Mercury Series

Gigabit Ethernet, External D38999, 1000Base-T/SX Media Converter, 28Vdc, Multimode, 850nM Vcsel's

Quad Port, Flange Receptacles

D38999 to D38999 / Optical to Electrical Media Converter

FEATURES

- Compliant with IEEE-802.3:2005 Gigabit Ethernet
- Optical fiber link distances up to 550 Meters
- Maximum optical channel bit error rate less than $1x10^{-12}$
- Operating temperature range from -40°C to +85°C
- Shock, vibration and immersion resistant per Mil-Std-810 and Mil-Std-1344
- Olive Drab Cadmium plating meets stringent EMI / RFI performance specifications
- Aluminum alloy chassis and Mil-Dtl-38999 housings are strong, durable, corrosion resistant and light weight
- Mil-T-29504 compliant optical fiber connector interface
- D38999 fiber optic insert configuration conforms to Mil-Std-1560
- D38999 electrical interfaces provides robust interconnection to vehicle or platform wiring

APPLICATIONS

Mercury series bulkhead mounted Gigabit Ethernet media converters enable high speed network communications over long distances in harsh environments.

- Gigabit Ethernet switches and peripherals
- Telecom and datacom switch / router rack-to-rack links
- Storage or computation clusters

The Mil-Dtl-38999, Series III connectors provide sealed optical and electrical interfaces that are water-tight to Mil-Std-810 / IP67 / NEMA-4x when mated.

The multimode optical fiber interface supports applications where copper cable link distance, bandwidth, weight or bulk make the use of twisted pair, twinax or quadrax copper conductors unacceptable.

DESCRIPTION

Mercury series Gigabit Ethernet media converters consist of optoelectronic transmitter and receiver functions integrated along with the 1000Base-T Ethernet electrical to 1000Base-SX optical media conversion circuitry into a bulkhead mounted Mil-Dtl-38999 connector assembly.

The optical transmitters are high output 850nm VCSEL's. The optical receivers consist of GaAs PIN and preamplifier assemblies and limiting post-amplifiers.

The electrical interface to the Mercury series bulkhead optical media converters is a Mil-Dtl-38999 connector enabling interconnection to an internal or external backbone cable interface.

Mercury series Gigabit Ethernet media converters are vibration isolated, environmentally hardened components designed for use in harsh environment applications.

- Sealed against liquid and solid contaminants
- Shock and vibration resistant

ORDERING INFORMATION

Application	Item Number
1000Base-T to 1000Base-SX, 28Vdc	M33R-8SAT-HW

See Appendix A3 for more part number options

MOOG

ABSOLUTE MAXIMUM RATINGS

Absolute maximum limits mean that no catastrophic damage will occur if the product is subjected to these ratings for short periods, provided each limiting parameter is in isolation and all other parameters have values within the performance specification. It should not be assumed that limiting values of more than one parameter can be applied to the product at the same time.

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Storage Temperature	T_S	-55		+100	°C
Supply Voltage	V_{CC}	-0.5		45.0	V
Data Input Voltage	V_I	-0.5		V_{CC}	V

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Operating Temperature	T_A	-40		+85	°C
Supply Voltage	V_{CC}	+18.0	+28.0	+36.0	VDC
Power Supply Noise (p-p)	N_P			200	mV

SPECIFICATIONS COMPLIANCE

Requirement	Feature	Condition	Notes
MIL-STD-883	ESD	Class II	2200V
MIL-STD-810	Vibration	$3.8g^2/Hz$	43G rms
MIL-STD-810	Shock	40.0g	6-9mS
MIL-STD-1344	Flame Resistance	Method 1012	30 Seconds
MIL-STD-1344	Damp Heat	10 Cycles	24 Hours
MIL-STD-38999	Mating Durability	500 Cycles	<0.5dB Change
FDA / CDRH / IEC-825-1	Eye Safety	Class 1	No Safety Interlocks Required

