SWITCH MATRIX CATALOG

SWITCH SOLUTIONS

ELECTROMECHANICAL MATRIX
SOLID STATE MATRIX
FIBER OPTIC MATRIX
FULLY INTEGRATED SYSTEMS

OUR EXPERTISE, YOUR SWITCH SOLUTION
SINCE 1945
Our Experience
As the world’s largest manufacturer of electromechanical switches, Dow-Key Microwave Corporation is committed to providing unparalleled customer service, competitive pricing, on-time delivery, and products that are distinguished by quality and reliability. Founded in 1945, we are the oldest continuously operating switch manufacturer in the United States. Today, we are part of Microwave Products Group, a subsidiary of Dover Corporation. Dover is a multi-billion dollar, NYSE-traded, diversified manufacturer of a wide range of proprietary electronic components and systems.

Quality Assurance
Dow-Key Microwave is a world-class manufacturer with an unparalleled reputation for product quality. Indeed, our space-qualified switches have contributed to the mission success of nearly 100 satellite and launch vehicle programs since 1972. Our commitment to continuous improvement of our products and processes, along with our extensive series of internal and external assessments, ensures compliance with the AS9100 and ISO-9001:2000 standards requirements.

Advanced Capabilities
Dow-Key Microwave’s 36,000-square-foot, state-of-the-art manufacturing facility includes two Class 7 clean rooms in order to support our high-reliability space and military projects. To accomplish the engineering, manufacture, and test of our products and assemblies, we invest heavily in capital equipment. This advanced equipment includes a wide array of vector network analyzers and synthesized sources, noise figure measuring equipment, passive inter-modulation (PIM) test stands, thermal/vacuum chambers, RF power sources, and shock and vibration stations for environmental screening, to name just a few.

Your Switch Solution
The best in the RF switch industry, Dow-Key Microwave’s engineering team is dedicated to supporting customers through product selection, custom-designed solutions, and RF system integration. Whether your organization needs electromechanical switches, automated test equipment, or space-qualified switching arrays, our engineering team works with your specific requirements to create the optimum RF switching solution. Backed by decades of industry experience, our highly skilled technical staff is continuously improving the quality and variety of our product offering based upon customer needs as well as advances in technology. We offer customers the best value solution for their applications, on budget and on time. Since 1945, our experience is your switch solution.
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For our other product lines, see separate Product Catalog and Space Product Brochure for more details.

ORDERING INFORMATION

At Dow-Key you are not limited to the products in this catalog, as it is intended to be used as a guide in selecting a switch product or switch matrix for a given application. Requests for modification of standard items and their specifications in order to meet specific needs are always welcome. Inquiries regarding custom integrated components or switch assemblies are also always appreciated.

The catalog is subject to change without notification at any time and new product information is constantly being added in the form of press releases through the corporate website at www.dowkey.com. Please visit our website to request quotes, download product materials, for listing of our manufacturer’s representative and factory contact information.

Ordering

The information found in this catalog or on www.dowkey.com should be sufficient for you to select a particular Dow-Key product. In those cases where additional information is required, call Dow-Key directly or our local Dow-Key Sales Representative who will provide you with price and delivery information.

When placing your order, please include the part number, product name, quantity, and shipping instructions. In the case of a non-standard/product, a full description of desired features must accompany your order to avoid any errors. Send orders to:

Dow-Key Microwave
4822 McGrath Street
Ventura, CA 93003 U.S.A.

Or send them in care of our Sales Representative in your area. A complete listing of our Representatives can be found at www.dowkey.com.

Orders will be accepted by way of U.S. mail, telephone, fax, or email. Confirmation of orders on your standard Purchase Order is required.

Phone: 805.650.0260
Fax: 805.650.1734
Email: askdk@dowkey.com

Dow-Key’s minimum order amount is $300.00.

Domestic Terms

Net 30 days, F.O.B. Dow-Key plant, Ventura, California, U.S.A. unless otherwise specified. Shipments made to firms are on a C.O.D. basis unless credit has been established or on receipt of advance payment. American Express, MasterCard and Visa are also accepted.

Export Terms

Unless other terms have been agreed upon in advance, export terms are either payment in advance of shipment or against a confirmed irrevocable letter of credit. All prices are F.O.B Ventura, California, U.S.A.

Shipping

Orders within the United States and Canada will be shipped via United Parcel Service Ground unless other instructions are received. Shipment to all other countries will be by customer direction.

Packaging

All products shipped from Dow-Key Microwave, Ventura, California are packaged in accordance with best commercial practices unless otherwise specified in the contract or purchase order.

Delivery

Most standard products are available from within our typical manufacturing lead-time of 4 to 12 weeks after receipt of order.

Source Inspection

Should Customer Source Inspection of product be required, a charge of $300.00 per day per occurrence will apply.

Application and Technical Assistance

Dow-Key provides a knowledgeable and experienced engineering staff to work closely with customers in product design and application development as well as minor modifications to existing standard products. This service is also available for the design of individual specialized switching components or complex switching systems.

Warranty

Dow-Key Microwave Corporation warrants all switch products to be free of defects in material and workmanship for a period of one year after the date of initial shipment. The limit of liability under this warranty is to repair, replace or refund purchase price on any product or part thereof that is returned by the purchaser and proves to be defective after examination by Dow-Key. This warranty does not extend to any products mishandled, misused or subjected to abuse or neglect in storage, transportation or use. Repairs or alterations made without consent or knowledge of Dow-Key Microwave Corporation will invalidate this warranty. This warranty supersedes all others, either expressed or implied.

Return Material Authorization

Please contact Dow-Key to receive a Return Material Authorization (RMA) number prior to returning any item for service. Items returned to Dow-Key without a RMA number are subject to return without evaluation or any work being done. Dow Key will not accept COD freight charges for returned items.

Dow-Key Terms and Conditions

Dow-Key’s Terms and Conditions apply to all orders unless other provisions have been previously agreed upon. A copy of Dow-Key’s Terms and Conditions can be found at www.dowkey.com.

Certificate of Compliance

If requested at order placement, a certificate of compliance is available upon shipment.

Minimum Order Amount

Dow-Key’s minimum order amount is $300.00.

Product Changes

Dow-Key Microwave Corporation continuously improves products as new technologies, materials and processes become available. We, therefore, reserve the right to alter, amend, discontinue, or replace any product and or specifications in this catalog at our sole discretion without prior notice.
ELECTROMECHANICAL SWITCH MATRICES
The MS-series is a switch solution populated with individual switches to allow the user to control multiple coaxial switches easily through software. It gives the user the flexibility to add as many switches as needed (limited to the size of the enclosure) on the rear panel or inside the box starting with a 19” 1RU chassis up to 4RU (and larger enclosures for custom designs).

- Switches can be mixed & matched
- Terminated and non-terminated switches
- Normally Open & Latching switches
- Built-in firmware to add, remove and address switches for trouble free switch replacement
- Application configuration available through "configuration file" - transferred via HTTP, USB or COM ports.
- Keeps track of the life of each switch
- Field upgradable firmware via boot loader

**Features**

- **Configuration**: Multiple Switches (bidirectional): SPDT(3), DPDT, SP3T, SP4T SP6T, SP8T, SP10T, SP12T
- **Operating Frequency**: DC-18 GHz, DC-26.5 GHz or DC-40 GHz
- **Manual Control**: LCD with Keypad (1RU)
- **Remote Control**: ENET: Ethernet, Built-In Website, RS-232 and USB port.
- **Impedance**: 50-Ohm

**Application**

The MS-series is a switch solution populated with individual switches to allow the user to control multiple coaxial switches easily through software.

- Switches can be mixed & matched
- Terminated and non-terminated switches
- Normally Open & Latching switches
- Built-in firmware to add, remove and address switches for trouble free switch replacement
- Application configuration available through "configuration file" - transferred via HTTP, USB or COM ports.
- Keeps track of the life of each switch
- Field upgradable firmware via boot loader

**Specifications**

- **Relay Type**: Coaxial
- **I/O Connector Type**: SMA Female or N Female
- **Switching Time**: 50 ms (incl. control delay)
- **MTBF**: 30,000-50,000 Hours
- **Operating Life (min)**: 1,000,000 (cold)
- **Operating Temperature**: 0 °C to +50 °C
- **Storage Temperature**: -20 °C to +70 °C
- **Operating Humidity**: 10-80% non-condensing
- **Dimensions (max)**: 19” Wide rack mount 15.25” (1U-2U) & 18.5” (3U-4U) Depth (w/o handles) 1U to 4U Height (1.75” to 7.00”)
- **Weight**: Varies per part number

**Part Number Selector**

**Dow-Key Microwave**

- [www.dowkey.com](http://www.dowkey.com)
- 800.266.3695

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**RF Specifications**

<table>
<thead>
<tr>
<th>DC-18 GHz, Latching, Non-Terminated</th>
<th>SPDT(3) / DPDT Switch</th>
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<tbody>
<tr>
<td><strong>Frequency [GHz]</strong></td>
<td><strong>VSWR Max.</strong></td>
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<tr>
<td>---</td>
<td>---</td>
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<tr>
<td>DC-1</td>
<td>1.10</td>
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<tr>
<td>1-4</td>
<td>1.20</td>
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<tr>
<td>4-8</td>
<td>1.30</td>
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<tr>
<td>8-12</td>
<td>1.40</td>
</tr>
<tr>
<td>12-18</td>
<td>1.50</td>
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</table>

<table>
<thead>
<tr>
<th>DC-26.5 GHz, Latching, Non-Terminated/Terminated</th>
<th>SP3T - SP6T Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency [GHz]</strong></td>
<td><strong>VSWR Max.</strong></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>DC-4</td>
<td>1.2</td>
</tr>
<tr>
<td>4-8</td>
<td>1.3</td>
</tr>
<tr>
<td>8-12.4</td>
<td>1.4</td>
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<td>18-26.5</td>
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**Part Number Selector**

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<tr>
<th>CHASSIS HEIGHT</th>
<th>FREQUENCY</th>
<th>CONNECTOR</th>
<th>QUANTITY</th>
<th>SWITCH TYPE</th>
<th>TERMINATED</th>
<th>REMOTE CONTROL</th>
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<td>1-1.75”</td>
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<td>ENET = Ethernet</td>
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<td>DPDT Transfer</td>
<td>GPIB = GPIB</td>
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<tr>
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<td>3.5”</td>
<td>S Female</td>
<td>3</td>
<td>3 Switches</td>
<td>SP3T</td>
<td>blank</td>
</tr>
<tr>
<td>4U</td>
<td>4”</td>
<td>DC-40</td>
<td>4</td>
<td>4 Switches</td>
<td>SP4T</td>
<td>8 Switches</td>
</tr>
</tbody>
</table>

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(1) ADD A TERMINATION TO ONE PORT OF THE DPDT SWITCH TO GET A SPDT SWITCH

---

(1) Not available with all switch types.

