

User Guide

MSG O3A Motion Detection Sensor

All variants

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www.mirandasolutionsgroup.com



CONIENIS

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ABOUT THE WIRELESS VIBRATION METER SENSOR

The Wireless Vibration Meter Sensor uses an accelerometer to measure vibration speed and frequency and report on 3 axes. The sensor reports speed (mm/s) and frequency (Hz) on all three axes, and duty cycle (how much of the report interval vibration was present).

- Three axis measurement
- Reports critical vibration and frequency data
- Runtime indication via duty cycle

The Vibration Meter measures the vibration intensity of the system to which it is attached. The sensor uses an accelerometer to capture g-force on all axes and then calculates speed and frequency from that acceleration data. The Vibration Meter reports the duty cycle, or how long the sensor was measuring vibrations throughout the heartbeat.

Wireless Vibration Meter Sensor Features

- Wireless range of 1,200+ feet through 12+ walls *
- Frequency-Hopping Spread Spectrum (FHSS)
- Interference immunity
- Power management for longer battery life **(12+ years on AA batteries)
- Encrypt-RF® Security (Diffie-Hellman Key Exchange + AES-128 CBC for sensor
- data messages)
- Onboard data memory stores up to hundreds of readings per sensor:
 - 10-minute heartbeats = 22 days
 - 2-hour heartbeats = 266 days
- Over-the-air updates (future proof)

* Actual range may vary depending on environment.

** Battery life is determined by sensor reporting frequency, battery type, and other variables.

Example Applications

- Vibration monitoring
- Smart machines, smart structures & smart materials
- Bridge and building seismic activity monitoring
- Assembly line monitoring
- Additional applications

SENSOR SECURITY

MSG has taken extreme measures to ensure your data security is handled with the utmost care and attention to detail. The same methods utilized by financial institutions to transmit data are also used in MSG 03A's security infrastructure. Security features of the gateway



include tamper proof network interfaces, data encryption, and bank-grade security. MSG O3A leverages industry leading partner's proprietary sensor protocol which uses low transmit power and specialized radio equipment to transmit application data. Wireless devices listening on open communication protocols cannot eavesdrop on sensors. Packet level encryption and verification is key to ensuring traffic is not altered between sensors and gateways. Paired with best-in-class range and power consumption protocol, all data is transmitted securely from your devices. Thereby ensuring a smooth, worry-free, experience

Data Security on the Sensor

The fortified sensor secures your data from attackers and secures the sensor from becoming a relay for malicious programs. Even when the sensor is at rest, the sensor is designed to prevent prying eyes from accessing the data. The sensor does not run on an off-the-shelf multi-function OS (operating system). Instead it runs a purpose-specific real-time embedded state machine that can't be hacked to run malicious processes. It also provides no active interface listeners that can be used to gain access to the device over the network.

Data Security on the Gateway

The gateways are designed to prevent prying eyes from accessing the data that is stored on the sensors. Gateways do not run on an off the shelf multi-function OS (operating system). Instead they run a purpose specific real-time embedded state machine that cannot be hacked to run malicious processes. There are also no active interface listeners that can be used to gain access to the device over the network. The fortified gateway secures your data from attackers and secures the gateway from becoming a relay for malicious programs.

ViewMySensors Security

The online software and central hub for configuring your device settings. All data is secured on dedicated servers operating Microsoft SQL Server. Access is granted through the viewmysensors user interface, or an Application Programming Interface (API) safeguarded by 256-bit Transport Layer Security (TLS 1.2) encryption. TLS is blanket of protection to encrypt all data exchanged between viewmysensors.com and you.

ORDER OF OPERATIONS

It is important to understand the order of operations for activating your device. If done out of order, your device may have trouble communicating with the MSG 03A software (viewmysensors). Please consult the steps below to make sure you are performing your setup correctly.



SET-UP STEPS

1. Register your gateway on viewmysensors.com

Your gateway must be registered first to verify communication between the device and MSG 03A software. Any sensors you wish to add onto your network must come after the gateway.

2. Register your sensor on viewmysensors.com

After you have registered your gateway, it is time to add your sensor to your viewmysensors.com account.

3. Install batteries in your device

After your device is added and your gateway is communicating, you can install the batteries. Your Temperature Sensor takes coin-cell, AA batteries, or industrial 3.6V Lithium batteries.

4. Install your sensor

Place your sensor in the desired spot using screws or double-sided tape. Make sure you have the correct antenna orientation to receive a strong signal.

NOTE: Each step is covered in more detail in the following sections.

