

MVB-ICM

Datasheet

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Foreword

Notational Conventions

The following categorized signal words with defined meaning might appear in the manual.







Signal Words	Meaning
 DANGER	Indicates a high potential hazard which, if not avoided, will result in death or serious injury.
 CAUTION	Indicates a potential risk which, if not avoided, could result in property damage, data loss, lower performance, or unpredictable result.
 ANTISTATIC	Indicates static sensitive equipment.
 DANGER! ELECTRIC SHOCK	Indicates High voltage danger.
 TIPS	Provides methods to help you solve a problem or save you time.
 NOTE	Provides additional information as the emphasis and supplement to the text.

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1 Overview

1.1 Introduction

The MVB-ICM isolate embedded communication module, provides full-featured MVB interface and two extended interfaces, and implements protocol conversion between MVB and serial or SPI interfaces.

46.5 x 48mm micro size, 2.54 mm pitch male expansion connector. +5V power supply, low power consumption. Industrial wide temperature, suitable for embedded applications.

On-board application CPU is used for secondary development of on-board programming by user, and seamlessly integrates data processing a communication.



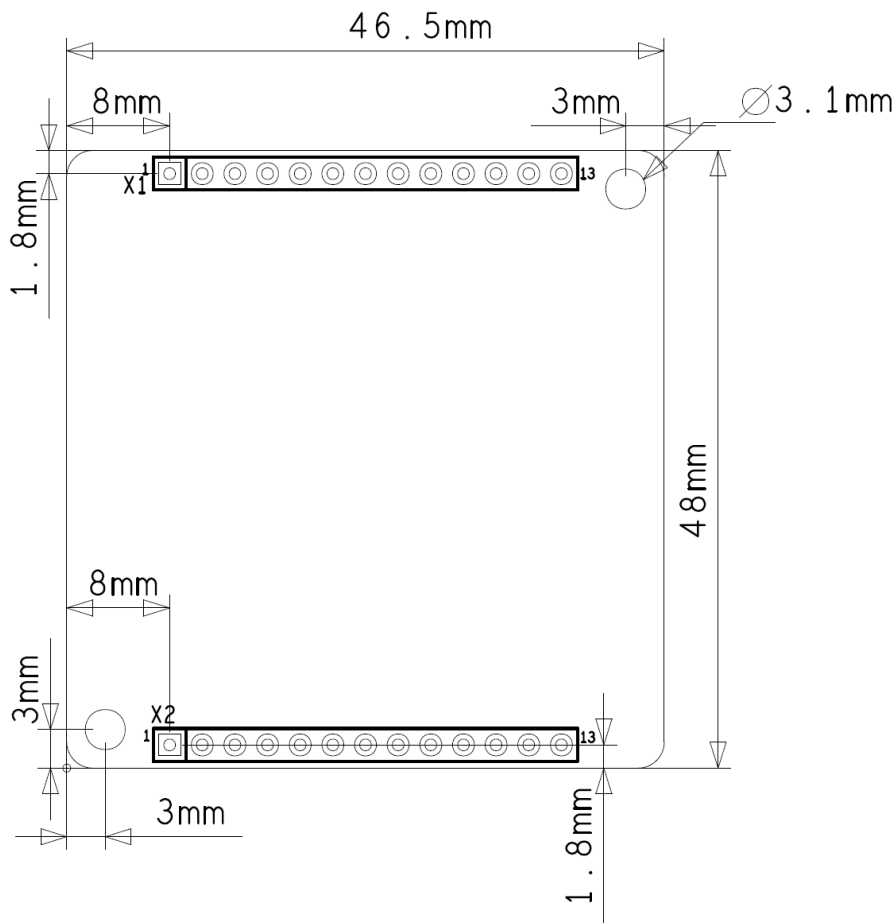
1.2 Features

- Full-featured MVB interface, supporting EMD and ESD+
- The MVB interface fully complies to the TCN standard IEC61375
- One UART extended interface
- One SPI extended interface
- On-board application CPU for secondary programming
- +5V power supply, low power consumption
- Small size, Industrial wide temperature

1.3 Technical Specifications

Item	Parameters	Details
	Media type	Optional EMD, ESD+
	Standard	IEC61375
	PD	128 default, or more
	Isolation	2.5 kVrms
Extended Serial Interface	Interface type	3.3V LVCMOS
	Duplex type	full-duplex, half-duplex
	Working mode	Asynchronous UART
	Baud rate	≤ 1.5 Mbps
Extended SPI Interface	Interface type	3.3V LVCMOS
	Mode	Slave
	Baud rate	≤ 25 Mbps
Configuration Management	Configuration tool	yacer-DMS configuration management software
	Console interface	Special DMS-UART interface (by DMS-UART-8P cable) Extended DMS-UART interface Extended UART interface
	Power Supply	+5 VDC
	Power consumption	< 2W
Mechanical Characteristics	Connector	Two 2.54mm pitch 13-pin single-row male connectors
	Dimensions	46.5 x 48 mm
	Weight	15 g
Operating Environment	Operating temperature	-40 ~ +70°C
	Storage temperature	-40 ~ +85°C
	Operating humidity	5 ~ 95% RH (no condensation)

1.4 Mechanical Data



1.5 Applications

- Protocol conversion between MVB and serial interface
- Protocol conversion between MVB and SPI interface
- Train Communication Network (TCN)
- Train Control and Management System (TCMS)
- Embedded development and application

