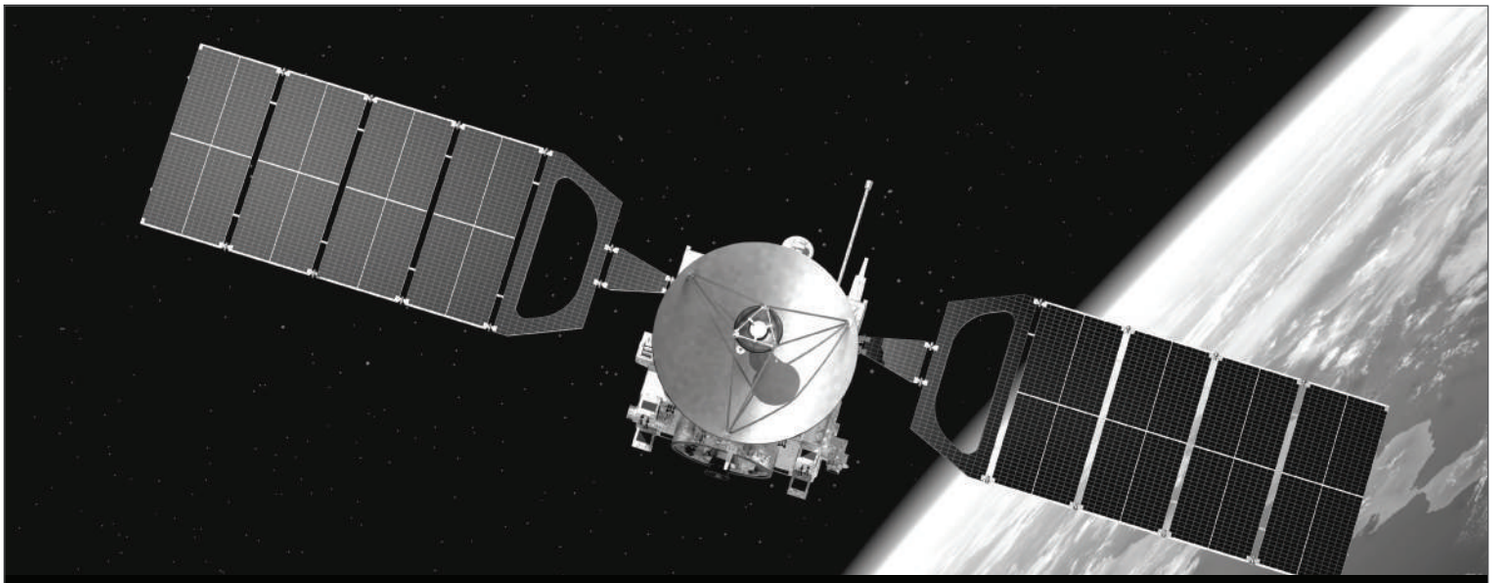


VTI INSTRUMENTS HIGH PERFORMANCE SWITCHING

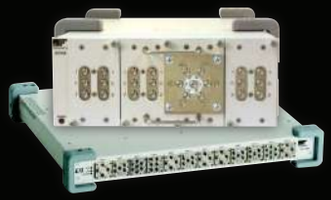
Solutions Available Up To 67GHz

RF/MICROWAVE SWITCHING

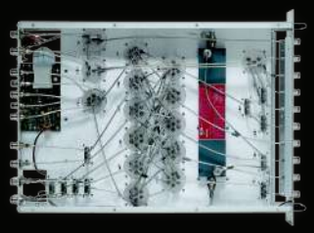
The "BRAIN"

EX7000-CORE CONTROLLER

The "BRAWN"



STANDARD MODULAR PRODUCTS



DEVELOPMENT CHASSIS

CUSTOM SERVICES GROUP

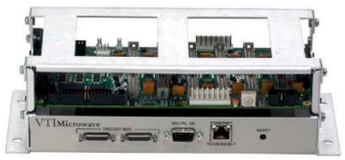
RELIABLE DATA FIRST TIME EVERY TIME

VTI Instruments / AMETEK PROGRAMMABLE POWER

The EX7000 Family

The EX7000 family is the industry's first series of scalable microwave subsystems built on an open-architecture Ethernet/LXI platform. This innovative family of products simplifies the development of custom RF Interface Units (RFIU) requirements with its common hardware platform and software communications interface, while maintaining the look and feel of a standard COTS product.

