

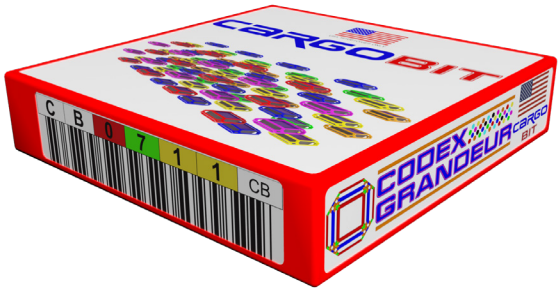
Data Castle

Cloud Storage

200Year Retention

Single Payment Storage
Never Erased Ever
Triple Factory Redundancy
100% Data Guarantee

1 Tera Byte TB (tebi) (2^40)
= 1,099,511,627,776 Bytes
8,684,811 TB per $1.00



75.557 Zetta Byte Semi Cartridge
$7,500 + $1,200 1st Year Triple B/U
Plus Annual Communications Cost

All original Data 281 Yotta located at customer site
Loss of Internet does not lose any access to Data
Factory Cloud provides Triple Redundant Plus Backup
Data Castle 222 High Performance COLD STORAGE
One Time Payment for ALL DATA LIFETIME at your location
Multiple Annual Communications Options for
Factory Triple Redundant Plus Backup

Data Castle **Disk**
25GbE FDX (Formatted)

281,474,976,710,656,000,000,000,000
Yotta Zetta Exa Peta Tera Giga Mega Kilo Hecto



Data Castle **222**
$7,500 One Time
Hardware Cost Plus
$1,200 Annual
Communications

Data Castle

Data compression and deduplication on *reducible data* are now available with a guaranteed 5:1 result, or more on typical systems. The fine print of *reducible data* does not include many pre-compressed or incompressible data formats, or non-*reducible data* formats such as compressed audio, compressed image and compressed video file formats, PDF, most office work file formats, all compression formats, pre-compressed Data Sets, and almost any professional commercial file format being used. Large voluminous amounts of Data storage can achieve 65:1 or more with pattern sensitive data, and deduplication. Actual performance may vary.

Data Castle is a dedicated computer intensive lossless subspace conversion system for digital data storage and communication that goes far beyond normal pattern sensitive digital data compression. Data Castle will work with most digital storage, and communication systems available without modification in any way, shape, or form.

Data Castle is a lossless subspace conversion unit that in no way, shape, or form ever does any Data content or pattern analysis. Data Castle is not pattern or content sensitive, and there is no such thing as non-compressible data, or non-*reducible data*. Data Castle has always been very unique since 1983 with an all data 6:1 ratio.

Data Castle lossless subspace conversion is up to (2^52):1 at this time, not including any file formatting or pre-compression ratio. Data Castle subspace conversion requires simultaneous software threads of intense complex instruction set computer (CISC) time. All CISC cores will be 100% saturated per server. GPU's are RISC.

Some custom hardware is included at each location for the physical security of Data Castle. Once installed, Data Castle can not be moved in any direction more than a couple of miles without termination of program. Special mobile Data Castle locations are possible, if justified.

Data Castle is a subspace conversion (state machine) only, and does not involve any normal processing of Data Center activity. Data is sent to Data Castle in a maximum ultra compressed 7zip formated file with a hash number from the customer, and returned to the customer in a much smaller (2^52):1 maximum compressed Data Castle formated file with a unique hash number. The processed data, serial number, time, conversion hash are all registered and stored into the Deep Freezer of the state machine to guarantee future returning file integrity.

Similar to a read head placed after the write head on a tape machine that reads back what has just been written on the tape, Data Castle reads back the subspace converted file and verifies the hash signature that every subspace conversion process starts with, that is provided by the customer when the original 7zip file is created. Read after Write subspace conversion system with hash, and a full bit level integrity comparison cycle will guarantee, and verify no bit loss for any future return to the original bit pattern before being sent out of the Data Castle machine with up to a (2^52) subspace conversion.

The (2^52):1 maximum compressed Data Castle formatted file can then be manipulated with any conventional program, however the internal compressed subspace converted data is not available for use by any conventional program without being returned, or having a CargpBit subspace conversion first.

Every Data Castle state machine is unique, and generate very different file contents that are not compatible with any other Data Castle state machine. A subspace conversion file can be intercepted on the public Internet forever, and only the one single Data Castle state machine that generated it will be able to return the data. The subspace converted file contents can only be returned by a customer authorized Data Castle unit, remote or on site. (HERE) option will allow the customer to decide which different Data Castle state machines can, and can not return the subspace conversion file. The factory has all customer signature data, and can be reconstructed in case of emergency.

Communication:

Data Castle subspace converted files are naturally coded to specific Data Castle units only, and the customer decides what if any remote Data Castle units can return the file. Data Castle subspace converted files are naturally secured without external encryption, and can be placed on the open unsecured Internet with millions of unauthorized intercepted copies made, and no copy can be returned without the customer specified authorized Data Castle unit anywhere on planet earth.

Communication with subspace conversion files between different Data Castle state machines that are typically located in the same building, or at great distances from each other with Starlink.

The reduced file size is a natural efficiency boost for any existing data communication link. The existing communication link with no modifications will achieve a (2^52) increase in both capacity and speed between the two Data Castle state machines, or storage to storage with subspace conversion occurring later.



Data communication performance at (2^52):1 achieved has:
99.999,999,999,999,977,795,539,507,496...% Efficiency.

1 bit remains light speed. For every single 1 bit transmitted over fiber optics, or any physical transmission system running at the speed of light, (2^52) another 4,503,599,627,370,495 bits will also arrive at the same exact time.

Data Security

(2^52) x 1 bit = 4,503,599,627,370,496 bits or
(2^52) x 1 bit = 4,503,599,627,370,495 bits are missing for each 1 bit transmitted, making interception of communications a waste of time, and effort. The missing bits can possibly be seen with a crystal ball, however the amount of crystal balls required is enormous, and time consuming.

Data Castle Secured 222

Lowest Cost Unit - Expanded to include:
Qty 2 - 4K Displays - Keyboard - Mouse
Local Massive Storage Disk Drive
<u>Customer Authorized</u> FTL Communications
For Starlink and Low Speed Internet of
Remote Massive Storage Disk Drives

High Performance COLD Storage
Limited by 25GbE Only to Host Computer
Customer Data is RAW only till 25GbE NIC
RAW only when returned with 25GbE NIC

Data Castle Secured 777

Millions of HOT Local Disk Drives on
1TB Disk Coming Soon
supporting existing software of any kind
Limited by dual 25GbE Only to Host Computer

Data Castle Secured 3600

Millions of HOT Local Disk Drives on
1TB Disk Coming Soon
supporting existing software of any kind
Limited by 400GbE Only to Host Computer



USA+TERRITORIES ONLY

Data Castle

Secured 222

HARDWARE

Pages (5-41)

Off-line Remote Cold Data Storage

Up to 78,840TB per Year

- **With Multiple ExabE+ over low speed Internet**

Data Transfer Limited by Local 25GbE ONLY

216 Tera Bytes per 24 Hours MAX

One Cost for Hardware Upfront
Low Cost per Year of Lifetime Storage
Triple Redundant 3-2-1 Lifetime Storage
Data 100% Guaranteed Never Erased

Please see 777 and 3600 for
Local Hot Live Disk Drive Storage

$7,500 Dollars	**1Time**	**Hardware Included**
$1,200 Dollars	**Every Year**	**Factory Triple Backup**



Data Castle Secured 222
QSFP Fiber Optic
NIC - 25GbE
25GbE Full Duplex Near Real-Time

Secured 222

$7,500 Dollars
$1,200 Dollars

1Time
Every Year

Hardware Included
Factory Triple Backup

AI Overview

The cost for **216 TB** of data storage using Cloud Cold Storage is $334.80 per month (at a rate of **$1.55 per TB per month**). www.cloudcoldstorage.com

Cost Breakdown

- **Rate per TB: $1.55** per TB / month
- **Total Storage: 216 TB**
- **Base Monthly Cost: $334.80** / month www.cloudcoldstorage.com

Key Plan Features

- **Egress Fees:** $0 (Free egress and data retrieval)
- **Hidden/Surprise Fees:** None reported by the provider for standard recovery and streaming
- **Data Center Options:** Available in US (e.g., Los Angeles) at **$1.55/TB/month** and UK (London) at **£1.32 / €1.52 per TB/month** www.cloudcoldstorage.com

AI Overview

At a rate of **$1.55 per TB per month** (via Cloud Cold Storage), storing 6,480 TB costs $10,044.00 per month and **$120,528.00 per year**. www.cloudcoldstorage.... +1

Cost Breakdown

- **Per Terabyte Rate:** $1.55 / TB / month
- **Total Storage:** 6,480 TB
- **Monthly Cost:** $10,044.00
- **Annual Cost:** $120,528.00
- **Retrieval & Egress Fees:** $0.00 (zero fees for data recovery or streaming back) www.cloudcoldstorage.... +1

If you would like to compare this against other providers (such as AWS S3 Glacier Deep Archive or Google Cloud Archive), let me know and I can run the calculation for those tiers as well.

Data Castle Secured 222
216TB per 24 Hours = No Cost per Transfer
Another 6,480TB per every 30 Days = No Cost per Transfer
$1,200 per Year Flat Fee Lifetime + Triple Backup 3-2-1
With Unique Multiple ExabE+ over 1MbE+ Internet
Limited by Local 25GbE ONLY

Data Castle
AMD EPYC 4585PX 16 Core
16 Cores ECC Ram
25GbE Full Duplex
Factory Triple Redundant Automated Backup
Data Sent to Factory is 100% Guaranteed
and Verified on every Data Castle unit

Store or Return in 24 Hours up to:



almost anything (216TB) or

54 (4TB) Memory Cards or



5 (40TB) LTO-10 Cartridges or



2 (100TB) LTO-10 Cartridges or



6.75 (32TB) Disk Drives or



88.163% of (245TB) SSD or

AI Overview

Cold cloud storage rates typically range from $1.00 to $4.50 per TB per month for base storage capacity across major providers, though extra fees apply for retrieval and data transfer. Finout +1

Cold & Archive Rates by Provider (Per TB / Month)

- **AWS (Amazon S3):**
  - **S3 Glacier Flexible Retrieval:** ~$3.69 per TB ($0.0036 per GB)
  - **S3 Glacier Deep Archive:** ~$1.01 per TB ($0.00099 per GB) — lowest-cost archive tier Eon.io +1
- **Microsoft Azure:**
  - **Cold Blob Storage:** ~$4.61 per TB ($0.0045 per GB)
  - **Archive Blob Storage:** ~$1.01 per TB ($0.00099 per GB) Finout
- **Google Cloud Storage (GCP):**
  - **Coldline:** ~$4.10 per TB ($0.0040 per GB)
  - **Archive:** ~$2.46 per TB ($0.0024 per GB) Finout
- **Alternative Providers:**
  - **Cloud Cold Storage:** $1.55 per TB with zero retrieval or egress fees.
  - **IBM Cloud (One-Rate plan):** ~$10.00 per TB flat-rate across eligible storage.
  - **Backblaze B2:** Starts at $6.95 per TB per month (hot storage model with free egress/transactions). Backblaze +2

Important Cost Factors to Consider

- **Retrieval & Egress Fees:** Pulling data out of cold or deep archive tiers usually triggers hefty per-GB retrieval charges and transit/egress costs. Wasabi Technologies +1
- **Minimum Retention Periods:** Hyperscalers enforce mandatory minimum storage windows (e.g., 90 days for cold tiers and 180 to 365 days for archive tiers); deleting or overwriting files earlier incurs full-term penalties. University of California,... +1

If you share **how much data you plan to store, how often you need to retrieve it**, and **your preferred cloud provider (AWS, Azure, GCP, or independent)**, I can help calculate a more accurate cost estimate.

AI Overview

The cost for **216 TB** of data storage using Cloud Cold Storage is $334.80 per month (at a rate of **$1.55 per TB per month**). www.cloudcoldstorage.com

216TB at $1.55 per TB per Month = $334.80 every Month
The same 216TB is ~$4,017.60 per Year - every Year

365 Days X 216TB is ~$1,466,424.00 per Year - every Year
78,840TB total - NO NEW DATA every Year

Data Castle

216TB per 24 Hours = No Cost per Transfer
The same 216TB is $1,200.00 per Year - every Year

365 Days X 216TB is still $1,200.00 per Year - every Year
78,840TB total - ALL NEW DATA every Year

1TB Disk for Customer - 3TB Disk Internal System

Data Castle **Disk 25GbE FDX (Formatted)** 281,474,976,710,656,000,000,000,000

Yotta Zetta Exa Peta Tera Giga Mega Kilo Hecto

1TB Internal Disk for LOCAL STORAGE No Internet
Starlink Option possible

Data Castle will never erase data for any reason. All data remains for Life. It is possible to purchase the optical disc option and purchase usable copies from the Factory of all data stored over the years for local usage, without any Internet required on one single 1,000 Year Disc.

Optional dedicated fiber optic Business Internet from AT&T for Near Real-Time performance. Internet, Weather, Power, and Computer Systems dependent.

ALL DATA is triple redundant remote backup storage plus Factory storage, and customer optical disc.

Secured 222

Purchase hardware + 1 Year Triple Backup First
$7,500.00 + $1,200.00 = $8,700.00 and Options

Send Files, Data, Data Sets, Data Bases, Compressed Video Storage, Live Video Feeds, entire Disk Drives, SSD, Disc, or Tapes into the Data Castle 222. A customer assigned (Hash) code, and sha512-sum signature file will be sent to the Factory at a maximum of 216 Tera Bytes in 24 Hours. Larger files will continue on into more total time to transfer into the Data Castle 222.

For example moving one single 4TB memory card, a data image from clonezilla into 7z, and the sha512-sum signature are automatically generated and sent into the Data Castle 222 that requires about 27 minutes at 25GbE. If this is the only storage needed, and the Internet is available, the transmit code is sent to the Data Castle 222 Factory via a 24 hour per day available Data Center. The Factory will scan the Data Center multiple times per day when the Internet is available. A receipt code will be returned to the Data Castle 222 and the Log File Name will turn from YELLOW to GREEN, verifying that the 7z file, and the sha512-sum files matched when received at the Factory.

The stored data will never be erased for any reason for life, and if two or more data files have the same name, the old file is simply located below the new file, and the old files can be accessed at any time by returning all of them to the customer who can then sort them out.

Secured 222

All data sent to the Data Castle 222 is converted in near real-time, and no analysis of data content in any way, shape, or form is performed. Every single Data Castle 222 is unique, with its own signature code that if intercepted on the Internet, can not be read by any other Data Castle unit, or computer system unless customer authorized.

Data Castle 222 will store up to 90 days of 216TB per day into a local storage if no Internet available for transmission.

Data Castle 222 can receive up to 90 days of 216TB per day into a local storage from the Factory if requested by the customer. The files are returned when sent back over the 25GbE to the customer computer. The two files 7z with customer assigned (Hash), and sha512-sum signature files will confirm data integrity. Customer must have the customer assigned (Hash) code to return the original Clonezilla images in the customer computer system.

If after 1 Year the customer decides not to continue the service, all data will remain and never be erased for any reason. All data will be available at any time to the customer. At any time the customer can purchase one Month of service or 30 consecutive days of new storage available at $100.00 per Month.

This is Cold Storage, and the response time from the Factory is dependent on Internet, Power, and Computer Systems all working 24 hours per day. The optional disc drive unit will enable purchase of 1,000 Year optical discs.

Secured 222

LOCAL
Existing PC or Server
With 25GbE Dedicated NIC
Windows or Linux
Running Customer Software
Possible
Security Systems
Engineering - Business
Almost Anything

LOCAL
LTO Tape Drive

LOCAL
Memory Card

LOCAL
Network

25GbE

Data Castle **Secured 222**

1GbE

LOCAL *Data Castle* **Secured 222**

1TB Disk for Customer - 1TB Disk Internal System

Data Castle **Disk**
25GbE FDX (Formatted)

281,474,976,710,656,000,000,000,000
Yotta Zetta Exa Peta Tera Giga Mega Kilo Hecto

Secured 222





USA TERRITORIES ONLY

Data Castle (2)

Secured 222 Data Only

Low Speed Internet

REMOTE

Data Castle

FACTORY

REMOTE
Back Up Files 1

REMOTE
Back Up Files 2

REMOTE
Back Up Files 3



Data Castle is a Codex Grandeur LLC product, that in no way, shape, or form is connected to the SpaceX, or Starlink Corporation. The Starlink services and hardware are not modified in any way, shape, or form. This is an optional purchase by the customer

Data Castle **ONLY WORKS** with Data Castle data. One, two or more Data Castle computers can be linked together with customer permission using Starlink business services. The Data Castle allows up to 2.684 Peta bits per second over the common 10Mbs Uplink, and 10Mbs Downlink. Excessive service charges are not required.

Only the Uplink speed is ever used for Data Castle data transfer
Starlink is NOT INCLUDED in Data Castle - Optional Only

Starlink is used to demonstrate the low bits per second requirement of Data Castle. Any reliable low speed Internet link will work, at a multiple of that available bit rate.



USA TERRITORIES ONLY



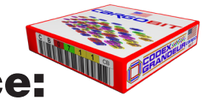


USA TERRITORIES ONLY

Data Castle (1) **Data Castle (2)**

Business Priority Package Starlink
For Customer Authorized Data Castle Units Only
No modification to SpaceX or Starlink hardware
No signal modification in any way, shape, or form





Near Real-Time
Data Castle Live Data Performance:
Starlink Uplink / Starlink Downlink
Maximum Continuous Bits per Second

9,600 bps Up **FDX Near Real-Time x (2^52) = 25GbE**
9,600 bps Down **FDX Near Real-Time x (2^52) = 25GbE**

Local Database File Real-Time Starlink Example
Optional 75.557 Zetta Byte Cartridge Transfer
(Actual 268,435,456 Bytes / 22Mbs)
[22Mbs] Starlink Uplink / [22Mbs] Downlink
Maximum Continuous Bits per Second Full Duplex
One 75.557 ZB File Transmission = ~2.03 Minutes

Without *Data Castle* 75.557 ZB requires
22Mbs uplink = 1,089,056,427 Years
22Mbs downlink = 1.089,056,427 Years



64 files at 22,528 Bytes each
sha512sum + Index
22,528 / 1024 = 22 (Sub Files)
Storage Bytes x (2^52)
Each (Sub File) has its own sha512sum + Index
Each (Sub File) stores
288,230,376,151,711,744
Peta Tera Giga Mega Kilo Hecto

(Selected Internal Format Amount)
or 2,882 LTO-10 100TB Tapes
Per (Sub File)

22 (Sub Files) = Combined into 1 (Single File)

6,341,068,275,337,658,368
Exa Peta Tera Giga Mega Kilo Hecto

64 (Single Files) = Total Diskette Usable Storage Capacity
405,828,369,621,610,135,552
Exa Peta Tera Giga Mega Kilo Hecto

or LTO-10 100TB Tapes
4 Million, 57 Thousand, 8 Hundred Fifty Six

One Single 1.44 diskette holds (4,057,856) 100TB LTO-10 Tapes
Of previous compressed video storage, programs, and data

LTO-10 40TB or LTO-10 100TB Tapes are NOT REQUIRED for Data Castle
And used for comparison ONLY.

Different Selected Internal Formats can be used for different applications and will change the Storage Capacity
Pages (32-35)



Home > Store > Tape > Desktop Tape > SymplyPRO XTF Ethernet Tape – Desktop

SymplyPRO XTF Ethernet Tape – Desktop

SymplyPRO XTF Ethernet is a unique 10Gb iSCSI appliance with a full-height LTO appliance, designed to eliminate the need for dedicated servers. Housed in a durable, stylish metal alloy chassis, it features a premium cooling system and a reliable power supply for lasting performance.

Included Drive : LTO-10

LTO-9 LTO-10

× Clear

$21,999.00

– 1 + Add to Cart

Finance available — contact us for leasing options.

Got a question? Reach out to us—our team is ready to help!

AI Overview

The LTO-10 40TB tape cartridge is an enterprise-grade archival storage medium delivering a massive 40TB of native capacity and up to 100TB of compressed storage.



Key Specifications

- **Native Capacity:** 40TB uncompressed data
- **Compressed Capacity:** Up to 100TB using standard compression
- **Base Material:** Thin, high-strength Aramid base film that allows extra tape length inside standard dimensions
- **Archival Life:** Estimated at 30+ years of stable offline storage

Google lto 10 40tb tape

Pricing and Options

- **Fujifilm LTO-10 Ultrium 40TB Cartridge:** Typically priced around $499 to $592 per single tape depending on the supplier.
- **Quantum LTO-10 Ultrium 40TB Cartridge:** Premium enterprise labeling options retail around $2,825.
- **Compatibility:** Fully compatible with standard LTO-10 drives produced by hardware partners like MagStor.
- Read the official announcement from Fujifilm.
- Explore roadmap details from the LTO Program.
- View desktop options at MagStor.

If you would like, let me know:

- What **backup or archiving software** you plan to use
- Whether you need a **desktop drive** or a **tape library system**

I can recommend a complete hardware setup for your data volume.





MagStor
Fujifilm LTO-10 Ultrium 40TB Data Cartridge LTO10 16978170

$ 499.99 ~~$ 888.89~~

– 1 + Add to Cart

Share

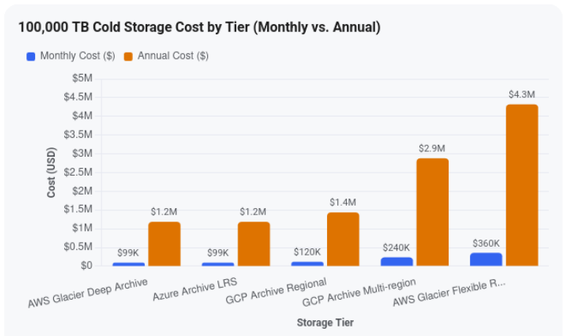
Pickup Available At 7100 Huntley Rd.
View Store Details

AI Overview

Storing **100,000 TB (100 PB)** in cloud cold/archive tiers costs approximately $99,000 to $240,000 per month (**$1.19M to $2.88M per year** based on 100,000,000 GB) at standard public rates, before retrieval, API, and egress fees. On-premises **LTO-9 tape** media costs roughly **$513,611 to $716,667** for one copy (or **$1.03M to $1.43M** for two copies) in cartridges alone, excluding drives, tape libraries, power, and staffing. CostGoat +5

Cloud Archive Cost Estimates (100,000 TB = 100,000,000 GB)

Provider & Tier	Rate ($/GB-mo)	Monthly Cost	Annual Cost	5-Year Storage Cost
AWS S3 Glacier Deep Archive	$0.00099	$99,000	$1,188,000	$5,940,000
Azure Blob Storage Archive (LRS)	$0.00099	$99,000	$1,188,000	$5,940,000
Google Cloud Archive (Regional)	$0.00120	$120,000	$1,440,000	$7,200,000
Google Cloud Archive (Multi-region)	$0.00240	$240,000	$2,880,000	$14,400,000
AWS S3 Glacier Flexible Retrieval	$0.00360	$360,000	$4,320,000	$21,600,000



Key Cost Drivers at 100,000 TB Scale

- **Retrieval & Egress Fees:** Restoring large volumes triggers per-GB retrieval charges plus outbound data transfer fees. For example, bulk retrieval from AWS Glacier Deep Archive at $0.0025/GB plus internet egress can add substantial cost on large restores. Usage.ai +4
- **Minimum Retention Windows:** Archive tiers enforce minimum storage durations (such as 180 days on AWS Glacier Deep Archive and Azure Archive, or 365 days on Google Cloud Archive), billing early deletions for the remaining days. Eon.io +4
- **Object Counts & Metadata:** Millions of small files add per-object metadata and request charges that can exceed raw byte storage costs. Binadox +2
- **LTO Tape Hardware & Media:** Storing 100,000 TB natively on 18 TB LTO-9 cartridges takes about **5,556 tapes** per copy (at $92.45–$129.00 per cartridge), plus enterprise tape libraries, drives, facilities, and management overhead. At 100 PB scale, negotiated enterprise cloud discounts or on-premises tape libraries often change the total cost of ownership. Archiware P5 +3

You can review detailed tier and transfer rules on Amazon S3, Azure Blob Storage, and Google Cloud Storage.

To narrow down a more realistic estimate, let me know:

- Your **retention period** (e.g., 1, 5, or 10 years) and **expected retrieval/egress volume**
- Your **preferred model** (cloud archive vs. on-premises LTO tape or hybrid)
- **Access speed needs** (hours/days for deep archive vs. minutes/seconds)

MICROCHIP

24AA512/24LC512/24FC512

512K I²C Serial EEPROM

Device Selection Table

Part Number	Vcc Range	Max. Clock Frequency	Temp. Ranges	Available Packages
24AA512	1.7-5.5V	400 kHz(1)	I	CSP, MF, P, SM, SN, ST, ST14
24LC512	2.5-5.5V	400 kHz	I, E	MF, P, SM, SN, ST, ST14
24FC512	1.7-5.5V	1 MHz(2)	I	MF, Q4B, P, OT, SM, SN, ST, ST14

Note 1: 100 kHz for Vcc < 2.5V
2: 400 kHz for Vcc < 2.5V

Features

- Single Supply with Operation down to 1.7V for 24AA512 and 24FC512 Devices and 2.5V for 24LC512 Devices
- Low-Power CMOS Technology:
  - Read current: 400 µA, maximum
  - Standby current: 1 µA maximum (I-Temp.)
- Two-Wire Serial Interface, I²C Compatible
- Cascadable for up to Eight Devices
- Schmitt Trigger Inputs for Noise Suppression
- Output Slope Control to Eliminate Ground Bounce
- 100 kHz, 400 kHz and 1 MHz Clock Compatibility
- Page Write Time: 5 ms, Maximum
- Self-Timed Erase/Write Cycle
- 128-Byte Page Write Buffer
- Hardware Write-Protect
- ESD Protection: >4000V
- More than 1 Million Erase/Write Cycles
- Data Retention: >200 years
- RoHS Compliant
- Temperature Ranges:
  - Industrial (I): -40°C to +85°C
  - Extended (E): -40°C to +125°C
- Automotive AEC-Q100 Qualified

Packages

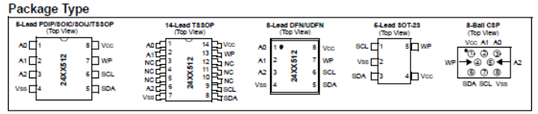
- 8-Lead SOIC, 8-Lead SOIJ, 8-Lead TSSOP, 14-Lead TSSOP, 8-Lead DFN, 8-Lead UDFN, 8-Lead PDIP, 5-Lead SOT-23 and 8-Ball CSP

Description

The Microchip Technology Inc. 24XX512(1) is a 512 Kbit Electrically Erasable PROM. The device is organized as one block of 64K x 8-bit memory with a two-wire serial interface. Its low-voltage design permits operation down to 1.7V, with standby and active currents of only 1 µA and 400 µA, respectively. The 24XX512 also has a page write capability for up to 128 bytes of data. This device is capable of both random and sequential reads up to the 512K boundary. Functional address lines allow up to eight devices on the same bus, for up to 4 Mbit address space.

Note 1: 24XX512 is used in this document as a generic part number for the 24AA512/24LC512/24FC512 devices.

Package Type



© 2008-2021 Microchip Technology Inc.

