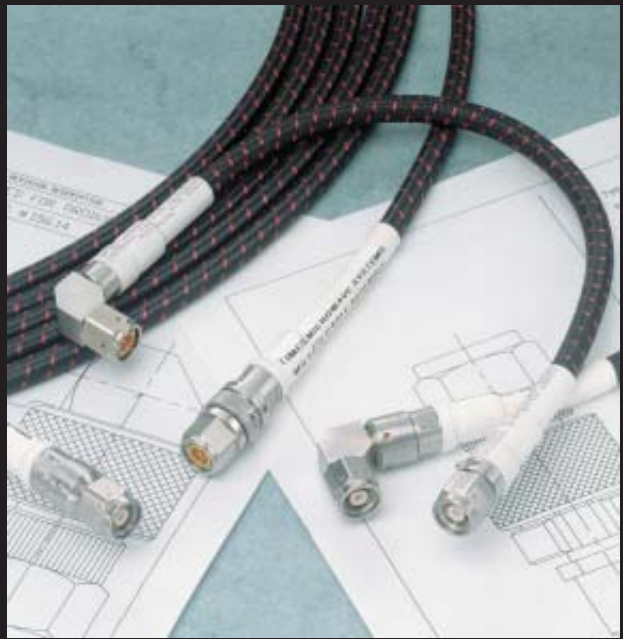


COAXIAL CABLE ASSEMBLIES PRODUCTS & CAPABILITIES



TIMES MICROWAVE SYSTEMS



TIMES MICROWAVE SYSTEMS, Inc. has been designing and manufacturing coaxial cables and cable subsystems for more than fifty years. From its inception, TIMES (TMS) continues to be in the forefront of this industry, pioneering a wide range of coaxial cable and connector developments. TMS cable assemblies are used to interconnect microwave transmitters, receivers, and antennas on commercial and military airframes, missiles, ships, satellites, and ground based communications systems. TMS cable assemblies are also used as test leads for test and instrumentation applications.

TIMES MICROWAVE SYSTEMS is a technically oriented coaxial cable manufacturer that has been able to continually meet and exceed the challenges for specialty engineered transmission lines for both the commercial and military sectors, drawing upon:

- Thousands of cable and connector designs
- Material and process controls
- ISO 9001 Certification
- RF and microwave design capability
- Unique in-house testing capabilities including RF shielding/leakage, vibration, moisture/vapor sealing, phase noise, flammability, etc.
- MIL-T-81490, MIL-C-87104, and MIL-PRF-39012 experience
- FAA, FAR25, DO-160



Customized solutions to meet the system interconnect needs of our customers that you can count on day in and day out is our business. We invite you to put TIMES MICROWAVE SYSTEMS to the test:

***The test of experience,
innovation, and support!***

TMS QUALIFICATIONS & CAPABILITIES

QUALIFICATIONS

TIMES MICROWAVE SYSTEMS products are qualified for service on the following airframes and platform applications:

A-10	B-717
AGM-129A (ACM)	BAe 125
AH-IS COBRA	BAe 146
AH-64 APACHE	BOEING 727
AIRBUS A300	BOEING 737
AIRBUS A319	BOEING 747
AIRBUS A320	BOEING 757
AIRBUS A321	BOEING 767
BAe 146	BGM-109
AWACS	(TLAM & TASM)
B-52	C-17

C-130	F-16
C-160	F-18
CANADAIR	F-22
CL-600	F-111
CG-47	F-117
CESSNA 208	GRIPEN
CN 235	HARRIER
CP-140	JSF
DD-963	L-159
DDG-51	LAMPS
DDG-91	LOCKHEED L-1011
E-2C	LYNX
EA-6H	McDONNELL DC-8
EF-111	McDONNELL DC-9
EH-101	McDONNELL DC-10
EH-IX	McDONNELL MD-10
F-14	McDONNELL MD-11
F-15	McDONNELL MD-80

McDONNELL MD-81	P-3C
McDONNELL MD-82	PILATUS PC-12
McDONNELL MD-83	PPG-7
McDONNELL MD-87	S-3
McDONNELL MD-88	SOCATA
MH-47	TBM-700
MH-60	SEA KING
MIRAGE 2000-5	SH-60
NIMROD MR4A	BLACK HAWK
OH-X	TA-4
OV-10	TORNADO
OV-1D	V-22



MARKETS SERVED



CAPABILITIES

TIMES MICROWAVE SYSTEMS is a vertically integrated organization, allowing us to maintain complete control over all aspects of our business.



ENGINEERING:

- Complete in-house design, development, prototyping and trouble-shooting capabilities
- Four CAD stations
- Twelve network analyzers
- Degreed engineers comprise over 25% of Times Microwave Systems' workforce



TESTING:

- Complete parametric testing of all assemblies performed on state-of-the-art Network Analyzer equipment
- Assemblies sealed per MIL-T-81490 and MIL-C-87104 are verified by advanced Helium mass spectrometer equipment



QUALITY:

- Manufacturing managed by the most advanced SPC techniques
- Quality system per MIL-I-45208
- Soldering per MIL-STD-2000

TIMES QUALIFIED MILTECH™ CABLE ASSEMBLIES



Starting on page 5

MILTECH Qualified Cable Assemblies

- Manufactured to the requirements of MIL-C-87104 and MIL-T-81490, FAA FAR25 and DO-160
- Fully vapor sealed for system longevity
- Highly ruggedized for severe environments
- Used on the most advanced commercial and military platforms



Starting on page 18

Special Products

- Phase matched/Amplitude matched cable assemblies
- Phase adjustable trimmers
- Equalized cable assemblies
- Millimeter wave cable products
- 18 GHz test leads
- Test adapters
- Tools



Starting on page 22

MILTECH Qualified Cable Assemblies

- Standard interface for the F-22
- 1.2:1 VSWR per mated pair through 20 GHz
- Available for flexible and semi-rigid cables from 0.086"/2.18 mm through 0.340"/8.64 mm OD
- Many sizes available
- Redundant gasket seals
- Qualified for high vibration environments
- Simple field replacement of individual cables

TIMES QUALIFIED MILTECH™ CABLE ASSEMBLIES

The Times Qualified *MILTECH* family of hermetically sealed flexible RF and microwave transmission line assemblies are optimized and qualified for commercial, military and other demanding applications. The proprietary application of a spiral flat strip braid results in a cable assembly with superior phase coaxial cables without sacrificing flexibility! There are now three versions of the popular *MILTECH* 340 cable, all providing the same electrical performance, but allowing a choice of cable weights – ideal for applications where both low loss and reduced weight are required. These *MILTECH* cable assemblies exhibit extremely long life in the rigorous environments found in airborne, shipboard and ground based applications.

TMS distinguishes itself by designing and manufacturing the cable, the connectors, and the cable/connector junction. This engineered integration of cable and connectors makes TMS cable assemblies unique. The integration optimizes the electrical and mechanical performance and includes a 1×10^{-5} cc/sec/ft vapor seal that ensures longevity. This control of the cable/connector interface guarantees the right mix of electrical and mechanical characteristics, strength and durability, resulting in a broadband transmission line perfectly suited for severe environments.

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 *MILTECH* 210
Stranded silver-plated copper on *MILTECH* 480

Times qualified *MILTECH* flexible RF and microwave transmission line assemblies described here meet the following performance criteria:

Cable Type	Recommended Cable Clamp
<i>MILTECH</i> 210	MS2919-4
<i>MILTECH</i> 230	MS2919-4
<i>MILTECH</i> 265	MS2919-5
<i>MILTECH</i> 340	MS2919-7
<i>MILTECH</i> 480	MS1919-8

Times Qualified *MILTECH* Cable

Times Qualified Assembly Type	Cable Diameter (In./mm.)	Loss@ 18 GHz (dB/ft.)	TMS Specification	Minimum Bend Radius (In./mm.)	Mass
<i>MILTECH</i> ™ 210	0.21/5.3	0.48	<i>MILTECH</i> 210	1.00/25.4	0.035lb/ft (52g/m)
<i>MILTECH</i> ™ 230	0.23/5.8	0.38	<i>MILTECH</i> 230	1.15/29.2	0.045lb/ft (68g/m)
<i>MILTECH</i> ™ 265	0.265/6.7	0.32	<i>MILTECH</i> 265	1.30/33.0	0.065lb/ft (97g/m)
<i>MILTECH</i> ™ 340	0.34/8.6	0.22	<i>MILTECH</i> 340	1.90/48.3	0.105lb/ft (157g/m)
<i>MILTECH</i> ™ 340XL	0.34/8.6	0.22	<i>MILTECH</i> 340XL	1.90/48.3	0.080lb/ft (120g/m)
<i>MILTECH</i> ™ 340EL	0.34/8.6	0.22	<i>MILTECH</i> 340EL	1.90/48.3	0.070lb/ft (105g/m)
<i>MILTECH</i> ™ 480	0.46/12.2	0.13 (@ 10 GHz)	<i>MILTECH</i> 480	2.25/57.2	0.200lb/ft (303g/m)

DETAILED PERFORMANCE SPECIFICATIONS

Times qualified **MILTECH** flexible RF and microwave transmission line assemblies described here meet the following performance criteria:

Electrical Characteristics

Tested frequency range	0.5 to 18 GHz (10 GHz for <i>MILTECH</i> 480)
Characteristic impedance	50 Ohms
VSWR	1.4:1 maximum; add 0.05 per angle connector
Insertion loss	see following pages
Velocity of propagation	76% Nom. For <i>MILTECH</i> 210, 230, 265 80% Nom. For <i>MILTECH</i> 340/340XL 78% Nom. For <i>MILTECH</i> 480
Maximum operating voltage	2500 Volts (1000 Volts with SMA) 1000 Volts for <i>MILTECH</i> 210 and 230
RF leakage	-90 dB maximum per foot over tested Frequency range including connectors
Insertion loss stability	In accordance with MIL-T-81490
VSWR stability	In accordance with MIL-T-81490

Mechanical Characteristics

Temperature range	-55°C to +200°C
Chemical resistance	In accordance with MIL-T-81490 and MIL-C-87104
Flexure	In accordance with MIL-T-81490 and MIL-C-87104
Salt fog	In accordance with MIL-T-81490 and MIL-C-87104
Humidity	In accordance with MIL-T-81490 and MIL-C-87104
Abrasion resistance	In accordance with MIL-T-81490 and MIL-C-87104
Cable/connector tensile strength	45 lbs. minimum (<i>MILTECH</i> 210, 230, 265) 75 lbs. minimum (<i>MILTECH</i> 340/340XL, 480)
Vapor leakage	1×10^{-5} cc/sec/ft of Helium maximum including connectors
Vibration	In accordance with MIL-T-81490
Shock	In accordance with MIL-T-81490

Assembly Performance Overview

Electrical characteristics – All of the cable assembly styles noted above provide low loss, low VSWR and inherently stable performance. These sealed transmission line products provide the longest service life available.

Mechanical characteristics – The cable assemblies are designed, manufactured and tested to provide reliable interconnections in the most demanding installations and environments. This unparalleled combination of bending, torque and tensile strengths guarantee a long service life.

