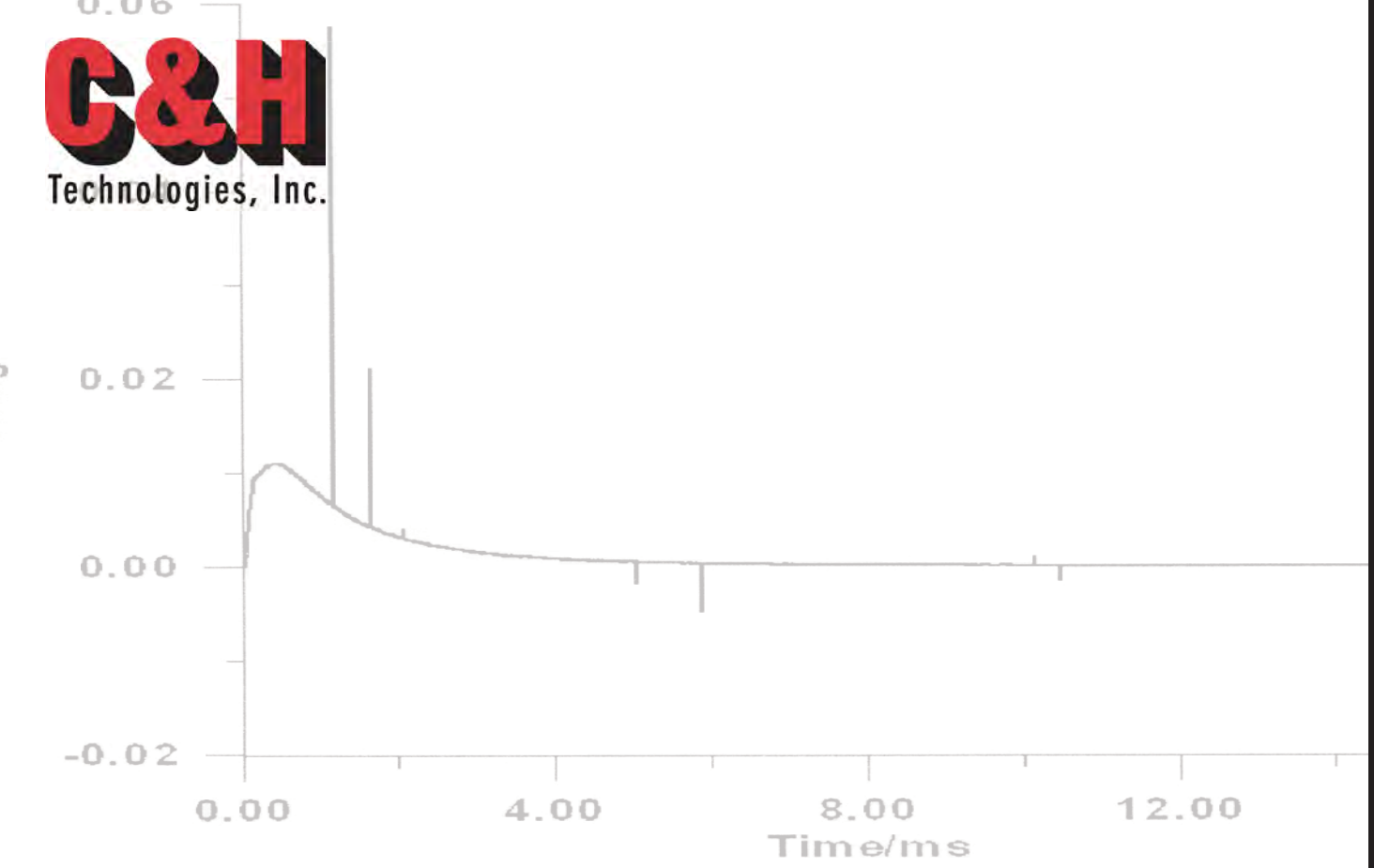
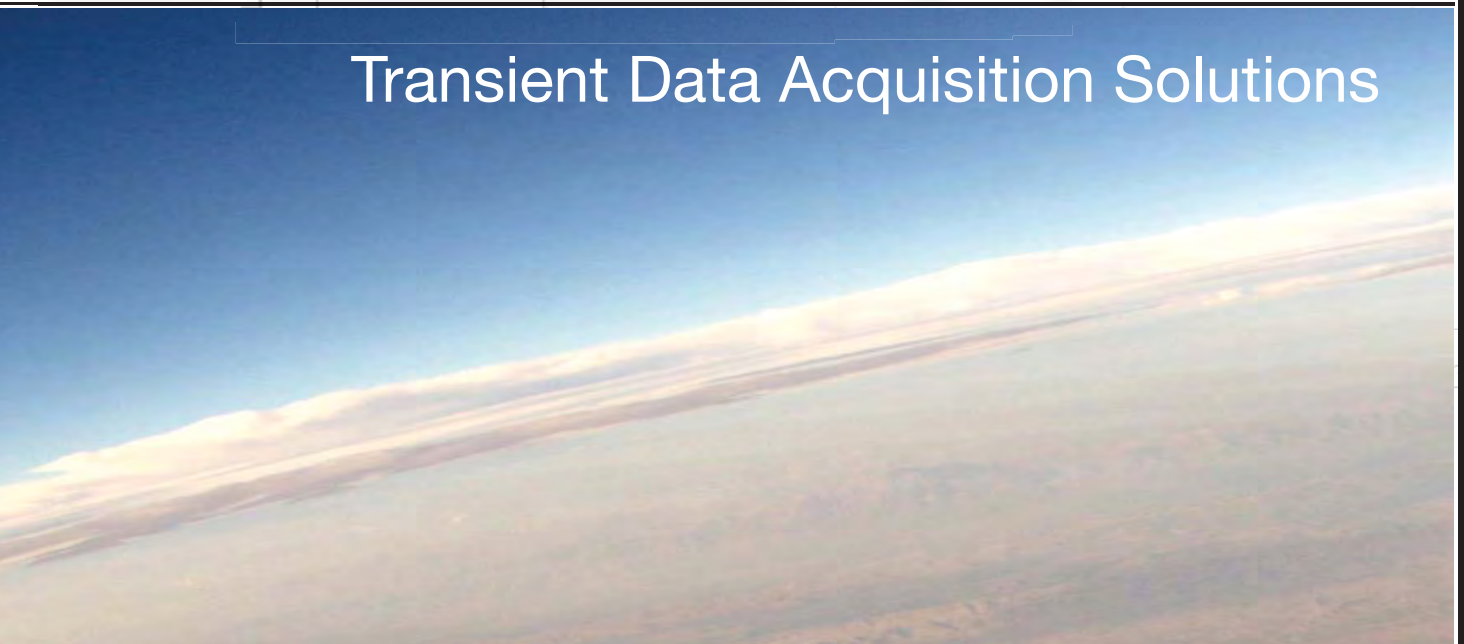
C&H Technologies, Inc.



