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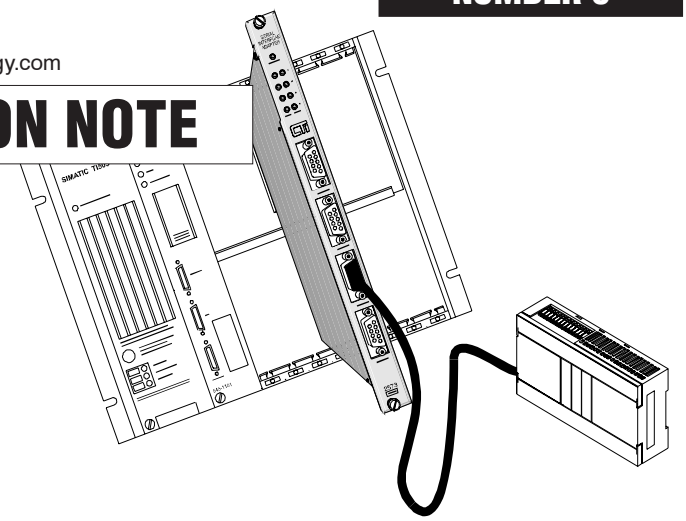
NUMBER 5

APPLICATION NOTE

2573-MOD Serial Interface Adapter to Siemens SIMATIC S7-200 Micro PLC



The CTI 2573-TCM2 Serial Interface Adapter allows the Simatic® 505 PLC and the S7-200 to share data using the Modbus Protocol.

2573-MOD to S7-214 Modbus RTU Application Example

The following Command Block examples show how to set up the 2573-MOD to read 10 words of V memory from the
S7-214 PLC starting at location V0 using the Modbus Function 3 (Read Holding Registers).

These command blocks, used in conjunction with the attached ladder logic example, will initialize the 2573-MOD serial port, initiate the modbus query, and store the response from the S7-214.

NOTE: The S7-214 must be loaded with the Modbus RTU driver Slave Program available from the Siemens Fax Back Service Tip #41.

CREATE CONNECTION COMMAND

LOCATION	DESCRIPTION	HEX	DECIMAL	COMMENTS
V200	Command Error Word	0000	0	An error code will be written here if one is encountered when the command is executed
V201	Command (Create Connection)	0001	1	
V202	Connection Number = 19923	4B17	19223	
V203	Protocol Manager Number (Modbus Master RTU)	0028	40	Select Modbus RTU Protocol
V204	Physical Port Number = 3	0003	3	Port number 3 of 2573-MOD
V205	Port Baud Rate = 9600	2580	9600	Match baud rate of S7-214
V206	Reserved (Set to zero)	0000	0	This word is not used
V207	Parity (0 = None, 1 = Odd, 2 = Even)	0002	2	Select EVEN parity to match port set up of S7-214
V208	Reserved (Set to zero)	0000	0	This word is not used
V209	Handshake (0 = none, 4 = RS-485)	0004	4	Select RS-485 communication to S7-214
V210-V215	Unused - reserved for future use (Set to 0)	0000	0	These locations should be set to 0 and not used by another application

The above command block sets up the 2573-MOD port number 3 to talk to the S7-214 RS-485 Freeport at 9600 baud, even parity, and RS-485 communication.

In the modbus protocol, the master device (2573-MOD) initiates a transaction (called query) to the slave device (S7-214). The following command block shows how to set up the query command to read 10 holding registers from the S7-214 beginning at address 0.

The query message specifies the slave address, starting register, and quantity of registers to be read.

MODBUS QUERY COMMAND

LOCATION	DESCRIPTION	HEX	DECIMAL	COMMENTS
V220	Error Word	0000	0	An error code will be written here if an error is encountered when the command is executed.
V221	Command Code (Modbus Send)	2801	10241	Command code for "send modbus query".
V222	Connection Number = 19223	4B17	19223	Matches connection for port 3 in create connection command block.
V223	Command Flag	0000	0	Not used in this version.
V224	Modbus Slave Address	0001	1	S7-214 in example set to address 1.
V225	Modbus Function Code	0003	3	Read Holding Registers.
V226	Query Data V Memory Location	00F0	240	Query Data is stored in V memory starting at V240.
V227	Query Data Length	0004	4	There are 2 words (4 bytes) of data **This should *exactly* match the number of bytes used in the query data stored at V240.**
V228	Response V Memory Location	00FA	250	This is the V memory location within the PLC where the response from the S7-214 is to be stored.
V229	Response V Memory to reserve	0032	50	Reserve 50 bytes (25 words) for the response. You must make sure that you reserve enough memory to accommodate the number of registers that you ask for, plus 4 bytes for the response function code and byte count. You can reserve more than you need for the actual response.
V230	Command Time-out	0002	2	Sets command time-out for 2 seconds. If time-out errors are encountered, this may be increased. A value of 0 will default the time-out at 9 seconds.
V231-V235	Unused (set to 0)	0000	0	These locations should be set to 0 and not used by another application.

