General Service Bulletin

Tracer AdaptiView™ Settings for the Head Pressure Control Option

CVHE, CVHF, CVHG, CDHF, CDHG, and CVGF CenTraVac™ Chillers

ATTENTION: Warnings and Cautions appear at appropriate sections throughout this literature. Read these carefully.

⚠ **WARNING** – Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ **CAUTION** – Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE – Indicates a situation that could result in equipment or property-damage only accidents.

Introduction

This bulletin discusses the optional head pressure control feature that is available for use in Tracer AdaptiView UC800 CTV firmware versions 2.06 and later. Due to the variety of job site applications, the settings for the head pressure control may need to be adjusted to gain unit stability.

⚠ WARNING

Hazardous Voltage w/Capacitors!

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

Note: For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN or PROD-SVB06A-FR.

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Discussion

System Differential Pressure Logic

To assure proper oil and refrigerant management within the CenTraVac chiller, it is necessary to maintain an adequate refrigerant differential pressure.

Refrigerant differential pressure = condenser refrigerant pressure - evaporator refrigerant pressure.

Evaporator refrigerant pressure is calculated by the Tracer AdaptiView using the saturated evaporator refrigerant temperature converted to pressure.

On units not equipped with the optional condenser pressure transducer, condenser refrigerant pressure is calculated by Tracer AdaptiView using the saturated condenser refrigerant temperature converted to pressure. On units equipped with the optional condenser pressure transducer, the condenser pressure is taken directly from the transducer.

For all chillers factory-equipped with Tracer AdaptiView, the required system minimum refrigerant differential pressure of 3 psid or more must be maintained.

Note: *If Tracer AdaptiView controls have been retrofitted onto an older CenTraVac chiller, be aware that the older CenTraVac chiller may have a different required minimum refrigerant differential pressure. Refer to engineering bulletin CTV-PRB006-EN for guidance.*

Failure to maintain an adequate minimum refrigerant differential pressure may result in oil loss or in the "stacking" of refrigerant in the condenser.

In addition to maintaining the minimum refrigerant differential pressure during chiller operation, the following guidelines must also be met in order to ensure adequate oil and refrigerant management in the chiller:

- The refrigerant differential presure should reach or exceed the required minimum refrigerant differential pressure within 15 minutes of starting the chiller.
- Run the chiller no less than 30 minutes at or above the required minimum refrigerant pressure differential to assure that the oil returns to the oil tank.

If the above guidelines cannot be met because of low tower water temperatures, then some form of tower water flow control must be used.

Tracer AdaptiView chiller controls provide for the embedded control of either an electronic modulating condenser water regulating valve, a condenser water pump Variable Frequency Drive (VFD), or any condenser water flow control device that can utilize a 0–10 Vdc input signal range.

Control of these devices provides minimum refrigerant pressure differential (also known as "head pressure control") for the chiller and allows for the continuous operation of the chiller during periods of low entering condenser water temperatures. Adjustable control parameters provide flexibility in different applications, yet it is relatively easy to set up and tune. Under conditions of varying evaporator conditions, this control will work to maintain an adequate minimum refrigerant differential pressure to meet the chiller's oil and refrigerant management requirements.

The following control sequence is meant to be adaptable to either a VFD or a modulating electronic control valve that will accept a 0–10 Vdc input and that can vary flow in the condenser water loop. Tracer AdaptiView embedded head pressure control does not actually sense or control condenser water flow directly. Instead, the chiller's refrigerant system differential pressure is measured and the flow device is modulated to maintain a minimum required refrigerant differential pressure for the CenTraVac chiller.

Sequence of Operation

In general, the following control states, chiller modes, delays, set points, and functions only exist if the **Refrigerant Pressure Output Type** in the Tracer TU **Configuration** menu is set to **Condenser Head Pressure Control**.

At Tracer AdaptiView power-up or reset, and after the compressor is stopped, the **Condenser Head Pressure Control** output is initialized to the voltage defined by the **Off State Output Command** setting.

