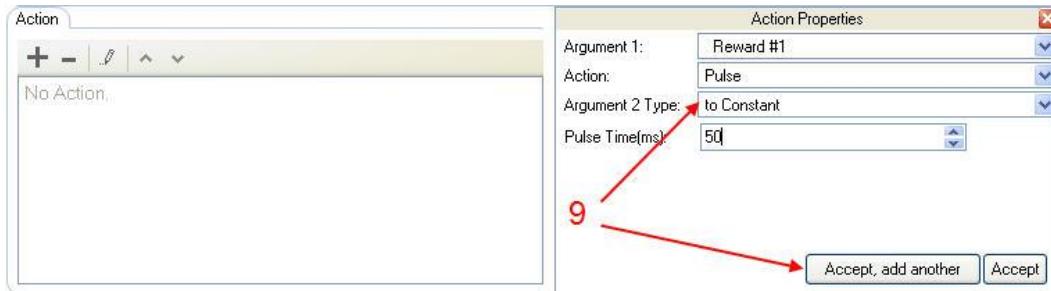
## Tutorial #3

### Building a Fixed Interval Schedule

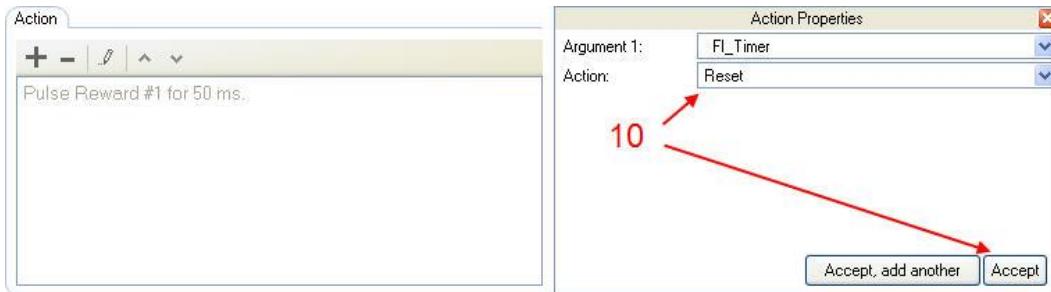
8. The Condition Properties window now requires a Logical Operator. Select **AND**. Select the variable FI\_Timer for Argument 1, (greater than or equal) for the Operator and the variable FI\_Value for Argument 2. Click **Accept** to complete the Condition.



9. Add the first Action Properties to deliver reward and **Click Accept, add another**.



10. Click Accept when satisfied with your entries.



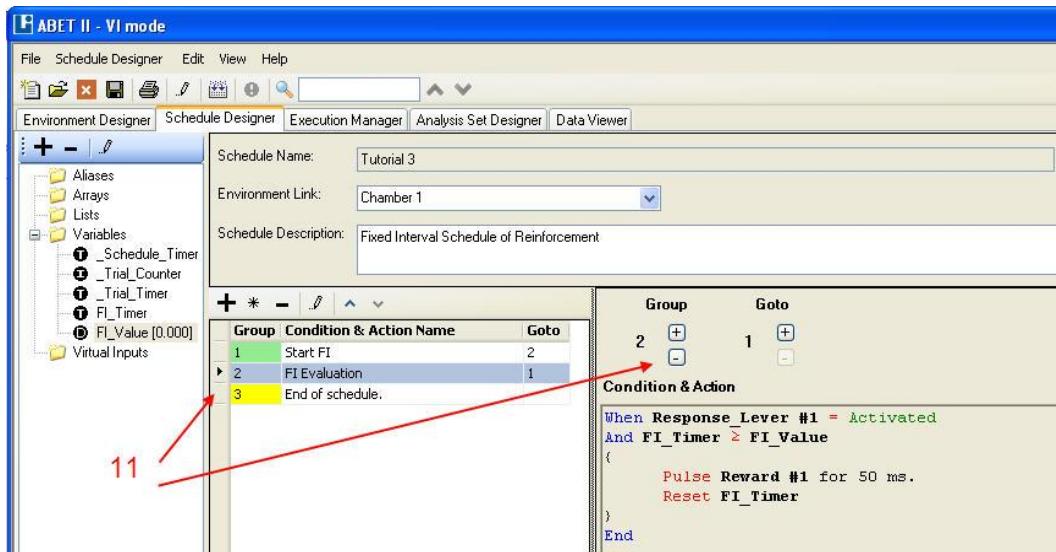
**Note:** When applied to a timer variable, the reset action both stops and resets the timer to value zero (0). Timers may also be started, stopped and re-started without reset.

11. Click OK to return to the Schedule Designer. Edit the Group and Goto for Start FI and FI Evaluation if needed so that FI Evaluation is in Group 2 and has a Goto pointing to Group 1 while Start FI is in Group 1 and advances to Group 2. Cycling back to the Start FI condition after each reward simply restarts the FI\_Timer since the Condition Argument [When \_Schedule\_Timer > 1] will always be true until the session is stopped.

Image on the next page

## Tutorial #3

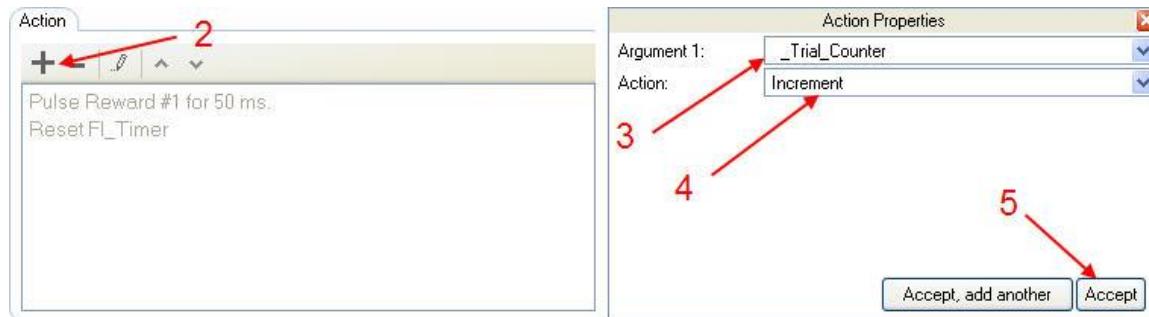
### Building a Fixed Interval Schedule



### Using the \_Trial\_Counter Variable

In Tutorial 2 the Max\_Session\_Time feature was used. To use the Max\_Number\_Trials feature the schedule must increment the \_Trial\_Counter Variable. The FR and FI schedules do not technically have trials, but you may want to limit these schedules based on run time or total number of rewards. Add this counter as follows:

1. Highlight the FI Evaluation Condition and click the **Edit** (pencil) Icon (not shown).
2. Click the Add (+) Icon on the Action Tab
3. Select \_Trial\_Counter for Argument 1
4. Select Increment for the Action
5. Click Accept and OK (not shown) to complete the edit.



The completed fixed interval schedule is made up of just two conditions as shown.

**Conditions and Actions:**

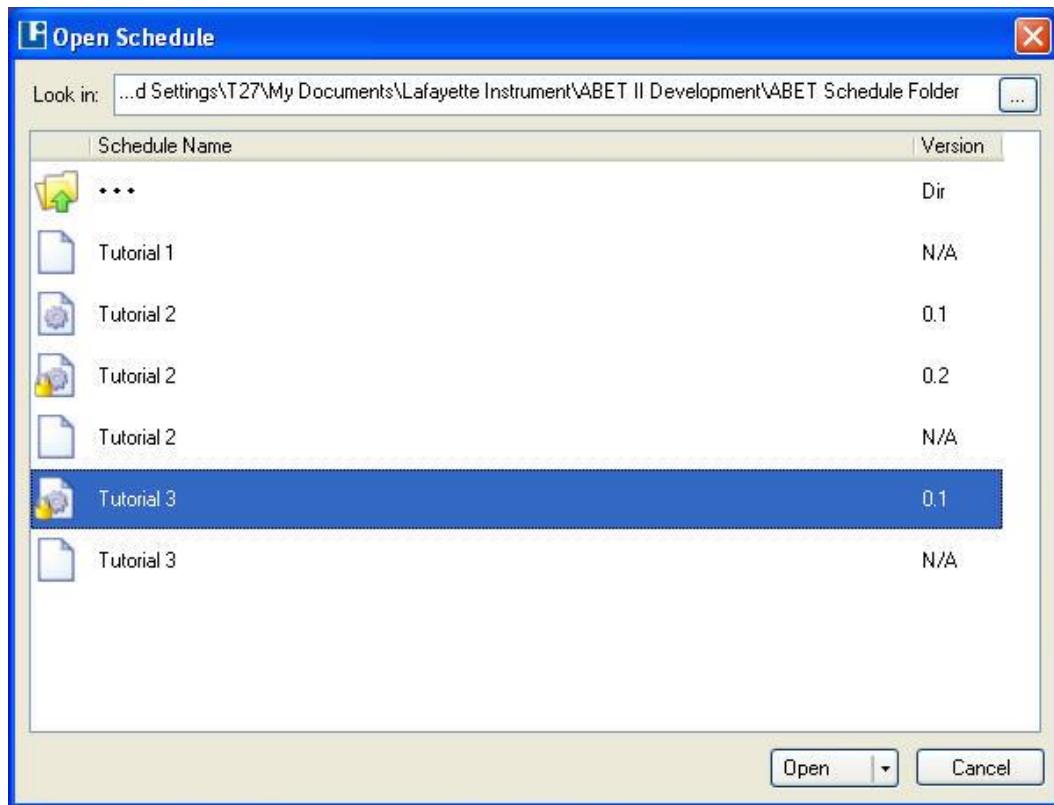
Group	Name	Goto	Condition	Action
1	Start FI	2	When _Schedule_Timer ≥ 1	Turn on House Light #1 Turn on Stimulus Light #1 Start FI Timer
2	FI Evaluation	1	When Response Lever #1 = Activated And FI_Timer ≥ FI_Value	Pulse Reward #1 for 50 ms. Reset FI_Timer Increment _Trial_Counter
3	End of Schedule	-		

## Tutorial #3

### Building a Fixed Interval Schedule

#### Running the FI Schedule

Before closing the Fixed Interval schedule in Schedule Designer create a version 0.1 and finalize the version. Close this FI Schedule before clicking the Execution Manager tab. Go to the Open Schedule window and observe that you now have two copies of Tutorial 3. Highlight the locked version and Click Open.



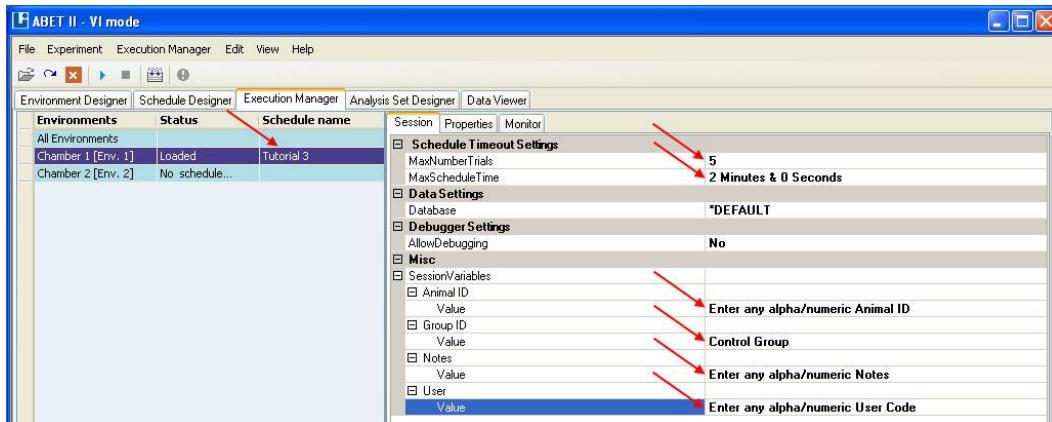
The Session tab for Chamber 1 with Tutorial 3 Loaded is Displayed  
Add the following information to the Session Screen.

Max_Number_Trials	Highlight <b>Unlimited (No value set)</b> and type in the number <b>5</b> to limit the schedule to 5 rewards.
Max_Trial_Time	Highlight <b>Unlimited (No value set)</b> and type in <b>2 Minutes</b> or use the radio button to open the Minutes:Seconds window. This entry limits the session time independent of rewards earned.
Database	No entry, this example uses the *DEFAULT Database
Debugger Settings	No entry, this example will not use the Debugger feature
Misc – SessionVariables	Highlight the empty Value cell and enter Animal, Group, Notes and User Information as needed.

See [Preferences](#) to add to or edit the Session Variables list. Entries may be made optional or required as needed. When required, the schedule will not run until the required fields have entries.

## Tutorial #3

### Building a Fixed Interval Schedule



Click the Properties Tab and note that the value of the FI\_Value variable is 5.000. This value may be changed prior to running the FI Schedule if desired. Simply highlight the value as shown and overtype with the new value.

Session		Properties	Monitor
<b>Schedule Properties</b>			
<u>_ScheduleFilePath</u>		C:\Documents and Settings\	
Arrays			
Lists			
ScheduleFinalized		Yes	
ScheduleVersion		0.1	
SummaryItems		<b>1 Item</b>	
<b>Variables</b>			
<u>_Schedule_Timer</u>		(Timer)	
Value		0	
<u>_Trial_Counter</u>		(Integer)	
Value		<b>0</b>	
<u>_Trial_Timer</u>		(Timer)	
Value		0	
<u>FI_Timer</u>		(Timer)	
Value		0	
<u>FI_Value</u>		(Decimal)	
Value		<b>5.000</b>	

Click the **Run** (Play) Icon when satisfied with your entries. If a single chamber is running a detailed status screen will appear. If multiple chambers are running or if you click the Monitor Tab just the Summary Items previously selected will be displayed.

**Make a sufficient number of responses to generate 5 rewards and note that the session ends as expected. Run again with fewer responses to allow the 2 minute session to time out.**

**Note:** When loading multiple environments leave the selection on All Environments while entering common information such as Trials, Schedule Time, User Name and perhaps Group. Switch to individual Environments to enter Chamber Specific information such as Animal ID or Animal Weight and then switch back to All Environments before clicking the run Icon.

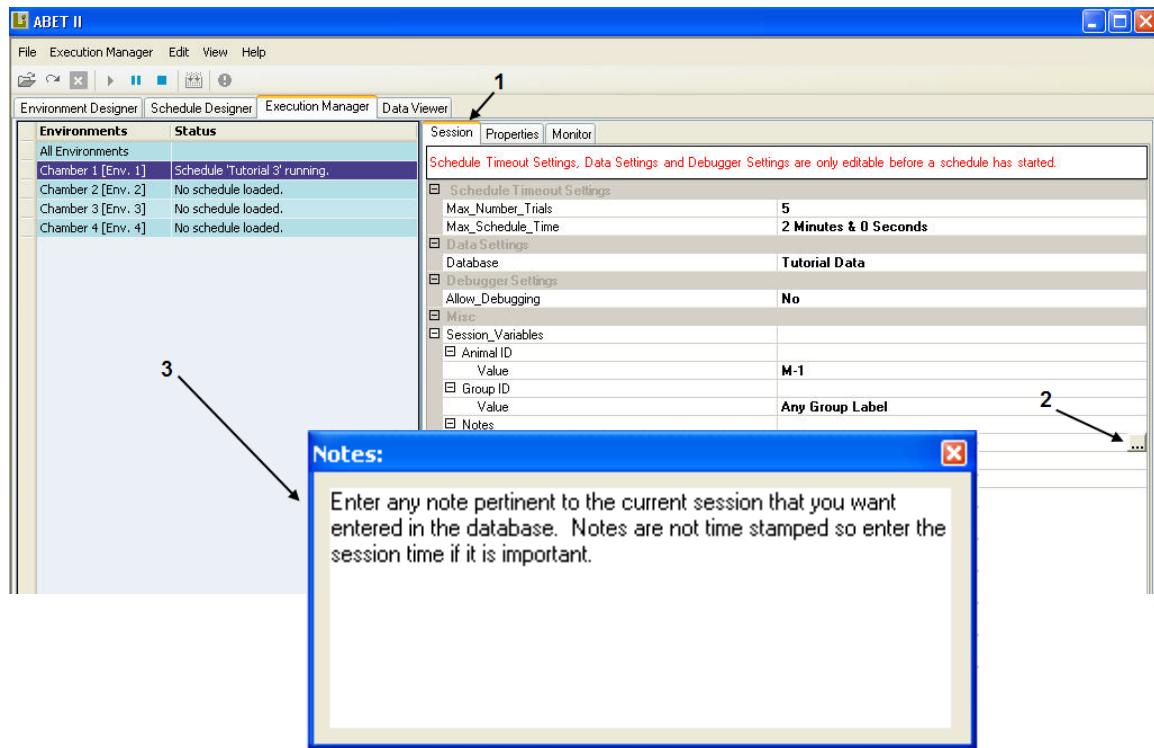
## Tutorial #3

### Building a Fixed Interval Schedule

#### Using Notes

As illustrated above, notes may be entered prior to running a schedule. In addition, notes may be added while the schedule is running. Notes are not automatically time stamped. Try this feature now.

1. Click the Session Tab
2. Highlight the Notes Row if needed and click the Notes radio button
3. Enter Notes and click the Close Icon “x” to place them in the value cell.



**Note:** Notes may be entered as a continuous line. Although they will wrap in the data entry box, they will not wrap when displayed by the Data Viewer. A hard carriage return [Enter] will produce a multi-lined display in the viewer. The Notes field is limited to approximately 255 characters including spaces, and some actions such as a carriage return use two characters; however, keep in mind that there is no limit to the number of multi-line session variables that can be added prior to running an experiment. See [\[Preferences – Execution Manager – Session Fields\]](#) for adding session variables and for selecting the single line Text-Box or Multi-Line Test-Box option for the Session Variable.

## Tutorial #3

### Building a Fixed Interval Schedule

#### Viewing the FI Data

Click the Data Viewer Tab and populate the data list as before, by clicking **Search with selected Criteria**. If you like, you can restrict the selected sessions by using the **Date Range** or **Search Text** options. For Example enter **Schedule is Tutorial 3** to display Tutorial 3 data only. Note the session information that is now displayed includes the session variables and notes.

Name	Value
Schedule Name	Tutorial 3
Version	0.1
Environment	Chamber 1 [1]
Machine Name	T27
Date/Time	8/9/2012 2:35:49 PM
Database	*DEFAULT
Schedule Run ID	17
Finalized	Yes
Record Count	83
Animal ID	Enter any alpha/numeric Animal ID
Group ID	Control Group
Max_Number_Trials	5
Max_Schedule_Time	120
Notes	Enter any alpha/numeric Notes
Schedule_Description	Fixed Interval Schedule of Reinforcement
User	Enter any alpha/numeric User Code

#### Reduced Data Tab

Raw data files at this point are still relatively small and easy to manage, but given the amount of information stored in the raw file, it is easy to understand that at some point you may want to reduce this to only the key elements of interest. The Reduce Data utility is provided for this purpose. Once a session file is selected

1. Click the **Reduced Data** tab to open a blank query field.
2. Hold the Shift or Ctrl key and highlight Response\_Lever #1 and Reward #1 Click **Run Query** to populate the blank field.

Evt_Time	Evt_ID	Evt_Name	Item_Name	Alias_Name	Group_ID	Num_Args	Arg1_Name	Arg1_Value	Arg2_Name	A
12.136	2	Input Event	Response_Lever #1		2	0				
12.137	7	Pulse Output Event	Reward #1		2	1	Duration	0.05		
14.47	2	Input Event	Response_Lever #1		2	0				
17.458	2	Input Event	Response_Lever #1		2	0				
17.46	7	Pulse Output Event	Reward #1		2	1	Duration	0.05		
24.677	2	Input Event	Response_Lever #1		2	0				
24.677	7	Pulse Output Event	Reward #1		2	1	Duration	0.05		
25.75	2	Input Event	Response_Lever #1		2	0				
26.527	2	Input Event	Response_Lever #1		2	0				
27.524	2	Input Event	Response_Lever #1		2	0				
28.59	2	Input Event	Response_Lever #1		2	0				
30.758	2	Input Event	Response_Lever #1		2	0				
30.759	7	Pulse Output Event	Reward #1		2	1	Duration	0.05		
32.108	2	Input Event	Response_Lever #1		2	0				
32.56	2	Input Event	Response_Lever #1		2	0				
33.37	2	Input Event	Response_Lever #1		2	0				
35.195	2	Input Event	Response_Lever #1		2	0				
37.079	2	Input Event	Response_Lever #1		2	0				
37.08	7	Pulse Output Event	Reward #1		2	1	Duration	0.05		

## Tutorial #3

### Building a Fixed Interval Schedule

#### Measuring Delta Times

The time between two Events in the raw or reduced data views may be easily measured with this simple tool. This example uses the following view to measure the time between the second to last reward and the last rewarded response.

1. Click the first item that you want to time from. In this case a Reward #1 Event
2. Hold the Control key and Click the end item that you want to time to. The shift key may also be used to highlight the entire block, but only the one delta time is shown. The analysis set designer will be used to create a list of multiple measures based on user defined parameters.
3. The delta time between the two selected events is displayed on the bottom of the screen

Event Totals									Reduced Data	IRT / BIN	Analysis	Cumulative Recorder	Tools	
Evt_Time	Evt_ID	Evt_Name	Item_Name	Alias_Name	Group_ID	Num_Args	Arg1_Name	Arg1_Value						
12.136	2	Input Event	Response_Lever #1		2	0								
12.137	7	Pulse Output Event	Reward #1		2	1	Duration	0.05						
14.47	2	Input Event	Response_Lever #1		2	0								
17.458	2	Input Event	Response_Lever #1		2	0								
17.46	7	Pulse Output Event	Reward #1		2	1	Duration	0.05						
24.677	2	Input Event	Response_Lever #1		2	0								
24.677	7	Pulse Output Event	Reward #1		2	1	Duration	0.05						
25.75	2	Input Event	Response_Lever #1		2	0								
26.527	2	Input Event	Response_Lever #1		2	0								
27.524	2	Input Event	Response_Lever #1		2	0								
28.59	2	Input Event	Response_Lever #1		2	0								
30.758	2	Input Event	Response_Lever #1		2	0								
30.759	7	Pulse Output Event	Reward #1		2	1	Duration	0.05						
32.108	2	Input Event	Response_Lever #1		2	0								
32.56	2	Input Event	Response_Lever #1		2	0								
33.37	2	Input Event	Response_Lever #1		2	0								
35.195	2	Input Event	Response_Lever #1		2	0								
37.079	2	Input Event	Response_Lever #1		2	0								
37.08	7	Pulse Output Event	Reward #1		2	1	Duration	0.05						

Reduced Data queries may be made on an individual Item (Variable, Condition, Input, Output) or Alias. This is the Item\_Name in the Raw Data file. Queries may also be made on Events which would include all Items with the same Event Name in the Raw Data file. It is also possible to combine an Item/Alias and Event with a Boolean AND or OR logic designation. A combination of key variables or events will make it easy to review the critical elements of a schedule. This is useful for both schedule testing/debugging and for data analysis. Creating Analyses Sets is covered in Tutorial #7 and in the Advanced Features section of this manual.

## Tutorial #3

### Building a Fixed Interval Schedule

#### Additional Notes on the Reduced Data Feature:

- SYSTEM will display schedule startup and shutdown.
- USER (not displayed for this session) will display a user generated event.
- The Item/Alias list will contain every defined variable for the environment and the schedule.
- The event category is more inclusive than Item/Alias. For example, if this schedule had produced data on two levers, selecting “Input Event” from the Event list would give you all responses on both levers listed as they occurred. Selecting Response\_Lever #1 or the alias for that lever from the Item/Alias list would give you just the selected responses.
- Multiple items or events may be selected from either list using standard Windows shortcuts (shift click for a continuous list, ctrl click for a disjointed list). Additional buttons are provided to select or clear all. Invert may be used to eliminate 1 or 2 items from a long list. Highlight the items to eliminate and click Invert. All items not selected will now be highlighted.
- Click Run Query to produce a data sheet based on the selection(s) made. Run several queries to get a feel for this feature.
- **Note:** The data source field from which the schedule selection was made for the data reduction example is hidden in this screen capture so additional columns of data could be displayed as needed. A **Show** and **Hide** tab or button is found in the top right corner of the Data Source area. Click this to toggle between views as needed.

#### Additional Query Examples:

Query on Pellet or Reward #1:

Evnt_Time	Evnt_ID	Evnt_Name	Item_Name	Alias_Name	Group_ID	Num_Args	Arg1_Name	Arg1_Value	Arg2_Name	Arg2_Value
10.723	7	Pulse Output Event	Reward #1	Pellet	2	1	Duration	0.05		
21.017	7	Pulse Output Event	Reward #1	Pellet	2	1	Duration	0.05		
31.162	7	Pulse Output Event	Reward #1	Pellet	2	1	Duration	0.05		
41.236	7	Pulse Output Event	Reward #1	Pellet	2	1	Duration	0.05		
51.525	7	Pulse Output Event	Reward #1	Pellet	2	1	Duration	0.05		

Query on Condition Event:

Evnt_Time	Evnt_ID	Evnt_Name	Item_Name	Alias_Name	Group_ID	Num_Args	Arg1_Name	Arg1_Value	Arg2_Name	Arg2_Value
0.007	1	Condition Event	FI 010		0	0				
10.723	1	Condition Event	FI 020		2	0				
10.726	1	Condition Event	FI 010		1	0				
21.017	1	Condition Event	FI 020		2	0				
21.019	1	Condition Event	FI 010		1	0				
31.162	1	Condition Event	FI 020		2	0				
31.163	1	Condition Event	FI 010		1	0				
41.236	1	Condition Event	FI 020		2	0				
41.238	1	Condition Event	FI 010		1	0				
51.525	1	Condition Event	FI 020		2	0				

## Tutorial #3

### Building a Fixed Interval Schedule

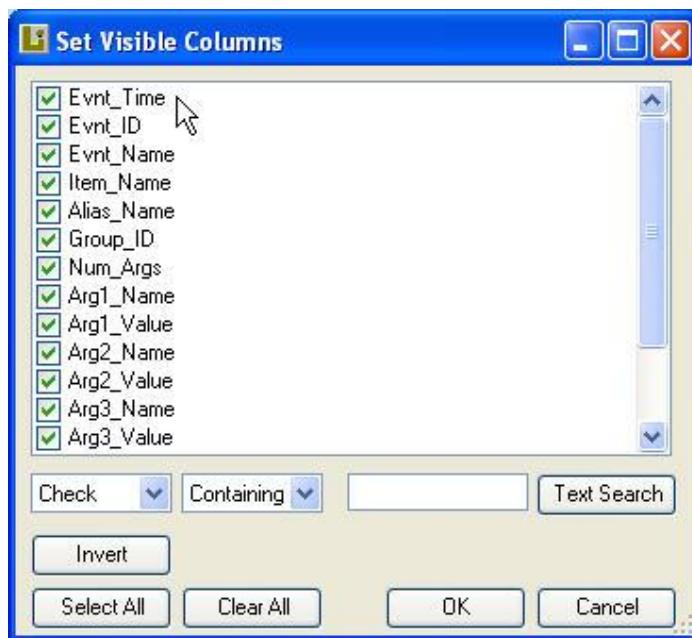
#### Exporting Raw Data

Raw data may be exported to Excel. You can copy or export the entire file or a highlighted portion of the file. If desired, select the rows of interest using standard Window's left click with Shift or Ctrl actions. Right click over any part of the raw data display. Select one of the displayed options. The export options will open a Save As panel.

The screenshot shows the ABET II software interface in VI mode. The main window displays a table of raw data with columns: Evnt\_Time, Evnt\_ID, Evnt\_Name, Item\_Name, Alias\_Name, Group\_ID, Num\_Args, Arg1\_Name, and Arg1\_Value. A context menu is open over a row of data, specifically for the second row (Evnt\_ID 2). The menu includes options like 'Select all rows' (Ctrl+A), 'Copy all rows' (Ctrl+C), 'Copy selected rows' (Ctrl+C), 'Export all rows to file with Session Info' (Ctrl+E), 'Export all rows to file' (Ctrl+E), 'Export selected rows to file with Session Info' (Ctrl+E), 'Export selected rows to file' (Ctrl+E), 'Refresh Data' (Ctrl+R), and 'Configure column filter'. The 'Configure column filter' option is at the bottom of the menu.

#### Configure Column Filter

Right Click over the raw data field as shown above and select this option from the bottom of the list to reduce the columns to be displayed.



## Tutorial #4

### Building a Progressive Ratio Schedule

#### The Progressive Ratio Schedule (PR)

The Progressive Ratio Schedule is similar to the Fixed Ratio schedule except that the number of responses required to earn a reward are increased according to a predefined set of rules. This can be done in a number of ways. The PR schedule in this example illustrates the use of math actions to advance the progression. A simple Addition is used here, but virtually any equation that can be broken down into a sequence of Add, Subtract, Multiply and Divide actions could be used.

Tutorial 5 illustrates using lists to determine the progression of the PR value.

#### Defining variables for the PR Schedule

This schedule may be built from scratch or start by opening Tutorial 2 (the FR Schedule) and using the **Save As** to create a new schedule file with the name **Tutorial 4**. Begin by creating four new user defined variables as listed below:

**Rewards\_per\_step:** Define as an integer with a default value of 2. This variable will be used to determine how many rewards to deliver at each step of the progression.

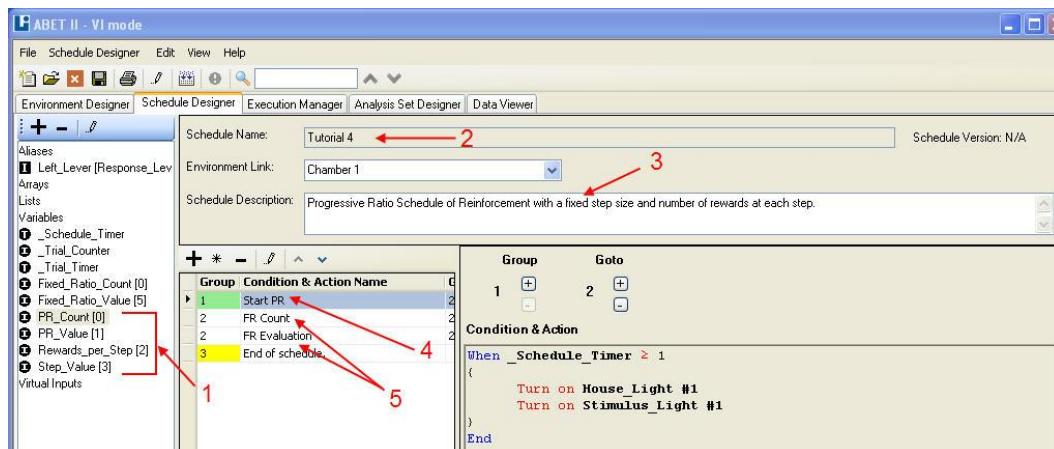
**Step\_value:** Define as an interger with a default value of 3. This variable will be added to the **PR\_Value** each time the **Rewards\_per\_step** criterion is met.

**PR\_Value:** The number of responses required to activate a reward. This is functionally identical to the **FR\_Value** variable used in Tutorial #2. A default starting value of one (1) is used here.

**PR\_Count:** This is functionally identical to the **FR\_Count**. The new variable names were used for clarity. The old FR variables could just as easily been edited and used. A default starting value of zero (0) is used here.

Compare your results with the highlighted items in the following screen capture:

1. New Variables
2. New Schedule Name
3. New Schedule Description
4. New Condition Name for the Start Condition
5. The FR Count & FR Evaluation Conditions have not been edited at this point.



## Tutorial #4

### Building a Progressive Ratio Schedule

#### The PR Schedule Outline

Group	Name	GoTo	Condition Argument	Actions	Comments
1	Start PR	2	When the Schedule Timer is > 1	Turn ON House Light and Stimulus Light	Waiting for 1 second assures time for some ABET II housekeeping tasks. For such a simple task one could use zero.
2	PR Evaluation	3	When a PR Count is > than or = to a PR Value	Deliver a Pellet Reward, Turn OFF the Stimulus Light, Increment the "trial" counter, decrement a "rewards per step" variable, Reset the PR Count, and Start a Time Out Timer	This schedule is going to make use of a time out period following reward. This will be signaled with the Stim Light turning off. The Ratio will be incremented in equal steps after each ratio has been satisfied a user set number of times. An action will be needed for each of these functions.
2	PR Count	2	When the Left Lever is activated	Increment the PR Count	This is identical to the FR Count
2	PR Rewards per Step	2	When the rewards per step variable is zero (0)	Increase the PR Value by the Step Value and Reset the Rewards per Step Variable	Increasing the PR Value will illustrate adding two variables
3	Reward Timeout	2	When the Time Out Timer reaches 5 seconds	Turn ON the Stimulus Light and Reset the Time Out Timer	A constant value is used here for the time out value, but a variable could also be used. Resetting the Timer also stops the timer until restarted in the PR Evaluation Condition above

You should now be able to use the schedule outline above and details below to design this schedule. Try building as much of the PR schedule as you can from the information above. A complete schedule printout is provided at the end of this section and may be referred to as needed. The default variable values used above will create a session that starts with an FR1 for two rewards, steps up to FR4 for two rewards, FR7 for two rewards, etc. Max\_Schedule\_Time or Max\_Trial\_Count may be used to run the schedule for a set session time or number of rewards or whichever is met first.

Sometimes it is useful to have a timeout following a reward, for example when the reward is a drug. This has been added as a Group 3 Condition.

At this point you can edit the FR Count and FR Evaluation Conditions or delete them. Use the Plus/Add tool or Star/Insert tool to open new Add Condition & Action windows. Use the Up Arrow and Down Arrow tools to move conditions on the list.

- **Build the PR Evaluation Condition in Group 2 Goto Group 3 with:**

```

When PR_Count ≥ PR_Value
{
    Pulse Reward #1 for 50 ms.
    Turn off Stimulus_Light #1
    Increment _Trial_Counter
    Decrement Rewards_per_Step
    Reset PR_Count
    Start Time_Out_Timer
}
End

```

## Tutorial #4

### Building a Progressive Ratio Schedule

- **Build the PR Count Condition in Group 2 Goto Group 2 with:**

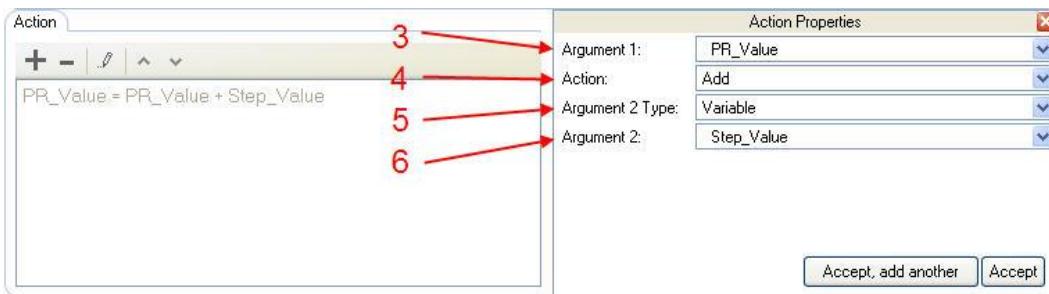
```
When Left_Lever = Transition On
{
    Increment PR_Count
}
End
```

- **The following section covers building the PR Rewards per Step condition in detail.**

### Using Mathematical Expressions in the Action Properties

This example uses a single Add action to increment the PR\_Ratio\_Value by the Step\_Value after a user selected number of rewards. Multiple mathematical actions could be listed in sequence to replicate many progression equations. For complex progressions it will be easier to create the progression in a spreadsheet and copy it to a list. Using lists will be illustrated in Tutorial #5.

1. Open the Add Condition & Action window.
2. Add the Condition Argument `When Rewards_per_Step ≤ 0`. (Detail not shown)  
Since the variable is an Integer, the Equal Operator could be used. However, computers can carry a very small insignificant decimal that is never seen, but could affect the outcome of the Condition Properties. Adding Greater Than or Less Than to the Operator is a safeguard against possibly missing the target value.
3. Select **PR\_Value** from the Variable List for Argument 1
4. Select **Add** for the Action to take.
5. Select **Variable** for the Argument 2 Type.
6. Select **Step\_Value** from the variable list for Argument 2



7. Add a second Action selecting **Rewards\_per\_Step** for Argument 1 and **Reset** for the Action.
- **Build the Reward Timeout Condition in Group 3 Goto Group 2 with:**

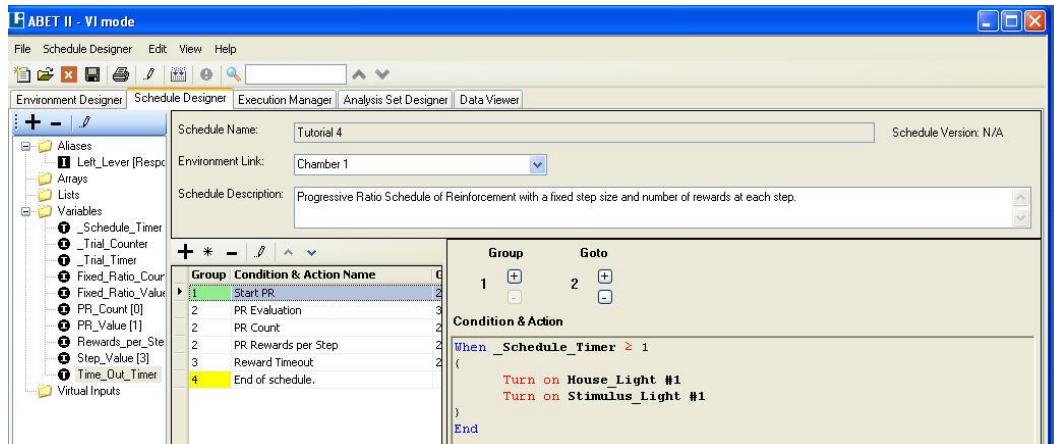
```
When Time_Out_Timer ≥ 5.000
{
    Turn on Stimulus_Light #1
    Reset Time_Out_Timer
}
End
```

Make sure to place this in Group 3 and set the Goto to return to Group 2.

## Tutorial #4

### Building a Progressive Ratio Schedule

#### The finished schedule for Tutorial #4:



Schedule Designer View

**Conditions and Actions:**

Group	Name	Goto	Condition	Action
1	Start PR	2	When <u>_Schedule_Timer</u> ≥ 1	Turn on House_Light #1 Turn on Stimulus_Light #1
	↳ Start Condition for PR			
2	PR Evaluation	3	When <u>PR_Count</u> ≥ <u>PR_Value</u>	Pulse Reward #1 for 50 ms. Turn off Stimulus_Light #1 Increment Trial Counter Decrement Rewards_per_Step Reset PR_Count Start Time_Out_Timer
	↳ Determines when to reward			
2	PR Count	2	When <u>Left_Lever</u> = Activated	Increment PR_Count
	↳ Response Count Condition for PR			
2	PR Rewards per Step	2	When <u>Rewards_per_Step</u> ≤ 0	<u>PR_Value</u> = <u>PR_Value</u> + <u>Step_Value</u> Reset Rewards_per_Step
	↳ Evaluate and update the number of rewards at each step in the PR			
3	Reward Timeout	2	When <u>Time_Out_Timer</u> ≥ 5.000	Turn on Stimulus_Light #1 Reset Time_Out_Timer
	↳ An optional pause in the schedule following reward. Responses made during time out have no effect on the PR Count.			
4	End of Schedule	-		

Print Preview View

**Note:** Unused variables may be deleted from the Variables List to produce a cleaner display and eliminate superfluous entries in the data file. If left in place, they have no effect on schedule performance.

#### Running the first Progressive Ratio Schedule

When satisfied with the above Save and Close the schedule by clicking the **Save Icon/Disk** followed by the **Close Icon /X** or select **Save** and **Close** from the Schedule Designer menu. Click the **Execution Manager** tab or select Execution Manager from the View menu. Load and run the progressive ratio schedule. View the data using all the tools and features previously described.

If you have any problems with running this schedule, review previous tutorials. Other useful titles may be found in the Advanced ABET II Features, Tools and Concepts section of the manual. For example click [[Using the ABET Debugger](#)] or [[Trouble Shooting Guide](#)] or other sections following the last tutorial.

## Tutorial #5

### Using the Lists Features

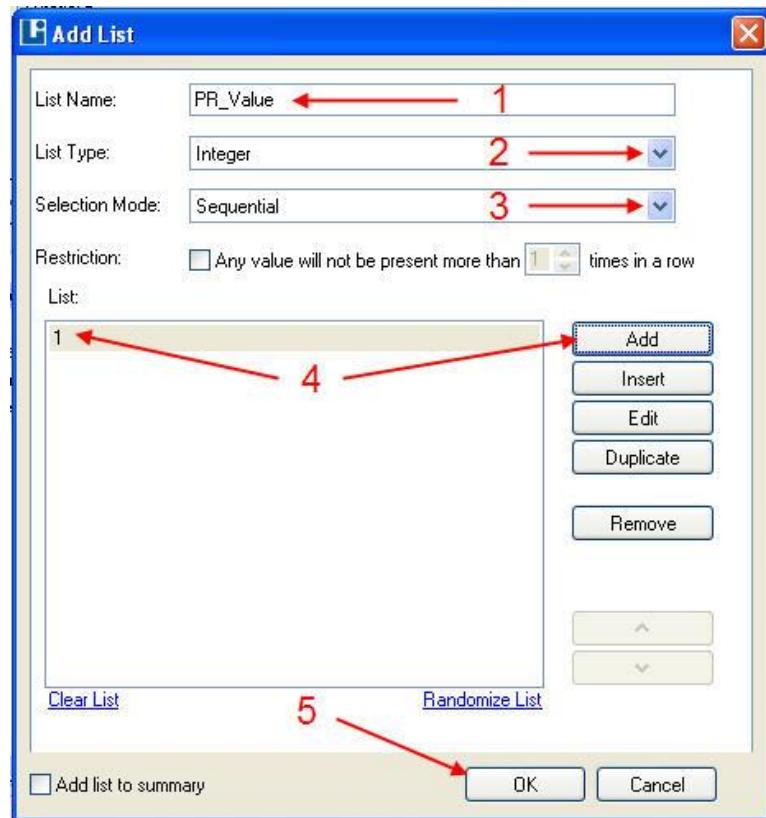
#### Using the Lists Feature

Lists are probably one of the more powerful features of the ABET II programming system. They save a tremendous amount of programming logic and are as easy to construct as a simple variable. Once a list is built, it can be used in any aspect of the schedule that a simple variable could be used.

Open Tutorial 4 in Schedule Designer. Use **Save As** on the Schedule Designer menu and enter a new file name of Tutorial 5. Edit the Schedule Description. Delete the simple Variable PR\_Value if you want to use this for the list variable name. ABET II will not allow you to create a List variable and a simple variable with the same name. Alternatively, you could simply name the list PR\_List\_Value. You can also delete the Step\_Value variable as it will not be used in Tutorial 5. Remember variables are schedule specific. They may be shared, but deleting or renaming them in one schedule will have no effect on any other schedule. When these variables are first deleted they may trigger an error message that can be ignored for now as it will be resolved when the schedule is edited.

The following sections explain all the options and features provided by the list variable. Please take a moment to look at these tools before continuing with building the Tutorial 5 Progressive Ratio. To skip this section and proceed with the tutorial detail, go to or click [[Completing Tutorial #5](#)].

#### Defining the List Variable



A list variable is very much like the simple variables used up to this point, except multiple values may be stored and accessed based on user selected settings. Highlight the Lists folder and click the Plus/Add tool found at the top of the workspace to open the Add List window shown here.

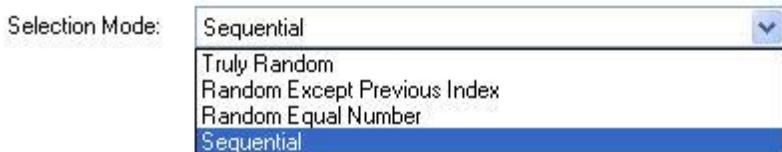
The key to this image is on the next page.

## Tutorial #5

### Using the Lists Features

1. Enter a **List Name** as you would for a simple variable. **PR\_Value** was used here.
2. Select a **List Type** as you would for a simple variable. **Integer** should be selected for the progressive ratio list.
3. Specify a **Selection Mode** from the list provided. **Sequential** should be used for the Progressive\_Ratio list. See additional information below.
4. The List must contain at least one value. Use Add and enter the number one (1) for now.
5. Click OK to close the Add List window.

#### Choices for Item Selection from a Variable List



##### **Truly Random:**

Any list item may be drawn with no rules or exceptions. It is unlikely that list items will be drawn an equal number of times unless the number of samples drawn is very large relative to the number items in the list. Numbers may be repeated in the list to create different probabilities. For example a 1, 1, 2 list would result in 66 2/3% of 1's and 33 1/3% of 2's given a large enough sample.

##### **Random Except Previous:**

Similar to Truly Random except the same item in the list as designated by the index may not be selected twice in a row. If multiple list items have the same value, it is still possible that the same list value will be selected twice in a row. Use **Restriction** below to avoid selecting the same value multiple times in a row.

##### **Random Equal Number:**

All list items must be drawn before any number can be repeated. Basically each list item is removed from the list when drawn. The list is repopulated only when it is empty. A completely balanced design can be accomplished by running a total number of trials that is an even multiple of the number of items in the list. For example, a schedule designed with 100 trials and 10 list items would guarantee that each animal and/or each run had every list item used 10 times although the order of use would be uniquely random for each session.

##### **Sequential:**

As implied, list items are drawn sequentially starting with the first list item and continuing to the end of the list. The next list item to be drawn will begin again at the beginning of the list. Lists may be randomized and drawn from sequentially if you want the same "random" order for each animal.

##### **Restriction**

An optional check box is provided to put some restriction on a list that is randomly drawn from. For example, in a study where the reward is 1 pellet 70% of the time and 2 pellets 30% of the time, you might make a list with 6 two's and 14 one's. If drawn from randomly it is possible, although unlikely, that you could get 14 one's in a row. The **Restriction** option lets you limit the number of times that the same value is repeated.

## Tutorial #5

### Using the Lists Features

#### Adding List Items

Click **Add** to reveal the Add List Item form as shown.

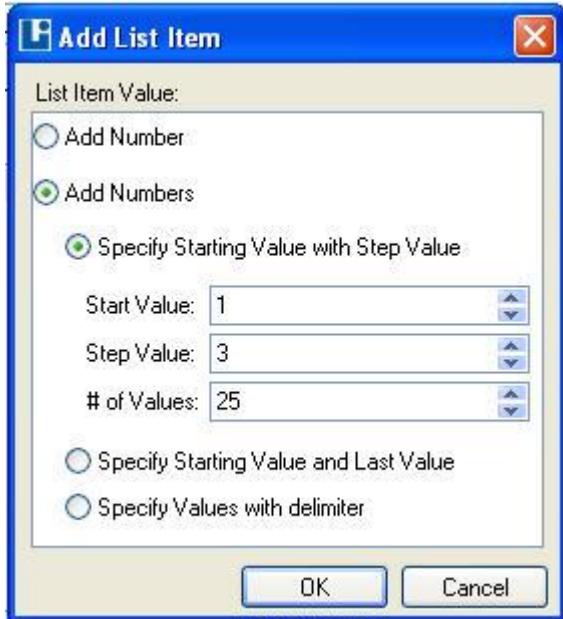
##### Add List Item Option 1:

The default selection is **Add Number**. This is used to Add a single Number at a time. To complete the Add List exercise above, you entered 1 and clicked OK for the number to appear in the list window. Although not very useful for building large lists, this option will come in handy for small lists or if you need to add a number to an existing list. Once added, the Up/Down arrows can be used to move the new number anywhere on the list.



##### Add List Item Option 2:

Click **Add** again and this time select **Add Numbers**. Three options are provided for adding multiple numbers. The default is designed to build a list with a specified **Start Value**, **Step Value** and **# of Values**. The following illustration would produce results identical to the PR schedule in Tutorial #4.

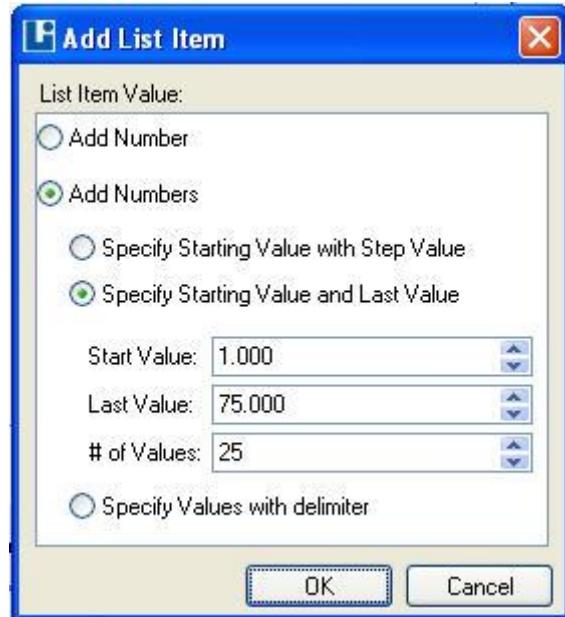


## Tutorial #5

### Using the Lists Features

#### Add List Item Option 3:

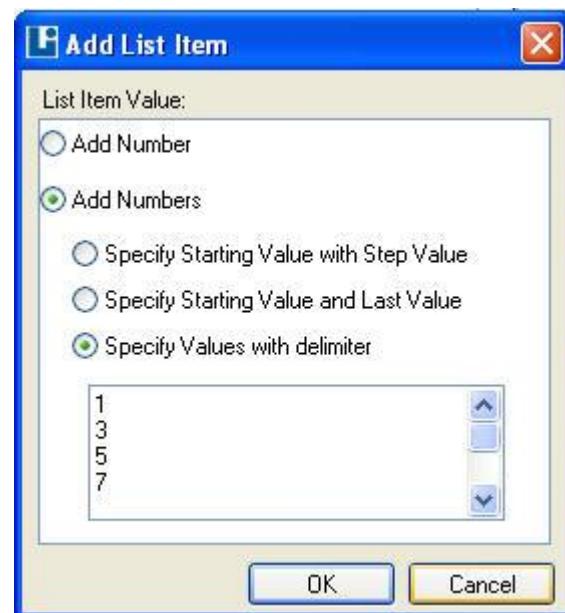
For this option it is best to use a Decimal Variable. Click the second button under **Add Numbers** to build a list with a specified **Start Value**, **Step Value** and **# of Values**. Specify Starting Value and Last Value. The display is identical to the above except that the **Step Value** is replaced by a **Last Value**. This works best with decimal variables where the incremental value can be calculated to three decimal places. With integer variables, the step value may not be consistent.



#### Add List Item Option 4:

This is by far the most efficient and useful option. Click the third button under **Add Numbers** to build or copy a list to a blank work space. For example type 1[space] 2 [space] 3 etc. or 1 [enter] 2 [enter] 3 [enter] etc. in the workspace provided. Click OK and the list is transferred to the Add List form. Click OK on that form and the list variable is complete. Highlight and use the pencil Icon to edit the list at any time.

As an option enter the sequence in Excel as cells or in Word, Notepad, or Wordpad with a [space] or carriage return [Enter] as the delimiter, copy the sequence and paste it in the space provided.



**Schedule Tip:** Use a spreadsheet to produce lists from complex formulas. When copying the list from an Excel spreadsheet all values must be in the same column.

## Tutorial #5

### Using the Lists Features

#### Managing List Items



#### Insert List Item

**Insert** allows you to insert a single number or list of numbers at any point within an existing list. Highlight the list variable and click the Edit/Pencil tool. Highlight any number on the existing list and click **Insert** to reveal the same Add List Item form shown previously. Use any of the Add List Item options to add a single value or string of values **above** the highlighted number.

#### Edit List Item

**Edit** allows you to change the value of a single number in a list. Highlight the list variable and click the Edit/Pencil tool. Highlight the number to be edited and click **Edit**. Overtake the new value in the Add List Item cell or use the control arrows to increment or decrement the value and click **OK**.

#### Duplicate List Item

**Duplicate** is similar to Insert, except it allows you to add another number to a list with the same value as any single number already in the list. Highlight any number already on the list and click **Duplicate**. Use the Up/Down arrows to move the value to a new position on the list if needed.

#### Remove List Item

**Remove** permanently deletes a single highlighted number from the list. See Clear List (#7) to remove all values from the list.

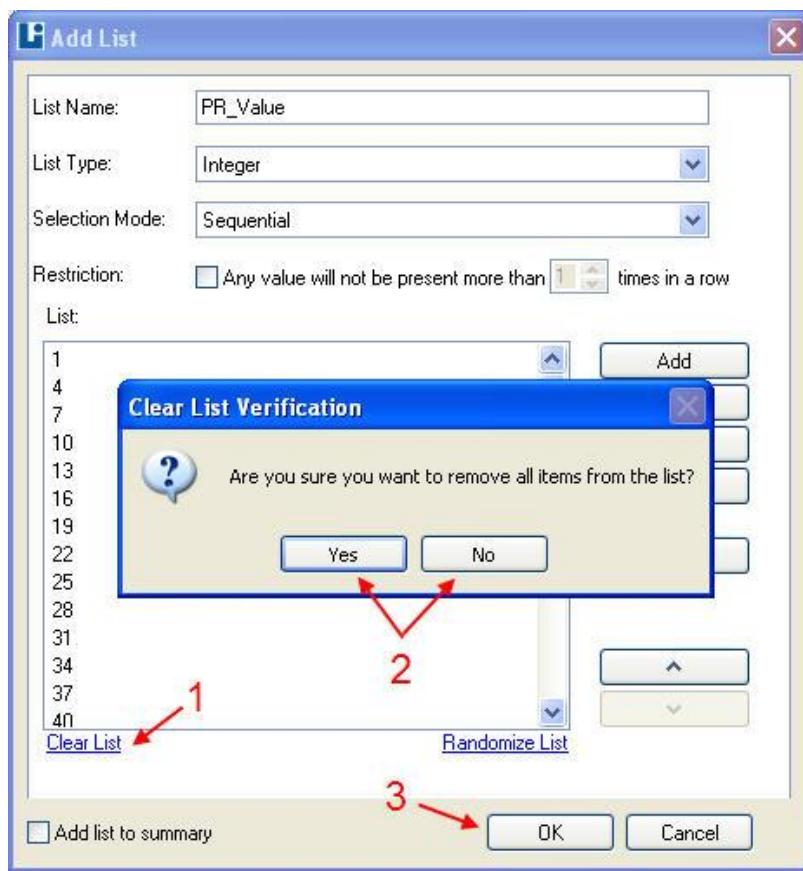
#### Up/Down Arrows

Up/Down Arrows may be used to move any highlighted number on the list as needed.