1.6 Order Information

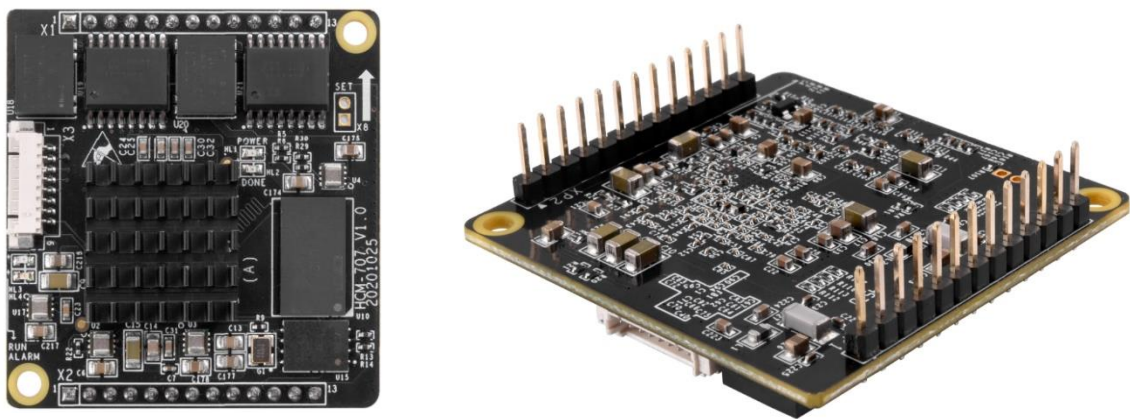
Model	Description
MVB-ICM-200	MVB + 1 x UART Serial Interfaces
MVB-ICM-300	MVB + 1 x SPI interface

2 Hardware and Physical Interfaces

2.1 Appearance

The top and bottom view of MVB-ICM are as follows, and the signals are drawn out through connector X1 and X2.

X3 is the special configuration interface used to connect the DMS-UART-8P configuration cable and configure it online through the management computer's USB interface.



2.2 LED Indicators

Item	Description
RUN	Running indicator, flashing during normal operation
ALARM	Alarm indicator, on when the device is not ready or fails, and off during normal operation
POWER	Power indicator, always on after power on

2.3 Pin Definition

2.3.1 X1: 1x13 2.54mm pitch connector

Pin	Name	Type	Description
1	MVB_A_5V_OUT	O	Positive supply Line_A
2	MVB_A_TxD +		Positive wire Line_A transmit
3	MVB_A_TxD -		Negative wire Line_A transmit
4	MVB_A_RxD +		Positive wire Line_A receive
5	MVB_A_RxD -		Negative wire Line_A receive
6	MVB_A_GND		Ground Line_A
7	NC		Standby, must be left floating
8	MVB_B_5V_OUT	O	Positive supply Line_B
9	MVB_B_TxD +		Positive wire Line_B transmit
10	MVB_B_TxD -		Negative wire Line_B transmit
11	MVB_B_RxD +		Positive wire Line_B receive
12	MVB_B_RxD -		Negative wire Line_B receive
13	MVB_B_GND		Ground Line_B



User must short connect TxD+ & RxD+, TxD- & RxD- of MVB interface.

2.3.2 X2: 1x13 2.54mm pitch connector

Pin	Name	Type	Description
1	GND		Logic GND
2	SPI_SS	I	SPI slave select
3	SPI_SCK	I	SPI serial clock
4	SPI_MISO /DMS_UART_TxD	O	SPI data output /Extended DMS-UART data transmit
5	SPI_MOSI /DMS_UART_RxD	I	SPI data input /Extended DMS-UART data receive
6	DMS_Enable	I	<ul style="list-style-type: none"> ● Floating: SPI working mode ● Grounding: DMS-UART working mode
7	UART_TX_Enable	O	UART transmit enable, high-level enable
8	UART_RxD	I	UART data receive
9	UART_TxD	O	UART data transmit
10	RESET_IN	I	Module reset, active low. Power-On Reset supported, this pin may be left floating.
11	PG_OUT	O	Power Good signal output
12	+5V	I	DC +5V Input
13	GND		Logic GND

3 Building Configuration Environment

3.1 Connect Management Computer to MVB-ICM

MVB-ICM provides a variety of configuration management methods to meet different application scenarios.

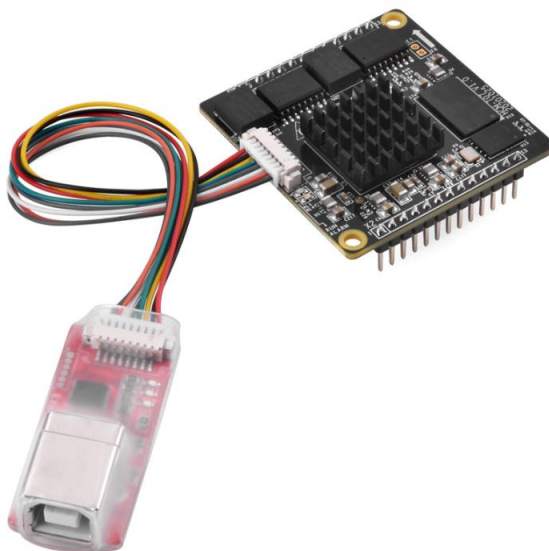
After the MVB-ICM is configured, the configuration parameters are saved in FLASH on the MVB-ICM board, and will be automatically loaded to work every time MVB-ICM is powered on or restarted in the future.

3.1.1 Configure with special DMS-UART interface

Connect the special DMS-UART interface (X3) of MVB-ICM to the USB interface of the computer with the DMS-UART-8P configuration cable.

