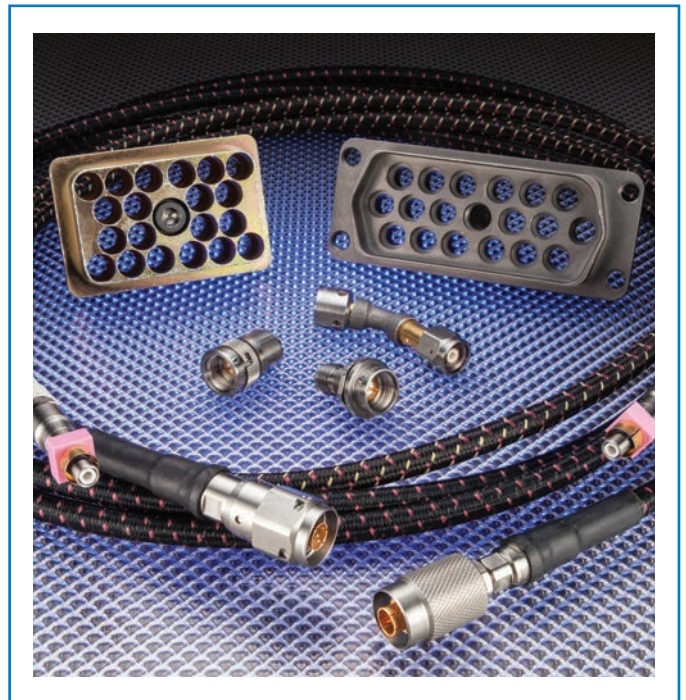
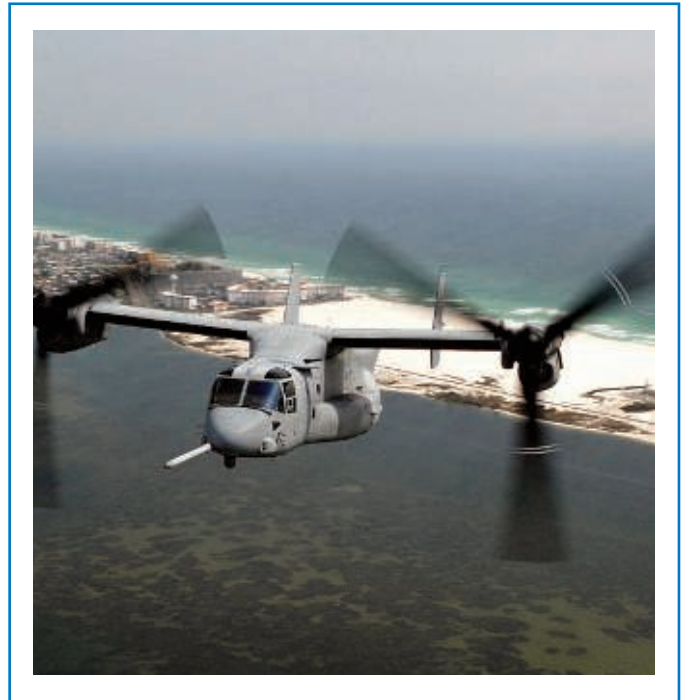
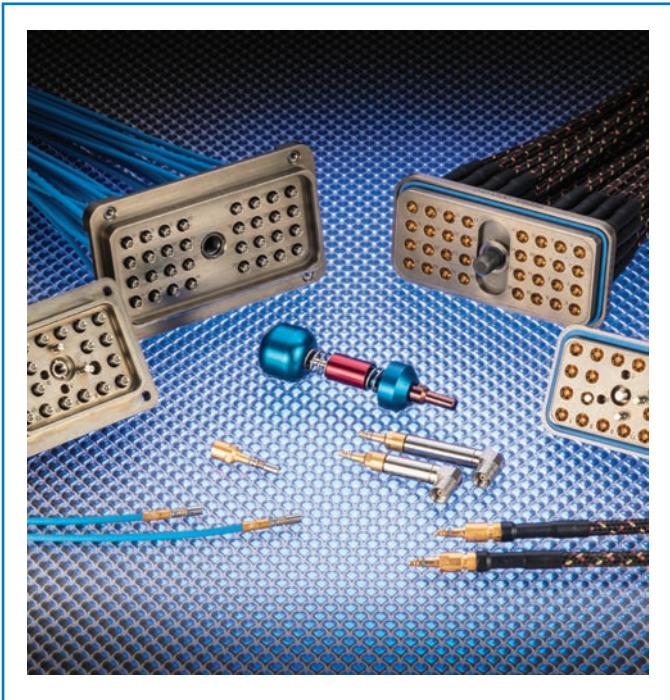


High-Density Interconnect Multi-Port Systems



M8 Multi-Port INTERCONNECTION SYSTEM

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.

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

Electrical Specifications:

