# Test Project

## Module D – Smart fire protection and intercom system

## *Intelligent Security Technology*

Submitted by:

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# Module D – Smart fire protection and intercom system

**Competition time**: 180 minutes

This module simulates the full construction process of an integrated intelligent building security and fire linkage system for a future community. The community aims to create a safe modern residential space integrating building intercom, access control management, security early warning, fire linkage control, and emergency lighting linkage.

As a security system integration engineer, Competitors are responsible for building the community building intercom and entrance access control subsystems, with a focus on debugging and verifying fire linkage scenarios. This includes smoke alarm triggering of audible and visual warnings, linkage control for exhaust fan starts and stop, automatic emergency lighting activation, fire-forced door access unlocking, low-light auxiliary lighting, and other extended functions.

The project covers physical installation and deployment of building intercom devices, building logic configuration on the digital intelligent security platform, intercom device access and commissioning, access control user permission configuration, face recognition/access card unlocking function testing, and the full-process configuration and verification of fire linkage functions. The system shall realize linkage output from smoke alarm signals to audible and visual alarms, smoke exhaust equipment, and emergency lighting systems, as well as automatic access control unlocking and smooth passageway access in fire scenarios. Competitors shall complete the full-process commissioning and acceptance from infrastructure set up to fire linkage business operation.

## Instructions to the Competitor

1.At the beginning of the Competition, Competitors should read and confirm all task requirements. Competitors shall complete the tasks in the order provided to better manage the Competition pace and ensure completeness of answers.

2.Only a limited number of finished network cables will be provided on site. Competitors shall make additional network cables as required. All network cables must be checked according to the required standard. If a cable does not meet the standard, it must be remade immediately.

3.During the Competition, Competitors shall not modify device usernames or passwords unless specifically required by the Test Project.

4.Competitors shall have basic system troubleshooting and fault-location ability. Competitors shall be able to inspect and make necessary adjustments to the operating environment by checking system logs, service status, network connectivity, and related configuration files.

5.All screenshots or videos generated during the Competition must be saved in the specified folder: Desktop\Exam Materials\Module D\Screenshots. Materials must be complete and accurately named for later assessment.

6.All submitted screenshots must show the complete current screen and must not be cropped or obscured.

7.A screenshot tool is provided, with the file path: Desktop\Exam Materials\Configuration Tool\Snipaste\Snipaste.exe


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# Initial information

## Device initial information

| DEVICE NAME | IP ADDRESS | USERNAME | PASSWORD |
|---|---|---|---|
| Unit Door Station | 192.168.3.42 | / | / |
| Indoor Station | 192.168.3.43 | / | / |
| Serial Port Server | 192.168.3.80 | admin | 12345678 |

## Platform initial information

| PLATFORM NAME | ACCESS ADDRESS | USERNAME | PASSWORD |
|---|---|---|---|
| Digital Intelligent Security Platform | http://192.168.3.122 | admin | vcom@2026 |

Important Note: All devices in the global system must be configured with unique IP addresses. Duplicate IP addresses are not allowed. IP conflicts may cause device communication failure and prevent the devices from functioning properly.


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# Task D-1 – Equipment installation and planning and design of security systems

## Task description

The project has entered the first stage: infrastructure construction. The construction team has completed the cable trunking installation.

According to the requirements of Equipment Installation Design Drawing.drawio located at Desktop\Exam Materials\Module D\Equipment Installation Design Drawing\Equipment Installation Design Drawing.drawio, complete the device installation on the assigned workstation.

Prior to cable routing and wiring construction, finish the System Connection Design Drawing. All cables shall be routed reasonably, neatly and orderly.

The entire installation process shall ensure that the equipment is securely fixed, accurately positioned, and correctly connected.