This configuration is most convenient and direct in the scenarios where users can access MVB-ICM.

MVB-ICM can be pre-configured in this way for scenarios where work parameters are set once and no adjustment is made.



3.1.2 Configure with extended DMS-UART interface

When user designs the motherboard, ground the DMS_Enable signal of X2, connect DMS_UART_TxD, DMS_UART_RxD signals to the serial transceiver of the motherboard, and then connect to the serial port of the management computer.

In the application scenario of enclosed chassis, the configuration interface can be brought out to the chassis panel in this way, so that users can configure MVB-ICM at any time.

3.1.3 Configure with extended UART interface

Extended UART is not only the MVB data forwarding interface between MVB-ICM and the host, but also the configuration interface, which can accept the host's configuration management commands.

This allows the host (such as an embedded computer or MCU) to directly manage MVB-ICM while sending and receiving MVB data.

3.2 Get configuration management software yacer-DMS

The user can obtain a compressed package yacer-DMS.zip of configuration management software in the following ways:

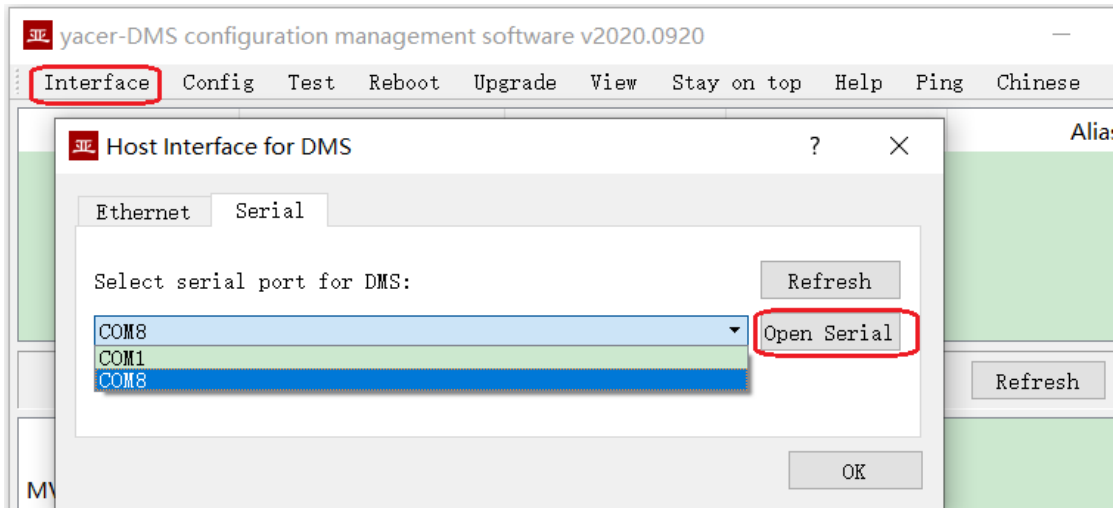
- In the “tools” directory of the accompanied U disk of MVB-ICM;
- Software channel on the official website (www.yacer.com.cn).

3.3 Run yacer-DMS software

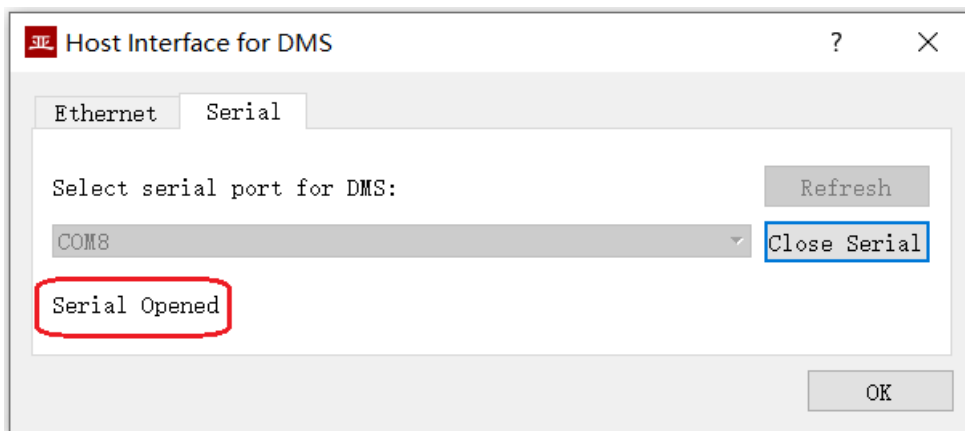
As the free-installation application software, unzip yacer-DMS.zip, enter the working directory and double click the file yacer-DMS.exe to run.

3.4 Select & Open Configuration Serial Port

Click the “Interface” button on the toolbar to pop up the “Host Interface for DMS” configuration dialog. Enter the “Serial” page, select the serial port of the computer connected to MVB-ICM from the drop-down list, and click “Open Serial” button.



