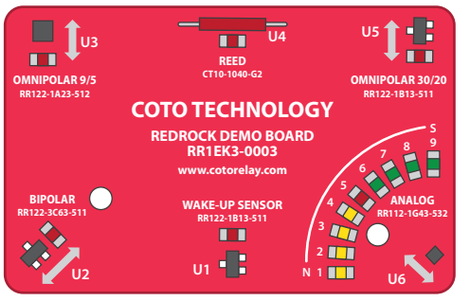
QUICK START GUIDE - RR1EK3-0003

Coto Technology offers the lowest power and highest sensitivity magnetic sensors in the world. They operate based on tunneling magnetoresistance (TMR) technology which is more sensitive than Hall technology and other magnetoresistive technologies. This demonstration kit permits you to evaluate the performance of sensors on the board with supplied magnets and/or other magnets.

DEMONSTRATION KIT CONTENTS:

- Auto Turn-on Demonstration Circuit board
- Magnet-1: Linear magnet
- Magnet-2: Rotational magnet with center post
- Spare Battery: 3V CR2032 coin cell



DEMO BOARD DESCRIPTION

This demo board operates off a 3V coin cell battery and automatically turns on when removed from the box. Auto Turn-on function is enabled using an omnipolar sensor U1 (RR122-1B13-511) and a magnet installed in the box. This board demonstrates operation of the following sensors mounted on the PCB.

U1 - Omnipolar 30/20 RR122-1B13-511 Digital Sensor used for Wake-up

U2 - Bipolar RR122-3C63-511 Digital Sensor

U3 - High-sensitivity Omnipolar 9/5 RR122-1A23-512 Digital Sensor

U4 - CT10-1040-G2 Molded Reed Switch

U5 - Omnipolar 30/20 RR122-1B13-511 Digital Sensor

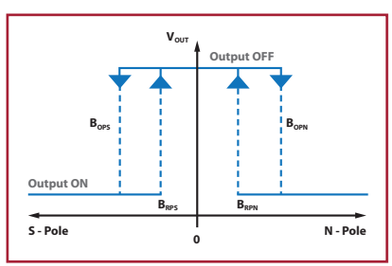
U6 - Analog RR112-1G43-532

LEDs on the outputs of the digital sensors indicate when the sensor is triggered. LED array (numbered 1-9 in the above graphic) shows voltage output from the Analog sensor.

Features and Output Characteristics of the sensors and typical applications are described below.

U1/U5: RR122-1B13-511 30/20 Omnipolar Digital Sensor

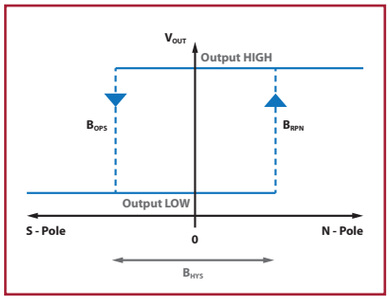
B_{OP}= ±30G, B_{RP}= ±20G, 10Hz. Activated with north or south magnet poles. For more details on the sensor and other options available, please refer to the RR122-1B13-511 datasheet.



Applications: Security, Proximity Sensing, Door Closed/Open Detectors, Wake-Up Sensors.

U2: RR122-3C63-511 Bipolar Digital Sensor

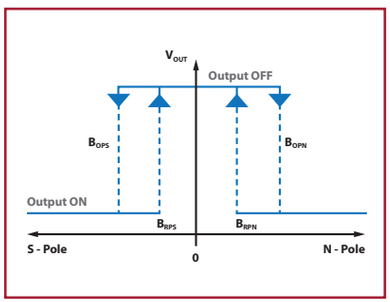
B_{OP}= -10G, B_{RP}= 10G, 500Hz. Activated with south pole, stays latched. De-activated with north pole. For more details and other options available, please refer to the RR122-3C63-511 datasheet.



Applications: Rotation Sensing such as in Utility Meters, RPM Counting, and Reciprocating Systems.

U3: RR122-1A23-512 High-Sensitivity 9/5 Omnipolar Digital Sensor

B_{OP}= ±9G, B_{RP}= ±5G, 10Hz. Activated with north or south magnet poles. For more details on the sensor and other options available, please refer to the RR122-1A23-512 datasheet.

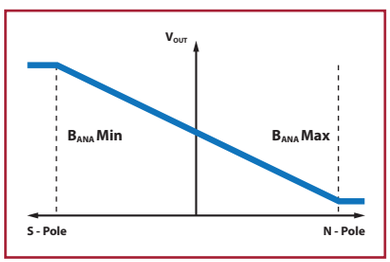


Applications: Fluid Flow Sensors, Toggle Switching, Linear Position Measurement, Security, Proximity Sensing, Door Closed/Open Detectors, Wake-Up Sensors.etc.

