Deploy XL: Manual Run Detection

XL is designed to automatically detect run time and down time by comparing a cycle input from the manufacturing process to the Down threshold entered (by the user) in the Part settings. For most discrete manufacturing processes, this is the best way to detect run and down time.

Some processes (e.g. cutting, blending, and mixing) have no regular cycles, or a “piece” can take minutes or hours to manufacture. When deploying XL on these processes, it can be better to disable automatic run detection and to initiate Manual Run Detection (MRD).

This means run time and down time will be monitored manually from an external source rather than from the cycle input. The three ways in which XL can be manually controlled are:

1. **Digital Input**: A 5-24V DC input, typically controlled by a PLC.
2. **Barcode Scan**: The operator uses a barcode to alternate between Run and Down
3. **XL API**: Through programmatic integration with other applications and systems.

Automatic run detection and MRD are mutually exclusive. When automatic run detection is enabled, any Process Running and Process Down signals are ignored.

Running Production State

The Running production state is enabled through the **Run** or **Run + Down** signal. This replaces the running signal that is generated by the automatic run detector.

Run Variants: Running is the only run-based production state supported with MRD. Run variants (Running Slow, Running Poor Quality, and Running Poorly) are disabled since these states are normally determined by the XL run detector and are unlikely to be known by external systems.

Definitely Running: Running with manual run detection also assumes that the process is Definitely Running since the production state is being explicitly provided to XL.

For example, if a changeover is configured to end by Definitely Running, when the Running production state is active, the changeover will end.

Down Production State

The Down production state is automatically enabled: when Running is disabled; or, when a direct **Down** signal is received.

Down Reasons: When a Down event is entered, down Reasons work the same way as with automatic run detection. The Reason will be applied to the most recent Down event.

Production State Priorities

Enabling the production state (Running or Down) is only the first of two requirements for generating an event. The second is that the desired state be the highest priority production state that is enabled, at which time it becomes the active state.



Production states are organized in a hierarchy (see graphic at right). Down and Running are the two lowest priority levels of the hierarchy and are the only production states that are mutually exclusive. All other production states are prioritized based on their level in the hierarchy, with higher production states overriding lower production states. When a higher production state is enabled, the lower production state remains enabled and will become active again once the higher production state condition ends.

Production State Priorities continue to apply with MRD. For example, Meal/Break and Changeover will continue to have precedence over Running and Down.

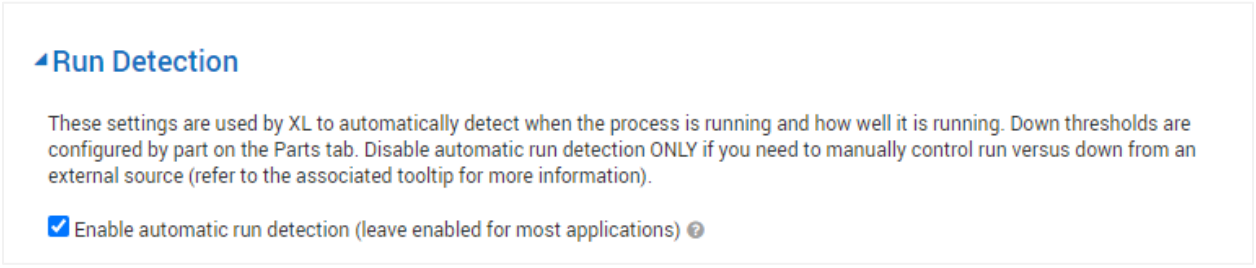
Cycles

If you are providing a Process Running signal and a Cycle input, it is important for the integrity of your OEE calculations that XL only receives cycle inputs during run time.

If XL receives cycle inputs while in a down condition, these cycles will not be included in the OEE Performance calculation and the cycles received during down time could substantially (and incorrectly) increase the OEE score.

Enable Manual Run Detection

Regardless of what option you choose to send a Run or Down signal, you must first disable automatic run detection. Once this step has been completed, XL will no longer use cycle inputs to detect run time or down time.



1. Log in to the device as **Administrator.**
2. Navigate to Settings > Parts and Run States > Run States.
3. Deselect the “Enable automatic run detection” check-box.
4. Click the **Save** button.

Option 1: Run/Down by Digital Input

In these steps, you will configure XL to receive a **Run**, **Down**, or **Run + Down** signal from your process. Typically, this signal will be provided by a PLC-controlled relay.

