

# Small Cell & DAS Coaxial Jumper Cables



As we move closer to the realization of 5G, the need for high quality RF infrastructure components has never been greater. In the coming years, we will see wireless applications that were not even imaginable a short time ago such as remote robotic surgery and autonomous vehicles. These applications will require the low latency, ubiquitous coverage and high data speeds which make up 5G.

High frequency Massive MIMO along with fiber will provide the backbone of 5G while densification of existing 4G/LTE networks in the form of Small Cell and iDAS will provide the needed penetration. Due to mandates from many municipalities and building landlords, most of the Small Cells and iDAS networks that are yet to be built will involve the co-location of the major carriers, requiring reliable, fully tested RF components.



Times also offers many other product amenities such as scannable jumper bar codes which tie back to test curves, one-piece silicone rubber WPB boots and Cold Shrink boots to weatherize Small Cell jumpers as well as special tools and connectors for field termination, if ever necessary.

**Your network is only as good as its weakest link. When reliability counts, use Times Microwave low PIM jumpers!**



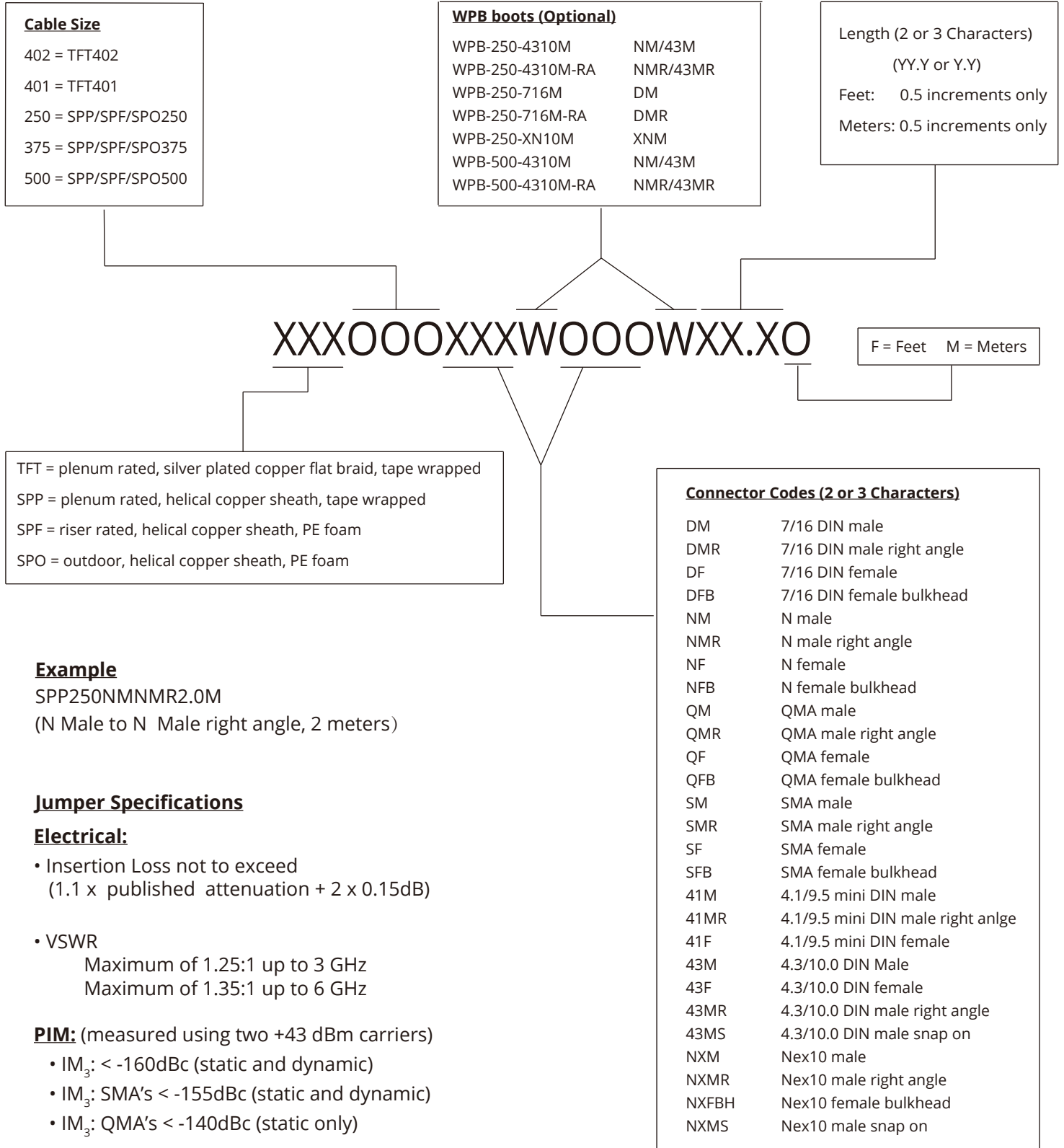
Times Microwave Systems is your “go-to” source for low PIM jumpers for Small Cell and DAS applications. We offer a full complement of indoor and outdoor, low PIM jumper cable products in the form of SPP (Plenum listed), SPF (Riser listed) and SPO. We also offer an ultra-flexible, Plenum listed, low PIM product (TFT) which is often the best/most desirable RF interconnect option for both Small Cell and iDAS networks where ultra-flexibility, ruggedness and low PIM performance are all required.