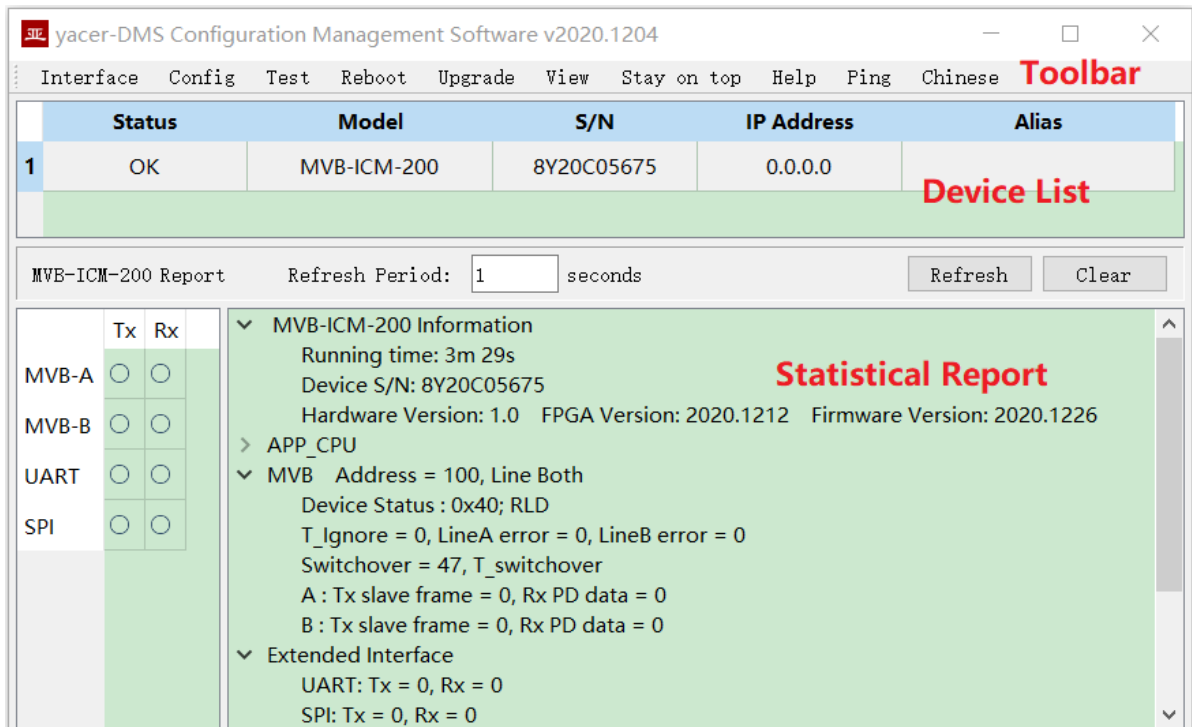
If the serial port is successfully opened, the status is as follows:



3.5 Main Window of yacer-DMS

The following figure is the main interface of the configuration management software, which can be divided into three parts:

- **Toolbar:** Functional operation buttons;
- **Device List:** Displaying the basic information and operation status of online devices;
- **Statistical Report:** Displaying the receive/transmit indication & statistics, and device details.



3.6 Statistical Report

The statistical report has three panels: control panel, receive/transmit indication panel and information panel.

3.6.1 Control Panel

MVB-ICM-200 Report Refresh Period: seconds

Control Widget	Function
Refresh Period: <input type="text" value="1"/> seconds	Statistical report refresh cycle
<input type="button" value="Refresh"/>	Manual refresh operation
<input type="button" value="Clear"/>	Clear the statistical report

3.6.2 Receive/Transmit Indication Panel

- Tx: The interface sends a frame of data, corresponding Tx indicator blinks once;
- Rx: The interface receives a frame of data, corresponding Rx indicator blinks once.

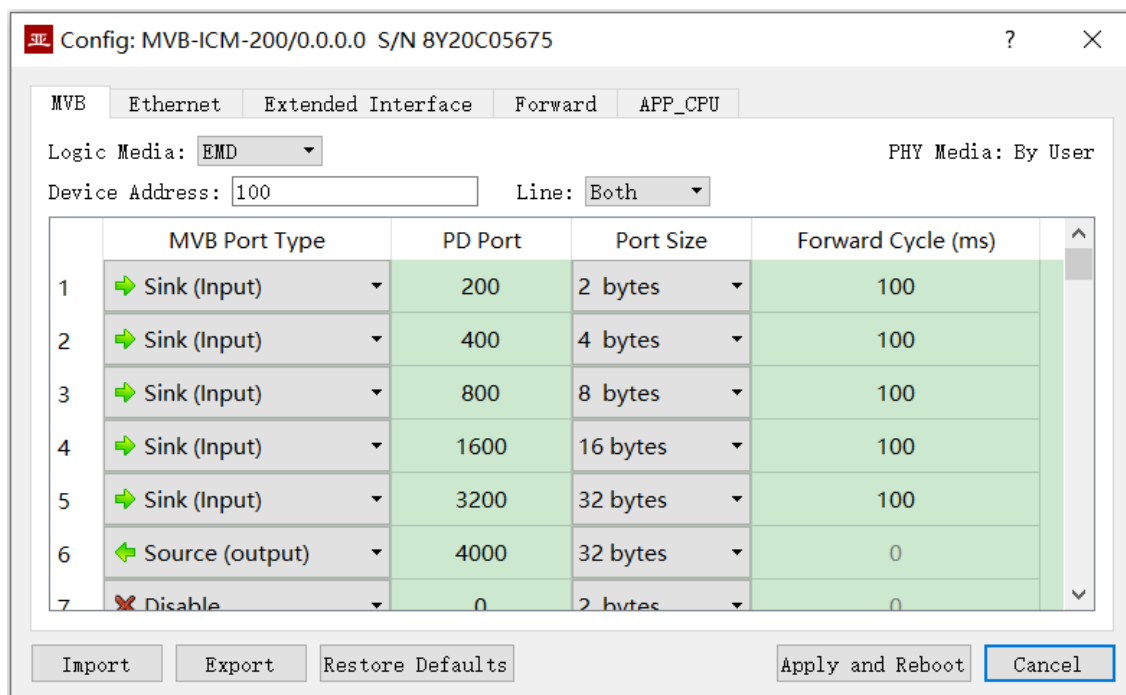
3.6.3 Information Panel

The right side of the statistical report is the information panel, which can display the following contents:

- Device information: Running time, S/N number, version number;
- APP_CPU: Application CPU operation information;
- MVB: MVB interface status information, receive/transmit statistics;
- Extended Interface: Status and receive/transmit statistics of UART and SPI interface;
- DMS Service: DMS message receive/transmit statistics.

