
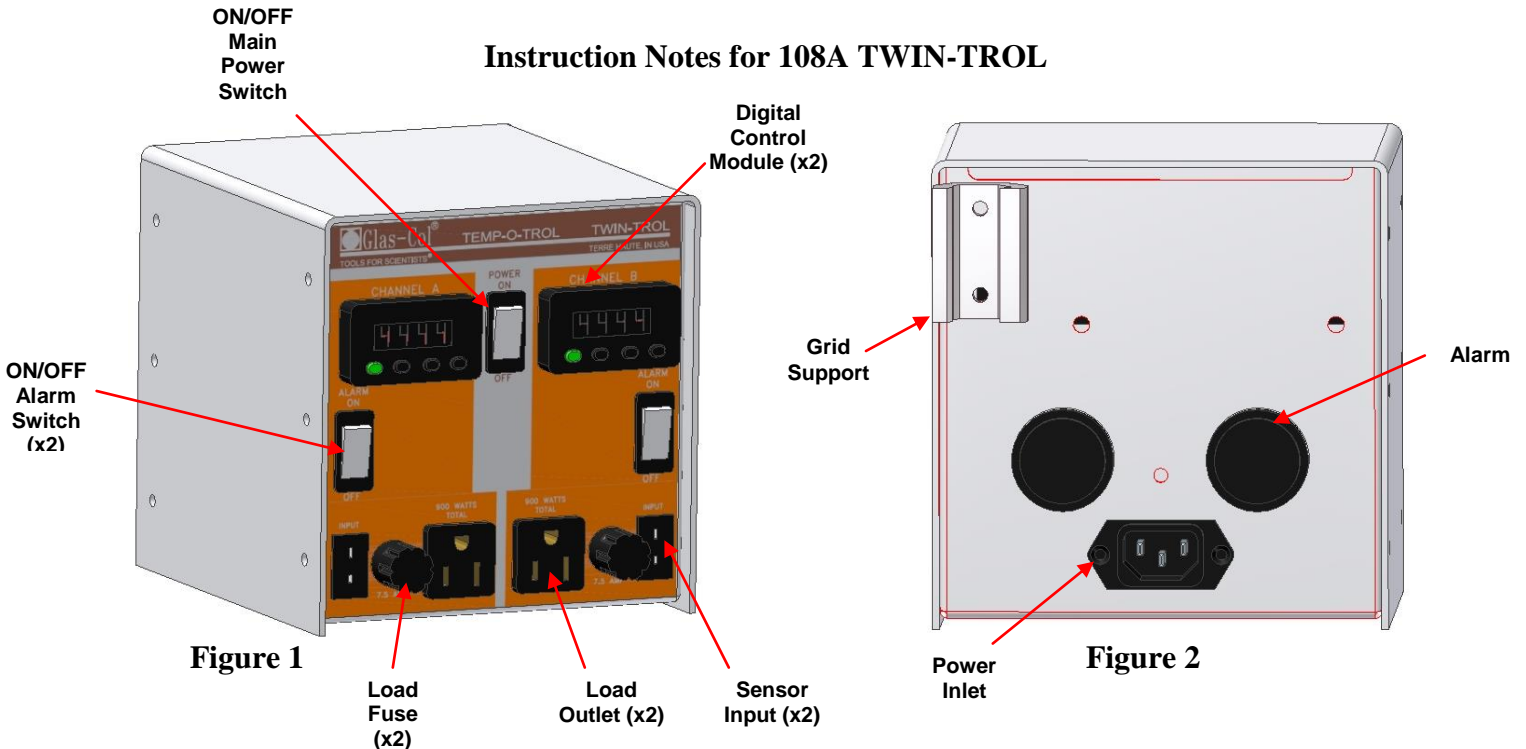


User Instructions

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Instruction Notes for 108A TWIN-TROL



General Description

This control is ideal for 2 independent temperature processes. This space saving design combines 2 controls into one package to maximize bench space. This control displays both the setpoint and process temperature and uses the most modern 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 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 family of control accepts a type "J", "K", or "T" thermocouples 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

