# tSH-700 Serial Port Sharer

## Easy Integration, Flexible Application



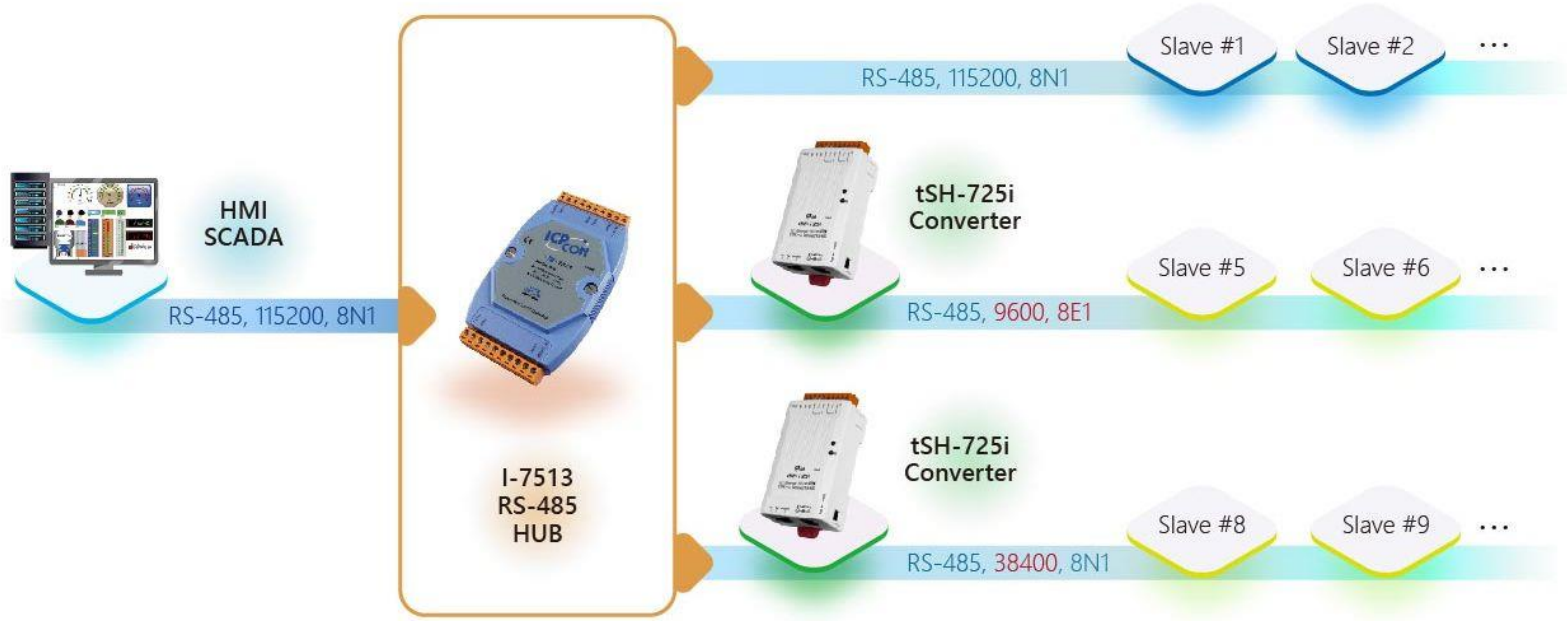

A serial port is commonly referred to as a COM port. In industrial environments, serial ports are still widely used in applications such as PLCs, I/O modules, GPS receivers, microcontrollers, barcode scanners, LED text displays, industrial motors, digital multi-meters, and more, due to their low cost, simplicity, ease of use, and stability.

The ICP DAS tSH-700 series modules are specifically designed for the integration and use of serial devices. The tSH-72x series converter has two serial ports and supports communication parameter conversion and Modbus RTU/ASCII protocol conversion. The tSH-73x series sharer has three serial ports and supports serial port sharing in addition to the above functions. This allows two master controllers to access or control multiple slave devices simultaneously.

Let's see how the ICP DAS tSH-700 series modules are used.

