

# What is Pro/II?

## **Simulation Applications**

- Design new processes
- Evaluate alternate plant configurations
- Modernize and revamp existing plants
- Assess and document compliance with environmental regulations
- Troubleshoot and debottleneck plant processes
- Monitor, optimize, and improve plant yields and profitability

## **Industries Served**

- Oil and gas processing
- Refining and petrochemicals
- Chemicals and pharmaceuticals
- Engineering and construction

<http://www.simsci-esscor.com/>

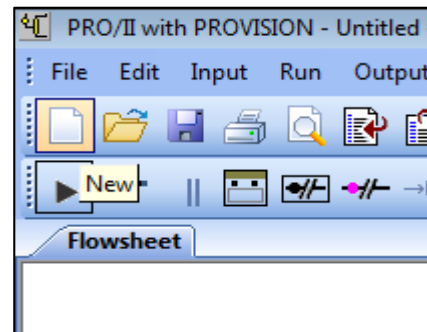
# 7 Basic Steps

- 1 – Draw Your Flowsheet
- 2 – Define your components
- 3 - Select Your Thermodynamic Calculation Methods
- 4 – Define Your Streams
- 5 – Define Your Units
- 6 – Run Your Simulation
- 7 – Review Your Results

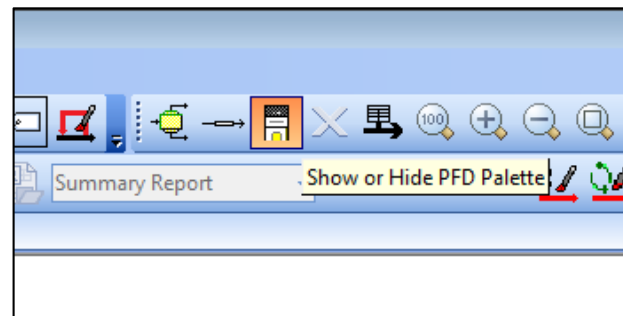
# Step 1 – Draw Your Flowsheet

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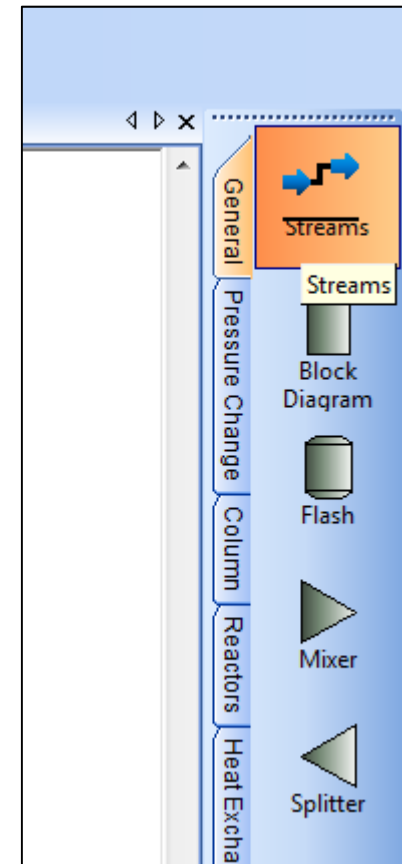
1. Open Pro/II
2. Click “New”



3. Click “Show or Hide PFD Palette”

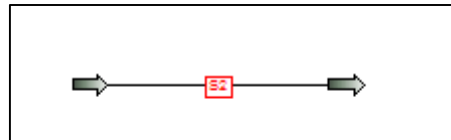


4. Choose “Streams” from PFD Palette →



# Step 1 – Draw Your Flowsheet

5. Draw a stream – a SIMPLE system

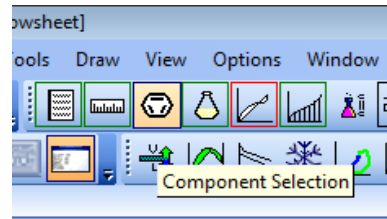


- **Red** means 'incomplete/didn't work'
- **Blue** means 'complete/good'
- **Yellow** means 'warning'

