DWARF API2.0

October 13 geändert

1. IP Address

1.1 AP mode

IP Address is fixed to 192.168.88.1 .

1.2 STA mode

IP Address is the IP Address returned by Bluetooth.

2. HTTP interface

JPG Image Port Number: 8092 Others: 8082

2.1 Universal error code

Error code	Value	Explanation
HTTP_OK	0	Success
HTTP _ INVAID _ PARAM	-2	Invalid parameter

2.2 JPG image transmission interface

Port Number: 8092

2.2.1 Telephoto

GET request URL:

http://IP:PORT/mainstream

2.2.2 Wide angle

GET request URL:

http://IP:PORT/secondstream

3. RTSP image transmission interface

3.1 Telephoto

Codeblock

```
1  rtsp://192.168.88.1/ch0/stream0
```

3.2 Wide angle

Codeblock

```
1  rtsp://192.168.88.1/ch1/stream0
```

3.3 Album interface

3.3.1 Album media type

Type	Value
All types	0
Ordinary photos	1
Video	2
Continuous shooting	3
Astronomy	4
Panorama	5

3.3.2 Get the number of album files

POST request URL:

http://IP:PORT/album/list/mediaCounts

Methord:Post

Content-Type: application/json

Return result:

Codeblock

```
{
    "code": 0,
    "data": [
        {
            "count": 20,
            "mediaType": 0
        },
        {
            "count": 7,
            "mediaType": 1
        },
        {
            "count": 6,
            "mediaType": 2
        },
        {
            "count": 7,
            "mediaType": 3
        },
        {
            "count": 4,
            "mediaType": 5
        },
        {
            "count": 3,
            "mediaType": 4
        }
    ]
}
```

3.3.8 List interface

3.3.8.1 List json format

Codeblock

```
{
    "mediaType": 1,
    "fileName": "DWARF_20230619172007798.jpeg",
    "filePath": "/sdcard/DWARF_II/Normal_Photos/DWARF_20230619172007798.jpeg",
    "thumbnailPath": "/sdcard/DWARF_II/Normal_Photos/DWARF_20230619172007798.jpe
    "modificationTime": 1687195206,
    "fileSize": 10031155,
    "videoDuration": 0,
    "burstImgCount": 0,
    "astroTargetName": "M31",
    "basicParams": [
        {
            "name": "expTime",
            "value": ""
        }
    ],
    "featureParams": [
        {
            "name": "fileCount",
            "value": "0"
        }
    ],,
    "images": [
        {
            "filePath": "/sdcard/DWARF_II/Burst/DWARF_20230809180050065/1.jpg",
            "thumbnailPath":"",
            "fileSize": 0
        },
        {
            "filePath": "/sdcard/DWARF_II/Burst/DWARF_20230809180050065/2.jpg",
            "thumbnailPath": "",
            "fileSize": 0
        },
    ]
}
```

Field	Value type	Explanation	Nullable
mediaType	int	Media type	Nonempty
fileName	string	File name	Nonempty
filePath	string	File path	Nonempty
thumbnailPath	string	Thumbnail path	Nonempty
modificationTime	int64	Modification time	Nonempty
fileSize	int64	File size	Nonempty
videoDuration	int	Video duration (s)	Can be empty
burstImgCount	int	Number of continuous shots	Can be empty
astroTargetName	string	Shooting target	Can be empty
basicParams	JSON object	Basic parameters	Can be empty
featureParams	JSON object	Feature parameter	Can be empty
images	JSON object	Picture list	Can be empty, the front end requires the json object to keep the same structure as this table
panoImgCount	int	Number of panoramic photos	Can be empty

3.3.8.2 Query interface, in descending order by modification time

POST request URL:

http://IP:PORT/album/list/mediaInfos

Methord:Post

Content-Type: application/json

Request parameters:

Codeblock

```
{
    "mediaType": 1,
    "pageIndex": 0,
    "pageSize": 0
}
```

Field	Value type	Explanation
mediaType	int	Type
pageIndex	int	Page index, starting from 0
pageSize	int	Page size, no paging when 0

Return result:

1. All types

Codeblock

```

```

2. Ordinary photos

Codeblock

```
{
    "code": 0,
    "data": [
        {
            "basicParams": null,
            "featureParams": null,
            "fileName": "DWARF_20231006101125356.jpeg",
            "filePath": "/sdcard/DWARF_II/Normal_Photos/DWARF_20231006101125356.
            "fileSize": "689.38 KB",
            "mediaType": 1,
            "modificationTime": 1696587084,
            "thumbnailPath": "/sdcard/DWARF_II/Normal_Photos/DWARF_2023100610112
        },
        {
            "basicParams": null,
            "featureParams": null,
            "fileName": "DWARF_20231006100856698.jpeg",
            "filePath": "/sdcard/DWARF_II/Normal_Photos/DWARF_20231006100856698.
            "fileSize": "825.84 KB",
            "mediaType": 1,
            "modificationTime": 1696586936,
            "thumbnailPath": "/sdcard/DWARF_II/Normal_Photos/DWARF_2023100610085
        },
        {
            "basicParams": null,
            "featureParams": null,
            "fileName": "DWARF_20231006100228162.jpeg",
            "filePath": "/sdcard/DWARF_II/Normal_Photos/DWARF_20231006100228162.
            "fileSize": "760.69 KB",
            "mediaType": 1,
            "modificationTime": 1696586546,
            "thumbnailPath": "/sdcard/DWARF_II/Normal_Photos/DWARF_2023100610022
        },
        {
            "basicParams": null,
            "featureParams": null,
            "fileName": "DWARF_20231006100049241.jpeg",
            "filePath": "/sdcard/DWARF_II/Normal_Photos/DWARF_20231006100049241.
            "fileSize": "1.11 MB",
            "mediaType": 1,
            "modificationTime": 1696586448,
            "thumbnailPath": "/sdcard/DWARF_II/Normal_Photos/DWARF_2023100610004
        },
        {
            "basicParams": null,
            "featureParams": null,
            "fileName": "DWARF_20231006100043074.jpeg",
            "filePath": "/sdcard/DWARF_II/Normal_Photos/DWARF_20231006100043074.
            "fileSize": "1.21 MB",
            "mediaType": 1,
            "modificationTime": 1696586442,
            "thumbnailPath": "/sdcard/DWARF_II/Normal_Photos/DWARF_2023100610004
        }
    ]
}
```

3. Continuous shooting

Codeblock

```

```

4. Video

Codeblock


```
{
    "code": 0,
    "data": [
        {
            "basicParams": null,
            "featureParams": [
                {
                    "name": "duration",
                    "value": "74"
                },
                {
                    "name": "width",
                    "value": "3840"
                },
                {
                    "name": "height",
                    "value": "2160"
                }
            ],
            "fileName": "DWARF_20230530085407647.mp4",
            "filePath": "/sdcard/DWARF_II/Videos/DWARF_20230530085407647.mp4",
            "fileSize": "264.17 MB",
            "mediaType": 1,
            "modificationTime": 1685408122,
            "thumbnailPath": "/sdcard/DWARF_II/Videos/Thumbnail/DWARF_2023053008
        },
        {
            "basicParams": null,
            "featureParams": [
                {
                    "name": "duration",
                    "value": "4"
                },
                {
                    "name": "width",
                    "value": "3840"
                },
                {
                    "name": "height",
                    "value": "2160"
                }
            ],
            "fileName": "DWARF_20230530085359109.mp4",
            "filePath": "/sdcard/DWARF_II/Videos/DWARF_20230530085359109.mp4",
            "fileSize": "17.03 MB",
            "mediaType": 1,
            "modificationTime": 1685408044,
            "thumbnailPath": "/sdcard/DWARF_II/Videos/Thumbnail/DWARF_2023053008
        },
        {
            "basicParams": null,
            "featureParams": [
                {
                    "name": "duration",
                    "value": "1"
                },
                {
                    "name": "width",
                    "value": "3840"
                },
                {
                    "name": "height",
                    "value": "2160"
                }
            ],
            "fileName": "DWARF_TELE_TL_1970-01-01-12-42-18-258.mp4",
            "filePath": "/sdcard/DWARF_II/Videos/DWARF_TELE_TL_1970-01-01-12-42-
            "fileSize": "4.82 MB",
            "mediaType": 1,
            "modificationTime": 315504000,
            "thumbnailPath": "/sdcard/DWARF_II/Videos/Thumbnail/DWARF_TELE_TL_19
        },
        {
            "basicParams": null,
            "featureParams": [
                {
                    "name": "duration",
                    "value": "5"
                },
                {
                    "name": "width",
                    "value": "3840"
                },
                {
                    "name": "height",
                    "value": "2160"
                }
            ],
            "fileName": "DWARF_TELE_TL_1970-01-01-13-05-21-577.mp4",
```


5. Panorama

Codeblock

```
```

3.3.9 Delete

POST request URL:

http://IP:PORT/album/delete

Methord:Post

Content-Type: application/json

Request parameters:

Codeblock

```
{
    "datas":[
        {
            "mediaType": 0,
            "filePath": "/sdcard/DWARF_II/Normal_Photos/DWARF_20230619155313190.
            "fileName": "DWARF_20230619155313190.jpeg"
        },
        {
            "mediaType": 0,
            "filePath": "/sdcard/DWARF_II/Videos/DWARF_20230530085407647.mp4",
            "fileName": "DWARF_20230530085407647.mp4"
        }
    ]
}
```

Return result:

Codeblock

```
{
    "code": 0,
    "data": [
        {
            "mediaType": 0,
            "filePath": "",
            "fileName": ""
            "isSuccess": false
        }
    ]
}
```

3.4 Configuration interface

3.4.1 Get default parameter configuration

GET request URL:

http://IP:/getDefaultParamsConfig

3.4.2 Configuration file

params_config.json
54.61KB

3.5 Get firmware version

POST URL:

http://IP:PORT/firmwareVersion

3.5.1 Return the result

Successfully returned

Codeblock

```
{
    "code": 0,
    "data": {
        "majorVersion": 2,
        "minorVersion": 0,
        "patchVersion": 1
    }
}
```

Failure returns

Codeblock

```
{
    "code": 0,
    "data": {
        "majorVersion": -1,
        "minorVersion": -1,
        "patchVersion": -1
    }
}
```

3.6 Firmware upgrade interface(DWARF2)

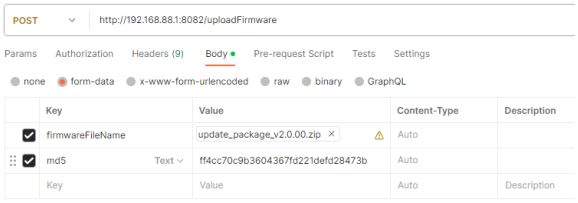
POST URL:

http://IP:PORT/uploadFirmware

3.6.1 Error code

Error code	Value	Explanation
HTTP_OK	0	Success
HTTP_FILE_NOT_EXIST	-1	File
HTTP _ INVAID _ PARAM	-2	Invalid parameter
HTTP_CHECK_MD5_ERROR	-3	MD5 verification failed

3.6.2 Request parameters



Request header Content-Type:

multipart/form-data; boundary=yourboundary

Yourboundary can be customized.

