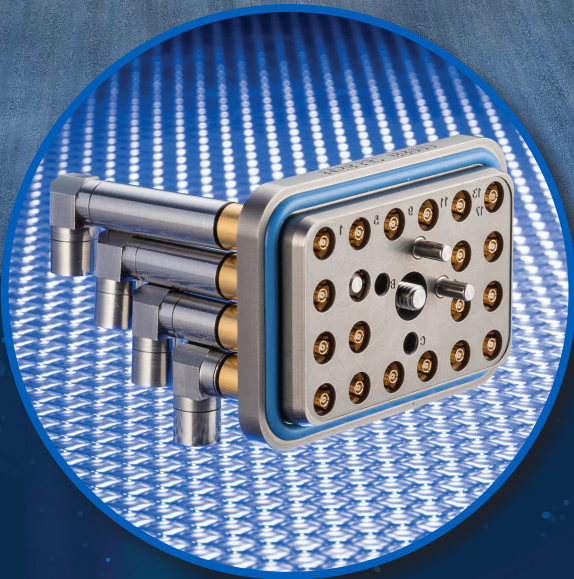


High-Density Interconnect

Multi-Port Systems



T **TIMES**
MICROWAVE SYSTEMS
AN AMPHENOL COMPANY

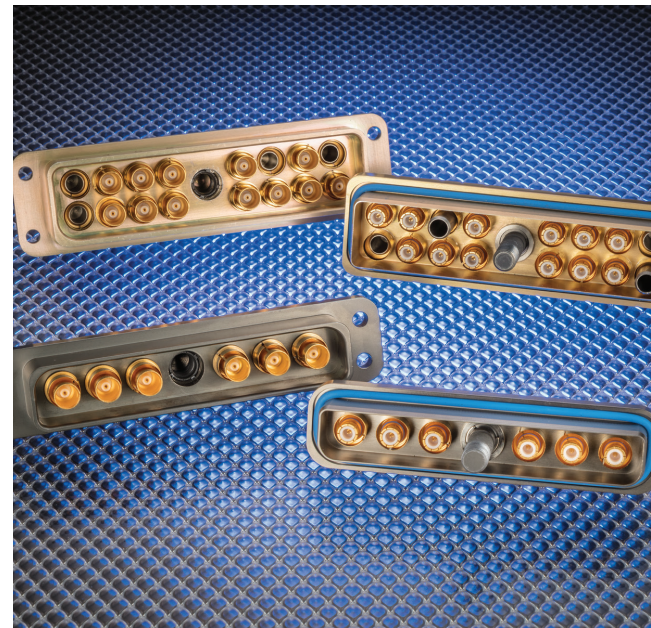
High-Density Interconnect

Multi-Port Systems



M8 MULTI-PORT

The TIMES MICROWAVE SYSTEMS M8 Multi-Port Connector system was designed for high performance environments and qualified to meet the demanding transmission line assembly specifications of MIL-T-81490 and MIL-C-87104 offering excellent shielding and phase stability with low VSWR and insertion loss up to 20 GHz. The M8 interconnection system easily survives harsh environments where high vibration, shock, temperature and humidity can cause cable and system performance degradation. The TIMES MICROWAVE SYSTEMS M8 Multi-port interconnect system is presently used on a number of airborne applications and has logged hundreds of thousands of flight hours.



16 and 6 port M8 shells

M8 Features:

- 20 GHz Operating Frequency
- Replaceable Interfaces (optional)
- Hermetically sealed connector housing and contacts
- Spring loading interfaces to guarantee full mating and electrical performance under all environmental conditions
- Better than 100 dB of isolation between channels
- Available in Phase Matched and equalized assemblies
- Stainless Steel and Titanium (for weight savings) coaxial connectors
- Jackscrew mating system

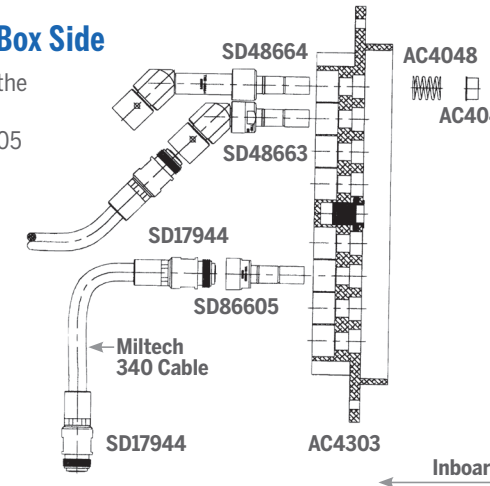


M8 MULTI-PORT Typical System / Replaceable Front Ends

Receptacle/ Box Side

Typically used on the following cables:

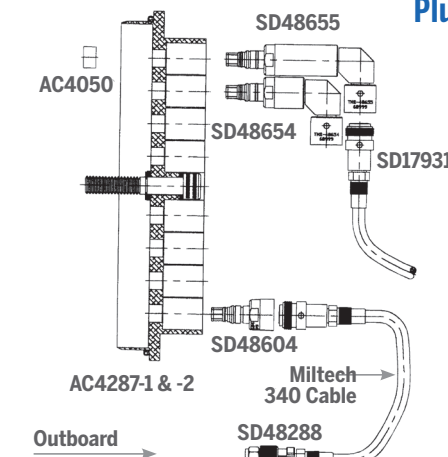
- TFlex 402 and 405
- RG402, 405 and SF-142
- PhaseTrack (PT) 110 & 150



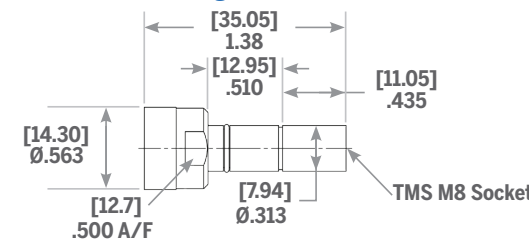
Plug/Harness Side

Typically used on the following cables:

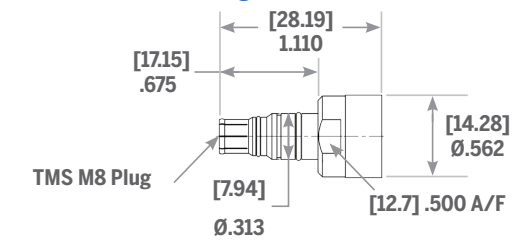
- Miltech (MT) 210 thru 480
- Miltech (MTL) 210 thru 440
- PhaseTrack (PT) 150 thru 318



