Wiegand Converter

Communication Manual

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Revision History

2012/7/4(V1.0)	Initial
2013/1/8(V1.1)	Modify the color of 12Pin Cable

1. Communication format

Communication baud rate：57600, N, 8, 1

Packet format：(in binary HEX)

STX	Node ID	Length Low_byte	Length High_byte	CMD Code	SUB CMD	DATA# 1	DATA# 2	DATA# 3	……	DATA #n	XOR	SUM

Field	Size (byte)	Description
STX	1	Packet Leading Code=0x7A
Node	1	Reader RS-485 node id, Range (1~16)
Length	2	Packet Length，Count from STX to SUM
CMD Code	1	Command ID, Ex: Reader CMD Code=0x42
SUB CMD	1	Sub-command ID, refer to Command Description (Chapter 3)
DATA#	N	CMD data, refer to Command Description (Chapter 3)
XOR	1	Exclusive every byte(start from STX to end of DATA) by 0xFF
SUM	1	Sum every byte(start from STX to XOR)

2. Communication protocol

In the communication protocol, since the converter is passive to reactive, the Host has to send a polling command to converter periodically. When the converter received a polling command (CMD), it wills response DI/DO status (DATA) to the Host. If the converter contained with some information (like as card id), it will feedback the information to host.

CMD: the packet of host send to reader
DATA: the packet the reader reply back to host

Note 1: Converter may reply other else packet back to Host.
For example,

1. **Converter sends back the "Nack" DATA packet to Host if the CMD packet with the wrong value of SUM or XOR field.**
2. **Converter sends back the "Unknown CMD" DATA packet to Host if the CMD packet with the wrong CMD code.**

Refer to DATA packet description (Chapter 3.2) for details.

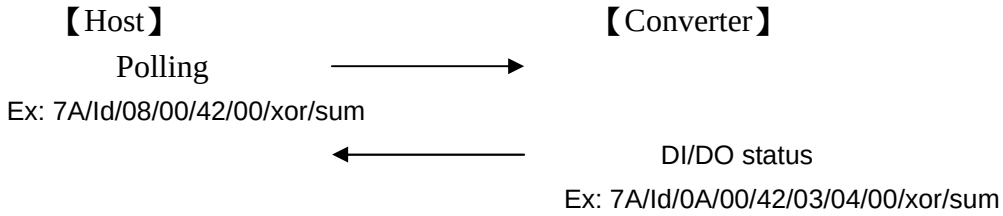
Note 2: To avoid Host/Reader communication data format mix up, if packet contents data same as STX (not include STX field), it has to be duplicated STX, but not be counted in length.

For example,

1. **Set DO Active Time: Assume set Lock Relay active timer in 12.2 sec (0x7a).**
   Host sends Command:
   7A/id/0B/00/42/02/00/7A/7A/00/xor/sum
2. **Get Card Data: Assume access a card data is 0x1234567A. Host will get:**
   7A/Id/0E/00/42/01/00/00/7A/7A/56/34/12/xor/sum

2.1 Normal Polling

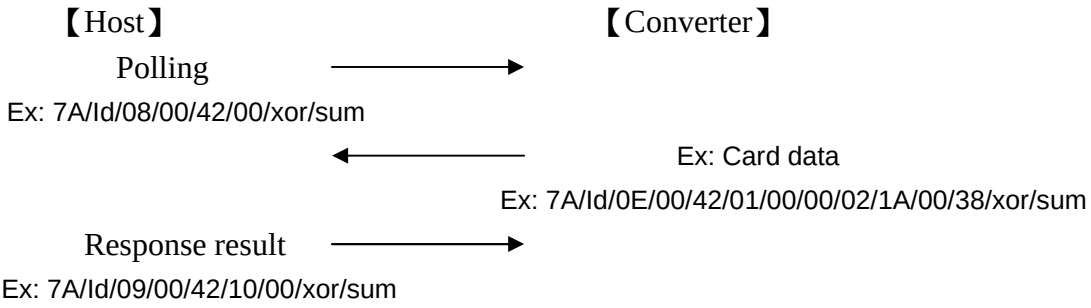
If there is no any information within converter, converter will reply DI/DO status to host back.



