

TSC 4133A

TSC 4136A

TSC 4159A

**Operations and Maintenance
Manual**



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TSC 4133A 5V Pulse Distribution Amplifier
TSC 4136A RF Distribution Amplifier
TSC 4159A Low Frequency Distribution Amplifier

Operations and Maintenance Manual

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DOC04133A Rev B

Revision History

Revision	Description	Date	Approved
A	Initial release.	1/12/06	GAR
B	Add jumper information for 4159A	6/29/06	GAR

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1: Introduction



Note

FIRST READ THIS MANUAL THOROUGHLY.

This is especially true for the sections regarding **Safety** and **Operation**.

1.1 Symbols

These symbols (icons) appear throughout the manual as well as on the unit itself.

Symbol	Definition
Note	This symbol means the following information is a note that gives you important information that may affect how you use the 4133A, 4136A, and 4159A.
	Caution, refer to manual. Read all instructions in this manual before using this product.
	Caution - Risk of electrical shock
	Fuse symbol.
	LAN port, network. DO NOT CONNECT TO TELECOM CONNECTIONS THAT CARRY HAZARDOUS VOLTAGES.
	Chassis ground.
	CE marking attesting compliance with applicable European Directives.
	Earth terminal symbol: used to indicate an earth ground connection to chassis.

1.2 About This Manual

This manual tells you how to install, set up, monitor, and troubleshoot the 4133A, 4136A, and 4159A.

“[Chapter 1, Introduction](#)” on page 1 explains symbols that appear in the manual and on the unit as well as documentation conventions. The chapter also briefly describes the unit.

“[Chapter 2, Installing and Setting Up the Unit](#)” on page 5 contains important safety information and describes how to install the 4133A, 4136A, and 4159A, and assign a fixed IP address.

“[Chapter 3, Monitoring the unit](#)” on page 9 describes how to check status and monitor alarms.

“[Chapter 4, Troubleshooting the unit](#)” on page 13 describes how to troubleshoot the input and outputs, replace power supplies, and replace fuses.

“[Chapter 5, Warranty and Shipping Information](#)” on page 17 explains how to contact Timing Solutions Corporation for warranty service and provides shipping guidelines.

“[Appendix A, Specifications](#)” on page 19 contains the detailed specifications for the 4133A, 4136A, and 4159A.

1.2.1 Conventions

This manual uses several typographical conventions to help explain how to use the 4133A, 4136A, and 4159A.

Convention	Definition
Bold	Words in bold show: <ul style="list-style-type: none">■ Buttons and icons to click■ Menu options to select■ Commands to type■ Non-variable information displayed in response to commands
<i>Italics</i>	Words in <i>italics</i> show: <ul style="list-style-type: none">■ Names of windows and dialog boxes■ Variable information displayed in response to commands

1.3 4133A, 4136A, and 4159A Overview

These units are 1U (1.75") high, 19-inch, rack-mount, distribution amplifiers that accept two inputs and produce nine outputs (chosen from the two inputs). The units can be configured with redundant hot swappable AC or DC power supplies.

The front panel provides green/red LED status for the power supplies and for all output signals.

An Ethernet port on the rear panel provides the capability to remotely monitor the status of the power supplies, input, and all output signals. Any failure in the unit will immediately provide an alarm to this port.

Figure 1 shows the unit's front panel, and Figure 2 shows the unit's rear panel.