All Times Microwave Systems low PIM jumpers are fully tested for static and dynamic PIM in addition to VSWR and IL. We have used X-ray and customized induction soldering equipment to optimize the dynamic PIM performance of each cable-connector combination. We stand behind our product by placing the actual test data on each and every jumper that we supply, along with a serial number traceable back to the actual test curves.

Times offers the most extensive line of low PIM telecom connectors on the market, which include but are not limited to, 4.3/10.0's, QMA's, NEX 10's and 2.2/5.0's. The portfolio includes plugs and jacks, straights and right angles, and thread-on and snap-on coupling nuts. We use a jumper Smart part numbering system which allows for rapid order entry and manufacture. Most configurations ship inside of two weeks, regardless of quantity.

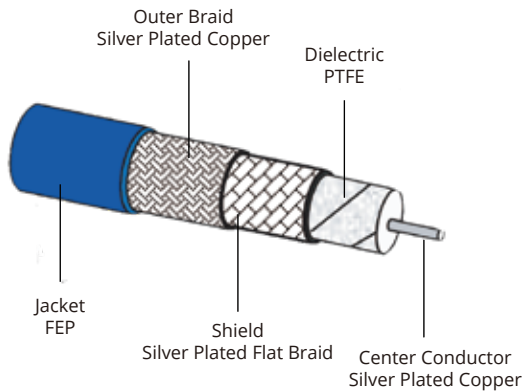


# Smart Part Number Key for Low PIM Jumpers



# TFT™ Ultra Flexible Low PIM Coaxial Cable Assemblies

- Extremely flexible; perfect for challenging in-cabinet cabling requirements
- Plenum rated so suitable for indoor and outdoor installations
- Ruggedness and flexibility of a braided cable with the demanding electrical performance required for telecom applications

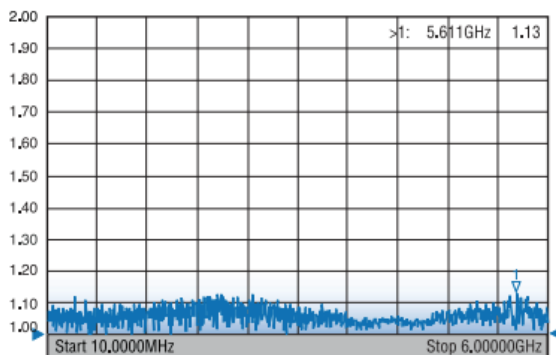


## Features

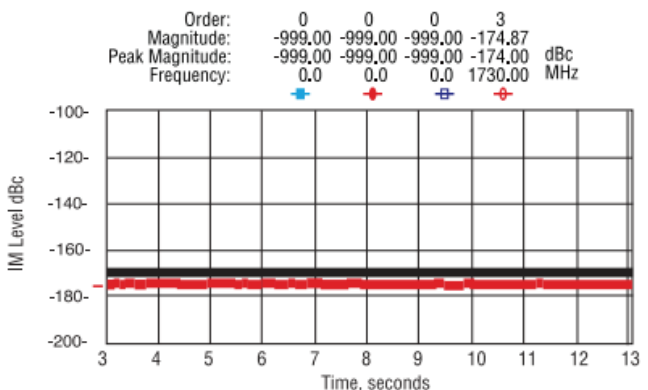
- Available in any required connector configuration and length
- UL listed, type CMP (plenum) UL file #E-170516
- 100% tested for static and dynamic PIM, VSWR and insertion loss. Data available online
- <-160 dBc PIM performance

