PC series serial port protocol

Serial port configuration

The serial communication port of the controller is set as follows：

- 115200bits/s
- 8-bit data
- 1 starting bit
- 1 stop bit
- No Parity

Communication protocol description

The controller uses simple communication protocol based on ASCII code.The command is not case sensitive,? a and ? A Same. **Command terminated by Enter.** (Hexadecimal 0x0d， '\r')

Command response

The controller will respond according to one of the following 2 midways：

For commands requiring replies, such as reading speed, current query, etc., reply query is considered as a command response.

For commands that do not need to be answered, such as speed setting, the controller will issue "+" as the command response after each carriage return.

Command error

If a command or query has been received but cannot be recognized or is not accepted for some reason, the controller will issue a "-" to display the error.

Command Table

Set command in operation	**Parameter**	**Describe**
!AC	Channel soft start	Set soft start
!D0	Digit value	Set Independent Digital Output Bits
!D1	Digit value	Set Independent Digital Output Bits
!DC	Channel soft stop	Set soft stop
!EES	/	Save configuration to EEPROM
!EX	/	Emergency shutdown
!MG	/	Release Shutdown
!M	Numerical value	Set motor speed
Query command	**Parameter**	**Describe**
?A	Enter value	Read motor current
?AI	Enter value	Read analog input
?AIC	Enter value	Analog input after reading conversion
?BA	Enter value	Read battery current
?BS	\	Read brushless motor speed RPM
?CIA	Channel	Read internal analog quantity command
?CIP	Channel	Read internal pulse command
?CIS	Channel	Read internal serial port command
?D	Enter value	Read all digital inputs

?DI	Enter value	Read independent digital input
?DO	无	Read the current digital output
?E	无	Read closed loop error
?F	无	Read feedback
?FF	无	Read fault mark
?FS	无	Read status flag
?LK	无	Read lock status
?M	Channel	Read the actual motor command
?P	Channel	Read the power level of the application
?PI	Enter value	Read pulse input
?PIC	Channel	Read converted pulse input
?S	Channel	Read encoder motor speed RPM
?T	Sensor value	Read enclosure and internal temperature
?V	Sensor value	Read internal voltage

Command Description

! AC - Set Soft Start

Set the speed change rate when one motor starts. This command is the same as the MACC configuration command but can be provided, so it can be changed quickly during motor operation. The soft start value is 0.1 * RPM/s. When the controller used is equipped with an encoder, the speed and soft start value are the actual speed. The brushless motor controller uses Hall sensor to measure the actual speed, and the soft start time is the actual RPM/s.

When the controller used has no speed sensor, the soft start value is relative to the maximum speed configuration parameter, which is the standard speed at full power provided by the user. Assuming that the maximum speed parameter is set to 1000, the soft start value of 10000 means that the motor will accurately go from 0 to full speed within 1 second, regardless of the actual motor speed.

Grammar :!AC nn mm
Here :nn=motor channel
mm=soft start value is 0.1 * RPM/s
Example :! AC 1 2000 If the speed is measured by the encoder, increase the speed of motor 1 at 200RPM per second. AC 2 20000 If there is no speed sensor and the maximum speed is set to 1000, the time from 0 to full power
0.5s

! D0 -- Set independent digital output bit

The D0 command can turn off individual digital outputs by selecting numbers

Grammar :! D0nn
Here :nn=Output value
Example :! D0 2: Turn output 2 to 0.

! D1 - Set independent digital output bit

The D1 command can turn off individual digital outputs by selecting numbers

Grammar :!D1 nn

Here :nn=Output value

Example :! D1: Turn output 1 to ON

! DC - Set Soft Stop

Same as AC, but the speed changes from fast to slow.

Grammar :!DC nn mm

Here :nn=motor channel

mm=soft stop value at 0.1 * RPM/s

Example :! DC 1 2000 If the speed is measured by the encoder, reduce the speed of motor 1 at 200RPM per second.

! DC 2 20000 If there is no speed sensor and the maximum speed is set to 1000, the time from full power to zero speed is 0.5s.

! DS --- Set all data output bits

One or more digital outputs can be turned on or off at the same time. This numeric value can range from 0 to 255, and the binary value affects the respective output pins.

Grammar : ! DS nn

Here :nn=Apply bit pattern to all outputs immediately

Example : ! DS 03: Turn 1 and 3 to ON, and turn off the others.

! EES -- Save configuration to EEPROM

This command is a copy of the EESAV maintenance command. It provides a real-time command that makes saving configuration changes possible.

Grammar： ! EES

Explain： The configuration cannot be saved while the motor is running. Saving to EEPROM takes several milliseconds, during which the control loop will be delayed.

Note: After the configuration is changed, the save command must be sent to take effect! (except speed command)

! EX - Emergency Stop

The EX command will cause the controller to enter the emergency stop, which is the same as the hardware emergency stop detected on the input pin. The emergency stop will remain until the controller restarts or when the MG command is received to release the emergency stop.

