

# PODD60L-01 Two-mode micro-pod

Model: PODD60L-01

## PRODUCT DESCRIPTION

The PODD60L-01 Two-Mode Micro-Pod delivers exceptional performance in an ultra-compact, ultra-lightweight package weighing just 85g. Specifically engineered for catapult-launched drones, it withstands harsh launch impacts. Experience stable, clear footage thanks to its integrated servo image stabilization and built-in tracking functions. Designed for versatility, it features wide voltage input (12-28V) and dynamic power consumption control for extended flight times. Housed in a robust metal shell that ensures EMC compliance and superior durability, this micro-pod combines advanced AI tracking, reliable image stabilization, and critical EMC protection for demanding drone payload applications. Its lightweight design and impact-resistant construction make the PODD60L-01 the ideal compact drone camera solution for military, surveillance, reconnaissance, and industrial inspection missions requiring both performance and reliability.

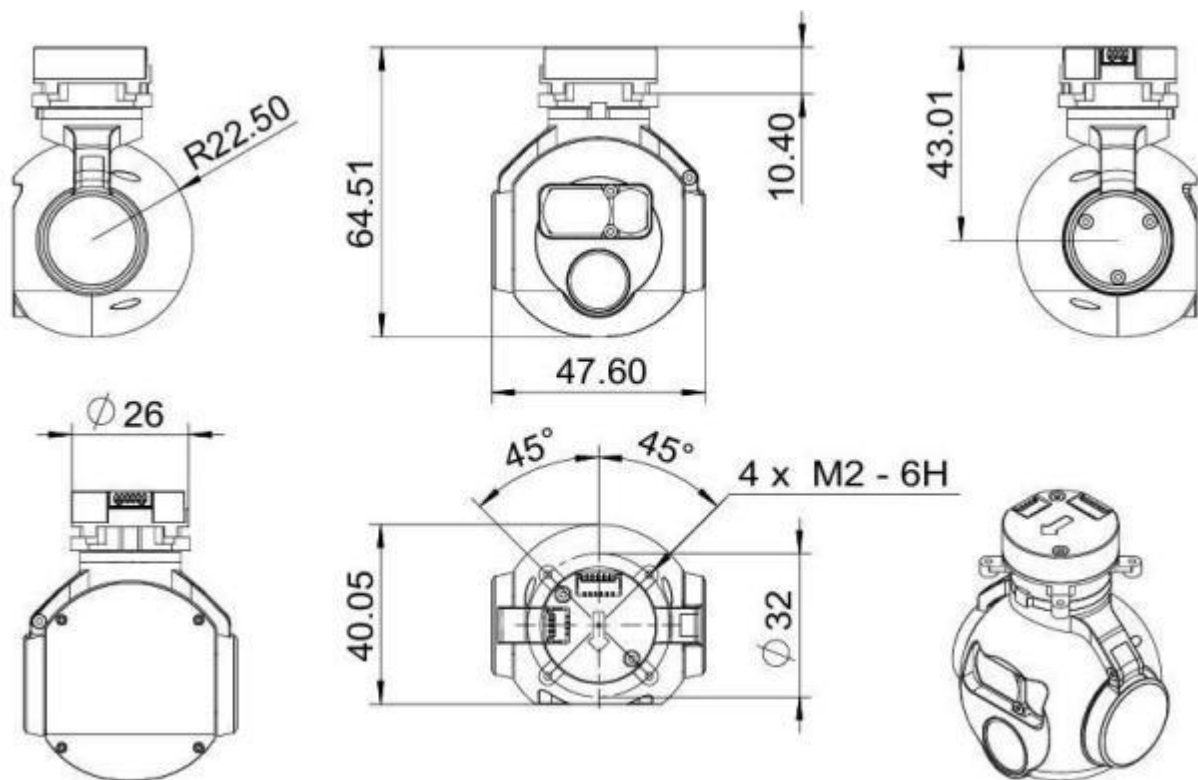


## TECHNICAL PARAMETER

| System specification      |                     |
|---------------------------|---------------------|
| System type               | Gyro stability      |
| Weight                    | ≤85g                |
| System characteristics    |                     |
| Platform type             | Two-axis            |
| Pitch                     | -110°~+110°         |
| Roll                      | -100°~+40°          |
| Max angular velocity      | ≥100°/s             |
| Stability accuracy        | 0.1mrad(1°/2Hz)(1σ) |
| Motor encoder accuracy    | ≤0.3°               |
| Visible Light Imaging     |                     |
| Resolution and frame rate | 1920×1080@60fps     |
| FOV                       | 19.7°×11°(16mm)     |
| Laser Ranging             |                     |
| Measuring range           | 5-1200m             |
| Ranging accuracy          | ±1m                 |
| Target tracking           |                     |
| Tracking speed            | ≥40°/s              |
| System external interface |                     |
| Control interface         | Serial port         |

|                                |               |
|--------------------------------|---------------|
| Video output                   | Network(RTSP) |
| <b>Power supply</b>            |               |
| Supply voltage                 | 12V~28V       |
| Power consumption              | Av.≤10W       |
|                                | Max.≤20W      |
| <b>Environmental condition</b> |               |
| Working temp                   | -20℃~+60℃     |
| Storage temp                   | -20℃~+60℃     |
| Launch impact                  | ≥400g         |

## MECHANICAL STRUCTURE



## CONTROL PROTOCOL

### 1 Scope

This agreement specifies the data communication process and control protocol between DYT and controllers (such as flight control and pod controllers).

### 2 Communication between DYT and Controllers

#### 2.1 Data Communication Process

- The controller sends instructions to DYT. The instruction content is shown in Table 1. All instructions are trigger-type and only need to be sent once.
- After DYT powers on and completes self-check, it sends information to the controller at a cycle of 16.7 ms. The information content is shown in Table 2.

- c) For multi-byte variables, the low byte comes first, followed by the high byte.
- d) The default baud rate of the serial port is 115200, and the parity check mode is no parity.
- e) When target position calculation and data guidance functions are required, the attitude angles and latitude-longitude information of the carrier aircraft need to be sent to DYT at a frequency of 1–60 Hz.
- f) SEI information is data superimposed in the H.264 video stream and is disabled by default.

## 2.2 Communication Protocol

**Table 1 Control Instruction Data**

| Data source            |                     | Controller      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |
|------------------------|---------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Destination            |                     | DYT             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |
| Transmission Frequency |                     | Trigger to Send |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |
| Byte Sequence Number   | Parameter Name      | Data Type       | Explanation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Bytes Occupied |
| 0                      | Synchronous code 1  | U8              | 0xEB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1              |
| 1                      | Synchronous code 2  | U8              | 0x90                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1              |
| 2                      | Control Information | U8              | 0x00: Null Command<br>0x01: Visible Light 1<br>0x02: Visible Light 2<br>0x03: Infrared 1<br>0x04: Infrared 2<br>0x05: Image Enhancement On<br>0x06: Image Enhancement Off (Default)<br>0x07: Target Recognition On<br>0x08: Target Recognition Off (Default)<br>0x09: Storage On<br>0x0A: Storage Off (Default)<br>0x0D: Point Tracking (X, Y Coordinates)<br>0x0E: Stop Tracking<br>0x0F: Automatic Target Locking<br>0x10: Semi-Automatic Target Locking<br>0x11: Infrared White Hot<br>0x12: Infrared Black Hot<br>0x13: Tracking Algorithm - Adaptive<br>0x14: Tracking Algorithm - Personnel<br>0x15: Tracking Algorithm - Vehicle<br>0x16: Tracking Algorithm - Building<br>0x24: Pan/Tilt Search<br>0x25: Zoom Command<br>0x26: Specify Frame Angle<br>0x27: Motor On<br>0x28: Motor Off | 1              |

