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PRODUCT *GUIDE*

NETWORK SWITCHES

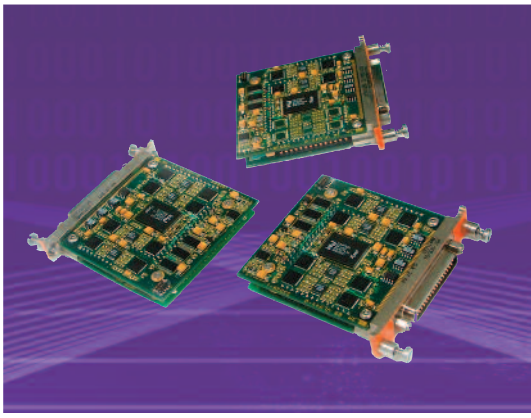
NET-500 & KAM-500

Rugged IEEE 1588
Ethernet Switches









Leaders in Airborne Data Acquisiton

ACRA CONTROL
A Curtiss-Wright Company

NETWORK SWITCHES

About ACRA CONTROL

ACRA CONTROL is a world leading supplier of airborne data acquisition networks and recording systems and real-time data processing ground stations to the aerospace industry. With two decades of experience, our reputation is built on reliable and innovative COTS products – a result of sustained investment in R&D and engineering expertise. This combined with AS9100 quality processes and strong program management ensures top class capabilities in aerospace projects of any size. ACRA CONTROL's customers include all of the major aerospace prime contractors and test agencies with products supplied to over 300 platforms in 40 countries worldwide. ACRA CONTROL is a Curtiss-Wright company and operates within the Integrated Sensing division of Curtiss-Wright Controls.

The ACRA CONTROL Difference

ACRA CONTROL's network switch products are specifically designed for the unique requirements of aerospace networks. They are deterministic, reliable and fast due to their hardwired switching design and have a rugged compact form to survive the extreme conditions of the aerospace environment. Live at power-up deterministic functionality eliminates boot-up delays and minimizes data loss from power outages. ACRA CONTROL's Xbar architecture facilitates flexible forwarding and filtering configurations (e.g. to send data to multiple destinations for real-time monitoring, recording and transmission). The synchronization of devices across a large distributed network is achieved to within 10s of nanoseconds – even under heavy network traffic conditions.

Any ACRA CONTROL DAU can act as an Ethernet node and connect to other DAUs, consoles and recorders using managed or unmanaged switches. ACRA CONTROL's managed switches include an embedded IEEE 1588 grandmaster that distributes Precision Time Protocol (PTP) packets to ensure system wide data coherency. Support for the Simple Network Management Protocol (SNMP) allows users to configure the switch and query for health and status information.

