

## *Testing 40GBASE-SR Links utilizing Panduit PanMPO Reference Cords & the JDSU Certifier40G Cable certifier*



### *Purpose*

The purpose of this document is to describe how to test a 40GBASE-SR4 channel using the one jumper test method procedure described in TIA-568-C.1 (TIA-526-14B and IEC 61280-4-1 Ed.2) using PanMPO reference cords with the JDSU Certifier40G cable certifier.

### *Background*

The introduction of the MPO in the end to end horizontal cabling infrastructure has complicated the process in qualifying a link via the one jumper source/power meter testing method as described in TIA-568-C.1 (TIA-526-14B and IEC 61280-4-1 Ed.2). Although the standards do mention the two and three jumper methods, the one jumper method is recommended for permanent link testing due to it including the permanent link connections in the loss measurement. No matter what method is used, it is recommended to save the reference value used to qualify the tested links.

Per ANSI/TIA-568-C.1-7 a 10GBASE-SR standards compliant MPO based horizontal infrastructure consists of **female** MPO connectors. Per the same standard, the 40GBASE-SR4 standards compliant MPO based horizontal infrastructure is comprised of **male** MPO connectors. When the 10GBASE-SR links are upgraded to 40GBASE-SR4 links, they will consist of non-standards-based **female** MPO connectors. With this gender disparity, there will be a mix of MPO gender types in the 40GBASE-SR4 links deployed in the field. Testing these links with the different gender types can prove to be difficult utilizing TIA-568-C.1 (TIA-526-14B and IEC 61280-4-1 Ed.2) Method B, one jumper method.

In addition to the complexity of the cabling infrastructure, the test equipment used to qualify a 40GBASE-SR4 permanent link can only be manufactured with one gender type of MPO interface. Due to this fixed gender interface, there have been instances where the one jumper method cannot be used, but instead the two or three jumper method had to be used to qualify the links.

Beyond the gender of the MPO connector, there are three different polarity methods associated with MPO based horizontal cabling; Methods A, B and C, which are also discussed in ANSI/TIA-568-C.1-7. This paper simply addresses Methods A and B.

Method A employs key-up to key-down adapters for array connectivity to maintain registration of Fiber 1 throughout the permanent link. As a result, when constructing a Method A channel for 40G, there needs to be an array flip or Method B cable introduced to the channel.

Method B employs key-up to key-up adapters to connect the array connectivity, which allows for the array to “flip” from one end of the 40G channel to the other to utilize Method B cables throughout the channel.

Trying to change the gender or polarity associated with the standard MPO connector in the field is not recommended due to the complex construction of the connector. Trying to change this characteristic in the field is extremely difficult and may lead to damage to the fiber exposed when attempting to replace the connector housing.

### Solution

Panduit and JDSU have worked together to provide a complete testing solution that will allow for the qualification of any 40BASE-SR4 permanent link utilizing the one jumper test method procedure described in TIA-568-C.1 (TIA-526-14B and IEC 61280-4-1 Ed.2) regardless of the gender in the fiber link.

Panduit has introduced the PanMPO, a universal MPO connector that can have the gender and polarity changed in the field with no risk of damage to the internal ribbon fiber or the connector’s end face.



The PanMPO is a multiple-fiber push-on/pull-off connector that is IEC-61754-7 and EIA/TIA-604-5 (FOCIS 5) compliant and can be either male or female in gender or key up or key down in housing polarity orientation. It provides an all-inclusive connector that can be configured to any gender necessary to test your horizontal infrastructure.

JDSU has introduced MPO modules for the Certifier40G Next-Generation Certifier to the market. Native MPO testing of 12-fiber MPO links and channels can now be performed eliminating the need for fan-out cables. A 5-second auto-test can verify both the polarity and the loss for all 12 fibers with pass/fail to standards-based or custom limits.



**Permanent Link Testing a Female-Based MPO Infrastructure – Method A or Method B**

When testing a Method A or Method B female-MPO-based infrastructure using the one jumper source/power meter testing method described in TIA-568-C.1 (TIA-526-14B and IEC 61280-4-1 Ed.2) with the PanMPO and the Certifier40G cable certifier, the following setup applies.

It is important to ensure that all the end faces associated with the permanent link being tested, the reference cords, and the test equipment are free of contamination. See “Cleaning Recommendations” at the end of this paper to ensure proper cleaning and inspection tools are being utilized.

