

# **T-RAD<sup>®</sup>-6000**

## **Leaky Feeder Coaxial Cables**



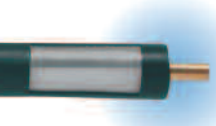
### ***Provides Interior RF Communications***

- ***Mines***
- ***Tunnels***
- ***In-Building***
- ***Underground Garages***

### ***Sensor Applications***

- ***Perimeter Detection***
- ***Security Systems***

# T-RAD®-600



Times Microwave Systems' T-RAD 50 ohm, leaky feeder coax radiating cables provide cost effective radio frequency coverage in enclosed or underground areas, where single point source antennas are not practical. Applications include: metro stations, tunnels, mines, ships, and in-building wireless systems. T-Rad cables may also be used as a single backbone, supplying multiple services across a broad frequency range from AM radio rebroadcast through the higher frequency 802.11 WLAN applications. T-RAD-600s flexibility, combined with Times' "EZ" attachment connectors makes quick and easy installations possible for a wide variety of interior communications applications.

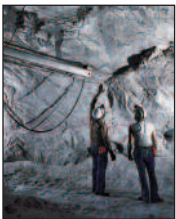


## Tunnels/Rail-Transit

Times Microwave supplies T-RAD-600 cable for a wide variety of tunneling applications, including the use of T-RAD-600 cable to provide communications for the PATH rail tunnels at the World Trade Center site in New York City. T-RAD-600 is used as a backbone to provide radio frequency coverage throughout the mile long rail tunnels between New Jersey and lower Manhattan. A cascaded amplifier system offsets the attenuation and coupling losses, which are characteristics of all leaky feeder systems.

## In-Building Communications

T-RAD-600 cable successfully provides broadband coverage in building applications for VHF, UHF, cellular, PCS and 802.11b WLAN frequencies. Typically this cable is run through a building, where point source antennas are not practical. The T-RAD's flexible design allows it to be routed easily for quicker and more cost effective installation. With the use of cross-band couplers a single T-RAD cable backbone can support multiple use frequencies.



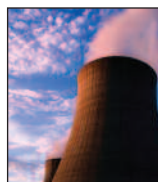
## Mining Applications

T-RAD-600 leaky feeder cables are used to provide underground communications for a wide variety of mining applications. The cable is run throughout the mining tunnels and allows a controlled amount of signal to leak into the surrounding environment. This

enables the cable to receive and transmit, where radio frequency coverage is required. T-RAD cable can be run into splitters, providing a means to run leaky feeder cable into any shadowed or cross-tunnel areas.

## Perimeter Detection Systems

Times Microwave supplies T-RAD-600DB cable for direct burial detection system applications. This cable provides coverage around highly sensitive areas that need added security, such as prisons, nuclear facilities and military installations. The T-RAD cable radiates a signal creating an EMF field, which when compromised detects intrusions and alerts security personnel.



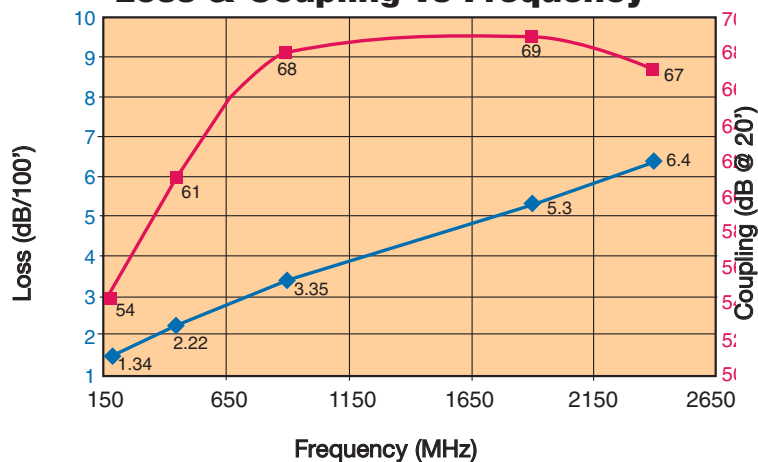
Part Description				
Part Number	Application	Jacket	Color	Stock Code
AA-9096	T-RAD-600-PVC	PVC	Black	44030
AA-9097	T-RAD-600-FR	FRPE	Black	44031
AA-9299	T-RAD-600-DB	PVC/PE	Black	44038