## Tutorial #5

### Using the Lists Features

#### Clear List



1. Click **Clear List** to remove all items and start over.
2. A Clear List Verification will appear. Click **Yes** to proceed, **No** to retain the existing list. Once cleared, you can still click Cancel to save the list.
3. Click **OK** and the list values are permanently removed. The list cannot be automatically restored.

#### Randomize List:

Sometimes it is preferable to create a randomized list that is drawn from sequentially rather than a sequential list that is drawn from randomly. This provides for random presentations of values but retains consistency between sessions and/or animals. Simply click **Randomize List** followed by **OK** to utilize this feature. Click Cancel prior to clicking OK to restore the original order of the list. Once OK has been clicked, the list cannot be automatically restored to the original order.

**Note:** For additional information on the use of Lists refer to [[Using Lists in Conditions and Actions](#)] in the Advanced Features of ABET II Section of this manual.

## Tutorial #5

### Using the Lists Features

#### Completing Tutorial #5

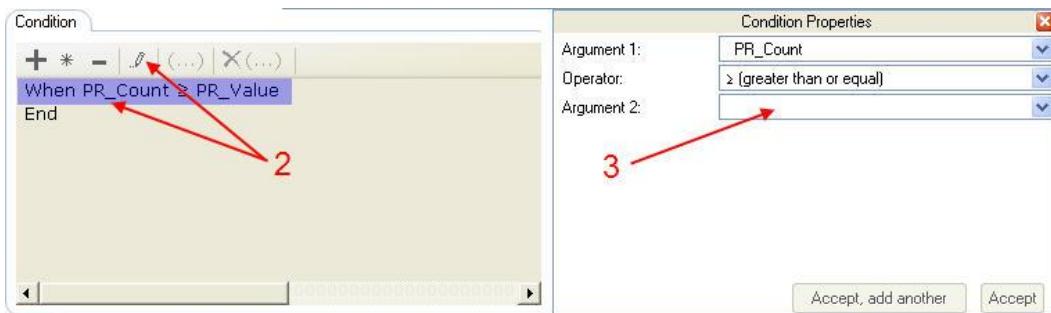
Use any of the above methods to create a list for Tutorial 5. Once a suitable list is built a couple of simple edits will complete the second PR Schedule.

**Schedule Tip:** Since this schedule is using a Sequential List, you can prevent the schedule from returning to the beginning of the list by either making the list long enough (and the ratio value large enough) that this would never happen, or by adding a trial counter and using a Max\_Number\_Trials value that would terminate the schedule at the end of the list.

#### Condition PR Evaluation

The PR Evaluation needs to be updated. In this illustration the simple variable PR\_Value was deleted and the same label used for the list variable. If you highlight the PR Evaluation Condition and look at the Condition & Action detail, it still looks like the argument is [When PR\_Count > PR\_Value] however this is from the old variable link and does not reflect the change to a list.

1. Click the **Edit/Pencil** tool (not shown)
2. Highlight the Condition argument and click the **Edit/Pencil** tool on the Condition Tab
3. Argument 2 will be blank if the simple variable was deleted. If a new name was used for the list variable, and PR\_Value was not deleted that label will still appear here.

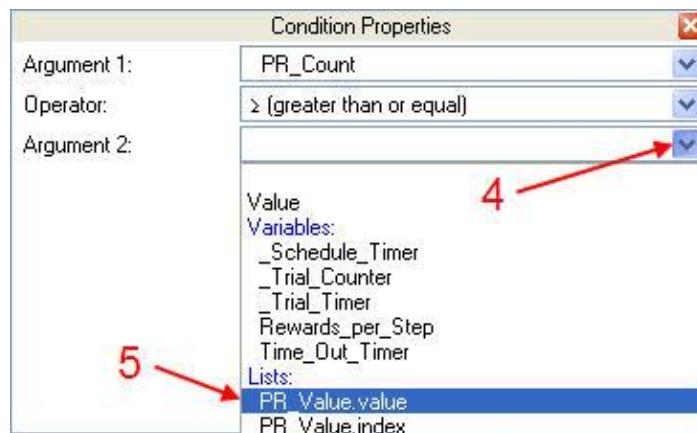


4. Click the pull down arrow for Argument 2 and note the presence of two List Variables. These are actually two components of the same variable: The Value of each item in the list (the numbers you placed on the list) and an Index (the position of each item in the list). For example in the list 1, 4, 7, 10, 13, 16, 19, the 5<sup>th</sup> item in the list has a value of 13 but an index of 5. When selecting from a list, **Get Next Value** or **Get Next Index** will have the same effect based on the selection mode assigned to the variable. The index is a useful tool when matching items from multiple lists.

5. For this application click **PR\_Value\_Value**

**Note:** There are no changes to the Action part of this condition.

6. Click **Accept** to complete this step (not shown).



## Tutorial #5

### Using the Lists Features

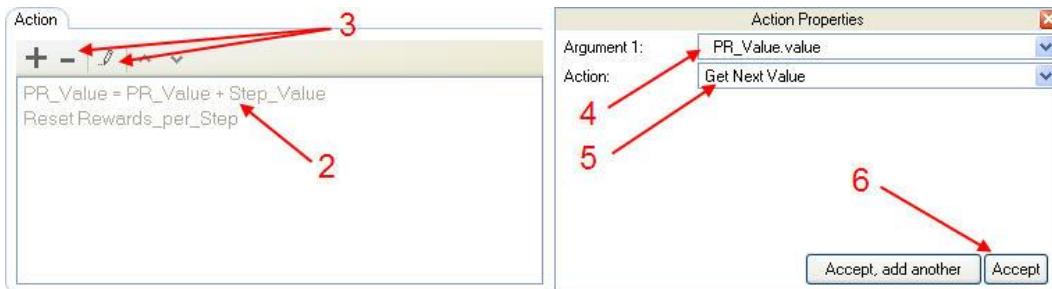
**Schedule Tip:** In addition to using the index to match list, indexes may also be acted upon directly. For example, **Decrement** (subtract) from the index to back up in a sequential list (useful for correction trials). Similarly, **Increment** (add) to the index to skip values; or **Reset** the index to return to the front of the list (sequential) or to **Reload** (repopulate) the list (random equal number {also referred to as random without replacement}).

#### Condition PR Count

There are no changes to the PR Count Condition

#### Condition PR Rewards per Step

1. Highlight the PR Rewards per Step Condition & Action name on the Schedule Designer tab and click the **Edit/Pencil** tool (not shown)
2. Highlight **[PR\_Value = PR\_Value + Step\_Value]** on the Action tab.
3. Use the **Delete** and **Add** tools or click the **Edit/Pencil** tool
4. Argument 1 will be blank. Use the pull down menu to select the lists variable, **PR\_Value.Value**
5. Use the pull down menu for the Action item to select **Get Next Value**.
6. Click **Accept** and **OK** (not shown) to complete the changes to the **PR Rewards per Step** condition.



#### Condition Reward Timeout

There are no changes to the Reward Timeout Condition

#### Running Tutorial 5 – Progressive Ratio from a list

Save Tutorial 5 and close the file in the Schedule Designer. Click the Execution Manager Tab. Load Schedule 5 making changes to session fields or the Rewards\_per\_Step variable on the Properties tab if you like. View the data to confirm the expected results.

If the schedule does not run as expected, check your condition arguments and actions against the print out on the next page.

## Tutorial #5

### Using the Lists Features

#### Print Preview of the Progressive Ratio Schedule using List

**Conditions and Actions:**

Group	Name	Goto	Condition	Action
1	Start PR	2	When <code>Schedule_Timer</code> ≥ 1	<code>Turn on House Light #1</code> <code>Turn on Stimulus Light #1</code>
	↳ Start Condition for PR			
2	PR Evaluation	3	When <code>PR_Count</code> ≥ <code>PR_Value.value</code>	<code>Pulse Reward #1 for 50 ms.</code> <code>Turn off Stimulus Light #1</code> <code>Increment Trial Counter</code> <code>Decrement Rewards_per_Step</code> <code>Reset PR_Count</code> <code>Start Time Out Timer</code>
	↳ Determines when to reward			
2	PR Count	2	When <code>Left_Lever</code> = Activated	<code>Increment PR_Count</code>
	↳ Response Count Condition for PR			
2	PR Rewards per Step	2	When <code>Rewards_per_Step</code> ≤ 0	<code>GetNextValue PR_Value</code> <code>Reset Rewards_per_Step</code>
	↳ Evaluate and update the number of rewards at each step in the PR			
3	Reward Timeout	2	When <code>Time_Out_Timer</code> ≥ 5.000	<code>Turn on Stimulus Light #1</code> <code>Reset Time Out Timer</code>
	↳ An optional pause in the schedule following reward. Responses made during time out have no effect on the PR Count.			
4	End of Schedule	-		

**Warning:** In the above schedule the **GetNextValue** action was not used until after the first reward was delivered. This is an important consideration. Lists are initialized when a schedule is run and the first value is selected automatically. Therefore, it is important to use this value before using the **GetNextValue** action. This is particularly important when values are selected

**Sequentially or Random Equal Number.** Failure to follow this rule would miss the first value in a sequential list and would alter the desired balance for trial blocks when using a random equal number list. .

**Note:** For additional information on the use of Lists refer to [[Using Lists in Conditions and Actions](#)] in the Advanced Features of ABET II Section of this manual (page 154).

A special application of the List feature [[Using a multiple output list](#)] is also covered in the Advanced Features of ABET II Section of this manual (page 187)

The links provided above should take you directly to these sections.

## Tutorial #6

### Building a Variable Ratio Schedule

#### The Variable Ratio Schedule (VR)

The VR Schedule mimics the PR schedule in several design features. Like the PR it is probably better suited to using the List feature. You can use a sequential list that has been randomized (recommended) or use one of the random draws (Truly Random, Random Except Previous, Random Equal Number). The choice is up to the user. The brief illustration here demonstrates yet another way to design this schedule using a **Set to Random Constant** option.

This schedule may be built from scratch or by editing the FR schedule used in Tutorial #2 as done here. By now it should be more and more apparent just how flexible and easy to use the ABET II system is. Remember to use text labels that describe a condition's function if possible or add sufficient information in the description field to make your schedules easy to read and understand. The benefit of this will be appreciated when you return to a schedule after a long layoff or when trying to explain a schedule to a new user.

#### Defining Variables and Conditions for the VR Schedule

Create two new integer variables for this schedule.

**VR\_Count:** Define as an Integer with a default value of 0

**VR\_Value:** Define as an Integer with default value of 0.

#### First Condition – Start VR

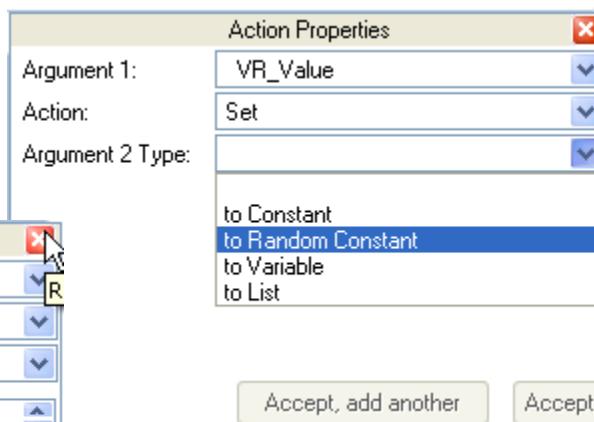
Start VR is identical to the Start Condition used for previous tutorials with an additional Action. The VR Value was defined with value zero (0). An action is added here to Set the Value to a random constant within a prescribed range. Again, highlight this condition and click the Edit/Pencil Tool to open the Edit Condition & Action Form.

- Click the **Add/+** tool on the Action Tab to open the Action Properties Form.

Select **VR\_Value** for Argument 1

Select **Set** for the Action

Select **to Random Constant** for the Argument 2 Type:



Action Properties	
Argument 1:	VR_Value
Action:	Set
Argument 2 Type:	to Random Constant
Min =	1
Max =	9
<b>Accept, add another</b> <b>Accept</b>	

Complete the **Min =** and **Max =** values as desired. Values of 1 and 9 were used in this example. This should produce a VR Ratio with a mean value of 5. Click **Accept** here and OK on the Edit form when finished.

## Tutorial #6

### Building a Variable Ratio Schedule

#### Second Condition – VR Evaluation

This condition is functionally identical to FR Evaluation and PR Evaluation. Cosmetic changes to this condition again include the Name and Description if present. The Condition arguments must be changed to reflect the appropriate variables for Tutorial #6, **VR\_Count** and **VR\_Value**. The first action, Pulse Reward #1 for 50 ms remains unchanged. The second action must again reflect the appropriate variable, **VR\_Count**. The completed code is as follows:

```
When VR_Count = VR_Value
{
    Pulse Reward #1 for 50 ms.
    Reset VR_Count
}
End
```

**Change the Goto for the VR Evaluation** from two (2) to one (1). This should use the Start VR condition to set a new value for the VR with every reward.

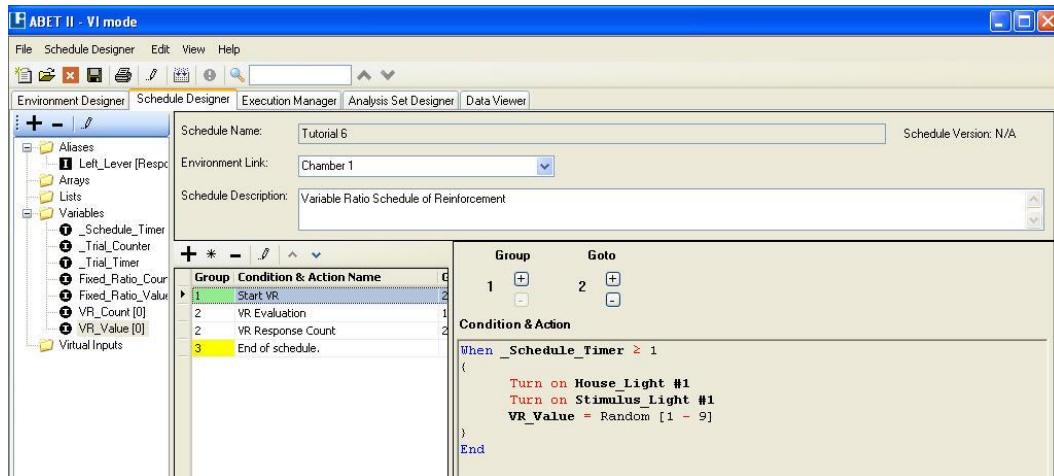
#### Third Condition – VR Response Count

This condition is functionally identical to FR Count and PR Count. The only changes made for this tutorial were in the name, description and action.

- The Action has been changed from **Increment FR\_Count** to **Increment VR\_Count**

#### The Finished Schedule for Tutorial #6

Tutorial #6 will draw a random VR value upon start and proceed to group 2. In group two it counts responses on the left lever or response lever #1 until the ratio count is equal to the value drawn at start. When the reward condition evaluates as true a 50 ms pulse is sent to the pellet dispenser and the VR count variable is reset to 0. By returning to the start condition, which evaluates true as long as the \_Schedule\_Timer is running, a new random value is drawn before returning to Group 2. This schedule should continue until stopped by the user or a Max\_Schedule\_Time is reached. You can also add a trial counter to VR Evaluation and use the Max\_Trial\_Count feature.



## Tutorial #6

### Building a Variable Ratio Schedule

#### Print Preview of Tutorial #6

##### ABET II - Schedule

**Schedule Name:** Tutorial 6

**Schedule Description:** Variable Ratio Schedule of Reinforcement

**Environment Link:** Environment 1

Name: Chamber 1  
 Usage: 8 inputs/15 outputs  
 Location: 1 A  
 Installed: Yes

Inputs		Outputs		Outputs with Intensity	
Line	Description/Label	Line	Description/Label	Line(s)	Description/Label
1	Response_Lever #1	1	Stimulus_Light #1		
2	Response_Lever #2	2	Stimulus_Light #2		
		3	Reward #1		
		4	Reward #2		
		5	House_Light #1		

##### Conditions and Actions:

Group	Name	Goto	Condition	Action
1	Start VR	2	When _Schedule_Timer ≥ 1	Turn on House_Light #1 Turn on Stimulus_Light #1 VR_Value = Random [1 - 9]
	↳ Start Condition for VR			
2	VR Evaluation	1	When VR_Count = VR_Value	Pulse Reward #1 for 50 ms. Reset VR_Count
2	VR Response Count	2	When Left_Lever = Activated	Increment VR_Count
	↳ Response Count Condition for VR			
3	End of Schedule	-		

##### Aliases:

Alias Name	Alias Type	Device List
Left_Lever	Input	Response_Lever #1

##### Variables:

Name	Type	Value
_Schedule_Timer	Timer	0.000
_Trial_Counter	Integer	0
_Trial_Timer	Timer	0.000
Fixed_Ratio_Count	Integer	0
Fixed_Ratio_Value	Integer	5
VR_Count	Integer	0
VR_Value	Integer	0

## Running the Variable Ratio Schedule

When satisfied with the above Save and Close the schedule by clicking the **Save Icon/Disk** followed by the **Close Icon /X** or select **Save** and **Close** from the Schedule Designer menu. Click the **Execution Manager** tab or select Execution Manager from the View menu. Load and run the progressive ratio schedule. View the data using all the tools and features previously described.

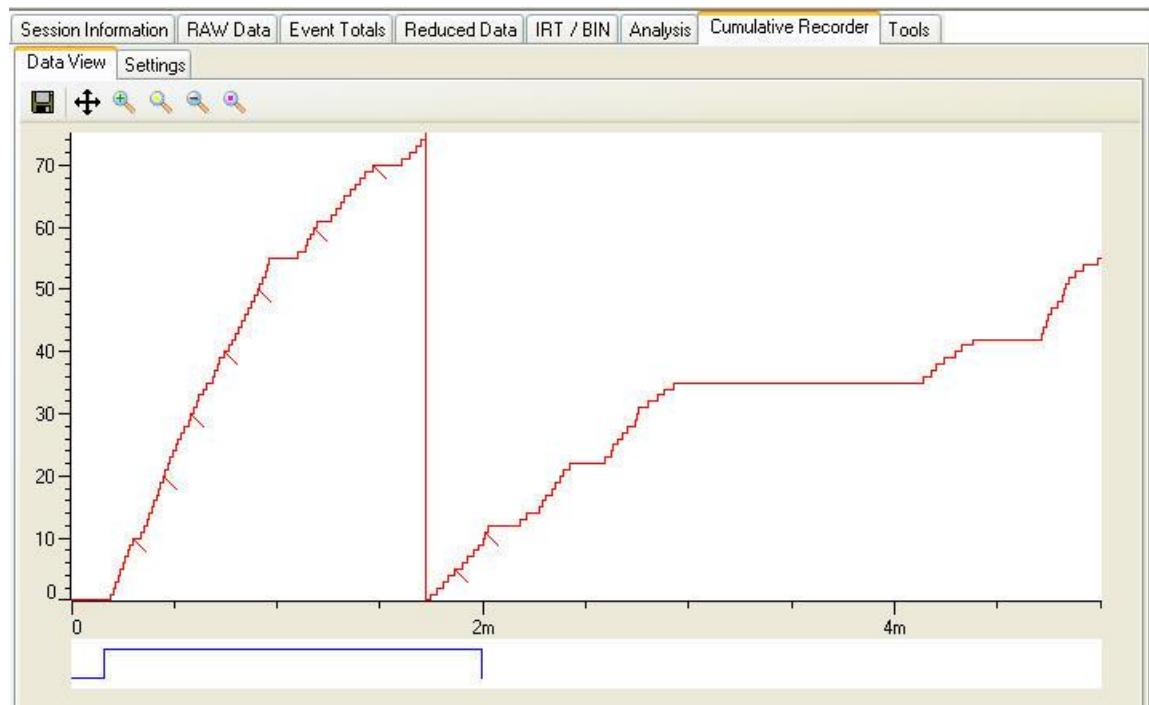
If you have any problems with running this schedule, review previous tutorials. Other useful titles may be found in the Advanced ABET II Features, Tools and Concepts section of the manual. For example click [[Using the ABET Debugger](#)] or [[Trouble Shooting Guide](#)] or other sections following the last tutorial.

## Tutorial #7

### The Cumulative Recorder

#### The Cumulative Recorder

The cumulative record creates a graph of responses or events over time. In its traditional application as shown below, responses are shown as a step over time while rewards are shown as a downward pip or hash mark on the response line. A timeline of other events may be displayed below the response chart to show the state of a stimulus or other schedule conditions. In the chart below, a FR10 was active for 2 minutes in the presence of a stimulus light. Following 2 minutes the light was turned off and responses were recorded but no reward was given.



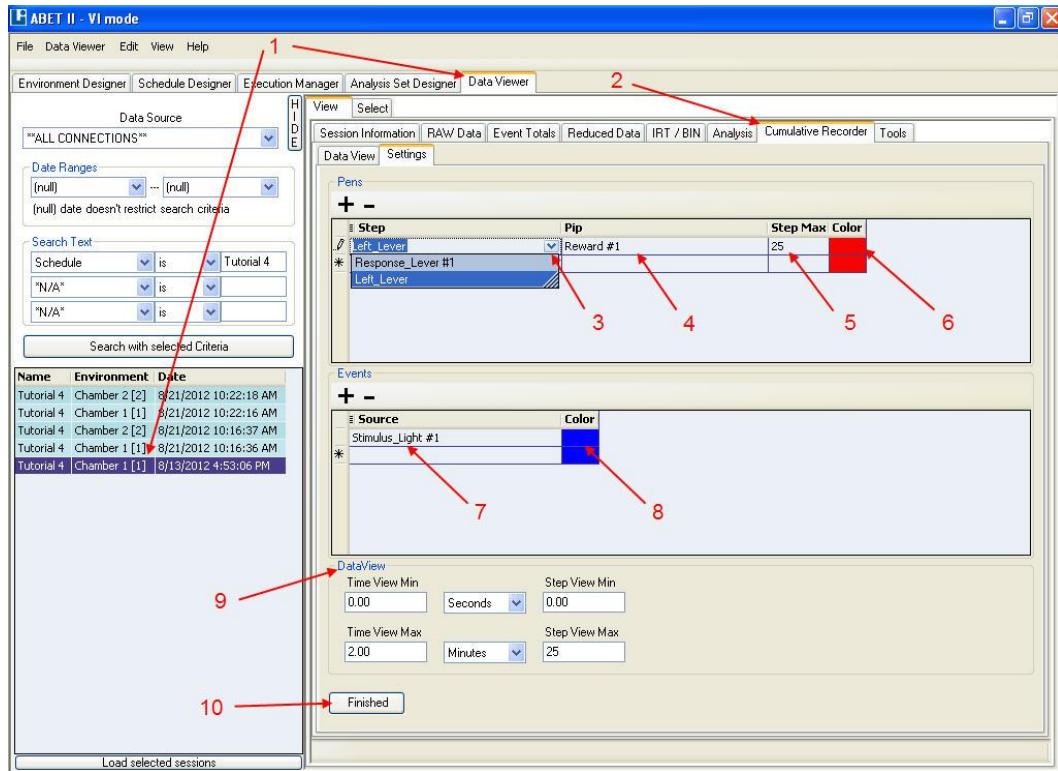
#### Settings that define the Cumulative Record

Refer to the next page for an image of the Settings screen.

1. Begin by clicking on the Data Viewer Tab and selecting a data file that you want to chart. A session run in Tutorial 4 The Progressive Ratio Schedule was used for this example.
2. Click the Cumulative Recorder Tab followed by the **Settings** tab if not active.
3. Select the Input to be counted as a **Step** pen on the cumulative record with the drop down menu. If both the environment label and an alias are available either may be used with the same result. Left\_Lever was selected in this example. Multiple Pens may be used on the same graph if desired. Only those Inputs with at least one entry in the raw data will be shown. For example, had there been any responses on the inactive lever, that input would also have been listed and a second pen line could have been added.
4. Select the Output that will create a **Pip** mark on the cumulative recorder. Reward #1 was selected in this example.
5. Enter a numerical value for the **Step Max**. This is the number of responses for each reset of the step line. Typically this will be rather large; however since the sample data in this case was small a value of 25 was used here.

## Tutorial #7

### The Cumulative Recorder



6. The default color for the step pen is red. Click on the color box to change this color if desired. Since multiple pens may be charted at the same time, using different colors for each may make them easier to read.
7. Select a source for an Event Marker. The stimulus light was used here.
8. The default color for the event marker is blue. Again, this may be changed if needed.
9. Complete the Data View section to suit the data and the way you want to view it.

**Time View Min** will set the starting point of the graph. This will be zero (0) unless you wish to view a particular segment of a graph.

**Time View Max** will set the X-Axis or elapsed time for the screen view. Graphs may be panned when the screen view is less than the total time of the chart.

**Step View Min** should be left set to zero (0).

**Step View Max** will set the Y-Axis or total number of steps that can be displayed. This is typically set to the same value as Step Max. Using a smaller value will cut off some of the data. Using a larger value will simply add white space above the reset point of the graph.

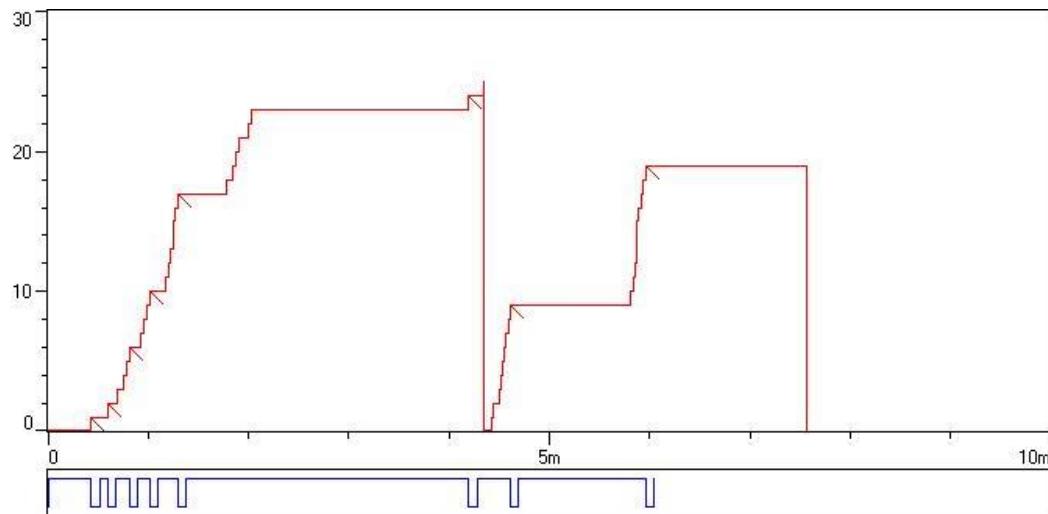
10. Click Finished to view the Cumulative Record Chart. To view another session simply highlight the data source and click the Cumulative Recorder tab.

## Tutorial #7

### The Cumulative Recorder

#### Sample Cumulative Record

This record shows data from a progressive ratio schedule with a 10 second timeout following reward. The timeout was marked by turning the stimulus light off. The Y-Axis was set to 30 and the Step Max to 25.

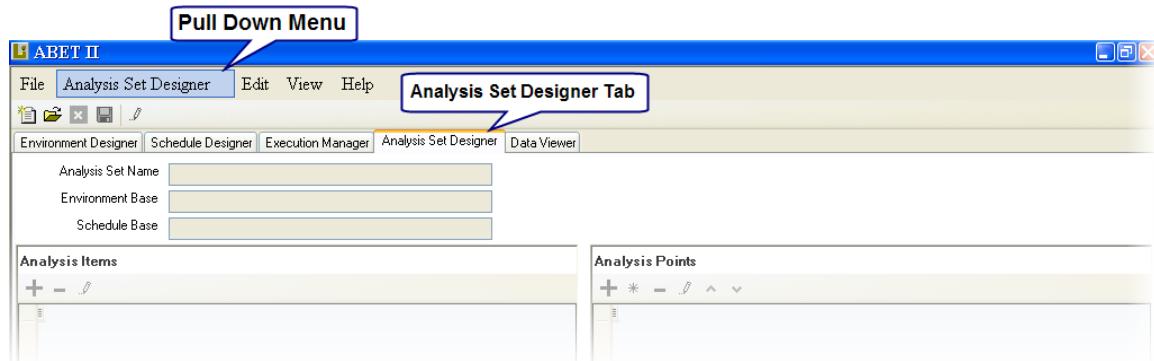


# The Analysis Set Designer- Part I

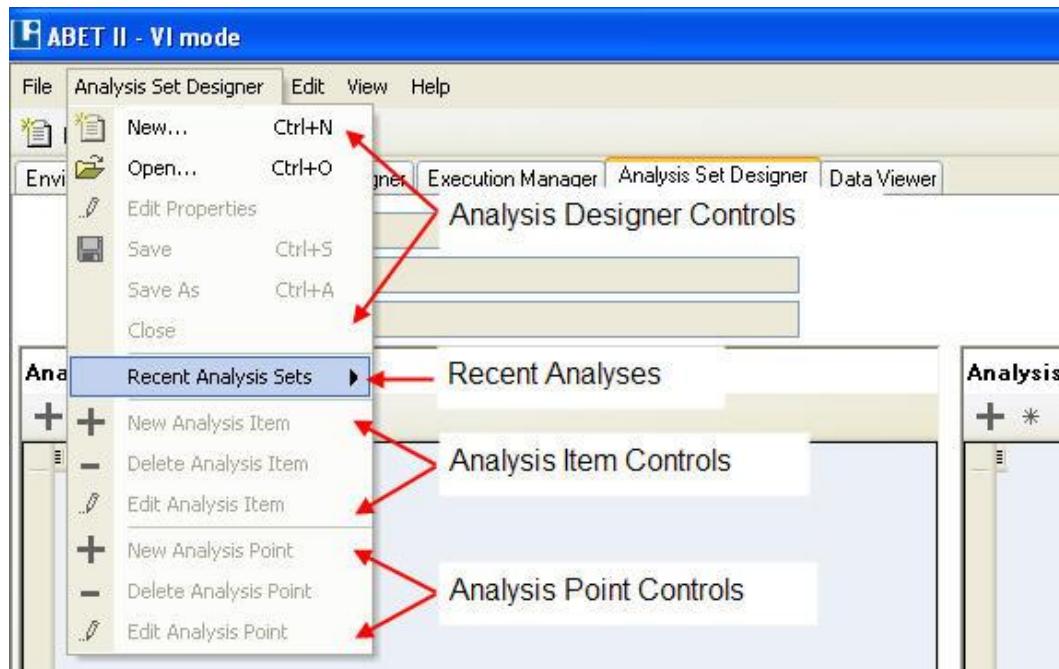
## The Analysis Set Designer

The Analysis Set Designer is an added feature of ABET II that greatly expands its data display and data analysis capabilities. Like other tabs, once clicked this tab will also cause the pull down menu to change. This section will contain a mix of examples similar to previous tutorials and technical explanations similar to that found in the Advanced Features Section. Please contact Lafayette Instrument Co. if you have any questions or require assistance with this feature as some concepts are easier to explain as they relate to your specific schedule and data needs.

### Tabs, Menus and Tools

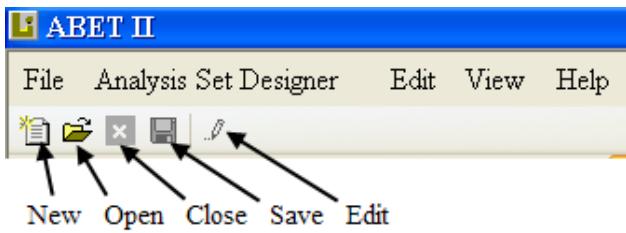


Click the Analysis Set Designer pull down menu to reveal the following menu items grouped into four categories.

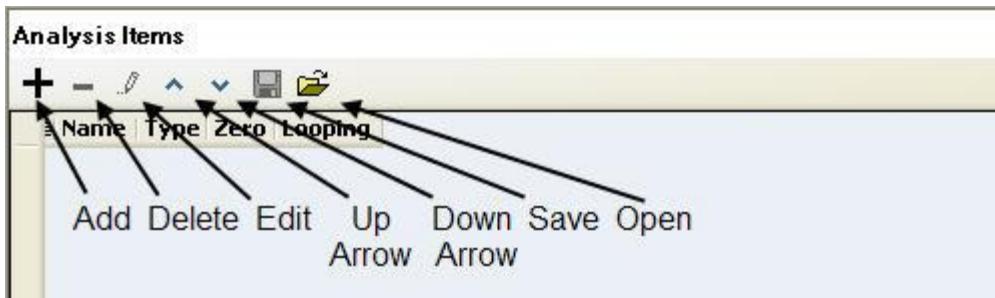


Analysis Designer Controls are also available from the top tool bar.

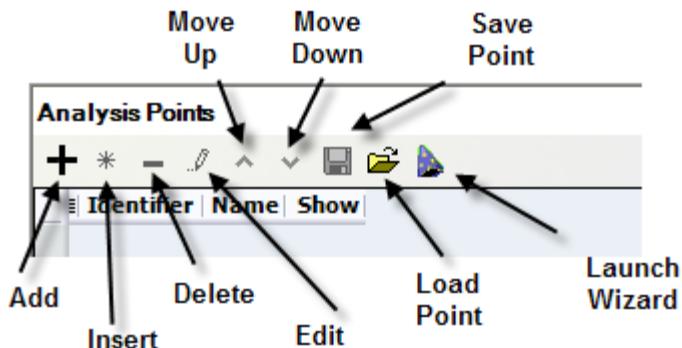
## The Analysis Set Designer- Part I



Additional Analysis Items Controls are available from that section of the workspace.



Additional Analysis Points Controls are available from that section of the workspace.



Moving the cursor over any of the above tools will provide a more detailed description of each Icon/Tool. Create an Analysis Set for each schedule or a single set for multiple schedules that share the same properties used in the measure. An Analysis Set may have one or multiple measures and each measure may have one or multiple points.

### Analysis Tip

One advantage of the Analysis Set Designer, in addition to its virtually unlimited flexibility, is that measures (and corresponding statistics) that were not planned for in advance may still be extracted from the raw data. That said, it is prudent to build an Analysis Set and test it with new schedule data collected on a pilot animal before starting an actual experiment to make sure you obtain the data you will need. Sometimes it is easier to make a small adjustment to the schedule rather than adding additional elements to the analysis to get a specific measure.

# The Analysis Set Designer- Part I

## Terms used for the Analysis Set Designer:

**Analysis Set:** A package (or set) of various analysis items that will be applied to the session data from the same or similar schedules.

**Analysis Item:** An individual measure within the Analysis Set. Six broad categories are provided in the form of **Design Options** as listed below.

- a) **Measure/Paths** is used to define a latency, event time, inter-event time, or other measure of time using the first, last or Nth encounter of the Analysis Point (**Normal Mode**). An **Absolute** Mode allows you to measure **From** an absolute First, Last or Nth occurrence to multiple occurrences or from multiple occurrences **Until** an absolute First, Last or Nth occurrence.
- b) **Bout Analysis** is used to define the number and duration of bursts of activity within defined parameters.
- c) **Instance Counts** is a simple total count of all occurrences of the target input, output or event.
- d) **Evaluation.** An Evaluation requires the user to identify a Condition to isolate discrete points of time in the raw data based on trials, responses, variable change, etc. These defined points in time, created each time the Condition tests true, then act as markers to be used for subsequent Measures, Counts or calculations. For example an Evaluation might display the value of a specified variable every time the Condition test true. This commonly used to evaluate blocks of trials, responses, or time within a session.
- e) **Call** is used to pass data between analysis items. The Call is used to display the data of interest while the Evaluation points are executed in the background and typically not displayed
- f) **Time bin evaluation** is used to place evaluations in incremental time bins within a session. A time bin evaluation of response counts using a duration of 300 seconds would result in the total number of responses that occurred in the first 5 minutes of the session, the second 5 minutes, third 5 minutes and so on.

**Analysis Point:** A single point used in defining the Analysis Item. A Starting Point, one or more Mid Points, and an End Point are typical. Each point may have a single or multiple logic elements. Bouts and counts are typically defined by a single Analysis Point. Analysis Points select time stamps from the raw data that meet the design criteria and from which the measure can be calculated.

**Other terms:** Terms such as Operator, Constant and Expression will be defined as they appear in this section.

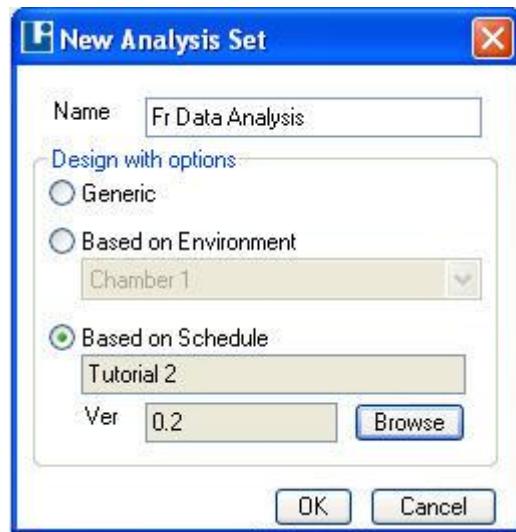
## Data for Sample Analyses

Data from Tutorial #2 using a Fixed Ratio Value of 5 will be used for the following examples. If you have not run this schedule either with an animal or with simulated responses generating at least a small number of rewards, you will need to do so prior to running an analysis.

# The Analysis Set Designer- Part I

## Using a Measure/Path

The Measure/Paths Design Option is used to measure response latencies, time between responses, duration of trials or any other set of point to point time measures within a session. Measuring a Post Reinforcement Pause will be covered in considerable detail after which the time to reward interval, reward-reward interval and time to first response will be briefly illustrated. Additional Design Options will be covered next, followed by Concepts, Advanced Analysis Features and a Report Generator.



To get started click the Analysis Set Designer tab and select **New...** from the the pull down menu, or click the **New/Sheet** Tool from the top tool bar, or use the shortcut Ctrl+N to open the **New Analysis Set** form shown here.

Enter a **Name** for the analysis set. FR Data Analysis was used here.

The design may be based on one of three options defined below. Click **Based on Schedule** and use the browse button to find the Tutorial 2 schedule that was used to collect the data to be analyzed. If your schedule does not have a version number “N/A” will appear in the Ver space. Once a schedule is selected, the Environment used in the

design of that schedule is also automatically attached. This means you will have both the Environment labels and the Schedule labels on which to base your Analysis Points.

## Design with Options definitions

**Generic:** The generic option requires that virtually all expressions be entered manually. This might be used if a data set and printed copy of a schedule were available but not the original files. Labels must be typed exactly (case sensitive) as shown in the database and/or schedule. The System Variables \_Trial\_Counter, \_Schedule\_Timer and \_Trial\_Timer are the only variables that can be automatically selected.

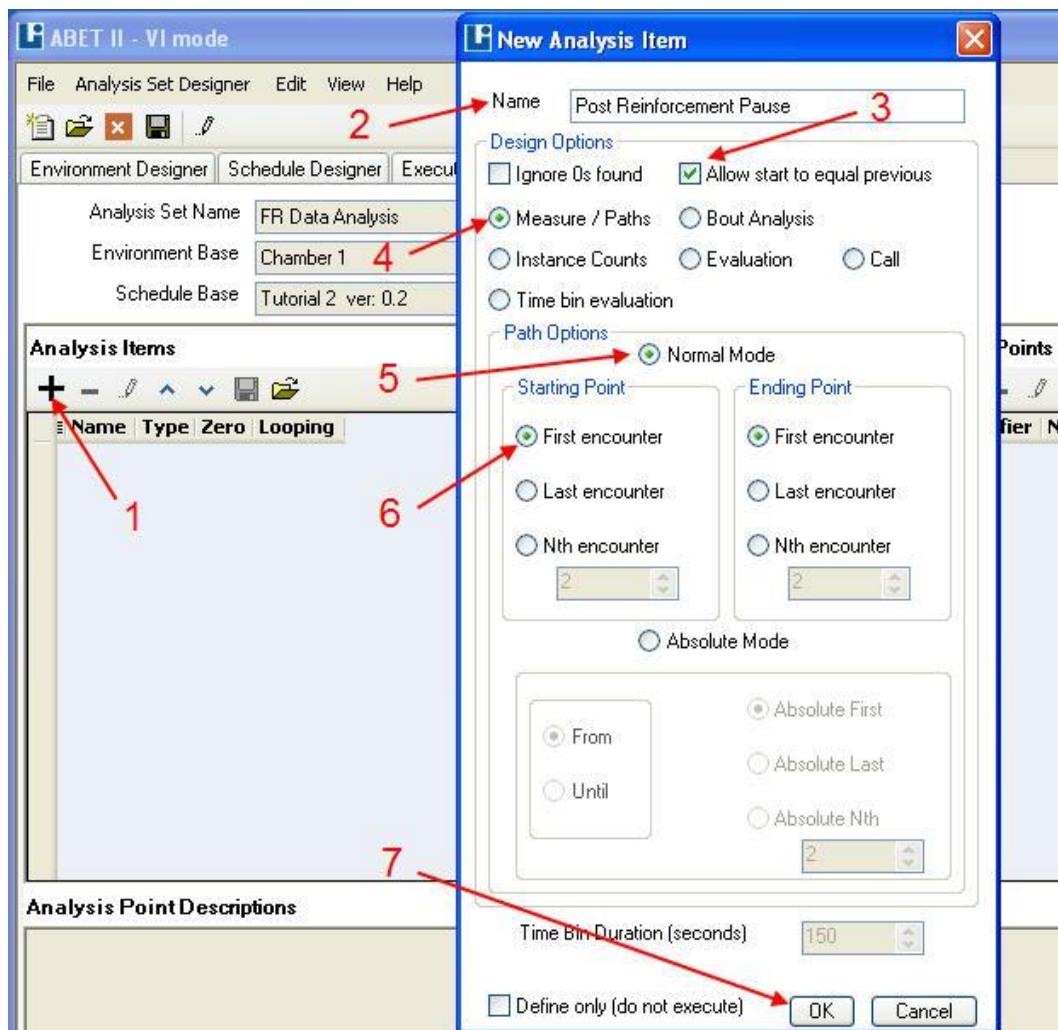
**Based on Environment:** Use this option if an Analysis Set is expected to run across multiple schedules that may share the same environment labels. This option will let you select expressions from both the Input and Output lists associated with the selected environment as well as the three system variables listed with the Generic option.

**Based on Schedule:** This is the most powerful and useful option of the three, and the one that will be used in the following examples. When you link to a schedule you also automatically link to the environment that was used to build the schedule. You will now have access to environment labels, input and output aliases, and all user created variables on which to build the analysis points for the analysis items or measures.

# The Analysis Set Designer- Part I

## The Post Reinforcement Pause Measure

The first Sample Analysis Item for the FR Data Analysis Set is the Post Reinforcement Pause. By definition this will always be the interval from the delivery of a reward to the first lever response following delivery. Each Analysis Item may produce a single Analysis or data column in the Data Viewer or when exporting to a spreadsheet, or it may produce multiple Analyses depending on the Design Option used. Measure/Paths and Instance Counts for example produce a single Analysis for each Analysis Item while an Evaluation will typically have multiple data columns.



Step by Step actions are provided on the next page even though the default settings are used for most of this first Analysis Item.

**Additional information on how data measures or paths are processed is provided in the Additional ABET II Features, Tools and Concepts section, see [[Using First/Last Measurement Paths](#)].**

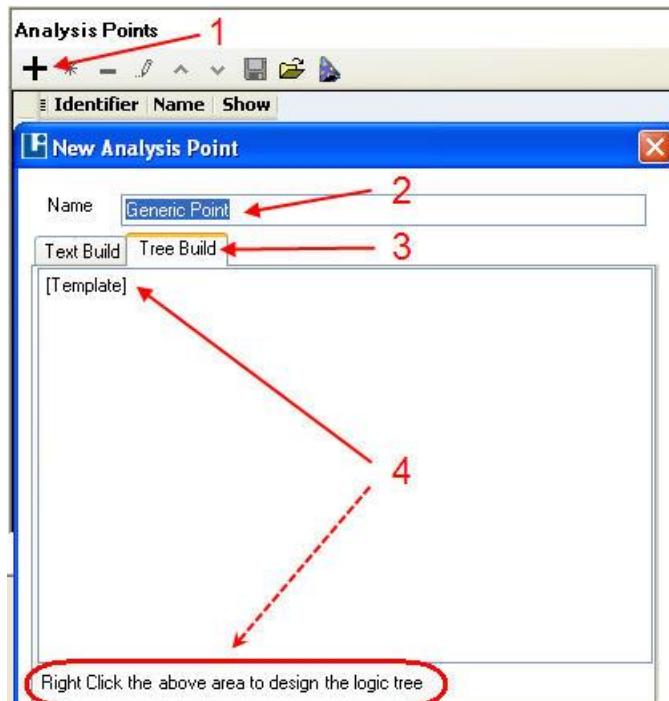
# The Analysis Set Designer- Part I

## Adding the Analysis Item - Post Reinforcement Pause (PRP):

Refer to the illustration on the previous page.

1. Click the **Add/+** tool for Analysis Items to open the New Analysis Item form.
2. Enter a suitable name for the Analysis Item, in this case “**Post Reinforcement Pause**”
3. For now leave the **Ignore 0s found** unchecked and **Allow start to equal previous** checked. Checking **Ignore** and removing the check from **Allow Start** will restrict the selection of data points and eliminate unwanted zeros. Zeros in an analysis should be checked against the raw data file to determine if these are valid pieces of data or an error in definition. Either the options or point definitions may be edited to refine the Analysis Item function.
4. Leave the **Measure/Paths** Design Option checked as indicated by the green button. Other design options will be illustrated later in this section.
5. Leave the Normal Mode path option checked.
6. Starting and ending points of a measure may be based on the first encounter, last encounter or Nth encounter of an “Expression”, where the Expression is an Input, Output, Alias, Variable, Timer or List selection. For the purpose of this example the measure will be made from each (first) reward to the first response following the reward. For additional information see [Using First/Last Measurement Paths](#) in the Advance Features section of this manual.
7. Click OK to close the window. Note that the Analysis Item is now posted with it’s Name, Type (Path Option), Zero option (Allow or Ignore) and Looping choice that does or does not allow the start element to equal a previously selected element in the data.

## Adding the Start Analysis Point



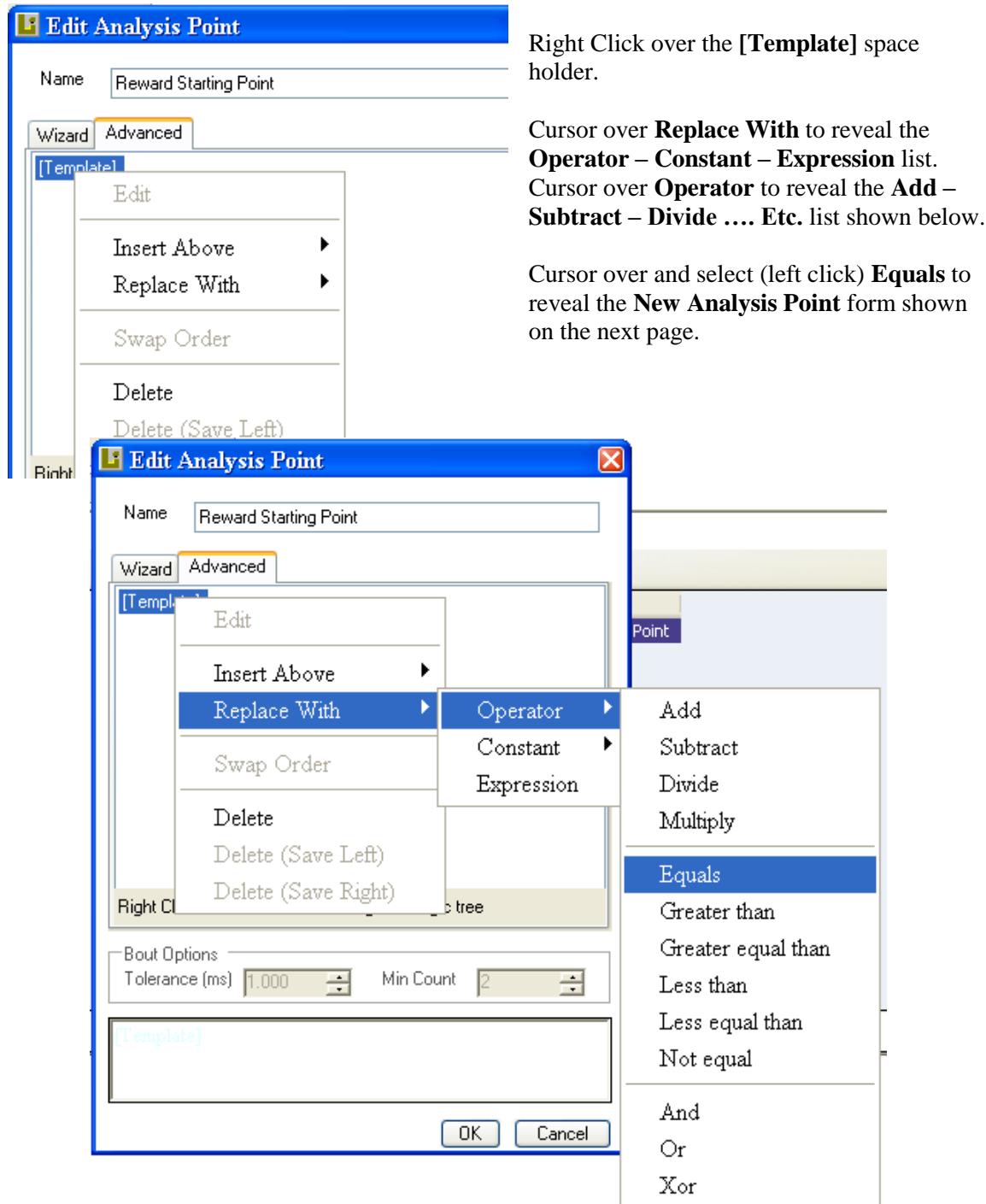
Analysis Points may be built from text however this requires an advanced understanding and knowledge of the analysis syntax and structure or existing analyses that can be pasted. Two more helpful methods when getting started are to use a tree structure which is detailed here or a Wizard tool that will be used in a future example.

1. Click the **Add/+** tool in the Analysis Points tool bar to open the New Analysis Point form shown here.
2. Highlight the name Generic Point and type over a name appropriate to this measure. **Reward Starting Point** was used for this illustration.
3. Click the **Tree Build** Tab if not already active.
4. Right click over **[Template]** to reveal the next image.

## The Analysis Set Designer- Part I

**Note:** If you continue with the following steps, the header on the form will remain as **New Analysis Point**. If the form is closed at any time by clicking OK, it can always be reopened with the **Edit/Pencil** tool. The only difference is that the header will now be displayed as **Edit Analysis Point** in place of **New Analysis Point** as shown on the following illustrations.

The next several steps will be used to define three Analysis Points for the Post Reinforcement Pause Analysis Item measure. There is no one way to do this, so feel free to experiment with the available tools



## The Analysis Set Designer- Part I

**Edit Analysis Point**

Name: Reward Starting Point

Operator [==]

- [Template]
- [Template]

The [Template] space holder is now replaced with a double equals sign “==” and two logic paths are created.

Right Click over the top [Template] space holder.

Cursor over **Replace With** as on the previous page.

Cursor over and select (left click) **Expression** to reveal the **Generate Expression** form below.

**Edit Analysis Point**

Name: Reward Starting Point

Operator [==]

- [Template]
- [Template]

Context menu options:

- Insert Above
- Replace With
- Swap Order
- Delete
- Delete (Save Left)
- Delete (Save Right)

Submenu for Replace With:

- Operator
- Constant
- Expression

**Generate Expression**

Name: Reward #1.Transition

Inputs/Outputs:

- Transition State Only
- Index (Comparing List Items)

Input: (dropdown menu)

Output: Reward #1 (dropdown menu)

Alias: (dropdown menu)

Variables:

- Vars: (dropdown menu)
- Timers: (dropdown menu)
- Lists: (dropdown menu)
- Arrays: (dropdown menu)

Expression: == [Template]

OK Cancel

Use the **Output** drop down arrow and select **Reward #1**.

Click **Transition State Only**

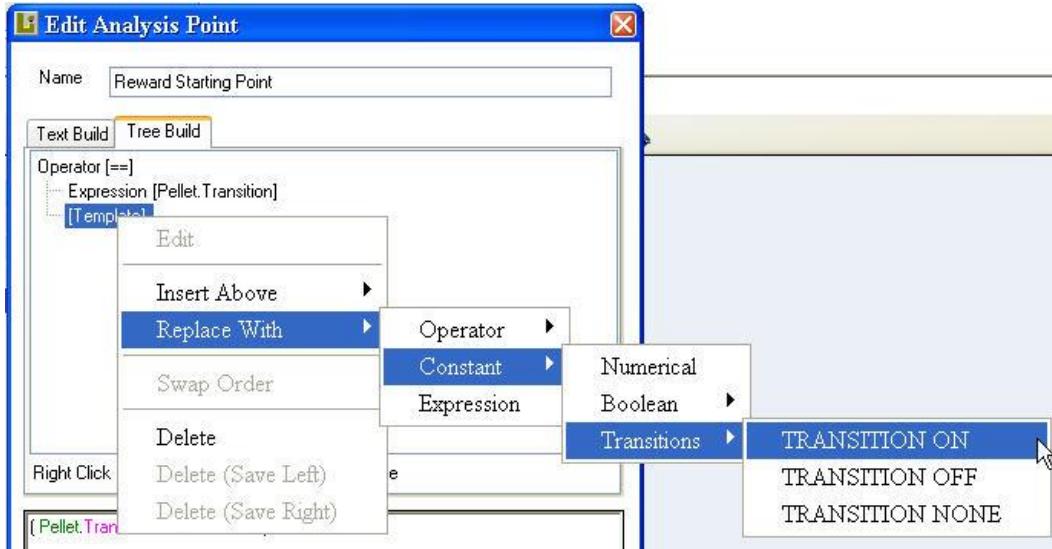
The Name **Reward #1.Transition** is automatically entered.

Click OK (not shown).

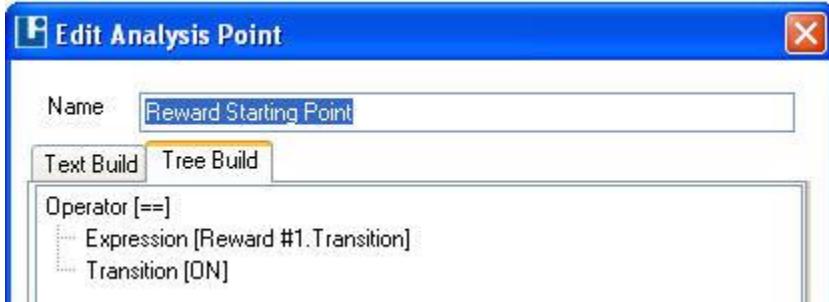
**Note:** Advanced users may simple type, **Reward #1.Transition** in the name field; however the label must match up exactly with the raw data label to work.

