
iRAYPLE
AGV Code Reader
User' s Manual V1.0.7



Table of Contents

1 Overview	2
1.1 AGV System	2
1.2 Working Principle of AGV Code Readers	3
1.3 Running of AGV Code Readers	6
2 Introduction of AGV Code Reader	8
2.1 Product Information	8
2.2 Features	8
2.3 Technical Specifications	8
2.3.1 R3138MG010E and R3138MG011E Specifications	8
2.4 Appearance and Dimensions of AGV Code Reader	9
2.4.1 Appearance	9
2.4.2 Dimensions	10
2.4.3 Pin Description	10
2.5 Accessories	11
3 Client Installation and Introduction	12
3.1 Installing Smart Vision Studio	12
3.2 Introduction of Smart Vision Studio	13
3.2.1 Homepage	13
3.2.2 Connecting to the Code Reader	14
4 Configuring AGV Code Reader	15
4.1 Device Information	15
4.2 Configuring Images	15
4.2.1 Configuring Exposure	15
4.2.2 Configuring Trigger	15
4.2.3 Configuring Built-in Illuminator	16
4.3 Algorithm Parameters	16
4.3.1 Configuring Working Mode	16
4.3.2 Configuring Parameters Related to 2D Codes	16
4.3.3 Configuring AGV Parameters	18
4.4 Transmission Control	19
5 Errors and Troubleshooting	24
5.1. Status of LED Lights	24
5.2 FAQs	24

1 Overview

1.1 AGV System

- “Tags” are deployed to form a grid, with a fixed gap (about 1 meter) between every 2 tags.
- The number of each tag (such as 01, 02, and 03 in the following figure) represents a position. The distribution diagram of all tags is stored on the scheduling platform.
- The scheduling platform formulates a route for AGV based on customer orders and the position of AGV, and instructs AGV to carry goods to the designated position. For example, AGV resides in the position of 15, and the designated position is 01. The scheduling platform might formulate a route of 15-05-04-03-02-01.
- The code reader on AGV reads tags and outputs tag numbers, AgvX, AgvY, and AgvAngle to correct the position of AGV.
- AGV uploads the obtained tags to the scheduling platform. Then, the platform determines whether to modify the route based on the position of AGV since multiple AGVs might run at the same time.
- AGV goes straight ahead when no tag is read.

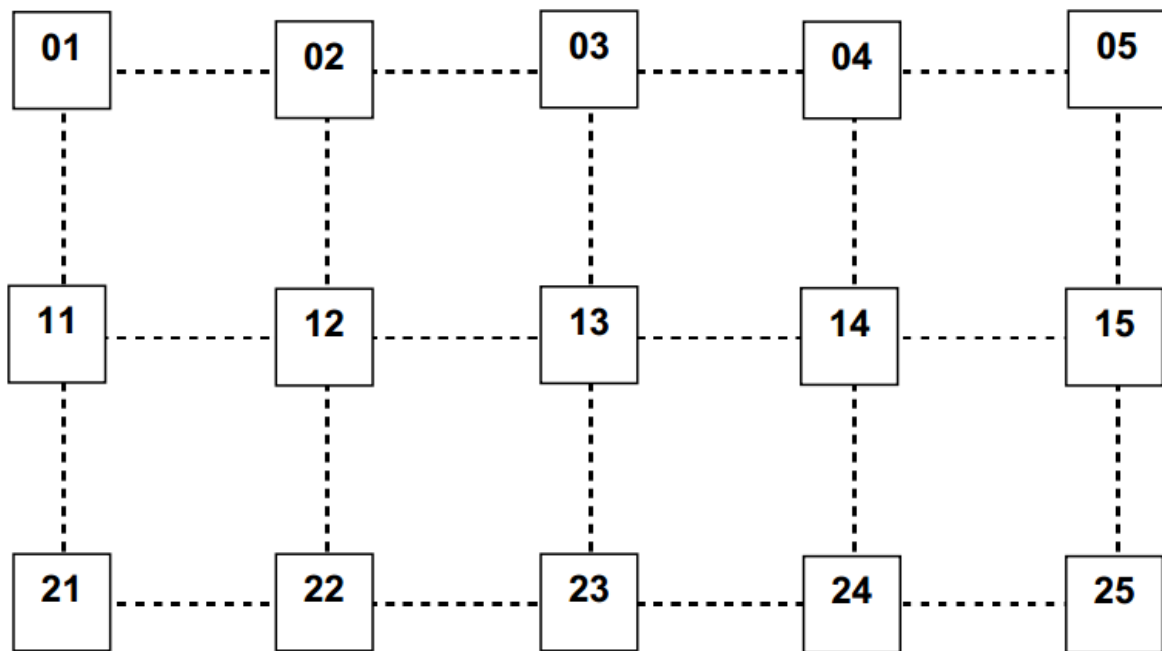


Figure 1-1 Distribution diagram of tags



Figure 1-2 Working scenario of AGV

1.2 Working Principle of AGV Code Readers

AGV tags support 1x1 DM code, 4x4 DM code and code tape. Different tags share the same recognition principle. 4x4 tag and code tape have multiple DM codes, which are more applicable to complex environments. Even several DM codes cannot be read due to stains, other codes can be read.

1x1 tag: a single DM code, as shown in Figure 1-3.

- A tag number is used to recognize the absolute position of AGV.
- The center of the tag is set as the origin point to establish an absolute coordinate system.

DM code value:

02000050, which is the tag number.

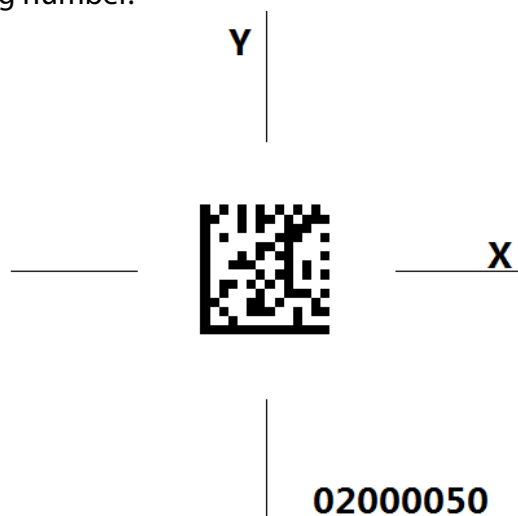


Figure 1-3 1x1 DM code

4x4 tag: DataMatrix code, as shown in Figure 1-4.

- A tag number is used to recognize the absolute location of AGV.
- The center of the tag is set as the origin point to establish an absolute coordinate system.

DM code value:

3 6 00000005, each code is arranged by rules.

- 3: Indicates the column where AGV resides.
- 6: Indicates the row where AGV resides.
- 00000005: the tag number, which indicates the position of AGV.
- Tag center: the origin point (0,0) of the absolute coordinate system.