Parameter	Type	Explanation
fiwmwareFileName	File	Upgrade firmware package name
md5	Text	Firmware MD5 checksum

3.6.3 Return the result

Codeblock

```
{
    "code": -3
}
```

Codeblock

```
{
        "code": 0,
        "message": "获取成功！",
        "data": {
                "deviceId": 1,
                "majorVersion": 2,
                "minorVersion": 0,
                "patchVersion": 1,
                "link": "https:\/\/tipscope-app-image.oss-cn-hangzhou.aliyuncs.c
                "updateContent": "1. Optimize astronomical autofocus and add inf
                "md5": "c50c36e72cb7cd9337437a5879218d68",
                "fileName": "update_package_v2.0.01.zip",
                "updateType": 0
        }
}
```

3.6.4 Device side version number file

/etc/software_version

3.7 Get log file information

GET URL:

http://IP:PORT/logInfo

3.7.1 Return the result

Field	Value type	Explanation	Nullable
hasLogFile	bool	Is there a log file	Nonempty
fileName	string	File name	Nonempty
timestamp	string	Timestamp	Nonempty
fileSize	int64	Log file size	Nonempty

Codeblock

```
{
    "code": 0,
    "data": {
        "hasLogFile": true,
        "fileName": "",
        "timestamp":,
        "fileSize": 0
    }
}
```

3.8 Log download interface

GET URL:

http://IP:PORT/downloadLog

3.8.1 Return the result

Return file format:

DWARF_II_LOG_D49CDD8E7440_2023-12-05-21-30-19-195.zip

3.9 Obtain device information

POST URL:

http://IP:PORT/deviceInfo

3.9.1 Return the result

Field	Value type	Explanation	Nullable	Range of values
deviceId	int	Device ID	Nonempty	1:DWARF II 2:MAGNI
deviceName	string	Device name	Nonempty	Default: DWARF_XXXXXX (last 6 bits of MAC address) Limit: no more than 29 characters
devicePwd	string	Device password	Nonempty	Default: DWARF_12345678 Limit: 64 characters
macAddress	string	MAC address	Nonempty	
apIpAddress	string	AP Mode IP Address	Nonempty	DWARF:192.168.88.1
sdCardInfo	JSON object	SD card information	Nonempty	
staWifiName	string	STA Wi-Fi Name	Not empty (can be an empty string)	
staWifiPwd	string	STA Wi-Fi password	Not empty (can be an empty string)	

staIpAddress	stirng	Firmware package file name	Not empty (can be an empty string)	
bleServiceId	string	Bluetooth serviceId	Nonempty	DWARF II:0000DAF2-0000-1000-8000-00805F9B34FB
wifiConnectedMode	int	WiFi connection mode	Nonempty	0: AP mode 1: STA mode
sn	string		Can be empty, D2 does not have this field	
mac	string		Can be empty, D2 does not have this field	
activateStatus	int		Can be empty, D2 does not have this field	

Codeblock

```
{
    "code": 0,
    "data": {
        "deviceId": 1,
        "apIpAddress": "192.168.88.1",
        "deviceName": "DWARF_XXXXXX",
        "devicePwd": "DWARF_12345678",
        "macAddress": "D4:9C:DD:8F:D0:78",
        "sdCardInfo": {
            "availableSize": 31,
            "hasSdcard": true,
            "totalSize": 59
        },
        "staIpAddress": "192.168.88.1",
        "staWifiName": "DWARF_STA",
        "staWifiPwd": "12345678",
        "bleServiceId": "0000DAF2-0000-1000-8000-00805F9B34FB",
        "wifiConnectedMode": 0
    }
}


```

3.10 Modify device name and password

POST URL:

http://IP:PORT/setDeviceNameAndPsd

Content-Type: application/json

3.10.1 Error code

Error code	Value	Explanation
HTTP_SET_DEVICE_NAME_PASSWORD_FAILED	-5	Wrong setting name password
HTTP_SET_DEVICE_NAME_OLD_PASSWORD_ERROR	-6	Old password error

3.10.2 Request parameters

Field	Type	Explanation	Nullable
mode	int	0: Change password 1: Change name	Nonempty
oldValue	string	Old value (for password modification)	Nonempty
newValue	string	New value	Nonempty

Codeblock

```
{
    "mode": 1,
    "oldValue": "DWARF_xxxxxx",
    "newValue": "xxxxxxxx"
}
```

3.10.3 Return the result

Codeblock

```
{
    "code": 0,
    "data": {
        "mode": 1,
        "deviceName": "DWARF_XXXXXX",
        "devicePwd": "DWARF_12345678"
    }
}
```

3.11 Reset device information

POST URL:

http://IP:PORT/resetDeviceInfo

3.11.1 Return the result

Codeblock

```
{
    "code": 0
}
```

3.12 Get reset status

POST URL:

http://IP:PORT/getResetState

3.12.1 Return the result

Codeblock

```
{
    "code": 0,
    "data": {
        "isReseted": true,
        "deviceName": "DWARF_XXXXXX",
        "devicePwd": "DWARF_12345678"
    }
}
```

4. WebSocket interface

4.1 **Websocket communication address** :

ws://IP:9900/

4.2 Proto file

- astro.proto 3.09KB
- base.proto 1.13KB
- ble.proto 4.30KB
- camera.proto 3.48KB
- focus.proto 565 B
- motor_control.proto 1.68KB
- notify.proto 4.54KB
- rgb.proto 301 B
- shooting_schedule.proto 4.68KB
- system.proto 1.42KB
- track.proto 419 B

4.3 **Protobuf protocol format** :

message WsPacket {

UINT32 major_version = 1;//protocol major version

UINT32 minor_version = 2;//protocol version

UINT32 device_id = 3;//Device ID

UINT32 module_id = 4;//Module ID

Uint32 cmd = 5;//instruction

Uint32 type = 6;//Message type 0: Request 1: Response 2: Notification 3: Response

Bytes data = 7;//Request and response data, corresponding to specific business interfaces

String client_id = 8;//ws Client id

}

4.4 Module ID

Module ID	Value	Command interval	Explanation
MODULE_NONE	0		No
MODULE_CAMERA_TELE	1	10000-10499	Telephoto camera module
MODULE_CAMERA_WIDE	2	12000-12499	Wide-angle camera module
MODULE_ASTRO	3	11000-11499	Astronomy module
MODULE_SYSTEM	4	13000-13299	System modules
MODULE_RGB_POWER	5	13500-13799	RGB & Power Management Modules
MODULE_MOTOR	6	14000-14499	Motor module
MODULE_TRACK	7	14800-14899	Tracking module
MODULE_FOCUS	8	15000-15099	Focusing module
MODULE_NOTIFY	9	15200-15499	Notification module

MODULE_PANORAMA	10	15500-15599	Panoramic module
MODULE_SHOOTING_SCHEDULE	13	16100-16300	Shooting schedule module

4.5 Websocket universal error code

Error code	Value	Explanation
WS_OK	0	Success
WS_PARSE_PROTOBUF_ERROR	-1	Protocol parsing error
WS_SDCARD_NOT_EXIST	-2	SD card not detected
WS _ INVAID _ PARAM	-3	Invalid parameter
WS_SDCARD_WRITE_ERROR	-4	SD card write failed
WS_DEVICE_NOT_ACTIVATED	-5	Device is not activated
WS_SDCARD_FULL_ERROR	-6	Device storage is full

4.6 Heartbeat

Client actively sends string "ping", server level returns string "pong".

4.7 Telephoto camera function

4.7.1 CMD instruction

CMD	Value	Explanation
CMD_CAMERA_TELE_OPEN_CAMERA	10000	Turn on the camera
CMD_CAMERA_TELE_CLOSE_CAMERA	10001	Turn off the camera
CMD_CAMERA_TELE_PHOTOGRAPH	10002	Take photos
CMD_CAMERA_TELE_BURST	10003	Start continuous shooting
CMD_CAMERA_TELE_STOP_BURST	10004	Stop continuous shooting
CMD_CAMERA_TELE_START_RECORD	10005	Start recording
CMD_CAMERA_TELE_STOP_RECORD	10006	Stop recording
CMD_CAMERA_TELE_SET_EXP_MODE	10007	Set exposure mode
CMD_CAMERA_TELE_GET_EXP_MODE	10008	Acquire exposure mode
CMD_CAMERA_TELE_SET_EXP	10009	Set exposure value
CMD_CAMERA_TELE_GET_EXP	10010	Get exposure value
CMD_CAMERA_TELE_SET_GAIN_MODE	10011	Set gain mode
CMD_CAMERA_TELE_GET_GAIN_MODE	10012	Acquisition gain mode
CMD_CAMERA_TELE_SET_GAIN	10013	Set gain value
CMD_CAMERA_TELE_GET_GAIN	10014	Get gain value
CMD_CAMERA_TELE_SET_BRIGHTNESS	10015	Set brightness
CMD_CAMERA_TELE_GET_BRIGHTNESS	10016	Acquire brightness
CMD_CAMERA_TELE_SET_CONTRAST	10017	Set contrast
CMD_CAMERA_TELE_GET_CONTRAST	10018	Get contrast
CMD_CAMERA_TELE_SET_SATURATION	10019	Set saturation
CMD_CAMERA_TELE_GET_SATURATION	10020	Acquire saturation
CMD_CAMERA_TELE_SET_HUE	10021	Set tone
CMD_CAMERA_TELE_GET_HUE	10022	Get hue
CMD_CAMERA_TELE_SET_SHARPNESS	10023	Set sharpness
CMD_CAMERA_TELE_GET_SHARPNESS	10024	Acquire sharpness
CMD_CAMERA_TELE_SET_WB_MODE	10025	Set white balance mode
CMD_CAMERA_TELE_GET_WB_MODE	10026	Acquire white balance mode
CMD_CAMERA_TELE_SET_WB_SCENE	10027	Set white balance scene
CMD_CAMERA_TELE_GET_WB_SCENE	10028	Get white balance scene
CMD_CAMERA_TELE_SET_WB_CT	10029	Set the white balance color temperature value
CMD_CAMERA_TELE_GET_WB_CT	10030	Obtain the white balance color temperature value
CMD_CAMERA_TELE_SET_IRCUT	10031	Set IRCUT
CMD_CAMERA_TELE_GET_IRCUT	10032	Get IRCUT status
CMD_CAMERA_TELE_START_TIMELAPSE_PHOTO	10033	Start time-lapse photography
CMD_CAMERA_TELE_STOP_TIMELAPSE_PHOTO	10034	Stop time-lapse photography
CMD_CAMERA_TELE_SET_ALL_PARAMS	10035	Set all parameters
CMD_CAMERA_TELE_GET_ALL_PARAMS	10036	Get all parameters
CMD_CAMERA_TELE_SET_FEATURE_PARAM	10037	Set feature parameters
CMD_CAMERA_TELE_GET_ALL_FEATURE_PARAMS	10038	Get all feature parameters
CMD_CAMERA_TELE_GET_SYSTEM_WORKING_STATE	10039	Get the working status of the whole machine
CMD_CAMERA_TELE_SET_JPG_QUALITY	10040	Set jpg preview quality
CMD_CAMERA_TELE_PHOTO_RAW	10041	Shoot RAW image
CMD_CAMERA_TELE_SET_RTSP_BITRATE_TYPE	10042	Set rtsp preview bit rate type

4.7.2 All error codes

Error code	Value	Explanation
CODE_CAMERA_TELE_OPENED	10500	Camera is turned on
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed
CODE_CAMERA_TELE_OPEN_FAILED	10504	Camera failed to open
CODE_CAMERA_TELE_CAPTURE_RAW_FAILED	10510	Failed to catch RAW image
CODE_CAMERA_TELE_WORKING_BUSY	10511	The telephoto camera is busy with work

4.7.3 Turn on the camera

4.7.3.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_OPEN_FAILED	10504	Camera failed to open

4.7.3.2 Request

```
message ReqOpenCamera {
    bool binning = 1;                   //0:4k 1:1080p
    int32 rtsp_encode_type = 2;      // 0:H264 1:H65
}
```

4.7.3.3 Response

```
message ComResponse {
    int32 code = 1;
}
```

4.7.4 Turn off the camera

4.7.4.1 Error code

4.7.4.2 Request

```
message ReqCloseCamera {
}
```

4.7.4.3 Response

```
message ComResponse {
    int32 code = 1;
}
```

4.7.5 Set all camera parameters

4.7.5.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed

4.7.5.2 Request

```
message ReqSetAllParams {
INT32 exp_mode = 1;//Exposure mode 0: Auto 1: Manual
INT32 exp_index = 2;//Exposure gear index
INT32 gain_mode = 3;//gain mode
INT32 gain_index = 4;//Gain gear index
INT32 ircut_value = 5;//IRCUT value 0: CUT 1: PASS
INT32 wb_mode = 6;//white balance mode 0: automatic 1: manual
INT32 wb_index_type = 7;//White Balance Manual Mode Index Type: 0: Color Temperature Mode 1: Scene Mode
INT32 wb_index = 8;//white balance color temperature or scene for index
INT32 brightness = 9;//brightness
INT32 contrast = 10;//contrast
Int32 hue = 11;//hue
Int32 saturation = 12;//saturation
INT32 sharpness = 13;//sharpness
INT32 jpg_quality = 14;//jpg mass
}
```

4.7.5.3 Response

```
ComResponse
```

4.7.6 Get all camera parameters

4.7.6.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off

4.7.6.2 Request

```
message ReqGetAllParams {
}
```

4.7.6.3 Response

```
message ResGetAllParams {
    repeated CommonParam all_params = 1;
    int32 code = 2;
}
```

```
message CommonParam {
    bool hasAuto = 1;
    int32 auto_mode = 2;
    int32 id = 3;
    int32 mode_index = 4;
    int32 index = 5;
    double continue_value = 6;
}
```