AI Overview

100,000 TB equals **100 petabytes (PB)** of archival data cold storage—an enterprise or data-center scale volume rather than a consumer setup. Backblaze +3

Scale and Context

- **Capacity:** 100,000 TB = 100 PB = 100,000,000 GB.
- **Perspective:** Backblaze noted 100 PB as equivalent to roughly 11,415 years of 24/7 HD video or about a quarter of Facebook's data at that benchmark.
- **Data center overhead:** Large data centers typically keep over 10% of storage capacity unutilized as a buffer, according to a consensus on Quora.

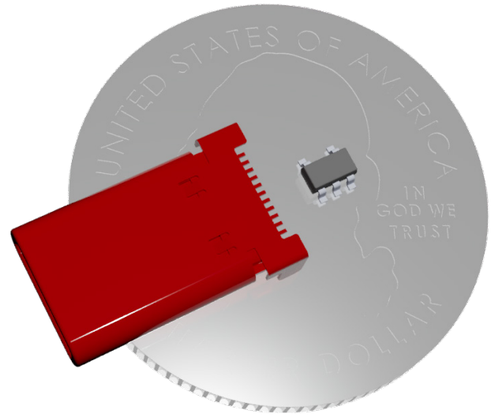
Estimating and Planning 100,000 TB Storage

- **Cloud & MSP costs:** You can model 100,000 TB backup and storage costs using the interactive cost estimator at Exaba, which compares cloud object tiers against hardware and power costs.
- **Hardware vs. archive:** Enterprise deployments at this scale rely on dense storage servers, LTO tape libraries, or cloud archive/object tiers rather than consumer drives; a discussion on Reddit pcmasterrace notes that spinning hard drives are generally favored over SSDs for long-term cold storage reliability. Exaba +1

*(Note: If you meant **physical cold storage**—such as refrigerated or blast-freezer shipping containers for food or pharmaceuticals—let me know and I can share container options instead.)*

To help narrow this down, what is your **primary use case** (e.g., **backup/disaster recovery**, **media archive**, or **compliance retention**), and do you prefer **cloud object/archive storage** or **on-premises hardware**?

AI responses may include mistakes. Learn more



USA $0.25 Quarter Scale
USB-C Red Connector
SOT-23 512K EEPROM
Aluminum Case
Smaller than Quarter
Epoxy Fill Water Protection
125 Degree Centigrade
Automotive AEC-Q100
>200 years Data Retention
Key Chain Option

512 Kbit Electrically Erasable PROM
Organized as one block of 64K x 8-bit memory
Formatted as 64 (Sub Files) as in 1.44 Diskette
<8 Second Total Read after Write Cycle

18,446,744,073,709,551,616

Exa Peta Tera Giga Mega Kilo Hecto

18.446 Exa Byte Cold Storage Data Backup
Smaller than USA Quarter Diameter
Only compatible with Codex Grandeur LLC Products
All 64 (Sub Files) have separate sha512sum Hash + Index

Years Required at full Data Transfer to fill Total Storage
At 25GbE (233) Years for Complete Read or Write
At 100GbE (58) Years for Complete Read or Write
At 4TbE (1.461) Years for Complete Read or Write

Please see OPTION = Data, Dataset, Database Formatting for ability to segment for (FAST) individual file access

Once Data has been computed, it can be transferred to other customer authorized machines to fill memory faster

Computer generated Data will also fill memory faster

Security Cameras 222



25GbE Fiber Optic
Real-Time LIVE FDX

up to 8 Panavision
Lossless Cameras
at 3GbE each Real-Time
up to 250 typ 8k Lossy
Compressed Cameras
Real-Time LIVE

Data Castle 222

Low Speed Link
or
Starlink Upload

Less Than 1 Sec

Data Castle

FACTORY

When Internet
Available

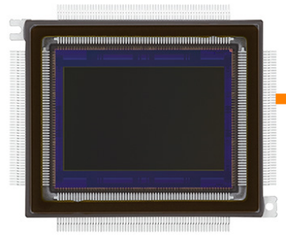
Designated
Data Center
24/7
When Internet
Available
Optional Secured
NotaryTimeStamp

Back Up Files
1

Back Up Files
2

Back Up Files
3

Security Cameras 222



25GbE Fiber Optic
Real-Time LIVE HDX

One (246) Mega Pixel
Canon Imagers
Please see Page 52
for YouTube video link

Data Castle 222

Low Speed Link
or
Starlink Upload

Less Than 1 Sec

Data Castle

FACTORY

When Internet
Available

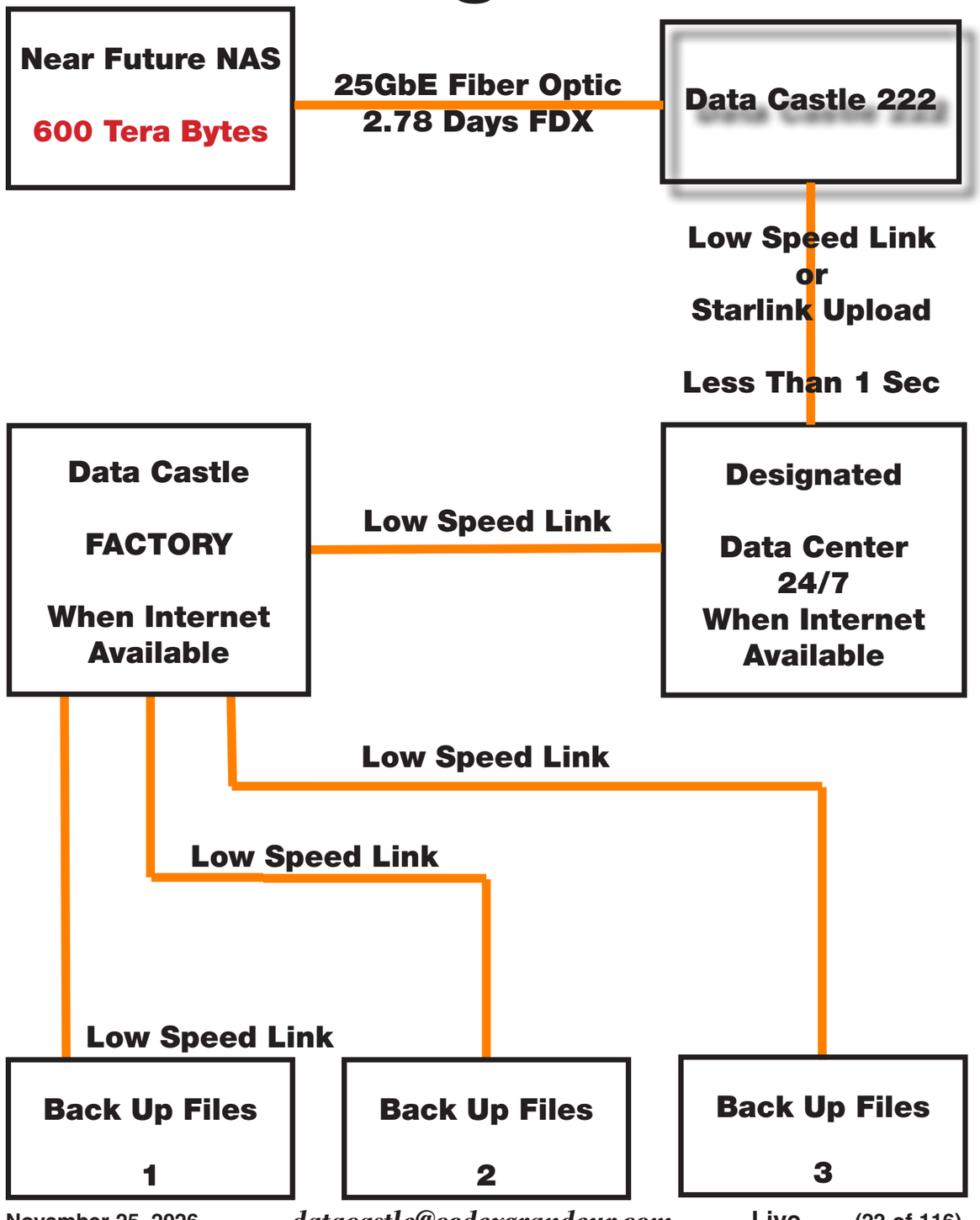
Designated
Data Center
24/7
When Internet
Available
Optional Secured
NotaryTimeStamp

Back Up Files
1

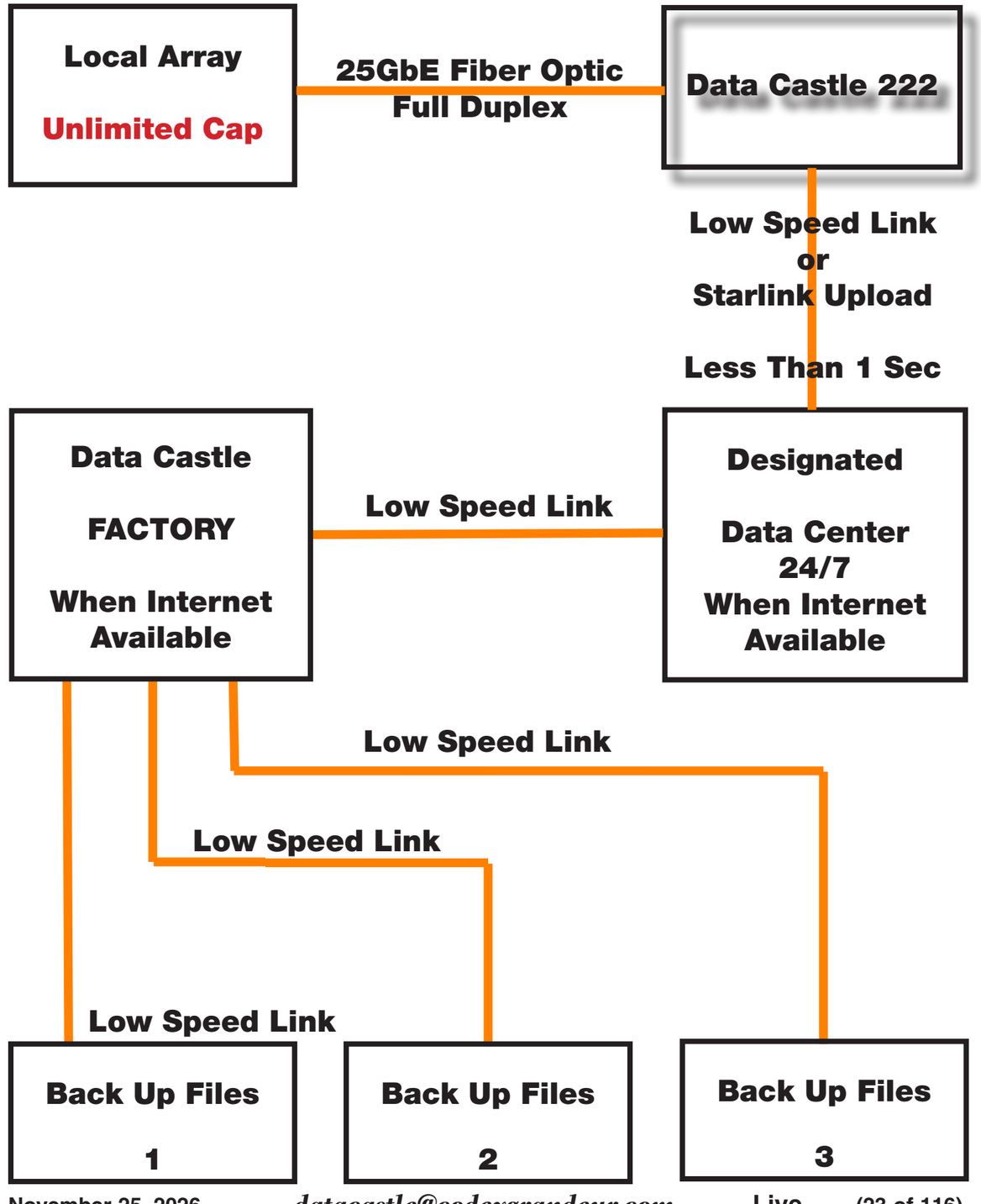
Back Up Files
2

Back Up Files
3

Storage 222



Storage 222





RGB

16 Bit
PRECISION COLOR

16 Stops
DYNAMIC RANGE

1600 ISO
NATIVE

1 TB/hr
FULL SENSOR RAW

HDR
PRIMO EVF

Modular
ENDLESS CONFIGURATIONS

Mounts
SP70, SYSTEM 65, PV35, PL

FILMED IN IMAX
Certified
8K FULL FRAME

Pixel Pitch

The 5-micron pixel pitch allows for 35 million pixels on the full 8K sensor. This combination of size and number eliminates edge sharpening and enables filmmakers to control the sharpness of their images through their choice of optics.

Bit Depth

Dynamic Range



Best Security Cameras on Earth

Codex Grandeur is not connected to Panavision in any way, shape, or form. The Dynamic Range with low light ability, and Panavision lens make these cameras ideal for large scale 24/7 monitoring. One hundred million dollar jets, and other aircraft need sabotage protection especially in hangers, and normally considered safe locations.

Farms, cattle, and even crops need monitoring 24/7, along with food storage facilitys, processing plants, and warehouses.

Lossless pixel data is important to computer image processing with remote locations required for most practical applications.

The 1 TB/hr data rate is supported by the Data Castle at 25GbE, 24/7 non-stop.

1 TB/hr is ~277,777,778 Bytes per second
or
less than 3GbE with formatting
and
Will easily fit into the 25GbE FDX of Data Castle
even
at the full rate of 25GbE
the
Data Castle will store Lossless Pixel Data
for
YEARS of Continuous Storage
with
the onboard 1 TB Disk



Almost Anywhere Near-Real Time

Almost Anywhere Near-Real Time

Almost Anywhere Near-Real Time

Almost Anywhere Near-Real Time

Almost Anywhere Near-Real Time

Almost Anywhere Near-Real Time

Almost Anywhere Near-Real Time

Almost Anywhere Near-Real Time

Almost Anywhere Near-Real Time

Almost Anywhere Near-Real Time

Fast Movie Making

Continuous Recording 24/7

1 TB/hr Live is 277.8 MBs

Starlink UpLink is about 22Mbs or 2.2MBs

Data Castle reduces 277.8 MBS to < 9,600 bps

Easily fits into Starlink UpLink speed NRT

Will easily fit into the 25GbE FDX of Data Castle

All Cameras can link to each other at any time

All Cameras can send Live Video back to Base

All Data is Always Recorded and Never Erased

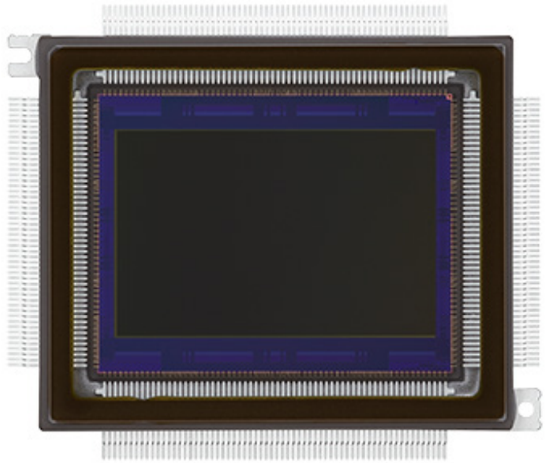
All Cameras can send full day recordings to each other and back to base in seconds

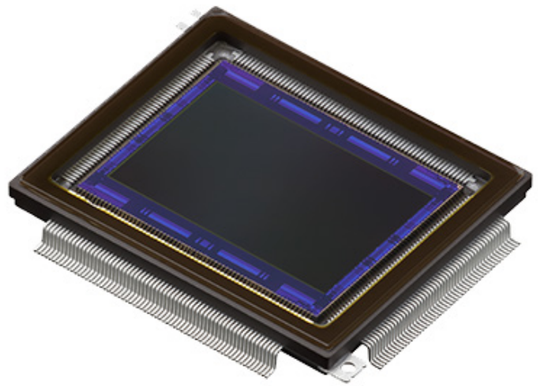
Data Castle has a build in Back-Up Drive

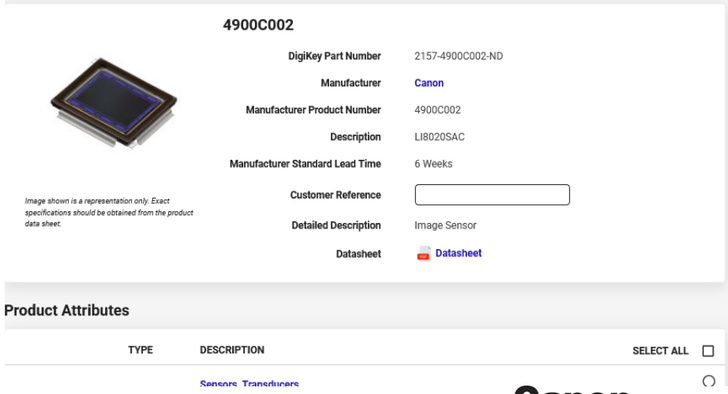
Data Castle can send data back to Factory at any time for Triple Redundant Back-Up

288PB / (2^52) will easily fit onto one (Sub File) of a 1.44 Diskette

288PB file Starlink Up/Down in < 0.001 Seconds





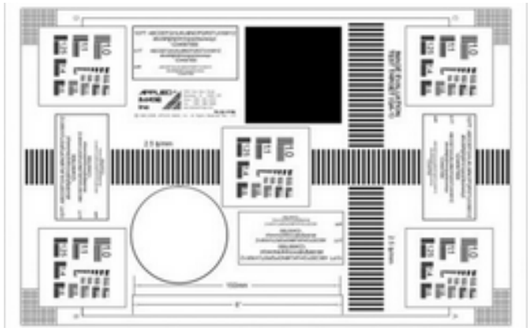


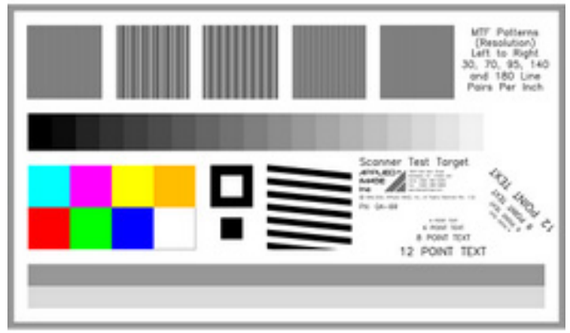
Canon
LI8020SAC
(Lima India 8020 Sierra Alpha Charlie)
19568 x 12588 (Horizontal x Vertical)

34.9mm Diagonal 246MP CMOS Sensor on 228pin QFP / 2.304 m Square Pixels at 5.0fps

(Maximum Data Rate in bits per second)
(19568 X 12588) X (12 bits per pixel) X (5.0 Frames per second) =
14,779,319,040 bits per second = 14.779319040 Giga bits per second
Easily fits into one standard 25GbE Fiber Optic Cable

(1)-25GbE Fiber Optic Camera can be supported in Near Real-Time
With one Data Castle System storing Centuries of Lossless Camera Detail
Possible to transmit Camera Starlink (A) to another
Starlink Data Castle System at Location (B) in Near Real-Time
Please see the 4 minute Canon Video:
https://youtu.be/3ND210j4ElM?si=HspsorYzCeSHV0J9
[Possible Application]





Data Castle is 100% Lossless
No Video Compression Necessary

Replace 8k 35Mpixel lossy compression cameras
With (19568 X 12588) X (12 bits per pixel)
246Mpixel Lossless compression cameras

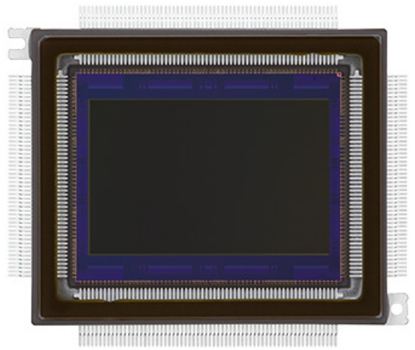
Blade Runner (1982 Movie) levels of Zoom Detail

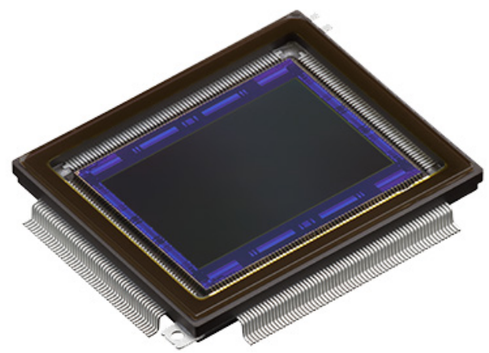
Airports, Trains, $100M+ Jets, Banks, Perimeter

Warehouse, Farms, High Security Areas,

Machine Control, Factory, Robotics

Autonomous Vehicle Driving









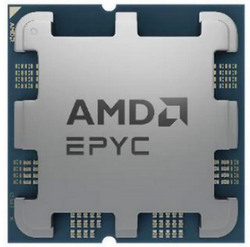


Data Castle Secured 222
Hardware

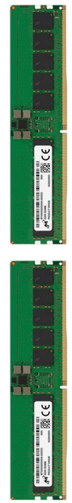


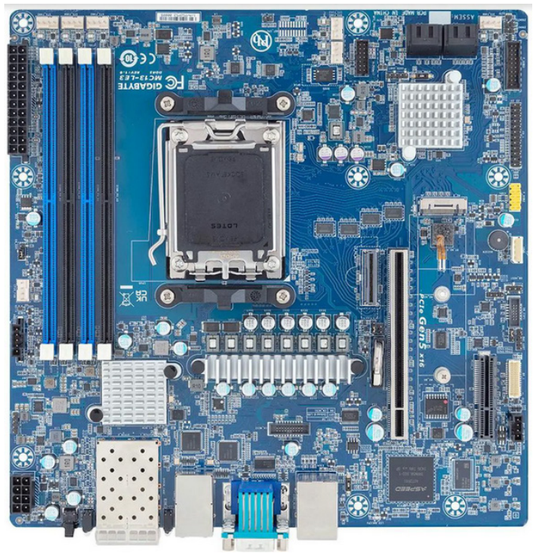














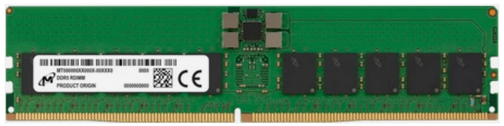


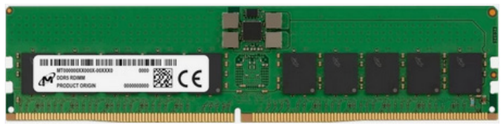
Data Castle Secured 222
AMD EPYC 4585PX 16 Cores
16 Cores 2 QSFP 25GbE / 25GbE













OPTIONAL - RAM DISK for FtlSpinUp Secured Mobile Data 222

1TB Disk for Customer - 1TB Disk Internal System

FtlSpinUp Disk 25GbE FDX (Formatted) 281,474,976,710,656,000,000,000,000
Yotta Zetta Exa Peta Tera Giga Mega Kilo Hecto

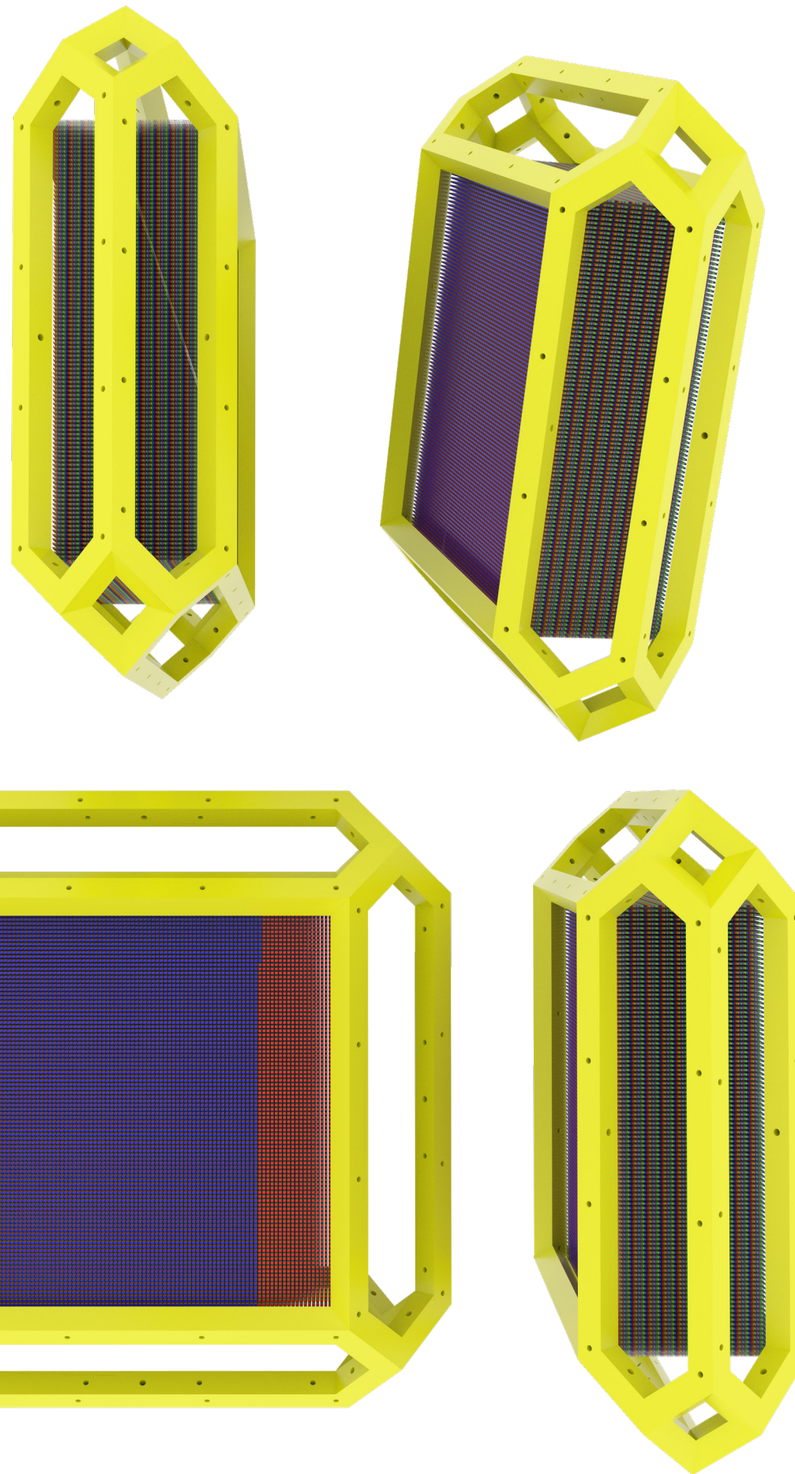
OPTIONAL RAM DISK (Formatted) 9,007,199,254,740,992,000,000,000
Yotta Zetta Exa Peta Tera Giga Mega Kilo Hecto

$10,000 Dollars Included **1Time Forever** **Hardware Included Factory Triple Backup**

Additional customer 9.007 Yotta Byte ram disk, 32 GB ram, 512 GB NVME SSD, and Eaton Tripp Lite SU1500RTXLCDN 1500VA Online Double-Conversion UPS 1350W SmartOnline Pure Sine Wave 2U Rackmount 8 Outlets AVR 2-Year Manufacturer's Warranty & $250 000 Insurance Electronics.