|     |             |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |
|-----|-------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|     |             |     | <p>0x29: Follow Mode Off</p> <p>0x2A: Azimuth Follow</p> <p>0x2B: Center Position</p> <p>0x2C: Suppress Gyro Drift</p> <p>0x2D: Laser Ranging On</p> <p>0x2E: Laser Ranging Off</p> <p>0x30: Electric Lock Mode</p> <p>0x31: Release Electric Lock</p> <p>0x32: Azimuth Scanning</p> <p>0x33: Stop Scanning</p> <p>0x39: Calibrate Gyroscope (Parameter 3 is zero. Turn off the motor first, keep stationary for 10s after sending the command, then turn on the motor.)</p> <p>0x3A: Data Guidance</p> <p>0x3B: Specify Attitude Angle</p> <p>0x3C: Calibrate Zero Position of Flight Control and Pod Attitude Angles</p> <p>0x4A: Image Board Power Control</p> <p>0x50: Pseudo Color</p> <p>0x51: OSD Display On</p> <p>0x52: OSD Display Off</p> <p>0x55: Low Light Mode Off</p> <p>0x56: Low Light Mode On</p> <p>0x58: Digital Zoom On</p> <p>0x59: Digital Zoom Off</p> <p>0x5A: Specify Zoom Factor</p> <p>0x5B: Take Photo</p> <p>0x5C: Focus Mode</p> <p>0x5D: Focus Position</p> <p>0xA0: Save FLASH Parameters</p> <p>0xB0: Lifting Mechanism Control</p> <p>0xB1: Set Current Angle as Zero Position</p> |   |
| 3、4 | Parameter X | S16 | <p>Default value is 0.</p> <p>When Control Information = 0x0D (Point Tracking):</p> <p>Represents the horizontal pixel coordinate of the locking point. The image center is 0.</p> <p>When Control Information = 0x24 (Pan/Tilt Search):</p> <p>Represents the azimuth rotation speed in units of 0.1°/s.</p> <p>When Control Information = 0x26 (Specify Frame Angle), 0x32 (Azimuth Scanning), or 0x3B (Specify Spatial Angle):</p> <p>Represents the azimuth angle in units of 0.01°.</p> <p>When Control Information = 0x2C (Suppress Gyro Drift):</p> <p>Data type is int16 with a range of -2000 to 2000.</p> <p>When Control Information = 0x5A (Specify Zoom Factor):</p> <p>Represents the zoom factor in units of 0.1x.</p>                                                                                                                                                                                                                                                                                                                                                                                 | 2 |

|      |             |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |
|------|-------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|      |             |     | When Control Information = 0xB0 (Lifting Control):<br>0 = Stop, 1 = Ascend, 2 = Descend.<br>When Control Information = 0x4A (Image Board Power Control):<br>0 = Restart, 1 = Power On, 2 = Power Off.                                                                                                                                                                                                                                                   |    |
| 5、6  | Parameter Y | S16 | Default value is 0.<br>When Control Information = 0x0D (Point Tracking):<br>Represents the vertical pixel coordinate of the locking point. The image center is 0.<br>When Control Information = 0x24 (Pan/Tilt Search):<br>Represents the pitch rotation speed in units of 0.1°/s.<br>When Control Information = 0x26 (Specify Frame Angle), 0x32 (Azimuth Scanning), or 0x3B (Specify Spatial Angle):<br>Represents the pitch angle in units of 0.01°. | 2  |
| 7    | Parameter 3 | U8  | When the control information is 0x01 to 0x04: It represents the small picture in picture-in-picture.<br>0 = Cancel multi-screen;<br>1 = Visible 1; 2 = Visible 2;<br>3 = Infrared 1; 4 = Infrared 2;<br>When the small picture is the same as the large picture, the multi-screen is canceled.<br>When the control information is 0x32 "Azimuth Scanning", it represents the scanning speed, where 1 bit = 0.2°/s.                                      | 1  |
| 8    | Zoom Rate   | S8  | When the control information is "Zoom Command", 0 to +100 represents the zoom-in rate, and 0 to -100 represents the zoom-out rate.                                                                                                                                                                                                                                                                                                                      | 1  |
| 9~14 | Keep        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6  |
| 15   | Checksum    | U8  | Start adding from the 0th byte, and take the lower 8 bits.                                                                                                                                                                                                                                                                                                                                                                                              | 1  |
|      | Total       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 16 |

When the control information is 0x3a "Data Guidance", bytes 3 to 14 are as shown in the following table.

| Byte Sequence Number | Parameter Name       | Data Type | Unit               | Explanation                                                                                                                                                                                        | Bytes Occupied |
|----------------------|----------------------|-----------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 3                    | Data Guidance Status | U8        |                    | 0x00: Exit Geographic Tracking<br>0x01: Geographic Tracking of Current Field of View Center Position<br>0x02: Geographic Tracking of Specified Position<br>0x0A: Calibration Based on Known Target | 1              |
| 4~7                  | Target Latitude      | Int32     | 10 <sup>-7</sup> ° |                                                                                                                                                                                                    | 4              |
| 8~11                 | Target Longitude     | Int32     | 10 <sup>-7</sup> ° |                                                                                                                                                                                                    | 4              |
| 12、13                | Target Altitude      | S16       | 0.2m               |                                                                                                                                                                                                    | 2              |
| 14                   | Reserved             | U8        |                    |                                                                                                                                                                                                    | 1              |

#### Command Examples:

Rotate right at 10°/s: EB 90 24 64 00 00 00 00 00 00 00 00 00 03  
 Rotate down at 10°/s: EB 90 24 00 00 9C FF 00 00 00 00 00 00 00 3A  
 Stop rotation: EB 90 24 00 00 00 00 00 00 00 00 00 00 00 9F  
 Go to azimuth 10°, pitch -10°: EB 90 26 E8 03 18 FC 00 00 00 00 00 00 00 A0  
 Zoom in: EB 90 25 00 00 00 00 00 32 00 00 00 00 00 00 D2  
 Zoom out: EB 90 25 00 00 00 00 00 CE 00 00 00 00 00 00 6E  
 Stop zooming: EB 90 25 00 00 00 00 00 00 00 00 00 00 00 A0  
 Zoom to 5x: EB 90 5A 32 00 00 00 00 32 00 00 00 00 00 00 39  
 Point tracking at coordinates (100, -200): EB 90 0D 64 00 37 FF 01 32 00 00 00 00 00 00 55  
 Stop tracking: EB 90 0E 00 00 00 00 00 00 00 00 00 00 00 89

**Table 2 Periodic Telemetry Information**

| Data source            |                               | Controller |      |                                                                                                                                                                                                                                                                                                                                                                 |                |
|------------------------|-------------------------------|------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Destination            |                               | DYT        |      |                                                                                                                                                                                                                                                                                                                                                                 |                |
| Transmission Frequency |                               | 60Hz       |      |                                                                                                                                                                                                                                                                                                                                                                 |                |
| Byte Sequence Number   | Parameter Name                | Data Type  | Unit | Explanation                                                                                                                                                                                                                                                                                                                                                     | Bytes Occupied |
| 0                      | Sync Word 1                   | U8         |      | 0xEE                                                                                                                                                                                                                                                                                                                                                            |                |
| 1                      | Sync Word 2                   | U8         |      | 0x16                                                                                                                                                                                                                                                                                                                                                            |                |
| 2                      | Status Information Feedback 1 | U8         |      | Bits 7-6: Tracking video source<br>00: Visible light 1<br>01: Visible light 2<br>10: Infrared 1<br>11: Infrared 2<br>Bits 5-4: Tracking algorithm type<br>00: Adaptive<br>01: Personnel<br>10: Vehicle<br>11: Building<br>Bit 3: Target automatic prompt<br>1: On<br>0: Off<br>Bit 2: Target tracking status<br>1: Locked<br>0: Searching<br>Bits 1-0: Reserved | 1              |
| 3                      |                               |            |      | Bits 7: Image Enhancement<br>1: On<br>0: Off<br>Bit 6: Reserved<br>Bit 5: Storage<br>1: On<br>0: Off                                                                                                                                                                                                                                                            | 1              |