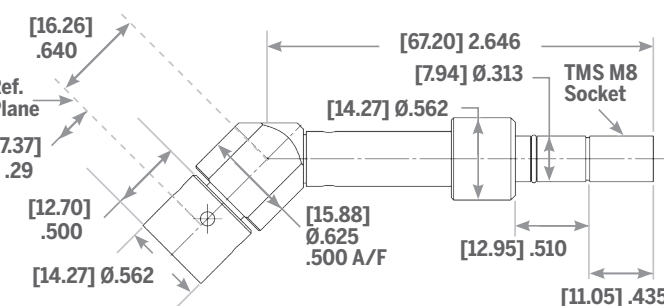
Straight SD48605



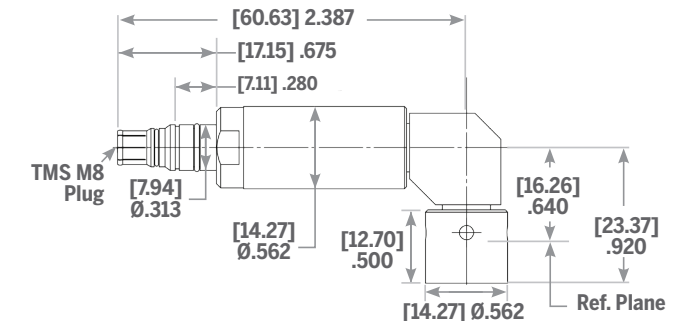
Straight SD48604



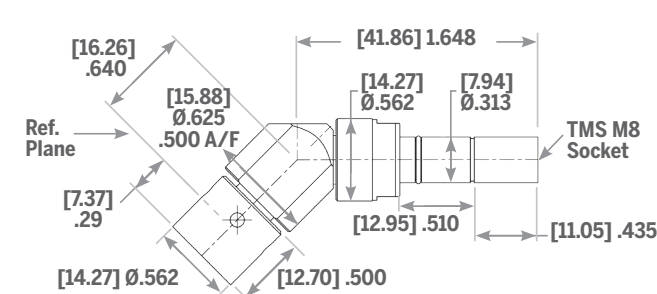
45° SD48664



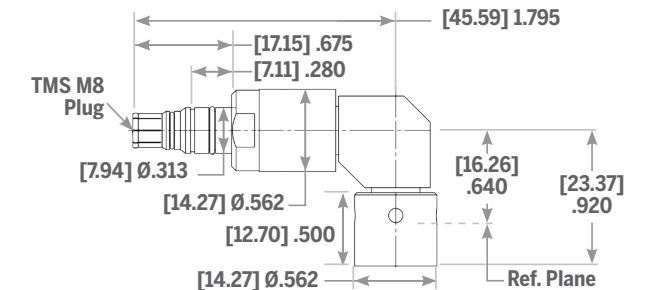
90° SD48655



45° SD48663



90° SD48654



High-Density Interconnect

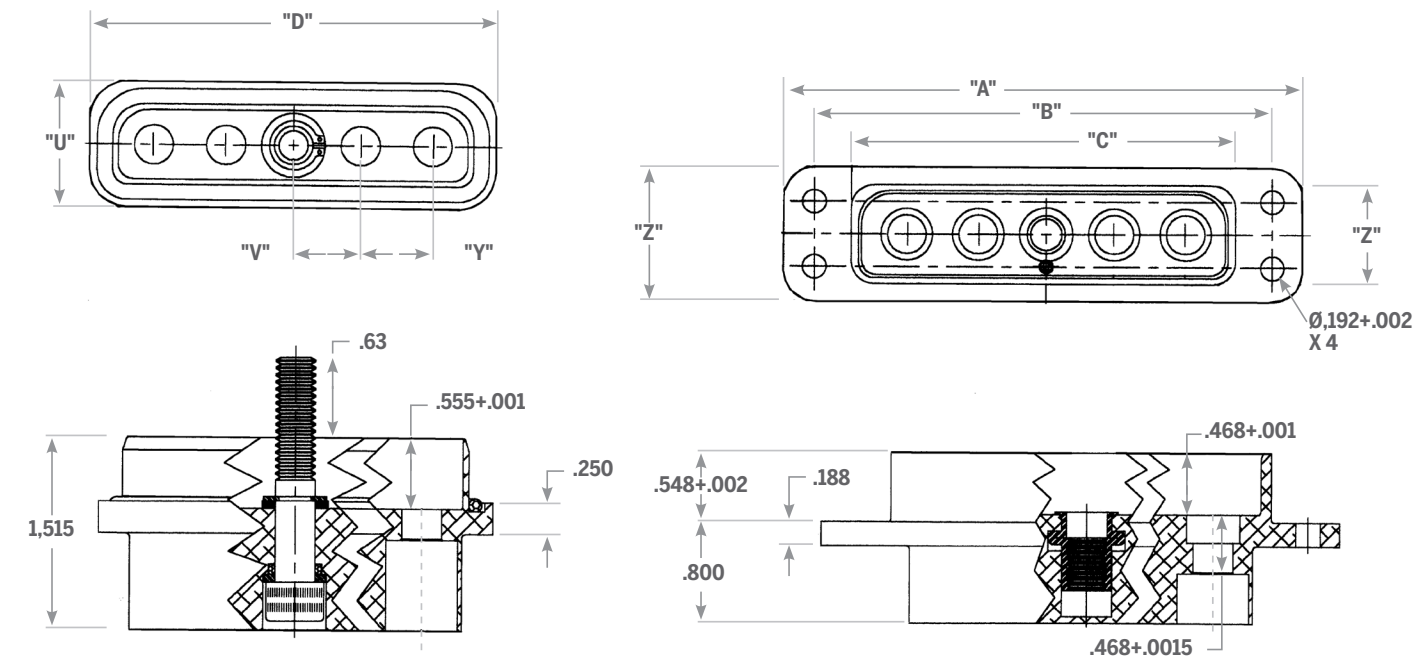
Multi-Port Systems

M8 MULTI-PORT Shells - Single Row

The TIMES MICROWAVE SYSTEMS M8 Multi-Port connector is available with:

- 0.440"/11.18cmm contact spacing, can accept cable diameters up to 0.31"/7.88mm.
- 0.585"/14.86mm contact spacing, can accept cable diameters up to 0.48"/12.19mm.

Dimensions vs. Number of Ports



Port Spacing	"U"	"V"	"W"	"X"	"Y"	"Z"
0.440	0.960	0.512	1.020	0.500	0.440	0.734
0.585	1.035	0.585	1.093	0.531	0.585	0.807

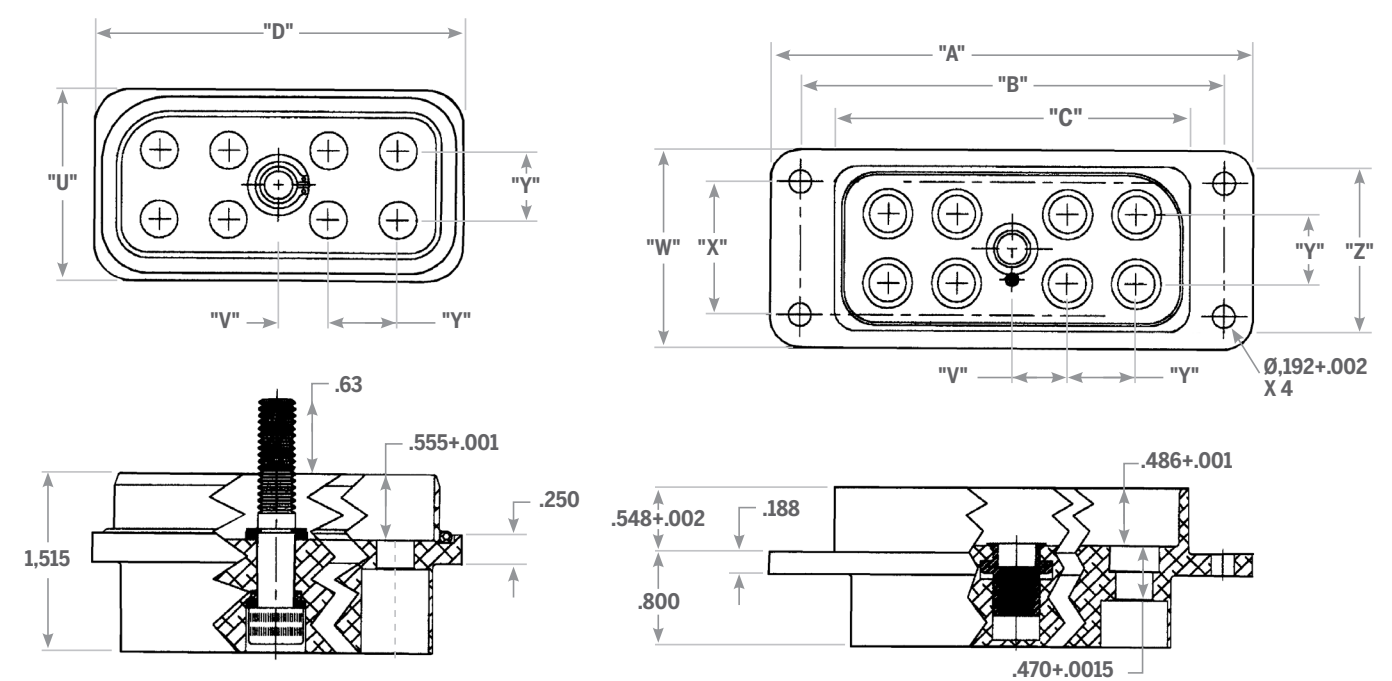
N° of Ports	Plug P/N	Receptacle P/N	Port Spacing	"A"	"B"	"C"	"D"
4	AC4512	AC4513	0.440	3.700	3.300	2.800	3.000
6	AC4514	AC4515	0.440	4.580	4.180	3.680	3.880
8	AC4516	AC4517	0.440	5.460	5.060	4.560	4.760
4	AC4518	AC4519	0.585	4.290	3.790	3.210	3.410
6	AC4520	AC4521	0.585	5.460	4.960	4.380	4.580
8	AC4522	AC4523	0.585	6.630	6.130	5.550	5.750

M8 MULTI-PORT Shells - Double Row

The TIMES MICROWAVE SYSTEMS M8 Multi-Port connector is available with:

- 0.440"/11.18cmm contact spacing, can accept cable diameters up to 0.31"/7.88mm.
- 0.585"/14.86mm contact spacing, can accept cable diameters up to 0.48"/12.19mm.

Dimensions vs. Number of Ports



Port Spacing	"U"	"V"	"W"	"X"	"Y"	"Z"
0.440	1.400	0.504	1.460	0.875	0.440	1.174
0.585	1.620	0.507	1.678	1.125	0.585	1.392

N° of Ports	Plug P/N	Receptacle P/N	Port Spacing	"A"	"B"	"C"	"D"
4	AC4524	AC4525	0.440	2.720	2.320	1.820	2.020
8	AC4526	AC4527	0.440	3.600	3.200	2.700	2.900
12	AC4528	AC4529	0.440	4.480	4.080	3.580	3.780
16	AC4530	AC4531	0.440	5.360	4.960	4.460	4.660
4	AC4532	AC4533	0.585	2.910	2.410	1.830	2.030
8	AC4534	AC4535	0.585	4.080	3.580	3.000	3.200
12	AC4536	AC4537	0.585	5.250	4.750	4.170	4.370
16	AC4538	AC4539	0.585	6.420	5.920	5.340	5.540

