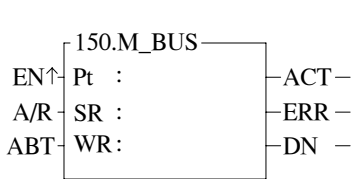


FUN150 M-BUS	Convenient instruction for Modbus RTU Master (which makes PLC as the Modbus RTU master through Port1or Port2)	FUN150 M-BUS
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Pt : 1 , Modbus RTU master through Port 1
 2 , Modbus RTU master through Port 2
 SR : Starting register of communication program
 WR : Starting register for instruction operation. It controls 8 registers , the other programs can not repeat in using.

Range Ope-	HR	ROR	DR	K
	R0 R3839	R5000 R8071	D0 D3071	
Pt				1~2
SR	○	○	○	
WR	○	○*	○	

Descriptions

1. FUN150 (M-BUS) instruction makes PLC act as Modbus RTU master through Port 1 or Port 2, thus it is very easy to communicate with the intelligent peripheral with Modbus RTU protocol.
2. The master PLC may connect with 247 slave stations through the RS-485 interface.
3. If through Port1, the DIP switch (SW1) of master PLC has to be set as 1=OFF, 2=ON (turn off setting and restart).
4. Only the master PLC needs to use M-BUS instruction.
5. It employs the program coding method or table filling method to plan for the data flow controls; i.e. from which one of the slave station to get which type of data and save them to the master PLC, or from the master PLC to write which type of data to the assigned slave station. It needs only seven registries to make definition; every seven registers define one packet of data transaction.
6. When execution control "EN ↑" changes from 0→1 and both inputs Pause "PAU" and Abort "ABT" are 0, and if Port1 or Port2 hasn't been controlled by other communication instructions (i.e. M1960 or M1962 = 1), this instruction will control the Port1 or Port2 immediately and set the M1960 or M1962 to be "0" (which means it is being occupied), then going on a packet of data transaction immediately. If Port1 or Port2 has been controlled (M1960 or M1962 = 0), then this instruction will enter into the standby status until the controlling communication instruction completes its transaction or pause/abort its operation to release the control right (M1960 or M1962=1), and then this instruction will become enactive, set M1960 or M1962 to be 0, and going on the data transaction immediately.
7. While in transaction processing, if operation control "ABT" becomes 1, this instruction will halt immediately and release the control right (M1960 or M1962 set to be 1). Next time, when this instruction takes over the transmission right again, it will restart from the first packet of data transaction.
8. While "A/R" =0 , Modbus RTU protocol ; "A/R" =1 , Modbus ASCII protocol (Reserved) .
9. While it is in the data transaction, the output indication "ACT" will be ON.
10. If there is error occurred when it finishes a packet of data transaction, the output indication "ERR" will be ON.
11. If there is no error occurred when it finishes a packet of data transaction, the output indication "DN" will be ON.