|       |                                               |     |          |                                                                                                                                                                                                                                                  |   |
|-------|-----------------------------------------------|-----|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|       | Status Information<br>Feedback 2              | U8  |          | Bit 4: Roll Axis Mode<br>0: Reset<br>1: Control<br>Bit 3: Motor Status<br>1: On<br>0: Off<br>Bit 2: Follow Mode<br>1: On<br>0: Off<br>Bit 1: Electric Lock Mode<br>1: On<br>0: Off<br>Bit 0: Laser Status<br>1: On<br>0: Off                     |   |
| 4     | Least Significant 8<br>Bits of Zoom<br>Factor | U8  | 0.1x     | Combined with bits 0-3 of byte 5 to form a u16.                                                                                                                                                                                                  | 1 |
| 5     | Status Feedback<br>Information 3              | U8  |          | Bits 7-6: Displayed large picture<br>Bits 5-4: Displayed small picture<br>00: Visible 1 (Zoom/Forward View)<br>01: Visible 2 (Wide Angle/Side View)<br>10: Infrared 1<br>11: Infrared 2<br>Bits 0-3: The upper 4 bits of the zoom magnification. | 1 |
| 6、7   | Target miss amount<br>X-axis offset angle     | S16 | 0.05°    | Represents the horizontal and vertical deviations of the locking point, with the image center as 0.                                                                                                                                              | 2 |
| 8、9   | Target miss amount<br>Y-axis offset angle     | S16 | 0.05°    | The numerical values correspond to direct physical quantities, and the different field angles of visible light and infrared lenses are uniformly calculated internally by DYT.                                                                   | 2 |
| 10、11 | Roll frame angle                              | S16 | 0.01°    | Left is negative, right is positive.<br>Up is positive, down is negative.                                                                                                                                                                        | 2 |
| 12、13 | Pitch frame angle                             | S16 | 0.01°    |                                                                                                                                                                                                                                                  | 2 |
| 14、15 | Azimuth frame<br>angle                        | S16 | 0.01°    |                                                                                                                                                                                                                                                  | 2 |
| 16    | Gate horizontal<br>pixels                     | U8  | 4 pixels | 1bit=4 pixels                                                                                                                                                                                                                                    | 1 |
| 17    | Gate vertical pixels                          | U8  | 4 pixels | 1bit=4 pixels                                                                                                                                                                                                                                    | 1 |
| 18、19 | Reserved                                      |     |          |                                                                                                                                                                                                                                                  | 2 |
| 20、21 | Roll angular<br>velocity                      | S16 | 0.01°/s  | Left is negative and right is positive.<br>Up is positive and down is negative.                                                                                                                                                                  | 2 |
| 22、23 | Pitch angular<br>velocity                     | S16 | 0.01°/s  |                                                                                                                                                                                                                                                  | 2 |

|       |                          |     |         |                                                                                                                                                                                                                                                                                                          |   |
|-------|--------------------------|-----|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 24、25 | Azimuth angular velocity | S16 | 0.01°/s |                                                                                                                                                                                                                                                                                                          | 2 |
| 26、27 | Laser ranging            | U16 | 0.1m    | 0 indicates invalid.                                                                                                                                                                                                                                                                                     | 2 |
| 28    | Self-check Result        | U8  |         | Bit7: Self-check completion<br>1: Self-check completed<br>0: Self-check in progress<br>Bits3~Bit6: Reserved<br>Bit2: Gyroscope calibration<br>1: Calibration failed<br>0: Calibration successful<br>Bit1: Encoder and servo drive<br>1: Error<br>0: Normal<br>Bit0: Image board<br>1: Error<br>0: Normal | 1 |
| 29、30 | Reserved                 |     |         |                                                                                                                                                                                                                                                                                                          | 2 |
| 31    | Checksum                 | U8  |         | Sum from the 0th byte and take the least significant 8 bits.                                                                                                                                                                                                                                             | 1 |

**Table 3 Aircraft Attitude and Latitude-Longitude Information**

| Data source            |                      | Controller                                          |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |
|------------------------|----------------------|-----------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Destination            |                      | DYT                                                 |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |
| Transmission Frequency |                      | Transmit periodically at a frequency of 1 to 60 Hz. |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |
| Byte Sequence Number   | Parameter Name       | Data Type                                           | Unit               | Explanation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Bytes Occupied |
| 0                      | Sync Word 1          | U8                                                  |                    | 0xEB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1              |
| 1                      | Sync Word 2          | U8                                                  |                    | 0x91                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1              |
| 2、3                    | Aircraft Roll Angle  | S16                                                 | 0.01°              | Viewing from the tail to the head of the aircraft; Azimuth angle: zero when the nose points due north, positive when the nose points east of north, and negative when it points west of north; Pitch angle: the angle between the nose and the horizontal plane, zero at horizontal, positive when the nose is up, and negative when it is down; Roll angle: zero when the fuselage is horizontal, positive when tilted to the right, and negative when tilted to the left (send 0 if not available). | 2              |
| 4、5                    | Aircraft Pitch Angle | S16                                                 | 0.01°              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2              |
| 6、7                    | Aircraft Yaw Angle   | S16                                                 | 0.01°              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2              |
| 8~11                   | Latitude             | Int32                                               | 10 <sup>-7</sup> ° |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 4              |
| 12~15                  | Longitude            | Int32                                               | 10 <sup>-7</sup> ° |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 4              |
| 16、17                  | Altitude             | S16                                                 | 0.2m               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2              |



|       |                           |     |        |                                                              |    |
|-------|---------------------------|-----|--------|--------------------------------------------------------------|----|
| 18、19 | Relative Height           | S16 | 0.2m   |                                                              | 2  |
| 20    | Year                      | U8  |        | +2000                                                        | 1  |
| 21    | Month                     | U8  |        |                                                              | 1  |
| 22    | Day                       | U8  |        |                                                              | 1  |
| 23    | Hour                      | U8  |        |                                                              | 1  |
| 24    | Minute                    | U8  |        |                                                              | 1  |
| 25    | Second                    | U8  |        |                                                              | 1  |
| 26    | Centisecond               | U8  | 10ms   |                                                              | 1  |
| 27、28 | Airspeed                  | U16 | 0.5m/s |                                                              | 2  |
| 29、30 | Satellite Ground<br>Speed | U16 | 0.5m/s |                                                              | 2  |
| 31    | Checksum                  | U8  |        | Sum from the 0th byte and take the least significant 8 bits. | 1  |
|       | Total                     |     |        |                                                              | 32 |

**Table 4 Target Latitude-Longitude Information**

| Data source            |                 | Controller                                                                                                                       |                    |             |                |
|------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------|----------------|
| Destination            |                 | DYT                                                                                                                              |                    |             |                |
| Transmission Frequency |                 | Transmit periodically at a frequency of 1 to 60 Hz, determined by the aircraft's latitude-longitude and laser ranging frequency. |                    |             |                |
| Byte Sequence Number   | Parameter Name  | Data Type                                                                                                                        | Unit               | Explanation | Bytes Occupied |
| 0                      | Sync Word 1     | U8                                                                                                                               |                    | 0xEE        | 1              |
| 1                      | Sync Word 2     | U8                                                                                                                               |                    | 0x18        | 1              |
| 2~5                    | Latitude        | Int32                                                                                                                            | 10 <sup>-7</sup> ° |             | 4              |
| 6~9                    | Longitude       | Int32                                                                                                                            | 10 <sup>-7</sup> ° |             | 4              |
| 10、11                  | Altitude        | S16                                                                                                                              | 0.2m               |             | 2              |
| 12、13                  | Relative Height | S16                                                                                                                              | 0.2m               |             | 2              |
| 14                     | Year            | U8                                                                                                                               |                    | +2000       | 1              |
| 15                     | Month           | U8                                                                                                                               |                    |             | 1              |
| 16                     | Day             | U8                                                                                                                               |                    |             | 1              |
| 17                     | Hour            | U8                                                                                                                               |                    |             | 1              |
| 18                     | Minute          | U8                                                                                                                               |                    |             | 1              |

|       |             |    |      |                                                              |    |
|-------|-------------|----|------|--------------------------------------------------------------|----|
| 19    | Second      | U8 |      |                                                              | 1  |
| 20    | Centisecond | U8 | 10ms |                                                              | 1  |
| 21~30 | Reserved    |    |      |                                                              | 10 |
| 31    | Checksum    | U8 |      | Sum from the 0th byte and take the least significant 8 bits. | 1  |
|       | Total       |    |      |                                                              | 32 |

