

# NPCIUSB

## Voltage Piezo USB Amplifier



# Warranty

Newport Corporation warrants that this product will be free from defects in material and workmanship and will comply with Newport's published specifications at the time of sale for a period of one year from date of shipment. If found to be defective during the warranty period, the product will either be repaired or replaced at Newport's option.

To exercise this warranty, write or call your local Newport office or representative, or contact Newport headquarters in Irvine, California. You will be given prompt assistance and return instructions. Send the product, freight prepaid, to the indicated service facility. Repairs will be made and the instrument returned freight prepaid. Repaired products are warranted for the remainder of the original warranty period or 90 days, whichever comes first.

## **Limitation of Warranty**

The above warranties do not apply to products which have been repaired or modified without Newport's written approval, or products subjected to unusual physical, thermal or electrical stress, improper installation, misuse, abuse, accident or negligence in use, storage, transportation or handling. This warranty also does not apply to fuses, batteries, or damage from battery leakage.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE. NEWPORT CORPORATION SHALL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM THE PURCHASE OR USE OF ITS PRODUCTS.

©2017 by Newport Corporation, Irvine, CA. All rights reserved.

Original instructions.

No part of this document may be reproduced or copied without the prior written approval of Newport Corporation. This document is provided for information only, and product specifications are subject to change without notice. Any change will be reflected in future publishings.

# Table of Contents

Waranty .....	<a href="#">ii</a>
EU Declaration of Conformity .....	<a href="#">v</a>
<hr/>	
<b>1.0 Introduction .....</b>	<b>1</b>
1.1 Scope of the Manual.....	1
1.2 Certification of Newport Corporation .....	1
1.3 Purchased Part Package.....	2
1.4 Instructions for Using Piezo Electrical Elements and Power Supplies .....	2
1.5 Safety Instructions.....	3
1.5.1 General Warning or Caution .....	3
1.5.2 Electric Shock .....	3
1.5.3 Icons.....	3
1.6 Warnings and Cautions .....	4
<hr/>	
<b>2.0 Warnings and Cautions.....</b>	<b>5</b>
2.1 Installation, Power Supply .....	6
2.2 Operation.....	6
2.3 Maintenance and Inspection.....	7
2.4 Environmental Conditions.....	7
<hr/>	
<b>3.0 NPC1USB Definition .....</b>	<b>8</b>
3.1 Keywords .....	8
3.2 User Elements/Connections .....	9
3.2.1 Front Pane .....	9
3.3 Introduction .....	9
3.3.1 Block Diagram .....	9
3.3.2 Amplifier without integrated feedback controller .....	10
3.4 Initiation .....	10
3.4.1 Main Supply Voltage .....	10
3.4.2 Connecting Piezo Stage .....	10
<hr/>	
<b>4.0 Handling .....</b>	<b>11</b>
4.1 Controlling via Interface .....	11
4.2 Configuration USB 2.0.....	11
<hr/>	
<b>5.0 State Diagram .....</b>	<b>12</b>
5.1 Command Syntax.....	13
5.1.1 Blank Spaces.....	13

5.1.2	Decimal Separator.....	13
5.1.3	Command Terminator.....	13
5.1.4	Command Execution Time.....	13
5.1.5	Command Set.....	14
<hr/>		
<b>6.0</b>	<b>Command Overview.....</b>	<b>15</b>
	ID — Set/Get Stage Identifier.....	16
	MM – Enter/Leave DISABLE State.....	17
	OR — Enable Output Stage and Set Initial Voltage.....	18
	PA — Move Absolute.....	19
	PR — Move Relative.....	20
	PW — Enter/Leave CONFIGURATION State.....	21
	RS — Reset Controller.....	22
	RS## — Reset Controller’s Address to 1.....	23
	SA — Set/Get Controller’s RS-485 Address.....	24
	SE — Do Nothing, No Error for Compatibility.....	25
	SL — Set/Get Negative Software Limit.....	26
	SR — Set/Get Positive Software Limit.....	27
	ST — Stop Motion.....	28
	TB — Get Command Error String.....	29
	TE — Get Last Command Error.....	30
	TH — Set/ Get Point Position.....	31
	TP — Same as TH for Compatibility.....	32
	TS — Get Positioner Error and Controller State.....	33
	VA — Set/Get Slow Rate.....	35
	VE — Get Controller Revision Information.....	36
	ZT — Get All Axis Parameters.....	37
<hr/>		
<b>7.0</b>	<b>Pinouts.....</b>	<b>38</b>
7.1	24 VDC IN and OUT (Female $\varnothing$ 2.1 x $\varnothing$ 5.5 x 11 mm).....	38
7.2	USB Connector (USB Mini-B Receptacle).....	38
<hr/>		
<b>8.0</b>	<b>Electrical Specifications.....</b>	<b>39</b>
<hr/>		
<b>9.0</b>	<b>Mechanical Specifications.....</b>	<b>39</b>
<hr/>		
<b>10.0</b>	<b>Environmental Conditions.....</b>	<b>39</b>
<hr/>		
	<b>Service Form.....</b>	<b>41</b>

# EU Declaration of Conformity

**NPC1USB** **Newport®****Year C € mark affixed: 2016**

## EU Declaration of Conformity

**Product Name: Voltage Piezo USB Amplifier****Type of Equipment:** Electrical equipment for measurement, control and laboratory use in industrial locations.**Manufacturer:**

Newport Corporation,  
1791 Deere Avenue  
Irvine, CA 92606  
U.S.A.

We hereby certify that the above described device in its conception, construction and form put by us into circulation is in accordance with all relevant essential requirements of the EMC Directive 2014/30/EU. This declaration is no longer valid if the device is modified without our consent.

The agreement with further valid guideline / regulations following for the product is explained:

Low Voltage Directive: 2014 / 35 / EU

EMC Directive: 2014 / 30 / EU

DIN EN 61010-1:2011

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directives and Standards.



Gwen Briens  
Sr. Director, Motion and Instruments Business

Newport Corporation  
1791 Deere Ave, Irvine, CA 92606 USA





# Voltage Piezo USB Amplifier NPC1USB




---

## CAUTION

Please read carefully before switching on the power. Please see also instructions for safety when using piezoelectric actuators and power supplies.

---

## 1.0 Introduction

---

### 1.1 Scope of the Manual

This manual describes the piezo amplifier NPC1USB from **Newport Corporation**. If you have any problems please contact the manufacturer of the system: **Newport Corporation**, 1791 Irvine Ave. Irvine, CA 92606. Phone: (877) 835-9620

### 1.2 Certification of Newport Corporation

Newport Corporation works in according to an ISO 9001:2008 certified quality management system. Its effectiveness is verified and proven by periodic audits by the BSI. Our certificate can be found at [newport.com](http://newport.com)




---

## CAUTION

This instruction manual includes important information for using piezo actuators. Please take time and read this information. Piezo positioning systems are mechanical systems with highest precision. Correct handling guarantees the precision over long time.

