STRATOS
optical technologies

Stratos T2 Series

TFOCA Media Converters

Ethernet Connectivity in Rugged Environments

The Cinch Stratos T2 series media converter is a 2-channel optical transceiver and media converter. Each channel interfaces with up to 1000MBPS Ethernet electrical signals and converts to/from up to 1000MBPS optical signals. The optical interface uses a TFOCA-II 4-CH connector and supports a variety of optical wavelengths & fiber modes. The modular electrical interface uses either a MIL circular connector or POE RJ45 mag-jacks.

Features

- Support up to a 2GBPS ethernet link (2 channels at 1GBPS each) over fiber between linked devices.
- Rugged MIL Circular Connector or RJ45 POE for electrical interface.
- All units are 100% tested at both temperature extremes prior to shipment.
- MIL-STD-810 qualified for temperature, thermal shock, vibration, mechanical shock, humidity, and altitude.
- FCC Class A compliant with internal & external EMI sealing.
- Built and tested in the USA.
- Durable Leaded Solder & Conformal Coating.
- Rugged PTFE anodized finish & all stainless-steel hardware.

Applications

- Oil & Gas
- Fire & Rescue
- Security
- Shipboard
- Tactical Communications
- Military Communications

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T2 Series Media Converters

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Standard Product Line

Part Number	Link Distance		Optical Data Rate	Electrical Data Rate	Fiber Mode	Wavelength	Electrical Connector	Power Input	Link Control
	Min	Max							
T2F-DTL002-24V	2km (OM1)	2km (OM4)	100 Mbps BFX Locked	10/100 Mbps Fast Ethernet Autonegotiate	Multimode OM1 63/125 um	1310 nm	13-PIN MM	9-32V	N
T2F-DTL002-24V-01	2km (OM1)	2km (OM4)	100 Mbps BFX Locked	10/100 Mbps Fast Ethernet Autonegotiate	Multimode OM1 63/125 um	1310 nm	13-PIN MM	9-32V	Y
T2F-RJ002-POE	2km (OM1)	2km (OM4)	100 Mbps BFX Locked	10/100 Mbps Fast Ethernet Autonegotiate	Multimode OM1 63/125 um	1310 nm	2X RJ45	POE	N
T2F-RJ002-POE-01	2km (OM1)	2km (OM4)	100 Mbps BFX Locked	10/100 Mbps Fast Ethernet Autonegotiate	Multimode OM1 63/125 um	1310 nm	2X RJ45	POE	Y
T2K-DTL002-24V	0.5 KM (OM1)	1 KM (OM4)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Multimode OM1 63/125 um	850 nm	37-PIN MM	9-32V	N
T2K-DTL002-24V-01	0.5 KM (OM1)	1 KM (OM4)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Multimode OM1 63/125 um	850 nm	37-PIN MM	9-32V	Y
T2K-RJ002-POE	0.5 KM (OM1)	1 KM (OM4)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Multimode OM1 63/125 um	850 nm	2X RJ45	POE	N
T2K-RJ002-POE-01	0.5 KM (OM1)	1 KM (OM4)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Multimode OM1 63/125 um	850 nm	2X RJ45	POE	Y
T2K-DTL202-24V	0.5 KM (OM1)	1 KM (OM4)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Multimode OM1 63/125 um	1310 nm	37-PIN MM	9-32V	N
T2K-DTL202-24V-01	0.5 KM (OM1)	1 KM (OM4)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Multimode OM1 63/125 um	1310 nm	37-PIN MM	9-32V	Y
T2K-RJ202-POE	0.5 KM (OM1)	1 KM (OM4)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Multimode OM1 63/125 um	1310 nm	2X RJ45	POE	N
T2K-RJ202-POE-01	0.5 KM (OM1)	1 KM (OM4)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Multimode OM1 63/125 um	1310 nm	2X RJ45	POE	Y
T2K-DTL602-24V	4 KM (OS1)	10 KM (OS2)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Singlemode SMF 9/125 um	1310 nm	37-PIN MM	9-32V	N
T2K-DTL602-24V-01	4 KM (OS1)	10 KM (OS2)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Singlemode SMF 9/125 um	1310 nm	37-PIN MM	9-32V	Y
T2K-RJ602-POE	4 KM (OS1)	10 KM (OS2)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Singlemode SMF 9/125 um	1310 nm	2X RJ45	POE	N
T2K-RJ602-POE-01	4 KM (OS1)	10 KM (OS2)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Singlemode SMF 9/125 um	1310 nm	2X RJ45	POE	Y
T2K-DTL802-24V	30 KM (OS1)	10 KM (OS2)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Singlemode SMF 9/125 um	1310 nm	37-PIN MM	9-32V	N
T2K-DTL802-24V-01	30 KM (OS1)	10 KM (OS2)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Singlemode SMF 9/125 um	1310 nm	37-PIN MM	9-32V	Y
T2K-RJ802-POE	30 KM (OS1)	10 KM (OS2)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Singlemode SMF 9/125 um	1550nm	2X RJ45	POE	N
T2K-RJ802-POE-01	30 KM (OS1)	10 KM (OS2)	1000 MPBS BLX Locked	10/100/1000 Mbps Gig Ethernet Autonegotiate	Singlemode SMF 9/125 um	1550nm	2X RJ45	POE	Y