(2) For 9 and more switches, we can mount inside the chassis. See Appendix A for details.

---

Check Availability
MS-Controller | Build Your Own Solution

The MS-6101 controller offers an ideal switch setup allowing anyone to build their own matrix solution by plugging-in Dow-Key CAN bus controlled switches onto the rear panel. The controller converts CAN interface to either Ethernet or GPIB interface.

The 1RU controller is outfitted with 24 RJ11 ports on the back to support 24 CAN bus switches and can be expanded to support additional switches as needed by adding patch panels.

CAN bus switches, RJ11-X cables, RJ11 patch panel (for expansion) and secondary power supply are purchased separately.

Input power:
The input AC power supply will down convert and distribute DC voltage to all the switches and sub-component (including the patch panel if needed).

MS-6101 Specifications

I/O Connector Type
24x RJ11-6

RoHS Compliant
Yes

EMI Shielded Ports
RJ45, USB, RS-232, GPIB, RJ11-6, CAN bus

MTBF
30,000-50,000 Hours

Operating Temperature
0 °C to +50 °C

Storage Temperature
-20 °C to +70 °C

Operating Humidity
10-80%, non-condensing

Dimensions (max)
19" Wide rack mount
15.25" Depth
7U Height (1.75")

Weight (approx)
10 lbs

Manual Control
LCD with Keypad

Remote Control Ethernet or GPIB Option
MS-6101-ENET
Ethernet (TCP/IP), 100/100 BASE-T, HTTP (built-in website), manual or DHCP IP address assignment

RS-232
DB9 (f), Baud Rate1200 -115200 bps

USB Port
Operates as a virtual RS-232

GPIB (IEEE-488), RS-232 and USB port.

Commands/Syntax
Dow-Key SCPI commands

Switching Time
50 ms (including control delay)

AC Power Supply
110-240 VAC, 50-60 Hz

Fuse
Access/replaceable on the rear

Electromechanical | Multiple Switches

RF Specifications (cont.)

DC-18 GHz, Normally Open, Non-Terminated

<table>
<thead>
<tr>
<th></th>
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<td>70</td>
<td>0.20</td>
<td>100</td>
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<tr>
<td>4-8</td>
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<td>16-18</td>
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<td>55</td>
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DC-18 GHz, DC-26.5 GHz, Latching, Terminated

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<td>18-26.5</td>
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<td>55</td>
<td>0.80</td>
<td>45</td>
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DC-18 GHz, Normally Open, Non-Terminated

<table>
<thead>
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<td>0.30</td>
<td>70</td>
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<tr>
<td>8-12.4</td>
<td>1.40</td>
<td>60</td>
<td>0.40</td>
<td>60</td>
</tr>
<tr>
<td>12.4-18</td>
<td>1.50</td>
<td>60</td>
<td>0.60</td>
<td>50</td>
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</table>

DC-18 GHz, Normally Open Non-Term. / Latching Term.

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<td>60</td>
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</tbody>
</table>

SEE APPENDIX C FOR SWITCH SCHEMATICS

FOR SWITCHES MOUNTED INSIDE A CHASSIS, CONTACT DOW KEY MICROWAVE FOR RF SPECIFICATIONS.

We reserve the right to alter, amend or replace any specifications at our sole discretion and without prior notice.
### Electromechanical

**Operating Frequency**
- DC-18 GHz, DC-26.5 GHz or

**Control Interface**
- CAN Bus control

**Coil Voltage**
- 12 Vdc

**Coaxial**
- SMA Female or 2.9 mm Female

**Relay Type**
- 50-Ohm

**Operating Life (min)**
- 1,000,000 (cold)

---

**SWITCH TYPE** | **PART NUMBER** | **FREQUENCY** | **ACTUATOR** | **RF CONNECTOR** | **TERMINATED**
--- | --- | --- | --- | --- | ---
SPDT(2)/DPDT | 411C-420832N | DC-18 GHz | LATCHING | SMA | NO
SPDT(2)/DPDT | 411C-421132N | DC-40 GHz | LATCHING | SMA | NO
SP3T | 535-5208-3 | DC-18 GHz | NORMALLY OPEN | SMA | NO
SP3T | 431KL-420822N | DC-26.5 GHz | LATCHING | SMA | NO
SP3T | 431KL-420823N | DC-26.5 GHz | LATCHING | SMA | YES
SP4T | 545-5208-3 | DC-18 GHz | NORMALLY OPEN | SMA | NO
SP4T | 441KL-420822N | DC-26.5 GHz | LATCHING | SMA | NO
SP4T | 441KL-420823N | DC-26.5 GHz | LATCHING | SMA | YES
SP6T | 565-5208-3 | DC-18 GHz | NORMALLY OPEN | SMA | NO
SP6T | 461KL-420822N | DC-26.5 GHz | LATCHING | SMA | NO
SP6T | 461KL-420823N | DC-26.5 GHz | LATCHING | SMA | NO
SP6T | 581KL-420852N | DC-26.5 GHz | LATCHING | SMA | YES
SP6T | 581KL-420853N | DC-26.5 GHz | LATCHING | SMA | NO
SP8T | 581KL-420852N | DC-26.5 GHz | LATCHING | SMA | NO
SP8T | 581KL-420853N | DC-26.5 GHz | LATCHING | SMA | NO
SP8T | 581KL-420854N | DC-26.5 GHz | LATCHING | SMA | NO
SP8T | 581KL-420853N | DC-26.5 GHz | LATCHING | SMA | NO
SP8T | 581KL-420854N | DC-26.5 GHz | LATCHING | SMA | NO

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**ADD A TERMINATION TO ONE PORT OF THE DPDT SWITCH TO GET A SPDT SWITCH**

---

**LIST OF CAN BUS SWITCHES**

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**TABLE 1**

---

**Additional Components**

---

**Specifications / Part Numbers**

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**Controller Power**
- +12 Vdc

**MTBF**
- 30,000-50,000 Hours

**Current Draw (max)**
- 300 mA (excl. switches)

**Operating Temperature**
- 0 °C to +50 °C

**Storage Temperature**
- -20 °C to +70 °C

**Operating Humidity**
- 10-80% non-condensing

**Specifications / Part Numbers**

---

**Features**

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**Application / What You Need**

The MS-ENET and MS-GPIB kits are low budget solutions for users who are comfortable to assemble components on their own to build a RF switch solution.

Depending on the type of control, there are two kits available. Either kit consists of an Ethernet/GPIB control board and either RJ11-RJ45 cables (to be used with CAN bus switches), where some assembly is required.

RF switches are not included and are purchased separately. Refer to the MS-6101 Controller page for a list of available Dow-Key CAN bus switches (Table 1).

**MS-ENET**
- This kit allows the user to control switches via Ethernet (TCP/IP), where some assembly is required.

**MS-GPIB**
- This kit allows the user to control switches via GPIB (IEEE-488), where some assembly is required.

**Expansion**
- Support >20 switches

---

**General**

---

**Controller**
- Ethernet with LCD/Keypad

**GPIB**
- GPIB with LCD/Keypad

**ENET/GPIB Control**
- 20x RJ11-4

**Control Board Power**
- +12 Vdc

**Control Board Power**
- +12 Vdc

**Current Draw (max)**
- 300 mA (excl. switches)

**Operating Temperature**
- 0 °C to +50 °C

**Storage Temperature**
- -20 °C to +70 °C

**Operating Humidity**
- 10-80% non-condensing

**Commands/Syntax**
- Dow-Key SCPI commands

**Switching Time**
- 50 ms (incl. control delay)

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**Additional Components**

---

**Software**

---

**Commands/Syntax**
- Dow-Key SCPI commands

**Switching Time**
- 50 ms (incl. control delay)

---

**Application**

Best used for ATE, test-bench and system integrated applications.

**What You Need**

1. Select either MS-ENET or MS-GPIB kit.
2. Choose any CAN bus controlled switches per Table 1.
3. Purchase additional RJ11-4 cable if 13 or more switches are required.
4. If more than 20 switches are required, purchase RJ11 patch panel board along with RJ11-4 cables. The board support 11 additional switches and can be cascaded to support up to 256 switches.

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**Electromechanical**

---

**Operating Life (min)**
- 1,000,000 (cold)

**Control Interface**
- CAN Bus control

**Coil Voltage**
- 12 Vdc

**Program & Control**
- Through the MS-6101 controller you can add/remove and assign unique CAN ID address to the switch, and track the life of each switch.

