

Session 9 : I/O Communications



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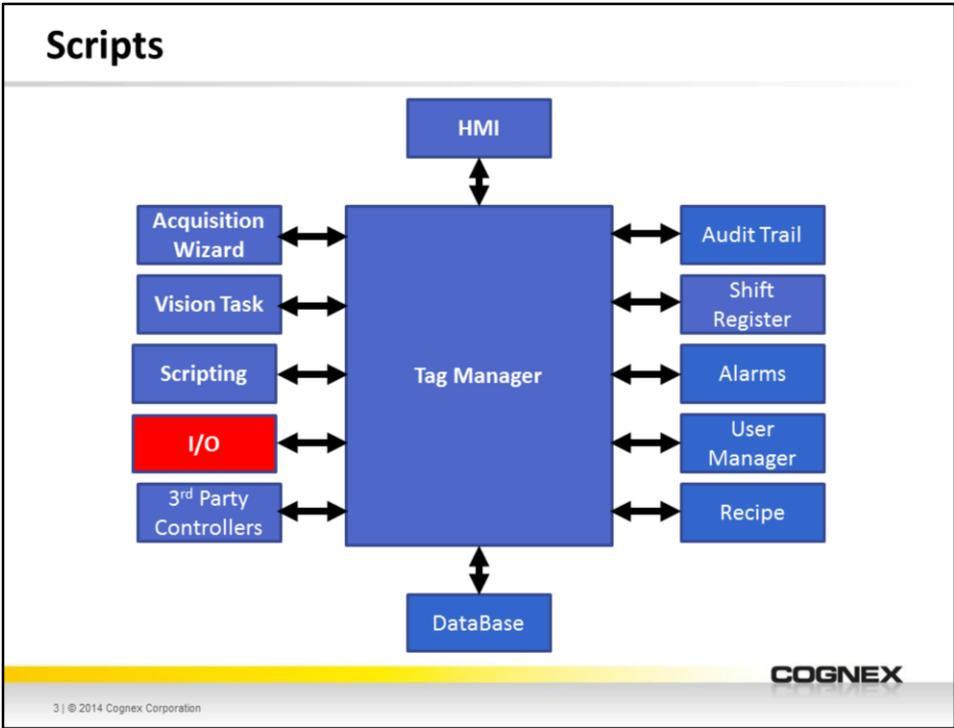
Objective

Cognex Designer Basic – I/O Communications

- Review Designer setup of CC24 card
- Review Designer I/O Software Options
- Implement PLC communication blocks
- Create CC24 card response to triggers

❖ Lab: Implement Discrete I/O with HMI to control LEDs

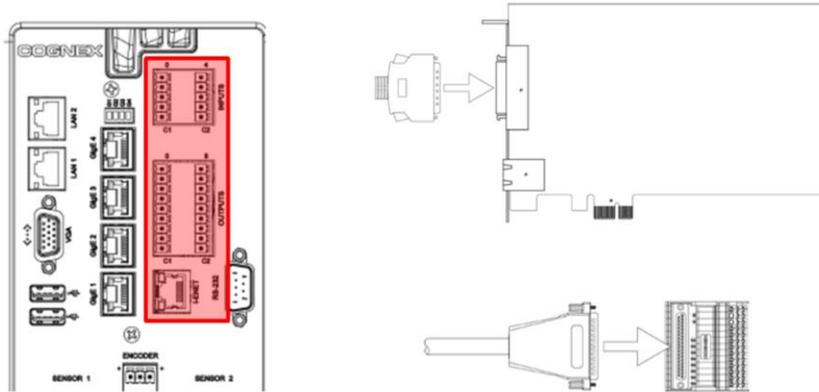
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Scripting is used throughout the Cognex Designer application. C# must be used when scripting in Cognex Designer though VisionPro will allow for both C# and VB (within a ToolBlock)

Communication Card

On VC-5 and the Communication Card



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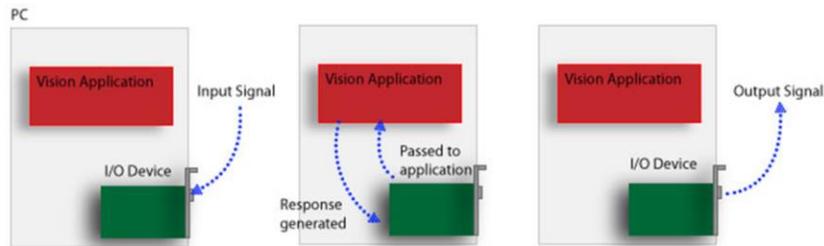
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The Precision I/O (discrete communication) and Factory Floor Protocol (PLC communication) is accomplished through a separate card. The VC-5 controller already has the card integrated into it's assembly. If not using the controller, the separate Communication Card can be purchased and installed into your PC. Make sure the drivers are loaded before starting the Cognex Designer so that it "sees" the communication card.

