

CADI SmartSense

SmartNODE

SMN-890/s User Manual



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Product Information

- Product model: SMN-890/S
- Product name: SMART-NODE 890
- Manufacturing site: 31 Ubi Road 1, #03-00 Aztech Building, Singapore 408694

Version Information

- This version is subject to change or upgrade without notice
- Version: 2.2
- Issue date: 02/03/2011

Declaration

Cadi Scientific Pte Ltd reserves the right to change the product described in this Operator's Manual. All information contained in this Operator's Manual is subject to change without notice.

Regulatory Information

For customers in U.S.A and Canada

The SMN-890S (FCC ID: VPE-SMN890S) has been tested and found to comply with the limits for a Class B digital device, 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 instructions, 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 or more of the following measures: Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio or TV technician for help.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.





For customers in Europe

This equipment has been tested and found to comply with the limits set out in the R&TTE Directive.



Where you see this symbol on any of our electrical products or packaging in Europe, it means that at end of life the product or battery must be disposed of in accordance with any applicable laws or requirements for the separate disposal of electrical equipment or batteries.

Symbols

Symbol	Explanation	Symbol	Explanation
	Warning (see manual)		CE Mark
	DC Power		Disposal Requirement

1. Introduction

The SMN-890 SmartNODE™ RFID Receiver is an integral component of the SmartSense Wireless Vital Signs and Location Tracking System. The system is designed for wireless and automated measurement and recording of patient vital signs and for location tracking of patients and high-value assets.



The SMN-890 will periodically transmit IR beacon signal. This beacon signal consists of unique location ID. This location will be received by tags which are in range. IR signal are much localized which give better location tracking determination.

The SMN-890 SmartNODE™ RFID Receiver is a LAN-enabled receiver for receiving data transmitted by the SmartSense™ series of wireless sensors and monitors. The receiver uploads data received from the sensors to the SmartSense™ database via its built in Ethernet LAN interface.

In a typical installation, the receivers are to be installed at strategic locations in the hospital in a manner to meet the specific coverage requirement of the application. The receivers being Ethernet LAN capable lend themselves well to deployment using standard Ethernet LAN equipment and infrastructure.

2. Specifications

TECHNICAL DATA	
Interfaces	
Ethernet LAN	10 Base-T
RF	
RF Frequency	US (SMN-9xx): 919.8MHz or 925MHz Europe (SMN-8xx): 868.4MHz
Input connector	US (SMN-9xx): RP-SMA Europe (SMN-8xx): SMA
Input impedance	50ohm
IR	
Frequency	38kHz
Nature	940 nm peak IR wavelength
Power	
Power source	12VDC
Current consumption	500mA (typical)
Environment	
Operating temperature range	10 °C – 40 °C
Storage & Transport temperature range	-15 °C - 60 °C
Physical	
Dimension	270 x 150 x 40mm
Weight	400g
Compliance	
Certification	CE, FCC
RF Compliance	ETSI EN 300 220
EMC Compliance	ETSI EN 301 489

3. Installations and Maintenance

The CADI SMN890S should be installed only by authorized personnel. The software of the CADI SMN890S is a property to Cadi Scientific Pte Ltd. No one should, in any manner amend, copy or exchange the software without prior permission from Cadi Scientific Pte Ltd.

3.1 Environment Requirement

The environment where CADI SMN890S is used should be in accordance with the requirements specified in specification.

In addition, CADI SMN890S should be used in an environment without excessive noise, dust, flammable or erosion substances. If mounted in a box, ensure there is enough space in the front and back of the box for easy operation, maintenance and services. To ensure good ventilation, CADI SMN890S should have 2 inches (5cm) space with other objects.

When transporting CADI SMN890S from one place to another with difference in temperature, frosting may occur. If so, CADI SMN890S should be turned ON only after frosting disappears.

3.2 Open Box for Inspection

The power requirement should be in accordance with specifications.

The approved power adaptor is:

The Model of power adaptor	DA18-120UK-M
Isolation	Class II Isolation



Warning

CADI SMN890S working environment and power should be in accordance with requirements. Otherwise technical performance will not be satisfied. It may cause damage to the device or other unexpected outcome.

Appropriate power source should be selected to satisfy the system power voltage requirements. Otherwise it may cause serious damage to the system.

3.3 Installation Instructions

Warning

All analogue or digital equipment connected to the CADI SMN890S should be in accordance with IEC standards (IEC 60960 for information technology equipment safety and IEC 60601-1 for medical electrical equipment safety). All equipment should be connected in accordance with IEC 60601-1-1 standards. The personnel in charge of connecting peripheral equipment are responsible for making sure that these standards are followed. In doubt, contact manufacturer.

Warning

The Device should be position when it is disconnected from direct plug-in power adaptor to avoid failure of device operation

3.4 Cleaning

Warning

Turn off CADI SMN-890S SMB-800 and unplug the cord from the wall outlet before cleaning the CADI SMN-890S.

Clean the CADI SMN-890S regularly. In places with poor environmental conditions, cleaning should be more frequent. Consult hospitals before cleaning for any regulations.

