

Cabling DMX-512

The DMX-512 standards are controlled by ETSA (The Entertainment Services and Technology Association, www.esta.org). The cables for DMX-512 are based on the RS-485 data standard. Therefore, most of the cables suggested for DMX-512 were originally intended for RS-485. Table 1 shows these cables (including some newer RS-485 versions).

| Belden Part # | Impedance | Capacitance | Construction | Diameter |
|---------------|-----------|-------------|--------------|----------|
| 9841 | 120Ω | 12.8 pF/ft. | One-pair | .232" |
| 9842 | 120Ω | 12.8 pF/ft. | Two-pair | .340" |
| 9843 | 120Ω | 12.8 pF/ft. | Three-pair | .360" |
| 9844 | 120Ω | 12.8 pF/ft. | Four-pair | .390" |
| 7200A | 120Ω | 12.8 pF/ft. | One-pair | .240 |
| 7201A | 120Ω | 12.8 pF/ft. | Two-pair | .322" |
| 7202A | 120Ω | 12.8 pF/ft. | Three-pair | .347" |
| 7203A | 120Ω | 12.8 pF/ft. | Four-pair | .362" |
| 3105A | 120Ω | 11 pF/ft. | One-pair | .284" |
| 3107A | 120Ω | 11 pF/ft. | Two-pair | .356" |
| 3108A | 120Ω | 11 pF/ft. | Three-pair | .420 |
| 3109A | 120Ω | 11 pF/ft. | Four-pair | .420 |

Table 1

There are a number of other cables that would work very well with DMX-512 signals besides those above. Table 2 shows some of the alternate cables.

| Belden # | Application | Impedance | Cap. | Construction | Diameter |
|----------|---------------|-----------|-----------|-----------------------------|------------|
| 1800F | Digital Audio | 110Ω | 13 pF/ft. | 1-pair 24AWG ultra-flexible | .211" |
| 9180 | Digital Audio | 110Ω | 13 pF/ft. | 1-pair install 26AWG | .144" |
| 1696A | Digital Audio | 110Ω | 13 pF/ft. | 1-pair rugged 22AWG | .234" |
| 1800B | Digital Audio | 110Ω | 13 pF/ft. | 1-pair install 24AWG | .177" |
| 1801A | Digital Audio | 110Ω | 13 pF/ft. | 1-pr 24AWG install plenum | .165" |
| 1802B | Digital Audio | 110Ω | 13 pF/ft. | 2-pair 24AWG "figure-8" | .180x.360" |
| 1803F | Digital Audio | 110Ω | 13 pF/ft. | 4-pair 24AWG flexible | .488" |
| 1805F | Digital Audio | 110Ω | 13 pF/ft. | 8-pair 24AWG flexible | .661" |
| 1806F | Digital Audio | 110Ω | 13 pF/ft. | 12-pair 24AWG flexible | .829" |
| 1850F | Digital Audio | 110Ω | 13 pF/ft. | 16-pair 24AWG flexible | .944" |
| 1852F | Digital Audio | 110Ω | 13 pF/ft. | 24-pair 24AWG flexible | 1.205" |
| 1854F | Digital Audio | 110Ω | 13 pF/ft. | 32-pair 24AWG flexible | 1.346" |
| 7891A | Digital Audio | 110Ω | 13 pF/ft. | 2-pair 26AWG flexible | .343" |
| 7890A | Digital Audio | 110Ω | 13 pF/ft. | 4-pair 26AWG flexible | .399" |
| 7880A | Digital Audio | 110Ω | 13 pF/ft. | 8-pair 26AWG flexible | .541" |
| 7892A | Digital Audio | 110Ω | 13 pF/ft. | 12-pair 26AWG flexible | .679" |
| 7893A | Digital Audio | 110Ω | 13 pF/ft. | 16-pair 24AWG flexible | .770" |

Table 2

The DMX-512 standard suggests a one-pair or two-pair cable. The data runs only on one pair. The second pair is for an ‘alternate data pair’. It is *not intended* for DC powering of remote devices and is stated so in the DMX-512 standards. Larger numbers of pairs, the cables above with more than just one or two-pairs could be used for DMX-512 applications except for the fact that these are not supported by the connector choice, the 5-pin XLR. The 5-pin XLR is intended only to support DMX-512 on one or two pairs. XLR connectors can easily fit the one and two-pair cables listed above.