**Table 5 Single Status Return**

| Data source            |                            | Controller           |      |                                                             |                |
|------------------------|----------------------------|----------------------|------|-------------------------------------------------------------|----------------|
| Destination            |                            | DYT                  |      |                                                             |                |
| Transmission Frequency |                            | Trigger transmission |      |                                                             |                |
| Byte Sequence Number   | Parameter Name             | Data Type            | Unit | Explanation                                                 | Bytes Occupied |
| 0                      | Sync Word 1                | U8                   |      | 0xEE                                                        | 1              |
| 1                      | Sync Word 2                | U8                   |      | 0x19                                                        | 1              |
| 2                      | Corresponding Control Code | U8                   |      | The control code corresponding to this status               | 1              |
| 3                      | Parameter Length           | U8                   |      | N                                                           | 1              |
| 4~N+3                  | Parameter                  |                      |      | When N is 0, there is no parameter                          | N              |
| N+4                    | Checksum                   | U8                   |      | Sum from the 0th byte and take the least significant 8 bits | 1              |

**When the control code is 0x3a "digital guidance", the parameter length is 2.**

| Byte Sequence Number | Parameter Name           | Data Type | Unit | Explanation                                                                                                                                                                                         | Bytes Occupied |
|----------------------|--------------------------|-----------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 4                    | Digital Guidance Command | U8        |      | 0x00: Exit Geographic Tracking<br>0x01: Geographically Track the Current Field of View Center Position<br>0x02: Geographically Track a Specified Position<br>0x0a: Calibrate Based on Known Targets | 1              |
| 5                    | Status                   | U8        |      | 0 indicates success, and 1 indicates failure.                                                                                                                                                       | 1              |

**When the control code is 0xb0 "Lifting Control", the parameter length is 1.**

| Byte Sequence Number | Parameter Name | Data Type | Explanation | Bytes Occupied |
|----------------------|----------------|-----------|-------------|----------------|
|----------------------|----------------|-----------|-------------|----------------|

|   |                |    |                                                                                                                                                    |   |
|---|----------------|----|----------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 4 | Lifting Status | U8 | 0 indicates stop, 1 indicates ascent, 2 indicates descent, 3 indicates ascent in place, 4 indicates descent in place, and 0xff indicates an error. | 1 |
|---|----------------|----|----------------------------------------------------------------------------------------------------------------------------------------------------|---|

**Table 6 SEI Information**

| Data source            |                               | Pod Video          |      |                                                                                                                                                                                                                                                                                                                                                             |                |
|------------------------|-------------------------------|--------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Destination            |                               | Video Transmission |      |                                                                                                                                                                                                                                                                                                                                                             |                |
| Transmission Frequency |                               | 30Hz               |      |                                                                                                                                                                                                                                                                                                                                                             |                |
| Byte Sequence Number   | Parameter Name                | Data Type          | Unit | Explanation                                                                                                                                                                                                                                                                                                                                                 | Bytes Occupied |
| 0                      | Sync Word 1                   | U8                 |      | 0xEE                                                                                                                                                                                                                                                                                                                                                        | 1              |
| 1                      | Sync Word 2                   | U8                 |      | 0x16                                                                                                                                                                                                                                                                                                                                                        | 1              |
| 2                      | Status Information Feedback 1 | U8                 |      | Bits 7-6: Tracked video source<br>00: Visible light 1<br>01: Visible light 2<br>10: Infrared 1<br>11: Infrared 2<br>Bits 5-4: Tracking algorithm type<br>00: Adaptive<br>01: Personnel<br>10: Vehicle<br>11: Building<br>Bit 3: Target automatic prompt<br>1: On<br>0: Off<br>Bit 2: Target tracking status<br>1: Locked<br>0: Searching<br>Bits 1-0: Spare | 1              |
| 3                      | Status Information Feedback 2 | U8                 |      | Bit7: Image enhancement<br>1: On<br>0: Off<br>Bit6: Reserved<br>Bit5: Storage<br>1: On<br>0: Off<br>Bit4: Reserved<br>Bit3: Motor status<br>1: On<br>0: Off<br>Bit2: Follow mode<br>1: On<br>0: Off                                                                                                                                                         | 1              |

|       |                                             |     |         |                                                                                                                                                                                                                                                                                                 |   |
|-------|---------------------------------------------|-----|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|       |                                             |     |         | Bit1: Spare<br>Bit0: Spare                                                                                                                                                                                                                                                                      |   |
| 4     | Zoom Magnification<br>Low 8 Bits            | U8  | 0.1x    | Combined with bits 0-3 of byte 5 to form a u16.                                                                                                                                                                                                                                                 | 1 |
| 5     | Abnormal Information                        | U8  |         | Bits 7-6: Displayed large screen<br>Bits 5-4: Displayed small screen<br>00: Visible 1 (Zoom/Forward View)<br>01: Visible 2 (Wide-Angle/Side View)<br>10: Infrared 1<br>11: Infrared 2<br>Bits 0-3: High 4 bits of zoom magnification.                                                           | 1 |
| 6、7   | Target Miss Distance<br>X-axis Offset Angle | S16 | 0.05°   | It represents the horizontal and vertical deviations of the locking point, with the image center point as 0.<br>The values correspond to direct physical quantities, and the different field angles of visible light and infrared lenses are uniformly calculated by the pod's internal system. | 2 |
| 8、9   | Target Miss Distance<br>Y-axis Offset Angle | S16 | 0.05°   |                                                                                                                                                                                                                                                                                                 | 2 |
| 10、11 | Roll Frame Angle                            | S16 | 0.01°   | Left is negative and right is positive.<br>Up is positive and down is negative.                                                                                                                                                                                                                 | 2 |
| 12、13 | Pitch Frame Angle                           | S16 | 0.01°   |                                                                                                                                                                                                                                                                                                 | 2 |
| 14、15 | Azimuth Frame Angle                         | S16 | 0.01°   |                                                                                                                                                                                                                                                                                                 | 2 |
| 16、17 | Reserved                                    |     |         |                                                                                                                                                                                                                                                                                                 | 2 |
| 18、19 | Reserved                                    |     |         |                                                                                                                                                                                                                                                                                                 | 2 |
| 20、21 | Roll Angular Velocity                       | S16 | 0.01°/s |                                                                                                                                                                                                                                                                                                 | 2 |
| 22、23 | Pitch Angular Velocity                      | S16 | 0.01°/s |                                                                                                                                                                                                                                                                                                 | 2 |
| 24、25 | Azimuth Angular Velocity                    | S16 | 0.01°/s |                                                                                                                                                                                                                                                                                                 | 2 |
| 26、27 | Laser Ranging                               | U16 | 0.1m    | 0 indicates invalid.                                                                                                                                                                                                                                                                            | 2 |
| 28    | Self-Test Result                            | U8  |         |                                                                                                                                                                                                                                                                                                 | 1 |
| 29、30 | Reserved                                    |     |         |                                                                                                                                                                                                                                                                                                 | 2 |
| 31、32 | Aircraft Roll Angle                         | S16 | 0.01°   | Viewing from the tail to the head of the aircraft:<br>Azimuth angle: Zero when the nose points due north, positive when the nose points east of north, and                                                                                                                                      | 2 |
| 33、34 | Aircraft Pitch Angle                        | S16 | 0.01°   |                                                                                                                                                                                                                                                                                                 | 2 |
| 35、36 | Aircraft Yaw Angle                          | S16 | 0.01°   |                                                                                                                                                                                                                                                                                                 | 2 |