### Requirement 1

1. Launch the drawing software. Navigate to Desktop\Exam Materials\Configuration Tool\draw.io\ and double-click draw.io.exe to start the program.
2. Import the equipment library. Navigate to File → Import Library, and select the file Desktop\Exam Materials\Module D\draw.io Equipment Library\Smart Fire Protection and Intercom System.xml to complete the equipment library import.
3. Open the drawing project. Open the file System Connection Design Drawing.drawio for diagram editing.
4. Place all required devices on the canvas, eall twelve (12) pieces of equipment as listed:

Unit Door Station, Indoor unit, Smoke Sensor, Light Sensor, Power Supply Cabinet, Switch, Serial Port Server, IO Controller, Rack PDU, Computer, Fan, Light.

Ensure all twelve (12) devices are fully displayed with no omissions or incorrect model information. Capture a screenshot of this view and save it to `Desktop\Exam Materials\Module D\Screenshots` with the filename D-1-1.png.

### Requirement 2

Complete the full editing and connection debugging of System Connection Design Drawing.drawio to ensure the system connection diagram is complete, standardized and compliant. Export the final finished diagram, and save it to the path Desktop\Exam Materials\Module D\Screenshots with the standard file name D-1-2.png.

### Requirement 3

Fill out the Construction Scheme and Schedule Arrangement document.

File path: Desktop\Exam Materials\Module D\Construction Scheme and Schedule Arrangement\Module D-Construction Scheme and Schedule Arrangement

### Key requirements and notes

1. This module adopts a centralized wall-mounted installation method.
2. The equipment shall be installed in the corresponding positions shown in the equipment installation design drawing. Wiring shall be completed according to the requirements. Labels and cable ties shall be used for identification. Unused wire harnesses shall be insulated with electrical tape to prevent short circuits and equipment damage.


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# Task D-2 – Building space configuration

## Task description

The building space topology is the core infrastructure of the building intercom system. A standardized four-level spatial hierarchy is the basis for resident call routing, intercom device binding, access control permission issuing, and alarm event positioning. After the physical installation of building intercom devices is completed, a standardized digital community building space model shall be created on the digital intelligent security platform to accurately map physical space to system logic.

As the system administrator, Competitors shall enter the physical space information of the community area, building, unit, and resident room into the system according to the hierarchy of area number - building - unit - room, creating a clear, standardized, and complete spatial logic topology structure.

## Configuration requirements

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Area Name | Residential Area |
| Area Number | 1 |
| Sort Order | 1 |
| Building Name | Residential Building |
| Building Number | 1 |
| Sort Order | 1 |
| Unit Name | Unit 1 |
| Unit Number | 1 |
| Sort Order | 1 |
| Room Name | Room 101 |
| Room Number | 101 |
| Sort Order | 1 |


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# Task requirements

## Requirement 1

Log in to the backend of the Intelligent Building System. Go to **Facility Management > Areas** and create the area information. The area name shall be **Residential Area**, and the area number shall be **1**. After configuration takes effect, the area list shall fully display this configuration record. Capture the complete area list page screenshot for filing, with Area Name (Residential Area), Area Number (1) and Sort Order (1) clearly shown, then save it as D-2-1.png.

## Requirement 2

Go to Facility Management > Buildings, associate the upper-level area Residential Area, and create the building information. The building name shall be Residential Building, and the building number shall be 1. Capture the complete buildings list page screenshot for filing, clearly showing Building Name (Residential Building), Building Number (1), Area Name (Residential Area) and Sort Order (1), then save the file as D-2-2.png.

## Requirement 3

Go to Facility Management > Units, associate the upper-level building Residential Building, and create the unit information. The unit name shall be Unit 1, and the unit number shall be 1.

Capture the complete units list page screenshot for filing, clearly showing Unit Name (Unit 1), Unit Number (1), Building Name (Residential Building), Area Name (Residential Area) and Sort Order (1), then save the file as D-2-3.png.

## Requirement 4

Go to Facility Management > Rooms, associate the upper-level unit Unit 1, and create the room information. The room name shall be Room 101, and the room number shall be 101.

