

DELTA DVP Series PLC

COMMUNICATION PROTOCOL VER 1.0



1. Communication Interface: RS-232C
2. Communication Protocol ASCII mode, 9600 (Baud rate) , EVEN (Parity) , 1 (Start bit) , 1 (Stop bit)
3. DELTA PLC MODBUS PROTOCOL
4. Communication Data Frame

STX	Start character ':' (3AH)
ADR 1	Communication address: 8-bit address consists of 2 ASCII codes
ADR 0	
CMD 1	Command code: 8-bit command consists of 2 ASCII codes
CMD 0	
DATA (0)	Contents of data: n×8-bit data consist of 2n ASCII codes. n≤37, maximum of 74 ASCII codes
DATA (1)	
.....	
DATA (n-1)	
LRC CHK 1	LRC check sum: 8-bit check sum consists of 2 ASCII codes
LRC CHK 0	
END 1	End character: END 1 = CR (0DH) , END 0 = LF (0AH)
END 0	

■ ADR (Communication Address)

Valid communication addresses are in the range of 0...31. Communication address equals to 0 means broadcast to all PLC, the PLC will reply normal message to the master device.

For example, communication to PLC with address 16 decimal:

(ADR 1, ADR 0)='1','0'⇒'1'=31H, '0' = 30H

■ CMD (Command code) and DATA (data characters)

The format of data characters depends on the command code. For example, reading continuous 8 words form starting device address 0614H of PLC with address 01H.

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Command code	03
Starting Address Hi	06
Starting Address Lo	14
Number of Points Hi	00
Number of Points Lo	08
Error Check (LRC)	DA

Number of Points(max)
 = 18 (for 16 bit register)
 = 9 (for 32 bit register)

Example : Reading Coils T20~T27 from slave device 01

PC→PLC

“ : 01 03 06 14 00 08 DA CR LF”

PLC→PC

“ : 01 03 10 00 01 00 02 00 03 00 04 00 05 00 06 00 07 00 08 B8 CR LF”

Field Name	Example (Hex)
Slave Address	01
Command code	03
Bytes Count	10
Data Hi (T20)	00
Data Lo (T20)	01
Data Hi (T21)	00
Data Lo (T21)	02
Data Hi (T22)	00
Data Lo (T22)	03
Data Hi (T23)	00
Data Lo (T23)	04
Data Hi (T24)	00
Data Lo (T24)	05
Data Hi (T25)	00
Data Lo (T25)	06
Data Hi (T26)	00
Data Lo (T26)	07
Data Hi (T27)	00
Data Lo (T27)	08
Error Check (LRC)	C8

■ LRC CHK (check sum)

LRC (Longitudinal Redundancy Check) is calculated by summing up, module 256, the values of the bytes from ADR1 to last data character then calculating the hexadecimal representation of the 2's-complement negation of the sum.

For example, reading 1 word form address 0401H of the PLC with address 01H

STX	' :
ADR 1	' 0'
ADR 0	' 1'
CMD 1	' 0'
CMD 0	' 3'
Starting data address	' 0'
	' 4'
	' 0'
	' 1'
Number of data	' 0'
	' 0'
	' 0'
	' 1'
LRC CHK 1	' F'
LRC CHK 0	' 6'
END 1	CR
END 0	LF

$01H+03H+04H+01H+00+01H = 0AH$

the 2's-complement negation of 0AH is **F6H**

Exception response:

The PLC is been expected to return a normal response after receiving command messages from the master device. The following depicts the conditions that no normal response is replied to the master device.

The PLC does not receive the messages due to a communication error; thus the PLC has no response. The master device will eventually process a timeout condition.

The PLC receives the messages without a communication error, but cannot handle it, an exception response will return to the master device. In the exception response, the most significant bit of the original command code is set to 1, and an exception code explains the condition that caused the exception is returned.

An example of exception response of command code 01H and exception 02H:

Command message:

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Function	01
Starting Address Hi	04
Starting Address Lo	00
Number of Points Hi	00
Number of Points Lo	10
Error Check (LRC)	EA

Response message:

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Function	81
Exception Code	02
Error Check (LRC)	7C

Exception code:	Meaning:
01	Illegal command code: The command code received in the command message is not available for the PLC.
02	Illegal device address: The device address received in the command message is not available for the PLC.
03	Illegal device value: The device value received in the command message is not available for the PLC.
07	Check Sum Error Check if the check Sum is correct Illegal command messages The command message is too short. Command message length is out of range.

