MDCL-705i
User Manual

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Edited by Sunny Chiu

Warranty

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1. Introduction

The MDCL-705i module is a Modbus Data Concentrator with data logger function, which can concentrate data from several Modbus RTU slave devices through standard RS-485 interfaces, and allows Modbus TCP masters to read/write data via Ethernet/LAN. The Modbus master can use one Modbus command to get all data with the same type from various Modbus RTU slave devices via the concentrator. In other words, through the help of a MDCL module, the Modbus RTU slave devices can be accessed over Ethernet with better read and write performance.

Up to 250 Modbus RTU commands to read data from Modbus RTU slave devices can be performed in the MDCL module and up to 8 Modbus TCP masters can connect the module to get the polled data. The support for data logger allows users to pick-up up to 120 parameters for long-term logging. Users can download data log files (CSV file) from the web interface or transfer the files to FTP server for advanced analysis.
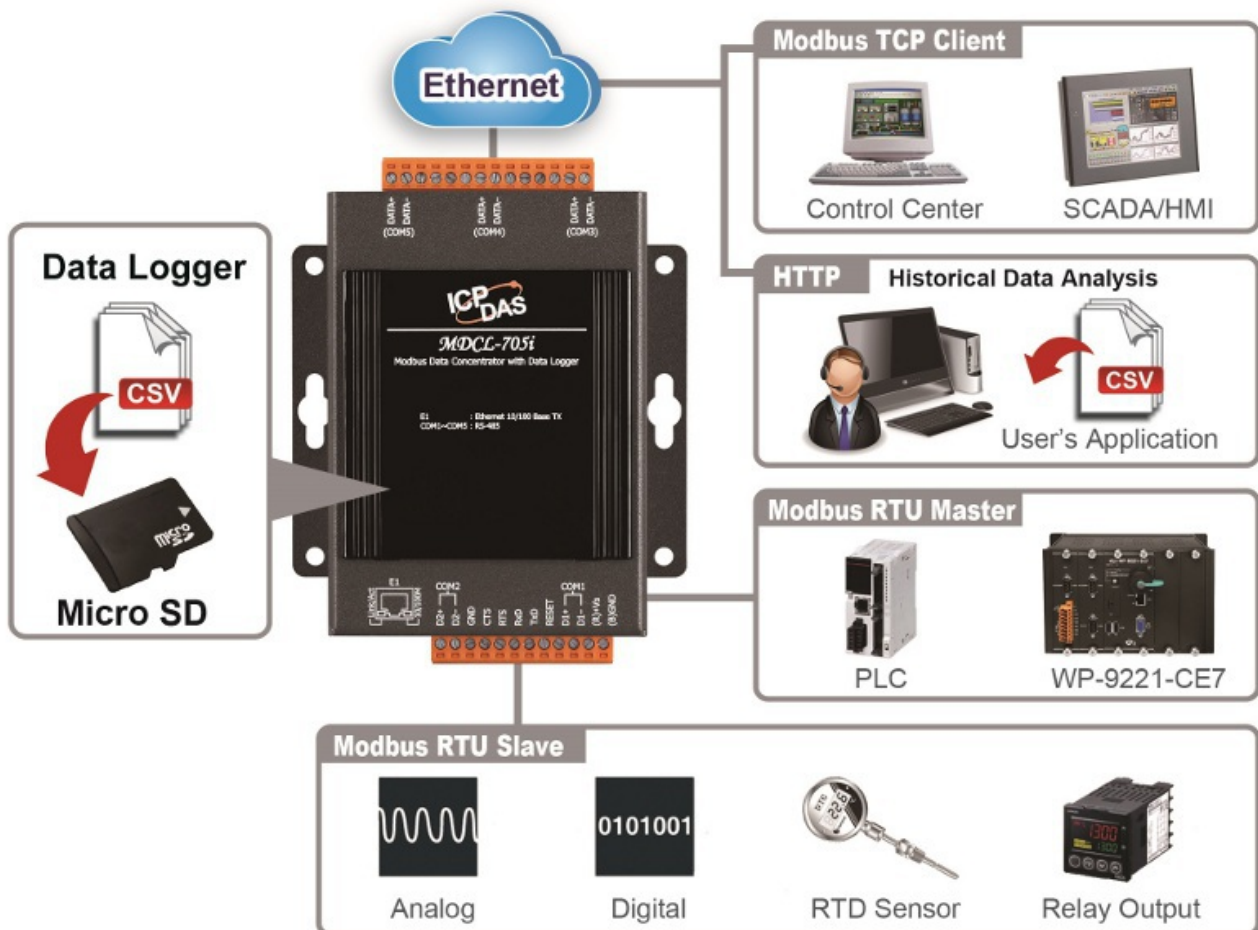
Features

HTML5 web-based user interface

HTML5 is the latest version of the HTML markup language. It is supported by most current browsers including Mozilla Firefox, Apple Safari, Google Chrome and so on.

For the reason, the Web-based user interface of the MDCL-705i is accessible from a wide variety of devices anywhere. Users can configure the module and monitor connection status of each polling definition through their smart phones, tablets or desktops without a line of code.
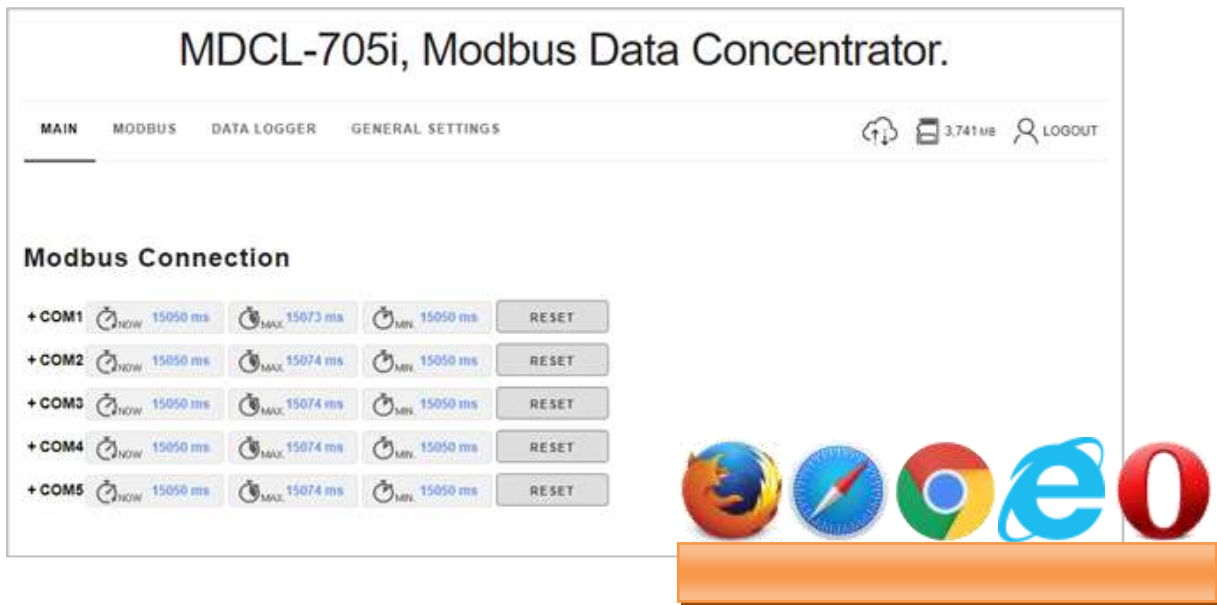
Great Capability of Shared Memory

The MDCL-705i module can perform up to 250 polling definitions. And the internal shared memory has four tables to store the polled AI, AO, DI and DO data. Each table can store up to 9600 registers.
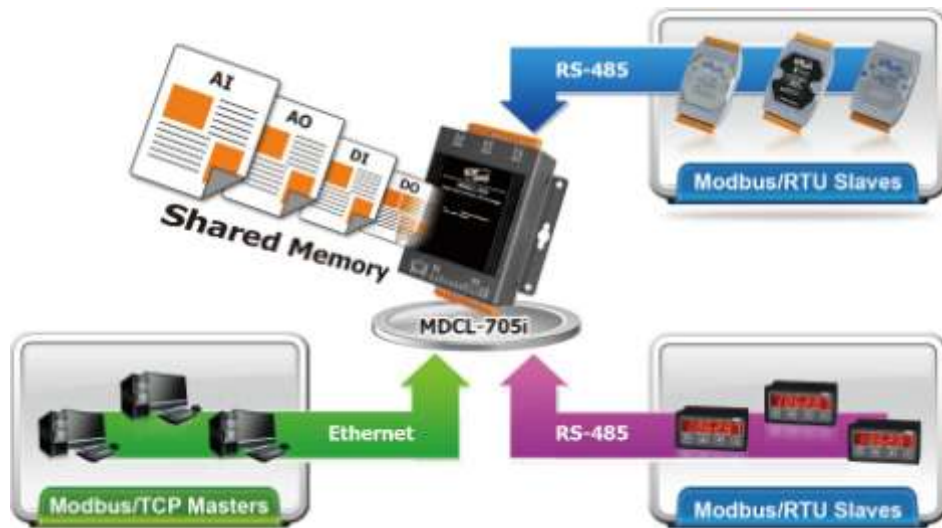
Editing CSV files to Ease Hard Work of Managing Definitions and Logs

Editing and checking a lot of polling definitions or log channel settings is hard work and is easy to make mistakes. Using CSV files to manage so many configurations with Excel makes it easy; the CSV files can be imported or exported from the module via a simple mouse-click action.

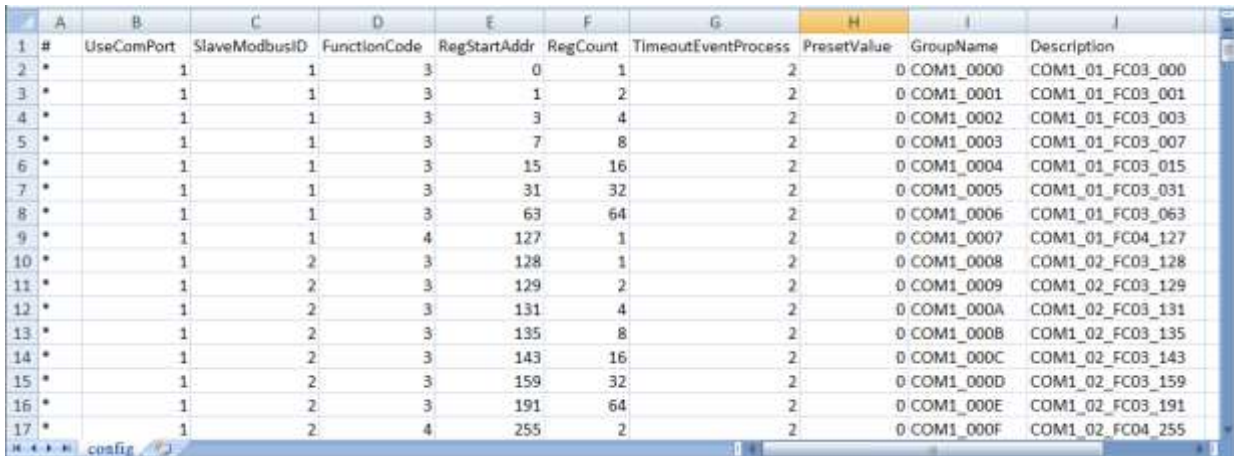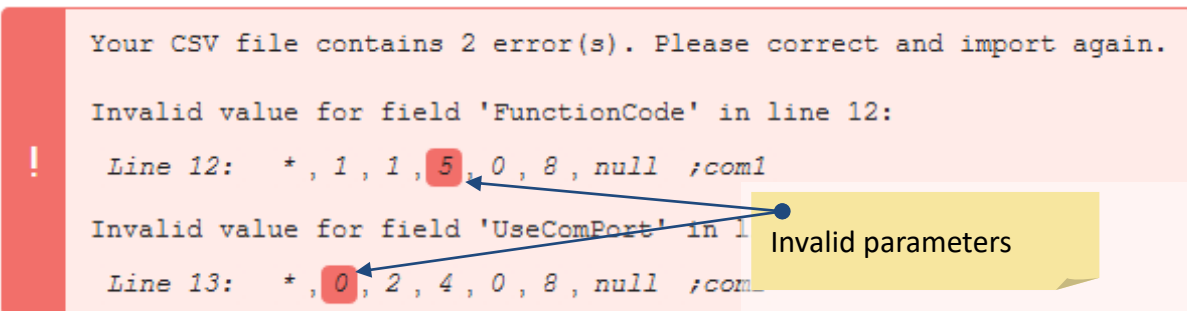| #	UseComPort	SlaveModbusID	FunctionCode	RegStartAddr	RegCount	TimeoutEventProcess	PresetValue	GroupName	Description
*	1	1	3	0	1	2	0	COM1_0000	COM1_01_FC03_000
*	1	1	3	1	2	2	0	COM1_0001	COM1_01_FC03_001
*	1	1	3	3	4	2	0	COM1_0002	COM1_01_FC03_003
*	1	1	3	7	8	2	0	COM1_0003	COM1_01_FC03_007
*	1	1	3	15	16	2	0	COM1_0004	COM1_01_FC03_015
*	1	1	3	31	32	2	0	COM1_0005	COM1_01_FC03_031
*	1	1	3	63	64	2	0	COM1_0006	COM1_01_FC03_063
*	1	1	4	127	1	2	0	COM1_0007	COM1_01_FC04_127
*	1	2	3	128	1	2	0	COM1_0008	COM1_02_FC03_128
*	1	2	3	129	2	2	0	COM1_0009	COM1_02_FC03_129
*	1	2	3	131	4	2	0	COM1_000A	COM1_02_FC03_131
*	1	2	3	135	8	2	0	COM1_000B	COM1_02_FC03_135
*	1	2	3	143	16	2	0	COM1_000C	COM1_02_FC03_143
*	1	2	3	159	32	2	0	COM1_000D	COM1_02_FC03_159
*	1	2	3	191	64	2	0	COM1_000E	COM1_02_FC03_191
*	1	2	4	255	2	2	0	COM1_000F	COM1_02_FC04_255

config

Built-in definition validation

One of the polling definitions may not be executed due to invalid parameters is given in the imported config.csv file. The MDCL module provides the function of validating and displaying invalid parameters with line information in config.csv file on its web interface.

```
Your CSV file contains 2 error(s). Please correct and import again.

Invalid value for field 'FunctionCode' in line 12:
  Line 12:   * , 1 , 1 , 5 , 0 , 8 , null  ;com1

Invalid value for field 'UseComPort' in l
  Line 13:   * , 0 , 2 , 4 , 0 , 8 , null  ;com
```

Invalid parameters

Automatic data transfer via FTP (ongoing)

The MDCL-705i can upload the data log files to an FTP server based on user's daily task schedule. Log files from different modules will be transferred to different folders on an FTP server; the name of every log file will contain its creation time and date.

Supports NTP client

NTP stands for Network Time Protocol and it is a networking protocol for clock synchronization between computer systems. It is used to synchronize computer clock times in a network.

In order to ensure the data logged with correct timestamps, an NTP server can be set by IP address or name on the MDCL-705i to synchronize the date and time information based on the specified schedule.

Support for Modbus TCP master and Modus RTU master

The MDCL-705i can be accessed by Modbus TCP Master and Modus RTU Master. Changing the mode for a COM port from Master to Slave allows a connected Modus RTU Master to read/write data from/to the Modbus RTU slave devices on the other COM ports.

Support Data Logging

- Up to 120 parameters per record with ratio and offset conversion functions.
- Selectable data logging time interval from 5 seconds to 60 minutes.
- Built-in 32GB microSD card.
- Log file time period varies from 1 to 24 hours.
- Downloading log files via the web interface of the MDCL-705i.

Timestamp alignment

In general, we have to synchronize log data from multiple sensor signals measured in different parts. They are likely to have slightly different sampling rates and clock times that require an offset. It is a hard and complex task to calculate and align the timestamp of log data from different instruments or locations. MDCL provides a very clever mechanism that allows users to quickly align the time and perform more sophisticated analyses.

1. **Support NTP time synchronization.**
   MDCL has a built-in Real Time Clock, and records data with timestamps. To increase the accuracy of system time in the RTC, MDCL can be configured to execute automatic time correction from the NTP server on the network, or manually set to synchronize its clock with the time of your local PC or an NTP server.

2. **Generate filename with creation date and time.**
   MDCL provides a consistent name format for log files that allows you to identify them. The file name begins with a "T_" prefix followed by the creation date and time in MMDDHH format.

3. **Shift log intervals based on clock times.**
   The log interval in MDCL is ranged from 5 seconds to 6 hours, it records data every interval starting on the hour (00:00) where intervals are less than or equal to 1 hour; and beginning at midnight where intervals are more than 1 hour.

   Besides the first entry, the data will be recorded at 00:00, 15:00, 30:00 and 45:00 every hour when the Logging Rate is set to a 15-minute interval.

   If three MDCL modules are enabled to log data with different starting time, and the same Logging Rate setting of 15 minutes is applied, the entries will seem to be logged at the same time point, although they are recorded on different MDCL.
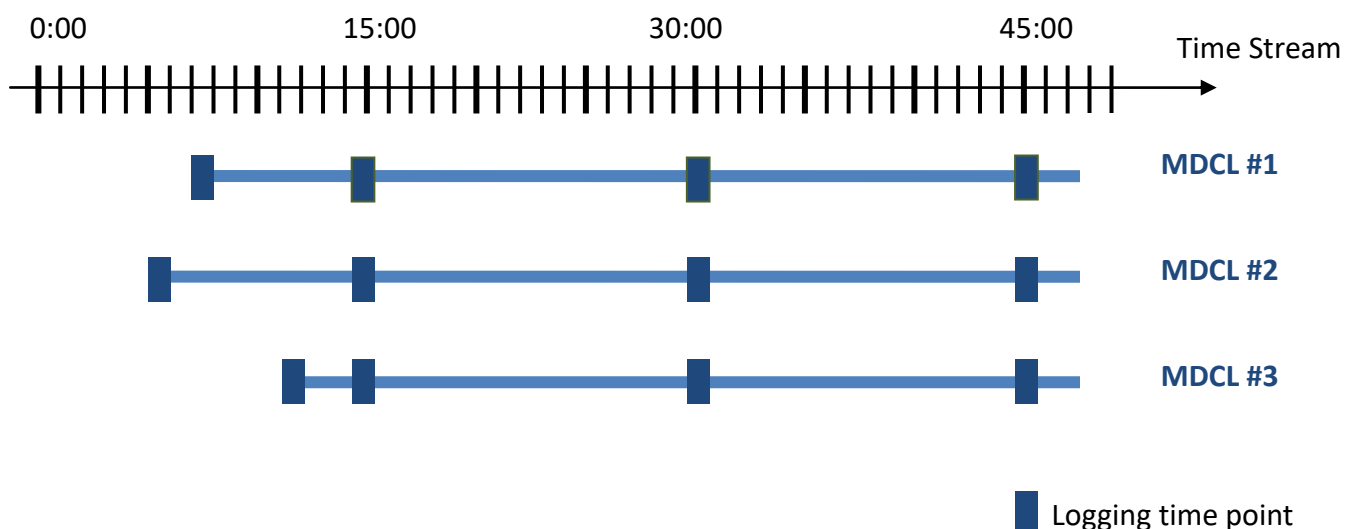
4. **Create log file on the hour**.

The time interval for creating a new log file in MDCL is synchronized to 24 hour time. Depending on the setting of maximum logging period, a new log file would be created at every interval on the hour starting at midnight (00:00:00).

For instance, setting the maximum logging period to 6 hour means that new files would be create to record data at 00:00:00, 06:00:00, 12:00:00, 18:00:00, and repeat that schedule.

If three MDCL modules are enabled to log data with different starting time and the same Maximum Logging Period of 6 hour is applied, the log files will seem to start logging at the same time among these devices, except the first time.
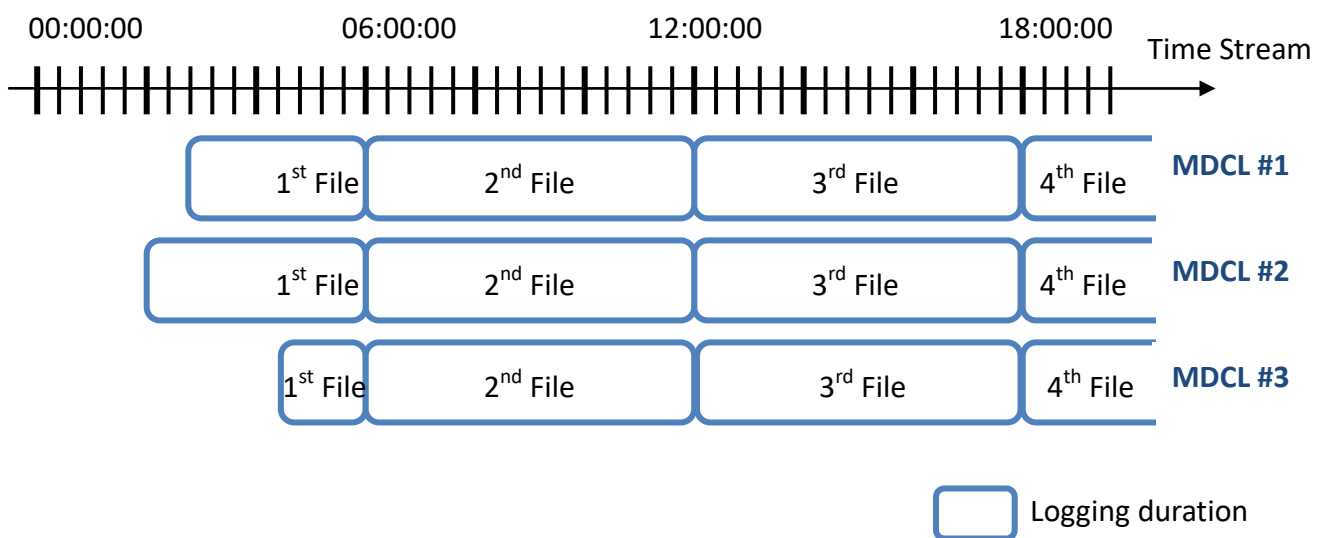
In conclusion, when you retrieve a large amount of files from multiple MDCL modules with the same Logging Rate and Maximum Logging Period settings, you can easily complete the data synchronization by modifying the prefix "T_" in the file name based on where these files were collected from.

