SWB-2813 Specifications

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Contents

SWB-2815A/B Specifications

These specifications describe the SWB-2815A/B matrix relay card.

Topology	1-wire 4 × 86 matrix

About These Specifications

Specifications characterize the warranted performance of the instrument under the stated operating conditions. Data in this document are ***Specifications*** unless otherwise noted.

Typical Specifications are specifications met by the majority of the instrument under the stated operating conditions and are tested at 23 °C ambient temperature. Typical specifications are not warranted.

All voltages are specified in DC, AC_{pk}, or a combination unless otherwise specified.

Clean devices and terminal blocks by brushing off light dust with a soft, nonmetallic brush. Remove other contaminants with a soft, lint-free, dampened cloth. Do not use detergent or chemical solvents. The unit must be completely dry and free from contaminants before returning to service.

Cautions

Caution This module is rated for Measurement Category I and intended to carry signal voltages no greater than 100 V_{rms}/150 V_{pk}/150 VDC. This module can withstand up to 800 V impulse voltage. Do not use this module for connection to signals or for measurements within Categories II, III, or IV. Do not connect to MAINS supply circuits (for example, wall outlets) of 115 VAC or 230 VAC. Refer to the ***Read Me First: Safety and Electromagnetic***

Compatibility document for more information on measurement categories.

Caution In systems that include cards with different maximum voltages, the lowest safety voltage rating as specified on the front of the card applies for the entire system. The system can include all cards in the carrier, and all cards in other carriers that are connected with the NI 2806 expansion bridge.

Caution When hazardous voltages (>42.4 Vpk/60 V DC) are present on any channel, safety low-voltage (≤42.4 Vpk/60 V DC) cannot be connected to any other channel.

Caution Always disconnect or turn off power sources before powering on a chassis.

Input Characteristics

Maximum switching voltage	
Row/column-to-ground	150 V, CAT I
Row-to-column	150 V
Maximum switching current	1.0 A (per channel)
Maximum carry current	1.0 A (per channel)
Maximum switching power	
Per channel	20 W

Per crosspoint	20 W
DC path resistance	
Initial	<1 Ω
End-of-life	≥2 Ω
Open channel	>1 × 10^9 Ω

Note DC path resistance typically remains low for the life of the relay. At the end of relay life, the path resistance rises rapidly above the specified value. Load ratings apply to relays used within the specification before the end of relay life.

Thermal EMF, typical	<150 µV
Bandwidth, typical (-3 dB, 50 Ω termination, column-row-column)	≥8 MHz
Crosstalk, typical (50 Ω termination) channel-to-channel	
10 kHz	<-70 dB
100 kHz	<-55 dB
1 MHz	<-35 dB
Isolation, typical (50 Ω termination) open channel	

10 kHz	>70 dB
100 kHz	>55 dB
1 MHz	>35 dB
Analog bus line connections	AB <0...7> (8 lines)

Dynamic Characteristics

Simultaneous drive limit[1]	176 relays
Relay operate/release time (simultaneous relays), typical[2]	
Up to 8 relays	<1 ms
Up to 50 relays	<2 ms
Expected relay life, mechanical (no load)	1×10^9 cycles
Expected relay life, electrical (resistive, <10 pF load)	
10 V,100 mA	1×10^8 cycles
20 V, 500 mA	1×10^7 cycles

20 V, 1 A	4×10^6 cycles
100 V, 10 mA	1×10^6 cycles

Note Optional 100 Ω series protection resistance, available for the interface cable, increases the expected relay life at higher voltages by protecting the reed relays from the effects of cable and load capacitance. For more information about increasing the life of your relay, visit ni.com/info and enter the Info Code `relaylifetime`.

Note Reed relays are highly susceptible to damage caused by switching capacitive and inductive loads. Capacitive loads can cause high inrush currents, and inductive loads can cause high flyback voltages. The addition of appropriate protection can greatly improve contact lifetime. For more information about adding protection circuitry to a capacitive load, visit ni.com/info and enter the Info Code `relaylifetime`. For information about inductive loads, enter the Info Code `relayflyback`.

