cORL-A1
Optical Return Loss Meter

Operating Manual	BN 2298/21
	BN 2298/22
	BN 2298/23

◆ JDSU

The description of additional features of the device can be found at:

http://www.jdsu.com/test

Copyrights

Note: Changes may be made to specifications, descriptions and delivery information.

Printed in Germany

CONTENT

1   INTRODUCTION

cORL-A1 Optical Return Loss Meter

The cORL-A1 Test set is specially designed for high performance testing of all optical signals and systems, i.e. broadband, PONs, and Gigabit Ethernet.

AC line operation via a separate AC adapter and the USB interface for remote control ensure ease of use in the laboratory. The Compact Photonic Tools are stackable, so you can assemble individual test sets.

Common features

The cORL-A1 is available in two or three laser versions with the option to select from four key wavelengths: 1310, 1490, 1550, and 1625 nm. The single optical output found in the cORL-A1 greatly simplifies the optical connections and calibrations. The 75 dB dynamic range in return loss enables the measurement of high performance angled physical contact (APC) connectors.

Through the use of the mode key, the unit will operate as a simple fiber-coupled optical power meter (OPM) or as a simple Fabry-Perot Light Source. Full standard commands for programmable instruments (SCPI) for these modes are supported.

Innovative features

TWIN or TRIPLE Test

Enabling TWIN or TRIPLE test features on the cOPM-A1 dramatically lowers test durations by allowing simultaneous measurement for two or three wavelengths. Accessing this features requires pairing the cORL-A1 with the a cOPM-A1. When this feature is enabled on both units, the cOPM-A1 will automatically detect the present wavelengths and display the

simultaneous measured output power (or loss) for each wavelength. Additionally, with these two units paired together, simultaneous insertion loss and return loss may be measured. Pairing the cORL-A1 with the cOPM created the functionality of the historic JDSU RM Series or singlechannel RX Series.

Differences between the devices

All versions with FC/APC connectors.

Type BN ...	Description	Wavelengths
2298/21	Dual Wavelength Optical Return Loss Meter	1310,1550 nm
2298/22	Triple Wavelength Optical Return Loss Meter	1310, 1490, 1550 nm
2298/23	Triple Wavelength Optical Return Loss Meter	1310, 1550, 1625 nm

Operating manual update

Continuing enhancement and further development of the Compact Photonic family may mean that this operating manual does not cover all the latest functions of your device.

If the operating instructions about features provided by your device are missing, please visit the JDSU web site to check if additional information is available.

To download the latest operating instructions:
1. Visit the JDSU web site at **www.jdsu.com/test**.
2. Select your model from the product line.
3. Open the download area and download the operating instructions if available.

Symbols used in this operating manual

The following symbols, warnings and character formats are used in this operating manual:

⚠	**CAUTION** Follow the instructions carefully to avoid **damage** to the device. **WARNING** Follow the instructions carefully to avoid **damage** to the device or **injury** to the person. **DANGER** Follow the instructions carefully to avoid **damage** to the device or **severe injury** to the person.
⚡	**High Voltage** Follow the instructions carefully to avoid **damage** to the device or **severe injury** to the person. This safety instruction is given if the danger is due to **high voltage**.
☢	**Laser** Follow the instructions carefully to avoid **damage** to the device or **severe injury** to the person. This safety instruction is given if the danger is due to **laser radiation**. Information specifying the laser class is also given.
!	**Very important instruction** Follow this instruction carefully; e.g. **!** Make sure you protect yourself and others from exposure to laser light.

✓	**Requirement**
	This requirement must be met first; e.g.
	✓ The system is switched on
⇒ 1. 2.	**Instruction**
	Follow the instructions given (the numbers indicate the order in which the instructions should be followed); e.g.
	⇒ Select mode.
Italics	**Result**
	Indicates the result of following an instruction; e.g.
	The page opens.
Bold type face	**Pages, controls, and display elements**
	Screen pages, controls, and display elements are indicated in **bold type**.
Text in blue	**Cross references**
	Cross references are indicated in blue type. When using the PDF version, just click on the blue text to skip to the cross reference.
[Store]	**Instrument keys**
	Instrument keys are indicated within square brackets.

2 SAFETY INFORMATION

Warning symbols on the unit

⚠️ **Warning symbols indicating a potential hazard**

! In all cases where the unit is labeled with a warning symbol, the operating manual must be consulted to learn more about the nature of the potential hazard and any action that must be taken.

Proper usage

This instrument is intended for measurements on optical fiber devices and systems.

⇒ Please make sure the device is not operated outside the permitted ambient conditions.
⇒ Observe the specified measurement range.
⇒ Always make sure that the device is in proper working order before switching it on.

Laser safety

Dangerous laser radiation

WARNING

Laser radiation can cause irreparable damage to the eye and skin.

This device is a Class 1 Laser product according to DIN EN 60825-1:2001.

LASER RADIATION

**CLASS 1
LASER PRODUCT**

Observe the following instructions when working with this device and laser systems in general:

! Connect all optical fibers before switching on the radiation source.

! Switch off the radiation source before disconnecting the optical fibers.

! Never look directly into the output of a laser source or into an optical fiber connected to it.

! Always cover unused ports.

! Observe the normal precautions for working with laser radiation and follow any local regulations.

Ventilation

Insufficient ventilation

CAUTION

Insufficient ventilation can damage the device or adversely affect its function and safety.

! Ensure adequate ventilation when operating the device.

SNT-121A Adapter

Safety class

The SNT-121A AC Adapter/Charger Unit is protectively isolated to conform with IEC 60950.

Environmental conditions

⚠️ **CAUTION**

Ambient temperature too high/low

Temperatures outside the operating range of 0 to +40 °C can damage the SNT-121A Adapter or adversely affect its function and safety.

! Only operate the SNT-121A Adapter indoors.
! The SNT-121A Adapter must only be operated at ambient temperatures between 0 and +40 °C.

⚠️ **CAUTION**

Insufficient ventilation

Insufficient ventilation can damage the SNT-121A Adapter or adversely affect its function and safety.

! Ensure adequate ventilation when operating the SNT-121A Adapter.

⚠️ **CAUTION**

Condensation

Operation in the presence of condensation can damage the SNT-121A Adapter or adversely affect its function and safety.

! Do not operate the SNT-121A Adapter if condensation has formed.
! If condensation cannot be avoided, such as when the SNT-121A Adapter is cold and is moved to a warm room, wait until the SNT-121A Adapter Unit is dry before plugging it into the AC power line.

3 GETTING STARTED

Unpacking the device

Packing material

We suggest that you keep the original packing material. It is designed for reuse (unless it is damaged during shipping). Using the original packing material ensures that the device is properly protected during shipping.