Custom properties & configurations available by request

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Fiber Link Budget Reference

$P = T_{POWER,MIN} - R_{SENS,MIN}$

Equation 1 – Calculating Power Budget

$B = (D * A_{FIBER}) + (N_{SPLICE} * L_{SPLICE}) + (N_{CONN} * L_{CONN})$

Equation 2 – Calculating Link Budget

$M = P - B$

Equation 3 – Calculating Link Margin / Buffer

Symbol	Definition	Units
P	Power Budget	dB
B	Link Budget	dB
D	Link Distance	KM
M	Link Margin / Buffer	dB
N_{SPLICE}	Number of Splices	-
N_{CONN}	Number of Connectors	-
A_{FIBER}	Attenuation, Fiber	dB / KM
L_{SPLICE}	Loss, Splice	dB
L_{CONN}	Loss, Connector	dB
$T_{POWER, MIN}$	Transmit Power Minimum	dBm
$R_{SENS, MIN}$	Receiver Sensitivity Minimum	dBm

Fiber Mode	Fiber Type (Core/Clad Ø)	Wavelength	Fiber Attenuation A_{FIBER}	Splice Loss L_{SPLICE}	Connector Loss L_{CONN}
Multimode	OM1 (62.5/125um)	850nm	3.5 dB / KM	0.1 dB Typical	1 dB Typical
	OM1 (62.5/125um)	1310nm	1.5 dB / KM	0.1 dB Typical	1 dB Typical
	OM2 (50/125um)	850nm	3.5 dB / KM	0.1 dB Typical	1 dB Typical
	OM2 (50/125um)	1310nm	1.5 dB / KM	0.1 dB Typical	1 dB Typical
	OM3 (50/125um)	850nm	3.5 dB / KM	0.1 dB Typical	1 dB Typical
	OM3 (50/125um)	1310nm	1.5 dB / KM	0.1 dB Typical	1 dB Typical
	OM4 (50/125um)	850nm	2.5 dB / KM	0.1 dB Typical	1 dB Typical
	OM4 (50/125um)	1310nm	0.8 dB / KM	0.1 dB Typical	1 dB Typical
Singlemode	OS1 (9/125um)	1310nm	1.0 dB / KM	0.1 dB Typical	1 dB Typical
	OS1 (9/125um)	1550nm	1.0 dB / KM	0.1 dB Typical	1 dB Typical
	OS2 (9/125um)	1310nm	0.4 dB / KM	0.1 dB Typical	1 dB Typical
	OS2 (9/125um)	1550nm	0.4 dB / KM	0.1 dB Typical	1 dB Typical

Custom properties & configurations available by request.
Cinch can vary optical properties (increasing $T_{power, min}$ or decreasing $R_{sens, max}$) to improve overall link budget.