The ram disk is 32GB ram x (2^52) includiing special Formatting = 9,007,199,254,740,992,000,000,000 Bytes formatted of random access memory. Recommended for live Data, Data Set, and Data Base analysis, conversions, manipulations, calculations, with near real-time random access. When power is lost, the 32GB ram will be moved to the 512GB NVME SSD in under 1 minute. At power up the stored 32GB image is returned to the 32GB ram, and the additional 1TB Internal System disk drive. Occasional 32GB images are made to the 1TB Internal System disk drive also.

Please see (Pages 34 - 37) for OPTIONAL Data, Data Set, Data Base formatting. The data can be formatted for extremely fine grain to allow for random searching, analysis, conversions, manipulations, calculations, and mapping in near real-time. The Mobile Data 222 conversion rate is 25GbE FDX, or 50GbE HDX. Please see catalog for faster models.



OPTION = Data, Dataset, Database Formatting

Data are observations or measurements (unprocessed or processed) represented as text, numbers, or multimedia.

A **Dataset** is a structured collection of data generally associated with a unique body of work.

A **Database** is an organized collection of data stored as multiple datasets. Those datasets are generally stored and accessed electronically from a computer system that allows the data to be easily accessed, manipulated, and updated. **www.usgs.gov reference = USGS**

Customer OPTIONAL formatting is not required, when conventional file systems are used.

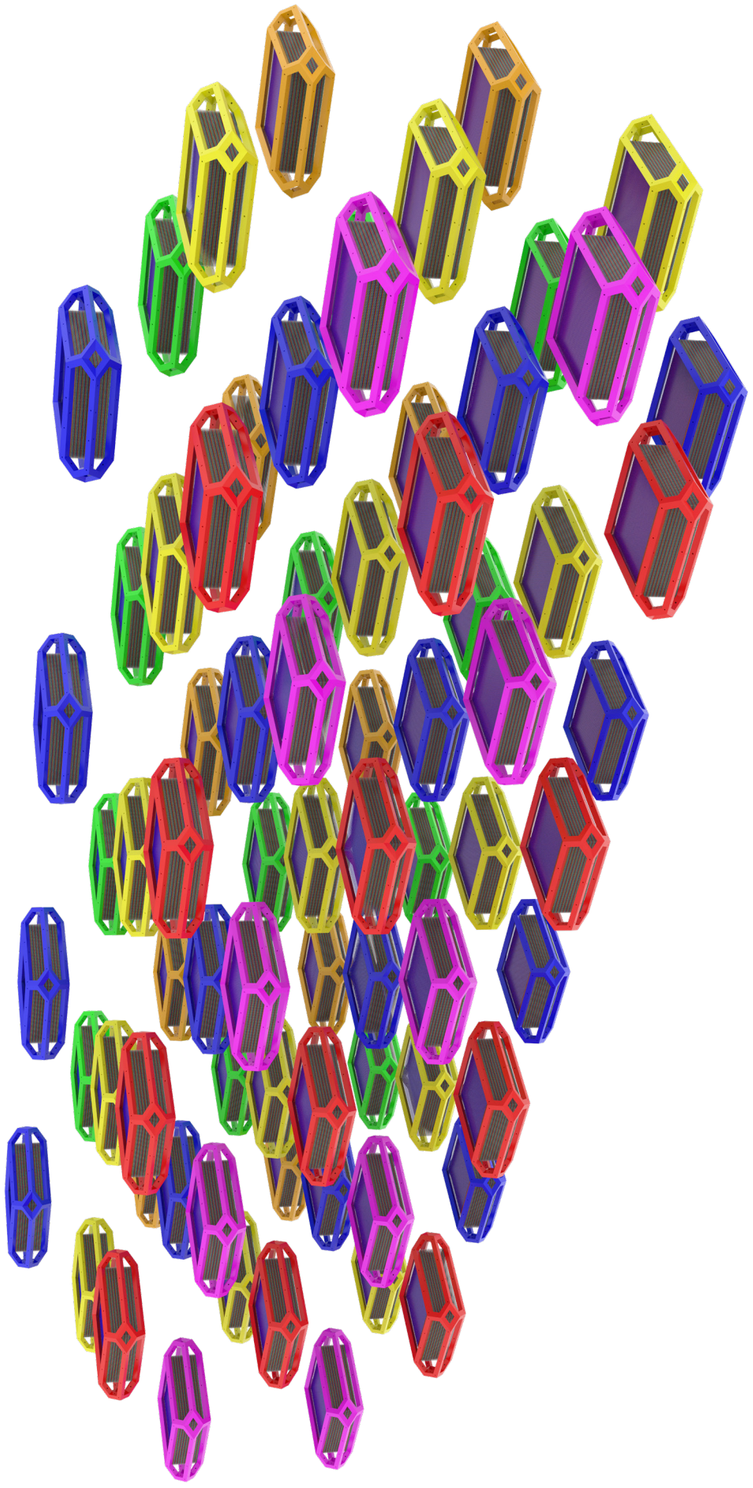
OPTIONAL formatting can be manipulated external to FtlSpinUp by remote existing computers. Only the initial subspace conversion and eventual return is required on the FtlSpinUp machine. Usage of the Ram Disk magnified from (2^52) can optionally be used in the form of extreme detail expansion, being the opposite to data storage efficiency. The conceptional model on Page 24 represents a structural housing containing the data array. The planar surfaces of the housing represent electrical interconnection socket panels providing data paths to the data array. One single housing is one single Element.

The Data, Dataset, and Database can be dynamically formatted with a vernier fine grain, to a coarse grain supporting custom Data, Dataset, and Database architectures. Vernier fine grain will use the most number of bytes, and provide the most multidimensional interconnected dynamic detail supporting optimal analysis, and work. Coarse grain is typical of current Database formatting designed for optimal byte storage efficiency.

Each conceptual model Element has 14 direct connection planar surfaces used for communication switching between different Elements in the array of multiple Elements. The 14 direct connection surfaces have 8 switchable positions for each separate Element. High frequency electrical switching between different Elements allows dynamic reconfigurations without computation of any kind. The constituent fine grain component factors that are customer defined inside of each Element are dynamic also, however with some computation required for location reconfiguration.

FtlSpinUp numerical multidimensional interconnected geometric array of Elements can be static or dynamic. FtlSpinUp has the customer option of dynamic constructions, where the Database is configured with customer input for optimized long distance fiber optic communications, and Dell computer architecture ability for diverse, multidimensional and dynamic numerical interconnection of Element arrays used in machine intelligence, machine vision, and pattern analysis.

Each element also has its own unique Database that is both local, and global to authorized customer elements. Additional bytes are used for checksum, ECC, and Database formatting, with proprietary overhead not involved in the direct customer usable data count. The customer byte count and actual byte count used for checksum, ECC, and Database formatting through the FtlSpinUp application program interface, both automatic, and customer programmable will be different. FtlSpinUp proprietary overhead is invisible to the customer, and not involved in any data communications. No additional charge is applied for the FtlSpinUp Element Database, or proprietary overhead, and is considered a unique FtlSpinUp feature.



OPTION = Data, Dataset, Database Formatting

Almost all data processing up till now has been concerned with limiting the real world needs to fit the boundary limitations of data storage, time, cost, energy, environment, human cost, buildings, communications, profit margin, and final product. Maximum efficiency with minimum resource allocation, and utilization, will achieve a serious loss of both strategic, and tactical performance.

FtlSpinUp is capable of exploding data detail into permutations, and combinations not practical and low cost until now. The current perspective of data is viewed from the outside-in because of human, and machine limitations. FtlSpinUp can achieve an inside-out perspective on data.

It is now possible to expand data into unlimited components that enhance association, analysis, and generate targeted processing segmentation, while quiet data remains dormant. The constant generation of associative data blocks insure new analysis results. FtlSpinUp compressed data blocks are created, and updated based on desired target characteristics such as video surveillance automobiles of a specific manufacture, color, shape, license, occupants, location, time, are stored in different associative blocks.

Knowledge-Based systems with deductive and inductive inference, and dynamically-reconfigurable systems with software-controlled reconfigurability are given almost unlimited data storage, including complex question-answering: knowledge-based systems with correlation analysis. Simultaneous communication of data among processors with (2^52) increase in performance. Lower native 1GbE Ethernet allows multi-dimensional network arrays with very low cost overhead. Actual data throughput is (2^52) time 1Gb Ethernet with FtlSpinUp. Of course 25GbE HDX is also multiplied by (2^52) with FtlSpinUp.

FtlSpinUp supports very fine grain subspace conversion data blocks eliminating the need for massive scale data storage and retrieval at one time. Every single FtlSpinUp payload section has a very limited non-compressed write-able area for customer usage that allows real time dynamic update of Data Base and Data Set pointers of the (2^52) compressed data, so no conversion is required. The (2^52) to 1 compression ratio is maintained. Of course a Data Base, and Data Set of pointers can be generated. Individual FtlSpinUp payload sections are independent, and can be maneuvered without destruction of overall compression. Only customer data contained in the individual FtlSpinUp payload section is relocated. Customer formatting of FtlSpinUp payload sections is possible with optional software.

Similar to a very large file that has been compressed with the 7-zip file manager into different files numbering into the hundreds, where every single specific different numbered file has to be available, or the original very large file can not ever be decompressed. FtlSpinUp is just the opposite. The original very large file that has been compressed with FtlSpinUp into specific different files numbering into the hundreds, thousands, or millions, can be decompressed individually. Also the separate individuals, including individuals from different compressed very large files, can be assembled into new creations before decompression.

A very large file that has been compressed with the 7-zip file manager into segmented different files numbering into the hundreds, and every single specific different segmented numbered file has to be available, or the original very large file can not ever be decompressed. FtlSpinUp is just the opposite. The original very large file is subspace converted with FtlSpinUp into specific different files numbering into the hundreds, thousands, or millions, can be decompressed individually. Also the separate individuals, including individuals from different compressed very large files, can be assembled into new creations before decompression.







75.557 Zetta Byte
200 Yr Retention
100,000 Cycles
8 second R/W
$512.00 Retail
Random Access
No Batteries
~ Size of LTO Tape Cartridge

Semiconductor Flash
x (2^52) (Formatted)

75,557,863,725,914,323,419,136
Zetta Exa Peta Tera Giga Mega Kilo Hecto

OPTIONAL

1 Single Data Castle 75.557 Zetta Byte Semiconductor Cartridge can hold over 755,578,637 Individual LTO 100TB Tapes

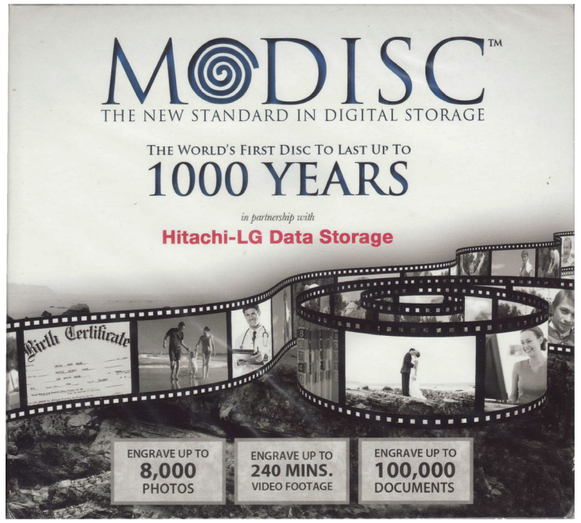
(755,578,637) LTO-10 100TB Tapes

Legacy Data Center storage as seen on the left page, typically requires huge amounts of power, and electric supply for cooling alone.

The Data Castle Trade Secret uses the 75.557 Zetta Byte cartridge pictured above, along with 1,000 Year Discs for permanent storage of Data that is never erased.

The Data is reduced by (2^52) (Formatted). This requires many Complex Instruction Set Computers working in parallel to store, verify, and Download Return the data.

The cartridge above, and 1,000 year discs require small amounts of electric, and generate almost no heat for centuries of on-line use.







OPTIONAL

The 100GB BDXL M-DISC is recommended, and any optical disc supported by the drive is usable, and can be multiplied by Data Castle (2^52) using the same (Formatted) data storage used with the 1.44 Diskette.

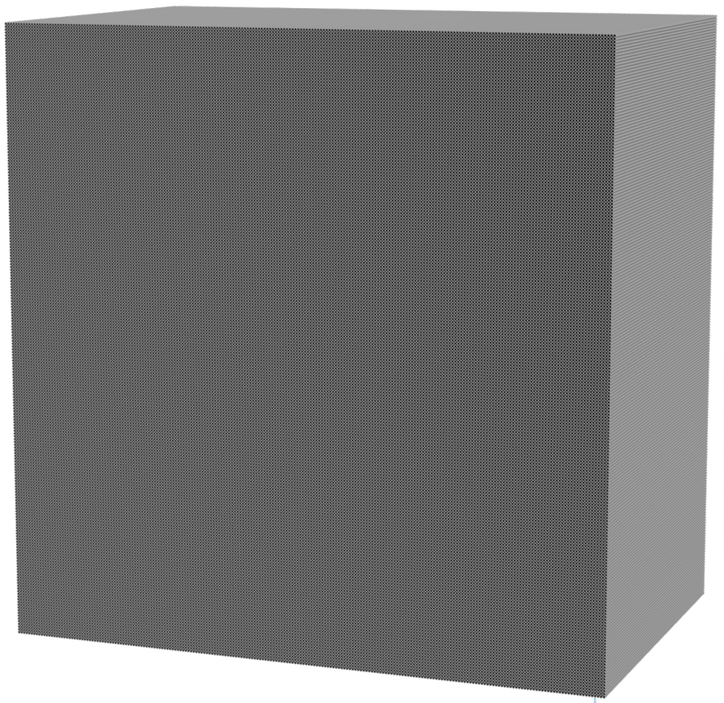
The special conversion formatting allows local storage of internal system Deep Freezer data.

The special subspace conversion will function at near real-time for the data storage and data return from the optical disc drive, limited by the speed of the optical drive used.

100GB BDXL (Formatted) M-DISC (2^52)

28,147,497,671,065,600,000,000,000
Yotta Zetta Exa Peta Tera Giga Mega Kilo Hecto

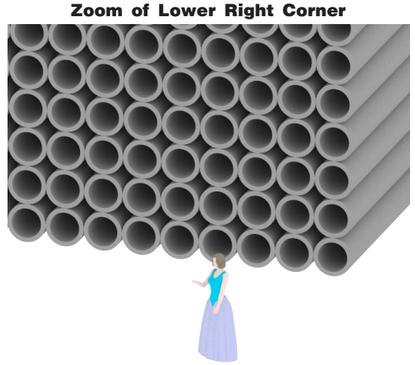
One 1,000 year disk will hold 352 CargoBit 75.557 Zeta Byte cartridges.



Rough Approx.
216 X 216 Pipes
=10,964,533,248
~410TbE Fiber Strands

Same Number of Bytes over 1 Single 1GbE at (2^52)

Zoom of Lower Right Corner



450 359 962 737 049 600 000 000 Bytes

Zetta Exa Peta Tera Giga Mega Kilo Hecto

Same # of bytes sent over 1 single 1GbE in 1.0 Seconds
450,359,962,737,049,600,000,000 Bytes / (2^52)=100,000,000Bytes
100,000,000 Bytes over 1GbE = 1.0 Second
1.0 Second over 1 single 1GbE up/down Line

OR

Same bytes sent over 46,656 Pipes full of ~410TbE in 1 Second
450,359,962,737,049,600,000,000 = No Subspace Conversion
450,359,962,737,049,600,000,000 / ~410TbE = 10,964,533,248
10,964,533,248 ~410TbE Fiber Strands 1.0 Full Second

26-in. HDPE sleeve with 34 (2-in. 6912 Fiber Strands) per pipe
34 X 6912 = 235,008 ~410TbE Fiber Strands per pipe
10,964,533,248 / 235,008 Fiber Strands per pipe
= approx. 46,656 Pipes
Square Root 46,656 = 216 X 216 Pipes of ~410TbE Fiber Strands
Continuous Run for 1.0 Full Second

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COOLING CLOUD SUSTAINABILITY POWER COLO DESIGN EDGE HYPERSCALE AI METAVERSE 5G NETWORKS LOCATIONS

NTT Global Data Centers We love our clients, but everyone needs space 7 campuses across the U.S. Learn more

PODCAST

Data Center Fiber at Gigawatt Scale: A Talk With Quantum Loophole CEO Josh Snowhorn

The Cabling Podcast sits down with Josh Snowhorn, founder and CEO at Quantum Loophole, to discuss the massive QLoop fiber ring project under the Potomac.

DCF Staff

April 21, 2023



Quantum Loophole CEO Josh Snowhorn testing one of the giant conduits that will house fiber for the QLoop, the company's fiber ring connecting the new campus to Data Center Alley in Northern Virginia.

ENCHANTED ROCK The Power is On.
The Brattle Group: Decarbonized Resilience
GET THE WHITE PAPER

VOICES OF THE INDUSTRY



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Collaboration is Multiplication: Listening and...

Phillip Marangella, Chief Marketing and Product Officer at EdgeConneX, shares his perspectives on why collaboration is the key to meeting the needs of data center customers.

Voices of the Industry

Data centers are more than just the sum of their parts and there

are far more pieces in play than most people outside the industry would consider. Connectivity is one of the key functions external to the data center that enables effective operation, and as such, we focus significant efforts in providing coverage of the activities of both the technology and the industry supporting these options.

Josh Snowhorn is founder and CEO at Quantum Loophole, an operator of data center campuses in the gigawatt scale. At DCF we've been providing regular updates on Quantum Loophole and its vision for "data center cities" since the company came out of stealth in early 2021. The company says it has already leased a massive 240 megawatts of capacity at its campus in Adamstown, Maryland.

Central to the entire undertaking is QLoop, the 43-mile hyperscale fiber ring connecting Quantum Loophole's 2,100+ acre data center development site in Frederick County, Maryland to the Data Center Alley connectivity ecosystem around Ashburn, Virginia.

ADVERTISEMENT



In a recent edition of **The Cabling Podcast**, our sister publication Cabling Installation & Maintenance checked in with Snowhorn for an update on the construction of data center and fiber conduit infrastructure.

Snowhorn said the projects is the largest medium haul fiber backbone that's ever been created. The QLoop network ring network ring offer capacity for more than 200,000 strands of fiber connecting to the Ashburn ecosystem in under one half millisecond Round Trip Time (RTT). "And we are bolstering that with some pretty amazing cross-connect capabilities," he added.

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To meet the needs of the rapidly expanding global colocation market, a significant amount of new infrastructure must be built quickly. Project buffering can eliminate many of ...





"Each property will have access to conduits and thousands of strands of fiber directly into the QLoop system to enable seamless, private and secure connectivity for all of our campus-wide customers."

Here's the podcast with CIM host Matt Vincent, followed by a summary of the key discussion points.

Gigawatt-Scale Data Center Fiber

A frequent speaker at industry conferences, Snowhorn's key founding and executive positions include time at Terremark, Verizon, Cincinnati Bell, and CyrusOne. Snowhorn founded the Global Peering Forum, the annual meeting for the Internet interconnection and peering community, where he serves on the board of directors. He also serves on the advisory board of Telescent, a maker of automated data center interconnection machines.

As the discussion begins, Snowhorn provides an update on (1:46) underground fiber infrastructure linking up Quantum Loophole's Frederick data center campus' network center 1 and 2 sites, "which

are kind of like giant, horizontal meet-me rooms, multiple acres themselves. We have up to 60 conduits in some cases interconnecting the two network centers."

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Of the QLoop (2:27) fiber ring project, Snowhorn adds:

> "We have completed our south Potomac river boring, which was over 3000 ft., and it goes 91 feet below the bedrock of the Potomac. That was a huge, 26-in. HDPE sleeve that was pulled through, and then 34 two-inch ducts inside of that. That's been completed and approved and vaults have been put in place. Terrestrial construction has started with multiple crews working laying in the 34 ducts, buried deeply to accomodate the most extreme security standards."

Of his company's partnership with Aligned Data Centers, Snowhorn noted that (3:43) "at Quantum Loophole, we don't build data centers ourselves. We supply land, energy, water, and fiber, or conduit. We call those 'the elements of the data center business.' Aligned is our first customer, they have closed on the acquisition of 75 acres of land, and I believe they're well underway with their permitting process and preparing to construct, hopefully, their first building by the end of the year."

Snowhorn also discussed (4:24) the origin and founding of his company.

> "The impetus for creating Quantum Loophole is really that we saw a gap in the industry -- there wasn't anybody providing just those baseline services, and entitlement preparation of site so others can go and just have an 'easy button' to build their data centers. We felt like we had a unique offering and it's proven to be true, we have lots of company demand, and lots of big-scale entities going in. We've sold several conduits already, so that's already well underway."

At the root of Quantum Loophole's stated "dig once" approach, Snowhorn said (5:20):

> "You're really trying to just prevent cuts, prevent what happens in the famous backhoe pictures you see, where they tear up a bunch of duct. In our case, we can hold over 235,000 strands of fiber in our primary system; the whole thing is designed for 6912-fiber trunks -- so imagine a backhole pulling that up and the splicing hell that would ensue afterwards to repair it. So dig once means, put it all in place and hopefully we don't overbuild, and hopefully we don't underbuild."

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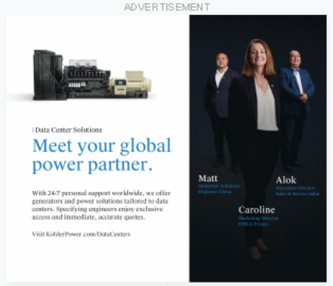



Quantum Loophole Founder and CEO Josh Snowhorn speaks to The Cabling Podcast.

Splicing Skills and Automated Connections

Later in the interview (6:36), Matt asks how working with a high-fiber-count cable like 3456 is different from working with 144-fiber cable (which the world used to consider high-fiber-count), and if installers had to to "level up" on their splicing skills or any other installation skills to get comfortable working with this high-fiber count fiber.

QLoop's press coverage mentions (7:51) that its network infrastructure has a radius that will accommodate 6912-fiber availability. In response to this info, we asked Snowhorn if his teams have worked with that fiber count yet; and if so, if there's been a noticeable difference between it and 3456-fiber cable.

Snowhorn also shared (9:07) his insights regarding the value proposition of automatic, robotic cross connections powered by Telescent, as installed at Quantum Loophole's Maryland data center campus.

> "It really comes out of a need to change how people do interconnection. Your classic way of doing it is either truck rolls to a remote hut, or having 24x7 staff with tickets open, and hopefully no RX/TX reversals in play. But when you start thinking about the scale of what we're building, with more fiber strand count coming into a single location than anyone's ever seen, that really starts to bring in a need for change. The Telescent machines do something quite unique in that we can give the control of the interconnection to the client, so they can use a portal via an API, log in, and enable a cross-connect in 2 minutes without ever touching it as long as the machine has been pre-patched.

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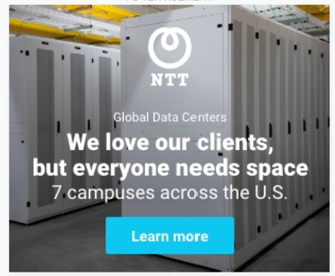

The bigger picture of that is they have the same machine on their campus and building, and then maybe they have the same machine located in Ashburn and Manassas, let's say 20 buildings, and they want to enable an interconnection. The machine has a built-in OTDR, they can punch light out, they can verify the connection and do 20 connections at the same time, all in 2 minutes, and batch a job. They can do 1,000 connections in 2,000 minutes theoretically, across 20 locations, without a human being touching it. That's game-changing. That really creates flexibility for outages, creates hopefully a reduction in truck roll and labor costs, and a more rapid delivery of interconnection."

As the QLoop is such a notably large outside and inside plant undertaking for data center construction, to close out the podcast (11:30) we asked Snowhorn for a recap of the project's specifications and a preview of what's in store for the rest of the year. In response, Snowhorn said:

> "It's literally hundreds of sites, hundreds of data centers, but we don't actually touch those other data centers once we get into Loudon County. We

cross the Potomac, which is insanely hard to do: I now know why nobody tries to do it, becuase it's that hard. It's just been nothing but a struggle to get it done, but we're doing it. I don't think anybody's going to try and do it again for a long time. Machines blowing up, costs, the approvals -- going 9 stories below the bedrock of the Potomac is insane. The costs are through the roof -- I cannot think of a single thing that was easy about what we've done.

We drop down [and] have over 500 vaults on the 43-mile ring, and those vaults are designed to create a massive intersection of splice points, so that people can tie into the system. We're a wholesaler to the wholesalers, so our goal was not to go build throughout the entire Ashburn corridor and interconnect every building and be another competitive carrier. We wanted to be a support mechanism to create an expansion of that ecosystem."

