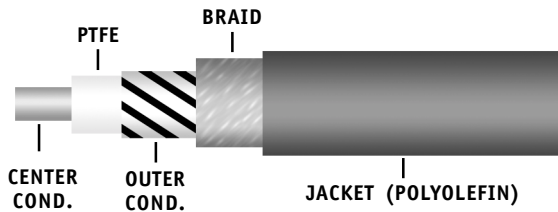


VNA Cable Assemblies

up to 40 GHz

FREQUENCY	LOSS DB/FT	VSWR
10 GHz	0.46	1.25
18 GHz	0.65	1.30
26.5 GHz	0.83	1.35
40 GHz	1.2	1.40

MIDISCO 8285 SERIES CUTAWAY VIEW



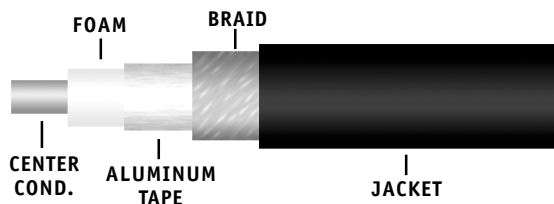
MIDISCO's 8285 series cable assemblies provide a cost-effective solution to the growing need for phase and amplitude stable test cables for production test environments up to 40 GHz. One end is fitted with a ruggedized 2.4 mm, 2.9 mm, or 3.5 mm female test port connector to interface directly with HP/Agilent and Aritsu/Wiltron VNA's (Vector Network Analyzers). Available connectors for the 2nd end include 2.4 mm, 2.9 mm, 3.5 mm, 7 mm, 26.5 GHz SMA, TNC, and type N. The outer conductor is a thin wall copper tube heliax that provides performance stability, and crush resistance of 150 lbs. of plane compressive force per inch. The outer jacket is polyolefin.

Key Parameters
 Bend Radius: 0.5"
 Phase and Amplitude Stable

LMR™ Cable Assemblies

Low Loss, Flexible

LMR SERIES CUTAWAY VIEW



MIDISCO now supplies cable assemblies using the popular LMR series cable. LMR cables have insertion losses compatible with corrugated copper cables, but are more flexible. Until recently, users had few options for LMR assemblies because of limited connector availability. MIDISCO has connectors readily available to fabricate cable assemblies using LMR100, 100A, 195, 200, 240, 400, 500 and 600. Consult the factory for LMR cables not listed including those suitable for direct burial and more flexible versions of LMR240, 400, and 600. Performance data on all LMR series cables is available.

LMR cables have copper center conductors, foam dielectric, aluminum laminated tape bonded to the dielectric, a tinned copper braid, and then a black polyethylene jacket.

TYP. INSERTION LOSS DB/100 FEET

CABLE	DIA.	1 GHZ.	2 GHZ.	2.5 GHZ.	PWR*
LMR100	.110	22.48	31.79	35.54	20 W
LMR195	.195	11.75	16.9	19.02	100 W
LMR200	.195	10.47	15.01	16.87	120 W
LMR240	.240	7.98	11.49	12.93	170 W
LMR400	.405	4.13	5.99	6.76	370 W
LMR600	.590	2.65	3.90	4.43	590 W

* 2 GHz CW @ 40° C, SL. (See derating chart inside back cover)

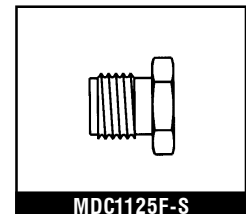
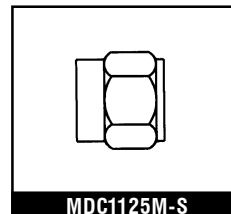
TM: LMR is a trademark of Times Microwave.

Open Circuits

up to 40 GHz

Model Number	Connector Type	Frequency Range
MDC1125M-N*	N-M	18GHz
MDC1125F-N*	N-F	18GHz
MDC1125M-S*	SMA-M	18GHz
MDC1125F-S*	SMA-F	18GHz
MDC1125F-7/16	7/16-F	7.5GHz
MDC1125M-7/16	7/16-M	7.5GHz
MDC1125M-F	F-M	3.0GHz
MDC1125F-F	F-F	3.0GHz
MDC1125F-2.9	2.9-F	40GHz
MDC1125M-2.9	2.9-M	40GHz

*: Add -C to Model Number for Chain.



TECHNICAL NOTE NUMBER 2
(5/12/00, J DS)

Low Frequency, Low Loss Cable Assemblies – Think LMR™

TYP. INSERTION LOSS DB/100 FEET

CABLE	DIAM	MAX. FREQ	1 GHZ	2 GHZ	2.5 GHZ	4 GHZ	PWR*
LMR100	.110	2.5 GHZ	22.48	31.79	35.54	NA	20 W
LMR195	.195	2.5 GHZ	11.30	15.98	17.87	NA	100 W
LMR200	.195	2.5 GHZ	10.16	14.37	16.06	NA	120 W
LMR240	.240	2.5 GHZ	7.67	10.84	12.12	NA	170 W
LMR400	.405	2.5 GHZ	3.88	5.58	6.13	NA	370 W
8165	.165	26 GHZ	13	16	19	22	310 W
8190	.190	18 GHZ	11	13	14	17.5	1550 W
9913	.405	4 GHZ	4.5	6.66	7.74	11	160 W

*: CW @ 40⁰ C, sea level.