- ◆ The format of data characters depends on the command. The available command codes are described as followed,

Code	Name	Description
01	Read Coil Status	S, Y, M, T, C
02	Read Input Status	S, X, Y, M, T, C
03	Read Holding Registers	T, C, D
05	Force Single Coil	S, Y, M, T, C
06	Preset Single Register	T, C, D
15	Force Multiple Coils	S, Y, M, T, C
16	Preset Multiple Register	T, C, D
17	Report Slave ID	None

DELTA DVP-ES Series PLC DEVICE ADDRESS

Device	Range	Effective Range	Address
S	000~255	000~127	0000~00FF
S	246~511		0100~01FF
S	512~767		0200~02FF
S	768~1023		0300~03FF
X	000~377 (Octal)	000~177 (Octal)	0400~04FF
Y	000~377 (Octal)	000~177 (Octal)	0500~05FF
T	000~255	000~127	0600~06FF
M	000~255	0000~1279	0800~08FF
M	256~511		0900~09FF
M	512~767		0A00~0AFF
M	768~1023		0B00~0BFF
M	1024~1279		0C00~0CFF
C	000~255	000~127 232~255	0E00~0EFF
D	000~255	000~599 1000~1143	1000~10FF
D	256~511		1100~11FF
D	512~767		1200~12FF
D	768~1023		1300~13FF
D	1024~1279		1400~14FF

Command Code : 01, Read Coil Status

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Command code	01
Starting Address Hi	06
Starting Address Lo	14
Number of Points Hi	00
Number of Points Lo	25
Error Check (LRC)	BF

Number of Points(max) = 255 = 0x00FF

Example : Reading Coils T20~T56 from slave device 01

PC→PLC “ : 01 01 06 14 00 25 BF CR LF”

PLC→PC “ : 01 01 05 CD 6B B2 0E 1B D6 CR LF”

Field Name	Example (Hex)
Slave Address	01
Command code	01
Bytes Count	05
Data (Coils T27...T20)	CD
Data (Coils T35...T38)	6B
Data (Coils T43...T36)	B2
Data (Coils T51...T44)	0E
Data (Coils T56...T52)	1B
Error Check (LRC)	E6

■ **Command Code : 02, Read Input Status**

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Command code	02
Starting Address Hi	05
Starting Address Lo	14
Number of Points Hi	00
Number of Points Lo	25
Error Check (LRC)	BF

Example : Reading Contact Y024~Y070 from slave device 01

PC→PLC “ : 01 02 05 14 00 25 BF CR LF”

PLC→PC “ : 01 01 05 CD 6B B2 0E 1B E5 CR LF”

Field Name	Example (Hex)
Slave Address	01
Command code	02
Bytes Count	05
Data (Coils Y033...Y024)	CD
Data (Coils Y043...Y034)	6B
Data (Coils Y053...Y044)	B2
Data (Coils Y063...Y054)	0E
Data (Coils Y070...Y064)	1B
Error Check (LRC)	E5

■ **Command Code : 03, Read Holding Register**

Holding Register : T, C, D

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Command code	03
Starting Address Hi	06
Starting Address Lo	14
Number of Points Hi	00
Number of Points Lo	08
Error Check (LRC)	DA

Number of Points(max)

= 18 (for 16 bit register)

= 9 (for 32 bit register)

Example : Reading Coils T20~T27 from slave device 01

PC→PLC

“ : 01 03 06 14 00 08 DA CR LF”

PLC→PC

“ : 01 03 10 00 01 00 02 00 03 00 04 00 05 00 06 00 07 00 08 B8 CR LF”

Field Name	Example (Hex)
Slave Address	01
Command code	03
Bytes Count	10
Data Hi (T20)	00
Data Lo (T20)	01
Data Hi (T21)	00
Data Lo (T21)	02