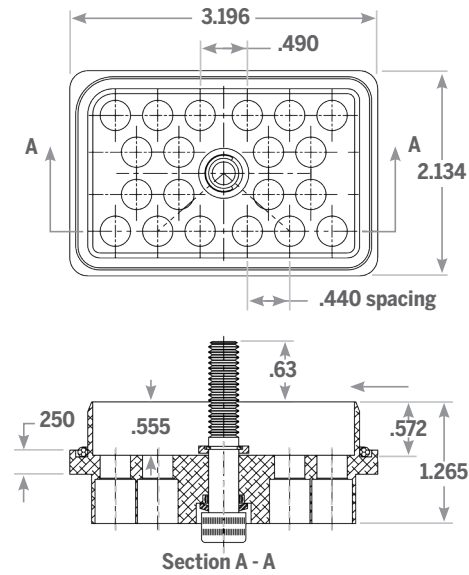
High-Density Interconnect

Multi-Port Systems

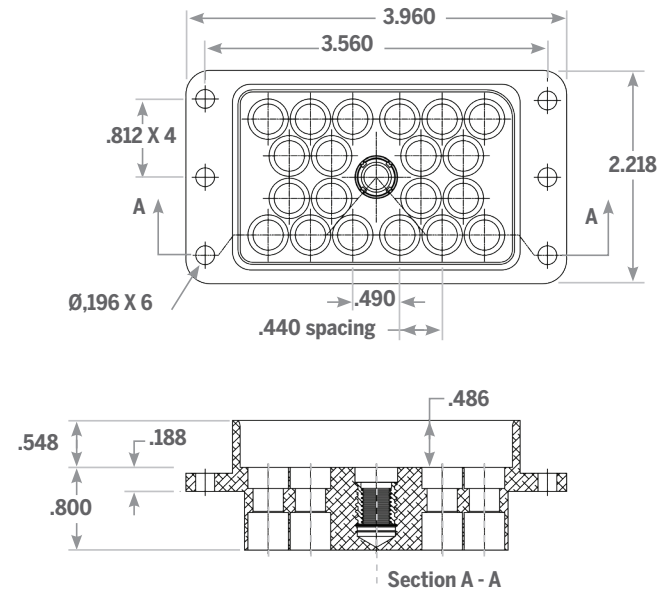
M8 MULTI-PORT Shells - 20 and 24 Port 4 Row

.440" port spacing for cable diameters up to 0.31" / 7.88mm

P/N 49804



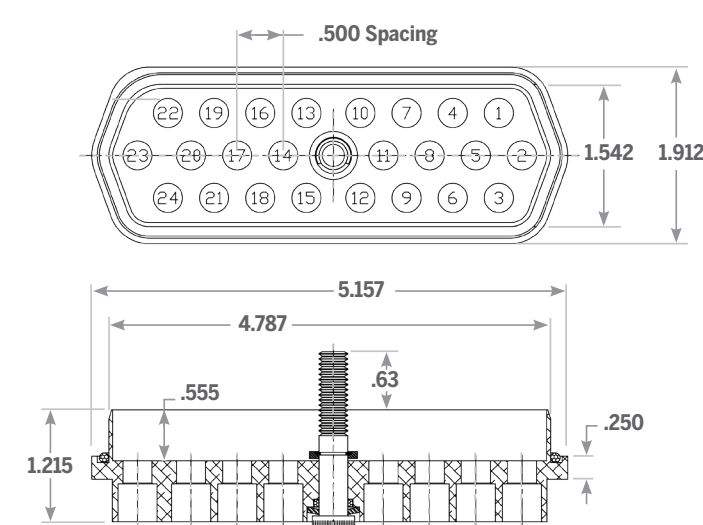
P/N 49805



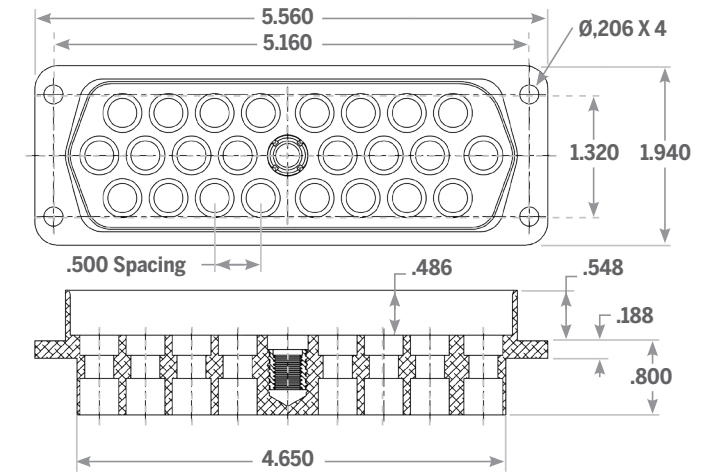
M8 MULTI-PORT Shells - 24 Port / Tool

.500" port spacing for cable diameter up to 0.31" / 7.88mm

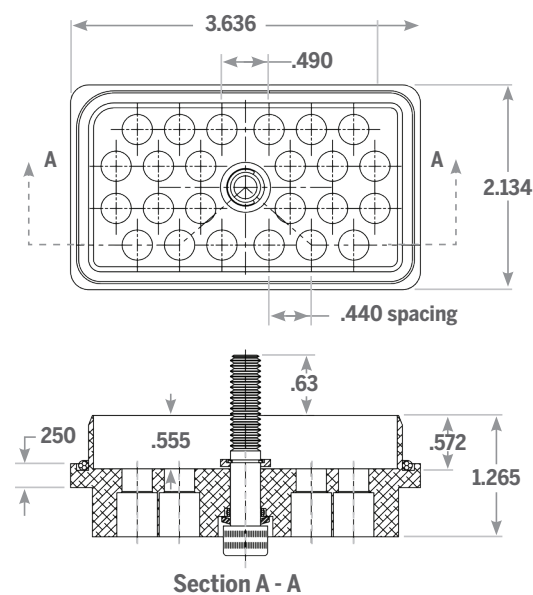
P/N 49764



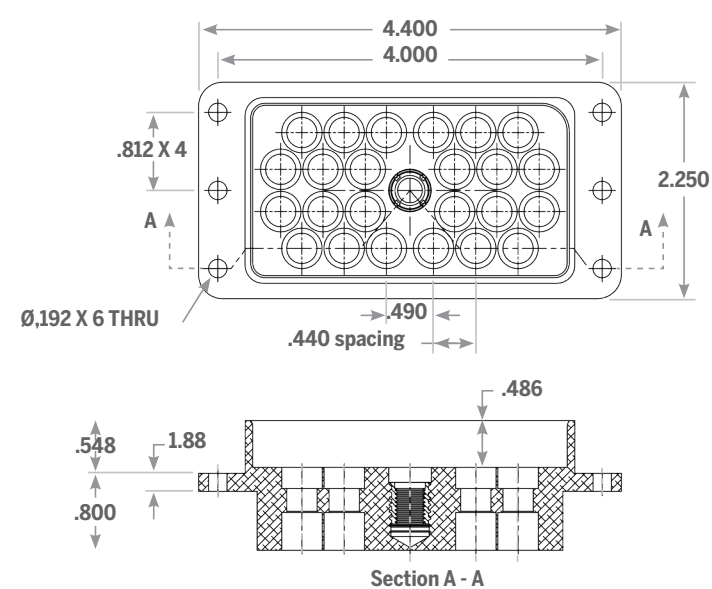
P/N 49763



P/N 49705



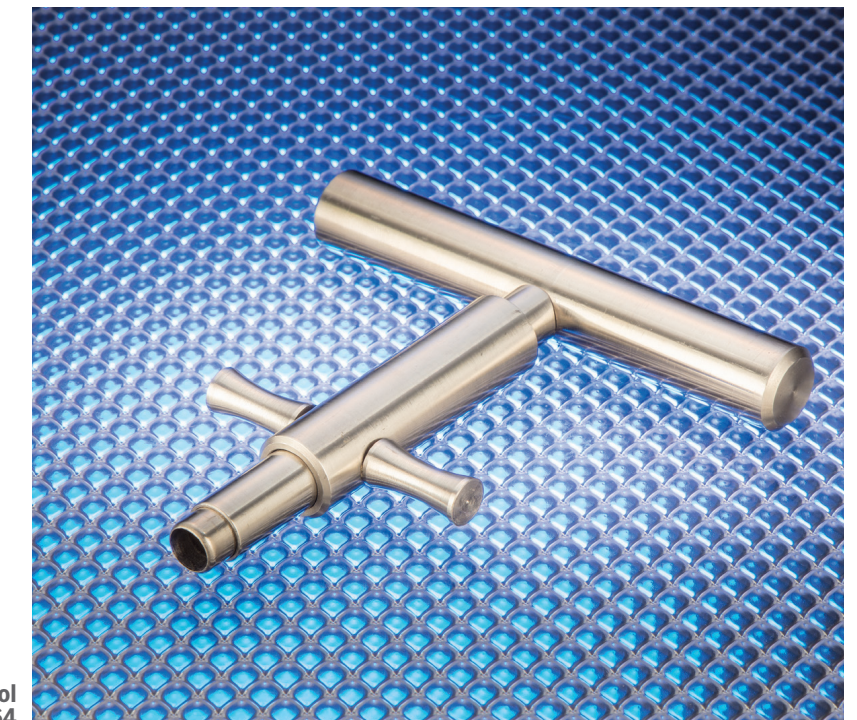
P/N 49706



M8 Contact Insertion/ Extraction Tool

The insertion and extraction of M8 Multi-Port contacts from the M8 shell is a simple process that uses an easily operated insertion/extraction hand tool. This factory tool is designed for production line applications.

