GARDASOFT VISION

USER MANUAL

PP820, PP821, PP822,

PP820C, PP821C, PP822C

PP860, PP861, PP862,

PP860C, PP861C, PP862C

LED Lighting Controllers

Revision 12

1   Disclaimer

Except as prohibited by law:

- All hardware, software and documentation is provided on an "as is" basis.

- It is essential that the user ensures that the operation of the product is suitable for their application.

- The user must ensure that incorrect functioning of this equipment cannot cause any dangerous situation or significant financial loss to occur.

- Gardasoft Vision Ltd and Gardasoft Products Ltd will not accept any liability for consequential loss of any kind.

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2   Getting Started

Throughout this manual, references to the PP820 refer to all products unless otherwise stated. PP82x refers to the PP820, PP821, PP822, PP820C, PP821C and PP822C. PP86x refers to the PP860, PP861, PP862, PP860C, PP861C and PP862C.

Read the sections on Safety and Specifications and check the PP820 fulfils your requirements. Gardasoft Vision produces other controllers which are listed on our website.

Connect the PP820 up to a supply and an LED lighting unit as described in "Connections".

Read the section on "Operation" and set up the PP820 to supply a small continuous current to the LED unit. Check that the LED unit illuminates. Refer to the Communications section and read how to send RS232 or Ethernet commands.

Mount the PP820 as described in "Mechanical Fixing" using the mounting holes. In particular read the notes on heatsinking. Set up the PP820 for the desired operation and test.

Visit www.gardasoft.com for Application Notes on this product.

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3 Safety - English

3.1.1 PP820 – Safety

Please read this before using the PP820 family of products. If in doubt, contact your distributor or Gardasoft Vision.

3.1.2 Heat

The PP820 can get very hot. It should be positioned where personnel cannot accidentally touch it and away from flammable materials.

Do not exceed the power ratings given in the manual. Note that at the maximum ratings the case temperature can reach 80°C.

If the output load is short circuited then the heat dissipated within the unit will greatly increase, resulting in a further rise in temperature.

3.1.3 Electrical

The user must ensure that the potential difference between any combination of applied signals does not exceed the supply voltage. WARNING: Higher voltages may cause a danger to personal health.

The PP820 does not have complete tracking isolation of inputs and outputs.

Transients caused by inductive loads must be suppressed external to the PP820.

When switched off, there is still energy stored in the PP820 for about 15 seconds. 10 seconds after the power LED goes off, the energy has been discharged.

The PP820 outputs high energy pulses. Care must be taken to connect the outputs correctly and protect the output wiring and load from inadvertent short-circuits.

3.1.4 General

The PP820 must not be used in an application where its failure could cause a danger to personal health or damage to other equipment.

4 Safety - German

4.1.1 Sicherheitshinweis PP820

Bitte lesen Sie sich diesen Sicherheitshinweis gründlich durch, bevor Sie die Produkte der Serie PP820 benutzen. Sollten dennoch Zweifel Ihrerseits bestehen, zögern Sie nicht sich mit uns in Verbindung zu setzen.

4.1.2 Wärmeentwicklung

Die Geräte können während des Betriebes sehr heiss werden. Sie sollten daher dort untergebracht sein, wo Personen keine Brandverletzungen erleiden können und wo sich keine entflammbaren Materialen befinden.

Überschreiten Sie nicht die im Manual angegeben Höchstspannungen. Beachten Sie, dass die Temperaturen bei max. Spannung bereits 80°C betragen können.

Wird pro Kanal mit hohen Blitzspannungen und kurzen Blitzzeiten gearbeitet, steigen die Temperaturen nochmals an!

4.1.3 Elektrischer Betrieb

Stellen Sie sicher, dass die Spannungsdifferenz zwischen jeder Kombination angelegter Signale nicht die Versorgungsspannung übersteigt. ACHTUNG: Höhere Spannungen können sich Gesundheitsgefährdend auswirken.

Ein und Ausgänge haben keine komplette Leiterbahnisolierungen. Überschläge, die aus Induktion resultieren können, müssen ausserhalb des PP820 abgehalten werden.

4.1.4 Generell

Die Controller der PP820 Serie sollten nicht in Applikationen eingesetzt werden, in welchen ein Fehlverhalten des Gerätes gesundheitliche Schäden verursachen könnte oder technische Ausrüstung zerstören könnte.