Programming within the Cognex Designer will be the same.

Separate I/O

PIO and FFP separate from PC – passed through PCIe



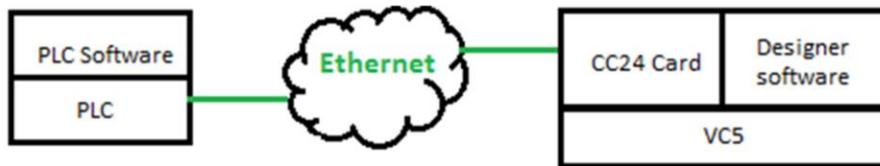
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Note that the communication for the precision IO and the Factory Floor Protocol is done on the card itself – whether it be the card within the VC-5 or the card that can be installed in a PC. The information is then transferred to the application via the PCIe bus.

Cognex Designer Communications – CC24 and PLC

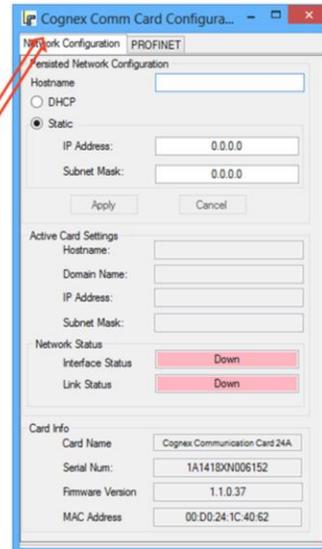
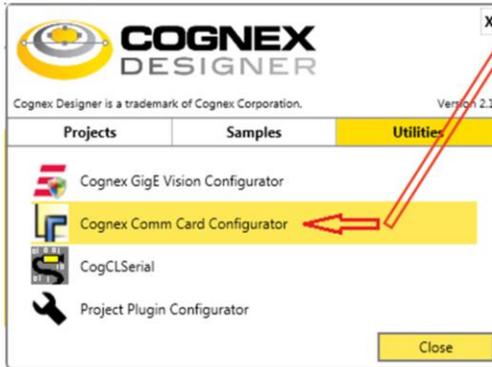
The systems are configured as follows:



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Check the settings on your CC24 Card

- Start Designer
- Go to Utilities tab
- Select Cognex Comm Card Configurator



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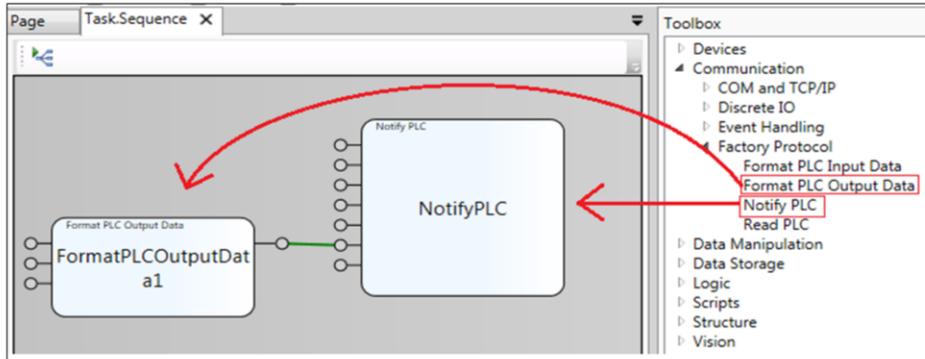
PLC I/O Options

- **Open a project that you want to connect to a PLC.**
- **There are two ways to set up communications with the PLC.**
 - **Method 1 -Via Designer**
(setup using the Sequence -> Communication blocks)
 - **Method 2- Via the CC24 card directly**
(setup using Explorer -> Devices)

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Method 1: (Communication blocks within the Task.Sequence)

- Move these blocks to the sequence area:
 - Toolbox-> Communication -> Factory Protocol -> Format PLC Output data
 - Toolbox-> Communication -> Factory Protocol -> Notify PLC



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Edit the “FormatPLCOutputData1” block

- **Select the following:**
 - **1- Automatic Array Length** checkbox
 - **2- Format according to FFP Protocol**
 - **3- EtherNet/IP**

Data Format

Array Length

Byte Array Length: 16

1 Automatic Array Length

2 Format according to FFP Protocol

Protocol: **3** EtherNet/IP

Endianness: Little Endian

Swap bytes in 16-bit words

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Adding data to the FormatPLCOutputData Block

- Click the “+” sign and select the type of data to send.
- In this example we are sending:
 - **1**- a 32 bit signed integer
 - **2**- a Boolean as a Single Bit
 - **3**- ASCII text.