Upon recognition of a call for cooling and a corresponding call for the condenser water pump, the **Condenser Head Pressure Control** output is commanded to a value that is 50 percent of the maximum flow position (50 percent of the **Output Voltage @ Desired Maximum Flow**). The condenser water pump is then started.

Once the condenser water flow is proven and all other pre-start conditions (pre-lube, etc.) are met, the compressor is commanded on. Once compressor operation is confirmed, the head pressure control will begin running closed-loop control for head pressure per the internal setpoint.

During normal operation with condenser water conditions providing a refrigerant differential pressure greater than the **Head Pressure Control Setpoint**, the control output will increase the condenser water flow, up to the maximum allowed output.

During operation with cool condenser water conditions and a resulting refrigerant differential pressure less than the **Head Pressure Control Setpoint**, the control output will decrease the condenser water flow, down to the minimum allowed output.

Hardware Requirements

In order to provide the 0–10 Vdc head pressure control output signal, a Tracer AdaptiView CenTraVac chiller must be equipped with the optional dual analog "%RLA and Condenser Pressure Output" LLID. If factory-installed, this is shown on wiring diagrams as LLID 1A15. The 0–10 Vdc output signal will be available on LLID 1A15 terminals J2-4 (+) and J2-6 (-).

On Tracer AdaptiView units not factory-equipped with LLID 1A15, and if applying condenser head pressure control is desirable, it will be necessary to purchase and install the correct dual analog output LLID. Contact Trane Aftermarket for parts identification and pricing.

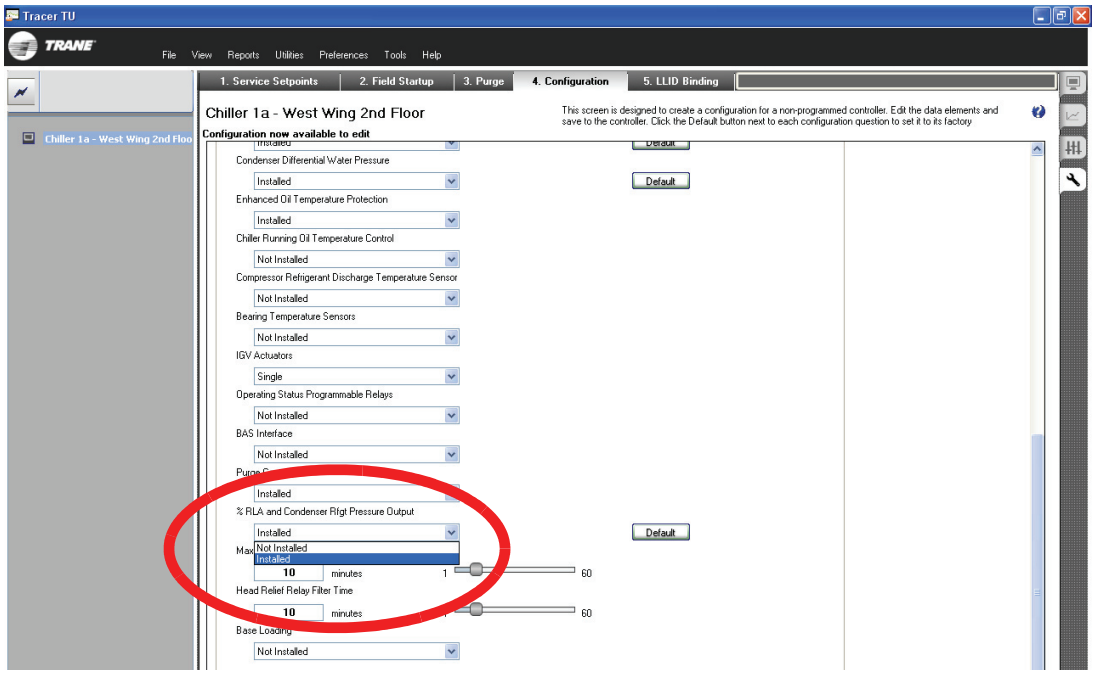
The Tracer AdaptiView/UC800 platform does not have LLID hardware to provide a 4–20 mA analog output. If a 4–20 mA signal is a requirement of the controlled device, then the use of an external signal converter (not provided by Trane) will be required.