See pages 14, 16 and 18 for specific cable electrical specifications



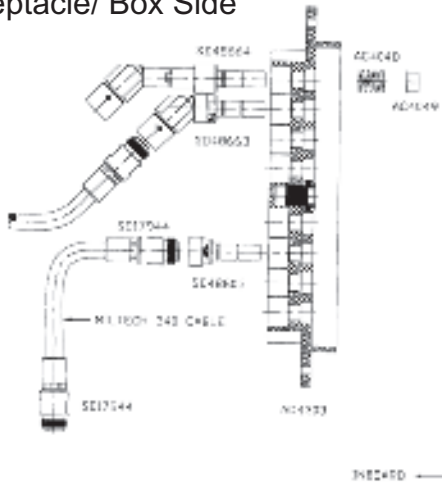
16 and 6 port M8 shells



M8 Multi-Port Typical System / Replaceable Front Ends

Typical System Interface

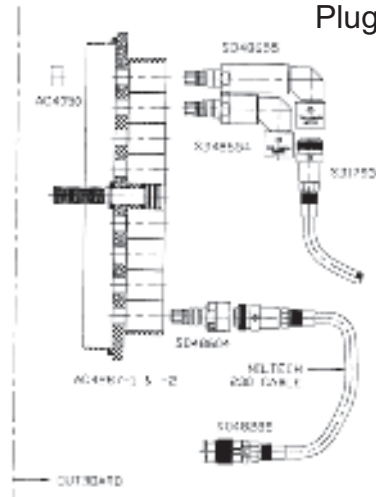
Receptacle/ Box Side



Typically used on the following cables

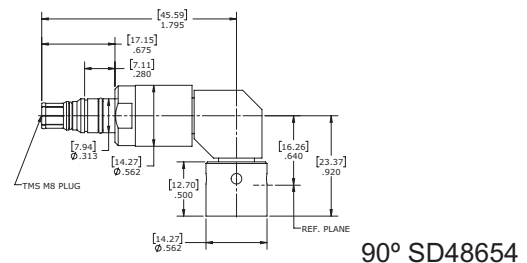
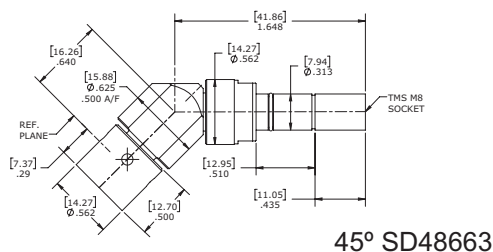
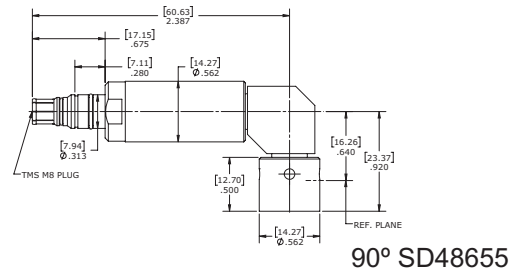
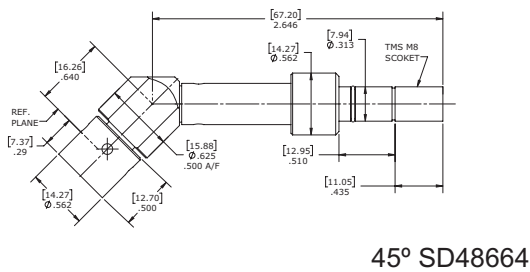
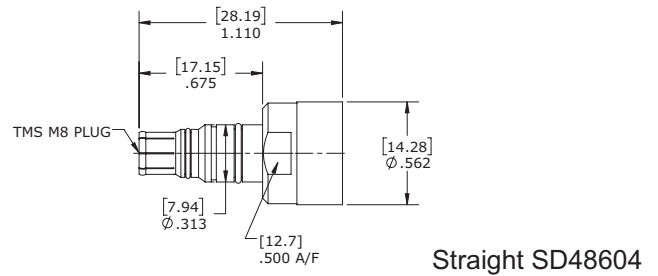
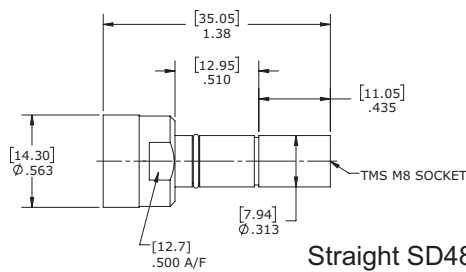
- TFlex 402 and 405
- RG402, 405 and SF-142
- PhaseTrack (PT) 110 & 150

Plug/Harness Side



Typically used on the following cables

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



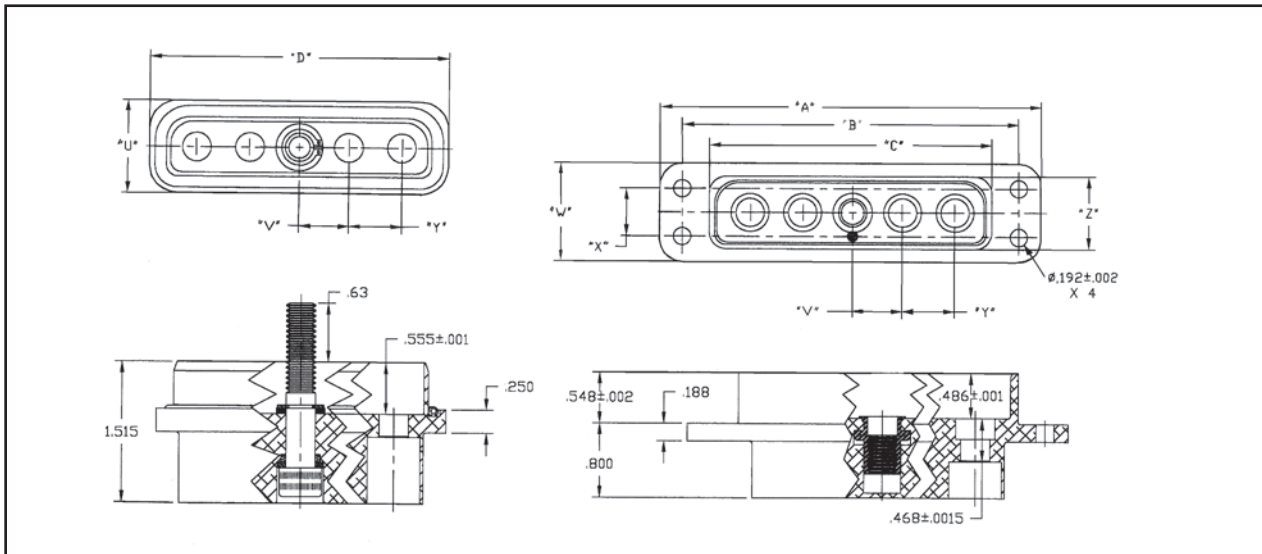
M8 Multi-Port Shells - Single Row

Shells:

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

- 0.440"/11.18mm 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

No. 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

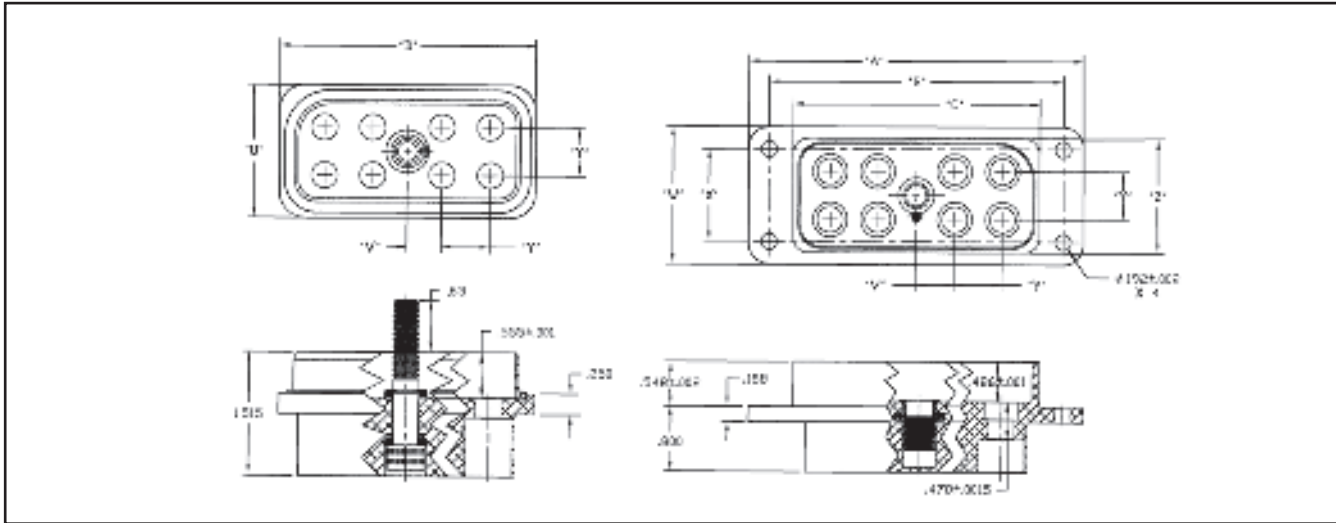
M8 Multi-Port Shells - Double Row

Shells:

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

- 0.440"/11.18mm 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.