Checking the package contents

Your device is shipped with the following accessories:
• Operating manual
• SNT-121A Adapter

Checking for shipping damage

After you unpack the device, check to see if it has been damaged during shipping. This is particularly likely if the packaging is visibly damaged. If there is damage, do not attempt to operate the device. Doing so can cause further damage. In case of damage, please contact your local JDSU Sales Company. Addresses can be found at **www.jdsu.com.**

Recovery following storage/shipping

Condensation can occur if a device that is stored or shipped at a low temperature is brought into a warm room. To prevent damage, wait until no more condensation is visible on the surface of the device before powering it up. Do not operate the device until it has reached its specified temperature range and wait until it has cooled down if the device was stored at a high temperature (see „Ambient temperature" on page 52).
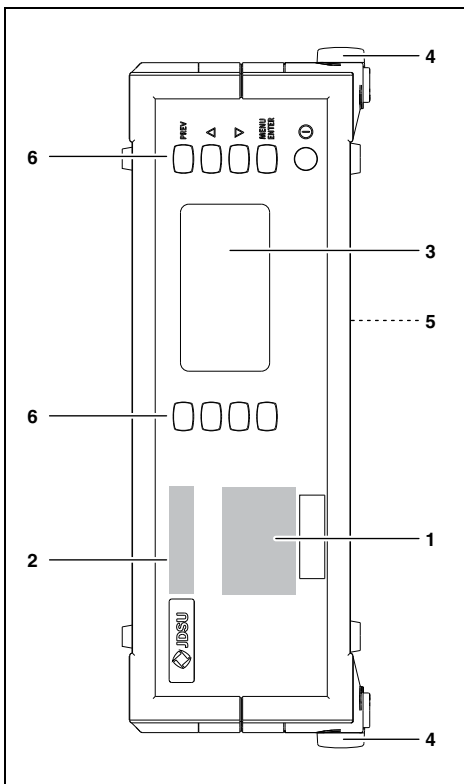
Device overview

Fig. 1   Frontal view

1	Connector panel (see on page 12 for details)
2	Device label
3	Display
4	Stand
5	Power supply connector, USB control interface, reset button (on rear of the device)
6	Keys

λ	Press to select a wavelength.
PREV	Press to go back one menu level (without making any changes).
MENU ENTER	Press to: • open menu and select menu item • store settings
RL$_0$	Triggers the normalizing procedure
Laser ON/OFF	Press to switch laser on and off.
Device Mode	Toggle between modes: Power Meter $\rightarrow$ Laser Source $\rightarrow$ Return Loss Test $\rightarrow$...
$\textcircled{\textlarge I}$	Press to switch the device on and off.
$\begin{array}{c}\triangle\\\triangledown\end{array}$	Press to: • scroll up/down in the menus • change values in the menus

Connector panel
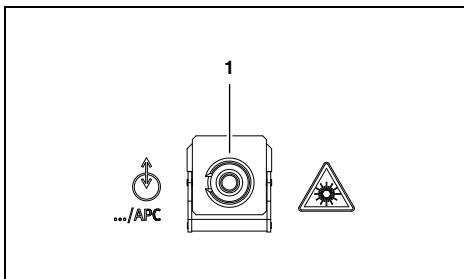
Fig. 2   cORL-A1 connector panel

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1   Optical connector

Power supply

The following power sources can be used to operate the cORL-A1:

• the SNT-121A Adapter
• via the USB control interface

Operation from AC power

NOTICE: Only the SNT-121A Adapter must be used to operate the cORL-A1 from AC power.

To fit the AC line plug adapter:

1. Select the appropriate AC line plug adapter.
2. Slide the AC line plug adapter into the slot.
   The SNT-121A Adapter is ready for use.
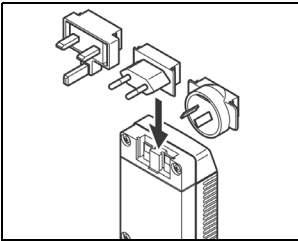
Fig. 3   SNT-121A Adapter.

To change the AC line plug adapter:

1. Place the SNT-121A against the edge of a table or bench as shown (see Fig. 4).
2. Push the SNT-121A downwards.
3. Slide a different AC line plug adapter into the slot (see Fig. 3).
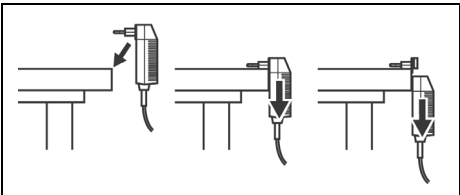
Fig. 4   SNT-121A: Changing the AC line plug adapter.

To operate the cORL-A1 from AC power:

1. Connect the SNT-121A DC power cord to the cORL-A1 DC power socket.
   (The socket is located on the back panel.)
2. Plug the SNT-121A into the AC line socket.
   The cORL-A1 switches on automatically when powered from the SNT-121A.

Operation from USB interface power

Although the USB interface is primarily intended for remote control, it can also be used to power the cORL-A1.

To power the cORL-A1 via the USB interface:

⇒ Just connect a standard USB cable to any USB socket of a PC or USB hub.

Notes:

- The device can be operated manually even if it is powered via the USB interface.
- The device will be powered by the SNT-121A Adapter if the SNT-121A Adapter and the USB interface are both connected.

4 BASIC OPERATION

Switching the device on/off

To switch the device on:

⇒ Press **[⏻]** to switch on the device.

To switch the device off:

⇒ Press and hold down **[⏻] for more than 2 sec.** to switch off the device.

Display elements

```
Laser Source        USB
          O F F

    1310nm    -3.00dBm

            CW      PERM
```

Laser OFF

1 wavelength
Continuous
wave

```
Laser Source        USB

  1310 nm    -6.80dBm
  1550 nm    -6.61dBm
          Auto λ    PERM
```

Laser ON

2 wavelengths

Auto-λ

Fig. 5   Measurement display in laser source mode.

⏦	**External power supply**
	The cORL-A1 is powered by the external AC adapter when this symbol is shown.
USB	**Power supply via USB**
	The device is powered via the USB interface for remote operation.
CW **Auto-**λ	**Signal modulation**
	• **CW:** Continuous wave
	• **Auto-**λ**:** Auto wavelength detection
	• **270 Hz, 1 kHz, 2 kHz**: modulation frequency
Center of display	Shows the measurement results or setup values.

Navigating in the menus

✓ The measurement display is shown.

⇒ Press **[MENU ENTER]** to open the MAIN menu.
The MAIN *menu opens.*

To select a menu item:
1. Press **[▲▼]** to highlight an item.
2. Press **[MENU ENTER]** to select the item.

