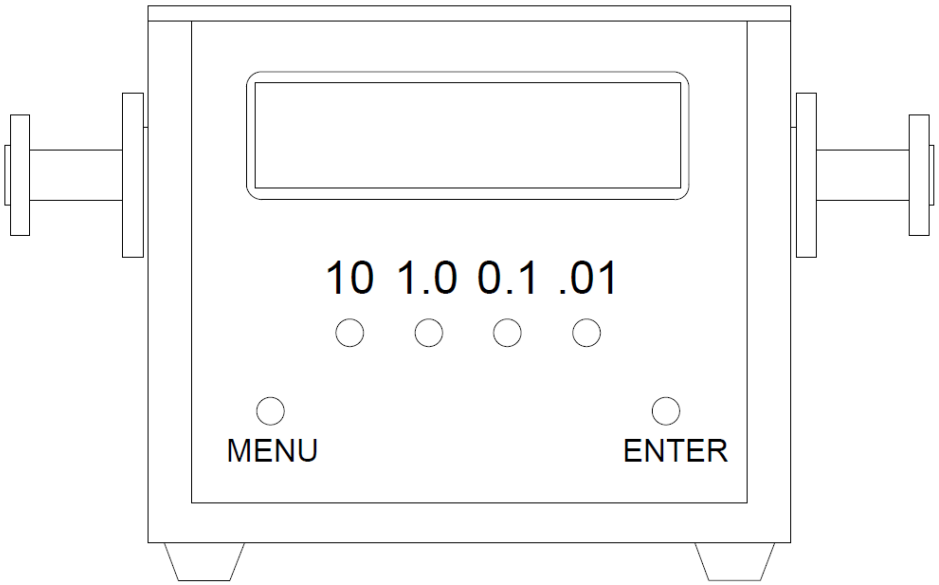
# PROGRAMMABLE ATTENUATOR

STA-60-XX-P1




USER'S GUIDE

ERAVANT

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# SPECIFICATIONS

| | |
|---|---|
| Supply Voltage | +24 V |
| Attenuator Speed | 35 dB/s |
| Max Attenuation | 70 dB |
| Resolution | 0.01 dB |
| USB Protocol | 2.0 |
| GPIB Protocol | National Instruments 488.2 |

# INITIAL SETUP

Initial Setup can be accessed by pressing MENU from the Front Panel, only when the unit is not in operation.

Refer to Figure 1 and Figure 2 for Front Panel View and Back Panel View respectively.

1. Power: Connect the Power Adapter on the Back Panel to DC Input and Turn ON the Power Switch. The unit will enter its pre-saved power up state of either local or remote mode.
2. Remote Mode: To enter Remote Mode, press **MENU** followed by **1.0** on the Front Panel. Then press **MENU** a second time to exit. The unit will also enter Remote Mode upon receiving a USB or GPIB command.
3. Local Mode: The unit can switch back to Local Mode by pressing **MENU** followed by **10** and a second **MENU** press to exit. The unit will be switched Local to Remote Mode upon receiving a GPIB or USB command.
4. Product Information and Settings: To view Serial Number, Manufacturing Date, and Frequency Band, press **0.1**. After displaying the product information, the clock must be set to the correct date/time by pressing **10** and **1.0** until the correct values are listed. Press **ENTER** to save. Next, the default power up mode must be selected. Press **10** to have the unit always power up in remote mode. Press **1.0** to keep the factory setting of powering up in local mode. After selecting the default power up mode, the choice to enable or disable automic responses will appear. Press **10** to disable all automatic responses in order to minimize bus activity. Press **1.0** to enable responses and have the unit automatically respond with its current attenuation after each completed USB or GPIB command. These settings will be saved for all future powerups.
5. GPIB Address: To set the GPIB address, press **.01** to select the desired address in range 1-30. ON/OFF Power cycling will not change the address.

# LOCAL MODE OPERATION

1. Local Mode: The unit can switch to Local Mode by pressing **MENU** followed by **10** and a second **MENU** press to exit.
2. Upon entering Local Mode, the unit will automatically set the attenuation to 70 dB. To select a new attenuation level, first press 10 to change the displayed value to 0.00 dB. Each time **10** is pressed, the attenuation will increase by 10 dB until 70 dB is reached, at which point the attenuation will start back at 0.00 dB with another button press. Pressing **1.0** will increase the displayed value by 1 dB, and so forth for the **0.1** and **.01** buttons.
3. After the desired attenuation value is displayed, press **ENTER** to set it. A "?" displayed next to the attenuation shows that **ENTER** has not yet been pressed.
4. The unit will exit Local Mode and directly enter Remote Mode if a USB or GPIB command is received. Pressing **MENU** will also exit Local Mode.