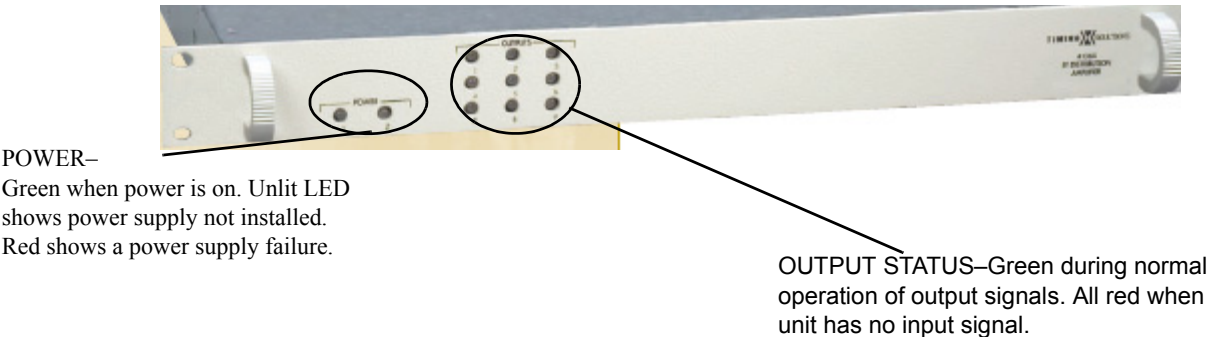


Figure 1: Front panel

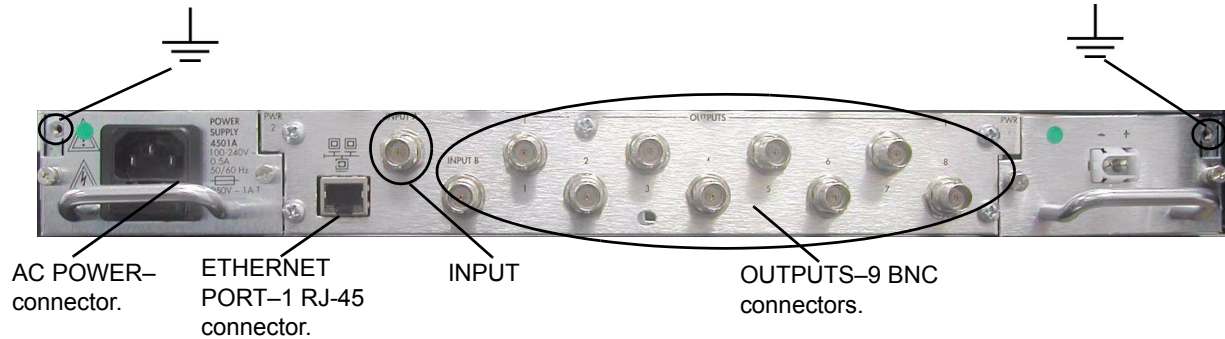


Figure 2: Rear panel

2: Installing and Setting Up the Unit

2.1 Safety Information



Warning

This unit is for INDOOR USE ONLY. It is not sealed to prevent moisture from entering the enclosure.

Do not attempt to install or operate this equipment if you have not first acquired proper training.

Equipment is intended for installation in an enclosed- or open-type equipment rack.

Ensure that all cables are properly connected. The power cord must be easy to remove from the back.

Verify that input line voltage and current capacity are within specifications before turning on the unit.

Disconnect all sources of input power before removing the top cover of this unit.

Operating and maintenance personnel must receive proper training before installing or maintaining electrical equipment.

2.2 Installing the Unit

The Unit ships ready for installation into a standard 19" (48.3 cm) rack. You can mount the unit using General Devices slides with part numbers C-300-S-126, -128 and -130.

Required for installation:

- North American or European IEC power cord. One or the other will be supplied with the unit.
- #1 Phillips screwdriver.
- One #6-32 x 5/8" pan head screw with lock washer.
- Customer-supplied, double-shielded RG223 cables with BNC connectors from source and to next devices in system.
- Customer-supplied, shielded LAN cable for network connection (RJ-45).
- Rack-mount slide kit from General Devices, C-300-S-126, -128 or -130 (Optional)

- Rack mounting screws.
- Screwdriver for the rack mount screws and slide, as needed.



Caution

Since the unit does not have a AC mains power switch, both the appliance inlet connector and the plug on the detachable power supply cord are considered to be suitable disconnect means for disconnecting the unit from the AC mains supply. If the rear of the unit is not accessible after installation in the instrument rack, you must provide a suitable external AC disconnect means for the unit.

To set up the 4133A, 4136A and 4159A:

1. Unpack carefully and inspect the unit.
2. Check for physical damage.
 - If you observe physical damage, immediately contact Timing Solutions and the carrier.
 - We recommend saving the shipping container for submitting any necessary claims to the carrier.
3. Set the 4159A jumper setting for input impedance appropriately for your application. The unit ships from the factory set to 50 ohms. See “[4.6 Setting the jumpers for input impedance](#)” on page 16 for information on changing the setting.
4. Using a #1 Phillips screwdriver and a #6-32 pan head screw, connect a safety ground wire to the ground point next to one power supply.
5. Plug the female end of the power cord into the male IEC-320 plug on the rear of each power supply.
6. Plug the male end of each power cord into a 100–240 VAC, 50/60 Hz power source.



Caution

Ensure that this power supply cord is connected to a properly grounded mains receptacle.