REGISTRATION

If this is your first time using the ViewMySensors online portal, you will need to create a new account or contact support@mirandasolutionsgroup.com for account access. If you have already created an account, you can skip to the "Logging into the Online System" section. The following instructions will guide you through creating the account.

Logging-in

- 1. Open ViewMySensors from a web browser or from your smart device
- 2. Enter your username and password.
- **3.** Select the "Login" button.

MIRAND solutions gro	Aup
LOG IN	
Password	Forgot?
Login	
English (US)	

Registering ADevice

You will need to enter the Device ID and the Security Code from your devices in the corresponding text boxes. Select the **Scan Barcode** button to use the camera on your smart-phone to scan the QR code on your sensor and gateway. If you do not have a camera on your phone, or the system is not accepting the QR code, you may enter the Device ID and Security Code manually.



- The Device ID is a unique number located on each device label.
- Next, you will be asked to enter the Security Code (SC) on your device. A security code will be a set of six capital letters.



When completed, select the Finish Adding button.

Setting Up Your Sensor

Unlike most sensors, choosing a use case in Step 2 of adding this sensor does not give you the option to customize your settings. These will need to be adjusted in the settings tab for your device.

Select the Skip button when completed.

Vibration Meter Setting	gs 🕜
Sensor Name	
Vibration Meter - 48	
How will you use your sense	or?
-	~



Validation

The validation checklist will help you ensure your sensor is communicating with the gateway properly and you have a strong signal. Checkpoint 4 will only complete when your sensor achieves a solid connection to the gateway. Once you insert the batteries the sensor will communicate with the gateway every 30 seconds for the first few minutes. Select the Save button when completed.



NOTE: You can skip this section if your device has been added and preconfigured prior to shipping.

Setting Up Actions

Actions are the alerts that will be sent to your phone or email in the event of an emergency. Low battery life and device inactivity are two of the most common actions to have enabled on your device. Select the Done button when completed.



BATTERYINSTALLATION

The standard version of this sensor is powered by two replaceable 1.5 V AA sized batteries (included with purchase). The typical battery life is 10 -12 years.

Place batteries in the device by first taking the sensor and sliding the battery door open. Insert fresh AA batteries in the carriage, then shut the battery door

Complete the process by opening up viewmysensors and selecting Sensors from the main navigation menu. Verify that the sensor is showing and has a full battery level.

MSG 03A Wireless Motion Detection Sensor





Open ViewMySensors and select Sensors from the main navigation menu. Verify that ViewMySensors is showing the sensor has a full battery level. Replace the battery door by screwing in the four corners.

Industrial Batteries

3.6V Lithium batteries for the Industrial Wireless Vibration Meter is supplied by MSG. The battery life for the Industrial battery is up to 7 years. The Industrial sensor does not need to have batteries installed. The batteries are already in the sensors when they are shipped.

In order for the sensor to function properly, you will need to attach the included antenna. Simply screw the antenna onto the barrel connector on the top of the device. Make sure the antenna connection is snug, but do not over tighten. When placing the sensor, make sure to mount the sensor with the antenna oriented straight up (vertical) to ensure the best wireless radio signal.

Since the electronics are sealed within the sensor housing, we have added an "On/Off" switch to the unit for your convenience. If you are not using the sensor, simply leave the button in the off position to preserve battery life. If the sensor needs to be reset for any reason, you can simply cycle the power by turning the switch to the "Off" position and waiting 30 seconds before powering back on

SENSOR INSTALLATION

The Wireless Vibration Meter can be mounted using screws, double-sided tape, and even glue. Make sure you have a strong signal to the gateway before installing the sensor so you can make the necessary adjustments. Use the viewmysensor user interface to access the sensor and gateway signal strength.

Antenna Orientation

In order to get the best performance out of your Wireless Sensors, it is important to note proper antenna orientation and sensor positioning. Antennas should all be oriented.



in the same direction, pointing vertically from the sensor. If the sensor is mounted flat on its back on a horizontal surface, you should bend the antenna as close to the sensor housing as possible giving you the most amount of antenna pointing vertical. You should make the antenna wire as straight as possible, avoiding any kinks and curving of the wire.



SENSOR OVERVIEW

A list of all sensors registered under your account will be displayed in the Sensors page. Select **Sensors** from the main navigation menu to access the sensor overview page to view sensor details and begin adjusting your sensors.

Menu System

- A. Details Displays a graph of recent sensor data.
- **B. Readings -** List of all past heartbeats and readings.
- C. Actions List of all actions attached to this sensor.
- D. Settings Editable levels for your sensor.