---

### 1.3 Purchased Part Package

Please check the completeness of the delivery after receiving the shipment:

- Voltage amplifier NPC1USB
- Power supply 24 VDC (Sold Separately – Model: CONEX-PS recommended)
- USB cable
- Quick Start Guide (available on Newport.com)
- .INF Drivers (available on Newport.com)

### 1.4 Instructions for Using Piezo Electrical Elements and Power Supplies

- Piezoelectric actuators from **Newport Corporation** are controlled by voltages up to 150V. These values can be quite hazardous. Therefore, please read the installation instructions carefully. Only authorized personal should handle the power supply.
- After transportation, piezoelectric actuators should be allowed to sit for approximately 2 hours to adapt to room temperature before being switched on.
- Piezoelectric actuators are made from ceramic materials with and without metallic casings. The piezo-ceramic is a relatively brittle material. This should be noted when handling piezo electric actuators. All piezo-elements are sensitive to bending or shock forces.
- Due to the piezoelectric effect, piezo-actuators can generate electrical charges by changing the mechanical load or the temperature or by such actions described above.
- Piezoelectric actuators are able to work under high compressive forces. Only actuators with a pre-load can be used under tensile loads (these tensile forces must be less than the pre-load, given in the data sheet).
- Please note that the acceleration of the ceramic material (e.g., caused by a fall, discharging, or high dynamic applications) will occur. After excitation of the actuators by a voltage in the upper control range, the ceramic will move and generate an opposite high voltage after disconnection.
- Heating of the ceramic material will occur during dynamic operation and is caused by structure conditional loss processes. Failure may occur if the temperature exceeds specified values cited below.
- The piezoelectric effect disappears with increasing temperature up to the Curie temperature (usual values approx. 140–250 °C).
- Piezoelectric actuators such as stacks or other devices work electrically as a capacitor. These elements are able to store electrical energy over a long period of time (up to some days) and the stored energy may be dangerous.
- If the actuator remains connected to the drive electronics, it will be unloaded within a second after shutdown and quickly reaches harmless voltage values.
- Piezo-actuators can generate voltages by warming or cooling only (a result of longitudinal change). The discharge potential should not be ignored due to the inner capacitance. This effect is insignificantly at room temperature.
- Piezo-actuators from Newport Corporation are adjusted and glued. Any opening of the unit will cause misalignment or possible malfunction and the guarantee will be voided.
- Please use only original parts from Newport Corporation.
- Please contact Newport Corporation or your local representative, if there are any problems with your actuator or power supply.





**CAUTION**

**Shock forces may damage the built-in ceramic elements. Please avoid such forces, and handle the units with care, otherwise the guarantee is voided.**

**1.5 Safety Instructions**

**1.5.1 General Warning or Caution**



*Figure 1: General Warning or Caution Symbol.*

The Exclamation Symbol in Figure 1 may appear in Warning and Caution tables in this document. This symbol designates an area where personal injury or damage to the equipment is possible.

**1.5.2 Electric Shock**



*Figure 2: Electrical Shock Symbol.*

The Electrical Shock Symbol in Figure 2 may appear on labels affixed to the DL Controller/Driver. This symbol indicates a hazard arising from dangerous voltage. Any mishandling could result in irreparable damage to the equipment, in personal injury, or death.

**1.5.3 Icons**

**European Union CE Mark**



*CE Mark.*

The presence of the CE Mark on New Focus equipment means that this instrument has been designed, tested and certified compliant to all applicable European Union (CE) regulations and recommendations.

**Waste Electrical and Electronic Equipment (WEEE)**



*WEEE Directive Symbol.*

This symbol on the product or on its packaging indicates that this product must not be disposed with regular waste. Instead, it is the user responsibility to dispose of waste equipment according to the local laws. The separate collection and recycling of the waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For information about where the user can drop off the waste equipment for recycling, please contact your local Newport representative.

**Control of Hazardous Substances**



*RoHS Compliant Symbol*

This label indicates the products comply with the EU Directive 2011/65/EC that restricts the content of six hazardous chemicals.

**1.6 Warnings and Cautions**

The following are definitions of the Warnings, Cautions and Notes that may be used in this manual to call attention to important information regarding personal safety, safety and preservation of the equipment, or important tips.




---

**WARNING**

**Situation has the potential to cause bodily harm or death.**

---




---

**CAUTION**

**Situation has the potential to cause damage to property or equipment.**

---



---

**NOTE**

**Additional information the user or operator should consider.**

---

## 2.0 Warnings and Cautions

---




---

### RISK OF ELECTRIC SHOCK

- Do not open the units! There are no user serviceable parts inside. Opening or removing covers may expose you to dangerous shock hazards and other risks. Refer all servicing to qualified service personnel.
  - Do not spill any liquids into the cabinet or use the units near water.
- 

### CAUTION



- Allow adequate ventilation around the units so that heat can properly dissipate. Do not block ventilated openings or place the units near a radiator, oven, or other heat sources. Do not put anything on top of the units except those that are designed for this purpose (e.g. actuators).
- Work with the units only in a clean and dry environment. Only specially prepared units (e.g. actuators) can work under other conditions.
- Please only use original parts from *Newport Corporation*.
- Newport Corporation does not provide any warranty for damages or malfunctions caused by additional parts not supplied by *Newport Corporation*. Additional cables or connectors will change the calibration and other specified data. This can change the specified properties of the units and cause them to malfunction.
- Do not place the units on a sloping or unstable cart, stand, or table as they may fall or not work accurately.
- Piezo elements are sensitive systems capable of the highest positioning accuracy. However, they only demonstrate their excellent properties if they are handled correctly. Please only mount them at the special mounting points.

Immediately unplug your unit from the wall outlet and refer servicing to qualified service personnel under the following conditions:

- When the power supply cord or plug is damaged.
  - If cleaning supplies or liquid has been spilled or objects have fallen into the unit.
  - If the unit has been exposed to rain or water.
  - If the unit has been dropped or the housing is damaged.
-

## 2.1 Installation, Power Supply

---

### RISK OF ELECTRIC SHOCK



- Do not insert or unplug the power plug with wet hands, as this may result in electrical shock.
  - Do not install in rooms where flammable substances are stored. If flammable substances come into contact with electrical parts inside, a fire or electrical shock may occur.
  - Do not damage or modify the power cord. Do not pull on, excessively bend, or place heavy objects on the power cord, as this could cause electrical damage and result in a fire or electrical shock.
  - Always grasp the plug portion when unplugging the power plug. Pulling on the cord may expose or snap the core wire, or otherwise damage the power cord. Damaging the cord may cause an electricity leak and result in a fire or electrical shock.
- 

### CAUTION



- Do not use accessories other than those provided (e.g. power cord). Plug the power cord only in grounding equipment conductor power sockets to prevent inadvertent loosening.
  - Do not place heavy objects on any cables (e.g. power cords, sensor cables, actuator cables, optical cables).  
Leave sufficient space around the power plug so that it can be unplugged easily. If objects are placed around the power plug, you will be unable to unplug it in case of an emergency.
  - Install the system so that the on/off-switch is accessible without problem.
- 

## 2.2 Operation

Please note the area with general safety precautions.




---

### RISK OF ELECTRIC SHOCK

Do not spill inflammable substances inside the voltage amplifier. If these substances come into contact with an electrical component inside the voltage amplifier, a fire or electrical shock may occur.

---




---

### CAUTION

If the voltage amplifier emits smoke, excess heat, or unusual smells, immediately turn off the power switch and unplug the power plug from the outlet. Then contact Newport Corporation for technical services.

---

## 2.3 Maintenance and Inspection



---

### CAUTION!

- When cleaning the exterior box of the voltage amplifier, first turn off the power switch and unplug the power plug. Failure to follow these procedures may result in a fire or electrical shock.
  - Clean the exterior box using a firmly wrung-out cloth. Do not use alcohols, benzene, paint thinner or other flammable substances. If flammable substances come into contact with an electrical component inside the voltage amplifier, a fire or electrical shock may occur.
- 

## 2.4 Environmental Conditions

The amplifier can be used in the following environmental conditions:

- Indoor
- Altitude up to 2,000 m
- Temperature: -40–80 °C
- Relative humidity: 5–80% (non-condensing)

The recommended environmental conditions detailed in the following:

- Indoor
- Altitude up to 2,000 m
- Temperature: 15–40 °C
- Relative humidity: 10– 70% (non-condensing)

## 3.0 NPC1USB Definition

---

Piezo Amplifier for one PZT Actuator with a USB Interface; no feedback sensor (i.e. Open Loop Mode).

### 3.1 Keywords

#### **Closed Loop**

The operating mode for piezo actuating systems with integrated feedback sensor system; position accuracy is constantly controlled.

