ENGLISH

ONE-900 UHF RFID Reader User Manual

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1. THINGS TO START FROM

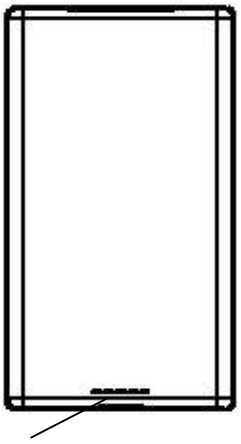
1.1 Functions & Applications

ONE-900 long range reader is a high performance integrated reader. It can read EPC G2 C1 passive tags at up to 10m, but with moderate size and weight. The reader is unique at working with not only EPC G2 C1 passive tags, but also our BGC series 2.4GHz active tags.

The reader aims at providing an efficient and cost-effective solution for automatic vehicle identification. The dual-frequency reader resolves reading problems through car window tint/film by using active tags; also it enables most clients to use the lower cost passive tags.

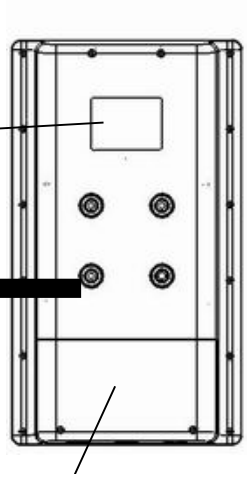
1.2 Appearance Navigator

Front View



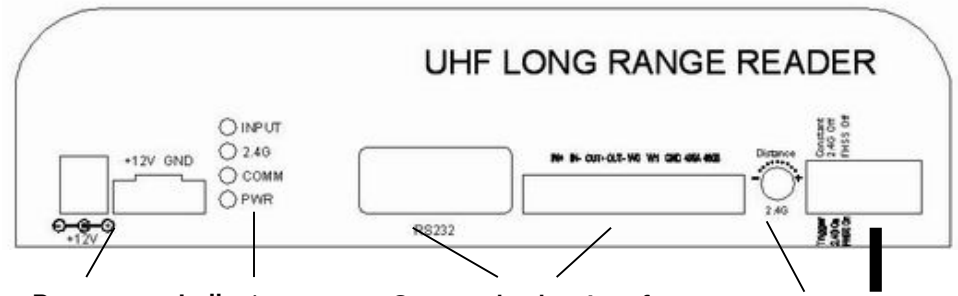
Status LEDs: 1 Red, 4 Blue

Back View



Removable Cover

Bottom View



Power Interface

Indicators

Communication Interfaces, GPIOs

2.4G and 900M Settings

1.3 Compliant Tags

ONE-900 can read both standard EPC G2 C1 passive tags and our BGC series active tags. **Notes: The manufacturer is not liable for ensuring reading results and compliance of the reader with tags from other suppliers.**

The manufacturer supplies the following tag models:

- **Passive Tags (EPC G2 C1/ISO18000-6C)**

BMC-G2C-01

- **Active Tags**

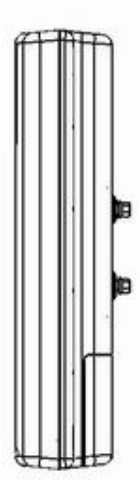
BGC-S

BGC-04

BGC-K

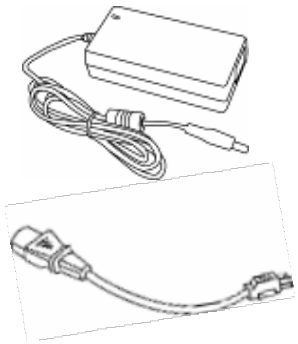
Each model has several sub-models (e.g. BGC-04-12, BGC-04-70), which provides different reading distances when working with a reader. Please refer to our Active Tag Selection and Installation Guide to choose a suitable tag model.

1.4 What Is In The Box



Reader

CD



12V/5A (DC) Power Adaptor

Please check the completeness of the standard accessories when the reader arrives.

1.5 Other Accessories

Clients can fix a on their sites in any way they may see fit. Also clients are recommended to order a standard pole mounted bracket from the manufacturer to install the reader. Below is our mounted bracket.

Parts

After Assembly

2. QUICK CONFIGURATION GUIDE

2.1 Start to Read

ONE-900 can work on three reading modes. By factory default, once a ONE-900 is connected to the appropriate power supply, it will begin to read tags continuously. Also the reader can be triggered to read by a loop detector or infrared detector.