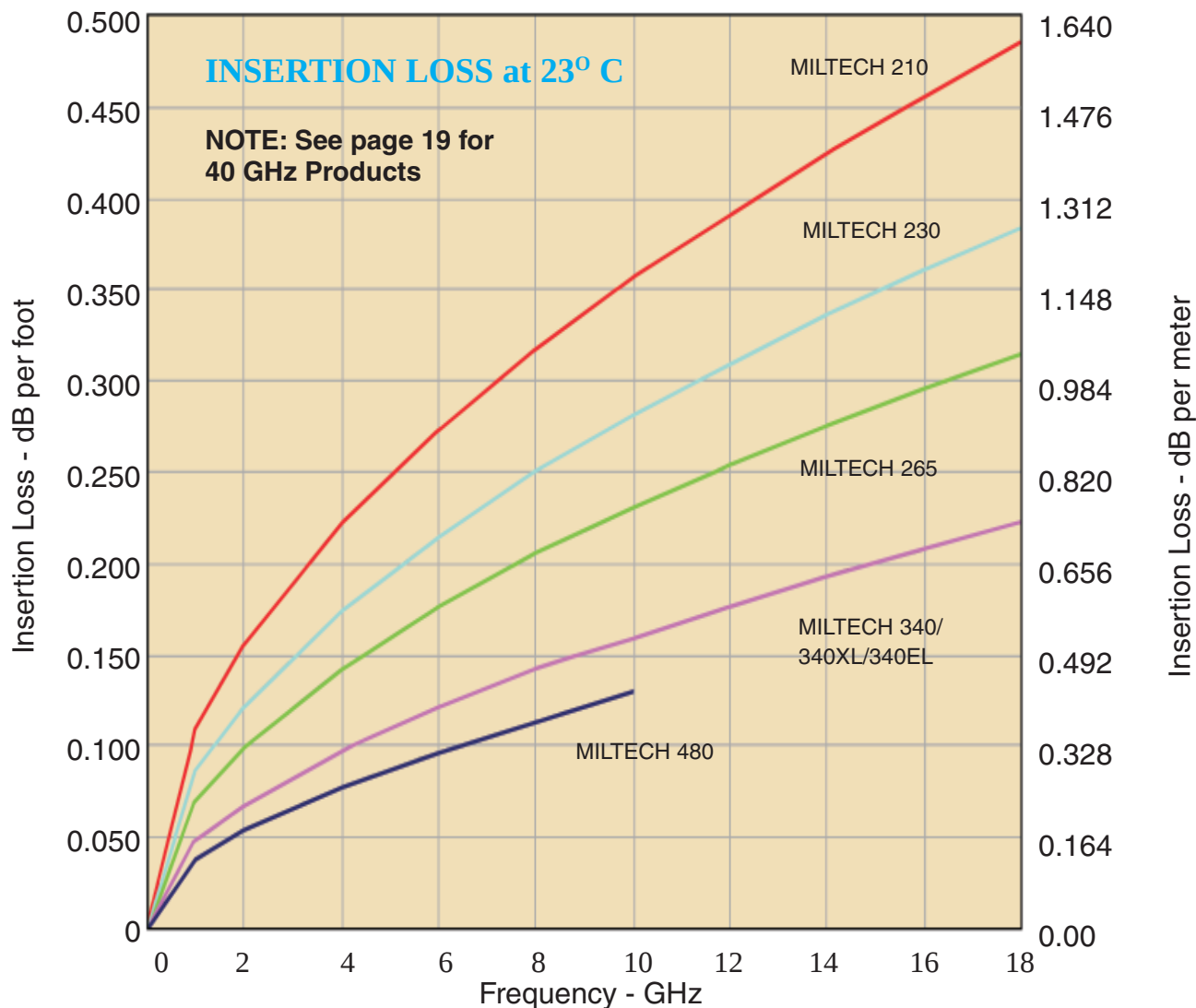
Insertion loss - Following is a graph of loss vs. frequency for *MILTECH* cables and equations to be used for calculating the loss at specific frequencies.

Testing - Each cable assembly is measured for insertion loss and VSWR over the test frequency range.

Connectors - All of the connectors used in these cable assemblies are of precision stainless steel design which meet or exceed the requirements of MIL-PRF-39012. They are uniquely designed to provide maximum electrical, mechanical and environmental performance.

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:

$$IL = K_1 \times \text{SqRt}(\text{FMHz}) + 0.000146 \times (\text{FMHz}) \text{ dB per 100 feet}$$

or

$$IL = K_2 \times \text{SqRt}(\text{FMHz}) + 0.000480 \times (\text{FMHz}) \text{ dB per 100 meters}$$

(where FMHz is the frequency in MHz)

Cable Type	K_1 , dB/100 feet.	K_2 , dB/100 meters.
MILTECH 210	0.34158	1.1207
MILTECH 230	0.26643	0.87390
MILTECH 265	0.21603	0.70876
MILTECH 340/340XL /EL	0.14582	0.47775
MILTECH 480	0.11462	0.37605

CONNECTOR LOSS	
Frequency MHz	Straight connectors* Connector loss/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
Insertion Loss @23°C	
*For angled connectors, add 0.1dB/conn.	

POWER HANDLING

The power handling values shown here apply to complete *MILTECH* assemblies with TNC connectors, based on a maximum assembly component temperature of 200°C. Figures 1 and 2 below illustrate the average power handling capability of the cable at 25° C/sea level and at 100°C/70,000 ft. *MILTECH* assemblies may be used at higher power levels if required, however, high ambient temperature and high altitude reduce the power rating of a particular cable by impeding the heat transfer out of the cable. The CW power rating must be derated by a correction factor for the ambient temperature and altitude. For estimated power ratings in conditions other than those shown, the derating factors shown in Tables 1 and 2 must be applied to the 25°C/sea level data to determine the power handling capability. Please consult the factory or your TMS representative for special conditions or requirements.

Fig. 1: *MILTECH* Maximum Power Handling Characteristics
25°C/Sea Level

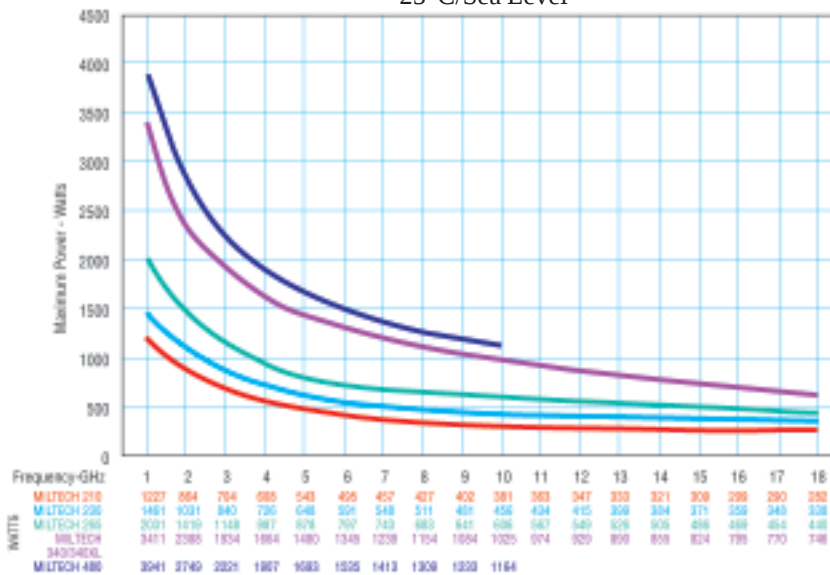


Fig. 2: *MILTECH* Maximum Power Handling Characteristics
100°C/70,000 ft. (21.34 km)

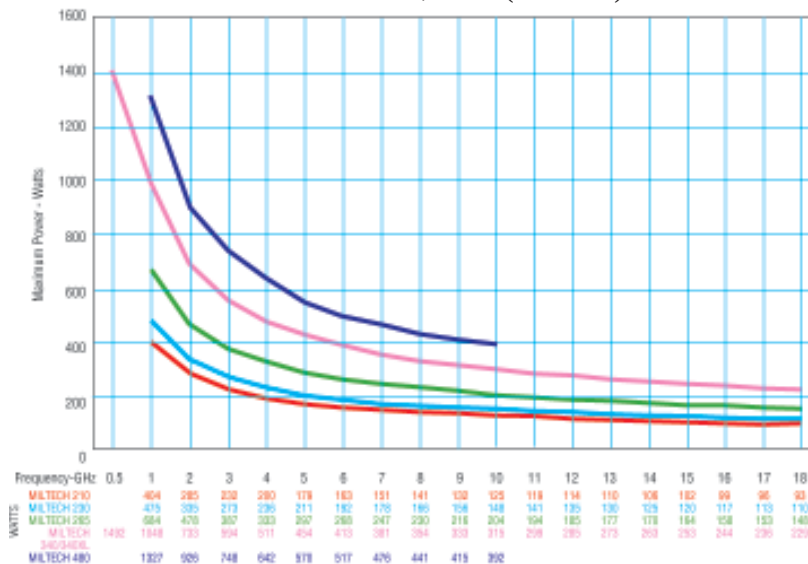


Table 1
Altitude Correction Factor

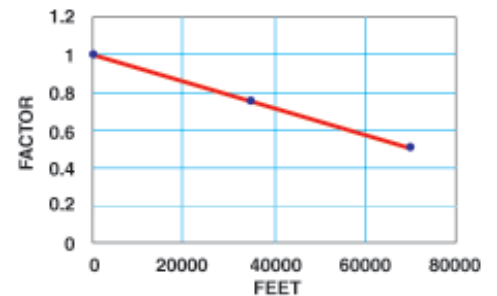
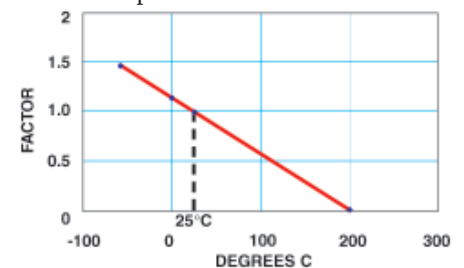


Table 2
Temperature Correction Factor



Apply straight line derating factors, as follows:

TEMPERATURE: Choose the applicable power level from the 25°C/sea level chart and multiply by the correction factor corresponding to the desired ambient temperature.

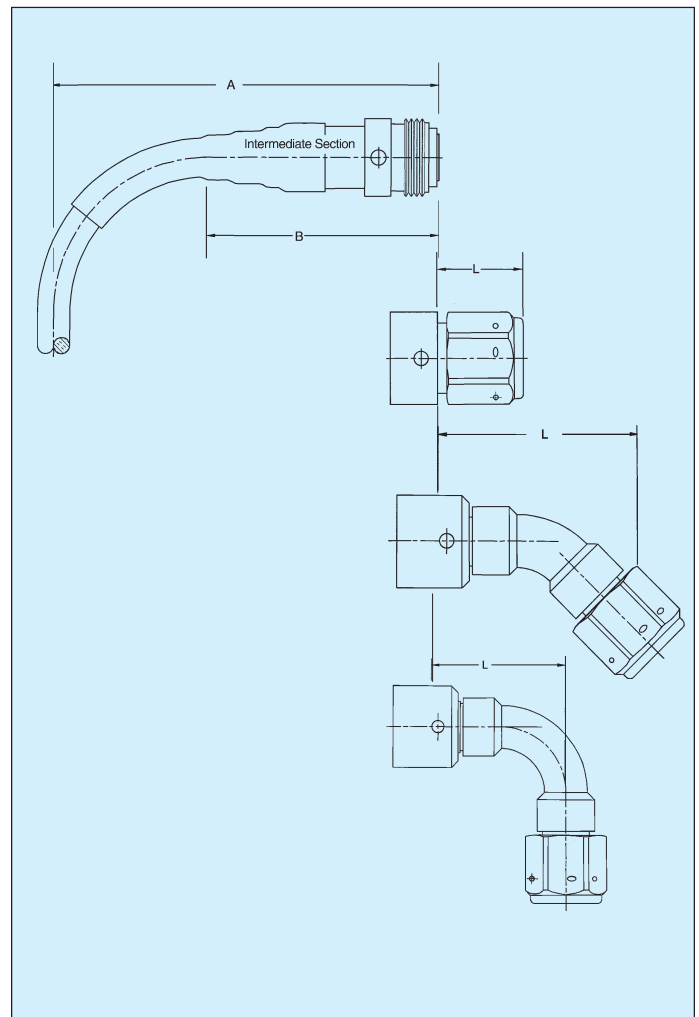
ALTITUDE: After obtaining the temperature adjusted power handling, multiply by the correction factor corresponding to the desired ambient altitude.

