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Counter (Encoder) Input
Specifications & Installation Guide

July 27, 2011

Configuration:

___PCI-CTR05 (5 Counters) P/N

___PCI-CTR10 (10 Counters) P/N

___PCI-CTR20 (20 Counters) P/N

___USB-4301 (5 Counters) P/N

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Contents

1 Specifications

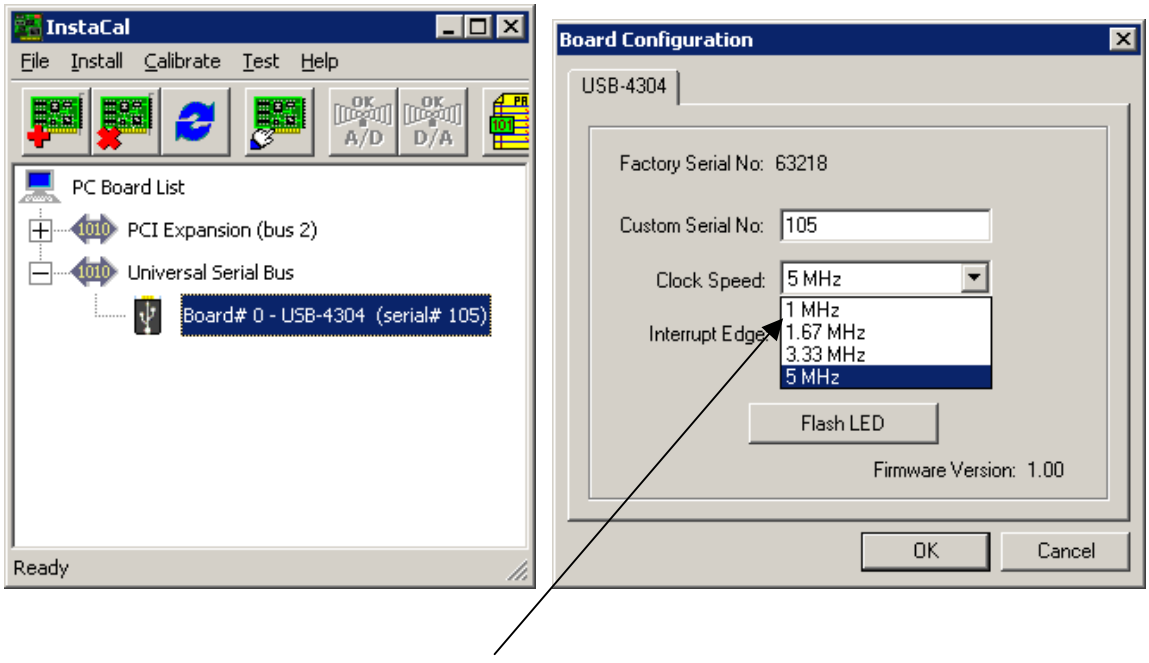
- Compatibility: 5V/TTL
- Clock input frequency: 6.8 MHZ max (145 nS minimum period)
- Clock input minimum pulse width: 70 ns
- Voltage for low input: -0.5 V min, 0.8 V max
- Voltage for high input: 2.2 V min, Vcc max
- Crystal oscillator frequency: 10 MHz
- Frequency accuracy: 50 ppm

2 Installation

2.1 Installation Procedure USB-4301

This section assumes that the PCI TLAser400 Interface Card and Total Vu software are installed, a scanner is connected and calibrated, and a measurement is defined. Refer to the *Total Vu Operator's Manual* for further details.

1) Install the InstaCal Software by browsing to the InstaCal folder in **"C:\Program Files\LaserLinc\Total Vu"** or the Total Vu CD "***\InstalCal***" and executing "D:\InstaCal\icalsetup.exe".
2) Connect the USB cable from the USB-4301 to any PC USB connection.
3) Windows will detect a new Plug-N-Play device. Wait until the message says "*Ready to Use*".
4) Execute the InstaCal software. **INSURE THE USB-4301 IS DETECTED BY INSTACAL.**
5) **IMPORTANT** - Double click on the entry USB-4301
   Select "*Clock Speed*" pull-down menu, and change to *1 MHz*, click "*OK*".

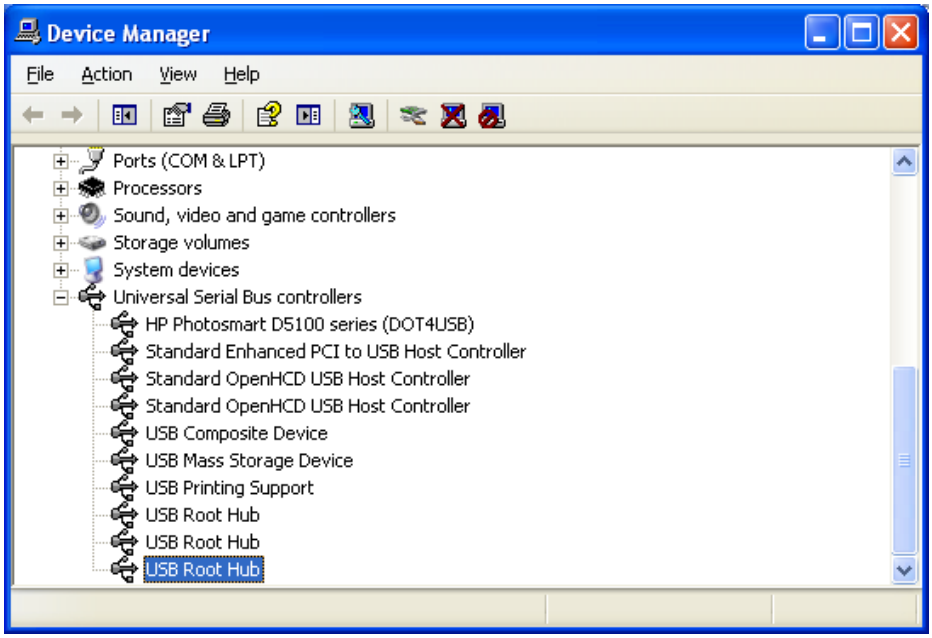


Select 1 MHz Clock Speed

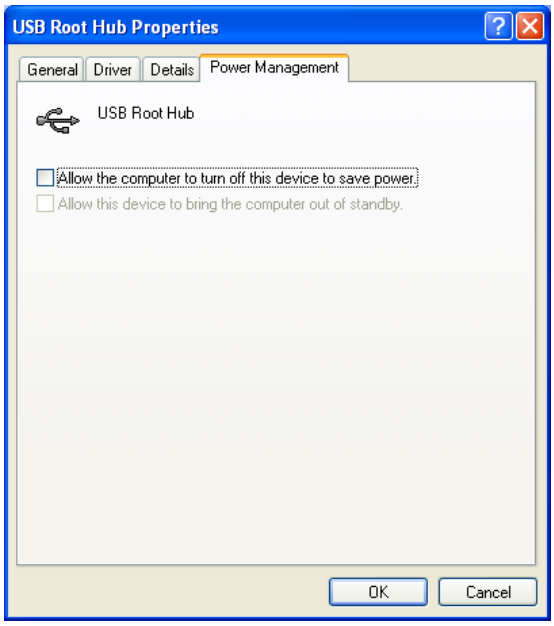
6) Exit InstaCal.