If you cannot provide an automated Run/Down signal, skip this step and proceed to **Option 2: Run/Down by Barcode Scan**.

1) Enable Manual Run Detection

See the **previous section**.

2) Wire Digital Input(s) – instructions vary by model

Wiring Digital Inputs varies greatly between the **XL HD** and the **XL410/610/810**. **Make sure to follow instructions for your model**.

XL HD Model

Before connecting any inputs, verify that all sources of power have been completely disconnected from the XL device



MULTIPLE POWER SOURCES: This product has more than one source of power. Relay outputs may be at mains potential from a secondary power source. Always disconnect power from all power sources before installing or servicing the XL device, and before opening the user access plate.



SHOCK HAZARD: To avoid risk of shock, always disconnect all sources of power before installing or servicing the XL device, and before opening the user access plate. Do not reapply power until the access plate has been reinstalled and securely closed. Failure to follow these precautions could result in personal injury or death due to electric shock.

XL uses digital inputs (wired via M12 connectors to Digital Input Ports) to connect to your process and gain necessary information to generate metrics:

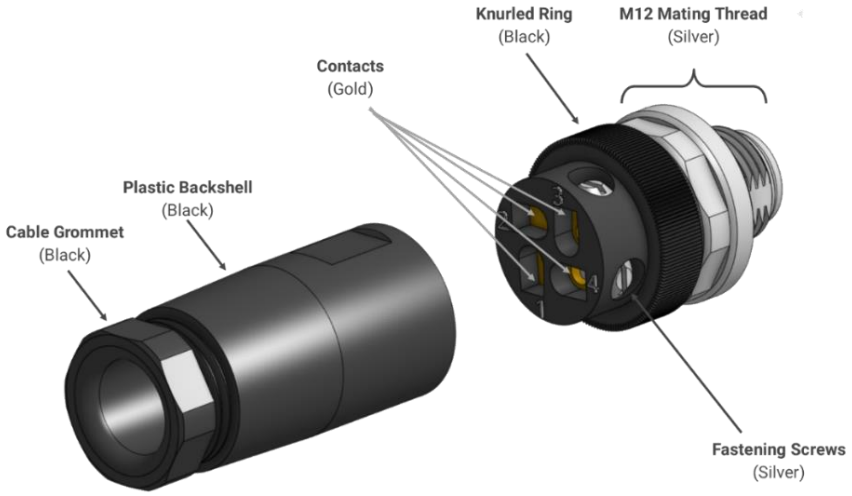
Item	Specification
High Speed Inputs	▪ (6) Digital Inputs ▪ 5 to 24 VDC ▪ Ports are configurable as Sinking (NPN) or Sourcing (PNP) via browser ****Note**: If providing multiple digital inputs, **all** must be either sinking or sourcing ▪ Low Speed (50 Hz max) or High Speed (4,000 Hz max) configurable via browser

Example signals: photoelectric sensors, proximity switches, relays, PLC (Programmable Logic Controller) outputs, or other devices that are physically appropriate for their manufacturing environment.

Connecting Instructions

1. Wire M12 connectors using directions in the next section.
2. Match up notch on M12 connector to notch on panel connector and screw M12 mating thread clockwise into panel connector and repeat for any additional inputs.

M12 Connectors



To wire an M12 Connector:

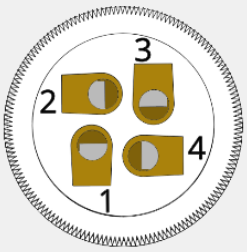
- Remove the plastic backshell and thread wires through to contacts.
- Follow the specified Contact Pairings below and replace backshell.
- Screw the grommet at the back of the M12 connector until the wire is compressed.

Digital Input Wiring Instructions

Note: Digital Input connectors are designed to allow two inputs per connector for six total inputs. This would be achieved by doubling the GND and +24V wires and wiring the second input into Contact 4.

