

# **CTRIO WORKBENCH**

## **CONFIGURING OUTPUTS**

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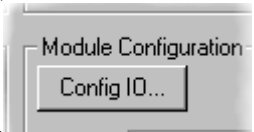
## Configure I/O Dialog Overview

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The **Configure I/O** dialog box (pictured below) is where input and output functions are assigned to the module. The choice of input and output functions determines which options are available.

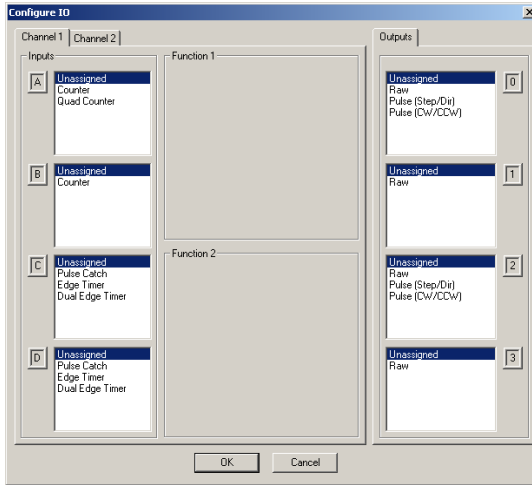
The input and output function boxes prompt you with selections for supported functions. The configuration software allows only supported selections.

For **DirectLOGIC** users, click on the “**Config IO...**” button to arrive at a dialog box shown below. Notice that the window has a tab for each input Channel. Remember that the **H0-CTRIO(2)** only has one input channel (left graphic).

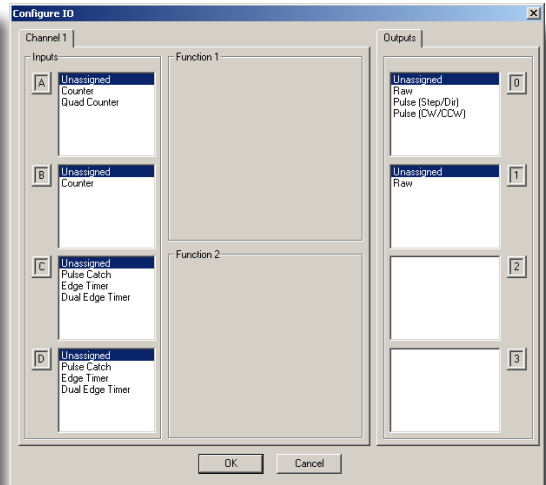


**NOTE:** You do not have to be in **PROGRAM** mode to enter the **Configure IO** dialog box, however you must be in **PROGRAM** mode to write the configuration to the **CTRIO(2)** module.

**H2, H4, T1H-CTRIO, H2-CTRIO2**  
**Configure I/O Dialog**



**H0-CTRIO(2)**  
**Configure I/O Dialog**



The input options are listed by function. Four boxes labeled A, B, C, and D correspond to the input terminals on the face of the module (1A-1D or 2A-2D; A-D for the H0-CTRIO(2)). The Output functions are listed as 0, 1, 2, and 3. These numbers correspond to the markings on the module output terminals [(Y0-Y3)(C0-C3); Y0-Y1 for the H0-CTRIO(2)].

- DL**
- Win**
- NI**

Be sure to write the changes to the module from Workbench when the configuration is complete. For example, you might click on **Pulse(step/dir)** in the “0” box, then **OK** to return to the main Workbench window. Once you arrive back at the main window, you must click **Write Module** to save your selection to the module. The module will need to be in Program Mode to perform the **Write Module** operation. If you do not perform the **Write Module** operation (or a **Write File** operation) any configuration changes you made will be lost upon quitting Workbench. This applies to all changes to the module configuration.

