GE
Digital Energy

MultiLink ML3000 Series

Managed Ethernet Switches with 1588v2 Support

The MultiLink™ ML3000 Series of Managed Ethernet Switches provide extremely reliable networks with very fast reconfiguration times for recovering from faults occurring in the network. The complete set of network management functions available provides the configurability and monitoring capability needed for most applications, while the high level of security features available ensures your network is protected from tampering or illegal access.

The MultiLink ML3000 line of managed switches are designed for the unique needs of the protection and control industry and are unsurpassed in the areas of Network Security, Industrial Robustness and Network Reliability.

Key Benefits

- High density substation Ethernet switches
- Up to 36 ports copper (model dependent)
- Up to 18 ports fiber (model dependent)
- Power over Ethernet (PoE) capable, reducing wiring complexity and cost (number of ports dependent on model)
- 1588v2 boundary clock and transparent clock capable for high precision timing applications, such as synchrophasor and IEC® 61850 Process Bus
- Field replaceable power supply models available (ML3001 and ML3101)

Applications

- Enables high speed, redundant connections to GE's Multilin™ Universal Relays
- Merging units, synchrophasor, and high precision timing applications
- PoE allows easy cabling for VoIP telephones, badge readers and surveillance cameras

Managed Networks

- Supports SNMPv3 with full backwards compatibility for v1 and v2
- Traffic segregation and prioritization via IEEE® 802.1p and IEEE 802.1Q
- Alarm contacts for detection of critical network or switch events
- LLDP to support topology discovery in Network Management Systems (NMS)
- 1588v2 including the C37.238 Power Profile timing support

Ease-of-Use

- Simple but powerful web management interface
- Support for industrial protocols (e.g. Modbus®)

Industrially Hardened

- UL® listed/CE agency approved
- IEC 61850 and IEEE 1613 approval for operation in electric substation environments
- Redundant and mixed power supply options for increased reliability
- Harsh chemical environment options ensure product function and viability

Secure

- Secure management via SSL
- Port security prevents unauthorized devices from gaining network access
- Multi-level passwords for different users or groups
- Complete event logging for forensic and regulatory auditing and reporting

imagination at work

Designed for the Needs of Protective Relaying

The MultiLink Ethernet Switches have been designed for the specific requirements of devices used in utility and industrial environments, such as protective relays. MultiLink Ethernet Switches support many unique features that allow for full redundancy under network fault conditions.

Link Loss Alert

The MultiLink Ethernet Switch family's Link Loss Alert feature allows protective relays to recover from situations where only one of the fiber cables connected to the relay is damaged. The Link Loss Alert feature works with both 10Mbit and 100Mbit fiber ports of GE's Multilin Universal Relay, and allows for seamless switching to the relay's secondary port under all network fault conditions.

Modbus Protocol Support

Identifying network communication problems and retrieving network statistics from the MultiLink Ethernet Switches can now be achieved in SCADA or DCS systems through the use of the supported Modbus TCP/IP protocol. Modbus is a protocol supported by most Human Machine Interfaces (HMI) and PLC's and can therefore be integrated into existing systems without having to invest in additional SNMP or other network management software.

Enhanced High Speed Recovery of Redundant Ring Networks

The unique requirements of the protection and control industry necessitate Ethernet networks to be more reliable and to recover from network problems faster than is generally accepted in other commercially available equipment. The MultiLink Ethernet Switch's SMART RSTP feature allows for recovery from faults in ring network architectures in less than 5 milliseconds per switch in the network – 10 times faster than generally available in standard Ethernet switches.

Robust Ethernet Switches for Providing Secure and Reliable Networks

GE's MultiLink Ethernet Switches have been tested and certified to meet the same rigorous environmental standards as all of our protection relays and meters.

- Operating temperature from -40°C to +85°C without fans
- Type tested to IEC 61850-3 and IEEE 1613 requirements
- Dual power supply option with the ability to mix the input sources used (i.e. 48 VDC and 125 VDC)

Enhanced Security

The MultiLink family of Ethernet Switches have advanced techniques available for providing secure network communications including:

- SNMP v1/v2/v3 supplying secure access to network devices through authentication and encryption
- Embedded RADIUS and TACACS+ security for remote access and password verification
- SSL web encryption to prevent eavesdropping, tampering or message forgery
- Port security through the disabling of packets from unauthorized MAC addresses
- Event logging and email notifications of unauthorized access attempts

Full Network Management Capabilities

The MultiLink Ethernet Switches support most 802.1 network management features and are configurable using the Command Line Interface (CLI) and through our web management interface. Management functionality includes:

- SNMPv3 for secure configuration of network switches
- Full support of the CLI commands
- Web management interface for user-friendly configuration and monitoring
- RSTP (802.1D-2004) industry standard method for providing recovery of redundant networks
- SMART RSTP (ring only mode) for enhanced fast recovery (<5ms/hop) of ring architecture networks
- RMON for monitoring of network status and statistics
- VLAN (802.1q) providing the ability to segregate the network into smaller virtual networks (up to 256)
- QoS (802.1Q) for prioritization of network traffic
- Port mirroring to assist in network troubleshooting
- IGMP snooping to enable reductions in multicast traffic
- SNTP for synchronizing the switch's internal clock
- SMTP providing email notification when problems in the network have occurred
- LLDP for facilitating the discovery of network topology by management systems
- Event logs creating a historical record of events occurring on the network
- IPv6 support allowing for more addressable devices in a network

Port and Power Supply Options

	100Mbps Ports	100FX Ports	Gigabit Ports	Power Supply
ML3000	Up to 32	Up to 16	Up to 4	Fixed
ML3001	Up to 32	Up to 16	Up to 4	Field Replaceable
ML3100	Up to 16	Up to 16	Up to 8	Fixed
ML3101	Up to 16	Up to 16	Up to 8	Field Replaceable

PoE Applications

PoE can be used to power PoE-capable surveillance cameras, telephones and badge readers, allowing customers to reduce wiring. The ML3000 supports both the 802.1af PoE and 802.1at PoE+ standards, with up to 32 ports PoE or 16 ports PoE+. The ML3100 supports the 802.1at PoE+ standard, with up to 16 ports PoE+.

