

# WIRELESS MAGNET CONTACT SWITCH

## with Integrated Diagnostic Tools

### INSTALLATION GUIDE



This guide covers all models of MC-21 switch.

### Overview

The MC-21 product family includes:

- MC-21U Window/Door Switch with 902 MHz radio
- MC-21Y Window/Door Switch with 868 MHz radio
- MC-21J Window/Door Switch with 928 MHz radio

The package includes the magnet contact switch, magnet and installation guide.

### MC-21 Switch Description

The 21 series MC magnet contact switch (also referred to as the switch in this guide) is a wireless, energy harvesting proximity (reed) switch that monitors status of a window or door within interior spaces and transmits the value to linked receiving controllers.

The switch can be configured to monitor close to open and/or open to close transitions or only the state of the switch

This product is intended for indoor use only

NOTE: The MC is a solar powered device that absorbs solar energy storing it for use during low light periods. Before assigning the MC device to a receiver/controller, the device should be exposed to a good light source for a minimum of 6 minutes or install the start assist battery.

## Switch Operation

The Window/Door (MC) switch is mounted to a door or window frame to monitor open, closed and changing states of the door or window. Depending on the receiving controller and application, the switches transmission may trigger the activation of a load such as a light, or a heating or air conditioning load.

The MC switch is powered by solar energy from natural or artificial light sources. The solar energy is transformed into electrical energy which is then stored, providing a continuous power source for the sensor. In some door applications and when used with an occupancy sensor; the switch triggers a change in occupancy and the occupancy sensor latches the current state. Consult the controller's documentation for further information.

The sensor will operate even with a brief exposure to light, however for best results the sensor should be mounted in a location with exposure of 6 hours of natural or artificial light (200 - 500 lux or 20-50 fc) on a daily basis.

The switch transmits telegrams that indicate the state of the door (open/closed or changing). The sensor must be within range of any linked receivers or controllers, installed within 24m (80') of each other. For applications exceeding 24m (80') range, telegram repeaters may be needed to extend the reception range.

The window/door switch supports the following Equipment Profile:

EEP A5-30-02: Digital Input

Window Contact, Single Input

## Telegram Transmissions

The switch will repeatedly broadcast a telegram on a timer (heartbeat timer). The heartbeat has two configurable settings 1000 seconds [default] or 100 seconds.

Telegrams will also be transmitted on open or closed events of the reed switch (or on the wake cycle in certain configurations). The default setting has a telegram sent on each open or close event. The type of event that will cause the device to wake up and transmit can be configured to allow energy savings (prolonged life in low light conditions).

**TIP: To configure transmissions , refer to section, Test Operating Modes- "Reed Transmission Select Mode and Heartbeat Select Mode".**

**TIP: To get feedback on the light level where the sensor is mounted, refer to sections "Test Operating Modes" and "Light Level Test".**

**TIP: For range verification between the sensor and controller, refer to sections "Test Operating Modes" and "Installing Wireless Devices".**

## Mounting the Sensor

The MC-21 switch should be mounted with the switch housing on the door/window trim and the magnet on the door or window. The mounting location of the sensor is important as

this will directly affect the receiver's reception of the telegrams. Before installing, refer to the sections in the guide detailing the installation of wireless devices, layout tips and test operation modes.

Some applications will require the switch to be mounted on the door or window. It is preferable to install the switch closer to the hinged edge in these applications and always perform a thorough check to insure normal use will not damage the switch.

Some door/window trim is beveled causing the switch to be at a slight angle to the magnet; this is not a problem so long as the orienting of the magnet directions are followed.

On some commercial applications with deep trim, the switch may have to be located with the solar cell facing downwards. This method is not ideal, but is acceptable if there is enough ambient light to charge the solar cells.

See the sections on light level test and range confirmation\* to aid in optimal placement. \* (requires F series Echoflex controller)

The sensor can be mounted using screws (not supplied) through the back plate or using double-sided tape or Velcro™ (not supplied).

The magnet provided with the window/door switch models should be mounted on the door or window.

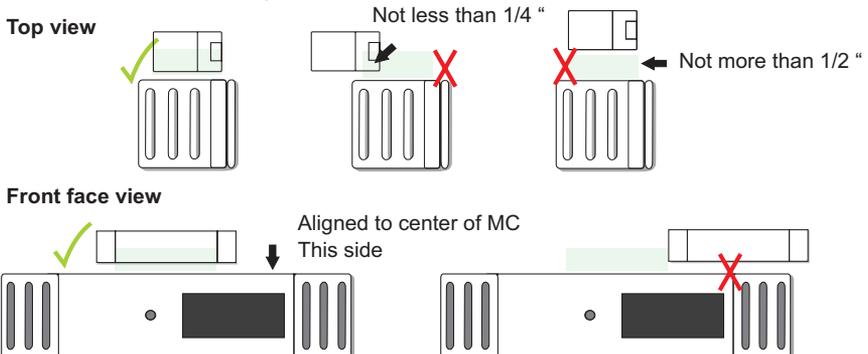
Refer to the magnet orientation section of the guide before installing. Remove the decorative cover revealing the two mounting holes and mount using screws (#6, not provided). Replace the cover.