The condenser water flow device to be controlled (electric valve, pump VFD, etc.) is field-provided and -installed.

Setup

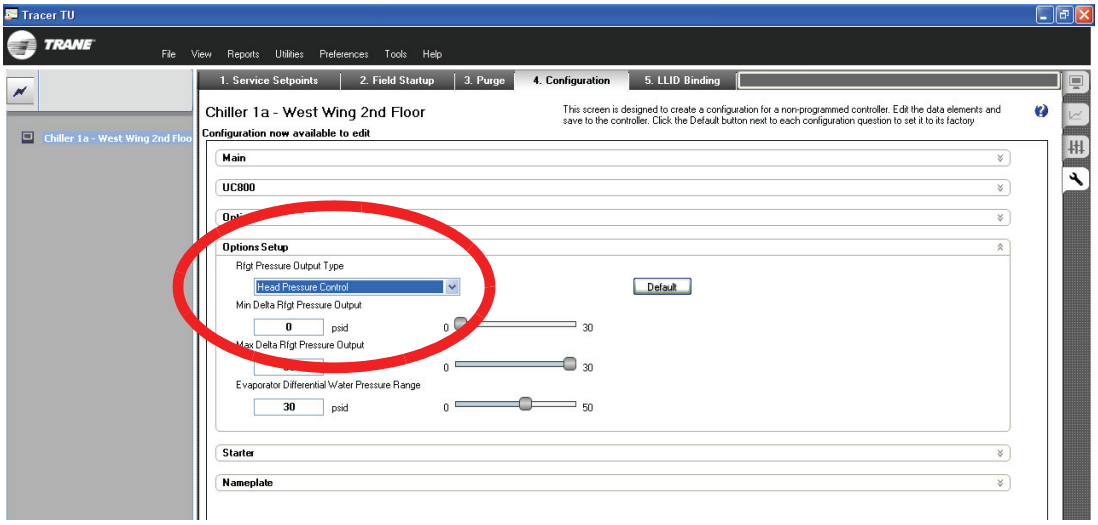
The Tracer™ TU laptop service tool must be used to configure and set up the head pressure control output feature of the Tracer AdaptiView. Start and connect Tracer TU to the UC800.

1. In **Configuration** view, select the **Options** tab. Set **%RLA and Condenser Rfgt Pressure Output** to **Installed**.



2. In **Configuration** view, select the **Options Setup** tab. Set **Rfgt Pressure Output Type** to **Head Pressure Control**.

   Note: *Older units with retrofit Tracer AdaptiView CVR software will also need to have* ***Pump Control*** *set to* ***Installed****, or the* ***Head Pressure Control*** *feature will not appear.*



3. Select **Save** to save the configuration to the UC800.
4. In **LLID Binding** view, ensure that the **%RLA and Condenser Pressure Outputs** LLID is properly bound in and communicating.
5. In **Field Startup** view, select the **Head Pressure Control** tab. Set the following setpoints:

- **Actuator Stroke Time** - Set this value to the actual time that it takes the commanded flow device to "stroke" from the specified minimum flow position to its maximum flow position. This setpoint is adjustable from 1 second to 1000 seconds, with a factory default of 30 seconds.

  Note: *The factory default setting may not be appropriate for the device being controlled. Measure the actual stroke time of the device being controlled and enter it as the* ***Actuator Stroke Time****.*

- **Desired Minimum Flow** - This value sets the desired minimum flow for the application. It is the lowest flow that is commanded while running the pump. This setpoint is adjustable from 0 to 100 percent, with a factory default of 20 percent. This value is typically adjusted in the field to result in a lowest flow rate that is just above the point at which the condenser water proof-of-flow device (flow switch) will make/break.

- **Head Pressure Control Setpoint** - This is the setpoint to which the control algorithm controls. For CVHE, CVHF, or CVHG and CDHF or CDHG chillers, this setpoint is adjustable from 3 psid to 10 psid (20.7 kPaD to 68.0 kPaD), with a factory default of 3 psid (20.7 kPaD).