Grammar： ! EX

! MG - Emergency stop release

The MG command will release the emergency stop condition and allow the controller to return to normal operation.

Grammar. ! MG

! M - Set motor speed

Grammar： !M nn mm

Here：

nn=Channel 1

The speed setting values 0 to 1000 are positive.

The speed setting value 0 to - 1000 is reverse.

mm=Channel 2

The speed setting values 0 to 1000 are positive.

The speed setting value 0 to - 1000 is reverse.

For single channel controller, just send! M nn

?A— Motor current

Measure and report the motor current of all channels. Note that the current flowing through the motor is always higher than the current flowing through the battery.

Grammar： ?A[cc]

Reply： A=aa

Here: cc=Motor channel

aa =Current per channel * 10

Example: Q: ?A

reply：A=100：200

Note: A single controller will report a separate value. The Sepex controller reports motor current and field current. Some power panel units measure the motor current and calculate the battery current, while others measure the battery current and calculate the motor current. The detected current value is always more accurate than the calculated current value. See the instructions of the controller to find out which type of current is measured.

?AI---Analog input

Report the original value of each enabled analog quantity in mV form, and report it as 0 if the input is not enabled

Grammar： ?AI[cc]

Reply： AI=nn

Here: cc=Number of analog input ports

nn =MV value of each channel

allowed band: 0-5000mV

?AIC—Analog input after conversion

An analog quantity is converted into all adjustment return values for a command or feedback (min/max/center/dead band/linear). If the input is not enabled, the query returns 0

Grammar： ? AIC

Reply： AIC=nn

Here: nn =Conversion analog input value+/- range

?BA --- Battery current

Measure and report the current flowing through the battery. The battery current is always lower than the motor current

Grammar： ?BA[cc]

Reply： BA=aa

Here， cc=Motor channel

aa =Current per channel * 10

Example: Q: ?BA

A: BA=100：200

Note: A single controller will report a separate value. The Sepex controller reports motor current and field current. Some power panel units measure the motor current and calculate the battery current, while others measure the battery current and calculate the motor current. The detected current value is always more accurate than the calculated current value. See the instructions of the controller to find out which type of current is measured.

?BS—Read BL motor speed RPM

For brushless motor controller, report that the RPM value measured by the motor hall sensor is the most actual speed.

Grammar: ?BS

Reply: BS=nn

Here, nn =RPM

Note: In order to accurately report RPM, the number of motor poles in the configuration parameters must be correct.

?CIA---Read internal analog quantity command

Returns the motor command value, which is calculated from the analog input port, regardless of whether the command is actually applied to the motor. For example, the query can be used to read the commands given by the game controller or from the external microprocessor, even though the controller may be currently responding to RS232 commands or pulse commands with higher priority. The return value is the command value (min/max/center point/dead band/linear) of the original analog input with all adjustments and conversions

Grammar: ? CIA

Reply:CIA=nn

Here, nn=Command value within+/- 1000

?CIP—Read internal pulse command

Returns the motor command value, which is calculated from the pulse input port, regardless of whether the command is actually applied to the motor. For example, the query can be used to read the commands given by the game controller or from the external microprocessor, even though the controller may be currently responding to RS232 commands or pulse commands with higher priority. The return value is the command value (min/max/center point/dead band/linear) after all adjustments and conversions of the original pulse input quantity

Grammar: ? CIP

Reply:CIP=nn

Here, nn=Command value within+/- 1000

?CIS—Read internal serial port command

Returns the motor command value, which is input from the serial port input port, regardless of whether the command is actually applied to the motor. For example, the query can be used to read out the commands given from the external microprocessor, even though the controller may be currently responding to a pulse or analog command with higher priority.

Grammar： ？CIS

Reply: CIS=nn

Here, nn=Command value within+/- 1000

?D—Digital input

Report the status of each active digital input port. The result of the query response is a digital quantity, which must be converted to binary and give the status of each input.

Grammar： ?D[cc]

Reply： D=nn

Here， cc =Digital input value

nn =b1+b2*2+b*4+。。+bn*2^{n-1}

Example, Q： ？D

A： D=17, input 1 and 5 are valid, and all others are invalid

?DI---Read independent digital input

Reports the status of individual digital inputs, such queries result in boolean values (0 or 1)

Grammar： ?DI[cc]

Reply： DI=nn

Here， cc=Digital input value

nn=Status 0 or 1 for each input

Example： Q：？DI

A： DI=1：0：1：0：1：0

Q：？DI 1

A： DI=0

?DO—Digital output status

Read the actual status of all digital outputs. The result of the query response is a digital quantity, which must be converted to binary and give the status of each output.

Grammar： ?DO[cc]

Reply： DO=nn

Here， cc=Digital input value

nn= d1+d2*2+d*4+。。+dn*2^{n-1}

Example: Q：？ DO

A： DI=17 Output 1 and 5 are active, others are inactive

Q：？ DO 1

A： DO=1，The queried output port 1 is active.

Note: When querying independent output ports, reply 0 or 1 according to their respective statuses.

