EX1200 series

HIGH-DENSITY SWITCHING AND DATA ACQUISITION SYSTEMS

SCALABLE
HIGH-DENSITY
PERFORMANCE GRADE
COST-EFFECTIVE
SET UP AND RUN

RELIABLE DATA FIRST TIME EVERY TIME
VTI is at the Core of Virtually Every Major ATE Tester

VTI’s signal switch/measure and control components are employed worldwide in a broad spectrum of applications for aerospace, defense, telecommunications, test and measurement, contract manufacturing, automotive, medical, and commercial functional test.

VTI presides over the VXIbus consortium, co-founded the LXI standard, and is an active member of many other consortia that drive test and measurement industry standards. Our commitment to long-term open-platform standards has enabled system integrators to develop common ATE systems that are not impacted by the effects of obsolescence using standard products that are designed to maintain active production status in excess of 15 years.

The eX1200 is our next generation family that leverages our reputation for delivering innovative, modular high-density designs with common hardware and software architectures that can be leveraged throughout the life cycle of a product.

In 2005, VTI cofounded LXI*, an industry standard for ethernet-based test instrumentation, and is also the industry leader in open platform switching solutions. LXI stands for LAN eXtension for Instrumentation. It extends on traditional LAN, adding instrument interoperability requirements, timing and synchronization options, and enhanced performance, that makes it ideal as an instrumentation platform.

The eX1200 family incorporates LXI core technology as well as optional extended function capabilities, to take full advantage of the benefits the specification offers. The eX1200 family’s powerful synchronization and triggering capabilities provide the confidence that it can be integrated within any LXI, GPIB, PXI or VXI hybrid system:

- Distributed switching and measurement systems over LAN
- Synchronized measurement data to IEEE 1588 precision
- Highly deterministic hardware-based triggering using the LXI Wired Trigger bus
- Protection against PC bus obsolescence
- Assurance of multi-vendor instrument interoperability
- Scalable solutions that optimize rack space
- LAN extensions for Instrumentation

VTI is a leading supplier of data acquisition hardware and software, design and deliver precision modular instrumentation and data acquisition systems, serve high reliability markets where measurement performance is critical, and industry recognition from peers and customers.
The EX1200 product family is a modular and scalable series of multifunction switch/measure units that can be configured to address a variety of applications in the mechanical data acquisition and electronic test environments.

**OVERVIEW**

The EX1200 product family is a modular and scalable series of multifunction switch/measure units that can be configured to address a variety of applications in the mechanical data acquisition and electronic test environments.

**This family contains the following core components:**

- **Mainframes**
- **Plug-in cards**
- **Accessories and connectivity**

**Mainframes**
- Providing power to the plug-in cards
- Analog bus for routing measurements from plug-in cards to DMM
- A shared communication bus and system clock
- Synchronization

**Plug-in cards**
- General purpose and multiplexer switching 300 V, 3 A
- Power switching up to 16 A
- High voltage switching up to 1000 V
- RTD simulator
- Comparator/threshold detector
- RF/microwave switching
- Sources / tachometer / counters
- Digital I/O

**Robust I/O Interface**
- Connectivity options give users convenient and easy methods to connect the I/O to the instrument

**slots for inserting plug-in cards for specific functionality**

- 5-lane analog bus capable of routing signals up to 300 V, 3 A internally to the DMM for measurement.
- Optional 6.5 digit DMM capable of measuring DCV, ACV, DCL, ACL, 2W Ω, 4W Ω, temperature transducers, and frequency.

**Connectivity options give users convenient and easy methods to connect the I/O to the instrument**

- Terminal block with screw-in terminals for connecting user I/O
- Direct connections from switch module I/O to the internal DMM bus for measurement
- Terminal block routes user I/O to the plug-in card
A Single, Modular, Scalable Solution

Internal 5-wire bus routes directly to DMM
1/2 rack, 1U with 2 slots
Robust connectors provide durable interface
Full-featured 6.5 digit DMM
Full rack, 1U with 6 slots
Modules plug in from the front – minimizes system wiring
Internal bus extension
Digital alarm outputs
LAN/UXI status LEDs
Standard LAN connectivity
8-line UXI Wired Trigger Bus – precision hardware handshaking
Full rack, 3U with 16 slots
Full rack 8U with 14 slots
Integrated mass interconnect receiver on plug-in cards
Access points in rear to interface with I/O

High-Density Switching and Data Acquisition Systems

A P P L I C A T I O N S
• High-performance switching for ATE, DC to 26.5 GHz
• Power supply switching
• Temperature monitoring (RTD, thermocouple, thermistor)
• Automotive ECM testing
• High voltage monitor
• Data logging applications
• Cable/harness testing
• Battery test
• RTD/sensor simulation
• White Goods Testing

HIGHLIGHTS
• Modular, scalable architecture in half and full rack 1U, 3U and 8U versions provides low cost-per-channel across a wide range of channel count
• Small footprint for switching/scanning applications with up to 576 2-wire channels in 1U
• Optional EXLab "Set Up and Run" software simplifies data acquisition and analysis
• Measurement support for all thermocouple types, RTDs, and thermistors with built-in cold junction compensation
• Scan list architecture, tightly synchronized with internal 6.5 digit DMM, increases test throughput
• Analog and digital plug-in modules provide control capability of external devices
• Multiple calibration sets yield more accurate data across temperature range (up to eight per module)
• LXI communication interface eliminates platform obsolescence and support cost concerns
• Tightly synchronized measurements in a distributed architecture using IEEE 1588
• Highly deterministic handshaking using the LXI Wired Trigger Bus
• Web-based access for monitoring and control of devices, from anywhere in the world, using any web-enabled device

R E L I A B L E  D A T A  F I R S T  T I M E  E V E R Y  T I M E
Data Acquisition

**SWITCH/MEASURE AND CONTROL FOR DATA ACQUISITION**

When installed with the optional 6.5 digit DMM, the EX1200 family can be configured as a cost-effective, high-density, scanning measurement and control instrument capable of acquiring data from thermocouples, RTDs, thermistors, and voltage/current sensors at rates up to 1000 samples per second.

Plug-in switch/multiplexer modules are used to expand the number of channels that can be scanned in a single system. Additional plug-in modules extend the capabilities of this instrument for data acquisition by adding precision analog and digital outputs for controlling external devices, as well source/tach for measurements on rotating machinery.

**MEASUREMENT CAPABILITY**

**INPUT**

<table>
<thead>
<tr>
<th>Type</th>
<th>DC Voltage</th>
<th>AC Voltage</th>
<th>DC Current</th>
<th>AC Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 nV</td>
<td>100 nV</td>
<td>1 nA</td>
<td>10 nA</td>
<td></td>
</tr>
<tr>
<td>100 nV</td>
<td>100 V</td>
<td>3 A</td>
<td>3 A</td>
<td></td>
</tr>
</tbody>
</table>

**OUTPUT**

<table>
<thead>
<tr>
<th>Type</th>
<th>DAC (DC Voltage)</th>
<th>DAC (Current)</th>
<th>RTD Simulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 µV</td>
<td>160 V</td>
<td>4 Ω</td>
<td>10,000 Ω</td>
</tr>
<tr>
<td>2 µA</td>
<td>160 mA</td>
<td>4 Ω</td>
<td>10,000 Ω</td>
</tr>
</tbody>
</table>

**TERMINAL BLOCKS**

Terminal blocks provide wired cable assemblies with screw terminal breakout points that allow users to probe connections between instruments.

**TERMINAL BLOCKS**

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1200-TB44</td>
<td>Screw terminals supporting 20 AWG, 30 AWG wires</td>
</tr>
<tr>
<td>EX1200-TBR</td>
<td>Signals up to 120 V</td>
</tr>
</tbody>
</table>

Signals up to 120 V

Interface to plug-in module

Screw terminals supporting 20 AWG, 30 AWG wires

Built-in precision CJC reference thermistor

Signals up to 120 V

Interface to plug-in module
The eX1200 series is supported by the popular EXlab turn-key software package. The EXlab’s intuitive GUI significantly shortens time-consuming test setup and configuration. Test engineers can begin monitoring, recording, and analyzing data within minutes.