MILTECH™ CABLE ASSEMBLY CONFIGURATIONS

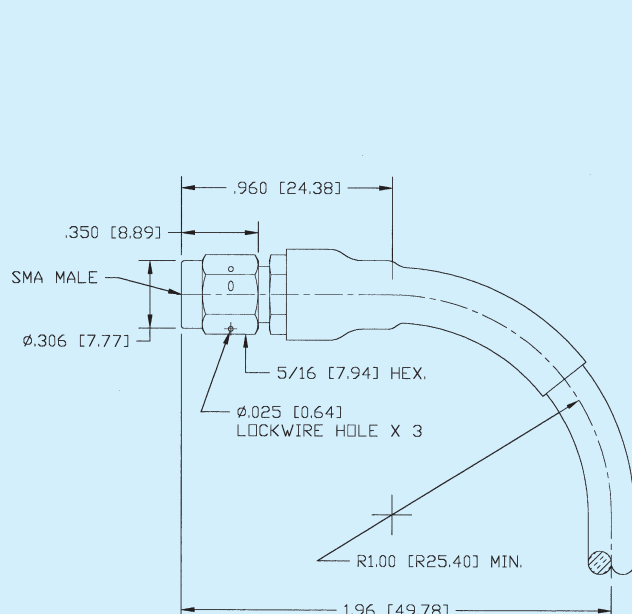
MILTECH cable assemblies consist of a *MILTECH* cable terminated with specially designed and fabricated connectors. *TIMES MICROWAVE SYSTEMS* manufactures a complete line of connectors to complement the *MILTECH* coaxial cables. The completed assemblies are available with either non-replaceable or replaceable connectors. The replaceable feature allows a damaged front end interface to be quickly replaced in the field without the need to remove the complete transmission line. All connector interfaces are designed to comply with various requirements of *MIL-STD-348*, *MIL-PRF-39012*, *MIL-C-87104*, OR *MIL-T-81490* and feature passivated stainless steel bodies and coupling nuts, PTFE dielectrics and gold-plated beryllium copper center contacts. An intermediate section, ruggedly attached to the cable itself, provides the point of attachment for the replaceable connector front end without sacrificing the vapor seal of the cable assembly. To determine the insertion loss for the complete assembly, add the cable loss to the connector loss shown on page 7.

MILTECH™ Cable Assembly Connector Envelopes

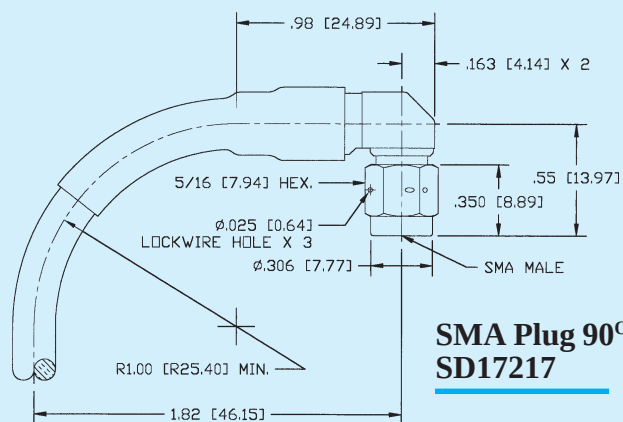
The installation envelopes for common *MILTECH* connectors installed on cables can be determined from the data on the following pages organized by the specific *MILTECH* cable size. The figure shown represents a typical transmission line assembly with the intermediate section attached. Dimension A is the distance from the front end dimension datum to the centerline of the cable when bent 90 degrees at the minimum bend radius of the cable. Dimension B is the solid length of the intermediate section where a cable can begin to be bent. Care must be exercised to be sure that the minimum bend radius of the cable is not reduced. For applications where space is limited, an angled connector (30, 45, or 90 degrees) should be considered to minimize stresses placed on the cable-to-connector junction. To determine the overall installation envelope, simply add dimension A to the overall connector length L. Dimensions for all replaceable front end connectors can be found on pages 14-17.



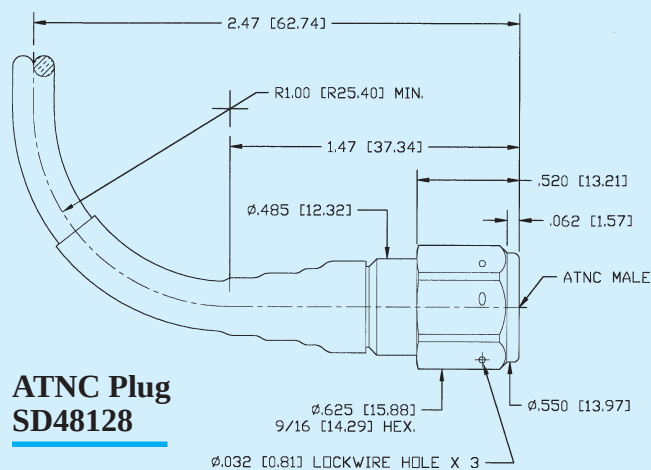
Non-replaceable Connectors



**SMA Plug
SD17218**

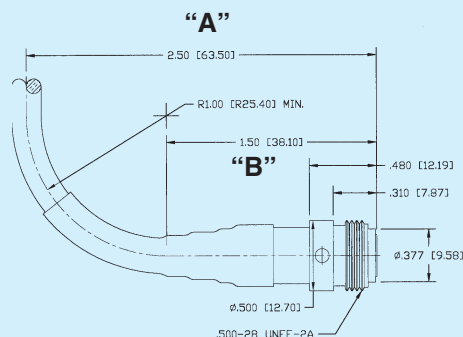


**SMA Plug 90°
SD17217**



**ATNC Plug
SD48128**

Replaceable Connectors

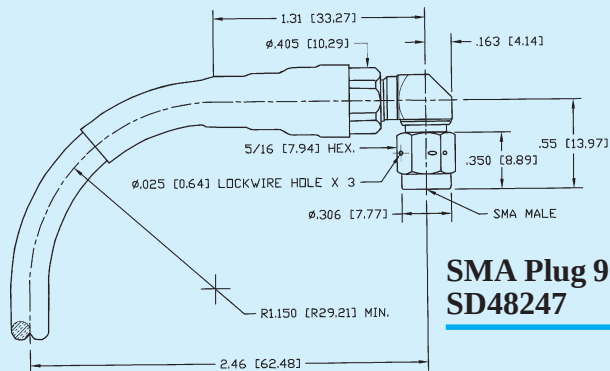


Connector Type	Part Number	Weight (oz/g)	Tool P/N
N Plug	SD48721	0.97/28	TN550-688
SMA Plug	SD48530	0.62/18	TN550-625
TNC Plug	SD48555	0.62/18	TN550-625
TNC Jack BKHD	SD48590	0.79/23	TN550-625
TNC Plug 90°	SD48572	1.41/40	TN550-625
TNC Plug 45°	SD48576	1.32/38	TN550-625
TK Plug	SD48554	0.73/21	TN550-625
Intermediate Section	SD17966	1.28/37	TN550-500

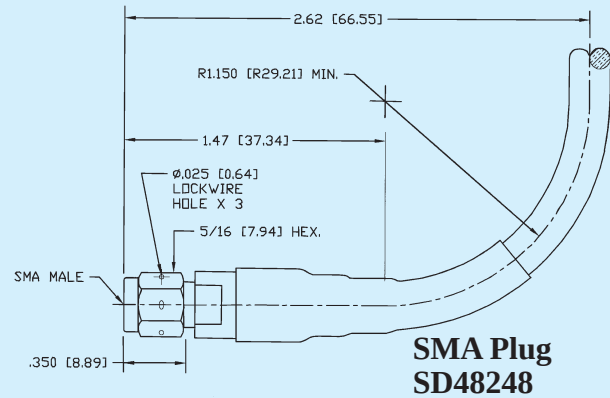
Dimensions for all replaceable connectors may be found on pages 14-17.

MILTECH™ 230 ENVELOPE DIMENSIONS

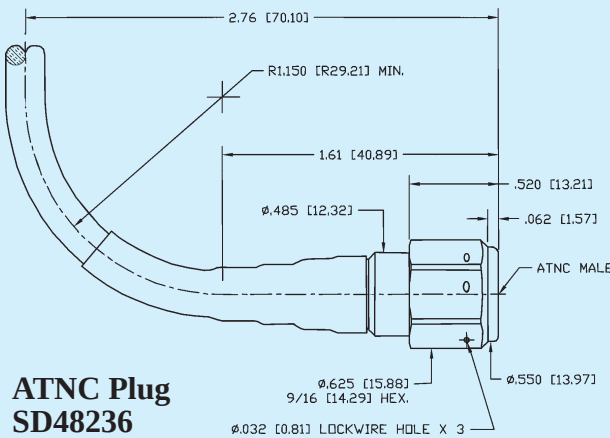
Non-replaceable Connectors



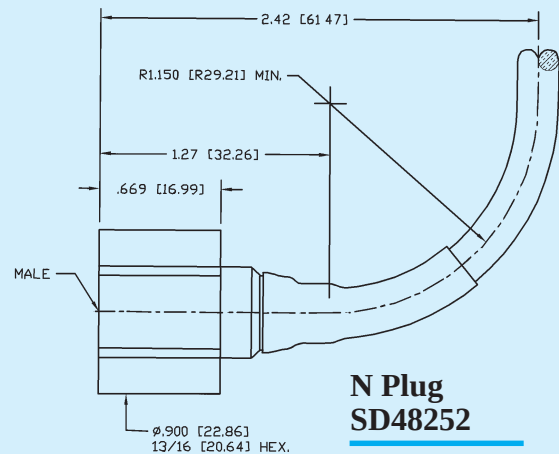
**SMA Plug 90°
SD48247**



**SMA Plug
SD48248**

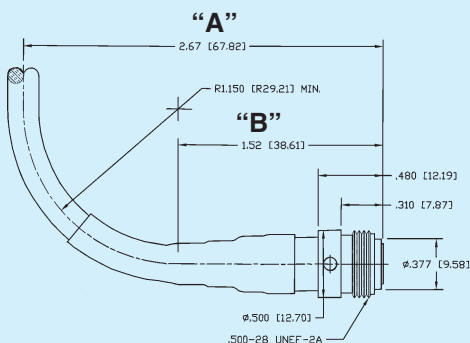


**ATNC Plug
SD48236**



**N Plug
SD48252**

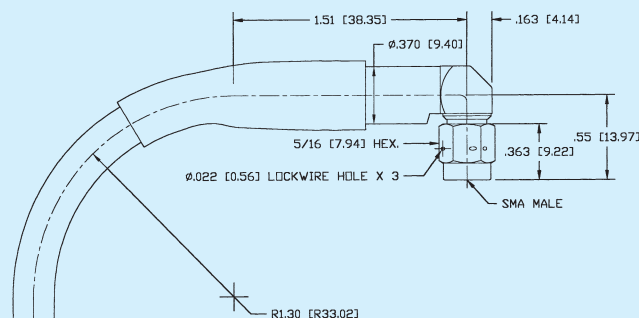
Replaceable Connectors



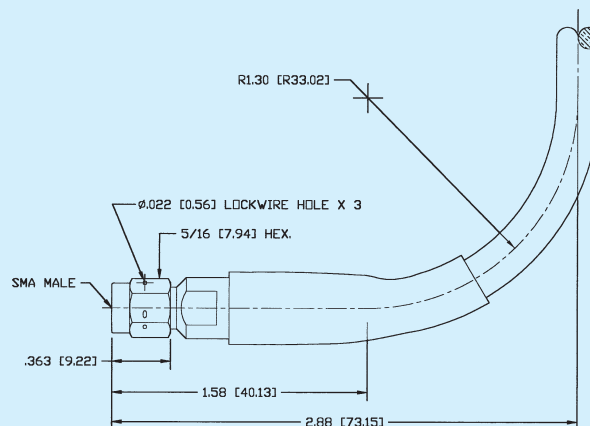
Connector Type	Part Number	Weight (oz/g)	Tool P/N
N Plug	SD48721	0.97/28	TN550-688
SMA Plug	SD48530	0.62/18	TN550-625
TNC Plug	SD48555	0.62/18	TN550-625
TNC Jack BKHD	SD48590	0.79/23	TN550-625
TNC Plug 90°	SD48572	1.41/40	TN550-625
TNC Plug 45°	SD48576	1.32/38	TN550-625
TK Plug	SD48554	0.73/21	TN550-625
Intermediate Section	SD17966	1.28/37	TN550-500

Dimensions for all replaceable connectors may be found on pages 14-17.

