Audio Group

Hardware Configuration

VAX

VT-100

with Graphical Display

VAX

DSC A/I, O/A

DSC Control Console

FPC Array Processor

IBM PC

Chroma Keyboard

8051 or 6301

AMY
Adding Noise with the Exponential ROM

Any operation:

\[
\exp[\ln A_i + B(t)] - \exp(\ln A_i)
\]

\[
= \exp(\ln A_i) \cdot \exp[B(t)] - \exp(\ln A_i)
\]

\[
= A_i \cdot \exp[B(t)] - A_i
\]

\[
= A_i[\exp B(t) - 1]
\]

Desired result: Output = \( A_i \cdot B(t) \)

Any operation \( \approx \) Desired result if

\[
\exp(B(t)) - 1 \approx B(t)
\]
Noise Generation
(continued)

\[ x(i) \]
\[ x(i-n) \]
\[ x(i-2n) \]

\[ \text{Logic} \]

\[ D \pm 0, 1, 2 \]

\[ \text{up/down counter} \]

\[ B(t) \]

\[ \text{output} \]

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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<tr>
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3 dB bandwidth: \( 0.318 \times \frac{f_s}{n} \)

\( f_s \): sampling rate
\( n \): delay between shift registers
Noise Generation (continued)

\[ y(i) = x(i) + y(i-1) - x(i-n) \]
\[ z(i) = y(i) + z(i-1) - y(i-n) \]
\[ y(i-n) = x(i-n) + y(i-n-1) - x(i-2n) \]

\[ z(i) \text{ or } B(t) \]
Noise Generation
in A/M/Y

15-bit shift register

LPF

Variable-bandwidth

LPF

LPF

Impulse Response:

\[ y(i) = x(i) - x(i-n) + y(i-1) \]

\[ H(z) = \frac{Y(z)}{X(z)} = \frac{1 - z^{-n}}{1 - z^{-1}} \]