

32-Channel Solid-State Relays

NI SCXI-1163R

- 32 optically isolated solid-state relays
- Relays arranged in 8 banks of 4x1 multiplexers
- 750 operations/s
- 200 mA at 240 VDC/ V_{rms} capacity
- Fully software programmable

Operating Systems

- Windows 2000/NT/XP

Recommended Software

- LabVIEW
- LabVIEW Real-Time Module
- LabWindows/CVI
- Measurement Studio
- NI Switch Executive

Other Compatible Software

- Visual Basic
- C/C++

Driver Software (included)

- NI-SWITCH

Certifications and Compliance

- UL
- CE



Overview

The National Instruments SCXI-1163R includes 32 normally open, or Form A, optically isolated solid-state relays, arranged in eight banks of four relays with one common pole for each bank. You can use the NI SCXI-1163R to switch high-voltage loads, up to 240 VAC/VDC and up to 200 mA.

The SCXI-1163R is programmed serially over the SCXibus. You can therefore easily integrate SCXI-1163R modules into existing SCXI systems without additional DAQ devices or cabling. The modules can also operate in parallel mode when cabled directly to a plug-in DIO device.

You can use an SCXI system equipped with the SCXI-1163R in a variety of industrial and laboratory applications. The SCXI-1163R safely isolates the computer from large common-mode voltages, ground loops, and voltage spikes that often occur in industrial and research environments. You can use the solid-state relay channels to switch a wide range of AC and DC voltage and power signals to control field devices.

Extended Features and Specifications

National Instruments switch modules are built with a number of core features that are covered in detail in the Switch Overview section.

For additional information about the SCXI-1163R, including software support, certifications and compliance, relay control, etc., please see page 20. For detailed specifications, please see page 505.

Ordering Information

NI SCXI-1163R	776572-63R
Includes switch module and NI-SWITCH driver software.	
Accessories	
SCXI-1326 terminal block	777687-26
PXI-4021 switch controller	778278-01
PCI-4021 switch controller	778277-01

For information on extended warranty and value added services, see page 20.

See page 499 for accessory and cable information.

BUY ONLINE!

Visit ni.com/products and enter `scxi1163r`.

Switch Specifications

Specifications (continued)

SCXI-1191, PXI-2591

Input Characteristics

Number of channels per bank	4
Number of banks	4
SCXI-1191	4
PXI-2591	1
Input voltage	
Channel-to-ground	30 V _{rms} /VDC
Maximum switching voltage	
AC	30 V _{rms}
DC	30 VDC
Maximum switching capacity per channel	
AC	0.33 A at 30 V _{rms}
DC	0.33 A at 30 VDC
Maximum switching power per channel	10 W
Contact on resistance (initial)	200 mΩ maximum
Contact material	Gold

RF Performance Characteristics

Characteristic impedance (Z ₀)	50 Ω
Insertion loss	
2.5 GHz	<0.6 dB
4 GHz	<0.9 dB
VSWR	
2.5 GHz	<1.3
4 GHz	<1.5
Isolation	
2.5 GHz	>60 dB
4 GHz	>55 dB
Maximum RF carry power at 900 MHz	10 W

Dynamic Characteristics

Relay operate time (at 20 °C)	
Typical	15 ms
Relay release time (at 20 °C)	
Typical	15 ms
Expected life	
Mechanical (no load)	5x10 ⁶ operations
Electrical (maximum switching capacity) ..	10 ⁹ operations

Caution: Exceeding the maximum switching capability decreases expected life.