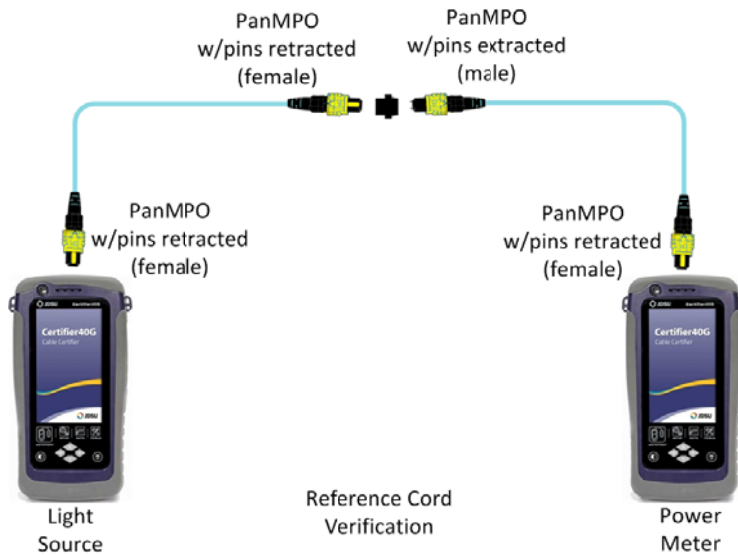
Figure 1 shows how to set up the one-jumper reference utilizing Method A or Method B polarity. The PanMPO reference cord is set up so both ends of the cord are female (pins retracted). Setting the cord gender this way enables a direct connection between the source and power meter. The polarity of the cord will be set to Method A (Key Up to Key Down) or Method B (Key Up to Key Up), depending on the polarity of the link under test.



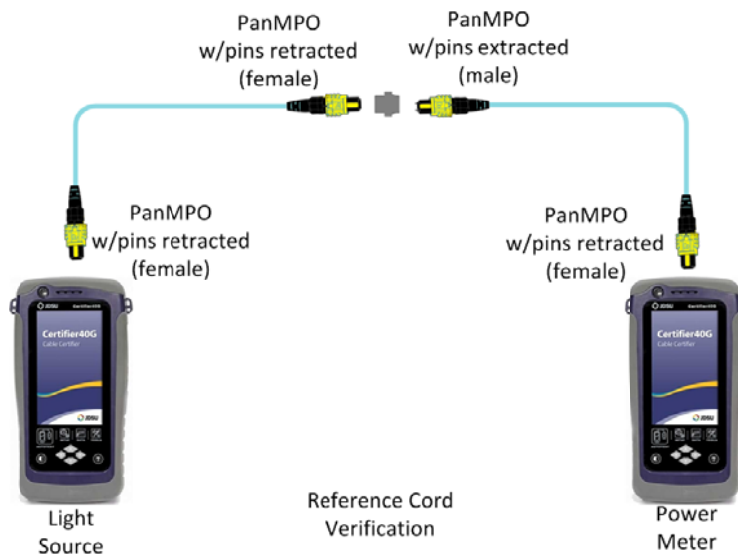
**Figure 1. One-Jumper Reference Setup when Testing Method A or Method B Female Based Horizontal Cabling Infrastructure**

**Note: the JDSU Certifier40G will learn the polarity of the link when setting the reference and test to that method. Therefore, to test a Method A system, set the reference with a Method A cord. Likewise, to test a Method B system, set the reference with a Method B cord.**

After setting the reference, reference cord verification can be completed by adding the additional PanMPO reference cord set to the proper polarity for the link under test (Method A or Method B) (See Figure 2 and Figure 3). This will test the additional cord to ensure that it is within reference grade specifications. Note: If the total IL is  $\leq 0.25$  dB, then the cord is useable for testing purposes. If the total IL is  $> 0.25$  dB inspect and re-clean the MPO end face of the cord and retest. If the value remains above 0.25 dB, discard the cord and do not use it as a reference cord.