CONTROLLER "BRAIN"



Embed within your own design

STANDARD MODULAR PRODUCTS

Use standard LXI slices to configure your own design

DEVELOPMENT CHASSIS

Use a platform to develop your design

CUSTOM SERVICES GROUP

Let AMETEK configure and build for you

A COTS SOLUTION FOR CUSTOM RFIU REQUIREMENTS

- Configured easily into commercial-off-the-shelf products
- Supported and repeatable product builds
- Documented and designed for long-term, worldwide support
- Embedded BOMs, configuration details, and component specifications are accessible via the web from anywhere in the world

A COMMON CORPORATE-WIDE SOLUTION

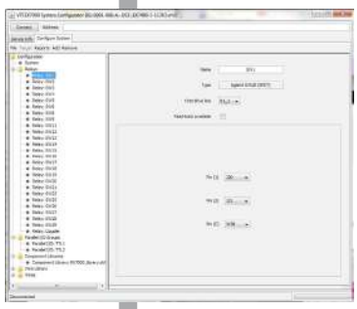
- Based on LXI, a forward-looking Ethernet-based standard
- Provides the trust required for an OEM solution with AMETEK's reputation for product longevity
- Supported by an experienced team of RF/microwave engineers who can help you develop your system or develop one for you
- Leverage and build on your existing engineering investment

Save Time & Money

DEVELOPING MICROWAVE SUBSYSTEMS

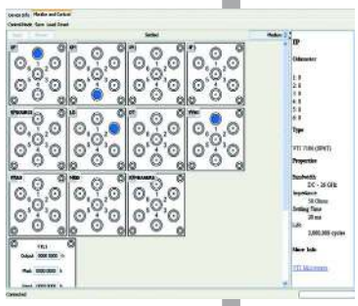
The AMETEK VTI Way...

1 DAY OF WORK



VTI Microwave's Broadband Integrated Design Wizard In-House

1. We utilize our in-house configuration system
2. Simplifies bill of materials generation
3. Aids in wire list generation
4. Path-Level instrument driver is generated automatically
5. Graphical User Interface is generated automatically



vs. The Hard Way...

65 DAYS OF WORK

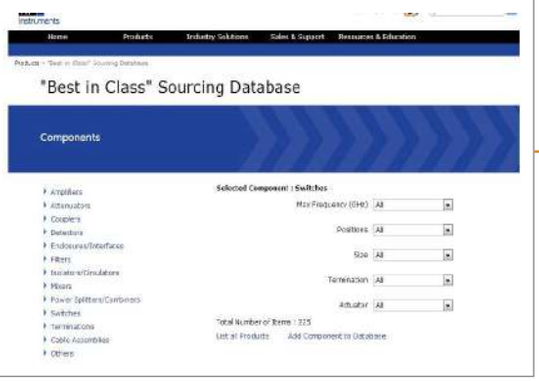
Develop a Microwave Subsystem Piece-by-Piece

1. Vendor calls and research - 5 Days...
2. Time working on bill of materials - 5 Days...
3. Time working on wire list - 5 Days...
4. Time con guring instrument drivers - 30 Days...
5. Time designing a graphical interface - 20 Days...

Experience the Simplicity

STEP 1

WE HELP SELECT COMPONENTS



STEP 2

DOWNLOAD ONTO THE EX7000 INTERFACE

This best-in-class sourcing database is the only knowledge base of its kind in the world. AMETEK's relationships with leading component suppliers coupled with the extensive experience of our development team to:

- Select from a library of 1000's of components
- Download datasheets
- Access 100's of technical notes
- Utilize engineering charts and calculators

With a click of the mouse, a complete list of RF/microwave components, schematic, and any other user documentation can be downloaded into the EX7000 LXI-based interface.

The result is a customized assembly defined and documented as a standard product, allowing anyone to repair and maintain the box. Combined with AMETEK's commitment to long-term product support, this ensures product viability for many years

STEP 3

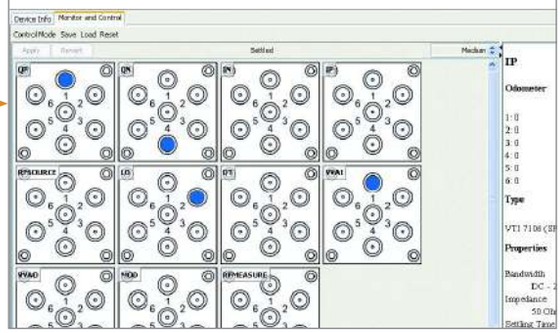
CONFIGURE THE EX7000 PLATFORM AS A COTS DEVICE

Using the on-board Broadband Integrated Design Wizard, configure the EX7000 per the electrical schematic and component list. Assign reference designator names to each component and logical channel and path names to be used in the application code.