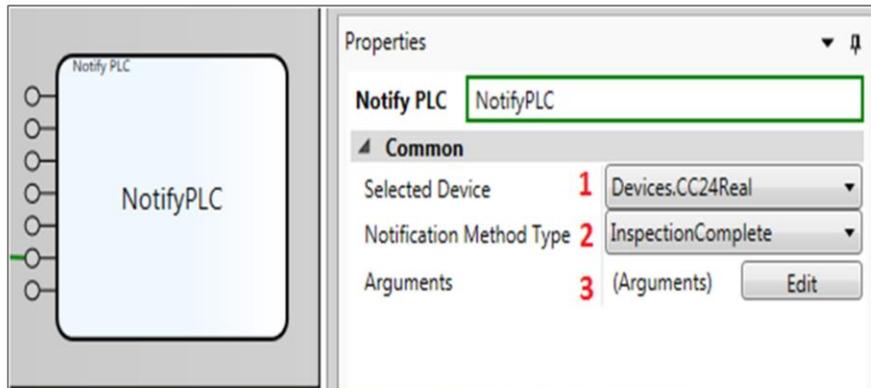
The screenshot shows the 'Data Format' dialog box with the following settings:

- Array Length: Byte Array Length: 16, Automatic Array Length checked.
- Format according to FFP Protocol: checked.
- Protocol: EtherNet/IP
- Endianness: Little Endian
- Swap bytes in 16-bit words: unchecked

Name	Type	Byte Offset	Length in Bytes	Bit Offset	Show as Pin	Value	
Value1	32-bit signed integer	0	4	N. A.	<input checked="" type="checkbox"/>	set through Pin	<input checked="" type="checkbox"/>
Value2	Single Bit	4	1	0	<input checked="" type="checkbox"/>	set through Pin	<input checked="" type="checkbox"/>
Value3	ASCII Text	8	8	N. A.	<input checked="" type="checkbox"/>	set through Pin	<input checked="" type="checkbox"/>

In the Properties of the NotifyPLC tool block

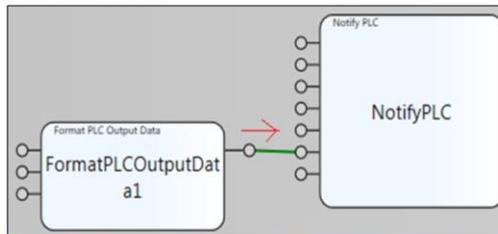
1. Select your CC24 device.
2. Select "InspectionComplete" as the Notification Method.
3. If you need to edit the arguments (expected values) you can do that by clicking the [Edit] button.



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Current PLC Setup (Review)

- Created a **FormatPLCOutputData1** block that accepts 3 pieces of information
 - (represented by 3 pins).
- Created a **NotifyPLC** block accepting 7 pieces of information
 - (represented by 7 pins)
- Hover over each pin to see the data it is expecting.
- The output pin of the **FormatPLCOutputData1** block can be connected to the **NotifyPLC** pin second from the bottom
 - This pin will show as type "ResultData (byte[])"
 - The pin accepts the 3 values encoded into a byte string by the **FormatPLCOutputData1** block.



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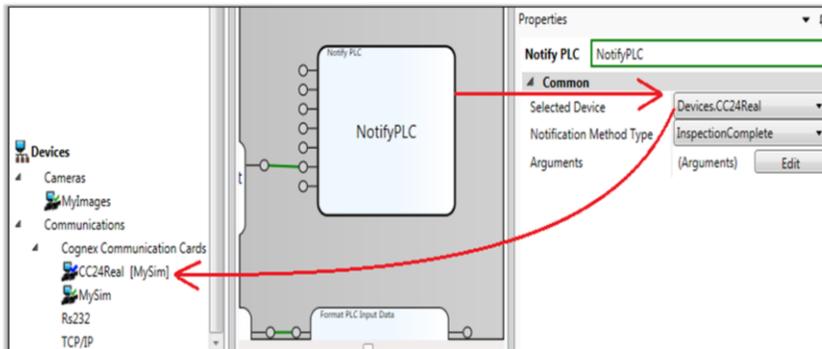
(Notes) To communicate with the PLC you will also need to:

- Create values to pass into the FormatPLCOutputData1 block
- Create the PLC Expected values to pass to the rest of the NotifyPLC pins
- Execute your sequence

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NotifyPLC Overview

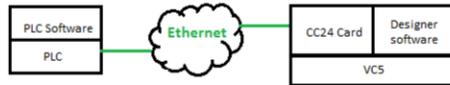
- The data string containing the values set up in the FormatPLCOutputData1 block will be sent
 - using the NotifyPLC block to the “selected device” that the NotifyPLC block is associated with in its Properties section.
 - This is the CC24 card which has been configured with an IP address and linked to a PLC in your settings.



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Method 2: (via Explorer Devices)

- The CC24 card can react in real-time to events.
- Using Designer adds a certain overhead to processing a situation.
 - The CC24 card can track and respond in milliseconds or less
 - Using an operating system and Designer can add hundreds of milliseconds of processing time.



- Designer can be used to program the CC24 card in the VC5 (or other system) to:
 - Look for events sent by the PLC
 - Process events through a script
 - Spot the transition that flags the event
(Any change in pin, pin goes from Low to High or High to Low)
 - Adjust for the Factory Floor Protocol (FFP)
 - Generate a response to the event
by setting a pin high or low, with some specifications

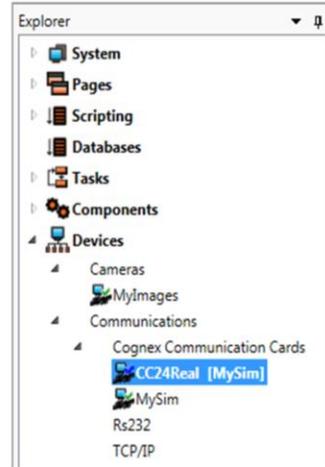
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setup of the CC24 direct event handling

In our example we called the card
“CC24Real [MySim]”

Double-click on:

- Explorer -> Devices
 - > Communications
 - > Cognex Communication Cards
 - > CC24Card



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Creating a "Configured Event"

Devices.CC24Real X

Configured Events: +
NewEvent1 X
NewEvent2 X
NewEvent3 X

Event Description

Event name: NewEvent1

I/O Handler Script: [None] ... +

Event Causes:

Bank	Line Number	Transition	+
InputBank0	0	Any	X

Factory Floor Protocol

Signal Name	Signal Index	Edge Type	+
TriggerAcquis	0	RisingEdge	X

Event Responses:

Bank	Line Number	Transition	Pulse Width	Delay Type	Delay Value	+
OutputBank0	0	SetLow	0	None	0	X

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Creating a “Configured Event”

1. Click the + sign at the top left
(next to “configured events” label)
2. A new event name has appeared in the top middle.
Update the event name to something relevant.
3. If you want the event to trigger a script:
 - Click the + sign in the top right corner,
(to the right of the I/O Handler Script label)
 - A new window will pop up and ask you for a Script name.
 - Enter the Script name and click [Accept].



- Now you can click [...] to the right of your script name,
(in the top right, in the I/O handler Script section)
- This will put you into the Script editor
with which you should already be familiar.

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To configure an event for which the CC24 should watch:

- Create a new line in the “Event Causes” section
 - (top middle) by clicking the + sign in that section.
- Set the InputBank you want the CC24 should monitor.
- Set the Line Number of the InputBank the CC24 should monitor.
- Set the transition that the CC24 should watch for on this line.
 - (Any, High->Low, Low->High)

An event will be triggered by ANY of the event causes.

Meaning:

“Event causes” logic is using OR instead of AND for handling multiple “event causes” to see if an event is triggered.

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Set the Event Response (how the CC24 reacts to an event)

- Create a new line in the “Event Responses” section (bottom) by clicking the + sign in that section.
- Select the OutputBank and Line Number of the CC24 card.
- Set the transition that should occur on this line
 - (SetHigh, SetLow, Toggle)
- Set the Pulse Width.
- Set the Delay Type (none, Time) and the delay value in milliseconds (if required).

