

# Model TA-7600-Series Tapered Amplifier



User's Manual

 **New Focus™**  
A Newport Corporation Brand

## EU Declaration of Conformity

We declare that the accompanying product, identified with the **CE** mark, complies with requirements of the Electromagnetic Compatibility Directive, 2004/108/EC and the Low Voltage Directive 2006/95/EC.

**Model Numbers: TA-76XX Series**

**Year **CE** mark affixed: 2013**

**Type of Equipment:** Electrical equipment for measurement, control and laboratory use in industrial locations.

**Manufacturer:** Newport Corporation

1791 Deere Avenue  
Irvine, CA 92606

### **Standards Applied:**

Compliance was demonstrated to the following standards to the extent applicable:

BS EN61326-1: 2013 “Electrical equipment for measurement, control and laboratory use – EMC requirements” for use in a controlled electromagnetic environment.

This equipment meets the CISPR 11:2009+A1 Class A Group 1 radiated and conducted emission limits.

BS EN 61010-1:2010, “Safety requirements for electrical equipment for measurement, control and laboratory use”.



Mark Carroll  
Sr. Director, Instruments Business  
Newport Corporation  
1791 Deere Ave, Irvine, CA92606 USA

## Warranty

New Focus warrants that this product will be free from defects in material and workmanship and will comply with the New Focus 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 New Focus' 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 occurs 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. NEW FOCUS SHALL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM THE PURCHASE OR USE OF ITS PRODUCTS.

First printing 2014

© 2014 by New Focus, Santa Clara, CA. All rights reserved. No part of this manual may be reproduced or copied without the prior written approval of New Focus.

This manual has been provided for information only and product specifications are subject to change without notice. Any change will be reflected in future printings.

New Focus  
3635 Peterson Way  
Santa Clara, CA, 95054  
USA

Part No. 90065406 Rev A

## **Confidentiality & Proprietary Rights**

### **Reservation of Title**

The New Focus programs and all materials furnished or produced in connection with them ("Related Materials") contain trade secrets of New Focus and are for use only in the manner expressly permitted. New Focus claims and reserves all rights and benefits afforded under law in the Programs provided by New Focus.

New Focus shall retain full ownership of Intellectual Property Rights in and to all development, process, align or assembly technologies developed and other derivative work that may be developed by New Focus. Customer shall not challenge, or cause any third party to challenge the rights of New Focus.

### **Preservation of Secrecy and Confidentiality and Restrictions to Access**

Customer shall protect the New Focus Programs and Related Materials as trade secrets of New Focus, and shall devote its best efforts to ensure that all its personnel protect the New Focus Programs as trade secrets of New Focus. Customer shall not at any time disclose New Focus's trade secrets to any other person, firm, organization, or employee that does not need (consistent with Customer's right of use hereunder) to obtain access to the New Focus Programs and Related Materials. These restrictions shall not apply to information (1) generally known to the public or obtainable from public sources; (2) readily apparent from the keyboard operations, visual display, or output reports of the Programs; 3) previously in the possession of Customer or subsequently developed or acquired without reliance on the New Focus Programs; or (4) approved by New Focus for release without restriction.

### **Trademarks**

The New Focus logo and name are registered trademarks of Newport Corporation in Mexico, Israel, Singapore, European Union, Taiwan, Hong Kong, China, Japan, Korea, Canada, Australia, and the United States.

### **Service Information**

This section contains information regarding factory service for the source. The user should not attempt any maintenance or service of the system or optional equipment beyond the procedures outlined in this manual. Any problem that cannot be resolved should be referred to New Focus.

## Technical Support Contacts

### North America

#### **New Focus**

3635 Peterson Way, Santa Clara, CA 95054

Telephone: (866) 683-6287

Telephone: (408) 919-1500

### Asia

#### **Newport Opto-Electronics Technologies**

中国 上海市 爱都路 253号 第3号楼 3层 C部位  
, 邮编 200131

253 Aidu Road, Bld #3, Flr 3, Sec C, Shanghai  
200131, China

Telephone: +86-21-5046 2300

Fax: +86-21-5046 2323

### Europe

#### **Newport/MICRO-CONTROLE S.A.**

Zone Industrielle

45340 Beaune la Rolande, FRANCE

Telephone: (33) 02 38 40 51 56

### **Newport Corporation Calling Procedure**

If there are any defects in material or workmanship or a failure to meet specifications, promptly notify Newport's Returns Department by calling 1-800-222-6440 or by visiting our website at [www.newport.com/returns](http://www.newport.com/returns) within the warranty period to obtain a **Return Material Authorization Number (RMA#)**. Return the product to Newport Corporation, freight prepaid, clearly marked with the RMA# and we will either repair or replace it at our discretion. Newport is not responsible for damage occurring in transit and is not obligated to accept products returned without an RMA#.

E-mail: [rma.service@newport.com](mailto:rma.service@newport.com)

When calling Newport Corporation, please provide the customer care representative with the following information:

- Your Contact Information
- Serial number or original order number
- Description of problem (i.e., hardware or software)

To help our Technical Support Representatives diagnose your problem, please note the following conditions:

- Is the system used for manufacturing or research and development?
- What was the state of the system right before the problem?
- Have you seen this problem before? If so, how often?
- Can the system continue to operate with this problem? Or is the system non-operational?
- Can you identify anything that was different before this problem occurred?

## Table of Contents

i

EU Declaration of Conformity .....	ii
Warranty .....	iii
Technical Support Contacts .....	v
Table of Contents .....	vi
List of Figures .....	ix
List of Tables.....	ix

## **1 Safety Precautions 11**

1.1 Classification and Limitations .....	11
1.2 Precautions for the Safe Operation of Class 4 Lasers .....	11
1.3 Definitions and Symbols.....	12
1.3.1 General Warning or Caution .....	13
1.3.2 Electric Shock.....	13
1.3.3 European Union CE Mark.....	13
1.3.4 Alternating Voltage Symbol.....	13
1.3.5 On.....	14
1.3.6 Off.....	14
1.3.7 Fuses .....	14
1.3.8 USB.....	14
1.3.9 Frame or Chassis.....	15
1.3.10 Waste Electrical and Electronic Equipment (WEEE).....	15
1.3.11 Control of Hazardous Substances.....	15
1.3.12 Laser Radiation Warning Label.....	16
1.3.13 Avoid Direct Eye Exposure Label.....	16
1.3.14 Laser Aperture Label .....	16
1.3.15 Eyewear Required Label .....	17
1.4 Warnings and Cautions.....	17
1.4.1 General Warnings .....	17
1.4.2 General Cautions .....	18
1.4.3 Summary of Warnings and Cautions .....	18
1.5 Location of Labels and Warnings .....	22
1.5.1 TA-7600-LN Rear Panel.....	22
1.5.2 TA-76xx Head .....	23

## **2 General Information 25**

2.1 Theory of Tapered Amplifiers .....	25
2.2 Getting to Know Your Tapered Amplifier System.....	25
2.2.1 Key Product Features:.....	26
2.2.2 Instrument Features.....	26
2.3 Controller Input Power .....	27

2.4	Specifications .....	27
2.4.1	Tapered Amplifier .....	27
2.4.2	System Specifications.....	27
2.4.3	General Specifications.....	28
<b>3</b>	<b>Getting Started</b>	<b>29</b>
3.1	Unpacking and Handling.....	29
3.2	Inspection for Damage .....	29
3.3	Parts List.....	30
3.4	Choosing and Preparing a Suitable Work Surface .....	30
3.5	Optical Requirements.....	30
3.6	Electrical Requirements .....	31
3.7	Controller Power Supplies .....	31
3.8	Quick Start.....	32
3.8.1	Connecting the Amplifier Components.....	32
3.8.2	Grounding and Powering the Laser System .....	33
3.8.3	Seeding the Amplifier.....	33
3.8.4	Turning the Amplifier ON .....	34
3.8.5	Turning the Amplifier OFF.....	34
3.8.6	Software Installation.....	34
<b>4</b>	<b>System Operation</b>	<b>35</b>
4.1	Description of Tapered Amplifier System .....	35
4.1.1	Tapered Amplifier Head.....	35
4.1.2	Tapered Amplifier Controller .....	36
4.2	Using the Front Panel.....	37
4.2.1	Setting the Tapered Amplifier Gain Current .....	39
4.2.2	Tapered Amplifier Current Limit Protection .....	39
4.3	Menu Section.....	39
4.3.1	Control Knob .....	39
4.3.2	Display Elements .....	40
4.3.3	Title Screen.....	40
4.3.4	Instrument Firmware Version Screen.....	40
4.3.5	Amplifier Head Startup Information Screen.....	40
4.3.6	Main Screen .....	41
4.3.7	Information Screen .....	41
4.4	Rear Panel .....	42
4.4.1	USB Interface.....	43
4.4.2	RS-232 Serial Interface .....	43
4.4.3	Chassis Ground .....	43
4.4.4	AC Power Cord.....	43
4.4.5	Fuses.....	44
<b>5</b>	<b>Computer Interfacing</b>	<b>45</b>

5.1	Introduction.....	45
5.2	GUI Application.....	45
5.3	Computer Interface Terminology.....	45
5.3.1	<...> Delimiting Punctuation.....	45
5.3.2	<CR> Carriage Return.....	46
5.3.3	<LF> Line Feed.....	46
5.3.4	(;) Semicolons.....	46
5.3.5	Command Termination.....	46
5.3.6	Response Termination.....	46
5.4	Tapered Amplifier Operation Mode.....	46
5.5	USB Communication.....	46
5.6	RS-232 Communication.....	47
5.7	Commands Summary.....	47
5.7.1	Conventions.....	47
5.7.2	Types of Commands.....	48
5.7.3	Index of Commands.....	48
<b>6</b>	<b>Tips and Techniques</b> .....	<b>66</b>
6.1	Introduction.....	66
6.2	Grounding a Laser Head.....	66
<b>7</b>	<b>Maintenance and Service</b> .....	<b>68</b>
7.1	Enclosure Cleaning.....	68
7.2	Technical Support.....	68
7.3	Obtaining Service.....	69
7.4	Warranty.....	69
7.5	Service Form.....	70
<b>8</b>	<b>Appendix A – Error Messages</b> .....	<b>72</b>
8.1	Introduction.....	72
8.2	Error Description.....	72



## List of Figures

Figure 1	General Warning or Caution Symbol. ....	13
Figure 2	Electrical Shock Symbol. ....	13
Figure 3	CE Mark. ....	13
Figure 4	Alternating Voltage Symbol. ....	13
Figure 5	‘On’ Symbol. ....	14
Figure 6	‘Off’ Symbol. ....	14
Figure 7	Fuse Symbol. ....	14
Figure 8	USB Symbol. ....	14
Figure 9	Frame or Chassis Terminal Symbol. ....	15
Figure 10	WEEE Directive Symbol. ....	15
Figure 11	RoHS Compliant Symbol. ....	15
Figure 12	Laser Radiation Warning Label. ....	16
Figure 13	Avoid direct eye exposure label. ....	16
Figure 14	Laser Aperture Label. ....	16
Figure 15	Eyewear Required Label. ....	17
Figure 16	Rear Panel Labels and Warnings. ....	22
Figure 17	TA-7600 Amplifier Head labels and warnings. ....	23
Figure 18	Tapered Amplifier Block Diagram. ....	36
Figure 19	Front Panel Layout. ....	38
Figure 20	A sample title screen. ....	40
Figure 21	A sample Firmware Instrument Version Screen. ....	40
Figure 22	A sample Amplifier Head Information screen. ....	41
Figure 23	A sample Main Screen. ....	41
Figure 24	A sample Information Screen. ....	42
Figure 25	Rear panel. (Label IEC 320 as it’s referred to in text.) ....	42


## List of Tables

*This page is intentionally left blank.*

# 1 Safety Precautions


## 1.1 Classification and Limitations


---

	<p style="text-align: center;"><b>DANGER</b></p> <p>The TA-7600 Tapered Amplifier is a Class 4 laser system. Its output beam is, by definition, a safety and fire hazard. Take precautions to prevent exposure to direct and reflected beams. Diffuse as well as specular reflections can cause severe skin or eye damage.</p>
---	--

## 1.2 Precautions for the Safe Operation of Class 4 Lasers

---

	<p style="text-align: center;"><b>DANGER</b></p> <p>The infrared radiation that the TA-7600 emits is extremely dangerous to the eye. Infrared radiation passes easily through the cornea, which focuses it on the retina where it can cause instantaneous permanent damage.</p>
---	---

<p><b>Eyewear Required</b></p>		<p style="text-align: center;"><b>WARNING</b></p> <p>Wear protective eyewear at all times. Selection depends on the wavelength and intensity of the radiation, the conditions of use and the visual function required. Protective eyewear vendors are listed in the Laser Focus World, Lasers and Optronics, and Photonics Spectra buyer's guides.</p>
------------------------------------	---	--

- Wear protective eyewear at all times. Selection depends on the wavelength and intensity of the radiation, the conditions of use and the visual function required. Protective eyewear vendors are listed in

the *Laser Focus World*, *Lasers and Optronics*, and *Photonics Spectra* buyer's guides. Consult the ANSI or ACGIH standards listed at the end of this section for guidance.