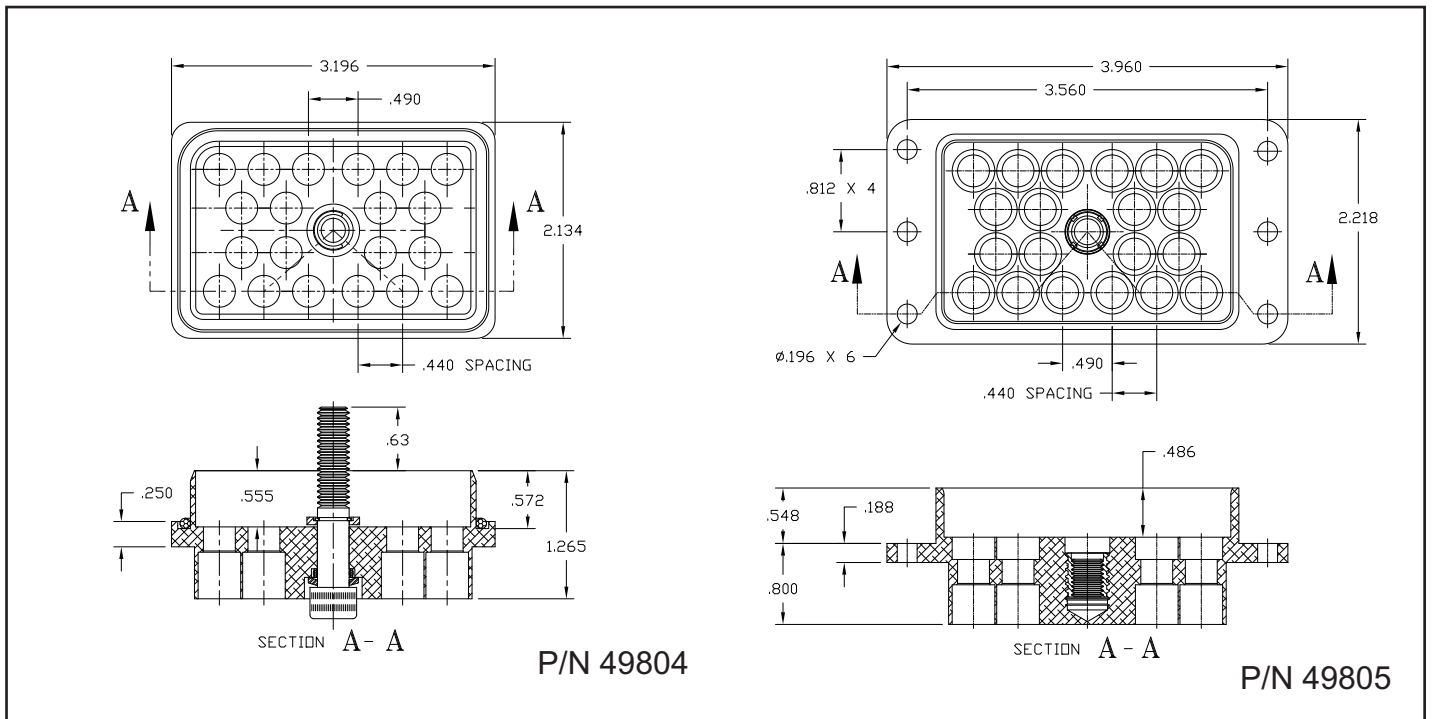
Dimensions vs. Number of Ports



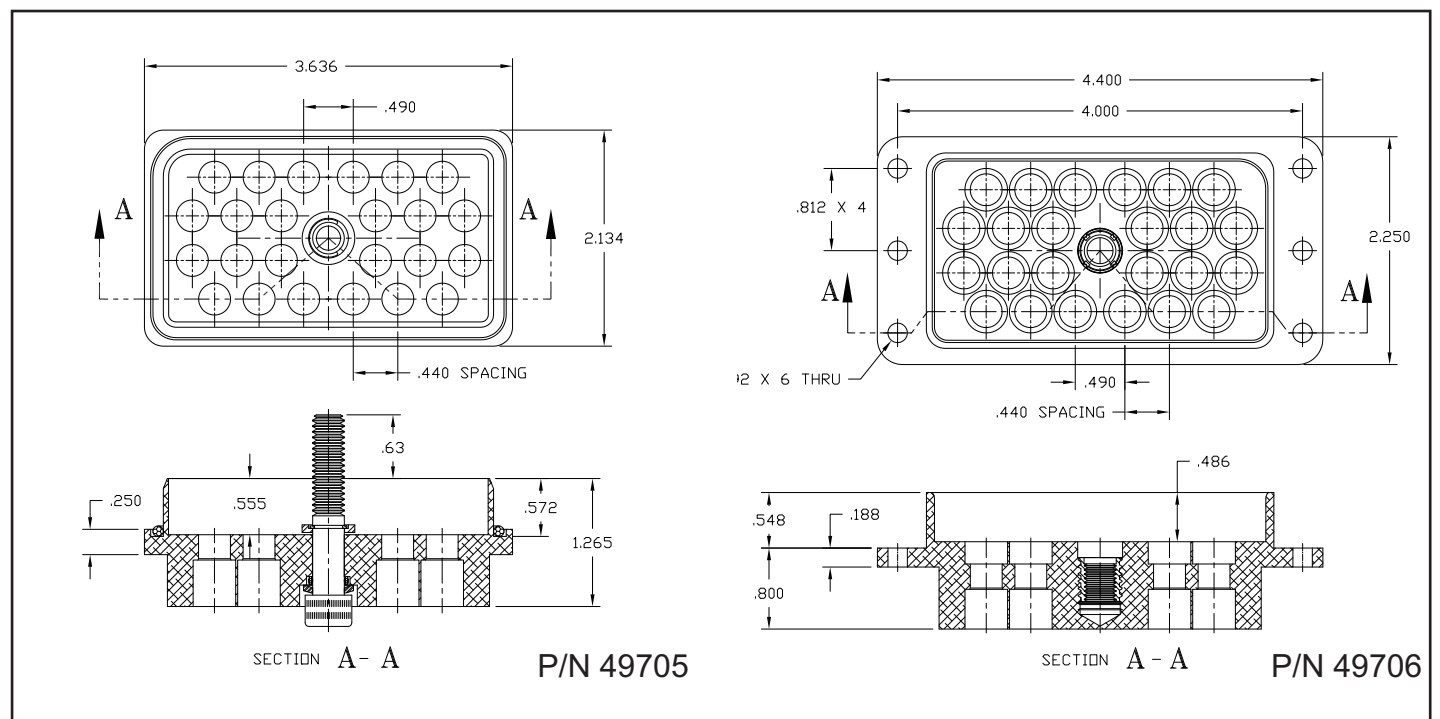
Port Spacing	"U"	"V"	"W"	"X"	"Y"	"Z"
0.440	1.400	0.504	1.460	0.875	0.440	1.174
0.585	1.620	0.507	1.678	1.125	0.585	1.392