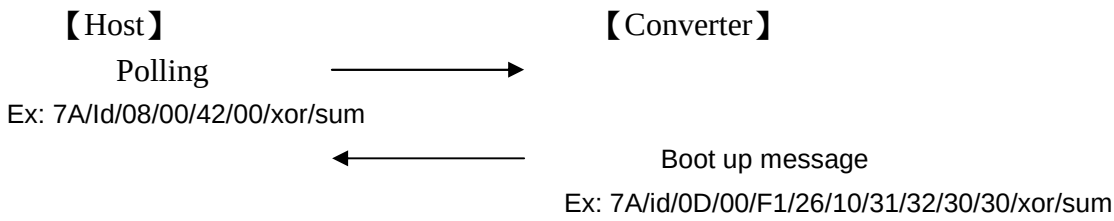
2.2 Polling to get information

If converter contained with some information, like the Card data, Keypad data, converter will reply the information data back to host.

Note: Host has to reply the "response result" to converter when it gets the Card data.



Sometime, Host may get the converter boot up DATA message if the reader had been rebooted.



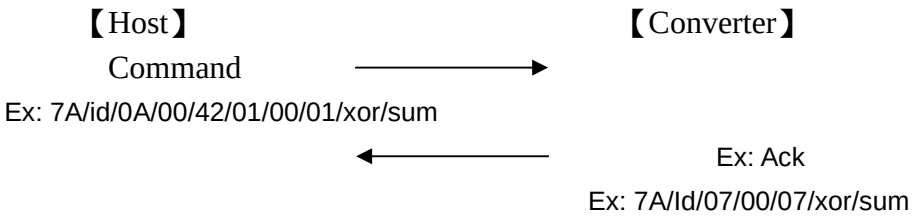
2.3 Send Command to converter

Converter will perform the action as Host command requested.

If the [CMD Code] can not be recognized, converter will reply the "**Unknown**" packet back.

If the [XOR] or [SUM] field error, converter will reply the "**Nack**" packet.

Refer to the DATA packet description (Chapter 3.2) for the "**Nack**" and "**Unknown**" packet format.



3. Communication Packet Description

3.1 CMD: the command packet of Host send to converter

3.1.1 Polling

CMD Code: 0x42
Sub-CMD: 0x00
Data#(N): 0 byte

Example: node = 0x01

0x7A	**0x01**	**0x08**	**0x00**	**0x42**	**0x00**	**0xCE**	**0x93**

Response may as following packets

1. DI/DO status

   For example, DI/DO status = 0x00

0x7A	**0x01**	**0x0A**	**0x00**	**0x42**	**0x03**	**0x00**	**0x00**	**0xCF**	**0x99**

2. Card data
3. Keypad data input
4. Nack
5. Unknown CMD

Refer to DATA packet description (Chapter 3.2)

3.1.2 Active DO

CMD Code: 0x42
Sub-CMD: 0x01
Data#(N): 2 bytes
Data#1: DO Channel
0x00: Lock Relay
0x01: Alarm Relay
Data#2: Active perform
0x00: OFF
0x01: ON
0x02: ON → OFF, active one time

Response may as following packets

1. ACK
2. Nack
3. Unknown CMD

Refer to DATA packet description

3.1.3 Set DO active timer

CMD Code:	0x42
Sub-CMD:	0x02
Data#(N):	3 bytes
Data#1:	DO Channel 0x00: Lock Relay 0x01: Alarm Relay
Data#2:	Active timer (low byte)
Data#3:	Active timer (high byte) If Active timer is 0x0000, the DO channel will OFF. If Active timer is 0xFFFF, the DO channel will keep as ON. Otherwise, the Active Timer is the DO CH active time. (Unit: 0.1s)

Response may as following packets

1. ACK
2. Nack
3. Unknown CMD
4. Alert Message

Refer to DATA packet description (Chapter 3.2)

3.1.4 Response card access result

CMD Code:	0x42
Sub-CMD:	0x10
Data#(N):	1 bytes
Data#1:	Card access result 0x00: Card passed Converter will beep 1 long sound, green LED turn ON & lock relay turn ON in active timer. 0x01: Card reject Converter will beep 2 short times 0x02: Acknowledged received data Converter will beep 3 short times

3.1.5 Query the device model

CMD Code:	0xFA
Sub-CMD:	None
Data#(N):	None

Response may be as following packets

1. "**device model**" DATA packet
2. Nack
3. Unknown CMD

Refer to the DATA packet description (Chapter 3.2)

3.1.6 Query the device information

CMD Code: 0xFC
Sub-CMD: None
Data#(N): None

Response may as following packets

1. "**device informationn**" DATA packet
2. Nack
3. Unknown CMD

Refer to the DATA packet description (Chapter 3.2).