---

**Relay Type**

---

**Impedance**
- 50-Ohm

**I/O Connector Type**
- SMA Female or 2.9 mm Female

**Operating Frequency**
- DC-18 GHz, DC-26.5 GHz or DC-40 GHz

**Operating Life (min)**
- 1,000,000 (cold)

---

**Relay Type**

---

**Coaxial**
- 50-Ohm

**I/O Connector Type**
- SMA Female or 2.9 mm Female

**Operating Frequency**
- DC-18 GHz, DC-26.5 GHz or DC-40 GHz

---

**Index**

---

**Application**

- Dow-Key SCPI commands

---

**Commands/Syntax**
- Dow-Key SCPI commands

---

**Software**
- Dow-Key SCPI commands
Electromechanical

MP-Series | Multiplexer

**Features**

<table>
<thead>
<tr>
<th>Switch Configuration</th>
<th>1xN bidirectional Terminated &amp; Non-Terminated Maximum 1x143</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Frequency</td>
<td>DC-18 GHz or DC-26.5 GHz</td>
</tr>
<tr>
<td>Manual Control</td>
<td>LCD with Keypad (1RU) Touch Screen LCD (2RU-4RU)</td>
</tr>
<tr>
<td>Impedance</td>
<td>50-Ohm</td>
</tr>
</tbody>
</table>

**Application**

MP-series is a multiplexer with the capability to switch one input to as many as 143 outputs. The input/output ports are bidirectional.

Design starts from 1x13 to 1x143 (1RU-4RU enclosure) and can be customized to support a larger configuration. It is available with maximum frequency at 18 GHz or 26.5 GHz, both terminated and non-terminated options along with SMA or N-type connectors.

**Software Features:**
- Built-in firmware to add, remove and address switches for trouble free switch replacement
- Application configuration available through "configuration file" - transferred via HTTP, USB or COM ports.
- Keeps track of the life of each switch
- Switches for trouble free switch replacement
- Built-in firmware to add, remove and address switches for trouble free switch replacement
- Operates as a virtual RS-232

**Specifications**

<table>
<thead>
<tr>
<th>Relay Type</th>
<th>Coaxial</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O Connector Type</td>
<td>SMA Female or N Female</td>
</tr>
<tr>
<td>Switching Time</td>
<td>50 ms (incl. control delay)</td>
</tr>
<tr>
<td>Operating Life (min)</td>
<td>1,000,000 (cold)</td>
</tr>
<tr>
<td>MTBF</td>
<td>30,000-50,000 Hours</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 °C to +50 °C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-20 °C to +70 °C</td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>10-80% non-condensing</td>
</tr>
<tr>
<td>Dimensions (max)</td>
<td>19” Wide rack mount 15.25” (1U-2U) &amp; 18.5” (3U-4U) Depth (w/o handles) 1U to 4U Height (1.75” to 7.00”)</td>
</tr>
<tr>
<td>Weight</td>
<td>Varies per part number</td>
</tr>
</tbody>
</table>

**RF Specifications**

**MP-Series | Multiplexer**

***THE RF PERFORMANCE FOR ≤1x70 IS SLIGHTLY BETTER.***

**DC-18 GHz, Non-Terminated, SMA**

<table>
<thead>
<tr>
<th>Frequency (GHz)</th>
<th>VSWR Max.</th>
<th>Isolation Min. (dB)</th>
<th>Insertion Loss Max. (dB)</th>
<th>CW Power Max. (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC-4</td>
<td>1.30</td>
<td>70</td>
<td>1.0</td>
<td>100</td>
</tr>
<tr>
<td>4-8</td>
<td>1.35</td>
<td>65</td>
<td>1.5</td>
<td>70</td>
</tr>
<tr>
<td>8-12.4</td>
<td>1.50</td>
<td>60</td>
<td>1.5</td>
<td>60</td>
</tr>
<tr>
<td>12.4-18</td>
<td>1.80</td>
<td>55</td>
<td>2.0</td>
<td>50</td>
</tr>
</tbody>
</table>

**THE RF PERFORMANCE FOR ≤1x100 IS SLIGHTLY BETTER.**

**DC-18 GHz, Non-Terminated, SMA**

<table>
<thead>
<tr>
<th>Frequency (GHz)</th>
<th>VSWR Max.</th>
<th>Isolation Min. (dB)</th>
<th>Insertion Loss Max. (dB)</th>
<th>CW Power Max. (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC-4</td>
<td>1.30</td>
<td>70</td>
<td>2.0</td>
<td>100</td>
</tr>
<tr>
<td>4-8</td>
<td>1.35</td>
<td>65</td>
<td>3.0</td>
<td>70</td>
</tr>
<tr>
<td>8-12.4</td>
<td>1.50</td>
<td>60</td>
<td>4.0</td>
<td>60</td>
</tr>
<tr>
<td>12.4-18</td>
<td>1.80</td>
<td>55</td>
<td>5.0</td>
<td>50</td>
</tr>
</tbody>
</table>

**Remote Control ENET:**

- Operates as a virtual RS-232
- DB9-F, Baud Rate 1200 - 115200 bps
- Built-in website, manual or DHCP IP address assignment
- Operates as a virtual RS-232
- Dow-Key SCPI commands

**Commands/Syntax**

- Dow-Key SCPI commands
- Built-in firmware to add, remove and address switches for trouble free switch replacement
- Operates as a virtual RS-232
- Operates as a virtual RS-232
- **Part Number Selector**

**Electromechanical**

3RU Model

**MP-Series | Multiplexer**

**Remote Control ENET**

- Operates as a virtual RS-232
- DB9-F, Baud Rate 1200 - 115200 bps
- Built-in website, manual or DHCP IP address assignment
- Operates as a virtual RS-232
- Dow-Key SCPI commands

**Commands/Syntax**

- Dow-Key SCPI commands
- Built-in firmware to add, remove and address switches for trouble free switch replacement
- Operates as a virtual RS-232
- Operates as a virtual RS-232
- **Part Number Selector**

**Electromechanical**

3RU Model

**MP-Series | Multiplexer**

**Remote Control ENET**

- Operates as a virtual RS-232
- DB9-F, Baud Rate 1200 - 115200 bps
- Built-in website, manual or DHCP IP address assignment
- Operates as a virtual RS-232
- Dow-Key SCPI commands

**Commands/Syntax**

- Dow-Key SCPI commands
- Built-in firmware to add, remove and address switches for trouble free switch replacement
- Operates as a virtual RS-232
- Operates as a virtual RS-232

**Part Number Selector**

- Dow-Key SCPI commands
- Built-in firmware to add, remove and address switches for trouble free switch replacement
- Operates as a virtual RS-232
- Operates as a virtual RS-232

**Part Number Selector**

**MP - 3U 18 S - 100 ENET**

**Chassis Height**

1U = 1.75”
2U = 3.50”
3U = 5.25”
4U = 7.00”

**Frequency**

18 = DC-18 GHz
26 = DC-26.5 GHz

**Connection**

N = N female
S = SMA female

**Outputs**

1 = 1 Output
2 = 2 Outputs
3 = 3 Outputs

**Terminated**

T = 2W Termination

**ENET**

ENET = Ethernet

**Maximum outputs vary per following parameters:**

For DC-18GHz Switch: Maximum 143 outputs (Non-Terminated & SMA)
Maximum 132 outputs (Terminated & SMA)
Maximum 47 outputs (Non-Terminated or Terminated & N)
For DC-26.5GHz Switch: Maximum 64 outputs (Non-Terminated or Terminated & SMA)

- Maximum 143 outputs (Non-Terminated & SMA)
- Maximum 132 outputs (Terminated & SMA)
- Maximum 47 outputs (Non-Terminated or Terminated & N)
- Maximum 64 outputs (Non-Terminated or Terminated & SMA)

**See Appendix B for more RF data & Appendix C for switch schematics**

We reserve the right to alter, amend or replace any specifications at our sole discretion and without prior notice.
For more complex test setups and signal switching, the CB-series crossbar matrix is an excellent choice. It allows testing of multiple UUT/DUT (units/devices under test) with many input/output signals or high-speed communication buses without having to connect and disconnect them from the setup.

A crossbar system can route any input signal to any output port such that the path between the I/O ports is unique at any given time.

Software Features:
- Built-in firmware to add, remove and address switches for trouble-free switch replacement
- Application configuration available through "configuration file" - transferred via HTTP, USB or COM ports.
- "Keep track of the life of each switch" - transferred via HTTP, USB or COM ports.
- "Configuration" - transferred via HTTP, USB or COM ports.
- Field upgradable firmware via boot loader
- Applications available through • Built-in firmware to add, remove and address switches for trouble-free switch replacement
- Manual Control
- LCD with Keypad
- Touch Screen LCD
- ENET: Ethernet, Built-In Website, RS-232 and USB port.
- Power Supply: 110-240 VAC, 50-60 Hz
- AC Power Supply: 110-240 VAC, 50-60 Hz
- Cooling / Venting: Fans as required by 2U-4U models
- MTBF: 30,000-50,000 Hours
- Operating Humidity: 10-80% non-condensing
- Storage Temperature: -20 °C to +70 °C
- Operating Temperature: 0 °C to +50 °C
- Storage Temperature: -20 °C to +70 °C
- Operating Humidity: 10-80% non-condensing
- Dimensions (max): 1/2" Wide rack mount
- 15.25" (1U-2U) & 18.5" (3U-4U) Depth (w/o handles)
- 1U to 4U Height (1.75" to 7.00"
- Weight: Varies per part number
- Operating Life (min): 1,000,000 (cold)
- Operating Life (max): 1,000,000 (hot)
- Configuration: Non-Blocking Crossbar
- Switch Configuration: 2x2 up to 12x12 Terminated & Non-Terminated
- Operating Frequency: DC-18 GHz or DC-26.5 GHz
- Manual Control: LCD with Keypad (1RU)
- Impedance: 50-Ohm

