

# SCXI 32-Channel Optically Isolated Digital Output and SSR Switch Modules

## NI SCXI-1163, NI SCXI-1163R

- 32 digital outputs (SCXI-1163) or relays (SCXI-1163R)
- 8 banks of 4 lines
- 300 V<sub>rms</sub> isolation per bank
- TTL and CMOS (SCXI-1163)
- Switch up to 240 VAC/VDC (SCXI-1163R)
- NI-DAQ driver software simplifies configuration and measurement
- NI-SWITCH simplifies system development for even the most complex switching applications

### Operating Systems

- Windows 2000/NT/XP

### Recommended Software

- LabVIEW
- LabWindows/CVI
- Measurement Studio
- VI Logger

### Driver Software

- NI-DAQ 7
- NI-SWITCH\*

\*Included with SCXI-1163R



## Overview

The National Instruments SCXI-1163 and SCXI-1163R are isolated digital output modules. The NI SCXI-1163 has 32 channels of optically-isolated digital outputs, arranged into eight isolated banks of four output lines each. The SCXI-1163 interfaces to field digital logic signals, eliminating ground-loop problems and isolating the host computer from damaging voltages. The SCXI-1163R includes 32 normally open, or Form A, solid-state relays, arranged into eight banks of four relays with one common pole for each bank. You can use the SCXI-1163R to switch high-voltage loads, up to 240 VAC/VDC and up to 200 mA.

The SCXI-1163 and SCXI-1163R are controlled over the SCXibus. You can therefore easily integrate SCXI-1163 and 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.

## Applications

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

Module	TTL/CMOS	240 VAC/VDC
SCXI-1163	✓	—
SCXI-1163R	✓	✓

Table 1. Module Compatibility

## Description

Figure 1 is a block diagram of the SCXI-1163 and SCXI-1163R. The major functions and operation of the modules are described in the following paragraphs.

### Optically Isolated Digital Channels/SSRs

The 32 channels of the SCXI-1163 and SCXI-1163R are organized into eight banks of four channels each. Each bank is optically isolated to 300 V<sub>rms</sub> from each other and from the SCXI chassis earth ground. The SCXI-1163 digital outputs are open-collector outputs with 4.7 k $\Omega$  pull-up resistors, as diagrammed in Figure 2. The digital outputs are compatible with most TTL and CMOS circuits. Each bank of four output lines share one +5 VDC supply voltage, V<sub>cc</sub>, provided by the user.

Each channel of the SCXI-1163R is an independent, normally open, Form A, solid-state relay. Each bank of four relays shares one common, as shown in Figure 3. Each relay is capable of switching up to 200 mA at 240 VAC/VDC.

### Update Rates

In multiplexed mode digital output lines or relays are controlled by digital lines on the DAQ device. With the SCXI-1163, a bit set to logic high generates a logic high at the corresponding output line. With the SCXI-1163R, a line set to logic high turns the corresponding solid-state relay off. A bit set to logic low turns on the solid-state relay, allowing current to flow. If the module is operating in multiplexed mode, updates are written to the SCXI-1163/R by the controlling DAQ device through the SCXibus. In NI-DAQ 7, you can update all 32 lines at 600 updates/s. One update corresponds to all 32 digital lines. This transfer rate was determined using a 1 GHz Pentium IV computer