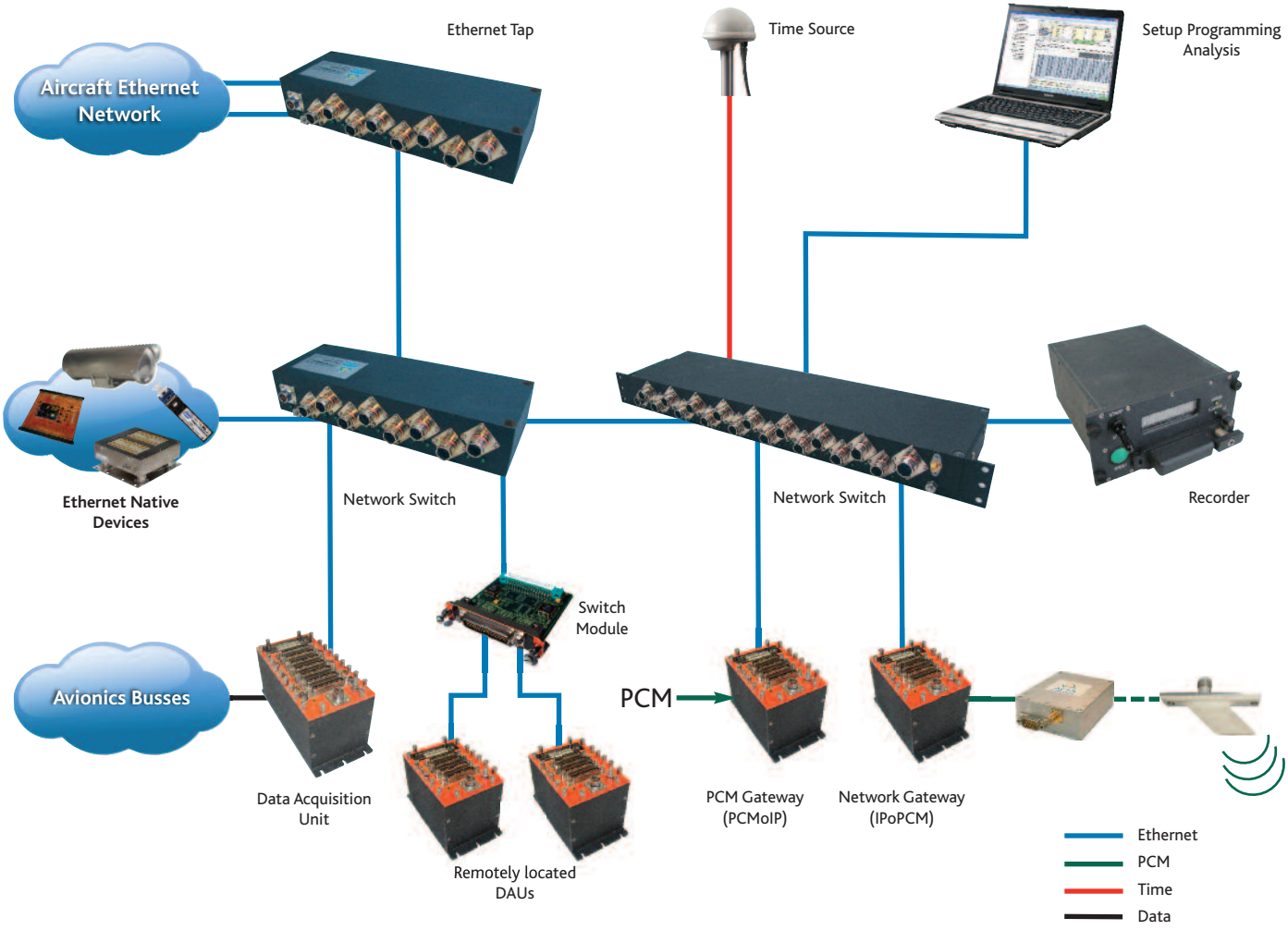
Ethernet Advantages

- *Significantly less wiring*
- *Standard open interfaces and protocols*
- *Higher data rates and improved time synchronization*
- *Reduction of programming and troubleshooting time during installation and test*
- *Reduced cost and ease of integration with COTS equipment*
- *A flexible future-proof architecture*

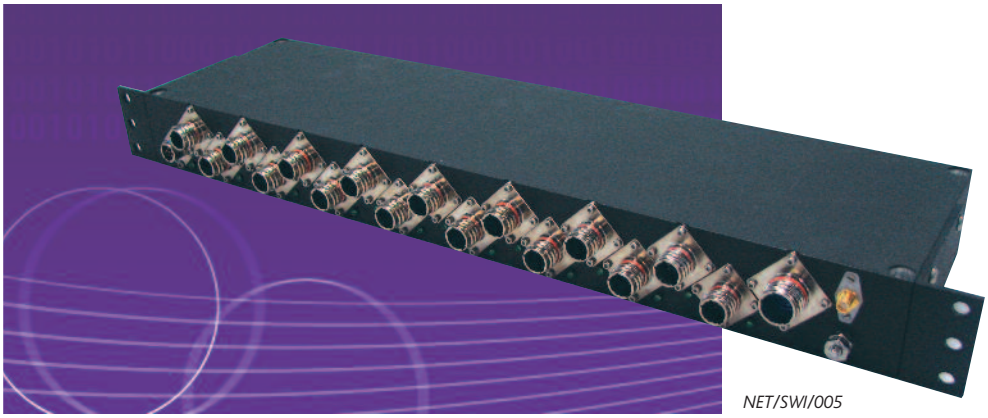


Ethernet Solution

ACRA CONTROL's switches allow data from clusters of DAUs to be aggregated close to the sensor or bus for transmission across a distributed system. External Ethernet sources can be integrated directly into the network without the need for additional hardware.