1. On/Off power switch.
2. On/Off alarm switch.
3. 15-amp output.
4. Circuit protection (fuses)
5. Audible alarm.

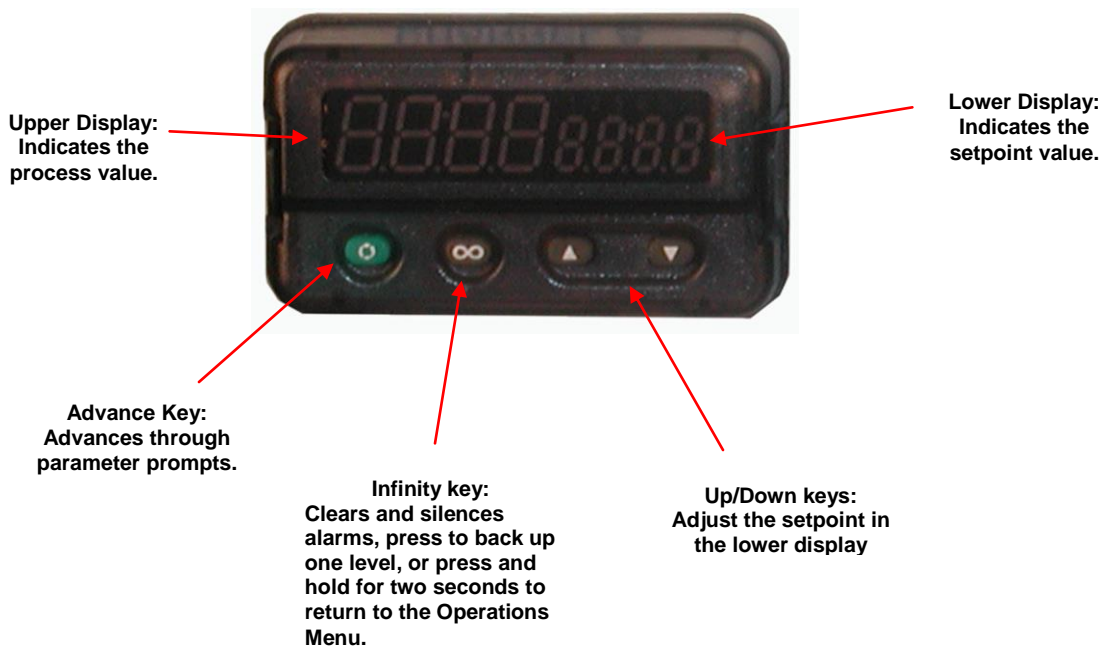


Figure 3. Digital Control Module Detail

How to Setup and Operate each Channel

First, connect the heater load and the sensor to the load and sensor receptacles on the front panel. Next, plug the control line cord into an appropriate 3-wire grounded power receptacle. Push the power switch to the "ON" position. Wait five seconds for the control unit to energize.

The control is shipped from the factory with the display reading 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 changing the display, press the **Infinity** key to display the set point temperature and the process temperature (temperature at the sensor).

To begin the heating application, use the **Up/Down** arrow keys to enter the desired set point temperature. This is shown in the lower 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 most applications. Auto-tuning allows the control to set the parameters without those parameters being input by the user. It also minimizes the amount of temperature overshoot of the set point and decreases the time required for the process to stabilize.

After setting the auto-tuning parameter [Aut] to YES, press the **Infinity** key to display the set point and process temperatures. While the control is in the auto-tuning mode, the lower display alternately flashes the set point and the "Aut" prompt. When tuning is complete, the lower display indicates only the set point.

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-tuning be used each time a process is being run. 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.

Auto-tuning feature allows quick and simple automatic control for the majority of heating applications. This control is capable of performing other control functions and has a variety of features.

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 can be tried to provide optimum results.

Specifications

Control Mode

- Microprocessor-based, single input, single output.
- PID parameters
 - Proportional band: 1 to 999 °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, Up and Down** keys and ON/OFF switch.
- Dual, four digit LED displays.
- Thermocouple receptacle or (RTD) and 3-wire load receptacle.

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:	-200°C to 1200°C
Range Type K:	-200°C to 1370°C
Range Type T:	-200°C to 400°C

Primary Output (Heating or Cooling)

- 7.5 Amp per channel, 120 Volts.

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.

Setup Menu

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.