# SCXI 32-Channel Optically Isolated Digital Output and SSR Switch Modules

SCXI Digital Output and SSR Switch

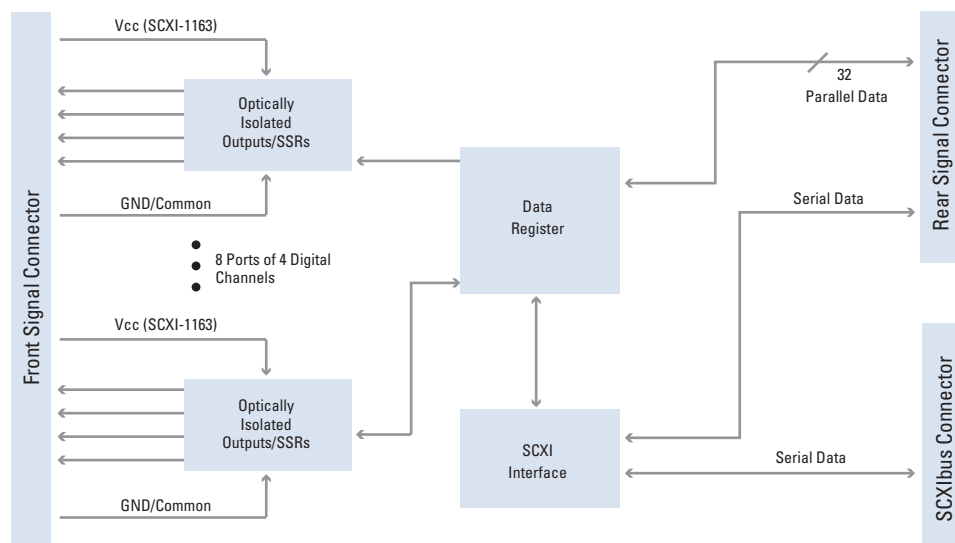


Figure 1. SCXI-1163 and SCXI-1163R Block Diagram

and is highly system and computer dependent. The SCXI-1163/R also has a parallel interface to the rear signal connector (for parallel mode operation with a plug-in DIO device). In parallel mode, update rates depend on propagation delays for SCXI-1163, on set/reset lines for 1163R, and on max update rate of controlling DIO device. If the DIO device has the capability, strobed updates are possible.

## Modes of Operation

### Multiplexed

In multiplexed mode, a single DAQ device controls one or more SCXI modules through the SCXibus using a serial data protocol. This multiplexed-mode operation uses a maximum of five digital I/O lines of the DAQ device. With MUX-mode operation, you can control several SCXI-1163 and SCXI-1163R modules, along with other SCXI modules, in one or more chassis with a single DAQ device. Multiplexed mode is a cost-efficient solution for larger systems.

### Parallel

For high update speeds, you can also operate the SCXI-1163 and SCXI-1163R in parallel mode, connecting each module directly to a DIO DAQ device – 6503 (DIO-24), 6533 (DIO-32HS), 6534, and 6508 (DIO-96). In this configuration, each channel of the SCXI-1163 or SCXI-1163R module connects to a corresponding digital output line of the DIO device.

## Signal Connection

Digital signals connect to screw terminals located in the SCXI-1326 terminal block, which connects directly to the front of the SCXI module, or the TBX-1326, a DIN-rail mountable terminal block, which connects to the SCXI-1163 or SCXI-1163R using the SH48-48-B shielded cable. See Table 2 for more information.

Terminal Block	Part Number	Type	Cable	Page
SCXI-1326	777687-26	Screw terminals Front-mounting	—	329
TBX-1326	777207-26	Screw terminals DIN-rail mount	SH48-48-B	331

Table 2. Terminal Block Options for SCXI-1163 and SCXI-1163R

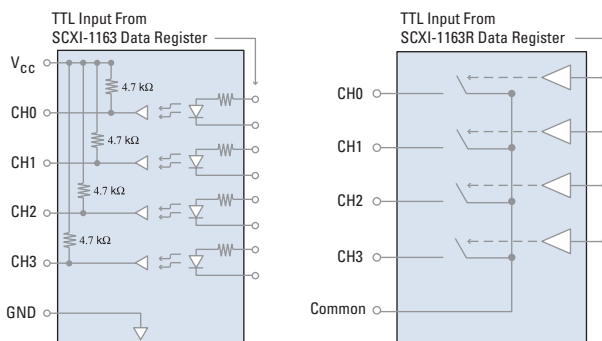


Figure 3. Digital Output Diagrams for SCXI-1163 and the SCXI-1163R

## Ordering Information

NI SCXI-1163 .....776572-63  
NI SCXI-1163R .....776572-63R

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

## BUY ONLINE!

Visit [ni.com/info](http://ni.com/info) and enter *scxi1163* and/or *scxi1163r*.

See page 276 to configure your complete SCXI system.