# FRONT AND BACK PANEL VIEW

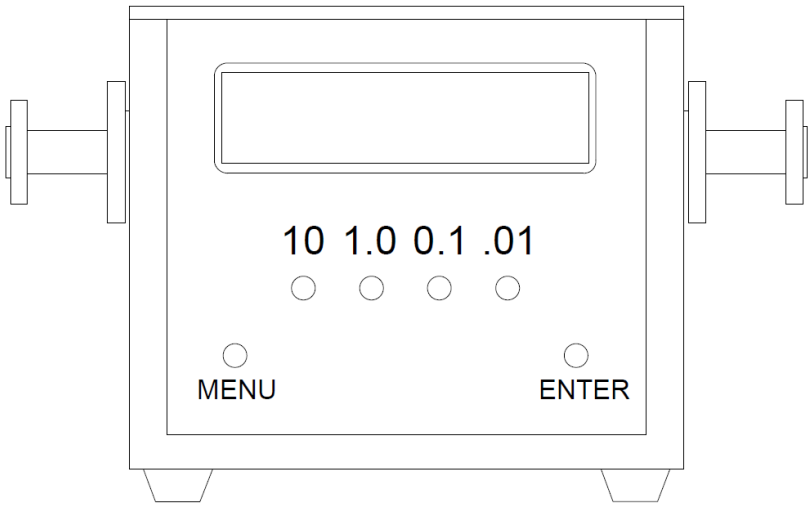


*Figure 1: Front Panel View*

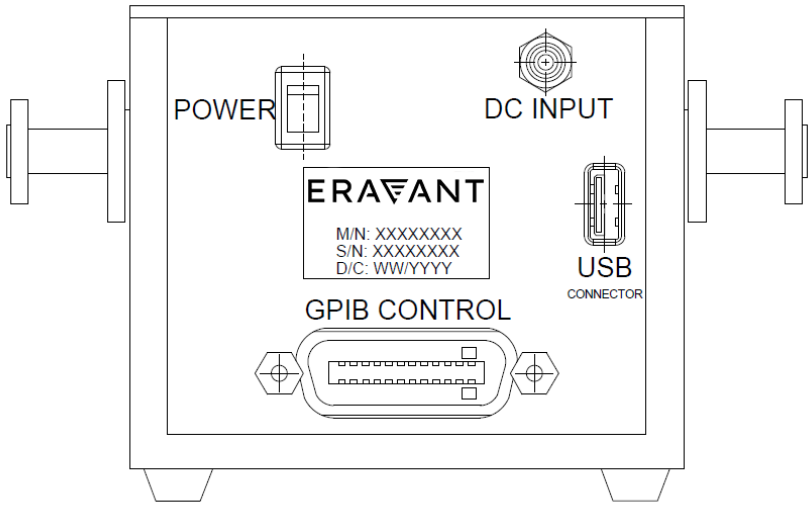


*Figure 2: Rear Panel View*

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# IMPLEMENTING CUSTOM GPIB CONNECTION

**Note: The GPIB connection is kept for legacy and customers' convenience. It is not recommended to use GPIB connection for customer control purposes.**

1. Initial Software Installation and requirements:
    a. Microsoft .NET Framework 4.5 or above
    b. National Instruments 488.2 GPIB Driver with support for .NET Framework option
2. Configure GPIB Settings. This can be done through the Interactive GPIB Utility installed with the National Instruments Driver or via custom code.
    **a. Initiate GPIB Connection via the National Instruments command "ibdev". Refer to Figure 3**
        i. Enter board index of GPIB Adapter that the device is connected to. If the board index is unknown, open National Instrument's Measurement & Automation Explorer (NI MAX), click the "DEVICES AND INTERFACE" tab. Device will be listed as "NI GPIB-USB-HS GPIBx " where "x" is the board index.
        ii. Enter the primary GPIB address of the unit. To change the primary GPIB address, refer to Step 5 of Initial Setup
        iii. Secondary address is never used and must always be set to 0.
        iv. For timeout, enter 13
        v. Enter 1 for 'EOI on last byte' flag
        vi. Enter 0 for end-of-string mode/byte
        vii. The unit will then exit the screen stating "Initiate GPIB or USB connection," (This is based off of the GPIB REN line being asserted upon calling "ibdev").
    **b. Set desired frequency attenuation levels via the command "ibwrt".**

    The attenuation input for "ibwrt" must be a string ranging from 0 to 70 terminated by EOI and may contain termination characters "\r" (CR), "\n" (LF), or "\r\n" (CRLF). An example implementation of "ibwrt" is shown below in Figure 4.

