

Direct 9 Series

ARINC 801 Compliant Optical Transceiver, 100Base-FX Applications, Multimode, 1310nm

Duplex Optical Transceiver Unit



FEATURES

- Compliant with IEEE-802.3u / 100Base-FX Fast Ethernet
- Optical fiber link distances up to 2.0Km (62.5/125µ 500MHz*Km MMF)
- Maximum optical channel bit error rate less than 2.5×10^{-10}
- Operating temperature range from -40°C to $+85^{\circ}\text{C}$
- Shock and vibration resistant per RTCA / D0-160E
- Electroless nickel plating meets stringent EMI / RFI performance specifications
- D-Subminiature housings are strong, durable, corrosion resistant and light weight
- ARINC 801 compliant optical fiber connector interface
- Threaded mating connectors provide secure interface conditions in high shock and vibration environments

APPLICATIONS

Direct 9 series printed circuit board mounted optical transceivers enable high speed network communications over long distances in harsh environments.

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

The 9 position D-Subminiature shell provides a rugged optical interface that is compliant with ARINC 801.

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

DESCRIPTION

Direct 9 series D-Subminiature optical fiber transceivers consist of optoelectronic transmitter and receiver functions integrated into a printed circuit board mounted D-Subminiature / ARINC 801 compliant receptacle connector. The optical transmitters are 1310nm light emitting diodes. The transmitter input lines are driven with differential LVPECL signals applied to the transmitter (TX+ and TX-) lines. Temperature compensated, LED drivers convert the transmitter input signals to a suitable modulation current.

The optical receivers consist of PIN and preamplifier assemblies and limiting post-amplifiers. Outputs from the receivers consist of differential LVPECL data signals on the receiver (RX+ and RX-) lines and a single ended LVPECL Signal Detect function on the SD pin.

The receiver data lines are squelched upon Signal Detect deassertion, preventing errant data generation when an invalid incoming optical signal is presented to the transceiver. The optical mating interface to the Direct 9 series D-Subminiature optical fiber transceivers is a DB-9 fiber optic cable plug with ARINC 801 contacts. The electrical interface to the Direct 9 series D-Subminiature optical transceivers is a solder pin field enabling direct substitution for existing electrical 9 position D-Subminiature connectors.

Direct 9 series D-Subminiature optical fiber transceivers are vibration isolated, environmentally hardened components designed for use in harsh environment applications.

ORDERING INFORMATION

Application	Product Number
100Base-FX Fast Ethernet	P24D-2L1C-EF

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Single Port Direct 9 Series D-Subminiature / ARINC 801 Optical Transceiver,
100Base-FX / Fast Ethernet Applications, Multimode, 1310nm LED's

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		+4.5	V
Data Input Voltage	V_I	-0.5		V_{CC}	V
Differential Input Voltage (p-p)	V_D			2.0	V
RX Output Current	I_O			50	mA

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Operating Temperature	T_A	-40		+85	°C
Power Supply Voltage	V_{CC}	+3.135		+3.465	V
TX Common Mode Voltage	V_{CM}		2.0		V
TX Differential Input Voltage (p-p)	V_D	0.35		1.25	V
Power Supply Noise (p-p)	N_P			200	mV

SPECIFICATIONS COMPLIANCE

Requirement	Feature	Condition	Notes
RTCA / D0-160E	ESD	Class II	2200V
RTCA / D0-160E	Vibration	3.8g ² /Hz	43G rms
RTCA / D0-160E	Shock	40.0g	6-9mS
RTCA / D0-160E	Flame Resistance	Method 1012	30 Seconds
RTCA / D0-160E	Damp Heat	10 Cycles	24 Hours
Arinc 801	Mating Durability	500 Cycles	<0.5dB Change
FDA / CDRH / IEC-825-1	Eye Safety	Class 1	No Safety Interlocks Required

MATERIALS

Item	Detail	Notes
Shell	Steel Alloy	
Shell Plating	Electroless Nickel	
Insert	Thermoplastic	
Solder Pins	Brass	
Solder Pin Plating	Gold	
Alignment Sleeves	Composite Polymer	
Printed Circuits	Polyimide / FR-4	