To leave a menu without making any changes:
⇒ Press **[PREV]**.

Configuring the device

This chapter describes the basic settings in the Configuration menu.

✓ The measurement display is open.

⇒ Press **[MENU ENTER]** to open the MAIN menu and select **Configuration.**
The CONFIGURATION *menu opens:*

```
MENU: CONFIGURATION
Edit Date              ++
Edit Time
Select Source Mode
Firmware Update
Select Language
```

```
MENU: CONFIGURATION
Edit λ-Table
Select Auto λ
Edit Contrast
Set Factory Default
Show Info               ++
```
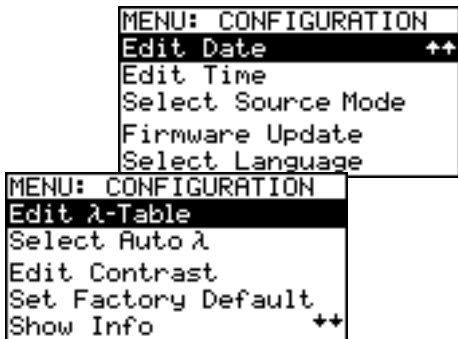
The following table gives a short overview of the menu items. These are explained in the sections below.

Edit λ-Table	Edit the wavelengths in the table and the view status (show/hide) of each entry.
Select Auto-λ	Activate/deactivate "Automatic Wavelength Detection".
Edit Contrast	Adjust display contrast.
Set Factory Default	Set the device parameters and settings to their default values as defined by JDSU. This does not affect any stored measurement results.
Show Info	Display basic device information.
Edit Date	Adjust date.
Edit Time	Adjust time.

Select Source Mode	Enable or disable compatibility to OLS-15 signal modulation.
Firmware Update	Download the current device firmware version from the internet to the device.
Select Language	Select the language of the device texts.

Editing the Lambda-Table

The wavelength table (λ-Table) supports the definition of up to 30 wavelengths. The wavelengths with the attribute "shown" form a set of wavelengths which will be rotated through when the **[λ]** key is pressed.

The remaining wavelengths are "hidden".

E.g. if only two wavelengths have the attribute "shown", you can toggle between them with a single keystroke.

To edit the λ-Table:

1. Press **Edit λ-Table** in the CONFIGURATION menu.
   The EDIT λ-TABLE *menu opens (displayed wavelengths may vary according to model and settings).*

```
MENU: EDIT λ-TABLE
1530nm    hidden      ++
1550nm    shown
1570nm    hidden
1590nm    shown
1607nm    shown       ++
```

2. Highlight the entry to be edited and press **[MENU ENTER]**.
   A window opens:

```
MENU: EDIT λ-TABLE
Edit
Show
Hide

                    1550nm
```
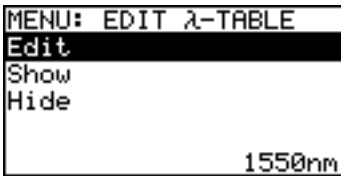
3. Press **[MENU ENTER]** again to edit the selected wavelength (**Edit** is already selected).
   The value to be edited is displayed:

```
MENU: EDIT λ-TABLE

   1550nm
```

4. Press **[▲▼]** to change the value:
   - Press once to change one step at a time.
   - Hold down the key to increase the step change rate.
5. Press **[MENU ENTER]** to set the new wavelength.
   The EDIT λ-TABLE *window is displayed again.*
6. Press **[MENU ENTER]** again to change the view status.
7. Select **Show** to show the wavelength in the table
   – or –
   Select **Hide** to hide the wavelength in the table.
8. Press **[MENU ENTER]** to confirm the selection.

Repeat steps 2 through 7 as required.

Enabling Auto-Lambda mode

Auto-λ is a special feature developed by JDSU that allows you to identify wavelengths automatically. To do this, the signal is modulated at a certain frequency (by a light source equipped with Auto-λ, such as a JDSU OLS-55/-56), which can be detected by a JDSU cORL-A1.

Wavelengths cannot be reliably detected if:
- the receive level is too low,
- wavelength encoding cannot be detected due to interference
- you are measuring the absolute level of a system that does not have wavelength encoding that matches JDSU power sources.

To switch Auto-λ mode on/off:

1. Select **Select Auto-λ** in the CONFIGURATION menu.
   The AUTO-λ *menu is displayed.*

```
MENU: AUTO-λ
DISABLE
ENABLE
```
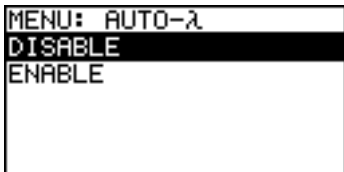
2. Select **ENABLE** to switch on Auto-λ
   – or –
   Select **DISABLE** to switch off Auto-λ.
3. Press **[MENU ENTER]** to confirm the setting.
   If Auto-λ mode is activated and a laser source supporting Auto-λ is connected, Auto-λ will be displayed in the bottom center display pane.

Display in Auto-λ mode

When **Auto-λ** mode is activated and different wavelengths are detected, the power levels measured at these wavelengths are displayed simultaneously.

```
                        USB
  1310nm    -3.03dBm
  1550nm    -3.00dBm
  1625nm    -3.00dBm
              Auto λ    PERM
```

Fig. 6   Display in **Auto**-λ mode showing the detected wavelengths and their power levels.

Setting the display contrast

1. Select **Edit Contrast** in the CONFIGURATION menu.
   The CONTRAST menu opens:

```
MENU: CONTRAST
Press arrow
UP  :  to increase
DOWN:  to decrease
```

2. Press **[▲▼]** to increase/decrease the contrast.
3. Press **[MENU ENTER]** to store the value and exit from the menu.

Setting the factory default values

1. Select **Set Factory Default** in the CONFIGURATION menu.
   The FACTORY DEFAULT menu opens:

```
MENU: FACTORY DEFAULT

ENTER: to confirm
ANY KEY: to quit
```

2. Press **[MENU ENTER]** to set the factory defaults.
   – or –
   Press any key to exit from the menu without making any changes.

Note: Setting the factory default values does not affect your stored measurement results.

Displaying device information

⇒ Select **Show Info** in the CONFIGURATION menu.
The INFO menu opens and basic device information is shown: device name, family, serial number, calibration date, software version, battery type and, if applicable, date and time.