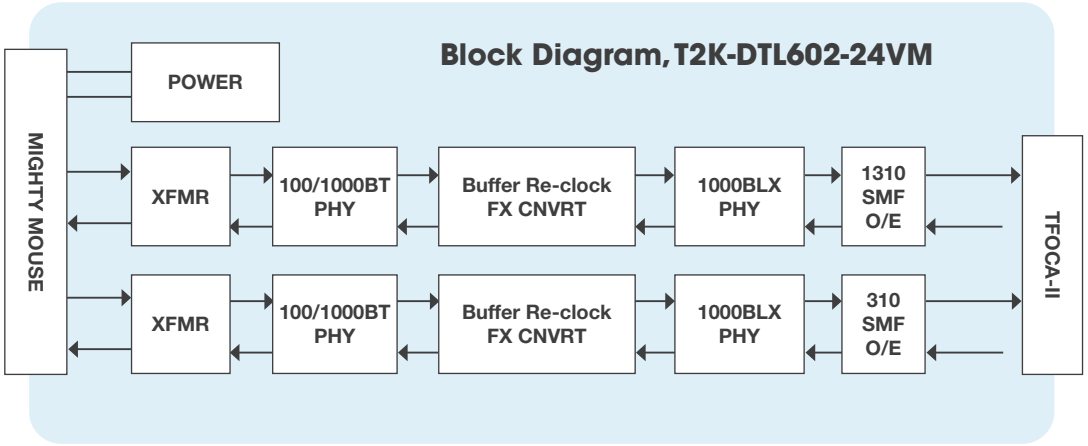
Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Unit
Storage Temperature	Ts	-55		+100	C
Supply Voltage - DTL	Vcc	0		+35	V
Supply Voltage - PoE, Per IEEE 802.3AF	Vcc	0		+60	V

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Case Operating Temperature	Ts	-40		+71	C
Supply Voltage - DTL	Vs	0	+24	+35	V
Supply Voltage - POE	Vs	+2.8	+48	+57	V
Power Draw	Ps		5.0	6.0	W

Block Diagram



The electrical signals are transformer coupled into a Physical Layer Device (PHY), buffered, and then regenerated into up to an optical data stream. The optical data stream is then routed to an internal optical transceiver to create the optical signal. The optical signal is routed to the TFOCA-II compatible connector interface for direct connection to a tactical optical cable.

The media conversion process is compliant to the IEEE 802.3 specifications for Fast Ethernet 100BT and 100BFX, as well as the IEEE 802.3Z specifications for Gigabit Ethernet 100/1000BT and 1000BLX. The Ethernet connection supports auto-negotiation for 100/1000BT interfaces. The Ethernet connection also supports auto-cross to automatically support both crossed and un-crossed ethernet cables.

Optical Performance

T2F-XXX002 (100 Mbps, 1310 nm, Multimode)

Applicable Part Numbers: T2F-DTL002-24V, T2F-DTL002-24V-01, T2F-RJ002-POE, T2F-RJ002-POE-01

Parameter	Symbol	Min	Typical	Max	Unit
Transmit Output Power	P_o	-12.0	-	-3.0	dBm
Transmit Output Center Wavelength	λ_{OUT}	1263	1310	1360	nm
Transmit Output Spectral Width	$\Delta\lambda_{RMS}$	-	-	4	nm
Transmit Extinction Ratio	ER	8	10	-	dB
Transmit Rise/Fall Time (10-90%)	t_R	-	-	3000	ps
Receive Sensitivity	P_I	-32.0	-	-3.0	dBm
Receive Wavelength	λ_{IN}	1270	-	1355	nm
Fiber Core Diameter	$ø_{CORE}$	-	63	-	um

T2K-XXX002 (1000 Mbps, 850 nm, Multimode)

Applicable Part Numbers: T2K-DTL002-24V, T2K-DTL002-24V-01, T2K-RJ002-POE, T2K-RJ002-POE-01