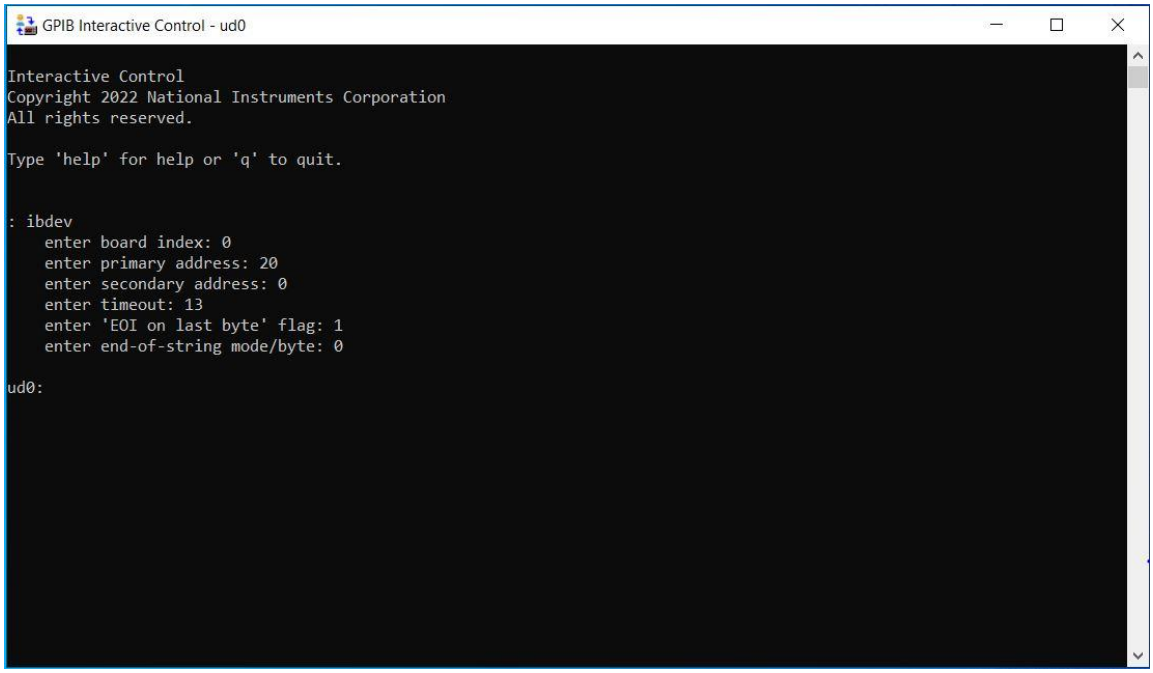


*Figure 3: Screenshot of command "ibdev" initiated with National Instruments GPIB Interactive Control utility*

