

KSwitch D10 MMT 6G-2GS SFP notes

Revision History

Version	Description	Author
V 1.0 Feb 2023	Initial Version, Valid for FW GA 2.00	Tech-Support M.Stärk
V 2.0 June 2024	Added 2.5GBase-LR module, Valid for FW GA 2.03	Tech-Support M.Stärk

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1. SFP support

1.1. Summary

1000Base-X (optical) SFPs are supported; speed must be manually adjusted.

All checked 1000Base-X SFPs modules does support operation with 1Gb/s speed.

Operation with 2.5G speed is not possible, as 1000Base-X is limited to 1G.

10GBase-X (optical) SFPs can be used, speed must be manually adjusted.

All checked 10GBase-X modules does support operation with 1Gb/s speed.

Only some newer 10GBase-X modules does operate with 2.5Gb/s speed.

Obviously, 10G speed is not possible, as KSwitch D10 MMT SFP slots are defined for max 2.5G.

2.5G optical SFPs are now seen on the market.

Some Fiber SFPs with 2.5G speed are announced.

Some Copper SFPs are supported.

1000Base-T modules do not require manual speed settings, working directly with 1G speed.

2.5GBase-T SFPs operate only with speed 2500 after manual adjustment.

10GBase-T SFPs are not supported.

DAC cables (10GBase-CR) can be used with speed 1000 and speed 2500, after manual adjustment.

There are no special requirements for optical SFPs regarding TSN operation.

Copper SFPs might include buffers, which could impact TSN performance.

1.2. adjust transfer speed

interface speed can be adjusted via WEB interface or CLI:

WEB: Configuration -> Ports -> Change configured Speed inside table from Automatic to 1Gbps FDX
Save and Refresh

Port	Link	Warning	Speed		Adv Duplex		Adv speed						Flow Control			PFC		Maximum Frame Size	Excessive Collision Mode	Frame Length Check	
			Current	Configured	Fdx	Hdx	10M	100M	1G	2.5G	5G	10G	Enable	Curr Rx	Curr Tx	Enable	Priority				
*			<>	<>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0-7	10240	<>	<input type="checkbox"/>
1	●	Down	Automatic	Automatic	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0-7	10240	Discard	<input type="checkbox"/>
2	●	Down	Automatic	Automatic	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0-7	10240	Discard	<input type="checkbox"/>
3	●	Down	1Gfdx	Automatic	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0-7	10240	Discard	<input type="checkbox"/>
4	●	Down	Automatic	Automatic	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0-7	10240	Discard	<input type="checkbox"/>
5	●	Down	Automatic	Automatic	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0-7	10240	Discard	<input type="checkbox"/>
6	●	Down	Automatic	Automatic	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0-7	10240	Discard	<input type="checkbox"/>
7	●	Down	Automatic	Automatic	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0-7	10240	Discard	<input type="checkbox"/>
8	●	Down	Disabled	Automatic	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0-7	10240	Discard	<input type="checkbox"/>

CLI:

```
#configure terminal
(config)#interface 2.5GigabitEthernet *
(config-if)# speed 1000
(config-if)# duplex full
(config-if)#exit
(config)#exit
#
```

```
#show interface 2.5GigabitEthernet * status
```

```
Interface Mode Speed Aneg Media Type SFP Family Link Operational Warnings
```

```
-----
2.5G 1/1 Enabled 1Gfdx No SFP 1G Optical 1Gfdx
2.5G 1/2 Enabled 1Gfdx No SFP 1G Optical 1Gfdx
```

```
#
```

1.3. DDMI

DDMI is not required to detect SFP type, if enabled it provides further information of SFP state (like temperature and signal strength). Per default, DDMI is disabled.

WEB Interface:

Enable DDMI via WEB: -> Configuration -> DDMI -> set to enabled.

Query DDMI results:

WEB: -> Monitor -> DDMI -> Detailed

The screenshot shows the IStax web interface for a Kontron KSwitch D10. The left sidebar contains a navigation menu with categories like Configuration, Monitor, and Diagnostics. The main content area is divided into two sections: 'Transceiver Information' and 'DDMI Information'.