Use clean soft cloth or cotton sponge dampened with cleaning solutions to wipe the CADI SMN-890S exterior. Use the following recommended solutions:

Diluted soap solution;

Diluted Ammonia, Sodium hypochlorite (bleaching powder) or diluted formaldehyde (35-37%);

Alcohol or Glutaraldehyde.

Note

Sodium hypochlorite with concentration range 500 ppm (Diluted bleaching powder for family use 1:100) to 500 ppm (Diluted bleaching powder for family use 1:10) is very effective. The ppm depends by the amount of stain

(blood, mucilage glue of animal or plant) on the surface of the CADI SMN-890S.

Observe the following to prevent damage to the CADI SMN-890S;

Some solution needs to be diluted before use. Follow instructions.

Do not immerse the CADI SMN-890S in liquid or any cleaning solutions. Do not pour liquid or cleaning solutions onto the CADI SMN-890S.

Do not allow liquid or cleaning solutions to enter the CADI SMN-890S switched, ports or any vents.

Do not use any material or solutions that will cause damage.



Caution

Ignoring the above may cause damage to the CADI SMB-800 casing or labels and may result in the CADI SMN-890S malfunction.

Note

See appropriate chapters or instructions for cleaning accessories.

4. Typical System Setup

The following diagram shows how SMN-890 is deployed in a typical SmartSense System configuration.

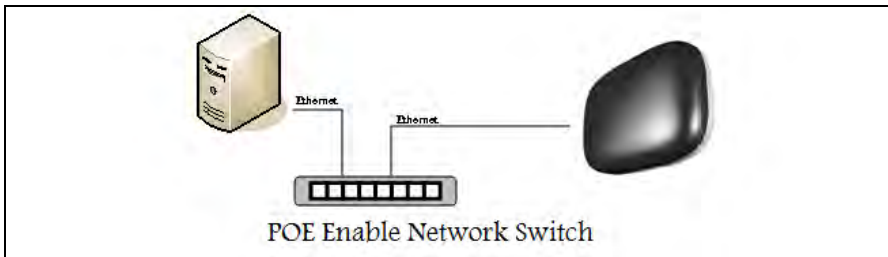


Figure 1: SMN-890 System Setup

4.1 POE Switch Requirements

SMN-890 is a POE powered device. SMN-890 consists of IR transmit module which its IR transmission power is configurable. The IR transmission power will affect the SMN-890 power consumption. Below table shows the requirements needed for a POE switch which uses to power up the SMN-890.

POE switch requirements		
1	Standards	IEEE802.3af compliant
2	Power output per port	Power (Watt)
		7.7
		15.0
		IR power Level
		3 - 16
		0 - 2

Table 1: POE Switch Requirements

5. External Control Interface and LED Indicators

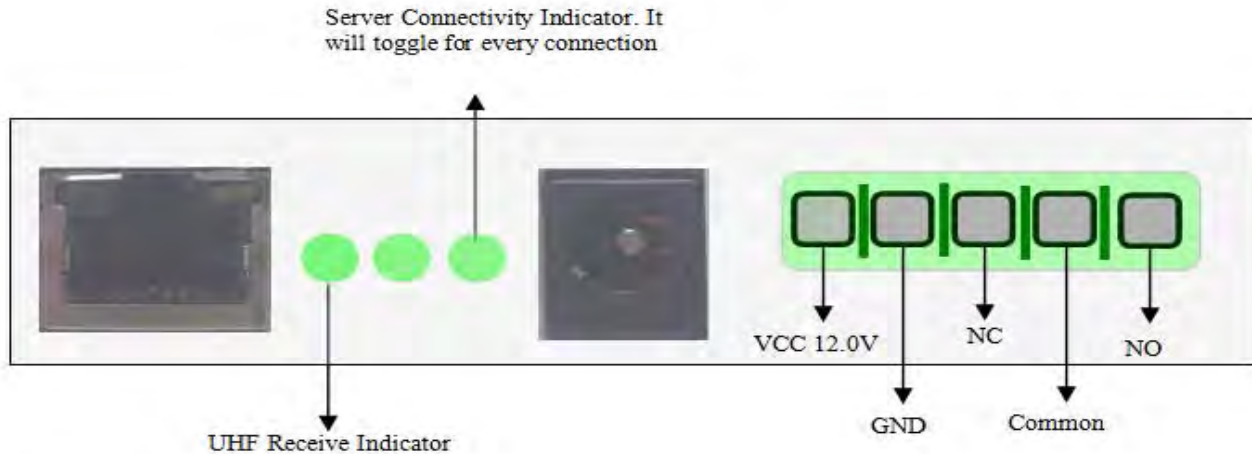


Figure 2: SMN-890 LEDs Indicator



6. SmartNODE Configuration

The SMN-890 can be configured through serial or Web interface. The serial configuration format is as described below;

6.1 Serial Configuration

The Serial settings are;

- a. Baud Rate = 57600
- b. Data bits = 8
- c. Parity = none
- d. Stop bits = 1

Each configuration string consists of;

1. Command Code (CC)
2. Equal Sign '='
3. Parameter Value
4. Carriage returns <CR>

Command Code (cc)	' = ' ASCII 3D	Parameter Value	<CR> ASCII 13
---------------------	----------------	-----------------	---------------