Capture the complete rooms list page screenshot for filing, clearly displaying Room Name (Room 101), Room Number (101), Unit Name (Unit 1), Building Name (Residential Building), Area Name (Residential Area) and Sort Order (1), then save the file as D-2-4.png.


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# Task D-3 – Intercom device configuration

## Task description

After the digital building space topology model has been created, intercom terminal devices shall be managed by the platform and configured for standardized access, realizing accurate binding between physical devices and the building space logic. The unit door station is the core access control and intercom terminal at the unit entrance, supporting visitor calling, identity verification, and access control linkage. The indoor station is the resident-side intercom terminal, supporting video calls, remote door opening, and message receiving.

According to the building intercom access specifications of the integrated security platform, both device types shall be registered to the digital intelligent security management platform. Standard network parameters, server communication addresses, and building space positions shall be configured to ensure stable communication between devices and the platform server and accurate spatial attribution.

## Configuration requirements

### Unit door station basic device information

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Device Type | Unit Door Station |
| Device Name | Unit Door Station |
| Installation Position | Residential Area - Residential Building - Unit 1 |
| Device Serial Number | 1 |
| Device Address Code | Manual |
| Server IP Address | 192.168.3.122 |
| Device IP Address | Manual |
| IPv4 Subnet Mask | 255.255.255.0 |
| IPv4 Default Gateway | 192.168.3.1 |
| DNS Server | 114.114.114.114 |
| Device Port | 80 |


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### Indoor station basic device information

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Device Type | Indoor Unit |
| Device Name | Indoor Station 101 |
| Installation Position | Residential Area - Residential Building - Unit 1 |
| Device Serial Number | 2 |
| Device Address Code | Manual |
| Server IP Address | 192.168.3.122 |
| Device IP Address | Manual |
| IPv4 Subnet Mask | 255.255.255.0 |
| IPv4 Default Gateway | 192.168.3.1 |
| DNS Server | 114.114.114.114 |
| Device Port | 80 |

# Task requirements

## Requirement 1

Log in to the backend of the Intelligent Building System. Go to Device Management > Device List and click Add to open the device information pop-up window. Complete the unit door station basic information, network parameters, and installation position binding according to the configuration requirements.

After saving the newly added device page, click the Edit button to enter the edit page, then capture the full-page screenshot and save the file as D-3-1.png.

## Requirement 2

Log in to the backend of the Intelligent Building System. Go to Device Management > Device List and click Add to open the device information pop-up window. Complete the indoor Unit basic information, network parameters, and installation position binding according to the configuration requirements.

After saving the newly added device page, click the Edit button to enter the edit page, then capture the full-page screenshot and save the file as D-3-2.png.

# Task D-4 – Access control user permission configuration

## Task description

After the building space topology and intercom terminals have been fully managed by the platform, residents shall be assigned corresponding door-opening permissions. This realizes two (2) identity verification modes: face unlocking and access card unlocking and improves the hierarchical access control system for building entrances and exits.

Face unlocking uses the face recognition camera of the unit door station to verify and open the door, suitable for regular residents. Access card unlocking supports physical card access and configurable validity periods, suitable for visitors and temporary residents. Through resident information filing, permission type binding, portrait/card number entry, and user association with indoor stations and building space locations, the intercom device can identify residents and issue door-opening commands.

## Configuration requirements

### Face unlocking user configuration

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Username | User A |
| Assigned Device | Indoor Station 101 |
| Registration Number | 13812345678 |
| Unlocking Permission Type | Face Recognition Unlocking |
| Photo | Competitor Portrait Photo |


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### Access card unlocking user configuration

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Username | User B |
| Assigned Device | Indoor Station 101 |
| Registration Number | 18912345678 |
| Unlocking Permission Type | Access Card Unlocking |
| Card Number | Obtained from Card Reader |
| Expiration Date: | Manual |

### Competitor photo

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Competitor Photo Path | Desktop\Exam Materials\Competitor Photo |

# Task requirements

### Requirement 1

Log in to the backend of the Intelligent Building System. Go to User Management > User List and click Add. Enter all information for User A, bind the indoor station, select Face Recognition Unlocking, and upload the Competitor portrait photo.

