



Using IMI USB M2-Slide Adapters

Introduction

The standard Flash storage device for many years has been SATA 2.5" Flash drives. However, this has been replaced recently by either M.2 SATA Flash Cards or M.2 NVME Flash Cards. The prevalent choice is M.2 NVME drives as their PCIE interface has more data ports than M.2 SATA devices (namely 4 channels versus 1 channel) and are inherently much faster than SATA SSD's. Also the 2280 M.2 form factor which is 80 millimeters long is the standard M.2 length chosen although M.2 cards come in lengths 110mm, 80mm, 60mm, 42mm. and 30mm.

Because PCIE comes in varying high speeds and data channel widths, getting a duplicator for the NVME PCIE Flash devices can be difficult and expensive. Also, insertion and extraction of the M.2 cards in a duplicator can be a challenge due to the socketing of the 67 pin M.2 connector which normally requires a 25 degree insertion angle followed by a screw addition to hold the M.2 card in place. And finally the heat generated by fast PCIE transmission which may require adding a heat sink on top of the card.

Fortunately, IMI has come up with an elegant and practical M2 programming solution using USB to M.2 adapters in an IMI designed M.2 slide holder s (See Figure 1 & Figure 2 below.)

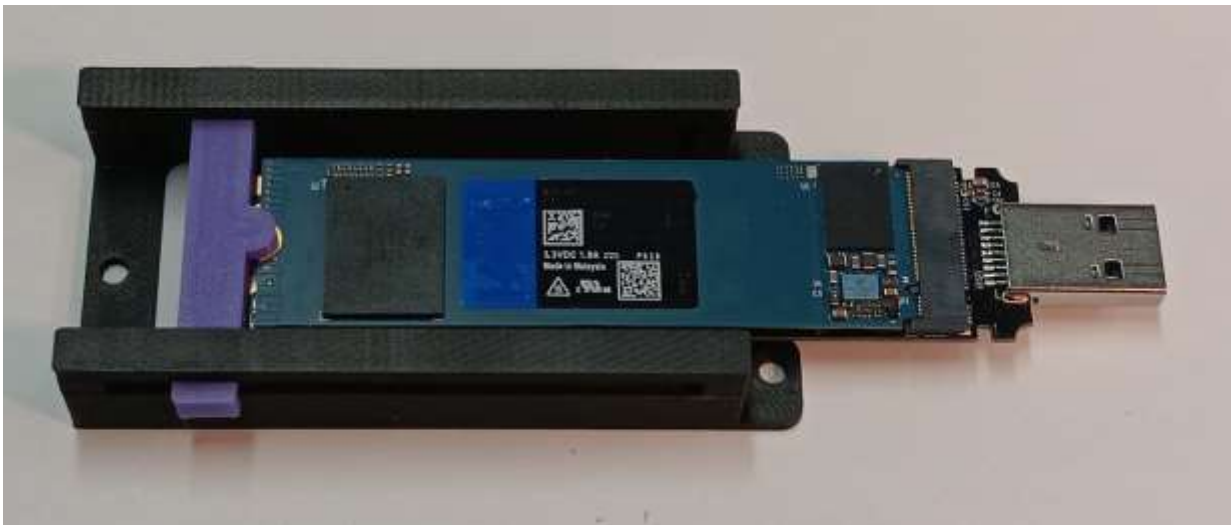


Figure 1: USB to M.2 Adapter M2-Slide-V1-A with USB Type A Connector



Figure 2: USB to M.2 Adapter M2-Slide-V1-C with USB Type C Connector



Figure 3: USB-MC-to-MC Cable and USB-MC-to-MA Cable

These IMI USB to M.2 Adapters support all M.2 2280, 2260, 2242, & 2230 M.2 formats. If you need M.2 22110 format, please let us know. Also, shown in Figure 3 are two commonly required USB Type C cables. Since the typical computer used Female USB Female sockets, the user may need one of these cables when using the M.2 Slide shown in Figure 2. IMI stocks these cables.



Using the IMI M2 USB Adapters with IMI USB Duplicators

IMI Duplicators such as the M5352B, M5615B, M5116-PR, M5132-PR, & M-1600-USB all use USB Type A sockets so for these instruments, the adapter required for program M.2 SSD's on IMI equipment is normally the M2-Slide-V1-A adapter shown in Figure 1 above which can be directly plugged into the IMI.

The two characteristics of the M.2 SSD's that needs to be addressed for programming these devices with USB duplicators is the following:

1. Provide a reliable signal bridge between an M.2 connector and the USB duplicator.
2. Address the two normal signal interfaces used with M.2; namely SATA and PCIE.
3. Provide a simple and reliable means for the user to insert and extract the M.2 card from its holder.
4. Provide a means for the user to add a heatsink to the M.2 card for programming
5. Increase the typical USB program and copy speeds to take advantage of the faster SATA and PCIE speeds of M.2 SSD's.
6. Address the increased ICC currents required by the M.2 SSD's and the USB adapters used.

