



## Autostart - Using a Vue controller without a host computer

### **General description**

Vue controllers (with the exception of MC) support stand-alone operation with a feature called Autostart. When Autostart is enabled, at power-up the controller automatically performs a procedure to set the laser/TEC(s) to a preset operating state. The details of this procedure vary from one type of controller to another.

This capability allows Vue controllers to operate without any interaction from a PC or other host computer. You configure the desired state of the controller using WinVue (or some other serial interface). The controller stores this information, and when turned on it automatically sets itself to this pre-configured state. Any of the controller's capabilities can be used, including constant current, constant power, pulsing, and external control. A safety (CDRH) time delay is optionally provided.

This document explains how Autostart works, how to set it up, and how to use it.

### **Laser drivers only: MV series, LV series**

After a safety delay the laser is turned on at the configured operating point.

### **Laser driver/TEC combinations: DPSS and HCT**

The temperature servo(s) are turned on and stabilized first, with the laser current off. The laser initially comes on at a modified current until a specified time has elapsed, to allow the laser to warm up and the temperatures to re-stabilize if necessary. When these preparations are complete, the laser is set to its final operating point.

### **TEC controller**

The temperature servo is turned on and stabilized, remaining on indefinitely.

If a controller is connected by passthrough, the command to start the laser can be sent automatically once the servo is locked.

## **WinVue support**

When a Vue controller ships from the factory Autostart is disabled. To enable it requires a one-time initial set up with a host PC, conveniently done with WinVue's Autostart window.

The TEC version of WinVue does not have an Autostart window, since the procedure is quite simple. There is a checkbox on the main TEC control window to run Autostart the next time the controller is turned on. The rest of this page does not discuss TEC any further.

## **Autostart window**

The appearance of this window varies from one product to another, depending on which features exist on each.

### **Enable on power-up**

Controller type: All

Check this box to tell the controller to perform Autostart the next time power is turned on. This does not affect what the controller is doing right now.

### **Execute from beginning**

Controller type: All

Causes Autostart to run right now, simulating the turn-on condition. This is provided for test purposes and will not affect what the controller will do the next time it is turned on.

### **Abort**

Controller type: All

Stops the Autostart procedure immediately. This does not return the controller to the initial (power-on) state, but rather preserves the operating condition that existed at the instant the button was pressed.

### **Constant power operation**

Controller type: any type that supports constant power operation

Click this box to use constant power control for the laser operating mode. Uncheck the box to operate the laser at a constant current. Note that some systems may include a warm up state, which is always at a constant current.

### **Operating current**

Controller type: All

Type here the desired laser operating current. If the “Constant power operation” box is checked, this value is irrelevant.

### **Operating power**

Controller type: any that is configured for constant power operation

Type here the desired laser output power. If the “Constant power operation” box is not checked, this value is irrelevant.

### **Warmup current**

Controller type: DPSS, HCT, MV

Type here the current used to warm up the laser. This applies only during the warm up process and does not affect the final operating point.

In the case of MV, this current is applied if the laser temperature falls below the low temperature limit.

### **Low temperature limit**

Controller type: DPSS, HCT, MV

Type here the minimum temperature at which laser operation is permitted. Below this value the controller performs a special “warm up” procedure, where the laser current is set to the warmup current value. The warm up procedure continues until the temperature rises to two degrees above this limit, at which point normal operation is initialized.

### **High temperature limit**

Controller type: DPSS, HCT, MV

Type here the maximum temperature at which laser operation is permitted. Above this value the laser current is shut off, and the controller waits for the temperature to decrease. When the temperature is two degrees below this limit, normal laser operation is resumed.

### **Delay before laser start (CDRH compliant)**

Controller type: All

Check this box to force the controller to wait for at least 30 seconds before applying current to the laser. When this box is not checked, Autostart turns on the laser as quickly as possible after the power is turned on. Some systems still require a delay for temperature control.

## **Resume on interlock close**

Controller type: All

If this box is checked, systems that are under Autostart control will automatically restart when an interlock fault is cleared.