No. 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

M8 Multi-Port Shells - 20 and 24 Port 4 Row

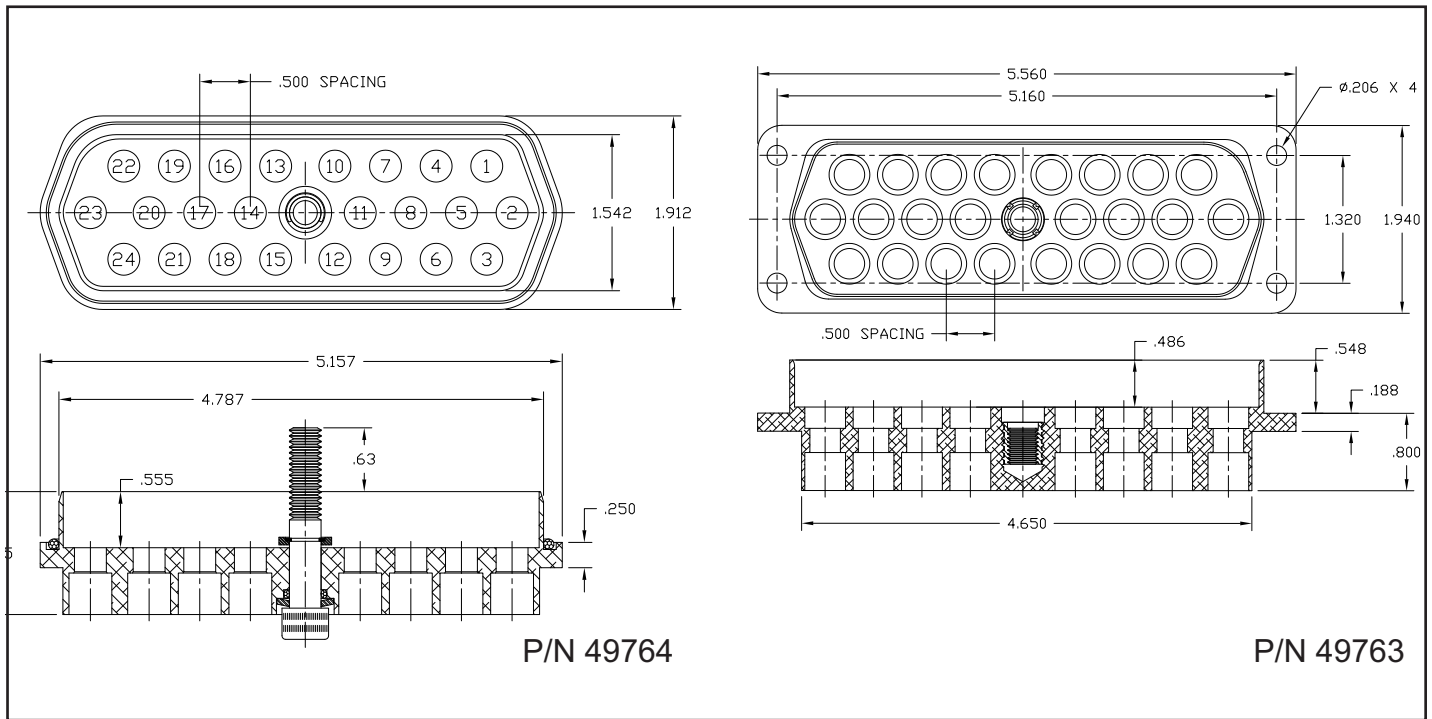


.440" port spacing for cable diameters up to 0.31" / 7.88mm



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

M8 Multi-Port Shell - 24 Port / Tool



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

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.



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

Electrical Specifications

See pages 14, 15 and 16 for specific cable electrical specifications

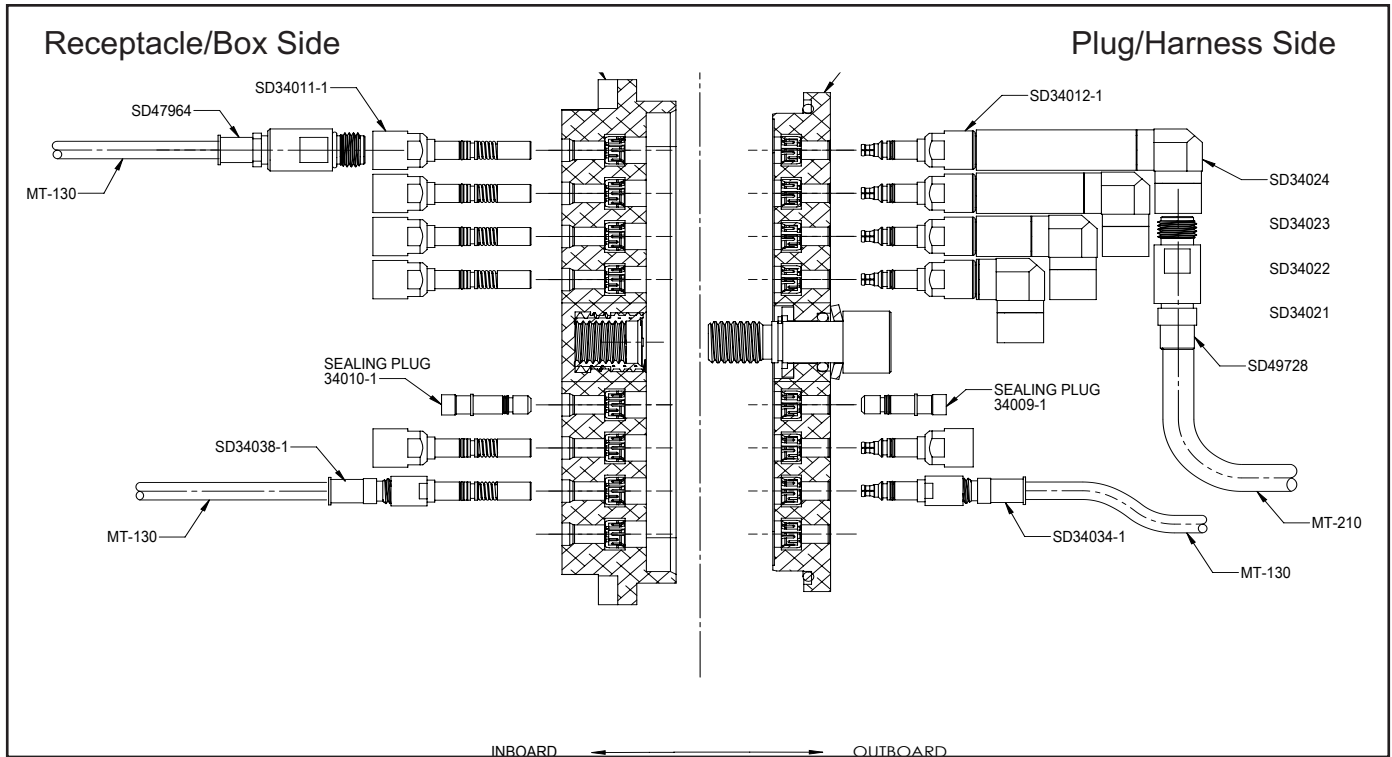


32, 20, 14 Port MMP shells



Mini Multi-Ports - "MMP"

Typical System Interface



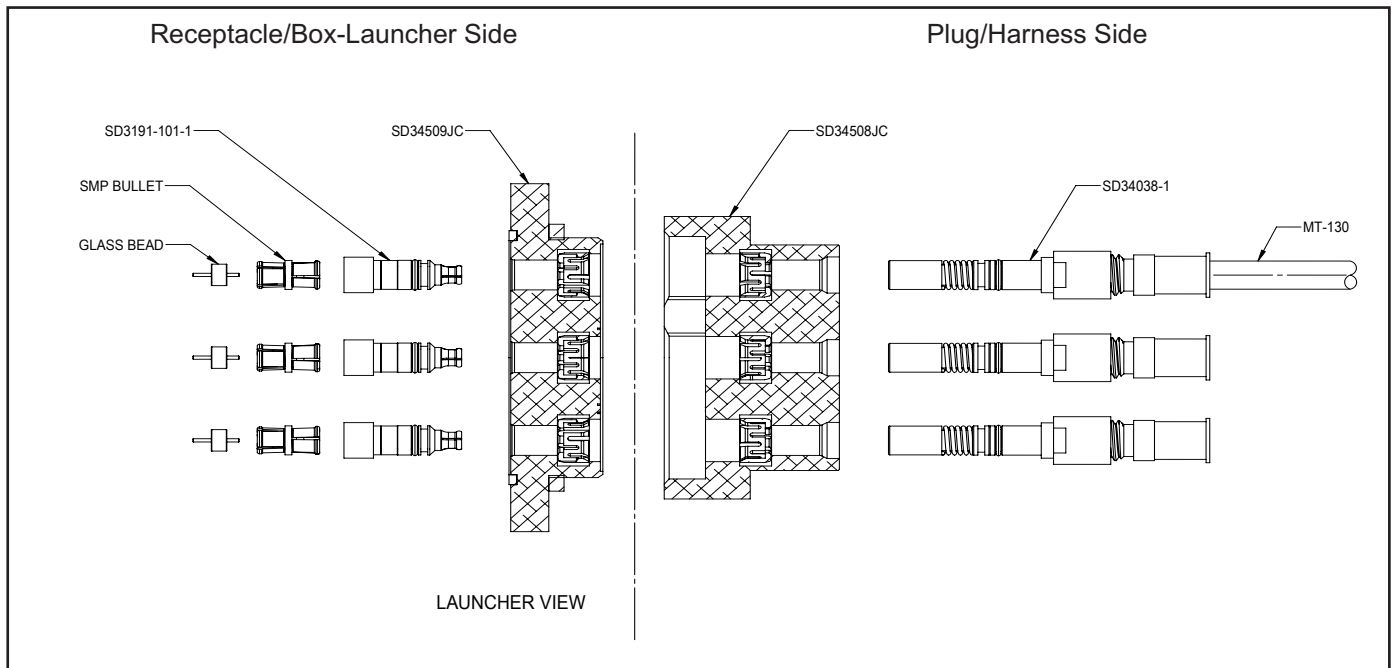
Typical System Interface for Modular Interface

