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IXIA 10GE LAN/WAN and OC 192 POS Load Modules

Overview

Ixia offers two families of load modules that operate in multiple modes, as specified in [Table 19-1](#).

Table 19-1. Operating Modes Available for Multimode Cards

Family	OC-192 POS	BERT	10GE WAN	10GE LAN	FEC	VCAT/ Channel ized
10G MSM	X		X	X		X
OC-192 Triple Mode	X	X	X			
UNIPHY	X	X	X	X	X	

Full specifications for each family may be found at:

- [10G MSM Family](#) on page 19-1
- [OC-192c Triple Mode Family](#) on page 19-6
- [UNIPHY Family](#) on page 19-12

10G MSM Family

The 10G MSM load module family consists of a UNIPHY LM Load module which supports SONET and Ethernet at 10G rates. Modes supported on this board include POS, WAN, and LAN. For POS there is additional feature support such as DCC, RPR, and SRP.

[Figure 19-1](#) on page 19-2 displays the 10G MSM module.

Figure 19-1. MSM10G1-02 Load Module



Note. Due to power requirements, only one MSM module can be used in a 250 or 400T chassis. Other modules can be used with the MSM in the same chassis, but only one CPM1000T8 at a time (except the CMP1000T8 module, which has the same limitation).

Part Numbers

The MSM family part numbers are shown in [Table 19-2](#).

Table 19-2. 10G MSM Modules

Load Module	Part Number	Description
MSM10G1-02	944-0012	10GE OC192 load module, 1-port Multi Services Module, supports 10GE LAN/WAN and optional OC-192c POS (order OPTOC192POS). Full features: supports routing and Linux-based applications. Requires an XFP transceiver. Purchase options include XFP-1310 and XFP-1550. NOTE: Maximum one (1) MSM10G1-02 load module permitted per IXIA 400T chassis .
	945-0005	SW-VCAT-SONET configuration option, SONET Virtual Concatenation (VCAT) Option license per port. Includes support for LCAS and GFP-F protocols. Requires purchase of a supported load module (see 945-0003 MSM2.5G1-01 or 944-0012 MSM10G1-02)
	945-0002	SW-RPRSRP-SONET, OC-48/OC-192 configuration option, SONET RPR and SRP stream generation and protocol support, license per port. Requires purchase of a supported load module (see LMOC192xx, LM10GUxF, LMOC48xx, 945-0003 MSM2.5G1-01, or 944-0012 MSM10G1-02)
	OPTOC192POS	10 Gigabit Ethernet OC-102 POS configuration option for 944-0012 (MSM10G1-02) and LM10GUxx load modules.

Specifications

Table 19-3. 10G MSM Load Module Specifications

	MSM10G1-02
# ports	1
-M Card Available	No
Layer2/Layer3 Card Available?	Yes

Table 19-3. 10G MSM Load Module Specifications

	MSM10G1-02
Layer 7 Card Available	No
Data Rate	10GB
Connector/ Wavelength-Mode	XFP 1310nm or 1550nm Single or pluggable
Capture buffer size	Up to 384 MB
Captured packet size	17-65,535bytes
Streams per port	256
Advanced streams	256
Preamble size: min-max	8
Frame size: min-max	17-65,535
Inter-frame gap: min-max ¹	4.0ns - 42sec in 3.2ns steps
Inter-burst gap: min-max	4.0ns - 42sec in 10.0ns steps
Inter-stream gap: min-max	4.0ns - 42sec in 10.0ns steps
Normal stream frame rate	0.023fps - full line rate
Advanced stream min frame rate ²	Slow: 0.023fps Fast: 1525fps
Latency ³	20ns resolution

1. Packet gap size also depends on the stream mode selected, Fixed or Average.
2. Streams are divided up into two categories: 224 slow speed streams and 32 fast streams.

3. When performing latency measurements in POS mode, the following restrictions apply:

The minimum frame size should be 80 bytes for latency measurements to be supported at line rate. On the MSM10G, there is only one packet group mode (wide packet groups) . Two different scenarios apply:

If sequence checking is enabled, then the number of packet group IDs is limited in this way:

When Wide Bin Mode (on the Wide Packet Groups page) is **not** enabled = 65536.

When Wide Bin Mode is enabled = 524288.

If sequence checking is **not** enabled, then the number of packet group IDs is limited in this way:

When Wide Bin Mode (on the Wide Packet Groups page) is **not** enabled = 65536.

