

INTRODUCTION ON 10G to 40G MPO MIGRATION METHODS

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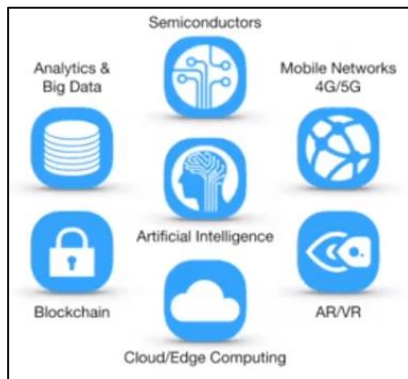
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ABSTRACT: In this white paper, the methods to build “Polarity B” 40G MPO channel using existing “Type C” MPO trunk cables are discussed in below three different scenarios.

- Migration to 40G at one end – Using MPO-LC hydra cable
- Migration to 40G at one end – Using Customized MPO Patch Cord
- Migration to 40G at both ends – Using Customized MPO Patch Cord

The world is becoming digital, the world is becoming connected. At the end of year 2018, 55.1% of the worldwide population is using internet ^[1] while 36% is using smart phones ^[2], and the number keeps growing. This together with the explosion of hot topics like "Big Data", "Cloud Computing", "Artificial Intelligence", "Internet of things" in the recent years ^[3], generating intensive demands on data transmission in terms of speed and coverage. Massive infrastructures, e.g. base stations, data centers have been built and under construction all over the world to adapt this trend. However, building new infrastructures costs time and money, upgrade from existing infrastructures in most cases seems more optimistic way. In this white paper, the methods to migrate from existing 10G “Polarity C” MPO channel to 40G MPO channel will be discussed.



For 10G MPO configuration, three methods are introduced in the ANSI/TIA-568 standards, i.e. “Method A”, “Method B” and “Method C”. “Method A” needs both straight and cross patch cords, while “Method B” if without any modification, will give very confusing port correspondence at the near and far ends. Due to simple components management and straight forward port correspondence, “Method C” is chosen predominantly as the preferred 10G MPO configuration method. Nevertheless, this will cause problem if using the same backbone cables to migrate to 40G MPO channel, as “Type C” MPO trunk cables can hardly be used for 40G application. The way to configure 40G MPO channel has been detailed discussed in the white paper “40G-100G MPO Configuration”, thus will not be discussed here. The most important point of 40G MPO configuration is that the whole channel in the end needs to act as if “Polarity B”. The methods to build “Polarity B” 40G MPO channel using existing “Type C” MPO trunk cables are discussed below in three different scenarios.

- **Migration to 40G at one end – Using MPO-LC hydra cable**

This method will be adopted if only need to increase speed to 40G at one end without system capacity increases. It is achieved by replacing the LC patch cords with MPO-LC hydra cable, the detailed channel configuration is illustrated in [Figure 1](#).

Imagine a light signal is sent via Port 2 in the below MPO cassette, the light will go all the way through the “Type C” trunk cable, the upper MPO cassette, and the MPO-LC hydra cable, ending up in Port 12 of MPO transceiver. Using the same principle, the fibre mapping can be illustrated subsequently as in below [Table 1](#). That’s exactly the fibre mapping needed for a 40G MPO configuration.

Table 1 Fibre Mapping - Migration to 40G at one end - Using MPO-LC hydra cable

LC Side		MPO Side	
Port 1	Rx	Port 1	Tx
Port 2	Tx	Port 12	Rx
Port 3	Rx	Port 2	Tx
Port 4	Tx	Port 11	Rx
Port 5	Rx	Port 3	Tx
Port 6	Tx	Port 10	Rx
Port 7	Rx	Port 4	Tx
Port 8	Tx	Port 9	Rx

- **Migration to 40G at one end – Using Customized MPO Patch Cord**

In practice, most of time, speed increase will accompany with capacity upgrade as well. In such case, the MPO cassette needs to be removed and replaced by a MPO patch cord. As mentioned previously, “Type C” trunk cable is not suitable for 40G MPO configuration. To achieve the migration, customized MPO patch cord must be used, i.e. none of the standard “Type A”, “Type B” and “Type C” fibre mapping. Prysmian Group has defined our own “Type P” fibre mapping as to adopt this migration. Due to confidential issues, the detailed fibre mapping will not be illustrated here.

