TechNote

Using the CTC Model 5100 Optional High-Speed Inputs

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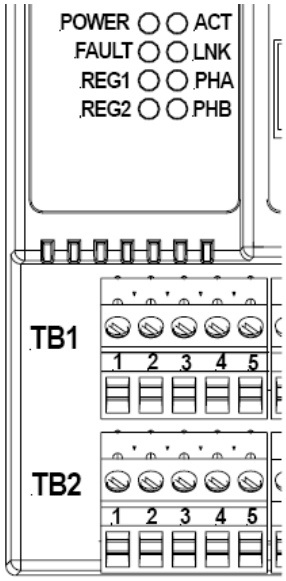
CTC's Model 5100 controllers offer an optional high-speed input option. These inputs allow you to have up to two high-speed counters and two registration inputs or to use them as general purpose inputs.

The Model 5100 high-speed input option is included in the 5102 and 5104 models only. The inputs include two differential 5V inputs that can be used as quadrature encoder inputs or two individual 5V differential input counters (no direction). There are also two single-ended 24-Volt inputs that can be used as registration inputs when using the 5V inputs as an encoder.

The inputs on the model 5100 are accessed using the leftmost terminal blocks where the input power and 5V output are located.



Power and input terminations

TB1-1	+VS Input
TB1-2[2]	REG1
TB1-3[2]	+PHA
TB1-4[2]	+PHB
TB1-5	+5 VDC Output
TB2-1	VS Return
TB2-2[2]	REG2
TB2-3[2]	-PHA
TB2-4[2]	-PHB
TB2-5	VS Return

Using the High-Speed Inputs in Your Program

Standard Input Usage

If you are using these as standard inputs in your program, you can use the symbol browser to define them as inputs 997 through 1000 as follows.

PHB +/-	Input 997
PHA+/-	Input 998
Reg1	Input 999
Reg2	Input 1000

When using the high-speed inputs as counter(s) or registration inputs, use the following registers:

High-speed Counters and Registration

High-speed Counters

Register	Function
5001	Internal High-speed Counter 1 (for Dual counters, only Counter for Quadrature mode): R/W
5002	Internal High-speed Counter 2 (for Dual counters, not used in Quadrature mode): R/W
5011	Internal High-speed Counter 1 Speed: R
5100	Internal High-speed Counter Mode, 0 = Quadrature, 1 = Dual Counters: R/W
5101	Internal High-speed Counter Frequency Period: R/W
5102	Internal High-speed Counter Frequency Value: R

Registration

Register	Function
5103	Internal Registration 1 Start Value (Compare to counter 1): R/W
5104	Internal Registration 1 Window Size: R/W
5105	Internal Registration 1 Capture Value (from Counter 1): R
5106	Internal Registration 1 Status, 0 = Armed, 1 = Captured: R/W
5107	Internal Registration 2 Start Value (Compare to counter 1): R/W
5108	Internal Registration 2 Window Size: R/W
5109	Internal Registration 2 Capture Value (from Counter 1): R
5110	Internal Registration 2 Status, 0 = Armed, 1 = Captured: R/W

Register 5100 allows you to set the counter inputs as either quadrature (standard encoder inputs), or as dual counters. When 5100 is set to a value of 0, your encoder value will be available for R/W in register 5001. If you set 5100 to a value of 1 (dual counter mode), the count value of the first input (channel PBA, CNT1, or DIN1) will be available in register 5001. The count value of the second input (channel PHB, CNT2, or DIN2) will be available in register 5002.

Both Registration inputs 1 and 2 will take a snap shot of register 5001 and store it in Capture Value Registers 5105 and 5109 respectively once the inputs are armed. Storing a value of 0 in Internal Registration 1. Status Register 5106 will arm Reg1 while storing a value of 0 in Internal Registration 2 Status Register 5110 will arm Reg2.

Note that both registration inputs take a snap shot of the current count value of 5001 only (even when dual count mode is enabled).

Once the armed registration inputs have been triggered, their status registers 5106 and 5110 will read a value of 1 and will need to be armed again to enable Reg1 and Reg2 inputs.

You can limit the window of when the Reg1 will be allowed to trigger based on the value of 5001. This is done using the Internal Registration Start Value Registers 5103 and 5107 and the Internal Registration Window Size Registers 5104 and 5108.

Example

The following code is a web example used to determine material stretch. It uses the counter inputs as a quadrature counter. Both Registration inputs are armed and allowed to trigger when the encoder is between count values 100000 for Reg1 and between 60000 and 110000 for Reg2. The values are then subtracted and compared to an expected value to determine how much the material has stretched.

```
[1] Initilize
    ;;; Set the Counter Mode to quadrature (store 0 to Reg 5100)
    ;;; Reset the Counter to 0 (store 0 to Reg 5001)
    ;;; Set the Registration Window between 50000 and 100000 for Reg1
    ;;; (store 50000 to Reg 5103 and 50000 to Reg 5104)
    ;;; Set the Registration Window between 60000 and 110000 for Reg2
    ;;; (store 60000 to Reg 5107 and 50000 to Reg 5108)
    ;;; Arm both Registration Inputs
    ;;; (store 0 to both Reg 5106 and 5110)
    ------------------------------------------------------------------------------
    <NO CHANGE IN DIGITAL OUTPUTS>
    ------------------------------------------------------------------------------
    store 0 to Counter_Mode_R5100
    store 0 to Internal_Counter1_R5001
    store 50000 to Registration1_Window_Start_R5103
    store 50000 to Registration1_Window_Size_R5104
    store 60000 to Registration2_Window_Start_R5107
    store 50000 to Registration2_Window_Size_R5108
    store 0 to Reg1_Status_Reg_5106
    store 0 to Reg2_Status_Reg_5110
    goto Wait_for_Trigger

[2] Wait_for_Trigger
    ;;; Wait for both Registration inputs to trigger and then goto Calculate_Stretch.
    ;;; If the counter goes to far without seeing the registration inputs goto the
    ;;; Error step to handle the error.
    ------------------------------------------------------------------------------
    <NO CHANGE IN DIGITAL OUTPUTS>
    ------------------------------------------------------------------------------
    store Reg1_Status_Reg_5106 and Reg2_Status_Reg_5110 to Both_Triggered_R1
    if Both_Triggered_R1=1 goto Calculate_Stretch
    if Internal_Counter1_R5001 >=120000 goto Error
    goto Wait_for_Trigger

[3] Calculate_Stretch
    ;;; Subtract the two Registration inputs and then continue
    ;;; your process after that.
    ------------------------------------------------------------------------------
    <NO CHANGE IN DIGITAL OUTPUTS>
    ------------------------------------------------------------------------------
    store Reg2_Capture_Value_R5109 - Reg1_Capture_Value_R5105 to Calculated_Stretch_R2
    store Expected_Stretch_R701 - Calculated_Stretch_R2 to Stretch_Error_R3
    goto Continue_Process

[4] Error
    ;;; Here is where you would set any alarms and deal with the error.
    ------------------------------------------------------------------------------
    Alarm_Out_15
    ------------------------------------------------------------------------------
    store 5 to Error_Tracking_R100
```