Parameter	Type	Explanation
has_auto	bool	Is there an automatic mode
auto_mode	int32	0: Automatic 1: Manual
id	int32	See parameter configuration file
mode_index	int32	See parameter configuration file
index	int32	See parameter configuration file
continue_value	double	See parameter configuration file

4.7.7 Set feature parameters

4.7.7.1 Request

Set feature parameters

```
message ReqSetFeatureParams {
    CommonParam param = 1;
}
```

4.7.7.2 Response

ComResponse

4.7.8 Get all feature parameters

4.7.8.1 Request

```
message ReqGetAllFeatureParams {
}
```

4.7.8.2 Response

```
message ResGetAllFeatureParams {
    repeated CommonParam all_feature_params = 1;
    int32 code = 2;
}
```

4.7.9 Get the working status of the whole machine

4.7.9.1 Request

```
message ReqGetSystemWorkingState {
}
```

4.7.9.2 Response

ComResponse

4.7.10 Take photos

4.7.10.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
WS_SDCARD_NOT_EXIST	-2	SD card not detected
WS_SDCARD_WRITE_ERROR	-4	SD card write failed

4.7.10.2 Request

```
message ReqPhoto {
}
```

Subsequent addition of zoom-in support function:

Uint32 x = 1;//The abscissa of the center point of the enlarged and translated image (relative to the image coordinate system)

Uint32 y = 2;//The ordinate of the center point of the enlarged and translated image (relative to the image coordinate system)

Double ratio = 3;//magnification ratio (integer, 1- 10)

4.7.10.3 Response

ComResponse

4.7.11 Start continuous shooting

4.7.11.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
WS_SDCARD_NOT_EXIST	-2	SD card not detected
WS_SDCARD_WRITE_ERROR	-4	SD card write failed

4.7.11.2 Request

```
message ReqBurstPhoto {
}
```

4.7.11.3 Response

Continuous shooting return

ComResponse

4.7.12 Stop continuous shooting

4.7.12.1 Request

message ReqStopBurstPhoto {

}

4.7.12.2 Response

ComResponse

4.7.13 Start recording

4.7.13.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
WS_SDCARD_NOT_EXIST	-2	SD card not detected
WS_SDCARD_WRITE_ERROR	-4	SD card write failed

4.7.13.2 Request

message ReqStartRecord {

}

4.7.13.3 Response

ComResponse

4.7.14 Stop recording

4.7.14.1 Error code

4.7.14.2 Request

message ReqStopRecord {

}

4.7.14.3 Response

ComResponse

4.7.15 Start time-lapse photography

4.7.15.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_RECORDING	10506	Recording
WS_SDCARD_NOT_EXIST	-2	SD card not detected
WS_SDCARD_WRITE_ERROR	-4	SD card write failed

4.7.15.2 Request

message ReqStartTimeLapse {

}

4.7.15.3 Response

ComResponse

4.7.16 Stop time-lapse photography

4.7.16.1 Request

message ReqStopTimeLapse {

}

4.7.16.2 Response

ComResponse

4.7.17 Set exposure mode

4.7.17.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed

4.7.17.2 Request

message ReqSetExpMode {

INT32 mode = 1;//0: Auto 1: Manual

}

4.7.17.3 Response

ComResponse

4.7.18 Acquire exposure mode

4.7.18.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed

4.7.18.2 Request

message ReqGetExpMode {

}

4.7.18.3 Response

ComResponse

4.7.19 Set exposure value

4.7.19.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed

4.7.19.2 Request

```
message ReqSetExp {
  int32 index = 1;
}
```

4.7.19.3 Response

ComResponse

4.7.20 Get exposure value

4.7.20.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed

4.7.20.2 Request

4.7.20.3 Response

4.7.21 Set gain mode

4.7.21.1 Error code

4.7.21.2 Request

```
message ReqSetGainMode {
INT32 mode = 1;//0: Auto 1: Manual
}
```

4.7.21.3 Response

ComResponse

4.7.22 Acquisition gain mode

4.7.23 Set gain value

4.7.23.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed

4.7.23.2 Request

```
message ReqSetGain {
  int32 index = 1;
}
```

4.7.23.3 Response

ComResponse

4.7.24 Get gain value

4.7.25 Set IRCUT

4.7.25.1 Error code

4.7.25.2 Request

```
message ReqSetIrCut {
  int32 value = 1;
}
```

4.7.25.3 Response

ComResponse

4.7.26 Get IRCUT status

4.7.27 Set white balance mode

4.7.27.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed

4.7.27.2 Request

```
message ReqSetWBMode {
  int32 mode = 1;
```

}

4.7.27.3 Response

ComResponse

4.7.28 Acquire white balance mode

4.7.29 Set white balance scene

4.7.29.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed

4.7.29.2 Request

```
message ReqSetWBSence {
  int32 value = 1;
}
```

4.7.29.3 Response

ComResponse

4.7.30 Get white balance scene

4.7.31 Set the white balance color temperature value

4.7.31.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed

4.7.31.2 Request

```
message ReqSetWBCT {
  int32 index = 1;
}
```

4.7.31.3 Response

ComResponse

4.7.32 Obtain the white balance color temperature value

4.7.33 Set brightness

4.7.33.1 Mapping relationship

	Minimum value	Maximum value	Default value
UI value (A)	-100	100	0
Actual value (B)	0	255	128

B = (A + 100) * 255.0 / 200

4.7.33.2 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed

4.7.33.3 Request

```
message ReqSetBrightness {
  int32 value = 1;
}
```

4.7.33.4 Response

ComResponse

4.7.34 Acquire brightness

4.7.35 Set contrast

4.7.35.1 Mapping relationship

	Minimum value	Maximum value	Default value
UI value (A)	-100	100	0
Actual value (B)	0	255	128

B = (A + 100) * 255.0 / 200

4.7.35.2 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off

CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed

4.7.35.3 Request

```
message ReqSetContrast {
  int32 value = 1;
}
```

4.7.35.4 Response

ComResponse

4.7.36 Get contrast

4.7.37 Set saturation

4.7.37.1 Mapping relationship

	Minimum value	Maximum value	Default value
UI value (A)	-100	100	0
Actual value (B)	0	255	128

B = (A + 100) * 255.0 / 200

4.7.37.2 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed

4.7.37.3 Request

```
message ReqSetSaturation {
  int32 value = 1;
}
```

4.7.37.4 Response

ComResponse

4.7.38 Acquire saturation

4.7.39 Set tone

4.7.39.1 Mapping relationship

	Minimum value	Maximum value	Default value
UI value (A)	-180	180	0
Actual value (B)	0	255	128

B =(A + 180) * 255.0 / 360

4.7.39.2 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed

4.7.39.3 Request

```
message ReqSetHue {
  uint32 value = 1;
}
```

4.7.39.4 Response

ComResponse

4.7.40 Get hue

4.7.41 Set sharpness

4.7.41.1 Mapping relationship

	Minimum value	Maximum value	Default value
UI value (A)	0	100	50
Actual value (B)	0	100	50

B = A

4.7.41.2 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_CAMERA_TELE_ISP_SET_FAILED	10502	ISP parameter settings failed

4.7.41.3 Request

```
message ReqSetSharpness {
```

int32 value = 1;

}

4.7.41.4 Response

ComResponse

4.7.42 Acquire sharpness

4.7.43 Set jpg preview quality

4.7.43.1 Request

message ReqSetJpgQuality {

int32 quality = 1;

}

4.7.43.2 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off

4.7.43.3 Response

ComResponse

4.8 Focus function

4.8.1 CMD instruction

CMD	Value	Explanation
CMD_FOCUS_AUTO_FOCUS	15000	Normal mode autofocus
CMD_FOCUS_MANUAL_SINGLE_STEP_FOCUS	15001	Manual single-step focusing
CMD_FOCUS_START_MANUAL_CONTINU_FOCUS	15002	Start manual continuous focus
CMD_FOCUS_STOP_MANUAL_CONTINU_FOCUS	15003	Stop manual continuous focus
CMD_FOCUS_START_ASTRO_AUTO_FOCUS	15004	Start astronomical autofocus
CMD_FOCUS_STOP_ASTRO_AUTO_FOCUS	15005	Stop astronomical autofocus

4.8.2 All error codes

4.8.3 Normal autofocus

4.8.3.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off

4.8.3.2 Request

message ReqNormalAutoFocus {

Uint32 mode = 1;//0: global focus 1: area focus

UINT32 center_x = 2;//Area focus x coordinates

UINT32 center_y = 3;//Area focus y coordinates

}

4.8.3.3 Response

ComResponse

4.8.4 Start astronomical autofocus

4.8.4.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_FOCUS_ASTRO_AUTO_FOCUS_SLOW_ERROR	15100	Slow astronomical autofocus failed
CODE_FOCUS_ASTRO_AUTO_FOCUS_FAST_ERROR	15101	Fast astronomical autofocus failed, you need to perform a slow astronomical autofocus first

4.8.4.2 Request

Codeblock

```
// 天文自动对焦
message ReqAstroAutoFocus {
    uint32 mode = 1;                // 0: 慢速对焦; 1: 快速对焦
}
```

4.8.4.3 Response

ComResponse

4.8.5 Stop astronomical autofocus

4.8.5.1 Error code

No

4.8.5.2 Request

Codeblock

```
message ReqStopAstroAutoFocus {

}
```

4.8.5.3 Response

ComResponse

4.8.6 Manual single-step focusing

4.8.6.1 Error code

Error code	Value	Explanation
WS _ INVAID _ PARAM	-3	Invalid parameter

4.8.6.2 Request

```
message ReqManualSingleStepFocus {
UINT32 direction = 1;//Focus direction 0: far focus 1: near focus
}
```

4.8.6.3 Response

```
message ComResponse {
  int32 code = 1;
}
```

4.8.7 Start manual continuous focus

4.8.7.1 Error code

Error code	Value	Explanation
WS _ INVAID _ PARAM	-3	Invalid parameter

4.8.7.2 Request

```
message ReqManualContinuFocus {
  uint32 direction = 1;
}
```

4.8.7.3 Response

ComResponse

4.8.8 Stop manual continuous focus

4.8.8.1 Error code

No

4.8.8.2 Request

```
message ReqStopManualContinuFocus {
}
```

4.8.8.3 Response

ComResponse

4.9 Wide-angle camera function

4.9.1 CMD instruction

CMD	Value	Explanation
CMD_CAMERA_WIDE_OPEN_CAMERA	12000	Turn on the camera
CMD_CAMERA_WIDE_CLOSE_CAMERA	12001	Turn off the camera
CMD_CAMERA_WIDE_SET_EXP_MODE	12002	Set exposure mode
CMD_CAMERA_WIDE_GET_EXP_MODE	12003	Acquire exposure mode
CMD_CAMERA_WIDE_SET_EXP	12004	Set exposure value
CMD_CAMERA_WIDE_GET_EXP	12005	Get exposure value
CMD_CAMERA_WIDE_SET_GAIN	12006	Set gain
CMD_CAMERA_WIDE_GET_GAIN	12007	Acquisition gain
CMD_CAMERA_WIDE_SET_BRIGHTNESS	12008	Set brightness
CMD_CAMERA_WIDE_GET_BRIGHTNESS	12009	Acquire brightness
CMD_CAMERA_WIDE_SET_CONTRAST	12010	Set contrast
CMD_CAMERA_WIDE_GET_CONTRAST	12011	Get contrast
CMD_CAMERA_WIDE_SET_SATURATION	12012	Set saturation
CMD_CAMERA_WIDE_GET_SATURATION	12013	Acquire saturation
CMD_CAMERA_WIDE_SET_HUE	12014	Set tone
CMD_CAMERA_WIDE_GET_HUE	12015	Get hue
CMD_CAMERA_WIDE_SET_SHARPNESS	12016	Set sharpness
CMD_CAMERA_WIDE_GET_SHARPNESS	12017	Acquire sharpness
CMD_CAMERA_WIDE_SET_WB_MODE	12018	Set white balance mode
CMD_CAMERA_WIDE_GET_WB_MODE	12019	Acquire white balance mode
CMD_CAMERA_WIDE_SET_WB_CT	12020	Set white balance color temperature
CMD_CAMERA_WIDE_GET_WB_CT	12021	Obtain white balance color temperature
CMD_CAMERA_WIDE_PHOTOGRAPH	12022	Take photos
CMD_CAMERA_WIDE_BURST	12023	Continuous shooting
CMD_CAMERA_WIDE_STOP_BURST	12024	Stop continuous shooting
CMD_CAMERA_WIDE_START_TIMELAPSE_PHOTO	12025	Start time-lapse photography
CMD_CAMERA_WIDE_STOP_TIMELAPSE_PHOTO	12026	Stop time-lapse photography
CMD_CAMERA_WIDE_GET_ALL_PARAMS	12027	Get all parameters
CMD_CAMERA_WIDE_SET_ALL_PARAMS	12028	Set all parameters