Parameter	Symbol	Min	Typical	Max	Unit
Transmit Output Power	P_o	-10.0	-	-4.0	dBm
Transmit Output Center Wavelength	λ_{OUT}	830	850	860	nm
Transmit Output Spectral Width	$\Delta\lambda_{RMS}$	-	-	0.85	nm
Transmit Extinction Ratio	ER	8	10	-	dB
Transmit Rise/Fall Time (10-90%)	t_R	-	-	260	ps
Receive Sensitivity	P_I	-20.0	-	-3.0	dBm
Receive Wavelength	λ_{IN}	800	-	860	nm
Fiber Core Diameter	$ø_{CORE}$	-	63	-	um

T2K-XXX202 (1000 Mbps, 1310 nm, Multimode)

Applicable Part Numbers: T2K-DTL202-24V, T2K-DTL202-24V-01, T2K-RJ202-POE, T2K-RJ202-POE-01

Parameter	Symbol	Min	Typical	Max	Unit
Transmit Output Power	P_o	-10.0	-	-4.0	dBm
Transmit Output Center Wavelength	λ_{OUT}	1285	1310	1343	nm
Transmit Output Spectral Width	$\Delta\lambda_{RMS}$	-	-	4	nm
Transmit Extinction Ratio	ER	8	10	-	dB
Transmit Rise/Fall Time (10-90%)	t_R	-	-	260	ps
Receive Sensitivity	P_I	-20.0	-	-3.0	dBm
Receive Wavelength	λ_{IN}	1270	-	1355	nm
Fiber Core Diameter	$ø_{CORE}$	-	63	-	um

T2F-XXX602 (1000 Mbps, 1310 nm, Singlemode)

Applicable Part Numbers: T2K-DTL602-24V, T2K-DTL602-24V-01, T2K-RJ602-POE, T2K-RJ602-POE-01

Parameter	Symbol	Min	Typical	Max	Unit
Transmit Output Power	P_o	-8		0	dBm
Transmit Output Center Wavelength	λ_{OUT}	1285	1310	1343	nm
Transmit Output Spectral Width	$\Delta\lambda_{RMS}$			4	nm
Transmit Extinction Ratio	ER	8	10		dB
Transmit Rise/Fall Time (10-90%)	t_R			260	ps
Receive Sensitivity	P_I	-20		0	dBm
Receive Wavelength	λ_{IN}	1270		1355	nm
Fiber Core Diameter	$ø_{CORE}$		9		um

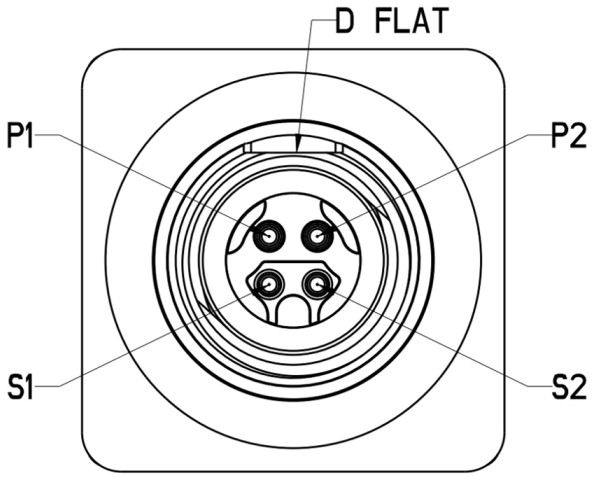
T2F-XXX802 (1000 Mbps, 1550 nm, Singlemode)

Applicable Part Numbers: T2K-DTL802-24V, T2K-DTL802-24V-01, T2K-RJ802-POE, T2K-RJ802-POE-01

Parameter	Symbol	Min	Typical	Max	Unit
Transmit Output Power	P_o	-1.0	-	+5.0	dBm
Transmit Output Center Wavelength	λ_{OUT}	1530	1550	1570	nm
Transmit Output Spectral Width	$\Delta\lambda_{RMS}$	-	-	1	nm
Transmit Extinction Ratio	ER	8	10	-	dB
Transmit Rise/Fall Time (10-90%)	t_R	-	-	260	ps
Receive Sensitivity	P_I	-24.0	-	0	dBm
Receive Wavelength	λ_{IN}	1260	-	1625	nm
Fiber Core Diameter	$ø_{CORE}$	-	9	-	um