MATERIALS

Item	Detail	Notes
D38999 Cylindrical Shells	Aluminum Alloy	
Plating	Olive Drab Cadmium	
D38999 Inserts	Thermoplastic	
Interfacial Seals	Elastomer	
Optical Alignment Sleeves	Composite Polymer	
Printed Circuits	Polyimide / FR-4	Mil-P-31032 Type 4
Housing	Aluminum Alloy	

OPTICAL TRANSMITTERS T_A = Operating Temperature Range

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Output Power	P_o	-9.5		-4.0	dBm
Optical Output Wavelength	λ_{OUT}	830	850	860	nM
Spectral Width	$\Delta\lambda_{RMS}$			0.85	nM

OPTICAL RECEIVERS T_A = Operating Temperature Range

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Sensitivity	P_I	-17.0		-2.0	dBm
Optical Wavelength	λ_{IN}	830	850	860	nM

POWER SUPPLY CURRENT T_A = Operating Temperature Range

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Current per Port @ 28VDC	I_{CCT}		100	150	mA

OPTICAL LINK DISTANCES

Protocol	Cable Specification	Distance
Gigabit Ethernet - IEEE-802.3:2005 - 1000BASE-SX	62.5/125µ 200MHz*Km	275M
	50/125µ 500MHz*Km	550M

COPPER LINK DISTANCES

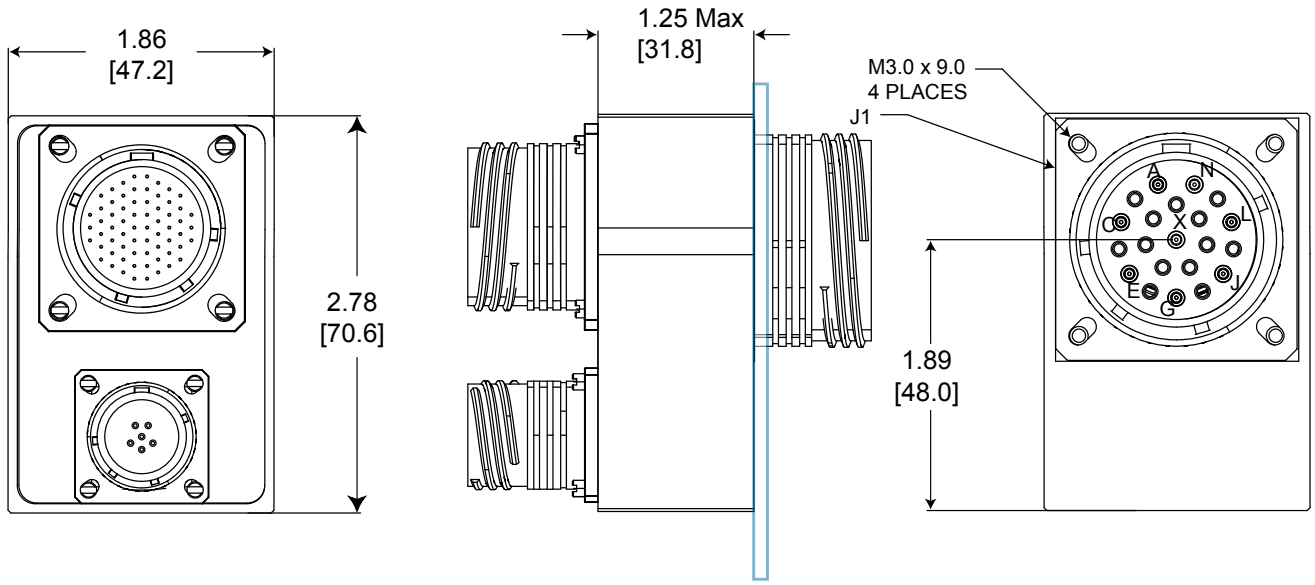
Protocol	Cable Specification	Distance
Gigabit Ethernet - IEEE-802.3:2005 - 1000BASE-T	TIA/EIA-568-B Cat 5E - for other transmission media, please consult the factory	100M