## TFT401NMNM5.0M Typical Performance

Typical VSWR



Dynamic PIM Test Results

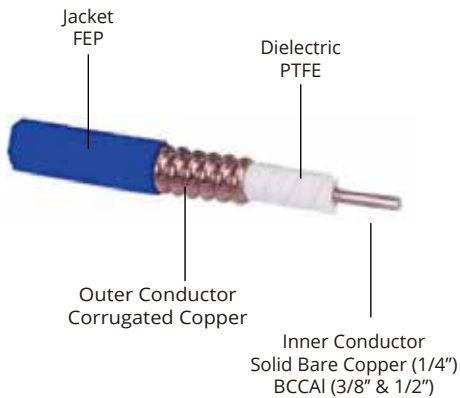


# TFT Cable Specifications

Physical Specifications	TFT-401			TFT-402		
Jacket: FEP; OD: in (mm)	0.265	(6.73)		0.160	(4.06)	
Center Conductor: OD: in (mm)	0.064	(1.628)		0.037	(0.93)	
Bend Radius: in (mm)	1.375	(34.93)		0.75	(19.05)	
Weight: lbs/1000 ft (kg/km)	78	(92)		31	(36)	
Environmental Specifications						
Operating Temperature Range °C/°F	-55/+150 (-67/+302°)					
Electrical Specifications						
Impedance: Ohms	50 Ohms			50 Ohms		
Capacitance: pF/ft (pF/m)	28.2 (92.5)			26.7 (87.6)		
Inductance: μH/ft (uH/m)	0.071 (0.23)			0.067 (0.22)		
Shielding Effectiveness: dB	>80			>80		
Attenuation & Average Power @ MHz	dB/100ft	(dB/100m)	kW	dB/100ft	(dB/100m)	kW
450	4.8	15.8	0.95	7.4	24.2	0.45
700	6.1	22.2	0.75	9.2	30.3	0.36
850	6.8	22.2	0.68	10.2	33.5	0.33
1900	10.5	34.4	0.44	15.4	50.4	0.22
2100	11.1	36.3	0.41	16.2	53.1	0.21
2400	11.9	39.1	0.38	17.3	56.8	0.19
5800	19.7	64.7	0.25	27.3	89.6	0.12
Connectors	TFT-401			TFT-402		
7-16 Male Straight	3190-2853			3190-2942		
7-16 Male Right Angle	3190-2854			3190-2967		
7-16 Female Straight	3190-3002			3190-3003		
7-16 Female Straight Panel Mount	-			3190-3012		
4.3-10 Male Straight	3190-6144			3190-6125		
4.3-10 Male Right Angle	3190-6180			-		
4.3-10 Male Snap On Straight	3190-6201			3190-6202		
4.3-10 Female Straight	3190-6197			3190-6195		
4.3-10 Female Bulkhead Straight	3190-6455			3190-6196		
4.1-9.5 Male Straight	3190-3014			3190-3009		
4.1-9.5 Male Right Angle	3190-3027			3190-6173		
4.1-9.5 Female Straight	-			3190-6184		
N Male Straight	3190-2833			3190-2904		
N Male Right Angle	3190-6186			3190-3015		
N Female	3190-2851			3190-3004		
N Female Bulkhead Straight	3190-2835			3190-3013		
2.2-5 Male Straight	-			3190-6655		
2.2-5 Female Straight	-			3190-6654		
Nex10 Male Straight	3190-6660			3190-6659		
Nex10 Male Right Angle	3190-6509			3190-6510		
Nex10 Male Snap On Straight	3190-6604			-		
Nex10 Female Bulkhead Straight	3190-6594			3190-6652		
QMA Male Straight	3190-6348			3190-2984		
QMA Male Right Angle	3190-6228			3190-3022		
SMA Male Straight	3190-2947			3190-2903		
SMA Male Right Angle	3190-3006			3190-3005		