Command Code	2 letter Command Code in ASCII
' = '	Letter code indicate this is configure packet
Parameter value	Data to Set SMN890
<CR>	Carriage return as line terminator



COMMAND	VALUES	Example	DESCRIPTION
01	00 01	01=00<CR>	LAN FULL DUPLEX LAN HALF DUPLEX
09S1	<IP:PORT>	09S1=192.168.1.100:25002<CR>	SERVER 1 IP : PORT #
09S2	<IP:PORT>	09S2=192.168.1.101:25002<CR>	SERVER 2 IP : PORT #
09S3	<IP:PORT>	09S3=192.168.1.102:25002<CR>	SERVER 3 IP : PORT #
09S4	<IP:PORT>	09S4=192.168.1.103:25002<CR>	SERVER 4 IP : PORT #
0B	<IP>	0B=192.168.1.1<CR>	GATEWAY (Need Device Reset For Setting To Take Effect)
0C	<IP>	0C=255.255.255.0<CR>	NETWORK MASK (Need Device Reset For Setting To Take Effect)
0D	<IP>	0D=192.168.1.10<CR>	DEVICE IP (Need Device Reset For Setting To Take Effect)
0E	00 01	0E=0<CR>	USE DHCP (Need Device Reset For Setting To Take Effect)
11	01 ~ 65000	11=7<CR>	USE STATIC IP (Need Device Reset For Setting To Take Effect)
14	01 02 03 04	14=4<CR> 14=5<CR> 14=6<CR>	Upload Interval In Seconds (Default 5 secs) Channel 4 (868.4Mhz) Channel 5 (919.8Mhz) Channel 5 (925.0Mhz)
			Note: Frequency settings must follow respective country regulatory. Improper frequency settings will violate country regulatory.
15	01 02 03 04	15=1<CR> 15=2<CR> 15=3<CR> 15=4<CR>	Tx Power Level 1 (-10dB) Tx Power Level 2 (-6dB) Tx Power Level 3 (+2dB) Tx Power Level 4 (+10dB)
16	00 01	16=00<CR> 16=01<CR>	Normal Rx Strength Reduce Rx Strength
18	Total 12 character only use in production	18=010203040506<CR>	Set the device MAC Address
1A	00-255	1A=61<CR>	SmartSense Network ID
23	0 ~ 255	23=60<CR>	TCP Timeout values in second
31	0 1 2 3	31=0<CR> 31=1<CR> 31=2<CR> 31=3<CR>	Turn Off IR Turn On Side IR Turn On Centre IR Turn On Both IR
32	3 ~ 16	32=5<CR>	Set IR Power (3 is maximum 16 is minimum)



34	0 ~ 255	34=4<CR>	Set IR transmit Interval in 250ms step
35	0 ~ 65535	35=7<CR>	Set Location ID
53	Total 8 characters	53=01020304<CR>	Insert Tag ID which is allow to pass by node without generating alarm
54	Total 8 characters	54=01020304<CR>	Delete Tag ID from list
FF	restart	ff=restart<CR>	Restart The device.
	debug	ff=debug<CR>	Toggle Device Debug Message
	echoid	ff=echoid<CR>	Toggle Echoing of received Packet by the radio
	echopid	ff=echopid<CR>	Toggle Echoing of received Guaranteed delivery data type
	help	ff=help<CR>	Print all the command

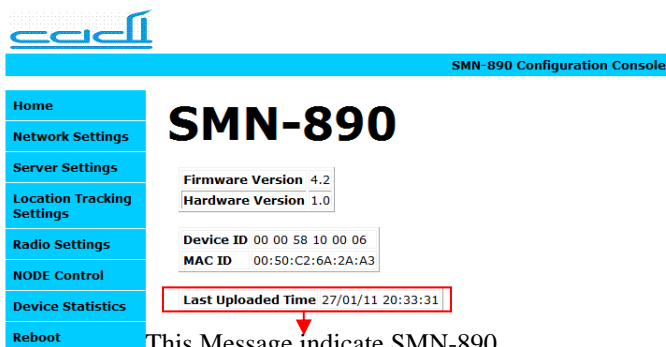
6.2 Web Configuration

6.2.1 Home Page

The SMN-890 web console home page shows;

- Firmware version
- Hardware version
- Device ID
- Mac ID
- Last uploaded Date/Time

The home page is shown as figure 3 below.



Home	<h1>SMN-890</h1> <p>Firmware Version 4.2 Hardware Version 1.0</p> <p>Device ID 00 00 58 10 00 06 MAC ID 00:50:C2:6A:2A:A3</p> <p>Last Uploaded Time 27/01/11 20:33:31</p>
Network Settings	
Server Settings	
Location Tracking Settings	
Radio Settings	
NODE Control	
Device Statistics	
Reboot	

This Message indicate SMN-890 last uploaded time to server

Figure 3: SMN-890 Web Console Home Page

6.2.2 Location Tracking Configuration Page

The SMN-890 location page allow user to configure location tracking settings.