Power

Power consumption per relay	50 mW
Power consumption limit[3]	8.8 W

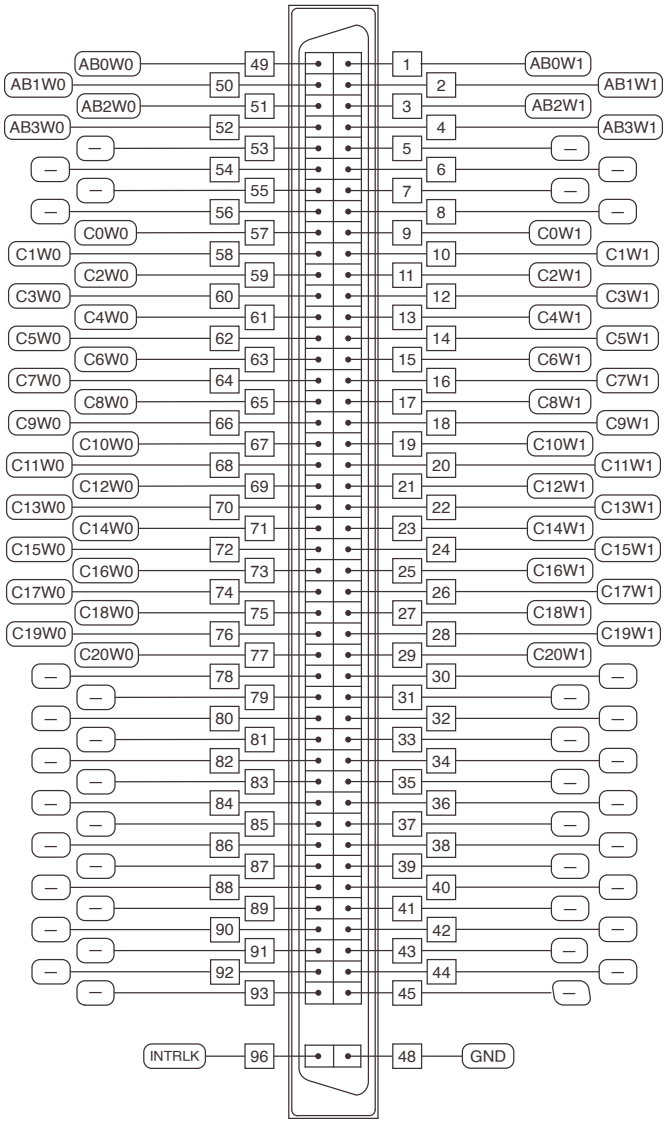
Power dissipation limit	
Card	8.8 W
Carrier	8.8 W

Physical Characteristics

Relay type	Reed
Relay contact material	Iridium
I/O connectors	96 position, plastic SCSI
Power requirement, carrier	20 W at 5 V, 5 W at 3.3 V
Dimensions (L × W × H)	11.2 cm × 1.2 cm × 17.1 cm(4.4 in. × 0.5 in. × 6.7 in.)
Weight	240 g (8.5 oz)

Connector Pinout

Figure 1. SWB-2813A/B Connector Pinout



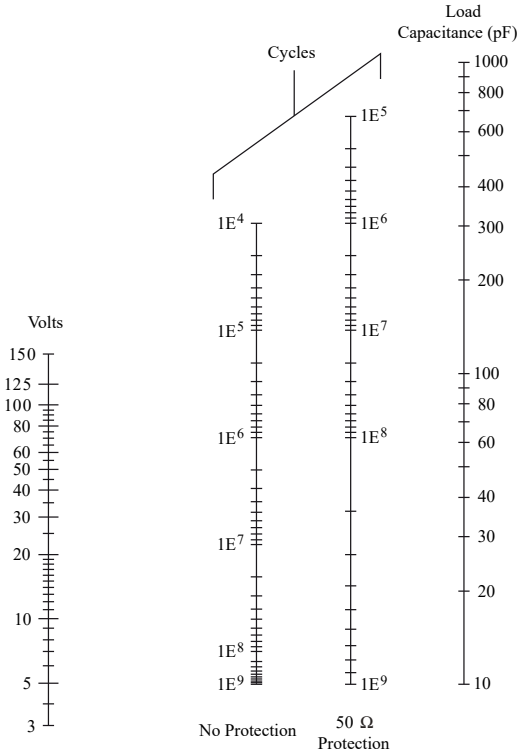
Reed Relay Life

Reed Relay Life Nomograph

The following figure shows the reed relay lifetime nomograph. The purpose of this graph is to estimate reed relay lifetime.

Note This nomograph is not meant to be an exact or guaranteed specification and should only be used as a guideline to estimate lifetime. Actual reed relay lifetimes may vary, depending on application.