Flowchart of based configuration procedure

```
                    ┌─────────────┐
                    │    Start    │
                    └─────────────┘
                           │
                           ▼
    ┌──────────────────┐      ┌──────────────────────┐         ┌─────────────┐
    │ Configure IP     │─────▶│  Configure COM Port  │◀ ─ ─ ─ ─│   Sec 5.1   │
    │ address          │      └──────────────────────┘         └─────────────┘
    └──────────────────┘                 │
            ┊                             ▼
    ┌─────────────┐           ◇ Do the COM port settings ◇    No
    │   Sec 4.1   │           ◇ match the device's?       ◇ ──────┐
    └─────────────┘                      │                        │
                                    Yes  │                        │
```
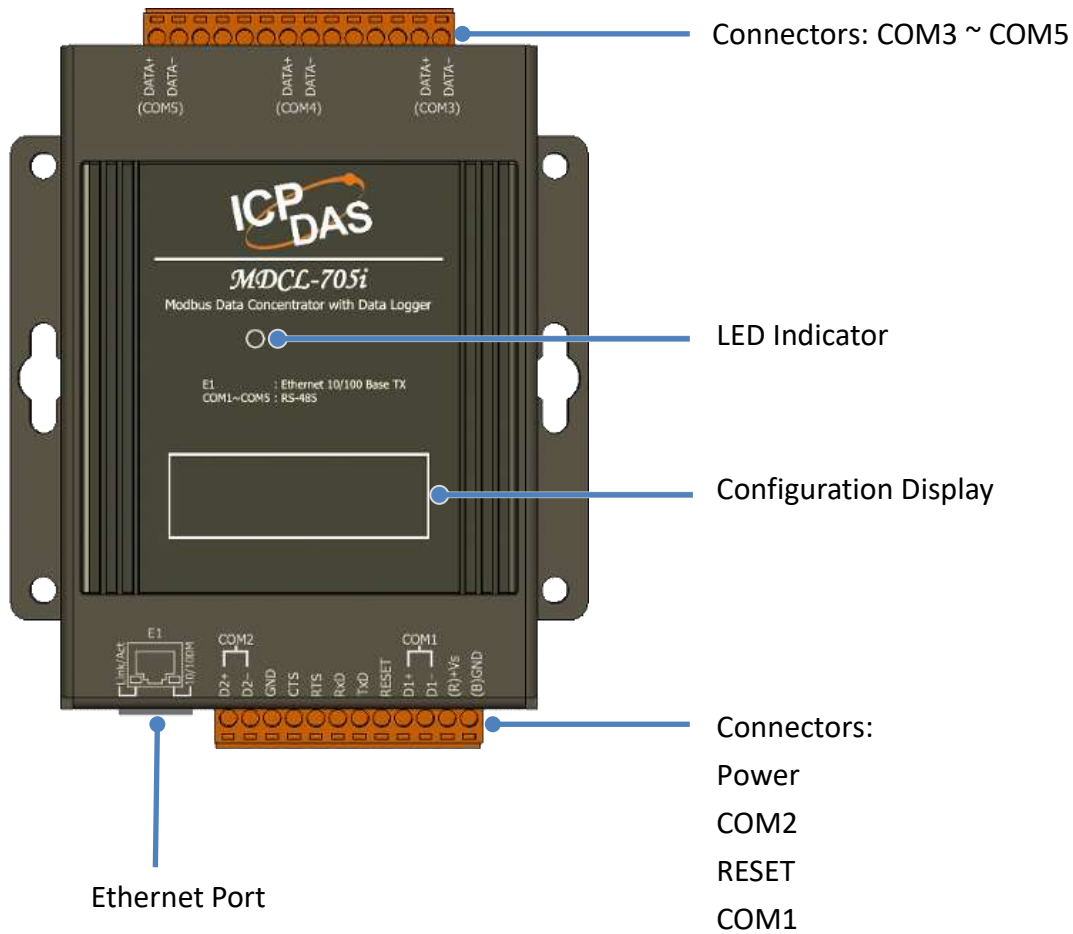
MDC configuration (config.csv)

```
                    ┌──────────────────────┐         ┌──────────────────┐
                    │ Export/Edit config.csv│◀ ─ ─ ─ │  Sec 6.1, 6.2    │
                    │ (Polling definitions) │        └──────────────────┘
                    └──────────────────────┘
                               │
                               ▼
                    ┌──────────────────────┐         ┌──────────────────┐
                    │  Import config.csv    │─ ─ ─ ─ │     Sec 6.1      │
                    └──────────────────────┘         └──────────────────┘
                               │
                               ▼
                    ◇ Is every polling      ◇   No
                    ◇ definition status good?◇ ──────┐
                               │
                          Yes  │
```

Logger Configuration (record.csv)

```
                    ┌──────────────────────┐         ┌─────────────┐
                    │ Set logging time interval│─ ─ ─│   Sec 7.1   │
                    └──────────────────────┘         └─────────────┘
                               │
                               ▼
                    ┌──────────────────────┐         ┌──────────────────┐
                    │ Export/Edit record.csv│◀ ─ ─ ─ │   Sec 7.2, 7.3   │
                    │ (Log channel settings)│        └──────────────────┘
                    └──────────────────────┘
                               │
                               ▼
                    ┌──────────────────────┐         ┌──────────────────┐
                    │  Import record.csv    │─ ─ ─ ─ │     Sec 7.2      │
                    └──────────────────────┘         └──────────────────┘
                               │
                               ▼
                    ◇ Is every channel      ◇   No
                    ◇ set up correctly?      ◇ ──────┐
                               │
                          Yes  │
                               ▼
                        ┌─────────────┐
                        │     End     │
                        └─────────────┘
```

2. Hardware Information

2.1. Specifications

Model	MDCL-705i
Data Logger	
Data Type	Boolean, 16-bit Integer, 32-bit Integer and 32-bit Floating
Max. Recording Period per File	1 hr, 2 hr, 6 hr, 12 hr, 24 hr
File Manager Interface	Built-in web server
Storage Media	microSD Card (Up to 32 GB)
File Format	CSV
Time Interval	5 sec, 10 sec, 30 sec, 1 min, 5 min, 10 min, 15 min, 30 min, 1 hr, 6 hr
Max. Records	120 points per record
Display	
Type	5-Digit 7 Segment LED Display (display system information)
LED Indicators	
Status	1 x System, to (display heartbeat)
COM Port	
RS-232	1 (console port for connection with PC only)
RS-485	2 x 2-wire RS-485 (non-isolated) 3 x 2-wire RS-485 (2.5 kV isolation protection)
Baud Rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
Data Format	N81, E81, O81, N82, E82, O82
Protocol	Modbus RTU master/Modbus RTU slave
Polling Definition	250 definitions for all RS-485 ports
Shared Memory	9600 registers for each of AI, AO, DI and DO data
Max. Connection	32 slaves for each RS-485 port

Ethernet	
Ports	1 x 10/100 Base-TX
Protocol	Modbus/TCP slave, HTTP
Socket Connections	8 Modbus/TCP
Power	
Input Range	+10 VDC ~ +48 VDC (non-regulated)
Consumption	2 W
Mechanical	
Casing	Metal
Dimension	97 mm x 120 mm x 42mm (W x L x H)
Installation	DIN-Rail or Wall Mounting
Environmental	
Operating Temperature	-25 ~ +75 °C
Storage Temperature	-30 ~ +80 °C
Humidity	10 ~ 90% RH, Non-condensing

2.2. Appearance

Connectors: COM3 ~ COM5

LED Indicator

Configuration Display

Connectors:
Power
COM2
RESET
COM1

Ethernet Port

LED indicator

The LED is used as a heartbeat indicator and slows to approximately one flash per second.

Ethernet Port
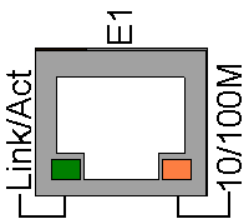
The MDCL-705i is equipped with a RJ45 port for Ethernet LAN connection. When 100BASE-TX is operating, the 10/100M LED is lit orange. When 10BASE-T is operating or the machine is not connected to the network, it is turned off. When an Ethernet link is detected and an Ethernet packet is received, the Link/Act LED is lit green.

Power Connector

(B)GND
(R)+Vs
D1-
D1+
RESET
TxD
RxD
RTS
CTS
GND
D2-
D2+

+10 ~ +48 V$_{DC}$
Power Supply
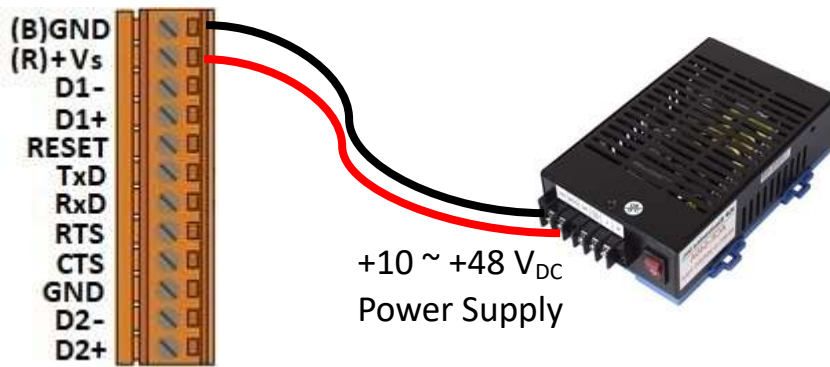
Configuration display

MDCL-705i includes a 5-digit 7-Segment LED display to indicate configuration in the module as below:

11111. 1. 192 2. 168 3. 255 4.　　1	• The IP address for the MDCL-705i 　(192.168.255.1)
22222. 　502 　001	• Modbus TCP communication settings 　Port: 502 　Net ID: 1
33333. 1.1152 2.1152	• Baud rate setting for each COM port 　COM1: 115200 bps 　COM2: 115200 bps
44444. 1. 801 2. 801	• Data format setting for each COM port 　COM1: 8N1 　COM2: 8N1
55555. 　00	• The count of TCP/IP connection 　0: No TCP/IP connection
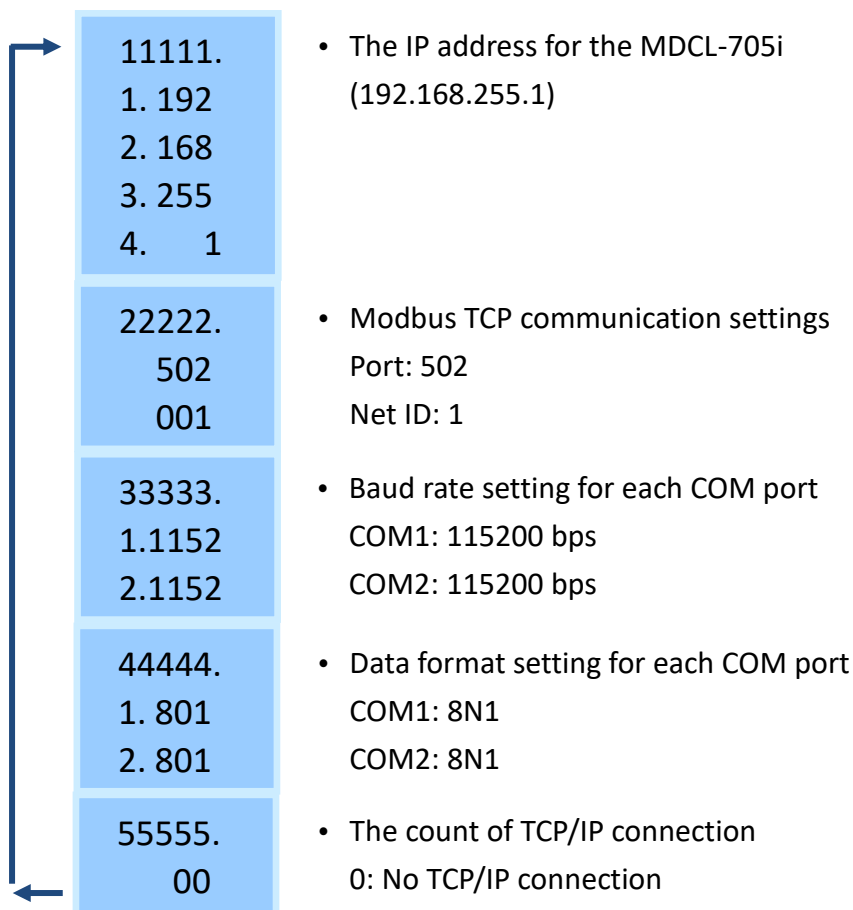
Reset

Shorting the RESET pin to GND pin over 3 seconds can reset the IP/Subnet Mask/Gateway addresses to the factory default settings.

Over **3** seconds to restore factory default settings
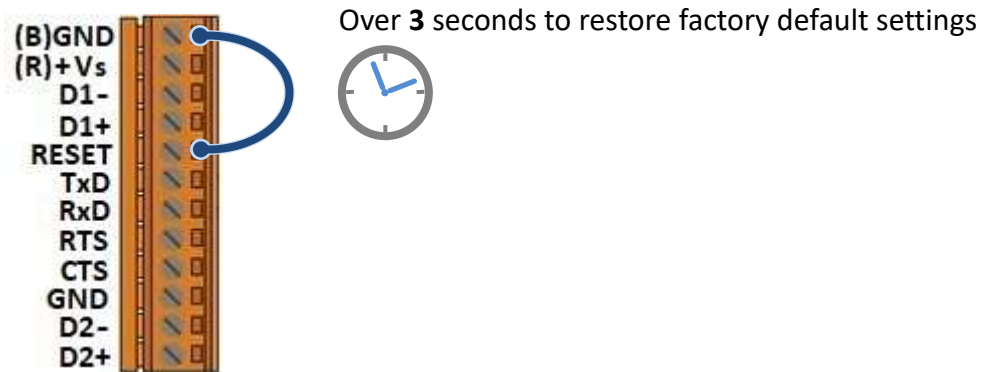
2.3. Pin Assignments

Terminal No.		Pin Assignment
E1		Link/Act ▮ E1 ▮ 10/100M
COM2	01	D2+
	02	D2-
	03	GND
	04	CTS
	05	RTS
	06	RxD
	07	TxD
	08	RESET
COM1	09	D1+
	10	D1-
	11	(R)+Vs
	12	(B)GND

Terminal No.		Pin Assignment
COM5	26	DATA+
	25	DATA-
	24	
	23	
	22	
	21	
COM4	20	DATA+
	19	DATA-
	18	
	17	
	16	
	15	
COM3	14	DATA+
	13	DATA-

2.4. Wiring Connections

RS-232 wiring

3-wire Connection Wiring (Console port for connection with PC only)
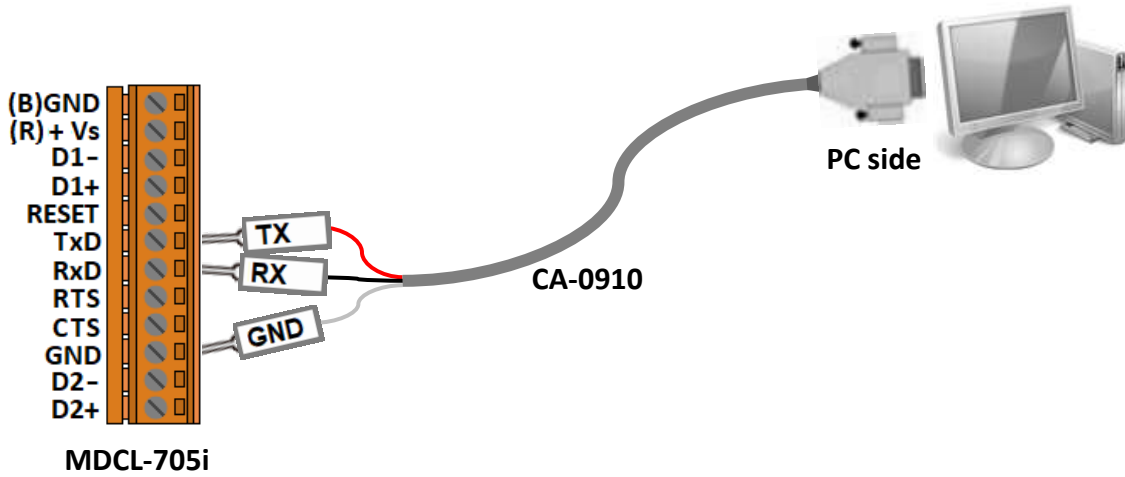
RS-485 wiring
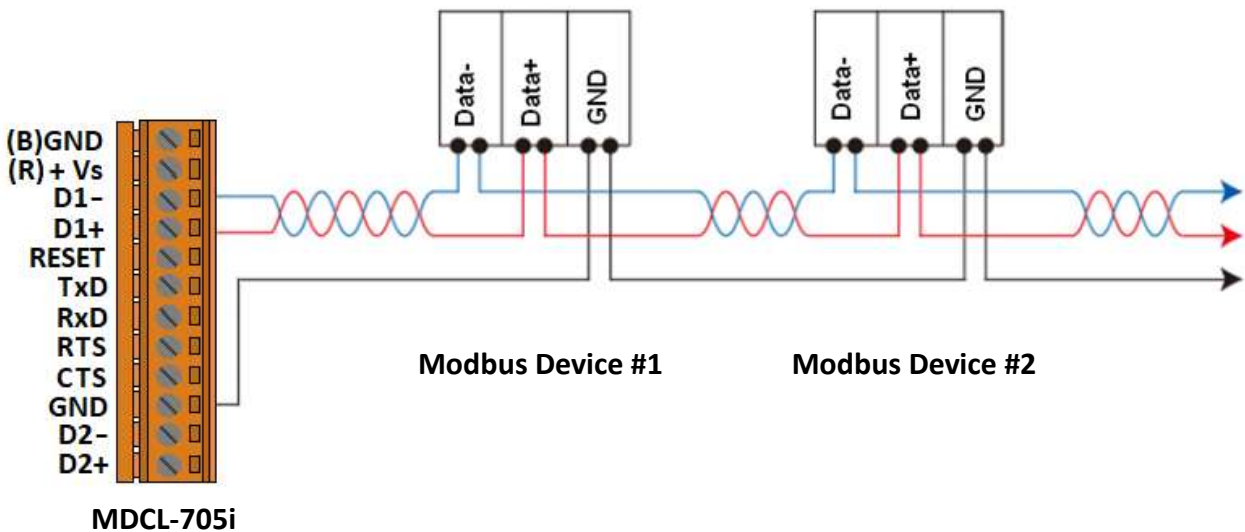
2.5. Dimensions
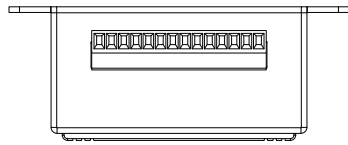
Top View
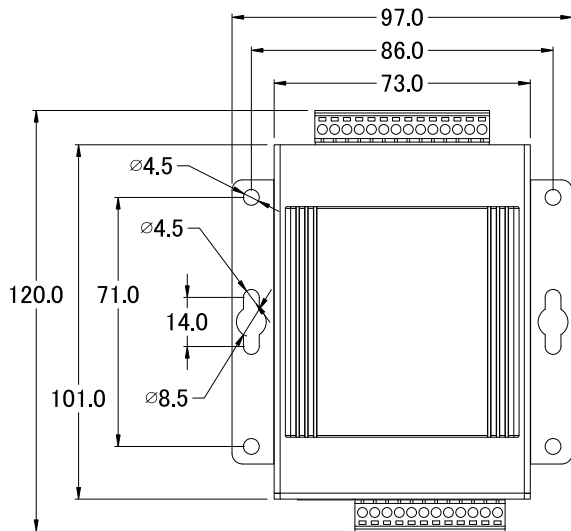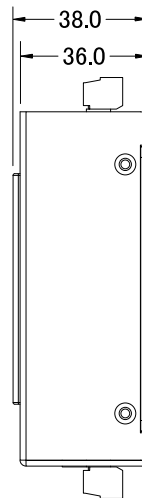
Front View   **Right Side View**   **Rear View**
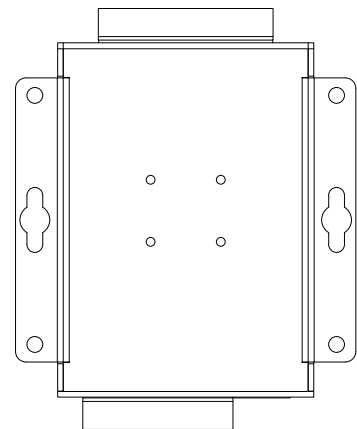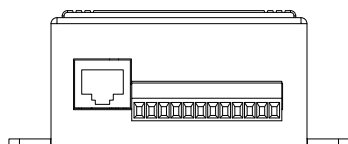
Bottom View

2.6. Mounting the Hardware

Wall/panel mounting

Step 1: Install the four mounting screws into the 4 keyhole mounting holes.

Step 2: Fasten the screws securely.
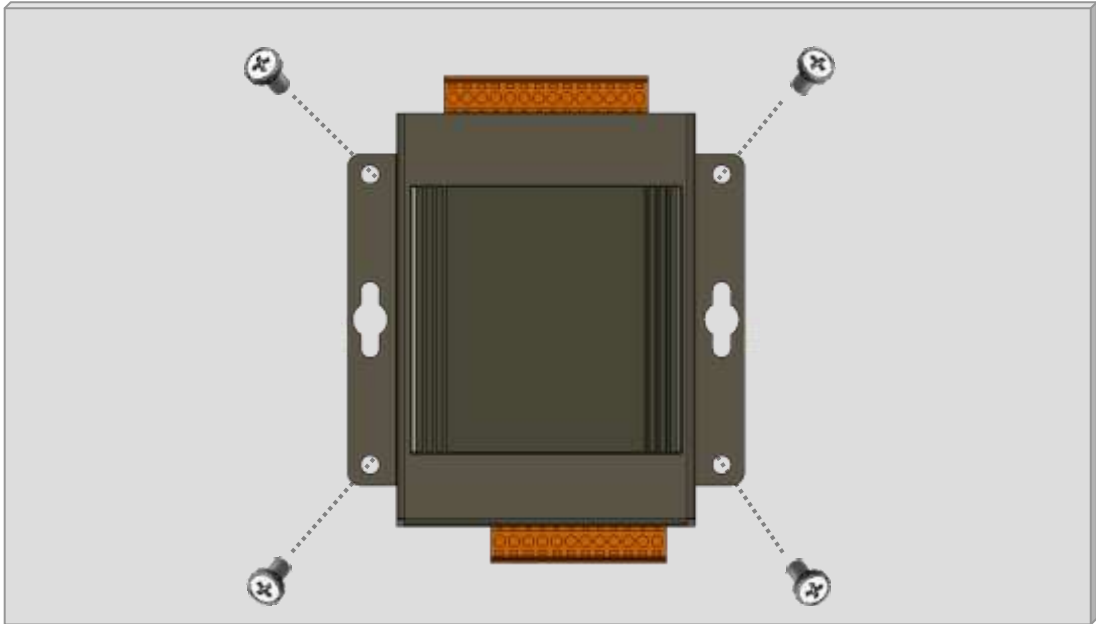
DIN Rail mounting

Step 1: Align the screw holes of the DIN-rail clip with the holes on the back side of the module, and then fasten the screws securely.
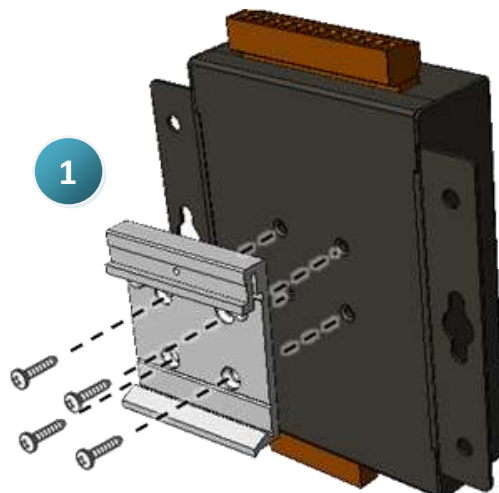
Step 2: Hook upper tab over upper flange of DIN rail.

Step 3: Tilt the module toward DIN rail until it snaps securely to DIN rail
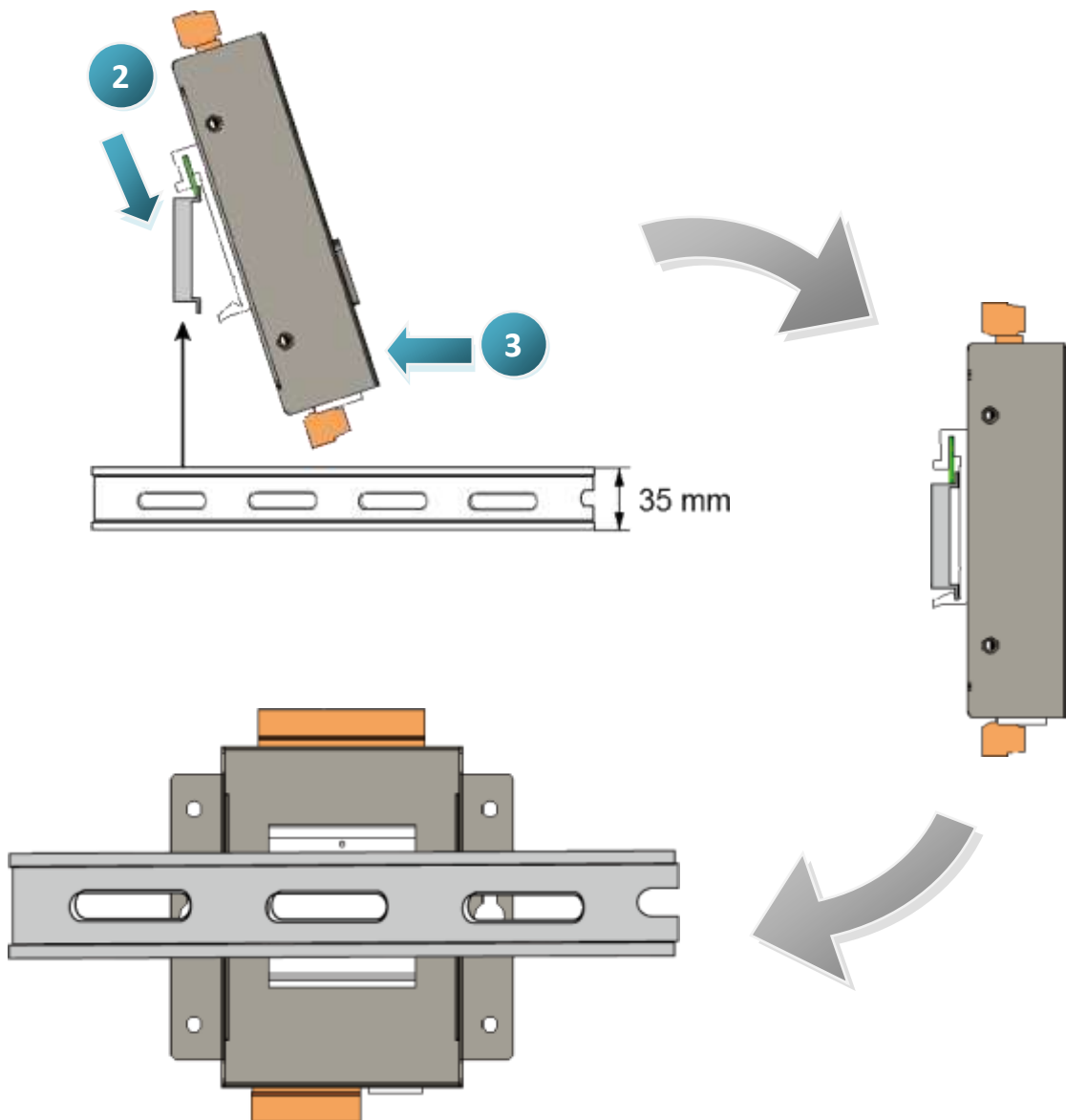
3. Getting Started

The MDCL-700 comes with a default IP address of 192.168.255.1; therefore, a valid IP address should be assigned for the module to join your network. Then you can configure the MDCL module from its web user interface.

The factory default settings

IP Address	Subnet Mask	Gateway
192.168.255.1	255.255.0.0	192.168.0.1

STEP 1: Connect the MDCL module to the same network as your computer and power on all the devices. You can also connect the module to PC directly with an Ethernet cable.
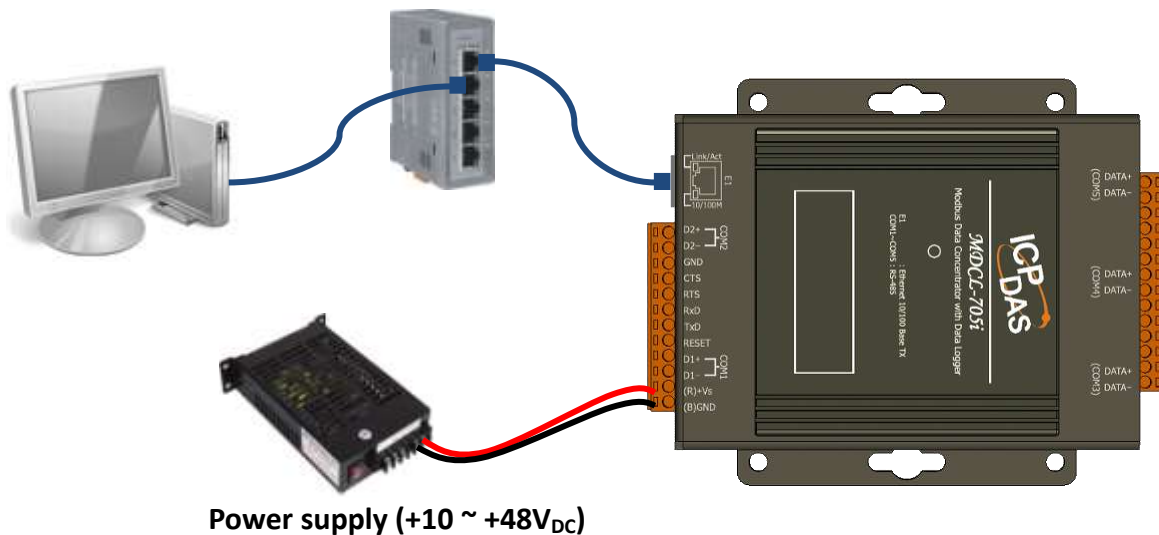
Power supply (+10 ~ +48V$_{DC}$)

STEP 2: Set the IP configuration on your computer.
If the MDCL module is new with using the default IP address of 192.168.255.1, your pc should pick up an IP address in the range of 192.168.255.2 to 192.168.255.253 that is not in use.