3. 2 DATA : the reply packet from convertor to Host

3.2.1 Ack Message

CMD Code: 0x00
Sub-CMD: None
Data#(N): None

3.2.2 Nack Message (SUM or XOR error)

CMD Code: 0x08
Sub-CMD: None
Data#(N): None

3.2.3 Unknown CMD Code

CMD Code: 0x09
Sub-CMD: None
Data#(N): None

3.2.4 Card Data (Wiegand raw data)

CMD Code: 0x42
Sub-CMD: 0x01
Data#(N): 2+N byte, N: Length of card number
Data#1: DI/DO status, refer to the DATA of DI/DO status description (Chapter 3.2.6)
Data#2: Reversed, default is 0x00
Data#3 ~ Data#N: Wiegend raw data

Note: Converter reply whole of Wiegand raw data in binary, the data format is available depends on the Wiegand decoding.
For example:

1. HID 26bit card id: 1300028 (digital format)
   Data#3 ~ Data#6: 0x02 0x1A 0x00 0x38
   Show in binary format: 10000110**100000000000111000** (26bits)
   As HID **"*Technology Basics White Paper*"** description, the data format is
   Parity(1bit)+Facility Code(8bit)+Card ID(16bit)+Parity(1bit)
   Facility Code=0b00001101=0xD=13
   Card ID=0000000000011100=0x1C=28
2. HID 35bit card id: 163856 (digital format)
   Data#3 ~ Data#7: 0x06 0x11 0xC5 0x00 0x20
   Show in binary format: 11000010001110001010000000000100000 (35bits)
   As HID **"*HID card format corporate 1000*"** description, the data format is
   Parity(1bit)+Facility Code(13bit)+Card ID(20bit)+Parity(1bit)
   Card ID=0b00101000000000010000=163856

3.2.6 DI/DO status

CMD Code: 0x42
Sub-CMD: 0x03
Data#(N): 2 byte
Data#1: DI/DO status
Bit0: Push Button (0/1:OFF/ON)
Bit1: Magnetic Switch (0/1:OFF/ON)
Bit2: Tamper Switch ((0/1: Cover opened/Cover closed)
Bit3: Reserved
Bit4: Lock Relay State (0/1:OFF/ON)
Bit5: Alarm Relay State (0/1:OFF/ON)
Bit6: Reserved
Bit7: Reserved

Data#2: Reserved (default: 0x00)

3.2.7 Device model

CMD Code: 0xFA

Sub-CMD~Data#10: Device model string, 11 bytes.

"AR1000 ": Atop Mifare reader

"AR1100 ": Atop EM reader

"AR1200WG ": Atop Wiegand module

Note: the tail of model string will be filled with space (0x20) if the string length less than 11 bytes.

3.2.8 Device information

CMD Code: 0xFC

Sub-CMD: Device product id

0x24: Atop Mifare reader

0x25: Atop EM reader

0x26: Atop Wiegand module

Data#1: Major firmware version

For example

0x99: version 9.9 for testing.

Data#2: (Reserved, default value=0x00)

3.2.9 Device boot up message

CMD Code: 0xF1

Sub-CMD: Device product id

0x26: Wiegand Convertor

Data#1: Major firmware version

For example

0x10: version 1.0

Data#2~7: Model name

For example

"AR1200WG"

4. Command List

CMD: the command packet of Host send to converter

CMD Code	Sub Cmd	Packet Length	Function	Format STX/ID/L1/L2/CMD Code/SUB CMD/CMD DATA(N)/XOR/SUM
0x42	0x00	8	Polling	Ex: 7A/id/08/00/42/00/xor/sum
0x42	0x01	10	Active DO	Ex: 7A/id/0A/00/42/01/00/01/xor/sum
0x42	0x02	11	DO active timer	Ex: 7A/id/0B/00/42/02/00/00/0A/xor/sum
0x42	0x10	9	Access Result	Ex: 7A/id/09/00/42/10/00/xor/sum
0xFA		7	Device model	Ex: 7A/id/07/00/FA/xor/sum
0xFC		7	Device info.	Ex: 7A/id/07/00/FC/xor/sum