With EXlab and the EX1200 family, engineers can design a mixed-signal distributed measurement system that includes voltage, thermocouple, RTD, and digital inputs.

- Wide range of graphical displays to generate customized views of multiple channels
- Simultaneously record and store time-stamped data in open data formats
- Easy instrument discovery and connectivity on startup
- Save and import configurations for repeat tests
- Easily configure alarms and triggers
- Simplified options for timing and synchronization
- Self-calibration routines accessible in software
- Calculated and virtual channels supported

The web interface is accessible from any web-enabled device, including smart phones and tablets, and provides easy to use tools for test sequencing and scanning. Power on your instrument and start taking data in less than a minute.

A powerful embedded application dedicated to scanning measurement and control is provided. Each measurement channel can be configured independently with pass/fail limits that can be evaluated on the fly.

Stimulus and switch settings can be modified as part of the test sequence and input channels can be measured to verify how they respond to these changes. This robust utility minimizes processor overhead and test execution time.
The eX1200 family is the highest density switch and I/O instrument on the market with the ability to mix low-level, power, and RF switch modules in a single mainframe. This scalable family of products is designed to leverage capital investments in one common hardware and software platform that can be used in development, manufacturing, and field service.

Mix and match a variety of modules to build a comprehensive signal switching subsystem that can be supplemented with precision analog and digital I/O modules.

DON’T COMPROMISE DENSITY FOR PERFORMANCE

Typical switch cards that conform to the 3U Eurocard footprint (e.g. PXI) have a limited amount of available working space and manufacturers are often forced to make design tradeoffs between density and performance.

To achieve higher channel counts on a PXI card, smaller relays are tightly packed on a switch module. This puts signal carrying traces closer to one another and limits the channel-to-channel crosstalk immunity as well as current carrying capacity.

eX1200 series switching modules offer nearly double the available working space and increased channel count capacity to ensure the highest degree of signal integrity in the same vertical footprint as PXI. For lower density switching applications, VTI also offers a comprehensive family of performance PXI Express switch modules.

WHY INVEST IN A 6.5 DIGIT DMM WHEN 1.5 DIGITS CAN BE LOST IN SWITCH NOISE?

<table>
<thead>
<tr>
<th>Typical PC-Based 2 A Matrix</th>
<th>LXI-Based eX1200-4003 2 A Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>160 mm</td>
<td>285 mm</td>
</tr>
<tr>
<td>Dual 4 x 8; 64 two-wire crosspoints</td>
<td>25 MHz bandwidth</td>
</tr>
<tr>
<td>100 mm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Typical PC-Based 2 A Matrix</th>
<th>LXI-Based eX1200-4003 2 A Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 MHz bandwidth</td>
<td></td>
</tr>
</tbody>
</table>

-60 dB crosstalk @ 100 kHz
-1 V aggressor adds 1 mV of noise to 10 V signal
-30x error when compared to higher integrity switch card
-1.5 digits are lost off a measurement instrument due to the crosstalk

-90 dB crosstalk @ 100 kHz
-1 V aggressor adds only 31.6 µV noise to 10 V signal
-Maximize full range of measurement instrument capability
Open Software – Expedite System Readiness

THE MOST SIGNIFICANT INVESTMENT OF ANY AUTOMATED TEST PROJECT RIDES IN THE SYSTEM SOFTWARE. VTI’S COMMITMENT TO DELIVERING OPEN ARCHITECTURE SOLUTIONS EXTENDS TO SOFTWARE UTILITIES AND TOOLS THAT REDUCE DEVELOPMENT TIME WHILE MAXIMIZING THE FLEXIBILITY TO CHOOSE THE APPLICATION DEVELOPMENT ENVIRONMENT.

FLEXIBLE APPLICATION PROGRAMMING OPTIONS

Every EX1200 series module is delivered with an application programming interface (API) that conforms to industry standard VTI specifications.

The VTI drivers can be used directly in the most common application development environments such as LabVIEW™, LabWindows/CVI™, C++ and Visual Basic. The EX1200 drivers allow a programmer to:

• Achieve faster development time through system wide path-level programming
• Plan routine maintenance by automatically tracking relay closures
• Precisely synchronize distributed measurements through IEEE 1588
• Use the LXI Wired Trigger bus for highly deterministic hardware handshaking
• Auto-Instrument discovery using NI-MAX™ and Agilent Connection Expert™

OPERATING SYSTEM INDEPENDENCE

VTI’s innovative approach to driver development provides system developers with true OS independence without sacrificing the convenience that instrument drivers deliver.

An VTI-like API can be imported into Linux® and other operating systems. The intuitive APIs simplify programming, making low-level coding unnecessary to access the full capability of the instrument.

BUILT-IN PATH-LEVEL SWITCH CONFIGURATOR

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. With the EX1200 family there is now no need for expensive switch configurator utilities.

CONFIDENCE CHECKING

Internal feedback provides assurance of relay closure

EXTENSIVE TRIGGERING

Extensive hardware and LAN-based handshaking with other system devices increases test throughput by limiting communication with a host PC.

AUTOMATIC SCANNING

Predefined channel lists can be stored on-board to simplify programming setup and reduce test execution time.

SAFETY INTERRUPT

This failsafe feature forces all relays to a default state in the event of a fault condition. This allows hazardous voltages to be automatically removed from the interface panels.

PROGRAMMABLE TIMING DELAY

Delays can be programmed into the modules to account for the settling of other system devices. When used with triggers and scan lists, a highly deterministic measurement system can be easily configured.

RELAY HEALTH MONITORING

A relay odometer keeps track of the number of times a relay has been actuated and can be used to predict routine maintenance. Switch self-test is supported on select switch instruments and tracks path resistance across relays to monitor relay health.
Connectors and Cabling

PROTECTING SIGNAL INTEGRITY END-TO-END

The performance of a switch system goes beyond just the relays and the switch card PCB. Everything in the signal path, including the cabling and connectors from the DUT and to the measurement instruments, can add noise and degrade the signal.

VTI optimizes the system-level performance by providing easy to use connectivity options that minimize signal loss.

**TYPICAL VTI HIGH-DENSITY CONNECTOR**
- CRIMP/POKE SIMPLIFIES CABLE CONSTRUCTION INCREASES DURABILITY
- WIRES TERMINATE DIRECTLY INTO CONNECTOR MAXIMIZING PERFORMANCE
- 22 AWG WIRE ALLOWS FOR 2 A CARRY
- INCREASED PIN SEPARATION EXTENDS VOLTAGE RATING TO 300 V

**TYPICAL PC HIGH-DENSITY CONNECTOR**
- PC BOARD REQUIRED FOR SUCCESSFUL TERMINATION
- NOT RECOMMENDED TO BE BUILT BY END USER
- ADDITIONAL CONNECTION POINT INCREASES INSERTION LOSS AND ADDS ANOTHER POINT OF FAILURE
- MAXIMUM 28 AWG WIRE RESTRICTS CURRENT CARRYING CAPABILITY TO 1 A CARRY
- MINIMAL PIN SEPARATION LIMITS SWITCHED VOLTAGE TO 100 V

Connectors and Cabling

**CONNECTORS AND ACCESSORIES**

For each product in the EX1200 series, VTI Instruments offers a range of connectivity options that give users different options to interface to the instruments. There are four basic types of connectivity options:

- PRE-ASSEMBLED CABLES
- TERMINAL BLOCKS
- INTERFACE TEST ADAPTERS
- CRIMP TOOLS
- CRIMP PINS
- TEFLON/PVC COATED WIRES
- INSERTION AND EXTRACTION TOOLS
- HOODS/COVERS
- NYLON SHROUDS

**DISCRETE ACCESSORIES**

VTI Instruments offers discrete components for all its connectors that allow users to build their own cable assemblies. This includes:

- MATING CONNECTORS
- STRAIN RELIEF ACCESSORIES
- CRIMP TOOLS
- CRIMP PINS
- TEFLON/PVC COATED WIRES
- INSERTION AND EXTRACTION TOOLS
- HOODS/COVERS
- NYLON SHROUDS

