Operator's Manual
Compass™ 215M
Diode-Pumped Laser

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If you call outside our office hours, your call will be taken by our answering system and will be returned when the office reopens.

If there are technical difficulties with your laser that cannot be resolved by support mechanisms outlined above, please E-mail or telephone Coherent Technical Support with a description of the problem and the corrective steps attempted. When communicating with our Technical Support Department, via the web or telephone, the model and Laser Head serial number of your laser system will be required by the Support Engineer responding to your request.

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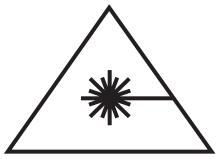
Preface

This manual contains user information for the Compass 215M laser.

The Compass 215M laser is a modular component, sold for use in OEM equipment and is not to be used as a stand-alone laser. The OEM is responsible for compliance with all applicable safety regulations.

Read this manual carefully before operating the laser for the first time. Special attention should be given to the material in Section One, Laser Safety, that describes the safety features built into the laser.



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

U.S. Export Control Laws Compliance

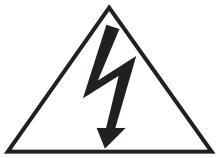
It is the policy of Coherent to comply strictly with U.S. export control laws.

Export and re-export of lasers manufactured by Coherent are subject to U.S. Export Administration Regulations, which are administered by the Commerce Department. In addition, shipments of certain components are regulated by the State Department under the International Traffic in Arms Regulations.

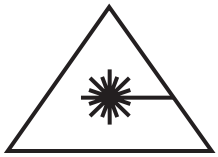
The applicable restrictions vary depending on the specific product involved and its destination. In some cases, U.S. law requires that U.S. Government approval be obtained prior to resale, export or re-export of certain articles. When there is uncertainty about the obligations imposed by U.S. law, clarification should be obtained from Coherent or an appropriate U.S. Government agency.

Symbols Used in this Document and on the System

This symbol is intended to alert the operator to the presence of important operating and maintenance instructions.



This symbol is intended to alert the operator to the presence of dangerous voltages associated with the laser that may be of sufficient magnitude to constitute a risk of electric shock.



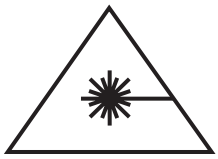
This symbol is intended to alert the operator to the danger of exposure to hazardous visible and invisible laser radiation.

This symbol is intended to alert the operator to the danger of electro-static discharge (ESD) susceptibility.

SECTION ONE: LASER SAFETY

Optical Safety

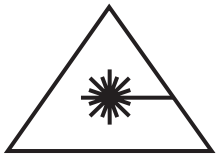
Because of its special properties, laser light poses safety hazards not associated with light from conventional sources. The safe use of lasers requires that all laser users and everyone near the laser system are aware of the dangers involved. The safe use of the laser depends upon the user being familiar with the instrument and the properties of coherent, intense beams of light.



Direct eye contact with the output beam from the laser will cause serious damage and possible blindness.

Laser beams can ignite volatile substances such as alcohol, gasoline, ether and other solvents, and can damage light-sensitive elements in video cameras, photomultipliers and photodiodes. Reflected beams may also cause damage. For these reasons and others, the user is advised to follow the precautions below.

1. Observe all safety precautions in the operator's manual.
2. Extreme caution should be exercised when using solvents in the area of the laser.
3. Limit access to the laser to qualified users who are familiar with laser safety practices and who are aware of the dangers involved.
4. Never look directly into the laser light source or at scattered laser light from any reflective surface. Never sight down the beam into the source.
5. Maintain experimental setups at low heights to prevent inadvertent beam-eye encounter at eye level.



Laser safety glasses can present a hazard as well as a benefit; while they protect the eye from potentially damaging exposure, they block light at the laser wavelengths, which prevents the operator from seeing the beam. Therefore, use extreme caution even when using safety glasses.

6. As a precaution against accidental exposure to the output beam or its reflection, those using the system must wear laser safety glasses as required by the wavelength being generated.
7. Use the laser in an enclosed room. Laser light will remain collimated over long distances and therefore presents a potential hazard if not confined.
8. Post warning signs in the area of the laser beam to alert those present.
9. Advise all those using the laser of these precautions. It is good practice to operate the laser in a room with controlled and restricted access.

Electrical Safety

The Compass 215M laser uses AC and DC voltages inside the laser enclosure. Do not disassemble the enclosure. There are no user serviceable components inside. All units are designed to be operated as assembled. Warranty will be voided if the enclosure is disassembled.

Laser Safety Requirements

This laser product is intended to be sold to an original equipment manufacturer of electronic products for use as a component (or replacement thereof) in such electronic products. As such, this product is exempt from DHHS performance standard for laser products in accordance with paragraph 1040.10(a)(1).

The following information is provided to assist the OEM in complying with radiation safety standards.

Laser Emission and Classification

The Compass 215M laser is classified by the United States National Center for Device and Radiological Health (CDRH) as a CLASS IIIB laser product. It emits VISIBLE AND INVISIBLE LASER RADIATION of 0.52 to 0.57 μm and 1.05 to 1.13 μm wavelength from the aperture in the front of the laser head. Collinear radiation of 0.79 to to 0.82 μm may also be present.

Laser Radiation Emission Indicator

A laser radiation emission indicator consisting of a yellow light is provided on the side of the laser head. This light is illuminated when the laser diode is energized. This light does not meet the IEC-825 requirement that warning laser lights must be fail-safe or redundant.

The laser can operate in OEM applications even if the LED is not installed at the laser head.

Interlock

A normally closed remote interlock switch can be installed between pins 1 and 11 on the 15-pin connector of the analog controller. Refer to Figure 4-3, item 3 and to Table 3-1. With the interlock switch closed the laser can be activated. Opening the switch stops laser action immediately.

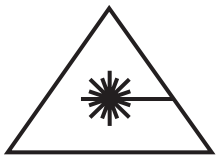
Autostart Function

The Autostart Function allows activation of the laser without a user-furnished analog input device.

The Autostart Function is activated by closing the pins of the Autostart Function connection at the analog controller e.g. via a jumper or a remote switch (see Figure 4-3, item 3).

In case of an activated Autostart Function (Autostart jumper set resp. Autostart switch closed) the interlock will be overruled!

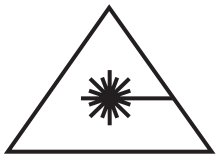
For an active interlock circuit the Autostart Function must be deactivated.



In case of an activated Autostart Function the laser starts automatically after warm-up and emits laser light.

The OEM is responsible for compliance with all applicable safety regulations.

Hazardous Radiation Exposure



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

Waste Electrical and Electronic Equipment (WEEE, 2002)

The European Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) is represented by a crossed-out garbage container label (Figure 1-1). The purpose of this directive is to minimize the disposal of WEEE as unsorted municipal waste and to facilitate its separate collection.

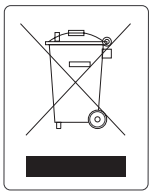


Figure 1-1. Waste Electrical and Electronic Equipment Label

RoHS Compliance

Refer to the following table for RoHS compliant components in this laser product.

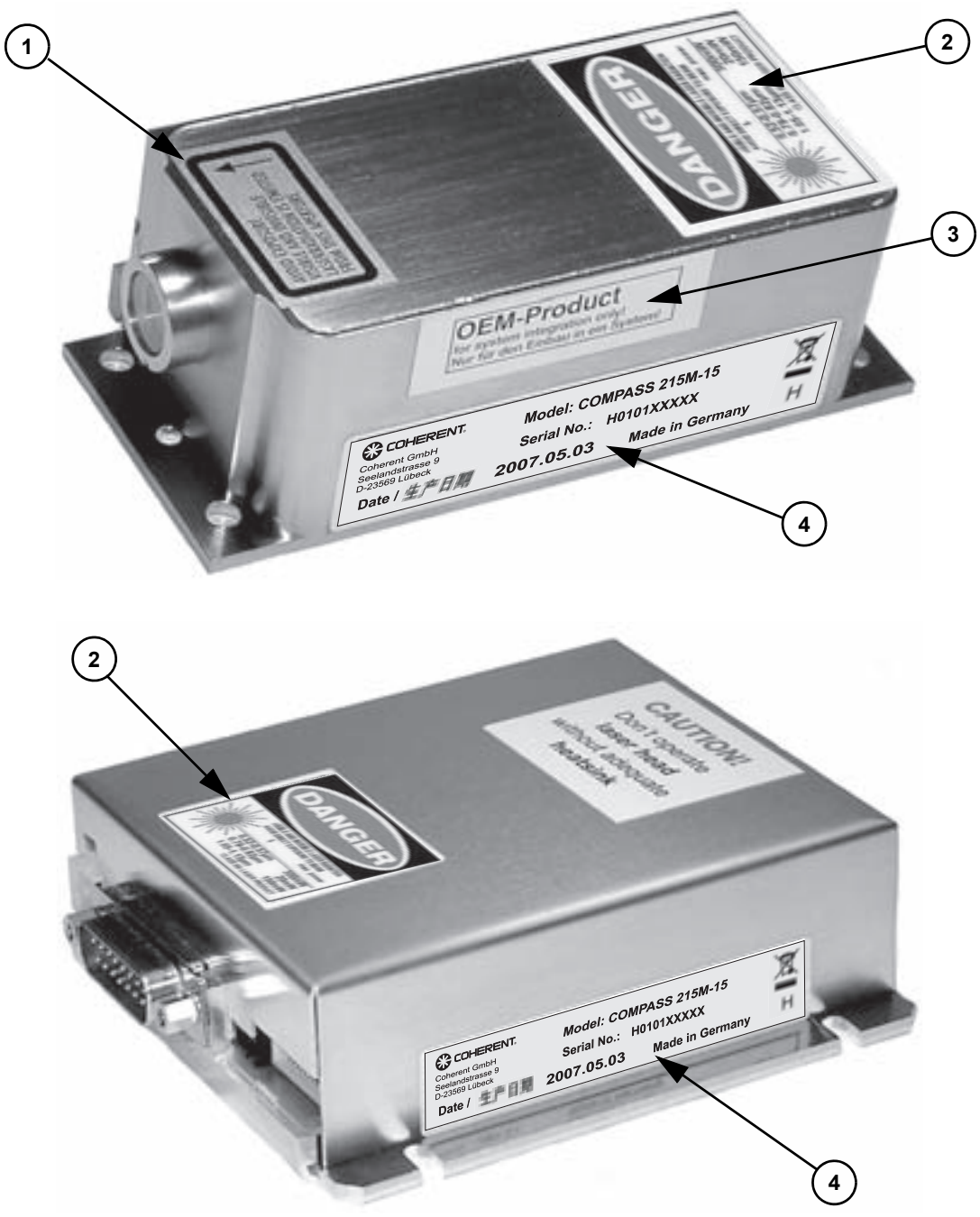
Table 1-1. RoHS Compliant Components

O = 小于 最高浓度值　　X = 大于 更多 最高浓度值

Description		铅 Pb	汞 Hg	镉 Cd	六价铬 Cr6+	多溴联苯 PB B	多溴二苯醚 PBDE
COMPASS 115M Laserhead		X	O	X	O	O	O
COMPASS 215M Laserhead		X	O	X	O	O	O
COMPASS 315M Laserhead		X	O	X	O	O	O
COMPASS 115M Powersupply		X	O	X	O	O	O
COMPASS 215M Powersupply		X	O	X	O	O	O
COMPASS 315M Powersupply		X	O	X	O	O	O
COMPASS x15M Heatsink		X	O	O	O	O	O
COMPASS x15M CONTROLLER CABLE		X	O	O	O	O	O
COMPASS x15M CABLE SET ANALOG DONGLE		X	O	O	O	O	O

Location of Safety Labels

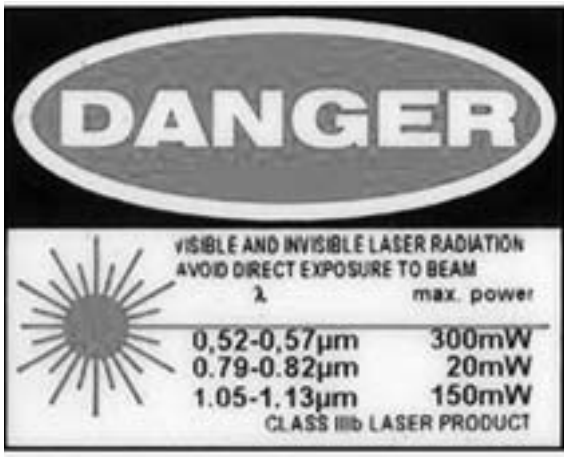
Refer to Figure 1-2 for the location of safety labels.



NOTE: KEY ON FOLLOWING PAGE

Figure 1-2. Safety Labels (Sheet 1 of 2)

1.



2.

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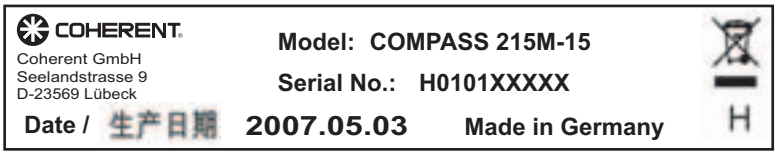


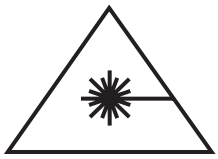
4.

Figure 1-2. Safety Labels (Sheet 2 of 2)

FRENCH TRANSLATION
SECTION UN: SÉCURITÉ LASER

Sécurité Optique

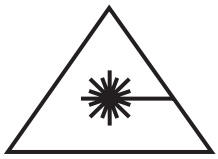
La lumière laser, du fait de ses propriétés particulières, ne présente pas les mêmes risques que les autres sources lumineuses traditionnels. L'utilisation sécurisée de laser requiert que tous les utilisateurs de laser, et que chaque personne proche d un système laser, connaissent les dangers inhérents à l'utilisation d'une telle source lumineuse. L'utilisation sécurisée de laser dépend de l'habitude qu'a l'utilisateur avec les instruments et les propriétés d'une lumière cohérente et intense.



