

User Manual

Variable Output Voltage Temperature Control 108A TOW-VOVC (J, K, or T)



General Description

This control is a single output PID control with the capability of adjusting the AC output voltage with fixed positions and ideal for small heat loads. This control displays both the setpoint and process temperature and uses the most modern PID control technology for the best temperature stability. The Auto-tune feature minimizes setpoint overshoot and learns your process.

Changing your setpoint is easily done with the interface keys. Several sensor input types are available. This unit comes with an audible alarm function, 6' detachable power cord and grid support bracket, which is ideal for fume hood mounting to maximize bench space. This model of control can accept a type "J", "K", or "T" thermocouple, depending on the model ordered.

The control automatically sets the PID parameters through a "learning" sequence in the auto-tuning mode. PID parameters include proportional band, reset/integral and rate/derivative. User-friendly features include automatic LED indicators to aid in monitoring and setup, as well as dual LED displays for process temperature and set point indication. This control automatically stores all information in a non-volatile memory.

Control Features:

- On/Off power switch.
- On/Off alarm switch.
- 10-amp MAX load output.
- Circuit protection (fused)
- Audible alarm.
- USB Communication



Setting the control

To enter the Setup Menu push and hold the up and down arrow keys for approximately 3 seconds. Once there, push the green advance key to scroll through to the prompt of choice and then use the up and down arrow keys to change the range. At any point within the Setup menu to return to the default display push the Infinity ∞ key.

Parameter	Parameter Name	Glas-col Factory Setting		Watlow Default
Setup Page				
LoC	Lockout Menu	DEFAULT		5
SEn	Sensor Type	DEFAULT		tC
Lin	Linearization	SET FOR TC INPUT TYPE		J
dEC	Decimal	DEFAULT		0
C_F	Display Units	C		F
r.Lo	Range Low	0° C		0.0
r.h.i	Range High	T/C Type	Value	9,999.0
		J	800	
		K	1250	
		T	400	
Fn1	Function of Output 1	HEAT		oFF
o.t.Y	Output Type	DEFAULT		voLt
Fn2	Function of Output 2	ALM		oFF
h.A9	Heat Algorithm	DEFAULT		PID
h.SC	Hysteresis (Heat & Cool)	DEFAULT		3.0 F or 2.0 C
C.A9	Cool Algorithm	DEFAULT		oFF
Al.Y	Alarm Type	PR.AL		oFF
Al.Y	Alarm Hysteresis	DEFAULT		1.0
Al.LA	Alarm Latching	LAT		nLAt
Al.bL	Alarm Blocking	DEFAULT		oFF
Al.S.i	Alarm Silencing	DEFAULT		oFF
Al.dSP	Alarm Display	DEFAULT		on
r.P	Ramp Action	DEFAULT		oFF
r.r.t	Ramp Rate	DEFAULT		1.0
o.h.i1	Power Scale Output High 1	DEFAULT		100.0
o.h.i2	Power Scale Output High 2	DEFAULT		100.0
PRr1	Upper or Left Display	DEFAULT		AC.Pu
PRr2	Lower or Right Display	DEFAULT		AC.SP
Ad.S	Zone Address - Standard Bus Com	DEFAULT		1

Upon power up of the control, using the advance key will scroll through the various prompts found in the Operations Menu. At any point within the Operations menu to return to the default display push the Infinity ∞ key.

Parameter	Parameter Name	Glas-col Factory Setting	Watlow Default
Operation Page			
AUT	Autotune	DEFAULT	no
C.P?	Control Mode Active	DEFAULT	AUto
h.Pb	Heat Proportional Band	DEFAULT	25.0 F or 14.0 C
C.Pb	Cool Proportional Band	DEFAULT	25.0 F or 14.0 C
t i	Time Integral	DEFAULT	180
t d	Time Derivative	DEFAULT	0
o.t b 1	Time Base Output 1	DEFAULT	1.0 or 20.0
o.t b 2	Time Base Output 2	DEFAULT	1.0 or 20.0
ALo	Alarm Low Set Point	DEFAULT	32.0 F or 0.0 C
Ah i	Alarm High Set Point	50° C	300.0 F or 150.0 C
.C.R	Calibration Offset	DEFAULT	0.0

How to Setup and Operate:

First, connect the heater load and the sensor to the load and sensor receptacles on the front panel. Next, plug the control AC line cord into an appropriate 3-wire grounded AC power receptacle. Toggle the power switch to the "ON" position. Wait approximately five seconds for the control unit to initialize. The TOW-VOVC series control is ready for operation when the process temperature appears in the left portion of the display and the set point temperature appears in the right portion of the display.