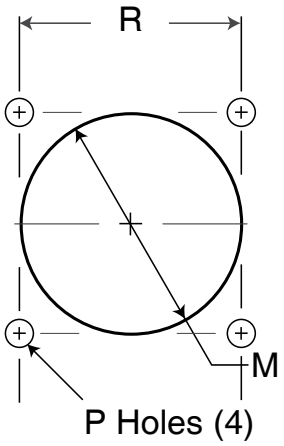
Quad Port Mercury Series Mil-Dtl-38999, 1000Base-T to 1000Base-SX,
Gigabit Ethernet Media Converter, Multimode, 28Vdc, 850nM VCSEL's

OUTLINE DRAWING

Dimensions are shown as: inches (mm)

Weight = 8.3 oz / 235 grams





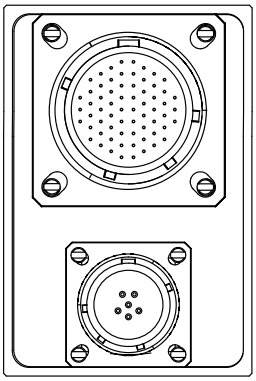
Panel Cutout Dimensions

Rear Panel Mounting Only

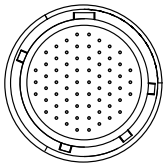
Shell Size Code	Shell Size	M Min	P Holes	R Bsc
H	23	1.547 (39.29)	0.159 (4.0) 0.149 (3.8)	1.375 (34.9)

Quad Port Mercury Series Mil-Dtl-38999, 1000Base-T to 1000Base-SX,
Gigabit Ethernet Media Converter, Multimode, 28Vdc, 850nM VCSEL's

MEDIA CONVERTER INSERT ARRANGEMENTS

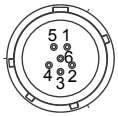


J1

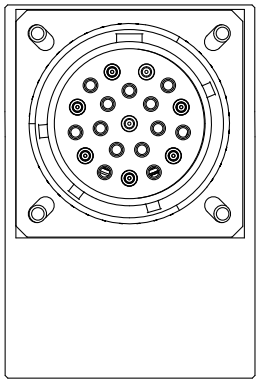


Media Converter Insert Pin Numbers	Media Converter Pin Functions	Mating Cable Plug Connector P/N
	4x1000Base-T See Pages 6, 7 & 8	CAT-5E **D38999/26WF35SN**

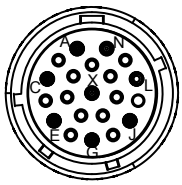
J2



Media Converter Insert Pin Numbers	Media Converter Pin Functions	Mating Cable Plug Connector P/N
	Power Supply Pin 1 = Case Ground Pin 2 = Case Ground Pin 3 = Case Ground Pin 4 = Case Ground Pin 5 = VEE Pin 6 = VCC	26-22 Guage Copper Wire **D38999/26WA35SN**



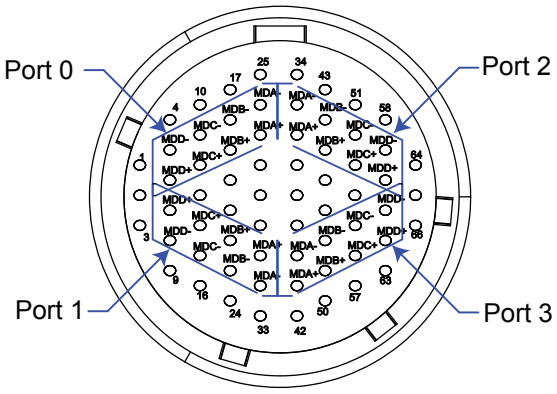
J3



Media Converter Optical Pin Numbers	Media Converter Optical Functions		Mating Cable Plug Connector P/N
	1000Base-SX		
Port	**TX**	**RX**	
0	J	L	50 or 62.5µ /125µ Optical Cable
1	N	G	**D38999/26WH21PN**
2	X	A	M29504/04
3	E	C	See Appendix A2

Optical TX Pins are outputs from this device, Optical RX Pins are inputs to this device
Media Converter Fiber Pin Numbers and Functions Shown - Mating Cable Plug Opposite

