Controller Selection Guide

PRODUCT	CHANNELS AND TRIGGERING		OUTPUT AND PULSING											ADVANCED FEATURES			COMMUNICATION INTERFACES		
			CHANNEL CURRENT RATINGS				POWER		VOLTAGE	PULSING									
											Max. Frequency								
	Lighting Channels	Digital Triggers	Continuous (A)	Pulsed (A)	Min. Recommended Lighting Current (mA)	Control Step Size (mA)	Max. Avg Power per Channel (W)	Max. Avg Power per Controller (W)	Max. Overdrive Voltage (V)	Min Pulse Width (µS)	Using one channel only	Using all channels together	Timing Repeatability (µS)		SAFEPOWER™	SAFESENSE™	Ethernet	RS232	GigE Vision / GenICam
RC SERIES ENTRY-LEVEL CONTROLLERS																			
RC120	1	1 IN / 0 OUT	1.2	2	50	3	25 @ 20°C 10 @ 40°C	25 @ 20°C 10 @ 40°C	32	100	100Hz	100Hz	2		●	●	●	-	●
TR-RC TRINITI™ CONTROLLERS*																			
TR-RC120	1	1 IN / 0 OUT	1.2	2	50	3	25 @ 20°C 10 @ 40°C	25 @ 20°C 10 @ 40°C	32	100	100Hz	100Hz	2	Triniti™	●	●	●	-	●
OPTOTUNE LENS CONTROLLER																			
TR-CL180	1 lens output	1 IN / 0 OUT	+/- 0.4*	+/- 0.4*	N/A	0.1	N/A	N/A	N/A	5-50ms refocus latency depending on lens			N/A	0-10V Analog & Waveforms	-	-	●	●	●
RT SERIES VERSATILE LIGHTING CONTROLLERS																			
RT220-2	2	2 IN / 0 OUT	2	2	50	2	30	40**	40	20	800Hz	800Hz	2		●	●	●	-	●
RT220-20	2	2 IN / 0 OUT	3	20	500	6	30	40**	40	20	800Hz	800Hz	2		●	●	●	-	●
RT220F-2	2	2 IN / 0 OUT	2	2	50	2	30	40**	40	4	1kHz	1kHz	2		●	●	●	-	●
RT220F-20	2	2 IN / 0 OUT	3	20	500	6	30	40**	40	4	1kHz	1kHz	2		●	●	●	-	●
RT260-2	2	2 IN / 0 OUT	2	2	50	2	30	40**	40	20	800Hz	800Hz	2		●	●	-	●	-
RT260-20	2	2 IN / 0 OUT	3	20	500	6	30	40**	40	20	800Hz	800Hz	2		●	●	-	●	-
RT260F-2	2	2 IN / 0 OUT	2	2	50	2	30	40**	40	4	1kHz	1kHz	2		●	●	-	●	-
RT260F-20	2	2 IN / 0 OUT	3	20	500	6	30	40**	40	4	1kHz	1kHz	2		●	●	-	●	-
RT420-2	4	4 IN / 0 OUT	2	2	50	2	30	50**	40	20	800Hz	800Hz	2		●	●	●	-	●
RT420-20	4	4 IN / 0 OUT	3	20	500	6	30	50**	40	20	800Hz	800Hz	2		●	●	●	-	●
RT420F-2	4	4 IN / 0 OUT	2	2	50	2	30	50**	40	4	1Khz	1kHz	2		●	●	●	-	●
RT420F-20	4	4 IN / 0 OUT	3	20	500	6	30	50**	40	4	1Khz	1kHz	2		●	●	●	-	●
RT460-2	4	4 IN / 0 OUT	2	2	50	2	30	50**	40	20	800Hz	800Hz	2		●	●	-	●	-
RT460-20	4	4 IN / 0 OUT	3	20	500	6	30	50**	40	20	800Hz	800Hz	2		●	●	-	●	-
RT460F-2	4	4 IN / 0 OUT	2	2	50	2	30	50**	40	4	1kHz	1kHz	2		●	●	-	●	-
RT460F-20	4	4 IN / 0 OUT	3	20	500	2	30	50**	40	4	1kHz	1kHz	2		●	●	-	●	-
RT820F-2	8	8 IN / 0 OUT	2	2	50	2	30	100**	40	4	3kHz	2.5kHz	2	Limited Functions on Ch. 5-8	●	●	●	-	-
RT820F-20	8	8 IN / 0 OUT	3	20	500	6	30	100**	40	4	3kHz	2.5kHz	2	Limited Functions on Ch. 5-8	●	●	●	-	-
RT860F-2	8	8 IN / 0 OUT	2	2	50	2	30	100**	40	4	3kHz	2.5kHz	2	Limited Functions on Ch. 5-8	●	●	-	●	-
RT860F-20	8	8 IN / 0 OUT	3	20	500	6	30	100**	40	4	3kHz	2.5kHz	2	Limited Functions on Ch. 5-8	●	●	-	●	-