Factory Tool
TN-2964



High-Density Interconnect

Multi-Port Systems

MINI MULTI-PORTS - "MMP"

The TIMES MICROWAVE SYSTEMS Mini Multi-Port Connector (MMP) system was designed after our M8 product line to meet the same high performance environment standards and qualified to meet the demanding transmission line assembly specifications of MIL-T-81490 and MIL-C-87104 offering excellent shielding and phase stability with low VSWR and insertion loss up to 40 GHz. The MMP interconnection system easily survives harsh environments where high vibration, shock, temperature and humidity can cause serious cable and system performance degradation. The TIMES MICROWAVE SYSTEMS MMP system is presently used on a number of airborne applications and has logged tens of thousands of flight hours.

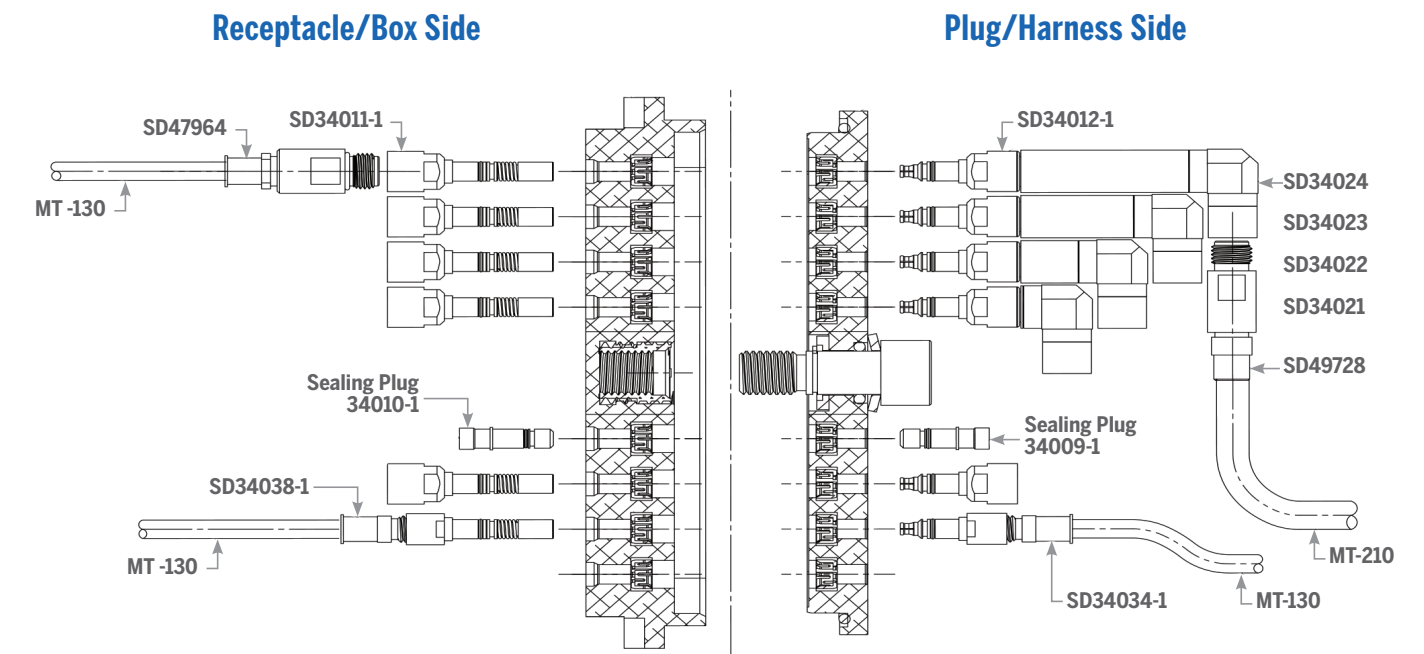


M8 Features:

- 40 GHz Operating Frequency
- Replaceable Interface (optional)
- Hermetically sealed housings and connector attachments
- Spring loading interfaces to guarantee full mating and electrical performance under all conditions
- Better than 100 dB of isolation between channels
- Available in Phase Matched and equalized assemblies
- Stainless Steel coaxial connector
- Jackscrew mating system



MINI MULTI-PORTS - "MMP" Typical System Interface



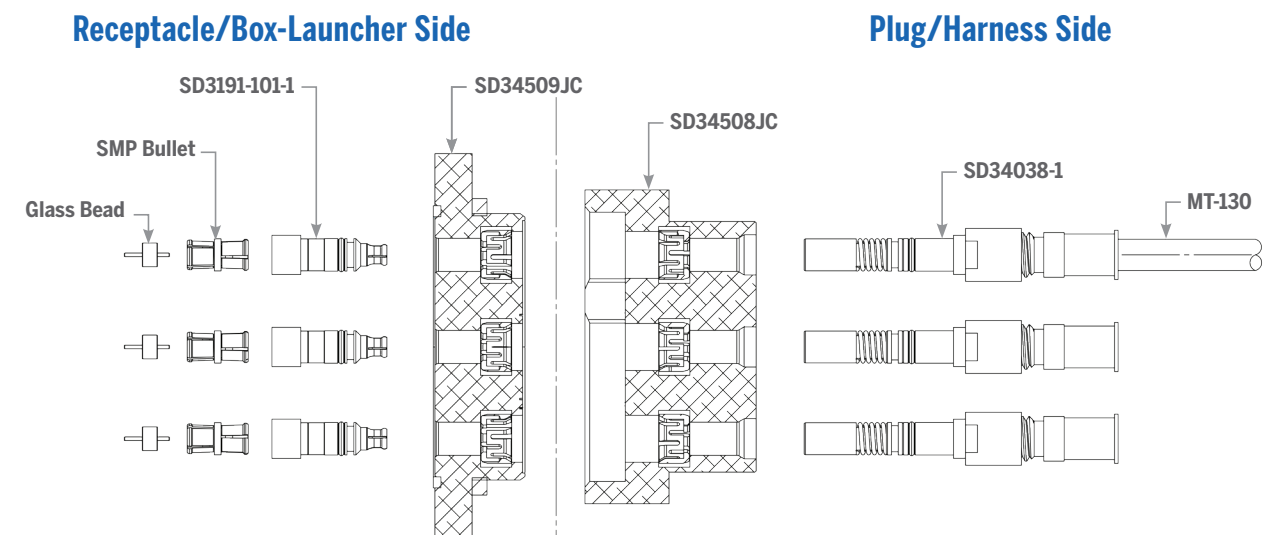
Typical System Interface for Modular Interface

Typically used on the following cables:

- PhaseTrack (PT) 110 thru 150
- TFlex 405
- RG405

Typically used on the following cables:

- MilTech (MT) 130 thru 210
- MilTech Lightweight (MTL) 130 thru 210
- PhaseTrack (PT) 110 thru 210

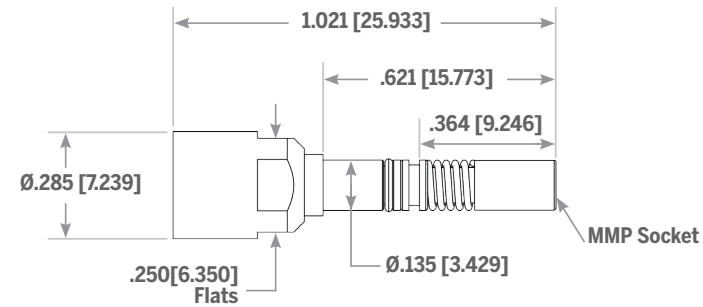


High-Density Interconnect

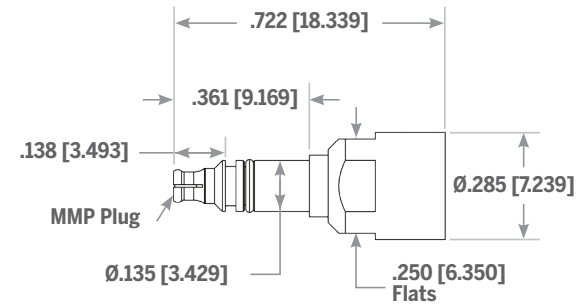
Multi-Port Systems

MINI MULTI-PORTS - "MMP"

P/N 34011-2
Replaceable Front End

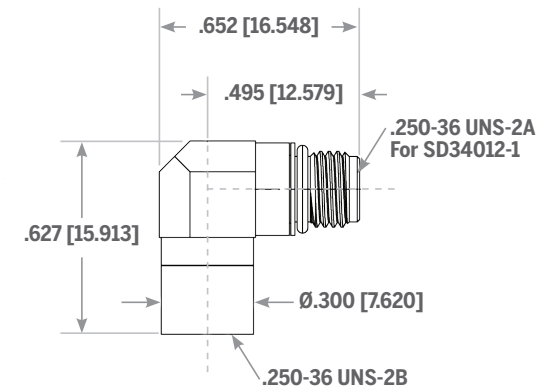


P/N 34012-2
Replaceable Front End

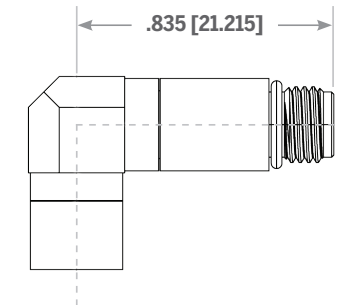


MINI MULTI-PORTS - "MMP"

