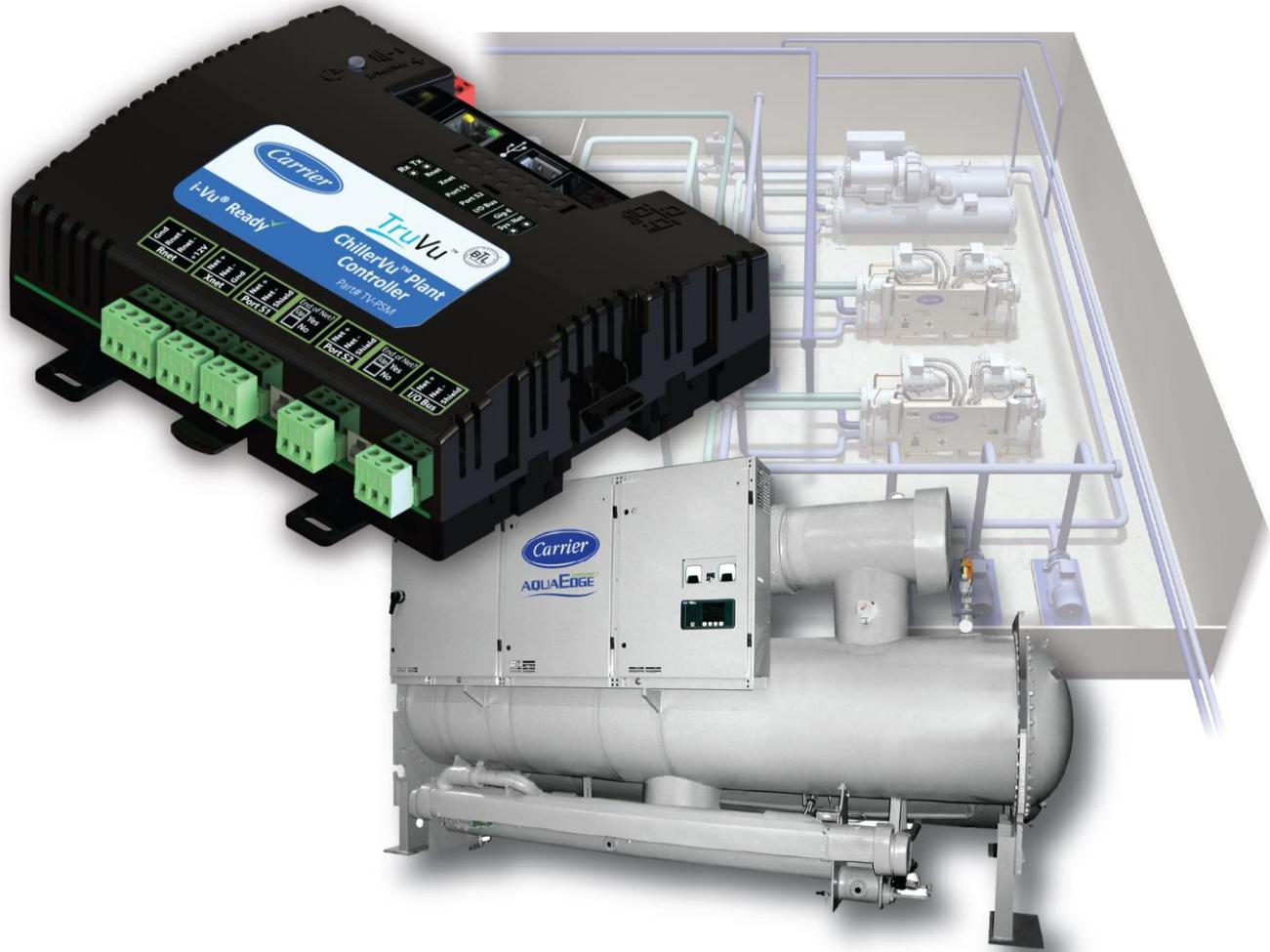


TruVu™ ChillerVu™

23XRV Series Counterflow

Application Guide





Verify that you have the most current version of this document from www.hvacpartners.com, the **Carrier Partner Community** website, or your local Carrier office.

Important changes are listed in **Document revision history** at the end of this document.

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What is the TruVu™ ChillerVu™ series counterflow application?