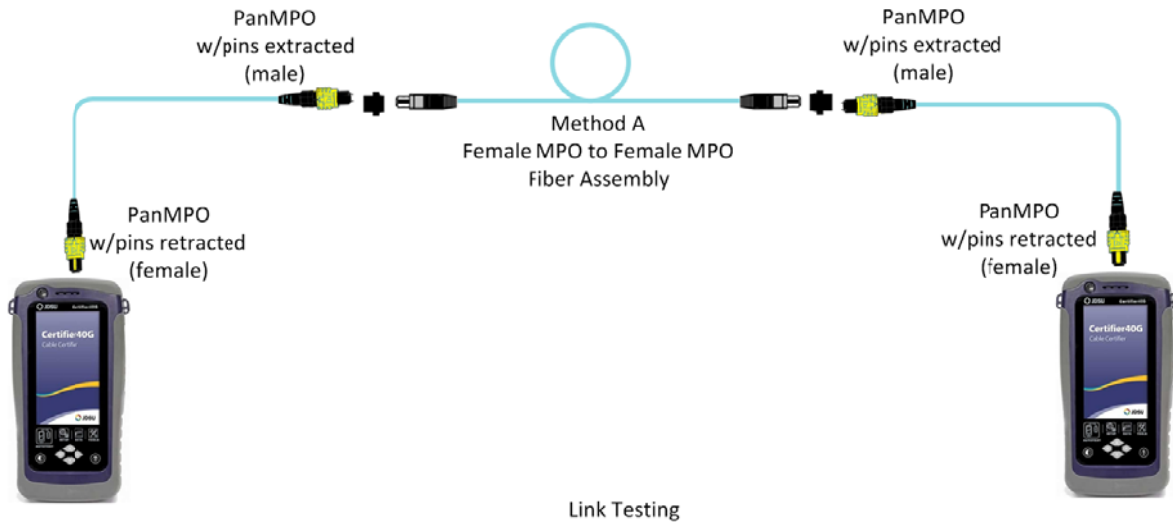


***Figure 2. MPO Reference Cord Verification (Method A Cords)***

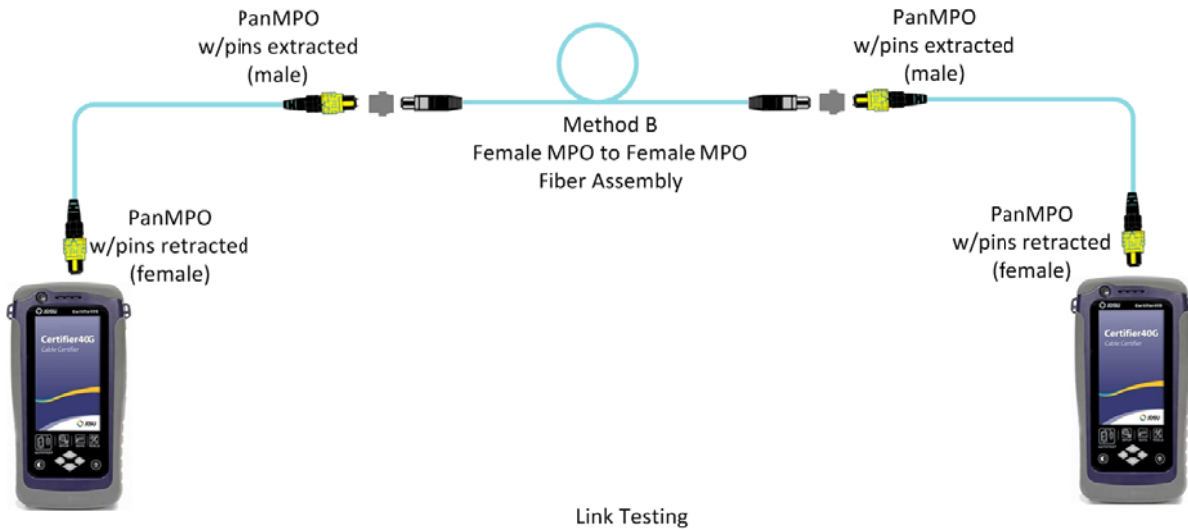


***Figure 3. MPO Reference Cord Verification (Method B Cords)***

Once the cord is qualified for test, the permanent link can be tested. The PanMPO connectors at the MPO adapter can be changed so the gender is now male and can be used to test the Method A or Method B female MPO horizontal link as shown in Figure 4 and Figure 5.