The whole channel configuration is illustrated below in [Figure 2](#). MPO cassette is replaced by the “Type B” MPO adaptor and the customized MPO patch cord, which connects directly to the 40G MPO transceiver.

Imagine a light signal is sent via Port 2 in the below MPO cassette, the light will go all the way through the “Type C” trunk cable, and ends up at position 1 in the left MPO connector of “Type C” trunk cable. Since the “Type C” trunk cable is connected to the customized MPO patch cord via “Type B” MPO connector, Position 1 in the left MPO connector of “Type C” trunk cable will connect to Position 12 in the right MPO connector of the customized MPO patch cord. Prysmian Group defined “Type P” fibre mapping is arranged in such a way that the light will arrive at Position 1 in the left MPO connector of the customized MPO patch cord, ending up at Port 12 of MPO transceiver. Using the same principle, the fibre mapping can be illustrated the same as illustrated in [Table 1](#). That’s exactly the fibre mapping needed for a 40G MPO configuration.

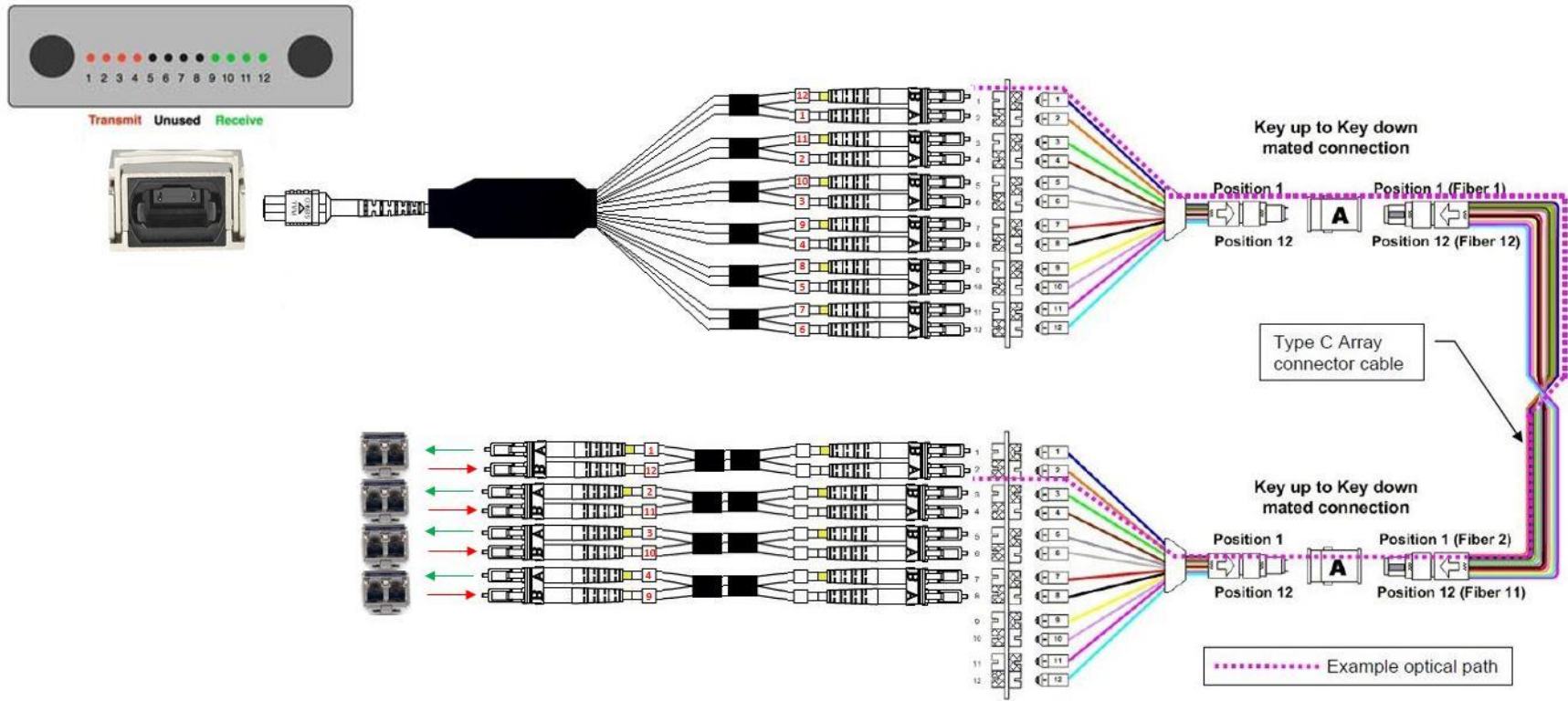


Figure 1 Migration to 40G at one end – Using MPO-LC hydra cable

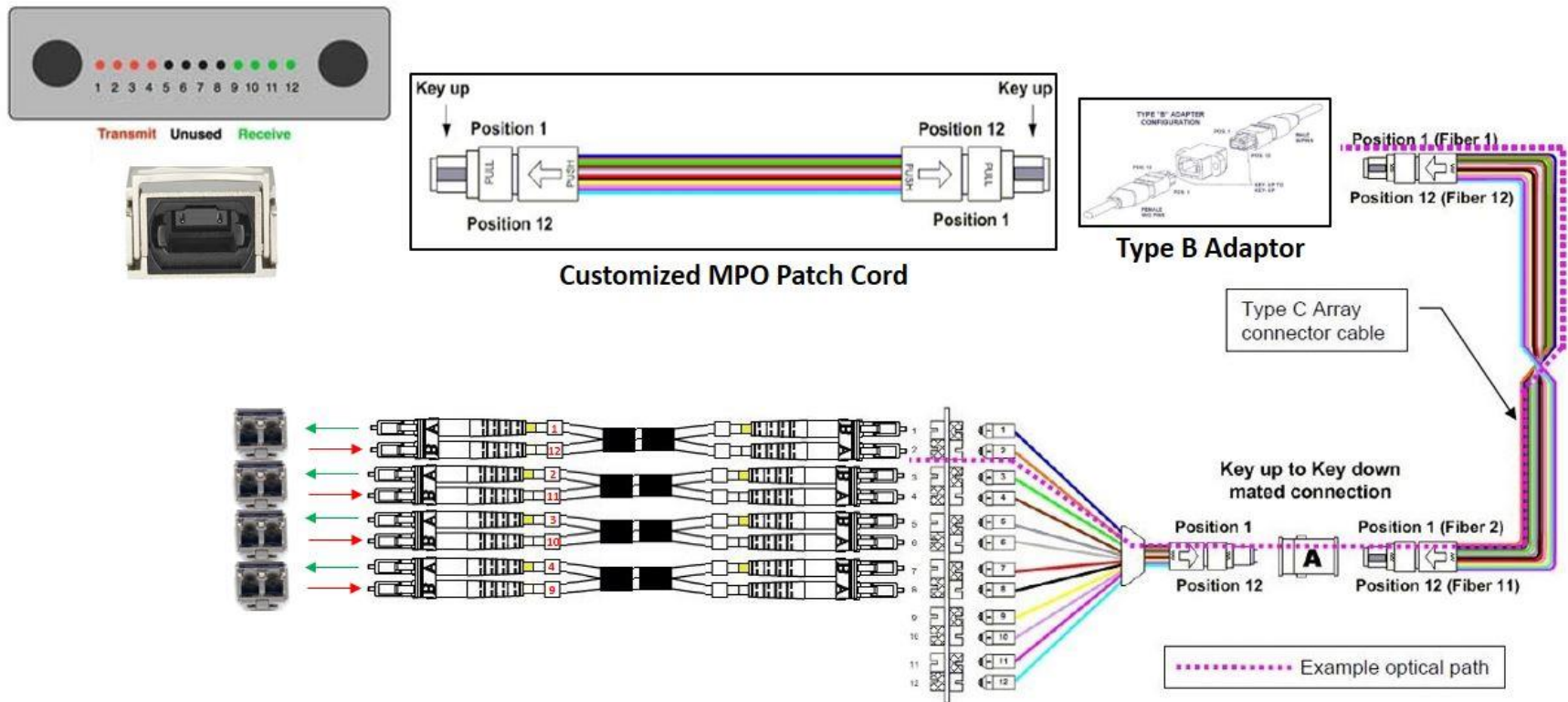


Figure 2 Migration to 40G at one end – Using Customized MPO Patch Cord

- **Migration to 40G at both ends – Using Customized MPO Patch Cord**