Save the configuration to on-board memory and create automatic power-up and shutdown states, track relay closure counts to assist preventative maintenance, and generate scan lists to reduce test execution times.

STEP 4

PROGRAM AND CONTROL FROM ANYWHERE IN THE WORLD



Embed the EX7000-Core relay driver and I/O into your assembly. Purchase the EX7400 custom RF/microwave enclosure with power supplies to house your configuration or purchase the complete subsystem or standard microwave slices from us.

All EX7000 family products provide a powerful webbased monitor and control interface that is specific to every component list. A common open-architecture software driver includes path-level programming to reduce development time.

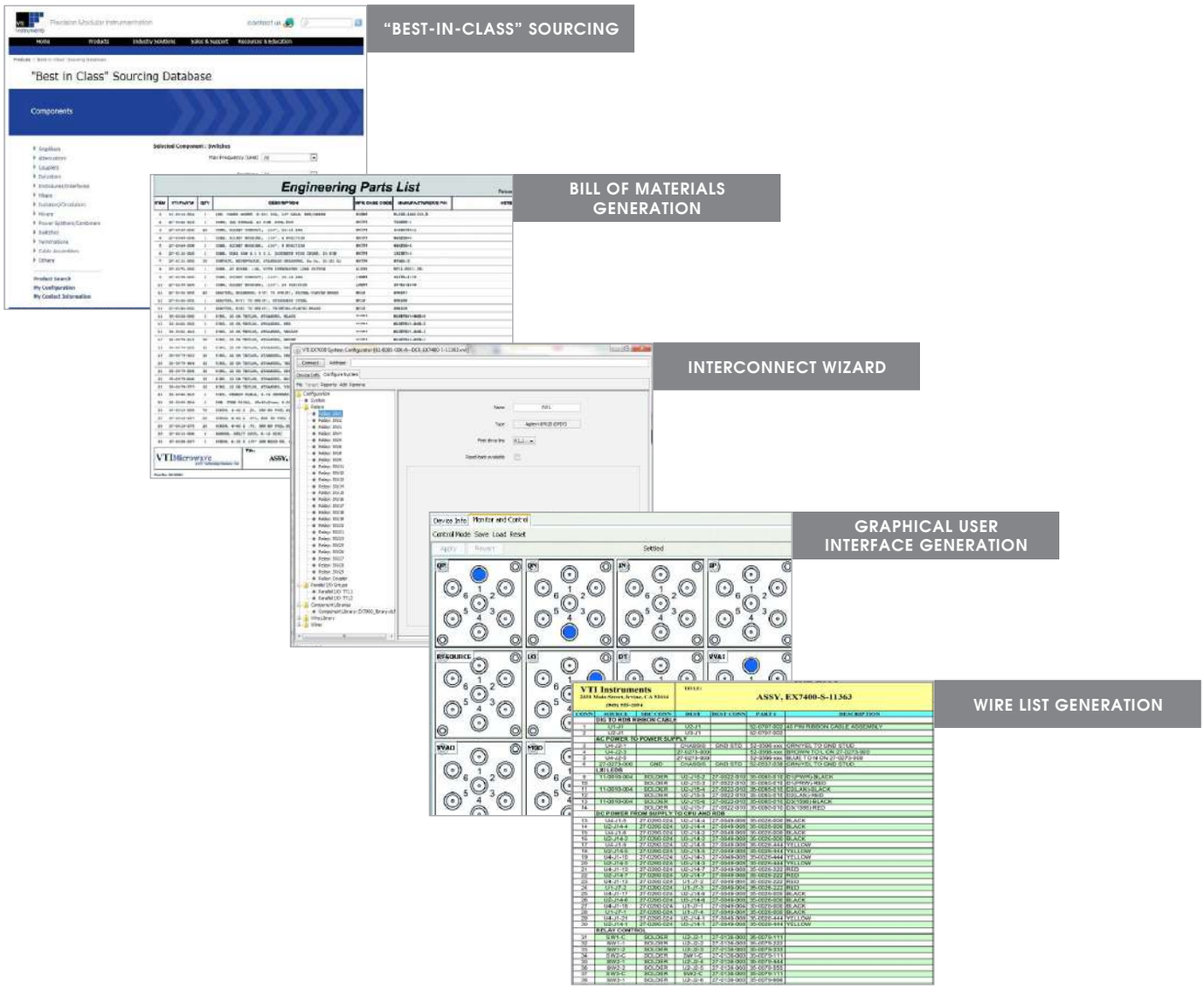
Broadband Integrated Design Wizard

FROM DESIGN TO PRODUCTION

VTI Instruments's Broadband Integrated Design Wizard has been designed to expedite the process during the specification and development phase of the microwave subsystems, while also providing a streamlined process for automatically creating the documentation necessary for long-term support of the product. By combining a powerful web-based search engine with an intuitive graphical configuration utility, developers can create a custom assembly with the look and feel of a standard COTS product.