When Wide Bin Mode is enabled = 2097152.

Port LEDs

Each 10G MSM port incorporates a set of LEDs, as described in the following table.

Table 19-4. 10G MSM Port LEDs

LED Label	Usage
LASER ON	Green when the port's laser is turned on. Blank otherwise.
Pause	Green when transmit is paused, blank when powered off.
PPP/Link	Green in link up condition, Red in link down condition, blank indicates loopback mode enabled.
Tx	Green if transmit is active and frames are being sent, blank otherwise.
LOS	Green when signal level is good, Red when loss of signal occurs, blank if no transceiver detected.
Option	N/A
Trigger	Green when Trigger A condition occurs, Red for Temperature Fault, blank otherwise.
Error	Red when module in error state (fault condition), blank otherwise.
Rx	Green indicates valid receive frames, Red indicates errored frames received, blank when no frames received.
LOF	Green when valid framing occurs, Red when Loss of Frame occurs.

Clock In/Out

The load module provides coaxial connectors for clock input and clock output to allow the DUT to phase-lock with the interface. When running off an external

clock, the clock input signal must meet the requirements listed in [Table 19-5](#) in order to ensure proper performance of the load module.

Table 19-5. Clock Input Specifications

Parameter	Characteristic
Connector	SMA
Frequency	SONET: 155.52 MHz \pm 20ppm 10GE: 161.132 MHz \pm -100ppm
Amplitude	1.1 Vpp minimum, into 50 Ω , AC coupled
Duty cycle	40 to 60%

The clock in/out electrical interface parameters are defined in [Table 19-6](#).

Table 19-6. Clock Output Specifications

Parameter	Characteristic
Connector	SMA
Frequency	SONET: 155.52 MHz \pm 20ppm 10GE: 161.132 MHz \pm -100ppm
Amplitude	500m Vpp minimum, 600 Vpp typical into 50 Ω
Duty cycle	40 to 60%

The load module contains a phase-locked loop (PLL) that reduces the jitter of the input clock, either from the internal or external clock source. The bandwidth of the PLL is approximately 1kHz.

Trigger Out

The signals and LEDs available on the trigger out pins for these cards are described in [Table 19-7](#).

Table 19-7. 10G MSM Trigger Out Signals

Pin / LED	Value
Trigger Out	10nS active high pulse on trigger
Trigger LED	Indicates Trigger, Pause Frame received in 10GE mode.

Statistics

Statistics for 10G MSM cards, under various modes of operation may be found in [Table B-25](#) on page B-137.

OC-192c Triple Mode Family

The OC-192c Triple Mode family of load modules implements Optical Carrier interfaces that run at OC192 speeds. The interface operates in concatenated

mode, as opposed to channelized mode. One of the modules in this family (the LMOC192cPOS) is shown in [Figure 19-2](#).

Figure 19-2. LMOC192c Load Module



Part Numbering

The OC192 cards come with a number of options. All part numbers are of the form:

LMOC192**H**T**O**S or
LMFOC192**H**T**O**S

where **H** is the hundreds designator, **T** is the tens designator, **O** is the ones designator, and **S** is the suffix.

LMF boards have no fiber optic interface. It allows for quick validation of serializer and deserializer designs for WAN Packet over SONET/SDH products operating at the STS-192c/STM-64 level. The LMF interface is a 300 pin MegaArray BERG connector, which is an industry standard MSA interface and is compliant per OIF1999.102.8, SFI-4 specification. A reference clock can be supplied through this interface ranging in frequency from 25 MHz to 622 MHz.

The part numbers for these load modules are shown in [Table 19-8](#). Items without a *Price List Names* entry are no longer available.

Table 19-8. OC-192c Load Modules

Load Module	Part Number	Description
LMOC192cPOS		POS, 1-port, intermediate reach (SR1), 1310nm, singlemode
		POS, 1-port, intermediate reach, 1310nm, singlemode
		POS, 1-port, intermediate reach, 1550nm, singlemode
		POS, 1-port, no optics
LMOC192cVSRPOS	LMOC192168	POS, 1-port, VSR optics, parallel interface
LMOC192cBERT		BERT, 1-port, intermediate reach, 1310nm, singlemode
		BERT, 1-port, intermediate reach, 1550nm, singlemode
LMOC192cVSR-BERT		BERT, 1-port, VSR optics, parallel interface