ML3000 equipped with PoE power supply supported input voltage for PoE or PoE+. Available with a field replaceable power supply in the ML3001 model.

ML3100 equipped with PoE+ power supply supported input voltage for PoE+. Available with a field replaceable power supply in the ML3101 model.

Maximum PoE and PoE+ Combinations

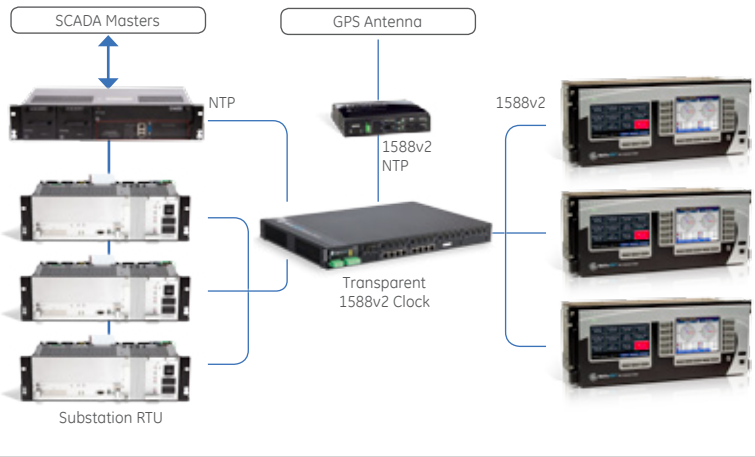
ML3000, ML3001	
PoE Ports	**PoE+ Ports**
32	0
24	4
16	8
8	12
0	16
ML3100, ML3101	
PoE Ports	**PoE+ Ports**
0	16

Examples of PoE enabled devices include:

- Badge readers
- Security cameras
- IP telephones

1588v2 Timing Protocol

The ML3000 series supports the end-to-end transparent clock, boundary clock and ordinary clock as specified in the IEEE 1588v2 standard. This allows a timing signal to maintain its accuracy as it passes through an Ethernet network. Customers can reduce wiring costs by relying on their substation LAN to deliver a high accuracy timing signal, which will save them the cost of cabling used to deliver IRIG-B signals, that are often used today. The ML3000 series supports the IEEE C37.238 IEEE Standard Profile for Use of IEEE 1588 Precision Time Protocol in Power System Applications.



ML3000 Managed Ethernet Switch with 1588v2 Timing

Supports temperature extremes from -40°C to +85°C, no fans

Front or rear mount 19" rack mount rear mount shown

Up to 32 ports 100Mbps
Up to 16 ports 100FX
PoE and PoE+ supported
LC, SC, ST, MTRJ and SFP options
1588v2 timing supported

Two relay contacts

- One contact signals loss of power
- Second contact is software controlled

Optional dual power supplies

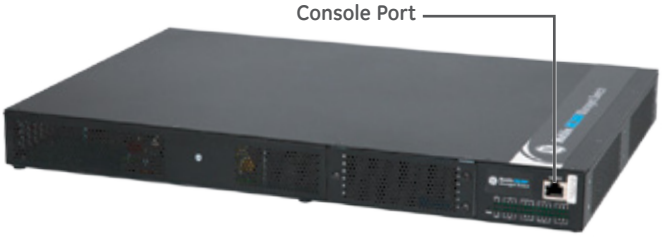
- 90-250V AC/DC or
- 22-60 VDC
- Optional field replaceable power supplies with ML3001 model

Gigabit ports

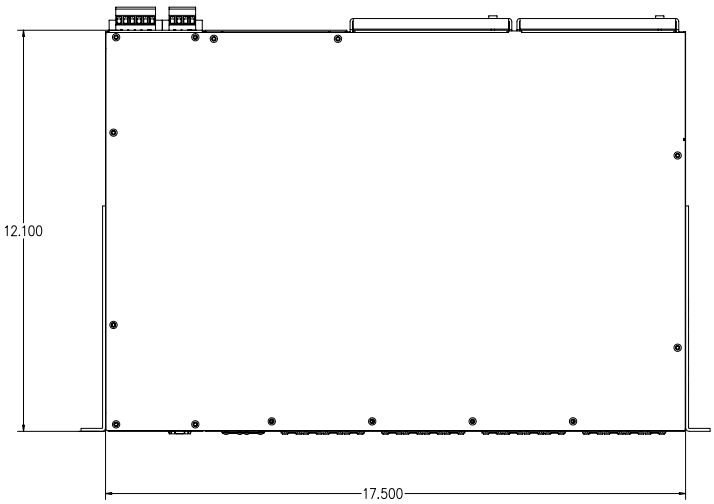
- Up to 4 ports
- SFP or RJ45
- 1588v2 timing

