

Cosmos4 installations using analogue multiplexed links – Baseband noise.

A discussion on the issues that may be of concern to installation and commissioning engineers, by David Cahill Systems Engineering Manager Dalman Technical Services Ltd.

CONTENTS

- 1 INSTALLED SYSTEM(S)**
- 2 LINK AUDIO – DE-SYNCHRONIZATION.**
- 3 SUPERVISION DATA**
- 4 TRANSMITTER KEYING METHODOLOGY**
- 5 TRAFFIC AUDIO – (USER AUDIO?)**
- 6 TEST TONE**
- 7 ABDA TEST SIGNAL**
- 8 FURTHER READING**

1 INSTALLED SYSTEM(S)

The 7 Station Cosmos4 system installed at Norwich Ambulance has a mixture of multiplexed analogue microwave (MAM) links and Telco land line. One link uses digital over analogue land line and the other 6 are sent from the Link Node to a Master site (for further individual distribution) over the same MAM link – this link also carries other voice channels of the same service operator. The Cosmos4 and the MAM equipments are owned by East Anglia Ambulance Service and are maintained by the local NTL Service Centre. The MAM equipment is Motorola Starpoint and Starplex.

The NTL commissioning engineer reports that the introduction of the Cosmos4 equipment has had no adverse affect on the operation of the adjacent systems. However there were two commissioning issues which had to be overcome: -

- i The links were not 'locked'. In the 'unlocked' mode the links exhibited a slow audio phase roll which the Cosmos4 Automatic Bulk Delay Adjustment (ABDA) process followed – causing continuous recalculation of the Delay Table. Once the links had been synchronized (by sending a master clock to the remote end) ABDA stabilised.
- ii Particular attention is required to ensure that the audio levels of all channels within the MAM are within the system level requirement – and not exceeded.

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2 LINK AUDIO – DE-SYNCHRONIZATION.

Cosmos4 applies only audio signals to the link, and audio on a given link will not be in synchronization with that on another link. This is an emergent effect of the function of Cosmos4; the Bulk Delay compensation circuits are adjusted such that all transmitter audio is synchronized. It follows that, in order for there to be synchronization at the Base Station at the end of a variable delay link the Cosmos4 signals on links will statistically not be in synchronization.

3 SUPERVISION DATA

Part of the audio applied to the link is a 2 tone FSK data exchange signal which is in continuous operation between the LinkNode and the Stations. The baud rate is approximately 300 and the tone frequencies can varied, but only at the factory, there are currently 2 settings: -

- i 2950Hz and 3250Hz is the standard issue.

- ii 3050Hz and 3350Hz is set in systems which do not use the built-in RSSI Voter and require the FSK tone to be moved out of the way of an end-of-line voting process.

This signal, and the data contained within it are termed 'Supervision Data'. The level of Supervision Data is 15dB below the system traffic audio level (paragraph 5).

Supervision Data on a given link will not be in synchronization with that on another link for the reasons outlined in paragraph 2.

4 TRANSMITTER KEYING METHODOLOGY

In Cosmos4 the instruction to trigger the Base Station/Repeater transmitter is not sent as a discrete tone. Transmitter trigger instructions are contained within one bit of Supervision Data.

5 TRAFFIC AUDIO – (USER AUDIO?)

Audio that is not part of the Supervision Data process is band limited to below 2500Hz (adjustable in the field). Traffic audio on a given link will not be in synchronization with that on another link for the reasons outlined in paragraph 2.

6 TEST TONE

The maintenance engineer has facilities to inject a Test Tone to the link; the level of this tone is under the control of the engineer. Test Tone on a given link will not be in synchronization with that on another link for the reasons outlined in paragraph 2.

7 ABDA TEST SIGNAL

With ABDA enabled the ABDA Test Signal will be sent up the link at one second intervals (duration approximately 33milliseconds) – but not when the Base Station transmitter key is ON and not when the Test Tone is ON. ABDA Test Signal on a given link will not be in synchronization with that on another link for the reasons outlined in paragraph 2.

8 FURTHER READING

"Simulcasting Without (Too Many) Tears" – Update of a paper presented by R. Attack at the 1989 APCO Conference in Sparks, Nevada

(Available on the web: - <http://quasi-sync.atackscomputers.co.uk>)

"Simulcast Audio Synchronization" (a lighter weight discussion, for a heavyweight discussion see "Simulcasting Without (Too Many) Tears" by R. Attack, as listed above),

File SimulcastAudioSynchronization.doc* Dalman Technical Services Ltd.

Adjustment of Audio Compensation, Cosmos4 – Technical Publications Book 1 Section 8.

File 10800_18.doc* Issue 3+ Dalman Technical Services Ltd.

* The 2 files marked with an asterisk are available as *.pdf on the web at <http://www.dalmants.co.uk>.

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