  Note: *For CenTraVac chillers with factory-installed Tracer AdaptiView controls, CenTraVac Technical Service recommends that an initial* ***Head Pressure Control Setpoint*** *of 4 psid (27.6 kPaD) be set for the system. Adjust this setpoint upwards if operational issues (oil loss, etc.) result from unit operation with low refrigerant differential pressures.*

  Older CenTraVac chillers with retrofitted Tracer AdaptiView controls, if using the optional Head Pressure Control output, may have a different required minimum refrigerant differential pressure. Refer to engineering bulletin CTV-PRB006-EN for guidance.

- **Output Voltage at Desired Maximum Flow** - This is the voltage for the full desired flow of the device to be controlled, and is the largest flow command that will ever be sent to the device. This setpoint is adjustable from 0 to 10 Vdc, with a factory default of 10 Vdc.

- **Output Voltage at Desired Minimum Flow** - This setpoint corresponds to the lowest flow point of the device to be controlled. For example, an electronic valve may accept a 2–10 Vdc signal, with 2 Vdc corresponding to full closed and 10 Vdc corresponding to full open. In this situation, the **Output Voltage at Desired Minimum Flow** would be set to 2 Vdc. This setpoint is adjustable from 0 to 10 Vdc, with a factory default of 2 Vdc.

  Note: *The* ***Desired Minimum Flow*** *setpoint defined earlier is in addition to the value set for the* ***Output Voltage at Desired Minimum Flow****. For example, if the* ***Desired Minimum Flow*** *is set to 20 percent, the* ***Output Voltage at Desired Minimum Flow*** *is set to 2 Vdc, and the* ***Output Voltage at Desired Maximum Flow*** *is set to 10 Vdc, the lowest flow command sent during chiller operation will be 3.6 Vdc (i.e., 20 percent of 2 to 10 Vdc).*

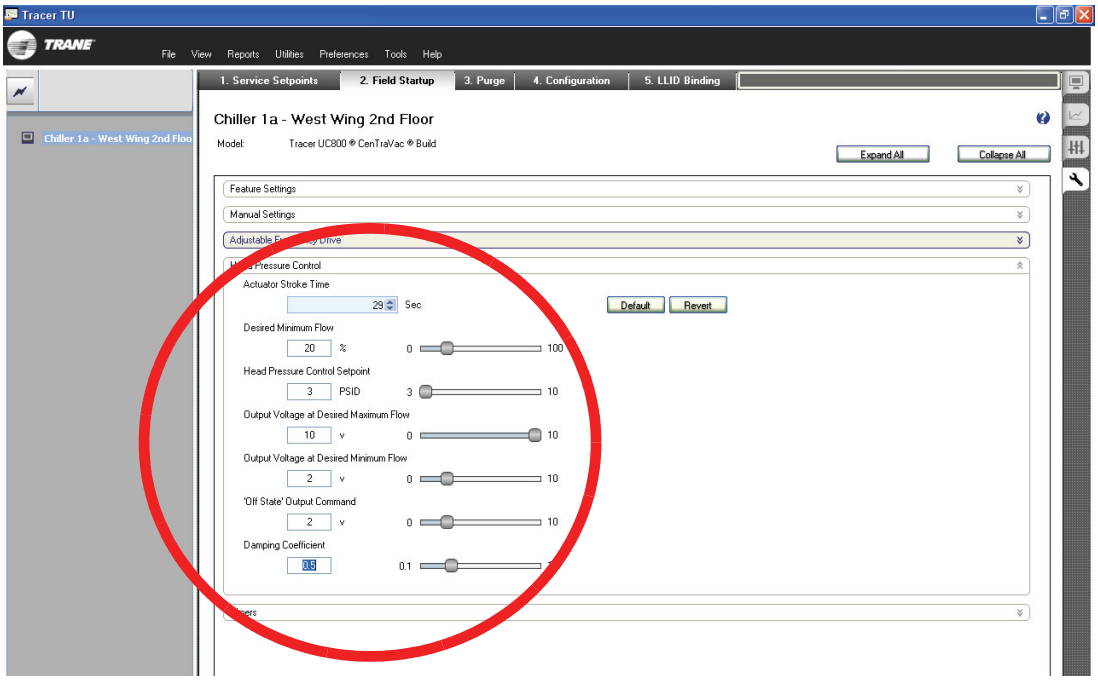
- **Off State Output Command** - This setpoint sets the voltage that the output will assume after initialization and/or after the compressor and condenser water pump have been shut off. This setpoint is adjustable from 0 to 10 Vdc, with a factory default of 2 Vdc.