### CAN Bus Specifications

<table>
<thead>
<tr>
<th>Relay Type</th>
<th>Coaxial, Normally Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O Connector Type</td>
<td>SMA Female or N Female</td>
</tr>
<tr>
<td>Switching Time</td>
<td>50 ms (incl. control delay)</td>
</tr>
<tr>
<td>Operating Life (min)</td>
<td>1,000,000 (cold)</td>
</tr>
<tr>
<td>MTBF</td>
<td>30,000-50,000 Hours</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 °C to +50 °C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-20 °C to +70 °C</td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>10-80% non-condensing</td>
</tr>
</tbody>
</table>
| Dimensions (max) | 1/2" Wide rack mount
| | 15.25" (1U-2U) & 18.5" (3U-4U) Depth (w/o handles)
| | 1U to 4U Height (1.75" to 7.00"
| Weight | Varies per part number |

### Part Number Selector

<table>
<thead>
<tr>
<th>CB</th>
<th>1</th>
<th>U</th>
<th>18</th>
<th>S</th>
<th>4</th>
<th>X</th>
<th>6</th>
<th>ENET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Inputs</td>
<td>Terminated Inputs</td>
<td>Number of Outputs</td>
<td>Terminated Outputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1U = 1.75&quot;</td>
<td>18 = DC-18 GHz</td>
<td>N = N female</td>
<td>T = 2W Termination</td>
<td>T = 2W Termination</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2U = 3.00&quot;</td>
<td>26 = DC-26.5 GHz</td>
<td>S = SMA female</td>
<td>1 = 1 Input</td>
<td>1 = 1 Output</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3U = 5.25&quot;</td>
<td>50-Ohm</td>
<td>3 = 3 Inputs (blank)</td>
<td>2 = 2 Outputs (blank)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4U = 7.00&quot;</td>
<td>Accessible/replaceable on the rear</td>
<td>12 = 12 Inputs (blank)</td>
<td>3 = 3 Outputs (blank)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### RF Specifications

#### DC-18 GHz, Non-Terminated, SMA or N

<table>
<thead>
<tr>
<th>Frequency (GHz)</th>
<th>VSWR</th>
<th>Isolation (dB)</th>
<th>Insertion Loss (dB)</th>
<th>CW Power (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC-4</td>
<td>1.30</td>
<td>80</td>
<td>2.0</td>
<td>100</td>
</tr>
<tr>
<td>4-8</td>
<td>1.35(1)</td>
<td>80</td>
<td>3.0</td>
<td>90</td>
</tr>
<tr>
<td>8-12</td>
<td>1.45</td>
<td>80</td>
<td>3.5</td>
<td>75</td>
</tr>
<tr>
<td>12-16</td>
<td>1.55</td>
<td>80</td>
<td>4.0</td>
<td>65</td>
</tr>
<tr>
<td>16-18</td>
<td>1.80</td>
<td>80</td>
<td>5.0</td>
<td>60</td>
</tr>
</tbody>
</table>

#### DC-18 GHz, Terminated, SMA or N

<table>
<thead>
<tr>
<th>Frequency (GHz)</th>
<th>VSWR</th>
<th>Isolation (dB)</th>
<th>Insertion Loss (dB)</th>
<th>CW Power (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC-4</td>
<td>1.30</td>
<td>80</td>
<td>2.0</td>
<td>100</td>
</tr>
<tr>
<td>4-8</td>
<td>1.45</td>
<td>80</td>
<td>3.5</td>
<td>90</td>
</tr>
<tr>
<td>8-12</td>
<td>1.55</td>
<td>80</td>
<td>4.0</td>
<td>75</td>
</tr>
<tr>
<td>12-16</td>
<td>1.80</td>
<td>80</td>
<td>4.5</td>
<td>65</td>
</tr>
<tr>
<td>16-18</td>
<td>2.00</td>
<td>80</td>
<td>5.5</td>
<td>60</td>
</tr>
</tbody>
</table>

#### DC-18 GHz, Non-Terminated, SMA or N (11x11 to 12x12)

<table>
<thead>
<tr>
<th>Frequency (GHz)</th>
<th>VSWR</th>
<th>Isolation (dB)</th>
<th>Insertion Loss (dB)</th>
<th>CW Power (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC-4</td>
<td>1.30</td>
<td>80</td>
<td>2.0</td>
<td>100</td>
</tr>
<tr>
<td>4-8</td>
<td>1.45</td>
<td>80</td>
<td>3.5</td>
<td>90</td>
</tr>
<tr>
<td>8-12</td>
<td>1.55</td>
<td>80</td>
<td>4.0</td>
<td>75</td>
</tr>
<tr>
<td>12-16</td>
<td>1.80</td>
<td>80</td>
<td>4.5</td>
<td>65</td>
</tr>
<tr>
<td>16-18</td>
<td>2.00</td>
<td>80</td>
<td>5.5</td>
<td>60</td>
</tr>
</tbody>
</table>

### SP10T normally open Switches

#### DC-18 GHz, Non-Terminated, SMA or N

<table>
<thead>
<tr>
<th>Frequency (GHz)</th>
<th>VSWR</th>
<th>Isolation (dB)</th>
<th>Insertion Loss (dB)</th>
<th>CW Power (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC-4</td>
<td>1.30</td>
<td>80</td>
<td>2.0</td>
<td>100</td>
</tr>
<tr>
<td>4-8</td>
<td>1.45</td>
<td>80</td>
<td>3.5</td>
<td>90</td>
</tr>
<tr>
<td>8-12</td>
<td>1.55</td>
<td>80</td>
<td>4.0</td>
<td>75</td>
</tr>
<tr>
<td>12-16</td>
<td>1.80</td>
<td>80</td>
<td>4.5</td>
<td>65</td>
</tr>
<tr>
<td>16-18</td>
<td>2.00</td>
<td>80</td>
<td>5.5</td>
<td>60</td>
</tr>
</tbody>
</table>

We reserve the right to alter, amend or replace any specifications at our sole discretion and without prior notice.
The 4141 Model is a bidirectional crossbar switch matrix configured with 2 inputs and 32 outputs using cascaded SP8T coaxial switches. The non-connected output ports are terminated to 50-ohm loads.

A crossbar system can route any input signal to any output port such that the path between the I/O ports is unique at any given time.

The switches can either be controlled via a LCD with keypad on the front or remotely via Ethernet or GPIB along with RS-232 serial interface.

This model is equipped with front panel LCD/keypad display for manual and local control, and remotely it can be controlled via RS-232 with the options of Ethernet or GPIB.

It is best used for RF testing where phase matched paths are critical and easy access to connect/disconnect I/O ports of the UUT is required from the front.

Model 4169 is a bidirectional crossbar switch configured with maximum (10) inputs and (10) outputs - all accessible on the front - where unused input and output ports are internally terminated to a 2W/50-ohm load and all paths are phase matched.

A crossbar system can route any input signal to any output port such that the path between the I/O ports is unique at any given time.

This model is equipped with front panel LCD/keypad display for manual and local control, and remotely it can be controlled via RS-232 with the options of Ethernet or GPIB.

It is best used for RF testing where phase matched paths are critical and easy access to connect/disconnect I/O ports of the UUT is required from the front.

---

### Specifications

#### Part Numbers

- **4141-2/32-ENET**
- **4141-1/32-GPIB**

---

### Application

**RF Specifications & Rear View**

- **Characteristics of Capacitance, Inductance, and Loss**
- **Voltage Swing**
- **Current Range**
- **Temperature Range**
- **Humidity Range**
- **Environmental Requirements**
- **Power Consumption**
- **Interchangeability**

---

### Part Numbers

- **4169-N/ENET**
- **4169-N/M/GPIB**

---

### Features

- **Maximum I/O ports:** 2x32 bidirectional
- **Non-blocking Crossbar**
- **Operating Frequency:** DC-18 GHz
- **Manual Control:** LCD with Keypad
- **Remote Control:** Ethernet/RS-232 or GPIB/RS-232
- **Impedance:** 50-Ohm

---

### Application

The 4141 Model is a bidirectional crossbar switch matrix configured with 2 inputs and 32 outputs using cascaded SP8T coaxial switches. The non-connected output ports are terminated to 50-ohm loads.

A crossbar system can route any input signal to any output port such that the path between the I/O ports is unique at any given time.

The switches can either be controlled via a LCD with keypad on the front or remotely via Ethernet or GPIB along with RS-232 serial interface.

This system is best used for RF signal switching among multiple devices. A suggested application is to use it as an expansion port for network analyzers.

