PXIe-2727 Features

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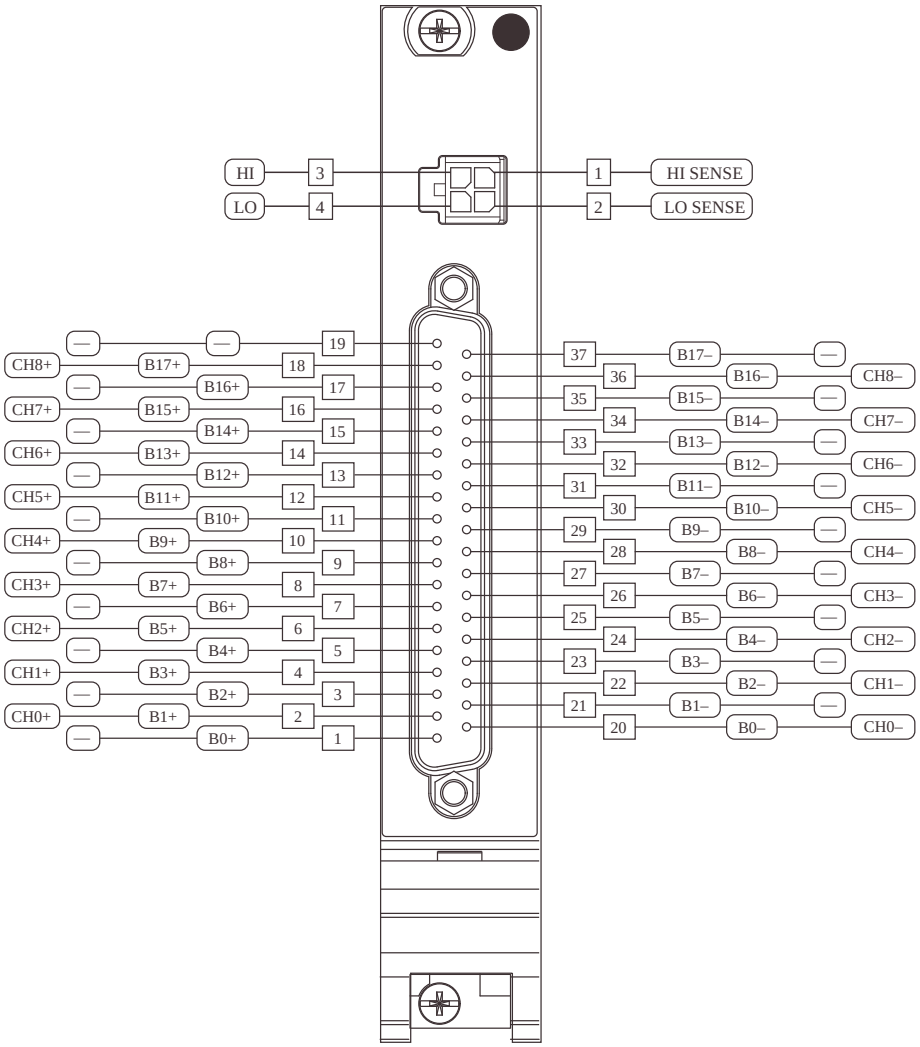


