

Engineered Products

FBT® Flexible Low Loss High Power

Cable: FBT® is a flexible low loss indoor/outdoor highly fire retardant cable suitable for use up to 150°C. Intended specifically for runs within and between base station cabinets, it can also be used in return air handling plenums or outdoors.

FlexTech™ Commercial Cable

Assemblies: The use of higher frequencies for telecommunications applications has placed increasingly rigorous demands on cable assembly performance. Our 50 year plus background in military microwave assemblies has provided us the expertise to address these performance requirements, while our commercial expertise allows us to provide economical solutions. FlexTech™ jumper assemblies furnished standard with LMR-DB cable provide rugged dependability for any application.

T-RAD™ 50 Ohm Leaky Feeder Cable:

T-RAD™ leaky feeder cables offer a cost effective solution to providing RF coverage in enclosed areas. The flexibility of the cable combined with quick attachment connectors, allows the cable to be easily installed, which is ideal for in-building applications.

SilverLine™: SilverLine™ Test Cables are cost effective, durable, high-performance cable assemblies designed for use in a broad range of test and interconnect applications. Fabricated from rugged, solid PTFE dielectric cable with stainless steel connectors and a proven strain relief system, these cables provide long life and excellent stability in applications where they are repeatedly flexed and mated/unmated. They are ideal for use in production, field and laboratory test environments. They are also economical enough to be used as interconnects in test systems.

LMR Bundled Cable: By bundling LMR® cables together under a common polyethylene outer jacket, this innovative design is the perfect solution for Smart Antenna and other sector applications. LMR® Bundled Cable greatly reduces the cost of installation by slashing the cost of labor and accessories compared to an installation using individual runs. LMR® Bundled Cable is supplied as a complete system, including weather seal breakout boots and ground kits with full technical support and custom tools, pictorial instructions and installation videos.

Certified Installer Training Program

The LMR® Certified Installer Training Program covers all installation aspects of LMR coaxial transmission line cables, connectors and components, including grounding. Topics covered include:

- Coaxial cable fundamentals: characteristics, attenuation, return loss
- LMR coaxial cable designs, features and benefits
- Connectors
 - Various interfaces
 - EZ (non-solder) vs. TC (solder style) of center conductor attachment
 - Clamp vs. crimp style connector attachments
 - Impedance uniformity
 - Other characteristics
- Connector termination demonstrations (EZ and TC), using prep and installation tools on LMR-240, 400, 600 and 900 connectors and cables
- Attendee connector terminations
 - EZ-400-NMH-X (3190-2590)
 - EZ-400-NMH-RA-X (3190-2638)

- EZ-600-NMC-2 (3190-2641)
- EZ-900-NMC-2 (3190-1262)
- Attendees work with a full set of LMR tools and test assemblies they build for attenuation and return loss, using a hand held field analyzer
- Ground kit and weather sealing demonstrations
- SilverLine, QMA and TuffGrip demonstrations
- Radiating cable demonstrations
- LMR bundled cable with end cap and ground kit demonstrations

This one day program is available to groups of 10 or more and can be arranged through any Times distributor. It can be held at a location convenient to the group, at the Times Microwave location in Wallingford, Connecticut or at a participating Times distribution partner location. Attendees receive a certificate as a trained LMR installer. Contact your local Times representative for details.

Part #	Description
CITP	Certified Installer Training Program

Engineered Products:

FBT™ -195

Flexible Low Loss High Power Communications Coax

Ideal for...

- High Power Base Station Jumper Assemblies
- In-Building Plenum Feeder Runs
- Any High Power Low Loss RF cable application



• **FBT™** is an indoor/outdoor highly fire retardant cable intended specifically for runs within and between base station cabinets. It is also applicable for return air handling plenums (e.g., dropped ceilings, raised floors). It has a UL/NEC rating of ‘CL2P’ for plenum applications.

• **Flexibility** and bendability are hallmarks of the FBT cable design. The flexible outer conductor enables the tightest bend radius available for any cable of similar size and performance.

• **Low Loss** is another hallmark feature of FBT. Size for size LMR has the lowest loss of any flexible cable and comparable loss to semirigid hard-line cables.

• **RF Shielding** is 50 dB greater than typical single shielded coax (40 dB). The multi-ply bonded foil outer conductor is rated conservatively at > 90 dB (i.e. >180 dB between two adjacent cables).

• **Weatherability:** FBT cables designed for outdoor exposure incorporate FEP jackets for UV resistance and have life expectancy in excess of 20 years.

• **Connectors:** A wide variety of connectors are available for FBT-195 cable, including all common interface types, reverse polarity, and a choice of solder or non-solder center pins. Most LMR connectors employ crimp outer attachment using standard hex crimp sizes.

• **Cable Assemblies** – All FBT cable types are available as pre-terminated cable assemblies. Refer the section on FlexTech for further details.

Construction Specifications			
Description	Material	In.	(mm)
Inner Conductor	Solid BC	0.037	(0.94)
Dielectric	Low Density PTFE	0.113	(2.87)
Outer Conductor	Aluminum Tape	0.119	(3.02)
Overall Braid	Tinned Copper	0.142	(3.61)
Jacket	Brown FEP	0.175	(4.45)

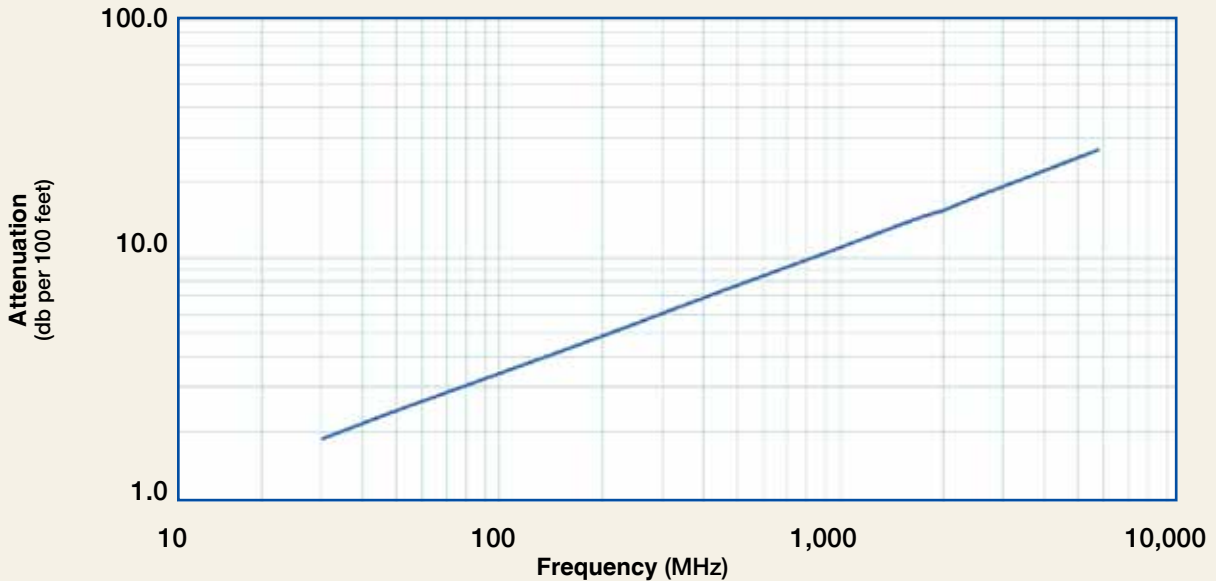
Mechanical Specifications			
Performance Property	Units	US	(metric)
Bend Radius: installation	in. (mm)	0.5	(12.7)
Bend Radius: repeated	in. (mm)	2	(50.8)
Bending Moment	ft-lb (N-m)	0.1	(0.14)
Weight	lb/ft (kg/m)	0.020	(0.03)
Tensile Strength	lb (kg)	40	(18.2)
Flat Plate Crush	lb/in. (kg/mm)	10	(0.19)

