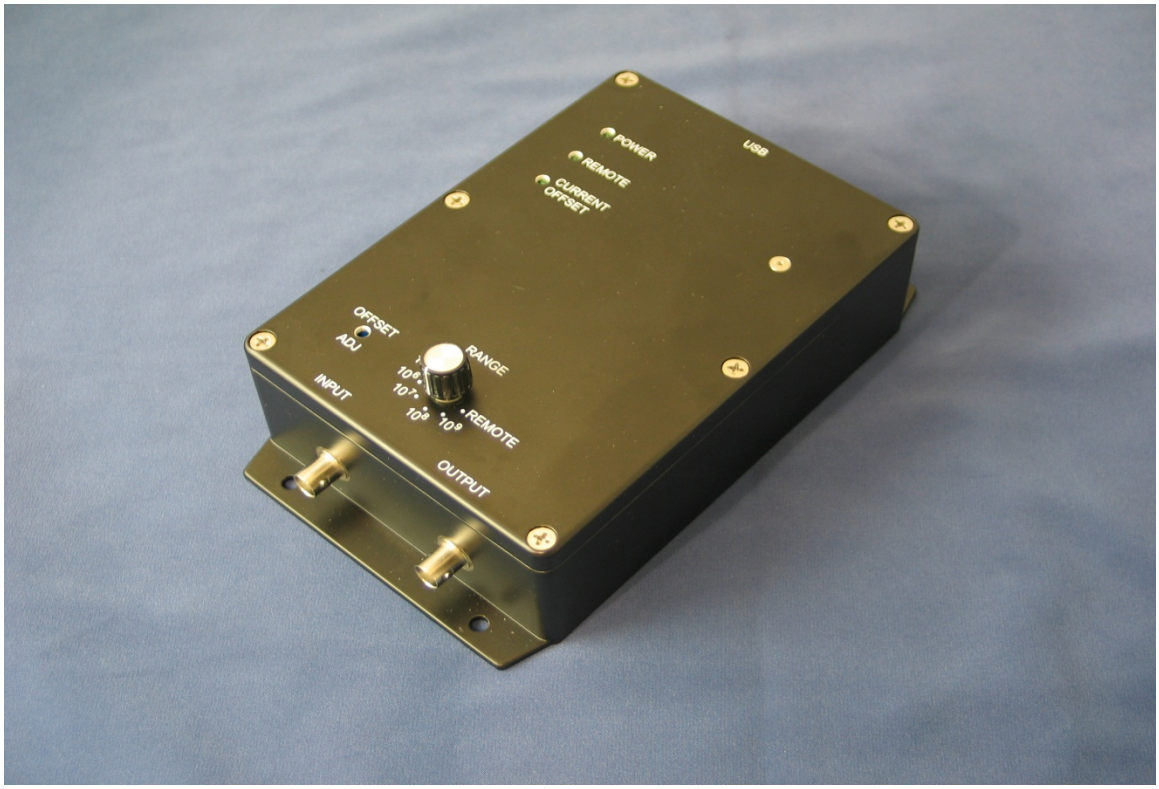
USER MANUAL

SDX-1153

PC Based Power Meter



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Contents

THE SDX-1153 LASER POWER METER

1.1 Introduction

To obtain full performance from the SDX-1153 and the PC Software, we recommend that you read this manual carefully.

The SDX-1153 is a microprocessor-based power meter that uses precision resistors to provide a highly accurate measurement system with no need for external calibration. It provides 6 ranges from 10KΩ to 1GΩ. These ranges can be manually selected or selected by remote control when the SDX-1153 is used with the PC based software. The software also provides a current zero function.