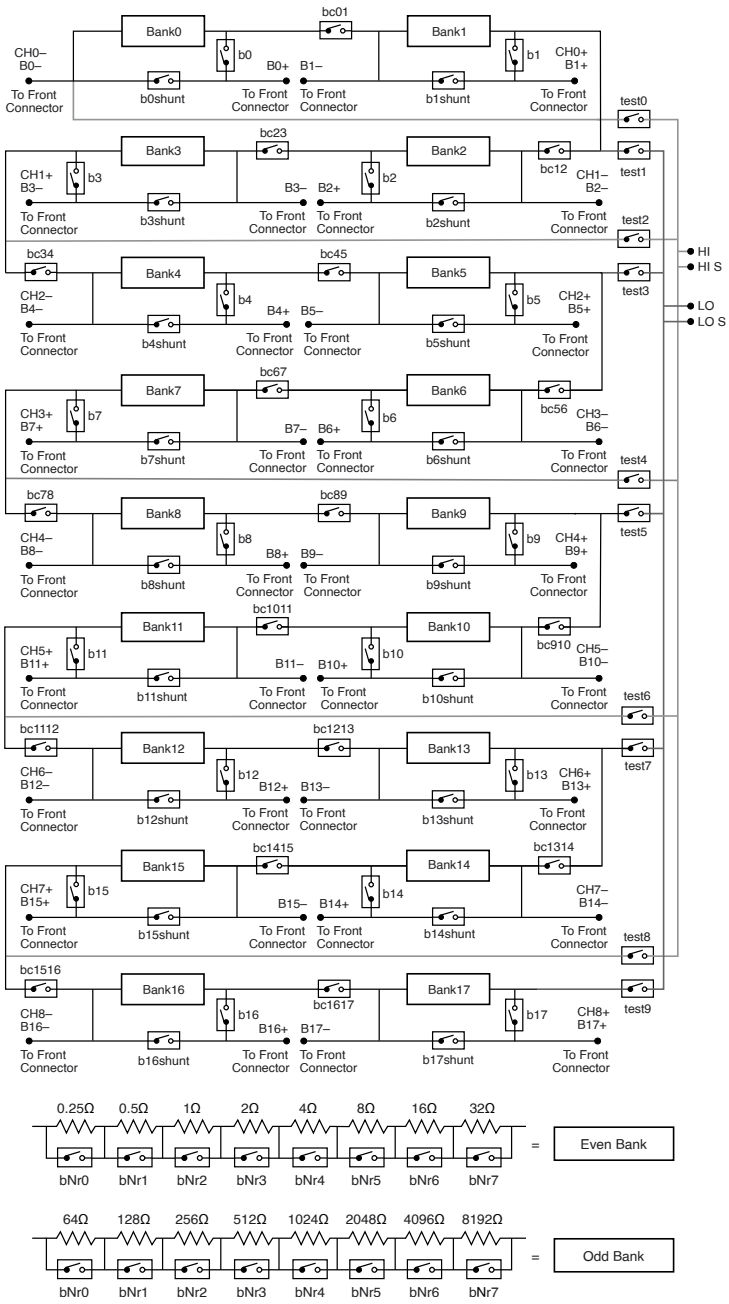
Table 1. Signal Descriptions

Signal	Description
B**x**+	Positive bank connection
B**x**-	Negative bank connection

Signal	Description
CH**x**+	Positive signal connection
CH**x**-	Negative signal connection
HI	HI input connection
HI SENSE	HI sense connection
LO	LO input connection
LO SENSE	LO sense connection
—	No connection

PXIe-2727 Hardware Diagram

This figure shows the hardware diagram of the module.



Note Resistance values are nominal. Refer to the **PXIe-2727 Specifications** for resistor values and accuracy information.

Refer to the following list for relay names on the module.

- kb0r0, kb0r1...kb0r7
- kb1r0, kb1r1...kb1r7
- kb2r0, kb2r1...kb2r7
- kb3r0, kb3r1...kb3r7
- kb4r0, kb4r1...kb4r7
- kb5r0, kb5r1...kb5r7
- kb6r0, kb6r1...kb6r7
- kb7r0, kb7r1...kb7r7
- kb8r0, kb8r1...kb8r7
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- kb10r0, kb10r1...kb10r7
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- kb12r0, kb12r1...kb12r7
- kb13r0, kb13r1...kb13r7
- kb14r0, kb14r1...kb14r7
- kb15r0, kb15r1...kb15r7
- kb16r0, kb16r1...kb16r7
- kb17r0, kb17r1...kb17r7
- kb0...kb17
- kb0shunt...kb17shunt
- kbc01, kbc12...kbc1617
- ktest0, ktest1...ktest9

PXIe-2727 Topology

This figure shows the topology for the module.

