ASCII format communication protocol

The command set of ASCII format for CE-A digital transducers

There are six ASCII format commands for communications between master equipment and CE-A transducers.

- To read the transducer's name: $(Addr)M<CR>
- To read the configuration: $(Addr)2<CR>
- To set the configuration:
  %(OldAddr)(NewAddr)(InputRange)(BaudRate) (DataFormat) <CR>
- To read all data: #(Addr) A<CR>
- To read the data of total accumulative energy: #(Addr) W<CR>
- To clear the data of energy: &(Addr) (Order) <CR>
  Address (Addr): 00~FF (hex indicated by two bit ASCII code)
  Data format: 1 bit for start bit "0", 8 bits for data, 1 bit for stop bit "1"
  (It is supposed that the all following ID address is 01.)

To read the transducer's name (All under mentioned commands are illustrated with CE-AJ41)

To read the transducer's name from a specified address

Command format: **$(Addr)M<CR>**

$:	Command symbol	1 byte	(24H)
(Addr):	Address of the transducer	2 bytes	(30H31H)
M:	To read the transducer's name	1 byte	(4DH)
<CR>:	Enter, end mark.	1 byte	(0DH)

Response: **!(Addr)(TransducerName)<CR>**

!:	Delimiter
(Addr):	Address of the transducer
(TransducerName):	name code of transducer
<CR>:	Enter, end mark.

Example: Command: $01M<CR> (24H 30H 31H 4DH 0DH)
Response: ! 01J411<CR> (21H 30H 31H 4AH 34H 31H 31H 0DH)

!:	Delimiter
01:	Address
J411:	The name code of transducer CE-AJ41-12 (Different name code for different transducer)

To read the configuration

To read the configuration of a transducer by a specified address

Command format: **$(Addr)2<CR>**

$:	Command symbol	1 byte	(24H)

(Addr):	Address of the transducer	2 bytes	(30H 31H)
2:	To read the configuration	1 byte	(32H)
<CR>:	Enter, end mark	1 byte	(0DH)

Response: **!(Addr)(InputRange)(BaudRate)(DataFormat) <CR>**

Example: Command: $012<CR> (24H 30H 31H 32H 0DH)
Response: !01000601<CR>

!	Delimiter	(21H)
01	address of the transducer	(30H 31H)
00	input range (reserved codes)	(30H 30H)
06	communication Baudrate 9600bps	(30H 36H)
01	no checksum	(30H 31H)
<CR>	end mark	(0DH)

To set configuration

To set the configurations of the transducer including address and baudrate

Command: **%(OldAddr)(NewAddr)(Input Range)(BaudRate)(DataFormat)<CR>**

%:	Command Symbol	1 byte	(25H)
(OldAddr):	Old address (00~FFH)	2 bytes	(30H 31H)
(NewAddr):	New address (00~FFH)	2 bytes	(30H 32H)
(InputRange):	Must be 00	2 bytes	(30H 30H)
(BaudRate):	The communication baudrate (03~07)	2 bytes	(30H 33H——30H 37H)

No.	Baudrate code	Baudrate
03	30H 33H	1200bps
04	30H 34H	2400bps
05	30H 35H	4800bps
06	30H 36H	9600bps
07	30H 37H	19200bps

(Data Format)	Must be 01	2 bytes	(30H 31H)
<CR>	Enter, end mark	1 byte	(0DH)

Response: **!(Addr)<CR>**
Or: **?(Addr)<CR>** (Response to a wrong command received)

Example: command: %0102000701<CR> (25H 30H 31H 30H 32H 30H 30H 30H 37H 30H 31H 0DH)
Response: !02<CR> (21H 30H 32H 0DH)

This command successfully changed the address of the transducer from 01to 02; its new baudrate is 19200bps.

To read all data

To read all real-time data from a specified transducer. The sequence of data:

Ua, Ia, Ub, Ib, Uc, Ic, P, Q, Cosφ, F and Pa, Pb, Pc. Only15 parameters transducer has the last three parameters.