Setting date and time

1. Select **Edit date** in the CONFIGURATION menu.
The EDIT DATE MENU opens:

```
MENU: EDIT DATE


    yyyy/mm /dd
    2007/NOV/27

```
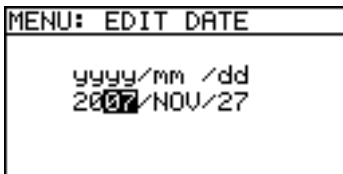
2. Press **[▲▼]** to set year and press **[MENU ENTER]**.
3. Press **[▲▼]** to set month and press **[MENU ENTER]**.
4. Press **[▲▼]** to set day and press **[MENU ENTER]**.
5. Select **Edit time** in the CONFIGURATION menu.
The EDIT TIME menu opens.
6. Press **[▲▼]** to set hours and press **[MENU ENTER]**.
7. Press **[▲▼]** to set minutes and press **[MENU ENTER]**.
8. Press **[▲▼]** to set seconds and press **[MENU ENTER]**.

Note: The date and time will need to be set again if the device is without any power for more than 1 hour.

The device is without any power if

• neither the SNT-121A Adapter is connected,
• nor a USB connection is established and
• no batteries are fitted or the batteries are discharged.

Achieving compatibility with the OLS-15

The Optical Power Source OLS-15 from JDSU (which is no longer available) is equipped with special signal modulation specifically matched to the Optical Power Meter OLP-15 (also no longer available). You can simulate this signal modulation to make the cORL-A1 compatible with the OLS-15.

1. Select **Laser-Mode** in the CONFIGURATION menu.
   The SOURCE MODE menu opens:

```
MENU: SOURCE MODE
DISABLE OLS-15 Mode
ENABLE  OLS-15 Mode



```
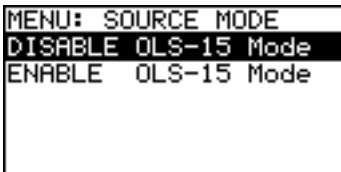
2. Select the desired mode and press **[MENU ENTER]** to accept the setting.

It is not possible to transmit several wavelengths simultaneously (multi-λ operation) in OLS-15 mode.

Updating the firmware

The latest version of the firmware can be downloaded from the internet at any time and stored in the EEPROM.

To find the latest firmware version:

1. Visit the JDSU web site at **www.jdsu.com/ test_and_measurement**.
2. Select your model from the product line.
3. Open the download area and download the latest firmware.

You will also find step-by-step instructions on how to update the firmware there.

After downloading the firmware to your PC follow the steps below to install the firmware into your device.

To install the firmware into the device:

1. Select **Firmware Update** in the CONFIGURATION menu.
   The FIRMWARE UPDATE menu opens:

```
MENU: FIRMWARE UPDATE
        Updates at
   http://www.jdsu.com

PREV : to cancel
                      ++
```

2. Press **[▼]** to open the next window.
   – or –
   to cancel.

```
MENU: FIRMWARE UPDATE
                      ++
Press ENTER to start

! Remove all power  !
! sources to stop   !
```
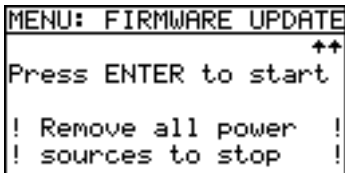
3. Press **[MENU ENTER]** to start the update.
   – or –
   Press **[PREV]** to cancel.

4. Connect the device to the PC via the USB interface.

Note: Once the update has been started it cannot be
         stopped by pressing any of the keys.
         To stop the update you must disconnect the
         device from all power sources (adapter/charger,
         batteries, USB connection).

Selecting a language

1. Select **Select Language** in the CONFIGURATION menu.
   The SELECT LANGUAGE menu opens:

```
MENU: SELECT LANGUAGE
English
Deutsch
Français


```
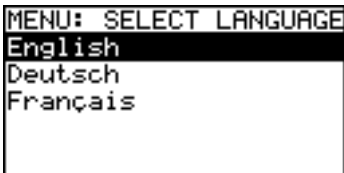
2. Press **[▲▼]** to highlight the language you want and press **[MENU ENTER]** to select it.

5 OPERATION

The cORL-A1 has the following operating modes:

1. **Laser Source:** The cORL-A1 operates as a laser source.
2. **Power Meter:** The cORL-A1 operates as a power meter.
3. **Return Loss Test:** The cORL-A1 operates as a loss test meter. The laser source and the power meter are both activated.

To select modes 1 to 3:

⇒ Press **[Device Mode]** repeatedly:
Laser Source → Power Meter → Return Loss Test →...
The selected mode will be shown at the top of the display.

Laser Source mode

Display in Laser Source mode

The display after powering up the device will differ depending on the cORL-A1 model (two or three wavelengths).

| ```
Laser Source    USB
        OFF
   1310nm   -3.00dBm
          CW      PERM
``` | **Laser OFF**<br><br>1 wavelength<br>Continuous wave |
| ```
Laser Source    USB
  1310 nm   -6.80dBm
  1550 nm   -6.61dBm
         Auto λ   PERM
``` | **Laser ON**<br><br>2 wavelength<br><br>Auto-λ |

Fig. 7   Measurement display in Laser Source mode.

OFF	Laser switched off.
1310nm	**Wavelength**
1310nm **1550nm**	Display of selected wavelength.
	Possible combinations: $\lambda 1 \rightarrow \lambda 2 \rightarrow \lambda 1 + \lambda 2 \rightarrow \lambda 1 \rightarrow ...$ BN 2287/02, 2287/03: $\lambda 1 \rightarrow \lambda 2 \rightarrow \lambda 3 \rightarrow \lambda 1 + \lambda 2 + \lambda 3 \rightarrow \lambda 1 \rightarrow ...$
-3.00dBm	**Output power level**
-6.00dBm	Displayed for each selected wavelength.

SOURCE MAIN menu

⇒ Press **[MENU ENTER]** to open the SOURCE MAIN menu.

```
MENU: SOURCE MAIN
Select Auto-λ OFF
Select Modulation
Adujust Level
Configuration
```

Select Auto-λ OFF	Switch Auto-λ on/off (see next section).
Select Modulation	Select modulation frequency (see „Signal modulation" on page 29).
Adjust Level	Set output power level (see „Adjusting the output power level" on page 29)
Configuration	Open configuration menu for basic settings (see „Configuring the device" on page 16).

All following settings refer to the SOURCE MAIN menu.

Auto-Lambda

Switching Auto-λ on/off

⇒ Press **[MENU ENTER]** to switch Auto-λ on and off (toggle function).

Note: The signal is only modulated (at 270 Hz, 1 kHz, 2 kHz) when Auto-λ is deactivated.

Signal modulation

Modulation frequencies provided by the cORL-A1:
- CW (Continuous Wave): without modulation
- 270 Hz modulation
- 1 kHz modulation
- 2 kHz modulation

To select a modulation frequency:

✓ Modulation cannot be selected when Auto-λ is activated. Switch off Auto-λ first (see "Auto-Lambda" on page 28).

