SCXI 32-Channel Optically Isolated Digital Input Modules

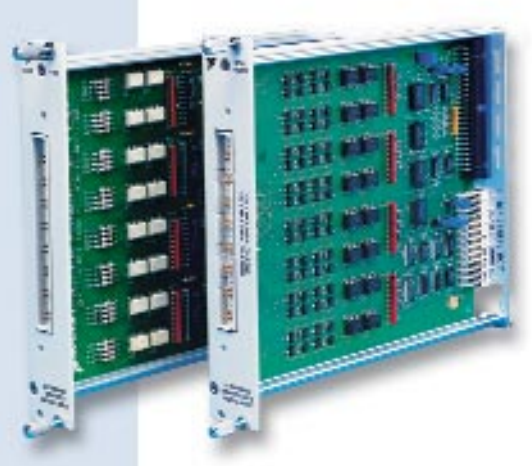
NI SCXI-1162, NI SCXI-1162HV

- 32 channels
- 8 banks of 4 lines
- 300 V_{rms} isolation per bank
- TTL and CMOS (SCXI-1162)
- Up to 240 VAC/VDC signals (SCXI-1162HV)
- NI-DAQ driver software simplifies configuration and measurement

Operating Systems
- Windows 2000/NT/XP

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

Driver Software
- NI-DAQ 7



Overview

The National Instruments SCXI-1162 and the SCXI-1162HV are optically-isolated digital input modules. The NI SCXI-1162 has 32 channels of optically-isolated digital inputs, arranged into eight isolated banks of four input lines each. The SCXI-1162 interfaces to field digital logic signals, such as TTL and CMOS, where high common-mode voltages can be present. The SCXI-1162HV senses the presence of a wide range of AC or DC signals, from digital logic level signals up to 240 VAC/VDC signals. The optical isolation of the SCXI-1162 and SCXI-1162HV eliminates ground-loop problems and isolates the host computer from damaging voltages.

The SCXI-1162 and SCXI-1162HV are controlled by the DAQ device serially in multiplexed-mode over the SCXIbus. You can therefore easily integrate multiple SCXI-1162 and SCXI-1162HV modules into existing SCXI systems without additional DAQ devices or cabling. The modules can also operate in parallel mode when cabled directly to a DIO device.

Applications

You can use an SCXI system equipped with the SCXI-1162 or the SCXI-1162HV in a variety of industrial and laboratory applications. The SCXI-1162 and SCXI-1162HV safely isolate the computer from the large common-mode voltages, ground loops, and voltage spikes that often occur in industrial and research environments. The SCXI-1162HV can monitor TTL level inputs as well as sense the presence of high-voltage AC and DC signals. For example, you can use an SCXI-1162HV to sense the on/off state of power circuits, proximity switches, pushbutton switches, thermostats, or relays. The SCXI-1162 interfaces directly to field digital logic input signals that should be isolated from the host computer.

Description

Figure 1 is a block diagram of the SCXI-1162 and SCXI-1162HV. The major functions and operation of the modules are described in the following paragraphs.

