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Transferring Asynchronous Data Using Synchronous Communications Paths

Overview

The most common communications interface in current use is the simple serial asynchronous RS-232 data interface. However, there are many communication paths provided by telephone companies, satellite links, or private radio/microwave links that are available only with a synchronous interface. This paper addresses common methods to bridge this gap by showing ways to transport asynchronous data via synchronous links.

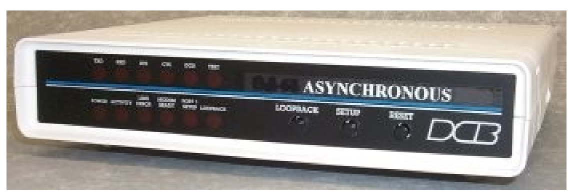
Although this paper does not attempt to discuss transporting synchronous data via an asynchronous path, DCB manufacturers products to aid in that task as well.

Why Do It?

Commonly used equipment is often supplied with an asynchronous RS-232 interface for data transport, management, and configuration. In some installations, the only reasonable communication path available uses synchronous interfaces. In some installations, it's a matter of economics, in others it's simple practicality as there is no other data path available between the two sites..

What Are The Options?

There are several commercial products that provide a conversion between the two protocols. One such product is the DCB SAC-128, a synchronous to asynchronous converter. Another is the DCB Asynchronous DSU, used when asynchronous communications are required with a 56 or 64 Kbps DDS telco circuit. The third hardware product is a statistical multiplexer having a synchronous network port. The fourth and least understood method is a method known as “oversampling”, whereby the asynchronous data is transported via a much faster synchronous link with no other conversion.



SAC-128 Synchronous-Asynchronous Converter

Dedicated hardware

Products are available to convert the asynchronous data to synchronous that allow asynchronous terminal devices to operate over synchronous communications likes.

Converter: The DCB SAC-128 is one such product, that operates up to 128 Kbps synchronous speeds. These are used when the asynchronous speed is very near the synchronous path speed. An example would be transmitting 57.6 Kbps data through a 64 Kbps link or 115.2 Kbps data through a 128 Kbps link. Typical cost of Asynchronous – Synchronous hardware his about 500 $US per interface.

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Asynchronous DSU: If the need is simply to transport asynchronous data through a 56 or 64 Kbps DDS circuit, the asynchronous DSU is usually the most cost effective method. This is basically a synchronous DSU combined with an asynchronous interface. The typical cost of an asynchronous DDS DSU is typically about 550 US$.

Statistical Multiplexer: The DCB SR series of statistical multiplexers provide a hardware product that connects 1 to 32 ports of asynchronous RS-232 data and transfers it over a synchronous composite network port. These cost from about 500 US$ to about 3500 US$, depending upon the number of RS-232 ports needed.

Oversampling

A little-understood method of transporting asynchronous data through a synchronous path is by way of "oversampling". In this method, a relatively slow asynchronous data stream is "sampled" and transported by a relatively fast synchronous interface, and transported to the other end. At that end, the oversampled data stream is interpreted by the attached asynchronous interface correctly as the lower speed asynchronous data.

One common use of the oversampling method is to transport 9.6 Kbps asynchronous data through a 56 Kbps or 64 Kbps communications path. By using a synchronous data rate that is higher than the Nyquist rate (a lower bound for the sample rate for alias-free signal sampling) , which is twice the actual frequency of the asynchronous data, reliable data transfer is guaranteed. In most real-world applications, we prefer to have a three times ratio between the slower asynchronous data rate and the transport data rate. By that rule, 9.6 Kbps or even 19.2 Kbps data is easily transported by a 56 Kbps or 64 Kbps circuit. Modern integrated circuits accommodate such oversampling with no problems.

The only additional cost incurred is that of acquiring the correct cable to connect the two devices. Data signals are connected together while clock signal leads are ignored. DCB s+1

More information on the theory behind oversampling may be obtained by researching the "Nyquist Rate" or "Shannon's Law". Wikipedia contains good explanations of both.