Honeywell

# PlantScape Controller Implementation

## Lesson 3

# Building Level Indicators

5 - 21

***Notes***

**Introduction**

The purpose of this lesson is to give you the knowledge to be able to create and configure a level indicator. After you complete this lesson you will have configured the CM that will calculate the levels of material in Tank A, Tank B, and the Reactor.

**Objectives**

❶ Create a new CM named CM#_LVLA to calculate material levels

❷ Add and configure AUXCALC and DATAACQ Function Blocks

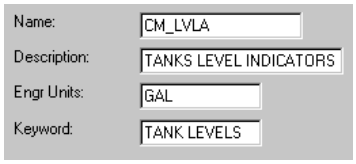
❸ Operate CM#_LVLA and CM#_ACCA in Station

Honeywell

## Adding and Configuring a new CM

- Create a new CM

- Modify the settings to match the information below
  - **Main** tab
    - Name **CM#_LVLA**
    - Description **TANKS LEVEL INDICATORS**
    - Engr Units **GAL**
    - Keyword **TANK LEVELS**
    - Execution Period **200MS**
  - **Server** Tab
    - Point Detail Page **sysDtlLVLA.dsp***
    - Group Detail Page **sysGrpLVLA.dsp***




- Close **CM#_LVLA** and save changes

- Assign **CM#_LVLA** to **CEE0101**

5 - 22

## *Notes*

**Adding and Configuring a new CM**
When adding a new CM you can use any one of the following three methods:
- Click File > New > Control Module
- Drag a CM from the Library Tab to the Project Tab
- Double click on the CM in the Library Tab (This method adds the CM to the Project and opens the chart for configuration, in one step. It also allows more work area since only one tree needs to be open.)

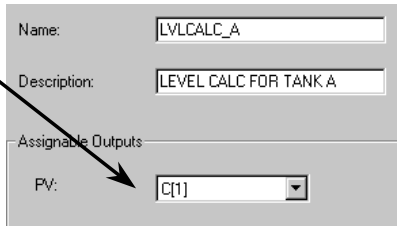
* Note: sysDtlACCA.dsp and sysGrpACCA.dsp are <u>not</u> standard detail and group displays. They were modified from standard detail and group displays for this course.

Before any Function Blocks are inserted to the CM it is good practice to assign the CM to the corresponding CEE. This will enable you to completely configure the I\O Channel Function Blocks without having to close and reopen the CM.

Honeywell

# Adding and Configuring Function Blocks (Tank A)

- Open **CM#_LVLA**
- Add an **AUXCALC** Function Block
- Double click on the **AUXCALC** Block
- Modify the settings to match the information below
  - Name **LVLCALC_A**
  - Description **LEVEL CALC FOR TANK A**
  - Assignable Outputs **PV C[1]**




- Add a new Pin to the **LVLCALC_A** Block
  - P[1] Input/Top

5 - 23

## *Notes*

### Adding and Configuring Function Blocks (Tank A)

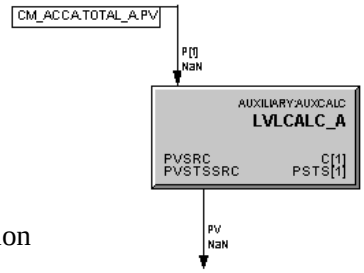
Configuring the AUXCALC Block is different from any other block configured in previous lessons. The PV is the result of any of the block functions that the user chooses. In this case, we choose C1, which is the result of calculation 1.

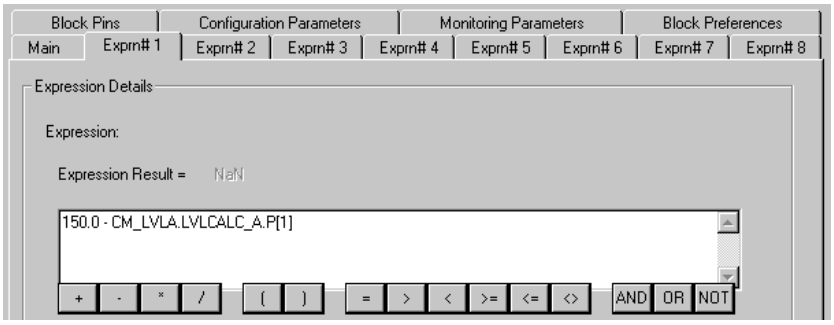
The AUXCALC will use a Parameter Connection for its input. That is why we are adding a new pin at this point. To add a new pin, enter the Block Configuration screen and select the type of input and position for the pin.