The TruVu™ ChillerVu™ series counterflow (SCF) application is a proprietary control sequence designed to optimize the performance of two Carrier 23XRV screw chillers piped in a series counterflow arrangement.

When combined with the TruVu™ ChillerVu™ plant control system, the 23XRV SCF control program provides comprehensive, micro-processor-based, chilled water plant control that utilizes the full power and flexibility of the i-Vu® system.

⚠ CAUTION You can ONLY use the TruVu™ ChillerVu™ SCF control program with the TruVu™ ChillerVu™ controller.

SCF overview

- Starts and stops a chiller plant by using an internal time schedule, remote contact override, network command, outside air temperature, cooling requests, or a time schedule override
- Provides chiller staging, fault logic, and automatically starts and stops chillers
- Provides machine-specific sequencing to provide the correct online chiller capacity at any given time
- Offers optional soft start ramp loading, chilled water reset
- Balances the load efficiently between the 2 machines

You can find detailed information for the TruVu™ ChillerVu™ controller in the *TruVu™ ChillerVu™ Installation and Start-up Guide*.

Application library

You must generate the TruVu™ ChillerVu™ SCF control program, with the basic SCF system graphic, in EquipmentBuilder, using the Plant System Manager SAL library. Build the control program by selecting options and control features that match your mechanical system's requirements.

The SAL library's SCF application to use with the i-Vu® application is *23XRV chillers connected with UPC Open controllers (Chlr 23XRV SCF w/UPCs)* (page 16)

NOTE For information regarding connectivity to the 23XRV Chillers, please contact your Carrier equipment sales engineer.

You can also use the following logic from the SAL library, if required by the application:

- **Pump Managers** with control sequences for constant or variable flow primary and secondary chilled water pumps, and constant or variable flow condenser pumps
- **Tower Manager** with control sequences for multiple towers
- **Open and Closed Cooling Tower** programs for tower-specific control points, including condenser water pumps and associated equipment

Supported chiller hardware

The TruVu™ ChillerVu™ SCF application is used exclusively with Carrier 23XRV screw chillers. The application does not support any other chiller types or models.

Network and hardware points

The SCF control program uses a combination of network and hardware points.