Typically used on the following cables:

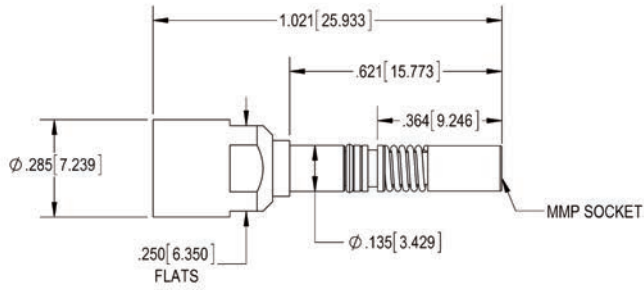
- PhaseTrack (PT) 110 thru 150
- TFlex 405
- RG405

Typically used on the following cables:

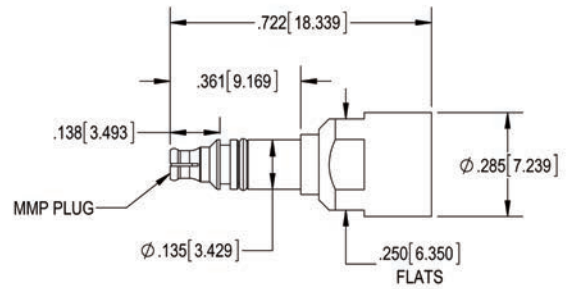
- MilTech (MT) 130 thru 210
- MilTech Lightweight (MTL) 130 thru 210
- PhaseTrack (PT) 110 thru 210



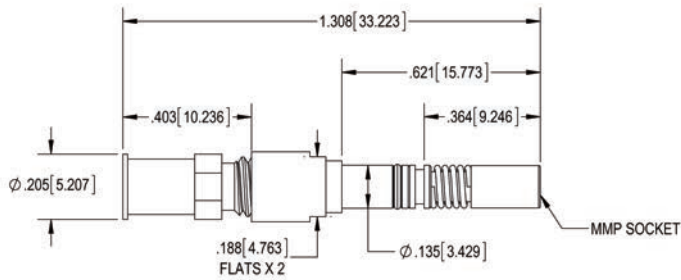
Mini Multi-Ports - "MMP"



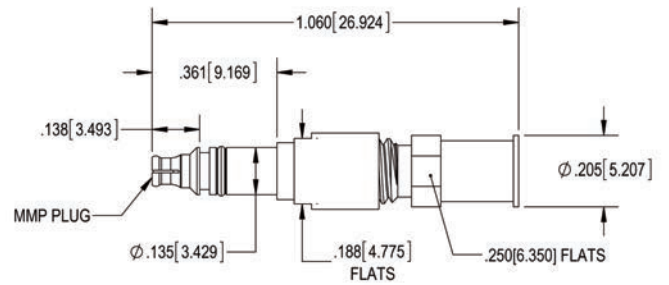
P/N 34011-2
Replaceable Front End



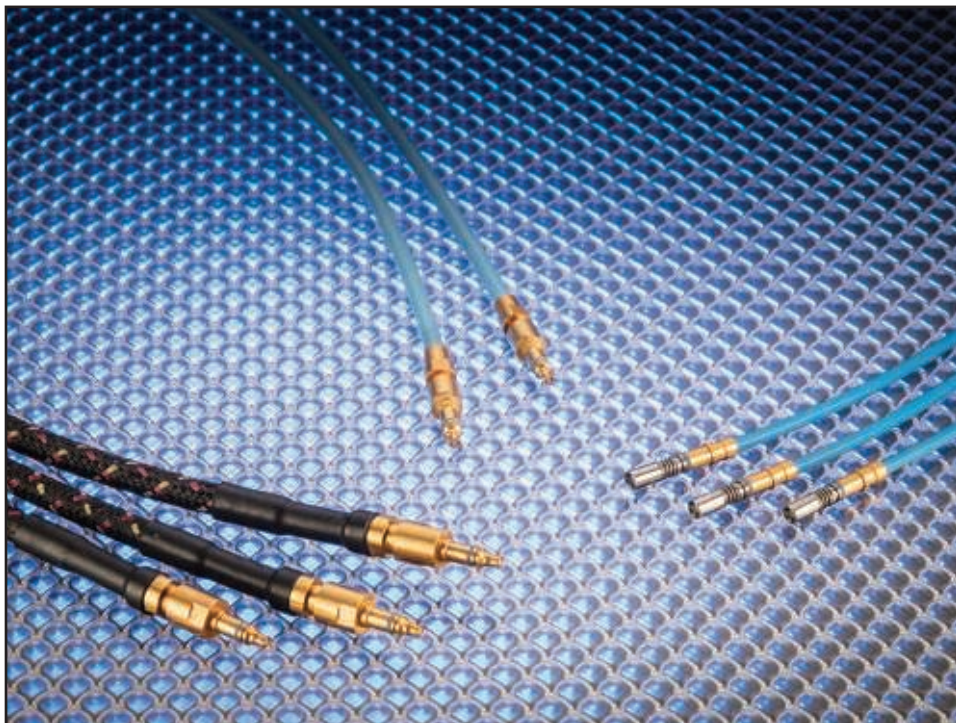
P/N 34012-2
Replaceable Front End



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

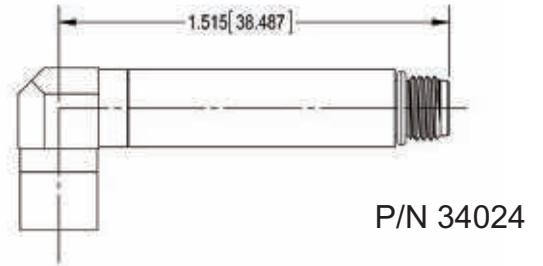
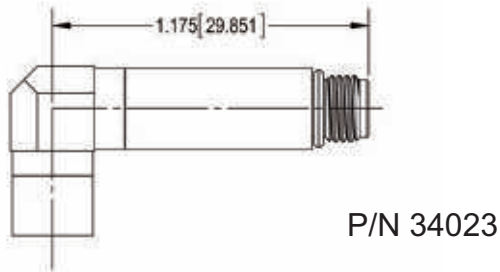
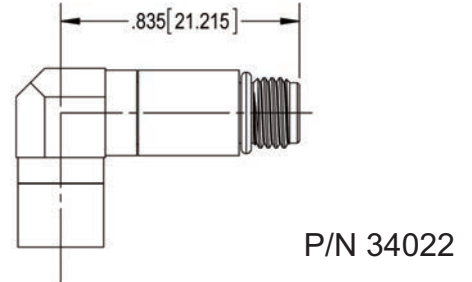
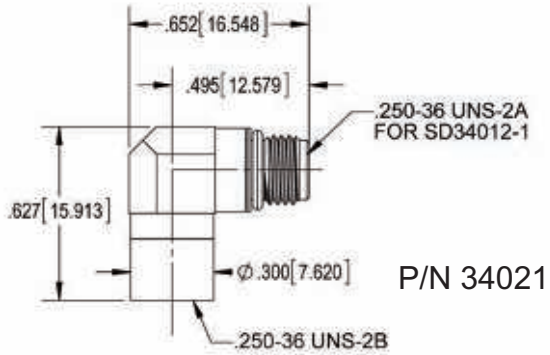