IMI Slide Adapter Supports both SATA & PCIE M.2 SSD's

With regard to items 1 & 2 above, after much testing, IMI has chosen a USB to M.2 bridge chip from Realtek that supports both SATA and PCIE M.2 cards. In addition, this chip performed better than many other types on competing adapters in terms of standby current and the time taken to initialize the chip.

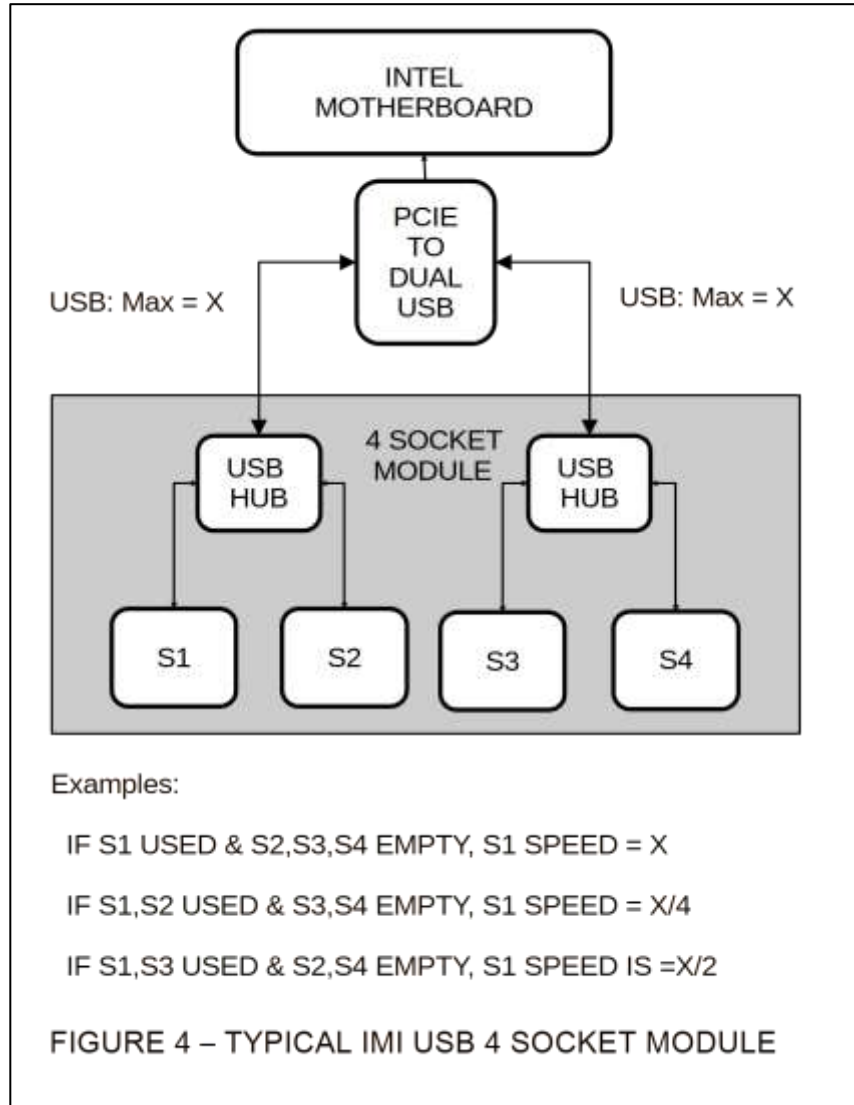
IMI Slide Adapter Uses a Sliding Bar to hold the M.2 SSD in Place

The IMI Sliding Bar is easy to use and also allows the addition of a heat sink to be added to the M.2 card for use in programming . Note however, our testing indicated the that the SDD's tested using our adapters did not overly heat due to actual speed they were found to run.

M.2 Speed Considerations Using IMI USB Duplicators

IMI USB duplicators typically connector a standard Intel motherboard to a PCIE switch chip connected to PCIE to USB bridge chips. In addition, on the M5116-PR and M5132-PR, the USB signals are split again in two by USB hubs.

Figure 4 below shows the layout of a typical IMI 4 USB socket module on IMI M5116PR and M5132-PR duplications. . Note, various other similar schemes are used on other IMI duplicators.



The net maximum USB port speed for each IMI model ignoring software considerations is given below in Tables 1 & 2.