Le contact direct avec l'œil du faisceau laser peut provoquer des lésions importantes et une possible cécité.

Les faisceaux lasers peuvent enflammer des substances volatiles comme l'alcool, l'essence, l'éther ou d'autres solvants encore, et peut endommager des éléments sensibles à la lumière comme les caméras vidéos, les photomultiplicateurs et les photodiodes. Les faisceaux réfléchis peuvent aussi induire des dommages. Pour toutes ces raisons, il est conseillé à l'utilisateur de suivre les précautions suivantes.

1. Observer toutes les précautions de sécurité du manuel utilisateur.
2. Une attention particulière doit être prise quand des solvants sont utilisés dans la même salle que le laser.
3. L'utilisation de laser doit être limitée aux personnes qualifiées et habituées à une utilisation sans risque des laser et qui en sont informées des dangers.
4. Ne jamais regarder directement le faisceau laser ou la lumière diffusée par une surface réfléchissante. Ne pas renvoyer la lumière laser dans la source laser.
5. Maintenir le montage expérimentale à une faible hauteur pour éviter toute rencontre du faisceau laser avec les yeux.



Les lunettes de sécurité laser peuvent présenter un risque aussi bien qu'un avantage ; elles protégent les yeux d'une exposition potentiellement dangereuse, elles bloquent la lumière aux longueurs d'onde du laser, ce qui empêche l'opérateur de voir le faisceau laser. Par conséquent, prendre une attention particulière même avec l'utilisation de lunettes de sécurité.

6. Afin d'éviter une exposition accidentelle au faisceau de sortie du laser ou à une de ses réflexions, les utilisateurs du système doivent porter des lunettes de sécurité imposées par la longueur d'onde générée par le laser.
7. Utiliser le laser dans une pièce fermée. La lumière laser restera collimatée sur une longue distance, et peut ainsi présenter un risque si elle n'est pas confinée.
8. Placer des panneaux d'avertissement dans la zone où se trouve le faisceau laser pour avertir les personnes y étant présentes.
9. Conseiller tous les utilisateurs de laser de ces précautions. Il est préférable de se servir du laser dans une pièce ayant un accès contrôlé et limité.

Sécurité Electrique

Le laser Compass 215M ne présente pas de risques électriques. Ne pas démonter le boîtier. Il n'y a pas de composants utilisables à l'intérieur. Tous les boîtiers sont conçus pour être employés assemblés. La garantie sera annulée si le boîtier est démonté.

Recommandations sur la Sécurité Laser

Cet équipement laser est destiné à être vendu comme composant (ou pièce de rechange) pour un équipement électronique OEM (Original Equipement Manufacturer). Ainsi, ce produit est exempté de la norme DHHS pour les produits laser conformément au paragraphe 1040.10(a)(1). Les informations suivantes sont destinées à fournir une assistance aux OEM au niveau des normes de sécurité laser.

Émission et Classification Laser

Le laser Compass 215M est classé par le CDRH (United States National Center for Device and Radiological Health) comme un laser de classe IIIB. Il émet une radiation laser dans le VISIBLE ET L'INVISIBLE à 0,52 – 0,57 µm et 1,05 – 1,13 µm à partir de la sortie de la tête laser. Une autre radiation à 0,79 – 0,82 µm, peut également être présente dans le faisceau laser.

Voyant Émission Radiation Laser

La tête du système laser est munie sur le côté d'un voyant d'émission de radiation laser (lumière jaune). Cet indicateur est éclairé quand la diode laser est alimentée. Cet indicateur lumineux ne rentre pas dans les recommandations de l'IEC-825 pour laquelle le système doit stopper si l'indicateur lumineux ne fonctionne pas (fail-safe), et pour laquelle l'indicateur a un circuit de commande redondant.

Le laser peut opérer dans des applications OEM même si la DEL n'est pas installée sur le côté de la tête laser.

Interlock (Verrouillage)

Un interrupteur de verrouillage à distance fermé normalement peut être installé entre les broches 1 et 11 du connecteur à 15 broches du bloc de commande analogique. Reportez-vous au schéma 4-3, au point 3 et au tableau 3-1. Le laser peut être activé lorsque l'interrupteur de verrouillage est sur fermé. Lorsqu'il est placé sur ouvert, l'action du laser est immédiatement interrompue.

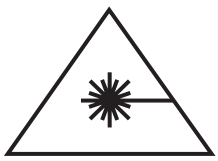
Fonction Autostart (Lancement Automatique)

La fonction Autostart (Lancement automatique) permet d'activer le laser sans avoir recours à un dispositif d'entrée analogique apporté par l'utilisateur.

La fonction Auto Start (lancement automatique) est activée en fermant les broches du branchement de la fonction Auto Start au bloc de commande analogique par le biais par exemple d'un connecteur ou d'un interrupteur à distance (Cf. schéma 4-3, point 3).

Si une fonction Auto Start est activée (connecteur Auto Start configuré avec pour réponse la fermeture de l'interrupteur Auto Start), le verrouillage sera annulé !

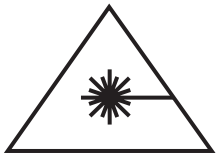
Pour un circuit de verrouillage actif, la fonction Auto Start doit être désactivée.



Si une fonction Autostart est activée, le laser démarre automatiquement après le réchauffage et émet un faisceau laser.

L'équipementier est responsable du respect de toutes les réglementations applicables en matière de sécurité.

Exposition à des Radiations Dangereuses



L'utilisation de contrôles et tout ajustement ou performance des procédures autre que ceux indiqués dans ce manuel peut entraîner une exposition à des radiations dangereuses.

Déchets d'Équipements Électriques et Électroniques (DEEE, 2002)

La Directive européenne concernant les déchets d'équipements électriques et électroniques (DEEE) (2002/96/EC) est représentée par une étiquette indiquant un conteneur marquée d'une croix (Figure 1-3). Cette directive a pour objet de minimiser le traitement des DEEE en tant que déchets municipaux non triés et d'en faciliter la collecte séparé.

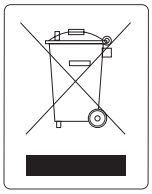


Figure 1-3 : Pictogramme Concernant les Déchets d'Équipements Électriques et Électroniques

Conformité RoHS

Se référer au tableau suivant pour la conformité RoHS des composants dans ce produit laser.

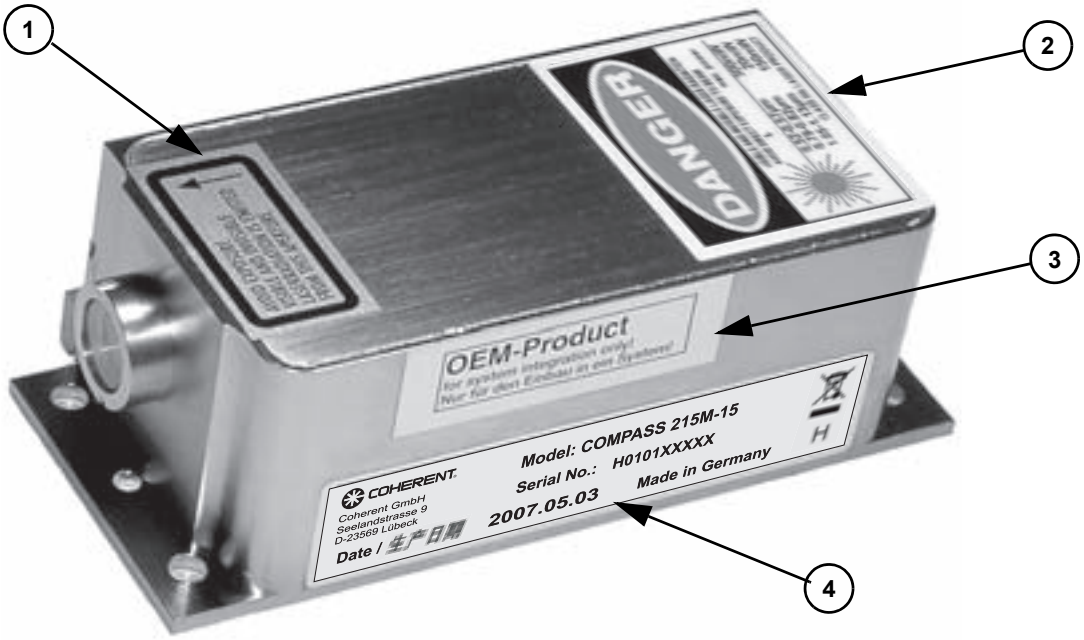
Tableaux 1-2 : Composants Conformes à RoHS

O = 小于 最高浓度值　　X = 大于 更多 最高浓度值

Description		铅 Pb	汞 Hg	镉 Cd	六价铬 Cr6+	多溴联苯 PB B	多溴二苯醚 PBDE
COMPASS 115M Laserhead		X	O	X	O	O	O
COMPASS 215M Laserhead		X	O	X	O	O	O
COMPASS 315M Laserhead		X	O	X	O	O	O
COMPASS 115M Powersupply		X	O	X	O	O	O
COMPASS 215M Powersupply		X	O	X	O	O	O
COMPASS 315M Powersupply		X	O	X	O	O	O
COMPASS x15M Heatsink		X	O	O	O	O	O
COMPASS x15M CONTROLLER CABLE		X	O	O	O	O	O
COMPASS x15M CABLE SET ANALOG DONGLE		X	O	O	O	O	O

Emplacement des Étiquettes de Sécurité

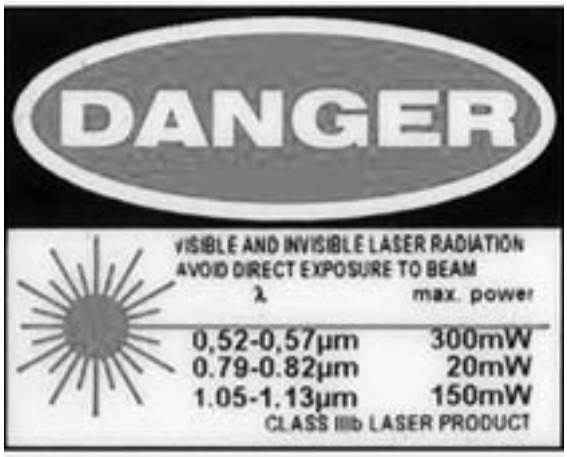
Se référer à la Figure 1-4 pour l'emplacement des étiquettes de sécurité.



NOTA : EXPLICATION DANS LES PAGES SUIVANTES

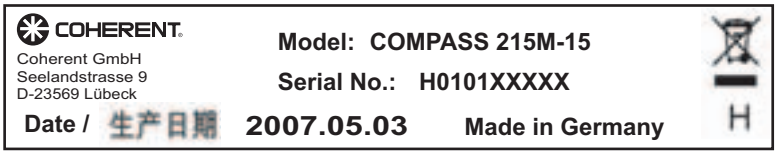
Figure 1-4 : Etiquettes de Sécurité (Sheet 1 of 2)

1.



2.

3.



4.

Figure 1-4 : Etiquettes de Sécurité (Sheet 2 of 2)

SECTION TWO: DESCRIPTION AND SPECIFICATIONS

System Description

The Compass 215M laser is a miniature solid-state, diode-pumped laser system designed for OEM and industrial use. The Compass 215M is an intracavity frequency-doubled Nd:YAG laser that provides variable output powers of 532 nm (green) wavelength. Refer to Table 2-1 for output power of each version.

The Compass 215M can be remotely controlled and monitored using the analog interface.

The Compass 215M laser system consists of:

- Laser head
- Analog controller
  - Cable – laser head to analog controller
- DC power supply (optional)
  - Pigtail cable/connector
- Heat Sink (optional)

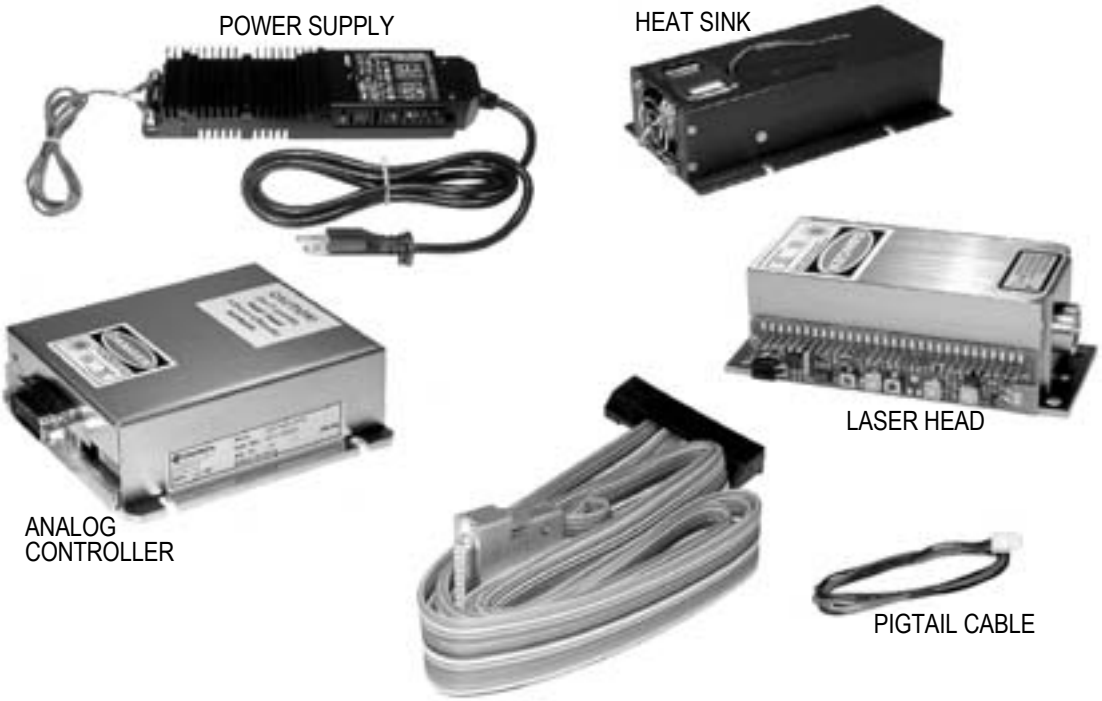


Figure 2-1. Compass 215M Laser Components

Laser Head

The emission wavelength of the diode laser is selected and temperature tuned to match an absorption band of the Nd:YAG material at approximately 810 nm. The advantages of pumping with a semiconductor diode laser rather than a flashlamp include:

- Higher efficiency
- Longer lifetime
- Small and rugged package
- Hazardous voltages not required

The optical layout of the Compass 215M is shown schematically in Figure 2-2. Rather than pumping the Nd:YAG rod from the side, as in a flashlamp pumped laser, the point source characteristic of the Compass 215M diode laser permits very effective pumping in an end-pump configuration.

