



# TomoScan FOCUS LT Rackmount User's Manual

DMTA067-01EN — Rev. D  
October 2023

This instruction manual contains essential information on how to use this Evident product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed. Keep this instruction manual in a safe, accessible location.

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Canada

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This document was prepared with particular attention to usage to ensure the accuracy of the information contained therein, and corresponds to the version of the product manufactured prior to the date appearing on the title page. There could, however, be some differences between the manual and the product if the product was modified thereafter.

The information contained in this document is subject to change without notice.

Part number: DMTA067-01EN

Rev. D

October 2023

Printed in Canada

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## Important Information — Please Read Before Use

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### Intended Use

The TomoScan FOCUS LT Rackmount is designed to perform nondestructive inspections on industrial and commercial materials.



#### **WARNING**

Do not use the TomoScan FOCUS LT Rackmount for any purpose other than its intended use. It must never be used to inspect or examine human or animal body parts.

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### Instruction Manual

This instruction manual contains essential information on how to use this product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed. Keep this instruction manual in a safe, accessible location.

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**IMPORTANT**

Some of the details of components illustrated in this manual may differ from the components installed on your device. However, the operating principles remain the same.

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## Device Compatibility

Only use this device with the approved ancillary equipment provided by Evident. Equipment provided by Evident and approved for use with this device is described later in this manual.

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**CAUTION**

Always use equipment and accessories that meet Evident specifications. Using incompatible equipment could cause equipment malfunction and/or damage, or human injury.

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## Repair and Modification

This device does not contain any user-serviceable parts. Opening the device might void the warranty.

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**CAUTION**

In order to prevent human injury and/or equipment damage, do not disassemble, modify, or attempt to repair the device.

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## Safety Symbols

The following safety symbols might appear on the device and in the instruction manual:



General warning symbol

This symbol is used to alert the user to potential hazards. All safety messages that follow this symbol shall be obeyed to avoid possible harm or material damage.



High voltage warning symbol

This symbol is used to alert the user to potential electric shock hazards greater than 1000 volts. All safety messages that follow this symbol shall be obeyed to avoid possible harm.

## Safety Signal Words

The following safety Signal words might appear in the documentation of the device:



**DANGER**

The DANGER signal word indicates an imminently hazardous situation. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, will result in death or serious personal injury. Do not proceed beyond a DANGER signal word until the indicated conditions are fully understood and met.



**WARNING**

The WARNING signal word indicates a potentially hazardous situation. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in death or serious personal injury. Do not proceed beyond a WARNING signal word until the indicated conditions are fully understood and met.



## CAUTION

The CAUTION signal word indicates a potentially hazardous situation. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, may result in minor or moderate personal injury, material damage, particularly to the product, destruction of part or all of the product, or loss of data. Do not proceed beyond a CAUTION signal word until the indicated conditions are fully understood and met.

## Note Signal Words

The following note signal words could appear in the documentation of the device:

### IMPORTANT

The IMPORTANT signal word calls attention to a note that provides important information, or information essential to the completion of a task.

### NOTE

The NOTE signal word calls attention to an operating procedure, practice, or the like, which requires special attention. A note also denotes related parenthetical information that is useful, but not imperative.

### TIP

The TIP signal word calls attention to a type of note that helps you apply the techniques and procedures described in the manual to your specific needs, or provides hints on how to effectively use the capabilities of the product.

## Safety

Before turning on the device, verify that the correct safety precautions have been taken (see the following warnings). In addition, note the external markings on the device, which are described under “Safety Symbols.”

## Warnings



### WARNING

#### General Warnings

- Carefully read the instructions contained in this instruction manual prior to turning on the device.
- Keep this instruction manual in a safe place for further reference.
- Follow the installation and operation procedures.
- It is imperative to respect the safety warnings on the device and in this instruction manual.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment could be impaired.
- Do not install substitute parts or perform any unauthorized modification to the device.
- Service instructions, when applicable, are for trained service personnel. To avoid the risk of electric shock, do not perform any work on the device unless qualified to do so. For any problem or question regarding this device, contact Evident or an authorized Evident representative.
- Do not touch the connectors directly by hand. Otherwise, a malfunction or electric shock may result.
- Do not allow metallic or foreign objects to enter the device through connectors or any other openings. Otherwise, a malfunction or electric shock may result.



### WARNING

#### Electrical Warning

The device must only be connected to a power source corresponding to the type indicated on the rating label.



## CAUTION

If a non-approved power supply cord not dedicated to Evident products is used, Evident will not be able to ensure the electrical safety of the equipment.

## Battery Precautions



## CAUTION

- Before disposing of a battery, check your local laws, rules, and regulations, and follow them accordingly.
- Transportation of lithium-ion batteries is regulated by the United Nations under the United Nations Recommendations on the Transport of Dangerous Goods. It is expected that governments, intergovernmental organizations, and other international organizations shall conform to the principles laid down in these regulations, thus contributing to worldwide harmonization in this field. These international organizations include the International Civil Aviation organization (ICAO), the International Air Transport Association (IATA), the International Maritime Organization (IMO), the US Department of Transportation (USDOT), Transport Canada (TC), and others. Please contact the transporter and confirm current regulations before transportation of lithium-ion batteries.
- For California (USA) only:  
The device may contain a CR battery. The CR battery contains perchlorate material, and special handling may be required. Refer to <http://www.dtsc.ca.gov/hazardouswaste/perchlorate>.
- Do not open, crush, or perforate batteries; doing so could cause injury.
- Do not incinerate batteries. Keep batteries away from fire and other sources of extreme heat. Exposing batteries to extreme heat (over 80 °C) could result in an explosion or personal injury.
- Do not drop, hit, or otherwise abuse a battery, as doing so could expose the cell contents, which are corrosive and explosive.
- Do not short-circuit the battery terminals. A short circuit could cause injury and severe damage to a battery making it unusable.
- Do not expose a battery to moisture or rain; doing so could cause an electric shock.
- Only use an external charger approved by Evident to charge the batteries.

- Only use batteries supplied by Evident.
- Do not store batteries that have less than 40 % remaining charge. Recharge batteries to between 40 % and 80 % capacity before storing them.
- During storage, keep the battery charge between 40 % and 80 %.
- Do not leave batteries in the TomoScan FOCUS LT Rackmount unit during device storage.

## Regulations for Shipping Products with Lithium-Ion Batteries

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### IMPORTANT

When shipping a Li-ion battery or batteries, be sure to follow all local transportation regulations.

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### WARNING

Damaged batteries cannot be shipped through normal routes — DO NOT ship damaged batteries to Evident. Contact your local Evident representative or material disposal professionals.

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## Equipment Disposal

Before disposing of the TomoScan FOCUS LT Rackmount, check your local laws, rules, and regulations, and follow them accordingly.

## BC (Battery Charger - California, USA Community)



The BC marking indicates that this product has been tested and complies with the Appliance Efficiency Regulations as stated in the California Code of Regulations Title 20, Sections 1601 through 1608 for Battery Charger Systems. The internal battery charger within this device has been tested and certified pursuant to the California Energy Commission's (CEC) requirements; this device is listed on the online CEC's (T20) database.

## CE (European Conformity)



This device complies with the requirements of directive 2014/30/EU concerning electromagnetic compatibility, directive 2014/35/EU concerning low voltage, and directive 2015/863 which amends 2011/65/EU concerning restriction of hazardous substances (RoHS). The CE marking is a declaration that this product conforms to all the applicable directives of the European Community.

## UKCA (United Kingdom)



This device complies with the requirements of the Electromagnetic Compatibility Regulations 2016, the Electrical Equipment (Safety) Regulations 2016, and the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012. The UKCA marking indicates compliance with the above regulations.

## RCM (Australia)



The regulatory compliance mark (RCM) label indicates that the product complies with all applicable standards, and has been registered with the Australian Communications and Media Authority (ACMA) for placement on the Australian market.

## WEEE Directive



In accordance with European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE), this symbol indicates that the product must not be disposed of as unsorted municipal waste, but should be collected separately. Refer to your local Evident distributor for return and/or collection systems available in your country.

## China RoHS

*China RoHS* is the term used by industry generally to describe legislation implemented by the Ministry of Information Industry (MII) in the People's Republic of China for the control of pollution by electronic information products (EIP).



The China RoHS mark indicates the product's Environment-Friendly Use Period (EFUP). The EFUP is defined as the number of years for which listed controlled substances will not leak or chemically deteriorate while in the product. The EFUP for the TomoScan FOCUS LT Rackmount has been determined to be 15 years.

**Note:** The Environment-Friendly Use Period (EFUP) is not meant to be interpreted as the period assuring functionality and product performance.



