

The LanPro BM® UTP Network cable.

LPCE001CP_AN_ENB02W



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LanPro stocks CAT5e UTP, type BM (Bi-Metallic) cable in blue and gray colors since year 2009 as a very cost effective business structured cabling solution compared to the traditional 100% copper made cable. Mostly used for non-critical, budget-limited applications like those needed in commercial and home networks involving video surveillance, alarms and data cabling, it constitutes an excellent choice.

The needed formulation of Copper-Aluminum for the manufacturing of a Cat5e cable took several months of testing for it to pass mechanical and electrical certifications.

LanPro has sold almost 6 million meters of this cable annually since 2009 with the complete satisfaction of its customers in countries like: Panama, Venezuela, and Costa Rica and is releasing the product for sale in other markets.

Eventhough the LanPro BM® cable is a winner product, it is not for all the applications. LanPro doesn't recommended it for use in:

- Installations using lengths longer than 75m for powering of remote equipment with the PoE standard.
- Military installations or in those with stringent specifications that require 100% copper runs.
- Installations where cost is not an issue and can withstand the high cost of 100% copper cables.

It is customary for LanPro to guide its customers on their application for a successful network deployment in which a mixture of BM or 100% copper gives the best cost-effective solution.

The LanPro BM® Cat5e cable is compatible with the traditional termination methods.

Copper has been the traditional choice in the manufacturing of UTP Network Cable, mostly because Copper has excellent electrical and mechanical properties. It is strong yet flexible and very resistant to corrosion.

Copper is easy to work with, being both ductile and malleable. The ease with which it can be drawn into wire makes it useful for electrical work, in addition to its excellent electrical properties. At 59.6×10^6 S/m, copper has the second highest electrical conductivity of any element, just behind silver. This high value is because all the valence electrons (one per atom) take part in the conduction mechanism.

LanPro offers CAT5e, CAT6 and CAT6a cables made of up to 99.9% of pure copper, offering the best possible performance for the most stringent applications. However, the fast rise of copper mineral price, makes pure copper wire increasingly expensive every day over. This aspect alone, affects low budget applications accordingly.

Several companies have offered Bi-metallic wires for many years. The wires are made from the metallurgic bond of different metals, one of them usually a low cost one, like steel or aluminum and copper to achieve reasonable performances. Unfortunately most of these special cables are made in low quality facilities or with a poor quality control, just aiming at a final lower price. There are many factories that offer these wires, but most of them fail when the cable is subject to lab testing and quality controls.

In the Year 2009, LanPro got involved in the development of a new Bi-metallic wire UTP cable that excels in both areas: performance and low price.

A A short history

The Bi-metallic wire is not a new product, it has been used for many years. Technically speaking, the Bi-metallic (Copper-Aluminum) or (Copper-Steel) or (Copper-Iron) wire is the product of a clad-welding technique; the wire is made by fusing a lower cost core metal with an external copper cladding. The two different kinds of metals are bonded at their interface and the copper cladding thickness remains constant along the wire, so they become a single and inextricable wire.

Bi-metallic wire has the advantage of light weight, high conductivity and good heat spreading ability. It has been widely used for many years to make high frequency coils in the fields of computer, mobile communication, audio equipment, aviation devices, car cables, light-weight transformers, etc.

In the Data Network field, Bi-metallic cables have been poorly manufactured and end users have preferred the traditional pure copper counterparts.

B Why Aluminum?

Aluminum is a soft, durable, lightweight, malleable metal with appearance ranging from silvery to dull grey, depending on the surface roughness. Is the third more abundant metal on the Earth.

Corrosion resistance can be excellent due to a thin surface layer of aluminum oxide that forms when the metal is exposed to air, effectively preventing further oxidation. Aluminum is a good thermal and electrical conductor, by weight better than copper.

Aluminum is capable of being a superconductor, with a superconducting critical temperature of 1.2° K and a critical magnetic field of about 100 Gauss.

C Advantages of Cu-Al Bi-metallic Wire.

With composite characteristics, the Bi-metallic wire combines different beneficial properties in a single wire. Bi-metallic wire integrates the beneficial properties of the excellent conductivity of copper and the light weight of aluminum.

With excellent plasticity and easy to process further, Cu-Al wire can be manufactured in the same way as copper wire. Bi-metallic wire is easy to be processed into fine round or flat wire.

On the economical point of view, the density of Cu-Al alloy wire is about 37-40% of that of copper, its length is 2.45-2.65 times of copper in same weight and diameter. All of these contribute to reduced production cost for wire manufacturers.