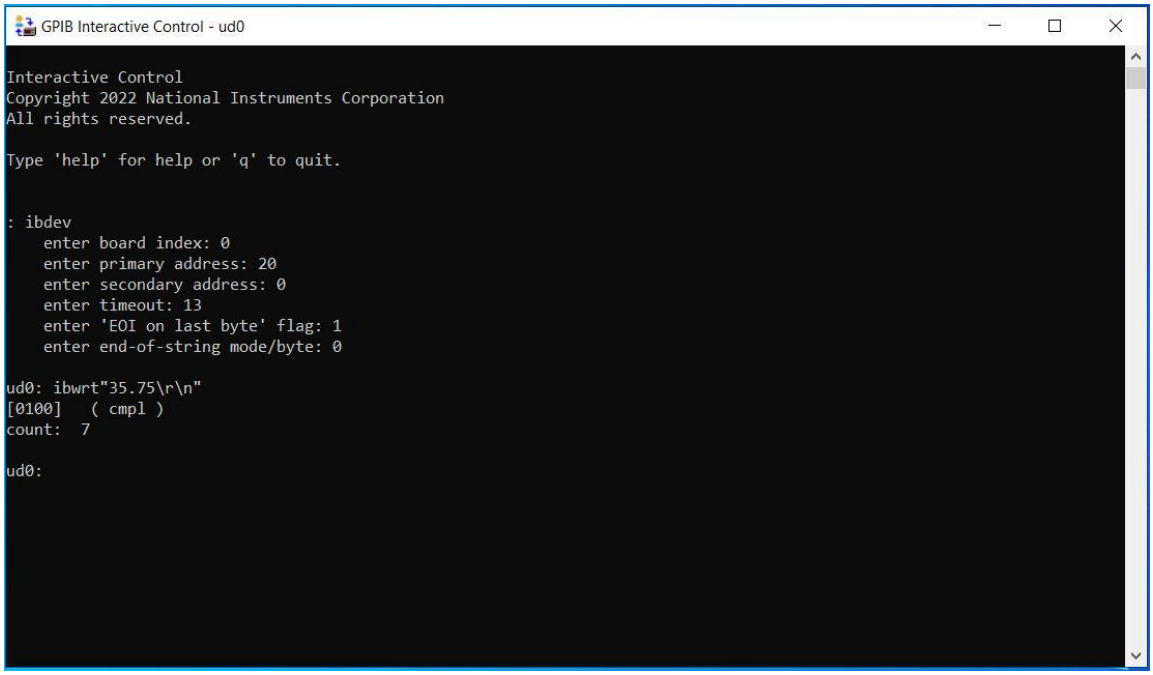


*Figure 4: Screenshot of command "ibwrt" to set attenuation to 35.75 dB immediately after the above call to "ibdev"*

**c. Read a response string from GPIB command via "ibrd".**

If a response from each attenuation command is desired (see Step 4 of Initial Setup), call "ibrd" immediately after sending an "ibwrt" command. Calling "ibrd" will return the string "GPIB CMD: nn.nn dB complete." It should be noted that only custom software can send "ibrd" in time to catch the response (typing "ibrd" manually in the Interactive GPIB Utility after an "ibwrt" is too slow).

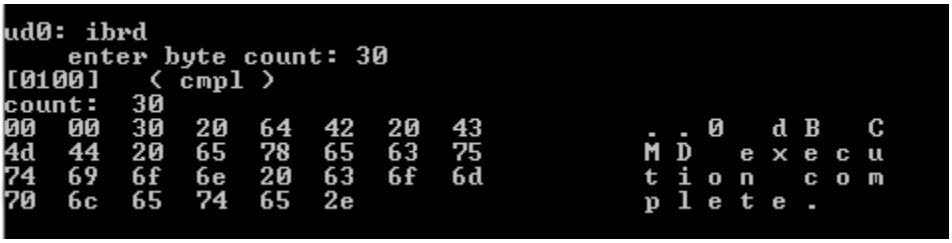


*Figure 5: Screenshot of command "ibrd" to read response from GPIB*

**d. Conduct a serial poll with "ibrsp" to read back the serial poll byte.**

The function "ibrsp" will trigger a serial poll and the unit will respond with its status byte. Calling "ibrsp" or sending any successful GPIB commands will reset the status byte to 0.

**e. Close GPIB connection via command "ibonl", followed by the respective GPIB board index when finished.**

The command "ibonl" ends the GPIB connection and cleans up memory resources for all devices connected to the respective board index entered in the command. This should be called before closing any custom GPIB communication programs with the device. A demonstration is shown below in Figure 6 for board index 0.