|       |                        |       |                     |                                                                                                                                                                                                                                                                                                                                                                                       |    |
|-------|------------------------|-------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|       |                        |       |                     | <p>negative when it points west of north.</p> <p>Pitch angle: The angle between the nose and the horizontal plane, with zero at horizontal. It is positive when the nose is upward and negative when downward.</p> <p>Roll angle: Zero when the fuselage is horizontal, positive when the aircraft banks to the right, and negative when it banks to the left (send 0 if absent).</p> |    |
| 37~40 | Latitude               | Int32 | 10 <sup>^-7</sup> ° |                                                                                                                                                                                                                                                                                                                                                                                       | 4  |
| 41~44 | Longitude              | Int32 | 10 <sup>^-7</sup> ° |                                                                                                                                                                                                                                                                                                                                                                                       | 4  |
| 45、46 | Altitude               | S16   | 0.2m                |                                                                                                                                                                                                                                                                                                                                                                                       | 2  |
| 47、48 | Relative Height        | S16   | 0.2m                |                                                                                                                                                                                                                                                                                                                                                                                       | 2  |
| 49    | Year                   | U8    |                     | +2000                                                                                                                                                                                                                                                                                                                                                                                 | 1  |
| 50    | Month                  | U8    |                     |                                                                                                                                                                                                                                                                                                                                                                                       | 1  |
| 51    | Day                    | U8    |                     |                                                                                                                                                                                                                                                                                                                                                                                       | 1  |
| 52    | Hour                   | U8    |                     |                                                                                                                                                                                                                                                                                                                                                                                       | 1  |
| 53    | Minute                 | U8    |                     |                                                                                                                                                                                                                                                                                                                                                                                       | 1  |
| 54    | Second                 | U8    |                     |                                                                                                                                                                                                                                                                                                                                                                                       | 1  |
| 55    | Centisecond            | U8    | 10ms                |                                                                                                                                                                                                                                                                                                                                                                                       | 1  |
| 56、57 | Airspeed               | U16   | 0.5m/s              |                                                                                                                                                                                                                                                                                                                                                                                       | 2  |
| 58、59 | Satellite Ground Speed | U16   | 0.5m/s              |                                                                                                                                                                                                                                                                                                                                                                                       | 2  |
| 60    | Frame Count            | U8    | 0-255 cycle         |                                                                                                                                                                                                                                                                                                                                                                                       | 1  |
| 61、62 | Reserved               |       |                     |                                                                                                                                                                                                                                                                                                                                                                                       | 2  |
| 63    | Checksum               | U8    |                     | Start adding from byte 0 and take the lower 8 bits.                                                                                                                                                                                                                                                                                                                                   | 1  |
|       | Total                  |       |                     |                                                                                                                                                                                                                                                                                                                                                                                       | 64 |

### 2.3 Network Control

When network control is required, establish a TCP connection to port 2000 of the pod. The TCP protocol is encapsulated based on the above-mentioned protocol, while the protocol returned by the pod remains unchanged as described above.

| Byte Sequence Number | Name         | Content    | Explanation                                                         |
|----------------------|--------------|------------|---------------------------------------------------------------------|
| 0                    | Frame Header | 0xeb       |                                                                     |
| 1                    | Frame Header | 0x90       |                                                                     |
| 2                    | Data Length  | N          | U8 type, where N is the data length.                                |
| 3~2+N                | Data         | EB 90..... |                                                                     |
| 3+n                  | Checksum     |            | Start accumulating from the 3rd byte and take the lower eight bits. |

**Example:** eb 90 10 eb 90 2b 00 00 00 00 00 00 00 00 00 00 00 00 a6 4c (4c is the checksum, starting accumulation from the second eb)

Where: eb 90 2b 00 00 00 00 00 00 00 00 00 00 00 00 a6 is the valid data (a6 is the checksum, starting accumulation from eb)

## DYT HOST COMPUTER SOFTWARE OPERATION INSTRUCTIONS

### 1. Connection Schematic Diagram

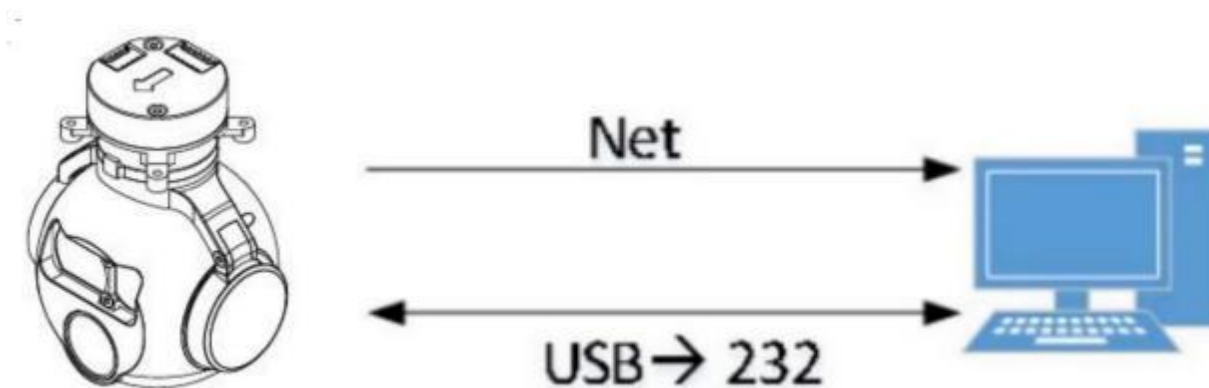


Figure 1 Test Connection Schematic Diagram

### 2 Pre-power-on Preparations

#### 2.1 Pre-power-on Preparations

- 1) Please install the pod in a suspended manner as shown in Figure 2.
- 2) Connect the wires according to the correct wiring sequence.
- 3) Use a USB-to-232 cable and a network cable to connect the pan-tilt to the computer.
- 4) Check the power supply voltage, then power on.

### 3 Operation of the Host Computer

#### 3.1 Power On

Turn on the control software and connect the pod's video source and control interface to the computer according to requirements.

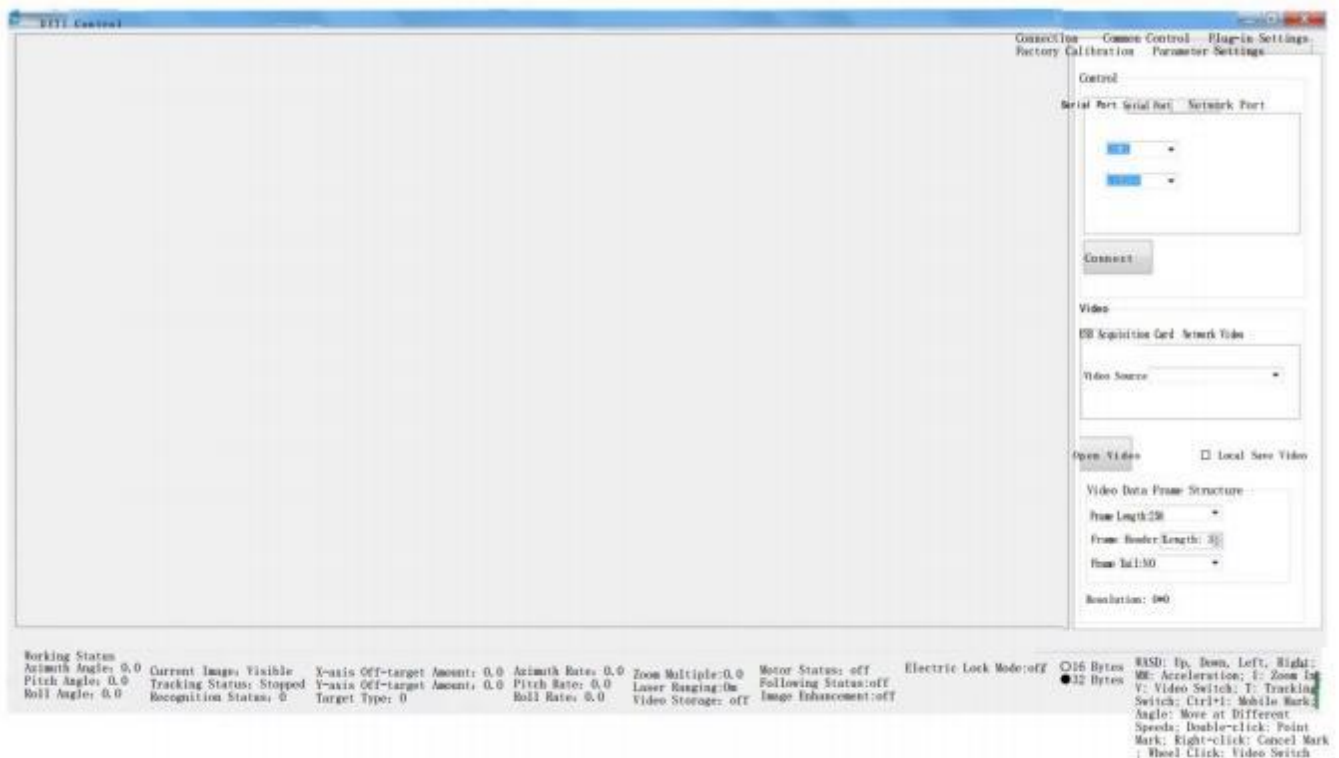


Figure 3 Open Interface

### 3.1.1 Control Interface Connection

The control interface supports serial port control or network port control.