Rear Mount Option

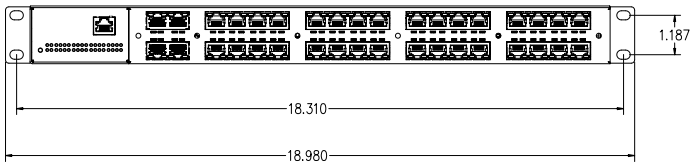
Console Port



Unit Dimensions (Inches) - Front Mount

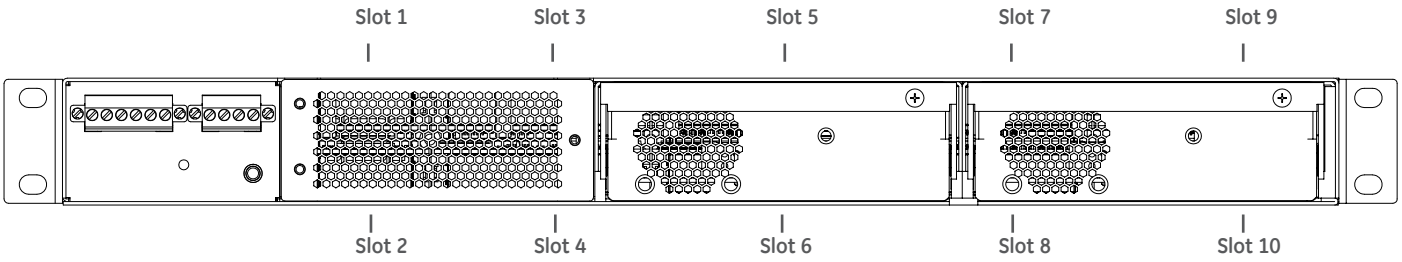


Unit Dimensions (Inches) – Model without Thermal Fin Cover



Slot Arrangement

- Slots 1 and 2 are for Gigabit ports
- Slots 3 through 10 are for 100Mbps or 10Mbps ports
- Maximum fiber count is 18 ports when fiber is placed in slots 1, 3, 5, 7 and 9
- Otherwise maximum fiber count is 16 ports
- If 1588 timing is selected in a slot, both top and bottom slots must support 1588. For example if slot 3 is 1588v2 capable, then slot 4 must also be 1588v2 capable or blank
- PoE power supply options must be selected in order to support PoE or PoE+ modules



ML3100 Managed Ethernet Switch with 1588v2 Timing

Supports temperature extremes from -40°C to +85°C, no fans

Front or rear mount 19" rack mount rear mount shown

Up to 16 ports 100Mbps
Up to 16 ports 100FX
PoE+ supported
LC, SC, ST, MTRJ and SFP options
1588v2 timing supported

Two relay contacts

- One contact signals loss of power
- Second contact is software controlled

Optional dual power supplies

- 90-250V AC/DC or
- 22-60 VDC
- Optional field replaceable power supplies with ML3101 model

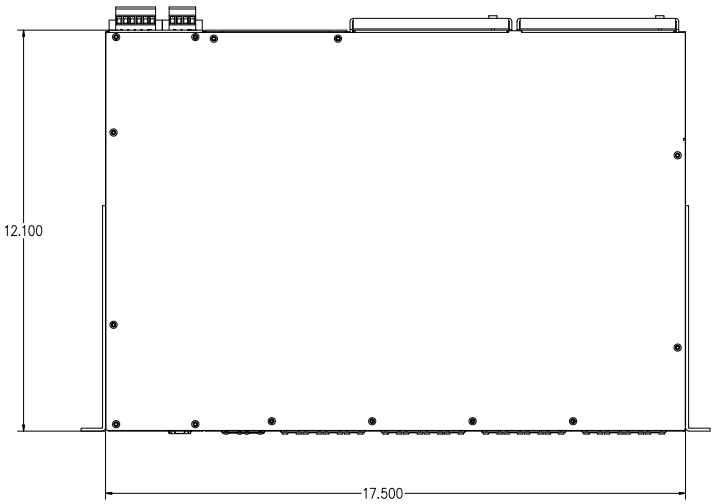
Gigabit ports

- Up to 8 ports
- SFP or RJ45
- 1588v2 timing

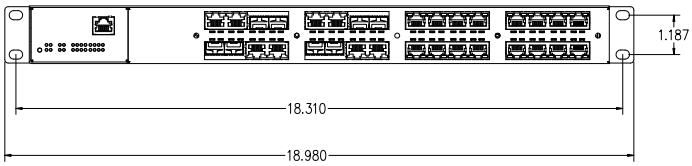
Rear Mount Option

Console Port

Unit Dimensions (Inches) - Front Mount

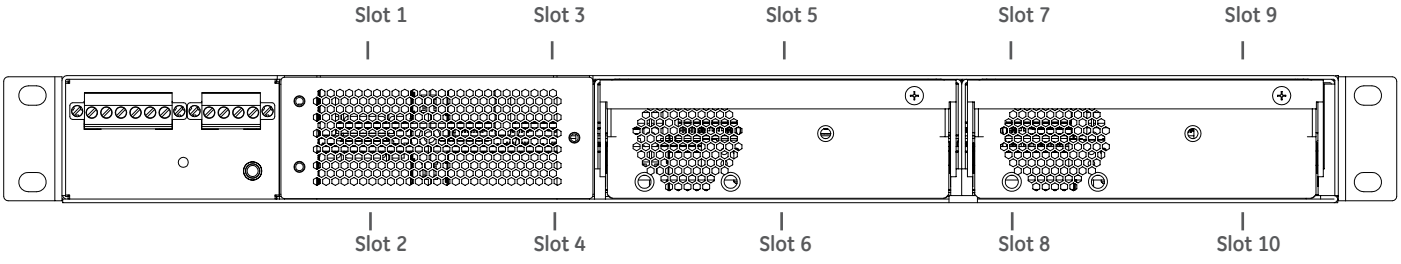


Unit Dimensions (Inches) – Model without Thermal Fin Cover



Slot Arrangement

- Slots 1 through 4 are for Gigabit ports
- Slots 5 through 8 are for 100 Mbps or 10Mbps ports
- Maximum fiber count is 16 ports
- If 1588 timing is selected in a slot, both top and bottom slots must support 1588. For example if slot 3 is 1588v2 capable, then slot 4 must also be 1588v2 capable or blank
- PoE power supply options must be selected in order to support PoE+ modules



EnerVista Web Interface Provides User-Friendly Configuration and Network Monitoring

Easy-to-Use Web Configuration and Reporting Software

The EnerVista Web configuration software allows programming of all settings in the MultiLink Ethernet Switches using a simple web browser. Accessible by typing the pre-configured IP address of your switch into the address bar of a web browser, the user-friendly graphical interface allows for easy navigation, monitoring and configuration through simple point and click operations.