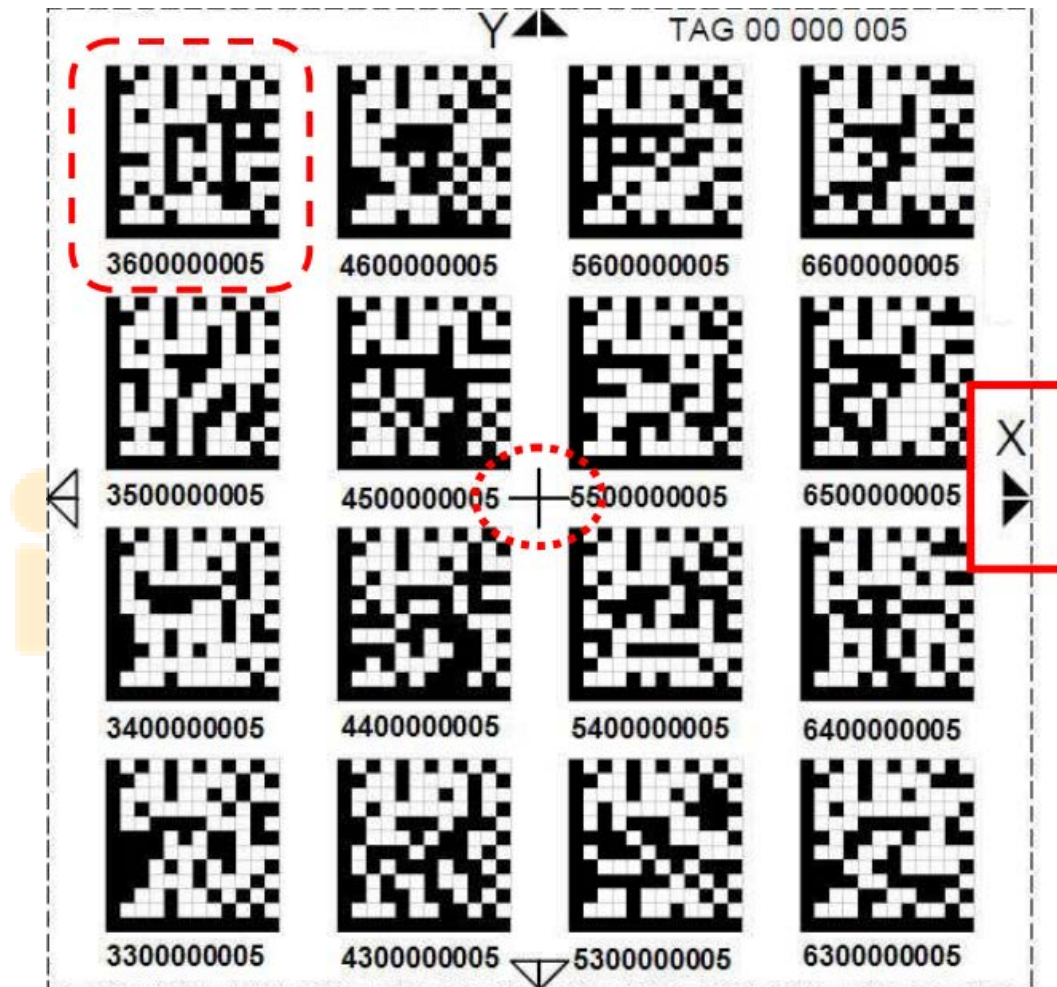


Figure 1-4 4x4 DM code matrix

Data Matrix position tape: a single row that consists of multiple DataMatrix codes, which is used to calculate the distance AGV runs.



Figure 1-5 Data Matrix position tape

Code value	000000	000002	000004	000006	000008	000010
Absolute position	0.00M	0.02M	0.04M	0.06M	0.08M	0.1M

Table 1-1 Relationship between code values and absolute positions

- An absolute position is tagged every 0.1 meters, as shown in the green box in Figure 1-5.
- The direction of the code tape is that of the X axis. The output X value indicates the advance distance. The min. distance is 0 m.
- The results output by the code tape include X position, Y position, and angle of deflection.
- DM can be 10x10 bit, 12x12 bit, or 14x14 bit.

The frame rate of the AGV code reader is 100 FPS. The code reader processes data every 10 ms and outputs the following content:

- Tag number, which is used to indicate the absolute position of AGV.
- The X and Y coordinates in the absolute coordinate system, which indicate the center of the camera view, and angle of deflection. The data helps navigate AGV to make the center of AGV coincide with that of tags.

Attention:

- Before attaching tags to the ground, define the X axis and Y axis of the ground.
- When attaching tags to the ground, make sure that all “X Marks” follow the direction of the X axis and all “Y Marks” follow the direction of the Y axis, as shown in Figure 1-6.
- No matter how much degree camera or AGV rotated: If the X coordinate is positive, AGV moves towards -X axis (left) and vice versa. If the Y coordinate is negative, AGV moves towards +Y axis (up) and vice versa.

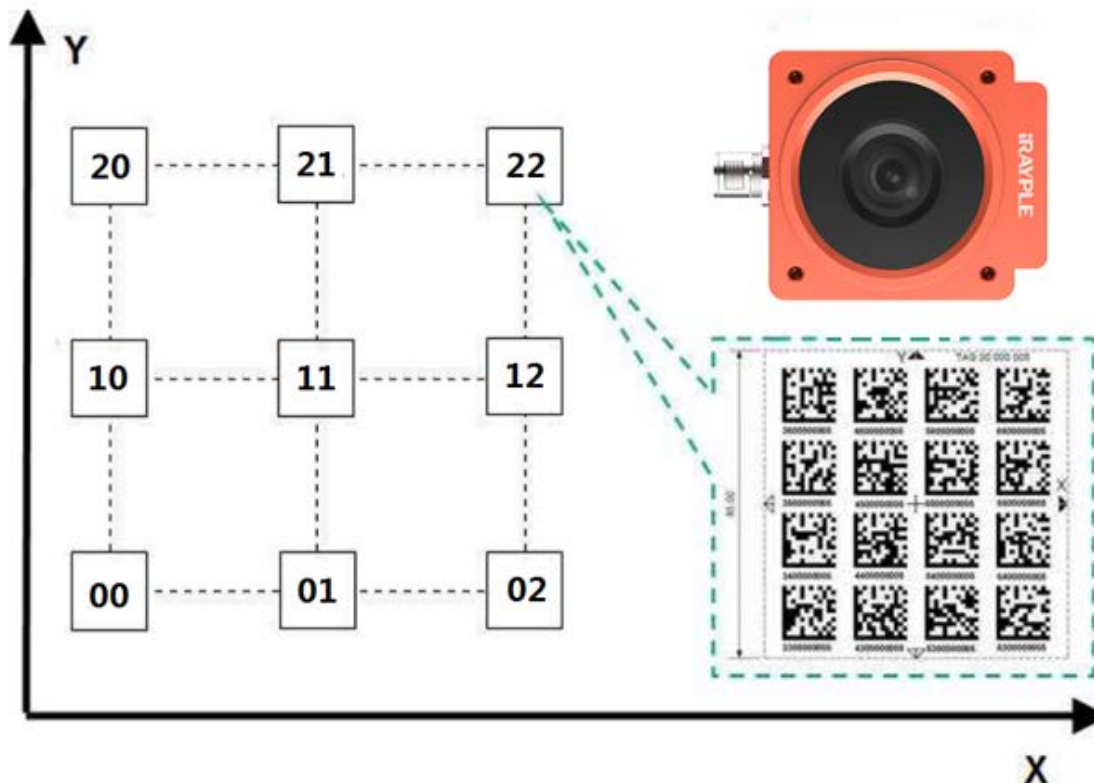


Figure 1-6 Attach tags

1.3 Running of AGV Code Readers

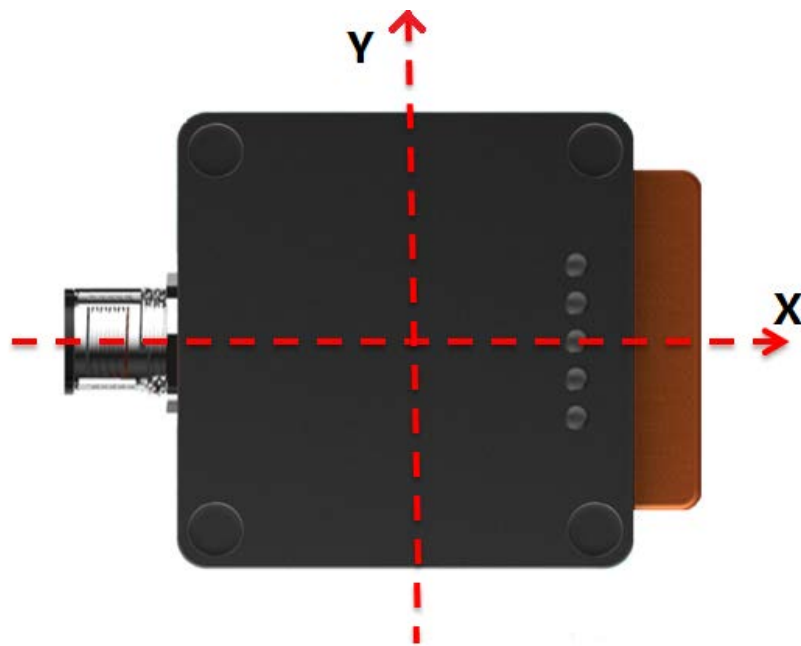


Figure 1-7 Initial position of the AGV code reader

The preceding figure shows the initial position of the AGV code reader. If AGV runs off track, the position of AGV is adjusted based on position offset and angle offset.