For serial port control: As shown in Figure 4-1, select the "Serial Port" tab, click the serial port drop-down list, select the corresponding serial port number of the pod, and click "Connect".

For network port control: As shown in Figure 4-2, select the "Pod Network Port" tab, enter the pod's IP, check "Add EB90", and click "Connect".

After a successful connection, the pan-tilt status will be updated in real time at the lower left corner.



Figure 4-1 Serial Port Connection

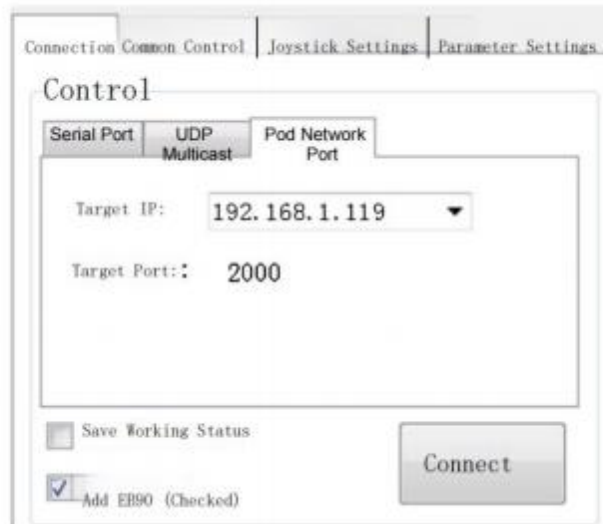


Figure 4-2 Network Port Connection

### 3.1.2 Turn on Video

The host computer supports two video input methods: USB capture card input and network input.

- 1) Make wiring according to the input method (completed before power-on).
- 2) As shown in Figure 5-1 and Figure 5-2, select the corresponding tab according to the input method.
- 3) Enter the video source for USB capture card input or the video stream address for network input.
- 4) Click the "Turn on Video" button (wait for a few seconds; if the connection is successful, the pan-tilt live video will be displayed in the video window).



Figure 5-1 USB Capture Card Input



**Video**

usb Capture Card | Network Video

IP:

☐ Parse Frame Structure

☐ Save Video Locally

**Video Data Frame Structure**

Frame Length:

Header Length

Frame Tail:

Resolution: 0\*0

Figure 5-2 Network Input

## 3.2 Common Controls

### 3.2.1 Pod Rotation

Table 1

| No. | Button/Input Box              | Functions                                                                                     |
|-----|-------------------------------|-----------------------------------------------------------------------------------------------|
| 1   | Up/Down/Left/Right/Stop       | Control the rotation direction of the pod.                                                    |
| 2   | Center                        | Rotate the pod to the zero position.                                                          |
| 3   | On/Off Motor                  | Control the power on/off of the motor.                                                        |
| 4   | Azimuth Follow/Stop Following | Control whether the pod's azimuth axis follows the aircraft's rotation.                       |
| 5   | Specified Angle               | Control the pod to rotate to a specified angle (values in the azimuth and pitch input boxes). |

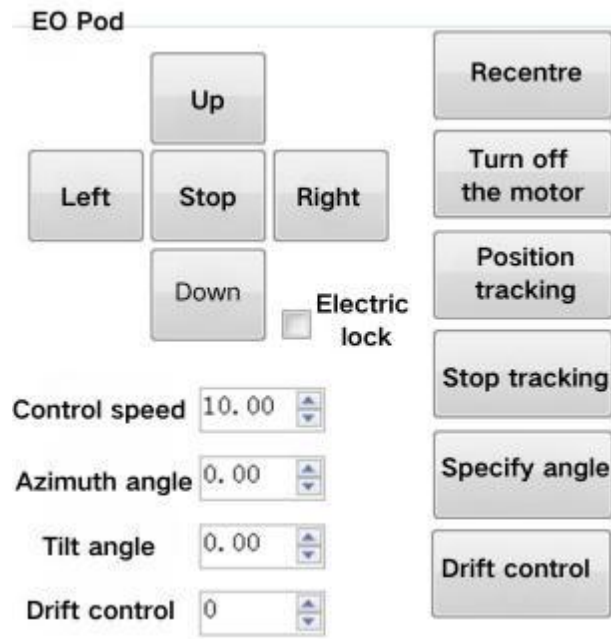


Figure 6 Pod Rotation Control

### 3.2.2 Target Tracking

Table 2

| No. | Button/Input Box                       | Functions                                                                                                                        |
|-----|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| 1   | Double-click in the video              | Track a specified target.                                                                                                        |
| 2   | Right-click in the video               | Cancel tracking.                                                                                                                 |
| 3   | Start tracking                         | Directly track the target at the center of the video.                                                                            |
| 4   | Stop button                            | Cancel tracking.                                                                                                                 |
| 5   | Turn on/off person-vehicle recognition | Turn on or off the person-vehicle recognition function.                                                                          |
| 6   | Automatic recognition to tracking      | Retain.                                                                                                                          |
| 7   | Semi-automatic tracking                | Suitable for tracking person-vehicle targets, and the tracking process will be corrected according to the recognition algorithm. |
| 8   | Traditional tracking                   | Traditional tracking algorithm that does not recognize targets.                                                                  |

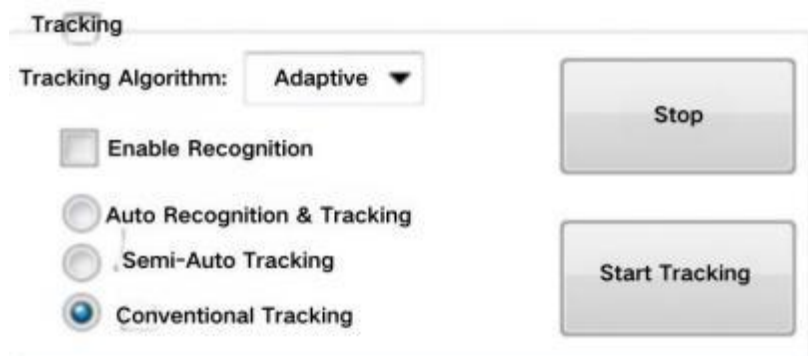


Figure 7 Target Tracking

### 3.2.3 Image Display

There are mainly two types of display screens: visible light and infrared. Among them, infrared has two colors: white hot and black hot, and digital zoom can be performed on both visible light and infrared respectively.