Duplicator	2 Devices	4 Devices	8 Devices	16 Devices	32 Devices
M1500-USB	300 mb/sec	150 mb/sec	75 mb/sec	-----NA-----	-----NA-----
M1600-USB	300 mb/sec	300 mb/sec	150 mb/sec	-----NA-----	-----NA-----
M5116-PR	300 mb/sec	300 mb/sec	300 mb/sec	75 mb/sec	-----NA-----
M5132-PR	300 mb/sec	300 mb/sec	300 mb/sec	150 mb/sec	75 mb/sec
M5315B	300 mb/sec	300 mb/sec	300 mb/sec	150 mb/sec	-----NA-----
M5615B	300 mb/sec	300 mb/sec	300 mb/sec	150 mb/sec	-----NA-----

Table 1 : IMI USB Duplicator MAX Copy & Verify in mb/sec



Duplicator	2 Devices	4 Devices	8 Devices	16 Devices	32 Devices
M1500-USB	18 gb/min	9 gb/min	4.5 gb/min	-----NA-----	-----NA-----
M1600-USB	18 gb/min	18 gb/min	9 gb/min	-----NA-----	-----NA-----
M5116-PR	18 gb/min	18 gb/min	18 gb/min	4.5 gb/min	-----NA-----
M5132-PR	18 gb/min	18 gb/min	18 gb/min	9 gb/min	4.5 gb/min
M5315B	18 gb/min	18 gb/min	18 gb/min	9 gb/min	-----NA-----
M5615B	18 gb/min	18 gb/min	18 gb/min	9 gb/min	-----NA-----

Table 2 : IMI USB Duplicator MAX Copy & Verify in gb/min

We now discuss the above max speed numbers dependence upon other factors besides the particular IMI USB duplicator that is being used.

Speed Factor Number 1 – M.2 SATA or NVME

M.2 NVME devices support up to 4 PCIE data ports and M.2 SATA supports only one data port. However, our tests at this time only measured the speeds take with NVME cards. Since M.2 SATA devices typically support up to 500MB/sec and are max speed was 300MB/sec, this is probably not a significant factor so our test results should apply equally for both SATA and NVME M.2 cards.

Speed Factor Number 2 – Which Ports are used for the M.2 Slide Adapter

As seen in Figure 4, the IMI duplicator sockets may run at different speeds depending upon the number of times the USB signal being used has been split between the PCIE to dual USB bridge and the split of the dual USB bridge is split between the IMI USB module dual USB hub. As an example, In a M5132-PR with 32 sockets divided up in 8 modules, each module with two dual USB hubs, if 8 USB parts are used on only one USB socket per 4 socket module, the speed shown in Table 1 is 300mb/sec but will decrease to 150MB/sec if two non adjacent sockets on 4 modules is used or decrease to 75mb/sec if two adjacent sockets are used on 4 modules. In addition, due to software concerns, the duplication software will tend to run only as fast as the slowest module. Hence, the user must be careful to maximize the use of the chose sockets.

With the exception of the M1600-USB duplicator, the rule to follow for maximum copy/verify speeds is to widely distribute the USB devices as possible both on modules and within modules.

For the M16600-USB 8 duplicator, the first 4 sockets should be used as they are individually mapped to PCIE USB bridges.



Speed Factor Number 3 – Master Data Source and the Type of Duplicator Boot Drive.

The master image used in IMI duplication is different depending upon where it is gotten from the master socket or from a master file. In addition it matters whether it is a binary master image copy (i.e., an exact copy or an IMI smart copy).

In our speed testing of the M.2 card SSD's, we found the following results:

Test #1: Run a smart copy of a Linux formatted M.2 250GB NVME SSD which had a 15GB USMART image by placing the NVME M.2 device in the master slot and copying the device on a M5132PR to 7 other target M.2 devices with one device on each of the M5132-PR modules.

Result #1: Copy and Verify speed for the 15GB master device image was 300mb/sec.

Test #2: Repeat Test #1 copy to 7 target SSD's but use the 15GB USMART image stored on the IMI standard 1 TB 2.5" HDD.

. Result #2: Copy and Verify speed for the 15GB master device image was 150mb/sec.

Test #3: Repeat Test #1 copy to 7 target SSD's but use the 15GB USMART image stored on the IMI 1 TB 2.5" SATA SSD.

Result #3: Copy and Verify speed for the 15GB master device image was 300mb/sec.

Speed Test Conclusion:

Use of a 1TB SATA 2.5 SSD for running IMI USB duplicators in place of a SATA 2.5" HDD can yield up to 100% improvement if the duplicator USB sockets are used in limited numbers (such as for M.2 SSD's) but if all the sockets are used, then only the M1600-USB duplicator will see a significant speed advantage with a SATA SSD boot drive.

If you have further questions relating to M.2 duplication or the speed of IMI duplicators, please contact IMI and we will be happy to assist you.