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This instruction manual is the main reference document for the use and operation of BS-IC21-1yx-D6EC and is mainly prepared in accordance with the Technical Agreement of BS-IC21-1yx-D6EC MEMS Inertial Measurement Unit and the Technical Conditions of KTJT-001 Inertial Measurement Unit and Triaxial Gyro Combination.

BS-IC21-1yx-D6EC series inertial measurement unit can change the measurement accuracy and measurement range of the inertial sensor according to the user's requirements.



1 Product features and technical parameters

1.1 Composition and function

The MEMS inertial measurement unit consists of a three-axis gyroscope, a three-axis acceleration meter, a three-axis inclination angle, a temperature sensor, a signal processing board, a structure and necessary software, and is used for measuring three-axis angular rate, three-axis acceleration and three-axis inclination angle of a carrier. And output that gyro, the loading table and the inclination data aft error compensation (including temperature compensation, installation misalignment angle compensation, nonlinear compensation and the like) through an RS-422 serial port according to an agreed communication protocol.

All models available:

1.2 Main technical parameters

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BS-IC21-11-D6EC BS-IC21-1A1-D6EC BS-IC21-12-D6EC BS-IC21-1A2-D6EC

1.2.1 Gyroscope specifications

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Measuring range (customizable) %	
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Clos smooth, 1σ, room temperature) 1	
Temperature Temperature Temperature Temperature range Temperature range	
Zero-bias error over full temperature range	
Temperature range	
Random walk	
Zero-bias repeatability 0/h 10 5 Zero bias acceleration sensitivity 0/h/g 1 1 Resolution 0/h 2 1 Scale factor nonlinearity ppm 500 Scale factor repeatability ppm 500 Cross coupling 0/4 0.1 Bandwidth Hz 125 1.2.2 Add table technical indicators	
Zero bias acceleration sensitivity \(^{\text{h/g}}\) 1	
Resolution °/h 2 1	
Scale factor nonlinearity ppm 500 Scale factor repeatability ppm 500 Cross coupling % 0.1 Bandwidth Hz 125 1.2.2 Add table technical indicators Parameter Unit IBS-IC21-1y-1 BS-IC2 Measuring range (customizable) g ±10 (80g optional) ±30 (80g Zero-bias stability (Allan Variance @ mg 0.02 0.0 25 °C) Zero-bias stability (1s smoothing) mg 0.1 0.5 Zero-bias stability (10 s smoothing) mg 0.05 0.2	
Scale factor repeatability ppm 500 Cross coupling % 0.1 Bandwidth Hz 125 1.2.2 Add table technical indicators Parameter Unit IBS-IC21-1y-1 BS-IC2 Measuring range (customizable) g ±10 (80g optional) ±30 (80g. Zero-bias stability (Allan Variance @ mg 0.02 0.0 Zero-bias stability (1s smoothing) mg 0.1 0.5 Zero-bias stability (10 s smoothing) mg 0.05 0.2	
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mg 0.02 0.0 Zero-bias stability (1s smoothing) mg 0.1 0.5 Zero-bias stability (10 s smoothing) mg 0.05 0.2	optional)
Zero-bias stability (1s smoothing) mg 0.1 0.5 Zero-bias stability (10 s smoothing) mg 0.05 0.2	15
Zero-bias stability (10 s smoothing) mg 0.05 0.2	
Zero-bias error over full temperature mg 1 3	2
range	
Random walk $m/s/\sqrt{h}$ 0.001 0.00	
Zero-bias repeatability mg 0.1 0.5	5
Scale factor repeatability ppm 500	
Tracing Scale factor nonlinearity ppm 500	
Trace Bandwidth Hz 125	
ld base map	
Base map BS-IC21-1yx-D6EC EX2.9	

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Diskette 1.2.3 Tilt angle specification (not configured by default, optional) CAD **Parameter** Unit BS-IC21-1y-x ± 1.7 Measuring range (customizable) g Zero-bias stability (1s smoothing) 0.5 mg $m/s/\sqrt{h}$ 0.08 Random walk 100 Scale factor nonlinearity ppm Electrical characteristics BS-IC21-1y-x **Parameter** Unit Voltage V 5 Power consumption W 2 mV100 Ripple 1.2.5 Environmental adaptability Unit BS-IC21-1y-x Parameter $^{\circ}$ C -45~85 **Operating temperature** $^{\circ}$ C -55~105 Storage temperature 10~2000Hz, 6.06g Vibration **Impact** 1000g,0.1ms 1.2.6 Other **Parameter** Unit BS-IC21-1y-x Weight 55 ± 5 g Space coordinate system 2.1 Right Hand Rule Principle 1 The MEMS IMU contains three axial spatial coordinate systems, namely X, Y and Tracing Z. The X axis points to the direction of the electrical connection interface, the Y axis points to the left side of the IMU, and the Z axis point to the top surface of the IMU, as Trace shown in Figure 2-1. Old base map Base map BS-IC21-1yx-D6EC EX2.900.012SM

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Figure 2-1 IMU Space Coordinate System

The installation of IMU should be matched with the axial direction of the coordinate system, otherwise the measured angular velocity data will be inaccurate. The axis of the coordinate system can be quickly assigned and determined by following the "right-hand rule principle 1". Stretch out the right hand and spread out the thumb, index finger and middle finger respectively. The direction of the thumb is the X axis, the direction of the index finger is the Y axis, and the direction of the middle finger is the Z axis, as shown in Figure 2-2.