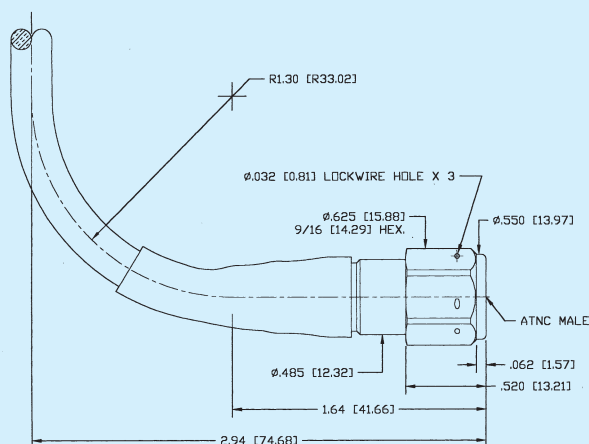
Non-replaceable Connectors



**SMA Plug 90°
SD48217**

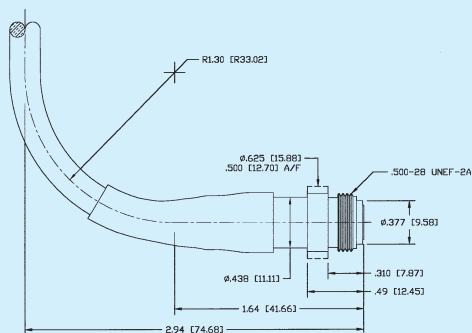


**SMA Plug
SD48214**



**ATNC Plug
SD48190**

Replaceable Connectors

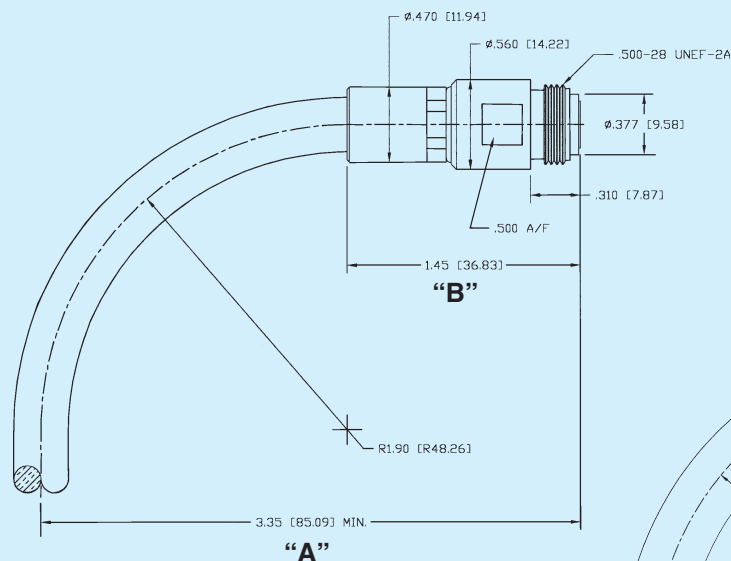


Connector Type	Part Number	Weight (oz/g)	Tool P/N
N Plug	SD48721	0.97/28	TN550-688
SMA Plug	SD48530	0.62/18	TN550-625
TNC Plug	SD48555	0.62/18	TN550-625
TNC Jack BKHD	SD48590	0.79/23	TN550-625
TNC Plug 90°	SD48572	1.41/40	TN550-625
TNC Plug 45°	SD48576	1.32/38	TN550-625
TK Plug	SD48554	0.73/21	TN550-625
Intermediate Section	SD17945	1.128/32 ... 1/2" Open End	

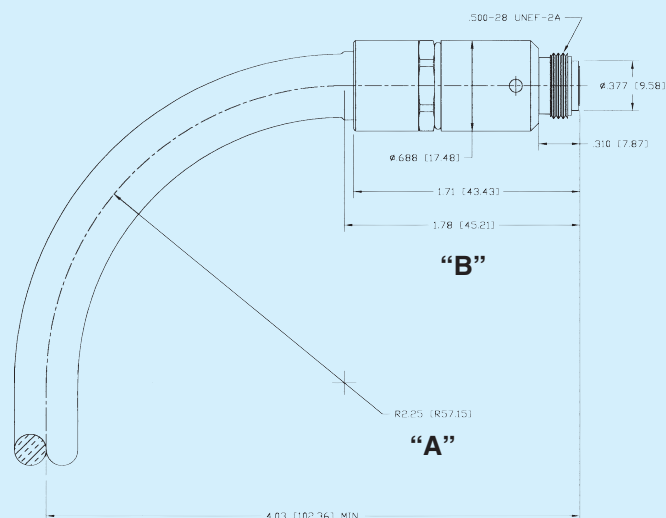
Dimensions for all replaceable connectors may be found on pages 14-17.

MILTECH 340/340XL and MILTECH 480

MILTECH 340/340XL/EL



MILTECH 480



Standard Replaceable Connectors

COMMON FRONT ENDS

Connector Type	Part Number	Weight (oz/g)	Tool P/N
ATNC Plug	SD48555	0.62/18	TN550-625
ATNC Plug 45°	SD48576	1.32/38	TN550-625
ATNC Plug 90°	SD48572	1.41/40	TN550-625
ATNC Plug 90°	SD48573	1.50/43	TN550-625
ATNC Jack	SD48601	0.62/18	TN550-625
ATNC Jack BKHD	SD48590	0.79/23	TN550-625
ATNC 90° Jack BKHD	SD48609	1.58/45	TN550-625
ATNC 90° Jack BKHD	SD48569	1.76/50	TN550-625
N Plug	SD48721	0.97/28	TN550-688
N Plug 90°	SD48628-1	2.06/59	TN550-625
N 90° Jack BKHD	SD48629	2.90/83	TN550-625
N Jack BKHD	SD48667	1.25/36	TN550-625
SC Plug	SD48642	1.65/47	TN550-688
SC Jack BKHD	SD48680	2.50/71	TN550-625
SMA Plug	SD48530	0.62/18	TN550-625
SMA Plug 90°	SD48608	1.02/30	TN550-625
TK Plug	SD48554	0.73/21	TN550-625
MILTECH 340/340XL Int. Sec ...	SD17944	1.12/32 ½" Open End	
MILTECH 480 Int. Sec.	SD17935	1.60/46	TN550-688

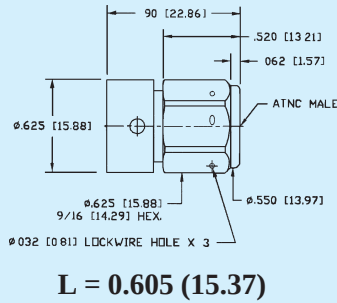
Self-Locking Replaceable Connectors

COMMON FRONT ENDS

Connector Type	Part Number	Weight (oz/g)	Tool P/N
ATNC Plug	SD48606	1.06/30	TN550-688
ATNC Plug 90°	SD48645	2.11/60	TN550-625
N Plug	SD48669	1.55/44	TN550-625
N Plug 90°	SD48647	2.55/73	TN550-625
SMA Plug	SD48689	1.30/37	TN550-625
SMA Plug 90°	SD48688	0.70/20	TN550-625
TNC Plug 45°	SD48674	2.15/61	TN550-625

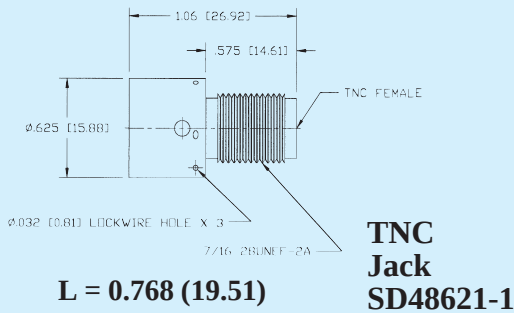
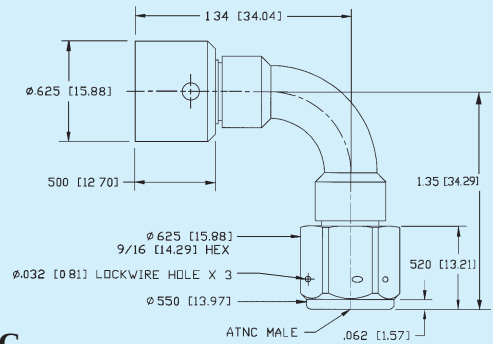
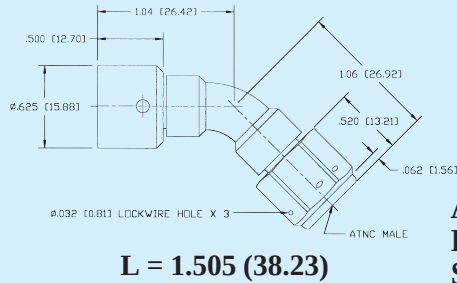
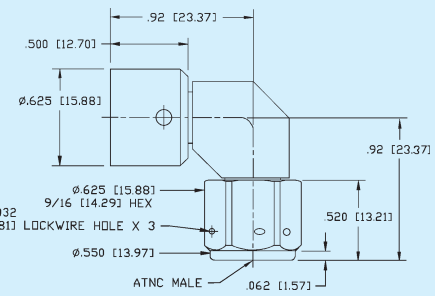
Dimensions for all replaceable connectors may be found on pages 14-17

MILTECH™ REPLACEABLE FRONT END CONNECTORS



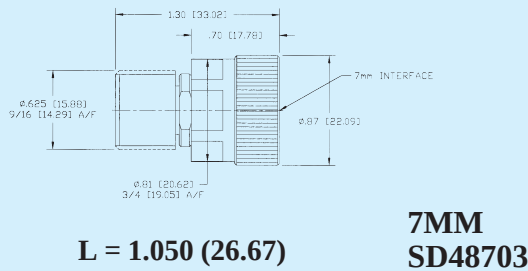
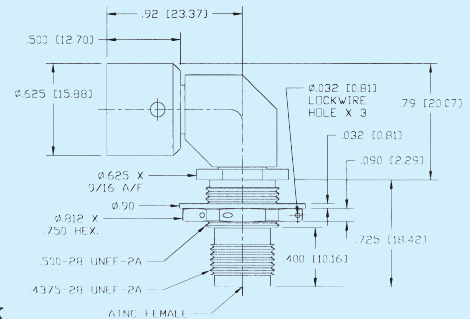
ATNC Plug 90° SD48573

L = 0.640 (16.26)



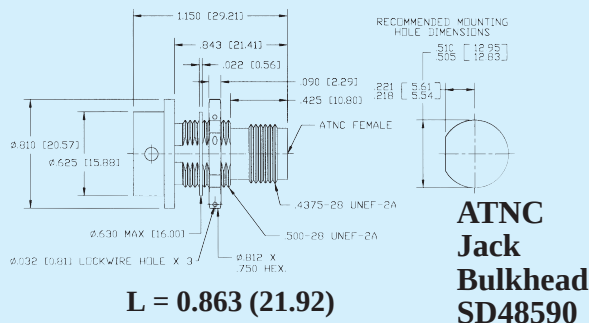
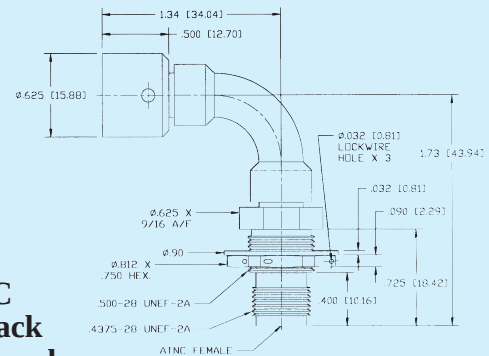
ATNC 90° Jack Bulkhead SD48609

L = 0.640 (16.26)