Network points

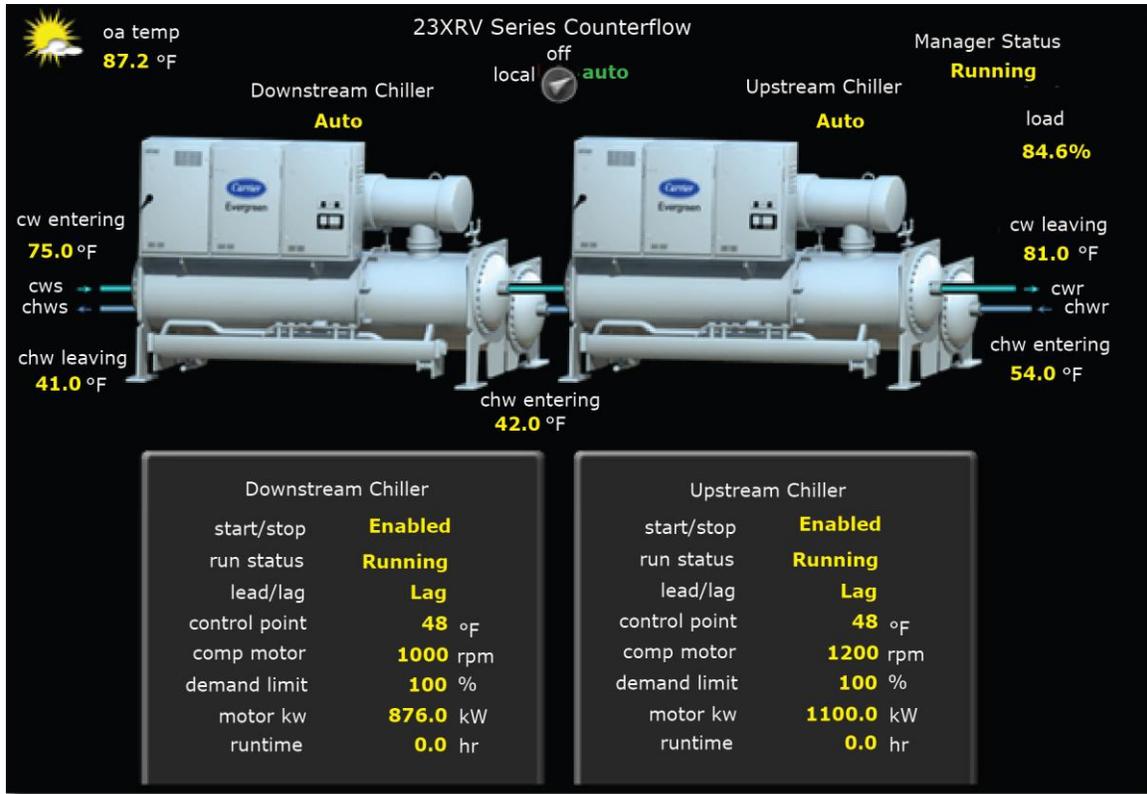
Name	Address
Downstream Chiller Demand Limit	exp:#downstream_chiller_2/cm_ch_dl_write
Downstream Chiller Evaporator Liquid Temp	exp:#downstream_chiller_2/crt
Downstream Chiller KW	exp:#downstream_chiller_2/linekw_p
Downstream Chiller Leaving Chilled Water Setpoint	exp:#downstream_chiller_2/cm_ch_sp_write
Downstream Chiller RPM	exp:#downstream_chiller_2/cpr_rpm
Enable CM Write Downstream Chiller	exp:#downstream_chiller_2/cm_ch_write_ena
Enable CM Write Upstream Chiller	exp:#upstream_chiller_1/cm_ch_write_ena
Network Downstream Chiller Status	exp:#downstream_chiller_2/status
Network Upstream Chiller Enable	exp:#upstream_chiller_1/cm_ch_ss_write
Network Downstream Chiller Enable	exp:#downstream_chiller_2/cm_ch_ss_write
Network Upstream Chiller Status	exp:#upstream_chiller_1/status
OA Temp	bacnet://*/AV:80001
Upstream Alarm	exp:#upstream_chiller_1/cm_ch_alarmstatus_msv
Upstream Chiller Chilled Water Return Temp	exp:#upstream_chiller_1/ent_chw_temp
Upstream Chiller Chilled Water Supply Temp	exp:#upstream_chiller_1/lvg_chw_temp
Upstream Chiller Compressor Ontime	exp:#upstream_chiller_1/c_hrs
Upstream Chiller Condenser Refrig Temp	exp:#upstream_chiller_1/crt
Upstream Chiller Cond Water Entering Temp	exp:#upstream_chiller_1/ent_cw_temp
Upstream Chiller Cond Water Leaving Temp	exp:#upstream_chiller_1/lvg_cw_temp
Upstream Chiller Demand Limit	exp:#upstream_chiller_1/cm_ch_dl_write
Upstream Chiller Evaporator Liquid Temp	exp:#upstream_chiller_1/est
Upstream Chiller KW	exp:#upstream_chiller_1/linekw_p
Upstream Chiller Leaving Chilled Water Setpoint	exp:#upstream_chiller_1/cm_ch_sp_write
Upstream Chiller RPM	exp:#upstream_chiller_1/cpr_rpm

Hardware points

Name	Point type	I/O type
CHWR Temp	BAI	Thermistor
CHWS Temp	BAI	Thermistor
*OAT Sensor	BAI	Thermistor
Chiller Manager Start	BBI	Dry Contact
Downstream Chiller Power Loss	BBI	Dry Contact
Emerg Shutdn	BBI	Dry Contact
Refrig Shutdn	BBI	Dry Contact
Upstream Chiller Power Loss	BBI	Dry Contact
Downstream Chiller Enable	BBO	Relay / Triac Output
Upstream Chiller Enable	BBO	Relay / Triac Output

***NOTE** You must select OAT when building your control program in EquipmentBuilder in order to have that hardware point.