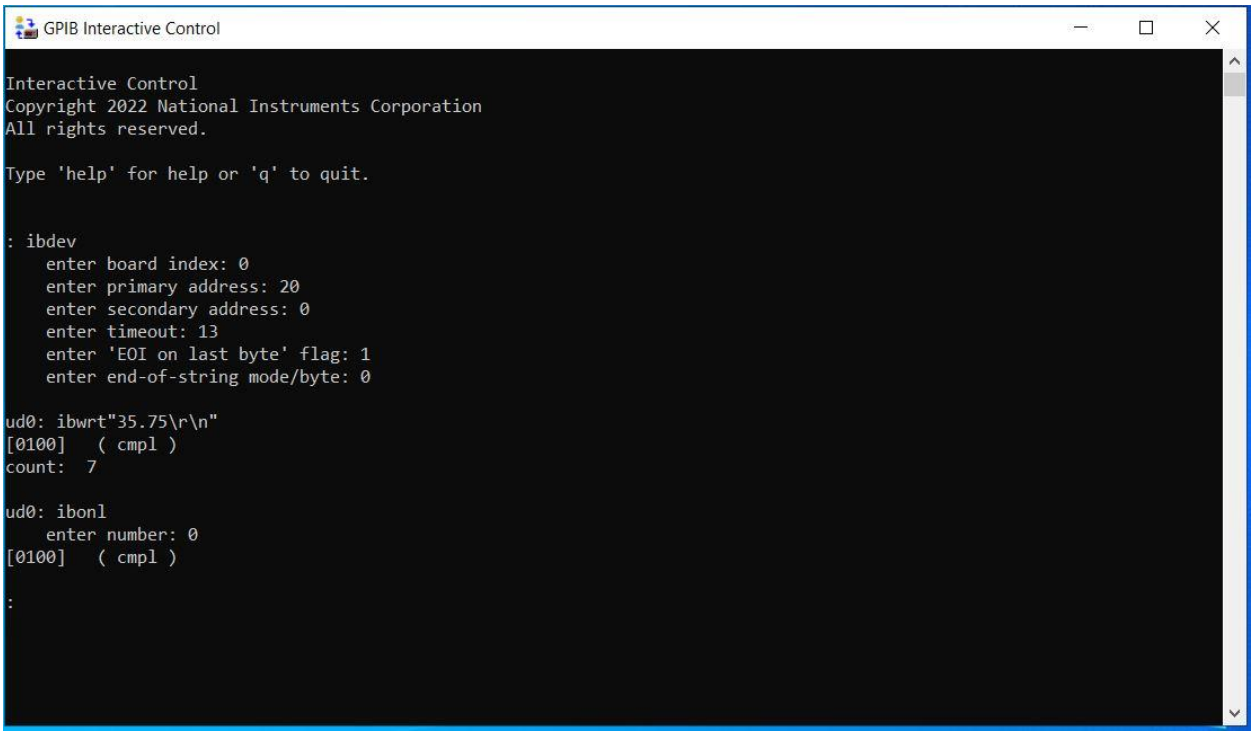


Figure 6: Screenshot of command “ibonl” for board index 0

## Warning:

1. Always leave a 200 ms delay between GPIB commands to account for status byte updates. Rapidly sent commands may be lost.
2. Never leave unconnected GPIB cables attached to the device during use; this can distort sent commands and incoming responses.
3. Always call “ibonl” or unplug the GPIB cable before powering the device off. Failing to do so will result in an incomplete device reset. See section 2e of Implementing Custom GPIB Connection for more information on “ibonl”.

# IMPLEMENTING CUSTOM USB CONNECTION

**Command Set:**

**nn.nn** = Move to given attenuation value

**R** = Reset to 70 db attenuation

**I** = Report identification string for the unit

**S** = Report value of serial poll byte

**G** = Report value of current attenuation

In this manual, we use NI-VISA to demonstrate the command set for the programmable attenuator using the USB connection.

1. **Initial Software Installation:**

   Download and Install NI-VISA driver from NI website below. Please note the customer needs to login the PC as an administrative user to use this software.

   https://www.ni.com/en-us/support/downloads/drivers/download.ni-visa.html#442805

2. **Configure serial port settings**

   a. Locate device COM port number. In Windows "Device Manager," the device can be found under "Ports." It will be listed as "USB Serial Port," with its respective COM port number located next to it.

   b. Baud rate should be set to 57600.

   c. 8 data bits

   d. No Parity

   e. 1 stop bit

   f. No Flow Control

   Any method of creating a serial port connection with these settings will suffice. One simple solution is to use the C# .NET "SerialPort," class to create custom USB communication software for the device. The serial port setting in NI-VISA is shown in Figure 7.

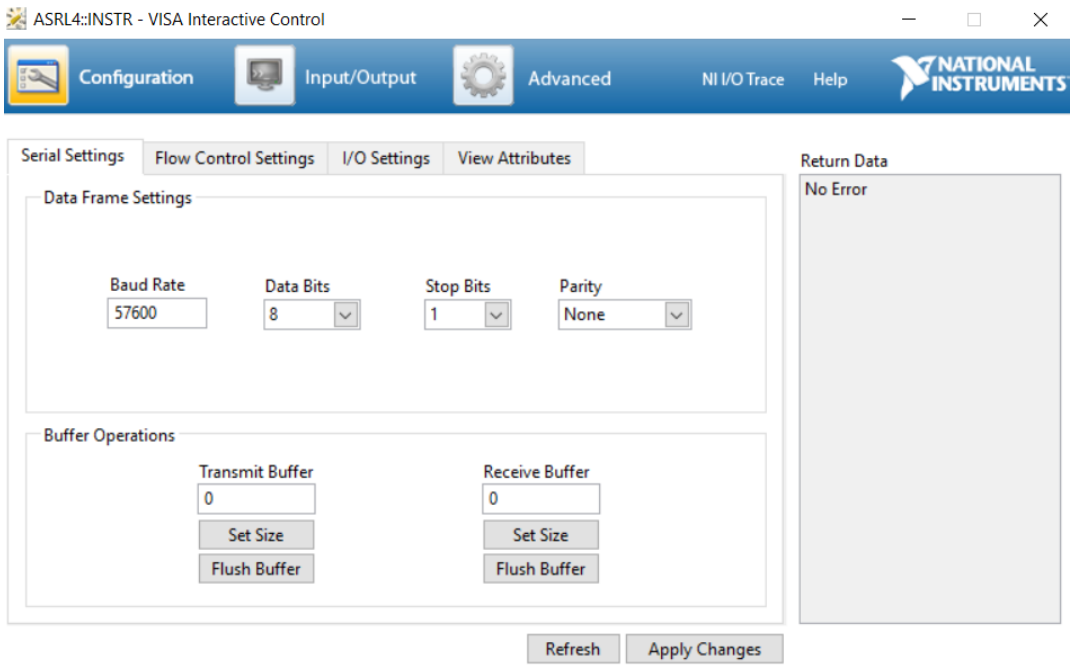


*Figure 7: Screenshot of serial port settings in NI-VISA*

3. **Send commands terminated via "\r" (CR), "\n" (LF), or "\r\n" (CRLF)**

   If each command is not terminated the serial buffer on the device will continue to fill up with commands but none will be processed.

