
EBRAX
ATM SECURITY LLC

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1. Overview and Features

1.1. Introduction

The **MASS** is a security equipment developed to be installed in Automatic Teller Machines (ATMs). Being an anti-skimming solution, the objective of the device is to protect the ATM against attempts of fraud by cloning of magnetic cards and steal of passwords from its owners. In machines equipped with **MASS**, the fraud is detected in real time. Upon detection, **MASS** actions include sounding the alarm of the equipment, emission of a jamming signal and disabling critical functions of the ATM, hindering the operation of the fraudulent (skimming) device.

Conventional anti-skimming solutions only monitors around the card reader area, hence preventing only a part of current frauds. **MASS**, however, is capable of detecting both the standard overlay skimmers and the deep insert ones, making it much more efficient. In this version, the device can monitor up to 6 different areas of the ATM fascia and the internal part of the card reader, granting great coverage of the ATM.

Example of Skimmers:

Figure 1. Overlay Skimmers

Figure 2. Deep Insert Skimmers

Introduced in 2019, the **MASS** was developed based on the Generation 2 anti-skimming solution. It uses a similar sensor (G2), that supports multiple detection zones and self-adjustment features. The **MASS**, however, was developed based on a modular concept, granting more flexibility in relation to previous solutions. In this concept, it can provide the exact solution the customer needs with the smallest number of necessary hardware. Only the modules related to the requested features must be acquired, allowing customers to have and efficient and economical solution for their needs. In addition, **MASS** is easily upgradeable by the addition of other modules as needed.

Currently available modules are:

- **Control Module;**
- **Actuator Module;**
- **Alarm Module;**
- **USB Communication Module;**
- **485 Communication Module;**
- **Bluetooth Module;**
- **Overlay Sensor (Capacitive);**
- **Deep Insert Sensor (Optical);**
- **Calibration Module.**

Each module has its exclusive function in the system, communicating with each other using a proprietary encrypted protocol. This allows the **MASS** to be installed in any part of the ATM, without the need to have any part installed inside the safe.

All MASS modules and sensors are easily installed. No special tools or any structural/electrical modifications in the ATM are necessary

Figure 3. **MASS** configuration using 5 modules

1.2. Features

- **Control Module:**

- Power Supply Input: 12/24Vdc;
- General module/sensors management;
- Automatic Failure Management;
- Sensor adjustment buttons (optional);
- Can monitor up to 8 overlay and 1 deep insertion sensors;
- Status indicative LEDs;

- **Actuator Module:**

- Signal Jamming Technology;
- ATM screen / card reader power control;
- Status indicative LEDs;

- **Alarm Module:**

- Skimmer detection signaling;
- System malfunction signaling;
- Installation failure signaling;
- Status indicative LEDs;
- Two configurable dry-contact output ports;

- **Communication Module:**

- USB protocol support (115200 baudrate);
- Sensors status in real time;
- Status indicative LEDs;
- Alarm timer customizable for each sensor;
- DEBUG mode for sensors;

- **Overlay Sensor (Mass Detection)**

- Alarm temporization customizable;
- Dip and motorized card readers supported;
- Can detect any type of mass;
- Proprietary algorithm that compensates slow environment changes, such as temperature, humidity, dust or mechanical wear.
- Sensibility and detection levels customizable;
- Status indicative LEDs;
- **Deep Insert Sensor (Optical Technology);**
- Alarm temporization customizable;
- Dip and motorized card readers supported;
- Can detect any type of material;
- Proprietary algorithm that compensates slow environment changes, such as temperature, humidity, dust or mechanical wear.
- Sensibility and detection levels customizable;
- Status indicative LEDs;

- **Connection Cables:**

- Connect each module;
- Tri-axial, shielded and grounded;
- MicroFit connector;

1.3. Applications

The **MASS** can be used in several applications, being able to monitor any part of the ATM or other desired devices. Some examples of applications are shown as follows:

- Monitor the presence of a standard overlay skimmer over the card reader and take actions as needed
- Detect a deep insert skimmer inside the card reader
- Monitor physical violations to the walls of the ATM, inking the money of generating smoke
- Detect Bluetooth frauds in pump stations

The functionalities depend on the modules and sensors you connect to the system.

The standard configurations are:

- **One Sensor Anti-Skimming Monitoring**

- Control Module;
- Alarm Module;
- Overlay Sensor (Capacitive);
- Deep Insert Sensor (Optical).

- **Multiple Sensors Anti-Skimming Monitoring**

- Control Module;
- Alarm Module;
- Up to 8 capacitive sensors;
- Deep Insert Sensor (Optical).

- **Anti-Skimming monitoring with ATM video and card reader shutdown**

- Control Module;
- Alarm Module;
- Actuator Module;
- Up to 8 capacitive sensors;
- Deep Insert Sensor (Optical).

- **Anti-Skimming monitoring by USB or 485**

- Control Module;
- Communication Module;
- Actuator Module (Optional);
- Up to 8 capacitive sensors;
- Deep Insert Sensor (Optical).

2. Modules Specification

2.1. Overview

Being a modular concept, **MASS** can provide the exact solution the customer needs. With the option to configure the solution with only the modules requested, the customer does not need to purchase unnecessary features, focusing on the essentials. If needed, further modules can be included to the solution easily, making **MASS** a great option for upgrades.

The modules are projected in a way that allow the inclusion of any future module easily, as in a *plug and play* solution. The module responsible to manage any other modules is the Control Module.

The inclusion of modules is *plug and play*. The exception would be for new modules, not included in the control module firmware. In this case, a firmware update would be needed.

2.2. Control Module

The control module is responsible for providing a stabilized power source to the other modules, independently from the input power voltage (12Vdc or 24Vdc).

Using an encrypted and ordered communication, the control module manages all other modules. It may trigger alarms, debug mode, failure detection and others.

The control module is responsible for performing a failure check in the whole system, quickly detecting any problem with a defective module or installation issues.

O module includes an adjustment button, a sounding alarm and 3 indicative LEDs (On, Failure and Alarm).

Figure 4. Control Module

2.3. Actuator Module

The actuator module triggers the electromagnetic transducer and the video-power device, depending on system status.

The module is protected against inversions between the transducer and video-power, triggering a failure in the control module.

To verify the necessity of using a transducer or video-power device, please check their specific sections within this document (Section 3).

Figure 5. Actuator Module

2.4. Alarm Module

The alarm module informs the system status through two opto-coupled outputs connected to the ATM alarm board. Both outputs are configured at factory as needed by the ATM application.

Common configurations:

Output 1 = Output 2 (**Default**)

Output 1 = System Alarmed
Output 2 = System Failure

Output 1 = Capacitive Sensor Alarmed
Output 2 = Optical Sensor Alarmed

Figure 6. Alarm Module

2.5. Communication Module

The communication module provides data output using an USB protocol that can connect to the ATM.