Power Requirement

+5 VDC	950 mW maximum (all relays closed)
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Physical

Dimensions	
SCXI-1191	17.3 by 19.6 by 3.0 cm (6.81 by 7.70 by 1.19 in.)
PXI-2591	10 by 16 by 4 cm (3.9 by 6.3 by 1.6 in.)
I/O connector	5 SMA female per bank

Environment

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

SCXI-1192

Input Characteristics

Number of relays	8 SPDT (latching)
Input voltage	
Channel-to-ground	30 V _{rms} /VDC
Maximum switching voltage	30 VDC
Maximum carry current per channel	2 ADC
Maximum continuous carry power per channel	
1 to 3 GHz	120 W
3 to 8 GHz	80 W
8 to 12.4 GHz	60 W
12.4 to 18 GHz	50 W

The total input power for all relays combined should not exceed the preceding specifications. When using multiple relays, refer to table below for adjusted maximum input power

Active Relays	1 to 3 GHz	3 to 8 GHz	8 to 12.4 GHz	12.4 to 18 GHz
1	120 W	80 W	60 W	50 W
2	60 W	40 W	30 W	25 W
4	30 W	20 W	15 W	12.5 W
8	15 W	10 W	7.5 W	6.25 W

Contact resistance (initial)	100 mΩ maximum
Contact material	Gold plate

RF Performance Characteristics

Characteristic impedance (Z ₀)	50 Ω
Insertion loss at:	
≤4 GHz	≤0.2 dB
4 to 8 GHz	≤0.3 dB
8 to 12.4 GHz	≤0.4 dB
12.4 GHz to 18 GHz	≤0.5 dB
VSWR at:	
≤1 GHz	≤1.1
1 to 4 GHz	≤1.15
4 to 8 GHz	≤1.25
8 to 12.4 GHz	≤1.35
12.4 to 18 GHz	≤1.5

Isolation:	
≤1 GHz	≥85 dB
1 to 4 GHz	≥80 dB
4 to 8 GHz	≥70 dB
8 to 12.4 GHz	≥65 dB
12.4 to 18 GHz	≥60 dB

Dynamic Characteristics

Relay operate time (at 20 °C)	
Typical	15 ms
Relay release time (at 20 °C)	
Typical	15 ms
Expected life	
Mechanical (no load)	5x10 ⁶ operations
Electrical at 5 W	5x10 ⁶ operations (to 3 GHz, 50 Ω, VSWR maximum 1.2)

Caution: Exceeding these electrical parameters decreases expected life.

Power Requirement

+5 VDC	800 mA, maximum
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Physical

Dimensions	17.3 by 19.6 by 3.0 cm (6.81 by 7.70 by 1.19 in.)
I/O connector	24 SMA female

Environment

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

SCXI-1163R

Input Characteristics

Number of relays	32 organized as 8 optically isolated banks of 4 relays each
Relay type	Normally open (Form A), solid-state relays
Maximum switching voltage	
AC	240 VAC
DC	240 VDC
Maximum switching capacity	200 mA
Commonmode isolation	250 V _{rms} between banks, and bank to ground
On-resistance	8 Ω
Output capacitance	110 pF at 50 V, 1 MHz
Leakage current	1 μA maximum
Transfer rate in serial mode ¹	
(1 word = 32 bits)	750 words/s
Relay set time	0.6 ms
Relay reset time	0.1 ms
Power-on state	Relays open

Switch Specifications

Specifications (continued)

Physical

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

Environment

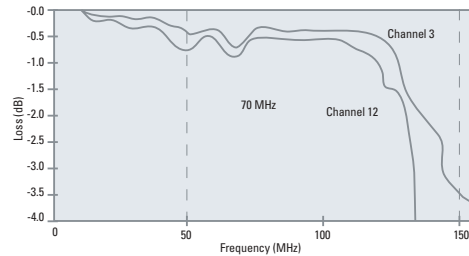
Operating temperature 0 to 50 °C
 Storage temperature -20 to 70 °C
 Relative humidity 5 to 90% noncondensing

¹Transfer rate depends largely on the computer and software. These tests were made using an AT-MIO-16E-2 installed in a 450 MHz Pentium III computer running LabVIEW and Windows NT.