- Maintain a high ambient light level in the laser operation area. This keeps the eye's pupil constricted, thus reducing the possibility of eye damage.
- Avoid looking at the output beam; even diffuse reflections are hazardous.
- Avoid wearing jewelry or other objects that may reflect or scatter the beam while using the laser.
- Use an infrared detector or energy detector (IR viewer) to verify that the laser beam is off before working in front of the laser.
- Operate the laser at the lowest beam intensity possible, given the requirements of the application.
- Expand the beam whenever possible to reduce beam power density.
- Avoid blocking the output beam or its reflection with any part of your body.
- Establish a controlled access area for laser operation. Limit access to those trained in the principles of laser safety.
- Post prominent warning signs near the laser operation area
- Set up the laser so the beam is either above or below eye level
- Provide enclosures for beam paths whenever possible.
- Set up shields to prevent specular reflections.
- Set up an energy absorbing target to capture the laser beam, preventing unnecessary reflections or scattering.

### **1.3 Definitions and Symbols**

---

The following terms and symbols are used in this documentation for the Model TA-7600-LN and on the attached TA-76xx Tapered Amplifier Head where safety-related issues occur.

### 1.3.1 General Warning or Caution



Figure 1 *General Warning or Caution Symbol.*

The Exclamation Symbol in the figure above appears on the product and in Warning and Caution tables throughout this document. This symbol designates that documentation needs to be consulted to determine the nature of a potential hazard, and any actions that have to be taken.

### 1.3.2 Electric Shock



Figure 2 *Electrical Shock Symbol.*

The Electrical Shock Symbol in the figure above appears throughout this manual. This symbol indicates a hazard arising from dangerous voltage. Any mishandling could result in irreparable damage to the equipment, and personal injury or death.

### 1.3.3 European Union CE Mark



Figure 3 *CE Mark.*

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

### 1.3.4 Alternating Voltage Symbol



Figure 4 *Alternating Voltage Symbol.*

This international symbol implies an alternating voltage or current.

**1.3.5 On**

Figure 5 'On' Symbol.

The symbol in the figure above represents a power switch position on the Model TA-7600-LN Tapered Amplifier Controller. This symbol represents a Power On condition.

**1.3.6 Off**

Figure 6 'Off' Symbol.

The symbol in the figure above represents a power switch position on the Model TA-7600-LN Tapered Amplifier Controller. This symbol represents a Power Off condition.

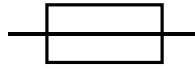
**1.3.7 Fuses**

Figure 7 Fuse Symbol.

The symbol in the figure above identifies the fuse location on the Model TA-7600-LN Tapered Amplifier Controller.

**1.3.8 USB**

Figure 8 USB Symbol.

The symbol in the figure above identifies the USB connector location on the Model TA-7600-LN Tapered Amplifier Controller.

### 1.3.9 Frame or Chassis

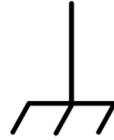


Figure 9 *Frame or Chassis Terminal Symbol.*

The symbol in the figure above appears on the Model TA-7600-LN Tapered Amplifier Controller. This symbol identifies the frame or chassis terminal

### 1.3.10 Waste Electrical and Electronic Equipment (WEEE)



Figure 10 *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 New Focus representative.

### 1.3.11 Control of Hazardous Substances

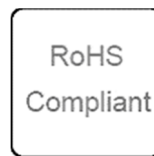


Figure 11 *RoHS Compliant Symbol*

This label indicates the products comply with the EU Directive 2002/95/EC that restricts the content of six hazardous chemicals.

### 1.3.12 Laser Radiation Warning Label



Figure 12 *Laser Radiation Warning Label.*

This label indicates the presence of visible and invisible laser radiation as well as the wavelength range and maximum output power.

### 1.3.13 Avoid Direct Eye Exposure Label



Figure 13 *Avoid direct eye exposure label.*

This label indicates the presence of laser radiation. Users are advised to avoid direct eye exposure.

### 1.3.14 Laser Aperture Label



Figure 14 *Laser Aperture Label.*

This label indicates the location of the laser aperture.



### 1.3.15 Eyewear Required Label

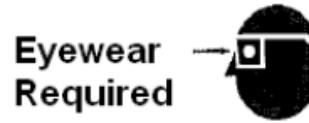



Figure 15 *Eyewear Required Label.*


This symbol indicates that the product users need to use appropriate protective eyewear at all times.

## 1.4 Warnings and Cautions

---

The following are definitions of the Warnings, Cautions and Notes that are used throughout this manual to call your attention to important information regarding your safety, the safety and preservation of your equipment or an important tip.

	<b>WARNING</b> Situation has the potential to cause bodily harm or death.
---	--

	<b>CAUTION</b> Situation has the potential to cause damage to property or equipment.
---	---

---

### NOTE

Additional information the user or operator should consider.

---

#### 1.4.1 General Warnings

Observe these general warnings when operating or servicing this equipment:

- Heed all warnings on the unit and in the operating instructions.
- Do not use this equipment in or near water.
- This equipment is grounded through the grounding conductor of the power cord.

- Route power cords and other cables so that they are not likely to be damaged.
- Disconnect power before cleaning the equipment. Do not use liquid or aerosol cleaners; use only a damp lint-free cloth.
- Lockout all electrical power sources before servicing the equipment.
- To avoid fire hazard, use only the specified fuse(s) with the correct type number, voltage, and current ratings as referenced in the appropriate locations in the service instructions or on the equipment. Only qualified service personnel should replace fuses.
- To avoid explosion, do not operate this equipment in an explosive atmosphere.
- Qualified service personnel should perform safety checks after any service.

#### **1.4.2 General Cautions**

Observe these cautions when operating this equipment:

- If this equipment is used in a manner not specified in this manual, the protection provided by this equipment may be impaired.
- To prevent damage to equipment when replacing fuses, locate and correct the problem that caused the fuse to blow before re-applying power.
- Do not block ventilation openings.
- Do not position this product in such a manner that would make it difficult to disconnect the power cord.
- Position the equipment so that access to the mains disconnect On/Off switch is readily available.
- Use only the specified replacement parts.
- Follow precautions for static sensitive devices when handling this equipment.
- This product should only be powered as described in the manual.
- There are no user-serviceable parts inside the Model TA-7600-LN Tapered Amplifier.
- Adhere to good laser safety practices when using this equipment.

#### **1.4.3 Summary of Warnings and Cautions**

The following general warning and cautions are applicable to this instrument:

**WARNING**

Before operating the Model TA-7600-LN Tapered Amplifier Controller, please read and understand all of Section 1.

**WARNING**

Do not attempt to operate this equipment if there is evidence of shipping damage or you suspect the unit is damaged. Damaged equipment may present additional hazards to you. Contact New Focus technical support for advice before attempting to plug in and operate damaged equipment.

**WARNING**

To avoid electric shock, connect the instrument to properly earth-grounded, 3-prong receptacles only. Failure to observe this precaution can result in severe injury.

**WARNING**

Before cleaning the enclosure of the Model TA-7600-LN Tapered Amplifier Controller, or the enclosure of any attached Tapered Amplifier Head, the AC power cord must be disconnected from the wall socket.

**CAUTION**

There are no user serviceable parts inside the Model TA-7600-LN and the associated Tapered Amplifier Head. Work performed by persons not authorized by New Focus will void the warranty. For instructions on obtaining warranty repair or service, please refer to Section 7.

**WARNING**

If this equipment is used in a manner not specified in this manual, the protection provided by this equipment may be impaired.



### WARNING

While the Model TA-7600-LN Tapered Amplifier Controller's front panel key switch turns power OFF to the internal electronics, it should not be depended upon to fully disconnect the unit from MAINS power. Disconnect the power cord to fully isolate the Model TA-7600-LN from MAINS power. Do not position the TA-7600-LN Tapered Amplifier Controller so that it is difficult to disconnect the power cord.



### WARNING

Do not power up the Model TA-7600-LN without a Tapered Amplifier Head connected.



### WARNING

Do not attempt to power up the Tapered Amplifier if the cable between the Tapered Amplifier Controller and the Tapered Amplifier Head is damaged.



### WARNING

Use only New Focus Part Number 90035117 cable, or New Focus approved alternative, to connect the TA-7600-LN Tapered Amplifier Controller to a TA-76xx series Tapered Amplifier Head.



### WARNING

Do not disconnect the cable between the Model TA-7600-LN Tapered Amplifier Controller and the attached amplifier head while the Model TA-7600-LN Tapered Amplifier Controller is powered up.



### WARNING

Secure the connector screw locks at both ends of the cable between the Model TA-7600-LN and the attached amplifier head.



The Model TA-76xx Tapered Amplifier System is intended for use in an industrial/laboratory environment. Use of this product in other environments, such as residential, may result in electromagnetic compatibility difficulties due to conducted as well as radiated disturbances.



The TA-76xx System is designed to operate in a controlled electromagnetic environment; i.e., where R.F. transmitters, such as mobile telephones, may not be used in close proximity.



### WARNING

Use of controls or adjustments or performance procedures other than those specified herein may result in hazardous radiation exposure.



### WARNING

The Model TA-7600-LN Tapered Amplifier Controller is intended for use **ONLY** with New Focus specified amplifier head modules. **DO NOT ATTEMPT TO USE THE TAPERED AMPLIFIER CONTROLLER WITH UNAPPROVED OTHER DEVICES.**



### WARNING

The TA-76xx series amplifier heads are intended for use **ONLY** with a New Focus TA-7600-LN Tapered Amplifier Controller. **DO NOT ATTEMPT TO USE THE LASER HEAD WITH UNAPPROVED OTHER DEVICES.**

## 1.5 Location of Labels and Warnings

### 1.5.1 TA-7600-LN Rear Panel

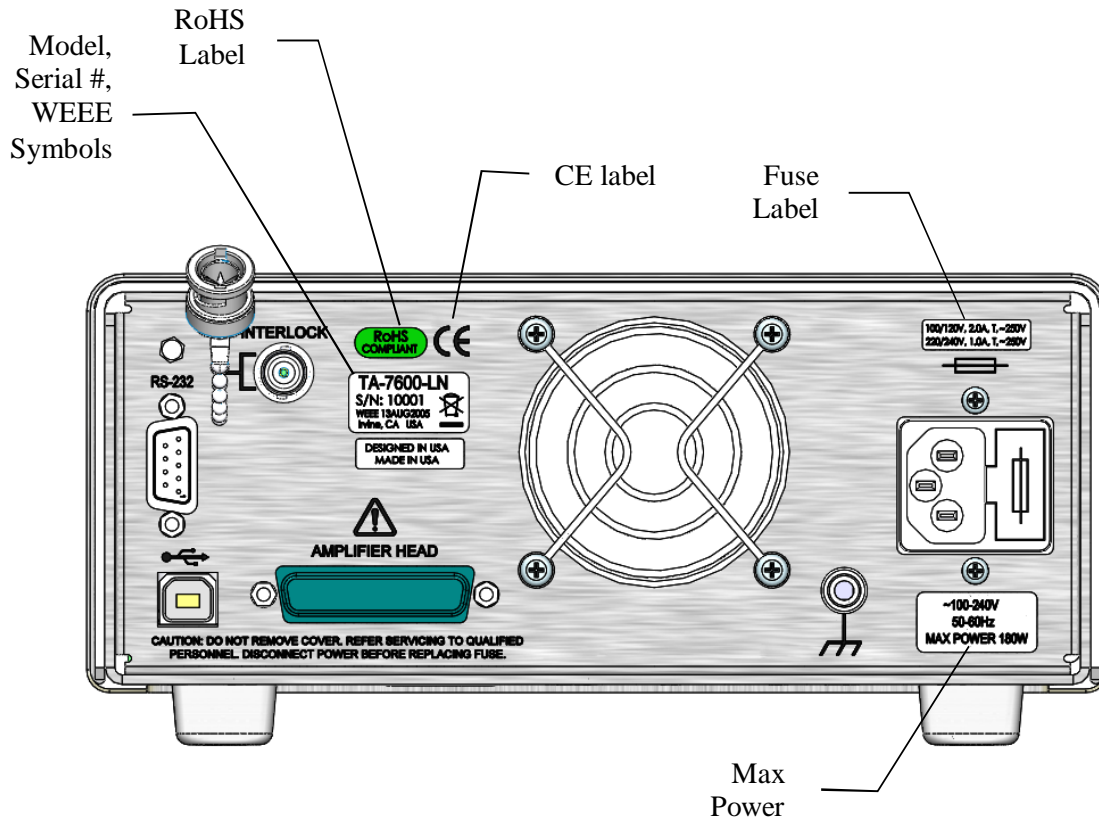


Figure 16 Rear Panel Labels and Warnings.