Honeywell

## Adding and Configuring Function Blocks (Tank A) *…continued*

- Add a Parameter Connector to the **P[1]** Pin
- Enter Parameter Connector Information
  - **CM#_ACCA.TOTAL_A.PV**
- Double click on the **LVLCALC_A** Block
- Click on the Exprn#1 tab and enter the following information
  - **150.0-CM#_LVLA.LVLCALC_A.P[1]**
- Click **OK**




5 - 24

## *Notes*

**Configuring Expression Details**

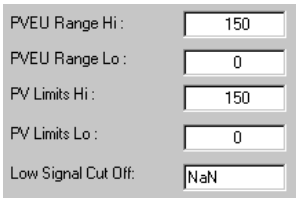
Expression 1 will calculate the level in Tank A. Tanks A and B have capacities of 150 Gallons each. We are subtracting the A flow totalizer amount from 150 to calculate the level. Recall that each time the process starts, both A and B are refilled.

Notice that the AUXCALC has access to the entire database in the expression syntax. We did not have to bring in CM#_ACCA.TOTAL_A.PV as an input to the block. We could have referenced it directly in the expression. We added it as an input so that it would be visible from the chart drawing

Honeywell

## Adding and Configuring Function Blocks (Tank A) *…continued*

- Add a **DATAACQ** Block
- Configure the **DATAACQ** with the following information
  - **Main** Tab
    - Name **LEVEL_A**
    - Description **LEVEL IN TANK A**
    - Engr units **GAL**
    - PVEU Range Hi **150**
    - PVEU Range Lo **0**
    - PV Limits Hi **150**
    - PV Limits Lo **0**
    - Clamping/Filtering **Clamping Enabled**




  - **Alarms** Tab

| | Trip Point | Priority | Severity |
|---|---|---|---|
| **PV Low** | **5** | **High** | **0** |

5 - 25

## *Notes*

**Adding a Data Acquisition Block**

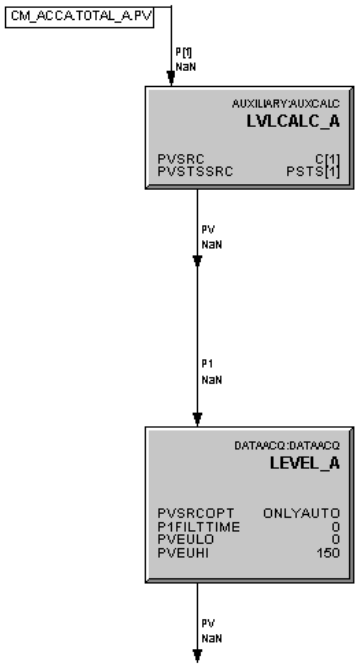
We are using the DATAACQ block for similar reasons that we used it in the PID loop -- namely for High and Low alarming. ( In this case we are only concerned with the low alarm.)

We are adding it for another reason as well. We want to indicate the tank level in a display. The Display Builder Indicator uses percent parameters for its input. The DATAACQ block has a parameter PVP, which is PV in percent. This is the parameter we will use in the display.