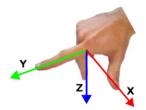


Figure 2-2 Right Hand Rule Principle 1

2.2 Right hand rule principle two

The three-degree-of-freedom gyroscope in the IMU can measure the angular velocity in three directions. The direction of the angular velocity of the axial rotation of the coordinate axis can be quickly determined by following the right-hand rule principle 2. Stretch out the right hand and spread out the thumb. The direction of the thumb is the axial direction, and the direction of the other four fingers is the angular velocity of the axial rotation of the thumb, as shown in Figure 2-3.



Figure 2-3 Right Hand Rule Principle 2

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3 Structural installation

See Figure 3-1 for outline drawing of BS-IC21-1yx-D6EC

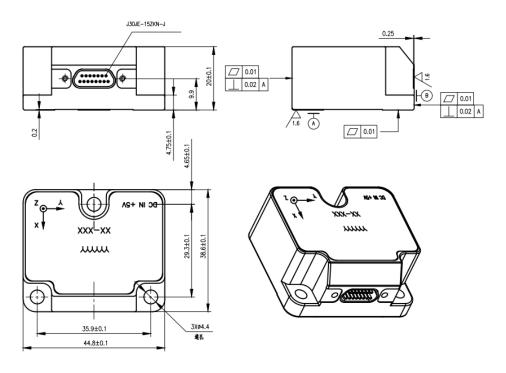


Fig. 3-1 Outline drawing of IMU

BS-IC21-1y-x is installed through 3 Φ 4.4 through holes, and installed with 3 M4 screws (with spring washer and flat washer). When installing the connector, the plug shall be locked with the socket and the cable shall be fixed. In the figure \bigcirc , A , \bigcirc , B Is the installation datum plane of the inertia group.

It is recommended that the flatness of the mounting surface opposite to the reference surface shall not be greater than 0.01 mm, the verticality shall not be greater than 0.02 mm, and the surface roughness shall not exceed 0.8 μ m.

4 Electrical characteristics

4.1 Electrical interface

T	racin	g
T	race	
01d	base	map

The electrical connector model of BS-IC21-1yx-D6EC is J30JE-15-ZKN-J. See Table

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4-1 and Figure 4-1 for the specific distribution of contacts.

Table 4-1 J30JE-15ZKN-J Contact Distribution

Contact number	Pin definition	Туре	Explain
1	TxD-	OUTPUT	Product RS422 output interface negative
			terminal
2	RxD-	INPUT	Product RS422 receiving interface negative
			terminal
4	TOV	OUTPUT	Sync Signal ⁽¹⁾
5	NRST	INPUT	Reset signal ⁽²⁾
8	VSUP	SUPPLY	Positive end of product power supply, DC
			regulated power supply
9	TxD+	OUTPUT	Product RS422 output interface positive
			terminal
10	RxD+	INPUT	Product RS422 receiving interface positive
			terminal
11	ExtTrig	INPUT	External Trigger Source ⁽³⁾
12、13、15	GND	SUPPLY	Product ground, power ground and serial port
			ground
3、6~7、14	Reserved by the	/	/
	manufacturer		

Notice

- (1) The synchronization signal needs to be specially configured according to the requirements. The default IMU does not have this configuration and needs to be suspended.
- (2) The reset signal needs to be specially configured as required. The default IMU does not have this configuration and needs to be suspended.
- (3) The external trigger source needs to be specially configured according to the requirements. The default inertia group does not have this configuration and needs to be suspended.

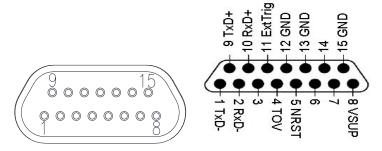


Fig. 4-1 Configuration Diagram of Connector Node (Seen from the Outside of the Product)

4.2 Electrical interface connections

The BS-IC21-1yx-D6EC is very simple to use. If no special additional functions are required, the IMU will send data through the RS422 communication interface protocol

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about 1 s after it is powered on. Figure 4-2 shows a simple interconnection diagram for the BS-IC21-1yx-D6EC.

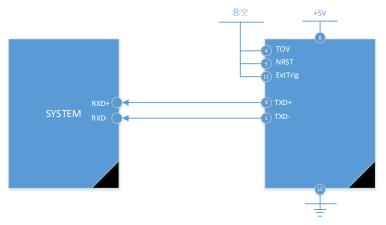


Fig. 4-2 Electrical connection 1 If all functions of BS-IC21-1yx-D6EC are to be used, interconnection wiring with IMU is required as shown in Figure 4-3.