The data portion of the modbus request in this example is stored at V memory location 240.

The format for the data is:

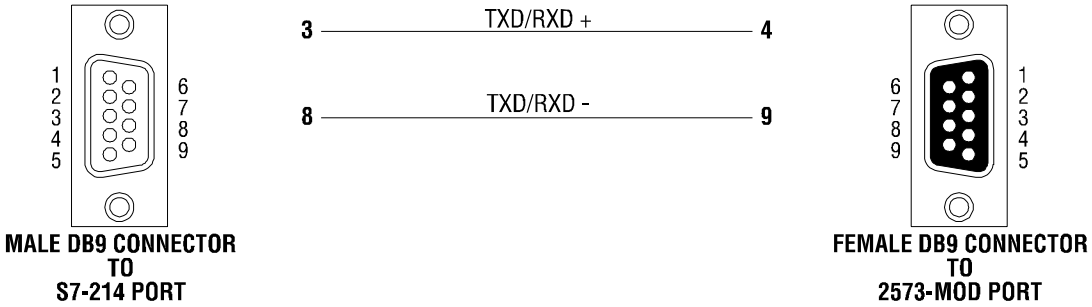
Starting Address Hi:	***00 (hex)***
Starting Address Lo:	***00 (hex)***
No. of Registers Hi:	***00 (hex)***
No. of Registers Lo:	***0A (hex) (10 decimal)***

V memory 240 should contain 0000 (hex) and V memory 241 should contain 000A (hex)

Location	**Hex Value**	**Decimal Value**	**Comments**
V240	0000	0	Starting Address
V241	000A	10	Number of Registers

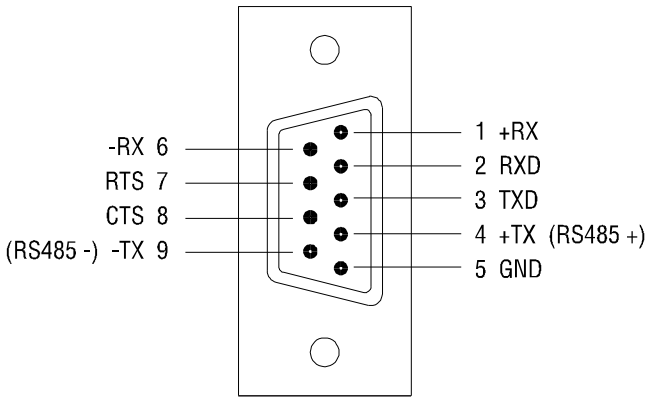
In this example, the response from the S7-214 is stored in the PLC beginning at V memory location 250. The format of the response, assuming the first 10 VW locations in the S7-214 contain data values 1-10, will be as follows:

Location	**Hex Value**	**Decimal Value**	**Comments**
V250	0003	3	Response Function Code
V251	0014	20	Byte Count (10 words = 20 bytes)
V252	0001	1	Data in S7-214 VW0 = 1
V253	0002	2	Data in S7-214 VW2 = 2
V254	0003	3	Data in S7-214 VW4 = 3
V255	0004	4	Data in S7-214 VW6 = 4
V256	0005	5	Data in S7-214 VW8 = 5
V257	0006	6	Data in S7-214 VW10 = 6
V258	0007	7	Data in S7-214 VW12 = 7
V259	0008	8	Data in S7-214 VW14 = 8
V260	0009	9	Data in S7-214 VW16 = 9
V261	000A	10	Data in S7-214 VW18 = 10



RS-485 Cable from 2573-MOD to S7-214

The serial ports on the 2573-MOD use a DB9 male connector to provide multiple electrical interfaces.
The electrical interface in use is determined by which pins are connected to the serial communications cable.
The illustration above shows the pinouts for one of the ports; all ports are identical.