3.7 Configure Device

Click on the “Config” button on the toolbar or double-click the selected device in the device list, DMS pops up the configuration dialog. According to the interface and function, the dialog divides the configuration items into several configuration pages.



The following operation buttons are located at the bottom of the dialog:

Button	Function
	Open the configuration file, read the configuration parameters refresh the configuration dialog
	Export configuration parameters from the configuration dialog to a file for saving
	Refresh the configuration dialog with the factory paramters
	Write the configuration parameters in the dialog to the device, and restart the device to make the configuration take effect
	Cancel current configuration operation

4 Function and Configuration

4.1 MVB Configuration

The MVB configuration page is able to configure the media type, device address, line type of MVB, and process data port parameters as slaves.

The screenshot shows a configuration window titled "Config: MVB-ICM-200/0.0.0.0 S/N 8Y20C05675". It has tabs for "MVB", "Ethernet", "Extended Interface", "Forward", and "APP_CPU". The "MVB" tab is active. Below the tabs, there are fields for "Logic Media: EMD" and "PHY Media: By User". A "Device Address" field contains the value "100" and a "Line:" dropdown is set to "Both". Below these fields is a table with 8 rows and 5 columns: "MVB Port Type", "PD Port", "Port Size", "Forward Cycle (ms)", and a vertical scrollbar. The table data is as follows:

	MVB Port Type	PD Port	Port Size	Forward Cycle (ms)
1	➔ Sink (Input)	200	2 bytes	100
2	➔ Sink (Input)	400	4 bytes	100
3	➔ Sink (Input)	800	8 bytes	100
4	➔ Sink (Input)	1600	16 bytes	100
5	➔ Sink (Input)	3200	32 bytes	100
6	➔ Source (output)	4000	32 bytes	0
7	✗ Disable	0	2 bytes	0
8	✗ Disable	0	2 bytes	0

4.1.1 Media Type

The physical layer of MVB-ICM supports EMD, ESD+, and the user chooses the logical layer media type based on the application scenario.

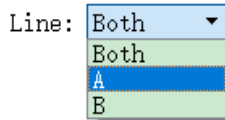
This image shows a close-up of the "Logic Media" dropdown menu. The menu is open, showing three options: "EMD" (highlighted in blue), "EMD" (highlighted in light blue), and "ESD+" (highlighted in light green). To the right of the dropdown, the text "PHY Media: By User" is visible.

4.1.2 Device Address

Users configure device address in the range of 0 to 4095 according to field requirements.

4.1.3 Line Type

Users can choose to work in dual-line redundancy or single-line mode A or B.



4.1.4 PD Port Configuration

The default version of MVB-ICM supports the configuration of up to 128 process data ports. If users need to configure more PD ports, please contact the manufacturer for customization.

Each PD port entry includes the following parameters:

- Port Type: Sink or Source port, disable means this entry is invalid;
- PD Port: Set port number 0 ~ 4095;
- Port Size: 2, 4, 8, 16, 32 bytes correspond to 0 ~ 4 of fcode;
- Forward Cycle: valid when the port type is a sink port, indicating the period during which MVB PD data is periodically forwarded to extended UART.

	MVB Port Type	PD Port	Port Size	Forward Cycle (ms)
1	➔ Sink (Input)	200	2 bytes	100
2	➔ Sink (Input)	400	4 bytes	100
3	✘ Disable	800	8 bytes	100
4	➔ Sink (Input) ➔ Source (output)	1600	16 bytes	100
5	➔ Sink (Input)	3200	32 bytes	100
6	➔ Source (output)	4000	32 bytes	0
7	✘ Disable	0	2 bytes	0
8	✘ Disable	0	2 bytes	0

4.2 Ethernet Configuration

MVB-ICM has no Ethernet interface. This page is only for configuration device alias to add a description or mnemonic identifier to the protocol converter.

Device Alias:

4.3 Extended Interface Configuration

The extended UART interface uses UART-HDLC working mode, encapsulates MVB data and information as frames, and transmits them on the UART interface.

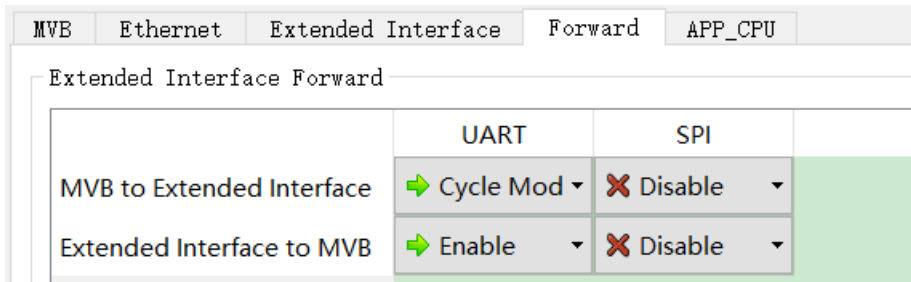
Duplex mode depends on the design of the motherboard. When the motherboard uses RS-485, it is set to half-duplex mode. Set to full duplex when the motherboard is RS-232, RS-422 or when it is directly connected to the UART of the host.

