

# Low PIM Xpress Assemblies

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**T** **TIMES**  
MICROWAVE SYSTEMS  
AN AMPHENOL COMPANY

# Low PIM Xpress Program

## 5G won't wait – neither should you

### *Times Microwave's Low PIM Xpress*

Demand is hot for the incredible speed and bandwidth expansions promised by 5G communications technology. Fast installation and deployment of high-quality 5G service will create industry leaders in a market with astronomic potential, so you can't afford to wait on slow or overbooked suppliers and experts to get you there.

Network densification is crucial to 5G – more small cells and DAS networks are needed in more locations to support such high speeds with high RF performance, low PIM and good shielding. Leveraging our history and experience building mission-critical, high-end assemblies, Times can provide the highest-quality products you need with unparalleled support and turnaround.

We're so committed to meeting your needs – and keeping your 5G deployment on track – we created the Times Microwave Low PIM Xpress program to assure fast delivery of these essential system components. Times' low PIM jumpers are assembled in the USA by highly skilled American workers, keeping production close to home for expedited delivery. In partnership with our network of distributors, we promise to deliver without delay.

**One week or less!** To order, contact your distributor today!



CABLE	SIZE	FLEXIBILITY	SHIELDING	RATING
SPP-250	0.250	Good	Excellent	Plenum
SPO-250	0.250	Good	Excellent	Outdoor
SPO-500	0.500	Good	Excellent	Outdoor
TFT-5G-402	0.16	Ultra	Superior	Plenum and Outdoor
TFT-5G-401	0.265	Ultra	Superior	Plenum and Outdoor



## Low PIM RF Interconnect Solutions

Short for passive intermodulation, PIM is a type of distortion/noise generated by two or more high power signals interacting with non-linear characteristics in the RF path. Essentially, when two or more high power frequencies exist on the same RF interconnect, there is the chance to form additional frequencies which will raise the noise floor.

Cables, connectors and termination workmanship can all play a role in PIM performance as PIM will occur as the result of non-linear junctions of materials and components. In other words, junctions where current does not increase linearly with voltage.

While PIM is an issue for almost every wireless system, it is more noticeable in cellular applications such as 5G because the frequency bands used are very close to each other. PIM can create interference that limits receive sensitivity, lowering the cellular system's reliability, data rate, and capacity. Passive intermodulation issues can result in decreased system capacity and data rates and dropped calls.

The need for RF interconnect solutions that can accommodate these critical connections while minimizing PIM will continue to grow. Ensuring

connectors are properly and securely tightened and choosing suitable materials and platings help reduce PIM issues. Next, eliminate any nonlinear contacts within the RF interconnect and any poor electrical contacts. PIM issues can be caused by ferrous materials, loose parts, parts with rough surfaces, oxidation, residual flux, etc. If conductive material is used, particulate on the face of the dielectric or within the interface itself will cause problems and may move directly on the connectors when installed.

### *Low PIM Jumpers Tested to Ensure Performance*

In the telecom industry, it is relatively standard to test for the magnitude of the 3rd harmonic created by the placement of two 20 watt signals onto the RF interconnect. A PIM level requirement of -153 dBc or better is fairly standard in the industry. At Times Microwave Systems, we design and test our low PIM jumpers to perform to -160 dBc or better.



iBwave VEX files available at [www.iBwave.com](http://www.iBwave.com)

# TFT - 5G

- -160 dBc PIM for optimal system performance
- UL listed, type CMP (plenum), UL file # E-170516
- Extremely flexible
- Durable FEP outer jacket
- For indoor and outdoor use



## Specifications

	Units	402	401
Diameter	in (mm)	0.160 (4.06)	0.265 (6.73)
Center Conductor	in (mm)	0.037 (0.94)	0.064 (1.63)
Dielectric	in (mm)	0.113 (2.87)	0.208 (5.28)
Shield	in (mm)	0.123 (3.12)	0.218 (5.54)
Outer Braid	in (mm)	0.138 (3.51)	0.240 (6.10)
Minimum Bend Radius	in (mm)	0.50 (12.7)	0.75 (19.05)
Weight	lb/1000 ft (kg/1000 m)	31.0 (46.1)	78.0 (116.1)
Velocity of Propagation	%	76	72
Capacitance	pF/ft (pF/m)	26.7 (87.6)	28.2 (92.5)
Shielding	dB	>80	>80



