Product Manual

IM300, IM500, and IM700 UNATTENDED PAYMENT TERMINAL PRODUCT MANUAL

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Revision History

Version	Contents	Author	Date
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V1.11	removed ground cable	William Qiu	2018/10/16
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V1.17	changed RS232 pinout	William Qiu	2020/03/16
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V1.20	added mounting torque	William Qiu	2021/07/15
V1.21	changed antenna labels and IM300 spec	William Qiu	2022/04/29

This document is meant to aid in the installation of the IM series of devices into an integrated unattended payment terminal. The IM300 encrypting PIN pad, the IM500 secure card reader, and the IM700 contactless card reader are each covered within this document.

Table of Contents

1 Product Introduction

1.1 Glossary

UPM	Unattended Payment Module
EPP	Encrypting PIN Pad
SCR	Secure Card Reader
ESD	Electrostatic Discharge
GND	Ground
LCD	Liquid Crystal Display
MDB	Multidrop Bus
USB	Universal Serial Bus
RS232	Recommended Standard 232
RAM	Random Access Memory
MCU	Microcontroller Unit
CPU	Central Processing Unit
SAM	Secure Access Module
SIM	Subscriber Identity Module

1.2 Unattended Payment Terminal

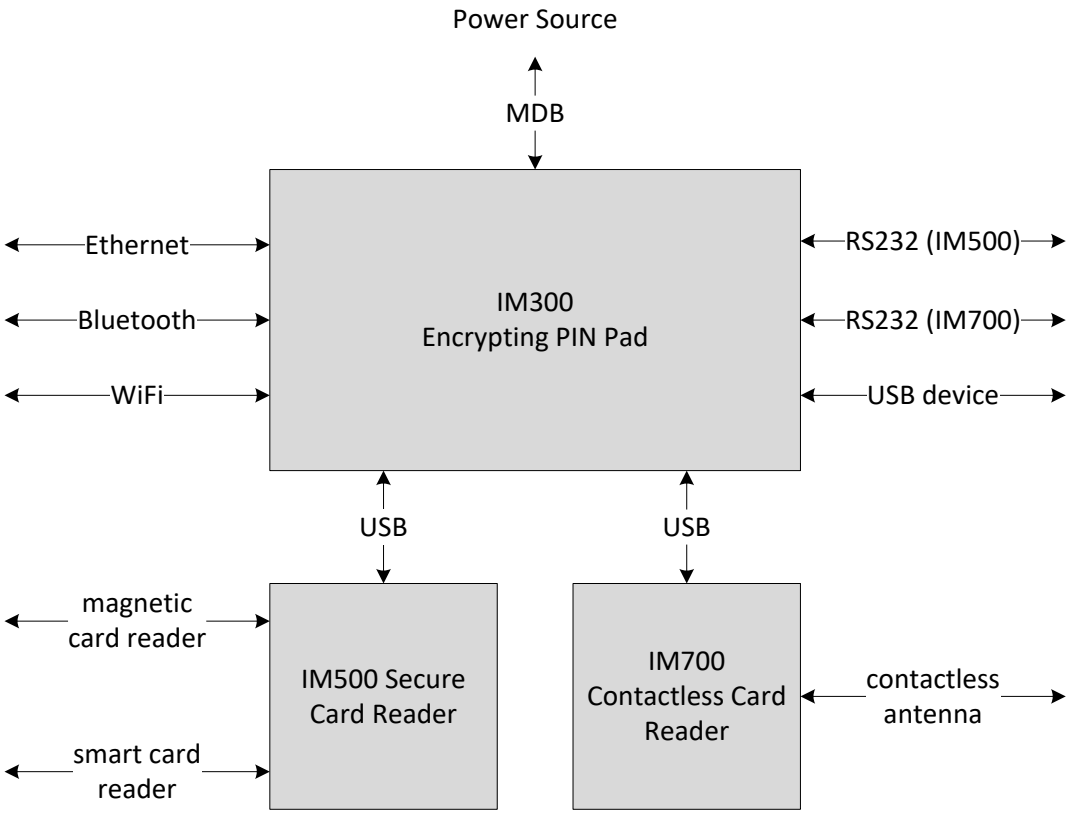
The IM series from PAX is a set of modular devices designed to be capable of unattended operation in outdoor or indoor environments. They are designed to be used with vending, parking, or other such unattended payment terminals.

The modules that comprise the IM series are as follows:

- IM300; an encrypting PIN pad
- IM500; a secure card reader
- IM700; a contactless card reader

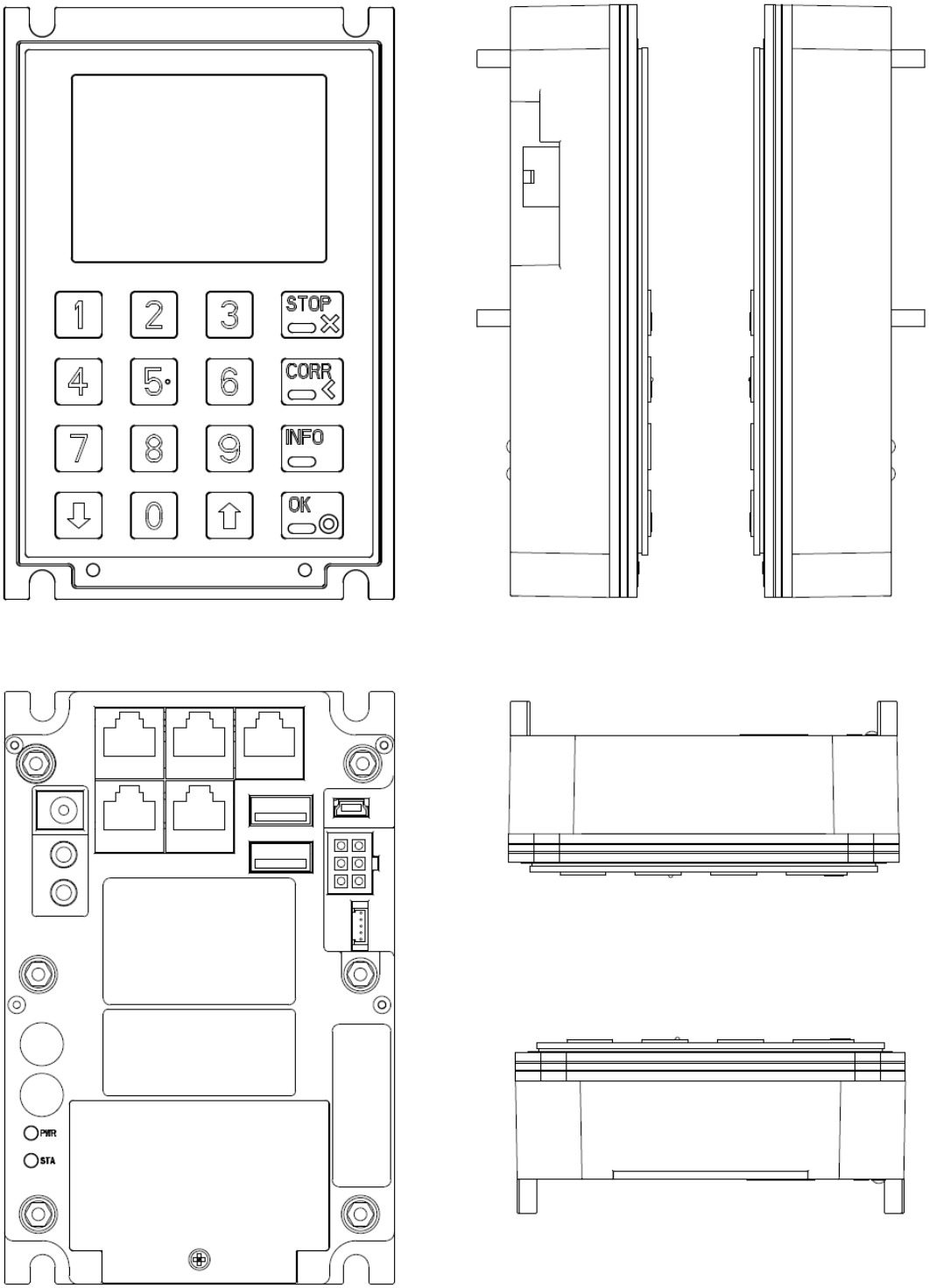
These modular devices can operate alone or together. Because these are completely separate devices, they can be installed in a variety of physical configurations relative to each other. The devices in the IM series are also designed to operate in a wide range of temperatures, repel the ingress of dust and water, resist physical impacts, and disperse electrostatic discharges. These are all qualities that allow the devices to be installed in a wide variety of outdoor or indoor locations.