电器电子产品有害  
物质限制使用  
标志

本标志是根据“电器电子产品有害物质限制使用管理办法”以及“电子电气产品有害物质限制使用标识要求”的规定，适用于在中国销售的电器电子产品上的电器电子产品有害物质使用限制标志。

（注意）电器电子产品有害物质限制使用标志内的数字为在正常的使用条件下有害物质等不泄漏的期限，不是保证产品功能性能的期间。

产品中有害物质的名称及含量

部件名称		有害物质					
		铅及其化合物 (Pb)	汞及其化合物 (Hg)	镉及其化合物 (Cd)	六价铬及其化合物 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
主体	机构部件	×	○	○	○	○	○
	光学部件	×	○	○	○	○	○
	电气部件	×	○	○	○	○	○
附件		×	○	○	○	○	○

本表格依据 SJ/T 11364 的规定编制。  
 ○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T26572 规定的限量要求以下。  
 ×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T26572 规定的限量要求。

## Korea Communications Commission (KCC)



Seller and user shall be noticed that this equipment is suitable for electromagnetic equipment for office work (class A) and it can be used outside the home. This device complies with the EMC requirements of Korea.

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.



## EMC Directive Compliance

This equipment generates and uses radio-frequency energy and, if not installed and used properly (that is, in strict accordance with the manufacturer’s instructions), may cause interference. The TomoScan FOCUS LT Rackmount has been tested and found to comply with the limits for an industrial device in accordance with the specifications of the EMC directive.

## FCC (USA) Compliance

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<b>NOTE</b>
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This product has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the product is operated in a commercial environment. This product generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, might cause harmful interference to radio communications. Operation of this product in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

---

<b>IMPORTANT</b>
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Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the product.

### FCC Supplier’s Declaration of Conformity

Hereby declares that the product,

Product name: TomoScan FOCUS LT Rackmount

Model: TomoScan FOCUS LT Rackmount

Conforms to the following specifications:

FCC Part 15, Subpart B, Section 15.107 and Section 15.109.

### Supplementary information:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

### Responsible party name:

EVIDENT SCIENTIFIC, INC.

### Address:

48 Woerd Avenue, Waltham, MA 02453, USA

### Phone number:

+1 781-419-3900

## ICES-001 (Canada) Compliance

This Class A digital apparatus complies with Canadian ICES-001.

Cet appareil numérique de la classe A est conforme à la norme NMB-001 du Canada.

## Warranty Information

Evident guarantees your Evident product to be free from defects in materials and workmanship for a specific period, and in accordance with conditions specified in the Terms and Conditions available at <https://www.olympus-ims.com/en/terms/>.

The Evident warranty only covers equipment that has been used in a proper manner, as described in this instruction manual, and that has not been subjected to excessive abuse, attempted unauthorized repair, or modification.

Inspect materials thoroughly on receipt for evidence of external or internal damage that might have occurred during shipment. Immediately notify the carrier making the delivery of any damage, because the carrier is normally liable for damage during shipment. Retain packing materials, waybills, and other shipping documentation needed in order to file a damage claim. After notifying the carrier, contact Evident for assistance with the damage claim and equipment replacement, if necessary.

This instruction manual explains the proper operation of your Evident product. The information contained herein is intended solely as a teaching aid, and shall not be used in any particular application without independent testing and/or verification by the operator or the supervisor. Such independent verification of procedures becomes increasingly important as the criticality of the application increases. For this reason, Evident makes no warranty, expressed or implied, that the techniques, examples, or procedures described herein are consistent with industry standards, nor that they meet the requirements of any particular application.

Evident reserves the right to modify any product without incurring the responsibility for modifying previously manufactured products.

## **Technical Support**

Evident is firmly committed to providing the highest level of customer service and product support. If you experience any difficulties when using our product, or if it fails to operate as described in the documentation, first consult the user's manual, and then, if you are still in need of assistance, contact our After-Sales Service. To locate the nearest service center, visit the Service Centers page on the Evident Scientific Web site <https://www.evidentscientific.com/service-and-support/service-centers/>.



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# Introduction

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The TomoScan FOCUS LT Rackmount (*LT* stands for “latest technology”) is a high-performance UT inspection system. This system uses phased array and conventional ultrasound to perform nondestructive inspections. The TomoScan FOCUS LT Rackmount was designed to replace the TomoScan FOCUS and TomoScan III PA, and provide users with increased performance and capabilities. The open architecture allows direct connection with Microsoft Windows-based computer or UNIX workstations through standard network protocols.

The *Automated Ultrasonic Testing for Pipeline Girth Welds* publication provides an overview of the principles of automated ultrasonic testing (AUT) of girth welds, and explains the many parameters that influence the results of these inspections. This 366-page book, available from Evident, is a useful reference that examines basic AUT concepts, and explains aspects of the process including sizing and acceptance criteria.

## Key Features

TomoScan FOCUS LT Rackmount key features include:

- Setup, data acquisition, and data analysis from standard computer
- TomoView software for both data acquisition and analysis
- 16, 32, or 64 focusing channels
- 128 channels with linear amplifier for phased array inspection
- Real-time data compression
- High pulsing rate
- High data throughput (up to 8000 8-bit A-scans/second of 512 points each)
- Flexible interface with scanners and manipulators

The TomoScan FOCUS LT Rackmount is available in three different configurations, which are identified by two numbers separated by a colon. The first number indicates the number of focusing channels; the second number indicates the total number of elements in the configuration. Table 1 on page 22 shows possible TomoScan FOCUS LT Rackmount configurations.

**Table 1 Possible TomoScan FOCUS LT Rackmount Configurations**

16:128
32:128
64:128

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**NOTE**

For the complete description of the different TomoScan FOCUS LT Rackmount model numbers, see “Operating Specifications” on page 50.

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**IMPORTANT**

This unit has been licensed for Windows Compact 2013 and then downgraded back to Windows CE 5 for application compatibility.

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# 1. Instrument Overview

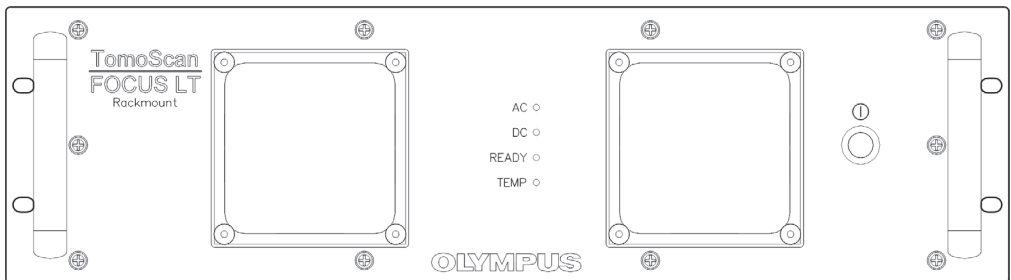
---

This chapter describes the front and back panels of the TomoScan FOCUS LT Rackmount.

## 1.1 Front Panel

Figure 1-1 on page 23 shows the front panel of the TomoScan FOCUS LT Rackmount unit. This panel enables the user to perform the following:

- Turn on and off the TomoScan FOCUS LT Rackmount
- Monitor the status of the AC and DC power supplies
- Monitor the boot-up status



**Figure 1-1 The TomoScan FOCUS LT Rackmount front panel**

The front panel of the TomoScan FOCUS LT Rackmount contains the following elements:

## AC

The letters AC stand for *alternating current*. When this indicator lights green, it indicates that the unit is powered by an alternating current through the power entry module.

When this indicator lights red, it indicates that, either the internal AC power supply exceeds its input limits, which are in the range of 90 VAC to 264 VAC, or that the instrument is defective and requires servicing. If the input voltage is found to be within the limits, please see “Technical Support” on page 19 for technical support.

## DC

The letters DC stand for *direct current*. When this indicator lights green, it indicates that the unit is powered by direct current through the DC IN connector.

When this indicator lights red, it indicates that either the DC power supply exceeds the DC input limits, which are in the range of 14 VDC to 25.5 VDC, or that the instrument is defective and requires servicing. If this indicator lights red, and the input voltage is found to be within the limits, please see “Technical Support” on page 19 for technical support.

---

<b>TIP</b>
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If both AC and DC sources are connected and powered, the instrument automatically operates from the AC input, and the DC input is disabled.

---

## READY

When this indicator light is off, it indicates that the unit is not powered. When this indicator blinks red, it indicates that the internal temperature is above 65 °C and that the instrument is defective and requires servicing. Please see “Technical Support” on page 19 for technical support.