Transient Data Acquisition Solutions



LXI Member

Faster Analysis Times
Reducing Data Storage
Lower Channel Bandwidth

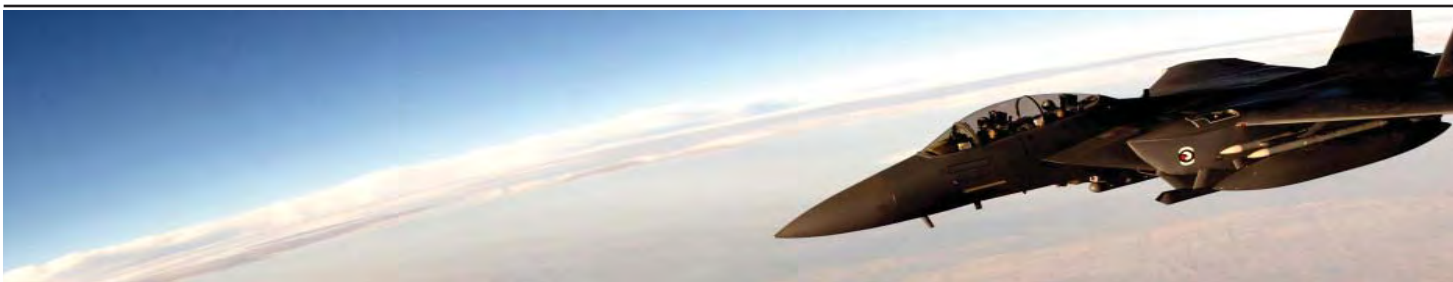
Transient Data Acquisition methodologies can overcome the shortcomings of conventional data logging systems for those applications where the data to be analyzed is transient or relatively stable for a significant percentage of the time. Time tagging, generally 32 bits, preserves relative time of occurrence information for multi-channel systems to facilitate exact reconstruction of critical events.

Real Time Data Compression is the key to solving your Transient Data Acquisition problems and C&H has developed methods to accomplish this for both analog and digital signals. These methods enable the recognition, in real time, that sequential sample values (analog or digital) are identical thereby allowing the storage of only the first occurrence of a value with its associated time tag. This leads to significant benefits for the user.

Faster Analysis Times are possible because no repetitive data must be analyzed or processed.

Reduced Data Storage is possible because redundant data is eliminated.

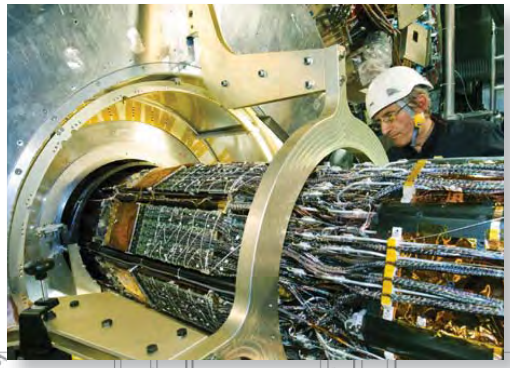
Lower Channel Bandwidth is possible because less data is retained for transmission to any host device. This can be very significant where Channel bandwidth is limited such as with PCM links, VXI backplanes or wireless LAN.