**ACCESSORIES**

For each product in the EX1200 series, VTI Instruments offers a range of connectivity options that give users different options to interface to the instruments. There are four basic types of connectivity options:
Connectors and Cabling

PRE-ASSEMBLED CABLES

VTI Instruments offers fully assembled cables that have mating connectors on one end and loose wires on the other end. Different options for cable length are available for many of the connectors.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-0363-006</td>
<td>41-pin, Unterminated Cable Assembly, 3 ft</td>
<td></td>
</tr>
<tr>
<td>70-0363-002</td>
<td>44-pin, Unterminated Cable Assembly, 3 ft</td>
<td></td>
</tr>
<tr>
<td>70-0363-001</td>
<td>104-pin, Unterminated Cable Assembly, 3 ft</td>
<td></td>
</tr>
<tr>
<td>70-0363-005</td>
<td>160-pin, Unterminated Cable Assembly, 3 ft</td>
<td></td>
</tr>
</tbody>
</table>

* To match plug-in card to connector type, see table on page 20

INTERFACE TEST ADAPTERS

Interface test adapters are used in automated test stations to interface between test instruments in the test rack and the device under test. VTI offers pre-configured mainframes with interface receivers and all associated cabling and wiring. Please refer to VTI's createX series data sheets.

- CMX24-XT: Integrated 18-slot PXI Express/EX1206A mainframe with pull-through receiver
- CMX34-G18: Integrated 18-slot PXI Express/EX1208A mainframe, with cabled receiver

PXI EXPRESS SWITCHING

For applications where the channel counts for signal switching are not large, VTI offers the SMX series - a broad range of “precision instrumentation grade” switch modules on the PXIe platform.

The SMX series is an extension to the EX1200 series, and can be controlled using the same instrument drivers. This allows smaller systems within PXI to be upgraded, or larger systems to be downsized easily.

- Best-in-class signal switching performance on PXI/PXIe form factor
- PXIe as opposed to PXI - mitigates obsolescence and is based on faster, newer, and forward looking instrumentation platform
- Relay health monitoring and self-test within matrix cards
- Software benefits – path level switching, confidence checking, and safety interrupts

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMX-3276</td>
<td>76 channel, dual (1x38) 2-wire, 300V/2A multiplexer</td>
</tr>
<tr>
<td>SMX-4610</td>
<td>160 crosspoint, four (4x10), 2-wire, 300V/2A matrix</td>
</tr>
<tr>
<td>SMX-6002</td>
<td>12-channel, 16A, Form C (SPDT) switch</td>
</tr>
<tr>
<td>SMX-6001</td>
<td>80-channel, 2A, Form A (SPST) switch</td>
</tr>
<tr>
<td>SMX-6051</td>
<td>Four SPDT multiplexer, 3-GHz</td>
</tr>
<tr>
<td>SMX-7600</td>
<td>DC to 26.5-GHz, microwave switch carrier and relay driver</td>
</tr>
</tbody>
</table>
### MAINFRAMES

<table>
<thead>
<tr>
<th>Model</th>
<th>Slots</th>
<th>Note</th>
<th>Size</th>
<th>LAN Specification</th>
<th>Backplane Extension Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1202</td>
<td>2</td>
<td>Full Rack, 1U</td>
<td>L3 1/10/10T</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>EX1206A</td>
<td>6</td>
<td>Full Rack, 1U</td>
<td>L3 1/10/10T</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>EX1206A</td>
<td>16</td>
<td>Full Rack, 3U</td>
<td>L3 1/10/10T</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>EX1214-ICA</td>
<td>14</td>
<td>6U slots with integrated mass interconnect receiver</td>
<td>Full Rack, 8U</td>
<td>L3 1/10/10T</td>
<td>6</td>
</tr>
</tbody>
</table>

### SWITCHES

#### DISCRETE

<table>
<thead>
<tr>
<th>Model</th>
<th>Channels</th>
<th>Configuration</th>
<th>Switched V/A</th>
<th>Switched Power (max)</th>
<th>Bandwidth (-3 dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1200-2011ICA</td>
<td>20</td>
<td>12 SPDT, 5 SP4T, 2 Dual Ganged SPDT, 1 SPDT</td>
<td>115 VAC/28 VDC, 12 A</td>
<td>115 VAC/28 VDC, 25A</td>
<td>300 W</td>
</tr>
<tr>
<td>EX1200-2011ICA</td>
<td>14</td>
<td>11 SP4T, 3 SPDT</td>
<td>30 V, 0.5 A</td>
<td>10 W</td>
<td>1 GHz</td>
</tr>
</tbody>
</table>

#### MULTIPLEXER

<table>
<thead>
<tr>
<th>Model</th>
<th>Channels</th>
<th>Configuration</th>
<th>Switched V/A</th>
<th>Switched Power (max)</th>
<th>Bandwidth (-3 dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1200-2001A</td>
<td>48</td>
<td>2x (1x24) 1-wire, 2x (1x12) 2-wire</td>
<td>1000 VDC/700 VAC, 2 A</td>
<td>25 W/25 VA</td>
<td>60 MHz</td>
</tr>
<tr>
<td>EX1200-2001B</td>
<td>30</td>
<td>3x (1x10) 1-wire</td>
<td>1000 VDC/700 VAC, 2 A</td>
<td>25 W/25 VA</td>
<td>60 MHz</td>
</tr>
<tr>
<td>EX1200-2001C</td>
<td>8</td>
<td>Max. 2x (1 x 2) 2-wire</td>
<td>1000 VDC/700 VAC, 2 A</td>
<td>25 W/25 VA</td>
<td>400 MHz</td>
</tr>
<tr>
<td>EX1200-2001D</td>
<td>12</td>
<td>8x (1x16) 1-wire, 8x (1x8) 2-wire, 4x (1x8) 4-wire</td>
<td>300 V 2 A</td>
<td>60 W/125 VA</td>
<td>50 MHz</td>
</tr>
<tr>
<td>EX1200-2001E</td>
<td>48</td>
<td>2x (1x24) 2-wire, 1x(1x24) 4-wire plus 2x 3A channels</td>
<td>300 V 2 A</td>
<td>60 W/125 VA</td>
<td>35 MHz</td>
</tr>
<tr>
<td>EX1200-2001F</td>
<td>48</td>
<td>2x (1x24) 2-wire, 1x(1x24) 4-wire FET mux</td>
<td>250 V 2 A</td>
<td>5 W/4.2 VA</td>
<td>10 MHz</td>
</tr>
<tr>
<td>EX1200-3001B</td>
<td>72</td>
<td>2x (1x38) 2-wire, (1x36) 4-wire</td>
<td>300 V 2 A</td>
<td>60 W/125 VA</td>
<td>40 MHz</td>
</tr>
<tr>
<td>EX1200-3001C</td>
<td>96</td>
<td>4x (1x24) 2-wire, (1x48) 4-wire</td>
<td>240 VAC/120 VOL, 1 A</td>
<td>30 W/37.5 VA</td>
<td>20 MHz</td>
</tr>
<tr>
<td>EX1200-3101</td>
<td>64</td>
<td>16x (1x4) 2-wire, 8x (1x6) 4-wire</td>
<td>300 V 2 A</td>
<td>60 W/125 VA</td>
<td>45 MHz</td>
</tr>
</tbody>
</table>

#### DIGITAL I/O

<table>
<thead>
<tr>
<th>Model</th>
<th>Channels</th>
<th>Sample Rate</th>
<th>Memory</th>
<th>Iout max (Sink)</th>
<th>Iout max</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1200-7500</td>
<td>8x 8-bit ports</td>
<td>2 MHz</td>
<td>2 MB</td>
<td>&lt; 300 mA</td>
<td>60 V</td>
</tr>
</tbody>
</table>