Using the communication module, it is possible to monitor each sensor individually, set the alarm temporization, access DEBUG mode, verify general status of the system and calibrate the control module.

The module is protected by two cryptographic layers and can only be accessed through authorized software

Figure 7. Communication Module

2.6. Bluetooth Module

The Bluetooth Module has the same functionalities as the communication module. However, it does not have any physical outputs and communicates only through bluetooth.

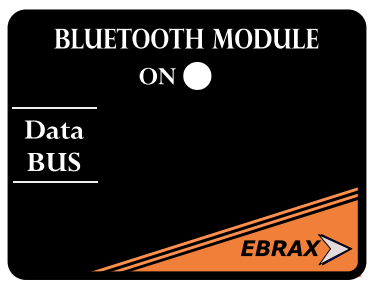


Figure 8. Bluetooth Module

2.7. Calibration Module

The calibration module is an important tool for the technicians that need to perform tests and calibrate the equipment in field.

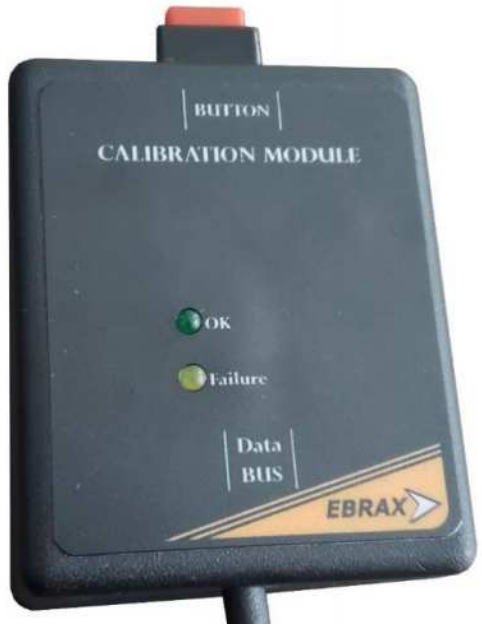


Figure 9. Calibration Module

2.8. Video Power Device

The Video Power device is responsible for managing the power supply of the ATM video monitor or any other peripheral device connected to it.

When a fraud is detected, the control module commands the actuator module to trigger the VD Power device, turning the video monitor off and preventing usage of the equipment while compromised by an installed skimming device.

Figure 10. Video Power Device

2.9. Electromagnetic Transducer

The electromagnetic pulse transducer works together with the overlay sensor. While it focuses on the detection of the skimming device, the transducer interferes with its operation, increasing the overall security provided by **MASS**. The transducer is placed on the internal wall of the card reader bezel and is connected to the actuator module, that commands the generation of the pulses emitted by the transducer.

When a fraud is detected and the kit enters alarm mode, the transducer is activated, starting the pulse emission. With its power supply given by the actuator module, the transducer emits the magnetic pulses in random and omnidirectional form. These pulses intervene with the operation of the skimming device, making the data collected from the magnetic card completely diverse from the real information contained in it.

There is also no risk of interference in the permanent data stored in the magnetic card. This is assured by the huge difference between the magnetic fields involved in read and write operation. Only intense fields can affect data stored inside the magnetic cards. In read-only operations, the involved devices work with low intensity magnetic fields.

Figure 11. Electromagnetic Transducer

2.10. Overlay Sensor and Antennas

Through this sensor, **MASS** can detect if any additional object was installed in monitored regions of the ATM. The extra mass is immediately detected by the capacitive sensor, that triggers alert mode in the control module. If the alert condition remains active for too long, alarm mode is triggered.

Figure 12. Overlay Sensor (Capacitive technology)

To work as needed, the overlay sensor needs to be connected to an antenna. This antenna is specifically designed for each ATM configuration, granting maximum efficiency in detection around the installed area.

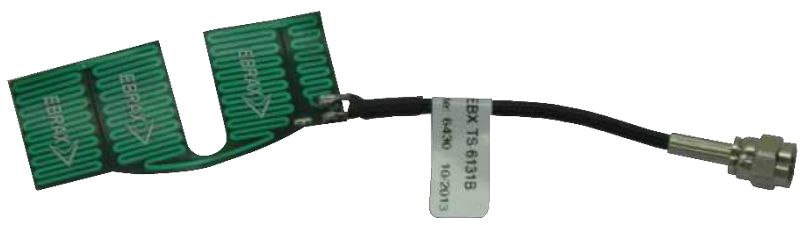


Figure 13. Example of Antenna

The general sensibility of the overlay sensor is strongly influenced by two factors:

- Parameters defined in the sensor *firmware*
- Geometrical parameters of the antennas.

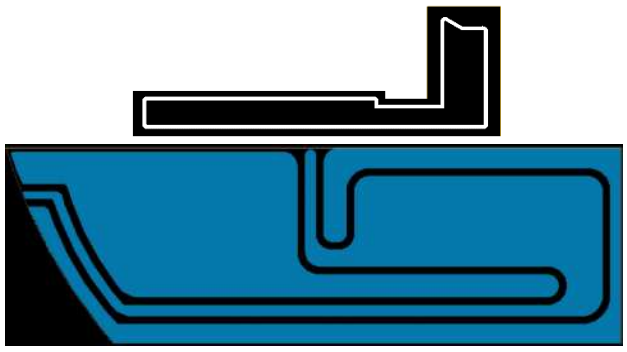


Figure 14. Example of Antenna Layout

With the advance of the most recent frauds, the necessity of monitoring other parts of the ATM increased. In the manner, requests to monitor areas such as the keypad, camera support, receipt dispenser and the shutter has been increased.
The Multizone concept was developed to reach a higher security level by granting the capacity to monitor these areas not covered by standard anti-skimming solutions.

MASS can include up to 8 sensors in a single ATM.

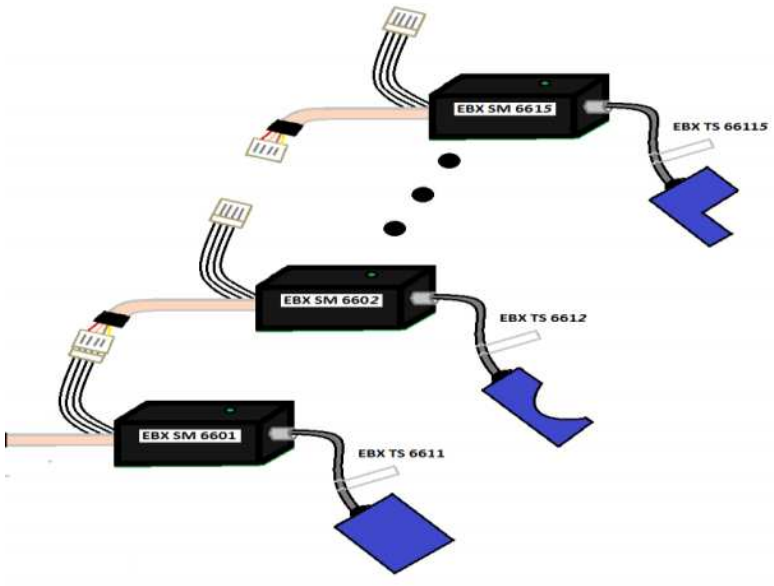


Figure 15. **MASS** configuration with multiple sensors

Figure 16. Example of overlay skimmers

The graph as follows represents the humidity variation throughout a single day. The blue line represents the variation in humidity and the gray line represents the compensation of this variation applied by the sensor. This automatic compensation grants stability and security to the data measured in any environment condition.