NOTE: Details on how to change the IP address on your computer depend upon the type architecture and operating system you are using. Use the Help and Support functionality on your computer and search for "IP Addressing".

STEP 3: Enter the IP address of the module into the web browser. (For example, http://192.168.255.1)
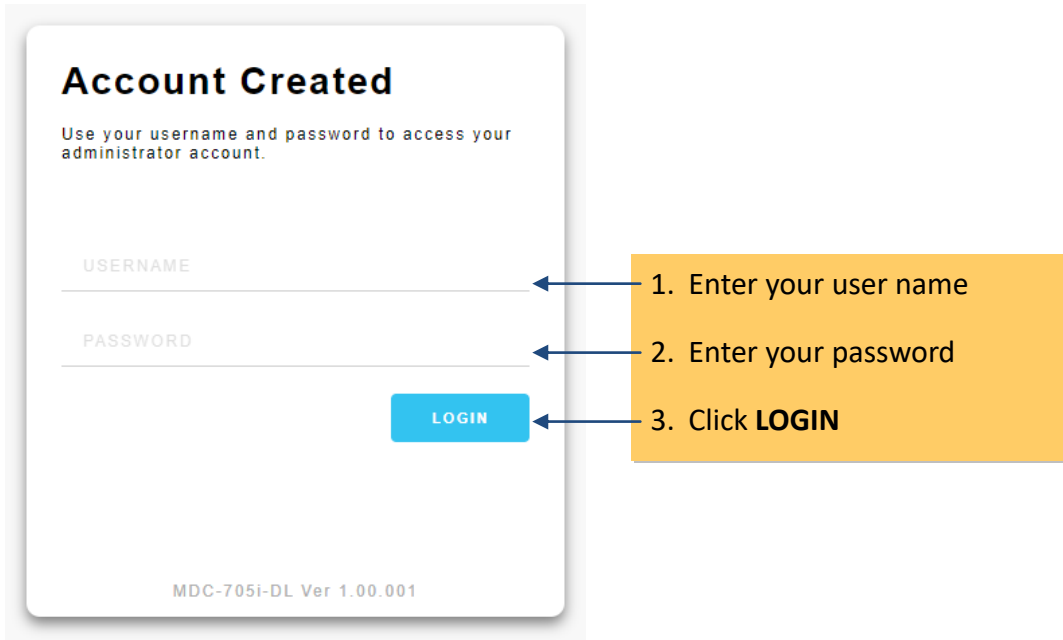
STEP 4: Create your account (for the first time login)

Upon initial login through the web interface, you will be prompted to create your user name and password as an administrator. Both user name and password must be at least four characters; they can be composed only of alphanumeric (A-Z, a-z, 0-9, case-sensitive) characters and dot (.), dash (-), underline (_) and at (@) symbols.

1. Enter your user name (> 4 characters)
2. Enter your password
3. Enter your password again
4. Click **CREATE ACCOUNT**

STEP 5: Enter your username and password to log in to the MDCL module.

STEP 6: Confirm the connection status icon is open on the status bar.

Denotes the connection between the computer and the MDC module is open.

Denotes the connection between the computer and the MDC module is failed.

STEP 7: Go to **GENERAL SETTINGS** and select **NETWORK SETTINGS** tab, enter valid IP/Subnet mask and Gateway addresses on the network for your MDCL module. Make sure that the IP address you pick is not currently in use by another device on the network.
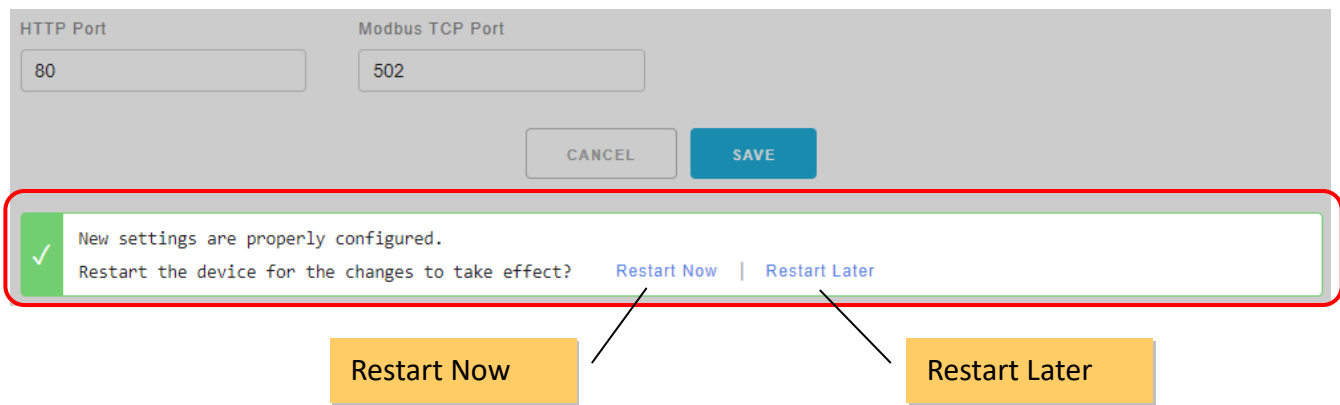

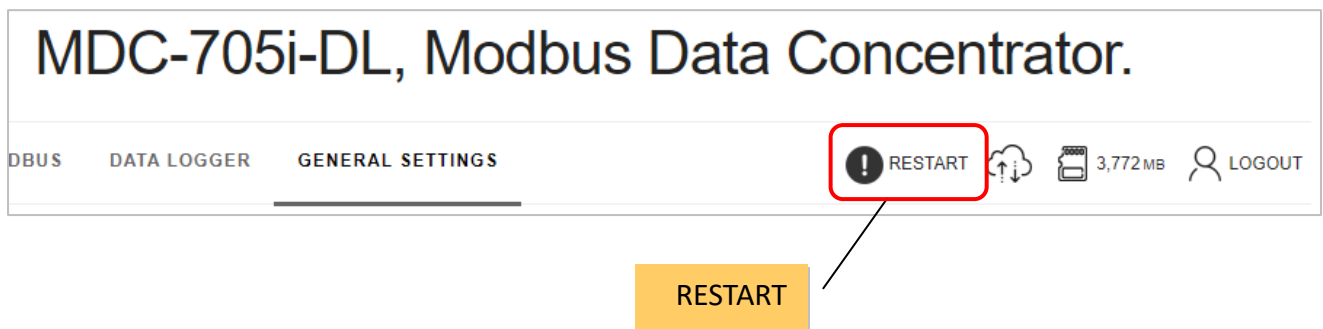| Field	Description	Default Setting	Type
IP Address	Enter a valid IP address for the MDCL-705i	192.168.255.1	Required
Subnet Mask	Enter the Subnet Mask address for the module	255.255.0.0	Required
Default Gateway	Enter the Gateway address for the module	192.168.0.1	Required
DNS Server 1	Enter the primary DNS server address (IPv4) If a domain name is set for the NTP server or the FTP server, at least one DNS server should be specified for host name lookups.	-	Optional
DNS Server 2	Enter the secondary DNS server address (IPv4)	-	Optional
HTTP Port	Enter the HTTP port number	80	Required
Modbus TCP Port	Enter the Modbus TCP port number	502	Required

Save new changes

Click **SAVE** to save new changes, a pop-up message opens for users to restart the module now or later.

- **Restart Now**: restart the modules immediately to take the changes in effect
- **Restart Later**: restart the modules later

HTTP Port	Modbus TCP Port
80	502

CANCEL   SAVE

✓ New settings are properly configured.
Restart the device for the changes to take effect?   Restart Now | Restart Later
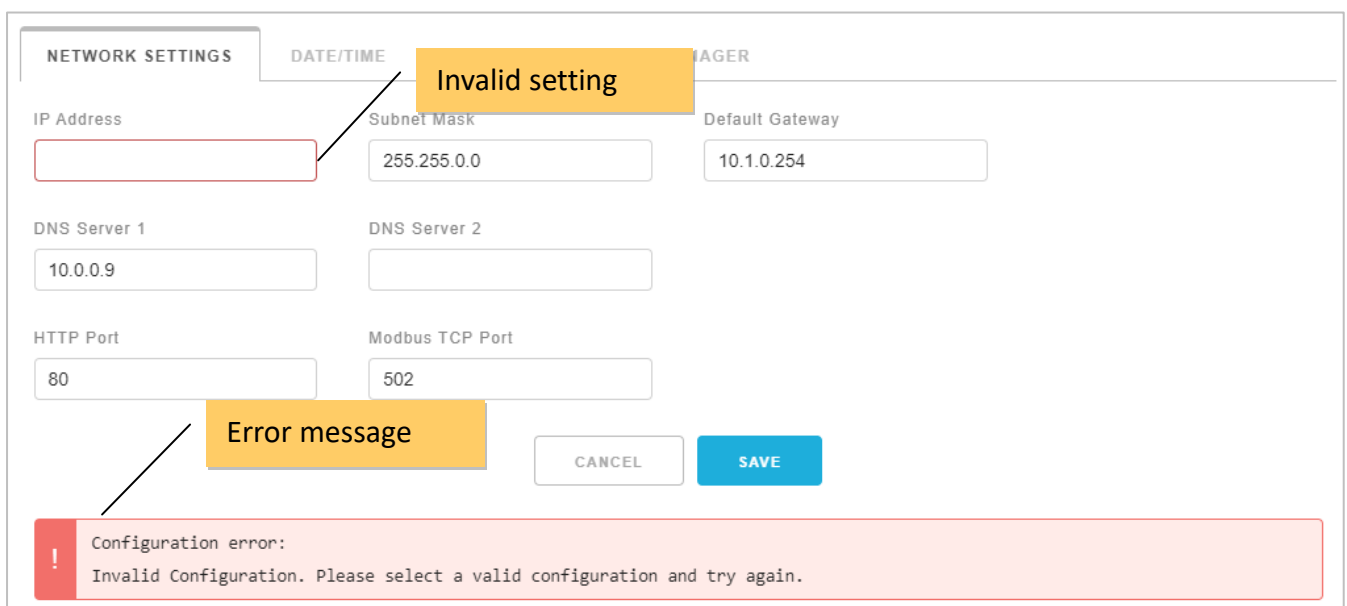
Restart Now

Restart Later

Restart later

If you click Restart Later, an icon with label **RESTART** will be added on the status bar for restart the module later. You can restart the module when your settings were completed.

MDC-705i-DL, Modbus Data Concentrator.

DBUS   DATA LOGGER   **GENERAL SETTINGS**   ❗ RESTART ⬆ 🗄 3,772 MB 👤 LOGOUT

RESTART

Error message

If an invalid setting is specified, an error message will pop-up after the **SAVE** button is clicked. The field in error will be highlighted with a red border, it may be caused due to an invalid value is set or a required field is left blank. You just need to enter valid setting and click SAVE again.

NETWORK SETTINGS   DATE/TIME   AGER

Invalid setting

IP Address	Subnet Mask	Default Gateway
	255.255.0.0	10.1.0.254

DNS Server 1	DNS Server 2
10.0.0.9	

HTTP Port	Modbus TCP Port
80	502

Error message

CANCEL   SAVE

❗ Configuration error:
Invalid Configuration. Please select a valid configuration and try again.

STEP 8: Log in to the MDCL web user interface

Restore the IP address on your computer, enter the new IP address for the MDCL module in the web browser and press Enter to open the web interface.

The MDCL web interface is mainly divided into the following parts:
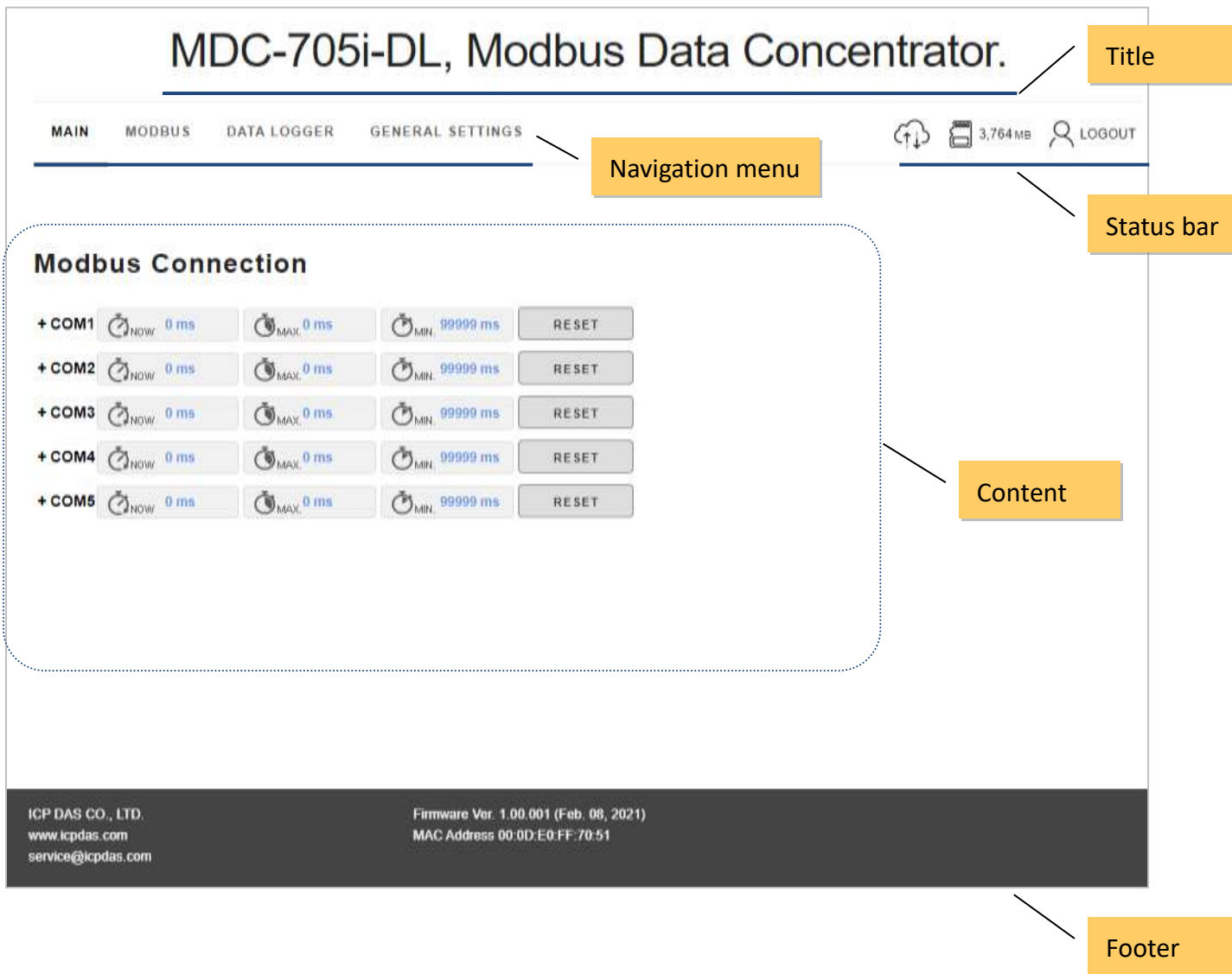
Item	Description
Title	Displays the MDCL model number
Navigation menu	Houses text links to the section for configuring and managing the module's settings.
Status bar	Contains notification icons and logout icon.
Content	Displays the main operating page related to the functional tab on navigation menu.
Footer	Contains information of ICP DAS web site, firmware version and MAC address.

Reset network settings to factory defaults

The IP/Subnet mask/Gateway modified in a MDCL-700 can be reset to factory defaults by shorting the RESET pin to GND pin over 3 seconds. The LED display will show "RESET" as below and the IP address set previously will be cleared and returned to the factory default.
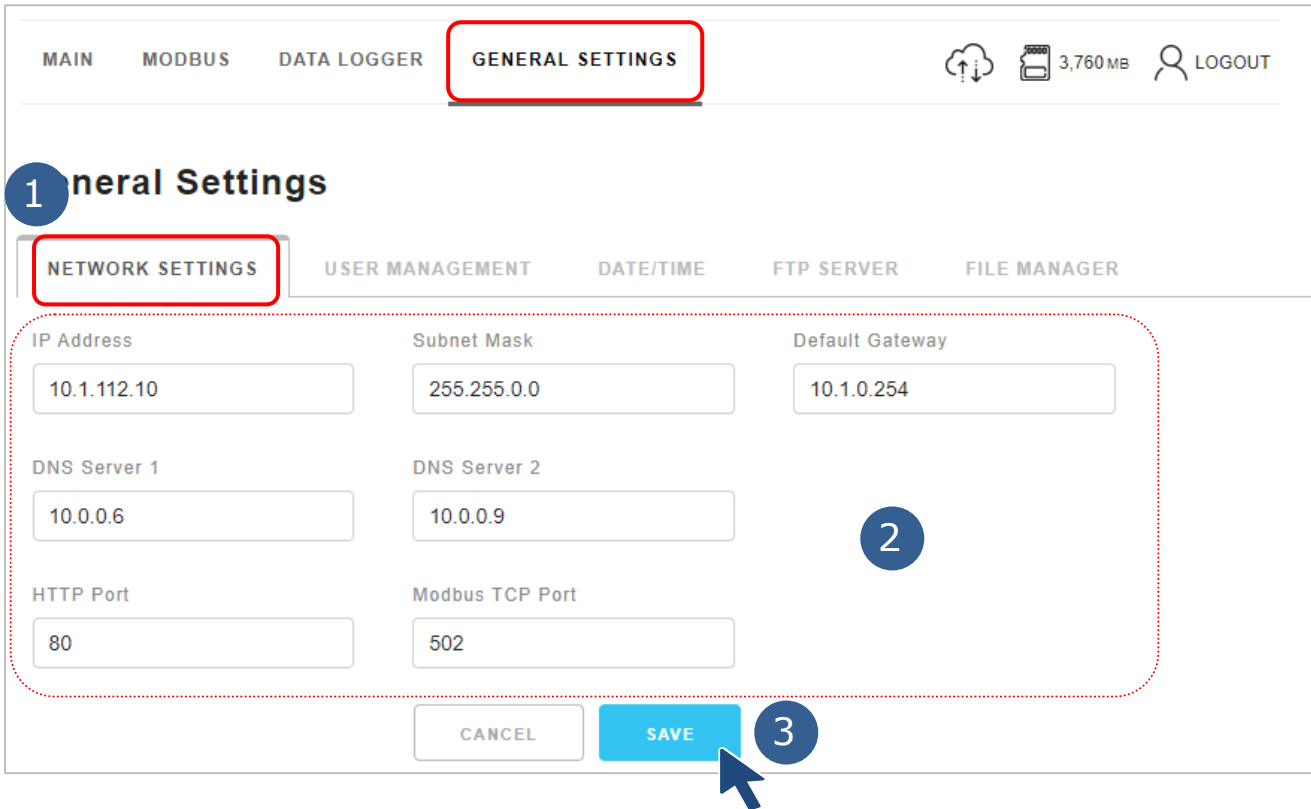

3 seconds
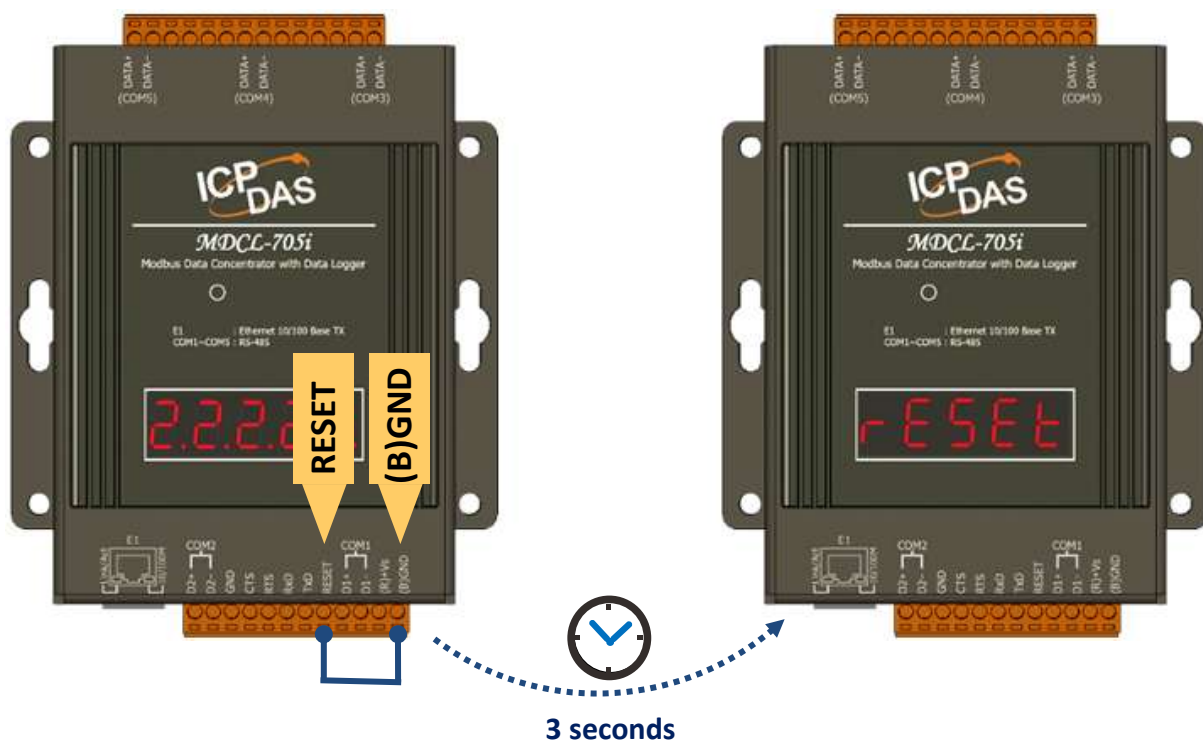
4. System Configuration

4.1. Network Configuration

STEP 1: Go to **GENERAL SETTINGS** and select **NETWORK SETTINGS** tab.

STEP 2: Enter valid IP/Subnet mask and Gateway addresses on the network.
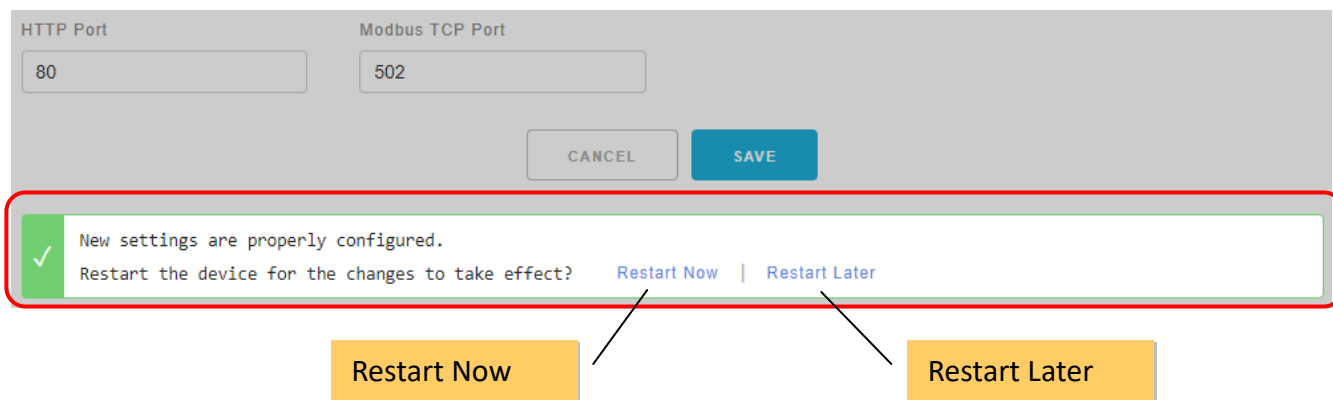
STEP 3: Click **SAVE** to save new changes.

| Field	Description	Default setting	Type
IP Address	Enter a valid IP address	192.168.255.1	Required
Subnet Mask	Enter the Subnet Mask address	255.255.0.0	Required
Default Gateway	Enter the Gateway address	192.168.0.1	Required
DNS Server 1	Enter the primary DNS server address (IPv4) If a domain name is set for the NTP server or the FTP server, at least one DNS server should be specified for host name lookups.	-	Optional
DNS Server 2	Enter the secondary DNS server address (IPv4)	-	Optional
HTTP Port	Enter the HTTP port number	80	Required
Modbus TCP Port	Enter the Modbus TCP port number	502	Required

Save new changes

Click **SAVE** to save new changes, a pop-up message opens for users to restart the module now or later.