#### COUNTER/MULTIFUNCTION

<table>
<thead>
<tr>
<th>Model</th>
<th>Channels</th>
<th>Sample Rate</th>
<th>Memory</th>
<th>Output</th>
<th>Min Pulse Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1200-1501</td>
<td>8 counter</td>
<td>1 MHz</td>
<td>256 k reading</td>
<td>NA</td>
<td>50 ns</td>
</tr>
<tr>
<td>EX1200-1501T</td>
<td>8 channel</td>
<td>1 MHz</td>
<td>256 k reading</td>
<td>NA</td>
<td>50 ns</td>
</tr>
<tr>
<td>EX1200-7501</td>
<td>16 DIO Static</td>
<td>1 MHz</td>
<td>256 k reading</td>
<td>NA</td>
<td>50 ns</td>
</tr>
</tbody>
</table>

#### DMMs

<table>
<thead>
<tr>
<th>Model</th>
<th>Channels</th>
<th>Max/Min (Max)</th>
<th>Functions</th>
<th>Max V/I</th>
<th>Max Frequency (ACV)</th>
<th>Max Reading Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1200-2105</td>
<td>EX1200A</td>
<td>3.5/5.5 ACV, DCV, DIO, AC/DC, FREQ, TEMP</td>
<td>300 V/3 A</td>
<td>1.5 MHz</td>
<td>2,000/s</td>
<td></td>
</tr>
<tr>
<td>EX1200-2305</td>
<td>EX1200A</td>
<td>3.5/5.5 ACV, DCV, DIO, AC/DC, FREQ, TEMP</td>
<td>300 V/3 A</td>
<td>1.5 MHz</td>
<td>2,000/s</td>
<td></td>
</tr>
</tbody>
</table>
EX1200 Series Quick Reference

**ANALOG OUTPUT/CONTROL**

<table>
<thead>
<tr>
<th>Model</th>
<th>Channels</th>
<th>Voltage/Current Range</th>
<th>Sample Rate</th>
<th>Max Isolation</th>
<th>Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1200-3604</td>
<td>4 V/I, 16 bit</td>
<td>±1/0/5/10/20 V, ±20 mA</td>
<td>500 kS/s</td>
<td>200 VDC/200 VAC peak</td>
<td>1 Msample</td>
</tr>
<tr>
<td>EX1200-3608</td>
<td>8 V/I, 16 bit</td>
<td>±1/0/5/10/20 V, ±20 mA</td>
<td>500 kS/s</td>
<td>200 VDC/200 VAC peak</td>
<td>1 Msample</td>
</tr>
</tbody>
</table>

**COMPARATOR/EDGE DETECTOR**

<table>
<thead>
<tr>
<th>Model</th>
<th>Channels</th>
<th>Modes</th>
<th>Voltage Range</th>
<th>Min Pulse Width</th>
<th>Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1200-7416</td>
<td>16 DE/SE</td>
<td>Edge detect, Windows, Pulse</td>
<td>±10 V/100 V</td>
<td>1 μs</td>
<td>128k events</td>
</tr>
</tbody>
</table>

**PROGRAMMABLE LOAD**

<table>
<thead>
<tr>
<th>Model</th>
<th>Channels</th>
<th>Voltage/Current Range</th>
<th>Sample Rate</th>
<th>Max Isolation</th>
<th>Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1200-3604</td>
<td>4 V/I, 16 bit</td>
<td>±1/2/5/10/20 V, ±20 mA</td>
<td>500 kS/s</td>
<td>200 VDC/200 VAC peak</td>
<td>1 Msample</td>
</tr>
<tr>
<td>EX1200-3608</td>
<td>8 V/I, 16 bit</td>
<td>±1/2/5/10/20 V, ±20 mA</td>
<td>500 kS/s</td>
<td>200 VDC/200 VAC peak</td>
<td>1 Msample</td>
</tr>
</tbody>
</table>

**RTD SIMULATOR**

<table>
<thead>
<tr>
<th>Model</th>
<th>Channels</th>
<th>Accuracy</th>
<th>Range</th>
<th>RTD Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1200-7000</td>
<td>8</td>
<td>±0.1 °C</td>
<td>4Ω - 6.5 kΩ</td>
<td>Pt-100, Pt-200, Pt-500, Pt-1000, Cu-100, Ni-100, Ni-120</td>
</tr>
</tbody>
</table>

**BREADBOARD**

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Connectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1200-7000</td>
<td>Prototyping</td>
<td>44p, 104p, 160p</td>
</tr>
</tbody>
</table>

**TERMINAL BLOCKS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Channels</th>
<th>Range</th>
<th>Connector compatibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1200-TB44</td>
<td>44-pin HD D-sub</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EX1200-TB104</td>
<td>104-pin HD D-sub</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EX1200-TB160</td>
<td>160-pin DIN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EX1200-TB200</td>
<td>200-pin HD SCSI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EX1200-TBR</td>
<td>6-slot terminal block receiver</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*EX1200 Data Sheet for more info*

---

**EX1200 Mainframe Specifications**

**1U MAINFRAMES**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Dimensions</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1202</td>
<td>Two standard plug-in module slots</td>
<td>Half rack 1U mainframe (20.25&quot; D, 8.61&quot; W, 1.75&quot; H)</td>
<td>4.9 lbs (2.3 kg)</td>
</tr>
<tr>
<td>EX1202</td>
<td>Two standard plug-in module slots plus 6.5 digit DMM</td>
<td>Half rack 1U mainframe (20.25&quot; D, 8.61&quot; W, 1.75&quot; H)</td>
<td>5.3 lbs (2.4 kg)</td>
</tr>
<tr>
<td>EX1206A</td>
<td>Six standard plug-in module slots (optional 6.5 digit DMM)</td>
<td>Full rack 1U mainframe (17.7&quot; D, 17.23&quot; W, 1.75&quot; H)</td>
<td>7.1 lbs (3.2 kg)</td>
</tr>
</tbody>
</table>

**3U MAINFRAMES**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Dimensions</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1208A</td>
<td>Sixteen standard plug-in module slots (optional 6.5 digit DMM)</td>
<td>Full rack 3U mainframe (17.65&quot; D, 16.72&quot; W, 1.75&quot; H)</td>
<td>16.2 lbs (7.4 kg)</td>
</tr>
</tbody>
</table>

**8U MAINFRAMES**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Dimensions</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX1214-ICA</td>
<td>Fourteen 8U high-density slots</td>
<td>Full rack 8U mainframe (23.5&quot; D, 23.9&quot; W, 14&quot; H)</td>
<td>57.5 lbs (26.1 kg)</td>
</tr>
</tbody>
</table>

**General Specifications**

**ENVIRONMENTAL SPECIFICATIONS**

- **OPERATING TEMPERATURE** 0 °C – 55 °C
- **OPERATING ALTITUDE** 10,000 ft (3,000 m) maximum
- **OPERATING HUMIDITY** 5% - 95% non-condensing @ 0 °C - 30 °C, 5% - 75% non-condensing @ 30 °C – 60 °C, 5% - 45% non-condensing @ 60 °C – 50 °C (per 3.8.2 of MIL-PRF-28800F Class 3)
- **STORAGE TEMPERATURE** -40 °C – 70 °C
- **STORAGE ALTITUDE** 15,000 ft (4,500 m) maximum
- **STORAGE HUMIDITY** 5% - 95%, non-condensing

**CLOCK SPECIFICATIONS**

- **CLOCK OSCILLATOR ACCURACY** ±50 ppm
- **SYNCHRONIZATION ACCURACY** Reports “synchronized” when < ±200 µs of the 1588 master clock
- **TIME32W**
  - **ACCURACY** As good as time synchronization down to 50 ns
  - **RESOLUTION** 25 ns

**LXI SUPPORTED EXTENSIONS**

- LXI W/B, LXI Event Log, LXI Event Messaging, LXI IEEE 1588 Clock Synchronization, LXI Timestamped Data
EX1200-2165 | 2365 DMMs
6.5 Digit DMM