Command: **#(Addr)A<CR>** (23H 30H 31H 41H 0DH)
Response: **>(Data Ua)(Data Ia)(Data Ub)(Data Ib)(Data Uc)(Data Ic)(Data P)(Data Q) (Data Cosφ) (Data F) <CR>** (12 parameters CE-AJ41 transducer output)

Or: **>(Data Ua)(Data Ia)(Data Ub)(Data Ib)(Data Uc)(Data Ic)(Data P)(Data Q) (Data Cosφ) (Data F)(Data Pa)(Data Pb)(Data Pc)<CR>** (15 parameters CE-AJ41 transducer output)

Response of CE-AJ11: >(Data Ua)(Data Ia)(Data P)(Data Q)(Data Cosφ)(Data F)<CR>

Response of CE-AJ31: >(Data Uab)(Data Iab)(Data Ucb)(Data Icb)(Data P)(Data Q)(Data Cosφ)(Data F) <CR>

Response of CE-AI32: >(Data Ia)(Data Ib)(Data Ic)<CR>

Response of CE-AV42: >(Data Ua)(Data Ub)(Data Uc)<CR>

Data F: The data F consist of 5 digits of decimal value and a decimal point. This value is a real value of the frequency measured.

Data Cosφ: The data consist of a sign "+" or "–" and 5 digits of decimal value of data and a decimal point. This value is a real value of the power factor measured.

Other Data XX: The data consist of a sign "+" or "–" and 5 digits of decimal value of data and a decimal point. The data are shown in the form of a percentage as the ratio of the real value to the maximum value of its measurable range. Suppose the maximum value of its measurable range of current is 5A. If the output data is +0.6000, then the real current value is: I= 60%×5A=3.0000A

Example: Suppose: address is 01, the maximum value of its measurable range: Current Io=5A, Voltage Uo=100V, Frequency F=50Hz.

Command: #01A<CR> (23H 30H 31H 41H 0DH)

Response:

>+1.0000+0.6000+1.0000+0.6000+1.0000+0.6000+0.6000+0.0000+1.00 0050.000<CR>

Then: Ua = +1.0000×Uo = +100%×100V = 100.00V
Ia = +0.6000×Io = +60%×5A = 3.0000A
Ub = +1.0000×Uo = +100%×100V = 100.00V
Ib = +0.6000×Io = +60%×5A = 3.0000A
Uc = +1.0000×Uo = +100%×100V = 100.00V
Ic = +0.6000×Io = +60%×5A = 3.0000A
P = +0.6000×Uo×Io×3 = +60%×100V×5A×3 = +900.00W (For 1 element and 3-phase 3wire AC Electrical Multi-parameter Digital Transducer, the calculation of P need not multiply by 3.)
Q = +0.0000×Uo×Io×3 = +0%×100×5×3 = 0Var (For 1 element and 3-phase 3wire AC Electrical Multi-parameter Digital Transducer, the calculation of Q need not multiply by 3.)
Cosφ = +1.0000
F = 50.000Hz

To read the data of total accumulative energy

[For CE-AJ11(2), CE-AJ31(2) and CE-AJ41(2) only]

Command: **#(Addr)W<CR>**

Response: **>(Order)(+)(Data Kwh)(+)(Data Kvarh)(CHK)<CR>**

Or: **?(Addr)<CR>** (response to a wrong command received)

#: Command symbol 1 byte (23H)

W:	To read the data of energy	1 byte	(57H)
(Order):	Frame number	2 bytes	(00~FF)
(see note 1)			
(+):	Sign "+" or "–"	1 byte	(2BH or
2DH)			
(Data Kwh):	Data of active power	6 bytes	
(+):	Sign "+" or "–"	1 byte	(2BH or
2DH)			
(Data Kvarh):	Data of reactive power	6 bytes	
(CHK):	Checksum (hex)	2 bytes	

The intelligent transducer can output the total accumulative active energy and reactive energy. It starts to accumulate immediately after power on. The data of total accumulative energy are stored in the ferroelectric RAM of the transducer. The transducer will respond the data of energy immediately after it received the command to read that data of total accumulative energy.

