# Using multiple Matrox Altiz units

Overview

This document will provide information on how to mount and setup multiple Matrox AltiZ units to perform synchronized acquisitions. The Matrox AltiZ units can be placed at different heights, positions over the conveyor, or in parallel to increase the Field of View (FoV) along the conveyor's width. The FoV between synchronized Matrox AltiZ units can overlap or can be staggered.
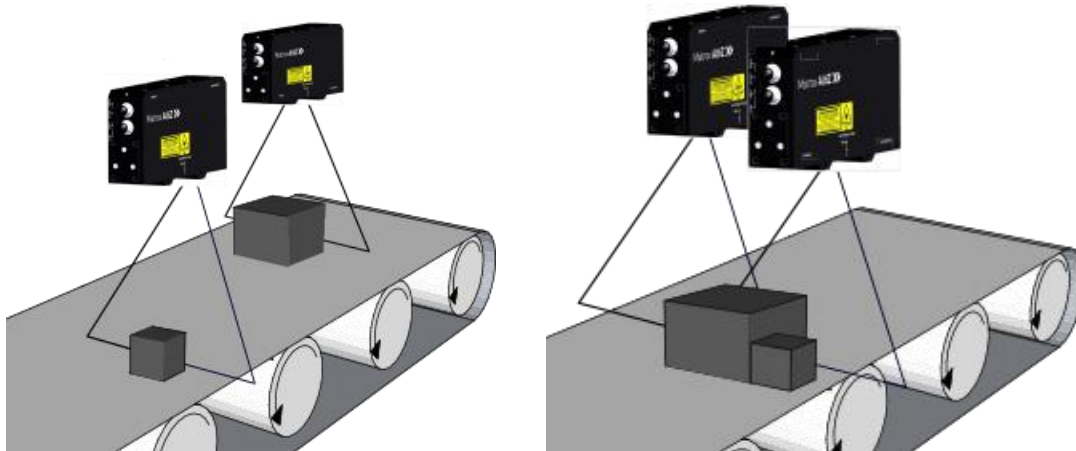

If there is an overlap between the FoVs, you will need to shift the exposure times so that the laser from one Matrox AltiZ unit does not interfere with that of the other.

Hardware configuration

Star configuration

In this configuration, the first Matrox AltiZ unit receives and processes an external input signal (for example, an encoder or a proximity sensor), which initiates its own line and frame trigger. A Sync signal can be set up to trigger the line acquisitions of the additional Matrox AltiZ units in the Star configuration. The Sync Signal is typically the **Exposure Active** signal of the first Matrox AltiZ unit.

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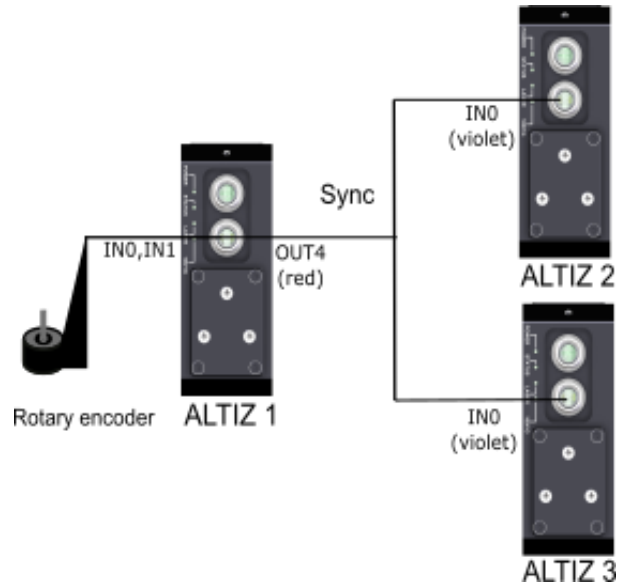
In our example, we connected AUX_OUT4 of ALTIZ 1 to AUX_IN0 of ALTIZ 2 and 3. Other input and output pins can be used, as long as they are free.
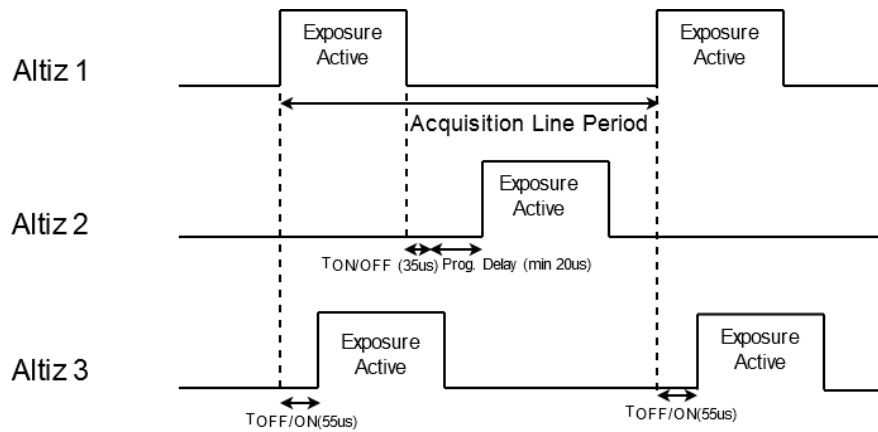
In the case of an overlap between the FoVs, the exposure window of two adjacent AltiZ units must be offset to avoid artifacts introduced by the neighboring laser. Line acquisitions on ALTIZ 1 and ALTIZ 3 are triggered simultaneously, and then ALTIZ 2 is triggered when the exposure of both ALTIZ 1 and ALTIZ 3 turns OFF.