# SPP™ Low Loss, Low PIM Indoor Coaxial Cable Assemblies

- Plenum rated for indoor applications
- Lower loss than PE or FEP foam cables
- Attractive molded boots for professional looking installations

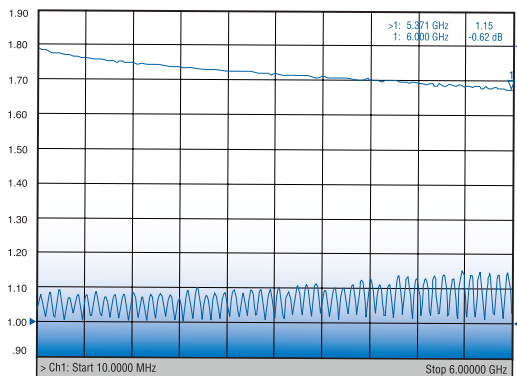


## Features

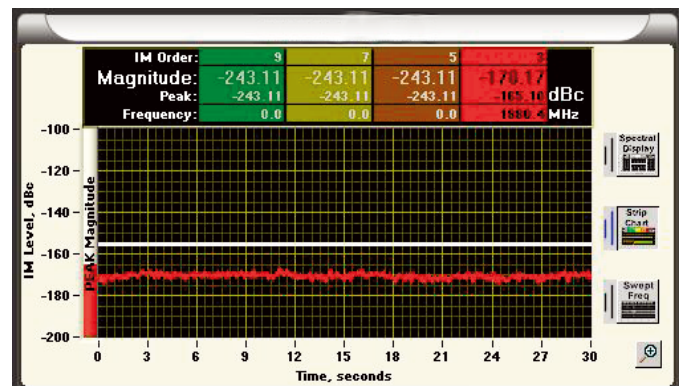
- Available in any required connector configuration and length
- UL listed, type CMP (plenum) UL file #E-170516
- 100% tested for static & dynamic PIM, VSWR & insertion loss. Data available online
- <-160 dBc PIM performance

