
SERIAL COMMUNICATION WITH POWER EXPRESS® MODULES

Specification of protocol

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Power Express modules can be connected to upper system via RS485 or (through converter) via RS232 serial line.

Characteristic of protocol:

Character size:	8 bits
Data rate:	19 200 b/s
Parity:	even
Number of stop bits:	1

All data on the link conforms to the American Standard Code for Information Interchange (ASCII). In this publication each maintain of an ASCII character is backed up by giving hexadecimal (HEX) code. The control characters used are:

- SOH (01H) Start of Heading
- STX (02H) Start of Text
- ETB (17H) End of Transmission Block
- ETX End of Text

Message protocol

Each message consists of a FRAME which contains one or two message BLOCKS is terminated with the ASCII character ETX. Incoming messages are scanned and stored so that an action takes place until ETX is received and then all the units affected act together. Power Express units understand two types of messages:

- D message – digital output control
- F message – analogue output control

Each message BLOCK is headed with the character SOH and then a single character 'd' or 'f' to indicate which type of message it is. The message type character may be followed by optional parameter string and the beginning of text part is headed by STX character.

D message: digital output control

(for units PER 610, PEW200)

D messages for outputs**SOH 'd' b n...n STX text ETB ETX****b** group number in the range:

'0' (30H) - '9' (39H) it means 10 groups, text encoding type I

'@' (40H) - 'I' (49H) it means 10 groups, text encoding type II

n...n string of 2-4 characters in range 30H - 39Hfor *encoding type I*2 characters '0' '0' means ON or OFF corresponding relays according to parameters in **text**

and '0' '1' - '9' '9' means pulse with in range 0,1 - 9,9 s

for *encoding type II*

2 - 4 characters '0' '0' means ON, toggle or OFF corresponding relays

according to parameters in **text** and '0' '1' - '9' '9' '9' '9' means pulse with in range 0,1 - 999,9 s**text** for *encoding type I* – string up to 24 chars. :

'/' (2FH) no change

'0' (30H) - '?' (3FH) each char. represents the possible 16 states of the 4 relays concerned:

'1' (31H) -relay 1 ON, all the other OFF 0001

'2' (32H) -relay 2 ON, all the other OFF 0010

:

'?' (3FH) – all four relays ON 1111

for *encoding type II* – string up to 32 chars. :**n0 n1 n2 ... n15 f0 f1 f2 ... f15** where characters**n0 .. n15** determines 96 bit mask for relays, which are to be turned ON(ON-mask)**f0 .. f15** determines 96 bit mask for relays, which are to be turned OFF(OFF-mask)

If the same bit is set in ON – mask as well as in OFF-mask then matching relay is to be complemented

Each character x of n(f)0 .. n(f)15 encodes 6-bit of the 96 bit ON/OFF mask: y (6 bits) : range y = 00H-3FH

Encoding: x = y+30H : range x = 30H-6FH

Examples:

mask for relay 1

'1'(31H) '0'(30H) '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0'

mask for relay 5

'@'(40H) '0'(30H) '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0'

mask for relay 7

'0'(30H) '1'(31H) '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0'

mask pro relay 96

'0'(30H) '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' '0' 'P'(50H)

Following message example closes relay in group 0 and address 1 :

SOH 'd' '@' '0' '0' STX '1' '0' ETB ETX

D messages for inputs**SOH 'd' 'P' b aa STX cc text ETB ETX**

- b** group number in the range: **'0' (30H) - '9' (39H)** it means 10 groups
- aa** string of 1 or 2 characters in range **30H - 39H**
address of analog output, corresponding to the input, in the range 1 – 96
- cc** number of the input - 1 or 2 char in the range : **'0' (30H) - '9' (39H)**
- text** 1 char with following meaning:
- '0' (30H)** input disable
 - '1' (31H)** input enable
 - '@' (40H)** end of short press of input (for future use)
 - 'A' (41H)** end of long press of input (for future use)
 - 'B' (42H)** short press of input (PEW200 only)
 - 'C' (43H)** start of press of input (for future use)

Following message example recalls infrared command nr.32 stored in unit PEW200 in group 1 with address 5 :