The highly divergent and astigmatic output beam of the diode laser is imaged onto the laser rod by lens 1 through the dichroic rear mirror 1 of the YAG laser. Mirror 1 together with the output coupler mirror 2 forms the Nd:YAG laser resonator.

The resonator contains the active Nd:YAG crystal and a frequency doubling crystal. Both resonator mirrors are highly reflective for the fundamental wavelength of 1064 nm of Nd:YAG. By building up a high resonator internal power, the intensity becomes high enough for the frequency doubling crystal to generate light of 532 nm wavelength in a non-linear process. After emerging from the output coupler, the Nd:YAG laser beam passes through a collimating lens and exits through the case window.

In order to be absorbed optimally by the Nd:YAG crystal, the diode laser must emit a wavelength of approximately 810 nm.

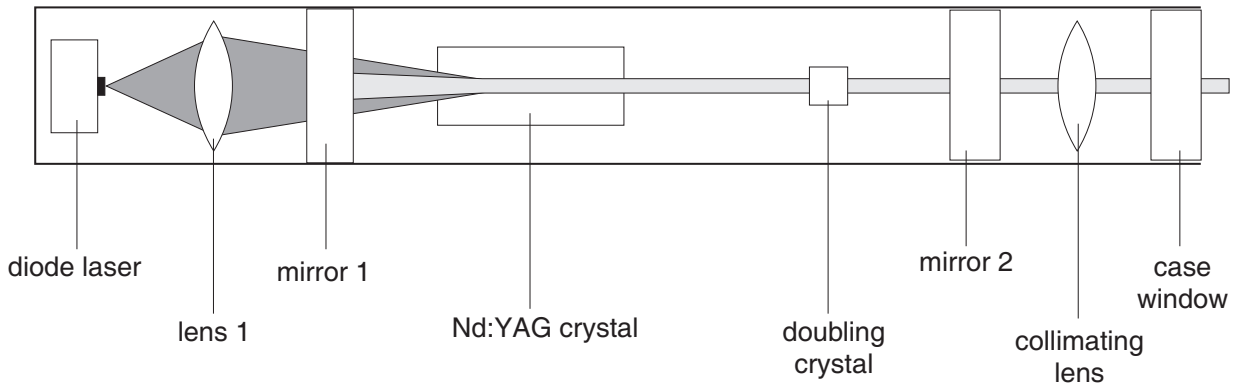


Figure 2-2. Optical Schematic

Since the diode laser exhibits a variation of wavelength with temperature (~ 0.3 nm/°C), fine control of its wavelength can be achieved by control of the operating temperature. A thermoelectric cooler is mounted within the laser head to provide for both heating and cooling as needed. Excess heat is removed via the baseplate of the laser head.

Analog Controller

The analog controller controls diode laser operation and active resonator parameters. It also provides a remote autostart function and status monitoring over an I/O interface. Refer to Figure 4-3 and Table 4-2 for a description of the I/O interface (15-pin analog connector). Table 3-1 lists the command and status signals.

Connecting a user-designed analog control (and monitoring) circuit controls and monitors the system. System monitoring is available if included in the user-designed control circuit. System control via a user-designed analog control is possible if the jumper, as shown in Figure 4-3, item 3, is open.

Power Supply

The optional self-contained commercial power supply (50W) provides an output of 5 VDC. Any power supply that complies with the specifications listed in Table 2-1 can be used; the optional power supply is recommended, however.

Heat Sink/ Cooling Fan

A heat sink with an optional DC cooling fan is provided for temporary operation or for initial testing of the laser system. The ambient temperature must not exceed 35°C. The heat sink has a thermal impedance of 0.6ºC/W. The fan is powered by a DC connector on the laser head as described in Section Three: Installation.

Specifications

Specifications for the Compass 215M laser are listed in Table 2-1.

Table 2-1. Specifications, Dimensions, and Features

SYSTEM SPECIFICATIONS	
Wavelength	532 nm
CW output power: Compass 215M-10 Compass 215M-15 Compass 215M-20 Compass 215M-50 Compass 215M-75	 10 mW 15 mW 20 mW 50 mW 75 mW
Spatial mode	TEMoo
M^2	< 1.1
Beam asymmetry	> 95%, 1.05:1
Beam diameter at $1/e^2$	0.32 mm
Beam divergence	< 2.5 mrad
Pointing stability	< 6 µrad/°C
Noise (10 Hz to 1 GHz)	<0.5% (rms)
Long term power stability	< ± 2% over 8 hours
Warm up time	< 10 minutes
Polarization ratio	100:1, vertical
Static alignment tolerances:[1] Beam position Beam angle	 ± 0.25 mm ± 1.0 mrad
UTILITY AND ENVIRONMENTAL REQUIREMENTS	
Operating voltage[2]	5 VDC ± 5%
Power consumption	< 50W
Laser head baseplate temperature range (non condensing)	10 to 45°C

All specifications are subject to change without notice.

[1] Static alignment tolerances are relative to dowel holes.

[2] The optional power supply must meet the following requirements:

- DC Voltage: + 5V ± 5%
- Power: 50W
- Ripple: < 5% peak-to-peak

Table 2-1. Specifications, Dimensions, and Features (Continued)

Maximum power consumption: Laser head Analog controller	 < 25W < 15W
Storage temperature	−20°C to 70°C (−4ºF to 158ºF)
Beam height	19 mm
Recommended orientation for integration	Horizontal
Dimensions (length x width x height): Laser Head Analog Controller Heatsink (optional) Power Supply (optional) Cable - Laser head to analog controller	 100 x 42 x 32 mm (4 x 1.7 x 1.3 in) 100 x 104 x 33.6 mm (4 x 4.1 x 1.3 in) 155 x 85 x 40 mm (6.1 x 3.3 x 1.6 in) 235 x 63.5 x 35 mm (9.3 x 2.5 x 1.4 in) ca. 1 m (3.3 ft.)
Weights: Laser Head Analog Controller Heatsink (optional) Power Supply (optional)[2] Cable - Laser head to analog controller	 0.25 kg (0.55 lb.) 0.24 kg (0.53 lb.) 0.35 kg (0.77 lb.) 0.70 kg (1.54 lb.) 0.35 kg (0.77 lb.)

All specifications are subject to change without notice.

[1] Static alignment tolerances are relative to dowel holes.

[2] The optional power supply must meet the following requirements:

- DC Voltage: + 5V ± 5%
- Power: 50W
- Ripple: < 5% peak-to-peak

SECTION THREE: INSTALLATION

Installation

Installation consists of performing the following basic steps:

1. Determine heat sink requirements and install heat sink.
2. Interconnect system components.
3. Close autostart function.
4. Connect a means of controlling (and monitoring) the laser system.
5. Connect the system to a power source.

The above tasks are described in this section. After performing all of the above tasks, the laser can be turned on and operated in accordance with Section Four: Operation.

Do not operate the system without a heat sink installed on the laser head.

Heat Sink Requirement

It is imperative that the laser head be adequately heat sinked; otherwise, it will overheat and shut down in a matter of seconds. The graph on Figure 3-1 allows determination of the heat sink thermal impedance requirement based on the anticipated ambient temperature.

For example, if the maximum expected ambient temperature is 35°C, then the heat sink thermal impedance must be 0.7°C/W or less.

Note that the mounting surface of the heat sink must be very flat to ensure good thermal contact and to avoid damage to the laser head. Many extruded heat sinks are warped and the mounting surface should thus be milled flat—to within 0.05 mm over the mounting surface. Thermal grease should be used between the laser head and heat sink to maximize thermal contact.

For an overview of heat sink technology, refer to any standard heat sink catalog.

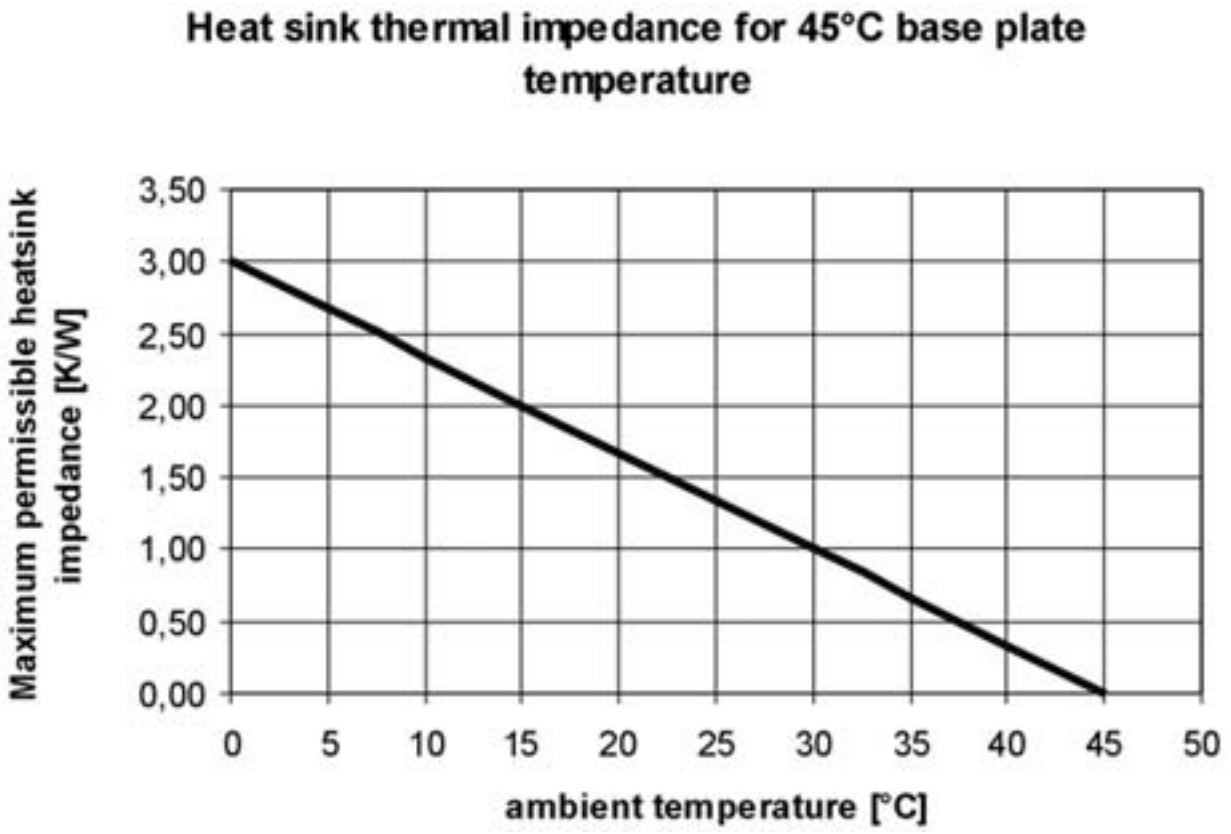


Figure 3-1. Heat Sink Thermal Impedance

The analog controller also requires heat sinking, albeit considerably less than that for the laser head. The maximum heat developed in the controller is 15W, and the maximum baseplate temperature allowed is 90°C. Consequently, with an ambient temperature of 45°C, heat sinking with a thermal impedance of approximately 3.0°C/W will suffice for the controller.

After establishing heat sink requirements and attaching the heat sinks, proceed to the paragraph titled "Interconnections".

Interconnections

Figure 3-3 and Figure 3-4 show the physical location of the laser system components, dimensions of the laser head, and the analog controller.

Ensure that the laser head and analog controller are adequately heat sinked as described in the section titled "Heat Sink Requirement".

To prevent surge currents, do not apply power to the laser system until all connections have been established.

1. The laser head connector is protected from electrostatic discharge (ESD) during shipping. Remove any and all packing and protection materials from the connector.
2. Connect the laser system as shown on Figure 3-2 (for analog control).

   Do not connect the laser system to any power source at this time.
3. Remove the protective cover from the laser head output window.
4. Proceed to the paragraph titled "Installing System Control and Monitoring" on page 3-7.

Heat Sink/ Cooling Fan

An optional heat sink with DC cooling fan is provided for temporary operation or for initial testing of the laser system. The heat sink has a thermal impedance of 0.6ºC/W. The heat sink is powered by a DC connector on the laser head (Figure 4-2, item 5).