Honeywell

## Adding and Configuring Function Blocks (Tank A) *…continued*

- Wire
  - **LVLCALC_A - PVVALSTS**
    to
    **LEVEL_A - P1**



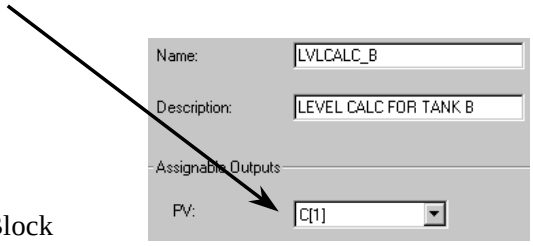

5 - 26

***Notes***

Honeywell

## Adding and Configuring Function Blocks (Tank B) *…continued*

- Add a second **AUXCALC** Function Block
- Double click on this **AUXCALC** Block
- Modify the settings to match the information below
  - Name **LVLCALC_B**
  - Description **LEVEL CALC FOR TANK B**
  - Assignable Outputs **PV: C[1]**




- Add a new Pin to the **LVLCALC_B** Block
  - **P[1] Input/Top**

5 - 27

### *Notes*

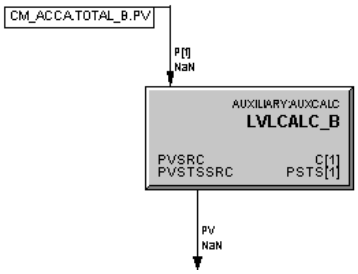
**Adding and Configuring Function Blocks (Tank B)**

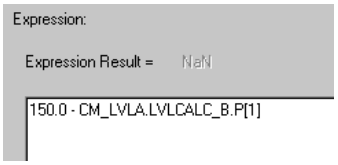
This AUXCALC block will be used to calculate the level in Tank B. Its configuration will be nearly identical to that for Tank A.

Honeywell

## Adding and Configuring Function Blocks (Tank B) *…continued*

- Add a Parameter Connector to the **P1** Pin
- Enter Parameter Connector Information
  - **CM#_ACCA.TOTAL_B.PV**
- Double click on the **LVLCALC_B** Block
- Click on the Exprn#1 tab and enter the following informati
  - **150.0-CM#_LVLA.LVLCALC_B.P[1]**
- Click **OK**




5 - 28

## *Notes*

**AUXCALC Expressions**

Note that the AUXCALC block can have up to eight expressions. The result of each is C1 through C8. The expressions can use inputs from the block's own controller database or that of any other controller on the Supervisory C-Net through peer-to-peer connections. The expressions have many math functions available and the results can be used through out the control scheme.

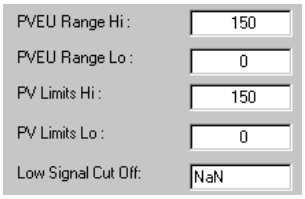
The AUXCALC has a counterpart in the Regulatory Control family. It is called the REGCALC block. In the reference below, Table 1 lists the math functions available for both the AUXCALC and the REGCALC blocks.

For more information on configuring REGCALCL blocks refer to the ***Control Builder Components Theory, Regulatory Control, REGCALC Block.***

Honeywell

## Adding and Configuring Function Blocks (Tank B) *…continued*

- Add a **DATAACQ** Block
- Configure the **DATAACQ** with the following information
  - **Main** Tab
    - Name **LEVEL_B**
    - Description **LEVEL IN TANK B**
    - Engr units **GAL**
    - PVEU Range Hi **150**
    - PVEU Range Lo **0**
    - PV Limits Hi **150**
    - PV Limits Lo **0**
    - Clamping/Filtering **Clamping Enabled**




  - **Alarms** Tab

| | Trip Point | Priority | Severity |
|---|---|---|---|
| • PV Low | **5** | **High** | **0** |