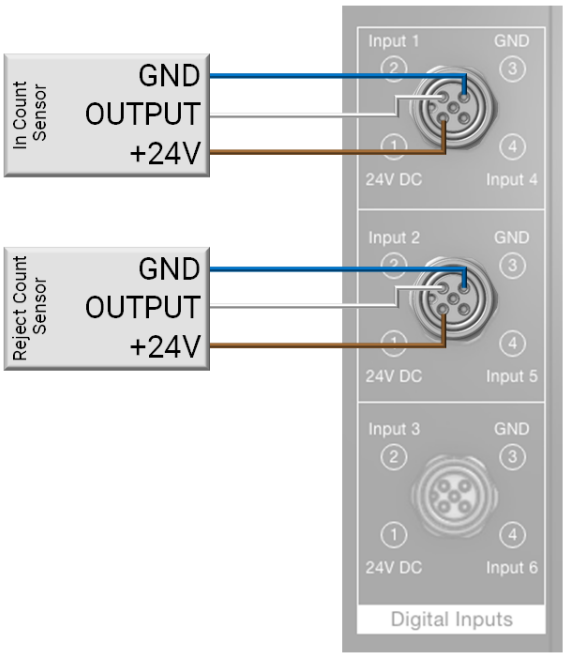
We recommend using all three provided connectors for a single output before trying to add a second output to any connector.

The wire colors listed below are *typical* sensor wire colors. Actual sensor wire colors may vary.

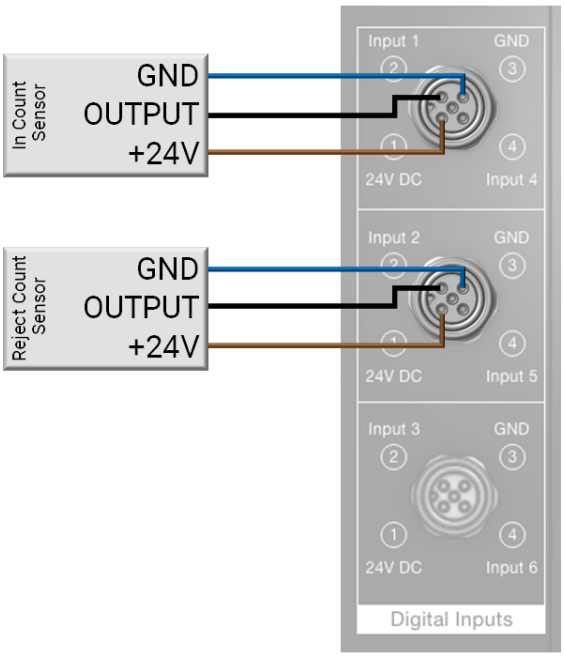
Connector Type	Contact Description	Connector Contacts
Sinking (NPN)	▪ +24V (brown wire) ..... Contact 1 ▪ Input 1 (white wire) ..... Contact 2 ▪ GND (blue wire) ..... Contact 3	
Sourcing (PNP)	▪ +24V (brown wire) ..... Contact 1 ▪ Input 1 (black wire) ..... Contact 2 ▪ GND (blue wire) ..... Contact 3	
PLC	▪ First Input ..... Contact 2 ▪ GND ..... Contact 3 ▪ Second Input ..... Contact 4	

Digital Input Wiring Diagrams – XL HD

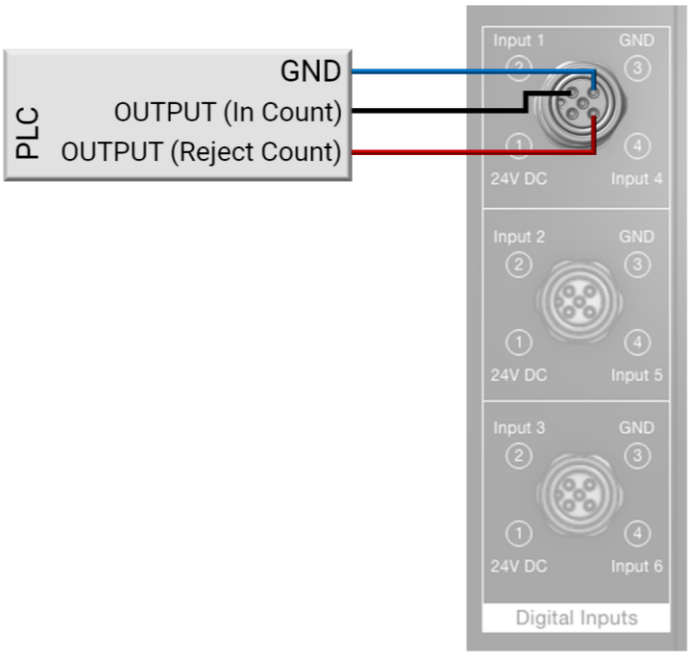
Sinking (NPN) Outputs



Sourcing (PNP) Outputs



PLC Outputs



XL410/610/810 Models

Remove Power and Access Plate

MULTIPLE POWER SOURCES: This product has more than one source of power. Relay outputs may be at mains potential from a secondary power source. Always disconnect power from all power sources before installing or servicing the XL device, and before opening the user access plate.