## **Warmup CW**

Controller type: MV, HCT

Check this box to force the controller to operate the laser continuously (CW) during warm up, even though the final operating mode may be pulsed.

## **Additional Autostart parameters**

### **Temperature set points**

On systems with one or more temperature servos, Autostart activates these servos and waits for the temperatures to stabilize before turning on the laser. All WinVue controllers store the temperature set points in non-volatile memory, regardless of whether Autostart is used or not. These set points are adjusted using the Main TEC Control window, not the Autostart window.

### **Pulsed operation**

On systems that support pulsed operation, Autostart sets the pulsed parameters to their last known values. These parameters, which are manipulated through the “Pulsing” window, include pulsed/cw operation, internal/external triggering, repetition rate, and pulse width. All WinVue controllers store these values in non-volatile memory, regardless of whether Autostart is used or not.

## **Autostart states**

WinVue presents the current state of Autostart in text.

*Programmer's note:* Under the hood, WinVue obtains the Autostart state by periodically sending the command “ast?” to the controller. The reply, a small integer, is then translated into a human-readable form. The mapping between the integers and the state names varies from one product to another; see Appendix 1.

### **Disabled**

Controller type: All

The controller was powered up with Autostart disabled. No subsequent Autostart commands have been received.

## **Standby**

Controller type: DPSS

The temperature servos are on but the laser has been turned off using WinVue or a serial command. When the laser is turned back on the Warmup state will be immediately entered.

## **Waiting temps (or Waiting)**

Controller type: All

This state is entered when the controller is first turned on and Autostart is enabled. It is also entered when "Execute from beginning" is clicked, or the command "as1" is sent on the serial interface.

On systems that feature temperature control (DPSS and HCT) the servos are enabled. The laser is off. Autostart remains in this state until all the temperatures have stabilized. In addition, if safety compliance is selected this state always lasts at least 30 seconds. On HCT this safety delay is a user-settable option.

If the optional safety delay is enabled, it only happens once each time the controller is turned on; subsequent restarts of the controller (for example, after a fault reset) skip directly to the Warmup (or Complete) state.

## **Warmup**

Controller type: DPSS, HCT, MV

The behavior of this state varies from one product to another.

For DPSS and HCT systems, the laser is turned on at the warm up current and held there for the warm up time.

For MV this state is entered briefly, and persists only if the external temperature sensor reports an under-temperature condition. This state is also entered when the external temperature reading is too low. The laser diode is at the warmup current until the under-temperature condition no longer exists. From a system point of view, the under-temperature condition suggests the danger of condensation on optical surfaces, and operating the laser diode at some safe (below threshold) current is intended to provide enough heat to raise the temperature of the system without producing light.

## **Cooldown**

Controller type: MV

This state occurs if the external temperature sensor reports an over-temperature condition. The laser diode is turned off until the condition no longer exists

## Complete

Controller type: All

The laser operates at the preset power or current. The temperature servos, if any, are on.

## Fault

Controller type: All

The laser has been shut off because of a fault condition. When the Clear Faults button is pressed in WinVue, or the “cf” command is sent on the serial interface, the controller will restart the Autostart procedure (if enabled), and proceed just like at turn-on.

## Aborted

Controller type: All

The Autostart procedure has been aborted. The moment the Abort button is pressed or “as0” is sent through the serial interface, the controller stops the Autostart sequence. It does not turn off the laser or the temperature servos. To run Autostart again it must be started from the beginning, either using the “Execute from the beginning” button on WinVue, sending the “as1” command on the serial interface, or cycling the power.

### Appendix 1: list of states (returned by ast?)

State	DPSS	LV	HCT	HV	MV
Disabled	0	0	0	0	0
Standby	1				
Waiting	2	1	1	1	1
Warmup	3		2		2
Cooldown					6
Complete	4	3	3	3	3
Fault	5	4	4	4	4
Aborted	6	5	5	5	5