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TRANSMITTERS T_A = Operating Temperature Range, V_{CC} = 3.135V to 3.465V

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Output Power ¹	P_o	-19.0		-14.0	dBm
Optical Output Wavelength	λ_{OUT}	1261	1310	1360	nM
Extinction Ratio	ER	10.0			dB
Optical Rise / Fall Time (10% to 90%)	$t_{R,F}$	0.6		3.0	nS
Duty Cycle Distortion (p-p)	DCD			1.0	nS
Data Dependent Jitter (p-p)	DDJ			0.6	nS
Random Jitter (p-p)	RJ			0.76	nS

 1. BER=2.5x10⁻¹⁰ @ 125Mbps, PRBS 2⁷-1, NRZ, P_o = Power launched into 62.5/125 μ patch cable - 1.0 meter long

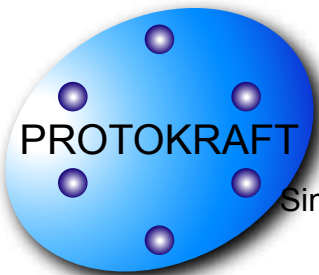
RECEIVERS T_A = Operating Temperature Range, V_{CC} = 3.135V to 3.465V

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Sensitivity ¹	P_i	-31.5		-8.0	dBm
Optical Wavelength	λ_{IN}	1100		1590	nM
Contributed Duty Cycle Distortion (p-p)	DCD			0.4	nS
Contributed Data Dependent Jitter (p-p)	DDJ			1.0	nS
Contributed Random Jitter (p-p)	RJ			2.14	nS
Signal Detect Assert Time	t_{SDAS}		<10	100	μ S
Signal Detect Deassert Time	t_{SDDA}		<10	350	μ S
Signal Detect Threshold					
Decreasing Light	LSTD	-45.0		-34.5	dBm
Increasing Light	LSTI	-45.0		-34.0	
Signal Detect Hysteresis	HYS	1.5	2.25	3.5	dB
RX Data Output - Low	$V_{OL} - V_{CC}$	-1.810		-1.475	V
RX Data Output - High	$V_{OH} - V_{CC}$	-1.165		-0.880	V

 1. BER=2.5x10⁻¹⁰ @ 125Mbps, PRBS 2⁷-1, NRZ, Compliant with FDDI PMD ISO / IEC 9314-3 and IEEE-802.3u

Supply Current Requirements T_A = Operating Temperature Range, V_{CC} = 3.135V to 3.465V

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Current (per channel)	I_{CCT}		190	245	mA