1.3 Device Connections

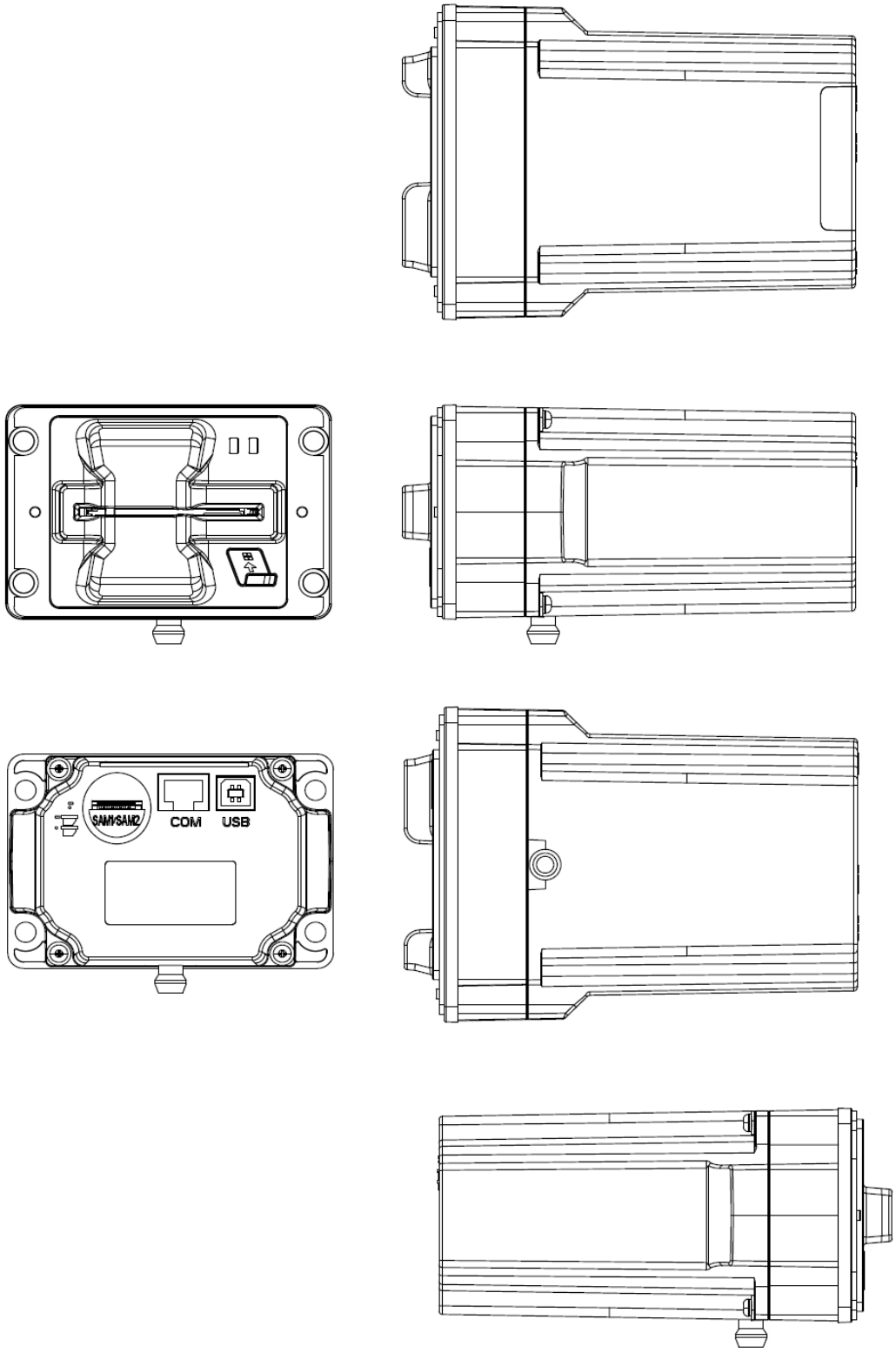


1.4 Illustration of Modules

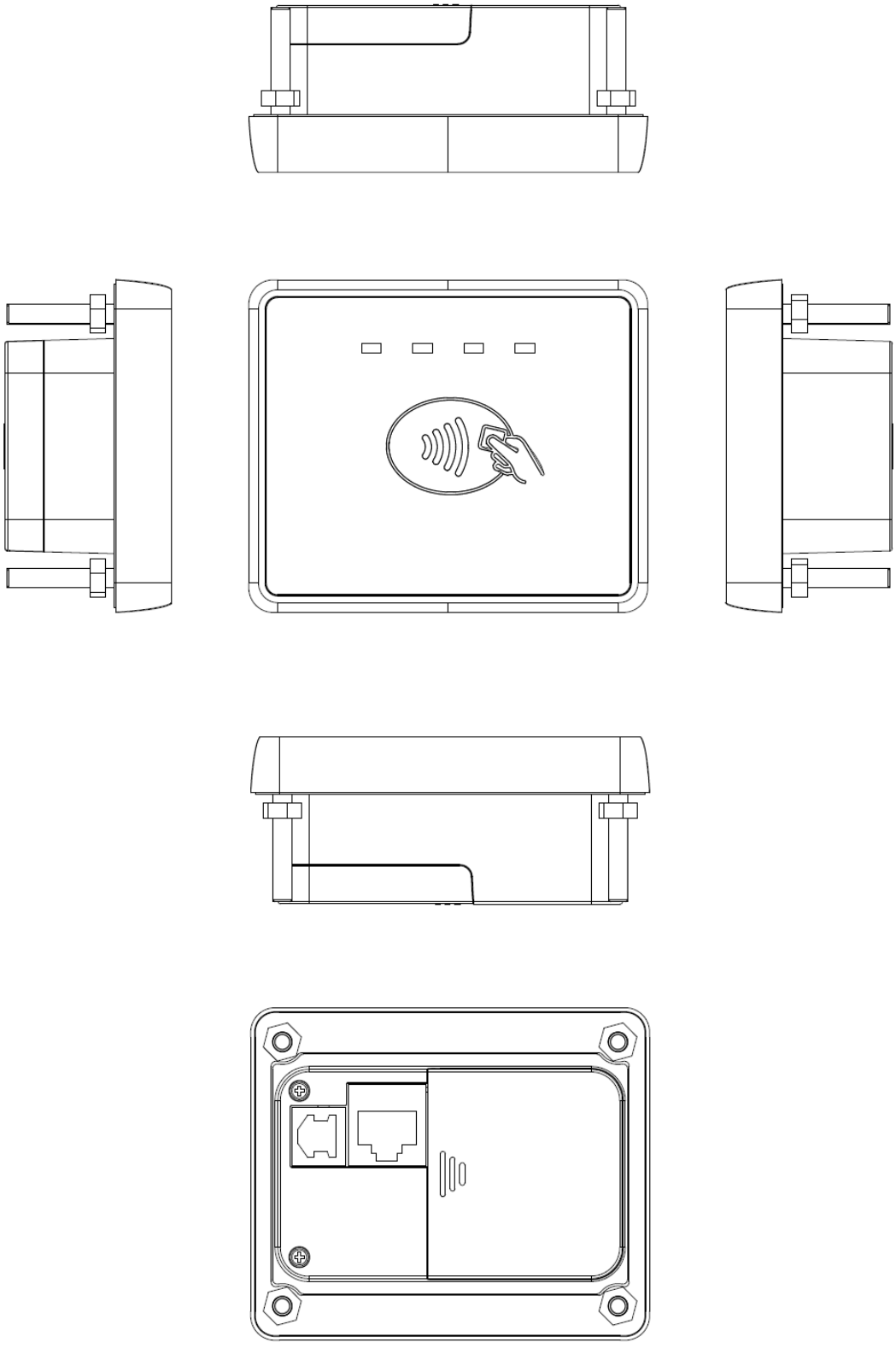
1.4.1 IM300 Illustration



1.4.2 IM500 Illustration



1.4.3 IM700 Illustration



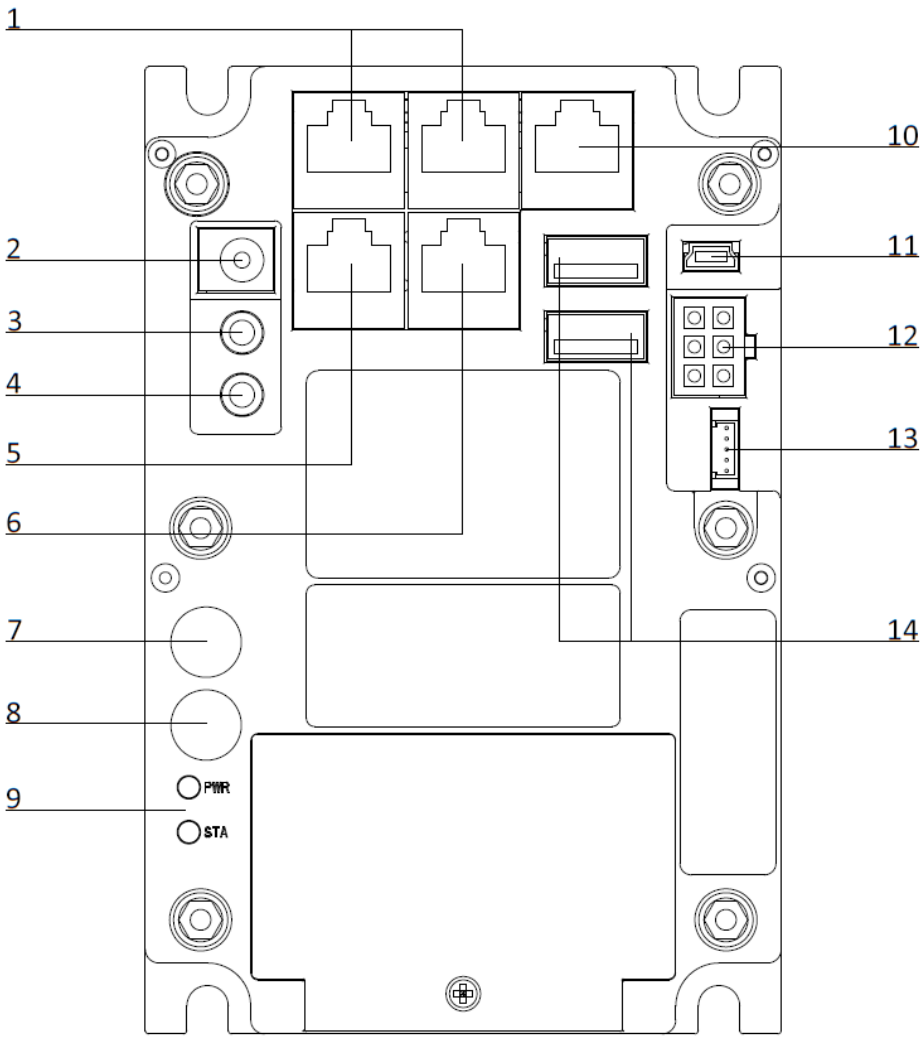
1.5 Device Specifications

1.5.1 IM300 Specifications

CPU:	1.25 GHz Application Processor	
Operating System:	Prolin (Linux)	
Memory:	4 Gb DDR3	
	4 Gb NAND Flash	
Display:	2.8" TFT color display	
	320 x 240 pixels	
SAM Slots:	2 slots, ISO/IEC 7816	
Peripheral Ports:	4 RS232 (RJ45)	
	1 Ethernet (RJ45, 100 Mb/s)	
	2 USB 2.0 (USB Type-B)	
	1 USB 2.0 (USB Mini-B)	
	1 MDB port	
	1 microphone jack	
	1 speaker jack	
	1 1.25 mm 5 pin socket	
Wi-Fi:	2.4 GHz 802.11 b/g/n (optional)*	
Bluetooth:	Bluetooth V4.0 (optional)*	
Cellular Network:	3G (optional)*	
Battery:	1 button battery, 600mAh, 3.0 V	
Power Supply:	Input:	9 VDC to 42 VDC (MDB)
	Output:	5 VDC (USB2.0 Type-A) x 2
		12 VDC (RS232 via RJ45) x 2
		12 VDC (6.3mm DC power jack)
Buzzer:	≥80dB	
Operating Temperature:	-20°C to 70°C	
	-4°F to 158°F	
Storage Temperature:	-30°C to 70°C	
	-22°F to 158°F	
Relative Humidity:	5% to 95% (without condensation)	
Dimensions:	92mm x 33.8mm x 140mm	

∗ The availability and configuration of optional modules are dependent on the model number of the IM300 unit.

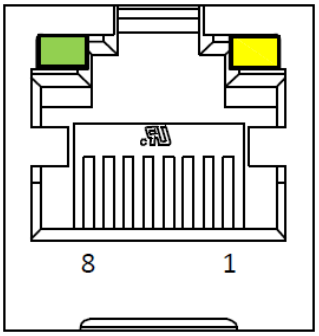
1.5.1.1 IM300 Output Connectors



1. RS232 via RJ45ports
2. 6.3mm DC power jack (12VDC)
3. Microphone jack
4. Speaker jack
5. Ethernet port
6. RS232 via RJ45ports; for IM500
7. ANT 1 (cellular network antenna)
8. ANT 2 (Wi-Fi & Bluetooth antenna)
9. LED indicators
10. RS232 via RJ45ports; for IM700
11. USB 2.0 Mini-B
12. MDB port
13. Temperature control (reserved)
14. USB 2.0 Type-A

Ethernet

The lower left RJ45 port on the back of the IM300 is a standard 1000BASE-T Ethernet port. It has green and yellow indicator lights placed on its upper left and right sides as shown below:



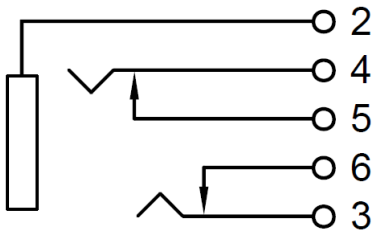
Microphone

The IM300 has a standard 3.5mm microphone jack.

Speaker

The IM300 has a standard 3.5mm speaker jack. This is meant to be support a mono channel speaker operating with a maximum power draw of 1.3 W. Do not plug earphones into this jack, the IM300 may damage them during operation.