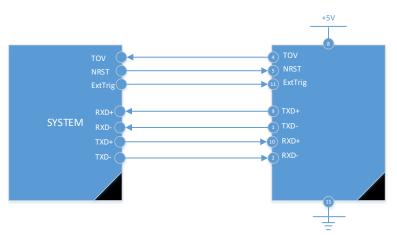


Figure 4-3 Electrical connection 2

4.3 Additional Function 1: Reset

The BS-IC21-1y-x has a separate digital input pin (NRST) that allows the BS-IC21-1y-x to be reset without re-powering up if the IMU has been configured for a particular configuration. The trigger mode of the NRST signal can be specially defined according to the requirements.

4.4 Additional function 2: external trigger

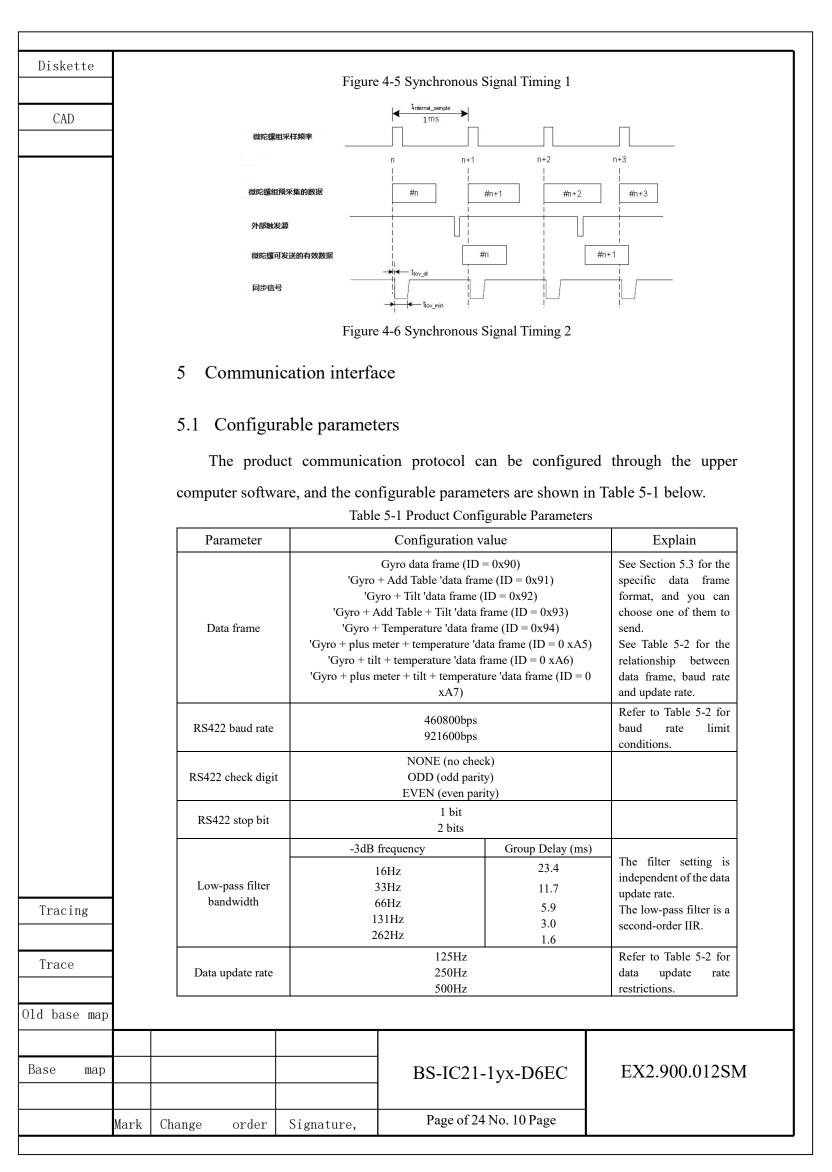
The BS-IC21-1y-xhas an independent digital input pin (ExtTrig). If the IMU has completed a specific configuration, when it receives an external trigger signal and generates an interrupt, it can send data through the RS422 communication interface protocol. The frequency of sending data is synchronized with the frequency of the ExtTrig signal. However, there are two special cases where sending data is not affected

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Diskette	hy an aytamal trigger course
	by an external trigger source:
CAD	a) In normal mode, send command 'C' to the IMU to test the RS422 interface. The
	IMU will transmit the configuration data stream independent of the external trigger
	source.
	b) In the power-on initialization state, the IMU sends the initialization state data
	without being affected by the external trigger source.
	Figure 4-4 is the timing diagram of the external trigger source sending data. The
	sampling frequency of the IMU is 1000Hz. The external trigger source shall not be
	higher than the sampling frequency. Latency is the trigger data sending delay.
	teternal_sample 1 ms
	微陀螺组采样频率
	n n+1 n+2 n+3 n+4 n+5
	微陀螺组预采集的数据 #n #n+1 #n+2 #n+3 #n+4 #n+5
	微陀螺組可发送的有效数据 #n-1 #n #n+1 #n+2 #n+3 #n+4
	外部軸发源
	微陀螺组发送的数据 #n #n+1 #n+4
	Latency Latency Latency
	Figure 4-4 External Trigger Timing Diagram
	4.5 Additional function 3: synchronization
	The BS-IC21-1y-x has an independent digital output pin (TOV). If the IMU is
	configured specifically, it can output a signal of a specific frequency and provide a
	synchronization signal. Figure 4-5 shows the synchronization timing diagram without
	the external trigger source. Figure 4-6 shows the synchronization timing diagram with
	the external trigger source. The sampling frequency is 1000 Hz.
	Ims Ims
	微陀螺组采样频率
	n n+1 n+2 n+3
	微陀镙组顶采集的数据 #n #n+1 #n+2 #n+3
Tracing	
11001116	微陀螺組可发送的有效数据 #n #n+2 #n+2
Trace	同步信号
old base map	
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iskette		1000Hz
	Restore factory	Restore factory settings
CAD	settings	Restore factory settings and save

