



Tech Notes

Simulating Satellite Link Delay On The Bench

Like most communications systems the purpose of a satellite link is to replace a wired link between two pieces of equipment. The major difference between a satellite link and almost any other is the significant time delay present over the link. The transmission time from the earth to the satellite is approximately 125 milliseconds, and the full delay from one end of the link to the other is 250 milliseconds. This delay presents several problems, some of which are listed below.

A voice circuit is slightly annoying with one hop of delay, but is irritating with two or more hops of delay introduced just because of the time it takes for the far end party to respond. Any echo from the far end is delayed by two round trip times and severely restricts the ability to talk without echo cancellers.

Data circuits normally do not have a problem with the delay unless an "acknowledgment" is required for packetized circuits. The round trip delay of approximately 500 milliseconds considerably slows down these types of circuits.

Testing to determine the effects of the satellite link delay on a communications protocol/circuit would be difficult to simulate on the bench because of this delay time. The PSM-2100 and PSM-4900 series of modems have one feature that can make bench testing much more realistic. That is the receive channel FIFO buffer. This buffer is normally used to absorb small changes in the data rate, such as those caused by Doppler shift as the satellite moves slightly in the sky.

To simulate the satellite link including the buffer simply set two modems to the parameters to be used on the satellite link. Then link the IF of the two modems together. The back to back link can be accomplished in any of several methods. The transmit of one unit can be connected to the receive of the other and visa versa. A better method is probably to tie all the transmit and receives into a hybrid splitter/combiner where noise can also be added. Insure that the levels into each demodulator is reduced to an appropriate level either using pads or reducing the transmit output level. Of course the transmit frequency of one modem must be set to the receive of the other.

To simulate the satellite delay the receive buffer is now enabled in each direction. For a PSM-2100 series of modems this can be done by setting the receive clock to the "Mod Clock" position. These modems also require that the transmit and receive data rates be the same. For the PSM-4900 series of modems the receive clock can be set to the "Internal" option, and the transmit and receive data rates do not have to be the same. The FIFO delay can be set either in bits or milliseconds. Go to the milliseconds position and enter a value of 250 milliseconds.

Now your link fairly accurately simulates the delay properties of a true satellite link without the bother and expense of real satellite access.