## Output Function Selections

### Supported Functions

The module supports four output functions (five if CTRIO2):

- Raw: The control program has simple ON/OFF control of the output.
- Pulse (Step/Direction): Use for motor control. The control program sends profiles or calls stored profiles that define the movements.
- Pulse (CW/CCW): Use for motor control. The control program sends profiles or calls stored profiles that define the movements.
- Discrete Ch(1,2)/Fn(1,2): CTRIO(2) has precision ON/OFF control of the output, determined by:
  - a. Preset Table: ON/OFF as events of a preset table occur. Preset table monitors a counter input. Presets occur in order only.
  - b. Programmable Limit Switch (PLS): ON/OFF depending on current region in the table. PLS monitors a counter input.
  - c. Pulse Catch: Precise ON/OFF of an output as an input pulses ON or OFF.
  - d. Level Mode: Only available on a counter input that is scaled to a rate. Similar to a PLS, but only offers one threshold. Also offers a deadband.
- (CTRIO2) Discrete on Pulse Out (0/1; 2/3) has precision ON/OFF control of the output, determined by:
  - a. Preset Table: ON/OFF as events of the preset table occur. Preset table monitors a pulse output position. Presets occur in order only.
  - b. Programmable Limit Switch (PLS): ON/OFF depending on current region in the table. PLS monitors a pulse output position.

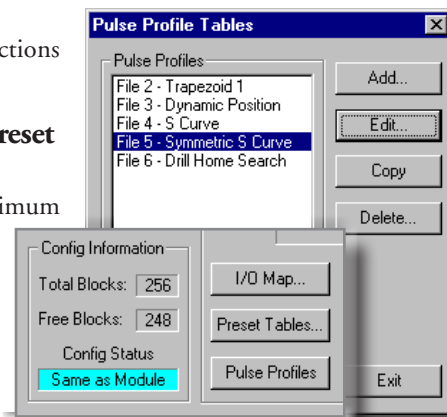


Each function uses one or two output terminals for making connections to field devices (plus a common). Combinations of the listed functions are possible. The configuration dialog allows only supported configurations.

The following pages describe the function selections available in the **Config I/O Outputs** panel.

### CTRIO Memory Usage: Pulse Profiles and Preset Tables

CTRIO configuration software can create a maximum of 255 predefined Pulse Profiles. Pulse Profiles available is 255 minus the number of predefined Preset Tables. Pulse Profiles and Preset Tables are saved as File 1 through File 255. The module has 256 Total Blocks of memory allocated for Pulse Profiles and Preset Tables usage.



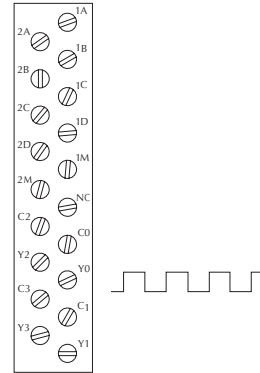
## Raw Output

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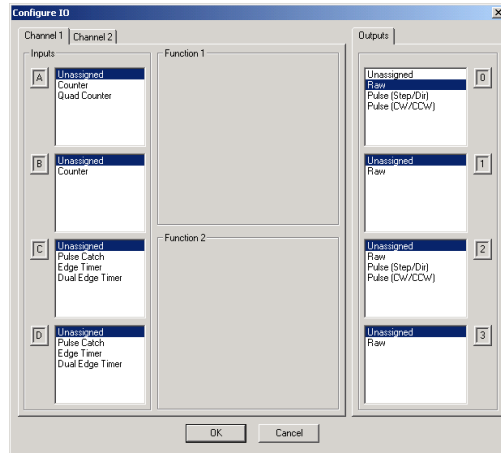
The CTRIO(2) module supports a Raw output mode that allows the CPU/controller program to have direct access to the module output points. Each output can be configured for Raw output mode and each will have a unique control bit.

**NOTE:** To insure proper operation, the field device wiring and the configuration must be compatible. For wiring information see Chapter 3.



Refer to (A-6) *Output Control Bit Definitions (Raw Mode)* in Appendix A for Raw output control bit addressing.