Setup Menu

- LoC**: Lockout Menu
- SEn**: Sensor Type
- Lin**: Linearization
- dEC**: Decimal
- C_F**: Display Units
- rLo**: Range Low
- rHi**: Range High
- Fn1**: Function One
- oTy**: Output Type
- Fn2**: Function Two
- hA9**: Heat Algorithm
- hSC**: Heat Hysteresis
- Co9**: Cool Algorithm
- ALY**: Alarm Type
- ALH**: Alarm Hysteresis
- ALL**: Alarm Latching
- ALB**: Alarm Blocking
- ALS**: Alarm Silencing
- ALD**: Alarm Display
- rP**: Ramp Action
- rR**: Ramp Rate
- oH1**: Power Scale High Output 1
- oH2**: Power Scale High Output 2
- PL1**: Upper or Left Display
- PL2**: Lower or Right Display
- AdS**: Zone Address

Setup Menu 16 th & 32 nd DIN PID Controller		
Display	Parameter Name Description	Range (Defaults are shown bold)
LoC [LoC]	Lockout Menu Set the security clearance level. The user can access the selected level and all lower levels. Appears if: Always	1 to 5 1 Operations Menu (read only, A/M button disabled)* 2 Operations Menu (A/M button disabled, Set point R/W)* 3 Operations Menu (A/M button enabled, Set point R/W, Control Mode R/W)* 4 Operations Menu R/W access* 5 Operations Menu and Setup Menu full R/W access *You can change the security level at any level
SEn [SEn]	Sensor Type Set the analog sensor type to match the device wired to this input. Appears if: Always	TC : Thermocouple Volts : Volts dc mV : Milliamps dc RTD : RTD 100 Ω
Lin [Lin]	Linearization Set the linearization to match the thermocouple type wired to this input. For example, select H for a type K thermocouple. Appears if: Sensor Type is set to Thermocouple.	J : J K : K N : N S : S T : T
dEC [dEC]	Decimal Set the precision of the displayed value. Appears if: Always	0 : Whole 00 : Tenths 000 : Hundredths
C_F [C_F]	Display Units Select which units will be displayed. Appears if: Always	F : °F C : °C
rLo [r.Lo]	Range Low Set the low range of the set point. Appears if: Always	-1,999.000 to 9,999.000 0.0
rHi [r.hi]	Range High Set the high range of the set point. Appears if: Always	-1,999.000 to 9,999.000
Fn1 [fn1]	Function of Output 1 Select which function will drive this output. Appears if: If output 1 is ordered	Off : Off Cool : Cool Heat : Heat Alarm : Alarm
oTy [o.ty]	Output Type Select whether the process output will operate in volts or milliamps. Appears if: A process output (PM_C_F_ _ AAAB _ _)	Volts : Volts mV : Milliamps

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.

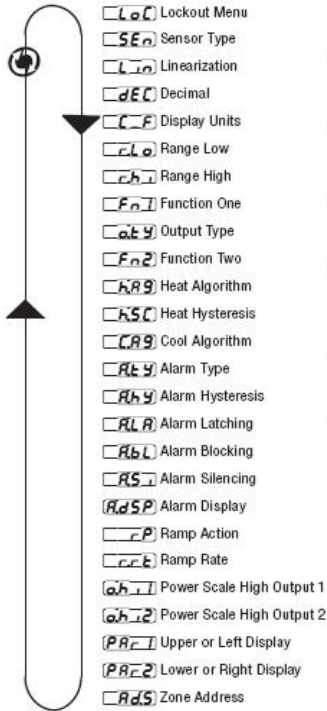
Setup Menu

- ∞ Lockout Menu
- ∞ Sensor Type
- ∞ Linearization
- ∞ Decimal
- ∞ Display Units
- ∞ Range Low
- ∞ Range High
- ∞ Function One
- ∞ Output Type
- ∞ Function Two
- ∞ Heat Algorithm
- ∞ Heat Hysteresis
- ∞ Cool Algorithm
- ∞ Alarm Type
- ∞ Alarm Hysteresis
- ∞ Alarm Latching
- ∞ Alarm Blocking
- ∞ Alarm Silencing
- ∞ Alarm Display
- ∞ Ramp Action
- ∞ Ramp Rate
- ∞ Power Scale High Output 1
- ∞ Power Scale High Output 2
- ∞ Upper or Left Display
- ∞ Lower or Right Display
- ∞ Zone Address