With the Broadband Integrated Design Wizard, we can automatically create:

- Bills of material
- Interconnect diagrams for simplified path-level programming
- Graphical web-based front panels for monitor and control from anywhere in the world
- Wire lists



Instrument Drivers

"LEAN" OPEN INSTRUMENT DRIVERS

The industry standard drivers support application development in all common environments including C#, Visual Basic, LabVIEW™, Python, C/C++, and Java. VTI's innovative approach to driver development also provides true operating system independence with drivers that work seamlessly in Windows and Linux. Direct word serial communication (SCPI Control) is also supported.

BUILT-IN SYSTEM-LEVEL SWITCHING

System-level (not just card level) I/O can be logically named such that an entire path consisting of multiple relays can be connected with a single function call. On-board intelligence ensures that there are no conflicts with shared resources.

RELAY ODOMETER

Tracks cycle count of each relay coil. Assists preventative maintenance programs by monitoring for relay end-of-life

EXCLUDE LISTS

Prevents undesirable combinations of relay closures. Prevents unsafe conditions such as shorting sources to ground or source to source.

SCAN LISTS

Removes the burden of managing and synchronizing the sequencing of up to 16k switch states from the host controller to speed up test execution. Sequences can be advanced via LXI Extended Function Trigger Events or the general-purpose digital I/O port.

CONFIGURATION TABLE

Store 128 known configurations for quick recall during test. Power-up state automatically configures box to default state once power is applied.

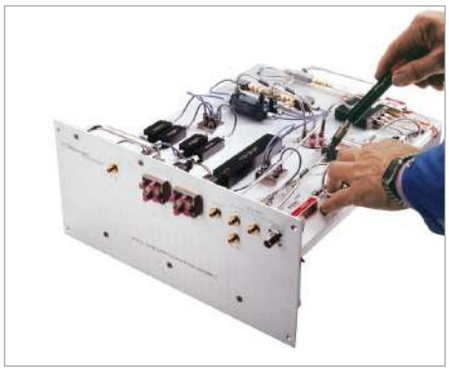
PROGRAMMABLE MBB AND BBM

The application code can globally define whether or not the relays "break-before-make" or "make-beforebreak" when sequencing through relay setups.

WEB-BASED MONITOR AND CONTROL

All components connected to a driver board are automatically identified and displayed in the web interface where they can be monitored and controlled via a standard web browser.

Custom Integration Services



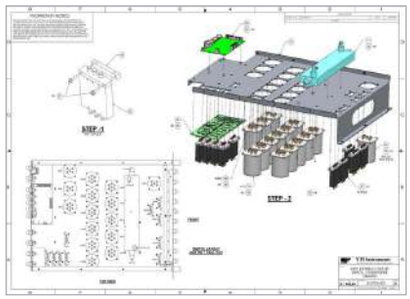
PARTNER OF CHOICE

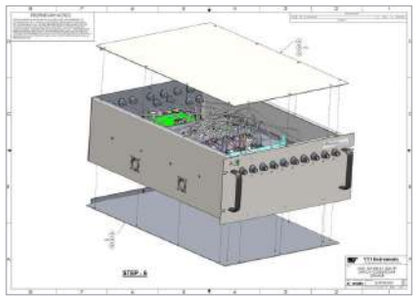
AMETEK specializes in the design and manufacture of open-architecture solutions for custom microwave subsystems and broadband RF switching. Pioneers in the development of the first miniature microwave relay, The VTI Instruments brand leverages the 30+ years of individual experience of our design engineers along with state-of-the-art test and analysis tools, to bring the combined benefits of a custom engineering group and a worldwide service and support infrastructure to our customers. ISO 9001 registered, AMETEK is an experienced, proven supplier of testing systems for critical applications in the aerospace, defense, manufacturing, medical and process industries.