The ON to OFF response time is 35µs and the OFF to ON response time is 55µs, as outlined in the *Electrical Specifications* section of *Appendix B* in the *Installation and Technical Reference manual*. This results in a duration limit for the exposure time:

$$100µs < Exposure\ Time\ < \frac{Acquisition\ Line\ Period - T_{OFF/ON}}{2}$$
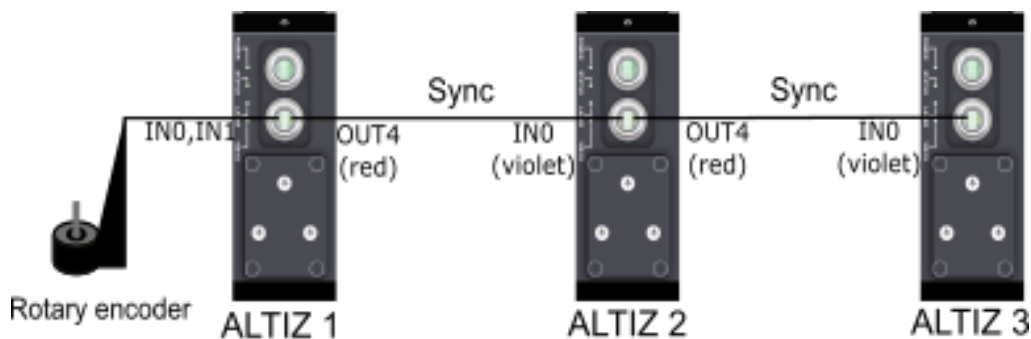
With more than two AltiZ units, a programmable delay of min 20µs ($T_{OFF/ON}$-$T_{ON/OFF}$=20µs) is required between the end of exposure on AltiZ 1 and the exposure start of AltiZ 2.

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Daisy chain configuration

In this configuration, the Sync signal is transmitted sequentially from one Matrox AltiZ unit to the next.