## SPP250NMNM1.0M Typical Performance

Typical VSWR



Dynamic PIM Test Results

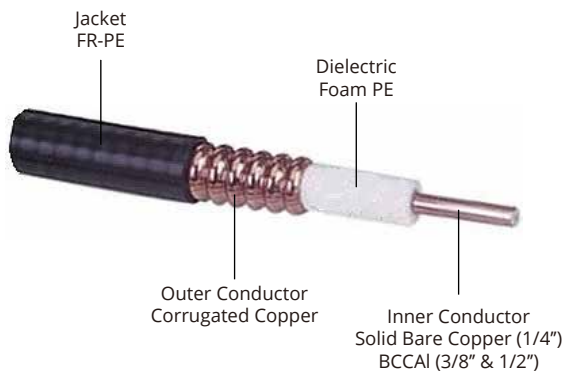


# SPP Cable Specifications

	1/4"			3/8"			1/2"		
Physical Specifications	SPP-250			SPP-375			SPP-500		
Jacket: FEP; OD: in (mm)	0.280 (7.1)			0.402 (10.2)			0.500 (13.4)		
Center Conductor: OD: in (mm)	0.068 (1.7)			0.100 (2.7)			0.136 (3.5)		
Bend Radius: in (mm)	1.25 (32)			1.38 (35)			1.50 (38)		
Weight: lbs/1000 ft (kg/km)	66 (78)			115 (127)			200 (167)		
Environmental Specifications									
Operating Temperature Range °C/°F	-55/+200 (-67/+392°)								
Electrical Specifications									
Impedance: Ohms	50 Ohms			50 Ohms			50 Ohms		
Capacitance: pF/ft (pF/m)	27.0 (8.2)			27.5 (8.4)			29.0 (8.8)		
Inductance: μH/ft (uH/m)	0.067 (0.22)			0.067 (0.22)			0.069 (0.23)		
Shielding Effectiveness: dB	>100			>100			>100		
Attenuation & Average Power @ MHz	dB/100ft (dB/100m) kW			dB/100ft (dB/100m) kW			dB/100ft (dB/100m) kW		
450	3.8	12.5	1.01	2.5	8.4	2.11	2.3	7.4	2.63
700	4.8	15.8	0.81	3.2	10.6	1.67	2.8	9.3	2.07
850	5.3	17.4	0.73	3.6	11.7	1.50	3.2	10.4	1.87
1900	8.1	26.6	0.47	5.5	18.1	0.97	4.9	16.1	1.20
2100	8.6	21.1	0.45	5.8	19.1	0.92	5.2	17.0	1.14
2400	9.2	30.1	0.42	6.3	20.5	0.85	5.6	18.3	1.05
5800	14.8	48.7	0.26	10.3	33.8	0.52	9.2	30.3	0.63
Connectors	SPP-250			SPP-375			SPP-500		
7-16 Male Straight	3190-2853			3190-2940			3190-6267		
7-16 Male Right Angle	3190-2854			3190-6064			3190-6279		
7-16 Female Straight	3190-3002			3190-6119			3190-6281		
4.3-10 Male Straight	3190-6144			3190-6295			3190-6369		
4.3-10 Male Right Angle	3190-6180			-			3190-6365		
4.3-10 Male Snap On Straight	3190-6201			-			-		
4.3-10 Female Straight	3190-6197			-			-		
4.3-10 Female Bulkhead Straight	3190-6455			-			-		
4.1-9.5 Male Straight	3190-3014			-			3190-6233		
4.1-9.5 Male Right Angle	3190-3027			-			-		
4.1-9.5 Female Straight	-			-			-		
N Male Straight	3190-2833			3190-2951			3190-6216		
N Male Right Angle	3190-6186			3190-6061			3190-6278		
N Female Straight	3190-2851			3190-3064			3190-3011		
N Female Bulkhead Straight	3190-2835			-			-		
Nex10 Male Straight	3190-6660			3190-6626			-		
Nex10 Male Right Angle	3190-6509			3190-6661			-		
Nex10 Male Snap On Straight	3190-6604			-			-		
Nex10 Female Bulkhead Straight	3190-6594			3190-6653			-		
QMA Male Straight	3190-6348			-			-		
QMA Male Right Angle	3190-6228			-			-		
SMA Male Straight	3190-2947			-			-		
SMA Male Right Angle	3190-3006			-			-		

# SPF™ Low PIM Indoor Coaxial Cable Assemblies

- Riser rated for indoor applications
- Excellent shielding, better than 100 dB, so no cross talk in dense installations
- Super flexible, durable & easy to install

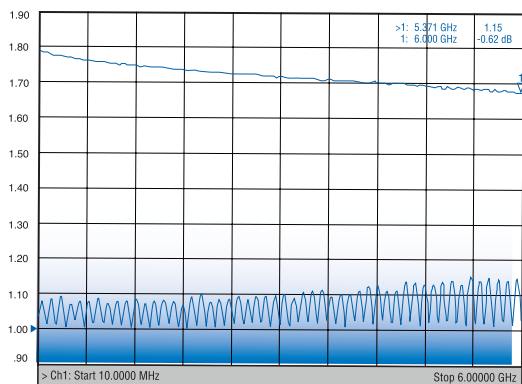


## Features

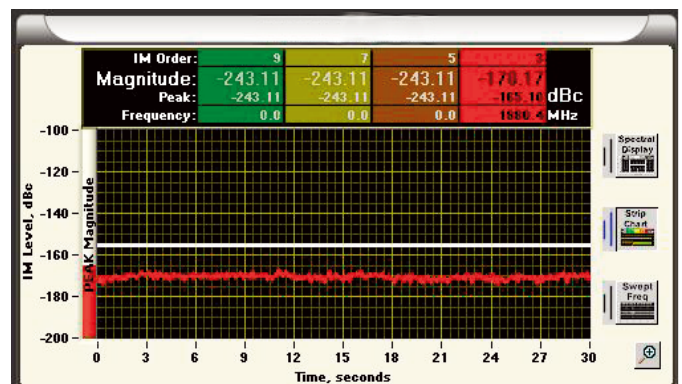
- Available in any required connector configuration and length
- UL listed, type CMR (riser) UL file #E-170516
- 100% tested for static and dynamic PIM, VSWR and insertion loss
- <-160 dBc PIM performance