P/N 34034-1
Direct Cable Attachment
for MT130/MTL160



Mini Multi-Ports - "MMP"

Coaxial Right Angle Insertable Standoffs



Various right angle standoffs with replaceable MMP front ends



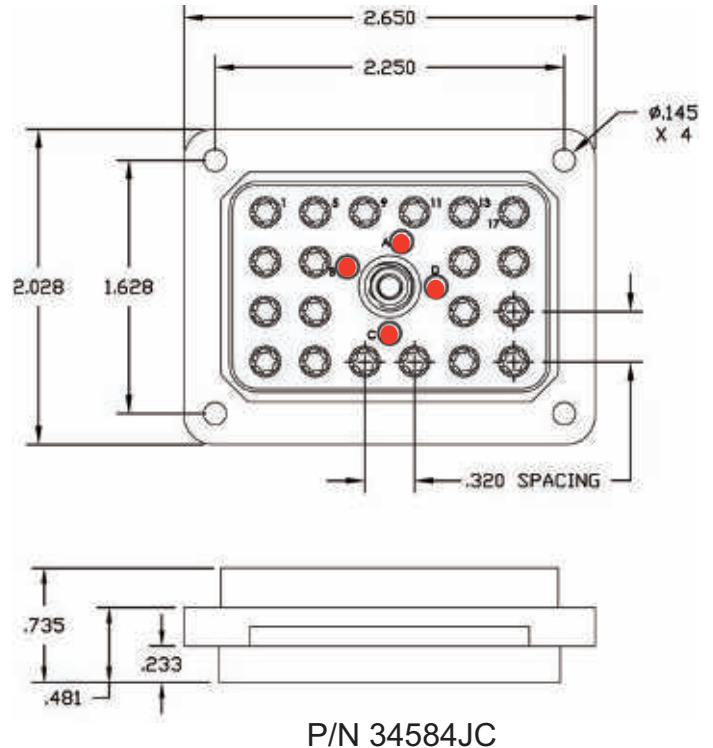
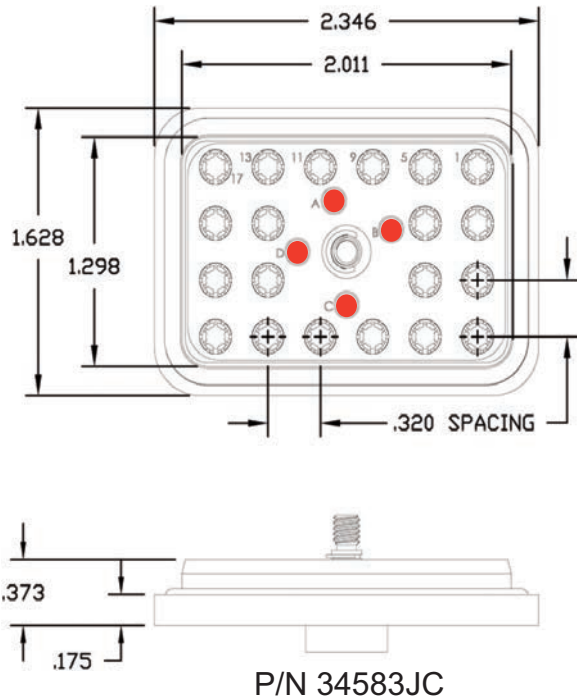
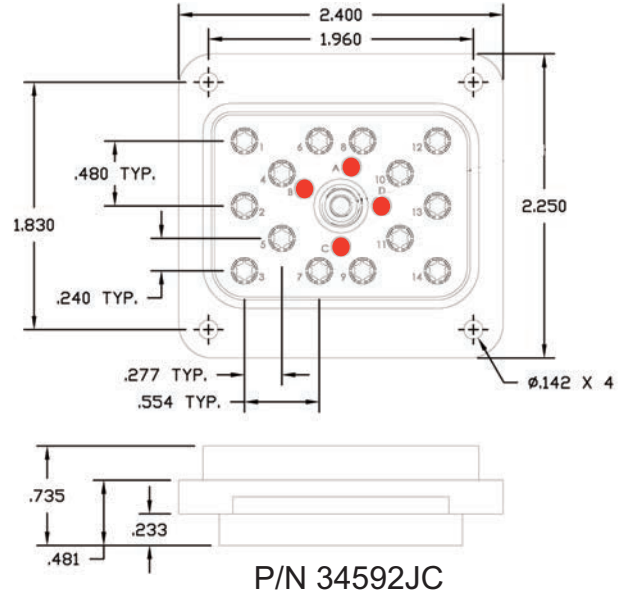
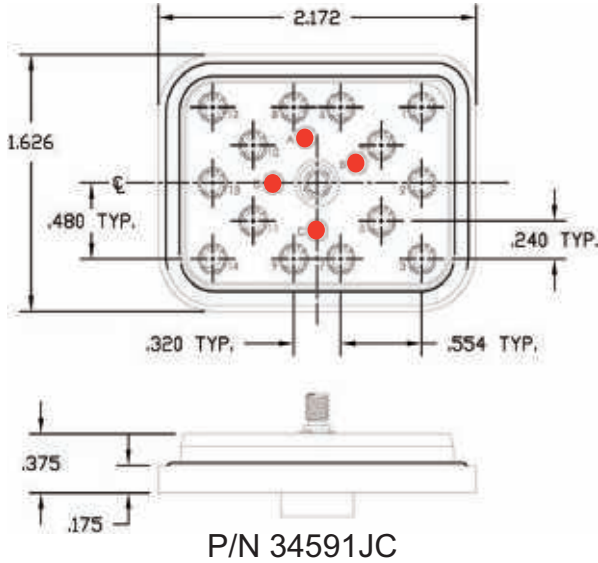
Nested angle standoffs in MMP shell

Shown with P/N 34012-2 Replaceable Front Ends

14 and 20 port Keyed Shell

Shells:

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 - Keying 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:

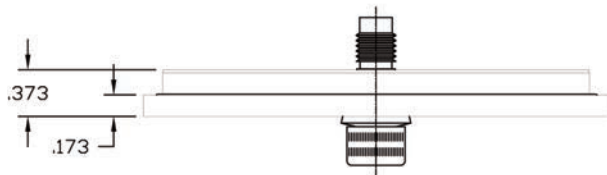
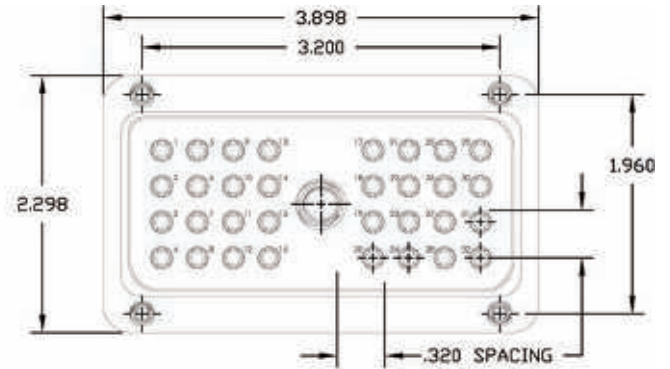
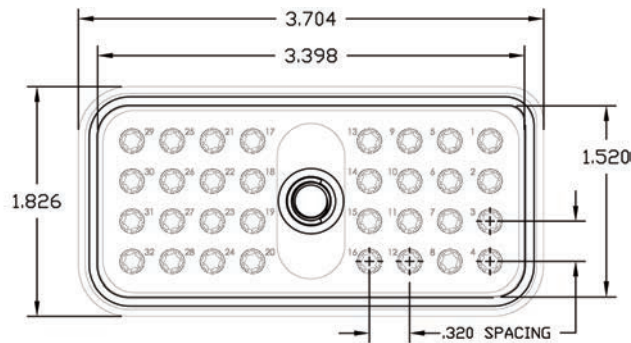
Note: Keying pin locations shown above in red

- 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 - Keying PIN BC - Plug Mate PIN AD
- Option 5 - Keying PIN BD - Plug Mate PIN AC
- Option 6 - Keying PIN CD - Plug Mate PIN AB

32 Port Shell

Shells:

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.



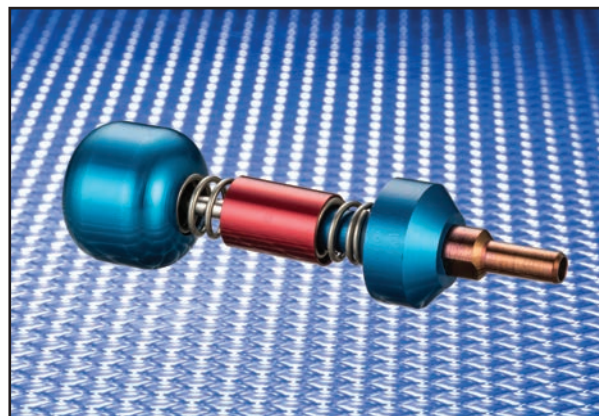
P/N 34515JC



P/N 34514JC

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

Times Qualified 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 electro-mechanically 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.

MT Cable Characteristics



Cable materials – typical

- A Center conductor – Solid silver-plated copper*
- B Dielectric – Taped polytetrafluoroethylene
- C First shield – Silver-plated copper strip
- D Interlayer – Aluminum backed tape
- E Second shield – Silver plated copper braid
- F Vapor shield – composite tapes/extruded FEP
- G Outer jacket – Nomex®

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

Cable Type

MT 130
MT 160
MT 210
MT 230
MT 265
MT 300
MT 340
MT 480

Recommended Cable Clamp

MS21919-3
MS21919-3
MS21919-4
MS21919-4
MS21919-5
MS21919-5
MS21919-6
MS21919-8

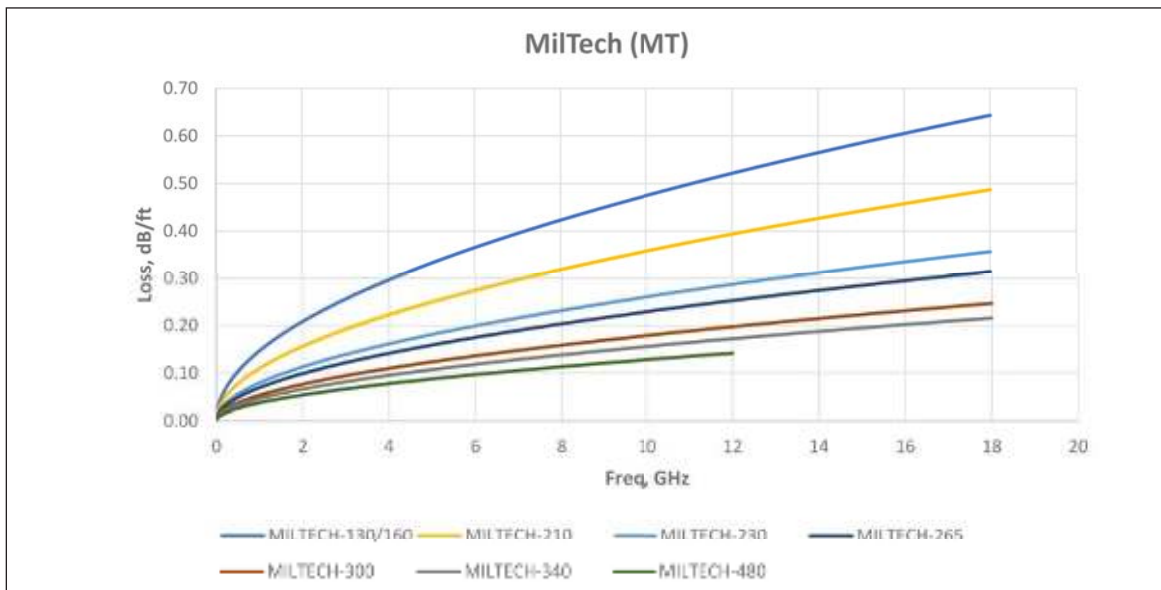
Times Qualified MilTech® Cable

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

Times Qualified 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.



Insertion loss at intermediate frequencies can be calculated as follows:

$$I_l = k_1 \times \sqrt{f} + k_2 \times f \text{ dB per 100 feet}$$

(where FMHz is the frequency in MHz)

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 300	0.1645	0.0001055
MT 265	0.21603	0.000146
MT 340	0.1436	0.0001304
MT 480	0.11465	0.0001435

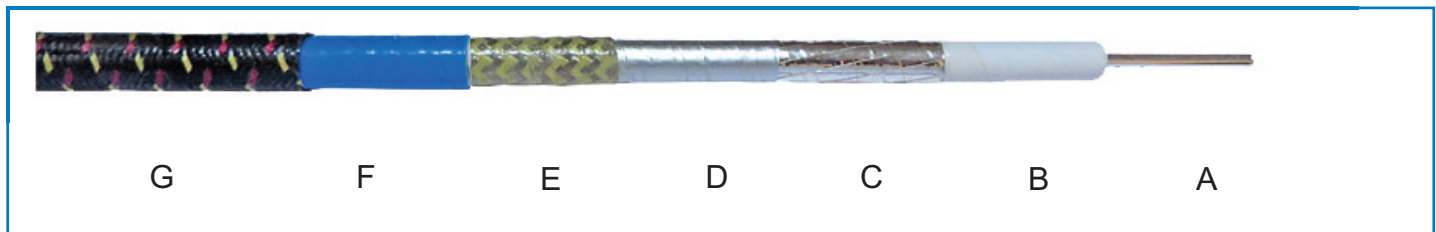
CONNECTOR LOSS

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

Times Qualified 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 1×10^{-5} cc/sec/ft vapor seal that ensures longevity within airframe, shipboard, military ground and other harsh environments.