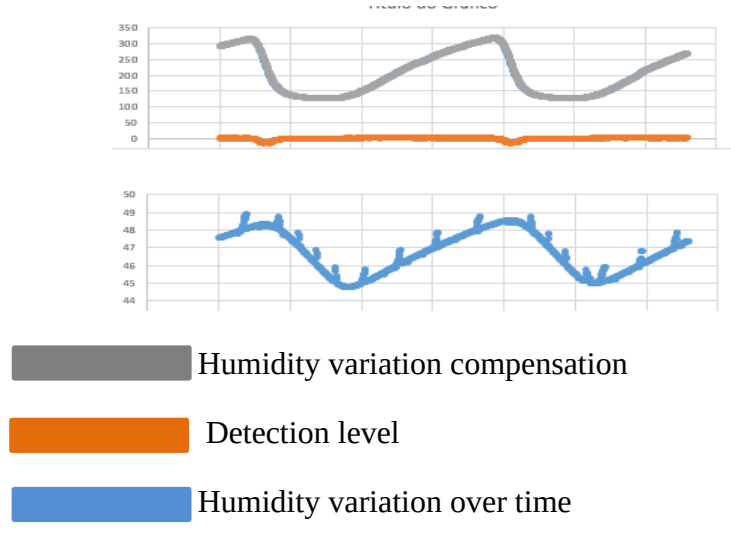


Figure 17. Self compensation due to humidity changes

By the Graph as follows, we can verify the reaction of the overlay sensor when detecting an object placed at the monitored area. After the first measure point out of the standard environment, system triggers alert mode. If alert mode remains triggered longer than the programmed timer, the system enters alarm mode, taking appropriate actions.

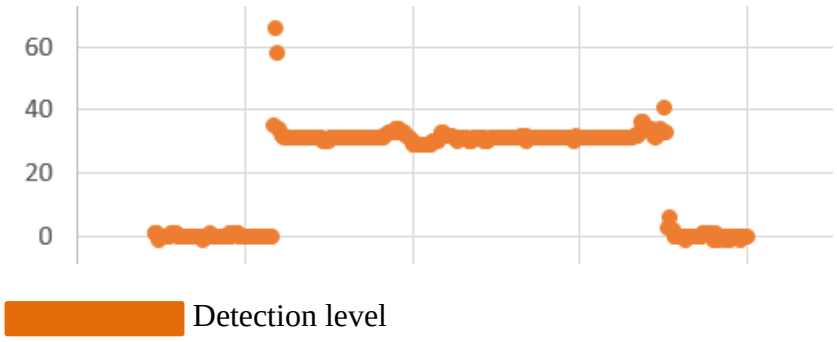


Figure 18. Fraud detection example

The overall sensor specifications are shown by Table 1, as follows:

Table 1 Overlay sensor specifications

Capacitive Sensor	
Input Voltage	**8~ VDC**
Amperage Nominal	**10~15mA**
Operation Temperature	**0°C ~ 50°C**
Max. length Cable Antenna	**25 CM**

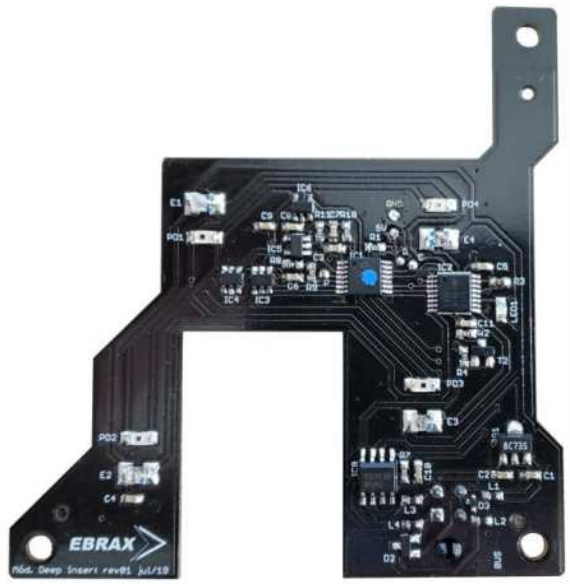


Figure 19. Deep Insert Sensor

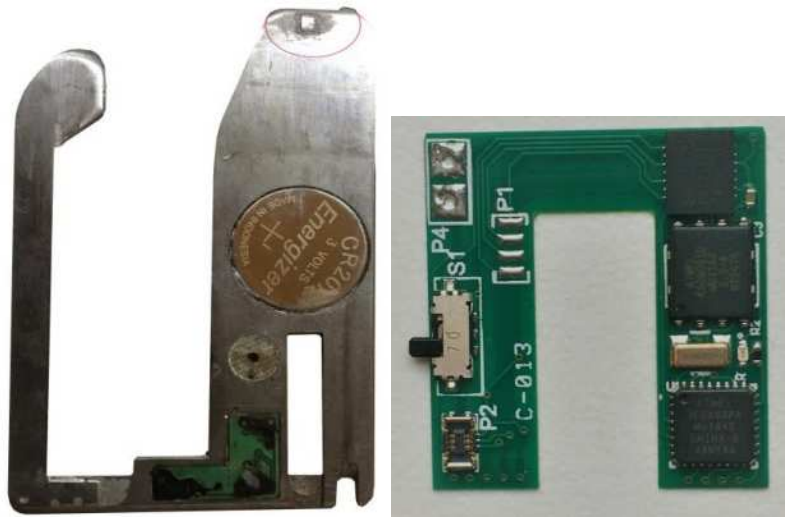


Figure 20. Examples of Insertion frauds

2.11. Deep Insert Sensor

The deep insert sensor uses optical technology and has a robust compensation algorithm to avoid false alarms due to temperature, humidity, dust or natural wearing of the monitored equipment.

With 4 sets of strategically positioned LEDs, the deep insert sensor is designed to monitor the internal part of the card reader for insertion frauds, where the standard overlay sensor cannot reach.

When an abnormal condition is detected by any of the LEDs, system triggers alert mode. If alert mode remains triggered longer than the programmed timer, the system enters alarm mode, taking appropriate actions.

The standard timer is set to 4 minutes. This allows the sensor to distinguish between a fraud and a standard transaction.