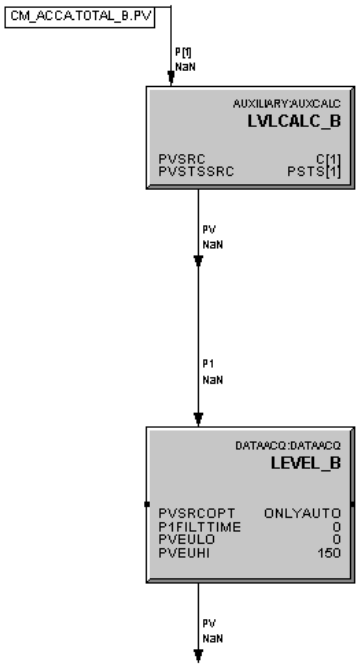
5 - 29

***Notes***

Honeywell

## Adding and Configuring Function Blocks (Tank B) *…continued*

- Wire
  - **LVLCALC_B - PV**
    to
    **LEVEL_B - P1**



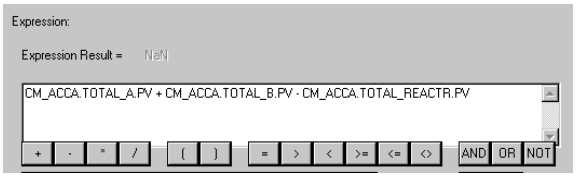

5 - 30

***Notes***

Honeywell

## Adding and Configuring Function Blocks (Reactor) *…continued*

- Add a third **AUXCALC** Block
- Configure the **AUXCALC** with the following information
  - **Main** Tab
    - Name **LVLCALC_REACTR**
    - Description **LEVEL FOR REACTOR**
    - Assignable Outputs **PV: C[1]**
  - **Exprn 1** Tab
    - CM#_ACCA.TOTAL_A.PV + CM#_ACCA.TOTAL_B.PV - CM#_ACCA.TOTAL_REACTR.PV




- Add three new Pins to the **LVLCALC_REACTR** Block
  - P[1] Input/Left
  - P[2] Input/Left
  - P[3] Input/Left

5 - 31

### *Notes*

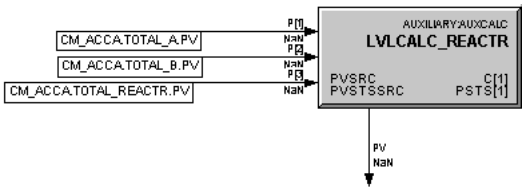
**Level for Reactor**

This AUXCALC block will calculate the level in the reactor. It totals the Tank A and Tank B charge amounts and subtracts the Reactor drain flow total.

Honeywell

## Adding and Configuring Function Blocks (Reactor) *…continued*

- Add a Parameter Connector to the **P1** Pin
- Enter Parameter Connector Information
  - **CM#_ACCA.TOTAL_A.PV**
- Add a Parameter Connector to the **P2** Pin
- Enter Parameter Connector Information
  - **CM#_ACCA.TOTAL_B.PV**
- Add a Parameter Connector to the **P3** Pin
- Enter Parameter Connector Information
  - **CM#_ACCA.TOTAL_REACTR.PV**




5 - 32

## *Notes*

**Parameter Connections**

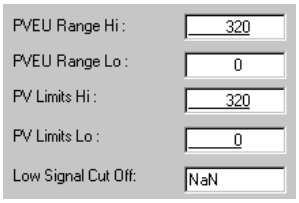
Since the AUXCALC expression uses the amounts from the Tank A, Tank B, and Reactor totalizers directly, these parameter connectors are for chart reference only.

Because we did add them as parameter inputs, the expression could be alternatively written: CM#_LVLA.LVLCALC_REACTR.P[1] + CM#_LVLA. LVLCALC_REACTR.P[2] - CM#_LVLA. LVLCALC_REACTR.P[3]

Honeywell

## Adding and Configuring Function Blocks (Reactor) *…continued*

- Add a **DATAACQ** Block
- Configure the **DATAACQ** with the following information
  - **Main** Tab
    - Name **LEVEL_REACTR**
    - Description **LEVEL IN REACTOR**
    - Engr units **GAL**
    - PVEU Range Hi **320**
    - PVEU Range Lo **0**
    - PV Limits Hi **320**
    - PV Limits Lo **0**
    - Clamping/Filtering **Clamping Enabled**




  - **Alarms** Tab

| | Trip Point | Priority | Severity |
|---|---|---|---|
| PV High High | **300** | **Urgent** | **0** |
| PV High | **280** | **Low** | **0** |
| PV Low | **10** | **Journal** | **0** |
| PV Low Low | **5** | **Journal** | **0** |