INDUSTRY LEADERS AND BEST-IN-CLASS INDUSTRY PARTNERS

As active and founding members of the LXI, PXI, VXI and IVI consortiums, we understand the requirements of today's testing environments along with the complexities of planning for the future from the inside out. Our strong industry commitment combined with close relationships with the leading manufacturers of best-in-class components brings VTI brand customers the most cost-effective and comprehensive solutions available in the marketplace today

Custom Integration Services





KEY BENEFITS

REDUCE ENGINEERING OVERHEAD AND MAINTAIN DESIGN CONTROL

- Focus your attention to testing your product – not designing an instrument
- One part number for core ATE hardware – significantly reduces documentation overhead
- Transparent management of configuration control and obsolescence

REDUCE PROJECT SCHEDULE RISKS

- Strong relationships with RF component suppliers
  for significantly reduced lead times
- Streamline process for custom builds – reduces project schedule (average 10 weeks)
- We stock many of the most common RF switch components
- Software development package mitigates software risks.

WE PROVIDE ALL THE ENGINEERING DOCUMENTATION REQUIRED FOR REPEAT BUILDS AND LONG-TERM SUPPORT

- Wire list and BOM
- Electrical schematics
- ATP
- Mechanical drawings
- User documentation
- EX7000 architecture facilitates design changes in the field, even without our involvement

COST-EFFECTIVE AND FLEXIBLE SOLUTIONS

AMETEK VTI solutions leverage a unique combination of modularity and reusability, providing the greatest level of flexibility throughout the operational life of a system, from both a hardware and software perspective. Whether our solutions are used as an in-house development platform, embedded within a design, or configured and built to specification by AMETEK's Custom Engineering group, VTI brand customers have confidence in using the best performing, highest quality products available.

SUPERIOR DESIGN AND CONTROL

AMETEK VTI incorporates SolidWorks™ 3D modeling, a dedicated state-of-the-art 3D design and assembly tool, and its web-based Microwave Configurator, to leverage proven best practices, techniques, and best-in-class component selection and placement. This helps to eliminate the guesswork and uncertainty surrounding the microwave subsystem design process, thereby reducing overall system and engineering costs. Complete access to subsystem operation is provided by an intuitive, web-based user interface, giving users the power to control, monitor and maintain from anywhere in the world.

Solutions Utilizing the EX7000 Family

APPLICATION SPECIFIC FRONT PANELS

- LED Indicators for switch status
- Custom silkscreens of block diagram, logical I/O, and corporate logos
- Mechanical support for rack mounting and power meter head support
- Web-based GUI with active block diagram of application specific design
- Every design built for maintainability

Solutions Utilizing the EX7000 Family

RF/MICROWAVE INTERFACE TEST ADAPTERS

- RF/microwave ITA's allows microwave components to be placed as close as possible to DUT to maximize signal integrity and reduce signal attenuation.
- RF/microwave ITA's used for path level characterizations
- Access to panels with detailed wiring identification within the ITA's simplifies routine maintenance functions

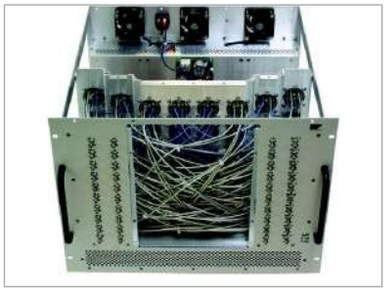
RF SIMULATOR AND POWER DISTRIBUTION

- Hybrid power distribution & RF routing
- Characterization and test of complex programmable RF filters
- Linear power supply integrated into solution
- Critical VSWR requirements

Solutions Utilizing the EX7000 Family

EXPANDABLE MATRIX BUILDING BLOCKS

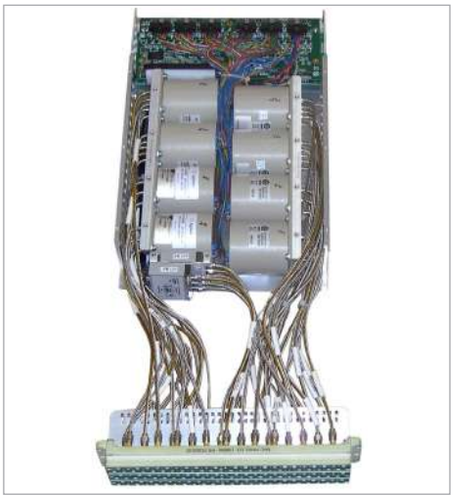
- Industry's only large scale RF matrix built for maintainability
- Common relay building blocks simplifies sparing
- Easy access to front back and sides
- Staggered mechanical design for easy relay extraction
- Zero down-time solution
- 10x10 and 12x12 systems built with expansion ports to scale up to larger matrices
- Use 4 (10x10)'s to form a 20x20 or 4 (12x12)'s to form a 24x24
- Careful cable selection for uniform insertion loss