Single loop plants with coolers in series (series counter flow)



Characteristics	<ul style="list-style-type: none"> For Carrier 23XRV screw chillers only A single pump or headered pump serves both chillers
Location	Constant flow systems where load variations are usually small
Mechanical applications	For 23XRV series counterflow applications only
Control applications	<ul style="list-style-type: none"> CHWST is used for staging CHWST sensor is located downstream of both chillers CHWRT sensor is located upstream of both chillers Chilled Water Flow Meters are highly recommended for all applications and are mandatory for applications where third parties control the chilled water pumping equipment
Advantage	<ul style="list-style-type: none"> Optimized staging based on machine-specific and proprietary equipment performance data Easy to control the system chilled water temperature
Disadvantages	May require additional time for optimal system tuning

Start-up and Commissioning

Before you begin

- The 23XRV PIC chillers must be commissioned and started by the Carrier equipment service technician.
- You must have the list of machine-specific tuning coefficients provided by your Carrier equipment sales representative.
- The TruVu™ ChillerVu™ controller must be installed and running. See the *TruVu™ ChillerVu™ Technical Instructions* for details.

To begin

- 1 Connect the UPC Open controller for each 23XRV chiller to the S1 port of the TruVu™ ChillerVu™ controller, using a daisy chain configuration.
- 2 Install all sensors or other hardware inputs and outputs, check out wiring, and connect to the controller.
- 3 In the i-Vu® interface, add the TruVu™ ChillerVu™ controller to the system database. See the *TruVu™ ChillerVu™ Technical Instructions* for details.

To set up

- 1 If communicating over BACnet, edit the **Addresses** on the **Properties > Network Points** tab to enable communication. See *Communicating with 23XRV chillers* for instructions.
- 2 In the i-Vu® application:
 - Add the SCF control program and the .view file
 - NOTE** Verify that the internal 23XRV PIC staging logic is disabled.
 - **Download** All Content to the controller
 - On the **Properties > BACnet Objects** tab, configure the tuning coefficients provided by Charlotte Chiller Marketing. See *TruVu™ ChillerVu™ SCF system constants* (page 14).
- 3 Commission hardwired sensors or other I/O points, if present.

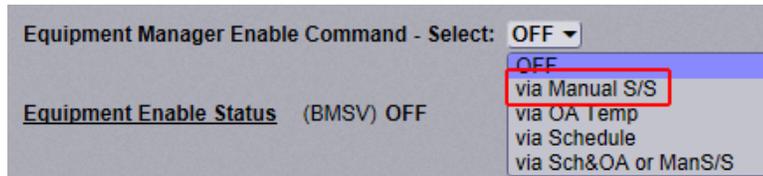
To configure Properties

In the i-Vu® interface, select the SCF control program in the navigation tree and go to the **Properties > Control Program** tab.

Expand the following sections and set these values:

Run Conditions

- 1 **Equipment Manager Enable Command** — Select **via Manual S/S** for the initial system start-up. Once the system is commissioned, you can select whichever **Equipment Manager Enable Command** sequence is appropriate for the project.



- 2 **Chiller Manager Start** — Select **Stop** or **Off** and check **Lock** for the point used in the application (BBV, BNI, or BB).
- 3 **Local - Off - Auto:** — Select **auto**.

Chiller Rotation

Chiller rotation method: — Select **7 - Never Rotate**.

Chiller Lead/Lag Control

- 1 **Chilled Water Supply Setpoint** — Leave the default of **45 °F**.
- 2 **Lag Chiller Staging:** — Select **Load**.
- 3 **Load of lead chiller > 79% enables lag chiller with a hysteresis of 44%** — Verify the values **79%** and **44%**.
- 4 **Soft Starting > Enable Soft Starting on lag chiller start** — Select **Enable**.

Upstream Chiller and **Downstream Chiller** — Confirm that the values in the i-Vu® application the PICs match those that are read from the ICVC or through Network Service Tool.

To start-up the SCF system

Set the start command in the SCF program by accessing the i-Vu® interface and navigating to **Properties > Control Program** tab > **Run Conditions > Chiller Manager Start** (BBV, BNI, or BBI, depending on your system). Select **Start** or **On**, as applicable.

The **Equipment Run Status** should change to **On** and, after a short delay, the lead machine should enable and ramp up.

- Assuming sufficient load, the lag machine starts when:
 - The lead machine exceeds 79% capacity (in **Chiller Lead/Lag Control**, the **Load of lead chiller** default value)
 - The chilled water supply temperature is greater than the setpoint for 10 minutes
- When the lag machine starts, **Soft Starting** logic allows both machines to ramp up together by calculating a demand limit for each machine that will be gradually raised over time. The calculated demand limit is raised by 10% every minute (configurable) until it reaches 100% and Soft Starting is no longer active.
- Also, whenever both machines are operating, the upstream machine receives a calculated setpoint that is higher than the downstream machine, which balances the load between the 2 machines.
- If load is **insufficient** to run both machines, (capacity drops below 35%, or below the default lag chiller enable load value minus 44% hysteresis), then only the lead machine operates.
- When the load conditions increase sufficiently again, as stated above, the lag machine stages on.

