



A Product Line Using 8mm Tape Technology

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The IDEAS Group of SAIC**



Presentation Overview

- ◆ SAIC/IDEAS Group Overview
- ◆ Recorder Product Line
 - ❖ E1/T1 Recorders
 - ❖ High Speed Recorder Product Development
 - ❖ TAPEDANCER Product Development



SAIC In Brief

Throughout the World ... from Science ... to Solutions ... to Service

for over 25 years

Over 20,000 employees at 300 sites World-Wide
Fiscal Year Revenues for 1995 - \$2 Billion

Principle U.S. Offices

Albuquerque, NM	Oak Ridge, TN
Arlington, VA	San Francisco, CA
Bremerton, WA	Santa Barbara, CA
Colorado Springs, CO	Tucson, AZ
Dayton, OH	Virginia Beach, VA
Hawaii	Washington, DC
Huntsville, AL	Omaha, NE
Indianapolis, IN	Orlando, FL
Las Vegas, NV	Sacramento, CA
Los Angeles, CA	San Diego, CA
McLean, VA	Sierra Vista, AZ

International Locations

Auckland	Ottawa
Camberley, UK	Panama
Cambridge	Paris
Dhahran	Riyadh
The Hague	South Korea
Heidelberg	Sydney
Kuwait City	Taipei
Madrid	Tokyo
Moscow	Vancouver
Nuremberg	



Ideas Group Capabilities



- ◆ Program Management
- ◆ System Integration, Installation, and Test
- ◆ Software Development and Support
- ◆ Engineering Design and Development
- ◆ Expertise in real-time processing
- ◆ Manufacturing and Fabrication
- ◆ Custom RF, Analog, and Digital Products
- ◆ Space Flight Hardware Development
- ◆ Documentation and Training



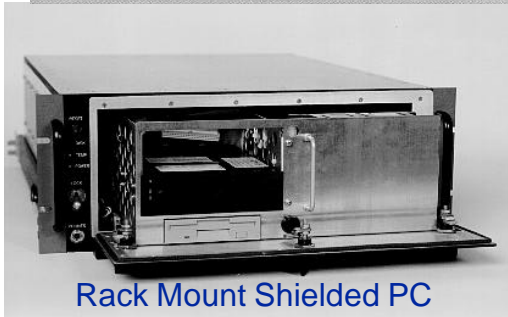
IDEAS Group Products



MDRS-9350 Digital Voice Processor



ACS-2130 Telecom Test Set



Rack Mount Shielded PC

- Recorders
- Instrumentation
- Digital
- Analog
- Custom processing
- Demodulators
- Modem test sets
- Demultiplexers
- Synthesizers
- Signal Generators
- Rack-mount computers
 - EMI/RFI shielded
 - Single board chassis
- Specialized FIR filters
- Interference mitigation
- Ion mass spectrometers
- Magnetometers