On the other hand, many of the multipair cables above have individually jacketed pairs. Each one could therefore have a five-pin XLR and be used for multiple DMX connections. As you can see, Belden offers up to 32 pair in such a format.

The largest boot (opening) in the Neutrik XLR line is 9.7mm (.382”). In the Switchcraft line, the largest opening is .328” (8.3mm) for the large opening in the A, AA or Q-G family. Standard XLR connectors have smaller cable dimensions. Check the cable choice above, and check the connector dimensions with the manufacturer before purchasing. For instance, Belden 7891A in Table 2 (diameter .343” or 8.71mm) will only fit the Neutrik extra-large boot.

The difference between the multipair versions in Table 1 and Table 2 is that the multipair digital audio cables in Table 2 are *individually jacketed* pairs with an overall jacket. This means that each pair can be split out of the bundle and an XLR easily put on each pair (or one XLR for two-pairs). Doing this with the multipair cables in Table 1 requires heat-shrink, a lot of work, and doesn’t look very pretty (nor will it last very long).

A third cable alternative is Category cables, such as Category 5e, or 6. These are most often UTP, unshielded twisted pairs. Their impedance (100Ω) puts them reasonably close to the 120Ω of RS-485. Further, while they can run DMX-512 today, there is a lot of work being done to use the Ethernet® networking protocol for DMX-512. That would mean that Category data cables installed today to run DMX-512 could also run Ethernet tomorrow. It also means that the same cable type could be used for both Ethernet and DMX-512 applications. There are dozens and dozens of UTP Category cables that might be considered for DMX-512. Table 3 is a *much* abbreviated list.

This is *not* true of existing DMX-512 (RS-485) cables. They would not support 100baseT or faster Ethernet standards.

| Belden # | Application | Imp. | Cap. | Rating | Diameter |
|-----------------|--------------------|-------------|-------------|--------------------------|-----------------|
| 1583A | Category 5e | 100Ω | 15 pF/ft. | Riser | .195” |
| 1585A | Category 5e | 100Ω | 15 pF/ft. | Plenum | .198” |
| 1700A | Category 5e+ | 100Ω | 15 pF/ft. | Riser | .200” |
| 1701A | Category 5e+ | 100Ω | 15 pF/ft. | Plenum | .195” |
| 1304A | Category 5e patch | 100Ω | 15 pF/ft. | Rugged, ultra-flex | .245” |
| 1305A | Category 5e patch | 100Ω | 15 pF/ft. | Ultra-rugged, ultra-flex | .295 |
| 1872A | Category 6 | 100Ω | 15 pF/ft. | Riser | .365 x .165” |
| 1874A | Category 6 | 100Ω | 15 pF/ft. | Plenum | .365 x .165” |

Table 3

Belden 1304A and 1305A 'Tactical Category 5e patch cable' are flexible, ultra-rugged cables designed specifically for the emerging needs of the lighting industry, running either DMX-512 or Ethernet protocols. It can be tied in a knot, or run over by a forklift, and will still meet Category 5e patch performance standards. We are aware of no other cables that can accomplish this.

Many other combinations are available including double-jacketed or armored versions. Other UTP versions are made to handle RGB/VGA video as well as data, or be oil/gas/UV resistant. Of course, in DMX applications, one pair, or at most two pairs, would be used. There would be no connection to the ground pin (Pin 1) in the connector, since UTP is, by definition, 'unshielded twisted pairs' and therefore has no shield, no ground, and no ground wire, no drain wire.

For more details on any of the cables mentioned in this paper, check the 'eCatalog' at www.belden.com. You can also find details there on the hundreds of different Category 5e, Category 6, or Category 6a cables. Be sure to check the 'Industrial' section for extra rugged or oil/gas resistant versions.

Samples of any cables can be obtained by calling Belden Customer Service at 1-800-235-3361.