

THE MEASURABLE DIFFERENCE.



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# OXYGEN TRAINING > COUNTER CHANNELS



# COUNTER CHANNELS - HARDWARE OVERVIEW



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Hardware								
	TRION-CNT	TRION-BASE	TRION-TIMING	TRION-VGPS	TRION-1802/1600-dLV (EOL)	TRION(3)-18x0-MULTI	TRION-1620-ACC	TRION-2402-dACC
#Counter	6	2	1	1	2	2	1	2
#Inputs/Counter	3 DI	3 DI	3 DI	3 DI	3 DI	1 AI	1 AI	1 AI
Isolation	✓	✗	✗	✗	✗	✓	✓	✗
Sensor supply	5V and 12V	5V and 12V	5V and 12V	5V and 12V	5V and 12V	0...24 V	✗	✗
Encoder (A,B,Z) support	✓	✓	✓	✓	✓	✗	✗	✗
Frequency measurement	✓	✓	✓	✓	✓	✓	✓	✓
Event counting	✓	✓	✓	✓	✓	✓	✓	✓
Trigger level	0 to 50 V 12 mV steps	CMOS/TTL	CMOS/TTL	CMOS/TTL	CMOS/TTL	75 % of input range	70 % of input range	CMOS/TTL
Counter time base	80 MHz	80 MHz	80 MHz	80 MHz	100 MHz	100 MHz	80 MHz	80 MHz
Max. input frequency	10 MHz	10 MHz	10 MHz	10 MHz	10 MHz	2 MHz	1 MHz	500 kHz

EOL... End of Line



# EXEMPLARY CHANNEL SETUP FOR ROTATIONAL ENCODERS

Based on the applied settings,

- ① CNT x/x counts the number of detected events according to the selected counting mode
- ② Frequency\_CNT x/x will determine the frequency between two rising edges
- ③ Angle\_CNT x/x will output the actual angle and be reset after 360° if HW reset is enabled (update rate depending on Resample rate)
- ④ Speed\_CNT x/x will determine the running speed (update rate depending on Resample rate)
- ⑤ To read in noisy signals, a moving average filter can be applied in event and encoder mode. The filter length determines the averaging length
- ⑥ Based on the sample rate and the pulses per revolution a maximum speed can be calculated

AMPLIFIER OPTIONS	
Mode	Encoder
Threshold	2.4 V
Retrigger	0.8 V
Filter	0.1 us

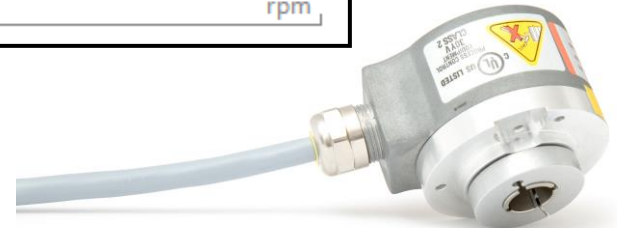
COUNTER GROUP SETTINGS	
Type	Rotation
Pulses	500 pulses / revolution
Mode	X1
Resample rate	10000 Hz

SIGNAL ROUTING	
Source_A	Input_A Invert <input type="checkbox"/>
Source_B	Input_B Invert <input type="checkbox"/>
<input checked="" type="checkbox"/> HW reset <input type="checkbox"/> SW reset <span>Reset now</span>	
Source_Z	Input_Z Invert <input type="checkbox"/>

Filter length	11	pulses
Max. Speed	1171.875	rpm

$$Max. speed [rpm] = \frac{Sample\ rate [Hz] * 60}{Pulses\ per\ Revolution}$$





# EXEMPLARY CHANNEL SETUP FOR LINEAR (DISTANCE) ENCODERS

- 1 Go to the general counter group settings (*CNT x/x*) and select *Encoder Mode* to count the number of pulses detected by the sensor
- 2 Depending on the TRION board, it is possible to specify a user-defined *Threshold* and *Retrigger* level
- 3 The intent of the filter is to eliminate distortions like jitter or glitches from the signal and can be set to various gate times or set to *Off*. For more details, please refer to the TRION series modules technical reference manual.