Module	TTLC/CMOS	240 VAC/VDC
SCXI-1162	✓	–
SCXI-1162H	✓	✓

Table 1. Module Compatibility

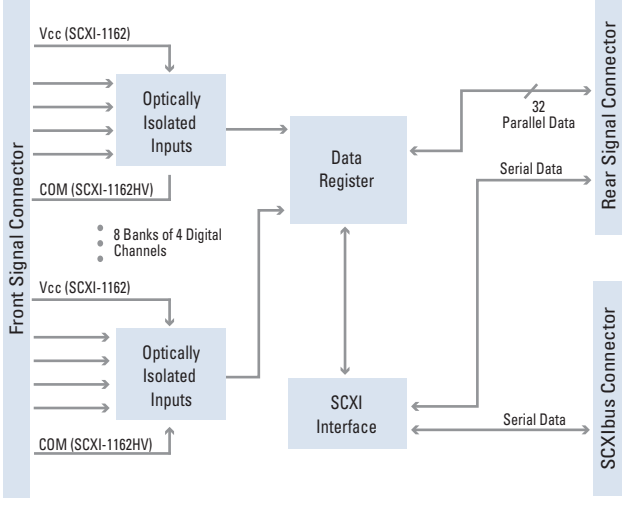


Figure 1. SCXI-1162 and SCXI-1162HV Block Diagram

SCXI 32-Channel Optically Isolated Digital Input Modules

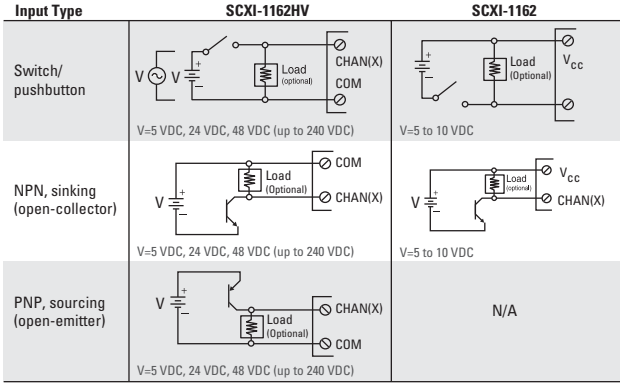


Figure 2. Input Wiring Diagrams for SCXI-1162 and SCXI-1162HV

Optically Isolated Digital Inputs

The 32 channels of the SCXI-1162 and SCXI-1162HV are organized into eight banks of four inputs each. Each bank is optically isolated to 300 V_{rms} from each other and from the SCXI chassis earth ground. The SCXI-1162 accepts many types of digital signals, including TTL, CMOS, and voltage references from 5 to 10 V (Figure 2). A 360 resistor in series with the optoisolator limits the current, as diagrammed in Figure 3. Each bank of four input lines shares one +5 to +10 V reference voltage, V_{CC}, which you supply. Each input of the SCXI-1162HV consists of current-limiting circuitry in series with a bidirec-tional optoisolator, as diagrammed in Figure 4. Each bank of four inputs share a COM pin, to which you must connect a ground reference. A positive or negative DC input signal with a magnitude greater than 2 V, up to 240 V, turns on the optocoupler circuit and register as a logic high. When sensing the presence of AC signals, a 50 or 60 Hz sinusoidal signal with a magnitude of at least 10 VAC registers a constant logic high. A 1 kHz sinusoidal signal registers a constant logic high when its magnitude exceeds 2 VAC. The SCXI-1162HV returns a constant logic low as long as the peak magnitude of the signal does not exceed ±1 V.

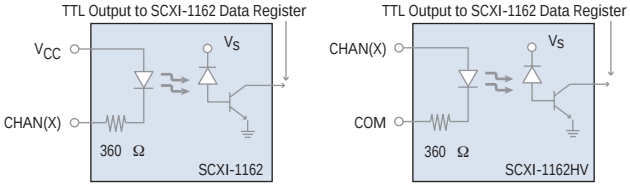


Figure 3. Digital Input Diagrams of the SCXI-1162 and the SCXI-1162HV

Data Register

The logical states of the 32 digital input channels are placed into the 32-bit data register. If the module is operating in serial mode, the 32-bit data register value is read through the SCXIbus. You can access the data register at 700 words/s. One word corresponds to all 32 digital lines. This transfer rate was determined using a 500 MHz Pentium III computer and is highly computer and system dependent. The data register also has a 32-bit parallel interface to the rear signal connector (for parallel operation with a plug-in DIO device).

Modes of Operation

Multiplexer

In serial mode, a single DAQ device reads 32-bit digital patterns from the data register of one or more SCXI modules through the SCXIbus using a serial data protocol. This serial-mode operation uses a maximum of five DIO lines of the DAQ device. With serial-mode operation, you can control several SCXI modules in one or more chassis using a single DAQ device.

Parallel

You can also operate the SCXI-1162 and SCXI-1162HV in parallel mode, connecting each module directly to a digital I/O DAQ device – 6503 (DIO-24), 6533 (DIO-32HS), 6534, and 6508 (DIO-96). In this configuration, each input channel of the SCXI-1162 or SCXI-1162HV module connects directly to a corresponding digital input line of the DIO device.

Signal Connection

Field 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-1162 or SCXI-1162HV using the SH48-48-B shielded cable (Table 2).

Terminal Block	Part Number	Type	Cabling	Page
SCXI-1326	777687-26	Screw terminals Front-mounting	–	328
TBX-1326	777207-26	Screw terminals DIN-rail mount	SH48-48-B	328

Table 2. Terminal Block Options for SCXI-1162 and SCXI-1162HV

Ordering Information

NI SCXI-1162 776572-62
NI SCXI-1162HV 776572-62H

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

BUY ONLINE!

Visit ni.com/info and enter scxi1162 and/or scxi1162hv.

See page 276 to configure your complete SCXI system.

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 1 kHz AC	10 VAC[1] 2 VAC[1]	±240 VAC[1]

Input impedance (SCXI-1162) 360
Input current limiting (SCXI-1162HV) ..... 1 mA
Common-mode isolation ..... 300 V_{rms} between banks and bank to earth
Common-mode transient rejection ..... 500 V/µs typical, 100 V/µs minimum
Transfer rate in MUX mode[2] ..... 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 (Iout = 12 mA)	–	0.6 V
Output high voltage (Iout = -0.4 mA)	3.0 V	–
Output low current (per channel)	–	15 mA

Common-mode isolation ..... 250 V_{rms} between banks, and bank to earth
Common-mode transient rejection ..... 500 V/µs typical, 100 V/µs minimum
Transfer rate in MUX mode[2]
  (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[1]
  DC ..... 240 VDC
Maximum switching capacity ..... 200 mA
Common-mode isolation ..... 250 V_{rms} 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[2]
  (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)

[1]VAC assumes sinusoidal waveform.
[2]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*