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5 Safety - French

5.1.1 PP820 - Consignes d'utilisation

Veuillez lire attentivement ces consignes, avant utilisation de la gamme des produits du PP820. En cas de doute n'hésitez pas à contacter votre revendeur ou GardaSoft Vision.

5.1.2 Chaleur

Le PP820 peut atteindre une température très élevée. Il ne doit pas être placé à proximité d'une source de chaleur ou de matériel inflammable, ou à la portée du personnel, risque de brûlure.

Respecter les puissances requises dans le manuel d'utilisation. Noter que le contrôleur peut atteindre 80°C.

En cas de court circuit, la chaleur qui se dissipe à l'intérieur du boîtier va fortement augmenter, ce qui entraînera une augmentation supplémentaire de température.

5.1.3 Electrique

L'utilisateur doit s'assurer que la différence de potentiel des combinaisons ne doit pas excéder la tension de l'alimentation.

ATTENTION ! Une tension trop élevée pourrait entraîner de graves conséquences sur la santé du personnel.

Toutes entrées et sorties du PP820 ne sont pas complètement isolées.

5.1.4 Généralité

Le PP820 ne doit pas être utilisé dans les conditions mentionnées ci-dessus ; sous peine de conséquences graves sur la santé du personnel ou d'endommagement d'autre équipement.

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#General Description

The PP820 current controller provides repeatable intensity control of LED lighting for machine vision applications. It includes the power supply, intensity control, timing and triggering functions required for machine vision systems.

LED lighting needs a constant current supply as small variations in voltage can cause large variations in light output. Currents can be specified as follows:

Product	Maximum current	Step size
PP820, PP860	20A	100mA
PP820C, PP860C	20A	7mA
PP821, PP861	2A	10mA
PP821C, PP861C	2A	0.5mA
PP822, PP862	5A	25mA
PP822C, PP862C	5A	1.5mA

Three modes of operation are provided separately for each channel:

- **Continuous:**

  In continuous mode the output is a continuous current.

- **Strobed:**

  In this mode output is pulsed once per trigger. One input is used as a trigger. The pulse width can range from 1us to 300ms in 0.1us steps. The delay can range from 4us to 300ms in 0.1us steps.

- **Switched:**

  In switched mode a trigger input can be used to switch the output current on and off. The output is only enabled when the input has a voltage on it.

Triggers occur on the leading edge of the input that is on the transition from logic 0 to logic 1. Output 1 is triggered from INPUT 1, output 2 from INPUT 2, etc.

Configurations can be saved in non-volatile memory so that the PP820 will resume operation after a power cycle.
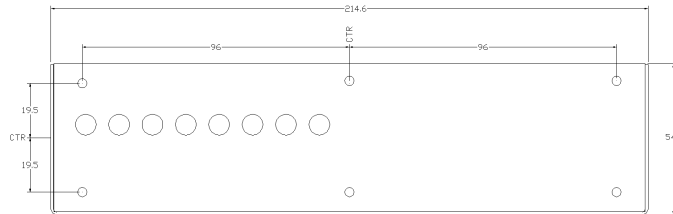
7   Specifications

Parameter	Value	Notes
Supply voltage (V_s)	10V (min) 48V (max)	The supply voltage must be at least 1V above the forward voltage of the lighting being driven. Ideally set this voltage as low as possible to reduce the total unit power dissipation.
Quiescent supply current (IS)	50mA (typ)	
Total allowed unit power dissipation in free air	P_D=16 Watts (max)	
Total unit power dissipation with heatsink	P_D=24 Watts (max)	
Total average output current	12A max	
Operating temperature range	5°c to 40°c	

8   Mechanical Fixing

The PP820 can be mounted onto a flat surface using the threaded holes in the base, see diagram.

The enclosure of the PP820 is used to dissipate power in the form of heat. For this reason the material to which the unit is attached must be suitable, preferably metallic with ability to dissipate the produced heat. This is particularly important if the power dissipation of the PP820 (as defined by P_D the section on Specifications) exceeds 10 Watts.

The PP820 enclosure is a fire enclosure as long as the following conditions are met. The unit must be mounted either with the mounting face horizontal or downwards or with the large face of the base horizontal and downwards. All downwards facing holes must have a screw in them.