SEE APPENDIX C FOR SWITCH SCHEMATIC

---

### Specifications

#### General

- **Relay Type:** Latching Coaxial
- **Self-Terminating:** 2W, 50-Ohm Output Ports
- **I/O Connector Type:** SMA Female
- **Switching Time (typ):** 540 ms (incl. control delay)
- **Operating Life (min):** 1,000,000 (cold)
- **MTBF:** 30,000-50,000 Hours
- **Operating Temperature:** 0 °C to +50 °C
- **Storage Temperature:** -20 °C to +70 °C
- **Operating Humidity:** 10-80% non-condensing
- **Dimensions (max):**
  - 19" Wide rack mount
  - 20" Depth
  - 4U Height (7.00")

#### Interface

- **Manual Control:** 4x40 LCD with Keypad
- **Remote Control Ethernet or GPIB Option**
  - **ENET Option:** Ethernet (TCP/IP), 10/100 BASE-T, manual IP address assignment
  - **DB9 Female, Baud Rates 9,600 bps**
  - **GPIB Option (IEEE-488) 24-pin (f) & RS-232**
- **Switching Time (typ):**
  - 420 ms approx. (incl. control delay)
  - **Fuse:** Accessible/replaceable on the rear

#### Power

- **AC Power Supply:** 85-264 VAC, 47-63 Hz, 150 W
- **Cooling / Venting:** 2 Fans / Side-to-Side
- **Weight (max):** 30 lbs

---

### Remote Control

**Ethernet (TCP/IP), 10/100 BASE-T,**

- **Commands / Syntax:** Dow-Key SCPI commands
- **Operating Humidity:** 10-80% non-condensing
- **Dimensions (max):**
  - 19" Wide rack mount
  - 20" Depth
  - 4U Height (7.00")

#### Power Supply

- **AC Power Supply:** 85-264 VAC, 47-63 Hz, 150 W
- **Cooling / Venting:** 2 Fans / Side-to-Side
- **Weight (max):** 30 lbs

---

### DC Power Supply

- **Power Consumption:** 150 W
- **Fuse:** Accessible/replaceable on the rear

---

### Comparison of Specifications

<table>
<thead>
<tr>
<th>Part Numbers</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>4141-2/32-ENET</td>
<td><strong>Maximum I/O ports:</strong> 2x32 bidirectional Non-blocking Crossbar <strong>Operating Frequency:</strong> DC-18 GHz <strong>Manual Control:</strong> LCD with Keypad <strong>Remote Control:</strong> Ethernet/RS-232 or GPIB/RS-232 <strong>Impedance:</strong> 50-Ohm</td>
</tr>
<tr>
<td>4141-1/32-GPIB</td>
<td><strong>Maximum I/O ports:</strong> 1x16 bidirectional Normally Open, Phase-Matched Terminated Input &amp; Output ports <strong>Configuration:</strong> Non-blocking Crossbar <strong>Operating Frequency:</strong> DC-18 GHz <strong>Manual Control:</strong> LCD with Keypad <strong>Remote Control:</strong> RS-232 with Ethernet or GPIB <strong>Impedance:</strong> 50-Ohm</td>
</tr>
</tbody>
</table>

---

### SWIFT CHART

**Frequency (GHz)** | **VSWR Max.** | **Isolation Min. [dB]** | **Insert. Loss Max. [dB]** | **CW Power Max. [W]**
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DC-8</td>
<td>1.40</td>
<td>70</td>
<td>3.0</td>
<td>10</td>
</tr>
<tr>
<td>8-12</td>
<td>1.70</td>
<td>65</td>
<td>4.0</td>
<td>7.5</td>
</tr>
<tr>
<td>12-18</td>
<td>1.85</td>
<td>60</td>
<td>5.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>

---

### DC Power Supply

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuse:</strong> Accessible/replaceable on the rear</td>
</tr>
<tr>
<td><strong>Cooling / Venting:</strong> 2 Fans / Side-to-Side</td>
</tr>
<tr>
<td><strong>Weight (max):</strong> 30 lbs</td>
</tr>
</tbody>
</table>
**Electromechanical**

**4601 | Fan-Out**

**Features**
- **Input/Output ports**: 4x4 to 8x8 unidirectional
- **Configuration**: Non-blocking Full Fan-Out
- **Operating Frequency**: 1-18 GHz
- **Manual Control**: LCD Touch Screen
- **Remote Control**: Ethernet
- **Power Supply**: Redundant power supplies
- **Impedance**: 50-Ohm

**Part Numbers**
- N/M-ENET

**Specifications**
- **Application**: The 4601 Model is an unidirectional 50-ohm Fan-Out switch matrix configured with a maximum of 8 inputs and 8 outputs. The RF inputs are first amplified with high linearity amplifiers (to compensate for the insertion loss) and then divided using 4-way and 3-way power dividers before being routed to SP8T coaxial switches terminated with 2W/50-ohm loads. Hence, the frequency band is limited to 1-18 GHz.
- **Input/Output ports**: 4x4 to 8x8 unidirectional
- **Configuration**: Non-blocking Full Fan-Out
- **Operating Frequency**: 1-18 GHz
- **Manual Control**: LCD Touch Screen
- **Remote Control**: Ethernet
- **Power Supply**: Redundant power supplies
- **Impedance**: 50-Ohm

**4701 | Fan-Out**

**Features**
- **Input/Output ports**: 9x9 to 12x12 unidirectional
- **Configuration**: Non-blocking Full Fan-Out
- **Operating Frequency**: 1-18 GHz
- **Manual Control**: LCD Touch Screen
- **Remote Control**: Ethernet
- **Power Supply**: Redundant power supplies
- **Impedance**: 50-Ohm

**Part Numbers**
- N/M-ENET

**Specifications**
- **Application**: The 4701 Model is an unidirectional 50-ohm Fan-Out switch matrix configured with a maximum of 12 inputs and 12 outputs. The RF inputs are first amplified with high linearity amplifiers (to compensate for the insertion loss) and then divided using 4-way and 3-way power dividers before being routed to terminated SP12T coaxial switches with 2W/50-ohm loads. Hence, the frequency band is limited to 1-18 GHz.
- **Input/Output ports**: 9x9 to 12x12 unidirectional
- **Configuration**: Non-blocking Full Fan-Out
- **Operating Frequency**: 1-18 GHz
- **Manual Control**: LCD Touch Screen
- **Remote Control**: Ethernet
- **Power Supply**: Redundant power supplies
- **Impedance**: 50-Ohm

**Electromechanical**

**4601-8/8-ENET**

**4701-12/12-ENET**

**Application**

**RF Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>4601</th>
<th>4701</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSWR (max)</td>
<td>2.50:1</td>
<td>2.50:1</td>
</tr>
<tr>
<td>Isolation (min)</td>
<td>60 dB</td>
<td>60 dB</td>
</tr>
<tr>
<td>Gain</td>
<td>0 dB</td>
<td>0 dB</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>0.5 dB</td>
<td>0.5 dB</td>
</tr>
<tr>
<td>1dB Compression (min)</td>
<td>+5 dBm</td>
<td>+5 dBm</td>
</tr>
<tr>
<td>3rd Order Intercept (min)</td>
<td>+10 dBm</td>
<td>+10 dBm</td>
</tr>
<tr>
<td>2nd Order Intercept (min)</td>
<td>+20 dBm</td>
<td>+20 dBm</td>
</tr>
<tr>
<td>Noise Figure (max)</td>
<td>11 dB</td>
<td>11 dB</td>
</tr>
</tbody>
</table>

**Specifications**

- **Relay Type**: Latching Terminated Coaxial
- **Other Components**: Amplifiers, Power Dividers
- **I/O Connector Type**: N (f) inputs / SMA (f) outputs
- **Switching Time (min)**: 300 ms (incl. control delay)
- **MTBF**: 30,000-50,000 Hours
- **Dimensions (max)**: 19" wide rack mount, 20" Depth, 3U Height (5.25")
- **Operating Temperature**: 0 °C to +50 °C
- **Storage Temperature**: -20 °C to +70 °C
- **Operating Humidity**: 10-80% non-condensing
- **Weight**: 50 lbs
- **Local Control**: 6.5" LCD Touch Screen (640x480)
- **Remote Control**: Ethernet TCP/IP, 10/100/1000 BASE-T
- **Commands/Syntax**: Dow-Key SCPI commands
- **Operating System**: Microsoft Windows 7 or later
- **Hard drive**: 160 GB (min) SATA HD / removable
- **CPU/ Memory**: Intel processor / 2 RAM (min)
- **Power Supply**: 120-240 VAC, 50-60 Hz, 2A-1A, 250W (max)
- **Power switch with guard on the front and LED indicators for redundancy
- **Fuse**: Accessible/replaceable on the rear
- **Cooling / Venting**: 2 Fans / Side-to-Side

**Application**

**RF Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>4601</th>
<th>4701</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSWR (max)</td>
<td>2.50:1</td>
<td>2.50:1</td>
</tr>
<tr>
<td>Isolation (min)</td>
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</tr>
<tr>
<td>Gain</td>
<td>0 dB</td>
<td>0 dB</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>0.5 dB</td>
<td>0.5 dB</td>
</tr>
<tr>
<td>1dB Compression (min)</td>
<td>+5 dBm</td>
<td>+5 dBm</td>
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<tr>
<td>3rd Order Intercept (min)</td>
<td>+10 dBm</td>
<td>+10 dBm</td>
</tr>
<tr>
<td>2nd Order Intercept (min)</td>
<td>+20 dBm</td>
<td>+20 dBm</td>
</tr>
<tr>
<td>Noise Figure (max)</td>
<td>11 dB</td>
<td>11 dB</td>
</tr>
</tbody>
</table>

**Specifications**

- **Relay Type**: Latching Terminated Coaxial
- **Other Components**: Amplifiers, Power Dividers
- **I/O Connector Type**: N (f) inputs / SMA (f) outputs
- **Switching Time (min)**: 300 ms (incl. control delay)
- **MTBF**: 30,000-50,000 Hours
- **Dimensions (max)**: 19" wide rack mount, 20" Depth, 4U Height (7.00")
- **Operating Temperature**: 0 °C to +50 °C
- **Storage Temperature**: -20 °C to +70 °C
- **Operating Humidity**: 10-80% non-condensing
- **Weight**: 50 lbs
- **Local Control**: 6.5" LCD Touch Screen (640x480)
- **Remote Control**: Ethernet TCP/IP, 10/100/1000 BASE-T
- **Commands/Syntax**: Dow-Key SCPI commands
- **Operating System**: Microsoft Windows 7 or later
- **Hard drive**: 160 GB (min) SATA HD / removable
- **CPU/ Memory**: Embedded Intel processor / 2 RAM (min)
- **Power Supply**: 120-240 VAC, 50-60 Hz, 2A-1A, 250W (max)
- **Power switch with guard on the front and LED indicators for redundancy
- **Fuse**: Accessible/replaceable on the rear
- **Cooling / Venting**: 2 Fans / Side-to-Side
3202 | L-band Fan-Out

The 3202 Model is a non-blocking full fan-out solid state switch matrix operating from 800 MHz to 2500 MHz (L-band). The system can be configured with maximum 12 inputs and 12 outputs or as 8 by 16.

