Synchronizing a RAVE network with an External Clock

The BNC connectors on the rear panel of the RAVE™ products serve two purposes. In one application they allow the user to stack two units in parallel, which provides the redundancy feature. In this mode, the primary unit acts as the functioning master unit, and the secondary unit acts as the slave. When the master fails, the slave kicks in. This redundancy feature can be implemented on any of the RAVE analog I/O models. In the second application, the "Sync Input" BNC provides the user the ability to clock the RAVE network from an external source. When using an external clock, the CobraNet™ system "conductor" is forced to redistribute a remote clock rather than its locally generated clock. An external device may be a signal processor that's time sensitive, a device that requires a different clock frequency, a video source, a house synch, an AES source, a signal generator (for testing jitter or deviation) or a device that does not have the clock pullability capabilities of a RAVE. In the last case, it may be easier to force the RAVE network to follow the external source rather than the reverse.

To setup the external synchronization feature, a well-shielded 50-ohm coaxial cable should be connected between the external device's clock output to one of the RAVE unit's "Sync Input". Note that the RAVE device in this implementation must be the network conductor, as this is the unit that sources the CobraNet system clock. The conductor is distinguishable by illumination of the amber "Conduct" LED. The leftmost rotary switch on the RAVE must also be set to **8** or greater. This would be the left transmit wheel on the model 188s-24 analog RAVE. Note that since the left thumbwheel is dedicated to this feature, bundle assignment values are somewhat limited on the conductor. Even so, there are still 126 bundle assignments remaining… this assumes hardware configuration.

The external clock applied to the conductor's "Sync Input" must meet the following specifications:

1. The external clock applied must be a multiple of the network clock. "Network clock" refers to the isochronous cycle period. This requirement allows multiples of 750 Hz. A 15.75 kHz signal would be an example of an acceptable external clock frequency (i.e., 750 x 21 = 15750). Note that common frequencies such as 44.1 kHz and 32 kHz are not acceptable.

2. The applied clock frequency must fall in the range from 750 Hz to 49.5 kHz. However, lower frequencies generally have difficulty meeting the specifications

in requirement 3 (see below). Common clock sources begin to fall short below 15 kHz or so.

3. The applied clock must have no greater than +/- 50 ppm deviation from the reference clock and no more than ¼ sample period (approximately 5 microseconds) drift from edge to edge. At 48 kHz, +/- 50 ppm amounts to about +/- 2.4 Hz. As mentioned above, low frequency clocks are difficult to find with the given requirements. At 750 Hz, +/- 50 ppm is less than four hundredths of a cycle.

   If the applied clock is out of synch/tolerance, the red **TxError** and **RxError** LEDs on the RAVE front panel will blink simultaneously. If there is no lock at all, the **TxError** and **RxError** LEDs on the RAVE will remain illuminated.

Thus far, this document has addressed hardware configuration of the external synchronization feature. However, all external synch functions on RAVE are also configurable via software using the MI variables through SNMP access. Software configuration eliminates the channel and delivery limitations imposed by the front panel rotary switches. Through software, a permanent conductor can be assigned to handle the role of clock distribution. This eliminates the potential that a temporary mishap will cause another unit to source the system clock. Conductor arbitration is also dependent on priority. Several units holding the same priority level make determination of the system conductor upon power up unreliable. This concern is also addressed with permanent assignment of the conductor role via the software interface. The software interface also allows the conductor to source multicast bundles when in the external sync mode. This is not possible when configured through hardware.
Whether through hardware or software configuration, it should be noted that a valid clock must still be applied to the rear panel "Sync Input" on the RAVE conductor.

Rave products can also source a clock to an external device or "Sync Input" on another RAVE. This is useful when driving multiple independent products that have AES3 receivers. These devices may not have the ability to source a sample clock but may need to synchronize to a common source. Also, sourcing a clock to the "Sync Input" on another RAVE allows two independent networks to slave to the same system clock. Though each network has its own conductor, both reference the same clock source. This is useful when implementing multiple VLANs on a network switch or when large amounts of multicast bundle delivery require separate LAN segments.