The graph as follows represents the behavior of the sensor when detecting a fraud.

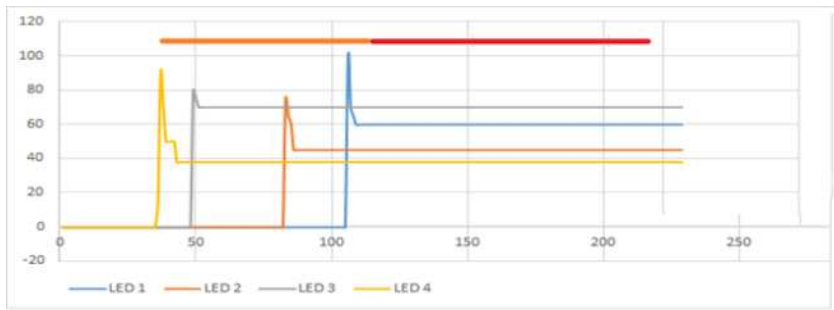


Figure 21. Fraud detection behavior

Each sensing LED has a “vision” angle of 60º and can precisely monitor up to 8 cm distance, being it more than enough to cover the internal part of the card reader.

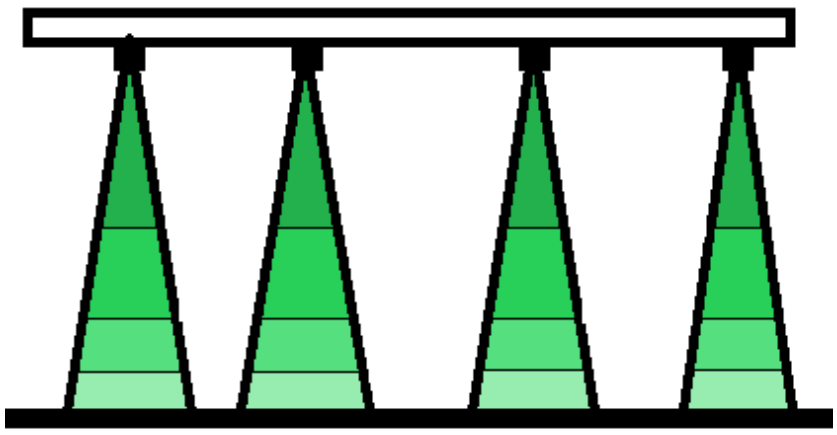


Figure 22. Deep insert sensor optical coverage

Figure 23. Deep insert sensor installed in the card reader

2.12. Cables and Power Supply

- **Connection cable between modules**

Triaxial 5 way shielded cables with Microfit-Molex connectors grant a stable connection for transmissions and noise isolation. Through a derivation, other cables may connect to the system, forming another connection branch.

Figure 24. Connection cable between modules

- **Connection Cable to Sensor Module**

Having the same wiring, the connection cable to the overlay sensor has a different connector in one of its edges. A grounding cable is connected to this edge, increasing the sensor performance.

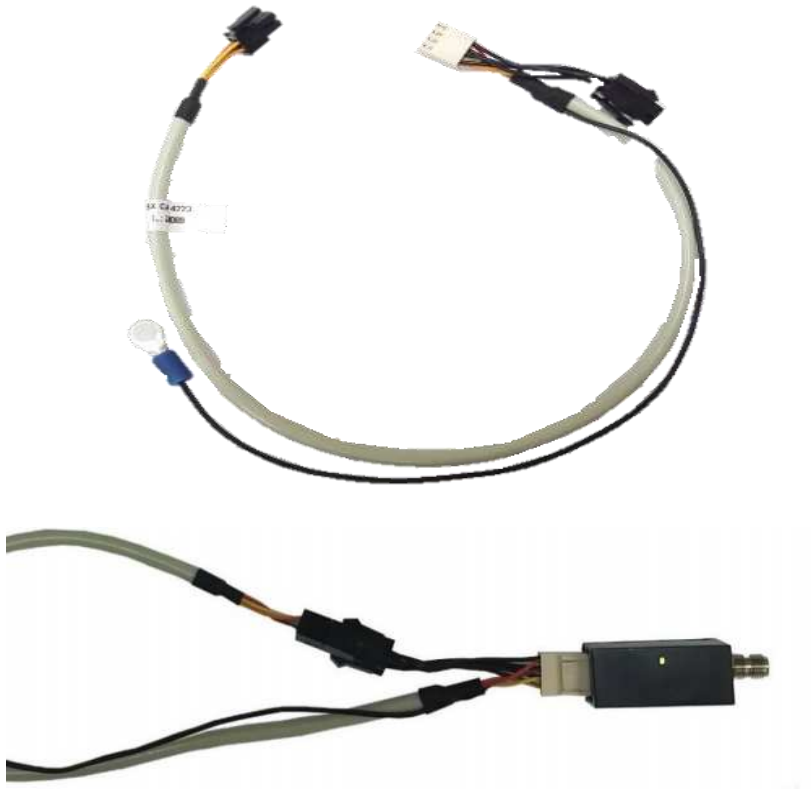


Figure 25. Connection cable to sensor module

- **Power Supply Cable**

The power supply cable, as a “bypass” type, is directly connected to a DC power source of the ATM, making it a stable and compact option.

Figure 26. Power supply cable

- **Power Supply Unit**

If the ATM does not have a DC power source available, the Power Source Unit (PSU) can be used. It can connect to an AC power source and provide the correct electrical levels required for the equipment. Table 2 provides the PSU specifications:

Table 2 Power supply unit specifications:

EBX FA 9018	
Input Voltage	**90~240 VDA**
Output Voltage	**14,5 V**
Amperage Nominal	**500mA**
Input Frequency	**47Hz ~ 63Hz**
Operation Temperature	**-20°C ~ 60°C**
Frequency Switching	**Fixed 60Hz**
Ripple	**500 mV**

Figure 27. Power Source Unit

3. Installation guide

3.1. General Guidelines

The installation of the equipment is an essential part of the whole solution. It must be performed carefully, since a poorly performed procedure may compromise the efficiency of **MASS.**

As verified since the introduction of anti-skimming solutions, most field problems are related to poor installation. In the manner, it is recommended to frequently perform training for technicians, granting the necessary knowledge to perform an efficient installation.

3.2. Preparation and Materials

It´s very important that the technician has the necessary tools to access the areas required for the installation of the sensors and modules.

Before you start the installation procedure, it's necessary to clean the surface with the parts of the solution will be installed. This will grant that the modules and sensors are firm and stable during regular operation of the ATM.

The list of required material is shown as follows:

- Clean cloths;
- Isopropyl or common alcohol;
- Double Sided tape (3M™ recommended);
- Nylon cable ties

3.3. Peripherals Installation

It's important to start installation by the peripheral, such as antennas, video-power device and electromagnetic transducer. Doing this, it's easier to determine the placement of the modules, given the length of the connection cables.