### AMPLIFIER OPTIONS

Mode	1	Encoder
Threshold	2	2.4 V
Retrigger	2	0.8 V
Filter	3	0.1 us

### COUNTER GROUP SETTINGS

Type	Linear
Pulses	1000 pulses / m
Mode	X1
Resample rate	10000 Hz

### SIGNAL ROUTING

Source_A	Input_A	Invert	<input type="checkbox"/>
Source_B	Input_B	Invert	<input type="checkbox"/>
<input checked="" type="checkbox"/> HW reset	<input type="checkbox"/> SW reset	Reset now	
Source_Z	Input_Z	Invert	<input type="checkbox"/>

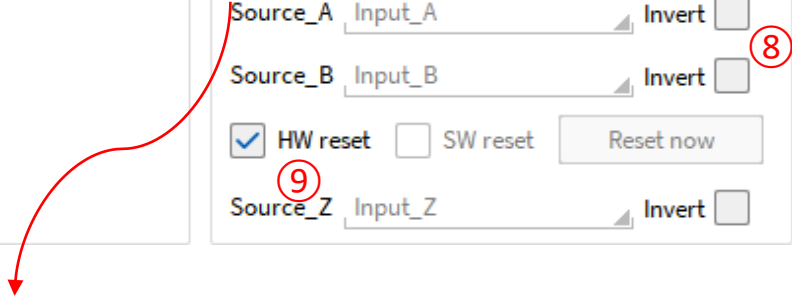




# EXEMPLARY CHANNEL SETUP FOR LINEAR (DISTANCE) ENCODERS

- ④ Select *Linear* Type
- ⑤ Enter the number of pulses per meter delivered by the sensor (i.e. 360, 500, 512 or 1800)
- ⑥ Select the encoder counting mode with which the event count channel will increase or decrease the event count: *X1, X2, X4 or A-up/B-down*. For more details, please refer to the TRION series modules technical reference manual
- ⑦ Enter the resample rate (sample rate for software channels *Angle\_CNT x/x, Speed\_CNT x/x*)
- ⑧ Possibility to invert the signals
- ⑨ If *HW reset* is selected, the event count and angle will be reset if the signal connected to Z has a rising edge. No reset will be applied if *HW reset* is deselected

AMPLIFIER OPTIONS		COUNTER GROUP SETTINGS	
Mode	Encoder	Type	④ Linear
Threshold	2.4 V	Pulses	⑤ 1000 pulses / m
Retrigger	0.8 V	Mode	X1 ⑥
Filter	0.1 us	Resample rate	10000 ⑦ Hz
SIGNAL ROUTING			
Source_A	Input_A	Invert	<input type="checkbox"/>
Source_B	Input_B	Invert	<input type="checkbox"/>
<input checked="" type="checkbox"/> HW reset	<input type="checkbox"/> SW reset	Reset now	
Source_Z	Input_Z	Invert	<input type="checkbox"/>



**Remark:**  
**The hardware Signal Routing cannot be changed for Encoder channels**





# EXEMPLARY CHANNEL SETUP FOR (DISTANCE) ENCODERS

Based on the applied settings,

- ① CNT x/x counts the number of detected events according to the selected counting mode
- ② Frequency\_CNT x/x will determine the frequency between two rising edges
- ③ Angle\_CNT x/x will output the absolute distance from the Zero position (Input Z) if HW reset is enabled and the relative distance otherwise
- ④ Speed\_CNT x/x will determine the velocity [m/s]

**Remark:**  
*Other encoders (i.e. flow meters) can surely be connected to counter channels as well. The engineering unit can be changed in the Counter Group Settings*





# EXEMPLARY CHANNEL SETUP FOR FLOW METERS

- ① Go to the general counter group settings (CNT x/x) and select *Events* mode to count the number of pulses detected by the sensor
- ② Depending on the TRION board, it is possible to specify a user-defined *Threshold* and *Retrigger* level
- ③ The intent of the filter is to eliminate distortions like jitter or glitches from the signal and can be set to various gate times or set to *Off*. For more details, please refer to the TRION series modules technical reference manual.

### AMPLIFIER OPTIONS

Mode **①**

Threshold  V **②**

Retrigger  V **②**

Filter **③**  us

### COUNTER GROUP SETTINGS

Type

Pulses  pulses /

Resample rate  Hz

### SIGNAL ROUTING

Source\_A   Invert

HW reset  SW reset





# EXEMPLARY CHANNEL SETUP FOR FLOW METERS

- ④ As flow meters determine flow of a medium like water per time, the sensor outputs a linear signal. Thus, *Linear* Type must be selected
- ⑤ Enter the number of pulses per reference unit output by the sensor
- ⑥ Enter the resample rate (sample rate for software channels Angle\_CNT x/x, Speed\_CNT x/x )
- ⑦ Select the input of the counter channel (A, B or Z) to which the sensor signal is connected
- ⑧ Possibility to invert the signal
- ⑨ If *HW reset* is selected, an additional counter input can be selected to reset the event count and angle if a rising edge is detected
- ⑩ *SW reset* is not required for this sensor type
- ⑪ Immediately resets events and angle