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# Baud Rate and Data Format Conversion




- Case: A customer has used an I-7513 module to create a star topology for wiring their RS-485 devices, which can reduce interference between devices and simplify partition wiring. However, several RS-485 devices use different communication parameters (baud rate, data format), which causes integration problems. It is not easy to expand the serial port of the master controller, and it is not easy to modify the program. If you keep changing the communication parameters, there is a risk of malfunction of the slave devices.
- With the ICP DAS tSH-725i converter, you can set different communication parameters for the master and slave devices to unify the communication interface. In this way, the system can be quickly and easily integrated to connect multiple RS-485 devices without changing the configuration of the master.

# RS-232 / RS-485 Converter




- Most RS-232/RS-485 converters on the market have the same communication parameters (baud rate/data format) on the input and output sides. The advantage is that they can communicate without user setting, but the disadvantage is that they can't help if the communication parameters of the two ends are different.
- ICP DAS tSH-724i can be used as an RS-232 / RS-485 converter, and each port can be set with different communication parameters. When the baud rate of the two ports is different, the built-in 512-byte buffer of each port provides a good buffering and stabilizing effect for half-duplex communication. One of the ports can be configured to connect to a master, while the other port is for slave devices. This can be flexibly adjusted according to the site requirements.

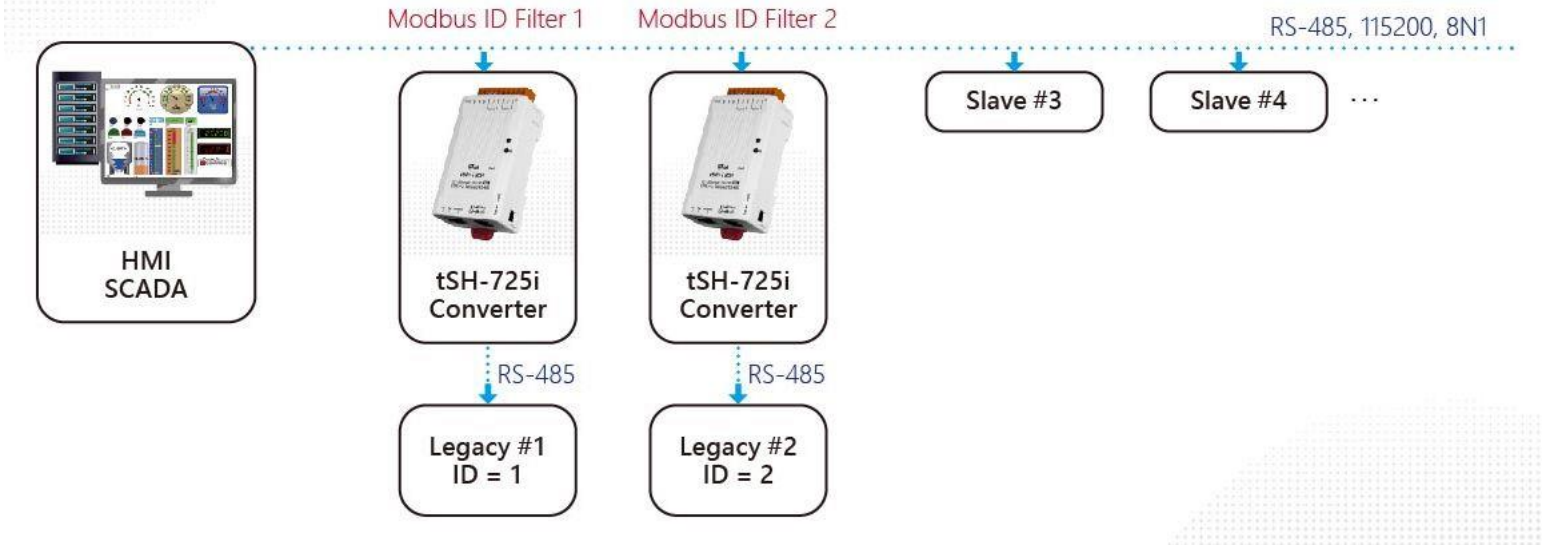
# Modbus Protocol Conversion




- Some older devices still use the Modbus ASCII protocol, such as some early PLCs, instruments, sensors, etc., while newer systems tend to use the Modbus RTU protocol, which can transmit the same amount of data in smaller packets and has better communication performance. If you want to expand the old equipment and integrate it into the new system, you may encounter the problem of incompatible protocols and fail to communicate.
- ICP DAS tSH-700 series modules support Modbus RTU/ASCII protocol conversion function, which can help users to realize the communication between different devices and improve the integration and scalability of the system. The master controller does not need to expand serial ports or mix two communication protocols, which can simplify the troubleshooting and maintenance process.