## The Analysis Set Designer- Part I

To complete the definition of the Reward Starting Point, right click over the bottom [Template] space holder. Cursor over **Replace With**, **Constant**, **Transitions** and finally **TRANSITION ON**.



Select (left click) **TRANSITION ON** to produce the view below.



Click **OK** at the bottom of the New or Edit Analysis Point window. This completes the definition of the Starting Point for measuring the Post Reinforcement Pause. A summary of this definition will be found at the bottom of the Analysis Set Designer tab display. Use the Edit feature if changes are required.

### Analysis Point Descriptions

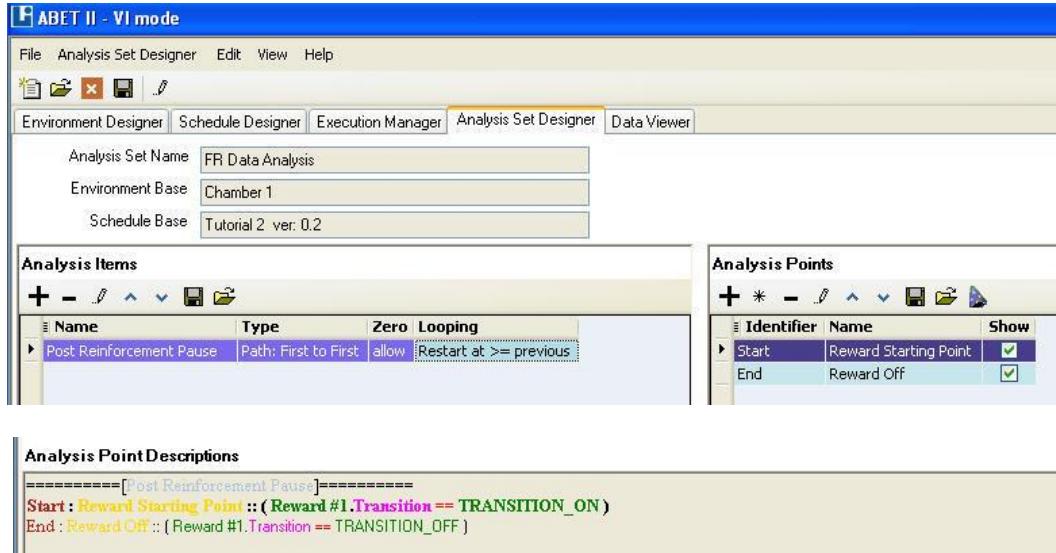
```
===== [Post Reinforcement Pause] =====
Start : Reward Starting Point :: (Reward #1.Transition == TRANSITION_ON)
```

The end point for the PRP is the first response that occurs following the reward. However, if this Analysis Item contained just these two points, it would result in a number of zero values. The reason for this is because a response creates the reward, and the time stamp for the response and the reward can have the same time stamp. Although there is a specific order that is followed in presenting data in the raw data view, the measurement tool treats all events with the same time stamp as occurring simultaneously. Zero data may be eliminated in two ways. Add a midpoint to clearly separate the responses or use the Ignore 0s found Design Option provided for Analysis Items. Both are illustrated below.

# The Analysis Set Designer- Part I

## Adding an Analysis Midpoint:

The midpoint Pellet.Transition OFF may be added here using the same steps as above with the only change being the final selection of Transition OFF in place of Transition ON. Click the Analysis Points **Add/+** Icon to start. The midpoint will temporarily appear as an End at this time.

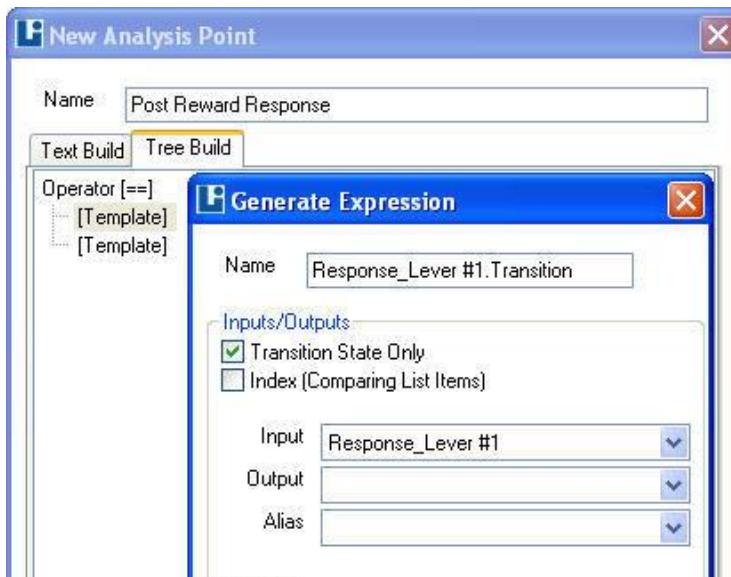


**Note:** The Analysis Points **Name** is automatically labeled “Generic Point” by default. You can change this to anything such as **Reward Off** as seen above. Also, this is currently listed as the End of the Analysis Item, but this will change as soon as we add another Analysis Point.

## Adding an Analysis End Point

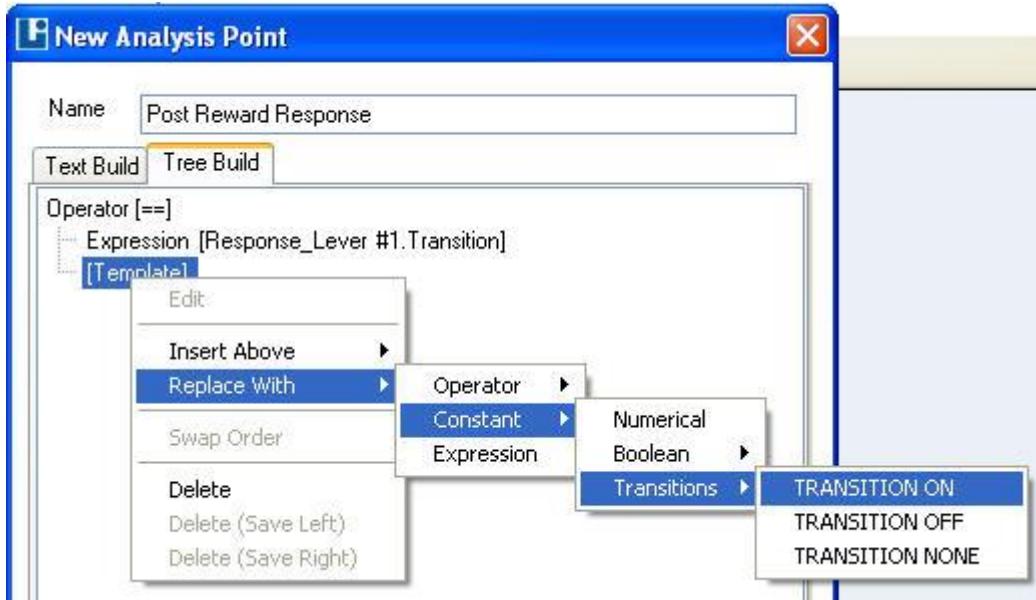
The end point for this measure is the first response to occur following a reward.

- Follow the same procedure used for the Start Point and the Midpoint.
- This time draw the Expression from the Input List as shown.
- Again, be sure to check the Transition State Only box.



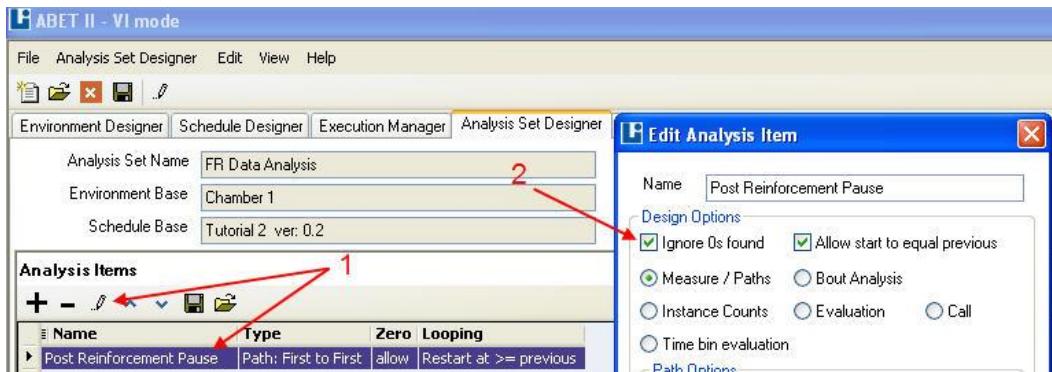
## The Analysis Set Designer- Part I

- Replace the second Template with the Constant, Transition ON



### Using the Ignore 0s found option

- Highlight the Analysis Item, Post Reinforcement Pause and Click the Edit/Pencil tool to reveal the Edit form.
- Check Ignore 0s found and click OK (not shown)

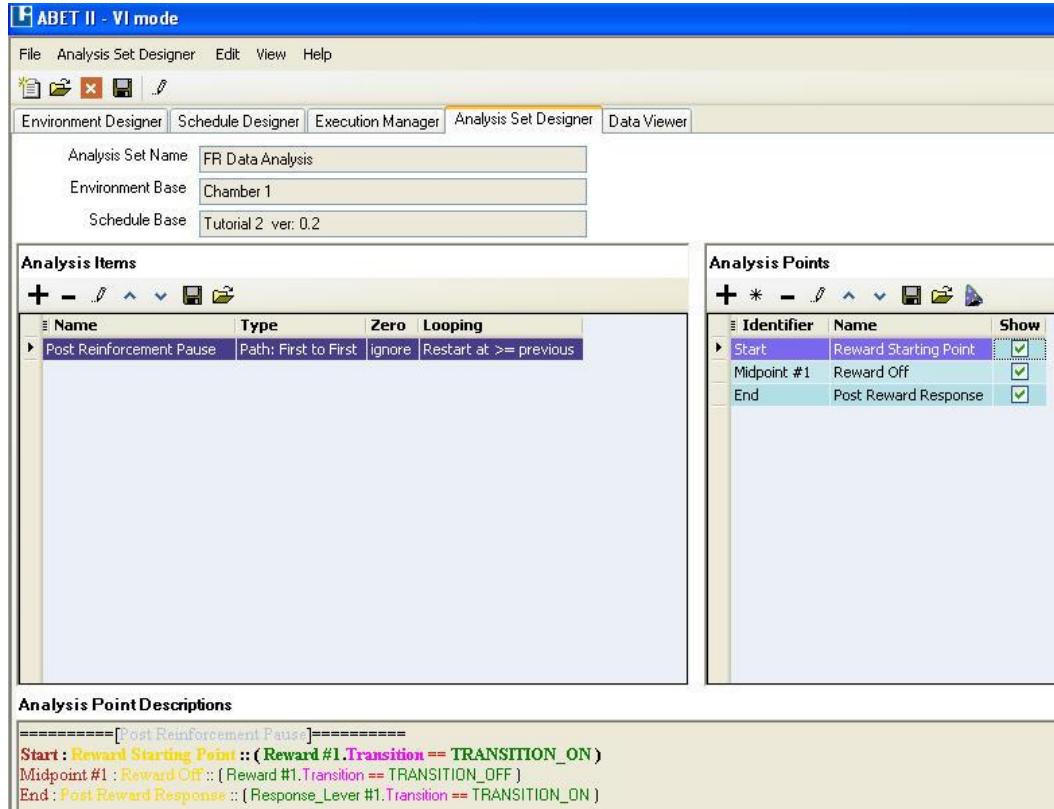


The summary line will now display "Ignore" in the Zero column in place of "Allow" as shown above. In this case the two methods will provide the exact same results. In those situations where a zero may be a valid data value, it is best to design the analysis leaving the Ignore 0s found option unchecked using other methods to properly define the correct measure.

# The Analysis Set Designer- Part I

## The Completed Measure

This completes the measure. The Analysis Set Designer screen should now look similar to the following. Select **Save** from the Analysis Set Designer menu, the **Save Icon** from the top tool bar or **Ctrl+S** to save the Analysis Set up to this point.

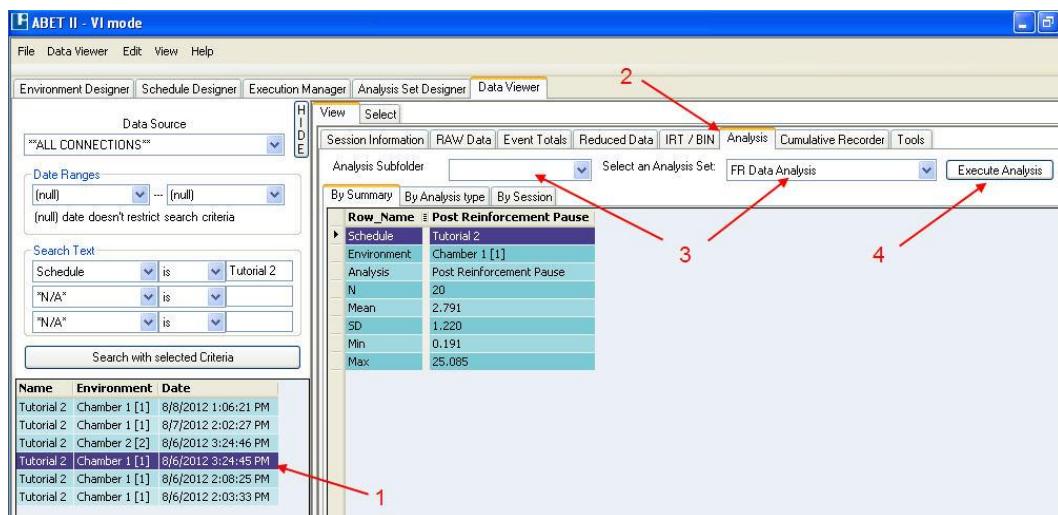


# The Analysis Set Designer- Part I

## Running the PRP measure on a single test session

Click the Data Viewer Tab to exit the Analysis Set Designer view. For a refresher on opening data files return to [\[The Data Viewer Tab\]](#) in Tutorial #1.

1. Select a file with Tutorial 2 data including multiple responses and rewards.
2. Select the Analysis Tab
3. Use the Pull Down Menus to select an Analysis Set from an Analysis Subfolder if used. Folders are not generated by ABET II, but can be created with Windows Explorer if needed to better organize one's lab. For this example simply select **FR Data Analysis** from the Analysis Set
4. Click **Execute Analysis**



Three tabs appear on the Data Viewer that will become more meaningful when working with multiple analyses and multiple sessions.

- The **Summary Tab** will provide a quick overview without detail.
- The **By Analysis Type** tab lets you look at individual analyses across sessions with a tab for each analysis.
- The **By Session tab** lets you look at individual sessions across analyses with a tab for each session.

Data Columns include the Schedule, Environment, Date/Time, and Analysis Name with the number of elements (N) in the analysis, the Mean, Standard Deviation (SD), Minimum Value (Min) and Maximum Value (Max) for the analysis followed by the individual values used to obtain these values in the order of occurrence in the raw data file.

This information may be copied or exported as needed for further analysis as previously illustrated for raw data.

# The Analysis Set Designer- Part I

## Comparing the PRP results with the raw data file

It is always a good idea to verify that the measure you've created is doing the job as intended. This is easy to do by returning to the raw data.

Note the first value in your PRP data. This of course will be different than the values seen here. The first PRP value in the example is 1.62 seconds. Click the RAW Data Tab to reveal a view similar the following screen capture.

1. Find and left click the first occurrence of the Pulse Output Event Reward #1. In this data file, this occurred at time 161.372 seconds.
2. Hold the Shift key or Ctrl key (Ctrl key used below), find the first lever response following the reward (time 162.992 seconds) and click to highlight all three elements (Shift) or just the two elements (Ctrl) that mark the Start Point and End Point in the PRP Analysis.
3. The “Delta Time” is automatically displayed at the bottom of the screen. In this example, the time 1.620 matches the time noted in the analysis. Make the same comparison for your data. You can repeat this as many times as you like to verify that the logic tree used to form the Analysis Item is valid.

Evt_Time	Evt_ID	Evt_Name	Item_Name	Alias_Name	Group_ID	Num_Args	Arg1_Name
155.868	2	Input Event	Response_Lever #1	Left_Lever	2	0	
155.875	1	Condition Event	FR Count		2	0	
155.875	16	Variable Event	Fixed_Ratio_Count		2	1	Value
157.167	2	Input Event	Response_Lever #1	Left_Lever	2	0	
157.168	1	Condition Event	FR Count		2	0	
157.168	16	Variable Event	Fixed_Ratio_Count		2	1	Value
158.541	2	Input Event	Response_Lever #1	Left_Lever	2	0	
158.544	1	Condition Event	FR Count		2	0	
158.544	16	Variable Event	Fixed_Ratio_Count		2	1	Value
159.96	2	Input Event	Response_Lever #1	Left_Lever	2	0	
159.961	1	Condition Event	FR Count		2	0	
159.961	16	Variable Event	Fixed_Ratio_Count		2	1	Value
161.371	2	Input Event	Response_Lever #1	Left_Lever	2	0	
161.372	1	Condition Event	FR Count		2	0	
161.372	16	Variable Event	Fixed_Ratio_Count		2	1	Value
161.372	1	Condition Event	FR Evaluation		2	0	
161.372	7	Pulse Output Event	Reward #1		2	1	Duration
161.372	16	Variable Event	Fixed_Ratio_Count		2	1	Value
162.992	2	Input Event	Response_Lever #1	Left_Lever	2	0	
162.992	1	Condition Event	FR Count		2	0	
162.992	16	Variable Event	Fixed_Ratio_Count		2	1	Value
164.083	2	Input Event	Response_Lever #1	Left_Lever	2	0	
164.083	1	Condition Event	FR Count		2	0	
164.083	16	Variable Event	Fixed_Ratio_Count		2	1	Value
165.656	2	Input Event	Response_Lever #1	Left_Lever	2	0	
165.657	1	Condition Event	FR Count		2	0	
165.657	16	Variable Event	Fixed_Ratio_Count		2	1	Value
169.216	2	Input Event	Response_Lever #1	Left_Lever	2	0	
169.217	1	Condition Event	FR Count		2	0	
169.217	16	Variable Event	Fixed_Ratio_Count		2	1	Value

# The Analysis Set Designer- Part I

## The Time to Reward Measure

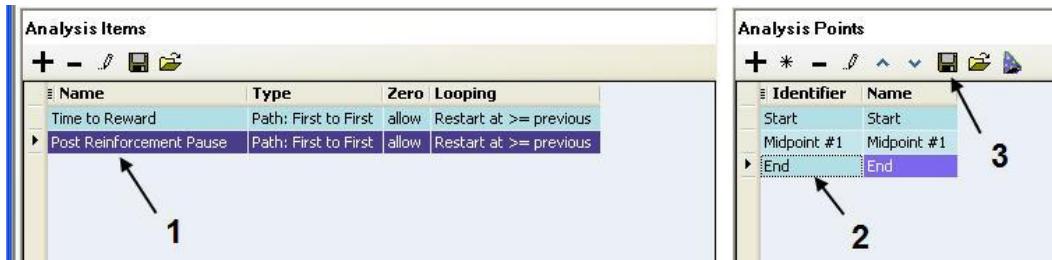
For the purpose of this example we defined Time to Reward as the time from the first response in the FR until the ratio is completed. In this measure only two points are needed, the first response in each set and the delivery of the reward. Since the final response in the FR sequence will have the same time stamp as the reward pulse output, the **Design Options** selection **Allow start to equal previous** needs to be unchecked. By doing this, the start time for each subsequent response set is greater than the end time of the previous response/reward set. Similarly, the **Ignore 0s found** option could be checked to eliminate the zero values that would be created if the **Allow start to equal previous** was left checked.

To create the **Time to Reward** measure click the “+” Icon for the Analysis Items and create a **New Analysis Item** with name, “Time to Reward”. Check **Ignore 0s found**, uncheck **Allow start to equal previous**, retain the default selections for the Path Options, Starting Point - First encounter and Ending Point - First encounter.

Create the first Analysis Point: **Response\_Lever#1.Transition == TRANSITION\_ON**. You can repeat the procedures used for the End Point of the Post Reinforcement Pause measure or use the save and open/paste features described here.

### Save:

1. Highlight the Post Reinforcement Pause Analysis Item.
2. Highlight the End Point for the PRP since it is also the Start Point for Time to Reward.
3. Click the Save Icon to save this point in the analysis folder



### Paste:

1. Highlight the Time to Reward Analysis Item.
2. Click the Open Icon for a saved analysis point
3. Highlight the file to be loaded
4. Click Open to complete the paste (not shown).

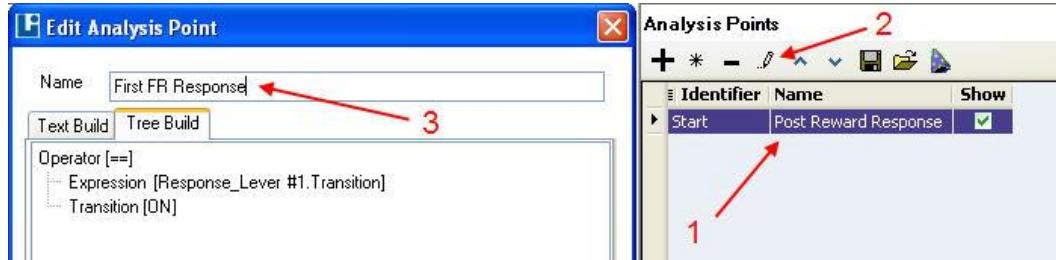


# The Analysis Set Designer- Part I

## Renaming the Start Point:

The Analysis Point will be entered with the identifier “Start” and the copied name of “End”.

1. Highlight this point if not already highlighted
2. Click the Edit tool
3. Change the Name to First FR Response

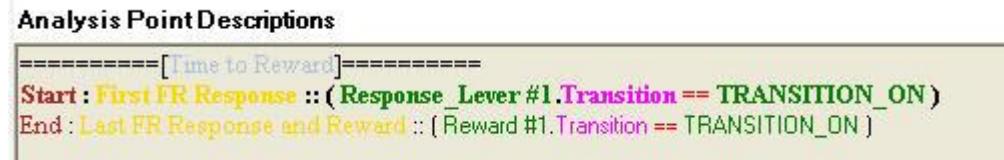


4. Click OK (not shown)

## Create an End Point for the Time to Reward analysis item.

Since the last response in an FR sequence results in the delivery of a reward, this is most easily done by using the Start Point from the PRP measure and editing it using the same technique illustrated for the Start Point.

1. Highlight the Post Reinforcement Pause Analysis Item.
2. Highlight the Start Point for the PRP since it is also the End Point for Time to Reward.
3. Click the Save Icon to save this point in the analysis folder
4. Highlight the Time to Reward Analysis Item.
5. Click the Open Icon for a saved analysis point
6. Highlight the file to be loaded
7. Click Open to complete the paste
8. Click the Edit/Pencil Tool and change the Name of the End Point. Last FR Response and Reward was used here.
9. The final description of the Time to Reward measurement (Analysis Item) should be displayed in the summary at the bottom of the Analysis Set Designer page as follows:



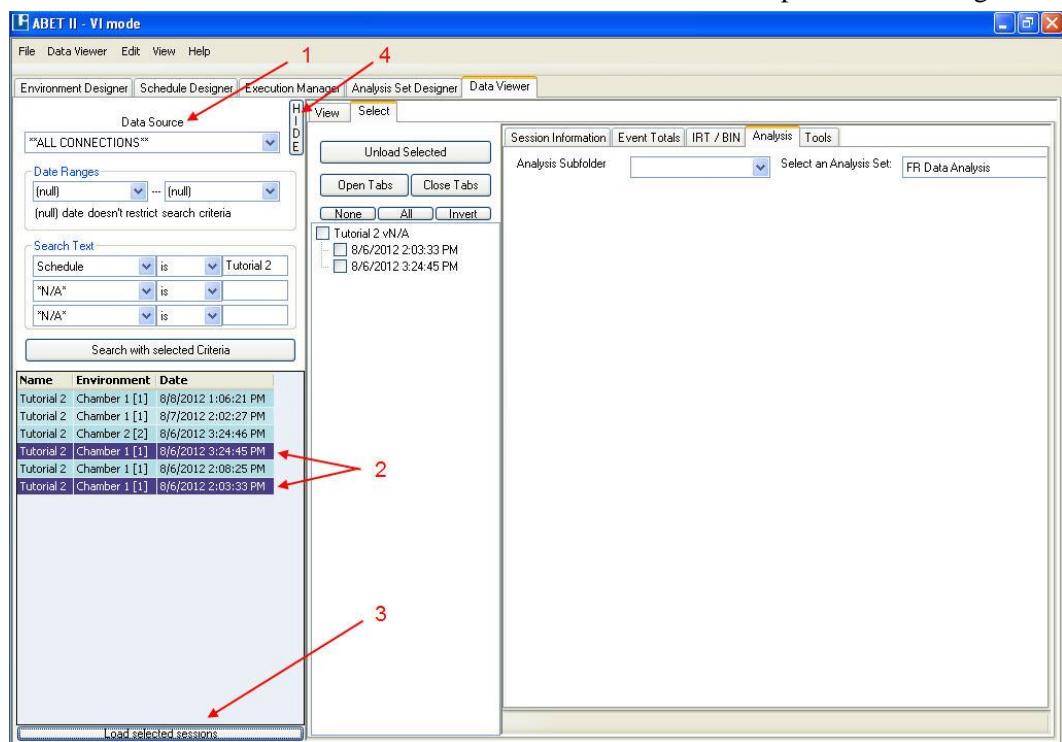
Save this Analysis Set that now contains two Analysis Items

# The Analysis Set Designer- Part I

## Analyzing Multiple Sessions for PRP and Time to Reward

Multiple sessions must be selected before they can be analyzed as a group. Use this screen capture and the sequence of steps that follow.

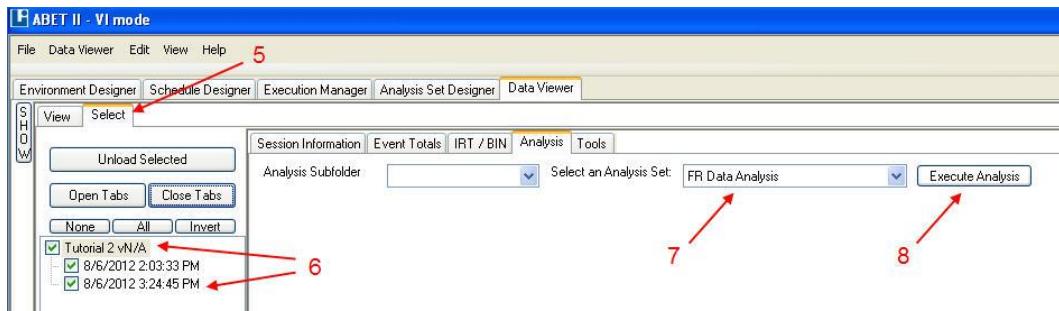
1. Select the Data Source for the raw data to be analyzed. This could be all session data or some filtered sessions as shown.
2. Highlight at least two sessions that you want to analyze using Click, Shift Click or Ctrl Click as needed. The order of selection will determine the order of the data display. Click from top to bottom for date descending order and from bottom to top for date ascending order.
3. Click **Load selected sessions** at the bottom of the screen. The sessions loaded will appear on the Data Viewer Select tab.
4. Click **Hide** to be able to view the full Data View Tab used for Step 5 and following.



5. Click the **Select** Tab if not already activated.
6. Click the main/top folder(s) to select all the loaded sessions in that folder or the individual sessions for a subset of the loaded sessions. The Session Information for the schedules selected will be displayed. Click the Analysis Tab (not shown)
7. Select an Analysis Set
8. Click Execute Analysis to start the analysis.

The above 5 Steps and the resulting data display are shown on the next page.

# The Analysis Set Designer- Part I



## Sample Data Display By Summary

The By Summary tab provides a single column of data across sessions for each Analysis Item or Type with the total N, Mean, Standard Deviation, Min and Max values.

By Summary		
Row_Name	Post Reinforcement Pause	Time to Reward
Schedule	Tutorial 2	Tutorial 2
Environment	Chamber 1 [1]	Chamber 1 [1]
Analysis	Post Reinforcement Pause	Time to Reward
N	31	31
Mean	2.155	23.731
SD	0.804	10.721
Min	0.191	0.864
Max	25.085	317.358

## Sample Data Display By Analysis Type

The By Analysis tab opens additional tabs, one for each Analysis Item in the Analysis Set. Click the Post Reinforcement Pause tab to view the summary for this measure as well as the detailed data from each session. The Environment and Date and Time of the Session are included.

Post Reinforcement Pause		
Row_Name	_Summary	Session #2
Schedule	Tutorial 2	Tutorial 2
Environment	Chamber 1 [1]	Chamber 1 [1]
Time	8/6/2012 3:24:45 PM	8/6/2012 2:03:33 PM
Analysis	Post Reinforcement Pause	Post Reinforcement Pause
N	31	20
Mean	2.155	2.791
SD	0.804	1.220
Min	0.191	0.191
Max	25.085	25.085
Blank		2.035
1		1.62
2		1.377
3		2.004
4		1.034
5		2.112
6		1.193

# The Analysis Set Designer- Part I

## Sample Data Display By Session

The By Session tab opens additional tabs, one for each Session selected. Click any session tab to view the detailed data for each Analysis Item for a single session. In this display of the FR Data Analysis, the Post Reinforcement Pause detail and the Time to Reward detail are shown.

The screenshot shows the ABET II - VI mode software interface. The title bar reads "ABET II - VI mode". The menu bar includes File, Data Viewer, Edit, View, and Help. The tabs at the top are Environment Designer, Schedule Designer, Execution Manager, Analysis Set Designer, and Data Viewer. The Analysis Set Designer tab is active. The Data Viewer tab is also visible. On the left, there is a toolbar with buttons for View (selected), Select, Unload Selected, Open Tabs, Close Tabs, None, All, and Invert. Below this is a tree view showing "Tutorial 2 vNA" expanded, with three sessions listed: "8/6/2012 3:24:45 PM" and "8/6/2012 2:03:33 PM". The main area contains a table titled "Session Information" with tabs for Event Totals, IRT / BIN, Analysis, and Tools. The Analysis tab is selected. A dropdown menu "Select an Analysis Set" is set to "FR Data Analysis". Below this are three summary tabs: By Summary, By Analysis type, and By Session. The "By Session" tab is selected. The table displays data for two sessions, "Tutorial 2" and "Tutorial 2". The columns are Row\_Name, Analysis #1, and Analysis #2. The rows include Schedule, Environment, Time, Analysis, N, Mean, SD, Min, Max, and Blank. The "Analysis" row shows "Post Reinforcement Pause" for both sessions. The "Time" row shows "8/6/2012 3:24:45 PM" for both sessions. The "N" row shows "20" for both sessions. The "Mean" row shows "2.791" for Session 1 and "33.887" for Session 2. The "SD" row shows "1.220" for Session 1 and "16.160" for Session 2. The "Min" row shows "0.191" for Session 1 and "0.864" for Session 2. The "Max" row shows "25.085" for Session 1 and "317.358" for Session 2. The "Blank" row is empty.

Row_Name	Analysis #1	Analysis #2
Schedule	Tutorial 2	Tutorial 2
Environment	Chamber 1 [1]	Chamber 1 [1]
Time	8/6/2012 3:24:45 PM	8/6/2012 3:24:45 PM
Analysis	Post Reinforcement Pause	Time to Reward
N	20	20
Mean	2.791	33.887
SD	1.220	16.160
Min	0.191	0.864
Max	25.085	317.358
Blank		
1	1.62	5.504
2	1.377	18.037
3	2.004	317.358
4	1.034	128.288
5	2.112	12.5
6	1.193	10.03
7	0.977	10.971
8	0.871	26.257
9	0.716	6.549

# The Analysis Set Designer- Part I

## Inter-Reward Interval – Using the Analysis Points Wizard

Inter-Reward Interval is defined here as simply the time between each successive reward. The only event of interest for this measure is the reward or pellet pulse. As before begin by adding a new Analysis Item.

1. Click the Add/+ Tool for Analysis Items and Enter **Inter-Reward Interval** as the name
2. The default Path Options should be left as is, Normal Mode with First Encounter checked for both the Starting Point and the Ending Point.
3. Check the Design Option, **Ignore 0s**. Failure to check this will result in all zeros as each reward delivery will simply be evaluated against itself.
4. Check the Design Option, **Allow start to equal previous** checked. Failure to check this will result in reporting only half the values desired. The time between reward 1 and 2 will be followed by the time between reward 3 and 4, but the time between reward 2 and 3 will not be shown. The result of the above actions are shown below.

The screenshot shows two windows side-by-side. On the left is the 'Analysis Items' window, which lists three items: 'Post Reinforcement Pause', 'Time to Reward', and 'Inter-Reward Interval'. The 'Inter-Reward Interval' item is selected. Red numbers 1, 2, 3, and 4 are placed below the first four rows of the table respectively. On the right is the 'Analysis Points' window, which contains a single row labeled '5'. A red arrow points from the number 5 to the 'Identifier' column of the table.

5. The first two Analysis Items were built using the Tree Build tab. In this example the Analysis Wizard will be used. Click the Wizard/Wizard's Hat tool to reveal the following work space.
6. Click the FR Evaluation to highlight the details of this condition in the space below.

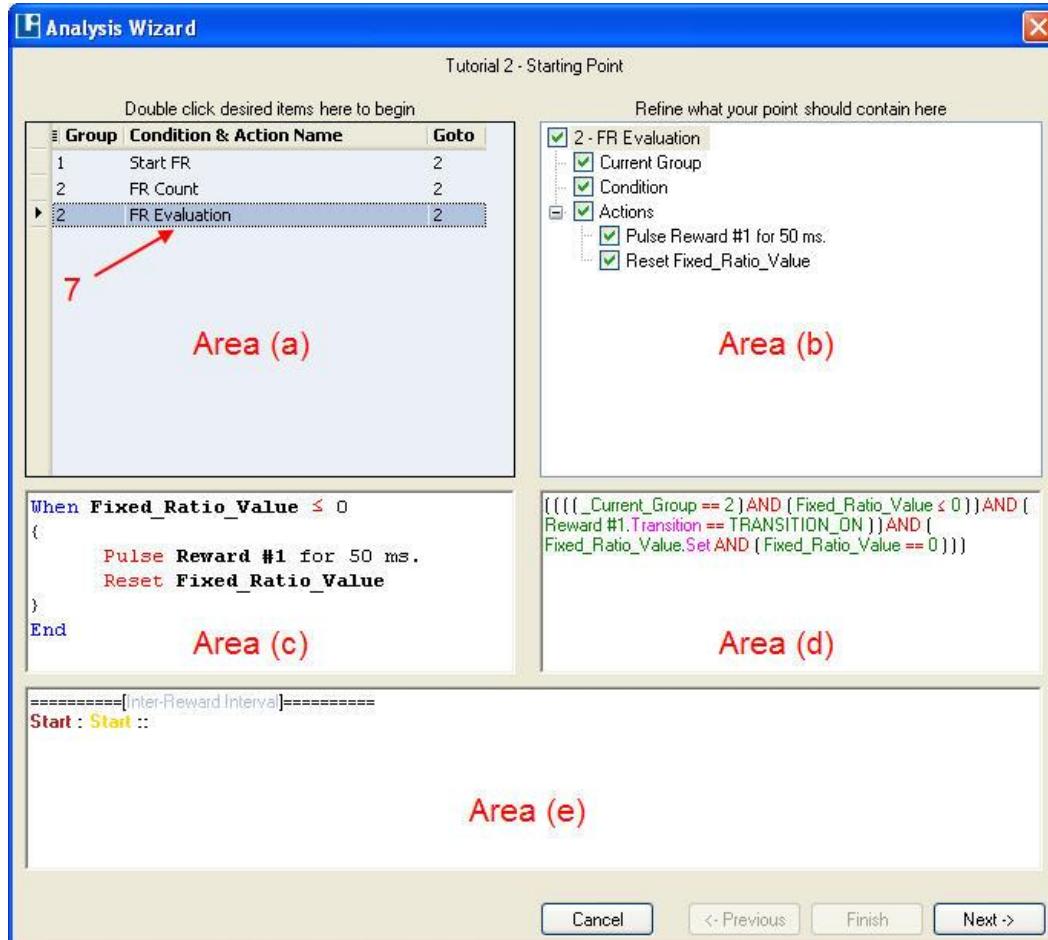
The screenshot shows the 'Analysis Wizard' dialog box. The left pane displays a hierarchical tree structure under 'Tutorial 2 - Starting Point'. The 'FR Evaluation' node is expanded, showing its children: 'Start FR' and 'FR Count'. A red arrow points from the number 6 to the 'FR Evaluation' node. The right pane contains a large empty text area labeled 'Refine what your point should contain here'. Below the tree, a code editor shows the following pseudocode:

```
When Fixed_Ratio_Value ≤ 0
{
    Pulse Reward #1 for 50 ms.
    Reset Fixed_Ratio_Value
}
End
```

At the bottom of the code editor, it says '===== [Inter-Reward Interval] ====='. The bottom of the dialog box has buttons for 'Cancel', '<- Previous', 'Finish', and 'Next >'. A red arrow also points from the number 5 to the 'Identifier' column in the 'Analysis Points' table.

## The Analysis Set Designer- Part I

7. Double click the FR Evaluation Condition and the condition components are displayed along with the associated Analysis Point description that could be selected. Note the various areas in the current display.



**Area (a)** The first thing you will notice is a display of the Group, Condition & Action Names and Goto criteria from the schedule on which the Analysis Set is based. A single Left Click over any part of a condition row in **Area (a)** displays the detail in **Area c**. A double Left Click over any part of a condition row in **Area (a)** displays the condition details with check boxes in **Area (b)**.

**Area (b):** Use this area to refine what aspects of a condition should be used to define the analysis point. A **check all** box appears at the top that will insure that the point is recognized only when all aspects of the selected condition are satisfied. A detailed list of the point definition is displayed in **Area (d)**. A specific aspect of the condition may be selected by unchecking some of the boxes and noting the changes in **Area (d)**. In this simple schedule any subset of the condition will result in the same result; however, in a more complex schedule using the Action "Turn on Left\_Light" for example might result in multiple measures with Start points in any condition where this action occurred.

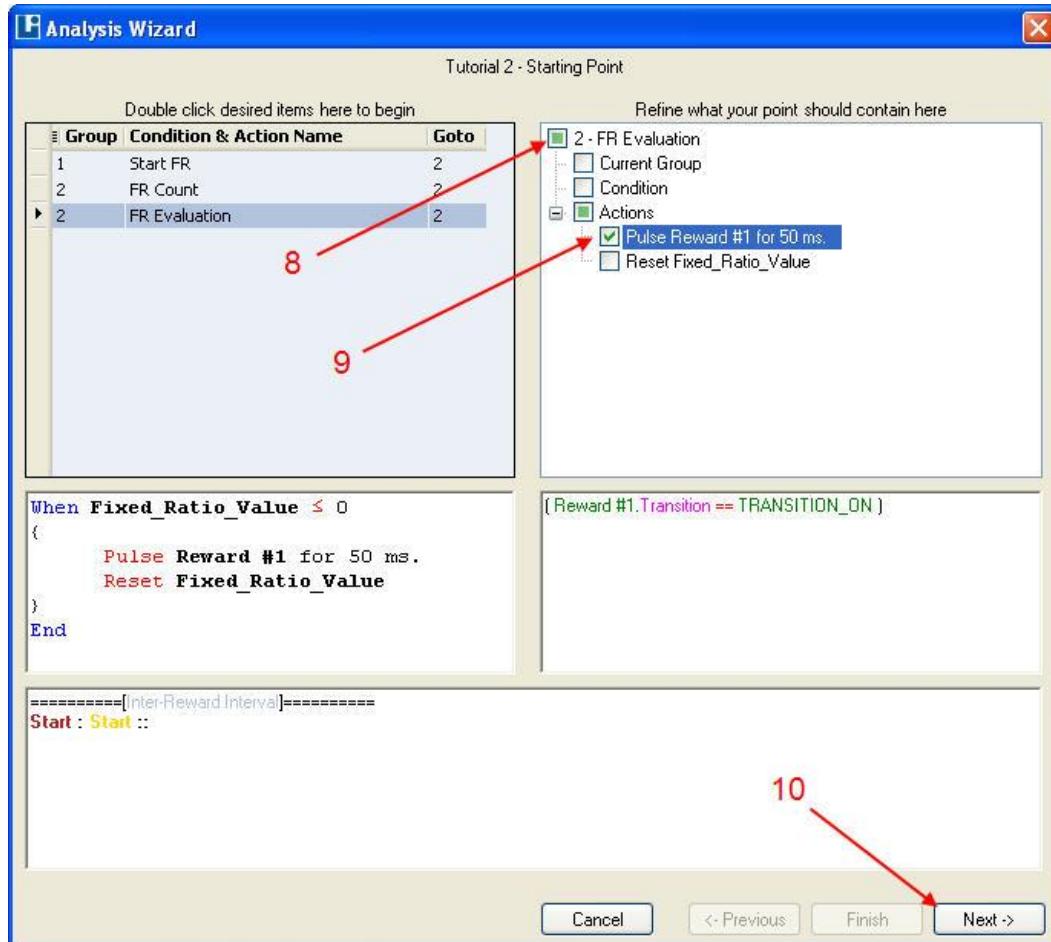
**Area (c):** Schedule detail for the row highlighted in **Area (a)**.

**Area (d):** Analysis point definition code.

**Area (e):** Analysis Item summary of all analysis points.

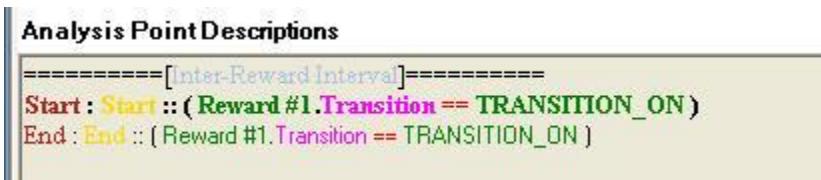
## The Analysis Set Designer- Part I

8. Uncheck the highest level check box to clear all components.
9. Check **Pulse Reward #1 for 50 ms** as this is the only component of interest for determining the Time between Rewards.
10. Check Next to complete this selection. Area (b), (c), and (d) will be cleared and the Start Analysis Point description will be placed in the Summary Area (e) with the name “Start”. This name may be edited after the Wizard is finished.



11. Repeat the above process again since the Start and End Points are the same, but click Finish. The Wizard will return to the Analysis Set Designer with the following Analysis Point Descriptions. Edit the Start and End point names if desired and save to complete the Inter-Reward Interval Analysis Item.

### Completed Descriptions for Inter-Response Interval



## The Analysis Set Designer- Part I

Run the FR Data Analysis set as before on one or more sessions.

1. Click the By Session tab
2. Click a specific session tab if the analysis was run on multiple sessions.
3. Note that you now have three Analyses including the Inter-Reward Interval.
4. Use the side bar to scroll down through additional data points.

A sample screen view is provided below. Note, the N for Inter-Reward Interval will always be one less than the Time to Reward. The N for Post Reinforcement Pause will depend on whether or not a response was recorded following the last Reward.

The screenshot shows the Analysis Set Designer software interface. At the top, there's a menu bar with 'View' and 'Select'. Below it is a toolbar with tabs: 'Session Information', 'RAW Data', 'Event Totals', 'Reduced Data', 'IRT / BIN', 'Analysis' (which is selected), 'Cumulative Recorder', and 'Tools'. A dropdown for 'Analysis Subfolder' is open, showing 'Tutorial 2' (selected) and 'FR Data Analysis'. To the right of this is a 'Select an Analysis Set' dropdown with 'FR Data Analysis' and an 'Execute Analysis' button. Below these are three tabs: 'By Summary' (highlighted with a red arrow), 'By Analysis type' (highlighted with a red arrow), and 'By Session' (highlighted with a red arrow). The main area is a data grid titled 'Tutorial 2' with columns: 'Row\_Name', 'Analysis #1', 'Analysis #2', and 'Analysis #3'. The 'Analysis #3' column contains the 'Inter-Reward Interval' data. Red arrows point to specific parts: arrow 1 points to the 'By Session' tab, arrow 2 points to the 'FR Data Analysis' in the subfolder dropdown, arrow 3 points to the 'Inter-Reward Interval' value in the grid, and arrow 4 points to the vertical scroll bar on the right side of the grid.

Row_Name	Analysis #1	Analysis #2	Analysis #3
Schedule	Tutorial 2	Tutorial 2	Tutorial 2
Environment	Chamber 1 [1]	Chamber 1 [1]	Chamber 1 [1]
Time	8/6/2012 3:24:45 PM	8/6/2012 3:24:45 PM	8/6/2012 3:24:45 PM
Analysis	Post Reinforcement Pause	Time to Reward	Inter-Reward Interval
N	20	20	19
Mean	2.791	33.887	38.309
SD	1.220	16.160	16.845
Min	0.191	0.864	1.086
Max	25.085	317.358	318.735
Blank			
1	1.62	5.504	19.657
2	1.377	18.037	318.735
3	2.004	317.358	130.293
4	1.034	128.288	13.534
5	2.112	12.5	12.142
6	1.193	10.03	12.164
7	0.977	10.971	27.234
8	0.871	26.257	7.42
9	0.716	6.549	10.289
10	2.047	9.573	6.315
11	1.135	4.268	4.569
12	7.314	3.434	12.396
13	6.704	5.082	11.046
14	25.085	4.342	31.66
15	0.35	6.575	1.725
16	0.294	1.375	6.924

Note: ABET II does not provide for cell wrapping. Placing the cursor in the top row will allow you to drag the column width boarder to better fit as much as possible on one screen. Keeping labels short will allow you to display more data. Date may also be copied or exported with the same right click action used for raw data and other data displays.

# The Analysis Set Designer- Part I

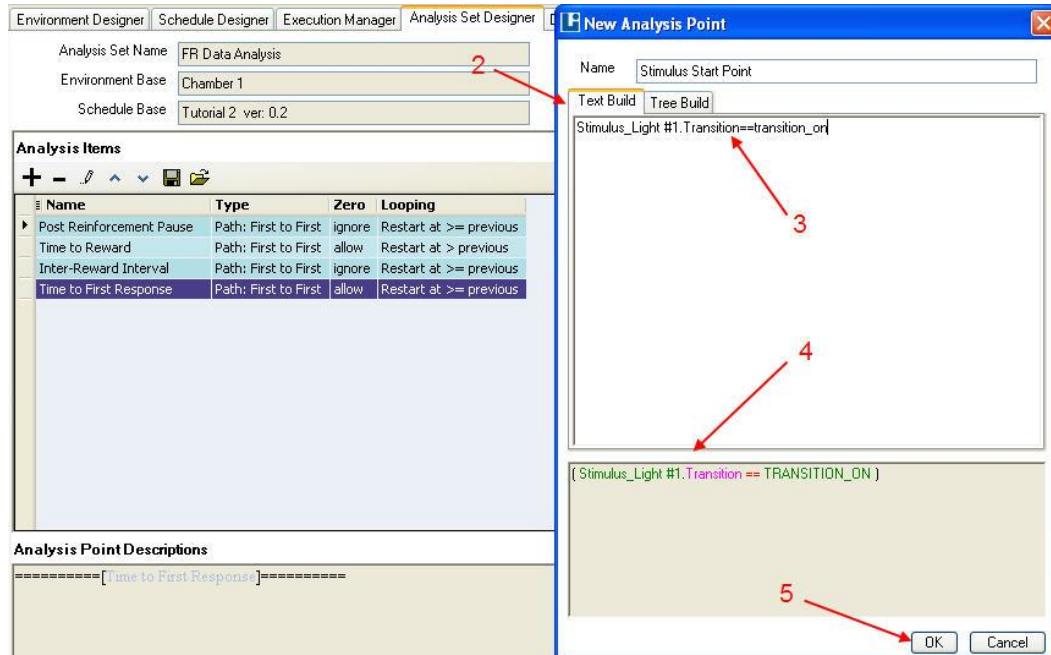
## Time to First Response - Using the Text Build Tab

This option is basically a blank slate on which the knowledgeable user can directly type instructions for each Analysis Point. For the point to work, the text must match exactly (case sensitive) the defined inputs, outputs, aliases or variables used in Environment Designer and Schedule Designer and displayed in the RAW Date display. Operators, Constants and other aspects of the definition must match the system keywords, but are not necessarily case sensitive. To make the Text Option more user friendly, we have added the ability to right click in the text area and use the same **Insert Item/Replace With** features available to users of the Tree Build form.

This measure should have just one value. It is defined as the latency of the first response following the start of the session. We will use the onset of the stimulus light as the start point and a response as the end point.

Add an Analysis Item as before. This will again be a Measure/Path, however, the Zero's option and Looping Option will not affect it so using the defaults is fine.

1. Click the Add/+ tool in the Analysis Points Area (not shown)
2. Click the Text Build tab if not already active
3. Right Click and Insert or type the start point criteria, Stimulus\_Light #1.Transition==TRANSITION\_ON
4. A more stylized statement appears in the space below.
5. Click OK to complete the first Analysis Point.



Repeat the above using a response transition as the defining action for the second Analysis Point or end point to the first response measurement. The result is shown on the next page.

# The Analysis Set Designer- Part I

The screenshot shows the Analysis Set Designer interface. On the left, the 'Analysis Items' panel lists several items with their properties:

Name	Type	Zero	Looping
Post Reinforcement Pause	Path: First to First	ignore	Restart at >= previous
Time to Reward	Path: First to First	allow	Restart at > previous
Inter-Reward Interval	Path: First to First	ignore	Restart at >= previous
Time to First Response	Path: First to First	allow	Restart at >= previous

Below this is the 'Analysis Point Descriptions' section, which contains the following text:

```
===== [Time to First Response] =====
Start : Stimulus Start Point :: ( Stimulus_Light#1.Transition == TRANSITION_ON )
End : First Response :: ( Response_Lever #1.Transition == TRANSITION_ON )
```

A separate 'New Analysis Point' dialog box is open on the right, showing the 'Text Build' tab with the text:

```
Name: First Response
Text Build: Tree Build
Response_Lever #1.Transition==transition_on
```

## Completed Descriptions for the Time to Reward Analysis Item

The screenshot shows the completed descriptions for the 'Time to Reward' analysis item. It includes the start and end points:

```
===== [Time to First Response] =====
Start : Stimulus Start Point :: ( Stimulus_Light#1.Transition == TRANSITION_ON )
End : First Response :: ( Response_Lever #1.Transition == TRANSITION_ON )
```

## Sample Data View for Time to First Response Analysis Item

The screenshot shows the 'Analysis' tab of the Sample Data View. The data is presented in a grid format with four columns labeled 'Analysis #1', 'Analysis #2', 'Analysis #3', and 'Analysis #4'. A red arrow points to the 'Analysis #4' column, specifically to the 'Time to First Response' row.

Row_Name	Analysis #1	Analysis #2	Analysis #3	Analysis #4
Schedule	Tutorial 2	Tutorial 2	Tutorial 2	Tutorial 2
Environment	Chamber 1 [1]	Chamber 1 [1]	Chamber 1 [1]	Chamber 1 [1]
Time	8/6/2012 3:24:45 PM	8/6/2012 3:24:45 PM	8/6/2012 3:24:45 PM	8/6/2012 3:24:45 PM
Analysis	Post Reinforcement Pause	Time to Reward	Inter-Reward Interval	Time to First Response
N	20	20	19	1
Mean	2.791	33.887	38.309	154.868
SD	1.220	16.160	16.845	0.000
Min	0.191	0.864	1.086	154.868
Max	25.085	317.358	318.735	154.868
Blank				
1	1.62	5.504	19.657	154.868
2	1.377	18.037	318.735	
3	2.004	317.358	130.293	
4	1.034	128.288	13.534	
5	2.112	12.5	12.142	
6	1.193	10.03	12.164	
7	0.977	10.971	27.234	
8	0.871	26.257	7.42	
9	0.716	6.549	10.289	
10	2.047	9.573	6.315	
11	1.135	4.268	4.569	
12	7.314	3.434	12.396	
13	6.704	5.082	11.046	
14	25.085	4.342	31.66	
15	0.35	6.575	1.725	
16	0.204	1.375	6.921	

# The Analysis Set Designer- Part I

## Instance Counts

Response counts, trials, rewards, and other simple data may be retrieved from the Event Totals Tab, the IRT/Bin Tab or from a defined variable; however, this analysis type makes it easy to include this data with other measurements. Multiple Analysis Points for Instance Counts result in multiple data values. Use any of the previously described methods to create a new Analysis Item.

Select **Instance Counts** instead of Measure/Paths as used for all the previous examples for this illustration. In this option, each Analysis Point is a count element. Multiple counts may be placed in the same Analysis Item. For example create an analysis item with three counts, left lever responses, right lever responses and rewards. The following screens should assist in this example.

1. Create an Analysis Item with Design Option **Instance Counts** using the default settings for Ignore 0s found and Allow start to equal previous. The name “Session Counts” was used below.

Analysis Items			
Name	Type	Zero	Looping
Post Reinforcement Pause	Path: First to First	ignore	Restart at >= previous
Time to Reward	Path: First to First	allow	Restart at > previous
Inter-Reward Interval	Path: First to First	ignore	Restart at >= previous
Time to First Response	Path: First to First	allow	Restart at >= previous
Session Counts	Counter	allow	Restart at >= previous

2. Multiple counters may be defined, each designated as Pt#1 through Pt#N. These “points” may be defined using any of the same methods already illustrated for measures. For this example three points or counters were defined with labels Lever #1, Lever #2, and Reward.

Analysis Points		
Identifier	Name	Show
Pt #1	Lever #1	<input checked="" type="checkbox"/>
Pt #2	Lever #2	<input checked="" type="checkbox"/>
Pt #3	Reward	<input checked="" type="checkbox"/>

3. The Analysis Point Descriptions shown here may be used to verify your entries.

Analysis Point Descriptions
===== [Session Counts] =====
Pt#1 : Lever #1 :: ( Response_Lever #1.Transition == TRANSITION_ON )
Pt#2 : Lever #2 :: ( Response_Lever #2.Transition == TRANSITION_ON )
Pt#3 : Reward :: ( Reward #1.Transition == TRANSITION_ON )

Save and run the Analysis Set to test your entries.

# The Analysis Set Designer- Part I

## Sample Data for Instance Counts

The screenshot shows the Analysis Set Designer interface with the 'Analysis' tab selected. The main area displays a grid of data for 'Tutorial 2'. The columns are labeled 'Row\_Name', 'Analysis #4', 'Analysis #5', 'Analysis #6', and 'Analysis #7'. The rows include various statistical measures like Mean, SD, Min, Max, and blank entries. The data grid has scroll bars on the right and bottom.