When this indicator lights orange, it indicates that the unit is correctly powered off.

When this indicator is blinking green twice per second, it indicates that the unit is starting up.

When this indicator lights steady green, it indicates that the unit is ready for operation.



## TEMP

The letters TEMP stand for *temperature*. When this indicator light is off, it indicates that the external temperature sensor is not powered or the instrument is off.

When the instrument is on and the external temperature sensor is connected, the internal +12 VDC power supply is probably defective. When this indicator lights green, it indicates that the external temperature sensor is connected and the temperature reading is inside the correct range (−40 °C to +85 °C).

When this indicator lights amber, the temperature reading is close to one of its limits (−40 °C or +85 °C).

When this indicator lights red, it indicates that there is a problem with the temperature sensor, the sensor is disconnected, or its reading is outside its temperature range (−40 °C to +85 °C). Please see “Technical Support” on page 19 for technical support.

## On/off switch (ⓘ)

This switch is used to turn on and off the TomoScan FOCUS LT Rackmount.

### 1.1.1 Handles

Two handles are located on each side of the front panel. They are used to insert or remove the unit from a standard 480 mm (19 in.) rack mount cabinet. These handles can also be used to carry the unit.

### 1.1.2 Fans

Two fans cool the internal components. Each fan has a mesh filter used to filter the air drawn in by the fan.

Fan grills for the air outlet are located on both sides of the unit.



#### CAUTION

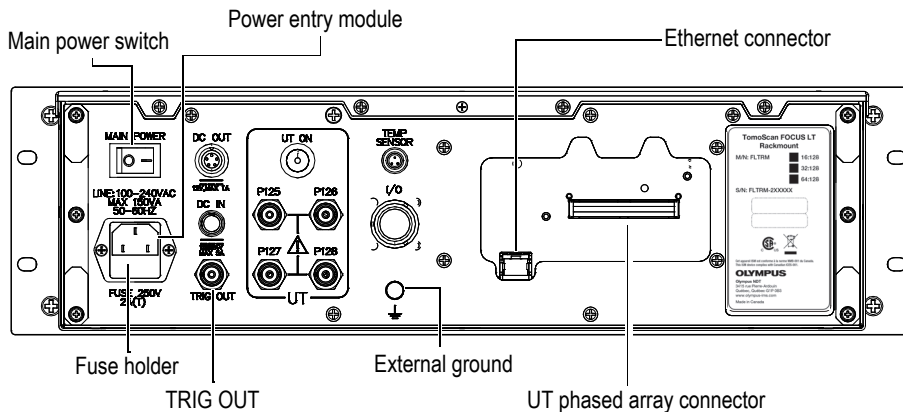
The fan grills must remain unobstructed to ensure a sufficient airflow inside the unit housing and the mesh filters must be cleaned whenever necessary (for details, see “Maintenance and Troubleshooting” on page 43).

---

## 1.2 Back Panel

Figure 1-2 on page 26 shows the back panel of the TomoScan FOCUS LT Rackmount unit. This panel enables the user to perform the following:

- Connect a phased array probe to the TomoScan FOCUS LT Rackmount
- Connect up to 4 conventional ultrasound probes
- Enable or disable the UT conventional ultrasound mode
- Connect the TomoScan FOCUS LT Rackmount to an Ethernet network
- Output DC voltage to power external devices
- Connect input/output signals (encoders, alarms, etc.)
- Connect an external temperature sensor
- Connect the TomoScan FOCUS LT Rackmount to an AC or DC power source
- Switch on and off the AC power source
- Replace the fuse
- Ground the unit



**Figure 1-2 The TomoScan FOCUS LT Rackmount back panel**

The back panel of the TomoScan FOCUS LT Rackmount contains the following elements:

## MAIN POWER switch

This switch is used to connect and disconnect the internal power supply from the AC power entry module.

---

<b>NOTE</b>
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The MAIN POWER switch, located on the back panel, must be turned on in order to use the front-panel On/Off switch (ⓘ) or to use the Auto-Boot startup modes (see “Automatic Startup Modes” on page 36).

---

## DC OUT

This connector provides a power supply voltage of  $\pm 12$  VDC rated at 1 A for external devices.

## DC IN

This connector allows the TomoScan FOCUS LT Rackmount to be supplied from a DC power source. The DC IN connector accepts voltages in the range of 15 VDC to 24 VDC, rated at 5 A.

## TRIG OUT

This connector is used for calibration and diagnostic.

## UT ON

This button alternately enables and disables the P connectors.

When the indicator light is on, it indicates that the conventional ultrasound mode is enabled and the last four phased array channels are routed onto the P125, P126, P127, and P128 connectors.

When this indicator light is off, it indicates that the conventional ultrasound mode is disabled.

## P125, P126, P127, P128

These BNC connectors allow the unit to be used with conventional ultrasound probes. The P connectors correspond to the last four channels of the UT PHASED ARRAY connector.



**WARNING**



When the instrument is used in conventional ultrasound mode with the P125, P126, P127, and P128 connectors, the voltage present on the P connectors can be dangerous as a shock hazard.

---

#### TEMP SENSOR

This connector is used to monitor the temperature of the external sensor, Evident part number ACUX230C. Temperature range is from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  with an 11-bit resolution.

#### I/O

This connector is used to connect any digital input/output signals.

#### ETHERNET

This 8-position modular connector allows the connection of the TomoScan FOCUS LT Rackmount to an Ethernet (10BASE-T) or Fast Ethernet (100BASE-T) network. Indicator lights above the connector can be used to monitor the status of the Ethernet link. In normal operation, an indicator lights green when the Ethernet link is established and a second indicator flashes yellow when activity occurs on the network.

#### UT PHASED ARRAY

This Minidock-type connector is composed of 160 pins, which give access to 128 channels. It connects the phased array probes with the Minidock connector or the Hypertronics connector when using the Hypertronics connector adapter.

---

**NOTE**

When the conventional ultrasound mode is enabled with the UT ON button, the last four phased array channels are routed onto the P125, P126, P127, and P128 connectors and are no longer available on the UT PHASED ARRAY connector.

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## 1.2.1 Power Entry Module

The power entry module allows the connection of a standard three-lead power cord with a central ground. The universal-type internal power supply accepts any voltage level in the range of 100 VAC to 240 VAC, operating at frequencies between 50 Hz and 60 Hz. Voltage fluctuation must not exceed  $\pm 10\%$  of the supply voltage range.

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<b>NOTE</b>
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Please note that the on/off switch is located on the front panel. The TomoScan FOCUS LT Rackmount can also be supplied from a DC power source. The DC IN connector, located on the back panel, accepts voltages in the range of 15 VDC to 24 VDC, rated at 5 A.

---

## 1.2.2 Fuse and Fuse Holder

A fuse holder contains the instrument main fuse. This fuse is used to protect the TomoScan FOCUS LT Rackmount from an external power surge or from an internal short circuit.

The fuse holder also contains a spare fuse in a small compartment if a fuse replacement is required (for details, see “Changing the Fuse” on page 46).



<b>WARNING</b>
----------------

Use only 250 V slow-blow fuses of the identical rating that meet IEC 127 standards. Using fuses that are not recommended can cause a fire hazard.

---

## 1.2.3 External Ground (⏏)

This ground terminal can be used to ground the TomoScan FOCUS LT Rackmount unit using an external wire. This terminal is very useful for certain inspections when it is recommended to ground the inspection system with the part under inspection.

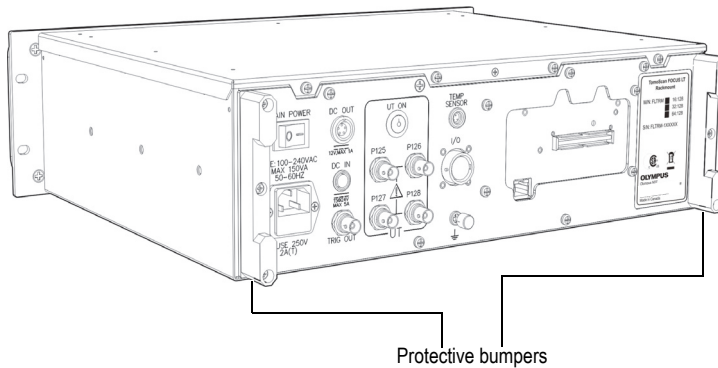
## 1.2.4 Protective Bumpers

The rubber bumpers protect the back-panel components when the unit is resting on its back during handling (see Figure 1-3 on page 30).



### CAUTION

Do not leave the TomoScan FOCUS LT Rackmount vertical on the bumpers of the back panel, because the high center of gravity could make the unit unstable and likely of falling.