Communication Status & Port Navigation

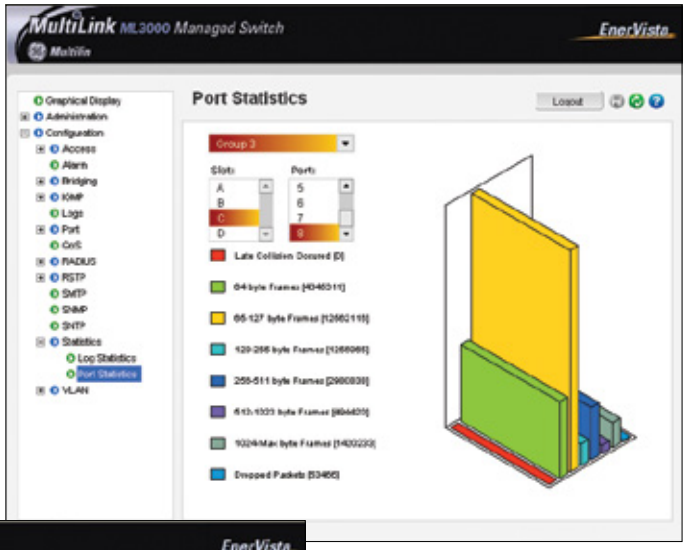
- Instant graphical indication of the status of all communication ports
- Identify the configuration of all communication parameters
- The ability to click on any of the shown Ethernet terminals to jump immediately to the settings screen for that port

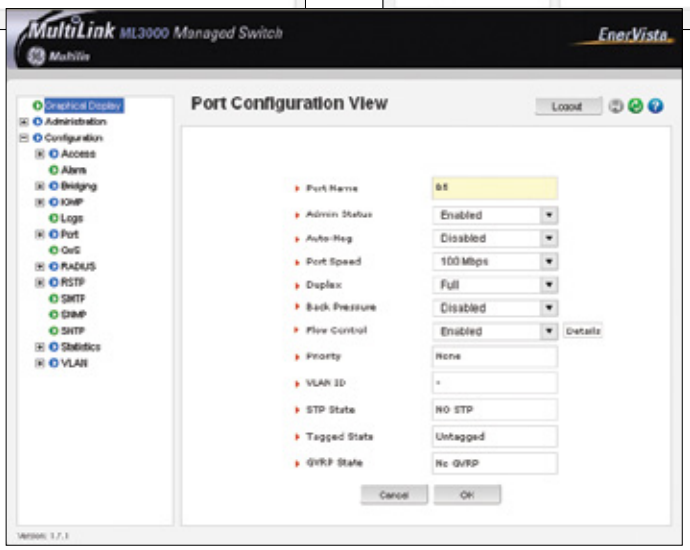
Intuitive Menu Driven Configuration

- Navigate through configuration screens using an easy to understand categorized menu tree
- Configure all settings using menu driven pull-down fields
- Program alarm triggers by selecting from a list of all possible conditions
- Eliminate the need to memorize any CLI commands

Powerful Troubleshooting Statistics

- Monitor traffic statistics using intuitive bar graph representations
- Identify the amount and type of traffic sent and received through each port of the switch
- Simplify troubleshooting by identifying the number of CRC errors, collisions, and dropped packets occurring on each port
- Clear and restart the capturing of port statistics to allow for troubleshooting of specific network problems





Technical Specifications

NETWORK STANDARDS AND COMPLIANCE

- Ethernet V1.0/V2.0 IEEE 802.3: 10Base-T
- IEEE 802.3u: 100Base-TX, 100Base-FX
- IEEE 802.3z: 1000Base-X Ethernet (Auto-negotiation)
- IEEE 802.3ab: 1000Base-X Ethernet
- IEEE 802.1p: Priority protocol
- IEEE 802.1d: Spanning tree protocol
- IEEE 802.1w: Rapid spanning tree protocol
- IEEE 802.1q: VLAN tagging
- IEEE 802.3x: Flow control
- IEEE 802.3ad: Link aggregation (Trunking)
- IEEE 802.1x: Port-based network access control
- IEEE 802.3af: Power over Ethernet (PoE)*
- IEEE 802.3at: Power over Ethernet (PoE+)
- IEEE 1588v2 Timing compliance: IPv6 Compliance

POWER SUPPLIES

Power Consumption: 55W Max
24/48 VDC Power Input (range 22 to 60 VDC)*
AC/DC Power Input (range 90-250V AC or DC)
For PoE Applications
PoE 802.3af: 48 VDC Power Input (range 45 to 57 VDC)*
PoE+ 802.3at: 48 VDC Power Input (range 52 to 56 VDC)

ENVIRONMENTAL SPECIFICATIONS

UL 60950 and Component Parts rating: -40°C to 60°C
IEC 60068 Type Test short term rating: -40°C to 85°C
Storage Temperature: -40°C to 85°C
Altitude: -200 to 13,000ft (-60 to 4000m)
Ambient Relative Humidity: 5% to 95%

PHYSICAL SPECIFICATIONS

Enclosure: Rugged high-strength sheet metal
Height: 2.63 in / 6.7cm
Width: 17.5 in / 44.5 cm
Depth: 12 in / 30.5 cm
Weight: 14.2 lbs (6.5 kg)

APPROVALS

CE MARKING

- EN60950-1: Low Voltage Directive
- EN61000-6-2: EMC Directive
- EN61000-6-4: EMC Directive

CULUS

- UL60950-1
- C22.2 No. 60950-1
- UL Listing

EMI & OPERATING CONDITIONS FOR SUBSTATIONS

- FCC Part 15 subpart B Class A
- IEC 60255-25/CISPR11/CISPR22 Class A
- IEC 61850-3
- IEEE 1613