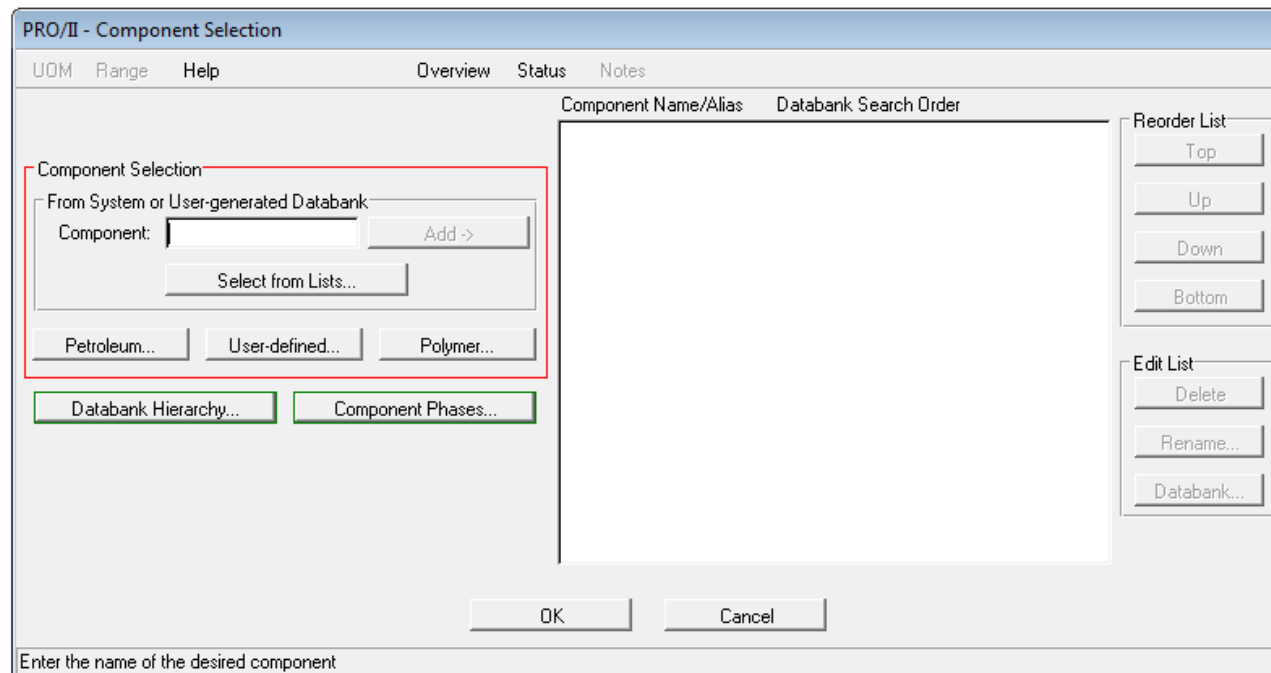
# Step 2 – Define your components

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1. Push the **RED** “Component Selection” button