Table 19-8. OC-192c Load Modules

Load Module	Part Number	Description
LMOC192cPOS+BERT		POS with BERT, 1-port, intermediate reach, 1310nm, singlemode
		POS with BERT, 1-port, intermediate reach, 1550nm, singlemode
LMOC192cVSR-POS+BERT	LMOC192468	POS with BERT, 1-port, VSR optics
LMOC192cPOS+WAN		POS+WAN, 1-port, intermediate reach, 1310nm, singlemode
LMOC192cPOS+BERT+WAN		POS+BERT+WAN, 1-port, intermediate reach, 1310nm, singlemode
		POS+BERT+WAN, 1-port, intermediate reach, 1550nm, singlemode
LM10GEWAN		10GBASE-LW (WAN), 1-port, 1310nm, singlemode
		10GBASE-EW (WAN), 1-port, 1550nm, singlemode
Options	SW-DCCSONET	DCC SONET support.
	945-0002	SW-RPRSONET SW-SRPSONET SRP SONET and RPR SONET support

Specifications

The load module specifications are contained in [Table 19-9](#). Note that the -M modules are not included in the table; their limitations versus the non-M version are discussed in [Ixia Load Modules](#) on page 1-4.

Table 19-9. OC192 Load Module Specifications

	LMOC192cPOS LMOC192cPOS+ WAN	LMOC192c BERT	LMOC192c POS+BERT¹
# ports	1	1	1
-M Card Available	N	N	N
Layer2/Layer3 Card Available?	N	N	N
Layer 7 Card Available	N	N	N
Data Rate	1-100% of OC192 speeds	N/A	
Connector/ Wavelength-Mode	SC / 1310nm or 1550nm Singlemode	SC / 1310nm or 1550nm Singlemode	SC / 1310nm or 1550nm Singlemode
Capture buffer size	32MB	N/A	
Captured packet size	33-64k	N/A	
Streams per port	255	N/A	
Flows per port	N/A	N/A	
Advanced streams	160	N/A	
Preamble size: min-max	N/A	N/A	
Frame size: min-max	54-65535	N/A	
Inter-frame gap: min-max	N/A ²	N/A	
Inter-burst gap: min-max	1us - 42sec	N/A	
Inter-stream gap: min-max	1us - 42sec	N/A	
Normal stream frame rate	0.023fps - full line rate		
Advanced stream frame rate ³	Slow: 0.023 - 2083333 fps Med: 95fps - full line rate Fast: 1525fps - full line rate		
Latency	20ns resolution	N/A	

1. Refer to the LMOC192cPOS and LMOC192cBERT columns for the characteristics of this card when its port is in POS or BERT mode, respectively.
2. The inter-frame gap is indirectly controlled by the frame rate.
3. Streams are divided up into three categories: 144 slow speed streams, 8 medium streams and 8 fast streams.

The Ixia VSR modules, which were developed in accordance with the OIF Implementation Agreement VSR-1, use twelve parallel multimode fiber optic lines operating at 1.25Gbps per channel, instead of existing 1310nm or 1550nm serial optics. VSR optics are designed to drive signals over distances less than 300 meters, which is sufficient for interconnecting devices within a service provider's Point-of-Presence (POP). Over these short distances, VSR optics offer a significant cost savings compared to intermediate and long-reach serial lasers.

When performing latency measurements, the following restrictions apply:

- If latency is measured with packets that are smaller than 80 bytes, then normal (not wide-packet group) mode should be used and the number of packet group IDs is limited to 1,024.
- If packets are 80 bytes or larger, then wide-packet group mode may be used. Two different scenarios apply when using wide-packet group mode:
 - If sequence checking is enabled, then the number of packet group IDs is limited to 8,192.
 - If sequence checking is not enabled, then the number of packet group IDs is limited to 128k.

Port LEDs

Each OC192c port incorporates a set of 10 LEDs, as described in [Table 19-10](#).

Table 19-10. LMOC192cPOS Port LEDs

LED Label	Usage
LOS	Red during Loss of Signal, Green otherwise.
LOF	Red during Loss of Frame, Green otherwise.
PPP	Green if a PPP link has been established. Red otherwise.
Tx	Green while data is transmitted.
Rx	Green while data is received.
Error	Red on any error.
Trigger	Follows the state of the <i>Trigger Out</i> pin, which is programmed via User Defined Statistic 1.
Option 1	Reserved for future use.
Option 2	Reserved for future use.
LASER ON	Green when the port's laser is turned on.

Trigger Out Values

The signals available on the trigger out pins for all cards in this category are described in [Table 19-11](#).