#### **Open Loop**

The operating mode for actuating systems without feedback sensor inside; no position information is available.

#### **Modulation Input**

The amplifier can be controlled by an applied analogue voltage signal from 0 V to +10 V.

#### **Monitor Output**

The output voltage signal corresponds to the position of the piezo actuating system with the applied voltage signal (OPEN LOOP mode only for NPC1USB).

#### **PC Interface**

USB 2.0

#### **Hyper Terminal Program**

This software enables the control of the piezo actuating system by using the USB interface. The available commands are described in chapter 5.0: "State Diagram".

#### **Soft Start**

Initialize after turning-on procedure. During the initialization sequence, the piezo electrical actuator is controlled for approximately 10 seconds with a voltage signal of 130 V.

---

#### **NOTE**

**The actuating system is moving during the initialization process.**

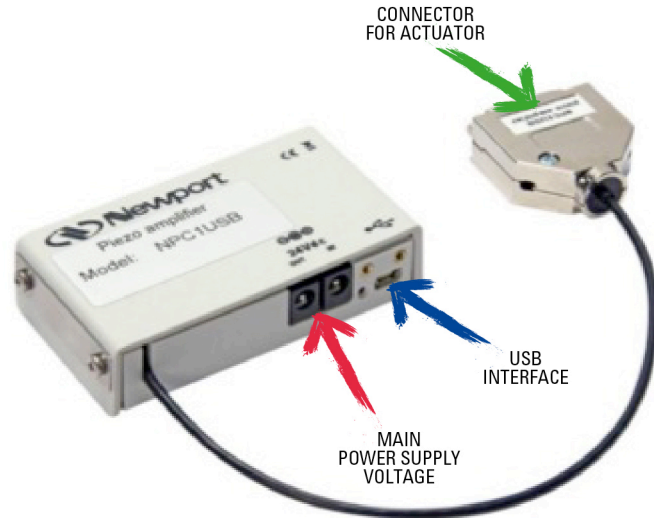
---

#### **Main Supply Voltage**

The main supply voltage to the amplifier is 24 VDC; an external wide range power supply needed for use (Recommended: CONEX-PS from Newport Corporation).

### 3.2 User Elements/Connections

#### 3.2.1 Front Panel



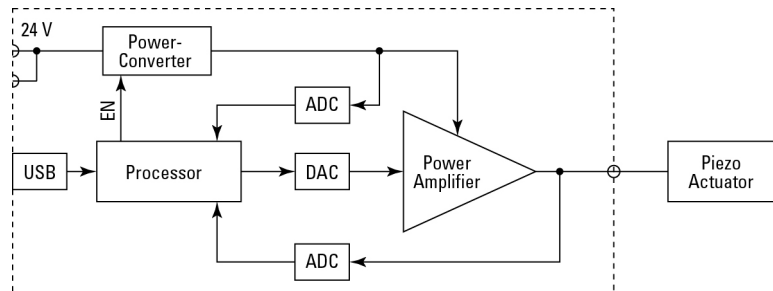
### 3.3 Introduction

The NPC1USB piezo stack amplifier is designed to control one low voltage piezo actuator with higher output current. The amplifier comes as a stand-alone device with a standard PC interface and USB connection. The NPC1USB can be controlled by an analog voltage signal of 24 V or by PC interface.

The NPC1USB is designed to control open loop actuating systems without any internal feedback sensor.

#### 3.3.1 Block Diagram

The chart below shows the block diagram of the NPC1USB. With exception of the display and the processor, the circuit is a similar of the NPC amplifier series.



**NOTE**

The travel capability of actuators or stages is limited to 80% due to the limited voltage range of the NPC1USB. With a lower current, the achievable rise times and frequencies are expected to be lower depending on the actuator/stage type.

### 3.3.2 Amplifier without integrated feedback controller

Any system delivered in open loop mode cannot be modified to be in closed loop later on.

Any closed loop system can be easily calibrated to a different closed loop piezo. This is only possible at Newport Corporation and will require additional effort and costs.

Please contact our sales team for more information.

## 3.4 Initiation

Please follow all safety instructions given in this user manual and the NPC1USB Quick Start Guide.

### 3.4.1 Main Supply Voltage

The NPC1USB amplifier requires a main supply voltage of 24 VDC. A power supply unit suitable for voltages from 100 up to 240 Volt AC is included in the shipment. The socket for the main supply voltage is located on the back panel of the amplifier.

### 3.4.2 Connecting Piezo Stage

Piezo electric stages are connected to the amplifier unit by using the D-SUB connector on the back panel. Please make sure that the amplifier is switched off when connecting / disconnecting the PZT to the amplifier. Please fasten the screws of the D-SUB connector to guarantee a firm connection.

Please refer to the instructions and list of commands in Chapter 10 of this manual.



## 4.0 Handling

### 4.1 Controlling via Interface

The amplifier NPC1USB is controlled via an USB 2.0 interface. Therefore, signal parameters and information about the actuator position or status can be adjusted or settled directly in the computer interface. Furthermore, the system settings of the amplifier unit can also be changed by using the interface. A fully PC controlled piezo system for automation purposes is feasible. Please connect the amplifier system by using the USB interface with your PC.

Please Note: The Piezo Amplifier must be turned off during this process.

For using the interface, a simple Terminal-Program can be used. (Please note that the program “WINDOWS-HyperTerminal” isn’t a part of Microsoft® WINDOWS since WINDOWS–VISTA is launched). By using the USB interface, please install the necessary driver which is supplied on the Newport Corporation website at: [www.newport.com/p/NPC1USB](http://www.newport.com/p/NPC1USB)

The supplied VI-driver is used for the integration of the amplifier systems into an existing Lab-View® program or for programming of a new program. As a part of the supplied software package software for controlling of the amplifier units is included or can be downloaded from our web site as well.

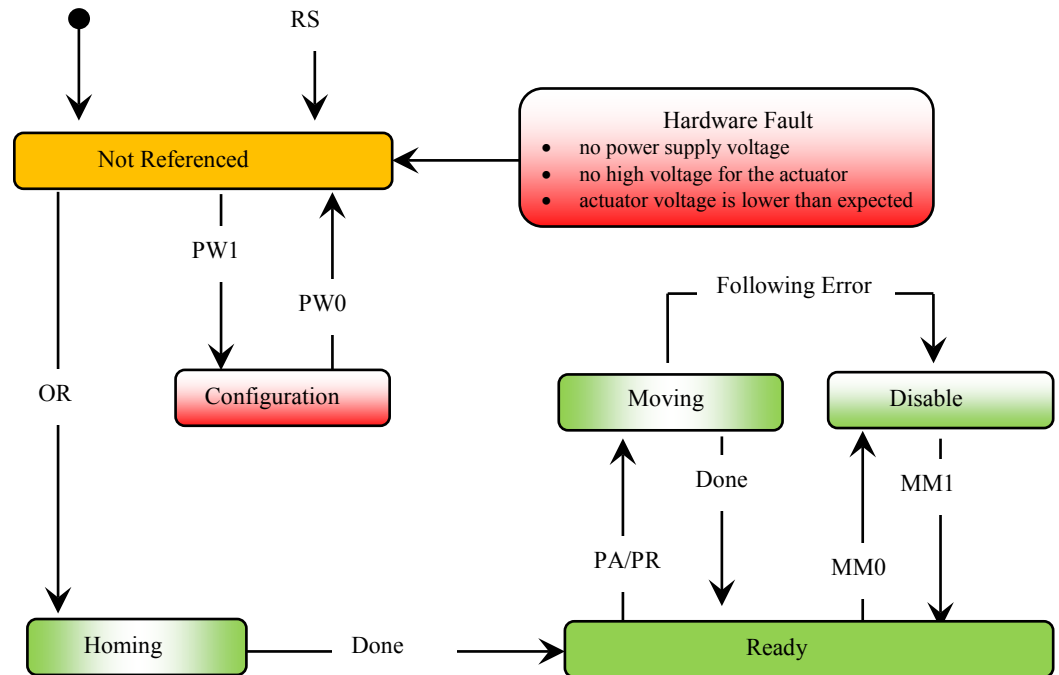
### 4.2 Configuration USB 2.0

For external control by PC interface USB 2.0 the following settings are necessary:

Baud rate / Bits per second	57,600
Data bits	8
Stop bits	1
Parity	None
Flow control	Hardware

## 5.0 State Diagram

For a safe and consistent operation, the NPC1USB Uses 6 different operation states: Not referenced, Configuration, Homing, Ready, Disable and Moving. In each state, only specific commands are accepted by the NPC1USB. It is important to understand the state diagram below and which commands and actions cause transition between different states. Also, see the TS command for command/state information:



### End of Runs encountered in the following state

NOT REFERENCED:	No action
CONFIGURATION:	No action
HOMING:	Set voltage to zero and then change to NOT REFERENCED state
MOVING:	Abort motion and then change to NOT REFERENCED state
READY:	Change to NOT REFERENCED state
DISABLE:	Change to NOT REFERENCED state

### LED display

NOT REFERENCED:	If everything is OK then <b>SOLID ORANGE</b>
NOT REFERENCED:	If hardware faults or wrong parameters the <b>SOLID RED</b>
NOT REFERENCED:	If end of runs then <b>SLOW BLINK ORANGE</b>
CONFIGURATION:	<b>SLOW BLINK RED</b>
READY:	<b>SOLID GREEN</b>
DISABLE:	<b>SLOW BLINK GREEN</b>
HOMING:	<b>FAST BLINK GREEN</b>
MOVING:	<b>FAST BLINK GREEN</b>

After connecting the NPC1USB to power, the controller must first be initialized. When the initialization is successful, the controller gets to the NOT REFERENCED state. From the NOT REFERENCED state, the controller can go to the CONFIGURATION state

with the PW1 command. In CONFIGURATION state, the NPC1USB allows changing all stage configuration parameters like? The PW0 command saves all changes to the controller's memory and returns the controller back to the NOT REFERENCED state.

To execute any move commands (PA, PR), the controller must be in the READY state. To get from the NOT REFERENCED state to the READY state, the positioned must be homed first with the OR command. During homing (OR command execution), the controller is in HOMING state. If the homing is successful, the controller automatically gets to the READY state. The process for homing, and which signals are looked for during homing, can be defined with the HT command.

## 5.1 Command Syntax

The NPC1USB is a command driven controller. The general format of a command is a two letter ASCII character preceded and followed by parameters specific to the command:

**Command format:**

nn	AA	xx
----	----	----

**nn** Optional or required controller address.

**AA** Command name.

**xx** Optional or required value or "?" to query current value.

Both, upper and lower case characters are accepted. Depending on the command, it can have an optional or required prefix (nn) for the controller address and/or a suffix (xx) value or a "?".

### 5.1.1 Blank Spaces

Blanks are allowed and ignored in any position, including within a numerical value. The following two commands are equivalent, but the first example might be confusing and uses more memory:

2PA1.43 6

2PA1.436

### 5.1.2 Decimal Separator

A dot (".") is used as a decimal separator for all numerical values.

### 5.1.3 Command Terminator

Commands are executed as the command terminator CRLF (carriage-return line-feed, ASCII 13 and ASCII 10) is received. The controller will analyze the received string. If the command is valid and its parameters are in the specified range, it will be executed. Otherwise it will be memorized as an error.

After the execution of the command, all remaining characters in the input string, if any, will be ignored. Therefore, it is not possible to concatenate several commands on a single string from the PC to the NPC1USB.

Each command will properly handle the memorization of related errors that can be accessed with the TE command. Please refer to the command set in chapter 5.1.5 for details.

### 5.1.4 Command Execution Time

The NPC1USB controller interprets commands continuously as they are received. The typical execution time for a "tell position command" (nTP?) is about 10 ms. Here,

command execution time means the time from sending the command until receiving the answer.

It is important to note that a move command that may last for several seconds, will not suspend the controller from further command execution. So for an efficient process flow with many move commands, it is recommended to use the PT command (to get time for a relative move), the TS command (to query the controller status), or the TP command (to get current position) before any further motion command is sent.

### 5.1.5 Command Set

This chapter describes the supported two-letter ASCII commands used to configure and operate the NPC1USB. The general command format is:

<b>nn</b>	<b>AA</b>	<b>xx</b>
-----------	-----------	-----------

**nn** Optional or required controller address.

**AA** Command name.

**xx** Optional or required value or “?” to query current value.

Most commands can be used to set a value (in that case the command name is followed by the value “xx”) or to query the current value (in that case the command name is followed by a “?”). When querying a value, the controller responds with the command it received followed by the queried value. For example, a 1VA10 sets the velocity of the controller #1 to 10 units/second. A “1VA?” sends the response “1VA10”.

Not every command can be executed in all states of the NPC1USB and some commands have different meaning in different states. It is therefore important to understand the state diagram of the controller, see chapter 5.0: “State Diagram”.

## 6.0 Command Overview

	Not Ref.	Config.	Disable	Ready	Motion	Description
<b>ID</b>	–	○	□	□	-	Set/Get stage identifier
<b>MM</b>	–	–	●	●	–	Enter/Leave DISABLE state
<b>OR</b>	●	–	–	–	–	Enable output stage and set initial voltage
<b>PA</b>	–	–	–	●	–	Move absolute
<b>PR</b>	–	–	–	●	–	Move relative
<b>PW</b>	●	●	–	–	–	Enter/Leave CONFIGURATION state
<b>RS</b>	●	–	●	●	–	Reset controller
<b>RS##</b>	□	○	□	□	□	Reset controller's address to 1
<b>SA</b>	–	○	–	–	–	Set/Get controller's RS-485 address
<b>SE</b>	–	–	–	●	–	Do nothing, no error for compatibility
<b>SL</b>	–	○	□	□	–	Set/Get negative software limit
<b>SR</b>	–	○	□	□	–	Set/Get positive software limit
<b>ST</b>	-	–	–	–	●	Stop motion instead
<b>TB</b>	●	●	●	●	●	Get command error string
<b>TE</b>	●	●	●	●	●	Get last command error
<b>TH</b>	●	●	●	●	●	Get setpoint position
<b>TP</b>	●	●	●	●	●	Same as TH for compatibility
<b>TS</b>	●	●	●	●	●	Get positioner error and controller state
<b>VA</b>	–	○	□	□	–	Set/Get slew rate
<b>VE</b>	●	●	●	●	●	Get controller revision information
<b>ZT</b>	●	●	●	●	●	Get all axis parameters

Motion: Corresponds to HOMING and MOVING state (for details see chapter 5.0: "State Diagram").

- Changes configuration parameters. Those changes will be stored in the controller's memory with the **PW1** command and remain available after switching off the controller.
- Changes working parameters only. Those changes will get lost when switching off the controller.
- Accepted command.
- Not accepted command (will return an error).

Command: Command passed without preceding controller number applies to all controllers (e.g. MM0 disables all controllers).