Setup Menu 16 th & 32 nd DIN PID Controller		
Display	Parameter Name Description	Range (Defaults are shown bold)
∞ Fn2 [fn2]	Function of Output 2 Select which function will drive this output. Appears if: If output 2 is ordered	∞ Off CoL Cool HEAT Heat ALM Alarm
∞ hAg [h.Ag]	Heat Algorithm Set the heat control method. Appears if: Output 1 or 2 set to heat	∞ Off PID PID On-Off On-Off
∞ hSC [hSC]	Hysteresis (Heat & Cool) Set the control switching hysteresis for on-off control. This determines how far into the "on" region the process value needs to move before the output turns on. Appears if: Heat or Cool Algorithm is set to On-Off.	0 to 9,999,000°F or units 0 to 5,555,000°C Units, 3.0°F or 2.0°C
∞ CAg [C.Ag]	Cool Algorithm Set the cool control method. Appears if: If Output 1 or 2 is set to cool	∞ Off PID PID On-Off On-Off
∞ ALy [A.y]	Alarm Type Select how the alarm will or will not track the set point. Appears if: Always	∞ Off PRAL Process Alarm DEAL Deviation Alarm
∞ Ahy [A.hy]	Alarm Hysteresis Set the hysteresis for an alarm. This determines how far into the safe region the process value needs to move before the alarm can be cleared. Appears if: When alarm type is set to process or deviation alarm	0.001 to 9,999,000°F or units 0.001 to 5,555,000°C Factory set at 10 Units, 1.0°F or 1.0°C
∞ ALA [A.LA]	Alarm Latching Turn alarm latching on or off. A latched alarm has to be turned off by the user. Appears if: When alarm type is set to process or deviation alarm	Non-Latching Latching
∞ AbL [A.bL]	Alarm Blocking Select when an alarm will be blocked. After startup and/or after the set point changes, the alarm will be blocked until the process value enters the normal range. Appears if: When alarm type is set to process or deviation alarm	∞ Off Start Startup SetPt Set Point both Both
∞ ASi [A.Si]	Alarm Silencing Turn alarm silencing on to allow the user to disable the output tied (configured) to this alarm Appears if: When alarm type is set to process or deviation alarm	∞ Off On On
∞ AdSP [A.dSP]	Alarm Display Display an alarm message when an alarm is active. Appears if: When alarm type is set to process or deviation alarm	∞ Off On On

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.

Setup Menu



Setup Menu 16 th & 32 nd DIN PID Controller		
Display	Parameter Name Description	Range (Defaults are shown bold)
<input type="checkbox"/> [rP] [rP]	Ramp Action Select when the controller's set point will ramp to the defined end set point. Appears if: Always	<input type="checkbox"/> [oFF] Off <input type="checkbox"/> [StAr] Startup <input checked="" type="checkbox"/> [SEPC] Set Point Change <input checked="" type="checkbox"/> [bOth] Both
<input type="checkbox"/> [rRt] [r.r]	Ramp Rate Set the rate for the set point ramp. Set the time units for the rate with the Ramp Scale parameter. Appears if: Ramp Action is set to Startup, Set Point or Both.	1.0°F or units 1.0°C
<input type="checkbox"/> [oHi1] [o.hi1]	Power Scale Output High 1 Set maximum value of output 1 range. Appears if: Output 1 is set to heat	0.0 to 100% 100.0
<input type="checkbox"/> [oHi2] [o.hi2]	Power Scale Output High 2 Set maximum value of output 2 range. Appears if: Output 2 is set to heat	0.0 to 100% 100.0
<input type="checkbox"/> [PAR1] [PAR1]	Upper or Left Display Select parameter to display. Appears if: Always	<input checked="" type="checkbox"/> [RCPv] Active Process Value <input type="checkbox"/> [nonE] none
<input type="checkbox"/> [PAR2] [PAR2]	Lower or Right Display Select parameter to display. Appears if: Always	<input checked="" type="checkbox"/> [RCSp] Active Set Point <input type="checkbox"/> [RH] Alarm High Set Point <input type="checkbox"/> [RLo] Alarm Low Set Point <input type="checkbox"/> [nonE] None
<input type="checkbox"/> [AdS] [Ad.S]	Zone Address - Standard Bus Communication Set zone address from 1-16. Appears if: Always	1-16 1

Operations Menu: Used mainly for Autotune and Alarm setup

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.