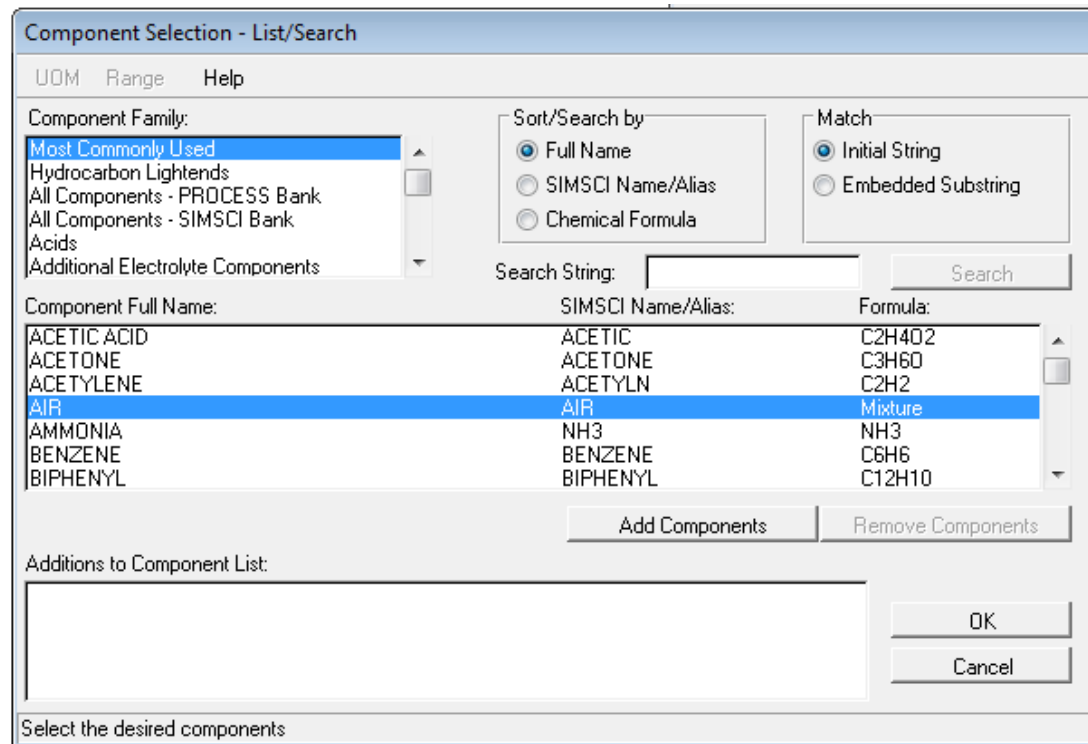


2. Push “Select from lists...”; notice the **red**



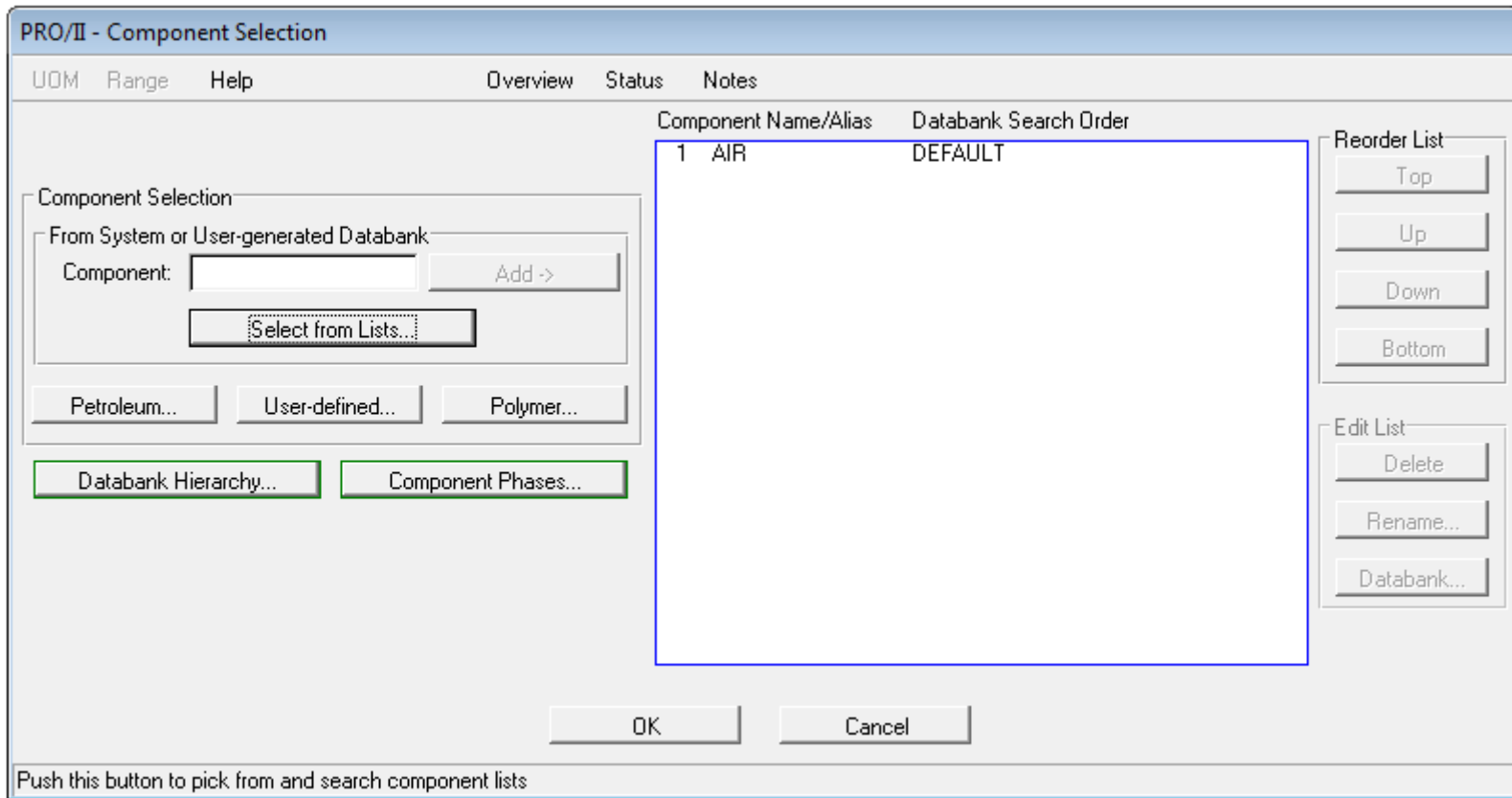
# Step 2 – Define your components

3. Click “Most Commonly Used” and then choose “AIR”
4. Click “Add component” and “OK”





# Step 2 – Define your components

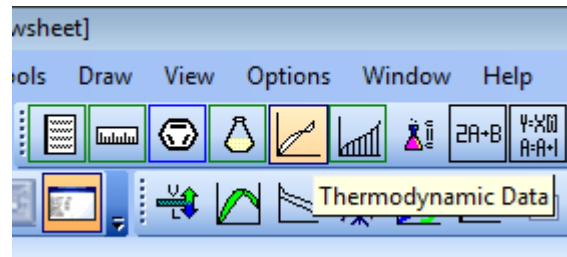


**BLUE** means done!!!

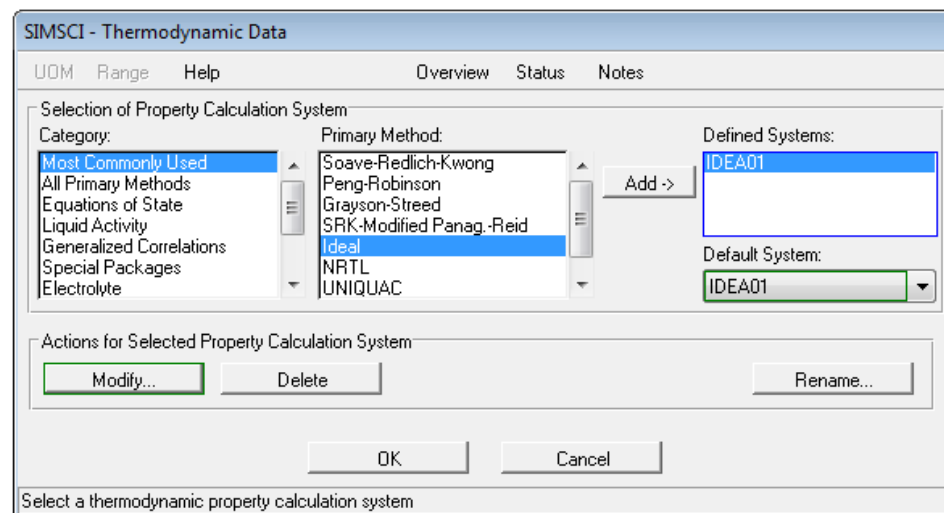
# Step 3 - Select Your Thermodynamic Calculation Methods

# Step 3 - Select Thermodynamic

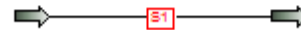
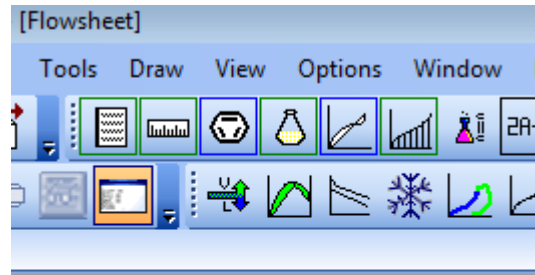
1. Click the *other* **RED** button



2. Click “Most Commonly Used”, then choose “Ideal”
3. Click “Add” and “OK”



# Step 3 - Select Thermodynamic



**BLUE** means done!!!

# Step 4 – Define Your Streams

# Step 4 – Define Your Streams

1. Double click the stream and fill in things in RED

PRO/II - Stream Data

UOM Range Help Tag Overview Status Notes

Stream: S1 Description:

To Unit: (Product Stream)

Stream Type

- Composition Defined
- Petroleum Assay
- Referenced to Stream
- Solids Only Stream

Flowrate and Composition...

Stream Solids Data...

Stream Polymer Data...

Thermal Condition

First Specification:

Second Specification:

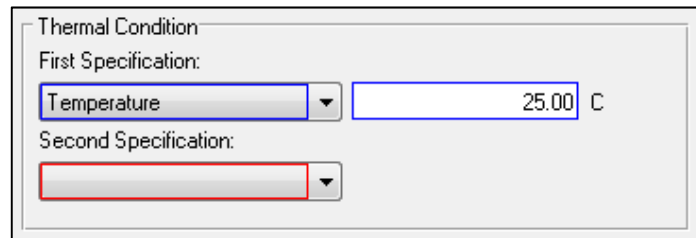
Thermodynamic System: Determined From Connectivity