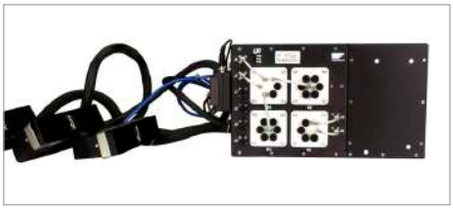


Solutions Utilizing the EX7000 Family

PARALLEL TESTING OF WIRELESS CHIPSETS

- Devices Under Test (DUTs) tested in parallel with exact repeatable measurements across all channels
- Isolation critical performance – parallel testing cannot tolerate "channel bleeding"
- High-pedigree components and physical layout optimizes performance
- Careful cable selection and routing ensures phase matching across all paths
- Special Automatic Test Procedure (ATP) for isolation verification with oscilloscope interface
- Interface cables designed to minimize crosstalk
- True MIMO device testing
- S-parameter testing data available





CUSTOMIZED MULTI-INSERTION CONNECTORIZATION

- Mates to interface adapters on ATE for simplified connectivity
- Incorporate RF and non-RF signals
- Comprehensive RF characterization to the UTT interface

Solutions Utilizing the EX7000 Family

OPTICAL ATTENUATION/DISTRIBUTION & DELAY

- Switchable optical delay paths
- Extending EX7000 beyond microwave components to power and optical applications
- Careful routing of fiber optics for optimized phase performance
- LXI to I2C converter transparent to user
- Non RF switching applications high voltage or high current
- Can switch up to 100 A current with appropriate relay and heat extraction mechanisms

RF REPEATER

- 2W RF power amplification
- Massive energy dissipation with heat sinks
- Thermal solution critical to success
- Careful design to ensure sufficient airflow and cooling

1X25 HIGH DENSITY MULTIPLEXER

- 26.5 GHz
- 1U footprint
- Leverage COTS products for cost effective custom solutions

EX7000-Core

LXI Extended Class Universal Relay Driver and I/O

GENERAL SPECIFICATIONS

Digital Control Board	
Dimensions	0.9''H x 6''W x 3.6'' D
Connectors	
Host Interface	RJ-45 (CAT-5e), Ethernet (10/100T)
Trigger Bus	Two 25-pin mini D-sub, 8 LVDS in/out
TTL I/O	9-pin D-sub
Relay Driver Board	
Dimensions	0.63''H x 8.56''W x 4''D
Connectors	
Relay Drivers	Twelve 20-pin IDC
Power	8-pin power header, 2x 5 V, 3x GND, 3x EXT_SOURCE (5-48 V)
DCB-to-RDB	40-pin IDC
Relay Power	5 V to 48 V, Three per driver board in groups of 24
Relay Drivers	72 per board
Max Current Sink	410 mA 200 mA(all channel ON) 800 mA (reset/high-current only)
TTL I/O	32 channels per board

FEATURES

- Significantly reduces development efforts for custom microwave solutions by eliminating the need to design relay drivers, communications interface, firmware, and device drivers
- Modular design allows scalable solutions in increments of 72 highcurrent sink, 12 reset/control, and 32 TTL I/O channels
- Design based on industry standards (LXI and IVI drivers) to ensure interoperability and ease of use
- Graphical web-based command and control simplifies RF/microwave system design and debug
- Enhanced maintenance capability through tracking of relay cycle counts and remote monitoring of fault conditions
- Continuous current sink for driving nonlatching component types or pulsed current mode for control of latching components
- Supports non-relay components such as attenuators and synthesizers

EX71HD

High-Density, Modular 26.5 GHz Microwave Switch

FEATURES

- Significantly reduces development efforts for custom microwave solutions by eliminating the need to design relay drivers, communications interface, firmware, and device drivers
- Modular design allows scalable solutions in increments of 72 highcurrent sink, 12 reset/control, and 32 TTL I/O channels
- Design based on industry standards (LXI and IVI drivers) to ensure interoperability and ease of use
- Graphical web-based command and control simplifies RF/microwave system design and debug
- Enhanced maintenance capability through tracking of relay cycle counts and remote monitoring of fault conditions
- Continuous current sink for driving nonlatching component types or pulsed current mode for control of latching components
- Supports non-relay components such as attenuators and synthesizers

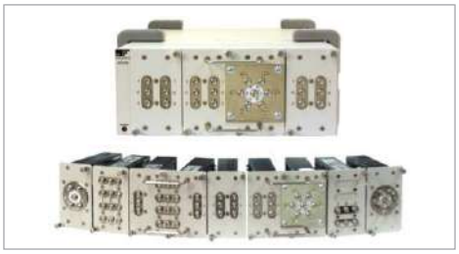
GENERAL SPECIFICATIONS

	VSWR	Insertion Loss	Isolation
DC-4 GHz	1.20:1	0.20 dB	80 dB
4-8 GHz	1.30:1	0.30 dB	75 dB
8-12 GHz	1.40:1	0.40 dB	70 dB
12-18 GHz	1.50:1	0.50 dB	60 dB
18-26.5 GHz	1.60:1	0.60 dB	55 dB

