

Ones and zeroes can take many forms

This is another “alphabet soup” column. This time we’re looking at the various digital standards that we’re liable to run into when transporting digital signals from point to point. But it’s a rapidly-evolving world which probably means that most of what is not true today might be tomorrow and all bets are off by the end of the week!

Around the TV studio, SDI, or Serial Digital Interface, reigns supreme. There are several flavours for high definition and standard definition signals. HD-SDI also known as SMPTE 292M, runs on coaxial cable at 75 ohms with a bit rate of 1.485 Gbits/s. Standard definition, which seems to *never* be called SD-SDI but just plain SDI, is sometimes called SMPTE 259M and might be running at various speeds from 177 to 360 Mbits/s.

These standards are all very fine at the studio but even the lightest are too heavy for long-haul transmission, which is where the MPEG crunching comes in. What comes out might be ASI, or Asynchronous Serial Interface, which is another 75 ohm coaxial standard. ASI could be running at any old rate as required, even up to 90 Mbit/s (ASI doesn’t care) but if it’s an ATSC signal it’s probably 19.392658 Mbits/s, and certainly that’s where it’s going to end up in the transmitter. This can be important as an ASI signal is sometimes also referred to as a SMPTE 310M signal, in which case it *must be* 19.392658 Mbit/s. Some of the ATSC exciters we run into right now will do a rate downconversion, and some will not.

So beware!

Of course, being digital devices our new radio and fibre links don’t much care if they’re carrying video or audio or data. And there are some older standards that can be carried as well, often not for their original purpose. T1 (also called DS-1) was developed by AT&T and was originally meant to carry 24 voice channels from point to point. At 8-bits of resolution and a sampling rate of 8 KHz, each voice channel or time-slot is a raw 64 kbits/s. Put all those slots together and you’ll end up with a full duplex 1.544 Mbit/s. The phone company will often mux (multiplex) a few voice channels together to make up a broadcast audio circuit and, of course, you can, too. But because T1 is part of the Plesiosynchronous Digital Hierarchy (no, I am not kidding! And no, these standards may be old but they don’t quite date to the Jurassic Era!), clocking between T1 frames is not precise. Your broadcast circuits must all remain in the same T1 frame to keep their proper phase relationship.

The European telcos chose to build up channels a little differently so



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the popular E1 standard (their version of T1, now common around here as well) consists of 32 time-slots with an aggregate bit-rate of 2.048 Mbits/s. At least their slots are the same size at 64 kbits/s. T1 and E1 were originally meant to run on twisted pair so they're nominally balanced standards and can either be delivered by the phone company in that form via ISDN Primary Rate Interface. The usual form of delivery is via RJ-45 connector but buyer beware: the wiring scheme for ISDN is not the same as either of the Ethernet layouts.

Or they can be further multiplexed, most commonly to DS-3 and E3, which are nominally coaxial, with aggregate rates of 44.736 Mbits/s (672 slots) or 34.368 Mbits/s (512 slots) respectively.

Just to make things interesting, all of the coaxial standards use 75 ohm coaxial cable and BNC connectors. Unless colour-coding or something similar is consistently used to identify different types of circuits as they are installed in your rack, they're all going to look very much the same afterwards. As do the ISDN circuits and any 10- or 100BaseT Ethernet circuits that might be floating around.

Good luck, and happy hunting!

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