SHOCK HAZARD: To avoid risk of shock, always disconnect all sources of power before installing or servicing the XL device, and before opening the user access plate. Do not reapply power until the access plate has been reinstalled and securely closed. Failure to follow these precautions could result in personal injury or death due to electric shock.

CAUTION: Keep mains-connected wiring (including relay output wiring) separate from signal and I/O wiring. Use the left knockout(s) for mains-connected wiring (including relay output wiring) and the right knockout for signal and I/O wiring.

CAUTION: Take care to pass all wiring through the back panel knockouts using cable glands that meet local electrical code. Make sure that any unused knockouts are plugged using hardware that meets local electrical code.

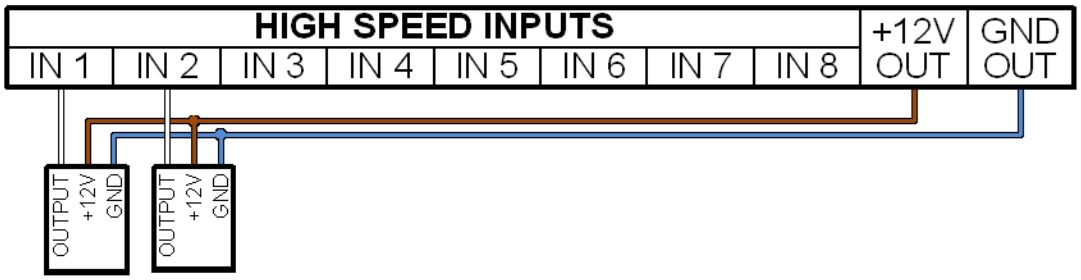
1. Verify that all sources of power have been completely disconnected from the XL device.
2. Remove and save the screws holding the access plate (eight to ten screws, depending on model).
3. Gently pull the access plate away from the XL device. The access plate will remain connected to the XL device via its grounding strap.

Connections

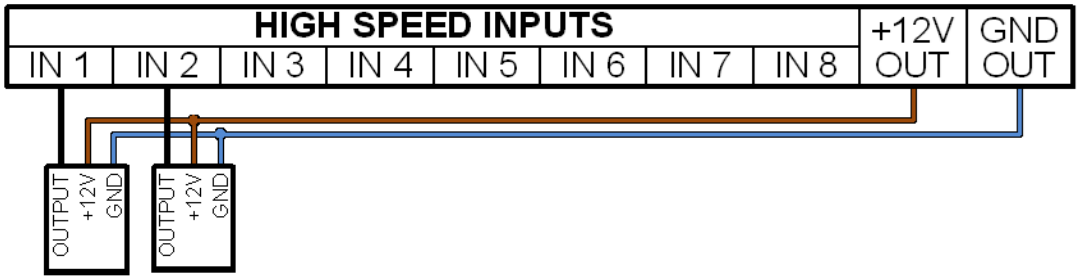
With power removed, wire your signal inputs to 10-pin terminal block marked “HIGH SPEED INPUTS”. This terminal block can be unplugged from the logic board to make wiring easier.

- Sensors are connected to power from the XL device.
- Inputs are configurable as Sinking or Sourcing and can be assigned as Counts (In, Good, Reject or End of Line) or for Running and Down.
- Two Inputs are shown, but additional sensors may be connected in the same way.
- The wire colors listed below are typical sensor wire colors. Actual sensor wire colors may vary.