ATNC 90° Jack Bulkhead SD48569

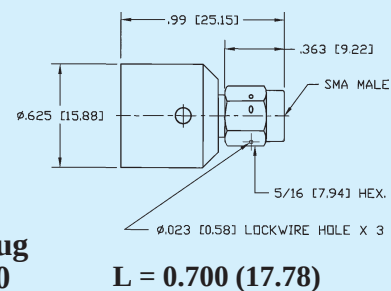
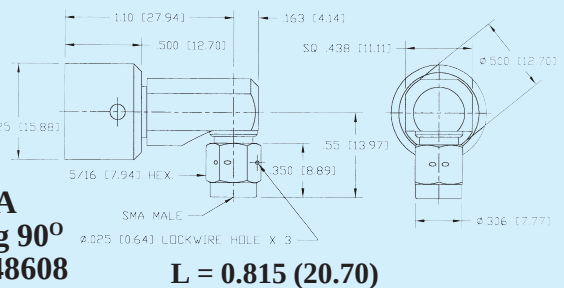
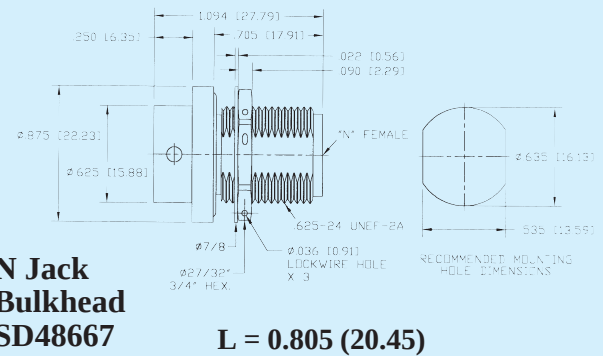
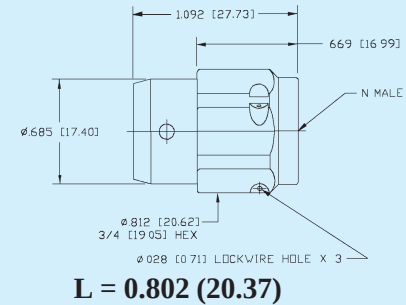
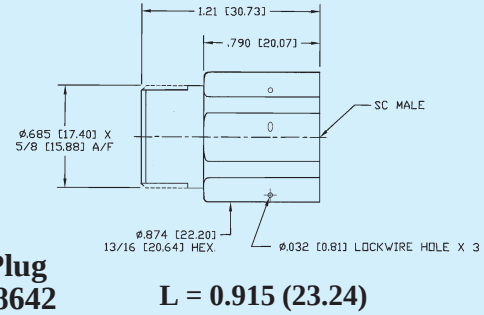
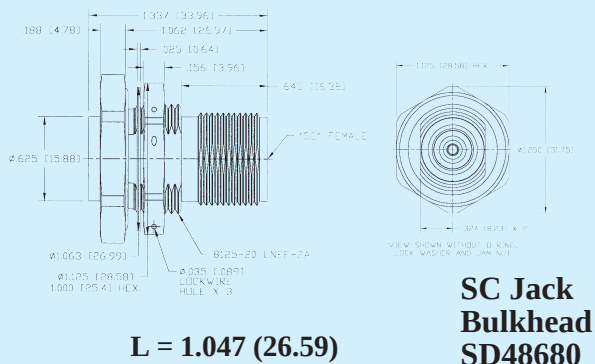
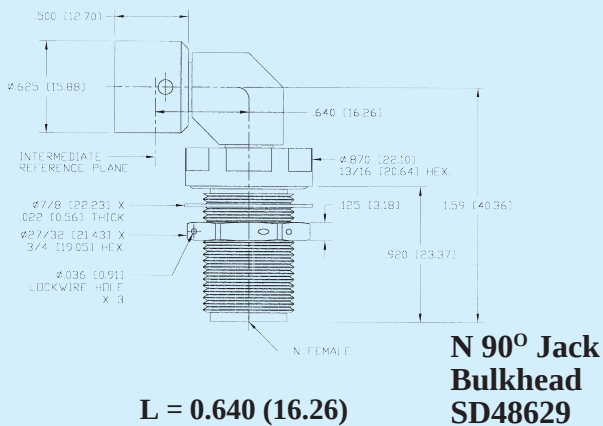
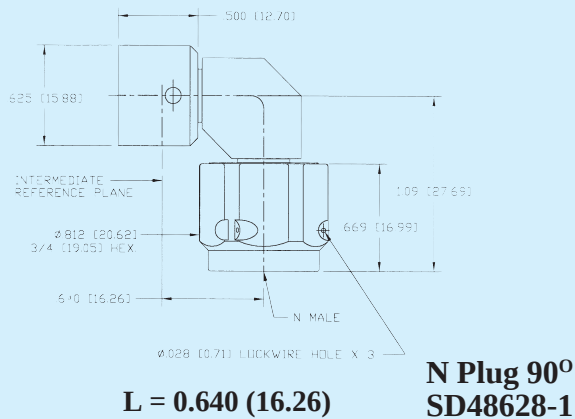
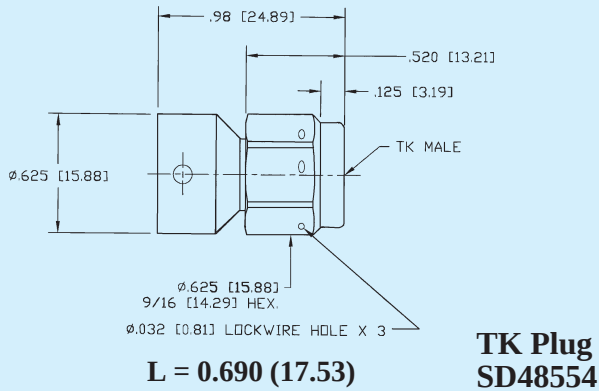
L = 1.05 (26.67)



ATNC 90° Jack Bulkhead SD48569

L = 1.05 (26.67)

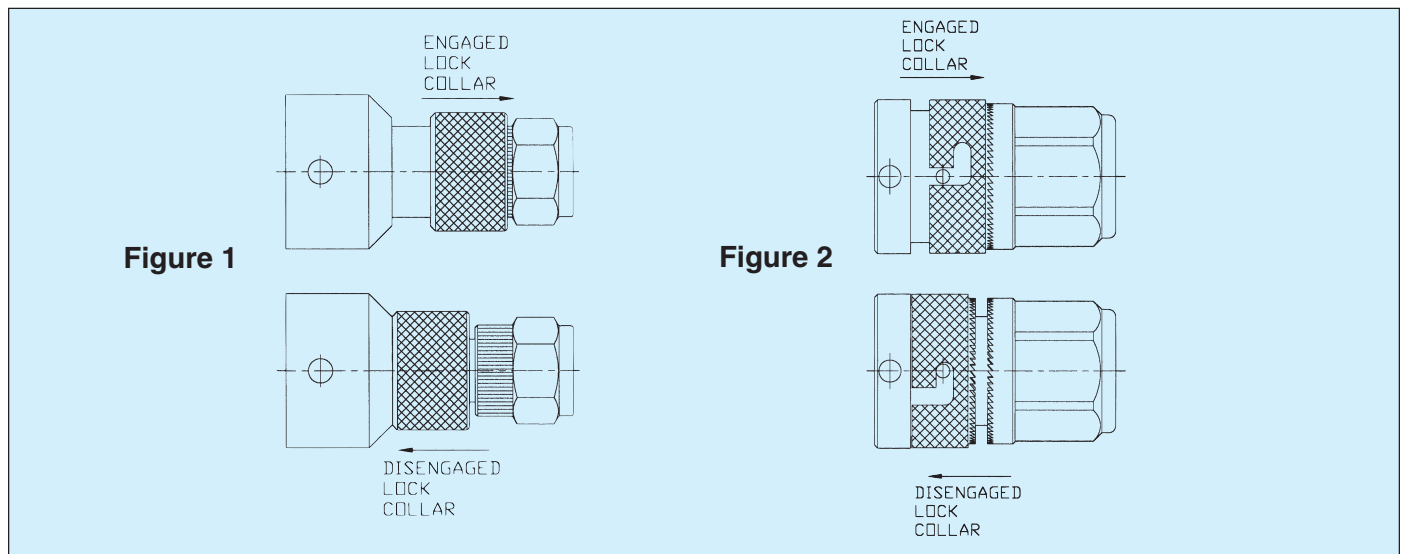
MILTECH™ REPLACEABLE FRONT END CONNECTORS



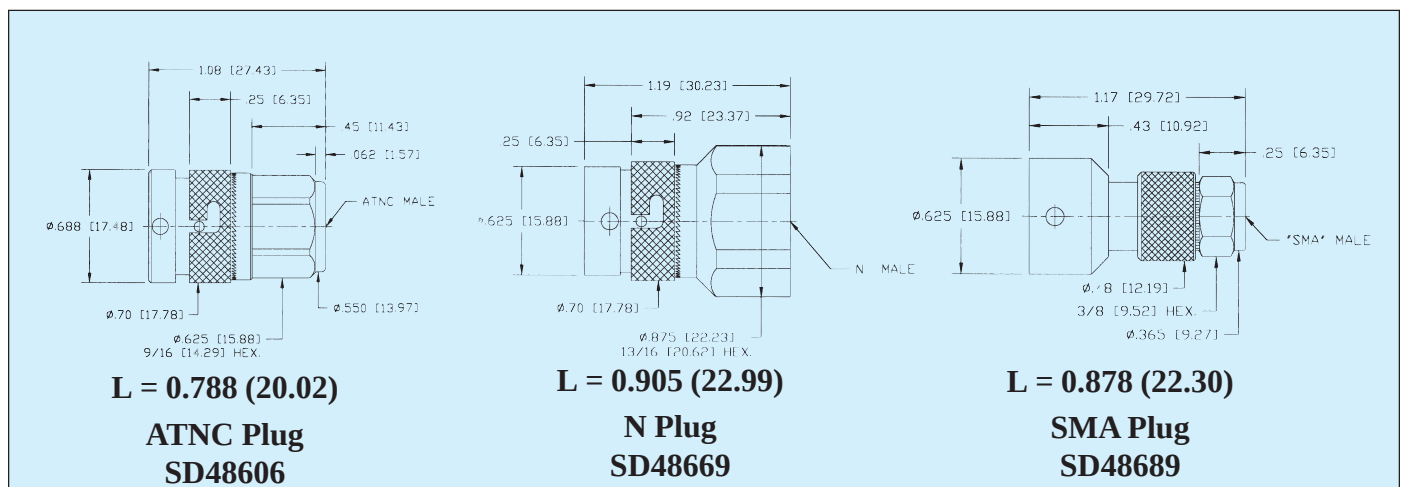
SELF LOCKING CONNECTORS

TIMES MICROWAVE SYSTEMS has been a pioneer in the development of self-locking connectors for high performance connectors used in the aerospace industry. Originally developed for the USAF F-15 Program, the self-locking feature eliminates the need for expensive torque wrenches and makes the mating connection a simple, one hand operation! The self-locking feature eliminates the need for time consuming safety wire connectors, yet they provide positive engagement during vibration. All interfaces comply with MIL-PRF-39012 and the connectors are made from the same high quality corrosion resistant materials used on other TMS connectors.

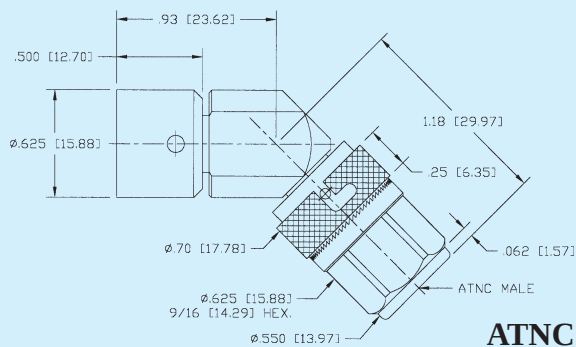
Illustrated below are two different styles of self-locking connectors. Figure 1 utilizes a “lock collar” to provide the locking mechanism and is typically used on smaller connectors, i.e. SMA. Figure 2 utilizes a “bayonet” locking collar and is typically used on larger connectors. Both designs incorporate a knurled outer surface for slip free hand operation. Both are illustrated in the locked and unlocked positions.