In the case of an overlap between the FoVs, acquisition for the following AltiZ in the chain is triggered by the falling edge of the **Exposure Active** signal from the previous AltiZ in the chain. In the daisy chain configuration, the exposure is limited to half of the Acquisition Line Period, minus the ON to OFF response time
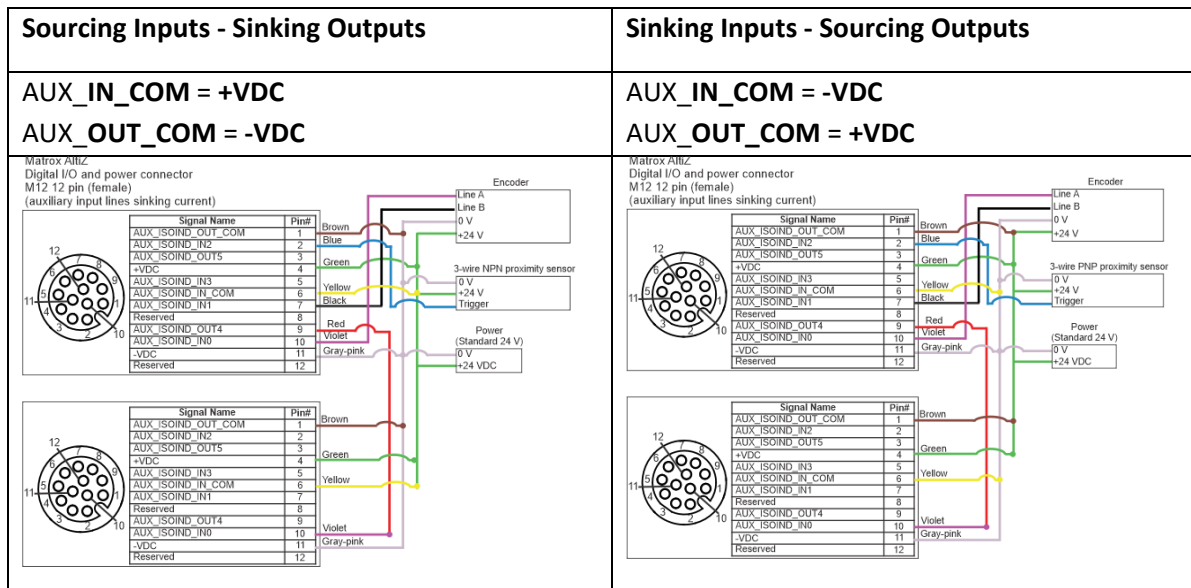
$$100\mu s < Exposure\ Time\ < \frac{Acquisition\ Line\ Period}{2} - T_{ON/OFF}$$

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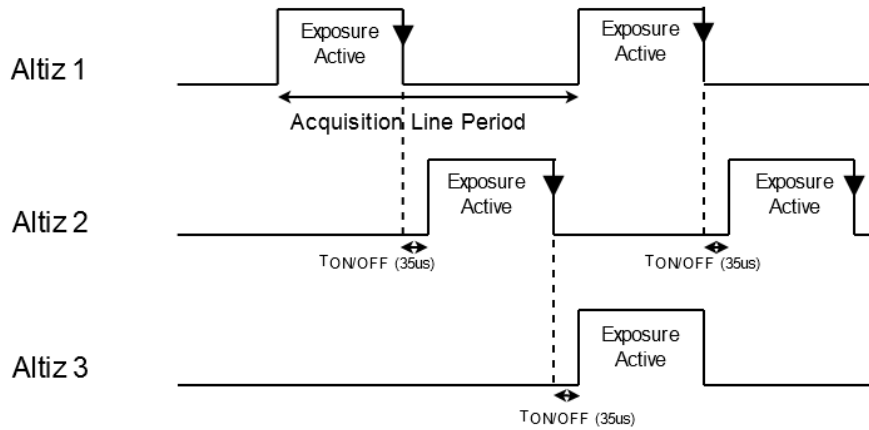
Connecting the auxiliary input and output lines

Two power configurations allow the current to flow from the AUX_OUT pin to the AUX_OUT_COM pin (or vice versa) and from the AUX_IN pin to the AUX_IN_COM pin (or vice versa). In one configuration, the inputs are sourcing current and the outputs are sinking current. In the second configuration, the inputs are sinking current and the outputs are sourcing current.

Sourcing Inputs - Sinking Outputs	Sinking Inputs - Sourcing Outputs
AUX_**IN_COM** = +VDC AUX_**OUT_COM** = -VDC	AUX_**IN_COM** = -VDC AUX_**OUT_COM** = +VDC

- Connecting AUX_IN_COM and AUX_OUT_COM from multiple Matrox AltiZ units to a single +VDC and -VDC can be done by using a power distribution block (ex: Phoenix Contact VIP-2/SC/PDM-2/16)
- The rated current for each AltiZ is 500mA @ 24 V (12 W), as specified in the *Electrical Specifications* section of *Appendix B* in the *Installation and Technical Reference manual*.

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Software configuration using Matrox Capture Works

Set volume parameters (y and z directions)

To configure the volume parameters *Length World, Motion Step World, Size Z World*, and *Offset Z World*, read the following examples in the *Chapter 6* in the *Installation and Technical Reference manual.*

- Example 1: Quickly performing a single-profile scan with default settings.
- Example 2: Performing a single-profile scan with optimized settings.
- Example 3: Performing a multi-profile surface scan using a constant line (profile) rate

Ensure that **SourceSynchronization** is set to **Synchronize**.