7. Connect the input signal cables from a source to the INPUT BNC connector on the rear panel.
8. Connect up to nine cables to the OUTPUT BNC connectors on the rear panel to supply users with a copy of the input signal.
9. (Optional.) Connect a shielded LAN cable to the Ethernet port on the rear panel of the 4133A, 4136A and 4159A.

2.3 Assigning a Static IP Address

The 4133A, 4136A and 4159A contain a Lantronix® Xport™ Ethernet to RS-232 converter, which provides the unit’s Ethernet connection.

The unit ships from the factory with a default IP address of 0.0.0.0, which enables DHCP. If the network has a DHCP server, it will assign each unit an IP address, gateway address, and subnet mask when the unit starts up.

To monitor multiple units remotely through their Ethernet connections, you must assign each unit a fixed IP address. You identify which unit is the source of an alarm by its IP address. Follow the instructions in this section to assign a unit's IP address.



Note

For more detailed information, see the *Xport User Manual*. Section 3.3 discusses several different ways that you can assign IP addresses. Chapter 4 explains how to permanently configure the IP address. You can download the *Xport User Manual* from the Lantronix® Web site as an Adobe® Acrobat® PDF file. Go to:
<http://www.lantronix.com/>

If you want to permanently configure the IP address, you must install the Lantronix DeviceInstaller software. This software is available only by downloading from the Lantronix Web site. Go to: <http://www.lantronix.com>

You can also assign the IP address using Telnet.



Note

If you move the 4133A, 4136A or 4159A to a different network hub after setting up the static IP address, the host computer may not be able to make a connection. You may need to release the IP address lease on your operating system.

To assign the static IP address using the Lantronix DeviceInstaller software:

1. Obtain the following network information from your system administrator for each 4133A, 4136A and 4159A you want to install:
IP Address: _____
Subnet Mask: _____
Gateway: _____
2. Connect a Windows® PC to the same local subnet as the 4133A, 4136A or 4159A.
3. Install and start the Lantronix® DeviceInstaller software.
4. Use the DeviceInstaller software to search for devices on the network. When you have discovered the appropriate device, assign the appropriate IP address using the DeviceInstaller software.

To assign the static IP address using Telnet:

1. Telnet to the assigned address, port 9999.
2. Press **Enter** within five seconds to enter the setup mode.
3. Select Option 0.
4. Set the IP address and follow the on-screen instructions to save the setting.
5. Telnet to the new IP address.
6. Type **I**
 - You do not need to type a carriage return or line feed.
 - The system returns **I41xxA-00\r\n**, where xx is the specific unit part number and 00 is the hardware version, and turns on the front panel input LEDs for two seconds before returning to normal operation.
 - If you see these responses, you know you are communicating with the unit.

2.4 Cleaning



Warning

Do not spray or use too much liquid when cleaning the unit. Liquid can enter the unit and damage sensitive electronic components.

- Clean the main chassis with a soft cloth dampened with a mild soap and water solution.

3: Monitoring the unit

3.1 Accessing the System

You access the unit remotely by connecting to its Command-And-Response (CNR) Port through the Ethernet connection. The CNR port (Port 10001), which uses TCP/IP, lets you input commands, displays results of the commands, and publishes alarms as they occur.

When you Telnet to the CNR port, the system does not display a prompt.

3.2 Checking System Information

3.2.1 Checking Status and Alarms

The system can report status and alarms that occurred since the last status check.

To check system status:

- Type: S

You do not need to type a carriage return or line feed.

The system returns *Sabcde,ghij\r\n* where

- *abcde* is current status.
- *ghij* is latched status since the last status request.

Both *abcde* and *ghij* are hexadecimal numbers, with each bit position representing one alarm. LSB (farthest right) is output 1.

Alarms remain active in the current status field until the problem is corrected. Latched status bits are not cleared until the second status request after an alarm is cleared.

Example: S08000,08001

This example shows that power supply 2 has an alarm, and output 1 had a failure that was cleared or resolved itself since the last status request.

Table 1 defines each status or alarm bit position.

Table 1: Status or alarm binary codes

Status or alarm character position	Bit position	Bit value and description
a or f	19	Not used, always 0
	18	Not used, always 0
	17	Not used, always 0
	16	Not used, always 0
b or g	15	1 = Power supply 2 fault
	14	1 = Power supply 1 fault
	12	Not used, always 0
	12	Not used, always 0
c or h	11	Not used, always 0
	10	Not used, always 0
	9	Not used, always 0
	8	1 = output 9 failed
d or i	7	1 = output 8 failed
	6	1 = output 7 failed
	5	1 = output 6 failed
	4	1 = output 5 failed
e or j	3	1 = output 4 failed
	2	1 = output 3 failed
	1	1 = output 2 failed
	0	1 = output 1 failed

3.2.2 Checking Model Number and Software Version

Both commands are case sensitive. You do not need to type a carriage return or line feed.