Table 19-11. OC192 Trigger Out Signals

Pin	Signal
A	Low (0V) on User Defined Statistic 1 true. High (+5V) otherwise.
B	Low (0V) on User Defined Statistic 2 true High (+5V) otherwise.

Optical Specifications

The optical characteristics for the OC192c cards are described in [Table 19-12](#).

Table 19-12. LMOC192c Optical Specifications

Specification	OC192c 1310nm	OC192c 1550nm	OC192c VSR-1
Manufacturer	GTRAN	GTRAN	Gore
Average Output Power–Min/Max	+1 dBm / +5 dBm	-1 dBm / +2 dBm	-10 dBm / -5 dBm
Transmit Center Wavelength–Min/Max	1300 nm / 1320 nm	1530 nm / 1565 nm	830 nm / 860 nm
Receive Center Wavelength–Min/Max	1280 nm / 1580 nm	1280 nm / 1580 nm	830 nm / 860 nm
Receive Sensitive–Min/Max	-17 dBm / 0 dBm	-17 dBm / 0 dBm	-16 dBm / -3 dBm
Safety	Class 1 Laser	Class 1 Laser	Class 1 Laser

NOTE: An attenuating should be used when looping back to the same port or when using a short length of cable.

Statistics

Statistics for OC192 cards, under various modes of operation may be found in [Table B-18](#) on page B-85.

UNIPHY Family

The UNIPHY family of load modules is based on a universal PHY which allows each port to operate in a number of modes. [Figure 19-3](#) and [Figure 19-4](#) are pictures of two of the load modules in this family.

Figure 19-3. UNIPHY LM10GUEF-FEC



Figure 19-4. UNIPHY LM10GUPF-XFP



Part Numbers

The currently available part numbers are shown in [Table 19-13](#).

Table 19-13. UNIPHY Load Modules

Load Module	Part Number	Description
LM10GUEF-FEC	LM10GUEF-FEC	10GE Universal Base Load Module with G.709 FEC capabilities, 1-port, 1550nm, singlemode. One or more of OPT10GELWAN, OPTOC192POS, or OPTOC192BERT must be purchased.
LM10GULF-P	LM10GULF-P	10GE Universal Base Load Module, 1-port, 1310nm, singlemode. -P version uses a PowerPC with 256MB processor memory. One or more of OPT10GELWAN, OPTOC192POS, or OPTOC192BERT must be purchased.
LM10GUPF-XFP	LM10GUPF-XFP	10GE Universal Base Load Module with pluggable XFP interface, 1-port. One or more of OPT10GELWAN, OPTOC192POS, or OPTOC192BERT must be purchased.
LM10GUVF	LM10GUVF	10GE Universal Base Load Module with VSR parallel optics, 1-port, 1310nm, singlemode. One or more of OPT10GELWAN, OPTOC192POS, or OPTOC192BERT must be purchased.
10G MSM	MSM10G1-02	10G Universal Base Load Module, 1-port, 1550nm, singlemode. -P version uses a PowerPC with 256MB processor memory. One or more of OPT10GELWAN or OPTOC192POS must be purchased in addition.
Transceivers	XFP-1550	XFP Transceiver, 1550nm
	XFP-1310	XFP Transceiver for LM10GUPF-XFP, 1310nm
Options	OPT10GELWAN	10GE LAN/WAN configuration option for the LM10GU*F.
	OPTOC192POS	OC-192 POS configuration option for the LM10GU*F.
	OPTOC192BERT	OC-192 BERT configuration option for the LM10GU*F.
	SW-DCCSONET	DCC SONET support for LM10GU*F.
	945-0002	SW-RPRSONET SW-SRPSOINET DCC SONET support for LM10GU*F.

Specifications

The limitations of -M, Layer 2/3 and Layer 7 cards are discussed in [Ixia Load Modules](#) on page 1-4.