OK Cancel

Push to bring up the flowrate and assay window

# Step 4 – Define Your Streams

## 2. Specify the Temperature to be 25°C

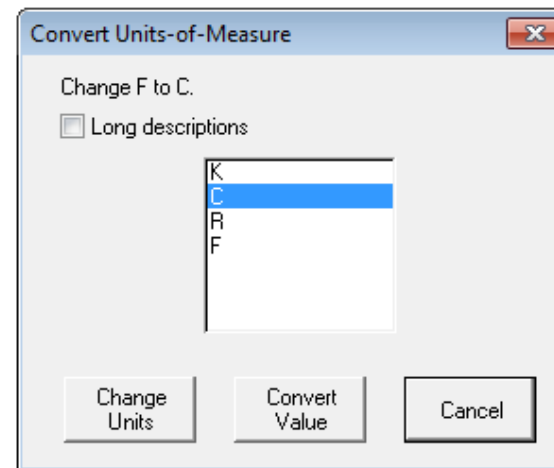


Thermal Condition

First Specification:

Temperature 25.00 C

Second Specification:



Convert Units-of-Measure

Change F to C.

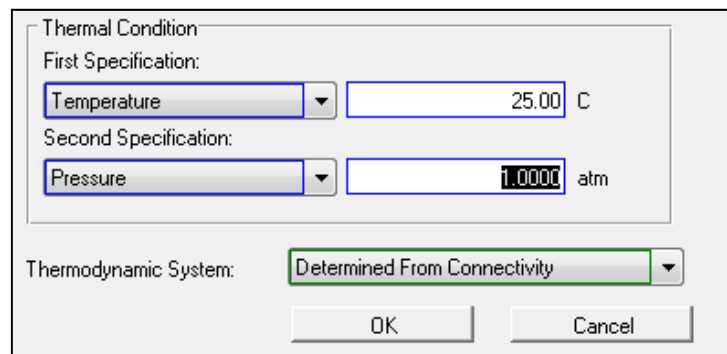
Long descriptions

K  
C  
R  
F

Change Units Convert Value Cancel

*Notice the unit conversion! (go to UOM)*

## 3. Specify the Pressure to be 1atm



Thermal Condition

First Specification:

Temperature 25.00 C

Second Specification:

Pressure 1.0000 atm

Thermodynamic System: Determined From Connectivity

OK Cancel

# Step 4 – Define Your Streams

## 4. Define Flowrate ...

Stream Data - Flowrate and Composition

UOM Range Help Tag

Specify flowrate and composition for stream S1

Fluid Flowrate Specification

Total Fluid Flowrate: 100.00 lb-mol/hr  Total LV or GV rate on an Adjusted Standard Basis

Individual Component Flowrates

Component Concentrations

Total Fluid Flowrate: \_\_\_\_\_ lb-mol/hr

| Copy  | Component | Composition |
|-------|-----------|-------------|
| Paste |           | Mole        |
|       | AIR       | 1.0000      |

Clear Compositions Total: 1.0000  Normalize Component Flowrates Based on Specified Fluid Flowrate

OK Cancel

Enter the composition

100 lbmol/hr

Note: mass & volumetric flowrates are also in UOM

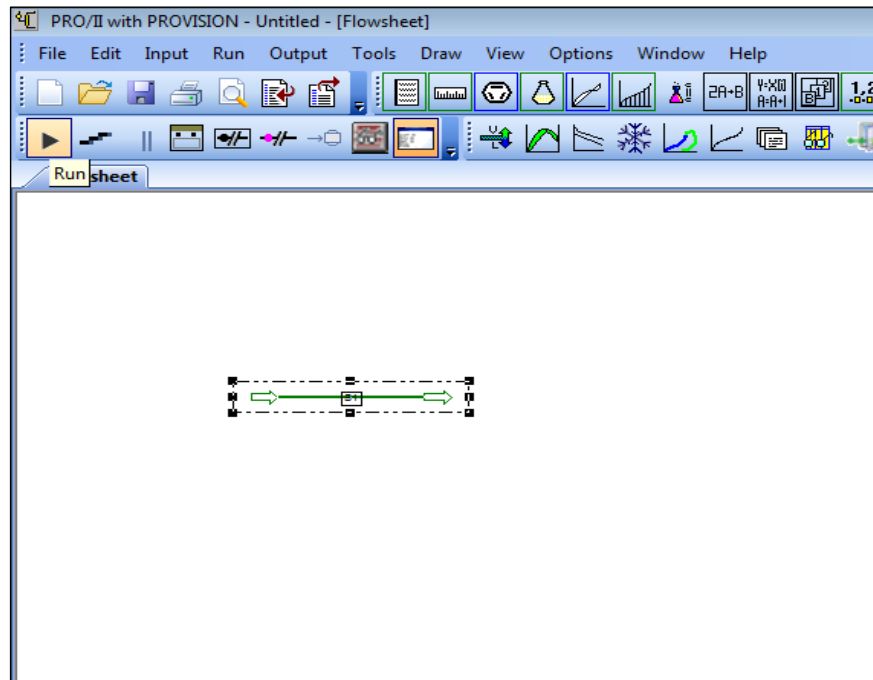
## 5. ...and composition (must add up to 1 or 100)

| Component | Composition |
|-----------|-------------|
|           | Mole        |
| AIR       | 1           |