MVB	Ethernet	Extended Interface	Forward	APP_CPU
UART				
Working Mode	UART-HDLC			
Duplex	Full-Duplex			
Baudrate (bps)	115200			
Options (Double-click)	Data Bits: 8 Parity Bits: None Stop Bits: 1 CRC: Enable Rx FCS: Forward			

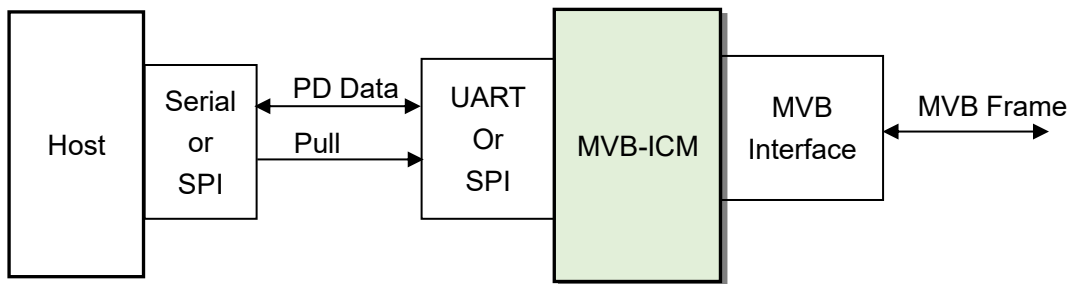
4.4 Forward Configuration

4.4.1 Function Description

The “Forward” configuration page sets the forwarding relationship between MVB and extended UART, SPI interfaces. The default is Disable, which takes effect when enabled by the user.



MVB-ICM is connected to the host through an extended interface as shown in the following figure.

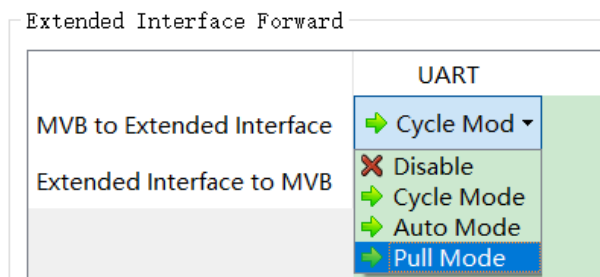


MVB-ICM configured with PD source port can receive PD data from the host through extended interface, and then refresh to MVB interface buffer. When PD master frame is received from MVB interface, MVB-ICM sends slave frame to respond, which contains the latest data in buffer. MVB-ICM configured with PD sink port can receive PD slave frame from the source of MVB bus, and then refresh to send buffer of extended interface. According to the forward configuration of MVB-ICM, PD data shall be sent to the host actively, or PD data should be sent passively after the pull command is received from the host.

4.4.2 MVB Sink to Extended UART

To meet the needs of different scenarios, MVB to UART provides three forwarding modes:

- Cycle mode: The MVB process data is forwarded to UART according to the forward cycle in the MVB configuration page.
- Auto Mode: The MVB process data is automatically forwarded at full speed based on the UART baud rate, and the forward cycle in the MVB configuration page does not work;
- Pull Mode: MVB-ICM does not actively forward, and when UART receives the pull command message, it passively sends the process data of the command request to the host.

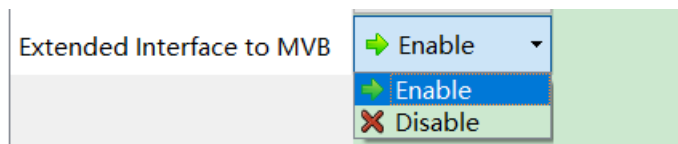


When extended UART works in RS-485 half-duplex mode, if MVB-ICM is configured with PD source port and sink port, both MVB-ICM and the host have data sent to the RS-485 bus. In this case, if the MVB to Extended Interface is configured as cycle mode or auto mode, MVB-ICM and host send operations may occur simultaneously, causing bus conflicts. To avoid conflicts, the MVB to Extended Interface must be configured as pull mode. MVB-ICM does not send actively, only passively sends after receiving the pull command from the host.

When extended UART works in RS-422 full-duplex mode, the send and receive operations of UART can be carried out simultaneously without conflict. The MVB to Extended Interface can be configured as cycle mode or auto mode, which can simplify the software implementation of the host device.

4.4.3 Extended UART to MVB Source

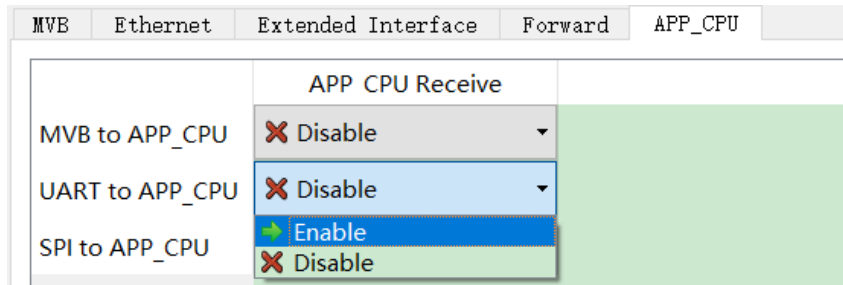
When MVB-ICM is configured with PD source port, data received from UART can be refreshed to the MVB source port buffer if Extended Interface to MVB is enabled.