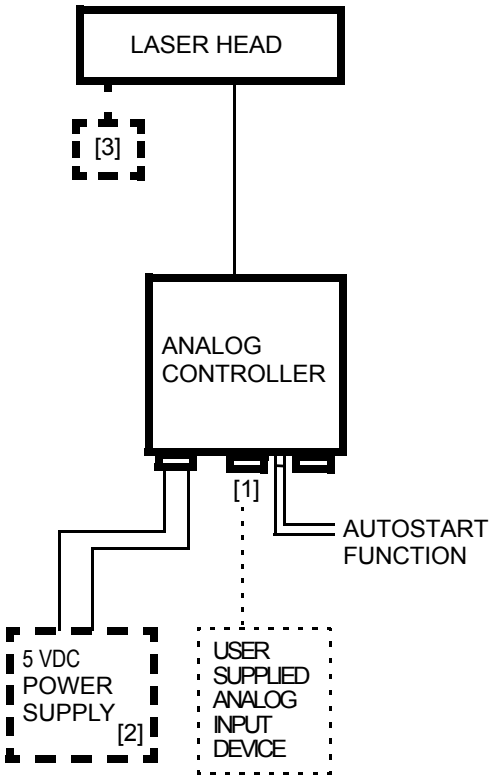
The voltage is 5 VDC. The upper connector on the laser head is positive. The red fan lead is positive.

Connecting a User-Furnished Power Supply

Any power supply that complies with the specifications listed in Table 2-1 can be used with the laser system; however, the optional power supply is recommended. If a user-furnished power supply will be used, a pigtail cable is supplied to connect a furnished power supply to the analog controller.

One end of the pigtail cable connects to the analog connector (Figure 4-3, item 4). The other end consists of two un-terminated leads for connecting to the user power supply. Ensure that the polarity of the connection is correct. The plus (+) and minus (–) terminals are identified at the analog controller.

The unassembled connector can be used if the pigtail cable does not meet user requirements.



ANALOG CONTROL CONFIGURATION

NOTES:

- - - - - OPTIONAL EQUIPMENT

. . . . . USER FURNISHED EQUIPMENT

[1] A user-supplied analog input and monitoring device can be connected to the analog connector for laser system control.

[2] If the user elects to provide his own DC power supply, the laser system input requirements for DC level, power, ripple, and noise are listed in the paragraph titled "Connecting a User-Furnished Power Supply" on page 3-3.

[3] A fan can be connected to the laser head. Refer to Figure 3-2 and Table 3-2 for additional information about the fan connector. Also refer to the paragraph titled "Heat Sink/ Cooling Fan" on page 3-3.

Figure 3-2. Interconnection Diagram

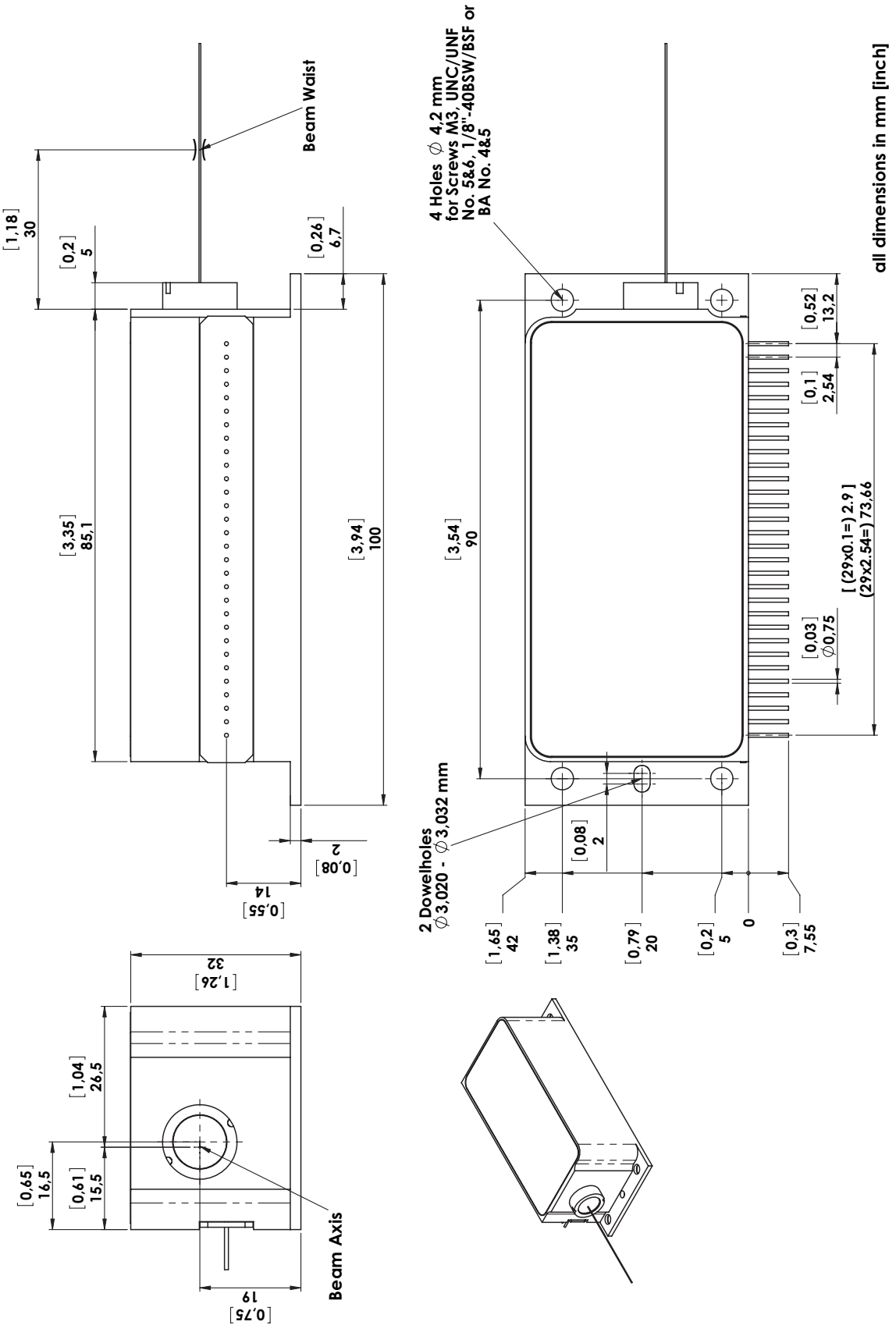


Figure 3-3. Laser Head Dimensions

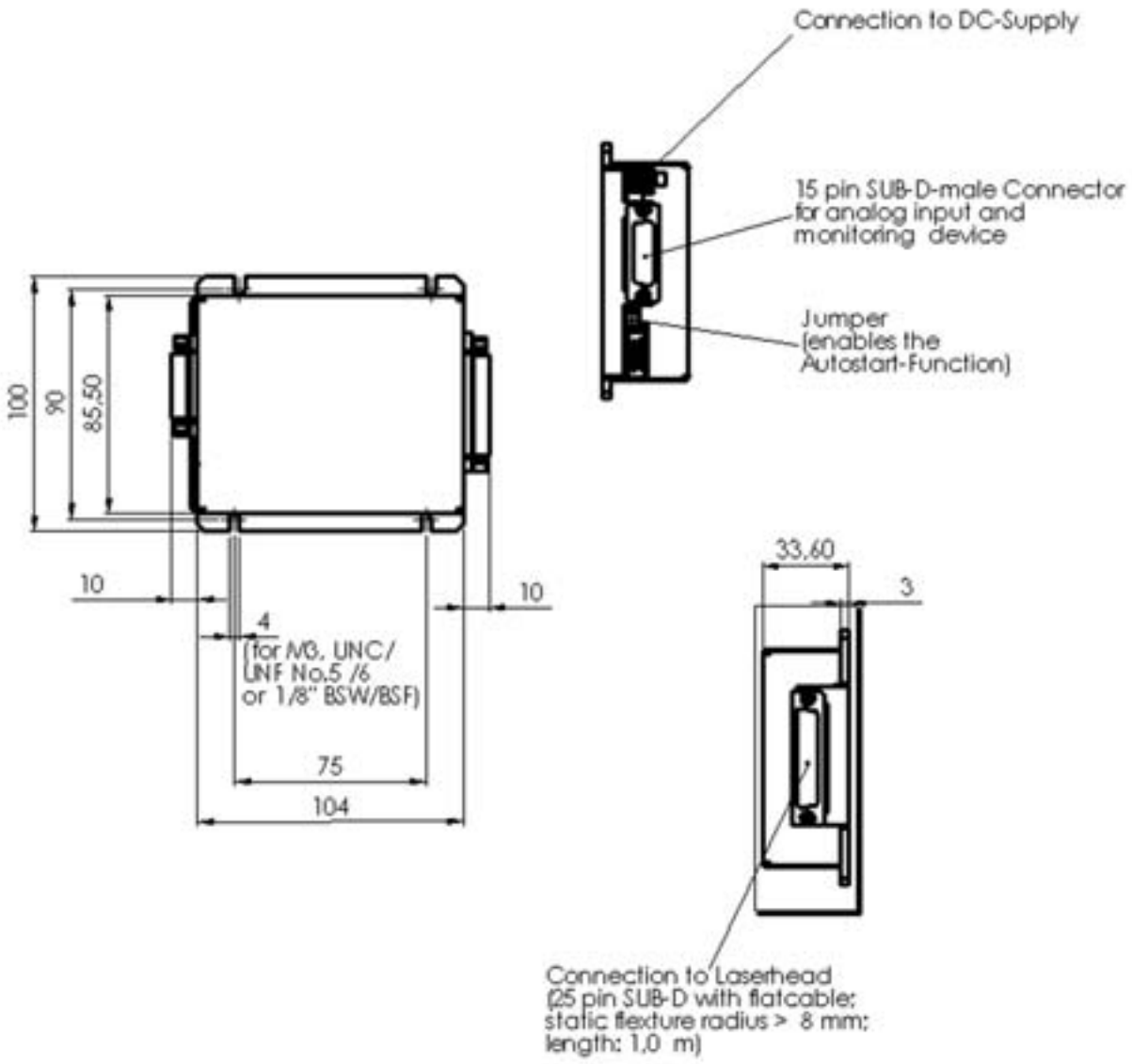


Figure 3-4. Analog Controller Dimensions

Installing System Control and Monitoring

The Compass 215M laser can be controlled and monitored by connecting a user-furnished analog control and monitoring circuit to the analog controller. The setup of this user furnished device is described in the following paragraph.

In addition an autostart function allows operation without a user-furnished analog input device.

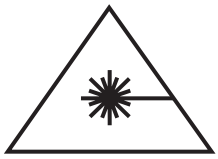
Autostart Function

The Autostart Function allows activation of the laser without a user-furnished analog input device.

The Autostart Function is activated by closing the pins of the Autostart Function connection at the analog controller e.g. via a jumper or a remote switch (see Figure 4-3, item 3). A connector is delivered with the laser.

In case of an activated Autostart Function (Autostart jumper set resp. Autostart switch closed) the interlock will be overruled!

For an active interlock circuit the Autostart Function must be deactivated.



In case of an activated Autostart Function the laser starts automatically after warm-up and emits laser light.

The OEM is responsible for compliance with all applicable safety regulations.

Control via a User Furnished Analog Input Device

Refer to Table 3-1 for a description of the analog controller connector pins. A user interface can be designed to enable all commands and monitor all laser system status available on the connector. **Therefore, the autostart jumper must be open.** Refer to Table 3-2 for the impedance of each pin.

A minimal interface must control the following in- and outputs:

Pin 1, Interlock

The laser turns on only if the interlock pin is connected (for example, via a door switch). Opening the interlock loop turns the laser off. After reconnection of the interlock, there is a 3-second delay before the laser restarts. **Notice: A set autostart jumper will overrule the interlock!**

Pin 13, Laser Power Set-Point

The analog input for pin 13 ranges from 0 to 5V. This corresponds to output powers from about 0 to the maximum-rated power. To become the present power set-point, it has to be transferred into the internal non-volatile memory of the laser controller by applying the ENTER signal to pin 8. After the enter signal has been applied, the voltage on pin 13 is ignored.

Pin 8, Enter

This pin is internally pulled up to 5V with an 100 Kohm resistor. To initiate the enter signal, this voltage must be pulled down to analog ground (pin 10) for at least 1 ms. The rising edge from 0 to 5V then writes the analog voltage, which is applied on pin 13 into the non-volatile memory. Afterwards, the controller initiates a search procedure for optimal operation parameters. Refer to Figure 4-1 for turn-on characteristics.

Although the internal memory is non-volatile, the procedure of applying a voltage to pin 13 and initiating a reset to pin 8 should be performed each time the facility power has been turned on.

During operation, the Laser Power Set-Point and Enter commands can be used to change the power level. This always initiates a search procedure with the typical turn-on characteristic. It is not necessary to turn the laser diode off for power changes.

Pin 3, Power On/Off

Power On/Off is a TTL input (TTL high = on, low = off) to turn all power stages except the diode laser on to allow thermalization of components without the laser diode being turned on. The rising edge from TTL low to high starts all temperature control stages. The Power On/Off signal must remain high during operation.

Should the laser turn off due to a heat sink over-temperature error (status on pin 12) or an over-temperature of thermalized components (status on pin 7), the temperature control stages can only be turned on again by a rising edge signal on pin 3 with the high level retained. Refer to Figure 3-6 for more information.

Pin 6, Power On/Off Status

TTL output that indicates Power On/Off status.