Application Areas

Physical Sciences

- Particle Accelerators
- Materials Testing
- Physics Labs

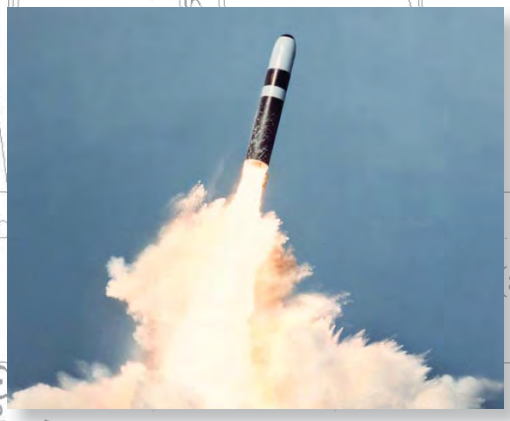


Engine Test Stands

- Aircraft Engines
- Automotive Engines

Systems Testing

- Missiles
- Spacecraft
- Nuclear Weapons



Remote Facility Monitoring

- Power Distribution
- Pumping Stations
- Building Resources

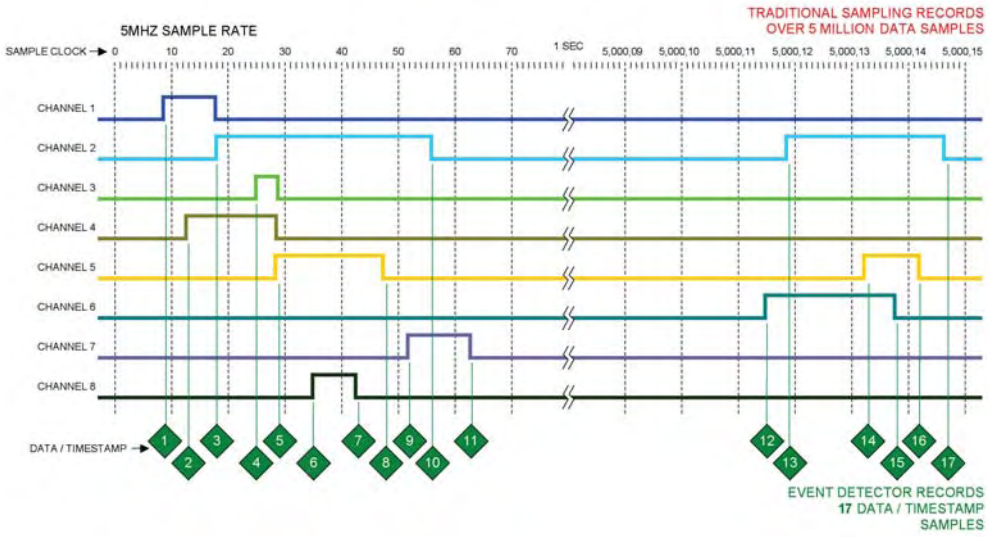
Real Time Data Compression Enabling Technologies

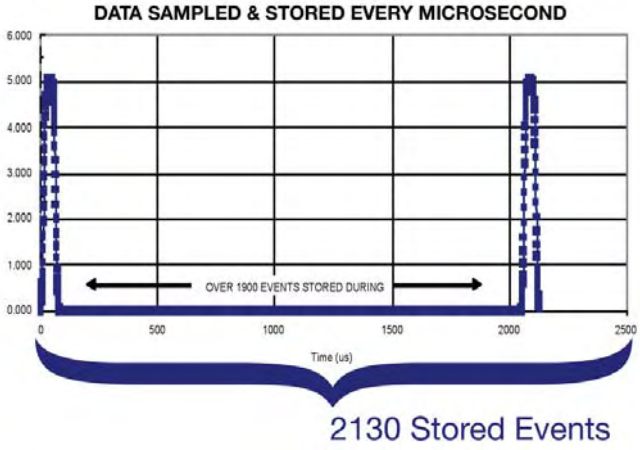
Event Detectors: These are digital devices capable of detecting, in real time, the occurrence of a physical event such as a relay closure, bit state, bit pattern or voltage threshold and recording this fact (data) with a time tag. Data is only recorded when a change occurs but the time tag information continues to update at pre programmed rates. A comparison with conventional Digital Data Logging on the facing page shows the reduction in data required to reconstruct or analyze events.