To check the TSC model number:

- Type: **I**
 - The system returns **I44xxA-00\r\n**, where **xx** is the specific unit part number, and **00** is the hardware version.

To check the software version

- Type: **V**
 - The system returns **Vxx\r\n** where **xx** is the software version.

Example: V00.

3.3 Understanding Alarm Output

The 4133A, 4136A and 4159A automatically publish alarms to the CNR port as they occur.

The alarms appear in the format **ALARM***fghij* where *fghij* is the summary of the power supply and output signal status. The format of the alarm status is identical to the “S” command response defined in [Table 1](#) on page 10.

Example: ALARM00003

This example shows that outputs 1 and 2 have active faults.

4: Troubleshooting the unit

Perform all of the following procedures before returning the unit for service. If the unit still appears to have a problem, call Timing Solutions Corporation and request technical support. Have the serial number of your unit ready to give to a technical representative.

4.1 Troubleshooting Output Problems

If all of the OUTPUT LEDs are red, the unit is not receiving a valid input signal on the input.

If one OUTPUT LED is red, return the unit to TSC for repair. The output circuits have no user-serviceable parts. For contact information, see “5.1 Warranty Information” on page 17.

4.2 Troubleshooting Power Supply Problems

Table 2 shows the POWER LED states, their definitions, and actions required.

Table 2: INPUT LED troubleshooting

POWER LED status	What it means	What do to
Power supply 1 green and power supply 2 red.	Power supply 2 failure or no power supply installed into power supply 2 slot.	Replace the failed power supply or set power supply jumper to one power supply. For more information, see “4.3 Configuring for Dual Power Supplies” on page 13.
Power supply 1 green and power supply 2 not lit.	Power supply jumper is set for one power supply.	No action required if only one power supply is installed. If two power supplies are installed, see “4.3 Configuring for Dual Power Supplies” on page 13.

4.3 Configuring for Dual Power Supplies

The power supply setting is configured at the factory based upon single or dual power supply configuration. If you are adding a second power supply to a unit that was originally configured for a single power supply, you should change the internal jumper setting. The jumper setting ensures that the power supply LEDs reflect the proper configuration and that the second power supply is monitored.



Caution

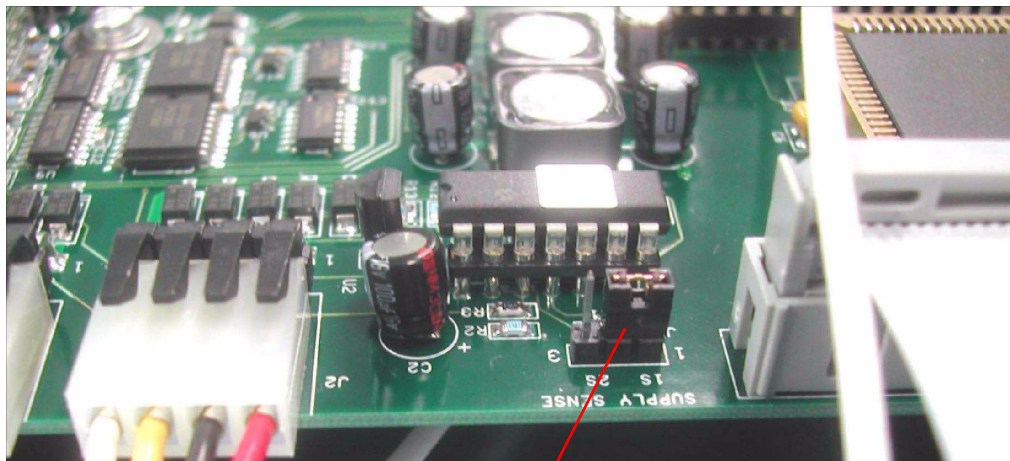
When opening the top cover and changing the power supply settings, use proper ESD precautions. This includes ensuring that you are properly grounded before touching the internal PWA of the unit to change the jumper settings.

Required for this procedure:

- #1 Phillips screwdriver

To change the jumper setting:

1. Disconnect both power supplies from their power source.
2. Using a #1 Phillips screwdriver, remove the top cover.
3. Move the jumper one position to the left to the 2S position.