*Triniti™ is a protocol to support 'plug & play' lighting. Triniti™ enabled lights are available from our lighting partners. Triniti™ controllers have an M12 lighting connector, which also supports non triniti use.

*Output current is limited by the capability of the lens model.

**Additional total controller power is available when the controller is attached to a heatsink.

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PRODUCT	CHANNELS AND TRIGGERING		OUTPUT AND PULSING												ADVANCED FEATURES			COMMUNICATION INTERFACES		
			CHANNEL CURRENT RATINGS				POWER		VOLTAGE	PULSING										
											Max. Frequency									
	Lighting Channels	Digital Triggers	Continuous (A)	Pulsed (A)	Min Recommended Lighting Current (mA)	Control Step Size (mA)	Max. Avg Power per Channel (W)	Max. Avg Power per Controller (W)	Max. Overdrive Voltage (V)	Min Pulse Width (µS)	Using one channel only	Using all channels together	Timing Repeatability (µS)			SAFEPOWER™	SAFESENSE™	Ethernet	RS232	GigE Vision / GenICam
TR-RC TRINITI™ ENABLED CONTROLLERS*																				
TR-RT220-2	2	2 IN / 0 OUT	2	2	50	2	30	40**	40	20	800Hz	800Hz	2	Triniti™		●	●	●	-	●
TR-RT220-20	2	2 IN / 0 OUT	3	20	500	6	30	40**	40	20	800Hz	800Hz	2	Triniti™		●	●	●	-	●
TR-RT220F-2	2	2 IN / 0 OUT	2	2	50	2	30	40**	40	4	1kHz	1kHz	2	Triniti™		●	●	●	-	●
TR-RT220F-20	2	2 IN / 0 OUT	3	20	500	6	30	40**	40	4	1kHz	1kHz	2	Triniti™		●	●	●	-	●
TR-RT420-2	4	4 IN / 0 OUT	2	2	50	2	30	50**	40	20	800Hz	800Hz	2	Triniti™		●	●	●	-	●
TR-RT420-20	4	4 IN / 0 OUT	3	20	500	6	30	50**	40	20	800Hz	800Hz	2	Triniti™		●	●	●	-	●
TR-RT420F-2	4	4 IN / 0 OUT	2	2	50	2	30	50**	40	4	1kHz	1kHz	2	Triniti™		●	●	●	-	●
TR-RT420F-20	4	4 IN / 0 OUT	3	20	500	6	30	50**	40	4	1kHz	1kHz	2	Triniti™		●	●	●	-	●
RTCC LIGHTING CONTROLLERS WITH PROGRAMMABLE TRIGGER LOGIC																				
RTCC420-2	4	4 IN / 2 OUT	2	2	50	2	30	50**	40	20	800Hz	800Hz	2	Programmable Trigger Logic †		●	●	●	-	●
RTCC420-20	4	4 IN / 2 OUT	3	20	500	6	30	50**	40	20	800Hz	800Hz	2	Programmable Trigger Logic †		●	●	●	-	●
RTCC420F-2	4	4 IN / 2 OUT	2	2	50	2	30	50**	40	4	1kHz	1kHz	2	Programmable Trigger Logic †		●	●	●	-	●
RTCC420F-20	4	4 IN / 2 OUT	3	20	500	6	30	50**	40	4	1kHz	1kHz	2	Programmable Trigger Logic †		●	●	●	-	●
RTCC460-2	4	4 IN / 2 OUT	2	2	50	2	30	50**	40	20	800Hz	800Hz	2	Programmable Trigger Logic †		●	●	-	●	-
RTCC460-20	4	4 IN / 2 OUT	3	20	500	6	30	50**	40	20	800Hz	800Hz	2	Programmable Trigger Logic †		●	●	-	●	-
RTCC460F-2	4	4 IN / 2 OUT	2	2	50	2	30	50**	40	4	1kHz	1kHz	2	Programmable Trigger Logic †		●	●	-	●	-
RTCC460F-20	4	4 IN / 2 OUT	3	20	500	6	30	50**	40	4	1kHz	1kHz	2	Programmable Trigger Logic †		●	●	-	●	-
HT SERIES HIGH POWER CONTROLLER																				
TR-HT220-50	2	2 IN / 4 OUT	5	50	200	1mA (I<2A) 15mA (I>2A)	120@40ºC ‡ 150@20ºC ‡	120@40ºC ‡ 150@20ºC ‡	60	1	15kHz	15kHz	2	Supports generic or triniti™ lights		●	●	●	-	●
CC SERIES TIMING CONTROL																				
CC320	0	8 IN / 8 OUT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Programmable Trigger Logic †		-	-	●	-	-