NET/SWI/005

NETWORK SWITCHES

NET-500 Family

ACRA CONTROL manufactures Ethernet switches with different port and link speed configurations. There are two categories of switches available: static routing and configurable routing. Static routing switches aggregate the data from DAU ports and forward the data through aggregator ports. Configurable routing switches use Xbar technology to allow users to customize the number of DAU and aggregator ports to suit varied applications and feature flexible filtering configurations. Ethernet taps are also available which facilitate non-intrusive monitoring of one or more Ethernet links.



NET/SWI/003

- *Compact and rugged housing*
- *Live at power-up*
- *Hardwired or configurable routing*
- *IEEE 1588 PTP transparency*
- *Based on open standards and protocols*
- *Rugged Mighty Mouse connectors*
- *Store and forward switching architecture*
- *Integrated GPS and digital IRIG-B**
- *Embedded IEEE 1588 Grandmaster**
- *SNMP Support*

**Grandmasters only*

NET-500 Switches

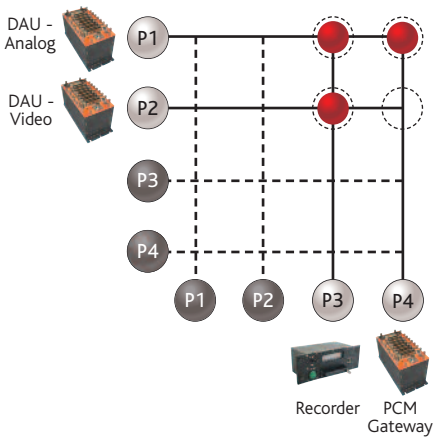
Switch	Ports	Gigabit	DAUs	Aggregators	Tap	Filtering	Grandmaster
NET/SWI/001❖	8	-	7	1	-	-	-
NET/SWI/003	8	✓	1-7	1-7	1-3	✓	✓
NET/SWI/005	16	✓	10-15	1-6	-	-	✓
NET/TAP/001	4	✓	-	-	2	-	-

❖Extended temperature (-50 to 105°C) operation for engine mounting

Xbar

Xbar is the next generation switching architecture that blends the rugged and live on power-up performance of ACRA CONTROL's switches with a flexible crossbar architecture (currently available in ACRA CONTROL's NET/SWI/003). The Xbar technology allows static forwarding tables to be defined and features sophisticated filtering hardware to create high performance Ethernet switches with flexible forwarding and filtering configurations.

In the simple example to the right, four network devices (DAU-Analog, DAU-Video, Recorder, and an Ethernet-to-PCM gateway) are interconnected through a four port switch. The user-defined static forwarding table used in the Xbar switching fabric is shown as dashed circles. The red points show which devices are connected together and these can be reconfigured at any time by the user. In this example, Ethernet streams from the DAU-Analog are forwarded to both the Recorder and PCM gateway. Ethernet streams from the DAU-Video are forwarded only to the Recorder.



Open Standards and Protocols

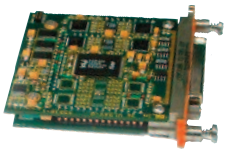
ACRA CONTROL embraces open standards and protocols for its switch products including IPv4 over Ethernet, SNMP, IEEE 1588 PTP and TFTP. These provide critical services facilitating device control and the generation, synchronization and transmission of real-time data. As part of the iNET-X framework, this open standards philosophy facilitates device interoperability and frees the end user from proprietary hardware and software products.

IEEE

iNET-X

KAM-500 Family

The technology in the NET-500 range of switches is also available as plug-in modules for the KAM-500 data acquisition system. Ethernet modules are perfect for applications where space is at an absolute premium or where only a few ports are required e.g. in a small network or remote location.



