Audio Processing
For
Better Repeated Audio

Simulcast Forum - IWCE 2007

What’s the problem? Over

- Low repeated audio from field units
- Inconsistent audio levels
  - Dispatch
  - Mobile
  - Portable
- Levels often too high, even in clipping
- Simulcast requires better audio control and no clipping
Possible Remedies

- Repeat through console using console audio processing
- Provide repeated audio advantage - 3 kHz in = 3.5 kHz out
- Adding a compressor amplifier or some other type of “AGC” circuit in the transmit audio path
- User training and better field unit maintenance

Options Analysis

- Repeat through console using console audio processing
  ▶ Requires console that supports this function
  ▶ If console interface fails, repeat audio is lost
  ▶ Requires audio being brought all the way to the console
  ▶ Does not address varying levels of dispatch audio
  ▶ Does not equalize dispatch audio to field audio
Options Analysis

- Provide repeated audio advantage - 3 kHz in = 3.5 kHz out
  - Amplifies both loud and weak audio
  - Can cause distorted audio if audio is clipped
  - Simple to implement
  - Does not address varying levels of dispatch audio
  - Does not equalize field audio to dispatch audio

Options Analysis

- Adding a compressor amplifier or some other type of “AGC” circuit in the transmit audio path
  - Must be done carefully or unnatural audio can result
  - Must be in the path with both the dispatch and field audio to address both problems
  - Represents a possible single point of failure
  - Modern equipment can level audio without clipping
Options Analysis

- User training and better field unit maintenance
  - Ha!
  - Difficult to administer with consistent results
  - Should be done regardless but often infrastructure owner does not control field units

Compression/AGC Amp Option

- Modern units provide advanced features
- Relatively inexpensive
- Adjustments are critical for correct sounding audio
- Equipment selection must be done carefully
Example Installation

Example System

- Alto ACL4 has four audio processors in one shelf.
- A compressor that provides gain for lower audio levels
- A limiter that limits the loud audio
- Threshold switch to reduce amplifying noise
- Limiter has a soft limit to reduce clipping
- Cool LED indicators
Field Data

Typical Block Diagram

Receiver Voter with Console Priority

ACM4.0 Audio Processor (4 units included)
Typical Block Diagram

Remote Site Installation

- Receive audio
- Transmit Audio
- Console Audio

Audio Bridge (Tellabs, Vega, etc.)

Unit #1 ACL4.0 Audio Processor (4 units included)

Base Station/Repeater

Questions?

- A special thanks to Motorola’s Larry Young for his initial work on this problem.