J1 PIN FUNCTIONS
ETHERNET PIN AND PORT ASSIGNMENTS
TOP



Front view of the J1 connector shown - mating cable plug opposite - see J1 D38999 Pin Function Chart for details

J1 / D38999 PORT / PIN ASSIGNMENTS

PORT #	PIN #	FUNCTION	PORT #	PIN #	FUNCTION
0	27	MDA+	2	36	MDA+
0	26	MDA-	2	35	MDA-
0	19	MDB+	2	45	MDB+
0	18	MDB-	2	44	MDB-
0	12	MDC+	2	53	MDC-
0	11	MDC-	2	52	MDC+
0	6	MDD+	2	60	MDD+
0	5	MDD-	2	59	MDD-
1	32	MDA+	3	40	MDA+
1	31	MDA-	3	41	MDA-
1	23	MDB+	3	48	MDB+
1	22	MDB-	3	49	MDB-
1	15	MDC+	3	55	MDC+
1	14	MDC-	3	56	MDC-
1	8	MDD+	3	61	MDD+
1	7	MDD-	3	62	MDD-

J1 / D38999/xxxF35PN ELECTRICAL PIN FUNCTIONS - Continued on next page

Pin #	Port #	Function	RJ-45 Pin #	Logic Family
1	N/A	N/C	N/A	Do Not Connect - Factory Use Only
2	N/A	N/C	N/A	Do Not Connect - Factory Use Only
3	N/A	N/C	N/A	Do Not Connect - Factory Use Only
4	0	MDD-	8	IEEE-802.3.2005 10/100/1000Base-T
5	0	MDD+	7	IEEE-802.3.2005 10/100/1000Base-T
6	N/A	N/C	N/A	Do Not Connect - Factory Use Only
7	N/A	N/C	N/A	Do Not Connect - Factory Use Only
8	1	MDD+	7	IEEE-802.3.2005 10/100/1000Base-T
9	1	MDD-	8	IEEE-802.3.2005 10/100/1000Base-T
10	0	MDC-	5	IEEE-802.3.2005 10/100/1000Base-T
11	0	MDC+	4	IEEE-802.3.2005 10/100/1000Base-T
12	N/A	N/C	N/A	Do Not Connect - Factory Use Only
13	N/A	N/C	N/A	Do Not Connect - Factory Use Only
14	N/A	N/C	N/A	Do Not Connect - Factory Use Only
15	1	MDC+	4	IEEE-802.3.2005 10/100/1000Base-T
16	1	MDC-	5	IEEE-802.3.2005 10/100/1000Base-T
17	0	MDB-	6	IEEE-802.3.2005 10/100/1000Base-T
18	0	MDB+	3	IEEE-802.3.2005 10/100/1000Base-T
19	N/A	N/C	N/A	Do Not Connect - Factory Use Only
20	N/A	N/C	N/A	Do Not Connect - Factory Use Only
21	N/A	N/C	N/A	Do Not Connect - Factory Use Only
22	N/A	N/C	N/A	Do Not Connect - Factory Use Only
23	1	MDB+	3	IEEE-802.3.2005 10/100/1000Base-T
24	1	MDB-	6	IEEE-802.3.2005 10/100/1000Base-T
25	0	MDA-	2	IEEE-802.3.2005 10/100/1000Base-T
26	0	MDA+	1	IEEE-802.3.2005 10/100/1000Base-T
27	N/A	N/C	N/A	Do Not Connect - Factory Use Only
28	N/A	N/C	N/A	Do Not Connect - Factory Use Only
29	N/A	N/C	N/A	Do Not Connect - Factory Use Only
30	N/A	N/C	N/A	Do Not Connect - Factory Use Only
31	N/A	N/C	N/A	Do Not Connect - Factory Use Only
32	1	MDA+	1	IEEE-802.3.2005 10/100/1000Base-T
33	1	MDA-	2	IEEE-802.3.2005 10/100/1000Base-T
34	2	MDA-	2	IEEE-802.3.2005 10/100/1000Base-T