DATA : the reply packet from converter to Host

CMD Code	Sub Cmd	Packet Length	Function	Format STX/ID/L1/L2/CMD Code/SUB CMD/CMD DATA(N)/XOR/SUM
0x00		7	Ack	Ex: 7A/id/07/00/00/xor/sum
0x08		7	Nack	Ex: 7A/id/07/00/08/xor/sum
0x09		7	Unknown	Ex: 7A/id/07/00/09/xor/sum
0x42	0x01	10+N	Card data	Ex: 7A/id/0E/00/42/01/00/00/66/6B/45/E7/xor/sum
0x42	0x03	10	DI/DO status	Ex: 7A/id/0A/00/42/03/04/00/xor/sum
0xFA	**note1**	18	Device model	Ex: 7A/id/12/00/FA/41/52/31/32/30/30/57/47/20/20/20/xor/sum
0xFC	**note2**	10	Device info.	Ex: 7A/id/0A/00/FC/26/99/FF/xor/sum
0xF1	**note2**	15	Device info.	Ex: 7A/id/11/00/F1/26/10AR1200WG/xor/sum

note 1: “Sub Cmd” field is the first byte of device model name.

note 2: “Sub Cmd” field is the product id.

5. Appendix

5.1 Hardware Specification

- Power require DC 9~24V, working current under 300mA
  Reverse voltage protection.
  ESD 15KV protection.
- Wiegand Interface, standard format data input
  DATA0/DATA1/LED_G/LED_R/BUZZER/HOLD/TAMPER
  HOLD/Present SW Control.
- Include power source for reader module, it's the same as power input voltage.
- RS-485 interace
  DATA+/DATA-
  Communication baud rate 57600,N,8,1
- Indicator Status/Com LED
- DIP-Switch Node ID set. (Node ID: 1~31
- Digital photo isolated input x 2
- Relay x 2
  Relay contactor specification: 120V,1A / 24V, 2A
  Provide relay N.O. or N.C pin out.
- Operation Temperature: -10 to℃ +70℃
- Humility: 10%~-90% non-condensing
- Metal housing, 75mm x 85mm x 28mm

5.2 Pin Assignment

Connector 1: Power & RS-485(COM/PWR)

Function	Pin	Print	Color	Description
RS-485	1	**D+**	Blue	RS-485(A) DATA+
	2	**D-**	White	RS-485(B) DATA-
Power	3	**V+**	Red	Power Input, +9VDC~ +24VDC
	4	**V-**	Black	Power Input V-
Frame Ground	5	**FG**	Yellow	Frame Ground

Relay Out & Digital Input (I/O)

Function	Pin	Print	Color	Description
Lock Relay	1	**R1_NC**	Black	Normal Close for Relay 1
	2	**R1_C**	Brown	Common for Relay 1
	3	**R1_NO**	Red	Normal Open for Relay 1
Alarm Relay	4	**R2_NC**	Orange	Normal Close for Relay 2
	5	**R2_C**	Yellow	Common for Relay 2
	6	**R2_NO**	Green	Normal Open for Relay 2
Ground	7	**GND**	Blue	Common Ground
Digital Input	8	**DI1**	Purple	to Exit Button
	9	**DI2**	Gray	to Door Open Sensor
Reserved	10		White	

Wiegand:

Function	Pin	Print	Color	Description
Wiegand	1	**WG-0**	Green	Data 0(5VDC)
	2	**WG-1**	White	Data 1(5VDC)
	3	**WG-G**	Orange	Green LED (5VDC/50mA output)
	4	**WG-R**	Brown	Red LED (5VDC/50mA output)
	5	**BUZZ**	Yellow	Buzzer (5VDC/50mA output)
	6	**HOLD**	Blue	Hold/Present (***note3***)
	7	**COM**	Gray	Tamper Common
	8	**SEL**	Purple	Tamper Select
Ground	9	**GND**	Black	Common Ground
	10		Blue	N/A
Power Out	11	**V-**	Black	Power Output (GND)
	12	**V+**	Red	Power Out = Power IN

Note 3: “Hold” input, to prevent multiple reads from a single card presentation and anti-passback errors. Hold=1, allow only a card once read, must be removed from the RF field for one second before it will be read again.

DIP Switch

Function	Switch	Description
RS-485 ID	1~5	RS-485 Identification (ID range: 1~31) (***note4***)
	6	Reserved
	7	Wiegand HOLD/PRESENT Enable/Disable.
	8	Reserved

Not

e 4: DIP switch for RS-485 ID ADDRESS SETUP.

ID \ DIP	1	2	3	4	5
1	**ON**	OFF	OFF	OFF	OFF
2	OFF	**ON**	OFF	OFF	OFF
3	**ON**	**ON**	OFF	OFF	OFF
4	OFF	OFF	**ON**	OFF	OFF
.	.	.	**.**	.	.
30	OFF	**ON**	**ON**	**ON**	**ON**
31	**ON**	**ON**	**ON**	**ON**	**ON**