KAM-500 Modules



KAM-500 Switches

Switch	Ports	DAUs	Aggregators	Tap
KAD/SWI/101	4	3	1	-
KAD/SWI/102	4	2	1-2	-
KAD/SWI/103	4	-	-	2

Related Products

KAM-500 Ethernet Interfaces

ACRA CONTROL has developed reliable high performance Ethernet interface modules that allows other busses and PCM systems to be easily interconnected in an Ethernet network.

- KAD/EBM/103 is an AFDX parser that can process dynamically generated packet structures.
- KAD/ETH/102 is a full-duplex, fast Ethernet module that bridges Ethernet technologies with non-Ethernet systems allowing PCM based controllers to be programmed over Ethernet.
- KAD/ARR/101 is an AFDX redundancy remover that performs error checking and filters redundant frames.
- KAD/BCU/140 is a backplane controller that enables the KAM-500 to become a fully PTP compliant Ethernet network node.
- KAD/EBM/102 is a Gigabit Ethernet bus monitor that turns a KAM-500 into a network end node.



KAM-500 Chassis

There are over a hundred modules available, please refer to the Data Acquisition Product Guide for further information.

Recorders

ACRA CONTROL's recorders are stand-alone compact, rugged units that record data directly from an Ethernet network. They support IRIG/GPS time synchronization and have removable CompactFlash® or SATA solid-state drive storage options. The SSR-500 range also features modular data acquisition capabilities. Please refer to the Recorders Product Guide for further details.



NET/REC/002

ACRA CONTROL Online

The ACRA CONTROL website has a membership area with detailed data sheets for all our products along with a host of other features. These include video tutorials, FAQs and Application Support Notes. Members can download technical papers presented at conferences, ACRAscope company newsletters, case studies, technical focus articles and details about upcoming exhibitions and conferences.

www.acracontrol.com

NETWORK SWITCHES

Environmental Specifications

Operating Temperature
MIL-STD-810F Methods 501.4 and 502.4 Procedure II
-40°C to 85°C, at least 4 hours after stabilization

Storage Temperature
MIL-STD-810F Methods 501.4 and 502.4 Procedure I
-55°C to 105°C, at least 4 hours after stabilization

Altitude
MIL-STD-810F Method 500.4 Procedure II
Maximum pressure of 115Kpa (1150mbar) and a minimum pressure of 3.6Kpa (36mbar)

Rapid Decompression
MIL-STD-810F Method 500.4 Procedure III room ambient to 3.6Kpa at a rate of 218Kpa/minute (2180mbar/min.)

Explosive Decompression
MIL-STD-810F Method 500.4 Procedure IV unit unpowered and a pressure change from 2,438m (8000ft) to 12,192m (40,000ft) was achieved in 784ms.

Shock
MIL-STD-810F Method 516.5 Procedure V – modified 100g, 11ms, terminal peak saw tooth 12 (two in each direction of three mutually perpendicular axes)

Sinusoidal Vibration
MIL-STD-810F Method 514.5 Procedure I
Frequency Range 10 - 2000Hz
Amplitude 10g
Sweep rate One octave per minute

Random Vibration
MIL-STD-810F Method 514.5 Procedure I
60 minutes per axis Random Endurance, 17grms
$0.04g^2$/Hz from 15 to 89.2Hz
4dB/octave from 89.2 to 300Hz
$0.2g^2$/Hz from 300 to 1000Hz
-6dB/octave from 1000 to 2000Hz
10 minutes per axis Random Endurance, 33grms
Frequency range 15-2000Hz
Spectrum $0.04g^2$/Hz from 15 to 30.7Hz
4dB/octave from 30.7 to 300Hz
$0.83g^2$/Hz from 300 to 1000Hz
-6dB/octave from 1000 to 2000Hz

Acceleration Operational
MIL-STD-810F Method 513.5 Procedure II
16.5g in each direction of three mutually perpendicular axes
Duration Minimum of one minute in each direction

Water Ingress (Drip Test)
MIL-STD-810F Method 506.4 Procedure III
Precipitation rate $280l/m^2$/hr.
Duration 45 minutes, divided equally between three faces (one side, one end and one top)