SOH 'd' 'P' '1' '5' STX '3' '2' 'B' ETB ETX

F message: analog output control

(for units PEA208, PED108, PED202, PEE120, PEF150, PEF200, PET102, PET105)

F messages for outputs**SOH 'f' n...n STX b text ETB ETX**

n...n parameters = string of chars in range : **'0' (30H) - '9' (39H)**
 3 or 6 chars for decrease/increase commands
 3 chars for all the others.

b group number in the range : **'0' (30H) - '9' (39H)** it means 10 groups

text up to 32 chars with following meaning:

' 1 ' (31H) *fade down* at rate as per header n..n

' 2 ' (32H) *fade up* at rate as per header n..n
 -parameter 3 time in 0,1 sec (0-99.9s)

' (' (28H) *decrease level*
 -parameter 3 or 6 chars
 first 3 chars '0"0"0' – '9"9"9' level in 0,1%
 next 3 chars '0"0"0' – '9"9"9' fade time in 0,1sec (0-99.9s)
 (aprox. 5 s if only 3 chars parameter)

') ' (29H) *increase level*
 -parameter 3 or 6 chars
 first 3 chars '0"0"0' – '9"9"9' level in 0,1%
 next 3 chars '0"0"0' – '9"9"9' fade time in 0,1sec (0-99.9s)
 (aprox. 5 s if only 3 chars parameter)

' > ' (3EH) *set lamp level* at % brightness as per header as Maximum level.
 It remains valid until next ' > ' command accepted. Ranges for '3'
 and '8' remains unchanged

' ? ' (3FH) *set lamp level* at % brightness as per header as Minimum level. It
 remains valid until next ' > ' command accepted. Ranges for '3'
 and '8' remains unchanged

' @ ' (40H) *disable inputs*

' A ' (41H) *enable inputs*

' 4 ' (34H) *start flashing*
 -parameter: 3 chars
 first 1 char: ON/OFF ratio ranging
 from '0' - 0% ON (i.e. off) to '9' – 90% ON (full on)
 next 2 chars: total cycle period
 from '0"1' – 0.1 seconds period to
 '9"9' – 9.9 seconds period

' 5 ' (35H) *stop flashing*

' 3 ' (33H) *set level*

' 8 ' (38H) *set level for next fade*
 -parameter: 3 chars '0"0"0' – '9"9"9' level in 0.1% (0-99,9%)

' / ' (2FH) *no action*

' 9 ' (39H) *stop fade at current level*

Following message example fades up a dimmer in group 0 and address 4 in fade rate 1sec: SOH 'f' '0' '1' '0' STX '0' '/' '/' '/' '2' ETB ETX

F messages for inputs**SOH 'f' 'P' b aa STX cc text ETB ETX**

- b** group number in the range : **'0' (30H) - '9' (39H)** it means 10 groups
- aa** chars string of 1 - 2 chars in the range **30H - 39H**
address of analog output, corresponding to the input, in the range 1 – 32.
- cc** number of the input - 1 or 2 char in the range : **'0' (30H) - '9' (39H)**
- text** 1 char with following meaning:
- '0' (30H)** input disable
 - '1' (31H)** input enable
 - '@' (40H)** end of short press of input (for future use)
 - 'A' (41H)** end of long press of input (for future use)
 - 'B' (42H)** short press of input
 - 'C' (43H)** start of press of input (for future use)

Following message example recalls scene 5 stored in PEE120 in group 1 and address 3:

SOH 'f' 'P' '1' '3' STX '5' 'B' ETB ETX

'?' and '!' message: general status request and response

'?' message: general status request

SOH '?' t b aa STX text ETB ETX

- t** 1 char - type of responded port: ('d' for relay, 'f' for analog output)
- b** group number in the range : '0' (30H) - '9' (39H) it means 10 groups
- aa** address of input/output – string of 1 or 2 char in range: '0' (30H) - '9' (39H)
- text** string of up to 6 chars (except SOH,STX,ETB,ETX) with following meaning:
first 3 chars in range '0' (30H) - '9' (39H) means offset of starting char in status string (default 000)
next 3 chars in range '0' (30H) - '9' (39H) means length of the part of status string what should be responded (default 001)