4.9.2 All error codes

Error code	Value	Explanation
CODE_CAMERA_WIDE_OPENED	12500	Wide-angle camera turned on
CODE_CAMERA_WIDE_CLOSED	12501	The wide-angle camera is turned off
CODE_CAMERA_WIDE_CANNOT_FOUND	12502	Can't find the camera
CODE_CAMERA_WIDE_OPEN_FAILED	12503	Failed to open camera
CODE_CAMERA_WIDE_CLOSE_FAILED	12504	Failed to turn off camera
CODE_CAMERA_WIDE_SET_ISP_FAILED	12505	Failed to set ISP parameters
CODE_CAMERA_WIDE_PHOTOGRAPHING	12506	Taking pictures

4.9.3 Turn on the camera

4.9.3.1 Error code

Error code	Value	Explanation
CODE_CAMERA_WIDE_CANNOT_FOUND	12502	Can't find the camera
CODE_CAMERA_WIDE_OPEN_FAILED	12503	Failed to open camera

4.9.3.2 Request

message ReqOpenCamera {

Bool binning = 1;//Wide-angle has no binning parameter, no need to fill in

}

4.9.3.3 Response

ComResponse

4.9.4 Turn off the camera

4.9.4.1 Error code

Error code	Value	Explanation
CODE_CAMERA_WIDE_CLOSE_FAILED	12504	Failed to turn off camera

4.9.4.2 Request

message ReqCloseCamera {

}

4.9.4.3 Response

ComResponse

4.9.5 Take photos

4.9.5.1 Error code

Error code	Value	Explanation
CODE_CAMERA_WIDE_CLOSED	10501	Camera is off
WS_SDCARD_NOT_EXIST	-2	SD card not detected
WS_SDCARD_WRITE_ERROR	-4	SD card write failed

4.9.5.2 Request

message ReqPhoto {

}

4.9.5.3 Response

ComResponse

4.9.6 Start recording

4.9.6.1 Error code

Error code	Value	Explanation
CODE_CAMERA_WIDE_CLOSED	-10501	Camera is off
CODE_CAMERA_WIDE_EXP_TOO_LONG	-12508	The exposure time is too long, and recording is not supported.

4.9.6.2 Request

message ReqStartRecord {

}

4.9.6.3 Response

ComResponse

4.9.7 Stop recording

4.9.7.1 Error code

4.9.7.2 Request

message ReqStopRecord {

}

4.9.7.3 Response

ComResponse

- 4.9.8 Start continuous shooting
- 4.9.9 Stop continuous shooting
- 4.9.10 Get all parameters
- 4.9.11 Set exposure mode

4.9.12 Acquire exposure mode

4.9.13 Set exposure value

4.9.14 Get exposure value

4.9.15 Set gain mode

4.9.16 Acquisition gain mode

4.9.17 Set gain value

4.9.18 Get gain value

4.9.19 Set white balance mode

4.9.20 Set the white balance color temperature value

4.9.21 Set brightness

4.9.22 Set contrast

4.9.22.1 Mapping relationship

4.9.22.2 Error code

Error code	Value	Explanation
CODE_CAMERA_WIDE_CLOSED	12501	Camera is off
CODE_CAMERA_WIDE_SET_ISP_FAILED	10502	ISP parameter settings failed

4.9.22.3 Request

```
message ReqSetContrast {
  int32 value = 1;
}
```

4.9.22.4 Response

ComResponse

4.9.22.5 Error code

Error code	Value	Explanation
CODE_CAMERA_WIDE_CLOSED	12501	Camera is off
CODE_CAMERA_WIDE_SET_ISP_FAILED	10502	ISP parameter settings failed

4.9.22.6 Request

```
message ReqSetSaturation {
  uint32 value = 1;
}
```

4.9.22.7 Response

ComResponse

4.9.23 Set saturation

4.9.23.1 Mapping relationship

	Minimum value	Maximum value	Default value
UI value (A)	-100	100	60
Actual value (B)	0	100	80

B =(A + 100) * 100.0 / 200

4.9.23.2 Error code

Error code	Value	Explanation
CODE_CAMERA_WIDE_CLOSED	12501	Camera is off
CODE_CAMERA_WIDE_SET_ISP_FAILED	10502	ISP parameter settings failed

4.9.23.3 Request

```
message ReqSetSaturation {
  uint32 value = 1;
}
```

4.9.23.4 Response

ComResponse

4.9.24 Set tone

4.9.24.1 Mapping relationship

	Minimum value	Maximum value	Default value
UI value (A)	-180	180	0
Actual value (B)	-2000	2000	0

B = A * 2000.0 / 180

4.9.24.2 Error code

4.9.24.3 Request

```
message ReqSetHue {
  uint32 value = 1;
}
```

4.9.24.4 Response

ComResponse

4.9.25 Set sharpness

4.9.25.1 Mapping relationship

	Minimum value	Maximum value	Default value
UI value (A)	0	100	17
Actual value (B)	1	7	2

B = A * 6.0 / 100 + 1

4.9.25.2 Error code

Error code	Value	Explanation
CODE_CAMERA_WIDE_CLOSED	12501	Camera is off
CODE_CAMERA_WIDE_SET_ISP_FAILED	10502	ISP parameter settings failed

4.9.25.3 Request

```
message ReqSetSharpness {
  uint32 value = 1;
}
```

4.9.25.4 Response

ComResponse

4.10 Astronomical function

4.10.1 CMD instruction

CMD	Value	Explanation
CMD_ASTRO_START_CALIBRATION	11000	Start calibration
CMD_ASTRO_STOP_CALIBRATION	11001	Stop calibration
CMD_ASTRO_START_GOTO_DSO	11002	Start GOTO Deep Space Object
CMD_ASTRO_START_GOTO_SOLAR_SYSTEM	11003	Start GOTO Solar System Target
CMD_ASTRO_STOP_GOTO	11004	Stop GOTO
CMD_ASTRO_START_CAPTURE_RAW_LIVE_STACKING	11005	Start stacking
CMD_ASTRO_STOP_CAPTURE_RAW_LIVE_STACKING	11006	Stop overlay
CMD_ASTRO_START_CAPTURE_RAW_DARK	11007	Start shooting dark scenes
CMD_ASTRO_STOP_CAPTURE_RAW_DARK	11008	Stop filming darkfield
CMD_ASTRO_CHECK_GOT_DARK	11009	Inquire about the dark field that has been shot
CMD_ASTRO_GO_LIVE	11010	GO LIVE interface
CMD_ASTRO_START_TRACK_SPECIAL_TARGET	11011	Start tracking the sun and moon
CMD_ASTRO_STOP_TRACK_SPECIAL_TARGET	11012	Stop tracking the sun and moon
CMD_ASTRO_START_ONE_CLICK_GOTO_DSO	11013	One-click GOTO deep space celestial body
CMD_ASTRO_START_ONE_CLICK_GOTO_SOLAR_SYSTEM	11014	One-click GOTO solar system target
CMD_ASTRO_STOP_ONE_CLICK_GOTO	11015	Stop one-click GOTO
CMD_ASTRO_START_WIDE_CAPTURE_LIVE_STACKING	11016	Start wide-angle overlay
CMD_ASTRO_STOP_WIDE_CAPTURE_LIVE_STACKING	11017	Stop wide-angle overlay
CMD_ASTRO_START_EQ_SOLVING	11018	Start EQ verification
CMD_ASTRO_STOP_EQ_SOLVING	11019	Stop EQ verification
CMD_ASTRO_WIDE_GO_LIVE	11020	Wide-angle GO LIVE interface
CMD_ASTRO_START_CAPTURE_RAW_DARK_WITH_PARAM	11021	Start shooting the dark field with specified parameters (manually set exposure, gain, binning).
CMD_ASTRO_STOP_CAPTURE_RAW_DARK_WITH_PARAM	11022	Stop shooting the dark field with specified parameters
CMD_ASTRO_GET_DARK_FRAME_LIST	11023	Query the list of recorded dark scenes
CMD_ASTRO_DEL_DARK_FRAME_LIST	11024	Delete the specified dark field list
CMD_ASTRO_START_CAPTURE_WIDE_RAW_DARK_WITH_PARAM	11025	Start shooting wide-angle dark field with specified parameters (manually set exposure and gain. Binning is

		fixed to 1 internally, setting does not work).
CMD_ASTRO_STOP_CAPTURE_WIDE_RAW_DARK_WITH_PARAM	11026	Stop shooting dark field with wide-angle specified parameters
CMD_ASTRO_GET_WIDE_DARK_FRAME_LIST	11027	Query the list of wide-angle dark scenes taken
CMD_ASTRO_DEL_WIDE_DARK_FRAME_LIST	11028	Delete the specified wide-angle dark field list

4.10.2 Start calibration

4.10.2.1 Error code

Error code	Value	Explanation
CMD_ASTRO_PLATE_SOLVING_FAILED	11500	Plate solving failed
CODE_ASTRO_FUNCTION_BUSY	11501	Astronomical function busy
CODE_ASTRO_CALIBRATION_FAILED	11504	Calibration failed
CODE_STEP_MOTOR_LIMIT_POSITION_WARNING	14518	Calibration limit warning

4.10.2.2 Request

```
message ReqStartCalibration {
}
```

4.10.2.3 Response

ComResponse

4.10.3 Stop calibration

4.10.3.1 Error code

4.10.3.2 Request

```
message ReqStopCalibration {
}
```

4.10.3.3 Response

ComResponse

4.10.4 Start GOTO and track deep space objects

4.10.4.1 Error code

Error code	Value	Explanation
WS_PARSE_PROTOBUF_ERROR	1	Protobuf parsing failed
CODE_ASTRO_PLATE_SOLVING_FAILED	11500	Plate solving failed
CODE_ASTRO_FUNCTION_BUSY	11501	Astronomical function busy
CODE_STEP_MOTOR_LIMIT_POSITION_WARNING	14518	GOTO limit warning
CODE_STEP_MOTOR_LIMIT_POSITION_HITTED	14519	Star collision limit
CODE_ASTRO_GOTO_FAILED	11505	GOTO failed

4.10.4.2 Request

```
message ReqGotoDSO {
  double ra = 1;
  double dec = 2;
  string target_name = 3;
}
```

Parameter	Type	Explanation
ra	double	right ascension coordinate
dec	double	Declination coordinates
target_name	string	target name

4.10.4.3 Response

ComResponse

4.10.5 Start GOTO and track solar system targets

4.10.5.1 Error code

Error code	Value	Explanation
WS_PARSE_PROTOBUF_ERROR	1	Protobuf parsing failed
WS _ INVAID _ PARAM	3	Invalid parameter
CODE_ASTRO_PLATE_SOLVING_FAILED	11500	Plate solving failed
CODE_ASTRO_FUNCTION_BUSY	11501	Astronomical function busy
CODE_STEP_MOTOR_LIMIT_POSITION_WARNING	14518	GOTO limit warning
CODE_STEP_MOTOR_LIMIT_POSITION_HITTED	14519	Star collision limit
CODE_ASTRO_GOTO_FAILED	11505	GOTO failed

4.10.5.2 Request

```
message ReqGotoSolarSystem {
  int32 index = 1;
  double lon = 2;
  double lat = 3;
```

string target_name = 4;

}

Parameter	Type	Explanation
index	int32	Solar System Target Number: Mercury = 1, Venus = 2, Mars = 3, Jupiter (Jupiter) = 4, Saturn = 5, Uranus (Uranus) = 6, Neptune (Neptune) = 7, Moon (moon) = 8 Sun (Sun) = 9
lon	double	GPS longitude coordinates
lat	double	GPS latitude coordinates
target_name	string	target name

4.10.5.3 Response

ComResponse

4.10.6 Stop GOTO

4.10.6.1 Error code

4.10.6.2 Request

message ReqStopGoto {

}

4.10.6.3 Response

ComResponse

4.10.7 Start Sun track & & Moon track

4.10.7.1 Error code

Error code	Value	Explanation
WS_PARSE_PROTOBUF_ERROR	1	Protobuf parsing failed
WS _ INVAID _ PARAM	3	Invalid parameter
CODE_ASTRO_FUNCTION_BUSY	11501	Astronomical function busy
CODE_STEP_MOTOR_LIMIT_POSITION_WARNING	14518	GOTO limit warning
CODE_STEP_MOTOR_LIMIT_POSITION_HITTED	14519	Tracking collision limit

4.10.7.2 Request

Codeblock

```
message ReqTrackSpecialTarget {
    int32 index = 1;
    double lon = 2;
    double lat = 3;
}
```

Parameter	Type	Explanation
index	int32	Special target number: Sun: 0 Moon: 1
lon	double	GPS longitude coordinates
lat	double	GPS latitude coordinates

4.10.7.3 Response

ComResponse

4.10.8 Stop sun and moon tracking

4.10.8.1 Error code

4.10.8.2 Request

Codeblock

```
message ReqStopTrackSpecialTarget {

}
```

4.10.8.3 Response

ComResponse

4.10.9 Start telephoto stacking

4.10.9.1 Error code

Error code	Value	Explanation
WS_PARSE_PROTOBUF_ERROR	1	Protobuf parsing failed
WS_SDCARD_NOT_EXIST	2	SD card not detected
WS_SDCARD_WRITE_ERROR	4	Image writing to SD card failed (maybe the card is full)
CODE_CAMERA_TELE_WORKING_BUSY	10507	The telephoto camera is busy.