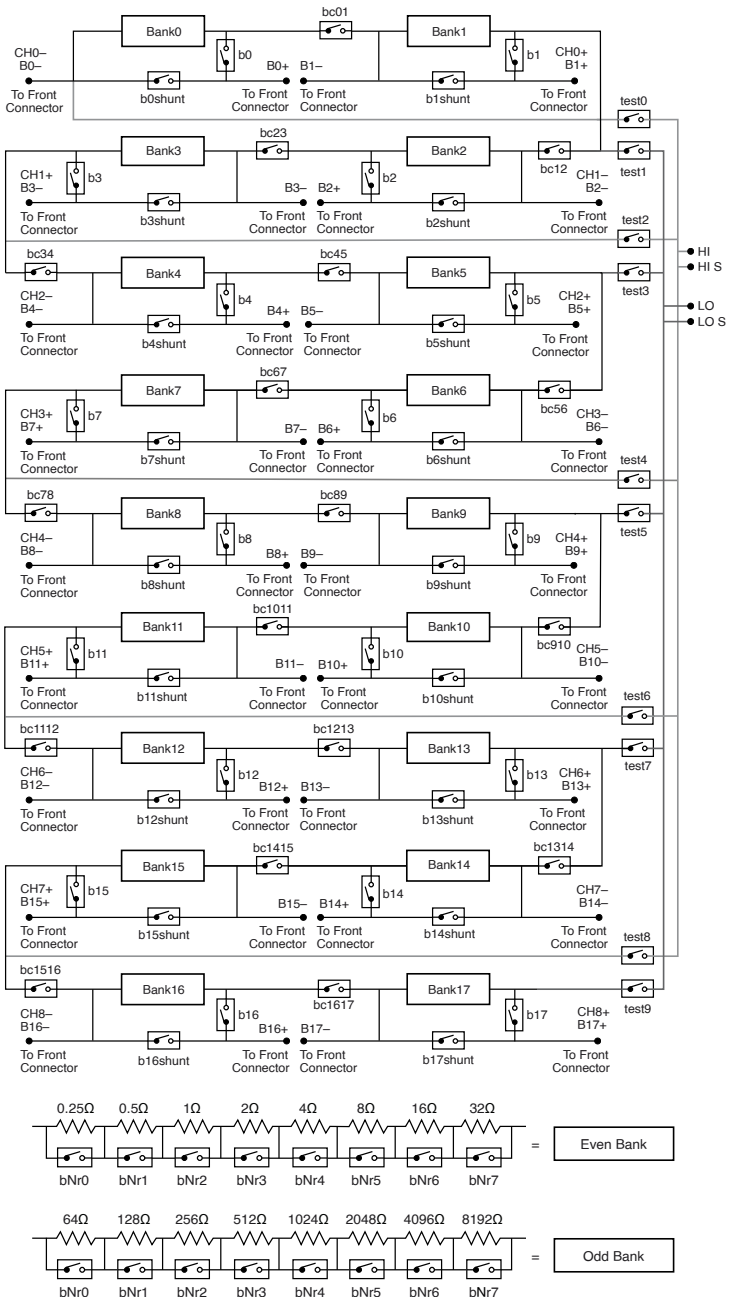
Module software name: 2727/Independent
(NISWITCH_TOPOLOGY_2727_INDEPENDENT)

The module is composed of reed relays in parallel with discrete resistors. The module has nine channels that can nominally switch from 0 Ω to 16,383 Ω in 0.25 Ω steps.

Note NI has created a set of reference VIs that you can use to specify a desired resistance value to output or RTD temperature to simulate. Using the reference VIs is the simplest way to interact with the programmable resistor module. It is also possible to program using direct calls in NI-SWITCH, NI-DAQmx, NI Switch Executive, or an IVI switch driver. For more information, including a detailed overview of the module architecture, visit ni.com/r/272xoverview.

Note Switching inductive loads, such as motors and solenoids, can produce high-voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life.

Independent Topology



Note Bank connect relays allow adjacent banks or channels to connect together internally. For example, you can connect two or more adjacent channels together to create a potentiometer, a voltage divider, or a multi-segment resistor chain.

Making a Connection

Each 16-bit channel is composed of two adjacent 8-bit banks on the module. For example, ch0 is composed of banks 0 and 1 and ch1 is composed of banks 2 and 3. NI has created a set of reference VIs that will programmatically open and close relays based on a user-specified resistance value or RTD temperature to simulate. To access these reference VIs, visit ni.com/r/272xoverview.. NI recommends using this set of reference VIs for the easiest programming experience. If not using these reference VIs, NI recommends using the low-level relay control VIs or functions instead of the connect channel VIs or functions. The DAQmx Relay API supports closing multiple relays in a single driver call, which is faster than the channel API.