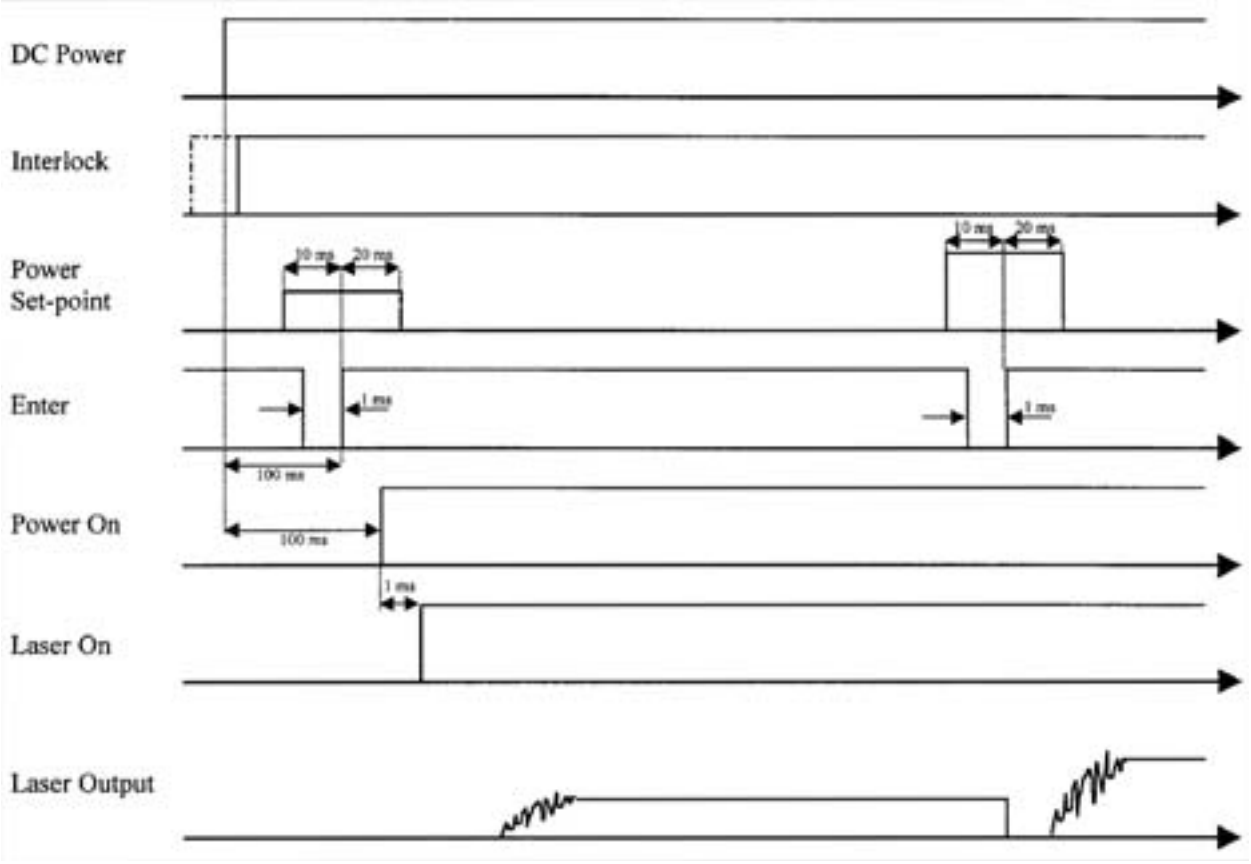
TTL low indicates power is off (laser is not thermalized). In this case, the laser diode cannot be turned on.

TTL high indicates the laser is thermalized and the laser diode can be turned on.

Pin 2, Laser On/Off

Laser On/Off is a TTL input (TTL high = on, low = off) to turn the laser diode on and off. The rising edge turns the laser diode on. The signal must remain high during laser diode operation. With the laser diode off, the thermalization remains active in preparation for the next turn-on. When the laser is reactivated, the search procedure begins immediately; there is no thermalization wait time.

Should the laser turn off either due to a heat sink over-temperature error (status on pin 12) or a over-temperature of thermalized components (status on pin 7), the laser can only be turned on again by a rising edge signal on pin 2 with the high level retained. Refer to Figure 3-6.



Note: Time intervals given in the diagram are minimum values.

Figure 3-5. Timing Diagram

There is a typical 3-second delay for laser safety between the Laser On high signal and turn on of the diode laser.

Pin 4, Laser On/Off Status

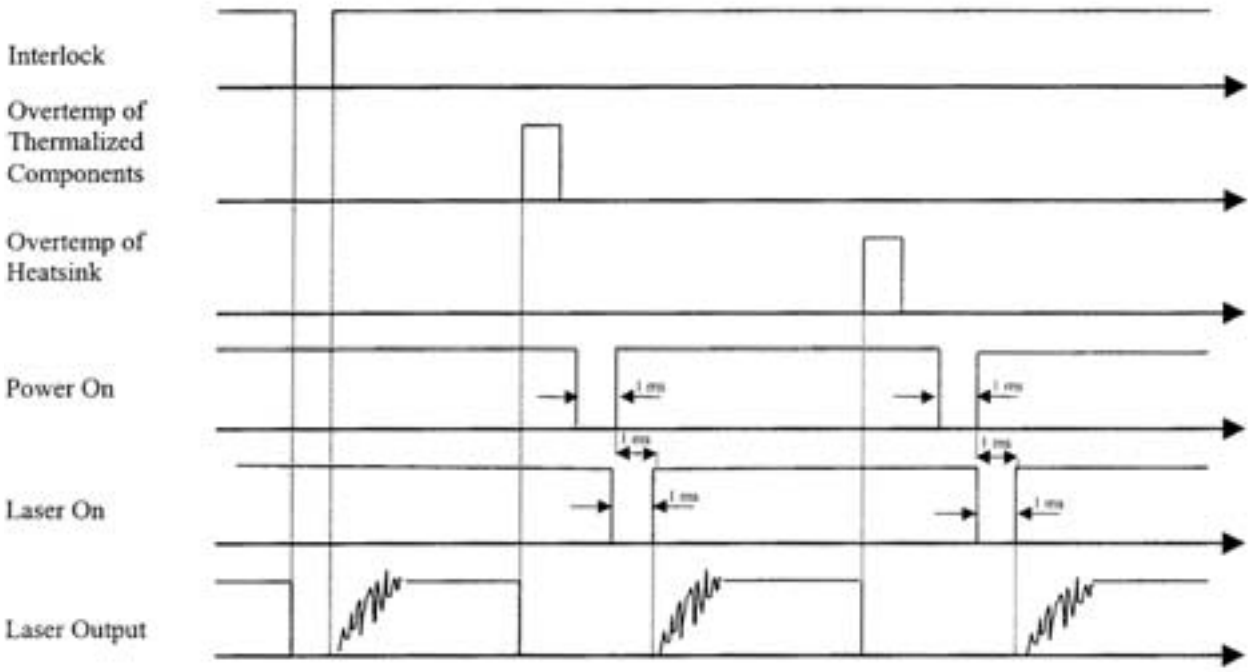
A TTL output that can be used to monitor the status of the laser diode and hence the laser. TTL high = on, low = off.

In summary, the following turn-on procedure is recommended:

1. Close interlock loop.
2. Turn on facility power, 5 VDC.
3. Apply analog voltage between 0 and 5V at pin 13 to set the power level.
4. Pull pin 8 to analog ground (longer than 1 millisecond) to initiate the enter command.
5. Rising edge with retained TTL high on pin 3 to turn the power on.
6. Rising edge with retained TTL high on pin 2 to turn the laser on.

Indicators and Fault Handling

- *Interlock interruption*. The laser starts automatically after the interlock loop is closed again.
- *Overtemperature of thermalized components (pin 7)*. The laser can be turned on again by first applying a rising edge on pin 3 (Power On) with remaining TTL high, and then by applying the same to pin 2 (Laser On). Check the heat sink, thermal contact between laser head base plate and the heat sink and environmental conditions. Contact Coherent or an authorized representative if the problem persists.
- *Heat sink overtemperature*. The laser can be turned on again by first applying a rising edge on pin 3 (Power On) with remaining TTL high, and then by applying the same to pin 2 (Laser On). Check the heat sink, thermal contact between the heat sink and the laser head base plate and environmental conditions. Choose a better heat sink if the problem persists.
- *Laser diode overcurrent*. Turn the system off. Check the entire system, especially electronics, and try to turn the system on again. Contact Coherent or an authorized representative if the problem persists.
- *Laser ready (pin 15) turns to TTL high*. The actual power is within a certain window of the laser power set point. During the search procedure after turn on, there can be transient high periods. Therefore this output must be monitored for approximately 30 seconds to ensure that the laser output is stable.



Note: Time intervals shown in the diagram are minimum values.

Figure 3-6. Timing Diagram of Fault Handling

External Interlock

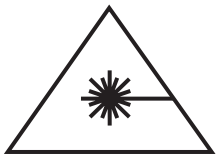
The system will not operate with the interlock open. The interlock is closed when the pins of the interlock on the analog controller connector (Figure 4-3, item 3) are connected.

An external interlock circuit can be connected to the laser system and wired to a door switch to provide additional operating safety. The laser starts automatically after the interlock loop is closed again.

To incorporate an external safety interlock circuit into the laser system, turn the laser off and remove the jumper between the pins of the interlock on the analog controller connector. Attach the external interlock circuit to these terminals. Any external interlock circuit should be equivalent to a mechanical closure of the circuit.

In case of an activated Autostart Function (Autostart jumper set resp. Autostart switch closed) the interlock will be overruled!

For an active interlock circuit the Autostart Function must be deactivated.



In case of an activated Autostart Function the laser starts automatically after warm-up and emits laser light.

The OEM is responsible for compliance with all applicable safety regulations.

Table 3-1. Analog Controller – Control and Monitoring Interface

PIN	DESCRIPTION	FUNCTION
1	Interlock	Connects through a user-supplied external interlock switch to 5V, which is available on pin 11 of this connector. With the switch closed, the laser can be activated. Opening the switch stops laser action immediately. **Notice: A set autostart jumper will overrule the interlock!**
2	Laser On/Off (command)	Laser on/off input (TTL high = on, low = off). This command turns only the laser diode on and off. With the laser diode off, the thermoelectric elements remain active, holding the laser components thermalized in preparation for the next turn-on. When the laser is reactivated, the search procedure begins immediately; there is no thermalization wait time. **Notice: A set autostart jumper will overrule the Laser On/ Off command!**
3	Power On/Off (command)	Power on/off input (TTL high = on, low = off). This command turns all power stages except the laser diode on, allowing thermalization of components without the laser diode being on. When switched to off, all power stages including the laser diode (if it were turned on) are shut down.
4	Laser On/Off (status)	Laser on/off output (TTL high = on, low = off). This output can be used to monitor the on/off status of the laser diode and therefore of the laser.
5	Laser Diode Overcurrent (status)	Laser diode overcurrent output (TTL high = overcurrent, low = OK). Monitoring this output assists in troubleshooting. Because the laser diode is heavily protected from overcurrent, a high signal here is indicative of a serious problem.
6	Power On/Off (status)	Power on/off output (TTL high = on, low = off). Indicates the status of pin 3 and verifies that the controller has accepted the power on or off signal.

Table 3-1. Analog Controller – Control and Monitoring Interface (Continued)

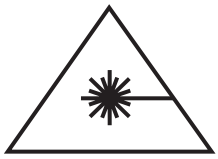
PIN	DESCRIPTION	FUNCTION
7	Overtemperature (status)	Overtemperature of thermalized components output (TTL high = over-temperature, low = OK). The laser will automatically shut down if an overtemperature occurs. After it has cooled to a sufficiently low temperature, the laser can be restarted using the "laser on" and "power on" signals.
8	Enter (command)	Enter input TTL. This pin is normally high and requires a pull-down pulse with a time duration of at least 1 msec in order to trigger the enter command. The rising flank to 5V enters the analog power setpoint (pin 13) into memory and initiates the search for optimal parameters. It is necessary to trigger enter every time that the set output power is changed.
9	Digital Ground	Digital ground.
10	Analog Ground	Analog ground.
11	+ 5V Output	+ 5V output (max. 200 mA). This output can be used for the TTL signals.
12	Heat Sink Overtemp (status)	Overtemperature of heat sink output (TTL high = over-temperature, low = OK). An over-temperature indication here means the heat sinking is inadequate for the existing ambient temperature. Either lower the ambient temperature or improve the heat sinking. When overtemperature is indicated, the laser shuts down. After it has cooled down sufficiently, the laser can be restarted using the power on and laser on signals.
13	Laser Power Setpoint (command)	Laser power setpoint input. Voltage of 0 to 5V corresponds to set output power of 0 to maximum. This input only gives the desired set-point for output power; Enter (pin 8) must be triggered to actualize.
14	Power Monitor Output (status)	Internal power monitor output. Output voltage of 0 to 5V corresponds to laser output power of 0 to maximum. For accurate indication of output power, it will be necessary to calibrate against a user-provided external detector.
15	Laser Ready (status)	Laser ready output (TTL high = ready, low = not ready). This output turns to TTL high if the actual power is within a certain window of the laser power set point. During the search procedure after turn-on, there can be transient high periods. Therefore this output should be monitored for ~ 30 seconds to ensure that the laser output is stable.

Table 3-2. Analog-Interface

PIN	PIN NAME	DIRECTION	MIN. / MAX. TERMINAL IMPEDANCE
1	Interlock	–	< 1 k
2	Laser On/Off	Command	< 1 k
3	Power On/Off	Command	< 1 k
4	Laser On/Off	Status	> 4,7 Kohm
5	LD Overcurrent	Status	> 4,7 Kohm
6	Power On/Off	Status	> 4,7 Kohm
7	Overtemp	Status	> 4,7 Kohm
8	Enter	Command	< 1 k
9	Digital Ground	–	–
10	Analog Ground	–	–
11	+ 5V Output (200 mA max.)	–	–
12	Overtemp Heatsink	Status	> 4,7 Kohm
13	Laser Power Setpoint	Command	< 100R (int. Impedance 4,7 k)
14	Power Monitor Output	Status	> 1M (int. Impedance 1 k)
15	Laser Ready	Status	> 4,7 K

SECTION FOUR: OPERATION

Operation



All personnel must wear laser safety glasses to protect against the radiation generated from the laser.