CODE_ASTRO_FUNCTION_BUSY	11501	Astronomical function busy
CODE_ASTRO_DARK_GAIN_OUT_OF_RANGE	11502	Gain beyond darkfield shooting range (darkfield coverage 30-150 gain)
CODE_ASTRO_DARK_NOT_FOUND	11503	Darkfield not found
CODE_ASTRO_NEED_GOTO	11513	No GOTO
CODE_ASTRO_NEED_ADJUST_SHOOT_PARAM	11514	Parameters are not suitable

4.10.9.2 Request

message ReqCaptureRawLiveStacking {

}

4.10.9.3 Response

ComResponse

4.10.10 stop telephoto stack

4.10.10.1 Error code

4.10.10.2 Request

message ReqStopCaptureRawLiveStacking {

}

4.10.10.3 Response

ComResponse

4.10.11 Start wide-angle stack

4.10.11.1 Error code

4.10.11.2 Request

Codeblock

```
message ReqCaptureWideRawLiveStacking {
}
```

4.10.11.3 Response

ComResponse

4.10.12 Stop wide-angle stack

4.10.12.1 Error code

4.10.12.2 Request

Codeblock

```
message ReqStopCaptureWideRawLiveStacking {
}
```

4.10.12.3 Response

ComResponse

4.10.13 Inquire about the dark field that has been shot

4.10.13.1 Error code

4.10.13.2 Request

message ReqCheckDarkFrame {

}

4.10.13.3 Response

message ResCheckDarkFrame {

int32 progress = 1;

int32 code = 2;

}

Parameter	Type	Explanation
progress	int32	Shooting progress, return the percentage progress * 100, that is, keep 2 decimal places
code	int32	Error code

4.10.14 Start shooting dark scenes

4.10.14.1 Error code

Error code	Value	Explanation
WS_PARSE_PROTOBUF_ERROR	1	Protobuf parsing failed
WS_SDCARD_NOT_EXIST	2	SD card not detected
WS_SDCARD_WRITE_ERROR	4	Failed to write the image to the SD card (possibly because the card is full).
CODE_CAMERA_TELE_WORKING_BUSY	10511	The telephoto camera is busy
CODE_ASTRO_FUNCTION_BUSY	11501	Astronomy function is busy

4.10.14.2 Request

message ReqCaptureDarkFrame {

int32 reshoot = 1;

}

Parameter	Type	Explanation
reshoot	int32	Whether to reshoot, 0: No; 1: Remake

4.10.14.3 Response

ComResponse

4.10.15 Stop shooting dark scenes

4.10.15.1 Error code

4.10.15.2 Request

message ReqStopCaptureDarkFrame {

}

4.10.15.3 Response

ComResponse

4.10.16 GO LIVE interface

4.10.16.1 Error code

Error code	Value	Explanation
CODE_CAMERA_TELE_OPEN_FAILED	10504	Camera failed to open
CODE_ASTRO_FUNCTION_BUSY	11501	Astronomy function is busy

4.10.16.2 Request

message ReqGoLive {

}

4.10.16.3 Response

ComResponse

4.10.17 One-click GOTO deep space celestial object target (supported starting from protocol version 1.4)

4.10.17.1 Error code

Focus, calibration, GOTO deep space object target interface returns error code normally

Error code	Value	Explanation
WS_PARSE_PROTOBUF_ERROR	1	Protobuf parsing failed
WS _ INVAID _ PARAM	3	Invalid parameter
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_ASTRO_PLATE_SOLVING_FAILED	11500	Plate solving failed
CODE_ASTRO_FUNCTION_BUSY	11501	Astronomy function is busy
CODE_ASTRO_CALIBRATION_FAILED	11504	Calibration failed
CODE_ASTRO_GOTO_FAILED	11505	GOTO failed
CODE_STEP_MOTOR_LIMIT_POSITION_WARNING	14518	Limit warning
CODE_STEP_MOTOR_LIMIT_POSITION_HITTED	14519	Collision limit
CODE_FOCUS_ASTRO_AUTO_FOCUS_SLOW_ERROR	15100	Slow astronomical autofocus failed
CODE_ASTRO_SKY_SEARCH_FAILED	11517	Sky detection failed

4.10.17.2 Request

Codeblock

```
message ReqOneClickGotoDSO {
    double ra = 1;
    double dec = 2;
    string target_name = 3;
}
```

Parameter	Type	Explanation
ra	double	Right ascension coordinates
dec	double	Declination coordinates
target_name	string	Target name

4.10.17.3 Response

Codeblock

```
message ResOneClickGoto {
    int32 step = 1;
    int32 code = 2;
    bool all_end = 3;
}
```

4.10.18 One-click GOTO solar system target (supported starting from protocol version 1.4)

4.10.18.1 Error code

Same focus, calibration, GOTO solar system target error code

Error code	Value	Explanation
WS_PARSE_PROTOBUF_ERROR	1	Protobuf parsing failed
WS _ INVAID _ PARAM	3	Invalid parameter
CODE_CAMERA_TELE_CLOSED	10501	Camera is off
CODE_ASTRO_PLATE_SOLVING_FAILED	11500	Plate solving failed
CODE_ASTRO_FUNCTION_BUSY	11501	Astronomy function is busy
CODE_ASTRO_CALIBRATION_FAILED	11504	Calibration failed
CODE_ASTRO_GOTO_FAILED	11505	GOTO failed
CODE_STEP_MOTOR_LIMIT_POSITION_WARNING	14518	Limit warning

CODE_STEP_MOTOR_LIMIT_POSITION_HITTED	14519	Collision limit
CODE_FOCUS_ASTRO_AUTO_FOCUS_SLOW_ERROR	15100	Slow astronomical autofocus failed

4.10.18.2 Request

Codeblock

```
message ReqOneClickGotoSolarSystem {
    int32 index = 1;
    double lon = 2;
    double lat = 3;
    string target_name = 4;
}
```

Parameter	Type	Explanation
index	int32	Solar system target number: Mercury = 1, Venus = 2, Mars = 3, Jupiter = 4, Saturn = 5, Uranus (Uranus) = 6, Neptune (Neptune) = 7, Moon = 8 Sun = 9
lon	double	GPS longitude coordinates
lat	double	GPS latitude coordinates
target_name	string	Target name

4.10.18.3 Response

Codeblock

```
message ResOneClickGoto {
    int32 step = 1;    // 步骤编号
    int32 code = 2;    // 错误码
    bool all_end = 3;  // 指示整个一键GOTO是否结束
}
```

Parameter	Type	Explanation
step	int32	Step number: Sky detection = 10, Focus = 20, Calibration = 30, Goto = 40，

4.10.19 Stop one-click GOTO (supported since protocol version 1.4)

4.10.19.1 Error code

4.10.19.2 Request

message ReqStopOneClickGoto {

}

4.10.19.3 Response

ComResponse

4.10.20 Start EQ verification (supported since protocol version 1.5)

4.10.20.1 Error code

Error code	Value	Explanation
WS_PARSE_PROTOBUF_ERROR	1	Protobuf parsing failed
WS _ INVAID _ PARAM	3	Invalid parameter
CODE_CAMERA_TELE_CLOSED	10501	The camera has been turned off (only focus failure returns).
CODE_ASTRO_EQ_SOLVING_FAILED	11516	EQ calculation failed (only calculation failed to return)
CODE_FOCUS_ASTRO_AUTO_FOCUS_SLOW_ERROR	15100	Slow Astronomy autofocus failed (focus failure only returns)

4.10.20.2 Request

Codeblock

```
message ReqStartEqSolving {
    double lon = 1;  // GPS经度
    double lat = 2;  // GPS纬度
}
```

4.10.20.3 Response

Codeblock

```
message ResStartEqSolving {
    double azi_err = 1;  // 方位轴极轴误差，正顺时针，负逆时针
    double alt_err = 2;  // 俯仰轴极轴误差，正向上，负向下
    int32 code = 3;    // 错误码
}
```

4.10.21 Stop EQ verification (supported since protocol version 1.5)

4.10.21.1 Error code

4.10.21.2 Request

Codeblock

```
message ReqStopEqSolving {

}
```

4.10.21.3 Response

ComResponse

4.10.22 Start shooting dark field (with parameters).

4.10.22.1 Error code

Error code	Value	Explanation
WS_PARSE_PROTOBUF_ERROR	1	Protobuf parsing failed
WS_SDCARD_NOT_EXIST	2	SD card not detected
WS_SDCARD_WRITE_ERROR	4	Failed to write the image to the SD card (possibly because the card is full).
CODE_ASTRO_FUNCTION_BUSY	11501	Astronomy function is busy

4.10.22.2 Request

```
message ReqCaptureDarkFrameWithParam{
    int32 exp_index = 1;
    int32 gain_index = 2;
    int32 bin_index = 3;
    int32 cap_size = 4;
}
```

Parameter	Type	Explanation
exp_index	int32	Exposure parameter index value
gain_index	int32	Gain parameter index value
bin_index	int32	Binning parameter index value
cap_size	int32	Number of shots

4.10.22.3 Response

ComResponse

4.10.23 Stop shooting dark field (with parameters)

4.10.23.1 Error code

4.10.23.2 Request

```
message ReqStopCaptureDarkFrameWithParam{
}
```

4.10.23.3 Response

ComResponse

4.10.24 Query the list of shot dark scenes (with shooting parameters).

4.10.24.1 Error code

Error code	Value	Explanation
WS_OK	0	Success
CODE_ASTRO_DARK_NOT_FOUND	-11503	No dark field data

4.10.24.2 Request

```
message ReqGetDarkFrameList {
}
```

4.10.24.3 Response

```
message ResGetDarkFrameInfo {
   int32 exp_index = 1;
   int32 gain_index = 2;
   int32 bin_index = 3;
}

message ResGetDarkFrameInfoList {
   int32 code = 1;
   repeated ResGetDarkFrameInfo results = 2;
}
```

Parameter	Type	Explanation
exp_index	int32	Exposure parameter index value
gain_index	int32	Gain parameter index value
bin_index	int32	Binning parameter index value
exp_name	string	The value corresponding to the exposure parameter and the index value, see the configuration file
gain_name	string	The value corresponding to the gain parameter and the index value, see the configuration file
bin_name	string	The value corresponding to the binning parameter and the index value, see the configuration file.

Parameter	Type	Explanation
code	int32	The interface returns an error code, see 3.9.24.1
results	ResGetDarkFrameInfo	Array of ResGetDarkFrameInfo structure, corresponding to multiple dark field results.