Directly under the tab bar is an overview of your sensor. This allows you to see the signal strength and the battery level of the selected sensor.

- Green indicates the sensor is checking in and within user defined safe parameters.
- **Red** indicates the sensor has met or exceeded a user defined threshold or triggered event.
- Gray indicates that no sensor readings are being recorded, rendering the sensor inactive.
- Yellow indicates that the sensor reading is out of date, due to perhaps a missed heartbeat check-in.

Details View

The Details View will be the first page you see upon selecting which sensor you would like to modify.

- A. The sensor overview section will be above every page. This will consistently display the present reading, signal strength, battery level, and status.
- B. The Recent Readings section below the chart shows your most recent data received by the sensor.
- C. This graph charts how the sensor fluctuates throughout a set date range. To change the date range displayed in the graph, navigate up to the top of the Readings Chart section on the right-hand corner to change the from and/or to date.



Readings View

Selecting the "Readings" tab within the tab bar allows you to view the sensor's data history as time stamped data.

On the far right of the sensor history data is a cloud icon. ^(A) Selecting this icon will export an excel file for your sensor into your download folder.

Note: Make sure you have the date range for the data you need input in the "From" and "To" text boxes. This will be the most recent week by default. Only the first 2,500 entries in the selected date range will be exported.

The data file will have the following fields:

- 1. MessageID: Unique identifier of the message in our database.
- **2. SensorID:** If multiple sensors are exported you can distinguish which reading was from which using this number even if the names for some reason are the same.
- 3. Sensor Name: The name you have given the sensor.
- 4. Date: The date the message was transmitted from the sensor.
- 5. Value: Data presented with transformations applied but without additional labels.
- 6. Formatted Value: Data transformed and presented as it is shown in the monitoring portal.
- 7. Battery: Estimated life remaining of the battery.
- 8. Raw Data: Raw data as it is stored from the sensor.
- **9. Sensor State:** Binary field represented as an integer containing information about the state or the sensor when the message was transmitted. (See "Sensor State" explained below).
- **10. Alert Sent:** Boolean indicating if this reading triggered a notification to be sent from the system.



Sensor State

The value presented here is generated from a single byte of stored data. A byte consists of 8 bits of data that we read as Boolean (True (1) / False (0)) fields.

When broken into individual bits, the State byte contains the following information: aaaabcde

STS: This value is specific to the sensor profile and is often used to indicate error states and other sensor conditions.

UNUSED: This sensor does not use these bits.

AWARE: Sensors become aware when critical sensor specific conditions are met. Going aware can cause the sensor to trigger and report before the heartbeat and cause the gateway to forward the data to the server immediately resulting in near immediate transmission of the data.

TEST: This bit is active when the sensor is first powered on or reset and remains active for the first 9 messages when using default configurations.

STS Specific Codes:

- 0 = No problems, sensor is functioning normally.
- 1 = Open circuit detected in lead.
- 2 = Short circuit detected in lead.

3 = Range error. Temperature is reading outside of -40 F and 257 F (-40 C and 125 C).

If the customer has calibrated the sensor this field the Calibrate Active field is set False (0) AND the sensor is operating inside the Min and Max Thresholds, the bits look like 00000000, this is represented as 0.

If the sensor is using factory calibrations and it is outside the threshold, the bit values are 00010010 and it is represented as 18 (16 + 2 because both the bit in the 16 value is set and the bit in the 2 value is set).



Settings View

To edit the operational settings for a sensor, choose the "Sensor" option in the main navigation menu then select the "Settings" tab to access the configuration page.

A. **Sensor Name** is a unique name you give the sensor to easily identify it in a list and in any notifications.

B. **Heartbeat Interval** is how often the sensor communicates with the gateway if no activity is recorded.

C. **Sensitivity Threshold** is set to be the highest acceptable amount of vibration. If the vibration magnitude is below this setting, the vibration will be ignored and the vibration indicated will be 0. If this setting is 0, then all vibrations will be measured and analyzed even when the sensor is relatively still. This also determines what vibration levels contribute to duty cycle. If set to 0, duty cycle will generally be 100%.

D. **Measurement Method** determines the method of measurement of the sensor. It presents axes data in RMS. Absolute Mean, or Peak only Data.

- E. Enable Averaging ...
- F. Vibration Aware Threshold ...

G. Vibration Aware Buffer ...

H. **Window Function** is a drop-down menu with three options: No window (Best frequency resolution), Hanning Window (Good frequency resolution and amplitude accuracy). Flattop Window (Best amplitude accuracy).