***Figure 4. Test setup for Method A 40GBASE-SR4 Female MPO Horizontal Cabling***

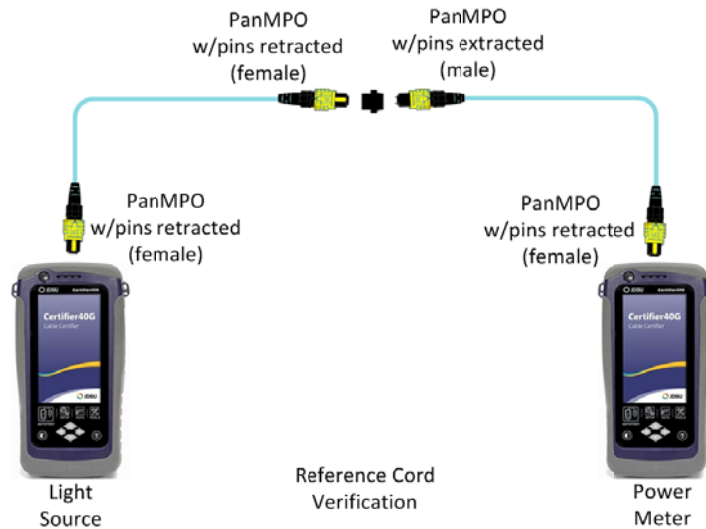


***Figure 5. Test setup for Method B 40GBASE-SR4 Female MPO Horizontal Cabling***

**Permanent Link Testing a Male-Based MPO Infrastructure – Method A or Method B**

When testing a Method A or Method B Male-MPO-based infrastructure utilizing the one jumper source/power meter testing method as described in TIA-568-C.1 (TIA-526-14B and IEC 61280-4-1 Ed.2) with the PanMPO and the Certifier40G cable certifier the following setup applies.

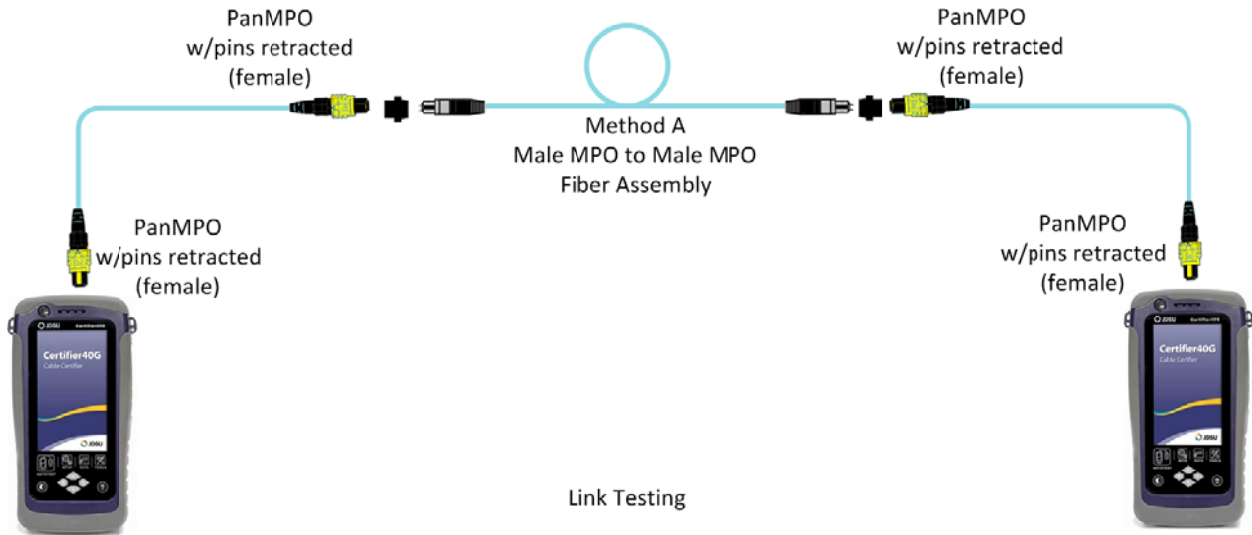
Figure 6 shows how to set up the one-jumper reference utilizing Method A or Method B. The PanMPO reference cord is setup so both ends of the cord are Female (pins retracted). With the cords gender set this way, direct connection between the source and power meter can be made. The polarity of the cord will be set to Method A (Key Up to Key Down) or Method B (Key Up to Key Up) depending upon the polarity of the link under test. As discussed earlier, the JDSU will learn the polarity of the link by the polarity of the reference cord being used.