When a bank relay is closed, the corresponding resistor is placed in parallel with the low resistance of the relay, which nominally equates to a zero Ω shunt. Closing any of the 8 bank relays in a given bank decreases the resistance of that bank.

For example, the following procedure uses the NI-SWITCH Relay API to short across the largest resistor in bank 0 and join bank 0 and bank 1 in series.

1. Close b0r7 by calling the niSwitch Relay Control VI with the inputs of b0r7 and close.
2. Close bc01 by calling the niSwitch Relay Control VI with the inputs of bc01 and close.

You can perform the same operation using the NI-SWITCH Channel API, as shown below.

1. Connect b0->b0r7 by calling niSwitch Connect Channels VI with the inputs of b0 and b0r7.
2. Connect b0->b1 by calling niSwitch Connect Channels VI with the inputs of b0 and b1.

Each bank is initially in a high impedance (open) state across the bank terminals. To enable the desired output channel you must first connect the bank relay, bN.

Each bank includes a shunt relay that completely bypasses the bank's string of 8 series relays. Closing the shunt relay bN->bNshunt, for example, b0->b0shunt or low-level kb0shunt, results in a low resistance across the bank, 0 Ω nominally. This allows the module to pass signals with minimal attenuation. On 16-bit modules, such as this module, closing the upper bank's shunt relay reduces the resistance when outputting values less than 64 Ω.

Note It is not necessary to close all 8 bank relays and the shunt relay. Configuring multiple banks this way can exceed the power budget of the module.

The 4-pin front panel test connector can connect to any adjacent pair of even-odd banks, allowing resistance measurements, or voltage measurements, across those two banks, for example b0 to b1, b2 to b3, b4 to b5. On 16-bit modules, such as this module, this allows channel resistance measurements using a DMM with Offset Compensated Ohms (such as the PXI-4070, PXI-4071, or PXI-4072). To connect a pair of banks to the test leads, close the appropriate test relays using the command testN->testout. For example, to measure the resistance across banks 0 and 1, call test0->testout and test1->testout. For banks 2 and 3, call test1->testout and test2->testout. Refer to the device's hardware diagram for valid test relay connections.

Note Closing multiple pairs of test relays introduces low impedance paths between banks. NI recommends disconnecting the 37-pin DSUB connector if these low impedance paths would damage your device under test or cause the current specifications of the module to be exceeded.

Note Each channel on the module exhibits an "open" when initialized, reset, and first powered on. The niSwitch Reset and niSwitch Disconnect All Channels VIs or niSwitch_reset and niSwitch_DisconnectAll functions will disconnect all relays, resulting in an open circuit on each channel.

PXIe-2727 Relay Replacement

The module uses reed relays.

Note The module uses a custom lead length to meet safety standards. Trim leads per rework instructions or use one of the custom relays from the relay kit.

Refer to the following table for information about ordering replacement relays.

Replacement Relay	Part Number
Coto (all relays)	9117-0001
NI relay kit (10 relays)	781451-10

The module uses lead-free assemblies. Ensure you have the following:

- Temperature-regulated soldering iron set to 371 °C (700 °F) for lead-free solder rework
- 96.5/3.0/0.5 Tin/Silver/Copper solder (flux core) for lead-free solder rework
- Solder wick
- Fine pick
- Isopropyl alcohol
- Cotton swabs

Note The module uses lead-free assemblies. NI recommends using lead-free solder for relay replacement on lead-free assemblies.

Notice Do not rework lead assemblies using a lead-free work station. Lead solder from the unit could contaminate the station.

Notice If a lead-free assembly is reworked with lead solder, label the assembly to indicate this. This can prevent the same unit from being

reworked later on a lead-free solder station, which could contaminate the station.