Notes for optional functions

- **Lead Chiller Fault Handling** – Assuming single chiller operation, the lag chiller stage should start if the lead chiller faults
- **Chiller Rotation** – Once you have observed stable operation, set **Chiller rotation method** to option **6 – Runtime Equalize**. Over time, the run hours of both machines should be roughly equal.

You should also test these functions, if applicable, in the following **Properties > Control Program** section:

- **Chiller Shutdowns** – verify that the system correctly shuts down when receiving a refrigerant, emergency, or plant shutdown signal
- **Demand Limiting** – verify that the system demand limit correctly regulates chiller operation when a demand limit signal is received over the network

Sequence of operation

The TruVu™ ChillerVu™ SCF application controls a single pair of 23XRV chillers in a series counterflow piping arrangement. Sequencing of multiple pairs of chillers or non-23XRV machines is **not** supported.

Chiller sequencing preconditions

- 1 Prior to start, the SCF control program runs a rotation calculation (see *Rotation method* (page 12)) to assign the lead chiller.
- 2 Once the lead chiller is assigned, the ability to start is determined, based on its current operational status. If the lead chiller is not able to start, then the lag chiller is assigned as the lead and its ability to start is determined.
- 3 Variables are included that you can set to indicate the need to open any system isolation valves that may be present. These points are BACnet binary variables, which you can assign to actual hardware output channels, or to be read by a 3rd party, to indicate if a system is ready to start and open the associated isolation valves.
- 4 A leaving chilled water setpoint is sent to each machine in the pair. The configured setpoint is sent to the downstream chiller. The upstream chiller is sent a setpoint that varies depending on the system status. When the upstream machine is the lead and is the only machine running, it is sent the configured setpoint. When both machines are running, it is sent a calculated setpoint designed to provide load balance or to assist if the downstream machine is unable to achieve its target setpoint.

Lead chiller enable/disable - chiller start initiation

When start conditions are met, the SCF control program initiates a start sequence of the lead chiller, which enables associated pump control logic, if present.

The SCF program monitors the flow switch input, if present, and prevents chiller operation on loss of flow. It also shuts down the operating chillers, if closed during operation, and sets a system alarm. The flow switch input assumes a normally closed switch (open contact = flow), resulting in a loss of flow being signaled by a contact closure.

The logic fails the lead chiller, if after 20 minutes (configurable), one of the following **Running Modes** is not confirmed from the chiller:

- **Prestart**
- **Start Up**
- **Ramplng**
- **Running**
- **Demand**
- **Recycle** (CCS is configurable as an acceptable run status and not associated with failure)

If confirmation is not received, the system sets a **Chiller Failure** alarm. The lead chiller status is changed to failed, the lag chiller is assigned as the lead, and the system initiates a start command to the newly assigned lead chiller.

If both chillers are failed, the system can attempt to reset both chillers and re-initiate the start sequence (optional).

Chiller staging conditions

After a successful system start, the following staging is initiated to satisfy the system load:

- When enabled, each chiller modulates its individual capacity using its internal controls to maintain its leaving chilled water setpoint, sent by the application settings, which default to 45 °F (configurable).
- The control program monitors the downstream chiller leaving chilled water temperature sensor. If the downstream chiller leaving chilled water temperature sensor exceeds the deviation from setpoint for the 10-minute default (configurable), the lag chiller start sequence initiates.
- Once the lag start sequence initiates, the lead chiller's operating capacity is calculated. If the capacity has exceeded the efficiency optimization threshold, plus the deadband for the 10-minute default (configurable), then the lag chiller is commanded on.
- Both chillers run until the efficiency optimization threshold, minus the deadband, has been met for the 10-minute default (configurable), and then the lag chiller is commanded off.
- The lag chiller is enabled or disabled, as needed, to maintain the leaving chilled water setpoint.
- If the lead chiller fails during operation, an alarm signal is issued over BACnet, converts the lag chiller to the lead chiller, and assigns the appropriate leaving chilled water setpoint to the lead chiller.
- If the lag chiller fails during operation, an alarm signal is issued over BACnet.