Power supply jumper configured for one power supply (in the 1S position).

4. Replace the top cover.
5. Reconnect the power supplies.

4.4 Replacing Power Supplies

For units with a single power supply, the normal LED state is for one LED to be green and the other not lit. For units with dual power supplies, the normal LED state is for both LEDs to be green.

If a power supply LED is red, check that the affected power supply is connected to a properly functioning 100–240 VAC, 50/60 Hz power source or to an appropriate DC source. If the LED remains red, you should replace the power supply.

For AC power supplies, use only TSC 4501A power supplies. For DC power supplies, use only TSC 4502A power supplies.

In a unit with dual power supplies, you can hot swap the power supplies. This means you can leave the working power supply connected to power and all input and output devices connected when you replace the failed power supply.

Required for this procedure:

- #1 Phillips screwdriver

To replace a power supply:

1. Disconnect the power cord from the failed power supply.
2. Using a #1 Phillips screwdriver, remove the two screws from the failed power supply.
3. Using #1 Phillips screwdriver, remove the ground screw.
4. Slide the power supply out of the chassis.
5. Slide the new power supply into the chassis, making sure it clicks into place.
6. Replace the two screws in the power supply.
7. Replace the ground screw in the power supply.
8. Reconnect the power cord to the new power supply.

4.5 Replacing Fuses

If you know that a local event caused blown fuses throughout a rack, you can replace the fuses in each 4501A power supply. The AC power supplies have two fuses.

The DC power supplies do not have any customer-serviceable fuses.

Required for this procedure:

- Small flat-head screwdriver
- Replacement fuses for a standard IEC 320 power entry module with fuse (5 x 20 mm, 1 amp, 250 volt fuse)

To replace a fuse:

1. Disconnect the power cables from the power supplies.
2. Using a small screwdriver, open the fuse cover on the power supply.
3. Replace the old fuses as necessary in each power supply.
4. Close the fuse covers.
5. Reconnect the power cables to the power supplies.

4.6 Setting the jumpers for input impedance

The TSC 4159A input impedance may be configured to be either HIGH (10 kohms or LOW (50 ohms) impedance by setting internal Jumpers JP2 and JP3 on the TSC 4159A main board. JP2 controls the module's input impedance. JP3 controls the module's gain to maintain unity gain for both HIGH and LOW impedance configurations.



Caution

When opening the top cover and changing the power supply settings, use proper ESD precautions. This includes ensuring that you are properly grounded before touching the internal PWA of the unit to change the jumper settings.

Required for this procedure:

1 Phillips screwdriver

To change the jumper setting:

1. Disconnect both power supplies from their power source.
2. Using a #1 Phillips screwdriver, remove the top cover.
3. Move both the JP2 and JP3 jumpers to either LO-Z or HI-Z.
4. Replace the top cover
5. Reconnect the power supply (or supplies)

4.7 Solving Operational Problems

If the unit does not operate properly after you have checked the following:

- Troubleshoot the outputs as described in “4.1 Troubleshooting Output Problems” on page 13
- Checked that the correct power is applied to the power supplies
- Checked that the fuses are good

return the unit to TSC for repair. For contact information, see “5.1 Warranty Information” on page 17.

5: Warranty and Shipping Information

This chapter provides information on how to contact Timing Solutions Corporation for warranty service, as well as shipping guidelines for the 4133A, 4136A and 4159A.

5.1 Warranty Information

The 4133A, 4136A and 4159A carry a warranty from Timing Solutions Corporation for a period of 1 year from date of shipment.

For repairs, contact Timing Solutions Corporation:

- Phone (303) 939-8481
- Fax (303) 443-5152

Address written correspondence to:

Timing Solutions Corporation
4775 Walnut Street, Suite 1B
Boulder, CO 80301
USA

5.2 Shipping Information

If you need to ship this unit for any reason, including returning equipment to Timing Solutions for warranty service, follow these shipping instructions. Failure to follow these instructions may damage your system.

5.2.1 Packing Instructions

- Always ship the 4133A, 4136A and 4159A appropriately packaged to protect them from damage.
- No cables or connectors may be attached to the rear of the chassis.
- Wrap the chassis in plastic to protect against moisture.

Appendix A: Specifications

A.3 Electrical Specifications

Table 3 lists the electrical specifications for the 4133A, 4136A and 4159A.