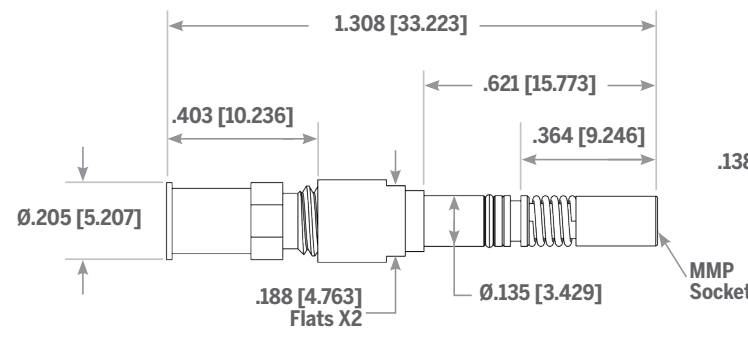
P/N 34021



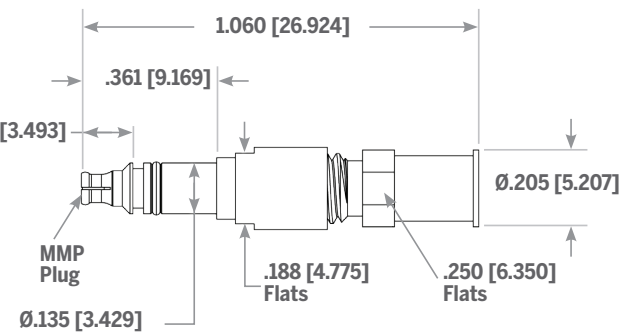
P/N 34022



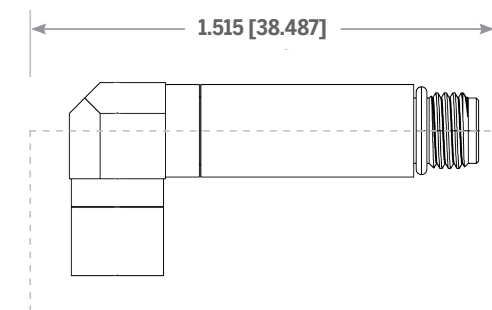
P/N 34038-1
Direct Cable Attachment
For MT130/MTL160



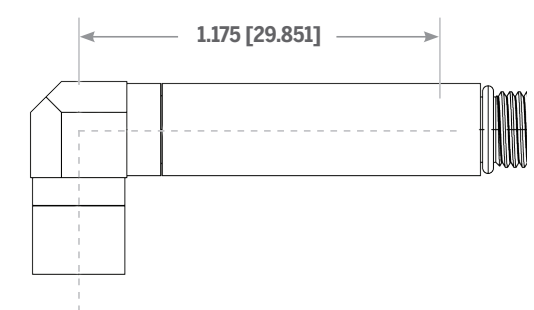
P/N 34034-1
Direct Cable Attachment
for MT130/MTL16



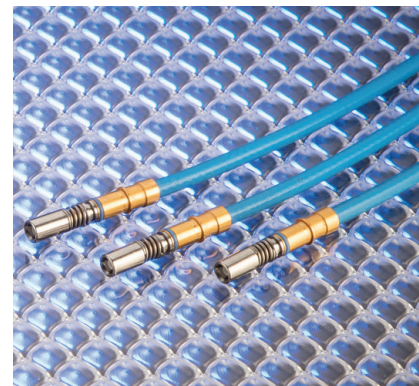
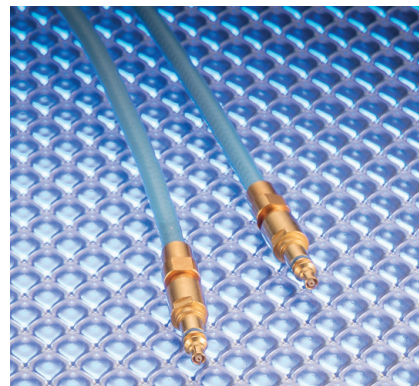
P/N 34023



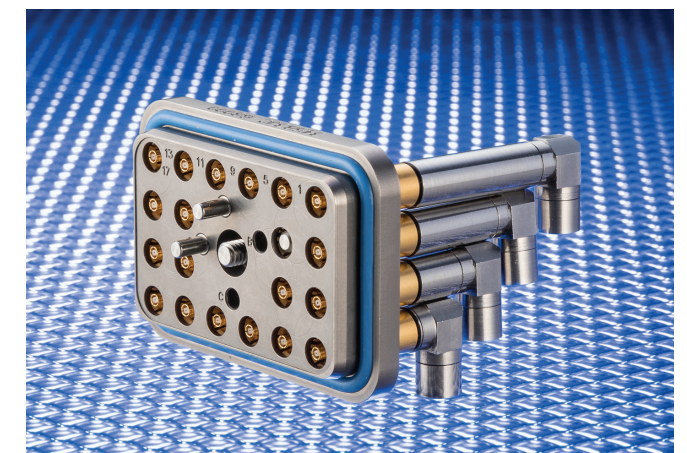
P/N 34024



Shown with P/N 34012-2 Replaceable Front Ends



Various right angle standoffs with replaceable MMP front ends



Nested angle standoffs in MMP shell

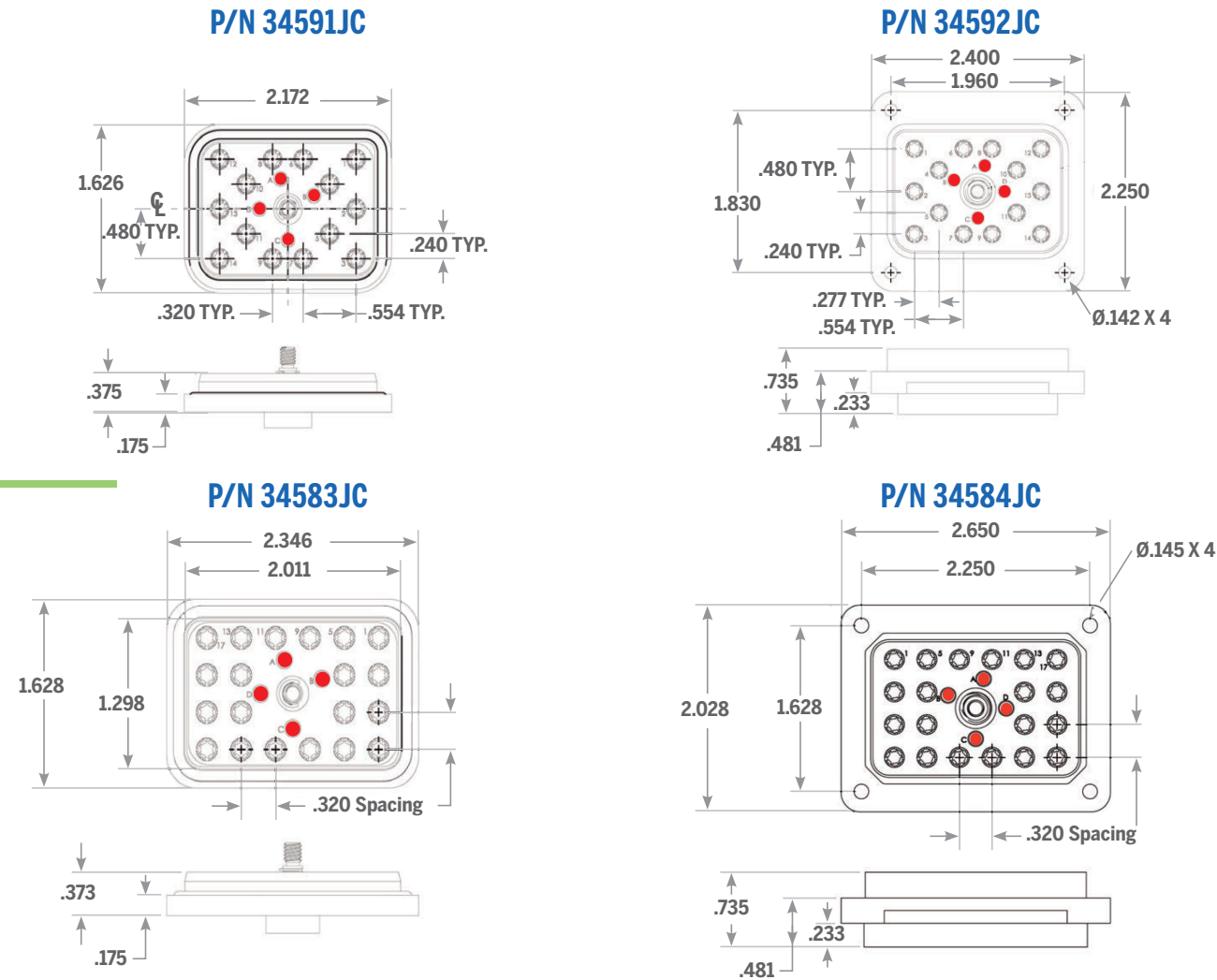
High-Density Interconnect

Multi-Port Systems

MINI MULTI-PORTS - "MMP" 14 and 20 port Keyed Shell

The Times Microwave Systems MMP Multi-Port connector is available with

- .0320"/8.13mm contact spacing, and can accept cable diameters up to .21"/5.33mm.