## SPF250NMM1.0M Typical Performance

Typical VSWR



Dynamic PIM Test Results



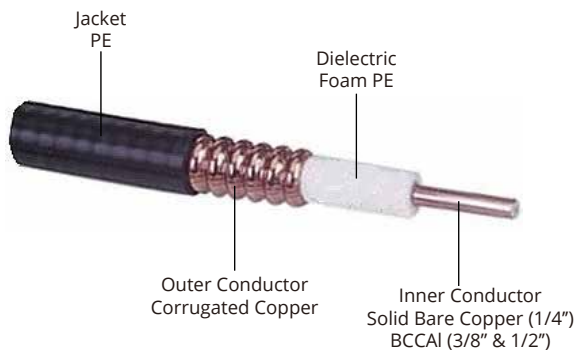


# SPF Cable Specifications

	1/4"			3/8"			1/2"		
Physical Specifications	SPF-250			SPF-375			SPF-500		
Jacket: FEP; OD: in(mm)	0.300	(7.7)		0.425	(10.8)		0.525	(13.4)	
Center Conductor: OD: in(mm)	0.075	(1.9)		0.110	(2.8)		0.142	(3.6)	
Bend Radius: in(mm)	1.00	(25)		1.70	(43.0)		2.00	(51)	
Weight: lbs/1000 ft (kg/km)	46	(67)		78	(120)		140	(210)	
Environmental Specifications									
Operating Temperature Range °C/°F	-40/+85 (-40/+185°)								
Electrical Specifications									
Impedance: Ohms	50			50			50		
Capacitance: pF/ft (pF/m)	24.2 (79.4)			24.3 (79.7)			25.2 (82.7)		
Inductance: µH/ft (uH/m)	0.061 (0.200)			0.061 (0.200)			0.063 (0.205)		
Shielding Effectiveness: dB	>100			>100			>100		
Attenuation & Average Power @ MHz	dB/100ft	(dB/100m)	kW	dB/100ft	(dB/100m)	kW	dB/100ft	(dB/100m)	kW
450	4.1	13.3	1.01	2.8	9.1	2.11	2.2	7.2	2.63
700	5.1	17.1	0.81	3.5	11.5	1.67	2.8	9.1	2.07
850	5.7	18.7	0.73	3.9	12.8	1.50	3.1	10.2	1.87
1900	8.9	29.2	0.47	6.0	19.7	0.97	4.8	15.7	1.20
2100	9.4	30.8	0.45	6.4	21.0	0.92	5.2	17.1	1.14
2400	10.1	33.1	0.42	6.9	22.6	0.85	5.7	18.7	1.05
5800	16.5	54.1	0.26	11.6	38.0	0.52	10.9	35.8	0.63
Connectors	SPF-250			SPF-375			SPF-500		
7-16 Male Straight	3190-2853			3190-2940			3190-6267		
7-16 Male Right Angle	3190-2854			3190-6064			3190-6279		
7-16 Female Straight	3190-3002			3190-6119			3190-6281		
4.3-10 Male Straight	3190-6144			3190-6295			3190-6369		
4.3-10 Male Right Angle	3190-6180			-			3190-6365		
4.3-10 Male Snap On Straight	3190-6201			-			-		
4.3-10 Female Straight	3190-6197			-			-		
4.3-10 Female Bulkhead Straight	3190-6455			-			-		
4.1-9.5 Male Straight	3190-3014			-			3190-6233		
4.1-9.5 Male Right Angle	3190-3027			-			-		
4.1-9.5 Female Straight	-			-			-		
N Male Straight	3190-2833			3190-2951			3190-6216		
N Male Right Angle	3190-6186			3190-6061			3190-6278		
N Female	3190-2851			3190-3064			3190-3011		
N Female Bulkhead Straight	3190-2835			-			-		
Nex10 Male Straight	3190-6660			3190-6626			-		
Nex10 Male Right Angle	3190-6509			3190-6661			-		
Nex10 Male Snap On Straight	3190-6604			-			-		
Nex10 Female Bulkhead Straight	3190-6594			3190-6653			-		
QMA Male Straight	3190-6348			-			-		
QMA Male Right Angle	3190-6228			-			-		
SMA Male Straight	3190-2947			-			-		
SMA Male Right Angle	3190-3006			-			-		