Switching Frequency	DC to 26.5 GHz
Switching Time	< 15 ms
RF Impedance	50
Connector	SMA
Lifespan	1 million cycles

EX7204A/EX7204L

High-Performance Modular Microwave Switch



SPECIFICATIONS AND ORDERING INFORMATION

MAINFRAMES

Model No.	Description
EX7204A	Half-rack 2U, LXI extended class, 4-slot mainframe for non-latching modules
EX7204L	Half-rack 2U, LXI extended class, 4-slot mainframe for latching modules

FEATURES

- Combine up to 32 SPDT or 16 multiport high-performance relays in a compact 2U footprint
- Dual LXI/USB communication control
- External power supply included AC/ DC power adapter included (100-240 V AC, 50-60 Hz)
  Max DC Power Capacity -
  7204A: 24 V 50 W
  7204L: 12 V 60 W
- Dimensions: 3.5"H x 8.6"W x 14.5"D

RELAY MODULES

MODEL NO.	SLOT WIDTH	RELAY	QTY	BAND WIDTH	RELAY LIFE	CON-NECTOR	TERMINATION	INSERTION LOSS (6GHZ)	ISOLATION (6GHZ)	VSWR (6GHZ)	REPEATABILITY (6GHZ)
EX7204A-2121S	1	SPDT fail-safe	2	18 GHz	$5x10^6$ cycles	SMA	None	0.20 dB	70.0 dB	1.25:1	0.05 dB
EX7204A-3121S	1	SPDT fail-safe	3	18 GHz	$5x10^6$ cycles	SMA	None	0.20 dB	70.0 dB	1.25:1	0.05 dB
EX7204A-4121S	1	SPDT fail-safe	4	18 GHz	$5x10^6$ cycles	SMA	None	0.20 dB	70.0 dB	1.25:1	0.05 dB
EX7204L-0202T	1	SPDT latching	2	18 GHz	$5x10^6$ cycles	SMA	50	0.20 dB	70.0 dB	1.25:1	0.05 dB
EX7204L-0402T	1	SPDT latching	4	18 GHz	$5x10^6$ cycles	SMA	50	0.20 dB	70.0 dB	1.25:1	0.05 dB
EX7204L-0602T	2	SPDT latching	6	18 GHz	$5x10^6$ cycles	SMA	50	0.20 dB	70.0 dB	1.25:1	0.05 dB
EX7204A-1141S	1	SP4T normally open	1	18 GHz	$5x10^6$ cycles	SMA	None	0.20 dB	70.0 dB	1.25:1	0.05 dB
EX7204A-2142S	1	SP4T normally open	2	26.5 GHz	$1x10^7$ cycles	SMA	None	0.30 dB	70.0 dB	1.30:1	
EX7204A-1161S	1	SP6T normally open	1	18 GHz	$5x10^6$ cycles	SMA	None	0.20 dB	70.0 dB	1.25:1	0.05 dB
EX7204A-2162S	1	SPDT latching	2	26.5 GHz	$1x10^7$ cycles	SMA	None	0.30 dB	70.0 dB	1.30:1	
EX7204L-0202T/0106T	2	SPDT latching SP6T latching	2 1	18 GHz 18 GHz	$5x10^6$ cycles $5x10^6$ cycles	SMA SMA	50 Ω 50 Ω	0.20 dB 0.20 dB	70.0 dB 70.0 dB	1.25:1 1.25:1	0.05 dB 0.05 dB

EX72SF
High-Performance Modular Microwave Switch

FEATURES

- Combine up to 6 SPDT and 6 multiport high-performance building blocks in 2U footprint
- Switch signals up to 40 GHz
- Relays employ patented self-cleaning technology that maximizes repeatability (< 0.03 dB) over lifetime minimizes measurement uncertainty
- Extended life and self-terminating options provide maximum design flexibility
- Latching relay design reduces power consumption and improves repeatability and thermal stability
- Dimensions: 3.5''H x 17.3''W x 14.5''D