Row_Name	Analysis #4	Analysis #5	Analysis #6	Analysis #7
Schedule	Tutorial 2	Tutorial 2	Tutorial 2	Tutorial 2
Environment	Chamber 1 [1]	Chamber 1 [1]	Chamber 1 [1]	Chamber 1 [1]
Time	8/6/2012 3:24:45 PM	8/6/2012 3:24:45 PM	8/6/2012 3:24:45 PM	8/6/2012 3:24:45 PM
Analysis	Time to First Response	Session Counts - Lever #1	Session Counts - Lever #2	Session Counts - Reward
N	1	1	1	1
Mean	154.868	101.000	0.000	20.000
SD	0.000	0.000	0.000	0.000
Min	154.868	101.000	0.000	20.000
Max	154.868	101.000	0.000	20.000
Blank				
1	154.868	101	0	20
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

## Bout Analysis

Bout Analysis is generally used when “responses” occur in bursts such as data from a lickometer or in a free feeding situation, but response bouts of any kind may be evaluated by simply selecting the **Bout Analysis** option when creating a new Analysis Item. Data of interest includes how many bouts occur, how many “responses” or inputs make up each bout, and how long was each bout. The user defines the bout tolerance in seconds as well the minimum bout count.

Click the Analysis Set Designer Tab and open an existing Analysis Set or create a new Analysis Set. Create a New Analysis Item selecting the Bout Analysis design option. The time and response selection will not appear in the analysis so making it part of the name is helpful. Planning ahead the name used here is Bout Analysis 3S 5R

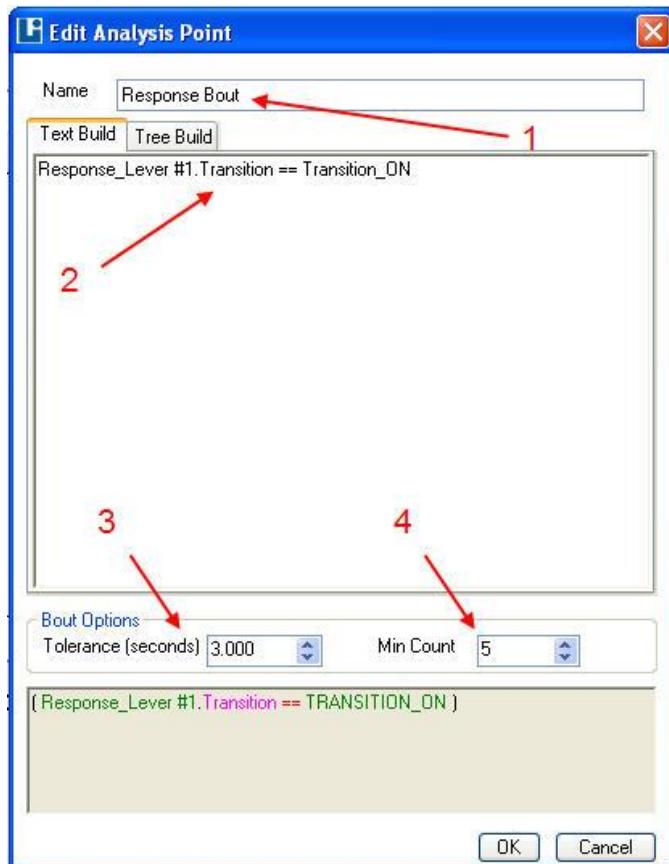
The screenshot shows the Analysis Set Designer interface. At the top, there are three input fields: 'Analysis Set Name' (Bout Analysis), 'Environment Base' (Chamber 1), and 'Schedule Base' (N/A). Below this is a section titled 'Analysis Items' with a toolbar for managing items. A table lists the analysis item details:

Name	Type	Zero	Looping
Bout Analysis 3 S 5 R	Bout	allow	Restart at >= previous

## The Analysis Set Designer- Part I

Click the Add Analysis Point icon (+) to create a single analysis point. Like the Instance Count, the Bout Analysis may contain multiple Analysis Points. The point description may be created using either the Text Build or Tree Build Methods. For this example the following Bout Options were used:

1. Enter a name for the New Analysis Point – Response Bout or similar.
2. Enter the point description: Response\_Lever #1.Transition==Transition\_ON
3. Enter Tolerance (seconds): 3.000. Only responses occurring with an IRT of 3 seconds or less will be included in a given bout.
4. Enter Min Count: 5. A minimum of 5 responses are needed to count as a bout. Bouts of less than 5 responses will not be included in this analysis.



Analysis Points		
Identifier	Name	Show
Pt #1	Response Bout	<input checked="" type="checkbox"/>

# The Analysis Set Designer- Part I

## Description Summary

Analysis Point Descriptions	
===== [Bout Analysis 3 S 5 R] =====	
Pt #1 : Response Bout :: ( Response_Lever #1 . Transition == TRANSITION_ON )	

Save the Analysis Set and run on a suitable session file. A Tutorial 2 FR Session was used for the following sample screen.

## Bout Analysis Data

Each Bout Analysis Point generates two Analysis Columns

1. The “Bout” column is the duration in seconds of each bout.
2. The “Bout^Cnt” column is the number of responses that make up the bout. By definition at least 5 responses with inter response times of less than 3 seconds are required.

The results from Bout Analysis 3S 5R are shown below.

Tutorial 2		
Row_Name	Analysis #1	Analysis #2
Schedule	Tutorial 2	Tutorial 2
Environment	Chamber 1 [1]	Chamber 1 [1]
Time	8/6/2012 3:24:45 PM	8/6/2012 3:24:45 PM
Analysis	Bout Analysis 3 S 5 R - Generic Bout	Bout Analysis 3 S 5 R - Generic Bout^Cnt
N	13	13
Mean	4.914	6.538
SD	0.841	0.482
Min	1.278	5.000
Max	10.883	11.000
Blank		
1	9.788	8
2	4.002	5
3	8.641	6
4	4.221	5
5	6.022	8
6	4.284	5
7	10.883	11
8	5.076	5
9	4.336	5
10	2.277	8
11	1.508	6
12	1.561	6
13	1.278	7

The above data was verified against the IRT Data and Raw Data from the same session.

## The Analysis Set Designer- Part II

### Using Evaluation and Call

These Analysis Items were defined at the start of The Analysis Set Designer – Part I. The definitions are repeated here for convenience.

#### Evaluation:

An Evaluation requires the user to identify a Condition to isolate discrete points of time in the raw data based on trials, responses, variable change, etc. These defined points in time, created each time the Condition tests true, then act as markers to be used for subsequent Measures, Counts or calculations. For example an Evaluation might display the value of a specified variable every time the Condition tests true. This is commonly used to evaluate blocks of trials, responses, or time within a session.

#### Call:

Call is used to pass data between analysis items. The Call is used to display the data of interest while the Evaluation points are executed in the background and typically not displayed.

#### The 5CSRT Schedule:

The illustrations that follow for Evaluation and Call are taken from the complete Analysis Set provided as part of the 5CSRT Application for the nose poke chamber. For those not familiar with this task, it consists of 5 choice nose pokes each fitted with a stimulus light placed on a curved wall at one end of the test chamber. A brief flash of the light signals the animal to respond to the target hole within a limited period of time. A correct response results in the delivery of a reward that must be retrieved before the next trial can begin. Errors occur if the animal fails to respond, responds to the wrong hole or responds early (before the stimulus is presented). Repeated responses prior to retrieving the reward are recorded as a Preservation Response (correct or incorrect).

### Evaluation Results at the End of a Session

The 5CSRT Analysis Set contains an Evaluation labeled “Threshold”. It was designed to calculate overall performance data for determining when an animal in training may be advanced to the next stage of the task.

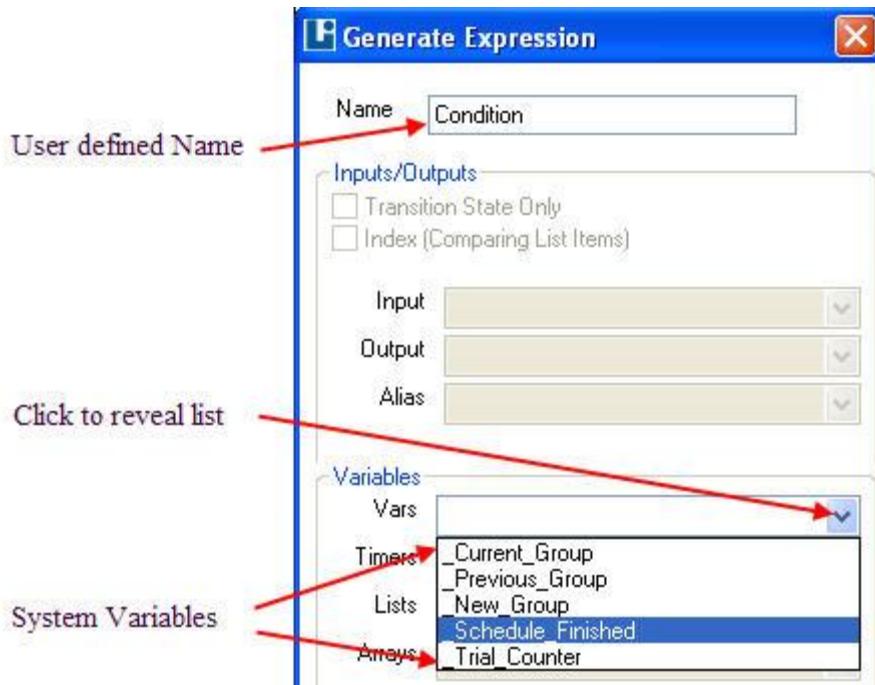
#### Analysis Point Descriptions for Evaluation Threshold.

```
===== [Threshold] =====
Condition : Condition :: _Schedule_Finished
Eval #1 : Accuracy :: (Accuracy * 100)
Eval #2 : Omission :: (OmissionPercent * 100)
Eval #3 : ITI :: ITI
Eval #4 : Stim_Duration :: Stimulus_Duration
Eval #5 : Session :: Session_Index
Eval #6 : Trials_Completed :: _Trial_Counter
```

## The Analysis Set Designer- Part II

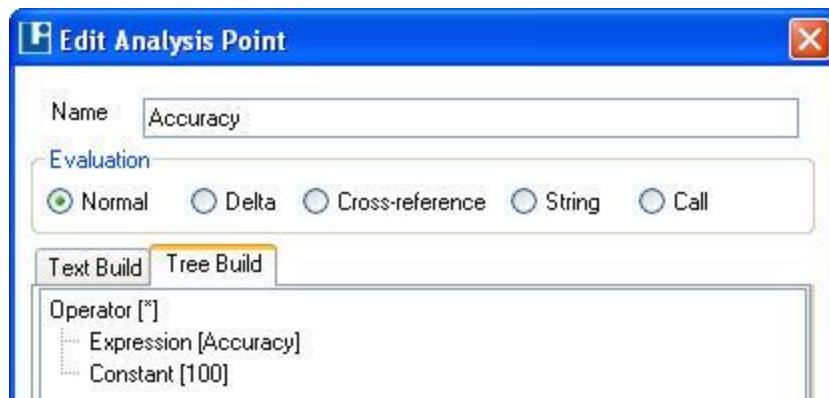
### The Condition expression for Evaluation Threshold

**Condition:Condition::\_Schedule\_Finished** identifies a single point in the data when the schedule is finished. The first “Condition” is the **Identifier** label assigned by the Analysis Set Designer. The second “Condition” is the **Name** entered by the user. Any name may be assigned. Condition emphasizes the function of this first expression. The Name “End of Schedule” might be used to emphasize the point in time that the evaluation data represents. **\_Schedule\_Finished** is a system variable that may be accessed from the **Vars** pull down menu on the Expression tablet.



### Sample Analysis Point - Accuracy

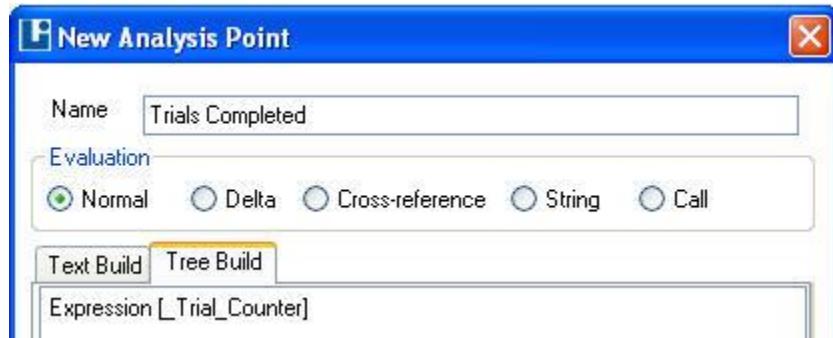
Accuracy is a user entered name for the first Evaluation Points (Eval#1) following the condition. Eval#1 is a Normal or simple evaluation that takes the value of the decimal variable **Accuracy** at the end of the session and multiplies it by 100 to display percentage. The Tree Build for this is shown below. The opening template was replaced with the multiply Operator [\*]. Placed under that operator were the variable [Accuracy] taken from the schedule variable list and the constant value [100].



## The Analysis Set Designer- Part II

### Additional Evaluation Analysis Points

The evaluation Threshold contains a total of 6 evaluations. Two require a math operator as shown in the above example. The others simply provide the user with the values of pertinent user set variables used in this task. This includes the value of the ITI, the Stimulus duration, a session identifier and the number of trials completed. The Analysis Build screen for this last point is shown below.



### Evaluations that are not displayed

It is often convenient to separate data by trials or blocks of data. The data of interest may be defined without being displayed and then placed in an evaluation that calls the data, takes the delta (difference) between each value and the preceding value, or uses the data in a new calculation and displays the results based on the evaluation condition. The condition definition determines which defined data measures, counts, etc. to report.

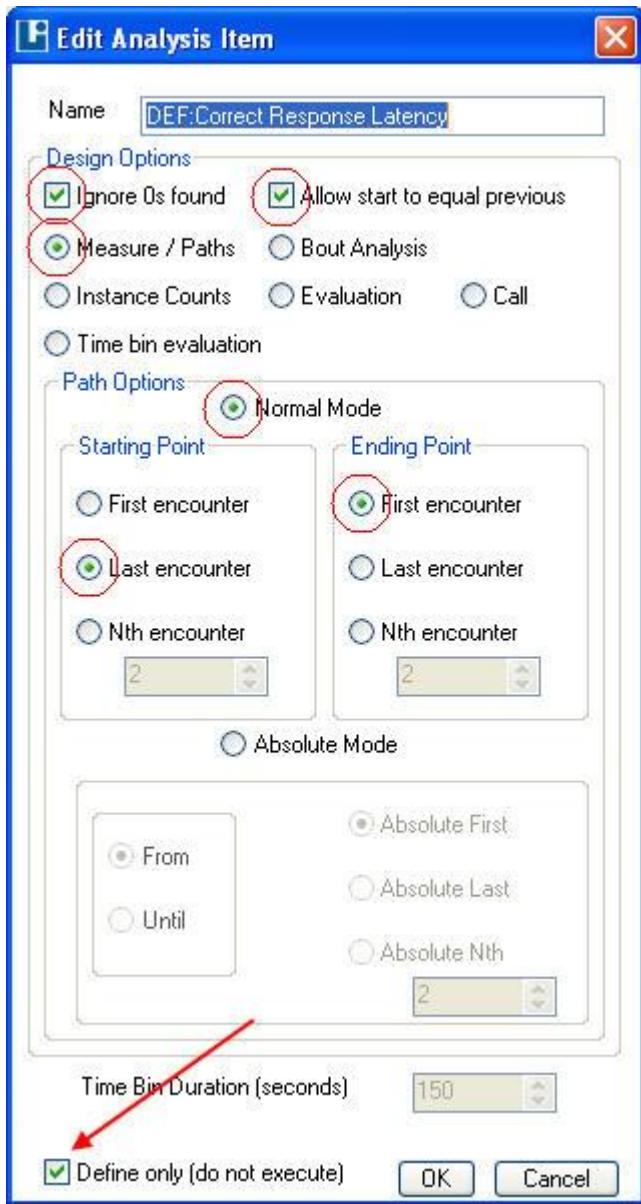
The 5CSRT Analyses Set includes 10 DEF Analysis Items as shown below. The first four are measures while the remaining six are counters. These may be entered in any order and later moved up or down the list for clarity.

Analysis Items				
Name	Type	Zero	Looping	
Threshold	Evaluation	N/A	N/A	
DEF:Correct Response Latency	Path: Last to First	ignore	Restart at >= previous	
DEF:Incorrect Response Latency	Path: Last to First	ignore	Restart at >= previous	
DEF:Reward Collection Latency	Path: Last to First	ignore	Restart at >= previous	
DEF:Reward Collection Latency including Persev Incorr Trials	Path: Last to First	ignore	Restart at >= previous	
DEF:Premature Responses	Counter	allow	Restart at >= previous	
DEF:Perseverative Correct	Counter	allow	Restart at >= previous	
DEF:Perseverative Incorrect	Counter	allow	Restart at >= previous	
DEF:Time-out NosePokes	Counter	allow	Restart at >= previous	
DEF:Feed-tray Panel Pushes during ITI	Counter	allow	Restart at >= previous	
DEF:Beam Breaks	Counter	allow	Restart at >= previous	
Block Analysis	Evaluation	N/A	N/A	
Trial Latencies	Evaluation	N/A	N/A	

## The Analysis Set Designer- Part II

### DEF: Correct Response Latency

The correct response latency is the latency from the time the stimulus is presented until the correct response is made. This measure was created using the following tools. The only difference between this measure and measures illustrated previously is that the check box at the bottom of the Analysis Item form was checked. The design options and path options selected were chosen to insure accurate data. For example, Last to First calculations were needed to prevent an omission trial from affecting the latency of a subsequent correct trial.



The Correct Response Latency requires a start point consisting of any stimulus light transitioning on and an end point consisting of only a correct response. By definition if Lamp #1 is the stimulus then Hole #1 would have to be the response. These Analysis Points were defined using the Boolean operators of OR and AND as shown on the next page.

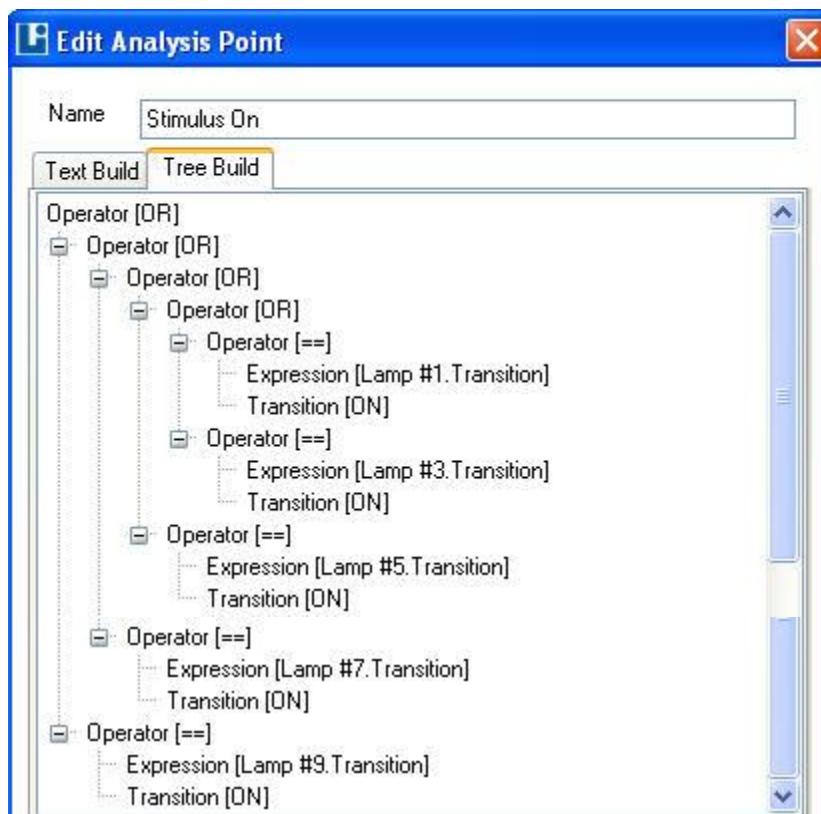
## The Analysis Set Designer- Part II

### Start Analysis Point for DEF: Correct Response Latency

Text Build or Description:

```
((((( Lamp #1.Transition == TRANSITION_ON ) OR ( Lamp #3.Transition == TRANSITION_ON  
)) OR ( Lamp #5.Transition == TRANSITION_ON )) OR ( Lamp #7.Transition ==  
TRANSITION_ON )) OR ( Lamp #9.Transition == TRANSITION_ON ))
```

Tree Build:



## The Analysis Set Designer- Part II

### End Analysis Point for DEF: Correct Response Latency

Text Build or Analysis Set Item Description

```
((((( Stimuli.IOIndex == Lamp #1.Index ) AND ( Hole #1.Transition == TRANSITION_ON ))  
OR (( Stimuli.IOIndex == Lamp #3.Index ) AND ( Hole #3.Transition == TRANSITION_ON )))  
OR (( Stimuli.IOIndex == Lamp #5.Index ) AND ( Hole #5.Transition == TRANSITION_ON )))  
OR ((( Stimuli.IOIndex == Lamp #7.Index ) AND ( Hole #7.Transition == TRANSITION_ON ))  
OR (( Stimuli.IOIndex == Lamp #9.Index ) AND ( Hole #9.Transition == TRANSITION_ON ))))  
AND (_Current_Group == 7 ))
```

This is nothing more than individual statements for each stimulus and associated response connected by the OR operator. This is shown below with the parenthesis removed for clarification.

Stimuli.IOIndex == Lamp #1.Index AND Hole #1.Transition == TRANSITION_ON	OR
Stimuli.IOIndex == Lamp #3.Index AND Hole #3.Transition == TRANSITION_ON	OR
Stimuli.IOIndex == Lamp #5.Index AND Hole #5.Transition == TRANSITION_ON	OR
Stimuli.IOIndex == Lamp #7.Index AND Hole #7.Transition == TRANSITION_ON	OR
Stimuli.IOIndex == Lamp #9.Index AND Hole #9.Transition == TRANSITION_ON	AND
_Current_Group == 7	

\_Current\_Group == 7 is added to eliminate responses made outside the limited hold interval used to define a correct response.

### DEF: Premature Responses

This counter simply records responses made during the ITI Interval. Select **Instance Count** for the Analysis Item and again check **Define only (do not execute)** as illustrated for the defined measure above.

Text Build or Analysis Set Item Description

```
(( ( ITI_Timer < ITI ) AND ( _Current_Group == 4 ) ) AND ((( ( Hole #1.Transition ==  
TRANSITION_ON ) OR ( Hole #3.Transition == TRANSITION_ON ) ) OR ( Hole #5.Transition ==  
TRANSITION_ON ) ) OR (( Hole #7.Transition == TRANSITION_ON ) OR ( Hole #9.Transition  
== TRANSITION_ON ))))
```

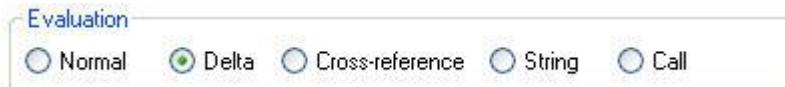
Again, this is shown below with the parenthesis removed for clarification.

ITI_Timer < ITI	AND
Current_Group == 4	AND
Hole #1.Transition == TRANSITION_ON	OR
Hole #3.Transition == TRANSITION_ON	OR
Hole #5.Transition == TRANSITION_ON	OR
Hole #7.Transition == TRANSITION_ON	OR
Hole #9.Transition == TRANSITION_ON	

## The Analysis Set Designer- Part II

### Evaluations Based on Blocks of Trials

This section will illustrate dividing data into blocks of trials as well as the evaluation options displayed below and each time you define an evaluation point.



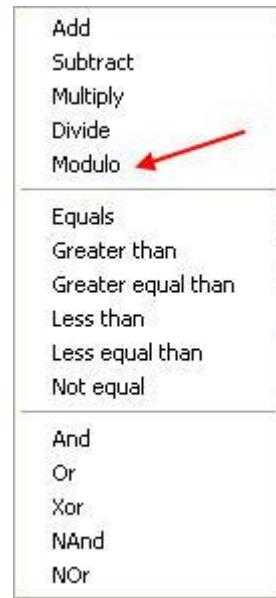
The Block Analysis Item again begins with a definition of the condition that defines the points in the raw data where the evaluation data points will be read or calculated. In this illustration, we divide the data into blocks of 10 trials. The key to performing this analysis is the use of the Modulo operator shown on the complete Operator Selection frame below Add, Subtract, Multiply and Divide.

In computing, the modulo operation results in the remainder of the division of one number by another. Given two positive numbers A and B. A modulo B is the remainder of the Euclidean division of A by B. For example, 7 mod 2 would evaluate to 1 because 7 divided by 2 yields a quotient of 3 and a remainder of 1. In the Analysis Item Condition Definition below the Modulo operation is shown by the percent % symbol. This is simply the symbol of choice, Modulo is not a percentage. The statement,

`_Trial_Counter % 10 ) == 0.0`

will test true at trial 10, 20, 30, etc.

The complete condition description is listed below. The first three elements perform the modulo calculation each time the trial counter is changed after the schedule has started. The last three elements pick up the final block of trials:



Text Build or Analysis Set Item Description

```
(((_Trial_Counter.Changed AND (_Schedule_Timer > 0)) AND ((_Trial_Counter % 10) == 0.0)) OR ((_Trial_Counter == _Trial_Counter.Final) AND _Trial_Counter.Changed))
```

Shown with the parenthesis removed for clarification

```
Trial_Counter.Changed      AND  
_Schedule_Timer > 0          AND  
_Trial_Counter % 10 ) == 0.0      OR  
_Trial_Counter == _Trial_Counter.Final      AND  
_Trial_Counter.Changed
```

## The Analysis Set Designer- Part II

### Analysis Points for Block Analysis

The 14 Analysis Points for the Evaluation Block Analysis are listed below with Identifiers Eval#1 through Eval #14 and user assigned names that identify the data contained in the evaluation.

These have been grouped by type for this illustration but may be organized in any meaningful order once they are defined even if an evaluation uses information from another evaluation listed later.

Analysis Points		
Identifier	Name	Show
Condition	Condition	<input type="checkbox"/>
Eval #1	BlockTrials	<input checked="" type="checkbox"/>
Eval #2	Correct	<input checked="" type="checkbox"/>
Eval #3	Incorrect	<input checked="" type="checkbox"/>
Eval #4	Omission	<input checked="" type="checkbox"/>
Eval #5	Premature Responses	<input checked="" type="checkbox"/>
Eval #6	Running Accuracy%	<input checked="" type="checkbox"/>
Eval #7	Block Accuracy%	<input checked="" type="checkbox"/>
Eval #8	Running Omission%	<input checked="" type="checkbox"/>
Eval #9	Block Omission%	<input checked="" type="checkbox"/>
Eval #10	Call to Perseverative Correct	<input checked="" type="checkbox"/>
Eval #11	Call to Perseverative Incorrect	<input checked="" type="checkbox"/>
Eval #12	Call to Time-out NosePokes	<input checked="" type="checkbox"/>
Eval #13	Call to Feed-tray Panel Pushes during ITI	<input checked="" type="checkbox"/>
Eval #14	Call to Beam Breaks	<input checked="" type="checkbox"/>

### Delta Evaluations

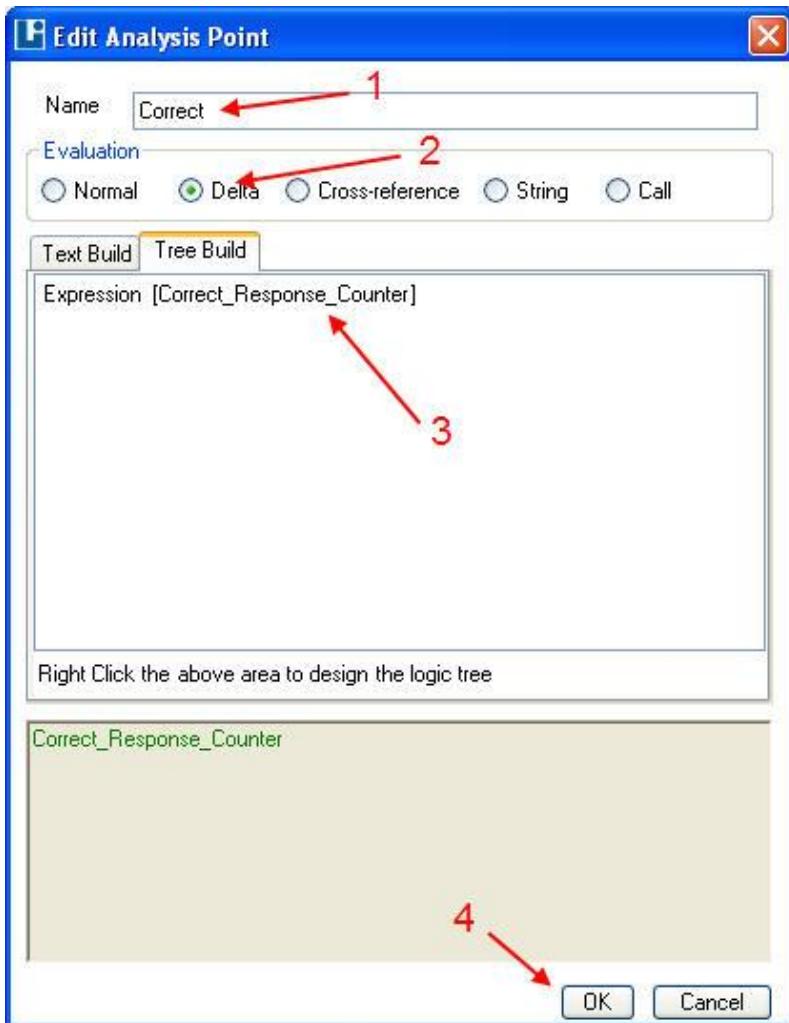
The trial, correct, incorrect, omission and premature responses counters increment throughout the schedule session. The Delta takes the difference between the current value and the previous value. For example if the correct count is 6 after the completion of trial ten, 14 on trial twenty and 23 on trial thirty, a Delta Evaluation would result in block values for correct response of 6, 8 and 9 respectively. The Analysis Point Description for Eval #2, Correct is shown below.

**Eval #2 : Correct :: Correct\_Response\_Counter << Delta >>**

To create this Analysis Point, simply click the New/Plus tool to reveal a New Analysis Point frame identical to the Edit Analysis Point frame shown on the next page.

1. Add a **Name** that describes the Analysis Point.
2. Select the **Delta** Evaluation Type.
3. Replace **[Template]** with the **Expression Variable (Vars)** of the variable to evaluate which in this case was **Correct\_Response\_Counter**.
4. Click **OK** to complete the New Analysis Point.

## The Analysis Set Designer- Part II



### Normal Evaluations

Eval #6 Running Accuracy Percentage and Eval #8 Running Omission Percentage take total variable values at each evaluation point rather than the Delta. This is a Normal Evaluation and is easily built using the Tree Build method to define the desired calculation. The analysis Descriptions are provided below.

**Eval #6 : Running Accuracy% :: ( Accuracy \* 100 )**

Running Accuracy Percentage is simply the value of decimal variable **Accuracy** multiplied by 100.

**Eval #8 : Running Omission% :: ( ( Omission\_Counter / \_Trial\_Counter ) \* 100 )**

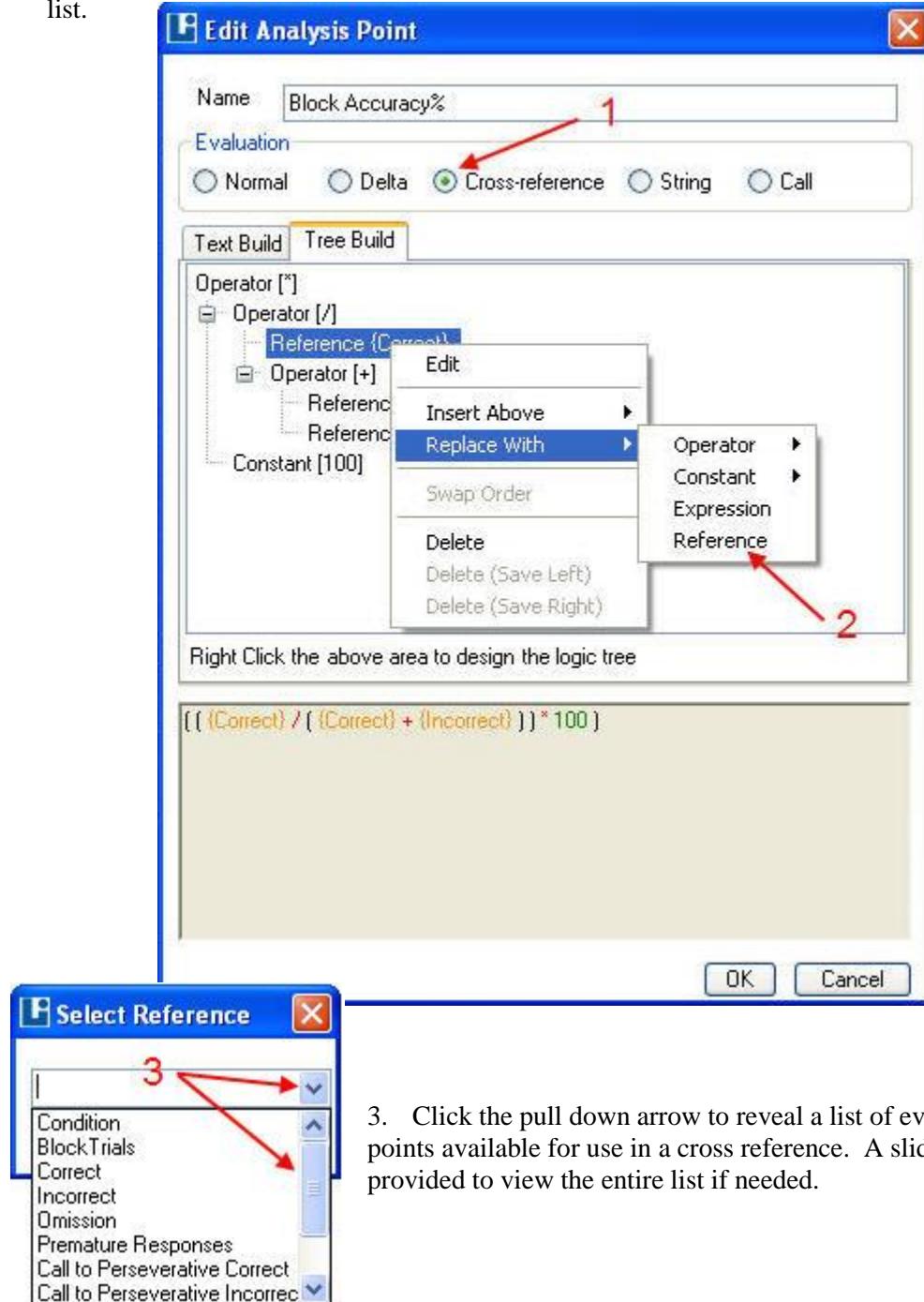
Running Omission Percentage is derived by dividing the value of integer variable **Omission\_Counter** by integer variable **\_Trial\_Counter** and multiplying the decimal result by 100.

## The Analysis Set Designer- Part II

### Cross-Reference Evaluations

Eval #7 Block Accuracy Percentage and Eval #9 Block Omission Percentage are calculations that depend on other analysis points for their formulas. Using other analysis points in a new analysis point is quite simple on the Tree Build tab. You can also right click inside the Text Build tab to access the same list for replacement or insertion when creating or editing an Analysis Point.

1. Click the **Cross-reference** Evaluation Option
2. Right click the template, select **Replace With** and note that **Reference** is now added to the list.



## The Analysis Set Designer- Part II

### String Evaluations

The 5CSRT Analysis Set does not contain an example of a String Evaluation. The String option places a list name in the data list when the expression is an .index value. This is useful when the index value is a randomly drawn number 1,2, 3, etc. but you want a trial by trial list of images or output stimuli presented.

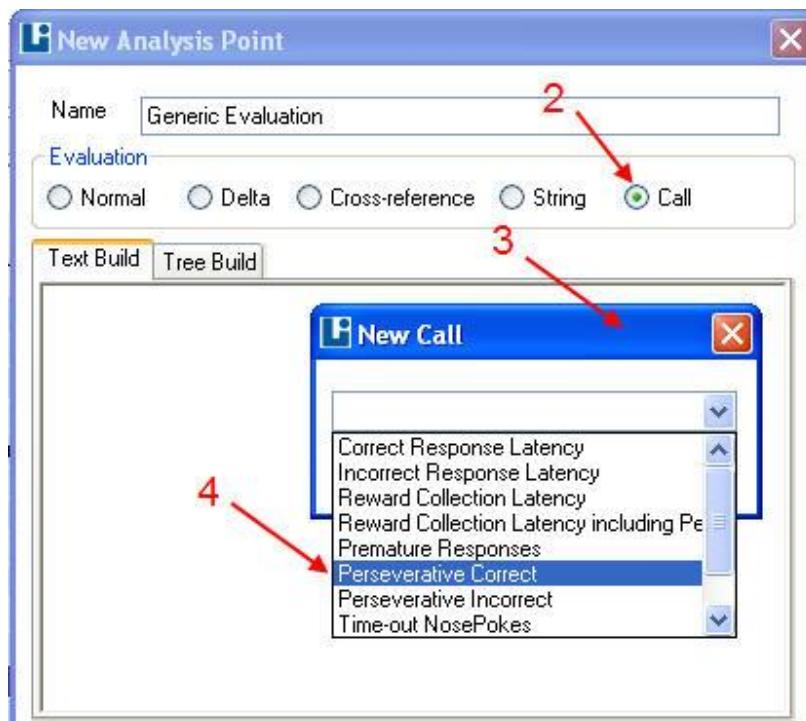
Comparing this with a Normal Evaluation, if a **Normal** Analysis Point is used then Image.index will return the numerical value. If a **String** Analysis Point is used then Image.index will return the label of the image in the list.

### Call Evaluations

The final five Evaluations are Calls to DEF Counters previously explained. These counters are incremented under the rules of the Block Analysis Condition. In other words they result in the incremental values for each block of trials. For variable counters used in the schedule and incremented from schedule start to schedule finish use the Delta function as previously described to obtain incremental values for each block.

#### Eval #10 : Call to Perseverative Correct :: [Perseverative Correct] << Call >>

1. Click the Add/Plus tool to open the New Analysis Point form
2. Click the Call Evaluation option
3. The New Call form immediately appears
4. Use the drop down arrow and slide bar if needed to select the DEF Counter to use in the evaluation.
5. Click OK. The Name for the New Analysis Point is automatically generated as Call to the counter or measure selected. In this illustration Eval #10 is “Call to Perseverative Correct”.

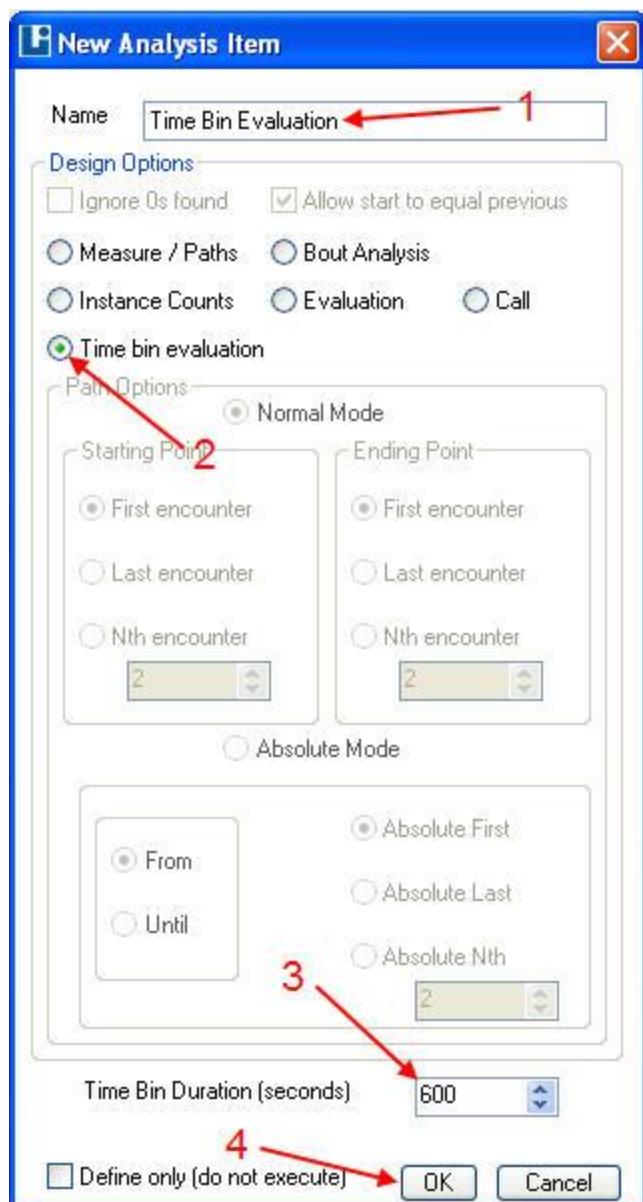


## The Analysis Set Designer- Part II

### Time Bin Evaluation

The Time Bin Evaluation evaluates data based on blocks of time. It can be used with defined counters or schedule variables as illustrated in the section on evaluating results based on trial blocks. In this case the evaluations are based on blocks of time. The following illustrations are based on the 5CSRT schedule, one defined counter from above and one normal evaluation.

1. Open a New Analysis Item form and enter a suitable Name.
2. Click Time bin evaluation.
3. Enter the Time Bin Duration in seconds. The session for 5CSRT is 30 minutes or 1800 seconds long. A duration of 600 seconds or 10 minutes was used here to produce three time bins.
4. Click OK to close the form.

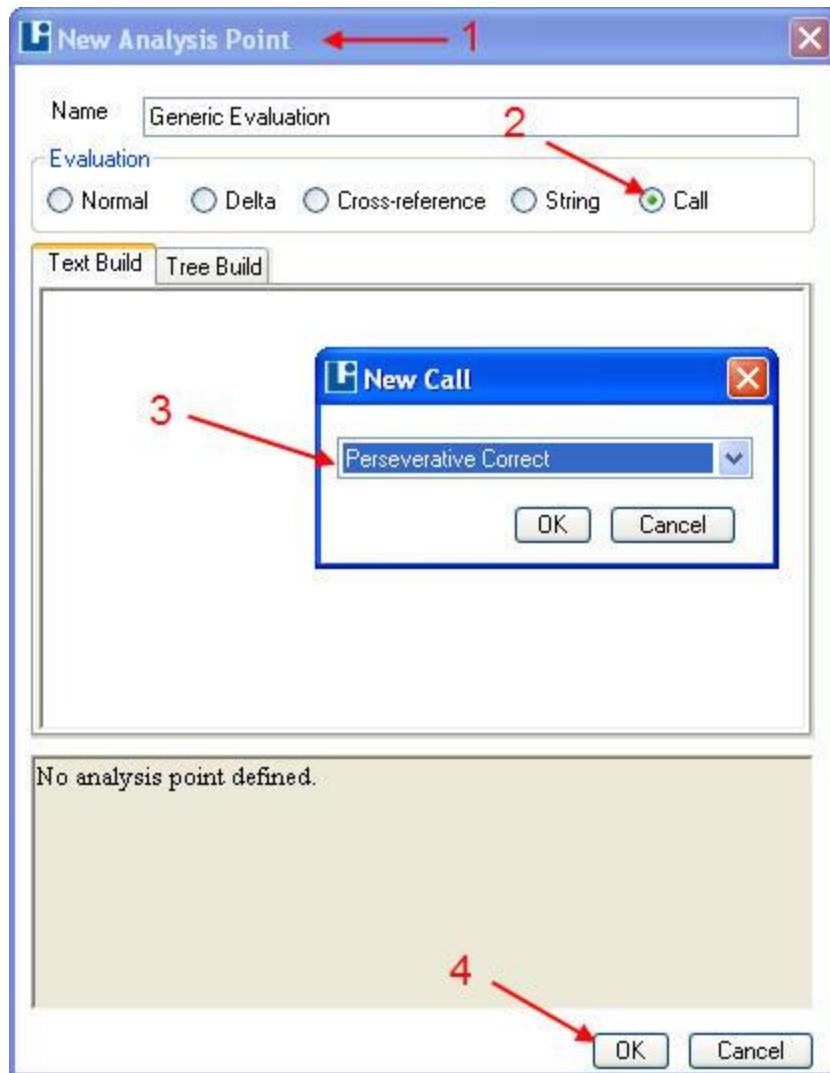


## The Analysis Set Designer- Part II

### Call Analysis Point for Time Bin Evaluation

Identical to previous Call Evaluations.

1. Click the Plus/Add Tool (not shown) to open the New Analysis Point form.
2. Click Call in the Evaluation area. The New Call form will automatically open.
3. Select the defined count to use
4. Click OK. The New Analysis Point form closes automatically and replaces the Name Generic Evaluation with an Analysis Point Name based on the defined count being called.



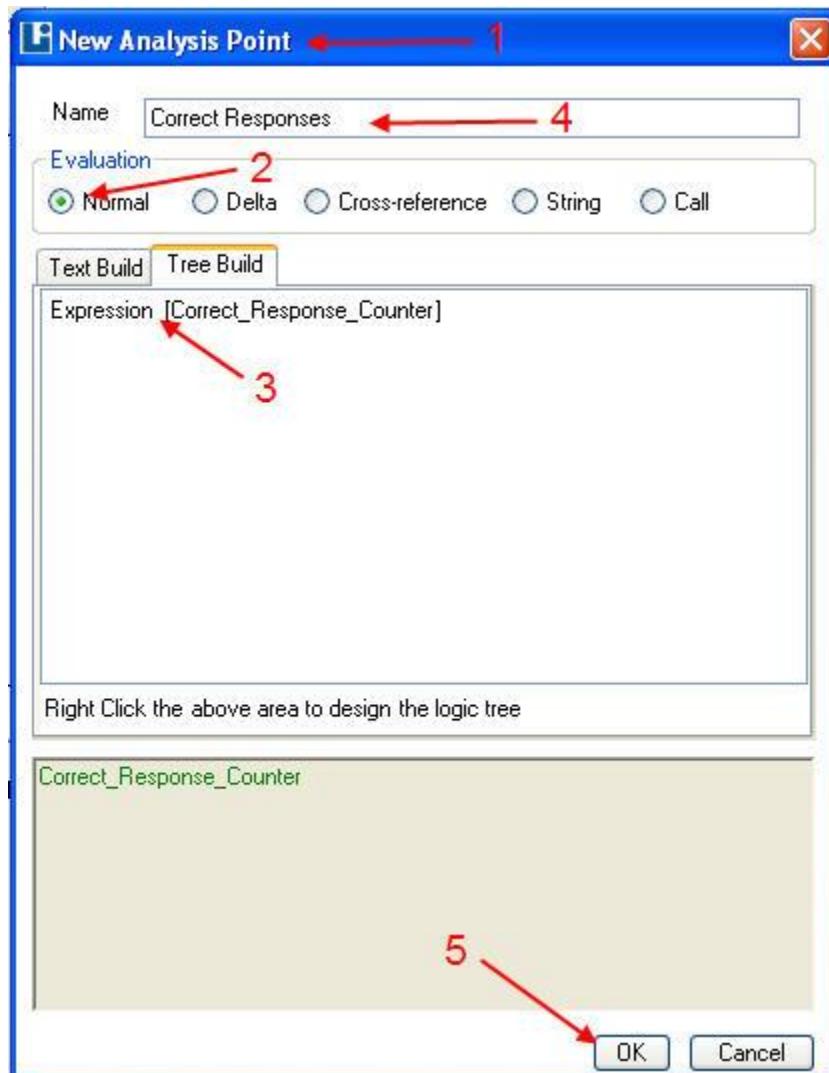
Analysis Points		
Identifier	Name	Show
Eval #1	Call to Perseverative Correct	<input checked="" type="checkbox"/>

## The Analysis Set Designer- Part II

### Normal Analysis Point for Time Bin Evaluation

Identical to previous Normal Evaluations.

1. Click the Plus/Add Tool (not shown) to open the New Analysis Point form.
2. Click Normal in the Evaluation area.
3. Replace the Template on the Tree Build Tab with the Expression Correct\_Response\_Counter
4. Enter a suitable Name based on the evaluation point under construction
5. Click OK to close the New Analysis Point form.



Analysis Points		
Identifier	Name	Show
Eval #1	Call to Perseverative Correct	<input checked="" type="checkbox"/>
Eval #2	Correct Responses	<input checked="" type="checkbox"/>

## The Analysis Set Designer- Part II

### Sample Data Display for Time Bin Evaluation

Running the above on a suitable data file results in values for each evaluation based on the time bin value used and the session duration. In this illustration a 30 minute session with a 10 minute time bin resulted in three data lines for each analysis.

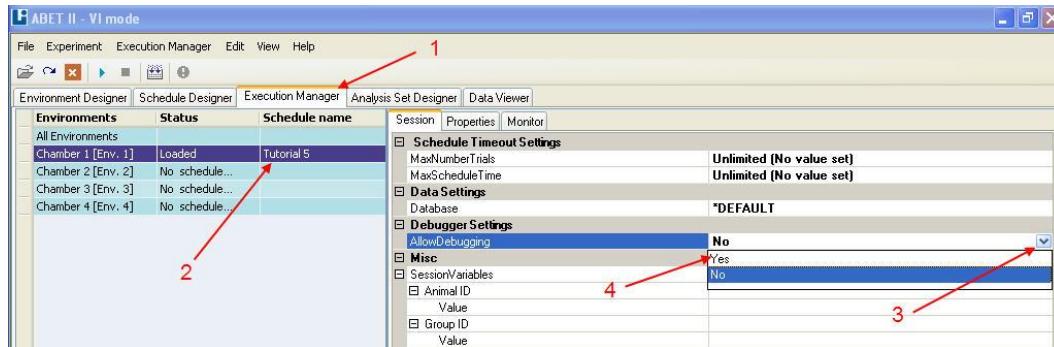
	By Summary	By Analysis type	By Session
	5-choice Mouse basic NL2		
Row_Name	Analysis #1		Analysis #2
Schedule	5-choice Mouse basic NL2		5-choice Mouse basic NL2
Environment	Chamber6 [6]		Chamber6 [6]
Time	10/7/2011 2:38:31 PM		10/7/2011 2:38:31 PM
Analysis	Time Bin Evaluation - Perseverative Correct - Total		Time Bin Evaluation - Correct Responses
N	3		3
Mean	1.667		48.333
SD	0.272		6.400
Min	1.000		34.000
Max	2.000		61.000
Blank			
1	2		34
2	2		50
3	1		61

# The ABET II Debugger

## Using the ABET II Debugger

The ABET II Debugger can be used with any schedule, but Tutorial 5 will be used here as it includes a group change following reward.

1. Click on the Execution Manager Tab.
2. Load the schedule you wish to debug. In this case, Tutorial 5.
3. Click the pull down button for the Debugger Settings.
4. Select Yes to change the default setting of No.



Click the Run Icon or select Run from the Execution Manager menu. A Debugger Tab now appears along with the Session, Properties and Monitor tabs. Click to reveal a listing of Device Aliases, Arrays, Lists, Variables and Virtual Inputs as used in Tutorial 5.

An Output area appears as shown with tools to Save, Print or Copy the Output detail.



Group 1 Condition ‘Start PR’ has tested true, the House\_light #1 and Stumuls\_Light #1 have been turned ON, and the schedule has advanced to Group 2. This display will not change until a condition in Group 2 tests True.

### Following the First Response:

Generate a response with the virtual interface or connected hardware and view the changes to the Output List as shown below:

```
Schedule State Change: Running
Group 1 - 'Start PR' [Schedule_Timer ≥ 1] (Condition = TRUE)
    Turn on House_Light #1
    Turn on Stimulus_Light #1
    Next Group = 2
```

Group 2 detail is now added to the Ouput as shown on the next page.

# The ABET II Debugger

Two conditions evaluate as True with the first response.

```
Group 2 - 'PR Count' [Left_Lever = Transition On] (Condition = TRUE)
    Increment PR_Count (1)
    Next Group = 2
Group 2 - 'PR Evaluation' [PR_Count ≥ PR_Value.value] (Condition = TRUE)
    Pulse Reward #1 for 50 ms.
    Turn off Stimulus_Light #1
    Increment_Trial_Counter (1)
    Decrement Rewards_per_Step (1)
    Reset PR_Count (0)
    Start Time_Out_Timer
    Next Group = 3
```

## Following a 5 second Time Out:

Group 3 evaluates true.

```
Group 3 - 'Reward Timeout' [Time_Out_Timer ≥ 5.000] (Condition = TRUE)
    Turn on Stimulus_Light #1
    Reset Time_Out_Timer
    Next Group = 2
```

## Following the Second Response:

The same two conditions test True in Group 2 as with the first response, Group 3 tests True following 5 seconds as above, but a new condition from Group 2 now tests True as soon as the group is entered as well.

```
Group 2 - 'PR Count' [Left_Lever = Transition On] (Condition = TRUE)
    Increment PR_Count (1)
    Next Group = 2
Group 2 - 'PR Evaluation' [PR_Count ≥ PR_Value.value] (Condition = TRUE)
    Pulse Reward #1 for 50 ms.
    Turn off Stimulus_Light #1
    Increment_Trial_Counter (2)
    Decrement Rewards_per_Step (0)
    Reset PR_Count (0)
    Start Time_Out_Timer
    Next Group = 3
Group 3 - 'Reward Timeout' [Time_Out_Timer ≥ 5.000] (Condition = TRUE)
    Turn on Stimulus_Light #1
    Reset Time_Out_Timer
    Next Group = 2
Group 2 - 'PR Rewards per Step' [Rewards_per_Step ≤ 0] (Condition = TRUE)
    GetNextValue PR_Value (Value = 4 | Index = 2)
    Reset Rewards_per_Step (2)
    Next Group = 2
```

'PR Rewards per Step' has now tested True. The next PR\_Value is drawn and the Rewards\_per\_Step variable is reset.