OVERVIEW

• Modular 6.5 digit DMMs for the EX1200 mainframes
• Tightly integrated into mainframes, allowing high-speed, synchronized scanning measurements without the need for external cabling.
• Input can be routed directly to the DMM or through an internal analog bus on the backplane.
• Super fast scanning with no processor intervention required
• Scanning configuration can be saved in the DMM’s non-volatile memory allowing quick recall of saved states
• Integrating ADC for with adjustable integration time depending on the level of accuracy required.
• “true rms” AC readings
• Frequency and temperature measurements

OVERVIEW

DC voltage, AC voltage
DC current, AC current
3-wire Ω, 4-wire Ω
Temperature and Frequency
850 V
1.5 kV
2A, 250 V fuse, externally accessible

General Specifications

DC Voltage

<table>
<thead>
<tr>
<th>Range</th>
<th>Input Resistance</th>
<th>Resolution 5.5 digit</th>
<th>Resolution 5.5 digit</th>
<th>Resolution 4.5 digit</th>
<th>Accuracy 5.5 digit</th>
<th>Accuracy 4.5 digit</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mV</td>
<td>10 GΩ / 10 MΩ</td>
<td>0.01 µV</td>
<td>1 µV</td>
<td>10 µV</td>
<td>0.0150%</td>
<td></td>
</tr>
<tr>
<td>1 V</td>
<td>10 GΩ / 10 MΩ</td>
<td>1 µV</td>
<td>10 µV</td>
<td>100 µV</td>
<td>0.0069%</td>
<td></td>
</tr>
<tr>
<td>10 V</td>
<td>10 GΩ / 10 MΩ</td>
<td>10 µV</td>
<td>100 µV</td>
<td>1 mV</td>
<td>0.0029%</td>
<td></td>
</tr>
<tr>
<td>100 V</td>
<td>10 MΩ</td>
<td>100 µV</td>
<td>1 mV</td>
<td>10 mV</td>
<td>0.0050%</td>
<td></td>
</tr>
<tr>
<td>300 V</td>
<td>10 MΩ</td>
<td>100 µV</td>
<td>1 mV</td>
<td>10 mV</td>
<td>0.0055%</td>
<td></td>
</tr>
</tbody>
</table>
# DMM Specifications

## 6.5 Digit DMM

### General Specifications

#### DC CURRENT

<table>
<thead>
<tr>
<th>Range</th>
<th>Input Resistance</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mA</td>
<td>&gt;0.1 V</td>
<td>10 nA</td>
<td>100 nA</td>
</tr>
<tr>
<td>10 mA</td>
<td>&gt;0.1 V</td>
<td>100 nA</td>
<td>1 µA</td>
</tr>
<tr>
<td>100 mA</td>
<td>&gt;0.6 V</td>
<td>1000 µA</td>
<td>10 µA</td>
</tr>
<tr>
<td>1 A</td>
<td>&gt;0.4 V</td>
<td>1 µA</td>
<td>100 µA</td>
</tr>
<tr>
<td>3 A</td>
<td>&gt;0.9 V</td>
<td>10 µA</td>
<td>100 µA</td>
</tr>
</tbody>
</table>

#### AC VOLTAGE

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mV</td>
<td>100 nV</td>
<td>10 µV</td>
</tr>
<tr>
<td>1 V</td>
<td>100 µV</td>
<td>1 µV</td>
</tr>
<tr>
<td>10 V</td>
<td>10 µV</td>
<td>100 µV</td>
</tr>
<tr>
<td>100 V</td>
<td>100 µV</td>
<td>1 mV</td>
</tr>
</tbody>
</table>

#### AC CURRENT

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mA</td>
<td>10 nA</td>
<td>100 nA</td>
</tr>
<tr>
<td>100 mA</td>
<td>100 nA</td>
<td>1 µA</td>
</tr>
<tr>
<td>1 A</td>
<td>1 µA</td>
<td>100 µA</td>
</tr>
<tr>
<td>3 A</td>
<td>1 µA</td>
<td>100 µA</td>
</tr>
</tbody>
</table>

### Temperature

#### Type Min Max

- J: -200 °C 1200 °C
- K: -200 °C 1372 °C
- T: -200 °C 400 °C
- E: -200 °C 900 °C
- S: -50 °C 1768 °C
- R: -50 °C 1768 °C
- B: -250 °C 1820 °C
- N: -200 °C 1300 °C

#### Temperature Offset PPM

- 0.3
- 3.0
- 30.0

---

**RELIABLE DATA FIRST TIME EVERY TIME**

---

26
### EX1200 SERIES

#### Applications
- Single frequency measurement range from 0.05 Hz to 1 MHz
- Tooth wheel RPM measurement
- Measure position and speed from quadrature encoder signal
- Wide range of measurement functions makes this ideal for both electronic functional test and data acquisition

#### General Specifications

**Frequency/Counter Inputs**
- **Number of Channels**: 8 (analog/digital)
- **Input Signal Range**: ±48 V
- **Common Mode Input Sensitivity**: ±500 mV
- **Highly Stable Base Clock**: 50 MHz
- **Signal Frequency Range**: 3 Hz to 1 MHz in AC coupling mode
- **Time Base Clock Stability**: ±1 ppm
- **Counter Type**: 32-bit, reciprocal counting type
- **Minimum Detectable Pulse**: 600 ns on analog channel

**DAC Outputs**
- **Number of Channels**: 2
- **Output Type**: Constant voltage or constant current
- **Output Mode**: Static mode or dynamic mode (frequency to voltage/current conversion)
- **Voltage Mode Range**: ±10 V, up to 20 mA per channel
- **Current Mode Range**: ±20 mA, drive up to 250 Ω load
- **Output Resolution**: 16-bit
- **Isolation**: Channel-to-channel, galvanic

**Data Control & FIFO Buffer**
- **Number of Samples**: 256,000

**TRIGGERING**
- **Software, Immediate, EX1200-based LXI triggers**

**Quadrature Measurement**
- **Two Channels to be paired for each encoder input**

**Digital Input/Output**
- **Number of Channels**: 16
- **Input Signal Level**: Logical HIGH 2.5 V to 60 V, Logical LOW < 2.5 V
- **Isolation**: Channel-to-channel

**Digital Output Signals**
- **Optically isolated solid state switch**
- **Output Signal Compatibility**: 50 mA sink/source, up to 60 V (AC/DC)

**Update Control**
- **Software Paced**

**Features**
- 8 frequency counter channels, 16 isolated digital I/O, 2 isolated DAC channels per card
- Highly stable 50 MHz, TCXO base clock along with 32-bit counter for frequency measurement
- Counter channel accepts both analog and digital inputs with ±48 V differential input range eliminates need for signal conditioning in most applications
- Programmable hysteresis and threshold levels
- Isolated digital
- Precision isolated 16-bit current or voltage source

**Applications**
- Single frequency measurement range from 0.05 Hz to 1 MHz
- Tooth wheel RPM measurement
- Measure position and speed from quadrature encoder signal
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**Data Control & FIFO Buffer**
- **Number of Samples**: 256,000
eX1200 Series

EX1200-2001 | 2002
High Power Switch Modules

Features
• Switch up to 16 A current – highest in its class
• Large switching capacity in a small footprint
• High breakdown voltage (1,000 V RMS between open contacts)
• Failsafe interrupt detects fault conditions and opens relays to their default state. This protects the test object from damage if a fault occurs.

Applications
• High current/high power switching
• AC line power switching
• Switching AC or DC power supplies
• Driving relays for industrial machines
• Solid-state switching
• Automotive engine control

EX1200-2001 – 1 OF 20 SPST
EX1200-2002 – 1 OF 12 SPDT

General Specifications
Configuration
EX1200-2001
EX1200-2002
Maximum Switching Voltage
250 VAC, 300 VDC
Maximum Switching Current
10 A
480 W, 4000 VA per channel
1 x 10^9
1 x 10^8 at full load
< 10 ms
< 100 mΩ
> 1 x 10^3 Ω
40 MHz
41 Ω

EX1200-2007A | 2008H | 2087A
High Voltage Multiplexers

Features
• Switch signals up to 1000 V
• Large shield planes used to reduce crosstalk and voltage spikes to adjacent channels
• Failsafe interrupt detects fault conditions and opens relays to their default state. This protects the test object from damage if a fault occurs.
• EX1200-2087A features Continuous Relay Self-Monitoring that continuously checks for welded relay contacts and generates an interrupt if detected. This protects the test object by preventing unintentional routing of power.