- **Antennas**

a) Have a good and clean access to the desired installation area;
b) Clean up the installation area using alcohol and clean cloths. Make sure there is no dust, grease, oil or any other residue.

Figure 28. Installation surface needing cleaning

c) Remove the double-sided tape cover and carefully place the antenna in its installation position. Press you finger over the whole surface of the antenna, making sure it is completely firm on the installation surface.

Caution: The antenna is fragile. You must take special care when handling it. Do not use your nails, as it may rupture the internal circuitry of the antenna.

Caution: Take care to not obstruct any mobile parts of the card reader

Figure 29. Antenna installed inside the card reader bezel

- **Electromagnetic Transducer**

As the transducer produces a directed electromagnetic field, its correct positioning is essential for an effective operation. It's very important that the transducer is placed on the same plane as the antenna.

After installed in the card reader bezel, the transducer is connected to the actuator module.

Caution: Make sure the transducer is installed in a way that does not affect the regular positioning of the ATM card reader.

Figure 30. Transducer installation

- **Video Power Device**

To install the VD Power device, follows these steps:

a) Disconnect the power supply cable connected to the ATM video monitor.
b) Connect this cable to the VD power device
c) Connect the opposite end of the VD power device cable to the ATM video monitor.
d) The last free cable of the VD power device is to be connected to the actuator module. Once you define the installation position of this module, you can connect the VD Power cable to it.

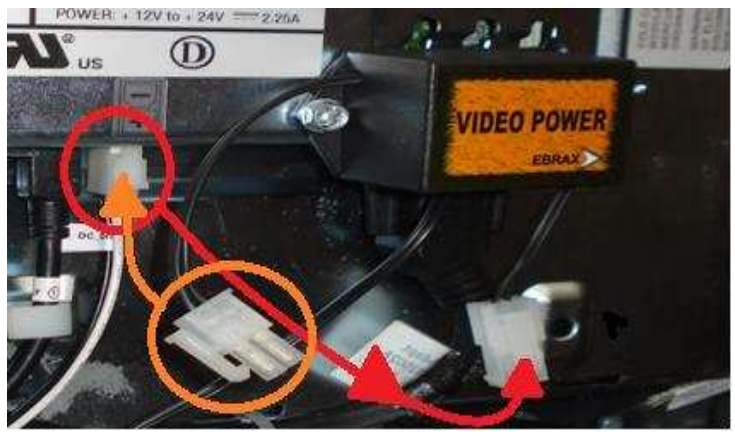


Figure 31. Video-Power device installation

3.4. Modules Installation

Having an encrypted bus communication, **MASS** achieves a higher level of security. This avoids the need of installing the modules in the safer area of the ATM (e.g. inside the safe), granting a cheaper and quicker maintenance.

Modules

For an easier installation and maintenance, it is recommended to place the modules close to each other.

The modules are connected to each other using the connection cables. These cables have a single conector in one end and two conectors at the other end. One is connect to the module itself and the other one (derivation) is designed to be connected to the single end side of another connection cable. This grants the possibility of connecting as much modules as wanted, given the control module support them and you have enough cables.

Figure 32 show a schemmatic of how the cables are connected to each other. The connectors inside the red square are connected to each other, leaving the free connector to the module itself.

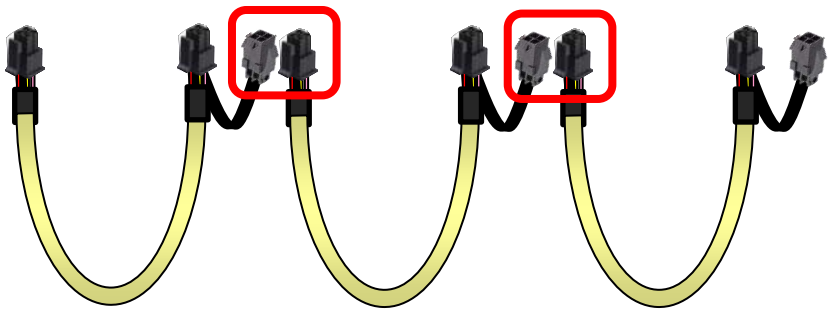


Figure 32. Functional Schemmatic of connection cables

Figure 33. Example of connection to a module

Figure 34. Example of multiple modules installation

After placing all modules, connect the video-power, transducer and alarm cable to its module inputs.

Figure 35. Video-Power connection

Figure 36. Transducer connection

Overlay Sensor

The Overlay Sensor installation demands special attention, because a poor installation can lead to a false alarm.

1st Step: After installing the Antenna on the bezel, connect the Overlay Sensor to the Antenna Cable through the coaxial connector.

Figure 37. Antenna Connection

2nd Step: Position the sensor in an area that do not stretch the Antenna Cable. It must not be too tight nor loose. Cover the connection with a heat shrink insulation to avoid short circuits to ground.

Correct Installation Example

Figure 38. Example of correct sensor installation

Incorrect Installation Examples:

Figure 39. Antenna Cable too tight

Figure 40. Overlay Sensor installed over the Antenna

Figure 41. Inappropriate curved cable

It is important that the cable do not stress the Antenna or the Overlay Sensor.

3º Step: After removing dust and grease from the installation area, remove the double-faced protective cover and install the Overlay Sensor.

4º Step: Connect the Overlay Sensor Cable.

Figure 42. Sensor cable connection

Deep Insert Sensor

The Deep Insert Sensor detects light variations in the inner area of the card reader. Due to its operation principle, its mandatory that the sensor is well tighten to card reader. Any movement may lead to a false alarm.

1st Step: Install the Deep Insert Sensor with screws on card reader fixation holes, located on its corners.

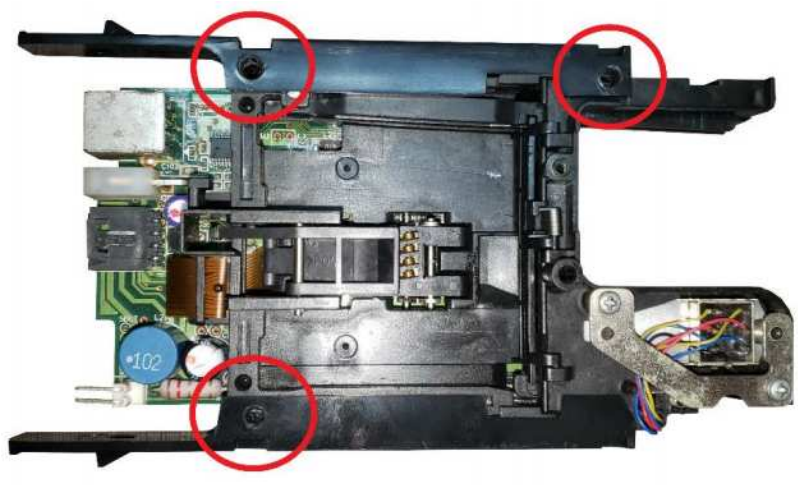


Figure 43. Deep Insert sensor positioning

2nd Step: Use a M3 nut and a M3x20mm screw to ensure a minimum space between the Card reader and the Deep Insert Sensor PCB, as shown below.