4.5 APP_CPU

The APP_CPU configuration page enables MVB interface and extended interface data to be forwarded to the application CPU for processing by the user's secondary development software.

All options should be disabled when the application CPU is not enabled.

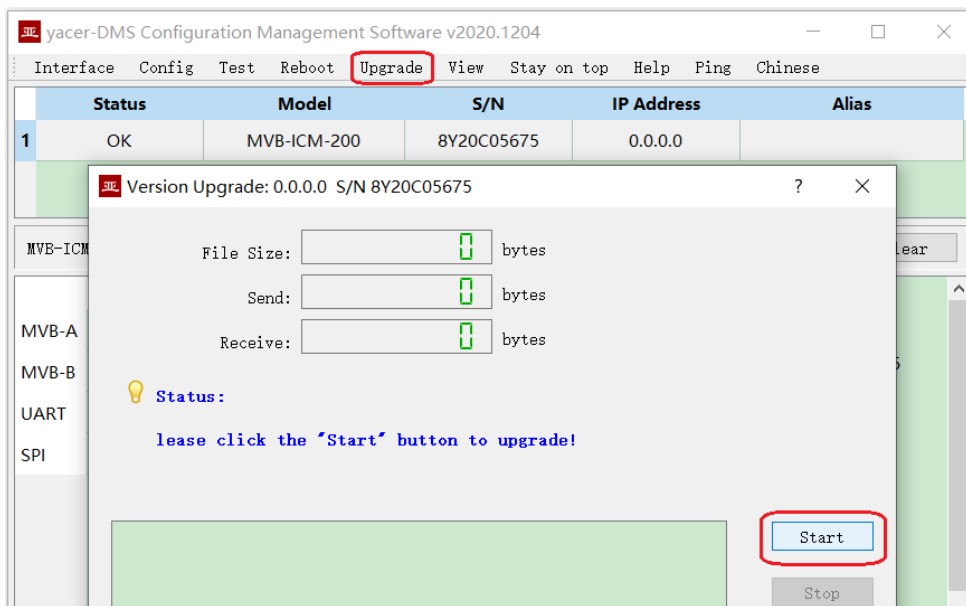


5 System Maintenance

5.1 Firmware Version Upgrade

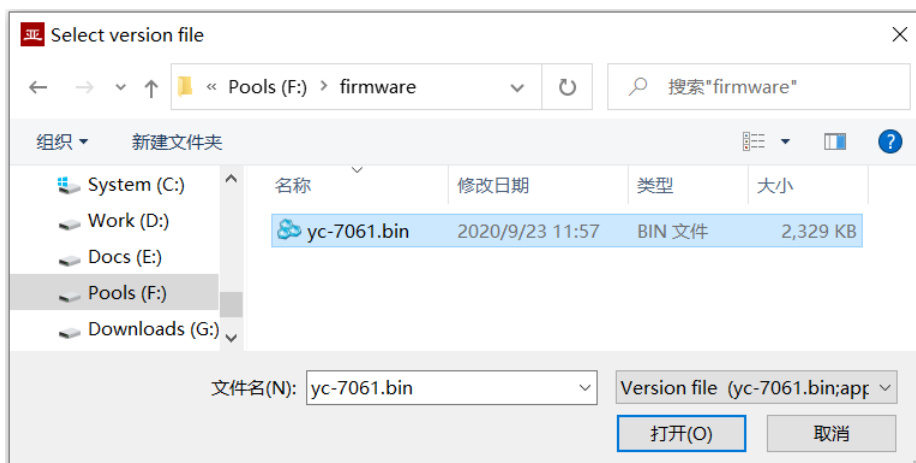
5.1.1 Start Upgrade

Click the “Upgrade” button on the toolbar to pop up the version upgrade dialog, and then click the “Start” button.