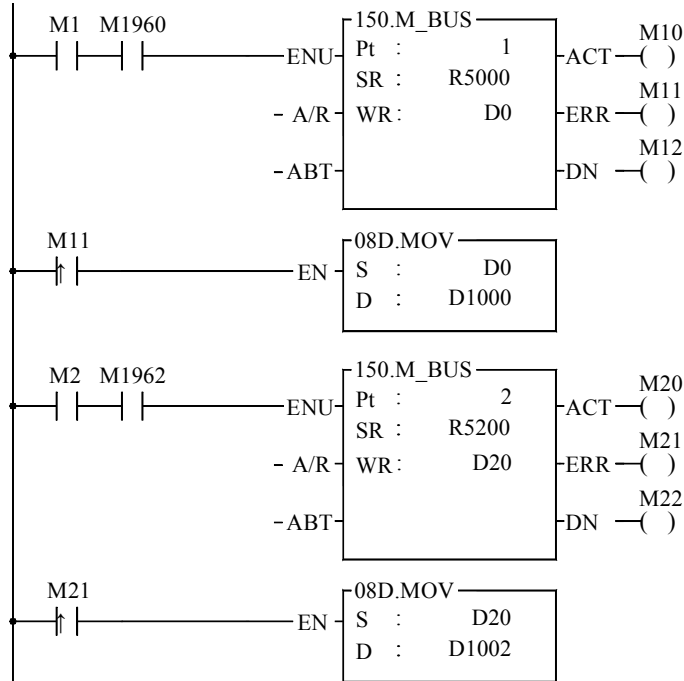
Communication instruction

FUN150 M-BUS	Convenient instruction for Modbus RTU Master (which makes PLC as the Modbus RTU master through Port1or Port2)	FUN150 M-BUS
<p>【 Interface signals of Port2 】</p> <p>M1962: This signal is generated from CPU. ON, it represents that Port2 is free and ready. OFF, it represents that Port2 is occupied, data transaction is going.</p> <p>M1963: This signal is generated from CPU. When the communication program completed the last packet of data transaction, M1963 will be ON for a scan time (for successive data transaction). When the communication program completed the last packet of data transaction, M1963 will be ON (for single packet of data transmission).</p> <p>R4157: The Port2 Rx/Tx Time-out setting. The system will produce pertaining setting value according to R4158 communication parameter setting; the user needs not to set it.</p> <p>R4158: The register for communication parameter setting of Port2. (please refer to section 12.7.2 for Port2 communication parameter setting descriptions)</p> <p>R4159: The content of Low Byte defines the Time-out span of M-BUS instruction; its unit is 0.01 second (the default is 50, which means 0.5 second) The M-BUS instruction employs Time-out span to judge whether the slave station on line or not. When the master PLC sent out the read/write command to the slave station, the slave station didn't reply within this period means that there is abnormal event in communication called Time-out. When there are multi-drop linking, properly adjust this value (greater than 1 scan time of the slave station with the longest scann time) to shorten the communication response time among the active linking stations if there are many slave stations power off (The time-out cases will happen).</p> <p>: The content of High Byte defines the transmission delay time between two packets of data transaction for M-BUS instruction; its unit is 0.01 second (the default is 0). For point to point link, this value can be set as 0 to shorten the communication transaction time and promote the communication efficiency. In the case of linking multi-drop and if the scan time of master PLC is far longer than any slave station, this value can be set to 0 to shorten the communication transaction time and promote the communication efficiency. When there are multi-drops to link in parallel by using master/slave method and the scan time of master PLC is close to that of slave station's, it must properly adjust this value (greater than 1 scan time of the slave station with the longest scan time) to reach the best, error-free communication quality.</p>		

FUN150 M-BUS	Convenient instruction for Modbus RTU Master (which makes PLC as the Modbus RTU master through Port1 or Port2)	FUN150 M-BUS
<p>【 Interface signals of Port1 】</p> <p>M1960 : This signal is generated from CPU. ON, it represents that Port1 is free and ready. OFF, it represents that Port1 is occupied, data transaction is going.</p> <p>M1961 : This signal is generated from CPU. When the communication program completed the last packet of data transaction, M1961 will be ON for a scan time (for successive data transaction). When the communication program completed the last packet of data transaction, M1961 will be ON (for single packet of data transmission).</p> <p>R4146 : The register for communication parameter setting of Port1. (please refer to explanation for Port1 communication parameter setting of section 12.7.2)</p> <p>R4147 : The content of Low Byte defines the Time-out span of M-BUS instruction; it's unit is 0.1 second. (the default is 5, which means 0.5 second) The M-BUS instruction (only master PLC needs) employs Time-out span to judge whether the slave station on line or not. When the master PLC sent out the read/write command to the slave station, the slave station didn't reply within this period means that there is abnormal event in communication called Time-out. When there are multi-drops linking, properly adjust this value (greater than 1 scan time of the slave station with the longest scan time) to shorten the communication response time among the active linking stations if there are many slave stations power off (The time-out cases will happen).</p> <p>: The content of High Byte defines the transmission delay time between two packets of data transaction for M-BUS instruction; its unit is 0.01 second (the default is 0). For point-to-point link, this value can be set as 0 to shorten the communication transaction time and promote the communication efficiency. In the case of linking multi-drops and if the scan time of master PLC is far longer than any slave station, this value can be set to 0 to shorten the communication transaction time and promote the communication efficiency. When there are multi-drops to link in parallel by using master/slave method and the scan time of master PLC is close to that of slave station's, it must properly adjust this value (greater than 1 scan time of the slave station with the longest scan time) to reach the best, error-free communication quality.</p> <p>R4148 : When Low Byte of R4147 is not 0, Low Byte of R4148 makes no effect. When Low Byte of R4147 is 0, Low Byte of R4148 defines the Time-out span of M-BUS instruction, the unit is 0.01 second (for fine tuning ;the default is 0). The function is identical to explanation for R4147 low byte.</p>		