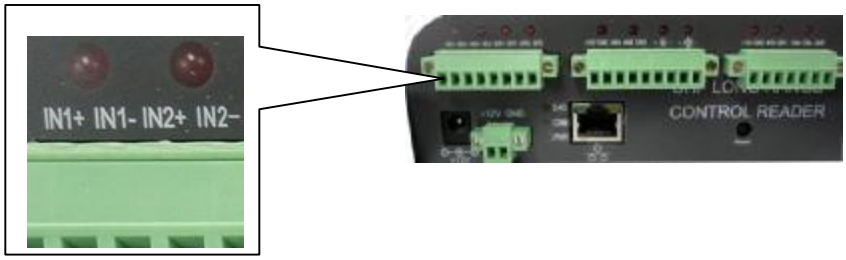
As shown on the left, clients can switch between constant and trigger mode easily on the reader's panel.

Notes: after switching the reading mode, the reader should restart to make the change takes effect.

Otherwise, clients can also program the interrogator to read in response to commands.

Trigger Reading

To enable this mode, the reader needs to be wired to a trigger (typically a loop detector or infrared detector) via its general inputs.



There are two pairs of signal inputs on the reader: IN1+/IN1-, and IN2+/IN2-. **Only** IN1 ports are applicable for this function. For testing purposes, you may short IN1+ with IN1-, which will generate a valid trigger signal. Notes: when trigger signals varnish, ONE-900 will continue to read for 2 seconds.

Installers can pull out the terminal blocks on the reader's interfaces for easy wiring with external devices, and then insert back the terminal blocks to complete connection with the reader (shown below).

Command Mode

In this mode, ONE-900 will remain on standby until it receives a command from PC. For example, the PC sent a read command to a ONE-900, and then the reader will start to read and make a return to the PC. The command mode is to facilitate clients to integrate the reader.

When a reader is working, it should emit LED and audio signals according to its operation status.

Reader Operation Status	LED Signals	Audio Signals
Standby	Red Light Constant On	No
Reading	Blue Light Keeps Flash	Beep Once for Each Read

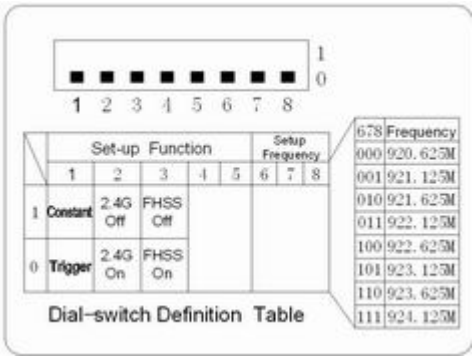
Turn On/Off 2.4G

ONE-900 is a hybrid reader. But the 2.4G reading function can be turned on or off by pushing the toggle switch 2 on the reader's panel.

Notes: after push the switch, the reader should be restarted to allow the new settings to take effect.

2.2 Setup Frequency

ONE-900 can operate on either fixed frequency or FHSS mode.



As shown above, switch 3, 6, 7, and 8 on the reader's panel is to set the operating frequency of the reader. There are eight frequency channels available on the reader. It can be set to operate on any of the channels or automatically hops between channels. By default, the reader should operate on 922.625MHz.

Chart: Frequency Channels Settings of ONE-900

Switch	3	6	7	8	Operating Frequency
Position	1	0	0	0	920.625 MHz
	1	0	0	1	921.125 MHz
	1	0	1	0	921.625 MHz
	1	0	1	1	922.125 MHz
	1	1	0	0	922.625 MHz
	1	1	0	1	923.125 MHz
	1	1	1	0	923.625 MHz
	1	1	1	1	924.125 MHz
	0	Any			Auto-hop between Channels

2.3 Transmit Data

ONE-900 can transmit data to a controller via wiegand (26/34), or to a PC via RS232 or RS485 interface. By default, ONE-900 should upload data via wiegand 26. Clients can set to use other interfaces in the example software provided by the manufacturer. Once the settings have been saved to the reader, the reader should be restarted to activate the settings.

- **Wiegand 26**

There are clear interface definitions on the reader's panel to enable connection with a controller.

- **Wiegand 34**

There are clear interface definitions on the reader's panel to enable connection with a controller.

- **RS232**

If the reader is set to transmit data via RS232, it will upload data actively to an external device when it reads a tag.

- **RS485**

The reader can be set to upload data actively or passively via RS232 to external devices. With built-in RS485 protocols, a reader can connect to a controller or PC directly. Also multiple readers can be used to build a network.

For more details about protocols and data formats, please refer to part 6.

Please note that the maximum data transmission distances of the interfaces are different.