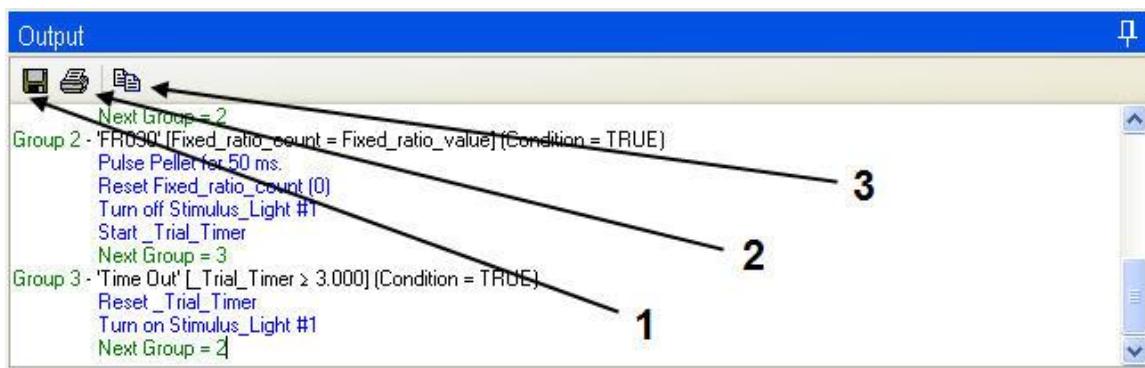
Continue to generate responses to follow the progression of the schedule. At any time you can print, save or copy the output until the session schedule is removed, replaced or reloaded.

# The ABET II Debugger

## Debugger Output Options

Three output Icons are provided that are active while the schedule is running as well as after the schedule is stopped. Note, when the schedule is stopped you must click on the Debugger Tab unless the preference option has been changed to default to the Debugger Tab or to the Current Tab (do not change view).

1. **Save:** Opens a Save As form. By default the output file is saved in the ABET Debug Logs folder in Rich Text File (.rtf) format.
2. **Print:** Opens a print menu with the following selections
  - Page Setup including Paper, Orientation, Margins and printer specifications.
  - Print Preview
  - Print
3. **Copy:** Click the Copy Icon to place the entire output list on the clipboard. Open a new document in any suitable application (MS Word, Notepad, Wordpad etc.) and Paste.



A complete output stream is provided. The appearance is the same for the print preview, a printed hardcopy or content that has been copied and pasted to another document.

```
Schedule State Change: Running
Group 1 - 'Start PR' [_Schedule_Timer ≥ 1] (Condition = TRUE)
    Turn on House_Light #1
    Turn on Stimulus_Light #1
    Next Group = 2
Group 2 - 'PR Count' [Left_Lever = Transition On] (Condition = TRUE)
    Increment PR_Count (1)
    Next Group = 2
Group 2 - 'PR Evaluation' [PR_Count ≥ PR_Value.value] (Condition = TRUE)
    Pulse Reward #1 for 50 ms.
    Turn off Stimulus_Light #1
    Increment _Trial_Counter (1)
    Decrement Rewards_per_Step (1)
    Reset PR_Count (0)
    Start Time_Out_Timer
    Next Group = 3
Group 3 - 'Reward Timeout' [Time_Out_Timer ≥ 5.000] (Condition = TRUE)
    Turn on Stimulus_Light #1
    Reset Time_Out_Timer
    Next Group = 2
Group 2 - 'PR Rewards per Step' [Rewards_per_Step ≤ 0] (Condition = TRUE)
    GetNextValue PR_Value (Value = 4 | Index = 2)
    Reset Rewards_per_Step (2)
    Next Group = 2
Schedule State Change: Stopped
```

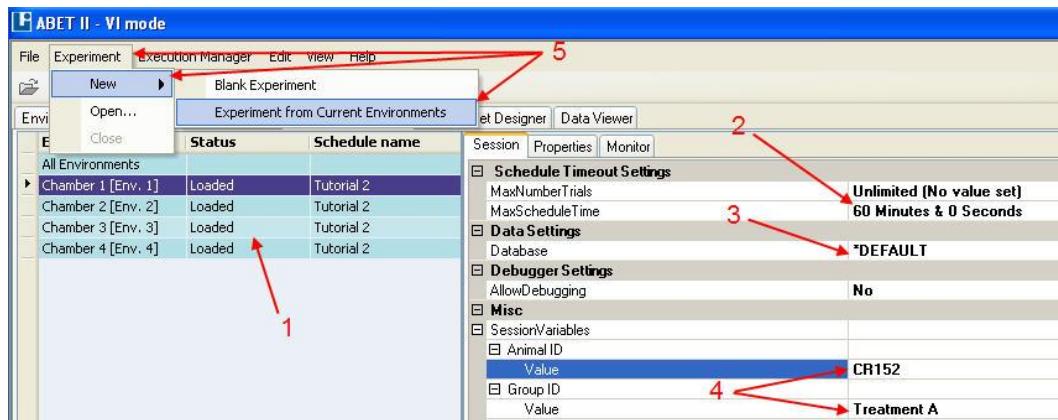
# Setting up and Running Experiments in ABET II

## Experiments

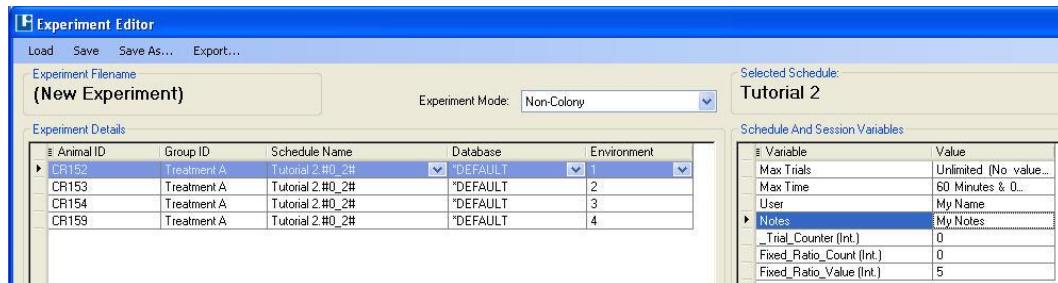
Early versions of ABET II allowed you to save entries made on the Execution Manager tab as an experiment. Beginning with Version 2.16 several additional features were added and **Experiment** is now added to the top menu whenever the Execution Manager tab is activated. Clicking **Experiment** lets you navigate to a separate work space. The biggest change involves adding a **Colony Mode**. **Colony Mode** uses animals that have been fitted with an RFID tag. Multiple animals may have access to the same environment; however, the schedule and schedule parameters assigned to each animal are pre-loaded in the environment file and loaded to the environment as called for. The Non-Colony Mode will be detailed here as it provides the same tools as older software versions.

### New Experiment from Preloaded Schedules

1. Load one or more schedules using individual environments or the All Environments feature.
2. Set Schedule Timeout Settings as desired.
3. Select the Database to use
4. Add Session Variables information as needed
5. Click **Experiment** on the top menu, scroll down to **New** and over to **Experiment from Current Environments**.



A new window will appear with all the experiment settings. This form may be edited, changing any of the entries made previously. If the **Save** and **Save As** tools are not highlighted simply click in any editable field and click enter. The information will not change but the tools will now be activated.

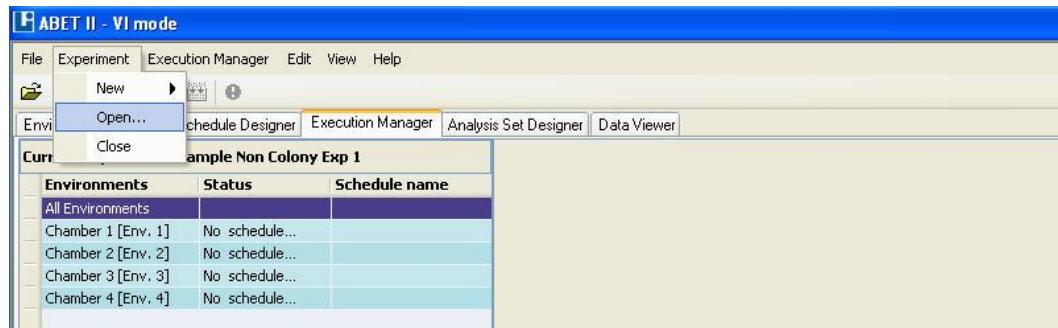


## Setting up and Running Experiments in ABET II

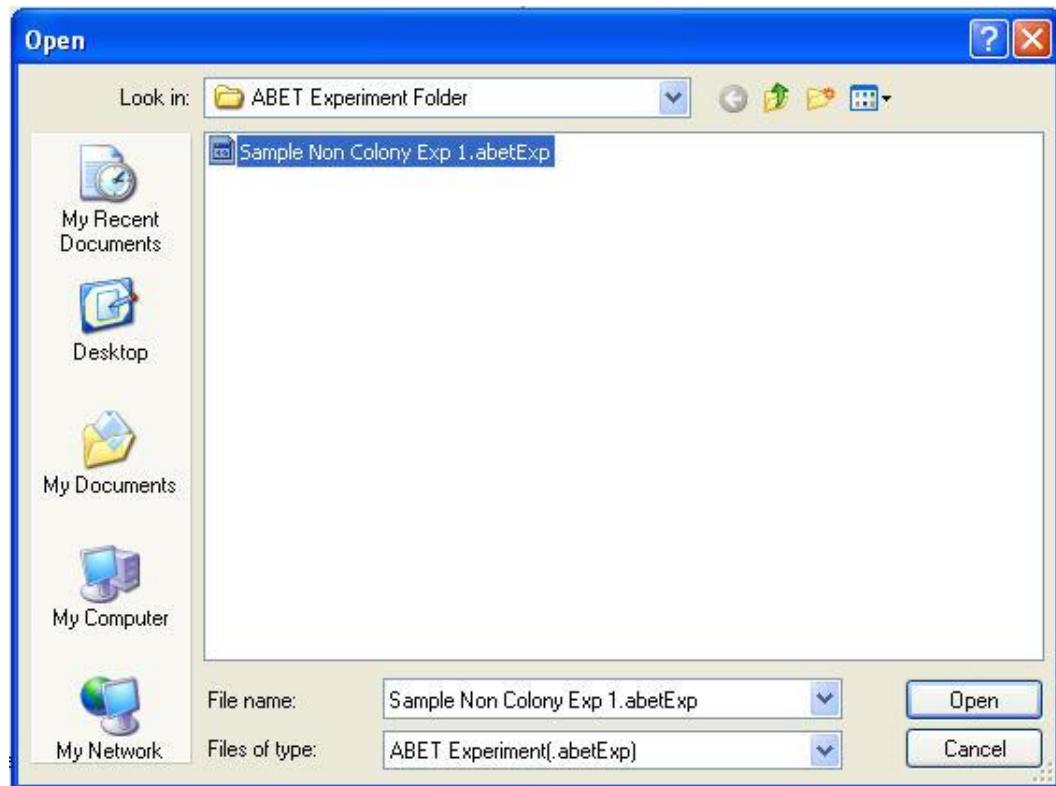
After Saving click Cancel to return to the Environments. If the experiment has been edited you can also click **Apply to Environments** and a “Save changes ?” question box will appear. Click Yes to bring up the standard Windows Save As form.

### Using a Saved Experiment

Simply Click Experiment Open from the top menu to Open a saved experiment.

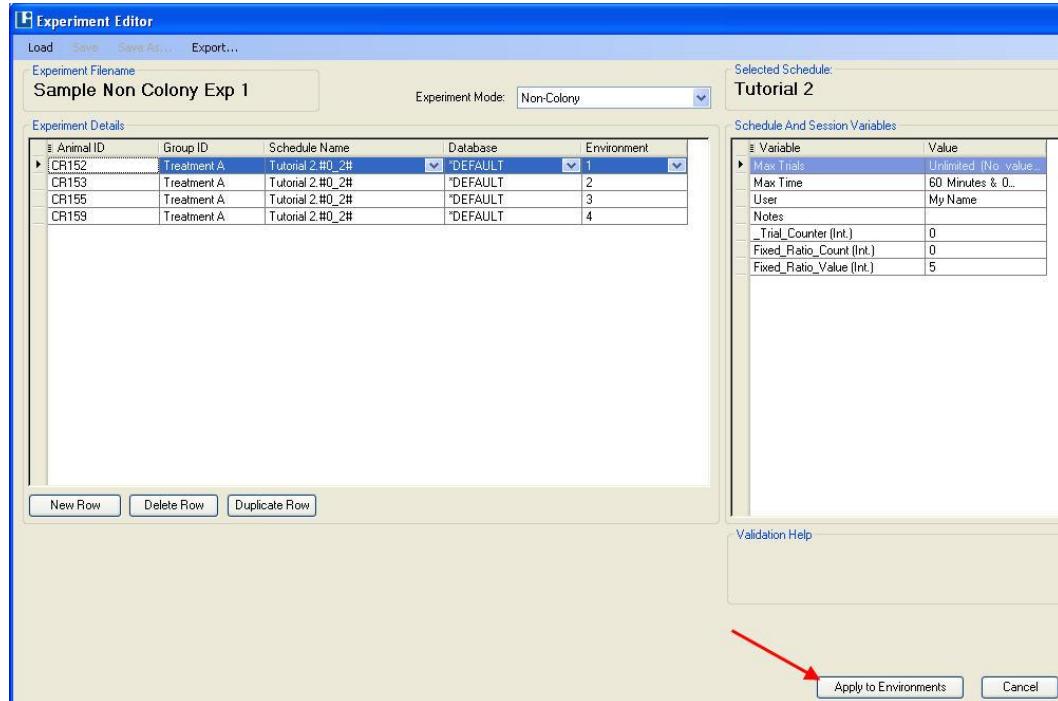


Highlight the Experiment File to be used and Click the **Open** button.

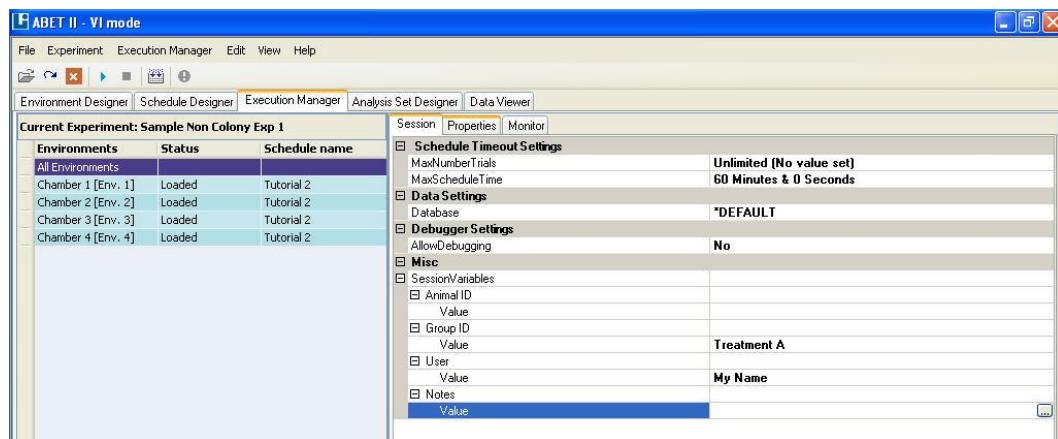


## Setting up and Running Experiments in ABET II

The Experiment Editor will open. Edit Experiment Details and/or Schedule and Session Variables if needed.



Click **Apply to Environments** to load the experiment detail and return to the Execution Manager tab.



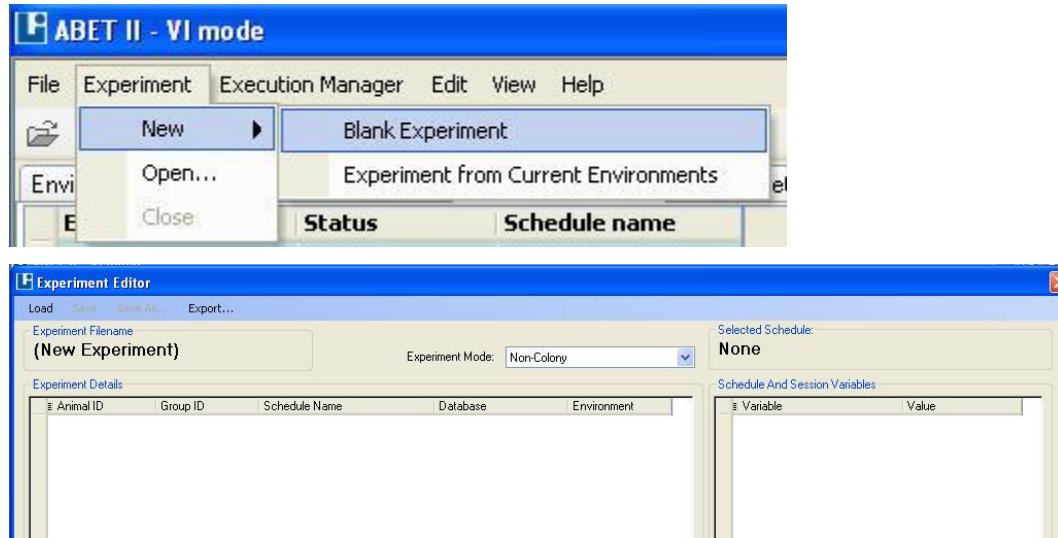
**Note:** Session information saved in the Experiment file is controlled by the Preferences settings for each session field or variable. For example you may not want to save Notes, the animal weight or any other variable that may change from session to session. For more information on setting preferences, go to [[Preferences – Execution Manager – Session Fields](#)] in the Additional Tools, Features and Concepts of ABET II section of this manual.

# Setting up and Running Experiments in ABET II

## Creating a New Blank Experiment

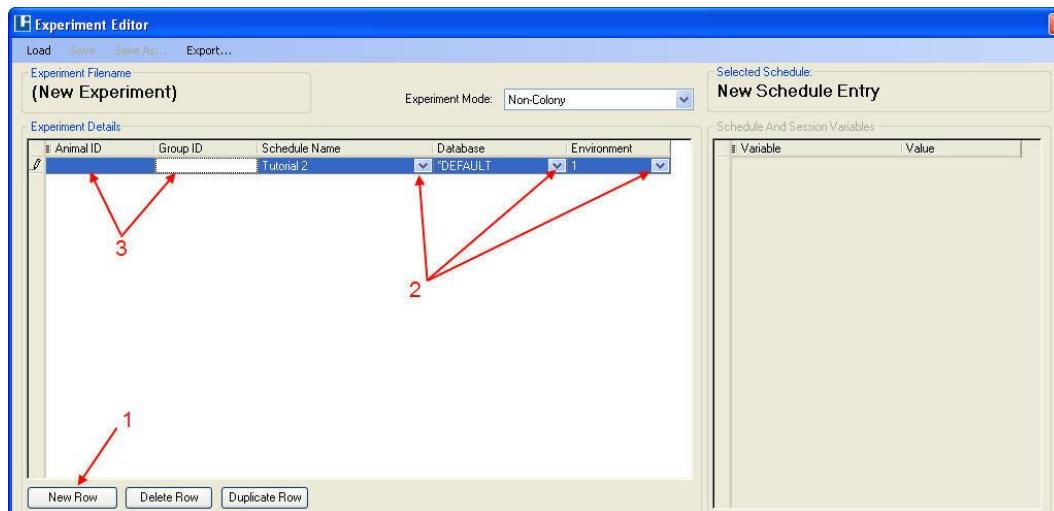
Experiments may be created from scratch using the Experiment menu selection. The following illustrates an experiment in the Non-Colony mode. This is the default mode that will be appropriate for most users.

Click **Experiment**, scroll down to **New** and over to **Blank Experiment** to open the Experiment Editor shown below. Use this blank form to create an experiment with the tools provided. Of course you can also Open an existing experiment, edit it to meet any new requirements and use Save As to create a “New” Experiment.



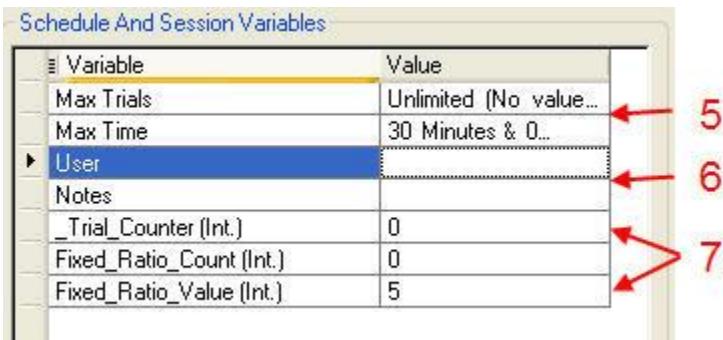
## Adding a New Row to a New Experiment

1. Click New Row to configure the first environment for the new experiment.
2. Use the pull down menus to select a Schedule Name, Database and Environment
3. Tab to or Click the Optional Animal ID and Group ID Cells and type any text appropriate to the selected cell

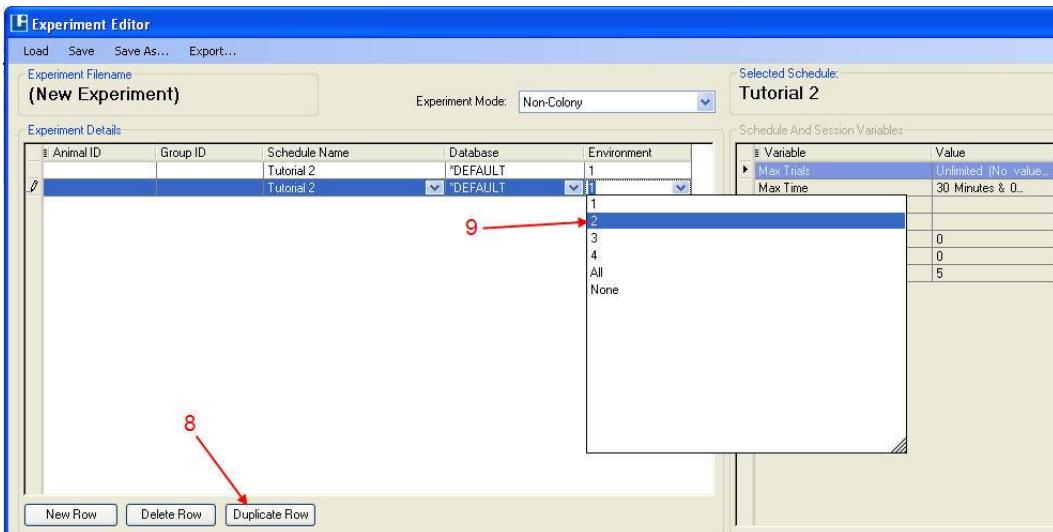


## Setting up and Running Experiments in ABET II

4. Press Enter to accept the above information (it can still be edited if needed) and activate the Schedule and Session Variables area.
5. Enter trials and/or Schedule time if appropriate.
6. Complete User, Notes, or other session field created in preferences as appropriate.
7. Edit Variables if appropriate.

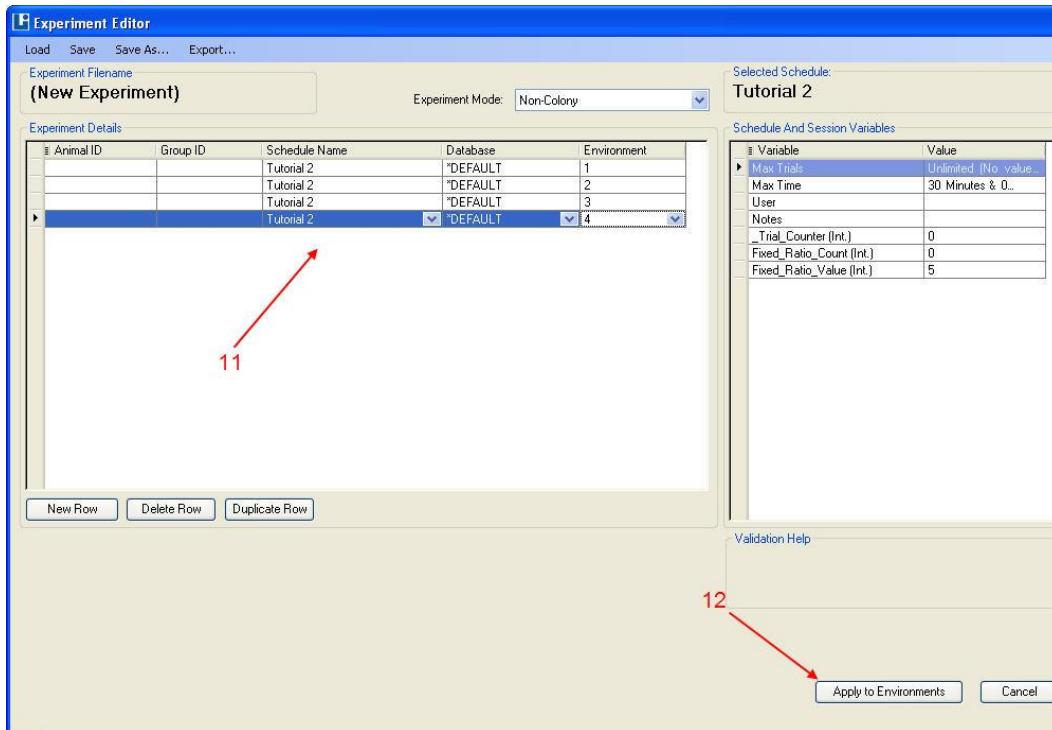


8. Use **Duplicate Row** if most of the information for Chamber 2 is identical to Chamber 1.
9. Click the Environment pull-down menu to update the environment.
10. Press the key board Enter to accept the new row. (not shown)



## Setting up and Running Experiments in ABET II

11. Continue until the Experiment is complete
12. Click Apply to Environments when finished.

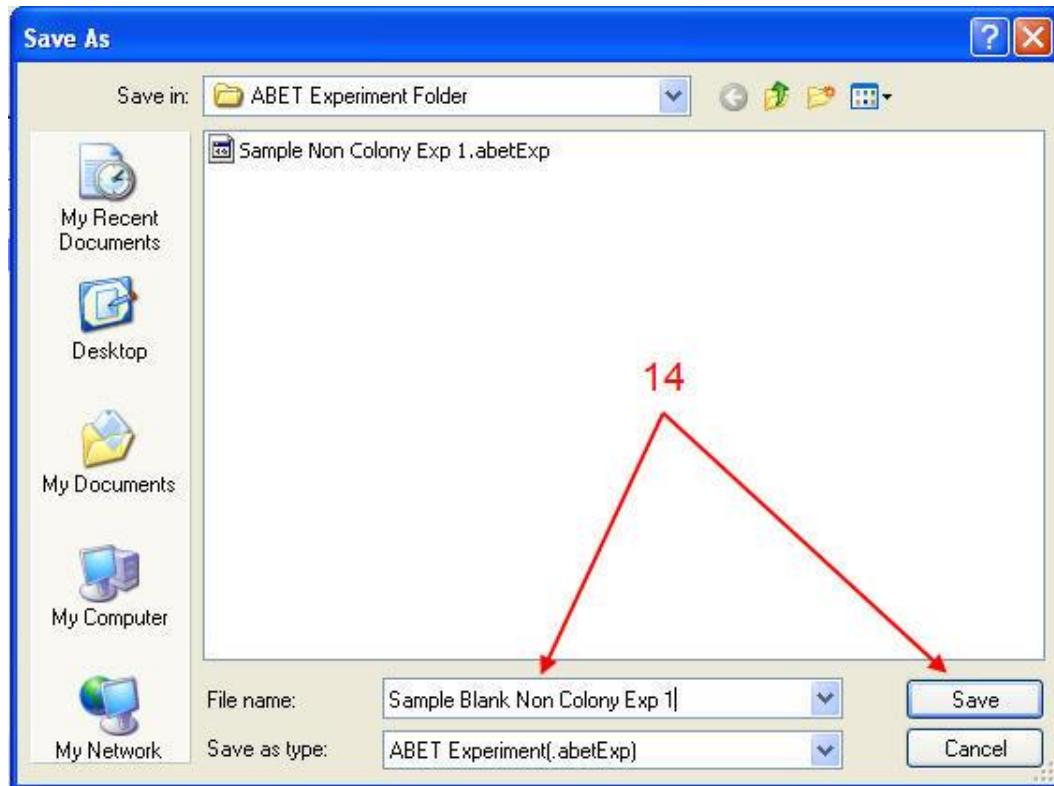


13. A Save Changes alert will appear as shown. Click Yes.

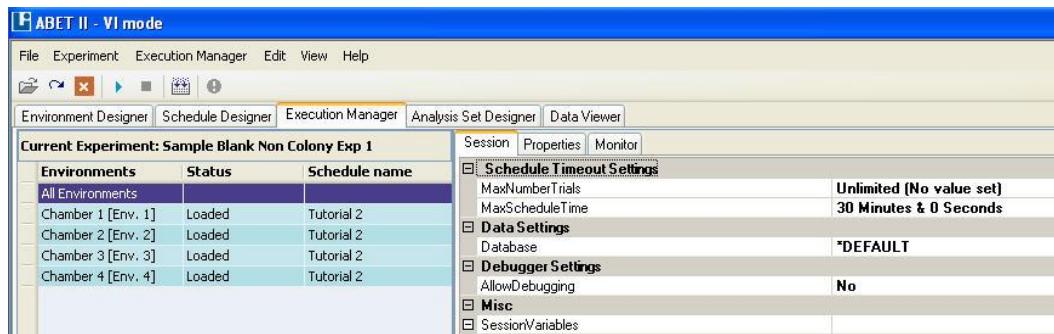


## Setting up and Running Experiments in ABET II

14. Enter a suitable File Name and click **Save**.



Clicking Save above will close the Save As window and automatically open the Execution Manager tab. Additional edits may be made or simply click the Run Icon to start All Experiments or highlight individual chambers and start as needed.



The next day if you want to repeat a session, simply click on the Experiment Menu, Select Open and open the Experiment File that you would like to run. Again, you will have an opportunity to edit parameters, animal information and other information and replace the experiment file or save to a new experiment file before applying or loading the experiment to the environment.

# Setting up and Running Experiments in ABET II

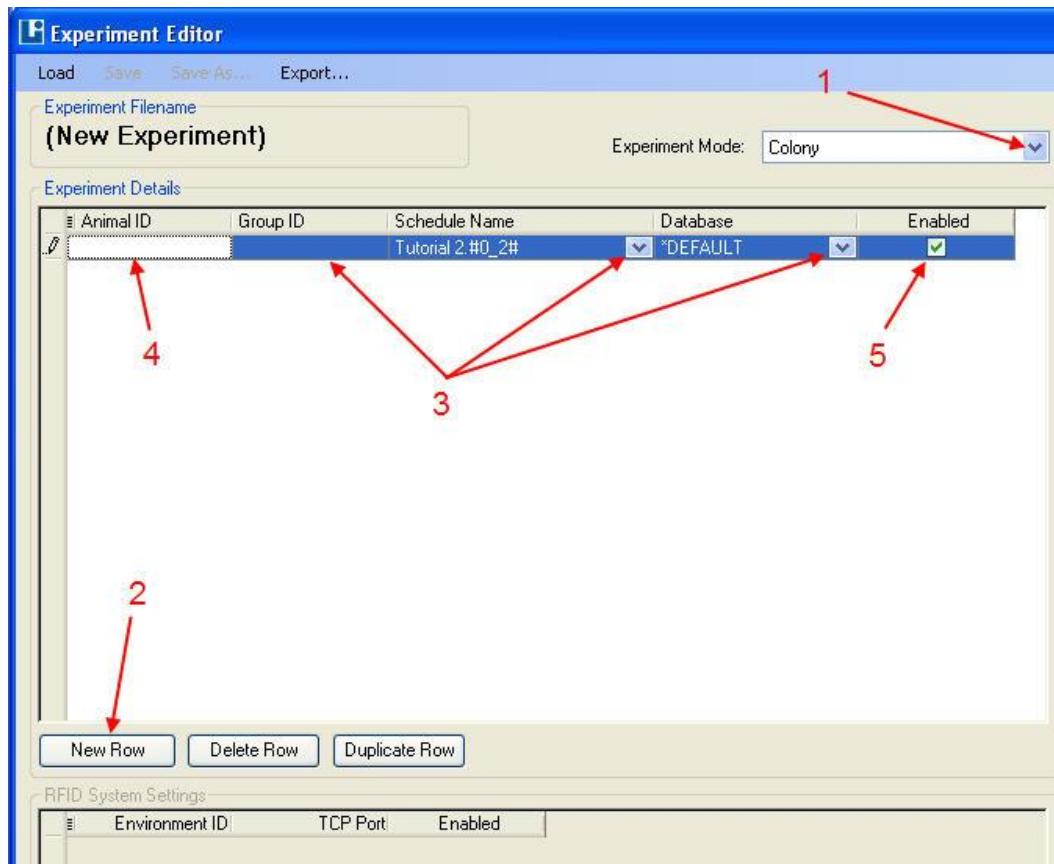
## Using the Colony Mode Feature

An additional feature of creating and using Experiments is the ability to run in systems where animals are group housed and access to a test chamber is controlled by an RFID tag. Please contact Lafayette Instrument Co. or Campden Instruments for additional information about appropriate systems.

Follow the procedures above for Creating a new Blank Experiment.

### Experiment Details

1. Click the Experiment Mode drop down arrow and select **Colony**. In addition to **Experiment Details** a new section will now appear with **RFID System Settings**.
2. Click **New Row** to enter animal specific information.
3. Complete the Experiment Details as before except for Animal ID
4. Animal ID will now be a specific ID that links this row information with a particular RFID tag.
5. An Enabled check box is provided to select or unselect individual animals each time an experiment is run.



## Setting up and Running Experiments in ABET II

### RFID System Settings

1. Click **New Row** in the RFID System Settings area.
2. Associate the test environment with the RFID Reader (TCP Port) that serves as the gate way to that environment.
3. An Enabled check box is again provided to select or unselect environments that are available each time an experiment is run

	Environment ID	TCP Port	Enabled
1	1	1024	<input checked="" type="checkbox"/>

New Row    Delete Row

## Additional Tools, Features and Concepts of ABET II

### Additional Tools, Features and Concepts of ABET II

#### Introduction

The previous tutorials and other sections of this manual were designed to provide you with enough information to use all the basic tools and features needed for most schedules. Standard operant schedules were used for illustration, but ABET II can be used to collect data from any device that can generate inputs via switch closures or other circuits with a sinking ground and control any device that operates on 28 V DC. (24 to 30 V DC is typically acceptable). Virtually any logical relationship may be developed between these inputs and outputs making this behavioral programming tool suitable for mazes, learned helplessness chambers, human response panels as well as other standard and custom devices. Each section below covers a topic not covered in the Tutorial Section or adds to the general understanding of how the ABET II system works.

#### How ABET II processes Conditions & Groups

- Conditions contain a simple or compound argument(s) and single or multiple action(s). When the argument or arguments are true all actions for the condition are executed.
- Groups contain a single or multiple conditions. Only one group can be active at a time. When multiple conditions exist in a single group and two or more are satisfied simultaneously, the actions of all conditions testing true at the same time will be executed.
- The schedule may advance to a new group or stay in the existing group based on the Goto associated with the condition. Each evaluation freezes the state of all conditions. A variable change that results in a new condition testing true with possibly a new Goto will not have that effect until the next evaluation even though the two could be a millisecond or less apart.
- If two or more conditions test true at the same time and the Goto associated with the multiple conditions is different, the Goto that will take place is the top most TRUE condition in the list of conditions in the currently active group.

#### Good Schedule Design Practices

There is no single way to design a schedule, nor is there only one schedule that will accomplish the task at hand, but following some good designing rules will make the job easier.

- Keep in mind that conditions in the same group are processed from the top of the group to the bottom of the group. This happens in less than 1 ms so actions occur simultaneously. Where this becomes most important is for the **Goto** or transition phase of the condition. When multiple conditions can be true at the same time, the **Goto** will always be determined by the top most **Condition** of those conditions satisfied in the **Group**. In these situations always place the condition that determines the transition to a new group at the top of the list.

## Additional Tools, Features and Concepts of ABET II

- Begin with something on paper. Draw a simple flow diagram or simply list the conditions and actions that make up your schedule. Although not necessary, it is highly recommended that you build the schedule on a spreadsheet first. Use five columns with headings **Group**, **Name** (Condition), **Goto**, **Condition**, and **Action** in that order. Add a column for comments if you like. It is much easier to move conditions, repeat actions, insert groups and track your logic in this format than in the Schedule Designer.

**Example:** For this example we will use a simple FR schedule with Reward and a timeout or Inter-trial interval. Notice the FR Reward “test” comes before the response increment so that we have the **Condition** that controls the flow at the top of the **Group**.

### Persistent Conditions – Avoiding this potential logic flaw

The best way to describe this logic flaw is with an example. The following fixed ratio schedule is contained in a single group with three conditions: 1) turn the stimulus light ON at the start of the schedule, 2) increment a response counter, and 3) reward when the ratio value has been reached. The Schedule Designer printout is shown below with the details.

Conditions and Actions:

Group	Name	Goto	Condition	Action
1	FR Start	1	When _Schedule_Timer ≥ 0	Turn on Stimulus_Light #1
	Start Condition for FR			
1	FR Count	1	When Response_Lever #1 = Activated	Increment FR_Count
	FR Response Count			
1	FR Reward	1	When FR_Count = FR_Value	Pulse Reward #1 for 50ms Reset FR_Count
	Evaluate FR			
2	End of Schedule	-		

Run this schedule and it appears to run OK. The light is turned ON and an appropriate number of responses generate a reward. However, run this schedule for just 10 seconds and you will produce approximately 50,000 records in the database. Run it for 1 minute and you will have in excess of 300,000 records and in one hour in excess of 18 Million records. Even with a 2 Gigabyte capacity, the ABET II database would only be able to run this schedule for approximately 100 hours.

The flaw in this schedule is caused by the first condition testing true as soon as the schedule is started and continues to test true every subsequent pass through the group. Because this occurs several times a millisecond and both a condition event and an output ON event are recorded each time, you end up with the number of records estimated above.

### Solutions for Persistent Conditions

One of the easiest solutions for this problem is to simply **Goto** a new **Group** when the **Condition** tests true. This method would be used in the above example and was used in most of the tutorials where the Start Condition was the only condition in Group 1 and it immediately transitioned to Group 2 after turning on a house light, stimulus light or performed some other start up function.

When using a **Condition** that tests two variable; i.e., When **Variable\_Counter** is equal to/greater than **Variable\_Value**, the persistent condition flaw may be avoided by simply resetting the **Variable\_Counter** as one of the actions. You can also modify the **Variable\_Value** adding a constant or variable, multiplying by a constant or variable or drawing a new value from a sequential list that is larger.

## Additional Tools, Features and Concepts of ABET II

### Working with Non-Latched Hardware

Non latched hardware can be very helpful when it is desirable to measure the duration of a response be it a lever press, beam break or other device; however, it is a little more susceptible to the persistent condition.

In this mode, a similar situation can occur as with the persistent condition above.

For example, the condition **When Response\_Lever #1 = Activated** or **When Photo\_Beam #1 = Activated** will produce continuous inputs for as long as the lever is held or the photo beam is broken unless the first input to test True results in a **Goto** a new Group. The new Group must then start with a condition of type **When Response\_Lever #1 = Not Activated** or **When Photo\_Beam #1 = Not Activated** again with a **Goto** that transitions to another group. Another solution is to use the **Transition On** argument in place of **Activated**. Unlike Latched Hardware, Non-Latched Hardware will enter a Transition On and a Transition Off time stamp in the database that of course can be used to analysis the duration of the response at any time.

**Note:** The Whisker Server used with all ABET II Touch systems including the Bussey-Saksida touch chambers is designed to work with non-latched hardware; therefore, the rules stated above for ABET II Standard will apply to all ABET II Touch applications and schedules.

### Using Boolean logic

A very simple example of the use of Boolean logic was used for the Fixed Interval Schedule in Tutorial #3. One of the strong features of the ABET II schedule designer is the ability to incorporate virtually unlimited levels of Boolean logic in the condition arguments using parenthesis to nest arguments as needed. Two examples of this are found in the 5CSRT task. The correct response condition arguments simply “AND” the nose poke response for each hole with the stimulus for that hole. Since the 5 such pairings are “OR’d”, any correct response regardless of which stimulus is turned ON will cause the condition to test True.

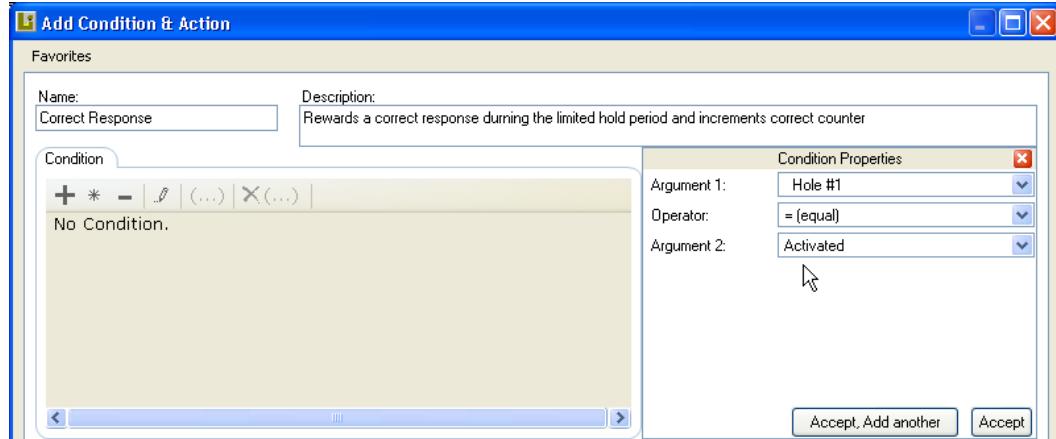
```
When (Hole #1 = Transition On  
And Stimuli.value = Lamp #1)  
Or (Hole #3 = Transition On  
And Stimuli.value = Lamp #3)  
Or (Hole #5 = Transition On  
And Stimuli value = Lamp #5)  
Or (Hole #7 = Transition On  
And Stimuli value = Lamp #7)  
Or (Hole #9 = Transition On  
And Stimuli value = Lamp #9)
```

The Incorrect Response condition is almost identical except the **Stimuli.value** argument is changed from equal “=” to not equal “ $\neq$ ”. Now any response to a hole that is not lit up will cause the condition to test True.

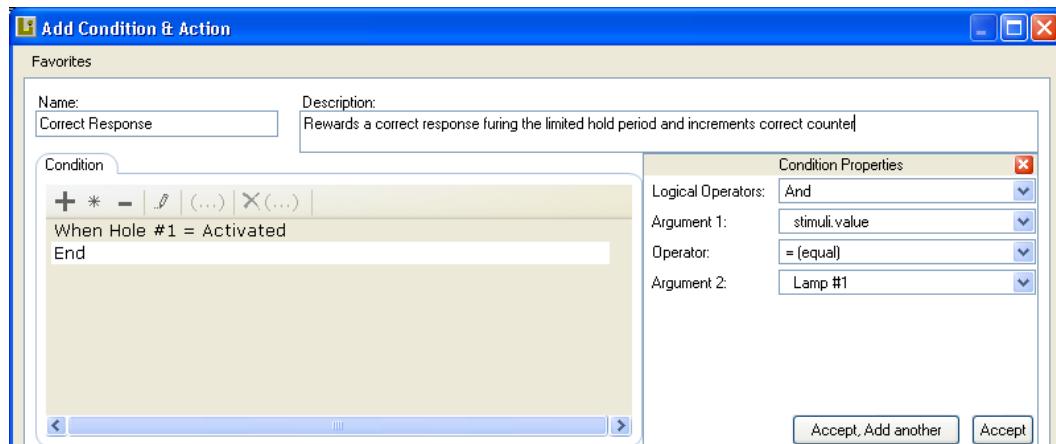
Remember, in either case you do not actually write the code that is shown above and in schedule designer. It is generated automatically by the selections you make in the Schedule Designer Condition Properties form. A few of these are illustrated to help you become familiar with this tool.

## Additional Tools, Features and Concepts of ABET II

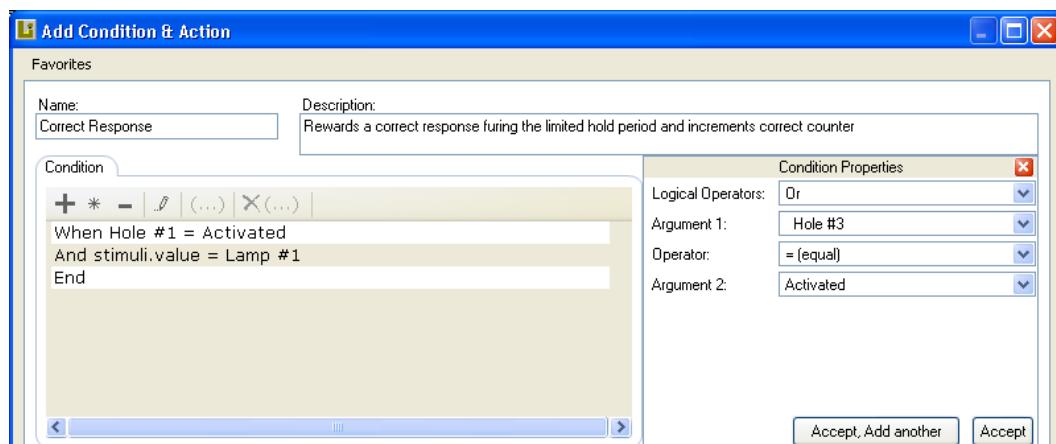
Start with the properties for the first Condition statement “When Hole #1 = Transition On” by selecting the Argument 1, Operator, and Argument 2 shown here and clicking “Accept, Add another”.



Next select the properties for the second condition statement, “And Stimuli.value = Lamp #1” using the Logical Operator “And”, and the Argument 1, Operator, and Argument 2 shown below:

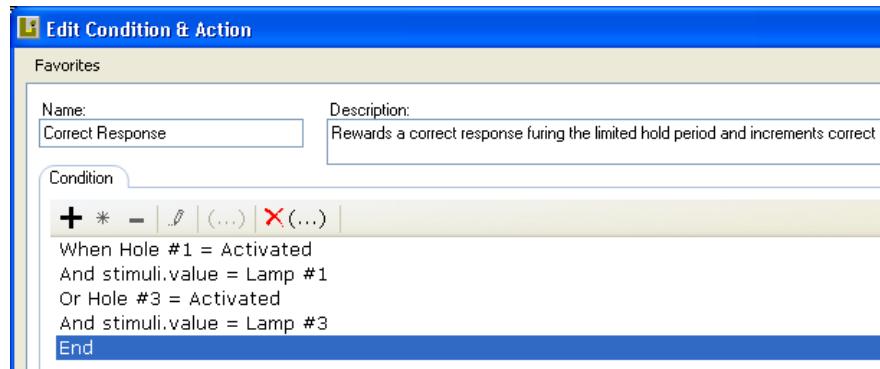


Complete the next line as follows with the Logical Operator “Or”.



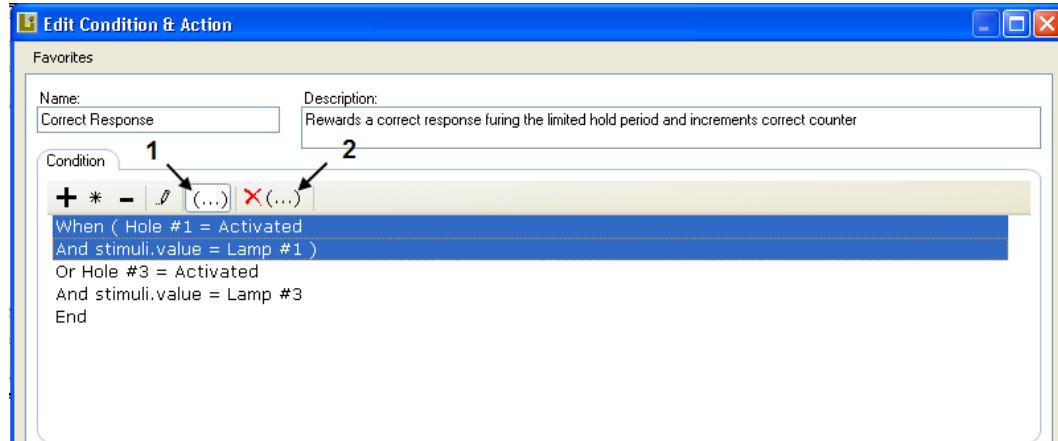
## Additional Tools, Features and Concepts of ABET II

Enter the properties for the next line with Logical Operator And, Argument 1 of Lamp #3, Operator “=(equal), and Argument 2 “Transition On”. When finished click “Accept”. The condition should now appear as shown.



The Boolean logic must be properly grouped to have the desired effect. This is being illustrated with just the first four arguments for the condition. The arguments for Holes 5, 7 & 9 may be added first or later.

Two tools are available, the “Add Parenthesis” (#1) and the “Remove Parenthesis” (#2). Highlight the first two lines using standard windows techniques including shift click or ctrl click as needed. When highlighted as shown, click the “Add Parenthesis” tool #1.

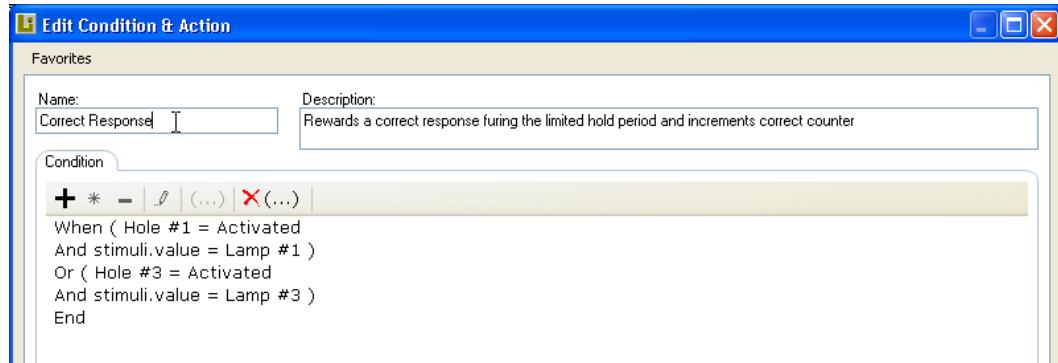


Repeat the above for the second two lines. Both the completed Edit Condition & Action form and the Designer workspace are shown below for reference.

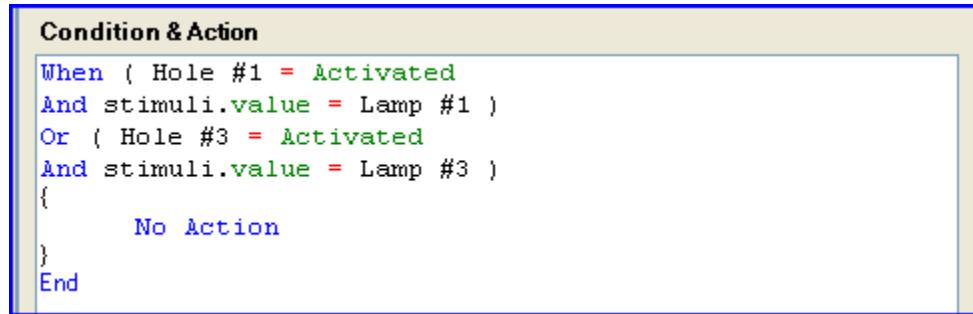
The screen shots show usage of ‘Activated’ for the ‘state’ of the input, e.g. Hole #1. However earlier we discussed using ‘Transition On’. The explanation for why and when to use these to qualifiers can be found in [Working with Non-Latched Hardware](#) in the Advanced ABET II Features, Tools and Concepts section of this manual. The usage of Transition On works equally well with both types of interface hardware, Latched and Non-Latched, and so should be used for this tutorial.

## Additional Tools, Features and Concepts of ABET II

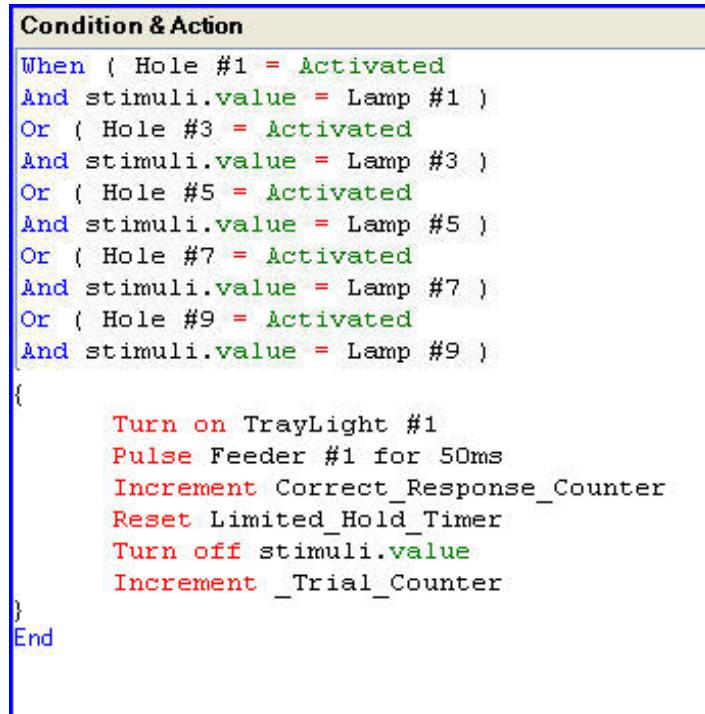
Partial Correct Response work sheet with arguments for Hole #1 and Hole #3 properly contained within parenthesis.



Partial Correct Response Code as shown in Schedule Designer Condition & Action Display.



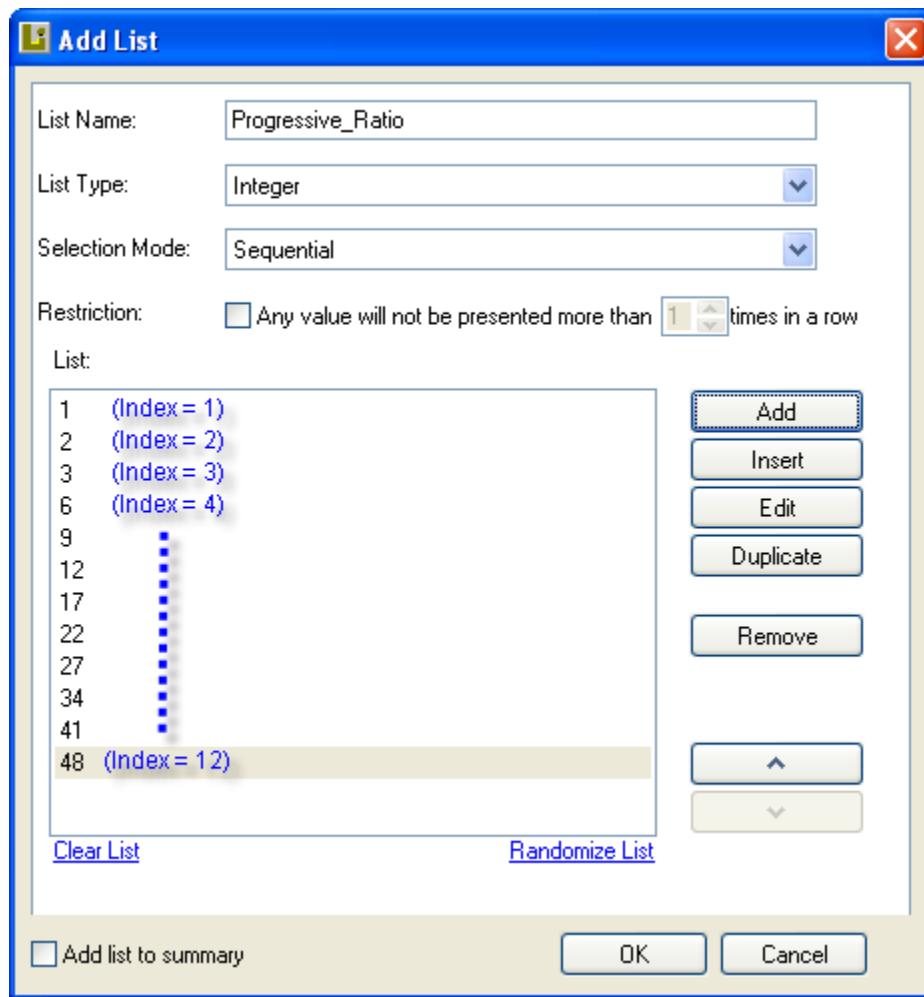
The completed code as shown in the Schedule Designer Condition & Action Display



## Additional Tools, Features and Concepts of ABET II

### Using Lists in Conditions and Actions

Both conditions and actions have access to list values and list indexes. Each item in a list has a value and an index associated with it. The value is just that, the value that was entered or added to the list and that you see on the list summary. The index is a sequential number that ABET II automatically assigns to indicate the position of each value entered on the list. The figure below shows how ABET will automatically assign indexes to list items.