Physical & Mechanical Specifications		
	in	(mm)
Inner Conductor: Solid BCCA1	0.176	(4.47)
Dielectric: Gas-Injected Foam Polyethylene	0.455	(11.56)
Inner Shield: Bonded Aluminum Tape	0.458	(11.63)
Jacket: Extruded PVC or FR	0.530	(13.46)
DB Version PVC/PE	0.590	(14.98)
Bend Radius: Installation	1.5	(38)
Bend Radius: Repeated	6.0	(152.4)
Weight: Extruded PVC or FR	0.09 lbs./ft	(0.137 kg/m)
DB Version PVC/PE	0.14 lbs./ft	(0.213 kg/m)
Operating Temperature Range	-40°/+185°F	-40°/+85°C

Electrical Specifications				
Velocity of Propagation	86%			
Dielectric Constant	1.35			
Time Delay	1.18 nS/ft		(3.87 nS/m)	
Impedance	50 ohms			
Voltage Withstand	4000 Volts DC			
Jacket Spark	6000 Volts RMS			
Attenuation	(MHz)	dB/100 ft	dB/100 m	Coupling Loss*
	150	1.34	4.39	54
	450	2.22	7.28	61
	900	3.35	10.98	68
	1900	5.30	17.38	69
	2400	6.40	20.99	67

\* Coupling loss measured at 6.5feet (2 meters)

## T-RAD-600 Loss & Coupling vs Frequency



## T-RAD-600 Comparison

T-RAD-600 -vs- Corrugated Copper			
	3/8" CC	T-RAD-600	1/2" CC
Overall Diameter (in)	0.460"	0.520"	0.650"
Insertion Loss/Coupling Loss			
150 MHz	1.5/56	1.3/54	1.0/58
450 MHz	2.6/61	2.2/61	2.0/63
900 MHz	3.7/68	3.4/69	2.9/68
1700 MHz	5.3/74	5.3/72	4.0/73
2400 MHz		6.4/67	5.0/73

## Connectors

**Connectors:** Times offers a wide variety of "EZ" style connectors for quick attachment.



### Connectors

Interface	Description	Part Number	Stock Code	VSWR* Freq. (GHZ)	Coupling Nut	Inner Contact Attachment	Outer Contact Attachment	Finish* Body/Pin	Length in (mm)	Width in (mm)	Weight lb (g)
N Male	Straight Plug	EZ-600-NMH-D	3190-1268	<1.25:1 (2.5)	Hex/Knurl	Spring Finger	Crimp	SG	2.1 (53)	0.92 (23.4)	1.164 (74.4)
	Right Angle	EZ-600-NMH-RA	3190-762	<1.25:1 (6)	Hex	Spring Finger	Crimp	SG	2.1 (53)	0.92 (23.4)	0.185 (83.9)
N Female	Straight Jack	EZ-600-NF	3190-955	<1.25:1 (2.5)	NA	Spring Finger	Crimp	SG	2.3 (59)	0.87 (22.1)	0.150 (68.0)
	Bulkhead Jack	EZ-600-NF-BH	3190-616	<1.25:1 (2.5)	NA	Spring Finger	Crimp	SG	2.4 (61)	0.88 (22.4)	0.195 (88.5)
TNC Male	Straight Plug	EZ-600-TM	3190-418	<1.25:1 (2.5)	Knurl	Spring Finger	Crimp	SG	1.7 (43)	0.59 (15.0)	0.112 (50.8)
	Reverse Polarity	EZ-600-TM-RP	3190-796	<1.25:1 (2.5)	Knurl	Spring Finger	Crimp	AG	2.2 (56)	0.87 (22.0)	0.112 (50.8)
TNC Female	Reverse Polarity	EZ-600-TF-RP	3190-797	<1.25:1 (2.5)	NA	Spring Finger	Crimp	AG	2.3 (58)	0.87 (22.0)	0.100 (45.4)
UHF Male	Straight Plug	EZ-600-UM	3190-615	<1.25:1 (2.5)	Knurl	Spring Finger	Crimp	SG	1.7 (43)	0.88 (22.4)	0.164 (74.4)
7-16 DIN Male	Straight Plug	EZ-600-716-MH	3190-503	<1.25:1 (2.5)	Hex	Spring Finger	Crimp	SS	2.0 (51)	1.30 (33.0)	0.254 (115.2)

## Our Mission

TIMES MICROWAVE SYSTEMS designs and manufactures high performance RF and microwave transmission lines. These products consist of flexible 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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