**Figure 1-3 Protective bumpers on the back panel**

## 2. System Installation

---

This chapter explains the procedures for installing the TomoScan FOCUS LT Rackmount and for connecting the system components and peripherals to the main unit.

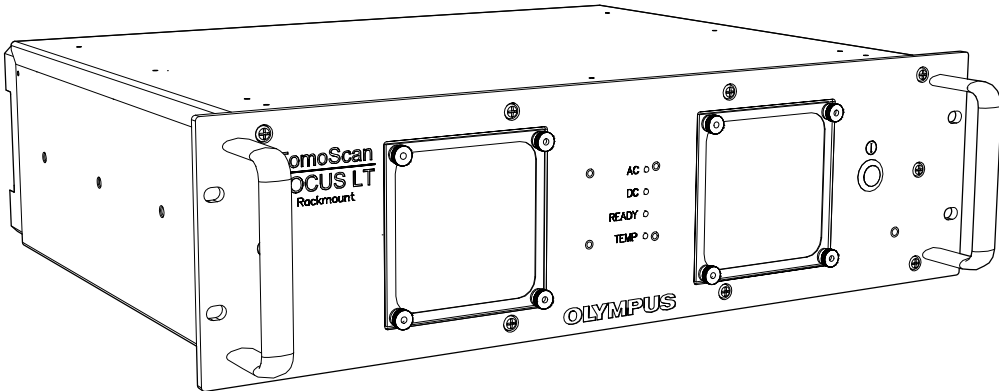
### 2.1 Standard Equipment

The packing list should include the following items:

- TomoScan FOCUS LT Rackmount with the proper internal configuration
- AC power cord
- Crossover Ethernet cable
- CD-ROM including the TomoView installation software, TomoView user's manual, and TomoScan FOCUS LT Rackmount user's manual
- Calibration certificate
- Protection key for TomoView software options
- Probe adapter (optional item)

### 2.2 Installing the Unit

This section provides installation instructions for the TomoScan FOCUS LT Rackmount unit (see Figure 2-1 on page 32).



**Figure 2-1 The TomoScan FOCUS LT Rackmount unit**

### To install the TomoScan FOCUS LT Rackmount unit

- ◆ Slide the TomoScan FOCUS LT Rackmount in a standard 480 mm (19 in.) cabinet away from heat sources, leaving a minimum clearance of 5 cm (2 in.) to allow for heat dissipation.



#### **CAUTION**

The TomoScan FOCUS LT Rackmount must be properly ventilated so as to prevent overheating and ensure an appropriate operation. Be sure to use the instrument in a well-ventilated cabinet while avoiding the obstruction of the air inlets located on the front panel of the enclosure as well as the air outlets located on both sides of the housing.

---

## 2.3 Connecting the Unit

This section explains the procedure for connecting the TomoScan FOCUS LT Rackmount unit. All of the connectors used for the connections are located on the back panel of the unit.



**WARNING**

The instrument must be connected according to the manufacturer's instructions in order to prevent risk of electric shock.

The TomoScan FOCUS LT Rackmount unit must always be completely inserted into the cabinet and the front panel screws properly tightened in order to ensure a correct grounding of the instrument. An incorrect grounding of the instrument may produce electrostatic discharges that can damage the electronic components or cause electric shocks.

---

**To connect the TomoScan FOCUS LT Rackmount unit**

1. Ensure that the instrument is disconnected from the power source.
- 

**WARNING**

To prevent the risk of an electric shock, first disconnect the power cord from the power outlet, and then disconnect the power cord from the instrument.

---

2. Using an Ethernet cable, connect the TomoScan FOCUS LT Rackmount ETHERNET connector to an Ethernet network or to the network interface card of the control and analysis computer. The ETHERNET connector, which is an input/output terminal can connect directly to a data-acquisition instrument. The cable supplied with the instrument is by default an Ethernet crossover cable (Evident part no. 60ND0001).
  3. Using the appropriate cables, connect the probe(s) to the PHASED ARRAY connector or to the P125 to P128 UT connectors (for details, see "Connecting Probes" on page 34).
  4. Using the appropriate cables, connect each of the components required by your setup and your needs to the corresponding TomoScan FOCUS LT Rackmount connector (for ex., encoders, alarms, etc.). For details on the connectors, see "Back Panel" on page 26.
  5. When using an AC power source, connect the power cord to the power entry module of the TomoScan FOCUS LT Rackmount back panel. Connect the other end of the power cord to a three-terminal-grounded power outlet. Turn on the
-

unit by first switching the back-panel MAIN POWER switch, and then pressing the front panel On/Off switch.

6. When using a DC power source, connect the power cord to the DC IN connector of the TomoScan FOCUS LT Rackmount back panel. Connect the other end of the power cord to a suitable DC power source. Turn on the unit by pressing the front panel On/Off switch.
7. Set up the ultrasound data acquisition and analysis software. Refer to the software user's manual for the setup procedure.

## 2.4 Connecting Probes

In phased array mode, probes are connected to the UT PHASED ARRAY connector.

In conventional ultrasound mode, probes are connected to the P125 to P128 connectors.



### CAUTION

Probes can suffer permanent damage if fired without couplant for more than one hour. If the probes are not being used for inspection, the TomoScan FOCUS LT Rackmount unit should be turned off.

---

Evident recommends turning off the TomoScan FOCUS LT Rackmount unit before connecting and disconnecting the probes.

---

### IMPORTANT

The TomoScan FOCUS LT Rackmount unit has been tested and found to comply with the radio frequency limits for an industrial device in accordance with the specifications of the EMC directive. To maintain compliance with the emissions specifications of the EMC directive, you must respect the following conditions:

- All cables used for connecting the probes must have an overall shielding to ensure electromagnetic compatibility and optimal performance.
  - Ferrite clamp filters must be attached to the probe cables connected to the TomoScan FOCUS LT Rackmount unit.
-

Before using the TomoScan FOCUS LT Rackmount unit, attach the ferrite clamp filters (supplied with the TomoScan FOCUS LT Rackmount unit) to the probe cables.

### IMPORTANT

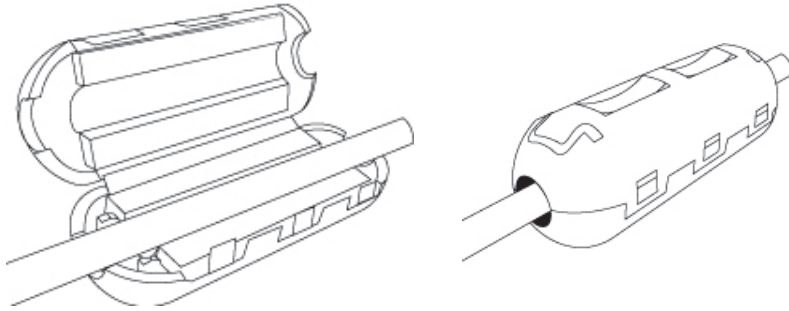
- If you do not attach the ferrite clamp filters, the TomoScan FOCUS LT Rackmount unit will not comply with the international and European electromagnetic emissions specifications.
- Be sure not to clamp the cable between the pawls of the ferrite clamp filter.
- Attach the ferrite clamp filters as closely as possible to the cable ends. The ferrite clamp filters are not effective unless they are immediately adjacent to the cable end connected to the TomoScan FOCUS LT Rackmount unit.
- Use the ferrite clamp filter corresponding to the cable diameter. The filter must not slip easily nor be hard to clip onto the cable.
- Be sure to close the two ferrite clamp-filter parts tightly until the clamp clicks.

### To install ferrite clamp filters

1. Select the ferrite clamp filter according to the proper probe cable diameter (see Table 2 on page 35).
2. Attach the ferrite clamp filter onto the cable (see Figure 2-2 on page 36) of the phased array probe, close to the probe connector that connects to the TomoScan FOCUS LT Rackmount.

**Table 2 Selection of the ferrite clamp filters**

Number of probe elements	Cable diameter	Steward part number	Evident part number
16 or 32	4.8 mm	28A0592-0A2	18BA0037
64	6.6 mm	28A0593-0A2	18BA0038
128	9.0 mm	28A0640-0A2	18BA0040



**Figure 2-2 Attaching a ferrite clamp filter on a probe cable**

## 2.5 Automatic Startup Modes

The TomoScan FOCUS LT Rackmount provides three special automatic startup modes: auto-boot on AC power, auto-boot on DC power, and auto-UT. These modes are methods for starting the TomoScan FOCUS LT Rackmount and defining the UT ON button startup state when power is applied to its AC or DC power source inputs. The following subsections describe each of these modes.