### 1.5.2 TA-76xx Head

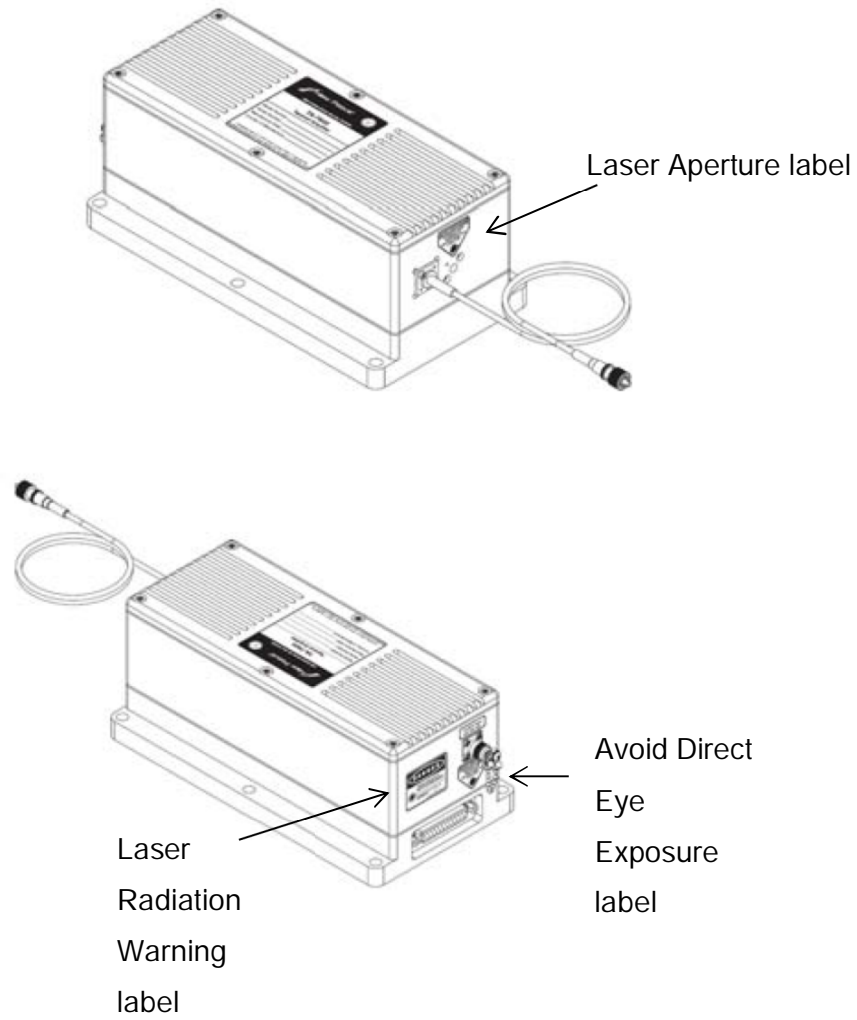


Figure 17 TA-7600 Amplifier Head labels and warnings.





## 2 General Information

### 2.1 Theory of Tapered Amplifiers

---

Semiconductor diodes can be used to optically amplify the output of an external cavity diode laser (ECDL) converting milliwatts of input power into watts of output power. One such diode is the GaAs tapered amplifier diode. In a GaAs tapered amplifier diode, a tapered gain region of GaAs is electrically pumped inverting the carrier population in this region. The output of an ECDL, at a power  $P_{\text{seed}}$ , can then be focused into the tapered portion of the GaAs tapered amplifier chip by way of a focusing lens. As the beam propagates through the gain region it will experience amplification due to stimulated emission from electron-hole recombination. Anti-reflection coatings on both the input and output facets of the tapered amplifier chip prevent self-lasing and allow for the amplified beam to exit at the wide end of the taper with a power  $P_{\text{out}}$ .

Sufficient seed power from the seeding ECDL is necessary to surpass the lasing threshold of the tapered amplifier chip. In addition, for optimal amplification the seed wavelength must match as closely as possible the center wavelength of the gain band of the tapered amplifier diode and the seed beam polarization must be in accord with the polarization condition of the tapered amplifier diode. When these conditions are met the seed beam can be optically amplified to yield nearly diffraction-limited beam quality while preserving important spectral and spatial seed beam characteristics (single longitudinal mode, narrow linewidth, etc.).

### 2.2 Getting to Know Your Tapered Amplifier System

---



#### CAUTION

**There are no user serviceable parts inside the Model TA-7600-LN and the associated Tapered Amplifier Head. Work performed by persons not authorized by New Focus will void the warranty. For instructions on obtaining warranty repair or service, please refer to Section 7.**

## 2.2.1 Key Product Features:

### Flexible configurations

- Standards models available at 767nm, 780nm, 795nm, 852nm, 915nm
- Use your own seed laser or a New Focus ECDL for a complete MOPA system
- Custom wavelengths and powers available

### Protections

- Laser current limit and fault protection
- Active seed power monitoring helps prevent self lasing that can damage the tapered amplifier chip
- Active temperature control closed-loop
- Ability to turn off the output current if a fault is detected with the TEC
- Over-temperature protection

### TA-7600-LN Controller

- Improved data presentation and system control via large display
- Ergonomic adjustment knob
- Integral LED pushbuttons
- Autoranging power supply that can operate on 100 - 240 volt AC power

### Plug & play

- Pre-aligned FC/APC fiber input
- USB and RS232 remote interface
- Amplifier head recognition
- Intuitive graphical user interface provided

## 2.2.2 Instrument Features

### Intuitive Controls and VFD Display

Improved data presentation and system control are achieved using a large wide viewing angle 2 row by 20 character vacuum florescent display (VFD), ergonomic adjustment knob, and thoughtfully arranged pushbuttons, some with integral LEDs.

## 2.3 Controller Input Power

The Model TA-7600-LN Controller has an autoranging power supply that can operate on 100 - 240 volt AC power.

## 2.4 Specifications

### 2.4.1 Tapered Amplifier

Model Number	Wavelength Coverage Range, nm	Maximum Power, mW
TA-76XX	350-755	1 W at maximum; free space output
TA-7612	755-775	1W at 765 nm; free space output
TA-7612-P	755-775	0.5 W at 765 nm; fiber coupled output
TA-7613	775-785	1W at 780 nm; free space output
TA-7613-P	775-785	0.5 W at 780 nm; fiber coupled output
TA-7613-H	779-790	2 W at 780 nm; free space output
TA-7614-P	787-805	0.5 W at 795 nm; fiber coupled output
TA-7614-H	787-805	1.8 W at 795 nm; free space output
TA-7616	825-855	1 W at 850 nm; free space output
TA-7616-P	825-855	0.5 W at 850 nm; fiber coupled output
TA-7618	910-920	1 W at 915 nm; free space output
TA-76XX-X	920-5000	5 W at maximum; free space output

Typical Beam Divergence	< 2.5 mrad
Maximum Beam Spot Size (at 60 cm from laser aperture)	2x4 mm

### 2.4.2 System Specifications

AMPLIFIER CHIP CONTROLLER	
<b>Current Control (Constant Current Mode)</b>	
Control Range	0 to 5 A
Compliance Voltage	1 to 5V
Laser Driver Output Power	max 25W
Resolution	100 uA
Resolution-Display	1 mA

<b>TEC Driver</b>	
Output Current	0 to 4.3A
Compliance Voltage	0 to 4.5V
TEC Driver Output Power	max 19.35W

### 2.4.3 General Specifications

Environmental Specifications	
Voltage Requirements	100-240 VAC, 50-60Hz
Power Requirements	MAX POWER = 105 Watts
Chassis Ground	4 mm banana jack
Size (H x W x D) [in. (mm)]	3.48 (88.4) x 14.0 (355.6) x 16.51 (419.4)
Mainframe Weight [lb (kg)]	17.9 (8.1)
Operating Temperature	10°C to 40°C (<90% humidity non-condensing)
Storage Temperature	0°C to + 50°C (<90% humidity non-condensing)
Relative Humidity, Storage	<90% humidity non-condensing
Altitude	<2000 meters (6550 feet)
Installation Category	I
Pollution Degree	2
Use Location	Indoor use only

The Model TA-7600-LN Tapered Amplifier Controller and Tapered Amplifier Head were designed to operate in a controlled electromagnetic environment. While they will not be damaged by operation in an industrial electromagnetic environment, as defined in EN61326-1:2013, such operation may not yield optimal performance. For this reason, New Focus does not recommend operation of these devices in close proximity to mobile telephones, hand-held radio transmitters, and similar devices.

# 3 Getting Started

## 3.1 Unpacking and Handling

---

It is recommended that the Model TA-7600-LN Tapered Amplifier Controller and the Tapered Amplifier Head be unpacked in a lab environment or work site. Unpack the system carefully; small parts are included with the instrument. Inspect the box carefully for loose parts. Save the packaging material in case you need to ship your equipment in the future.

## 3.2 Inspection for Damage

---

The Model TA-7600-LN Tapered Amplifier Controller and the associated amplifier head are carefully packaged at the factory to minimize the possibility of damage during shipping. Inspect the box for external signs of damage or improper handling. Inspect the contents for damage. If there is visible damage to the instrument upon receipt, inform the shipping company and New Focus immediately. Carefully open the box and save the shipping material for later use.



### WARNING

**Do not attempt to operate this equipment if there is evidence of shipping damage or you suspect the unit is damaged. Damaged equipment may present additional hazards to you. Contact New Focus technical support for advice before attempting to plug in and operate damaged equipment.**



### CAUTION

**The user is advised to save the packaging material in case the unit has to be shipped to a different location. The packaging material is specially designed to protect the unit during shipping.**

### **3.3 Parts List**

---

The following is a list of parts included with the Model TA-7600 System

1. TA-7600-LN Tapered Amplifier Controller and its accessory items.
2. 90035117 Cable
3. TA-76xx Tapered Amplifier Head

The following is a list of parts included with the Model TA-7600-LN Tapered Amplifier Controller:

1. USB Flash drive with Software Drivers and Utilities, User's Manual, Start-Up Guide.
2. IEC320 AC line cord with a NEMA 5-15P
3. USB Cable for connecting the Tapered Amplifier to a computer.

If you are missing any parts or have questions about the parts you have received, please contact New Focus.

### **3.4 Choosing and Preparing a Suitable Work Surface**

---

The Model TA-7600-LN and the Tapered Amplifier Head may be placed on any reasonably firm table or bench during operation.