4. **Set desired frequency attenuation levels via the command "nn.nn".**

   The attenuation input must be a string ranging from 0 to 70. An example of implementing attenuation level to 48 dB is shown below in Figure 8. Enter "48\n" in the command box and click "Write". Once the motor has completed its motion, "USB CMD: xx dB complete.\r\n" will be sent across USB from the device (if configured to do so as described in step 4 of Initial Setup). Read the incoming serial buffer as a string to receive the message. Click "Read" and the string is shown in the buffer window, as shown in Figure 8.

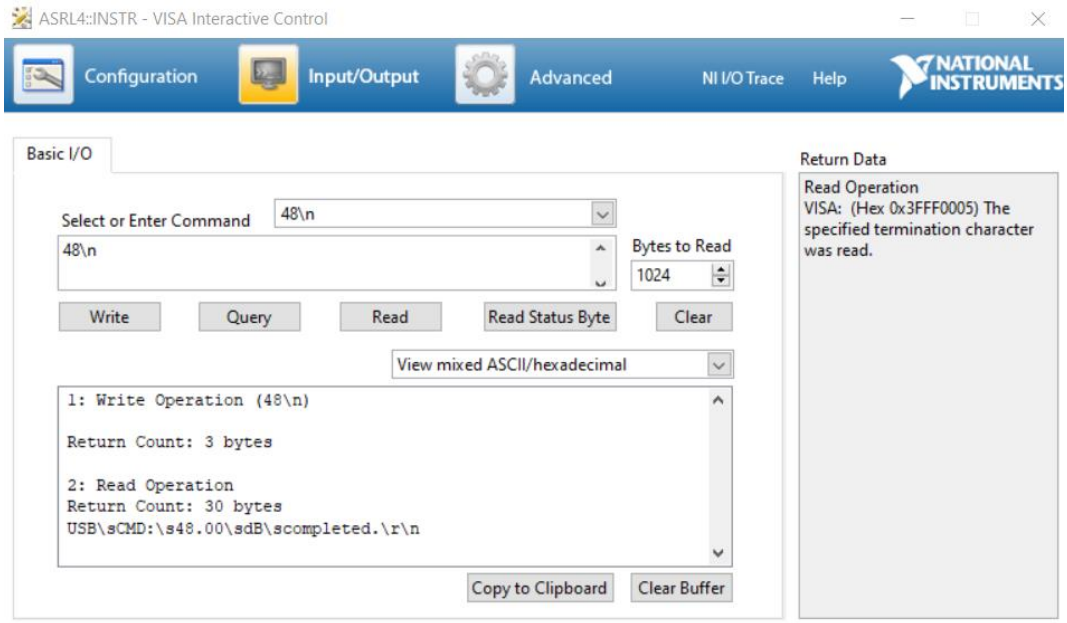


*Figure 8: Screenshot of implementation of 48 dB attenuation level.*

**5. Reset attenuation levels to 70 dB via the command "R".**

An example of resetting the attenuation level to 70 dB is shown below in Figure 9. Enter "R\n" in the command box and click "Write".