7) Disable USB Power Management

Enter Windows Device Manager - Select *START\CONTROL PANEL\SYSTEM*, Select *HARDWARE* tab, select *Device Manage*r, select *Universal Serial Bus Controller*



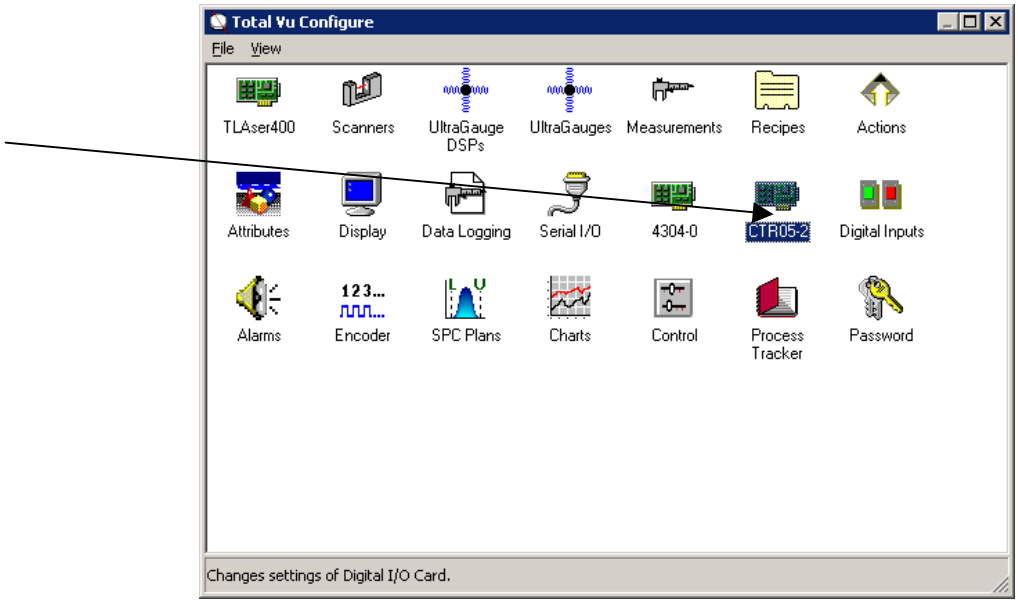
Select *USB Root Hub, Power Management* tab – uncheck "Allow the computer to turn off this device to save power" (If there are more than one *USB ROOT HUBS* ,repeat for each occurrence)



2.2 Installation Procedure PCI CTR card

This section assumes that the PCI TLAser400 Interface Card and Total Vu software are installed, a scanner is connected and calibrated, and a measurement is defined. Refer to the *Total Vu Operator's Manual* for further details.

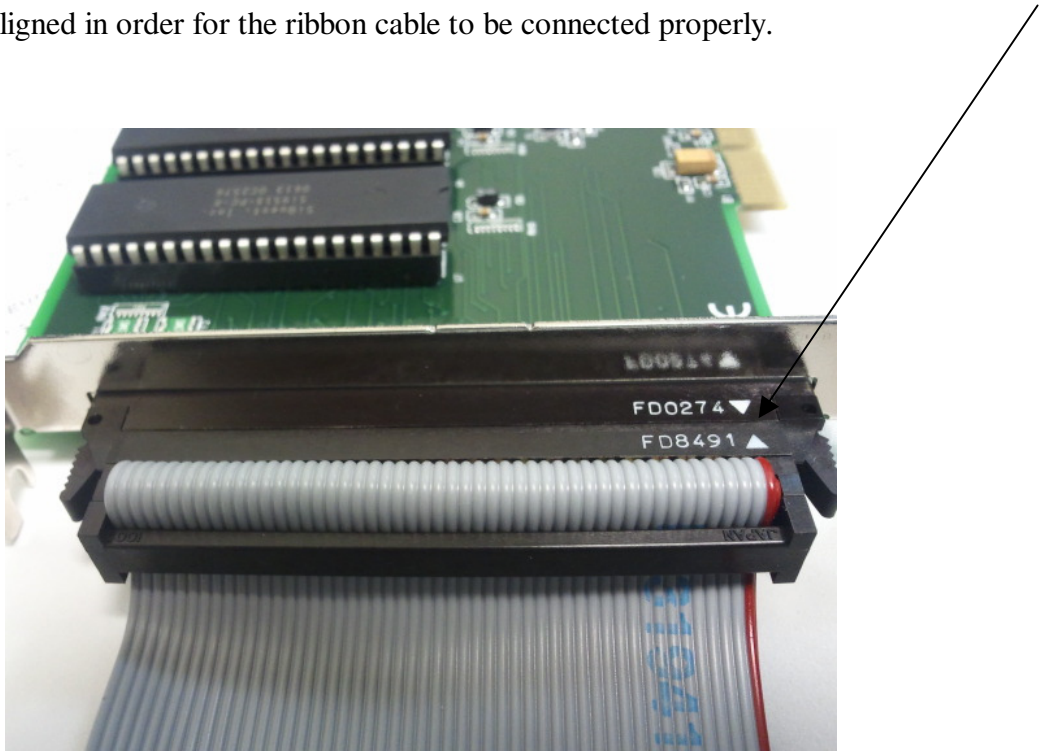
1) Power down the PC.
2) Install the PCI CTR-05/10/20 into any available PCI slot in the PC.
3) Connect the cable from the PTRB to the PC backpanel PCI CTR-05/10/20 connector.
4) Restart computer and boot Windows.
5) Windows will detect a new *Plug-N-Play device*, place the Total Vu CD into the CD drive and let Windows automatically find the driver. Follow the Window's prompts until finished.
6) Install the InstaCal Software by inserting Total Vu CD and executing "D:\InstaCal\icalsetup.exe".
7) After rebooting, execute the InstaCal software; **INSURE THE PCI CTR-05/10/20 CARD IS DETECTED BY INSTACAL**, then exit.
8) Execute Total Vu.
9) Select the *Configure/Full Configuration* screen and verify the appropriate icon; CTR-05/10/20 *icon* now appears.



For the CTR05 connect the 37 pin connector ribbon cable from the CTR05 card to the provided breakout box.

For the CTR10 connect one 37 pin connector ribbon cable from the CTR10 card's external port and to one of the breakout boxes provided. Connect the other 37 pin connector ribbon cable from the port on the inside of the computer on the front of the card, through the back of an empty PCI card slot and to the other breakout box provided.

For the CTR20 read this entire set of directions before you proceed. The connection on the back of the PC is reversible and will destroy hardware if reversed. If you stretch the cable out you will find a connector at each end and a connector at the center. The connectors at each end connect to your breakout box and are not reversible. These can be connected in any order. The connector in the center is shown in Figure 1 connected to the card. There are two arrows labeled FD0274 and FD8491. These arrows must be aligned in order for the ribbon cable to be connected properly.