It communicates with the processing circuit unit through the serial communication interface and adopts the RS-422 standard. Both the transmission baud rate and the data update rate can be configured by software. Table 5-2 shows the maximum data update rate corresponding to the transmission baud rate.

In the default state of the product, the communication protocol is: baud rate 921 600bps, 8 data bits, 1stop bit, no check bit, 0xA5 data frame, update rate 1000Hz.

Table 5-2 Maximum Data Update Rate

Table 5-2 Maximum Data	Opdate Kate	
Baud rate Data frame format	460800 bit/s	921600 bit/s
Gyro data frame (0x90)	1000Hz	1000 Hz
'Gyro + Add Table 'data frame (0 x91)	1000 Hz	1000 Hz
'Gyro + Tilt 'data frame (0x92)	1000 Hz	1000 Hz
'Gyro + plus meter + tilt 'data frame (0x93)	1000 HZ	1000 Hz
'Gyro + Temperature 'data frame (0x94)	1000 Hz	1000 Hz
'Gyro + plus meter + temperature 'data frame (0 xA5)	500 Hz	1000 Hz
'Gyro + tilt + temperature 'data frame (0 xA6)	500 Hz	1000 Hz
'Gyro + plus meter + tilt + temperature 'data frame (0 xA7)	500 Hz	1000 Hz

5.3 Data frame format

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Data frame is sent by IMU in each cycle, and the data format can be configured by referring to the corresponding data frame format in the operating instructions of the supporting upper computer. All formats are shown in the following table.

Table 5-2 Data Frame Format of Gyro

Seri al num ber	Parameter name	Valid range	Byte	Scale	Remark
1	Frame header	0x90	1		Packet header
2	X-axis angular	[-400, 400]	3	2-14	Unit: (/s, from high to low, the most
	velocity	[-2000, 2000]	3	2-12	significant bit of the first byte is the sign
					bit. See Note 1 for the specific algorithm.
3	Y-axis angular	[-400, 400]	3	2^{-14}	Unit: (/s, from high to low, the most

