



Audio Channel Transport Over TSIP

The Telecom Serial Interface Port, TSIP, implemented on Shannon (and Tomahawk) is optimized for use with telephony infrastructure backplanes such as H.110, H-MVIP and SC-BUS that contain multiple, synchronous lanes carrying data octets. These use clock rates that are a multiple of 2.048MHz and frame sizes that are multiples of 32 bytes. Specifically, it is documented for use with the three clock rates of 8.192MHz, 16.384MHz and 32.768MHz with the associated frame sizes of 128, 256 and 512 bytes per lane. However, the TSIP is not limited to these rates and frame sizes. It can interface with any synchronous serial data stream that places the same number of bytes in each frame. The clock rate can be optimized for the data throughput required because the interface is fully synchronous.

Suppose that you needed to transport 4 stereo channels of standard CD audio. The sample rate is 44,100 samples per second. The data samples are 16 bits each. The 4 stereo channels are actually 8 discrete channels. Total throughput is 5,644,800 bits per second. If we divide the 44,100 samples per second by 8 we can get a frame rate of 5,512.5 pulses per second. Each frame will contain 8 samples for each discrete stream. They can be interleaved to minimize delay or the data for each stream can be in blocks. In this example, you still have 128 bytes in each frame (4 stereo channels, 8 samples per frame and 2 bytes per sample). The standard configuration for 8.192MHz would work simply by providing the TSIP with a 5,644,800Hz clock.

The TSIP would work equally well if the frame size had to change. If we use the example above but we only need 3 stereo channels. There are two solutions. The first is to use the configuration described above. In this case, you simply have unused timeslots in your data interface. This is acceptable as the software will know the quantity of active channels and the unused timeslots to not consume any additional CPU cycles. The second solution allows for the clock rate to be reduced and the frame size to be reduced. The frame length will now be set to 96. The frame rate could still be the same 5512.5 pulses per second. Lastly the clock rate would be 4,233,600Hz.

These same kinds of calculations can be applied to larger numbers of channels. The TSIP interface supports 8 lanes of data with up to 128 bytes per frame, 4 lanes of data with up to 256 bytes per frame and 2 lanes of data with up to 512 bytes per frame. The aggregate in all of these modes is that the TSIP can support up to 1024 bytes per frame period. So, if we had to transport 32 channels of stereo CD audio instead of only 8 like the first example, the same configuration can be used with 4 stereo channels on each of the 8 lanes.

Please note that these throughput values are all bi-directional. There are separate RX and TX pins for each TSIP.