If a fire enclosure is used, the enclosure should be metal or plastic (with a flammability rating of UL94 V1 or better); with no holes below or to the sides of the PP820 when mounted. Cable entries below the PP820 should be via glands that have a flammability rating as before. The PP820 should be at least 10mm from any other part or side of the enclosure.

The PP820 does not have an IP rating and should be mounted so that moisture and dirt cannot enter the unit.

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9   Heat Dissipation

⚠ The PP820 has a linear circuit to produce the constant current output. This means that it generates heat which needs to be dissipated.

For more information on this and a spreadsheet to calculate the heat output, see application note APP941 at www.gardasoft.com.

9.1.1   Heat Output Per Channel

For a continuous output current the heat output is given by:

<heat output (W)> = <output current (A)> * (<supply voltage (V)> - <voltage across lighting (V)>)

where:

Output current   Set by the user

Supply voltage   Voltage across PSU+ and PSU-

Voltage across lighting Voltage across LD+ and LD-

This is usually easy to calculate as the voltage across the lighting is usually the voltage rating of the light given in its specification or can be measured using a voltmeter.

For a pulsed output the heat output is given by:

<heat output (W)> = <output current (A)> * <duty cycle>

* (<supply voltage (V)> - <voltage across lighting when pulsing (V)>)

<duty cycle> = <pulse width in seconds> * <trigger frequency in Hertz>

When overdriving, the voltage across the lighting is more difficult to find out. In most cases it is reasonable to use the voltage rating of the light.

9.1.2   Total Heat Output

The heat output for the PP820 is given by adding the heat output for all channels, as calculated above.

There are several ways to reduce the heat output from the PP820:

- Use pulse mode. If the output is only on when you need it then you can dramatically reduce the heat output. Feed the camera trigger into the PP820 and pulse the lights.

- Turn the light off when not needed. If you don't have precise timing of when the camera will trigger, you can use Switched mode to switch the output off or on depending on the trigger input (or use remote commands to turn the output on and off).

- Reduce the output current if possible

- Reduce the supply voltage. Most PSUs have some adjustment in their output voltage.

- Connect lights in series instead of parallel. If you have an array of lights or LEDs in parallel then changing the arrangement to serial will increase the voltage across them but reduce the overall current.

- Use two PP820s and use less channels from each. For high power applications this may be the easiest solution.

If the heat output is no greater than 16W, then no heatsinking is required. If the heat output is between 16W and 24W then the PP820 needs to be bolted to a solid piece of metal to dissipate the heat. Above 24W, it is necessary to have a large heatsink with fan cooling.

10   Connections

10.1   External Cables

To prevent overload of output wiring, all power and output cabling must be rated for a continuous load current of 6.3A minimum. This does not however apply to the RS232 and Trigger input connections.

10.2   Power Supply

⚠ To avoid a fire hazard from the PP820 or the power supply consider the implications of overheating in the unlikely event of a fault in the PP820. The power dissipation in the PP820 in a fault condition can be up to:

<Power supply voltage> * <max current delivered by Power supply>

Either limit the power supply output current so that not more than 30W can be dissipated in the PP820, or mount the unit in a fire enclosure.
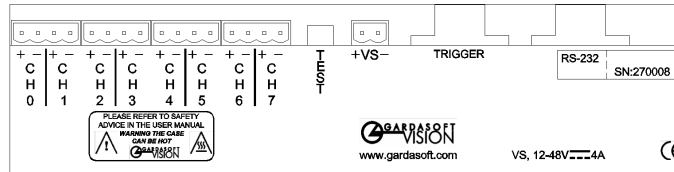
To limit the power, set the power supply output voltages to the minimum value required by the LED light and the PP820 together. Choose a PSU that limits its output current by design, by setting the current limit on the supply (if this feature exists) or use fuses. Remember to derate the fuse, if mounted in an enclosure, as the temperature will be higher than ambient. The external power supply will need to be able to supply at least the average output current for all channels.

The PP820 has 30.8mF of reservoir capacitance; so on power up there will be a large inrush current. It is therefore advisable that any power supply is able to limit this inrush current to safe and reasonable values.

The use of a regulated power supply with 100% short circuit protection is recommended. If however a non regulated power supply is used, then the maximum ripple voltage of this power supply must not exceed 10% of the actual DC value.