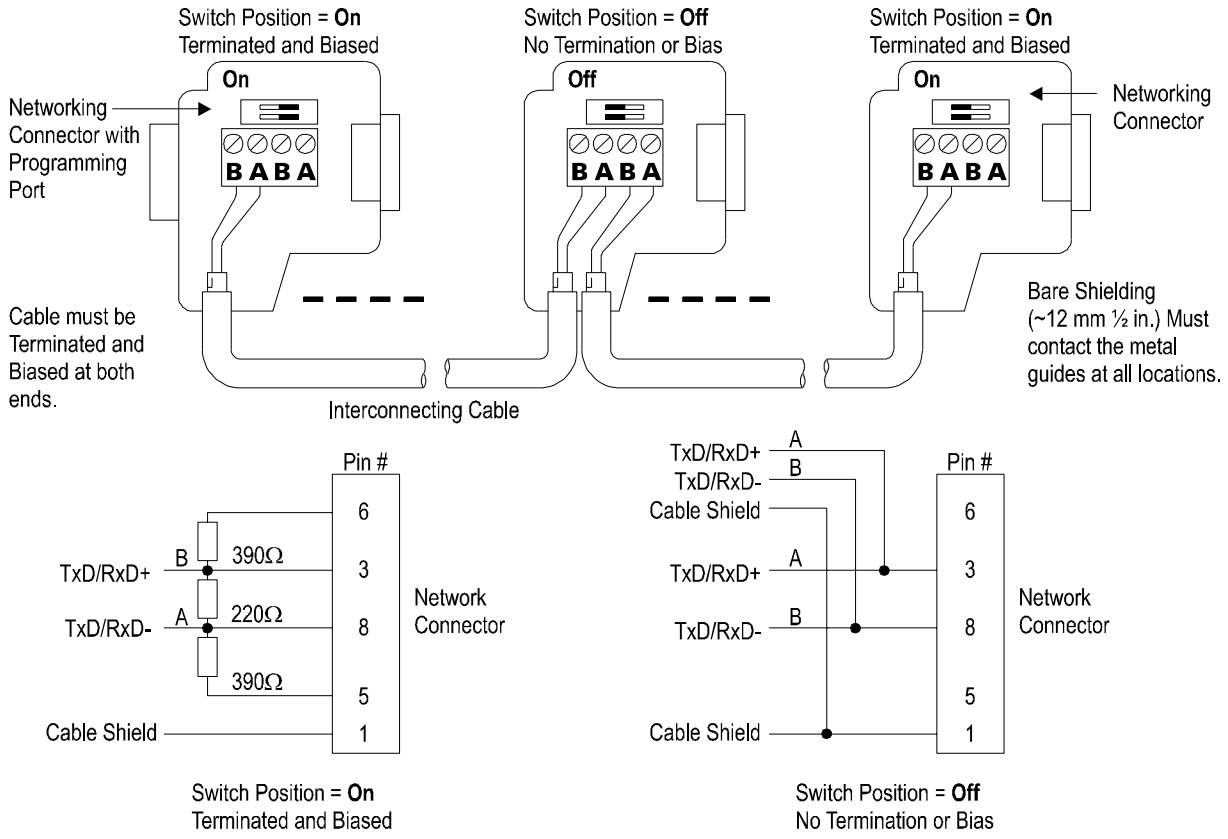
2573-MOD Serial Port Pinout

RS232 Cabling
To use the RS232 electrical interface, connect as shown below. Do not connect pins 1, 4, 6, or 9.

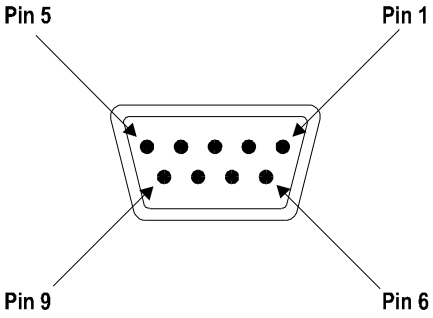
Pin #	RS-232 Signal
2	RxD: Received Data (input)
3	TxD: Transmitted Data (output)
5	SG: Signal Ground
7	RTS: Request to Send (output)
8	CTS: Clear to Send (input)

NOTE:
The RS-485 is not isolated from the S7-200 logic.

When interconnecting multiple S7-200 units, isolate the power supplies of DC units that are separated by more than 100 meters. This voids possible ground loop connections through the interconnecting cable. The internal power supply of the AC units already provide the necessary isolation.