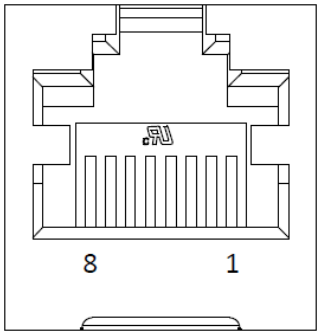
pin	signal
2	GND
4	SPEAKER_P
5	SPEAKER_P
6	SPEAKER_M
3	SPEAKER_M



RS232

Recommended Standard 232 is a protocol for serial communications. The upper left and upper middle RJ45 ports on the IM300 use RS232 and have the following pinout:

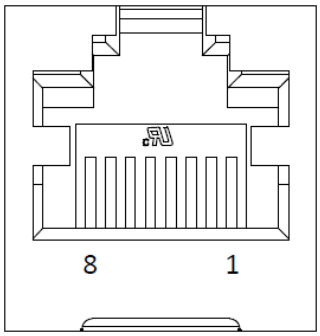
pin	signal
1	NC
2	NC
3	GND
4	NC
5	RX
6	TX
7	NC
8	NC



RS232 (for IM500)

The lower right RJ45 port on the IM300 uses RS232 and is reserved for connecting to the IM500. It has the following pinout:

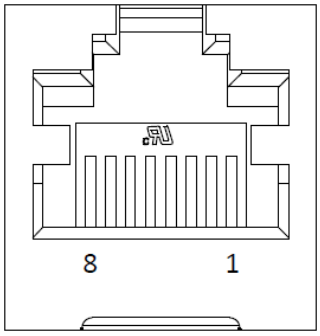
pin	signal
1	NC
2	NC
3	GND
4	NC
5	RX
6	TX
7	NC
8	12V output



RS232 (for IM700)

The upper right RJ45 port on the IM300 uses RS232 and is reserved for connecting to the IM700. It has the following pinout:

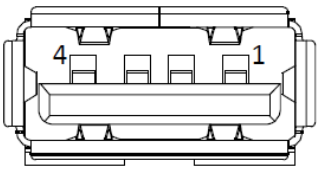
pin	signal
1	NC
2	NC
3	GND
4	NC
5	RX
6	TX
7	NC
8	12V output



USB 2.0 Type-A

The IM300 has two USB 2.0 Type-A ports available for use, they serve as host connections, and can output 5V. They have the following pinout:

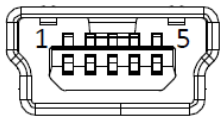
pin	signal
1	5V output
2	D-
3	D+
4	GND



USB 2.0 Mini-B

The IM500 has a USB 2.0 Mini-B port available for use, it serves as a device connection, and allows for the input of 5V. They have the following pinout:

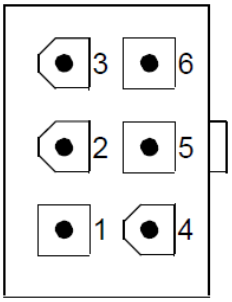
pin	signal
1	5V output
2	D-
3	D+
4	NC
5	GND



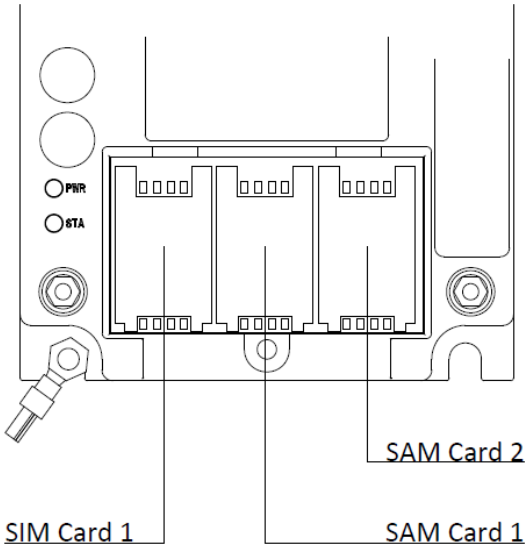
MDB

MDB (Multidrop Bus) is a communications protocol commonly used in the vending machine industry. The IM300 has a MDB port and can act a peripheral device to a master controller, it can accept an input voltage of 9V to 42V. The pinout for the MDB port is as follows:

pin	signal
1	POWER_IN
2	GND
3	NC
4	MASTER_RX
5	MASTER_TX
6	COM (D_GND)



1.5.1.2 IM300 SAM/SIM card Installation



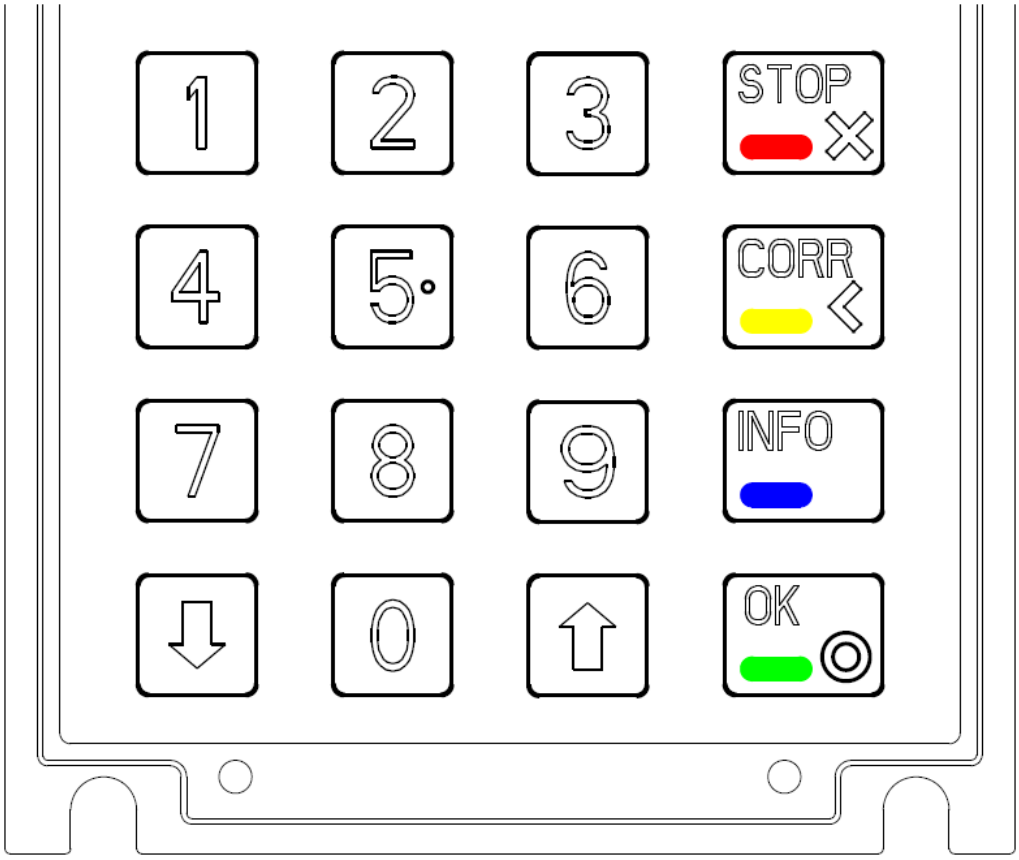
The IM300 has two SAM card slots as well as a SIM card slot available for use. These slots are normally hidden by a plastic cover affixed to the back of the IM300 by a screw. If the screw is loosened, the cover can be slid open three card mounts. From left to right, these mounts are for the SIM card, the first SAM card and the second SAM card respectively.

In order to install a card, open the mount and insert the card into the slot with the contacts facing downwards and the clipped corner of the card to the upper right, then lock the mount with the card inside and replace the cover.

1.5.1.3 IM300 Display

The IM300 has a 2.8" LCD screen with a resolution of 320 x 240 pixels. The screen has a life expectancy of over 50,000 hours, a display angle 100° along the vertical or horizontal axis, a LED backlight, and a scratch resistant glass cover.

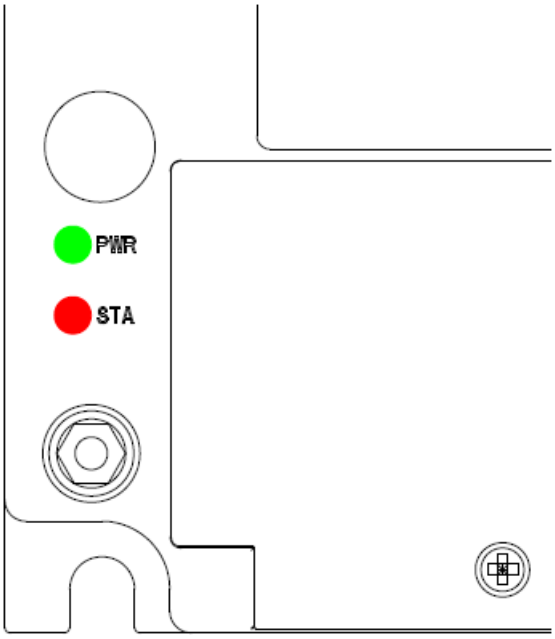
1.5.1.4 IM300 Keypad



The IM300 has a numeric keypad used for PIN entry and general user interface located on the front face of the device.

- The keypad contains 10 numeric keys (0 to 9), 2 navigational keys (up and down), and four functional keys (cancel, clear, help, and enter).
- The keys are metallic shells on a dome-switch keypad.
- The keys are capable of resisting up to 10 J of force.
- The keypad is designed to prevents the ingress of dust and water from the front of the device.
- The life expectancy of the keys are 1 million presses each minimum.
- The cancel, clear, and enter keys have raised symbols ("X", "<" and "O" respectively) marking them, while there is a raised dot on the "5" key to center the keypad.
- Each key press will be accompanied by the output of a tone from the device to acknowledge the press; the same tone will be used for all keys to prevent identification of the key.
- The keys are grounded.

1.5.1.5 IM300 Indicator LEDs



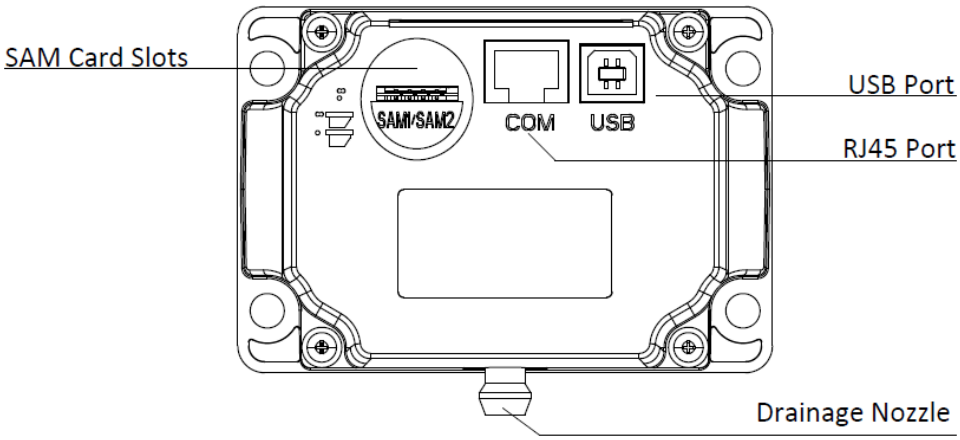
The IM300 has two indicator LEDs located on the lower left of its back face, displaying the power and security status of the device.

The power indicator LED is green while the security indicator LED is red. The power indicator LED lights up as soon as the device begins to boot and stays on as long as the device is powered. The security indicator LED lights up during the boot process and turns off during normal operation of the device, unless the service switch is inactive, in which case it will blink once every two seconds.