Applications
• High voltage multiplexing and scanning
• Hi-pot tests
• Switching source measure unit
• Cable breakdown test
• Power supply switching
• Power generator testing

General Specifications
Configuration
EX1200-2007A
EX1200-2008H
EX1200-2087
Maximum Switching Voltage
1000 VDC/700 VAC RMS
Maximum Switching Current
1 A
25 W (active load)
5 x 10^3
1 x 10^3 at full load
< 1 ms
< 1 Ω
> 1 x 10^7 Ω
1000 MHz
Bandwidth
400 kHz
Connector Type
160-pin DIN
Relay Type
Reed

EX1200-2007A – 1 OF 1 (1X10)
1-Wire MUXes
EX1200-2008H – 1 OF 3 (1X10) (6) SPDT with BJT
EX1200-2008H – 1 OF 3 (1X10)
2 (1X24) 1 wire
EX1200 SERIES

EX1200-3001 | 3001DS | 3048
3072 | 3164 300 V/2 A Multiplexers

Applications
- Applications where multiple points need to be switched to a common resource
- Thermal chamber testing
- Battery test
- Cable harness testing
- Semiconductor and PCB testing

Features
- High-density, 300 V/2 A multiplexers/scanner
- Direct routing to EX1200 series DMM through internal analog measurement bus simplifies field wiring
- Support thermocouple, RTD, and thermistor measurements with optional terminal block with built in CJC reference
- On-board scanning greatly reduces overall test execution time
- Configure as 1- (3001 only), 2- or 4-wire under program control
- Discharge relays to bleed out stray charge for sensitive measurements

Applications
- General applications where multiple points need to be switched to a common resource
- Thermal chamber testing
- Battery testing
- Cable harness testing
- Semiconductor and PCB testing

General Specifications
- Configuration
- Maximum Switching Voltage
- Maximum Switching Current
- Maximum Switching Power
- Mechanical
- Electrical
- Switching Time
- Path Resistance
- Insulation Resistance

EX1200-3048S
Solid State Multiplexer

Applications
- High-speed scanning
- Applications requiring long periods of continuous scanning where mechanical relays will wear
- Battery test
- Thermal/environmental chamber test
- Virtually unlimited relay life

Features
- High-density, 1x48 solid state multiplexer
- Switch up to 250 VAC/250 VDC, highest for a solid state switch module in its class
- Configure as 2- or 4-wire multiplexer
- Optically isolated design
- Very high-speed scanning - up to 1,000 measurements per second using the internal DMM

General Specifications
- Configuration
- Maximum Switching Voltage
- Maximum Switching Current
- Maximum Switching Power
- Switching Time
- Path Resistance
- Insulation Resistance

Bandwidth 50 MHz 35 MHz 40 MHz 45 MHz
Crosstalk @ 1 MHz < -70 dB < -45 dB < -70 dB < -70 dB
Connector type 160-pin DIN 104-pin D-sub 104-pin D-sub 160-pin DIN

EX1200-3048S - 1 OF 2 (X24) 2-WIRE MUXES
EX1200-3096
High-Density Multiplexer

FEATURES
• Dual 1 x 48, ultra high density multiplexer
• Low cost per channel
• Configure as 2- or 4- wire
• Capacitive discharge relays prevent high voltages from affecting sensitive measurement points

APPLICATIONS
High-channel count scanning applications
Environmental chamber test
Cable harness test

General Specifications

CONFIGURATION
- Dual 1 x 48 (2-wire)
  - 100 V
  - 0.5 A
  - 30 W/37.5 VA

MAXIMUM SWITCHING VOLTAGE
1 x 10^7

MAXIMUM SWITCHING CURRENT
< 3 ms
< 500 mA
> 1 x 10^6 G
< 7 µV
10 MHz
108 s/µs

CH1_48H
CH1_48L

CH1_2H
CH1_2L

CH1_1H
CH1_1L

CH1_COMH
CH1_COML

EX1200-3096 - 1 OF 2 (1x48) 2-WIRE MODES

EX1200-3608 | 3604
Analog Output

APPLICATIONS
500 kSa/s arbitrary waveform generation
±20 V, ±10 V, ±5 V, ±2 V and ±1 V output ranges
±20 mA, ±10 mA, and ±5 mA output ranges
Sensor simulation
Static output

FEATURES
• 4 (-3604) or 8 (-3608) independent, isolated, 16-bit D/A converter
• Isolated outputs can be combined in series to extend range to 160 V or in parallel to achieve 160 mA
• Extensive triggering capability
• Synchronize level changes with input measurements to facilitate test sequencing
• Sense lines for every channel to compensate for cable
• Voltage or current source

General Specifications

RESOLUTION
16-bits, monotonic

TIME DOMAIN
5 μs to 0.1% of specified value
< 800 ns
40 V/µs
250 ns
< 100 ns when all channels are running synchronized on the internal clock

VOLTAGE RANGE
- BIPOLAR
  ±20 V, ±10 V, ±5 V, ±2 V and ±1 V
  ±20 mA
  40 V
  Supported
- UNIPOLAR
  ±150 V when tied in series
  ±20 mA
  Current limitation of 50 mA and short circuit protection

DCV ACCURACY
±0.02% of setting ±0.305 mV@ ±1 V range
±0.002% of setting ±1.534 mV@ ±40 V range
±200 V
**General Specifications**

**CURRENT MODE**
- RANGES
- MAXIMUM OUTPUT
- COMPLIANCE VOLTAGE

**AWG SPECIFICATIONS**
- UPDATE RATE
- MAXIMUM WAVEFORM SIZE
- MODES
- OUTPUT MODES
- OPERATION MODES
- STANDARD WAVEFORMS
- CONNECTOR TYPE

**Applications**
- Applications where multiple test instruments need to be connected to multiple test points.
- Semiconductor and PCB test
- Functional/production test

**Features**
- High density, programatically reconfigurable matrices
- Switch signals up to 300 VAC/300 VDC and 2 A.
- Best in class switching performance - 45 MHz bandwidth
- Extensive signal shielding to preserve signal integrity
- Backplane connectivity on EX1200-4264 allows internal scanning measurements

**EX1200 SERIES**

**EX1200-3608 | 3604**

*Analog Output*

**EX1200-4003 | 4264**

*300 V/2 A Matrices*

**EX1200-4003 Dual 4 x 16 (2-wire)**

**EX1200-4264 Dual 2 x 32 (2-wire)**

**Configuration**
- EX1200-4003
- EX1200-4264

**Maximum Switching Voltage**
- 300 VAC/300 VDC

**Maximum Switching Current**
- 2 A

**Maximum Switching Power**
- 60 W, 62.5 VA per channel

**Rated Switch Operations**
- **Mechanical**
  - 1 x 10^8
- **Electrical**
  - 1 x 10^7 at full load
  - < 5 ms
  - < 500 mΩ
  - > 1 x 10^8 Q
  - 45 MHz
  - < -55 dB
  - < -70 dB
  - 100 pS
EX1200 SERIES

EX1200-4128
High-Density Matrix

APPLICATIONS
Applications where multiple test instruments need to be connected to multiple test points
Semiconductor and PCB test
Functional/production test

FEATURES
• Ultra high-density 4x128 1-wire matrix
• Switch up to 250 VAC/220 VDC, highest at its density in its class
• Connect rows to internal analog bus to construct larger matrices without external cabling
• Stub breaking relays reduce antenna effect on long open paths and increases switching performance

General Specifications
CONFIGURATION
4x 128 (1-wire)