Operations Menu

- AUT** Autotune
- C.M** Control Mode
- h.Pb** Heat Proportional Band
- C.Pb** Cool Proportional Band
- t.i** Time Integral
- t.d** Time Derivative
- o.t.b.1** Time Base
- o.t.b.2** Time Base
- A.Lo** Alarm Low Set Point
- A.Hi** Alarm High Set Point
- i.CA** Calibration Offset

Alarm: To change the upper alarm setting press the Advance key until Ahi appears and then use the up/down arrow keys. When done press the infinity key. Once an alarm conditions happens the alarm will sound and remain on until the process value drops below the established limit. At any time you may turn off the audible alarm by turning off the alarm switch. An alarm condition will also appear on the display.

Operations Menu 16 th & 32 nd DIN PID Controller		
Display	Parameter Name Description	Range (Defaults are shown bold)
AUT [AUT]	Autotune Start an autotune. While active the upper or left and lower or right display will flash t.u.n.i and h.e.t.a. Appears if: Heat or cool algorithm set to PID	<input type="checkbox"/> NO No <input type="checkbox"/> YES Yes
C.M [C.M]	Control Mode Active View the current control mode. Appears if: Always	<input type="checkbox"/> OFF Off <input checked="" type="checkbox"/> AUT Auto <input type="checkbox"/> MAN Manual
h.Pb [h.Pb]	Heat Proportional Band Set the PID proportional band for the heat outputs. Appears if: Heat algorithm set to PID	0 to 9,999.000°F or units 0 to 5,555.000°C Units, 25.0°F or 14.0°C
C.Pb [C.Pb]	Cool Proportional Band Set the PID proportional band for the cool outputs. Appears if: Cool algorithm set to PID	0 to 9,999.000°F or units 0 to 5,555.000°C Units, 25.0°F or 14.0°C
t.i [ti]	Time Integral Set the PID integral for the outputs. Appears if: Heat or cool algorithm set to PID	0 to 9,999 seconds per repeat 180.0
t.d [td]	Time Derivative Set the PID derivative time for the outputs. Appears if: Heat or cool algorithm set to PID	0 to 9,999 seconds 0.0 seconds
o.t.b.1 [o.tb1]	Time Base Output 1 Set the time base for fixed-time-base control. Appears if: Output 1 set to heat or cool with control algorithm set to PID.	0.1 to 60.0 seconds (solid-state relay or switched dc) 5.0 to 60.0 seconds (mechanical relay & NO-ARC power control) 1 sec. [SSR & sw dc], 20.0 sec. [mech. relay & NO-ARC]
o.t.b.2 [o.tb2]	Time Base Output 2 Set the time base for fixed-time-base control. Appears if: Output 2 set to heat or cool with control algorithm set to PID.	0.1 to 60.0 seconds (solid-state relay or switched dc) 5.0 to 60.0 seconds (mechanical relay & NO-ARC power control) 1 sec. [SSR & sw dc], 20.0 sec. [mech. relay & NO-ARC]
A.Lo [A.Lo]	Alarm Low Set Point Process - set the process value that will trigger a low alarm. Deviation - set the span of units from the closed loop set point that will trigger a low alarm. Appears if: If Alarm Type (A.ty) is set to Process or Deviation Alarm	-1,999.000 to 9,999.000°F or units -1,128.000 to 5,537.000°C Units, 32.0°F or 0.0°C
A.Hi [A.Hi]	Alarm High Set Point Process - set the process value that will trigger a high alarm. Deviation - set the span of units from the closed loop set point that will trigger a high alarm. Appears if: If Alarm Type (A.ty) is set to Process or Deviation Alarm	-1,999.000 to 9,999.000°F our units -1,128.000 to 5,537.000 C Units, 300.0 F or 150.0 C Change this value for upper alarm
i.CA [i.CA]	Calibration Offset Set an offset value for a process output. Appears if: Always	-1,999.000 to 9,999.000°F or units -1,110.555 to 5,555.000°C 0.0

How to Tune and Operate

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.