A few pointers when helping a customer select a cable based on insertion loss for their application.

1. The losses shown in the table are for 100 feet of cable. Most requirements are for much shorter cable assembly lengths, typically 6 feet or less – and often in the one to two foot range.
2. Many times, minimizing the cable diameter is important to a customer. For example, if a customer specifies an insertion loss close to that of LMR400 but requires a smaller diameter, suggest the LMR240. The increase in insertion loss @ 2 GHZ for a 2-foot raw cable length is theoretically only 0.1048 dB when comparing LM240 to LMR400. This difference is so small; it is even difficult to measure.
3. If we assume an insertion loss of 0.05 dB for a connector at 2 GHz, then a cable with zero length will have a loss of 0.1 dB. Using this in the example given above, a 2-foot LMR240 cable with connectors will have a theoretical loss of 0.3168 dB, compared to 0.2116 dB. For LMR400.
4. Customers sometimes ask about low loss corrugated copper cables, such as Andrew, Cablewave Division of RF Systems, and Eupen. Point out that the LMR cables have comparable losses, are more flexible, and more cost-effective. Some of these corrugated cables have a higher frequency and power rating than the LMR series, so we need this information from the customer, in addition to loss.

Power Handling: Also shown in the table is the CW power handling capability of each cable. There will be cases where this is the gating factor for the customer. In the example given above, even though the loss of the LMR240 is acceptable, the customer may require the LMR400 for its' higher power handling.

TECHNICAL NOTE NUMBER 3
(1/01, JDS)

More on LMR™ Cable and Cable Assemblies

Technical Note Volume 1, Number 2 discussed LMR as the cable of choice for low loss, low frequency (DC - 2.5 GHz) applications. The 2.5 GHz limit was based on data published by Times. Because all of the LMR cables with the exception of LMR-100 have foam dielectrics and bonded aluminum-tape outer conductor, characteristics usually associated with high frequency cable, I decided to do further research. I also discussed each LMR cable with Times Technical Support, and visited their website which has much more detailed information than their catalogs. Among other things, their website has an interactive calculator that will provide the loss of LMR cables as a function of frequency.

Based on the above, it has been determined that the LMR cables that are in the Microwave Distributors Company (MDC) mini-catalog are useable to 18 GHz (12 GHz for LMR-400). This is based on the “rule of thumb” that limits the useable frequency of cables to about 75% of their cutoff frequency, or the frequency rating of the installed connectors, whichever is lower. LMR cables that are not in the MDC mini-catalog are not addressed. However, they are large diameter cables that operate at lower frequencies.

Summarized below is an updated insertion loss table that shows the loss of the LMR cables up to 18 GHz, and compares them to the 8165 and 8190 low loss cables that we normally market. The power ratings and diameters of each cable were given in Technical Note Volume 1 Number 2 and are not repeated here.

TYPICAL INSERTION LOSS DB/FOOT

FREQ.	LMR-100	LMR-195	LMR-200	LMR-240	LMR-400	8165	8190	8301
2 GHZ	0.35	0.17	0.15	0.11	0.06	0.17	0.14	0.12
4 GHZ	0.52	0.24	0.22	0.17	0.09	0.23	0.17	0.17
6 GHZ	0.65	0.30	0.27	0.21	0.11	0.29	0.20	0.20
8 GHZ	0.77	0.36	0.31	0.24	0.13	0.35	0.23	0.24
10 GHZ	0.88	0.40	0.35	0.28	0.15	0.41	0.26	0.27
12 GHZ	0.99	0.45	0.39	0.30	0.17	0.47	0.29	0.30
14 GHZ	1.08	0.49	0.43	0.33	NA	0.53	0.32	0.33
16 GHZ	1.18	0.53	0.46	0.36	NA	0.59	0.35	0.35
18 GHZ	1.26	0.56	0.49	0.38	NA	0.65	0.38	0.38
20 GHZ	NA	NA	NA	NA	NA	0.71	NA	NA
22 GHZ	NA	NA	NA	NA	NA	0.77	NA	NA
24 GHZ	NA	NA	NA	NA	NA	0.83	NA	NA
26 GHZ	NA	NA	NA	NA	NA	0.89	NA	NA
CUTOFF	90 GHZ	41 GHZ	39 GHZ	31 GHZ	16 GHZ	35 GHZ	33 GHZ	~24 GHZ

™: LMR is a registered trademark of Times Microwave Systems.

Notes:

1. LMR-100 uses standard RG-316 connectors but has lower loss than RG-316, and is useable to 18 GHz.
2. LMR-195 uses the same connectors as RG-58/142, and is a lower loss, better-shielded replacement for RG-142 and SF 142.