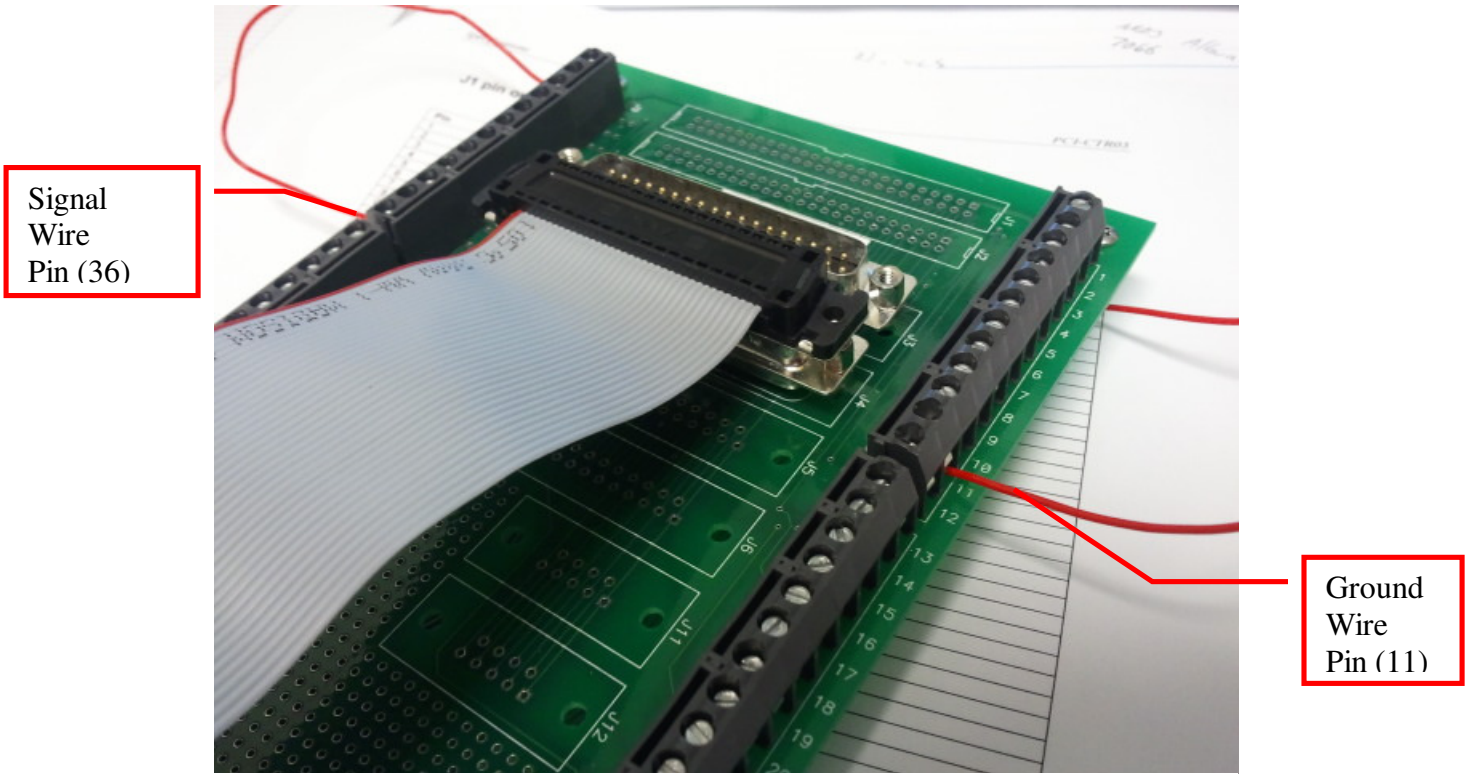


1. **Figure 1 Connector for CTR20 card looking up**

3 Wiring Procedure

3.1 CTR05 Wiring Procedure

The CTR05 has 37 output pins as shown in Figure 2 on the next page. The counter (encoder) inputs for the five (5) counters are signified as CTR1CLK through CTR5CLK. Select one of your counters and wire the signal wire to its respective input pin. Then connect the ground wire to GND (pin 11). For my example I chose counter 1 (CTR1CLK) with Figure 3 giving me pin 36 as my signal input pin. Therefore I have my signal wire running to pin 36 and my ground wire running to pin 11 as shown in Figure 2.



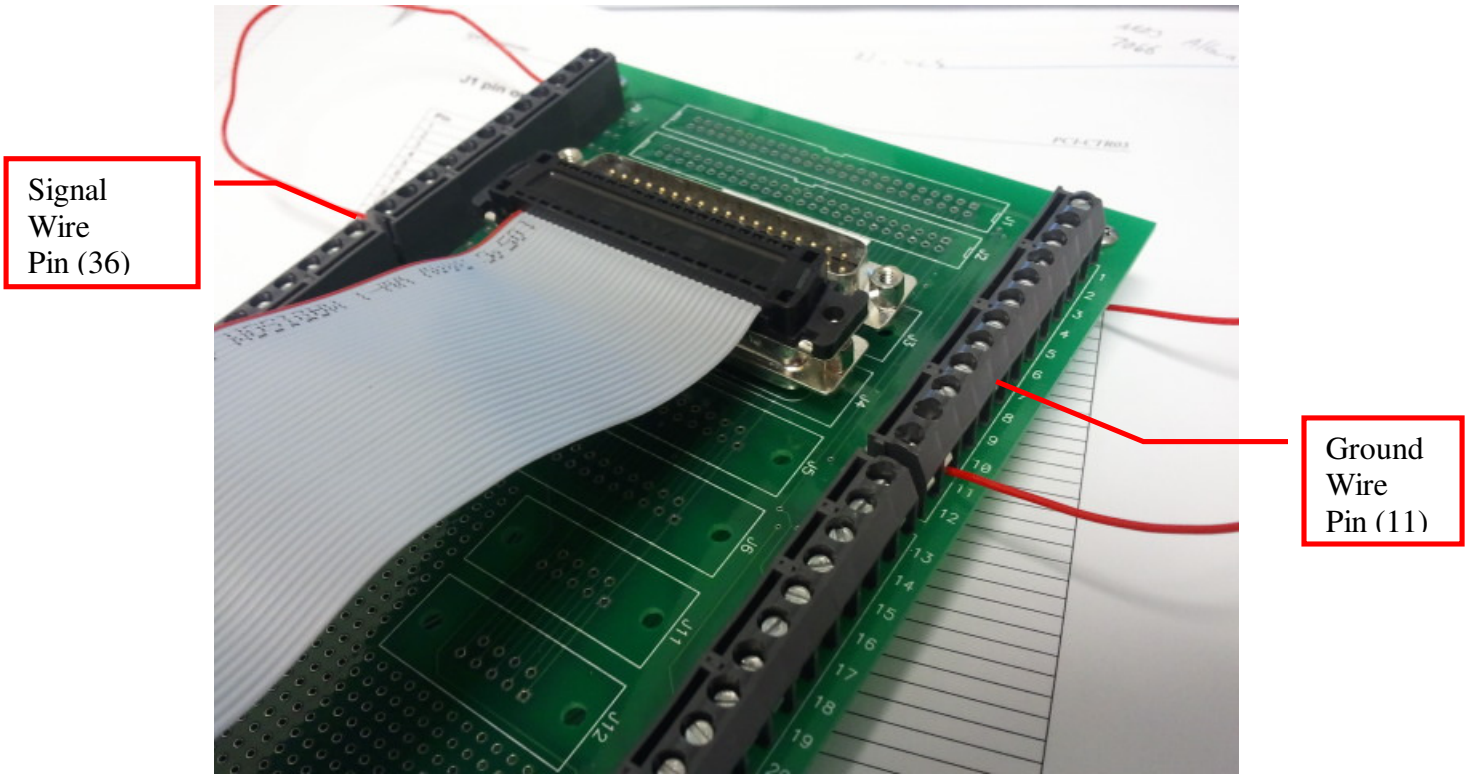
2. Figure 2 Counter Input wiring for Counter One (1)

Pin	Signal Name
1	IRQ INPUT
2	IRQ ENABLE
3	DOUT7
4	DOUT6
5	DOUT5
6	DOUT4
7	DOUT3
8	DOUT2
9	DOUT1
10	DOUT0
11	GND
12	CTR5GATE
13	CTR5CLK
14	CTR4GATE
15	CTR4CLK
16	CTR3GATE
17	CTR3CLK
18	CTR2GATE
19	CTR2CLK
20	PC +5V
21	DIN STROBE
22	DIN7
23	DIN6
24	DIN5
25	DIN4
26	DIN3
27	DIN2
28	DIN1
29	DIN0
30	OSC OUT
31	CTR5OUT
32	CTR4OUT
33	CTR3OUT
34	CTR2OUT
35	CTR1OUT
36	CTR1CLK
37	CTR1GATE

3. **Figure 3 CTR05 Pin Out**

3.2 CTR10 Wiring Procedure

The CTR10 has two breakout boards each using 37 output pins as shown in Figure 5 on the next page. The counter (encoder) inputs for the ten (10) counters are divided between two sets of five (5) counters. The inputs for the counters on board A are signified as CTR1CLK_A through CTR5CLK_A. The inputs for counters on board B are signified as CTR1CLK_B through CTR5CLK_B. Select one of your counters and wire the signal wire to its respective input pin. Then connect the ground wire to GND (pin 11). For my example I chose counter 1 on board A (CTR1CLK_A) with Figure 5 giving me pin 36 as my signal input pin. Therefore I have my signal wire running to pin 36 and my ground wire running to pin 11 as shown in Figure 4.



4. Figure 4 Counter Input wiring for Counter One (1) on Board A

Table 8. P1 pin out (Counter A)

Pin	Signal Name
1	IRQ_A INPUT
2	IRQ_A ENABLE
3	DOUT7_A
4	DOUT6_A
5	DOUT5_A
6	DOUT4_A
7	DOUT3_A
8	DOUT2_A
9	DOUT1_A
10	DOUT0_A
11	GND
12	CTR5GATE_A
13	CTR5CLK_A
14	CTR4GATE_A
15	CTR4CLK_A
16	CTR3GATE_A
17	CTR3CLK_A
18	CTR2GATE_A
19	CTR2CLK_A
20	PC +5V
21	DIN STROBE_A
22	DIN7_A
23	DIN6_A
24	DIN5_A
25	DIN4_A
26	DIN3_A
27	DIN2_A
28	DIN1_A
29	DIN0_A
30	OSC OUT_A
31	CTR5OUT_A
32	CTR4OUT_A
33	CTR3OUT_A
34	CTR2OUT_A
35	CTR1OUT_A
36	CTR1CLK_A
37	CTR1GATE_A