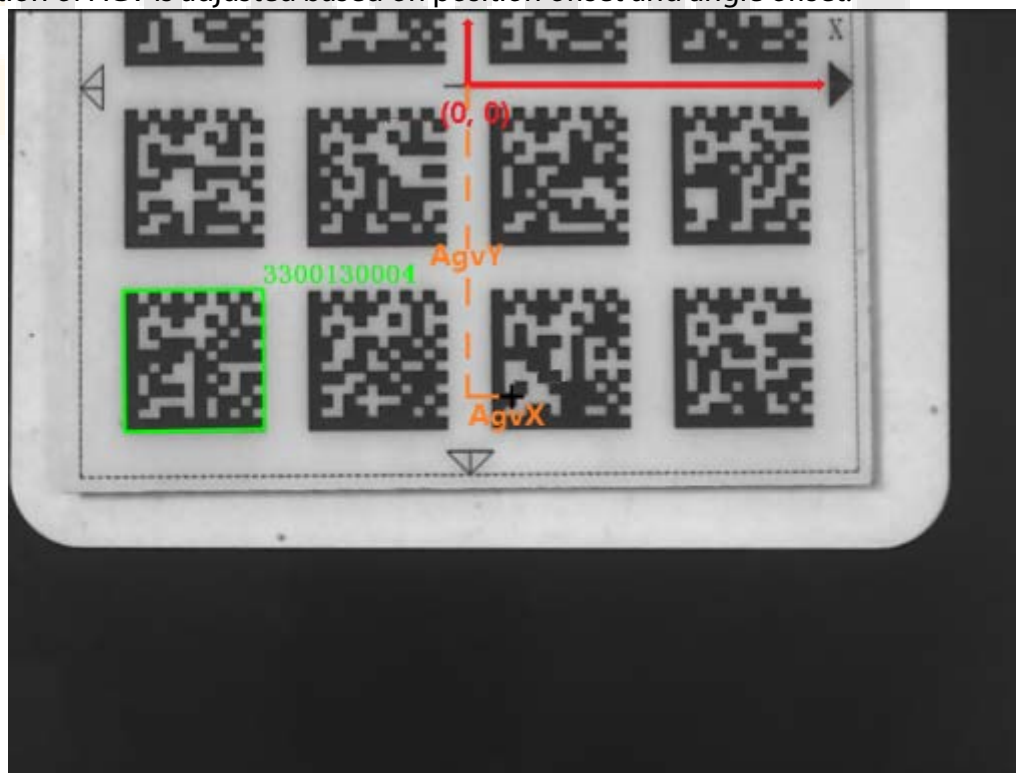


Figure 1-8 Real view of the AGV code reader

Use the 4x4 DM tag as an example. Figure 1-8 shows the real view of the AGV code reader, which indicates that AGV has run off track. The real-time results output by the AGV code reader are as follows;

AgvTagNum	130,004
Agvx	4
Agvy	-36
Agvangle	89

Figure 1-9 Output results

AgvTagNum: tag number 130004, which indicates the position of AGV.

AgvX: The center point needs to move 4 mm in the negative direction (to the left) of the X axis.

AgvY: The center point needs to move 36 mm in the positive direction (upward) of the Y axis.

AgvAngle: AGV rotates 89 degrees clockwise.

After the position of AGV is adjusted based on the preceding results, AGV returns to the initial position shown in Figure 1-7. At this point, the center of view coincides with the center of the tag, and the direction of advance is the X axis. Then, AGV continues to move along the route formulated by the scheduling platform.

Notes:

For a 4x4 code matrix, results can be output after one DM code is recognized. The existence of multiple codes allows adverse impacts on some tags, such as stains, reflection, and wear. This improves the stability and reliability of AGV.



2 Introduction of AGV Code Reader

2.1 Product Information

The product is mainly used to position and navigate AGV. The AGV code reader collects images and decoding two-dimensional codes in the images through internal algorithms. You can display images, configure parameters, view output results, and perform other operations in the client of the product.

2.2 Features

- Excellent decoding algorithm, which helps recognize tags of poor quality, such as stained tags, incomplete tags, and tags with low contrast.
- Embedded decoding algorithm, which improves the recognition rate and speed.
- Supports reading two-dimensional codes, such as DM-12 and DM-14, and 4x4 DM code matrix.
- Embedded aviation plug and abundant IO ports.
- 5 indicator lights, which are used for debugging and status monitoring.
- Supports saving, loading, and switching multiple sets of user parameters.
- Supports M12 prime lens, which enables code reading and positioning under a large view.
- IP64 protection, which allows the product to be used in complex industrial environments

2.3 Technical Specifications

2.3.1 R3138MG010E and R3138MG011E Specifications

Model	Shutter	Resolution	Frame Rate	Port	Color	Pixel Pitch	Target Surface
R3138MG010E/ R3138MG011E	Global	540 × 640	100	M12	Black and white	5.4 × 5.4	1/4"
Performance Parameter							
Trigger Mode	Free run mode						
Lens Focal Length	R3138MG010E: 3.37 mm R3138MG011E: 3 mm						
Working Distance	100 mm ± 20mm						
View Range	R3138MG010E: 104 mm × 85mm R3138MG011E: 132 mm × 110 mm						
Field of View	60° × 30°						
Max. Speed	3 m/s						
Port Parameter							
Connector	One industrial-grade M12 connector for Ethernet and GPIO						
Network Port	100M Ethernet						
Communication	100M Ethernet, RS-485						

Mode	
Communication Protocol	SDK, Serial, TCPServer, TCPClient
LED Indicator	POWR, NET, TRIG, RUN, ERR
Power	
Power Supply	DC 24 V $\pm$ 10%
Power Consumption	Illuminator disabled: 2.65W@24VDC; Stroboscopic illumination: 3.2W@24VDC; Illuminator enabled: 5.4W@24VDC
Structure	
Dimension	60 mm $\times$ 60 mm $\times$ 43 mm (excludes the height of the port)
Package Dimension	164 mm $\times$ 122 mm $\times$ 91 mm
Product Weight	< 225 g
Package Weight	< 350 g
Protection Level	IP64
Housing Material	Aluminum alloy
Working Environment	
Working Temperature	-20 $^{\circ}$ C to +50 $^{\circ}$ C
Working Humidity	20%–95% (no condensation)
Storage Temperature	-30 $^{\circ}$ C to +80 $^{\circ}$ C
Basic Parameters	
SDK	SVStudio
Certification	CE, FCC, KC

Table 2-1 R3138MG010 and R3138MG011E specifications

2.4 Appearance and Dimensions of AGV Code Reader

2.4.1 Appearance

An AGV code reader is composed of body, lens, built-in LED, lens cover, etc.