### AMPLIFIER OPTIONS

Mode Events

Threshold 2.4 V

Retrigger 0.8 V

Filter 0.1 us

### COUNTER GROUP SETTINGS

Type Linear

Pulses 250 pulses / l

Resample rate 10000 Hz

### SIGNAL ROUTING

Source\_A Input\_A Invert

HW reset  SW reset Reset now

HW reset  SW reset Reset now

Source\_Z Input\_A Invert







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# EXEMPLARY CHANNEL SETUP FOR FLOW METERS

Based on the applied settings,

- ① CNT x/x counts the number of detected events and increases by 1 every time a rising edge is detected
- ② Frequency\_CNT x/x will determine the frequency between two rising edges
- ③ Angle\_CNT x/x will output overall flow measured by the sensor, i.e. the liters detected since acquisition start
- ④ Speed\_CNT x/x will determine the throughput per time, i.e. the liters detected per second

CNT 1/1			
①	CNT 1/1@[RemoteNode]	TRION-BASE	[Red Stop Icon]
②	Frequency_C...[RemoteNode]	TRION-BASE	[Green Play Icon]
③	Angle_CNT 1/[...][RemoteNode]	TRION-BASE	[Blue Play Icon]
④	Speed_CNT 1/[...][RemoteNode]	TRION-BASE	[Red Stop Icon]
	CNT 1/1@[Remo...ode]_Velocity	TRION-BASE	

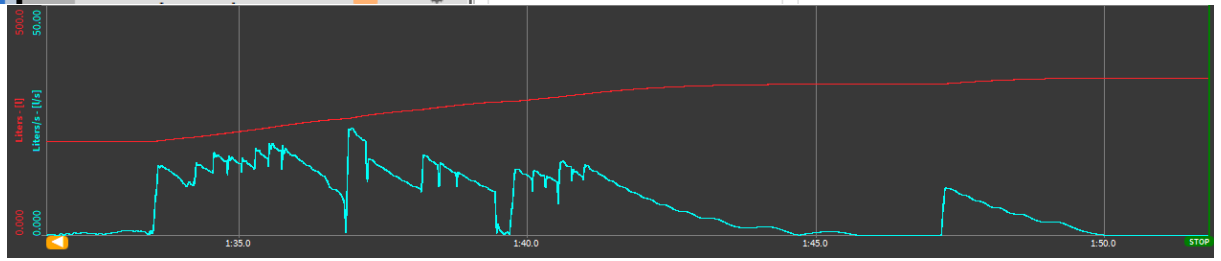
CNT 1/2			
	CNT 1/2@[RemoteNode]	TRION-BASE	[Purple Stop Icon]
	CNT 1/2@[RemoteNode]	TRION-BASE	[Purple Stop Icon]
	Frequency_C...[RemoteNode]		[Orange Stop Icon]

AMPLIFIER OPTIONS	
Mode	Events
Threshold	2.4 V
Retrigger	0.8 V
Filter	0.1 us

COUNTER GROUP SETTINGS	
Type	Linear
Pulses	250 pulses / 1
Resample rate	10000 Hz

SIGNAL ROUTING	
Source_A	Input_A Invert <input type="checkbox"/>
<input type="checkbox"/> HW reset <input type="checkbox"/> SW reset <input type="button" value="Reset now"/>	





# EXEMPLARY CHANNEL SETUP FOR CDM+TRG SENSORS

- 1 Go to the general counter group settings (*CNT x/x*) and select *Events* mode to count the number of pulses detected by the sensor
- 2 Depending on the TRION board, it is possible to specify a user-defined *Threshold* and *Retrigger* level
- 3 The intent of the filter is to eliminate distortions like jitter or glitches from the signal and can be set to various gate times or set to *Off*. For more details, please refer to the TRION series modules technical reference manual.

