River Line Police Radio Simulcast System

System Overview and Technical Outline
• Part 1- Equipment Overview
• Part 2- How it all works together
Let’s go over the main items then see how they all work together...

**Part 1 System Components**

- Base Station Equipment
  - Master Oscillator
  - PL Encoder
  - Line delay panel
  - Codec
  - DDS Modem
Base Station

• Motorola Quantar
- 125 Watt Hi-Band model
- TX 161.190   PL 97.4 produced by an external PL encoder
- RX 160.245 PL 110.9
- NOT set up as a repeater
- Has special interfacing for simulcast use
- Does NOT produce its own PL
- Uses M lead keying, NOT EIA tone sequence
Base Station

Audio, PTT and PL connections go through the system connector, J17- a 25 pair telco champ connector on the back of the Quantar.

1- Line 1 (TX Audio) +
26- Line 1 (TX Audio) –
2- Line 2 (RX Audio) +
27- Line 2 (RX Audio) –
47- Aux Input 9 (PTT Input)
5- Modem + (PL Input)
9- Station Ground
33- Station +14.2VDC for PL and Convex Power

32- Station Ground for PL and Convex Return
8- Station +5vdc jumped to pin 22 (Aux In 9 EXTPTT for bias voltage- this is jumped inside the telco hood.)
ADL and CTU Delay Equipment

Units manufactured by Convex Corporation. These two units work in unison to provide proper audio delay for telephone network delays. Telephone lines as you know can be routed by the telco in ways that you can’t imagine and are also routed every way possible but the most sensible. The Channel Timing unit, or CTU is located at the Morrisville Site, and is bridged to go out to Bensalem, Trenton and, WRTC in Camden, which each have a Automatic Delay Line, or ADL. The connections are clearly labeled on the front of the units and are straight forward.
ADL and CTU Delay Equipment

The manuals for both units are in the appendix of this presentation. We are just going to go over the basic settings here. For more information on how to log on to the units and make changes, consult the manual.

Delay- NJT’s specific “Hold Delay” is 20ms, or 20,000uS.
Based on the longest delay (not necessarily the longest distance) measured by the CTU based on the ADL signaling, and them some added for overhead for future line delay changes.

In other words:
The measured link delay is 15,500uS
The Hold delay is set to 20,000uS
The bulk delay of the CTU is adjusted automatically to 4500uS. It is the difference between the hold and measured link delay.

The hold delay MUST be set the same at ALL sites.
The CTU sends a signal over the wireline continuously to “train” the ADL’s to measure the link delay. It does this by comparing the signal based on the Spectracom oscillators 1PPS output pulse, since they are identical everywhere based on GPS signaling.
Audio Codec

Converts standard audio in to digital signals for use over 56Kbps digital telco pairs via a modem.

Two XLR connectors on the rear- Input and Output.  
On the front panel- power, ready (illuminates when it can see a far end unit) and a peak audio level indicator.

There are 2 for each site. One at the site, one at Morrisville.
Unity gain- 0 in, 0 out.
56Kbps Modems

Adtran units that are used to convert the Comrex digital signal to a 56Kbps line. And vice-versa.
Part 2- How it all works together
Basic System Diagram

- Console
- Voter
- Channel Bank
- Tellabs Audio Bridge
- Codec
- Modem
- Modem
- Codec

Codec to radio equipment
Things to keep in mind. . .

With a simulcast system, audio polarity is a **MUST**. Even though the Convex units are auto sensing, it is good practice to keep Tip to Tip and Ring to Ring. If audio is connected in reverse polarity, it will cause an out of phase situation that will cause the audio to sound very poor.