*Triniti™ is a protocol to support 'plug & play' lighting. Triniti™ enabled lights are available from our lighting partners. Triniti™ controllers have an M12 lighting connector, which also supports non triniti use.

†Gardasoft's Programmable Trigger Logic can also support FIFO, gate-reject, and single/quadrature encoder inputs for light timing. These features may slow the maximum frequency of the controller.

**Additional total controller power is available when the controller is attached to a heatsink.

‡Temperature and voltage derating charts apply. Quoted power ratings are valid for lighting voltages below 30V. Additional power is available when the controller is attached to a heatsink.

PP SERIES CONTROLLERS – MULTICHANNEL HIGH SPEED LINEAR CONSTANT CURRENT CONTROL

Optimised without active DC/DC voltage and power management, for price-sensitive, and more complex OEM applications.

PRODUCT	CHANNELS AND TRIGGERING		OUTPUT AND PULSING											ADVANCED FEATURES			COMMUNICATION INTERFACES		
			CHANNEL CURRENT RATINGS				POWER		VOLTAGE	PULSING									
											Max. Frequency (kHz)								
	Lighting Channels	Digital Triggers	Continuous (A)	Pulsed (A)	Min Recommended Lighting Current (mA)	Control Step Size (mA)	Max. Avg Power per Channel (W)	Max. Avg Power per Controller (W)	Max. Overdrive Voltage (V)	Min Pulse Width (µS)	Using one channel only	Using all channels together	Timing Repeatability (µS)		SAFEPOWER™	SAFESENSE™	Ethernet	RS232	GigE Vision / GenICam
PP4/5 TWO and FOUR CHANNEL GENERAL PURPOSE & OEM LINEAR CURRENT CONTROLLERS																			
PP520	2	2 IN / 0 OUT	2	10	100	3	Apps Eng Review‡		46	20	20	20	2	Product customisations availabale*	-	●	●	-	-
PP520F	2	2 IN / 0 OUT	2	10	100	3	Apps Eng Review‡		46	5	50	50	2	Product customisations availabale*	-	●	●	-	-
PP420	4	4 IN / 0 OUT	2	10	100	4	Apps Eng Review‡		46	20	25	15	2	Product customisations availabale*	-	●	●	-	-
PP420F	4	4 IN / 0 OUT	2	10	100	4	Apps Eng Review‡		46	5	50	15	2	Product customisations availabale*	-	●	●	-	-
PP480	4	4 IN / 0 OUT	2	10	100	3	Apps Eng Review‡		46	5	50	4	2	LED indicators of channel status	-	●	●	●	-
PP8/16 EIGHT AND SIXTEEN CHANNEL OEM LINEAR CURRENT CONTROLLERS																			
PP820	8	8 IN / 0 OUT	2	20	500	100	Apps Eng Review‡		46	4	70	32	8	Product customisations availabale*	-	-	●	-	-