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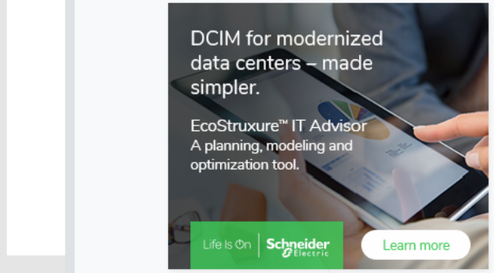




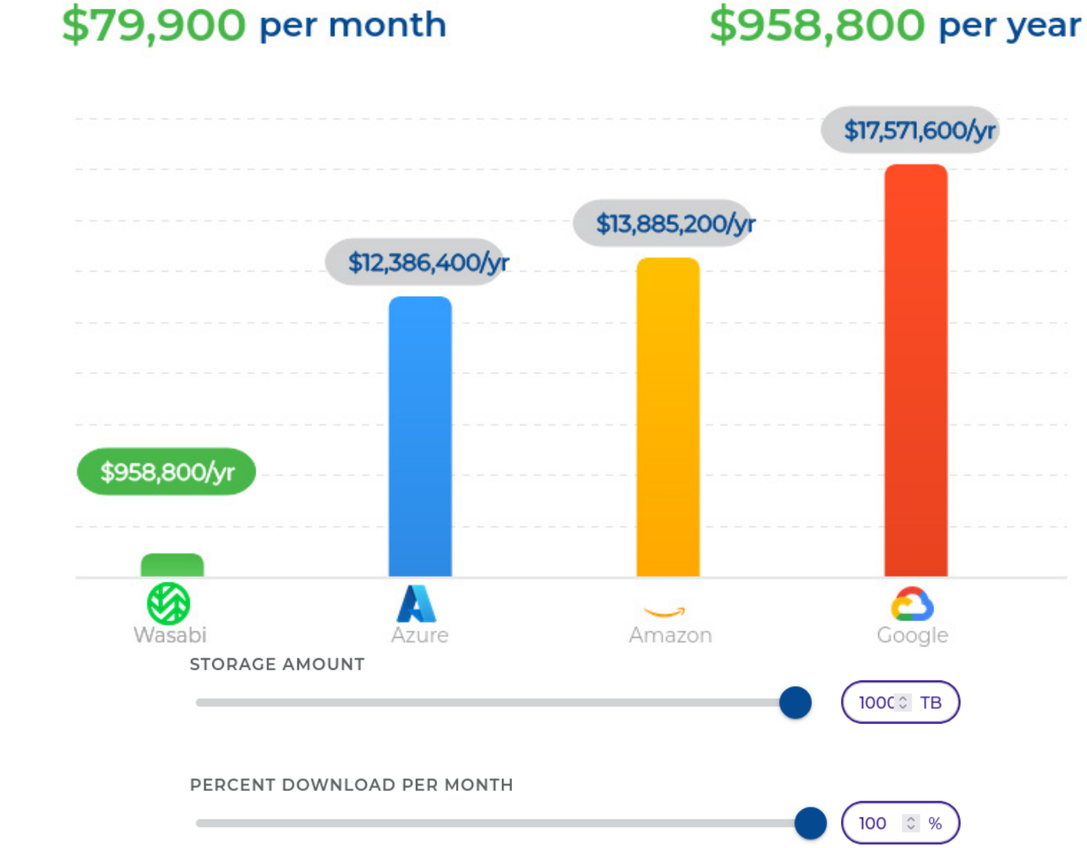
PODCAST

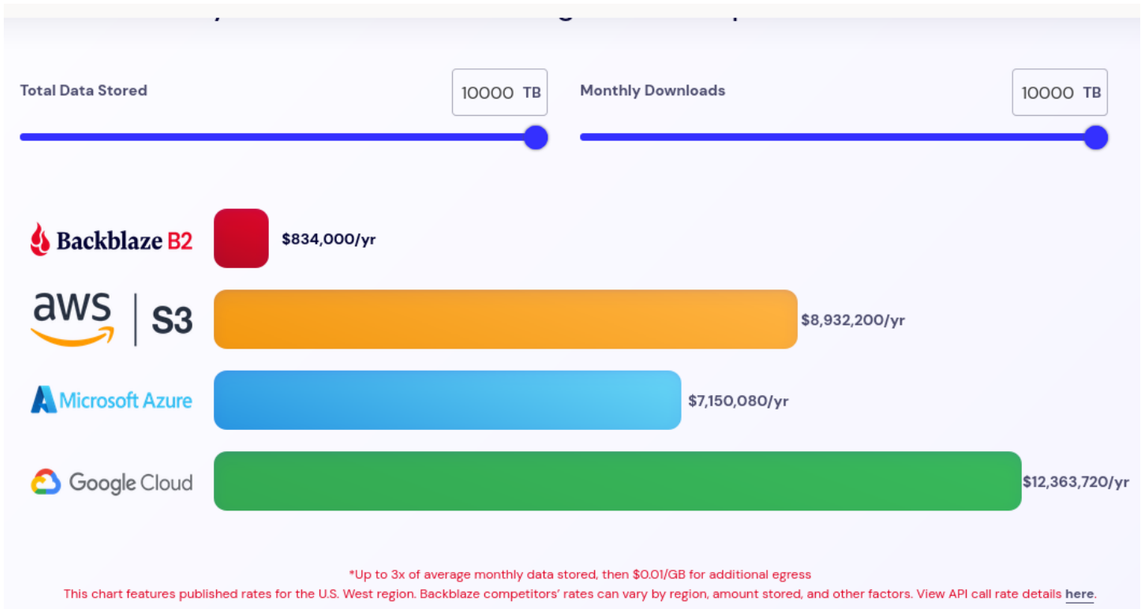
How Investment Powers the Global Growth of the Cloud



The Seagate Exos E SU84 storage enclosure supports 84 3.5 inch disk drives in a 5U box. A typical 42U rack cabinet will hold about 8-84 disk drive enclosures each.

CargoBit (2^52) will convert one single disk drive into the storage capacity of 4,503,599,627,370,496 disk drives, any size. 4,503,599,627,370,496 / 84 = 53,614,281,278,220 disk drive enclosures pictured above. 53,614,281,278,220 / 8 = 6,701,785,159,777 Cabinets full of disk drives. The electrical power and cost of physical space alone will pay for many, many CargoBit units instantly, not to mention the cost of all the disk drives that will wear out eventually, compared to the one single disk drive CargoBit uses.

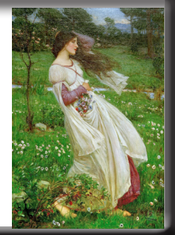




Amazon **$2,000,000 Dollars + Every Year**	=	10,000,000,000,000,000 Peta Tera Giga Mega Kilo Hecto
Azure **$2,000,000 Dollars + Every Year**	=	10,000,000,000,000,000 Peta Tera Giga Mega Kilo Hecto
Google **$2,000,000 Dollars + Every Year**	=	10,000,000,000,000,000 Peta Tera Giga Mega Kilo Hecto
Backblaze **$834,000 Dollars Every Year**	=	10,000,000,000,000,000 Peta Tera Giga Mega Kilo Hecto
Wasabi **$958,800 Dollars Every Year**	=	10,000,000,000,000,000 Peta Tera Giga Mega Kilo Hecto
Seagate Lyve Cloud **$7.50 TB/Mo Standard** **$900,000 Dollars Every Year**	=	10,000,000,000,000,000 Peta Tera Giga Mega Kilo Hecto



Singing Wind



256 Full Freq Left **Full Freq Right 256**

3-Dimensional **3-Dimensional**

2-Dimensional **2-Dimensional**

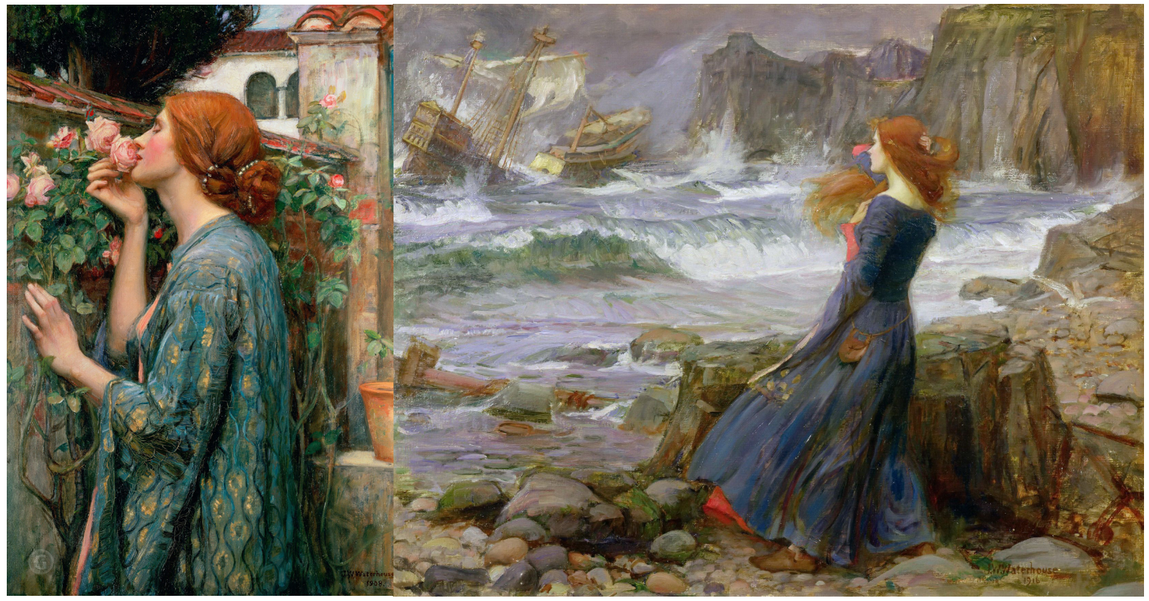
1-Dimensional **1-Dimensional**

[32 bit X] [32 bit Y] [32 bit Z] X 100 MHZ = 1.2 Giga Byte
X ((256 Left) + (256 Right)) = 614.4 Giga Bytes second
45 Minute 512 Channel Full Freq Album = 1.659 Peta Bytes
On 1 Single 25GB Blu-Ray Disc = www.ftlspinup.com
+100VDC to -100VDC
10HP to 100 HP Motor Generates 3 - 6 Phase from 1 Phase
No Amplifiers - No Crossover Networks - No Preamps
No Filters - No Oversampling - No Cables - No Switching
No Signal Capacitors - No Rails - No DSP
No Sine Wave or Integration Oversimplification

D/A & A/D Full 200VDC + Possible 400VDC Range +&- Out
From Signal to Direct Drive Output without Amplification
100% Numerical Analog Transistor with 10VDC SOA

Atmospheric Generated Harmonies with Controlled
Beat Frequencies and Cancellation Output
Ultrasonics Possible for Instrument Quality
32 Bit X,Y,Z Bezier Signal Generation to Analog Drive
Extreme Low Cost Player Model

Singing Wind



Numerical Analog Music

Sweet nectar of subtle nuance is recorded with huge and powerful dynamic range, and a noise floor that no one can hear. Girls dance freely, and with spirit.

Digital Music

The muse has left the building. HMS Subtlety with Captain Nuance is being destroyed by the huge and powerful dynamic range. Clean sterilized precision with a noise floor that no one can hear. Girls do not dance freely, and with spirit.

The muse was left behind with Digital Music, and we are the lessor for it. It is impossible to record a Concert Piano, or most real musical instruments in 2025, with Instrument Quality. It is impossible to generate a Concert Piano or most real musical instruments in Digital Music 2025, with Instrument Quality.

Subtle nuance and finite detail are not recorded with any microphone in 2025. Then the Music Digitized with binary digits is even more compromised before the slaughter of Digital mixing even begins.

The entire world of subtle nuance in Music was NOT recorded, or digitally generated because the details of critical information are missing. Singing Wind makes it possible to record, and generate Music.

In a world of $400,000 to Multiple Millions of dollars for a home audio playback system that can only work with the same audio signal that low cost audio systems work with.





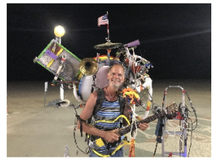
Affixation
Direct to Atmosphere Live Performance

Hundreds of individual sound sources live, and real-time. Positional, quantity, environmental, dependancy. Very, very expensive.

Home Performance Stereo Composite Left Channel Signal w/Optional LFE Bass



Home Performance Stereo Composite Right Channel Signal w/Optional LFE Bass



Composition of generated L-R recorded signals. Many details cancel each other out in atmosphere, also because everything is being forced into 2 separated composite signals, 1-Left and 1-Right. Worse when both are divided by any crossover for tweeter, midrange, bass, and woofer speakers. Adding to the Disaster, both the signal, and speaker can only create two dimensional waves. Digitization, and Digital Signal Processing has not solved the problem. Head Related Transfer Functions assume hidden details can be reconstructed, and everything was recorded. Everything was not recorded.

The best music recording available so far in the year 2020, generates the exact same stereo signals to be used on a $15 eBay special, and everything including amplifiers costing over $200,000, speakers costing over $300,000, with supporting D/A converters over $100,000, not to mention the turn table at well over $100,000 up. Surround sound is literally more of the same.

The difference between digital and analog can be significant. Digital can never work with analog, only pretend to. Digital is easier, and less expensive. Money is spent to sound analog.

Singing Wind will create 2^20 signals, 1,048,576 signals inside of both the left, and right channels, in the same size recorded stereo storage file, for a total of 2,097,152 stereo signals. The digital delivery system can be the exact same format, with the Singing Wind decoder included. **Affixation** is now possible with unlimited playback hardware potential, including existing systems. Surround Sound systems are possible with 2^20 Singing Wind signals available per channel. Lower cost materials are possible because individual component performance is reduced.

Billions of ears worldwide can not be wrong, the best sounding audio signal comes from the analog of vinyl records
THE ONLY THING BETTER IS 512 ANALOG SIGNALS L+R





Numerical Analog



From the instant a continuous musical analog signal is digitized, it is world of very expensive difficulty to reconstruct that same original continuous musical analog waveform, if economically possible. High end audio requires at least five, ten, or fifty plus thousand dollars to reconstruct the original continuous musical analog waveform per channel, or studio produced construction generation of a not so continuous musical analog waveform, all this is before the amplifier, or servo drive even begins the long journey to an elusive high end music audio system.

The very purpose of $100,000.00+ stereo digital to analog converters (DAC, D/A) is simply to get back to the original continuous musical analog signal, or create a continuous musical analog signal. The continuous musical analog signal can not exist in any digital format. Digital is discrete, while Analog is continuous. According to most music professionals, there is a difference between $50.00 digital DAC's, and $100,000.00+ digital DAC's, where more expensive DAC's can almost recreate the original continuous musical analog signal, and less expensive DAC's can not. Many times the analog to digital converters (A/D), or Digital Audio Workstations are not capable of creating a true continuous musical analog signal to be reconstructed in the first place. The working theory is that humans can not hear the missing finite detail, so why bother. A true continuous musical analog signal has no missing finite detail. The missing finite detail will never compound into noise artifacts as it does in Digital Audio Workstations when many sources are combined. The real problem with any digital music recording format is that it never recreates the original continuous musical analog signal.

Numerical Analog has no missing finite detail from the original continuous musical analog signal. No exotic power supplies, no exotic sub 100 femto second digital clocks, no sampling rate's such as 44.1khz CD, 96khz, 192khz, 352.8khz, 2.8224 MHZ = DSD64, DSD128, DSD256, DSD512 ..., and no bit depth specification as 16 bit CD, 24, or 32. No frequency filters, digital or analog are required. Numerical Analog individual waveform components do have unique built in time tracks creating a final delivery assembly of the thousands, and thousands of Numerical Analog music signals to the consumer for the elimination of critical electrical delivery timing paths. Both the addition of new abilities, and elimination of the old critical limitations reduce the cost by many magnitudes, putting the final playback pricing within the range of the consumer market.

Mr. Sanju Chiba, President of ELP Corp. has explained the difference between digital and analog better than anyone I have ever heard. The video is available on Youtube, and the ELP website. Please see the Youtube video "The Laser Turntable (LT) from ELP Corporation" starting about 4 minutes 10 seconds. "**... Never better than analog ...**".



Vinyl Recording Studio

Designed for owners of very unique one of a kind live direct to lathes vinyl records that can not be reproduced by any Digital Signal Processing system, with true analog mirror signal output, verified. And vinyl records that are not replaceable, or too expensive to replace the entire library.

The Vinyl Recording Studio will make a direct numerical analog copy of the input signal that contains every small detail not possible with Digital Recordings of any kind.

DSD or DXD can not generate 100,000,000 individual and unique 32bit Analog output signals per second where every single bit is 100% reproducible in the Analog signal output. Then the Digital Signal Processing also can not produce a mirror Analog output signal. Small distortions, and imperfections can not be reconstructed. Especially in the higher frequencies.

DSD also has a high frequency cut-off filter because of all the Digital Signal Processing noise generated by the process. Depending on the specific application that could be as low as 50khz or 90khz.

Singing wind does not have a cut-off filter of any kind, and is rated at 200khz and beyond.

Full Scale is 0 - 200,000 plus Cycles per Second Line Level

This is not a comparison to what it sounds like, this is what it is displayed as on a live Analog signal visual. The small changes the customer has made over many years to improve the sound in their music system will be recorded. A small signal cartridge, or transformer change will be recorded.

Typically any long Numerical Analog recording would require Tera Bytes of Digital Data Storage, costing hundreds of dollars per record, then triple back up would triple that cost.

Singing Wind uses the Data Castle storage system built in, so any Numerical Analog recording no matter how long will require less than one single 1.44 Diskette. Including digitized photos, videos, movies, and media.

Once the Numerical Analog signal is recorded, it can be played back forever, and never lose any detail. It will help extend, and save the original recording before it disintegrates.

Will also work with Magnetic Tapes of any kind.

Pages (60-65)

Vinyl Recording Studio
4 full frequency Line Left + 4 full frequency Line Right
Possible LFE - Woofer - Mid - Tweeter Line sources
No crossover required
and/or used for 5.1 Surround Sound
and/or used for 7.1 Surround Sound
and/or used for 7.1.4 Surround Sound

Designed for Home Recording of Vinyl Record Libraries
No Digital recording format delivers Direct Analog Output

Audio Home Recording Act of 1992 (AHRA) amended the United States copyright law by adding Chapter 10

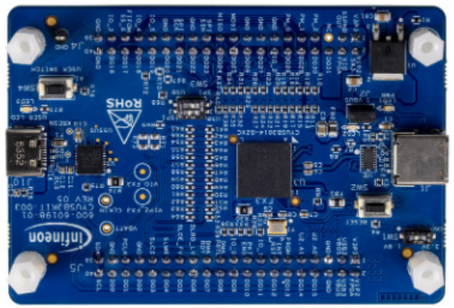
One single 1.44 Diskette can easly store any Vinyl Record set with photos and video

One single 100GB BDXL M-DISC can store Millions of Vinyl Disc Recordings

Serial Copy Management System with limited copies of copies possible. Recording copies are locked to machine.

Improvements and Repairs to Copies are supported in full Analog without Digital Signal Processing

16bit D/A HW Register + 16bit D/A HW Register - 000



USB 5Ghz is used in the Vinyl Recording Studio. Fiber Optic output is 100Mhz at 32bits creating two 16bit Digital to Analog converters. The two 16bit D/A converters work together to form a 32bit D/A DIRECT to standard Line Level analog signal for compatability. Possible Phono Input also. No high frequency, or any filters, or capacitors are used.

One 32bit D/A converter per Fiber Optic USB converter board without R2R switching noise or expensive components.

100Mhz at 32bits is 400 Mega Bytes per Second. Every single bit is individual and unique. 100,000,000 individual and unique 32bit D/A conversions per second.

4 seperate USB converter boards + 1 USB converter board for Recording are typically used on the Left, and 4+1 on the Right for 10 seperate USB conveter boards.

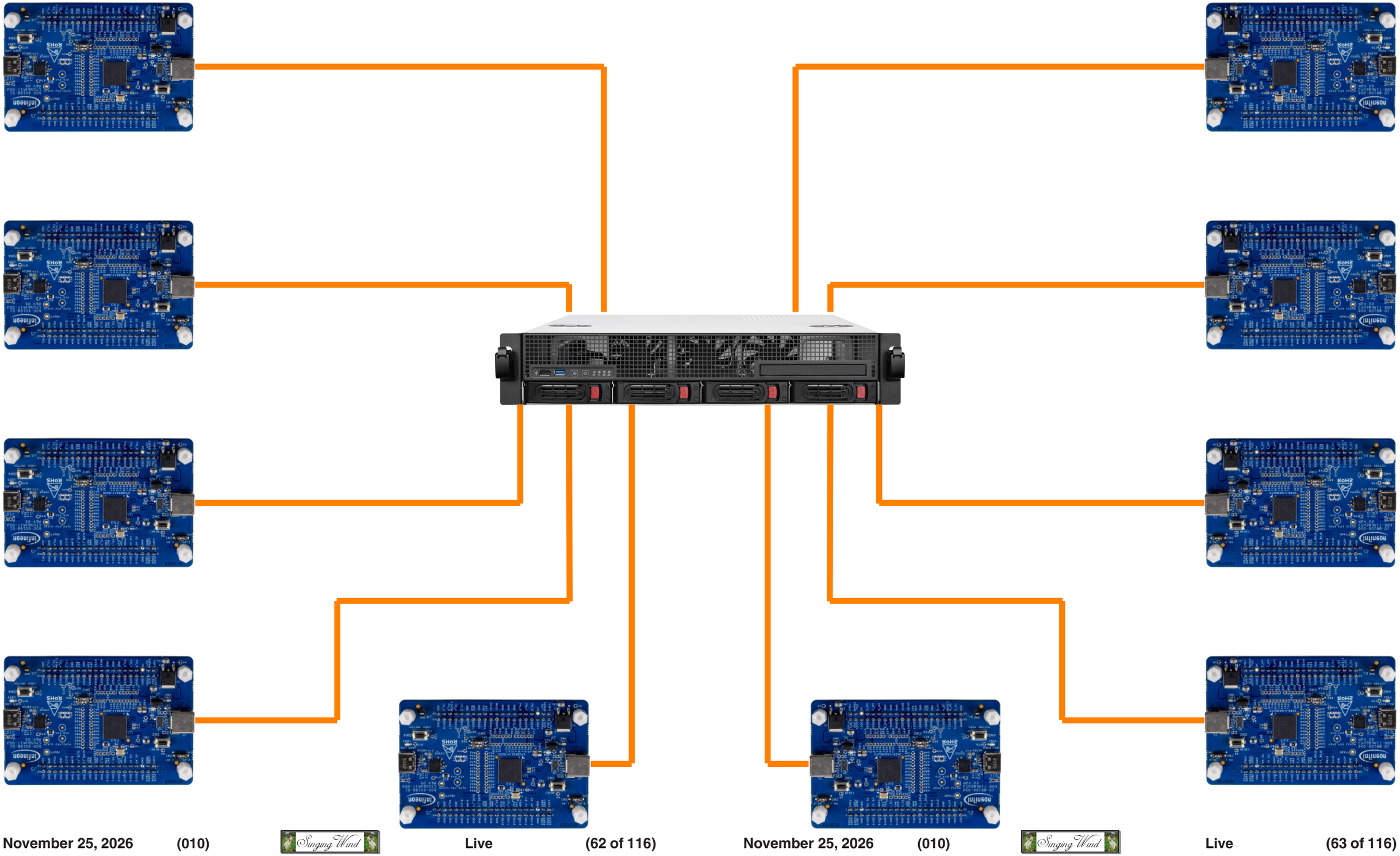
NO Digital Sigma/Delta - Delta/Sigma a.k.a DSD or DSP.

Full Scale is 0 - 200,000 plus Cycles per Second Line Level

100,000,000 / (200,000) = 500 32bit Direct Analog Signals
100,000,000 / (22,000) = 4,545 32bit Direct Analog Signals
100,000,000 / (10,000) = 10,000 32bit Direct Analog Signals
100,000,000 / (5,000) = 20,000 32bit Direct Analog Signals
100,000,000 / (1,000) =100,000 32bit Direct Analog Signals
(Cycles Per Second) per USB board

5 Fiber Optic lines on the Left, and 5 Fiber Optic lines on the Right feed 10 USB 5Ghz boards with 32bit D/A converters each. 400MBs X 8 Output is 3.2GBs and would require 50Gbe Internet.

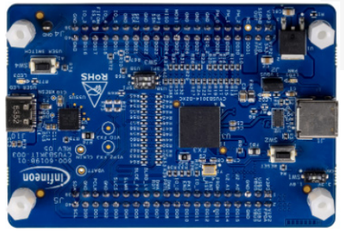
Singing Wind uses a file the size of a 1.44 Diskette to hold and transmit Years of ANALOG MUSIC and VIDEO.

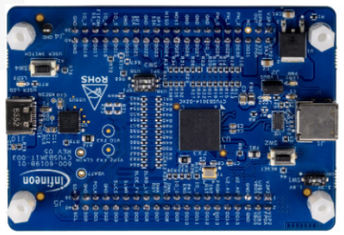


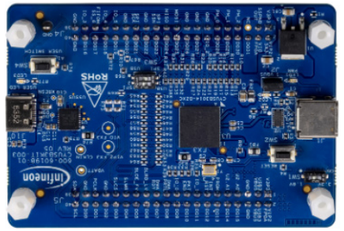


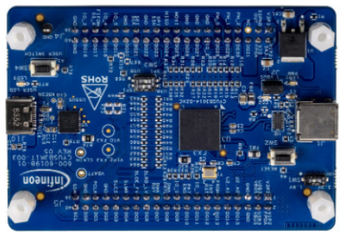


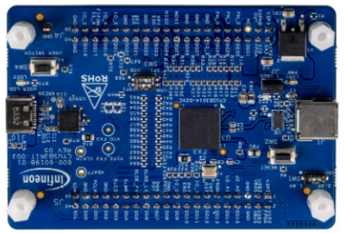


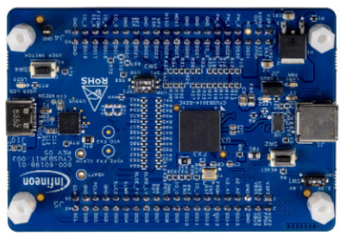


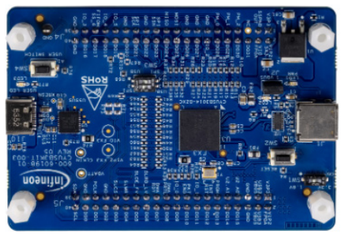


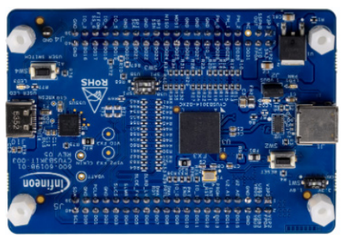


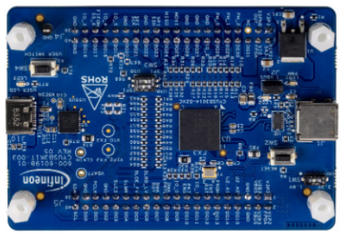


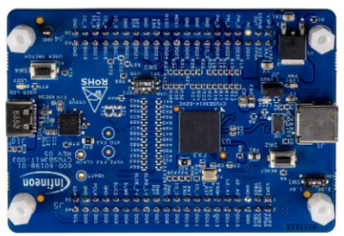








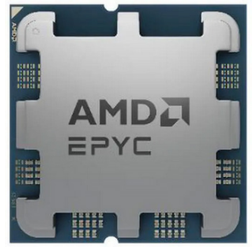




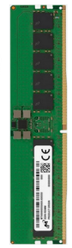


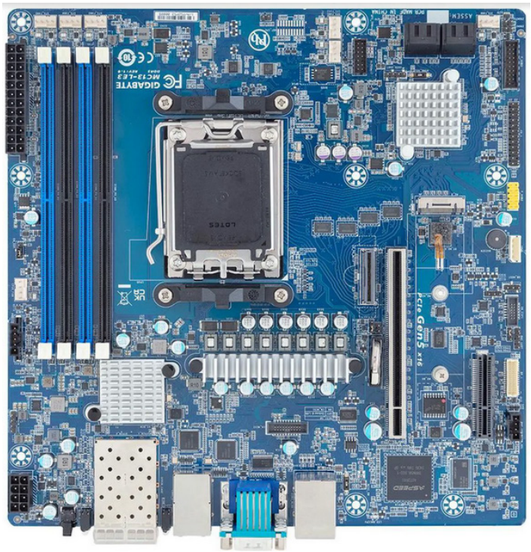














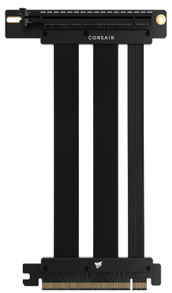




Singing Wind Vinyl Recording Studio

AMD EPYC 4585PX 16 Cores

16 Cores 2 QSFP 25GbE / 25GbE





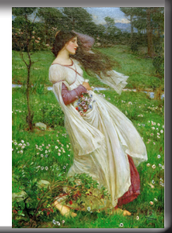








Singing Wind



Professional Vinyl Recording Studio

Ultimate Line Level compatible recording studio for Numerical Analog signals, and existing amplifier systems.

Modular and expandable up to 256 Left - 256 Right and more for a mix down to 1 Left - 1 Right.

The focus is on Numerical Analog and is always superior to any Digital Signal Processing possible, and can easily be converted into any Digital Signal Processing system because this is the source Analog signal itself.

This Numerical Analog system is superior to the vinyl lathe capability to cut details into the groove, and 100% repeatable.

With many music master tapes lost, worn out, and disintegrating, the Digital Signal Processing that has replaced it does not contain the playback performance of a true Analog signal, or the Analog signal has never been realized without Singing Wind. Existing audio systems are 2 Dimensional at best with the vague hope of some magical stereo illusion possible. Only the dedicated few seem to achieve this wonderment, as we mortals are left to wonder.

This system is the middle ground between low cost existing Line Level stereo, and multi-track Analog recordings, and the jump to Numerical Analog +100VDC -100VDC output without any amplifier system required.

