MT500 / MT8000 Series

ASCII Protocol Specification

Table of Contents

Command List

The following commands are used for communication between the ASCII host and the MT500 or MT8000.

Mnemonic	Command Name	Description
RD	Batch Read	Reads specified data in a continuous block
WD	Batch Write	Writes specified data in a continuous block
RR	Random Read	Reads data from multiple, non-consecutive devices
RW	Random Write	Writes data to multiple, non-consecutive devices
RC	Read Coil	Reads the specified coils in a continuous block
WC	Write Coil	Writes the specified coils in a continuous block

Optional Parameters-MT500

Parameters 1 – 5 are used as follows:
Parameter 1 is reserved for the RS485/RS422 Wiring Mode.
When serial port select RS485. The Parameter 1: 0: RS422, 1: RS485
EB500 V2.3.0 and newer version, select the serial port by **PLC I/F port**. And set the Parameter 1 to 0.

Parameter 2 is the Turn Around Delay
This sets the time delay (Range: 0~1000, Unit: about 10ms) between when the MT500 receives a command, and when a response is issued. Also, see Parameter 4.

Parameter 3 sets the Protocol Mode 0: Robust
The protocol uses the non-printable characters STX (02H) and ETX (03H), ACK (06H), and NAK (15H); and includes a 2-byte checksum. 1: Simple
Some Host devices (such as some Motion Controllers) are not capable of generating the non-printable characters, or calculating the checksum. In this mode, the data packets are formed as defined below, but do not include the STX, ACK, ETX, NAK, or checksum. The 0x0D at the end of the packet, the packet sent by the MT500 also has a 0x0D at the end.
Parameter 4 sets whether or not the MT500 responds to Write commands..
0: Responses On
1: Responses Off

Note:

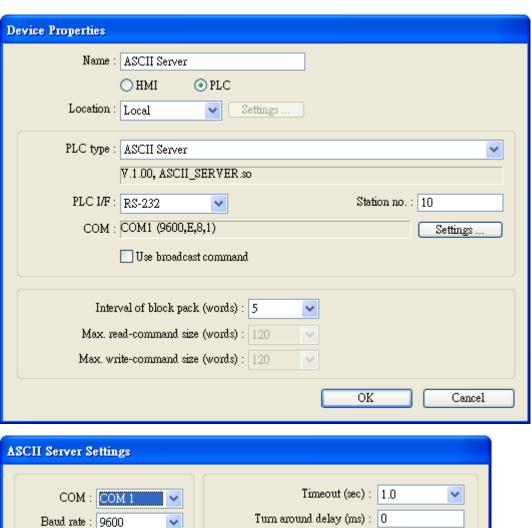If set to 1, the Turn Around Delay setting (Parameter 2) has no affect.

Parameter 5 HMI station number. ([pds]hmi500ascii_driverVer2)

Optional Parameters-MT8000

Go to EB8000 / Edit / System parameters / Device setting the ASCII driver and parameters.

Protocol

Robust: The protocol uses the non-printable characters STX (02H) and ETX(03H), ACK(06H), and NAK(15H); and includes a 2-byte checksum.

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Network Support

Wiring

The ASCII protocol shall support network wiring using RS485 2-wire or 4-wire, based on the setting of PLC I/F port.

Addressing

The protocol shall support each MT500/MT8000 having a unique Station ID. Valid Station ID's shall be from 1 to 255.

Broadcast Messages

A command with a Station ID of 0 shall be considered to be a Broadcast Message. Broadcast Messages shall be processed by the MT500/MT8000, regardless of the MT500/MT8000's Station Address. The MT500/MT8000 shall not issue a reply message when a Broadcast Message is received, regardless of the setting of Parameter 4.

Command Usage

RD (Batch Read)

Request

This command reads up to 99 consecutive 16-bit items from the HMI's 'LW' memory area. The command is always 14 bytes long.

Byte 1	Bytes 2,3	Bytes 4, 5	Bytes 6-9	Bytes 10, 11	Byte 12	Bytes 13, 14
1 Byte	2 Bytes	2 Bytes	4 Bytes	2 Bytes	1 Byte	2 Bytes
STX	Station	RD	Addr.	No. of Items	ETX	Checksum

Byte 1: Always STX (0x02)

Bytes 2, 3: The Station Number of the HMI to read (2 Hex digits)

Bytes 4, 5: The command to execute

Bytes 6-9: This is the starting address to read from. Must be 4 bytes long,

Bytes 10, 11: This the number of addresses to read, up to 99. Must be 2 bytes long.

Byte 12: Always ETX (0x03)

Bytes 13, 14: The checksum is the lowest 8 bits of the sum of bytes 2 through 12.