Table 19-14. UNIPHY Load Module Specifications

	10GUEF/ULF/ UPF/UVF (10GEWAN mode)	10GUEF/ULF/ UPF/UVF (10GE LAN mode)	10GUEF/ULF/ UPF/UVF (OC192 mode)	10GUEF/ULF/ UPF/UVF (BERT mode) ¹	10GUEF-FEC ²
# ports	1	1	1	1	1
-M Card Available	N	N	N	N	N
Layer2/Layer3 Card Available?	N	N	N	N	N
Layer 7 Card Available	N	N	N	N	N
Data Rate	1-100% of 10Gbps speeds	10GB	1-100% of OC192 speeds	N/A	1-100% of 10Gbps/OC192 speeds
Connector/Wavelength-Mode	SC / 1310nm or 1550nm Single or pluggable	SC / 1310nm or 1550nm Singlemode	SC / 1310nm or 1550nm Singlemode	SC / 1310nm or 1550nm Singlemode	SC / 1550nm Singlemode
Capture buffer size	32MB	32MB	32MB	N/A	
Captured packet size	24-65,000 bytes	24-65,000 bytes	33-64k	N/A	
Streams per port	255	255, 32 (-M)	255	N/A	
Advanced streams	160	160 16 (-M version)	160	N/A	
Preamble size: min-max	8	8	N/A	N/A	
Frame size: min-max	24-65,000	24-65,000	54-1600	N/A	
Inter-frame gap: min-max	3/4ns - 43sec in 3.4ns steps	3.2ns - 42sec in 3.2ns steps	N/A	N/A	
Inter-burst gap: min-max	3/4ns - 43sec in 3.4ns steps	3.2ns - 42sec in 3.2ns steps	N/A	N/A	
Inter-stream gap: min-max	3/4ns - 43sec in 3.4ns steps	3.2ns - 42sec in 3.2ns steps	4ns - 42secs	N/A	
Normal stream frame rate	0.023fps - full line rate	0.023fps - full line rate	0.023fps - full line rate	N/A	
Advanced stream min frame rate ³	Slow: 0.023fps Med: 95fps Fast: 1525fps	Slow: 0.023fps Med: 95fps Fast: 1525fps	Slow: 0.023fps Med: 95fps Fast: 1525fps	N/A	
Latency	20ns resolution	20ns resolution	20ns resolution	N/A	

1. Framed BERT only, channelized and unframed BERT are not available.

2. For values not shown, use values from the 10GEWAN/10GELan/OC192 columns according to mode.
3. Streams are divided up into three speed streams: 144 slow, 8 medium and 8 fast. MSM family streams are divided into two speed streams: 224 slow and 32 fast.

Port LEDs

Each UNIPHY port incorporates a set of LEDs, as described in the following table.

Table 19-15. UNIPHY Port LEDs

LED Label	Usage
LOS	Red during Loss of Signal. Green when link has been established and no Loss of Signal.
LOF	Red during Loss of Frame. Green when link has been established and no Loss of Signal.
PPP/Link	Green if Ethernet/PPP link has been established. Red otherwise.
Tx	Green while data is transmitted.
Rx	Green while data is received.
Error	Red on any Ethernet error.
Trigger	Green when Trigger is applied.
Pause	Indicates flow control frames have been received.
Option	Reserved for future use.
LASER ON	Green when the port's laser is turned on. Off otherwise.

Trigger Out Values

The signals and LEDs available on the trigger out pins for UNIPHY family load modules are described in [Table 19-16](#).

Table 19-16. 10 GE UNIPHY Trigger Out Signals

Pin / LED	Value
Trigger Out A	Low (0V) on User Defined Statistic 1 true, high (+5v) otherwise.
Trigger Out B	Low (0V) on (POS mode) User Defined Statistic 2 true or (Ethernet mode) pause frame detect, high (+5V) otherwise.
Trigger LED	Pulses each time a Pause Request is detected.
Pause/Option1 LED	Pulses each time a Pause Acknowledge is granted.

Clock Out Values

For -XFP suffix load modules, one coaxial connector is provided to allow phase-lock to the DUT. The frequency is either 311.0400 MHz or 322.2656 MHz +/- 100ppm.

Optical Specifications

The optical characteristics for the UNIPHY cards are described in [Table 19-17](#).

Table 19-17. UNIPHY Optical Specifications

Type	Specification	Wavelength	Value
Transmit	Output power (dBm)	1310nm	-6 to -1
		1550nm	-1 to 2
	Distance (km)	1310nm	10
		1550nm	40
	Extinction ratio (dB)	1310nm	6
		1550nm	8.2
Receive	Rx Sensitivity (dBm)	1310nm	-12.6
		1550nm	-14
	Overload (dBm)	1310nm	-1
		1550nm	-1
	Dispersion (ps/nm)	1310nm	40
		1550nm	800

Statistics

Statistics for UNIPHY cards, under various modes of operation may be found in [Table B-21](#) on page B-105 and [Table B-22](#) on page B-112.