MILTECH™ REPLACEABLE FRONT END SELF-LOCKING CONNECTORS

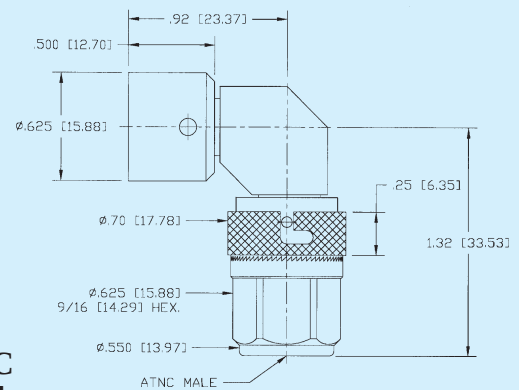


MILTECH™ REPLACEABLE FRONT END SELF-LOCKING CONNECTORS



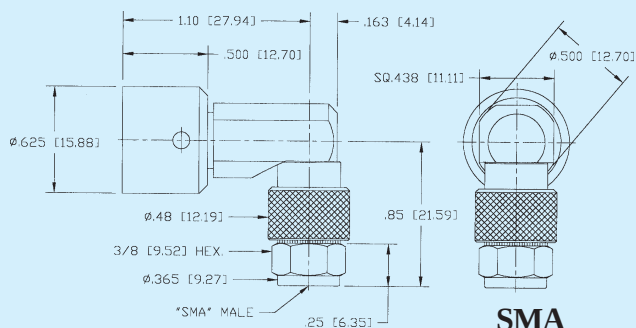
L = 1.475 (37.47)

**ATNC
45° Plug
SD48674**



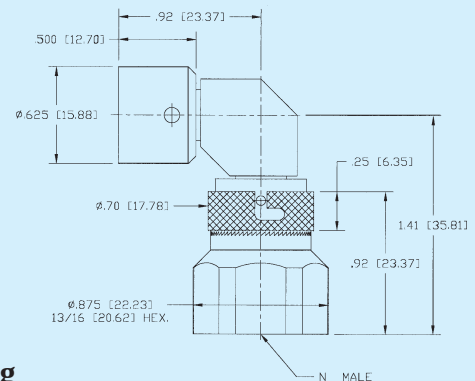
**ATNC
90° Plug
SD48645**

L = 0.640 (16.26)



L = 0.815 (20.70)

**SMA
Plug 90°
SD48688**



**N
90° Plug
SD48647**

L = 0.640 (16.26)

SPECIALIZED CONNECTORS

TIMES MICROWAVE SYSTEMS has produced specialized connectors for unique applications that require modifications to the standard connectors and interfaces. Most are manufactured to the requirements of MIL-T-81490, MIL-C-87104 and MIL-PRF-39012. With almost 10,000 connector designs to choose from, there's a good chance that we have the connector you need for your application with little or no modification.

Please contact us regarding your specific requirements.



PHASE MATCHED/AMPLITUDE MATCHED CABLE ASSEMBLIES

TIMES MICROWAVE SYSTEMS has extensive experience in the design and manufacture of phase and amplitude matched cable assemblies for use in a broad range of applications. We fabricate and store reference standards. In many cases, our existing cable designs will satisfy the requirements, however, when necessary, a new cable can be designed to meet the specific application.

For phase sensitive applications, *TIMES MICROWAVE SYSTEMS* has a dedicated temperature and humidity controlled facility in which we assemble and test all high precision, phase-matched cable assemblies. Our facility includes HP8510 Vector Automatic Network Analyzers.

Precise temperature and humidity control allows us to establish an unmistakable reference base line for all tests related to phase. This dedicated facility is used for both the development and high-volume production of cable assemblies. The primary benefits of such a dedicated facility include unambiguous results and prompt delivery of cable assemblies that meet the most demanding state-of-the-art requirements such as those found in MIL-C-87104 or MIL-T-81490.

Please contact us regarding your specific needs.

PHASE ADJUSTABLE TRIMMERS

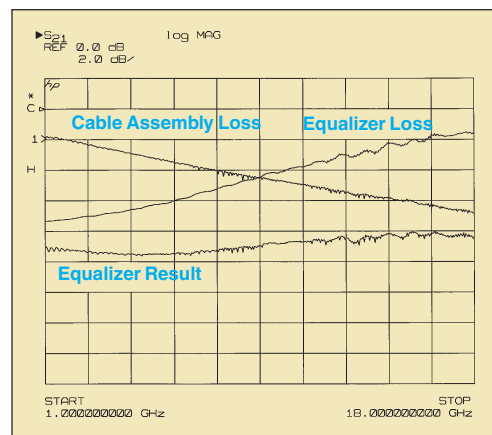
As high performance aircraft are upgraded with the latest technology EW and ESM systems, the need for phase matched cable assemblies is increasing. Phased array antennas often need multiple cable assemblies that require the cable assemblies to be phase matched after they are installed in the aircraft, some of which are routed through areas that subject the cables to multiple bends and twists, often exceeding the capabilities of the most phase stable cables. *TIMES MICROWAVE SYSTEMS* has developed in-line phase trimmers qualified to MIL-T-81490 requirements that can be adjusted to compensate for phase changes that occur as the result of installation. Typical phase adjustment is ± 100 degrees at 18 GHz.

Please contact us regarding your specific needs.

EQUALIZED CABLE ASSEMBLIES

For applications requiring a flat signal response as the frequency is swept, *TIMES MICROWAVE SYSTEMS* has developed cable assemblies with built-in signal equalizers. As most aerospace applications require commonality between “black boxes” for ease of maintenance and repair, a cable assembly with a built-in equalizer eliminates the need to incorporate the equalizer with the LRU. The equalizer is uniquely packaged to fit into the back end of the connector, with a minimal increase in the overall connector length. For existing cable assemblies, the equalizer can be packaged into a simple adapter that mates with the cable connector. *TIMES MICROWAVE SYSTEMS* can design an equalizer assembly that will maintain a flat signal response over a wide frequency range.

Please contact us regarding your specific needs.



MILLIMETER WAVE CABLE ASSEMBLIES

TIMES MICROWAVE SYSTEMS millimeter wave coaxial cable assemblies are designed to meet MIL-T-81490 as applicable and provide a highly reliable and ruggedized answer to your difficult signal transmission problems. Available in two cable sizes, these cable assemblies deliver lower losses (down to 0.820 dB/ft. at 40 GHz) and improved flexibility while maintaining an amplitude change during flexure of less than 0.1 dB.

Our standard construction, designed for maximum flexibility, can replace 0.141"/3.58mm hard-line in many internal "black box" applications, eliminating costly tooling expenses and facilitating assembly and repair. Typical applications extend to equipment racks, test leads and low cost equipment interconnections as well. These highly reliable assemblies will survive high concentrated loads and flexure without degradation in electrical performance.

Technical Data

	MILTECH 130 0.130"/3.30mm Cable Assemblies	MILTECH 175 0.175"/4.45 mm Cable Assemblies
Electrical performance:		
Maximum VSWR:2-12.4 GHz	1.30:1	1.30:1
12.4-40 GHz	1.40:1	1.40:1
Maximum insertion loss:	0.98dB per ft @ 40 GHz 0.78dB per ft @ 26 GHz 0.65dB per ft @ 18 GHz	0.82dB per ft @ 40 GHz 0.66dB per ft @ 26 GHz 0.54 dB per ft @ 18 GHz
Shielding efficiency:	Better than -90dB	Better than -90dB
Mechanical performance:		
Connector retention:	25 lbs.	35 lbs.
Minimum bend radius:	0.650"	0.875"
Environmental performance:		
Temperature range:	-65 to +200°C	-65 to +200°C
Moisture resistance:	MIL-STD 202, Method 106	MIL-STD 202, Method 106
Vibration:	MIL-STD 202, Method 204, Cond. C	Mil-STD 202, Method 204, Cond. C
Shock:	MIL-E-5272, Para. 4.15.5.1	MIL-E-5272, Para 4.15.5.1
Connectors:		
Passivated stainless steel	2.9 mm, plug and jack (K) 2.4 mm, plug and jack	2.9 mm, plug and jack (K) 2.4 mm, plug and jack

Please contact us regarding your specific needs.

MILLIMETER WAVE CABLE ASSEMBLIES

- Operation to 40 GHz • MIL-T-81490 features
- Stainless steel connectors
- 2 sizes for low insertion loss
- Operation to 200°C

Insertion loss at intermediate frequencies can be calculated as follows:

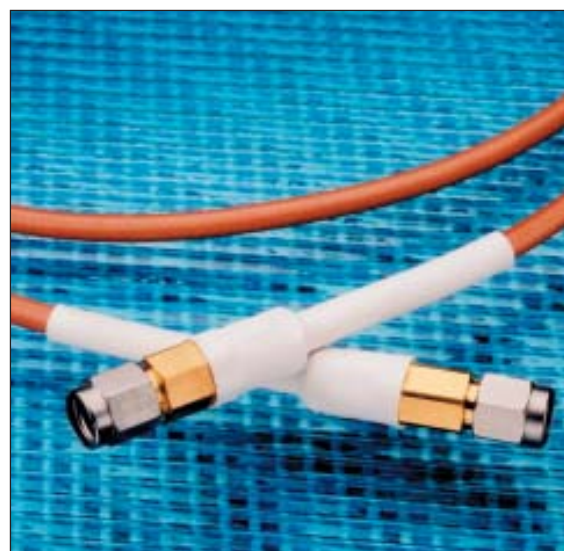
$$IL = K_1 \times \text{SqRt}(\text{FMHz}) + 0.000146 \times (\text{FMHz}) \text{dB per 100 feet}$$

or

$$IL = K_2 \times \text{SqRt}(\text{FMHz}) + 0.000480 \times (\text{FMHz}) \text{ dB per 100 meters}$$

(where FMHz is the frequency in MHz)

Cable	K_1 , dB/100 ft.	K_2 , dB/100 meters.
MM 0.130	0.4622	1.5160
MM 0.175	0.3822	1.2536



TESTMATE MICROWAVE TEST LEADS

TIMES MICROWAVE SYSTEMS Testmate cables have the flexibility, durability and reliability required for laboratory, manufacturing and field testing applications. A variety of **MILTECH** male and female replaceable interfaces are available, allowing a single cable to be customized by the end used for multiple interconnect solutions without degrading the low loss and VSWR of the cable assembly. For general purpose testing requirements up to 18 GHz, **TIMES MICROWAVE SYSTEMS** offers 2 cable sizes. Using the same construction techniques as the military qualified **MILTECH** cable described elsewhere in the catalog, these cables provide the flexibility and low loss required for testing applications. Our ¼" cable offers the lowest loss and best flexibility for its size. For test applications requiring long cable lengths, our ½" cable offers the lowest loss up to 18 GHz, while still providing excellent flexibility.



18 GHz Test leads

- Customer replaceable **MILTECH** connector front ends
- Excellent electrical characteristics
- Heavy wall polyurethane jacket provides excellent abrasion resistance
- 2 sizes for low insertion loss

Additional Testmate literature is available at:
www.timesmicrowave.com

Technical Data

	Testmate – 230 test leads	Testmate – 340 test leads
Electrical performance:		
Maximum VSWR: 0.5–18 GHz	1.35:1	1.35:1
Maximum insertion loss:	0.43 dB per ft @ 18 GHz	0.26 dB per ft. @ 18 GHz
Shielding efficiency	Better than –90 dB	Better than –90 dB
Mechanical performance:		
Outside diameter:	¼"/6.4 mm	½"/12.7 mm
Connector retention:	75 lbs.	150 lbs.
Minimum bend radius:	1.25"/31.8 mm	2.00"/50.8 mm
Environmental performance:		
Operating temperature:	–65 to +90°C	–65 to +90°C
Moisture resistance:	MIL-STD 202, Method 106	MIL-STD 202, Method 106
Vibration	MIL-STD 202, Method 204, Cond.C	MIL-STD 202, Method 204, Cond.C
Shock:	MIL-E-5272, Para. 4.15.5.1	MIL-E-5272, Para 4.15.5.1
Connectors:		
Passivated stainless steel - (works with all MILTECH replaceable front ends)	SMA, plug and jack TNC, plug and jack N, plug and jack 7 mm	SMA, plug and jack TNC, plug and jack N, plug and jack 7mm

Please contact us regarding your specific needs. See pages 14 and 15 for part numbers for additional connectors.