FUN150 M-BUS	Convenient instruction for Modbus RTU Master (which makes PLC as the Modbus RTU master through Port1 or Port2)	FUN150 M-BUS
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Program example Automatic cycling transmission



- Configure R5000~R5399 as the read only register (ROR) before programming, after then, when storing program, the ladder program will automatically contains the communication program .
- When there is communication error, gets and stores the error message to D1000 & D1001 would be helpful for error analysis or logging.

1. When execution control "EN ↑" changes from 0→1, and Port1 is not occupied by other communication instruction (M1960 ON), M-BUS instruction will start the data transaction. The M1960 is OFF during data transaction, and when the transaction is finished, the M1960 becomes ON. Employ the OFF↔ON change of M1960 (M-BUS execution control "EN ↑" = 0→1 means starting) may automatically starts for every packet of data transaction successively (when the last packet of transaction is completed, it will automatically return to the first packet of transaction to obtain the automatic cycling transmission).
2. When execution control "EN ↑" changes from 0→1, and Port2 is not occupied by other communication instruction (M1962 ON), M-BUS instruction will start the data transaction. The M1962 is OFF during data transaction, and when the transaction is finished, the M1962 becomes ON. Employ the OFF↔ON change of M1962 (M-BUS execution control "EN ↑" = 0→1 means starting) may automatically starts for every packet of data transaction successively (when the last packet of transaction is completed, it will automatically return to the first packet of transaction to obtain the automatic cycling transmission).