**Note:** List indexes are saved when the “OK” button is clicked, therefore, using the **Randomize List** link or the **Insert** button will not re-order the list item indexes. They will always begin at the first entry and increment for each item in the list until the last item in the list.

## Additional Tools, Features and Concepts of ABET II

### Using Lists in Conditions and Actions - Continued

#### Conditions:

The following table describes the list information that can be used to formulate conditions. The table assumes the list name to be **Progressive\_Ratio** as used in Tutorial #4. Click [[Here](#)] to return to Tutorial #4.

List Function	Description
Progressive_Ratio.value	The value of the current item in the list.
Progressive_Ratio.index	The index of the current item in the list

#### Actions:

The following table describes the list information that can be manipulated within an Action.

Progressive_Ratio.value: GetNextValue	The list will draw the next value from the list using the lists selection mode
Progressive_Ratio.value: Reset	Applies to the .index variable only. The list is initialized as if the schedule had started over. For a Sequential List Reset returns to the first item in the list. For Random Equal Number lists, the list is repopulated and a new value drawn. For Random Except Previous, a new value is drawn without restriction. For Truly Random there is no effect except to draw a new value.
Progressive_Ratio.index: GetNextIndex	Functions the same as GetNextValue above
Progressive_Ratio.index: Reset	Functions the same as Reset above
Progressive_Ratio.index: Increment*	Sets the new current index in the list to one more than the current index
Progressive_Ratio.index: Decrement*	Sets the new current index in the list to one less than the current index
Progressive_Ratio.index: Add*	Adds a constant, variable, or list(index or value) to the current index
Progressive_Ratio.index: Subtract*	Subtracts a constant, variable, or list(index or value) to the current index
Progressive_Ratio.index: Multiply*	Multiplies a constant, variable, or list(index or value) to the current index
Progressive_Ratio.index: Divide*	Divides a constant, variable, or list(index or value) to the current index
Progressive_Ratio.index: Set*	Sets a constant, variable, or list(index or value) to the current index

## Additional Tools, Features and Concepts of ABET II

### Additional Information using Lists:

**Note:** When performing incremental or mathematical functions on the index, if the resulting index is less than 1, the list index will be set to 1. If the resulting list index is more than the maximum list index, the list index will be set to the maximum list index. As a convenience, a warning will be placed in the data file.

**Warning:** Lists are initialized when a schedule is run and the first value is selected. Therefore, it is important to use this value before using the **GetNextValue** action. This is particularly important when values are selected **Sequentially** or **Random Equal Number**. Failure to follow this rule would miss the first value in a sequential list and would alter the desired balance for trial blocks when using a random equal number list.

List Values may be used directly or assigned to a simple variable that is used in its place. Examples of each are shown below. In either case the above warning still applies.

#### Assignment Example ...

```
When Tray #1 = Not Activated
{
    Distance = Distances.Value
    GetNextValue Distances
    Sample_side = Sample.Value
    GetNextValue Sample
}
End
```

#### Direct Usage Example ...

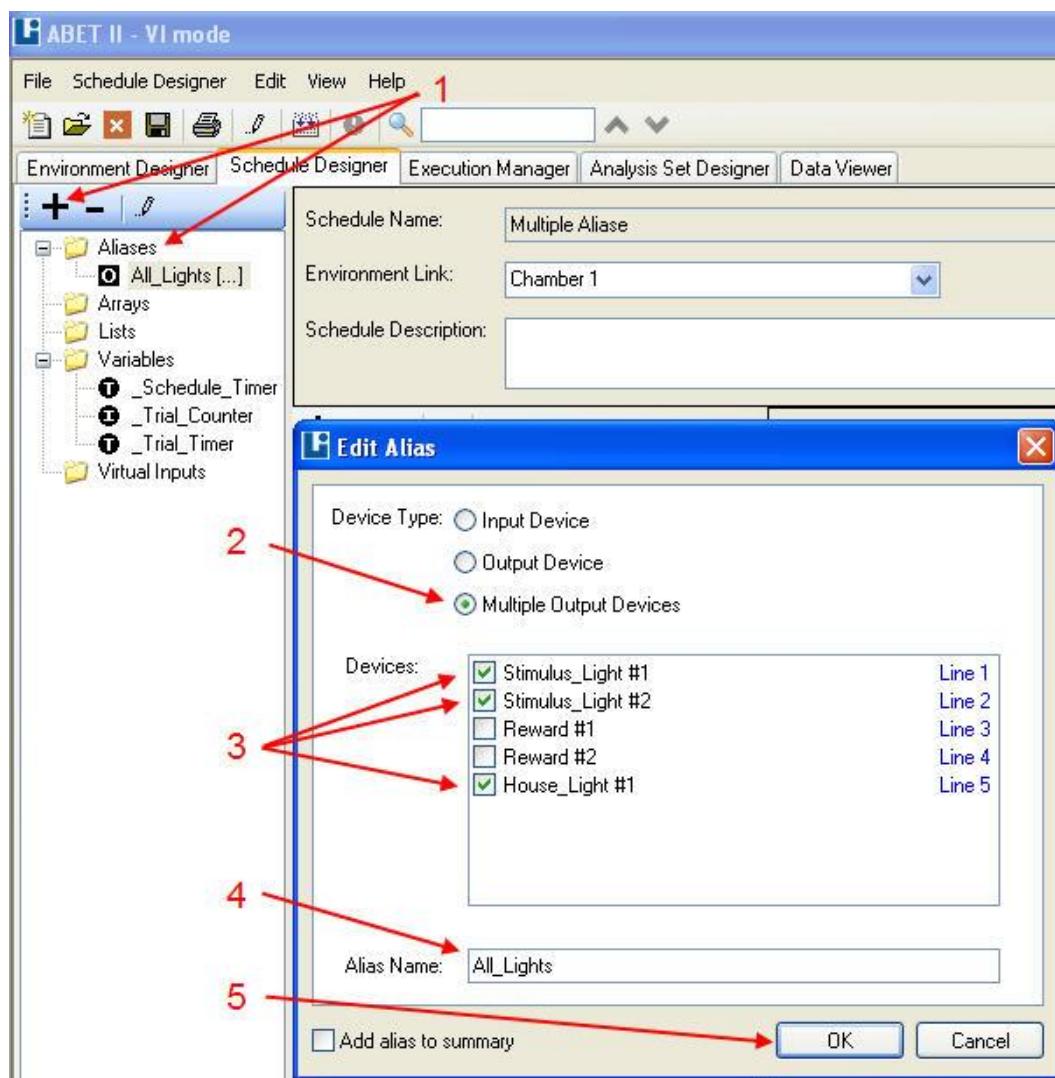
```
When _Schedule_Timer ≥ 0
{
    Large_Stimulus[1].DisplayAtLocation(1)
    Training_Images[1].DisplayAtLocation(2)
    GetNextImage Training_Images
    Turn off TrayLight #1
    Start Image_Timer

}
End
```

### Using Multiple Output Aliases in Conditions and Actions

#### Creating a Multiple Output Alias

1. Highlight **Aliases** and click the **Plus/Add Icon**
2. Check **Multiple Output Devices**
3. Check the **Devices** to be included in the alias. In this example the two stimulus lights and houselight were selected.
4. Enter an **Alias Name**
5. Click **OK**



# Additional Tools, Features and Concepts of ABET II

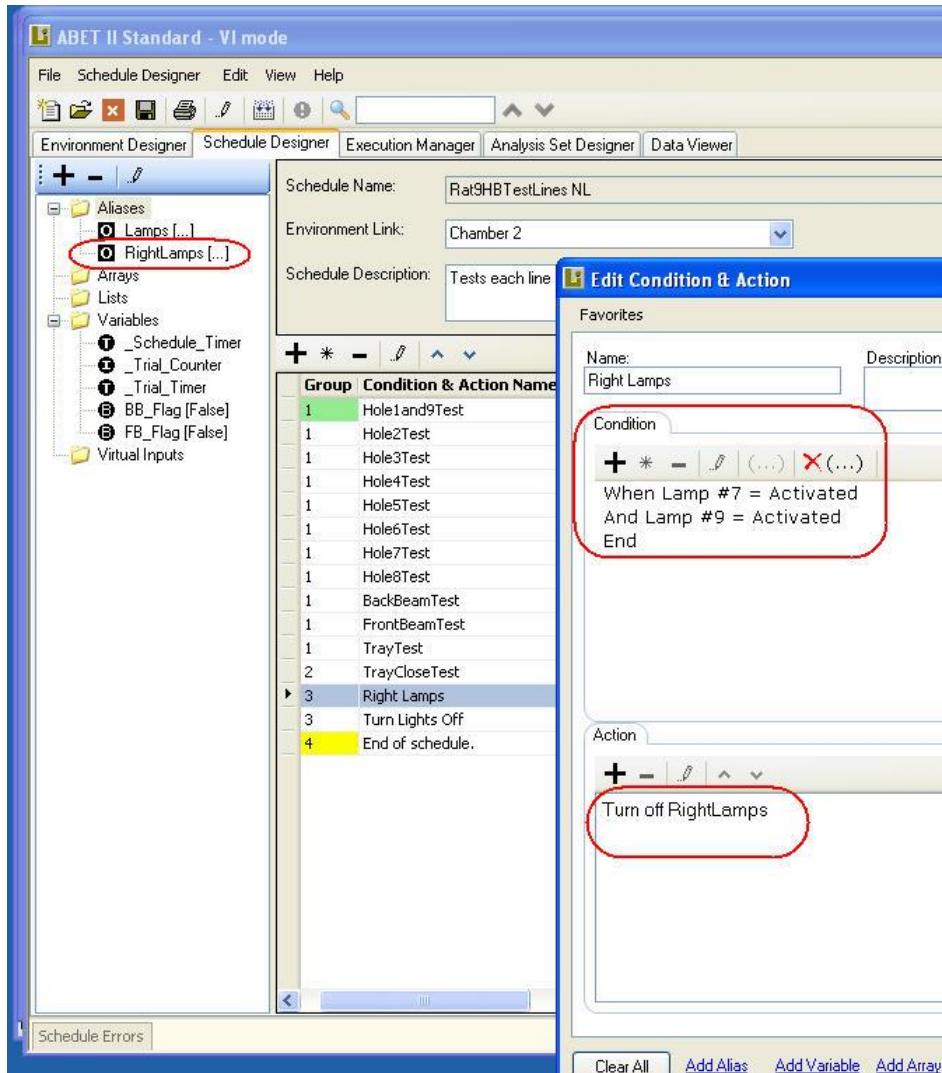
## Working with a Multiple Output Device Alias

Experiment with the multiple output device alias as needed, substituting it anytime several outputs must be turned ON or OFF at the same time. The following example uses the alias and individual actions in a sequence of conditions. A single response is used to re-run the sequence.

Conditions and Actions:

Group	Name	Goto	Condition	Action
1	Start	2	When _Schedule_Timer ≥ 1	Turn on All Lights Start Trial Timer
2	Lights OFF	3	When _Trial_Timer ≥ 5	Turn off All Lights
3	Lights ON	4	When _Trial_Timer ≥ 10	Turn on All Lights
4	Stimulus OFF	5	When _Trial_Timer ≥ 15	Turn off Stimulus Light #1 Turn off Stimulus Light #2
5	Reset	1	When Response Lever #1 = Transitioning On	Reset Trial Timer
6	End of Schedule	-		

**Note:** Multiple Output Device Aliases are not allowed in Conditions. In the example below, two stimulus lamps are turned ON or OFF by the Alias **RightLamps**; however, if there is a need to test the state of the two lights this would have to be done using the logical operator AND as part of the condition properties as shown below. The Condition Argument, “When RightLamps = Activated is not allowed.



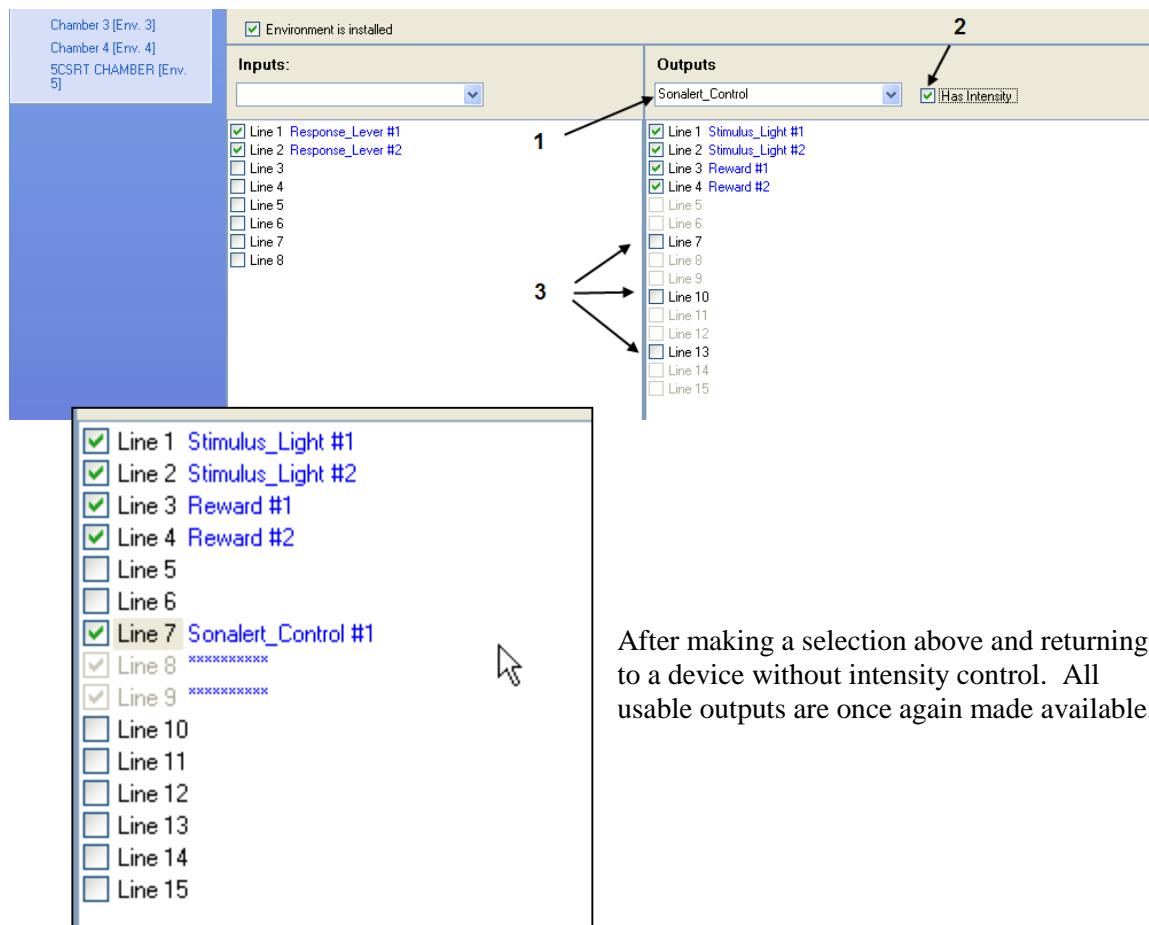
## Additional Tools, Features and Concepts of ABET II

### Using the Intensity Control Option

The ABET II **Intensity Control** option enables you to change the state of three output lines with a single **Action** argument. A number of devices use three output control lines to provide intensity, frequency, mode, or other settings based on a 3 bit binary code. An output Alias Group can be built for custom applications; however, standard Lafayette Instrument Co. devices are handled more easily with this option. This feature also facilitates pulsing or flashing between two levels in a single action.

To use this feature, a device must first be added to the Environment configured with the **Has Intensity** option. Return to [[Adding Chamber Components in the Environment Designer](#)] if needed for additional information on the configuration of environments.

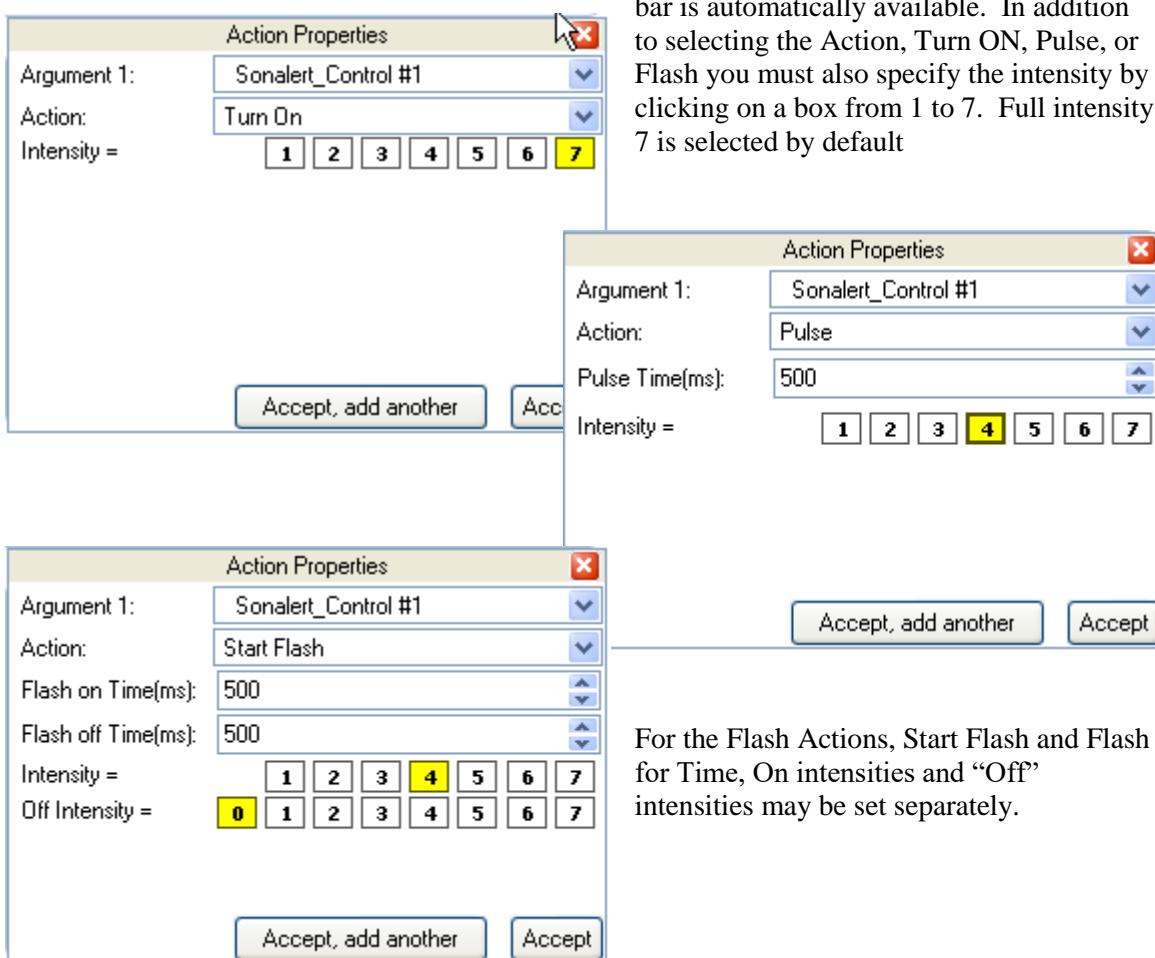
1. Enter a name for the chamber device with 3 bit control. **Sonalert\_Control** was used for this example.
2. Check the “Has Intensity” check box.
3. Note, devices like the Sonalert control are provided with a modular connector that parallels the terminal connections on an ABET II Interface I/O block. These connections are grouped on outputs 1-3, 4-6, 7-9, 10-12, 13-15 etc. As soon as the **Has Intensity** option is checked, those outputs not suitable for this option are made inactive. Check just the first output in the group to assign the device to a group of three outputs.



## Additional Tools, Features and Concepts of ABET II

### Using the Intensity Feature in an Action Statement

When a device installed with an intensity control is selected as an Action Property, an intensity bar is automatically available. In addition to selecting the Action, Turn ON, Pulse, or Flash you must also specify the intensity by clicking on a box from 1 to 7. Full intensity 7 is selected by default



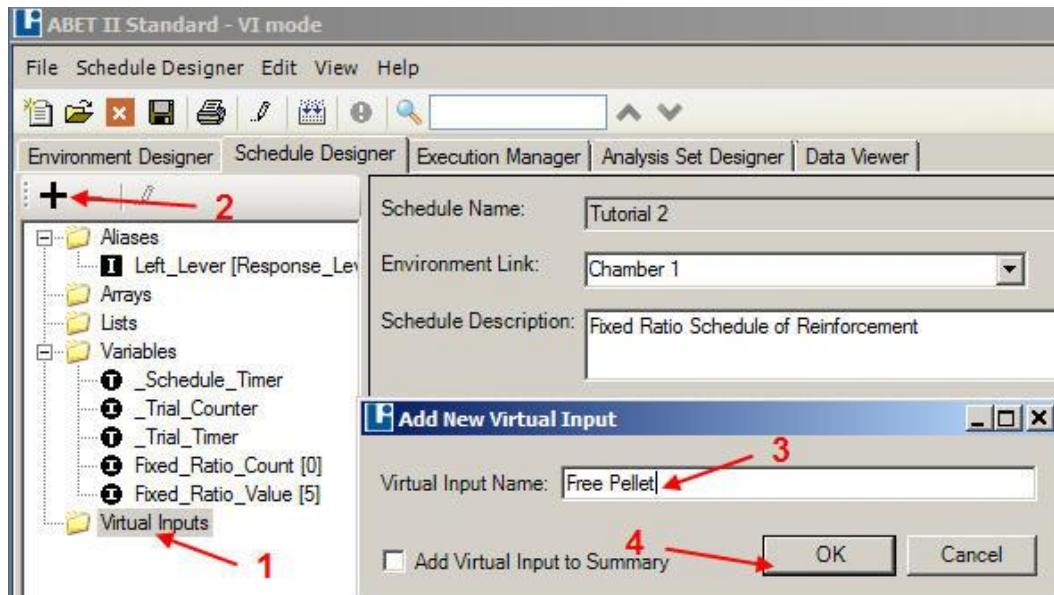
### Using Virtual Inputs

In the past if the user wanted to send an input signal to an actively running schedule, it was necessary to wire a physical switch or push button to an available input that could be integrated into the schedule and pressed as needed. A virtual input works the same way without using a hardware input. It is a software button on the GUI (Graphical User Interface) that is defined by the user and displayed on the Execution Monitor that can be incorporated into any schedule argument. This could be used to shift schedules, increment or decrement variable values on the fly, prime reward devices, provide free rewards, shape animal responses etc. The following example takes the FR5 schedule from Tutorial #2 and adds the virtual input to dispense free pellets.

#### Defining the Virtual Input

Open Tutorial 2 in the Schedule Designer and proceed with the following steps.

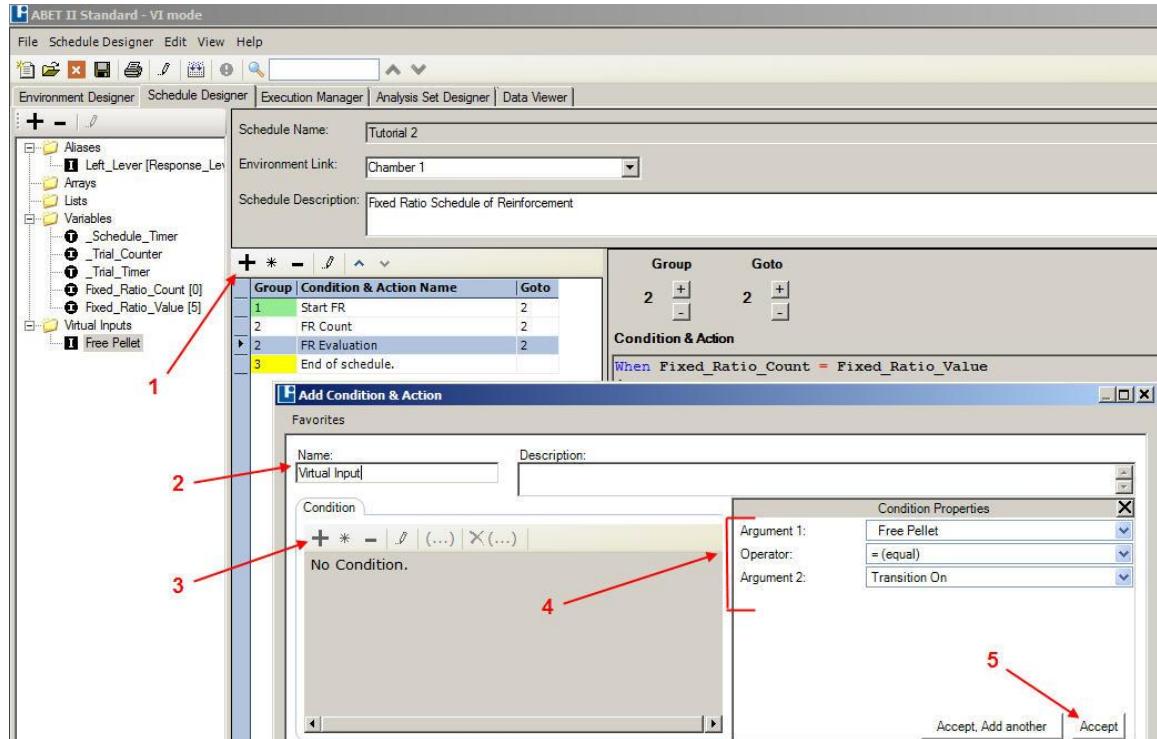
1. Select/Highlight **Virtual Inputs** in the Schedule Designer workspace shown below
2. Click the “+” or **ADD** tool to open the Add New Virtual Input form.
3. Enter a suitable **Name** for the Virtual Input.
4. Click **OK** to complete the task. The new input will now appear in the Virtual Inputs Folder.



# Additional Tools, Features and Concepts of ABET II

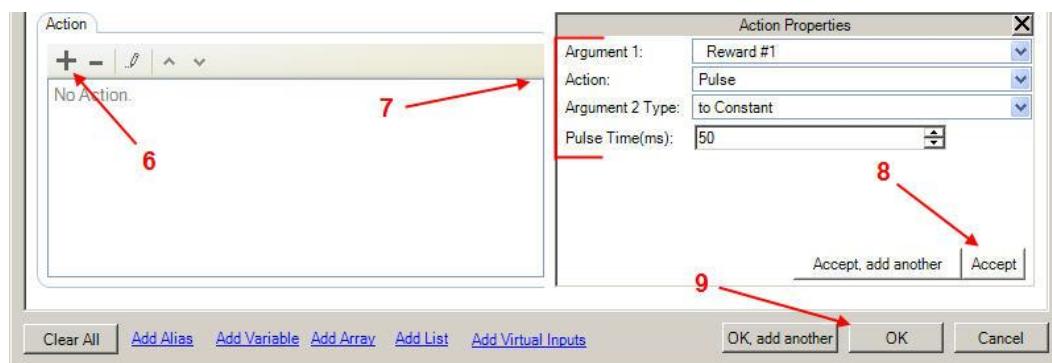
## Adding the Virtual Input to a New Condition.

1. Click the “+” or **ADD** tool in the Condition & Action workspace to open the Add Condition & Action form.
2. Enter a suitable Name for the new condition.
3. Click the “+” or **ADD** tool on the Condition tab to open the Condition Properties form
4. Complete the Condition Properties as shown with the Virtual Input in Argument 1 and Transition On in Argument 2.
5. Click Accept.



## Adding an Action to the Virtual Input Condition

6. Click the “+” or **ADD** tool on the Action tab to open the Action Properties form
7. Complete the Action Properties as shown with the Reward #1 in Argument 1, Action Pulse, to Constant in Argument 2 and 50 ms for a Pulse Time..
8. Click Accept.
9. Click OK



## Additional Tools, Features and Concepts of ABET II

The completed schedule was saved as **Tutorial 2 with Virtual Input** and is shown below.

The screenshot shows the ABET II Schedule Designer interface. At the top, there are fields for 'Schedule Name' (set to 'Tutorial 2 with Virtual Input'), 'Environment Link' (set to 'Chamber 1'), and 'Schedule Description' (set to 'Fixed Ratio Schedule of Reinforcement'). Below these are two main sections: 'Condition & Action Table' and 'Condition & Action Script'. The table lists actions grouped by condition: 'Start FR' (Group 1), 'FR Count' (Group 2), 'FR Evaluation' (Group 2), 'Virtual Input' (Group 2), and 'End of schedule.' (Group 3). The script section contains the following code:

```
When Free Pellet is Transitioning On
{
    Pulse Reward #1 for 50 ms.
}
End
```

### Running a Schedule with a Virtual Input

Click the Execution Manager and load an appropriate chamber with the schedule containing a virtual input. Click Run and the virtual input button will appear at the top of the Monitor tab as shown below. Click this button with your mouse and the Virtual Input condition that was added to the schedule will be executed.

The screenshot shows the ABET II Execution Manager interface. The 'Execution Manager' tab is selected. In the center, there is a table for environments. The first environment, 'Chamber 1 [Env. 1]', is listed with 'Status' 'Running' and 'Schedule name' 'Tutorial 2 with Virtual 1'. A red arrow points to the 'Free Pellet' button in the 'Session' tab of the right-hand panel. The right panel also displays variable mappings and device settings.

Environments	Status	Schedule name
All Environments		
Chamber 1 [Env. 1]	Running	Tutorial 2 with Virtual 1
Chamber 2 [Env. 2]	No schedule...	
Chamber 3 [Env. 3]	No schedule...	
Chamber 4 [Env. 4]	No schedule...	

Variables	Alias	Input Device	Output Device
Current Group	2	Left_Lever Alias Response_Lever #1	Response_Lever #1 Line: 1 Stimulus_Light #1 Line: 1
Previous Group	1	Input Device OFF	Output Device ON
		Count: 10	

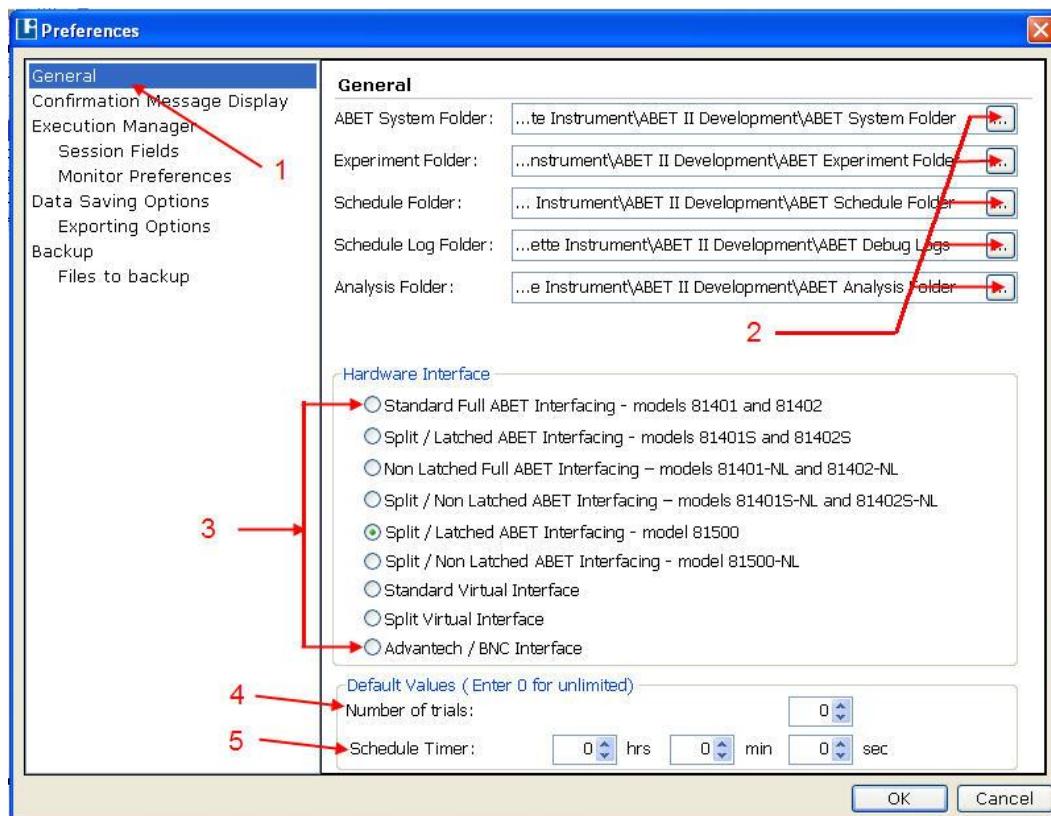
## Additional Tools, Features and Concepts of ABET II

### Setting Preferences

Select Preferences from the Edit menu at the top of any ABET II display to open the preferences screen shown below. The default settings will be adequate for many applications, but may be changed to accommodate specific requirements of your lab or experiment designs. If you have already worked through the tutorials, then some preferences have already been changed. All preferences will be covered in this section. Because some preferences are disabled when schedules are running, it is recommended that preferences be set when there are no schedules open, loaded, or running. In this section, all preferences will be covered in the order presented on the following screen capture.

### Preferences – General

1. Click the **Edit** menu item and select **Preferences**. By default the preferences window will open with a display of the General information. If another view is present click **General** to reveal the window as shown.



2. By default all ABET folders are created under “My Documents” in subfolder Lafayette Instrument\ABET II\ as defined below. Use the Browse button to locate an existing folder or to create a new folder. Multiple folders may be used to better organize experiments, schedules, analysis sets etc. or when needed for multiple users. The default folders and some default files are listed on the next page for your reference

## Additional Tools, Features and Concepts of ABET II

\ABET System Folder\  
Environments.abetEnv  
ABETII.ABETdb (the “Default” Database)  
CumulativeRecorderSettings.xml  
User defined Databases (*filename*.ABETdb)

\ABET Experiment Folder\  
Empty by default. Contains user defined Experiments (*filename*.abetExp)

\ABET Schedule Folder\  
Empty by default. Contains user defined Schedules (*filename*.abetSch)

\ABET Debug Logs\  
Empty by default. Contains user debug logs (*filename*.txt)

\ABET Analysis Folder\  
Empty by default. Contains user defined Analysis Sets (*filename*.ABETas),  
Analysis Items (*filename*.ABETai) and Analysis Points (*filename*.ABETap)

3. **Hardware Interface.** Check the Virtual Interface desired or the Hardware selection that corresponds to the hardware that is connected to your computer. The Split Virtual Interface has been used for the tutorial sections of this manual. If you are unsure of the model you have, **check the serial tag** on the interface as it may be different than the number screened on the metal case.

Newer Releases may have a simplified Hardware Selection Section that appears as follows:



Using this format is covered on the next page.

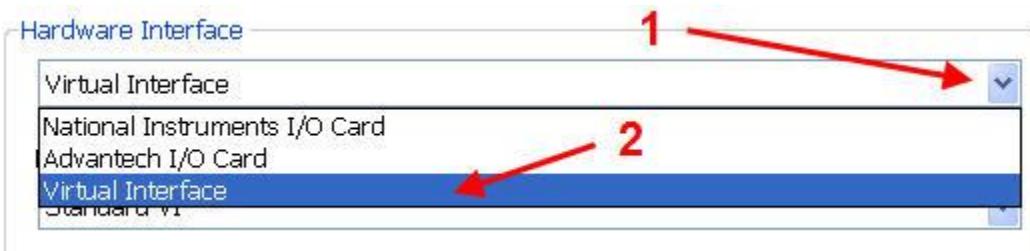
4. **Default Values - Trials.** Use this section to change the default for the Number of Trials to run. This is set to zero by default and may be changed from the Execution Manager. However if a consistent number of trials are being run day after day, changing the value here is a time saver.
5. **Default Values – Schedule Timer.** Use this section to change the default for the Schedule Session Time to run. This is set to zero by default and may be changed from the Execution Manager. Again, setting it here is a time saver is the same session time is used day after day.

## Additional Tools, Features and Concepts of ABET II

### Setting Hardware Interface Preferences with pull down menus.

This option is not available on older releases of ABET II. See Section #3 above

1. Click the first Pull Down Menu to reveal the available options.
2. Click **Virtual Interface** if hardware is not connected to the computer running ABET II.



**Note:** Click National Instruments I/O Card if you have an ABET 2G Interface connected to your computer and you will be testing your tutorials with a modular test chamber or similar environment. Click Advantech I/O Card if you have a Bussey-Saksida Touch Chamber package or other environment running on the Campden Instruments Interface package Model 81426A or similar.

3. Click the second Pull Down Menu depending on the selection above. The first illustration is for a Standard Virtual Interface. The alternative selection is for the Split Virtual Interface. The Split Interface was used for the tutorials.



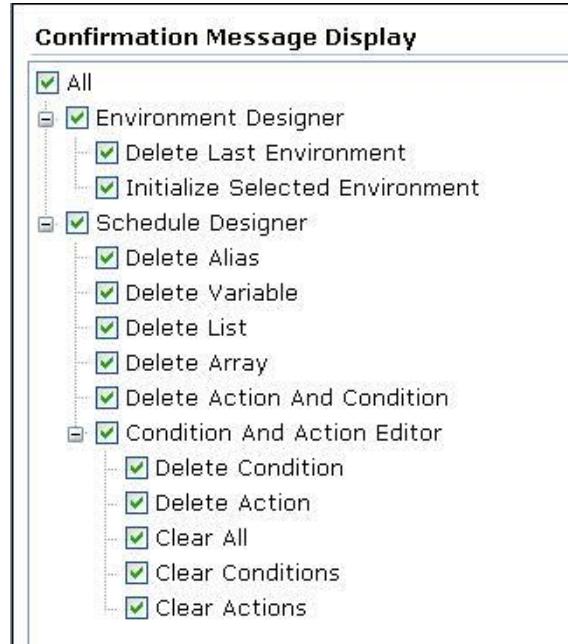
4. Click the radio button below that corresponds to your hardware if connected. A Latched Virtual Interface should be adequate for running the tutorial lessons.



# Additional Tools, Features and Concepts of ABET II

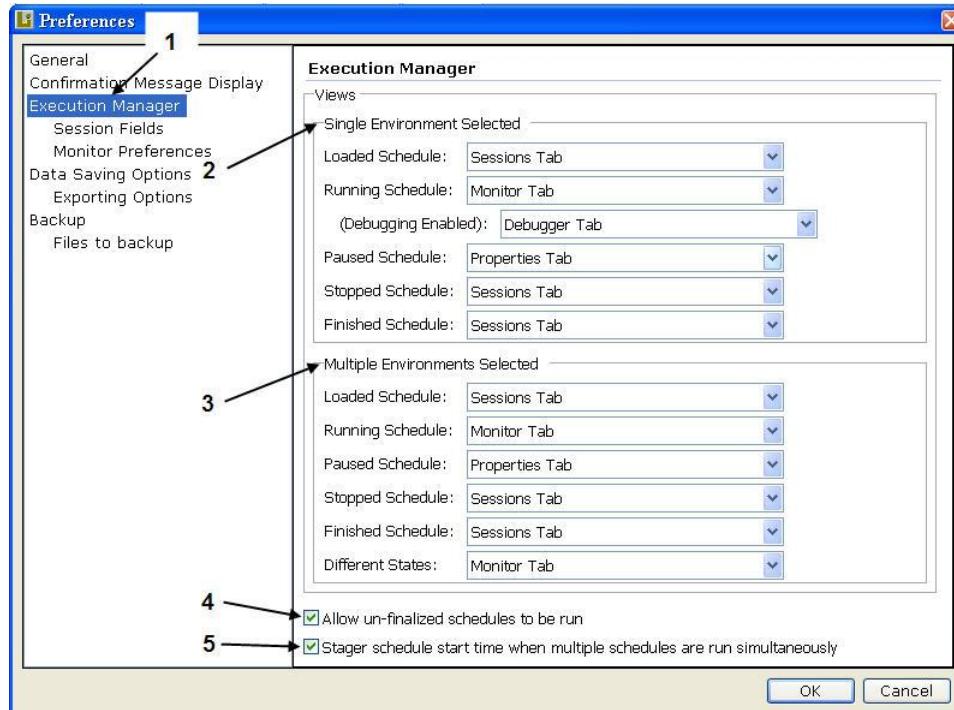
## Confirmation Message Display

Confirmation messages are the messages that pop up when you are about to perform a certain task that deserves a cautionary reminder. These are useful when new to a software application, but can become a nuisance as you become more experienced. Click “Confirmation Message Display” under the Preferences List to display the list of individual messages that are built into the ABET II application. By default all are enabled. Check boxes are provided to disable all, disable all within a given category or disable individual messages.



## Preferences - Execution Manager

1. Click Execution Manager to reveal the display as shown. This window may be used to control the appearance of the screen when the execution manager tab is active and schedules are first loaded, as well as when schedules are running, paused, stopped, finished etc.



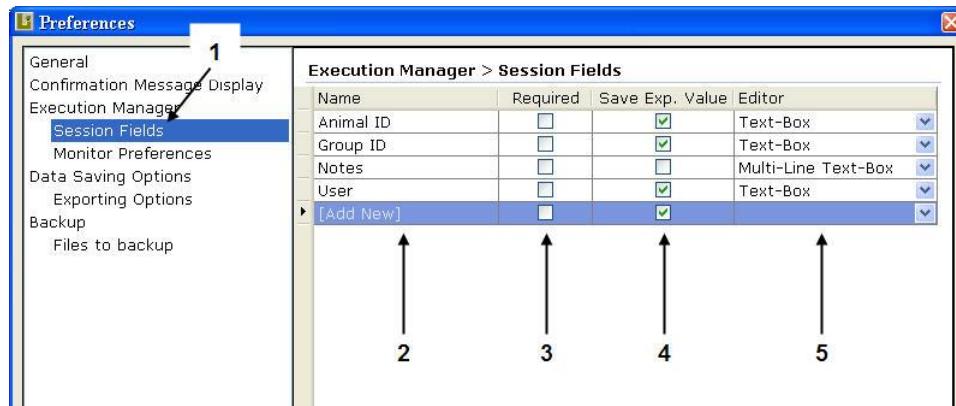
## Additional Tools, Features and Concepts of ABET II

2. Select the view to display when a single environment is selected. The default tabs are recommended until you complete the tutorials. With the defaults as shown, the Sessions Tab will be active when a schedule is loaded, stopped or finished; the Monitor Tab is active when a schedule is running unless the debugger is enabled, and the Properties Tab is active when a schedule is paused. Each of these can be replaced with a different tab, or you can also select, “Current Tab (do not change view)” in which case ABET will no longer automatically switch tabs but instead it will simply leave the screen display wherever it is at.
3. A separate section is provided for setting the display tabs when multiple environments are selected. It is the same as above except 1) the debugger is only available when running a single environment and 2) a selection is provided for when multiple environments are in “different states”.
4. A check box is provided to allow or disallow running un-finalized schedules. Removing the check in this box makes the ABET II system secure from running schedules in progress or early versions of a schedule. Remember that only finalized schedules store a description of the Environment and a copy of the schedule in the database selected when the schedule is run.
5. A check box is provided to control schedule start times when multiple schedules are “simultaneously” started. Unless there is a critical reason for change, we recommend leaving this box checked. Retaining the staggered start prevents possible overload to the power supply if a large number of outputs are turned ON together. It also allows the computer to more efficiently maintain millisecond time stamping of all actions.
6. A check to control appearance of the option to allow for the “Debugger” to run. The default is checked (feature is ON). (Check box not pictured in the above image)
7. A check box is provided to allow for automatic Analysis. The option if checked will give two additional fields in the Session tab for the Execution Manager. One field is “Analysis File”, this would be the Analysis Set file needed for the schedule being run. The second field is the “Output Folder” where analyzed results will be placed. The default is un checked (feature is OFF). (Check box not pictured in the above image)

## Additional Tools, Features and Concepts of ABET II

### Preferences - Execution Manager - Session Fields

1. Click **Session Fields** under Execution Manager to reveal the display as shown. This window may be used to control the number of session fields to be displayed in the execution manager and saved with the data file as well as some characteristics of these fields.



2. **Name:** Four commonly used fields are provided however these labels may be edited as needed by simply clicking in the cell to be changed until it is highlighted. Similarly, click in the [Add New] cell to create a new field label. All fields will be automatically placed in alphabetical order. The field "Dose (ml/kg)" was added below.

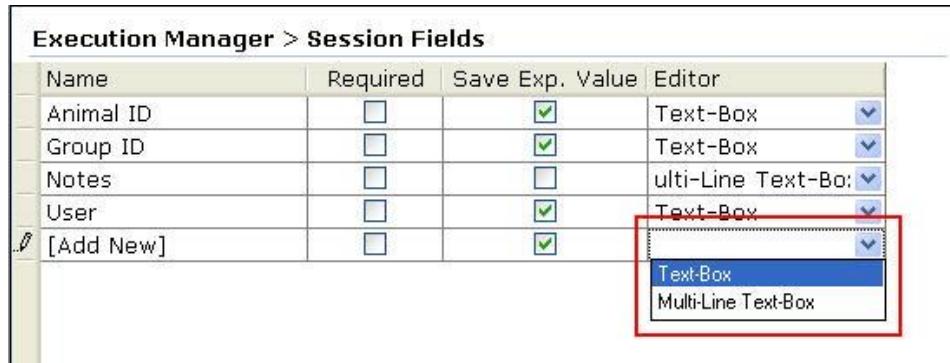
The screenshot shows the 'Execution Manager > Session Fields' table with the following data:

Name	Required	Save Exp. Value	Editor
Animal ID	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Text-Box
Dose (ml/kg)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Text-Box
Group ID	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Text-Box
Notes	<input type="checkbox"/>	<input type="checkbox"/>	Multi-Line Text-Box
User	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Text-Box
[Add New]	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

3. **Required Check Box:** Every Session Field for which this check box is checked must have an entry before the loaded schedule can be run. Unfortunately, we have no way to detect a valid vs. an invalid entry, but this does at least insure that a lab technician completes all critical entries.
4. **Save Experiment Value:** This check box expedites loading and running animals on the same schedule for multiple days. When the box is checked, the entry for those items that may be redundant such as Animal ID, Group ID and others is saved in the experiment file so that they do not have to be entered each time. Not checking this box will retain information on a "reload" of a schedule, but will not be saved in the experiment file.

## Additional Tools, Features and Concepts of ABET II

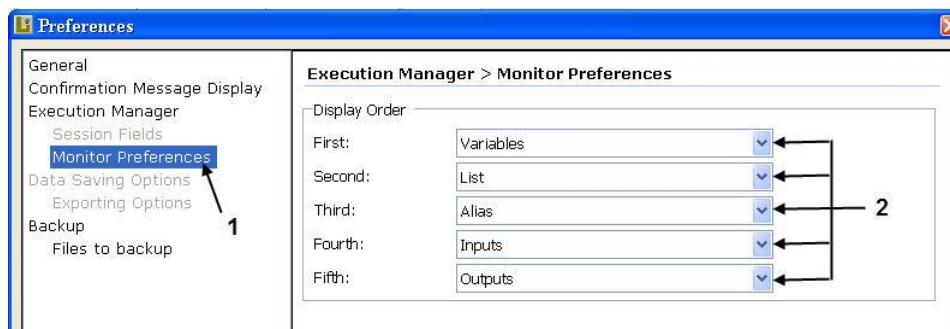
5. **Editor:** Use the pull down list as shown to select Text-Box or Multi-Line Text-Box for each Session Field. Both are limited to about 250 characters including the field label. Both will paste to a single line in Excel or Notepad and single line with wrapping in Word if copied from the Data Viewer Display. The Multi-line option is easier for inputting long lines of text and is easier to read from the Session Information Display when multi-lines are possible such as “Notes”.



### Preferences - Execution Manager - Monitor Preferences

Use this feature to determine the presence or absence of display item categories and the order of placement. The specific items to be displayed in each category are determined by the **Summary Items** list. Items may be added to the list as they are defined in Schedule Manager. The entire list can also be edited in the Schedule Designer by clicking on the Edit/Pencil tool on the top most tool bar. Changes made from the Schedule Manager are saved with the schedule. Changes can also be made on the Properties tab of the Execution Manager for each loaded schedule. These changes are retained during a **reload** but will be lost as soon as the schedule is removed. ” (See Refining the Monitor Display on the next page for additional details).

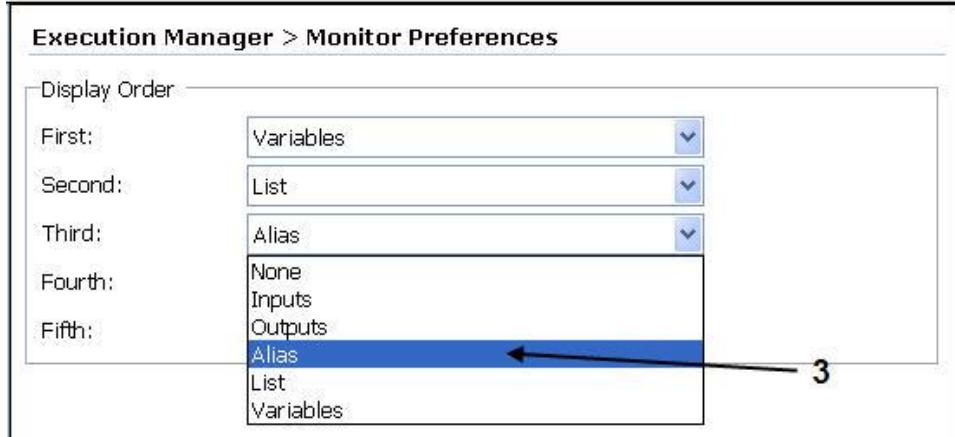
1. To access this feature click Monitor Preferences on the Preferences display.



2. Select the pull down arrow for the position to change.

## Additional Tools, Features and Concepts of ABET II

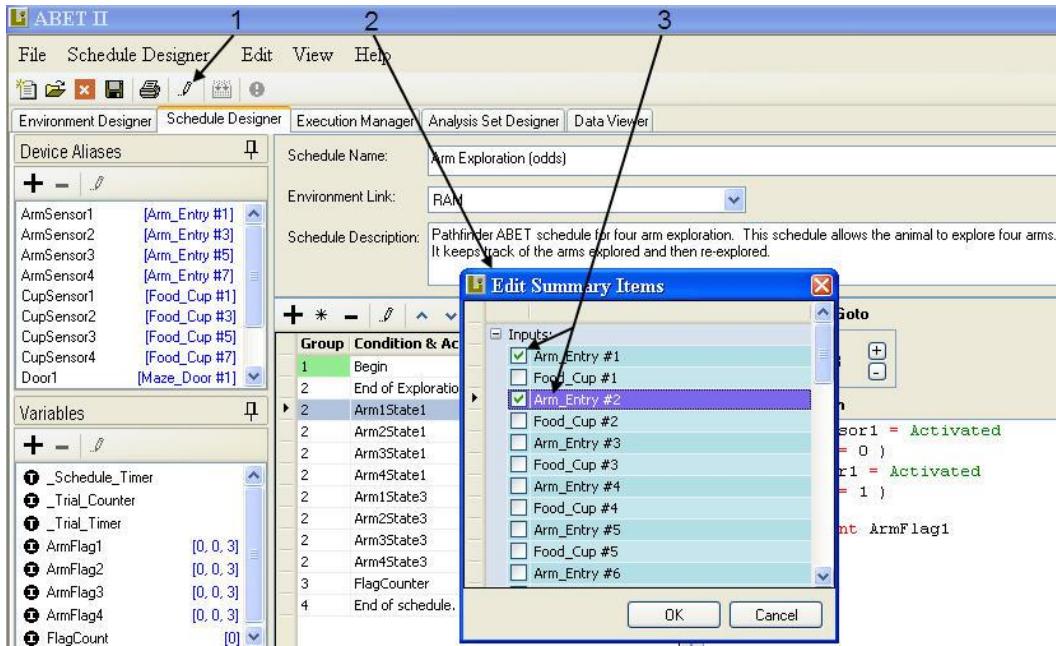
- Click the category to place in the selected position.



### Refining the Monitor Display in the Schedule Designer

Click the Schedule Designer Tab and load the schedule to be modified.

- Click on the pencil icon in the tool bar to reveal the “Edit Summary Items” form [2].
- Items will be listed by category. Those selected when the schedule was originally created will be indicated by a green check mark.
- Select those items that you want to add or remove from the display list and click in the box associated with that item to add or erase the green check.



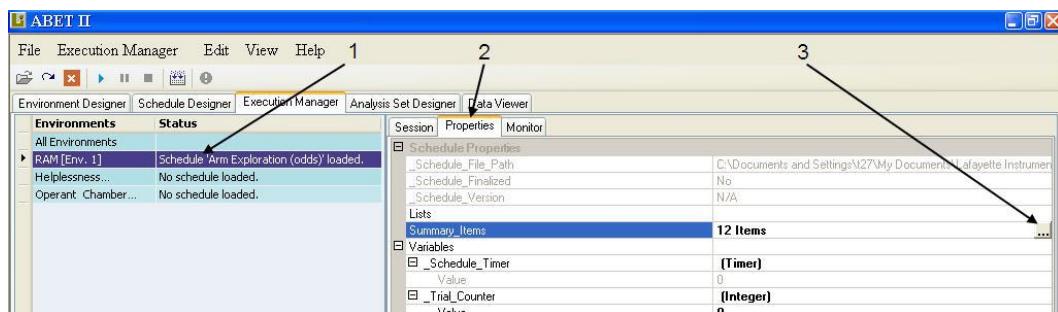
## Additional Tools, Features and Concepts of ABET II

### Refining the Monitor Display in the Execution Manager

Click the Execution Manager Tab and load the schedule or schedules to run.