4.10.25 Delete the specified dark field list

4.10.25.1 Error code

Error code	Value	Explanation
WS_OK	0	Success
CODE_ASTRO_DARK_NOT_FOUND	-11503	No dark field data

4.10.25.2 Request

```
//Delete dark field
message ReqDelDarkFrame {
  int32 exp_index = 1;
  int32 gain_index = 2;
  int32 bin_index = 3;
}

Delete the dark field list
message ReqDelDarkFrameList {
  repeated ReqDelDarkFrame dark_list = 1;
}
```

Parameter	Type	Explanation
exp_index	int32	Delete the exposure parameter index value of the dark field
gain_index	int32	Delete the gain parameter index value of the dark field
bin_index	int32	Delete the binning parameter index value of the dark field

4.10.25.3 Response

```
message ResDelDarkFrameList {
  int32 code = 1;
}
```

Parameter	Type	Explanation
code	int32	The interface returns an error code, see 3.9.25.1

4.11 System functions

4.11.1 CMD instruction

CMD	Value	Explanation
CMD_SYSTEM_SET_TIME	13000	Set the system time
CMD_SYSTEM_SET_TIME_ZONE	13001	Set the time zone
CMD_SYSTEM_SET_MTP_MODE	13002	Set MTP mode
CMD_SYSTEM_SET_CPU_MODE	13003	Set CPU mode

4.11.2 All error codes

Error code	Value	Explanation
CODE_SYSTEM_SET_TIME_FAILED	13300	Set time failed
CODE_SYSTEM_SET_TIMEZONE_FAILED	13301	Failed to set time zone

4.11.3 Set the system time

4.11.3.1 Error code

Error code	Value	Explanation
CODE_SYSTEM_SET_TIME_FAILED	13300	Set time failed

4.11.3.2 Request

```
message ReqSetTime {
Uint64 timestamp = 1;//timestamp, the time difference between the current time and midnight UTC on January 1, 1970, in seconds
}
```

4.11.3.3 Response

```
ComResponse
```

4.11.4 Set the time zone

4.11.4.1 Error code

Error code	Value	Explanation
CODE_SYSTEM_SET_TIMEZONE_FAILED	13302	Time zone setting failed

4.11.4.2 Request

```
message ReqSetTimezone {
   string timezone = 1;
}
```

4.11.4.3 Response

ComResponse

4.11.5 Set MTP mode(DWARF2)

4.11.5.1 Request

```
message ReqSetMtpMode {
Int32 mode = 1;//Can be omitted, default is on, cannot be closed
}
```

4.11.5.2 Response

ComResponse

4.11.6 Set CPU mode(DWARF2)

4.11.6.1 Request

```
message ReqSetCpuMode{
Int32 mode = 1;//0: Normal mode 1: Performance mode
}
```

4.11.6.2 Response

ComResponse

4.11.7 Lock & unlock the host

4.11.7.1 Protocol version

>=1.2

4.11.7.2 Request

Set whether to lock the host

```
message ReqsetMasterLock {
   bool lock = 1;
}
```

4.11.7.3 Response

ComResponse

4.12 RGB function

4.12.1 CMD instruction

CMD	Value	Explanation
CMD_RGB_POWER_OPEN_RGB	13500	Turn on the ring light
CMD_RGB_POWER_CLOSE_RGB	13501	Turn off the ring light
CMD_RGB_POWER_POWER_DOWN	13502	Shut down
CMD_RGB_POWER_POWERIND_ON	13503	Turn on the battery indicator
CMD_RGB_POWER_POWERIND_OFF	13504	Turn off battery indicator
CMD_RGB_POWER_REBOOT	13505	Restart

4.12.2 All error codes

Error code	Value	Explanation
CODE_RGB_POWER_UART_INIT_FAILED	13800	Serial port Initialization failed

4.12.3 Turn on the ring light

4.12.3.1 Request

```
message ReqOpenRgb {
}
```

4.12.3.2 Response

ComResponse

4.12.4 Turn off the ring light

4.12.4.1 Request

```
message ReqCloseRgb{
}
```

4.12.4.2 Response

ComResponse

4.12.5 Turn on the battery indicator

4.12.5.1 Request

```
message ReqOpenPowerInd{
}
```

4.12.5.2 Response

ComResponse

4.12.6 Turn off battery indicator

4.12.6.1 Request

```
message ReqClosePowerInd{
}
```

4.12.6.2 Response

ComResponse

4.12.7 Shut down

4.12.7.1 Request

message ReqPowerDown {

}

4.12.7.2 Response

ComResponse

4.12.8 Restart

4.12.8.1 Request

message ReqReboot {

}

4.12.8.2 Response

ComResponse

4.13 Motion control function

4.13.1 CMD instruction

CMD	Value	Explanation
CMD_STEP_MOTOR_RUN	14000	Motor motion
CMD_STEP_MOTOR_STOP	14002	Motor stop
CMD_STEP_MOTOR_SERVICE_JOYSTICK	14006	Joystick
CMD_STEP_MOTOR_SERVICE_JOYSTICK_FIXED_ANGLE	14007	Short press the arrow keys with the joystick
CMD_STEP_MOTOR_SERVICE_JOYSTICK_STOP	14008	Stop joystick
CMD_STEP_MOTOR_SERVICE_DUAL_CAMERA_LINKAGE	14009	Dual camera linkage

4.13.2 All error codes

Error code	Value	Explanation
WS _ INVAID _ PARAM	-3	Invalid parameter

4.13.3 Motor motion

4.13.3.1 Error code

Error code	Value	Explanation
WS _ INVAID _ PARAM	-3	Invalid parameter

4.13.3.2 Request

Codeblock

```
message ReqMotorRun {
  Int32 id =   1; // 1  : Rotation axis   2:   Pitch axis
  Double speed = 2;     //     5 gears: 0.1, 1, 5, 10, 30 degrees/s, supports ma
  Bool direction = 3;     //     0: left/down 1: right/up
  INT32 speed_ramping = 4;     //     Acceleration and deceleration: 0-1000, 100
  INT32 resolution_level = 5;
  //     Subdivision:
  // 0: 256 Subdivision
  // 1: 128 Subdivision
  // 2: 64 Subdivision
  // 3: 32 Subdivision
  // 4: 16 Subdivision
  // 5: 8 Subdivision
  // 6: 4 Subdivision
  // 7: 2 Subdivision
  // 8: 1 Subdivision
}
```

4.13.3.3 Response

message ResMotor {

int32 id = 1;

int32 code = 2;

}

4.13.4 Motor stop

4.13.4.1 Error code

No

4.13.4.2 Request

message ReqMotorStop {

Int32 id = 1;//0: Rotation axis 1: Pitch axis

}

4.13.4.3 Response

message ResMotor {

int32 id = 1;

int32 code = 2;

}

4.13.5 Joystick

4.13.5.1 Error code

Error code	Value	Explanation
WS _ INVAID _ PARAM	-3	Invalid parameter

4.13.5.2 Request

message ReqMotorServiceJoystick {

Double vector_angle = 1;//The angle of the direction vector, indicating the direction of motion of the field of view, 0-360 degrees, 0 degrees starting from the positive x-axis and increasing counterclockwise

Double vector_length = 2;//The length of the direction vector represents the scaling factor of the speed, 0-1, and the speed is finely adjusted according to the range of the joystick drag

Double speed = 3;//speed along the direction vector, 0.1 °/s-30 °/s

}

Speed mapping relationship :

Index is gear: 0-40

Codeblock

```
val b = 0.1
val a = (30 - 0.1) / 40.0.pow(3.0)
val speed = a * index.toDouble().pow(3.0) + b
```

4.13.5.3 Response

ComResponse

4.13.6 Short press the arrow keys with the joystick

4.13.6.1 Error code

Error code	Value	Explanation
WS _ INVAID _ PARAM	-3	Invalid parameter

4.13.6.2 Request

message ReqMotorServiceJoystickFixedAngle {

double vector_angle = 1;

double vector_length = 2;

double speed = 3;

}

4.13.6.3 Response

ComResponse

4.13.7 Stop joystick

4.13.7.1 Error code

No

4.13.7.2 Request

message ReqMotorServiceJoystickStop {

}

4.13.7.3 Response

ComResponse

4.13.8 Dual camera linkage

Error code	Value	Explanation
WS _ INVAID _ PARAM	-3	Invalid parameter
CODE_STEP_MOTOR_LIMIT_POSITION_HITTED	-14519	Collision limit

4.13.8.1 Request

message ReqDualCameraLinkage {

int32 x = 1;

int32 y = 2;

}

4.13.8.2 Response

ComResponse

4.14 Tracking function

4.14.1 CMD instruction

CMD	Value	Explanation
CMD_TRACK_START_TRACK	14800	Started tracking
CMD_TRACK_STOP_TRACK	14801	Stop tracking
CMD_SENTRY_MODE_START	14802	Start Sentinel Mode (Pack
CMD_SENTRY_MODE_STOP	14803	Stop Sentinel Mode
CMD_MOT_START	14804	Start "Multi-Object Tracking" feature
CMD_MOT_TRACK_ONE	14805	Telephoto: "Multi-Object Tracking" starts tracking a target (the firmware will return an identification box and ID, and track the target according to the user's click confirmation)
CMD_UFOTRACK_MODE_START	14806	Start sentinel UFO mode
CMD_UFOTRACK_MODE_STOP	14807	Stop Sentinel UFO Mode
CMD_MOT_WIDE_TRACK_ONE	14808	Wide-angle: "Multi-Object Tracking" starts tracking a specific target (firmware will return an identification box and ID, confirm tracking target based on user clicks)
CMD_WIDE_TELE_TRACK_SWITCH	14809	Object Detection with 30 classes for post-production non-sentinel mode. Choose between wide-angle and telephoto tracking button instructions
CMD_UFO_HAND_AOTO_MODE	14810	Used for post-UFO mode selection manual or automatic

4.14.2 All error codes

CMD	Value	Explanation
WS_PARSE_PROTOBUF_ERROR	1	Parsing failed
CODE_TRACK_TRACKER_INITING	14900	Tracking is initializing
CODE_TRACK_TRACKER_FAILED	14901	Trace failed

4.14.3 Started tracking

4.14.3.1 Request

Codeblock

```
message ReqStartTrack {
    int32 x = 1;    // x-coordinate of the top-left corner of the target box
    int32 y = 2;    // y-coordinate of the top-left corner of the target box
    int32 w = 3;    // Width of the target box
    int32 h = 4;    // Height of the target box
}

```

4.14.3.2 Response

Codeblock

```
message ComResponse {
    int32 code = 1;
}
```

4.14.4 Stop tracking

4.14.4.1 Request

Codeblock

```
message ReqStopTrack {
}
```

4.14.4.2 Response

Codeblock

```
message ComResponse {
    int32 code = 1;
}
```

4.14.5 Start Sentinel Mode

Protocol version 1.3 and above

4.14.5.1 Request

Codeblock

```
message ReqStartSentryMode {
    int32 mode = 1;  // 预留字段，现在可传0
}
```

4.14.5.2 Response

Codeblock

```
message ComResponse {
    int32 code = 1;
}
```

4.14.6 Stop Sentinel Mode

4.14.6.1 Request

Codeblock

```
message ReqStopSentryMode {
}
```

4.14.6.2 Response

Codeblock

```
message ComResponse {
    int32 code = 1;
}
```

4.14.7 Start "Multi-Object Tracking"

4.14.8 "Multi-Object Tracking" feature starts tracking a target

Codeblock

```
message ReqMOTTrackOne {
    int32 id = 1;
}
```

4.14.9 Start "UFO Tracking"

Protocol version 1.5 and above

4.14.9.1 Start UFO mode (to reuse Sentinel mode)

Codeblock

```

message ReqStartSentryMode {
    int32 mode = 1;
}
```

4.14.9.2 Stop UFO mode (to reuse Sentinel mode)

Codeblock

```
1
2  message ReqStopSentryMode {
3  }
```

4.15 Panoramic function

4.15.1 CMD instruction

CMD	Value	Explanation
CMD_PANORAMA_START_GRID	15500	Start panorama
CMD_PANORAMA_STOP	15501	Stop panorama

4.15.2 All error codes

CMD	Value	Explanation
CODE_PANORAMA_PHOTO_FAILED	15600	Panoramic shooting failed
CODE_PANORAMA_MOTOR_RESET_FAILED	15601	Panoramic shooting motor reset failed

4.15.3 Request

Codeblock

```
1  message ReqStartPanoramaByGrid{
2      uint32 rows = 1;
3      uint32 cols = 2;
4  }
```