If a 3D sound was there in the original recording created by a 2D microphone, then trying to bring that 3D sound back with any 2D system is a very problematic difficulty, and never fully realized. Not to mention all the 2D distortion effects introduced to create a 3D illusion.

Singing Wind has the ability to capture 3D sound numerically, and with microphones supported by the all the many Numerical Analog signals required to actually recreate the source harmonies, and effects in the real-time 3D atmosphere, instead of trying to recreate a illusion.

The physical systems are in place to recreate the original event, and not simply play back a recording.

The ability to "Burn Bits" means that there are systems inside of systems, and do not be fooled by the simple Numerical Analog signals per second. Many systems are behind each and every Numerical Analog signal per second and that is not possible with any Digital Signal Processing.

The business end means supporting Line Level systems as long as possible, with the direct migration to a much more economical Numerical Analog +100VDC -100VDC system.

The show boat 256 Left - 256 Right system is a demonstration unit to display the difference between Line Level and Numerical Analog +100VDC -100VDC.

This is a serious Professional Vinyl Recording Studio that will actually generate a True Analog signal for new Vinyl Records that exceeds any Digital Signal Processing.

Ironically the Vinyl Record is the best Analog signal carrier for the immediate future, until Numerical Analog +100VDC -100VDC without any amplifier becomes available.

Pages (68-73)

Professional Vinyl Recording Studio
8 full frequency Line Left + 8 full frequency Line Right
Possible LFE - Woofer - Mid - Tweeter Line sources
No crossover required
and/or used for 11.2 Surround Sound

Designed for Professional Recording of Vinyl Records

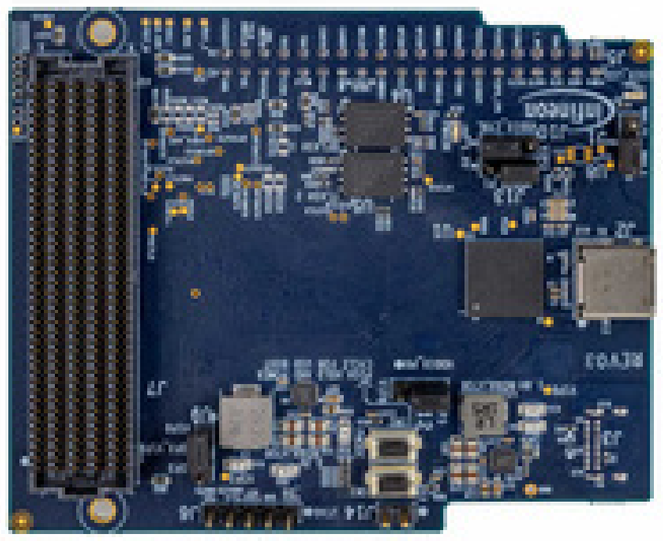
No Digital recording format delivers Direct Analog Output

One single 1.44 Diskette can easly store any Vinyl Record set with photos and video

One single 100GB BDXL M-DISC can store Millions of Vinyl Disc Recordings

Improvements and Repairs to Copies are supported in full Analog without Digital Signal Processing

16bit D/A HW Register + 16bit D/A HW Register - 000



USB 20Ghz is used in the Vinyl Recording Studio. Fiber Optic output is 400Mhz at 32bits creating two 16bit Digital to Analog converters. The two 16bit D/A converters work together to form a 32bit D/A DIRECT to standard Line Level analog signal for compatibility . Possible Phono Input also. No high frequency, or any filters, or capacitors are used.

One 32bit D/A converter per Fiber Optic USB converter board without R2R switching noise or expensive components.

400Mhz at 32bits is 1.6 Giga Bytes per Second. Every single bit is individual and unique. 400,000,000 individual and unique 32bit D/A conversions per second.

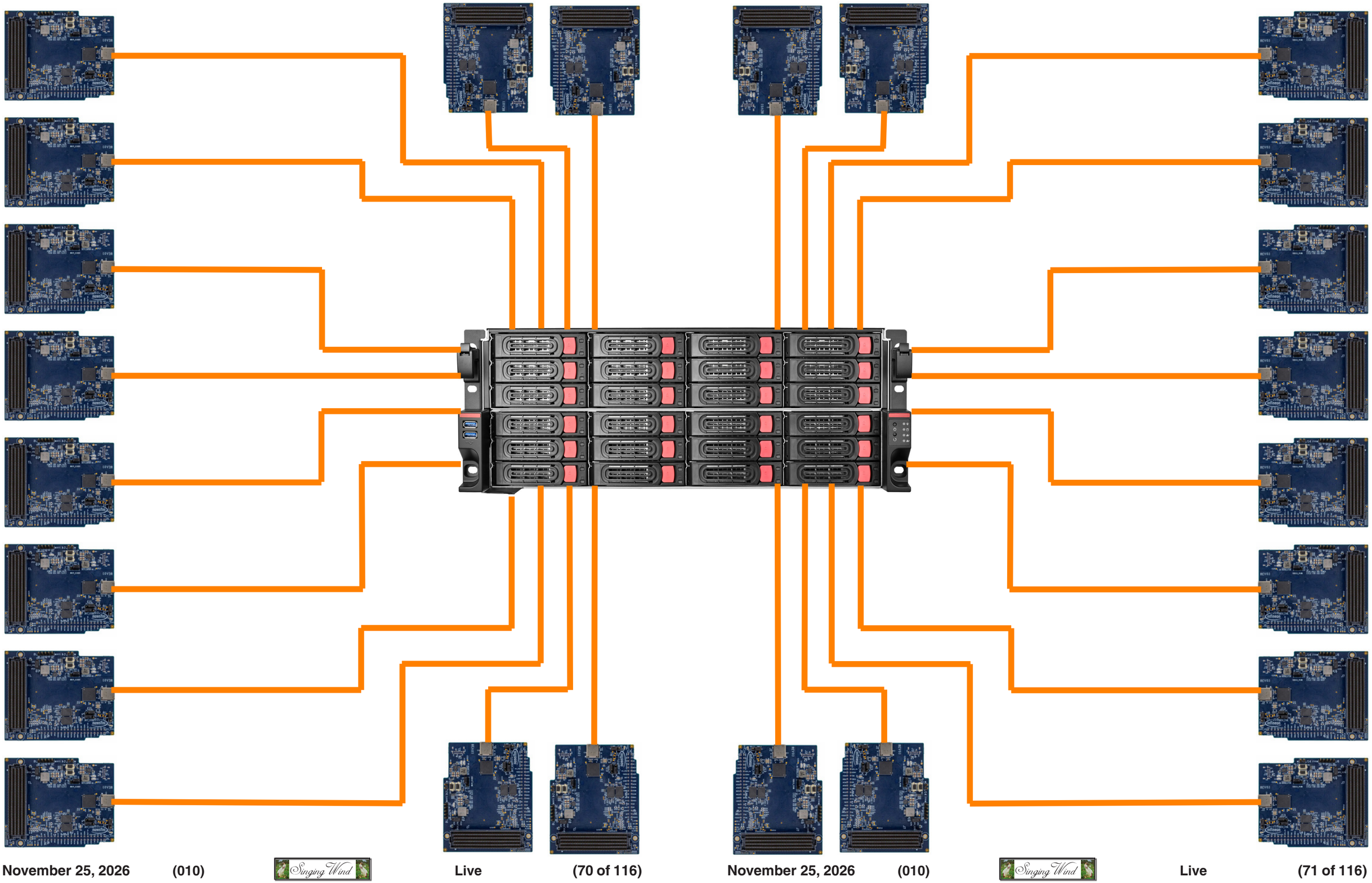
8 separate USB converter boards + 4 USB converter boards for Recording are typically used on the Left, and 8+4 on the Right for 24 separate USB converter boards.

NO Digital Sigma/Delta - Delta/Sigma a.k.a DSD or DSP. Full Scale is 0 - 800,000 plus Cycles per Second Line Level

400,000,000 / (800,000)= 500 32bit Direct Analog Signals
400,000,000 / (400,000)= 1000 32bit Direct Analog Signals
400,000,000 / (200,000)= 2000 32bit Direct Analog Signals
400,000,000 / (22,000) = 18,181 32bit Direct Analog Signals
400,000,000 / (10,000) = 40,000 32bit Direct Analog Signals
400,000,000 / (5,000) =80,000 32bit Direct Analog Signals
400,000,000 / (1,000) =400,000 32bit Direct Analog Signals
(Cycles Per Second) per USB board

12 Fiber Optic lines on the Left, and 12 Fiber Optic lines on the Right feed 24 USB 20Ghz boards with 32bit D/A converters each. 1.6 Giga Bytes per second X 24 Output is 38.4 Giga Bytes per second or 400Gbe Internet.

Singing Wind uses a file the size of a 1.44 Diskette to hold and transmit Years of ANALOG MUSIC and VIDEO.









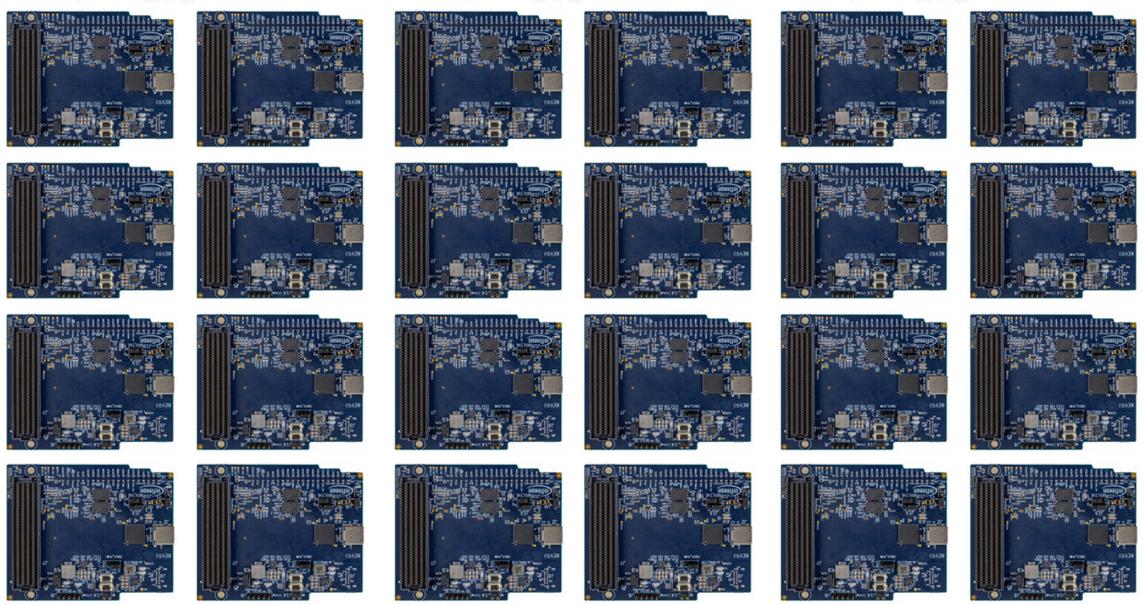








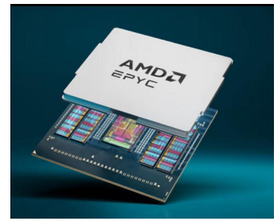


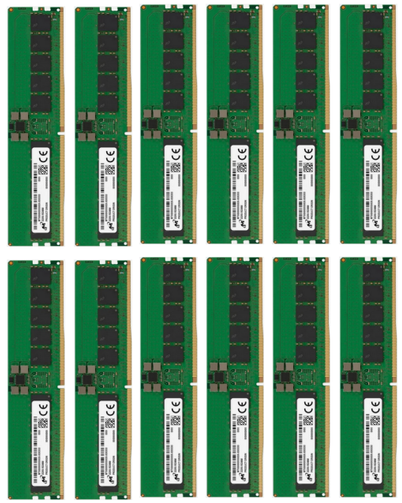


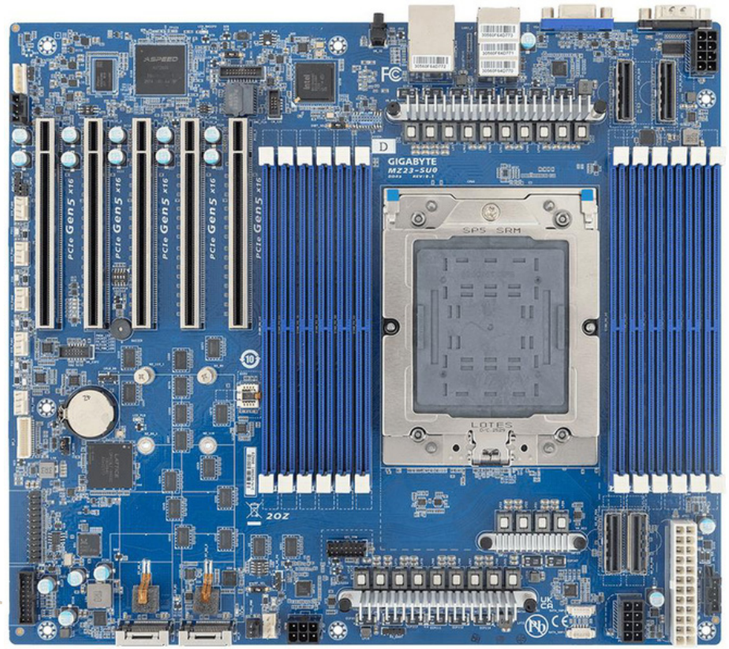
November 25, 2026 (010) Singing Wind Live (72 of 116)













Professional Vinyl Recording Studio

AMD EPYC 9965 192 Cores

2 QSFP 10GbE / 25GbE





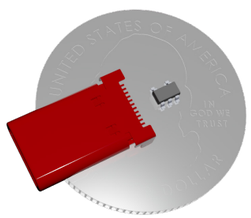
November 25, 2026 (010) Singing Wind Live (73 of 116)



256 Left - 256 Right

256 full frequency (Left) can be divided into (32) different 3Dimensional +100VDC to -100VDC driver outputs. Each of the (32) 3D drivers are used for X, Y, Z, Rot-X, Rot-Y, Rot-Z, Deflector 1, and Deflector 2. Every Driver is 32 unique bits each.

256 full frequency (Right) can be divided into (32) different 3Dimensional +100VDC to -100VDC driver outputs. Each of the 32 3D drivers are used for X, Y, Z, Rot-X, Rot-Y, Rot-Z, Deflector 1, and Deflector 2. Every Driver is 32 unique bits each.



Any length of full frequency, with any number of dimensions and channels can be stored on the Key Chain mass storage unit. Individual songs, Albums, and even Libraries. All Data is Keyed to individual customers.

Please see Pages (18-19)

Pages (76-81)

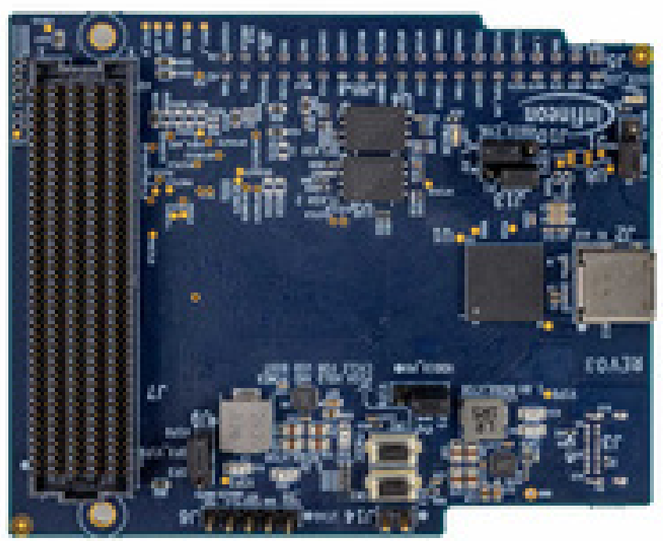
256 Left - 256 Right

USB 20Ghz is used in the 256Left - 256Right. Fiber Optic output is 400Mhz at 32bits divided by two in order to reduce the total electrical current for the 16 computers.

This creates 2 separate and unique 32bit D/A converters per 20Ghz USB converter board. Each 32bit D/A will have 200,000,000 32bit each. Each 32bit D/A is actually two separate 16bit D/A systems, unique and individual used together to produce one single 32bit D/A Numerical Analog signal.

An additional 64 USB 20Ghz boards are used on the Left, and 64 on the Right for Recording and Control of the Numerical Analog system.

16bit D/A HW Register + 16bit D/A HW Register - 001
16bit D/A HW Register + 16bit D/A HW Register - 000



No high frequency, or any filters, or capacitors are used. NO Digital Sigma/Delta - Delta/Sigma a.k.a DSD or DSP.

Both input for recording and output can be switched to either Line Level or Numerical Analog +100VDC -100VDC Direct Drive without any amplifiers involved. That is a major cost advantage compared to Line Level systems.

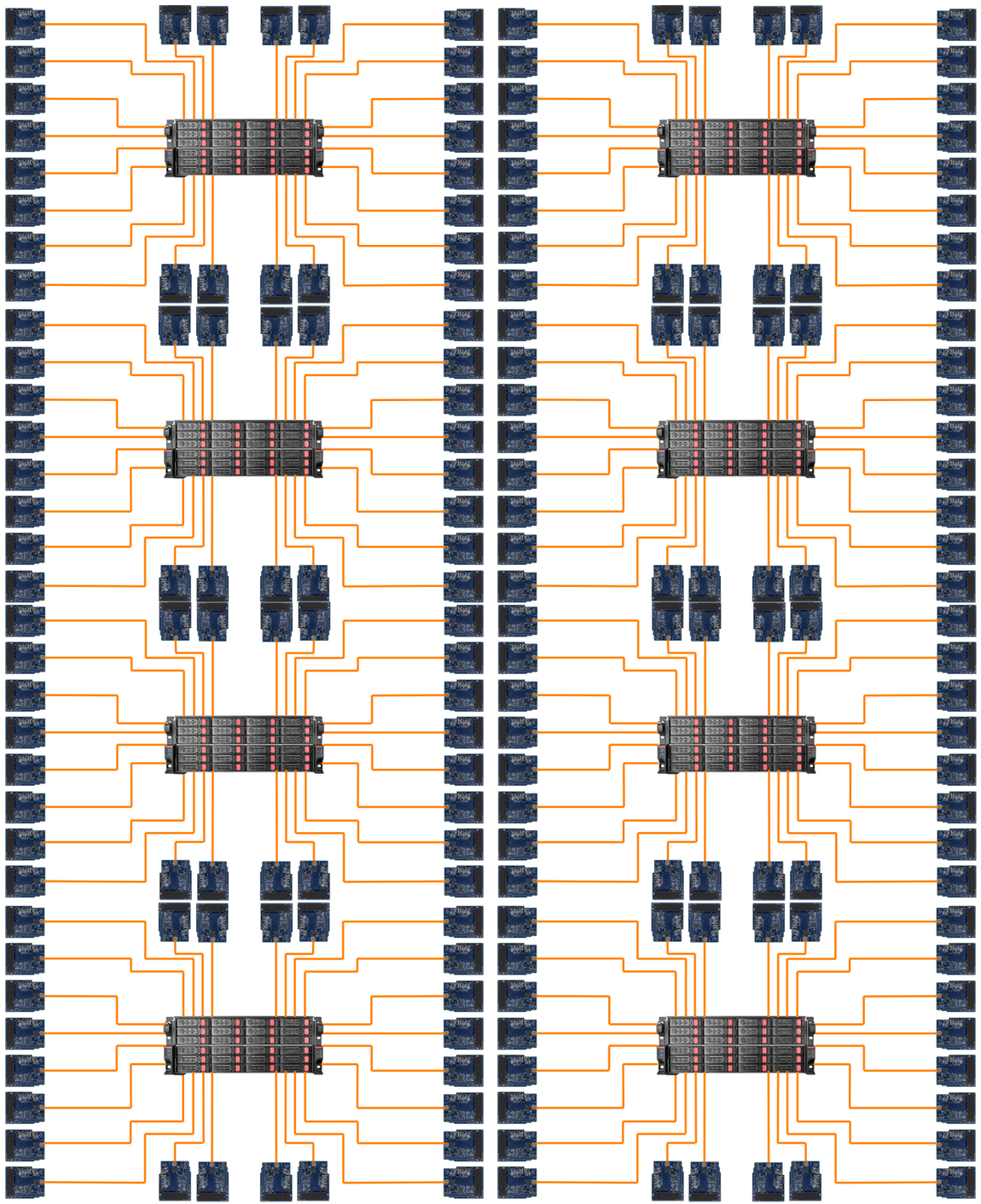
Full Scale is 0 - 800,000 plus Cycles per Second Line Level

200,000,000 / (800,000)= 250 32bit Direct Analog Signals
200,000,000 / (400,000)= 500 32bit Direct Analog Signals
200,000,000 / (200,000)= 1000 32bit Direct Analog Signals
200,000,000 / (22,000) = 9,090 32bit Direct Analog Signals
200,000,000 / (10,000) = 20,000 32bit Direct Analog Signals
200,000,000 / (5,000) =40,000 32bit Direct Analog Signals
200,000,000 / (1,000) 200,000 32bit Direct Analog Signals
(Cycles Per Second) per USB board

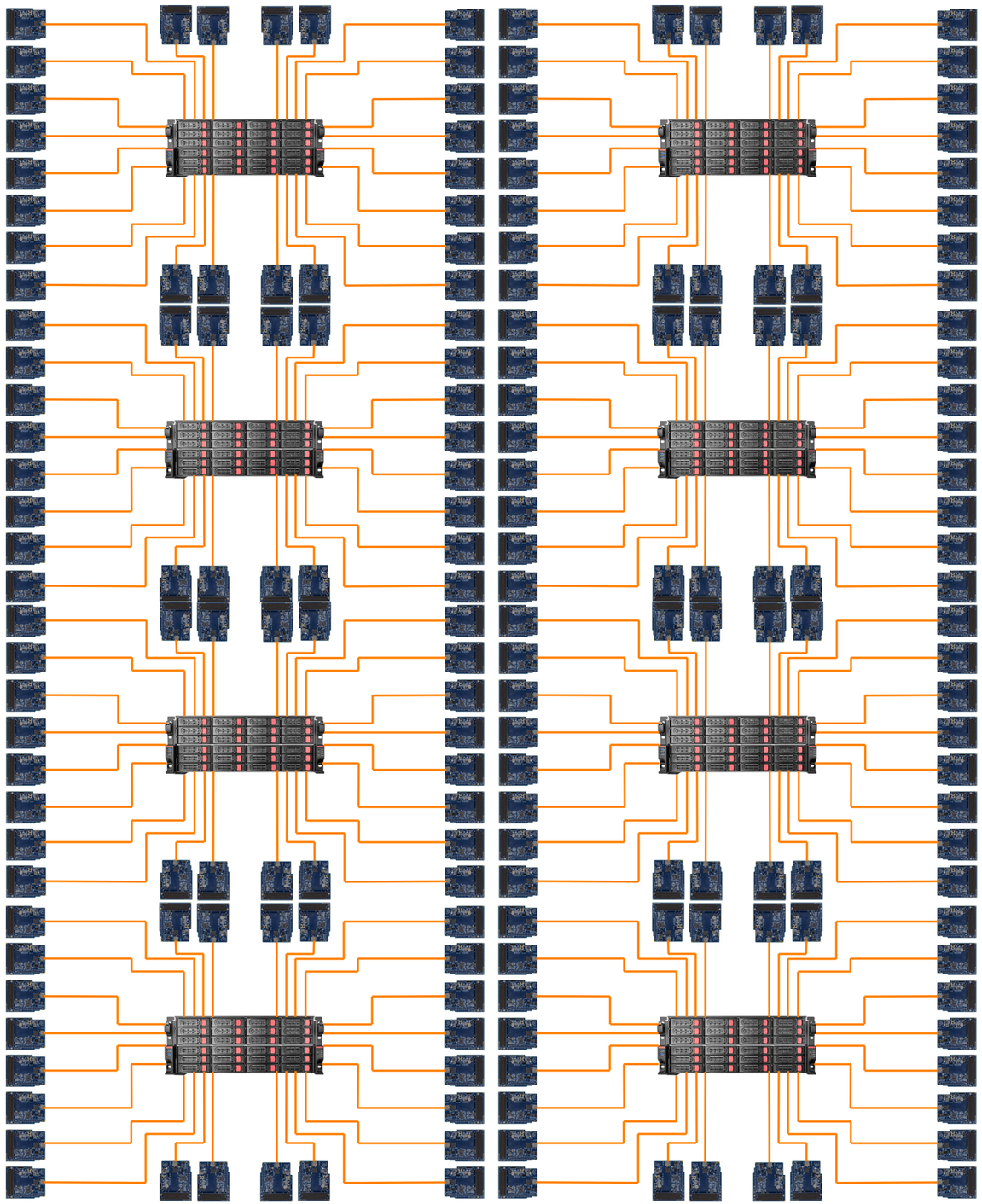
128 Fiber Optic lines on the Left, and 128 Fiber Optic lines on the Right feed 256 USB 20Ghz boards with 32bit D/A converters each. 1.6 Giga Bytes per second X 256 Output is 409.6 Giga Bytes per second or 800Gbe Internet.

Singing Wind uses a file the size of a 1.44 Diskette to hold and transmit Years of ANALOG MUSIC and VIDEO.