Table 3: Electrical specifications

Item	Specification
Protection Class	Class I (Grounded Type)
Power Input Voltage	100–240 V ~ 50/60 Hz, 13 Watts Note: Fluctuations not to exceed $\pm 10\%$ of nominal supply voltage.
Power Inlet Type	IEC 60320 sheet C14
AC Power Supply Cord Set	18 AWG (0.75 mm ² minimum)
DC Power Supply	The external wiring to this connector must be at a minimum 1.5 mm ² (14 AWG) with a 15 A fuse or circuit breaker. A 20 A circuit breaker may be used if the external wiring is jacketed 14 AWG, with maximum length of 20 feet. An internal fuse mounted on the power supply carrier board is included to protect this input but is not field replaceable. Mating connector for the DC power supply is a AMP 1-350344-0 and 2 sockets are required, AMP 350388-1.
Power Supply Part Numbers	AC: TSC 4501A DC: TSC 4502A
Power Mains Fuse	AC: (2) - 250V~1A time lag 5 x 20 mm. Initial shipments will have one fuse. DC: No customer-serviceable fuses.

Table 3: Electrical specifications (Continued)

Item	Specification
Signal Input	<ul style="list-style-type: none"> ■ 4132A: <ul style="list-style-type: none"> ■ Impedance: $50 \Omega \pm 5 \Omega$ ■ Logic one > 2.4 V ■ Logic zero < 0.8 V ■ 1 PPS to 1 MPPS ■ Duty Cycle 0-50% ■ 4136A: <ul style="list-style-type: none"> ■ Frequency: 1–20 MHz ■ Impedance: $50 \Omega \pm 5 \Omega$ ■ Level: +8 dBm to +15 dBm (13 dBm nominal) ■ 4159A: <ul style="list-style-type: none"> ■ Frequency 1 – 100 kHz ■ Impedance: $50 \pm 5 \Omega$ ■ Level < 6 V pp
Connectors	<ul style="list-style-type: none"> ■ Input: 1BNC ■ Output: 9BNC ■ LAN: RJ-45
4136A and 4159A Gain	$1.0 \pm 10\%$
4136A Spurious Distortion	< -80 dBc (with 5 MHz signal)
4136A Harmonic Distortion	< -40 dBc (with 5 MHz signal)
4136A SSB Phase Noise	At 10 MHz: <ul style="list-style-type: none"> ■ 1 Hz: -135 dBc ■ 10 Hz: -145 dBc ■ 100 Hz: -155 dBc ■ 1 kHz: -163 dBc ■ 10 kHz: -163 dBc
4132 Outputs	<ul style="list-style-type: none"> ■ Output voltage: <ul style="list-style-type: none"> ■ Logic one : + 3.0 V Typical into 50Ω ■ Logic zero : + 0.8 V Maximum into 50Ω ■ Pulse rise time < 2.0 ns ■ Pulse fall time < 2.0 ns ■ Skew between outputs < ± 500 ps ■ Jitter < 50 ps rms

A.3.1 Environment Specifications



Warning

This unit is for **INDOOR USE ONLY**. It is not sealed to prevent moisture from entering the enclosure. Equipment intended to be installed in an enclosed- or open-type equipment rack.

- Pollution Degree II per EN61010-1
- Installation (Over-Voltage) Category II for transient over-voltages per EN 61010-1
- Equipment suitable for continuous operation

Table 4 lists the environmental specifications for the 4133A, 4136A and 4159A.

Table 4: Environment specifications

Item	Temperature	Relative Humidity	Altitude
In Use	15°C to 40°C	10% to 85% (non-condensing)	3,000 meters (9,843 feet)
Storage	-40°C to 70°C	5% to 95% (non-condensing)	
Transportation	-40°C to 70°C	5% to 95% (non-condensing)	

A.4 Physical Specifications

Table 5 lists the physical specifications for the 4133A, 4136A and 4159A.

Table 5: Physical specifications

Item	Specification
Width	Standard 19-inch rack mount
Height	Standard 1U (~1.75 inches or 4.44 cm)
Depth	12.75 inches or 31.875 cm
Weight	Approximately 4.1 kg

Glossary

\n	Line feed
\r	Carriage return
CNR	Command and Response
DHCP	Dynamic Host Configuration Protocol
ESD	electrostatic discharge
LED	light-emitting diode
LSB	least significant bit
MSB	most significant bit
PDF	portable document format
PWA	printed wiring assembly
RF	radio frequency
TSC	Timing Solutions Corporation

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