Example: Read 3 words starting from address LW100, from the HMI at station 10 (0AH). This will read addresses LW100 – LW102.

Byte 1	Bytes 2,3	Bytes 4, 5	Bytes 6-9	Bytes 10, 11	Byte 12	Bytes 13, 14
STX	0A	RD	0100	03	ETX	2E
02	30,41	52,44	30,31,30,30	30,33	03	32,45

The checksum (bytes 13 and 14) is calculated as the lowest 8 bits of the sum of the Hex codes for bytes 2 – 12.

30 + 41+ 52 + 44 + 30 + 31 + 30 + 30 + 30 + 33 + 03 = 22E.

The lowest 8 bits of the result returns 2E.

Reply

The reply length is

L = (N * 4) + 8

Where N = the number of requested devices.

If the command is successful, the reply length will be at least 12 bytes, but could be as long as 404 bytes. It consists of the STX, followed by four bytes for each requested device, then the ETX and Checksum.

Byte 1	Bytes 2, 3	Bytes 4,5	Bytes 6-9	Bytes 10-13	Bytes 14-17	Bytes 18 - (L-7)	Bytes (L-6) -(L-3)
STX	Station	CMD	Data 1	Data 2	Data 3	Data 4 – Data (N-1)	Data N

Byte L-2	Byte L-1, L
ETX	Checksum

The above example returns the following, assuming the HMI contains the following data:

Address	Data
100	75 (4BH)
101	8047 (1F6FH)
102	16,321 (3FC1H)

The following is the packet sent from the HMI

STX	'0'	'A'	'R'	'D'	'0'	'0'	'4'	'B'	'1'	'F'	'6'	'F'	'3'	'F'	'C'	'1'
02H	30H	41H	52H	44H	30H	30H	34H	42H	31H	46H	36H	48H	33H	46H	43H	31H

ETX	'C'	'2'
02H	43H	32H

The values in each requested device are returned in Hex. The checksum is calculated on bytes 2 – (L-2).

In the event of an error, the reply is

Byte 1	Byte 2,3	Byte 4,5	Byte 6
NAK	Station	'R', 'D'	Err Code

WD (Batch Write)

Request

This command writes up to 99 consecutive 16-bit items to the HMI's LW memory area.
The length of the command is

L = (N * 4) + 14

Where N = the number of requested devices

The command will be at least 18 bytes long, but can be up to 410 bytes long.

Byte 1	Bytes 2, 3	Bytes 4, 5	Bytes 6-9	Bytes 10,11	Bytes 12-15	Bytes 16-19	Bytes 20 - (L-7)	Bytes (L-6) -(L-3)
STX	Station	WD	Addr.	No. of Items	Data 1	Data 2	Data 3 – Data(N-1)	Data N

Byte L-2	Byte L-1, L
ETX	Check-sum

Byte 1: Always STX (0x02)
Bytes 2, 3: The Station Number of the HMI to write (2 Hex digits)
Bytes 4, 5: The command to execute
Bytes 6, 7: This is the starting address to write to. Must be 4 bytes long,
Bytes 8, 9: This the number of addresses to write. Must be 2 bytes long.
Bytes 10 – (L-3): The data to write. Up to 99 items, four Hex digits each.
Byte (L-2): Always ETX (0x03).
Bytes L-1, L: Checksum

Example: Write 3 words starting from address D201, to the HMI at station 17 (11H).
This will write to addresses LW201, LW202, and LW203.

LW201 = 101 (0x65)
LW202 = 575 (0x23F)
LW203 = 1049 (0x419)

Byte 1	Bytes 2, 3	Bytes 4, 5	Bytes 6-9	Bytes 10,11	Bytes 2-15	Bytes 16-19	Bytes 20-23
STX	11	WD	0201	03	0065	023F	0419
02	31,31	57,44	30,32,30,31	30,33	30,30,36,35	30,32,33,46	30,34,31,39

Byte 24	Bytes 25,26
ETX	9A
03	39,41

The checksum (bytes 25 and 26) is calculated as the lowest 8 bits of the sum of the Hex codes for bytes 2 – 24.

31+ 31 + 57 + 44 + 30 + 32 + 30 + 31 + 30 + 33 + 30 + 30 + 36 + 35 + 30 + 32 + 33+ 46 + 30 + 34+ 31+ 39 + 03 = 49A.

The lowest 8 bits of the result returns 9A.