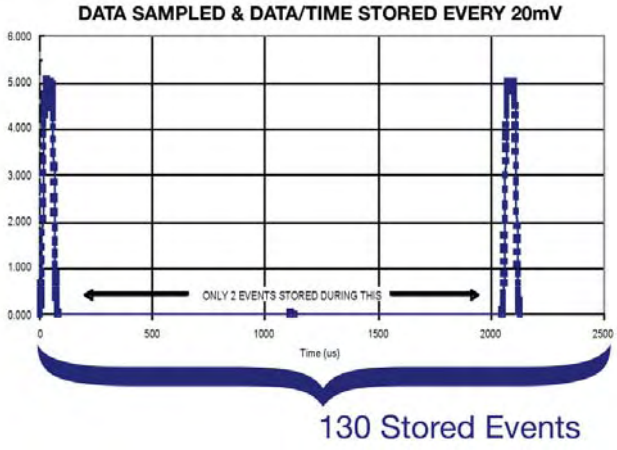
Aperture ADC's: These devices have programmable apertures (windows) which determine if a sample is to be stored. Upon starting, the first sample is always stored with its time tag. After that, if the measured signal does not vary more than the aperture amount from the original signal no sample is recorded but the sample clock keeps running. Once the signal goes outside the aperture its value is recorded and the aperture moves with the signal. If an aperture is programmed to "0", all samples are collected just as with a conventional ADC. The diagram at the right depicts the impact of this technology on data compression.

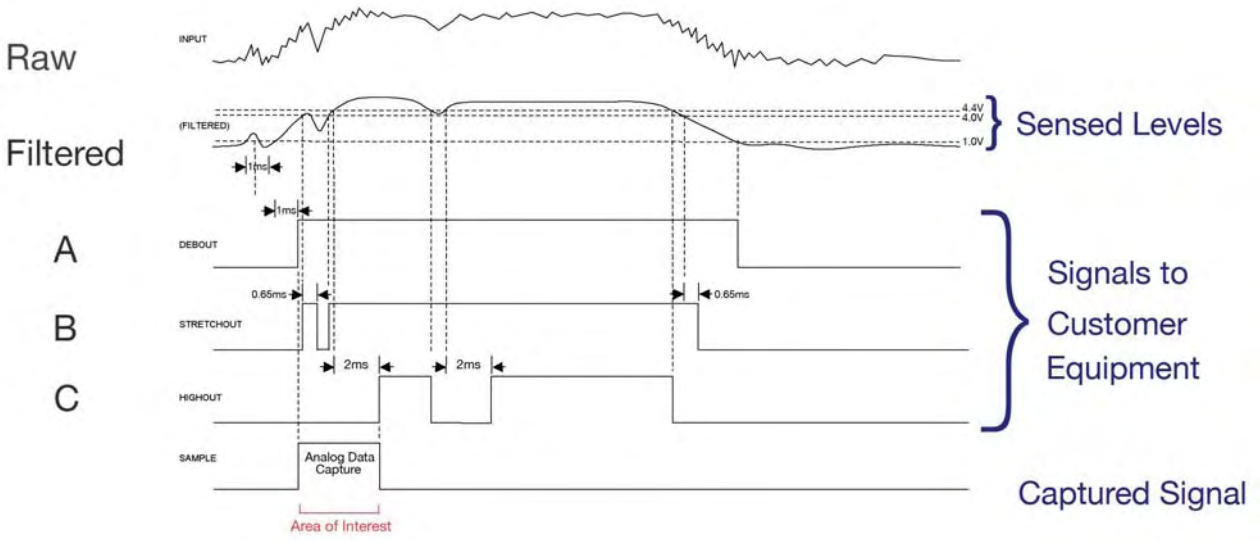
Signal Data Extraction: Electronically recognizing a region of interest in an analog or digital signal and extracting the signal from this region of interest while excluding all other portions of the signal. This technique is generally used to preprocess signals being fed to Event Detectors or Aperture ADCs. The example at the right shows how this technique may be used to greatly reduce the amount of data collected.

Real Time Data Compression Enabling Technologies









Transient Data Acquisition-Solution Examples

LXI/Ethernet -- Missile Simulation

- 96 Channel with customized Data Extraction
- Uses 12 Intelligent Chassis/Carriers
- Low speed Aperture ADC Technology
- Provides synchronization/control to other portions of system
- Uses data extraction circuits

LXI/Ethernet -- Weapons Testing

- 100+ Channel system
- Uses 13 Intelligent Chassis/Carriers
- High speed Aperture ADC Technology
- Programmable stable clocking system embedded on one Carrier

Transient Data Acquisition-Solution Examples

VXI -- Missile Testing

- 64 Channel replacing Tek 4286's
- Uses VXI carrier
- Uses 5 MHz Event Detectors
- Provides synchronization/clocking to other portions of system

cPCI/PXI -- Electronics Test

- Production line testing
- 16 Channel
- Uses 5 MHz Event Detectors
- Monitors times of occurrence of specific voltage levels

Integrate with Exceptional Ease

Scripting Utilities based on Lua[1]**,** an interpretive language, provides a powerful tool for utilizing the intelligence of our EM405-8 LXI (Ethernet) carrier and soon our VX406C intelligent VXI carrier. This software suite, shown in the diagram on the facing page, comes embedded on these carriers at no additional cost. This software provides enhanced programming capabilities that allow the user to embed application software on the carriers mentioned. Additional capabilities include:

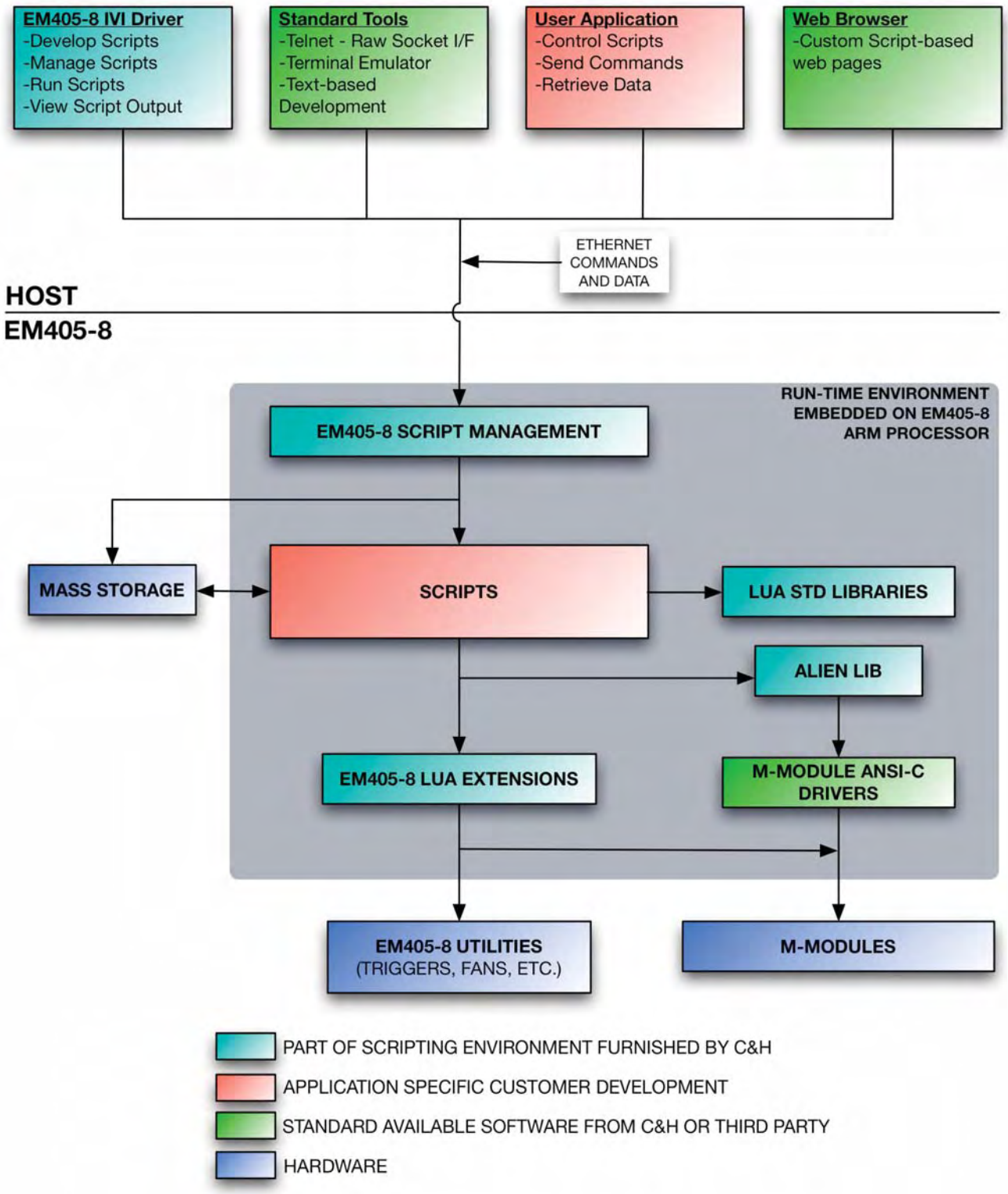
- C level drivers for any M Module may be embedded on carrier
- Customized Test Sequencers and Monitors may be easily developed
- Autonomous monitor and control of M Modules reduces load on host and minimizes communications over bus to host
- Automatic configuration possible using start-up scripts
- Start-up scripts can call other scripts thereby going directly to stand alone operation
- Any text editor may be used for script development
- Facilitates development of turn-key solutions with minimal effort

Linux Development Environments are available at additional cost for those who wish to have a greater degree of control over the embedded application environment on the C&H intelligent carriers. Currently available for our intelligent VXI carriers this environment will soon be available for our intelligent LXI (Ethernet) carriers. Data sheets and details may be found on the C&H web site.

ANSI/VITA Std 12-1996 M Module mezzanines, upon which our solutions are based, are available from a number of vendors and add additional capabilities beyond those discussed herein. This can add additional flexibility when implementing a specific Transient Data Acquisition solution.

1. Lua is an open source, interpretive programming language designed, implemented, and maintained by a team at PUC-Rio in Brazil. Lua is copyright 1994-2008 Lua.org, PUC-Brazil.