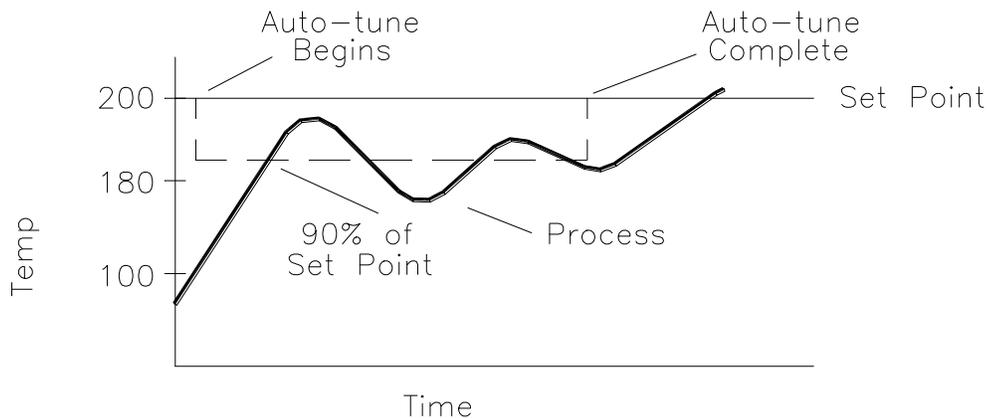
The control is factory set with the process temperature displayed in degrees C. If a display in degrees F is desirable, press the **UP/DOWN** arrow keys simultaneously for three seconds to access the Setup Page. Press the **Advance** key until the Celsius_Fahrenheit parameter C_F is shown in the lower display. Press the **UP** arrow key to change from C to F. After changes are complete, press the **Infinity** key to return to the normal operations screen.

To begin a first time heating application, use the **Up/Down** arrow keys to enter the desired set point temperature. This is shown in the right side of display. Press the **Advance** key to cycle through the Operations Page until the auto-tuning parameter Aut is shown in the lower display. Auto-tuning is recommended in the first time heating process at the user's process set point temperature. Auto-tuning allows the control to calculate the proper PID parameters required for optimal temperature control at the temperature set point entered when the auto-tune function was first activated. The auto-tune will minimize the amount of temperature overshoot of the set point and decreases the time required for the process to stabilize.

When the auto-tuning parameter Aut is set to YES, do not disturb or alter the control. The display will alternate between the normal operation screen and tUnlattrn screen. When tuning is complete, the display will no longer alternate between the tUnlattrn and normal operation screen. Auto-tune procedure can be active for a max time of 60 minutes. If the control is unable to tune the process within 60 minutes it will save the PID values to factory defaults.

The auto-tuning function can be aborted by setting auto-tuning Aut to NO or switching off power to the control.

It is recommended that auto-tune be used each time a process has been changed from the initial auto-tune. If the process is being duplicated, the parameters learned in the initial setup are stored in the memory of the control and no repeat of auto-tuning is required. If the sensor location has been changed in the process, it is highly likely that an auto-tune will be required to adjust the PID values for optimal controller performance.



To start auto-tune function:

1. Press the **Advance** key until the Aut prompt appears in the left portion of the display.
2. Change the parameter to YES.
3. Press the **Infinity** key to display the set point and sensor temperatures. While the control is in the tuning mode, the lower display alternately displays set point and the "Aut" prompt.
4. When tuning is complete, the lower display indicates setpoint only and Aut reverts to OFF. The control installs appropriate PID tuning parameters and saves them in the non-volatile memory.

*To abort auto-tuning, the operator must reset Aut to OFF. Auto-tuning may also be aborted by cycling power off and on. In all cases, aborting auto-tuning restores all original values.