- **Restart Now**: restart the modules immediately to take the changes in effect
- **Restart Later**: restart the modules later

Restart later

If you click Restart Later, an icon with label **RESTART** will be added on the status bar for restart the module later. You can restart the module while your settings were completed.
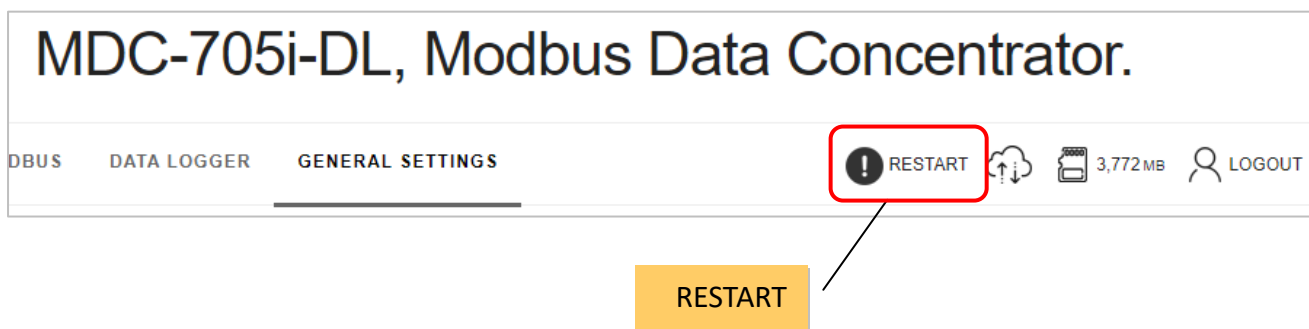
Error message

If an invalid setting is specified, an error message will pop-up after the **SAVE** button is clicked. The field in error will be highlighted with a red border, it may be caused due to an invalid value is set or a required field is left blank. You just need to enter valid setting and click SAVE again.
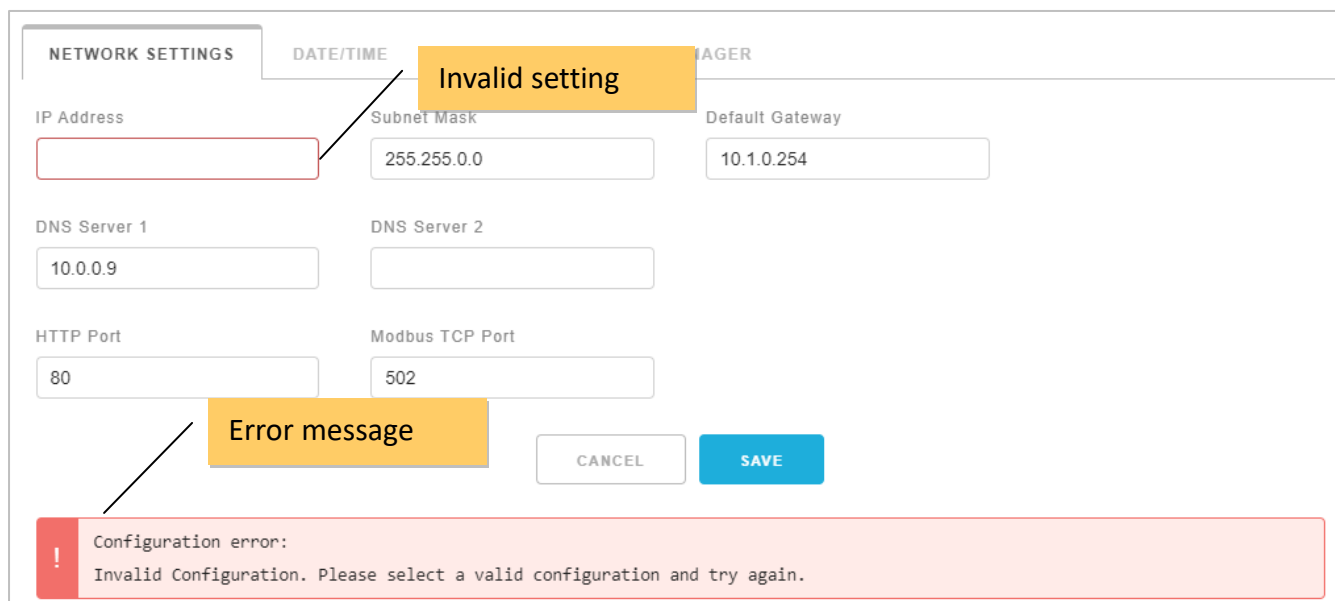
4.2. User Management (ongoing)

In order to protect the module from accidental modification while deployed on site, the MDCL module allows you to create a view-only user without the ability to change settings; you can also limit the user's access to specific information only.

4.3. Date and Time

System Time, Time Zone and Network Time Server can be set on **GENERAL SETTINGS > DATE/TIME** page

System time
- **Current System Time**: displays the current system time on your MDCL-705i. The date and time information is used for accurate timestamps in a log file.
- **SYNC WITH PC's CLOCK**: click the button to synchronize the system time with the PC's clock.

Time zone
- Select the time zone from Time Zone dropdown menu.

Clock synchronization over network
- **Network Time Server 1:** Enter the IP address or hostname of an NTP server (Required)
- **Network Time Server 2:** Enter the IP address or hostname of a redundant NTP server if needed. (Optional)

- **SYNC Now**: Click **SYNC NOW** to synchronize the system clock with NTP servers immediately.

- Auto time correction: tick on the checkbox of **Force synchronize** and select the update interval for time synchronization scheduler on the drop down menu.
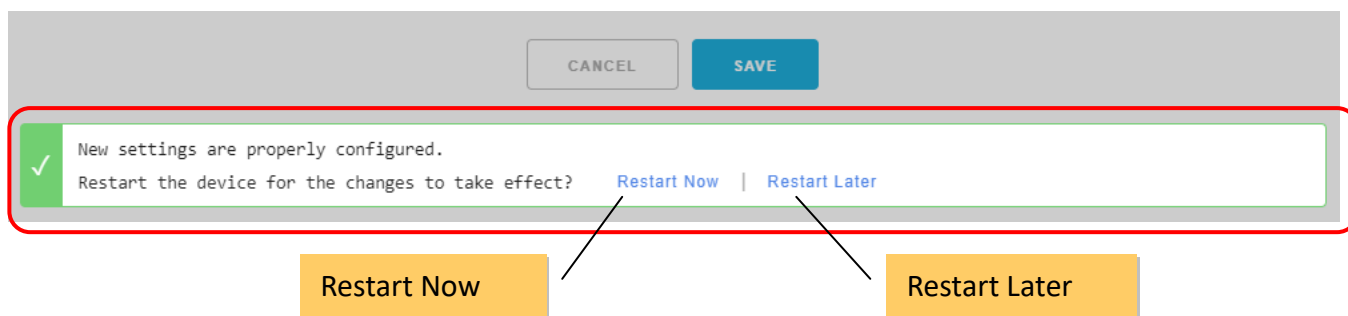
Save new changes

Click **SAVE** to save new changes, a pop-up message opens for users to restart the module now or later.

- **Restart Now**: restart the modules immediately to take the changes in effect
- **Restart Later**: restart the modules later

Restart later

If you click Restart Later, an icon with label **RESTART** will be added on the status bar for restart the module later. You can restart the module when your settings were completed.
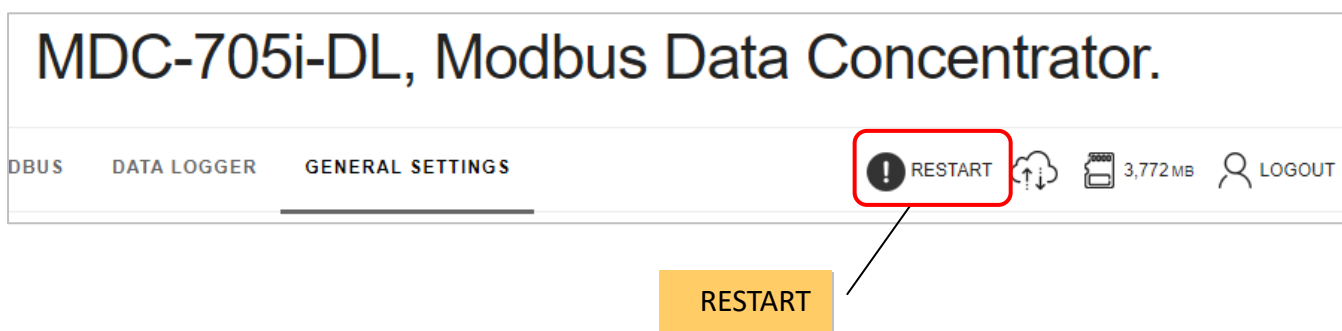
Error message

If **Network Time Server 1** is left blank, an error message will pop-up after the **SAVE** button is clicked. The field will be highlighted with a red border. Enter a valid setting and click SAVE again to fix it.
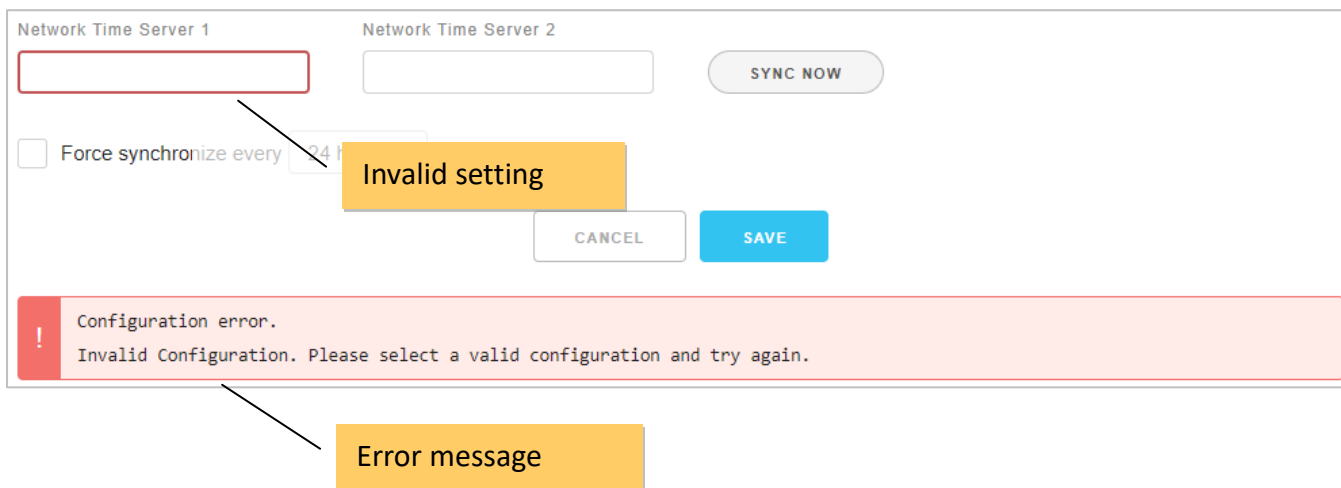
4.4. FTP Server Configuration (ongoing)

On **GENERAL SETTINGS > FTP SERVER** page, you can set a remote FTP server including the directory to where the log files will be updated periodically.

FTP server settings

Field	Description	Default Setting	Type
FTP Server Name	Enter the FTP server name.	-	Required
FTP Server	Enter the domain name or IP address of the FTP server.	-	Required
FTP Control Port	Enter the control port number on the FTP server	21	Required
Login User Name	Enter the user name for logging into the FTP server Keep it empty if user name is not required.	-	Optional
Password	Enter the password of the user account Keep it empty if password is not required.	-	Optional
Directory Path	Enter the directory to where the log files will be updated. An individual directory path may be set for each module to update its own log files.	Root directory	Optional

Save new changes

Click **SAVE** to save new changes, a pop-up message opens for users to restart the module now or later.

- **Restart Now**: restart the modules immediately to take the changes in effect
- **Restart Later**: restart the modules later

Restart later

If you click Restart Later, an icon with label **RESTART** will be added on the status bar for restart the module later. You can restart the module when your settings were completed.

Error message

If an invalid setting is specified, an error message will pop-up after the **SAVE** button is clicked. The field in error will be highlighted with a red border, it may be caused due to an invalid value is set or a required field is left blank. You just need to enter valid setting and click SAVE again to fix it.

4.5. File Manager (for Log Files)

From the **GENERAL SETTINGS > FILE MANAGER** page, you can search log files by date, and download or delete them by clicking on the corresponding icons in the log file list.

NETWORK SETTINGS	USER MANAGEMENT	DATE/TIME	FTP SERVER	FILE MANAGER

yyyy-mm-dd   SEARCH   📅

Date Created	Name	Size
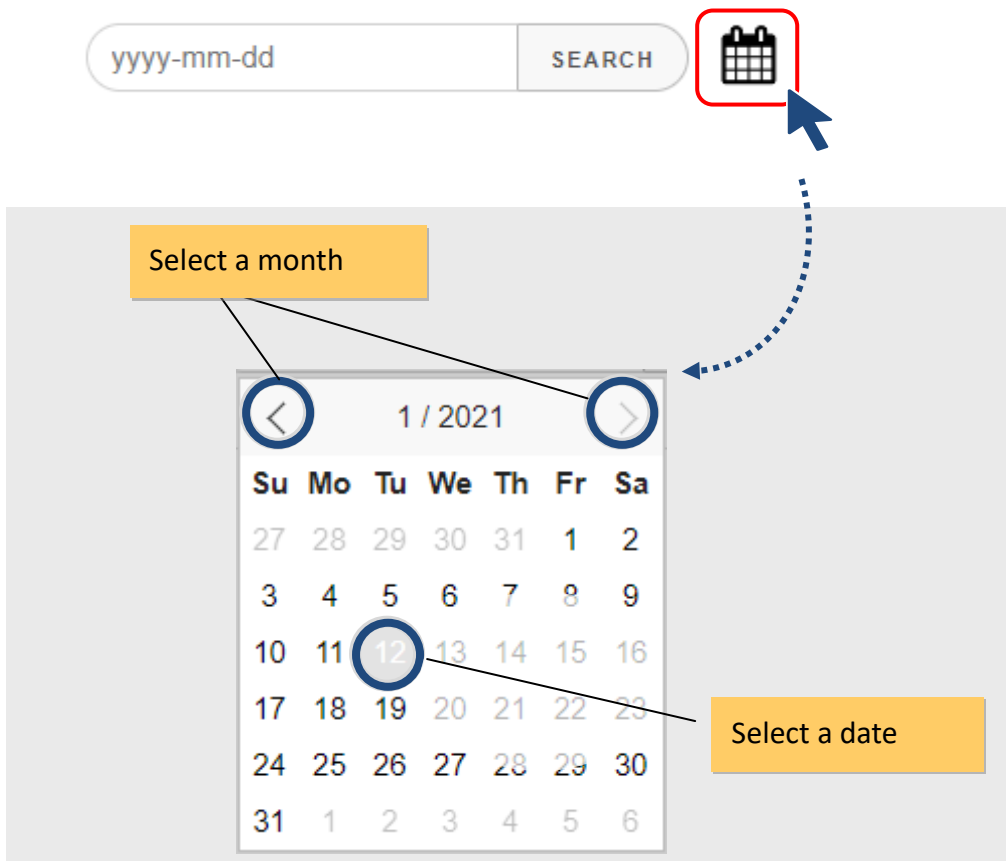
Specify a record created date for the search
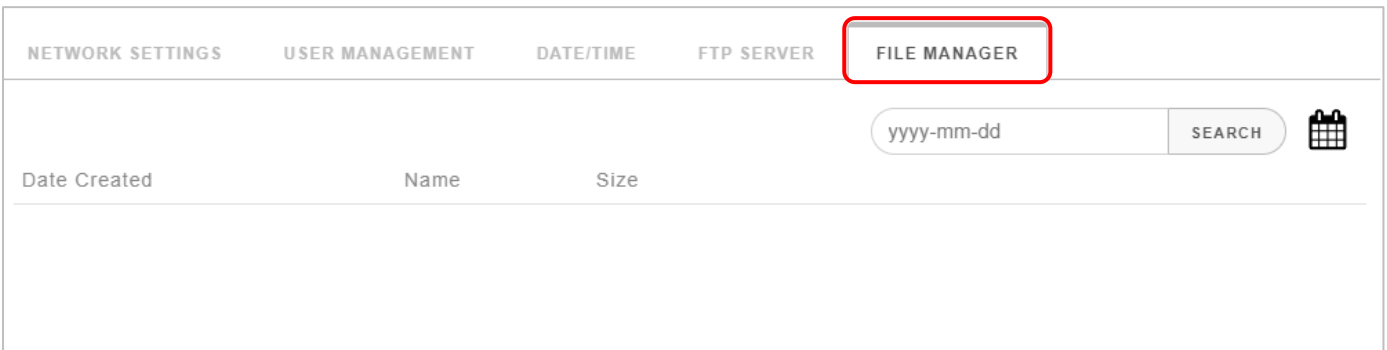
- Enter Date in the format yyyy-mm-dd, or

yyyy-mm-dd   SEARCH   📅

- Click the calendar icon to select the date of the log files that you would like to search. Take 2021/01/12 as an example:

yyyy-mm-dd   SEARCH   📅

Select a month

Select a date

	1 / 2021	

Su	Mo	Tu	We	Th	Fr	Sa
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	1	2	3	4	5	6

Search log files

- Confirm the date for search and then click **SEARCH**, the search result will be displayed on the page (as the chart below shows).

Confirm the date

2021-1-12   SEARCH
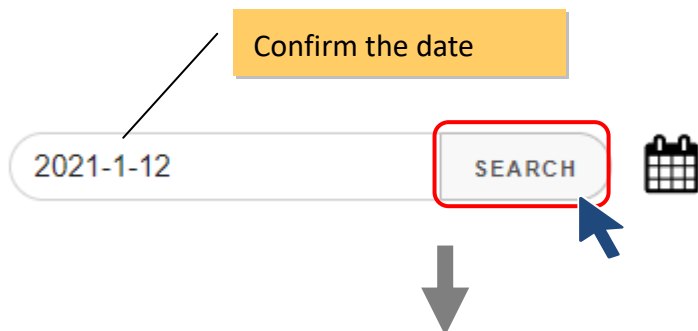
	NETWORK SETTINGS	USER MANAGEMENT	DATE/TIME	FTP SERVER	FILE MANAGER

2021-1-12   SEARCH

Date Created	Name	Size			
2021-01-12	T_011212.CSV	15,331	DOWNLOAD	DELETE	
2021-01-12	T_011200.CSV	15,331	DOWNLOAD	DELETE	
2021-01-12	T_011201.CSV	15,331	DOWNLOAD	DELETE	
2021-01-12	T_011202.CSV	15,331	DOWNLOAD	DELETE	
2021-01-12	T_011203.CSV	15,331	DOWNLOAD	DELETE	

Download file

- Click the DOWNLOAD icon for a file to download it

2021-01-12	T_011212.CSV	15,331	DOWNLOAD	DELETE

- Get the file in the default download directory of web browser. Downloading the data does not delete it from the MDCL.

| 2021-01-12 | T_011202.CSV | 15,331 | DOWNLOAD | DELETE |
| 2021-01-12 | T_011203.CSV | 15,331 | DOWNLOAD | DELETE |

T_011212.CSV

Delete file

- Click the **DELETE** icon for a file to delete it

2021-01-12   T_011212.CSV   15,331   DOWNLOAD   DELETE

- Click **DELETE** on pop-up message to complete the process.

2021-01-12   T_011212.CSV   15,331   Are you sure to delete this?   CANCEL   DELETE

5. Modbus Configuration

5.1. COM Port Configuration

The COM port configuration is used to configure the parameters for Modbus communication connection between MDCL and Modbus RTU slave devices. The configuration interface is provided on **MODBUS** page.

STEP 1: Select **MODBUS** from the navigation menu, and drop down the page to COM port section.

STEP 2: Click on the COM port tab.

STEP 3: Set communication parameters for each port.

STEP 4: Click **SAVE** to save new changes.

Items	Description	Type
Operation Mode	• Modbus Master: this mode is used to connect Modbus RTU slave devices. MDCL is acting as a master to send requests to slaves • Modbus Slave: this mode is used to connect Modbus RTU master; it allows the master to read/write data from/to the MDCL.	Required
Baud Rate	Defines the transmission speed between the MDCL and the RTU devices. The BaudRate can be set to 1200/ 2400/ 4800/ 9600/ 19200/ 34800/ 57600/ 115200 (bps) depending on the RTU device(s) being used.	Required
Data Bits	Defines the number of data bits in each character. It is fixed to 8 and the RTU devices need be set to 8-bit data, too.	Required
Parity	Defines the Parity bit. The parity bit can be set to None Parity, Even Parity or Odd Parity.	Required
Stop Bits	Defines the Stop bits. It can be set to 1 Stop Bit or 2 Stop Bits.	Required
Delay Between Polls(ms)	Defines the Poll Delay between each scan for Modbus RTU communication. Default value: 1000 ms. Available range: 20 to 6000 (ms).	Required
Timeout(ms)	Defines the period of time that the MDCL module will wait for a response from a RTU slave device. A timeout is occurred if the MDCL module does not receive the response within the specified time period, and then the MDCL will resend the same command continuously until the number of timeout errors equals to the value set in parameter **Retry Times**. Default value: 100 ms. Available range: 50 to 6000 ms.	Required
Retry Times	Defines the number of consecutive timeout errors are allowed for a command. If the count of timeout errors equals to the value set in **Retry Times**, the device will be determined to be disconnected. During the disconnection period, the MDCL will try to establish communication with the device every 10 seconds instead of executing this command in polling process, until it receives a correct response from the device. Default value: 2. Available range: 1 to 20.	Required

Save new changes

Click **SAVE** to save new changes, a pop-up message opens for users to restart the module now or later.

- **Restart Now**: restart the modules immediately to take the changes in effect
- **Restart Later**: restart the modules later.

Restart later

If you click Restart Later, an icon with label **RESTART** will be added on the status bar for restart the module later. You can restart the module when your settings were completed.

Error message

If an invalid setting is specified, an error message will pop-up after the **SAVE** button is clicked. The field in error will be highlighted with a red border, it may be caused due to an invalid value is set or a required field is left blank. You just need to enter valid setting and click SAVE again.

6. MDC Configuration (config.csv)

6.1. Exporting/Importing the Config.csv File

The MDC function in the MDCL-705i module can concentrate data from several Modbus RTU slave devices through standard RS-485 interfaces, and allows Modbus TCP masters to read/write data via Ethernet/LAN. The Modbus master can use one Modbus command to get all data with the same type from various Modbus RTU slave devices, and change the status of a channel by writing command to the register assigned for the channel in the MDCL module.

Modbus RTU polling definition in config.csv is used to define Modbus RTU commands for reading data from the slave devices. The Comma Separated Values (CSV) files can be viewed and edited in spreadsheet applications like Microsoft Excel, or in any text editor, in which the comma character (,) typically separates each field of text.

	A	B	C	D	E	F	G	H	I	J
1	#	UseComPort	SlaveModbusID	FunctionCode	RegStartAddr	RegCount	TimeoutEventProcess	PresetValue	GroupName	Description
2	*	1	5	1	0	8	2	10000	M_7018_1	temperature_1
3	*	1	5	1	0	8	2	10000	M_7018_2	temperature_2
4	*	2	4	2	0	4	2	10001	M_7017_1	Motor_1
5	*	2	4	2	0	4	2	10001	M_7017_2	Motor_2
6	*	3	3	3	2	3	0	10002	Device_3	Device_3__
7	*	3	3	3	2	3	0	10002	Device_4	Device_4__
8	*	4	2	4	2	3	0	10002	Device_5	Device_5__
9	*	4	2	4	2	3	0	10002	Device_6	Device_6__
10	*	5	1	1	2	3	0	10002	Device_7	Device_7__
11	*	5	1	1	2	3	0	10002	Device_8	Device_8__

The file name **config.csv** cannot be changed, and the name and order of parameters in each line for a polling definition cannot be changed, too. To avoid errors caused by manual editing, you can export the config.csv file from **Modbus** page and modify it to meet your requirements.
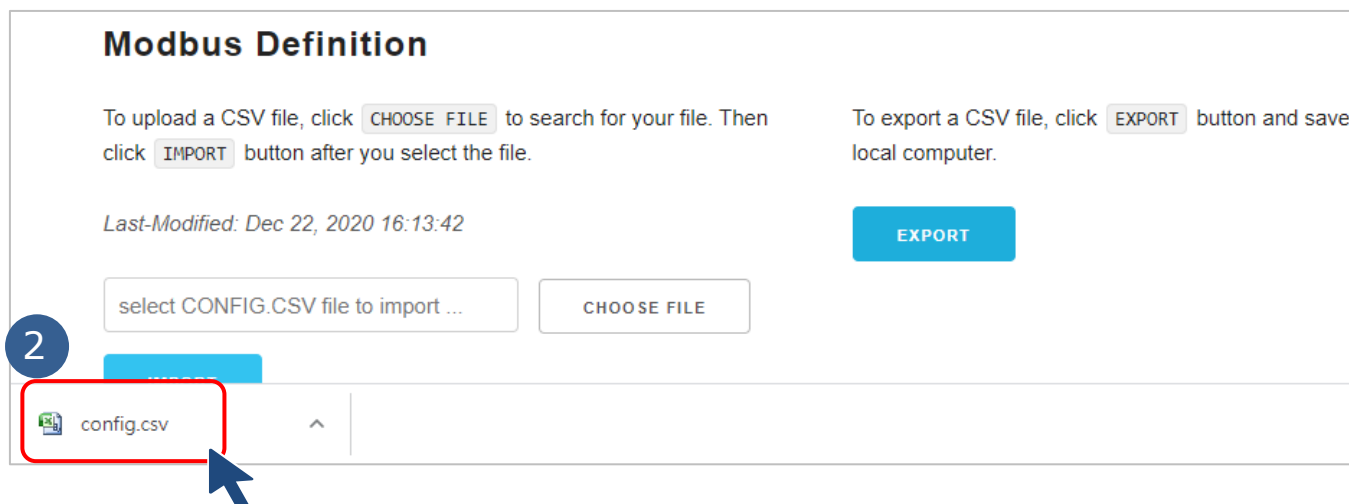
Export the config.csv

STEP 1: Click **EXPORT** on Modbus page.

STEP 2: Obtain the file from the download directory configured in the web browser.