U6: RR112-1G43-532 Analog Sensor

Ratiometric analog output; Sensitivity: -20mV/V/G.

Analog output is proportional to the magnetic field strength and polarity. When no magnet is present, output is at $V_{DD}/2$. For more details, please refer to the RR112 datasheet.



Applications: This sensor can be used to measure precise magnet linear or rotation position using the analog output.

CIRCUIT BOARD OPERATION

Remove the board from the box. This will cause U1 (RR122-1B13-511) to turn ON power to the board, and will light up the centrally located red Power Indicator LED. Also note that the LED-5 (red) will also be lit, indicating no magnet present at the RR112.

White arrows on the board indicate the direction of sensitivity for each sensor. Move the north and south poles of the linear magnet in the direction of the arrows to investigate operation of the Omnipolar and Bipolar sensors. Approach the RR112 with the linear magnet and notice how LEDs in the array light up in response to magnetic field strength from the north and south poles. Insert the short post of the rotational magnet into the hole next to U2 bipolar sensor, then turn the magnet to demonstrate performance of the bipolar sensor. Similarly, insert the short post of the rotational magnet into the hole next to the U6 Analog Sensor, then turn the magnet to demonstrate use of the RR112 for angle measurement. Use the grid space and the workbook on the back side of this *Quick Start Guide* to make quick measurements with the supplied linear magnet and other magnets in order to evaluate the performance of the sensors and magnets.

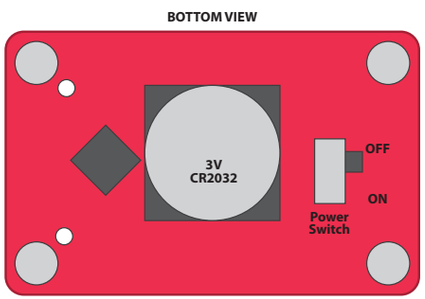
Please note: If the linear magnet is brought close to the wake-up sensor (U1), the board will power down, demonstrating the Auto-turn-ON function.

To turn the board off: Place the board into the box, in the correct orientation. A magnet embedded in the box will activate the wake-up sensor U1, which will drive the circuit to power-down the board. U1 consumes less than 50nA and, therefore, does not drain the battery appreciably, demonstrating Auto-ON function in power-down mode. In order to power down the board when outside the box, turn OFF the power switch on the bottom side. The switch may be turned back ON prior to placing the board in the box.

During extended normal operation, it is possible that the battery voltage will drop and, with no magnet present, LED-4 will light up; this is normal. If LED-4 (yellow) or LED-3 (yellow) is lit when the board is first removed from the box and a magnet is not present, this indicates that the battery is approaching depletion. In this case, replace the battery with the spare. **Please also remember to replace the spare battery in the kit with a fresh 3V battery (CR2032).**

TROUBLESHOOTING

If the board does not power up when removed from the box, [1] remove any magnet close to the wake-up sensor U1, [2] turn ON the switch on the bottom of the board, [3] replace the battery.



If the board does not turn OFF upon placing it into the box, [1] orient the board correctly in the box, [2] ensure wake-up magnet is present in the box, [3] turn OFF the power switch.

How to extend battery life: LEDs and other circuit elements drain the battery during normal operation. Whenever the board is outside the box, but not in use, turn OFF the power switch to conserve battery energy.

SUPPORT

For Datasheets and a full User's Guide showing a schematic of the circuit board, please visit **www.cotorelay.com** or send an email to **appsupport@cotorelay.com**