SRS-9500 Digital Recorder



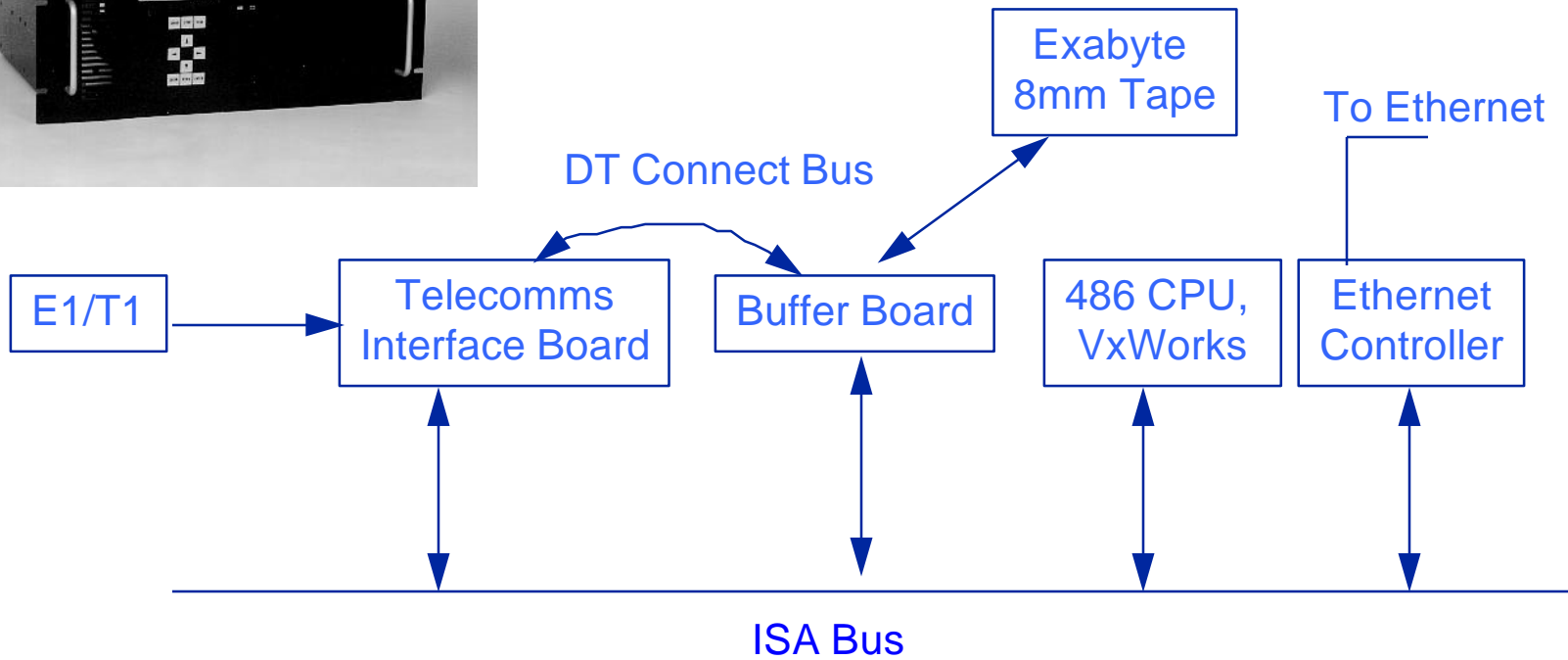
ACS-4408-1 Demodulator



ProDACS 1700 Digital Filter



E1/T1 Recorder Block Diagram



MDRS 9210/9215 Block Diagram



E1/T1 Recorder Technical Characteristics

- ◆ **Extensive hardware and software re-use allowed for a 12 week development cycle**
- ◆ **ISA Bus architecture**
- ◆ **10,000 lines of C Code**
- ◆ **Over 100 units fielded**
- ◆ **Efficient buffer design allows for real-time operation**