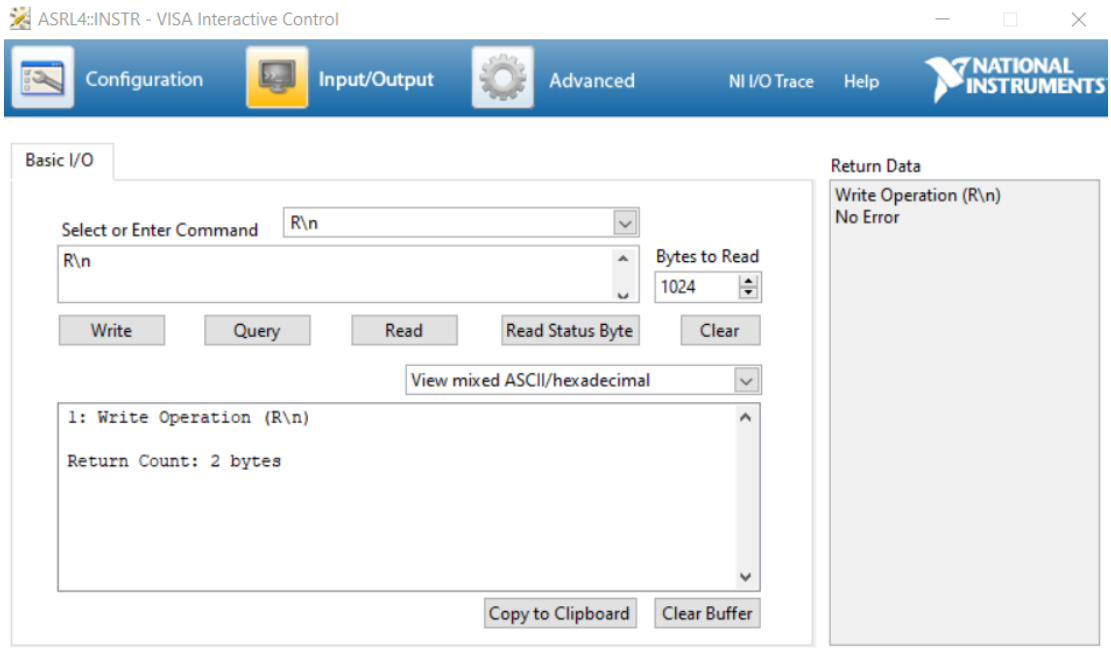


*Figure 9: Screenshot of resetting the attenuation level to 70 dB.*

6. **Report product identity information via the command “I”.**

An example of reporting the product identity information is shown below in Figure 10. Enter “I\n” in the command box and click “Write”. Read the incoming serial buffer as a string to receive the message. Click “Read” and the string is shown in the buffer window.

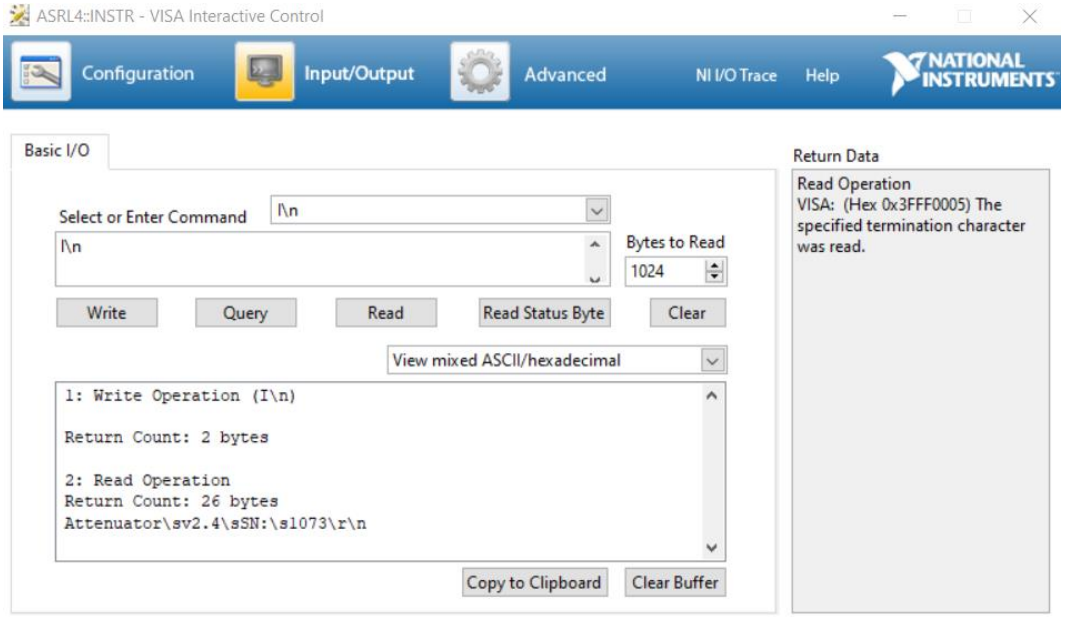


*Figure 10: Screenshot of reporting product identity.*

7. **Report product serial poll byte via the command “S”.**

An example of reporting the product serial poll byte is shown below in Figure 11. Enter “S\n” in the command box and click “Write”. Read the incoming serial buffer as a string to receive the message. Click “Read” and the string is shown in the buffer window.