PP820C	8	8 IN / 0 OUT	2	20	200	5	Apps Eng Review‡		46	4	70	32	8	Product customisations availabale*	-	-	●	-	-
PP821	8	8 IN / 0 OUT	2	2	300	10	Apps Eng Review‡		46	4	70	32	8	Product customisations availabale*	-	-	●	-	-
PP821C	8	8 IN / 0 OUT	2	2	300	2	Apps Eng Review‡		46	4	70	32	8	Product customisations availabale*	-	-	●	-	-
PP822	8	8 IN / 0 OUT	2	5	300	24	Apps Eng Review‡		46	4	70	32	8	Product customisations availabale*	-	-	●	-	-
PP822C	8	8 IN / 0 OUT	2	5	300	2	Apps Eng Review‡		46	4	70	32	8	Product customisations availabale*	-	-	●	-	-
PP860	8	8 IN / 0 OUT	2	20	500	100	Apps Eng Review‡		46	4	70	32	8	Product customisations availabale*	-	-	-	●	-
PP860C	8	8 IN / 0 OUT	2	20	200	5	Apps Eng Review‡		46	4	70	32	8	Product customisations availabale*	-	-	-	●	-
PP861	8	8 IN / 0 OUT	2	2	300	10	Apps Eng Review‡		46	4	70	32	8	Product customisations availabale*	-	-	-	●	-
PP861C	8	8 IN / 0 OUT	2	2	300	2	Apps Eng Review‡		46	4	70	32	8	Product customisations availabale*	-	-	-	●	-
PP862	8	8 IN / 0 OUT	2	5	300	24	Apps Eng Review‡		46	4	70	32	8	Product customisations availabale*	-	-	-	●	-
PP862C	8	8 IN / 0 OUT	2	5	300	2	Apps Eng Review‡		46	4	70	32	8	Product customisations availabale*	-	-	-	●	-
PP1620	16	8 IN / 0 OUT	2	20	100	6	Apps Eng Review‡		46	4	70	12	2	Product customisations availabale*	-	-	●	-	-
PP1621	16	8 IN / 0 OUT	2	2	100	1	Apps Eng Review‡		46	4	70	12	2	Product customisations availabale*	-	-	●	-	-
PP1660	16	8 IN / 0 OUT	2	20	100	6	Apps Eng Review‡		46	4	70	12	2	Product customisations availabale*	-	-	-	●	-
PP1661	16	8 IN / 0 OUT	2	2	100	1	Apps Eng Review‡		46	4	70	12	2	Product customisations availabale*	-	-	-	●	-
PPCC SERIES OEM LINEAR CURRENT CONTROLLERS WITH ADVANCED TRIGGER OUTPUT OPTIONS																			
PPCC1620	16	8 IN / 8 OUT	2	20	100	6	Apps Eng Review‡		46	4	8	6.5	2	Advanced Trigger Output Timing	-	-	●	-	-
PPCC1621	16	8 IN / 8 OUT	2	2	100	1	Apps Eng Review‡		46	4	8	6.5	2	Advanced Trigger Output Timing	-	-	●	-	-
PPCC1660	16	8 IN / 8 OUT	2	20	100	6	Apps Eng Review‡		46	4	8	6.5	2	Advanced Trigger Output Timing	-	-	-	●	-
PPCC1661	16	8 IN / 8 OUT	2	2	100	1	Apps Eng Review‡		46	4	8	6.5	2	Advanced Trigger Output Timing	-	-	-	●	-

*There are alternative firmware versions available for these products that enable complex light sequences to be configured across multiple channels. Also, faster speeds in certain circumstances. Please contact an applications expert for more information.