Environmental Specifications			
Performance Property		°F	°C
Installation Temperature Range		-67/+302	-55/+150
Storage Temperature Range		-67/+302	-55/+150
Operating Temperature Range		-67/+302	-55/+150

Electrical Specifications			
Performance Property	Units	US	(metric)
Velocity of Propagation	%	76	
Dielectric Constant	NA	1.73	
Time Delay	nS/ft (nS/m)	1.34	(4.40)
Impedance	ohms	50	
Capacitance	pF/ft (pF/m)	26.7	(87.6)
Inductance	uH/ft (uH/m)	0.067	(0.22)
Shielding Effectiveness	dB	>90	
DC Resistance			
Inner Conductor	ohms/1000ft (/km)	7.6	(24.9)
Outer Conductor	ohms/1000ft (/km)	4.90	(16.1)
Voltage Withstand	Volts DC	1000	
Jacket Spark	Volts RMS	3000	
Peak Power	kW	2.5	

Part Description					Stock
Part Number	Application	Jacket	Color	Code	
FBT-195	Indoor/Outdoor	FEP	Brown	54165	

Attenuation vs. Frequency (typical)



Frequency (MHz)	30	50	150	220	450	900	1500	1800	2000	2500	3400	5800
Attenuation dB/100 ft	2.0	2.5	4.4	5.3	7.8	10.9	14.1	15.4	16.3	18.3	21.4	28.2
Attenuation dB/100 m	6.4	8.3	14.4	17.5	25.1	35.6	46.2	50.7	53.5	60.0	70.2	92.5
Avg. Power kW	1.62	1.25	0.72	0.59	0.41	0.29	0.22	0.20	0.19	0.17	0.14	0.11

Calculate Attenuation = $(0.340820) \cdot \sqrt{\text{FMHz}} + (0.000183) \cdot \text{FMHz}$ (interactive calculator available at http://www.timesmicrowave.com/cable_calculators)
 Attenuation: VSWR=1.0 ; Ambient = +25°C (77°F) Power: VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F);
 Sea Level; dry air; atmospheric pressure; no solar loading



Connectors

Interface	Description	Part Number	Stock Code	VSWR** Freq. (GHz)	Coupling Nut	Inner Contact Attach	Outer Contact Attach	Finish* Body /Pin	Length in (mm)	Width in (mm)	Weight lb (g)
1. N Male	Straight Plug	TC-195-NM	3190-1555	<1.25:1 (2.5)	Knurl	Solder	Crimp	S/G	1.5 (38.1)	0.75 (19.1)	0.073 (33.1)
2. SMA Male	Straight Plug	TC-195-SM	3190-1553	<1.25:1 (2.5)	Hex	Solder	Crimp	SS/G	1.0 (25.4)	0.32 (8.1)	0.015 (6.8)
3. TNC Male	Straight Plug	TC-195-TM	3190-1554	<1.25:1 (2.5)	Knurl	Solder	Crimp	S/G	1.4 (35.6)	0.59 (15.0)	0.045 (20.4)

* Finish metals: N=Nickel, S=Silver, G=Gold, SS=Stainless Steel, A=Alballoy **VSWR spec based on 3 foot cable with a connector pair



Install Tools

Type	Part Number	Stock Code	Description
Crimp Tool	CT-240/200/195/100	3190-667	Crimp tool for LMR-100,195, 200 and 240 connectors
Deburr Tool	DBT-U	3192-001	Removes center conductor rough edges
Cutting Tool	CCT-02	3192-165	Cable and flush cut tool
Replacement Blade	RB-02	3192-166	Replacement blade for cutting tool

Engineered Products:

FBT™ -200

Flexible Low Loss High Power Communications Coax

Ideal for...

- High Power Base Station Jumper Assemblies
- In-Building Plenum Feeder Runs
- Any High Power Low Loss RF cable application



Part Description				Stock
Part Number	Application	Jacket	Color	Code
FBT-200	Indoor/Outdoor	FEP	Brown	54166

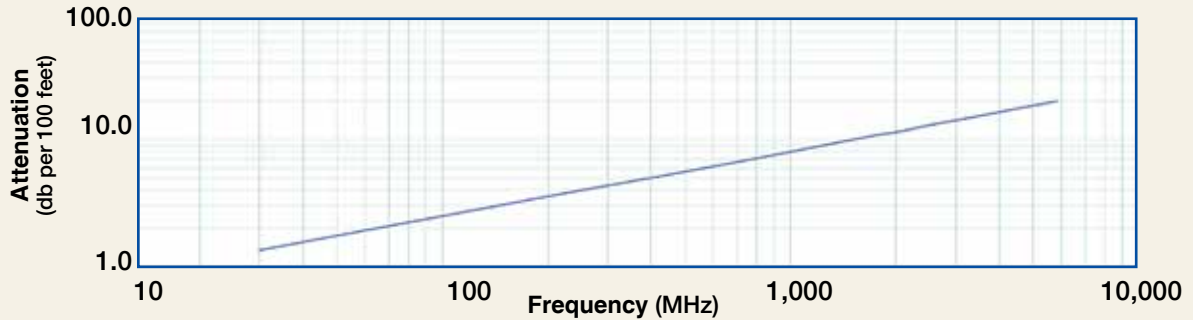
Environmental Specifications		
Performance Property	°F	°C
Installation Temperature Range	-67/+302	-55/+150
Storage Temperature Range	-67/+302	-55/+150
Operating Temperature Range	-67/+302	-55/+150

Construction Specifications			
Description	Material	In.	(mm)
Inner Conductor	Solid BC	0.040	(1.02)
Dielectric	Low Density PTFE	0.118	(3.00)
Outer Conductor	Aluminum Tape	0.123	(3.12)
Overall Braid	Tinned Copper	0.146	(3.71)
Jacket	Brown FEP	0.175	(4.45)

Mechanical Specifications			
Performance Property	Units	US	(metric)
Bend Radius: installation	in. (mm)	0.5	(12.7)
Bend Radius: repeated	in. (mm)	2	(50.8)
Bending Moment	ft-lb (N-m)	0.2	(0.27)
Weight	lb/ft (kg/m)	0.032	(0.05)
Tensile Strength	lb (kg)	30	(13.6)
Flat Plate Crush	lb/in. (kg/mm)	65	(1.169)