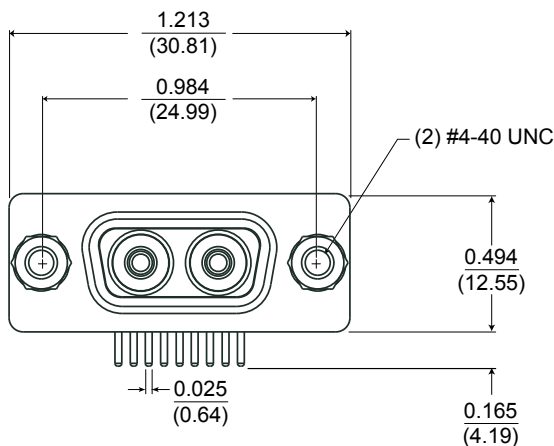


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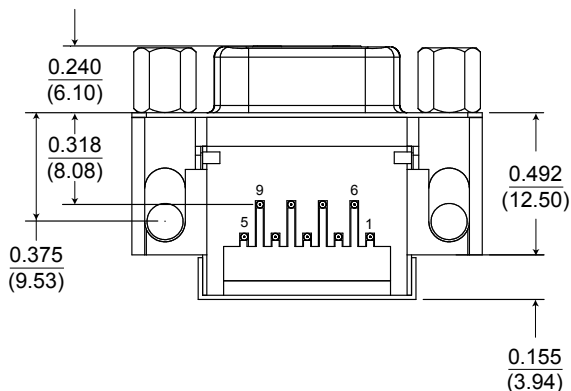
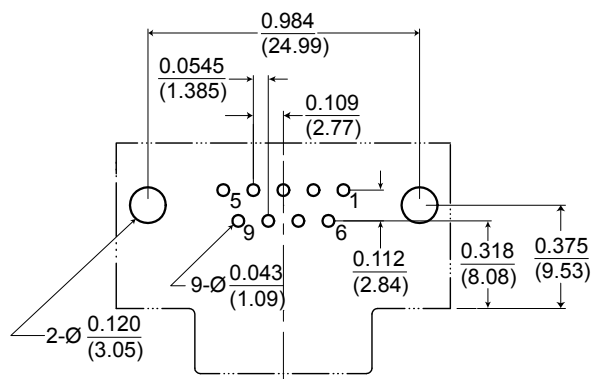
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OUTLINE DRAWING

Dimensions are shown as: inches (mm)

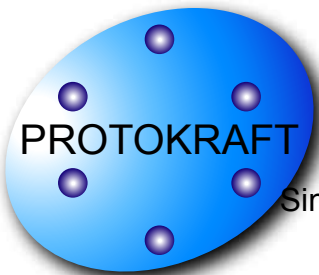


Recommended PCB Layout Top View - Component Side



Aqueous washing is permitted with the protective covers in place.
If necessary, after washing, clean the optical barrels with lint free swabs and Isopropyl alcohol
The transceivers are conformally coated but after aqueous washing the units should be baked @
85°C for 1.0 hour to eliminate any retained moisture.

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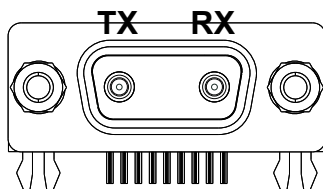
ELECTRICAL PIN ASSIGNMENTS

D-Subminiature Shell Size 09

Pin Number	Symbol	Description	Logic Family
1	RX-	Receiver Data - Output	LVPECL
2	RX+	Receiver Data - Output	LVPECL
3	GND	Ground	N/A
4	TX-	Transmitter Data - Input	LVPECL Internal 100Ω differential termination
5	TX+	Transmitter Data - Input	LVPECL Internal 100Ω differential termination
6	V _{cc}	Power Supply	N/A
7	SD	Loss of Signal Indicator - Output Satisfactory Operation: Logic "1" Output Optical Fault: Logic "0" Output	LVPECL
8	GND	Ground	N/A
9	GND	Ground	N/A

INSERT ARRANGEMENT

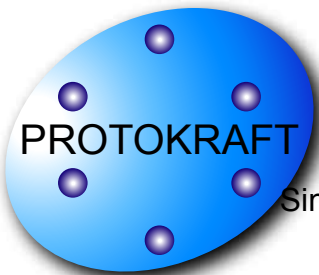
D-Subminiature Shell Size 09



Front face of the
transceiver socket
insert shown!

Mating cable plug
interface opposite.

