

BenchSystem™ Reed Relay, Brr1

Tools for Scientists and Engineers

Overview

Example Applications:

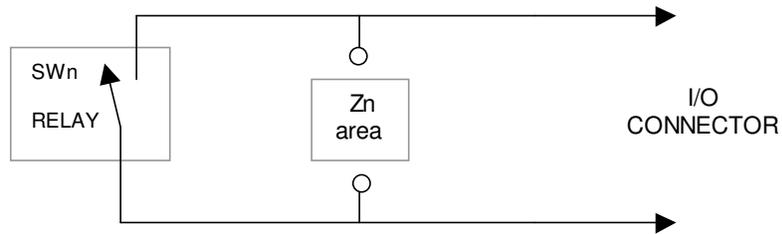
- Isolated signal routing to test and measurement equipment.
- Isolated control switching.

Features:

- 16 individual Form-A (SPST normally open) reed switches.
- Low leakage current. Long life.
- Individual relay status lamps.
- Intuitive command syntax simplifies relay grouping and MBB (Make Before Break) and BBM sequencing.
- Mounting areas provided for individual contact suppression networks.
- All signals are on one pluggable connector for quick disconnects.

The BenchSystem Reed Relay module provides isolated switching for various circuit applications. The unit receives commands and power from the Local Interface Bus (LIB). It is controlled by a simple set of single-letter commands.

For a discussion of the BenchSystem and the LIB bus, see the BenchSystem Controller datasheet.

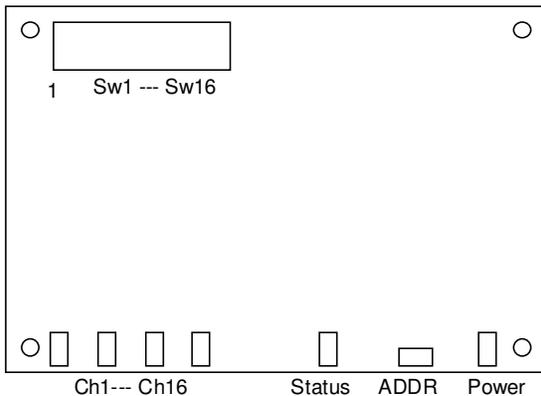


1 of 16 isolated switch channels

Hardware Description

This section explains the functionality of the Brr controls. Command examples are shown. The programming examples also illustrate features of the language and programming techniques.

In the following definitions: **(in)** refers to a BRR input signal, **(out)** to a Brr output, and **(i/o)** can be either.



Connector Layout and Pin One Locations

(To mount, wire, and program a BenchSystem see the “Bsys Getting Started.pdf” file.)

Buttons and Indicators

- Power Lamp** ON while 12Vdc power is applied at the LIB connector.
- Status Lamp** ON momentarily during the power-up memory test.
ON momentarily when a command is accepted.
ON while the ADDR button is being held in.
- Addr Button** Press and hold to force the card to accept any command, regardless of address, while it is being held. *This button must be held in to change the card address.* See bsys getting started.pdf.
- Ch1-16 Lamps** ON while the relay is Energized (while the switch is closed).

Power-on Reset

Applying 12Vdc power at the LIB connector causes the following events:

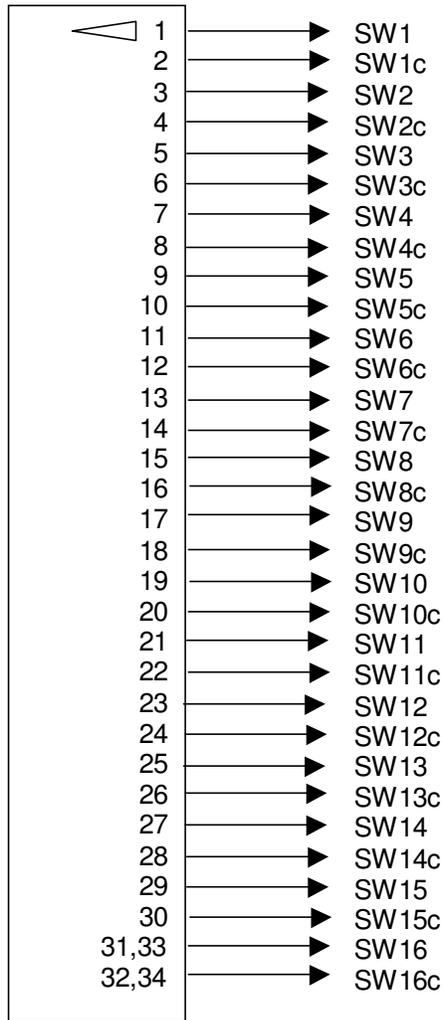
- The on-board microprocessor memory is tested.
- I/O signals are initialized.
- The LIB communication port is initialized.