### 2.5.1 Auto-Boot on AC Power

Use the auto-boot on AC power mode to remotely turn on a TomoScan FOCUS LT Rackmount unit from an AC power source. When this mode is enabled, the user does not need to press the front-panel on/off switch (ⓘ) to start the TomoScan FOCUS LT Rackmount. The unit starts automatically when AC power is applied to the power entry module on the back panel. The mode is disabled by default.

#### To toggle the state of the auto-boot on AC power mode

1. Turn off the TomoScan FOCUS LT Rackmount unit using the on/off switch (ⓘ) located on the front panel.
2. Turn off the MAIN POWER switch on the back panel.
3. Press and hold the on/off switch (ⓘ) on the front panel.
4. Turn on the MAIN POWER switch on the back panel.

5. Release the on/off switch (ⓘ) on the front panel when the READY indicator lights green.
6. To toggle the state of the mode, repeat steps 1 to 4 above.

## 2.5.2 Auto-Boot on DC Power

Use the auto-boot on DC power mode to remotely turn on a TomoScan FOCUS LT Rackmount unit from a DC power source. When this mode is enabled, the user does not need to press the on/off switch (ⓘ) to start the TomoScan FOCUS LT Rackmount. The unit starts automatically when DC power is applied to the DC IN input connector on the back panel. The mode is disabled by default.

### To toggle the state of the auto-boot on DC power mode

1. Turn off the TomoScan FOCUS LT Rackmount unit and disconnect the DC power cord, or turn off the external DC power source.
2. Press and hold the on/off switch (ⓘ) on the front panel.
3. Reconnect the DC power cord to the DC IN input connector on the back panel, or turn on the external DC power source.
4. Release the on/off switch (ⓘ) on the front panel when the READY indicator lights green.
5. To toggle the state of the mode, repeat steps 1 to 4 above.

## 2.5.3 Auto-UT Mode

Use the auto-UT mode to define the state of the UT ON button on the back panel when AC or DC power is applied to the TomoScan FOCUS LT Rackmount. The mode is disabled by default.

### To toggle the state of the auto-UT mode

1. Turn off the TomoScan FOCUS LT Rackmount unit and disconnect the power cord.
2. Press and hold the UT ON button on the back panel.
3. Turn on the TomoScan FOCUS LT Rackmount powered by either an AC or DC power source.

4. Release the UT ON button when the READY indicator lights green.
5. To toggle the state of the mode, repeat steps 1 to 4 above.

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## 3. Operation Overview

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This chapter describes the basic operation of the TomoScan FOCUS LT Rackmount. The TomoScan FOCUS LT Rackmount is controlled by a computer called the Workstation. This workstation controls the acquisition process and analyzes the ultrasonic data collected by the unit.

### 3.1 Hardware Configuration

The TomoScan FOCUS LT Rackmount has an open architecture that allows the integration into a variety of configurations. Figure 3-1 on page 39 shows the hardware architecture of the TomoScan FOCUS LT Rackmount.

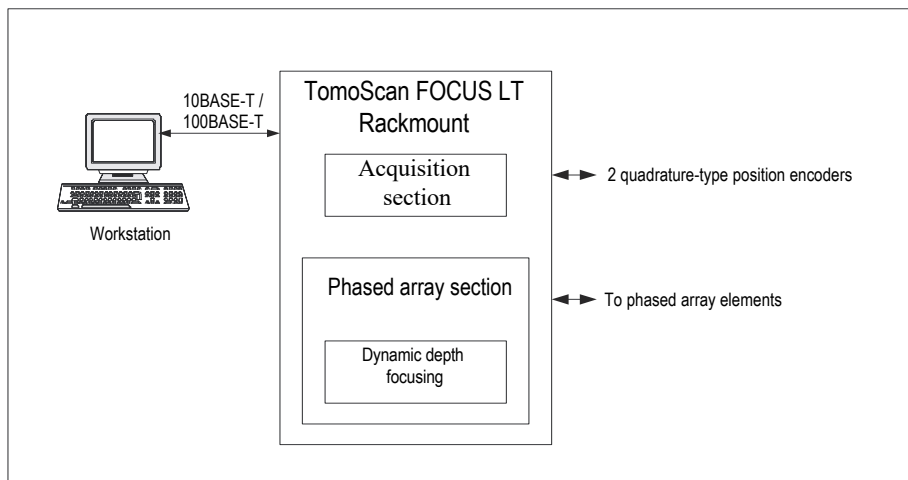


Figure 3-1 The hardware architecture of the TomoScan FOCUS LT Rackmount

This configuration requires a workstation and might also include a motor drive unit to drive a robotics system, including a manipulator. The main functions supported by the TomoScan FOCUS LT Rackmount configuration are described below.

## 3.2 TomoScan FOCUS LT Rackmount Main Unit

The TomoScan FOCUS LT Rackmount is an ultrasonic acquisition unit adapted for bidirectional communications through an Ethernet link. The TomoScan FOCUS LT Rackmount is composed of two sections: the acquisition section and the phased array section.

The acquisition section synchronizes the acquisition, collects the UT data (A-scan, C-scan), collects the I/O data (encoders), and sends the data to the workstation. The RPC (remote procedure call) server allows the configuration of the instrument in order to produce data (UT, I/O).

The phased array section manages the focal laws (transmission delay, reception delay, signal summing). The RPC server is used for the configuration of the focal laws.

## 3.3 Workstation

The workstation is a computer adapted for bidirectional communications through an Ethernet link. When the system is controlled by the TomoView acquisition software version 2.8 or more recent, the workstation is a standard computer running the Microsoft Windows XP or Microsoft Windows Vista operating system. The workstation has the following functions:

- Hosts the TomoScan FOCUS LT Rackmount software
- Hosts the TomoScan FOCUS LT Rackmount configuration file
- Controls the acquisition and receives data from the TomoScan FOCUS LT Rackmount through an Ethernet link
- Processes and displays UT data collected by the TomoScan FOCUS LT Rackmount for analysis
- Saves the UT acquisition data acquired during an inspection on files stored on internal or external data storage units.



## 3.4 Ethernet Link

The TomoScan FOCUS LT Rackmount must be linked to the workstation through an Ethernet network. To make this possible, the TomoScan FOCUS LT Rackmount is equipped with internal Ethernet hardware. For a network configuration using a network hub, a standard Ethernet cable can be used. For a point-to-point configuration, an Ethernet crossover cable (Evident part no. 60ND0001) is used.

The TomoScan FOCUS LT Rackmount is designed to be used with either a 10BASE-T Ethernet or a 100BASE-T Fast Ethernet network.

The TomoScan FOCUS LT Rackmount has no internal disk drive. The unit must therefore be linked, through an Ethernet network, to a workstation running a Bootp server software application before it can be turned on, and all the necessary data for proper functioning can be loaded. Once booted, the internal RPC (remote procedure call) server of the TomoScan FOCUS LT Rackmount connects to the workstation (that is, the client) through the Ethernet network. The RPC server allows to configure the hardware (that is, defines which data to produce), to control the acquisition, to verify the status of the instrument, etc. (For more details on installing and using the acquisition software relating to the TomoScan FOCUS LT Rackmount, see the *TomoView 2 Reference Manual*.)



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## 4. Maintenance and Troubleshooting

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This chapter deals with the basic maintenance that an operator can apply to the TomoScan FOCUS LT Rackmount. The maintenance operations explained below help keep the instrument in good physical and working conditions. Due to its design, the TomoScan FOCUS LT Rackmount requires only a minimum of maintenance.

### 4.1 Preventive Maintenance

As the TomoScan FOCUS LT Rackmount has no moving parts, it does not require preventive maintenance. Only a regular inspection of the instrument is recommended to ensure that the TomoScan FOCUS LT Rackmount has adequate grounding. Thus, verify that the TomoScan FOCUS LT Rackmount is completely inserted into the cabinet and that the front panel screws are properly tightened.



**WARNING**



The TomoScan FOCUS LT Rackmount must always be completely inserted into the cabinet and the front panel screws properly tightened in order to ensure a correct grounding of the instrument. An incorrect grounding of the instrument can produce electrostatic discharges that can damage the electronic components or cause electric shocks.

---

## 4.2 Instrument Cleaning

The TomoScan FOCUS LT Rackmount external surfaces, that is, the housing and the front panel, can be cleaned when needed. This section provides the procedure for the appropriate cleaning of the instrument.

### To clean the instrument

1. Ensure that the instrument is turned off and the power cord is disconnected.



#### WARNING



To prevent the risk of an electric shock, first disconnect the power cord from the power outlet, and then disconnect the power cord from the instrument.