EM405-8 Scripting Utilities Architecture Diagram



Packaged Event Detector Solutions

LXI™

- Programmable Threshold Inputs
- 31 bit time tags
- Sample rates to 5 Msps
- EM405-8x106, 64-Channel Event Detector
- EM405-8x107, 128-Channel Event Detector
- IVI Driver

ETHERNET

- Programmable Threshold Inputs
- 31 bit time tags
- Sample rates to 5 Msps
- EM405D100, 32-Channel Event Detector
- VXI Plug-n-Play or C drivers

VXI bus

- 32 or 64 Channel Event Detectors (VX405-C1xx)
- Programmable Threshold Inputs
- 31 bit time tags
- Sample rates to 5 Msps
- OCXO option
- VXI Plug-n-Play or C drivers

PXI™

- 16 or 32 Channel Event Detectors (PX451S)
- Programmable Threshold Inputs
- 31 bit time tags
- Sample rates to 5 Msps
- VXI Plug-n-Play or C drivers

VISIT WWW.CHTECH.COM FOR DETAILED SPECIFICATIONS

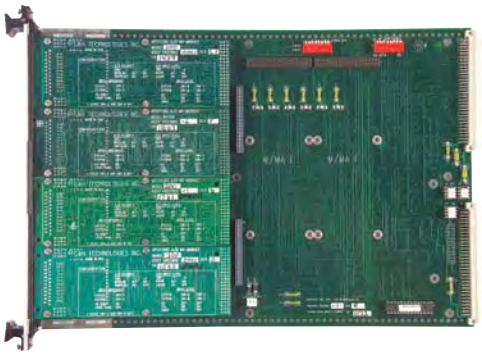
Packaged Aperture ADC Solutions

ETHERNET

- 8 Channels 1 Msps (EM405-8x108)
- 14 bit, 31 bit time tag
- 32 M sample memory
- Bipolar differential input (±10V or ±60V)
- VXI Plug-n-Play or C drivers

VXI bus

- 4 Channels to 100 Ksps (VX405Cx105)
- Programmable aperture window
- 31 bit time tag
- 32K on-board memory per channel
- Programmable anti-aliasing filter
- VXI Plug-n-Play or C drivers



PXI™

- 1-2 Channels to 100 Ksps (PX452S)
- Programmable aperture window
- 31 bit time tag
- 32K on-board memory per channel
- Programmable anti-aliasing filter
- VXI Plug-n-Play or C drivers

VISIT WWW.CHTECH.COM FOR DETAILED SPECIFICATIONS

MA200 Aperture ADC

- **Single channel to 100 Ksps**
- **12 bit resolution**
- **±5V, ±10V, 0-10V selectable input ranges**
- **Programmable aperture window**
- **31 bit time tags**
- **32K sample memory**
- **Programmable anti-aliasing filter**
- **VXI Plug-n-Play or C drivers**

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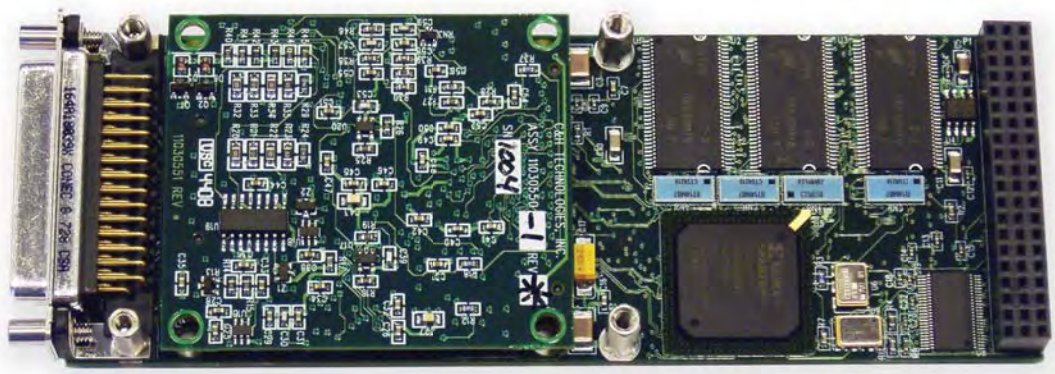
M228 High Speed Aperture ADC



- Up to 1 Msps sample rate
- 14 bit resolution
- 32 bit time tag
- Bipolar differential input (±10V or ±60V)
- 32M sample memory
- Programmable Aperture Window
- Two programmable anti-aliasing filters (Bessel & Linear Phase elliptic) plus by-pass mode
- Programmable Gain and voltage divider
- 10 MΩ Input Impedance
- VXI Plug-n-Play or C drivers

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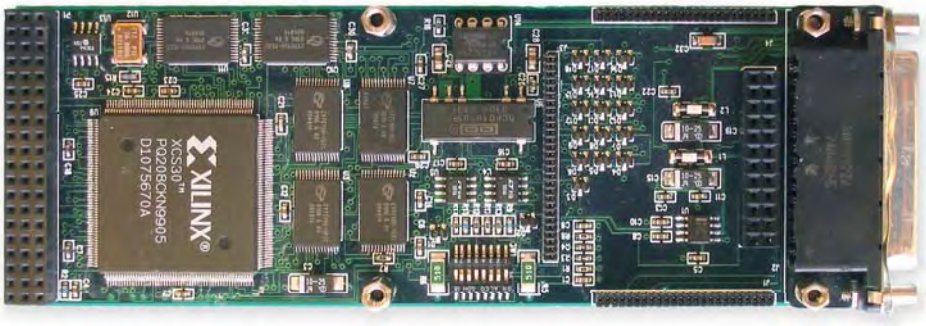
MA203 Event Detector