ISO

Manufactured using an ISO 9001 certified quality program

*** ML3000 & ML3001 models only**
Type tests are identical for the 3100/3101

EMI TYPE TESTS		
EN61000-4-2	Electrostatic Discharge	Level 4
EN61000-4-3	RF Immunity	Level 3
EN61000-4-4	Fast Transient Disturbance	Level 3 & 4
EN61000-4-5	Surge Immunity	Level 4
EN61000-4-6	Conducted RF Immunity	Level 3
EN61000-4-8	Power Magnetic Immunity	Level 5
EN61000-4-10	Damped Magnetic Immunity	Level 3
EN61000-4-11	Voltage Dip & Interruption	0, 40 70% dips, 250/300 cycle interrupts
EN61000-4-12	Ringwave Surge	1.0KV CM, 1KV DM
EN61000-4-16	Conducted RF Immunity 0-150 kHz	Level 3
EN61000-4-17	Voltage Ripple	Level 3
EN61000-4-29	Voltage Dips and Interruptions DC	All levels
IEEE C37.90.1	Fast Transient Disturbance	4KV CM & DM
IEEE C37.90.1	SWC Damped Oscillatory	2.5KV CM & DM
IEEE C37.90.2	RF Immunity	20V/m 80-1GHz
IEEE C37.90.3	Electrostatic Discharge	8KV CD, 15KV AD
NEMA TS2 2.1.6.1:2003	Power Transients High Repetition	300V, 2500W
NEMA TS2 2.1.6.2:2003	Power Transients Low Repetition	600V, 1 ohm impedance
NEMA TS2 2.1.7.1:2003	Transients I/O Terminals	300V, 1000 ohms impedance
NEMA TS2 2.1.8:2003	Non Destructive Transient Immunity	1000V, 1 ohm X 3

ENVIRONMENTAL TYPE TESTS		
IEC 60068-2-1	Environmental (Cold)	-40°C 16 hours
IEC 60068-2-2	Environmental (Dry Heat)	85°C 16 hours
IEC 60068-2-30	Relative Humidity Cyclic	6 day variant 2
IEC 60255-21-1	Sinusoidal Vibration	Class 1
IEC 60255-21-2	Shock & Bump	Class 2
NEMA TS2	Humidity	-34°C to 74°C, 10-95%
NEMA TS2	Shock	10g, x,y,z
NEMA TS2	Vibration Endurance	Vibration 5-30Hz 0.015" res search+ 1hr(0.5g) dwell on
MIL-STD-167-1	Vibration	5-30Hz, 0.5g plus resonance dwell

Ordering

			GigE		10 or 100Mbps									
			1	2	3	4	5	6	7	8	9	10		
ML3000	*	**	*	*	*	*	*	*	*	*	*	*	*	**ML3000 Chassis with Fixed Power Supplies**
Mounting	F													Front Mounted Ports
	B													Rear Mounted Ports
Power Supply		HX												Single Integrated 90 to 250V AC/DC Power Supply
		HH												Dual Integrated 90 to 250V AC/DC Power Supplies
		LX												Single Integrated 22 to 60 VDC Power Supply
		LL												Dual Integrated 22 to 60 VDC Power Supplies
		P1												Single Integrated 22 to 60 VDC Power Supply with PoE Support
		P2												Dual Integrated 22 to 60 VDC Power Supply with PoE Support
		HL												Combination of a 90 to 250V AC/DC and a 22 to 60 VDC Power Supply
Gigabit			A	A										2 x 1000 Mbits RJ45 Fixed Ports
			B	B										2 x 1000 Mbit SFP, LC Connector, Multimode Fiber, 550m
			C	C										2 x 1000 Mbit SFP, LC Connector, Multimode Fiber, 2km
			D	D										2 x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 10km
			E	E										2 x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 25km
			F	F										2 x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 40km
			G	G										2 x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 70km
			H	H										2 x 1000 Mbit SFP Ports (No Transceivers) Empty Cage
			J	J										2x 1000 Mbit RJ-45 Fixed Ports with 1588 timing
			K	K										2x 1000 Mbit SFP, LC Connector, Multimode Fiber, 550m with 1588 timing
			L	L										2x 1000 Mbit SFP, LC Connector, Multimode Fiber, 2km with 1588 timing
			M	M										2x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 10km with 1588 timing
			N	N										2x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 25km with 1588 timing
			P	P										2x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 40km with 1588 timing
			Q	Q										2x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 70km with 1588 timing
			R	R										2x 1000 Mbit SFP ports (no transceivers) empty cage with 1588 timing
			X	X										None
100Mbps					A	A	A	A	A	A	A	A		4 x 10/100 Mbit - RJ45 Copper
					B	B	B	B	B	B	B	B		4 x 10/100 Mbit - RJ45 Copper with PoE*
					C	C	C	C	C	C	C	C		4 x 10/100 Mbit - RJ45 Copper with PoE+*
					D	D	D	D	D	D	D	D		2 x 10Mbit - ST
					E	E	E	E	E	E	E	E		2 x 100Mbit - ST Multimode Fiber
					F	F	F	F	F	F	F	F		2 x 100Mbit - SC Multimode Fiber
					G	G	G	G	G	G	G	G		4 x 100Mbit - LC Multimode Fiber
					H	H	H	H	H	H	H	H		4 x 100Mbit - MTRJ Multimode Fiber
					J	J	J	J	J	J	J	J		2 x 100Mbit - SC Singlemode Fiber 20km
					K	K	K	K	K	K	K	K		4 x 100Mbit - LC Singlemode Fiber 20km
					L	L	L	L	L	L	L	L		2 x 100Mbit - SC Singlemode Fiber 40km
					M	M	M	M	M	M	M	M		4 x 100Mbit - LC Singlemode Fiber 40km
					N	N	N	N	N	N	N	N		4 x 100Mbit SFP Ports (No Transceivers) Empty Cage
					P	P	P	P	P	P	P	P		4x 10/100 Mbit - RJ45 Copper with 1588 Timing
					Q	Q	Q	Q	Q	Q	Q	Q		2x 100Mbit - ST mm Fiber with 1588 Timing
					R	R	R	R	R	R	R	R		2x 100Mbit - SC mm Fiber with 1588 Timing
					S	S	S	S	S	S	S	S		4x 100Mbit - LC mm Fiber with 1588 Timing
					T	T	T	T	T	T	T	T		4x 100Mbit - MTRJ mm Fiber with 1588 Timing
					U	U	U	U	U	U	U	U		4x 100Mbit - LC sm Fiber 20km with 1588 Timing
					W	W	W	W	W	W	W	W		2x 100Mbit - ST sm Fiber 20km with 1588 Timing
					Y	Y	Y	Y	Y	Y	Y	Y		2x 100Mbit - SC sm Fiber 20km with 1588 Timing
					Z	Z	Z	Z	Z	Z	Z	Z		4x 100Mbit - LC sm Fiber 40km with 1588 Timing
					X	X	X	X	X	X	X	X		None
Coating													X	None
													H	Harsh Chemical Environment Conformal Coating