Plug Shell Pin Number Identification:

Note: Keying pin locations shown above in red

Option 1	Keying PIN CD	Receptacle Mate PIN AB
Option 2	Keying PIN BD	Receptacle Mate PIN AC
Option 3	Keying PIN BC	Receptacle Mate PIN AD
Option 4	Keyinh PIN AD	Receptacle Mate PIN BC
Option 5	Keying PIN AC	Receptacle Mate PIN BD
Option 6	Keying PIN AB	Receptacle Mate PIN CD

Receptacle Shell Pin Number Identification:

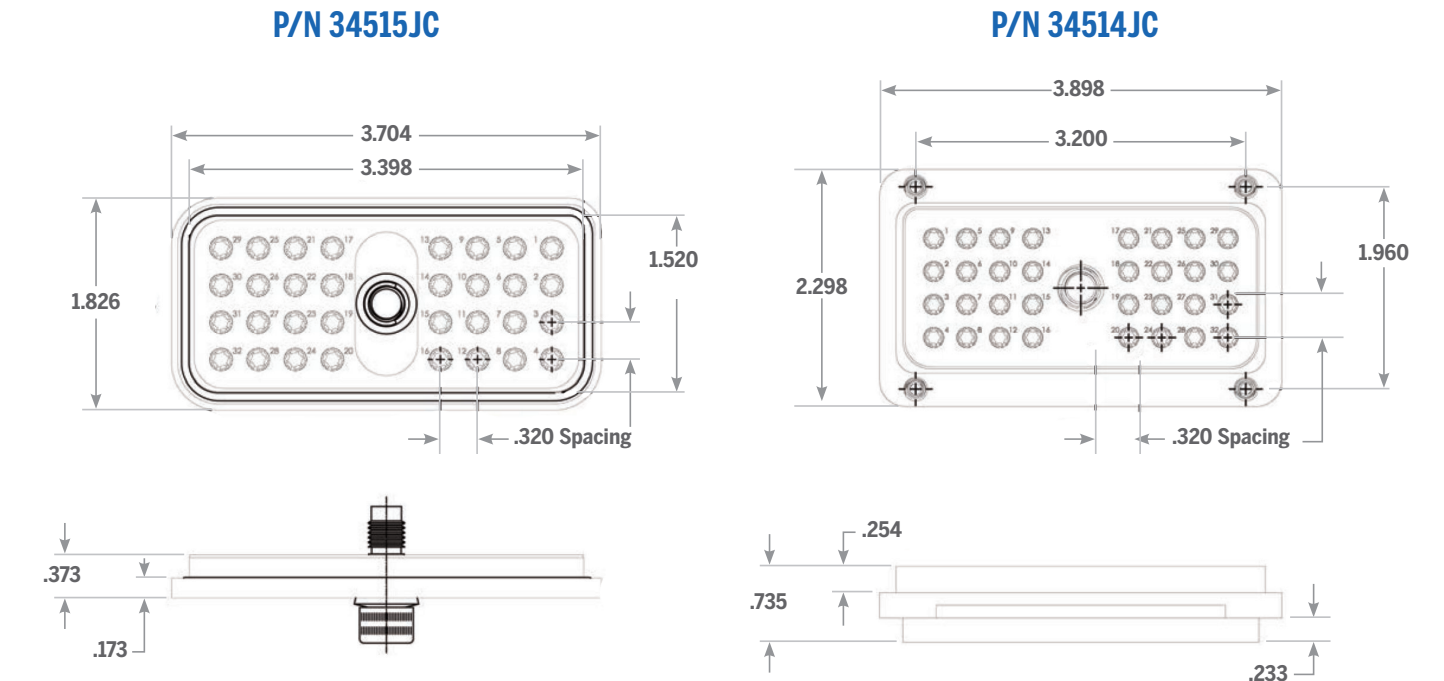
Note: Keying pin locations shown above in red

Option 1	Keying PIN AB	Plug Mate PIN CD
Option 2	Keying PIN AC	Plug Mate PIN BD
Option 3	Keying PIN AD	Plug Mate PIN BC
Option 4	Keting PIN BC	Plug Mate PIN AD
Option 5	Keying PIN BD	Plug Mate PIN AC
Option 6	Keying PIN CD	Plug Mate PIN AB

MINI MULTI-PORTS - "MMP" 32 Port Shell

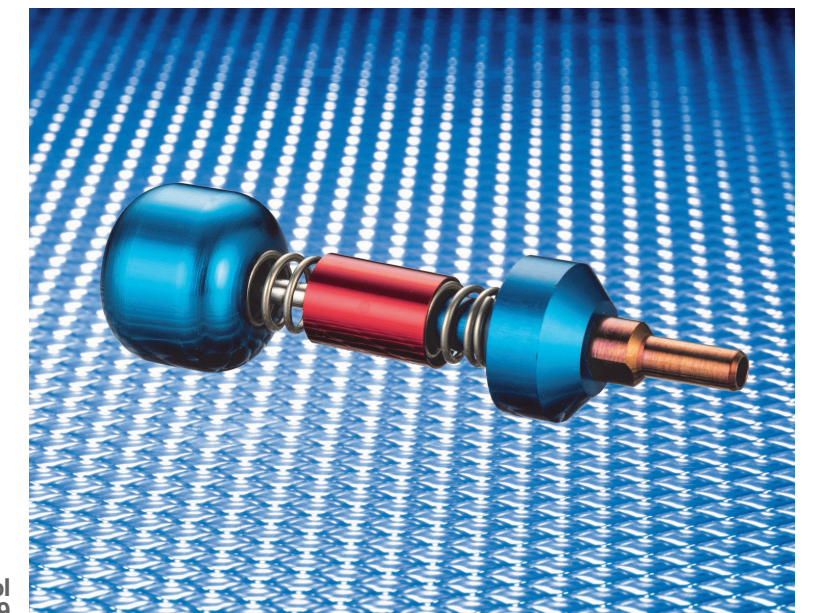
The Times Microwave Systems MMP Multi-Port connector is available with

- .0320"/8.13mm contact spacing, and can accept cable diameters up to 0.21"/5.33mm.



MMP Contact Insertion/Extraction Tool

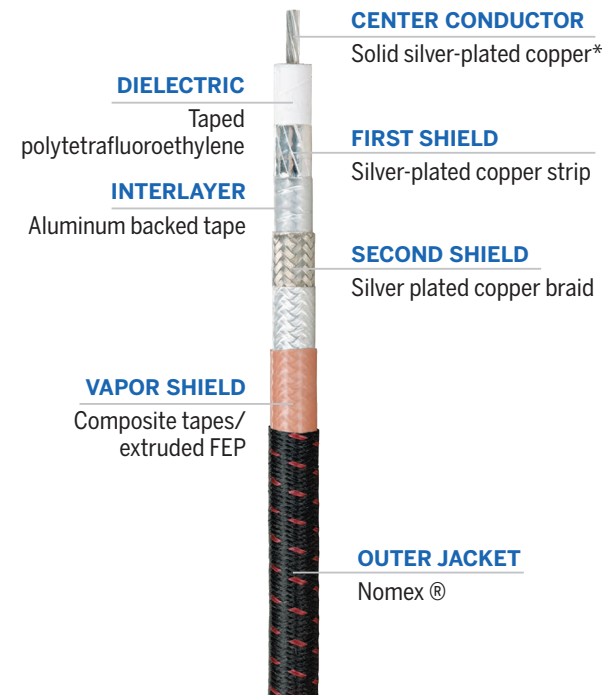
The insertion and extraction of MMP Multi-Port contacts from the MMP shell is a simple process that uses an easily operated insertion/extraction hand tool. This factory tool is designed for production line applications.



MMP Insertion/Extraction Tool
PN 3192-139

MILTECH® CABLE ASSEMBLIES

The Times Qualified MilTech (MT) family of hermetically sealed flexible RF and microwave transmission line assemblies are optimized and qualified for commercial, military and other demanding applications. The proprietary spiral strip conductor returns the lowest loss and superior phase tracking without sacrificing flexibility! MilTech cable assemblies exhibit extremely long life in the rigorous environments found in airborne, shipboard and ground based applications. For lighter weight options see MilTech Lightweight (MTL) cable on the following pages. Times Microwave Systems designs and manufactures the cable, connectors, and the cable/connector junction. This engineered integration of cable and connectors makes Times cable assemblies unique within the RF interconnect industry. The control of the cable/connector interface guarantees the right mix of electrical and mechanical characteristics, strength and durability. These electromechanically optimized transitions are also engineered to meet a 1 x 10⁻⁵ cc/sec/ft vapor seal that ensures longevity within airframe, shipboard, military ground and other harsh environments.



