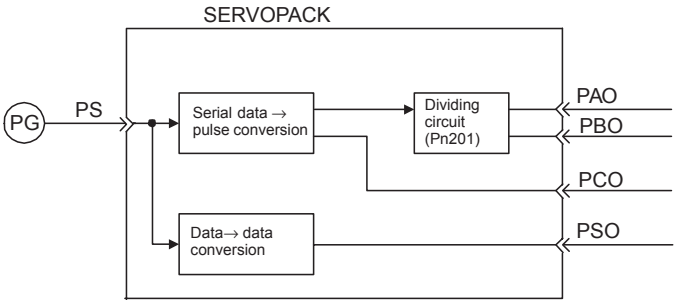
## 4.7.5 Absolute Encoder Reception Sequence

The sequence in which the SERVOPACK receives outputs from the absolute encoder and transmits them to the host device is shown below.

Be sure you understand this section when designing the host device.

### ■ Outline of Absolute Signals

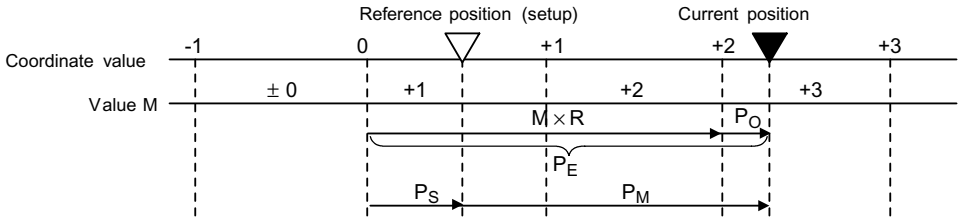
The absolute encoder's outputs are PAO, PBO, PCO, and PSO signals as shown below.




| Signal Name | Status | Signal Contents |
|---|---|---|
| PAO | Initial state | Serial data<br>Initial incremental pulse |
| | Normal state | Incremental pulse |
| PBO | Initial state | Initial incremental pulse |
| | Normal state | Incremental pulse |
| PCO | Always | Origin pulse |
| PSO | Always | Rotation count serial data |

## ■ Contents of Absolute Data

- Serial data: Indicates how many turns the motor shaft has made from the reference position (position specified at setup).
- Initial incremental pulse: Outputs pulses at the same pulse rate as when the motor shaft rotates from the origin to the current position at approximately 2500 $min^{-1}$ (for 16 bits when the dividing pulse is at the factory setting)




The final absolute data $P_M$ can be found by using the following formula.

$P_E = M \times R + P_O$

$P_M = P_E - P_S$

(Use the following for reverse rotation mode (Pn000.0 = 1).

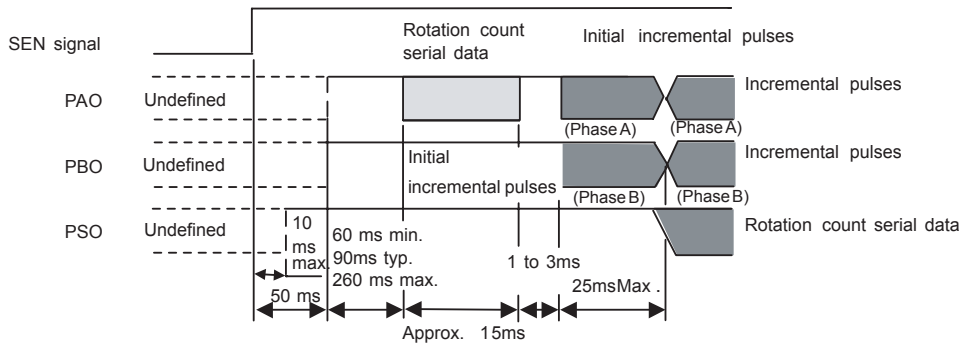
$P_E = -M \times R + P_O$

$P_M = P_E - R_S$

| | |
|---|---|
| $P_E$ | Current value read by encoder |
| M | Multiturn data (rotation count data) |
| $P_O$ | Number of initial incremental pulses |
| $P_S$ | Number of initial incremental pulses read at setup (This is saved and controlled by the host controller.) |
| $P_M$ | Current value required for the user's system. |
| R | Number of pulses per encoder revolution (pulse count after dividing, value of Pn201) |

## ■ Absolute Encoder Transmission Sequence

1. Set the SEN signal at high level.
2. After 100 ms, set the system to serial data reception-waiting-state. Clear the incremental pulse up/down counter to zero.
3. Receive eight bytes of serial data.
4. The system enters a normal incremental operation state approximately 50 ms after the last serial data is received.

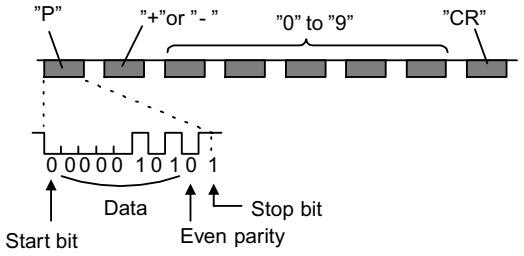


## ■ Detailed Signal Specifications

### PAO Serial Data Specifications

The number of revolutions is output in five digits.

| Data Transfer Method | Start-stop Synchronization (ASYNC) |
|---|---|
| Baud rate | 9600 bps |
| Start bits | 1 bit |
| Stop bits | 1 bit |
| Parity | Even |
| Character code | ASCII 7-bit code |
| Data format | 8 characters, as shown below. |



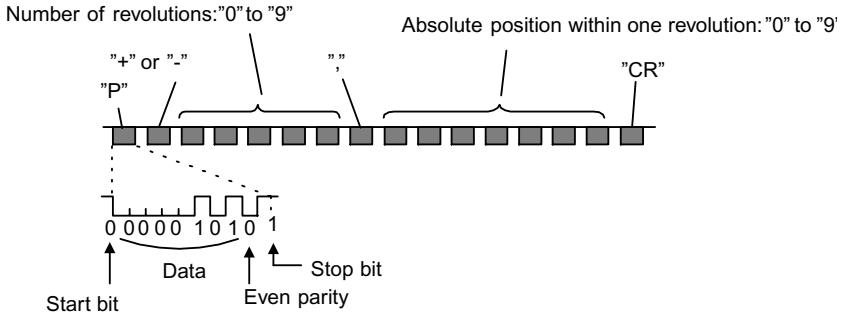

Note: 1. Data is "P+00000" (CR) or "P-00000" (CR) when the number of revolutions is zero.
2. The revolution range is "+32767" to "-32768." When this range is exceeded, the data changes from "+32767" to "-32768" or from "-32768" to "+32767. " When changing multiturn limit, the range changes. For details, see *4.7.6 Multiturn Limit Setting*.

## PSO Serial Data Specifications

The number of revolutions and the absolute position within one revolution are always output in five and seven digits, respectively.

The data output cycle is approximately 40 ms.

| Data Transfer Method | Start-stop Synchronization (ASYNC) |
|---|---|
| Baud rate | 9600 bps |
| Start bits | 1 bit |
| Stop bits | 1 bit |
| Parity | Even |
| Character code | ASCII 7-bit code |
| Data format | 13 characters, as shown below. |




Note: 1. The absolute position data within one revolution is the value before dividing.
2. Absolute position data increases during forward rotation. (Not valid in reverse rotation mode.)

## Incremental Pulses and Origin Pulses

Just as with normal incremental pulses, initial incremental pulses which provide absolute data are first divided by the frequency divider inside the SERVOPACK and then output.