10.3   Connectors

The RS232 and trigger connections are made using D-type connectors. The power input and output connectors are arranged as follows:

10.3.1 Power Input

The pinout of the power input connector is:

Pin	Function
1	Supply positive
2	Supply GND

The case of the PP820 is not connected to the GND supply connection.

10.3.2 Power Outputs

⚠ **Ensure that the output connections do not get shorted together by any metallic object as this can discharge a lot of energy and generate heat in the PP820.**

Each power output connector has the connections for two output channels. The pinout is:

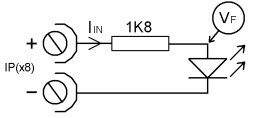| Pin	Function
1	First channel positive
2	First channel negative
3	Second channel positive
4	Second channel negative

10.3.3 Serial Connector (PP86x only)

The RS232 connector is a standard 9-way female D-type connected as follows. A standard straight through cable can be used to connect the PP86x to a PC serial port. The communications port should be set to 115Kbaud, no parity, 8 data bits and 1 stop bit.

Pin	Function
2	TX (output from PP86x)
3	RX (input to PP86x)
5	GND

10.3.4 Trigger Inputs

The trigger input connector is a 9-way D-type male.

The trigger connector pinout is given below.

	Pin	Function
Opto-Coupled Trigger Input Details Operating Conditions $5V <= V_{TRIG} <= 24V$ Logic 1 $V_{TRIG} < 1V$ Logic 0 V_F 1.5V typ	**1**	Input 4 positive
	2	Input 3 positive
	3	Input 2 positive
	4	Input 1 positive
	5	Input 0 positive
	6	GND (connected to PSU GND)
	7	Input 7 positive
	8	Input 6 positive
	9	Input 5 positive

10.3.5 Ethernet Connection (PP82x only)

The RJ45 Ethernet connector requires a straight through cable to connect into a network switch, hub or router. It runs at 10Mbits per second.

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11   Ethernet Setup (PP82x only)

You may need to ask your network administrator for advice about setting up the Ethernet connection.

Ethernet set up is not affected by cold booting the PP82x.

11.1   Connection

The Ethernet link uses a 10BaseT connection on a RJ45 connector. The PP82x is usually connected to a network switch (or hub or router) but it is possible to connect the controller directly into the network port on a PC by using a swapover cable.

11.2   MAC Address

The PP820x MAC address is:

0x00.0x0B.0x75.0x01.0xNN.0xNN.

11.3   IP Address

The PP82x needs an IP address to communicate over Ethernet. There are two ways to get an IP address; either programmed into the unit or using DHCP.

Most networks use a DHCP server. If there is a PC on the network, you may be able to find out whether a PC on the same network uses DCHP as follows:

- Go to Control Panel

- Select Network Connections

- Right click on Local Area Connection. Select Properties

- From the list, select Internet Protocol (TCP/IP), press Properties

If "Obtain an IP address automatically" is set, then DHCP is probably used. However, there may be an alternative fixed IP address on the "Alternative Configuration" tab.

You can find out what IP address is being used by a PC at any time by:

- Go to Control Panel

- Select Network Connections

- Right click on Local Area Connection. Select Status

- Select the Support tab. The IP address is displayed

When using a fixed IP address, you must ensure that you use an IP address that is not being used by any other device on the network. It is usual to keep the first three numbers of the IP address the same as other devices and to change only the last number. For example, if you have a network consisting of a PC (IP address 192.168.1.35) and two PP82xs, you might assign the addresses 192.168.1.201 and 192.168.1.202.

11.3.1   Programmed IP Address and DHCP

For DHCP mode, the PP82x acquires its IP address, subnet mask and gateway address from a DHCP server. Otherwise the PP820 has a fixed IP address, subnet mask and gateway address.

The PP82x is shipped with DHCP set by default.

To change the DHCP or fixed IP address setting, use the PP82x configuration program (downloadable from the PP820 page at www.gardasoft.com). This has a "Set Address" option which can be used to change the address of a PP82x even if it is wrongly set. To do this:

- Connect the PP82x to the network

- Run the PP820 configuration program

- Click on "Set Address"

- Enter the serial number of the PP82x

- Select DHCP or Fixed IP. Set the fixed IP addresses

- Press "Send"

Only the PP82x with the specified serial number will be changed.