TEST ADAPTERS

TIMES MICROWAVE SYSTEMS provides test adapters and between series test adapters for test labs and systems use. These durable, precision coaxial test adapters provide superior electrical performance and reliable service as test interfaces. Used as “connector savers”, they also can protect panel connectors from wear.

Constructed from gold-plated beryllium copper and stainless steel, these 50 ohm adapters operate from DC to 18 GHz. Typical electrical specifications are 0.15 dB insertion loss and 1.40:1 VSWR at 18 GHz. The mating interfaces conform to MIL-PRF-39012.

Type	Part Number
N jack – TNC jack	OE5062-1
N plug – TNC jack	OE5062-2
N jack – TNC plug	OE5062-3
N jack– TK jack	OE5062-4
N plug – TK jack	OE5062-5
N jack – TK plug	OE5062-6
N plug– TK plug	OE5063-7
TK plug – TK plug	OE6063-8
TNC plug – TNC plug	OE5063-9
Please contact us regarding your specific needs	

Type	Part Number
N plug – N plug	OE5108-7
N plug – N jack	OE5108-9
N plug – PTNC plug	OE5108-11
N plug –SMA jack	OE5108-13
N jack – SMA plug	OE5108-16
N jack – SMA jack	OE5108-17
PTNC jack – PTNC jack	OE5108-31
N plug – HN jack	OE5108-35
N plug – HN plug	OE5108-36
N plug – PTNC jack	OE5109-10
N plug - PTNC plug	OE5109-11
N plug – SMA jack	OE5109-13
N jack – PTNC jack	OE5109-15
N jack – SMA jack	OE5109-17
PTNC plug – PTNC plug	OE5109-30
PTNC jack – PTNC plug	OE5109-32
SMA jack – SMA jack	OE5109-33
SMA plug – SMA plug	OE5109-34
SMA plug – PTMC plug	OE5109-35
Please contact us regarding your specific needs	



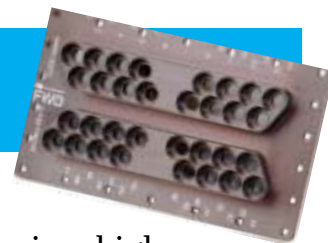
Tools

- Sold separately or in kits
- Can be customized to meet individual requirements
- Corrosion free stainless steel

TOOLS, SPANNER WRENCHES, & TORQUE WRENCHES

TIMES MICROWAVE SYSTEMS can provide the necessary tooling to facilitate the removal and replacement of replaceable connector interfaces for our cable assemblies. Most applications require only a simple open end or spanner wrench to complete the process. The correct tools are specified along with the replaceable connectors shown elsewhere in this catalog, however, custom tool and connector kits can be supplied for unique applications. Please contact us for your specific needs.

M8 MULTI-PORT INTERCONNECTION SYSTEM



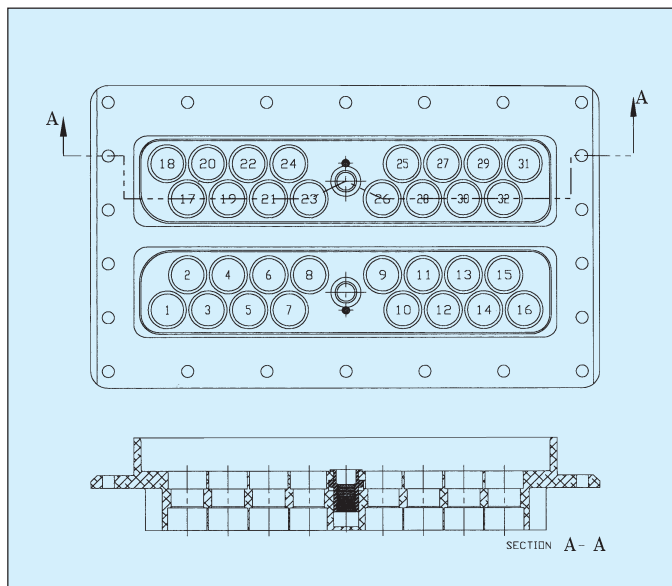
The *TIMES MICROWAVE SYSTEMS* M8 Multi-Port Connector family was specially designed and developed to mate multiple coaxial cable interfaces in a high performance environment not previously achievable with other multi-port connectors. The *TIMES MICROWAVE SYSTEMS* housings and contacts have been tested and qualified to such demanding transmission line assembly specifications as MIL-T-81490 and MIL-C-87104 and feature excellent 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 could cause serious cable and system performance degradation where other multi-port connection systems have been used. The *TIMES MICROWAVE SYSTEMS* M8 Multi-port interconnect system is presently used on a number of airborne applications.

To enhance the versatility of the multi-port interconnection system, the following features have been incorporated:

- The connector housing and each cable assembly is individually sealed.
- The M8 interface design includes spring loading to guarantee full mating under all conditions, providing reliable VSWR performance.
- Individual cable assemblies are inserted and removed easily from the rear of the connector housing using a simple hand tool.
- A single housing can accept all *MILTECH* cables as well as transmission lines of different sizes, including flexible and semi-rigid types from 0.086"/2.18mm to 0.480"/12.2mm OD.
- M8 Multi-Port housings are available in several configurations.
- Rack and panel or jackscrew mounts are available.

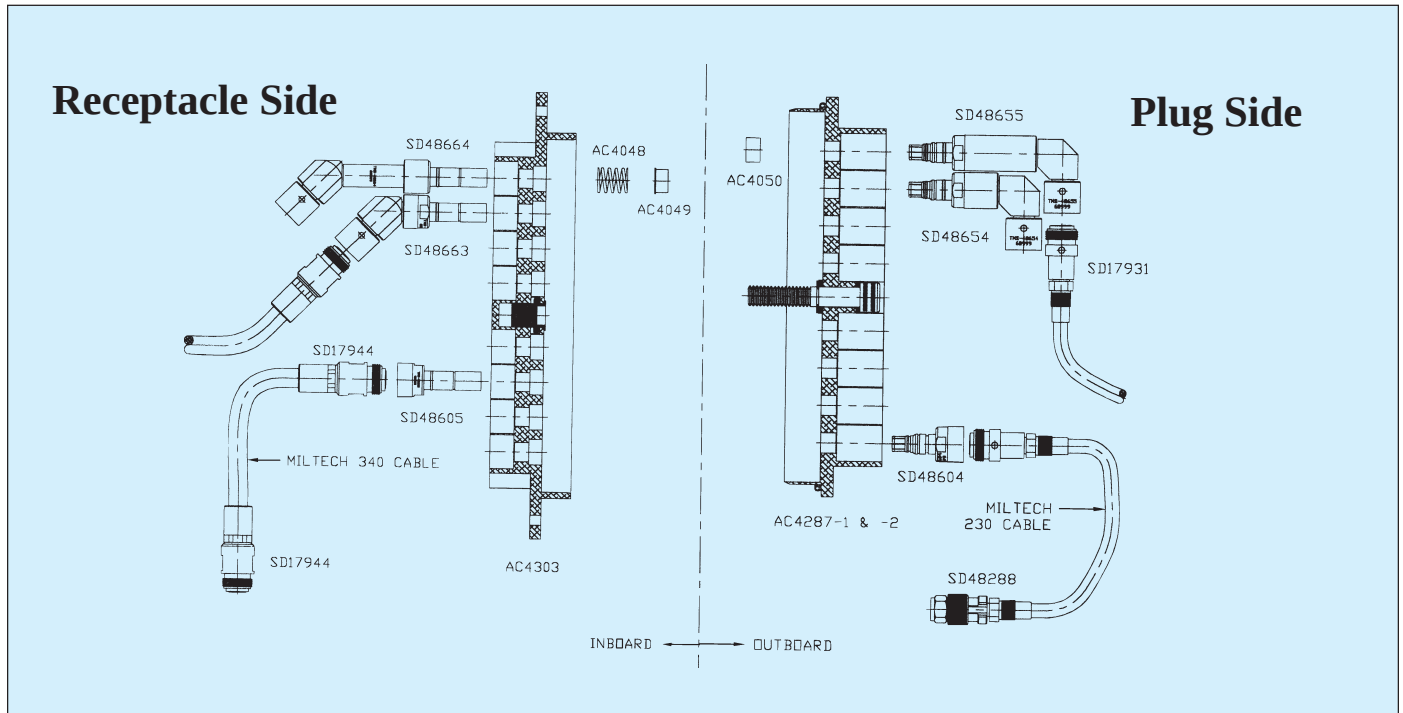
Electrical Specifications

Insertion Loss and VSWR per *MILTECH* Cable and Connector Specifications.