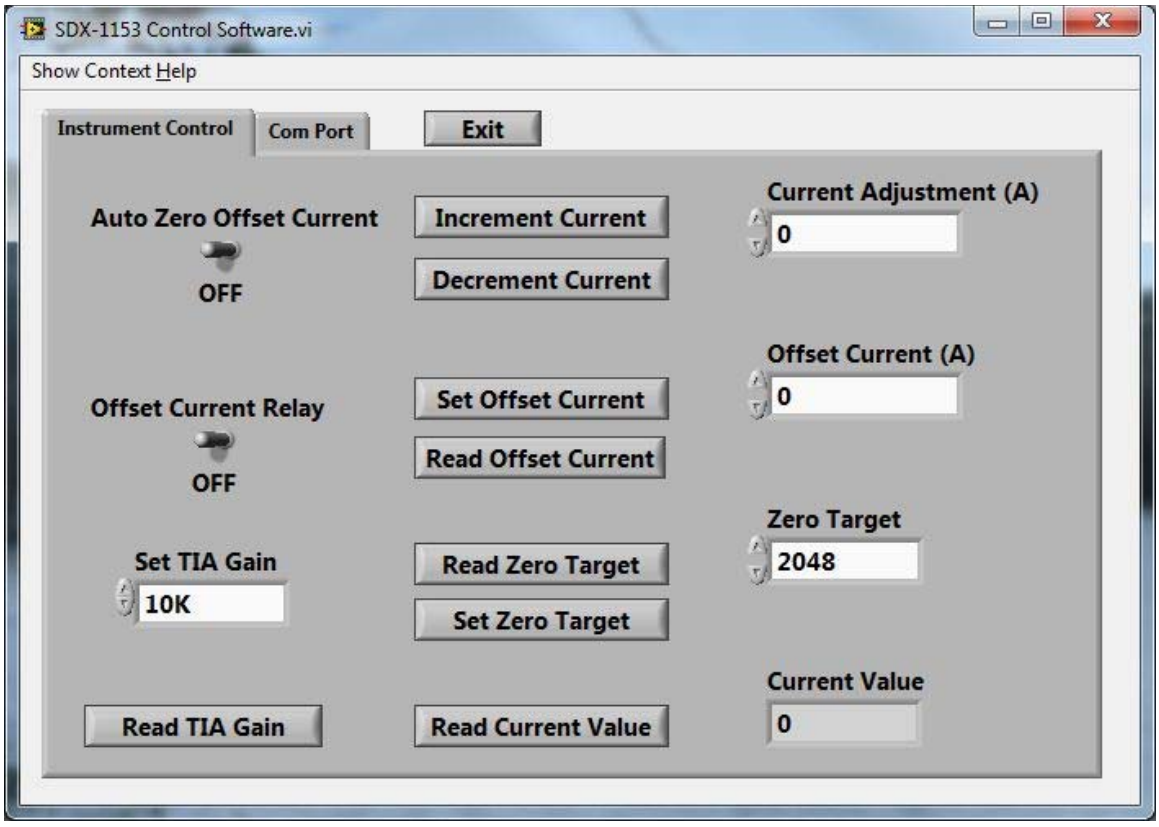


Fig 1.1 SDX-1153 Software user's interface

Unpacking

Each Gentec-EO SDX-1153 is thoroughly tested prior to shipment.

Visually inspect every SDX-1153 unit after removing it from the shipping containers. If you see any damage, retain all packaging materials and shipping receipts. Any damage

claim should be made promptly to the transportation company. Notify the nearest Gentec-EO representative concerning the claim, so that any repair or replacement can be arranged as soon as possible.

1.2 Specifications

The following specifications are based on the accuracy of the internal gain resistors, an operating temperature of 18 to 28ºC (64 to 82ºF) and a relative humidity not to exceed 80%.

Table 1-1 List of Specifications

Power Range	Accuracy	Voltage Zero	Output Voltage	-3dB Bandwidth	Temperature Coefficient
10KΩ	0.01%	±10mV	±10V	> 100Hz	5ppm
100KΩ	0.01%	±10mV	±10V	> 100Hz	5ppm
1MΩ	0.01%	±10mV	±10V	> 100Hz	5ppm
10MΩ	0.01%	±10mV	±10V	> 100Hz	5ppm
100MΩ	0.025%	±10mV	±10V	> 100Hz	10ppm
1GΩ	0.50%	±10mV	±10V	> 100Hz	25ppm
Current Zeroing				Range	Resolution
	±2% of setting			±10µA	19pA

The SDX-1153 is powered by the USB cable and requires a USB 2.0 connection supplying +5V at 500mA per instrument. It is recommended that you install the PC software before plugging the SDX-1153 into the PC as the software installer also loads the USB drivers. If these drivers are not present when you plug the SDX-1153 in the first time, Windows will search the internet for them, but it is faster to have them preinstalled by the SDX-1153 software.