The IP address of all the Gardasoft controllers can be found by clicking the Search button in the configuration program.

11.4   Communication

All the features below are implemented in a demonstration program available from www.gardasoft.com.

11.4.1   Automatic Sensing

The PP82x sends out a message on three events:

- On power up

- When an IP address is received or renewed by DHCP

- When an enquiry message is received

On the first two events, the message is broadcast. On the third it is a reply to a single IP address.

An enquiry message is a UDP packet from source port 30310, destination port 30311 with the message body "GardasoftSearch" (8-bit ASCII, 13 characters).

The message output by the PP82x is a UDP packet from source port 30311, destination port 30310. It is formatted as:

Gardasoft,PP82x,000000,111111111111,22222222

(8-bit ASCII, 44 characters), where

000000	the serial number of the unit
111111111111	the MAC address in 6 HEX bytes
22222222	the IP address in 4 HEX bytes

For example for PP822 serial number 12345, IP address 192.168.1.103, MAC address 00.0B.75.01.80.99 the packet comprises:

Gardasoft,PP822,012345,000B75018099,C0A80167

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12   Webpage Configuration
(PP82x only)

The PP82x has a small webserver inside, so that it can be configured using a standard web browser, such as Internet Explorer.

The IP address of the PP82x must be known (it can be searched for or set using the Ethernet configuration program). Open a web browser window and type the IP address (for example 192.168.1.71) of the PP82x into the URL box at the top. The main page of the PP82x webserver should be shown.

All web-pages except the main page can be password protected. If the password is unknown, it can be reset from the Ethernet configuration program.

12.1   Main Page

The main page shows general information about the PP82x. Links are provided to the configuration pages.

12.2   General Setup Page

The general setup page allows various parameters to be set up and the webpage password to be set.

There is also a text box where any command (see section 13) can be entered.

12.3   Channel Configuration Pages

There is one Channel Configuration Page for each output channel. All the parameters for each output channel can be set up. Press the Submit button to update the PP82x and save the changes to non-volatile memory.

13 RS232 and Ethernet Commands

13.1 Communication

The PP820 can be configured via the Ethernet connection using UDP or TCP/IP.

Sample C++ communication source code is available from Gardasoft Vision.

Communication consists of commands sent by the host (controlling PC). All output generated by the command is returned in reply UDP or TCP/IP packets. The last character sent is ">" ("greater than" symbol). Once this is received, the host knows that the command has been completed.

It is recommended that the host waits for the ">" symbol before sending the next command. UDP communications are not guaranteed to arrive, so the host software must be able to cope with lost messages.

Using the GT command, a host can request that a message is sent to it whenever an error occurs.

For TCP, commands from a host should be sent to destination port 30313. Replies will be to destination port 30312. For UDP, commands from a host should be sent from source port 30312 to destination port 30313. Replies will be sent from source port 30313 to destination port 30312.

A TCP/IP connection will timeout and close if it is idle for more than 10 seconds. The host must send regular "heartbeat" commands (e.g. "VR") to keep the link open.

13.2 Configuration Program

A Configuration Program is available from www.gardasoft.com which allows the PP8 to be configured using the commands below.

13.3 Command Structure

The PP820 can be programmed using string commands. These commands can be sent by RS232 for the PP86x or by Ethernet for the PP82x. Configuration programs are available at www.gardasoft.com for both options.

The commands comprise a code of two letters followed by the parameters (several commands can be placed on a single command line by separating them with a semi-colon (";"). A carriage return character should be sent to terminate the command line. The PP820 will send any replies to the commands followed by a '>' character to indicate that the command line has been completed.

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Commands comprise a code of two letters followed by the parameters (if any) needed for the command. Spaces in the commands are ignored.

Numeric parameters are separated by a comma (","). For a parameter which is a time period the default units are microseconds. "s", "ms" or "us" can be added to the end of the number to indicate seconds, milliseconds or microseconds. For currents, "a" or "ma" can be added to indicate "amps" or milliamps". The default is amps. For example:

Parameter	Meaning
0.1ms	0.1 milliseconds
200	200 microseconds
0.1s	0.1 seconds
100ma	100mA
2.45A	2.45A
2.3	2300mA or 2.3A

Note that parameters are in "USA/UK" format so that a half is written "0.5" not "0,5"

The command codes and their meaning are described below. The upper case commands are shown, followed by lower case letters denoting the numeric argument.