1. Select a single schedule from the list on the left. Clicking anywhere in the row will highlight the entire row.
2. Click on the properties tab on the right.
3. Find the **Summary\_Items** row and click on the choice '...' button on the right. This will open the same **Edit Summary Items** window shown above. As above, select those items that you want to add or remove from the display list and click in the box associated with that item to add or erase the green check.

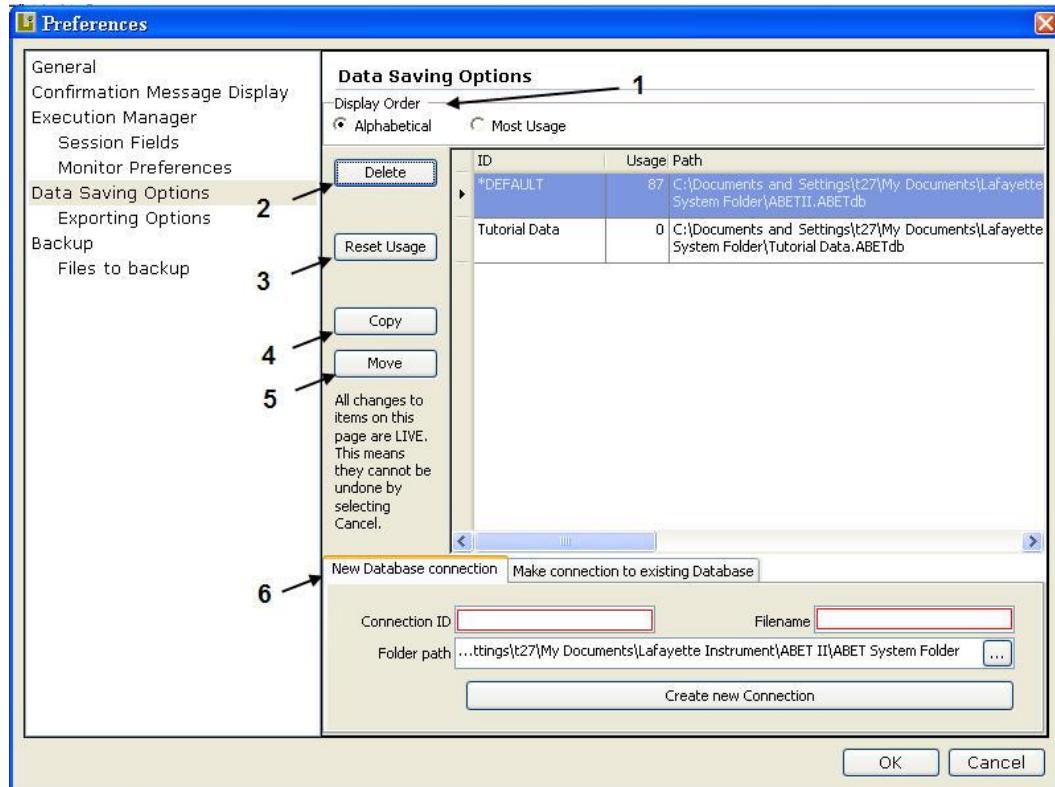
**Note:** If the choice button “...” (#3) is not present, simply click in the row to activate the display. Remember that changes made in the Execution Manager will be retained for as long as you reload the schedule, but will be lost once the schedule is closed. To retain changes they should be made from the Preferences menu.



## Additional Tools, Features and Concepts of ABET II

### Data Saving Options

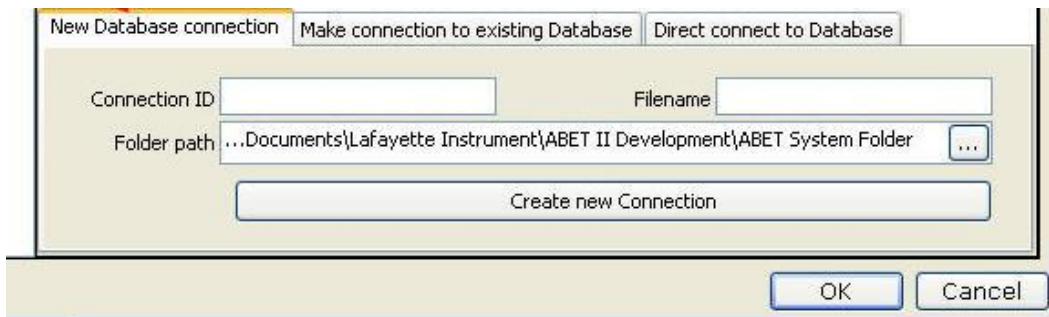
All ABET II data is saved in a Microsoft Access Database. This Preferences selection provides the means to create and control several aspects of all databases used by your ABET II Control Software. A brief description of the preference tools is provided below. Additional information on the creating and managing databases is provided in the [[Database Management](#)] section that follows.



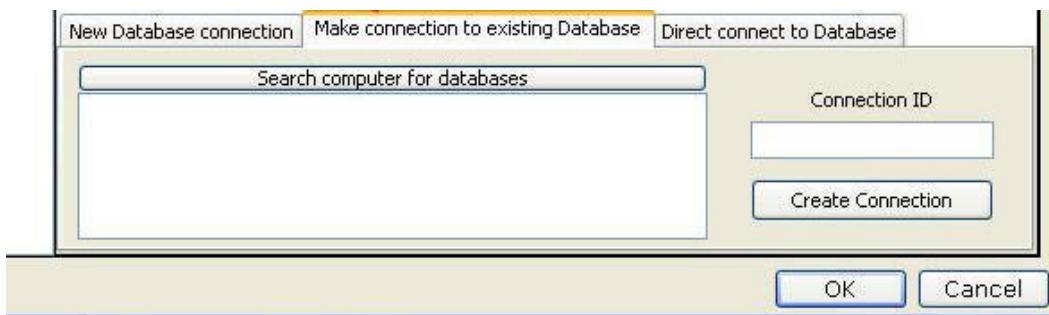
- Display Order:** When multiple databases are available they may be displayed based on the number of sessions saved (Usage) or alphabetically.
- Delete:** Highlight the table row to be deleted and click on this button. You will have the option to delete the connection ID only or both the connection link and the data file itself. Several confirmation messages will be provided (unless disabled) to prevent accidentally deleting a file.
- Reset Usage:** Highlight the table row to be reset. Clicking this button will reset the Usage number to zero (0) and will change the display order if the Most Usage display order option is selected.
- Copy:** Highlight the file to be copied. Clicking this button will open a “Save as” window providing the opportunity to save a copy of the existing database. Retain the same name in a new archival folder that you create or save a copy under a new name in the same or a different folder.

## Additional Tools, Features and Concepts of ABET II

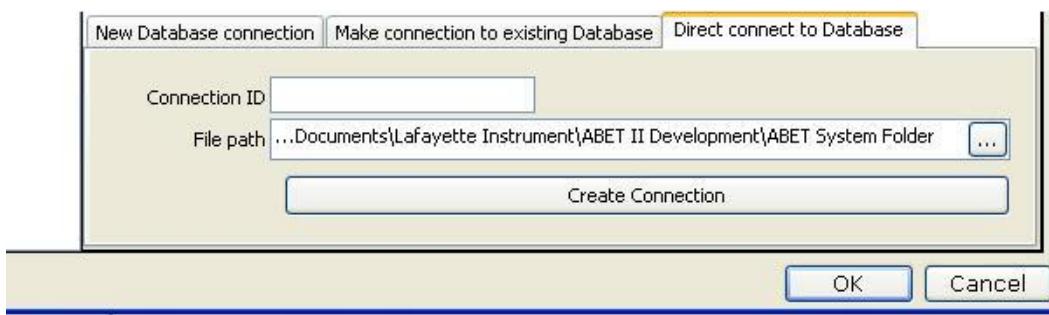
5. **Move:** Highlight the file to be moved. Clicking this button will open a “Browse For Folder” window with the option to make a new folder that the file will be moved to.
6. **New Database connection:** Use this tab to create a new database. The Connection ID that is displayed on this form and in the Execution Manager may be the same or different from the actual filename. Once you have entered these labels click **Create new Connection** to complete the process. These steps will be detailed in the Database Management Section to follow.



7. **Make connection to existing Database:** Click this tab to reveal the image shown below. To make a connection to an existing database, click “Search computer for databases”. The system folder will be searched first followed by the entire disk media on your computer. You may cancel the task at any time and the files found up to that point will be retained. Highlight the file that you wish to make available, add a Connection ID label and click “Create Connection” to complete this action.



8. **Direct connect to a Database:** Click this tab to reveal the image shown below. This is very similar to the above except it now provides a Windows Browse button to go directly to the path and file where the data base is located. You must use this method when connecting to a database located on a network.



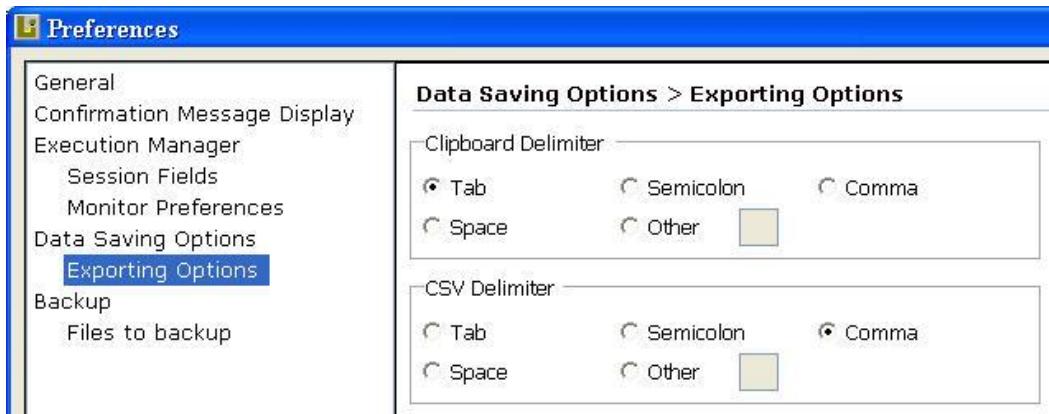
## Additional Tools, Features and Concepts of ABET II

### Exporting Options

Exporting Options is a subcategory of the Data Saving Options on the Preferences Menu although it has nothing to do with the database. Each tab of the Data Viewer produces a spreadsheet like display of data that features the ability to copy or export selected rows or all rows of data with a **Right Click**.

This option controls how data is delimited when using this feature.

Highlight **Exporting Options**.



#### Clipboard Delimiter

The default setting for the copy functions is **Tab**. This is preferred for data to be pasted to an Excel spreadsheet. Change as needed to copy and paste to other applications.

#### CSV Delimiter

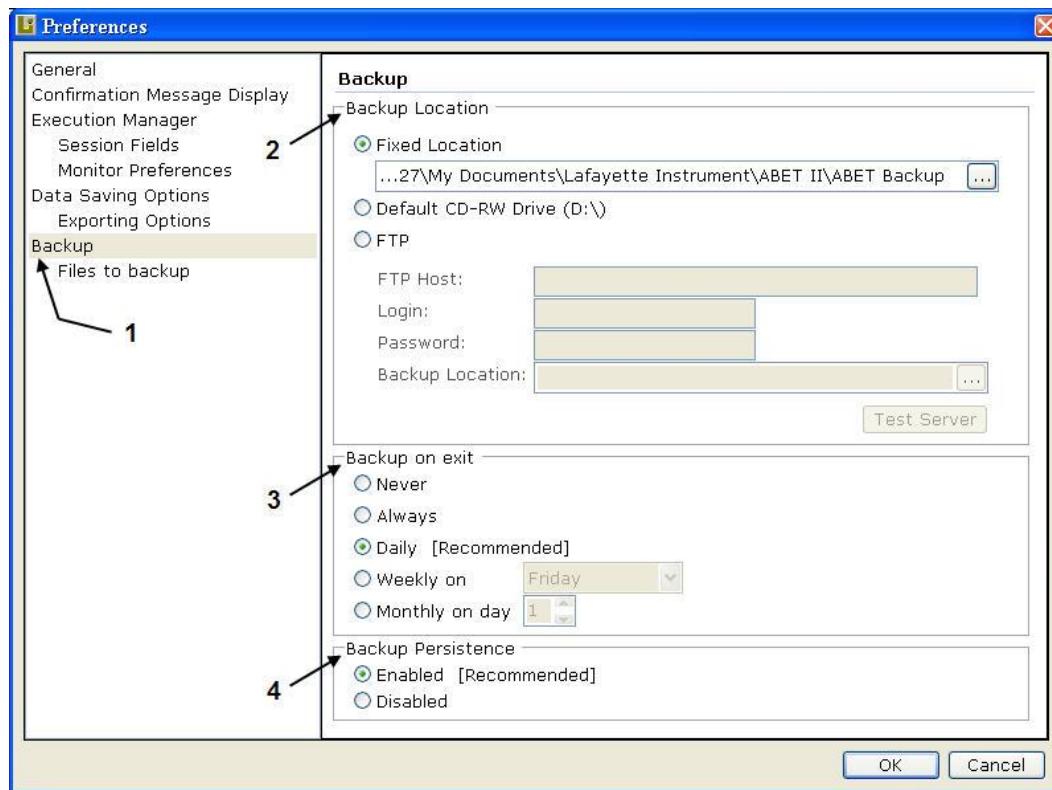
The default setting for the export functions is **Comma**. Again, change this setting as needed to copy and paste to other applications.

## Additional Tools, Features and Concepts of ABET II

### Backup

The ABET II software system may be backed up at any time as described next under the heading [[Backup/Restore](#)]. The Preferences settings control how backups are handled as well as the specific information to back up and/or restore.

1. Click **Backup** on the Preference menu to reveal the Backup information shown below.

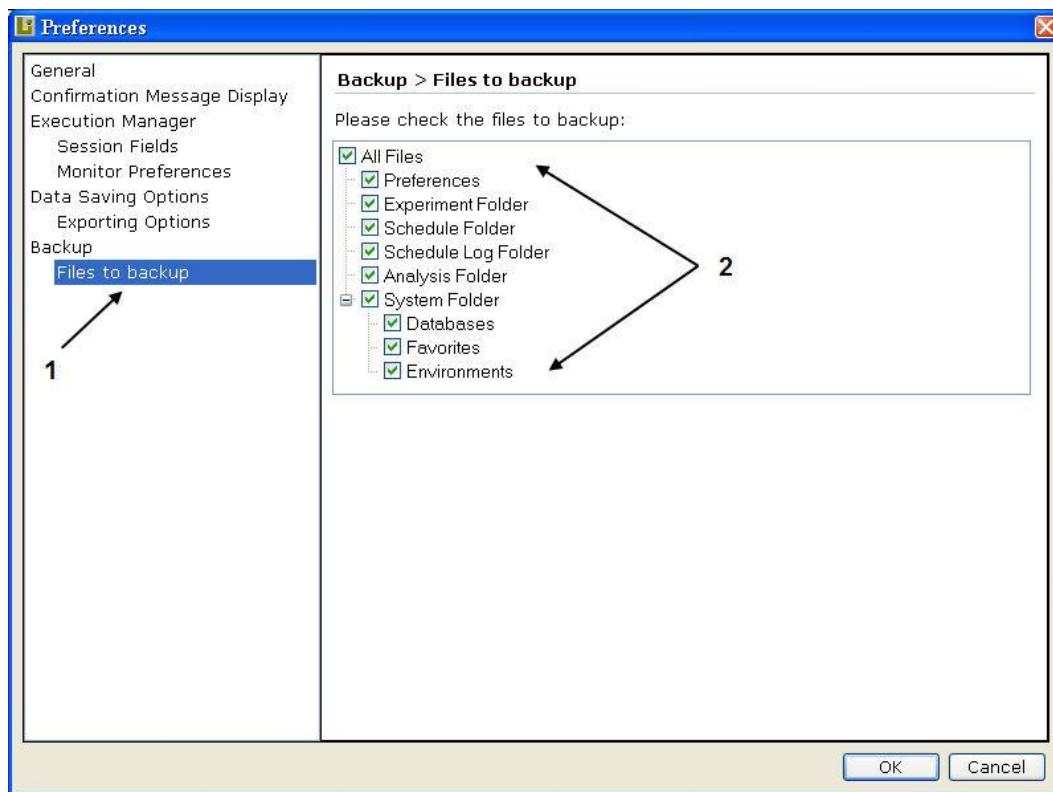


2. **Backup Location.** The default setting for this preference is a folder named “ABET Backup” in a fixed location in the same default path used for the general ABET folders displayed in the “General” window. This is determined at the time of installation. By default the path will be ....My Documents\Lafayette Instrument\ABET II\ABET Backup. Other options include a CD-RW Drive and an FTP site.
3. **Backup on exit.** Daily backups are recommended however you may elect to never back up on exit. In that case, ABET II files will only be backed up when you manually select “Backup Now” from the file menu. Other backup intervals include Always, Daily, Weekly and Monthly.
4. **Backup Persistence.** Enabled is recommended. This will assure that a new file is created for each backup and will let you go back to any previous backup needed. By disabling this option, each backup will overwrite the previous file.

## Additional Tools, Features and Concepts of ABET II

### Files to Backup

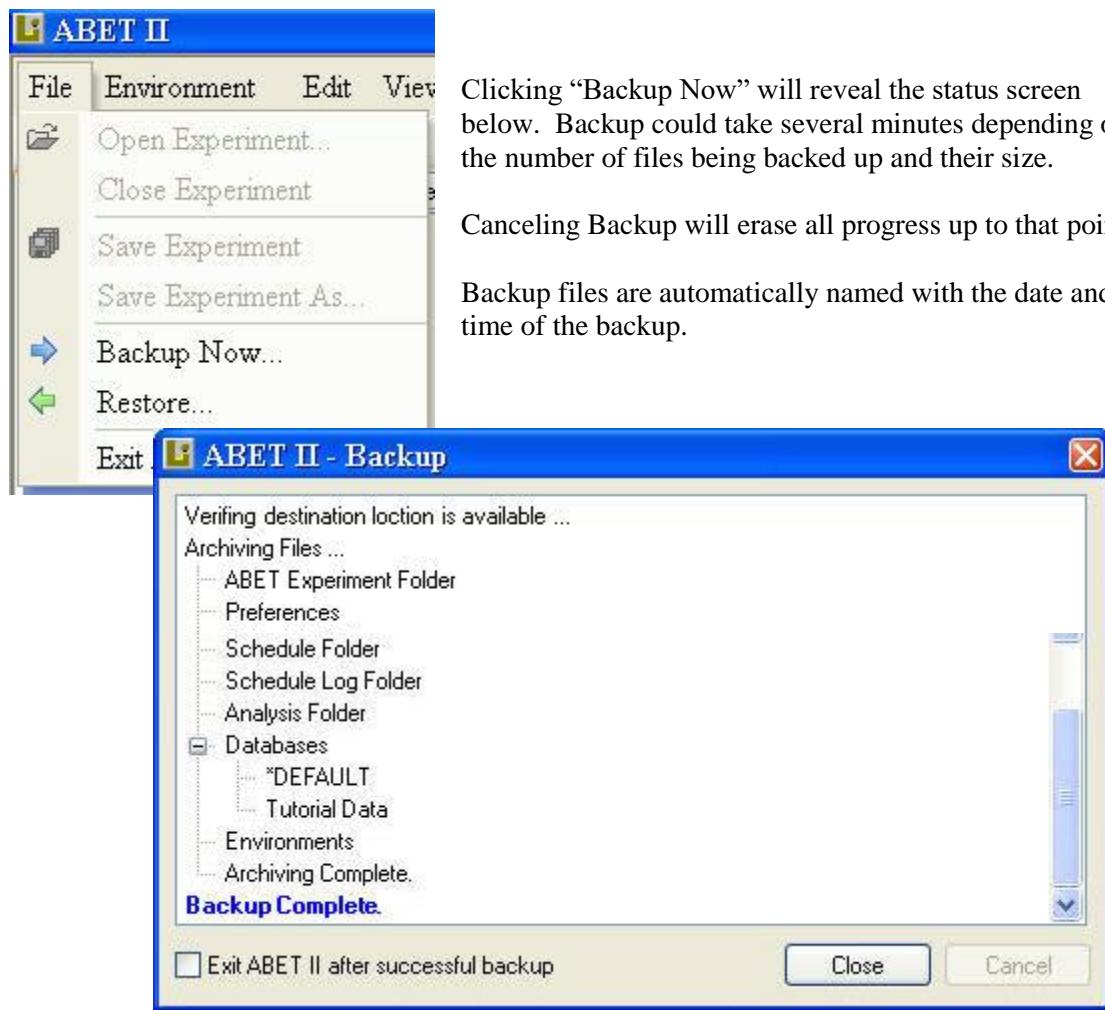
1. Files to backup is the last selection on the Preferences menu. Highlight this item to reveal a list of file folders and files to backup. Only the checked files are backed up whether the backup is user initiated or automatically initiated. Backing up all files is selected by default and is normally recommended. Remember you can selectively restore files from this list as needed.
2. Use the check boxes provided to change the files to backup if needed. One example of when this may be helpful is when the backup file is too large to e-mail. Remove a large database for example and perform one backup. Then select the database only and perform a second backup. Attach the two backups to two separate e-mails. Data for a single test session can also be placed in a separate file. Click the Raw Data tab in the data viewer after the session has been selected and copy or export that data to a separate Excel worksheet.



## Additional Tools, Features and Concepts of ABET II

### Backup/Restore - Backup

The ABET II System may be backed up at any time by simply selecting “Backup Now...” from the “File” menu. See [[Preferences – Backup](#)] for settings that govern manual and automatic backups such as files to back up, back up file location and backup persistence. Detail on when to perform an automatic backup is also determined by preferences settings.



Click “Close” when the backup is complete or check the box in the lower lefthand corner to automatically close this display following each successful backup.

**Note:** Backup/Restore has been designed primarily for maintaining critical information and data for the computer running ABET II. If you use this feature for setting up a new/replacement computer, it will be much easier if you use the same installation paths that were used for the first installation on the second computer. For this reason, accepting the defaults provided by the ABET II Install Wizard is recommended.

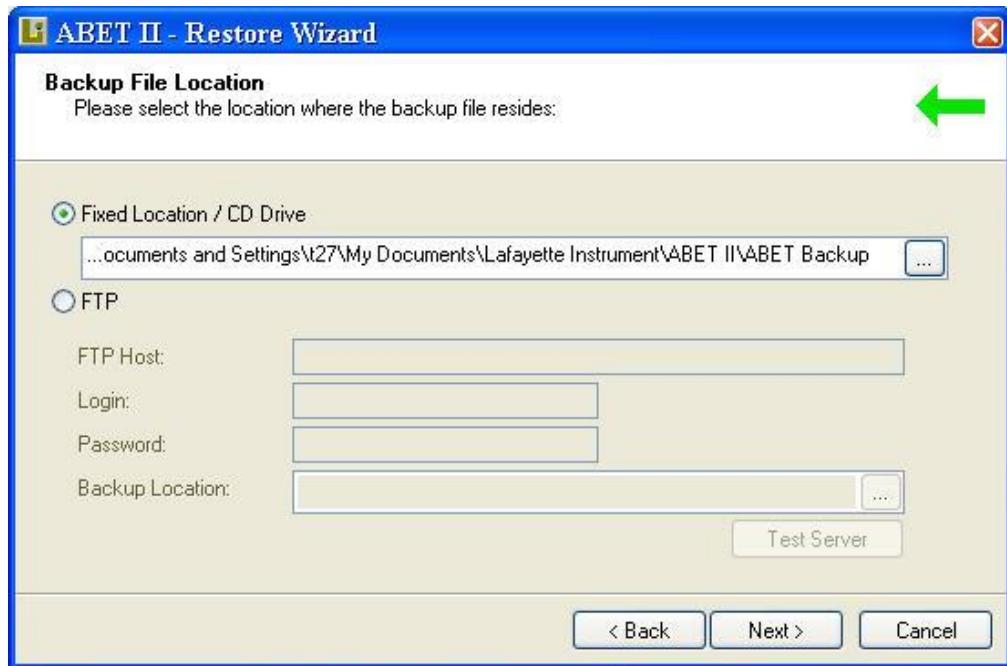
## Additional Tools, Features and Concepts of ABET II

### Backup/Restore - Restore

Click **Restore Now** on the File Menu shown on the previous page to reveal the form below.



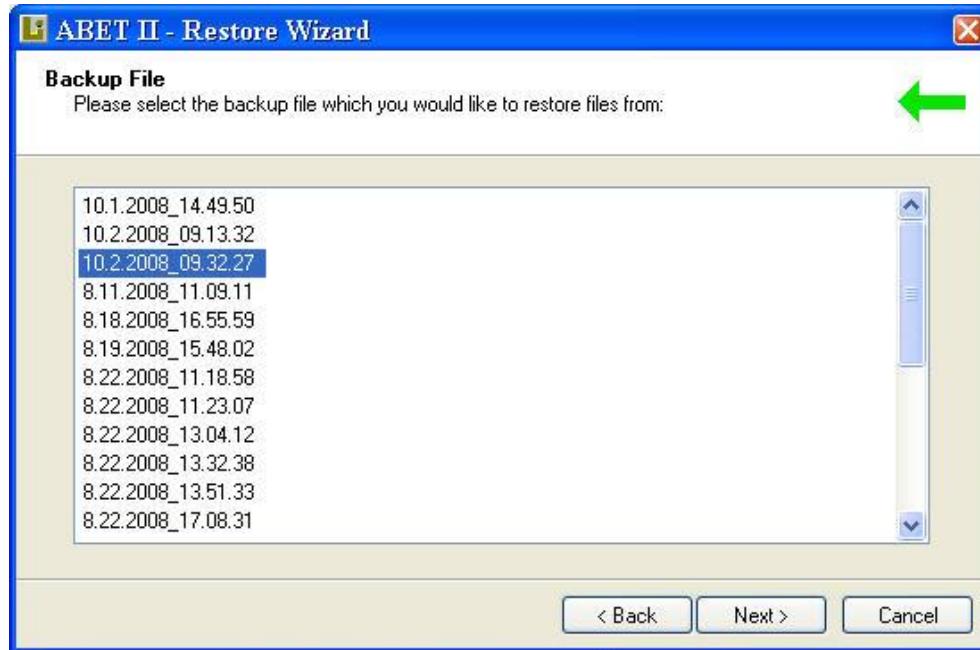
Click **Next** to reveal the Backup File Location form:



By default the file will reside at the fixed location defined in preferences at the time the backup was created. Use the browse button to locate another fixed location or check the FTP button if necessary.

## Additional Tools, Features and Concepts of ABET II

Click **Next** to reveal a list of all backup files at the location specified above. The file names were automatically generated when the file was created. It consists of the date followed by the time in military format (mm.dd.yyyy hh.mm.ss). Highlight (click) the file you need and click **Next**.



A status bar will appear while the backup file is unzipped. When the unzip process is complete the **Select file to restore** form will automatically appear.



By default all files are checked. You can uncheck all files or specific folders and manually select (check) individual files or folders as needed. Click **Next** when your selection is complete. Click **Finish** after the **Restore Results** screen is displayed.

# Additional Tools, Features and Concepts of ABET II

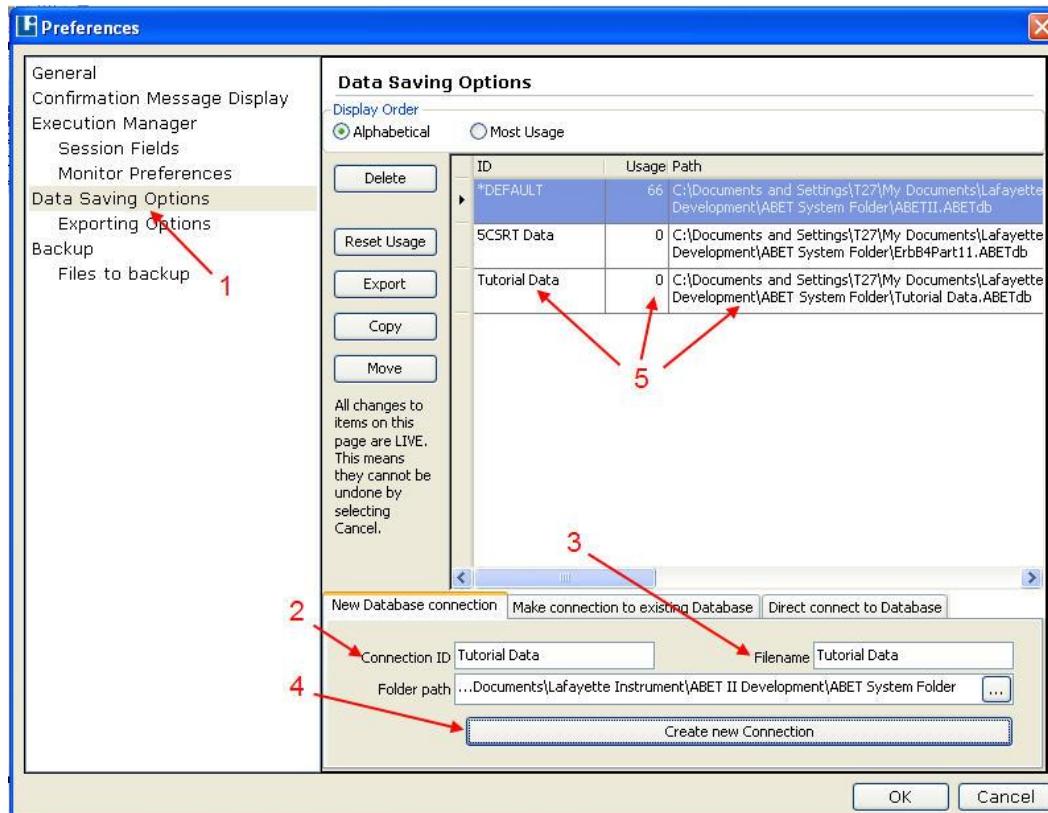
## Database Management

ABET II automatically creates a “Default” Database in the system folder with a file name of ABETII.ABETdb. This file may be deleted or renamed after you have completed the tutorial lessons and a new default file will be automatically created when you open ABET. Connections may have to be reestablished or created using the Data Saving settings and tools provided on the Preferences settings. These were described at [\[Preferences – Data Saving Options\]](#)

### Creating a Database for the Tutorial Schedules

ABET II can be run with the ‘Default’ database that is automatically created the first time ABET II is opened; however it is a good idea to think about how you want to organize your data prior to running experiments. Here you will name and create a separate Database that could be used with all the sample tutorials while learning ABET II or for experimental data collection. A few simple steps are required. Make sure that there are no schedules running or loaded in the Execution Manager. Select **Preferences** from the **Edit** menu to open the form shown below.

1. Highlight **Data Saving Options**.
2. Click in the Connection ID Box and enter a suitable name. This is the name that will appear in the Execution Manager and in the Data Viewer. It will also be saved as part of an Experiment profile. The name “Tutorial Data” has been used for this illustration.
3. Click in the Filename Box and enter a suitable name. The name “Tutorial Data” has been used again in this illustration; however the Connection ID and Filename may be different.
4. Click **Create new Connection**
5. The new ID, Usage and Path will appear on the database list. Click OK to exit the Preferences form or click another option as needed.



## Additional Tools, Features and Concepts of ABET II

### Using and Accessing a Network Database

In the previous example the path can be changed on the local computer or to a location on a network drive. It is also possible for multiple lab computers to share a common database. A network connection is required for each ABET II PC station as well as a shared network drive with read, write and create permissions. The drive should already be mapped for all stations. Below are the basic steps for creating a network database from within ABET II.

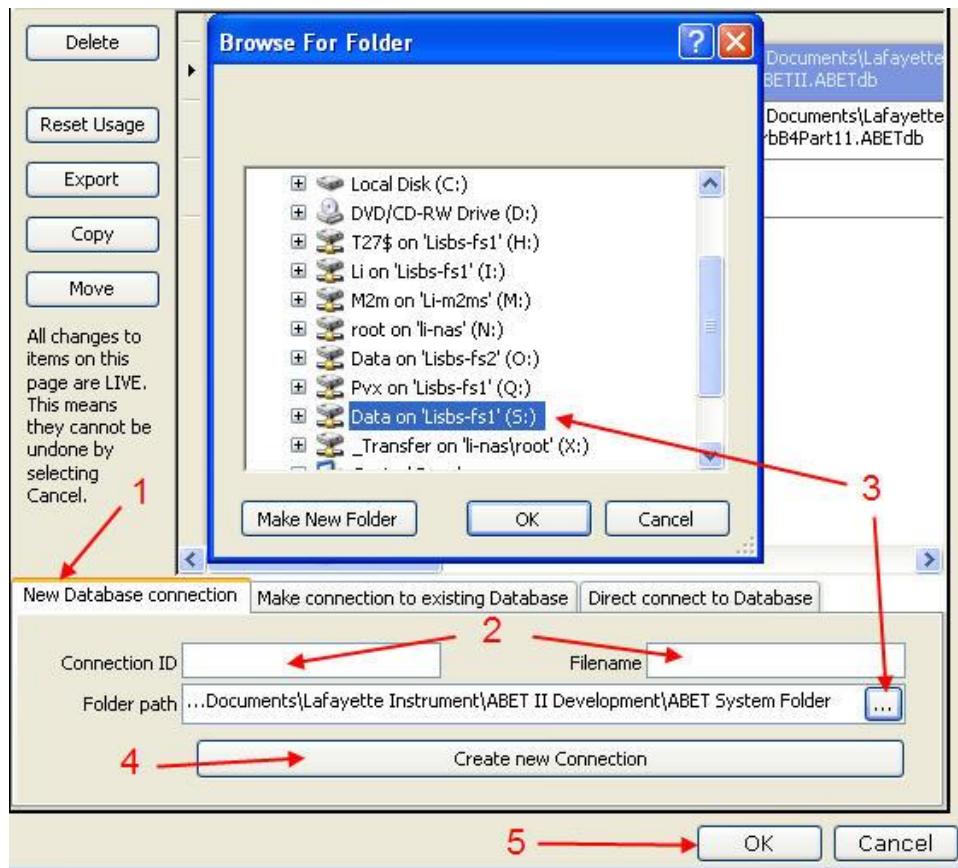
#### Initial Database Setup and Connection:

Network operations: Make sure that the shared network drive has been mapped to each local computer.

- a) If the drive is not mapped, from My Computer use Tools -> Map network drive.
- b) Browse for the desired location and assign it a drive letter to use.
- c) Check “Reconnect at logon”.
- c) Click Finish

Launch ABET II and go to Edit -> Preferences -> Data saving options. Return to [[Data Saving Options](#)] for more information if needed.

1. Click **New Database Connection** if not already active.
2. Fill in the filename and connection ID fields as described previously.
3. Click the Folder Path browse button and point the folder path to the shared network drive location much like you would for a local database.
4. Click **Create new Connection**. The database is now created and available to this station.
5. Click OK to exit the Preferences form.

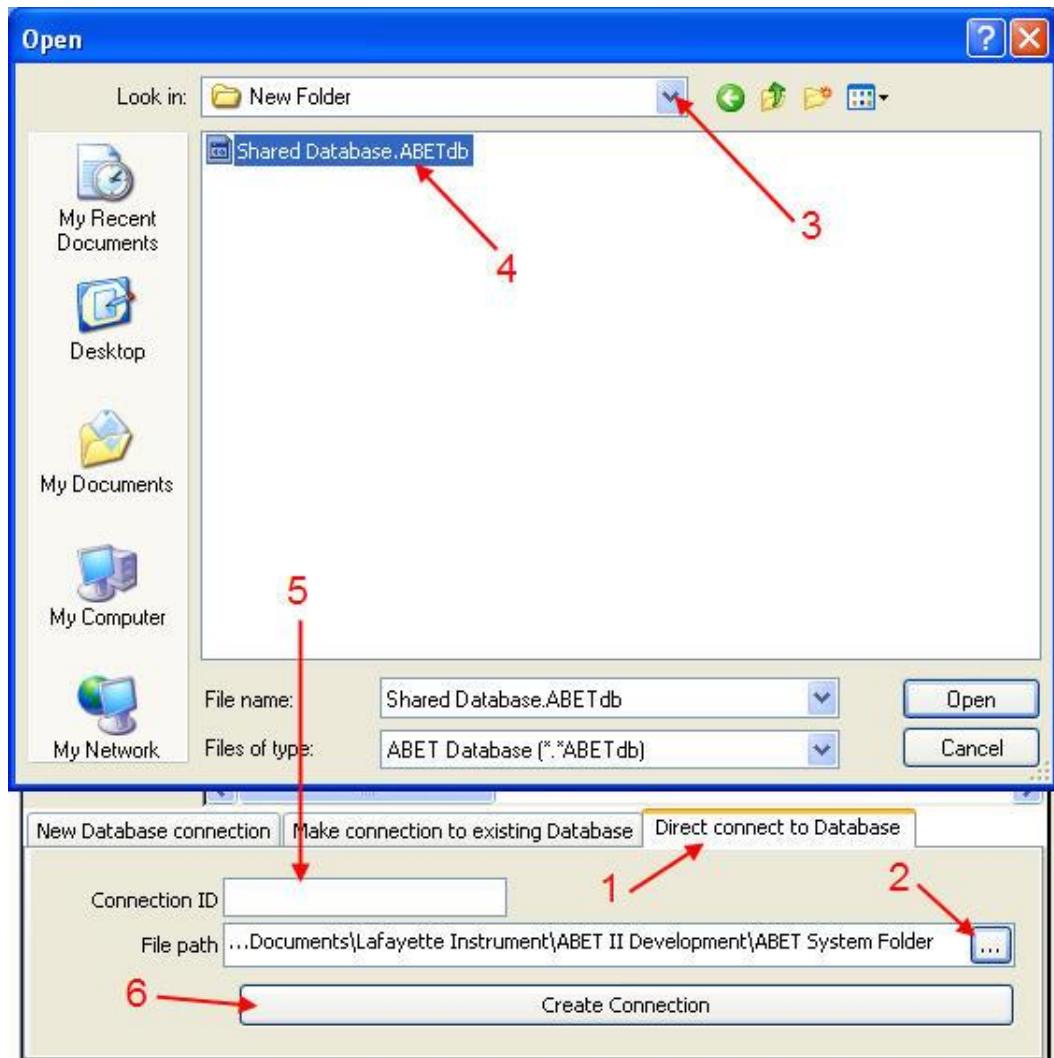


## Additional Tools, Features and Concepts of ABET II

### Connecting other stations to the Shared Database:

On another station launch ABET II and go Edit -> Preferences -> Data Saving Options. Again see [[Data Saving Options](#)] in the Preferences section for more information.

1. Click the **Direct connect to Database** tab to make a connection to the previously created network database.
2. Click the Browse button for the file path to produce a standard Windows Open form.
3. Use the pull down tool to navigate the network drive location where the database was just created and find the network folder.
4. Select the database.
5. Enter a suitable Connection ID for the new computer. This can be the same or different from the ID used on the first computer.
6. Click **Create Connection**.



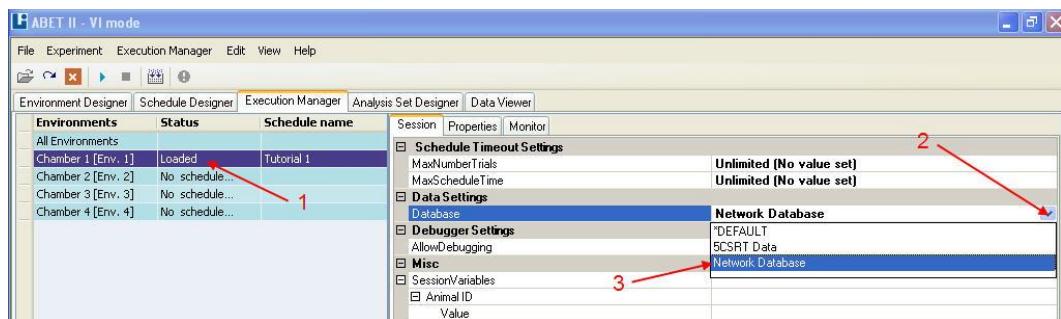
Click OK to exit the Preference form. Repeat the process for each ABET II PC station that is to access this shared database.

## Additional Tools, Features and Concepts of ABET II

### Selecting the database in the Execution Manager:

Selecting the Network Database is identical to selecting a local data base.

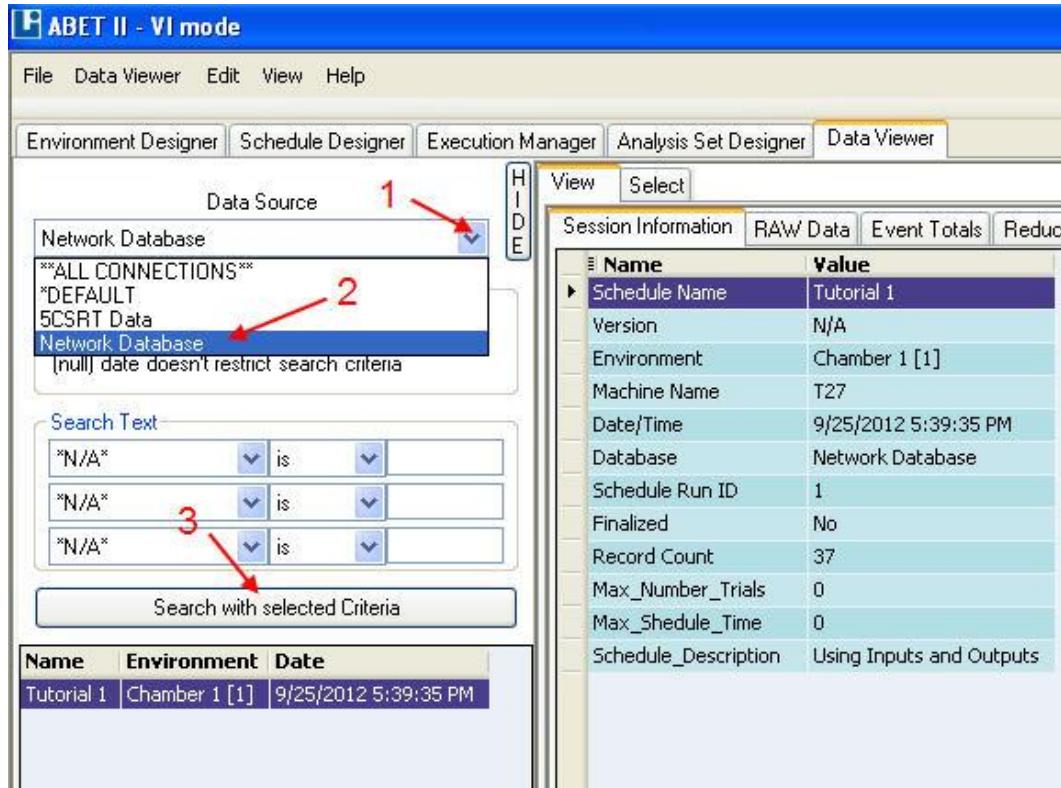
1. Load the Schedule to be run.
2. Click the **Pull Down** dialog for the Database.
3. Select the shared network database ID name. All data for the run schedule will be stored here.



### Viewing and analyzing data in a shared database:

Once data is collected it can be viewed and analyzed using ABET II Data Viewer tools using the same methods one would use to view data from a local data base.

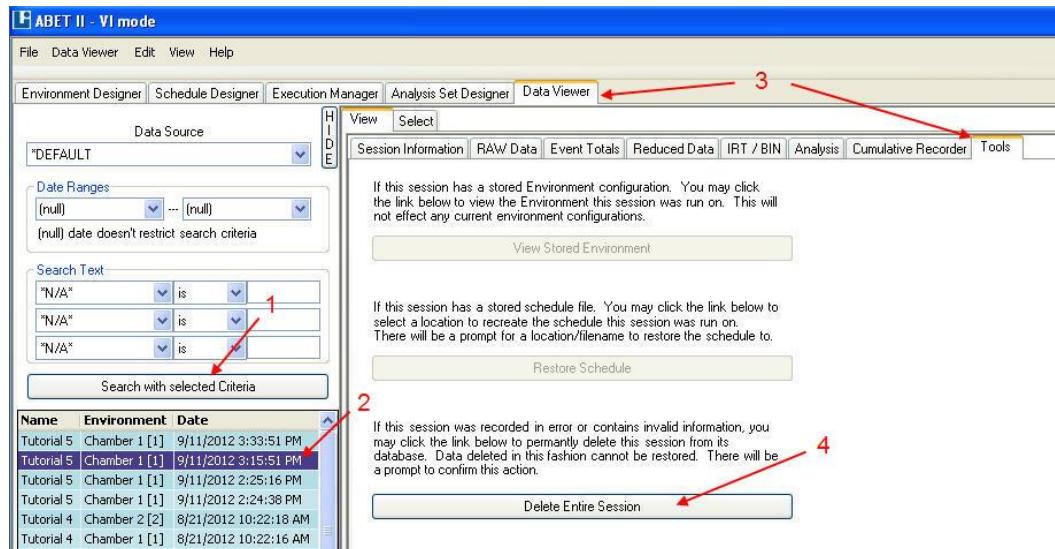
1. Click the Data Source pull down tool
2. Select the Network Database where the data has been stored
3. Click **Search with Selected Criteria**



## Additional Tools, Features and Concepts of ABET II

### Deleting a Single Session File from the Database

1. To delete a single session file simple populate the data list using the methods described throughout this manual and **Search with selected Criteria**
2. Highlight the session to delete
3. Click the **Tools** tab on the **Data Viewer** tab.
4. Click **Delete Entire Session**



A confirmation screen will appear. Click **Yes** to proceed, **No** or **Cancel** if you change your mind.



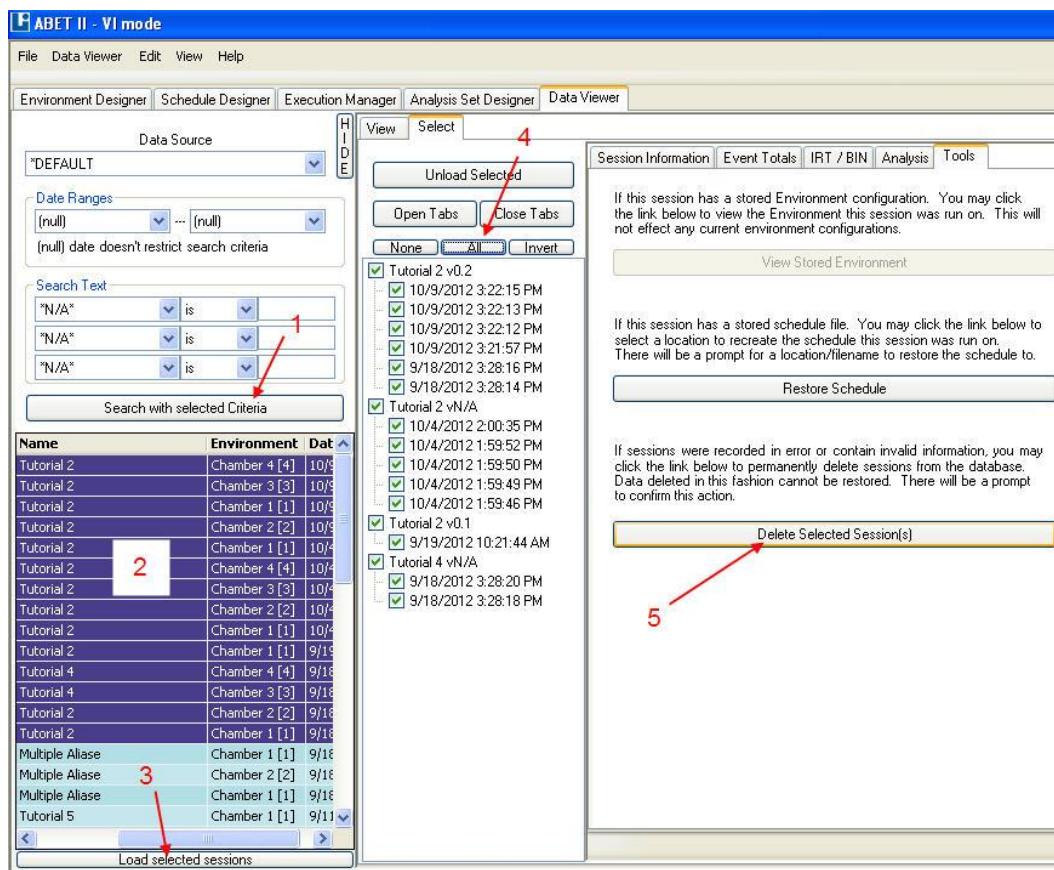
The file is deleted immediately although it will not be removed from the Data List until a new search is performed.

## Additional Tools, Features and Concepts of ABET II

### Deleting Multiple Sessions from the Database

Deleting multiple sessions requires that you first “Load” the sessions to be deleted.

1. Click **Search with selected Criteria** after selecting the **Data Source** and applying the **Date Range** and **Search Text** that is appropriate for reducing the session information as desired.
2. Highlight the specific sessions or group of sessions to be deleted.
3. Click the **Load Selected Sessions** button at the bottom of the list.
4. Click the specific sessions to be deleted or click all and remove check marks from those sessions to be saved.
5. When you are satisfied with your selections, click **Delete Selected Session(s)**



**Note:** The same confirmation screen seen previously when deleting a single session will appear. Click **Yes** to proceed, **No** or **Cancel** if you change your mind.

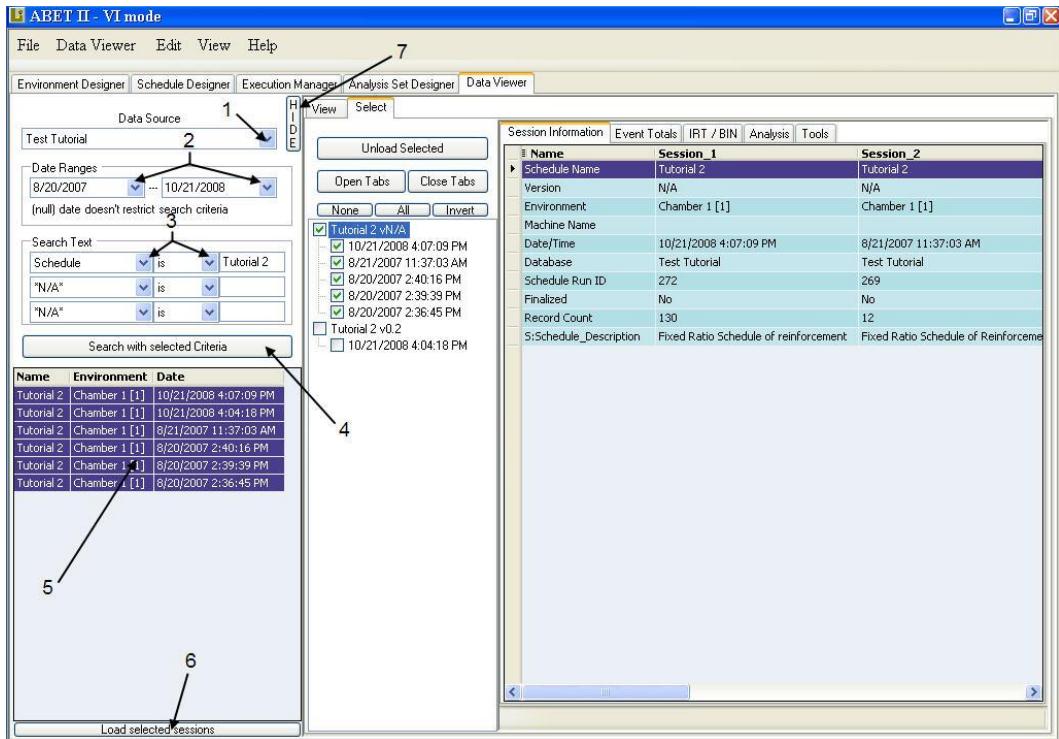
Again, files are deleted from the database immediately. The loaded list (#4 above) is also cleared immediately. The data list (#2 above) will remain unchanged even though the files are gone. Click Search with selected Criteria again and the list will be updated.

## Additional Tools, Features and Concepts of ABET II

## Viewing Raw or Reduced Data from Multiple Sessions

Click the Data Viewer Tab to reveal the screen shown below. The data to view may be limited in numerous ways and at different levels as illustrated.

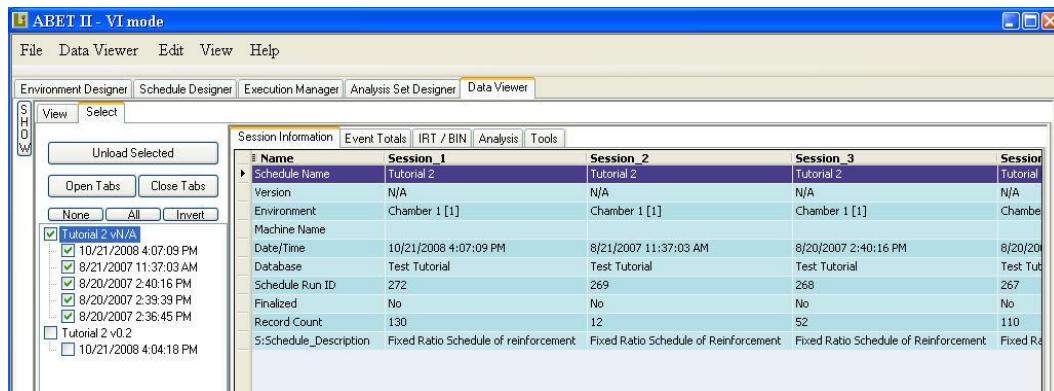
1. By default the **Data Source** is set to \*\*All Connections\*\*. In this example the Data Source was limited to the Test Tutorial database only.
  2. By default the **Date Range** is blank. A range was entered here to further reduce the data to be displayed.



3. By default the **Search Text** is blank. Up to three search filters may be entered. A single filter was used here based on the schedule name. Other delimiters include the following:
    - a) Environment
    - b) Version
    - c) Finalized
    - d) Animal ID
    - e) Group ID
    - f) Max\_Number\_Trials
    - g) Max Schedule Time
    - h) Notes
    - i) Schedule Description
    - j) User
  4. When the above steps have been completed, click **Search with selected Criteria** to populate the list below.

## Additional Tools, Features and Concepts of ABET II

5. The sessions to be loaded can be reduced further at this point or after the list has been loaded. Click the first line to be highlighted and use standard Windows Shift or Ctrl plus click to highlight individual rows or a block of rows as shown.
6. Click **Load selected sessions** to move the list to the column on the right. Here the data was further divided in to two versions of Tutorial 2 found within the selection criteria. Only the first group was checked. Additional tools are described below.
7. Once a selection has been loaded, click **Hide** to provide additional screen space as shown below.