The settings are;

Settings	Value	Description
Location ID	1 - 16383	Location Tracking ID
Enable Side/Center IR	Enable/Disable	Adjust IR coverage range
Enable IR Anti-Collision	Enable/Disable	Reduce IR collision
Overlapped Node Count	2 - 4	Number of SMN-890 nearby
IR TX power	0 - 16	0 (highest) - 16 (lowest)
IR Duty Cycle	1 - 9	Default 5
IR Tx Interval	0 - 255	In 250ms step
IR Burst Length	1 - 255	Default 8



SMN-890 Configuration Console

Home

Network Settings

Server Settings

Location Tracking Settings

Radio Settings

NODE Control

Device Statistics

Reboot

NODE Location Tracking Configuration

This page allows the configuration of the NODE location tracking settings.

CAUTION: Incorrect settings may cause the NODE fails to update the location correctly to server.

Enter the new location tracking settings for the NODE below

LOCATION ID:

ON SIDE IR ON CENTER IR

ENABLE IR ANTI-COLLISSION

OVERLAPED NODE COUNT

IR TX POWER:

IR DUTY CYCLE:

IR TX INTERVAL: *250ms

IR BURST LENGTH:

Figure 4: Location Tracking Configuration Page

6.2.3 Network configuration Page

The SMN-890 network configuration page allow user to configure network settings. The settings are;

Settings	Value	Description
IP Address	Valid IP address	Set static IP address
Gateway	Valid IP address	Set gateway IP
Subnet Mask	Valid IP address	Set netmask
Enable DHCP	Enable/Disable	Set static or DHCP



- Home
- Network Settings
- Server Settings
- Location Tracking Settings
- Radio Settings
- NODE Control
- Device Statistics
- Reboot

NODE Network Configuration

This page allows the configuration of the NODE network settings.

CAUTION: Incorrect settings may cause the NODE to lose network connectivity. Recovery options will be provided on the next page.

Enter the new settings for the board below:

Enable DHCP

IP Address:

Gateway:

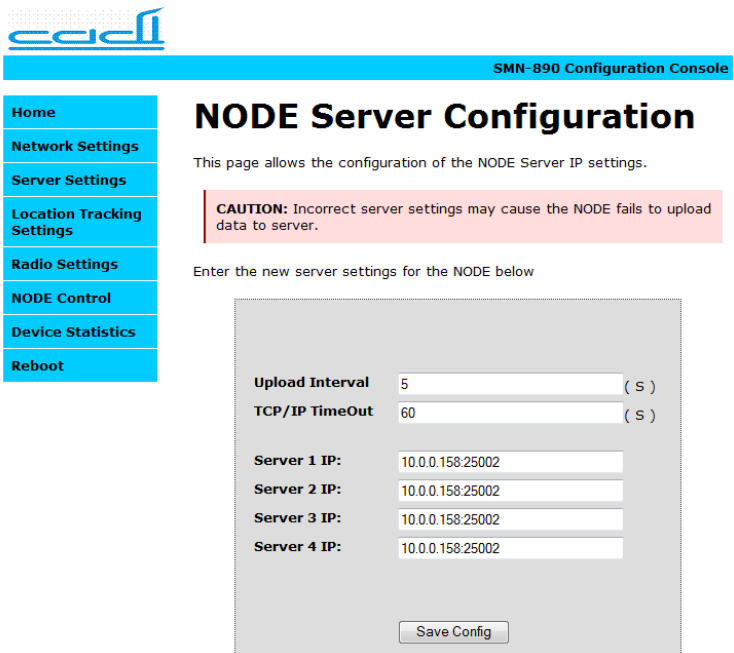
Subnet Mask:

Figure 5: Network Configuration Page

6.2.4 Server configuration Page

The SMN-890 server configuration page allow user to configure server connection settings. The settings are;

Settings	Value	Description
Upload Interval	Valid IP address	Set upload interval in seconds
TCP/IP Timeout	Valid IP address	Set connection timeout
Server IP (1 – 4)	Valid IP address	Set server IP



Home
Network Settings
Server Settings
Location Tracking Settings
Radio Settings
NODE Control
Device Statistics
Reboot

NODE Server Configuration

This page allows the configuration of the NODE Server IP settings.

CAUTION: Incorrect server settings may cause the NODE fails to upload data to server.

Enter the new server settings for the NODE below

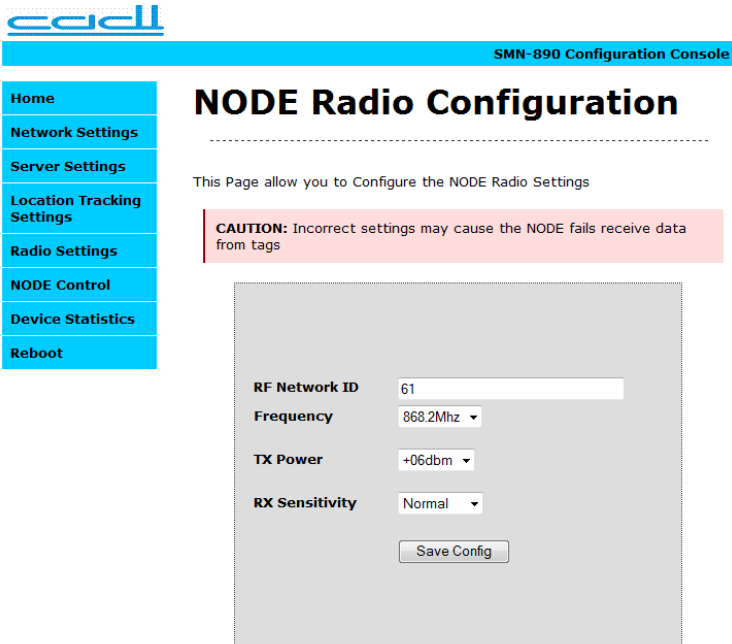
Upload Interval (S)
TCP/IP TimeOut (S)
Server 1 IP:
Server 2 IP:
Server 3 IP:
Server 4 IP:

Figure 6: Server Configuration Page

6.2.5 Radio Configuration Page

The SMN-890 radio configuration page allow user to configure radio settings. The settings are;

Settings	Value	Description
RF network ID	0 - 255	Set RF network ID
Frequency (MHz)	868.2 868.4 868.6 868.8 919.8 925.0	Set radio Frequency Note: Frequency settings must follow respective country regulatory. Improper frequency settings will violate country regulatory.
TX Power	Valid Tx Power	Set RF Tx Power
RX sensitivity	Normal/	Set RF receive sensitivity



cadll

SMN-890 Configuration Console

Home
Network Settings
Server Settings
Location Tracking Settings
Radio Settings
NODE Control
Device Statistics
Reboot

NODE Radio Configuration

.....

This Page allow you to Configure the NODE Radio Settings

CAUTION: Incorrect settings may cause the NODE fails receive data from tags

RF Network ID:

Frequency:

TX Power:

RX Sensitivity:

Figure 7: Radio Configuration Page

6.2.6 Node Control Configuration Page

The SMN-890 node control configuration page allow user to configure node control settings. The settings are;

Settings	Value	Description
Insert ID	Total 8 characters	Insert Tag ID which allow to pass by node without generating alarm
Delete ID	Total 8 characters	Delete Tag ID from list
Door Guard algorithm <ul style="list-style-type: none"> Asset Tag Mother Tag Infant Tag 	Enable/Disable	Enable door guard to specific tag type. Note: Mother Tag guard is disabled
Led Beacon	On/off	On/off led beacon
Buzzer Output	On/off	On/off buzzer
Door Access	Open/close	Open/close door
Door Close Duration	1 – 65535 sec	Set door close duration

Home

Network Settings

Server Settings

Location Tracking Settings

Radio Settings

NODE Control

Device Statistics

Reboot

NODE Controls

This Page allow you to control NODES' external Device such as LED Beacon, Door and Sound Output.

Door and Sound Output will be resumed to 'OFF' state automatically once timeout reached

ID LIST

INSERT ID: DELETE ID:

Door Guard Algorithm On ▾

Enable ▾ ASSET TAG (STG-850 & STG-851)

Disable ▾ MOTHER TAG (STG-852)

Enable ▾ INFANT TAG (STG-832)

LED Beacon Off ▾ ← Turn On external connected LED Beacon

Sound Output Off ▾

Door Access Close ▾ **Door Close Duration:** 60 (s)

Figure 8: Node Control Configuration Page

6.2.7 Authentication Page

To access SMN-890 configuration Page, user has enter correct user name and password.

User name: admin

Password:cadi0503

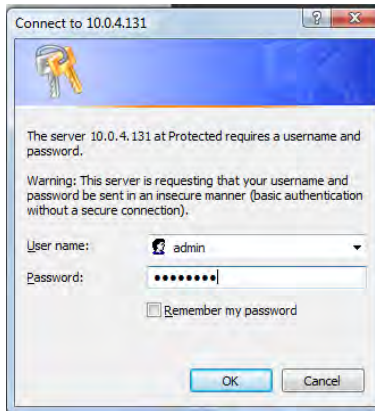


Figure 9: Authentication Page

7. Mounting Methods

7.1 Ceiling Mounted

7.1.1 Soft (Mineral Wool) Ceiling Board

1. In general for soft (Mineral Wool) ceiling board, 2 mounting plate are used. The 2 mounting plates should be affixed using M6 (3/8" inch) type metal screws up to the length of false ceiling material.

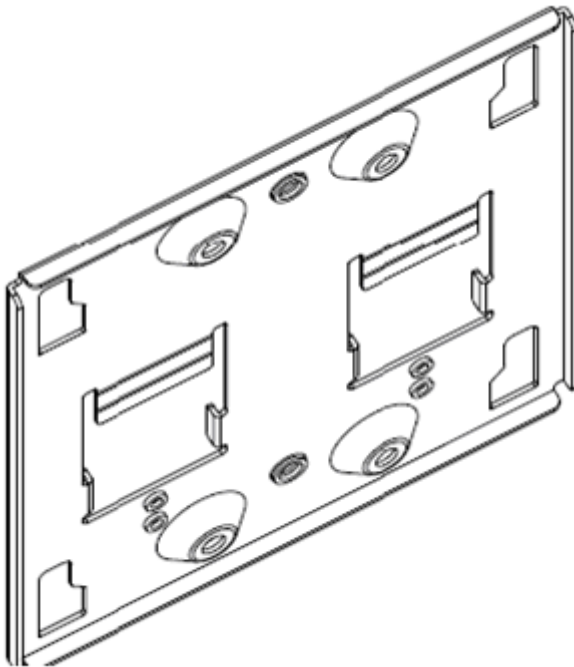


Figure 10: Side View of a Mounting Plate

2. Once the mounting plates are fixed to the ceiling, the SMN-890 should be pushed and then it is slid into the plate to place to mount the reader properly.
3. A hole should be made in the ceiling for the LAN cable to drop out from the ceiling into the Receiver. This cable will be interfaced to the Active RFID Receiver using a standard TCP/IP port available on the back of the Receiver using a standard RJ-45 connector. It is as shown on figure 11 below.