Error number	Reason
Err 1	A parameter value is invalid
Err 2	Command not recognised
Err 3	Numeric value is wrong format
Err 4	Wrong number of parameters
Err 5	(Warning only) A timing parameter was out of range and has been adjusted.

Any changes made using these commands are not saved permanently until the AW command has been issued.

13.3.1 Save the settings to memory.

AW

Once the settings are saved to memory they are then retained when the unit is switched off. If this is not done, changes to the settings are volatile, and if the unit is switched off they revert to those in force when the last AW command was issued.

13.3.2 Report the current settings for the outputs

ST Output the status of all channels
STf Output the status for one channel

f = output channel (0 to 7)

The status is output in the following format:

f **M** 1 **V** a **D** d **P** p **R** r For Pulsed Output Mode
f **M** 2 **V** a For Constant Mode
f **M** 3 **V** a For Switched Mode

Where:

f output channel
m is one of:
0 Not set up
1 Pulsed output
2 Continuous output
a Output current (amps)
p Pulse width (microseconds)
d Delay before pulse (microseconds)
r Retrigger delay

ST8

This command reports the internal trigger mode, period (TT command) and the trigger mode (FP command) settings. Typical output is:

TT 1, TP 20.00ms FP 0

13.3.3 Report the firmware version

VR

This command returns the firmware version. For example:

PP820 (HW005) V034

13.3.4 Continuous Output Mode

The channel is set to continuous mode with the specified output current.

RSf,a

Where:

f = output channel (0 to 7)
a = output current (A)

For example:

> Set a continuous current of 0.5A on output channel 3
>> RS3,0.5

13.3.5   Switched Output Mode

The channel is set to switched mode with the specified output current.

> **RW**f**,a**
> Where:
>> f = output channel (0 to 7)
>> a = output current (A)

For example:

> Set channel 4 to output 1A whenever input 4 is active.
>> RW4,1.0

13.3.6   Pulsed Output Mode

Set the pulse parameters. This command sets a channel to pulsed output. Note that output channel 1 can only be triggered by INPUT1 and output channel 2 can only be triggered by INPUT2, etc.

The pulse delay can be from about 3us to 1 second. The pulse width can be any value from 1us to 1 second.

> **RT**f,p,d,a
> **RT**f,p,d,a,r
> Where:
>> f = output channel (0 to 7)
>> p = pulse width (microseconds)
>> d = delay from trigger to pulse (microseconds)
>> a = output current (A)
>> r = retrigger delay (microseconds, optional)

For example to set channel 2 to pulsed output at 4A, pulse a continuous current of 0.5A on output channel 3 for 1ms after a delay of 500us:

> RT2,1000,500,4

13.3.7   Set Trigger Mode

> **FP0**   All channels triggered individually
> **FP1**   All channels triggered by input 0
> **FP2**   Channels 0 to 3 from trigger 0, 4 to 7 from trigger 4

Note that when channels are all being triggered from input 0, that the other triggers should not be pulsed. Delays are from 4us to 10us longer in FP1 and FP2 modes.

This setting can be saved to non-volatile memory using the AW command.

13.3.8   Internal Trigger Mode

This command enables or disables the internal trigger. When enabled, all outputs are triggered simultaneously using an internal trigger signal. This setting can be saved to non-volatile memory using the AW command.

TT0	Use external triggers
TT1	Use internal trigger (defaults to 25Hz)
TT1,p	Use internal trigger and set the period

Where:

p= period of the triggers in microseconds

For example:

TT1,200MS	Set the internal trigger to 200ms (5Hz)
TT1,100	Set the internal trigger to 100us (10KHz)

13.3.9   Clear Settings

Clear all output channel settings. All output channel and timer settings are cleared to default to 0.0A continuous. This does not clear any Ethernet settings.

CL

Simulate an Input Trigger

TRc

c   which input channel (0 to 7)

Simulates a trigger pulse.

Enable Ethernet Messages

GTm

m   = 0 to disable Ethernet messages

= 1 to enable Ethernet messages

When Ethernet messages are enabled, any error reports are sent to the most recent UDP or TCP address from which a command has been received.

Read any error messages

GR

If Ethernet messages are disabled then the last error number can be read by this command. The reply is of the form "ErrN" where N is the error code, for example:

Err45   Error 45 was the last error.