I. **Measurement Interval (Minutes)** determines how often the sensor takes a measurement. For example, if the Heartbeat is 10 minutes and the measurement interval is 1 minute, the sensor will make a measurement every minute, then report the average every 10 minutes. Only qualified (non zero) measurements are included in average. Recommended to have the heartbeat be a multiple of the measurement interval.

J. **Failed transmissions before link mode** is the number of transmissions the sensor sends without response from a gateway before it goes to battery saving link mode. In link mode, the sensor will scan for a new gateway and if not found will enter battery saving sleep mode for up to 60 minutes before trying to scan again. A lower number will allow sensors to find new gateways with fewer missed readings. Higher numbers will enable the sensor to remain with its current gateway in a noisy RF environment better. (Zero will cause the sensor to never join another gateway, to find a new gateway the battery will have to be cycled out of the sensor.)

The default heartbeat interval is 120 minutes or two hours. It is recommended that you do not lower your heartbeat level too much because it will drain the battery.

Finish by selecting the "Save" button.

Vibration Meter Settings





Note: Be sure to select the "Save" button anytime you make a change to any of the sensor parameters. All changes made to the sensor settings will be downloaded to the sensor on the next sensor heartbeat (check-in). Once a change has been made and saved, you will not be able to edit that sensor's configuration again until it has downloaded the new setting.

ACTIONS OVERVIEW

Notifications for a single sensor or gateway can be created, deleted, and edited by selecting the "Actions" tab in the sensor tab bar. You can toggle the Action Trigger on or off by selecting the switch under Current Action Triggers.

Creating An Action

Actions are triggers or alarms set to let you know when a sensor reading identifies that immediate attention is needed. Types of actions include sensor readings, battery level, device inactivity, and scheduled data. Any one of these can be set to send a notification or trigger an action in the system.

- Select "Actions" in the main navigation menu.
- A list of previously created actions will display on the screen. From here, you have the ability to filter, refresh, and add new actions to the list.

Note: If this is your first time adding an event, the screen will be blank.

• From the Actions page, tap "Add Action" in the left-hand corner.

Step 1: What triggers your action?

The dropdown menu will have the following options for Action Types:

- Sensor Reading: Set actions based on sensor activity or reading.
- **Device Inactivity:** Actions when the device does not communicate for an extended period of time.
- Advanced: Actions based on advanced rules, such as comparing past data points with current ones.
- **Scheduled:** These are actions that fire at a time set basis.

elect Action Type	
Select Action Type	
Sensor Reading	
Battery Level	
Device Inactivity	
Advanced	

Select **Sensor Reading** from the dropdown menu. A second dropdown menu will appear. From here, you will be able to see a list of the different type of sensors registered to your account.



Choose **Temperature** in the dropdown menu.

Next, you will be asked to input the trigger settings. You have the option of setting this trigger for greater than or less than a temperature reading

ction Trigger Conditions	
lotify when sensor reading is	
Greater Than	~
Greater Than	
Less Than	
Equal To	

If you do not have a temperature sensor, the option in this example will not be available, select any variable output sensor and follow along.

Variable output sensors can have multiple event triggers created.

Example: A temperature sensor used in a freezer. You may want to be notified if the temperature goes below 0° or above 30° Fahrenheit. You would create two events.

• Action 1- Trigger Set for temperatures LESS THAN 0°F.

• Action 2 - Trigger set for temperatures GREATER THAN 30° F.

Step 2: Actions



- 1. Press the Add Action button under the Event Information header and available action types are presented in a select list.
- 2. Choose **Notification Action** from the notification list.
- **A.** Configure the subject for the notification.
- **B.** Customize the message body for the notification
- **C.** Save button commits any changes to message content fields.
- D. Recipient list identifies who will receive the notification. Select the icon next to a user to configure how they will be notified Choose if you want notifications sent immediately when triggered or if you want a delay before it is sent and press Set.

A **green** icon indicates the users that will not receive the notifications. If a delay has been selected, the delay time will display beside the icon.

- E. Select System Action from the Add Action list.
- F. Scroll down to the System Action section.

The Action to be Done select list has the following options.

- Acknowledge: Automatically signal that you have been notified of an action. When an action has been triggered, alerts will continue processing until the action returns to a value that no longer triggers an action.
- Full Reset: Reset your trigger so it is armed for the next reading.
- Activate: Enable an action trigger.
- **Deactivate:** Disable an action trigger.

Notification Settings		Recipient	Email	SMS	Voice
Subject		Click on icon to enable or disable	e Name		
Time less than X		C 15 North King	4		
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Source B I ≟≡ :≡	an az ?		2	0	<i>c</i> •
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Step 3: Action Name and Devices

By default, the sensor(s) will not be assigned to the action conditions you have just set. To assign a sensor, find the device(s) you want to designate for this action and select. Selected sensor boxes will turn green when activated. Choose the sensor box again to unassign the sensor from the action.