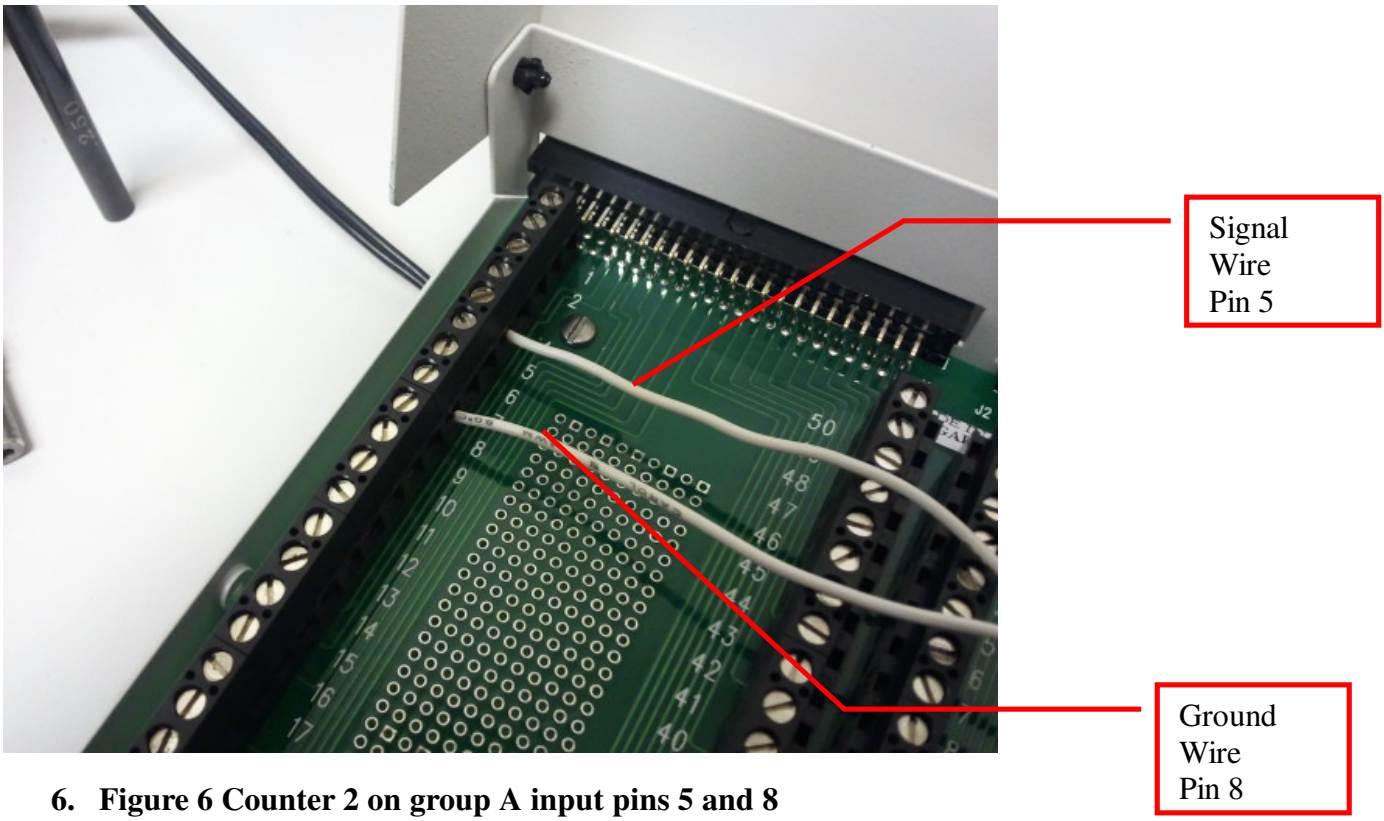
Table 9. P2 pin out (Counter B)

Pin	Signal Name
1	IRQ_B INPUT
2	IRQ_B ENABLE
3	DOUT7_B
4	DOUT6_B
5	DOUT5_B
6	DOUT4_B
7	DOUT3_B
8	DOUT2_B
9	DOUT1_B
10	DOUT0_B
11	GND
12	CTR5GATE_B
13	CTR5CLK_B
14	CTR4GATE_B
15	CTR4CLK_B
16	CTR3GATE_B
17	CTR3CLK_B
18	CTR2GATE_B
19	CTR2CLK_B
20	PC +5V
21	DIN STROBE_B
22	DIN7_B
23	DIN6_B
24	DIN5_B
25	DIN4_B
26	DIN3_B
27	DIN2_B
28	DIN1_B
29	DIN0_B
30	OSC OUT_B
31	CTR5OUT_B
32	CTR4OUT_B
33	CTR3OUT_B
34	CTR2OUT_B
35	CTR1OUT_B
36	CTR1CLK_B
37	CTR1GATE_B

5. Figure 5 CTR10 Pin Out

3.3 CTR20 Wiring Procedure

The CTR20 has 100 output pins as shown in Figure 7 on the next page. The counter (encoder) inputs for the twenty (20) counters are divided between four groups (A through D) of five (5) counters. The inputs for group A are labeled CTR1CLK_A through CTR5CLK_A. The inputs for group B are signified as CTR1CLK_B through CTR5CLK_B. The inputs for group C are labeled CTR1CLK_C through CTR5CLK_C. The inputs for group D are labeled CTR2CLK_D through CTR5CLK_D. Select one of your counters and wire the signal wire to its respective input pin. Then connect the ground wire to any GND. For my example I chose counter 2 on group A (CTR2CLK_A) with Figure 7 giving me pin 5 as my signal input pin. I also chose the GND on pin 8. Therefore I have my signal wire running to pin 5 and my ground wire running to pin 8 as shown in Figure 6.



6. Figure 6 Counter 2 on group A input pins 5 and 8

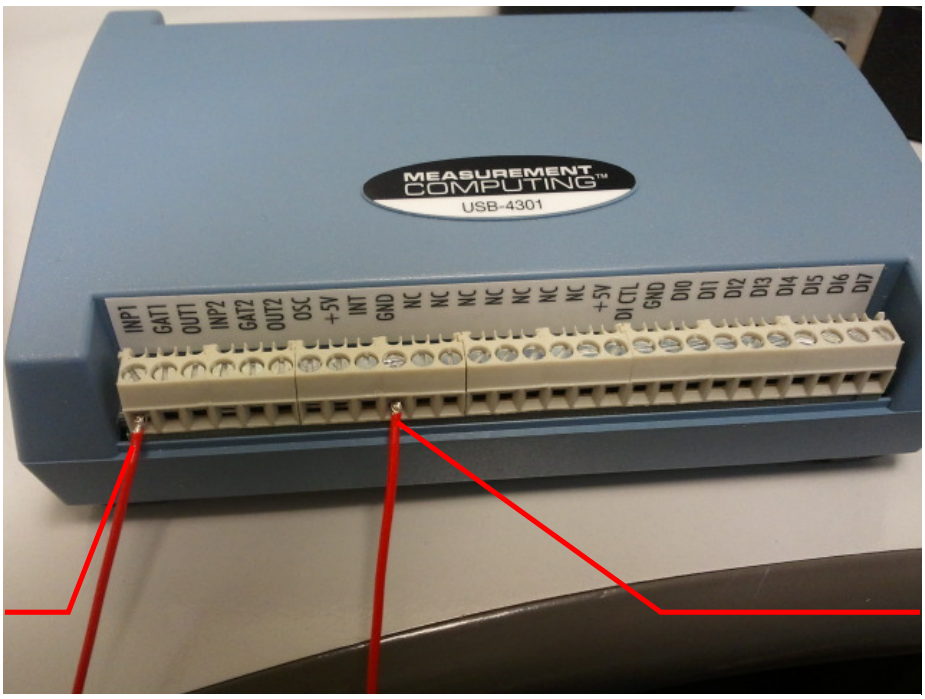
Counter C, D		Counter A, B	
Pin	Signal Name	Pin	Signal Name
100	GND	50	GND
99	PC +5V	49	PC +5V
98	OSC OUT_D	48	OSC OUT_B
97	EXT SRCD_IN	47	EXT SRCB_IN
96	GND	46	GND
95	CTR5GATE_D	45	CTR5GATE_B
94	CTR5OUT_D	44	CTR5OUT_B
93	CTR5CLK_D	43	CTR5CLK_B
92	GND	42	GND
91	CTR4GATE_D	41	CTR4GATE_B
90	CTR4OUT_D	40	CTR4OUT_B
89	CTR4CLK_D	39	CTR4CLK_B
88	GND	38	GND
87	CTR3GATE_D	37	CTR3GATE_B
86	CTR3OUT_D	36	CTR3OUT_B
85	CTR3CLK_D	35	CTR3CLK_B
84	GND	34	GND
83	CTR2GATE_D	33	CTR2GATE_B
82	CTR2OUT_D	32	CTR2OUT_B
81	CTR2CLK_D	31	CTR2CLK_B
80	GND	30	GND
79	CTR1GATE_D	29	CTR1GATE_B
78	CTR1OUT_D	28	CTR1OUT_B
77	CTR1CLK_D	27	CTR1CLK_B
76	IRQCD_IN	26	IRQAB_IN
75	PC +5V	25	PC +5V
74	GND	24	GND
73	PC +5V	23	PC +5V
72	OSC OUT_C	22	OSC OUT_A
71	EXT SRCC_IN	21	EXT SRCA_IN
70	GND	20	GND
69	CTR5GATE_C	19	CTR5GATE_A
68	CTR5OUT_C	18	CTR5OUT_A
67	CTR5CLK_C	17	CTR5CLK_A
66	GND	16	GND
65	CTR4GATE_C	15	CTR4GATE_A
64	CTR4OUT_C	14	CTR4OUT_A
63	CTR4CLK_C	13	CTR4CLK_A
62	GND	12	GND
61	CTR3GATE_C	11	CTR3GATE_A
60	CTR3OUT_C	10	CTR3OUT_A
59	CTR3CLK_C	9	CTR3CLK_A
58	GND	8	GND
57	CTR2GATE_C	7	CTR2GATE_A
56	CTR2OUT_C	6	CTR2OUT_A
55	CTR2CLK_C	5	CTR2CLK_A
54	GND	4	GND
53	CTR1GATE_C	3	CTR1GATE_A
52	CTR1OUT_C	2	CTR1OUT_A
51	CTR1CLK_C	1	CTR1CLK_A