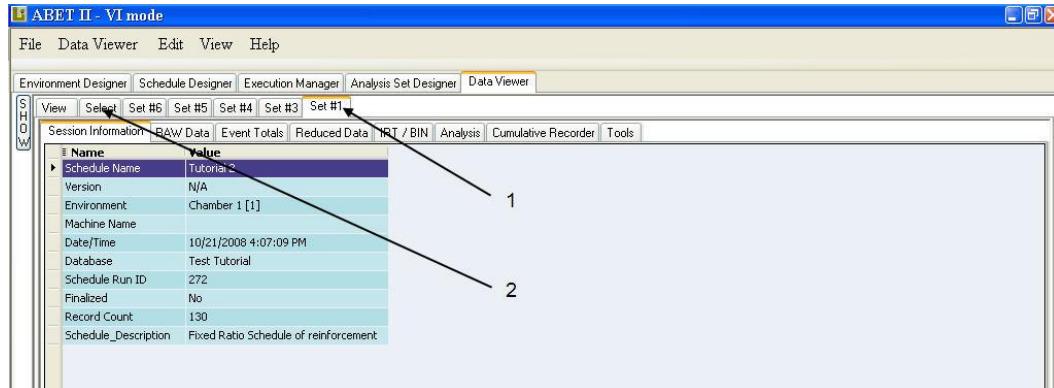
**Unload Selected:** Click here to remove all sessions that have been loaded.

**None, All:** Click **None** or **All** to remove all checks or add all checks to the sessions that have been loaded. You can also check the group boxes or individual boxes.

**Invert:** Use this short cut to click all items in a large group except one or two. Click the individual box(s) for the one or two to be **eliminated** and then click **Invert**. The one or two boxes that were checked will be unchecked and all the remaining sessions will be selected.

**Tabs:** Use Open Tab and Close Tab to add or remove tabs that will allow you to select a single session from the display.

1. When a single tab is clicked you will now have access to the RAW Data tab, the Reduced Data tab, and the Cumulative Recorder tab. The most recent session will be identified as tab #1.
2. Click **Select** to return to the previous screen



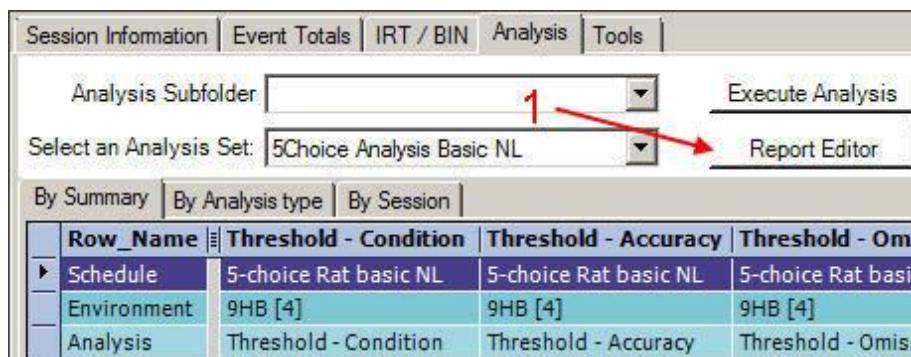
## Additional Tools, Features and Concepts of ABET II

### The Report Editor

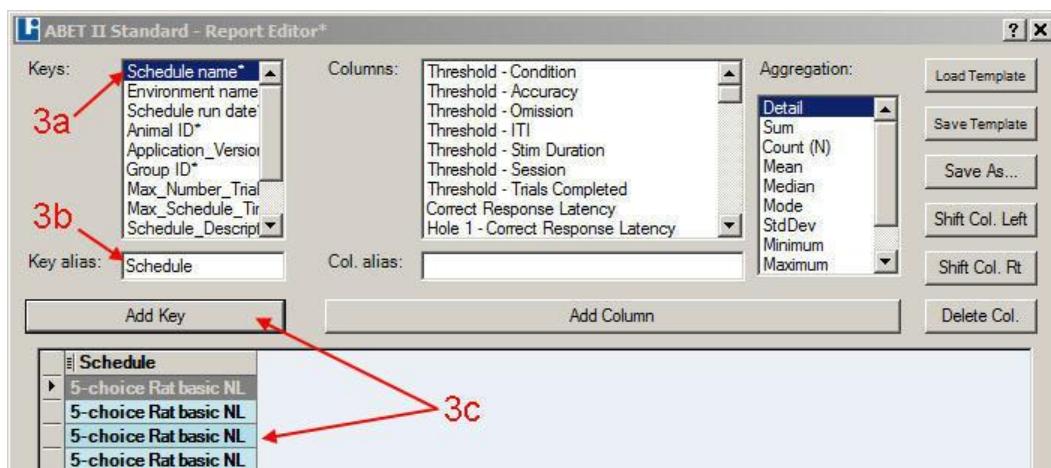
A report generator is only available once an Analysis has been carried out on one or more saved sessions. This editor may be used to organize and reduce the amount of data created by a detailed analysis set. For example, the analysis set provided with the ABET II 5CSRT Test schedules contains 11 pieces of Session Information and 64 Data Elements. The Report Editor is a useful tool that places only the data of interest in any order desired with the ability to edit column headers. Once created, it can be saved and reused as needed. Report templates are not provided with any standard schedules although Analysis Sets are. If you have a template that you simply want to run or need assistance running an Analysis Set, go to [[Using a saved Report Editor Template](#)] immediately following this section.

#### Creating a Report Editor Template

1. Click on Report Editor following the completion of Execute Analysis.7



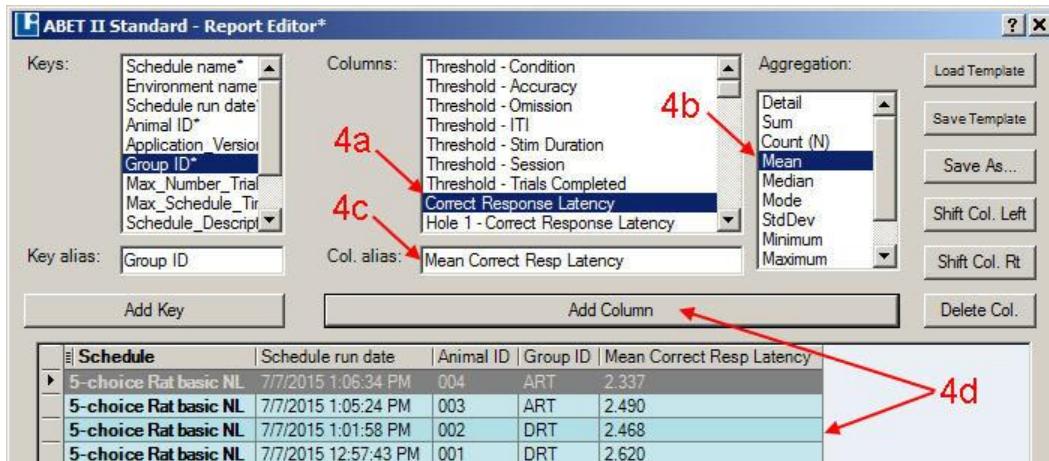
3. The Keys section lists session header information that might be relevant to the report including default information and user generated fields. Report data may be sorted on any column so potential fields such as Animal ID and Group ID are excellent choices. Adding Keys to the report.
  - a) Highlight the key to be added, for example, Schedule Name
  - b) If Key Alias is left blank the default name will be used as the column head. In this example, Schedule Name has been shortened to just Schedule.
  - c) Click Add Key. The "Schedule" Column is immediately added with data from each session in the analysis.



## Additional Tools, Features and Concepts of ABET II

Repeat the above process to add Schedule run date, Animal ID, Group ID and/or any keys pertinent to the analysis and report of interest to you.

4. The Columns section lists each data element of the analysis that forms the columns of the analysis set. In addition, Aggregation lets you select what aspect of the data column to include. Multiple entries of the same data element (column) may be included, for example mean and standard deviation as long as a different Col. Alias is assigned.
  - a) Highlight the Column to be added, for example, Correct Response Latency.
  - b) Select the Aggregation desired:
    - i. Detail: Lists each element in the data set. In this example each individual correct response latency.
    - ii. Sum: The sum of all elements (latencies) in the Detail list.
    - iii. Count (N): The number of elements (latencies)
    - iv. Mean: The simple Mean, Sum divided by N/
    - v. Median
    - vi. Mode
    - vii. Standard Deviation
    - viii. Minimum value in the Detail list.
    - ix. Maximum value in the Detail list.
    - x. First (N). A partial Detail list starting with the first element with a user selected N. For example the first 5 elements.
    - xi. Last (N). A partial list of the last N elements in the Detail list.



- c) Edit Col. Alias if desired.
- d) Click Add Column and the column is immediately displayed

Repeat the above process to add the Mean and SD of the Correct Response Latency, the Correct Response Count and/or any additional data elements (Columns) pertinent to the analysis and report of interest to you.

## Additional Tools, Features and Concepts of ABET II

5. Once selected, Keys and Columns may be shifted to any position with the Shft Col Left and Shft Col Rt buttons or deleted with the Delete Col button. The Correct Resp Column is shifted two columns to the left in the following example.
- Highlight a cell in the Column to move.

The screenshot shows the ABET II Standard - Report Editor window. In the 'Columns' list, 'Threshold - Session' is selected. In the 'Aggregation' dropdown, 'Count (N)' is selected. The table below shows four rows of data. The 'Correct Resp' column is highlighted with a red border. A red arrow points from the text '5a' to the bottom right corner of the 'Correct Resp' cell in the fourth row.

Schedule run date	Animal ID	Group ID	Mean Correct Resp Latency	Correct Resp Latency SD	Correct Resp
7/7/2015 1:06:34 PM	004	ART	2.337	0.873	23.000
7/7/2015 1:05:24 PM	003	ART	2.490	0.863	19.000
7/7/2015 1:01:58 PM	002	DRT	2.468	0.949	17.000
7/7/2015 12:57:43 PM	001	DRT	2.620	0.935	18.000

- Click the Shift Col Left button to shift one position.
- Click again until the column is in the desired position.

The screenshot shows the ABET II Standard - Report Editor window. The 'Correct Resp' column has been moved to the second position in the table header. A red arrow points from the text '5c' to the 'Shift Col. Left' button. Another red arrow points from the 'Correct Resp' column header in the table to the left, indicating its new position.

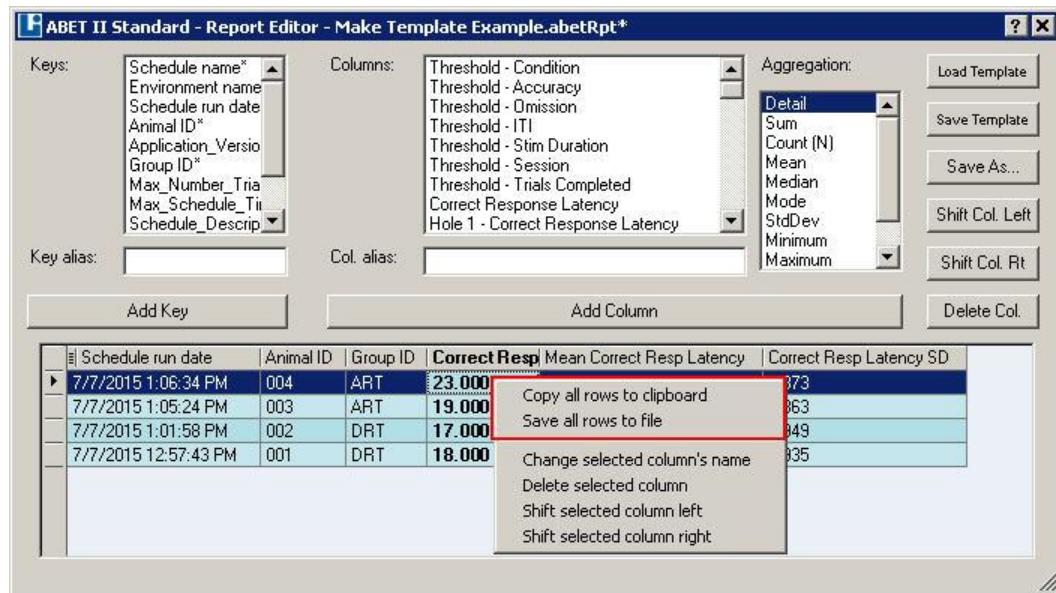
Schedule run date	<b>Correct Resp</b>	Animal ID	Group ID	Mean Correct Resp Latency	Correct Resp Latency SD
7/7/2015 1:06:34 PM	23.000	004	ART	2.337	0.873
7/7/2015 1:05:24 PM	19.000	003	ART	2.490	0.863
7/7/2015 1:01:58 PM	17.000	002	DRT	2.468	0.949
7/7/2015 12:57:43 PM	18.000	001	DRT	2.620	0.935

6. Clicking in the header space above any column will sort the rows by the data for that key.

**Note:** it is also possible to right click over any part of the template to reveal the menu on the next page. The four lower items on this menu duplicate the functions previously described.

## Additional Tools, Features and Concepts of ABET II

Saving the report data using either of the two options shown below.



Copy all rows to clipboard and past to a spreadsheet, text document, or other suitable document.

Save all rows to file. The data may be saved to a .CSV File and opened with any compatible application.

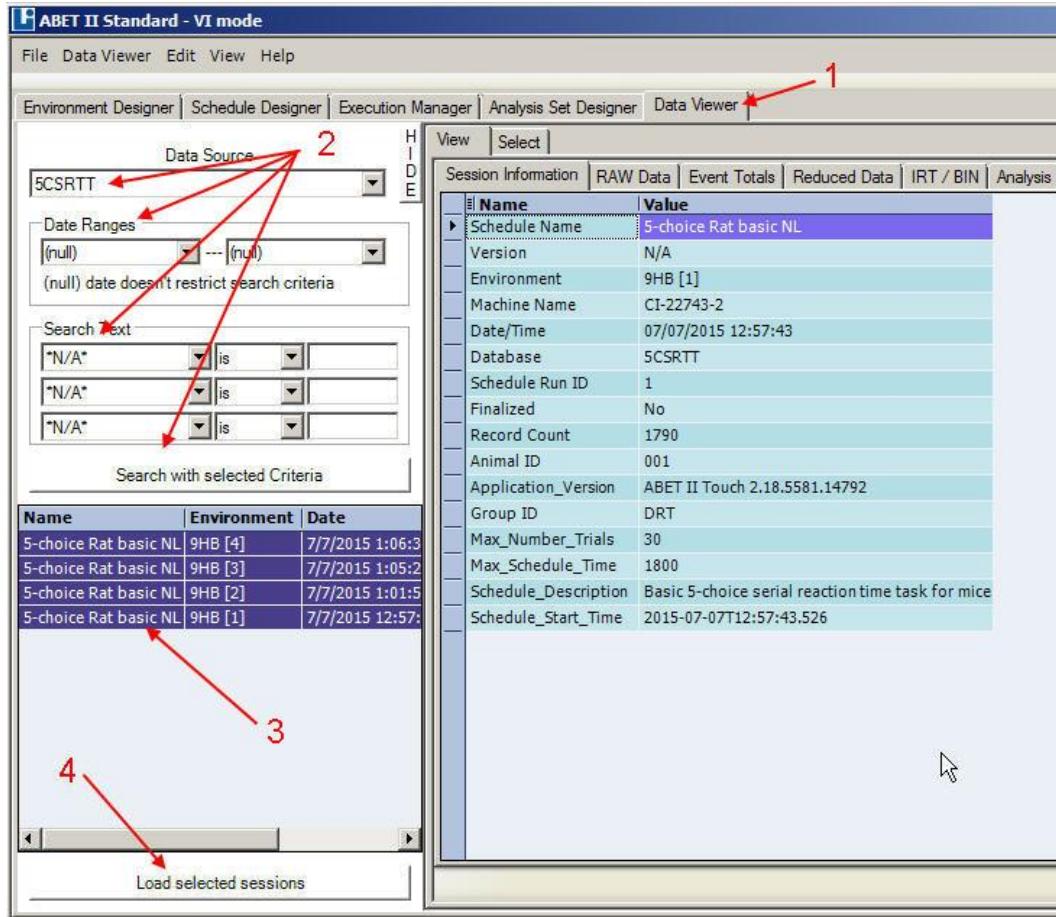


# Additional Tools, Features and Concepts of ABET II

## Using a saved Report Editor Template

See Reviewing Raw or Reduced Data from Multiple Sessions prior to this section for additional information.

1. Click on the Data Viewer tab.
2. Search for the sessions of interest based on the Data Source, Date Ranges and Search Text chosen.
3. Select the list of sessions to load. All sessions from the 5CSRTT Database are selected here as the session list may be reduced prior to running Execute Analysis.
4. Click Load selected sessions to place the data files (sessions) from the list just created into a new column.



5. Select the session file(s) to be included by clicking “All”, the top check box or individual check boxes. The session information for each session selected will appear to the right. Individual sessions may be removed by simply unchecking the corresponding box.

Name	Environment	Date
5-choice Rat basic NL	9HB [4]	7/7/2015 1:06:33
5-choice Rat basic NL	9HB [3]	7/7/2015 1:05:22
5-choice Rat basic NL	9HB [2]	7/7/2015 1:01:52
5-choice Rat basic NL	9HB [1]	7/7/2015 12:57:43

Name	Session 1	Session 2	Session 3	Session 4
Schedule Name	5-choice Rat basic NL			
Version	N/A	N/A	N/A	N/A
Environment	9HB [4]	9HB [3]	9HB [2]	9HB [1]
Machine Name	CI-22743-2	CI-22743-2	CI-22743-2	CI-22743-2
Date/Time	7/7/2015 1:06:34 PM	7/7/2015 1:05:24 PM	7/7/2015 1:01:58 PM	7/7/2015 12:57:43 PM
Database	5CSRTT	5CSRTT	5CSRTT	5CSRTT
Schedule Run ID	4	3	2	1
Finalized	No	No	No	No
Record Count	1749	1482	1597	1790
Animal ID	004	003	002	001
Application_Version	ABET II Touch 2.18.5581.14792			
Group ID	ART	ART	ART	ART
Max_Number_Trials	30	30	30	30
Max_Schedule_Time	1800	1800	1800	1800
Schedule_Description	Basic 5-choice serial reaction time task for mice	Basic 5-choice serial reaction time task for mice	Basic 5-choice serial reaction time task for mice	Basic 5-choice serial reaction time task for mice
Schedule_Start_Time	2015-07-07T13:05:37Z	2015-07-07T13:05:37Z	2015-07-07T13:05:37Z	2015-07-07T13:05:37Z

## Additional Tools, Features and Concepts of ABET II

6. Click the Analysis Tab.
7. Select the Analysis Set for the selected sessions from the pull down menu, and
8. Click Execute Analysis. Report Editor appears (see #10) once the analysis is completed.

A progress screen will appear during the analysis period which may be a few seconds to a few minutes depending on the number of data elements in the analysis set, the number of sessions and the size of the raw data files.

9. At the completion of the analysis three tabs will appear:

- a. By Summary. The By Summary Data is displayed by default. Each column shows summary statistics for each data element even when the N for that element is 1. Use the Scroll bar at the bottom of the page to view all data elements.

Row_Name	Threshold - Condition	Threshold - Accuracy	Threshold - Omission	Threshold - ITI	Threshold - Stim Duration	Threshold - Session	Threshold - Trials Completed
Schedule	5-choice Rat basic NL	5-choice Rat basic NL	5-choice Rat basic NL				
Environment	9HB [4]	9HB [4]	9HB [4]				
Analysis	Threshold - Condition	Threshold - Accuracy	Threshold - Omission	Threshold - ITI	Threshold - Stim Duration	Threshold - Session	Threshold - Trials Completed
N	4	4	4	4	4	4	4
Mean	1,142.273	90.375	29.175	5.000	5.000	5.000	30.000
Median	1,142.273	90.375	29.175	5.000	5.000	5.000	30.000
Mode	All values	All values	30.000	5.000	5.000	5.000	30.000
SD	159.080	3.608	5.962	0.000	0.000	0.000	0.000
Min	896.476	85.700	20.000	5.000	5.000	5.000	30.000
Max	1,337.215	95.800	36.700	5.000	5.000	5.000	30.000

- b. By Analysis Type. Clicking this tab will result in a set of sub tabs representing each data element in the analysis with the first tab selected. A Summary column provides values across all sessions covered by the analysis. This is followed by an individual column for each session in the analysis. Click < > arrows to scroll across all available data elements to view.

Row_Name	Summary	Session #1	Session #2	Session #3	Session #4	pose Latency	Hole 5 - Correct
Schedule		5-choice Rat basic NL					
Environment		9HB [4]	9HB [3]	9HB [2]	9HB [1]		
Time		7/7/2015 1:06:34 PM	7/7/2015 1:05:24 PM	7/7/2015 1:01:58 PM	7/7/2015 12:57:43 PM		
Analysis		Threshold - Condition	Threshold - Condition	Threshold - Condition	Threshold - Condition		
N	4	1	1	1	1		
Mean	1,142.273	1,337.215	1,140.179	896.476	1,195.220		
Median	1,142.273	1,337.215	1,140.179	896.476	1,195.220		
Mode	All values	All values	All values	All values	All values		
SD	159.080	0.000	0.000	0.000	0.000		
Min	896.476	1,337.215	1,140.179	896.476	1,195.220		
Max	1,337.215	1,337.215	1,140.179	896.476	1,195.220		
Blank							
1		1337.215	1140.179	896.476	1195.22		

## Additional Tools, Features and Concepts of ABET II

- c. By Session. Clicking this tab will result in a set of sub tabs for each session. Sessions are identified by the Environment and Session Time. Again, use the Scroll bar at the bottom of the page to view all data elements.

By Summary   By Analysis type   By Session									
Row Name	Analysis #1	Analysis #2	Analysis #3	Analysis #4	Analysis #5	Analysis #6	Analysis #7	Analysis #8	Analysis #9
Schedule	5-choice Rat basic NL	5-choice Rat basic NL	5-choice Rat basic NL	5-choice Rat basic NL	5-choice Rat basic NL				
Environment	9HB [4]	9HB [4]	9HB [4]	9HB [4]	9HB [4]				
Time	7/7/2015 1:06:34 PM	7/7/2015 1:06:34 PM	7/7/2015 1:06:34 PM	7/7/2015 1:06:34 PM	7/7/2015 1:06:34 PM				
Analysis	Threshold - Condition	Threshold - Accuracy	Threshold - Omission	Threshold - ITI	Threshold - Stim Duration	Threshold - Session	Threshold - Trials Completed	Correct Response Latency	Hole 1 - Correct Response Latency
N	1	1	1	1	1	1	33	5	
Mean	1,337.215	95.800	20.000	5.000	5.000	30.000	2,337	2,412	
Median	1,337.215	95.800	20.000	5.000	5.000	30.000	2,209	2,003	
Mode	All values	All values	All values	All values	All values				
SD	0.000	0.000	0.000	0.000	0.000	0.000	0.873	1.199	
Min	1,337.215	95.800	20.000	5.000	5.000	5.000	30.000	0.190	0.190
Max	1,337.215	95.800	20.000	5.000	5.000	30.000	39.000	4,651	3,641
Blank									
1	1337.215	95.8	20	5	5	5	30	2,985	0.19
2								1,774	2,295
3								3.19	2,803
4								0.19	3,641
5								2.23	3,031
6								2,886	
7								3,918	
8								2,582	
9								1,712	
10								2,295	
11								2,803	
12								3.014	
13								2,454	
14								2,007	
15								1.47	
16								1,743	
17								1,463	
18								3,641	
19								2,094	
20								1,821	
21								3,031	
22								4,651	
23								1,695	

9c

10. Click Report Editor to open the report editor workspace

Session Information   Event Totals   IRT / BIN   Analysis   Tools									
Analysis Subfolder				Select an Analysis Set: 5Choice Analysis Basic NL				Report Editor	
By Summary   By Analysis type   By Session									
Schedule	5-choice Rat basic NL	5-choice Rat basic NL	5-choice Rat basic NL	5-choice Rat basic NL	5-choice Rat basic NL	5-choice Rat basic NL			
Environment	9HB [4]	9HB [4]	9HB [4]	9HB [4]	9HB [4]	9HB [4]	9HB [4]	9HB [4]	9HB [4]
Analysis	Threshold - Condition	Threshold - Accuracy	Threshold - Omission	Threshold - ITI	Threshold - Stim Duration	Threshold - Session	Threshold - Trials Completed	Correct Response Latency	Hole 1 - Correct Response Latency

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11. Click Load Template and select the report template previously generated. Template file names will be of the form, “FileName.abetRpt” and are located in the ABET Analysis Folder. If you do not have a template, return to the [\[Creating a Report Editor Template\]](#) preceding this section.
12. The data in the report is immediately displayed for the selected sessions. Use the scroll bar to view columns that do not fit on the screen.

Schedule name	Environment name	Schedule run date	Animal ID	Group ID	Max_Number_Trials	Max_Schedule_Time	Session Length (1)	% correct (1)	% missed (1)	Trials Completed (1)	Mean Correct Response Latency
5-choice Rat basic NL	9HB [4]	7/7/2015 1:06:34 PM	004	ART	30	1800	1337.215	95.8	20	30	2,337
5-choice Rat basic NL	9HB [3]	7/7/2015 1:05:24 PM	003	ART	30	1800	1140.179	90.5	30	30	2,490
5-choice Rat basic NL	9HB [2]	7/7/2015 1:01:58 PM	002	DRT	30	1800	896.476	89.5	36.7	30	2,468
5-choice Rat basic NL	9HB [1]	7/7/2015 12:57:43 PM	001	DRT	30	1800	1195.22	85.7	30	30	2,620

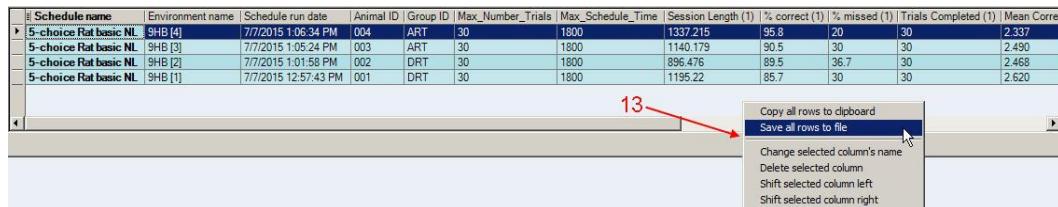
12

Clicking on any column name will allow you to sort the data by that column. Additional editing may also be performed before saving this file.

## Additional Tools, Features and Concepts of ABET II

13. Right Click anywhere over the display and a menu will appear with the following options:

- Copy all rows to clipboard
- Save all rows to file. Data will be saved to a .CSV File.
- Change selected column's name.
- Delete selected column
- Shift selected column left
- Shift selected column Right



The last three options are also available as buttons on the Report Editor workspace. These changes will not be saved if you simply close the report. Use **Save Template** to over write the exiting template with any changes made. Use **Save As** to save with a new template name.

14. In the following sample excel display, several columns were removed and column names shortened to improve fit and appearance. The data was also separated into the two groups and means were added.

Schedule Name: 5-choice Rat basic NL						
Schedule run date	Animal	Group	Session Time (sec)	% correct	Correct Resp Latency (sec)	Reward Collection Latency
7/7/2015 13:06	4	ART	1,337.22	95.8	2.337	4.821
7/7/2015 13:05	3	ART	1,140.18	90.5	2.49	5.027
Means:			1,238.70	93.15	2.41	4.92
7/7/2015 13:01	2	DRT	896.48	89.5	2.468	9.00
7/7/2015 12:57	1	DRT	1,195.22	85.7	2.62	4.394
Means:			1,045.85	87.60	2.54	6.70

15.

## Additional Tools, Features and Concepts of ABET II

### Using First/Last Measurement Paths

This document aims to give an overview of how the First/Last measurement paths work internally, so that you can choose which one is best suited for your analysis. In these examples, we are assuming that we have a start point, one midpoint, and an end point, respectively labeled A, B, and C; however, the logic is the same for any number of midpoints.

**Start:** At the beginning of an analysis, the analysis engine gathers up all the data points that match each specific condition. Suppose that only 3 data points matched conditions A and B, and 4 data points matched condition C. Our data will look like the following structure:

A	B	C
A1	B1	C1
A2	B2	C2
A3	B3	C3
		C4

**Sort:** The next thing we do with our data is sort it in order of ascending timestamps so that we can figure out the chronological order of events within this measure.

A	B	C
	B1	
		C1
A1		
A2		
	B2	
		C2
		C3
		C4
	B3	
A3		

Now we can see that B1 happened first, followed by C1, A1, A2, etc.

**Initialize:** We are going to look through the timestamps in the start condition to find the first available event. Anything that happened before the first event cannot be included in the measure. Thus, we will discard all data that happened prior to A1, and our new data will look like this:

A	B	C
A1		
A2		
	B2	
		C2
		C3
		C4
	B3	
A3		

## Additional Tools, Features and Concepts of ABET II

**Process:** Now that our data has been initialized, we are able to process it with the requested measure path.

### First-First

In the First-First measurement path, we use the timestamps of the first available start point and the first available end point. In this case, we start in column A, and the first event seen is A1. Then we move to column B and find the first event that occurs on or after A1, which is B2 in this case. Finally, we look down column C to find the first available event, which happens to be C2. Our result for this first-first measurement would be the time of C2 minus the time of A1. Lastly, to get the data ready for the next iteration of the measurement, we discard all the data in column A until the first timestamp in column A is the same as or later than our previous end point (C2). Thus, we will start with A3 when we generate our next point in this measurement.

A	B	C
A1		
A2		
	B2	
		C2
		C3
		C4
	B3	
A3		

Yellow points indicate points used in calculating this result, and the blue point indicates where our next measurement will start.

### First-Last

In the First-Last measurement path, we start off by performing the same procedure as the First-First measurement, but we do not report those results, of course. Instead, we find the *first* timestamp in column A that occurs *after* the timestamp we are using in column B, and we make a note of what that time is – in fact, that timestamp is the next start point. Then we find the *last* timestamp in column C that could possibly apply to this measure point (i.e. the last one before the next start point), and use that with the *first* available timestamp in A to calculate our result.

A	B	C
A1		
A2		
	B2	
		C2
		C3
		C4
	B3	
A3		

The red boxes indicate that we have discarded those values while looking for the next legal result.

## Additional Tools, Features and Concepts of ABET II

### Last-First

The Last-First measurement operates very similarly to the First-Last measurement, but instead of discarding as many of the last column as possible, we discard as many of the first column as possible, without going past the point we used in the second column.

A	B	C
A1		
A2		
	B2	
		C2
		C3
		C4
	B3	
A3		

### Last-Last

By now, you are probably able to guess how the last-last measurement works. We obtain the “last” parts in the same ways that we obtained the last in the first-last and the last-first measurements.

A	B	C
A1		
A2		
	B2	
		C2
		C3
		C4
	B3	
A3		

### Identical Results

If you only have one start point matched with one end point, all of the (First/Last)-(First/Last) measurements will give you the same result, regardless of how many times a midpoint occurs:

A	B	C
A1		
	B1	
	B2	
	B3	
		C1
A2		

## Additional Tools, Features and Concepts of ABET II

### Nth Measures

Instead of picking just the first or just the last point in a start or end condition, you can use an Nth measurement to extract a specific one in the middle. If we were to use a First-Nth measurement with  $N = 2$  on the original sample data, our result would use A1-B2-C3. However, if there are not at least  $N$  “candidates” for the point, the results may be dubious.

### Special Applications of Lists

In Tutorial #5, Using the Lists Feature, the concept of defining and using a numerical list was covered. For a review of this material see [[Defining the List Variable](#)]. Special applications of the List feature will be covered here.

### Using a Multiple Output List

Using a Multiple Output Alias has been discussed previously. Click [[Here](#)] to return to that section. In this example, we illustrate how to create a titration list for a programmable shocker. Eight outputs are utilized that deliver a 0.02 mA step with binary notation.

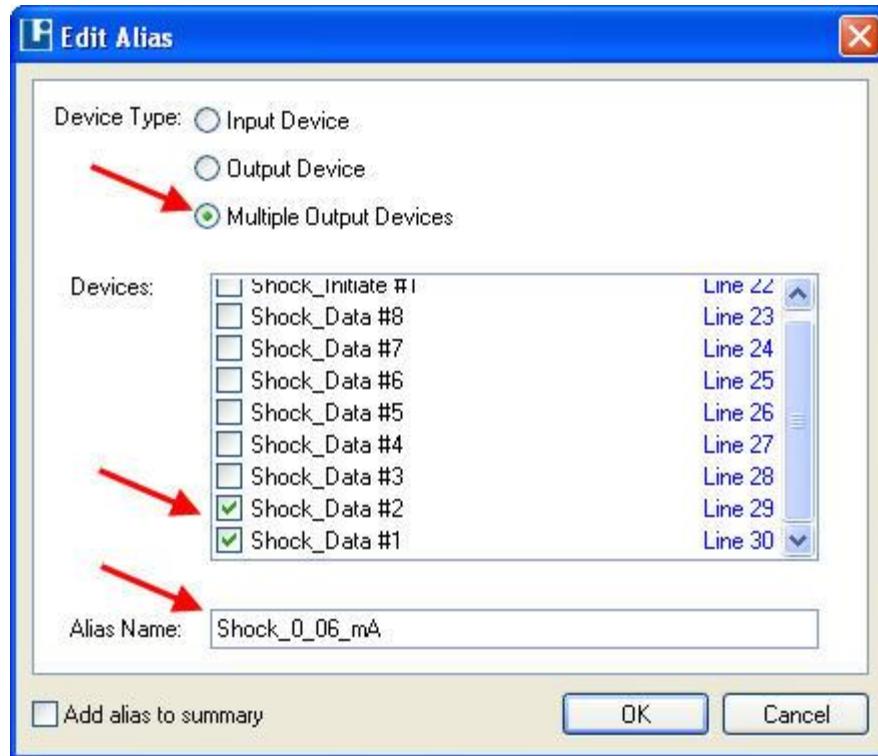
1. Begin by adding eight outputs. The actual outputs used may be different and any label may be assigned. Refer to the wiring diagram provided with your test chamber if the shock control cable has been wired by Lafayette Instrument Co.

The screenshot shows a software interface with two main sections. On the left, a list of outputs is displayed in a table-like format. The columns are labeled 'Outputs' and 'Shock\_Data'. There is also a checkbox labeled 'Has Intensity' which is unchecked. The list includes entries from Line 1 to Line 30, with the last few entries being checked and labeled as Shock\_Initialize #1 through Shock\_Data #21. Red arrows point from the number '1' to the checked entries in the list. On the right, a table provides the mapping between the output labels and their binary values and mA currents. The columns are labeled 'Label', 'mA', and 'Binary Value'. The data rows are:

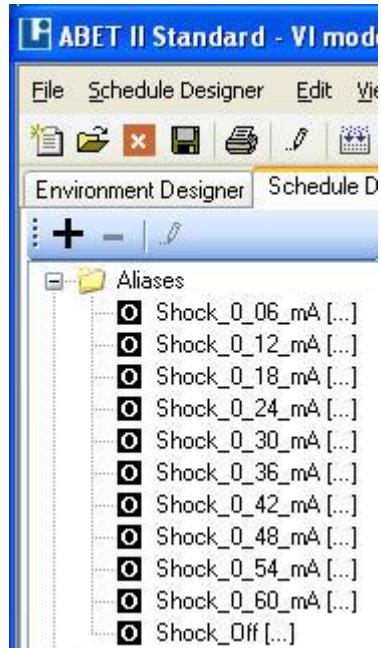
Label	mA	Binary Value
Shock_Data #1 = 0.02	= 0.02	= 0 0 0 0 0 0 0 1
Shock_Data #2 = 0.04	= 0.04	= 0 0 0 0 0 0 1 0
Shock_Data #3 = 0.08	= 0.08	= 0 0 0 0 0 1 0 0
Shock_Data #4 = 0.16	= 0.16	= 0 0 0 0 1 0 0 0
Shock_Data #5 = 0.32	= 0.32	= 0 0 0 1 0 0 0 0
Shock_Data #6 = 0.64	= 0.64	= 0 0 1 0 0 0 0 0
Shock_Data #7 = 1.28	= 1.28	= 0 1 0 0 0 0 0 0
Shock_Data #8 = 2.56	= 2.56	= 1 0 0 0 0 0 0 0

## Additional Tools, Features and Concepts of ABET II

2. For this example assume a titration from 0.06 to 0.60 mA in 0.06 mA increments. Define the first multiple alias for 0.06 mA by selecting Multiple Output Devices with Devices Data #1 (0.02 mA) and Data #2 (0.04 mA) as shown. ( $0.06 = 0.02 + 0.04$ ).



In a similar fashion create Aliases for the following:



**Shock\_0\_18 mA with Devices Shock\_Data #4 & #1**

**Shock\_0\_24 mA with Devices Shock\_Data #4 & #3**

**Shock\_0\_30 mA with Devices Shock\_Data #4, #3, #2 & 1**

**Shock\_0\_36 mA with Devices Shock\_Data #5 & #2**

**Shock\_0\_42 mA with Devices Shock\_Data #5, #3 & #1**

**Shock\_0\_48 mA with Devices Shock\_Data #5 & #4**

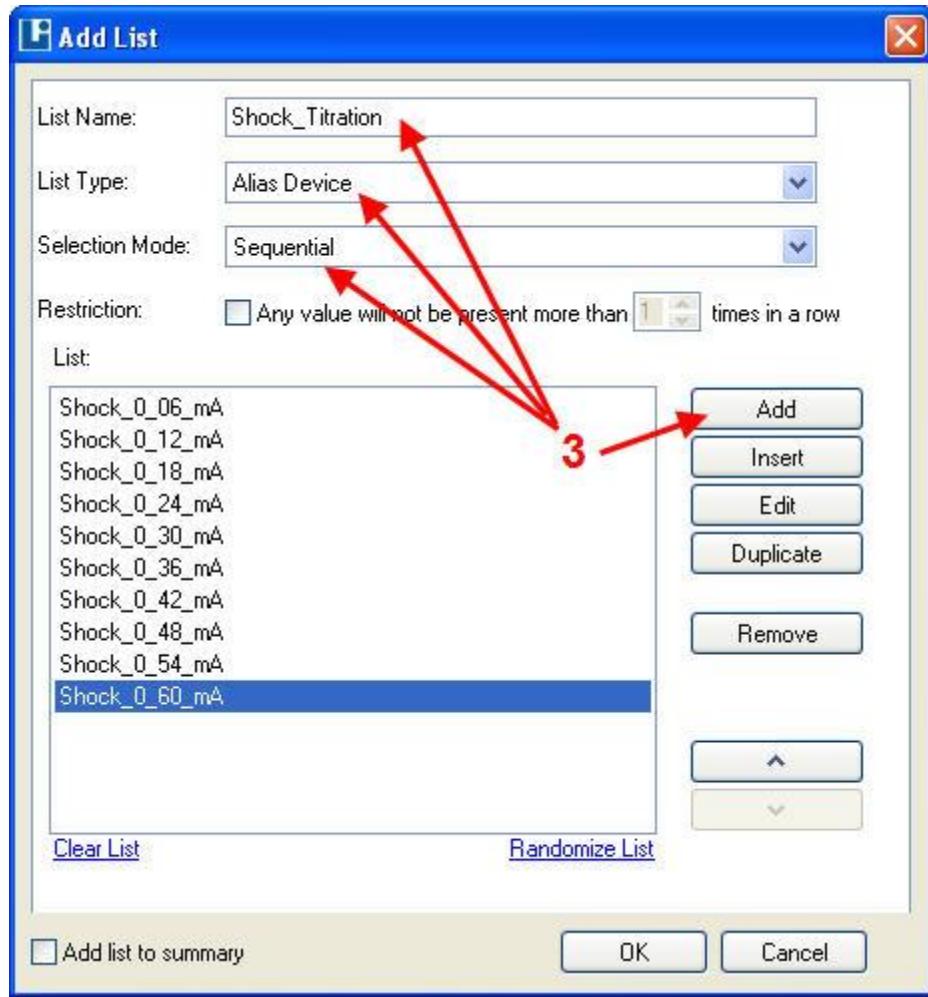
**Shock\_0\_54 mA with Devices Shock\_Data #5, #4, #2 & #1**

**Shock\_0\_60 mA with Devices Shock\_Data #5, #4, #3 & #2**

Finally, create a Shock\_Off Alias with all devices Shock\_Data #1 through Shock\_Data #8.

## Additional Tools, Features and Concepts of ABET II

3. Create a List using the Aliases from Step #2.



4. Build a schedule using the Multiple Output Alias List. The following example pulses each shock three times in three seconds for 500 ms. The next value is presented every 5 seconds until a response is made or the complete list has been used. The sequence is repeated after an intertrial interval of 30 seconds. A trial count or session time may be used to control the total length of the session.

**Conditions and Actions:**

Group	Name	Goto	Condition	Action
1	Start	2	When _Schedule_Timer ≥ 1	Turn on Shock_Titration.value Pulse Shock_Initiate #1 3 times, time = 500 ms., interpulse time = 500ms. Start Shock_Delay
2	Shock Response	4	When Lever_Response #1 = Transitioning On	Turn off Shock_Initiate #1 Turn off Shock_Off Shock_Titration.index = 1 Increment Trial Counter Start Trial_Timer
2	Clear Shock	3	When Shock_Delay ≥ 4.000	Turn off Shock_Off GetNextIndex Shock_Titration
3	Intershock Interval	1	When Shock_Delay ≥ 5	Reset Shock_Delay
3	Shock Sequence Complete	4	When Shock_Titration.index = 1	Start Trial_Timer Reset Shock_Delay Increment Trial Counter
4	Intertrial Interval	1	When Trial_Timer ≥ 30	Reset Trial_Timer
5	End of Schedule	-		

## Additional Tools, Features and Concepts of ABET II

### **Get\_Next\_Value vs Get\_Next\_Index**

Note in the above example, setting of the shock intensity was accomplished with the action, “Turn on Shock\_Titration.value, while “GetNextIndex Shock\_Titration” was used to increment the shock value from step to step. Actually GetNextIndex and GetNextValue could have been used and would have the same consequence. But, to reset the “GetNext” function to the start of the sequence only Titration.index is valid.

The index refers to the position of a given value in the list. The index is an integer from 1 to N, where N is the total number of items in the list. It may be set to a value or variable and a variable may be set to it and modified mathematically to move as needed in a sequential list. The index may also be used to synchronize or pair multiple lists when drawing at random from one.

The list Value is the value assigned to each item in the list. It can be a or an Integer, Decimal, Boolean, Output Device or Alias Device.

# Installing and Trouble Shooting ABET II

## Software and 2G Hardware Installation

A separate printed guide is available to assist with both software and hardware installation. This is supplied with the ABET II Installation Disk. If it has been omitted or lost simply contact Lafayette Instrument Co. to receive a copy. Topics covered include:

- Uninstalling Old ABET Software and Drivers
- Installing ABET II Software
- Installing NI PCI-DIO Drivers from Disk
- Windows Update for 81504CRD ABET 2G PCI Card Drivers
- Appendix A - Installation of Interface Components
- Appendix B - Component I/O Wiring Guidelines
- Appendix C - Installation with BNC Hardware
- Appendix D - Adjusting Virtual Memory
- Appendix E - Installing Graphviz for Displaying Schedules as Flow Charts

## Contacting Lafayette Support

Contacting Lafayette Instrument Co. is easy if the computer you are using is online. Click **Contact Support** on the **Help** menu to open the form shown below.

The screenshot shows a Windows-style dialog box titled "Contact Lafayette Support". The dialog has two tabs at the top: "Submit New Case" (selected) and "Check Existing Case". Below the tabs are four input fields: "Your name", "Your Email address", and "Your phone number", each with a red arrow pointing to it. To the right of these is a dropdown menu labeled "Contact Reason" with a red arrow pointing to its dropdown arrow. Below these fields is a large text area labeled "Comments" with a red arrow pointing to its top-left corner. In the bottom-left corner of the comments area is a "Clear Form" button. At the bottom left is a "Attach Files (Browse)" button with a red arrow pointing to it. To the right of this button is a file selection window showing two files: "Environments.abetEnv" and "Tutorial 2.#0\_2#.abetSch", each with a red arrow pointing to its checked checkbox. At the bottom right are "Submit" and "Close" buttons.

## Installing and Trouble Shooting ABET II

1. Enter your contact information
2. Use the pull down menu to select a contact reason. This will help direct your contact to the proper person.
3. Add comments to explain the issue or question that you need addressed.
4. Depending on the state of ABET II when this form is open files that may be pertinent to the contact may be attached. If you prefer to not send these files simply un-check the selection box.
5. Use the Attach Files button to add files not attached automatically. If you are having trouble finding a file refer back to your preferences settings. See [[Preferences -- General](#)]

When an on-line connection is available simply click **Submit** to e-mail the above form and attached files.

### **Additional Information when Contacting Lafayette Instrument Co. for Support**

#### **Schedules and Analysis Sets:**

For help with schedules or analysis sets, please send a copy of your environment configuration, schedule, database, and analysis files (if appropriate) with a description of what you are trying to do and how the schedule or analysis is now performing. The individual files may be copied as follows:

**Environment:** C:\.....My Documents\Lafayette Instrument\ABET II\ABET System Folder\Environments.abetEnv (If you are using a saved environment it will be “*YourEnvironmentName*.abetEnv”)

**Schedule:** C:\.....My Documents\Lafayette Instrument\ABET II\ABET Schedule Folder\i*ScheduleName*.abetSch

**Database:** C:\.....My Documents\Lafayette Instrument\ABET II\ABET System Folder\ABETII.ABETdb (If you are not using the “Default” database it will be “*YourDatabaseName*.ABETdb”). For large Databases, Individual Session Data may be sent by exporting the session to Excel. Please use the “Export all rows to file with Session Info” option. Save and send the Excel file.

**Analysis Set:** C:\.....My Documents\Lafayette Instrument\ABET II\ABET Analysis Folder\i*AnalysisSetName*.ABETas

You may also use the backup utility. Go to preferences [[Click Here](#)] to select the files to back up prior to running the back up. Select Schedule Folder, Analysis Folder, Databases and Environments. The default location for the backup file (if not altered in preferences) is: C:\.....My Documents\Lafayette Instrument\ABET II\ABET II Backups. These files can be quite large, so you may need to back up a single folder at a time, or simply send individual files as indicated above.

# Installing and Trouble Shooting ABET II

## Trouble Shooting Hints

### Schedules in Use Error Message

**Problem:** I try opening files in the schedule designer, but get a message that the file can't be open because it is in use within the execution manager, and that I can open it as read only. If it is in use, obviously all you have to do is unload (close) the file. But, occasionally this can happen even when the file is not open in the execution manager. This is usually caused by a computer crash or ABET II not being shut down properly.

**Solution:** ABET II creates a temporary lock file any time a schedule is running that is normally cleared when the schedule is unloaded. The above problem can be fixed by manually removing these files. Make sure ABET II is closed. Go to the schedule directory. By default this will be: C:\.....\My Documents\Lafayette Instrument\ABET II\ABET Schedule Folder\. If another path is being used, it will be listed in the Preferences file. Locate and delete the small 1K files with extension ".abetlocked". One of these files will of course have the same name as the schedule you were trying to open. **Caution: Do not delete the schedule, only the locked file.**

### Trouble Shooting System Crashes and Run Time Errors

ABET II consumes 100% resources so that I/O control is timely and response time stamps are accurate. Make sure no other applications are running while running ABET II. We recommend setting virtual memory to 3072 Initial and 6144 Max. Those users upgrading from an earlier version may require additional RAM due to the switch from Microsoft .NET Framework version 1.1 to .NET version 3.5. According to Microsoft, the resources recommended for v3.5 is an order of magnitude more than that required for v1.1. Please refer to the Software Installation Guide for additional details.

### Run Time Errors

A run time error may generate a form similar to the Contact Lafayette Support form shown previously. Again, fill in as completely as possible and click **Submit** if the computer is on-line.

If a lab computer is not on line there are two error files that may help diagnose your computer problem if a session fails to complete a schedule or locks up in the middle of a session for an unknown reason. These files are overwritten each time a schedule is run, so please make a copy before doing anything else. The default file location is:

C:\.....\My Documents\Lafayette Instrument\ABET II\ABET Debug Logs\.

The files to copy are: **ABETII-Errors.txt** and **LastRunLog.txt**

There may or may not be another file in the Error Log folder. The default file location for this is:

C:\.....\My Documents\Lafayette Instrument\ABET II\Error Log\.

The file name is Error Log n.txt where n is a sequential number from 1 – N with Error Log N.txt being the last file saved. These files are not replaced or erased automatically.

Copy these files to a mobile device and attach to an email:

## Installing and Trouble Shooting ABET II

Feel free to contact us if you have questions on any aspect of this product.

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Or generally at **[Info@lafayetteinstrument.com](mailto:Info@lafayetteinstrument.com), 765-423-1505 ext. 100 for the operator.**

## ABET II Users Manual

### Appendix A – ABET Hardware

#### **Minimum Computer Requirements:**

- Microsoft® Windows® 7 32 or 64 bit (64 bit recommended) or Microsoft® Windows® 8.1 or 10
- Personal computer with a minimum 2 GHz Dual Core Processor (3.2 GHz Quad Core Processor recommended)
- One PCIe Card Slot (full size)
- Optical Disk Drive
- VGA or higher resolution video adapter
- RAM Minimum of 4GB (8GB recommended)
- Hard Drive:
  - 100 MB of available hard-disk space for installation; additional free space required during installation (cannot install on removable flash storage devices)
  - Additional disk space required for data files and other working files (10 GB recommended)
- Microsoft-compatible keyboard and mouse
- Microsoft .NET Framework 3.5 support required

#### **ABET Interface Component Installation:**

Whether you purchase an ABET II Starter Package or individual components, the installation of the hardware will be the same.

1. Start with the 81504e NI-DAQ PCIe Interface Card. A full PCIe slot will be needed. Turn the PC off, disconnect the power cord, and remove the cover from your PCI using the instructions supplied with that device. Firmly seat the card in any suitable slot and reassemble the PC. Do not install the drivers supplied by NI. The appropriate drivers have been included with the ABET II installation disk. A detailed software installation guide should have been included.
2. Connect the 100-pin connector of the 81504CBL Interface Cable (supplied with 81504e Card) to the 81504e Digital I/O card connector.
3. Connect the two 50-pin connectors of the 81504CBL cable to the 81501(-NL) ABET II Starter Interface. Check to make sure that the 1-50 labeled cable is connected to the 1-50 connector on the 81501(-NL), and that the 51-100 labeled cable is connected to the 51-100 connector of the 81501(-NL).
4. Gently plug the first 81502(-NL) Expansion Interface into the top of the 81501(-NL) Starter Interface. Note: You cannot mix non -NL (i.e. 85101 and 81502) series interfaces and -NL (i.e. 81501-NL and 81502-NL) series interfaces. Use the alignment tabs and seat the top unit completely down on the bottom unit. Insert the locking screws into the side of the bottom unit and into the alignment tabs of the above unit. Connect each additional expansion interface to the top of the stack in a similar manner. (NOTE: The interfaces may have been connected at the factory.)
5. The interface at the bottom of the stack is Interface Location 1 for the 81501(-NL) Starter Interface when it's configured for a single test station (16/30 I/O). When the 81501(-NL) Starter Interface is configured for two test chambers (8/15 I/O), the designations 1A and 1B are used in the ABET II Environment configuration. Each additional interface in the stack increments from the bottom up as shown.

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**Appendix A – ABET Hardware**

81501(-NL) & 81502(-NL) Hardware with two chambers per module				
Interface	Connector	Function	Location	Chamber
Expansion Interface n	Right Hand (B)	Input 1-8, Output 1-15	nB	2n
	Left Hand (A)	Input 1-8, Output 1-15		2n-1
Expansion Interface 2	Right Hand (B)	Input 1-8, Output 1-15	3B	6
	Left Hand (A)	Input 1-8, Output 1-15		5
Expansion Interface 1	Right Hand (B)	Input 1-8, Output 1-15	2B	4
	Left Hand (A)	Input 1-8, Output 1-15		3
Bottom Unit	Right Hand (B)	Input 1-8, Output 1-15	1B	2
	Left Hand (A)	Input 1-8, Output 1-15		1

81501(-NL) & 81502(-NL) Hardware with one chamber per module				
Interface	Connector	Function	Location	Chamber
Expansion Interface n	Right Hand (B)	Input 9-16, Output 17 - 30	n	n
	Left Hand (A)	Input 1-8, Output 1-16		
Expansion Interface 2	Right Hand (B)	Input 9-16, Output 17 – 30	3	3
	Left Hand (A)	Input 1-8, Output 1-16		
Expansion Interface 1	Right Hand (B)	Input 9-16, Output 17 – 30	2	2
	Left Hand (A)	Input 1-8, Output 1-16		
Bottom Unit	Right Hand (B)	Input 9-16, Output 17 – 30	1	1
	Left Hand (A)	Input 1-8, Output 1-16		

6. Connect the chamber I/O connection block to the interface modules using one or two 81406-25 DB-25 cables as appropriate using the above tables as a guide. The 81508 I/O Block features 16 Inputs and 32 Outputs while the 81409 I/O Block is used for 8 Inputs and 15 Outputs.
7. Wire the animal behavior hardware devices to the 81508 or 81409 I/O modules. General wiring guidelines are provided below. Refer to any additional wiring information that may have been supplied with the device itself. Recheck all of the wiring connections to ensure they were properly made.
8. One or more model number 83619(\*C), 28 VDC power supplies may be needed for your system. Each supplies 2 amps of current and may be connected to the power jack on the starter interface or on any expansion interface.
9. Before turning the power supply(s) ON, the order of power up should be:
10. Power on the computer.
11. Start the ABET software.
12. Power on the interfaces with the 28 VDC power supply(s).

## ABET II Users Manual

### Appendix A – ABET Hardware

#### Wiring Guidelines for ABET Model 81409 and 81508 I/O Blocks

Chamber components may be wired in any order to the I/O Connection Blocks, however, it is much easier to complete the Hardware Configuration when all chambers are wired the same. A few “standard” connections are listed below.

#### **Inputs:**

- First or Left Response Lever – Input 1
- Second or Right Response Lever – Input 2
- Omnidirectional lever or shaping push button – Input 3

#### **Outputs:**

##### Without Intensity Control:

- First or Left Stimulus Light – Output 1
- Second or Right Stimulus Light – Output 2
- Pellet Dispenser – Output 3
- Liquid Dispenser – Output 4

##### With Intensity Control:

- Outputs 1,2,3
- Outputs 4,5,6
- Output 7
- Output 8

#### **Wiring Connections:**

Four rows of terminal screws are provided on the 81508 and 81409 I/O Connection Blocks. Inputs and Outputs are numbered with one terminal screw for each control line. The tall block of terminal screws behind the inputs are for connecting ground wires. The tall block of terminal screws behind the outputs are for connecting +28 V DC. Model 81409 is shown below.