Reply

If the command is successful, the reply is

Byte 1	Byte 2,3	Byte 4,5
ACK	Station	'W', 'D'

In the event of an error, the reply is

Byte 1	Byte 2,3	Byte 4,5	Byte 6
NAK	Station	'W', 'D'	Err Code

RR (Random Read)

Request

This command reads up to 99 independently-addressed 16-bit items from the HMI's LW memory area. The length of the command is

$$L = (N * 4) + 8$$

Where N = the number of requested devices

The command will be at least 12 bytes long, but can be up to 402 bytes long.

Byte1	Bytes 2, 3	Bytes 4, 5	Bytes 6-9	Bytes 10-13	Bytes 14 - (L-7)	Bytes (L-6) - (L-3)	Byte L-2
STX	Station	RR	Addr1	Addr2	Addr 3 – Addr (N-1)	Addr N	ETX

Byte L-1, L
Checksum

Byte 1: Always STX (0x02)
Bytes 2, 3: The Station Number of the HMI to read (2 Hex digits)
Bytes 4, 5: The command to execute
Bytes 6-9: This is the first address from which to retrieve data. Must be 4 bytes long,
Bytes 10-13: This is the second address from which to retrieve data. Must be 4 bytes long,
Bytes 14 – (L-7): The remaining addresses from which to retrieve data. Each address must be 4 bytes long.
Byte (L-2): Always ETX (0x03).
Bytes L-1, L: Checksum, calculated as the lower 8 bits of the sum of bytes 2 – (L-2).

Reply

If successful, the reply length is

L = (N * 4) + 8

Where N = the number of requested devices
If successful, the reply length will be at least 12 bytes, but can be up to 406 bytes. It consists of the STX, followed by four bytes for each requested device, then the ETX and Checksum.

Byte 1	Bytes 2,3	Bytes 4,5	Bytes 6-9	Bytes 10-13	Bytes 14-17	Bytes 18 - (L-7)
STX	Station	Cmd	Data 1	Data 2	Data 3	Data 4 – Data (N-1)

Bytes (L-6) -(L-3)	Byte L-2	Byte L-1, L
Data N	ETX	Checksum

The values in each requested device are returned in Hex. The checksum is calculated as the lower 8 bits of the sum of bytes 2 – (L-2)..
In the event of an error, the reply is

Byte 1	Byte 2,3	Byte 4,5	Byte 6
NAK	Station	'R', 'R'	Err Code

RW (Random Write)

Request

This command writes up to 99 independently-addressed 16-bit items to the HMI's LW memory area. The length of the command is

L = (N * 8) + 8

Where N = the number of requested devices

The command will be at least 16 bytes long, but can be up to 800 bytes long.

Byte 1	Bytes 2,3	Bytes 4,5	Bytes 6-9	Bytes 10-13	Bytes 14-17	Bytes 18 - 21
STX	Station	RW	Addr 1	Data 1	Addr 2	Data 2

Bytes (L-10) - (L-7)	Bytes (L-6) -(L-3)	Byte L-2	Byte L-1, L
Addr N	Data N	ETX	Checksum

Byte 1: Always STX (0x02)

Bytes 2, 3: The Station Number of the HMI to read (2 Hex digits)

Bytes 4, 5: The command to execute

Bytes 6-9: This is the first address to write data to. Must be 4 bytes long,

Bytes 10-13: This is the data to write to the address specified by the previous 4 bytes. Must be 4 bytes long,

Bytes 14 – (L-3): The remaining addresses and data to write to the HMI. Each address and data item must be 4 bytes long.

Byte (L-2): Always ETX (0x03).

Bytes L-1, L: Checksum, calculated as the lower 8 bits of the sum of bytes 2 – (L-2).

Reply

If the command is successful, the reply is

Byte 1	Byte 2,3	Byte 4,5
ACK	Station	'R', 'W'

In the event of an error, the reply is

Byte 1	Byte 2,3	Byte 4,5	Byte 6
NAK	Station	'R', 'W'	Err Code

RC (Read Coils)

Request

This command reads up to 99 consecutive coils from the HMI's 'LB' memory area. The command is always 14 bytes long.

Byte1	Bytes2,3	Bytes4,5	Bytes6-9	Bytes10, 11	Bytes12	Bytes13, 14
1 Byte	2 Bytes	2 Bytes	4 Bytes	2 Bytes	1 Byte	2 Bytes
STX	Station	RC	Addr	No. of Items	ETX	Checksum

Byte 1: Always STX (0x02)

Bytes 2, 3: The Station Number of the HMI to read (2 Hex digits)

Bytes 4, 5: The command to execute

Bytes 6-9: This is the starting address to read from. Must be 4 bytes long,

Bytes 10, 11: This the number of coils to read, up to 99. Must be 2 bytes long.

Byte 12: Always ETX (0x03)

Bytes 13, 14: The checksum is the lowest 8 bits of the sum of bytes 2 through 12.