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Notes and Review

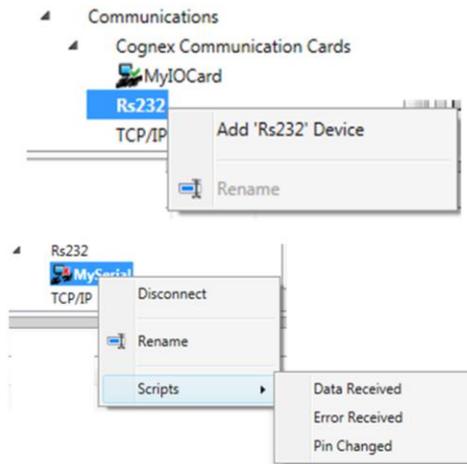
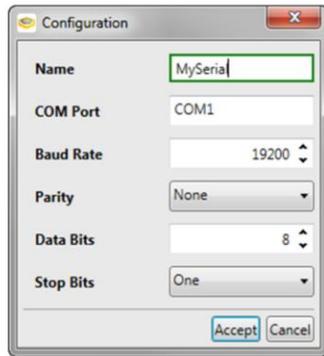
You have now set up the CC24 card in your VC5 to:

- Look for an event
(status or change of status on a certain Line/Pin)
- React to the event by changing a Line/Pin value to high/low or toggling it.
- We had a question ourselves as to when the I/O handler script would execute
 - An experiment has showed that the handler script occurs at the end of the sequence, but before the HMI updates, which is interesting and an important result.
 - That's tricky, in the above case the event action waits for the sequence to finish. But there are many types of events, like button push events, page change, events, etc. that do not necessarily behave the same way as far as how their event handlers are scheduled. We're thinking that in general for HMI events, you can treat their actions as occurring immediately.
The only waiting occurs when an event happens when a compiled program is running, like a script or a sequence (which is just a graphically represented script).
In that case the action for the event is *scheduled* to run after the current process finishes.

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RS232 – Serial Communication

Read / Write Serial

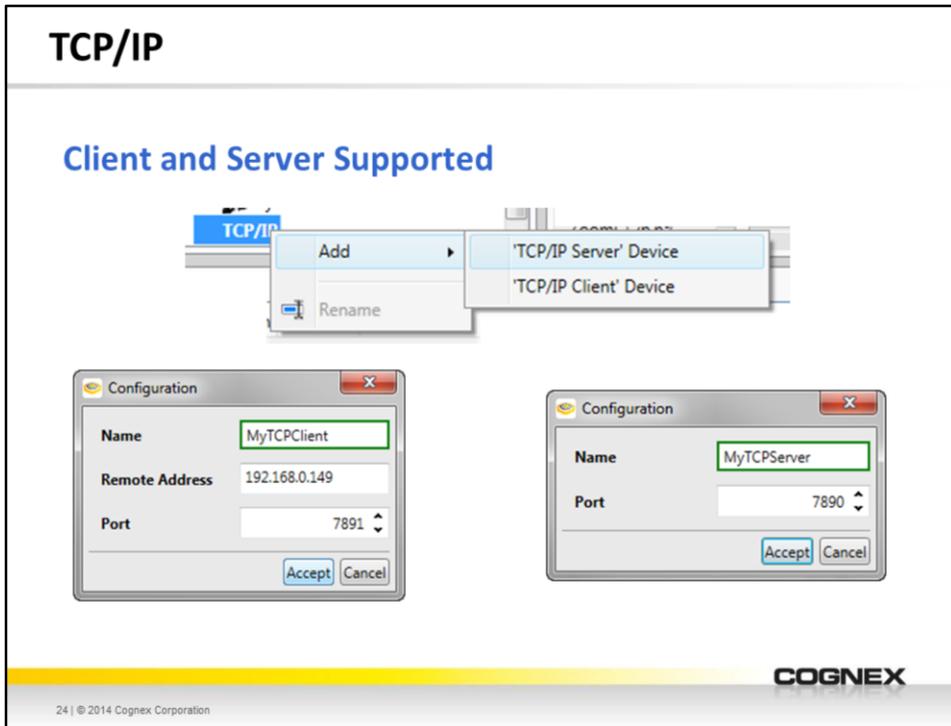


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RS232 serial communication can be accomplished through setting up an RS232 object under Devices -> Communication in the Explorer. Make sure you setup the configuration to match the device in which you wish to communicate.

Control of the communication is accomplished through scripting. Examples are at the back of this manual.



TCP/IP communication can be accomplished through setting up a TCP/IP object under Devices -> Communication in the Explorer. The Cognex Designer can act as a client or a server. The main difference is that the Client is responsible for opening the port.

- Client – Enter the IP address of the server (device) that you wish to establish communication. Then select a port number. We suggest a number greater than 3000.
- Server – Enter the port number that the Client will be using to establish communication.

Note: You may have multiple client and server TCP/IP objects within the application. They must use different ports.