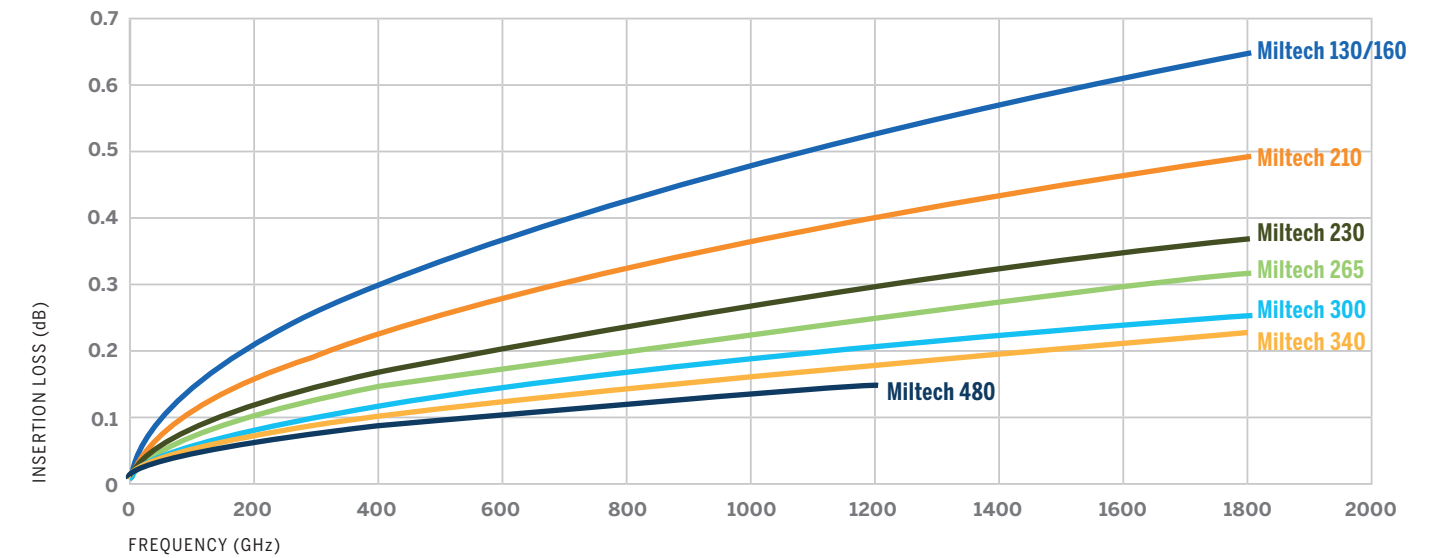
Specifications

Cable Type	Recommended Cable Clamp	Cable Diameter (In./mm.)	Loss@ 18 GHz (dB/ft.)	Minimum Bend Radius (In./mm.)	Mass
MT 130	MS21919-3	0.13/3.3	0.60	0.63/16.0	0.020lb/ft (30g/m)
MT 160	MS21919-3	0.17/4.3	0.60	0.63/16.0	0.022lb/ft (33g/m)
MT 210	MS21919-4	0.21/5.3	0.48	1.00/25.4	0.035lb/ft (52g/m)
MT 230	MS21919-4	0.23/5.8	0.38	1.15/29.2	0.045lb/ft (68g/m)
MT 265	MS21919-5	0.265/6.7	0.32	1.30/33.0	0.065lb/ft (97g/m)
MT 300	MS21919-5	0.300/7.6	0.25	1.75/44.5	0.085lb/ft (126g/m)
MT 340	MS21919-6	0.34/8.6	0.22	1.90/48.3	0.105lb/ft (157g/m)
MT 480	MS21919-8	0.46/12.2	0.13 (@ 10 GHz)	2.25/57.2	0.200lb/ft (303g/m)

MILTECH® CABLE ASSEMBLIES Insertion Loss

The following graph illustrates the cable insertion loss for each MilTech® cable at specific frequencies. The insertion loss at intermediate frequencies can be calculated from the formula

below for each cable type. The loss for each pair of connectors must be added to the overall cable loss to determine the insertion loss for the complete cable assembly.



Calculation

$$IL = K1 \times \sqrt{FMHz} + K2 \times (FMHz) \text{ dB per 100 feet}$$

where FMHz is the frequency in MHz

Connector Loss

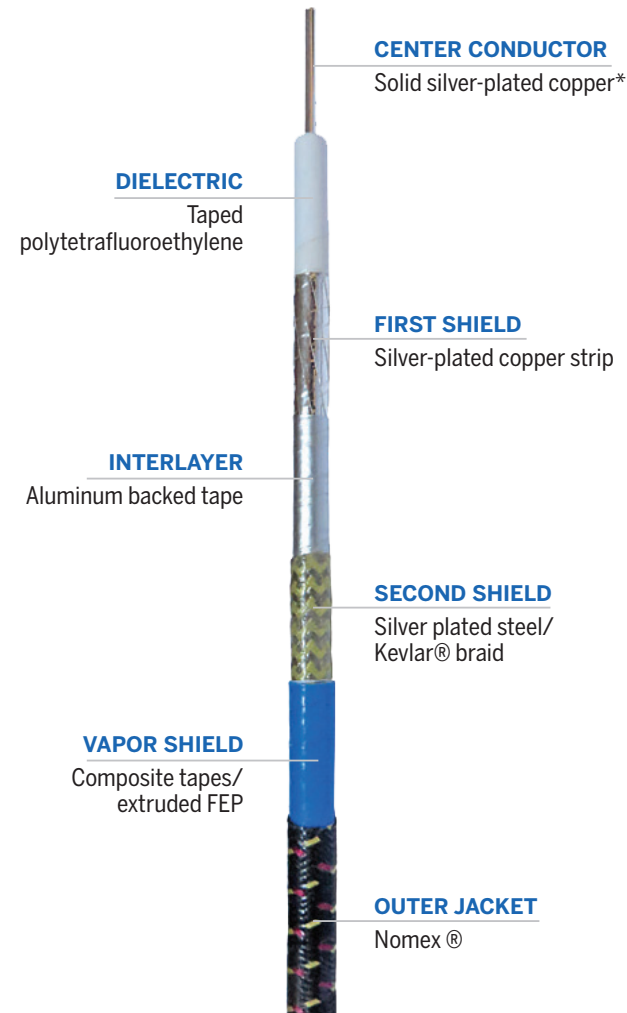
Insertion Loss @23°C. For angled connectors add 0.1dB/conn

Cable Type	K1	K2
MT 130	0.4271	0.0001483
MT 160	0.4271	0.0001483
MT 210	0.3416	0.000146
MT 230	0.2462	0.00014
MT 265	0.1645	0.0001055
MT 300	0.21603	0.000146
MT 340	0.1436	0.0001304
MT 480	0.11465	0.0001435

Frequency GHz	dB/pr
500	0.075
1000	0.10
2000	0.15
4000	0.20
6000	0.22
8000	0.25
10000	0.27
12000	0.28
14000	0.30
16000	0.31
18000	0.33

MILTECH® LITE CABLE ASSEMBLIES

The Times Qualified MilTech Lightweight (MTL) family of hermetically sealed flexible RF and microwave transmission line assemblies are optimized and qualified for commercial, military and other demanding applications. The proprietary spiral strip conductor returns the lowest loss and superior phase tracking without sacrificing flexibility! MTL cables provide the same electrical performance as MilTech cables but with lighter weights – ideal for application where both low loss and reduced weight are required. MTL cable assemblies exhibit extremely long life in the rigorous environments found in airborne, shipboard and ground based applications. Times Microwave Systems designs and manufactures the cable, the connectors, and the cable/connector junction. This engineered integration of cable and connectors makes Times cable assemblies unique within the RF interconnect industry. The control of the cable/connector interface guarantees the right mix of electrical and mechanical characteristics, strength and durability. These electromechanically optimized transitions are also engineered to meet a 1 x 10⁻⁵ cc/sec/ft vapor seal that ensures longevity within airframe, shipboard, military ground and other harsh environments.



* Solid silver-plated copper covered steel on MTL 130.
Stranded silver-plated copper on MTL 480

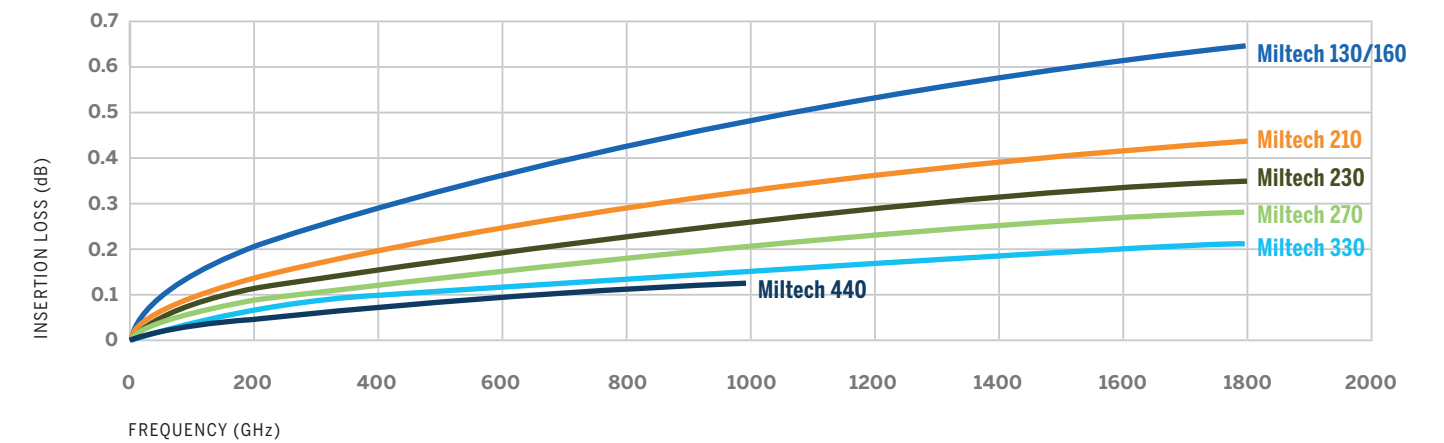
Specifications

Cable Type	Recommended Cable Clamp	Cable Diameter (In./mm.)	Loss@ 18 GHz (dB/ft.)	Minimum Bend Radius (In./mm.)	Mass
MT 130	MS21919-3	0.13/3.3	0.65	0.65/16.5	0.020lb/ft (30g/m)
MT 160	MS21919-3	0.16/4.1	0.65	0.65/16.5	0.021lb/ft (31g/m)
MT 210	MS21919-4	0.21/5.3	0.44	0.95/24.1	0.030lb/ft (45g/m)
MT 230	MS21919-4	0.23/5.8	0.36	1.03/26.2	0.037lb/ft (55g/m)
MT 270	MS21919-5	0.270/6.9	0.29	1.25/31.8	0.049lb/ft (73g/m)
MT 330	MS21919-6	0.34/8.6	0.22	1.75/44.5	0.068lb/ft (101g/m)
MT 440	MS21919-7	0.435/11.0	0.13 (@10 GHz)	2.50/63.5	0.135lb/ft (201g/m)