MTL Cable Characteristics



Cable Materials – Typical	Cable Type	Recommended Cable Clamp
A Center conductor – Solid silver-plated copper*	MTL 130	MS21919-3
B Dielectric – Taped polytetrafluoroethylene	MTL 160	MS21919-3
C First shield – Silver-plated copper strip	MTL 210	MS21919-4
D Interlayer – Aluminum backed tape	MTL 230	MS21919-4
E Second shield – Silver plated steel/Kevlar® braid	MTL 270	MS21919-5
F Vapor shield – composite tapes/extruded FEP	MTL 330	MS21919-6
G Outer jacket – Nomex®	MTL 440	MS21919-7

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

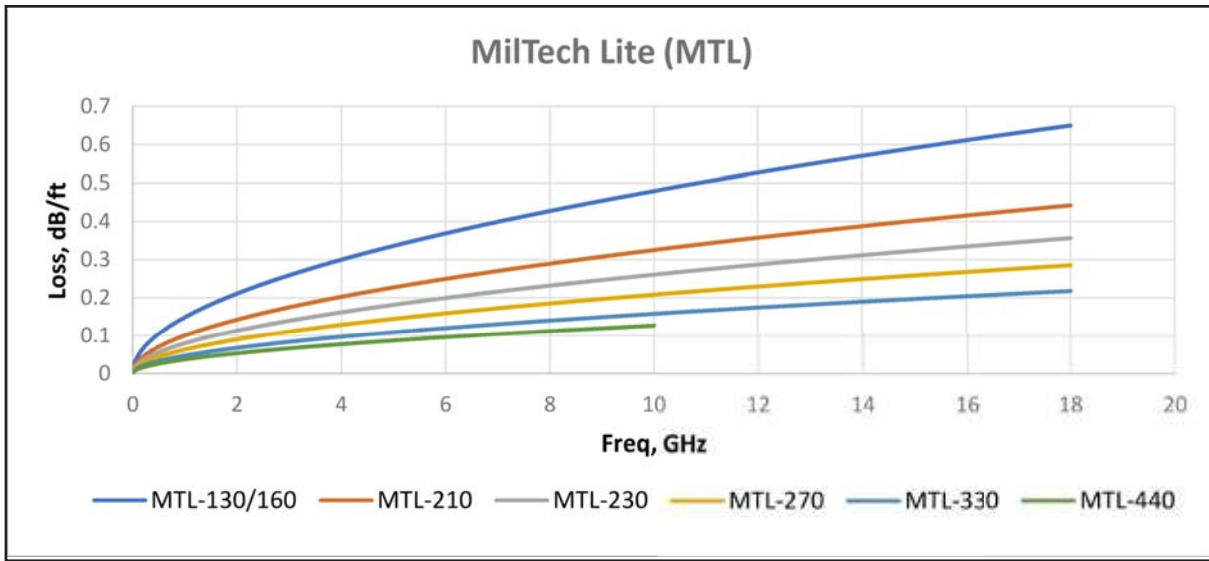
Times Qualified MilTech-Lite® Cable

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

Times Qualified 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.



Insertion loss at intermediate frequencies can be calculated as follows:

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

(where FMHz is the frequency in MHz)

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

CONNECTOR LOSS	
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
Insertion Loss @23°C	
For angled connectors, add 0.1dB/conn	

Times Qualified 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 1×10^{-5} cc/sec/ft vapor seal that ensures longevity within airframe, shipboard, military ground and other harsh environments.

PhaseTrack Cable Characteristics



Cable Materials – Typical	Cable Type	Recommended Cable Clamp
A Center conductor – Solid silver-plated copper*	PT 110	MS21919-2
B Dielectric – Phase Track TF4	PT 150	MS21919-3
C First shield – Silver-plated flat strip braid	PT 180	MS21919-3
D Interlayer – Metalized backed tape	PT 210	MS21919-4
E Second shield – Silver plated steel braid	PT 318	MS21919-6
F Outer jacket – extruded FEP		

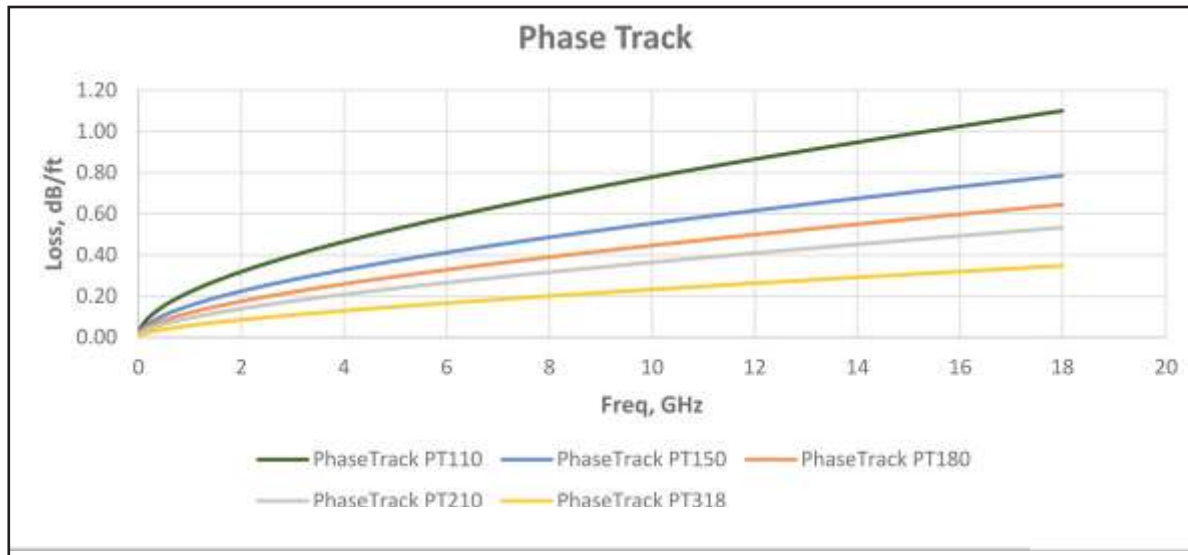
Times Qualified PhaseTrack® Cable

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

Times Qualified 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.



Insertion loss at intermediate frequencies can be calculated as follows:

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

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

About Times Microwave Systems

Times Microwave Systems, was founded in 1948 as the Times Wire and Cable Company. Today, the company specializes in the design and manufacture of high performance flexible, semi-flexible and semi-rigid coaxial cable, connectors and cable assemblies. With over 70 years of leadership in the design, development, and manufacture of coaxial products for defense microwave systems, Times Microwave Systems is the acknowledged leader, offering high tech solutions for today's most demanding applications.

Cable assemblies from Times Microwave Systems are used as interconnects for microwave transmitters, receivers, and antennas on airframes, missiles, ships, satellites, and ground based communications systems, and as leads for test and instrumentation applications.

As a highly specialized and technically focused company, Times Microwave Systems has been able to continually meet the challenges of specialty engineered transmission lines for both the military and commercial applications, drawing upon our:

- Thousands of unique cable and connector designs
- Exceptional RF and microwave design capability
- Precise material and process controls
- Unique in-house testing capabilities including RF shielding/leakage, vibration, moisture/vapor sealing, phase noise and flammability
- Years of MIL-T-81490, MIL-C-87104, and MIL-PRF-39012 experience
- AS 9100, Rev. C/ISO 9001:2008 Certification

In 2010, Times Microwave Systems introduced its Times-Protect™ line of lightning and surge protection solutions to address the challenging needs of wireless systems in the 21st century.

With over 70 years of Times Microwave Systems aerospace cable and connector technology experience and unparalleled design expertise, Times Microwave Systems' staff of Field Applications Engineers can help to provide the right solution for your interconnect applications.



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