1.5.2 IM500 Specifications

CPU:	528MHz Application Processor
Operating System:	Linux
Memory:	2Gb DDR3L SDRAM 1Gb NAND Flash
Magnetic Strip Reader:	Triple track, ISO7811 and ISO7812
Smart Card Reader:	1.8V, 3V, and 5V (a)sync cards; ISO7816, EMV4.3 and PBOC3.0; EMV L1 & L2 Contact
SAM Slots:	2 slots, ISO/IEC 7816
Peripheral Ports:	1 RS232 (RJ45) 1 USB 2.0 (USB Type-B)
Battery:	1 button battery, 200mAh, 3.0V
Power Supply:	Input: 5VDC (USB 2.0 Type-B) 12VDC (RS232 via RJ45) Output: none
Buzzer:	≥80dB
Temperature:	-30°C to 70°C -22°F to 158°F
Relative Humidity:	5% to 90% (no condensation)
Dimensions:	100mm x 130.8mm x 68mm

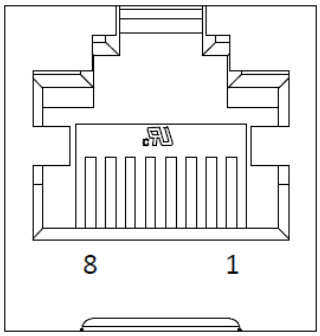
1.5.2.1 IM500 Output Connectors



RS232

Recommended Standard 232 is a protocol for serial communications. The RJ45 port on the back of the IM500 uses RS232 and has the following pinout:

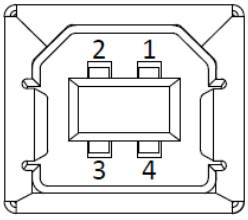
pin	signal
1	NC
2	NC
3	GND
4	NC
5	RX
6	TX
7	NC
8	5 ~ 12 V input



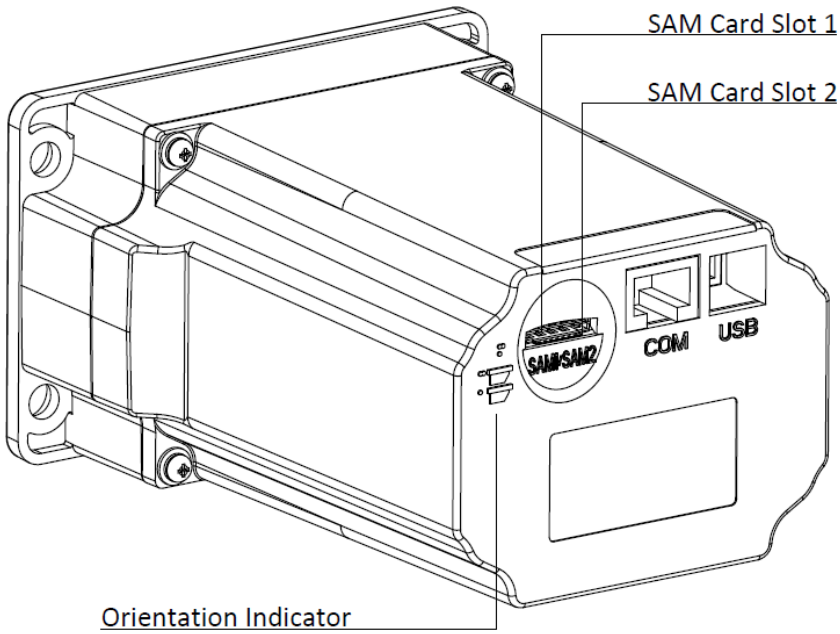
USB 2.0 Type-B

The IM500 has a USB 2.0 Type-B port available for use, it can accept or output 5V. The USB port has the following pinout:

pin	signal
1	5V
2	D-
3	D+
4	GND

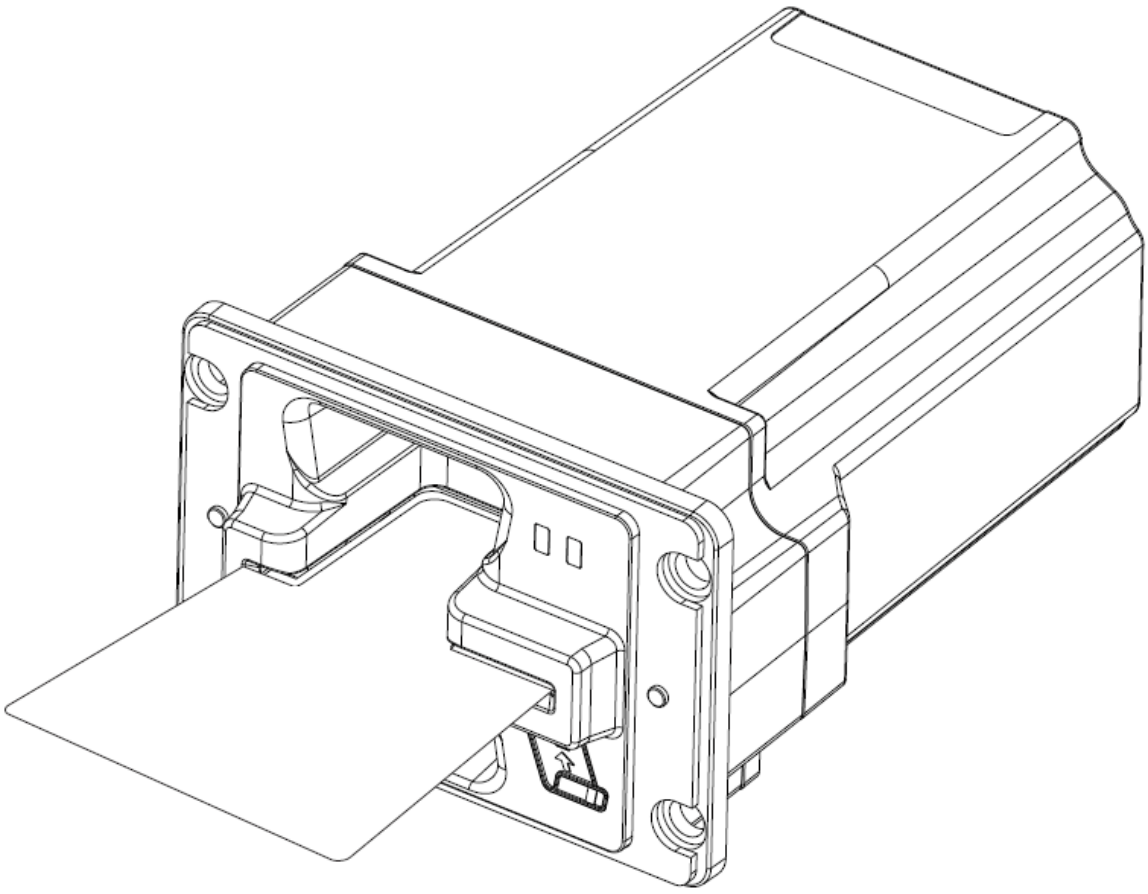


1.5.2.2 IM500 SAM card Installation



The IM500 has two SAM card slots available for use. These slots are exposed on the back face of the IM500. In order to install a SAM card, slide the SAM card into one of the open slots with the contacts facing down. When fully depressed into the slot, the clipped corner of the card should be exposed on the right side as shown on the orientation indicator.

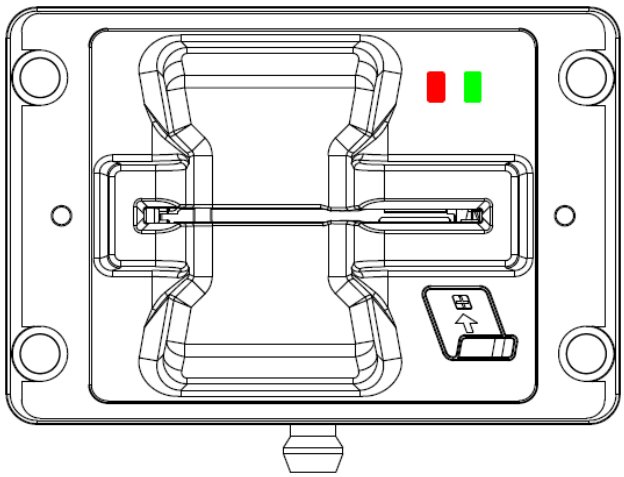
1.5.2.3 IM500 Card Reader



The IM500 has a two in one smart card and magnetic strip card reader located on the front face of the device.

- The magnetic card reader is capable of triple track reading.
- The magnetic card reader is capable of reading on insertion and removal.
- The magnetic card reader is capable of reading card conforming to the GB/T 14916, GB/T 15120, GB/T 15694-1, ISO 7812-2, and GB/T17552 standards.
- The magnetic card reader is capable of reading all triple track cards conforming to ISO7811-1 to ISO7811-6.
- The magnetic card reader is capable of reading high coercivity magnetic strip cards that conform to ISO7811-6 and ISO7811-8.
- To read a magnetic strip card, insert the card into the reader with the magnetic strip facing down and to the right.
- The life expectancy of the magnetic strip reader is 1 millions reads at a minimum.
- The smart card reader conforms to ISO7816, EMV4.3, and PBOC3.0.
- The smart card reader is capable of reading 1.8V, 3V, and 5V (a)synchronous cards.
- The smart card reader has a friction type contact.
- To read a smart card, insert the card fully into the reader with the contacts facing up and towards the readers.
- The life expectancy of the smart card reader is 500,000 reads at a minimum.

1.5.2.4 IM500 Indicator LEDs



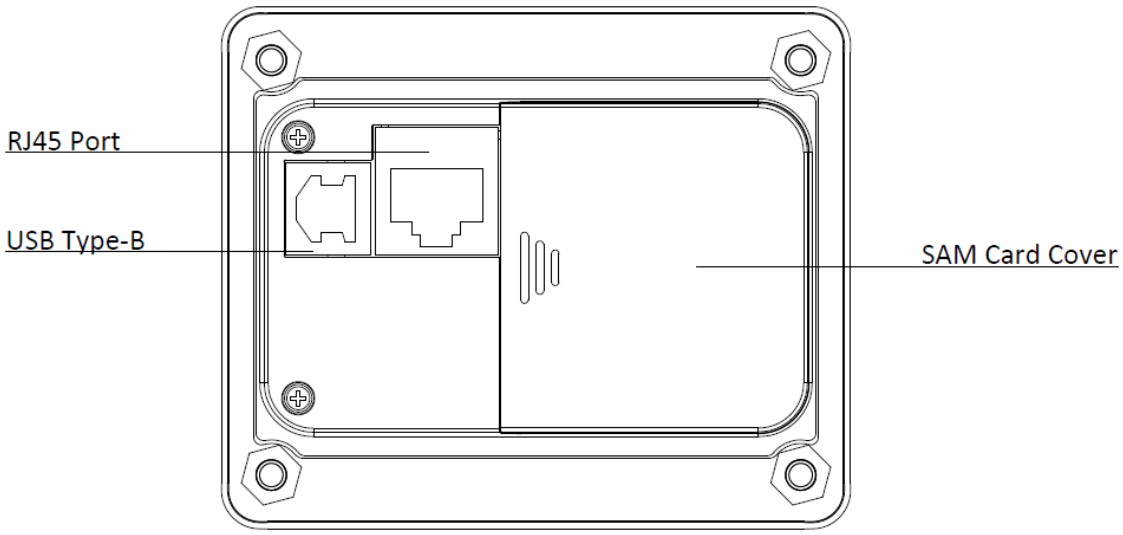
The IM500 has two indicator LEDs located on the right side of its front face, displaying the status of the device during its operation.

The green LED blinks twice during startup and then once when the boot sequence completes and the IM500 is ready. The green and red LEDs blink simultaneously when the hardware tamper-proofing signals are triggered.