Pull Down

During pull down, there is an alarm after the 10-minute default, or the time you set, if high chilled water temperature conditions exist.

There is an alarm if entering or return chilled water temperature readings are out of range for more than the configured time.

Power Loss

In the event of power loss to a chiller, and if the power loss relay is closed (optional), the application attempts to start the remaining chiller in the branch. If the remaining chiller is either already operating or unable to start, the application attempts to restart the inoperative chiller 30 seconds after its power is restored.

You can monitor the power loss binary input and disable the start command to prevent undesired restarts after power failure.

Load balancing

When both chillers must operate, the application calculates the appropriate setpoint to maintain equal load balance between the upstream and downstream chillers. The return water temperature and the leaving water temperature are monitored to determine the optimum leaving water temperature setpoint of the lead machine to balance the load between the 2 chillers. The system then sends the calculated setpoint to the upstream chiller and sends the configured leaving water temperature setpoint to the downstream chiller to ensure optimal efficiency and load balance. See *the sequencing preconditions* (page 9).

If both chillers are operating, and the leaving water setpoint of the downstream chiller is not met after a configured time delay, the leaving water setpoint is adjusted and sent to the upstream chiller to automatically compensate until the required downstream setpoint is achieved.

Automatic resets after single chiller failures

The SCF application is designed to allow automatic reset of its chiller lockouts after a local chiller failure, once the cause of the failure has been corrected and the local chiller alarm cleared.

The following example uses the upstream chiller, but the sequence is the same for either machine.

In the i-Vu® interface, on the **Properties** page > **Control Program** tab > **Upstream Chiller**, set **Automatically Re-enable Upstream Chiller on Failure** to **On** to enable automatic resets. If it is set to **Off**, automatic reset will not occur and you must manually reset it.

Sequence

- 1 Following a chiller failure and lockout of the chiller by the SCF application, the failed chiller's local alarm status ANI is monitored. When it has returned to Normal (value = 1), a 2-minute delay within the SCF reset logic begins.
- 2 After the 2-minute delay expires, the SCF chiller lockout is reset. If required by the SCF staging logic, the failed chiller becomes available to start.
- 3 If the SCF staging logic determines that the second chiller is required and the failed machine successfully starts, (both machines running), a run order swap is executed to return the machines to the previous run order and clear the lead_fail parameter.
NOTE During the reset, the swap function is inhibited and the chillers don't attempt to change lead/lag position. The failed chiller stays in the lag position.
- 4 If a second chiller is required and the previously failed machine does not re-start, then the reset process repeats again after 2 minutes. The logic continues to attempt to reset and restart the failed chiller until either the lag machine is no longer required or the lag chiller restarts successfully.
- 5 The application stores the adjusted run order (lead/stby MB) even if the SCF is disabled, and returns to using the replacement chiller (lag) as the lead, immediately when re-enabled, as long as power is not removed from the TruVu™ ChillerVu™ controller.

Automatic resets after dual chiller failures

The SCF application can restart the system following a failure of both chillers.

In the i-Vu® interface, on the **Properties** page > **Control Program** tab > **Resets** section, **Automatically reset chiller features in chiller manager if 2 fail** defaults to **Disable**.

Rotation method

The designated lead chiller rotates if one of the following conditions apply:

- **Daily** at 8 am (time is configurable)
- **Weekly**
- **Monthly**
- **Manual Rotation** through a software switch
- **Runtime** (if chiller runtime of 360 hours (configurable) is exceeded)
- **Runtime Equalize** (compares the runtime hours of each chiller and runs the chiller with the least amount of runtime as the lead)
- **Never Rotate**

Configure this in the i-Vu® interface, **Properties > Control Program > Chiller Rotation**. The default is Runtime EQ.