Electrical Specifications			
Performance Property	Units	US	(metric)
Velocity of Propagation	%	76	
Dielectric Constant	NA	1.73	
Time Delay	nS/ft (nS/m)	1.34	(4.40)
Impedance	ohms	50	
Capacitance	pF/ft (pF/m)	26.7	(87.6)
Inductance	uH/ft (uH/m)	0.067	(0.22)
Shielding Effectiveness	dB	>90	
DC Resistance			
Inner Conductor	ohms/1000ft (/km)	6.50	(21.3)
Outer Conductor	ohms/1000ft (/km)	4.90	(16.1)
Voltage Withstand	Volts DC	1000	
Jacket Spark	Volts RMS	3000	
Peak Power	kW	2.5	

Attenuation vs. Frequency (typical)



Frequency (MHz)	30	50	150	220	450	900	1500	1800	2000	2500	3400	5800
Attenuation dB/100 ft	1.8	2.3	4.1	4.9	7.1	10.0	13.0	14.3	15.1	16.9	19.8	26.1
Attenuation dB/100 m	5.9	7.7	13.3	16.1	23.2	32.9	42.7	46.9	49.5	55.5	65.0	85.7
Avg. Power kW	1.71	1.32	0.76	0.62	0.43	0.30	0.23	0.21	0.20	0.18	0.15	0.11

Calculate Attenuation = $(0.329075) \cdot \sqrt{\text{FMHz}} + (0.000183) \cdot \text{FMHz}$ (interactive calculator available at http://www.timesmicrowave.com/cable_calculators)
Attenuation: VSWR=1.0; Ambient = +25°C (77°F) **Power:** VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F);
 Sea Level; dry air; atmospheric pressure; no solar loading



Connectors

Interface	Description	Part Number	Stock Code	VSWR** Freq. (GHz)	Coupling Nut	Inner Contact Attach	Outer Contact Attach	Finish* Body /Pin	Length in (mm)	Width in (mm)	Weight lb (g)
1. BNC Male	Straight Plug	TC-200-BM	3190-225	<1.25:1 (2.5)	Knurl	Solder	Crimp	S/G	1.7 (43.2)	0.56 (14.2)	0.045 (20.4)
2. Mini-UHF	Straight Plug	TC-200-MUHF	3190-444	<1.25:1 (2.5)	Knurl	Solder	Crimp	NG	1.1 (27.9)	0.45 (11.4)	0.015 (6.8)
3. N Male	Straight Plug	TC-200-NM	3190-224	<1.25:1 (2.5)	Knurl	Solder	Crimp	S/G	1.5 (38.1)	0.75 (19.1)	0.073 (33.1)
4. N Male	Reverse Polarity	TC-200-NM-RP	3190-959	<1.25:1 (2.5)	Knurl	Solder	Crimp	N/G	1.5 (38.0)	0.75 (19.1)	0.073 (33.1)
5. SMA Male	Straight plug	TC-200-SM	3190-612	<1.25:1 (8)	Hex	Solder	Crimp	SS/G	1.0 (25.4)	0.32 (8.1)	0.015 (6.8)
6. SMA Male	Reverse Polarity	TC-200-SM-RP	3190-327	<1.25:1 (2.5)	Hex	Solder	Crimp	SS/G	1.0 (25.4)	0.32 (8.1)	0.015 (6.8)
7. TNC Male	Straight Plug	TC-200-TMC	3190-240	<1.25:1 (2.5)	Knurl	Solder	Clamp	S/G	1.7 (43.2)	0.59 (15.0)	0.045 (20.4)
8. TNC Female	Straight Jack	TC-200-TF	3190-263	<1.25:1 (2.5)	NA	Solder	Crimp	N/G	1.3 (33.0)	0.57 (14.5)	0.033 (15.0)

*Finish metals: N=Nickel, S=Silver, G=Gold, SS=Stainless Steel, A=Alloy **VSWR spec based on 3 foot cable with a connector pair

Hardware Accessories



Type	Part Number	Stock Code	Description
Ground Kit	GK-S200TT	GK-S200TT	Standard Ground Kit (each)

Install Tools

Type	Part Number	Stock Code	Description
Crimp Tool	CT-240/200/195/100	3190-667	Crimp tool for LMR-100, 195, 200 and 240 connectors
Deburr Tool	DBT-U	3192-001	Removes center conductor rough edges
Cutting Tool	CCT-02	3192-165	Cable end flush cut tool
Replacement Blade	RB-02	3192-166	Replacement blade for cutting tool



Engineered Products:

FBT™-240

Flexible Low Loss High Power Communications Coax

Ideal for...

- High Power Base Station Jumper Assemblies
- In-Building Plenum Feeder Runs
- Any High Power Low Loss RF cable application



Part Description					Stock
Part Number	Application	Jacket	Color	Code	
FBT-240	Indoor/Outdoor	FEP	Brown	54167	

Construction Specifications				
Description	Material	In.	(mm)	
Inner Conductor	Solid BC	0.051	(1.30)	
Dielectric	Low Density PTFE	0.150	(3.81)	
Outer Conductor	Aluminum Tape	0.155	(3.94)	
Overall Braid	Tinned Copper	0.178	(4.52)	
Jacket	Brown FEP	0.205	(5.21)	

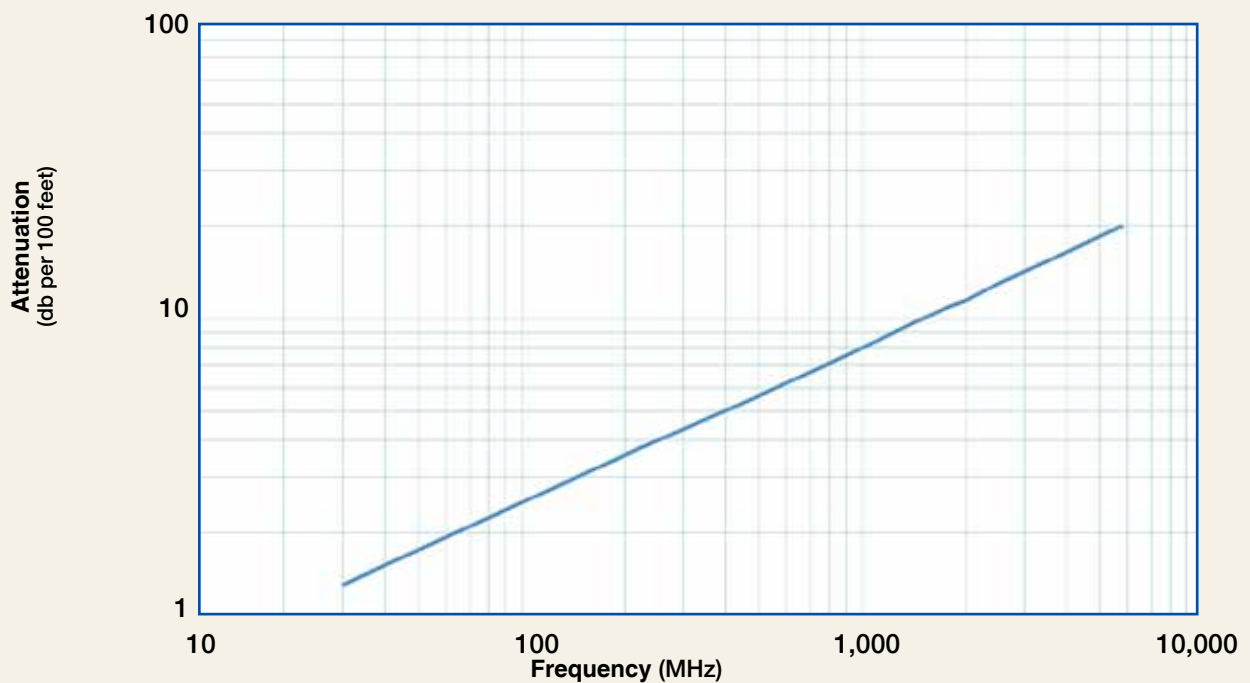
Environmental Specifications			
Performance Property	°F	°C	
Installation Temperature Range	-67/+302	-55/+150	
Storage Temperature Range	-67/+302	-55/+150	
Operating Temperature Range	-67/+302	-55/+150	