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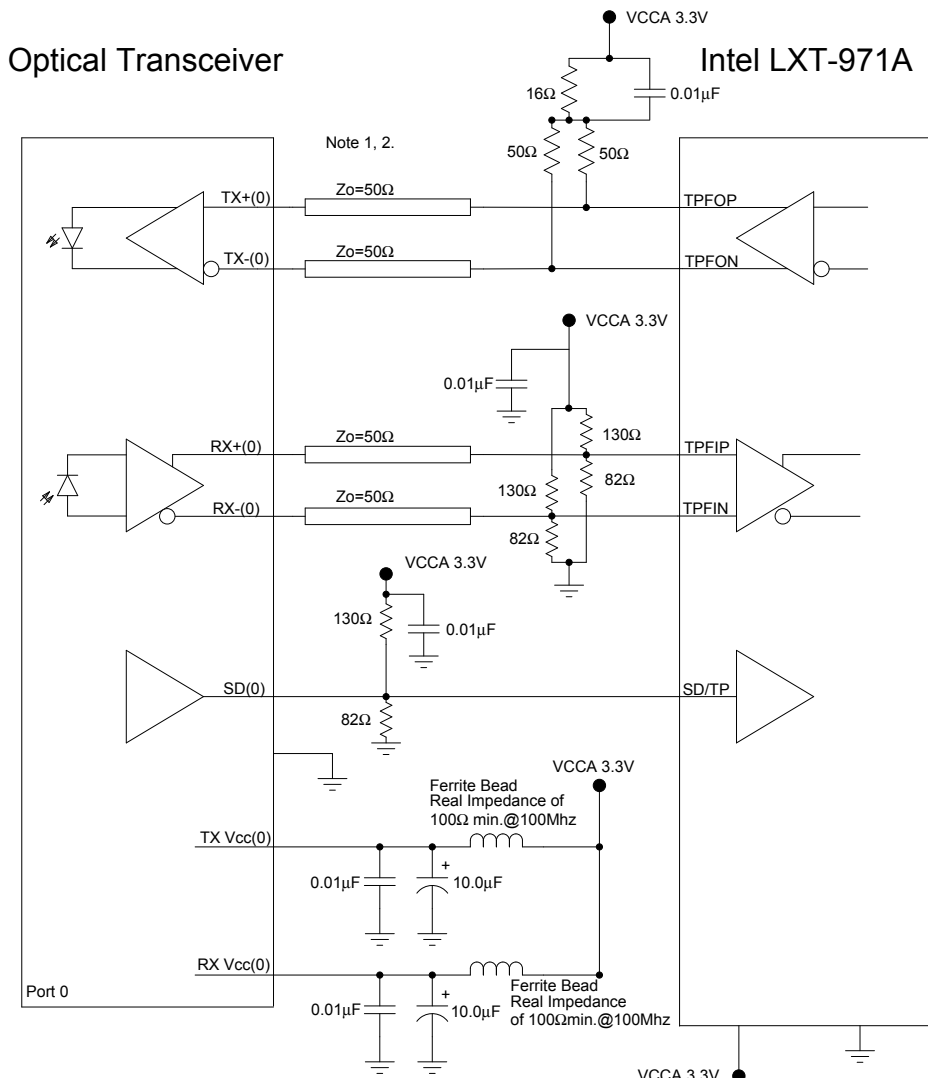


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APPLICATION SCHEMATIC

For +3.3V LVPECL PHY Circuits

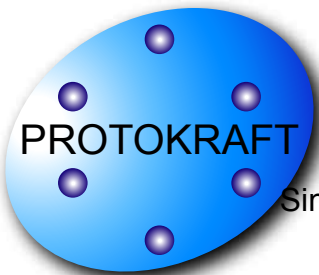


Note 1
When using controlled impedance cable (Coaxial cable),
lengths of >1meter are obtainable.

Note 2
50 ohm impedance termination shown.
For other impedance requirements please consult the factory