Humidity
MIL-STD-810F Method 507.4
Upper temperature 60°C
Intermediate temperature 30°C
Lower temperature 20°C
Relative humidity 95% (>85%during temperature reduction)
Dwell times Four hours at each level
Cycle duration 24 hours
Number of cycles: Five

EMI/EMC
MIL-STD-461E
CE101 (30Hz to 10kHz)
CE102 (10kHz to 10MHz)
CS101 (30Hz to 150kHz)
CS114 (30Hz to 150kHz)
CS115
CS116 (10kHz to 100MHz)
RE102 (10kHz to 18GHz)
RS103 (10kHz to 1GHz, 70V/m)
RS103 (400MHz to 18GHz 200V/m)
BS3G100 Part 2, Section 2
Magnetic influence, compass safe distance

ESD
EN61000-4-2:1995
Contact discharge Level 4, 8kV
Air discharge Level 4, 15kV

Electrical Bonding and Insulation
BS3G100, Part 4 Electrical insulation test, high voltage test
BS3G100, Part 4 Electrical insulation test, insulation resistance test
BS3G100, Part 4 Electrical insulation test, leakage current measurements

Contamination Testing
BS 3G 100, Part 2, section 3, subsection 3.12
Class A for Occasional Contamination 70 °C, for 93 hours
Fluids tested include
Propan-2-Ol
Ethylene Glycol (50% v/v in water)
AVTUR F-34
Aeroshell Turbine Oil 308
Aeroshell Fluid 31
Aeroshell F31
MIL-PRF-23699-F

Salt Fog Testing
MIL-STD-810F Method 509.4
24 hours exposure, 24 hours drying repeated twice
Salt Fall out: 1 to $3ml/80cm^2$/hr
Salt solution: 5 +/- 1% concentration
Salt Mix pH: 6.5 to 7.2
Temperature: 35°C+/-2°C

Product Listing

Ethernet Switches

NET-500	
NET/SWI/001	Airborne 8-port unmanaged aggregator with IEEE 1588 time support
NET/SWI/003	Airborne 8-port Ethernet switch with 4 Gigabit Ethernet ports and IEEE 1588 Grandmaster support
NET/SWI/005	Airborne 16-port Ethernet switch with 6 Gigabit aggregator ports and IEEE 1588 Grandmaster support
NET/TAP/001	Airborne 4-port Gigabit Ethernet tap
KAM-500	
KAD/SWI/101	KAM-500 Ethernet aggregator with 3 inputs and one output
KAD/SWI/102	KAM-500 Ethernet switch with 2 inputs, 1 output and 1 programming port
KAD/SWI/103	KAM-500 Ethernet tap module with a dedicated programming port

Ethernet Interface Modules

KAD/BCU/140	Ethernet KAM-500 backplane controller and packet generator
KAD/ARR/101	AFDX redundancy remover
KAD/EBM/102	Ethernet bus monitor
KAD/EBM/103	Parser for ARINC-429 on AFDX network
KAD/ETH/102	2.5Msample/sec data acquisition and programming over Ethernet

Recorders

NET-500	
NET/REC/001	Airborne stand-alone Ethernet IP recorder with CompactFlash® storage
NET/REC/002	Airborne stand-alone Ethernet IP recorder with SATA SSD storage
NET/REC/003	Airborne stand-alone Ethernet IP recorder with SATA SSD storage and Gigabit interface
SSR-500	
SSR/CHS/001	Airborne 4 user slot multi-role recorder chassis with CompactFlash® storage
SSR/CHS/002	Airborne 4 user slot multi-role recorder chassis with SATA SSD storage
SSR/CHS/003	Airborne 4 user slot multi-role Gigabit recorder chassis with SATA SSD storage
SSR/CHS/005	Airborne 2 user slot multi-role recorder with CompactFlash® storage

Software & Accessories

SWS/NET/003	NetSwitch Configurator 3 setup software for network switches
SWA/GSW/007	GS Works 7 visualization and analysis package

ACRA CONTROL Onboard





































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