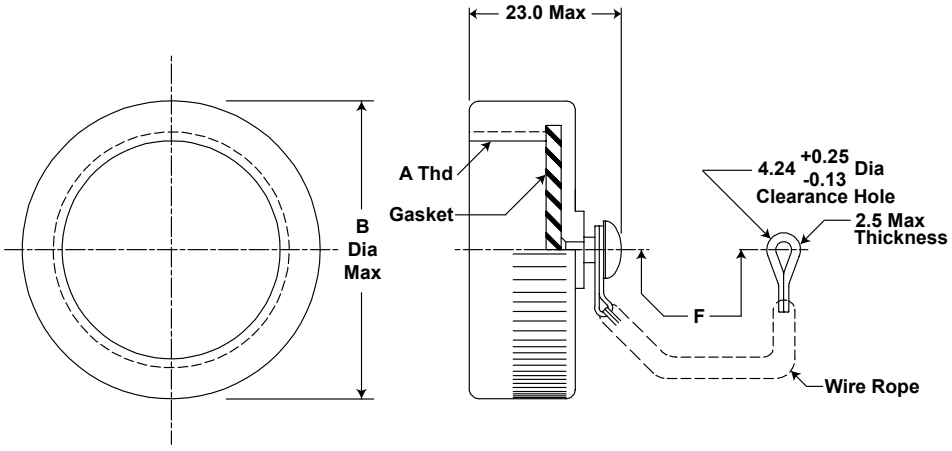
J1 / D38999/xxxF35PN ELECTRICAL PIN FUNCTIONS - Continued from previous page

Pin #	Port #	Function	RJ-45 Pin #	Logic Family
35	2	MDA+	1	IEEE-802.3.2005 10/100/1000Base-T
36	N/A	N/C	N/A	Do Not Connect - Factory Use Only
37	N/A	N/C	N/A	Do Not Connect - Factory Use Only
38	N/A	N/C	N/A	Do Not Connect - Factory Use Only
39	N/A	N/C	N/A	Do Not Connect - Factory Use Only
40	N/A	N/C	N/A	Do Not Connect - Factory Use Only
41	3	MDA-	2	IEEE-802.3.2005 10/100/1000Base-T
42	3	MDA+	1	IEEE-802.3.2005 10/100/1000Base-T
43	2	MDB-	6	IEEE-802.3.2005 10/100/1000Base-T
44	2	MDB+	3	IEEE-802.3.2005 10/100/1000Base-T
45	N/A	N/C	N/A	Do Not Connect - Factory Use Only
46	N/A	N/C	N/A	Do Not Connect - Factory Use Only
47	N/A	N/C	N/A	Do Not Connect - Factory Use Only
48	N/A	N/C	N/A	Do Not Connect - Factory Use Only
49	3	MDB-	6	IEEE-802.3.2005 10/100/1000Base-T
50	3	MDB+	3	IEEE-802.3.2005 10/100/1000Base-T
51	2	MDC-	5	IEEE-802.3.2005 10/100/1000Base-T
52	2	MDC+	4	IEEE-802.3.2005 10/100/1000Base-T
53	N/A	N/C	N/A	Do Not Connect - Factory Use Only
54	N/A	N/C	N/A	Do Not Connect - Factory Use Only
55	N/A	N/C	N/A	Do Not Connect - Factory Use Only
56	3	MDC-	5	IEEE-802.3.2005 10/100/1000Base-T
57	3	MDC+	4	IEEE-802.3.2005 10/100/1000Base-T
58	2	MDD-	8	IEEE-802.3.2005 10/100/1000Base-T
59	2	MDD+	7	IEEE-802.3.2005 10/100/1000Base-T
60	N/A	N/C	N/A	Do Not Connect - Factory Use Only
61	N/A	N/C	N/A	Do Not Connect - Factory Use Only
62	3	MDD-	8	IEEE-802.3.2005 10/100/1000Base-T
63	3	MDD+	7	IEEE-802.3.2005 10/100/1000Base-T
64	N/A	N/C	N/A	Do Not Connect - Factory Use Only
65	N/A	N/C	N/A	Do Not Connect - Factory Use Only
66	N/A	N/C	N/A	Do Not Connect - Factory Use Only