### **3.5 Optical Requirements**

---

Three seed laser requirements must be met for amplification: laser wavelength, power, and FC/APC PM single mode fiber coupled input. The seed laser must be at or near the specified center wavelength of the TA to achieve specified amplification output power. The seed laser must be  $\geq 10$  mW. The TA-7600 system has a safety feature that limits the TA current if the input power is lower than 10 mW. This is to protect the tapered amplifier chip and to ensure system performance. While not recommended, the minimum input power can be reset by the user via computer interface. Contact New Focus for further information. The seed must be fiber coupled with an FC/APC PM single mode fiber. Contact New Focus or your local representative should you need further information on seeding requirements.

### 3.6 Electrical Requirements

---

Before attempting to power up the unit for the first time, the following precautions must be followed:



#### WARNING

To avoid electric shock, connect the instrument to properly earth-grounded, 3-prong receptacles only. Failure to observe this precaution can result in severe injury.



#### WARNING

The TA-7600-LN Tapered Amplifier Controller is supplied with a detachable power cord. Do not replace this cord with an inadequately rated cord.

- Have a qualified electrician verify the wall socket that will be used is properly polarized and properly grounded.
- Provide adequate distance between the Models TA-7600-LN, and the amplifier head, and adjacent walls for ventilation purposes. Do not let any other equipment blow hot air towards the devices. Verify that correct rated fuses are installed according to the fuse marking on the rear panel. The unit has temperature sensors. If the unit overheats it will generate an error message and stop operation to protect itself until the user takes the necessary steps to lower the temperature.

### 3.7 Controller Power Supplies

---

AC power is supplied through the rear panel power entry module connector that provides in-line transient protection and RF filtering. The power entry module also contains the instrument's fuses.

The fuses are accessed by opening the power entry module using a flat-bladed screwdriver. The AC line cord must first be removed before the power entry module can be opened. Verify that the correct value fuses are installed in the power entry module.



#### WARNING

To avoid electric shock, connect the instrument to properly earth-grounded receptacles only. Failure to observe these precautions can result in fire, severe injury or death.

**WARNING**

To avoid electric shock, the appropriate fuses for the AC input power voltage must be installed in the instrument. Only qualified service personnel should replace fuses. Failure to observe these precautions can result in fire, severe injury or death.

## 3.8 Quick Start

---

This section outlines the basic steps needed to start using your Tapered Amplifier, including a brief setup and getting started guide. It assumes that you have read the earlier sections regarding safety and AC input power setting. For more detailed information on how to operate the instrument, refer to Chapter 4 System Operation.

**WARNING**

The safety of any system incorporating the equipment is the responsibility of the assembler of the system.

### 3.8.1 Connecting the Amplifier Components

**Mount the amplifier head:** The amplifier head is shipped with a mounting bracket already attached. This bracket also serves as a heatsink to avoid overheating the amplifier head. Mount the amplifier head/bracket in a stable position with the output aperture pointing towards an appropriate beam block. Output-beam height is two inches for the free-space models.

**Position the controller:** Position the controller within a cable length of the amplifier head (about five feet). The controller keyswitch should be off (fully counter-clockwise). Be careful position the controller in such a way that it will be easy to access the on/off switch on the rear of the device as well as the key switch on the front. Also position the controller in such a way that it is easy to remove the head plug cable.

Connect the Model TA-7600-LN Tapered Amplifier Controller to the Tapered Amplifier Head using the NPI101209 cable. Secure the screw locks on the connectors at both ends of the cable.



**WARNING**

Use only New Focus Model Number NPI101209 cable, or New Focus approved alternative, to connect the TA-7600-LN Tapered Amplifier Controller to a TA-76xx Series Amplifier Head.

**WARNING**

Do not disconnect the cable between the Model TA-7600-LN Tapered Amplifier Controller and the Amplifier Head while the Model TA-7600-LN Tapered Amplifier Controller is powered up.

**WARNING**

Secure the connector screwlocks at both ends of the cable between the Model TA-7600-LN and the Tapered Amplifier Head.

### 3.8.2 Grounding and Powering the Laser System

Verify that the proper fuses are installed. See Section 3.7, above, for details. Connect the binding post on the rear of the chassis to earth ground. While the protective ground wire within the MAINS power cord will provide adequate safety protection, when connected to a properly earth-grounded receptacle, the system noise performance may be improved if this additional connection is made to the rear of the chassis.

**WARNING**

To avoid electric shock, connect the instrument to properly earth-grounded receptacles only. Failure to observe these precautions can result in fire, severe injury or death.

**WARNING**

To avoid electric shock, the appropriate fuses for the AC input power voltage must be installed in the instrument. Only qualified service personnel should replace fuses. Failure to observe these precautions can result in fire, severe injury or death.

### 3.8.3 Seeding the Amplifier

Ensure that the optical seeding requirements are met (refer to Section 3.5). Connect the seed laser to the amplifier via the FC/APC connector on the input side of the amplifier. Make sure that the seed laser polarization is

aligned with the slow axis of the fiber (in line with the key of the FC/APC connector.) A green INPUT POWER LED on the controller front panel indicates adequate input seed power. If the INPUT POWER LED is red, seeding power is too low and the amplifier current will not turn on.

No further alignment of the seed laser is necessary.

### **3.8.4 Turning the Amplifier ON**

Turn lockout keyswitch to “I” position to power on the unit.

Press CURRENT ON/OFF button. The LED in the button will flash for at least 3 seconds and then stay ON. The actual amplifier diode current will quickly ramp up to the specified setpoint.

Turn the knob control to set the desired Current set point. If Constant Power mode is desired, allow the system time to stabilize (on the order of minutes), then press the Power Lock button. The power level can be adjusted in Constant Power mode by turning the knob. Allow the system time (on the order of minutes) to stabilize after changing the Current set point or Power set point in either mode. Note that Constant Power mode operation is limited to 1-99% of the total tapered amplifier current range.

### **3.8.5 Turning the Amplifier OFF**

To minimize the risk of power surges damaging the amplifier diode and to preserve the lifetime of the diode, push the CURRENT ON/OFF button to turn OFF the amplifier when it is not in use (the LED on the button will turn off) and before shutting down the system. Turn the front panel keyswitch to “O” position to shut down the entire system.

### **3.8.6 Software Installation**

For instructions on how to install the software provided with the Tapered Amplifier, please refer to TLB-7600 ReadMe.pdf file. You need to have a PDF reader to view its contents.

# 4 System Operation

## 4.1 Description of Tapered Amplifier System

---

### 4.1.1 Tapered Amplifier Head

The New Focus TA-7600 is designed to amplify coherent laser radiation in the near infrared spectrum. Fiber-coupled seed radiation is amplified by up to 20 dB (100 times) while substantially retaining the spectral and noise characteristics of the seed. The TA-76xx can provide up to 2 W, of coherent radiation in the region of 755 – 920 nm.

A key feature of the TA-7600 tapered amplifier head is the FC/APC optical input fiber connection which is standard with all New Focus tapered amplifiers. This allows the seed laser to be coupled into an internal fiber that has been carefully prealigned to the tapered amplifier diode. This prealigned internal fiber ensures reliable and trouble-free user alignment. The amplified laser output can be fiber coupled or free space. A 35 dB isolator at the output comes standard with every amplifier.

Thermal isolation of the laser head is achieved by enclosing the tapered amplifier diode block with thermally insulating foam. In addition, the base of the tapered amplifier housing acts as a heat sink. An on-board temperature sensor is used to monitor the diode temperature and provides the input to the temperature control closed-loop. A Peltier type thermoelectric cooler (TEC) is used maintain a constant tapered amplifier temperature.

There are two photodiodes in the tapered amplifier head that monitors input seed power and output amplified power. Beamsplitters are used to pick off a small percentage of the input and output beams and direct them to the photodiodes. The measured current of these photodiodes are calibrated at the factory. The purpose of the input photodiode is to ensure sufficient seed power and is a safety feature of the TA-7600 system. If the seed power is less than 10 mW, the user will not be able to turn on the tapered amplifier current, preventing damage as well as self-lasing of the amplifier. The output photodiode provides feedback for Constant Power mode.

### 4.1.2 Tapered Amplifier Controller

The tapered amplifier is controlled using the TA-7600-LN Tapered Amplifier Controller. To ensure best performance, each tapered amplifier head is calibrated with its corresponding controller. The control unit works in both manual and remotely programmed modes and is compatible with USB and RS232 interfaces. The TA-7600-LN's front panel multi-line display shows important operating parameters including amplifier current and input and output power.

The job of the Tapered Amplifier Controller is to provide a stable, low-noise power source for the diode amplifier, set the temperature in the amplifier head, and provide readouts of all relevant amplifier parameters. Conceptually, the circuitry inside the Tapered Amplifier Controller is built in two layers: analog and digital. The analog layer incorporates low-noise design for temperature and current control. The digital layer includes all the readouts and circuits to set various operating point parameters. This layer acts as an interface between the user (or the user's computer) and the analog layer.

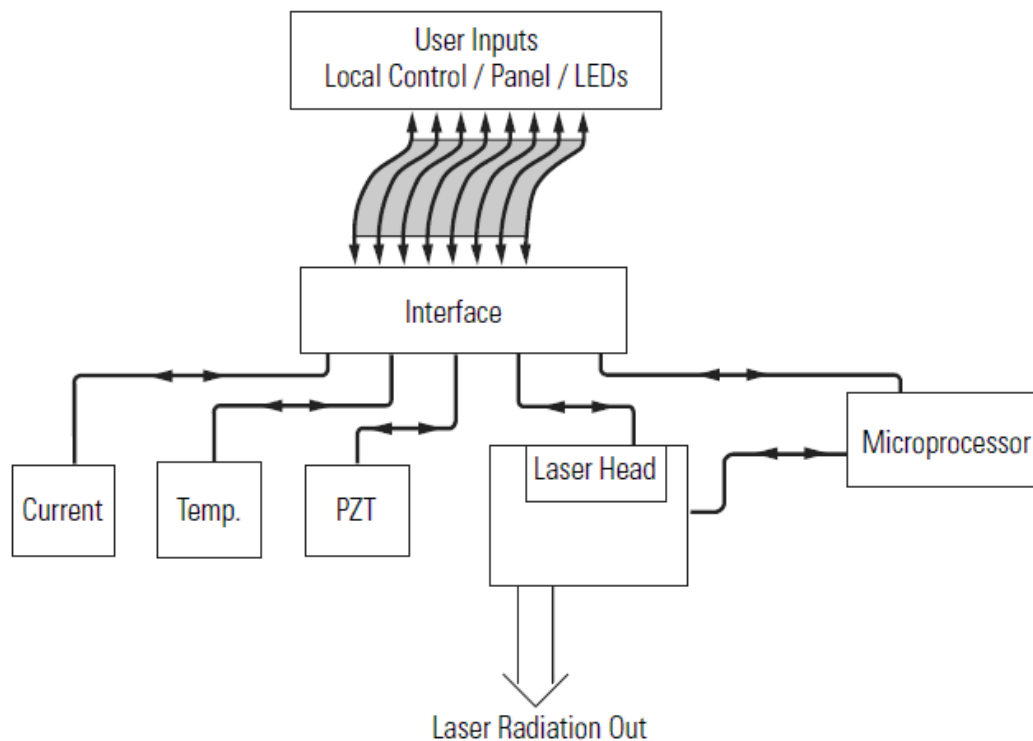


Figure 18 *Tapered Amplifier Block Diagram.*

The analog layer consists of four modules: current control, temperature control, and piezoelectric transducer (PZT) driver (which controls wavelength fine-tuning)

The digital layer includes a Digital Signal Processor (DSP) and user interface circuitry. There is a digital circuit in the amplifier head that contains information specific to each head, such as the optimal temperature, current settings, and the laser head serial number.

The current driver is a low-noise, analog, DC-current supply which provides up to several A of current to the amplifier diode. The AC ripple in the output is sub  $\mu$ A RMS.

The temperature driver controls the amplifier head's internal temperature by supplying current to thermoelectric (Peltier) elements in the amplifier head. A DSP is used to perform PID feedback control for each element. In this way, the tapered amplifier gain element temperature and the surrounding environment are stabilized to within plus or minus 10 millikelvin.

The DSP based digital board controls all of the other modules, runs the digital displays, and provides USB interfacing capability. It also communicates with the circuit board in the amplifier head to determine what kind of amplifier head it is.