Optical Pinout

Pin	Symbol	Type	Signal Description
P1	RX2	Receiver input	Channel 2 optical receive
P2	RX1	Receiver input	Channel 1 optical receive
S1	TX2	Transmitter output	Channel 2 optical transmit
S2	TX1	Transmitter output	Channel 1 optical transmit

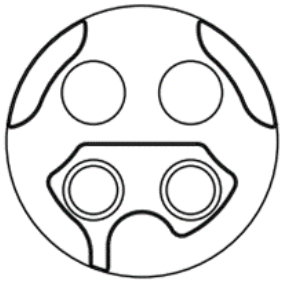


TFOCA-II Compatible Optical Interface

TFOCA Key Options

All Cinch TFOCA media converters use TFOCA "**Key Option 1**" unless otherwise specified. All other TFOCA key options are available by request.

Key Option 1
(Standard)



Key Option 2
(By request)

Key Option 3
(By request)

Key Option 4
(By request)

Link Control

Applicable Part Numbers: T2F-DTL002-24V-01, T2F-RJ002-POE-01, T2K-DTL002-24V-01, T2K-RJ002-POE-01, T2K-DTL202-24V-01, T2K-RJ202-POE-01, T2K-DTL602-24V-01, T2K-RJ602-POE-01

Link control changes the unit's behavior during an optical disconnect per the table below.

Link Control	Ethernet Link Status During Optical Disconnect
No (Disabled)	Connected
Yes (Enabled)	Disconnected

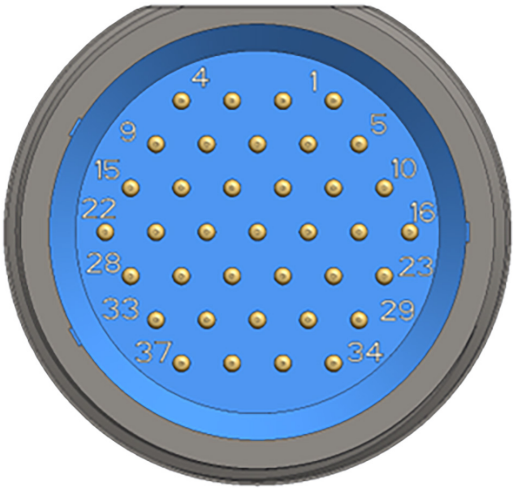
Electrical Pinout

Glenair 800-012-07NF8-13PN
Mil Circular Connector

T2F-DTL

Pin	Symbol	Description
1	CH1_RX+	Channel 1, Receive Positive
2	CH1_RX-	Channel 1, Receive Negative
3	CH1_TX+	Channel 1, Transmit Positive
4	CH1_TX-	Channel 1, Transmit Negative
5	CH2_TX+	Channel 2, Transmit Positive
6	CH2_TX-	Channel 2, Transmit Negative
7	CH2_RX+	Channel 2, Receive Positive
8	CH2_RX-	Channel 2, Receive Negative
9	VCC	+9 to +32 VDC Input Power
10	GND	Ground
11,12,13	NC	No Connect