The format of response is as follows:

>(Order)(+)(Data Kwh)(+)(data Kvarh)(CHK)<CR>

>:	Response symbol (3EH)	1 byte	
(Order):	Frame number (from 00 to FFH)	2 bytes	hex ASCII (see note 1)
(+):	Sign "+" or "–" (2BH or 2DH)	1 byte	hex ASCII
(Data Kwh):	Data of active energy	6 bytes	hex data
(+):	Sign "+" or "–" (2BH or 2DH)	1 byte	hex ASCII
(Data Kvarh):	Data of reactive energy	6 bytes	hex data
(CHK):	Checksum	2 bytes	accumulating 17 bytes given before (CHK), then the sum is ANDed with 0FFH to get the 2 bytes of hex data.

Note 1: Each response of the accumulative total active and reactive energy data has a frame number. When the transducer is powered on, its frame number starts with zero. When the transducer receives a correct command to clear the data of energy from master equipment, the transducer clears the energy data in its ferroelectric RAM and adds 1 to the frame number (circulating 00 through FF). The output data of energy are the sum of last output plus the new accumulated energy since the last output. If the transducer did not receive the correct command to clear energy data, the frame number will not change, and the data of energy will not be cleared and the transducer will continue to accumulate.

Generally, the data of energy starts to accumulate from zero immediately after the transducer is turned on. The longest period to accumulate is 1553.4 hours when U and I of input reach the maximum value of measuring range. The data will overflow when this value is exceeded. For the part numbers with accumulative energy data power failure protection function, they can save the accumulated active and reactive energy data when power is removed, and when power is reconnected to the transducer, the transducer begins accumulating energy from where it left off when power was removed.

Calculation of energy (The Uo and Io is the maximum value of measurable range of the transducer.):

$$\text{Energy} = \pm \text{DATA N} \times \frac{Uo \times Io}{1000 \times 3600} \text{ kwh}$$

Example: Command: #01W<CR>

Response: >01-0003E8+00003A68<CR> (hex)

The frame number is: 01
Active energy: -3E8H (hex) or -1000(decimal)
Reactive energy: 3AH (hex) or 58 (decimal)
Checksum:

68=(0x3E+0x30+0x31+0x2D+0x30+0x30+0x30+0x33+0x45+0x38+0x2B
+0x30+0x30+0x30+0x30+0x33+0x41) MOD 0x100

To clear the data of energy [For CE-AJ11(2), CE-AJ31(2) and CE-AJ41(2)only]

Command: **&(Addr)(Order)<CR>**
Response: **!(Addr)<CR>** (21H 30H 31H 0DH)
Or: **?(Addr)<CR>** (Response to a wrong command received)

Example: Command: &0101<CR>
Response: !01<CR> (Response to command with a correct frame number)
Or: ?01<CR> (Response to command with a wrong frame number)

Internal commands

A group of internal calibrating commands was set for calibration of the CE-AJ product: (Note: The second byte and the third byte of following four commands are address codes of transducer, the default address codes of all transducers were set to "01" before they were delivered.)

Command format: $(Addr)(Order)<CR>

- Calibrating command of zero adjusting for DC current: $010<CR> (24H 30H 31H 30H 0DH)
- Calibrating command of zero adjusting for DC voltage: $011<CR> (24H 30H 31H 31H 0DH)
- Calibrating command of zero adjusting for AC current: $013<CR> (24H 30H 31H 33H 0DH)
- Calibrating command of zero adjusting for AC voltage: $014<CR> (24H 30H 31H 34H 0DH)

For above 4 commands, 7 bytes of data will be responded from 1 element transducers, 13 bytes of data will be responded from 3-phase 4-wire transducers.

- Reset command: @CEAFW <CR> (40H 43H 45H 41H 46H 57H 0DH)

  The address codes of transducers will be reset to "01" and the Baud rate will be reset to 9600 bps by the reset command whatever the previous address codes and Baud rate of the transducer are. Four bytes of data will be responded from the transducer after receiving the reset command. This command can not be used in the network; otherwise it will cause bus conflict.

Please contact your supplier when user needs recalibrate the product. Our technicians will help you to recalibrate by using other internal commands.