MAXIMUM SWITCHING VOLTAGE
250 VAC, 220 VDC

MAXIMUM SWITCHING CURRENT
1 A

MAXIMUM SWITCHING POWER
60 W/63.5 VA

SWITCHING TIME
1 x 10^-3 s

MAXIMUM SWITCHING CURRENT (resistive)
< 5 ms

PATH RESISTANCE
1 Ω

INSULATION RESISTANCE
> 1 x 10^9 Ω

BANDWIDTH
45 MHz

CONNECTION
104-pin

CH_1NO  CH_1COM  CH_80NO  CH_80COM

EX1200-4128 – (4X128) 1-WIRE MATRIX

EX1200 SERIES

EX1200-5001 | 5002 | 5006 | 5007
General Purpose Switch

APPLICATIONS
General purpose switching
Can be combined with external wiring to form complex switch configurations
Functional/production test

FEATURES
• General purpose switching up to 300 V / 2 A
• Easy to use end-to-end path level switching for simplified programming
• Best bandwidth and crosstalk performance in its class

General Specifications
CONFIGURATION
EX1200-5003
EX1200-5004

MAXIMUM SWITCHING VOLTAGE
300 VDC/300 VAC

MAXIMUM SWITCHING CURRENT
2 A

MAXIMUM SWITCHING POWER
60 W, 125 VA

MECHANICAL
1 x 10^-8

SWITCHING TIME
< 3 ms

PATH RESISTANCE
< 300 mΩ

INSULATION RESISTANCE
> 1 x 10^9 Ω

BANDWIDTH
80 MHz

CROSSTALK @ 1 MHz
< -55 dB
< -60 dB
< -60 dB
< -60 dB

CONNECTION
104-pin DIN
104-pin SUB
104-pin DIN
104-pin SUB

EX1200-5001 – 1 of 80 SPSTs
EX1200-5002 – 1 of 32 SPDTs
EX1200-5003 – 1 of 40 SPDTs
EX1200-5004 – 1 of 12 SPDTs

CH_1NO  CH_1COM  CH_1NC  CH_2NO  CH_2COM  CH_2NC  CH_32NO  CH_32COM  CH_32NC

EX1200—5001  EX1200—5002  EX1200—5003  EX1200—5004

Bandwidth 80 MHz 40 MHz 80 MHz 80 MHz
Crosstalk @ 1 MHz < -55 dB < -55 dB < -60 dB < -60 dB
Connector type 104-pin DIN 104-pin DIN 104-pin SUB 104-pin SUB
EX1200 SERIES

EX1200-5004
High-Density 5A Switch

APPLiCATiONS
- General purpose switching
- Switching power supplies

FEATURES
- Switch signals up to 5 A
- Fail-safe interrupt forces relays to open in case of fault condition

General Specifications
- Maximum Switching Voltage: 250 VAC, 110 VDC
- Maximum Switching Current: 5 A
- Maximum Switching Power: 150 W/1250 V
- Rated Switch Operations:
  - Mechanical: $1 \times 10^7$
  - Electrical: $5 \times 10^5$
- Switching Time: $< 3 \text{ ms}$
- Path Resistance: $< 150 \text{ m}\Omega$
- Insulation Resistance: $> 1 \times 10^9 \Omega$
- Bandwidth: 40 MHz
- Connector Type: 104 pin

EX1200-6101 | 6102 | 6111
6216 | 6301 | 6301T RF Switches

APPLiCATiONS
- Ideal for applications switching RF signals
- Wireless device/chipset testing
- Testing with high-frequency oscilloscopes or spectrum analyzers

FEATURES
- High-density RF switches and matrices
- 50 W switching power – highest in class
- $> 3$ GHz bandwidth (6301)
- Stub breaking relays eliminate unterminated stub effect for best switching performance

General Specifications
- Configuration:
  - EX1200-6101: 10 x SP4T
  - EX1200-6102: 17 x SPDT
  - EX1200-6111: 5 x SP4T
  - EX1200-6216: Dual 1 x 16
  - EX1200-6301: Quad SP4T
  - EX1200-6301T: Quad SP4T 50 Ω self-terminated

- Maximum Switching Voltage: 220 VDC/250 VAC
- Maximum Switching Current: 2 A
- Maximum Switching Power: 50 W, 62.5 VA
- Rated Switch Operations:
  - Mechanical: $5 \times 10^5$
  - Electrical: $1 \times 10^8$
- Switching Time: $< 5 \text{ ms}$
- Path Resistance: $< 250 \text{ m}\Omega$
- Isolation: $< 60 \text{ dB} @ 1.3 \text{ GHz}$
- VSWR: $< 2.92:1 @ 1.3 \text{ GHz}$
- Connector Type: Dual-26 pin

Reliable Data First Time Every Time
EX1200 SERIES

EX1200-6101 | 6102 | 6111
6216 | 6301 | 6301T RF Switches

EX1200—6101 – 1 OF 10 ISOLATED (1X4) TREE MUXES
EX1200—6111 – 1 OF 5 ISOLATED (1X4) TREE MUXES
EX1200—6216 – 1 OF 10 ISOLATED (1X4) TREE MUXES
EX1200—6301 – 1 OF 4 ISOLATED (1X4) TREE MUXES
EX1200—6301T – 1 OF 4 ISOLATED (1X4) TREE MUXES WITH TERMINATION RESISTORS

FEATURES

• High-density coax switch
• Switch signals up to 500 V and 250 MHz
• Star configuration allows any channel to be connected to any other channel

APPLICATIONS

Ideal for applications using high voltage probes like transient measurements on power supplies
Differential coaxial switching

General Specifications

CONFIGURATION Dual 1 x 16
MAXIMUM SWITCHING VOLTAGE 500 VAC
MAXIMUM SWITCING CURRENT 0.5 A
MAXIMUM SWITCING POWER 2 A
BASED SWITCH OPERATIONS
SWITCHING TIME < 1 ms
PATH RESISTANCE < 500 μΩ
BANDWIDTH 250 MHz
CROSSOVER AT 100 MHz < -45 dB
ISOLATION AT 100 MHz < -45 dB
VSWR < 1.2:1
RELAY TYPE Mercury-wetted Reed
CONNECTOR TYPE Dual 26-pin

* NOTE: This module uses position sensitive mercury wetted reed relays and can only be used in the EX1208A mainframe.
**EX1200 SERIES**

**EX1200-7000**

**Prototyping Card**

**APPLICATIONS**
- 22 square inches through hole pattern
- Breadboard space for user-defined designs
- Handles back end LXI communication and access to LXI trigger bus and allows user designed front end
- 12.5 MHz clock for complex designs

**FEATURES**
- 96 Digital I/O lines configurable as input or output
- Three power supply rails
- Multiple front panel connector options
- IVI-driver simplifies software development

**APPLICATIONS**
- 22 square inches through hole pattern
- Breadboard space for user-defined designs
- Handles back end LXI communication and access to LXI trigger bus and allows user designed front end
- 12.5 MHz clock for complex designs

**EX1200-7100**

**Microwave Switch**

**APPLICATIONS**
- RF and microwave component/equipment testing
- Ideal for switching multiple test points to spectrum/network analyzers, high frequency oscilloscopes, or RF sources
- Radar and satellite testing
- Cell phone and wireless devices testing
- Semiconductor chipset testing

**FEATURES**
- Switch signals DC to 26.5 GHz
- Microwave building blocks are pluggable from the front
- Building blocks range from dual SPDT relays to SP6T relays, transfer switches and relay drivers
- Competitively priced to suit OEM/system integration model

**General Specifications**

**PLUG-IN RELAY MODULES**
- EX1200-7102
- EX1200-7104
- EX1200-7106
- EX1200-7122

**AVERAGE POWER PER CHANNEL**

<table>
<thead>
<tr>
<th></th>
<th>DC to 3 GHz</th>
<th>3-18 GHz</th>
<th>18-26.5 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>80 dB</td>
<td>70 dB</td>
<td>45 dB</td>
</tr>
<tr>
<td>Isolation (dB)</td>
<td>80 dB</td>
<td>70 dB</td>
<td>45 dB</td>
</tr>
<tr>
<td>Insertion loss (dB max)</td>
<td>0.3 dB</td>
<td>0.4 dB</td>
<td>0.7 dB</td>
</tr>
</tbody>
</table>