- **Damping Coefficient** - This setpoint can be used to make the control output more or less aggressive for a given system. This setpoint is adjustable from 0.1 to 1.8 in increments of 0.001, with a factory default setting of 0.5.

  Setting a larger **Damping Coefficient** will result in a faster response, and setting a smaller **Damping Coefficient** will result in a slower response.

  Note: *The factory default setting of 0.5 should provide an adequate control response for almost all systems. Adjust the* ***Damping Coefficent*** *only if close observation of the system operation indicates the control response is inaccurate.*

- Select **Save** to save the setpoints to the UC800.



Other Applications

Reverse Acting

There are some systems or flow devices where it might be desirable to have a reverse acting command provided for the flow control device. An example might be a valve controlling a bypass line, where opening the valve increases the bypass flow and reduces the flow through the condenser of the chiller. In this situation, it is necessary to increase the voltage signal to reduce the condenser flow, and decrease the voltage signal to increase the condenser flow. This can be accomplished by inverting the setpoints for **Output Flow at Desired Maximum Flow** and **Output Voltage at Desired Minimum Flow**.

- **Output Voltage at Desired Maximum Flow** - This is the voltage for the full desired flow of the device to be controlled, and is the largest flow command that will ever be sent to the device. For an application requiring a reverse acting signal, this setpoint is set to the low value, typically 2 Vdc (for a device accepting a 2–10 Vdc signal).
- **Output Voltage at Desired Minimum Flow** - This setpoint corresponds to the lowest flow point of the device to be controlled. For an application requiring a reverse acting signal, this setpoint is set to the higher value, typically 10 Vdc (for a device accepting a 2–10 Vdc signal).

  All other **Head Pressure Control** setpoints and recommendations remain the same.

Duplex Chiller

Note: *Head Pressure Control for AdaptiView Duplex chillers will be made available with the AdaptiView Duplex firmware release planned for first quarter 2009.*

CDHF and CDHG Duplex chillers have two refrigeration circuits with two refrigerant differential pressures. When **Condenser Head Pressure Control** is selected in **Configuration** view of a Duplex chiller with Tracer AdaptiView, a single analog output will be provided that is based on the lower of the two water flow commands of the two running circuits.

If only one circuit of the Duplex chiller is running **Condenser Head Pressure Control**, analog output will represent the flow command of just the running circuit.

If **Condenser Head Pressure Control** is selected for a Duplex chiller, there will be only a single analog output from a single analog LLID that is located in the circuit 1 panel.

Note: *If **Condenser Head Pressure Control** is not applied, and if it is desirable to instead receive simple traditional DeltaP or %HPC signals, then an analog output LLID for each circuit is required—one in each panel.*

CVGF Gear Drive Chiller

For CVGF gear drive chillers with Tracer AdaptiView controls, the **Head Pressure Control Setpoint** is adjustable from 11 psid to 30 psid (75.8 kPaD to 206.8 kPaD), with a factory default of 11 psid (75.8 kPaD).

For CVGF applications, CenTraVac Technical Service recommends that a **Head Pressure Control Setpoint** of 15 psid (103.4 kPaD) be set for the system. Adjust this setpoint upwards if operational issues (oil loss, etc.) result from unit operation with low refrigerant differential pressures.

All other **Head Pressure Control** setpoints and recommendations remain the same.

Questions

If the job site is still experiencing issues related to operating with low differential refrigerant pressure after the basic set-up of the head pressure control, contact CenTraVac Technical Service at techservice@trane.com.

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For more information, contact your local Trane office or e-mail us at comfort@trane.com