MI-WAVE®
Millimeter Wave Products Inc.

MI-WAVE®

511 Programmable Attenuator

| 10 | 1.0 | 0.1 | .01 |

Steps (dB)

MENU   ENTER
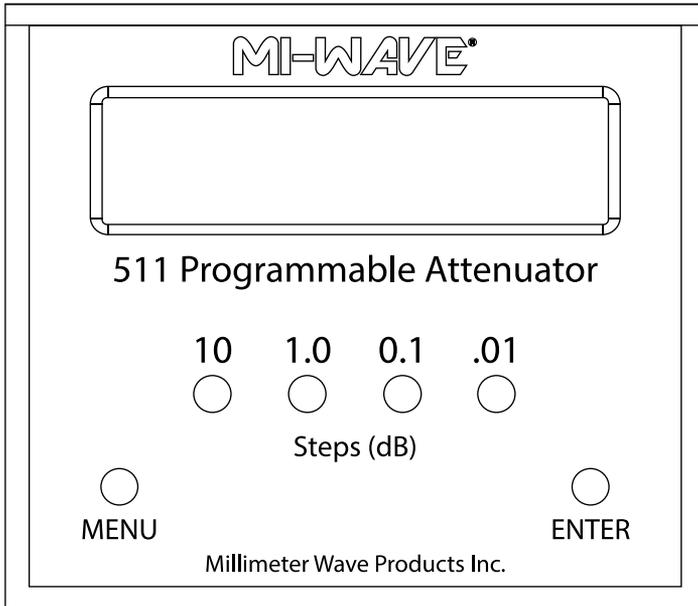
Millimeter Wave Products Inc.

User Guide

511 Series Programmable Attenuator
VERSION 2

Table of Contents

Specifications

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

Initial Setup

NOTE: *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* below for Front Panel View and Back Panel View respectively.

- **Power:** Connect the Power Adapter on the Back Panel to DC Input and Turn ON the Power Switch.

- **Remote Mode:** To enter Remote Mode, press <u>MENU</u> followed by <u>1.0</u> on the Front Panel. Then press <u>MENU</u> a second time to exit.

- **Local Mode:** The unit can switch back to Local Mode by pressing <u>MENU</u> followed by <u>10</u> and a second <u>MENU</u> press to exit.

- **Product Information:** To view Serial Number, Manufacturing Date and Frequency Band, press <u>0.1</u>. After this the clock must be set to the correct date/time by pressing <u>10</u> and <u>1.0</u> until the correct values are listed. Press <u>ENTER</u> to save.

- **GPIB Address:** To set the GPIB address, press <u>.01</u> to select the desired address in range 1–30 and then press <u>MENU</u> to store the address and exit. Once the address is set and stored, ON/OFF Power cycling will not change the address.

Local Mode Operation

- **Local Mode:** The unit can switch to Local Mode by pressing <u>MENU</u> followed by 10 and a second <u>MENU</u> press to exit.

- Upon entering Local Mode, the unit will automatically set the attenuation to 70 dB. To select a new attenuation level, first press <u>10</u> to change the displayed value to <u>0.00 dB</u>. Each time <u>10</u> is pressed, the attenuation will increase by <u>10 dB</u> until <u>70 dB</u> is reached, at which point the attenuation will start back at <u>0.00 dB</u> with another button press. Pressing <u>1.0</u> will increase the displayed value by <u>1 dB</u>, and so forth for the <u>0.1</u> and <u>.01</u> buttons.