1.3 Operation in Manual Mode

The SDX-1153 can be operated without the PC software as a stand-alone instrument. It will not supply current zeroing capability, but it does support voltage offset zeroing in both manual and automatic modes. To use the SDX-1153, connect the Output BNC to the DVM you wish to use. Connect the photodiode sensor to the input BNC. Select the range you wish to use with the Range switch in the top of the SDX-1153. Note that if you set the Range switch to Remote, the SDX-1153 will default to the 10KΩ range. Any residual output voltage up to ±10mV can be nulled with the Offset Zero potentiometer.

1.4 Operation in Remote Mode

The SDX-1153 can be operated with the PC software as a remotely controlled instrument. To use the SDX-1153, connect the Output BNC to the DVM you wish to use. Connect the photodiode sensor to the input BNC.

Plug the USB cable into the SDX-1153 and the PC that has had the SDX-1153 software loaded. Note that the required USB drivers are loaded automatically by the software installer.

Select the Com Port tab, and then press the Find Com Port Button.

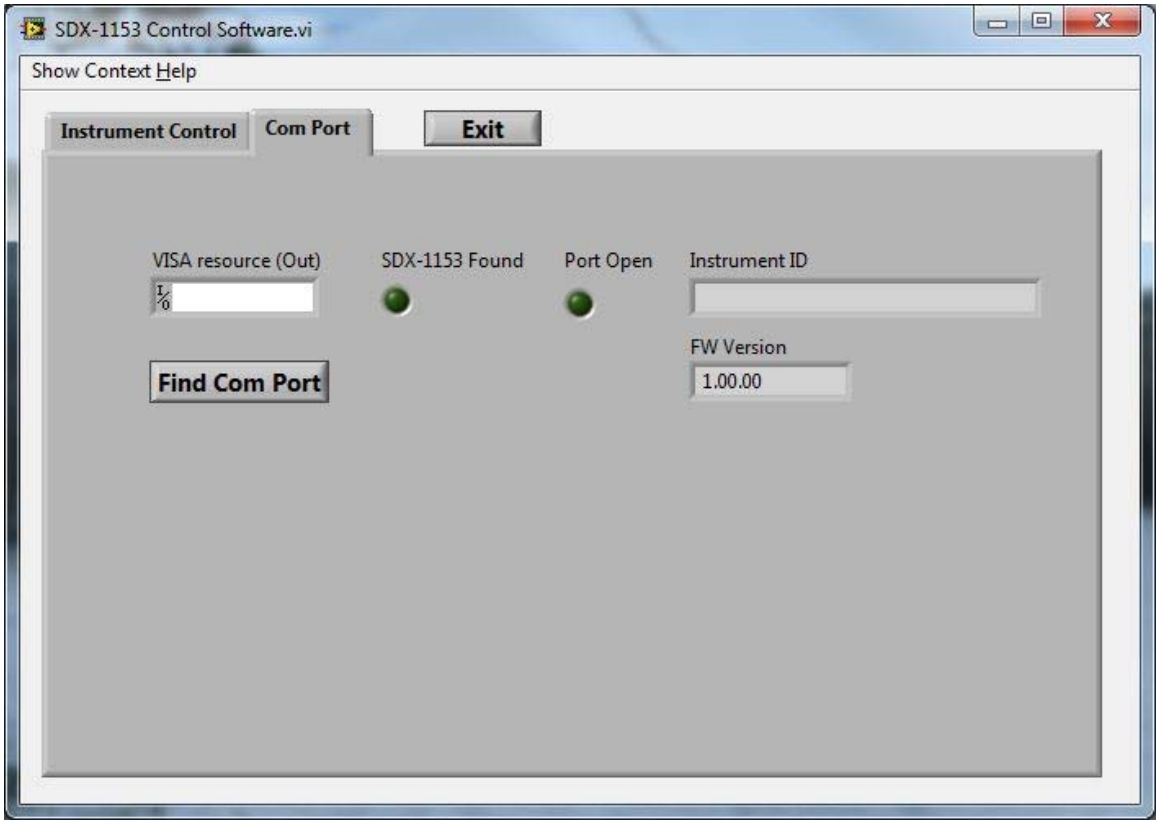
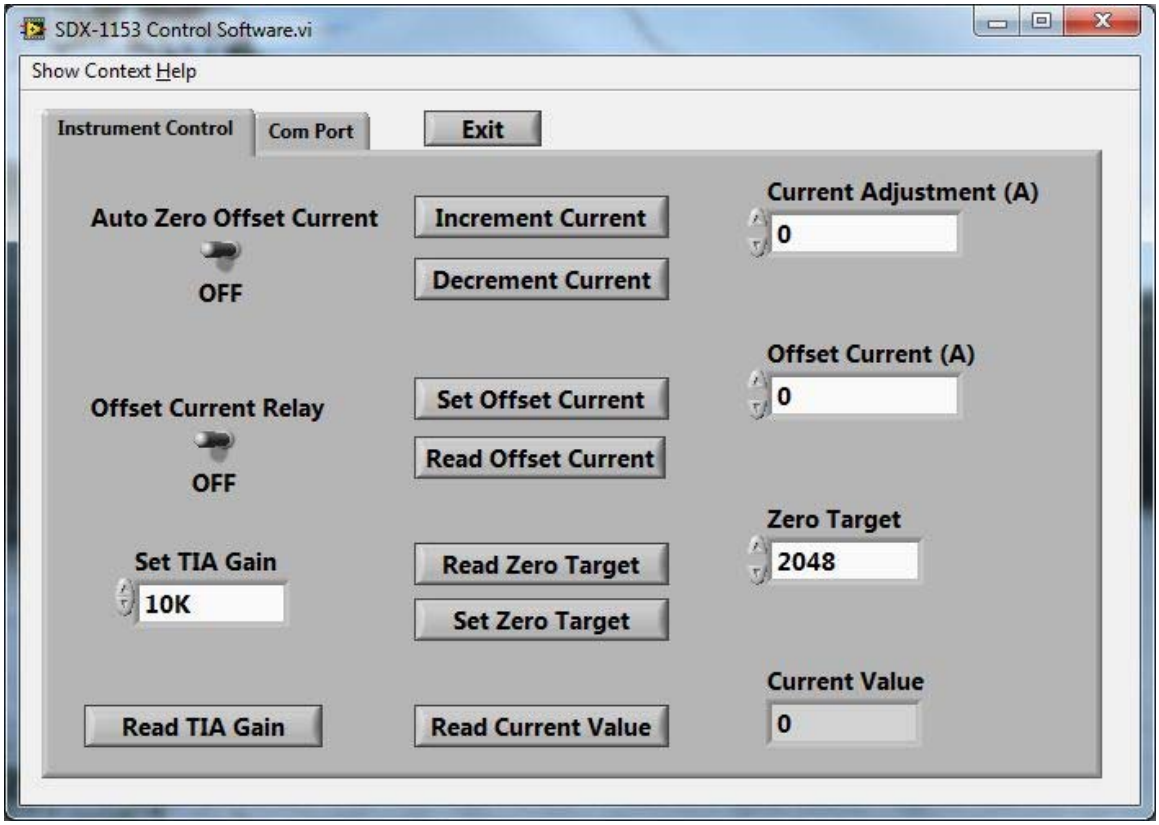