The module's output terminals are represented by the 0, 1, 2, and 3 boxes (0 and 1 for the H0-CTRIO(2)) along the right side of this dialog box.



## Discrete Outputs

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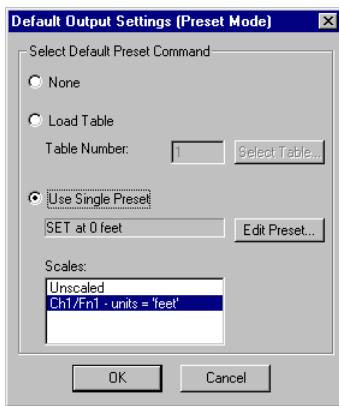
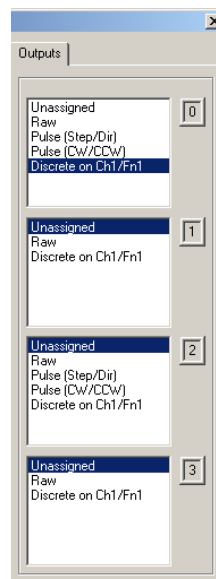
The H0-CTRIO(2) modules have two discrete outputs (Y0-Y1), all other CTRIO(2) modules have four discrete outputs numbered Y0-Y3 (C0-C3). When the Discrete option is selected, a variety of functions can be assigned to the output: Single Preset, PLS, Preset Table, Level Mode or Pulse Catch. Each function is described on the following pages.

### Creating and Using a Single Preset

The outputs can respond to presets assigned by the user in the **Configure IO** dialog.

The four outputs can all be assigned to one function, or they can be grouped within functions and within channels in any manner selected by the user.

To assign single output presets, begin by selecting the Output on the **Configure IO** dialog. The outputs are identified based on terminal number. In the example to the right, output terminal “0” is designated for a discrete output, i.e. Discrete on Ch1/Fn1 counter.



Once the output selection is made, a **Preset** button appears on the **Configure IO** dialog. The button is labeled as shown.

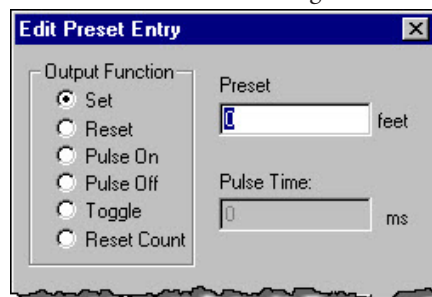


The leading numeral represents the number of the output terminal. Clicking on the **Preset** button causes the **Default Output Settings** dialog to pop up (on left). Default settings are loaded on power-up.

On the **Default Output Settings** dialog, select “**Use Single Preset**”. We will discuss Preset Tables later in this chapter. Now, click **Edit Preset** to arrive at the **Edit Preset Entry** dialog.

Six output functions are available (as shown in the figure below). Set the **Preset** value in engineering units if the signal has been scaled or in raw count if the signal has not been scaled. Refer to Chapter 5 for a discussion on scaling. **Pulse On** and **Pulse Off** require a **Pulse Time** setting. The **Pulse Time** is set in ms (1 sec = 1000 ms).

Output Function Definitions	
Set	Writes output ON (maintained)
Reset	Writes output OFF
Pulse On	Writes output ON for specified time
Pulse Off	Writes output OFF for specified time
Toggle	Changes state of output
Reset Count	Resets the count to Reset Value



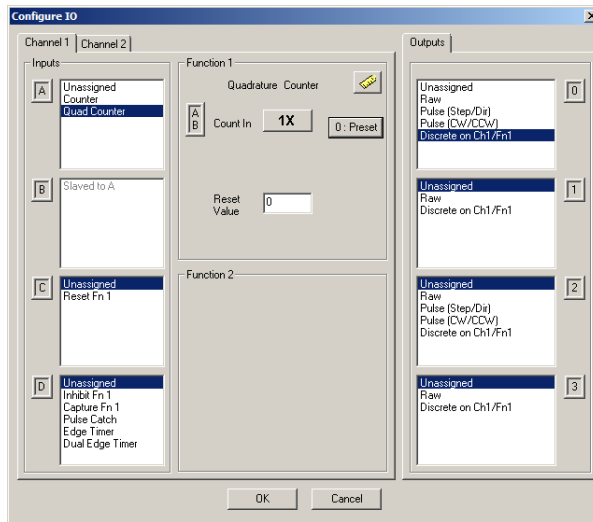
### Creating and Using the Programmable Limit Switch (CTRIO2 only)