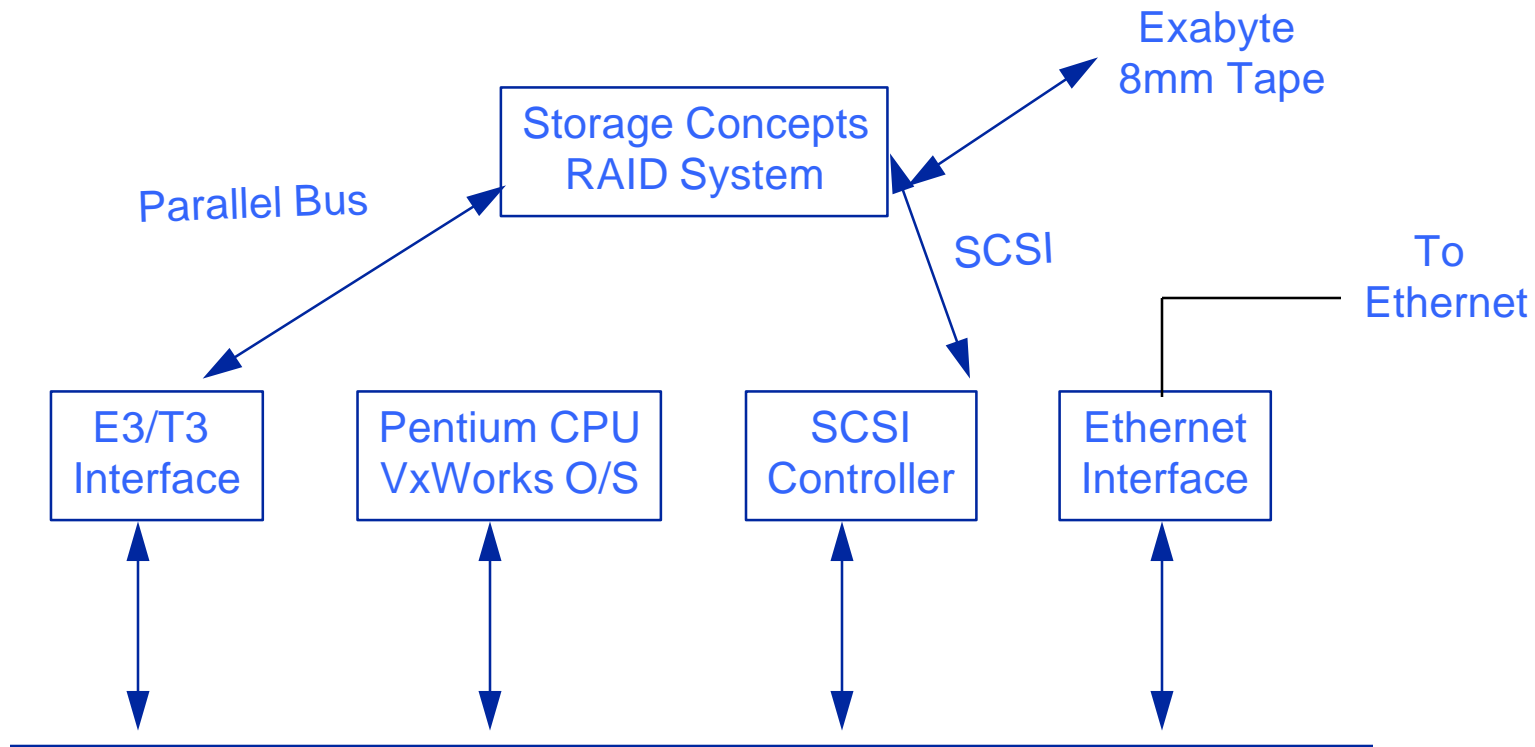
E1/T1 Recorder

Key Features:

- ◆ **Five hours of record time on 8 mm tape for a 2.048 Mbps signal**
- ◆ **Operates like a VCR; rewind, fast forward, search, play, stop, eject**
- ◆ **7" rack mount chassis or portable in a PC carrying case**
- ◆ **Ethernet remote control; simple GUI**



HSDR 9400 High Speed E3/T3 Recorder



HSDR 9400 High Speed E3/T3 Recorder



HSDR 9400 T3/E3 Recorder

◆ Technical Characteristics

- ❖ E3/T3 interface; architecture will support ATM/SONET OC-3 data rates in near future
- ❖ Uses economical high performance PCI Bus
- ❖ VxWorks real-time operating system

◆ Benefits

- ❖ Records real-time telecommunications signal up to E3/T3 rates (44 Mbps) for 2 hours



HSDR 9400 T3/E3 Recorder

- ❖ Incorporates Storage Concepts RAID System that allows for up to 20MB/second throughput to disk
- ❖ Tape back-up to Exabyte 8505
- ❖ Architecture is upgradeable to Exabyte Mammouth drives
- ❖ Simple to use: operates like MDRS series
- ❖ Remote Ethernet Interface; GUI



TAPEDANCER Product Overview

- ◆ Summary of key characteristics
- ◆ Design Tradeoffs
- ◆ Performance



TAPEDANCER

Product Overview

◆ Input/Output

- ❖ Analog Inputs: 12 channels (max)

 - Outputs: 2 channels

- ❖ Digital Inputs: 4 channels

 - Outputs: 1 channel

- ❖ CEPT: 2 Inputs/Outputs



TAPEDANCER Product Overview

◆ Transcription Features

- ❖ Pitch correction
- ❖ Backwards playback
- ❖ Variable repeat length
- ❖ Variable pause
- ❖ TNH21 footpedal
- ❖ X Factor playback
- ❖ .5X to 2X Scan Mode



TAPEDANCER Product Overview

◆ Control

❖ Front Panel LCD

❖ Remote SCPI Interface:

- Ethernet
- IEEE-488
- RS423
- Footpedal, TTL



TAPEDANCER Product Overview

◆ Summary of Analog Operating Modes

<u>BW</u>	<u>Bits/Sample</u>	<u>X Factor</u>
3.6 KHz	8	.5X-32X
4 KHz	8, 12	.5X-32X
8 KHz	8, 12	.5X-16X
16 KHz	8, 12	.25X-8X
32 KHz	8, 12	.125X-4X
64 KHz	8, 12, 14	.062X-1X



TAPEDANCER Product Overview

◆ Miscellaneous

- ❖ Universal TLDF Format
- ❖ Serial (Daisy Chain) Mode
- ❖ Parallel Drive Mode



TAPEDANCER Product Overview

◆ Design Trade-offs for Manufacturing

1. CPU (5=Excellent, 1=Poor)

	<u>486</u>	<u>TMS320C31</u>	<u>AMD29000</u>
Throughput	5	4	4
Cost	1	5	3
Interrupt/Latency	3	5	3
Interface	<u>5</u>	<u>3</u>	<u>2</u>
Totals	14	17	12