Figure 44. Deep insert sensor fixation

3rd Step: Fasten the screw, ensuring a well tighten installation.

Figure 45. Screw tighten

4th Step: Connect the Deep Insert Sensor to the data BUS using the Deep Insert Sensor Cable.

The Deep Insert Sensor shown above is a standard version, suitable to most card reader models. Customized versions, such as for motorized card reader, are available as well.

Figure 46. Custom sensor for motorized card reader

3.5. Power Supply Cable Installation

The Power Supply Cable should be installed using a connection branch of an ATM peripheral. This ramification can be achieved using a Bypass connection on the Power Supply Cable. The original connection efficiency is not affected.

Any 12V to 24V / 0.5A source can be used.

Figure 47. Deep insert sensor power supply connection

3.6. Recurring problems

The list below shows the most recurring problems and its workarounds.

1) Lack of cleanliness on Antenna installation

The Antenna installation area must be cleaned and grease and dust free.

If the surface is not properly cleaned, the double-faced tape may not keep the Antenna in position, leading to a false alarm.

2) Card Reader Antenna Wrong placement

The Antenna placement is crucial for a good sensor performance. The Overlay Sensor was designed to detect mass variation at specific areas. The Card Reader Antenna must be placed in the highlighted area below.

Figure 48. Target area for sensor antenna

3) Miscalibrated Sensor

The Sensor calibration ensures that the sensors adapts its measured levels to the installation environment. It is mandatory the ATM is in its operation position. That means card reader fasten, ATM fascia closed and all peripheral on its operation condition.

After any maintenance on the ATM is recommended to perform a calibration process.

4) Lack of ground connection

Using a capacitive principle, the Overlay sensor needs a proper ground connection to ensure a good system stability.

The impedance measured between the anti-skimming ground and the ATM chassis must be less than 2 Ohms.

5) Loose ATM mechanical parts

All sensors are affected by small movements in mechanical parts near its installation area.

During day-by-day operations, this mechanical parts movement can represent a huge change in the environment measured by the sensor, leading to a false alarm.

These movements usually occur due to a loose or missing screw.

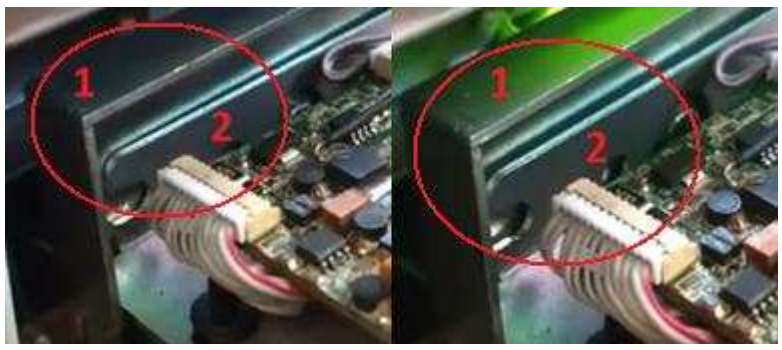


Figure 49. Representation of mechanical movements within the card reader that may interfere with the sensors.

6) Excessive stress in Antenna Cable

It is important that the Antenna Cable do not move after installation and calibration. However, tightening it in an excessive way may damage the antenna internal connections and/ or damage the connector.

Incorrect Example:

Figure 50. Excessively tight antenna cable

Correct Example

Figure 51. Correct example of antenna cable installation

7) Antenna reuse

Do not reuse the Antenna as it is fragile. During the removal process, its internal connections may be damaged.

Reuse it may seem to work, but under a bad contact condition, leading to a false alarm.

If an Antenna presents malfunction, replace it by a new one.

8) Multiple Antenna installation minimum distance

Installing multiple Antennas close to each other may lead to a malfunction due to cross interference.

The green box below shows a proper distance between antennas, while the red box shows a distance that leads to a false alarm.

Figure 52. Examples of correct and incorrect antenna installation

9) Sensibility level overrated

The Antenna Geometry and the Sensibility level are defined together based on frauds example and frauds tendency.

This set must be kept unchanged, because mixing Antennas with others Sensibility level may lead to a false alarm.

3.7. Preventive Maintenance

Being one of the most exposed area, the card reader is susceptible to dust accumulation which may affect sensors operation. A preventive maintenance is needed to ensure a proper operation and avoid a false alarm.

With aid of a cleaning cloth and isopropyl alcohol, remove all accumulated dust on the Antenna area.

Figure 53. Antenna area with accumulated dust

Ensure the Antenna is well attached to the bezel making smooth traction movements.

If some looseness is noticed, replace the Antenna for a new one.

Clean up the card reader with an antistatic brush or an air blower, removing all dust.

Figure 54. Card read with accumulated dust

Check cable distribution, ensuring all cables are secure. Through day-to-day ATM handling a connection cable or an Antenna cable may move from its installation position.

Figure 55. Cables organized

Check if the Sensors are properly connected.

Figure 56. Wrongly disconnected cable

4. Operation Modes

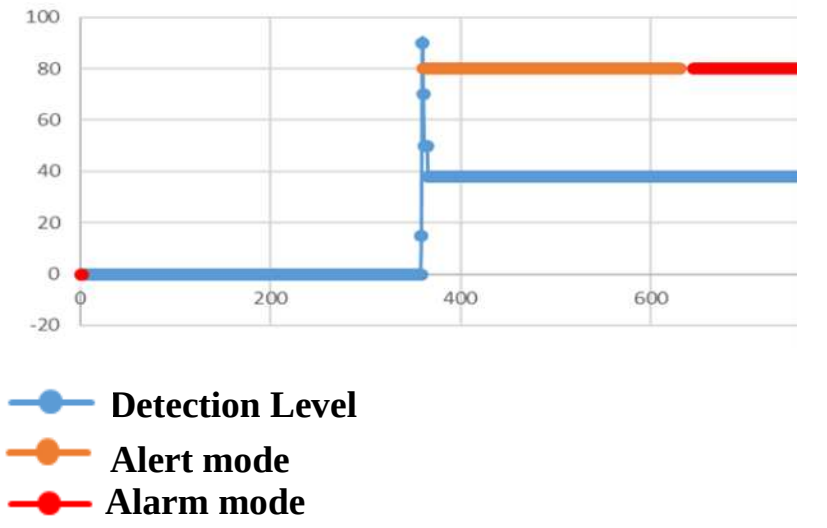
4.1. General description

The **MASS** anti-skimming system can detect any object installed over the Sensor Antenna.