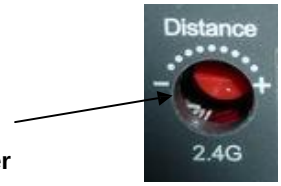
Interface	Maximum Data Transmission Distance	Devices Can Be Connected
Wiegand (26/34)	100m	Controller
RS232	10m	PC
RS485	1000m	Controller, PC

2.4 Adjust Reading Ranges

A standard ONE-900 reader can work with both EPC G2 C1 passive tags and active tags. With a passive tag, its reading range can be up to 10m, depending on tags and/or change the output power of the antenna. Its reading distances are more flexible on active tags. As there are more tag models selectable, also clients can adjust the ranges for 2.4G on the hardware easily. Below are further explanations on setting the reading ranges for 2.4G active tags.

As mentioned in 1.3, each of our major active tag models has several sub-models, shown by suffix e.g. -12, -70. These sub-models enable a reader to have variable minimum and maximum adjustable ranges. For example, to present both BGC-S-12 and BGC-S-70 tags in front of a BG-245-K, the min. adjustable range for BGC-S-12, should be around 3-5m, while the min. adjustable range for BGC-S-40 can reach 20-30m. The maximum adjustable range on a -12 tag can be 15-20m, while on a -40 tag, it can make 40m and more. For parking applications, however, -12 series tags should fit for most systems.

On the same tag, clients can still set different reading ranges by rotating the embedded potentiometer in the reader.



Potentiometer

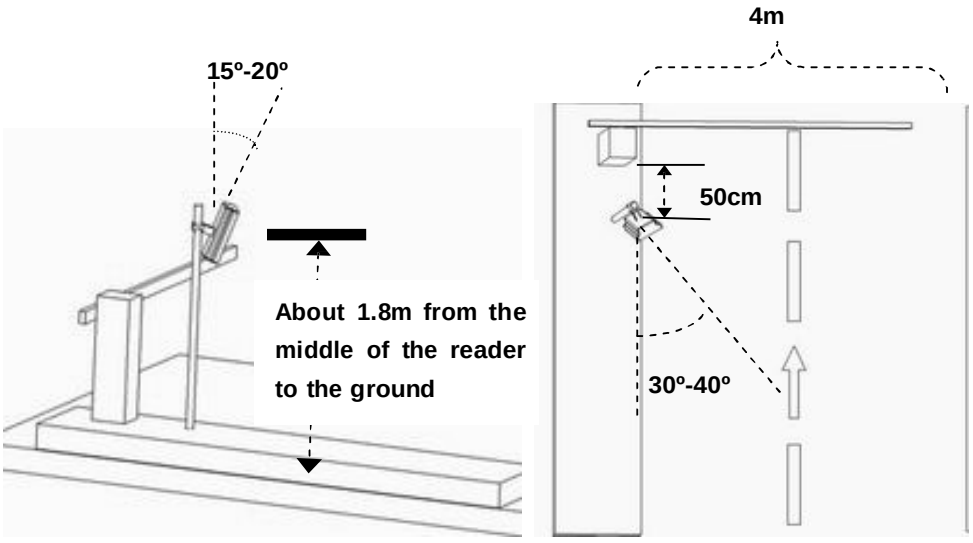
Clients can use a small screwdriver to rotate the potentiometer clockwise or counter clockwise, accordingly the reading range becomes longer or shorter. At the adjustable extreme, you can hear a low spring-like sound, after that, further rotation in the same direction would not change the reading range any more. There are around five valid rounds between the minimum and maximum adjustable position.

3. QUICK INSTALLATION GUIDE

3.1 Mount Reader

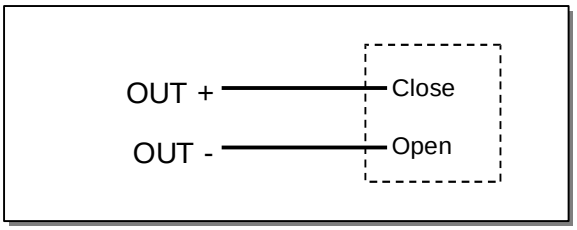
ONE-900 can be mounted on either a pole or wall. The reader is equipped with a linear horizontal antenna with limited readable angle. It should be installed at a suitable height and angle towards the ground, so as to give the optimal performance.

A series of factors can affect the reader installation height and angles, including the reading distance, width of the lane, types of vehicles, etc. The figure below shows a typical installation for your reference.



3.2 Control Peripherals via GPIOs

ONE-900 has 1 pair of relay outputs. Clients can program the reader to send close or open signals to the contact point when it reads a valid tag. In this way the reader is able to control a peripheral directly, e.g. barrier, alarm.