1.5.3 IM700 Specifications

CPU:	528MHz Application Processor
Operating System:	Linux
Memory:	2Gb DDR3 SDRAM 1Gb NAND Flash
Contactless Reader:	ISO/IEC 14443 Type A and Type B, Mifare ®, and Felica
SAM Slots:	2 slots, ISO/IEC 7816
Peripheral Ports:	1 RS232 (RJ45) 1 USB 2.0 (USB Type-B)
Battery:	1 Nickel button battery, 200mAh, 3.0V
Power Supply:	Input: 5VDC (USB2.0 Type-B) 12VDC (RS232 via RJ45) Output: none
Buzzer:	≥75dB
Temperature:	-30°C to 70°C -22°F to 158°F
Relative Humidity:	5% to 95% (no condensation)
Dimensions:	82mm x 34.2mm x 68mm

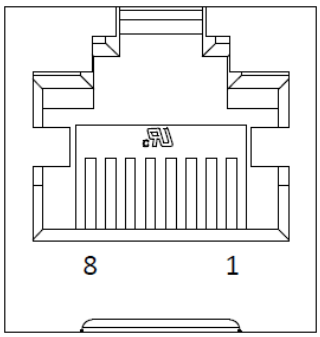
1.5.3.1 IM700 Output Connectors



RS232

Recommended Standard 232 is a protocol for serial communications. The RJ45 port on the back of the IM700 uses RS232 and has the following pinout:

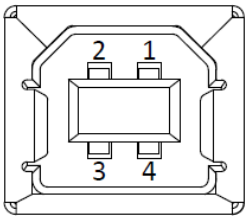
Pin	signal
1	NC
2	NC
3	GND
4	NC
5	RX
6	TX
7	NC
8	5 ~ 12 V input



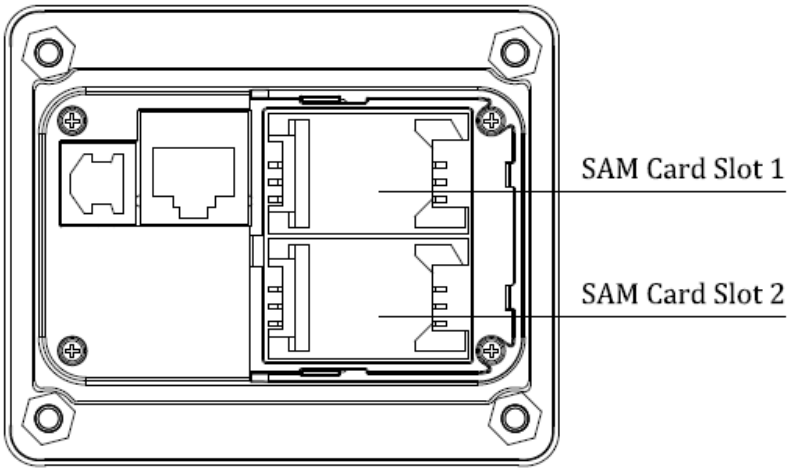
USB 2.0 Type-B

The IM700 has a USB 2.0 Type-B port available for use, it can accept or output 5V. The USB port has the following pinout:

pin	signal
1	5V
2	D-
3	D+
4	GND

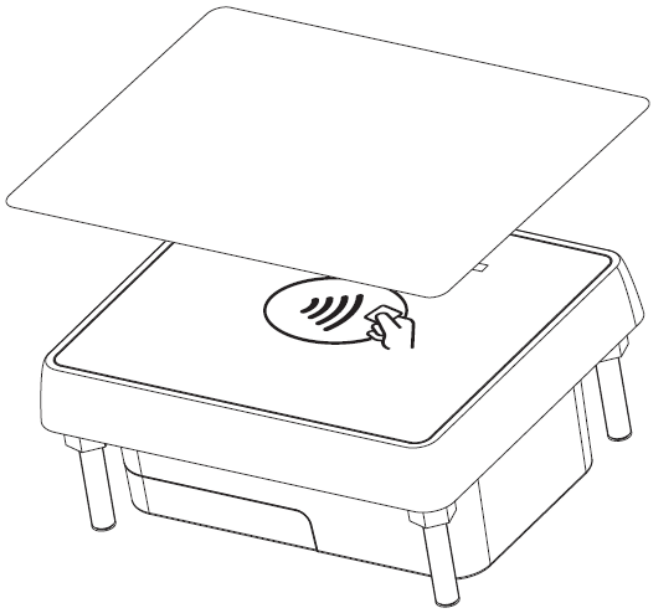


1.5.3.2 IM700 SAM card Installation



The IM700 has two SAM card slots available for use. These slots are exposed on the back face of the IM700. In order to install a SAM card, slide the SAM card into one of the open slots with the contacts facing down. When fully depressed into the slot, the clipped corner of the card should be exposed on the right side as shown on the orientation indicator.

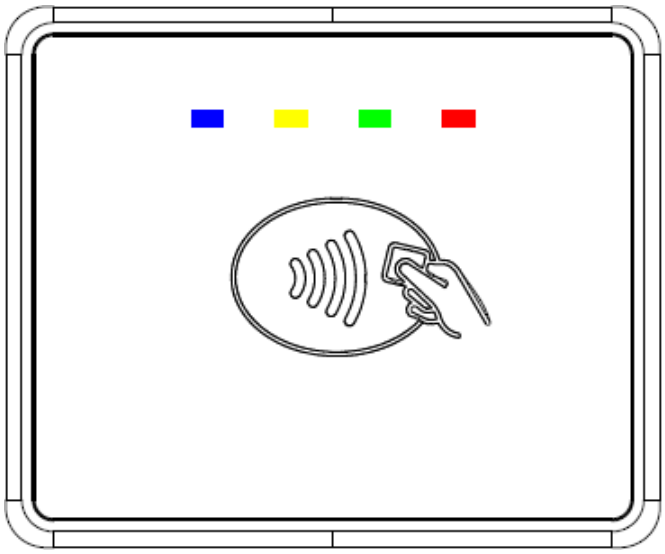
1.5.3.3 IM700 Contactless Card Reader



The primary function of the IM700 is to serve as a contactless card reader. The IM700 reads contactless cards through a RF antenna located on its front face.

In order for the IM700 to detect and interface with contactless cards, the user holds a contactless card with the face of the card roughly 4 cm or less from the face of the device. The orientation of the card does not matter so long as it is roughly facing the front of the device.

1.5.3.4 IM700 Indicator LEDs



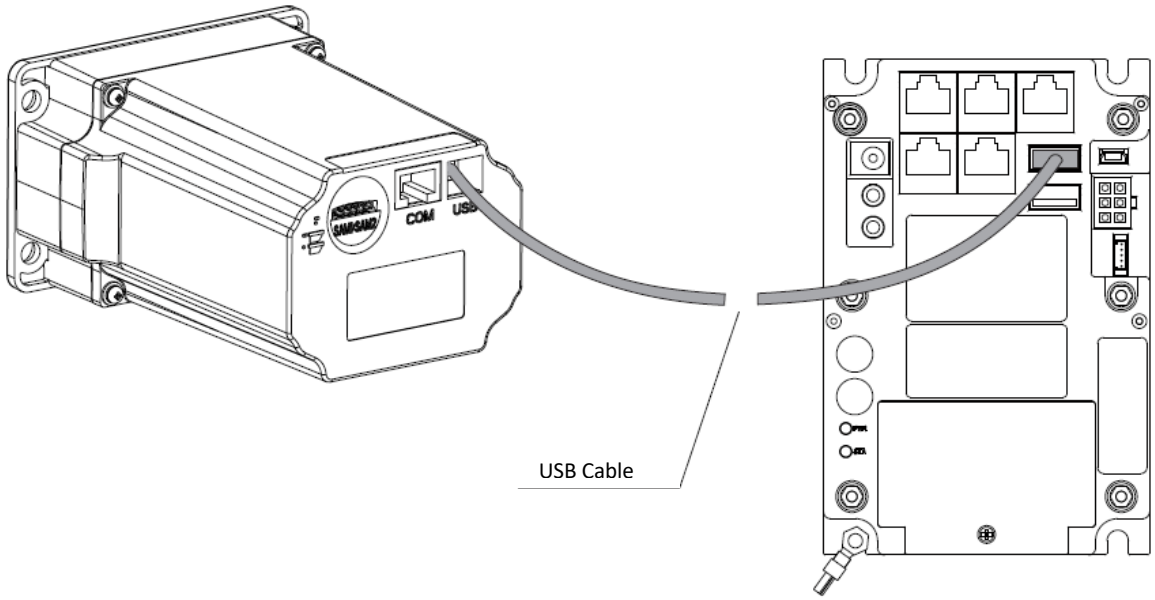
The IM700 has four indicator LEDs located on its front face. The different LED indicators show the following states for the IM700:

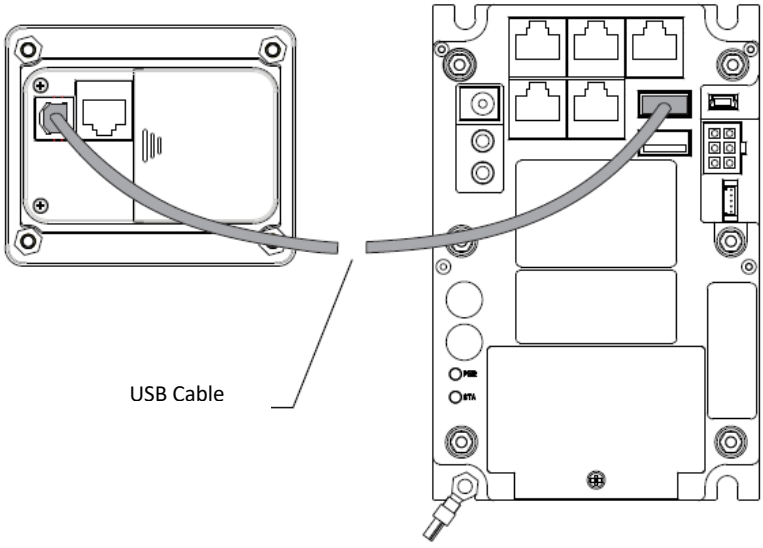
- All LEDs being in the off state means that the device is unpowered or powering up and connecting to a terminal.
- The blue LED indicates that the device is idle or ready for transaction.
- The yellow LED indicates that the device is processing payments or other services.
- The green LED indicates that the device has completed processing the transaction.
- The red LED indicates that the device has encountered an error.

2 Accessories and Cables

2.1 Device Interconnection

2.1.1 Device Connection with USB



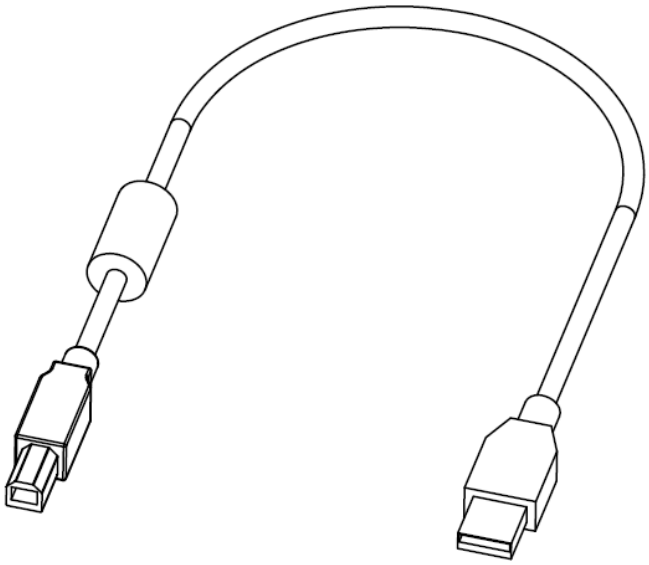


The entire unattended payment terminal system is designed around the three devices in the IM series functioning together. Both the secure card reader and the contactless card reader are linked to and accessed by the encrypted PIN pad.

The IM300 and the IM500 can be connected together by USB using either of the Type A USB ports on the IM500 as well as the Type B USB port on the IM500. The IM300 and the IM700 can be connected together by USB in the same manner.

A Type A to Type B USB cable is packaged with the devices.

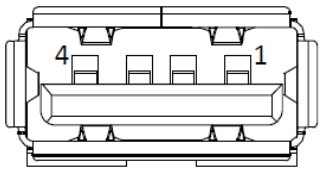
USB Cable



The IM500 and IM700 each come packaged with a USB Type-A to Type-B cable.

