

## Arista 40G Cabling and Transceivers: Q&A

### 40Gigabit Cables and Transceivers

#### Q. What 40G cables and transceivers are available from Arista?

A. Arista supports a full range of both copper cables and optical transceivers for 40GbE, compliant to the IEEE standards. For copper both QSFP+ to QSFP+ (40G to 40G) and QSFP+ to SFP+ (40G to 4x10G) cables enable short reach options. For longer distances the 40GBase-SR4 supports up to 100m on OM3 multimode fiber, and 150m over OM4 multi-mode fiber.

Product Number	Product Description
<b>40GbE Optics</b>	
QSFP-SR4	40GBASE-SR4 QSFP+ transceiver, up to 100m over parallel OM3 or 150m over OM4 multi-mode fiber
<b>40GbE to 10GbE</b>	
CAB-Q-S-0.5M	4 x 10GbE QSFP+ to 4 x SFP+ twinax copper cable, 0.5M
CAB-Q-S-1M	4 x 10GbE QSFP+ to 4 x SFP+ twinax copper cable, 1M
CAB-Q-S-2M	4 x 10GbE QSFP+ to 4 x SFP+ twinax copper cable, 2M
CAB-Q-S-3M	4 x 10GbE QSFP+ to 4 x SFP+ twinax copper cable, 3M
<b>40GbE to 40GbE</b>	
CAB-Q-Q-0.5M	40GbE QSFP+ to QSFP+ twinax copper cable, 0.5M
CAB-Q-Q-1M	40GbE QSFP+ to QSFP+ twinax copper cable, 1M
CAB-Q-Q-2M	40GbE QSFP+ to QSFP+ twinax copper cable, 2M
CAB-Q-Q-3M	40GbE QSFP+ to QSFP+ twinax copper cable, 3M
CAB-Q-Q-5M	40GbE QSFP+ to QSFP+ twinax copper cable, 5M
CAB-Q-Q-7M	40GbE QSFP+ to QSFP+ twinax copper cable, 7M

*Additional optics and cables may be released in future.*

#### Q. What is the 40GbE max supported distances?

A. The IEEE 40GBASE-X standard describes the following:

- 40GBASE-SR4 supports up to 100m on OM3, and 150m on OM4. There is no support for OM2 or OM1 (these are considered legacy).
- 40GBASE-LR4 supports up to 10km on 9u SM fiber (same fiber used for 10G single mode 10GBase-LR).
- 40GBASE-CR4 supports up to 7m. The maximum is a limitation of the copper technology, and may not be realistic in all environments.
- 40GBASE-KR4 specifies up to 1m for backplane technology - this is not applicable to Arista switches and is designed for server blade systems running 40GbE over a backplane

#### Q. Why is the QSFP-SFP+ cable only available as a 3m cable?

A. The QSFP+ to quad SFP+ cable merges 4 individual CX1 cables (each with a shield) into a single CR4 cable. As the cable length increases the diameter (gauge) also increases to counteract

cable losses. With the best cable technology currently available the longest reliable cable, which also is mechanically small enough to have 4 mated into a QSFP+ mechanical connection is 3m. Over time technology improvements are expected to enable longer than 3m cables.

**Q. Can a customer use third party QSFP+ to QSFP+ and SFP+ cables?**

A. Arista does not restrict the use of third party copper cables. These cables need to comply with the IEEE specifications, to allow them to be correctly recognized by the Arista switch. Interfaces with cables not recognized correctly will be disabled.

**Q. What is the minimum bend radius of the 40G copper cables?**

A. The QSFP-SFP (4-way) CR4 cables have a stated minimum bend radius of 32.35mm (1.27”) to ensure they are not damaged. The QSFP-QSFP cables have a stated minimum bend radius of 45mm (1.77”) to ensure they are not damaged.

*[QSFP-QSFP cables are thicker than the QSFP-SFP ones and need more space.]*

**Q. How does the QSFP+ to SFP+ fiber convertor allow 4x 10G**

A. The IEEE 40G-SR4 standard specified a parallel technology, with 4 lanes in each direction. The purpose of this was to allow for easier development of 40G, re-using 10G components. As a side result the 40G multi-mode transceivers can also support 4x10G modes. (The switch or router also has to support this in both the hardware and software). A fiber that connects from one 40G port to four 10G ports provides a physical path to allow the source “40G” port running in 4x10G mode to be connected to 4 unique 10G destinations. As the fiber is a passive medium it has no concept of the 40G or 10G signals.