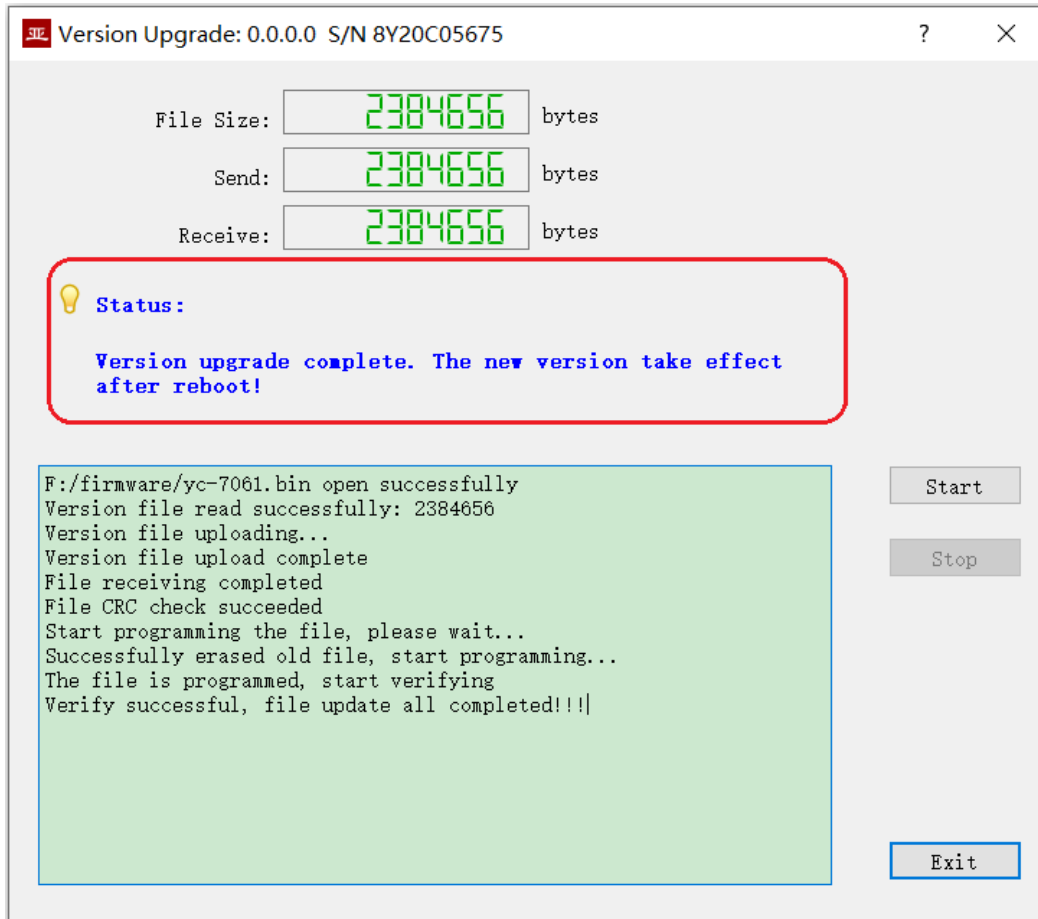
5.1.2 Select Version File

Pop up the “Select version file” dialog, and find the folder where the latest firmware version is stored, select the corresponding file, and click “Open” to start the update.



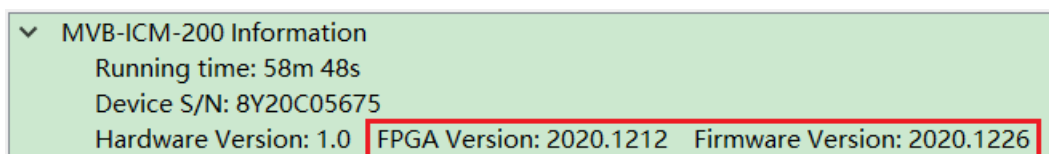
5.1.3 Complete Upgrade

When the page displays “Version upgrade complete” status, it indicates that the version upgrade is completed.



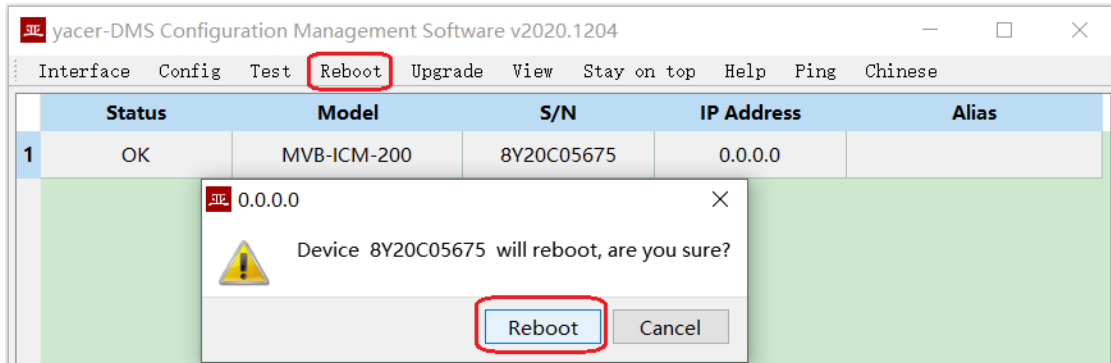
5.1.4 Confirm Upgrade

After the upgrade is completed, power up the device again, observe the version information in the statistical report, and determine whether the new version is successfully updated by the version date.



5.2 Reboot Device

Click the “Reboot” button on the toolbar to pop up the device reboot dialog, and then click the “Reboot” button to reboot the device.



6 Hardware Development

6.1 PG_OUT & Power Supply

If the I/O pin has a high-level input before the power-on of MVB-ICM is completed, it may cause damage to the components of this module. To avoid this, MVB-ICM provides PG_OUT outputs the signal as Power Good indication of the module.

When designing the motherboard, the power supply of the transceiver must be enabled to be controlled by PG_OUT signal to avoid risks during power-on.

PG_OUT is an open drain output pin that allows pull-up resistors to be connected to any voltages less than 6V. When the MVB-ICM module is powered on, the PG_OUT pin goes high impedance state. When the power supply voltage of MVB-ICM module is below 90% of the working requirement, PG_OUT output is low.

6.2 MVB Interface

Refer to the MVB-ICM evaluation board schematic diagram.

7 Software Development

Refer to MVB Programming Manual.

About the Manual

- The manual is for reference only. If there is inconsistency between the manual and the actual product, the actual product shall prevail.
- We are not liable for any loss caused by the operations that do not comply with the manual.
- All the designs and software are subject to change without prior written notice. The product updates might cause some differences between the actual product and the manual. Please contact the customer service for the latest program and supplementary documentation.
- There still might be deviation in technical data, functions and operations description, or errors in print. If there is any doubt or dispute, we reserve the right of final explanation.
- Upgrade the reader software or try other mainstream reader software if the manual (in PDF format) cannot be opened.
- Please visit our website, contact the supplier or customer service if there is any problem occurring when using the device.
- If there is any uncertainty or controversy, we reserve the right of final explanation.