Relay Channels

The Brr command list executes much faster than the relays can respond. Use the *delay command* to pause command execution for one relay-settling time when Make-Before-Break (MBB) or Break-Before-Make (BBM) operations are needed.

When switching *capacitive loads* a strong rush current occurs when the switch closes: $i = C dv/dt$. Current limiting series resistance may be needed to limit this current to an acceptable value.

When switching *inductive loads*, such as a solenoid or relay coil, a voltage spike is induced when the switch opens. Mounting holes are provided across each relay switch for arc suppression or voltage clamping circuitry, see Zn on the figure above.



RELAY SWITCH CONNECTOR (J2)

Brr Command Set

This section defines the commands used to control a Brr card over the Local Interface Bus. A command line can have one or more commands; up to 126 characters per line. Commands execute from left to right and spaces are optional. Command definitions use the following arguments:

- t a list of channel numbers 1-16. For example: "1-4,9,7" is channels 1,2,3,4, 9,and 7. The list executes from left to right.
- n a number between 65535 and -65536.
- x text characters, including numbers and punctuation.

Function level commands

These commands are used to control the relays on the Brr.

- E t** Energize relays in list t.
- D t** De-energize relays in list t
- ;** Semi-colon will **delay for one relay settling time**, before executing the rest of the command line. Use to guarantee MBB and BBM. For example "D7-9;E6" will de-energize coils 7-9, pause a few milliseconds while those relays settle, and then energize coil 6, to force a BBM operation.
- S n** n= 1 to 16. Return the Status of switch n as either 'E' (energized) or 'D' (de-energized).

System level commands

These commands are used for overall system configuration.

- idxxx** Set a unit id of xxx where xxx is up to 14 characters of text, terminated by the end of the command line. The ID is stored in non-volatile memory.
- a n** Set the unit address to a value 1-31. The Address is stored in non-volatile memory onboard the Brr.
- ?** Read back the Status of the **Brr**. An example status string is: 80,04,Brr1a,Unit_Id
 - 80 is the Brr Error status in hexadecimal format b8-b1 where:
 - ♣ b8 = Power UP has occurred
 - ♣ b7 = A non-volatile memory error has occurred. The address and unit ID must be redefined.
 - ♣ b6 = 0.
 - ♣ b5 = Response message Oflo (>100 characters).
 - ♣ b4 = Received message Oflo (>100 characters).
 - ♣ b3 = LIB communication errors. Check termination rules.
 - ♣ b2 = Unrecognized Command.
 - ♣ b1 = Illegal Command Argument.
 - 04 is the Unit Address.
 - Brr1a is the Unit Revision as set by the factory.
 - Unit_Id is the user programmable text string.

Programming Examples

There are 2 ways to communicate with the Local Interface Bus I/O cards from a BTC1 controller card:

1. Type a **putlib** command directly from the Console terminal when an BSOP program is not running.
2. From an BSOP program, using a **lib** command.

Console example

Console commands are interactive and work only when typed directly at the console terminal.

Type and Enter: putlib 1,E3S2 to set relay #3 on a BRR1 module and check the status of relay #2
--

BSOP Program example

Program commands work only from within a program file that has been “uploaded” to the controller and “run”.