Transceiver Information:

Vendor	AVAGO
Part Number	AFBR-57M5APZ
Serial Number	C908091X5X
Revision	
Data Code	2009-06-13
Transceiver	1000BASE-SX

DDMI Information:

Type	Current	Alarm/Warning	Low Warning Threshold	High Warning Threshold	Low Alarm Threshold	High Alarm Threshold
Temperature [C]	39.063	None	-10.000	85.000	-40.000	100.000
Voltage [V]	3.3592	None	2.9700	3.6300	2.7000	3.9000
Tx Bias [mA]	4.986	None	2.000	8.500	2.000	10.000
Tx Power [mW]	0.3140	None	0.1000	0.5011	0.0501	0.7079
Rx Power [mW]	0.3889	None	0.0490	1.1000	0.0000	6.5535

CLI:

Enable DDMI:

```
#configure terminal
(config)#ddmi
(config)#exit
#
```

Query DDMI results:

```
#show interface 2.5GigabitEthernet 1/1-2 transceiver
2.5GigabitEthernet 1/1:
```

Transceiver Information:

```
Vendor: AVAGO
Part Number: AFBR-57M5APZ
Serial Number: C908091X5X
Revision:
Date Code: 2009-06-13
Transceiver: 1000BASE-SX
```

DDMI Information:

Type	Current	Alarm/Warning	Low Warning Threshold	High Warning Threshold	Low Alarm Threshold	High Alarm Threshold
Temperature (C)	38.145	None	-10.000	85.000	-40.000	100.000
Voltage (V)	3.3592	None	2.9700	3.6300	2.7000	3.9000
Tx Bias (mA)	4.986	None	2.000	8.500	2.000	10.000
Tx Power (mW)	0.3140	None	0.1000	0.5011	0.0501	0.7079
Rx Power (mW)	0.4006	None	0.0490	1.1000	0.0000	6.5535

2. SFP support in detail

2.1. optical SFPs

1000Base-SX (Avago AFBR-57M5APZ, Cisco GLC-SX-MMD, PAC Opto LM28-C3S-TC-N-DD, ZYXEL SFP-SX;
Agilent HFBR 5720 AL)

reported as SFP Family 1G Optical

speed auto > no link established
speed 1000, duplex full -> iperf shows expected transfer rate for 1Gb connection
speed 2500, duplex full -> no link established, like expected

1000Base-LX (Avago AFCT-5715LZ with mono mode fiber)

reported as SFP Family 1G Optical

speed auto -> no link established
speed 1000, duplex full -> iperf shows expected transfer rate for 1Gb connection
speed 2500, duplex full -> no link established, like expected

2.5GBase-LR (Lantech Mini GBIC 2.5G SFP, SMF 1310nm, 2KM)

reported as SFP Family 2.5G Optical

speed auto -> 1 GbE link established
speed 1000, duplex full -> 1 GbE link established
speed 2500, duplex full -> 2,5 GbE link established

10GBase-SR (Finisar FTLX8571D3BCL, Fiberstore SFP-10GSR-85)

reported as SFP Family 10G Optical

with operational warning "SFP's nominal speed is higher than actual speed, which may cause instability"

speed auto -> no link established
speed 1000, duplex full -> iperf shows expected transfer rate for 1Gb connection
speed 2500, duplex full -> Finisar FTLX8571D3BCL no stable link established, no data transfer
Fiberstore SFP-10GSR-85, is fine (at least while applying 1Gb traffic, based on test setup)

10GBase-LR (Finisar FTLX1471D3BCL with mono mode fiber)

reported as SFP Family 10G Optical

with operational warning "SFP's nominal speed is higher than actual speed, which may cause instability"

speed auto -> no link established
Speed 1000, duplex full -> iperf shows expected transfer rate for 1Gb connection
Speed 2500, duplex full -> no stable link established, no data transfer

10GBase-ER (OPLINK TPC1XGJERI00040 with mono mode fiber)

reported as SFP Family 10G Optical

with operational warning "SFP's nominal speed is higher than actual speed, which may cause instability"

speed auto -> no link established
speed 1000, duplex full -> iperf shows expected transfer rate for 1Gb connection
speed 2500, duplex full -> no stable link established, no data transfer

10GBase-BX (Fiberstore SFP-10G-BX with mono mode fiber)

Bidirectional modules; Rx and Tx are transported on different wavelength via one single fiber matched pair of SFP+ Modules with single LC connector is used.

reported as SFP Family 10G Optical

with operational warning "SFP's nominal speed is higher than actual speed, which may cause instability"

speed auto -> no link established

speed 1000, duplex full -> iperf shows expected transfer rate for 1Gb connection

speed 2500, duplex full -> is fine (at least while applying 1Gb traffic, based on test setup)

2.2. copper SFPs

1000Base-T (Cisco GLT-C, Finisar FCLF-8521-3, Finisar FCLF.8522P2BTL, Methode DM7041-R)

reported as SFP Family 1G CuSFP

speed auto -> iperf shows expected transfer rate for 1Gb connection

speed 2500 duplex full -> no link established like expected

2.5GBase-T (Fiberstore SFP-2.5G-T)

reported as SFP Family 2.5G Optical

speed auto -> no link established

speed 1000, duplex full -> no link established

speed 2500, duplex full -> is fine (at least while applying 1Gb traffic, based on test setup)