Old base	e map						
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iskette			I	I I			
		velocity	[-2000, 2000]	3	2^{-12}		nt bit of the first byte is the sign
CAD							ote 1 for the specific algorithm.
	4	Z-axis angular	[-400, 400]	3	2^{-14}		s, from high to low, the most
		velocity	[-2000, 2000]	3	2^{-12}		at bit of the first byte is the sign
							ote 1 for the specific algorithm.
	5	Gyro status		1		All zeros	are normal. See Table 5-10 for
							specific definitions.
	6	Frame counter	[0, 255]	1	1		0-255 continuous count
	7						first high and then low, the most
		Delay		2			nt bit of the first byte is the sign
							ote 5 for the specific algorithm.
	8	CRC32		4		CRC32	verification, see instruction 6
	Seri		Table 5-3 Data Fr	ame Forr	nat of "Gyr	o + Add Ta	ble"
	al						
	num	Parameter name	Valid range	Byte	Scale		Remark
	ber						
	1	Frame header	0x91	1			Packet header
	2		[-400, 400]	3	2-14	Unit: (/	s, from high to low, the most
		X-axis angular				significant bit of the first byte is the sign	
		velocity	[-2000, 2000]	3	2^{-12}	bit. See N	ote 1 for the specific algorithm.
	3	37 ' 1	[-400, 400]	3	2^{-14}	Unit: (/	s, from high to low, the most
		Y-axis angular		_		significar	nt bit of the first byte is the sign
		velocity	[-2000, 2000]	3	2^{-12}	bit. See N	ote 1 for the specific algorithm.
	4	7 avis angular	[-400, 400]	3	2-14	Unit: (/	s, from high to low, the most
		Z-axis angular velocity	F 0000 00007		- 12	significar	nt bit of the first byte is the sign
		velocity	[-2000, 2000]	3	2 ⁻¹²	bit. See N	ote 1 for the specific algorithm.
	5	Carro status		1		All zeros	are normal. See Table 5-10 for
		Gyro status		1			specific definitions.
	6		[-10, 10]		2-19	III.ia C. C	Supt high and the state of
		V avis assisted	[-30, 30]	,	2^{-18}		irst high and then low, the most
		X-axis acceleration	[-50, 50]	3	2-17		nt bit of the first byte is the sign
racing			[-80, 80]		2^{-16}	Dit. See N	ote 2 for the specific algorithm.
	7		[-10, 10]		2-19	Unit: G, f	irst high and then low, the most
race		Y-axis acceleration	[-30, 30]	3	2-18	significar	nt bit of the first byte is the sign
			[-50, 50]		2-17	-	ote 2 for the specific algorithm.
base map		<u> </u>	I	I.		1	
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se map				DC 10	~21 1 	-D6FC	EV2 000 012CM
J map				BS-IC		k-D6EC EX2.900.012SM	
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D: -1 + +								
Diskette	-			[-80, 80]		2-16		
		8		[-10, 10]		2 ⁻¹⁹		
CAD				[-30, 30]		2 ⁻¹⁸	Unit: G, f	irst high and then low, the most
			Z-axis acceleration	[-50, 50]	3	2 ⁻¹⁷	significan	at bit of the first byte is the sign
				[-80, 80]		2 ⁻¹⁶	bit. See N	ote 2 for the specific algorithm.
		9		[-80, 80]		2	A 11	
		9	Add table status		1		All zeros	are normal. See Table 5-10 for specific definitions.
		10	F	[0 255]	1	1		-255 continuous count
			Frame counter	[0, 255]	1	1		
		11	D.I.		2			irst high and then low, the most
			Delay		2			at bit of the first byte is the sign
								ote 5 for the specific algorithm.
		12	CRC32		4		CRC32	verification, see instruction 6
		_		Table 5-4 For	mat of 'G	yro + Tilt' l	Data Frame	
		Seri						
		al	Parameter name	37-1:4	D-4-	Scale		Remark
		num	Parameter name	Valid range	Byte	Scale		Remark
		ber						
		1	Frame header	0x92	1			Packet header
		2	V!1	[-400, 400]	3	2-14	Unit: (/	s, from high to low, the most
			X-axis angular velocity			- 40	significan	t bit of the first byte is the sign
			velocity	[-2000, 2000]	3	2^{-12}	bit. See N	ote 1 for the specific algorithm.
		3	Y-axis angular	[-400, 400]	3	2^{-14}	Unit: (/	s, from high to low, the most
			velocity		_	40	significan	at bit of the first byte is the sign
			velocity	[-2000, 2000]	3	2^{-12}	bit. See N	ote 1 for the specific algorithm.
		4	Z-axis angular	[-400, 400]	3	2^{-14}	Unit: (/	s, from high to low, the most
			velocity			- 12	significan	at bit of the first byte is the sign
			velocity	[-2000, 2000]	3	2 ⁻¹²	bit. See N	ote 1 for the specific algorithm.
		5	Gyro status		1		All zeros	are normal. See Table 5-10 for
			Gy10 status		1			specific definitions.
		6					Unit: G, f	irst high and then low, the most
			X-axis inclination	[-1.7, 1.7]	3	2^{-22}	significan	at bit of the first byte is the sign
							bit. See N	ote 3 for the specific algorithm.
		7					Unit: G, f	irst high and then low, the most
Tracing			Y-axis inclination	[-1.7, 1.7]	3	2^{-22}	significan	at bit of the first byte is the sign
	1						bit. See N	ote 3 for the specific algorithm.
Trace	1							
	1							
ld base map	1							
Base map					DC 1/	701 1	DEEC	EV2 000 0129M
Base map	-				א-2ס	C21-1yx	-DOEC	EX2.900.012SM
				1				