7. Figure 7 CTR20 Pin Out

3.4 USB-4301 Wiring Procedure

The USB-430 has 56 output pins as shown in Figure 9 on the next page. The counter (encoder) inputs for the five (5) counters are signified as INP1 through INP5. Select one of your counters and wire the signal wire to its respective input pin. Then connect the ground wire to GND. For my example I chose counter 1 with my input being INP1 Therefore I have my signal wire running to INP1 and my ground wire running to GND as shown in Figure 8.

Signal Wire INP1



Ground Wire GND

8. Figure 8 USB-4301 Input for counter 1 (INP1 and GND)

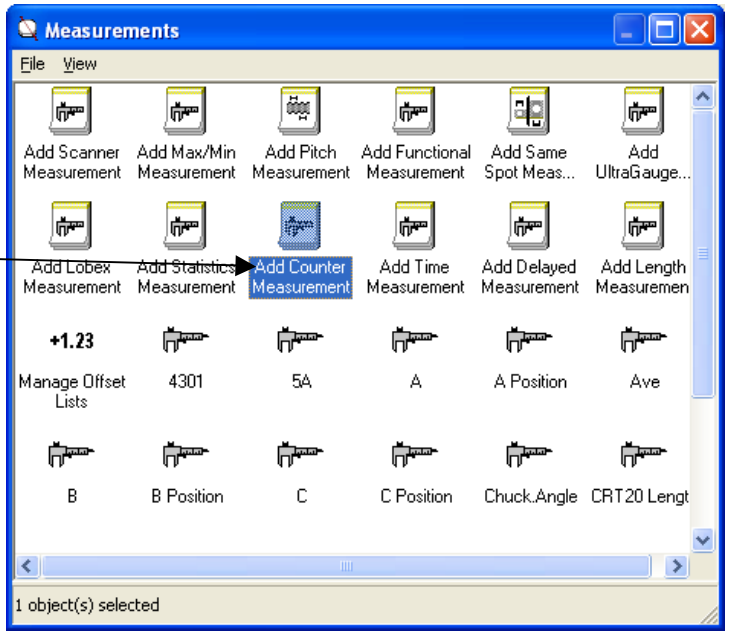
Pin	Signal Name	Pin Description	Pin	Signal Name	Pin Description
1	INP1	Counter 1 input	29	INP3	Counter 3 input
2	GAT1	Counter 1 gate	30	GAT3	Counter 3 gate
3	OUT1	Counter 1 output	31	OUT3	Counter 3 output
4	INP2	Counter 2 input	32	INP4	Counter 4 input
5	GAT2	Counter 2 gate	33	GAT4	Counter 4 gate
6	OUT2	Counter 2 output	34	OUT4	Counter 4 output
7	OSC	Oscillator output	35	INP5	Counter 5 input
8	+5V	+5V output	36	GAT5	Counter 5 gate
9	INT	Interrupt input	37	OUT5	Counter 5 output
10	GND	Ground	38	GND	Ground
11	RSVD	Do not connect	39	RSVD	Do not connect
12	RSVD	Do not connect	40	RSVD	Do not connect
13	RSVD	Do not connect	41	RSVD	Do not connect
14	RSVD	Do not connect	42	RSVD	Do not connect
15	RSVD	Do not connect	43	RSVD	Do not connect
16	RSVD	Do not connect	44	RSVD	Do not connect
17	RSVD	Do not connect	45	RSVD	Do not connect
18	+5V	+5V output	46	RSVD	Do not connect
19	DI CTL	Pull-up/down connection	47	RSVD	Do not connect
20	GND	Ground	48	GND	Ground
21	DI0	Digital input	49	DO0	Digital output
22	DI1	Digital input	50	DO1	Digital output
23	DI2	Digital input	51	DO2	Digital output
24	DI3	Digital input	52	DO3	Digital output
25	DI4	Digital input	53	DO4	Digital output
26	DI5	Digital input	54	DO5	Digital output
27	DI6	Digital input	55	DO6	Digital output
28	DI7	Digital input	56	DO7	Digital output

9. Figure 9 USB-4301 Pin Out

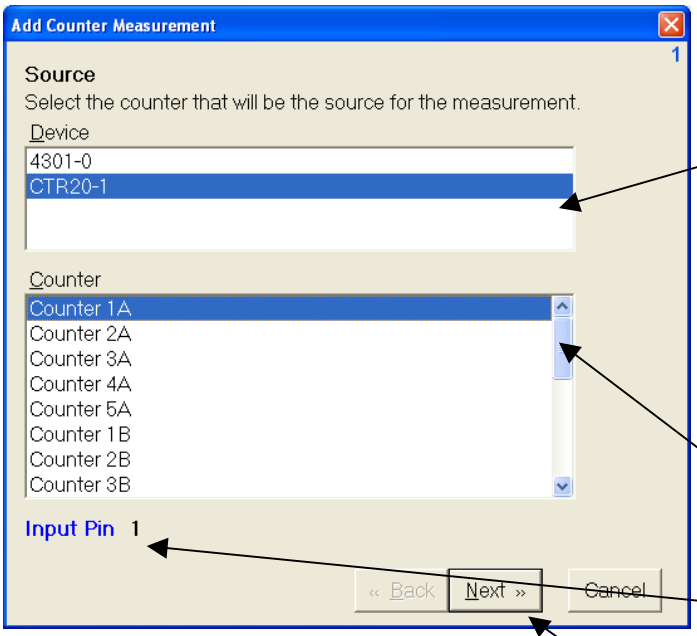
4 Software Configuration

4.1 Create Length Measurement

Identify which counter to which you have connected your signal wires as performed above in section 3. Open Total Vu Configure (Ctrl-C) and double click on 'Measurements' icon. Double click on 'Add Counter Measurement' as shown in Figure 10.



10. Figure 10 Measurements window



11. Figure 11 Add Counter Measurement Window

This will bring up the 'Add Counter Measurement' window as shown in Figure 11. In the first list select the device you will use to collect your encoder pulses (e.g. CTR20-1).

This will bring up the list of counters for your selected device. If you are using a CTR10 or a CTR20 the counters are grouped in two groups (A and B) or four groups (A, B, C and D) respectively. If you plan to make a rate measurement out of this encoder input, ensure that there are two counters available in your desired letter group. Next select one of these identified counters.

As soon as this selection is made Total Vu will tell you which pin your signal wire should be hooked up to.