FUN150 M-BUS	Convenient instruction for Modbus RTU Master (which makes PLC as the Modbus RTU master through Port1 or Port2)	FUN150 M-BUS																																																														
<p>SR : Starting register for communication program of M-BUS instruction</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">SR+0</td> <td style="width: 15%;">A5h</td> <td style="width: 15%;">50h</td> <td style="width: 60%;"> <ul style="list-style-type: none"> • A550h : it means valid M-BUS program </td> </tr> <tr> <td>SR+1</td> <td>07h</td> <td>Total transactions</td> <td> <ul style="list-style-type: none"> • Low Byte : Total number of transactions , one transaction needs 7 registers to describe </td> </tr> <tr> <td>SR+2</td> <td colspan="2">Slave station No. Which is about to transact with</td> <td> <ul style="list-style-type: none"> • Low Byte is valid, 0~247 (0 means that master PLC broadcasts the data to all slaves, the slaves do not reply). </td> </tr> <tr> <td>SR+3</td> <td colspan="2">Command code</td> <td> <ul style="list-style-type: none"> • Low Byte is valid; =1, means reading data from slave station; =2, means writing data to slave station. </td> </tr> <tr> <td>SR+4</td> <td colspan="2">Data length of this transaction</td> <td> <ul style="list-style-type: none"> • Low Byte is valid; the range is 1~125 (Reg.) or 1~255 (Dis). </td> </tr> <tr> <td>SR+5</td> <td colspan="2">Data type of Master PLC</td> <td> <ul style="list-style-type: none"> • Low Byte is valid, and its range is 1~3 or 12~13; it defines the data type of master PLC (see next page). </td> </tr> <tr> <td>SR+6</td> <td colspan="2">Starting reference of Master PLC</td> <td> <ul style="list-style-type: none"> • Word is valid; it defines the starting address of data (master). </td> </tr> <tr> <td>SR+7</td> <td colspan="2">Data type of slave station</td> <td> <ul style="list-style-type: none"> • Low Byte is valid, and its range is 0 or 4; it defines the data type of slave station (see next page). </td> </tr> <tr> <td>SR+8</td> <td colspan="2">Starting reference of Slave station</td> <td> <ul style="list-style-type: none"> • Word is valid; it defines the starting address of data (slave). </td> </tr> <tr> <td>SR+9</td> <td colspan="2">Slave station No. which is about to transact with</td> <td rowspan="7" style="vertical-align: middle; text-align: center;"> } Description of the 2_{nd} packet of transaction </td> </tr> <tr> <td>SR+10</td> <td colspan="2">Command code</td> </tr> <tr> <td>SR+11</td> <td colspan="2">Data length of this transaction</td> </tr> <tr> <td>SR+12</td> <td colspan="2">Data type of Master PLC</td> </tr> <tr> <td>SR+13</td> <td colspan="2">Starting reference of Master PLC</td> </tr> <tr> <td>SR+14</td> <td colspan="2">Data type of slave station</td> </tr> <tr> <td>SR+15</td> <td colspan="2">Starting reference of Slave station</td> </tr> <tr> <td>SR+2+N ×7</td> <td colspan="2">Reserved</td> <td> <ul style="list-style-type: none"> • N is the total number of transaction </td> </tr> </table>			SR+0	A5h	50h	<ul style="list-style-type: none"> • A550h : it means valid M-BUS program 	SR+1	07h	Total transactions	<ul style="list-style-type: none"> • Low Byte : Total number of transactions , one transaction needs 7 registers to describe 	SR+2	Slave station No. Which is about to transact with		<ul style="list-style-type: none"> • Low Byte is valid, 0~247 (0 means that master PLC broadcasts the data to all slaves, the slaves do not reply). 	SR+3	Command code		<ul style="list-style-type: none"> • Low Byte is valid; =1, means reading data from slave station; =2, means writing data to slave station. 	SR+4	Data length of this transaction		<ul style="list-style-type: none"> • Low Byte is valid; the range is 1~125 (Reg.) or 1~255 (Dis). 	SR+5	Data type of Master PLC		<ul style="list-style-type: none"> • Low Byte is valid, and its range is 1~3 or 12~13; it defines the data type of master PLC (see next page). 	SR+6	Starting reference of Master PLC		<ul style="list-style-type: none"> • Word is valid; it defines the starting address of data (master). 	SR+7	Data type of slave station		<ul style="list-style-type: none"> • Low Byte is valid, and its range is 0 or 4; it defines the data type of slave station (see next page). 	SR+8	Starting reference of Slave station		<ul style="list-style-type: none"> • Word is valid; it defines the starting address of data (slave). 	SR+9	Slave station No. which is about to transact with		} Description of the 2 _{nd} packet of transaction	SR+10	Command code		SR+11	Data length of this transaction		SR+12	Data type of Master PLC		SR+13	Starting reference of Master PLC		SR+14	Data type of slave station		SR+15	Starting reference of Slave station		SR+2+N ×7	Reserved		<ul style="list-style-type: none"> • N is the total number of transaction
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Communication instruction

FUN150 M-BUS	Convenient instruction for Modbus RTU Master (which makes PLC as the Modbus RTU master through Port1or Port2)	FUN150 M-BUS
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- Data code, type and reference number of Master station (Facon PLC)

Data code	Data type	Reference number
1	Y (Output Relay)	0~255
2	M (Internal M Relay)	0~1911
3	S (Step Relay)	0~999
12	R (Data Register Rxxxx)	0~3839
13	D (Data register Dxxxx)	0~3071

- Data code, type and reference number of Slave station (Modbus slave)

Data code	Data type	Reference number
0	Discrete Output	1~65535
4	Holding register	1~65535

Note: The data type for master and slave must be consistent. i.e. if the master station is any value between 1 to 3, the slave station must be the value 0; if the master station is any value between 12 to 13, the slave station must be the value 4.

