1.3 GHz and 4 GHz Multiplexers

NI SCXI-1190, NI PXI-2590, NI SCXI-1191, NI PXI-2591

- 4x1 unterminated multiplexer
- 50 characteristic impedance
- High-bandwidth electromechanical relays
- Excellent insertion loss, VSWR, and isolation specifications
- Fully software programmable

SCXI-1190 (quad 4x1), PXI-2590 (single 4x1)

- 1.3 GHz bandwidth
- SMB direct connectivity
- 1 A at 24 VDC capacity

SCXI-1191 (quad 4x1), PXI-2591 (single 4x1)

- 4 GHz bandwidth
- SMA direct connectivity
- 330 mA at 30 VDC capacity

Operating Systems

- Windows 2000/NT/XP

Recommended Software

- LabVIEW
- LabVIEW Real-Time Module (PXI Modules only)
- LabWindows/CVI
- Measurement Studio
- NI Switch Executive

Other Compatible Software

- Visual Basic
- C/C++

Driver Software (included)

- NI-SWITCH

Compliance

- CE

Overview

The National Instruments PXI-2590 and PXI-2591 are 4x1 high-frequency unterminated multiplexing switches. The NI SCXI-1190 and NI SCXI-1191 perform the same functions as the PXI-2590 and PXI-2591 but also offer a quad 4x1 multiplexing configuration. The switches are capable of switching signals from DC to 1.3 GHz (SCXI-1190 and PXI-2590) and DC to 4 GHz (SCXI-1191 and PXI-2591). The characteristic impedance of the channels is 50 .

For the SCXI-1190 and the PXI-2590, the maximum voltage rating of the switches is 24 V_{rms} with a maximum current of 1 A. For the SCXI-1191 and the PXI-2591, the maximum voltage rating is 30 V_{rms} with a maximum current of 330 mA. All are well suited for applications that require the routing of high-frequency signals inside automated test equipment (ATE) systems because they can switch signals with a very low insertion loss. In addition, the excellent voltage standing-wave ratio (VSWR) and isolation parameters make these modules the perfect choice in a system geared to high-frequency applications as shown in Table 1.

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 PXI-2590, PXI-2591, SCXI-1190, and SCXI-1191, including software, certifications and compliance, relay control, etc., please see page 20. For detailed specifications, please see page 504.

Ordering Information

NI SCXI-1190 776572-90
NI PXI-2590 777987-01
NI SCXI-1191 776572-91
NI PXI-2591 778339-01

Includes switch module and NI-SWITCH driver software.

For information on extended warranty and value added services, see page 20.
See page 499 for accessory and cable information.

BUY ONLINE!

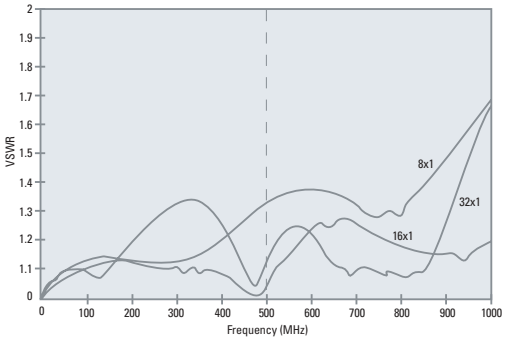
*Visit **ni.com/products** and enter pxi2590, pxi2591, scxi1190, and/or scxi1191.*

Module	Insertion Loss	VSWR
SCXI-1190, PXI-2590 (@ 1.3 GHz)	< 1.5 dB	< 1.5
SCXI-1190, PXI-2590 (@ 2 GHz)	< 3 dB	< 2.5
SCXI-1191, PXI-2591 (@ 4 GHz)	< 0.9 dB	< 1.5

Table 1. Parameters of High-Frequency Switching Modules

Switch Specifications

Specifications (continued)



Input Characteristics

Maximum switching voltage	150 V, CAT I
Maximum switching current	0.5 A (per channel)
Maximum carry current	1 A (per channel)
Simultaneous channels at maximum current	
PXI-2593	2, maximum
SCXI-1193	4, maximum
DC path resistance	
Initial	<1.0 Ω
End of life	≥2.0 Ω

Dynamic Characteristics

Maximum scan rate	100 operations/s
Expected relay life:	
Mechanical	$5x10^7$ operations
Electrical	$3x10^5$ operations (30 V, 0.3 ADC resistive)

Physical Characteristics

Relay type	Electromechanical, latching
Relay contact material	Silver palladium and gold
Dimensions	
PXI-2593	10 by 16 by 4 cm (3.9 by 6.3 by 1.6 in.)
SCXI-1193	3.0 by 17.3 by 19.6 cm (1.2 by 6.7 by 7.6 in.)
I/O connectors	
PXI-2593	18 MCX jacks
SCXI-1193	36 MCX jacks
Trigger connectors	2 SMB jacks

Environment

Operating temperature	0 to 50 °C
Storage temperature	- 20 to 70 °C
Relative humidity	5 to 85% noncondensing
Pollution degree	2
Approved 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-1190, PXI-2590

Input Characteristics

Number of channels per bank	4
Number of banks	
SCXI-1190	4
PXI-2590	1
Input voltage	
Channel-to-earth	24 VDC
Maximum switching voltage	
AC	24 V_{rms}
DC	24 VDC
Maximum switching capacity per channel	
AC	1 A_{rms} at 24 V_{rms}
DC	1 A at 24 VDC
Maximum switching power per channel	24 W
Contact resistance (initial)	100 mΩ maximum
Contact material	Gold-clad silver

RF Performance Characteristics

Characteristic impedance (Z_0)	50 Ω
Insertion loss	
100 MHz	<0.4 dB
500 MHz	<0.9 dB
1.3 GHz	<1.5 dB
2 GHz	<3 dB
VSWR	
100 MHz	<1.15
500 MHz	<1.35
1.3 GHz	<1.5
2 GHz	<2.5
Isolation	
500 MHz	>60 dB
1.3 GHz	>50 dB
2 GHz	>30 dB
Rise time	<300 ps
Signal delay	<3 ns
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 at maximum switching capacity	10^5 operations

Caution: Exceeding the maximum switching capability decreases expected life.

Power Requirement

+5 VDC	600 mA maximum (all relays closed)

Physical

Dimensions	
SCXI-1190	17.3 by 19.6 by 3.0 cm (6.81 by 7.70 by 1.19 in.)
PXI-2590	10 by 16 by 4 cm (3.9 by 6.3 by 1.6 in.)
I/O connectors	5 SMB female per bank

Environment

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

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 (Z0) ..... 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).. 10^5 operations
Caution: Exceeding the maximum switching capability decreases expected life.

Power Requirement

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

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 (Z0) ..... 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

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