After saving the newly added device page, click the Edit button to enter the edit page, then capture the full-page screenshot and save the file as D-4-1.png.

### Requirement 2

Go to User Management > User List and click Add. Enter all information for User B, bind the indoor station, select Access Card Unlocking, enter the access card number obtained from the card reader, and manually set the Expiration period.

After saving the newly added device page, click the Edit button to enter the edit page, then capture the full-page screenshot and save the file as D-4-2.png.

# Task D-5 – Face recognition unlocking test

## Task description

The system has entered the user acceptance testing stage. After the face unlocking permission has been configured, an on-site face recognition access test shall be completed to verify the recognition accuracy of the unit door station face collection module, the validity of face permission issuing, and the normal operation of the gate unlocking linkage logic. After the test, the unlocking log shall be retrieved in the backend and retained as an access audit record, ensuring that the full door-opening process is traceable.

## Task requirements

1. On-site face access test: Use the information of User A, who has face recognition unlocking permission, to complete face verification in front of the unit door station terminal. Confirm that the device recognizes the user successfully, the system issues a door-opening command, and the gate opens normally.
2. Backend unlocking record query: After the face unlocking test is completed, log in to the backend of the Intelligent Building System. Go to Record Management > Unlocking Record, filter and query the face recognition unlocking record, and verify that the record includes complete information such as unlocking type, device installation position, and unlocking time.
3. Capture the complete Unlocking Record list page screenshot for filing, ensure there is no less than one (1) record with Access Type set to face recognition unlocking, and save it as D-5-1.png.

# Task D-6 – Serial server configuration

## Task description

The RS485 Modbus protocol smoke sensor in the park is a traditional bus device and does not support direct TCP/IP Ethernet connection. It cannot directly upload fire data to the digital intelligent security central platform. The serial server acts as a protocol conversion gateway between the industrial RS485 bus and the LAN TCP/IP network. It enables smoke sensor alarm data to be synchronized to the building intercom security platform in real time and provides communication support for fire alarm push, access control linkage, and lighting linkage.

Competitors shall first use a dedicated configuration tool to complete serial server network parameter debugging and online verification and then enter the device information into the security platform for management.

## Configuration requirements

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Device Type | RS485 - Eight Serial Ports |
| Device Name | Serial Server |
| Device Serial Number | 123456789 |
| Serial Server IP | 192.168.3.80 |
| Subnet Mask | 255.255.255.0 |
| Gateway Address | 192.168.3.1 |

## Task requirements

### Requirement 1

1. Launch the Serial Server Configuration Tool; the executable path is: Desktop\Exam Materials\Configuration Tool\Serial Server Configuration Tool.exe
2. Fill in the static network information according to the standard parameters, click Search Device, and confirm that a serial server with model containing 468 and IP 192.168.3.80 is successfully found. Save the screenshot as D-6-1.png.

### Requirement 2

Go to Device Management > Communication Interface Device, click Add, and enter the complete serial server basic information and network parameters according to the configuration requirements. After configuration, the communication interface device list shall show: device type RS485 - Eight Serial Ports, device name Serial Server, device model TAS-LAN-468, serial server IP 192.168.3.80, subnet mask 255.255.255.0, and gateway address 192.168.3.1. Save the screenshot as D-6-2.png.

# Task D-7 – Smoke sensor test

## Task description

The smoke sensor uses the Modbus-RTU industrial bus protocol and is connected to the security platform after protocol conversion through the serial server. To verify the physical wiring, RS485 bus link, and Modbus communication protocol availability in advance, and to ensure stable operation of the subsequent smoke alarm linkage function, Competitors shall use the serial debugging assistant to send hexadecimal polling commands and directly read sensor register data.