Mechanical Specifications				
Performance Property	Units	US	(metric)	
Bend Radius: installation	in. (mm)	1.0	(25.4)	
Bend Radius: repeated	in. (mm)	2	(50.8)	
Bending Moment	ft-lb (N-m)	0.25	(0.34)	
Weight	lb/ft (kg/m)	0.040	(0.06)	
Tensile Strength	lb (kg)	60	(27.2)	
Flat Plate Crush	lb/in. (kg/mm)	85	(1.52)	

Electrical Specifications				
Performance Property	Units	US	(metric)	
Velocity of Propagation	%	76		
Dielectric Constant	NA	1.73		
Time Delay	nS/ft (nS/m)	1.34	(4.40)	
Impedance	ohms	50		
Capacitance	pF/ft (pF/m)	26.7	(87.6)	
Inductance	uH/ft (uH/m)	0.067	(0.22)	
Shielding Effectiveness	dB	>90		
DC Resistance				
Inner Conductor	ohms/1000ft (/km)	4.00	(13.1)	
Outer Conductor	ohms/1000ft (/km)	3.90	(12.8)	
Voltage Withstand	Volts DC	1500		
Jacket Spark	Volts RMS	5000		
Peak Power	kW	5.6		



Attenuation vs. Frequency (typical)



Frequency (MHz)	30	50	150	220	450	900	1500	1800	2000	2500	3400	5800
Attenuation dB/100 ft	1.4	1.8	3.1	3.7	5.4	7.6	9.9	10.9	11.5	12.9	15.1	20.0
Attenuation dB/100 m	4.5	5.8	10.1	12.2	17.6	25.0	33.2	35.7	37.7	42.3	49.6	65.6
Avg. Power kW	2.48	1.92	1.10	0.91	0.63	0.44	0.34	0.31	0.29	0.26	0.22	0.17

Calculate Attenuation =
 $(0.248515) \cdot \sqrt{\text{FMHz}} + (0.000183) \cdot \text{FMHz}$ (interactive calculator available at http://www.timesmicrowave.com/cable_calculators)

Attenuation:
 VSWR=1.0 ; Ambient = +25°C (77°F)

Power:
 VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F); Sea Level; dry air; atmospheric pressure; no solar loading

Engineered Products:

FBT-240

Flexible Low Loss High Power Communications Coax



Connectors		Part Number	Stock Code	VSWR**	Coupling	Inner Contact Attach	Outer Contact Attach	Body Finish*	Length in (mm)	Width in (mm)	Weight lb (g)
1. BNC Male	Straight Plug	TC-240-BMC	3190-242	<1.25:1 (2.5)	Knurl	Solder	Clamp	S/G	1.7 (43)	0.56 (14.2)	0.040 (18.1)
2. Mini-UHF	Straight Plug	TC-240-MUHF	3190-445	<1.25:1 (2.5)	Knurl	Solder	Crimp	N/G	1.1 (28)	0.45 (11.4)	0.014 (6.4)
3. N Female	Bulkhead Jack	TC-240-NF-BH	3190-419	<1.25 (2.5)	NA	Solder	Crimp	A/G	1.7 (44)	0.88 (22.2)	0.115 (52.2)
4. N Male	Straight Plug	TC-240-NMH	3190-382	<1.25:1 (2.5)	Hex	Solder	Crimp	N/S	1.5 (38)	0.75 (19.1)	0.086 (39.0)
5. N Male	Straight Plug	TC-240-NMC	3190-244	<1.25:1 (2.5)	Knurl	Solder	Clamp	S/G	1.5 (38)	0.75 (19.1)	0.082 (37.2)
6. SMA Female	Bulkhead Jack	TC-240-SF-BH	3190-824	<1.25:1 (2.5)	NA	Solder	Crimp	SS/G	1.1 (29)	0.31 (7.9)	0.019 (8.6)
7. SMA Male	Straight Plug	TC-240-SM-SS-X	3190-2898	<1.25:1 (10)	Hex	Solder	Crimp	SS/G	1.0 (25)	0.32 (8.1)	0.016 (7.3)
8. SMA Male	Right Angle	TC-240-SM-RA	3190-381	<1.35:1 (6)	Hex	Solder	Crimp	SS/G	0.8 (20)	0.65 (16.5)	0.019 (8.6)
9. SMA Male	Reverse Polarity	TC-240-SM-RP	3190-326	<1.25:1 (2.5)	Hex	Solder	Crimp	SS/G	1.0 (25)	0.32 (8.1)	0.016 (7.3)
10. TNC Male	Straight Plug	TC-240-TM	3190-275	<1.25:1 (2.5)	Knurl	Solder	Crimp	N/S	1.7 (43)	0.59 (15.0)	0.043 (19.5)
11. TNC Male	Right Angle	TC-240-TM-RA	3190-604	<1.35:1 (2.5)	Knurl	Solder	Crimp	N/G	1.3 (33)	0.57 (14.5)	0.055 (24.9)
12. Type F Male	Straight Plug	TC-240-FM-X	3190-2891	<.25:1 (2.5)	Knurl	Solder	Crimp	N/G	1.1 (28)	0.45 (11.4)	0.014 (6.4)



Hardware Accessories

Type	Part Number	Stock Code	Description
Ground Kit	GK-S240TT	GK-S240TT	Standard Ground Kit (each)



Install Tools

Type	Part Number	Stock Code	Description
Crimp Tool	CT-240/200/195/100	3190-667	Crimp tool for LMR-100, 195, 200 and 240 connectors
Deburr Tool	DBT-U	3192-001	Removes center conductor rough edges
Cutting Tool	CCT-02	3192-165	Cable and flush cut tool
Replacement Blade	RB-02	3192-166	Replacement blade for cutting tool

Engineered Products:

FBT-300

Flexible Low Loss High Power Communications Coax

Ideal for...