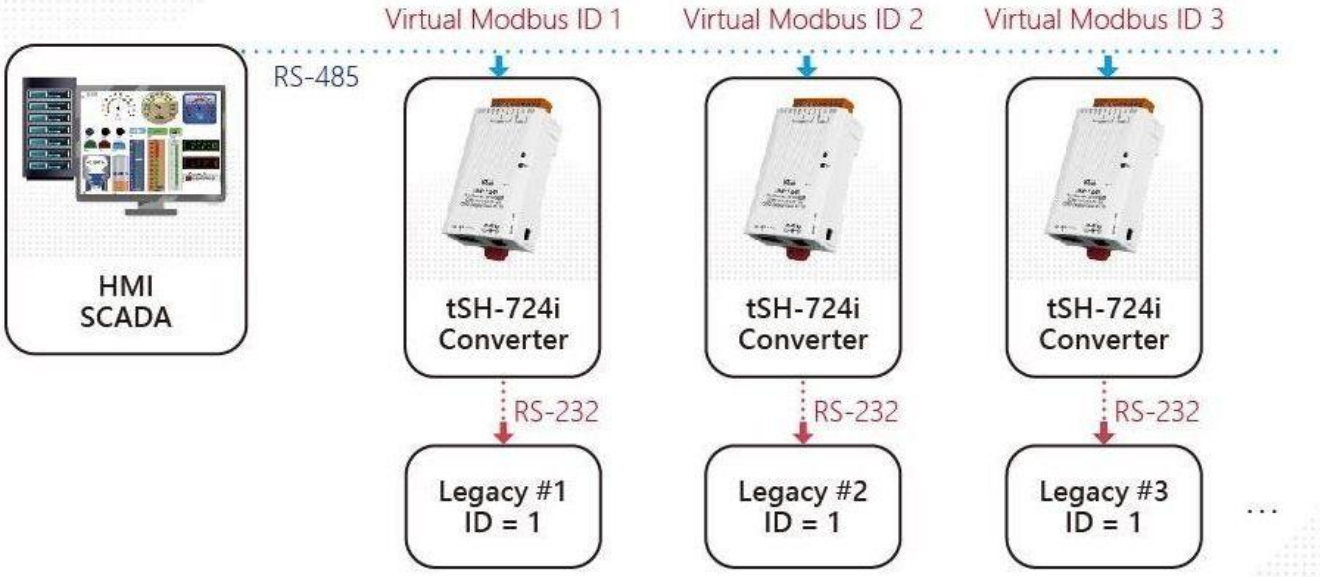
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# Modbus ID Filter