GENERAL SPECIFICATIONS

	VSWR	Insertion Loss	Isolation (EL*)
DC-4 GHz	1.20:1	0.36 dB	90 dB (100 dB)
4-8 GHz	1.35:1	0.42 dB	90 dB (100 dB)
8-12 GHz	1.35:1	0.48 dB	90 dB (100 dB)
12-15 GHz	1.45:1	0.52 dB	70 dB (80 dB)
15-18 GHz	1.45:1	0.57 dB	65 dB (70 dB)
18-20 GHz	1.70:1	0.60 dB	65 dB (70 dB)
20-26.5 GHz	1.70:1	0.70 dB	60 dB (65 dB)
26.5-40 GHz	1.95:1	1.10 dB	(65 dB)
***(EL) = With Extended Life Option**			
Switching Frequency	DC to 40 GHz	DC to 26.5 GHz	DC to 20 GHz
Switching Time	< 15 ms		
RF Impedance	50		
Connector	DC-26.5 GHz: SMA DC-40 GHz: 2.92 (f)		
Lifespan	2 million cycles (5 million cycles)		

ORDERING INFORMATION

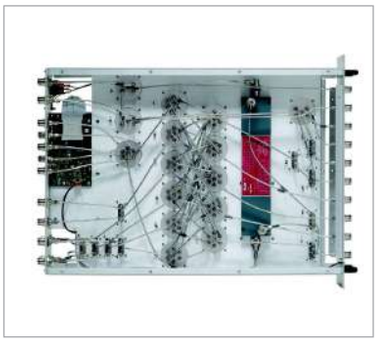
Model	Description
EX72SF	2U, 12-slot high-performance RF/ microwave switch mainframe
7200	Adapter, 6 universal 24 V driver lines
7202-20	SPDT, latching 20 GHz
7202-26	SPDT, latching 26.5 GHz
7202-20T	SPDT, self-terminated, 20 GHz
7202-26T	SPDT, self-terminated, 26.5 GHz
7202-20TEL	SPDT, self-terminated, EL, 20 GHz
7202-26TEL	SPDT, self-terminated, EL, 26.5 GHz
7222-26	Transfer, 26 GHz
7222-26EL	Transfer, EL, 26 GHz
7204-20	SP4T, latching 20 GHz
7204-26	SP4T, latching 26.5 GHz

Model	Description
7204-20T	SP4T, self-terminated, 20 GHz
7204-26T	SP4T, self-terminated, 26.5 GHz
7204-20TEL	SP4T, self-terminated, EL, 20 GHz
7204-26TEL	SP4T, self-terminated, EL, 26.5 GHz
7204-40TEL	SP4T, self-terminated, EL, 40 GHz
7206-20	SP6T, latching 20 GHz
7206-26	SP6T, latching 26.5 GHz
7206-20T	SP6T, self-terminated, 20 GHz
7206-26T	SP6T, self-terminated, 26.5 GHz
7206-20TEL	SP6T, self-terminated, EL, 20 GHz
7206-26TEL	SP6T, self-terminated, EL, 26.5 GHz
7206-40TEL	SP6T, self-terminated, EL, 40 GHz

EX7300 - EX7600

EX7300 Configuration
(Top Removed, Left)

EX7400 Configuration
(Top Removed, Right)



FEATURES

- Integrated EX7000-Core device control and relay driver interface
- LXI communications with IEEE-1588 and wired trigger-bus promotes seamless integration with other instrumentation
- 150 W power supply for the most complex designs
- Built-in fans for cooling
- Removable tray for mounting components and interconnect cables
- Supports custom RF/Microwave, optical, or power interface subassemblies while minimizing the time spent developing a software and communications interface.
- I/O access through rear or front panel for increased design flexibility
- 72 drive channels standard, expandable to 576 channels and 32-bit TTL I/O per driver board, expandable to 256
- Industry standard IVI driver set provides a well-documented software API that minimizes development time
- 128 element configuration table for quick recall of common setups
- Graphical XML configuration utility generates custom box "personality"
- Embedded web GUI for monitor and control of components

ORDERING INFORMATION

Model	Description	Dimensions
EX7300	3U mainframe with EX7000-Core	32.6mm (5.3") h x 444.5mm (17.5") W x 609.6mm (24.0") D
EX7400	4U mainframe with EX7000-Core	177.1mm (7.0") h x 444.5mm (17.5") W x 609.6mm (24.0") D
EX7500	5U mainframe with EX7000-Core	221.5mm (8.8") h x 444.5mm (17.5") W x 609.6mm (24.0") D
EX7600	6U mainframe with EX7000-Core	266.0mm (10.5") h x 444.5mm (17.5") W x 609.6mm (24.0") D

VTI INSTRUMENTS HIGH PERFORMANCE SWITCHING

RF/MICROWAVE SWITCHING

VTI Instruments / AMETEK PROGRAMMABLE POWER

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