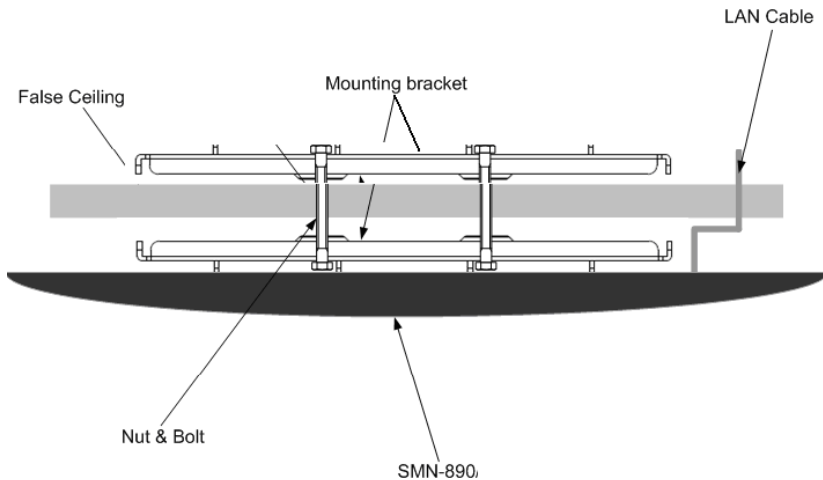


Figure 11: SMN-890 mounted on soft board ceiling using 2 mounting plate

7.1.2 Gypsum Ceiling Board

1. In general for gypsum ceiling board, single mounting plate is used. The mounting plate should be affixed using proper wall plug for gypsum ceiling board.
2. Once the mounting plate is fixed to the ceiling, the SMN-890 should be pushed and then it is slid into the plate to place to mount the reader properly.
3. A hole should be made in the ceiling for the LAN cable to drop out from the ceiling into the Receiver. This cable will be interfaced to the Active RFID Receiver using a standard TCP/IP port available on the back of the Receiver using a standard RJ-45 connector. It is as shown on figure 12 below.

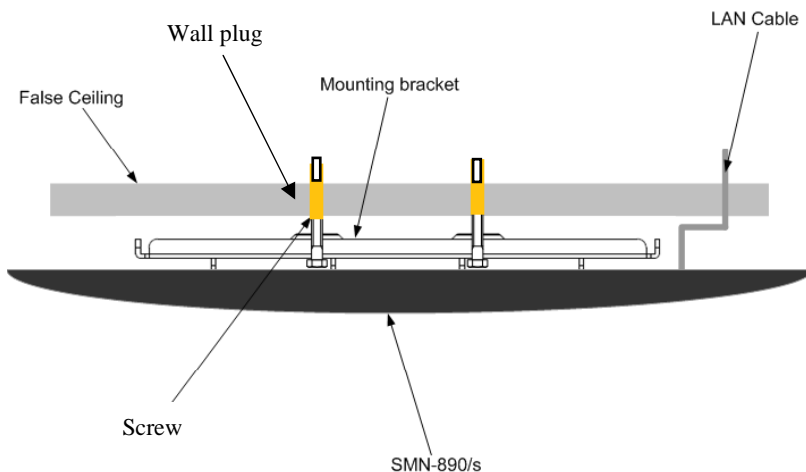


Figure 12: SMN-890 mounted on gypsum ceiling board using single mounting plate and 4 wall plugs

7.2 Wall Mounted

1. Typically, a wall mounted Active RFID Receiver requires three holes on the wall surface to mount the base of the wall mount bracket by using wall plug type 10mm with 14-18 screw size.



Figure 13: Wall mounting bracket

2. The length of the screw depends on the strength of the wall that can hold the Active RFID Receiver that weights approximately 600 grams.

3. A ceiling-to-wall conduit fitting should be laid until the base of the wall mounted bracket to install LAN cable and from there it should be linked up to back of the Receiver using a standard RJ-45 connector. It is as shown on figure 14 below.