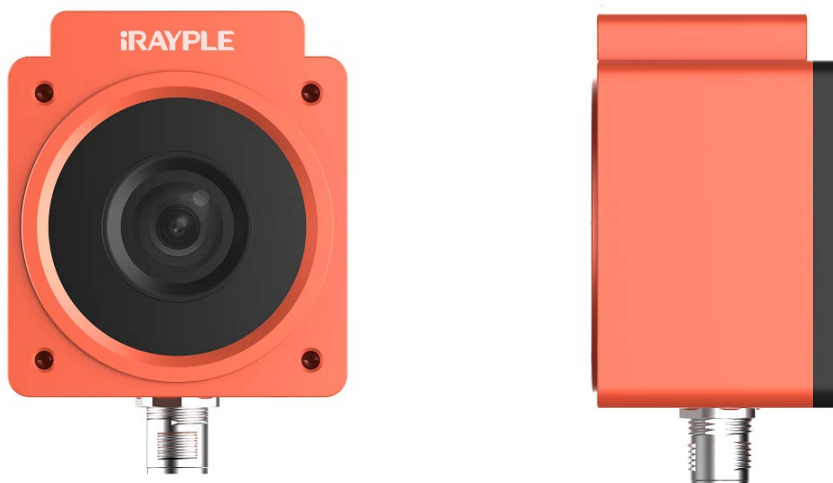


Figure 2-1 Appearance

2.4.2 Dimensions

There are 4 mounting screw holes in front of the body, which can be used to mount the AGV code reader. M4 screws can be used for mounting.

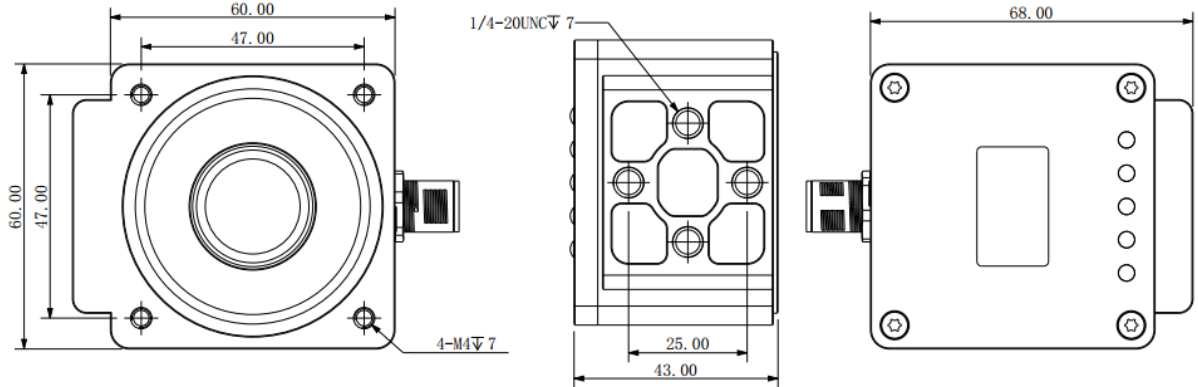


Figure 2-2 Dimensions

2.4.3 Pin Description

The AGV coder reader has only one 12-pin port. The description of the 12-pin port is as follows:

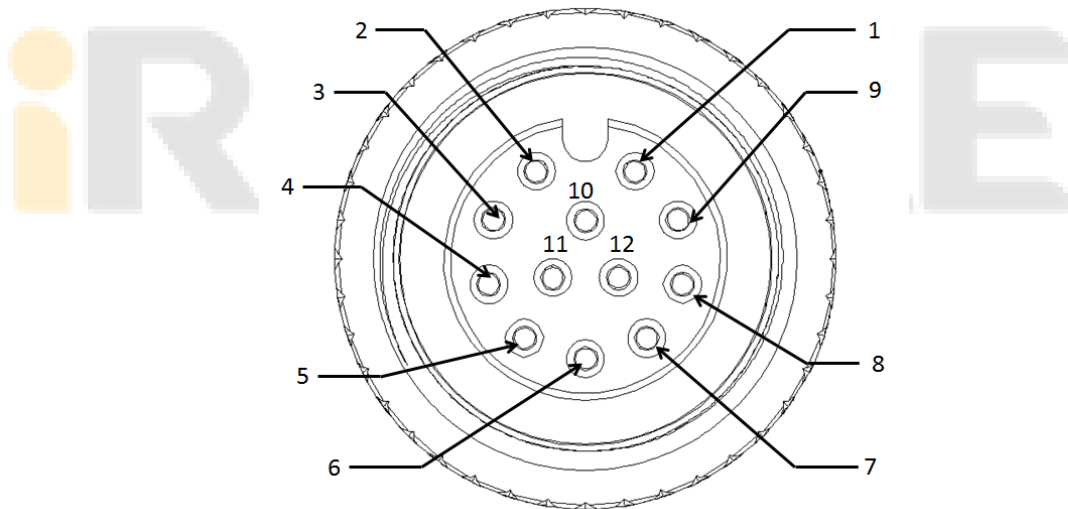


Figure 2-3 12-pin port

No.	Signal	Description
1	DC24V	VCC (+)
2	GND	Power ground
3	OPTO_OUT	Optocoupler output
4	OUT_COM	Optocoupler output ground
5	OPTO_IN	Optocoupler input
6	IN_COM	Optocoupler input ground
7	MDI1+	100 Mbps signal MDI1+
8	MDI1-	100 Mbps signal MDI1-
9	MDI0+	100 Mbps signal MDI0+

10	MDI0-	100 Mbps signal MDI0-
11	RS485+	RS485 signal+
12	RS485-	RS485 signal-

Table 2-2 Description of pin signals

2.5 Accessories

You must use the AGV code reader with the accessories listed in Table 2-3.

No.	Name	Quantity	Description
1	Device	1	AGV code reader
2	12-pin cable	1	12-pin cable
3	12 power adapter (not in the product list)	1	Power

Table 2-3 Accessories



3 Client Installation and Introduction

The client of AGV code reader is called Smart Vision Studio. You can install the client in Windows 7 or later.