- After the desired attenuation value is displayed, press <u>ENTER</u> to set it.
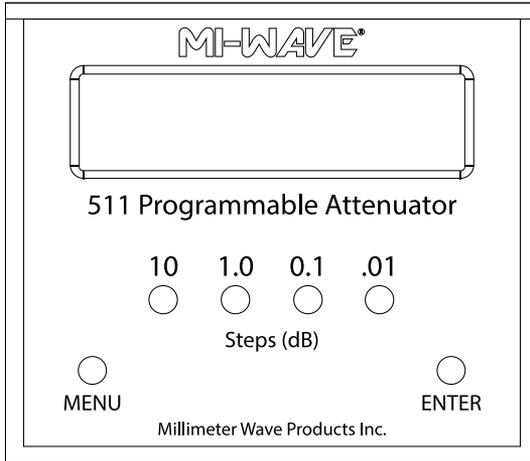
Front and Back Panel View
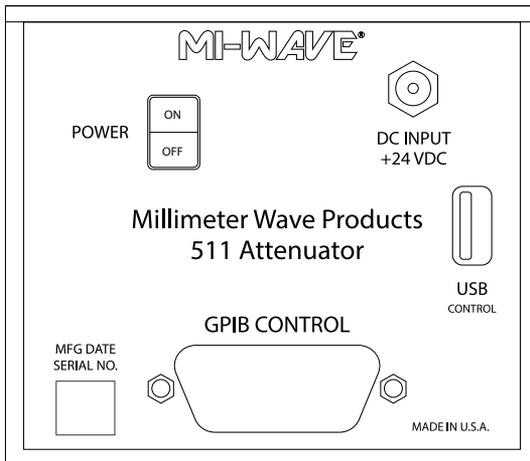

Figure 1: Front Panel View

Figure 2: Back Panel View

Implementing Custom GPIB Connection

Initial Software Installation and requirements:

- Microsoft .NET Framework 4.5 or above
- National Instruments 488.2 GPIB Driver with support for .NET Framework option

Configure GPIB Settings

This can be done through the Interactive GPIB Utility installed with the National Instruments Driver or via custom code.

1. Initiate GPIB Connection via the National Instruments command "`ibdev`". Refer to Figure 3 below.
2. 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
3. Enter the primary GPIB address of the unit. To change the primary GPIB address, refer to section 1.5
4. Secondary address is never used and must always be set to `0`.
5. For timeout, enter `13`
6. Enter `1` for 'EOI on last byte' flag
7. Enter `0` for end-of-string mode/byte
8. 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`").

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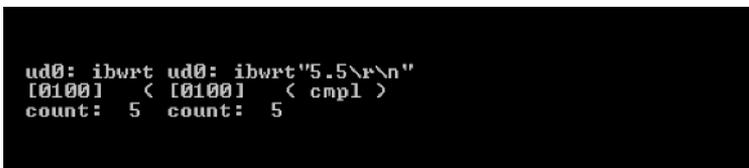

Figure 4: Screenshot of command "`ibwrt`" to set attenuation to 5.5 dB immediately after the above call to "`ibdev`"

7

Set desired frequency attenuation levels via the command "ibwrt".

The input for "`ibwrt`" must be a string ranging from 0 to 70 terminated by the newline characters "`\r\n` (CRLF)". An example implementation of "`ibwrt`" is shown on previous page 7 in Figure 4.

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

If a response from each GPIB command is desired, call "`ibrd`" immediately after sending an "`ibwrt`" command. Sending "`ibrd`" with a byte count equal to the incoming buffer size will return the string "`GPIB CMD: xx dB complete.\r\n`". 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).

```
ud0: ibrd
    enter byte count: 30
[0100]    < cmpl >
count:  30
00  00  30  20  64  42  20  43        .  .  0    d B    C
4d  44  20  65  78  65  63  75        M  D    e x e c u
74  69  6f  6e  20  63  6f  6d        t  i o n    c o m
70  6c  65  74  65  2e                p  l e t e .
```

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

ATTENTION:

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

NOTE: 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**.

```
ud0: ibonl
    enter number: 0
[0100]    < cmpl >
```

Figure 6: Screenshot of command "`ibonl`" for board index 0

⚠ Warning

Never leave unconnected GPIB cables attached to the device during use; this can distort sent commands and incoming responses.

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 above "**Attention**" section for more information on "`ibonl`".

8

Implementing Custom USB Connection

Initial Software Installation:

- Download and Install VCP (Virtual COM Port) driver from FTDI website:
- **https://ftdichip.com/drivers/vcp-drivers/**

Configure Serial Port Settings

- 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.
- Baud rate should be set to 57600.
- 8 data bits
- No Parity
- 1 stop bit
- 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.

Send attenuation commands ranging from 0 to 70 terminated via "\r\n"(CRLF)

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

A response to each USB command

Once the motor has completed its motion, "`USB CMD: xx dB complete.\r\n`" will be sent across USB from the device. Read the incoming serial buffer as a string to receive this message.

Index

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