4.16 Notification function

4.16.1 CMD instruction

CMD	Value	Explanation
CMD_NOTIFY_TELE_WIDI_PICTURE_MATCHING	15200	Telephoto wide-angle image matching
CMD_NOTIFY_ELE	15201	Battery Notification
CMD_NOTIFY_CHARGE	15202	Charge status notification
CMD_NOTIFY_SDCARD_INFO	15203	SD card capacity notification
CMD_NOTIFY_TELE_RECORD_TIME	15204	Recording time
CMD_NOTIFY_TELE_TIMELAPSE_OUT_TIME	15205	Telephoto time-lapse photography time
CMD_NOTIFY_STATE_CAPTURE_RAW_DARK	15206	Dark field shooting state
CMD_NOTIFY_PROGRASS_CAPTURE_RAW_DARK	15207	Dark field shooting progress
CMD_NOTIFY_STATE_CAPTURE_RAW_LIVE_STACKING	15208	Astronomical overlay shooting status
CMD_NOTIFY_PROGRASS_CAPTURE_RAW_LIVE_STACKING	15209	Astronomical overlay shooting progress
CMD_NOTIFY_STATE_ASTRO_CALIBRATION	15210	Astronomical calibration status
CMD_NOTIFY_STATE_ASTRO_GOTO	15211	Astronomical GOTO status
CMD_NOTIFY_STATE_ASTRO_TRACKING	15212	Astronomical tracking status
CMD_NOTIFY_TELE_SET_PARAM	15213	Telephoto parameter echo
CMD_NOTIFY_WIDE_SET_PARAM	15214	Wide-angle parametric echo
CMD_NOTIFY_TELE_FUNCTION_STATE	15215	Telephoto functional status
CMD_NOTIFY_WIDE_FUNCTION_STATE	15216	Wide-angle functional status
CMD_NOTIFY_SET_FEATURE_PARAM	15217	Feature parameter echo
CMD_NOTIFY_TELE_BURST_PROGRESS	15218	Telephoto continuous shooting progress
CMD_NOTIFY_PANORAMA_PROGRESS	15219	Telephoto panoramic shooting progress
CMD_NOTIFY_WIDE_BURST_PROGRESS	15220	Wide-angle continuous shooting progress
CMD_NOTIFY_RGB_STATE	15221	RGB Ring Light Status
CMD_NOTIFY_POWER_IND_STATE	15222	Power indicator status
CMD_NOTIFY_WS_HOST_SLAVE_MODE	15223	Leader/follower mode notification
CMD_NOTIFY_MTP_STATE	15224	MTP mode notification
CMD_NOTIFY_TRACK_RESULT	15225	Tracking result notification
CMD_NOTIFY_WIDE_TIMELAPSE_OUT_TIME	15226	Wide-angle time-lapse photography time
CMD_NOTIFY_CPU_MODE	15227	CPU mode
CMD_NOTIFY_STATE_ASTRO_TRACKING_SPECIAL	15228	Sun and moon tracking status
CMD_NOTIFY_POWER_OFF	15229	Shutdown notification
CMD_NOTIFY_ALBUM_UPDATE	15230	Album update notification
CMD_NOTIFY_SENTRY_MODE_STATE	15231	Sentinel mode status
CMD_NOTIFY_SENTRY_MODE_TRACK_RESULT	15232	Sentinel mode tracking box result notification
CMD_NOTIFY_STATE_ASTRO_ONE_CLICK_GOTO	15233	One-click GOTO status

CMD_NOTIFY_STREAM_TYPE	15234	Image type notification
CMD_NOTIFY_WIDE_RECORD_TIME	15235	Wide-angle video recording time
CMD_NOTIFY_STATE_WIDE_CAPTURE_RAW_LIVE_STACKING	15236	Wide-angle astronomical overlay shooting status
CMD_NOTIFY_PROGRASS_WIDE_CAPTURE_RAW_LIVE_STACKING	15237	Progress of wide-angle astronomical overlay photography
CMD_NOTIFY_MULTI_TRACK_RESULT	15238	Multi-Object Tracking Result Notification
CMD_NOTIFY_EQ_SOLVING_STATE	15239	EQ check status
CMD_NOTIFY_UFO_MODE_STATE	15240	Sentinel-UFO Mode Status
CMD_NOTIFY_TELE_LONG_EXP_PROGRESS	15241	Telephoto long exposure progress
CMD_NOTIFY_WIDE_LONG_EXP_PROGRESS	15242	Wide-angle long exposure progress
CMD_NOTIFY_TEMPERATURE	15243	Movement temperature
CMD_NOTIFY_PANORAMA_UPLOAD_COMPRESS_PROGRESS	15244	
CMD_NOTIFY_PANORAMA_UPLOAD_UPLOAD_PROGRESS	15245	
CMD_NOTIFY_PANORAMA_UPLOAD_COMPLETE	15245	
CMD_NOTIFY_STATE_CAPTURE_WIDE_RAW_DARK	15247	Wide-angle dark field shooting state
CMD_NOTIFY_SHOOTING_SCHEDULE_RESULT_AND_STATE	15248	
CMD_NOTIFY_SHOOTING_TASK_STATE	15249	
CMD_NOTIFY_SKY_SEACHER_STATE	15250	Sky detection status
CMD_NOTIFY_WIDE_MULTI_TRACK_RESULT	15251	Wide-angle multi-target box result notification
CMD_NOTIFY_WIDE_TRACK_RESULT	15252	Wide-angle single target box result notification

4.16.2 All status codes

Status code	Value	Explanation
STATE_IDLE	0	Idle state
STATE_RUNNING	1	Running
STATE_STOPPING	2	Is stopping
STATE_STOPPED	3	Has stopped
STATE_SUCCESS	4	Success
STATE_FAILED	5	Failure
STATE_ASTRO_PLATE_SOLVING	6	Astronomy is Plating Solving

4.16.3 Telephoto wide-angle image matching

4.16.3.1 Notification

```
message ResNotifyPictureMatching {
Uint32 x;//Coordinate x in the upper left corner of the matching box.
Uint32 y;//Coordinate y in the upper left corner of the matching box
Uint32 width;//Match box width
Uint32 height;//Match box height
Double value;//match value
   int32 code;
}
```

4.16.4 Electricity

4.16.4.1 Notification

```
message ComResWithInt {
Int32 value = 1;//battery value
}
```

4.16.5 State of charge

4.16.5.1 Notification

```
message ComResWithInt {
Int32 value = 1;//Charging status 0: not charged 1: slow charging 2: fast charging
}
```

4.16.6 Ring light status

4.16.6.1 Notification

```
message ResNotifyRgbState {
Int32 state = 1;//0: off 1: on
}
```

4.16.7 Power indicator status

4.16.7.1 Notification

```
message ResNotifyPowerIndState {
Int32 state = 1;//0: off 1: on
}
```

4.16.8 SD card capacity

4.16.8.1 Notification

```
message ResNotifySDcardInfo {
UINT32 available_size = 1;//Available space, unit: GB
```

```
UINT32 total_size = 2;//Total space, unit: GB
    int32 code = 3;
}
```

4.16.9 Recording time

4.16.9.1 Notification

```
message ResNotifyRecordTime {
INT32 record_time = 1;//Recording time, unit: s
}
```

4.16.10 Time-lapse photography time

4.16.10.1 Notification

```
message ResNotifyTimeLapseOutTime {
Int32 interval = 1;//Interval time, unit: s
INT32 out_time = 2;//Film time, unit: s
INT32 total_time = 3;//Recording time, unit: s
}
out_time = total_time / (30.0 * Interval);
```

Parameter	Type	Explanation
interval	int32	Interval time
out_time	int32	When the film is finished
total_time	int32	Recording time

4.16.11 Continuous shooting progress

```
message ResNotifyBurstProgress {
UINT32 total_count = 1;//Total number of continuous shots
UINT32 completed_count = 2;//Number of photos taken
}
```

4.16.12 Dark field shooting state

4.16.12.1 Status code

Status code	Value	Explanation
STATE_IDLE	0	Idle state
STATE_RUNNING	1	Running
STATE_STOPPING	2	Is stopping
STATE_STOPPED	3	Has stopped

4.16.12.2 Notification

```
enum OperationState {
    OPERATION_STATE_IDLE = 0;
    OPERATION_STATE_RUNNING = 1;
    OPERATION_STATE_STOPPING = 2;
    OPERATION_STATE_STOPPED = 3;
}
message ResNotifyOperationState {
    OperationState state = 1;
}
```

Parameter	Type	Explanation
state	OperationState	Running status: OPERATION_STATE_IDLE = 0; OPERATION_STATE_RUNNING = 1; OPERATION_STATE_STOPPING = 2; OPERATION_STATE_STOPPED = 3;

4.16.13 Dark field shooting progress

4.16.13.1 Notification

```
message ResNotifyProgressCaptureRawDark {
    int32 progress = 1;
    int32 remaining_time = 2;
}
```

Parameter	Type	Explanation
progress	int32	Shooting progress
remaining_time	int32	Remaining time (seconds)

4.16.14 Astronomical overlay shooting status

4.16.14.1 Status code

Status code	Value	Explanation
STATE_IDLE	0	Idle state
STATE_RUNNING	1	Running

STATE_STOPPING	2	Is stopping
STATE_STOPPED	3	Has stopped

4.16.14.2 Notification

```
enum OperationState {
  OPERATION_STATE_IDLE = 0;
  OPERATION_STATE_RUNNING = 1;
  OPERATION_STATE_STOPPING = 2;
  OPERATION_STATE_STOPPED = 3;
}
message ResNotifyOperationState {
  OperationState state = 1;
}
```

Parameter	Type	Explanation
state	OperationState	Running status: OPERATION_STATE_IDLE = 0; OPERATION_STATE_RUNNING = 1; OPERATION_STATE_STOPPING = 2; OPERATION_STATE_STOPPED = 3;

4.16.15 Astronomical overlay shooting progress

4.16.15.1 Notification

```
message ResNotifyProgressCaptureRawLiveStacking {
  int32 total_count = 1;
  int32 update_count_type = 2;
  int32 current_count = 3;
  int32 stacked_count = 4;
  int32 exp_index = 5;
  int32 gain_index = 6;
  string target_name = 7;
}
```

Parameter	Type	Explanation
total_count	int32	Total number of sheets
update_count_type	int32	0: Update the number of photos taken 1: Update the number of stacked sheets 2: Simultaneously update the number of photos taken and the number of photos stacked
current_count	int32	Number of shots taken
stacked_count	int32	Number of stacked sheets
exp_index	int32	Current exposure index: Used for front-end display of current shooting parameters
gain_index	int32	Current gain index: Used for front-end display of current shooting parameters
target_name	string	Target name

4.16.16 Astronomical calibration status

4.16.16.1 Status code

Status code	Value	Explanation
STATE_IDLE	0	Idle state
STATE_RUNNING	1	Running
STATE_STOPPING	2	Is stopping
STATE_STOPPED	3	Has stopped
STATE_ASTRO_PLATE_SOLVING	4	Astronomy is Plating Solving

4.16.16.2 Notification

```
enum AstroState {
  ASTRO_STATE_IDLE = 0;
  ASTRO_STATE_RUNNING = 1;
  ASTRO_STATE_STOPPING = 2;
  ASTRO_STATE_STOPPED = 3;
  ASTRO_STATE_PLATE_SOLVING = 4;
}
message ResNotifyStateAstroCalibration {
  AstroCalibrateState state = 1;
  int32 plate_solving_times = 2;
}
```

Parameter	Type	Explanation
state	AstroState	Astronomical status code: ASTRO_STATE_IDLE = 0; ASTRO_STATE_RUNNING = 1; ASTRO_STATE_STOPPING = 2;

		ASTRO_STATE_STOPPED = 3; ASTRO_STATE_PLATE_SOLVING = 4;
plate_solving_times	int32	When in the Plate Solving state, the number of times is attached to indicate the number of calculations

4.16.17 Astronomical GOTO status

4.16.17.1 Status code

Status code	Value	Explanation
STATE_IDLE	0	Idle state
STATE_RUNNING	1	Running
STATE_STOPPING	2	Is stopping
STATE_STOPPED	3	Has stopped
STATE_ASTRO_PLATE_SOLVING	4	Astronomy is Plating Solving

4.16.17.2 Notification

```
enum AstroState {
  ASTRO_STATE_IDLE = 0;
  ASTRO_STATE_RUNNING = 1;
  ASTRO_STATE_STOPPING = 2;
  ASTRO_STATE_STOPPED = 3;
  ASTRO_STATE_PLATE_SOLVING = 4;
}
message ResNotifyStateAstroGoto {
  AstroGotoState state = 1;
}
```