AMPLIFIER OPTIONS	
Mode	① Events
Threshold	② 2.4 V
Retrigger	0.8 V
Filter	③ 0.1 us

COUNTER GROUP SETTINGS	
Type	Rotation
Pulses	1800 pulses / revolution
Resample rate	10000 Hz

SIGNAL ROUTING	
Source_A	Input_A <input type="checkbox"/> Invert
<input checked="" type="checkbox"/> HW reset	<input type="checkbox"/> SW reset <input type="button" value="Reset now"/>
Source_Z	Input_Z <input type="checkbox"/> Invert





# EXEMPLARY CHANNEL SETUP FOR CDM+TRG SENSORS

- ④ As CDM+TRG sensors determine the rotation speed of a DUT, *Rotation Type* must be selected
- ⑤ Enter the number of pulses per revolution delivered by the sensor (i.e. 360, 720 or 1800)
- ⑥ Enter the resample rate (sample rate for software channels *Angle\_CNT x/x*, *Speed\_CNT x/x*)
- ⑦ Select the input of the counter channel (A, B or Z) to which the sensor signal is connected
- ⑧ Possibility to invert the signal
- ⑨ Select *HW reset* and specify the counter channel to which the reference pulse (TRG) is connected
- ⑩ As *HW reset* is activated, *SW reset* is not applicable here
- ⑪ As *HW reset* is activated, *Reset now* is not applicable here

AMPLIFIER OPTIONS		COUNTER GROUP SETTINGS	
Mode	Events	Type	④ Rotation
Threshold	2.4 V	Pulses	⑤ 1800 pulses / revolution
Retrigger	0.8 V	Resample rate	⑥ 10000 Hz
Filter	0.1 us	<b>SIGNAL ROUTING</b>	
		Source_A	Input_A ⑦ Invert ⑧
		<input checked="" type="checkbox"/> HW reset ⑩	<input type="checkbox"/> SW reset Reset now ⑪
		Source_Z	Input_Z ⑨ Invert



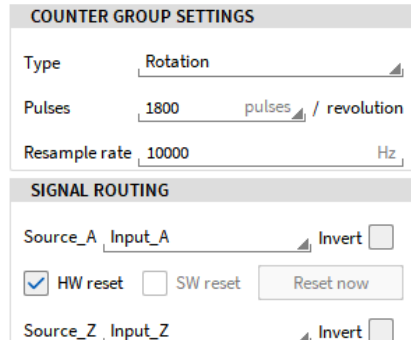
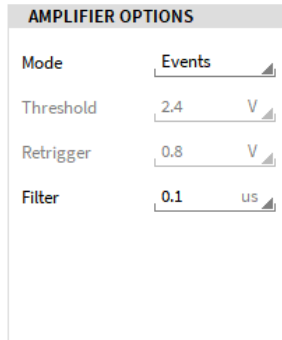
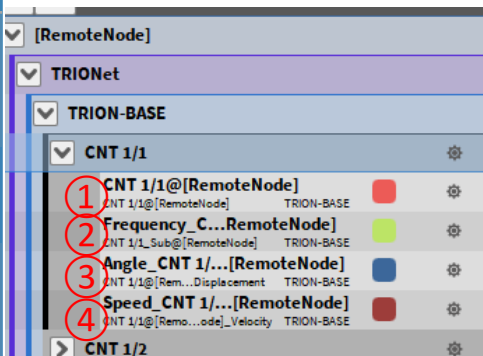


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# EXEMPLARY CHANNEL SETUP FOR CDM+TRG SENSORS

Based on the applied settings,

- ①  $CNT\ x/x$  counts the number of detected events according to the selected counting mode
- ②  $Frequency\_CNT\ x/x$  will determine the frequency between two rising edges
- ③  $Angle\_CNT\ x/x$  will output the actual angle and reset after  $360^\circ$  as *HW reset* is enabled (update rate depending on *Resample rate*)
- ④  $Speed\_CNT\ x/x$  will determine the running speed (update rate depending on *Resample rate*)





# EXEMPLARY CHANNEL SETUP FOR FREQUENCY DETECTION (1)

There are 2 possibilities to detect the frequency of a signal connected to a CNT channel.  
The first one is the following:

① Go to the general counter group settings (CNT x/x) and select *Events* or *Encoder* Mode to count the number of pulses detected by the sensor

② Depending on the TRION board, it is possible to specify a user-defined *Threshold* and *Retrigger* level

③ The intent of the filter is to eliminate distortions like jitter or glitches from the signal and can be set to various gate times or set to *Off*.  
For more details, please refer to the TRION series modules technical reference manual.