## Configuration requirements

### Serial debugging assistant configuration

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Serial Port | COM number identified by Device Manager, manual check |
| Baud Rate | 9600 bps |
| Data Bits | 8 |
| Stop Bit | 1 |
| Parity Bit | None |
| Flow Control | None |
| Display Mode | HEX Display |
| Sending Mode | Hexadecimal Sending |


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### Smoke sensor parameters

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Device Slave Address | 1 |
| Function Code | 03, Read Holding Register |
| Data Register Address | 0000H |
| Register Length | 11 |
| Smoke Reading Command (HEX) | 0103000B0001F5C8 |
| Smoke Concentration Value: 0 | 01 03 02 00 00 B8 44 |

# Task requirements

## Requirement 1

Physical wiring: Power the smoke sensor correctly. Connect the A/B terminals of the USB-to-RS485 converter module to the corresponding A/B terminals of the smoke sensor RS485 interface. Insert the USB-to-RS485 module into the computer USB port to complete the physical communication link.

## Requirement 2

Launch UartAssist; executable path: Desktop\Exam Materials\Configuration Tool\UartAssist.exe.Select the identified COM port, set the baud rate, data bits, stop bit, and parity bit according to the configuration requirements, open the serial port, select hexadecimal sending, enter the smoke reading command 0103000B0001F5C8, and send it. View the receiving area, parse the returned HEX data, and obtain the real-time smoke intensity value.

Serial Port Recognition Exception Handling:

If the computer fails to recognize the serial port device of this USB-to-RS485 module, follow the steps below to install the driver: Navigate to the path Desktop\Exam Materials\Resource Package\CH341SER.EXE and launch the driver installer. Click the first button labeled Install on the interface. Once the system prompts that the driver installation is complete, close the program window.

Save the screenshot of the command sending and data receiving interface as D-7-1.png

# Task D-8 – Smoke alarm configuration

## Task description

After the smoke sensor RS485 communication link and serial transparent transmission communication test have been verified, the corresponding serial server channel parameters and platform alarm rule filing shall be completed. After TCP client forwarding is configured on the serial server, real-time smoke monitoring data can be forwarded to the building intercom platform. The platform alarm rule binds the corresponding serial channel and function mapping so that when the sensor reports smoke values above the threshold, the system automatically identifies the fire signal and reminds duty personnel through alarm records.

## Configuration requirements

### Serial port configuration

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Serial Port | Serial Port 4 |
| Local Port | 505 |
| Target Port | 10563 |
| Target IP Address | 192.168.3.122 |
| Baud Rate | 9600 bps |
| Data Bits | 8 |
| Stop Bits | 1 |
| Parity Bit | None |


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### Function mapping configuration

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Access Device Type | Smoke Sensor |
| Access Device | Smoke Sensor |
| Channel Type - Input RX | Smoke Alarm |
| Channel Type - Output TX | Smoke Sensor Status |

### Smoke alarm configuration

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Alarm Name | Unit Building 1-101 Smoke Alarm |
| Associated Communication Interface Device | Manual |
| Associated Serial Port | Manual |
| Threshold | 0-100 |
| Channel Type - Input RX | Smoke Alarm |

# Task requirements

### Requirement 1

Launch Serial Server Configuration Tool; its executable path is Desktop\Exam Materials\Configuration Tool\Serial Server Configuration Tool.exe.

search for the serial server with IP 192.168.3.80 and model containing 468, switch to Serial Port 4, and complete all parameters. Save the screenshot as D-8-1.png.

### Requirement 2

Go to Device Management > Communication Interface Device, find the managed serial server, switch to Serial Port 4, and complete working mode, target server IP/port, serial parameters, and smoke sensor function mapping. Save the screenshot as D-8-2.png.

## Requirement 3

Go to Alarm Management > Alarm Settings, click Add, and complete the smoke alarm configuration. After configuration, the alarm list shall show alarm name Unit Building 1-101 Smoke Alarm, communication interface device Serial Server, serial port (COM4), and channel type - input RX Smoke Alarm.