# SPO™ Low PIM Outdoor Coaxial Cable Assemblies

- General use outdoor jumper cable
- Super flexible, durable & easy to install
- Excellent shielding, better than 100 dB, so no cross talk in dense installations

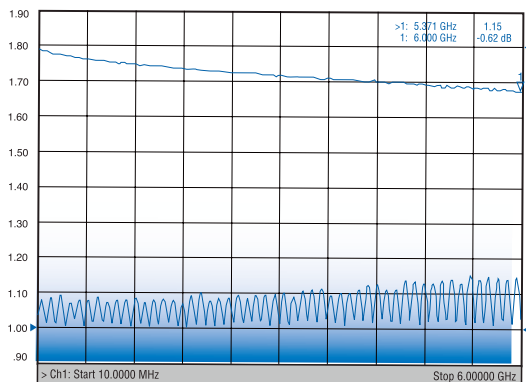


## Features

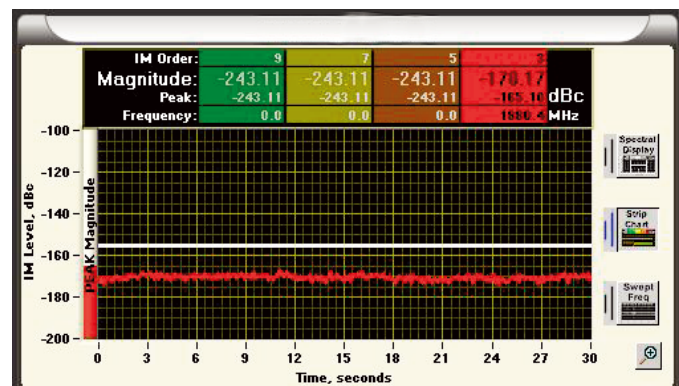
- Available in any required connector configuration and length
- 100% tested for static and dynamic PIM, VSWR and insertion loss
- <-160 dBc PIM performance

## SPO250NMNM1.0M Typical Performance

Typical VSWR



Dynamic PIM Test Results



# SPO Cable Specifications

	1/4"			3/8"			1/2"		
Physical Specifications	SPO-250			SPO-375			SPO-500		
Jacket: FEP; OD: in(mm)	0.300	(7.7)		0.425	(10.8)		0.525	(13.4)	
Center Conductor: OD: in(mm)	0.075	(1.9)		0.110	(2.8)		0.142	(3.6)	
Bend Radius: in(mm)	1.00	(25)		1.70	(43.0)		2.00	(51)	
Weight: lbs/1000 ft (kg/km)	46	(67)		78	(120)		140	(210)	
Environmental Specifications									
Operating Temperature Range °C/°F	-40/+85 (-40/+185°)								
Electrical Specifications									
Impedance: Ohms	50			50			50		
Capacitance: pF/ft (pF/m)	24.2 (79.4)			24.3 (79.7)			25.2 (82.7)		
Inductance: µH/ft (uH/m)	0.061 (0.200)			0.061 (0.200)			0.063 (0.205)		
Shielding Effectiveness: dB	>100			>100			>100		
Attenuation & Average Power @ MHz	dB/100ft	(dB/100m)	kW	dB/100ft	(dB/100m)	kW	dB/100ft	(dB/100m)	kW
450	4.1	13.3	1.01	2.8	9.1	2.11	2.2	7.2	2.63
700	5.1	17.1	0.81	3.5	11.5	1.67	2.8	9.1	2.07
850	5.7	18.7	0.73	3.9	12.8	1.50	3.1	10.2	1.87
1900	8.9	29.2	0.47	6.0	19.7	0.97	4.8	15.7	1.20
2100	9.4	30.8	0.45	6.4	21.0	0.92	5.2	17.1	1.14
2400	10.1	33.1	0.42	6.9	22.6	0.85	5.7	18.7	1.05
5800	16.5	54.1	0.26	11.6	38.0	0.52	10.9	35.8	0.63
Connectors	SPO-250			SPO-375			SPO-500		
7-16 Male Straight	3190-2853			3190-2940			3190-6267		
7-16 Male Right Angle	3190-2854			3190-6064			3190-6279		
7-16 Female Straight	3190-3002			3190-6119			3190-6281		
4.3-10 Male Straight	3190-6144			3190-6295			3190-6369		
4.3-10 Male Right Angle	3190-6180			-			3190-6365		
4.3-10 Male Snap On Straight	3190-6201			-			-		
4.3-10 Female Straight	3190-6197			-			-		
4.3-10 Female Bulkhead Straight	3190-6455			-			-		
4.1-9.5 Male Straight	3190-3014			-			3190-6233		
4.1-9.5 Male Right Angle	3190-3027			-			-		
4.1-9.5 Female Straight	-			-			-		
N Male Straight	3190-2833			3190-2951			3190-6216		
N Male Right Angle	3190-6186			3190-6061			3190-6278		
N Female	3190-2851			3190-3064			3190-3011		
N Female Bulkhead Straight	3190-2835			-			-		
Nex10 Male Straight	3190-6660			3190-6626			-		
Nex10 Male Right Angle	3190-6509			3190-6661			-		
Nex10 Male Snap On Straight	3190-6604			-			-		
Nex10 Female Bulkhead Straight	3190-6594			3190-6653			-		
QMA Male Straight	3190-6348			-			-		
QMA Male Right Angle	3190-6228			-			-		
SMA Male Straight	3190-2947			-			-		
SMA Male Right Angle	3190-3006			-			-		