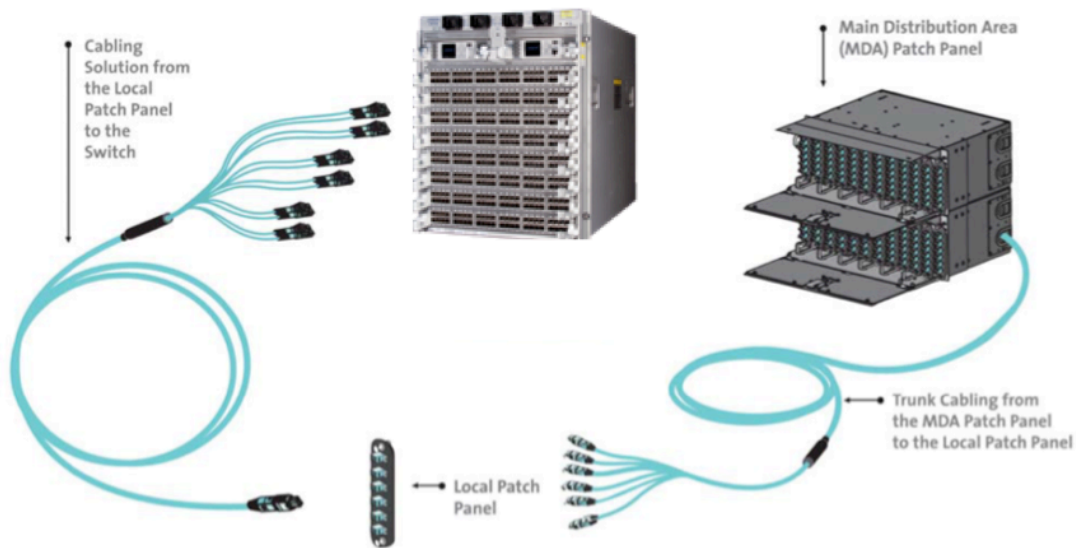
**Q. Where does a customer buy the special splitter cables?**

A. First, this is not really a special cable - it is an MTP-LC cable as shown below:



A large number of cabling companies have the MTP-LC cables available and are supplying these in volume to customers. However, these are usually a special order, as the total cable length, tail lengths and cable polarity are customer selectable. As a result these are commonly considered as “special” but are in fact standard cables, custom ordered.

In many existing DC environments LC-MTP cables are used to support high density fiber trunks between switches, rack patch panels and main distribution cabling panels (MDA) as shown below:



An MTP-12 cable has 6 fiber pairs, and an MTP-24 has 12 pairs of fiber, carried in a single cable - reducing cabling bundle diameter and easing cable management when used in trunk environments.

A regular MTP-12 to MTP-12 cable as shown below is also used for direct 40G to 40G connections or for patch connections between two locations.

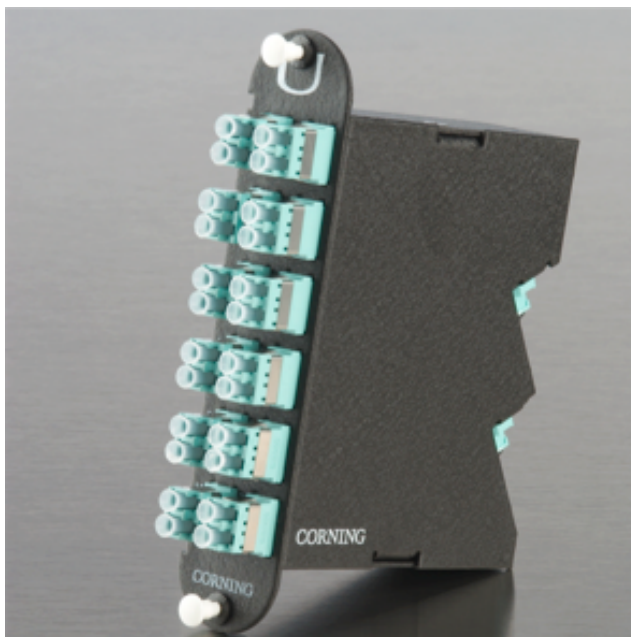


At the MTP ends there are 12 pins (an MTP-12), and two guide pins (or sockets) which can be seen in the photograph below.



Using an MTP-LC fan-out with an MTP-12 at one end a 40G interface can be adapted from one port of 40G into 4x10G and uses the same cabling to convert multiple 10G links into a single cable.

In addition to using a fan-out cable, there are also a number of cabling system solutions that use a “cassette” style system to break out the MTP into individual LC pairs (as below - 2 MTP-12 into 12 LC pairs).



### Q. What is the specification for the MTP-LC cable?

A. According to the IEEE 40GBASE-SR4 specifications, the 40G signal is carried over a single MTP-12 fiber, with only 8 of the 12 used, where the remaining four are not used, and can optionally be not present in the cable (to save cost). The specific mapping of Tx and Rx ports to fiber strands is defined in the standard, with 1-4, and 9-12 used as shown below. This would be an MTP-12 to an MTP-12.