Electrical Pinout

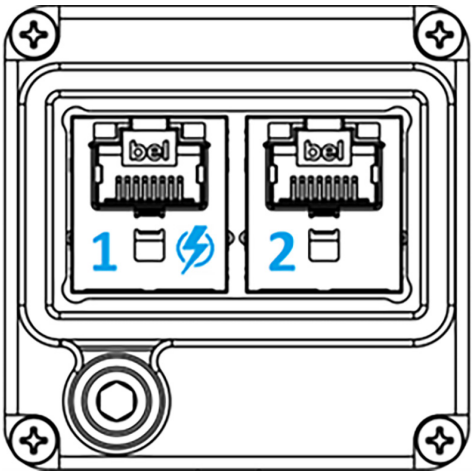


Glenair 800-012-07MT12-37PN
Mil Circular Connector

T2K-DTL

Pin	Symbol	Description
5	CH1_TP0+	Channel 1, Twisted Pair, 0 Positive
1	CH1_TP0-	Channel 1, Twisted Pair, 0 Negative
2	CH1_TP1+	Channel 1, Twisted Pair, 1 Positive
3	CH1_TP1-	Channel 1, Twisted Pair, 1 Negative
4	CH1_TP2+	Channel 1, Twisted Pair, 2 Positive
9	CH1_TP2-	Channel 1, Twisted Pair, 2 Negative
15	CH1_TP3+	Channel 1, Twisted Pair, 3 Positive
22	CH1_TP3-	Channel 1, Twisted Pair, 3 Negative
29	CH2_TP0+	Channel 2, Twisted Pair, 0 Positive
23	CH2_TP0-	Channel 2, Twisted Pair, 0 Negative
35	CH2_TP1+	Channel 2, Twisted Pair, 1 Positive
34	CH2_TP1-	Channel 2, Twisted Pair, 1 Negative
37	CH2_TP2+	Channel 2, Twisted Pair, 2 Positive
36	CH2_TP2-	Channel 2, Twisted Pair, 2 Negative
28	CH2_TP3+	Channel 1, Twisted Pair, 3 Positive
33	CH2_TP3-	Channel 1, Twisted Pair, 3 Negative
10, 11, 16, 17, 18	VCC	+9 to +32 VDC Input Power
6, 12, 13, 19, 20, 25, 26	GND	Ground
7, 8, 14, 21, 24, 27, 30, 31, 32	NC	No Connect

T2X-RJ



T568B / 802.3AF Mode B
PoE Power Input on Channel 1 only

Channel 1

Pin	Signal 100/100 Mbps	Signal 1000 Mbps	Power (PoE)	Color	Color Description
1	RX+	TxRx A+	-		White with orange stripe
2	RX-	TxRx A-	-		Solid orange, orange with white stripe
3	TX+	TxRx B+	-		White with green stripe
4	-	TxRx C+	DC+		Solid blue, blue with white stripe
5	-	TxRx C-	DC+		White with blue stripe
6	TX-	TxRx B-	-		Solid green, green with white stripe
7	-	TxRx D+	DC-		White with brown stripe
8	-	TxRx D-	DC-		Solid brown, brown with white stripe

Channel 2

Pin	Signal 100/100 Mbps	Signal 1000 Mbps	Power (PoE)	Color	Color Description
1	RX+	TxRx A+	-		White with orange stripe
2	RX-	TxRx A-	-		Solid orange, orange with white stripe
3	TX+	TxRx B+	-		White with green stripe
4	-	TxRx C+	DC+		Solid blue, blue with white stripe
5	-	TxRx C-	DC+		White with blue stripe
6	TX-	TxRx B-	-		Solid green, green with white stripe
7	-	TxRx D+	DC-		White with brown stripe
8	-	TxRx D-	DC-		Solid brown, brown with white stripe

Mechanical Properties

Plating Specification

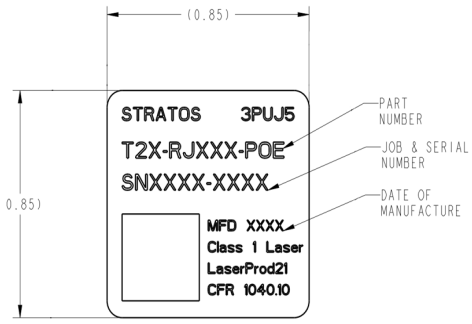
EMI conductive seal area
Chem film per MIL-DTL-5541 Type 1, Class 111
Color: Clear

All other areas
Hard Coat Anodize IAW MIL-A-8625
Type III, Class 2, Polytetrafluoroethyelene (PTFE) Impregnated,
0.0012in-.0018in THK
Color: Black

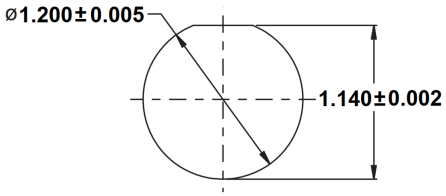
External O-Ring

Standard EMI O-Ring
Silicone Elastomer
Binder with silver aluminum conductive
Filler IAW MIL-DTL-83528G
Color: Light beige or blue
(Color depending on supplier))
Other external O-rings (non-conductive / non-EMI available by request)