3.1 Installing Smart Vision Studio

1. Double-click the installation package.
2. Click **Install**.

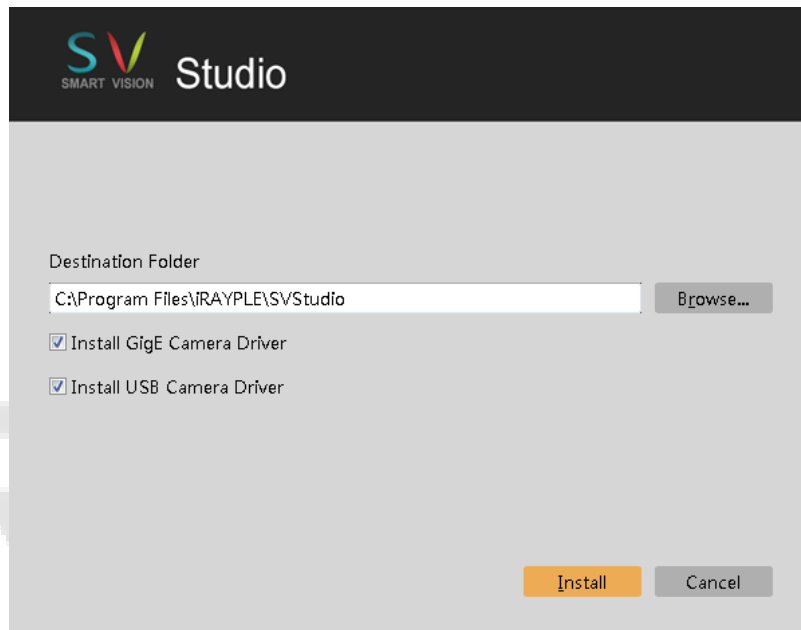


Figure 3-1 Select an installation directory

3. The following figure shows the installation progress.

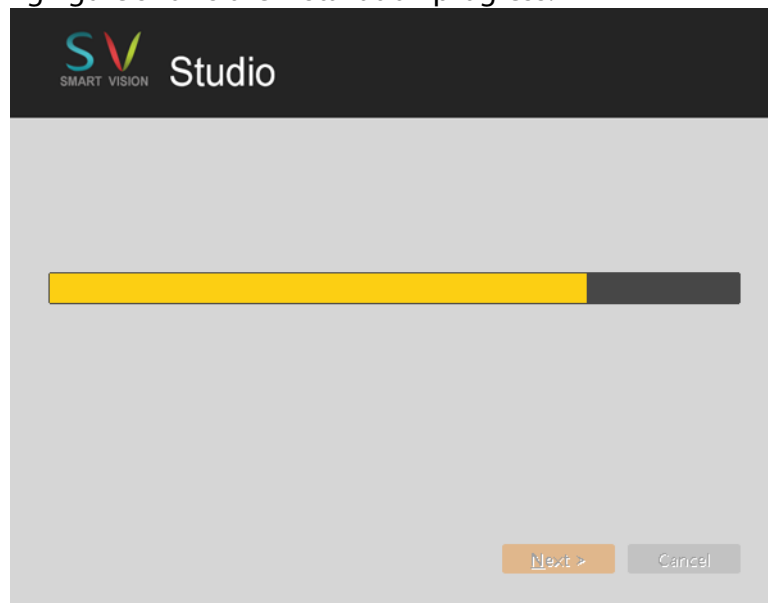


Figure 3-2 Installation progress

4. The installation is completed.

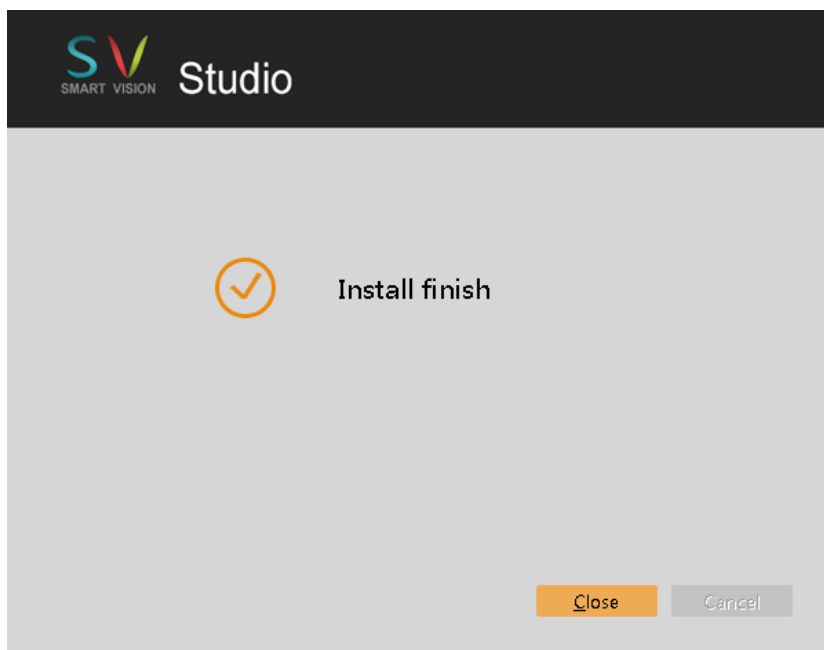


Figure 3-3 Installation completed

3.2 Introduction of Smart Vision Studio

3.2.1 Homepage

The following figure shows the homepage of Smart Vision Studio.

- ① Toolbar
- ② Device properties
- ③ Preview section
- ④ Output results

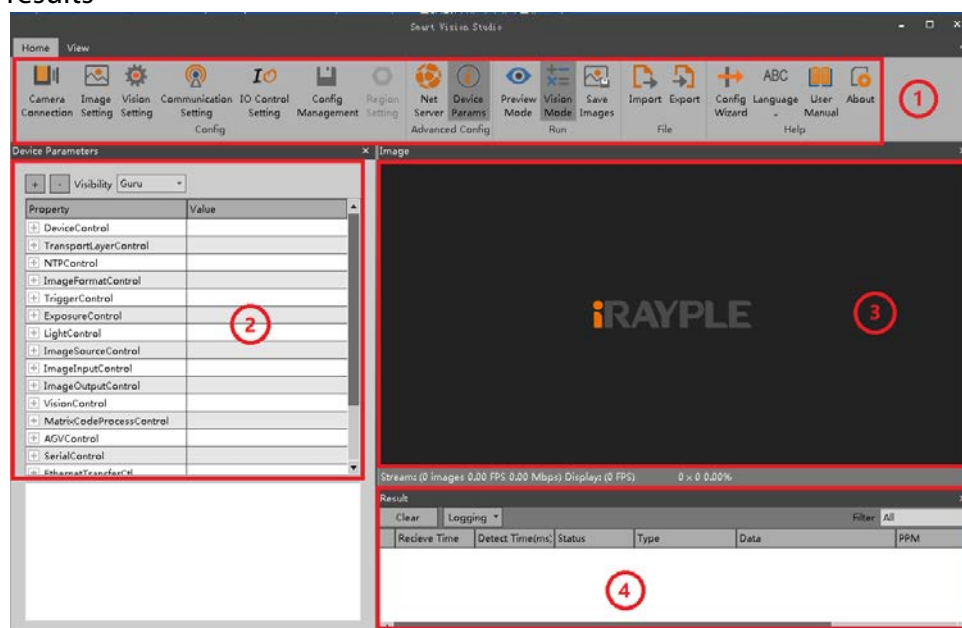


Figure 3-4 Homepage

3.2.2 Connecting to the Code Reader

After you start the client, the client finds devices on the same network segment and displays the devices in the device list. If new devices are connected to the network, click **Refresh** to refresh the device list.

Move the pointer to the device to be connected, and then click Connect or double-click the device. Make sure that the device is connectable. Otherwise, modify the IP address of the device.

Icons in the device list:

: Cameras that can be connected.

: The IP address of the camera is invalid. You must modify the IP address of the camera.

: The connected cameras. You can connect only one camera to the client.