---

2. To bring the instrument back to its original finish, clean the housing and the front panel with a soft cloth.



#### CAUTION

Do not clean the instrument with a water jet, spray can, or spray bottle. Liquid could seep in and damage the instrument, or the connector contacts could stay wet and produce a short circuit when connecting cables.

---

3. To remove persistent stains, use a damp cloth with a soft soapy solution. Do not use abrasive products or powerful solvents that might damage the finish.
4. Wait until the instrument dries completely before connecting the power cord and cables.

## 4.3 Maintenance of the Fan Filters

The TomoScan FOCUS LT Rackmount is equipped with two cooling fans, that are located on the front panel. Filters, located on the vent inlets, remove dust particles from the air drawn in by each fan. To allow sufficient airflow, filters must be cleaned and changed periodically, according to your TomoScan FOCUS LT Rackmount utilization and the quality of ambient air.

---

### 4.3.1 Cleaning the Fan Filters

#### To clean the fan filters

1. Unscrew and remove the four knurled screws that secure each fan filter (see Figure 4-1 on page 45).
2. Remove the fan filter.
3. Using a compressed-air jet, clean the filter on both sides.
4. Place the filter back in the appropriate position.
5. Screw the four knurled screws back into place.

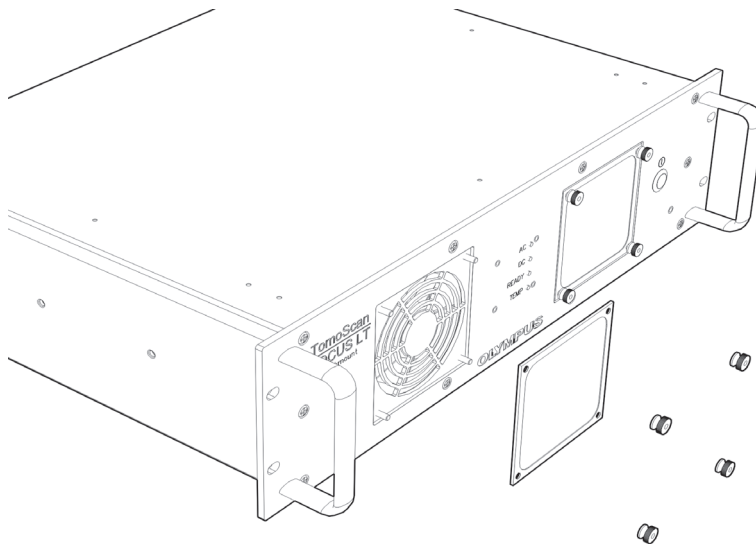


Figure 4-1 Fan filter removed from the TomoScan FOCUS LT Rackmount

### 4.3.2 Changing the Fan Filters

#### To change the fan filters

1. Unscrew and remove the four knurled screws that secure each fan filter (see Figure 4-1 on page 45).
2. Remove the fan filters.
3. Change the fan filters (Evident part no. 26AB0008).

4. Place the filters back in the appropriate positions.
5. Screw the four knurled screws back into place.

## 4.4 Changing the Fuse

The fuse protects the unit from power overload. If the TomoScan FOCUS LT Rackmount unit does not turn on when properly supplied by an AC power source, verify the fuse located in the power entry module on the back panel.

---

<b>NOTE</b>
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The internal power supply units of the instrument have protective fuses that are not replaceable by an operator. If these fuses are defective, please refer to a qualified technician for a replacement.

---

### To change the fuse

1. Ensure that the instrument is turned off and the AC power cord is disconnected from the back panel of the instrument.



<b>WARNING</b>
----------------



To prevent the risk of an electric shock, first disconnect the power cord from the power outlet, and then disconnect the power cord from the instrument.

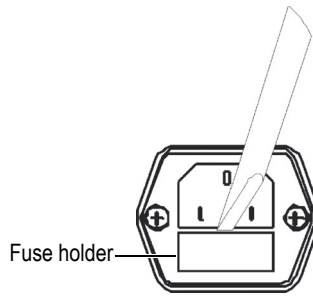
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<b>NOTE</b>
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The fuse in the power entry module is used only when the unit is powered by an AC source. When using a DC power source, overload protection is provided by internal voltage limiters inside the instrument.

---

2. Using a flat-blade screwdriver, pull out the fuse holder located on the back panel, as shown in Figure 4-2 on page 47.
  3. Remove the fuse from the fuse holder.
-



**Figure 4-2 Pulling out the fuse holder in the TomoScan FOCUS LT Rackmount**

4. Replace the fuse with a fuse of the correct rating as indicated in Table 3 on page 47.

**Table 3 Fuse rating**

Power supply	Fuse rating	
120 V or 240 V	250 V	2 A slow-blow



### WARNING

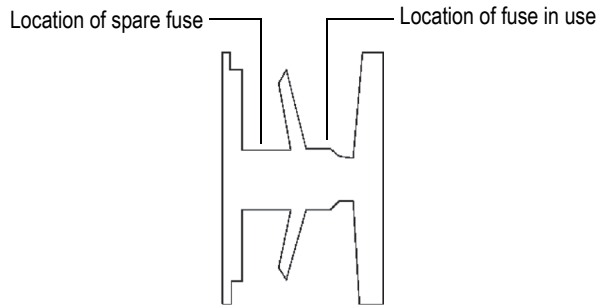
Use only 250 V slow-blow fuses that meet IEC 127 standards. Using fuses that are not recommended can cause a fire hazard.

5. Reinsert the fuse holder.

The fuse is now replaced, and the TomoScan FOCUS LT Rackmount should be ready for operation. If the instrument still does not operate after the fuse replacement, refer to a qualified technician.

### TIP

In order to have a spare fuse of the correct rating on hand, always keep a spare fuse in the fuse holder (see Figure 4-3 on page 48).



**Figure 4-3 Fuse and spare fuse locations (fuse holder pulled out - top view)**

## 4.5 Troubleshooting

This section will help you solve minor problems that could occur during the operation of your TomoScan FOCUS LT Rackmount. Evident has developed this troubleshooting guide assuming that the instrument has not been modified, and that the cables and connectors are those provided and suggested by Evident.

**Table 4 Troubleshooting guide**

<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
The unit does not turn on.	The fuse is blown.	Verify the fuse and replace it, if applicable, with a fuse of the correct rating. For the detailed procedure, see “Changing the Fuse” on page 46.
Communication problems occur between the computer and the TomoScan FOCUS LT Rackmount.	The workstation and the TomoScan FOCUS LT Rackmount are not connected with the proper Ethernet cable type.	Ensure that you use a crossover Ethernet cable for a direct connection between the workstation and the TomoScan FOCUS LT Rackmount.



## 5. Specifications

This chapter presents the general specifications (size, operating temperature, power requirements) of all TomoScan FOCUS LT Rackmount models, operating specifications, specifications of recorded data, specifications of the Ethernet link, and finally safety standards.

### 5.1 General Specifications

This section presents the general specifications of the TomoScan FOCUS LT Rackmount.

**Table 5 General specifications**

Category	Specification	Value
Housing	Size (W × H × D)	48.3 cm × 13.3 cm × 34.4 cm (19.00 in. × 5.25 in. × 13.5 in.)
	Net weight	11.5 kg (25.3 lb)
Environment	Storage temperature	−20 °C to 60 °C
	Operating temperature	Indoor use 0 °C to 50 °C
	Maximum relative humidity	95 %, non condensing
	Pollution degree	2
	Altitude	Up to 2000 meters
System	Ethernet interface	10BASE-T (bandwidth of 10 Mbps) 100BASE-T (bandwidth of 100 Mbps)
	Ethernet cable length	10BASE-T: 185 meters max. (607 feet) 100BASE-T: 100 meters max. (328 feet)

**Table 5 General specifications (continued)**

Category	Specification	Value
AC power requirements	Voltage	100 VAC to 240 VAC, tolerance $\pm 10\%$
	Frequency	50 Hz to 60 Hz, tolerance $\pm 3$ Hz
	Maximum power	150 VA
	Fuse	250 V, slow-blow: 2 A at 120 V or 240 V
DC power requirements	Voltage	15 VDC to 24 VDC, tolerance $-1$ V, $+1.5$ V, 5 A maximum

## 5.2 Operating Specifications

This section details the operating specifications of the TomoScan FOCUS LT Rackmount.

### 5.2.1 Pulsar/Receiver Differences and Limitations

The pulser/receiver specifications are given by model type. The main differences between the TomoScan FOCUS LT Rackmount models are the following:

- Number of active channels (16, 32, or 64)
- Hardware limitations

Hardware limitations occur when performing pitch-and-catch inspections (see Figure 5-1 on page 51). Those limitations are described in Table 6 on page 51.