‡This means that an Applications Engineer should calculate the correct power supply voltage and heatsinking requirement for the lighting selected.

Benchmarking

These benchmarks are intended to help you chose the correct controller for your application.

General Testing Environment

All operating parameters that have been quoted can be achieved across the ambient operating temperature range, given in each controller's manual.

PPCC16xx & RTCC420 lighting controllers

CC controllers combine a lighting control with advanced logic timing. To compare the lighting control capability with other controllers all CC functions were disabled and all Digital Outputs were disabled (set 'LOW' or 'Off'). All pulse measurements comply with the pulse definition defined in the appendix.

Output and Pulsing Parameters

Test conditions

Power supply

Unless otherwise stated, a 24V power supply capable of delivering 10A was used.

PP controllers do not have internal regulators, so the voltage was increased to 28V for these controllers. This enabled the full range of current control to be achieved.

Power

The limits of output power are shown for the majority of controllers. For PP controllers the power dissipation is a greater concern and this should be checked for all applications. See the product documentation or contact the Gardasoft Applications Team.

The power output rating of all Gardasoft controllers is based on entering the rating of the light as a current and not as a voltage. Use of a voltage rating may result in degraded performance.

Standard Cable & Load

Poor quality cables can limit the performance of lighting controllers. To ensure that all testing results can be repeated, the same lighting cables were used. This is 500mm of four twisted wire pairs connected in parallel to minimise the inductance and improve pulse shape. For this testing we use CAT5 unshielded cable because it is globally and readily available. Note: CAT5 cable is not suitable for high current applications.

All pulse measurements used standard test loads. The channel under test was connected to an LED light (2A at 24V). All other channels were loaded with 12Ω (Ohm) resistors.

Pulse Triggering

All triggers were fed from a single $5V_{Peak}$ signal source.

Controller functionality may be degraded when all triggers are active simultaneously. To account this, the user may extend the trigger pulse width to give the controller time to process all of the triggers.

Timing repeatability

Some uncertainty is observed in the output latency, due to different software processing paths between the trigger signal being interpreted by the controller and an output waveform being generated. This is recorded as "Timing Repeatability (µs)".

Min Recommended Lighting Current

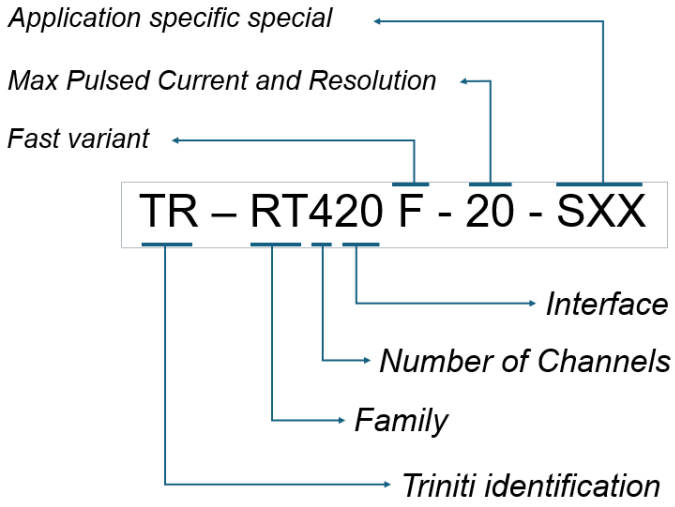
This is the minimum recommended lighting current to ensure output accuracy remains within ±5% of the setpoint shown in the user interface. Setting smaller lighting currents than the minimum recommendation may result in output inaccuracy greater than ±5%.

Note: Most Gardasoft customers prioritise lighting repeatability over absolute accuracy. In typical applications, repeatability is close to the control step size.

Gardasoft can supply customised products with improved control resolution for applications that require additional precision. Please email vision@gardasoft.com for application support.