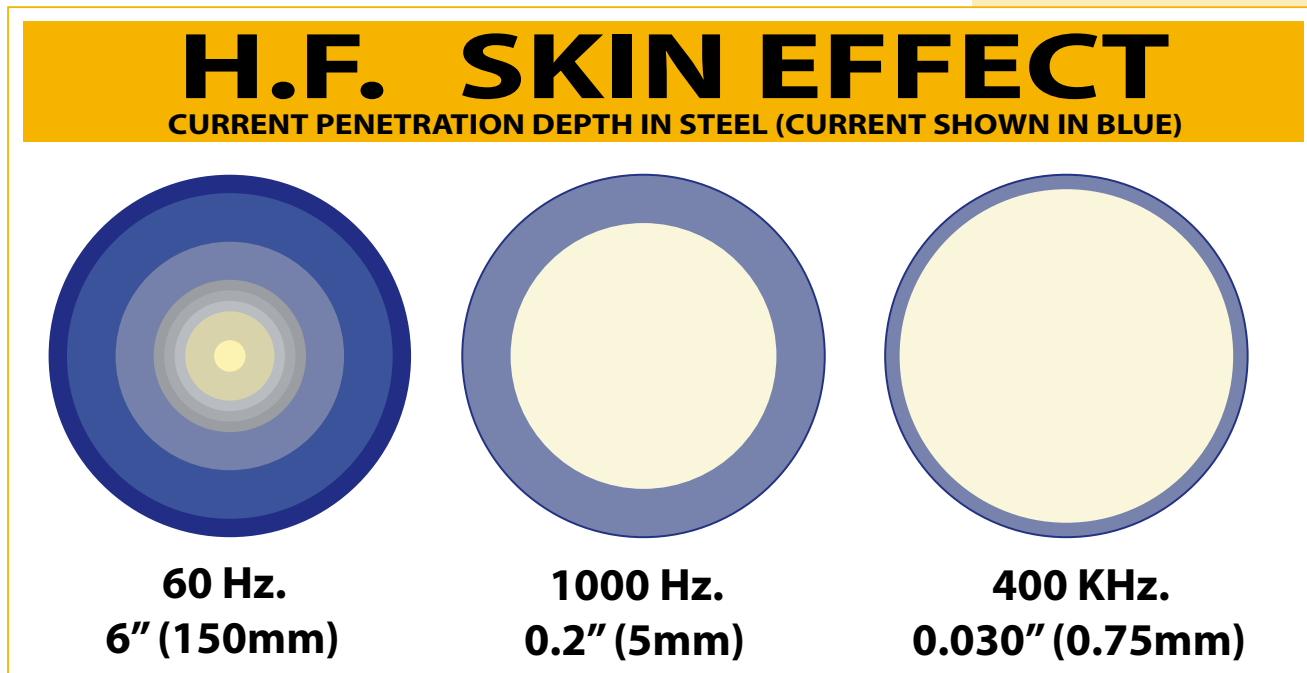
D The Skin Effect.

The Skin Effect is the tendency of an alternating electric current (AC) to distribute itself within a conductor so that the current density near the surface of the conductor is greater than that at its core. That is, the electric current tends to flow at the "skin" of the conductor, at an average depth called the skin depth. The skin effect causes the effective resistance of the conductor to increase with the frequency of the current, because much of the conductor is not serving as conductor. Skin effect is due to Eddy currents set up by the AC current. At 60 Hz, in copper, skin depth is about a centimeter. At high frequencies skin depth is much smaller.

In simple words, at higher frequencies (the faster the electrical signals are alternating) they have a tendency to travel in the border of the wire, and the inside of the cable is less and less used.

In the microwave field, the electrons travel basically in the border of the conductor wire, as is the case with the LanPro LP-C400[®] (high frequency coaxial cable, equivalent to LMR400[®]).

In this picture, you can see a graphical representation on the skin effect:



At 60 Hz, the signals travel more or less even inside the conductor.

At 1000 Hz the current flows in the outer 5mm of the conductor.

At 400 KHz the current flows in the outer 0.75mm of the conductor.

In a good conductor, working at microwave frequencies, most of the current flows in an extremely thin region near the surface. The extremely short skin depth at microwave frequencies shows that only surface coating on the guiding conductor is important. A piece of glass with an evaporated 3 μ m silver surface thickness is an excellent conductor at these frequencies. (3 μ m is a skinny 0.003 millimeter layer).

E Practical Considerations, the Up and Down side:

Because of the good electrical properties of the aluminum and copper as well as the skin effect due to the high speed signals, the practical use of Bi-metallic wires on network cables are not only feasible but desirable on today fast Ethernet networks.

Most of the Bi-metallic wires and cables available in the market today do not offer any safety standards. The LanPro Bi-Metallic cable is UL[®] approved and has a thick and expensive CMX[®] cover to offer better and safer characteristics than cheaper jackets. While most of the Bi-bimetallic cables are 10 to 15% on copper content per unit weight, LanPro contains more than 40% of copper. This makes a huge difference between our LanPro BM[®] cables against cheap competitors.