It is assumed that the operator has read Section One: Laser Safety, and is familiar with laser safety practices and the dangers involved.

Turn-On and Turn-Off

The following assumes that the laser has been installed in accordance with the procedures in Section Three: Installation.

Applying and removing facility power to and from the laser system will turn the system on and off. A delay will occur before laser light is emitted as shown on Figure 4-1 and as described in the paragraph titled "Turn-On Characteristics" on page 4-2.

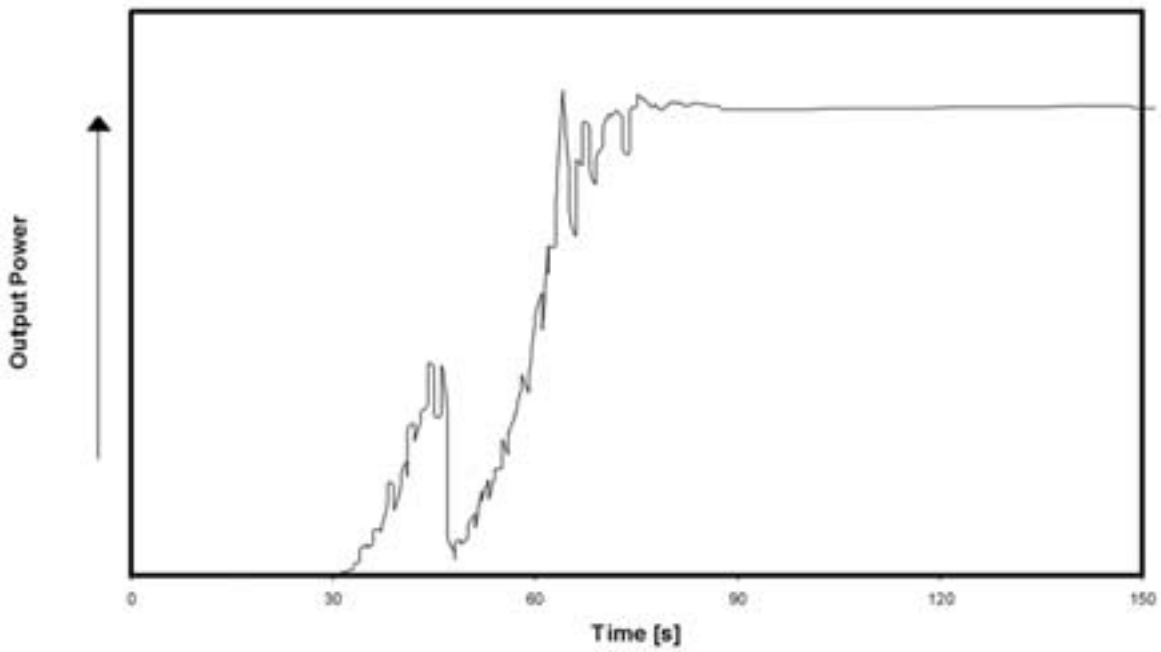


Figure 4-1. Turn-On Characteristics

After turn-on, proceed to the paragraph titled "Controlling the Laser System" on page 4-2.

If the laser does not start, refer to the troubleshooting charts located in Section Five: Troubleshooting.

User-Furnished Analog Input Device

Control of the Compass 215M via a user-furnished analog input device is possible if the jumper (shown in Figure 4-3, item 3) is open only.

Applying a TTL high or low to pin 2 on the analog controller connector as described in Table 3-1 will turn the system on and off. A delay will occur before laser light is emitted as shown on Figure 4-1 and as described in the paragraph titled "Turn-On Characteristics" on page 4-2.

After turn-on, proceed to the paragraph titled "Controlling the Laser System" on page 4-2.

If the laser does not start, refer to the troubleshooting charts located in Section Five: Troubleshooting.

Turn-On Characteristics

After power-up or a request for a new power output level, the controller goes through a search procedure in which the operating values of the laser diode (current and temperature) and of the resonator (temperature) are systematically varied until an optimal operating point is found. The laser output will fluctuate during this phase. Typically this process lasts 1 to 3 minutes.

Once the optimal values are established, the diode laser parameters are held constant and stable output power is maintained by regulation of the resonator parameters. A laser ready status signal is available from the analog controller connector, pin 15, when the output power is within a certain range of the set-point power.

Controlling the Laser System

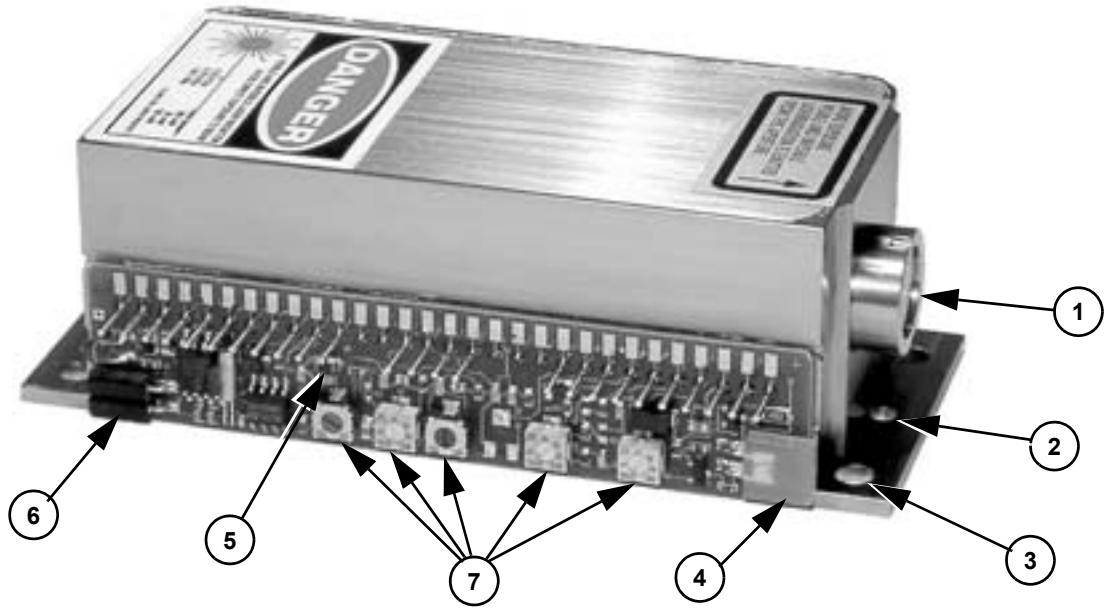
User-Furnished Analog Input Device

All laser system control and monitoring functions listed in Table 3-1 are available when a user-furnished analog input and monitoring device is connected to the analog controller.

It may be advantageous to calibrate the laser output power setpoints against the 0 to 5V input using a calibrated external power meter.

Note that the specifications of the Compass 215M are valid for nominal power level only.

Controls, Indicators, and Features



1. Exit window
2. Dowel holes
3. Mounting screw holes
4. LED
5. Laser head interface pins
6. Fan connector
7. Potentiometer

Figure 4-2. Laser Head Features

Table 4-1. Laser Head Features

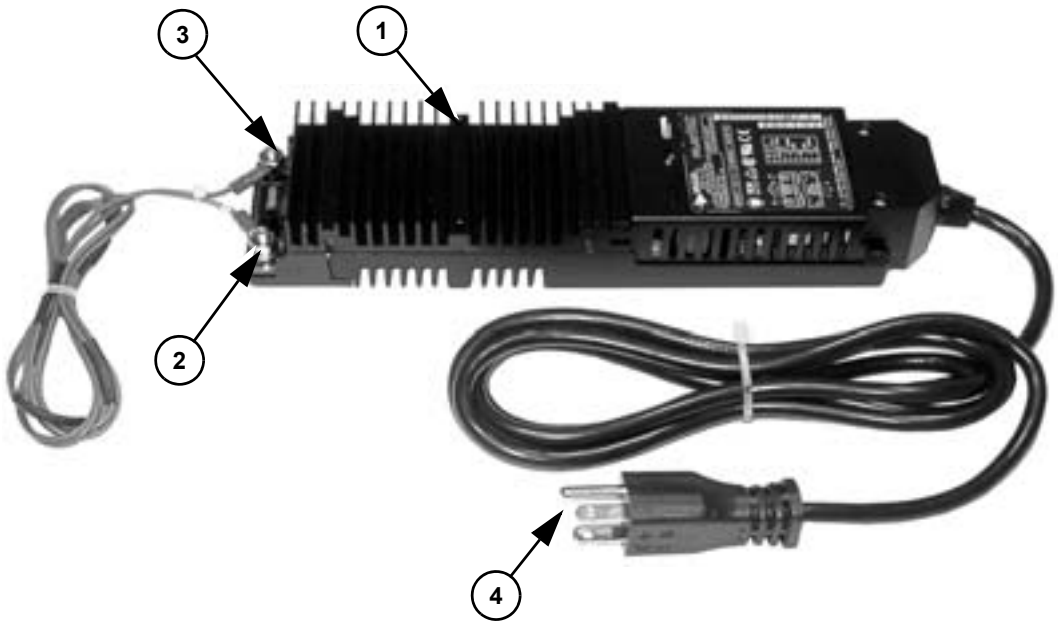
ITEM	CONTROL	FUNCTION
1	Exit window	532 nm laser light exits the sealed laser head from this window.
2	Dowel holes	Two dowel holes (3 mm, H7) as a reference for beam position and angle.
3	Mounting screw holes	Four mounting screws secure the laser head to the heat sink. Section Three: Installation, describes the exact position of these holes. Refer to this section, for additional information on heat sinks. Failure to properly heat sink the laser head will cause the system to shut down.
4	LED	Yellow laser radiation emission indicator.
5	Laser head interface pins	Provides an interface to the analog controller via a ribbon cable. The pins must be protected from static discharge whenever the cable is removed from the laser head.
6	Fan connector	Provides a DC voltage (same as input voltage) for connection of a cooling fan. The upper terminal is positive.
7	Potentiometer	Sealed potentiometer. Do not change any preset values. Changing preset values may result in unstable operation.

1. Connector (to laser head)
2. Factory use only
3. Autostart Function connector
4. Analog connector
5. Power supply connector

Figure 4-3. Analog Controller Features

Table 4-2. Analog Controller Features

ITEM	CONTROL	FUNCTION
1	Connector (to laser head)	Allows connection to the laser head via a ribbon cable. Refer to the interconnection diagram on Figure 3-3 for additional information.
2	Factory use only	
3	Autostart Function connector	The two pins of the autostart function connector must be connected for laser operation and can be used for use with user furnished autostart function switch.
4	Analog connector (15 pin D-connector)	Allows analog control and monitoring of the laser system. Refer to Section Four: Operation for additional information on controlling the laser system. Refer to Table 3-1 for a description of this control and monitor interface (command and status).
5	Power supply connector	Allows connection of an external 5 VDC (50W) power supply to the analog controller.

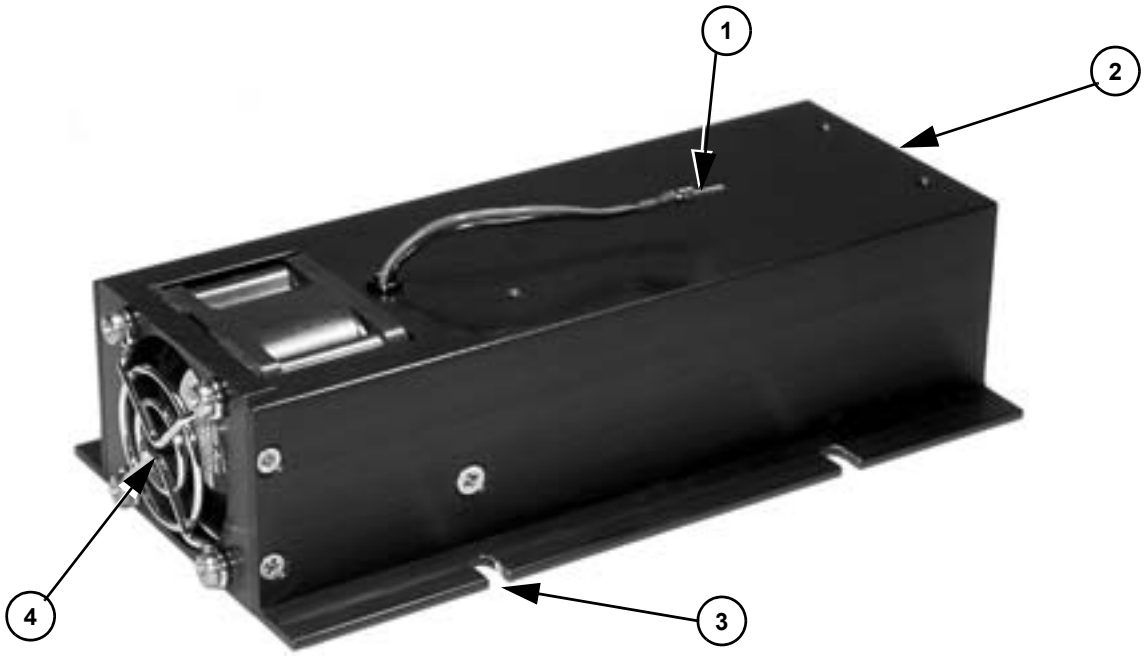


1. Mounting holes (4)
2. +OUT
3. –OUT
4. Power cord

Figure 4-4. Power Supply Connectors/Features

Table 4-3. Power Supply Connectors/Features

ITEM	CONTROL	FUNCTION
1	Mounting holes	Provides for mounting the power supply with M4 screws.
2	+OUT	Provides 5V output power from this terminal for the laser system. This voltage is also available from a connector on the laser head for powering a cooling fan if required. Refer to Figure 4-2, item 6. Refer to the interconnection diagram on Figure 3-3 for additional information.
3	–OUT	Return for the +OUT. Refer to the interconnection diagram on Figure 3-3 for additional information.
4	Power cord	Provides for connecting the laser system to a standard 110 or 230 VAC facility power outlet.