Figure 2. Reed Relay Lifetime Nomograph



Estimating Reed Relay Life

Complete the following steps to estimate relay lifetimes using the nomograph:

1. Determine the peak voltage experienced across the relay while switching and mark this value on the ***Volts*** line.
2. Determine the sum of the DUT, cable, and instrumentation capacitances and mark this value on the ***Load Capacitance*** line.
3. Draw a straight line between both values.
   The intersection points of this line and the ***No Protection*** and ***50 Ω Protection*** axes are the corresponding estimated relay lifetimes in cycles.

Related information:

- ni.com/infoni.com/info

Estimating Reed Relay Life Example

The reed relay module is connected to a DMM through 1 meter of cable. The DMM and cable capacitances are 100 pF and 30 pF respectively. The maximum voltage switched across the relay is 50 V. Determine the estimated number of relay cycles with and

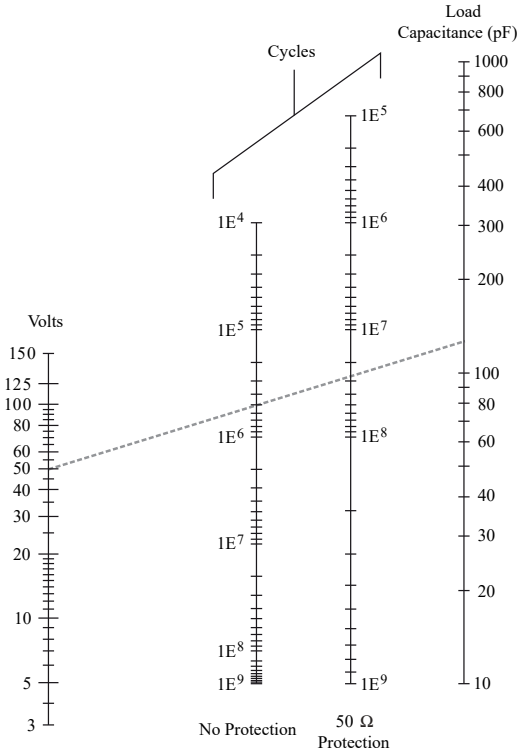
without protection resistance.

Estimating Reed Relay Life Solution

The total load capacitance is the sum of the cable and DMM capacitance, which is 130 pF. Draw a line between the 50 V point on the ***Volts*** axis and 130 pF on the ***Load Capacitance*** axis.

The line drawn intersects the ***Cycles*** axes at approximately 500,000 on the ***No Protection*** axis and about 25,000,000 on the ***50 Ω Protection*** axis (refer to the following figure). This series resistance should be placed as close as possible to the relay for maximum effect.

Figure 3. Reed Relay Life Nomograph Solution



Environment

Maximum altitude	2,000 m (800 mbar) (at 25 °C ambient temperature)

Pollution Degree	2

Indoor use only.

Operating Environment

Ambient temperature range	0 °C to 55 °C
Relative humidity range	10% to 90%, noncondensing

Storage Environment

Ambient temperature range	-20 °C to 71 °C
Relative humidity range	5% to 95%, noncondensing

Shock and Vibration

Operating shock	30 g peak, half-sine, 11 ms pulse
Random vibration	
Operating	5 Hz to 500 Hz, 0.3 g_{rms}
Nonoperating	5 Hz to 500 Hz, 2.4 g_{rms}

Compliance and Certifications

Safety Compliance Standards

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

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA C22.2 No. 61010-1

Note For safety certifications, refer to the product label or the Product Certifications and Declarations section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity
- AS/NZS CISPR 11: Group 1, Class A emissions
- AS/NZS CISPR 22: Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia, and New Zealand (per CISPR 11), Class A equipment is intended for use only in heavy-industrial locations.

Note Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.

Note For EMC declarations, certifications, and additional information, refer to the Product Certifications and Declarations section.

Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI products, visit ni.com/product-certifications, search by model number, and click the appropriate link.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the ***Engineering a Healthy Planet*** web page at ni.com/environment. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

EU and UK Customers

- **Waste Electrical and Electronic Equipment (WEEE)**—At the end of the product life cycle, all NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit ni.com/environment/weee.

电子信息产品污染控制管理办法（中国RoHS）

- **中国RoHS**— NI符合中国电子信息产品中限制使用某些有害物质指令(RoHS)。关于NI中国RoHS合规性信息，请登录 `ni.com/environment/rohs_china`。(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

Accessories

Refer to ni.com for more information about the following accessories.

Table 1. NI Accessories for the SWB-2813A/B

Accessory	Part number
SH96F-96M-NI SwitchBlock Cable	150275-01
SH96F-96M-RES-NI SwitchBlock Cable with 100 Ω resistance	150579-01
NI TBX-2809 Screw Terminal Accessory (unshielded)	781420-09