Temperature overshoot

In most cases this is due to a small sample size being heated with a high wattage heater. The control is set at the factory with the Power Scale High Output 1 with a value of 100. This value can be adjusted in the setup menu, reference page 5 and 6 for instructions on how to change

value. The Power Scale Output 1 is located in the output menu of the setup menu. If excessive temperature overshoot is occurring, adjust the value to 50 and start the heating process from ambient room temperature. If excessive temperature overshoot is still occurring, decrease to a lower value and repeat heating process from ambient room temperature. If the process temperature never makes it to the set point temperature value, increase the power scale high output 1 value. This process can take several value changes to obtain proper temperature control with your particular application setup. It is recommended to initiate the Auto-Tune process again after the proper power scale high output 1 value has been determined for your application.

Control Sensor:

Proper placement of the sensor can eliminate many problems in the total system. The probe should be placed so that it can detect any temperature change with little thermal lag. In a process that requires fairly constant heat output, the probe should be close to the heater. In processes where heat demand is variable, the probe should be close to the work area. Some experimenting with probe location should be tried to provide optimum results.

Variable Output:

The variable voltage output knob varies the output voltage from approx. 10 VAC (turned fully to the counter clockwise position) to max VAC (turned fully to the clockwise position). Max voltage will be approx. the AC line voltage being applied to the control, 110VAC-120VAC. Note: The voltage setting will affect the PID parameters of the controller in some cases. It may be necessary to run the auto-tune procedure after changing the variable output voltage if undesirable results are being obtained.

Specifications:

Control Mode

- Microprocessor-based, single input, single output.
- PID parameters

Proportional band: 1 to 999^o F

Reset: 0.00 to 99.99 repeats per minute.

Integral: 0.00 to 99.99 minutes per repeat.

Rate or Derivative: 0.00 to 9.99 minutes.

Operator Interface:

- Advance, Infinity, and Up-Down keys
- LED display.
- ON/OFF toggle power switch
- ON/OFF toggle alarm switch
- Manually adjusted output voltage control

Input:

- Type J, K, T thermocouple: input grounded or ungrounded.
- Automatic cold junction compensation and break protection for sensor.
- Degrees F or degrees C display; user selectable (preset for degrees C)

Range Type J:	0°C to 750°C
Range Type K:	-200°C to 1250°C
Range Type T:	-250°C to 350°C

Primary Output (Heating or Cooling):

- 10 Amp @ 120 VAC.

Accuracy:

- Calibration accuracy: 0.1% of span.
- Temperature stability: 0.2 °F / °F rise in ambient maximum.
- Voltage stability: 0.01% of span / % of rated line voltage.

Power:

- 50/60 Hz 5%
- Data retention upon power failure via nonvolatile memory.

Operating Environment:

- 32 to 149 °F / 0 to 65 °C; 0 to 90% RH, non-condensing.

Manual percentage output mode:

This mode is a function of the digital PID controller, not the manual voltage control. Manual operation provides direct (time proportioned % time) control from -100% to 100%. A negative value is allowed only when Ot 1=Cool. Automatic operation provides sensory feedback ON/OFF or PID control. When the operation transfers from automatic to manual operation, the power level from automatic operation is retained and restored to the previous set point.

The % LED indicates manual operation. The LED is on when in Manual operation and off when in AUTO operation. When the LED is flashing, press the **Infinity** key again within 5 seconds to complete the change in operation. If the sensor is open and LOC=0, 1 or 2, the control switches to Manual operation if the output was stable before the break occurred.

Responding to a Displayed Message

An active message will cause the display to toggle between the normal settings and the active message in the upper display and **ALARM** in the lower display.

Your response will depend on the message and the controller settings. Some messages, such as Ramping and Tuning, indicate that a process is underway. If the message was generated by a latched alarm and the condition no longer exists or if an alarm has silencing enabled it can be silenced simply by pushing the Infinity ☺ key. Alternatively, use the method below to view all and then clear.

Push the Advance Key to display **ALARM** in the upper display and the message source (such as **ALH1**) in the lower display. Use the Up ⬆ or Down ⬇ keys to scroll through possible responses, such as Clear **CLR** or Silence **SIL**. Then push the Advance ☺ or Infinity ☺ key to execute the action. See the Home Page for further information on the Attention Codes.