Parameter	Type	Explanation
state	AstroState	Astronomical status code: ASTRO_STATE_IDLE = 0; ASTRO_STATE_RUNNING = 1; ASTRO_STATE_STOPPING = 2; ASTRO_STATE_STOPPED = 3; ASTRO_STATE_PLATE_SOLVING = 4;

4.16.18 Astronomical tracking status

4.16.18.1 Status code

Status code	Value	Explanation
STATE_IDLE	0	Idle state
STATE_RUNNING	1	Running
STATE_STOPPING	2	Is stopping
STATE_STOPPED	3	Has stopped

4.16.18.2 Notification

```
enum OperationState {
  OPERATION_STATE_IDLE = 0;
  OPERATION_STATE_RUNNING = 1;
  OPERATION_STATE_STOPPING = 2;
  OPERATION_STATE_STOPPED = 3;
}
message ResNotifyStateAstroTracking {
  OperationState state = 1;
  string target_name = 2;
}
```

Parameter	Type	Explanation
state	OperationState	Running status: OPERATION_STATE_IDLE = 0; OPERATION_STATE_RUNNING = 1; OPERATION_STATE_STOPPING = 2; OPERATION_STATE_STOPPED = 3;
target_name	string	Tracking target name

4.16.19 Sun and moon tracking status

4.16.19.1 Status code

Status code	Value	Explanation
STATE_IDLE	0	Idle state
STATE_RUNNING	1	Running
STATE_STOPPING	2	Is stopping
STATE_STOPPED	3	Has stopped

4.16.19.2 Notification

```
enum OperationState {
    OPERATION_STATE_IDLE = 0;
    OPERATION_STATE_RUNNING = 1;
    OPERATION_STATE_STOPPING = 2;
    OPERATION_STATE_STOPPED = 3;
}
message ResNotifyStateAstroTrackingSpecial {
    OperationState state = 1;
    string target_name = 2;
    int32 index = 3;
}
```

Parameter	Type	Explanation
state	OperationState	Running status: OPERATION_STATE_IDLE = 0; OPERATION_STATE_RUNNING = 1; OPERATION_STATE_STOPPING = 2; OPERATION_STATE_STOPPED = 3;
target_name	string	Tracking target name
index	int32	Sun and Moon Numbering: Sun: 0 Moon: 1

4.16.20 Parametric echo

4.16.20.1 Notification

message CommonParam {

bool hasAuto = 1;

int32 auto_mode = 2;

int32 id = 3;

int32 mode_index = 4;

int32 index = 5;

double continue_value = 6;

}

Parameter echo

message ResNotifyParam {

repeated CommonParam param = 1;

}

Parameter	Type	Explanation
has_auto	bool	Is there an automatic mode
auto_mode	int32	0: Automatic 1: Manual
id	int32	See parameter configuration file
mode_index	int32	See parameter configuration file
index	int32	See parameter configuration file
continue_value	double	See parameter configuration file

4.16.21 Camera function status

4.16.21.1 Function id

Function	id
Turn on/off camera	1
Ordinary photography	2
Ordinary continuous shooting	3
Video recording	4
Time-lapse photography	5
Panorama	6
Ordinary tracking	7
Astronomical autofocus	8
Normal autofocus	9
Astronomical autofocus (fast)	10
Area autofocus	11
Dual camera linkage	12

4.16.21.2 Notification

message ResNotifyCamFunctionState {

OperationState state = 1;

uint32 function_id = 2;

}

4.16.22 Panoramic shooting progress

message ResNotifyPanoramaProgress {

int32 total_count = 1;

int32 completed_count = 2;

}

Parameter	Type	Explanation
total_count	int32	Total number of shots
completed_count	int32	Number of shots taken

4.16.23 Websocket leader/follower mode notification

message ResNotifyHostSlaveMode {

int32 mode = 1;

}

Parameter	Type	Explanation
mode	int32	0: Host 1: Slave

4.16.24 MTP mode notification

message ResNotifyMTPState {

int32 mode = 1;

}

Parameter	Type	Explanation
mode	int32	0: MTP off 1: MTP on

4.16.25 Tracking result notification

Codeblock

```
message ResNotifyTrackResult {
    int32 x = 1;
    int32 y = 2;
    int32 w = 3;
    int32 h = 4;
}
```

Parameter	Type	Explanation
x	int32	The x-coordinate of the upper left point of the tracking result box
y	int32	The y coordinate of the upper left point of the tracking result box
w	int32	Track the width of the result box
h	int32	Track the length of the result box

4.16.26 CPU mode notification

message ResNotifyCPUMode {

int32 mode = 1;

}

Parameter	Type	Explanation
mode	int32	0: Normal Mode 1: Performance Mode

4.16.27 Shutdown notification

//shutdown notification

message ResNotifyPowerOff {

}

4.16.28 Album update notification

Codeblock

```
message ResNotifyAlbumUpdate {
    int32 media_type = 1;
}

media_type和相册http接口里面的定义一致。
```

4.16.29 Sentinel mode state (UFO to reuse this state)

4.16.29.1 Status code

Status code	Value	Explanation
SENTRY_MODE_STATE_IDLE	0	Idle state [including UFO]
SENTRY_MODE_STATE_INIT	1	Initialization status, motor reset [including UFO]
SENTRY_MODE_STATE_DETECT	2	Detecting targets in [including UFO]
SENTRY_MODE_STATE_TRACK	3	Tracking targets [including UFOs]
SENTRY_MODE_STATE_TRACK_FINISH	4	Tracking completed (including video completion) [including UFO]

SENTRY_MODE_STATE_STOPPING	5	Stopping (after clicking stop, because the video is stored, it takes about 2 seconds to stop completely) [including UFO]

4.16.29.2 Notification (UFO to reuse)

```
enum SentryModeState {
  SENTRY_MODE_STATE_IDLE = 0;
  SENTRY_MODE_STATE_INIT = 1;
  SENTRY_MODE_STATE_DETECT = 2;
  SENTRY_MODE_STATE_TRACK = 3;
  SENTRY_MODE_STATE_TRACK_FINISH = 4;
  SENTRY_MODE_STATE_STOPPING = 5;
};
message ResNotifyStateSentryMode {
  SentryModeState state = 1;
}
```

Parameter	Type	Explanation
state	SentryModeState	SENTRY_MODE_STATE_IDLE = 0; SENTRY_MODE_STATE_INIT = 1; SENTRY_MODE_STATE_DETECT = 2; SENTRY_MODE_STATE_TRACK = 3; SENTRY_MODE_STATE_TRACK_FINISH = 4; SENTRY_MODE_STATE_STOPPING = 5;

4.16.30 Sentinel mode tracking box result notification

Codeblock

```
message ResNotifyTrackResult {
    int32 x = 1;
    int32 y = 2;
    int32 w = 3;
    int32 h = 4;
}
```

Parameter	Type	Explanation
x	int32	The x-coordinate of the upper left point of the tracking result box
y	int32	The y coordinate of the upper left point of the tracking result box
w	int32	Track the width of the result box
h	int32	Track the length of the result box

4.16.31 One-click GOTO status notification (supported since protocol version 1.4)

4.16.31.1 Status code

Status code	Value	Explanation
STATE_IDLE	0	Idle state
STATE_RUNNING	1	Running
STATE_STOPPING	2	Is stopping
STATE_STOPPED	3	Has stopped

4.16.31.2 Notification

Codeblock

```
enum OperationState {
    OPERATION_STATE_IDLE = 0;
    OPERATION_STATE_RUNNING = 1;
    OPERATION_STATE_STOPPING = 2;
    OPERATION_STATE_STOPPED = 3;
}
message ResNotifyOneClickGotoState {
    OperationState state = 1;
}
```

Parameter	Type	Explanation
state	OperationState	Running status: OPERATION_STATE_IDLE = 0; OPERATION_STATE_RUNNING = 1; OPERATION_STATE_STOPPING = 2; OPERATION_STATE_STOPPED = 3;

4.16.32 Image type notification

When the exposure time is greater than or equal to 1s, switch to jpg image transmission and notify the App that the current image transmission type is jpg.

When the exposure time is less than 1s, switch to rtsp image transmission and notify the App that the current image transmission type is rtsp.

Codeblock

```
message ResNotifyStreamType {
    int32 stream_type = 1;
    int32 cam_id = 2;
}
```

Parameter	Type	Explanation
stream_type	int32	1：RTSP 2：JPEG
cam_id	int32	0: Telephoto 1: Wide angle

4.16.33 Wide-angle astronomical overlay shooting status

4.16.33.1 Status code

Status code	Value	Explanation
STATE_IDLE	0	Idle state
STATE_RUNNING	1	Running
STATE_STOPPING	2	Is stopping
STATE_STOPPED	3	Has stopped

4.16.33.2 Notification

Codeblock

```
enum OperationState {
    OPERATION_STATE_IDLE = 0;
    OPERATION_STATE_RUNNING = 1;
    OPERATION_STATE_STOPPING = 2;
    OPERATION_STATE_STOPPED = 3;
}
message ResNotifyOperationState {
    OperationState state = 1;
}
```

Parameter	Type	Explanation
state	OperationState	Running status: OPERATION_STATE_IDLE = 0; OPERATION_STATE_RUNNING = 1; OPERATION_STATE_STOPPING = 2; OPERATION_STATE_STOPPED = 3;

4.16.34 Progress of wide-angle astronomical overlay photography

4.16.34.1 Notification

Codeblock

```
message ResNotifyProgressCaptureRawLiveStacking {
    int32 total_count = 1;
    int32 update_count_type = 2;
    int32 current_count = 3;
    int32 stacked_count = 4;
    int32 exp_index = 5;
    int32 gain_index = 6;
    string target_name = 7;
}
```

Parameter	Type	Explanation
total_count	int32	Total number of sheets
update_count_type	int32	0: Update the number of photos taken 1: Update the number of stacked sheets 2: Simultaneously update the number of photos taken and the number of photos stacked
current_count	int32	Number of shots taken
stacked_count	int32	Number of stacked sheets
exp_index	int32	Current exposure index: Used for front-end display of current shooting parameters
gain_index	int32	Current gain index: Used for front-end display of current shooting parameters
target_name	string	Target name

4.16.35 Multi-Object Tracking Result Notification

Codeblock

```
message ResNotifyTrackResult {
    int32 x = 1;
    int32 y = 2;
    int32 w = 3;
    int32 h = 4;
    int32 id = 5;
}
message ResNotifyMultiTrackResult {
    repeated ResNotifyTrackResult results = 1;
}
```

Parameter	Type	Explanation

x	int32	The x-coordinate of the upper left point of the tracking result box
y	int32	The y coordinate of the upper left point of the tracking result box
w	int32	Track the width of the result box
h	int32	Track the length of the result box
id	int32	ID of the current frame

4.16.36 EQ verification status notification (supported since protocol version 1.5)

4.16.36.1 Status code

Status code	Value	Explanation
STATE_IDLE	0	Idle state
STATE_RUNNING	1	Running
STATE_STOPPING	2	Is stopping
STATE_STOPPED	3	Has stopped

4.16.36.2 Notification

Codeblock

```
enum OperationState {
    OPERATION_STATE_IDLE = 0;
    OPERATION_STATE_RUNNING = 1;
    OPERATION_STATE_STOPPING = 2;
    OPERATION_STATE_STOPPED = 3;
}
message ResNotifyEqSolvingState {
    enum Action {
        UNSPECIFIED = 0;
        FOCUS = 1;
        SOLVING = 2;
    }
    Action step = 1;
    OperationState state = 2;
}
```

Parameter	Type	Explanation
state	OperationState	Running status: OPERATION_STATE_IDLE = 0; OPERATION_STATE_RUNNING = 1; OPERATION_STATE_STOPPING = 2; OPERATION_STATE_STOPPED = 3;

4.16.37 Long Exposure Shooting Progress Bar

4.16.37.1 Notification

Codeblock

```

message ResNotifyLongExpPhotoProgress {
    uint32 function_id = 1;
    double total_time = 2;
    double exposured_time = 3;
}
```

4.16.38 Movement temperature

4.16.38.1 Notification

```
message ResNotifyTemperature {
  int32 code = 1;
  int32 temperature = 2;
}
```

4.16.39 Sky Detection Status Notification

4.16.39.1 Notification

Codeblock

```
// 天空检测状态通知
message ResNotifySkySeacherState {
    OperationState state = 1;
}
```

5. access process

1. Get the working status.
2. Open the camera, telephoto and wide-angle.
3. Get parameter configuration.
4. HTTP image transmission.