Capture a screenshot of the Alarm Settings list page and save the file as D-8-3.png.


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# Task D-9 – Communication interface device – IO controller access configuration

## Task description

Exhaust fans, emergency lighting, and other devices in the park rely on the IO controller for switch-value linkage control. The IO controller uses RS485 bus communication and cannot be directly connected to Ethernet. The serial server shall be used to complete bus-to-TCP/IP network parameter configuration, connect the IO controller to the digital intelligent security platform communication interface, complete serial transparent transmission and function channel mapping, and establish the communication link for the platform to issue linkage commands to field execution devices.

## Configuration requirements

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Device Type | RS485 - Eight Serial Ports |
| Device Name | Serial Server |
| Device Serial Number | Manual Input |
| IP Address | 192.168.3.80 |
| Subnet Mask | 255.255.255.0 |
| Gateway Address | 192.168.3.1 |
| Serial Port | Serial Port 5 |
| Local Port | 506 |
| Target Port | 10563 |
| Target IP Address | 192.168.3.122 |
| Baud Rate | 9600 bps |


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| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Data Bits | 8 |
| Stop Bits | 1 |
| Parity Bit | None |
| Access Device Type | IO Controller |
| Access Device | IO Controller |
| Channel Type - Input RX | None |
| Channel Type - Output TX | Execute |

# Task requirements

## Requirement 1

Launch Serial Server Configuration Tool; its executable path is Desktop\Exam Materials\Configuration Tool\Serial Server Configuration Tool.exe.
Complete the parameter settings of the serial port connected to the IO controller according to the configuration table. Save the screenshot of the complete Serial Port 5 configuration page as D-9-1.png.

## Requirement 2

Go to Device Management > Communication Interface Device, find the managed serial server, edit the serial configuration, switch to Serial Port 5, enable configuration status, and complete TCP client working mode, target server IP/port, serial communication parameters, and IO controller function mapping. Save the screenshot as D-9-2.png.

# Task D-10 – Smoke alarm linkage with exhaust fan configuration

## Task description

When the smoke sensor monitoring value reaches the alarm threshold and the platform generates a fire alarm signal, the system shall automatically issue a command to the IO controller relay output port to turn on the public area exhaust fan for smoke exhaust and ventilation. At the same time, the platform shall display an alarm prompt to notify duty personnel, forming a complete fire linkage closed loop of fire detection - alarm reporting - automatic ventilation handling.

## Configuration requirements

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Linkage Name | Public Area Smoke Alarm Linkage with Exhaust Fan |
| Alarm Setting | Unit Building 1-101 Smoke Alarm |
| DO1 - Execution Action | ON |
| Action Device 1 | Exhaust Fan |
| Duration | 5s |

## Task requirements

### Requirement 1

Go to Linkage Management > Linkage Configuration, click Add, complete the linkage name, bind the trigger condition Unit Building 1-101 Smoke Alarm, select the corresponding serial server and Serial Port 4 channel, and configure the linkage execution area with Serial Server, Serial Port 5, IO Controller, DO1 action ON, execution device Exhaust Fan, and duration 5s. Enable and save the linkage configuration. Save the screenshot as D-10-1.png.

### Requirement 2

After completing linkage configuration and triggering the smoke alarm test, go to Alarm Management > Alarm Record and filter the alarm name Unit Building 1-101 Smoke Alarm. The interface shall display alarm name, access device type, trigger content, alarm recorded, Pending status. Save the screenshot as D-10-2.png.

### Requirement 3

After the alarm is triggered and the exhaust fan linkage is automatically executed, go to Linkage Management > Linkage Record and filter the linkage name Public Area Smoke Alarm Linkage with Exhaust Fan. The list shall display at least one (1) execution log of exhaust fan on, including linkage name, execution action, and linkage trigger time. Save the screenshot as D-10-3.png.