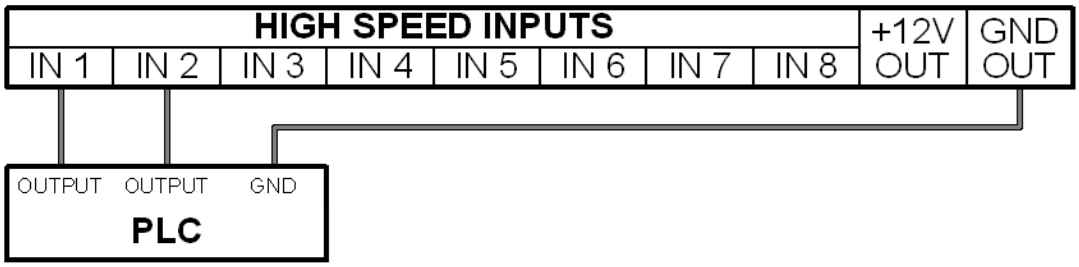
Sinking (NPN) Outputs



Sourcing (PNP) Outputs



PLC Outputs



Reinstall Access Plate

Fasten the access plate to the back panel using the screws that were removed in **Remove Access Plate**.

Apply Power



SHOCK HAZARD: This product must be grounded. Never defeat the ground conductor or operate the product in the absence of a suitably installed ground conductor.



ATTENTION: This product is suitable for connection to a TN-S power distribution system (AC Hot and AC Neutral lines with a separate protective grounding conductor).



ATTENTION: Refer to **Appendix B – Specifications** for power requirements.

1. Apply mains power to the XL device.
2. Verify that the XL scoreboard lights up and starts showing information. The format of the information will depend on the XL model.

3) Configure Signal Inputs

Input	Type	Function	Cycle Detection	Active	Debounce	Inhibit	Input Prescaler	Reject Reason
1	Count	In Count	Cycle	Low	Low Speed	No Inhibit	1	N/A
2	Count	Reject Count	No	Low	Low Speed	No Inhibit	1	Underweight
3	Run + Down	N/A	No	Low	Low Speed	N/A	N/A	N/A

1. Log in to the XL display as Administrator.
2. Navigate to Settings > Digital Inputs.
3. For the input that will receive the signal from your process (Input 3 above), in the “Type” column, select **Run**, **Down**, or **Run + Down**.
4. Optionally, in the “Active” column, choose if the input is recognized (i.e., is active) when the signal transitions to low or high.*
5. Click the **Save** button.

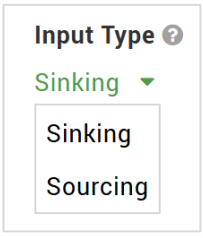
* When an input recognizes two states, such as "Run + Down", the first listed is the active state.

		Active Setting	
		Low	**High**
Type Setting	**Run**	Low = Run High = No Change	Low = No Change High = Run
	Down	Low = Down High = No Change	Low = No Change High = Down
	Run + Down	Low = Run High = Down	Low = Down High = Run

Set Sinking or Sourcing

By default, XL is set to accept Sinking (NPN) signals. If using a Sourcing (PNP) signal, use the instructions below to change it.

1. Log in to the XL display as Administrator.
2. Navigate to Settings > Digital Inputs.
3. At the bottom of the page, select either **Sinking** (used for sensors with NPN outputs) or **Sourcing** (used for sensors with PNP outputs, and devices with 5V DC to 24V DC outputs). This setting affects **all** the digital inputs.



4. Click **Save**.

Option 2: Run/Down by Barcode Scan

In these steps, you will configure XL to receive **barcode scans** to track run time and down time.

Note that while XL supports the use of barcode scanning to track run and down time, an automated machine output from your process will always be more accurate.

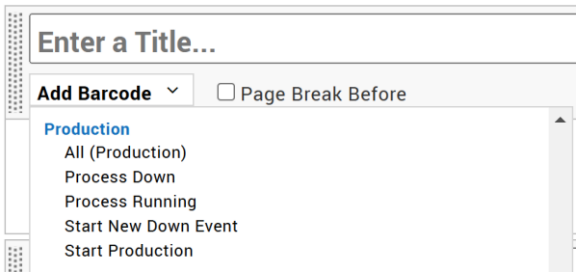
1) Enable Manual Run Detection

See **previous section**.

2) Print Barcodes

In this step, you will print barcodes to enable operators to scan a barcode to set XL into Run or Down.

1. Navigate to Settings > Print Barcodes.



2. Add the **Process Running** and **Process Down** barcodes to your barcode page.

Production: Process Running

Production: Process Down

3. For more information on how to configure barcode pages, refer to the **Configure XL** guide.

Option 3: Run/Down by API

If your process can generate a JSON string, you can control Run/Down detection through the API. Contact Vorne Support for more information on the API.

Alternatively, our integration partner at the Vetii|Group can provide integration tools to facilitate communication between your process and the XL API.