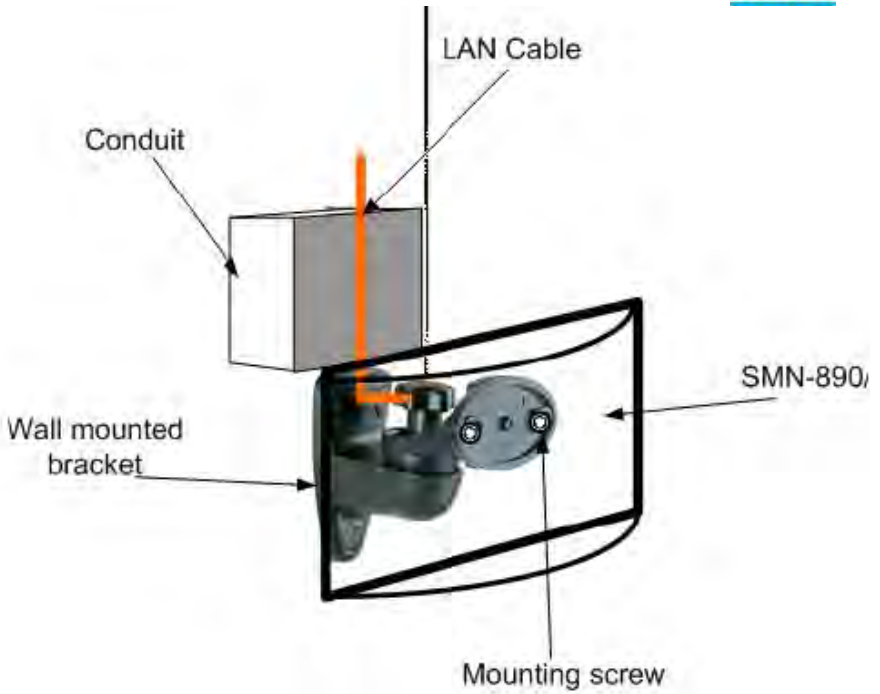
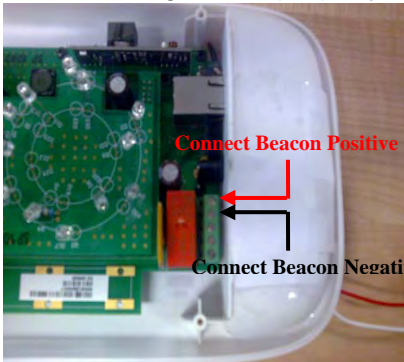


Figure 14: SMN-890 mounted on wall using wall mount bracket

8. Assemble of External LED Beacon

This section illustrates the method to assemble external LED beacon with SMN-890.

1. Unscrew the SMN-890 front case.
2. Connect LED beacon positive and negative contact to respective locations as shown on figure below. Make sure the both contacts have been tightened properly.



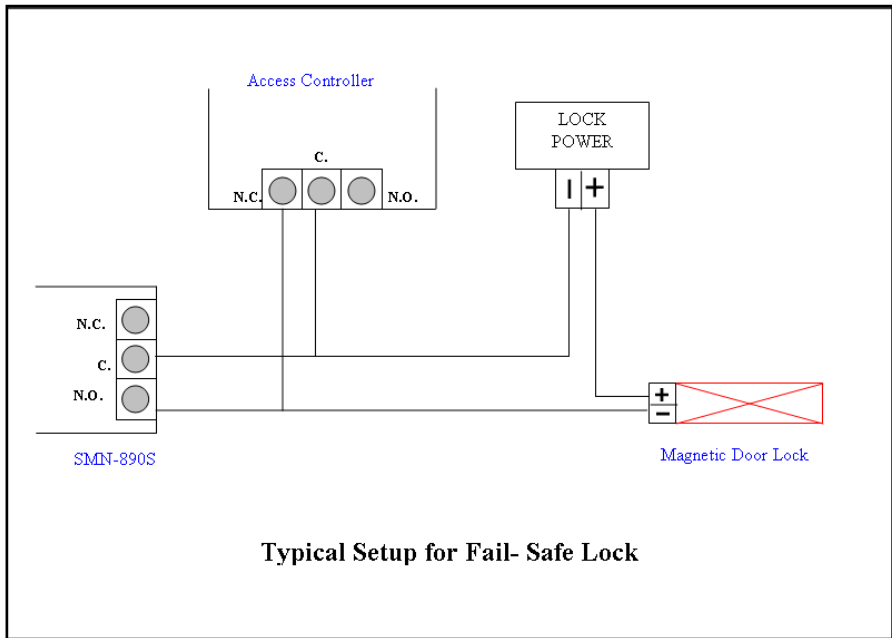
3. Assemble back the front case to SMN-890.



9. Assemble of External Magnetic Lock

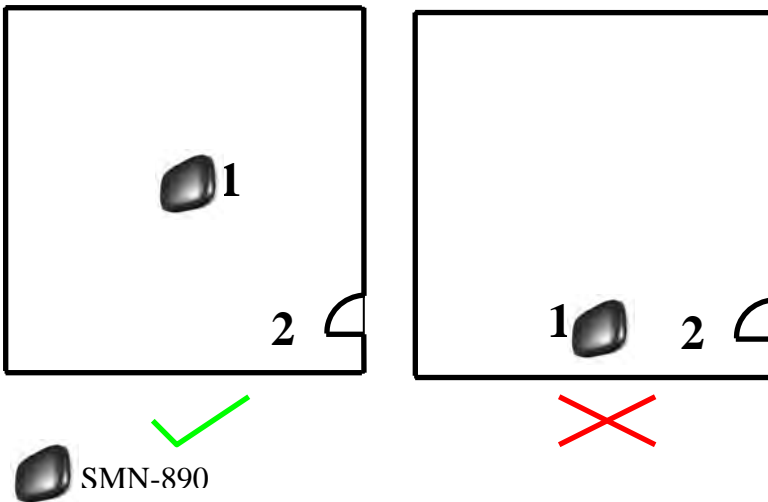
This section illustrates the method to assemble external magnetic lock with SMN-890S.