Data Acquisition and  
Signal Conditioning

# SCXI Digital I/O, and SSR Switch Specifications

## Specifications

### SCXI-1162, SCXI-1162HV

Typical for 25 °C unless otherwise noted.

#### Digital Input

Number of channels ..... 32 organized into 8 optically-isolated banks of 4 inputs each

Reference voltage Vcc (SCXI-1162) ..... +5 to +10 V

Digital Logic Levels for the SCXI-1162

Level	Minimum	Maximum
Input low voltage	Vcc - 10 V	Vcc - 4 V
Input high voltage	Vcc - 1.5 V	Vcc + 5 V
Input low current	-7 mA	-25 mA

Digital logic levels for the SCXI-1162HV

Level	Minimum	Maximum
Input low voltage (DC or peak AC)	—	± 1 V
Input high voltage (DC)	±2 VDC	±240 VDC
50-60 Hz AC	10 VAC <sup>1</sup>	±240 VAC <sup>1</sup>
1 kHz AC	2 VAC <sup>1</sup>	

Input impedance (SCXI-1162) ..... 360

Input current limiting (SCXI-1162HV) ..... 1 mA

Common-mode isolation ..... 300 V<sub>rms</sub> between banks and bank to earth

Common-mode transient rejection ..... 500 V/μs typical, 100 V/μs minimum

Transfer rate in MUX mode<sup>2</sup> ..... 750 words/s (1 word = 32 bits)

Propagation delay (in parallel mode)

SCXI-1162 ..... 0.5 μs typical, 2.0 μs maximum

SCXI-1162HV ..... 1.5 ms

### SCXI-1163, SCXI-1163R

Typical for 25 °C unless otherwise noted.

#### Digital Output

Number of channels ..... 32 organized into 8 optically isolated banks of 4 outputs each

Compatibility ..... Most TTL and CMOS logic

Supply voltage (Vcc) ..... +5 V ±0.5 V, provided by user

Power requirement from Vcc ..... 60 mA/bank typical, 80 mA/bank max

Digital logic levels

Level	Minimum	Maximum
Output low voltage (I <sub>out</sub> = 12 mA)	—	0.6 V
Output high voltage (I <sub>out</sub> = -0.4 mA)	3.0 V	—
Output low current (per channel)	—	15 mA

Common-mode isolation ..... 250 V<sub>rms</sub> between banks, and bank to earth

Common-mode transient rejection ..... 500 V/μs typical, 100 V/μs minimum

Transfer rate in MUX mode<sup>2</sup>

(1 word = 32 bits) ..... 750 words/s

Propagation delay (parallel mode) ..... 100 ns

Power-on state ..... High

### SCXI-1163R (only)

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<sup>1</sup>

DC ..... 240 VDC

Maximum switching capacity ..... 200 mA

Common-mode isolation ..... 250 V<sub>rms</sub> between banks, and bank to ground

On resistance ..... 6

Output capacitance ..... 110 pF at 50 V, 1 MHz

Leakage current ..... 1 μA maximum

Transfer rate in serial mode<sup>2</sup>

(1 word = 32 bits) ..... 750 words/s

Relay set time ..... 0.6 ms

Relay reset time ..... 0.1 ms

Power-on state ..... Relays open

### Certification and Compliance

SCXI-1162/HV, SCXI-1163/R ..... 300 V, Cat II working voltage

#### European Compliance

EMC ..... EN 61326 Group I Class A, 10m, Table 1 Immunity

Safety ..... EN 61010-1

#### North American Compliance

EMC ..... FCC Part 15 Class A using CISPR

Safety ..... UL Listed to UL 3111-1

CAN/CSA C22.2 No. 1010.1

#### Australia & New Zealand Compliance

EMC ..... AS/NZS 2064.1/2 (CISPR-11)

<sup>1</sup>VAC assumes sinusoidal waveform.

<sup>2</sup>Transfer rate depends largely on the computer and software. These tests were made using an AT-MIO-16E-2 installed in a 500 MHz PIII computer running NI LabVIEW and Windows NT.

For a definition of specific terms, please visit [ni.com/glossary](http://ni.com/glossary)