Fiber Number	12	11	10	9	.....	4	3	2	1
Transmit Channels:	1	2	3	4					
Receive Channels:						4	3	2	1

To specify a cable that converts a 40G interface to 4 x 10G pairs the MTP-12 fibers are mapped according to the 40G-SR4 specifications, identifying that Tx1 and Rx1 are mapped as Pair-1, Tx2 and Rx2 as Pair 2, and continue for all 4 pairs.

There are two different options for the cable to split MTP into LC - a straight through, or a crossover, to support different connections needs.

To make sure that Tx is wired to Rx on the other end (a cross-over cable) the table below shows both the MTP strand color and position number, the LC leg / side and color.

MTP Strand Color	MTP Position #	LC Leg / Side	LC Strand Color
Blue	1	1/B	Blue
Orange	2	2/B	Orange

Green	3	3/B	Green
Brown	4	4/B	Brown
Slate	5	NA	Slate
White	6	NA	White
Red	7	NA	Red
Black	8	NA	Black
Yellow	9	4/A	Yellow
Violet	10	3/A	Violet
Rose	11	2/A	Rose
Aqua	12	1/A	Aqua

If a “straight through” cable is required (as a X-over is already present in the path), then the above table should be modified, such that 1<->1A, 12<->1B and so on, etc.

### Arista 40GbE Product Configuration:

#### Q. How do you change the QSFP+ ports to support 10G or 40G mode?

A. On the 7050Q, 7050S-64 and 7050T-64 the 4 QSFP+ ports can support 4x10G or 1x40G on any port (independently configurable).

By default the QSFP+ ports on the 7050 Series (7050S-64 and 7050T-64) are setup as 4x10G as below:

Et52/1	notconnect	1	full	10G Not Present
Et52/2	notconnect	1	full	10G Not Present
Et52/3	notconnect	1	full	10G Not Present
Et52/4	notconnect	1	full	10G Not Present

To configure them for 1x40G mode use the command:

```
(config)#int et 52/1-4
(config-if-Et52/1-4)#speed forced 40gfull
```

You may see warnings if the transceivers are missing.

```
! Warning: Transceiver for interface Et52/1 is not present. Cannot verify compatibility of speed and duplex settings.
! Warning: Transceiver for interface Et52/2 is not present. Cannot verify compatibility of speed and duplex settings.
! Warning: Transceiver for interface Et52/3 is not present. Cannot verify compatibility of speed and duplex settings.
! Warning: Transceiver for interface Et52/4 is not present. Cannot verify compatibility of speed and duplex settings.
```

The output of show commands will now reflect 40G as a speed.

Et52/1	notconnect	1	full	40G Not Present
Et52/2	notconnect	1	full	40G Not Present
Et52/3	notconnect	1	full	40G Not Present
Et52/4	notconnect	1	full	40G Not Present

Inserting a suitable 40G transceiver or cable will bring the ports up in the “40G” mode. The other end will be another 40G device.

To configure the port for 4x10G mode reset it to the default and let it negotiate at 10G

```
(config-if-Et52/1-4)#no speed
```

Next, use the same optics with a splitter cable, and a 10G SFP+ (SR or SRL) at the other end.

Alternatively using copper cables and swap the QSFP-QSFP for a QSFP-4SFP+.

*NOTE: In 4.7.x releases this required a platform command:*

```
switch(config)#platform trident qsfm mode 40G
```

After this command the interfaces need to be shut/no shut.

In 4.8 and later the command was deprecated.

### **Q. How are the 7050Q shared QSFP+ ports changed to the SFP+ ports?**

A. By default the 7050Q has the SFP+ ports disabled, and they must be enabled before being used. There is a hardware command to activate the SFP+ ports, and disable the associated QSFP+ ports.

SFP+ Ports 17-20 are associated with QSFP+ port 15/1-4

SFP+ Ports 21-24 are associated with QSFP+ port 16/1-4

The command to configure the mode:

```
(config)#hardware port-group 1|2 select qsfm|sfp
```

To activate Eth17-24 you need:

```
(config)#hardware port-group 1 select Et15/1-4 | Et17-20
```

To activate Eth21-24 you need:

```
(config)#hardware port-group 2 select Et16/1-4 | Et21-24
```

Using this command will restart the forwarding agent, which will cause all links in these port groups to flap. Proceed with caution if in a production environment.

Using the QSFP+ ports, with a transceiver for 4x10G mode requires the same command as for the 7050-64 switches to enable 4x10G mode on the uplinks.