Alarms

The following alarms are pre-configured:

- **OAT Temp Failure** – outside air temperature sensor failure
- **Emergency Chiller Shutdown** – emergency shutdown binary input has been tripped
- **Refrigerant Leak Chiller Shutdown** – refrigerant leak binary input has been tripped
- **Loss of Flow** – loss of flow binary input has been tripped
- **Remote Shutdown** – remote shutdown network input has been tripped
- **Upstream Chiller Failure** – commanded on, but the status is off after 20-minute (configurable) delay.
- **Upstream Chiller Hand** – commanded off, but the status is on
- **Upstream Chiller Runtime** – the chiller has run for 10,000 hours (configurable)
- **Downstream Chiller Failure** – commanded on, but the status is off after 20-minute (configurable) delay.
- **Downstream Chiller Hand** – commanded off, but the status is on
- **Downstream Chiller Runtime** – the chiller has run for 10,000 hours (configurable)
- **Lead Chiller Failure** – the lead chiller is in failure and the lag chiller is on
- **High Main Chilled Water Supply Temp** – if the main chilled water supply temperature is greater than 55°F (configurable)
- **Low Main Chilled Water Supply Temp** – if the main chilled water supply temperature is less than 38°F (configurable)
- **High Main Chilled Water Return Temp** – if the main chilled water return temperature is greater than 65°F (configurable)
- **Low Main Chilled Water Return Temp** – if the main chilled water return temperature is less than 38°F (configurable)

Optional settings

Maintenance Mode

- You can assign the chiller to **Maintenance Mode** in the i-Vu® interface (**Properties > Control Program > Downstream Chiller** or **Upstream Chiller**).
- A chiller that is in **Maintenance Mode** is not engaged by the SCF application.

Demand Limiting

- The kW consumption of any operating chiller can be limited to the level indicated from a Network Demand Level input
- The Demand Limit mode is a value between 0 and 3 (default 0 = 100%), representing the 3 levels of demand limit (1=90%, 2=80%, 3=70%). You can adjust these values.

Chilled Water Setpoint Reset

- If enabled, the SCF application resets the chilled water setpoint based on outdoor air temperature (BACnet or Hardwired Input).
- As the outdoor air temperature drops from 75 °F to 50 °F (configurable), it will reset the chilled water setpoint upward by 0 °F to 10 °F (configurable). The maximum reset is 10 °F (configurable).

TruVu™ ChillerVu™ 23XRV SCF system constants

In order for the TruVu™ ChillerVu™ SCF application to operate properly and achieve maximum system efficiency, you must enter certain constants.

These constants are provided by Carrier Water Cooled Chiller Marketing and are based on the equipment selection data for the specific machines used on the project. The constants provided by chiller engineering are labeled as shown and provided in the following format:

x	x2	y	y2	c	e	BSST
0.0548	0.00194	0.56	0.05	2	0.019	39

NOTES

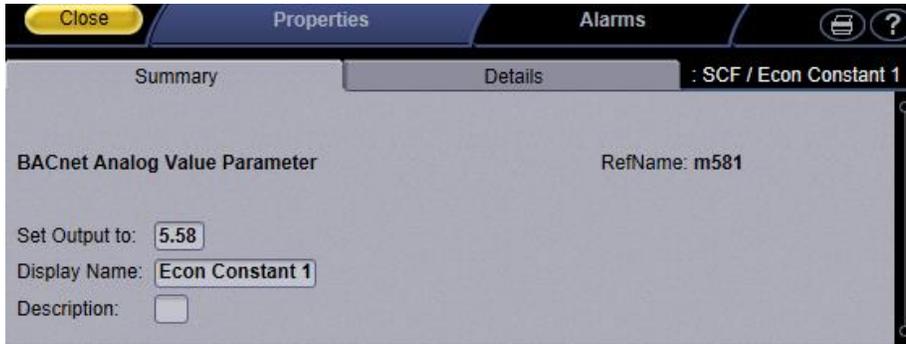
- You use only the first 6 (left to right) constants.
- The constants in the SCF application are assigned to the values as follows:
 - Constant 1 - x
 - Constant 2 - x2
 - Constant 3 - y
 - Constant 4 - y2
 - Constant 5 - c
 - Constant 6 - e
- The provided values must be multiplied x100 before entering them in the SCF application.
- Even though the SCF application has 2 sets of constants available, you use only 1 set, depending on whether the chillers have economizers or not.