## ID — Set/Get Stage Identifier

	Usage	Not Ref.	Config.	Disable	Ready	Motion
		–	○	□	□	–
<b>Syntax</b>	xxIDnn, or xxID?					
<b>Parameters</b>						
<b>Description</b>	<b>xx</b> [int]	—	Controller address.			
	<b>nn</b> [float]	—	Stage model number.			
<b>Range</b>	<b>xx</b>	—	1 to 31.			
	<b>nn</b>	—	1 to 31 ASCII characters.			
<b>Units</b>	<b>xx</b>	—	None.			
	<b>nn</b>	—	None.			
<b>Defaults</b>	<b>xx</b> Missing:		Error B.			
	Out of range:		Error B.			
	Floating point:		Error A.			
	<b>nn</b> Missing:		Error C.			
	Out of range:		Error C.			
<b>Description</b>	This ID? command gets the stage identifier. In CONFIGURATION mode, this Command allows changing the stage identifier.					
<b>Returns</b>	If the sign “?” takes place of nn, the command returns the current programmed value.					
<b>Errors</b>	A	—	Unknown message code or floating point controller address.			
	B	—	Controller address not correct.			
	C	—	Parameter missing or out of range.			
	D	—	Execution not allowed.			
	H	—	Execution not allowed in NOT REFERENCED state.			
	L	—	Execution not allowed in HOMING state.			
	M	—	Execution not allowed in MOVING state.			
<b>Rel. Commands</b>	None.					
<b>Example</b>	1ID?		Get stage identifier for controller #1.			
	1IDNPC1USB		Controller returns stage identifier: NPC1USB.			

## MM – Enter/Leave DISABLE State

	Usage	Not Ref.	Config.	Disable	Ready	Motion
		–	–	●	●	–
<b>Syntax</b>	xxMMnn or xxMM?					
<b>Parameters</b>						
<b>Description</b>	xx [int]	—	Controller address.			
	nn [float]	—	?			
<b>Range</b>	xx	—	1 to 31.			
	nn	—	0 changes state from READY to DISABLE. 1 changes state from DISABLE to READY.			
<b>Units</b>	xx	—	None.			
	nn	—	None.			
<b>Defaults</b>	xx	Missing:	Error B.			
		Out of range:	Error B.			
		Floating point:	Error A.			
	nn	Missing:	Error C.			
		Out of range:	Error C.			
<b>Description</b>	MM0 changes the controller’s state from READY to DISABLE. In the DISABLE state the actuator is not energized.					
	MM1 changes the controller’s state from DISABLE to READY. The controller’s set point is equal to its current position.					
<b>Returns</b>	If the sign “?” takes place of nn, the command returns the current programmed value.					
<b>Errors</b>	A	—	Unknown message code or floating point controller address.			
	B	—	Controller address not correct.			
	C	—	Parameter missing or out of range.			
	D	—	Execution not allowed.			
	H	—	Execution not allowed in NOT REFERENCED state.			
	I	—	Command not allowed in CONFIGURATION state.			
	L	—	Execution not allowed in HOMING state.			
	M	—	Execution not allowed in MOVING state.			
<b>Rel. Commands</b>	PW	—	Enter/leave CONFIGURATION state.			
<b>Example</b>	MM0		All controllers go to DISABLE state.			

## OR — Enable Output Stage and Set Initial Voltage

	Usage	Not Ref.	Config.	Disable	Ready	Motion
		●	—	—	—	—
<b>Syntax</b>	xxOR					
<b>Parameters</b>						
<b>Description</b>	xx [int]	—	Controller address.			
<b>Range</b>	xx	—	1 to 31.			
<b>Units</b>	xx	—	None.			
<b>Defaults</b>	xx	Missing:	Error B.			
		Out of range:	Error B.			
		Floating point:	Error A.			
<b>Description</b>	This command enables the output stage and sets the voltage to SL.					
<b>Returns</b>	If the sign “?” takes place of nn, the command returns the current programmed value.					
<b>Errors</b>	A	—	Unknown message code or floating point controller address.			
	B	—	Controller address not correct.			
	D	—	Execution not allowed.			
	I	—	Command not allowed in CONFIGURATION state.			
	J	—	Execution not allowed in DISABLE state.			
	K	—	Execution not allowed in READY state.			
	L	—	Execution not allowed in HOMING state.			
	M	—	Execution not allowed in MOVING state.			
<b>Rel. Commands</b>	PW – Enter/leave CONFIGURATION state.					
<b>Example</b>	1OR		Enables output stage of the controller #1 and sets the voltage to 0 V.			



## PA — Move Absolute

	Usage	Not Ref.	Config.	Disable	Ready	Motion
		—	—	—	●	—
<b>Syntax</b>	xxPAnn or xxPA?					
<b>Parameters</b>						
<b>Description</b>	<b>xx</b> [int]	—	Controller address.			
	<b>nn</b> [float]	—	Actuator voltage.			
<b>Range</b>	<b>xx</b>	—	1 to 31.			
	<b>nn</b>	—	$SL \leq nn \leq SR$ .			
<b>Units</b>	<b>xx</b>	—	None.			
	<b>nn</b>	—	Voltage.			
<b>Defaults</b>	<b>xx</b> Missing:	Error B.				
	Out of range:	Error B.				
	Floating point:	Error A.				
	<b>nn</b> Missing:	Error C.				
	Out of range:	Error C.				
<b>Description</b>	<p>The PA command initiates an absolute move. When received, the actuator will move, with the predefined slew rate, to the new target position specified by nn.</p> <p>The PA command is only accepted in the READY state, AND when the new target position is higher or equal to the negative software limit (SL), AND lower or equal to the positive software limit (SR).</p>					
<b>Returns</b>	If the sign “?” takes place of nn, the command returns the current programmed value.					
<b>Errors</b>	A	—	Unknown message code or floating point controller address.			
	B	—	Controller address not correct.			
	C	—	Parameter missing or out of range.			
	D	—	Execution not allowed.			
	H	—	Execution not allowed in NOT REFERENCED state.			
	I	—	Command not allowed in CONFIGURATION state.			
	J	—	Execution not allowed in DISABLE state.			
	L	—	Execution not allowed in HOMING state.			
	M	—	Execution not allowed in MOVING state.			
<b>Rel. Commands</b>	PR	—	Move relative.			
	TH	—	Get set-point voltage.			
	TP	—	Get current position (Please notice: same as TH).			
<b>Example</b>	1PA45.00		Move actuator on controller #1 to the absolute position 45.00 V.			

## PR — Move Relative

	Usage	Not Ref.	Config.	Disable	Ready	Motion
		—	—	—	●	—
<b>Syntax</b>	xxPRnn or xxPR?					
<b>Parameters</b>						
<b>Description</b>	xx [int]	—	Controller address.			
	nn [float]	—	?			
<b>Range</b>	xx	—	1 to 31.			
	nn	—	$SL \leq (\text{abspos} + nn) \leq SR$ .			
<b>Units</b>	xx	—	None.			
	nn	—	Voltage.			
<b>Defaults</b>	xx	Missing:	Error B.			
		Out of range:	Error B.			
		Floating point:	Error A.			
	nn	Missing:	Error C.			
		Out of range:	Error C.			
<b>Description</b>	<p>The PR command initiates a relative move. When received, the actuator will move, with the predefined slew rate, to the new target position nn units away from the current position.</p> <p>The PR command is only accepted in the READY state, AND when the distance of the position to the end of runs is larger than the commanded displacement.</p>					
<b>Returns</b>	If the sign “?” takes place of nn, the command returns the current programmed value.					
<b>Errors</b>	A	—	Unknown message code or floating point controller address.			
	B	—	Controller address not correct.			
	C	—	Parameter missing or out of range.			
	D	—	Execution not allowed.			
	H	—	Execution not allowed in NOT REFERENCED state.			
	I	—	Command not allowed in CONFIGURATION state.			
	J	—	Execution not allowed in DISABLE state.			
	L	—	Execution not allowed in HOMING state.			
	M	—	Execution not allowed in MOVING state.			
<b>Rel. Commands</b>	PW – Enter/Leave CONFIGURATION state.					
<b>Example</b>	1PR2.2		Move positioned on controller #1 to a new position 2.2 units away from the current target position.			