As a fan-out matrix, the input RF signals are amplified and divided across every output such that each input signal can be switched to all output ports simultaneously.

This model is equipped with a MS Windows based PC, removable SATA hard drive and redundant power supplies with LED monitoring on the front panel. Locally it can be controlled via an LCD touch screen and remotely with Ethernet.

This model is ideal for SATCOM applications where high density RF switching (transmitting and receiving) for narrowband, low frequency and low power applications are required.

Specifications

- Relay Type: Solid State
- I/O Connector Type: SMA female
- Switching Time (typ): 100 ms (incl. control delay)
- MTBF: 25,000-50,000 Hours
- Dimensions (max): 19” wide rack mount, 21” Depth, 3U Height (5.25”)
- Operating Temperature: 0°C to +50°C
- Storage Temperature: -20°C to +70°C
- Operating Humidity: 10-80% non-condensing
- Weight (max): 40 lbs
- Local Control: 6.5” LCD Touch Screen (640x480)
- Remote Control: Ethernet TCP/IP, 10/100/1000 BASE-T
- Commands/Syntax: Dow-Key SCPI commands
- Operating System: Microsoft Windows 7 or later
- Hard drive: 160 GB (min) SATA HD / removable
- CPU/ Memory: Embedded Intel processor / 2G RAM (min)
- Power Supply: 120-240 VAC, 50-60 Hz, 3-6A, 250W (max)
- Power ON/OFF switch with guard on the front and LED indicators for redundancy
- Fuse: Accessible/replaceable on the rear
- Cooling / Venting: 4 fans (side-to-side)

Part Numbers

- 3202 (12X12)
- 3202-NXM-ENET
- 3202-8X16-ENET (8X16)
- N+M: 6X6, 8X8, 10X10

---

3203 | VHF-band Fan-Out

The 3203 Model is a non-blocking full fan-out solid state switch matrix operating from 10 MHz to 1100 MHz (VHF-band). The system can be configured with a maximum 8 inputs and 16 outputs.

As a fan-out matrix, the input RF signals are amplified and divided across every output such that each input signal can be switched to all output ports simultaneously.

The 3203 series is equipped with a MS Windows based PC, LCD touch screen display with GUI for manual control and redundant power supplies with LED monitoring on the front panel. Remotely, it is controlled using Ethernet.

This model is ideal for SATCOM applications where high density RF switching (transmitting and receiving) for narrowband, low frequency and low power applications are required.

Specifications

- Relay Type: Solid State
- I/O Connector Type: SMA female
- Switching Time (typ): 100 ms (incl. control delay)
- MTBF: 25,000-50,000 Hours
- Dimensions (max): 19” wide rack mount, 21” Depth, 3U Height (5.25”)
- Operating Temperature: 0°C to +50°C
- Storage Temperature: 0°C to +70°C
- Operating Humidity: 10-80% non-condensing
- Weight (max): 40 lbs
- Local Control: 6.5” LCD Touch Screen (640x480)
- Remote Control: Ethernet TCP/IP, 10/100/1000 BASE-T
- Commands/Syntax: Dow-Key SCPI commands
- Operating System: Microsoft Windows 7 or later
- Hard drive: 160 GB (min) SATA HD / removable
- CPU/ Memory: Embedded Intel processor / 2G RAM (min)
- Power Supply: 120-240 VAC, 50-60 Hz, 3-6A, 250W (max)
- Power ON/OFF switch with guard on the front and LED indicators for redundancy
- Fuse: Accessible/replaceable on the rear
- Cooling / Venting: 4 fans (side-to-side)
### Solid State

#### 3204 | IF-band Fan-Out

- **Features**
  - Input/Output ports: 6x6 to 12x12 unidirectional
  - Configuration: Non-blocking Full Fan-Out
  - Operating Frequency: 20-200 MHz
  - Manual Control: LCD Touch Screen
  - Remote Control: Ethernet
  - Power Supply: Redundant power supplies
  - Impedance: 50-Ohm

**Part Numbers**

<table>
<thead>
<tr>
<th>Model</th>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>3204</td>
<td>12x12</td>
<td>6x6, 8x6, 10x10</td>
</tr>
</tbody>
</table>

**Application**

The 3204 Model is a non-blocking full fan-out solid state switching system operating from 20 MHz to 200 MHz (IF-band). The system can be configured to a maximum of 12 inputs and 12 outputs.

As a fan-out matrix, the input RF signals are divided across every output such that each input signal can be switched to all output ports simultaneously.

This model is equipped with a MS Windows based PC, removable SATA hard drive and redundant power supplies with LED monitoring on the front panel. Locally it can be controlled via an LCD touch screen and remotely with Ethernet.

This model is ideal for SATCOM applications where high density RF switching (transmitting and receiving) for narrowband, low frequency and low power applications are required.

**Specifications**

- **Relay Type**: Solid State
- **Other Components**: Amplifiers, Power Dividers
- **I/O Connector Type**: SMA female
- **Switching Time (typ)**: 100 ms (incl. control delay)
- **MTBF**: 25,000-50,000 Hours
- **Dimensions (max)**: 19” wide rack mount / 21” Depth / 3U Height (5.25”)
- **Operating Temperature**: 0°C to +70°C
- **Storage Temperature**: -20°C to +70°C
- **Operating Humidity**: 10-80% non-condensing
- **Weight (max)**: 40 lbs

We reserve the right to alter, amend or replace any specifications at our sole discretion and without prior notice.

---

#### 3205 | HF-band Fan-Out

- **Features**
  - Input/Output ports: 6x6 to 12x12 unidirectional
  - Configuration: Non-blocking Full Fan-Out
  - Operating Frequency: 2-32 MHz
  - Manual Control: LCD Touch Screen
  - Remote Control: Ethernet
  - Power Supply: Redundant power supplies
  - Impedance: 50-Ohm

**Part Numbers**

<table>
<thead>
<tr>
<th>Model</th>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>3205</td>
<td>6X12</td>
<td>6x6, 6x6</td>
</tr>
<tr>
<td>3205-NXM-ENET</td>
<td>6x6, 12x12</td>
<td></td>
</tr>
</tbody>
</table>

**Application**

The 3205 Model is a non-blocking full fan-out solid state switching system operating from 2 MHz to 32 MHz (HF-band). The system can be configured with a maximum of 6 inputs and 12 outputs.

As a fan-out matrix, the input RF signals are divided across every output such that each input signal can be switched to all output ports simultaneously.

This model is equipped with a MS Windows based PC, removable SATA hard drive and redundant power supplies with LED monitoring on the front panel. Locally it can be controlled via an LCD touch screen and remotely with Ethernet.

This model is ideal for SATCOM applications where high density RF switching (transmitting and receiving) for narrowband, low frequency and low power applications are required.

**Specifications**

- **Relay Type**: Electromechanical Relay
- **Other Components**: Amplifiers, Power Dividers
- **I/O Connector Type**: SMA female
- **Switching Time (typ)**: 100 ms (incl. control delay)
- **MTBF**: 25,000-50,000 Hours
- **Dimensions (max)**: 19” wide rack mount / 21” Depth / 3U Height (5.25”)
- **Operating Temperature**: 0°C to +50°C
- **Storage Temperature**: -20°C to +70°C
- **Operating Humidity**: 10-80% non-condensing
- **Weight (max)**: 40 lbs

We reserve the right to alter, amend or replace any specifications at our sole discretion and without prior notice.
FIBER OPTIC MATRICES
The 7001 models is a non-blocking 16x16 matrix with MEMS optical switches and splitters and it is configured as a 8x14 crossbar with two 1x4 fan-out switch segments. It switches input-to-output paths in pure optical domain with a operating wavelength of 1530-1565 nm in C-band.

This model is equipped with a MS Windows based PC, removable SATA hard drive and redundant power supplies with LED monitoring and guarded power switch on the front panel. Locally it can be controlled through an LCD touch screen with Graphical User Interface (GUI) and remotely through Ethernet.

The crossbar segment routes any input signal to any output port such that the path between the I/O ports is unique at any given time. Whereas the fan-out segment re-routes outputs 15 & 16 back to inputs 9-to-12 & 13-to-16 respectively to make two 1x4 fan-out switch configurations. See appendix C for more details.

This model is equipped with a MS Windows based PC, removable SATA hard drive and redundant power supplies with LED monitoring and guarded power switch on the front panel. Locally it can be controlled through an LCD touch screen with Graphical User Interface (GUI) and remotely through Ethernet.

The crossbar segment routes any input signal to any output port such that the path between the I/O ports is unique at any given time. Whereas the fan-out segment re-routes outputs 15 & 16 back to inputs 9-to-12 & 13-to-16 respectively to make two 1x4 fan-out switch configurations. See appendix C for more details.

The 7002 models is a non-blocking 16x16 matrix with MEMS optical switches and splitters and it is configured as a 14x15 crossbar with a 1x2 fan-out switch segment. It switches input-to-output paths in pure optical domain with a operating wavelength of 1530-1565 nm in C-band.

This model is equipped with a MS Windows based PC, removable SATA hard drive and redundant power supplies with LED monitoring and guarded power switch on the front panel. Locally it can be controlled through an LCD touch screen with Graphical User Interface (GUI) and remotely through Ethernet.