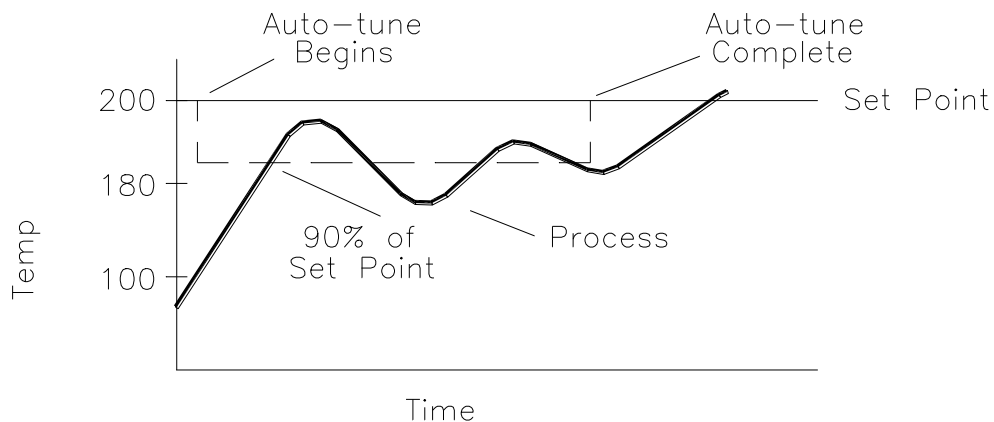
Tuning-Automatic

Auto-tuning: This control can automatically tune the PID parameters to fit the characteristics of your particular thermal system.

Auto-tune can only be used when Output 1 is hEAt. Once the auto-tune sequence has begun, the lower display flashes between AUt and the set point. The displayed set point remains unchanged.

Once the control finished "learning" the system, it returns to standard PID control with the values automatically set. Auto-tuning is complete within 80 minutes. Any change of the set point, while in auto-tune, re-initiates the auto-tune procedure.

In order for the control to successfully complete auto-tune, the process must cross set point four times within 80 minutes after auto-tune has started. If this does not happen within the 80 minute time limit, Pb1 remains at 0 and the control functions in an ON/OFF mode.



To start auto-tuning:

1. Press the **Advance** key until the Aut prompt appears in the lower display.
2. Change the parameter to On.
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.

Error Code Definitions and Actions:

Er.In - An open or reversed polarity sensor is the most likely cause. Check the sensor; if the connection is good and functions properly, call the factory. Make sure the input parameter [SEn] is set to the correct type thermocouple.

Er.Ab – Ambient temperature may be too hot or too cold. Make sure that the temperature surrounding the control is –18 to 65C.

Er.CS – Checksum Error. Settings may have changed unexpectedly. Press the **Infinity** key to clear the error. Verify settings. If error message persists, contact the factory.

To clear a corrected error, cycle power to the control.

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, predicated 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 14 AWG, 15 Amp, 125 VAC, less than 3 meters in length

Fuse:

Use only 250Volt fuse, 7.5 amp rating

Limited Warranty

Glas-Col warrants products of its manufacture to be free from defects in material and workmanship for one year and agrees to repair or replace without charge any products found defective upon examination at the factory. With proper care and operation, Glas-Col products will give long and efficient service. Chemical spillage, overloading and general misuse will greatly reduce the service life. Glas-Col is not responsible for damage to apparatus due to improper installation or through attempts to operate the apparatus beyond its rated capacity, intentional or otherwise.

Limitations of Warranties

APART FROM SUCH WRITTEN STATEMENT OF WARRANTY, THERE ARE NO WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, WHICH EXTEND BEYOND THE DESCRIPTION OF THE PRODUCTS ON THE FACE HEREOF.

Glas-Col products are intended only for legal and legitimate purposes in commercial laboratory and industrial settings.

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

Returns:

Call or fax Customer Service for a Return Material Authorization (RMA) number before any products.

Reference the RMA number on the shipping box and on a written description of the problem.

A 20% restocking charge of the net price is charged for all standard products returned to stock.

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