

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. 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 |

| Device | Range | | Type | Modbus Address (Hex) | Modbus Address (Dec) | Effective | | |
|--------|-----------------|--------|-------|----------------------|----------------------|-----------|----------|-----------|
| | | | | | | ES/EX/SS | SA/SX/SC | EH |
| S | 000~255 | | bit | 0000~00FF | 000001~000256 | 0~127 | 0~1023 | 0~1023 |
| S | 246~511 | | bit | 0100~01FF | 000247~000512 | | | |
| S | 512~767 | | bit | 0200~02FF | 000513~000768 | | | |
| S | 768~1023 | | bit | 0300~03FF | 000769~001024 | | | |
| X | 000~377 (Octal) | | bit | 0400~04FF | 101025~101280 | 0~177 | 0~177 | 000~377 |
| Y | 000~377 (Octal) | | bit | 0500~05FF | 001281~001536 | | | |
| T | 000~255 | | bit | 0600~06FF | 001537~001792 | 0~127 | 000~255 | 000~255 |
| | | | word | 0600~06FF | 401537~401792 | | | |
| M | 000~255 | | bit | 0800~08FF | 002049~002304 | 0~1279 | 0~4095 | 0000~4095 |
| M | 256~511 | | bit | 0900~09FF | 002305~002560 | | | |
| M | 512~767 | | bit | 0A00~0AFF | 002561~002816 | | | |
| M | 768~1023 | | bit | 0B00~0BFF | 002817~003072 | | | |
| M | 1024~1279 | | bit | 0C00~0CFF | 003073~003328 | | | |
| M | 1280~1535 | | bit | 0D00~0DFF | 003329~003584 | | | |
| M | 1536~1791 | | bit | B000~B0FF | 045057~045312 | | | |
| M | 1792~2047 | | bit | B100~B1FF | 045313~045568 | | | |
| M | 2048~2303 | | bit | B200~B2FF | 045569~045824 | | | |
| M | 2304~2559 | | bit | B300~B3FF | 045825~046080 | | | |
| M | 2560~2815 | | bit | B400~B4FF | 046081~046336 | | | |
| M | 2816~3071 | | bit | B500~B5FF | 046337~046592 | | | |
| M | 3072~3327 | | bit | B600~B6FF | 046593~046848 | | | |
| M | 3328~3583 | | bit | B700~B7FF | 046849~047104 | | | |
| M | 3584~3839 | | bit | B800~B8FF | 047105~047360 | | | |
| M | 3840~4095 | | bit | B900~B9FF | 047361~047616 | | | |
| C | 0~199 | 16-bit | bit | 0E00~0EC7 | 003585~003784 | 0~127 | 0~199 | 0~199 |
| | | | word | 0E00~0EC7 | 403585~403784 | 0~127 | 0~199 | 0~199 |
| | 200~255 | 32-bit | bit | 0EC8~0EFF | 003785~003840 | 232~255 | 200~255 | 200~255 |
| | | | Dword | 0EC8~0EFF | 403785~403840 | 232~255 | 200~255 | 200~255 |

| Device | Range | Type | Modbus Address (Hex) | Modbus Address (Dec) | Effective | | |
|--------|-----------|------|----------------------|----------------------|-----------|----------|-----------|
| | | | | | ES/EX/SS | SA/SX/SC | EH |
| D | 000~256 | word | 1000~10FF | 404097~404352 | 0~1311 | 0~4999 | 0000~9999 |
| D | 256~511 | word | 1100~11FF | 404353~404608 | | | |
| D | 512~767 | word | 1200~12FF | 404609~404864 | | | |
| D | 768~1023 | word | 1300~13FF | 404865~405120 | | | |
| D | 1024~1279 | word | 1400~14FF | 405121~405376 | | | |
| D | 1280~1535 | word | 1500~15FF | 405377~405632 | | | |
| D | 1536~1791 | word | 1600~16FF | 405633~405888 | | | |
| D | 1792~2047 | word | 1700~17FF | 405889~406144 | | | |
| D | 2048~2303 | word | 1800~18FF | 406145~406400 | | | |
| D | 2304~2559 | word | 1900~19FF | 406401~406656 | | | |
| D | 2560~2815 | word | 1A00~1AFF | 406657~406912 | | | |
| D | 2816~3071 | word | 1B00~1BFF | 406913~407168 | | | |
| D | 3072~3327 | word | 1C00~1CFF | 407169~407424 | | | |
| D | 3328~3583 | word | 1D00~1DFF | 407425~407680 | | | |
| D | 3584~3839 | word | 1E00~1EFF | 407681~407936 | | | |
| D | 3840~4095 | word | 1F00~1FFF | 407937~408192 | | | |
| D | 4096~4351 | word | 9000~90FF | 436865~437120 | | | |
| D | 4352~4607 | word | 9100~91FF | 437121~437376 | | | |
| D | 4608~4863 | word | 9200~92FF | 437377~437632 | | | |
| D | 4864~5119 | word | 9300~93FF | 437633~437888 | | | |
| D | 5120~5375 | word | 9400~94FF | 437889~438144 | | | |
| D | 5376~5631 | word | 9500~95FF | 438145~438400 | | | |
| D | 5632~5887 | word | 9600~96FF | 438401~438656 | | | |
| D | 5888~6143 | word | 9700~97FF | 438657~438912 | | | |
| D | 6144~6399 | word | 9800~98FF | 438913~439168 | | | |
| D | 6400~6655 | word | 9900~99FF | 439169~439424 | | | |
| D | 6656~6911 | word | 9A00~9AFF | 439425~439680 | | | |
| D | 6912~7167 | word | 9B00~9BFF | 439681~439936 | | | |
| D | 7168~7423 | word | 9C00~9CFF | 439937~440192 | | | |
| D | 7424~7679 | word | 9D00~9DFF | 440193~440448 | | | |
| D | 7680~7935 | word | 9E00~9EFF | 440449~440704 | | | |
| D | 7936~8191 | word | 9F00~9FFF | 440705~440960 | | | |

| | | | | | | | |
|---|-----------|------|-----------|---------------|--|--|--|
| D | 8192~8447 | word | A000~A0FF | 440961~441216 | | | |
| D | 8448~8703 | word | A100~A1FF | 441217~441472 | | | |
| D | 8704~8959 | word | A200~A2FF | 441473~441728 | | | |
| D | 8960~9215 | word | A300~A3FF | 441729~441984 | | | |
| D | 9216~9471 | word | A400~A4FF | 441985~442240 | | | |
| D | 9472~9727 | word | A500~A5FF | 442241~442496 | | | |
| D | 9728~9983 | word | A600~A6FF | 442497~442752 | | | |
| D | 9984~9999 | word | A700~A70F | 442753~443008 | | | |