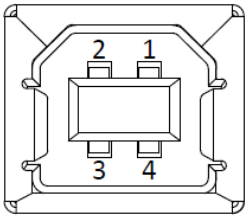
Pinout from the perspective of the IM300:

pin	signal
1	5V output
2	D-
3	D+
4	GND

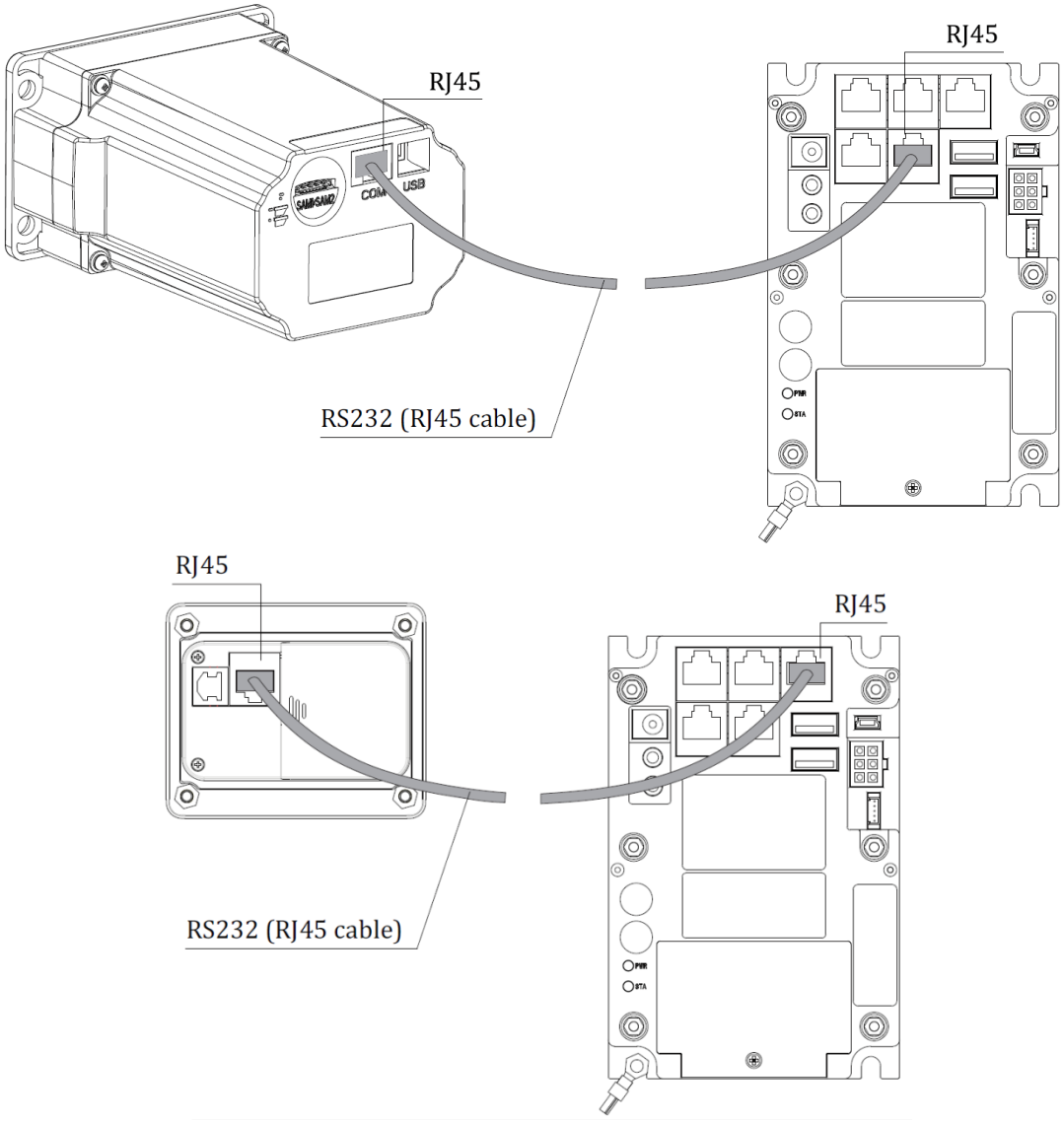


Pinout from the perspective of the IM500 or IM700:

pin	signal
1	5V
2	D-
3	D+
4	GND



2.1.2 Device Connection with RS232

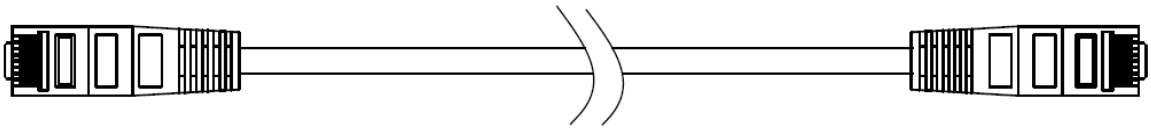


The entire unattended payment terminal system is designed around the three devices in the IM series functioning together. Both the secure card reader and the contactless card reader are linked to and accessed by the encrypted PIN pad.

The IM300 and the IM500 are connected together by RS232 using the lower right RJ45 port located on the back of the IM300. This port is reserved for use of the IM500. The IM300 and the IM700 are connected together by via RS232 using the upper right RJ45 port located on the back of the IM300. This port is reserved for use of the IM700.

The RJ45 cables are not normally packaged with the devices but are available upon request. Use only the cables provided by PAX, otherwise the pinout used may not matched what is needed by the RJ45 ports.

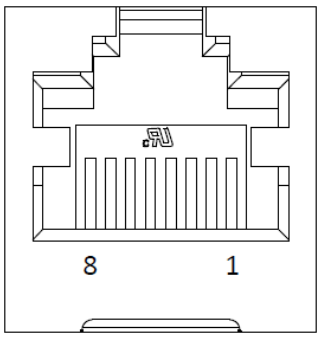
RJ45 Cable



The RJ45 cable is used to connect ports with the following pinouts:

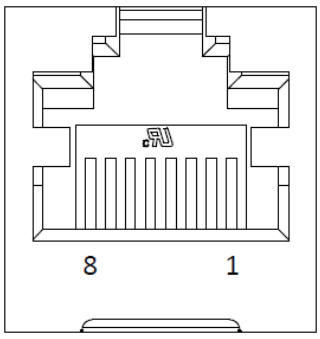
Pinout from the perspective of the IM300:

pin	signal
1	NC
2	NC
3	GND
4	NC
5	RX
6	TX
7	NC
8	12V output



Pinout from the perspective of the IM500 or IM700:

pin	signal
1	NC
2	NC
3	GND
4	5V output
5	RX
6	TX
7	NC
8	12V input



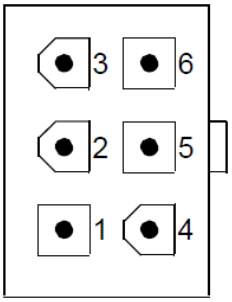
Since the RX and TX pins are from the perspective of the port itself, the actual wires for the cable are crossed so that the signals for pins 5 and 6 are correct no matter what. The other pins match 1 to 1 directly.

The RJ45 cables are not normally packaged with the devices but are available upon request.

2.2 Power Adapter

The IM300 is packaged with a power adapter that allows it accept an AC input of 100V to 240V at 50/60 Hz with a maximum current of 1.5A. The power plug is attached to a transformer, which is then connected to a 6 pin Molex connector with a ferrite choke. This connector can be plugged into the MDB port on the IM300 and has the following pinout:

pin	signal
1	POWER_IN
2	GND
3	NC
4	NC
5	NC
6	NC



2.3 Detachable Antenna

2.3.1 Wi-Fi Antenna

Certain configurations of the IM300 may include a detachable Wi-Fi antenna as a part of the product contents. This is a vertical antenna with a built in loading coil and a magnetic attachment at its base that allows for ease of installation on various metallic surfaces. The antenna is connected to the IM300 via a coaxial cable with a SMA connector, this can be connected to the lower of the two SMA connectors on the back of the IM300 labeled as ANT 2 (refer to 1.5.1.1).

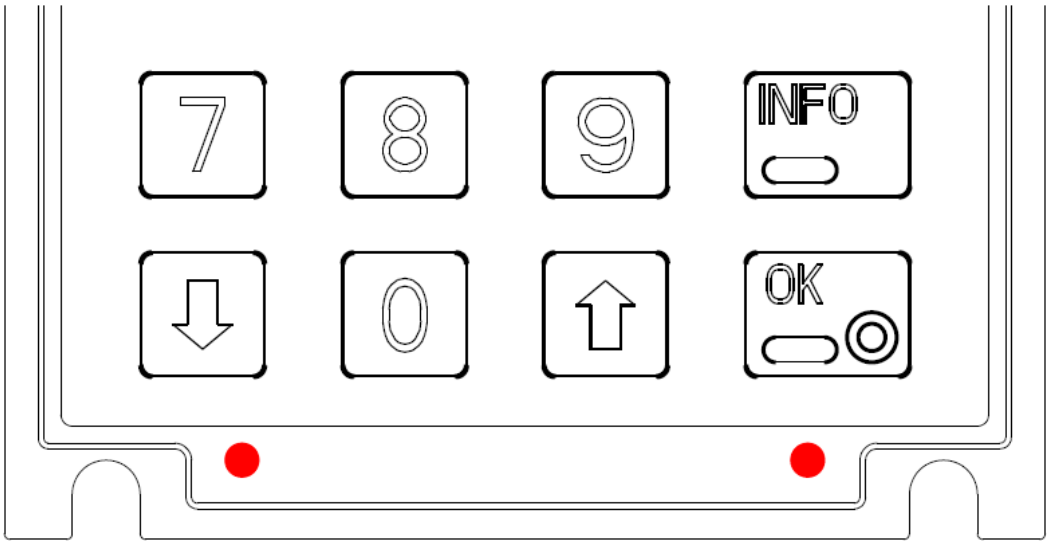
2.3.2 3G antenna

Certain configurations of the IM300 may include a detachable cellular network antenna as a part of the product contents. This is a dipole antenna with a plastic outer cover and a magnetic attachment at its base that allows for ease of installation on various metallic surfaces. The antenna is connected to the IM300 via a coaxial cable with a SMA connector, this can be connected to the upper of the two SMA connectors on the back of the IM300 labeled as ANTE 1 (refer to 1.5.1.1).