256 Left



256 Right









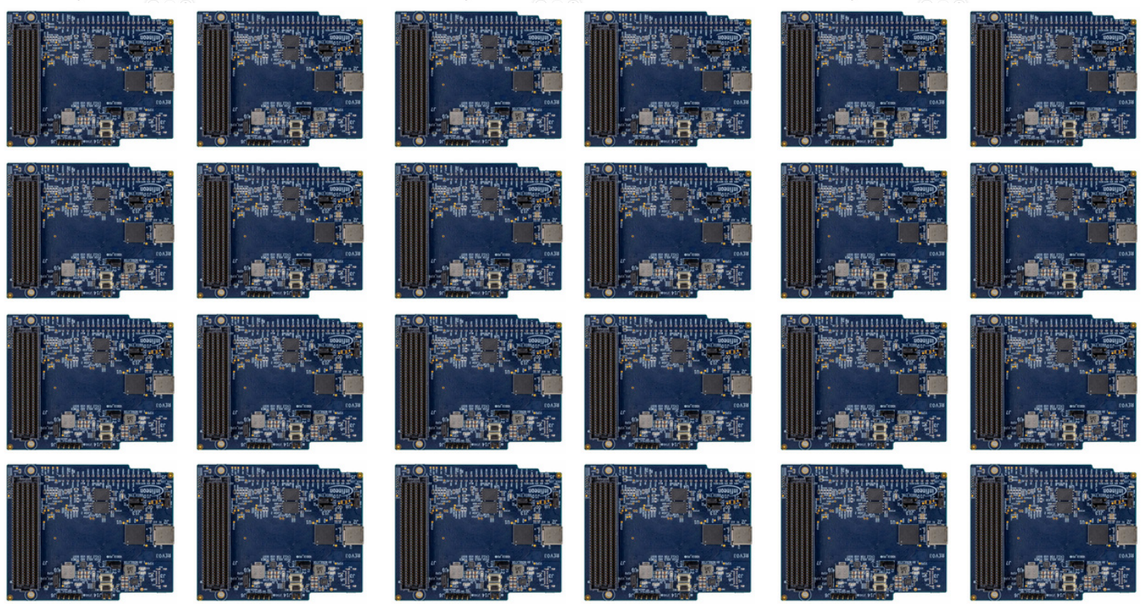








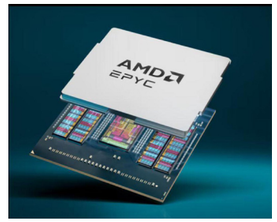


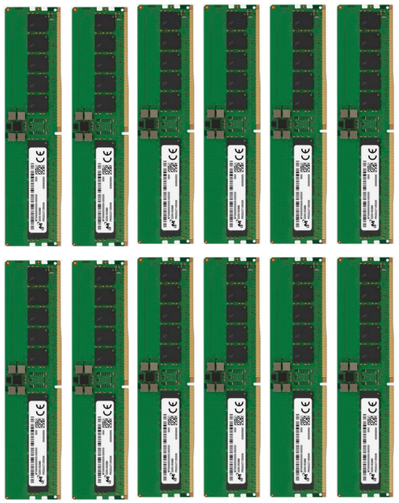


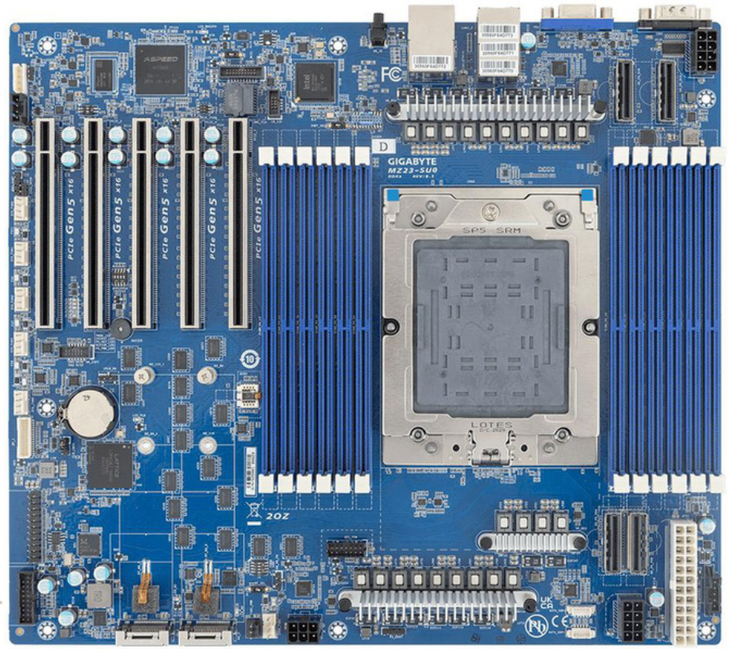
November 25, 2026 (001) Singing Wind (HW-Theory) (80 of 116)













Professional Vinyl Recording Studio

AMD EPYC 9965 192 Cores (Repeated X 16)

2 QSFP 10GbE / 25GbE





November 25, 2026 (001) Singing Wind (HW-Theory) (81 of 116)

Oversimplified Two Page Introduction

Critical electronic components for final product will not be available for purchase until first half of 2025. Prototype and preproduction is possible with a small performance derating. Even then it may be more of a cost derating.

Numerical Analog Music: Starting with eight (8) multiple full frequency source channels on the left, and eight (8) multiple full frequency source channels on the right. Full frequency is 0 - 1,000,000 analog cycles per second, with 5 nano second resolution. This provides conversion of 2 channel stereo to 8 left, and 8 right full frequency channels, and a separate channel for each transducer. Sub-woofer, woofer, midrange, and tweeter. Possibly 4 left, and 4 right for ambient, or special effects. All achieved without Digital Signal Processing.

No Amplifiers, No Filters, No Digital Signal Processing, No Signal Capacitors, No Rails, NOS = No Oversampling - Unlimited 200 Volt Source Pure Analog Music

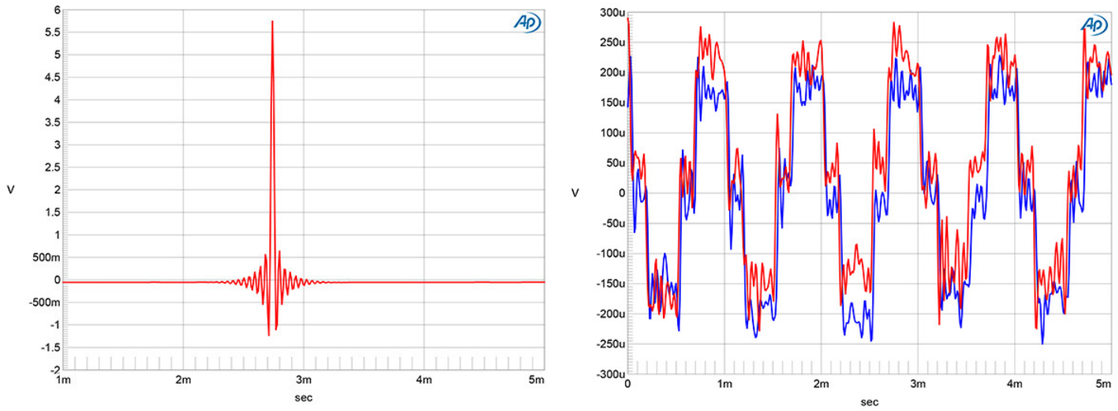
Once foundation components for 8L and 8R are achieved, multiple 8L and 8R system cost can be very low.

The Singing Wind product may begin as a Indiegogo product, targeting vinyl record recording for generational salvage of original music, and master tapes to replace DSD [1] in analog recording. The DSD Langoliers are closing in on original analog music, and old recordings are disintegrating. DSD is improving, however can never achieve 1/1, and will always have a digital heart and soul, with DSP noise filters galore.

While Singing Wind is capable of replacing existing amplifiers, and most existing music equipment, it is a very simple look down interface to integrate existing music equipment. Eventually the Singing Wind will support thousands of full frequency channels per speaker station, starting with up to sixty four thousand (64,000) music and movie channels supported by the special CargoBit integrated product. Multiple hours of music stored on a single Blu-Ray Disc 128GB, or downloaded from Internet in 128GB file size.

The multiple full frequency channels are necessary to achieve Instrument Quality.

The Singing Wind prototype with a dedicated state machine computer system, and fiber optics is designed to cost $5,000.00 to $10,000.00 (TBD) with Dealer support extra. A unique once in a lifetime transferable license for recording studios is included with initial production prototype systems investment only.



Some of the Real Consequences of Digital Music and DSP

[1] H. Inose, Y. Yasuda and J. Marakami, "A telemetering system by code modulation, delta-sigma modulation," IRE Trans. on Space, Electronics and Telemetry, SET-8, pp. 204-209, Sept. 1962

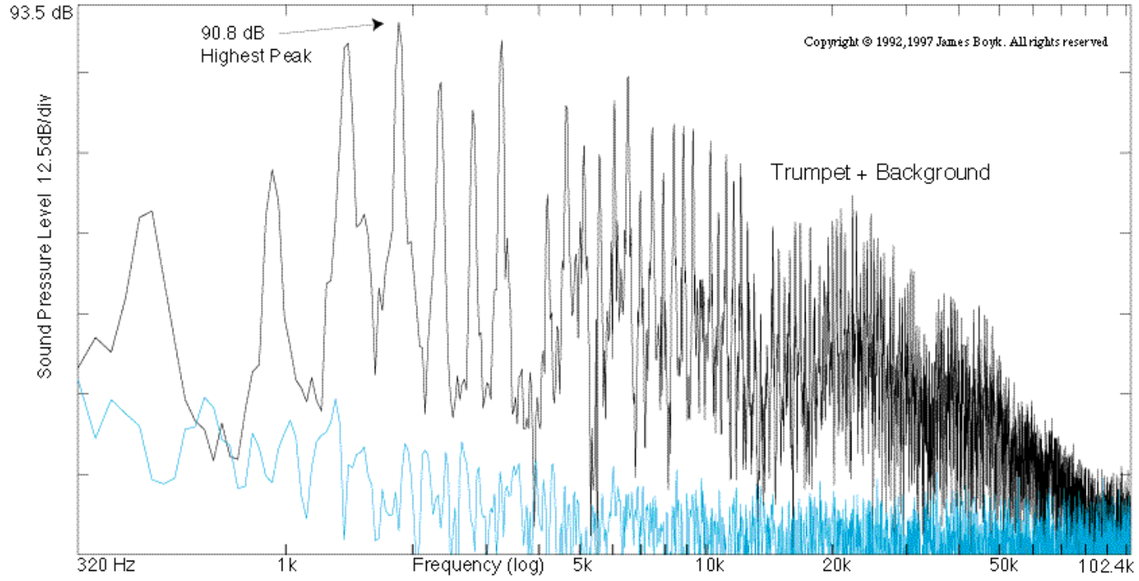


Figure 1(a) (Amplitude ≈ frequency). **Trumpet with Harmon mute**; 95.5 dB at Aco 7016 microphone 4 feet away. Microphone aimed at bell, which was angled down about 20 degrees. Upper Trace: Trumpet + Background, corrected to 70 kHz (see text). Lower trace: Background alone.

There's Life Above 20 Kilohertz!
A Survey of Musical Instrument Spectra to 102.4 KHz

James Boyk
California Institute of Technology
Music Lab, 0-51 Caltech, Pasadena, CA 91125, USA Tel: +626 395-4590, E-mail: boyk@caltech.edu Home: http://www.cco.caltech.edu/~musiclab
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Paper by California Institue of Technology available from above location.

This chart clearly shows musical instrument atmospheric modulation exceeding 100,000 cycles per second. The Singing Wind audio signal supports 1,000,000 cycles per second pure Analog.



Singing Wind is both the consumer product, and commercial recording studio product that will have the missing elementary details required for a true living numerical analog musical signal. The Numerical Analog Computer (NAC) is used in Singing Wind. No Digital to Analog converters. No filters, no preamps, no multiple staged amplifiers, no signal wires, no crossover filters, in Digital or Analog form anywhere almost ever. Analog music in, Analog music out. Lossless and 100% repeatable Analog music always.

Singing Wind starts with a dedicated hardware AMD EPYC computer that is a secure state machine supporting the CargoBit Numerical Analog Computer (NAC) music component. Fiber optic cables allow remote location from the Analog music modulators for economic cooling. The secure computer is not accessible directly, and supported by the application programming interface to the home system control panel used by the customer.

Singing Wind is a flexible format ***starting at*** 4GBs (4 billion bytes per second), over 4 separate 10Gbs Fiber optic cables with 8 Left and 8 Right for 16 NAC channels minimum starting configuration. This data rate supports no crossovers, and no rails for +100vdc to -100vdc NAC Analog source signal.

This starting configuration is 14.4TB (Tera Bytes per Hour). That will easily fit onto a 128GB Blu-Ray disc, or download file size with the Singing Wind CargoBit secure state machine. Thousands and thousands of channels at much higher bit rates are supported by the Singing Wind CargoBit secure state machine to fit onto one single 128GB Blu-Ray disc, or download file size.

The Singing Wind CargoBit secure state machine can be custom to each and every different home installation, including all third party electronics involved. The factory Data Center will handle the myriad of subtle differences for content delivery by licensed commercial recording studios for every installation. For example the bit depth alone will range from 1 to 64 bits per 200 million transfers per second per single channel in a system with thousands of channels of NAC music. Other features such as no rails and others also increase file size. This creates very large files that are still capable of one to two hours on a 128GB Blu-Ray disc, or download file size. Custom hardware is supported. Any transfer of data is not practical without the Singing Wind CargoBit secure state machine.

The Singing Wind CargoBit secure state machine will only work with music generated by licensed studio creators. Data Center products with CargoBit and FTLDCI support data subspace conversion for everything else. Home recording for a personal archive is supported, however legal licensing is required for transfer to any other Singing Wind CargoBit secure state machine for playback.

Singing Wind is designed to support third party hardware for everything except the Singing Wind CargoBit secure state machine.

Current high performance music systems are Dead On Arrival, by the sourced music signal. Both Analog and Digital source music signals prior to amplification by multiple stage amplifiers, are limited to low voltage integrated circuits, and small signal low noise transistors.

The Analog Kuzma CAR-60 MC moving coil diamond cantilever and micro ridge stylus cartridge for vinyl recording playback costing $18,200.00 generates about 0.0003 volt output, that is far too small for any general purpose amplifier, and must have a preamplifier usually with hand wound transformers, and hand made filters.

The Digital integrated circuits sometimes have a dedicated 5VDC for analog circuitry only, and more common is the 3.3VDC or less. The typical low current output must be converted to amplified voltage at the output pin. These IC's almost always contain massive amounts of Digital Signal Processing with Digital Filters that excel in preringing distortion, or noise that starts even before the signal begins because of all the Digital Signal Processing.

To add insult to injury, the same stereo signal Digital or Analog is used in all low cost playback devices, up to complex ultra high end music systems. Typically the ultra high end music systems consist of very expensive perfected materials that achieve a higher performance, with ultimately diminishing returns.

All of these low level source signals must be amplified, and possibly isolated transformer filtered before ever reaching the first stage of power amplification for driving the speakers. Great amounts of DSP (Digital Signal Processing) or analog signal processing have already occurred, and much more processing is required to drive the speaker outputs. Even when the left and right signals are ready, more DSP or Analog filters are necessary to separate the signal into different frequency ranges for tweeter, mid-range, woofer, and sub-woofer speakers. Eventually the left and right signals are now six to eight separated signals, that must be phase aligned, or more distortion will occur.

Even in a modest high performance music system, each stage involved is usually hundreds of dollars each, and probably more like tens of thousands each.

Singing Wind music system is targeted for less than tens of thousands each stage, not millions of dollars total, and the primary target is a consumer market. The performance will exceed the most expensive conventional high performance music system possible with stereo signals. The Singing Wind Home Theater System is a simple multiple of Singing Wind stereo music system components, possibly in smaller configurations for multiple positions.

Thousands of full frequency (0 - over 1,000,000 cycles per second) independent channels with analog amplifiers on the left, and Thousands of full frequency (0 - over 1,000,000 cycles per second) independent channels with analog amplifiers on the Right is where the Singing Wind consumer product begins. Earphones and Movie configurations are also supported as options.

Because no filters are used anywhere, the different frequency range speakers have their own separate channel with analog power amplifier each, and no crossover system of any kind anywhere. No preringing or post ringing anywhere, along with no filter slur, meshing, artifacts, or signal distortion of any kind is used or allowed.

No Digital Signal Processing (DSP) of any kind is used anywhere, with no Digital logic used in the Analog signal chain. The Numerical Analog Computer does all of the signal processing.

Thousands of complete full frequency (0 - over 1,000,000 cycles per second) independent channels with analog drivers on the left, and thousands on the right provide the missing information to the left and right channels of existing stereo systems. Along with the superior Analog performance of each single channel compared to the most expensive systems money can buy. Singing Wind speakers are in R&D now.

The full dedicated 4 wire 20, 30, 40, or 50 amps of a 220volt single phase home circuit breaker is required for the typical Singing Wind consumer stereo product. Obviously more channels require more amperage. Multiple circuit breakers will be required for a large home movie speaker installations. This is an intermittent maximum load only, and not a constant duty cycle electrical power load.

Multiple home dedicated 15A 110vac circuit breakers can be combined with a third party inverter product to create a 220vac single phase 4 wire outlet for Singing Wind.

C'est la vie - ELP

We all know what Digital Music is because we almost have no choice in our lives anymore. Analog has been usurped by Digital in almost every consumer product available for music. Even vinyl records now include some form of Digital processing, and even original master tape recordings from decades ago are now archived with Direct Stream Digital (DSD) format. Until Singing Wind, no good Analog music archive format existed.

In 1968, Analog music was alive and dancing. It was everywhere because Digital music had not arrived yet. The noise, distortion and limited dynamic range were tolerated because the continuous living signal was getting through. Now we have discontinuous dead chopped up little sushi bits of a music signal filtered to operating room sterilization levels that while technically almost perfect, miss something. Not to mention quality lyrics, or melody.

The best recordings, or 3D computer generation of piano, or any complex sound are both destroyed by their 2D audio signal format. Then the 2D audio signal format is limited by the 2D speaker. The argument as to how this is accomplished takes the form of thousands, and thousands of different physical products in the audio market.

It is not possible to hear a real piano over any audio recording device. This is why the term 'that sounds like' is everywhere, vs 'that is' referring to Instrument Quality. Close to a piano it is possible to feel the music, and that never happens to any accuracy with any existing audio format. Best possible 'sound' is in a 'sweet spot' only.

It was necessary for me to purchase a real piano just for experimentation. No recording or signal generator can reproduce the complex physical interactions. Of course numerical physical simulation is now practical, however no current audio format will support the degree of difficulty necessary. Singing Wind is a new audio format designed to support complex acoustic atmospheric modulation, that is not simply more of the same.

Digital anything is a converted Analog anything. Digital memory in all computers are Analog representations converted to Digital. All Digital storage is simply Analog representations converted to Digital. Digital music is simply continuous Analog music chopped up into little discontinuous sushi bits, and when put back into the water, the fish is dead.

Real living, and dancing music is ever changing complex atmospheric constructions that come and go, over here, and over there. This music is very human perceptible, and easily generated by standing next to a real piano, then recording the piano, and trying with the best audio equipment in the world to have the same experience. It is not possible. The subtle information necessary for recreation was not acknowledged to even exist, only recorded now and then by an accidental incidence.

Moving the microphone anywhere near a piano will change the sound recorded. Clearly these are not just sine waves combining together in a spherical atmospheric pressure wave demonstrated with a laboratory sine wave repeating oscillator sound generator. Obviously this complex system can not be recreated with a single signal source channel driving paper cones moving back and forth the way current stereo music is recorded.

Current Analog and Digital music is a plane wave projection by paper cones moving back and forth, that hopes to recreate some as-semblance of a depth of field. It is believed that the microphone picks up everything, or the Digital music effects generation will create a depth of field. The subtle information was never recorded, nor electronic music generated to contain the critical missing elements contained in Singing Wind.

Like the image on page **(NN)**, music playback of any kind has been limited to creating ripples on a pond with a stone, or multiple stones and having the ripples interact in a positive way hopefully, sometimes. Also the exact same music source signals (CD, Vinyl Record, Internet Stream) are used with a low cost stereo, and a multi million dollar stereo system.

Singing Wind can have thousands of full dynamic range source signals on the left, and thousands of full dynamic range source signals on the right. These thousands of full range source signals are used to construct multi dimensional atmospheric modulations that can not be recorded with current microphones, computer generated, or played back on any stereo system in existence.

Singing Wind is engineered to cost less than most medium, and all high end stereo systems. Singing Wind is affordable in quantity for multi speaker location movie sound. Singing Wind is compatible with existing music signals, although most of the critical information needed is missing with existing music recording formats of any kind. Singing Wind can be used to archive any existing Analog magnetic tapes, and vinyl record music source.

Most serious medium home stereo music systems begin at $5,000 to $10,000. Then small pieces of a single system begin to cost over $10,000 each, and go up quickly. Many professionals will hand the audio dealer $15,000, and ask them to put together the best system for that amount. Other professionals will spend many years studying what is possible, mix and match until they are satisfied with what they could afford. This is the audio dealer customer that ranges between medium, and ultra high end audio.

Singing Wind is designed to perform easily above the famous $2,000,000 million dollar audio system, and any ultra-high end audio system that money can buy. Power wattage can be built up in modules of 8X8 if desired, with little to no changes required to the lowest cost Singing Wind music system.

Singing Wind has the subtle detailed information required, with Analog generation that no other music system in the world has, that will project the sound construction forward similar to a piano, or most all musical instruments into a sound stage that can not exist without the critical information necessary that is supported by Singing Wind.

Singing Wind has broken the task necessary for each audio channel into possibly thousands of different full range Analog information sources that take all the stress away from the individual thousands of speaker actuators. This reduces the high performance materials required by exotic audio manufactures, and reduces the price performance point dramatically.

Most high end audio equipment use extreme exotic, and expensive materials that will allow their speakers to get the most possible from their limited left and right channel information available. Cones or planes moving back and forth only create ripples in the atmosphere. Singing Wind is designed to support new actuators that are more than simple speakers based on technology of over one hundred years ago, and climbing toward two hundred.

Thousands of left, and thousands of right channels are not simply the same thing with small changes each. The initial market will be supported by a dramatic difference between Singing Wind and all other music systems running the same single left and single right source material of everything in 2025. Special custom artist recordings will fill the gap, and custom movie soundtracks are immediately possible. After that all music can be available in Singing Wind format. We are living in a multi decade Digital audio dead end now, only getting worse.

Singing Wind will store original master tapes or vinyl recordings in a pure Analog no rail 200 volt direct current source signal. Because of the Singing Wind Numerical Analog Computer (NAC), no separate Digital conversion of any kind, A/D, or D/A is necessary.

Conventional computer storage is used by the NAC with a minimum conversion necessary. The Singing Wind NAC has all the benefits of Digital, without being Digital Signal Processing. Once the original master tape, or vinyl record has been stored with the Singing Wind Studio Numerical Analog Computer, it will never have to be played again. The Singing Wind Studio recording can be edited by a NAC workstation without disturbing the original in any way, shape, or form after initial read. Singing Wind supports the mixing, and editing if desired by the owner.

The early 1980's ever loving brick wall filter of 22,500 cycles per second CD music, said because humans can not hear it anyway. Filters, amplifiers, rail slamming loudness wars everywhere also was just the beginning of their Digital music.

The consumer version of Singing Wind is rated at over 1,000,000 cycles per second Analog playback. Original Singing Wind format NAC music will be sent to the consumer with full studio 1,000,000 cycles per second Analog information. Cycles per second is the actual Analog cycle compared to samples per second for Digital signal Processing which is only small pieces of a cycle. Obviously this is for the electronic signal recording distortion from vinyl record players, or magnetic tapes that are decades old, and enhanced signal integrity quality for new recordings. This far exceeds the atmospheric modulation requirement, however it is also used in studio, and factory prototype NAC signal processing without consumer knowledge.

Tape and vinyl records are pure Analog with serious flaws. Limited dynamic range, a vulnerable storage medium, perfect repeatability is difficult, and minute physics are involved, meaning expensive precision alignment is required.

Singing Wind is designed to eliminate the micro-physics of the past, replacing them with the NAC. Where minute detail was stored in micro-grooves in vinyl, or changing magnetic domains on tape the NAC works with a very real 200 vdc that continues up and down without rails continuous to well below, or above the physical dimensions of the past. The NAC continues well beyond the immediate 200 vdc available, and although not practical, could store and play back the micro-physics if desired.

The minute detail once desired is now zoomed into multiple 200 vdc working range without rails from top to bottom. Mixing and master can now decide if the musical instrument key press sound is important or not, and include it into the completed single 200 vdc final mix playback. Or the original master is sent out, and the customer can play with it.

Analog Data Storage that has to be converted to Digital. Some current technologies are:
RAM, Hardware cache, CPU cache, Scratchpad memory, DRAM, eDRAM, SDRAM, SGRAM, LPDDR, DRSRAM, EDO DRAM, XDR DRAM, RDRAM, SDRAM, DDR, GDDR, HBM, SRAM, 1T-SRAM, ReRAM, QRAM, Content-addressable memory (CAM), VRAM, Dual-ported RAM, Video RAM (dual-ported DRAM), Linear Tape-Open, Hard disk drive, Optical, 3D optical data storage, Optical disc, LaserDisc, Compact Disc Digital Audio (CDDA), CD, CD-Video, CD-R, CD-RW, Video CD, Super Video CD, Mini CD, Nintendo optical discs, CD-ROM, Hyper CD-ROM, DVD, DVD+R, DVD Video, DVD card, DVD-RAM, MiniDVD, HD DVD, Blu-ray, Ultra HD Blu-ray, Holographic Versatile Disc, WORM, CBRAM, Racetrack memory, NRAM, Millipede memory, ECRAM, Patterned media, Holographic data storage, Electronic quantum holography, 5D optical data storage, DNA digital data storage, Universal memory, Time crystal, Quantum memory, NVRAM, Memistor, Memristor, PCM (3D XPoint), MRAM, Electrochemical RAM (ECRAM), Nano-RAM, CBRAM, Early stage NVRAM, FeRAM, ReRAM, FeFET memory, ROM, MROM, PROM, EPROM, EEPROM, ROM cartridge, Solid-state storage (SSS), Solid-state drive (SSD), NVME, Solid-state hybrid drive (SSHD), USB flash drive, IBM FlashSystem, Flash Core Module, Memory card, Memory Stick, CompactFlash, PC Card, MultiMediaCard, SD card, SIM card, SmartMedia, Universal Flash Storage, SxS, MicroP2, XQD card, and Programmable metallization cell, just to name a few. The Binary Digit or bit is also Analog.

No Amplifiers, No Filters, No Digital, No Signal Capacitors, No Rails
NOS = No Oversampling - Unlimited 200 Volt Pure Analog Music

No Amplifiers

It would seem easy to simply use 512 Digital stereo music chips on the left, with another 512 Digital stereo music chips on the right for 1,024X1,024. These integrated circuits are somewhat expensive each, require great care with precision components. Each one is completely Digital from input to a miniature minute current output that then has to be converted into voltage and amplified to even reach audio line specifications of 2 volt peak to peak line voltage. Most IC Digital music chips work with 0-1.5vdc, 0-3.3vdc, and possible 0-5vdc only. The output signal from the chip has to be amplified to reach the first stage of the power amplifier. The circuitry of the IC music chip can only work within the voltages it has, and it is a lone way away from unlimited 200 volt pure Analog, where Singing Wind starts at.

The Digital operations inside of a music chip are terrible, then all of the Digital filters necessary to mask out, or the magical Digital noise shaping, usually has some residual mystery something that was not there in the first place left over as a free gift from hell.

Every single electronic component has its own imperfections, and when combined with other components these can lead to a distortion from the perfect theory that led to the electronic model of the universe. Music Integrated Circuits are full of components that add up in imperfections. Then the end result of this complex Digital Signal Process is magnified with another source of distortion, the amplifier. Eventually the minute signal coming out of the Digital music chip will make its way to driving the paper cone back and forth, after magnitudes of amplification stages of both current and voltage.

No Filters

Singing Wind native signal source both recorded and played back is a pure Analog +100 volt direct current to -100 volt direct current. It starts with the recording, and is recalled for playback in +100vdc and -100vdc without any amplification or Digital music chips necessary. Also NO FILTERS are used in the Singing Wind music signal from beginning to end, either Digital Filters, or Analog Filters.

Once recorded in Singing Wind music format, the Digitally data stored music can be mixed, edited and modified in any way, shape, or form outside of Singing Wind. New filters and sound modification outside of Singing Wind can be similar to the old Analog gear used in recording studios. New Digital music modifications are possible without DSP, or any type of FFT system. Of course conventional DAW systems can work, however expect conventional DAW system results. All filters inside of Singing Wind are forbidden.

All speaker systems now use filters of some kind, active or passive to separate the different frequency's for the tweeter, midrange, woofer, and sub. The one single music signal line of left and right are further distorted after output from the amplifier. Filters are almost everywhere in current audio technologies. We are told they do minimal, or no damage to the signal.

Singing Wind uses separate full range channels to support different frequency speakers, so no filters are required in any way, shape, or form.

All Music recording systems have electronic filters

Electronic filters are used in Music recording systems from beginning to end. Usually to reduce noise, and control frequency application in the electronic Music signal. Ubiquitous in the Music signal chain, and sometimes multiple filters are found in each of the different major components used in the recording, and playback of both Analog Music and Digital Music. Electronic power filters, and low frequency filters have no real effect on complex Music signals, as long as the Music signal does not have to go through them.