APPENDIX A1

RECEPTACLE PROTECTION CAPS

*MIL-DTL-38999/33 PROTECTION CAP PART NUMBERS	
MS RECEPTACLE CAP P/N	*D38999/33W19R



*See DSCC or SAE QPL for Approved Suppliers
http://www.dscc.dla.mil/programs/qmlqpl/QPLdetail.asp?QPL=38999

MIL-DTL-38999/33 Outline Dimensions - mm				
Shell Size Code	Shell Size	A Thread (inches)	B Max Dia	F +13.0 -7.0
F	19	1.2500-0.1P-0.3L-TS	39.0	127.00

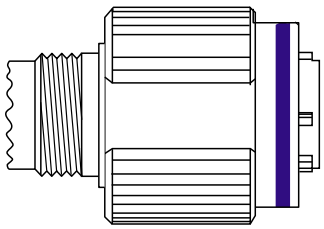
APPENDIX A2

MIL-DTL-38999 FIBER OPTIC CABLE PLUG / MIL-T-29504 PIN TERMINI

*See DSCC or SAE QPL for Approved Suppliers
http://www.dscc.dla.mil/programs/qmlqpl/QPLdetail.asp?QPL=38999

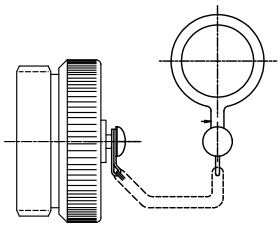
*D38999 PLUG - PIN INSERT

MIL-DTL-38999 CABLE PLUG	
MS PLUG P/N	*D38999/26WH21PN



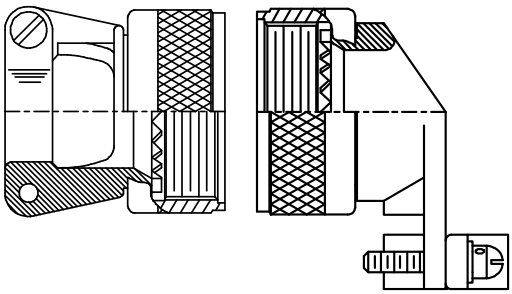
*CABLE PROTECTION CAP

D38999/32 PLUG PROTECTION CAP	
MS PLUG CAP P/N	*D38999/32W23N



*CABLE BACKSHELL

MIL-C-85049 CABLE BACKSHELL	
MS BACKSHELL P/N	*MS85049/xxxxxx**



**Straight or angled backshell - defined by application / mounting configuration

*FIBER OPTIC PIN TERMINUS

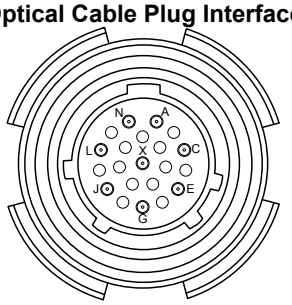
MIL-T-29504 PIN TERMINUS	
MS PIN TERMINUS P/N	*M29504/04-xxxx**