Example: Read 12 coils starting from address LB100, from the HMI at Station 7. This will read coils LB100 – LB111.

Byte1	Bytes2,3	Bytes4,5	Bytes6-9	Bytes10, 11	Bytes12	Bytes13, 14
STX	07	RC	0100	02	ETX	22
02	30,37	52,43	30,31,30,30	30,32	03	32,32

The checksum (bytes 13 and 14) is calculated as the lowest 8 bits of the sum of the Hex codes for bytes 2 – 12.

30 + 37 + 52 + 43 + 30 + 31 + 30 + 30 + 30 + 32 + 03 = 222.

The lowest 8 bits of the result returns 22.

Reply

The reply length is

L = N + 8

Where N = the number of requested devices

If the command is successful, the reply length will be at least 9 bytes, but could be as long as 107 bytes. It consists of the STX, followed by one byte for each requested device, then the ETX and Checksum.

Byte1	Bytes2,3	Bytes4,5	Byte2	Byte3	Byte4	Bytes 5 - (L-4)
STX	Station	RC	Data 1	Data 2	Data 3	Data 4 – Data (N-1)

Byte (L-3)	Byte L-2	Byte L-1, L
Data N	ETX	Checksum

If the HMI contains the following data:

100	101	102	103	104	105	106	107	108	109	110	111
0	0	1	0	1	0	1	1	0	0	0	1

The the following data is returned

STX	'0'	'7'	'R'	'C'	'0'	'0'	'1'	'0'	'1'	'0'	'1'	'1'	'0'	'0'	'0'	'1'
02H	30H	37H	52H	43H	30H	30H	31H	30H	31H	30H	31H	31H	30H	30H	30H	31H

ETX	'4'	'6'
03H	34H	36H

The values in each requested device are returned in Hex. The checksum is calculated on bytes 2 – (L-2).

In the event of an error, the reply is

Byte 1	Byte 2,3	Byte 4,5	Byte 6
NAK	Station	'R', 'C'	Err Code

WC (Write Coils)

Request

This command writes up to 99 consecutive coils to the HMI's 'LB' memory area. The length of the command is

L = N + 14

Where N = the number of requested devices

The command will be at least 15 bytes long, but can be up to 113 bytes long.

Byte1	Bytes2,3	Bytes4, 5	Bytes6-9	Bytes10-11	Byte12	Byte13	Bytes 14 - (L-4)
STX	Station	WC	Addr.	No. of Items	Data 1	Data 2	Data 3 – Data (N-1)

Byte(L-3)	ByteL-2	ByteL-1, L
Data N	ETX	Check-sum

Byte 1: Always STX (0x02)

Bytes 2, 3: The Station Number of the HMI to read (2 Hex digits)

Bytes 4, 5: The command to execute

Bytes 6-9: This is the starting address to write to. Must be 4 bytes long,

Bytes 10, 11: This the number of addresses to write. Must be 2 bytes long.

Bytes 12 – (L-3): The data to write. Up to 99 items, one Hex digit each.

Byte (L-2): Always ETX (0x03).

Bytes L-1, L: Checksum

Example: Write 5 bits starting from address LB214 to the HMI at station 12. This will write to addresses LB214 – LB218.

Write the following data:

214	215	216	217	218
1	1	0	0	1

Byte 1	Bytes 2,3	Bytes 4, 5	Bytes 6-9	Bytes 10,11	Byte 12	Byte 13	Byte 14	Byte 15	Byte 16	Byte 17	Bytes 18, 19
STX	0C	WC	0214	05	1	1	0	0	1	ETX	2F
02	30,43	57,43	30,32,31,34	30,35	31	31	30	30	31	03	32,46

The checksum (bytes 18 and 19) is calculated as the lowest 8 bits of the sum of the Hex codes for bytes 2 – 17.

30 + 43+ 57 + 43 + 30 + 32 + 31 + 34 + 30 + 35 + 31 + 31 + 30 + 30 + 31 + 03 = 32F.

The lowest 8 bits of the result returns 2F.

Reply

If the command is successful, the reply is

Byte 1	Byte 2, 3	Byte 4,5
ACK	Station	'W', 'C'

In the event of an error, the reply is

Byte 1	Byte 2, 3	Byte 4, 5	Byte 6
NAK	Station	'W', 'C'	Err Code

Error Codes

The following table lists the error conditions, and the Error Codes returned for those errors.

Code	Description
06H	Invalid Checksum
10H	Unknown Command
11H	Data Length Error – data overflowed receive buffer
12H	Communication Data Error – ETX not found
7AH	Illegal Address
7BH	More than 99 data items were requested