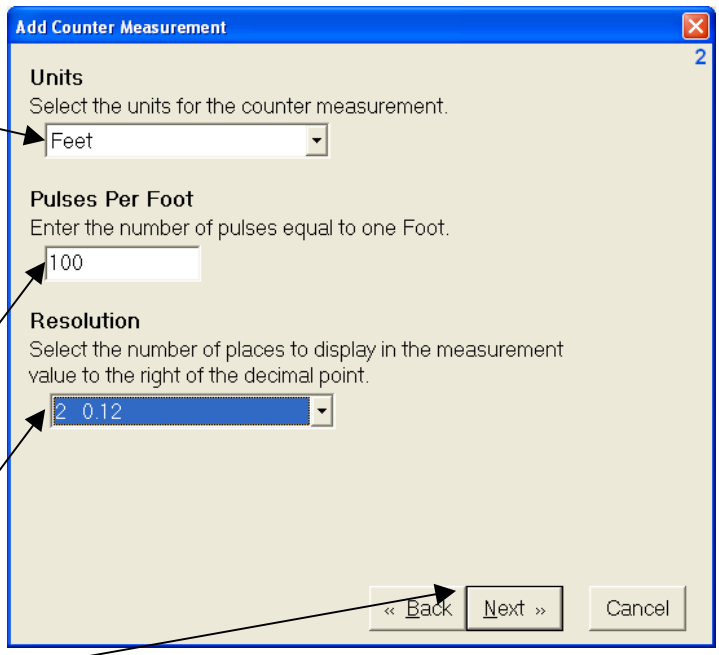
If this pin number confirms your selection push 'Next'.

The next window configures your selected counter to your encoder source as shown in Figure 12. In the first drop down menu select the unit that you would like your encoder readout to display in. This can be any unit of your choosing and does not pertain to your encoder source.

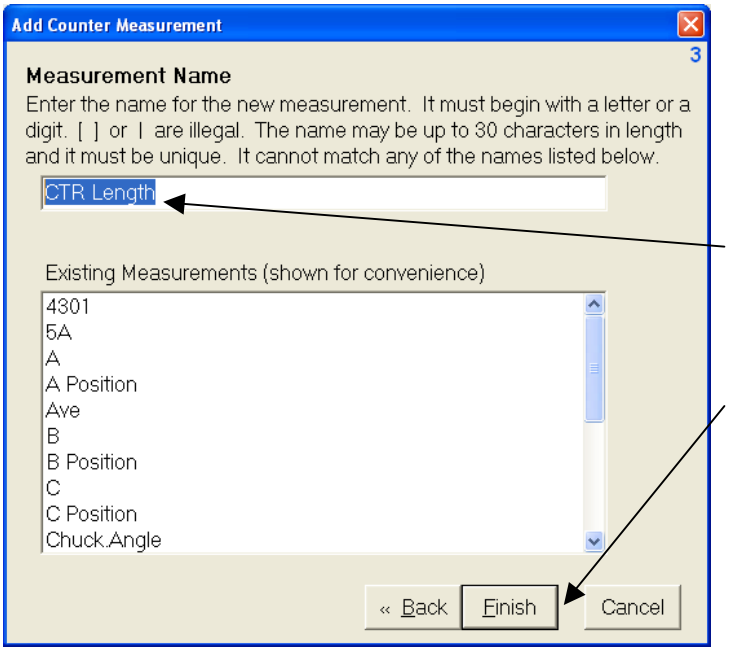
In the next blank you will be required to calculate how many encoder pulses will be generated by your signal source for each of your selected unit above. If you only know pulses per meter (17539 pulses/meter) and yet you want your readout in feet, do a simple conversion. (x 1/3.281 feet/meter = 5346 pulses/foot).

Next select how many decimal places you want displayed on your encoder length readout. Select this number in the drop down menu under 'Resolution'.

Now push 'Next'.



12. Figure 12 Configure Encoder



13. Figure 13 Measurement Name

Our final window allows us to set the measurement name as shown in Figure 13. Come up with a unique yet self-explanatory name representative of the encoder measurement created. This name will be displayed next to your measurement value in any windows or measurement displays. Insert this name in the blank under 'Measurement Name'.

With this name inserted select 'Finish'.

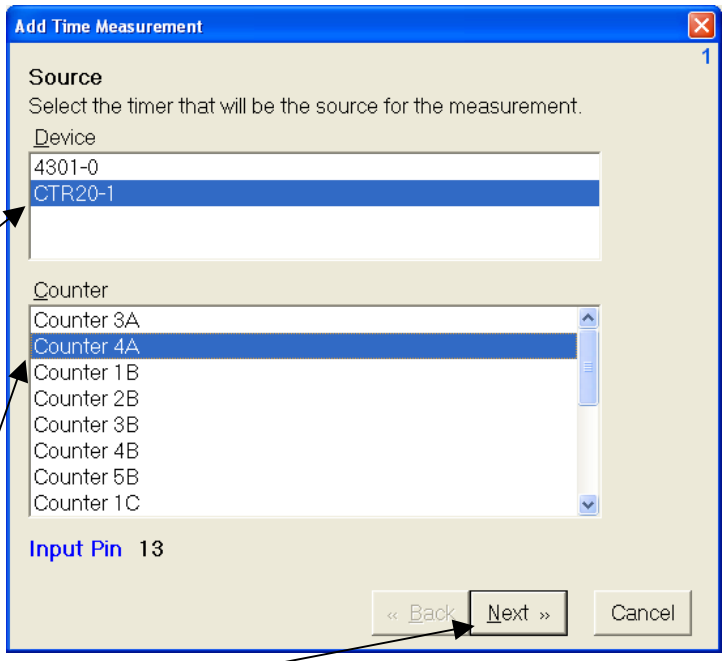
4.2 Create Speed/Rate Measurement

This will require the addition of a time measurement. This is because all rates are defined on a per time measurement (e.g. feet per second). Open up the Total Vu Configure window (Ctrl – C) and double click on the 'Add Time Measurement' icon.

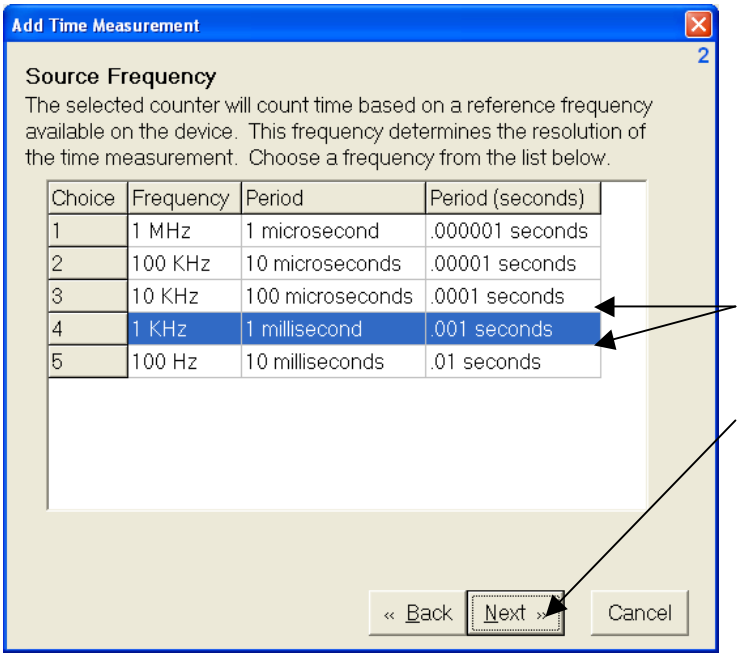
This will bring up the 'Add Time Measurement' window as shown in Figure 14. In the top list select the same device you used in section 4.1 (e.g. CTR20-1).

If you are using a CTR10 or a CTR20 the counters are grouped in two groups (A and B) or four groups (A, B, C and D) respectively. The next step requires that you select a counter in the same letter group as the counter used in section 4.1. In this example both of my selected counters are in group 'A'. Here I selected 'Counter 4A' as I had selected 'Counter 1A' in Section 4.1.

Now push 'Next'



14. Figure 14 Select Counter



The next screen requires you to select a 'Source Frequency'. Your selection depends on how precise you want your rate measurement to be. This will determine how many decimal points you can accurately display at a respective update frequency. A selection of '1 KHz' or '10 KHz' is recommended for most applications.

Now select 'Next'.