Continue toggling the sensor(s) corresponding to this new action until you are satisfied with your selection. These can be adjusted later by returning to this page.

Press the "Checkmark button" to complete the process.

SUPPORT

For technical support and troubleshooting tips please visit our support library online at <u>blog.mirandasolutionsgroup.com</u> If you are unable to solve your issue using our online support, email MSG support at <u>support@mirandasolutionsgroup.com</u>.

Select Devices	
Action Sensors Click Sensor to enable/disable	
Generator 1	0
Generator 2	Ø
Thermocouple - 386	



CERTIFICATIONS

United States FCC

This equipment has been tested and found to comply with the limits for a Class B digital devices, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of more of the following measures:

- **E.** Reorient or relocate the receiving antenna.
- F. Increase the separation between the equipment and receiver
- **G.** Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- **H.** Consult the dealer or an experienced radio/TV technician for help.

Warning: Changes or modifications not expressly approved by the manufacturer and could void the user's authority to operate the equipment.

RF Exposure



WARNING: To satisfy FCC RF exposure requirements for mobile transmitting devices, the antenna used for this transmitter must not be co-located in conjunction with any antenna or transmitter.

Wireless Sensors:

This equipment complies with the radiation exposure limits prescribed for an uncontrolled environment for fixed and mobile use conditions. This equipment should be installed and operated with a minimum distance of 23 cm between the radiator and the body of the user or nearby persons.

Wireless Sensors Contain FCC ID: ZTL-G2SC1. Approved Antennas

These devices have been designed to operate with an approved antenna listed below, and having a maximum gain of 14 dBi. Antennas having a gain greater than 14 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

- Xianzi XQZ-900E (5 dBi Dipole Omnidirectional)
- HyperLink HG908U-PRO (8 dBi Fiberglass Omnidirectional)
- HyperLink HG8909P (9 dBd Flat Panel Antenna)
- HyperLink HG914YE-NF (14 dBd Yagi)
- Specialized Manufacturing MC-ANT-20/4.0C (1 dBi 4" whip)



Canada (IC)

English

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the Equivalent Isotopically Radiated Power (E.I.R.P.) is not more than that necessary for successful communication. The radio transmitters (IC: 9794A-RFSC1, IC: 9794A-G2SC1, IC: 4160a-CNN0301, IC: 5131A-CE910DUAL, IC: 5131A-HE910NA, IC: 5131A-GE910 and IC: 8595A2AGQN4NNN) have been approved by Industry Canada to operate with the antenna types listed on previous page with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device. This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

French

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la Puissance Isotrope Rayonnée Èquivalente (P.I.R.È) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteurs radio (IC: 9794A-RFSC1, IC: 9794A-G2SC1, IC: 4160a-CNN0301, IC: 5131A-CE910DUAL, IC: 5131A-HE910NA, IC: 5131A-GE910 et IC: 8595A2AGQN4NNN) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne figurant sur la page précédente et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indigué, sont strictement interdits pour l'exploitation de l'émetteur. Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, méme si le brouillage est susceptible d'en compromettre le fonctionnement.



SAFETYRECOMMENDATIONS

Read Carefully

Be sure the use of this product is allowed in the country and in the environment required. The use of this product may be dangerous and has to be avoided in the following areas:

- Where it can interfere with other electronic devices in environments such as hospitals airports, aircrafts, etc.
- Where there is risk of explosion such as gasoline stations, oil refineries, etc.

It is responsibility of the user to enforce the country regulation and the specific environment regulation.

Do not disassemble the product; any mark of tampering will compromise the warranty validity. We recommend following the instructions of this user guide for correct setup and use of the product.

Please handle the product with care, avoiding any dropping and contact with the internal circuit board as electrostatic discharges may damage the product itself. The same precautions should be taken if manually inserting a SIM card, checking carefully the instruction for its use. Do not insert or remove the SIM when the product is in power saving mode.

Every device has to be equipped with a proper antenna with specific characteristics. The antenna has to be installed with care in order to avoid any interference with other electronic devices and has to guarantee a minimum distance from the body (23 cm). In case this requirement cannot be satisfied, the system integrator has to assess the final product against the SAR regulation.

The European Community provides some Directives for the electronic equipment introduced on the market. All the relevant information's is available on the European Community website: http://ec.europa.eu/enterprise/sectors/rtte/documents/



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