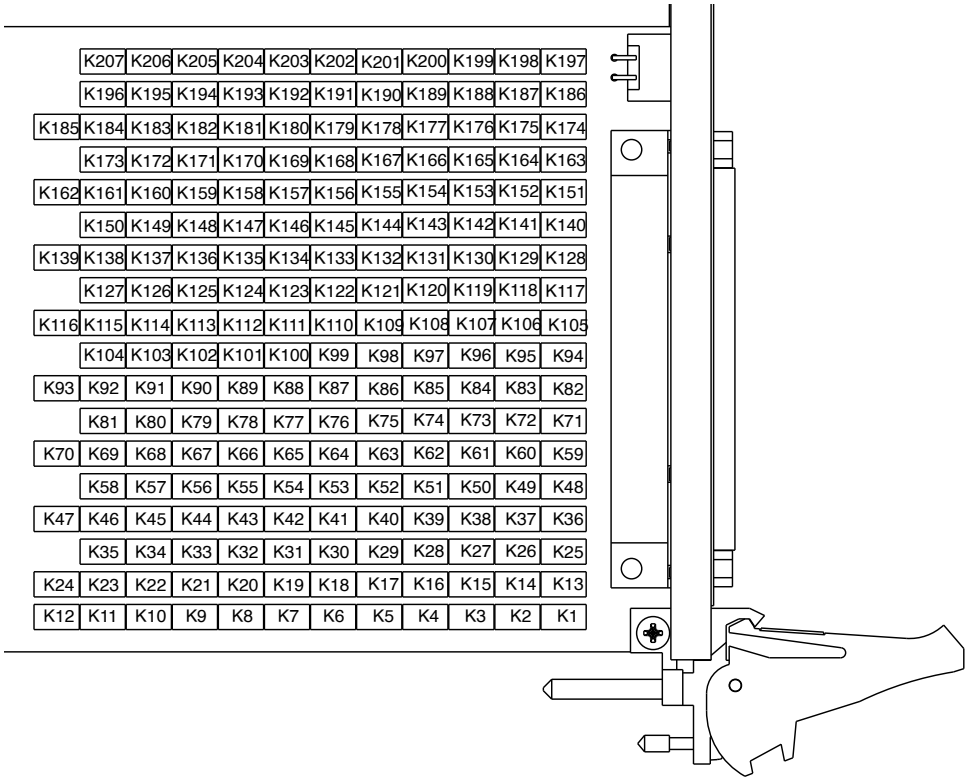
Complete the following steps to disassemble your module and replace a failed relay.

1. Ground yourself using a grounding strap or a ground connected to your PXI chassis.

   Note Properly grounding yourself prevents damage to your module from electrostatic discharge.