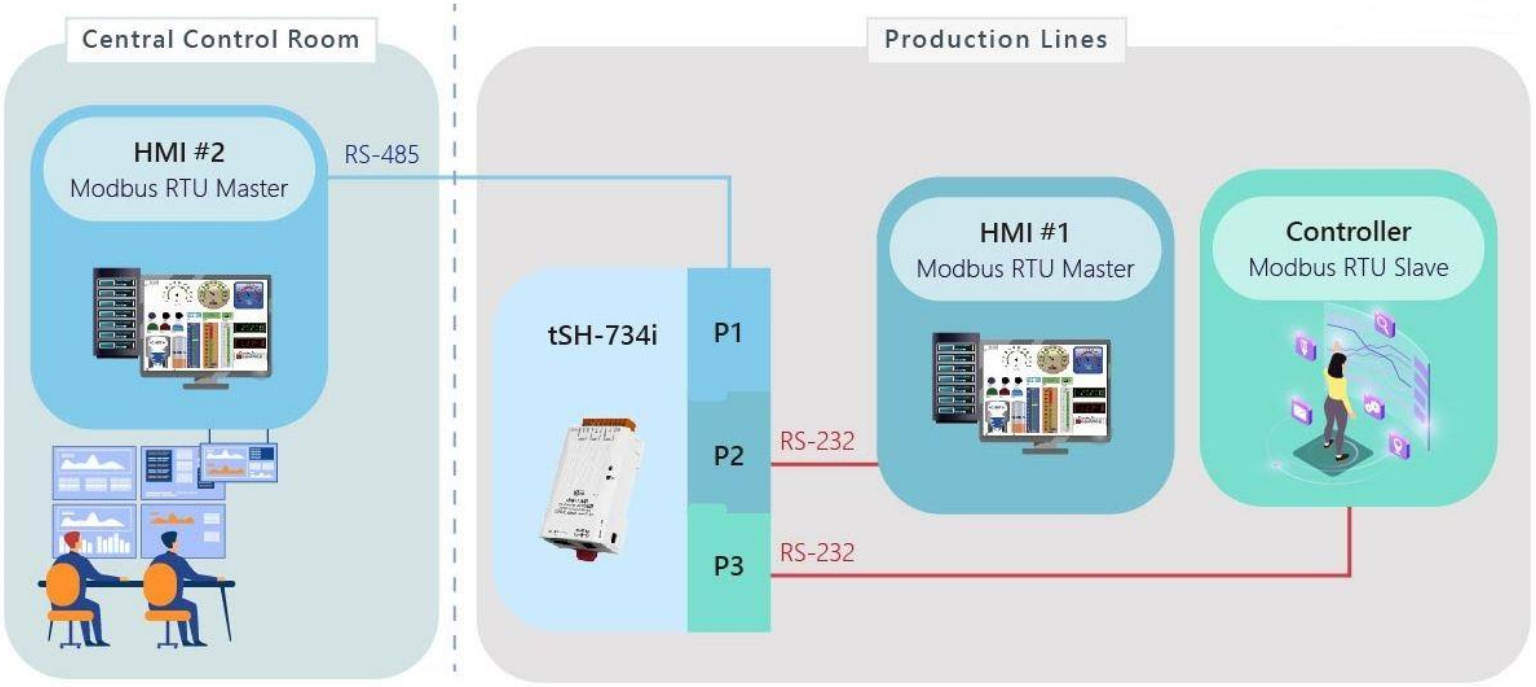

- Some legacy Modbus devices are used in a site. When they receive commands that are not related to them, the commands are still being analyzed and processed in the MCU. The next time they can accept new commands is about 400 ms later. To be compatible with these legacy devices, it is considered to modify the master program to add judgment and delay to prevent the legacy devices from becoming overloaded and unresponsive. This solution has its inconveniences and also causes the complexity of the master controller program and maintenance difficulties.
- With the ICP DAS tSH-725i converter, you can set the Modbus ID range as an ID filter and allow only the specified Modbus ID packets to pass and skip the irrelevant commands to prevent the legacy devices from becoming busy and delayed. This solution does not need to change the configuration of the master, just use ICP DAS tSH-725i to easily solve the delay problem caused by the legacy devices; it simplifies the master's access to various slave devices and improves the system operation efficiency.

# Virtual Modbus ID




- Some legacy Modbus devices were designed without the concept of multi-node communication in mind, resulting in fixed Modbus IDs that could not be changed. This limitation remained with the move to RS-485. As a result, system integration was limited. Expanding the number of serial ports on the master controller would require significant hardware and software modifications, adding complexity and making future maintenance difficult.
- The ICP DAS tSH-724i module not only acts as an RS-232/RS-485 serial port converter, but also provides station number conversion via the Modbus ID offset parameter. The tSH-724i uses a virtual Modbus ID for communication with the master controller, while converting it to a physical Modbus ID for communication with the slave devices. Although several slave devices may have the same ID, each tSH-724i performs individual conversions, allowing the master controller to easily access the corresponding slave devices with different virtual Modbus IDs without interference. This greatly enhances the system's expansion and integration capabilities, providing flexibility to adapt to various application scenarios.