Data Hi (T22)	00
Data Lo (T22)	03
Data Hi (T23)	00
Data Lo (T23)	04
Data Hi (T24)	00
Data Lo (T24)	05
Data Hi (T25)	00
Data Lo (T25)	06
Data Hi (T26)	00
Data Lo (T26)	07
Data Hi (T27)	00
Data Lo (T27)	08
Error Check (LRC)	C8

■ **Command Code : 05, Force Single Coil**

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Command code	05
Coil Address Hi	05
Coil Address Lo	00
Force Data Hi	FF
Force Data Lo	00
Error Check (LRC)	F6

MMNN = 0xFF00....Coil ON

MMNN = 0x0000....Coil OFF

Example : Forcing Coil Y000 ON

PC→PLC “ : 01 05 05 00 FF 00 F6 CR LF”

PLC→PC “ : 01 05 05 00 FF 00 F6 CR LF”

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Command code	05
Coil Address Hi	05
Coil Address Lo	00
Force Data Hi	FF
Force Data Lo	00
Error Check (LRC)	F6

■ **Command Code : 06, Preset Single Register**

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Command code	06
Register Address Hi	06
Register Address Lo	00
Preset Data Hi	12
Preset Data Lo	34
Error Check (LRC)	AD

Example : Setting Register T0 to 00 03

PC→PLC “ : 01 06 06 00 12 34 AD CR LF”

PLC→PC “ : 01 06 06 00 12 34 AD CR LF”

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Command code	06
Register T0 Address Hi	06
Register T0 Address Lo	00
Preset Data Hi	12
Preset Data Lo	34
Error Check (LRC)	AD

Switch (c)

Case 0 : T0

Q → : 01 06 06 00 12 34 AD CR LF

Case 1 : C0

Q → : 01 06 0E 00 12 34 AF CR LF

Case 2 : C232

Q → : 01 06 0E E8 12 34 56 78 EF CR LF

Case 3 : D10

Q → : 01 06 10 0A 12 34 99 CR LF

Case 4 : D1000

Q → : 01 06 13 E8 12 34 BA CR LF

■ **Command Code : 15, Force Multiple Coils**

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Command code	0F
Coil Address Hi	05
Coil Address Lo	00
Quantity of Coils Hi	00
Quantity of Coils Lo	0A
Byte Count	02
Force Data Hi	CD
Force Data Lo	01
Error Check (LRC)	11

Quantity of Coils (max) = 255

Example : Setting Coil Y007...Y000 = 1100 1101, Y011...Y010 = 01.

PC→PLC “ : 01 0F 05 00 00 0A 02 CD 01 11 CR LF”

PLC→PC “ : 01 0F 05 00 00 0A E1 CR LF”

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Command code	0F
Register T0 Address Hi	05
Register T0 Address Lo	00
Preset Data Hi	00
Preset Data Lo	0A
Error Check (LRC)	E1

■ **Command Code : 16, Preset Multiple Register**

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Command code	10
Starting Address Hi	06
Starting Address Lo	00
Number of Register Hi	00
Number of Register Lo	02
Byte Count	04
Data Hi	00
Data Lo	0A
Data Hi	01
Data Lo	02
Error Check (LRC)	C6

Number of Register(max)

= 16 (for 16 bit register)

= 8 (for 8 bit register)

Example : Setting Register T0 to 00 0A, T1 to 01 02.

PC→PLC “ : 01 10 06 00 02 00 04 00 0A 01 02 D6 CR LF”

PLC→PC “ : 01 10 06 00 00 02 E7 CR LF”

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Command code	10
Starting Address Hi	06
Starting Address Lo	00
Number of Registers Hi	00
Number of Registers Lo	02
Error Check (LRC)	E7

■ **Command Code : 17, Report Slave ID**

Returns a description of controller present at the slave address, the current status of the slave Run indicator, and other information specific to the slave device.

Command message:

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Command code	11
Error Check (LRC)	EE

Response message:

Field Name	Example (Hex)
Heading	3A
Slave Address	01
Command code	11
Byte Count	04
Slave ID	01
Run Indicator Status 00 = OFF FF = ON	FF
Data 0 (D1001 HI)	40
Data 1 (D1001 LOW)	10
Error Check (LRC)	9A