Once an object is detected, the sensor enters in Alert Mode, where a configurable timer (also known as Alarm Time) ticks while the object remains.

When the Alarm Time reach a programed value, the **MASS** enters Alarm Mode, signaling to all connected peripheral this condition.

The graph below shows the Overlay Sensor operation under a fraud detection condition.



If the object is removed, the Alarm Timer is reseted and the sensor enters in Operation Mode.

Operation without detected fraud

Figure 57. Overlay Sensor not activated

Figure 58. Deep Insert Sensor not activated

Operation with detected fraud

Figure 59. Overlay Sensor activated

Figure 60. Deep Insert Sensor activated

4.2. FAIL Function

The FAIL function is automatically managed by the Control Module and aids the identification of damaged peripheral, installation problems and system malfunction.

Through the FAIL function is possible to identify the following conditions:

- Module Improper disconnection
- Damaged Electromagnetic Transducer
- Damaged Video Power
- Electromagnetic Transducer and Video Power reverse connection
- Unknown peripheral connected
- Actuator Module without a peripheral connected
- Failed Calibration process
- Communication Module Failure

In the event of one of the conditions above, the FAIL function is automatically activated, turning the LED FAULT on and beeping each 20 seconds.

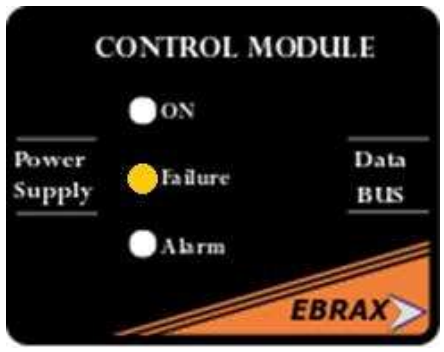


Figure 61. FAIL mode indication

Identifying Failure Source

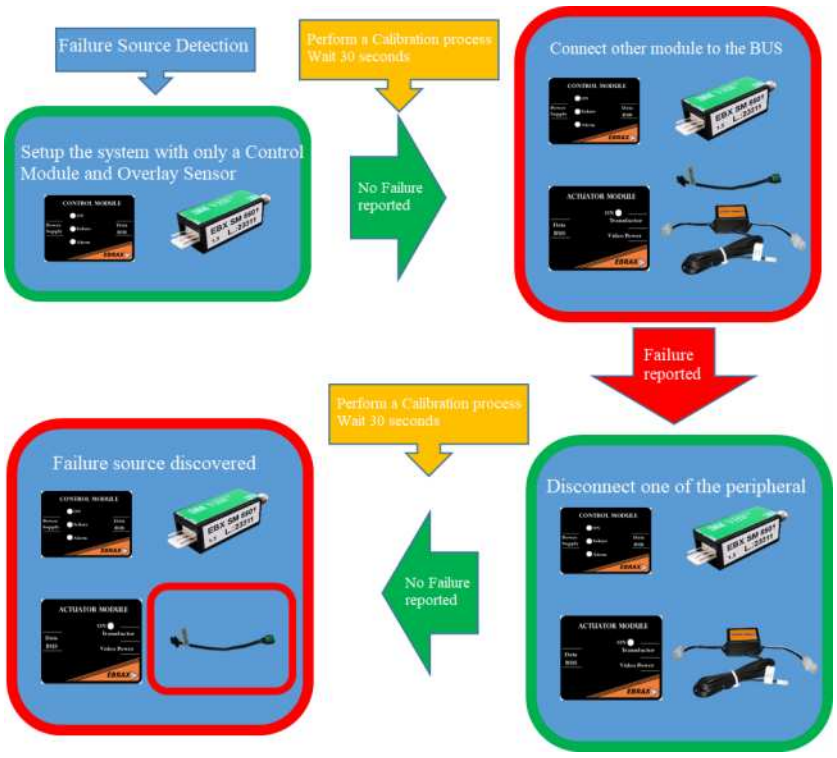
To identify which module presents failure, perform a system calibration with only the Control Module and one Overlay Sensor connected.

Wait 30 seconds to check if the FAIL indication ceases.

If the system starts normal operation, add a new module to the bus and perform a new system calibration.

Wait 30 seconds to check if the FAIL indication ceases.

Add a new module to bus, performing a system calibration after each new module until the FAIL indication returns. The last module added should be damaged or incorrectly connected.



5. Android APP

The Android app **EBX M.A.S.S. Control** is a useful tool assisting in testing and configuring a **MASS** installation.

Through a Bluetooth connection or USB-OTG is possible to:

- Check System Status;
- Send Calibration Command;
- Enter DEBUG mode;
- Change Alarm Times.

The following devices are needed in order to connect the **MASS** System to the Android app:

Table 3 – List of material needed

USB-OTG	Bluetooth
Communication Module	Bluetooth Module
USB Cable	-
OTG Adaptor	-

Figure 62. USB-OTG adaptor

Figure 63. USB Cable

a) Connect the OTG Adaptor to the phone.

b) Connect the USB cable to the Communication Module

c) Connect the second end of the USB cable to the OTG Adaptor

d) Run the **EBX MASS Control** App and choose the VID and PID available in the popup window.

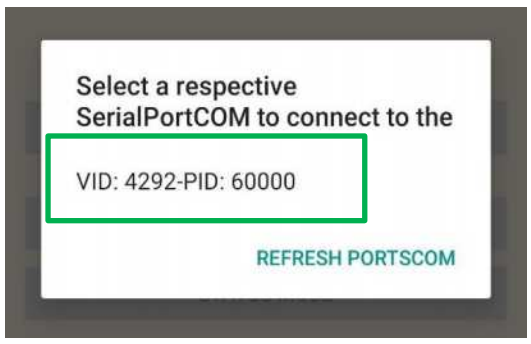


Figure 64. VID/PID List

Figure 65. USB-OTG connection example

Figure 66. Bluetooth connection example

e) After a successful connection, the options "Configuration", "Debug Mode" and "Status Mode" will be available.

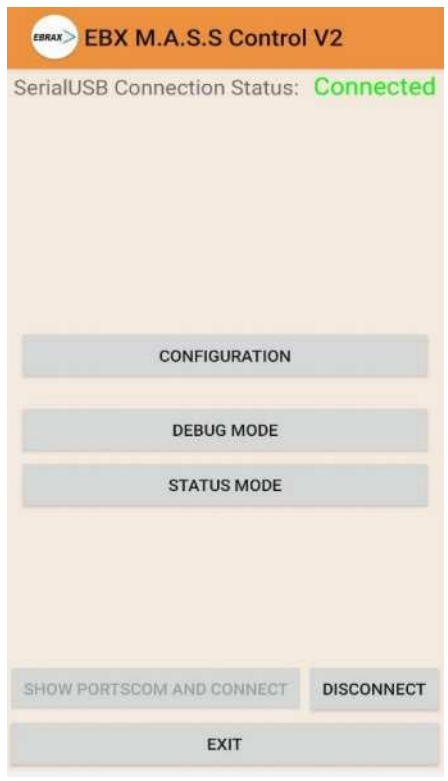


Figure 67. EBX M.A.S.S Control main window (?)

f) The "CONFIGURATION" window gives access to:

- Send Calibration Command;
- Change Alarm Time.