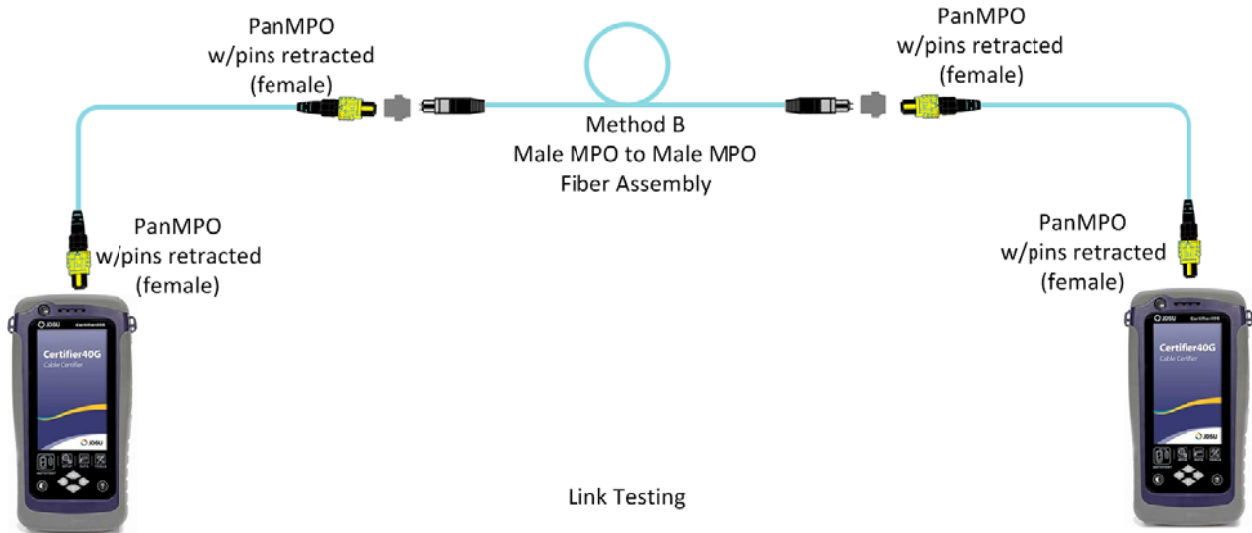
**Figure 6. One-Jumper Reference Setup for Testing Male MPO Based Horizontal Cabling Infrastructure**

After setting the reference, reference cord verification can be completed by following the process shown in Figure 2 or Figure 3 depending on the polarity of the MPO cabling.

Once the cord is qualified for test, the permanent link can be tested. Both PanMPO connectors can be set to female and will be able to be utilized to test the Method A or Method B male MPO horizontal link as shown in Figure 7 or Figure 8.



***Figure 7. Test Setup for Method A 40GBASE-SR4 Male MPO Horizontal Cabling***



***Figure 8. Test Setup for Method B 40GBASE-SR4 Male MPO Horizontal Cabling***



### Panduit Part Numbers:

**FRBXR7-R7M02** = 2m PanMPO reference cord assembly  
**FMTPFCT** = Panduit reel-type cleaner for MPO connectors

### JDSU Part Numbers:

**NGC-4500-MM-NA** = Certifier40G Copper/Multimode kit with North American Power Cords  
**NGC-4500-MPO-S** = MPO 850nm Light Source Adapter for Certifier40G  
**NGC-4500-MPO-PM** = MPO 850nm Power Meter Adapter for Certifier40G

### Cleaning Requirements

TIA standards including TIA-526-14B require that fiber end faces be inspected according to IEC 61300-3-35, which in turn requires the end faces be subjected to a non-subjective test to ensure they are free of defects or scratches. These requirements also apply to MPO connectors. The JDSU P5000i Digital Inspection Microscope with MPO adapters combined with the Certifier40G and Panduit MPO cleaners allows technicians to quickly and easily meet this requirement in the field.



### Summary

The introduction of the MPO in the end-to-end horizontal cabling infrastructure has complicated the link qualification process via the one-jumper source/power meter testing method described in TIA-568-C.1 (TIA-526-14B and IEC 61280-4-1 Ed.2).

Panduit and JDSU have worked together to provide a complete testing solution with the combination of PanMPO reference cords and Certifier40G cable certifier that will allow for the qualification of any 40BASE-SR4 permanent link utilizing the one jumper test method procedure regardless of the gender or polarity of the MPO in the horizontal cabling infrastructure.