Following request example finds status of fuse of dimmer in group 0 and address 12:
SOH '?' 'f' '0' '1' '2' STX '0' '0' '3' '0' '0' '1' 'B' ETB ETX

'!' message: response on general status request**SOH '!' t b aa STX text ETB ETX**

- t** 1 char - type of responded port: ('d' for relay, 'f' for analog output)
- b** group number in the range : '0' (30H) - '9' (39H) it means 10 groups
- aa** address of input/output – string of 1 or 2 char in range: '0' (30H) - '9' (39H)
- text** response string up to 23 chars (except SOH,STX,ETB,ETX) with meaning depending on t parameter (type of port):

for PER 610

1. **Byte** – manufacturer Identification
2. **Byte** - version number in range 30H ('0') - 7EH ('~')
 - 30H - 3FH = ver. 1.0 - 1.15
 - 40H - 4FH = ver. 2.0 - 2.15
 - : : : :
 - 70H - 7FH = ver. 5.0 - 5.15
3. **Byte** - bit 0 – output status = 1 output ON
= 0 output OFF
 - bit 1 - input status = 1 input ON
= 0 input OFF
 - bit 2 - no meaning = 0
 - bit 3 - no meaning = 0
 - bit 4 - no meaning = 1
 - bit 5 - input service = 1 disabled
= 0 enabled
 - bit 6 - no meaning = X
 - bit 7 - no meaning = 0
- 4.- 7. **Byte** – time to output change (HEX) in 0.02sec - if '0'0'0'0', the output will not change
8. **Byte** – mode of operation = 30H ('0') no action
 - = 31H ('1') coded
 - = 32H ('2') relay
 - = 33H ('3') system on
 - = 34H ('4') run
 - = 35H ('5') direction
 - = 36H ('6') delayed off
 - = 37H ('7') delayed on
 - = 38H ('8') run DC
9. - 12. **Byte** - parameters of relay (pulse with) in 0.1sec in range 0,1 - 999,9s
- 13.-14. **Byte** - address of cooperating relay (run - direction) in range '0'0' – '9'6'

for PEA 208, PED 108, PED 202, PEF150, PEF 200, PET 102, PET 105

1. **Byte** - manufacturer Identification
2. **Byte** - version number in range 30H ('0') - 7EH ('~')
 - 30H - 3FH = ver. 1.0 - 1.15
 - 40H - 4FH = ver. 2.0 - 2.15
 - : : : :
 - 70H - 7FH = ver. 5.0 - 5.15
3. **Byte**
 - bit 0 - input UP status = 1 input ON
= 0 input OFF
 - bit 1 - input DN status = 1 input ON
= 0 input OFF
 - bit 2 - mode of operation = 1 flashing
= 0 dimming
 - bit 3 - for *PED, PET* - fuse status = 1 O.K.
= 0 broken
 - for *PEF* – output status = 1 O.K.
= 0 short circuit
 - for *PEA* – no meaning = 1
 - bit 4 - for *PED, PET* - temperature = 1 O.K.
= 0 overheated
 - for *PEA, PEF* - no meaning = 1
 - bit 5 – input service = 1 disabled
= 0 enabled
 - bit 6 - no meaning = X
 - bit 7 - no meaning = 0
- 4 - 6. **Byte** - current output level in 0.1% (0 - 99.0%) or flashing parameters (depends on second bit in byte 3) in range 000 - 999
7. **Byte** - mode of operation = 30H ('0') no action
 - = 31H ('1') toggle
 - = 32H ('2') solid state
 - = 33H ('3') dimmer
 - for *PED, PET* = 34H ('4') three buttons
 - for *PEA* = 35H ('5') fluorescent
8. - 9. **Byte** - minimum level in range 0 - 99 %
- 10.-11. **Byte** - intermediate level range 0 - 99 %
- 12.-13. **Byte** - maximum level range 0 - 99 %
- 14.-16. **Byte** - fade time after short press of input in 0.1 sec in range 0 - 99.9s
- 17.-18. **Byte** - fade time during long press of input in sec in range 0 - 99 s

Following respond example answers the status of fuse OK of dimmer in group 0 and address 12:

SOH '! 'f' '0' '1' '2' STX 58H ETB ETX

Note: Respond message from PEF150 groups 3 to 15 consists only from first 6 bytes.