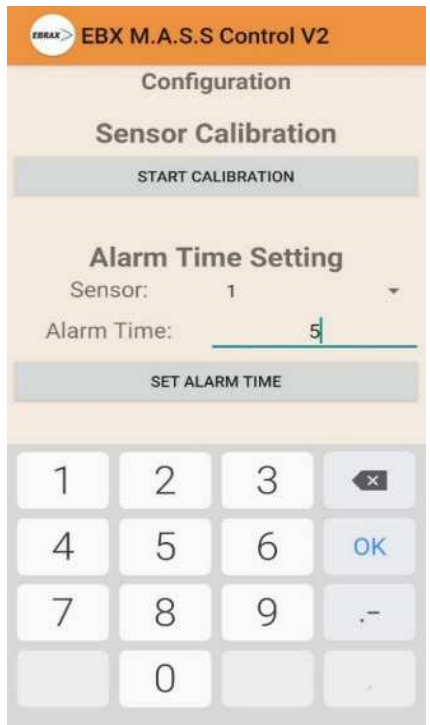


Figure 68. CONFIGURATION window

g) Pressing the "START CALIBRATION" button sends a calibration command to the **MASS** System.

h) To change the Alarm Time, select the desired sensor on the drop list and fill in the new Alarm

Time. Pressing “Set Alarm Time” changes the Alarm Time accord to the filled information. Notice that the maximum allowed Alarm Time is 255 seconds.

i) In DEBUG MODE, all sensors measured values are printed in its respective fields.

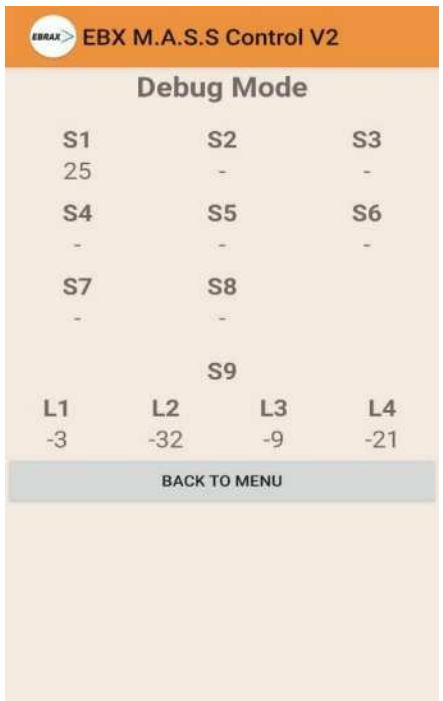


Figure 69. DEBUG mode window

Sensors S1 to S8 shows the Overlay Sensors measured value.
Sensor S9 shows the Deep Insert Sensor measured values, being L1 to L4 the values presented by each optical pair.

j) In STATUS MODE, the status of all sensors are displayed. The status can be Operation, Disconnected, Alert, Alarm.

Figure 70. STATUS Mode window

6. Outline Dimensions

EBX MSM 2070

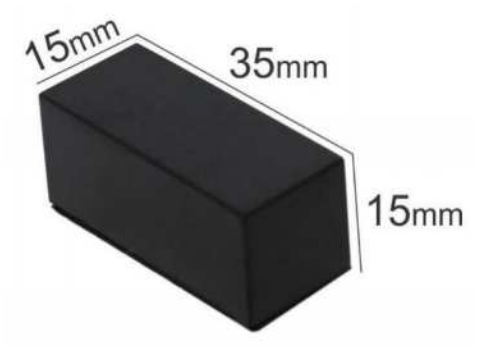


Figure 71. EBX MSM 2070 dimensions

EBX MCT 2010 e EBX MAT 2020

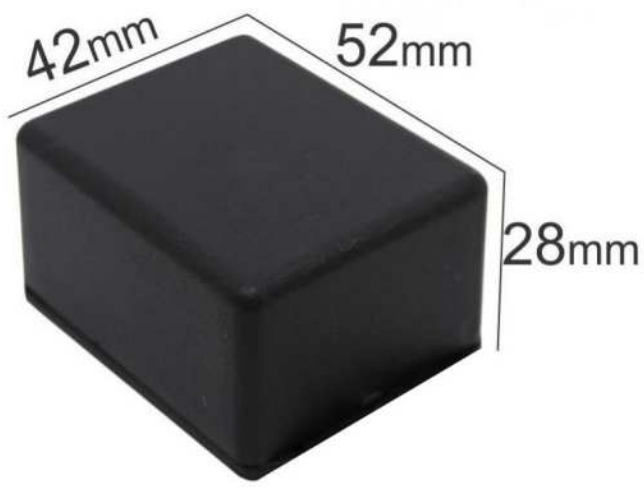


Figure 72. EBX MCT 2010 and EBX MAT 2020 dimensions

EBX MAL 2030, EBX COM 2040 and EBX MBL 2041

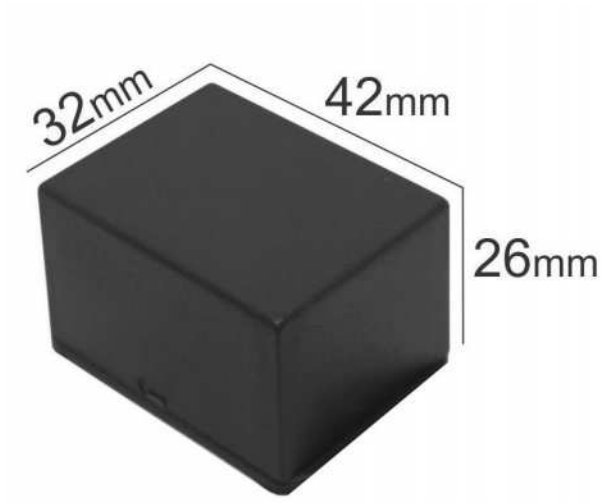


Figure 73. EMX MAL 2030, EBX COM 2040 and EBX MBL 2041 dimensions

7. Technical Support

EBRAX offers Technical Support during all project phases. From pre sales, helping defining the best **MASS** configuration, to in local technical support, solving specific problems.

At our website www.ebrax.net, all up-to-date documentation and anti-skimming solutions is available including:

- Products information: datasheets, application notes, user guides.

- Technical Support: FAQ, technical support solicitation and consultants contacts.

- Commercial information: Product Selection, Quotation information, sales office contact information.

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