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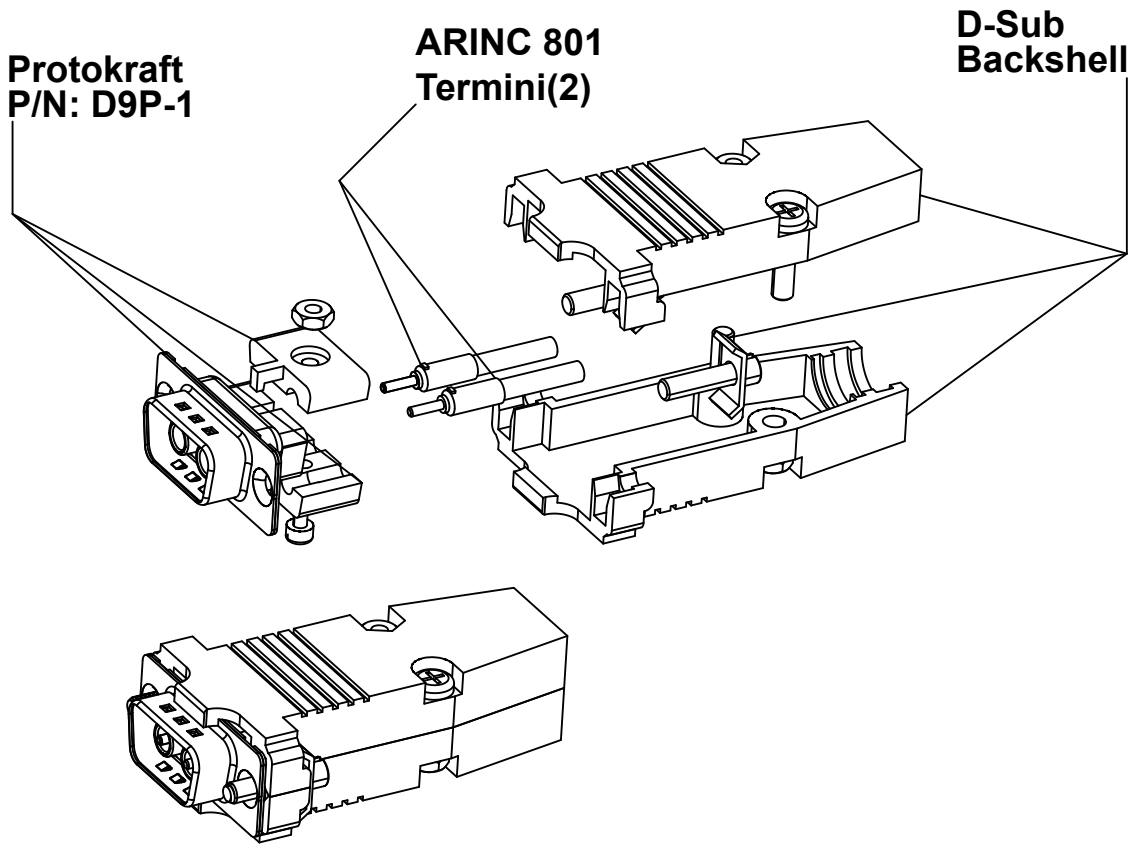


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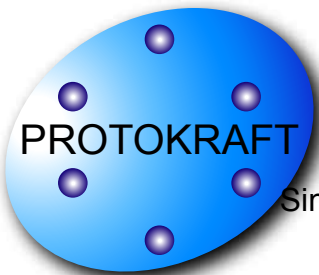
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APPENDIX A1

DIRECT 9 FIBER OPTIC CABLE PLUG / ARINC 801 PIN TERMINI



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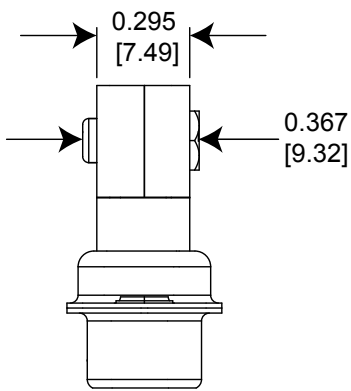
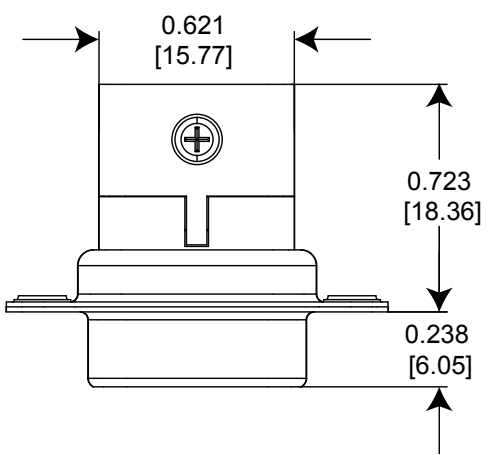
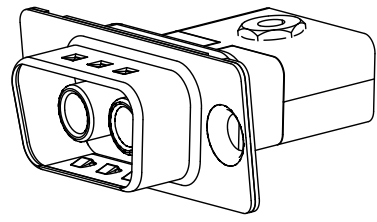
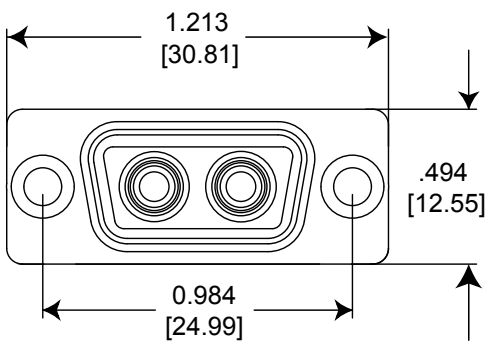