**defined by fiber optic cable configuration

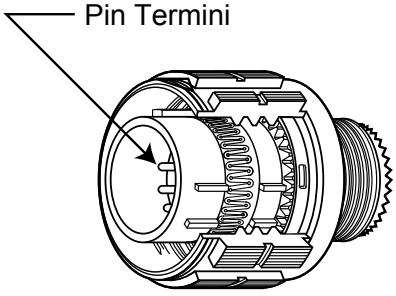
D38999 PLUG PORT FUNCTIONS

PORT NUMBER	TX	RX
0	J	L
1	N	G
2	X	A
3	E	C

TOP
Optical Cable Plug Interface



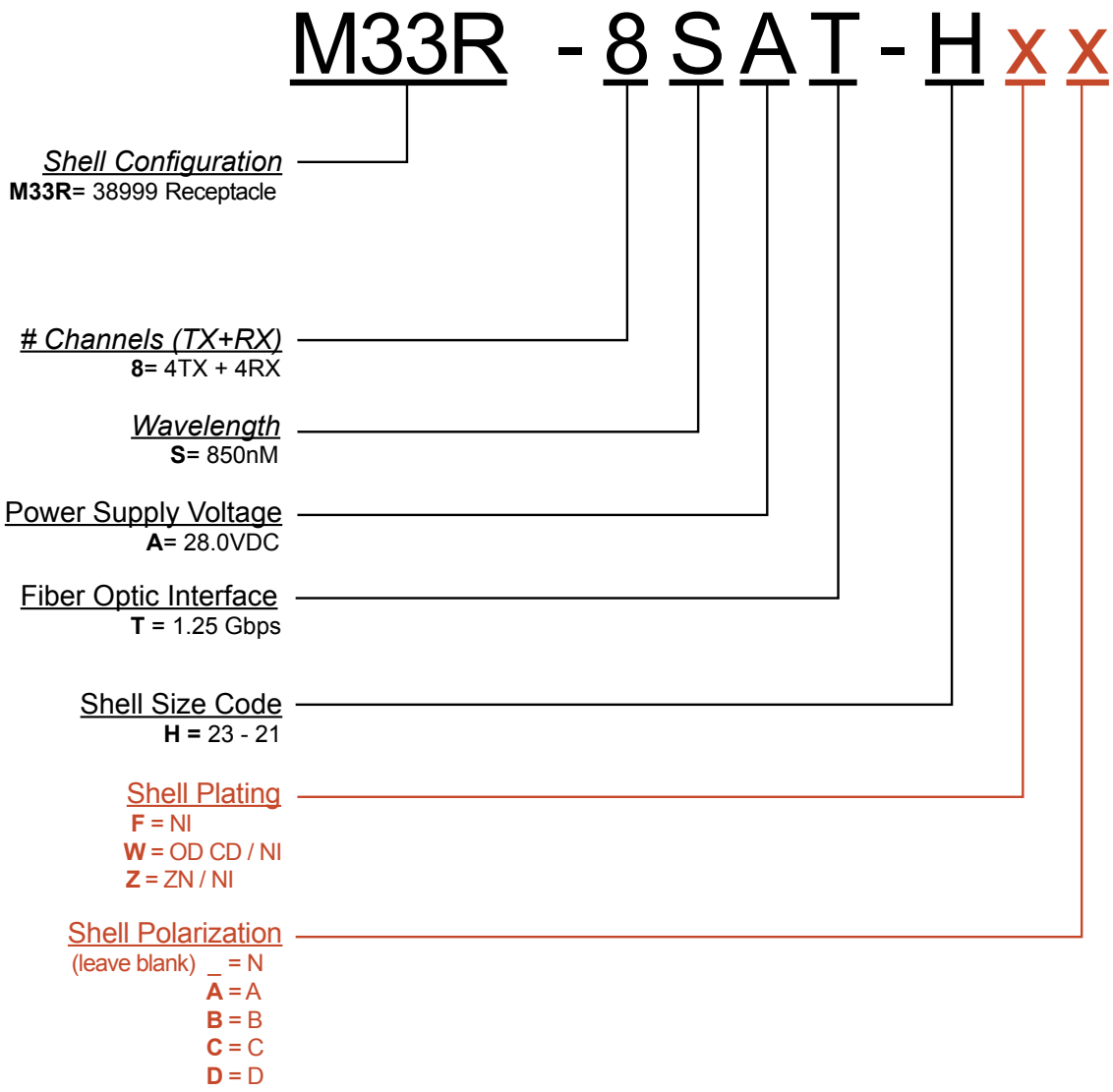
Front face of the optical cable plug pin insert shown. Transceiver insert opposite.



APPENDIX A3

PART NUMBER OPTIONS

Quad Port, Gigabit Ethernet, 850nm



Other wavelength, mounting and port count options are available.
Please consult the Protokraft website for alternate configurations.

MOOG PROTOKRAFT

192 Bob Fitz Road, Johnson City, TN 37615
salesmp@moog.com
moogprotokraft.com