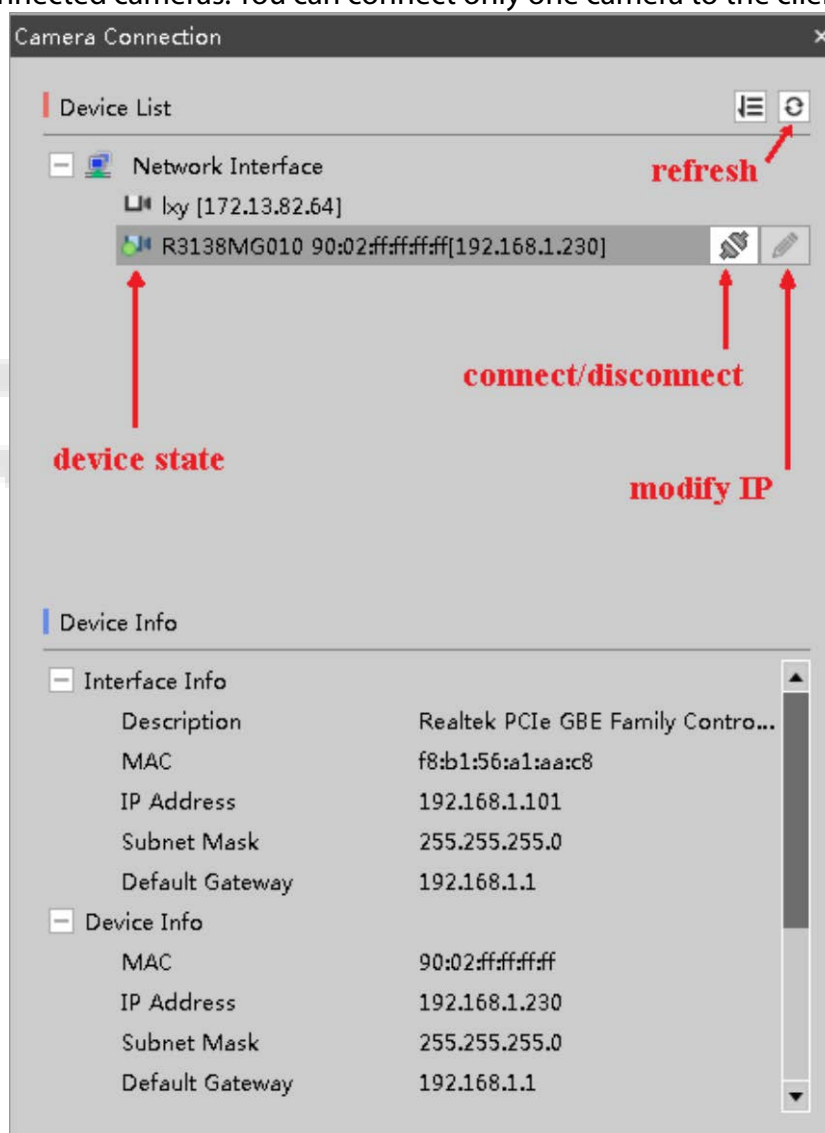


Figure 3-5 Device list

4 Configuring AGV Coder Reader

4.1 Device Information

Click **DeviceControl** to view device information, such as the manufacturer, device model, device version, firmware version, software version, and device serial number. You can provide the device version to us when you report issues. In the following figure, the device version is marked by a red box.

DeviceControl	
DeviceVendorName	Dahua Technology
DeviceModelName	R3051MG010
DeviceManufacturerInfo	Dahua Technology
DeviceVersion	V1.001.0000.3.R.20190409-26
DeviceFirmwareVersion	boot/20190105/ 71499
DeviceSoftwareVersion	DH_IC_FPGA-R3050MG010_V1.0.0.0.R.20190408
AlgorithmVersion	Datacode_1.0.76464
DeviceSerialNumber	0000000000000000
DeviceUserID	
DeviceReset	Device Reset

Figure 4-1 Device information

4.2 Configuring Images

4.2.1 Configuring Exposure

Only manual exposure is supported. Adjusting exposure and gain is to adjust the image brightness, so as to make the target clearer.

ExposureControl	
ExposureMode	Manual
ExposureTime	200.00 us
GainRaw	10.00

Figure 4-2 Configure exposure

4.2.2 Configuring Trigger

Click **TriggerControl**. **TriggerType** includes **FreeRun** and **SingleFrame**. You can set **FrameRate**, whose value must be less than the max. frame rate (**FrameRateMax**) supported by the device.

TriggerControl	
TriggerType	FreeRun
FrameRate	100.00 Hz
FrameRateMax	100.00 Hz
TriggerSource	Software
TriggerSoftware	Trigger Software

Figure 4-3 Configure trigger

4.2.3 Configuring Built-in Illuminator

Click **LightControl**. **LightMode** includes **Off**, **Always**, and **Flash**. Set **LightBrightness** to adjust the brightness of the light.

 LightControl	
LightSelector	Inner
LightMode	Flash
LightBrightness	60
LightPrechargeTime	50.00 us

Figure 4-4 Configure built-in illuminator

4.3 Algorithm Parameters

4.3.1 Configuring Working Mode

Click **VisionControl**. **WorkMode** includes **Preview** and **Vision**. Algorithms can work only in **Vision** mode. **FrmInBuffNr** indicates input buffer frames.

 VisionControl	
WorkMode	Vision
VisionFuntion	CodeDetect
FrmInBuffNr	2

Figure 4-5 Configure working mode

4.3.2 Configuring Parameters Related to 2D Codes

Click **MatrixCodeProcessControl**. The AGV code reader uses 4x4 DM code matrix, code tape, and 1x1 DM code. DMEnable: Specifies whether to enable the function.

IsCodeMatrix: Specifies whether the codes are a code matrix or code tape.

EnableBoxCorrection: Specifies whether to correct the positioning box.

SignPolarity: Configures black codes with a white background (Black) and white codes with a black background (White).

SignMirror: Indicates whether the current code is an image code.

VersionMinDM and VersionMaxDM: Configures the version number of DM codes. Figure 4-7 shows version numbers.

CodeMinWidth and CodeMaxWidth: Specifies the width of 2D codes.

TimeOutMatrixCode: Configures the time-out period. The more accurate the parameters, the faster the decoding speed.

☐ MatrixCodeProcessControl	
EnableMatrixCodeConfig	Enable
DMEnable	True
ResultFilterMatrixCode	False
MinMatrixCodeLen	0
MaxMatrixCodeLen	0
MaxOffsetLShapeAngle	90.00
MaxOffsetOtherAngle	90.00
PatternMatrixCode	
EnableRepeatedMatrixCode	True
DisRepeatedTimeoutMatrixCode	{Not Available}
DisRepeateStrategyMatrixCode	{Not Available}
IsCodeMatrix	True
ROILocator	{Not Available}
ROICircleThreshold	{Not Available}
ROICircleRadius	{Not Available}
EnableBoxCorrection	True
SignPolarity	Black
SignMirror	No
VersionMinDM	1
VersionMaxDM	3
CodeMinWidth	60
CodeMaxWidth	400
DecodeNum	1
TimeOutMatrixCode	20

Figure 4-6 Configuring parameters related to 2D codes

☐ ChunkDataControl	
☐ ChunkPipeline	
☐ ChunkImageScaleProcessResult	
☐ ChunkQRCodeProcessResult	
QRStatus	Complete
QRDetectTime	10,887
QRErrorCode	NoError
QRNum	1
☐ ChunkQR0	
QR0_CodeType	DM
QR0_CodeData	5600130004
QR0_CodeDataSize	10
QR0_Point0_X	480
QR0_Point0_Y	238
QR0_Point1_X	554
QR0_Point1_Y	179
QR0_Point2_X	611
QR0_Point2_Y	255
QR0_Point3_X	536
QR0_Point3_Y	313
QR0_PosPointNum	4
QR0_PPM	0.00
QR0_Quality	0
QR0_Angle	52.68
QR0_Version	2

Figure 4-7 Results

For a circled DM code, you can set ROICircleThreshold and ROICircleRadius to speed up decoding.