The American market has been flooded with low cost, low quality copper clad cable imported mostly from China and falsely presented in the market as being a 100% copper Cat5e cable.

With less copper involved in the manufacturing process, the cost to the consumer is lower, yet the consumer is not getting a true 100% copper Cat5e cable. LanPro offers both, the pure copper cable, our best and most awarded cable, as well as this new option, made under our own specifications in order to provide a lower cost solution for less than critical applications and when the budget is of increasing importance.

Additionally, some manufacturers have also falsely presented their Bi-metallic Cat5e cable wires as being AWG 24. In reality, a 26 AWG conductor is being sold and is hard to detect unless further examination beneath the sheath of the conductor is performed. A 26 AWG Cat5e cable will not make proper contact on Cat5e jack modules as most jack modules require 22 or 24 AWG as per the specification of properly qualified connectors. LanPro LP-CE001CP Bi-Metallic cable is the popular and accepted AWG24 gauge, making it an easier life for the technicians. Also, most of CAT5e Bi-metallic cable offered in the US doesn't pass a complete Cat5e cable performance characteristics and test methods as defined in TIA/EIA-568-B.2-2001. LanPro does. We have included a 100m sample test made to our LP-CE001CP Bi-Metallic UTP cable at the end of this note. We have included in the attachment the brochure with technical specifications and certification passing on regular tests made in production runs.

For more technical information or samples, please do not hesitate to contact one of our sales representatives at your convenience, or write directly to sales@lanpro.com.

Cat5e Bi-Metallic UTP Cable.

This cable is manufactured with bi-metallic technology, with the purpose of lowering cost without compromising performance and certification for most of the structured cabling applications in the market.

The technology of Bi-metallic cables is based in the high frequency skin effect in which most of the current flows near the surface of the conductor and much less in the core that is why the core is aluminum and the surface is copper. Excellent handling characteristics for the installer, with a jacket made with CMX® material, a very tough and abrasion resistant material.

A Copper/Aluminum ratio of 41/59, warrants the user excellent characteristics for the Price. Malleability, resistivity per meter, permits true certification as a Cat5e UTP cable for 100 m runs.

An uniform structure along the length of the cable, by means of uniform wire twist machining in the fabrication process that reduce cross talk between pairs to values that ensure certification.

We have subjected this cable to open flame and taken a photo of the cable extinguishing features in figure 1.



Figure 1

A Applications

- For structured UTP cable installations in indoors.
- Enables wiring of all kinds of network equipment based in the Cat5e standard.
- Power distribution to remote data equipment based in the PoE technology, limited to 75m. For 100m runs, we recommend our traditional • 100% copper Cat5e cable.

Certification shown in figure 2, results in a cable with excellent characteristics for it's Price.
It was performed with a model OMNIScanner2.



Cable ID: 100 Mts.

Date / Time: 01/11/2010 12:23:00pm

Headroom: 3.6 dB (NEXT 36-45)

Test Limit: Cat 5e Chan

Cable Type: Cat 5e UTP

Operator: LanPro America

Software Version: V06.12

NVP: 72%

Model: OMNIScanner2

Main S/N: 50D04C00038

Remote S/N: 50E04C00019

Main Adapter: CHAN 5/5E/6

Remote Adapter: CHAN 5/5E/6

Test Summary: PASS

Wire Map	Expected	Actual
PASS		
Omni:	12345678	12345678
Remote:	12345678	12345678

Length (ft), Limit 328	[Pair 78]	332
Prop. Delay (ns), Limit 555	[Pair 45]	484
Delay Skew (ns), Limit 50	[Pair 45]	15
Resistance (ohms)		N/A

Insertion Loss Margin (dB)	[Pair 45]	3.7
Frequency (MHz)	[Pair 45]	99.7
Limit (dB)	[Pair 45]	24.0