A Programmable Limit Switch (PLS) is a discrete output table used to turn an output ON or OFF at multiple points across an input's range.

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- ✓ NI

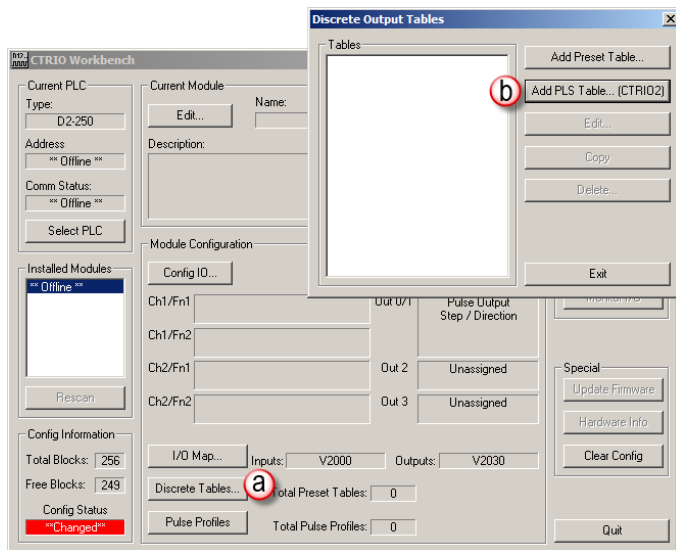
The PLS function is only available in the CTRIO2 modules. A PLS table must be created in the CTRIO2 module configuration. Once created, it can be edited using the configuration application.

To use a PLS table, an output must be configured as a discrete output paired with a counter or timer input function. For example, Channel 1 inputs A and B could be configured for quadrature counting, which would be Channel1 Function1. Output 0 could be configured as Discrete on Ch1/Fn1. When a PLS table is loaded for Output 0, the CTRIO2 module will monitor the input value for Ch1/Fn1 (Channel1 quad counter) and Output 0 will be the output turned ON and OFF by the table.

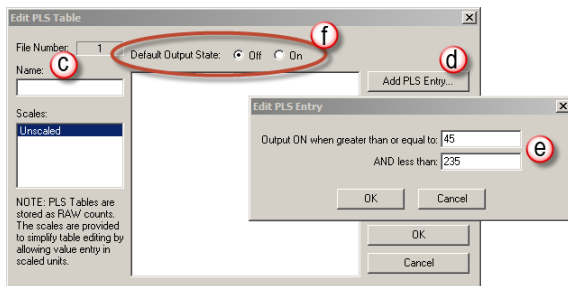


**NOTE:** Since a CTRIO2 Output's function is fixed in the configuration, an output cannot be changed programmatically to reference a different input function. This specific change requires a configuration change and project transfer.

To create a PLS table, click the “Discrete Tables...” button (a) then click the “Add PLS Table... (CTRIO2)” button (b).



Enter a table name in the text box (c), then click OK. Use the buttons on the right to build and modify a PLS table (d). If an input channel has scaling, it will show in the Scales list, and entries can optionally be entered in scaled units after selecting the appropriate entry in the Scales list (e).



The table entries are very simple. Select a default value for the discrete output; the output will be in this state if the input is not within a defined range (f). Add an entry for each range of input values where the output should be in the opposite state.