The last scenario happened frequently is where the whole system needs to be upgraded into 40G at both ends. The idea is pretty much the same as been described in migration to 40G at one end, the difference is that the MPO cassette needs to be removed and replaced by MPO patch cord at both ends. The detailed channel configuration is illustrated below in [Figure 3](#).

Imagine a light signal is sent via Port 1 in the below 40G transceiver, it will enter via Position 12 at left side of the customized MPO patch cord and leave via Position 11 at the right side based on Prysmian Group defined “**Type P**” mapping. The light will go via Position 2 at the down side of the “**Type C**” trunk cable and leave via Position 1 at the upper side. Finally, the light will go through Position 12 at the right side of upper customized MPO patch cord and ends up at Position 1 in the left, which corresponds to Port 12 of the upper MPO transceiver. Using the same principle, the fibre mapping can be illustrated subsequently as below in [Table 2](#). That’s exactly the fibre mapping needed for a 40G MPO configuration.

Table 2 Fibre Mapping - Migration to 40G at both ends - Using MPO

MPO Side (Below MPO)		MPO Side (Upper MPO)	
Port 1	Tx	Port 12	Rx
Port 2	Tx	Port 11	Rx
Port 3	Tx	Port 10	Rx
Port 4	Tx	Port 9	Rx
Port 9	Rx	Port 4	Tx
Port 10	Rx	Port 3	Tx
Port 11	Rx	Port 2	Tx
Port 12	Rx	Port 1	Tx

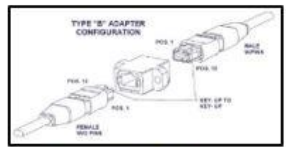
Summary