*** The power source of the ML3000 and ML3001 must be in the range of 45-57 VDC for PoE and 52-56 VDC for PoE+. PoE and PoE+ modules are only supported on units ordered with P1 or P2 power supply options.**

Notes:

- Slots 1 - 2 are for Gigabit ports.
- Slots 3 - 10 are for 100Mbps or 10Mbps ports.
- Maximum fiber count is 18 ports when fiber is placed in slots 1, 3, 5, 7 and 9, otherwise maximum fiber count is 16 ports.
- If 1588 timing is selected in a slot, both top and bottom slots must support 1588. For example, if slot 3 is 1588v2 capable, then slot 4 must be able to be 1588 v2 capable or blank.
- PoE power supply options must be selected in order to support PoE or PoE+modules.

DC Power Supply Range for PoE Applications:

- PoE 802.3af: 48 VDC Power Input (range 45 to 57 VDC)
- PoE+ 802.3at: 48 VDC Power Input (range 52 to 56 VDC)

Ordering

			GigE		10 or 100Mbps									
			1	2	3	4	5	6	7	8	9	10		
ML3001	*	**	*	*	*	*	*	*	*	*	*	*	*	**ML3001 Chassis with Field Replaceable Power Supplies**
Mounting	F													Front Mounted Ports
	B													Rear Mounted Ports
Power Supply		HX												Single Field Replaceable 90 to 250V AC/DC Power Supply
		HH												Dual Field Replaceable 90 to 250V AC/DC Power Supplies
		LX												Single Field Replaceable 22 to 60 VDC Power Supply
		LL												Dual Field Replaceable 22 to 60 VDC Power Supplies
		P1												Single Field Replaceable 22 to 60 VDC Power Supply with PoE Support
		P2												Dual Field Replaceable 22 to 60 VDC Power Supply with PoE Support
		HL												Combination of a 90 to 250V AC/DC and a 22 to 60 VDC Field Replaceable Power Supply
Gigabit			A	A										2 x 1000 Mbits RJ45 Fixed Ports
			B	B										2 x 1000 Mbit SFP, LC Connector, Multimode Fiber, 550m
			C	C										2 x 1000 Mbit SFP, LC Connector, Multimode Fiber, 2km
			D	D										2 x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 10km
			E	E										2 x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 25km
			F	F										2 x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 40km
			G	G										2 x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 70km
			H	H										2 x 1000 Mbit SFP Ports (No Transceivers) Empty Cage
			J	J										2x 1000 Mbit RJ-45 Fixed Ports with 1588 timing
			K	K										2x 1000 Mbit SFP, LC Connector, Multimode Fiber, 550m with 1588 timing
			L	L										2x 1000 Mbit SFP, LC Connector, Multimode Fiber, 2km with 1588 timing
			M	M										2x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 10km with 1588 timing
			N	N										2x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 25km with 1588 timing
			P	P										2x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 40km with 1588 timing
			Q	Q										2x 1000 Mbit SFP, LC Connector, Singlemode Fiber, 70km with 1588 timing
			R	R										2x 1000 Mbit SFP ports (no transceivers) empty cage with 1588 timing
			X	X										None
100Mbps					A	A	A	A	A	A	A	A		4 x 10/100 Mbit - RJ45 Copper
					B	B	B	B	B	B	B	B		4 x 10/100 Mbit - RJ45 Copper with PoE*
					C	C	C	C	C	C	C	C		4 x 10/100 Mbit - RJ45 Copper with PoE+*
					D	D	D	D	D	D	D	D		2 x 10Mbit - ST
					E	E	E	E	E	E	E	E		2 x 100Mbit - ST Multimode Fiber
					F	F	F	F	F	F	F	F		2 x 100Mbit - SC Multimode Fiber
					G	G	G	G	G	G	G	G		4 x 100Mbit - LC Multimode Fiber
					H	H	H	H	H	H	H	H		4 x 100Mbit - MTRJ Multimode Fiber
					J	J	J	J	J	J	J	J		2 x 100Mbit - SC Singlemode Fiber 20km
					K	K	K	K	K	K	K	K		4 x 100Mbit - LC Singlemode Fiber 20km
					L	L	L	L	L	L	L	L		2 x 100Mbit - SC Singlemode Fiber 40km
					M	M	M	M	M	M	M	M		4 x 100Mbit - LC Singlemode Fiber 40km
					N	N	N	N	N	N	N	N		4 x 100Mbit SFP Ports (No Transceivers) Empty Cage
					P	P	P	P	P	P	P	P		4x 10/100 Mbit - RJ45 Copper with 1588 Timing
					Q	Q	Q	Q	Q	Q	Q	Q		2x 100Mbit - ST mm Fiber with 1588 Timing
					R	R	R	R	R	R	R	R		2x 100Mbit - SC mm Fiber with 1588 Timing
					S	S	S	S	S	S	S	S		4x 100Mbit - LC mm Fiber with 1588 Timing
					T	T	T	T	T	T	T	T		4x 100Mbit - MTRJ mm Fiber with 1588 Timing
					U	U	U	U	U	U	U	U		4x 100Mbit - LC sm Fiber 20km with 1588 Timing
					W	W	W	W	W	W	W	W		2x 100Mbit - ST sm Fiber 20km with 1588 Timing
					Y	Y	Y	Y	Y	Y	Y	Y		2x 100Mbit - SC sm Fiber 20km with 1588 Timing
					Z	Z	Z	Z	Z	Z	Z	Z		4x 100Mbit - LC sm Fiber 40km with 1588 Timing
					X	X	X	X	X	X	X	X		None
Coating													X	None
													H	Harsh Chemical Environment Conformal Coating