2. Locate the relay you want to replace. Refer to the following figure and table for relay locations.

   Figure 1. Module Relay Map

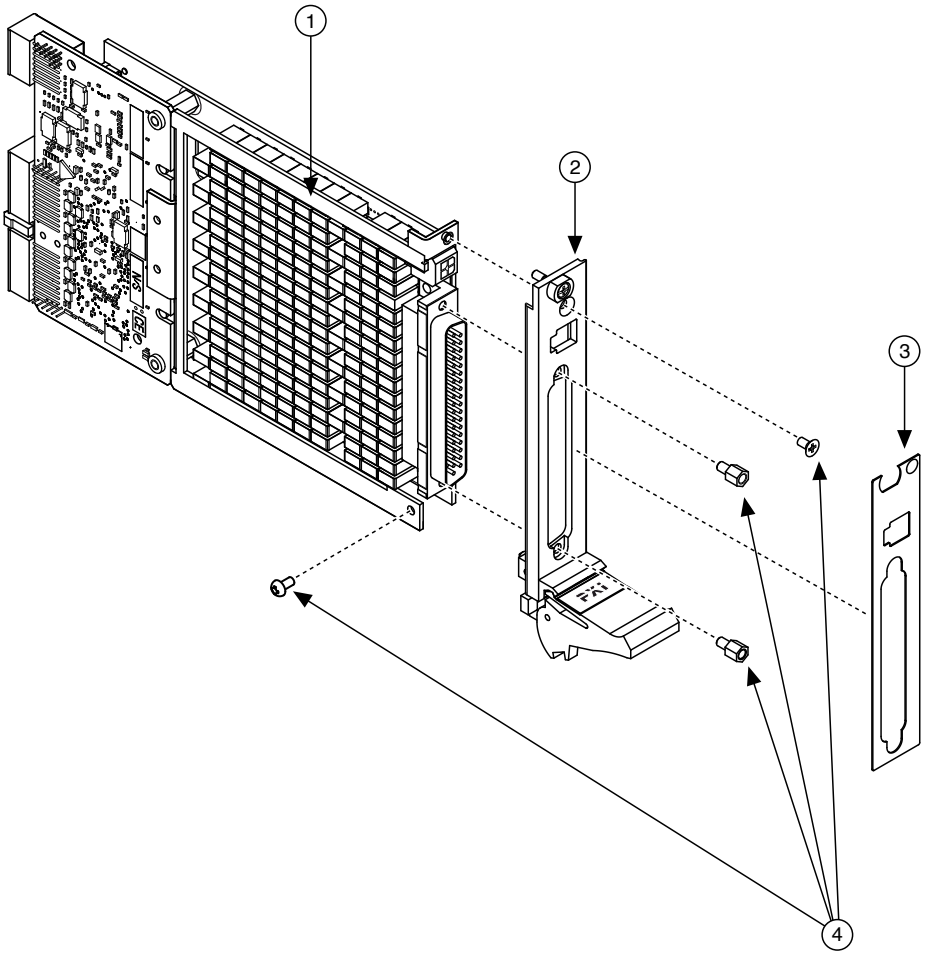


Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kb0shunt	K1	kb4r2	K53	kb9shunt	K105	kb13r2	K157
kb0	K2	kb4r3	K54	kb9	K106	kb13r3	K158
kbc01	K3	kb4r4	K55	kbc910	K107	kb13r4	K159
ktest0	K4	kb4r5	K56	test5	K108	kb13r5	K160
kb0r0	K5	kb4r6	K57	kb9r0	K109	kb13r6	K161
kb0r1	K6	kb4r7	K58	kb9r1	K110	kb13r7	K162
kb0r2	K7	kb5shunt	K59	kb9r2	K111	kb14shunt	K163
kb0r3	K8	kb5	K60	kb9r3	K112	kb14	K164
kb0r4	K9	kbc56	K61	kb9r4	K113	kbc1415	K165
kb0r5	K10	ktest3	K62	kb9r5	K114	kb14r0	K166
kb0r6	K11	kb5r0	K63	kb9r6	K115	kb14r1	K167
kb0r7	K12	kb5r1	K64	kb9r7	K116	kb14r2	K168
kb1shunt	K13	kb5r2	K65	kb10shunt	K117	kb14r3	K169
kb1	K14	kb5r3	K66	kb10	K118	kb14r4	K170
kbc12	K15	kb5r4	K67	kbc1011	K119	kb14r5	K171
test1	K16	kb5r5	K68	kb10r0	K120	kb14r6	K172
kb1r0	K17	kb5r6	K69	kb10r1	K121	kb14r7	K173
kb1r1	K18	kb5r7	K70	kb10r2	K122	kb15shunt	K174
kb1r2	K19	kb6shunt	K71	kb10r3	K123	kb15	K175
kb1r3	K20	kb6	K72	kb10r4	K124	kbc1516	K176
kb1r4	K21	kbc67	K73	kb10r5	K125	test8	K177
kb1r5	K22	kb6r0	K74	kb10r6	K126	kb15r0	K178
kb1r6	K23	kb6r1	K75	kb10r7	K127	kb15r1	K179
kb1r7	K24	kb6r2	K76	kb11shunt	K128	kb15r2	K180
kb2shunt	K25	kb6r3	K77	kb11	K129	kb15r3	K181
kb2	K26	kb6r4	K78	kbc1112	K130	kb15r4	K182

Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator	Relay Name	Reference Designator
kbc23	K27	kb6r5	K79	test6	K131	kb15r5	K183
kb2r0	K28	kb6r7	K80	kb11r0	K132	kb15r6	K184
kb2r1	K29	kb6r6	K81	kb11r1	K133	kb15r7	K185
kb2r2	K30	kb7shunt	K82	kb11r2	K134	kb16shunt	K186
kb2r3	K31	kb7	K83	kb11r3	K135	kb16	K187
kb2r4	K32	kbc78	K84	kb11r4	K136	kbc1617	K188
kb2r5	K33	test4	K85	kb11r5	K137	kb16r0	K189
kb2r6	K34	kb7r0	K86	kb11r6	K138	kb16r1	K190
kb2r7	K35	kb7r1	K87	kb11r7	K139	kb16r2	K191
kb3shunt	K36	kb7r2	K88	kb12shunt	K140	kb16r3	K192
kb3	K37	kb7r3	K89	kb12	K141	kb16r4	K193
kbc34	K38	kb7r4	K90	kbc1213	K142	kb16r5	K194
ktest2	K39	kb7r5	K91	kb12r0	K143	kb16r6	K195
kb3r0	K40	kb7r6	K92	kb12r1	K144	kb16r7	K196
kb3r1	K41	kb7r7	K93	kb12r2	K145	kb17shunt	K197
kb3r2	K42	kb8shunt	K94	kb12r3	K146	kb17	K198
kb3r3	K43	kb8	K95	kb12r4	K147	test9	K199
kb3r4	K44	kbc89	K96	kb12r5	K148	kb17r0	K200
kb3r5	K45	kb8r0	K97	kb12r6	K149	kb17r1	K201
kb3r6	K46	kb8r1	K98	kb12r7	K150	kb17r2	K202
kb3r7	K47	kb8r2	K99	kb13shunt	K151	kb17r3	K203
kb4shunt	K48	kb8r3	K100	kb13	K152	kb17r4	K204
kb4	K49	kb8r4	K101	kbc1314	K153	kb17r5	K205
kbc45	K50	kb8r5	K102	test7	K154	kb17r6	K206
kb4r0	K51	kb8r6	K103	kb13r0	K155	kb17r7	K207
kb4r1	K52	kb8r7	K104	kb13r1	K156	—	—

3. Remove the front panel, as shown in the following image.

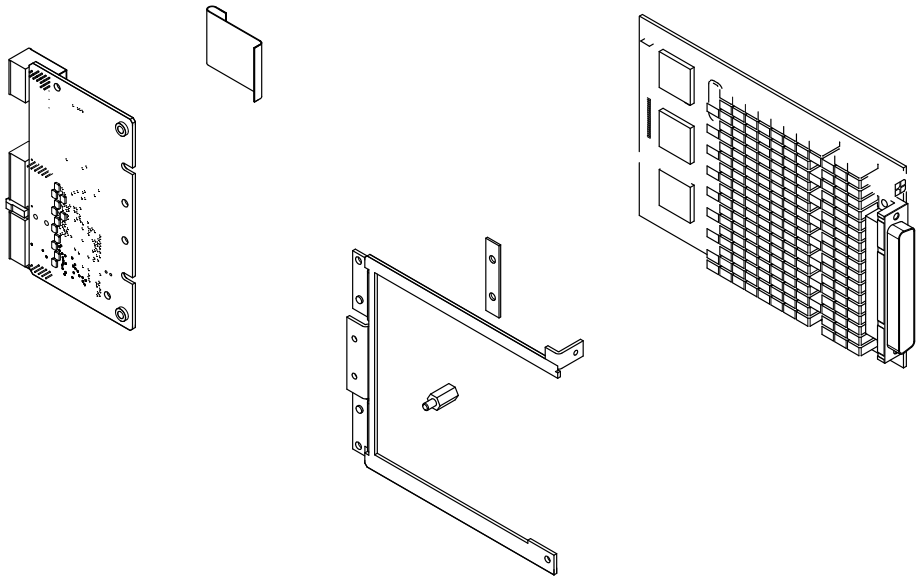
Figure 2. Removing the Front Panel



a. Bracket
b. Front Panel
c. Front Panel Overlay
d. Screws

4. Remove the bracket, as shown in the following image.

Figure 3. Removing the Bracket



a. CA3 Digital Back End
b. Bracket
c. Daughter Card
d. Screws

5. Replace the relay as you would any other through-hole part. Trim the replaced relay leads to no more than 1 mm (0.04 in.) from the PCB.

Tip Use the NI-SWITCH Switch Soft Front Panel to reset the relay count after you have replaced a failed relay. Refer to the **Switch Soft Front Panel Help** for more information.