Code Sample

/ Set a pattern and read a status. Illustrates that the result of the lib action can become the argument of console.

```
string  s;
```

```
start:
```

```
lib 1  "D2;E3-5";
```

```
      / Break #2, delay , Make #3,4,5.
```

```
s = lib 1  "S2 ";
```

```
      / Request and then read the 'E' or 'D' status of relay channel 2.
```

```
console s ;
```

```
      / print the 'E' or 'D' status of relay #2
```

```
·
  console lib 1  "S2 ";
```

```
      / or do the same thing with in-line coding on one line and eliminate the variable.
```

Specifications

Electrical

Parameter	Conditions	Min	Typical	Max	Units
+12V	I target=0.2A 0-40deg C	8.5	12	17.5	V (1)
Card Input Current	30mA + 16 x 10mA / coil		190		mA
Insulation Resistance	adjacent channels, open SW		10 ??		G ohms
Switching Current	dc or peak ac, resistive		500		mA
Switching Voltage	dc or peak ac, resistive		200		V
Carry Current	dc or peak ac, resistive		1.0		A
Contact Rating	dc or peak ac, resistive		10		Watts
Isolation Voltage	adjacent channels, open SW		200 ??		V
Capacitance	adjacent channels, open SW		2		pF
Operating Life (2)	1V @ 1mA resistive load		100 million		ops
Contact Resistance	50mV, 10mA		200		mOhm

- Notes: 1. Derate max from 40-70 degC: 17.5V – 140mV/degC
 2. Relay Manufacturer and Part No.: COTO 9007-05-00

Timing

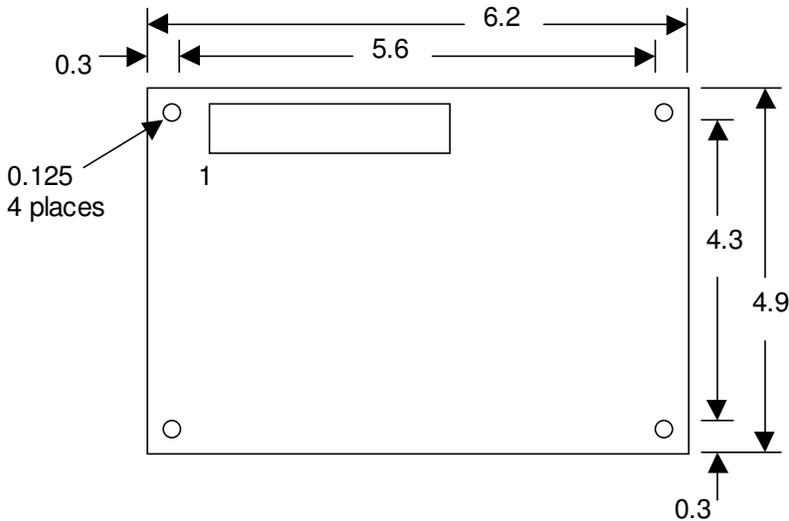
Parameter	Min	Typical	Max	Units
Settling delay command time		2.0		mS
Individual command execution time.		^^500		uS

Environmental

Operating Temperature: 0 to 70 degrees C.
 Storage Temperature: -20 to 85 degrees C.^

NOTE: Specifications are subject to change without notice.

Mechanical



Revisions

Preliminary:	11/11/03
Beta:	11/12/03
Beta2	12/26/03

Troubleshooting

Power led is not ON.

The 12Vdc is not present at the LIB connector, it is reversed, or the fuse on the card is blown. Measure 11Vdc on both sides of the fuse, F1. Verify that the LIB bus RJ11 plugs are wired one-to-one.

Status led remains ON.

'He's dead, Jim'. Contact the factory.

The status led does not blink when a command is sent. It could be:

1. CommA and CommB wiring on the LIB bus is reversed. Verify that the phone connectors are wired one-to-one.
2. The address is incorrect. Enter "putlib 31,?" from the console while holding in the address button, to see the actual address. This will always return a status unless there is a card on the bus with an address of 31.

The relay contacts seem to be Open or Closed regardless of the channel indicator.

The contacts may be welded shut or burned open. Verify the voltage at the relay coil to be >4.6V 'E', and <0.4V 'D'. Read Relay Operation in the Hardware Description concerning arc suppression and contact loading.

Known Issues

Board Revision History

7/27/03 Beta for board and spec sheet.

Future Changes

ExacTest Corporation may make changes to or discontinue the availability of its products and literature at any time.