### **WARNING**

**Before powering up or operating the Model TA-7600-LN Tapered Amplifier Controller, please read and understand all of Section 1.**

## **4.2 Using the Front Panel**

---

The front panel of the Model TA-7600-LN Tapered Amplifier Controller is designed for easy operation. It has various distinct areas, each with a specific set of related functions, and control knobs, as shown in Figure 19 below.



Figure 19 *Front Panel Layout*

Make sure the Tapered Amplifier Controller is plugged into a 3-pronged receptacle and your amplifier head cable is plugged into the both the back of the Tapered Amplifier Controller and the Tapered Amplifier Head. Connect the output of the Tapered Amplifier Head to a safely-terminated fiber-optic cable.

Turn on the AC power using the front panel keyswitch. On startup, the amplifier-head serial numbers, optimum diode parameter settings and other pertinent operating information stored in an EEPROM in the amplifier head are uploaded to the Tapered Amplifier Controller. The alphanumeric display will show the model number, and the Tapered Amplifier Controller software revision number. After a few seconds, the display will become active.

About 30 minutes of warm-up time is recommended for best performance. Allow further warm-up time (on the order of minutes) after setting or changing the current or power.

The keyswitch is the “ON/OFF” switch for the whole system including both the controller and the amplifier head. The CURRENT ON/OFF button controls the laser output from the amplifier head. When you push the CURRENT ON/OFF button, it flashes for a 6-second safety delay (default value) and then lights up to indicate that current is flowing through the diode in the amplifier head unit. This allows you to set up all the desired operating parameters with the AC Power on, but while the amplifier head is not generating light.

### 4.2.1 Setting the Tapered Amplifier Gain Current

To set the desired Current level turn the knob control below the display screen. The system is set so that the maximum drive current is below the damage threshold and self-lasing threshold. It is not possible for the end-user to increase the drive current beyond the factory set limit. Following initial 30 minute warm-up, allow additional warm-up time (order of minutes) for the system to stabilize after changing the Current or Power set point.

### 4.2.2 Tapered Amplifier Current Limit Protection

One of the parameters stored in the amplifier head's internal memory is the Tapered Amplifier Maximum Current Limit.

Normal operation occurs only when the tapered amplifier current set point does not exceed the maximum limit. To protect the tapered amplifier from being inadvertently driven over the limit, TA-7600-LN employs two over-the-limit conditions: SOFT LIMIT and HARD LIMIT.

If the current limit is exceeded by more than 2 mA, the system enters the SOFT LIMIT condition, in which the set point is limited as set by the limit level. When the user decreases the laser current level below the limit the system returns to normal operation.

If the current limit is exceeded by more than 7 mA, the system enters the HARD LIMIT condition, in which the unit will shut the laser immediately and display an error message. This protection feature avoids transients from being sent to the tapered amplifier. To return to normal operation the user needs to reduce the laser current level below the limit and then turn the current ON from the CURRENT ON/OFF button.

## 4.3 Menu Section

---

In addition to showing status parameters on the display, the Menu section of the front panel enables the User to view and change settings.

### 4.3.1 Control Knob

The TA-7600-LN control knob can be used to change values of the parameter shown in the area of the display directly above the knob.

The control knob can also be used to set the value of the Current or Power depending whether in constant current or Power Lock mode, respectively.

The knob has an acceleration algorithm that causes the rate of change of the value to increase as the knob is turned faster. Turning slowly allows for fine adjustment at the smallest displayed digit.

### 4.3.2 Display Elements

The Model TA-7600-LN Tapered Amplifier Controller uses a character display to depict information about the current state of the system. The display screens shown by the instrument can be classified as follows: title screen, laser head information screen, main Setup screen, parameter setup screen and error message screen.

### 4.3.3 Title Screen

The title screen is displayed for a few seconds every time the instrument is powered ON. A sample title screen is shown in Figure 20.



Figure 20 *A sample title screen.*

### 4.3.4 Instrument Firmware Version Screen

Immediately after the title screen, the next screen shows the instrument firmware version and date.

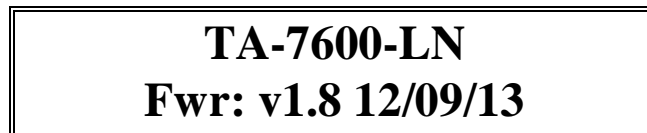


Figure 21 *A sample Firmware Instrument Version Screen.*

### 4.3.5 Amplifier Head Startup Information Screen

The Amplifier Head Information screen is displayed for a few seconds after the Instrument Firmware Version screen every time the instrument is powered ON. This screen is used to display the model and serial number of the laser head connected to the Tapered Amplifier Controller. A sample screen is shown in Figure 22.



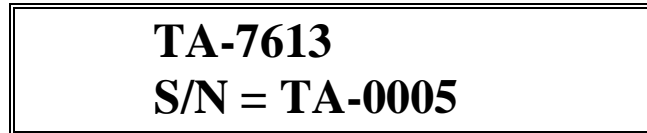


Figure 22 A sample Amplifier Head Information screen.

### 4.3.6 Main Screen

The Main screen is displayed after the Amplifier Head Information screen. When the unit is turned ON for the first time the main screen will show '0.0 mA' laser current. The User can then set the desired current value using the Control Knob. The value, in mA, will be displayed on the top line of the Main Screen. The bottom line will reflect this value relative to the maximum diode current, as a horizontal bar. Figure 23 shows what the Main Screen will look like on startup.

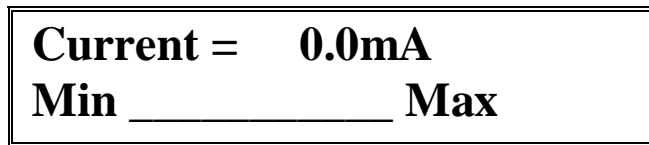


Figure 23 A sample Main Screen.

### 4.3.7 Information Screen

The Information screen is displayed by pressing the button labeled "i" on the top right corner of the controller front panel. The knob is used to scroll down the Information list. The values reported for S/N, Date of manufacture, ON Time, and Tot Time refer to the tapered amplifier head that is connected to the controller and cannot be changed by the user. ON Time is the duration that the TA current has been on and resets when the current is turned off. Tot Time is the total number of hours the current has been on since the manufacture date. The user is allowed to enable or disable the front panel knob, a useful feature to prevent unintentional adjustment of the TA current. To disable the knob, scroll down the menu until the diamond is located next to Knob Enable then press the "i" button. The screen will return to Main Screen and "Knob Disabled" will appear on the Main Screen to indicated the knob is disabled. In order to enable the knob, press the "i" button, scroll down to Knob Enable and then press the "i" button. Powering down the controller will also reset the Knob Enable to ON. The Information screen can be excited by pressing the "i" button. Avoid changing the Knob Enable setting by ensuring the diamond is not next to Knob Enable when exiting the Information Screen.

**Tot Time = 0035.0hr**  
**◆ Knob Enable = ON**

Figure 24 A sample Information Screen.

#### 4.4 Rear Panel

The Model TA-7600-LN rear panel has various dedicated input and output connectors, as well as important labeling, as shown in Figure 24.

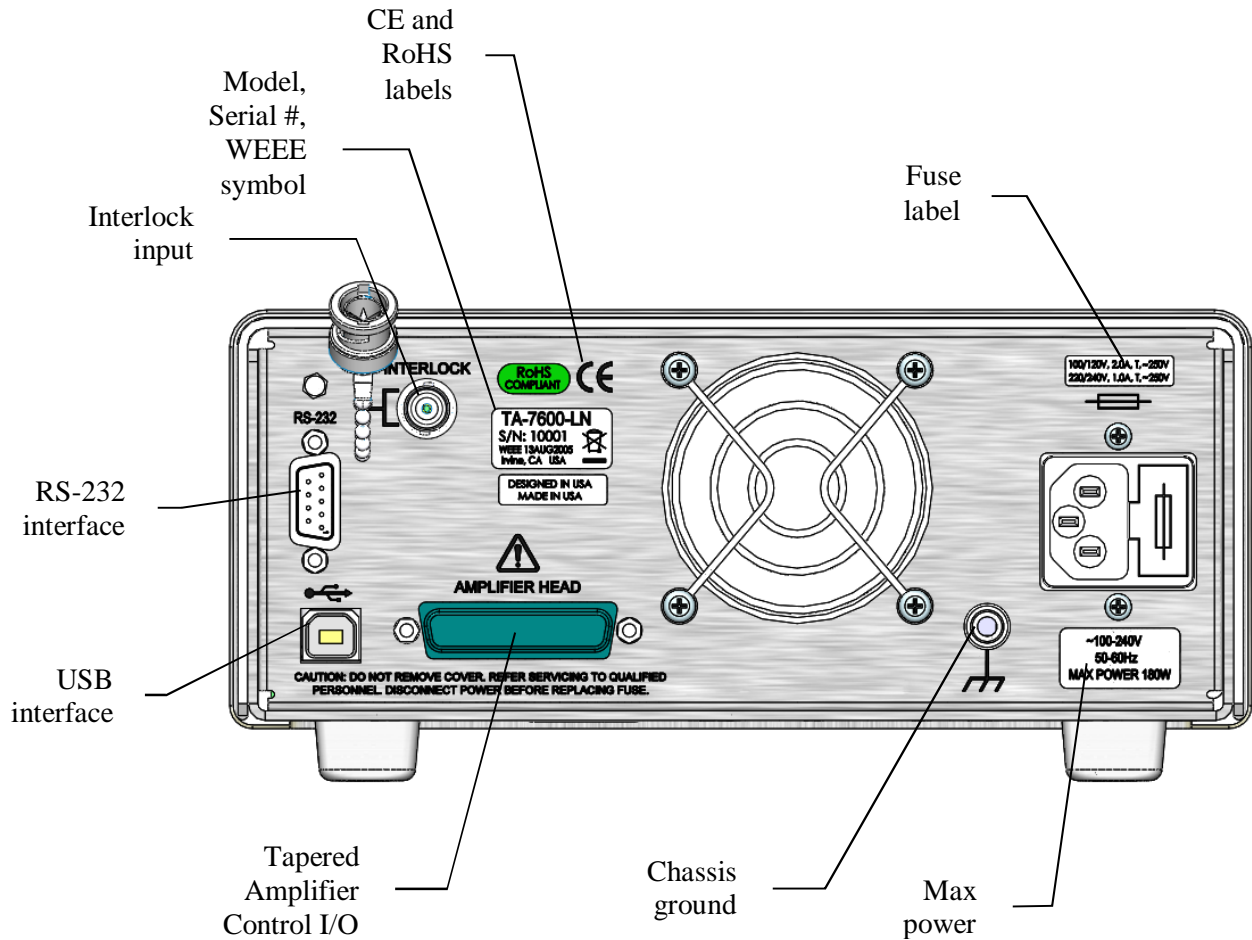


Figure 25 Rear panel. (Label IEC 320 as it's referred to in text.)

#### 4.4.1 USB Interface

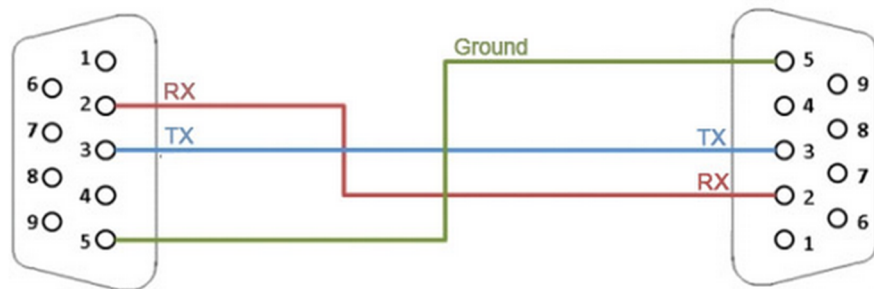
The TA-7600-LN is designed to communicate with standard USB host interfaces. The connector on the rear panel is a standard USB-B (full-size, device).

#### 4.4.2 RS-232 Serial Interface

The TA-7600-LN can also communicate via a standard RS-232 serial interface. The connector on the rear panel is a standard female 9-pin Dsub.

Note that the built-in serial port on a PC is a DTE device. A straight-through cable is used to connect a DTE device (PC) to a DCE device (e.g., TA-7600-LN). The TXD-RXD and RTS-CTS pins are not cross-connected in this case, hence the term straight through cable.