Fig 1.2 SDX-1153 Software Com Port Tab

The SDX-1153 software will attempt to automatically locate the virtual com port that Windows has assigned to the SDX-1153. If it cannot locate it, a panel will appear to allow you to manually select and open the port. Once the port and instrument have been located, the two LEDs will illuminate and the SDX-1153 is ready for remote use. See section 1.6 for details on this subject. The controls and indicators present on the Instrument Controls tab are:



Set TIA Gain

Sets and displays the TIA Gain if the SDX-1153 is in Remote Mode.

Read TIA Gain

Reads the TIA Gain from SDX-1153 in Remote Mode or Manual Mode.

Auto Zero Offset Current

Calls the Automatic offset current zeroing panel. This will result in a +/- 10uA current source being connected to the inverting input of the TIA. The instrument will then read the output voltage of the TIA and adjust the current until the output of the TIA is at zero volts.

The TIA is read by a 12 bit ADC, so the resolution is limited. Also, the ADC does not know where a true zero volt reading is. To compensate for this, the Zero Target must be set in the instrument. The following steps are used to do this.

1. Select the desired range.
2. Set the Auto Zero Offset Current to ON and let the SDX-1153 finish zeroing.
3. Observe the TIA output on a good DVM.

4. If the output is not zero or close to zero, then find the current you wish to zero by dividing the output by the set TIA range.
5. Enter this current value in the Current Adjustment control
6. Press the Decrement Current Button if the output was too high, press the Increment button if it was too low. Note you can also enter a small a current adjustment and keep incrementing or decrementing until the voltage output is at the desired level.
7. Once the output is set, press the Read Current Value button.
8. Enter the result in the Zero Target control and press Set Zero Target.
9. Press Read Zero Target to verify it was correctly written.

Now subsequent zeros will use the new target. This value is store in Flash so it is persistent over a power cycle.

Note that the output of the current source can be set or read directly with the Set Offset Current and Read Offset Current buttons. The current source is +/-10uA with a resolution of 19pA resolution. It is not calibrated, so the set value may not be the requested one, but it will be accurate to less than 2%.

The Current source can be connected or disconnected using the Offset Current Relay button, but the output of the source will not be modified.

The resolution of the current zeroing source is 19pA. This means in the 10kΩ range, a very small voltage offset can be achieved as the voltage correction resolution will be 10pA time 10kΩ, or 1.9μV. In the 1GΩ the voltage resolution will be 19mV. This means the voltage output can only be set to within ± 9.5mV, and then the remaining offset can be nulled with the voltage zeroing adjustment.

Offset Current Relay

The Current source can be connected or disconnected using the Offset Current Relay button, but the output of the source will not be modified.

Increment Current

Increments the internal offset zeroing current by the amount entered in the Current Adjustment Control.

See the help topic for the Auto Zero Offset Current for a full description of how this works.

Decrement Current

Decrements the internal offset zeroing current by the amount entered in the Current Adjustment Control.

See the help topic for the Auto Zero Offset Current for a full description of how this works.

Current Adjustment

The value to adjust the internal current source.

See the help topic for the Auto Zero Offset Current for a full description of how this works.

Set Offset Current

Sets the internal offset zeroing current by the amount entered in the Offset Current Control.

Read Offset Current

Reads the internal offset zeroing current.

Read Zero Target

Reads the target ADC value used for the Automatic Current Zeroing algorithm.

See the help topic for the Auto Zero Offset Current for a full description of how this works.

Set Zero Target

Sets the target ADC value used for the Automatic Current Zeroing algorithm.

See the help topic for the Auto Zero Offset Current for a full description of how this works.

Zero Target

Reads the current ADC Target value.

See the help topic for the Auto Zero Offset Current for a full description of how this works.

Read Current Value

Reads the current ADC value.

See the help topic for the Auto Zero Offset Current for a full description of how this works.

Current Value

The current ADC value.

See the help topic for the Auto Zero Offset Current for a full description of how this works.

Exit

Exits the SDX-1153 software and closes any open com ports.

All of these descriptions are available when running the software by selecting the Show Context Help item on the menu bar.

Installation and communication

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1.5 Installation

The SDX-1153 is not required for the SDX-1153 software installation. Do not plug the SDX-1153 into your PC until the SDX-1153 software has been installed as the installer loads the required USB drivers.

Connect the SDX-1153 USB port, located on the back panel of the instrument to the host device serial connector using the proper cable. The SDX-1153 comes with a standard USB cable.

1.5.1 To Install USB drivers for Windows™:

Installing the Labview software also installs the USB drivers. The drivers are not on the CD, but are embedded in the installer files. Labview first installs the SDX-1153 software, and then it runs the "USB driver installer-R2" automatically.

1.6 Custom Software Development

The SDX-1153 uses a Virtual Com Port, so any software that can access an RS232 port can be used to write custom control software.

1.6.1 Connecting to the SDX-1153 with HyperTerminal

To verify the USB installation and find the COM port number click:

Start → Settings → Control Panel → System → Device Manager

Scroll down to **Ports (COM & LPT)** and SINGLE click that line. One of the options should be

USB-to-Serial (COM#)

Note the COM port number. You need it for the next step.

You may use any serial communications software that you are familiar with. These instructions are for HyperTerminal because it is widely available on PCs with Windows™. Click:

Start → Programs → Accessories → Communications → HyperTerminal

To save communication settings, enter a name for the connection. In the drop down menu "**Connect using**" select the COM port that the USB driver was installed on (Section 1.7). Click **OK**.

Input the following settings into the communications parameter window that appears next.