*** The power source of the ML3000 and ML3001 must be in the range of 45-57 VDC for PoE and 52-56 VDC for PoE+. PoE and PoE+ modules are only supported on units ordered with P1 or P2 power supply options.**

Notes:

- Slots 1 - 2 are for Gigabit ports.
- Slots 3 - 10 are for 100Mbps or 10Mbps ports.
- Maximum fiber count is 18 ports when fiber is placed in slots 1, 3, 5, 7 and 9, otherwise maximum fiber count is 16 ports.
- If 1588 timing is selected in a slot, both top and bottom slots must support 1588. For example, if slot 3 is 1588v2 capable, then slot 4 must be able to be 1588 v2 capable or blank.
- PoE power supply options must be selected in order to support PoE or PoE+modules.

DC Power Supply Range for PoE Applications:

- PoE 802.3af: 48 VDC Power Input (range 45 to 57 VDC)
- PoE+ 802.3at: 48 VDC Power Input (range 52 to 56 VDC)

Ordering

			GigE				100Mbps					
			1	2	3	4	5	6	7	8		
ML3100	*	**	*	*	*	*	*	*	*	*	*	**ML3100 Chassis with Integrated Power Supplies**
Mounting	F											Front Mounted Ports
	B											Rear Mounted Ports
Power Supply		HX										Single Integrated 90 to 250V AC/DC Power Supply
		HH										Dual Integrated 90 to 250V AC/DC Power Supplies
		LX										Single Integrated 22 to 60 VDC Power Supply
		LL										Dual Integrated 22 to 60 VDC Power Supplies
		P1										Single Integrated 22 to 60 VDC Power Supply with PoE Support
		P2										Dual Integrated 22 to 60 VDC Power Supply with PoE Support
		HL										Combination of a 90 to 250V AC/DC and a 22 to 60 VDC Power Supply
Gigabit			A	A	A	A						2 x 1000 RJ45 or SFP Combo Ports, Ports are Auto-Detect, No SFT Transceivers, with 1588 Timing
			B	B	B	B						2 x 1000 RJ45 or SFP Combo Ports, Populated with 2 x SFP Multimode Fiber, 550m , with 1588 Timing
			C	C	C	C						2 x 1000 RJ45 or SFP Combo Ports, Populated with 2 x SFP Multimode Fiber, 2km, with 1588 Timing
			D	D	D	D						2 x 1000 RJ45 or SFP Combo Ports, Populated with 2 x SFP Singlemode Fiber, 10km, with 1588 Timing
			E	E	E	E						2 x 1000 RJ45 or SFP Combo Ports, Populated with 2 x SFP Singlemode Fiber, 25km, with 1588 Timing
			F	F	F	F						2 x 1000 RJ45 or SFP Combo Ports, Populated with 2 x SFP Singlemode Fiber, 40km, with 1588 Timing
			G	G	G	G						2 x 1000 RJ45 or SFP Combo Ports, Populated with 2 x SFP Singlemode Fiber, 70km, with 1588 Timing
			X	X	X	X						None
100Mbps							A	A	A	A		4 x 10/100Mbit - RJ45 Copper
							C	C	C	C		4 x 10/100Mbit - RJ45 Copper with PoE+*
							D	D	D	D		2 x 10Mbit - ST
							E	E	E	E		2 x 100Mbit - ST Multimode Fiber
							F	F	F	F		2 x 100Mbit - SC Multimode Fiber
							G	G	G	G		4 x 100Mbit - LC Multimode Fiber
							H	H	H	H		4 x 100Mbit - MTRJ Multimode Fiber
							J	J	J	J		2 x 100Mbit - SC Singlemode Fiber 20km
							K	K	K	K		4 x 100Mbit - LC Singlemode Fiber 20km
							L	L	L	L		2 x 100Mbit - SC Singlemode Fiber 40km
							M	M	M	M		4 x 100Mbit - LC Singlemode Fiber 40km
							N	N	N	N		4 x 100Mbit SFP Ports (No Transceivers) Empty Cage
							P	P	P	P		4 x 10/100Mbit - RJ45 Copper with 1588 Timing
							Q	Q	Q	Q		2 x 100Mbit - ST Multimode Fiber with 1588 Timing
							R	R	R	R		2 x 100Mbit - SC Multimode Fiber with 1588 Timing
							S	S	S	S		4 x 100Mbit - LC Multimode Fiber with 1588 Timing
							T	T	T	T		4 x 100Mbit - MTRJ Multimode Fiber with 1588 Timing
							U	U	U	U		4 x 100Mbit - LC Singlemode Fiber 20km with 1588 Timing
							W	W	W	W		2 x 100Mbit - ST Singlemode Fiber 20km with 1588 Timing
							Y	Y	Y	Y		2 x 100Mbit - SC Singlemode Fiber 20km with 1588 Timing
							Z	Z	Z	Z		4 x 100Mbit - LC Singlemode Fiber 40km with 1588 Timing
							X	X	X	X		None
Environment											X	None
											H	Harsh Chemical Environment Conformal Coating

*** The power source of the ML3100 and ML3101 must be in the range of 52-56 VDC for PoE+. PoE+ modules are only supported on units ordered with P1 or P2 power supply options.**

Notes:
- Slots 1 - 4 are for Gigabit ports.
- Slots 5 - 8 are for 100Mbps or 10Mbps ports.
- Gigabit ports are auto media detect combo ports, and may use either the SFP or RJ-45 ports
- Maximum fiber count is 16 ports.
- If 1588 timing is selected in a slot, both top and bottom slots must support 1588. For example, if slot 3 is 1588v2 capable, then slot 4 must be able to be 1588 v2 capable or blank.
- PoE+ power supply option must be selected in order to support PoE+module.