## PW — Enter/Leave CONFIGURATION State

Usage	Not Ref.	Config.	Disable	Ready	Motion
	●	●	—	—	—
<b>Syntax</b>	xxPWnn or xxPW?				
<b>Parameters</b>					
<b>Description</b>	xx [int]	— Controller address.			
	nn [float]	— ?			
<b>Range</b>	xx	— 1 to 31.			
	nn	— 1: changes from NOT REFERENCED state to CONFIGURATION state. 0: changes from CONFIGURATION state to NOT REFERENCED state.			
<b>Units</b>	xx	— None.			
	nn	— None.			
<b>Defaults</b>	xx	Missing:	Error B.		
		Out of range:	Error B.		
		Floating point:	Error A.		
	nn	Missing:	Error C.		
		Out of range:	Error C.		
<b>Description</b>	<p>PW1 changes the controller’s state from NOT REFERENCED to CONFIGURATION. In the CONFIGURATION state all parameter settings are saved in the controller’s memory and will remain available even after switching off the controller. Additionally, some settings are only possible in the CONFIGURATION state.</p> <p>Saved parameters are SA, SL, SR, ID, VA.</p> <p>PW0 checks all the stage parameters and saves them in the flash memory of the controller if they are acceptable. After that, it changes the controller’s state from CONFIGURATION to NOT REFERENCED.</p>				
<b>Returns</b>	If the sign “?” takes place of nn, this command returns the current programmed value.				
<b>Errors</b>	A	— Unknown message code or floating point controller address.			
	B	— Controller address not correct.			
	C	— Parameter missing or out of range.			
	D	— Execution not allowed.			
	J	— Execution not allowed in DISABLE state.			
	K	— Execution not allowed in READY state.			
	L	— Execution not allowed in HOMING state.			
	M	— Execution not allowed in MOVING state.			
<b>Rel. Commands</b>	MM	— Enter/Leave DISABLE state.			
<b>Example</b>	1PW1		Changes controller #1 to CONFIGURATION state.		

## RS — Reset Controller

	Usage	Not Ref.	Config.	Disable	Ready	Motion
		●	—	●	●	—
<b>Syntax</b>	xxRS or RS					
<b>Parameters</b>						
<b>Description</b>	xx [int]	—	Controller address.			
<b>Range</b>	xx	—	1 to 31.			
<b>Units</b>	xx	—	None.			
<b>Defaults</b>	xx	Missing:	Error B.			
		Out of range:	Error B.			
		Floating point:	Error A.			
<b>Description</b>	The RS command issues a hardware reset of the controller, equivalent to a power-up. This is also a required command to execute before changing from the DISABLE or READY state to the CONFIGURATION state, and before changing the controller's state with the PW1 command from NOT REFERENCED to CONFIGURATION.					
<b>Returns</b>	None.					
<b>Errors</b>	A	—	Unknown message code or floating point controller address.			
	B	—	Controller address not correct.			
	C	—	Parameter missing or out of range.			
	D	—	Execution not allowed.			
	I	—	Command not allowed in CONFIGURATION state.			
	L	—	Execution not allowed in HOMING state.			
	M	—	Execution not allowed in MOVING state.			
<b>Rel. Commands</b>	None.					
<b>Example</b>	1RS		Reset controller #1.			
	RS		Reset all controllers (only RS485-Mode).			

## RS## — Reset Controller's Address to 1

Usage	Not Ref.	Config.	Disable	Ready	Motion
	□	○	□	□	□
<b>Syntax</b>	xxRS## or RS##				
<b>Parameters</b>					
<b>Description</b>	xx [int]	—	Controller address.		
<b>Range</b>	xx	—	1 to 31.		
<b>Units</b>	xx	—	None.		
<b>Defaults</b>	xx	Missing:	Error B.		
		Out of range:	Error B.		
		Floating point:	Error A.		
<b>Description</b>	The RS## command resets the controller's address to 1. This address needs to be different for each NPC1USB when connected on a RS-485 communication network. Should the address change be saved in the device please store it with the sequence 1PW1, 1PW0.				
<b>Returns</b>	None.				
<b>Errors</b>	A	—	Unknown message code or floating point controller address.		
	B	—	Controller address not correct.		
	C	—	Parameter missing or out of range.		
	D	—	Execution not allowed.		
	I	—	Command not allowed in CONFIGURATION state.		
	L	—	Execution not allowed in HOMING state.		
	M	—	Execution not allowed in MOVING state.		
<b>Rel. Commands</b>	MM	—	Enter/Leave DISABLE state.		
<b>Example</b>	RS##		Reset all controller's address to 1.		

## SA — Set/Get Controller’s RS-485 Address

Usage	Not Ref.	Config.	Disable	Ready	Motion
	—	○	—	—	—
<b>Syntax</b> xxSAnn or xxSA?					
<b>Parameters</b>					
<b>Description</b>	xx [int]	—	Controller address.		
	nn [int]	—	Controller’s axis number.		
<b>Range</b>	xx	—	1 to 31.		
	nn	—	2 to 31.		
<b>Units</b>	xx	—	None.		
	nn	—	None.		
<b>Defaults</b>	xx	Missing:	Error B.		
		Out of range:	Error B.		
		Floating point:	Error A.		
	nn	Missing:	Error C.		
		Out of range:	Error C.		
<b>Description</b>	<p>The SA command sets the controller’s RS-485 address.</p> <p>Newport Corporation recommends using the supplied utility software for all controller configurations. The SA command is of practical use only when not using this software.</p>				
<b>Returns</b>	If the sign “?” takes place of nn, this command returns the current programmed value.				
<b>Errors</b>	A	—	Unknown message code or floating point controller address.		
	B	—	Controller address not correct.		
	C	—	Parameter missing or out of range.		
	D	—	Execution not allowed.		
	H	—	Execution not allowed in NOT REFERENCED state.		
	J	—	Execution not allowed in DISABLE state.		
	K	—	Execution not allowed in READY state.		
	L	—	Execution not allowed in HOMING state.		
	M	—	Execution not allowed in MOVING state.		
<b>Rel. Commands</b>	None.				
<b>Example</b>	1SA3		Set controller’s RS-485 address to 3.		

## SE — Do Nothing, No Error for Compatibility

	Usage	Not Ref.	Config.	Disable	Ready	Motion
		—	—	—	●	—
<b>Syntax</b>	xxSEnn, or xxSE? or SE					
<b>Parameters</b>						
<b>Description</b>	xx [int]	—	Controller address.			
	nn [float]	—	Unused.			
<b>Range</b>	xx	—	1.			
	nn	—	Unused.			
<b>Units</b>	xx	—	None.			
	nn	—	None.			
<b>Defaults</b>	xx	Missing:	Error B.			
		Out of range:	Error B.			
		Floating point:	Error A.			
	nn	Missing:	Error C.			
		Out of range:	Error C.			
<b>Description</b>	The SE command is implemented for compatibility only.					
<b>Returns</b>	None.					
<b>Errors</b>	A	—	Unknown message code or floating point controller address.			
	B	—	Controller address not correct.			
	C	—	Parameter missing or out of range.			
	D	—	Execution not allowed.			
	H	—	Execution not allowed in NOT REFERENCED state.			
	I	—	Command not allowed in CONFIGURATION state.			
	J	—	Execution not allowed in DISABLE state.			
	L	—	Execution not allowed in HOMING state.			
	M	—	Execution not allowed in MOVING state.			
<b>Rel. Commands</b>	None.					
<b>Example</b>	1SE3		Do nothing.			