**SWITCHING TIME**
- < 15 ms

**RF IMPEDANCE**
- 50 Ω

**CONNECTOR TYPE**
- SMA
eX1200 SERIES

EX1200-7008
Sensor Simulation

**APPLICATIONS**
- Simulate platinum/copper/nickel or custom user defined RTD types
- Programmable by temperature or resistance value
- Sensor simulation

**FEATURES**
- 8-channel, 2- or 4-wire RTD simulator
- Solid state servo mechanism produces fast, monotonic, glitch free resistance value programming
- Synchronize level changes with input measurements to facilitate test sequencing

**General Specifications**
- **NUMBER OF CHANNELS**: 8
- **RESOLUTION OF TEMPERATURE SIMULATION**: 0.1 ºC
- **ACCURACY OF TEMPERATURE SIMULATION**: ±0.1 ºC
- **RANGE OF RESISTANCE SIMULATION**: 4 Ω to 500 Ω, 40 Ω to 5,500 Ω, 100 Ω to 10,000 Ω
- **2- or 4-wire**
- **CONNECTORS**
  - (Pt100, Cu10, Cu100, Ni100, Ni120)
  - (Pt100, Pt200, Pt500, Pt1000)

**EX1200 SERIES**

EX1200-7416
Comparator/Event Detector/Time Stamp

**APPLICATIONS**
- Constantly monitor input for fault conditions
- Detect edges, out-of-bound conditions, and measure pulse widths
- Can be used as a timestamp module and as a Digital I/O
- "Go/no-go" tests where device needs to perform within a certain window
- Control applications where device or test needs to be shut down if a threshold is exceeded

**FEATURES**
- 16-Channel analog comparator/event detector
- Programmable debounce circuitry prevents erroneous readings
- 10 V and 100 V input ranges
- Onboard memory stores events with 1588 timestamps
- Inputs can be masked, inverted and combined to produce interrupts

**General Specifications**
- **NUMBER OF CHANNELS**: 16
- **INPUT RANGES**: ±10 V, ±100 V
- **INPUT THRESHOLD**: ±10 V with 82 mV resolution (8-bit)
  ±100 V with 820 mV resolution (8-bit), Programmable per channel
- **INPUT EDGE DETECTION**
  - Differential
  - ≤82 mV to ≤82 mV
  - ≤820 mV to ≤820 mV
  - Normal (rising), Inverted (falling), Programmable per channel
- **MODES**
  - Normal
  - Pulsed
  - Debounce Time
  - Memory
- **TIMESTAMP ACCURACY**: ±500 ns
- **CONNECTOR TYPE**: 44-pin
**EX1200-7600**

Programmable Resistor Ladder

**APPLICATIONS**
- Unit under test loading or simulation
- Sensor simulation
- Process control
- ATE calibration

**FEATURES**
- Simulate resistance from 0.5 Ω to 1.5 MΩ
- 0.1 Ω step size
- Fault sensing over-voltage, over-current and over-temperature circuits protects unit from damage.
- Internal 5W high-precision power resistors switched in and out using mechanical relays

**General Specifications**
- NUMBER OF CHANNELS: 1
- SWITCHING TIME: <3 ms
- RATE SWITCH OPERATIONS:
  - Mechanical: 5 x 10⁶
  - Electrical: 1 x 10⁵
- OVER TEMPERATURE PROTECTION: 102 °C (215.6 °F)
- MAXIMUM SWITCHING VOLTAGE: 200 Vac RMS
- MAXIMUM SWITCHING CURRENT: 0.5 A
- MAXIMUM SWITCHING/CARRY POWER: 5 W
- VOLTAGE SENSING CIRCUIT:
  - Internal: ±3.3 V, ±5.0 V, ±12.0 V, ±24 V
  - User: >2 V up to 60 V
- CURRENT SENSING CIRCUIT:
  - Internal: ±3.3 V, ±5.0 V, ±12.0 V, ±24 V
  - User: >2 V up to 60 V
- SETTING ACCURACY:
  - 0.5 to 60 Ω: ±0.15 Ω
  - 60.1 Ω to 1,499,999 Ω: ±0.25% of programmed value
- MINIMUM INCREMENT: 0.1 Ω
- CONNECTOR TYPE: 15-pin

**EX1200-7500**

Digital I/O

**APPLICATIONS**
- Simulate and receive digital data up to 2 MHz sample rate
- High-current capability for control of external relays - 300 mA sink
- Onboard 1 MB memory can be used for storing and generating patterns

**FEATURES**
- 64-channel, 2 MHz Digital I/O
- Each channel configurable as input or output
- Selectable output range from 3.3 V to 60 V
- Input data can be timestamped using EX1200 scan engine

**General Specifications**
- NUMBER OF CHANNELS: 64
- DATA INPUT CHARACTERISTICS:
  - Vout (high): >2 V to 60 V
  - Vout (low): <1.5 V @ 300 mA
- VOLTAGEx RANGE:
  - Internal: ±3.3 V, ±5.0 V, ±12.0 V, ±24 V
  - User: >2 V up to 60 V
- MODES:
  - Immediate
  - Asynchronous
  - Pattern
  - Gate (Pattern Mode)
- MEMORY DEPTH:
  - Output or input enabled: 2 Mb
  - Output and input enabled: 1 Mb
- MAXIMUM EXTERNAL CLOCK RATE:
  - Pattern generation disabled: 2.5 MHz
  - Pattern generation enabled: 2 MHz
- DATA INPUT CLOCK SOURCE:
  - Internal clock, from panel input 160 µs
EX1200-ICA Solutions
Integrated ICA and Switching Mainframe

FEATURES

- Integrated receiver and switch modules eliminate lossy cabling
- 14 High-density switch and I/O slots
- Integrated analog backplane expands measurement capability
- Matrix switching allows for flexible use of receiver I/O
- 270 V dc power option

The EX1200-ICA is an 8-slot signal switching mainframe with 62 tail plug cards with integrated receiver modules. It is used at the core of the US Navy CASI program as the enhanced general purpose interface subsystem.

These receiver modules greatly simplify cabling and maintenance, and also improves performance by eliminating cable losses between switch system and receiver.

The EX1214-ICA has access points in the rear that can be used to interface the I/O to internal test system resources such as spectrum analyzers and RF synthesizers. It also has a removable power supply that supports AC/DC inputs with remote enable/disable.

EX1200 SERIES

CUSTOM INTEGRATION SERVICES
VTI employs an innovative, modular approach to our standard product designs that allow us to quickly make customer-requested modifications that address specific application requirements. These custom products are then documented and supported just like our standard products. This relieves our customers of the burden of managing a custom development project and the associated long-term support issues, while helping them optimize their size and overall cost.

SYSTEM LEVEL EXPERIENCE
Our application engineering team has years of experience in integrating a wide range of instrumentation products into larger test systems. We work with customers during the project definition phase to help architect solutions that best meet the application requirements. Our expert knowledge of industry standards, such as VXI, VXI, PXI, and VME, at the hardware and software level has helped test developers reduce the time to ‘system readiness’ in the following applications:

- DATA ACQUISITION
- FUNCTIONAL / AUTOMATED TEST
- SIGNAL SWITCHING AND DISTRIBUTION

It is with this experience that we are able to provide our customers with a world-class selection of automated test and data acquisition solutions.

SERVICE AND SUPPORT
VTI Instruments has a worldwide sales, service, and support infrastructure, along with a staff of applications and technical sales people who have years of experience configuring and specifying test requirements. By utilizing state-of-the-art technology in all phases of product development, VTI Instruments is able to provide a level of worldwide support that is unique in the industry.

VTI is committed to preserving our customers’ initial capital investment in our products through a dedicated sustaining engineering program that continuously designs out component obsolescence. This approach enables us not only to enhance products, but also to considerably extend their life and support cycles. We strive to maintain hardware and software backward compatibility with our installed base whenever possible so as not to impact our customers’ existing test program sets.
VTI INSTRUMENTS
HIGH-DENSITY SWITCHING AND DATA ACQUISITION SYSTEMS

EX1200 series

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