Import the config.csv

STEP 1: Click **CHOOSE FILE** on MODBUS page and then select your config.csv file.

STEP 2: Click **IMPORT**.

Click **CHOOSE FILE**

MDCL will validate the imported file and present the result as success or error message with line and position information of invalid parameters as shown below. A definition with invalid parameters will not be executed in polling process.

Success message

✓ File upload successful.

File validation completed successfully.

Error message

Invalid value: COM port starts from 1

! File upload successful.

Your CSV file contains 2 error(s). Please correct and import again.

Invalid value for field 'UseComPort' in line 2:
  Line 2:   * , 0 , 4 , 0 , 5 , 1 , 0 , 103_01 , ReadR Data L

Invalid value for field 'FunctionCode' in line 3:
  Line 3:   * , 1 , 1 , 5 , 452 , 1 , 2 , 0 , 103_02 , ReadR Offset L

Invalid value: Function code 5 is not supported

6.2. Configuring polling definition

Before start to configure the parameters for the Polling Definition, be sure to check the COM port number that the target device is connected to, the Modbus ID for every Modbus RTU device, function code, start address, and the quantity for reading data. Up to 250 Modbus RTU commands can be performed in a MDCL-700 module, and up to 9600 registers for each of AI, AO, DI, and DO type data can be used.

	A	B	C	D	E	F	G	H	I	J
1	#	UseComPort	SlaveModbusID	FunctionCode	RegStartAddr	RegCount	TimeoutEventProcess	PresetValue	GroupName	Description
2	*	1	5	1	0	8	2	10000	M_7018_1	temperature_1
3	*	1	5	1	0	8	2	10000	M_7018_2	temperature_2
4	*	2	4	2	0	4	2	10001	M_7017_1	Motor_1
5	*	2	4	2	0	4	2	10001	M_7017_2	Motor_2
6	*	3	3	3	2	3	0	10002	Device_3	Device_3__
7	*	3	3	3	2	3	0	10002	Device_4	Device_4__
8	*	4	2	4	2	3	0	10002	Device_5	Device_5__
9	*	4	2	4	2	3	0	10002	Device_6	Device_6__
10	*	5	1	1	2	3	0	10002	Device_7	Device_7__
11	*	5	1	1	2	3	0	10002	Device_8	Device_8__

Each Polling Definition consists of 10 parameters listed as below:

Item	Description
#	Defines the type for a polling definition: "*****": Asterisk symbol denotes a valid polling definition. The MDCL will assign local register for data defined in the definition and put the polled data to the register. "**-**": Minus sign denotes a disabled polling definition. The MDCL will assign local register for data defined in the definition but **not** poll data. It can be applied where one or more devices are not used in different scenarios, but reserving the mapped register addresses is helpful for the management and maintenance of different projects. " ": A blank value in this field denotes a null polling definition. The MDCL will neither assign local register for data defined in the definition nor poll data. It is suitable for recording previously used commands.
UseComPort	Defines the COM port number to which the slave device is connected. The COM port number is from 1 to the total number of COM ports on the MDCL.
SlaveModbusID	Defines the identification of the remote slave. The valid range is from 1 to 255.
FunctionCode	Defines the request function code. A valid code can be 1 (Read DO), 2 (Read DI), 3 (Read AO) or 4 (Read AI) depending on the I/O features of the slave device.
RegStartAddr	Defines the starting address, i.e. the address of the first register specified. The available range is from 0 to 65535.

RegCount	Defines the quantity of registers to be read. The available range is from 1 to 125.

Timeout EventProcess	Defines which data will be read while a timeout error is occurred:
	
	    0: the exception code (Mode 1)
	
	    1: the latest data before the timeout error occurred (Mode 2)
	
	    2: a preset value (Mode 3)

PresetValue	Defines the preset value applied when the **TimeoutEventProcess** is set to 2. The available range is from 0 to 65535.
GroupName (*4)	Each polling definition must be assigned with a unique GroupName, which will be used in data log configuration. If two or more polling definitions share the same GroupName, the MDCL will fail to record data included in these polling definitions. The available range is 1 to 12 ASCII characters.
Description (*4)	The comment or description of a polling definition. It will be displayed on the web interface for users to get more information about the definition. The available range is 1 to 16 ASCII characters.

NOTE:

   *1. The maximum number of all the polling definitions is 250.

   *2. The MDCL provides 9600 internal Modbus registers for each table (DI/DO/AI/AO) to hold data collected from the RTU slave devices.

   *3. In order to retain register space mapped for specific devices; or to release those spaces mapped but reserve the definition for changed or stopped devices with a minimum level of modification, users just need to set different types for a polling definition in different applications.

   4. The characters "-", "", "~" and "#" are reserved and cannot be used in text field including the **GroupName** and **Description** fields

6.3. Verifying Polling Definitions

After the config.csv file is imported, polling definitions of each COM port will be listed below the configuration section. You can click the tab for every COM port to verify the parameters in polling definitions imported in the MDCL module.

STEP 1: Click the tab for a COM port on MODBUS page.
STEP 2: Verify the parameters in polling definitions.

6.4. Application

Environmental monitoring in a community library

For monitoring indoor air quality including temperature, humidity, CO, CO2 and PM2.5 concentration in a community library which has a lobby, a journal room, a reading room, a multimedia center and a stack room, one MDCL-705i and five CL-213 modules are used and deployed as shown below.
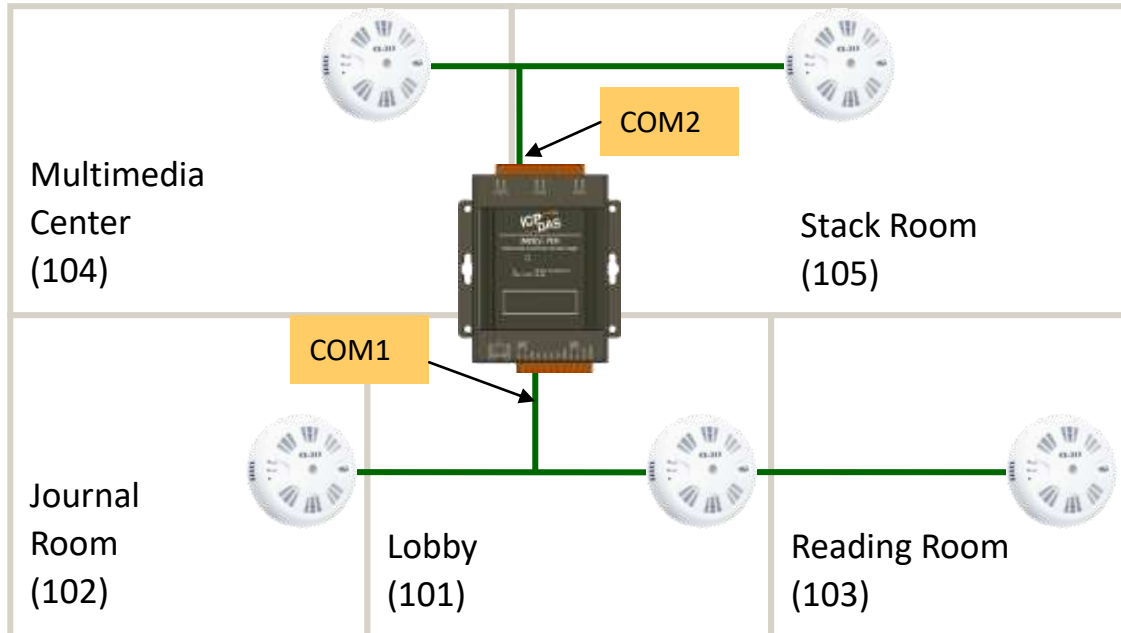
The following table shows the Modbus address for reading data from the CL-213 devices. This section will explain how to set the MDCL-705i to collect temperature, humidity, CO, CO2 and PM2.5 concentration information and their high alarm status from CL-213 devices.

Function Code	Register	Data	Unit
0x04 (Read AI)	300000	CO	1ppm
	300001	CO2	1ppm
	300002	PM2.5	1ug/m^3
	300003	Humidity	0.01%
	300004	Temperature	0.01°C
0x03 (Read AO)	400452	Temperature offset	0.01°C
0x01 (Read DO), (Write 1 to clear alarm status)	000304	High alarm status of CO	
	000305	High alarm status of CO2	
	000306	High alarm status of PM2.5	
	000307	High alarm status of Humidity	
	000308	High alarm status of Temperature	

1. Configuring the MDCL-705i

STEP 1: Obtain the necessary information for reading data from these CL-213 devices as below:

Room	CL-213 Number	MDCL COM#	Modbus ID	Function Code	Start Address	Quantity
Lobby (101)	1	1	1	4	0	5
		1	1	3	452	1
		1	1	1	304	5
Journal Room (102)	2	1	2	4	0	5
		1	2	3	452	1
		1	2	1	304	5
Reading Room (103)	3	1	3	4	0	5
		1	3	3	452	1
		1	3	1	304	5
Multimedia Center (104)	4	2	4	4	0	5
		2	4	3	452	1
		2	4	1	304	5
Stack Room (105)	5	2	5	4	0	5
		2	5	3	452	1
		2	5	1	304	5

STEP 2: Edit the config.csv as below:

	A	B	C	D	E	F	G	H	I	J
1	#	UseComPort	SlaveModbusID	FunctionCode	RegStartAddr	RegCount	TimeoutEventProcess	PresetValue	GroupName	Description
2	*	1	1	4	0	5	2	65535	101_1	Lobby Data
3	*	1	1	3	452	1	2	65535	101_2	Lobby Offset
4	*	1	1	1	304	5	0	0	101_3	Lobby Alarm
5	*	1	2	4	0	5	2	65535	102_1	JournalR Data
6	*	1	2	3	452	1	2	65535	102_2	JournalR Offset
7	*	1	2	1	304	5	0	0	102_3	JournalR Alarm
8	*	1	3	4	0	5	2	65535	103_1	ReadR Data
9	*	1	3	3	452	1	2	65535	103_2	ReadR Offset
10	*	1	3	1	304	5	0	0	103_3	ReadR Alarm
11	*	2	4	4	0	5	2	65535	104_1	MC Data
12	*	2	4	3	452	1	2	65535	104_2	MC Offset
13	*	2	4	1	304	5	0	0	104_3	MC Alarm
14	*	2	5	4	0	5	2	65535	105_1	StackR Data
		2	5	3	452	1	2	65535	105_2	StackR Offset
		2	5	1	304	5	0	0	105_3	StackR Alarm

config.csv

A unique GroupName for each polling definition

STEP 3: Import the config.csv

STEP 4: Click the tab for a COM port on MODBUS page, and verify the parameters in polling definitions.

Polling definitions for reading data from lobby, journal room, and reading room (on COM1 tab)

RELOAD — 1 - 9 of 9 — 10 ∨ items per page

#	Active	COM Port	Modbus Slave ID	Function Code	Modbus Address	Quantity	Timeout Exception	Preset Value	Group Name	Description
1	Enable	COM1	1	FC04	0	5	Mode3	65535	101_1	Lobby Data
2	Enable	COM1	1	FC03	452	1	Mode3	65535	101_2	Lobby Offset
3	Enable	COM1	1	FC01	304	5	Mode1	0	101_3	Lobby Alarm
4	Enable	COM1	2	FC04	0	5	Mode3	65535	102_1	JournalR Data
5	Enable	COM1	2	FC03	452	1	Mode3	65535	102_2	JournalR Offset
6	Enable	COM1	2	FC01	304	5	Mode1	0	102_3	JournalR Alarm
7	Enable	COM1	3	FC04	0	5	Mode3	65535	103_1	ReadR Data
8	Enable	COM1	3	FC03	452	1	Mode3	65535	103_2	ReadR Offset
9	Enable	COM1	3	FC01	304	5	Mode1	0	103_3	ReadR Alarm

Polling definitions for reading data from multimedia center and stack room (on COM2 tab)

RELOAD — 1 - 6 of 6 — 10 ∨ items per page

#	Active	COM Port	Modbus Slave ID	Function Code	Modbus Address	Quantity	Timeout Exception	Preset Value	Group Name	Description
1	Enable	COM2	4	FC04	0	5	Mode3	65535	104_1	MC Data
2	Enable	COM2	4	FC03	452	1	Mode3	65535	104_2	MC Offset
3	Enable	COM2	4	FC01	304	5	Mode1	0	104_3	MC Alarm
4	Enable	COM2	5	FC04	0	5	Mode3	65535	105_1	StackR Data
5	Enable	COM2	5	FC03	452	1	Mode3	65535	105_2	StackR Offset
6	Enable	COM2	5	FC01	304	5	Mode1	0	105_3	StackR Alarm

STEP 5: Select **MAIN** from the navigation menu, click COM1 and COM2 text to open the list of definitions polled by each COM port. You can get the connection status of each definition, GOOD indicates that the connection is normal

Description

Description can be used to provide site or device information about the definition.
If any connection is abnormal, the information can help users to troubleshoot problems.

2. Reading data from multiple CL-213 devices with one Modbus TCP read command

The addresses marked with a red frame in the picture are the internal register addresses on MDCL for data collected from the five CL-213 devices. The data of temperature, humidity, CO, CO2 and PM2.5 concentration from different CL-213 devices have been arranged in consecutive addresses. Using function code 0x04 to read the data addresses from 30000 to 30024, the remote Modbus master can read data from multiple CL-213 devices with one Modbus TCP read command.

Data Location	Data Address on MDCL	Data Contents
Lobby	300000 ~ 300004	CO, CO2, PM2.5, Temperature, Humidity
Journal Room	300005 ~ 300009	CO, CO2, PM2.5, Temperature, Humidity
Reading Room	300010 ~ 300014	CO, CO2, PM2.5, Temperature, Humidity
Multimedia Center	300015 ~ 300019	CO, CO2, PM2.5, Temperature, Humidity
Stack Room	300020 ~ 300024	CO, CO2, PM2.5, Temperature, Humidity

3. Writing data to MDCL to set the holding register in the CL-213 device with Modbus TCP command

The data of temperature offset written to mapped address 400000 in MDCL with function code 0x06 will be written to the CL-213 in the lobby to change the temperature offset setting in it.

4. Writing data to MDCL to force multiple coils in the CL-213 device with Modbus TCP command

Writing the number 1 to the mapped addresses 000000 to 000004 in MDCL with function code 0x0F is equal to writing 1 to the CL-213 in the lobby to clear high alarm status of temperature, humidity, CO, CO2 and PM2.5 concentration.

5. Reserving register space for devices added in the future

Consider a scenario where iSN-201-E modules for monitoring indoor illumination need be added after this application has been running for a while. We added polling definitions for collecting the illumination values in each room in the config.csv file and imported it.

iSN-201-E

Room	Model Number	MDCL COM#	Modbus ID	Function Code	Start Address	Quantity
Lobby (101)	CL-213	1	1	4	0	5
		1	1	3	452	1
		1	1	1	304	5
	iSN-201-E	1	6	4	5	1
Journal Room (102)	CL-213	1	2	4	0	5
		1	2	3	452	1
		1	2	1	304	5
	iSN-201-E	1	7	4	5	1
Reading Room (103)	CL-213	1	3	4	0	5
		1	3	3	452	1
		1	3	1	304	5
	iSN-201-E	1	8	4	5	1
Multimedia Center (104)	CL-213	2	4	4	0	5
		2	4	3	452	1
		2	4	1	304	5
	iSN-201-E	2	9	4	5	1
Stack Room (105)	CL-213	2	5	4	0	5
		2	5	3	452	1
		2	5	1	304	5
	iSN-201-E	2	10	4	5	1

	A	B	C	D	E	F	G	H	I	J
1	#	UseComPort	SlaveModbusID	FunctionCode	RegStartAddr	RegCount	TimeoutEventProcess	PresetValue	GroupName	Description
2	*	1	1	4	0	5	2	65535	101_1	Lobby Data
3	*	1	1	3	452	1	2	65535	101_2	Lobby Offset
4	*	1	1	1	304	5	0	0	101_3	Lobby Alarm
5	*	1	2	4	0	5	2	65535	102_1	JournalR Data
6	*	1	2	3	452	1	2	65535	102_2	JournalR Offset
7	*	1	2	1	304	5	0	0	102_3	JournalR Alarm
8	*	1	3	4	0	5	2	65535	103_1	ReadR Data
9	*	1	3	3	452	1	2	65535	103_2	ReadR Offset
10	*	1	3	1	304	5	0	0	103_3	ReadR Alarm
11	*	2	4	4	0	5	2	65535	104_1	MC Data
12	*	2	4	3	452	1	2	65535	104_2	MC Offset
13	*	2	4	1	304	5	0	0	104_3	MC Alarm
14	*	2	5	4	0	5	2	65535	105_1	StackR Data
15	*	2	5	3	452	1	2	65535	105_2	StackR Offset
16	*	2	5	1	304	5	0	0	105_3	StackR Alarm
17	*	1	6	4	5	1	2	65535	101_4	Lobby Illum
18	*	1	7	4	5	1	2	65535	102_4	JournalR Illum
19	*	1	8	4	5	1	2	65535	103_4	ReadR Illum
20	*	2	9	4	5	1	2	65535	104_4	MC Illum
21	*	2	10	4	5	1	2	65535	105_4	StackR Illum

Polling definitions for reading indoor illumination

Function Code	Register	Data	Unit
0x04 (Read AI)	300005	Ambient light	1lux

The registers mapped for reading CO, CO2, PM2.5, temperature and humidity in multimedia center and stack room are changed from 3000015 ~ 300024 to 300018 ~ 300027, because the register address mapped to read illumination of iSN-201-E connected to COM1 will be ranked before the registers mapped for devices connected to COM2.

Data Location	Data Address on MDCL	Data Contents
Lobby	300000 ~ 300004	CO, CO2, PM2.5, Temperature, Humidity
Journal Room	300005 ~ 300009	CO, CO2, PM2.5, Temperature, Humidity
Reading Room	300010 ~ 300014	CO, CO2, PM2.5, Temperature, Humidity
Lobby	300315	Illumination
Journal Room	300316	Illumination
Reading Room	300317	Illumination
Multimedia Center	300018 ~ 300022	CO, CO2, PM2.5, Temperature, Humidity
Stack Room	300023 ~ 300027	CO, CO2, PM2.5, Temperature, Humidity
Multimedia Center	300328	Illumination
Stack Room	300329	Illumination

Usually, we don't want to modify Modbus master programs with regard to accessing registers allocated for deployed devices every time we add a new device, so we can reserve register spaces for devices used in the future.

Previous local registers allocation

Scan sequence – COM1

Read AI from 300000 to 300004   of CL-213 #1

Read AI from 300000 to 300004   of CL-213 #2

Read AI from 300000 to 300004   of CL-213 #3

Scan sequence – COM2

Read AI from 300000 to 300004   of CL-213 #4

Read AI from 300000 to 300004   of CL-213 #5

Read AI

300000: 300004

300005: 300009

300010: 300014

300015: 300019

300020: 300024
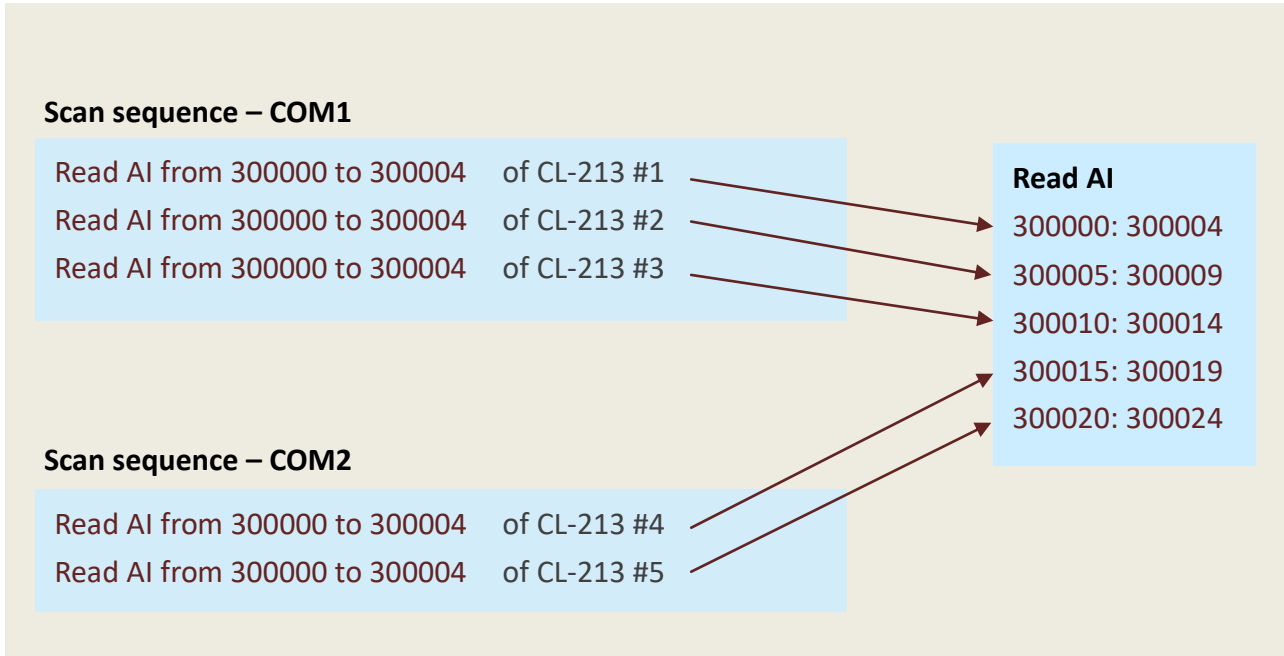
New local registers allocation of adding an iSN-201-E device in every room

Scan sequence – COM1

Read AI from 300000 to 300004   of CL-213 #1

Read AI from 300000 to 300004   of CL-213 #2

Read AI from 300000 to 300004   of CL-213 #3

Read AI from 300005   of iSN-201-E #1

Read AI from 300005   of iSN-201-E #2

Read AI from 300005   of iSN-201-E #3

Scan sequence – COM2

Read AI from 300000 to 300004   of CL-213 #4

Read AI from 300000 to 300004   of CL-213 #5

Read AI from 300005   of iSN-201-E #4

Read AI from 300005   of iSN-201-E #5

Read AI

300000: 300004

300005: 300009

300010: 300014

300015

300016

300017

300018: 300022

300023: 300027

300028

300029

For example, we can add definition to reserve the first 100 local registers (300000 to 300099) for COM1, the second 100 registers (300100 to 300199) for COM2 and so on.

Previous local registers allocation with reserved registers

Scan sequence – COM1

		Read AI
Read AI from 300000 to 300004	of CL-213 #1	300000: 300004
Read AI from 300000 to 300004	of CL-213 #2	300005: 300009
Read AI from 300000 to 300004	of CL-213 #3	300010: 300014
Read AI from 300015 to 300099	Definition for reserved register space	300015 ≀ 300099

Scan sequence – COM2

		300100: 300104
Read AI from 300000 to 300004	of CL-213 #4	300105: 300109
Read AI from 300000 to 300004	of CL-213 #5	300110 ≀ 300199
Read AI from 300110 to 300199	Definition for reserved register space	

New local registers allocation of adding iSN-201-E devices with reserved registers

Scan sequence – COM1

		Read AI
Read AI from 300000 to 300004	of CL-213 #1	300000: 300004
Read AI from 300000 to 300004	of CL-213 #2	300005: 300009
Read AI from 300000 to 300004	of CL-213 #3	300010: 300014
Read AI from 300005	of iSN-201-E #1	300015
Read AI from 300005	of iSN-201-E #2	300016
Read AI from 300005	of iSN-201-E #3	300017
Read AI from 300018 to 300099	Definition for reserved register space	300018 ≀ 300099

Scan sequence – COM2

		300100: 300104
Read AI from 300000 to 300004	of CL-213 #4	300105: 300109
Read AI from 300000 to 300004	of CL-213 #5	300110
Read AI from 300005	of iSN-201-E #4	300111
Read AI from 300005	of iSN-201-E #5	300112 ≀ 300199
Read AI from 300112 to 300199	Definition for reserved register space	

For the reason that the maximum numbers of registers that one definition can access is 125, use multiple definitions to reserve a larger register space if needed.

Reserve enough register space in the first stage

Add reserve definitions with minus sign in the first field, COM port and the amount of reserved registers, the MDCL will assign local registers for data defined in the definition but not poll data. (Refer to sec. 6.2)

7	*	1	2	1	304	5	0	0	102_3	JournalR Alarm
8	*	1	3	4	0	5	2	65535	103_1	ReadR Data
9	*	1	3	3	452	1	2	65535	103_2	ReadR Offset
10	*	1	3	1	304	5	0	0	103_3	ReadR Alarm
11	*	2	4	4	0	5	2	65535	104_1	MC Data
12	*	2	4	3	452	1	2	65535	104_2	MC Offset
13	*	2	4	1	304	5	0	0	104_3	MC Alarm
14	*							65535	105_1	StackR Data
15	*							65535	105_2	StackR Offset
16	*	2	5	1	304	5	0	0	105_3	StackR Alarm
17	*	3	1	4	0	5	2	65535	106_1	test
18	-	1	1	4	15	85	0	0	Reserve COM1	Reserve COM1
19	-	2	1	4	110	90	0	0	Reserve COM2	Reserve COM2

Specifies COM port for which the space is reserved.

Minus sign

Specifies the amount of reserved registers

Use the reserved registers in subsequent applications

Edit new polling definitions for reading data from newly added devices, and subtract the total number of registers used in these definitions from the number of previous reserved registers.

