

## INTRODUCTION TO SHIPBOARD CAT 6A ETHERNET

Just like in the commercial market, US Navy network bandwidth requirements continue to grow with seemingly unending requests for Systems Management, Data Services, Voice and Video Services, and other data requirements. To help support this thirst for increased bandwidth, a new Naval QPL Ethernet cable is soon to be published by NAVSEA.

MIL-DTL-24643/77 will be the new standard for Ethernet Networking. Meeting ANSI/TIA-Category 6A, MIL-DTL-24643 /77 is the next-generation 4pr Ethernet cable to earn a Naval QPL. It has substantially more data-carrying capability than the current Category 5e cable used in many data systems today.

Category 5e was designed for 1,000BaseT systems, whereby Category 6A is designed to support 10,000Base-T (10GBASE-T) systems. Many electrical performance attributes were enhanced or added in the Cat6A specification.

## THE TECHNOLOGY BEHIND IT

In order to transmit a stream of binary data at a high rate of frequency, it is critical that the quality of the electrical signal and its integrity are maintained in the transmission line in order to assure the data can be read without errors. The following electrical parameters are a few of the key values to assure the cable is acceptable:

**CHARACTERISTIC IMPEDANCE** Ethernet cables operate at a nominal 100-ohm impedance. Impedance mis-matches can lead to data errors along the cable length.



**PAIR BALANCE** Each twisted pair operates as a type of balanced system, with each wire of the pair carrying an equal and opposite voltage (+1V / -1V). When the pairs are dimensionally and electrically symmetrical, that balance provides a level of EMI immunity. This requirement is new with the Cat6A specification, and it is a key element.



**INSERTION LOSS** A measure of the decrease in signal strength along the cable run. The data signal must be strong enough on the receiving end for the digital signal to be read. Connector termination can play a significant role in this attribute.

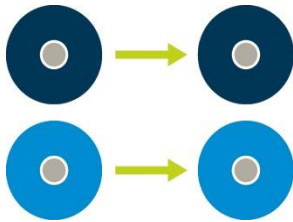


**SIGNAL STRENGTH**

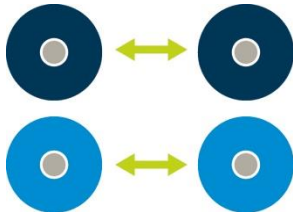
**RETURN LOSS** A measure of signal reflections along the cable. Poor characteristic impedance contributes to an undesirable return loss value.



**CROSS-TALK** There are many types of cross-talk measurements (NEXT, FEXT, ELFEXT, Alien, etc.) but for ease of understanding cross talk of any type is undesirable. It is the measure of the pairs interfering with each other, which increases error rates.



**POWER SUM MEASUREMENTS** All cross-talk measurements can be measured with only one pair energized, or all pairs energized. Power Sum is a measurement with all pairs energized, and it helps confirm how robust a cable is manufactured.



## BENEFITS OF THE 6A TECHNOLOGY

**DATA CAPABILITY** Substantially more data carrying capability in a similar footprint.

**INTEROPERABILITY** Cat6A terminates in the same RJ45 connectors as the existing Cat5e.

**SIZE** The max OD of the /77 cable is only 0.006" (0.15mm) larger than the /59. (Manufacturer nominal values will vary)

**FUTURE EXPANSION** Cat6A allows for technological improvements in data speeds utilizing the same cabling infrastructure, reducing life cycle costs and saving substantial time and dollars reinstalling new cable.

# COMPARISON OF KEY CAT5E (M24643/59) AND CAT6A (M24643/77) ELECTRICAL VALUES

CABLE PERFORMANCE								
Frequency MHz	RETURN LOSS dB/100m (min)		INSERTION LOSS dB/100m (max)		PSNEXT dB/100m (min)		PSACRF dB/100m (min)	
	Cat 5e	Cat 6A	Cat 5e	Cat 6A	Cat 5e	Cat 6A	Cat 5e	Cat 6A
100	20.1	20.1	22	19.1	32.3	42.3	20.8	24.8
200	N/A	18	N/A	27.6	N/A	37.8	N/A	18.8
250	N/A	17.3	N/A	31.1	N/A	36.3	N/A	16.8
300	N/A	16.8	N/A	34.3	N/A	35.1	N/A	15.3
400	N/A	15.9	N/A	40.1	N/A	33.3	N/A	12.8
500	N/A	15.2	N/A	45.3	N/A	31.8	N/A	10.8

Note that a 3 dB improvement is a 100% improvement in performance. dB is a logarithmic unit used to express the ratio of two values (input/output).

## CLOSING

Standards bodies (TIA, ISO, etc.) suggest installing network cabling to prepare for 2 generations of networking advancements. The /77 Cat6A provides that generational headroom, which can save future cabling installation costs. This is achieved by installing M24643/77 Cat6A cabling in upcoming cable installations, rather than the old generation M24643/59 Cat5e cabling which may require moving to Cat6A when the available bandwidth “pipeline” is too small for system requirements. One installation instead of two saves costs.

### BANDWIDTH “PIPELINE”