1. DC power connector
2. Laser head mounting holes
3. Heat sink mounting notch
4. Fan

Figure 4-5. Heat Sink

Table 4-4. Heat Sink

ITEM	CONTROL	FUNCTION
1	DC power connector	Provides for connecting the cooling fan to the laser head DC connector. The red lead is positive.
2	Laser head mounting holes	Provides four mounting holes for the laser head.
3	Heat sink mounting notch	Provides four mounting holes for securing the heat sink with cooling fan assembly.
4	Fan	Provides a flow of cooling air over the heat sink assembly fins.

SECTION FIVE: TROUBLESHOOTING

Table 5-1. Faults and Error Messages

PROBLEM	TROUBLESHOOTING REFERENCE
LASER DOES NOT START	
Configuration: Analog Operation	Chart 1A
Configuration: Analog Operation using a User Furnished Analog Input Device	Chart 1B
LASER SHUTS DOWN	
Configuration: Analog Operation	Chart 2A
Configuration: Analog Operation using a User Furnished Analog Input Device	Chart 2B
If the laser system or components are being returned directly to Coherent, an RMA (Return Material Authorization) number is required. Contact Coherent or an authorized representative.	

Chart 1A. Laser Does Not Start

CONFIGURATION: ANALOG OPERATION

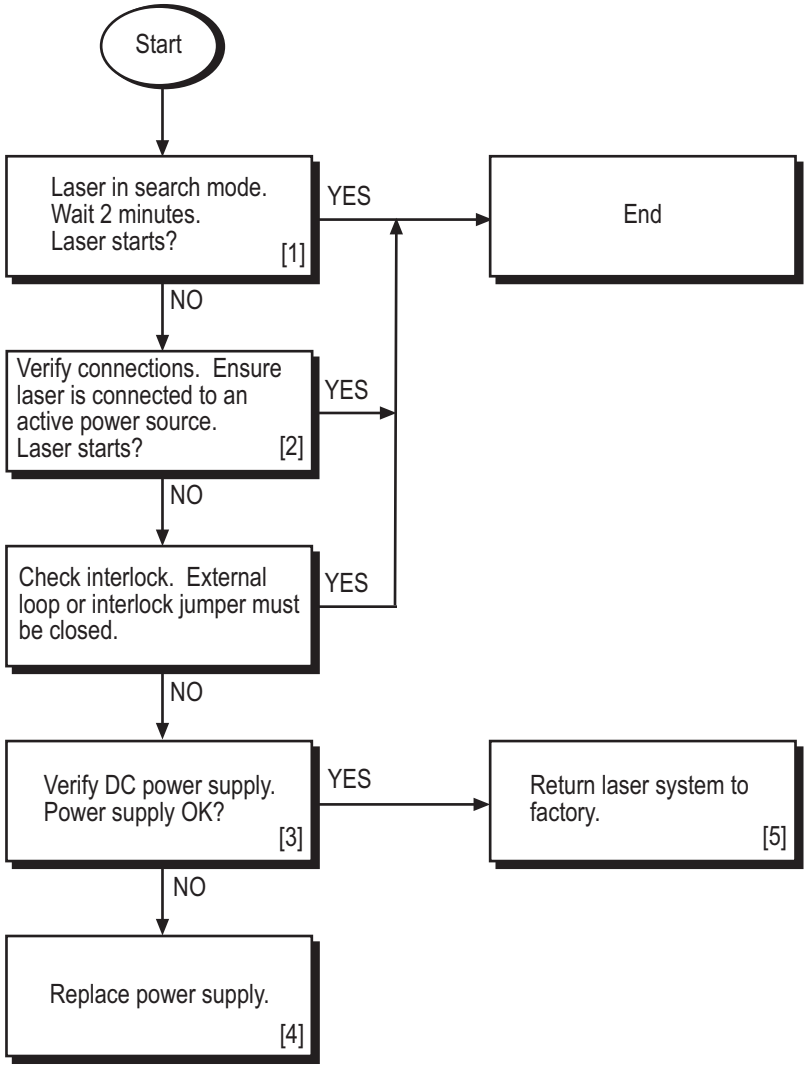


Chart 1A. Laser Does Not Start (Continued)

CONFIGURATION: ANALOG OPERATION

The numbered paragraphs below are keyed to, and supplement the flowchart for this chart.

[1] During turn-on, the laser enters a search procedure as described in Section Four: Operation. Refer to Figure 4-1, Turn-on Characteristics, and to the paragraph titled "Turn-On Characteristics" on page 4-2 for additional information on the search procedure. Wait at least 3 minutes for the laser to complete the search procedure.

[2] An interconnection diagram is shown on Figure 3-3. Disconnect the laser system from facility power and verify the following:

- All cables are installed
- All connectors are firmly seated

Re-connect the laser system to facility power. If using a power supply other than the Vicor power supply, ensure it is turned on.

[3] With the laser system connected to facility power, verify the following power supply output parameters between the two terminals (Figure 4-5, items 2 and 3).

- DC voltage:5V
- Power: 50W
- Ripple: < 5% peak-to-peak
- Line regulation:< 0.5%

[4] Disconnect the power supply from facility power prior to disconnecting the power supply from the laser system.

[5] If the laser system or components must be returned to Coherent, an RMA (Return Material Authorization) number is required. Contact Coherent or an authorized representative.

Chart 1B. Laser Does Not Start

CONFIGURATION: ANALOG OPERATION USING A USER FURNISHED ANALOG INPUT DEVICE

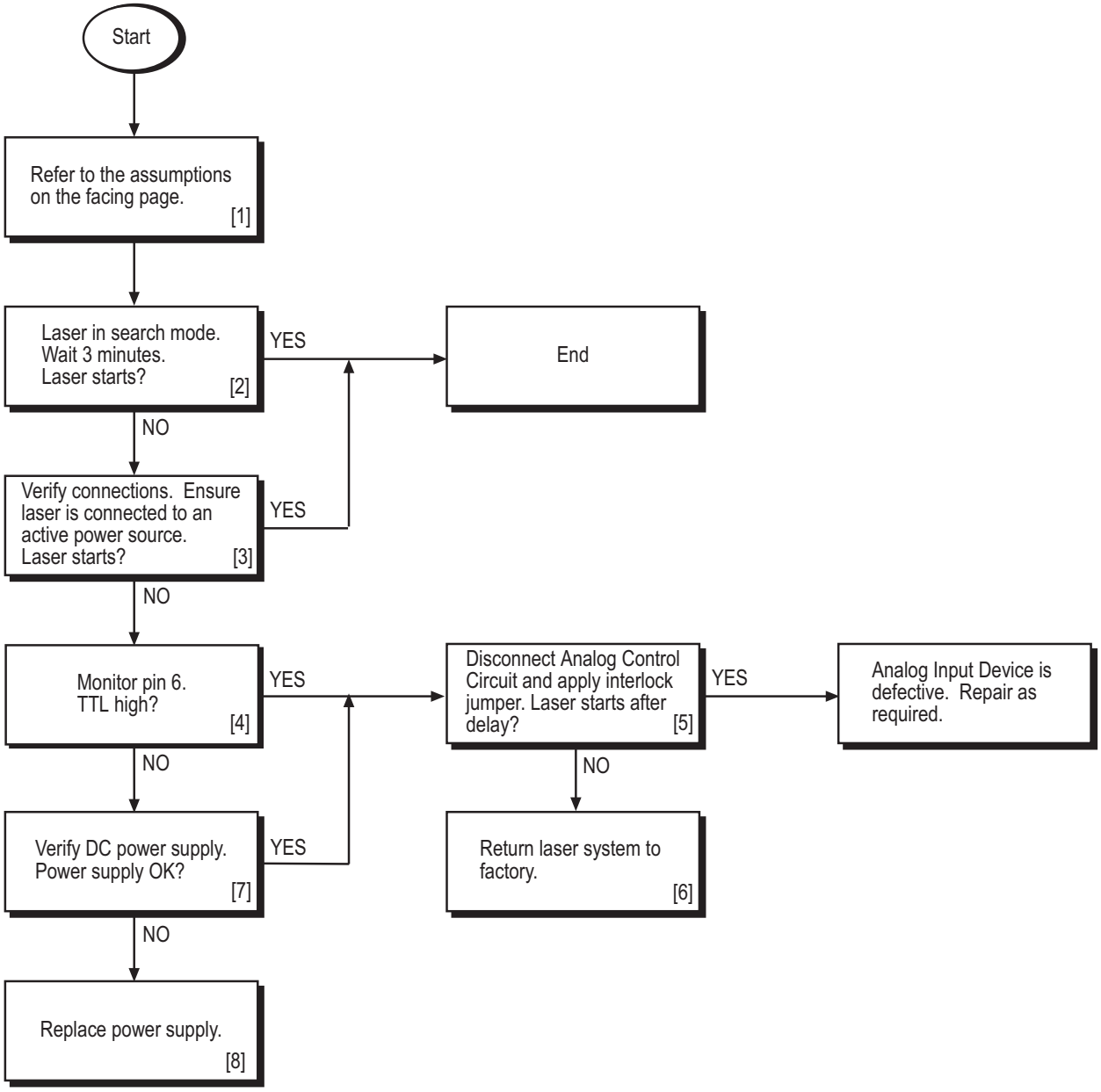


Chart 1B. Laser Does Not Start (Continued)

CONFIGURATION: ANALOG OPERATION USING A USER FURNISHED ANALOG INPUT DEVICE

The numbered paragraphs below are keyed to, and supplement the flowchart for this chart.

[1] ASSUMPTIONS:

- The laser system has been installed in accordance with the installation procedures in Section Three: Installation.
- The autostart function circuit is closed as described in the paragraph titled "Autostart Function" on page 1-3. The laser will not operate with the autostart function circuit open.
- The appropriate turn-on commands have been issued to the laser. As a minimum, pins 2 and 3 (on the analog controller 15-pin D-connector) must be TTL-high. Refer to Table 3-1 and the turn-on procedures for this configuration.
- This chart is not applicable for re-starting a laser that has shut down during operation.

[2] During turn-on, the laser enters a search procedure as described in the paragraph titled "Turn-On Characteristics" on page 4-2. Refer to Figure 4-1 for additional information on the search procedure. Wait at least 3 minutes for the laser to complete the search procedure.

[3] Referring to Table 3-1, note that the voltage level at pin 13 is proportional to laser output. 5 volts correspond to maximum nominal power. Increasing the output power will minimize the chance that the laser has been set to zero or a very low output power setting.

[4] An interconnection diagram is shown on Figure 3-3. Disconnect the laser system from facility power and verify the following:

- All cables are installed
- All connectors are firmly seated

Re-connect the laser system to facility power. If using a power supply other than the Vicor power supply, ensure it is turned on.

[5] Pin 6 refers to the analog connector (Figure 4-3, item 3) on the analog controller.

[6] Perform laser turn-off as described in the paragraph titled "Turn-On and Turn-Off" on page 4-1 (TTL low to pin 3 on the analog connector) and disconnect the laser from facility power prior to disconnecting the user-furnished analog input device.

[7] If the laser system or components must be returned directly to Coherent, an RMA (Return Material Authorization) number is required. Contact Coherent or an authorized representative.

[8] With the laser system connected to facility power, verify the following power supply output parameters between the two terminals (Figure 4-5, items 2 and 3).

- DC voltage:5V
- Power: 50W
- Ripple: < 5% peak-to-peak
- Line regulation:< 0.5%

[9] Disconnect the power supply from facility power prior to disconnecting the power supply from the laser system.

Chart 2A. Laser Shuts Down

CONFIGURATION: ANALOG OPERATION

The probable causes for the laser to shut down are:

- Over temperature
- Search mode (the laser does not actually shut down but output may not be visible)
- Open autostart function
- Laser failure
- Over current

[1] OVER TEMPERATURE

Laser shut-down due to an over temperature is caused by inadequate heat sink with respect to ambient temperature. The laser can be turned on again after it has cooled down. See Figure 3-6 for the timing diagram of fault handling. The ambient temperature and/or the heat sink must be corrected for proper continuous laser operation.

[2] OPEN AUTOSTART FUNCTION

The autostart function circuit is closed as described in the paragraph titled "Autostart Function" on page 1-3. The laser will not operate with the autostart function circuit open. Refer to Figure 4-3.

[3] LASER FAILURE

If the laser system or components must be returned directly to Coherent, an RMA (Return Material Authorization) number is required. Contact Coherent or an authorized representative.

[4] OVER CURRENT

An over current condition is considered a laser failure.