Display	Parameter Name Description	Range	Appears If
ALFn	<p>Attention</p> <p>An active message will cause the display to toggle between the normal settings and the active message in the upper display and ALFn in the lower display.</p> <p>Your response will depend on the message and the controller settings. Some messages, such as Ramping and Tuning, indicate that a process is underway. If the message was generated by a latched alarm or limit condition, the message can be cleared when the condition no longer exists. If an alarm has silencing enabled, it can be silenced.</p> <p>Push the Advance Key to display ALFn in the upper display and the message source (such as LIhI) in the lower display.</p> <p>Use the Up  or Down  keys to scroll through possible responses, such as Clear CLR or Silence SIL. Then push the Advance  or Infinity  key to execute the action. Alternatively, rather than scrolling through all messages simply push the Infinity  button to generate a clear.</p>	AL11 AL12 AL13 AL14 Alarm Low 1 to 4 ALh1 ALh2 ALh3 ALh4 Alarm High 1 to 4 ALF1 ALF2 ALF3 ALF4 Alarm Error 1 to 4 ECr1 Error Input 1 TUN1 Tuning 1 RPT Ramping 1 LOP1 Loop Open Error 1 LRP1 Loop Reversed Error 1 uALH Value to high to be displayed in 4 digit LED display uALL Value to low to be displayed in 4 digit LED display	an alarm or error message is active.

GLOSSARY

Automatic prompts: Data entry points where a microprocessor-based control "prompts" or asks the operator for information input.

Auto-tune: Automatically tunes the parameters to fit the characteristics of your particular thermal system.

Cold junction compensation: Electronic means to compensate for the effect temperature at the cold junction.

Cycle time: The time necessary to complete a full On-through-Off period in a time proportioning control system.

Derivative/Rate: Anticipatory action that senses the rate of change of the process, and compensates to minimize overshoot and undershoot.

Default parameters: The parameters (programmed instructions) permanently stored in microprocessor software to provide the data base.

Droop: Difference in temperature between set point and stabilized process temperature.

Hysteresis: In On/Off control, the temperature change necessary to change the output from On to full Off.

Input (sensor): Process variable information being supplied to the instrument.

Integral/Reset: Control action that automatically eliminates offset, or "droop", between set point and actual process temperature.

Offset: Adjustment to actual input temperature and to the temperature valves the control uses for display and control.

ON/OFF control: Control of temperature about a set point by turning the output full On below set point and full Off above set point.

Output: Action in response to difference between set point and process variable.

Overshoot: Condition where temperature exceeds stepping due to initial power up or process changes.

Parameter: a physical property whose value determines the response of a electronic control to given inputs.

PID: Proportioning control with auto-reset and rate.

Process variable: Thermal system element to be regulated, such as time, temperature, relative humidity, etc.

Proportional band: Span of temperature about the set point where time proportional control action takes place.

Set point: Intended value of the process variable.

Thermal system: A regulated environment consisting of a heat source, heat transfer medium, sensing device and a process variable control.

Thermocouple: Temperature sensing device that is constructed of two dissimilar metals wherein a measurable, predicative voltage is generated corresponding to temperature.

Thermocouple break protection: Fail-safe operation that assures output shutdown upon an open thermocouple condition.

Time Proportioning Control: Action which varies the amount of ON and OFF time when "close" to the set point (within the proportional band). This variance is proportional to the difference between the set point and the actual process temperature.

Maintenance

Simple preventative maintenance steps include keeping the controller clean. Protect it from overload, excessive dirt, oil and corrosion.

Cleaning

If cleaning is necessary, using only a damp cloth with only water, wipe only the exterior of the control chassis.

Replacement Parts:**Power cord:**

If the power cord supplied with the control would become missing or damaged, replace only with the appropriate rated power cord noted by the description below.

SJT-3 18 AWG, 10 Amp, 125 VAC, less than 3 meters in length (120volt controls only)

Fuse:

Use only 250Volt fuse, 10 amp rating (120volt controls only)

Warranty

See the current Glas-Col warranty policy located under the General Sales Policy on the Glas-Col website at www.glascol.com.

Glas-Col reserves the right to make product refinements without prior notice.

Calibration

Contact Glas-Col for more information about calibration.

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