9	*	1	3	3	452	1	2	65535	103_2	ReadR Offset
10	*	1	3	1	304	5	0	0	103_3	ReadR Alarm
11	*	2	4	4	0	5	2	65535	104_1	MC Data
12	*	2	4	3	452	1	2	65535	104_2	MC Offset
13	*								104_3	MC Alarm
14	*								105_1	StackR Data
15	*	2	5	3	452	1	2	65535	105_2	StackR Offset
16	*	2	5	1	304	5	0	0	105_3	StackR Alarm
17	*	1	6	4	5	1	2	65535	101_4	Lobby Illum
18	*	1	7	4	5	1	2	65535	102_4	JournalR Illum
19	*	1	8	4	5	1	2	65535	103_4	ReadR Illum
20	*	2	9	4	5	1	2	65535	104_4	MC Illum
21	*	2	10	4	5	1	2	65535	105_4	StackR Illum
22	-	1	1	4	18	82	0	0	Reserve COM1	Reserve COM1
23	-	2	1	4	112	88	0	0	Reserve COM2	Reserve COM2

Adds polling definitions for reading data from newly added iSN-201-E

Adjusts the value for keeping a fixed number of registers of a COM port

7. Data Logger Configuration (record.csv)

The data logger function on the MDCL-705i can record data from up to 120 channels simultaneously, it supports various types of data, including integer, float and Boolean. Users can choose to store raw data collected from Modbus slave devices, or store physical quantities converted with user-defined scaling parameters. The data log files are stored in microSD card with .csv format. The csv log files can be quickly imported into Excel or other analysis tools for further analysis.

The data logger configuration is divided into two parts: logging time settings and logging channel settings. Logging time settings are configured from the web interface, and the logging channel settings are stored in the record.csv file. The record.csv can be viewed and edited in spreadsheet applications like Microsoft Excel, or in any text editor, in which the comma character (,) typically separates each field of text.

	A	B	C	D	E	F	G	H	I
1	#	GroupName	IndexAddr	DataType	Scale	Offset	Unit	Prefix	Alias
2	*	103_01	0	2	1	0	ppm	ReadR_L	CO
3	*	103_01	1	2	1	0	ppm	ReadR_L	CO2
4	*	103_01	2	2	1	0	ug/m3	ReadR_L	PM2.5
5	*	103_01	3	2	0.01	0	%	ReadR_L	R.H.
6	*	103_01	4	1	0.01	0	˚C	ReadR_L	Temp
7	*	103_03	0	0	1	0		ReadR_L	HA_CO
8	*	103_03	1	0	1	0		ReadR_L	HA_CO2
9	*	103_03	2	0	1	0		ReadR_L	HA_PM2.5
10	*	103_03	3	0	1	0		ReadR_L	HA_R.H.

The file name record.csv cannot be changed, and the name and order of parameters in each line for a logging channel cannot be changed, too. To avoid errors caused by manual editing, you can export the record.csv file from DATA LOGGER page and modify it to meet your requirements.

7.1. Logging Interval Configuration

In order to meet the different requirements of various application scenarios, MDCL-705i supports data logging time interval from 5 seconds to 6 hours, and the maximum storage time for log files from 1 to 24 hours. According to the value specified for the **Maximum Logging Period** parameter, the MDCL-705i will closes the logging file in use and create a new file to store new data at every interval on the hour starting at midnight. For example, if the Maximum Logging Period parameter is set to 6 hours, the MDCL-705i will create a new file at 0:00:00, 6:00:00, 12:00:00 and 18:00:00 of a day. The first file may be less than 6 hours, and the subsequent files will log six hours of data except when the logging process is stopped. Logging Active is set to disable. This design can help users to compare and analyze data from multiple modules more quickly.

Logging Interval Configuration

STEP 1: Scroll down the DATA LOGGER page to the Configuration section.

STEP 2: Fill the fields as required

STEP 3: Click **SAVE**.

| Items	Description	Type
Logging Active	● Enable: Enables data logging function. ● Disable: Disables data logging function.	Required
Logging Rate	Defines recording interval time. Data is recorded periodically at the specified interval. Available setting: 5s, 10s, 30s, 1m, 5m, 10m, 15m, 30m, 1h, 6h	Required
Maximum Logging Period	Defines the maximum logging period of log files. Log files will be created at every interval on the hour, beginning at midnight. Available setting: 1h, 2h, 6h, 12h, 24h	Required
Data Log Overwrite	Defines the action when log space becomes full ● Stop logging when memory is full: only this mode is supported now	Required
Automatic File Update	Enable/Disable the schedule for uploading log files to the FTP server at regular intervals. Refer to sec.4.4 FTP Server Configuration for setting the FTP server. (Not Available)	Required

Save new changes

Click **SAVE** to save new changes, a pop-up message opens for users to restart the module now or later.

● **Restart Now**: restart the modules immediately to take the changes in effect
● **Restart Later**: restart the modules later.
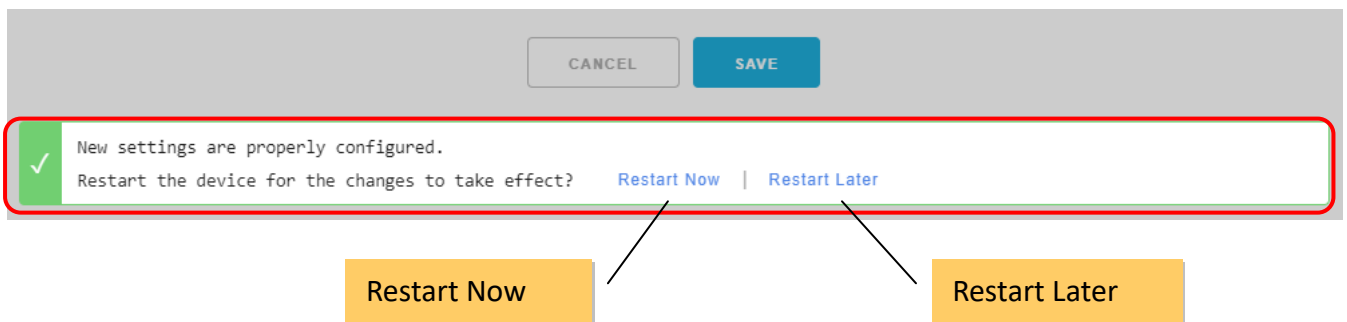
Restart later

If you click Restart Later, an icon with label **RESTART** will be added on the status bar for restart the module later. You can restart the module when your settings were completed.
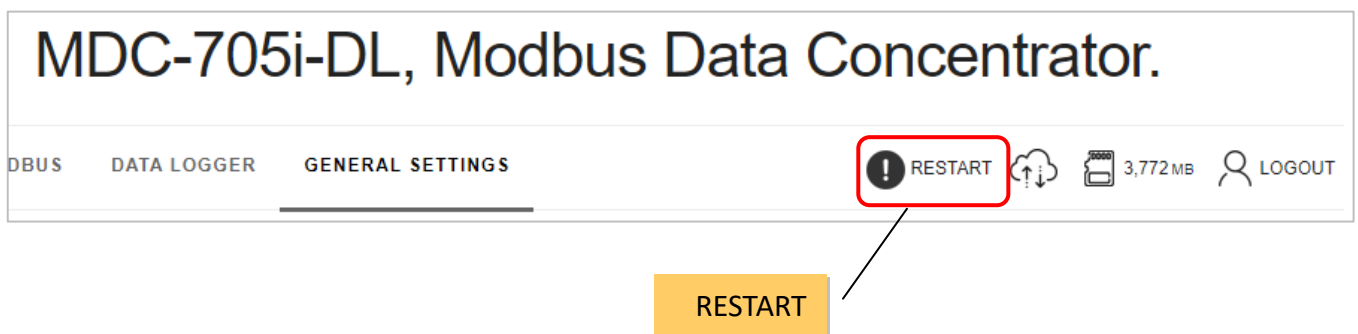
7.2. Exporting/Importing the Record.csv File

The data log function on the MDCL-705i can record up to 120 channels of data simultaneously, it supports various types of data, including integer, float and Boolean. You can choose to record the raw data collected from each device, or let the MDCL-705i convert the raw data into desired physical value and save it. The data log file is in CSV format for further analysis using Excel or other data analysis tools.

The data log files are saved in microSD card, you can copy files from microSD card to local computer, download them from the web interface or set to send log files to remote FTP server regularly.

The name of the file **record.csv** used to store log channel information cannot be changed, and the name and order of parameters in each line for a log channel cannot be changed, too. To avoid errors caused by manual editing, you can export the record.csv file from **DATA LOGGER** page and modify it to meet your requirements.

Export record.csv

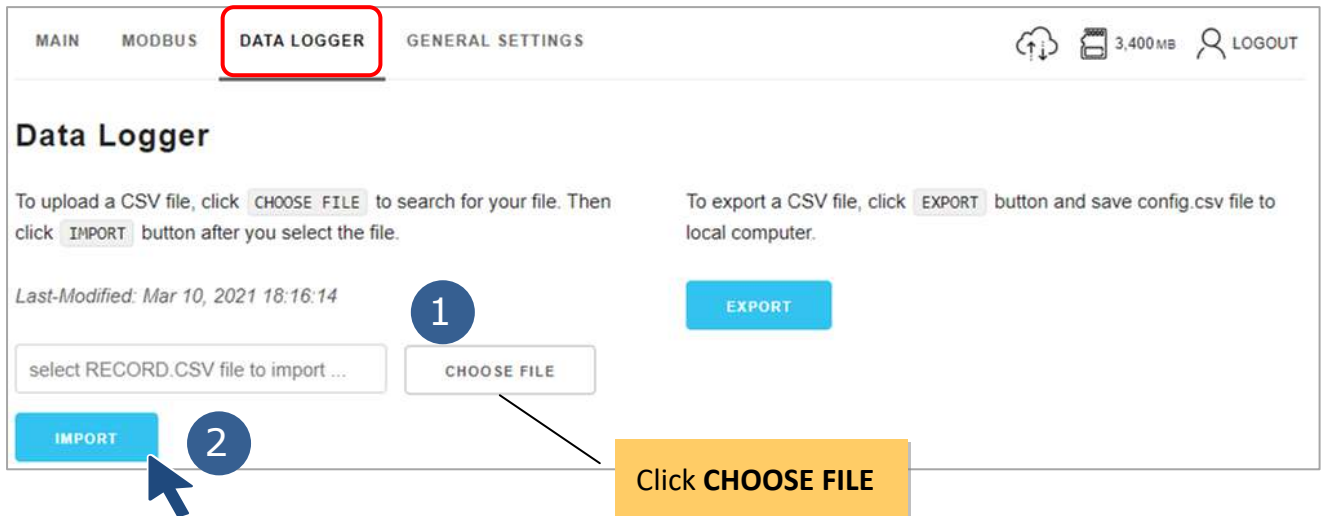STEP 1: Click **EXPORT** on DATA LOGGER page.

STEP 2: Obtain the file from the download directory configured in the web browser.
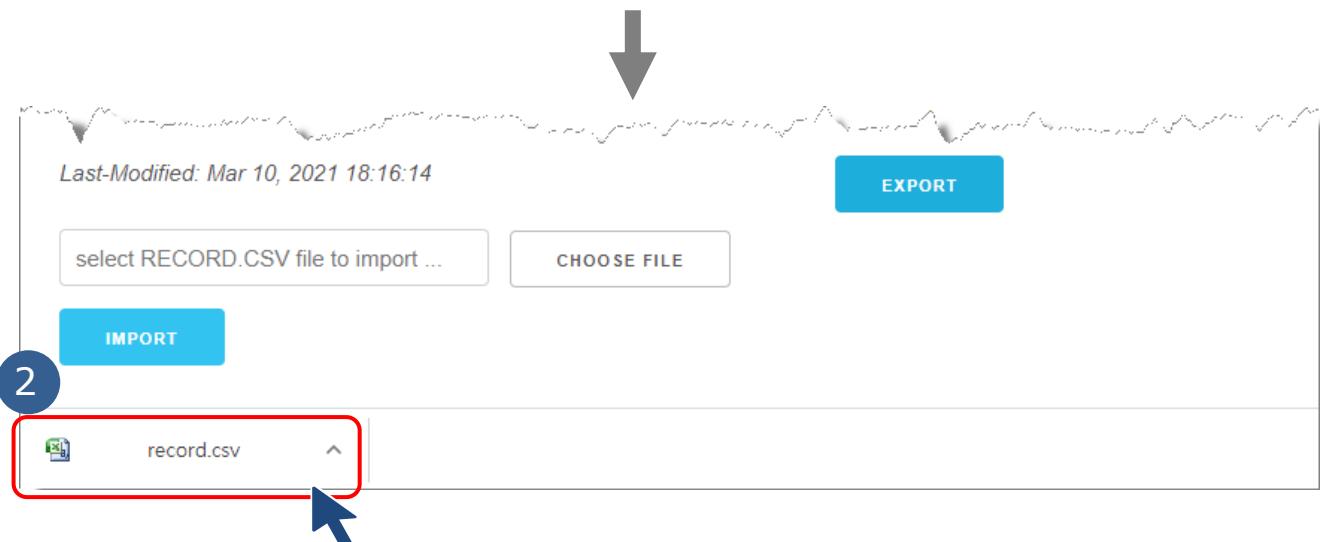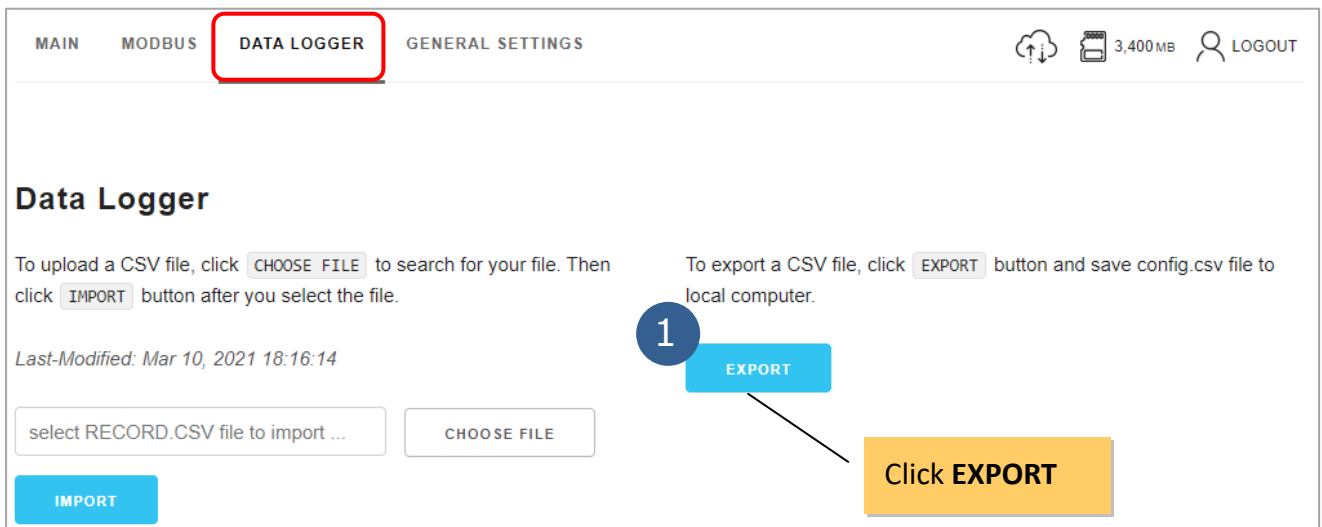
Import record.csv

STEP 1: Click **CHOOSE FILE** on DATA LOGGER page and then select your record.csv file.
STEP 2: Click **IMPORT**.

Click **CHOOSE FILE**

MDCL can help users to validate the imported file and present the result as success or error message with line and position information of invalid settings as shown below. A channel will not be recorded if any of its setting is invalid.

Success message
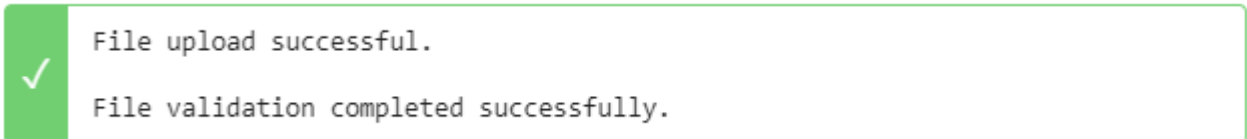
Error message (A channel with invalid setting will not be recorded.)

Invalid value: out of range

Invalid setting: reserved character "-" is used
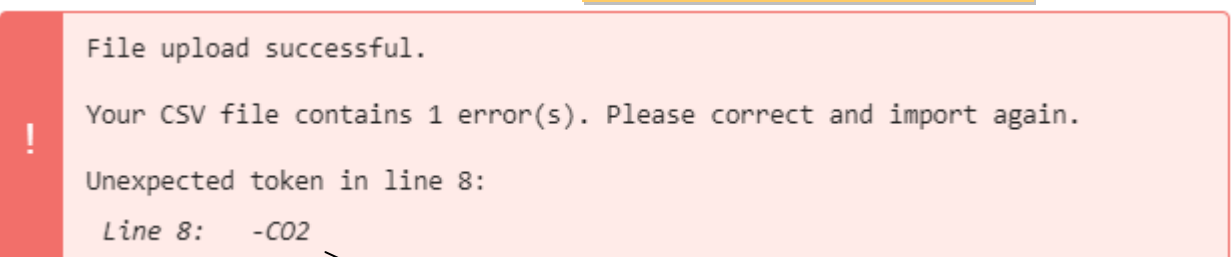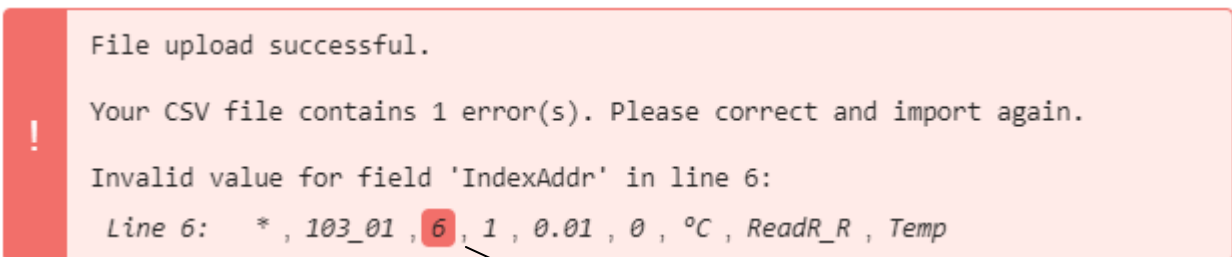
7.3. Logging Channels Configuration (Record.csv)

Data from up to 120 channels can be logged by the MDCL with timestamp and user-defined scaling. The configuration parameters for log channels are saved in record.csv file.

Before start to configure parameters for log channels, be sure to confirm the data type, the GroupName set in the config.csv file of a channel and the index address (starting from 0) in its group.

	A	B	C	D	E	F	G	H	I
1	#	GroupName	IndexAddr	DataType	Scale	Offset	Unit	Prefix	Alias
2	*	103_01	0	2	1	0	ppm	ReadR_L	CO
3	*	103_01	1	2	1	0	ppm	ReadR_L	CO2
4	*	103_01	2	2	1	0	ug/m3	ReadR_L	PM2.5
5	*	103_01	3	2	0.01	0	%	ReadR_L	R.H.
6	*	103_01	4	1	0.01	0	˚C	ReadR_L	Temp
7	*	103_03	0	0	1	0		ReadR_L	HA_CO
8	*	103_03	1	0	1	0		ReadR_L	HA_CO2
9	*	103_03	2	0	1	0		ReadR_L	HA_PM2.5
10	*	103_03	3	0	1	0		ReadR_L	HA_R.H.

The file name **record.csv** cannot be changed, and the name and order of parameters cannot be changed, too. Each line defines a set of log parameters for one log channel, and up to 120 channels can be configured in the record.csv file.

NOTE:

- The characters "-", "*", "~" and "#" are reserved and cannot be used in text field including the **GroupName**, **Unit**, **Prefix** and **Alias** fields

Description of parameters for a log channel:

Items	Description	Type
#	Defines the active type for a log channel: ● "*": The asterisk symbol denotes that the data logging function of the specified channel is enabled. ● "~": The swung dash symbol denotes that the data logging function of the specified channel is disabled. ● "": A blank field denotes that the log channel is unused. When this field is left blank, the specified channel is not included in the limit of 120 channels and will not be saved in the MDCL module; it can be used store configuration of a temporarily unused channel.	Required
GruopName (*1)	The GroupName entered here must be in line with the GroupName used in config.csv for the specified channel. If not, the setting becomes invalid and the data on this channel will not be recorded.	Required
IndexAddr	The index address in its group starting from 0.	Required
DataType	The MDCL supports a variety of data types as follows. The data type must be exactly the same as the definition of the channel on the slave device. 16-bit data and 32-bit data use a different number of registers. When setting the **IndexAddr** parameter, pay attention to the interval of each type of data. 	No.	Data Type	Register
0	Boolean	1
1	16-bit Signed Integer	1
2	16-bit Unsigned Integer	1
3	16-bit Integer in Hex	1
4	32-bit Signed Integer	2
20	32-bit Signed Integer Swapped	2
5	32-bit Unsigned Integer	2
21	32-bit Unsigned Integer Swapped	2
7	32-bit Floating	2
23	32-bit Floating Swapped	2		Required

Scale	Defines the slope of the formula for converting raw data into physical quantities. This should be set as a positive value. Default value: 1 Available range: up to 10 digits (including decimal point)	Optional
Offset	Defines the offset of the formula for converting raw data into physical quantities. Default value: 0 Available range: up to 10 digits (including decimal point and negative sign)	Optional
Unit (*1)	Defines the unit of the channel data Available range: up to 8 ASCII characters	Optional
Prefix (*1)	Defines the prefix of the channel name in the log file. The name of a channel in log files consists of the text in the **Prefix** and **Alias** fields. Prefix can be used to note the location or device name where the measurement is taken. Available range: up to 16 ASCII characters	Required
Alias (*1)	Defines the alias of the channel name in the log file. The name of a channel in log files consists of the text in the **Prefix** and **Alias** fields. Alias can be used to note the measurement target. Available range: up to 16 ASCII characters	Required

NOTE:

1. The characters "-", "", "~" and "#" are reserved and cannot be used in text field including the **GroupName**, **Unit**, **Prefix** and **Alias** fields

GroupName

The GroupName for a channel must contain the exact text (case-sensitive) you enter for the polling definition that the channel included in the config.csv file.

config.csv

	A	B	C	D	E	F	G	H	I	J
1	#	UseComPort	SlaveModbusID	FunctionCode	RegStartAddr	RegCount	TimeoutEventProcess	PresetValue	GroupName	Description
2	*	1	1	3	0	1	2	0	COM1_0000	COM1_01_FC03_000
3	*	1	1	3	1	2	2	0	COM1_0001	COM1_01_FC03_001
4	*	1	1	3	3	4	2	0	COM1_0002	COM1_01_FC03_003
5	*	1	1	3	7	8	2	0	COM1_0003	COM1_01_FC03_007
6	*	1	1	3	15	16	2	0	COM1_0004	COM1_01_FC03_015
7	*	1	1	3	31	32	2	0	COM1_0005	COM1_01_FC03_031
8	*	1	1	3	63	64	2	0	COM1_0006	COM1_01_FC03_063

record.csv

	A	B	C	D	E	F	G	H	I
1	#	GroupName	IndexAddr	DataType	Scale	Offset	Unit	Prefix	Alias
2	*	COM1_0000	0	3	10	4	ppm	COM1_0000	FC03_000_01
3	*	COM1_0001	0	1	1	0	ppm	COM1_0001	FC03_001_01
4	*	COM1_0001	1	2	0.001	1	ug/m3	COM1_0001	FC03_001_02
5	*	COM1_0002	0	4	1	5	%	COM1_0002	FC03_003_01
6	*	COM1_0002	2	20	1	0		COM1_0002	FC03_003_02

Data Type

32-bit integer and floating-point data uses two registers, as well we 16-bit integer data uses one register. When setting the ModbusAddr, the corresponding address interval must be reserved according to the number of registers used by the data type of the specified channel.

Setting Number	Data Type	Register Count	Available Range
0	Boolean	1	0,1
1	16-bit Signed Integer	1	-32,768 to 32,767
2	16-bit Unsigned Integer	1	0 to 65,535
3	16-bit Integer in Hex	1	0000 to FFFF
4	32-bit Signed Integer	2	−2,147,483,648 to 2,147,483,647
20	32-bit Signed Integer, Swapped	2	−2,147,483,648 to 2,147,483,647
5	32-bit Unsigned Integer	2	0 to 4,294,967,295
21	32-bit Unsigned Integer, Swapped	2	0 to 4,294,967,295
7	32-bit Floating	2	-3.402E+38 to +3.402E+38
23	32-bit Floating, Swapped	2	-3.402E+38 to +3.402E+38

Scale and Offset (User-Defined Scaling)

User-Defined Scaling in the MDCL is provided for converting Modbus readings to physical values such as temperature, pressure, flow, acceleration, and position. It is useful for users to recode, analyze and present data with engineering units. Scaling can be accomplished by applying scale factor (slope) and offset (y intercept) for one channel in record.csv.

The following formula is used to calculate scaling:

Actual value = Modbus Reading * Scale +Offset

The scale (slope) is the rise over the run; that is, how much the line rises vertically compared with how much it runs horizontally. Here we use two given points to calculate the slope and offset.