Dialecti	<u> </u>							
Diskette		8	Z-axis inclination	[-1.7, 1.7]	3	2-22	significan	irst high and then low, the most at bit of the first byte is the sign
		9	Inclination state		1			ote 3 for the specific algorithm. are normal. See Table 5-10 for specific definitions.
		10	Frame counter	[0, 255]	1	1	0	0-255 continuous count
		11	Delay		2		significan	irst high and then low, the most at bit of the first byte is the sign ote 5 for the specific algorithm.
		12	CRC32		4			verification, see instruction 6
			Table 4	5 Data Frama l	Farmat of	ICamo + A d	ld Tabla ± F	Nin Angle!
		Seri al num ber	Parameter name	5-5 Data Frame I Valid range	Byte	Scale	id Table + L	Remark
		1	Frame header	0x93	1			Packet header
		2	X-axis angular	[-400, 400]	3	2^{-14}		s, from high to low, the most
			velocity	[-2000, 2000]	3	2^{-12}		ote 1 for the specific algorithm.
		3	Y-axis angular	[-400, 400]	3	2-14		s, from high to low, the most
			velocity	[-2000, 2000]	3	2-12		at bit of the first byte is the sign ote 1 for the specific algorithm.
		4	Z-axis angular	[-400, 400]	3	2-14	Unit: (/	s, from high to low, the most
			velocity	[-2000, 2000]	3	2-12		at bit of the first byte is the sign ote 1 for the specific algorithm.
		5	Gyro status		1		All zeros	are normal. See Table 5-10 for specific definitions.
		6	X-axis acceleration	[-10, 10] [-30, 30] [-50, 50] [-80, 80]	3	2^{-19} 2^{-18} 2^{-17} 2^{-16}	significan	first high and then low, the most at bit of the first byte is the sign ote 2 for the specific algorithm.
Tracing		7	Y-axis acceleration	[-10, 10] [-30, 30] [-50, 50] [-80, 80]	3	$ \begin{array}{r} 2^{-19} \\ 2^{-18} \\ 2^{-17} \\ 2^{-16} \end{array} $	significan	first high and then low, the most at bit of the first byte is the sign ote 2 for the specific algorithm.
Trace		8	Z-axis acceleration	[-10, 10] [-30, 30]	3	2^{-19} 2^{-18}	+	irst high and then low, the most at bit of the first byte is the sign
ld base map	1	_						
Base map					BS-IC	C21-1yx-	D6EC	EX2.900.012SM
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skette				I	I		<u> </u>
]			[-50, 50]		2 ⁻¹⁷	bit. See Note 2 for the specific algorithm.
CAD	1			[-80, 80]		2^{-16}	
]	9	Add table status		1		All zeros are normal. See Table 5-10 for specific definitions.
		10					Unit: G, first high and then low, the most
			X-axis inclination	[-1.7, 1.7]	3	2^{-22}	significant bit of the first byte is the sign
							bit. See Note 3 for the specific algorithm.
		11					Unit: G, first high and then low, the most
			Y-axis inclination	[-1.7, 1.7]	3	2^{-22}	significant bit of the first byte is the sign
							bit. See Note 3 for the specific algorithm.
		12					Unit: G, first high and then low, the most
			Z-axis inclination	[-1.7, 1.7]	3	2^{-22}	significant bit of the first byte is the sign
							bit. See Note 3 for the specific algorithm.
		13					All zeros are normal. See Table 5-10 for
			Inclination state		1		specific definitions.
		14	Frame counter	[0, 255]	1	1	0-255 continuous count
		15					Unit: us, first high and then low, the most
			Delay		2		significant bit of the first byte is the sign
							bit. See Note 5 for the specific algorithm.
		16	CRC32		4		CRC32 verification, see instruction 6
		LI		11.565			ID . D
		Seri	1	able 5-6 Format o	of Gyro	+ Temperat	ure' Data Frame
		al					
		num	Parameter name	Valid range	Byte	Scale	Remark
		ber					
		1	Frame header	0x94	1		Packet header
		2	X-axis angular	[-400, 400]	3	2-14	Unit: (/s, from high to low, the most
			velocity	F 2000 20003	2	0-12	significant bit of the first byte is the sign
			velocity	[-2000, 2000]	3	2 ⁻¹²	bit. See Note 1 for the specific algorithm.
	1	1 T		[-400, 400]	3	2^{-14}	Unit: (/s, from high to low, the most
		3	Y-axis anoular	[100, 100]			
		3	Y-axis angular velocity		2	2-12	significant bit of the first byte is the sign
		3	Y-axis angular velocity	[-2000, 2000]	3	2 ⁻¹²	significant bit of the first byte is the sign bit. See Note 1 for the specific algorithm.
		4	velocity		3	2^{-12} 2^{-14}	
racing			velocity Z-axis angular	[-2000, 2000] [-400, 400]	3	2 ⁻¹⁴	bit. See Note 1 for the specific algorithm.
racing			velocity	[-2000, 2000]			bit. See Note 1 for the specific algorithm. Unit: (/s, from high to low, the most
	-		velocity Z-axis angular velocity	[-2000, 2000] [-400, 400]	3	2 ⁻¹⁴	bit. See Note 1 for the specific algorithm. Unit: (/s, from high to low, the most significant bit of the first byte is the sign
	- - -	4	velocity Z-axis angular	[-2000, 2000] [-400, 400]	3	2 ⁻¹⁴	bit. See Note 1 for the specific algorithm. Unit: (/s, from high to low, the most significant bit of the first byte is the sign bit. See Note 1 for the specific algorithm.
race	- - - -	4	velocity Z-axis angular velocity	[-2000, 2000] [-400, 400]	3	2 ⁻¹⁴	bit. See Note 1 for the specific algorithm. Unit: (/s, from high to low, the most significant bit of the first byte is the sign bit. See Note 1 for the specific algorithm. All zeros are normal. See Table 5-10 for
racing race base map	- - - -	4	velocity Z-axis angular velocity	[-2000, 2000] [-400, 400]	3	2 ⁻¹⁴	bit. See Note 1 for the specific algorithm. Unit: (/s, from high to low, the most significant bit of the first byte is the sign bit. See Note 1 for the specific algorithm. All zeros are normal. See Table 5-10 for
race	- - - -	4	velocity Z-axis angular velocity	[-2000, 2000] [-400, 400] [-2000, 2000]	3 3	2 ⁻¹⁴ 2 ⁻¹²	bit. See Note 1 for the specific algorithm. Unit: (/s, from high to low, the most significant bit of the first byte is the sign bit. See Note 1 for the specific algorithm. All zeros are normal. See Table 5-10 for specific definitions.
race base map	- - - -	4	velocity Z-axis angular velocity	[-2000, 2000] [-400, 400] [-2000, 2000]	3 3	2 ⁻¹⁴	bit. See Note 1 for the specific algorithm. Unit: (/s, from high to low, the most significant bit of the first byte is the sign bit. See Note 1 for the specific algorithm. All zeros are normal. See Table 5-10 for specific definitions.