## SL — Set/Get Negative Software Limit

	Usage	Not Ref.	Config.	Disable	Ready	Motion
		–	○	□	□	–
<b>Syntax</b>	xxSLnn or xxSL?					
<b>Parameters</b>						
<b>Description</b>	xx [int]	—	Controller address.			
	nn [float]	—	Negative software limit.			
<b>Range</b>	xx	—	1 to 31.			
	nn	—	0 (below zero is not possible!).			
<b>Units</b>	xx	—	None.			
	nn	—	Voltage.			
<b>Defaults</b>	xx	Missing:	Error B.			
		Out of range:	Error B.			
		Floating point:	Error A.			
	nn	Missing:	Error C.			
		Out of range:	Error C.			
<b>Description</b>	In the CONFIGURATION state, this command sets the negative software limit which can be saved in the controller’s nonvolatile memory using by the PW command.					
<b>NOTE</b>						
<b>SL must be lower than SR in every case.</b>						
<b>Returns</b>	If the sign “?” takes place of nn, this command returns the current programmed value.					
<b>Errors</b>	A	—	Unknown message code or floating point controller address.			
	B	—	Controller address not correct.			
	C	—	Parameter missing or out of range.			
	D	—	Execution not allowed.			
	H	—	Execution not allowed in NOT REFERENCED state.			
	L	—	Execution not allowed in HOMING state.			
	M	—	Execution not allowed in MOVING state.			
<b>Rel. Commands</b>	SR	—	Set/Get positive software limit.			
<b>Example</b>	1SL0		Set controller’s negative software limit to 0 V.			



## SR — Set/Get Positive Software Limit

	Usage	Not Ref.	Config.	Disable	Ready	Motion
		–	○	□	□	–
<b>Syntax</b>	xxSRnn or xxSR?					
<b>Parameters</b>						
<b>Description</b>	<b>xx</b> [int]	—	Controller address.			
	<b>nn</b> [float]	—	Positive software limit.			
<b>Range</b>	<b>xx</b>	—	1 to 31.			
	<b>nn</b>	—	130.			
<b>Units</b>	<b>xx</b>	—	None.			
	<b>nn</b>	—	Voltage.			
<b>Defaults</b>	<b>xx</b> Missing:		Error B.			
	Out of range:		Error B.			
	Floating point:		Error A.			
	<b>nn</b> Missing:		Error C.			
	Out of range:		Error C.			
<b>Description</b>	In the CONFIGURATION state, this command sets the positive software limit which can be saved in the controller's nonvolatile memory using by the PW command.					
<b>NOTE</b>						
<b>SL must be lower than SR in every case.</b>						
<b>Returns</b>	If the sign “?” takes place of nn, this command returns the current programmed value.					
<b>Errors</b>	A	—	Unknown message code or floating point controller address.			
	B	—	Controller address not correct.			
	C	—	Parameter missing or out of range.			
	D	—	Execution not allowed.			
	H	—	Execution not allowed in NOT REFERENCED state.			
	L	—	Execution not allowed in HOMING state.			
	M	—	Execution not allowed in MOVING state.			
<b>Rel. Commands</b>	SL	—	Set/Get negative software limit.			
<b>Example</b>	1SR100		Set controller's positive software limit to 100 V.			

## ST — Stop Motion

	Usage	Not Ref.	Config.	Disable	Ready	Motion
		–	–□	–	–	●
	<b>Syntax</b>	xxST				
	<b>Parameters</b>					
	<b>Description</b>	xx [int]	—	Controller address.		
	<b>Range</b>	xx	—	1 to 31.		
	<b>Units</b>	xx	—	None.		
	<b>Defaults</b>	xx	Missing:	Error B.		
			Out of range:	Error B.		
			Floating point:	Error A.		
	<b>Description</b>	The ST command is a safety feature. It stops a move in progress by decelerating the positioner immediately. The xxST command with preceding controller address stops a move in progress of controller xx. The ST command without preceding controller address stops the moves of ALL controllers.				
	<b>Returns</b>	None.				
	<b>Errors</b>	A	—	Unknown message code or floating point controller address.		
		B	—	Controller address not correct.		
		C	—	Parameter missing or out of range.		
		D	—	Execution not allowed.		
		H	—	Execution not allowed in NOT REFERENCED state.		
		I	—	Command not allowed in CONFIGURATION state.		
	<b>Rel. Commands</b>	None.				
	<b>Example</b>			None.		

## TB — Get Command Error String

	Usage	Not Ref.	Config.	Disable	Ready	Motion
		●	●	●	●	●
<b>Syntax</b>	xxTBnn					
<b>Parameters</b>						
<b>Description</b>	xx [int]	—	Controller address.			
	nn [char]	—	Error code (refer to TE command).			
<b>Range</b>	xx	—	1 to 31.			
	nn	—	Error code (refer to TE command).			
<b>Units</b>	xx	—	None.			
	nn	—	None.			
<b>Defaults</b>	xx	Missing:	Error B.			
		Out of range:	Error B.			
		Floating point:	Error A.			
	nn	Missing:	Returns explanation of current error.			
		Out of range:	Error C.			
<b>Description</b>	The TB command returns a string that explains the meaning of the error code nn (see TEcommand for complete list).					
<b>Returns</b>	Error description.					
<b>Errors</b>	A	—	Unknown message code or floating point controller address.			
	B	—	Controller address not correct.			
	C	—	Parameter missing or out of range.			
<b>Rel. Commands</b>	TE	—	Get Last Command Error.			
<b>Example</b>	1TBD		1TB Execution not allowed			

## TE — Get Last Command Error

	Usage	Not Ref.	Config.	Disable	Ready	Motion
		●	●	●	●	●
<b>Syntax</b>	xxTE					
<b>Parameters</b>						
<b>Description</b>	xx [int]	—	Controller address.			
<b>Range</b>	xx	—	1 to 31.			
<b>Units</b>	xx	—	None.			
<b>Defaults</b>	xx	Missing:	Error B.			
		Out of range:	Error B.			
		Floating point:	Error A.			
<b>Description</b>	<p>The TE command returns the currently command error. When a command is unable to execute, it memorizes the error. This error can be read with the TE command. The execution of a TE command clears the error buffer. The next TE command executed will return @, which means no error. When a new command error is generated before the previous command error is read, the new command error will overwrite the current memorized error.</p> <p>For a safe program flow it is recommended to always query the command error after each command execution.</p>					
<b>Returns</b>	Error Code.					
<b>Errors</b>	@	—	No error.			
	A	—	Unknown message code or floating point controller address.			
	B	—	Controller address not correct.			
	C	—	Parameter missing or out of range.			
	D	—	Command not allowed.			
	H	—	Execution not allowed in NOT REFERENCED state.			
	I	—	Command not allowed in CONFIGURATION state.			
	J	—	Execution not allowed in DISABLE state.			
	K	—	Command not allowed in READY state.			
	L	—	Execution not allowed in HOMING state.			
	M	—	Execution not allowed in MOVING state.			
	S	—	Communication time out.			
	V	—	Error during command execution.			
	Z	—	Actuator not connected.			
	—	—	Unknown error.			
<b>Rel. Commands</b>	TB	—	Get Command Error String.			
<b>Example</b>	1TE		Get last error memorized on controller #1.			

## TH — Set/ Get Point Position

Usage	Not Ref.	Config.	Disable	Ready	Motion
	●	●	●	●	●
<b>Syntax</b>	xxTH				
<b>Parameters</b>					
<b>Description</b>	xx [int]	—	Controller address.		
<b>Range</b>	xx	—	1 to 31.		
<b>Units</b>	xx	—	None.		
<b>Defaults</b>	xx	Missing:	Error B.		
		Out of range:	Error B.		
		Floating point:	Error A.		
<b>Description</b>	The TH command returns the set-point value of the actuator voltage. Please notice that creep and drift by temperature is not compensated by this kind of amplifier through an internal control loop.				
<b>Returns</b>	Set-point position [V].				
<b>Errors</b>	A	—	Unknown message code or floating point controller address.		
	B	—	Controller address not correct.		
<b>Rel. Commands</b>	None.				
<b>Example</b>	1TH		Get set-point position of controller #1		
	1TH80.00		Controller returns: set-point position = 80.00 V		

## TP — Same as TH for Compatibility

Usage	Not Ref.	Config.	Disable	Ready	Motion
	●	●	●	●	●
<b>Syntax</b>	xxTP				
<b>Parameters</b>					
<b>Description</b>	xx [int]	—	Controller address.		
<b>Range</b>	xx	—	1 to 31.		
<b>Units</b>	xx	—	None.		
<b>Defaults</b>	xx	Missing:	Error B.		
		Out of range:	Error B.		
		Floating point:	Error A.		
<b>Description</b>	See TH command.				