Chart 2B. Laser Shuts Down

CONFIGURATION: ANALOG OPERATION USING A USER FURNISHED ANALOG INPUT DEVICE

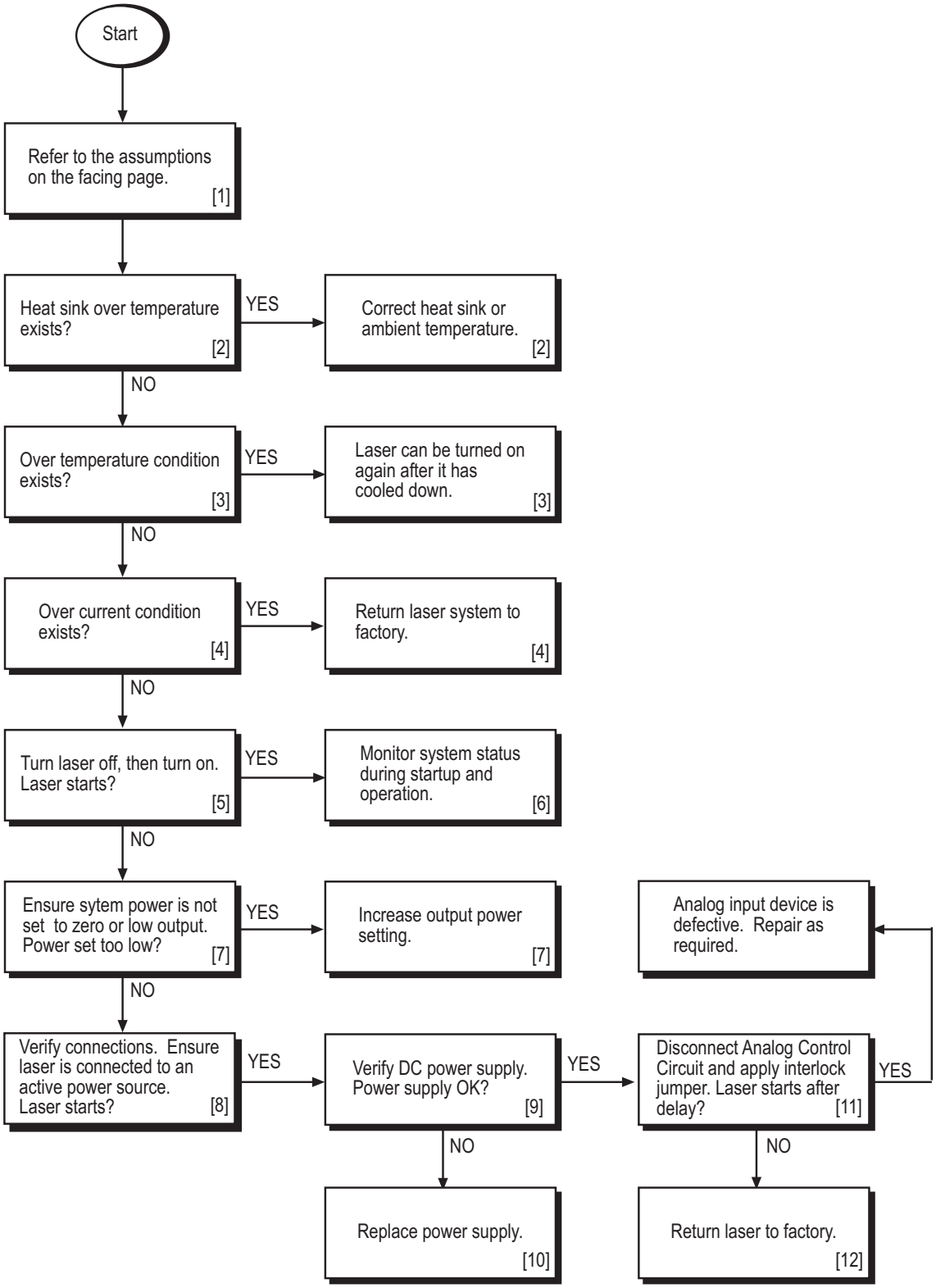


Chart 2B. Laser Shuts Down (Continued)

CONFIGURATION: ANALOG OPERATION USING A USER-FURNISHED ANALOG INPUT DEVICE

[1] ASSUMPTIONS:

- The laser system had been operating immediately prior to shutdown.
- The autostart function circuit is closed as described in the paragraph titled "Autostart Function" on page 1-3. The laser will not operate with the autostart function circuit open.

[2] Refer to Table 3-1 for information on over temperature status at pin 12. The ambient temperature and/or the heat sink must be corrected for proper continuous laser operation. Refer to Section Three: Installation, for information on establishing the correct heat based on ambient temperature.

[3] Refer to Table 3-1 for information on over temperature status at pin 7. The ambient temperature can be lowered and/or the heat sinking can be increased. If this problem persists, return the laser to the factory. If the laser system must be returned directly to Coherent, an RMA (Return Material Authorization) number is required. Contact Coherent or an authorized representative.

[4] Refer to Table 3-1 for information on over current status at pin 5. If the laser system or components must be returned directly to Coherent, an RMA (Return Material Authorization) number is required. Contact Coherent or an authorized representative.

[5] Turn the laser off by setting the input at pin 2 to TTL low as described in Table 3-1. Turn the laser on by setting the input at pin 2 to TTL high. The laser response to the on/off commands can be monitored at pin 4.

[6] Monitor the system for status and faults during the re-start attempt.

[7] Power can be increased using the Laser Power Setpoint command as described in Table 3-1.

[8] An interconnection diagram is shown on Figure 3-3. Disconnect the laser system from facility power and verify that all cables are installed and the connectors are firmly seated.

Re-connect the laser system to facility power. If using a power supply other than the Vicor power supply, ensure it is turned on.

[9] With the laser system connected to facility power, verify the following power supply output parameters between the two terminals (Figure 4-5, items 2 and 3).

- DC voltage:5V
- Power: 50W
- Ripple: < 5% peak-to-peak
- Line regulation:< 0.5%

[10] Disconnect the power supply from facility power prior to disconnecting the power supply from the laser system.

[11] Perform power turn-off (TTL low to pin 3 on the analog connector) and disconnect the laser from facility power prior to disconnecting the user furnished analog input device.

[12] If the laser system or components must be returned directly to Coherent, an RMA (Return Material Authorization) number is required. Contact Coherent or an authorized representative.

SECTION SIX: REPACKING PROCEDURE

The following is the factory-recommended repacking procedure for the Compass laser system. This procedure must be followed if the laser system is to be shipped to another location after initial installation, or returned to the factory for service.

Coherent recommends that after unpacking the system, the shipping boxes and materials be saved for shipping the laser in the future.

The Compass laser system requires two shipping boxes, available as a set with part number 1037015. Table 6-1 lists the contents of the shipping crate when the system is shipped from Coherent.

Table 6-1. Compass Shipping Box Contents

1. Laser Head
2. Analog Controller
3. Optional DC Power Supply
4. Optional Heat Sink
5. Laser Head Cable
6. Connector Kit
7. Operator's Manual

Attach anti-static foam and protective plastic cap onto the laser emission aperture during transportation.

Figure 6-1. Protective Laser Emission Cap

Place all of the components back into original protective plastic bags before shipping (except head cable and power supply)!

Figure 6-2. Packed Laser Components

Place the laser head and the controller <u>between</u> foils for maximum protection in box 1.

Figure 6-3. Place Laser Head Between Foils

Figure 6-4 shows the proper arrangement of the laser head and the controller in box 1.

Figure 6-4. Proper Arrangement of Box 1 Before Shipping

Place the power supply and the heat sink between foils for maximum protection in box 2.

Figure 6-5. Place Power Supply Between Foils

Figure 6-6 shows the proper arrangement of the power supply and the heat sink in box 2.

Figure 6-6. Proper Arrangement of Box 2 Before Shipping

WARRANTY

Coherent, Inc. warrants Diode-Pumped Solid State laser systems to the original purchaser (the Buyer) only, that the laser system, that is the subject of this sale, (a) conforms to Coherent's published specifications and (b) is free from defects in materials and workmanship.

Laser systems are warranted to conform to Coherent's published specifications and to be free from defects in materials and workmanship for a period of twelve (12+1) months. Replacement units shipped within warranty, carry the remainder warranty of the failed unit.

Responsibilities of the Buyer

The Buyer is responsible for providing the appropriate utilities and an operating environment as outlined in the product literature. Damage to the laser system caused by failure of Buyer's utilities or failure to maintain an appropriate operating environment, is solely the responsibility of the Buyer and is specifically excluded from any warranty, warranty extension, or service agreement.

The Buyer is responsible for prompt notification to Coherent of any claims made under warranty. In no event will Coherent be responsible for warranty claims made later than seven (7) days after the expiration of warranty.

Limitations of Warranty

The foregoing warranty shall not apply to defects resulting from any of the following:

- Components and accessories manufactured by companies, other than Coherent, which have separate warranties
- Improper or inadequate maintenance by the Buyer
- Buyer-supplied interfacing
- Operation outside the environmental specifications of the product
- Unauthorized modification or misuse
- Improper site preparation and maintenance
- Opening the housing

Coherent assumes no responsibility for customer-supplied material. The obligations of Coherent are limited to repairing or replacing, without charge, equipment which proves to be defective during the warranty period. Replacement sub-assemblies may contain reconditioned parts. Repaired or replaced parts are warranted for the duration of the original warranty period only. The warranty on parts purchased after expiration of system warranty is ninety (90) days. Our warranty does not cover damage due to misuse, negligence or accidents, or damage due to installations, repairs or adjustments not specifically authorized by Coherent.

Warranty applies only to the original purchaser at the initial installation point in the country of purchase, unless otherwise specified in the sales contract. Warranty is transferable to another location or to another customer only by special agreement which will include additional inspection or installation at the new site. Coherent disclaims any responsibility to provide product warranty, technical or service support to a customer that acquires products from someone other than Coherent or an authorized representative.

THIS WARRANTY IS EXCLUSIVE IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL OR IMPLIED, AND DOES NOT COVER INCIDENTAL OR CONSEQUENTIAL LOSS. COHERENT SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

PARTS LIST

The following parts can be ordered by contacting our Technical Support Hotline at 1-800-367-7890 (1-408-764-4557 outside the U.S.); through E-mail (clg.tech.services@Coherent.com); or your local Coherent service representative. When communicating with our Technical Support Department, via telephone or E-mail, the model and Laser Head serial number of your laser system will be required by the Support Engineer responding to your request.

Effective September 2006, this Coherent laser system was released as RoHS-compliant. If your laser system was purchased prior to September 2006 you should contact Coherent Technical Support to determine if the items listed below are the appropriate part numbers for your laser system. You can locate the date of manufacturing for your laser system on the system serial number label

Table B-1. Parts List

DESCRIPTION	PART NUMBER
Compass 215M-10 OEM Laser System	1100424
Compass 215M-15 OEM Laser System	1100422
Compass 215M-20 OEM Laser System	1100423
Compass 215M-50 OEM Laser System	1100426
Compass 215M-75 OEM Laser System	1100427
Compass 215M-10 laser head	1100077
Compass 215M-15 laser head	1100444
Compass 215M-20 laser head	1100445
Compass 215M-50 laser head	1100447
Compass 215M-75 laser head	1100446
Compass 215M controller	1096518 (all versions)
Compass 215M power supply Vicor 115V	1106265
Compass 215M power supply Vicor 230V	1104971
Compass 215M power supply Meanwell 115V	1106286
Compass 215M power supply Meanwell 230V	1106289

Table B-1. Parts List (Continued)

DESCRIPTION	PART NUMBER
Compass 215M heatsink	1108889 (all versions)
Compass 215M cable set	1095801 (all versions
Compass Shipping Boxes (System)	53925
Compass Shipping Boxes (Laser head only)	54719

Figure B-1. Compass 215M Parts

ACCESSORIES

Power Meter Accessories

Coherent offers a variety of instruments for laser test and measurement. For additional detailed information, including product selection guides, visit our web site at www.Coherent.com.

For the most common diagnostics need—measuring the output power of the Compass—we recommend two different types of power meters that are ideal fits to the Compass product family. These meters are discussed, next.

First Recommendation

We highly recommend the FieldMaxII-TO™—a full-featured power meter that supports interchangeable power sensors and offers capabilities like onboard statistical analysis and computer interfacing via USB. This meter comes with installable applications software and LabVIEW drivers.

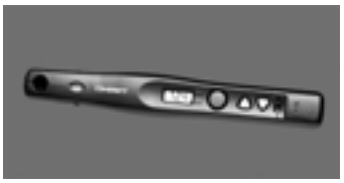
There are two primary sensors options for this meter:

- The PS10 provides high-resolution measurements—100 µW to 1W—and is best utilized for applications such as stability monitoring.
- The fast response time of the PM2 —2 mW to 2W—makes this sensor perfectly suited for applications such as laser tuning.

FieldMaxII-TO™ Laser Power Meter	Part Number 1098579
PS10 High-Sensitive Thermopile Sensor	Part Number 1098350
PM2 Air-Cooled Thermopile Sensor	Part Number 1098329

Alternative Recommendation

LaserCheck™—a hand-held, inexpensive laser power meter that is self-contained for easy storage—is specifically designed to provide power measurements. Its compact size enables measurements in optical set-ups where a standard detector head does not fit. With its built-in attenuator, this device is ready to measure output powers from 0.5 µW to 1W.



LaserCheck™ Power Meter	Part Number 1098293

GLOSSARY

°C	Degrees centigrade or Celsius
°F	Degrees Fahrenheit
µ	Microns
µrad	Microradian(s)
µsec	Microsecond(s)
$1/e^2$	Beam diameter parameter
AC	Alternating current
Amp	Amperes
CDRH	Center for Devices and Radiological Health
cm	Centimeter(s)
CW	Continuous wave
DC	Direct current
GHz	Gigahertz
Hz	Hertz
IR	Infrared
kg	Kilogram(s)
Kohm	Kilohm(s)
LED	Light emitting diode
m	Meter(s)
mAmp	Milliampere(s)
MHz	Megahertz
mm	Millimeter(s)
mrad	Milliradian(s)
msec	Millisecond(s)
mV	Millivolt(s)
mW	Milliwatt(s)
Nd:YAG	Neodymium doped yttrium aluminum garnet
nm	Nanometer(s)
OEM	Original equipment manufacturer
rms	Root mean square
RxD	Receive data
TEM	Transverse electromagnetic (cross-sectional laser beam mode)
TxD	Transmit data
VAC	Volts, alternating current
VDC	Volts, direct current
W	Watt(s)

INDEX

Compass™ 215M Laser Operator's Manual

Coherent Part Number: 0178-958-00, Rev AE