**Simple Straight Through Cable**



#### 4.4.3 Chassis Ground

This 4 mm banana jack is connected to chassis ground. It is intended to be used as an additional earth ground connection for the Model TA-7600-LN's enclosure.


#### 4.4.4 AC Power Cord

The Model TA-7600-LN will operate on either 50 or 60 Hz mains power. The instrument has an auto-ranging power supply and will operate with a nominal AC input voltage of 100 to 240 VAC.

The line cord supplied with each unit should be plugged only into a properly grounded receptacle to prevent electrical shock in the event of an internal short circuit to the metal cabinet. The detachable line cord should be connected to the IEC320 connector on the power entry module.

### 4.4.5 Fuses

The correct fuses must be installed into the fuse holder that is part of the AC power entry module. Please check the fuse label on the rear panel, before installing new fuses, see Figure 25.

	<p style="text-align: center;"><b>WARNING</b></p> <p>To avoid electric shock, the appropriate fuses for the AC input power voltage must be installed in the instrument. Only qualified service personnel should replace fuses. Failure to observe these precautions can result in fire, severe injury or death.</p>
---	---

# 5 Computer Interfacing

## 5.1 Introduction

---

The Model TA-7600-LN Tapered Amplifier Controller has USB and RS-232 interfaces to receive commands from and send responses to a host PC. The commands supported by the Tapered Amplifier Controller can be divided into two categories: “set commands” that cause it to take a desired action, and “query commands” that cause it to return a stored value.

The query commands are used to query the state of the controller and must end with a question mark (?). Set commands, on the other hand, are used to configure/setup the Tapered Amplifier for a desired mode of operation. These commands take at least one parameter. If the Tapered Amplifier Controller executes the command successfully, it responds with an “OK” string. Otherwise, it returns an error message. If an error is returned, it is recommended that the User read the error before issuing any additional commands. The subsequent sections in this chapter detail the communication protocols supported by the instrument.

## 5.2 GUI Application

---

An intuitive GUI is provided with the TA-76xx Tapered Amplifier system and can be easily installed. The files and installation guide can be found on the USB flash drive provided with the TA system. The GUI allows the user to perform all of the operations available on the TA 7600-LN Controller front panel.

## 5.3 Computer Interface Terminology

---

Listed below are the key abbreviations and concepts used in the command reference section of this manual.

### 5.3.1 <...> Delimiting Punctuation

For the purposes of this manual, any string enclosed by <...> is considered to be a command, a string, or a numerical argument. The punctuation <...> will be used to symbolize the typographic limits of the command, string or argument in question.

**5.3.2 <CR> Carriage Return**

The ASCII encoded byte 13 in decimal. (0D hex)

**5.3.3 <LF> Line Feed**

The ASCII encoded byte 10 in decimal. (0A hex)

**5.3.4 (;) Semicolons**

Semicolons are used to separate commands within a single transmission (concatenation).

**5.3.5 Command Termination**

All the commands sent to the driver must be terminated by a <CR><LF> sequence.

**5.3.6 Response Termination**

All the responses from the driver are terminated by a <CR><LF> sequence.

---

**5.4 Tapered Amplifier Operation Mode**

---

The Tapered Amplifier supports two modes of operation: LOCAL and REMOTE. The Tapered Amplifier will be in LOCAL mode, by default, following a power reset. In this mode, all the main setpoints and system parameters can be adjusted by turning the control knob on front panel of the Tapered Amplifier Controller. Output can be turned ON and OFF by pressing the CURRENT ON/OFF button. Please refer to Chapter 4: System Operation for a detailed description on how to accomplish these tasks. When the Tapered Amplifier Controller is in REMOTE mode, knob control is disabled; setpoints and other settings can be adjusted only by issuing appropriate commands from a host PC.

The Tapered Amplifier Controller can be put into REMOTE mode by issuing the command “SYSTem:MCONtrol REM”. It can be put back in LOCAL mode by issuing “SYSTem:MCONtrol LOC” command.

---

**5.5 USB Communication**

---

The instrument is designed to communicate with a host PC via a standard USB interface. Before connecting the instrument to the USB interface the User should install the New Focus Tapered Amplifier application included in the software CD that accompanies the tapered amplifier. The application automatically installs the right USB drivers. The User can communicate with the tapered amplifier through this interface by using the application or by developing software in the user’s preferred programming language. The software CD contains communication drivers and example programs in LabVIEW and C#.NET.

---

## 5.6 RS-232 Communication

---

The instrument is designed to communicate with a host PC via RS-232 communication interface. The pin out of the 9-pin D-sub connector located on the rear panel of the Tapered Amplifier is designed to interface directly with an IBM-compatible PC using a straight-through cable.

To communicate with the instrument, the host PC's RS-232 settings must be configured as follows: 8 data bits, no parity checking, 1 stop bit, and no hardware handshake. The Tapered Amplifier can support baud rates between 1200 and 57600 bps; the default baud rate is 19200 bps.

### Setting the Baud Rate for RS-232

1. Press the Menu button and scroll down to System Params menu. Press Enter button to see this menu. The first menu item is Baud Rate.
2. Turn the right-knob to select desired baud rate. Turn the knob clockwise to increase the value, counter-clockwise to decrease the value. Available baud rates are 1200, 2400, 4800, 9600, 19200, 38400, and 57600.
3. Press the Back button to exit the System Params menu.

---

## 5.7 Commands Summary

---

### 5.7.1 Conventions

There are two types of device commands: commands that cause the instrument to take a desired action, and queries that return a stored value or state of the instrument. Queries must end with a question mark (?), while commands may require parameter(s) to follow:

**SOURce:CURRent:DIODe 60.00**

For example, the value "60.00" in the command **SOURce:CURRent:DIODe 60.00** sets the diode current setpoint to 60.00 mA. The command/query **MUST** contain all of the letters shown in upper-case; lower-case letters in the commands are optional, and may be used for clarity.

The commands may be sent to the instrument in either upper or lower case or in any combination. For example, the following commands are equal:

**SOURce:CURRent:DIODe 60.00**

**SOUR:CURR:DIOD 60.00**

**source:current:diode 60.00**

**Source:Current:Diode 60.00**

**COMMAND TERMINATION:**

All commands sent to the Tapered Amplifier must be terminated by <Carriage Return><Line Feed>.characters. All responses sent out by the Tapered Amplifier are terminated by the same characters.

**5.7.2 Types of Commands**

There are five general types of commands: Standard Commands, Output Commands, Sense Commands, Source Command, and System Commands.

Standard Commands allow you to get information about the Tapered Amplifier, and to set Tapered Amplifier-specific parameters such as beeper, front panel etc. System Commands allow users to query laser, and any system-level information.

Output Commands are used to turn ON/OFF various outputs that affect laser performance. They can be used to query the state of the output also.

Source Commands are used to set/query laser operating parameters. Queries return the value of various Tapered Amplifier set points.

Sense Commands return the value of various laser operating conditions. Sense Commands read actual voltages, currents, and temperatures; the value returned is the same as that seen on the Tapered Amplifier front panel at the time the command is executed.

The next section has an index of all the possible computer control commands. Then, the pages that follow the index of commands give detailed information about each command, including a description of the command and examples of how the command is used.

**5.7.3 Index of Commands****Standard Commands**

<b>Syntax</b>	<b>Description</b>
<b>*IDN?</b>	Identification string query
<b>*RCL</b>	Recall Tapered Amplifier settings
<b>*RST</b>	Reset the Tapered Amplifier
<b>*SAV</b>	Save Tapered Amplifier settings
<b>BEEP</b>	Set Tapered Amplifier beeper status
<b>BEEP?</b>	Query Tapered Amplifier beeper status
<b>LOCKOUT</b>	Set Tapered Amplifier front panel state



<b>LOCKOUT?</b>	Query Tapered Amplifier front panel state
<b>ONDELAY</b>	Set amplifier output ON delay
<b>ONDELAY?</b>	Query amplifier output ON delay

### Output Commands

Syntax	Description
<b>OUTPut:STATE</b>	Set amplifier output state
<b>OUTPut:STATE?</b>	Query amplifier output state

### Sense Commands

Syntax	Description
<b>SENSe:CURRent:DIODE?</b>	Sense diode current
<b>SENSe:POWer:DIODE?</b>	Sense output power
<b>SENSe:POWer:INPUT?</b>	Sense input power
<b>SENSe:TEMPerature:TEC?</b>	Sense TEC (diode) temperature

### Source Commands

Syntax	Description
<b>SOURce:CPower</b>	Set constant current or constant power mode
<b>SOURce:CPower?</b>	Returns mode of operation (constant power or constant current)
<b>SOURce:CURRent:DIODE</b>	Set amplifier diode current setpoint
<b>SOURce:CURRent:DIODE?</b>	Query amplifier diode current setpoint
<b>SOURce:POWer:DIODE</b>	Set amplifier diode power setpoint
<b>SOURce:POWer:DIODE?</b>	Query amplifier diode power setpoint

### System Commands

Syntax	Description
<b>SYSTem:BAUDRATE</b>	Set RS-232 baud rate
<b>SYSTem:BAUDRATE?</b>	Query RS-232 baud rate
<b>SYSTem:ENTIME?</b>	Query Tapered amplifier usage time
<b>SYSTem:MCONtrol</b>	Set Tapered Amplifier operation mode (remote or local)
<b>SYSTem:MCONtrol?</b>	Query Tapered Amplifier operation mode (remote or local)
<b>SYSTem:LASer:MODEL?</b>	Query laser model number
<b>SYSTem:LASer:SN?</b>	Query laser serial number
<b>SYSTem:LASer:REV?</b>	Query laser revision number
<b>SYSTem:LASer:CALDATE?</b>	Query laser calibration date
<b>SYSTem:LASer:WAVElength?</b>	Query laser wavelength
<b>SYSTem:LASer:CONDition?</b>	Query laser condition register
<b>SYSTem:LASer:POWer?</b>	Query minimum input and maximum output power levels

**\*IDN?**

**Description** Identification string query.

**Syntax** \*IDN?

**Remarks** This query will cause the instrument to return an identification string.

	Model Name	Firmware Version #	Firmware Date	Tapered Amplifier
	⏟	⏟	⏟	⏟
New_Focus	XXXX	vYYY	mm/dd/yy,	SNZZZZ

**\*RCL**

**Description** Recall command.

**Syntax** \*RCL *Bin*

<u>Argument</u>	<u>Value</u>	<u>Description</u>
<i>Bin</i>	0	Restores factory default settings
	1 to 5	Restores settings saved in specified bin

**Remarks** This command restores the instrument to the setup states saved in instrument's non-volatile flash memory. The parameters that can be restored are:

1. Beeper enable state
2. Dial (rotary knob) lockout state
3. Amplifier output on-delay duration
4. RS-232 baud rate
5. Hardware configuration register setting
6. Diode current setpoint
7. Diode temperature setpoint

**See Also** \*RST, \*SAV

**\*RST**

**Description** Reset command.

**Syntax** \*RST

**Remarks** This command performs a soft reset of the instrument.

**See Also** \*RCL

**\*SAV**

**Description** Save command.

**Syntax**      **\*SAV Bin**

<b>Argument</b>	<b>Value</b>	<b>Description</b>
<i>Bin</i>	2 to 5	Saves current settings to specified bin

**Remarks**      This command stores the current state of the instrument in non-volatile flash memory. This state is then recalled using the **\*RCL** command. See description of **\*RCL** command for a list of values saved/recalled by the instrument.

**See Also**      **\*RCL**

---

## **BEEP**

**Description**      Beep command

**Syntax**          **BEEP Value**

**Remarks**      This command controls the instrument's beeper. The beeper is used to signal error or warning conditions.

If no value is specified:

- The Tapered Amplifier returns "NO PARAMETER SPECIFIED".
- No other action is taken.

If the value specified is not equal to 0, 1 or 2:

- The Tapered Amplifier returns "VALUE OUT OF RANGE".
- No other action is taken.

If the value is 0, 1 or 2:

- The beeper state is changed per table below.
- The Tapered Amplifier returns "OK".