The crossbar segment routes any input signal to any output port such that the path between the I/O ports is unique at any given time. Whereas the fan-out segment re-routes outputs 15 & 16 back to inputs 9-to-12 & 13-to-16 respectively to make two 1x4 fan-out switch configurations. See appendix C for more details.

The crossbar segment routes any input signal to any output port such that the path between the I/O ports is unique at any given time. Whereas the fan-out segment re-routes outputs 15 & 16 back to inputs 9-to-12 & 13-to-16 respectively to make two 1x4 fan-out switch configurations. See appendix C for more details.

SEE APPENDIX C FOR SWITCH SCHEMATIC

SEE APPENDIX C FOR SWITCH SCHEMATIC

### Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>7001</th>
<th>7002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Control</td>
<td>6.5&quot; (640x480) LCD Touch Screen GUI</td>
<td>6.5&quot; (640x480) LCD Touch Screen GUI</td>
</tr>
<tr>
<td>I/O Connector Type</td>
<td>LC</td>
<td>FC/APC</td>
</tr>
<tr>
<td>Switching Time (max)</td>
<td>35 ms (excl. software delay)</td>
<td>35 ms (excl. software delay)</td>
</tr>
<tr>
<td>Fiber Type</td>
<td>9/125 μm single mode</td>
<td>9 μm single mode</td>
</tr>
<tr>
<td>Lifetime (min)</td>
<td>107 cycles</td>
<td>107 cycles</td>
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<tr>
<td>Dimensions (max)</td>
<td>19&quot; wide full rack</td>
<td>19&quot; wide full rack</td>
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<tr>
<td>20&quot; Depth</td>
<td>20&quot; Depth</td>
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</tr>
<tr>
<td>3U Height (5.25&quot;)</td>
<td>3U Height (5.25&quot;)</td>
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</tr>
<tr>
<td>Operating Temperature</td>
<td>0 °C to +50 °C</td>
<td>0 °C to +50 °C</td>
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<tr>
<td>Storage Temperature</td>
<td>-20 °C to +65 °C</td>
<td>-20 °C to +65 °C</td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>10-80% non-condensing</td>
<td>10-80% non-condensing</td>
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<tr>
<td>Weight (typ)</td>
<td>30 lbs</td>
<td>30 lbs</td>
</tr>
<tr>
<td>Fuse</td>
<td>Accessible/replaceable on the rear</td>
<td>Accessible/replaceable on the rear</td>
</tr>
<tr>
<td>Cooling / Venting</td>
<td>2 fans / side-to-side</td>
<td>2 fans / side-to-side</td>
</tr>
<tr>
<td>Specifications</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
INTEGRATED SWITCH SYSTEM CAPABILITIES
Integrated Systems 5096 | C-band Fan-Out

**Features**
- Input/Output ports: 16x32, expandable to 32x64 unidirectional
- Configuration: Non-blocking Full Fan-Out
- Operating Frequency: 3.4-4.2 GHz (C-band)
- Manual Control: LCD Touch Screen
- Remote Control: RS-422
- Impedance: 50-Ohm

**Part Numbers**
- 5096 (32x64)
- 5263 (16x64)

**Application**
The C-band non-blocking fan-out solid state switch model is ideal for SATCOM applications with a narrow band operating frequency of 3.4-4.2 GHz. It can be configured to maximum 16 inputs and 64 outputs and is a fully integrated 19" rack 34U modular system using (8) sub-modules (32x64):
- 1x Controller module (3U)
- 2x 16x64 Input modules (3U ea.)
- 4x 32x16 Output modules (6U ea.)
- 1x Fan Control module (1U)

The system is fully controlled through the Controller module, which is equipped with a MS Windows based PC, removable SATA hard drive and multiple power supplies. Locally it can be controlled via an LCD touch screen and remotely with RS-422.

On the rear panel, the Input and the Output Modules are interconnected using 9-pin CAN bus D-sub connectors to create a full 16x64 or 32x64 matrix.

The system is engineered for AS9100/ISO-9001: 2008 certification.

**Specifications**
- CPU/ Memory: Embedded Intel processor / 2G RAM (min)
- I/O Connector Type: SMA female
- Dimensions (max): 19" wide full rack 21" Depth 34U Height (59.5")
- Operating Temperature: -40 °C to +50 °C
- Storage Temperature: 50 W / 5 V, redundant power supplies
- Power Supply: 120-240 VAC, 50-60 Hz, 3-6 A, 350 W / 12V
- Cooling / Venting: 1x1U Fan Module

Dow-Key SCPI commands
- RS-422 with DB9 male

**RF Characteristics (5096 & 5263)**
- VSWR (max) 1.3:1 input & output
- Isolation (min) 60 dB input/input
- Gain, any path -14 dB ± 2 dB @ 3.8 GHz, 20°C
- Gain, bal. b/tw. ch. (max) ± 1.5 dB @ 3.8 GHz, 20°C
- Gain Stability ± 0.2 dB over 5°C
- Gain, variation vs. freq. ± 0.5 dB over any 80 MHz segment ± 0.5 dB over any 80 MHz segment ± 1.5 dB over 3.4-4.2 GHz segment
- 1dB Compression (min) -5 dBm output
- 3rd Order Intercept (min) +4 dBm output
- Noise Figure (max) 17 dB
- Spurious Outputs (max) -100 dBm signal dependent
- -70 dBc signal related

5096 | C-band Non-Blocking Fan-Out 5263 | C-band Non-Blocking Fan-Out

5190/5191 | L-band Fan-In/Fan-Out

**Features**
- Input/Output ports: 12x48 Transmitter & 48x12 Receiver
- Configuration: 12x48 Non-blocking Full Fan-Out 48x12 Non-blocking Full Fan-In
- Operating Frequency: 950-2050 MHz (L-band)
- Manual Control: LCD Touch Screen
- Remote Control: RS-422
- Impedance: 50-Ohm

**Part Numbers**
- 5190 (Receiver)
- 5191 (Transmitter)

**Application**
The L-band non-blocking fan-out transmitter and fan-in receiver model is ideal for Teleport SATCOM applications with a narrow band operating frequency of 950-2050 MHz. The transmitter 19" rack is configured with 12 inputs and 48 outputs and the second 19" rack is the receiver tower with 48 inputs and 12 outputs.

Each rack is integrated using modular approach consisting for the following sub-modules:
- 5190/5191: Both Receiver and Transmitter
- Power supply module, Signal monitor panel and Fiber optic receiver
- 5190: Receiver Only (48x12)
- 4x 12x12 fan-in module, Main controller and L-Band amplifiers
- 5191: Transmitter Only (12x48)
- 4x 12x12 fan-out module and Slave controller

**Specifications**
- CPU/ Memory: Embedded Intel processor / 2G RAM (min)
- I/O Connector Type: SMA female
- Dimensions (max): 19" wide full rack 21" Depth 34U Height (59.5")
- Operating Temperature: -40 °C to +50 °C
- Storage Temperature: 50 W / 5 V, redundant power supplies
- Power Supply: 120-240 VAC, 50-60 Hz, 3-6 A, 350 W / 12V
- Cooling / Venting: As needed within each module

Dow-Key SCPI commands
- RS-422 with DB9 male

**RF Characteristics (5190 & 5191)**
- VSWR (max) 1.8:1 input & output
- Isolation (min) 55 dB input/input
- Gain, any path 0 dB ± 2.5 dB
- Gain, Operating (max) +12 dBm routed to 1 output (fan-in)
- Power, no damage (max) +15 dBm routed to 1 output (fan-in)
- 1dB Compression (min) +10 dBm output
- 3rd Order Intercept (min) +21 dBm output
- Noise Figure (max) 17 dB (12x48) 21 dB (48x12)

5190 (Receiver) 5191 (Transmitter)

Integrated Systems

5096  5263  5190  5191

4-2

Dow-Key Microwave • www.dowkey.com • 800.266.3695

AS9100/ISO-9001: 2008 Certified

4-3
The L-band non-blocking fan-out/fan-in solid state switch model is a compact 4x48 and 48x4 switch matrix solution integrated with a modular approach using (7) sub-modules:

- 3x 16x4 Fan-in modules (1U ea.)
- 1x Controller module (3U)
- 3x 4x16 Fan-out modules (1U ea.)

The system is fully controlled through the Controller module, which is equipped with a MS Windows based PC and two removable and replaceable power supplies cartridges. Locally it can be controlled from an LCD touch screen and remotely via Ethernet with SNMP v1 protocol.