To summarize, different methods are introduced for 10G “**Type C**” MPO configuration to 40G migration in three scenarios. Prysmian Group defined “**Type P**” fibre mapping is introduced. The configuration is out of the scope of current standard, thus cannot be referenced with any existing examples. To better understand how it works, the key point is the same as 10G and 40G MPO configuration – achieve the correct fibre mapping. Draw the fibre mapping, imagine how light is travelling inside the channel will greatly help your understanding on the channel configuration.

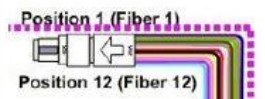
Lastly, we will emphasize that Prysmian Group always recommend “**Type B**” as the preferred way to configure MPO channels, no matter for 10G or 40G/100G solutions. It is easier to upgrade, thus more future proof. This white paper is mainly aiming at helping those who have adopted “**Type C**” channel for 10G solution, yet still wants to keep some of the components to migrate to 40/100G solutions.



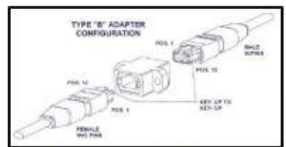
Customized MPO Patch Cord



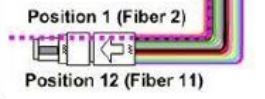
Type B Adaptor



Customized MPO Patch Cord



Type B Adaptor



..... Example optical path

Figure 3 Migration to 40G at both ends – Using Customized MPO Patch Cord

References

- [1] https://en.wikipedia.org/wiki/Global_Internet_usage
- [2] <https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/>
- [3] <https://theinternetofthings.io/tag/cloud/>