Bits per second	**9600**
Data bits	**8**
Parity	**None**
Stop bits	**1**
Flow control	**None**

Click **OK** to begin entering serial commands in the HyperTerminal window. The commands you type do not appear in the HyperTerminal window, unless you set the HyperTerminal up to do so. Only the response from the M-LINK is displayed. If you prefer to see the commands you are typing, on the HyperTerminal window click the **File** menu and execute the following sequence:

File → Properties → Settings (tab) → **ASCII setup** → select "**Echo typed characters locally**" → **OK**

In the HyperTerminal window type **VER**, press ↵ **ENTER**. If the response you receive tells you the firmware version of your SDX-1153, you are successfully connected and ready for serial command action.

1.6.2 SDX-1153 Serial Commands

All commands and replies are followed by a carriage return (0x0D) and a line feed (0x0A). Unless otherwise noted, if a command is used with no arguments it will become a query. All commands are case insensitive.

All commands reply with:

Ok if the command executed correctly.
Err if the command could not be executed.

All Queries reply with the item that was queried or Err if the query could not be executed.

The host software should wait for an instrument reply before executing a subsequent command or query.

VER	Queries the Firmware Version. No arguments are used. Example. Send: verCRLF Reply: 1.00.00CRLF
IDN	Queries the ID String. No arguments are used. Example. Send: idnCRLF Reply: SDX-153 InstrumentCRLF
BAS	Sets or Queries the instrument baseline voltage to be used as the target during a current zero. 2048 counts is a nominal zero volts target, but each SDX-1153 has a unique value that can be found and retained in flash. See the instructions in this manual for doing this. Example. Send bas2048CRLF sets the target level to 2048 ADC counts basCRLF queries the current target level. Example basCRLF returns the target level Reply 2048CRLF
TIA	Sets or queries the gain. Example. Send tia0CRLF. The SDX-1153 will set the gain to 10KΩ. Send tiaCRLF. The SDX-1153 will return the current gain index. Index Gain 0 10KΩ 1 100KΩ 2 1MΩ 3 10MΩ 4 100MΩ 5 1GΩ
ZRO	Starts or stops the current zero. Example. Send zro1CRLF The SDX-1153 perform a current zero. The SDX-

	1153 uses a 20 bit DAC to set the offset current. It performs a binary half search to find zero. As each setting is tried, the Current DAC setting in counts, the next adjustment, in counts, and the ADC reading, in counts is sent to the host. When it is done, or an ADC reading equal to the target is read, the zero will terminate and send OK to the host. Send str0CRLF M-Link will stop applying the current zero and reply Ok.
INC	Increases the offset current by the requested amount. The argument is in DAC counts, where 2^20 is +10µA, 2^19 is 0µA, and 0 is -10µA Example. Send inc10000CRLF The SDX-1153 will increase the current setting by 10000 Counts x 20 µA / 1048576 count = 190.7nA The SDX-1153 will reply OK. Sending inc with no argument will result in ERR being sent to the host.
DEC	Decreases the offset current by the requested amount. The argument is in DAC counts, where 2^20 is +10µA, 2^19 is 0µA, and 0 is -10µA Example. Send dec10000CRLF The SDX-1153 will decrease the current setting by 10000 Counts x 20 µA / 1048576 count = 190.7nA The SDX-1153 will reply OK. Sending dec with no argument will result in ERR being sent to the host.
DAT	Query Only. The host will send the value read by the internal 12 bit ADC, in counts. 4095 counts are nominally 1V at the output, and 0 counts are -1V at the output. This is a nominal value and is used only to provide a reference for the zeroing algorithm.
DAC	Sets or queries the current DAC directly. The argument is in DAC counts, where 2^20 is +10µA, 2^19 is 0µA, and 0 is -10µA Example. Send dac450000CRLF The SDX-1153 will set the current to 450000 Counts x 20 µA / 1048576 count - 10µA = -1.4169µA The SDX-1153 will reply OK. Sending dac with no argument will result in the current DAC setting being sent to the host. Example. Send dacCRLF The SDX-1153 will reply 450000CRLF
RLY	Sets of Clears the Current zero relay independent of the zro command.

	Example. Send rly1CRLF The SDX-1153 will set the current relay to connect the source to the TIA inverting input. The current source value will not be changed. The SDX-1153 will reply OK. Example. Send rlyoCRLF The SDX-1153 will set the current relay to disconnect the source to the TIA inverting input. The current source value will not be changed. The SDX-1153 will reply OK. Sending rly with no argument will result in ERR being sent to the host.