<b>Argument</b>	<b>Value</b>	<b>Description</b>
<i>Value</i>	0	Beeper off
	1	Beeper on
	2	Test beeper (100ms beep)

**See Also**      **BEEP?**

---

## **BEEP?**

**Description**      Beep query

**Syntax**          **BEEP?**

**Remarks**      This query returns the enable status of the beeper.

<b>Response</b>	<b>Description</b>	
<i>beep set</i>	0	Beeper off
	1	Beeper on

**See Also**      **BEEP**

---

## LOCKOUT

**Description**      Lockout the instrument front panel.

**Syntax**            **LOCKOUT** *Value*

**Remarks**        This command can be used to lockout all the buttons and dial knob or just the dial knob on the front panel.

If no value is specified:

- The Tapered Amplifier returns “NO PARAMETER SPECIFIED”.
- No other action is taken.

If the value specified is not equal to 0, 1 or 2:

- The Tapered Amplifier returns “VALUE OUT OF RANGE”.
- No other action is taken.

If the value is 0, 1 or 2:

- The front panel state is changed per table below.
- The Tapered Amplifier returns “OK”.

<b>Argument</b>	<b>Value</b>	<b>Description</b>
<i>Value</i>	0	Front panel buttons and dial knobs enabled
	1	Front panel buttons and dial knobs disabled
	2	Front panel dial knob disabled

**See Also**        **None**

---

## LOCKOUT?

**Description**      Instrument front panel lockout state query.

**Syntax**            **LOCKOUT?**

**Remarks**        This query returns the instrument’s front panel lockout state.

**Response**        **Description**  
*Value*              Front panel lockout state

**See Also**        **LOCKOUT**

---

**ONDELAY**

**Description** Amplifier turn on delay command.

**Syntax** **ONDELAY** *time*

**Remarks** This command controls the amplifier turn on delay. This is the amount of time between the moment the amplifier on command is received and the moment the output is actually energized. This setting is also used when an amplifier is commanded to turn on by pushing the CURRENT ON/OFF button on front panel of instrument when it is in local control mode.

If no value is specified:

- The Tapered Amplifier returns “NO PARAMETER SPECIFIED”.
- No other action is taken.

If the value specified is less than 6000 or greater than 60000:

- The Tapered Amplifier returns “VALUE OUT OF RANGE”.
- No other action is taken.

If the value is in range:

- The Tapered Amplifier turn on delay is changed to desired value.
- The Tapered Amplifier returns “OK”.

<b>Argument</b>	<b>Value</b>	<b>Description</b>
	<i>Time</i>	<i>Integer</i> Time, in milliseconds. Valid values are between 6000 and 60000

**See Also** **ONDELAY?**

---

**ONDELAY?**

**Description** Laser turn on delay query

**Syntax** **ONDELAY?**

**Remarks** This command returns the laser turn on delay time.

<b>Response</b>	<b>Description</b>
<i>Value</i>	Time, in milliseconds

**See Also** **ONDELAY**

---

**OUTPut:STATe**

**Description** Laser output enable command.

**Syntax** **OUTPut:STATe** *State*

**Remarks** This command turns the laser ON or OFF. When turning the laser ON, the light above the front panel's LASER POWER switch will flash for six seconds (default) before the power is turned ON. The flash time can be changed using the ONDELAY command.

If no value is specified:

- The Tapered Amplifier returns "NO PARAMETER SPECIFIED".
- No other action is taken.

If the value specified is not equal to 0 or 1:

- The Tapered Amplifier returns "VALUE OUT OF RANGE".
- No other action is taken.

If the value is 0 or 1:

- The amplifier output is turned OFF or ON.
- The Tapered Amplifier returns "OK".

Argument	Value	Description
	<i>State</i>	<i>Integer</i> 0 turns the laser OFF
		1 turns the laser ON

**See Also**      **ONDELAY?; OUTPut:STATe?**

---

### **OUTPut:STATe?**

**Description**      Amplifier output enable state query

**Syntax**            **OUTPut:STATe?**

**Remarks**        This command returns the amplifier output enable state.

Response	Description
<i>Value</i>	0      amplifier output OFF
	1      amplifier output ON

**See Also**        **ONDELAY; OUTPut:STATe**

---

### **SENSe:CURRent:DIODE?**

**Description**      Actual tapered amplifier diode current query

**Syntax**            **SENSe:CURRent:DIODE?**

**Remarks**        This command returns the magnitude of actual tapered amplifier diode current.

Response	Description
<i>Value</i>	<i>Actual tapered amplifier diode current in milli-Amperes (mA).</i>

**See Also**        **SOURce:CURRent:DIODE; SOURce:CURRent:DIODE?**

---

**SENSe:POWer:DIODE?**

<b>Description</b>	Actual laser diode output power query
<b>Syntax</b>	<b>SENSe:POWer:DIODE?</b>
<b>Remarks</b>	This command returns the magnitude of actual tapered amplifier diode output power.
<b>Response</b>	<b>Description</b> <i>Value</i> <i>Actual tapered amplifier diode output power in milli-Watts (mW).</i>
<b>See Also</b>	<b>SOURce:POWer:DIODE; SOURce:POWer:DIODE?</b>

---

**SENSe:POWer:INPUT?**

<b>Description</b>	Actual laser diode input power query
<b>Syntax</b>	<b>SENSe:POWer:INPUT?</b>
<b>Remarks</b>	This command returns the magnitude of actual tapered amplifier diode input power.
<b>Response</b>	<b>Description</b> <i>Value</i> <i>Actual tapered amplifier diode input power in milli-Watts (mW).</i>
<b>See Also</b>	<b>None</b>

---

**SENSe:TEMPerature:TEC?**

<b>Description</b>	Actual tapered amplifier diode temperature query
<b>Syntax</b>	<b>SENSe:TEMPerature:TEC?</b>
<b>Remarks</b>	This command returns the magnitude of actual tapered amplifier diode temperature. Note that the diode temperature is actively controlled. If the room temperature ever gets so high that the coolers have insufficient capacity to reduce the temperature, the control loop can become unstable and destroy the cooling elements. To prevent damage, the amplifier is automatically shut down if the amplifier diode temperature exceeds safe limits.
<b>Response</b>	<b>Description</b> <i>Value</i> <i>Actual tapered amplifier diode temperature in degC (°C).</i>
<b>See Also</b>	<b>SOURce:TEMPerature:TEC; SOURce:TEMPerature:TEC?</b>

---

**SOURce:CPower**

<b>Description</b>	Sets mode of operation to constant current or constant power
<b>Syntax</b>	<b>SOURce:CPower <i>Value</i></b>
<b>Remarks</b>	This command sets the Tapered Amplifier mode of operation.

<b>Argument</b>	<b>Value</b>	<b>Description</b>
<i>Value</i>	0	Sets mode to constant current

---

1 Sets mode to constant power

See Also **SOURce:CPower?**

---

### **SOURce:CPower?**

**Description** Queries mode of operation.

**Syntax** **SOURce:CPower** *Value*

**Remarks** This query returns the tapered amplifier mode of operation as constant current or constant power.

<b>Description</b>	<b>Value</b>	<b>Description</b>
<i>Value</i>	0	constant current
	1	constant power

See Also **SOURce:CPower**

---

### **SOURce:CURRENT:DIODE**

**Description** Amplifier current set.

**Syntax** **SOURce:CURRENT:DIODE** *Value*

**Remarks** This command sets the Tapered Amplifier current setpoint.

If no value is specified:

- The Tapered Amplifier returns “NO PARAMETER SPECIFIED”.
- No other action is taken.

If the value specified is greater than the diode current rating:

- The Tapered Amplifier returns “VALUE OUT OF RANGE”.
- No other action is taken.

If the value is in range:

- The Tapered Amplifier current is changed to specified value.
- The Tapered Amplifier returns “OK”.

<b>Argument</b>	<b>Value</b>	<b>Description</b>
<i>Value</i>	MAX	If the string “MAX” is specified as value, the diode current setpoint is set to the diode’s current rating
	Float	Desired tapered amplifier current in milli-Amperes (mA)

See Also **SOURce:CURRENT:DIODE?**

---

### **SOURce:CURRENT:DIODE?**

**Description** Tapered amplifier current setpoint query.



**Syntax**            **SOURce:CURRent:DIODE?**

**Remarks**        This query returns the tapered amplifier current setpoint.

**Response**        **Description**  
                   *Value*            Tapered amplifier current setpoint in milli-Amperes (mA)

**See Also** **SOURce:CURRent:DIODE**

### **SOURce:POWer:DIODE**

**Description**     Diode laser output power set.

**Syntax**            **SOURce:POWer:DIODE** *Value*

**Remarks**        This command sets the Tapered Amplifier output power setpoint.

If no value is specified:

- The Tapered Amplifier returns “NO PARAMETER SPECIFIED”.
- No other action is taken.

If the value specified is less than 1.0 or greater than 99.0:

- The Tapered Amplifier returns “VALUE OUT OF RANGE”.
- No other action is taken.

If the value is in range:

- The Tapered Amplifier power is changed to specified value.
- The Tapered Amplifier returns “OK”.

<b>Argument</b>	<b>Value</b>	<b>Description</b>
<i>Value</i>	MAX	If the string “MAX” is specified as value, the diode power setpoint is set to 99%
	MIN	If the string “MIN” is specified as value, the diode power setpoint is set to 1%
	Float	Desired diode laser power in percentage of laser amplifier’s output power rating (%)

**See Also**        **SOURce:POWer:DIODE?**

### **SOURce:POWer:DIODE?**

**Description**     Diode laser output power setpoint query.

**Syntax**            **SOURce:POWer:DIODE?**

**Remarks**        This query returns the Tapered Amplifier output power setpoint.

<b>Response</b>	<b>Description</b>
-----------------	--------------------

*Value* Tapered Amplifier power setpoint in percentage of laser amplifier's output power rating (%)

**See Also** **SOURce:POWer:DIODE**

---

### **SYSTem:BAUDRATE**

**Description** RS-232 baud rate set

**Syntax** **SYSTem:BAUDRATE** *Value*

**Remarks** This command controls the instrument's RS-232 baud rate.

If no value is specified:

- The Tapered Amplifier returns "NO PARAMETER SPECIFIED".
- No other action is taken.

If the value specified is less than 0 or greater than 6:

- The Tapered Amplifier returns "VALUE OUT OF RANGE".
- No other action is taken.

If the value is between 0 and 6:

- The RS-232 baud rate is changed per table below.
- The Tapered Amplifier returns "OK".

<b>Argument</b>	<b>Value</b>	<b>Description</b>
<i>Value</i>	0	Baud rate = 1200 bps
	1	Baud rate = 2400 bps
	2	Baud rate = 4800 bps
	3	Baud rate = 9600 bps
	4	Baud rate = 19200 bps
	5	Baud rate = 38400 bps
	6	Baud rate = 57600 bps

**See Also** **SYSTem:BAUDRATE?**

---

### **SYSTem:BAUDRATE?**

**Description** RS-232 baud rate query

**Syntax** **SYSTem:BAUDRATE?**

**Remarks** This query returns the RS-232 baud rate.

<b>Response</b>	<b>Description</b>
<i>Value</i>	0 Baud rate = 1200 bps
	1 Baud rate = 2400 bps
	2 Baud rate = 4800 bps

3	Baud rate = 9600 bps
4	Baud rate = 19200 bps
5	Baud rate = 38400 bps
6	Baud rate = 57600 bps

**See Also**      **SYSTem:BAUDRATE**

---

### **SYSTem:ENTIME?**

**Description**      Laser enable time query.

**Syntax**            **SYSTem:ENTIME?**

**Remarks**        This query returns the amount of time laser diode output has been enabled.

**Response**        **Description**  
*Value*              Laser diode enable time in minutes (min)

**See Also**        **OUTPut:STATe**

---

### **SYSTem:MCONtrol**

**Description**      Tapered Amplifier REMOTE/LOCAL operation mode set command.

**Syntax**            **SYSTem:MCONtrol** *Mode*

**Remarks**        This command is used to put the Tapered Amplifier in remote/local operation mode. The Tapered Amplifier will be in LOCAL mode, by default, following a power reset. In this mode, all the main setpoints and other system parameters can be adjusted by turning the control knobs on front panel of the Tapered Amplifier. When it is in REMOTE mode, knob control is disabled; setpoints and other settings can be adjusted only by issuing appropriate commands from a host PC.