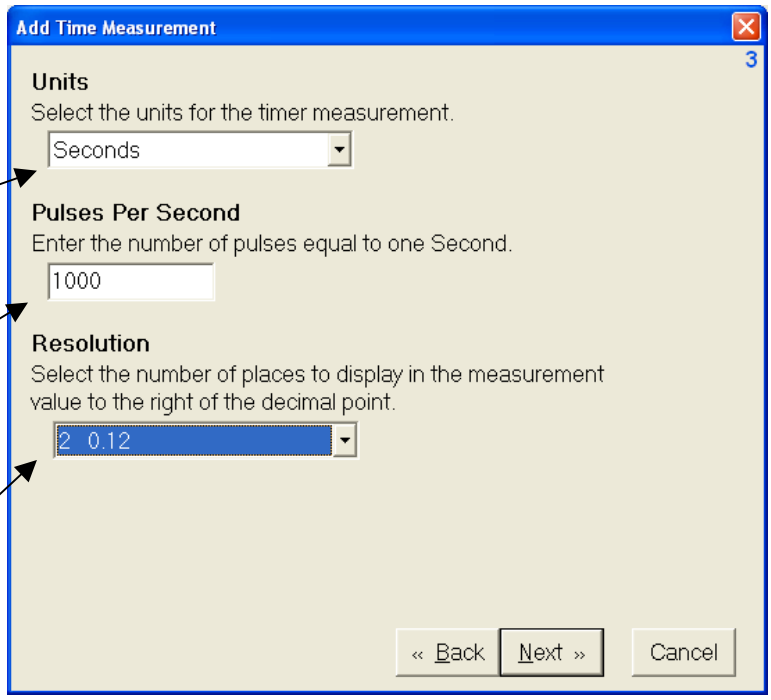
15. Figure 15 Source Frequency

Now decide what rate measurement base you desire. (e.g. Feet/second or Feet/Minute). Select this timer unit in the top drop down menu as shown in Figure 16.

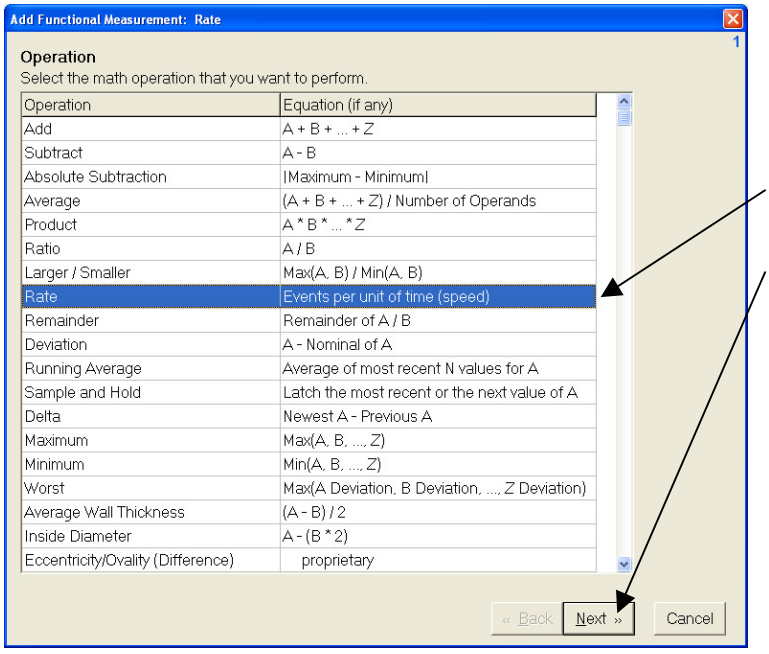
Do not put anything in or modify the 'Pulses Per Second' field as this will be updated automatically depending on your clock rate and unit selection.

For your timer 'Resolution' select 5, 3, or 2 for timer units of 'Hours', 'Minutes', or 'Seconds' respectively.

Click 'Next' to continue. On the next screen enter as the measurement name your chosen timer unit (e.g. Seconds). Click 'Finish'.



16. Figure 16 Timer Configuration



Double click on 'Add Functional Measurement' to bring up the 'Add Functional Measurement' window as shown in Figure 17. Select the Operation 'Rate'.

Click 'Next' to continue.

17. Figure 17 Select Rate

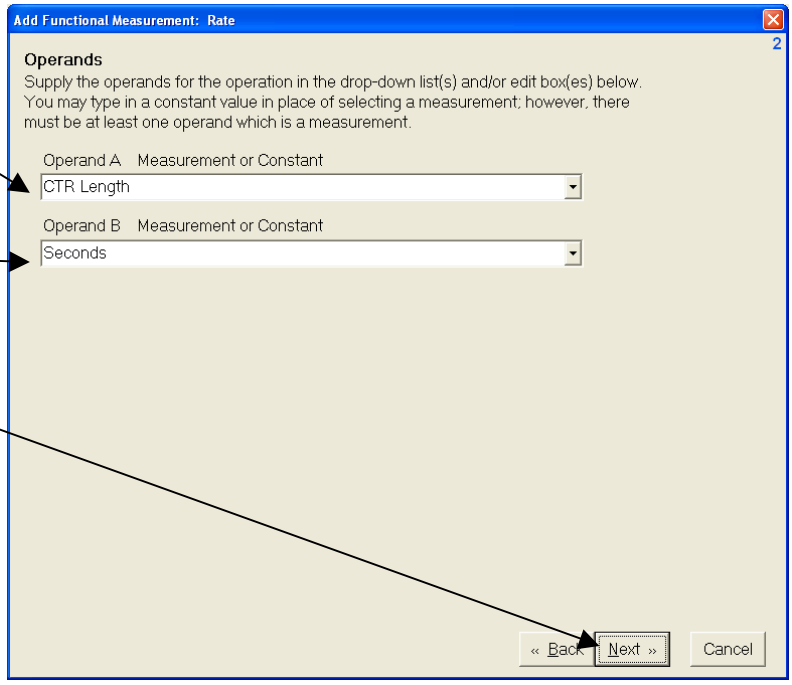
777 Zapata Drive Fairborn, OH 45324 USA 888.707.4852 Fax: 937-318-2445
E-mail: sales@laserlinc.com
www.laserlinc.com

For ‘Operand A’ select your encoder length measurement selected in section 4.1 above.

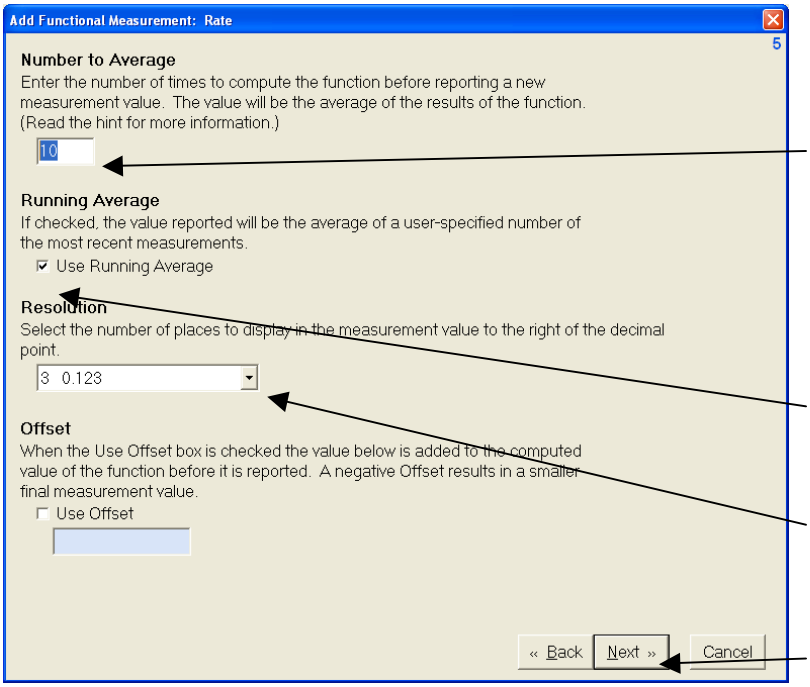
For ‘Operand B’ select your timer unit as specified in Figure 16 above.

Click ‘Next’ to continue.

On the next screen select the radio button next to ‘Continuous’ and click ‘Next’



18. Figure 18 Select Operands



In the space under ‘Number to Average’ insert a value of at least ‘10’. This will ensure your displayed measurement value is not affected by the resolution of your encoder output.

If you would like a continuous and instantaneous rate value to be displayed click the checkbox next to ‘Use Running Average’.

In the dropdown menus under ‘Resolution’ select how many decimal places you want displayed on your Speed/Rate value.

Click ‘Next’ *four* times to continue until you reach the ‘Measurement Name’ selection. Come up with a unique yet self-explanatory name representative of the encoder measurement created. This name will be displayed next to your measurement value in any windows or measurement displays. Insert this name in the blank under ‘Measurement Name’. With this name inserted select ‘Finish’.