3 Product Installation

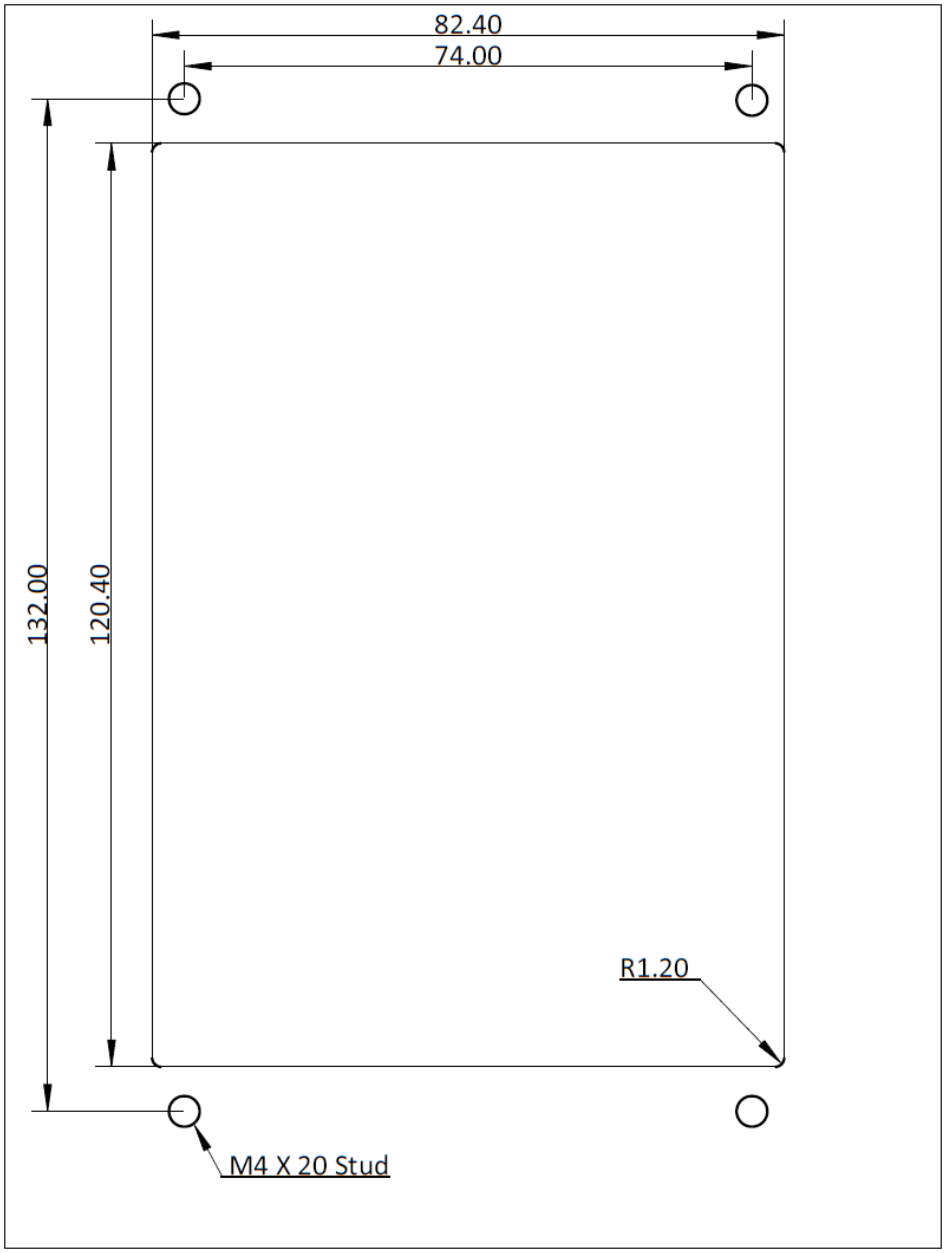
3.1 IM300 Installation

3.1.1 Anti-Removal Switch



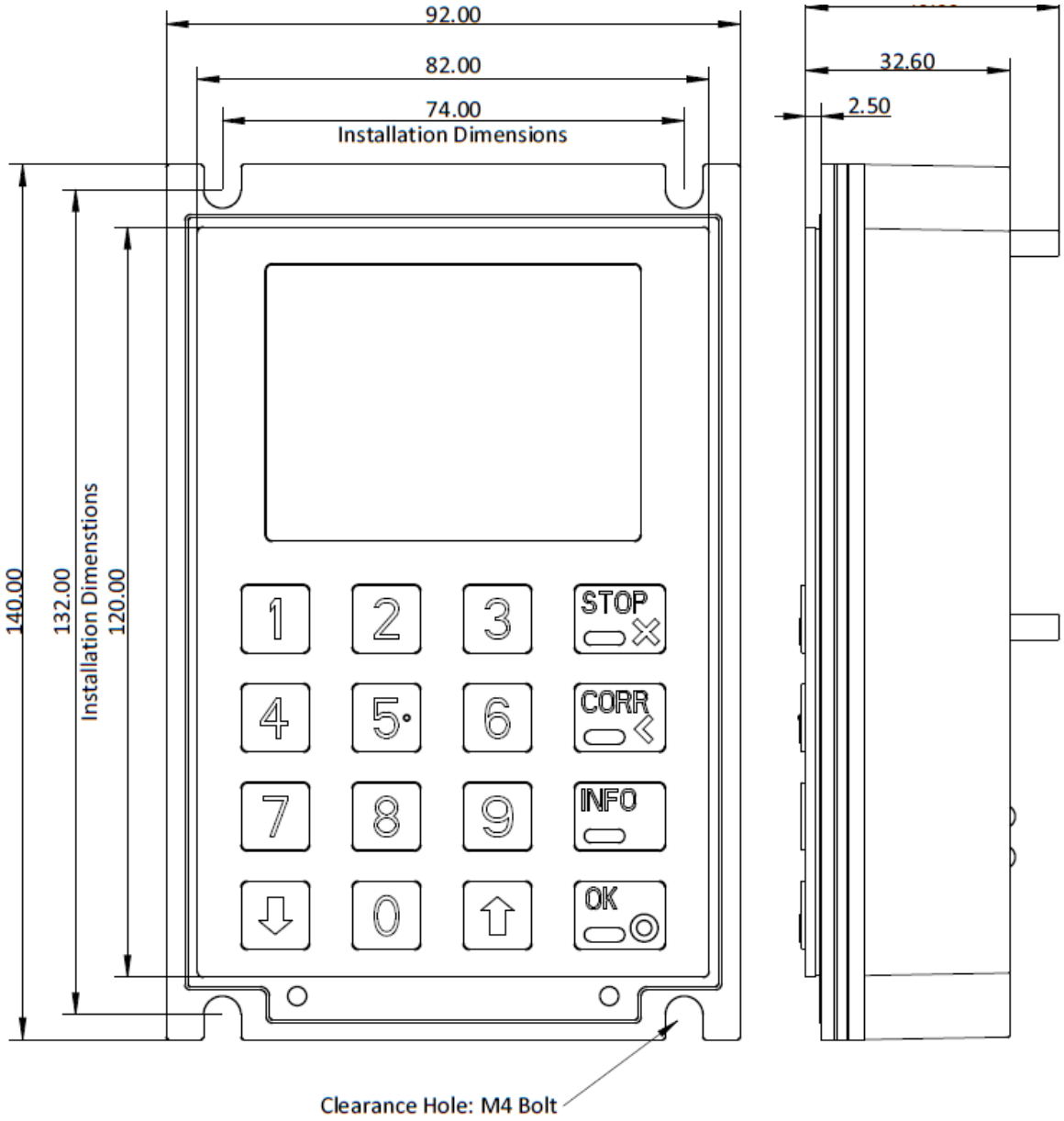
The IM300 has two dome switches located underneath the rubber seal layer on its front face. These two switches are located along the bottom border of the front face and should be fully depressed once the device is bolted into its frame. These buttons prevent the unauthorized removal of the IM300 since they would no longer be depressed as long as anyone attempts to remove the device from its mount.

3.1.2 Mounting Plate Dimension



The mounting plate must have the dimensions given above to hold the device in place and allow it to be installed.

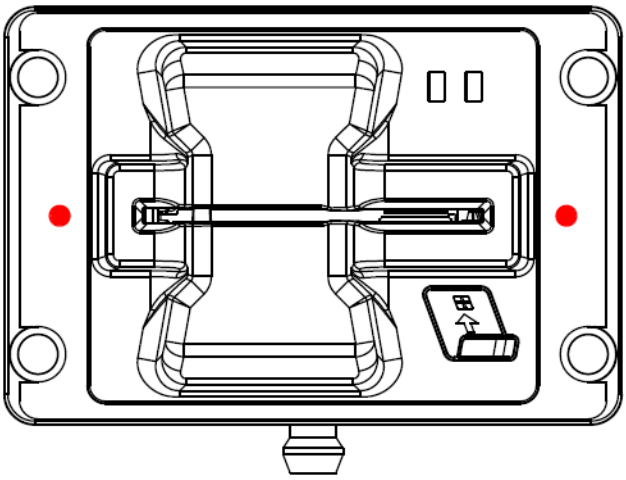
3.1.3 Installation onto an Unattended Terminal



The IM300 has 4 clearance holes meant for M4 stud bolts. Apply a torque of 0.6 ~ 0.8 Nm to four M4 nuts to fix them in the place, the device would then be firmly attached to the unattended terminal. The dimensions of the device and placement of the bolts are given in the figure above. There must be a clearance of 120mm x 82mm for the face plate of the IM300, and the surrounding rubber seal should be pressed firmly against the frame of the unattended terminal once the device is fully bolted on.

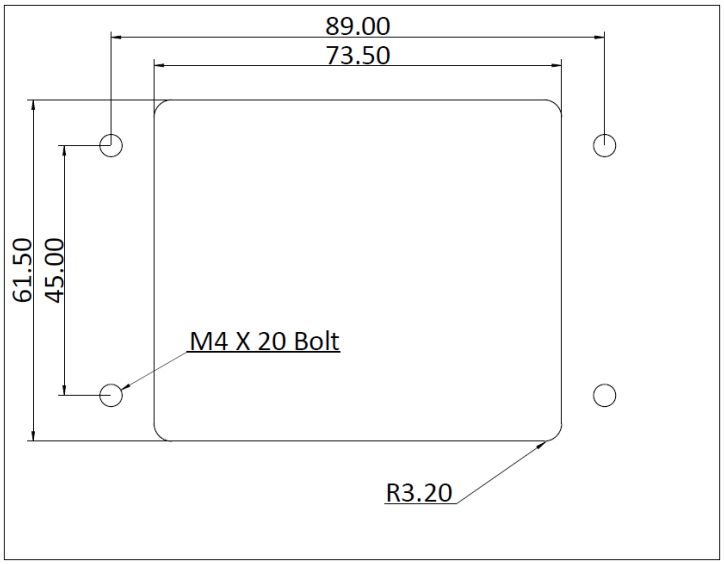
3.2 IM500 Installation

3.2.1 Anti-Removal Switch



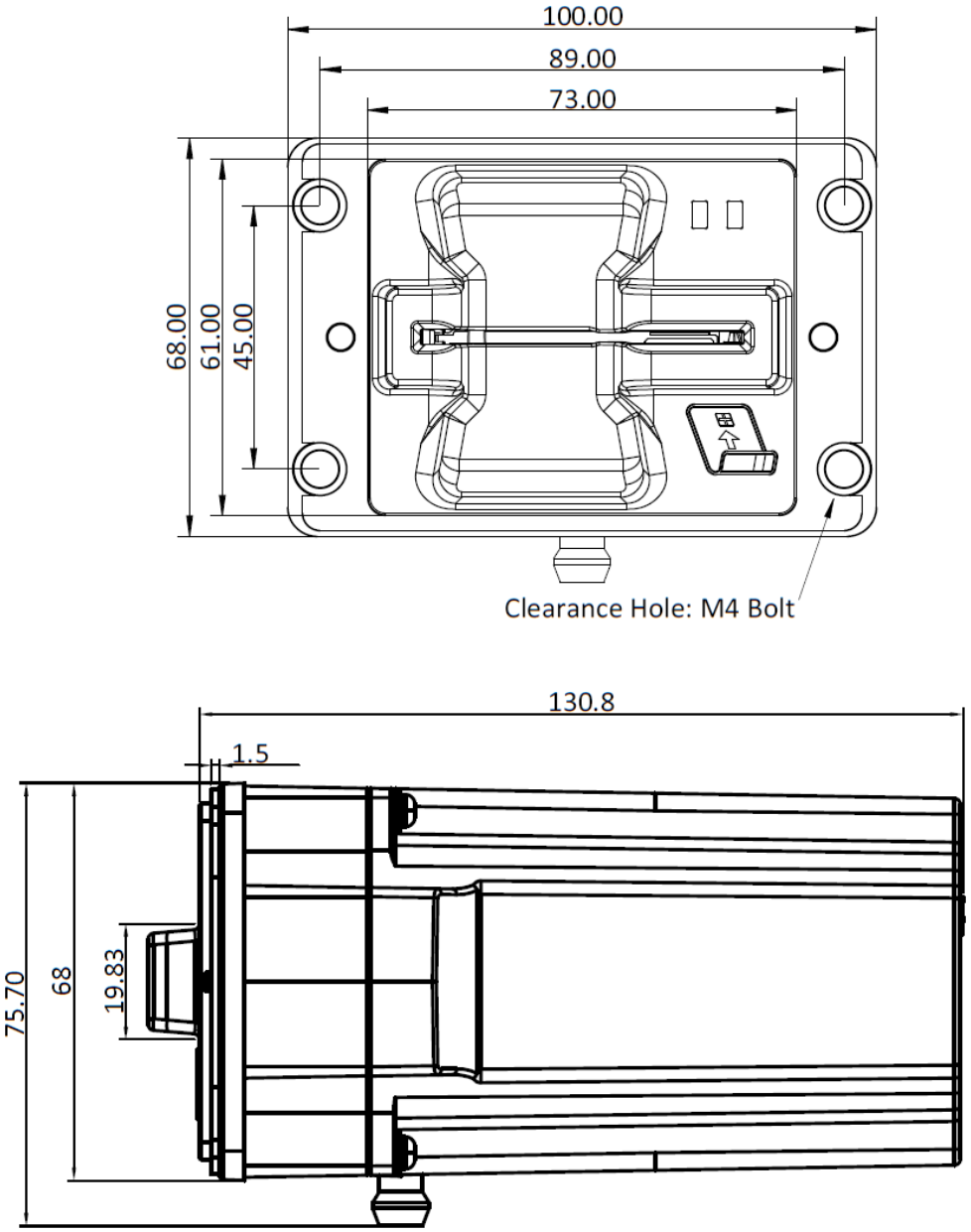
The IM500 has two dome switches located underneath the rubber seal layer on its front face. These two switches are located on either side of the border of the front face and should be fully depressed once the device is bolted into its frame. These buttons prevent the unauthorized removal of the IM500 since they would no longer be depressed as long as anyone attempts to remove the device from its mount.