### CENTER CONDUCTOR

Bare Copper

### DIELECTRIC

Expanded PTFE

### SHIELD

Tin Plated Flat Braid

### OUTER BRAID

Tin Plated Copper Braid

### JACKET

Blue FEP



## Attenuation - dB/100ft (dB/100m)

	402	401
450	8.24 (27.0)	5.43 (17.8)
600	9.63 (31.6)	6.43 (21.1)
900	12.03 (39.4)	8.21 (26.9)
1900	18.24 (59.8)	13.09 (42.9)
2100	19.30 (63.3)	13.96 (45.8)
2500	21.32 (69.9)	15.63 (51.2)
3500	25.86 (84.8)	19.51 (64.0)
4900	31.44 (103.1)	24.49 (80.3)
5800	34.72 (113.9)	27.50 (90.2)

Frequency in MHz

## Maximum Power - (w)

	402	401
450	541	1266
600	463	1071
900	371	845
1900	245	535
2100	232	502
2500	210	450
3500	205	363
4900	143	291
5800	129	260

Frequency in MHz

# How to order

**TFT402 - CODE CODE - 10.0 F**

- Connector A
Connector B -
Length / 3 dig
F = feet  
M = meters  
I = inches

USE ABBREVIATIONS FROM THE CHART BELOW.

Abbreviation	Description	Abbreviation	Description
10M	1.0/2.3 mini DIN Male	DMR	7/16-Male (plug) right angle
225F	2.2/5 Female (jack)	NF	N-Female (jack)
225M	2.2/5 Male (plug)	NFB	N-Female (jack) bulkhead
41F	4.1/9.5 mini DIN Female	NM	N-Male (plug)
41M	4.1/9.5 mini DIN Male	NMR	N-Male (plug) right angle
43F	4.3/10 Female (jack)	NXFB	Nex10 Female (jack) bulkhead
43FB	4.3/10 Female (jack) bulkhead	NXM	Nex10 Male (plug)
43M	4.3/10 Male (plug)	NXMR	Nex10 Male (plug) right angle
43MR	4.3/10 Male (plug) right angle	QM	QMA-Male (plug)
43MS	4.3/10 Male (plug) snap-on	QMR	QMA-Male (plug) right angle
DF	7/16 Female (jack)	SM	SMA-Male (plug)
DFP	7/16-Female (jack) panel mount	SMR	SMA-Male (plug) right angle
DM	7/16-Male (plug)		

**TFT401 - CODE CODE - 10.0 F**

- Connector A
Connector B -
Length / 3 dig
F = feet  
M = meters  
I = inches

USE ABBREVIATIONS FROM THE CHART BELOW.

Abbreviation	Description	Weather Boot - WPB (Y/N) See page 13 for details	Abbreviation	Description	Weather Boot - WPB (Y/N) See page 13 for details
225M	2.2/5 Male (plug)	N	NFB	N-Female (jack) bulkhead	N
41F	4.1/9.5 mini DIN Female	N	NM	N-Male (plug)	Y
41MR	4.1/9.5 mini DIN Male right angle	Y	NMR	N-Male (plug) right angle	Y
43F	4.3/10 Female (jack)	N	NXFB	Nex10 Female (jack) bulkhead	N
43FB	4.3/10 Female (jack) bulkhead	N	NXM	Nex10 Male (plug)	Y
43M	4.3/10 Male (plug)	Y	NXMS	Nex10 Male (plug) snap-on	Y
43MR	4.3/10 Male (plug) right angle	Y	NXMR	Nex10 Male (plug) right angle	N
43MS	4.3/10 Male (plug) snap-on	Y	QM	QMA-Male (plug)	N
DF	7/16 DIN female (jack)	N	QMR	QMA-Male (plug) right angle	N
DM	7/16 DIN Male (plug)	Y	SM	SMA-Male (plug)	N
DMR	7/16 DIN Male (plug) right angle	Y	SMR	SMA-Male (plug) right angle	N
NF	N-Female (jack)	N			