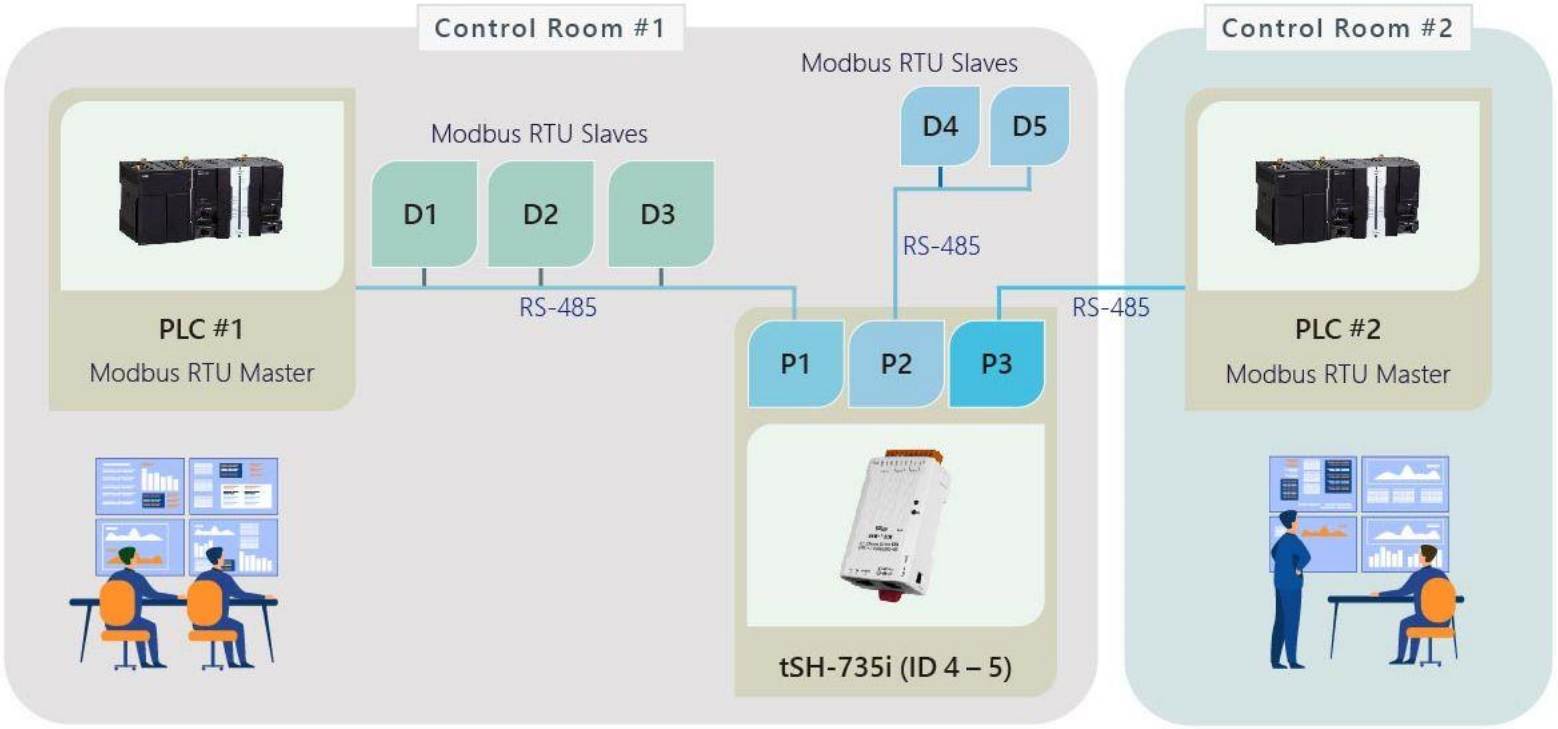
# Serial Port Sharing




- The original system uses a Human Machine Interface (HMI) with an RS-232 communications interface to connect to the machine controller in the field. The HMI displays the status of the machine controller and provides the function of setting up the machine by the field personnel. Due to the large area of the factory, there is a distance between several controllers, so the field personnel have to move around to change the parameters or check the status of each machine, which is a little inconvenient.
- With the tSH-734i, two RS-232 ports can be connected to the existing HMI and machine controller, and another RS-485 port can be connected to the second HMI. tSH-734i's serial port sharing function allows both HMIs to communicate with the machine controller. With the RS-485 support, the second HMI can be installed in a remote control room. In this way, you can monitor and control the distributed machines from the central control room, eliminating the time delay caused by personnel movement and greatly improving work efficiency.