# Step 4 – Define Your Streams

- The stream is no longer red
- All buttons are blue
- Run button is no longer red



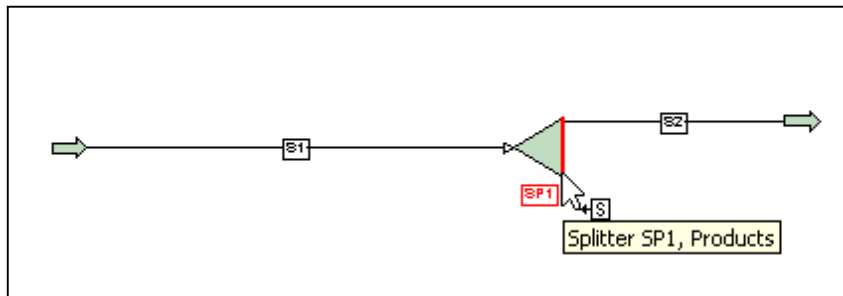
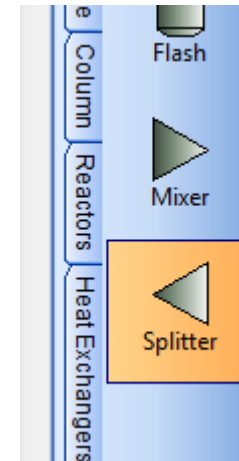
- ... we can run! ... but...

# Step 5 – Define Your Units

(make life exciting)

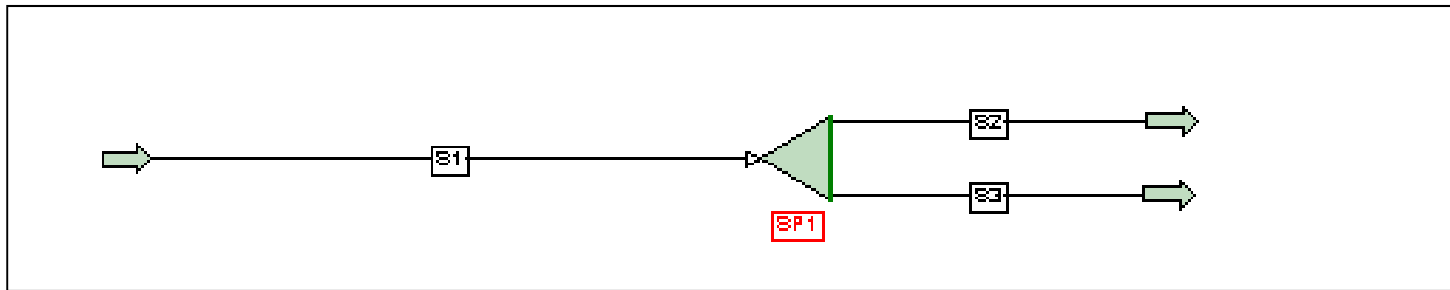
# Step 5 – Define Your Units

1. Choose a “Splitter” from palette
2. Place it in your flow sheet
3. Attach the stream to it



4. And add some output streams

# Step 5 – Define Your Units



**Pro/II will calculate the output streams, but the simulation is RED...**

# Step 5 – Define Your Units

5. Double click the **RED** splitter

PRO/II - Splitter

Range Help Overview Status Notes

Unit:  Description:

Thermodynamic System:

Product Rate Specifications

|   | Stream | Specification     |
|---|--------|-------------------|
| 1 | S2     | Parameter = value |
| 2 | S3     | Parameter = value |

Options When Feed is Inadequate to Satisfy Product Rate Specifications

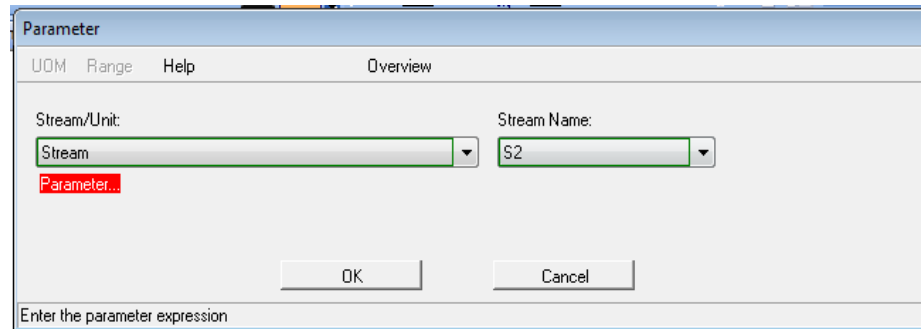
Satisfy Each Specification in Order Until Feed is Exhausted