Label



Bulkhead Cutout Dimension



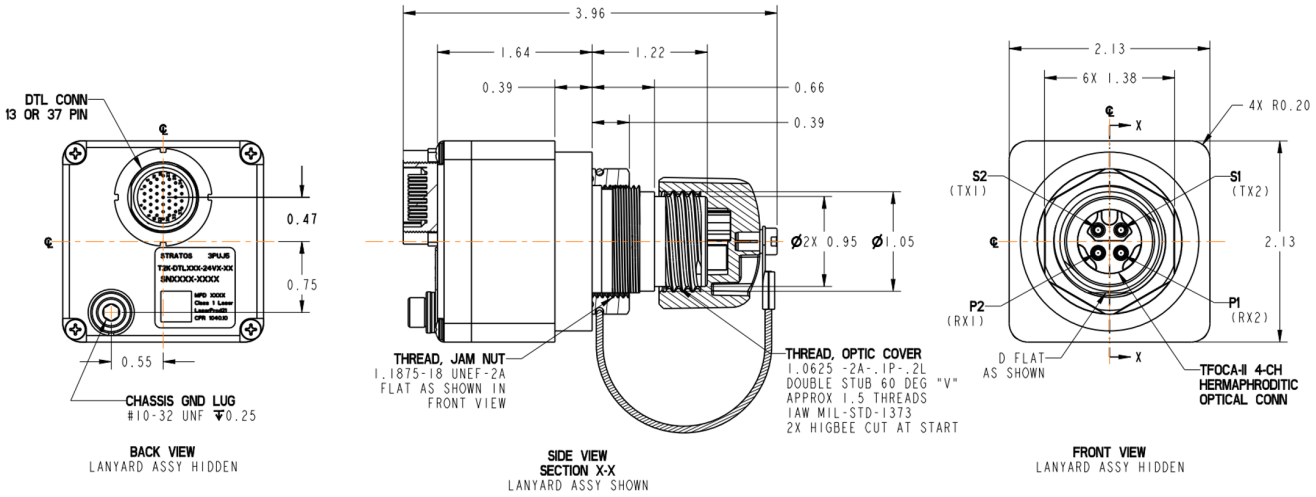
*All dimensions in inches

Torque Specifications

Item	Torque (in - lbs)	Recommended Tool	Description
Jam nut, optical lanyard	22 ± 2	1-3/8in	Wrench / socket wrench
Screw, grounding lug	22 ± 2	5/32in	Hex wrench
800-012-07NF8-13PN (T2F-DTL)	22 ± 2	Gleanair 600-146-04	13-pin spanner tool
800-012-07MT12-37PN (T2K-DTL)	22 ± 2	Glenair 600-146-08	37-pin spanner tool