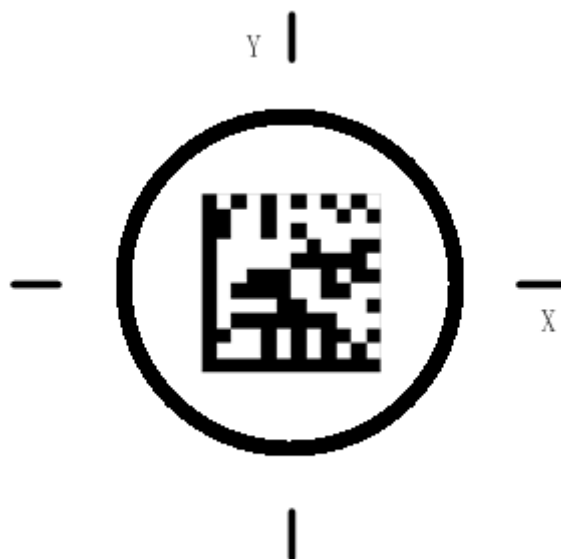


Figure 4-8 Circled DM code

IsCodeMatrix	False
ROILocator	Circle
ROICircleThreshold	80
ROICircleRadius	75

Figure 4-9 Circled DM code

4.3.3 Configuring AGV Parameters

Click **AGVControl**. **DmLenMM** indicates the physical width (mm) of a single DM code in a matrix. **DmIntervallLenMM** indicates the physical spacing (mm) of 2 adjacent DM codes in a matrix. **ResolutionX** and **ResolutionY** indicate the precision of output results X and Y, including 0.1 mm, 1 mm, and 10 mm. Assume that X is 9 with a precision of 1 mm. In this case, if you set the precision to 0.1 mm, the output value might be 92. **ResolutionAngle** indicates the precision of output angles, including 1°, 0.5°, 0.2°, and 0.1°. **OffsetAngle** indicates the offset angle, which is the angle that the coder reader needs to rotate clockwise to follow the advance direction of AGV. For example, if the code reader is installed (on the side where LED resides) to follow the advance direction of AGV, set **OffsetAngle** to 0. If the code reader is installed with a clockwise angle of 90 degrees to the advance direction, set **OffsetAngle** to 270. If the coordinate system does not match the positions of tags, you can also set **OffsetAngle** for correction. **TagSize** indicates the tag type, including 1x1 tag, 4x4 tags, and Code Tapes.

The result transmission method (CommMode) includes TCP and RS485. The result packing mode (ResultPackMode) includes the 21-byte hexadecimal format of Pepperl+Fuchs and fixed text format (x_pos,y_pos,angle,tag). The result obtaining method (ResultTransferStyle) includes query and upload. If you set **StopSendNoRead** to **True**, no results will be transmitted when no codes are read. You can modify the preceding parameters only when you set **AGVEnable** to **False**. To configure TCP transmission, set **EthernetTransferCtl**. The camera can be the client or server of TCP. To set

EthernetTransferCtl, you must also set **AGVEnable** to **False**.

Connection method for one leader with multi-followers: If PCL serves as a leader and multiple AGV code readers serve as RS-485 followers, set a unique SiteID (0-3) to each AGV code reader.

[-] AGVControl	
AGVEnable	True
SiteID	0
CommMode	RS485
ResultPackMode	P+F
ResultTransferStyle	Query
StopSendNoRead	False
Timeout	1000
DmLenMM	15.00 mm
DmIntervalLenMM	5.00 mm
ResolutionX	0.1 mm
ResolutionY	0.1 mm
ResolutionAngle	0.1
OffsetAngle	0
TagSize	4x4 tags/Code Tapes

Figure 4-10 Configure AGV parameters

[-] EthernetTransferCtl	
TransferEnable	True
TransferWorkMode	TCPServer
TCPPort	3000
TCPServerAddress	{Not Available}

Figure 4-11 Configure network parameters

4.4 Transmission Control

There are 3 methods for the device to communicate data:

- SDK: Use an SDK to receive the video data and output results of the AGV code reader. The SDK is similar to Smart Vision Studio.
- RS-485/TCP: Transmits data through RS-485 half-duplex or TCP. You can set the baud rate, data bit, check mode, and stop bit of serial ports. To use TCP, set the camera to TCP Client or TCP server.

[-] SerialControl	
BaudRate	Baud_115200
DataBits	Bits_8
Parity	Parity_None
StopBits	Bits_1

Figure 4-12 Configure serial ports

Communication mode: When selecting RS-485, if you use the Query method and the AGV code reader serves as the RS-485 follower, there is a question-and-answer query mode (the leader sends a request, and the AGV code reader responds). When **ResultPackMode** is set to **Common**, the result packing format is as follows:

(X position, Y position, angle, tag value)

When selecting the P+F format, see the following tables for request and response messages.

When you use the Upload method, the camera automatically uploads results without a command when a frame is captured. Therefore, the upload frequency depends on the camera frequency.

Request Message:

A request message consists of 2 bytes. The second byte corresponds to the first byte, and the 8-bit data is inverted.

Structure of a request message:

	Check	Flag Bit	Request Instruction					Reader Address	
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte1	Parity	R/W	bit 4	bit 3	bit 2	bit 1	bit 0	A1	A0
Byte2	Parity	- R/W	- bit 4	- bit 3	- bit 2	- bit 1	- bit 0	- A1	-A0

Table 4-1 Structure of a request message

R/W request/response flag bit:

- ⊙ R/W=1 is request message.
- ⊙ R/W=0 is response message.

Instruction of request results:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Byte 1	Byte 2	Feature
1	0	0	0	0	0	0	0	80	7F	Address 0
1	0	0	0	0	0	0	1	81	7E	Address 1
1	0	0	0	0	0	1	0	82	7D	Address 2
1	0	0	0	0	0	1	1	83	7C	Address 3
1	1	0	0	1	0	×	×	C8	37	Data Request

Table 4-2 Format of a request message

Application scenario: follower address 0 (default), 1, 2, 3. When only one AGV code reader is connected, perform a query based on C8 37. When multiple AGV code readers are connected, for example, 2 code readers are connected to a PLC (one for navigation, and other for recognition), perform a query based on SiteID. When SiteID equals 0, send 80 7F for a query. When SiteID equals 1, send 81 7E for a query.

Light instruction (results are no longer output after the light is turned off); **Only available in the query mode (question-and-answer mode).**

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Byte 1	Byte 2	Feature
1	1	1	1	1	0	0	0	F8	07	Address 0, off
1	1	1	1	1	1	0	0	FC	03	Address 0, on
1	1	1	1	1	0	0	1	F9	06	Address 1, off
1	1	1	1	1	1	0	1	FD	02	Address 1, on
1	1	1	1	1	0	1	0	FA	05	Address 2, off
1	1	1	1	1	1	1	0	FE	01	Address 2, on
1	1	1	1	1	0	1	1	FB	04	Address 3, off

1	1	1	1	1	1	1	1	FF	00	Address 3, on
---	---	---	---	---	---	---	---	----	----	---------------

Application scenario: follower address 0 (default), 1, 2, 3. If the AGV code reader is placed at the top, you do not need to turn on the light to output results. After AGV arrives at the specified position and sends a request signal, the AGV code reader turns on the light and outputs results. When SiteID equals 0, send F8 07 to turn off the light and stop the query, or send FC 03 to turn on the light and start the query.

