TECHNICAL NOTE

DiGiCo SOUNDTRACS UK Ltd

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RJ45 CONNECTION SYSTEM SPECIFICATION NOTES

For DiGiCo D-Rack, D2-Rack and compatible mixers and devices

The following notes are intended as a guide to system engineers planning external RJ45 connection cables systems for permanent building installation, external patch systems etc.

Communications Protocol Note

The Digico connection used for the D-Rack, D2-Rack, SD9 and SD11 consoles, Purple box format converter and Little Box interfaces is a proprietary protocol designed to operate with specific types of Cat 5e cables.

It is NOT compatible in any way Ethernet (as normally used for computer networks) and no attempt should be made to combine D-Rack signals with Ethernet, e.g. in a network switch. See further notes below.

It should noted that the data voltage is approximately 1V RMS 125MHz serial data. Earth (ground) differentials of over 0.5V due to poor power wiring will effectively stop the system from functioning.

Using standard cables:

Standard external cables are supplied by DiGiCo (2, 75 or 100mm) for use with these systems are manufactured as follows

Van Damme brand "Tourcat" Cat 5e Shielded Twisted Pair (STP) cable
Each end is terminated with shielded RJ45 plug and Neutrik NE8-MC1 EtherCON shells.
Each end is fitted with Laird-Signal Integrity Product type 28A0593-0A2 ferrite suppressor

The suppressor is fitted to meet International emission and immunity standards at each end using this clamp type ferrite. These ensure immunity to electrical interference common in on-stage environments

Alternative types that may be substituted as standard type

Neutrik brand EtherFLEX Slightly more bulky, robust Cat 5e Shielded Twisted Pair (STP) cable
with Laird-Signal Integrity Product type 28A0640-0A2 ferrite suppressor
terminated with shielded RJ45 plug and Neutrik NE8-MC1 EtherCON shells

TMB.com Proplex PCCAT5EP cable, This a premium grade/priced extremely robust low loss Cat 5e Shielded Twisted Pair (STP) well suited to regular touring use and long lengths (up to the 100m limit) with Kitagawa type SFC-6 ferrite suppressor
terminated with shielded RJ45 plug and Neutrik NE8-MC1 EtherCON shells

The plugs are wired as normal Cat 5 cable, pin 1 to pin 1 etc. to the "A" colour scheme,
that is twisted pairs 1-2, 3-6, 4-5, 7-8

1 White-Green
2 Green
3 White-Orange
4 Blue
5 White-Blue
6 Orange
7 White-Brown
8 Brown

Using custom cabling

Any cables not supplied by the factory should be made to strictly the same construction as the factory cables, as noted above. These parts are widely distributed through professional audio and industrial electronics supply sources.

Note the specified cable is Cat5e Shielded Twisted Pair (STP). Do NOT attempt to use Unshielded Twisted Pair (UTP) connectors. EtherCON shells must be used.

Cables sold as "Cat 6" or "Cat 7" might be used but the specific characteristics is of no added benefit as these are principally for very high speed networks. It should be noted no such cable has been tested and approved to be used with D-Rack. Note also performance data referring to Ethernet characteristics are not relevant for use with the D-Rack which does not use Ethernet.

For installed single uninterrupted cabling for longer runs using the specified cable, the absolute maximum length is 100m. Note this MUST NOT be interrupted by any connection (such as a patch bay or wall plate).

As such, for installed systems where there must be outlet points in walls and floors to connect to the mixer or rack, then sufficient permanent cable "tails" should be allowed. Provision for storage of such tails in suitable wall and floor boxes may be required as a result. The use of short patch cables for interconnection purposes at walls and floors is not permissible.

It is also important the D-Rack connection is kept electrically isolated from any other systems using a common route, such as ducting, and multicore network cables should not be used.

Also note the importance of maintain a low electrical earth (ground) potential difference between ends of the installed cable present mixer and rack mains supplies, see note above regarding this.

It perfectly permissible for the cable to pulled or installed in the building prior to terminating with the correct plugs, whilst other building work is carried out. The plugs may then be fitted later when the site is ready, as is normal for such installation work.

Ferrite suppressors to suit the cable must be fitted (and captive) adjacent the rack and the mixer. These clamp suppressors may be fitted after the cable has been pulled and terminated on site.

Even for short link cables (less than 10m) the cable is still important, the correct cable with the suppressor clamps should still be fitted to ensure immunity from external interference. In order to avoid possible standing waves problems, the minimum cable length should be 2m.

Using ready-installed (or "structured") cabling

This should not be attempted.

As noted above, the D-Rack does not use Ethernet. No attempt should be made for connection via Ethernet hubs, switches, repeaters etc.

Note, again, the system uses specific branded, high performance Cat5e STP cable types, not the more common UTP as used in many structured wiring systems.

Connections

The use of good quality terminations cannot be overstated. A properly made crimp is a reliable and low loss connection. A bad connection will cause much trouble.

The use of EtherCON shells is obligatory for interference suppression.

It is obvious but worth noting again, that these RJ45 connections carry up to 56 channels of audio. A cable failure will affect this number of channels, not just 1. A poorly made cable may prevent the entire mixer system from functioning.

Extending cables

As noted, the absolute limit of connection is 100m. This cannot be extended in copper cable. Note the Little Box interfaces are combiners and format converters, NOT repeaters and cannot extend the overall length. The total length of cable to either side of the box must remain within the 100m limit.

The Purple Box which converts the Cat5 signal to optical, can be used to extend the connection distance considerably using optical cables.