If no value is specified:

- The Tapered Amplifier returns “NO PARAMETER SPECIFIED”.
- No other action is taken.

If the value specified is not equal to “LOC” or “REM”:

- The Tapered Amplifier returns “VALUE OUT OF RANGE”.
- No other action is taken.

If the value is “LOC” or “REM”:

- The Tapered Amplifier operation mode is changed to LOCAL or REMOTE mode.
- The Tapered Amplifier returns “OK”.

<b>Argument</b>	<b>Value</b>	<b>Description</b>
	<i>Mode</i>	String              REM sets the Tapered Amplifier to REMOTE mode LOC sets the Tapered Amplifier to LOCAL mode

See Also **SYSTem:MCONtrol?**

### **SYSTem:MCONtrol?**

**Description** Tapered Amplifier REMOTE/LOCAL operation mode query

**Syntax** **SYSTem:MCONtrol?**

**Remarks** This command returns the Tapered Amplifier operation mode.

**Response**

<b>Description</b>		
<i>Value</i>	REM	Tapered Amplifier is in REMOTE mode
	LOC	Tapered Amplifier is in LOCAL mode

See Also **SYSTem:MCONtrol**

### **SYSTem:LASer:MODEL?**

**Description** Laser head model number query

**Syntax** **SYSTem:LASer:MODEL?**

**Remarks** This command returns the model number of the laser head connected to the Tapered Amplifier.

**Response**

<b>Description</b>	
<i>Value</i>	String laser head model number

See Also **SYSTem:LASer:SN?**

### **SYSTem:LASer:SN?**

**Description** Laser head serial number query

**Syntax** **SYSTem:LASer:SN?**

**Remarks** This command returns the serial number of the laser head connected to the Tapered Amplifier.

**Response**

<b>Description</b>	
<i>Value</i>	String laser head serial number

See Also **SYSTem:LASer:MODEL?**

### **SYSTem:LASer:REV?**

**Description** Laser head revision number query

**Syntax** **SYSTem:LASer:REV?**

**Remarks** This command returns the revision number of the laser head connected to the Tapered Amplifier.

**Response**

<b>Description</b>	
<i>Value</i>	String laser head revision number

*Value* String laser head revision number  
**See Also** **SYSTEM:LASer:SN?**

### **SYSTEM:LASer:CALDATE?**

**Description** Laser head calibration date query  
**Syntax** **SYSTEM:LASer:CALDATE?**  
**Remarks** This command returns the calibration date of the laser head connected to the Tapered Amplifier.  
**Response** **Description**  
*Value* String laser head calibration date  
**See Also** **SYSTEM:LASer:SN?**

### **SYSTEM:LASer:WAVElength?**

**Description** Laser diode wavelength query.  
**Syntax** **SYSTEM:LASer:WAVElength?**  
**Remarks** This query returns the laser diode wavelength.  
**Response** **Description**  
*Value* Laser diode wavelength in nanometers (nm)  
**See Also** **SYSTEM:LASer:MODEL?**

### **SYSTEM:LASer:CONDition?**

**Description** Laser head condition query  
**Syntax** **SYSTEM:LASer:CONDition?**  
**Remarks** This command returns the state of the laser head connected to the Tapered Amplifier.  
**Response** **Description**  
*Value* *Integer* A 16-bit decimal value representing the state of the laser head connected to the Tapered Amplifier.

<i>Bit #</i>	<i>Value</i>	<i>Description</i>
0	0	Soft limit condition not activated
	1	Output current is soft limited
1		Reserved
2		Reserved
3		Reserved
4	0	Rear-panel interlock is grounded
	1	Rear-panel interlock is floating

5	0	<i>Hard limit condition not activated</i>
	1	<i>Output current turned OFF due to hard limit</i>
6		<i>Reserved</i>
7		<i>Reserved</i>
8		<i>Reserved</i>
9	0	<i>Tapered Amplifier temperature is normal</i>
	1	<i>Output current turned OFF due to high Tapered Amplifier temperature</i>
10	0	<i>Output current is turned OFF</i>
	1	<i>Output current is turned ON</i>
11	0	<i>Output current ondelay expired</i>
	1	<i>Output current ondelay not expired</i>
12		<i>Reserved</i>
13	0	<i>Amplifier head disconnected</i>
	1	<i>Amplifier head connected</i>
14		<i>Reserved</i>
15		<i>Reserved</i>

---

**SYSTem:LASer:POWer?**

**Description** Laser diode input and output power threshold query.

**Syntax** **SYSTem:LASer:POWer?**

**Remarks** This query returns the minimum input and maximum output power levels of the Tapered Amplifier.

**Response** **Description**  
*Value1, Value2*      *Value1 is the minimum input power level in milli-Watts (mW)*  
                                  *Value2 is the maximum output power level in milli-Watts (mW)*

**See Also** **SOURce:POWer:DIODE; SOURce:CPower**

*This page has been intentionally left blank.*





*This page has been intentionally left blank*

# 6 Tips and Techniques

## 6.1 Introduction


---

This section explains operational details of the Model TA-7600-LN tapered amplifier controller and head. Application examples are provided.

## 6.2 Grounding a Laser Head

---

The TA-7600-LN Tapered Amplifier outputs are isolated from earth (chassis) ground. Isolating the laser head case avoids damaging the device from multiple ground loop potentials, AC transients, or static discharge. Since test equipment probes, signal sources, and package mounts are often partially earth grounded, it is often necessary to also bond the device case to earth ground. It is strongly recommended that a single point ground scheme be established, specifically at the binding post. This will help minimize noise, transients, and ground loop hazards. Be sure to include any signal generators in your ground circuit.

	<p><b>CAUTION</b></p> <p><b>Only one connection to ground is accepted. Failure to do so may result in the unit malfunction and/or damage. Be careful when connecting other instruments to TA-7600-LN Tapered Amplifier, as they may have their ground connected to the Earth Ground.</b></p> <p><b>For example, oscilloscopes have the probe ground connected to Earth Ground.</b></p>
---	--

If you have additional questions about your earth grounding method, contact a New Focus applications engineer.

*This page is intentionally left blank*

# 7 Maintenance and Service



## WARNING

Work performed by persons not authorized by Newport Corporation will void the warranty.

### 7.1 Enclosure Cleaning

---



## WARNING

Before cleaning the enclosure of the Model TA-7600-LN Tapered Amplifier Tapered Amplifier, the AC power cord must be disconnected from the wall socket.

The source enclosure should only be cleaned with a mild soapy water solution applied to a damp lint-free cloth. Do not use an acetone or alcohol solution; this will damage the finish of the enclosure.

### 7.2 Technical Support

---

Information and advice about the operation of any New Focus product is available from our technical support engineers. For quickest response, ask for New Focus Technical Support and know the model and serial number for your product.

**Hours:** 8:00–5:00 PST, Monday through Friday (excluding holidays).

**Toll Free:** 1-866-NUFOCUS (1-866-683-6287)

(from the USA & Canada only)

**Phone:** (408) 980-4300

Support is also available by fax and email:

**Fax:** (408) 919-6083

**Email:** techsupport@newfocus.com

We typically respond to faxes and email within one business day.

---

### **7.3 Obtaining Service**

---

The Vortex Plus Tunable Laser System has been designed to provide years of trouble-free operation with virtually no maintenance except for ensuring that the unit is not damaged, contaminated, or used in an unsafe manner. The TA-7600-LN tapered amplifier controller and head contain no user serviceable parts. To obtain information regarding factory service, contact New Focus or your New Focus representative. Please have the following information available:

1. Instrument model number (on the rear panel).
2. Instrument serial number (on rear panel or bottom of enclosure).
3. Description of the problem.

If the instrument is to be returned to New Focus, you will be given a Return Number, which you should reference in your shipping documents. Please fill out a copy of the service form, located on the following page, and have the information ready when contacting Newport Corporation. Return the completed service form with the instrument.

---

### **7.4 Warranty**

---

New Focus, a division of Newport Corp, guarantees its lasers to be free of defects for one year from the date of shipment or for 3000 hours of operation, whichever comes first. This is in lieu of all other guarantees, expressed or implied, and does not cover incidental or consequential loss. The laser head warranty is void if the inner laser cavity box is opened.

## 7.5 Service Form

---

**New Focus U.S.A.**  
**Office: 408-980-4300**  
**FAX: 408-919-6083**

Name \_\_\_\_\_ Return Authorization # \_\_\_\_\_  
(Please obtain RA# prior to return of item)

Company \_\_\_\_\_  
(Please obtain RA # prior to return of item)

Address \_\_\_\_\_ Date \_\_\_\_\_

Country \_\_\_\_\_ Phone Number \_\_\_\_\_

P.O. Number \_\_\_\_\_ FAX Number \_\_\_\_\_

***Item(s) Being Returned:***

Model # \_\_\_\_\_ Serial # \_\_\_\_\_

Description \_\_\_\_\_

Reason for return of goods (please list any specific problems):

---

---

---

---

*This page is intentionally left blank*

# 8 Appendix A – Error Messages

## 8.1 Introduction

---

The errors generated by the Tapered Amplifier can be retrieved by pushing the “i” button on front-panel of the Tapered Amplifier, scrolling to “Errors” menu, and pressing the “Enter” button. These errors can also be retrieved remotely by issuing “ERRSTR?” command through USB or RS-232 communication interfaces. Some of these errors can be cleared by switching the laser Tapered Amplifier OFF and then back ON. If the errors persist, please contact New Focus for assistance.

The next section tabulates and includes a brief description of each error.

## 8.2 Error Description

---

A table listing all error codes is shown below. The second column gives the error string assigned to the error while the third column gives a brief description of the error.

Error Code	Error String	Description
0	NO ERROR	No error exists in the error buffer
116	SYNTAX ERROR	This error is generated when the instrument receives a command that cannot be processed.  Some typical causes:  a. Using ASCII characters outside of a string constant that are not defined by the command language syntax.  b. Missing space between a set command and parameter.  c. Missing “?” character in case of query
126	WRONG NUM OF PARAMS	This error is generated when the instrument is unable to process a command due to a mismatch between the number of parameters received and the number of parameters required for the command.
201	VALUE OUT OF RANGE	This error is generated when the instrument is unable to process a command because the parameter value received is out of range of the acceptable values for the command.



407	TEC TEMP LIMIT	The temperature control subsystem output has been turned OFF because the TEC temperature has exceeded safe levels. Please allow the laser head to cool down before turning the laser power ON.
424	TEC OVER TEMP	The temperature control subsystem output has been turned OFF because the internal heatsink temperature has exceeded safe levels. Please allow the unit to cool down, and reset the Tapered Amplifier by turning it OFF and back ON.
501	LDD INTERLOCK FLT	The Tapered Amplifier Driver subsystem output has been turned OFF because of remote interlock (BNC connector on rear panel) assertion.
502	LDD CURRENT LIMIT	The Tapered Amplifier Driver subsystem output has been turned OFF because of actual current exceeding the current limit set point.
524	LDD OVER TEMP	The Tapered Amplifier Driver subsystem output has been turned OFF because the internal heatsink temperature has exceeded safe levels. Please allow the unit to cool down before turning the output ON again.
919	LASER DISCONNECTED	This error is generated when user tries to turn the Tapered Amplifier Driver subsystem output ON without having a tapered amplifier head connected to the controller.
920	LASER EEPROM ERROR	This error is generated when user tries to connect an amplifier head to the controller using an incompatible cable.
921	LD HEAD ACCESS OFF	This error is generated when user tries to modify select tapered amplifier head parameters.

---

---

**New Focus  
Worldwide Headquarters**

3635 Peterson Way  
Santa Clara, CA 95054

(In U.S.): 877-835-9620  
Tel: 408-980-4300  
Fax: 408-919-6083

Internet: [sales@newfocus.com](mailto:sales@newfocus.com)



Visit New Focus Online at:  
[www.newport.com/newfocus](http://www.newport.com/newfocus)

Newport Corporation, Irvine, California; Evry and Beaune-La-Rolande, France have all been certified compliant with ISO 9001 by the British Standards Institution. Mountain View, California is DNV certified.

Printed in U.S.A.