Since the limitation of Analog and Digital Music recording are well documented, and most extremely successful Music recordings have been a creation of sound, rather than a pure recording of sound, subtlety and nuance become a luxury that get into the way of the complete creation of sound. Loudness wars are alive and well.

The sincere recording studios that want to make accurate live Music recordings are limited by the specific Music recording technology applied. Almost certainly electronic filters are a primary component to that Music recording technology, and media distribution whatever it is.

Analog electronic filters for Music

In Analog Music the electronic filters are used primarily on the Music signal itself as it travels from gain stage, to gain stage picking up electronic noise from all the different components, and then finally through the crossover frequency filter in the speakers, with maybe another filter with the amplifier in amplified speakers. The Analog Music filters seem to have a dampening effect to clarity and detail.

Analog Music is well known for a loss if signal integrity when one recording is made of a previous recording with or without a microphone involved. Each sequential recording is a copy of the newly made previous recording. Some number of copies later, the subtlety and nuance are murdered, and the Music is almost not recognizable.

Analog Music has the potential for Digital Music replication if the groves in a vinyl recording could be manufactured in mass quantity, or the magnetic domains of tape could be manufactured in mass quantity. Numerical Analog can be manufactured in mass quantity, is used in Singing Wind, and does not have any loss of signal integrity, subtlety, or nuance.

Digital electronic filters for Music

In Digital Music the electronic filters are used primarily on the digital format itself, as the Digital Music does not pick up noise as it travels through all the different components, depending on what the components are. However the Digital electronic filters required by the Digital Music format just for delivery are devastation to Music signal integrity. The Digital Music filters seem to smear and create artifacts with a dampening effect to clarity and detail.

Digital Music electronic filters, especially Digital Signal Processing are always an approximation of the signal, and never an exact replica of the input signal. The bits of the original Digital Music are simply manufactured in mass quantity with only the original first generation loss of signal integrity, subtlety, and nuance. It is not well known that Digital Music has a loss if signal integrity when one recording is made of a previous recording with or without a microphone involved. The Music signal approximation is multiplied with each new generation of copy. Each sequential recording is a copy of the newly made previous recording. Some number of copies later, the subtlety and nuance are murdered, and the Music is almost not recognizable.

No Digital

Of course Singing Wind is pure Analog, and does use Digital storage without D/A or A/D converters. Because of the number of channels, the cost of multiple hundreds of D/A converters on the left, and another multiple hundreds of D/A converters on the right mandate the economic reality of pure Analog only. Even low cost Digital music chips are not low cost when the actual supported component complexity cost of many left, and many right for the complete system is discovered.

No Digital means no Digital inside of the Singing Wind music signal chain from beginning to end. The Digital data is the music frozen in pure Analog form, without Digital sampling, or intense Digital Sigma/Delta, Delta/Sigma a.k.a. DSD. So when the Digital data storage is sent to Singing Wind, it is actually Singing Wind pure Analog music with no expensive or Digital D/A converters, and when Singing Wind sends the pure Analog music to Digital storage outside of Singing Wind, it is automatically converted to Digital storage format without DSD, or expensive A/D converters.

Usually when Digital is employed in music systems it is because Digital is the lower cost component that is hosting Analog that has to be converted to Digital. With Singing Wind, Analog is the lower cost component, that trades off the Digital binary digit (bit) for pure Analog signal. Dedicated Digital computers are required to support the Singing Wind pure Analog signal chain with a core utilization of 100 percent duty cycle, and massive Digital data throughput not seen in current music systems. The Singing Wind computer is a secure state machine.

No Signal Capacitors

Signal Capacitors are widely used in Analog music systems, and some Digital music systems also. Usually they are used to automatically balance the offset voltage/current to reduce system complexity, and cost. You can find information on how signal capacitors change the sound, and some types sound better than others. The capacitor is not a perfect component on its best day, and then some minute amount of electrons in the signal detail will be lost with the translation from one signal level to the next signal level.

Singing Wind does not use signal capacitors anywhere inside of the pure Analog music signal chain.

200 Volt Pure Analog Music Storage

The late great audio legend Rupert Neve once said in an interview one of his advantages was he was working with 90 Volt Pure Analog signals that gave him an extra 6 decibels of sound to work with on his consoles.

In 2025 the vast majority of music IC voltages range from 0-1.2vdc to 0-5vdc and below. Some IC's do venture up into -15vdc and +15vdc or more that are typically limited in a specific function, usually the amplifier for a smaller signal source. Many expensive audio systems costing about the same, or more than most homes do venture up into higher voltages, starting with amplified signal sources from the same average music source as everyone else.

The degree of difficulty in working with high voltages are reflected in a very expensive customer purchase price. Singing Wind is designed for the ultimate home audio consumer, where low cost is second only to audio performance.

The advantage Singing Wind has is much wider voltage range pure Analog signal sources, and all Digital signal sources with the Numerical Analog Computer (NAC).

Numerical Analog Computer

Singing Wind is a complete system that requires new component designs not available in current music recording, and playback. This whole paper is only about the Numerical Analog Computer. This is the minimum foundation component design that is required for Singing Wind. The high performance from the Numerical Analog Computer system is not available in any existing music recording, and playback technology, at any economic cost. Extreme low economic cost is the critical design component for Singing Wind.

Singing Wind does not use rare exotic perfected high performance materials, and precision electronic components available at enormous economic cost found in music systems for rich people only. Wide tolerance components, lacking high precision and repeatability have been a constant problem for me, until I learned how to understand them, and experience the great advantage they have over high performance, high end systems. Easy to mass produce, very forgiving, and designs that want to work together can only be achieved with extensive time over target. Also known as Research and Development. Since LogEtronics R&D lab 1975.

Why is 200 Volt Pure Analog better than 90 Volt Pure Analog?

Rail to rail voltages that most audio recording studios Digital, or Analog have to deal with are standing targets, that do not move. Compressors are usually involved, or some system to manage the recording to keep the voltage peak to peak signals from clipping the high and low voltage rails.

Enter the loudness wars. Because of this fundamental rail to rail limitation, and people that should not be involved in the music industry in any way, shape, or form, have used the voltage rails as a beginning for their music production. The only way they can hear any detail is if the signal is slammed up against the rails in a demolition derby where detail is sacrificed for a cheap thrill. Quality and accurate detail are just words to these people.

The actual fact is that there is not enough electron dynamic range available in any existing recording format voltage standard, especially if nanobots are inside the IC's producing nano music that has to be amplified to reach any kind of human scale.

The Singing Wind 20 volt Pure Analog system is better than any other music recording or music playback system ever because their are NO RAILS EVER. The NAC operates just below the speed of light, so when the recording signal eventually reaches one of the 20 volt rails, it simply jumps to the beginning of the next 20 volt rail level. Unlimited numbers of rail sets can be used for 200 volt, 2,000 volt, and even 200,000 volt and more Pure Analog Singing Wind recordings. Everything is recorded in full detail, then the NAC workstation is used to decide what music detail is important, and what music detail will be reduced to fit into one actual 20 volt Pure Analog rail set.

The rich detail afforded with the true pure 20vdc Analog source music signal is way ahead from the start without all the amplifiers, filters, and Digital now required. It is very easy for Singing Wind to look down on any lower voltage music system with only a few resistors. It is very difficult for lower voltage music systems to work their way up to Singing Wind levels without extra noise, and distortion.

This will work with a home recording of any vinyl record, or tape, and extend to many channels for stereo and movie format studio recordings. The original vinyl record, or tape will never have to be played again, and any improvement, or change can be made without change to the original recording. The extreme low cost of Singing Wind channels does make this practical for both small scale, and large scale.

No Voltage Rails - No Compressor

When recording real instruments, or generating music with electronics the rail to rail voltages are the definitive boundary that must be considered, before any form of signal compression begins to stay withing the rails, and compromises quality.

When recording a real symphonic orchestra, the actual individual instrument quality is in very close physical proximity of the musician receiving feedback from their individual instrument. Most recordings are made with microphones placed far away from the individual musician, and or musical instrument because of rail to rail saturation, and microphone overload. Also the neighbor musician beside is also generating music, with further dynamic range considerations that saturate the rail to rail.

Typically a compromise is made between close distance recording, or even microphones designed for that specific instrument, ignoring the other instruments, to a distance away where the combined instruments can be calibrated with some normal operation within the rail to rail before the compression begins. Too close and the microphone itself will saturate and clip the rails. Too far away and the background noise overtakes the performance.

Singing Wind works with hundreds to thousands of channels, and low cost microphones are desirable because they can be placed close to the recording target, and not have to record anything else, where a very expensive microphone can not be economically practical in hundreds or thousands of recording targets.

Recording the audience and external ambient road noise is just as important as the recording target

The limitation of only two source channels for final mix, and physical limitations of the microphone saturation mean a significant loss of detail. Also recording the audience and external ambient road noise is just as important as recording the musicians on stage, for removing cell phones, emergency services, and coughing if desired. The extra channels of ambient noise help to eliminate any need for Digital Signal Processing.

Singing Wind works with unlimited voltage range of the NAC to record critical details compromised by a compression system by using an unlimited range of zoomed 200 Volt Pure Analog for recording, and then generation of music for play back. This can be 200 Volt, or a equivalent 256 X 200 Volt or 51,200 Volt magnified and dynamic range without any change in hardware required. The same recording system can be used to record a Saturn V rocket launch, with no compression, and record a whisper in the wind with no compression of any kind.

Special interfaces are possible for 51,200 Volt physical input ranges and the ability to change 200 Volt physical ranges occurs in less than 100 nano seconds external, and less than 10 nano seconds internal with no loss of signal integrity.

Any final mix with Singing Wind occurs numerically, with no loss to the original Analog source

The RAW Singing Wind recording is then converted with or without audio compression for any musical rail to rail voltage limitations required for conventional audio equipment, and the original is never lost. The ultra low cost allows hundreds of sources that do not have to be ultra perfect, because they are not trying to record everything by themselves. Singing Wind.

NOS = No Oversampling, No Noise Shaping, No Digital ...

Singing Wind is Analog. Most Digital music systems are Digital, and do not know the difference between the music signal, and all the noise generated by the Digital Signal Processing from beginning to end. Yes, the actual music signal itself has to be filtered, and separated from all the generated noise in the quantization processing.

“The process of converting an analog signal **(which has infinite resolution by definition)** into a finite range number system (quantization) introduces an error signal that depends on how the signal is being approximated. This quantization error is on the order of one least-significant-bit (LSB) in amplitude, and it is quite small compared to full-amplitude signals. However, as the input signal gets smaller, the quantization error becomes a larger portion of the total signal.” Sangil Park, Ph. D. Strategic Applications-Digital Signal Processor Operation

The completed Digital music signal is heavily scrubbed of any, and all detail for a noise free, and subtle detail free output that is sadly missing something, leaving the listener with a sense of sterile over simplicity. The music does not dance anymore, it just poses like a beautiful female model selling a dress.

The Analog music signal only gets in the way of Digital Signal Processing, and is never the first consideration as to importance, or priority in any way, shape, or form. Of course going from an infinite resolution, and infinite bit depth Analog music signal to a much less Digital quantization is humiliating enough, then they say it is better after all that change, when it clearly does not sound as good.

Why does the Analog signal have to compromise everything for Digital change? Make the Digital signal subservient to the Analog music signal from beginning to end. Singing Wind.

Multiple Simultaneous Problems

Music instruments are man made, and do not happen by accident. Flutes and drums with percussion instruments, along with bells represent the beginning of a man made sound. Hundreds and hundreds of years have been required to create music instruments to where they are today. The concert grand piano required well over 300 years and counting of continuous research and development. Grand Master pianist will have a very specific favorite Steinway piano, or have to search for one with the correct sound, and then it is not possible to audio record, and audio playback that very subtlety they spent so much of their life force in pursuit of.

Musical instruments are almost non existent in many peoples lives today, many children have never heard a concert grand piano in person, where beyond ten or twenty feet away is not in person. Some concert grand piano's are plant holders, and interior art decoration in homes.

Digital instruments do generate sound, however the digital organ grinder is a piano in name only. When the band is simply blasting their digital piano sound into the audience at full volume, no one cares about missing detail, or instrument quality. Five minutes later it is all over, the band has money in the bank, and the audience is happy. Celebrating hit songs has a known formula, and a Dead End.

The Digital Audio Workstation has become the slaughter house of subtlety, and nuance. If a singer can not sing, no problem. If a musician can not play the instrument, no problem. Whatever the problem is, no problem. Even with the DAW, some musicians are still beyond redemption, and they would have it no other way.

The deafening roar of the Digital Music conquest over Musical Instruments, and Analog Music is almost complete. How do you miss something that you have no experience with, and yet you do know something is missing? Research and Development laboratories have tone, and signal generators, including computer generated waveforms that all enforce the deafening roar of Digital Music because they have no soul. I had to purchase a Baldwin stand up piano for $100.00 from Warner Robbins just to break out of the trap. I did spend years studying the flute, and it is possible for musicians to fall into the same deafening roar of a Digital Music trap.

Did digital recording kill rock and jazz creativity?
Steve Guttenberg Audiophiliac https://youtu.be/gH2JED-8A-c

Decades before Digital Music was even possible, it was well understood that Analog Music recording quality was extremely limited, and that a unique "sound" could be generated, sent over the radio into homes, cars, and people to enhance their individual artist performance within the extreme bounds of the technology.

Many components were added to the Analog Music recording studio to keep the analog signal within the extreme bounds of recording limitations. The Fairchild compressor is one of the most famous, and much more analog instrumentation just inside the control room, after the original Music was generated. The solution decades ago was to overcome the extreme bounds of the technology, and work with what they had, and if no one had a better solution, it was a level playing field. Stereo arrived, and the problem of recorded delivery continued with records, and tapes of Analog Music. Digital arrived and solved everything, by solving nothing.

Measurable digital performance gains that somehow leave the soul of the Music Dead, with complete clarity, and huge dynamic range, and the Music is Dead. The solution is to ignore the problem, deny the problems of Digital Music even exist, while leaving the advantages of Analog Music in the past. My concept of little musical goldfish swimming happily in the bowl of Analog Music, are now chopped up into little bits, dumped into a huge fish tank, and sinking to the bottom Dead and lifeless with all the little bits of other musical goldfish thrown in because of Digital Music. The true analog signal is a living entity, that interacts with other analog signals, in that Digital Music has no ability to even recognize this, and actually works to destroy harmony with the cold mechanical precision of approximate digital accuracy. Singing Wind will solve this problem.

Steinway Concert Grand Piano can not be recorded in 2025

As obvious as it should be, it is not obvious that Music recordings are missing critical details. This detail takes the form of a Tours de Force radiated directed energy in a real musical instrument like a Steinway Concert Grand Piano. The Tours de Force radiated directed energy has a very real limitation in the form of radiated directed energy distribution over distance, however the signature of that Tours de Force radiated directed energy distribution is carried in the atmosphere beyond it's limited Tours de Force radiated directed energy effective range. The music signal will still exist after the Tours de Force radiated directed energy has dissipated into the atmosphere.

Both Analog Music and Digital Music fail to record, or generate this Tours de Force radiated directed energy that Singing Wind can. This Tours de Force radiated directed energy distribution is not limited to a Steinway Concert Grand Piano, and can be found in most live instruments including pipe organs, human voices, and sound effects. This Tours de Force radiated directed energy is repeatable, when recorded, or generated and played back with Singing Wind.

The Tours de Force radiated directed energy distribution has not been defined in 2025, and does not exist in electronic instruments of any kind. The public address system in concert hall does not, and is not capable of carrying this Tours de Force radiated directed energy to the audience. It is not simply amplitude of projected audio that is, or is not canceling out. The information necessary is never recorded, and never comes out of a speaker.

Please see the video below: The Tours de Force radiated directed energy distribution, even though it has dissipated from the instrument source and traveled out the fourth story window down to the street, is now a musical signal that is not recorded by Analog Music recordings, or Digital music recordings.

When I walked through the park in NYC in the late 1970's on a summers night, the real instruments were very different from anything electronic, even far away. Singing voices with, or without amplifiers were also very different. Singing Wind will explain why 2025 Digital Music is a giant step backwards compared to Analog Music regardless of any specific media or technological limitations. Singing Wind is a new format that is not bound by existing standards. The only possible economic way forward with physics in Music recordings is Singing Wind.

Ultimately, existing Digital Music recording and playback in 2025 was based on improving 1922's technology, or even possibly Siemens work of 1870's , and not creating a new and better system. A pathway must be created that allows the migration to a Tours de Force performance, with very little monetary cost to move away from the improved 1922's era performance. Singing Wind will allow a RetroBravo function of compatibility all existing Music recordings, while creating a Tours de Force signal that is not possible with existing Music recording and playback technology, at low cost.

Ludwig van Beethoven grew increasingly deaf from 1812 to 1827, and would not be the composer he was with modern electronic musical instruments. The Tours de Force radiated directed energy missing from all electronic recording and playback systems of any kind in 2025, do not hold a candle to the very real piano of his day hundreds of years ago, allowing the feedback required to create great music.

Why is it so easy to tell the difference between live and recorded music?
Steve Guttenberg Audiophiliac https://youtu.be/F14GJihWn_E

Two different Music Recording Systems that both Fail Dramatically

No one told me that music recording was fundamentally flawed, and that simply purchasing more expensive audio equipment would not solve the problem. Then the same recorded audio music signal used on my low cost equipment, was the exact same recorded audio music signal used on the most expensive audio equipment in the world.

A description of failure in both Analog Music recording, and Digital Music recording is required to prove that there even is a problem in the first place. Many people would be happy with 1980's era High Fidelity music recordings, and any improvement is just frosting on the cake. As a young musician I was aware of a problem like most musicians were, however it has taken many decades to even define a solution.

If digital audio is so perfect why doesn't it sound more realistic?

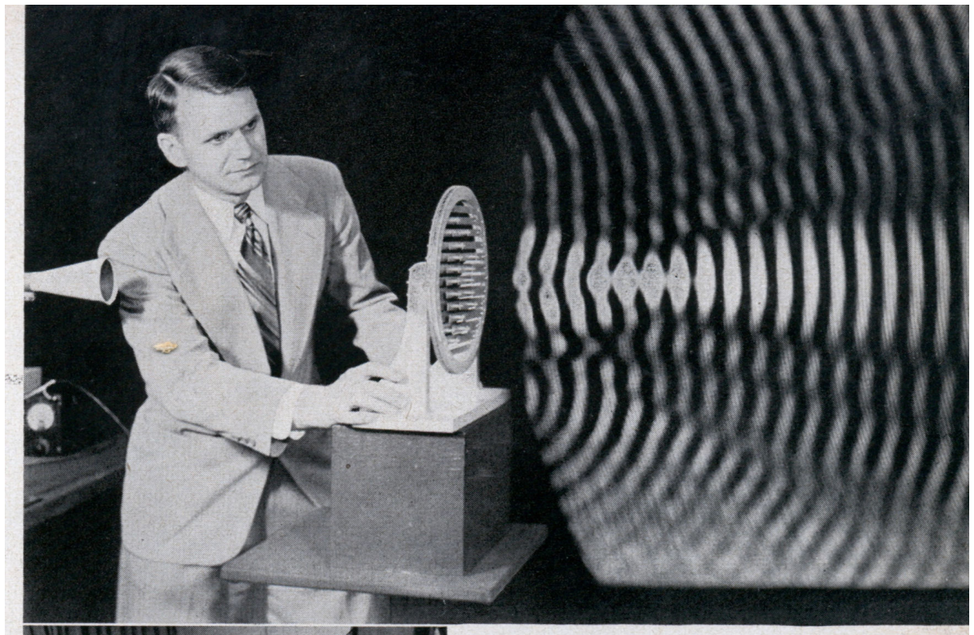
Steve Guttenberg Audiophiliac **https://youtu.be/7ZiscmBPpKs**

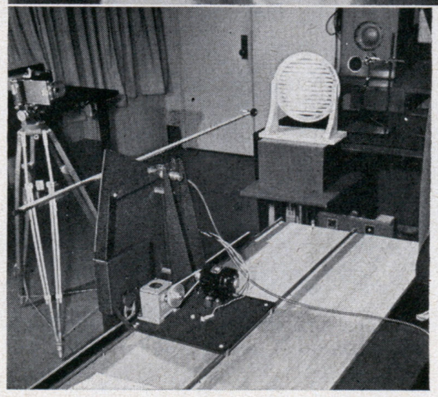
The False GOD of Telecommunications Theory, and DSP

Telecommunications is not music. Digital Signal Processing is not music. Sending sine waves from point A, to point B has nothing to do with recording music, or playback of music. Digital Processing of sine waves has nothing to do with recording music, or playback of music. The constant reference to proven telecommunications theory, and DSP in the recording, or playback of music is misapplied technology. Sine waves have little to do with music, and sine waves are certainly not the determinate foundation of music.

Bell Labs did not declare telecommunications theory to be music, or even musical. It is just more simple to use existing theory, and low cost digital computers compared to designing a music system from the ground up.

We all know what sound looks like because Bell Labs made a picture of it many decades ago. A bit is a bit, and sound waves are sound waves, case closed. Bell Labs with a simple oscillating resonator horn is not proving what complex musical instrument sound is, and had no intentions of doing so.





Neon Lamp Traces Sound Wave's Picture

THAT'S a sound wave you see in the picture above. Here demonstrating how an acoustic lens focuses sound from a horn, the wave was made visible with the device at left—an aluminum rod with a microphone and a neon lamp at the end. A small motor swings the rod in a wide arc, scanning the area. The microphone picks up the sound and turns it into electric current to feed the lamp. Wherever the sound is strongest, the light is brightest, and the wave is traced out. A complete sound photo, such as this from Bell Labs, takes 10 minutes exposure.

Digital Music Processing is the Punishment

When I was with Microsystems Altair Computer Center in 1976, we were an exhibitor at the Consumer Trade Fair, Personal Computing ‘76 Atlantic City, New Jersey, and the Star Trek Convention, Washington D.C. Someone had a Digital Music computer display on a table at one of them. It was amusing, and amazing at the same time. He explained that he could filter out the noise, however the sterile clean music did not sound as good for some unknown reason to him.

Digital signal processing is forced to have look down discrimination on a completed mixed complex Analog Music signal because the digital computer filters only have approximations of sine, and cosine waves the digital signal processing can work with. Both amplitude and frequency range must be predetermined to operate within a known bounded box of limitations. Only then can the digital signal processing theory that sine, and cosine waves can be combined to approximate any completed mixed complex Analog Music signal.

The horrifying sterile clean, and very dead Digital Music signal that sounds like it is missing something, is then called superior by engineers that have achieved their test measurement perceived nirvana of perfection. However, the baby was thrown out with the bath water. The only thing left of the completed mixed complex Analog Music signal is what could be approximated with combined sine, and cosine waves under 22kHz along with all the distortion from digital filtering, and digital signal processing

Worth a very few minutes of your time if possible, starting at 1:16:40 for the Digital Disease

The Digital Disease: Why analog sounds better
ANA[DIA]LOG **https://youtu.be/sMFWIvbRYdA**

Bernie Grundman, Chad Kassem, Ryan Smith - How to Create a Perfect Record + M. Jackson Thriller
45 RPM Audiophile **Start at 1:16:40 for Digital Disease** **https://youtu.be/6DArqAgLO5s**

Atmosphere is not limited to 22kHz

The completed mixed complex Analog Music signal range of interaction with other complex Analog Music signals, is being confused with the very limited human perception of isolated separate individual frequency range of analog sound signals used in a human hearing test. To make everything even worse, a frequency is assumed to be single, or a combination of sine, cosine waveforms contributing to the invisible digital integrity filter.

It has been predetermined that humans can not hear above 22kHz, so DSD will cut as much as possible above that, and DSD has to for a safety margin because of their noise shaping digital filtering. In DSD almost all the digital quantization noise by the digital signal processing above 22kHz is heavily filtered out. DSD 64 had some leakage into the perceptible audio range, so DSD 256 is better. DSD 512, and DSD 1024 are even better, however they will kill computer performance in the Digital Music recording process, and require extra computer power in the consumer playback, and file download.

The completed mixed complex Analog Music signal that exist in the atmosphere before it reaches any microphone of any kind, and if it was not digitized already in a DSD recording studio, must eventually be run through the DSD noise shaping digital filter. Not only noise goes through the DSD noise shaping digital filter, the entire completed mixed complex Analog Music signal has to go through it also.

Please see the papers linked to in the Sound beyond 20khz:The key to true high-fidelity? YouTube Video

Sound beyond 20khz: The key to true high-fidelity?
ANA[DIA]LOG **https://youtu.be/Btn572ZIC8k**

DSD: The Good, The Bad & The Test
ANA[DIA]LOG **https://youtu.be/eu5l-z7f6is**

Can Analog Distortion be Hi-Fi?
ANA[DIA]LOG **https://youtu.be/aTYc7vZuM-c**

Over Simplified Explanation:

The happy little Analog Musical goldfish swimming in their bowl, are picked up and chopped into little digital bits. The little happy Analog Musical goldfish digital bits can never live again in their new digital fish tank. Even worse, critical subtle nuance spirit and soul components of the happy little Analog Musical goldfish are discarded by the conversion into little digital bits.

Periodic Sine and Cosine Waves can not be combined to form any signal

The number one failure point of all Digital Music is the conversion from a continuous-time complex analog signal to a discrete-time numerical digital approximation. The original continuous-time complex analog signal is unlimited, however the discrete-time numerical digital approximation of the signal is bounded, by being limited in scope and function immediately because of the A/D converter. The entire digital process is limited by this step. Then the magic 22khz filter is applied, or some other magic standard that bounds the performance to known human limitations.

Before the real problems occur, two huge compromises have to be made by the discrete-time numerical digital approximation of the continuous-time complex unlimited analog signal. The scope of continuous-time complex unlimited analog signal amplitude, and frequency must be limited to fit the operational range of the A/D converter, and the completed quantization also requires an anti-aliasing distortion filter by the A/D converter to significantly attenuate artifacts after the A/D converter during the digital process.

Function must be limited by discrete numerical periodic sampling of both the complex unlimited analog signal amplitude, and frequency. Not only are amplitude and frequency being filtered at this point, but critical functioning components of the continuous-time complex unlimited Analog Music signal are also being filtered out.

The filter circuit by itself is a source of possibly serious distortion, and we have not even reached the A/D converter yet. Not only are all these compromises occurring simultaneously, in music these compromises occur between 44,100 times per second, to millions and millions of times per second. Since the conversion is asynchronous to the continuous-time complex unlimited Analog Music signal, this process is horribly under sampled for a complex Analog Music signal, and does not create a repeatable process.

PCM 44.1khz, 16 bit CD quality is not PCM DXD 384 24+ bit DSD workstation quality. DSD 64 is not DSD 1024. Even then the components, design, and application can have a dramatic effect on sound. Taking a high performance DSD source, and comparing it to a unknown PCM source is meaningless. Comparing a high performance DSD source, and comparing it to PCM DXD 384 should not even be possible, because the DSD source may have even been generated by mixing in the PCM DSD 384.

Multiple decades of PCM have created many, many different levels of quality over the years, while DSD is comparably recent with fewer different levels of quality. It is possible to find high quality DSD being compared to low quality PCM in 2025. MQA attempted to address these differences in PCM many years ago.