Blue elements (K to K + N) are used for emission

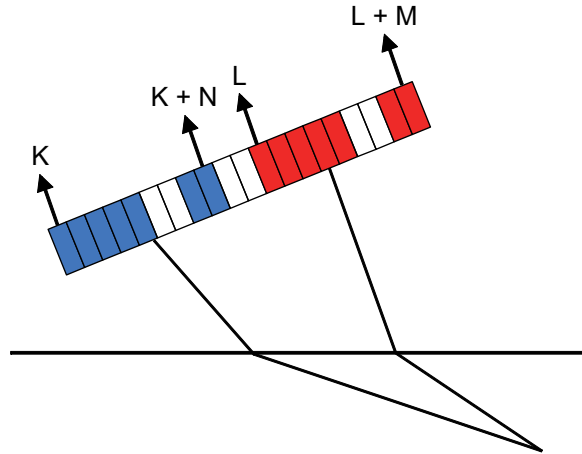


Figure 5-1 Illustration of pitch-and-catch inspection

Table 6 TomoScan FOCUS LT Rackmount hardware limitations

Model		Mode	Limit 1	Limit 2	Limit 3
16:128					N/A
K1	K = L	Pulse-echo	$N \leq 15$	$M \leq 15$	N/A
$K \geq 1$	$K \neq L$	Pitch-and-catch	$N \leq 15$	$M \leq 15$	N/A
32:128					N/A
$K \geq 1$	K = L	Pulse-echo	$N \leq 31$	$M \leq 31$	N/A
$K \geq 1$	$K \neq L$	Pitch-and-catch	$N \leq 31$	$M \leq 31$	N/A
64:128					N/A
$K \geq 1$	K = L	Pulse-echo	$N \leq 63$	$M \leq 63$	N/A
$K \geq 1$	$K \neq L$	Pitch-and-catch	$N \leq 63$	$M \leq 63$	N/A

## 5.2.2 Specifications for FLTRM16:128, FLTRM32:128, and FLTRM64:128

**Table 7 Specifications for FLTRM16:128, FLTRM32:128, and FLTRM64:128**

Category	Specification	FLTRM16:128	FLTRM32:128	FLTRM64:128
Pulser	Number of pulsers and receivers	16	32	64
	Number of elements	128		
	Pulse voltage	40 V, 80 V, and 115 V, $\pm 10\%$ (in high impedance)		
	Output impedance (115V) (pulse-echo)	$< 45 \Omega$	$< 48 \Omega$	$< 44 \Omega$
	Output impedance (115V) (pitch-and-catch)	$< 51 \Omega$	$< 53 \Omega$	$< 47 \Omega$
	Pulse shape	Negative square pulse		
	Pulse width	30 ns to 500 ns in steps of 2.5 ns, precision of 5 ns or $\pm 10\%$		
	Fall time	$< 11$ ns	$< 8$ ns	$< 8$ ns

**Table 7 Specifications for FLTRM16:128, FLTRM32:128, and FLTRM64:128**

Category	Specification	FLTRM16:128	FLTRM32:128	FLTRM64:128
Receiver	Full-scale input voltage	815 mV pp (pulse-echo)		
		550 mV pp (pitch-and-catch)		
	Input impedance	50 $\Omega$ , -0/+10 % (pulse-echo)		
		150 $\Omega$ , $\pm$ 10 % (pitch-and-catch)		
	Gain setting range	0 dB to 74 dB in steps of 0.1 dB		
	Tolerance	$\pm$ 0.5 dB (0 dB $\leq$ gain < 40 dB)		
		$\pm$ 1.0 dB (40 dB $\leq$ gain < 60 dB)		
		$\pm$ 1.5 dB (60 dB $\leq$ gain $\leq$ 74 dB)		
	Overall system bandwidth in pulse-echo (cutoff frequency at -3 dB)	540 kHz, $\pm$ 10 % to 19.3 MHz, $\pm$ 12 %	540 kHz, $\pm$ 10 % to 22 MHz, $\pm$ 12 %	540 kHz, $\pm$ 10 % to 23.5 MHz, $\pm$ 12 %
	Overall system bandwidth in pitch-and-catch (cutoff frequency at -3 dB)	540 kHz, $\pm$ 10 % to 20 MHz, $\pm$ 12 %	540 kHz, $\pm$ 10 % to 22 MHz, $\pm$ 12 %	540 kHz, $\pm$ 10 % to 22 MHz, $\pm$ 12 %
	Filters	Filter accuracy: $\pm$ 10 %, cutoff frequency at -3 dB		
		0.4 MHz to 1.7 MHz (band-pass)		
		1.1 MHz to 3.4 MHz (band-pass)		
		2.0 MHz to 7.4 MHz (band-pass)		
3.3 MHz to 7.5 MHz (band-pass)				
4.4 MHz to 11 MHz (band-pass)				
5.5 MHz to 15 MHz (band-pass)				
6.3 MHz to 20 MHz (band-pass)				
9.7 MHz to 22 MHz (band-pass)				
4.1 MHz to 20 MHz (high-pass)				
9.7 MHz to 22 MHz (high-pass)				
Insulation between channels	$\geq$ 57 dB at 10 MHz			

**Table 7 Specifications for FLTRM16:128, FLTRM32:128, and FLTRM64:128**

Category	Specification	FLTRM16:128	FLTRM32:128	FLTRM64:128
Beam forming	Scan type	Azimuthal and linear		
	Active elements	Up to 64		
	Total number of elements	128		
	Delay-range transmission	0 $\mu$ s—10 $\mu$ s in steps of 2.5 ns		
	Delay-range reception	0 $\mu$ s—10 $\mu$ s in steps of 2.5 ns		
	Dynamic depth focusing (DDF)	Yes		

There are four ultrasound connectors (P125, P126, P127, and P128) to connect conventional probes to the TomoScan FOCUS LT Rackmount, which correspond to the last four channels of the UT PHASED ARRAY connector.

The specifications for these channels are the same ones as the specifications for the phased array channels.



**WARNING**



When the instrument is used in conventional ultrasound mode with the P125, P126, P127, and P128 connectors, the voltage present on the P connectors can be dangerous as a shock hazard.

---

### 5.3 Specifications of Recorded Data

**Table 8 Specifications of recorded data**

Category	Specification	Value
Data acquisition and processing	Digitizing frequency	1.5625, 3.125, 6.25, 12.5, 25, 50, and 100 MHz, resolution of 8 bits or 12 bits
	A-scan length	32 to 8192 samples
	Acquisition depth	Without compression: 320 ns to 81.92 $\mu$ s in 40 ns steps
		With compression: up to 9.9 ms in 40 ns steps
	Number of focal laws	256
	Acquisition modes	Free running, encoder position, external signal
	Synchronization modes	Pulser, surface echo, external trigger
	A-scan recording	Up to 8000 A-scans/s (512 samples of 8 bits)
	C-scan data	Up to 20 kHz (four measurement gates plus synchronization gate)
	Data transfer	Up to 4.0 MB/s (8000 A-scans/s [512 samples of 8 bits])
	Pulse repetition frequency	Minimum 1 Hz
	Real-time averaging	1, 2, 4, 8, and 16
	Rectification	None (RF), full wave, halfwave+, halfwave-
	Video filtering	Smoothing (adjusted to probe frequency range)
Compression rate	Up to 255 (available only with digitizing frequency of 100 MHz)	
Time-Corrected Gain (TCG)	Dynamic range	Max. 74 dB with 0 dB of gain, $\pm 0.1$ dB
	Maximum slope	20 dB/ $\mu$ s
	Resolution	1 dB
	Trigger	Pulser, echo
	Number of points	256

**Table 8 Specifications of recorded data (continued)**

Category	Specification	Value
Data type	A-scan type	RF, rectified, rectified video
	C-scan type	4 gates (amplitude and time of flight for gate peak and gate crossing C-scans), and a synchronization gate (time of flight of the echo)
	Encoders	Maximum input frequency: 200 kHz
		Interface modes: quadrature, clock dir, up, down
	Digital input	2 digital inputs (for more information, see "I/O Connector" on page 59)
	Digital output	4 digital outputs (for more information, see "I/O Connector" on page 59)
Alarms	3 alarms available	

## 5.4 Specifications of the Ethernet Link

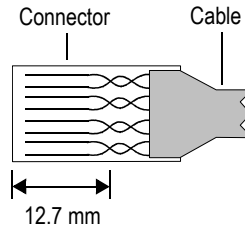
The TomoScan FOCUS LT Rackmount must be linked to the workstation with a category 5 Ethernet cable made of unshielded twisted pairs. The same cable can be used for 10BASE-T or 100BASE-T speeds; however, the maximum cable length depends on the link speed (see Table 9 on page 56).