- High Power Base Station Jumper Assemblies
- In-Building Plenum Feeder Runs
- Any High Power Low Loss RF cable application



Part Description				Stock
Part Number	Application	Jacket	Color	Code
FBT-300	Indoor/Outdoor	FEP	Brown	54168

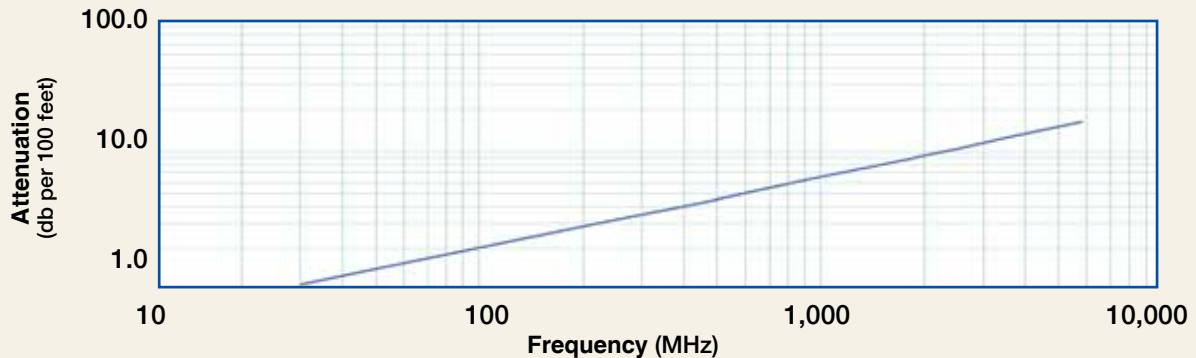
Environmental Specifications		
Performance Property	°F	°C
Installation Temperature Range	-67/+302	-55/+150
Storage Temperature Range	-67/+302	-55/+150
Operating Temperature Range	-67/+302	-55/+150

Construction Specifications			
Description	Material	In.	(mm)
Inner Conductor	Solid BC	0.063	(1.60)
Dielectric	Low Density PTFE	0.190	(4.83)
Outer Conductor	Aluminum Tape	0.196	(4.98)
Overall Braid	Tinned Copper	0.225	(5.72)
Jacket	Brown FEP	0.260	(6.60)

Mechanical Specifications			
Performance Property	Units	US	(metric)
Bend Radius: installation	in. (mm)	1.3	(31.8)
Bend Radius: repeated	in. (mm)	3	(76.2)
Bending Moment	ft-lb (N-m)	0.38	(0.52)
Weight	lb/ft (kg/m)	0.065	(0.10)
Tensile Strength	lb (kg)	120	(54.52)
Flat Plate Crush	lb/in. (kg/mm)	30	(0.54)

Electrical Specifications			
Performance Property	Units	US	(metric)
Velocity of Propagation	%	76	
Dielectric Constant	NA	1.73	
Time Delay	nS/ft (nS/m)	1.34	(4.40)
Impedance	ohms	50	
Capacitance	pF/ft (pF/m)	26.7	(87.6)
Inductance	uH/ft (uH/m)	0.067	(0.22)
Shielding Effectiveness	dB	>90	
DC Resistance			
Inner Conductor	ohms/1000ft (/km)	2.61	(8.6)
Outer Conductor	ohms/1000ft (/km)	2.21	(7.3)
Voltage Withstand	Volts DC	2000	
Jacket Spark	Volts RMS	5000	
Peak Power	kW	10	

Attenuation vs. Frequency (typical)



Frequency (MHz)	30	50	150	220	450	900	1500	1800	2000	2500	3400	5800
Attenuation dB/100 ft	1.1	1.4	2.5	3.0	4.3	6.2	8.0	8.8	9.3	10.5	12.3	16.3
Attenuation dB/100 m	3.6	4.7	8.1	9.9	14.2	20.2	26.3	28.9	30.6	34.3	40.3	53.5
Avg. Power kW	3.44	2.67	1.53	1.26	0.87	0.61	0.47	0.43	0.40	0.36	0.30	0.23

Calculate Attenuation = $(0.200179) \cdot \sqrt{\text{FMHz}} + (0.000183) \cdot \text{FMHz}$ (interactive calculator available at http://www.timesmicrowave.com/cable_calculators)
 Attenuation: VSWR=1.0 ; Ambient = +25°C (77°F) Power: VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F);
 Sea Level; dry air; atmospheric pressure; no solar loading



Connectors

Interface	Description	Part Number	Stock Code	VSWR** Freq. (GHz)	Coupling Nut	Inner Contact Attach	Outer Contact Attach	Finish* Body /Pin	Length in (mm)	Width in (mm)	Weight lb (g)
1. SMA Male	Straight Plug	TC-300-SM	3190-501	<1.25:1 (2.5)	Hex	Solder	Crimp	SS/G	1.0 (25)	0.35 (8.9)	0.018 (8.2)
2. SMA Female	Bulkhead Jack	TC-300-SF-BH	3190-590	<1.25:1 (2.5)	NA	Solder	Crimp	SS/G	1.1 (28)	0.31 (7.9)	0.022 (10.0)
3. TNC Male	Straight Plug	TC-300-TM	3190-500	<1.25:1 (2.5)	Knurl	Solder	Crimp	N/S	1.7 (43)	0.59 (15.0)	0.050 (22.7)

* Finish metals: N=Nickel, S=Silver, G=Gold, SS=Stainless Steel, A=Albloy **VSWR spec based on 3 foot cable with a connector pair

Hardware Accessories



Type	Part Number	Stock Code	Description
Ground Kit	GK-S300TT	GK-S300TT	Standard Ground Kit (each)



Install Tools



Type	Part Number	Stock Code	Description
Crimp Tool	CT-400/300	3190-666	Crimp tool for LMR 300 connectors
Deburr Tool	DBT-U	3192-001	Removes center conductor rough edges
Cutting Tool	CCT-02	3192-165	Cable end flush cut tool
Replacement Blade	RB-02	3192-166	Replacement blade for cutting tool



Engineered Products:

FBT™-400

Flexible Low Loss High Power Communications Coax

Ideal for...