1. Select **Select Modulation.**
   The MODULATION menu opens:

```
MENU: MODULATION
CW
270Hz
1kHz
2kHz
```

2. Highlight the desired frequency and press
   [MENU ENTER].

Adjusting the output power level

The output power level
- can be adjusted for each wavelength separately,
- can be adjusted while the laser is switched on or off,
- is stored when you change the wavelength or when you switch off the device.

Output power ranges

CW mode: -3 to -10 dBm[1]
Modulated and Auto λ: -6 to -13 dBm[1]

1) 1310 nm, 1550 nm and 1625 nm only. Different power ranges are possible at other wavelengths.

To change the output power level:

1. Select **Level Adjust.**
   The display changes to EDIT mode. The first wavelength is highlighted:

```
Laser Source          EDIT
         OFF

    1310nm  -6.00dBm
    1550nm  -6.00dBm
          Auto λ   PERM
```

2. Press **[▲▼]** to increase/decrease value:
   – press once to change the value one step at a time,
   – hold down key to increase the step change rate.
3. Press **[λ]** to select next wavelength.
4. Press **[MENU ENTER]** to accept the settings and exit EDIT mode.

Power Meter mode

Note: The cORL-A1 can be used to measure optical power levels on single-mode fibers. In contrast with "pure" power meters, the test port is an angled physical contact (APC) connector. An APC connector must therefore be used to connect a test signal to the cORL-A1.

Display in Power Meter mode

At one wavelength

At three wavelengths

Fig. 8   Measurement display in Power Meter mode.

Centre of display	Measured power level Display of value and units (dB, dBm, Watt).
Auto-λ	**Signal modulation** • **CW** (Continuous Wave): without modulation • **Auto-λ**: Automatic wavelength detection • **270 Hz, 1 kHz, 2 kHz:** modulated signal detected.
1310nm	**Wavelength** Display of selected wavelength.

METER MAIN menu

⇒ Press **[MENU ENTER]** to open the METER MAIN menu.

```
MENU: METER MAIN
dBM
Watt
Store ABS->REF
Edit Ref. Level
Configuration
```

Fig. 9   METER MAIN menu.

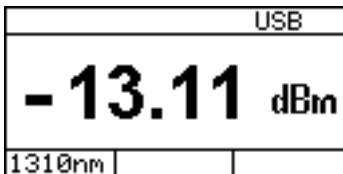| **dB**	Toggle between relative (dB) and absolute (dBm) mode.
	The mode displayed is the inactive mode which can be selected.
Watt	Change display units to Watts.
	dBm will be displayed in the **dB/dBm** line when Watts are selected.
Store ABS -> REF	Store the displayed level as the new reference level. The display automatically switches to relative mode (see „Setting the reference value" on page 34).
Edit Ref. Level	Edit the reference level (see „Setting the reference value" on page 34).
Configuration	Change the basic settings (see „Configuring the device" on page 16).

Selecting a wavelength

The sensitivity of the photo diode depends on the wavelength. The wavelength setting of the device must match the wavelength of the incoming signal to ensure a correct reading.

To select a wavelength:

⇒ Press **[**λ**]** to select a new wavelength.
 The value is shown in the lower left display pane:

selected wavelength

The wavelengths that can be selected by pressing this key are an extract of those contained in the internal wavelength table (λ-Table).

Note: See „Editing the Lambda-Table" on page 18 for details of how to edit this table.

Selecting the power level display mode (absolute/relative)

To display the relative power level:

✓ The absolute level in dBm is displayed and **dB** is shown in the menu.

⇒ Highlight **dB** and press **[MENU ENTER]** .
 *The display will show the relative level in **dB**.*

To display the absolute power level in dBm:

✓ The relative level in dB is displayed and **dBm** is shown in the menu.

⇒ Highlight **dBm** and press **[MENU ENTER]** .
*The display will show the absolute level in **dBm**.*

To display the absolute power level in Watts:

⇒ Highlight **Watt** and press **[MENU ENTER]**.
*The display will change to absolute mode when you select **Watts**, regardless of the display mode that is currently selected (relative or absolute). dBm will be shown in the **dB/dBm** menu line.*

⇒ Highlight **dBm** and press **[MENU ENTER]** if you wish to display absolute level in **dBm**.

Setting the reference value

The actual measured power level relative to a reference value is displayed in relative power display mode. The reference value can be set by defining the actual power level as the reference value. This setting can then be edited manually.

To set the reference level:

✓ The device is in absolute power level display mode.

1. Press **[MENU ENTER]** to open the MAIN menu.
2. Select **ABS** → **Ref** and press **[MENU ENTER]** to store the reference level.
   The actual power level is set as the new reference level. The reference level is displayed in the top display bar. Reference power level display mode is activated.

Note: The reference level must be stored for each wavelength separately and is saved even when the power is off.

To edit the reference level:

The reference level can be also edited manually.

3. Select **Edit Ref. Level** in the MAIN menu.
   The measurement display opens, showing EDIT in the top right corner:

4. Press **[λ]** to select the wavelength.
5. Press **[▲▼]** to change the value
6. Press **[MENU ENTER]** to accept the setting.

Return Loss Test mode

The laser source and the receiver of the cORL-A1 are both activated in Return Loss Test mode. The power meter unit wavelengths are locked to the source wavelengths. Only relative display mode is available.

In Return Loss Test mode, a signal is sent to the DUT from the internal laser source. The power level reflected from the DUT is measured and compared with the transmitted signal. The return loss result is displayed by the cORL-A1.

The accuracy of the return loss measurement is highly dependent on the quality of the optical connection to the cORL-A1.

⇒ Make sure that the test connection is kept very clean.

If the display does not show "High" when the test port is open:

⇒ Clean the test connection (see „Cleaning the test port" on page 38)
⇒ Normalize the unit (see „Normalizing" on page 37).

Display in Return Loss Test mode
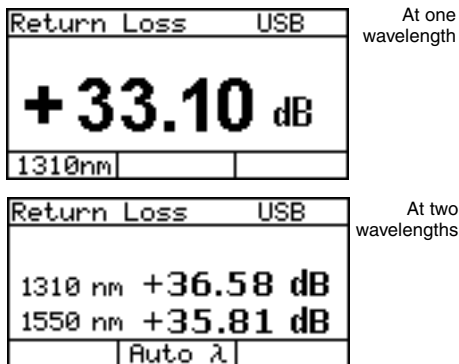
At one wavelength

At two wavelengths

Fig. 10 Measurement display in Return Loss Test mode.