Message of response result:

	Check Bit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte1	Parity	0		A1	A0			NP	
Byte2	Parity	0	TAG						
Byte3	Parity	0					X23	X22	X21
Byte4	Parity	0	X20	X19	X18	X17	X16	X15	X14
Byte5	Parity	0	X13	X12	X11	X10	X09	X08	X07
Byte6	Parity	0	X06	X05	X04	X03	X02	X01	X00
Byte7	Parity	0	Y13	Y12	Y11	Y10	Y09	Y08	Y07
Byte8	Parity	0	Y06	Y05	Y04	Y03	Y02	Y01	Y00
Byte9	Parity	0							
Byte10	Parity	0							
Byte11	Parity	0	ALG13	ALG12	ALG11	ALG10	ALG09	ALG08	ALG07
Byte12	Parity	0	ALG06	ALG05	ALG04	ALG03	ALG02	ALG01	ALG00
Byte13	Parity	0							
Byte14	Parity	0	Num34	Num33	Num32	Num31	Num30	Num29	Num28
Byte15	Parity	0	Num27	Num26	Num25	Num24	Num23	Num22	Num21
Byte16	Parity	0	Num20	Num19	Num18	Num17	Num16	Num15	Num14
Byte17	Parity	0	Num13	Num12	Num11	Num10	Num09	Num08	Num07
Byte18	Parity	0	Num06	Num05	Num04	Num03	Num02	Num01	Num00
Byte19	Parity	0							
Byte20	Parity	0							
Byte21	Parity	xor 1.7 ... 20.7	xor 1.6 ... 20.6	xor 1.5 ... 20.5	xor 1.4 ... 20.4	xor 1.3 ... 20.3	xor 1.2 ... 20.2	xor 1.1 ... 20.1	xor 1.0 ... 20.0

Table 4-3 Format of a response message

Parameter	Feature	Data Type
X Position X00-X23	The absolute position of the X axis.	Code tape: an unsigned integer. Tag/single code: signed integer.
Y Position Y00-Y13	The absolute position of the Y axis.	An signed integer (14 bits)
Angle ANG00-ANG13	The absolute angle.	An unsigned integer (14 bits)
TagNum Num00-Num34	The tag number, which indicates the position of AGV.	An unsigned integer (35 bits)
NP	0 indicates that the code is read, 1 indicates that no code is read.	1bits
TAG	The flag bit for a code matrix. 1 indicates that the code matrix is read.	1bits

	0 indicates that no code matrix is read.	
--	--	--

Table 4-4 Explanation of a response message

Code is recognized:

[TX] - C8 37

[RX] - 00 44 00 00 00 04 7F 5C 00 00 00 59 00 00 00 07 77 54 00 00 4A

Explanation:

NP=0: The code is read.

TAG=1: X is a signed integer. Otherwise, use an unsigned integer as the value.

$$\begin{aligned} \text{AgvX(Int)} &= \text{AgvX}(X00 \sim X23) = (\text{Int})(\text{Byte3 and } 0x07) * 0x80 * 0x4000 + (\text{Int})\text{Byte4} * 0x4000 + \\ &(\text{Int})\text{Byte5} * 0x80 + (\text{Int})\text{Byte6} \\ &= 0x04 = 4 \text{ mm} \end{aligned}$$

$$\begin{aligned} \text{AgvY(Short)} &= \text{AgvY}(Y00 \sim Y13) = (\text{Short})\text{Byte7} * 0x80 + (\text{Short})\text{Byte8} \\ &= 0x7F * 0x80 + 0x5C = 0x3FDC \end{aligned}$$

If X and Y are signed, you need to confirm whether it is positive or negative (Y is used as an example):

If: $(\text{AgvY} \gg 13) > 0$

Then: $\text{AgvY} = \text{AgvY} + 0xC000 = 0x3FDC + 0xC000 = 0xFFDC = -36 \text{ mm}$

$$\begin{aligned} \text{AgvAngle (UShort)} &= \text{AgvAngle}(\text{ANG00} \sim \text{ANG13}) = \text{Byte11} * 0x80 + \text{Byte12} = 0x00 * 0x80 + 0x59 \\ &= 0x59 = 89^\circ \end{aligned}$$

$$\begin{aligned} \text{AgvTagNum(UInt64)} &= \text{Byte14} * 0x4000 * 0x4000 + \text{Byte15} * 0x80 * 0x4000 + \text{Byte16} * 0x4000 + \\ &\text{Byte17} * 0x80 + \text{Byte18} \\ &= 0x00 * 0x4000 * 0x4000 + 0x00 * 0x80 * 0x4000 + 0x07 * 0x4000 + 0x77 * 0x80 + 0x54 \\ &= 0x00 + 0x00 + 0x1C000 + 0x3B80 + 0x54 = 0x1FBD4 = 130004 \end{aligned}$$

No code is recognized.

[TX] - C8 37

[RX] - 02 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 06

Explanation:

NP=1: No code is read.

AgvX (Short) = 0

AgvY (Short) = 0

AgvAngle (UInt) = 0

AgvTagNum(UInt64) = 0

Response light message:

	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte1	0	0	A1	A0	0	LIGHT	ERR	CRC

Parameter	Description
LIGHT	0: Turns off the light. 1: Turns on the light.
ERR	The return value. 0 indicates that there is no error.
CRC	Check bit: Bit7 XOR Bit6...XOR Bit1

For example:

Turn off the light of the code reader with an address of 0:

[TX] – F8 07

[RX] - 00

Turn on the light of the code reader with an address of 0:

[TX] – FC 03

[RX] - 05



5 Errors and Troubleshooting

5.1. Status of LED Lights

The AGV code reader has 5 indicator lights, which indicate power (POWER), network status (NET), trigger status (TRIG), running status (RUN), and errors (ERR).

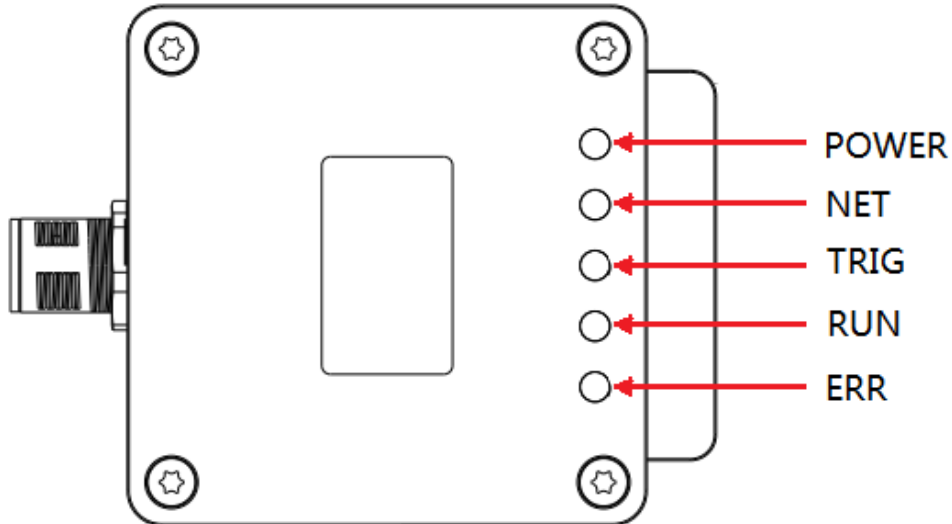


Figure 5-1 Indicator lights

Indicator Light	Description
POWER	The power light, which is solid green.
NET	The network light, which is solid green.
TRIG	The light is turned on when a trigger is generated.
RUN	Reserved
ERR	Reserved

Figure 5-1 Description of indicator lights

5.2 FAQs

No.	Issue	Possible Reasons	Solution
1	No cameras can be found by the client.	● The device is powered off ● The network is disconnected.	● Check whether the power light of the AGV code reader is normal. ● Check whether the network of the AGV code reader is normal.
2	The live view page is too dark.	● The built-in light is turned off. ● The power supply is not 24 V. ● Image parameters such as exposure and gain are not adjusted based on the actual situation.	● Turn on the light to adjust the brightness. ● Use a 24 V power supply. ● Adjust images parameters.
3	No streams can be pulled or the network is	● The network transmission speed is not 100 Mbps.	● Make sure that the network transmission speed is 100

	frequently disconnected.	●The GIGE driver is not installed properly.	Mbps. ●Reinstall the client.
4	The code reader cannot recognize the codes in its view.	●The code type is not supported. ●Algorithm parameters are inappropriate.	●Check whether the code type is supported by the AGV code reader. ●Configure appropriate algorithm parameters.
5	The output angle is 180 degrees to the expected angle.	●The camera is installed in the opposite direction.	●Adjust the installation direction. ●Set OffsetAngle.

Table 5-2 FAQs