On the rear panel, the fan-in and the fan-out modules are interconnected using RJ11 CAN bus connectors to create a full 4x48 and 48x4 matrix. (The 8x2 switch resides inside the control module)

### Specifications

<table>
<thead>
<tr>
<th>Relay Type</th>
<th>Solid State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Components</td>
<td>Amplifiers, Power Dividers &amp; Power Combiners</td>
</tr>
<tr>
<td>I/O Connector Type</td>
<td>SMA female</td>
</tr>
<tr>
<td>Dimensions (max)</td>
<td>19” Wide 21” Depth 9U Height (15.75”)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 °C to +40 °C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40 °C to +40 °C</td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>10-80% non-condensing</td>
</tr>
<tr>
<td>Local Control</td>
<td>6.5” LCD Touch Screen GUI</td>
</tr>
<tr>
<td>USB port for keyboard or mouse</td>
<td></td>
</tr>
<tr>
<td>Remote Control</td>
<td>Ethernet with SNMP v1 protocol</td>
</tr>
<tr>
<td>2x RJ-45 connectors available</td>
<td></td>
</tr>
<tr>
<td>Operating System</td>
<td>Microsoft Windows</td>
</tr>
<tr>
<td>Hard drive</td>
<td>160 GB (min) SATA HD / removable</td>
</tr>
<tr>
<td>CPU/ Memory</td>
<td>Embedded Intel processor / 2G RAM (min)</td>
</tr>
<tr>
<td>Power Supply</td>
<td>120-240 VAC, 50-60 Hz, 2x 300 W (max)</td>
</tr>
<tr>
<td>2x power module cartridges, Power ON/OFF switch with guard on the front panel</td>
<td></td>
</tr>
<tr>
<td>Fuse</td>
<td>Accessible/replaceable on the rear</td>
</tr>
</tbody>
</table>

### RF Characteristics (4x48 & 48x4)

<table>
<thead>
<tr>
<th>Application</th>
<th>Integrated Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF Characteristics (4x48 &amp; 48x4)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSWR (max)</td>
<td>1.8:1 input &amp; output</td>
</tr>
<tr>
<td>Isolation (min)</td>
<td>60 dB input/input</td>
</tr>
<tr>
<td>Gain</td>
<td>+2 dB ± 2 dB</td>
</tr>
<tr>
<td>Power Operating (max)</td>
<td>+3 dBm routed to 1 output (fan-in)</td>
</tr>
<tr>
<td>1dB Compression (min)</td>
<td>1 dBm (fan-in) 8 dBm (fan-out)</td>
</tr>
<tr>
<td>3rd Order Intercept (min)</td>
<td>+17 dBm (fan-in), -9 dBm input power +24 dBm (fan-out), +6 dBm input power</td>
</tr>
<tr>
<td>Noise Figure (max)</td>
<td>20 dB (fan-in) 18 dB (fan-out)</td>
</tr>
</tbody>
</table>

### Features

- **Input/Output Configuration**: 4x48 Non-Blocking Full Fan-Out, 48x4 Non-Blocking Full Fan-In, 8x2 Electromechanical Matrix (1)
- **Operating Frequency**: 950-2050 MHz (L-band)
- **Manual Control**: LCD Touch Screen
- **Remote Control**: 2x Ethernet ports, SNMP
- **Impedance**: 50-Ohm

### Part Number

5230

(1) not discussed on this data sheet
The Tables are to guide on how to determine the enclosure height for the MS-Series.

Depending on switch type, number of input & output ports and connector type, the number of switches that can be mounted on the rear panel or inside an enclosure varies.

### SMA, NON-TERMINATED (NT), TERMINATED (T), MOUNTED ON THE REAR PANEL, 1-8 SWITCHES

<table>
<thead>
<tr>
<th></th>
<th>SPDT(1)</th>
<th>DPDT</th>
<th>SP3T</th>
<th>SP4T</th>
<th>SP6T</th>
<th>SP8T</th>
<th>SP10T</th>
<th>SP12T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1RU</td>
<td>5NT, 5T</td>
<td></td>
<td>5NT</td>
<td></td>
<td>5NT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2RU</td>
<td>4NT, 4T</td>
<td>4NT, 4T</td>
<td>4NT, 4T</td>
<td>4NT, 4T</td>
<td>4NT, 4T</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3RU</td>
<td>4NT, 4T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4RU</td>
<td>8NT, 8T</td>
<td>8NT, 8T</td>
<td>8NT, 8T</td>
<td>8NT, 8T</td>
<td>8NT, 8T</td>
<td>8NT, 8T</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) For SPDT one port on the DPDT switch is externally terminated to 2W 50-ohm load.

### SMA, NON-TERMINATED (NT), TERMINATED (T), MOUNTED INSIDE THE MATRIX, 9-35 SWITCHES

<table>
<thead>
<tr>
<th></th>
<th>DPDT</th>
<th>SP3T</th>
<th>SP4T</th>
<th>SP6T</th>
<th>SP8T</th>
<th>SP10T</th>
<th>SP12T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1RU</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2RU</td>
<td>15NT</td>
<td>15NT, 15T</td>
<td>14NT, 14T</td>
<td>10NT, 10T</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3RU</td>
<td>18NT</td>
<td>27NT, 27T</td>
<td>21NT, 21T</td>
<td>15NT, 15T</td>
<td>12NT, 12T</td>
<td>9NT</td>
<td></td>
</tr>
<tr>
<td>4RU</td>
<td>24NT</td>
<td>35NT, 35T</td>
<td>28NT, 28T</td>
<td>20NT, 20T</td>
<td>16NT, 16T</td>
<td>13NT</td>
<td>11NT, 11T</td>
</tr>
</tbody>
</table>

### N, NON-TERMINATED (NT), TERMINATED (T), MOUNTED INSIDE THE MATRIX, 2-16 SWITCHES

<table>
<thead>
<tr>
<th></th>
<th>DPDT</th>
<th>SP3T</th>
<th>SP4T</th>
<th>SP6T</th>
<th>SP8T</th>
<th>SP10T</th>
<th>SP12T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1RU</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2RU</td>
<td>8NT</td>
<td></td>
<td></td>
<td>3NT</td>
<td>2NT, 2T</td>
<td>2NT</td>
<td></td>
</tr>
<tr>
<td>3RU</td>
<td>12NT</td>
<td></td>
<td></td>
<td>5NT, 5T</td>
<td>4NT, 4T</td>
<td>3NT</td>
<td>2NT, 2T</td>
</tr>
<tr>
<td>4RU</td>
<td>16NT</td>
<td></td>
<td></td>
<td>6NT, 6T</td>
<td>5NT, 5T</td>
<td>4NT</td>
<td>3NT, 3T</td>
</tr>
</tbody>
</table>

For TNC and BNC connectors contact Dow-Key.

---

DC-18 GHZ TERMINATED SWITCHES WITH SMA-TYPE CONNECTORS

### THE RF PERFORMANCE

FOR ≤1x56 IS SLIGHTLY BETTER.

<table>
<thead>
<tr>
<th>Frequency (GHz)</th>
<th>VSWR Max.</th>
<th>Isolation Min. (dB)</th>
<th>Insertion Loss Max. (dB)</th>
<th>CW Power Max. (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC-4</td>
<td>1.30</td>
<td>70</td>
<td>1.0</td>
<td>100</td>
</tr>
<tr>
<td>4-8</td>
<td>1.35</td>
<td>65</td>
<td>1.5</td>
<td>70</td>
</tr>
<tr>
<td>8-12.4</td>
<td>1.50</td>
<td>60</td>
<td>1.5</td>
<td>60</td>
</tr>
<tr>
<td>12.4-18</td>
<td>1.80</td>
<td>55</td>
<td>2.0</td>
<td>50</td>
</tr>
</tbody>
</table>

### VARIOUS SWITCH COMBINATIONS MOUNTED ON THE REAR

<table>
<thead>
<tr>
<th>Frequency (GHz)</th>
<th>VSWR Max.</th>
<th>Isolation Min. (dB)</th>
<th>Insertion Loss Max. (dB)</th>
<th>CW Power Max. (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC-4</td>
<td>1.30</td>
<td>70</td>
<td>2.0</td>
<td>100</td>
</tr>
<tr>
<td>4-8</td>
<td>1.45</td>
<td>65</td>
<td>3.5</td>
<td>70</td>
</tr>
<tr>
<td>8-12.4</td>
<td>1.60</td>
<td>60</td>
<td>4.5</td>
<td>60</td>
</tr>
<tr>
<td>12.4-18</td>
<td>2.00</td>
<td>55</td>
<td>5.5</td>
<td>50</td>
</tr>
</tbody>
</table>

### DC-18 GHZ SWITCHES WITH N-TYPE CONNECTORS

#### SP10 & SP12T SWITCHES MOUNTED INSIDE THE ENCLOSURE

<table>
<thead>
<tr>
<th>Frequency (GHz)</th>
<th>VSWR Max.</th>
<th>Isolation Min. (dB)</th>
<th>Insertion Loss Max. (dB)</th>
<th>CW Power Max. (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC-4</td>
<td>1.40</td>
<td>70</td>
<td>2.5</td>
<td>100</td>
</tr>
<tr>
<td>4-8</td>
<td>1.60</td>
<td>65</td>
<td>4.0</td>
<td>70</td>
</tr>
<tr>
<td>8-12.4</td>
<td>1.80</td>
<td>60</td>
<td>5.0</td>
<td>60</td>
</tr>
<tr>
<td>12.4-18</td>
<td>2.10</td>
<td>55</td>
<td>6.5</td>
<td>50</td>
</tr>
</tbody>
</table>

We reserve the right to alter, amend or replace any specifications at our sole discretion and without prior notice.
Appendix C

MS-SERIES: Example of Individual Switches

4x SP4T NON-TERMINATED SWITCH

4x SP8T TERMINATED SWITCH

1x DPDT SWITCH

Connection example:
To connect Input 2 to Output 3 close switch 2 to position 3 and switch 13 to position 2.

CB-SERIES: Example of Crossbar Switch Configurations

6X8 NON-TERMINATED SWITCH

MP-SERIES: Example of 1xN Switch Configurations

1x16 NON-TERMINATED SWITCH

1x100 NON-TERMINATED SWITCH

1x20 NON-TERMINATED SWITCH
MOUNTED ON THE REAR (OUTSIDE THE ENCLOSURE)

4X4 NON-TERMINATED SWITCH

Now, Ports 9 and 10 on Input switches are not connected. Ports 7, 8, 9, and 10 on output switches are not connected.

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We reserve the right to alter, amend or replace any specifications at our sole discretion and without prior notice.
Appendix C

Switch Schematics

MODEL 4141: 2X32 Switch Configuration

7001 Switch Configuration

7002 Switch Configuration

We reserve the right to alter, amend or replace any specifications at our sole discretion and without prior notice.