Satisfy Each Specification and Normalize Flowrates if Needed

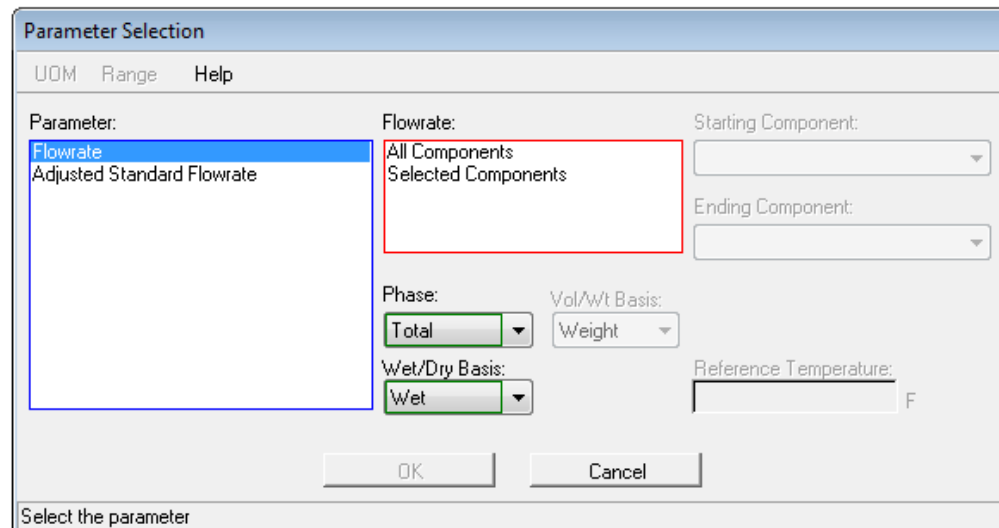
Enter the splitter specification

# Step 5 – Define Your Units

6. Click on “Parameter”



7. And click on “Parameter” again, then click “Flowrate”



# Step 5 – Define Your Units

8. Choose “All components” and click “OK”,  
(Click to the unit if you want to change it)

PRO/II - Splitter

Range Help Overview Status Notes

Unit:  Description:

Thermodynamic System:

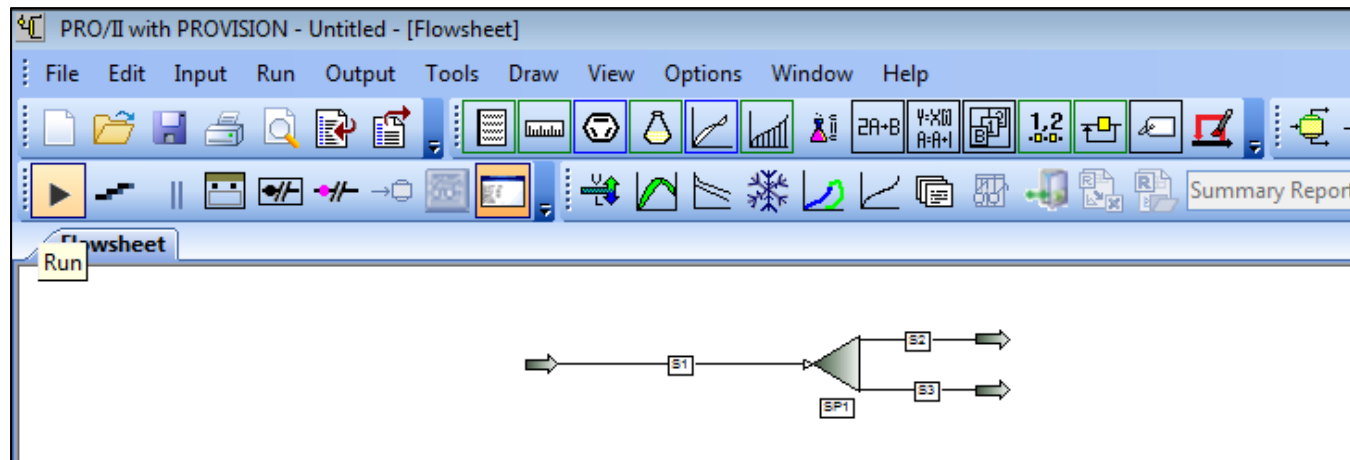
Product Rate Specifications

|   | Stream | Specification   |
|---|--------|---|
| 1 | S2     | <a href="#">Stream S2 Flowrate of All Components on a Wet basis in lb-mol/hr = 50.000</a> |
| 2 | S3     | Parameter = value   |