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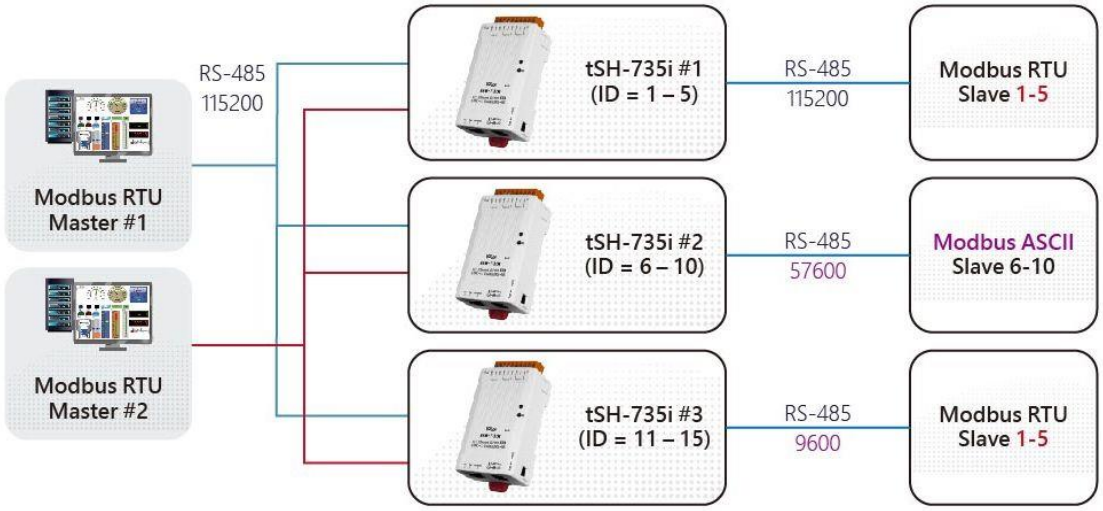
# Segmenting Devices into Zones




- The original system was controlled by PCL #1 for slave devices D1 - D5, and then tSH-735i was introduced to divide the slave devices into two segments. By using the serial port sharing function of tSH-735i, the slave devices D4 - D5 can be accessed by both PLC #1 and PLC #2. Use the Modbus ID Range function of the tSH-735i to restrict the packets from the slave devices D1 - D3 to the PLC #1 side only, and prohibit the forwarding of irrelevant packets to the P2 port. This reduces the traffic on the P2 port and prevents the tSH-735i from waiting for no response from the P2 port. This architecture also restricts D1 - D3 from being inadvertently accessed by PLC #2, achieving the effect of device partition protection and access control.

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# Epilogue




- As system functionality continues to expand, there are still many Modbus devices with different limitations that will be used. Previous solutions have often involved splitting the system, or increasing the number of serial ports and modifying the code to suit the needs of different devices. However, these methods increase system complexity and make modification and maintenance difficult, resulting in delays in system integration and frustration for system designers.
- The ICP DAS tSH-700 series converters and sharers provide a variety of functions, including communication parameter conversion, RS-232/RS-485 conversion, Modbus RTU/ASCII protocol conversion, Modbus ID station number conversion, packet filtering based on Modbus ID, device zone access control, and serial port device sharing, among others. The combination of these features provides great convenience and flexibility, reducing the problems associated with incompatible communication interfaces. This allows you to integrate multiple serial port devices efficiently and effortlessly.
- ICP DAS also offers other serial port related products such as tDS, tGW, PDS, MDC and more. For more information, please visit the ICP DAS website or contact sales@icpdas.com.

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