- Programmable Threshold Input
  - 0-25.5V
  - Sample Rates to 5 Msps
- Fixed Threshold Input (Optically Coupled)
  - +5V, +28V, Contact Closure
  - Sample Rates to 100 Ksps
- 32K sample memory
- 31 bit time tag
- 16 Channels
- VXI Plug-n-Play or C drivers



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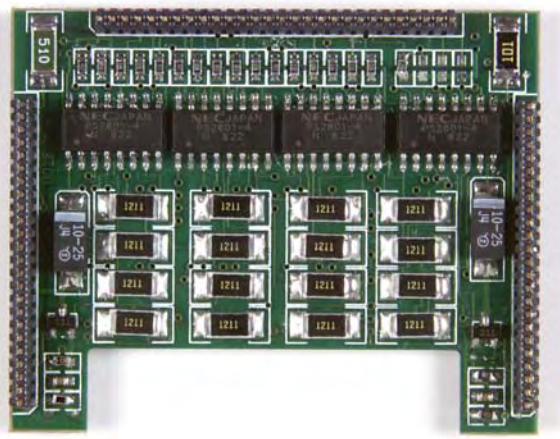
AM104 Signal Conditioners for MA203



OPTOCOUPLED INPUT ACCESSORY MODULE

	+5V (Opt 1)	+28V (Opt 2)
Normal Input Voltage Range:	0V to +5V	0V to +28V
Maximum OFF Input Voltage:	+1.8V	+11.0V
Minimum ON Input Voltage:	+2.6V	+17.0V
Input Protection:	-75V to +28V	-75V to +50V
Input Resistance:	100KΩ (minimum)	7.0KΩ (minimum)
Input Current:	3.5mA per channel at +5V input (max.)	3.0mA per channel at +28V input (max.)
Input Propagation Delay:	5µs	5µs
Maximum Signal Frequency:	200KHz	200KHz
Channel-Channel Isolation:	10MΩ minimum	10MΩ minimum
Input Voltage Isolation:	1000V minimum	1000V minimum

CONTACT SENSING INPUT ACCESSORY MODULE (OPT.3)

Output Sensing Current:	3.25mA (typical)
Output Voltage:	+5V (isolated supply from base module)
Maximum OPEN Sense Current:	2.1mA (1000Ω minimum resistance)
Minimum CLOSED Sense Current:	4.4mA (100Ω maximum resistance)
Input Propagation Delay:	5µs
Maximum Signal Frequency:	200KHz

PROGRAMMABLE THRESHOLD ACCESSORY MODULE (OPT.4)

Threshold Programming Range:	0- -25.5V
Threshold Programming Resolution:	100mV (8-bits)
Threshold Accuracy:	±0.5% of full scale (±127mV)
Threshold Programming:	3-bit Serial
Maximum Input Voltage:	48V
Input Hysteresis:	25mV
Input Impedance:	>100KΩ
Input Current:	<300µA (input voltage ≥ 30V)
Maximum Signal Frequency:	5MHz

VISIT WWW.CHTECH.COM FOR DETAILED SPECIFICATIONS

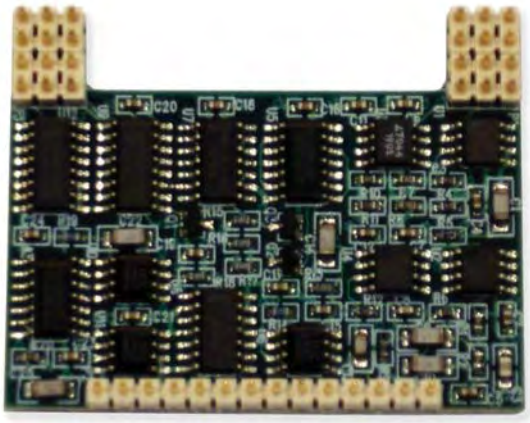
Carrier Family

- **Facilitates custom solutions in LXI, VXI, PXI, Ethernet, VME, cPCI and PCI**

- **On-board processing capabilities of VXI and LXI carriers make it easier to support customized configurations**

Signal Conditioning (M215)