3.2.2 Mounting Plate Dimension



The mounting plate must have the dimensions given above to hold the device in place and allow it to be installed.

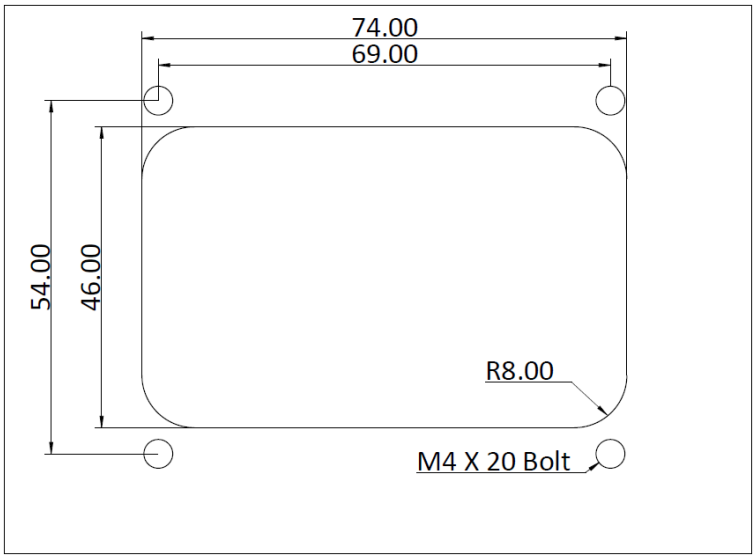
3.2.3 Installation onto an Unattended Terminal



The IM500 has 4 clearance holes meant for M4 bolts. Apply a torque of 0.6 ~ 0.8 Nm to four M4 nuts to fix them in the place, the device would then be firmly attached to the unattended terminal. The dimensions of the device and placement of the bolts are given in the figure above. There must be a clearance of 61mm x 73mm for the face plate of the IM500, and the surrounding rubber seal should be pressed firmly against the frame of the unattended terminal once the device is fully bolted on.

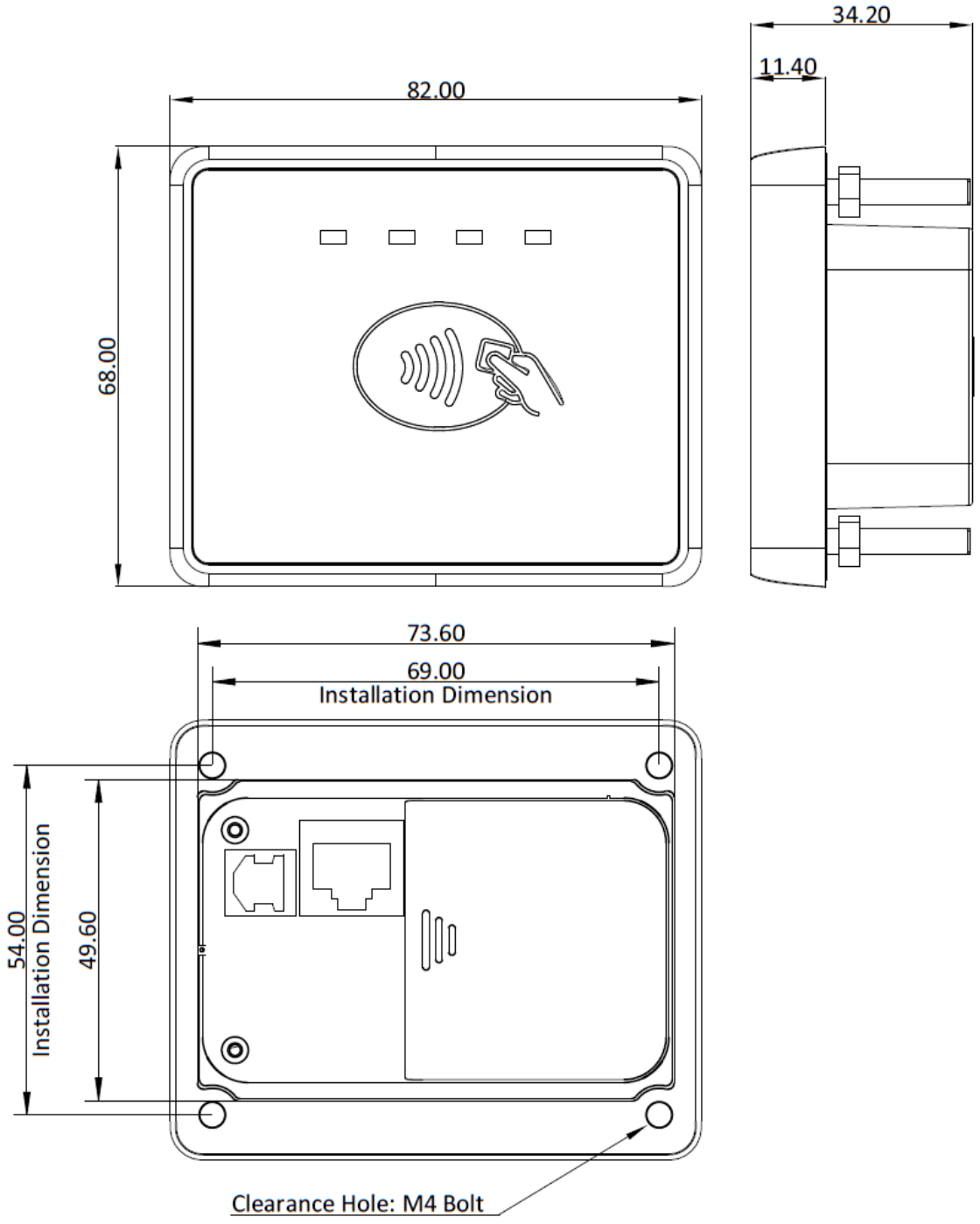
3.3 IM700 Installation

3.3.1 Mounting Plate Dimension



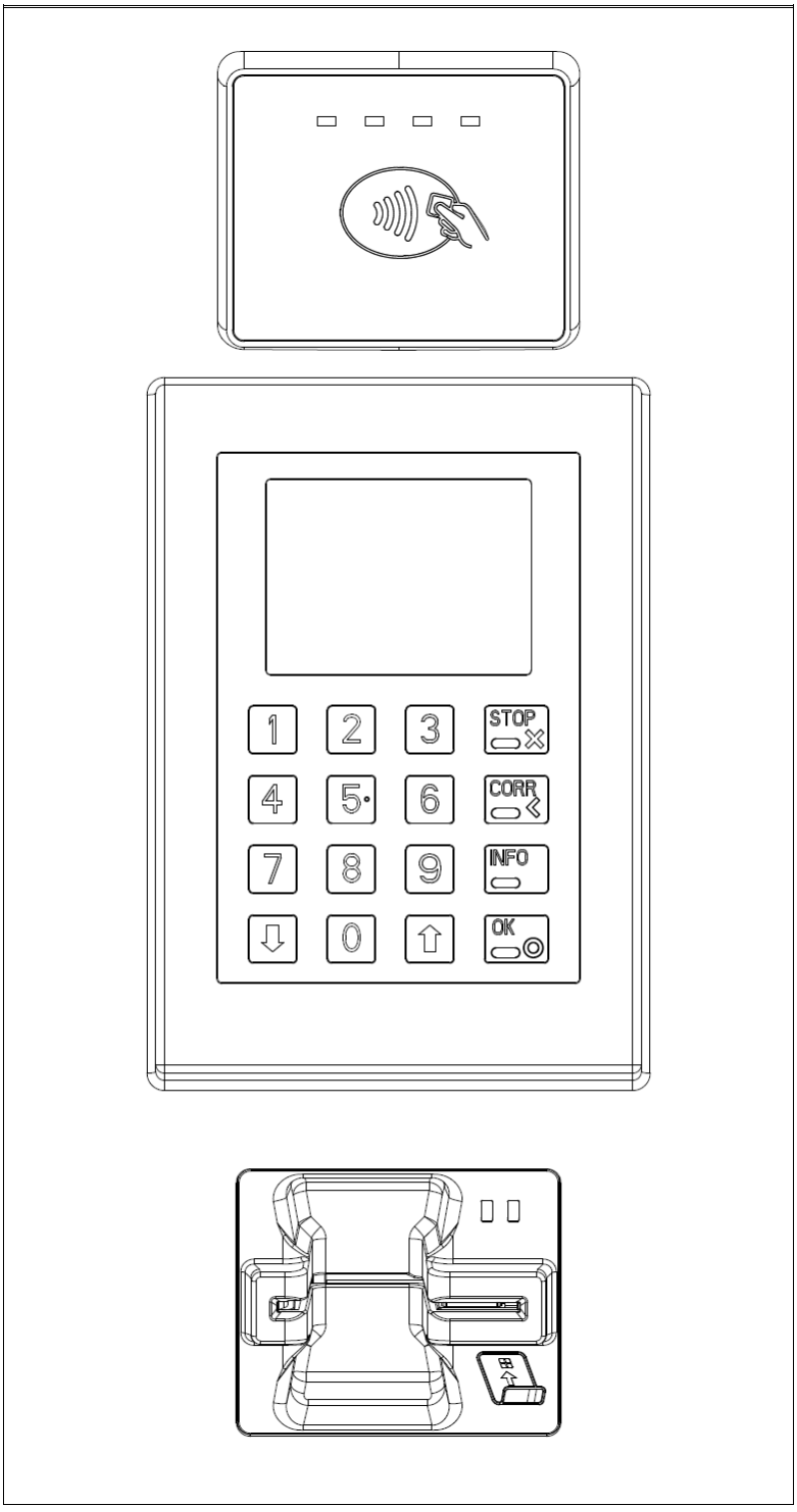
The mounting plate must have the dimensions given above to hold the device in place and allow it to be installed.

3.3.2 Installation onto an Unattended Terminal



The IM700 has 4 M4 bolts attached to the device. Apply a torque of 0.6 ~ 0.8 Nm to four M4 nuts to fix them in the place, the device would then be firmly attached to the unattended terminal. The dimensions of the device and placement of the bolts are given in the figure above. The IM700 should be installed from the front of the unattended terminal and requires a clearance of 49.6mm x 73.6mm for the back portion of the device. The surrounding rubber seal should be pressed firmly against the frame of the unattended terminal once the device is fully bolted on.

3.4 Example Configurations of Unattended Payment Terminals



The devices in the IM series can be assembled in an unattended payment terminal in many configurations, the above is one such example. The devices do not have to be in a particular position because they are connected to each other by cables and not fixed to each other.