## Orienting the magnet to the switch

The magnet placement is critical for the switch to operate properly.

The switch has a label on the side face indicating which side the magnet should be mounted adjacent to plus the ideal location of the magnet.

The gap between the switch housing and magnet should not exceed 1/2", nor should it be so close as to cause damage during the opening and closing of the door, leave a minimum 1/8" gap. The ideal planar orientation of the magnet to the switch should include the entire magnet profile; for reliable operation do not mount with less than 1/4" profile.



## Linking a Switch to a Controller or Receiver

This process requires the controller or receiver to be mounted and powered and within range of the sensor to be linked.

1. Activate LEARN or LINK mode at the receiver, if necessary refer to the manufacturer documentation.
2. Tap the switches TEACH button.
3. Deactivate LEARN mode at the receiver.

## Installing or Replacing the Start Assist Battery

The battery is not required for normal operation. The battery may be useful for installation purposes (when using the Range Confirmation test which depletes the energy stores of the MC quickly.)

1. Using a fingernail or small flat head screwdriver, pop the rear mounting plate off the sensor.
2. To remove old battery: Using a small flat head screwdriver or pen as a lever, insert pointed end under the battery's edge and pop out of the holder.
3. Install or replace the battery in the clip with a new CR1632 coin cell battery ensuring the battery edge is under the retaining clip and positive side (+) is facing up.
4. Press the rear mounting plate back into position.



Teach Button

## Test Operating Modes

The following tests can be selected when in test mode.

1. Light Level Test
2. Range Confirmation Test
3. Reed Test Mode
4. Reed Transmission Select Mode
5. Heartbeat Select Mode

**Light Level Test:** This test provides visual feedback of the immediate energy produced by the solar panels.

1. To enter Light Level Test mode, press and hold the teach button until the green LED begins to blink (about 6 seconds - LEDs are located on right hand side of the solar panel).
2. Press and hold the teach button again until the green LED stops blinking, about 6 seconds. The green LED will start blinking faster in accordance to the light level it is detecting, see tables below.

### MC-21 Light Test Indication

blinks	lux	foot candles	time to fully charge	discharge time
0	< 30	<3	below operating level	n/a
1	30-100	3-10	operational with no state changes	n/a
2	100-200	10-20	operational with any number of open-close or close to open state changes	min 48 hours
3	200-500	20-50	48 hours	100 hours
4	500-1000	50-100	24 hours	150 hours
5	1000+	100+	12 hours	200 hours

The time to fully charge is based on the storage capacitor charging from a non-operational condition. Discharge time indicates how long a fully charged sensor will operate in the dark when set to the 100 second heart beat timer. The test will repeat every 2 seconds and run for a duration of 100 seconds. You may quit the test at any time by pressing the Test button for 6 seconds.

**Range Confirmation Test:** This test provides visual feedback of the sensors signal strength by a linked receiver with range confirmation capability.

- Range Confirmation only available with “F series” Echoflex Controllers.
- The MC must be at full charge and/or have the battery installed for Range Confirmation Tests energy requirements.
- Only one receiver can be linked to the sensor for proper operation of the test.
- Disable repeaters in range for proper test operation.

To enter Range Confirmation Test mode, press and hold the teach button until the green LED begins to blink (about 6 seconds).

1. A quick press and release of the button at this point will allow you to select between test modes. Pressing and releasing the test button scrolls through the LED indicators. When the amber LED is blinking, go to step 3.
2. Press and hold the test button again for 6 seconds to select Range Confirmation Test.

All three LED’s will blink (for 1 second) in this test mode when the sensor transmits or receives a Range Confirmation Telegram followed by the sensor displaying the linked signal strength status for 2.5 seconds, see table below.

LED	Signal Strength
Green - Blinking 2.5 sec	-41 to -70 dBm
Amber - Blinking 2.5 sec	-70 to -80 dBm
Red - Blinking 2.5 sec	-80 to -95 dBm
No LED	No linked receivers detected

The test will repeat every 10 seconds and run for a duration of 3 minutes. You may quit the test at any time by pressing the test button for 6 seconds.