The functions are identical to those for relative measurement in Power Meter mode (see "Display in Power Meter mode" on page 31).

Note: The measurement results in Return Loss Test mode are displayed in positive values.

ORL MAIN menu

⇒ Press **[MENU ENTER]** to open the ORL MAIN menu.

Normalize Open Port	Stores the internal noise in ORL mode as reference value.
Configuration	Change basic settings (see „Configuring the device" on page 16).

Normalizing

The device should be normalized from time to time to ensure high measurement accuracy. This is done with the port open, i.e. no DUT connected.

Dangerous laser radiation!

Laser radiation can cause irreparable damage to the eye and the skin.

! When the system or test generator is switched on, never look directly into the output or into a connected optical fiber.

To normalize the unit:
1. Disconnect the DUT from the test port.
   Normalization can be performed with an open test port or with a mandrel for high return loss measurements.
2. Clean the fibre end surface of the test port.
3. Switch on the laser.
4. Press **[MENU ENTER]** to open the ORL MAIN menu.
5. Select **Normalize Open Port**.
   The normalization will be performed and the display will switch to measurement mode.
   The display shows "High".

Note: Normalization will be performed for all wavelengths automatically.

6 MAINTENANCE

⚡ ☀ **WARNING**	**Dangerous voltage and invisible laser radiation**
	Maintenance or cleaning of the device when it is connected up or operating may damage the device or injure you.
	! Make sure that the device is switched off and disconnected from all power sources and optical radiation sources before maintenance or cleaning.

Cleaning the test port

It is a good idea to check that the optical connections are clean and to clean them if necessary before starting measurements. Even very small dust particles on the end surfaces of the plugs can adversely affect the accuracy of the measurement.

1. Switch off the device.
2. Wipe off the plug end surface using cleaning sticks soaked in isopropanol. This cleaning method is very effective and leaves no residues.
3. Blow out the test adapter with clean compressed air (available in spray cans, e.g. Anti Dust Spray).

Note: Cover the optical connections with the dust cap whenever they are not in use. This prevents them from getting dirty.

Cleaning the instrument

If the instrument gets dirty through use, you can clean it using a soft cloth moistened with a mild solution of detergent.

CAUTION

Water and cleaning fluids

The device may be damaged or destroyed if water or cleaning fluids get inside it.

! Make sure that water or cleaning fluids do not get inside the instrument.

7 REMOTE CONTROL

Communication interface

The cORL-A1 is equipped with a USB interface for remote control via a PC. The driver files needed on the PC for this can be download from **www.jdsu.com/test_and_measurement**.

Key

The following table lists the parameter types used in remote control.

<NR1>	Integer value. Examples: 23, 90, 0
<NR2>	Real number. Examples: 23.45, 1.30
<NR3>	Exponential number. Examples: 4.3E-3, -8.9456E8, 123E-5
<NRf>	<NR1> | <NR2> | <NR3>
<BOOLEAN>	Boolean value. Examples: 0, 1, OFF, ON
<MNEMONIC>	Short form. The valid short forms are listed with the corresponding commands.
<STRING_RESPONSE_DATA>	IEEE4888.2, 8.7.1

Parameters

Overview

Utility commands

*IDN?
*OPC?
:SYST:PERM:POW
:DISP:CONT
:DISP:CONT?
:SYST:LANG
:SYST:LANG?
:SYST:DATE
:SYST:DATE?
:SYST:TIME
:SYST:TIME?
:DEV:MODE
:DEV:MODE?

Laser Source commands

:SYST:SOUR:NUMB?
:SYST:SOUR:WAV:VAL?
:SYST:SOUR:POW:MAX?
:SYST:SOUR:POW:MIN?
:SYST:SOUR:MODE
:SYST:SOUR:MODE?
:SOUR:ID
:SOUR:ID?
:SOUR:WAV:AUTO
:SOUR:WAV:AUTO?
:SOUR:MOD
:SOUR:MOD?
:SOUR:POW
:SOUR:POW?
:SOUR:STAT
:SOUR:STAT?

Power Meter commands

:POW:CAL:WAV:MAX?
:POW:CAL:WAV:MIN?
:POW:CAL:WAV:TAB
:POW:CAL:WAV:TAB?
:POW:CAL:WAV
:POW:CAL:WAV?
:POW:DISP:UNIT
:POW:DISP:UNIT?
:POW:REF:STAT
:POW:REF:STAT?
:POW:REF:VAL
:POW:REF:VAL?
:POW:WAV:AUTO
:POW:WAV:AUTO?
:POW:FETC:AM:AUTO:FREQ?
:POW:FETC:AM:INT:FREQ?

Return Loss commands

:SOUR:ID
:SOUR:ID?
:SOUR:STAT
:SOUR:STAT?
:RET:LOSS:NORM
:FETC:MEAS:VAL?

Utility commands

Command string	Parameter type / Response type / Unit / Info
*IDN?	Returns the unique identification of the device. **Response type:** <STRING_RESPONSE_DATA> e.g. JDSU Germany GmbH, cORL-A1/01,A-0106,V03.30
*OPC?	Returns "1" as soon as all operations in progress have been completed.
:SYST :PERM :POW	Ensures the device is switched on permanently i.e. that it does not switch off after 20 minutes.
:DISP :CONT	Sets the display contrast. **Parameter type:** <NR1> Range: 0...15 (0: min, 15: max.)
:DISP :CONT?	Returns the display contrast. Range: 0...15 (0: min, 15: max.)
:SYST :ERR?	Returns the oldest error in the error queue. **Response type:** <NR1>, <STRING_RESPONSE_DATA> e.g. -100,"Command error"
:SYST :DEV :DEF	Sets the device parameters to their default values.