10GBase-T (Fiberstore SFP-10G-T)

reported as SFP Family 10G Optical

with operational warning "SFP's nominal speed is higher than actual speed, which may cause instability"

speed auto -> no link established

speed 1000, duplex full -> no link established

speed 2500, duplex full -> no link established

10GBase-CR passive DAC cable (Molex 74752-1101)

reported as SFP Family 10G DAC

with operational warning "SFP's nominal speed is higher than actual speed, which may cause instability"

speed auto -> no link established

speed 1000, duplex full -> iperf shows expected transfer rate for 1Gb connection.

speed 2500, duplex full -> is fine (at least while applying 1Gb traffic, based on test setup)

3. SFP modules, fibers, connectors naming conventions

Helpful basics for lab-setup and material ordering.

SFP module types:

1000Base-SX	short range (550m) multi-mode fiber, 850nm
1000Base-LX	550m multi-mode fiber 1310nm or 5 km single-mode fiber 1310nm (most often LX10 10 km single-mode fiber)
10GBase-SR	short range (26m -400m), multi-mode fiber, 850nm
10Gbase-LR	long range (10Km), single-mode fiber, 1310nm
10Gbase-ER	extra-long range (40Km), single-mode fiber, 1550nm
10Gbase-LRM	long range (220m), multi-mode fiber, 1310nm This SFP+ needs EDC (electronic dispersion compensation) implemented in switch silicon EC is typically not present inside SFP+ modules. Somehow an intermediate standard, 10Gbase-ER is the replacement for this.
10GBase-CR	Direct attached copper; passive DAC cables up to 7m active DAC cables up to 10m
1000Base-T	Twisted Pair, up to 100m on Cat 5e/6/6a
2.5GBase-T	Twisted Pair, up to 100m on Cat 5e
10GBase-T	Twisted Pair, up to 30m on Cat 6a/7 with 10G speed

10G-Base-T

In general, 10GBase-T standard brings up to 100m with Cat 6A cables, up to 55m with Cat 6.

Distance with SFP+ modules is typically shorter, power budget of SFP(+) slots is limited.

Auto-negotiation like known from 1Gb/s links is still in use.

(Master/ Slave PLL, Pause, plus former reserved bits to identify 10G full duplex for advertisements and link status)

NBASE-T, IEEE802.3bz is new standard on top of 10GBase-T

Idea is to get best possible transfer rates for 10GBase-T devices on existing cables.

Auto negotiate speed between 100Mb/s, 1, 2.5, 5 or 10Gb/s is done, depending on cable quality and link partner capabilities. Well-known auto-negotiation concept is still in place.

The new feature, reduce speed on the fly, is named downshift.

Besides automatic downshift in case of increased error-rates, operator can issue downshift events.

Line encoding of 10Gbase-T is base for 2.5GBase-T and 5.0GBase-T.

5.0GBase-T Cat 6: 100 Meter, expected to work in most use cases also with Cat5e cabling

2.5GBase-T Cat 5e: 100 Meter.

Optical cables:

Mono mode (single mode) fiber SMF,
longer distances, more expensive
yellow jacket
lowest modal dispersion 0,1ns/km
Typical cladding diameter 125µm, core diameter 10µm
1280nm – 1650nm useable wavelengths
Up to 100km
9/125 printed on cables is single mode fiber

Multimode fiber (MMF) orange or aqua jacket
shorter distance; less expensive
higher modal dispersion
Optimized for 850nm and 1150nm
Two types are common:
step-index fiber (Stufenfaser)
typical core diameter 100µm 120µm or 400µm
modal dispersion 50ns/km
or
graded-index fibre (Gradientenfaser)
typical core diameter 50µm 62.5µm 85µm or 100µm
modal dispersion >1ns/km

50/125 and 62.5/125 printed on cables are multimode fibers

OM1 62.5/125	OM2 50/125	for 10Mbit/s to 1Gbit/s	(optimized for LED transmitters)
OM3 50/125		for 10Gbit/s up to ~400 m	(optimized for Laser transmitters)
OM4		for 40Gbit/s and 100Gbit/s up to 125 meters	

Connectors:

LC (Lucent or Local Connector) are most common for SFPs
LC /PC physical contact (fibers have direct contact, surface polished)
LC/SPC super physical contact (enhanced polished)
LC/UPC ultra physical contact (more enhanced polished)
LC/APC angled physical contact (+surface polished at 8° angle, to minimize reflections)

LC/UPC and LC/APC are state of the art