MILTECH® LITE CABLE ASSEMBLIES Insertion Loss

The following graph illustrates the cable insertion loss for each MilTech-Lite cable at specific frequencies. The insertion loss at intermediate frequencies can be calculated from the formula

below for each cable type. The loss for each pair of connectors must be added to the overall cable loss to determine the insertion loss for the complete cable assembly.



Calculation

$$IL = k1 \times \sqrt{FMHz} + K2 \times (FMHz) \text{ dB per 100 feet}$$

Where FMHz is the frequency in MHz

Connector Loss

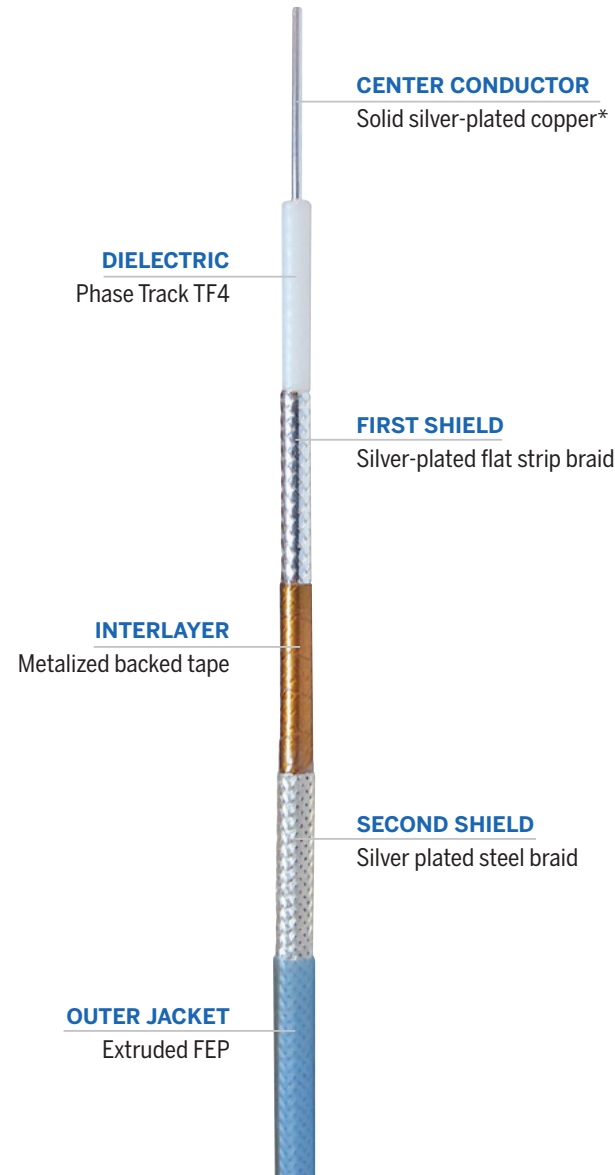
Insertion Loss @23°C. For angled connectors add 0.1dB/conn

Cable Type	K1	K2
MT 130	0.46466	0.0001463
MT 160	0.46466	0.0001463
MT 210	0.31165	0.0001337
MT 230	0.2462	0.000144
MT 270	0.1946	0.0001337
MT 330	0.1442	0.000134
MT 440	0.1129	0.0001354

Frequency GHz	dB/pr
500	0.075
1000	0.10
2000	0.15
4000	0.20
6000	0.22
8000	0.25
10000	0.27
12000	0.28
14000	0.30
16000	0.31
18000	0.33

PHASETRACK® CABLE ASSEMBLIES

The Times Qualified PhaseTrack (PT) family of hermetically sealed flexible RF and microwave transmission line assemblies are optimized and qualified for commercial, military and other demanding applications. The proprietary TF4 dielectric material returns superior phase tracking without the "PTFE knee" in the phase/temperature performance for phase-critical applications! – ideal for applications where both low loss and tight phase over temperature are required. PT cable assemblies exhibit extremely long life in the rigorous environments found in airborne, shipboard and ground based applications. Times Microwave Systems designs and manufactures the cable, the connectors, and the cable/connector junction. This engineered integration of cable and connectors makes Times cable assemblies unique within the RF interconnect industry. The control of the cable/connector interface guarantees the right mix of electrical and mechanical characteristics, strength and durability. These electromechanically optimized transitions are also engineered to meet a 1 x 10⁻⁵ cc/sec/ft vapor seal that ensures longevity within airframe, shipboard, military ground and other harsh environments.



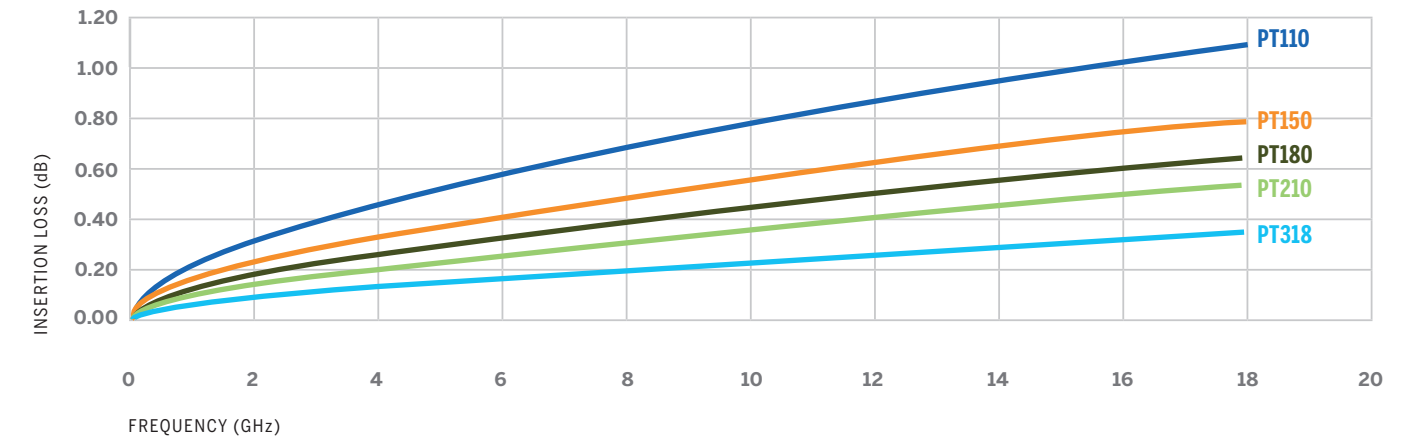
Specifications

Cable Type	Recommended Cable Clamp	Cable Diameter (In./mm.)	Loss@ 18 GHz (dB/ft.)	Minimum Bend Radius (In./mm.)	Mass
PT 110	MS21919-2	0.11/2.8	1.10	0.44/11.2	0.014lb/ft (21g/m)
PT 150	MS21919-3	0.15/3.8	0.71	0.75/19.1	0.024lb/ft (36g/m)
PT 180	MS21919-3	0.18/4.6	0.59	1.00/25.4	0.036lb/ft (54g/m)
PT 210	MS21919-4	0.22/5.6	0.48	1.13/28.7	0.046lb/ft (68g/m)
PT 318	MS21919-6	0.32/8.1	0.32	1.75/44.5	0.090lb/ft (134g/m)

PHASETRACK® CABLE ASSEMBLIES Insertion Loss

The following graph illustrates the cable insertion loss for each PhaseTrack cable at specific frequencies. The insertion loss at intermediate frequencies can be calculated from the formula

below for each cable type. The loss for each pair of connectors must be added to the overall cable loss to determine the insertion loss for the complete cable assembly.



Calculation

$$IL = K1 \times \sqrt{FMHz} + K2 \times (FMHz) \text{ dB per 100 feet}$$

Where FMHz is the frequency in MHz

Cable Type	K1	K2
PT 110	0.6581	0.0012035
PT 150	0.4168	0.0008594
PT 180	0.3151	0.0009031
PT 210	0.2597	0.0009435
PT 318	0.1415	0.0006975

Connector Loss

Insertion Loss @23°C. For angled connectors add 0.1dB/conn

Frequency GHz	dB/pr
500	0.075
1000	0.10
2000	0.15
4000	0.20
6000	0.22
8000	0.25
10000	0.27
12000	0.28
14000	0.30
16000	0.31
18000	0.33



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