5 - 33

## *Notes*

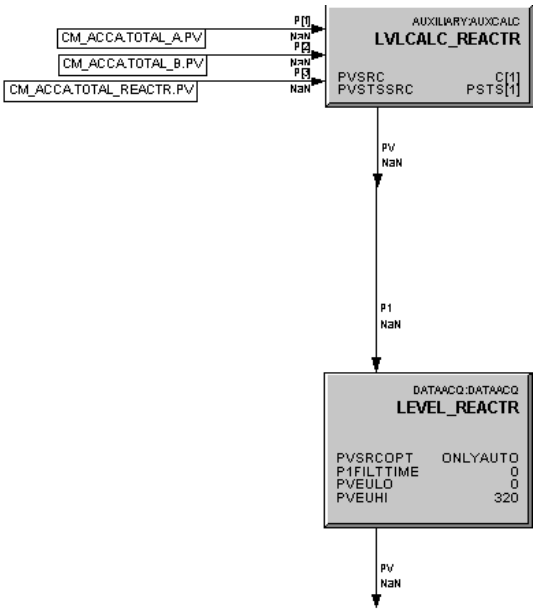
**DATAACQ Block for Reactor Level**

The reactor tank capacity is 320 gallons. The data acquisition block allows alarming and as we will see in the next lesson, interlocking, when the tank approaches full status.

Honeywell

## Adding and Configuring Function Blocks (Reactor) *…continued*

- Wire
  - **LVLCALC_REACTR .PV**
    to
    **LEVEL_REACTR . P1**




- Close and save **CM#_LVLA**

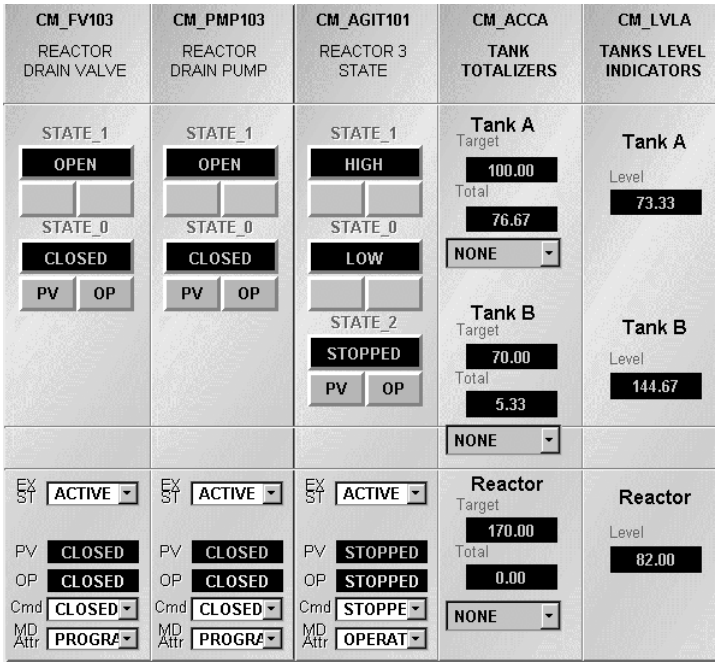
5 - 34

***Notes***

Honeywell

# Working with CM#_LVLA and CM#_ACCA

- Load and Activate **CM#_LVLA** and **CM#_ACCA**
- Configure Group #4 in station
  - **CM#_FV103 (slot 1)**
  - **CM#_PMP103 (slot2)**
  - **CM#_AGIT101 (slot3)**
  - **CM#_ACCA (slot 4)**
  - **CM#_LVLA (slot 5)**




5 - 35

## *Notes*

**Operating the Control Scheme**

- In Station  or Control Builder reset and Start the totalizers for A, B, and the Reactor
- In Station open CM#_FV101 and CM#_FV102 (Use Groups #2, #3, and #4)
- Set the MODE of CM#_FV101RC to AUTO and enter 85 for the SP
- Note the CM#_ACCA totals increasing for A and B, the A and B tank levels decreasing while the Reactor level increases
- Close CM#_FV101 and CM#_FV102. Put CM#_FV101RC in MAN and set the OP to 0.0.
- Open the Drain Valve, CM#_FV103
- Note the reactor level decreasing
- Close the drain valve when the reactor is empty

Honeywell

# This completes….

# PlantScape Controller Implementation

## Lesson 3

# Building Level Indicators

5 - 36

***Notes***