Example 1: Converting reading of K type thermocouple from the M-7018 into degrees Celsius

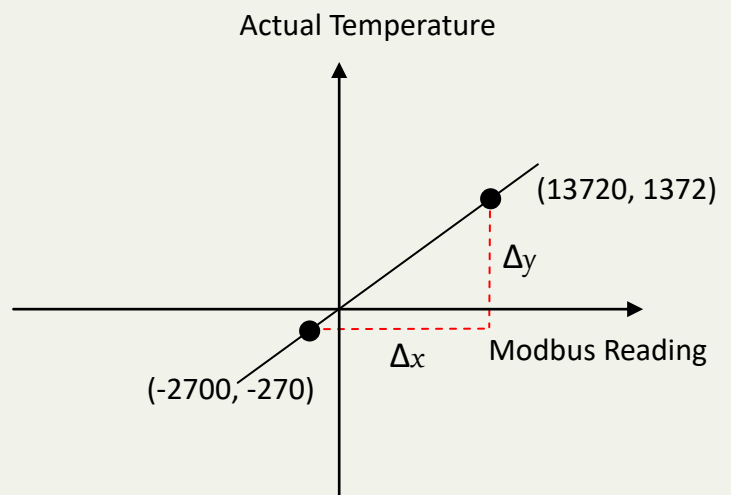Input type: K type thermocouple (0F)
Data Format

	Modbus Reading	Actual Temperature
High	13720	1372°C
Low	-2700	-270°C

$$\text{Scale} = \frac{\Delta y}{\Delta x} = \frac{(y2-y1)}{(x2-x1)} = \frac{(\text{Actual}_{High} - \text{Actual}_{Low})}{(\text{Reading}_{High} - \text{Reading}_{Low})}$$

$$= \frac{1372 - (-270)}{13720 - (-2700)}$$

$$= 0.1$$

Offset = Actual value - Modbus Reading * Scale
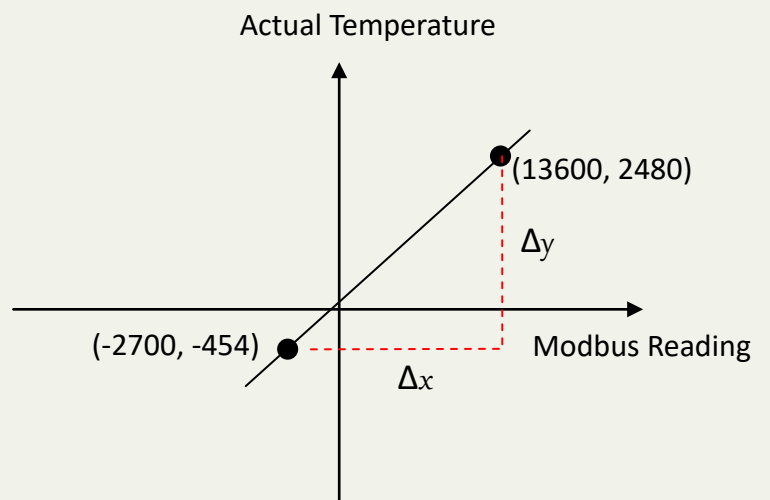
$$= 1372 - (13720 * 0.1)$$

$$= 0$$

Example 2: Converting reading of K type thermocouple from the M-7018 into degrees Fahrenheit

Input type: K type thermocouple (0F)

Data Format

	Modbus Reading	Actual Temperature	Actual Temperature
High	13600	2480°F	1360°C
Low	-2700	-454°F	-260°C

$$\text{Scale} = \frac{\Delta y}{\Delta x} = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{(\text{Actual}_{High} - \text{Actual}_{Low})}{(\text{Reading}_{High} - \text{Reading}_{Low})}$$

$$= \frac{2480 - (-454)}{13600 - (-2700)}$$

$$= 0.18$$

Offset = Actual value – Modbus Reading * Scale

$$= 2480 - (13600 * 0.18)$$

$$= 32$$

Example 3: Converting reading of 4-20mA pressure transmitters from the M-7018
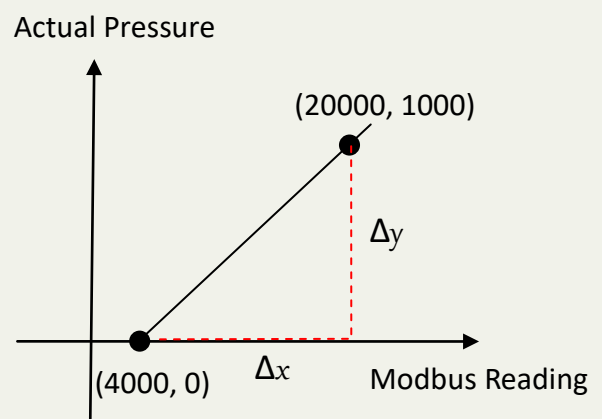Input type: +4 mA ~ +20 mA (07)
Data Format

	Modbus Reading	Corresponding current	Actual Pressure
High	20000	+20 mA	1000 bar
Low	4000	+4 mA	0 bar

$$\text{Scale} = \frac{\Delta y}{\Delta x} = \frac{(y2 - y1)}{(x2 - x1)} = \frac{(\text{Actual}_{High} - \text{Actual}_{Low})}{(\text{Reading}_{High} - \text{Reading}_{Low})}$$

$$= \frac{1000 - 0}{20000 - 4000}$$

$$= 0.0625$$

Offset = Actual value – Modbus Reading * Scale

$$= 1000 - (20000 * 0.0625)$$

$$= -250$$

Prefix and Alias

The text set for Prefix and Alias may be up to 16 ASCII characters including numeric(0-9) and alphabetic(case-sensitive) or a combination of these, except the reserved characters "-", "*", "~" and "#". The name of a channel in log files consists of Prefix and Alias. Prefix can be used to note the location or device name where the measurement is taken, and Alias can be used to note the measurement target.

record.csv

	A	B	C	D	E	F	G	H	I
1	#	GroupName	IndexAddr	DataType	Scale	Offset	Unit	Prefix	Alias
2	*	COM1_0000	0	3	10	4	ppm	COM1_0000	FC03_000_01
3	*	COM1_0001	0	1	1	0	ppm	COM1_0001	FC03_001_01
4	*	COM1_0001	1	2	0.001	1	ug/m3	COM1_0001	FC03_001_02
5	*	COM1_0002	0	4	1	5	%	COM1_0002	FC03_003_01
6	*	COM1_0002	2	20	1	0		COM1_0002	FC03_003_02

COM1_0000.FC03_000_01

Log file

	A	B	C	D
1	ver1.0	10.1.112.10	00:0D:E0:75:86:00	MDCL-705i
2		UINT16[3]	UINT16[1]	UINT16[2]
3		ppm	ppm	ug/m3
4	DATETIME	COM1_0000.FC03_000_01	COM1_0000.FC03_001_01	COM1_0000.FC03_001_02
5	2021/3/16 14:00:00	0	65535	1
6	2021/3/16 14:00:05	0	65534	1
7	2021/3/16 14:00:10	0	65535	1
8	2021/3/16 14:00:15	0	65535	1
9	2021/3/16 14:00:20	0	65535	1
10	2021/3/16 14:00:25	0	65535	1

7.4. Viewing Log Channel Settings

After the record.csv file is imported, the valid log channel settings will be listed below the log properties configuration section.

STEP 1: Scroll down the **DATA LOGGER** page to see the log channel list.

STEP 2: Check that all channels are correctly set up.

Logging Active			
Enable			

Logging Rate	Maximum Logging Period		Data Log Overwrite
10 Seconds	Log to a new file after every	6 Hours	Stop logging when memory is full

Automatic File Upload

Do Not Upload File   Set up the configuration for FTP server

Reload list   Select how many items per page

RELOAD   1 - 5 of 5   10 ∨ items per page

#	Active	Group Name	Index Address	Data Type	Scale	Offset	Unit	Prefix	Alias
1	Enable	COM1_0000	0	16-bit Integer in Hex	10	4	ppm	COM1_0000	FC03_000_01
2	Enable	COM1_0001	0	16-bit Signed Integer	1	0	ppm	COM1_0001	FC03_001_01
3	Enable	COM1_0001	1	16-bit Unsigned Integer	0.001	1	ug/m3	COM1_0001	FC03_001_02
4	Enable	COM1_0002	0	32-bit Signed Integer	1	5	%	COM1_0002	FC03_003_01
5	Enable	COM1_0002	2	32-bit Signed Integer Swap	1	0		COM1_0002	FC03_003_02

Log channel settings list
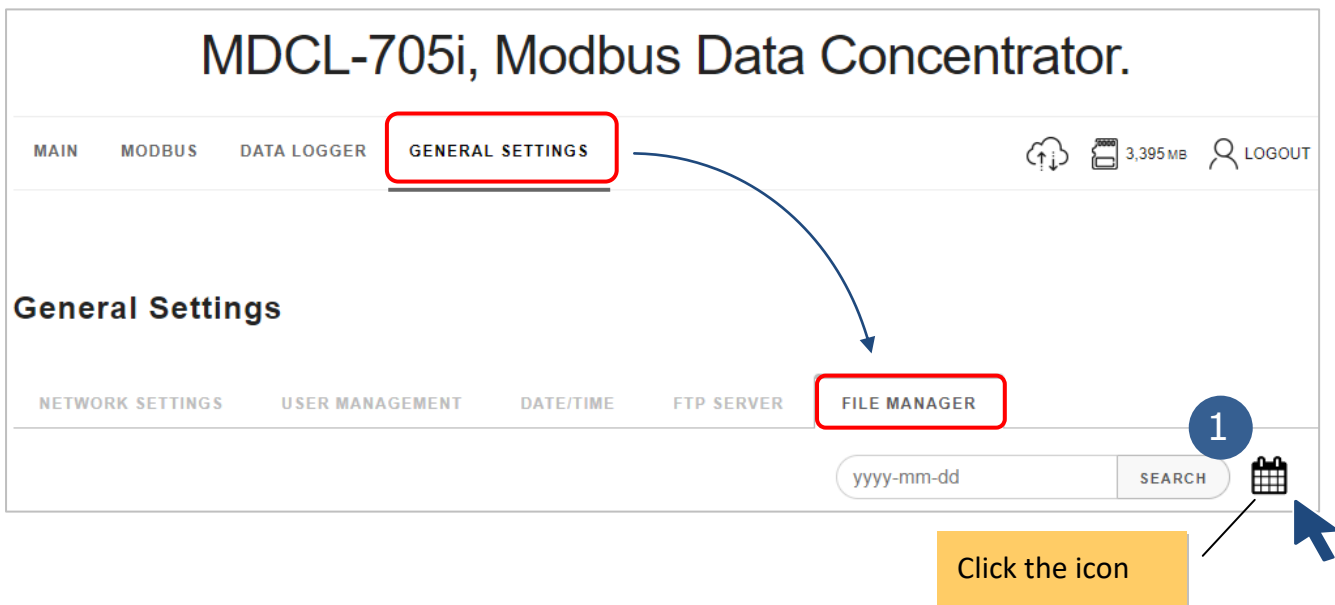
7.5. Downloading Log Files

Log files in MDCL are saved in comma separated values (CSV) format, which can be imported into Excel for further analysis. The log file name consists of prefix "T_" and creation date and time in mmddhh format.

If **Maximum Logging Period** is set to 6 hours, the MDCL will close the current file and create a new file every 6 hours on the hour starting at midnight (0:00:00, 6:00:00, 12:00:00, 18:00:00). The time for the first file to record data may be less than 6 hours. This design can help users compare and analyze data from multiple modules more quickly.
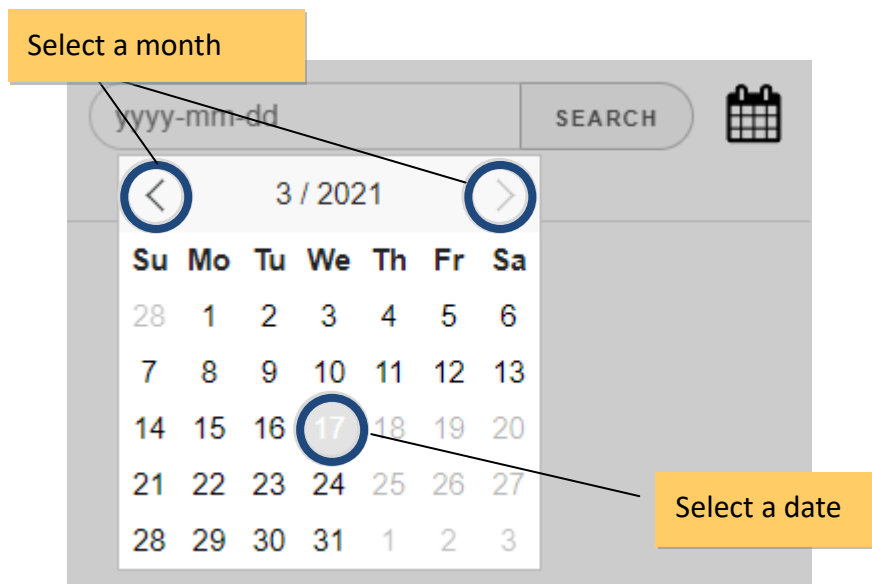
MDCL will automatically restart itself and adopt new settings for log channels while a new record.csv is imported successfully. And new data will be appended to the logging file without modifying the previous header content. At this time, you have to modify the header content and remove data recorded before the point in time when the record.csv file is imported in the first log file.

Download log file

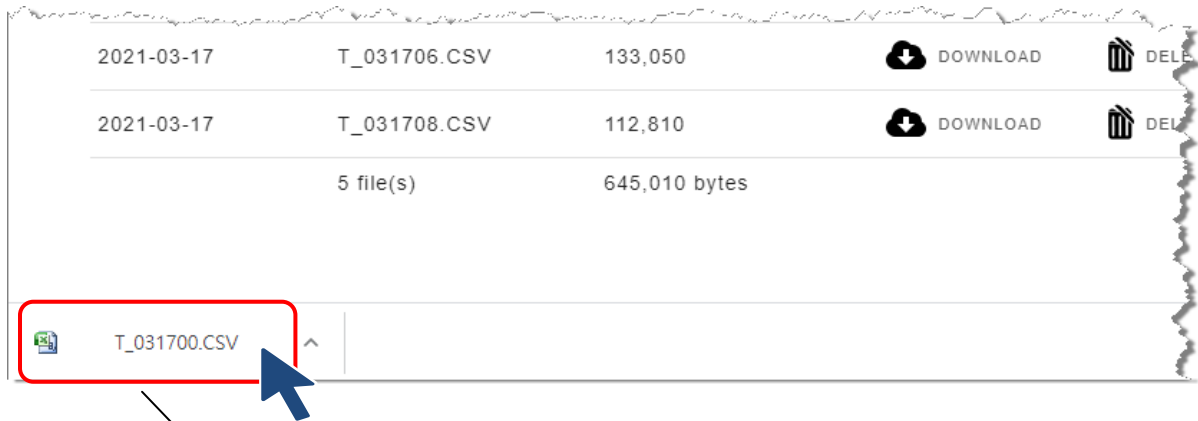STEP 1**:** Click **FILE MANAGER** on GENERAL SETTINGS page and click on the calendar icon.

STEP 2: Select the date of the log files and click **SEARCH**.

Select a month

3 / 2021

Su	Mo	Tu	We	Th	Fr	Sa
28	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3

Select a date

2021-3-17   SEARCH

2

STEP 3: Click the DOWNLOAD icon for a file to download it.

NETWORK SETTINGS	USER MANAGEMENT	DATE/TIME	FTP SERVER	FILE MANAGER	

2021-3-17   SEARCH

Date Created	Name	Size		
2021-03-17	T_031700.CSV	133,050	☁ DOWNLOAD	🗑 DELETE
2021-03-17	T_031702.CSV	133,050	☁ DOWNLOAD	🗑 DELETE
2021-03-17	T_031704.CSV	133,050	☁ DOWNLOAD	🗑 DELETE
2021-03-17	T_031706.CSV	133,050	☁ DOWNLOAD	🗑 DELETE
2021-03-17	T_031708.CSV	112,810	☁ DOWNLOAD	🗑 DELETE
	5 file(s)	645,010 bytes		

STEP 4: Get the file in the default download directory of web browser. Downloading the data does not delete it from the MDCL.

File name T_031700 created at 00:00:00, on March 17th.

Each MDCL log file consists of a file header and log entries as shown below. The first 4 lines are header information including the MDCL firmware version, IP address, MAC address module name, and data type, unit and name for each channel. After that are logged entries with timestamps.

Delete file

STEP 1: Click the **DELETE** icon for a file to delete it.

STEP 2: Click **DELETE** on pop-up message.

7.6. Application

Environmental monitoring and logging in a community library

The following section will introduce the steps for logging data collected in the environmental monitoring application in section 6.4.
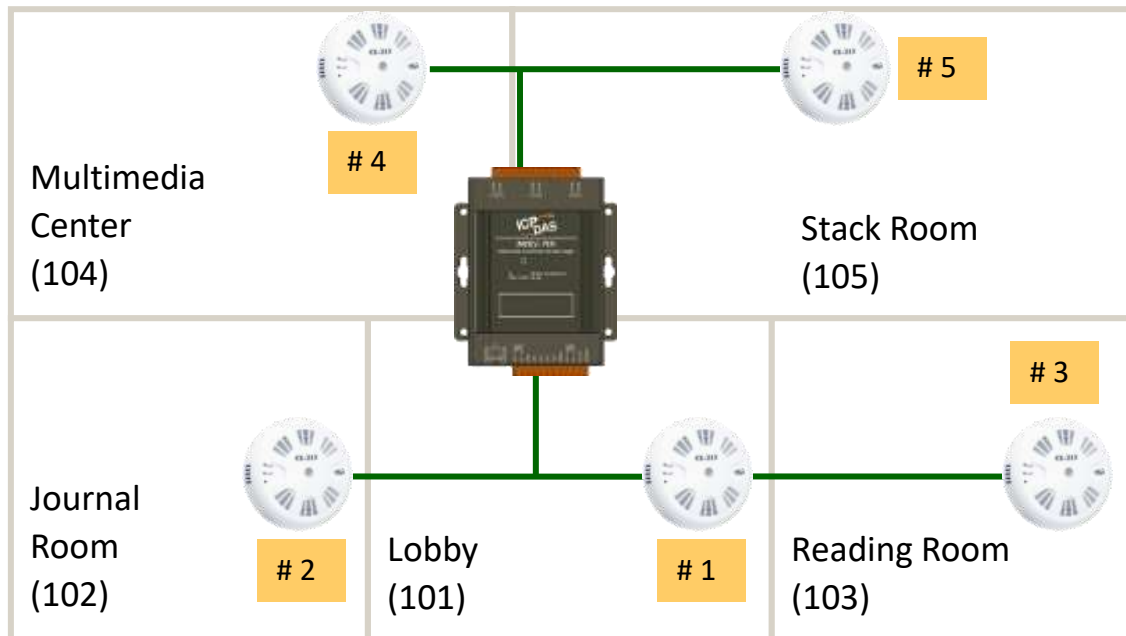
1. Configuring log channel (record.csv)

The following table shows polling definitions for reading temperature, humidity, CO, CO_2 and PM2.5 concentration from the 5 CL-213 devices in the community library.

	A	B	C	D	E	F	G	H	I	J
1	#	UseComPort	SlaveModbusID	FunctionCode	RegStartAddr	RegCount	TimeoutEventProcess	PresetValue	GroupName	Description
2	*	1	1	4	0	5	2	65535	101_1	Lobby Data
3	*	1	2	4	0	5	2	65535	102_1	JournalR Data
4	*	1	3	4	0	5	2	65535	103_1	ReadR Data
5	*	2	4	4	0	5	2	65535	104_1	MC Data
6	*	2	5	4	0	5	2	65535	105_1	StackR Data

The detail information of logging channel of a CL-213 device including temperature, humidity, CO, CO2 and PM2.5 concentration are shown below:

Address in Group	Data	Range	Unit	Data Type
0	CO	0 ~ 1000	1ppm	2 (U16)
1	CO2	0 ~ 9999	1ppm	2 (U16)
2	PM2.5	0 ~ 400	1ug/m^3	2 (U16)
3	Humidity	0 ~ 10000	0.01%	2 (U16)
4	Temperature	-1000 ~ +5000	0.01°C	1 (I16)

Edit record.csv

	A	B	C	D	E	F	G	H	I
1	#	GroupName	IndexAddr	DataType	Scale	Offset	Unit	Prefix	Alias
2	*	101_1	0	2	1	0	ppm	Lobby	CO
3	*	101_1	1	2	1	0	ppm	Lobby	CO2
4	*	101_1	2	2	1	0	ug/m3	Lobby	PM2.5
5	*	101_1	3	2	0.01	0	%	Lobby	Humidity
6	*	101_1	4	1	0.01	0	°C	Lobby	Temperature
7	*	102_1	0	2	1	0	ppm	JournalRoom	CO
8	*	102_1	1	2	1	0	ppm	JournalRoom	CO2
9	*	102_1	2	2	1	0	ug/m3	JournalRoom	PM2.5
10	*	102_1	3	2	0.01	0	%	JournalRoom	Humidity
11	*	102_1	4	1	0.01	0	°C	JournalRoom	Temperature
12	*	103_1	0	2	1	0	ppm	ReadingRoom	CO
13	*	103_1	1	2	1	0	ppm	ReadingRoom	CO2
14	*	103_1	2	2	1	0	ug/m3	ReadingRoom	PM2.5
15	*	103_1	3	2	0.01	0	%	ReadingRoom	Humidity
16	*	103_1	4	1	0.01	0	°C	ReadingRoom	Temperature
17	*	104_1	0	2	1	0	ppm	MultimediaCenter	CO
18	*	104_1	1	2	1	0	ppm	MultimediaCenter	CO2
19	*	104_1	2	2	1	0	ug/m3	MultimediaCenter	PM2.5
20	*	104_1	3	2	0.01	0	%	MultimediaCenter	Humidity
21	*	104_1	4	1	0.01	0	°C	MultimediaCenter	Temperature
22	*	105_1	0	2	1	0	ppm	StackRoom	CO
23	*	105_1	1	2	1	0	ppm	StackRoom	CO2
24	*	105_1	2	2	1	0	ug/m3	StackRoom	PM2.5
25	*	105_1	3	2	0.01	0	%	StackRoom	Humidity
26	*	105_1	4	1	0.01	0	°C	StackRoom	Temperature

Config.csv

	A	B	C	D	E	F	G	H	I	J
1	#	UseComPort	SlaveModbusID	FunctionCode	RegStartAddr	RegCount	TimeoutEventProcess	PresetValue	GroupName	Description
2	*	1	1	4	0	5	2	65535	101_1	Lobby Data
3	*	1	2	4	0	5	2	65535	102_1	JournalR Data
4	*	1	3	4	0	5	2	65535	103_1	ReadR Data
5	*	2	4	4	0	5	2	65535	104_1	MC Data
6	*	2	5	4	0	5	2	65535	105_1	StackR Data

2. Importing record.csv

STEP 1: Click **CHOOSE FILE** on DATA LOGGER page and then select your record.csv file.
STEP 2: Click **IMPORT**.

See success message

After the record.csv is imported into the MDCL, scroll down the DATA LOGGER page and check the channel settings.

Channel configuration for logging data from the lobby and journal room

RELOAD								1 - 10 of 25	10 ∨ items per page
#	Active	Group Name	Index Address	Data Type	Scale	Offset	Unit	Prefix	Alias
1	Enable	101_1	0	16-bit Unsigned Integer	1	0	ppm	Lobby	CO
2	Enable	101_1	1	16-bit Unsigned Integer	1	0	ppm	Lobby	CO2
3	Enable	101_1	2	16-bit Unsigned Integer	1	0	ug/m3	Lobby	PM2.5
4	Enable	101_1	3	16-bit Unsigned Integer	0.01	0	%	Lobby	Humidity
5	Enable	101_1	4	16-bit Signed Integer	0.01	0	°C	Lobby	Temperature
6	Enable	102_1	0	16-bit Unsigned Integer	1	0	ppm	JournalRoom	CO
7	Enable	102_1	1	16-bit Unsigned Integer	1	0	ppm	JournalRoom	CO2
8	Enable	102_1	2	16-bit Unsigned Integer	1	0	ug/m3	JournalRoom	PM2.5
9	Enable	102_1	3	16-bit Unsigned Integer	0.01	0	%	JournalRoom	Humidity
10	Enable	102_1	4	16-bit Signed Integer	0.01	0	°C	JournalRoom	Temperature

« ‹ 1 2 3 › »

Channel configuration for logging data from the reading room and multimedia center

RELOAD								11 - 20 of 25	10 ∨ items per page
#	Active	Group Name	Index Address	Data Type	Scale	Offset	Unit	Prefix	Alias
11	Enable	103_1	0	16-bit Unsigned Integer	1	0	ppm	ReadingRoom	CO
12	Enable	103_1	1	16-bit Unsigned Integer	1	0	ppm	ReadingRoom	CO2
13	Enable	103_1	2	16-bit Unsigned Integer	1	0	ug/m3	ReadingRoom	PM2.5
14	Enable	103_1	3	16-bit Unsigned Integer	0.01	0	%	ReadingRoom	Humidity
15	Enable	103_1	4	16-bit Signed Integer	0.01	0	°C	ReadingRoom	Temperature
16	Enable	104_1	0	16-bit Unsigned Integer	1	0	ppm	MultimediaCenter	CO
17	Enable	104_1	1	16-bit Unsigned Integer	1	0	ppm	MultimediaCenter	CO2
18	Enable	104_1	2	16-bit Unsigned Integer	1	0	ug/m3	MultimediaCenter	PM2.5
19	Enable	104_1	3	16-bit Unsigned Integer	0.01	0	%	MultimediaCenter	Humidity
20	Enable	104_1	4	16-bit Signed Integer	0.01	0	°C	MultimediaCenter	Temperature

« ‹ 1 2 3 › »

Channel configuration for logging data from the reading room and multimedia center

#	Active	Group Name	Index Address	Data Type	Scale	Offset	Unit	Prefix	Alias
21	Enable	105_1	0	16-bit Unsigned Integer	1	0	ppm	StackRoom	CO
22	Enable	105_1	1	16-bit Unsigned Integer	1	0	ppm	StackRoom	CO2
23	Enable	105_1	2	16-bit Unsigned Integer	1	0	ug/m3	StackRoom	PM2.5
24	Enable	105_1	3	16-bit Unsigned Integer	0.01	0	%	StackRoom	Humidity
25	Enable	105_1	4	16-bit Signed Integer	0.01	0	°C	StackRoom	Temperature

21 - 25 of 25   10 ∨ items per page

« ‹ 1 2 3 › »

3. Setting logging Interval

STEP 1: Move the DATA LOGGER page to the configuration section.

STEP 2: Select **Enable** from the "Logging Active" drop down menu and fill the required fields.