The little know fact that a Digital Music signal can not be re-recorded, because the Digital Music will degrade like Analog Music recording over, and over because of all the approximation. The Digital Music has the advantage of not needing to re-record like Analog Music for mass production because of the digital bits, not available with Analog Music recording.

The continued use of existing DSP, Wavelet, Fourier methods, Laplace, filter design, and existing electronic component mathematical theory does indeed create all the modern day Digital Music recording and playback problems.

Either there is a problem with Digital Music, or there is not. When a Digital Music recording and playback fails to recreate the musical Tour de Force energy of a musical instrument, that is called a loss of integrity catastrophic failure. The fact that it is the best Digital Music recording and playback possible, devolves into the meaningless dribble of endless excuses that are required for modern High Fidelity music.

An approximation compromise at the input combined with a continuous stream of compromise from beginning to end, and throughout in Digital Music results in the best sound possible today.

Over Simplified View of Digital Music Formats

Two primary representatives of Digital Music recording are PCM (Pulse Code Modulation), and DSD (Direct Stream Digital). is mentioned because of its application in Music recording. There are many variations of these digital formats for recording Digital Music.

PCM has electronic filters from anti-lasing on the Analog to Digital input, to the final analog stage output of the Digital to Analog converter used in playback. Digital Music filters with Digital Signal Processing are possibly used in the mixing, and mastering of the Digital Music recording. The transmission of Music in Digital format is clean, with no electronic filters or Digital Signal Processing required. Active Digital Music electronic filters, or passive Analog Music electronic filters are used in speaker crossover networks.

DSD has electronic filters from anti-lasing on the Analog to Digital input, to the final analog stage output of the Digital to Analog converter used in playback. Digital Music filters with Digital Signal Processing are possibly used in the mixing, and mastering of the Digital Music recording. The transmission of Music in Digital format is not clean, with extreme electronic filters required. While in theory DSD is much more simple, the reality requires extreme electronic filtration with Digital Signal Processing just for the digital information of the Music recording, and playback. Digital Signal Processing is also used for the Music signal processing separated from the digital information. Active Digital Music electronic filters or passive Analog Music electronic filters are used in speaker crossover networks.

Converting DSD to analog

PS Audio https://www.youtube.com/watch?v=9-EdxF8m2Ss

What's inside a DAC part 1

The Hans Beekhuyzen Channel https://youtu.be/dHuaLgCniAg

What's inside a DAC part 2

The Hans Beekhuyzen Channel https://youtu.be/zdnHEWAaBzE

Bernie Grundman talks about Digital, my thoughts

Ron Beaudry https://youtu.be/9G3whVBzFTA

DSD - Direct Stream Digital a.k.a. Delta-Sigma or Sigma-Delta

H. Inose, Y. Yasuda and J. Marakami, "A telemetering system by code modulation, delta-sigma modulation," IRE Trans. on Space, Electronics and Telemetry, SET-8, pp. 204-209, Sept. 1962.

When Sony made the decision to go with DSD to archive Analog storage in a Digital format decades ago, the inevitable loss of Analog integrity was on the way. Many vinyl records and tapes have been mastered with some form of DSD. Tapes are disintegrating, and no new Analog has appeared until Singing Wind.

The Numerical Analog Computer used by Singing Wind does not require any of the quantization and anti-aliasing distortion filtering required by Digital Music recording. Conventional Analog Music recording has also never required any of this, and the best recording systems have captured the subtle nuance spirit and soul components if and when they occur. The transition of the completed mixed complex Analog Music signal was sent to tape, or direct to vinyl. Enough of the original complex Analog Music signal survived to dance with the living analog signals way down into the audible frequencies.

The Digital Music recording process can record the remaining dancing signals that live in the audible frequencies that still remain on vinyl and tape. However when the direct Digital Music recording process murders the complex Analog Music signal dancing before it even reaches the A/D converter, the dancing never had a chance to occur. Anti-aliasing filters.

Digital Music recording can capture the audible frequency results of complex Analog Music signal dancing on a previously recorded on tape or vinyl because they once had a chance to live. Digital Music recording can not capture complex Analog Music signals dancing live, because they are murdered before reaching the A/D converter. When a Digital Music recording is sent to vinyl or tape, the complex Analog Music signal can live and dance again, although with some loss from all the chicanery. Direct to vinyl and tape do not have the system limitations of Digital Music recording.

The continuing increase in DSD and PCM sampling frequency and bit depth is too little, too late. A horrible increase in component, and digital signal processing economic cost of time, and dollars is a symptom of a system design that is not forgiving, and does not want to work together.

The limitations of tape and vinyl are confused with the superior complex Analog Music signal living on them. Because the Digital Music recording system murders the ability of the superior complex Analog Music signal to sing and dance together, the digital recorded signal is viewed as superior because of all the missing information.

Singing Wind does not have the limitations of Digital Music recording, vinyl, or tape and will support the singing and dancing of the superior complex Analog Music signal with all the advantages of digital. The Singing Wind Numerical Analog Computer will supersede all existing Music recording formats, and is designed for low cost consumer products.

Digital music similar to DSD all run the music itself through the Digital Signal Processing (DSP). Many cycles are required for a complete digital conversion and it is still digital all the way to the Digital to Analog conversion. Sometimes the processing does not yield the same results even though everything is Digital.

Singing Wind does not use Digital Signal Processing. The music is still alive when stored.

Bernie Grundman talks about Digital, my thoughts

Ron Beaudry https://youtu.be/9G3whVBzFTA

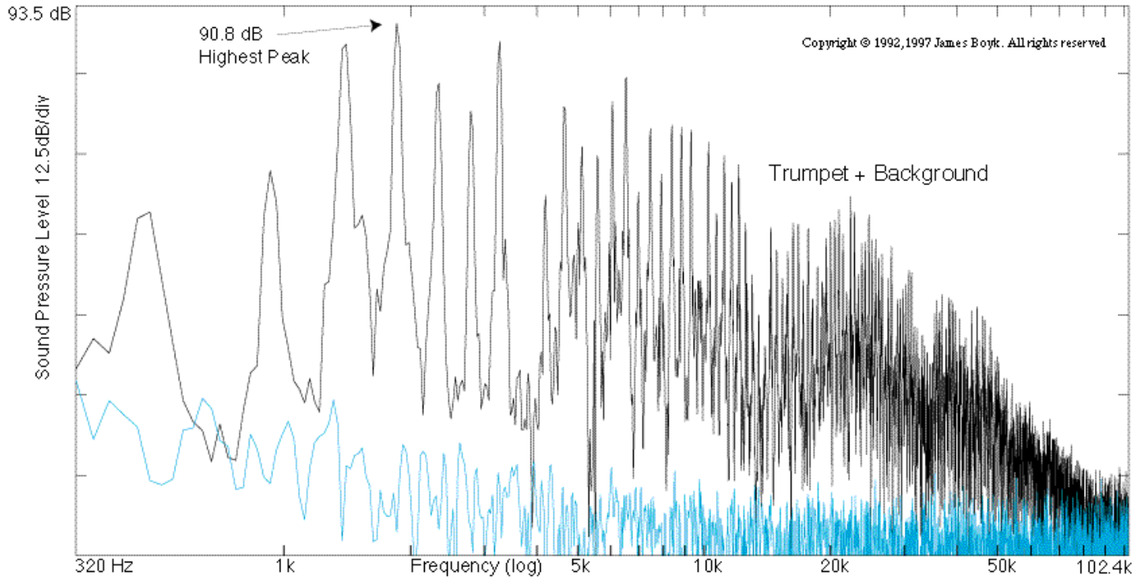


Figure 1(a) (Amplitude vs frequency). **Trumpet with Harmon mute**; 95.5 dB at Aco 7016 microphone 4 feet away. Microphone aimed at bell, which was angled down about 20 degrees. Upper Trace: Trumpet + Background, corrected to 70 kHz (see text). Lower trace: Background alone.

There's Life Above 20 Kilohertz!
A Survey of Musical Instrument Spectra to 102.4 KHz

James Boyk
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http://www.cco.caltech.edu/~musiclab
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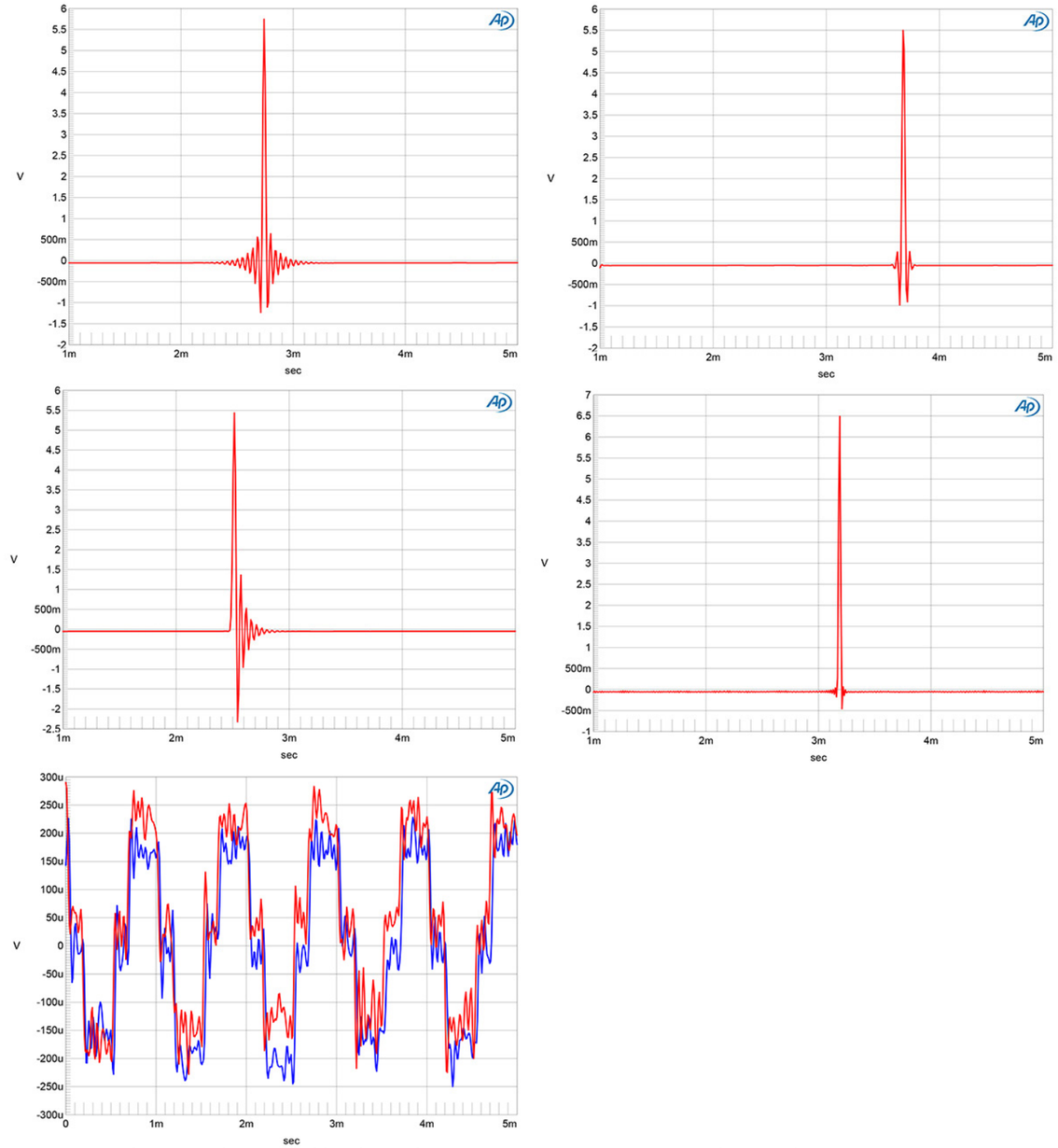
Paper by California Institue of Technology available from above location.

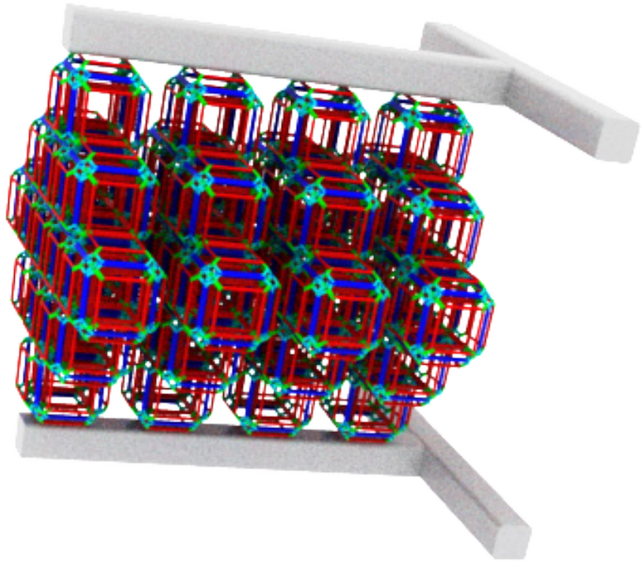
This chart clearly shows musical instrument atmospheric modulation exceeding 100,000 cycles per second. The Singing Wind audio signal supports 1,000,000 cycles per second pure Analog.

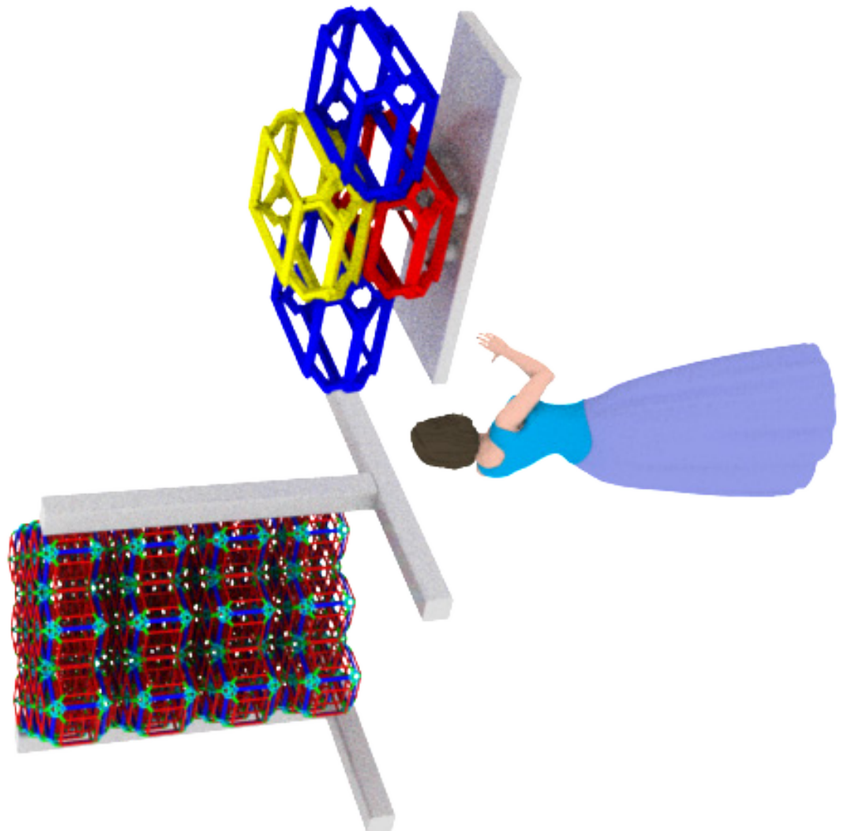


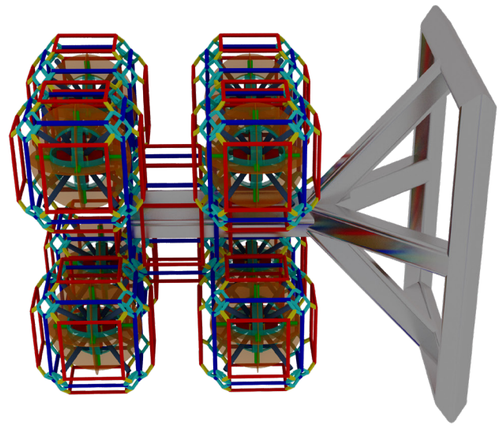
These are charts used by the audio magazine to stress test Digital to Analog Converters.

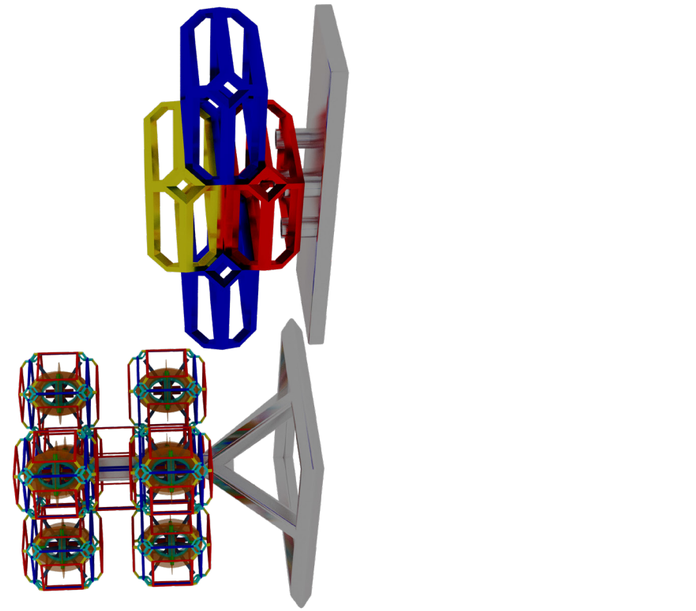
This is the characteristic result of Digital Signal Processing where the input was approximate simple straight lines.

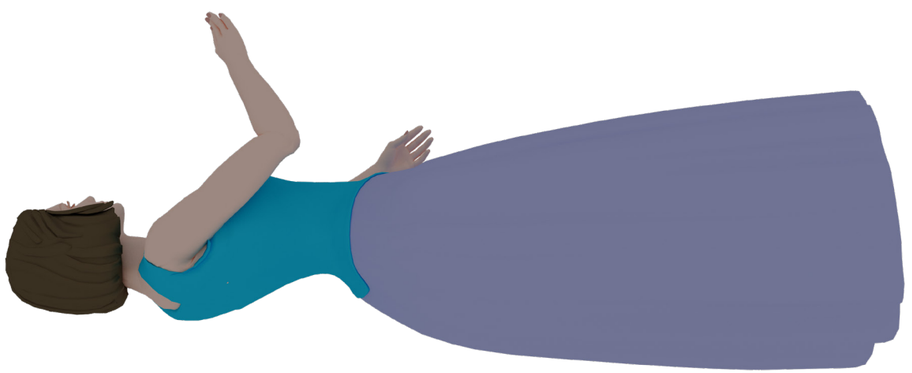
Any ringing or pointed lines are results of Digital filters with Digital Signal Processing , and we are told that is what we should see when the signal is filtered down in frequency for human hearing. Singing Wind is full range pure Analog, with NO FILTERS and NO Digital Signal Processing of any kind.











Singing Wind and Existing Digital Music

Singing Wind only works with Analog music, or Analog signals. Existing music can be played back on existing media and players to create Analog music that is then recorded by Singing Wind by the owner of the Digital music for legal reasons.

Singing Wind home players can record existing tape and vinyl recordings, and these recordings are locked into that specific home player only for legal reasons.

Singing Wind with a studio license can create original recordings, that can then be played back on any Singing Wind home player. Existing Digital recordings with legal ownership can be remastered by a Singing Wind studio license for playback by any home player. Every single recording is locked into every single home player with override codes specific to that individual home player.

The factory has a record of each individual home player that may range from 8 Left and 8 Right to thousands Left and thousands Right to Movie stations with thousands Left and thousands Right. Blu-Ray disc recordings can be mass produced, and unique specific override codes are then generated for every specific home player. The unique override codes will address the unique physics.

The Numerical Analog music signal is not touched in any way, shape, or form by the specific override codes that modify the Digital delivery system. Singing Wind has all the advantages of Digital, while the Numerical Analog signal is not touched.

The consumer can purchase a Blu-Ray recording at a store, or purchase a 128GB download from the Online store, and receive the specific override codes at the store, or through home Internet. The consumer does have a reference with the Singing Wind factory, that will generate the unique specific override codes at purchase for a very modest fee through the same store.

If a rogue Artificial Intelligent (AI) computer gets hold of a Singing Wind studio license, and starts generating illegal copies of Digital music, the Singing Wind factory will not generate the necessary unique specific override codes required, and no Singing Wind player will be capable of playback of that AI generated source.

Singing Wind operates with a secure processor that can not be copied, or replicated in any way, shape, or form. Every single Singing Wind computer is uniquely generated at the factory, and all monetary transactions are Data Center supported at the factory.

Prefix	Symbol	1000^m	10^n	Decimal	Short scale	Long scale	Since[n 1]
yotta	Y	1000^8	10^{24}	1 000 000 000 000 000 000 000 000	Septillion	Quadrillion	1991
zetta	Z	1000^7	10^{21}	1 000 000 000 000 000 000 000	Sextillion	Trilliard	1991
exa	E	1000^6	10^{18}	1 000 000 000 000 000 000	Quintillion	Trillion	1975
peta	P	1000^5	10^{15}	1 000 000 000 000 000	Quadrillion	Billiard	1975
tera	T	1000^4	10^{12}	1 000 000 000 000	Trillion	Billion	1960
giga	G	1000^3	10^9	1 000 000 000	Billion	Milliard	1960
mega	M	1000^2	10^6	1 000 000	Million		1960
kilo	k	1000^1	10^3	1 000	Thousand		1795
hecto	h	$1000^{2/3}$	10^2	100	Hundred		1795
deca	da	$1000^{1/3}$	10^1	10	Ten		1795
		1000^0	10^0	1	One		–
deci	d	$1000^{-1/3}$	10^{-1}	0.1	Tenth		1795
centi	c	$1000^{-2/3}$	10^{-2}	0.01	Hundredth		1795
milli	m	1000^{-1}	10^{-3}	0.001	Thousandth		1795
micro	μ	1000^{-2}	10^{-6}	0.000 001	Millionth		1960
nano	n	1000^{-3}	10^{-9}	0.000 000 001	Billionth	Milliardth	1960
pico	p	1000^{-4}	10^{-12}	0.000 000 000 001	Trillionth	Billionth	1960
femto	f	1000^{-5}	10^{-15}	0.000 000 000 000 001	Quadrillionth	Billiardth	1964
atto	a	1000^{-6}	10^{-18}	0.000 000 000 000 000 001	Quintillionth	Trillionth	1964
zepto	z	1000^{-7}	10^{-21}	0.000 000 000 000 000 000 001	Sextillionth	Trilliardth	1991
yocto	y	1000^{-8}	10^{-24}	0.000 000 000 000 000 000 000 001	Septillionth	Quadrillionth	1991

Fanfare for the Common Man - ELP



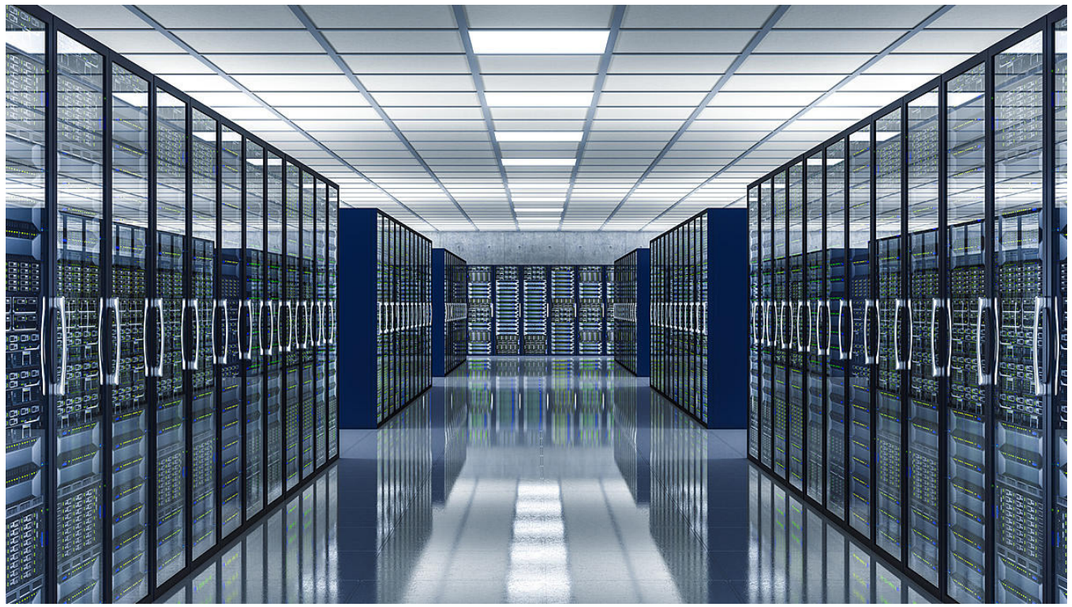








Small Business Wins against Large Data Centers With Data Castle



Magnitudes More Space with Magnitudes Less Data Storage





Prefix	Symbol	1000^m	10^n	Decimal	Short scale	Long scale	Since[n 1]
yotta	Y	1000^8	10^{24}	1 000 000 000 000 000 000 000 000	Septillion	Quadrillion	1991
zetta	Z	1000^7	10^{21}	1 000 000 000 000 000 000 000	Sextillion	Trilliard	1991
exa	E	1000^6	10^{18}	1 000 000 000 000 000 000	Quintillion	Trillion	1975
peta	P	1000^5	10^{15}	1 000 000 000 000 000	Quadrillion	Billiard	1975
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giga	G	1000^3	10^9	1 000 000 000	Billion	Milliard	1960
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kilo	k	1000^1	10^3	1 000	Thousand		1795
hecto	h	$1000^{2/3}$	10^2	100	Hundred		1795
deca	da	$1000^{1/3}$	10^1	10	Ten		1795
		1000^0	10^0	1	One		–
deci	d	$1000^{-1/3}$	10^{-1}	0.1	Tenth		1795
centi	c	$1000^{-2/3}$	10^{-2}	0.01	Hundredth		1795
milli	m	1000^{-1}	10^{-3}	0.001	Thousandth		1795
micro	μ	1000^{-2}	10^{-6}	0.000 001	Millionth		1960
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atto	a	1000^{-6}	10^{-18}	0.000 000 000 000 000 001	Quintillionth	Trillionth	1964
zepto	z	1000^{-7}	10^{-21}	0.000 000 000 000 000 000 001	Sextillionth	Trilliardth	1991
yocto	y	1000^{-8}	10^{-24}	0.000 000 000 000 000 000 000 001	Septillionth	Quadrillionth	1991

Prefix		Binary ÷ Decimal	Decimal ÷ Binary
kilo	kibi	1.024 (+2.4%)	0.9766 (−2.3%)
mega	mebi	1.049 (+4.9%)	0.9537 (−4.6%)
giga	gibi	1.074 (+7.4%)	0.9313 (−6.9%)
tera	tebi	1.100 (+10.0%)	0.9095 (−9.1%)
peta	pebi	1.126 (+12.6%)	0.8882 (−11.2%)
exa	exbi	1.153 (+15.3%)	0.8674 (−13.3%)
zetta	zebi	1.181 (+18.1%)	0.8470 (−15.3%)
yotta	yobi	1.209 (+20.9%)	0.8272 (−17.3%)
ronna	robi	1.238 (+23.8%)	0.8078 (−19.2%)
quetta	quebi	1.268 (+26.8%)	0.7889 (−21.1%)



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