Control Program	I/O Points	Alarm Sources	Trend Sources	Network Points	BACnet Objects	C
Device: This						
Name	Reference Name	Type	Present Value	Locked	Object Name	
Econ Constant 1	m581 2	(BAV)	5.53 3	<input type="checkbox"/> 0	m581_1	
Econ Constant 2	m583	(BAV)	0.2	<input type="checkbox"/> 0	m583_1	
Econ Constant 3 1a	m582	(BAV)	52	<input type="checkbox"/> 0	m582_1	
Econ Constant 4	m584	(BAV)	5.5	<input type="checkbox"/> 0	m584_1	
Econ Constant 5	m586	(BAV)	1500	<input type="checkbox"/> 0	m586_1	
Econ Constant 6	m585	(BAV)	1.9	<input type="checkbox"/> 0	m585_1	
metric	ratrk_metric	(BAV)	32 °F	<input type="checkbox"/> 0	ratrk_metric_1	
Non Econ Constant 1	m430	(BAV)	5.67	<input type="checkbox"/> 0	m430_1	
Non Econ Constant 2	m486	(BAV)	0.1	<input type="checkbox"/> 0	m486_1	
Non Econ Constant 3 1b	m431	(BAV)	53.5	<input type="checkbox"/> 0	m431_1	
Non Econ Constant 4	m494	(BAV)	0.5	<input type="checkbox"/> 0	m494_1	
Non Econ Constant 5	m496	(BAV)	530	<input type="checkbox"/> 0	m496_1	
Non Econ Constant 6	m495	(BAV)	1.9	<input type="checkbox"/> 0	m495_1	

- **1a** and **1b** – These are the 6 constants for each machine type; economizer equipped (1a - **Econ Constant**) and non-economizer equipped (1b - **Non Econ Constant**). You only need to enter one set to be used by the application, based on the economizer setting within the SCF **Properties** pages in the i-Vu® application.
- **2** – This is the Reference Name associated with **Econ Constant 1**. Each constant has a unique value and reference name. Double-click the **Reference Name** to enter an updated value.
- **3** – This is the actual value that is used for each constant.

To enter the updated values

- 1 Select the SCF application in the navigation tree.
NOTE SCF may not be the name of the application since it could have been changed by the user.
- 2 Select **Properties** > **BACnet Objects** tab and scroll to the list of constants.
- 3 Double-click the **Reference Name** for the first constant and enter the updated value in **Set Output to:**.
- 4 Click **Accept**.



- 5 Repeat steps 3 - 6 for the remaining 5 constants.

If there are any questions regarding constants, please contact the Carrier Water Cooled Chiller Marketing.

Communicating with the 23XRV chillers

In order for the SCF control program to communicate with the 23XRV chillers, you must edit values relating to the **Network Point Addresses** or **Reference Names**.

For more information regarding connectivity to the 23XRV chillers, please contact the Carrier Control Systems Support.

To connect using UPC Open controllers

To use the **Chlr 23XRV SCF w/UPCs** SAL for SCF staging, the 23XRV chillers must be equipped with UPC Open controllers that are compatible with the chiller PIC control versions.

In your i-Vu® interface, you must discover the UPC Open controllers and upload them into your database. (Select the TruVu™ ChillerVu™ in the navigation tree, go to **Devices > Manage** tab, click **Find Devices** and then **Upload all Content**.)

To establish connectivity for UPC Open-equipped 23XRV chillers, you must edit the **Address** for the **Network Points** for each chiller's upstream and downstream points to include the **BACnet Device Instance** for each UPC.

- 1 Locate the UPC Open's BACnet Device Instance from the navigation tree by right-clicking the UPC Open that is associated with the upstream chiller and then selecting **Module Status**.
- 2 Copy the **BACnet Device Instance** to the clipboard.

```
ADDRESS BINDING Used: device instance 1610109 is on network 1601
08/22/2016 14:01:41 CM: 9
Device Instance: 1610109
Application Software Version: PRG:chiller_23xrv_v05-20160322
```

- 3 Select the SCF equipment in the navigation tree and go to **Properties > Network Points** tab.
- 4 Scroll to the upstream chiller points.

- 5 You must edit the **Address** of all Network Points.

EXAMPLE

- Default settings for the Network Points **Alarm Status**, **Chilled Water Supply Temperature**, and **Chilled Water Return Temperature**

bacnet://x/av:37

bacnet://x/av:20

bacnet://x/av:26

- Replace the **x** with **1610109** for each upstream chiller variable

bacnet://1610109/av:37

bacnet://1610109/av:20

bacnet://1610109/av:26

- 6 Continue this process for the remaining upstream chiller network points and continue to the downstream chiller by replacing the **y** with the **BACnet Device Instance** number of the downstream chiller.

Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

Date	Topic	Change description	Code*
		No changes yet	

* For internal use only



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