Set the encoder and the Line Trigger

To configure the encoder for the first Matrox AltiZ unit, read the *Performing a multi-profile surface scan using an encoder,* example 4 of *Chapter 6* in the *Installation and Technical Reference manual.*

AltiZ 1

Once you have set up the encoder on AltiZ 1, perform the following to configure the encoder as a line trigger:

- Navigate to **Trigger Control** under **Quick Setup Control**, and set **Trigger Selector (TriggerSelector)** to **Line Start**.
- Expand **Trigger Selector** and set **Trigger Source** (**TriggerSource**) to **Encoder0.**
- Set **Trigger Mode** (**TriggerMode**) to **On**.

Feature	Value	Unit
▼ Trigger Control		
▼ Trigger Selector	Line Start ▼	
Trigger Source	Encoder 0 ▼	
Trigger Mode	On ▼	
Trigger Activation	Rising Edge ▼	

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AltiZ 2-n

The acquisition for Matrox AltiZ units that follow the first AltiZ in the sequence are triggered differently, depending on the type of configuration (star or daisy) and the unit's position in the configuration:

- Navigate to **Trigger Control** under **Quick Setup Control**, and set **Trigger Selector (TriggerSelector)** to **Line Start**.

- Expand **Trigger Selector** and set **Trigger Source** (**TriggerSource**) and **Trigger Activation** (**TriggerActivation**) with the values from the following table :

Configuration	Star	Daisy Chain
AltiZ 2, 4…	**Trigger Source** :Timer 0 End **Trigger Activation:** Rising Edge	**Trigger Source** : Line 0 **Trigger Activation:** Falling Edge
AltiZ 3, 5…	**Trigger Source** : Line 0 **Trigger Activation:** Rising Edge	

Set Exposure Time

To configure **Exposure Time** perform the following for every AltiZ in the configuration:

- Under **Acquisition Control**, expand **Source Selector** and select **Source 0 (Primary)**. Ensure that the value in the **Exposure Time** field is less than half of the value of the **Acquisition Line Period** field in the case of an overlap between the Field of Views.

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Set the I/Os

In our example the Sync signal we are using is the **ExposureActive** signal from AltiZ 1.
The **ExposureActive** signal is transmitted across the AUX_OUT4 output signal of AltiZ 1 to the AUX_IN0 input signal of AltiZ 2 and to subsequent Matrox AltiZ units. To set the **Line Source** for our Sync signal, perform the following:

- Navigate to **Digital IO Control** and set **Line4** under **Line Selector**
- Expand the **Line Selector** category and set **Line Source** to **Exposure Active**

Feature	Value	Unit
▶ User Set Control		
▶ Scan 3d Control		
▶ Image Format Control		
▶ Acquisition Control		
▶ Light Control		
▶ Source Control		
▶ Encoder Control		
▼ Digital IO Control		
▼ Line Selector	Line 4	
Line Status	False	
Line Inverter	False	
Line Source	Exposure Activ	
▶ User Output Selector	User Output 0	

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Set the delay (star configuration for AltiZ 2, AltiZ 4 …)

If you are using the star configuration, you will need to set a delay for all of the AltiZ units following AltiZ 1. To set a delay, perform the following:

- Navigate to **Counter and Timer Control** and expand the **Timer Selector** category, then select **Timer0**
- Set the timer duration to the desired delay value (for example, 50us)
- Set **Timer Trigger Source** to **Line 0** (if the **Exposure Active** signal is transmitted to AUX_IN0)
- Set **Timer Trigger Activation** to **Falling Edge**.

Feature	Value	Unit
▶ Light Control		
▶ Source Control		
▶ Encoder Control		
▶ Digital IO Control		
▼ Counter And Timer Control		
▶ Counter Selector	Counter 0	
▼ Timer Selector	Timer 0	
Timer Duration	50	µs
Timer Delay	0	µs
Timer Reset	Execute	
Timer Value	49.984001	µs
Timer Status	Timer Complet	
Timer Trigger Source	Line 0	
Timer Trigger Activatio	Falling Edge	

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