The total number of outlets shall be subject to different product descriptions.

?E—Read closed loop error

In the closed-loop mode, return the difference between the expected speed and the measurement feedback quality inspection. This query can be used to detect when the motor has reached the expected speed. In open-loop mode, the query returns 0.

Grammar：？E

Reply：E=nn

Here， nn=mistake

?F—Feedback value

Report the value of each channel feedback sensor in closed loop mode. The feedback source can be encoder, analog quantity or pulse. This query is very useful to confirm the correct feedback source in closed-loop mode and confirm that it is within the scope of use.

Grammar：？F[cc]

Reply：F=nn

Here， cc =Number of channels

nn=Feedback value

?FF—Fault identification

Reports the status of the controller after a failure condition occurs during operation. The reply is a single value, which must correspond to each independent status bit after being converted to binary.

Grammar：？FF[cc]

Reply：FF=f1+f2*2+f3*4+ …+ fn*2^{n-1}

Here， f1=overheated

f2=Overpressure

f3=Undervoltage

f4=short circuit

f5=Emergency stop

f6=Sepex Excitation fault

f7=MOSFET fault

f8=Startup configuration failure

?FS—Status ID

Reports the status of the status identifier, which is used by the controller to indicate internal conditions during normal operation. The response is a single value for all status identifiers. The indication of the individual identification is read after conversion to binary.

Grammar: ? FS

Reply: FF=f1+f2*2+f3*4+ …+ fn*2^{n-1}

Here, f1=Serial port mode

f2=Pulse mode

f3=Analog quantity mode

f4=Power stage shutdown

f5=Stop detection

f6=At Limit

f7=Not used

f8=Script Run

?LK—Lock status

The status of Fan Hu lock mark. If the configuration is locked, it is not possible to read any configuration parameters until the lock is released or the parameters are reset to factory defaults. This feature is very useful to protect the configuration of the controller from being copied.

Grammar: ? LK

Reply: LK=ff

Here, ff=0 : Unlocked

1: Locked

?M--- Commands for motor application

Reports the command values used in the controller. The value depends on the mode selected at that time. The selection of one control mode relative to other modes is based on the priority of commands

In RS232 mode, this value will report the command value entered through RS232 or USB port.

In analog quantity and pulse mode, the query will report the analog quantity or pulse quantity after minimum, maximum, center point, dead zone and linear adjustment conversion.

This query is used to check the current command and application effect.

Grammar: ?M[cc]

Reply: M=nn

Here, cc =Number of channels

nn =Command value from 0 to ± 1000 for each motor

Example: Q: ? M

A: M=800: - 1000

Q: ? M 1

A: M=800

?P--- Output power of motor application

Report the output power level power actually applied to the motor. This value is obtained after taking into account all internal corrections and temperature or overcurrent post limitation.

Grammar: ? P[cc]

Reply: P=p1：p2

Here， cc =Motor channel

p1 ， p2=0 to ± 1000 power level

Example， Q： ?P 1

A： P=800

?PI---Pulse input

Report the pulse input value after enabling. When configured as pulse width mode, the value is in mS. In frequency mode, the return value is HZ. In duty cycle mode, the return value range is 0-4095, and the corresponding pulse duty cycle is 0% to 100%.

Grammar： ? PI[cc]

Reply： PI=nn

Here， cc =Number of pulse capture channels

nn =Value of each channel

Allowed band： 0 to 65000us

?PIC----Read converted pulse

Returns the adjusted value converted to command or feedback (min/max/center/dead band/linear) on a pulse input port. If the input is not enabled, it returns 0

Grammar： ? AIC

Reply： AIC=nn

Here， nn =Within+/- range of converted analog input value

?S—Encoder speed RPM

Report the actual speed measured by the encoder as the actual speed per minute.

Grammar： ? S[cc]

Reply： S=vv：vv

Here， cc=Number of channels

vv =RPM

Note: In order to accurately report the speed per minute, the encoder display must be correctly stored in the encoder configuration.

?T—Temperature

Report the temperature of each radiator surface and chip. The unit is centigrade.

Grammar： ?T[cc]

Reply： T=tm：t1：t2

Here， cc=Temperature channel

tm =Internal IC

t1=Channel 1

t2=Channel 2

?V— Voltage

Report the voltage of the three internal parts of the controller: the main battery voltage, the internal voltage of the motor drive stage, and the 5v voltage value on the controller output terminal. For safe operation, the drive stage voltage must be above 12v, and the 5v output voltage value shows that the 5v is adjusted inside the controller minus the diode voltage drop, which should generally be about 4.7v. Used to detect overvoltage and undervoltage when battery voltage is applied.

Grammar： ？ V [cc]

Reply： V=vdr：vmot：v5out

Here， vdr=Internal voltage value(v) *10

Vmot=Main battery voltage(v) *10

V5out=Output terminal 5v (mv)

Example, Q： ?V

A： V=135：246：4730

Q：?V3

A： V=4730