- High Power Base Station Jumper Assemblies
- In-Building Plenum Feeder Runs
- Any High Power Low Loss RF cable application



Part Description				Stock
Part Number	Application	Jacket	Color	Code
FBT-400	Indoor/Outdoor	FEP	Brown	54171

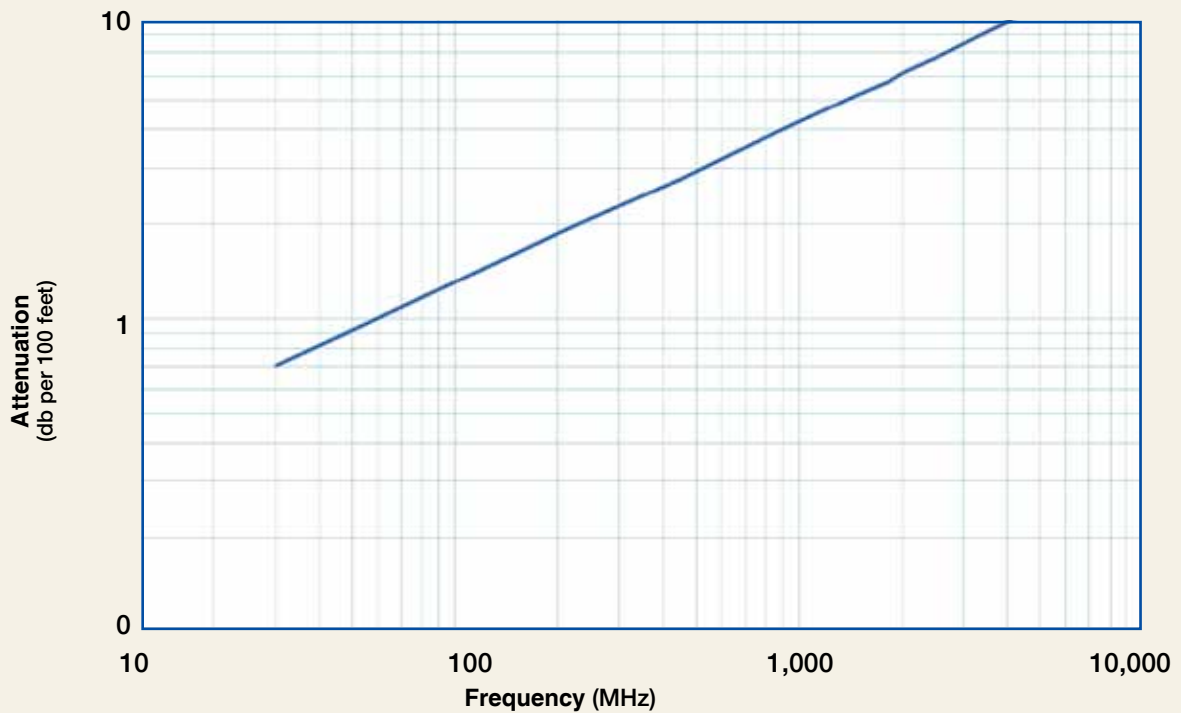
Environmental Specifications		
Performance Property	°F	°C
Installation Temperature Range	-67/+302	-55/+150
Storage Temperature Range	-67/+302	-55/+150
Operating Temperature Range	-67/+302	-55/+150

Construction Specifications			
Description	Material	In.	(mm)
Inner Conductor	Solid BCCAI	0.095	(2.41)
Dielectric	Low Density PTFE	0.285	(7.24)
Outer Conductor	Aluminum Tape	0.291	(7.39)
Overall Braid	Tinned Copper	0.320	(8.13)
Jacket	Brown FEP	0.370	(9.40)

Mechanical Specifications			
Performance Property	Units	US	(metric)
Bend Radius: installation	in. (mm)	1.8	(44.5)
Bend Radius: repeated	in. (mm)	4	(101.6)
Bending Moment	ft-lb (N-m)	1	(1.36)
Weight	lb/ft (kg/m)	0.104	(0.15)
Tensile Strength	lb (kg)	120	(54.5)
Flat Plate Crush	lb/in. (kg/mm)	185	(3.31)

Electrical Specifications			
Performance Property	Units	US	(metric)
Velocity of Propagation	%	76	
Dielectric Constant	NA	1.73	
Time Delay	nS/ft (nS/m)	1.34	(4.40)
Impedance	ohms	50	
Capacitance	pF/ft (pF/m)	26.7	(87.6)
Inductance	uH/ft (uH/m)	0.067	(0.22)
Shielding Effectiveness	dB	>90	
DC Resistance			
Inner Conductor	ohms/1000ft (/km)	1.80	(5.9)
Outer Conductor	ohms/1000ft (/km)	1.65	(5.4)
Voltage Withstand	Volts DC	2500	
Jacket Spark	Volts RMS	8000	
Peak Power	kW	16	

Attenuation vs. Frequency (typical)



Frequency (MHz)	30	50	150	220	450	900	1500	1800	2000	2500	3400	5800
Attenuation dB/100 ft	0.7	0.9	1.6	1.9	2.8	4.0	5.2	5.7	6.1	6.8	8.0	10.7
Attenuation dB/100 m	2.3	3.0	5.3	6.4	9.2	13.1	17.1	18.8	19.9	22.4	26.3	35.0
Avg. Power kW	6.23	4.82	2.76	2.27	1.58	1.10	0.84	0.77	0.73	0.65	0.55	0.41

Calculate Attenuation =

$(0.129138) \cdot \sqrt{FMHz} + (0.000146) \cdot FMHz$ (interactive calculator available at http://www.timesmicrowave.com/cable_calculators)

Attenuation:

VSWR=1.0 ; Ambient = +25°C (77°F)

Power:

VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F); Sea Level; dry air; atmospheric pressure; no solar loading

Engineered Products:

FBT-400

Flexible Low Loss High Power Communications Coax



Connectors											
Interface	Description	Part Number	Stock Code	VSWR** Freq. (GHz)	Coupling Nut	Inner Contact Attach	Outer Contact Attach	Finish* Body /Pin	Length in (mm)	Width in (mm)	Weight lb (g)
1. N Female	Straight Jack	TC-400-NF-PL	3190-964	<1.25:1 (2.5)	NA	Solder	Crimp	N/G	1.8 (45)	0.66(16.8)	0.105 (47.6)
2. N Male	Straight Plug	EZ-400-NMH-PL-D	3190-602	<1.25:1 (2.5)	Hex/Knurl	Spring Finger	Crimp	A/G	1.5 (38)	0.89(22.6)	0.113 (51.3)
3. N Male	Straight Plug	TC-400-NMH-PL	3190-759	<1.25:1 (2.5)	Hex	Solder	Crimp	S/G	1.5 (38)	0.89(22.6)	0.113 (51.3)
4. N Male	Right Angle	TC-400-NMH-RA-D	3190-2293	<1.35:1 (6)	Hex/Knurl	Solder	Crimp	A/G	1.8 (46)	1.25(31.8)	0.130 (59.0)



Hardware Accessories

Type	Part Number	Stock Code	Description
Ground Kit	GK-S400T	GK-S400T	Standard Grounding Kit (each)



Install Tools

Type	Part Number	Stock Code	Description
Crimp Tool	CT-U	3192-181	Crimp Handle (Dies Required)
Crimp Dies	Y1719	3190-202	.429" Hex Dies
Crimp Tool	CT-400/300	3190-666	Crimp tool for LMR 400 connectors
Crimp Rings	CR-400	3190-830	Crimp rings for TC/EZ-400 connectors (package of 10)
Deburr Tool	DBT-U	3192-001	For 'EZ' Style Connectors
Cutting Tool	CCT-02	3192-165	Cable and flush cut tool
Replacement Blade	RB-02	3192-166	Replacement blade for cutting tool

Engineered Products:

FBT™ -500

Flexible Low Loss High Power Communication

Ideal for...