**Table 9 Ethernet cable parameters and specifications**

Parameters	Specifications
Description	- Crossover Ethernet cable for direct connection to the workstation - Standard Ethernet cable for connection to the workstation through a network hub
Evident part number	Crossover cable: 60ND0001
Cable type	EIA/TIA standard, 150 $\Omega$ , unshielded, level 5
Minimum distance between nodes	0.6 meter (2 feet)
Maximum cable length	10BASE-T: 185 meters (607 feet)
	100BASE-T: 100 meters (328 feet)



To ensure the proper functioning of the Ethernet cable, the untwisted portion of the twisted pairs must be kept to a maximum of 12.7 mm (0.5 in.) from the tip of the connector (see Figure 5-2 on page 57).



**Figure 5-2 The twisted pairs in an Ethernet cable**



## 6. Connector References

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This chapter presents the technical description of the TomoScan FOCUS LT Rackmount back panel connectors. For each connector, you will find the following information: a brief description; the manufacturer number; the number of the corresponding cable connector; an illustration; and a table giving the specifications or the signal pinouts for the connector. The following connectors are presented:

- I/O connector
- TEMP SENSOR connector
- DC OUT connector
- DC IN connector
- TRIG OUT connector
- ETHERNET connector
- P connectors
- UT PHASED ARRAY connector

### 6.1 I/O Connector

Description

18-pin, female, shell 14

Manufacturer; number

ITT Cannon; KPT02A14-18S

Evident; 21AN0005

Suggested cable connector

ITT Cannon; KPT06B14-18P

Evident; 21AN0011

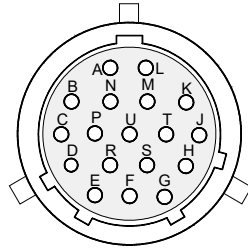


Figure 6-1 The I/O connector

Table 10 Pinout for the I/O connector

Pin	I/O	Signal	Description	Type
A	Input	PhB-1	Encoder 1: phase B / direction	TTL
B	Output	Dout1 / PaceOut	Programmable output. Can be configured as generic output 1 or as pace output signal (high level of 1 $\mu$ s). Default configuration: generic output 1.	TTL
C	Input	PhA-2	Encoder 2: phase A / Clock / Up / Down	TTL
D	–	GND	Ground	–
E	Output	AL2	Alarm output 2. Disabled on reset, value: 0 V. When active, value: 5 V.	TTL
F	Input	Din1/Preset1	Programmable input. Can be configured as generic input 1 or as preset of encoder 1. To use it as preset input, it must be configured as external preset from TomoView software. To preset, a high-level signal must be used.	TTL
G	Input	Din3/AcqEn	Programmable input. Can be configured as generic input 3 or as acquisition enable signal (enabled at high level). Default configuration: generic input 3.	TTL
H	Output	AL1	Alarm output 1. Disabled on reset, value: 0 V. When active, value: 5 V.	TTL
J	Output	Dout2	Generic output 2	TTL
K	–	GND	Ground	–
L	Output	Dout3	Generic output 3	TTL
M	Output	AL3	Alarm output 3. Disabled on reset, value: 0 V. When active, value: 5 V.	TTL

**Table 10 Pinout for the I/O connector (continued)**

Pin	I/O	Signal	Description	Type
N	Output	Dout4	Generic output 4	TTL
P	Input	PhB-2	Encoder 2: phase B / direction	TTL
R	Input	Din2/Rev. Sync. /Preset2	Programmable input. Can be configured as generic input 2, as <i>top tour</i> input (revolution synchronization signal) or, as preset of encoder 2. To use as preset input, it must be configured as an external preset from the TomoView software. To preset, a high-level signal must be used.	TTL
S	Output	+5 V	Supply output voltage, 500 mA max.	–
T	Input	Din4/ExtPace	Programmable input. Can be configured as generic input 4, duration $\geq 50 \mu\text{s}$ with PRF $< 10 \text{ kHz}$ (not supported with PRF $> 10 \text{ kHz}$ ). TomoView software sets this input as external pace input when firing on external pace.	TTL
U	Input	PhA-1	Encoder 1: phase A / Clock / Up / Down	TTL

## 6.2 TEMP SENSOR Connector

### Description

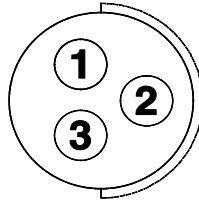
3-pin, female connector

### Manufacturer; number

W.W. Fischer Inc.; DEE.102.A052-130  
Evident; 21AB0125

### Suggested cable connector

W.W. Fischer Inc.; S.102.A052-130  
Evident; 21AB0126



**Figure 6-2 The TEMP SENSOR connector**

**Table 11 Pinout for the TEMP SENSOR connector**

Pin	I/O	Signal	Description
1	Output	+12 V	+12 V output, 40 mA
2	Input	+1 V to +5 V	Temperature sensor analog signal
3	–	NC	No connection

### 6.3 DC OUT Connector

#### Description

5-pin, female connector

#### Manufacturer; number

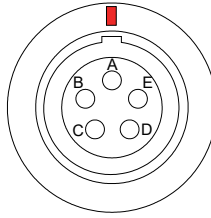
LEMO; HGG.2B.305.CLLP

Evident; 21AB0109

#### Suggested cable connector

LEMO; FGG.2B.305.CLCD62Z

Evident; 21AB0014



**Figure 6-3 The DC OUT connector**

**Table 12 Pinout for the DC OUT connector**

Pin	I/O	Signal	Description
A	Output	+12 V	+12 V output, 1 A, (maximum load capacitance: 1200 $\mu$ F)
B	–	NC	No connection
C	–	GND	Ground
D	–	NC	No connection
E	–	NC	No connection

## 6.4 DC IN Connector

### Description

2-pin, male connector

### Manufacturer; number

W.W. Fischer Inc.; D.103.Z051-60

Evident; 21AB0321

### Suggested cable connector

W.W. Fischer Inc.; S.103.Z051-130

Evident; 21AB0322

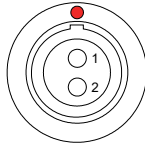


Figure 6-4 The DC IN connector

Table 13 Pinout for the DC IN connector

Pin	I/O	Signal	Description
1	Input	+15 V to +24 V	15 VDC to 24 VDC input, 5 A max.
2	–	GND	Ground

## 6.5 TRIG OUT Connector

### Description

Female, coaxial

### Manufacturer; number

Amphenol; 31-318

Evident; 21AJ0001

### Suggested cable connector

Any standard BNC plug

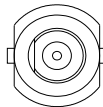


Figure 6-5 The TRIG OUT connector

Table 14 Pinout for the TRIG OUT connector

I/O	Signal	Description	Type
Output	Trigger	The TRIG OUT connector is used for calibration and diagnostic.	TTL



## 6.6 ETHERNET Connector

### Description

8-position modular, female connector

### Manufacturer; number

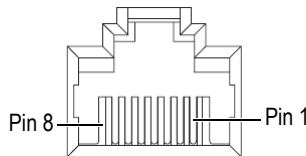
Stewart Connector; SS-650810SAFLS

Evident; 21AI0080

### Suggested cable connector

Stewart Connector; 940SP-360808

Evident; 21AI0079



**Figure 6-6 The ETHERNET connector**

**Table 15 Pinout for the ETHERNET connector**

Pin	I/O	Signal	Description
1	Output	TX+	Data transmission
2	Output	TX-	Data transmission
3	Input	RX+	Data reception
4	–	NC	No connection
5	–	NC	No connection
6	Input	RX-	Data reception
7	–	NC	No connection
8	–	NC	No connection

## 6.7 P Connectors

### Description

Female, coaxial

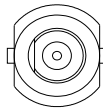
### Manufacturer; number

Amphenol; 31-318

Evident; 21AJ0001

### Suggested cable connector

Any standard BNC plug



**Figure 6-7 The P connectors**

**Table 16 Pinout for the P connectors**

Connector	I/O	Signal	Description
P125 to P128	Input/Output	RF	The P connectors are used to transmit and receive the RF signals of four conventional ultrasound probes.

## 6.8 UT PHASED ARRAY Connector

### Description

160-pin, female, Minidock-type connector

### Manufacturer; number

Global Components; 30033-160T

Evident; 21AI0170

### Suggested cable connector

Framatome; 89649-002

Evident; 21AI0153

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