TAPEDANCER

Product Overview

2. Accommodate upto 45 analog modes, 4 digital modes

A. Multiple COTS Boards - could not meet cost and size restraints

B. Field Programmable Logic

- Analog modes: 13 Xilinx designs; each one has approx. 8K gates
- Digital modes: 4 Xilinx designs; each one has approx. 4K gates
- Xilinx's handle buffering, speed matching, clock generation, switching
- Xilinx's are very economical (less expensive than multiple PC Boards)



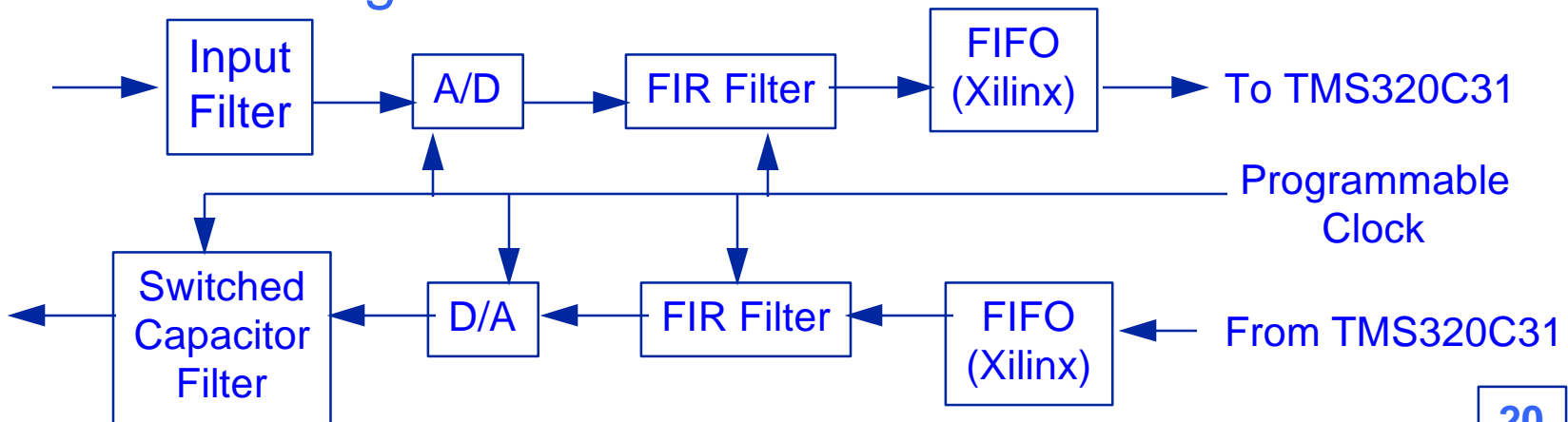
TAPEDANCER Product Overview

3. Data Acquisition

1. DSP Processor per channel



2. Sigma Delta A to D and D to A Conversion





TAPEDANCER Product Overview

	<u>DSP</u>	<u>Sigma-Delta</u>
Hardware Simplicity	5	2
Cost	2	4
Performance at 64Kbps	<u>1</u>	<u>5</u>
Total	8	11



TAPEDANCER Product Overview

◆ Performance Summary

- ❖ Throughput: 4Mbps required; > 6 Mbps achieved
- ❖ Analog performance:

	<u>Required</u>	<u>Achieved</u>
S/N, 8 Bit	43db	> 46db (typ)
S/N, 12 Bit	62db	> 64db (typ)
S/N, 14 Bit	69db	> 71db (typ)
Spurious, 8 Bit	46db	> 50db (typ)
Spurious, 12 Bit	65db	> 68db (typ)
Spurious, 14 Bit	72db	> 74db (typ)
Phase Linearity	8 degrees	<3 degrees (typ)
Flatness (8, 12 Bit)	+/- 1.5db	+/- 1db (typ)
Flatness (14 Bit)	+/- 0.5db	+/- 0.3db (typ)



Current Product Status

- ◆ **T1/L1 Recorders: Over 100 units fielded**
- ◆ **TAPEDANCER: DT&E Testing Phase; can accept orders 12/95; 1st qtr 1996 delivery**
- ◆ **HSDR: Orders 12/95; delivery 3/96**
- ◆ **Summary**
 - ❖ 8mm tape technology has dramatically lowered the cost and size of recording for a given bandwidth