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# Task D-11 – Light sensor USB-to-RS485 serial debugging

## Task description

For the light data collection scenario in the public corridor of the community, Competitors shall use a USB-to-RS485 module to directly connect the computer and the light sensor. Through the serial debugging assistant, Competitors shall complete hardware wiring, serial parameter configuration, Modbus-RTU command sending, and light data analysis, verify RS485 bus communication stability, and complete single-device sensor debugging.

## Configuration requirements

### Serial debugging assistant configuration

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Serial Port | COM number identified by Device Manager, manual check |
| Baud Rate | 9600 bps |
| Data Bits | 8 |
| Stop Bits | 1 |
| Parity Bit | None |
| Flow Control | None |
| Display Mode | HEX Display |
| Sending Mode | Hexadecimal Sending |


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### Light sensor parameters

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Device Slave Address | 1 |
| Function Code | 03, Read Holding Register |
| Data Register Address | 0000H |
| Register Length | 1 |
| Light Reading Command (HEX) | 01 03 00 07 00 01 35 CB |

# Task requirements

### Requirement 1

Connect the A/B terminals of the USB-to-RS485 module to the corresponding A/B terminals of the RS485 interface of the light sensor. Ensure the sensor is correctly powered. Insert the USB-to-RS485 module into the computer USB port to complete the physical link.

### Requirement 2

Launch UartAssist; executable path: Desktop\Exam Materials\Configuration Tool\UartAssist.exe

Select the identified COM port, configure the baud rate, data bits, stop bit, and parity bit, open the serial port, select hexadecimal sending, enter 01 03 00 07 00 01 35 CB, send it, view the receiving area, parse the returned HEX data, and obtain the real-time light intensity value.

Save the screenshot of the command sending and data receiving interface as D-11-1.png


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# Task D-12 – Light sensor access and lighting linkage alarm configuration

## Task description

The light sensor uses RS485 bus communication and cannot be directly connected to the LAN TCP/IP network. It shall use the serial server for protocol conversion so that collected light data can be uploaded to the digital intelligent security platform. The process includes hardware wiring, serial server channel parameter debugging, platform communication interface device parameter configuration, and light abnormal alarm rule filing. When corridor light value exceeds the threshold range of 2-800 lux, the platform shall automatically generate and retain alarm logs.

## Configuration requirements

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Device Type | RS485 - Eight Serial Ports |
| Device Name | Serial Server |
| Device Serial Number | Manual Input |
| IP Address | 192.168.3.80 |
| Subnet Mask | 255.255.255.0 |
| Gateway Address | 192.168.3.1 |
| Serial Port | Serial Port 6 |
| Local Port | 507 |
| Target Port | 10563 |
| Target IP Address | 192.168.3.122 |
| Baud Rate | 9600 bps |
| Data Bits | 8 |


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| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Stop Bits | 1 |
| Parity Bit | None |
| Access Device Type | Light Sensor |
| Access Device | Light Sensor |
| Channel Type - Input RX | Light Abnormal Alarm |
| Channel Type - Output TX | Light Sensor Status |
| Alarm Name | Public Corridor Light Abnormal Alarm |
| Threshold | 2-800 |

# Task requirements

## Requirement 1

Connect the A/B terminals of the light sensor RS485 interface to the A/B interface of Serial Port 6 of the serial server. Complete sensor power supply and bus wiring.

Launch Serial Server Configuration Tool; its executable path is Desktop\Exam Materials\Configuration Tool\Serial Server Configuration Tool.exe.;
search for the serial server with IP 192.168.3.80 and model containing 468, switch to Serial Port 6, complete all parameters, and save the screenshot as D-12-1.png.

## Requirement 2

Go to Device Management > Communication Interface Device, find the managed serial server, edit the serial configuration, switch to Serial Port 6, enable configuration status, and complete TCP client working mode, target server IP/port, serial communication parameters, and light sensor function mapping. Save the screenshot as D-12-2.png.