**Controller States (ef)**

ef [HEX]	ef [BIN]	Description
0A	1010	NOT REFERENCED from reset
0B	1011	NOT REFERENCED from HOMING
0C	1100	NOT REFERENCED from CONFIGURATION
0D	1101	NOT REFERENCED from DISABLE
0E	1110	NOT REFERENCED from READY
0F	1111	NOT REFERENCED from MOVING
10	10000	NOT REFERENCED ESP stage error
14	10100	CONFIGURATION
1E	11110	HOMING
28	101000	MOVING
32	110010	READY from HOMING
33	110011	READY from MOVING
34	110100	READY from DISABLE
3C	111100	DISABLE from READY
3D	111101	DISABLE from MOVING

**NOTES:**

The error buffer gets updated approx. every 1 ms.

The TS command reads the error buffer and clears the error buffer at the same time (same as for commands TE, TB). So when launching the TS command, it is important to process the TS feedback accordingly.

The error “No parameters” is only detected during the booting of the controller. When read, the error is cleared.

When there are no errors in the error buffer, the color of the LED will change from red to either green or orange depending on the controller state.

<b>Errors</b>	A	—	Unknown message code or floating point controller address.
	B	—	Controller address not correct.
<b>Rel. Commands</b>	None.		
<b>Example</b>	1TS		Get error and state of controller #1.



## VA — Set/Get Slow Rate

	Usage	Not Ref.	Config.	Disable	Ready	Motion
		–	○	□	□	–
<b>Syntax</b>	xxVAnn or xxVA?					
<b>Parameters</b>						
<b>Description</b>	xx [int]	—	Controller address.			
	nn [float]	—	Slew rate.			
<b>Range</b>	xx	—	1 to 31.			
	nn	—	$0.005 \leq nn \leq 6.5$ .			
<b>Units</b>	xx	—	None.			
	nn	—	V/ $\mu$ s.			
<b>Defaults</b>	xx	Missing:	Error B.			
		Out of range:	Error B.			
		Floating point:	Error A.			
	nn	Missing:	Error C.			
		Out of range:	Error C.			
<b>Description</b>	In the CONFIGURATION state, this command will set the slew rate for the output. In principle this is the same as velocity.					
<b>Returns</b>	If the sign “?” takes place of nn, this command will return the current programmed value.					
<b>Errors</b>	A	—	Unknown message code or floating point controller address.			
	B	—	Controller address not correct.			
	C	—	Parameter missing or out of range.			
	D	—	Execution not allowed.			
	H	—	Execution not allowed in NOT REFERENCED state.			
	L	—	Execution not allowed in HOMING state.			
	M	—	Execution not allowed in MOVING state.			
<b>Rel. Commands</b>	ZT	—	Get current mode parameters.			
<b>Example</b>	1VA0.005		Set the slew rate to 0.005 V/ $\mu$ s of controller #1.			
	1VA5e-3		See above			
	1VA?		Get slew rate of controller #1			
	1VA5.000000e-03					

## VE — Get Controller Revision Information

Usage	Not Ref.	Config.	Disable	Ready	Motion
	●	●	●	●	●
<b>Syntax</b>	xxVE				
<b>Parameters</b>					
<b>Description</b>	xx [int]	—	Controller address.		
<b>Range</b>	xx	—	1 to 31.		
<b>Units</b>	xx	—	None.		
<b>Defaults</b>	xx	Missing:	Error B.		
		Out of range:	Error B.		
		Floating point:	Error A.		
<b>Description</b>	This command returns the controller's revision information.				
<b>Returns</b>	Controller returns revision number.				
<b>Errors</b>	A	—	Unknown message code or floating point controller address.		
	B	—	Controller address not correct.		
<b>Rel. Commands</b>	None.				
<b>Example</b>	1VE		Get controller #1 revision information.		
	1VENPC1USB V1.001.239		Controller returns revision number.		

## ZT — Get All Axis Parameters

	Usage	Not Ref.	Config.	Disable	Ready	Motion
		●	●	●	●	●
<b>Syntax</b>	bbb.					
<b>Parameters</b>						
<b>Description</b>	xx [int]	—	Controller address.			
<b>Range</b>	xx	—	1.			
<b>Units</b>	xx	—	None.			
<b>Defaults</b>	xx	Missing:	Error B.			
		Out of range:	Error B.			
		Floating point:	Error A.			
<b>Description</b>	The ZT command returns the list of all current configuration parameters. The ZT command allows a quick review of all current stage parameter and simplifies the configuration of non-Newport stages(e.g. by using Hyper Terminal file transfer).					
<b>Returns</b>	All parameters.					
<b>Errors</b>	A	—	Unknown message code or floating point controller address.			
	B	—	Controller address not correct.			
<b>Rel. Commands</b>	None.					
<b>Example</b>	1ZT		Get controller #1 configuration data.			
	1IDNPC1USB					
	1SL0.000					
	1SR130.00					
	1VA5.000000e-03					

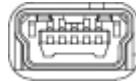
## 7.0 Pinouts

### 7.1 24 VDC IN and OUT (Female $\varnothing 2.1 \times \varnothing 5.5 \times 11$ mm)



Pin #	Description
Center	+24 VDC
Outer	Ground

### 7.2 USB Connector (USB Mini-B Receptacle)



Pin #	Description
1	+5 VDC IN, Do not connect if comm connector is used
2	Data -
3	Data +
4	N.C.
5	Ground

## 8.0 Electrical Specifications

Parameter	Specification	Remarks
Channels	1	
Output voltage	0...+130	[V]
Output current	10	[mA] continuous
Output connector	JST S4B-XH-A	Inside
Adapter cable	SUB-D15M	Outside
Interface	USB 2.0	
Resolution	16	Bit
Main supply	24 V $\pm$ 10%/0.2 A	[V]
Main supply connector	2.1 mm Barrel type	

## 9.0 Mechanical Specifications

Parameter	Specification	Remarks
Dimensions (L x W x H)	93 x 52.5 x 23 mm	

## 10.0 Environmental Conditions

Parameter	Specification	Remarks
<b>Storage/Transport</b>		
Humidity	5%–80%	In transport packing, non-condensing
Temperature	-40 °C–80 °C	In transport packing
Transport stress	DIN 30789	In transport packing
<b>Operation</b>		
Humidity	10%–70%	Non-condensing
Temperature	15 °C–40 °C	Operation parameters guaranteed







Visit Newport Online at:  
[www.newport.com](http://www.newport.com)

**North America & Asia**

Newport Corporation  
1791 Deere Ave.  
Irvine, CA 92606, USA

**Sales**

Tel.: (800) 222-6440  
e-mail: [sales@newport.com](mailto:sales@newport.com)

**Technical Support**

Tel.: (800) 222-6440  
e-mail: [tech@newport.com](mailto:tech@newport.com)

**Service, RMAs & Returns**

Tel.: (800) 222-6440  
e-mail: [service@newport.com](mailto:service@newport.com)

**Europe**

MICRO-CONTROLE Spectra-Physics S.A.S  
9, rue du Bois Sauvage  
91055 Évry CEDEX  
France

**Sales**

Tel.: +33 (0)1.60.91.68.68  
e-mail: [france@newport.com](mailto:france@newport.com)

**Technical Support**

e-mail: [tech\\_europe@newport.com](mailto:tech_europe@newport.com)

**Service & Returns**

Tel.: +33 (0)2.38.40.51.55

