16-Channel High-Power, General-Purpose Relay Switch

**NI 2565**
- 16 independent SPST relays
- Nonlatching relays
- Switch capacity per channel
  - 7 A at 250 V<sub>rms</sub>
  - 5 A at 30 VDC
- 1024 step scanlist for deterministic scanning
- Instrument synchronization made easy with hardware triggers
- Fully software programmable
- Operating speed of 5 cycles/s

**Application Software**
- NI LabVIEW
- NI Measurement Studio
- Visual C/C++
- Visual Basic

**Applications**
- Device activation
- High-current switching of DC power supplies
- Automated general purpose test system

**Driver Software**
- IVI-Compliant NI-SWITCH driver software for Windows 2000/NT/Me/9x*

**Overview**
The NI 2565, a 16-channel general-purpose relay switch module for PXI/CompactPCI, delivers high-current switching of DC power supplies, AC line power, and AC/DC current sources. The module has 16 independent Form A, nonlatching socketed relays, which can be replaced in the field, with the relay replacement kit. The module switches up to 5 A at 30 VDC and 7 A at 250 VAC. You have full control of the module with the IVI-compliant NI-SWITCH driver.

**Relay Channel Type**
The NI 2565 has 16 independent SPST (Form A) relays. The relays are nonlatching so that they open on power-down. Each relay provides two connections to the front connector - Normally Open Channel (CHx) and Common (COMx).

You can open or close each relay without affecting the other relays, or all relays can change state at the same time. Each relay is isolated with basic safety insulation between relay channels and reinforced safety insulation between any relay channel and any accessible low-voltage areas. The NI 2565 has a working common-mode voltage of 250 V<sub>rms</sub> or 250 VDC. The relay contacts have no access to the backplane of the PXI/CompactPCI chassis, so the backplane is well protected from high voltages present at the contacts.

**Applications**
The NI 2565 is well suited for general-purpose signal switching or device activation. For example, you can use to control external devices such as motors, lamps, or heaters.

**Relay Control and Scanning**
The NI 2565 uses the PXI backplane triggers to synchronize switch scanning with measurement devices such as a National Instruments NI 4060 DMM. The PXI backplane removes need for any external trigger cables.

The NI 2565 has a flexible scan-list architecture to reduce overall data acquisition and test time. Scans can be controlled through hardware or software timing. For hardware-timed applications, a scan-list of up 1,024 configuration steps can be downloaded directly into the memory of the card to deliver the fastest scan possible with no controller intervention. You can configure the module to process the scan list once or to continuously loop through the scan list. Commands in the scan list can open or close relays, wait for an External Trigger, and generate a Scanner Advanced trigger.

<table>
<thead>
<tr>
<th>Module</th>
<th>Bus</th>
<th>Function</th>
<th>Description</th>
<th>Switching Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI 2565</td>
<td>PXI/CompactPCI</td>
<td>General purpose</td>
<td>16-channel, SPST mechanical relay</td>
<td>7 A at 250 V&lt;sub&gt;rms&lt;/sub&gt;, 5 A at 30 VDC</td>
</tr>
</tbody>
</table>

Table 1. NI 2565 Switch Specifications (see page 381 for detailed specifications)
The External Trigger is sourced by an instrument, such as an NI 5411 arbitrary waveform generator, and causes the PXI switch module to advance to the next entry in the scan list. The Scanner Advanced trigger indicates when the module has closed all specified relays and the relays have settled. The Scanner Advanced trigger is typically connected to a measurement device, such as the NI 4060 DMM, which is configured to take a reading upon receiving the trigger. You can configure the NI 2565 to route the Scanner Advanced trigger to any PXI TTL trigger line or to the PXI star trigger.

**Signal Connections**

Two 16-pin screw terminal kits are shipped with the NI 2565 module. The 16-pin screw terminal kit includes a 16-pin screw terminal plug, a protective cable housing with strain relief, and a label for the housing. The two screw terminal plugs connect to the NI 2565 front connector.

**Software**

All National Instruments switch modules are shipped with NI-SWITCH software, an IVI-compliant driver that exports the complete switch functionality through an easy-to-use application programming interface. You should use this driver will all NI PXI and SCXI switch modules. NI-SWITCH works with National Instruments LabVIEW and Measurement Studio, as well as Microsoft Visual Basic and Visual C/C++.

**Ordering Information**

NI 2565 .................................................................777754-01
Includes switch module, NI-SWITCH driver software, and two 16-pin screw terminal plug kits.

For information on extended warranty and value added services, see page 22.

See page 372 for accessory and cable information.