**NOTE:** Unlike a preset table, events in a PLS table can occur in any order, even simultaneously.

## Creating and Using the Output Preset Tables

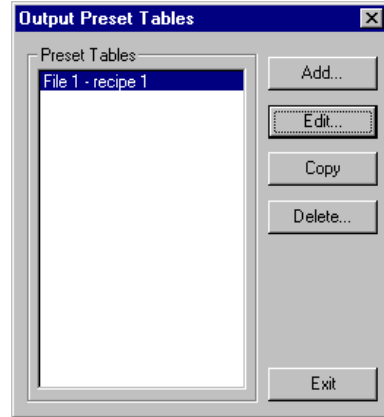
Preset tables can be used on an input configured for a:

- Timer, not scaled
- Quad/counter, not scaled
- Counter, scaled to position.

Click the “Preset Tables...” button on the main Workbench dialog. This will open the **Output Preset Tables** dialog.

To create a new table, click the “Add...” (or “Edit...”) button. This will open the Edit Preset Table dialog.

Build a Preset Table by adding preset entries one at a time. Click the **Add Preset...** (or “Edit Preset...”) button to open the Edit Preset Entry dialog.

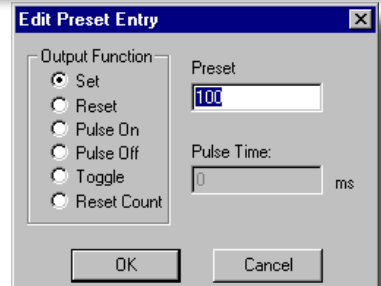
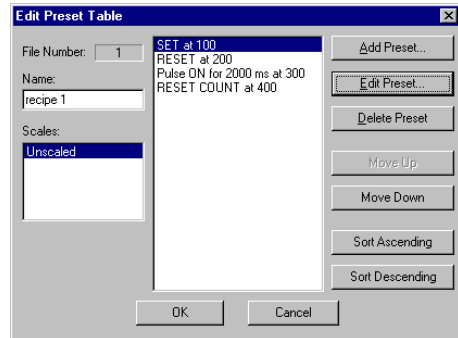


**NOTE:** The preset tables work similar to an event drum, not a programmable limit switch. For example, in the Edit Preset Table dialog below, the output is SET at count 100. Once the output is SET, if the count drops below 100, the output will not go OFF, it will remain SET. Once a step is complete, the focus is on the next step and that step only.

On the **Edit Preset Entry** dialog, select one of the six Output Functions. Set the preset value in engineering units if the signal has been scaled. Set the preset value in raw count if the signal has not been scaled (Scaling is discussed in Chapter 5, 5-9). Pulse On and Pulse Off require a Pulse Time setting. During the Pulse Output Time the table will be paused at the current table entry. The next table entry will not be evaluated until after the Pulse Output Time expires.

The Pulse Time is set in ms (1,000 ms = 1 sec). For the description of the Output Functions see page 6-3.

To set a particular table as the default table, use the Default Output Settings dialog described on page 6-5.





## Using the Discrete Outputs in Level Mode

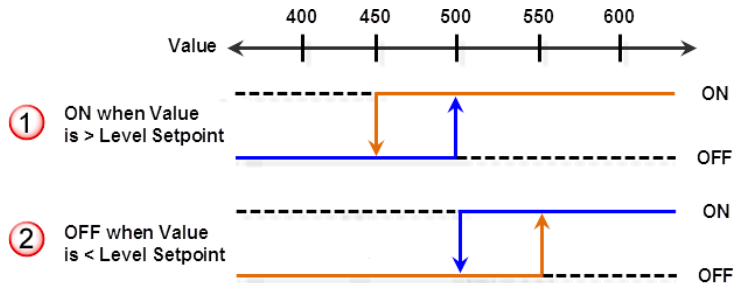
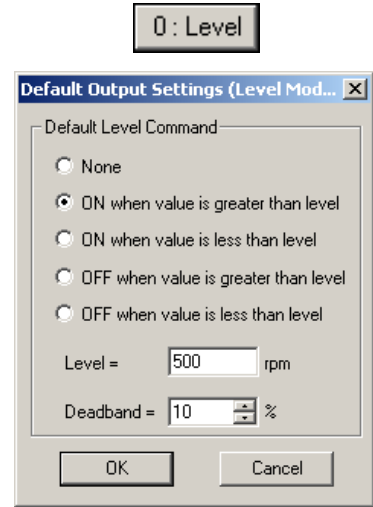
If a Counter or Timer function is scaled to produce a rate, alarm level settings can be used to trigger discrete outputs at values predetermined by the user.