Command string	Parameter type / Response type / Unit / Info
:SYST :LANG	Sets the language. **Parameter type:** <MNEMONIC> • EN: English • DE: German • FR: French
:SYST :LANG?	Returns the current language. EN or DE or FR
:SYST :DATE	Sets the date (yy,mm,dd). e.g. :SYST:DATE 07,11,30
:SYST :DATE?	Returns the date (yy,mm,dd). e.g. 07,11,30
:SYST :TIME	Sets the time (hh,mm,ss). e.g. :SYST:TIME 23,59,59
:SYST :TIME?	Returns the time (hh,mm,ss). e.g. 23,59,59
:DEV:MODE	Sets the device operating mode. **Parameter type:** <MNEMONIC> **Modes:** • SOUR: Laser Source mode • POW: Power Meter mode • RET_LOSS: Return Loss Test mode
:DEV:MODE?	Returns the device operating mode: SOUR or POW or RET_LOSS

Laser Source commands

Command string	Parameter type / Response type / Unit / Info
:SYST :SOUR :WAV :VAL?	Returns the wavelength [nm] for the specified LASER source. **Parameter type:** <NR1> e.g. :SYST:SOUR:WAV:VAL? 1
:SYST :SOUR :POW :MAX?	Returns the maximum power level [dBm x 100] of the specified LASER source. **Parameter type:** <NR1> e.g. :SYST:SOUR:POW:MAX? 2
:SYST :SOUR :POW :MIN?	Returns the minimum power level [dBm x 100] of the specified LASER source. **Parameter type:** <NR1> e.g. :SYST:SOUR:POW:MIN? 2
:SOUR:ID	Selects combination of LASER sources. **Parameter type:** <NR1> **Source ID:** • 1: LASER1 • 2: LASER2 (if present) • 4: LASER3 (if present) **2-LASER devices only:** • 3: LASER1 and LASER2 **3-LASER devices only** • 7: LASER1, LASER2 and LASER3
:SOUR:ID?	Returns combination of LASER sources. (For IDdescriptions see :SOUR:ID) 1 or 2 or 3 or 4 or 7

Command string	Parameter type / Response type / Unit / Info
:SOUR :WAV :AUTO	Sets Auto-λ modulation ON/OFF. **Parameter type:** <BOOLEAN> • 0: Auto-λ OFF • 1: Auto-λ ON Default setting: OFF (0)
:SOUR :WAV :AUTO?	Returns Auto-λ modulation status. • 0: Auto-λ OFF • 1: Auto-λ ON
:SOUR :MOD	Sets the modulation for the selected LASER source. **Parameter type:** <NR1> Values allowed: • 0: CW (continuous wave) • 270: mod. freq. 270 Hz • 1000: mod. freq. 1000 Hz • 2000: mod. freq. 2000 Hz **Note:** Setting will fail, if more than one LASER source is selected.
:SOUR :MOD?	Returns the current modulation. • 0: CW (continuous wave) • 270: mod. freq. 270 Hz • 1000: mod. freq. 1000 Hz • 2000: mod. freq. 2000 Hz • AUTO: Auto-λ modulation is ON.
:SOUR :POW	Sets the power level for the specified LASER source. **Parameter type:** <NR1,NR1> e.g. :SOUR:POW 1,-522 sets the power level for LASER1 to -5.22 dBm

Command string	Parameter type / Response type / Unit / Info
:SOUR :POW?	Returns the power level [dBm x 100] for the specified LASER source. **Parameter type:** <NR1> e.g. :SOUR:POW? 1
:SOUR :STAT	Sets state of the LASER ON/OFF. **Parameter type:** <BOOLEAN> • 0: LASER OFF • 1: LASER ON
:SOUR :STAT?	Returns the state of the LASER. • 0: LASER OFF • 1: LASER ON

Power Meter commands

Command string	Parameter type / Response type / Unit / Info
:POW :CAL :WAV :MAX?	Returns the maximum wavelength that can be set. e.g. 1650
:POW :CAL :WAV :MIN?	Returns the minimum wavelength that can be set. e.g. 780
:POW :CAL :WAV :TAB	Sets up to 30 wavelengths in the λ-Table. **Parameter type:** <NR1,NR1,...> e.g. :POW:CAL:WAV:TAB 820,850, 980,1280,1300,1310,1480,1510, 1550,1625

Command string	Parameter type / Response type / Unit / Info
:POW :CAL :WAV :TAB?	Returns the contents of the λ-Table. **Response type:** <NR1,NR1,...>
:POW :CAL :WAV	Selects the calibration wavelength from the λ-Table. See :SYST:CAL:WAV:TAB? for more details. **Parameter type:** <NR1> e.g. :POW:CAL:WAV 850
:POW :CAL :WAV?	Returns the calibration wavelength currently used by the instrument. e.g. 1310
:POW :DISP :UNIT	Selects how the power level is displayed. Parameter type: <MNEMONIC> • LIN: linear display of power level (µW) • LOG: logarithmic display of power level (dBm or dB)
:POW :DISP :UNIT?	Returns the power level display type: LIN or LOG
:POW :REF :STAT	Determines whether the power level reading is displayed as an absolute or a relative value. **Parameter type:** <BOOLEAN> • 0: absolute value (µW or dBm) • 1: relative value (dB) Default setting: 0

Command string	Parameter type / Response type / Unit / Info
:POW :REF :STAT?	Returns the type of power level display. **Response type:** <BOOLEAN> • 0: absolute value • 1: relative value
:POW :REF :VAL	Sets the value for the specified wavelength (to which the power level reading is referred) in relative mode. **Parameter type:** <NR1>,<NRf> e.g. :POW:REF:VAL 1310,-34.50 sets the reference value for 1310 nm to -34.50 dBm
:POW :REF :VAL?	Returns the value for the specified wavelength (to which the power level reading is referred) in relative mode. **Parameter type:** <NR1> **Response type:** <NRf> **Unit:** dBm e.g. :POW:REF:VAL? 1490
:POW :WAV :AUTO	Determines whether device recognizes Auto λ modulation frequencies which automatically sets the system calibration wavelength. **Parameter type:** <BOOLEAN> 0: Auto-λ recognition off 1: Auto-λ recognition on Default setting: 0
:POW :WAV :AUTO?	Returns whether Auto-λ recognition is on or off. **Response type:** <BOOLEAN> 0: Auto-λ detection off 1: Auto-λ detection on

Command string	Parameter type / Response type / Unit / Info
:POW :FETC :AM :AUTO :FREQ?	Returns • "1", if an Auto-λ modulation frequency was detected on the incoming signal. • "0" otherwise
:POW :FETC :AM :INT :FREQ?	Returns • "0", if the incoming signal is not modulated or Auto-λ modulation frequency is detected. • the modulation frequency [Hz] otherwise **Response type:** <NR1>
:FETC :MEAS :VAL?	Fetches the values measured by the device depending on its mode: **POW: input power fetched** Response type: <NR3,NR3,NR3> Response unit: • Absolute display (:POW:REF:STAT 0) - in dBm for :POW:DISP:UNIT LOG - in W for :POW:DISP:UNIT LIN • Relative display (:POW:REF:STAT 1) in dB **RET_LOSS: Return loss fetched** Response unit: dB +9.91E37 overflow −9.91E37 underflow The number of values fetched (1...3) depends on the number of wavelengths measured on the incoming signal.