Product Identification

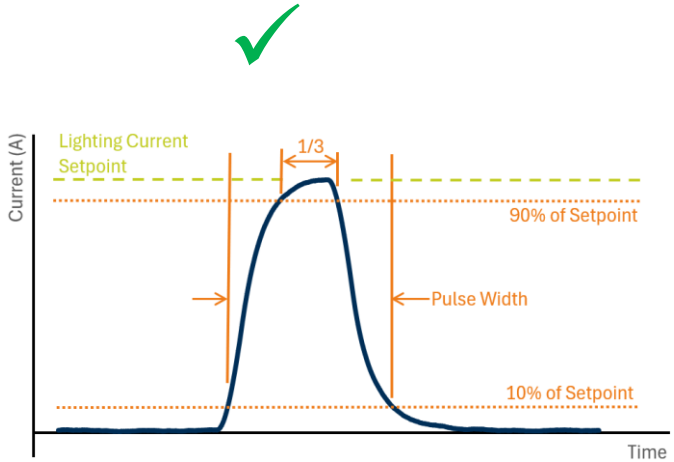
Gardasoft controller names provide an indication of the performance of the controller.



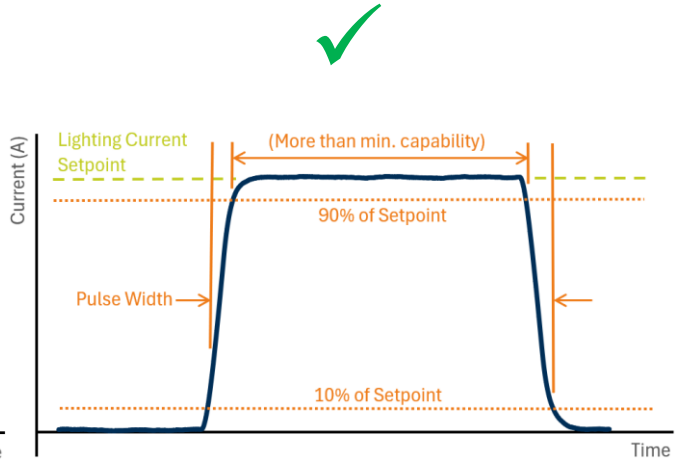
APPENDIX: MINIMUM PULSE WIDTH DEFINITION

Inductive effects, such as rise time, fall time, and settling time become important when lighting pulses are extremely short. To account for this, Gardasoft advertises the minimum pulse width in this selector guide as the shortest pulse width that can be achieved where at least 1/3 of the pulse width is above 90% of the user configured Lighting Current Setpoint:

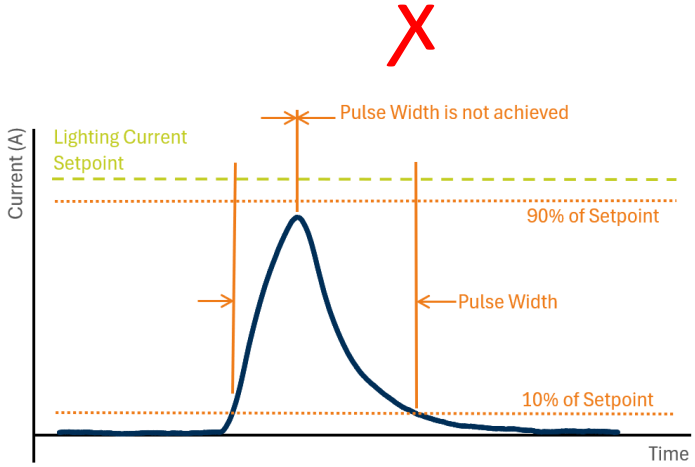
The minimum pulse width definition



Example: Pulse Width is above the minimum capability



Example: Pulse Width is below the minimum capability



Note: It is possible to set pulse widths in the controller's user interface that are shorter than the controller's capability at its maximum rated current. This is because Gardasoft controllers can deliver shorter pulses than advertised if the lighting current is reduced. Also, lower amplitude and shorter pulses are often useful in many applications, even if the configured lighting current setpoint cannot be achieved. Please refer to the user manuals for further information. or contact vision@gardasoft.com for additional guidance.