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APPENDIX A2

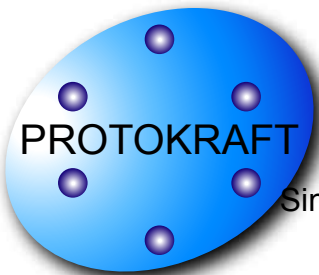
Direct 9 Fiber Optic D-Subminiature Cable Plug Insert

Dimensions are shown as: inches [mm]



Protokraft Direct 9 Fiber Optic Cable Plug Part Number: D9P-1

See Appendix A3 for test cable options

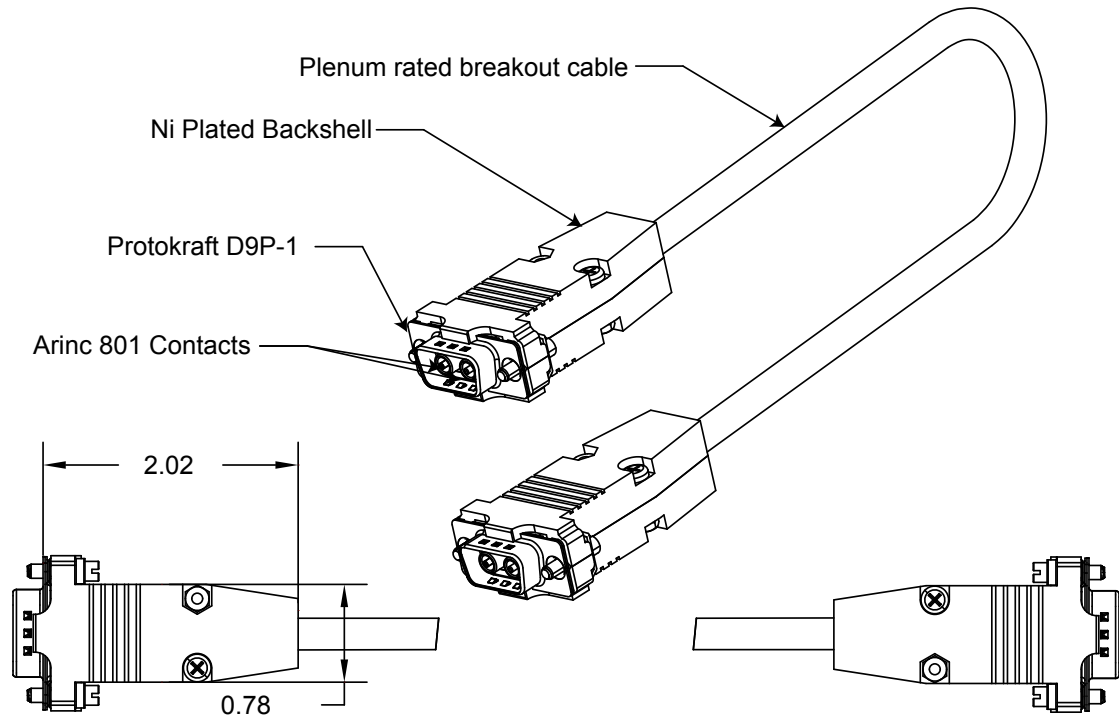


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APPENDIX A3

Direct 9 Fiber Optic D-Subminiature Test Cable Options



P24C-0121 -1 Shown



- P24C-XX X X- X
- 01-99 Meters
 - 1 = 50µm
 - 2 = 62.5µm
 - 1 = D9P-1 STRAIGHT
 - 2 = D9P-1 RIGHT ANGLE
 - 1 = D9P-1 STRAIGHT
 - 2 = D9P-1 RIGHT ANGLE
 - 3 = ST
 - 4 = LC
 - 5 = FC

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