Return Loss commands

Command string	Parameter type / Response type / Unit / Info
:SOUR:ID	See „:SOUR:ID" on page 41.
:SOUR:ID?	See „:SOUR:ID?" on page 41.
:SOUR :STAT	See „:SOUR:STAT" on page 41.
:SOUR :STAT?	See „:SOUR:STAT?" on page 41.
:RET :LOSS :NORM	Triggers the "Normalizing Open Port" function in Return Loss mode. **Note:** This operation takes a few seconds to complete.
:FETC :MEAS :VAL?	See „:FETC :MEAS :VAL?" on page 50.

8 SPECIFICATIONS

General specifications

Laser safety	IEC 60825-1:2001
Laser classification	Class 1 Laser Product
Connector type	FC/APC
Recalibration period	1 year
Warm-up time	15 min

Display

Display type	Graphical display, 64 x 128 pixels, monochrome,

Power supply

AC line operation	with separate SNT-121A Adapter
USB	Direct from USB, no SNT-121A Adapter required
Power consumption[1]	0.5 W

1) When connected to the AC power plug

Ambient temperature

Nominal range of use	-10 to +55 °C

Air humidity

Humidity	Non-condensing

Dimensions and weight

Dimensions (w x h x d)	250 x 88 x 210 mm
Weight	1.6 kg

ORL Mode

Peak wavelengths available	1310, 1490, 1550, 1625 nm
Wavelength accuracy	±20 nm
Fiber type	SMF-28
Spectral width	< 5 nm
Return loss range	
• Single wavelength	0 to 75 dB
• Multi wavelength	0 to 50 dB
Resolution	0.01 dB
Return loss accuracy	±0.7 dB (0 to 50 dB) ±0.9 dB (50 to 60 dB)[1]

1) Normalized with mandrel

FPL Mode

Maximum output power	0 dBm
Attenuation range	7 dB
Attenuation resolution	0.01 dB
Modulation	CW, 270 Hz, 1 kHz, 2 kHz
Stability	0.02 dB (15 min)/ 0.2 dB (8 hr)

OPM Mode

Wavelength range	1260 to 1650 nm
Power range	−70 to +6 dBm
Display resolution	0.01 dB/0.001 µW
Uncertainty at reference condition[1]	±0.4 dB

1) Reference condition: −20 dBm (CW), 1310 ±1 nm, 23 ±3°C, to 75% RH, 9 µm

SNT-121A Adapter

Power supply type	FW 75550/12
Nominal line voltage range	100 to 240 VAC
Nominal line frequency range	47 to 63 Hz
Power consumption	max. 8.5 W
Output	12 V ⎓ / 1.25 A
Temperature range	0 to +40 °C

Condensation – even occasional – is not tolerable.

9 ORDERING INFORMATION

1310/1550 nm	**BN 2298/21**
1310/1490/1550 nm	**BN 2298/22**
1310/1550/1625 nm	**BN 2298/23**

Calibration report	BN 2298/90.01

Accessories

Cleaning materials

OCK-10	
Optical connector cleaning kit	BN 2229/90.21
Cleaning tape for optical connectors	BN 2229/90.07
Spare optical cleaning tape	BN 2229/90.08
Mandrel for high return loss measurements	

INDEX

JDSU Environmental Management Program

Superb performance and high quality have always characterized JDSU datacom and telecom measurement technology products. In this same world-class tradition, JDSU has an established, proactive program of environmental management.

Environmental management is an integral part of JDSU's business philosophy and strategy requiring the development of long-term, productive solutions to problems in the key areas of economics, technology, and ecology.

A systematic environmental management program at JDSU is essential in regard to environmental policy and enhances cooperation between ourselves and our business partners.

The JDSU Environmental Management Program considers:

Product design and manufacture
Environmental restrictions and requirements are taken into account during planning and manufacture of JDSU products. This attention ranges form the raw materials and finished components selected for use and the manufacturing processes employed, through to the use of energy in the factory, and right on up to the final stages in the life of a product, including dismantling.

Hazardous materials
JDSU avoids or uses with care any hazardous or dangerous material in themanufacturing process or the end product. If the use of a dangerous material cannot be avoided, it is identified in product documentation and clearly labeled on the product itself.

Packaging materials
Preference is given to reusable or biodegradable single-substance packaging materials whenever possible.

Environmental management partnerships
JDSU encourages our customers and suppliers who take this responsibility seriously to join JDSU in establishing their own environmental management programs.

Recycling used products
This product complies with the European Union Waste Electrical and Electronic Equipment directive (WEEE), 2002/96/EC. This product should not be disposed of as unsorted municipal waste and should be collected separately and disposed according to your national regulations.

In the European Union, all equipment purchased from JDSU after 2005-08-13 can be returned for disposal at the end of its useful life. Measuring systems affected by this can be recognized by the symbol on the right of a crossed-out trash can and a black bar. This symbol can be found either on the device or in the accompanying documents.

Contact your local Technical Assistance Center (TAC) for return and collection services available to you.If you would like specific information about the JDSU Environmental Management Program, please contact us at:

If you would like specific information about the JDSU Environmental Management Program, please contact us at **www.jdsu.com/test**

The following pages provide with respect to Chinese Requirements information with regard to the location of restricted hazardous substances within this equipment.
As measuring equipment this equipment is excluded from the European regulations for the restriction of hazardous substances (RoHS).

"中国RoHS"

《电子信息产品污染控制管理办法》（信息产业部，第39号）
附录 (Additional Information required for the Chinese Market only)

本附录按照"中国RoHS"的要求说明了有关电子信息产品环保使用期限的情况，并列出了产品中含有的有毒、有害物质的种类和所在部件。本附录适用于产品主体和所有配件。

环保使用期限：

本标识标注于产品主体之上，表明该产品或其配件含有毒、有害物质（详情见下表）。

其中的数字代表在正常操作条件下至少在产品生产日期之后数年内该产品或其配件内含有的有毒、有害物质不会变异或泄漏。该期限不适用于诸如电池等易耗品。

有关正常操作条件，请参见产品用户手册。

产品生产日期请参见产品的原始核准证书。

有毒、有害物质的类型和所在部件

元器件 (Component)	有毒、有害物质和元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (CR^{6+})	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
产品主体 (Main Product)						
印刷电路板组件 (PCB Assemblies)	X	O	O	O	O	O
内部配线 (Internal wiring)	O	O	O	O	O	O
显示器 (Display)	O	O	O	O	O	O
键盘 (Keyboard)	O	O	O	O	O	O
塑料外壳零件 (Plastic case parts)	O	O	O	O	O	O
配件 (Accessories)	O	O	O	O	O	O
O：代表该部分中所有均质材料含有的该有毒、有害物质含量低于SJ/T11363-2006标准的限量。 **X**：代表该部分中所有均质材料含有的该有毒、有害物质含量高于SJ/T11363-2006标准的限值。						