Notes: the relay output can only control an equipment powered by maximum 110V/0.5A AC or 24V/1A DC power supply. To control a 220V equipment, an external relay should be used.

4. TROUBLE SHOORTING AND MAINTENANCE

4.1 Troubleshooting

- I push the switches on the reader but it does not work. Why is that? For example, I've switched off the 2.4G function, but it continues to read active tags.

You must restart the reader after pushing a switch, so that the new settings can take effects.

- Why the blue LEDs on my reader never flash and the reader cannot read tags?

Please check with its reading mode settings. Only at the constant mode, the reader will read tags automatically. At the trigger mode, however, the reader should receive a triggering signal to start reading.

- My reader can hardly read a tag or the distance shorter than expected, what is the reason?

The reader is equipped with a linear horizontal polarization antenna. So tags should be placed in a way where its polarization direction is in line with that of the reader's antenna. If you consider the reading ranges not so well on a tag, please rotate the tag by 90° and try again.

Also in one of following situations, the reading distance can be shortened even there is no problem on the reader: tags are close to or have direct contact with human body, metal

screen, or liquid obstruct between reader and tags.

- Why the reading distance of my reader on windshield tags is so short in the open air?

Windshield tags, as the name suggested, should be attached on window so as to get optimal reading effects. For simulation, you can fix a tag on a piece of glass with crystal tapes, and try again with the reader.

4.2 Maintenance

There are a few tips to get the optimal performance out of the reader.

- Always use the power adaptor provided by the manufacturer, or consult the supplier for a compliant power adaptor from a third source.

- DO NOT disassemble the reader. If there is any problem on the device, please return the supplier for repairing.

5. SUPPLEMENTARY

5.1 Technical Specifications

5.2 Warranty

Device Model	ONE-900
Operating Frequency	920.5-924.5MHz and/or 2.4GHz
Compliant Tags	EPC G2 C1/ISO-18000-6C/BGC series
Reading Range	Passive tag: up to 10m Active Tag: depending on tags & adjustment
Operating Mode	Constant, trigger, command
Antenna	1 integrated, linear horizontal
Moving Tag Detection	≤40Km/h
GPIOs	1 photo coupler input, 1 relay output
Communication Interfaces	Wiegand (26/34), RS232, RS485
Power Supply	DC 12V, 5A
Operating Temperature	-20℃ ～ +65℃
Storage Temperature	-40℃ ～ +85℃
Humidity	0 ～ 95%
Environmental Sealing	IP65, DC ground lightening proof
Housing	FRP + stain resistant aluminum
Size & Weight	460×260×110mm , 3kg
Memory	No

Please refer to the warranty policy for detailed terms and conditions.

6. COMMUNICATION PROTOCOLS AND DATA FORMATS

Here we'll explain further about the protocols that clients can use on a ONE-900 for data transmission and relevant data formats.

6.1 Wiegand

Wiegand protocols are used to connect a reader with a wiegand controller. This interface supports one-way data transmission, namely, the reader can send data to the controller, but cannot receive data via wiegand ports. Wiegand interface contains two data lines and one ground line.

For any binary data, e.g. 01010101B, the protocols send out 0 or 1 in separate lines. That is to say, the W0 line sends 0 only, and the W1 always sends 1. According to the data bits transmitted per frame, wiegand protocols have two types: wiegand 26 and wiegand 34.

To ensure a controller to receive data via wiegand, the ground line of the reader should always be connected to the ground port of the controller, or the negative electrode of the power supply of the reader.

- **Output Waveform**

The default pulse width time is 100us, pulse interval time is 1.0ms, and frame interval is no less than 800ms.The output waveforms can be changed in software.

- **Data Formats**

Wiegand 26

This protocol transmits 26-bits data per frame, and only 24 bits among which are valid data. We define the 24 bits to correspond to the last three bytes of a tag ID. Details are as below:

WIEGAND OUTPUT	Bit0	Bit1 - Bit12		Bit13 - Bit24	Bit25
PURPOSE	Even Parity over Bit1 - Bit12	ID[5]	ID[6]	ID [7]	Odd Parity over Bit13 - Bit24

Notes: ID 5~7 equals to the last three bytes of a tag ID.

Wiegand 34

This protocol transmits 34-bits data per frame, and only 32 bits among which are valid data. We define the 32 bits to correspond to the last four bytes of a tag ID. Details are as below:

WIEGAND OUTPUT	Bit0	Bit1 - Bit16		Bit17 - Bit32		Bit33
PURPOSE	Even Parity over Bit1 - Bit16	ID[4]	ID[5]	ID[6]	ID [7]	Odd Parity over Bit17 - Bit32

Notes: ID 4~7 equals to the last four bytes of a tag ID.