# Weather Sealing of RF Jumpers

As everyone involved with deploying RF infrastructure outdoors is well aware, moisture and water ingress, can be your enemy. We seal the cable-connector transitions of our low PIM jumpers to IP-68 with either a molded boot or a heavy-wall, adhesive lined shrink boot. The interfaces have gaskets that will seal out moisture when the coupling nuts are properly torqued or in the case of snap-on designs, engaged.

For jumpers that will be exposed to the elements, or placed in non-weather tight enclosures, it's important that the entire connector surface be protected. Otherwise, the effects of acid rain and/or salt fog may take their toll over time.

## WPB's (Weather Protection Boots)

WPB's (Weather Protection Boots) are one-piece molded silicone boots which are placed behind the connectors during manufacture of the jumpers. These boots have ribs molded into the inside of the cable entry hole which will provide an IP-68 seal to the cable. Once the jumpers are installed and the coupling nuts are properly torqued, the installer need only slide the boot forward over the connector. At this point, the forward end of the WPB boot will create an IP-68 seal to the female bulkhead connector to which the jumper is mated. We currently offer eight different WPB designs. The WPB boot system will provide reliable weather protection over the life of the install and eliminates the time, mess and technique associated with traditional weather sealing methods.



- **UV resistant silicone rubber**
- **Easy slide on and off**
- **Reusable**
- **Waterproof to IP68 standard**

	<b>716M</b>	<b>716M RA</b>	<b>41/43M</b>	<b>41/43M RA</b>	<b>NX10M</b>
1/4" & -401	WPB-250-DM	WPB-250-DM-RA	WPB-250-43M	WPB-250-43M-RA	WPB-250-NX10M
3/8"					WPB-375-NX10M
1/2"			WPB-500-43M	WPB-500-43M-RA	

# CS-2060T (Cold Shrink Boot)

Cold Shrink boots are made of UV resistant silicone and offer a consistent, reliable weather sealing option for jumpers that either do not have factory installed WPB boots or for connector configurations that are not currently available in the WPB system. Cold Shrink boots can be quickly installed and quickly removed (without a sticky mess). They are not reusable, however, you can quickly install a new Cold Shrink boot when needed.

- **UV resistant silicone rubber**
- **Easy installation and easy removal**
- **Waterproof to IP68 standard**



**Step 1**



**Step 2**



**Step 3**





## MISSION

TIMES MICROWAVE SYSTEMS designs and manufactures high performance RF and microwave transmission lines. These products consist of coaxial cables, connectors, accessories and cable assemblies.

We are committed to understanding the needs and requirements of our customers and providing highly engineered, cost effective products.

TIMES MICROWAVE SYSTEMS is dedicated to total customer satisfaction and superior results for our shareholders in all we do.



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