Worst Case Margin

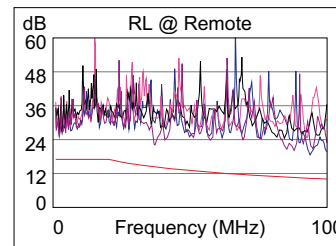
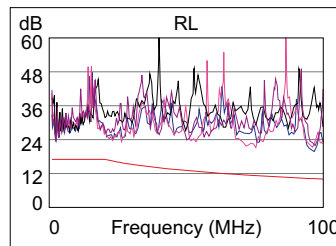
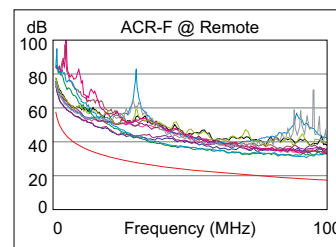
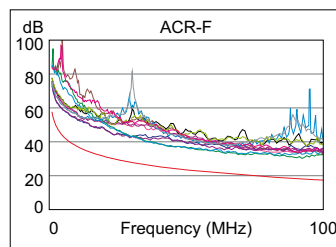
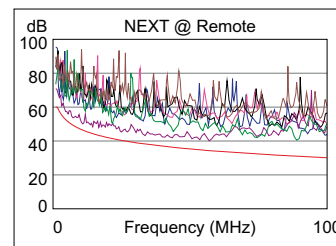
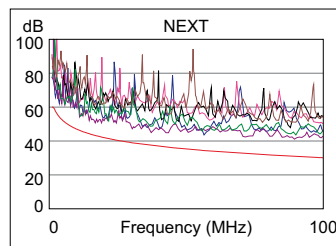
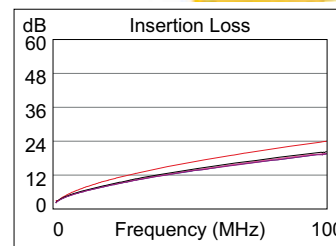
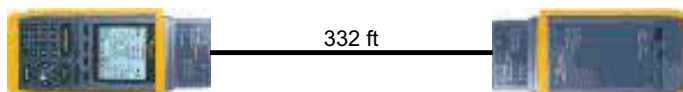
PASS	MAIN	SR
Worst Pair	36-45	36-45
NEXT (dB)	7.1	3.6
Freq. (MHz)	16.7	10.9
Limit (dB)	43.3	46.5
Worst Pair	36	36
PS NEXT (dB)	7.7	6.1
Freq. (MHz)	36.9	11.1
Limit (dB)	34.5	43.4

PASS	MAIN	SR
Worst Pair	36-45	36-45
ACR-F (dB)	11.7	11.7
Freq. (MHz)	69.3	69.3
Limit (dB)	20.6	20.6
Worst Pair	45	45
PS ACR-F (dB)	12.7	12.3
Freq. (MHz)	63.7	69.3
Limit (dB)	18.4	17.6

PASS	MAIN	SR
Worst Pair	12	12
RL (dB)	6.3	7.8
Freq. (MHz)	2.5	2.5
Limit (dB)	17.0	17.0

Compliant Network Standards:

10BASE-T	100BASE-TX	100BASE-T4
1000BASE-T	ATM-25	ATM-51
ATM-155	100VG-AnyLan	TR-4
TR-16 Active	TR-16 Passive	



Project: UTP Cat5e LANPRO BM

LinkWare Version 6.0



Figure 2

B Technical Specifications

Characteristics	Value
Attenuation (dB/100m)	0.772MHz 2.20dB/100m 1 MHz 2.30dB/100m 4 MHz 4.30dB/100m 10 MHz 6.60dB/100m 16 MHz 8.20dB/100m 20 MHz 9.30dB/100m 31.25MHz 11.7dB/100m 62.5 MHz 17.0dB/100m 100 MHz 22.0dB/100m
Crosstalk (dB/100m)	0.772MHz 67.0dB/100m 1 MHz 65.3dB/100m 4 MHz 56.3dB/100m 10 MHz 50.3dB/100m 16 MHz 47.3dB/100m 20 MHz 45.8dB/100m 31.25MHz 42.9dB/100m 62.5 MHz 38.4dB/100m 100 MHz 35.3dB/100m
Resistivity (Ohm/100m)	≤13 OHM/100m
Impedance (Ohm)	100 OHM±15 OHM
Capacitance (nF/m)	≤5.6nF/100m
Max Speed (Mbps)	≥100Mbps
Jacket Material	CMX
Isolation Material	HDPE
Cooper/Aluminum Ratio	41:59
Dielectric capability (KV/MIN)	≤1.0 KV/MIN
Diameter	AWG24

C Mechanical Specs

Performance Spec.	Value
Minimum bending radius	120 mm
Weight (Kg/m)	0.023kg/m
Range of operation (°C)	-15 °C -70°C

D How to order

LP-CE001CP Bi-Metallic Cat5e UTP Solid Cable CMX Jacket.

T	
T	Type
0--	UTP Solid
1--	UTP Stranded
2--	FTP Stranded AWG26
3--	FTP Solid
4--	SFTP Stranded AWG26
5--	SFTP Solid
-0-	CMX
-1-	CM
-2-	CMR
-3-	PLENUM
--0	100% Copper
--1	Bi-Metallic

C	
BL	Blue
GR	Gray

P	
B	1000ft box
S	100m spool

e.g.
LP-CE001BLB Bi-Metallic Cat5e UTP Solid Cable, CMX Jacket, Blue Color, 1000ft box