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	6	X-axis gyro				Unit: ℃	, from high to low, the most	
CAD		temperature	[-128, 128]	2	2^{-8}		bit of the first byte is the sign	
		•					te 4 for the specific algorithm.	
	7	Y-axis gyro					, from high to low, the most	
		temperature	[-128, 128]	2	2^{-8}		bit of the first byte is the sign	
							te 4 for the specific algorithm.	
	8	Temperature of Z-					, from high to low, the most	
		axis gyroscope	[-128, 128]	2	2-8		bit of the first byte is the sign	
							te 4 for the specific algorithm.	
	9	Gyro Thermometer		1			are normal. See Table 5-10 for	
		Status				:	specific definitions.	
	10	Frame counter	[0, 255]	1	1	0-	255 continuous count	
	11					Unit: us, fir	rst high and then low, the most	
		Delay		2		significant	bit of the first byte is the sign	
						bit. See No	te 5 for the specific algorithm.	
	12	CRC32		4		CRC32 v	verification, see instruction 6	
	Seri	Table 5-	7 Data Frame Fo	rmat of '	Gyro + Add	l Table + Ter	mperature'	
	al							
	num	Parameter name	Valid range	Byte	Scale		Remark	
	ber							
	1	Frame header	0xA5	1			Packet header	
	2		[-400, 400]	3	2 ⁻¹⁴	Unit: (/s	, from high to low, the most	
		X-axis angular				significant	bit of the first byte is the sign	
		velocity	[-2000, 2000]	3	2^{-12}	bit. See No	te 1 for the specific algorithm.	
		1					te i for the specific algorithm.	
	3	Y-axis angular	[-400, 400]	3	2-14		, from high to low, the most	
	3	Y-axis angular velocity				Unit: (/s	, from high to low, the most bit of the first byte is the sign	
			[-2000, 2000]	3	2 ⁻¹²	Unit: (/s significant bit. See No	, from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm.	
	3					Unit: (/s significant bit. See No Unit: (/s	, from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. , from high to low, the most	
		velocity	[-2000, 2000]	3	2 ⁻¹²	Unit: (/s significant bit. See No Unit: (/s significant	, from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. , from high to low, the most bit of the first byte is the sign	
		velocity Z-axis angular	[-2000, 2000] [-400, 400]	3	2 ⁻¹² 2 ⁻¹⁴	Unit: (/s significant bit. See No Unit: (/s significant bit. See No	, from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. , from high to low, the most	
	4	velocity Z-axis angular	[-2000, 2000] [-400, 400]	3	2 ⁻¹² 2 ⁻¹⁴	Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a	, from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. , from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm.	
Tracing	4	velocity Z-axis angular velocity	[-2000, 2000] [-400, 400]	3 3	2 ⁻¹² 2 ⁻¹⁴	Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a	, from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. , from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. The normal. See Table 5-10 for specific definitions.	
Tracing	5	velocity Z-axis angular velocity Gyro status	[-2000, 2000] [-400, 400] [-2000, 2000]	3 3	2 ⁻¹² 2 ⁻¹⁴ 2 ⁻¹²	Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a	, from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. , from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. The normal. See Table 5-10 for specific definitions.	
Tracing Trace	5	velocity Z-axis angular velocity	[-2000, 2000] [-400, 400] [-2000, 2000] —— [-10, 10]	3 3	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a Unit: G, fin	, from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. , from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. The normal. See Table 5-10 for specific definitions. The specific definitions the sign that the sign that the specific definitions that the sign	
	5	velocity Z-axis angular velocity Gyro status	[-2000, 2000] [-400, 400] [-2000, 2000] [-10, 10] [-30, 30] [-50, 50]	3 3	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a Unit: G, fin	, from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. , from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. The normal. See Table 5-10 for specific definitions.	
	5	velocity Z-axis angular velocity Gyro status	[-2000, 2000] [-400, 400] [-2000, 2000] [-10, 10] [-30, 30]	3 3	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a Unit: G, fin	, from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. , from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. The normal. See Table 5-10 for specific definitions. The specific definitions the sign that the sign that the specific definitions that the sign	
Trace	5	velocity Z-axis angular velocity Gyro status	[-2000, 2000] [-400, 400] [-2000, 2000] [-10, 10] [-30, 30] [-50, 50]	3 3	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a Unit: G, fin	, from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. , from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. The normal. See Table 5-10 for specific definitions. The specific definitions the sign that the sign that the specific definitions that the sign	
Trace	5	velocity Z-axis angular velocity Gyro status	[-2000, 2000] [-400, 400] [-2000, 2000] [-10, 10] [-30, 30] [-50, 50]	3 3 1	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a Unit: G, fin significant bit. See No	, from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. , from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. The normal. See Table 5-10 for specific definitions. The specific definitions the sign that the sign that the specific definitions that the sign	
Trace d base map	5	velocity Z-axis angular velocity Gyro status	[-2000, 2000] [-400, 400] [-2000, 2000] [-10, 10] [-30, 30] [-50, 50]	3 3 1	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a Unit: G, fin significant bit. See No	, from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. , from high to low, the most bit of the first byte is the sign te 1 for the specific algorithm. The normal. See Table 5-10 for specific definitions. The state of the first byte is the sign that the specific definitions. The specific definition is the sign that the specific algorithm.	