④ Select the correct counter input to which the signal is connected (A, B or Z)

⑤ Frequency\_CNT x/x will output the signal frequency in [Hz]

**AMPLIFIER OPTIONS**

Mode ①

Threshold ②  V

Retrigger  V

Filter ③   $\mu$ s

**COUNTER GROUP SETTINGS**

Type  ←

Pulses  pulses / revolution

Resample rate  Hz

---

**SIGNAL ROUTING**

Source\_A  ④  Invert

HW reset  SW reset

**Remark:**  
Counter Group Settings can remain unchanged

Dialog | Digital | Counter | CAN | Search...

Channel | Color | Setup

RemoteNode]

TRIONet

TRION-BASE

✓ CNT 1/1

- CNT 1/1@[RemoteNode] TRION-BASE
- Frequency\_C...[RemoteNode] TRION-BASE ⑤
- CNT 1/1\_Sub@[RemoteNode] TRION-BASE
- Angle\_CNT 1/...[RemoteNode] TRION-BASE
- Speed\_CNT 1/...[RemoteNode] TRION-BASE
- CNT 1/1@[Remo...ode]\_Velocity TRION-BASE

CNT 1/1\_Sub@[RemoteNode] TRION-BASE

Frequency\_CNT 1/1@[RemoteNode]

AMPLIFIER OPTIONS

Mode

FREQUENCY SETTINGS

SENSOR SCALING

Scaling 2-point Table

Scaling  Sensitivity

Unit

Scaling  ...z

Offset  Hz





# EXEMPLARY CHANNEL SETUP FOR FREQUENCY DETECTION (2)

There are 2 possibilities to detect the frequency of a signal connected to a CNT channel.  
The second one is the following:

- ① Go to the general counter group settings (*CNT x/x*) and select *Frequency* Mode
- ② Depending on the TRION board, it is possible to specify a user-defined *Threshold* and *Retrigger* level
- ③ The intent of the filter is to eliminate distortions like jitter or glitches from the signal and can be set to various gate times or set to *Off*.  
For more details, please refer to the TRION series modules technical reference manual.
- ④ Select the correct counter input to which the signal is connected (A, B or Z)
- ⑤ *Frequency\_CNT x/x* will output the signal frequency

AMPLIFIER OPTIONS		COUNTER GROUP SETTINGS	
Mode	① Frequency		
Threshold	② 2.4 V		
Retrigger	0.8 V		
Filter	③ 0.1 us		
SIGNAL ROUTING			
Source_A	Input_A	④	Invert <input type="checkbox"/>
<input type="checkbox"/> SW reset	Reset now		

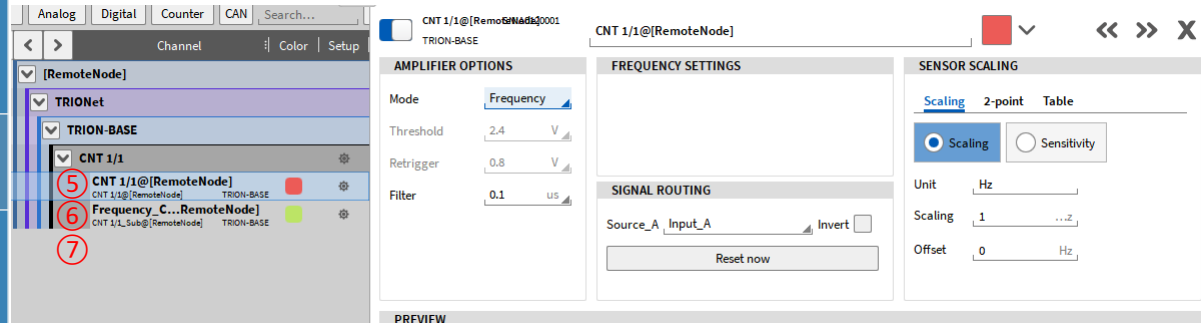




# EXEMPLARY CHANNEL SETUP FOR FREQUENCY DETECTION (3)

There are 2 possibilities to detect the frequency of a signal connected to a CNT channel.  
The second one is the following:

- ⑤ The channel *CNT x/x* will now output the detected frequency in [Hz]
- ⑥ The channel *Frequency\_CNT x/x* will not output any data in this case and may be deactivated
- ⑦ The software channels *Angle\_CNT x/x* and *Speed\_CNT x/x* will not be created with these settings



**Remark:**

*This possibility to determine the frequency was mainly integrated into OXGYEN to ensure the compatibility to old setup files which were created with OXYGEN version 2.5.1 or prior when the encoder support wasn't available in OXYGEN yet.*

*For creating a new setup, the first possibility of frequency detection is recommended.*