PXI-2566, SCXI-1166

Input Characteristics

Maximum switching voltage
 Channel-to-channel 150 VDC, 125 VAC, CAT I
 Channel-to-ground 150 VDC, 125 VAC, CAT I
 Simultaneous channels at maximum switching current (≤ 25 °C)
 PXI-2566 16
 SCXI-1166 32
 Maximum carry current 5 ADC, 5 AAC (per channel)
 Simultaneous channels at maximum carry current (≤ 25 °C)
 PXI-2566 9
 SCXI-1166 8
 Maximum switching power 60 W, 62.5 VA (DC to 60 Hz) (per channel)
 DC path resistance
 Initial $< 1.0 \Omega$
 End of life $\geq 1.0 \Omega$
 Thermal EMF $< 9 \mu\text{V}$ (typical at 23 °C)
 Minimum switching capacity 10 μA at 10 mVDC
 Bandwidth (-3 dB) ≥ 70 MHz



Crosstalk (Typical at 23 °C)

Channel-to-channel
 10 kHz ≤ -75 dB
 100 kHz ≤ -65 dB
 1 MHz ≤ -45 dB
 10 MHz ≤ -25 dB

Isolation (Typical at 23 °C)

Open channel
 100 kHz ≥ 65 dB
 1 MHz ≥ 45 dB
 10 MHz ≥ 25 dB

Dynamic Characteristics

Maximum speed 115 operations/s
 Relay operate time
 Typical 2 ms
 Maximum 4.4 ms
 Expected relay life
 Mechanical 10^9 operations
 Electrical
 30 VDC, 1 A resistive 5×10^5 operations
 30 VDC, 2 A resistive 10^5 operations
 125 VAC, 0.2 A resistive 3×10^5 operations
 125 VAC, 0.5 A resistive 10^5 operations

Physical Characteristics

Relay type Electromechanical, nonlatching
 Relay contact material Gold clad silver alloy
 I/O connectors Two 62-pin D-Sub
 Dimensions
 PXI-2566 10 by 16 cm (3.9 by 6.3 in.)
 SCXI-1166 3.0 by 17.3 by 19.6 cm (1.2 by 6.7 by 7.6 in.)

Environment

Operating temperature 0 to 50 °C
 Storage temperature -20 to 70 °C
 Relative humidity 5 to 85% noncondensing
 Pollution degree 2
 Approved at altitudes up to 2,000 m

Safety

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control and laboratory use:

IEC 61010-1, EN 61010-1
 UL 3111-1, UL 61010B-1
 CAN/CSA C22.2 No. 1010.1

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE Marking, as follows:

Low-Voltage Directive (safety) 73/23/EEC
 Electromagnetic Compatibility
 Directive (EMC) 89/336/EEC

SCXI-1160, SCXI-1161

Input Characteristics

Number of relays
 SCXI-1160 16
 SCXI-1161 8
 Relay type
 SCXI-1160 SPDT (Form C), latching
 SCXI-1161 SPDT (Form C), nonlatching
 Maximum input voltage
 Channel-to-channel 250 VDC, 250 V_{rms}
 Channel-to-ground 250 VDC, 250 V_{rms}
 Maximum switching voltage
 SCXI-1160 250 VDC, 250 V_{rms}
 SCXI-1161 250 VDC, 250 V_{rms}
 Maximum switching capacity
 SCXI-1160 2 A at 250 V_{rms} , 0.6 A at 48 VDC, 2 A at 30 VDC
 SCXI-1161 8 A at 125 V_{rms} , 6 A at 250 V_{rms} , 5 A at 30 VDC
 Minimum current load
 SCXI-1160 100 μA
 SCXI-1161 100 mA
 Channel on resistance
 SCXI-1160 (includes terminal block) 75 $\text{m}\Omega$ (initially)
 SCXI-1161 175 $\text{m}\Omega$ (initially)
 Contact material
 SCXI-1160 Gold-clad silver alloy
 SCXI-1161 Silver alloy
 Thermal offset
 SCXI-1160 3 μV

Dynamic Characteristics

Relay operate time
 SCXI-1160 10 ms
 SCXI-1161 15 ms
 Relay release time
 SCXI-1160 10 ms
 SCXI-1161 15 ms
 Maximum switching rate
 SCXI-1160 50 operations/s
 SCXI-1161 3 operations/s