DC Power Supply Range for PoE Applications:
- PoE+ 802.3at: 48 VDC Power Input (range 52 to 56 VDC)

Ordering

			GigE				100 Mbps					
			1	2	3	4	5	6	7	8		
ML3101	*	**	*	*	*	*	*	*	*	*	*	**ML3101 Chassis with Field Replaceable Power Supplies**
Mounting	F											Front Mounted Ports
	B											Rear Mounted Ports
Power Supply		HX										Single Field Replaceable 90 to 250V AC/DC Power Supply (Chassis Supports Optional Second 90 to 250V AC/DC Supply)
		HH										Dual Field Replaceable 90 to 250V AC/DC Power Supplies
		LX										Single Field Replaceable 22 to 60 VDC Power Supply (Chassis Supports Optional Second 22 to 60 VDC Supply)
		LL										Dual Field Replaceable 22 to 60 VDC Power Supplies
		P1										Single Field Replaceable 22 to 60 VDC Power Supply with PoE Support (Chassis Supports Optional Second 22 to 60 VDC Supply)
		P2										Dual Field Replaceable 22 to 60 VDC Power Supply with PoE Support
		HL										Combination of a 90 to 250V AC/DC and a 22 to 60 VDC Field Replaceable Power Supply
Gigabit			A	A	A	A						2 x 1000 RJ45 or SFP Combo Ports, Ports are Auto-Detect, No SFP Transceivers, with 1588 Timing
			B	B	B	B						2 x 1000 RJ45 or SFP Combo Ports, Populated with 2 x SFP Multimode Fiber, 550m , with 1588 Timing
			C	C	C	C						2 x 1000 RJ45 or SFP Combo Ports, Populated with 2 x SFP Multimode Fiber, 2km, with 1588 Timing
			D	D	D	D						2 x 1000 RJ45 or SFP Combo Ports, Populated with 2 x SFP Singlemode Fiber, 10km, with 1588 Timing
			E	E	E	E						2 x 1000 RJ45 or SFP Combo Ports, Populated with 2 x SFP Singlemode Fiber, 25km, with 1588 Timing
			F	F	F	F						2 x 1000 RJ45 or SFP Combo Ports, Populated with 2 x SFP Singlemode Fiber, 40km, with 1588 Timing
			G	G	G	G						2 x 1000 RJ45 or SFP Combo Ports, Populated with 2 x SFP Singlemode Fiber, 70km, with 1588 Timing
			X	X	X	X						None
100Mbps							A	A	A	A		4 x 10/100Mbit - RJ45 Copper
							C	C	C	C		4 x 10/100Mbit - RJ45 Copper with PoE+*
							D	D	D	D		2 x 10Mbit - ST
							E	E	E	E		2 x 100Mbit - ST Multimode Fiber
							F	F	F	F		2 x 100Mbit - SC Multimode Fiber
							G	G	G	G		4 x 100Mbit - LC Multimode Fiber
							H	H	H	H		4 x 100Mbit - MTRJ Multimode Fiber
							J	J	J	J		2 x 100Mbit - SC Singlemode Fiber 20km
							K	K	K	K		4 x 100Mbit - LC Singlemode Fiber 20km
							L	L	L	L		2 x 100Mbit - SC Singlemode Fiber 40km
							M	M	M	M		4 x 100Mbit - LC Singlemode Fiber 40km
							N	N	N	N		4 x 100Mbit SFP Ports (No Transceivers) Empty Cage
							P	P	P	P		4 x 10/100Mbit - RJ45 Copper with 1588 Timing
							Q	Q	Q	Q		2 x 100Mbit - ST Multimode Fiber with 1588 Timing
							R	R	R	R		2 x 100Mbit - SC Multimode Fiber with 1588 Timing
							S	S	S	S		4 x 100Mbit - LC Multimode Fiber with 1588 Timing
							T	T	T	T		4 x 100Mbit - MTRJ Multimode Fiber with 1588 Timing
							U	U	U	U		4 x 100Mbit - LC Singlemode Fiber 20km with 1588 Timing
							W	W	W	W		2 x 100Mbit - ST Singlemode Fiber 20km with 1588 Timing
							Y	Y	Y	Y		2 x 100Mbit - SC Singlemode Fiber 20km with 1588 Timing
							Z	Z	Z	Z		4 x 100Mbit - LC Singlemode Fiber 40km with 1588 Timing
							X	X	X	X		None
Environment											X	None
											H	Harsh Chemical Environment Conformal Coating

*** The power source of the ML3100 and ML3101 must be in the range of 52-56 VDC for PoE+. PoE+ modules are only supported on units ordered with P1 or P2 power supply options.**

Notes:
- Slots 1 - 4 are for Gigabit ports.
- Slots 5 - 8 are for 100Mbps or 10Mbps ports.
- Gigabit ports are auto media detect combo ports, and may use either the SFP or RJ-45 ports
- Maximum fiber count is 16 ports.
- If 1588 timing is selected in a slot, both top and bottom slots must support 1588. For example, if slot 3 is 1588v2 capable, then slot 4 must be able to be 1588 v2 capable or blank.
- PoE+ power supply option must be selected in order to support PoE+module.

DC Power Supply Range for PoE Applications:
- PoE+ 802.3at: 48 VDC Power Input (range 52 to 56 VDC)

Please refer to the GE Digital Energy website and Online Store for a complete list of modules and options.

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