## Requirement 3

After triggering the light sensor value to exceed the threshold, go to Alarm Management > Alarm Record and filter the alarm name Public Corridor Light Abnormal Alarm. The interface shall display alarm name, access device type, trigger content, alarm time, Pending status, and operation button. Save the screenshot as D-12-3.png.


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# Task D-13 – Light sensor linkage lighting control configuration

## Task description

Based on the connected light sensor, Competitors shall complete lighting controller communication access and light-lighting automatic linkage rule configuration. This realizes automatic light-on when the light level is below the threshold, completing the linkage closed loop between intelligent lighting and security sensors and reducing manual inspection and lighting energy consumption.

## Configuration requirements

| CONFIGURATION ITEM | CONFIGURATION CONTENT |
|---|---|
| Linkage Name | Insufficient Light Linkage Light |
| Alarm Setting | Public Corridor Light Abnormal Alarm |
| Associated Communication Interface Device | Serial Server |
| DO2 - Execution Action | On |
| Execution Device 2 | Corridor Light |
| Duration | 15s |

## Task requirements

### Requirement 1

Log in to the backend of the Building Intercom System. Go to Linkage Management > Linkage Configuration and complete the parameter settings of Insufficient Light Linkage Light according to the configuration requirements. The screenshot shall include basic information, trigger conditions, and linkage execution configuration. Save the screenshot as D-13-1.png.

### Requirement 2

After triggering the light-below-threshold alarm and completing automatic lighting linkage execution, go to Linkage Management > Linkage Records and filter the linkage name Insufficient Light Linkage Light. The page list shall display at least one (1) execution log, including linkage name, execution action, and linkage record time. Save the screenshot as D-13-2.png.


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# Task D-14 – Modbus light sensor cyclic polling monitoring based on thonny

## Task description

The original debugging only uses the Serial Debugging Assistant to manually send a single command, which is inefficient and cannot support long-term monitoring. Competitors shall use the built-in Thonny development tool to write and debug a Python script for automated long-term monitoring: cyclically polling two (2) light sensor data channels, parsing Modbus return values, persistently saving local logs, judging thresholds, and outputting local alarms. This supplements local offline monitoring capability outside the platform. A basic script framework has been provided. Competitors only need to complete the core parameters in Thonny. Hardware uses the connected devices and parameters.

## Configuration requirements

| CONFIGURATION ITEM | CONTENT |
|---|---|
| Hardware | USB-to-RS485 Module connected to Light Sensor |
| Communication Parameters | Baud rate 9600, data bits 8, stop bit 1, no parity, Modbus-RTU |
| Actual Local Serial Port Number | Manual Input |
| Light Sensor Reading Command | 01030007000135CB |
| Threshold Rule | Light value ≤50 -> local output: [Local Alarm] Insufficient corridor light |

## Task requirements

### Requirement 1

Launch: [thonny.exe] Execution path: Desktop\Exam Materials\Configuration Tool\thonny\thonny.exe
Open Desktop\Exam Materials\Module D\Resource Package\sensor_monitor_light.py in Thonny. The supporting scan_port.py script may be run as needed to quickly check the serial port number of the USB-to-RS485 device. The script function code is complete. Only the following three (3) parameters need to be filled in; do not modify other content: COM_PORT, LIGHT_CMD, and LIGHT_ALARM_THRESHOLD. Save the screenshot of the complete code editing interface showing the three (3) completed parameters as D-14-1.png

### Requirement 2

After parameter configuration, click Run in Thonny to execute sensor_monitor_light.py and keep it running for at least 5 seconds. In normal status, the console shall print the serial initialization result, real-time light value, and device status. In alarm status, manually block the light source to make the light value lower than the threshold; the console shall output the local alarm prompt. Save the screenshot of the Thonny Shell console containing both normal light logs and insufficient-light local alarm output as D-14-2.png.


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