# SPP and SPO Cables

- -160 dBc PIM for optimal system performance
- UL listed, type CMP (plenum), UL file # E-170516
- Durable FEP outer jacket



## Specifications

	Units	SPP-250	SPO-250	SPP-500
Diameter	in (mm)	0.280 (7.11)	0.402 (10.21)	0.500 (13.4)
Center Conductor	in (mm)	0.068 (1.73)	0.108 (2.74)	0.136 (3.5)
Dielectric	in (mm)	0.190 (4.83)	0.285 (7.24)	0.370 (9.4)
Outer Conductor	in (mm)	0.256 (6.50)	0.378 (9.60)	0.472 (12.1)
Min Bend Radius	in (mm)	1.250 (31.75)	1.250 (31.75)	1.50 (38)
Weight	lb/1000 ft (kg/1000 m)	66.0 (98.2)	115.0 (171.1)	200 (167)
Velocity of Propagation	%	76	76	76
Capacitance	pF/ft (pF/m)	26.7 (87.6)	26.7 (87.6)	29.0 (8.8)
Shielding	dB	>100	>100	>100



### CENTER CONDUCTOR

250 Solid Bare Copper  
375 Bare Copper Clad Alum.  
500 Bare Copper Clad Alum.

### DIELECTRIC

Expanded PTFE

### OUTER CONDUCTOR

Corrugated Copper  
Tube

### JACKET

Blue FEP

 Impedance  
50 Ohms

 Op Temp  
-67 to 392°F  
-55 to 200°C

## Attenuation - db/100ft (dB/100m)

	SPP-250	SPO-250	SPO-500
450	4.16 (13.65)	4.07 (13.35)	2.30 (7.55)
600	4.82 (15.81)	4.75 (15.58)	2.70 (8.86)
900	5.93 (19.46)	5.91 (19.39)	3.40 (11.16)
1900	8.71 (28.58)	8.92 (29.27)	5.27 (17.29)
2100	9.17 (30.09)	9.44 (30.97)	5.60 (18.37)
2500	10.04 (32.94)	10.41 (34.16)	6.23 (20.44)
3500	11.96 (39.24)	12.63 (41.44)	7.68 (25.20)
4900	14.27 (46.82)	15.37 (50.43)	9.52 (31.24)
5800	15.60 (51.18)	16.99 (55.74)	10.63 (34.88)

Frequency in MHz

## Maximum Power - (w)

	SPP-250	SPO-250	SPO-500
450	2223	580	1636
600	1924	497	1396
900	1565	400	1108
1900	1068	266	719
2100	1015	251	677
2500	928	228	610
3500	780	188	496
4900	655	155	401
5800	600	140	360

Frequency in MHz

# How to order

SPX 250 - CODE CODE - 10.0 F

P - Plenum  
 O - Outdoor  
 F - Fire Rated

Cable  
 Size

Connector B -

Length / 3 dig

F = feet  
 M = meters  
 I = inches

USE ABBREVIATIONS FROM THE CHART BELOW.

Abbreviation	Description	Weather Boot - WPB (Y/N) See page 13 for details
225M	2.2/5 Male (plug)	N
41M	4.1/9.5 mini DIN Male	N
41MR	4.1/9.5 mini DIN Male right angle	Y
43F	4.3/10 Female (jack)	N
43FB	4.3/10 Female (jack) bulkhead	N
43M	4.3/10 Male (plug)	Y
43MR	4.3/10 Male (plug) right angle	Y
43MS	4.3/10 Male (plug) Snap-on	Y
DF	7/16 DIN female (jack)	N
DM	7/16 DIN Male (plug)	Y
DMR	7/16 DIN Male (plug) right angle	Y
NFB	N-Female (jack) bulkhead	N
NF	N-Female (jack)	N
NM	N-Male (plug)	Y
NMR	N-Male (plug) right angle	Y
NXFB	Nex10 Female (jack) bulkhead	N
NXM	Nex10 Male (plug)	Y
NXMS	Nex10 Male (plug) Snap-on	Y
NXMR	Nex10 Male (plug) right angle	N
QM	QMA-Male (plug)	N
QMR	QMA-Male (plug) right angle	N
SM	SMA-Male (plug)	N
SMR	SMA-Male (plug) right angle	N



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