- High Power Base Station Jumper Assemblies
- In-Building Plenum Feeder Runs
- Any High Power Low Loss RF cable application



Part Description				Stock
Part Number	Application	Jacket	Color	Code
FBT-500	Indoor/Outdoor	FEP	Brown	54172

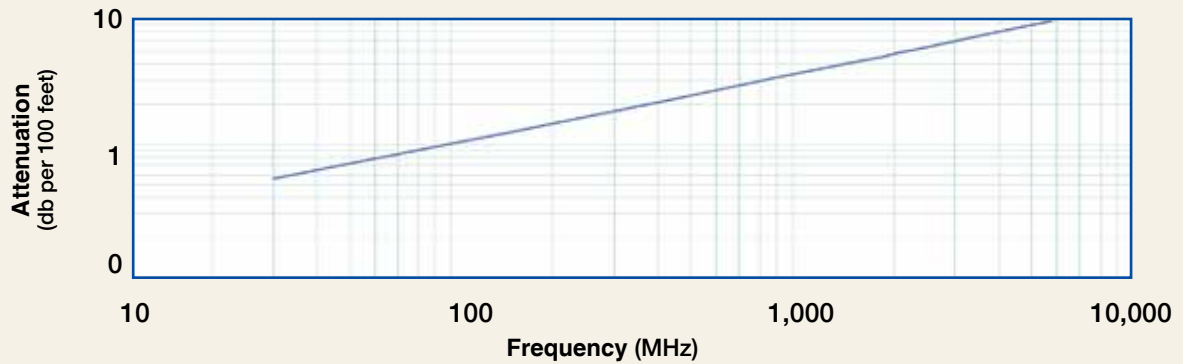
Environmental Specifications		
Performance Property	°F	°C
Installation Temperature Range	-67/+302	-55/+150
Storage Temperature Range	-67/+302	-55/+150
Operating Temperature Range	-67/+302	-55/+150

Construction Specifications			
Description	Material	In.	(mm)
Inner Conductor	Solid BCCAI	0.123	(3.12)
Dielectric	Low Density PTFE	0.370	(9.40)
Outer Conductor	Aluminum Tape	0.376	(9.55)
Overall Braid	Tinned Copper	0.405	(10.29)
Jacket	Brown FEP	0.465	(11.81)

Mechanical Specifications			
Performance Property	Units	US	metric
Bend Radius: installation	in. (mm)	2.3	(57.2)
Bend Radius: repeated	in. (mm)	5	(127.0)
Bending Moment	ft-lb (N-m)	1.75	(2.37)
Weight	lb/ft (kg/m)	0.168	(0.25)
Tensile Strength	lb (kg)	120	(54.5)
Flat Plate Crush	lb/in. (kg/mm)	185	(3.31)

Electrical Specifications			
Performance Property	Units	US	(metric)
Velocity of Propagation	%	76	
Dielectric Constant	NA	1.73	
Time Delay	nS/ft (nS/m)	1.34	(4.40)
Impedance	ohms	50	
Capacitance	pF/ft (pF/m)	26.7	(87.6)
Inductance	uH/ft (uH/m)	0.067	(0.22)
Shielding Effectiveness	dB	>90	
DC Resistance			
Inner Conductor	ohms/1000ft (/km)	1.09	(3.6)
Outer Conductor	ohms/1000ft (/km)	1.27	(4.2)
Voltage Withstand	Volts DC	3000	
Jacket Spark	Volts RMS	8000	
Peak Power	kW	11.6	

Attenuation vs. Frequency (typical)



Frequency (MHz)	30	50	150	220	450	900	1500	1800	2000	2500	3400	5800
Attenuation dB/100 ft	0.6	0.7	1.3	1.5	2.2	3.1	4.1	4.5	4.8	5.4	6.4	8.5
Attenuation dB/100 m	1.8	2.3	4.1	5.0	7.2	10.3	13.5	14.8	15.7	17.6	20.9	27.9
Avg. Power kW	8.90	6.88	3.94	3.24	2.24	1.56	1.20	1.08	1.03	0.91	0.77	0.57

Calculate Attenuation = $(0.100255) \cdot \sqrt{\text{FMHz}} + (0.000146) \cdot \text{FMHz}$ (interactive calculator available at http://www.timesmicrowave.com/cable_calculators)
 Attenuation: VSWR=1.0 ; Ambient = +25°C (77°F) Power: VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F);
 Sea Level; dry air; atmospheric pressure; no solar loading



Connectors

Interface	Description	Part Number	Stock Code	VSWR** Freq. (GHz)	Coupling Nut	Inner Contact Attach	Outer Contact Attach	Finish* Body /Pin	Length in (mm)	Width in (mm)	Weight lb (g)
N Male	Straight Plug	TC-500-NMC-PL	3190-900	<1.25:1 (2.5)	Hex	Solder	Clamp	S/G	2.1 (53)	0.92 (23.4)	0.228 (103.4)

* Finish metals: N=Nickel, S=Silver, G=Gold, SS=Stainless Steel, A=Alballoy **VSWR spec based on 3 foot cable with a connector pair



Install Tools

Type	Part Number	Stock Code	Description
Crimp Tool	CT-U	3192-181	Crimp handle (Dies Required)
Crimp Tool	CT-500	3192-169	Crimp tool for LMR-500 connectors
Crimp Dies	Y151	3190-465	.532" Hex Dies
Deburr Tool	DBT-U	3192-001	Removes center conductor rough edges
Cutting Tool	CCT-02	3192-165	Cable end flush cut tool
Replacement Blade	RB-02	3192-166	Replacement blade for cutting tool



Engineered Products:

FBT™-600

Flexible Low Loss High Power Communications

Ideal for...

- High Power Base Station Jumper Assemblies
- In-Building Plenum Feeder Runs
- Any High Power Low Loss RF cable application



Part Description				Stock
Part Number	Application	Jacket	Color	Code
FBT-600	Indoor/Outdoor	FEP	Brown	54173

Environmental Specifications		
Performance Property	°F	°C
Installation Temperature Range	-67/+302	-55/+150
Storage Temperature Range	-67/+302	-55/+150
Operating Temperature Range	-67/+302	-55/+150