**Reed Test Mode:** This test provides visual feedback to show if the reed switch is open or closed.

1. To enter Reed Test mode, press and hold the teach button until the green LED begins to blink (about 6 seconds).
2. A quick press and release of the button at this point will allow you to select between test modes. Pressing and releasing the test button scrolls through the LED indicators. When the red LED is blinking, go to step 3.
3. Press and hold the test button again for 6 seconds to select Reed Test Mode.

The red LED will blink if the switch is closed and the green LED will blink if the switch is open. The test times out in 100 seconds. If a quicker exit is desired, press and hold the teach button for 10 seconds to exit the test.

### **Reed Transmission Select Mode:**

Under normal operation, the switch stays in a static state until it wakes up by a 100 second timer expiring or by an interrupt. Upon a wake-up, the switch will check the state of the reed switch (open or closed) and send a telegram if the switch state has changed. The switch sends out a telegram on a heartbeat (every 10 wake cycles) if no change has occurred.

An interrupt will occur when the switch goes from an open to close state or closed to open state by default with a telegram transmitted immediately. The user can adjust when an interrupt occurs causing a telegram transmission.

The selections include sending a telegram:

- on each open or close event - default setting
- on open events only
- on close events only
- on wake-up only, every 100 seconds

The reduction of transmissions can be useful if low light conditions or frequent door movement require the switch to conserve energy.

1. To enter Reed Transmission Select mode, press and hold the teach button until the green LED begins to blink (about 6 seconds).
2. A quick press and release of the button at this point will allow you to select between test modes. Pressing and releasing the test button scrolls through the LED indicators. When the red and amber LEDs are blinking, go to step 3.
3. Press and hold the test button again for 6 seconds to select Reed Transmission Select Mode. See the table below.

Setting	Indication	Behavior
Default- all state changes	Green LED Blinking	Open to closed and closed to open will cause immediate transmission of either state changes, the last state change will be transmitted again on the next 100 second wake cycle.
Closed to Open	Amber LED Blinking	The switch will transmit closed to open switch state immediately, and on the next 100 second wake cycle.
Open to Closed	Red LED Blinking	The switch will transmit open to closed switch state immediately, and on the next 100 second wake cycle.
No state changes transmitted	Red and Amber LED Blinking	The switch will only transmit on the heartbeat (default 1000 seconds) if the state of the switch remains the same. The switch wakes up every 100 seconds. If it detects a change, it will transmit on the wake cycle. (The maximum time from door/window movement to next transmission is 100 seconds.

The test times out in 100 seconds. If a quicker exit is desired, press and hold the teach button for 10 seconds to exit the test.

**Heartbeat Select Mode:** The heartbeat select mode allows the installer to change the heartbeat setting on the switch. The default heartbeat is once every 1000 seconds. To enter Heartbeat Select mode, press and hold the teach button until the green LED begins to blink (about 6 seconds).

1. A quick press and release of the button at this point will allow you to select between test modes. Pressing and releasing the test button scrolls through the LED indicators. When the red and green LEDs are blinking, go to step 3.
2. Press and hold the test button again for 6 seconds to select Heartbeat Select Mode. See the table below.

Setting	Indication	Behavior
Heartbeat of 100 seconds	Amber LED Blinking	Transmits once every wake cycle
Default - Heartbeat of 1000 seconds	Green LED Blinking	Transmits once every 10 wake cycles if there are no switch state changes. If a reed state change is transmitted, it will send a redundant transmission on the next wake cycle and then resume the 1000 second heartbeat.

The test times out in 100 seconds. If a quicker exit is desired, press and hold the teach button for 10 seconds to exit the test.

## Wireless System Layout Hints

- Avoid locating transmitters and receivers on the same wall.
- Avoid locating transmitters and receivers where the telegrams must penetrate walls at acute angles. This increases the material the telegram must pass through reducing the signal power.
- Avoid large metal obstructions as they create radio shadows. Place receivers in alternate locations to avoid the shadow or use repeaters to go around the obstacle.
- Do not locate receivers close to other high frequency transmitters.
- Leave at least 3' between the receiver and any other source of interference including, ballasts, LED drivers, computers, video equipment, Wi-Fi/LAN routers, GSM modems and monitors.

## Agency Listings and Compliance

### FCC Part 15.231 (902 MHz model only)

Contains FCC ID: SZV-STM300U

The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (i.) this device may not cause harmful interference and
- (ii.) this device must accept any interference received, including interference that may cause undesired operation.



### IC RSS-210: (902 MHz model only)

Contains IC: 5713A-STM300U

### CE (868 MHz models only)

CE Marking



### ARIB STDT108 (928MHz models only)

Complies with the Japanese radio law and is certified according to ARIB STDT108.

This device should not be modified (otherwise the granted designation number will become invalid)



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Specifications subject to change without notice.

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