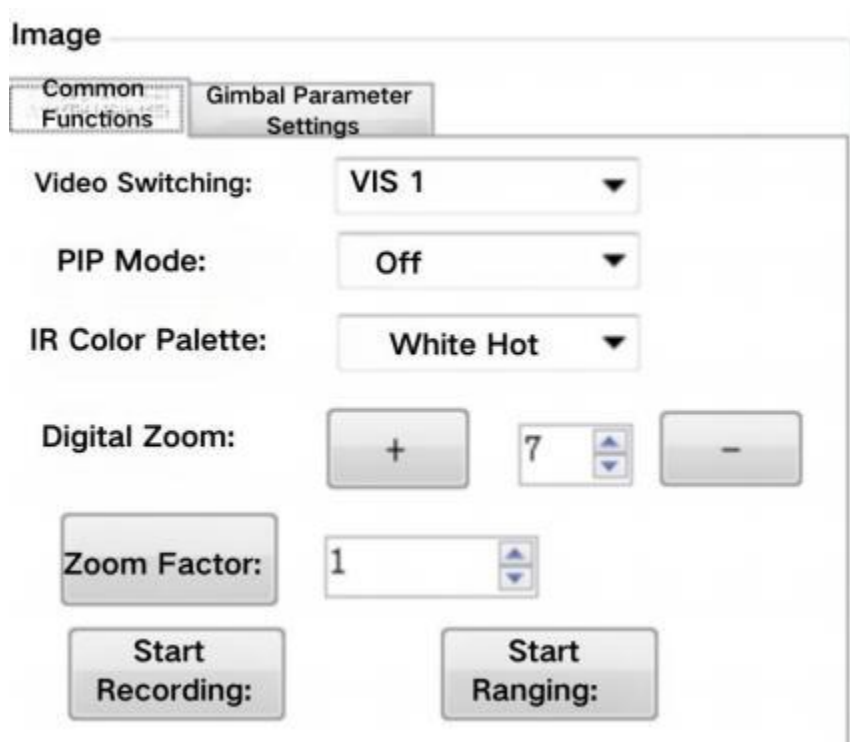


Figure 8 Image Display Control - Common Functions

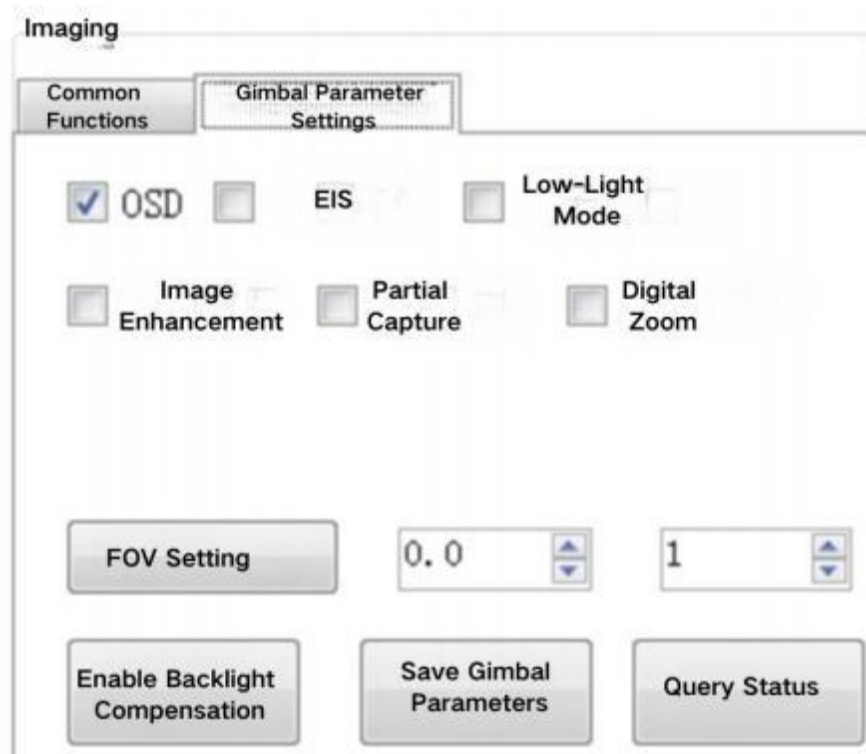


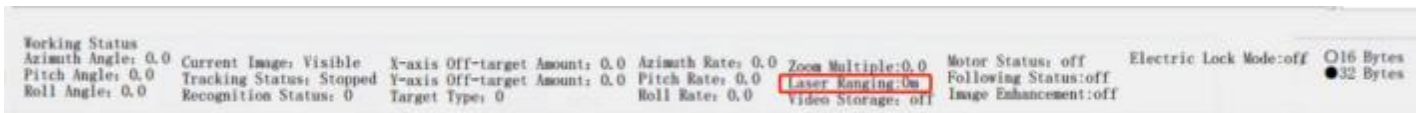
Figure 9 Image Display Control - Movement Parameter Settings

Table 3

| No. | Button/Input Box               | Functions                                                                  |
|-----|--------------------------------|----------------------------------------------------------------------------|
| 1   | OSD (On-Screen Display)        | Turn on or off the OSD (On-Screen Display) of the screen.                  |
| 2   | Electronic Image Stabilization | Enable or disable electronic image stabilization (supported by some pods). |
| 3   | Low-Light Mode                 | Activate low-light mode when the illumination is dim.                      |
| 4   | Image Enhancement              | Activate image enhancement mode when there is fog.                         |
| 5   | Local Image Capture            | Retain.                                                                    |
| 6   | Electronic Zoom                | Enable or disable electronic zoom (supported by some pods).                |

### 3.2.4 Laser Ranging

As shown in Figure 8, clicking the "Start Ranging" button enables the laser ranging function. The measured values can be viewed in the parameter display area, as shown in Figure 10.



|                    |                          |                               |                   |                    |                        |                         |           |
|--------------------|--------------------------|-------------------------------|-------------------|--------------------|------------------------|-------------------------|-----------|
| Working Status     | Current Image: Visible   | X-axis Off-target Amount: 0.0 | Azimuth Rate: 0.0 | Zoom Multiple: 0.0 | Motor Status: off      | Electric Lock Mode: off | Q16 Bytes |
| Azimuth Angle: 0.0 | Tracking Status: Stopped | Y-axis Off-target Amount: 0.0 | Pitch Rate: 0.0   | Laser Ranging: On  | Following Status: off  |                         | 32 Bytes  |
| Pitch Angle: 0.0   | Recognition Status: 0    | Target Type: 0                | Roll Rate: 0.0    | Video Storage: off | Image Enhancement: off |                         |           |
| Roll Angle: 0.0    |                          |                               |                   |                    |                        |                         |           |

Figure 10 Laser Ranging Parameter Display Area

## 3.3 Common Issues

### 3.3.1 Finding the Serial Port Number

Right-click the "Computer" icon, select "Properties", click Device Manager, and the interface shown in Figure 11 will appear. In general, the selected serial port number is the one that refreshes after inserting the connection cable (or port number). Double-click "Ports (COM & LPT)", and the refreshed USB port is the selected port.