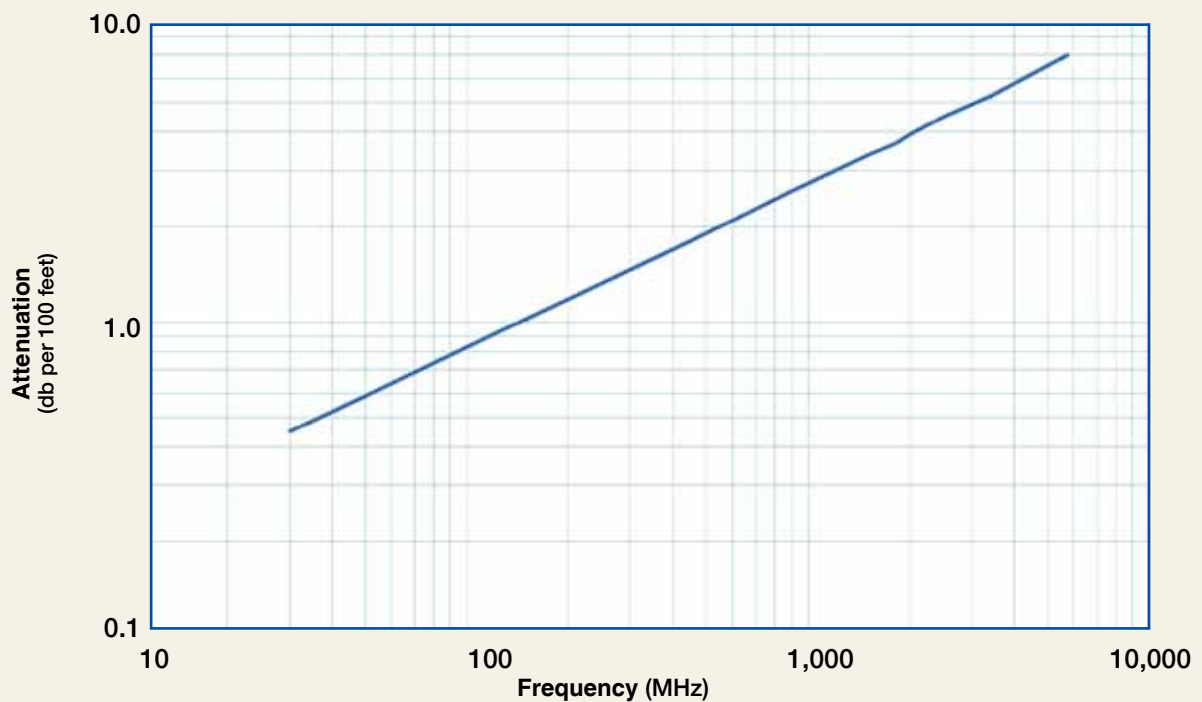
Construction Specifications			
Description	Material	In.	(mm)
Inner Conductor	Solid BCCAI	0.150	(3.81)
Dielectric	Low Density PTFE	0.455	(11.56)
Outer Conductor	Aluminum Tape	0.461	(11.71)
Overall Braid	Tinned Copper	0.490	(12.45)
Jacket	Brown FEP	0.565	(14.38)

Mechanical Specifications			
Performance Property	Units	US	(metric)
Bend Radius: installation	in. (mm)	2.8	(69.9)
Bend Radius: repeated	in. (mm)	6	(152.4)
Bending Moment	ft-lb (N-m)	2.75	(3.73)
Weight	lb/ft (kg/m)	0.210	(0.31)
Tensile Strength	lb (kg)	265	(120.3)
Flat Plate Crush	lb/in. (kg/mm)	210	(3.75)

Electrical Specifications			
Performance Property	Units	US	(metric)
Velocity of Propagation	%	76	
Dielectric Constant	NA	1.73	
Time Delay	nS/ft (nS/m)	1.34	(4.40)
Impedance	ohms	50	
Capacitance	pF/ft (pF/m)	26.7	(87.6)
Inductance	uH/ft (uH/m)	0.067	(0.22)
Shielding Effectiveness	dB	>90	
DC Resistance			
Inner Conductor	ohms/1000ft (/km)	0.73	(2.4)
Outer Conductor	ohms/1000ft (/km)	1.20	(3.9)
Voltage Withstand	Volts DC	4000	
Jacket Spark	Volts RMS	8000	
Peak Power	kW	40	



Attenuation vs. Frequency (typical)



Frequency (MHz)	30	50	150	220	450	900	1500	1800	2000	2500	3400	5800
Attenuation dB/100 ft	0.5	0.6	1.0	1.2	1.8	2.6	3.4	3.7	3.9	4.4	5.3	7.1
Attenuation dB/100 m	1.5	1.9	3.3	4.1	5.9	8.4	11.1	12.2	12.9	14.5	17.2	23.2
Avg. Power kW	11.84	9.14	5.23	4.30	2.97	2.07	1.57	1.43	1.35	1.20	1.01	0.75

Calculate Attenuation =

$(0.081389) \cdot \sqrt{\text{FMHz}} + (0.000146) \cdot \text{FMHz}$ (interactive calculator available at http://www.timesmicrowave.com/cable_calculators)

Attenuation:

VSWR=1.0 ; Ambient = +25°C (77°F)

Power:

VSWR=1.0; Ambient = +40°C; Inner Conductor = 100°C (212°F); Sea Level; dry air; atmospheric pressure; no solar loading

Engineered Products:

FBT-600

Flexible Low Loss High Power Communications Coax



Connectors											
Interface	Description	Part Number	Stock Code	VSWR** Freq. (GHz)	Coupling Nut	Inner Contact Attach	Outer Contact Attach	Finish* Body /Pin	Length in (mm)	Width in (mm)	Weight lb (g)
1. LC Male	Straight plug	TC-600-LCM-PL	3190-1221	<1.25:1 (1)	Hex	Solder	Clamp	N/S	3.1 (78.7)	1.62 (41.1)	1.20 (544)
2. N Male	Straight Plug	EZ-600-NMH-PL-D	3190-603	<1.25:1 (2.5)	Hex/Knurl	Spring Finger	Crimp	A/G	2.1 (53)	0.92 (23.4)	0.166 (75.3)
3. N Male	Straight Plug	TC-600-NMH-PL	3190-760	<1.25:1 (2.5)	Hex	Solder	Crimp	S/G	2.1 (53)	0.92 (23.4)	0.208 (93.4)
4. N Male	Right Angle	TC-600-NMC-RA	3190-233	<1.35:1 (2.5)	Hex	Solder	Clamp	S/G	2.1 (53)	0.92 (23.4)	0.280 (17.9)
5. N Male	Right Angle	TC-600-NMH-RA-D	3190-2427	<1.35:1 (6)	Hex	Solder	Crimp	A/G	1.8 (46.5)	1.62 (41.2)	0.185 (84.3)



Hardware Accessories

Type	Part Number	Stock Code	Description
Ground Kit	GK-S600TT	GK-S600TT	Standard Grounding Kit (each)



Install Tools

Type	Part Number	Stock Code	Description
Crimp Tool	CT-U	3192-181	Crimp handle (Dies Required)
Crimp Tool	CT-600	3192-170	Crimp tool for LMR-600 connectors
Crimp Dies	Y1720	3190-203	.610" hex dies
Crimp Rings	CR-600	3190-831	Crimp rings for TC/EZ-600 connectors (pkg of 10)
Deburr Tool	DBT-U	3192-001	Removes center conductor rough edges
Midspan Strip Tool	GST-600A	3190-1051	For ground strap attachment
Cutting Tool	CCT-02	3192-165	Cable end flush cut tool
Replacement Blade	RB-02	3192-166	Replacement blade for cutting tool