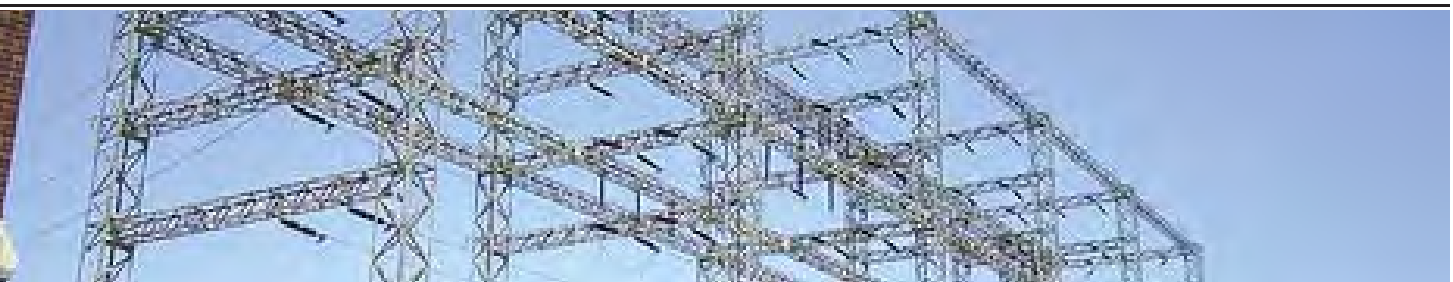
- 2 signal debounce circuits with differential outputs
- Quad isolated window comparator
- Programmable window references
- Current and resistance sensing
- Relay driver outputs
- Can be used to generate custom designs



Signal Data Extraction (AM110)

- Mounts on MA200 Aperture A/D
- 3 threshold output signals with preset delays
- Run signal to MA200 in signal range of interest
- Modified or new designs could be done by C&H or customer for MA200 or MA203

VISIT WWW.CHTECH.COM FOR DETAILED SPECIFICATIONS



Precision Clock Sources

Programmable Clock (M227)

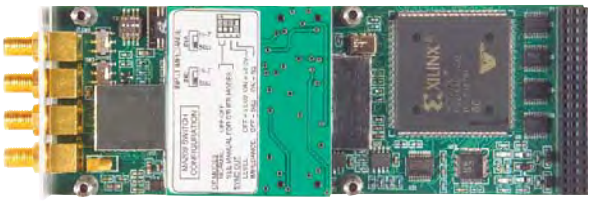
- 3 Channels, each to 50MHz
- Primary source on-board or external
- On-board source can be disciplined to external reference including M213 GPS
- Extensive on-board counting & Timing functions
- VXI Plug-n-Play or C drivers

GPS Timing Receiver (M213)

- 1pps & 100pps out
- Tracks up to 12 Satellites
- Use as primary references for Rubidium sources or C&H MA209 Pulse Generator
- Position tracking
- VXI Plug-n-Play or C drivers

Precision Oscillator (M207)

- 10MHz OCXO
- Stability of 1 x 10^{-8}
- Settable divide by N output
- Output to Front Panel or Carrier Triggers
- No driver required



Pulse Generation (MA204, MA209)

- 50MHz & 100MHz
- Timing Resolution to 10 picoseconds
- Full range of programmable functions
- Burst Mode
- External reference disciplining for greater long term stability
- VXI Plug-n-Play or C drivers

Support Modules

(for classical Data Acquisition applications)

M/MA Module Instrumentation

M67	1 Channel Digital Oscilloscope	MEN Mikro	M76	6.5 Digit DMM	C&H Tech.
M78	4 Channel Digital Oscilloscope	MEN Mikro	M385	250MHz Counter Timer	C&H Tech.

M/MA Module Analog Input

M392	16 Channel A/D, 12 or 16 bit	C&H Tech.	M16	4 Ch.Data Acquisition, 12 bit, 20V	MEN Mikro
M393	6 Ch. Differential A/D, 12,16 bit	C&H Tech.	M35N	8/16 Analog Inputs, 16 bit	MEN Mikro
DP-MM-1105	16 Channel A/D, 16 bit	Data Patterns	M36	8/16 Analog Inputs, 14 bit	MEN MIkro
DP-MM-1123	3 Ch. Strain Gauge SC	Data Patterns	M59	4 Ch.Data Acquisition, 16 bit, DSP	MEN Mikro

M/MA Module Switching

M218	16 Channel Form A Switch	C&H Tech.	M225	Quad 4x1 Multiplexer	C&H Tech.
M219	4x4 Matrix Switch	C&H Tech.	M338	Octal Relay w/emergency shut off	Acquisition Tech.
M220	Dual 8x1 Multiplexer	C&H Tech.	M43	8 Relay Outputs	MEN MIkro
M221	8 Channel Form C Switch	C&H Tech.	M56	16 Channel Analog Multiplexer	MEN Mikro
M222	4 Channel Form C Power Switch	C&H Tech.	M61	16 Binary Outputs	MEN Mikro

M/MA Module Temperature

M390	6 Ch. RTD Measurement Mod.	Acquisition Tech.	M70	Temperature Acquisition	MEN Mikro

Transient Data Acquisition Solutions

C&H Technologies provides test, measurement and data acquisition solutions to industries in design, production, maintenance and monitoring of electronic devices.

Our products overcome the shortcomings of conventional Data Logging when dealing with transient, slowly or infrequently varying signals. Our Real Time Data Compression Techniques lead to:

- Faster analysis times
- Lower data storage requirements
- Reduced communications channel bandwidth

C&H is a Round Rock, TX based company that has been providing products and systems solutions for Test, Measurement and Data Acquisition markets for over two decades. Its solutions are based on industry standard mezzanine technology that with appropriate carriers can provide common instrument solutions for a variety of backplanes and busses including LXI, VXI, PXI, VME, PCI and others.

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