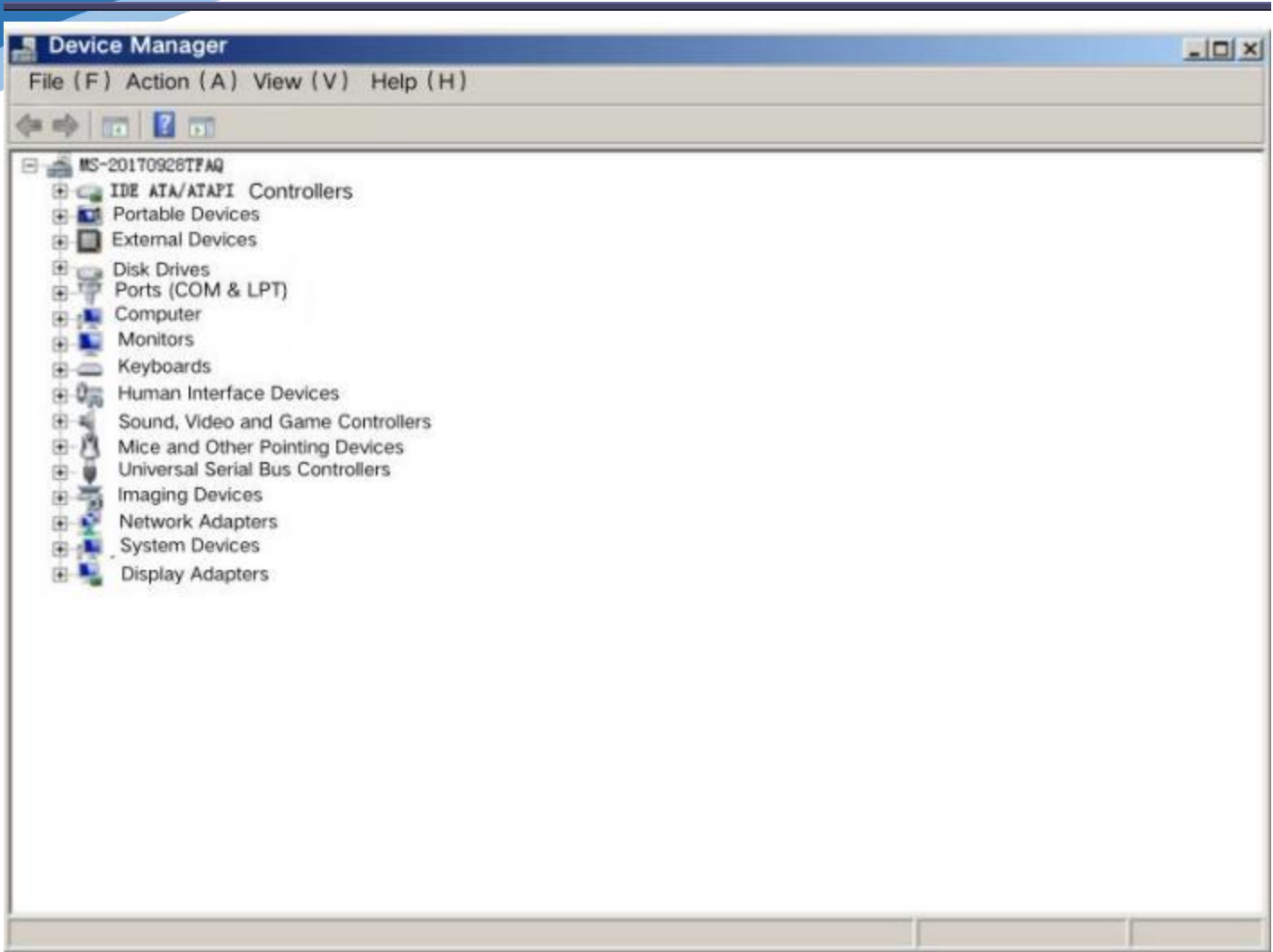


Figure 11 Device Manager

### 3.3.2 No Network Video Output

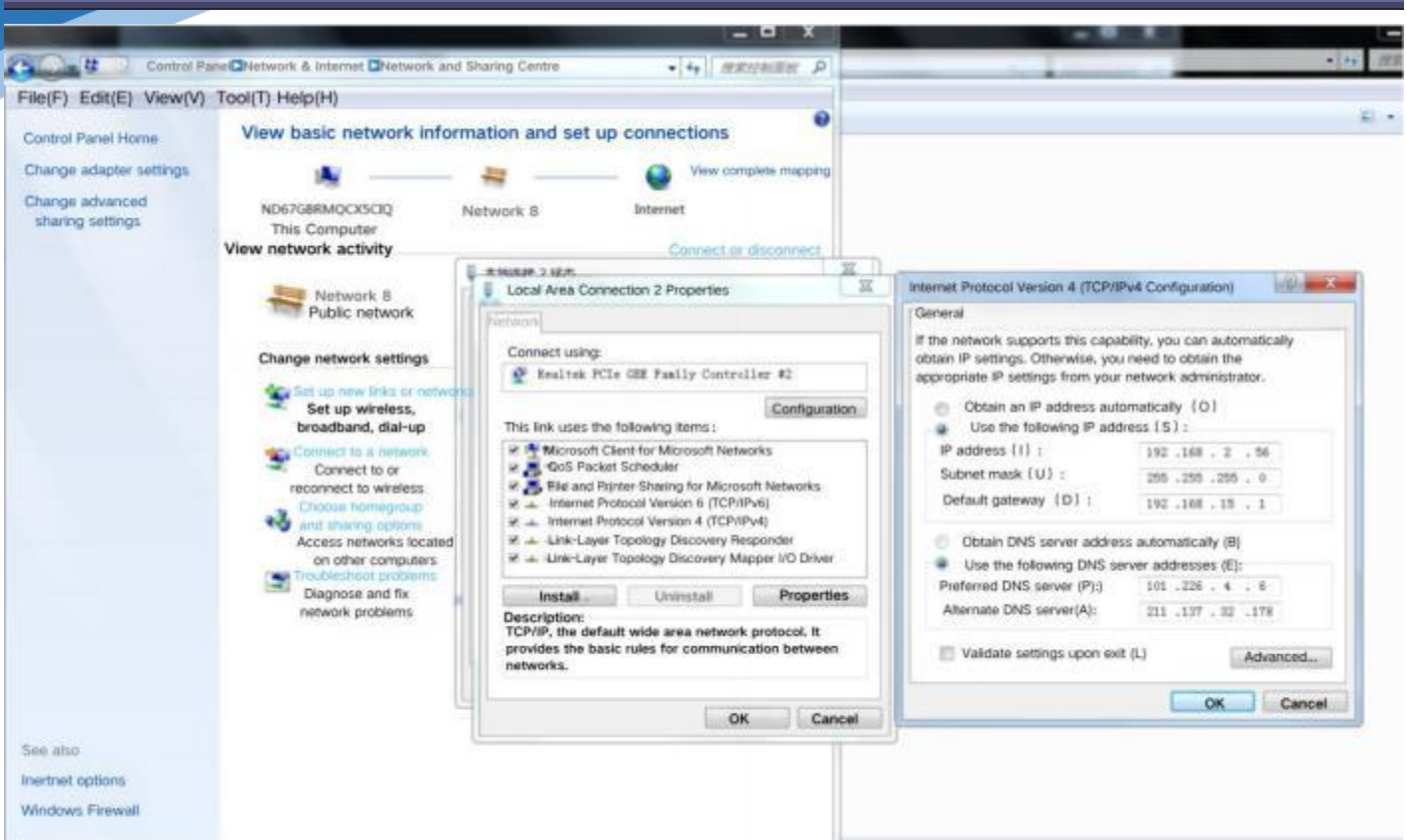


Figure 12 IP Address Modification

- 1) On the computer, open "Control Panel" → Network and Internet → "Network and Sharing Center";
- 2) Click the "Local Area Connection" icon → "Properties", then double-click "Internet Protocol Version 4 (TCP/IPv4)";
- 3) Ensure that the computer's IP address is in the same network segment as the video stream address. For example, if the video stream address is `rtsp://192.168.2.119/554`, the computer's IP address can be set to 192.168.2.56;
- 4) Turn off the firewall;
- 5) Click the "Open Video" button on the host computer, and the imaging video will be displayed on the right side of the host interface.

## PRECAUTIONS FOR USE AND MAINTENANCE

1. The daily maintenance tasks for operators are limited to replacing or inspecting cables, performing routine cleaning, and conducting functional checks to ensure the instrument remains in good technical condition.
2. Do not open the casing without authorization. There are no user-repairable components inside the machine. When a system failure occurs, the manufacturer's technical personnel should locate the fault before proceeding with repairs.
3. If the product is stored for a long period or not in use, it should be kept in a cool and dry environment.
4. When inserting user interface connectors, ensure they are aligned correctly before insertion. Do not pull directly on the cable when plugging or unplugging the connector.
5. All parameters of the product are debugged before leaving the factory. Unless otherwise specified, it is recommended to use the recommended configuration parameters.
6. If used on an aircraft, the overall performance is affected by the aircraft's weight, power system, flight control system, and user settings. Users must possess considerable professional capabilities and must debug the product to the approved performance before field use.
7. Under no circumstances should the thermal imaging lens be directed directly at the sun.

8. The SD card should be removed when the system is powered off.
9. Keep the front lens clean and free of debris.
10. The first four seconds after the pod is powered on are for automatic gyro calibration. During this period, keep the pod as stable as possible without vibration; otherwise, the gyro data from the last startup will be used. If the pod drifts, restart it or send a gyro calibration command.
11. The control software must run on a 64-bit system computer.