1. OBJECTIVE

Allows up to three sets of cycle control setpoints based on ranges of make-up conductivity.

Each range of make-up conductivity has a cycles setpoint with a 1% deadband.

Sets the maximum tower conductivity independently of the three make-up ranges.

2. TYPICAL APPLICATION

1. Sites where the make-up conductivity varies and the limiting hardness or silicon also varies with make-up the conductivity. User sets cooling tower cycles based on tower/make-up conductivity so that as the make-up conductivity varies, the tower/make-up conductivity setpoint changes to prevent scaling.

3. REQUIRED COMPONENTS

Controller software Version 4.0 or later and controller with **R2** or **RM** option.
Controller must be measuring make-up conductivity and controlling the bleed valve on the ratio of Tower-to-Make-up conductivity.
Trackster Version 2.1 or later with Terminal screen option.
As of 05/01 **Trackster** does not support the '**VC**' Special Control within View Configuration.

Supporting References:
1. Controller Operating & Maintenance Manual, Section: 4.2.3.2

Contact Aquatrac: www.aquatrac.com on operating or set-up questions.

3. INSTALLATION

3.1 Hardware Installation
1. Control of cooling tower cycles requires conductivity sensors in both the cooling tower make-up line and the cooling tower sump re-circulation line.

3.2 Software Set-Up – 'E' & 'F' Example

The following example assumes that the tower conductivity is connected to input **'E'**, the make-up conductivity connected to input **'F'** and bleed valve is powered by **Relay No.2** which is the typical cycle control set-up for a **Flex** series controller. The example also assumes that the maximum tower conductivity should not exceed 3,000uS.

1. Connect to the controller using **Trackster** at the Configure password level and verify that both the cooling tower and make-up conductivities are reading correctly and the Control Equation for the bleed valve is set to **E/F**.
2. Right click on the bleed valve, select *Configure Control* and key **Control-Alt-Shift** & you'll be in the **Trackster** terminal screen
3. Key *Enter* to get to the command prompt '**>**'
4. Key **SW2,,,,VC** & *Enter*
5. Key **VC2,300,8.2,700,5.4,1000,4.1,3000** & *Enter* & close the terminal window,
6. Calibrate your tower make-up conductivity across the all three ranges and then above the maximum and observe that the control setpoints change with each range.

3.3 Technical – Operational Notes

1. A maximum of 2 tower bleed controls with the **VC** special control are allowed in any one **Flex** or '**AS**' series controller. These controls can share the same make-up conductivity sensor.
2. Adjust Setpoints: **VC** dynamically re-writes the controller setpoints as the raw water conductivity changes. Any setpoint changes made in **Trackster** will be overwritten. LCD Adjust Setpoints: This option is blocked. **ENTER** key provides the same result as **PREV**ious; the current Setpoints are displayed.
3. Make-up conductivities must increase from Low Make-up to High Make-up conductivity or an Out-of-Range error occurs and the requested **VC** command change is rejected.
4. A make-up conductivity greater than High Make-up, switches control to the Tower Maximum Conductivity setpoint with a 1% deadband.
5. The cycles in each range can be any value. There is no assumption that cycles will decrease as raw water conductivity increases.
6. A system alarm '**Variable Cycles OFF invalid control eqn.**' if the relay control equation does not have two analog sensors separated by either '/', '+' or '-'. This alarm will occur as soon as you change the control equation.
7. **Caution:** The bleed control setpoints change as soon as the make-up conductivity moves into the next range. Towers with long holding times may experience scaling conditions as most of the water in the system does not change immediately with a change in make-up conductivity. The **HT**, Holding Time, special control may be more useful on systems with extended holding times.

3.4 Command Syntax

The SW command is used to set **V**ariable **C**ycles special control.
SW[1..8],,,,VC & *Enter* sets the Special Control on Relay1 to 8 in Flex or 1 to 5 in 'AS'
series controllers.

Once you have set the special control on the bleed relay you can use the **VC** command:
VC[1..8],Low Make-up, Low Cycles,Medium Make-up,Medium Cycles,High Make-up,High Cycles, Maximum Tower Conductivity & *Enter*

Where Low, Medium and High Make-up conductivities set the range for each cycle setpoint
0 – Low   Make-up uS controls at Low Cycles with 1% deadband
Low-Medium Make-up uS controls at Medium Cycles with 1% deadband
.   Medium-High Make-up uS controls at High Cycles with 1% deadband

Maximum Tower Conductivity controls the bleed, limiting the tower conductivity and
providing   a default for make-up conductivities greater than High Make-up

Typical example:
SW2,E/F,,,VC & *Enter*
Sets Relay No.2 to cycle control using the ratio of conductivity sensors E & F and sets the
Special Control to **VC**, Variable Cycles. Note that setpoints are not required since they are
controlled by the **VC** defaults until adjusted.

VC2,300,8.2,700,5.4,1000,4.1,3440 & *Enter*
Sets Relay No,2 to control at 8.2 cycles when the make-up conductivity is less than 300uS,
5.4cycles between 300 & 700 uS and 4.1 cycles between 700 & 1000 uS.
At a tower conductivity greater than 3440uS, the controller will operate the bleed to maintain
3440uS.