Click the **Level** button on the Configure IO dialog. This will open the **Default Output Settings (Level Mode)** dialog box. The alarm level is set within this panel.

Also, a deadband percentage (in tenths of a percent) can be set to prevent the output from changing too frequently (chattering) near the Rate Level threshold.

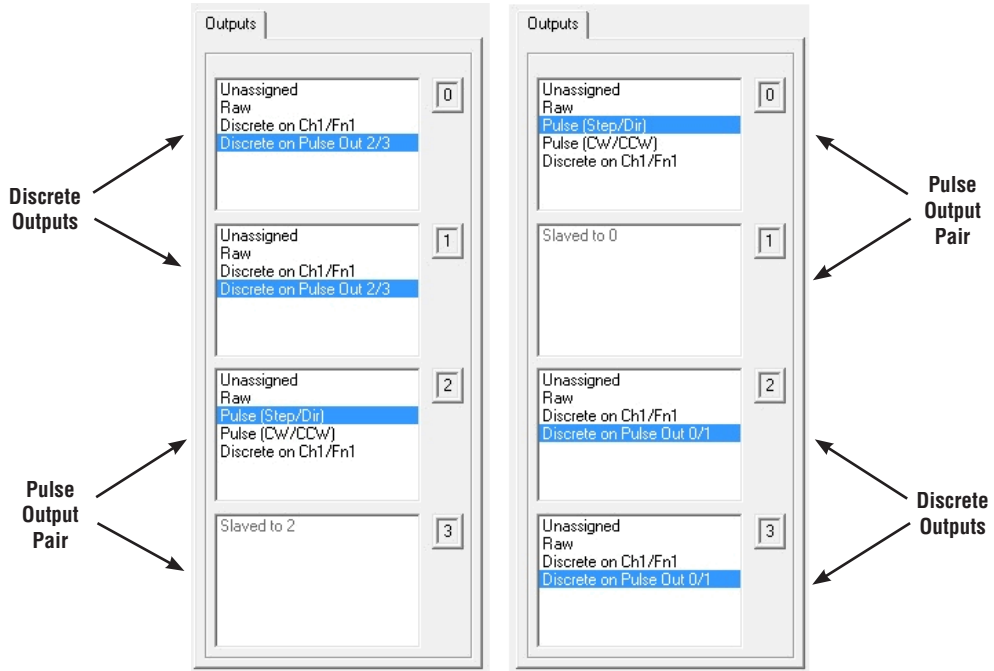
**“ON when value is greater than level”** example: Consider a Discrete Output set to turn ON when greater than 500 rpm and deadband is set to 10%. The output will turn ON when the level rises above 500 rpm. Due to the 10% deadband, the level must fall below 450 rpm to turn back OFF. See example 1 below.

**“OFF when value is less than level”** example: Consider a Discrete Output set to turn OFF when less than 500 rpm and a deadband set to 10%. When the level drops below 500 rpm, the output turns OFF. Due to the 10% deadband, the level must rise above 550 rpm for the output to turn back ON. See example 2 below.



### Using the Discrete Output For Pulse Output Function

Discrete on Pulse Out “x/x” is available on any CTRIO output, but only if there is an output pair (i.e. Out0/Out1 or Out2/Out3) configured for Pulse Output. Discrete on Pulse Out “x/x” allows the output to be used in conjunction with the other pulse output pair and a discrete output table. In other words, the Discrete Output state is determined by the Pulse Output position value in a preset table. This works just like the Discrete Output On Chx/Fnx function mentioned previously with the exception that the Preset or Level buttons are not supported.