Figure 1. The IVI-compliant NI-SWITCH driver software features a set of operations and attributes that exercise all the functionality of the switching hardware.
Specifications

**SCXI-1160, SCXI-1161**
Typical for 25 °C unless otherwise stated.

### Digital Relays

**Number of Relays**

<table>
<thead>
<tr>
<th>Module</th>
<th>16</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCXI-1160</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCXI-1161</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Relay type**

<table>
<thead>
<tr>
<th>Module</th>
<th>SPDT (Form C), latching</th>
<th>SPDT (Form C), non-latching</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCXI-1160</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCXI-1161</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Maximum input voltage**

<table>
<thead>
<tr>
<th>Module</th>
<th>Channel to Channel</th>
<th>Channel to Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCXI-1160</td>
<td>250 Vrms</td>
<td>250 Vrms</td>
</tr>
<tr>
<td>SCXI-1161</td>
<td>250 Vrms</td>
<td>250 Vrms</td>
</tr>
</tbody>
</table>

**Maximum switching voltage**

<table>
<thead>
<tr>
<th>Module</th>
<th>Channel to Channel</th>
<th>Channel to Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCXI-1160</td>
<td>250 Vrms</td>
<td>250 VDC</td>
</tr>
<tr>
<td>SCXI-1161</td>
<td>250 Vrms</td>
<td>250 VDC</td>
</tr>
</tbody>
</table>

**Maximum switching capacity**

<table>
<thead>
<tr>
<th>Module</th>
<th>Channel to Channel</th>
<th>Channel to Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCXI-1160</td>
<td>2 A at 250 Vrms</td>
<td>2 A at 30 VDC</td>
</tr>
<tr>
<td>SCXI-1161</td>
<td>5 A at 125 Vrms</td>
<td>5 A at 30 VDC</td>
</tr>
</tbody>
</table>

**On resistance**

<table>
<thead>
<tr>
<th>Module</th>
<th>SCXI-1160 (includes terminal block)</th>
<th>SCXI-1161</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>75 mΩ (initially)</td>
<td>175 mΩ (initially)</td>
</tr>
</tbody>
</table>

**Contact material**

<table>
<thead>
<tr>
<th>Module</th>
<th>SCXI-1160</th>
<th>SCXI-1161</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gold-clad silver alloy</td>
<td>Silver alloy</td>
</tr>
</tbody>
</table>

**Expected life**

<table>
<thead>
<tr>
<th>Module</th>
<th>Mechanical</th>
<th>Electrical</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCXI-1160</td>
<td>10^7 operations</td>
<td>10^7 operations at 2 A, 250 Vrms</td>
</tr>
<tr>
<td>SCXI-1161</td>
<td>2 x 10^6 operations at 2 A, 30 VDC</td>
<td>10^7 operations at 2 A, 250 Vrms</td>
</tr>
</tbody>
</table>

**Thermal offset**

<table>
<thead>
<tr>
<th>Module</th>
<th>SCXI-1160</th>
<th>SCXI-1161</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 μV</td>
<td></td>
</tr>
</tbody>
</table>

**Maximum operating speed**

<table>
<thead>
<tr>
<th>Module</th>
<th>Maximum Load</th>
<th>No Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCXI-1160</td>
<td>20 cycles/minute</td>
<td>50 cycles/s</td>
</tr>
<tr>
<td>SCXI-1161</td>
<td>20 cycles/minute</td>
<td>3 cycles/s</td>
</tr>
</tbody>
</table>

**Relay operating times**

<table>
<thead>
<tr>
<th>Module</th>
<th>Set Time</th>
<th>Reset Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCXI-1160</td>
<td>10 ms</td>
<td>10 ms</td>
</tr>
<tr>
<td>SCXI-1161</td>
<td>15 ms</td>
<td>15 ms</td>
</tr>
</tbody>
</table>

**Physical**

**Dimensions**

3.0 by 17.2 by 20.3 cm
(1.2 by 6.8 by 8.0 in.)

**Environment**

Operating temperature: 0 to 50 °C
Storage temperature: -20 to 70 °C
Relative humidity: 5 to 90% noncondensing

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Specifications

**NI 2565**
Typical for 25 °C unless otherwise stated.

### Input Characteristics

- **Number of relays**: 16 SPST
- **Common-mode voltage**
  - Channel-to-Channel: 250 Vrms, 250 VDC
  - Channel-to-Earth: 250 Vrms, 250 VDC
- **Maximum switching voltage**
  - AC: 250 Vrms
  - DC: 125 VDC
- **Maximum switching capacity**
  - 30 VDC (resistive load): 5 A
  - 250 VAC (resistive load): 7 A
  - Maximum switching power per channel: 1750 VA, 150 W
- **Expected life**
  - Mechanical at 180 cpm: 5 x 10^7 operations
  - Electrical at maximum switching capacity: 10^5 operations (exceeding maximum switching capacity decreases electrical life)

### PXI Bus Interface

**Slave**

### PXI Trigger Bus

- **Trigger lines**: 8
- **Star trigger**: 1

### Power Requirement

- **+5 VDC**: 350 mA (all relays open)
  - 1.4 A (all relays closed)

### Physical

- **Dimensions**: 10 x 16 cm (3.9 x 6.3 in.)
- **I/O connector**: Two 16x1 minicombicon connectors
- **I/O mating connector**: 16x2 minicombicon header

### Environment

- **Operating temperature**: 0 to 50 °C
- **Storage temperature**: -20 to 70 °C
- **Relative humidity**: 5% to 85% noncondensing

### Shock and Vibration

- **Functional shock**: MIL-T-28800E Class3
- **Random vibration**: MIL-T-28800E, MIL-STD-810E Category 1
- **Operational**: 5 to 500 Hz, 0.3 g rms
- **Nonoperational**: 5 to 500 Hz, 2.4 g rms