STEP 3: Click **SAVE** and restart the MDCL module.

After restarting, the MDCL will start logging data.

4. Downloading log files

STEP 1: Click **FILE MANAGER** on GENERAL SETTINGS page and click on the calendar icon.
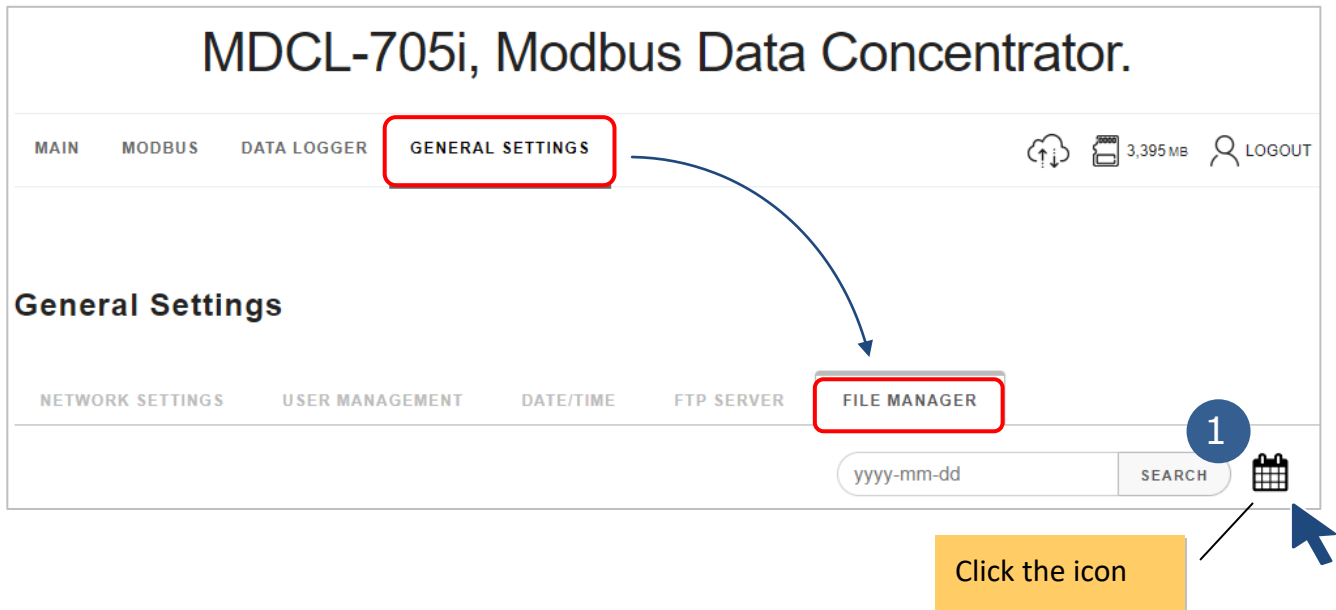
STEP 2: Select the date of the log files and click **SEARCH**.

STEP 3: Click the DOWNLOAD icon for a file to download it.

	NETWORK SETTINGS	USER MANAGEMENT	DATE/TIME	FTP SERVER	FILE MANAGER

2021-3-17　SEARCH

Date Created	Name	Size		
2021-03-17	T_031700.CSV	133,050	☁ DOWNLOAD	🗑 DELETE
2021-03-17	T_031702.CSV	133,050	☁ DOWNLOAD	🗑 DELETE
2021-03-17	T_031704.CSV	133,050	☁ DOWNLOAD	🗑 DELETE
2021-03-17	T_031706.CSV	133,050	☁ DOWNLOAD	🗑 DELETE
2021-03-17	T_031708.CSV	112,810	☁ DOWNLOAD	🗑 DELETE
	5 file(s)	645,010 bytes		

STEP 4: Get the file in the default download directory of web browser..

2021-03-17	T_031706.CSV	133,050	☁ DOWNLOAD	🗑 DELE
2021-03-17	T_031708.CSV	112,810	☁ DOWNLOAD	🗑 DEL
	5 file(s)	645,010 bytes		

T_031700.CSV ^

File name T_031700 created at 00:00:00, on March 17th

Each log file consists of a file header and log entries as shown below. The first 4 lines are header information including the MDCL firmware version, IP address, MAC address module name, and data type, unit and name for each channel. After that are logged entries with timestamps.

	A	B	C	D	E	F
1	ver1.0	10.1.112.10	00:0D:E0:FF:70:51	MDC-705i-DL		
2		UINT16[2]	UINT16[2]	UINT16[2]	UINT16[2]	INT16[1]
3		ppm	ppm	ug/m3	%	
4	DATETIME	Lobby.CO	Lobby.CO2	Lobby.PM2.5	Lobby.Humidity	
5	2021/3/17 00:00:00	0	410	0	53.36	26.12
6	2021/3/17 00:00:10	0	410	0	53.36	26.12
7	2021/3/17 00:00:20	0	411			
8	2021/3/17 00:00:30	0	411			
9	2021/3/17 00:00:40	0	411	0	53.38	26.14
10	2021/3/17 00:00:50	0	411	0	53.38	26.14
11	2021/3/17 00:01:00					26.14
12	2021/3/17 00:01:10					26.14
13	2021/3/17 00:01:20	0	410	0	53.37	26.11
14	2021/3/17 00:01:30	0	410	0	53.37	26.11
15	2021/3/17 00:01:40	0	410	0	53.37	26.11
16	2021/3/17 00:01:50	0	410	0	53.37	26.11
17	2021/3/17 00:02:00	0	410	0	53.37	26.11
18	2021/3/17 00:02:10	0	410	0	53.37	26.12

Callouts:
- Firmware version, IP address, MAC address and module name
- Data type and unit
- Channel name by Prefix.Alias
- Logging time starting on the hour (00:00)
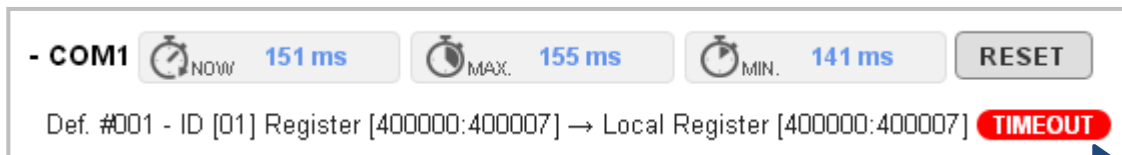
8. Troubleshooting

In this chapter, we will explain how to troubleshoot the communication problems.

Possible causes of TIMEOUT

- **Situation #1**: The slave device is not active or the transfer function of the slave site may fail.

  Solution: Check the slave device is powered up and the communication function is enabled.

- **Situation #2**: The COM port number to which the slave device is connected is not the same with the COM port number set in the polling definition.

  Solution: Check if the COM port set in the polling definition is the same as the COM port connected to the device. If not, connect the slave device to the COM port number defined in the polling definition, or fix the *UseComPort* parameter to the virtual COM port number that the slave device is connected to.

- **Situation #3**: The wiring for communication is wrong.

  Solution: Exchange the D+ and D- wiring of RS-485 connection, and check the GND pin on the slave device is properly connected to the MDCL-705i.

- **Situation #4**: An incorrect Baud Rate or/and Data Format setting is specified.

    Solution: Check if the Baud Rate, Data Format, Parity, and Stop Bits settings on the Modbus
    page are the same as the configuration of the slave device. If not, fix the difference
    between the settings on the web interface and the device configuration.

- **Situation #5**: An incorrect ID of the Modbus slave device is specified.

    Solution: Check and fix the ID number in the polling definition.

● **Situation #6**: The value set for **Delay Between Polls** or **Timeout** is not long enough.

Solution: Lengthen the **Delay Between Polls** or **Timeout** setting until it is suitable for communication with the slave device.

9. FAQ

Q1: What are the maximum numbers of polling definition and local register?

A1: The maximum number of polling definition in a MDCL-705i is 250, each definition can access up to 125 registers. Each of the four tables (DI/DO/AI/DO) can store up to 9600 registers of data.

Q2: What is the maximum number of registers can be accessed in one Modbus command from a Modbus master device?

A2: By following the Modbus protocol, the maximum amount of registers that one command can access is 255 of function code 01 and 02, and 126 of function code 03 and 04.

Q3: How are the local registers mapped to the polled data in a MDCL-705i?

A3: Only the function code 01/02/03/04 can be used in the polling definition section in config.csv.

    01: Read Coil Status (Read DO)

    02: Read Input Status (Read DI)

    03: Read Holding Registers (Read AO)

    04: Read Input Registers (Read AI)

Use the environmental monitoring application in section 6.4 as an example:

Config.csv

	A	B	C	D	E	F	G	H	I	J
1	#	UseComPort	SlaveModbusID	FunctionCode	RegStartAddr	RegCount	TimeoutEventProcess	PresetValue	GroupName	Description
2	*	1	1	4	0	5	2	65535	101_1	Lobby Data
3	*	1	1	3	452	1	2	65535	101_2	Lobby Offset
4	*	1	1	1	304	5	0	0	101_3	Lobby Alarm
5	*	1	2	4	0	5	2	65535	102_1	JournalR Data
6	*	1	2	3	452	1	2	65535	102_2	JournalR Offset
7	*	1	2	1	304	5	0	0	102_3	JournalR Alarm
8	*	1	3	4	0	5	2	65535	103_1	ReadR Data
9	*	1	3	3	452	1	2	65535	103_2	ReadR Offset
10	*	1	3	1	304	5	0	0	103_3	ReadR Alarm
11	*	2	4	4	0	5	2	65535	104_1	MC Data
12	*	2	4	3	452	1	2	65535	104_2	MC Offset
13	*	2	4	1	304	5	0	0	104_3	MC Alarm
14	*	2	5	4	0	5	2	65535	105_1	StackR Data
15	*	2	5	3	452	1	2	65535	105_2	StackR Offset
16	*	2	5	1	304	5	0	0	105_3	StackR Alarm

Scan sequence and mapped register addresses

The scan sequence will follow the order of polling definitions defined in the config.csv, as well as the data collected from different devices will be placed in consecutive addresses according to their type. The mapped register addresses of the data can be illustrated as shown below.

MDCL-705i
Local Registers

Read AI
300000: 300004
300005: 300009
300010: 300014
300015: 300019
300020: 300024

Scan sequence – COM1

Read AI from 300000 to 300004   of CL-213 #1
Read AO from 400452   of CL-213 #1
Read DO from 000304 to 000308   of CL-213 #1
Read AI from 300000 to 300004   of CL-213 #2
Read AO from 400452   of CL-213 #2
Read DO from 000304 to 000308   of CL-213 #2
Read AI from 300000 to 300004   of CL-213 #3
Read AO from 400452   of CL-213 #3
Read DO from 000304 to 000308   of CL-213 #3

Read AO
400000
400001
400002
400003
400004

Scan sequence – COM2

Read AI from 300000 to 300004   of CL-213 #4
Read AO from 400452   of CL-213 #4
Read DO from 000304 to 000308   of CL-213 #4
Read AI from 300000 to 300004   of CL-213 #5
Read AO from 400452   of CL-213 #5
Read DO from 000304 to 000308   of CL-213 #5

Read DO
000000: 000004
000005: 000009
000010: 000014
000015: 000019
000020: 000024

Q4: How to write data to output channels on a Modbus RTU slave device?

A4: Let's continue the example in Q3, the polling definition for the output channels with read function code are edited in the config.csv file and the config.csv file are imported. Now we have the local register addressed for the output channels on the Modbus RTU slave device.

Modbus TCP client or Modbus RTU master can write data to an output channel by writing data to the local register address mapped for the channel.

MDCL-705i
Local Registers

Read AI
300000: 300004
300005: 300009
300010: 300014
300015: 300019
300020: 300024

Scan sequence – COM1

Read AI from 300000 to 300004   of CL-213 #1
Read AO from 400452   of CL-213 #1
Read DO from 000304 to 000308   of CL-213 #1
Read AI from 300000 to 300004   of CL-213 #2
Read AO from 400452   of CL-213 #2
Read DO from 000304 to 000308   of CL-213 #2
Read AI from 300000 to 300004   of CL-213 #3
Read AO from 400452   of CL-213 #3
Read DO from 000304 to 000308   of CL-213 #3

Read AO
400000
400001
400002
400003
400004

Scan sequence – COM2

Read AI from 300000 to 300004   of CL-213 #4
Read AO from 400452   of CL-213 #4
Read DO from 000304 to 000308   of CL-213 #4
Read AI from 300000 to 300004   of CL-213 #5
Read AO from 400452   of CL-213 #5
Read DO from 000304 to 000308   of CL-213 #5

Read DO
000000: 000004
000005: 000009
000010: 000014
000015: 000019
000020: 000024

Q5: How to read the status of each connection?

A5: The status for each connection is saved as the sequence of polling definition from local register address 39600. The maximum number of polling definition in the config.csv file is 250, so the available address for the connection status is from 39600 to 39849. Function code 04 can be used to read the status and up to 126 register of status can be read in one command.

For example, use Function code 04 to read data from 39600 to 39605, the connection status of polling definition 001 to 006 may be read as the third column in the following table. 0 indicates the connection status is good and 0xFFFF indicates that the connection is timeout.

Def. number	Address	Status	Status display on web page
Def.#001	39600	0	GOOD
Def.#002	39601	0	GOOD
Def.#003	39602	0xFFFF	TIMEOUT
Def.#004	39603	0x8201	ERROR: ILLEGAL FUNCTION
Def.#005	39604	0	GOOD
Def.#006	39605	0x8402	ERROR: ILLEGAL DATA ADDRESS

The value of status:

0: Good

0xFFFF: Timeout

0x8XYY: Exception response. **X** - Modbus Function Code. **YY** - Exception Code.
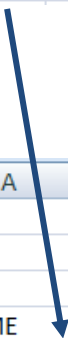
Exception Code	Name	Description
01	Illegal Function	The function code received is not an allowable action.
02	Illegal Data Address	The data address received in the query is not an allowable address.
03	Illegal Data Value	A value contained in the query data field is not an allowable value.
04	Illegal response length	The request would generate a response with size bigger than that available for MODBUS protocol.

Q6: How to show timestamps with seconds in Excel?

A6: If you open a log file in Excel and see ############ in **DATATIME** line, simply increase the width of the column to make the data visible.

	A	B	C	D	E	F
1	ver1.0	10.1.112.10	00:0D:E0:FF:70:51	MDC-705i-DL		
2		UINT16[2]	UINT16[2]	UINT16[2]	UINT16[2]	INT16[1]
3		ppm	ppm	ug/m3	%	°C
4	DATETIME	Lobby.CO	Lobby.CO2	Lobby.PM2.5	Lobby.Humidity	Lobby.Temperature
5	#########	0	410	0	53.36	26.12
6	#########	0	410	0	53.36	26.12
7	#########	0	411	0	53.36	26.12
8	#########	0	411	0	53.38	26.14
9	#########	0	411	0	53.38	26.14
10	#########	0	411	0	53.38	26.14
11	#########	0	410	0	53.38	26.14
12	#########	0	410	0	53.37	26.14
13	#########	0	410	0	53.37	26.11

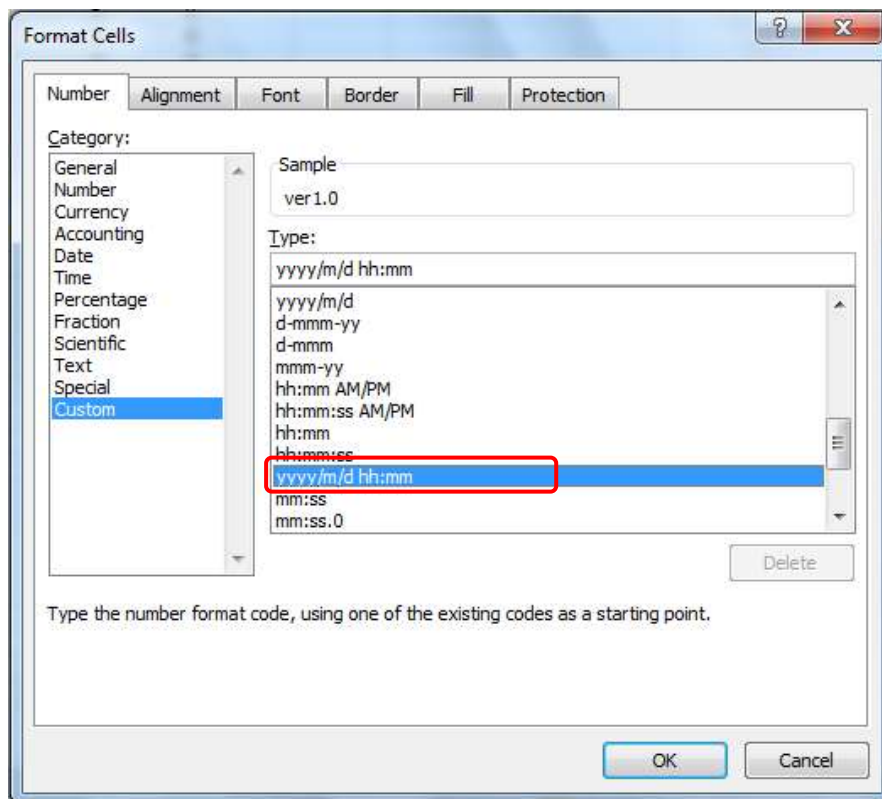|	A	B	C	D	E	F
1	ver1.0	10.1.112.10	00:0D:E0:FF:70:51	MDC-705i-DL		
2		UINT16[2]	UINT16[2]	UINT16[2]	UINT16[2]	INT16[1]
3		ppm	ppm	ug/m3	%	°C
4	DATETIME	Lobby.CO	Lobby.CO2	Lobby.PM2.5	Lobby.Humidity	Lobby.Temperature
5	2021/3/17 00:00	0	410	0	53.36	26.12
6	2021/3/17 00:00	0	410	0	53.36	26.12
7	2021/3/17 00:00	0	411	0	53.36	26.12
8	2021/3/17 00:00	0	411	0	53.38	26.14
9	2021/3/17 00:00	0	411	0	53.38	26.14
10	2021/3/17 00:00	0	411	0	53.38	26.14
11	2021/3/17 00:01	0	410	0	53.38	26.14
12	2021/3/17 00:01	0	410	0	53.37	26.14
13	2021/3/17 00:01	0	410	0	53.37	26.11

Excel formats times without seconds by default, so we needs to change the formatting of the column **DATATIME** according to the pattern "yyyy/m/d hh:mm:ss" to see the seconds.
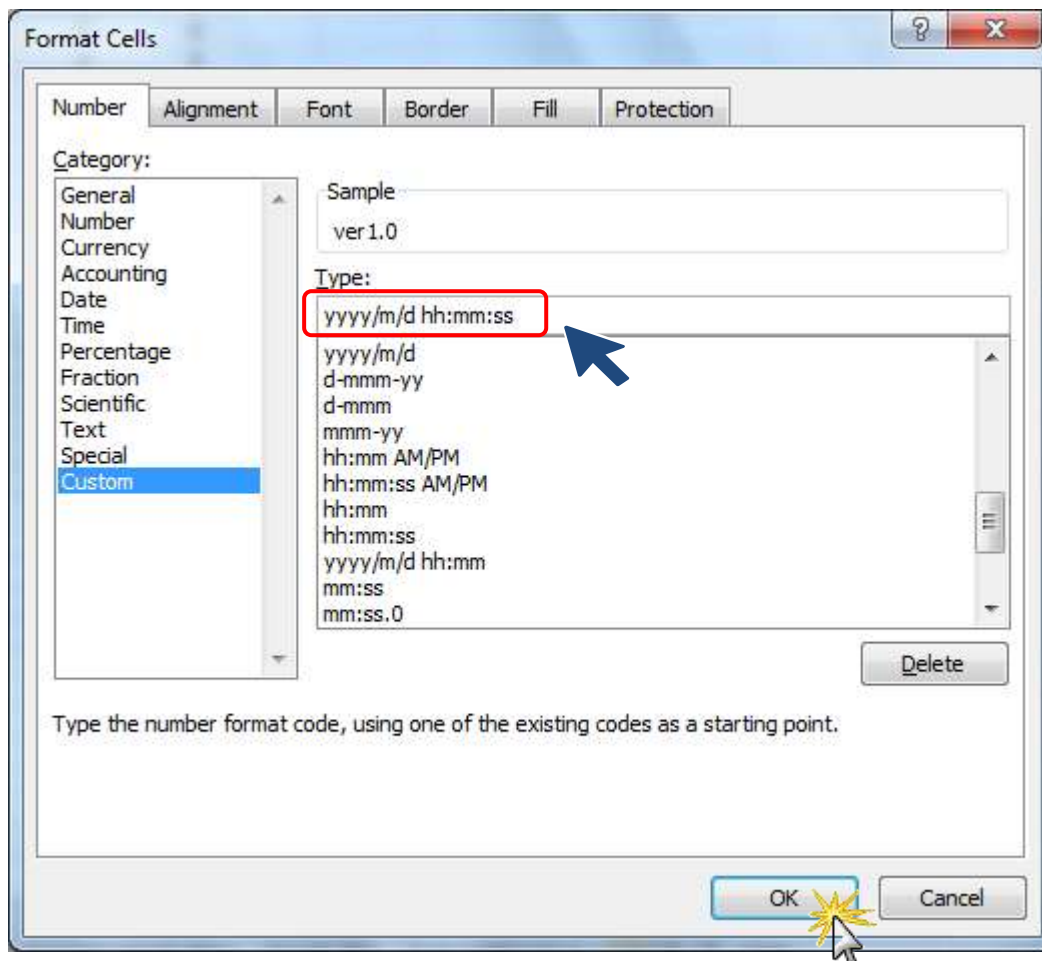Here are the step-by-step instructions.

Step 1: Mark the **DATATIME** line, and select **Format Cells** option on the right-click menu.
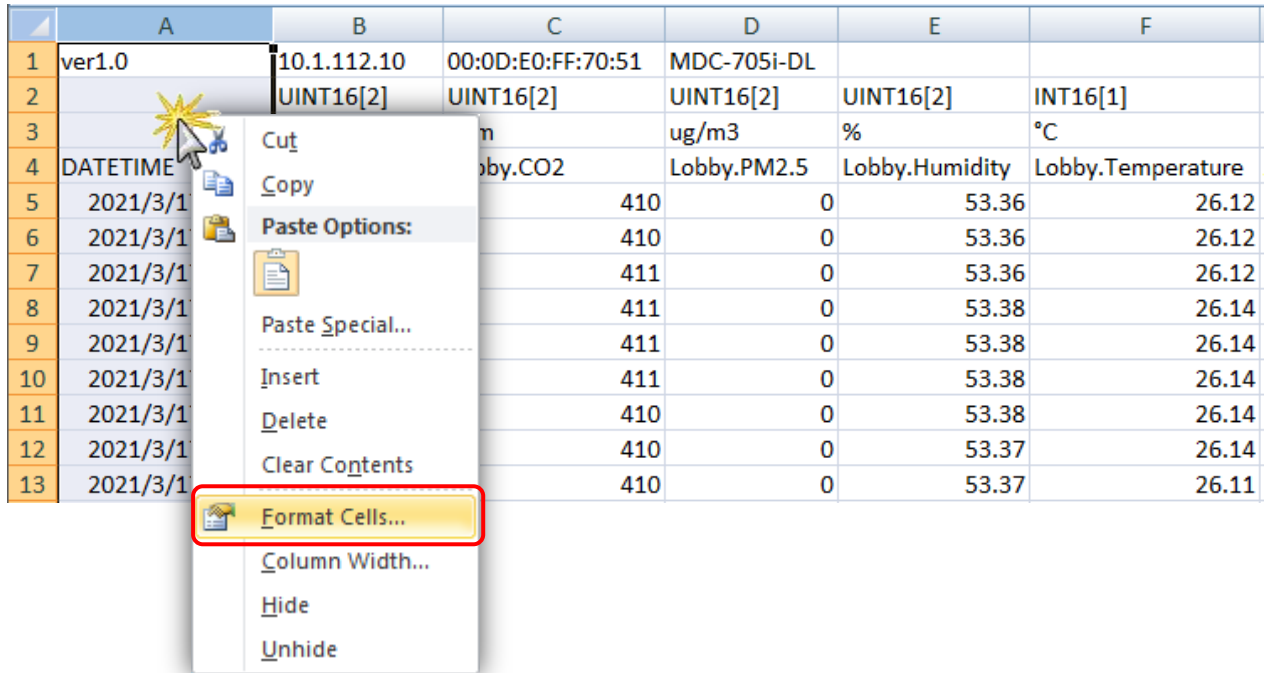
Step 2: Click **Custom** in the Category field and select **yyyy/m/d hh:mm** in Type field.

Step 3: Add **:ss** at the end of yyyy/m/d hh:mm and click OK.

Now the seconds are displayed in the timestamps.

	A	B	C	D	E	F
1	ver1.0	10.1.112.10	00:0D:E0:FF:70:51	MDC-705i-DL		
2		UINT16[2]	UINT16[2]	UINT16[2]	UINT16[2]	INT16[1]
3		ppm	ppm	ug/m3	%	°C
4	DATETIME	Lobby.CO	Lobby.CO2	Lobby.PM2.5	Lobby.Humidity	Lobby.Temperature
5	2021/3/17 00:00:00	0	410	0	53.36	26.12
6	2021/3/17 00:00:10	0	410	0	53.36	26.12
7	2021/3/17 00:00:20	0	411	0	53.36	26.12
8	2021/3/17 00:00:30	0	411	0	53.38	26.14
9	2021/3/17 00:00:40	0	411	0	53.38	26.14
10	2021/3/17 00:00:50	0	411	0	53.38	26.14
11	2021/3/17 00:01:00	0	410	0	53.38	26.14
12	2021/3/17 00:01:10	0	410	0	53.37	26.14
13	2021/3/17 00:01:20	0	410	0	53.37	26.11

Revision History

Revision	Date	Description
1.0.0	2021/06	First released