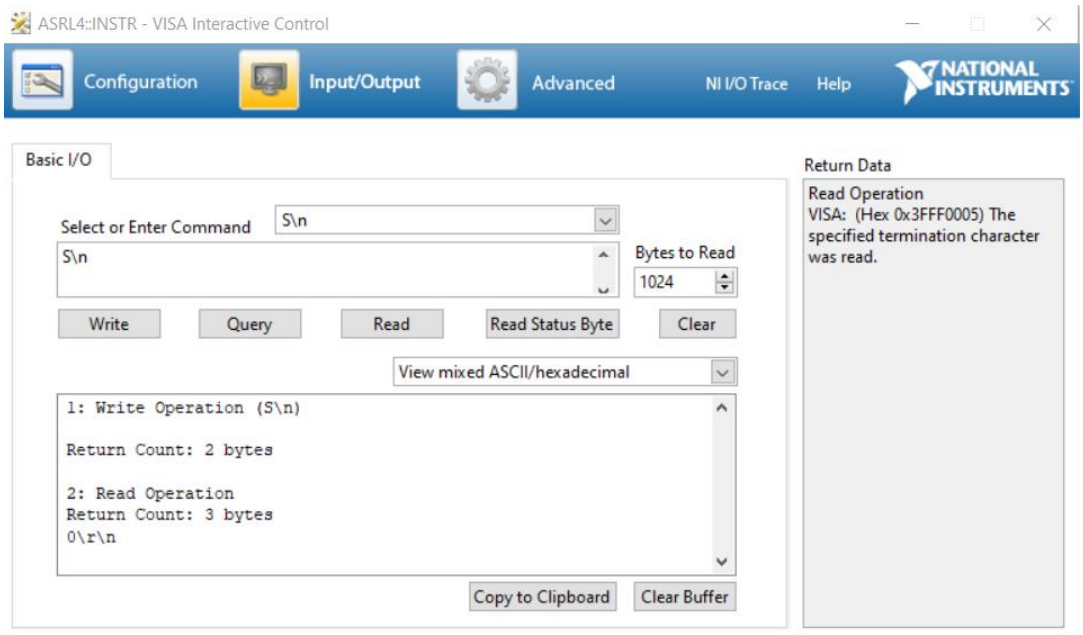


*Figure 11: Screenshot of reporting product serial poll byte.*

**8. Report product current attenuation level via the command "G".**

An example of reporting the product current attenuation level is shown below in Figure 12. Enter "G\n" in the command box and click "Write". Read the incoming serial buffer as a string to receive the message. Click "Read" and the string is shown in the buffer window.

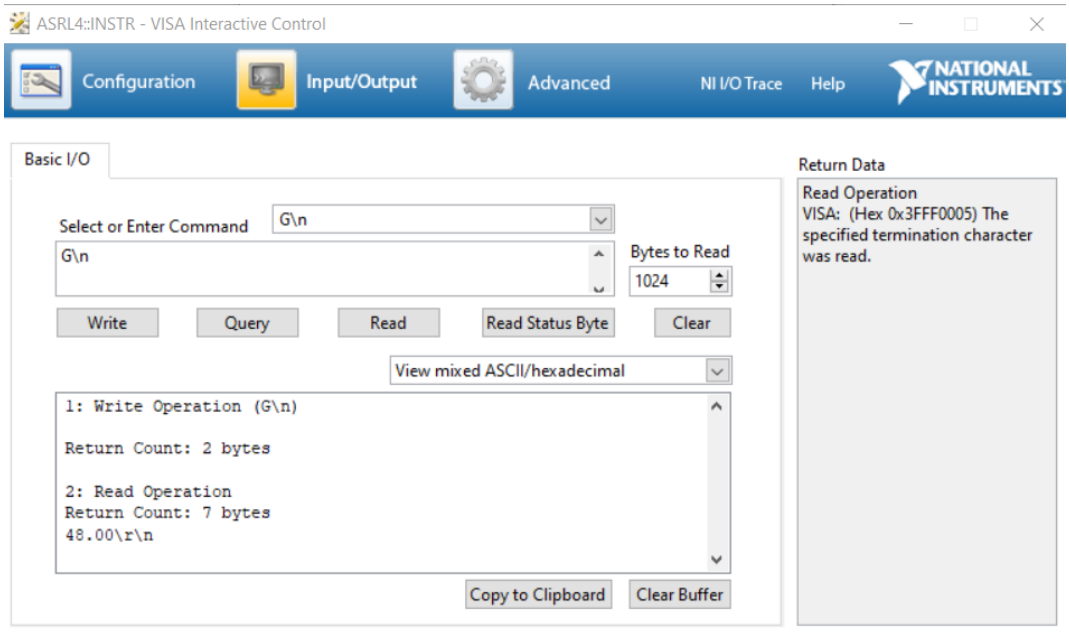


*Figure 12: Screenshot of reporting product current attenuation level.*

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