If there are no outstanding errors then an empty reply is sent followed by the ">" character that normally terminates a reply message.

Set/Clear the Webpage Password
    EY
    EY asc1, asc2, asc3, asc4, asc5, asc6

This command sets the password required to access the webpages. If EY is entered on its own then the password is cleared. There are six optional parameters, which are ASCII values for a password from one to six letters. A value of 65 is 'A', 66 is 'B', etc to 90 is 'Z'.

13.3.10   Command Summary

Command	Example	Effect
AW	AW	Save changes
ST	ST2	Show configuration for channel 2
VR	VR	Read the firmware version
RS	RS2,0.7	Set channel 2 to 0.7A continuous
RW	RW1,1.1	Set channel 1 to 1.1A, switched by input 1
RT	RT2,3,4,1.9	Set channel 2 to 3ms pulses, delayed by 4ms, with an output pulse current of 1.9A
FP	FP1	Trigger all channels from trigger input 0
TT	TT1,1ms	Set test mode with pulses every 1ms
CL	CL	Clear all output settings.
TR	TR2	Trigger channel 2
EY	EY65,66	Set webpage password to "AB"
GR	GR	Read any error messages
GT	GT1	Enable Ethernet messages

A. Error Codes

Error codes may be sent by the PP820 by Ethernet or RS232. These are shown as "Errnn", where nn gives the number of the error. The error codes are:

- E1

  One of the parameters to a command has an illegal value.

- E2

  Command not recognised.

- E3

  Failed to save parameters to non-volatile memory.

- E4

  The command has the wrong number of parameters.

- E5

  (Warning only) A timing parameter was out of range and has been adjusted.

- E18

  On power up, the stored configuration was invalid.

- E 40

  When the unit has powered up the non-volatile memory was corrupt and has been cleared. Set up the unit again.

- All other errors

  A hardware error has occurred. Try power cycling the unit and trying again to see if the fault clears. If not, make a note of the number and contact your distributor.

Gardasoft Traffic Strobe Lights

The products available at the time of writing include the following. Other products are also available. See www.gardasoft.com for details of the current range.

VTR1 Range

- Up to 300W per steradian output power
- Infra red 740nm, 850nm, 940nm and white options
- Ethernet, RS232 and RS422 options
- Trigger input and trigger output options
- 12 degree and 30 degree beam angle options

VTR2 Range

- Up to 3000W per steradian output power
- Infra red 740nm, 850nm, 940nm and white options
- Ethernet, RS232 and RS422 options
- Trigger input and trigger output options
- 12 degree and 30 degree beam angle options

Gardasoft LED Lighting Controllers

RT Range

- 2, 4 or 8 output channels up to 20A each
- 2, 4 or 8 trigger inputs
- SafePower™ and SafeSense™
- Front panel, RS232 or Ethernet configuration
- Fast pulsing option

RT200-20	Lighting controller: 2 channels up to 20A pulsing, front panel
RT220-20	Lighting controller: 2 channels up to 20A pulsing, Ethernet
RT260-20	Lighting controller: 2 channels up to 20A pulsing, RS232
RT200F-20	Lighting controller: 2 channels up to 20A fast pulsing, front panel
RT220F-20	Lighting controller: 2 channels up to 20A fast pulsing, Ethernet
RT260F-20	Lighting controller: 2 channels up to 20A fast pulsing, RS232
RT420-20	Lighting controller: 4 channels up to 20A pulsing, Ethernet
RT420F-20	Lighting controller: 4 channels up to 20A fast pulsing, Ethernet
RT820F-20	Lighting controller: 8 channels up to 20A fast pulsing, Ethernet
RT860F-20	Lighting controller: 8 channels up to 20A fast pulsing, RS232

PP704	DIN Rail mounting clip for RT range

PP Range

- 2, 4 or 8 output channels up to 20A each
- 2, 4 or 8 trigger inputs
- SafeSense™ option
- Front panel, RS232 or Ethernet configuration
- Fast pulsing option

Machine Vision Timing Controller

CC320 Controller

- 8 digital inputs
- 8 digital outputs
- 1 or 2 wire Encoder input
- Very flexible operation
- Ethernet control
- Front panel configuration

PP703	DIN Rail mounting clip for CC320