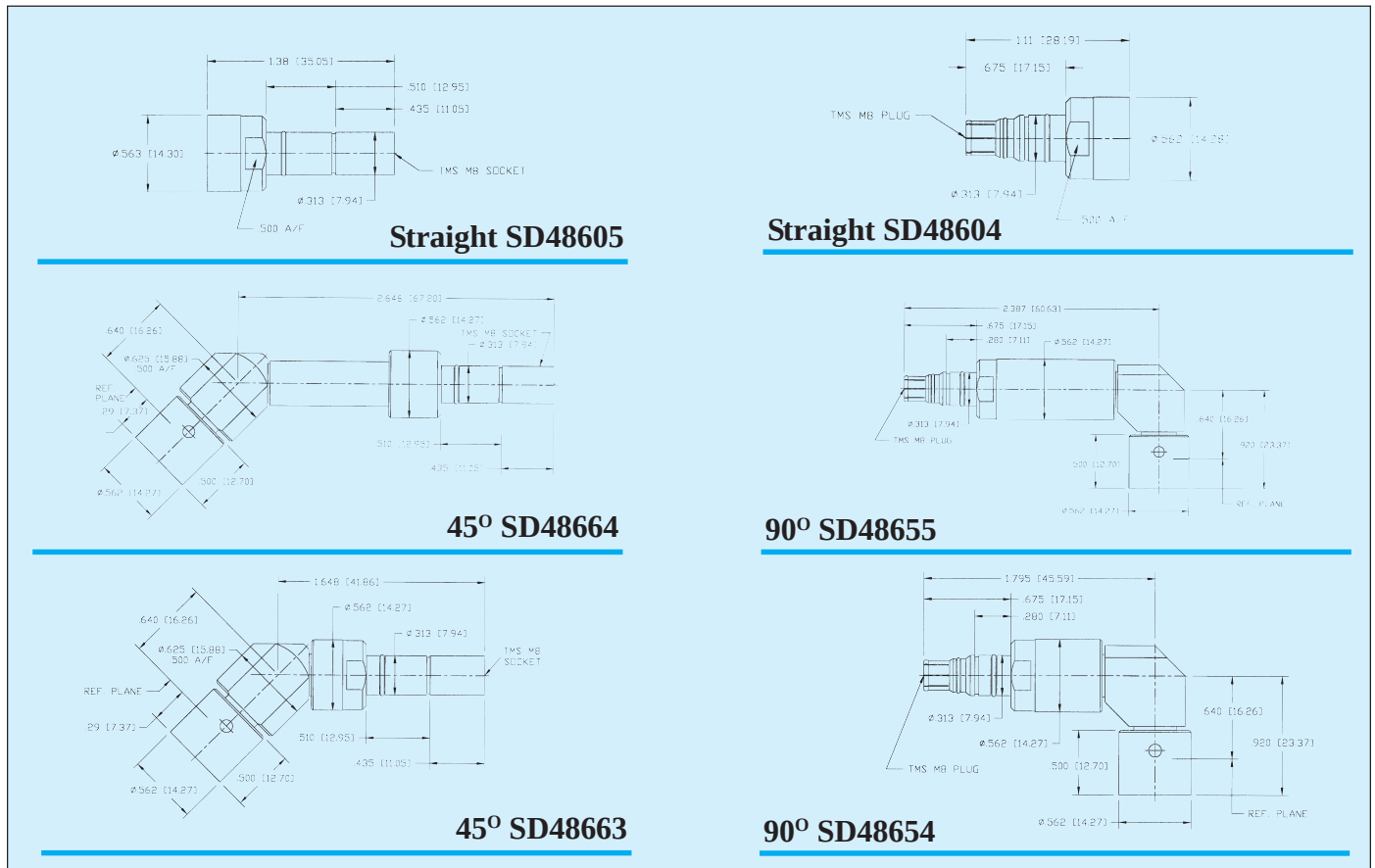


M8 MULTI-PORT INTERCONNECTION SYSTEM

Typical System Interface



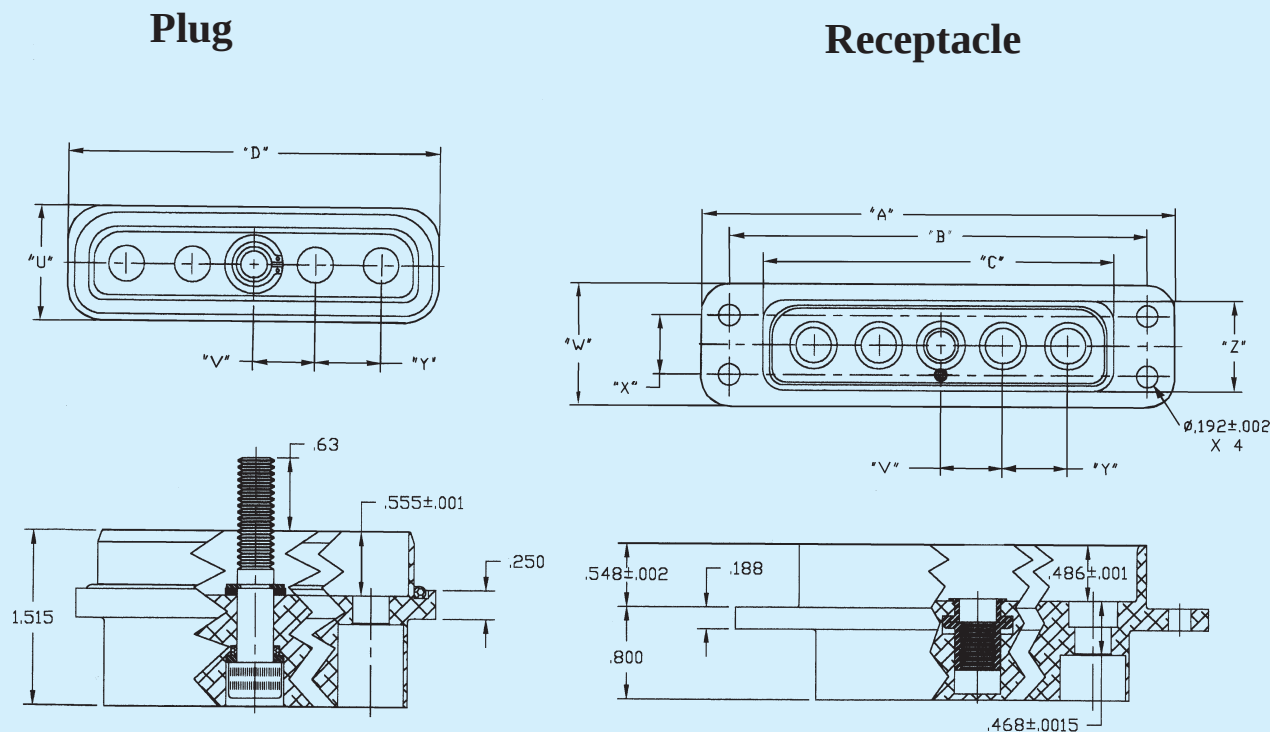
Standard Connectors



M8 MULTI-PORT INTERCONNECTION SYSTEM

Dimensions vs. Number of Ports

The *TIMES MICROWAVE SYSTEMS* M8 Multi-Port connector is available with replaceable or non-replaceable cables/contacts. The non-replaceable version, with 0.440"/11.18mm contact spacing, can accept cable diameters up to 0.31"/7.88mm. The replaceable version, with 0.585"/14.86mm contact spacing, can accept cable diameters up to 0.48"/12.19mm. Either version will accept flexible or a combination of flexible and semi-rigid cable.

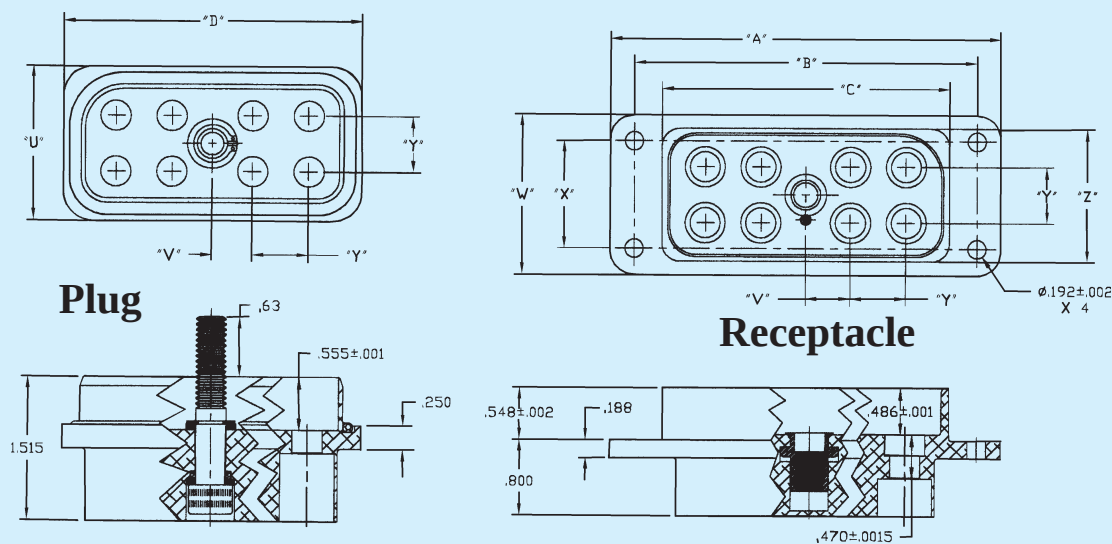


Port Spacing	"U"	"V"	"W"	"X"	"Y"	"Z"
0.440	0.960	0.512	1.020	0.500	0.440	0.734
0.585	1.035	0.585	1.093	0.531	0.585	0.807

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	AV4519	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 INTERCONNECTION SYSTEM

Dimensions vs. Number of Ports

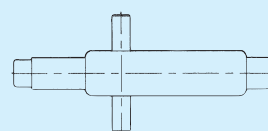


Port Spacing	"U"	"V"	"W"	"X"	"Y"	"Z"
0.440	1.400	0.504	1.460	0.875	0.440	1.174
0.585	1.620	0.507	1.678	1.125	0.585	1.392

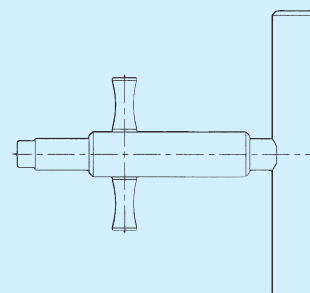
No. of Ports	Plug P/N	Receptacle P/N	Port Spacing	"A"	"B"	"C"	"D"
4	AC4524	AC4525	0.440	2.720	2.320	1.820	2.020
8	AC4526	AC4527	0.440	3.600	3.200	2.700	2.900
12	AC4528	AC4529	0.440	4.480	4.080	3.580	3.780
16	AC4530	AC4531	0.440	5.360	4.960	4.460	4.660
4	AC4532	AC4533	0.585	2.910	2.410	1.830	2.030
8	AC4534	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

Insertion/Extraction Tools

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. Both field and factory tool styles are available. The field tool will conveniently fit into a technician's pocket or toolbox and was designed for routine insertion or extraction of the M8 contacts. The factory tool was designed for production line applications, however, both are interchangeable.



**FaIELD Tool
TN-2478**



**Factory Tool
TN-2964**

CUSTOM PRODUCTS

TIMES MICROWAVE SYSTEMS also manufactures coaxial products for a broad range of unique applications in addition to the cable and connector products described elsewhere in this catalog. To date, we have designed more than 10,000 different flexible and semirigid cables and connectors to meet customer requirements. We will design and manufacture coaxial cables, connectors, adapters, test kits and tools to meet any specialized customer requirements. Prior applications include wave guide to coax adapters, impedance transforming cable assemblies, broadband delay lines, high shielding effectiveness assemblies, antenna extender assemblies, high pressure fuel resistant assemblies, high vibration assemblies, and low smoke/zero halogen cable assemblies. Please contact us regarding your specific needs.



SPECIAL APPLICATION WORKSHEET

Copy and fax this form to Times Microwave Systems Applications Engineering, or contact a TMS applications engineering manager directly at (203) 949-8400. You may also fax this form or call the sales manager for your area at the offices listed on the back cover.

FAX TO: (203) 949-8423

From: _____

Phone: _____

E-mail _____

Company _____

City: _____ State _____ ZIP _____

APPLICATION

1. Ground, airborne, shipboard or submarine, etc: _____
2. System name: _____
3. Platform: _____
4. Use (receive, transmit): _____
5. Number of this assembly per system: _____
6. Cable type (flex, rigid, semi-rigid): _____

DESIGN

Electrical

1. Frequency band: _____
2. Insertion loss: _____
3. VSWR (over frequency): _____
4. Power (rms, CW, or peak): _____

Mechanical

1. Length and tolerance: _____
2. Sealing requirements: _____
3. Connector requirements: _____
4. Cable diameter: _____
5. Crush resistance: _____
6. Impact shock: _____
7. Vibration levels: _____
8. Marking: _____

Environmental

1. Temperature (operating and non-operating): _____
2. Altitude: _____
3. Pressure: _____
4. Severe environments (salt fog, humidity, fuel, hydraulic fluid, solvents, etc): _____

SPECIAL CONSIDERATIONS: _____

Mockup Assistance

TIMES MICROWAVE SYSTEMS applications and engineering personnel are available to discuss customer requirements, to make recommendations for the best use of our products and to assist with mockup services as customer facilities. Such services generally include determining the cable types to be used, including cable lengths and routing, as well as connector configurations. Mockup assistance may also include installation procedures, specifications and testing procedures, as required.

SIMPLIFIED ORDERING

We have included cable and connector part numbers throughout this catalog as much as practicable. Please fill out the simplified ordering guide below and we will be happy to prepare a quotation.

Connector A	Cable Type and Length	Connector B

***Field-tested, high performance
coaxial cable assemblies
Pioneering a wide range of coaxial cable
and connector developments***



***Let our experience,
innovation and support
work for you!***



358 Hall Avenue, P.O. Box 5039, Wallingford, Connecticut 06492-5039

Telephone: (203) 949-8400 * FAX: (203) 949-8423

www.timesmicrowave.com

SALES OFFICES

**1206 West Tyson Street
Chandler, AZ
85224-4323
Tel: 408-786-1656
Fax: 408-786-3684
timeswest@aol.com**

**200 Pleasant Street
So. Yarmouth,
MA 02664
Tel: 978-352-6882
Fax: 978-352-7188
Fkaczor@timesmicrowave.com**

**4 School Brae, Dysart
Kirkcaldy, Fife
Scotland KY1 2XB UK
Tel: +44 (0) 1592655428
Fax: +44 (0) 1592653162
timesmicrowave@aol.com**

**5 Lippizaner Fields
Whiteley, Nr Fareham
Hants PO15 7BB
England
Tel & Fax: +44 14-8988-1819
sgamble@timesmicrowave.com**



CCA-4