- WR : Starting register for instruction operation of M-BUS (FUN150)

	High Byte	Low Byte
WR+0	Result code	Transaction No.
WR+1	Station number	Command code
WR+2	For internal working use	
WR+3	For internal working use	
WR+4	For internal working use	
WR+5	For internal working use	
WR+6	For internal working use	
WR+7	For internal working use	

- Result code indicates the transaction result; 0= normal, other value =abnormal.
- Transaction No. indicates which one is in processing (beginning from 0).
- Station number: the slave station No. which is in transaction.
 Command code=01H · reading coil status from slave station
 =03H · reading holding registers from slave station
 =0FH · force multiple coils
 =10H · preset multiple registers
- WR+4 B0=1, Port has been occupied and this instruction is waiting to acquire the transmission right for data transaction
 B4=1, this instruction is not first time performing.
 B12, output indication for "ACT"
 B13, output indication for "ERR"
 B14, output indication for "DN"

Result code: 0, Ttransaction is successful.

- 1, The setting of CPU DIP switch (SW1) is error (it must be 1=OFF, 2=ON), turn off and set as describing. (for Port1only)
- 2, Data length error (for length is 0 or over limit).
- 3, Command code error (command code is 0 or greater than 2)
- 4, Data type error
- 5, Reference number error
- 6, Inconsistence in data type (e.g. master station is 1~3 while slave is 12~13).
- 7, Port error (Not Port1 or Port2)
- 8, Invalid communication program
- A, No response from slave station (Time-out error).
- B, Communication error (received error data or exception reply).

FUN150 M-BUS	Convenient instruction for Modbus RTU Master (which makes PLC as the Modbus RTU master through Port1or Port2)	FUN150 M-BUS
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Extension instructions for communication

Transaction No.	Instruction	Operand	Description
nnn	Slave Station	Station number (xxx)	Describing the station number of slave station which is about to transact with. Station number=0, the master PLC broadcasts the data to all slave stations and slave stations will not reply. Station number=1~247, it means the station number of the slave which is about to transact with the master PLC.
	Command	Read (=1) Write (=2)	Master PLC read data from the slave station. Master PLC write data to the slave station.
	Date Length	1 ~ 125 or 1 ~ 255	Data length of this transaction. The range is 1 ~ 125 while register access The range is 1 ~ 255 while discrete access
	Master Data Address	Y0 ~ Y255 M0 ~ M1911 S0 ~ S999 R0 ~ R3839 D0 ~ D3071	Describing the data type & reference number of this packet of transaction for the master PLC
	Slave Data address	000001 ~ 065535 400001 ~ 465535	Describing the data type & reference number of this packet of transaction for the slave

※ Win-ProLadder provides the user friendly table edit for M-BUS Master :

<u>Sequence No.</u>	<u>Command</u>	<u>Slave</u>	<u>Data of Master</u>	<u>Data of Slave</u>	<u>Data length</u>
000	Read	1 ~ 247	Y0 ~ Y255	← 000001 ~ 065535	1 ~ 255
			M0 ~ M1911	← 000001 ~ 065535	1 ~ 255
			S0 ~ S999	← 000001 ~ 065535	1 ~ 255
			R0 ~ R3839	← 400001 ~ 465535	1 ~ 125
			D0 ~ D3071	← 400001 ~ 465535	1 ~ 125
001	Write	0 ~ 247	Y0 ~ Y255	→ 000001 ~ 065535	1 ~ 255
			M0 ~ M1911	→ 000001 ~ 065535	1 ~ 255
			S0 ~ S999	→ 000001 ~ 065535	1 ~ 255
			R0 ~ R3839	→ 400001 ~ 465535	1 ~ 125
			D0 ~ D3071	→ 400001 ~ 465535	1 ~ 125
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