6.2 RS485

RS485 protocol enables a reader to communicate with a remote controller or PC. It supports two-way communication between the reader and external devices, or the reader can be set to transmit data one-way to an external device.

Upload

Here upload refers to data transmission from the reader to an external device.
Upload includes data upload and command upload. Data upload is to deliver the tag ID or antenna data to a controller or PC, while command upload deals with the command and response between a reader and external devices.

Data Packet

A. RS485 General Protocol

NAME	LENGTH (Byte)	DEFINITION	DESCRIPTION
STX	1	02H	Start
DATABLOCK	8	Tag ID/ Tag information (ASCII)	----------
LF	1	0AH	----------
CR	1	0DH	----------
ETX	1	03H	End
CHKSUM	1	BCCH	Exclusive-Or from STX to ETX
		BCCL	

B. RS485 Mulit-Antenna Protocol

NAME	LENGTH (Byte)	DEFINITION	DESCRIPTION
STX	1	02H	Start
UIA	1	UIAH (ASCII)	RS485 address is 0~FEH. FEH is broadcast address. UIAH is high 4 bits, UIAL is low 4 bits.
		UIAL (ASCII)	
ANT	1	xx (ASCII)	Antenna serial #
DATABLOCK	16	Tag ID/ Tag information (ASCII)	----------
CHKSUM	1	BCCH (ASCII)	Exclusive-Or from STX to ETX. BCCH is high 4 bits, BCCL is low 4 bits.
		BCCL (ASCII)	
ETX	1	03H	End

Command Packet

NAME	LENGTH (Byte)	DEFINITION	DESCRIPTION
STX	1	09H	Start
UIA	1	UIAH (ASCII)	RS485 address is 0~FEH. FEH is broadcast address UIAH is high 4 bits, UIAL is low 4 bits.
		UIAL (ASCII)	
CMD	1	CMDH (ASCII)	Command is sent by PC/controller. CMDH is high 4 bits, CMDL is low 4 bits.
		CMDL (ASCII)	
LEN	1	LENH (ASCII)	Length of datablcok. LENH is high 4 bits, LENL is low 4 bits
		LENL (ASCII)	
DATABLOCK	16	30H (ASCII)	Data of user
CHKSUM	1	BCCH (ASCII)	Exclusive-Or from STX to ETX. BCCH is high 4 bits, BCCL is low 4 bits.
		BCCL (ASCII)	
ETX	1	0DH	End

Download

Here download refers to data transmission from a PC or controller to a reader. Reader is able to receive the packet from PC/controller, when reader is in 'Reply' and 'Request' mode.

'Reply' Data Packet

NAME	LENGTH (Byte)	DEFINITION	DESCRIPTION
STX	1	0AH	Start
UIA	1	UIAH (ASCII)	RS485 address is 0~FEH. FEH is broadcast address UIAH is high 4 bits, UIAL is low 4 bits.
		UIAL (ASCII)	
CMD	1	CMDH (ASCII)	Command is sent by reader. 01H is 'Reply'. CMDH is high 4 bits, CMDL is low 4 bits.
		CMDL (ASCII)	
LEN	1	LENH (ASCII)	Length of datablcok. LENH is high 4 bits, LENL is low 4 bits.
		LENL (ASCII)	
DATABLOCK	16	30H (ASCII)	Data of user
CHKSUM	1	BCCH (ASCII)	Exclusive-Or from STX to ETX. BCCH is high 4 bits, BCCL is low 4 bits.
		BCCL (ASCII)	
ETX	1	0DH	End

'Request' Data Format

NAME	LENGTH (Byte)	DEFINITION	DESCRIPTION
STX	1	0AH	Start
UIA	1	UIAH (ASCII)	RS485 address is 0~FEH. FEH is broadcast address. UIAH is high 4 bits, UIAL is low 4 bits.
		UIAL (ASCII)	
CMD	1	CMDH (ASCII)	Command is sent by reader. 02H is 'Request'. CMDH is high 4 bits, CMDL is low 4 bits.
		CMDL (ASCII)	
LEN	1	LENH (ASCII)	Length of datablcok. LENH is high 4 bits, LENL is low 4 bits.
		LENL (ASCII)	
DATABLOCK	16	Tag ID/ Tag information (ASCII)	
CHKSUM	1	BCCH (ASCII)	Exclusive-Or from STX to ETX. BCCH is high 4 bits, BCCL is low 4 bits.
		BCCL (ASCII)	
ETX	1	0DH	End