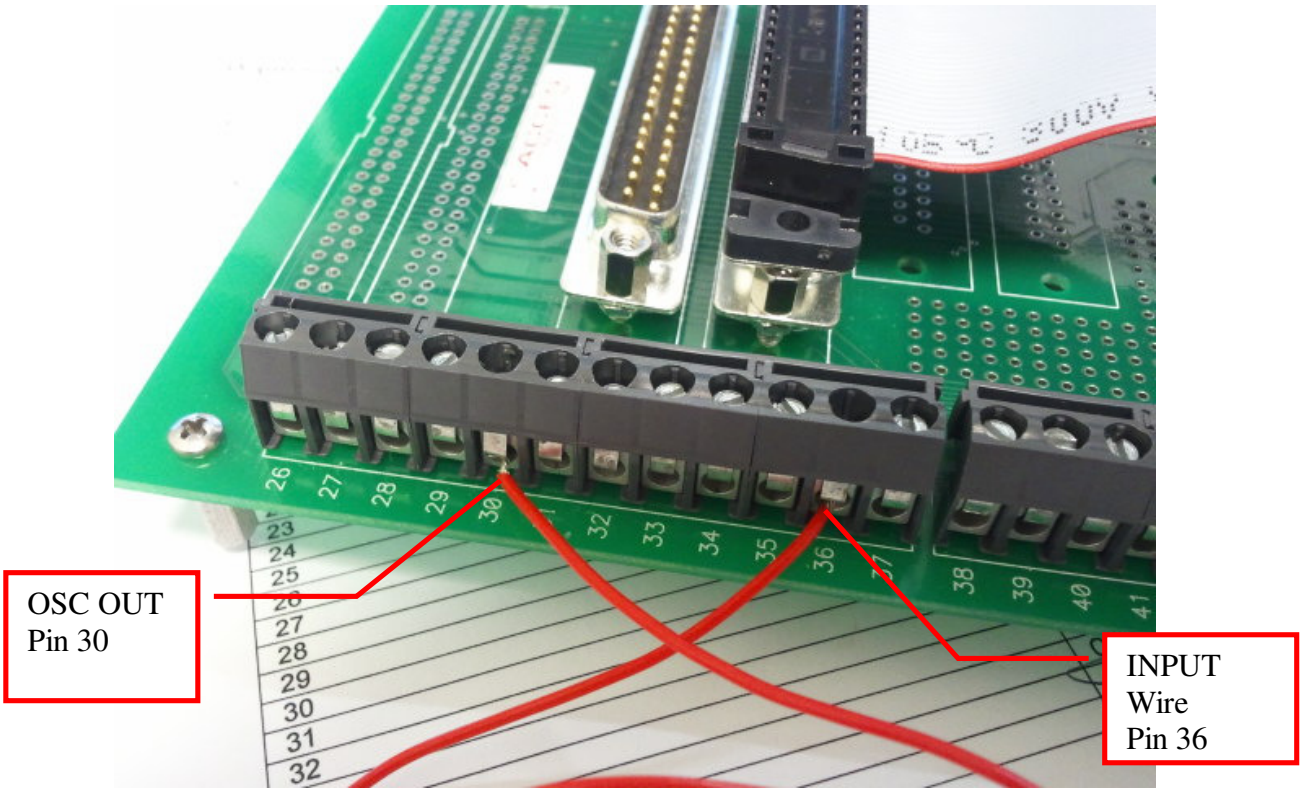
4.3 Verify Encoder Input using Oscillator Output

This section is used to verify that your configured Counter (Encoder) Input is working correctly. This is only needed as a troubleshooting step to identify whether the error lies in the signal source or the Counter Input configuration.

In the pin out diagrams (Figure 3, Figure 5, Figure 7, and Figure 9) find an OSC OUT output for your respective input device. This output will be used as a signal for your counter input.

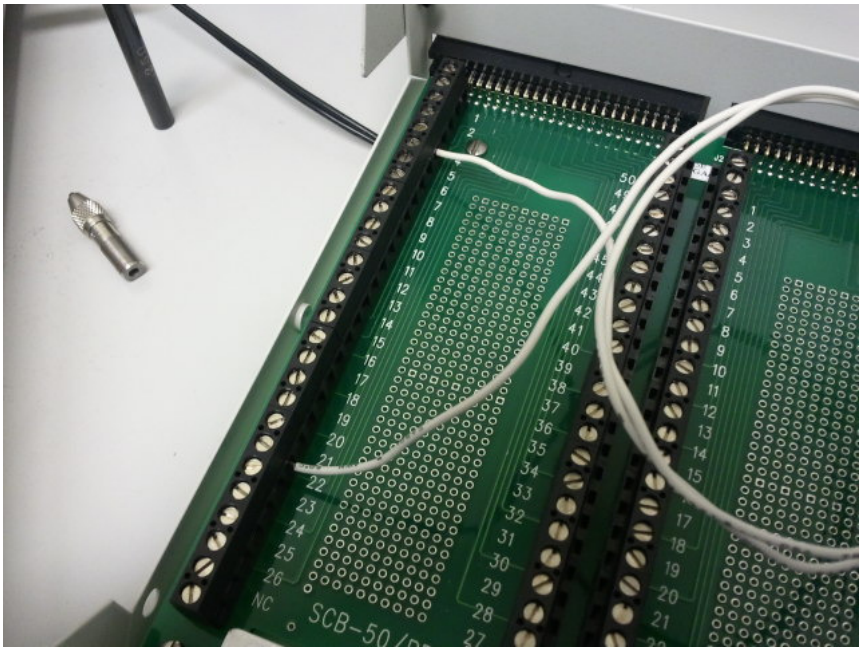
For the CTR05 use OSC OUT (pin 30). Run a wire from this pin to your counter input pin. For my example I chose counter one (1) with the input being pin 36. Therefore I have a wire running from pin 30 to pin 36 as shown in Figure 19.

For the CTR10 use OSC OUT_A or OSC OUT_B both pin 30 for their respective board. Run a wire from this pin to your counter input pin. For my example I chose counter one (1) on board A with the input being pin 36. Therefore I have a wire running from pin 30 to pin 36 as shown in Figure 19.



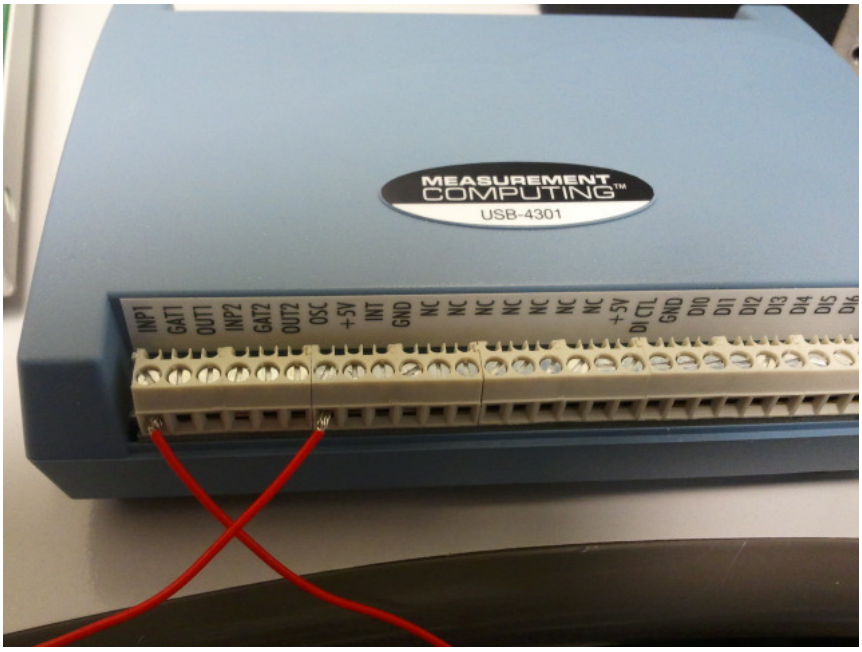
19. Figure 19 Oscillator Output test for CTR05 and CTR10

For the CTR20 use OSC OUT_A (pin 22). Run a wire from this pin to your counter input pin. For my example I chose counter one (1) on group A with the input being pin 5. Therefore I have a wire running from pin 22 to pin 5 as shown in Figure 20.



20. Figure 20 Oscillator Output test for CTR-20

For the USB-4301 use OSC. Run a wire from this pin to your counter input pin. For my example I chose counter one (1) with the input being INP1. Therefore I have a wire running from OSC to INP1 as shown in Figure 21.



21. Figure 21 Oscillator Output test for USB-4301