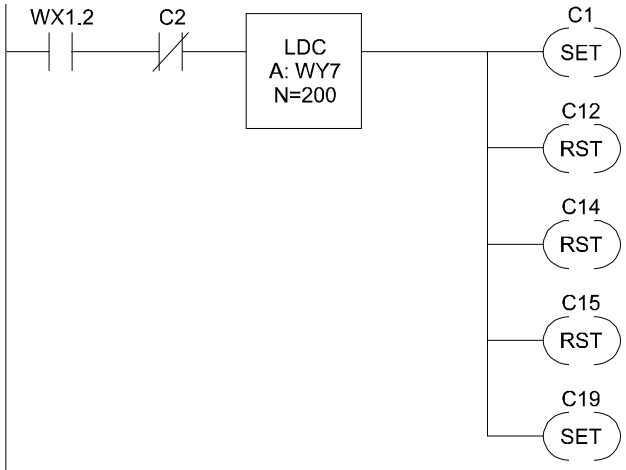


Bias and Termination of Interconnecting Cable



Pin 1 = Logic Ground
Pin 2 = 24 VDC Common
Pin 3 = Transmit/Receive Data +
Pin 4 = Reserved
Pin 5 = Logic Ground
Pin 6 = 5VDC (Current limited with 100Ω resistor in series)
Pin 7 = 24VDC (120mA max)
Pin 8 = Transmit/Receive Data -
Pin 9 = Reserved
Connector Shell = Logic Ground

Communications Port Pinout



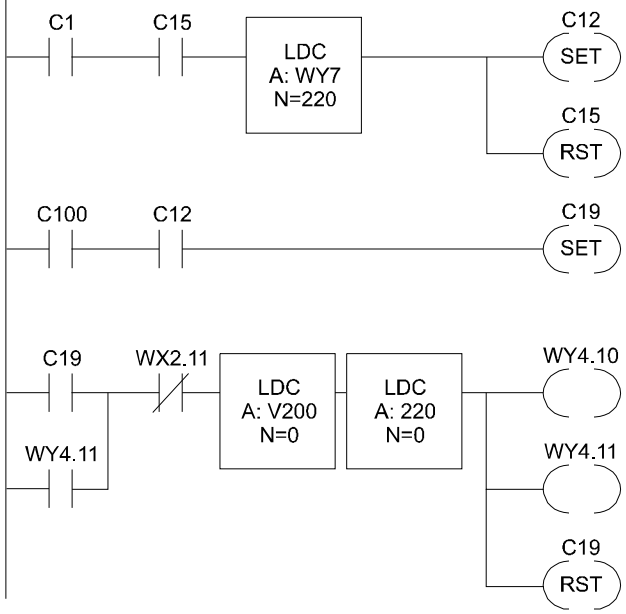
This rung selects the Create Connection Command Block by loading the V memory address of 200 in WY7. The 2573-MOD will turn the WX1.2 (SER CFG) bit on when the module is reset; it will remain on until all ports have been configured (either by DIP switch or by a Create Connection). Thus this rung is executed when WX1.2 first goes high.

C1 is set high to indicate that WY7 points to the Create Connection Command. C14 and C15 are reset to indicate no command cycle is in progress. The trigger enabling relay (C19) is turned on so the command trigger will fire.

When WX1.2 is on, C2 is turned on. This prevents the previous rung from re-executing on subsequent scans.

C14 is used as a flag which indicates that the command cycle was started. The cycle starts when Command Busy (WX2.11) comes on. C15 is reset at the beginning of a command cycle.

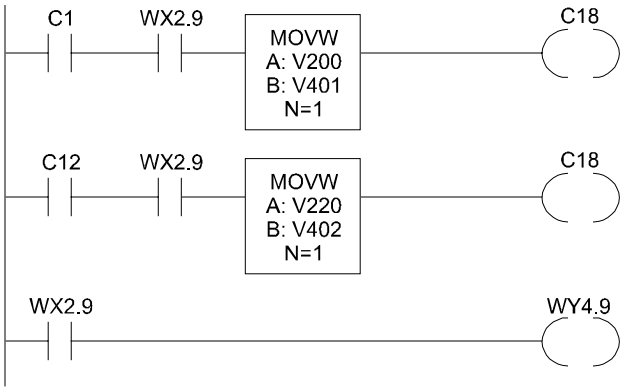
Once the command cycle is started (C14 is on), when command busy goes off, the command cycle is complete. The Cycle Complete flag (C15) is set and C14 is reset.



If C1 is on, then WY7 contains the address of the Create Connection Command Block. When C15 is on, the module has completed a command cycle. When both events are true, you have
successfully created a connection and are ready for the Send Query Command. This rung load WY7 with the address of this Command Block (V220), sets C12 to indicate this and reset the Cycle Complete flag (C15).

This rung is used to enable the trigger for the memory read command, assuming that other logic sets C100 when a particular event happens.

This rung is the command trigger for coupled mode. The Command Error words in both command blocks are cleared when a new command cycle is initiated.



If an error occurs (WX2.9 is on) and the Create Connection command is executing (C1 is on), this copies the Command Error Word to another V memory location.

This rung performs a function similiar to the rung above for errors that occur when executing the Send Query Command (C12 is on).

This rung raises ERRACK (WY4.9) when the command error (WY2.9) is raised. When the error is acknowledged, the 2573-MOD will lower command busy and command error. You can then trigger a new command.