1. Unscrew the SMN-890 front case.
2. Connect the wire as shown on figure below. Make sure the both contacts have been tightened properly.



10. IR Detection Operating Principles

IR signal is line of sight and cannot penetrate through wall. Thus, it is accurate in room base level tracking. IR signal tend to bounce from blocking material (IR reflector) such as concrete wall, table and etc. These IR reflectors will act as secondary IR source and help to scatter the IR signal to any direction in a room. As a result, an IR receiver, from any direction, in a room will be easily to pick up IR signal. Below examples illustrate the placement SMN-890 in each scenario to achieve best IR reception result.



1. The SMN-890 should be placed at centre of a room so that it can achieve larger IR coverage area.
2. Try not to place SMN-890 facing the door way in order to reduce IR spill out from a room.

11. Trouble Shooting Guides

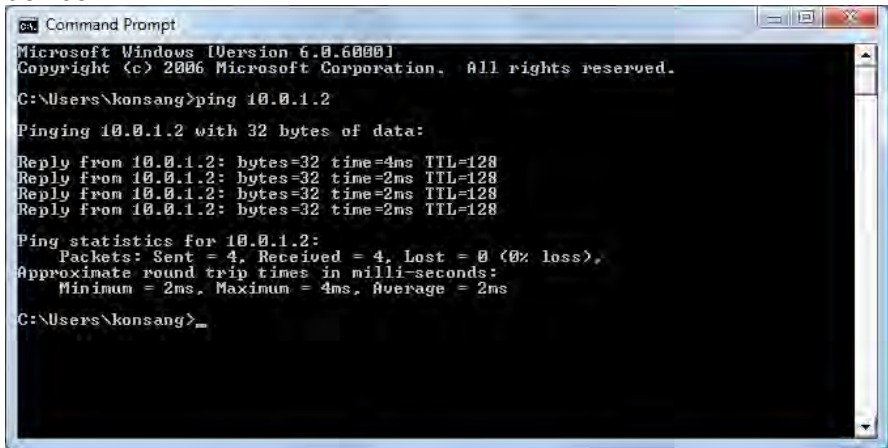
1. How to know if SMN-890 is connected to the network successfully?

Try to ping SMN-890 assigned IP address using command prompt.

If it is connected to the network, ping action should be successful.

If it still fails, check the LAN cable and make sure it is working.

Figure 15 below illustrates the example of pinging the network device.



```

C:\Users\kongsang>ping 10.0.1.2

Pinging 10.0.1.2 with 32 bytes of data:

Reply from 10.0.1.2: bytes=32 time=4ms TTL=128
Reply from 10.0.1.2: bytes=32 time=2ms TTL=128
Reply from 10.0.1.2: bytes=32 time=2ms TTL=128
Reply from 10.0.1.2: bytes=32 time=2ms TTL=128

Ping statistics for 10.0.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 4ms, Average = 2ms

C:\Users\kongsang>_
  
```

Figure 15: Ping network device.

2. Why SMN-890 cannot power-up by POE switch?

Make sure the switch's 'Power over Ethernet' feature is enabled for all the ports.

3. How to I verify if SMN-890 able to contact with server?

By using the web browser, try to browse the SMN-890 Web. As shown on 'figure 3 on Page 10', SMN-890 web will show the latest server uploaded date time if it is able to contact with server successfully. The last uploaded date time should not be more than 4 minutes behind current date time.

4. I can ping SMN-890 but SMN-890 seems not able to contact with server. What should I do?

Try to ping the server IP to make sure the server is contactable in network first.

If the server is able to ping, open the SMN-890 'server settings configuration page', make sure server IP address and port are set correctly. If only one server is used, make sure the 4 server IP are set to same value. For the changes of setting to take effect, click 'save' button then reboot the device by clicking the 'reboot' tab. 'Figure 6 on page 13' shows the 'server settings configuration page'.

If SMN-890 is still not able to contact with the server, check the firewall settings of the server. Make sure the server port is not blocked by firewall.

5. How to know if SMN-890 able to receive data from the sensor?

When SMN-890 receives data from sensor, the UHF Led will blink. It is shown on 'figure 2 on Page 6'. Besides, you can open SMN-890 statistic web page. The SMN-890 will show how much data has been received since it is power-on.

If SMN-890 cannot receive any data, make sure the SMN-890 RF frequency is set correctly and there is a tag within its coverage range.

6. Why SMN-890 Led keep blinking once it is power-up?

Once SMN-890 is power-up, its Led will keep blinking to indicate SMN- 890 now is in boot loading stage. When it is boot loaded successfully (after 10 seconds), the Led will stop blinking.

7. Why the Green Led on SMN-890 front side keeps blinking?

The blinking of this green led indicates SMN-890 is transmitting IR signal. The blinking frequency indicates the SMN-890 IR transmitting frequency. As thus, the green led will not blink if SMN-890 IR transmission is disabled.