9. Click “Value” on the right of ‘=’ and enter ‘50’  
(*this splits the stream in half*)

# Step 5 – Define Your Units

**We are now ready to roll!!!**

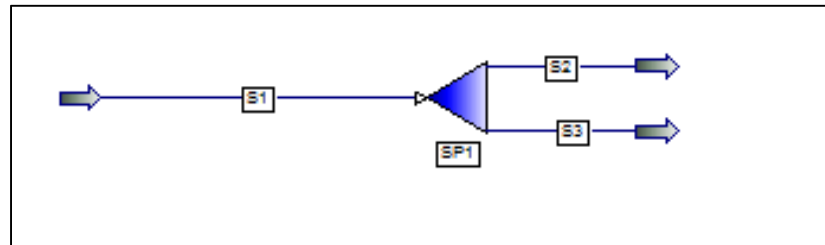




# Step 6 – Run Your Simulation

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1. Push the “Run” button and watch your simulation turn **BLUE**



# Step 6 – Run Your Simulation

- A **BLUE** simulation means it solved correctly from a *mathematical* point of view.
- You must use your engineering knowledge to check if the answers make *physical* sense.

# Step 7 – Review Your Results

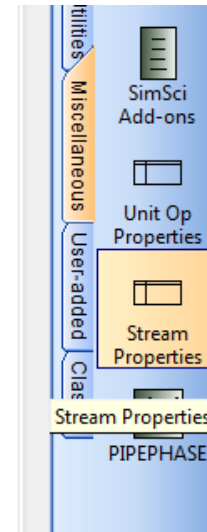
# Step 7 – Review Your Results

## Ways to Look at Results:

- Create a Table
- Generate Report
- Right Click on Unit of Interest
- Export to Excel
- Graphs (*more advanced*)

# Step 7 – Review Your Results

1. Choose a “stream properties” table from “Miscellaneous” tab on the palette



2. The double click on the “Property Table”



| Stream Name | Units     |
|-------------|-----------|
| Temperature | F         |
| Pressure    | PSIA      |
| Flowrate    | LB-MOL/HR |

Property Table

# Step 7 – Review Your Results

2. Select on the options in the “Property List to be used”
3. In the “Available Streams” section, click the stream you want to display and click “Add” or click “Add All” if you want all of them

**Stream Property Table**

UOM Range Help Overview

Property List to be used:  
Property Label List  
**Material Balance List**  
Short Property List  
Stream Summary  
Dry Stream Summary

Define Component Groups...

Table Appearance

Display Row Grid Lines Line Width: 1

Show Border Only Border Width: 2

Allow Multiple Rows Cell Character Width: 10

Maximum Streams/Row: 10

Stream Selection

Include All Streams (selected)  
Include Flowsheet Source/Sink Streams

Available Streams:  
S1 (selected)  
S2  
S3

Displayed Streams:

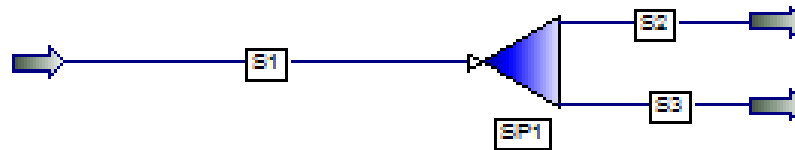
Add -> Add All <- Remove Remove All Up Down Top Bottom

Include Stream Property Table in the Report

OK Cancel

These streams are not yet in the property table

# Step 7 – Review Your Results



| Stream Name        |           | S1      | S2     | S3     |
|--------------------|-----------|---------|--------|--------|
| Stream Description |           |         |        |        |
| Phase              |           | Vapor   | Vapor  | Vapor  |
| Temperature        | F         | 77.000  | 77.000 | 77.000 |
| Pressure           | PSIA      | 14.696  | 14.696 | 14.696 |
| Flowrate           | LB-MOL/HR | 100.000 | 50.000 | 50.000 |
| Composition        |           |         |        |        |
| AIR                |           | 1.000   | 1.000  | 1.000  |



# Step 7 – Review Your Results

Alternatively Generate a more detailed report