T2X-DTL Dimensions

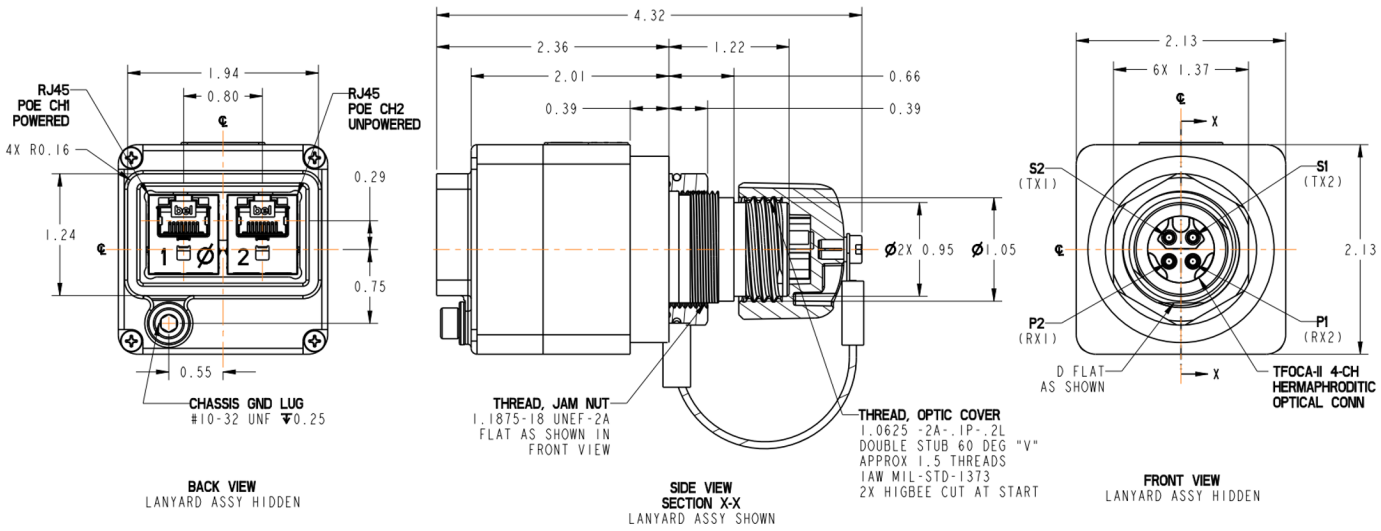
Applicable Part Numbers: T2F-DTL002-24V, T2F-DTL002-24V-01, T2K-DTL002-24V, T2K-DTL002-24V-01, T2K-DTL202-24V, T2K-DTL202-24V-01, T2K-DTL602-24V, T2K-DTL602-24V-01, T2K-DTL802-24V, T2K-DTL802-24V-01



*All dimensions in inches

T2X-RJ Dimensions

Applicable Part Numbers: T2F-RJ002-POE, T2F-RJ002-POE-01, T2K-RJ002-POE, T2K-RJ002-POE-01, T2K-RJ202-POE, T2K-RJ202-POE-01, T2K-RJ602-POE, T2K-RJ602-POE-01, T2K-RJ802-POE, T2K-RJ802-POE-01



*All dimensions in inches

Environmental Compliance

Category	Standard	Conditions
Operating Temperature	MIL-STD-810, Method 501 & 502	-40°C to +71°C
Thermal Shock	MIL-STD-810, Method 503	-40°C to +71°C
High Temp Operating Life	MIL-STD-202G, Section 108A	1000 hours at +71°C
Vibration	MIL-STD-810, Method 514.6	16.9 GRMS, 3 axes, 1 hr per axis
Mechanical Shock	MIL-STD-810, Method 516.6	20G peak, 18ms
Humidity	MIL-STD-810, Method 507.5	85% RH, -32°C to +27°C
Altitude	MIL-STD-810, Method 500	40,000ft transport
MTBF	MIL-HDBK-217FN2	100,000 hours, 30°C GB enviornment

Regulatory Compliance

Requirement	Feature	Condition	Notes
MIL-STD-883-3015.7	ESD	Class II	2200V
IEC-801-2	ESD	Human body model	25KV
IEC-801-3	EMI	Immunity	10V/M
FCC	EMI	Class A	>20dB
IEC-825 ISSUE 1993-11	Eye safety	Class 1	
FDA CDRH 21-CFR 1040	Eye safety	Class 1	

REVISION HISTORY

Rev	Description	OP	Date
A1	Initial release, combined datasheets	BAA	2021-12-17
A2	RX SENS corrected to -32dBm to -3dBm	BAA	2021-01-04
A3	T2F-002 Optical limit CHG ER min from 7 to 8	BAA	2021-01-06
A4	Paper change only, better image for 800-012-07NF8-13PN, simplify description on bullet 1 in key benefits & features	BAA	2021-01-07
A5	Maximum rating - min voltage changed to 8V, added extended range 802 product with 1550nm optics, removed TYP RISE/FALL T2F	BAA	2021-02-18
A6	Add link budget reference section	BAA	2022-03-08
A7	Revise dimensioning & image for 9.5 and 9.6	TD	2022-06-02