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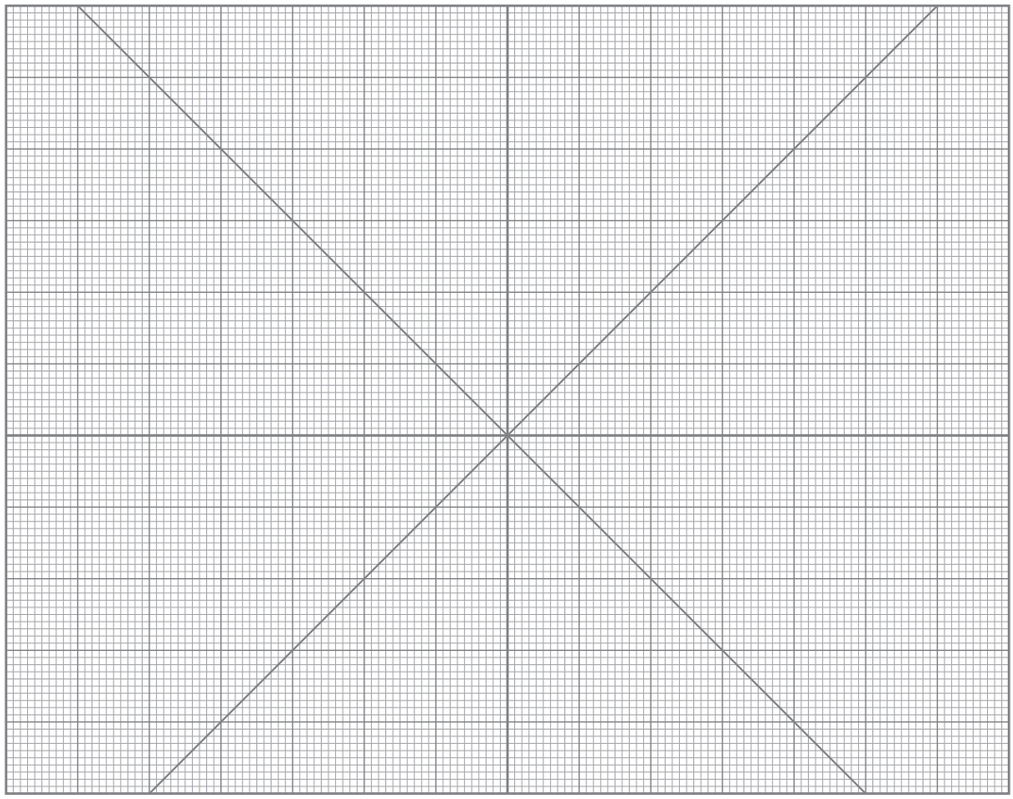

		Linear Magnet	Magnet-2	Magnet-3	Magnet-4
U1/U5: Omnipolar 30/20 Digital Sensor RR122-1B13-511					
N-pole	Operate distance				
	Release Distance				
S-pole	Operate distance				
	Release Distance				
U2: Bipolar Digital Sensor RR122-3C63-511					
N-pole	Release Distance				
S-pole	Operate distance				
U3: High-Sensitivity Omnipolar 9/5 Digital Sensor RR122-1A23-512					
N-pole	Operate distance				
	Release Distance				
S-pole	Operate distance				
	Release Distance				
U4: Reed Switch CT10-1040-G2					
N-pole	Operate distance (board turns OFF)				
	Release Distance (board turns ON)				
S-pole	Operate distance (board turns OFF)				
	Release Distance (board turns ON)				

		Linear Magnet	Magnet-2	Magnet-3	Magnet-4
U6: Analog Sensor RR112-1G43-532					
N-pole	1 - Yellow				
	2 - Yellow				
	3 - Yellow				
	4 - Yellow				
0-Field	5 - Red				
S-pole	6 - Green				
	7 - Green				
	8 - Green				
	9 - Green				

Note:

- Comparing how a magnet performs with U3 and U5 permits studying how sensor sensitivity impacts performance. The operate and release distances of U3 and U5 can then be compared to those of a typical reed switch (U4).
- Comparing how different magnets perform with a sensor permits studying how magnet strength impacts sensor performance.
- These measurements may only be used as first order study.
- For more accurate measurements please contact Coto Applications Support at: **appsupport@cototechnology.com**

Coto Technology TMR Sensor Workbook

The demo board can also be used to simulate an end application using the grid area in the *Quick Start Guide* and the simple steps described for the setup and experiments. Use the workbook area to record and compare sensor performance results with the supplied magnets and/or with application specific magnets.

Set up for the measurements with these steps

[1] Align edge of board parallel to grid, and Sensor on intersection of grid lines

[2] Grid lines are spaced approximately 1mm apart

Measure the Digital sensors following these steps

[1] Align cylindrical magnet with sensor grid line

[2] From ~25mm away, gradually move closer until sensor turns ON, and LED turns ON

[3] Hold magnet position, and record "Operate" distance

[4] From here, gradually move magnet away until sensor releases, and LED turns OFF

[5] Record "Release" distance

[6] Repeat with opposite magnet pole

Measure the Analog output from sensor U5 following these steps

[1] Start with N-pole close to board, and move away until LED is stable

[2] Then reverse magnet and gradually move S-pole close to sensor

[3] Record magnet position as each LED turns ON

Repeat measurement steps with another magnet for comparison