

# On/Off control of motors and other mechanisms - Relays

For On/Off control of motors or other mechanisms such as solenoids, lights or other custom circuits, WPILib has built in support for relay outputs designed to interface to the Spike H-Bridge Relay from VEX Robotics. These devices utilize a 3-pin output (GND, forward, reverse) to independently control the state of two relays connected in an H-Bridge configuration. This allows the relay to provide power to the outputs in either polarity or turn both outputs on at the same time.

## Relay connection overview

The cRIO provides the connections necessary to wire IFL spikes via the relay outputs on the digital breakout board. The breakout board provides a total of sixteen outputs, eight forward and eight reverse. The forward output signal is sent over the pin farthest from the edge of the breakout board, labeled as output A, while the reverse signal output is sent over the center pin, labeled output B. The final pin is a ground connection.

## Relay Directions in WPILib

Within WPILib relays can be set to `kBothDirections` (reversible motor or two direction solenoid), `kForwardOnly` (uses only the forward pin), or `kReverseOnly` (uses only the reverse pin). If a value is not input for direction, it defaults to `kBothDirections`. This determines which methods in the Relay class can be used with a particular instance.

## Setting Relay Directions

```
exampleRelay = new Relay(1);  
exampleRelay = new Relay(1, 2);  
exampleRelay = new Relay(1, Relay.Direction.kForward);  
exampleRelay = new Relay(1, 2, Relay.Direction.kReverse);  
  
exampleRelay.set(Relay.Value.kOn);  
exampleRelay.set(Relay.Value.kForward);
```

Relay state is set using the `set()` method. The method takes as a parameter an enumeration with the following values:

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- kOff - Turns both relay outputs off
- kForward - Sets the relay to forward (M+ @ 12V, M- @ GND)
- kReverse - Sets the relay to reverse (M+ @ GND, M- @ 12V)
- KOn - Sets both relay outputs on (M+ @ 12V, M- @ 12V). Note that if the relay direction is set such that only the forward or reverse pins are enabled this method will be equivalent to kForward or kReverse, however it is not recommended to use kOn in this manner as it may lead to confusion if the relay is later changed to use kBothDirections. Using kForward and kReverse is unambiguous regardless of the direction setting.