## Pulse Outputs

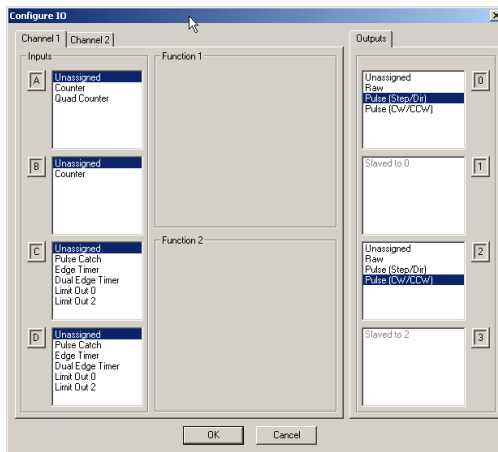
The CTRIO module offers two axes of motion control (Y0 and Y1 as an axis and/or Y2 and Y3 as an axis). The H0-CTRIO(2) has one axis of motion control (Y0 and Y1). The outputs can be configured for CW/CCW, or step and direction operation. The outputs respond to profiles defined by the user and called by the user control program. The following pulse profiles are supported:



- Trapezoid
- S-Curve
- Symmetrical S-Curve
- Dynamic Positioning
- Dynamic Velocity
- Home Search
- Free Form
- Dynamic Positioning Plus (CTRIO2)
- Trapezoid Plus (CTRIO2)
- Trapezoid w/ Limits (CTRIO2)
- Velocity Mode<sup>1</sup>
- Run to Limit Mode<sup>1</sup>
- Run to Position Mode<sup>1</sup>



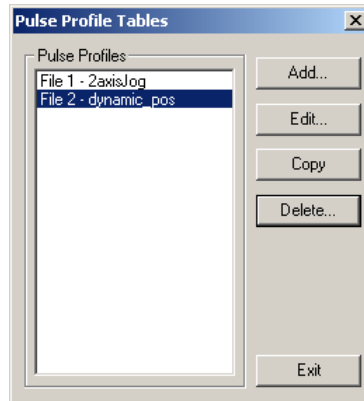
**NOTE 1:** There are three additional pulse profiles that are available but are not created using the Pulse Profile Tables. These profiles: Velocity Mode, Run to Limit Mode and Run to Position Mode, are discussed at the end of this chapter. For details on setting up and using the Pulse Outputs see Chapter 9 “Output Functions”.



### Creating Pulse Profiles

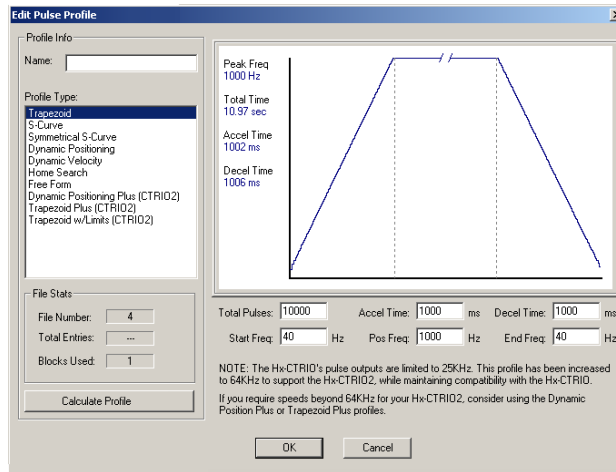
Click the **Pulse Profiles** button on the main Workbench dialog box. This will open the **Pulse Profile Tables** dialog. To create a new profile, click **Add** (or **Edit**).

Pulse Profiles



This will open the **Edit Pulse Profile** dialog.

On the **Edit Pulse Profile** dialog, select one of the ten **Profile Types**.



This dialog is used to name and define the pulse profile parameters. The various parameter fields contain typical default values however, any valid parameter entries can be entered.