iskette					Γ			
	7		[-10, 10]		2-19	Unit: G. f	irst high and then low, the most	
CAD		Y-axis acceleration	[-30, 30]		2-18		at bit of the first byte is the sign	
		1 dais deceleration	[-50, 50]		2-17		ote 2 for the specific algorithm.	
			[-80, 80]		2-16	on. see iv	ote 2 for the specific argorithm.	
	8		[-10, 10]		2-19	H. C. C.	* (1.1 1.1 1.1 .1	
		7	[-30, 30]		2-18		irst high and then low, the most	
		Z-axis acceleration	[-50, 50]	3	2-17		at bit of the first byte is the sign	
			[-80, 80]		2-16	bit. See N	ote 2 for the specific algorithm.	
	9					All zeros	are normal. See Table 5-10 for	
		Add table status		1			specific definitions.	
	10					Unit: °(C, from high to low, the most	
		X-axis gyro	[-128, 128]	2	2-8		at bit of the first byte is the sign	
		temperature				bit. See Note 4 for the specific algorithm.		
	11						C, from high to low, the most	
		Y-axis gyro	[-128, 128]	2	2-8		at bit of the first byte is the sign	
		temperature	[120, 120]		_		ote 4 for the specific algorithm.	
	12					+	C, from high to low, the most	
	12	Temperature of Z-	[-128, 128]	2	2-8		at bit of the first byte is the sign	
		axis gyroscope	[-120, 120]	2		bit. See Note 4 for the specific algorithm.		
	13	Gyro Thermometer					are normal. See Table 5-10 for	
	13	Status		1		All Zelos	specific definitions.	
	14	Status				Unit: °C, from high to low, the most		
	14	X-axis plus surface	F 400 4007		2-8	significant bit of the first byte is the sign		
		temperature	[-128, 128]	2		bit. See Note 4 for the specific algorithm.		
	1.5							
	15	Y-axis plus surface	F 120 1201	2	2-8		C, from high to low, the most	
		temperature	[-128, 128]	2	2-8	significant bit of the first byte is the sign		
							ote 4 for the specific algorithm.	
	16	Z-axis plus surface	5 400 4007				C, from high to low, the most	
		temperature	[-128, 128]	2	2-8		at bit of the first byte is the sign	
							ote 4 for the specific algorithm.	
	17	Add thermometer		1		All zeros	are normal. See Table 5-10 for	
		status					specific definitions.	
	18	Frame counter	[0, 255]	1	1	0	0-255 continuous count	
acing	19					Unit: us, f	irst high and then low, the most	
acing		Delay		2		significan	at bit of the first byte is the sign	
						bit. See N	ote 5 for the specific algorithm.	
race	20	CRC32		4		CRC32	verification, see instruction 6	
base map								
e map				BS-IC	C21-1yx-	-D6EC	EX2.900.012SM	
					-			
	Change	order Sign			of 24 No. 1		1	

CAD Seri al num ber 1 2 3	Parameter name Frame header X-axis angular velocity Y-axis angular velocity Z-axis angular velocity	0xA6 [-400, 400] [-2000, 2000] [-2000, 2000]	Byte 1 3 3 3	Scale	Unit: (/	Remark Packet header s, from high to low, the most	
3	X-axis angular velocity Y-axis angular velocity Z-axis angular	[-400, 400] [-2000, 2000] [-400, 400] [-2000, 2000]	3				
3	velocity Y-axis angular velocity Z-axis angular	[-2000, 2000] [-400, 400] [-2000, 2000]	3			s, from high to low, the most	
4	Y-axis angular velocity Z-axis angular	[-400, 400] [-2000, 2000]		2 12		t bit of the first byte is the sign	
4	velocity Z-axis angular	[-2000, 2000]	3	0-14	bit. See Note 1 for the specific algorithm. Unit: (/s, from high to low, the most		
	_		3	2^{-14} 2^{-12}	significant bit of the first byte is the sign		
5	_	[-400, 400]	3	2-14		ote 1 for the specific algorithm. s, from high to low, the most	
5	velocity	[-2000, 2000]	3	2 ⁻¹²	significant bit of the first byte is the sign bit. See Note 1 for the specific algorithm.		
	Gyroscope status — 1 —					are normal. See Table 5-10 for specific definitions.	
6	X-axis inclination	[-1.7, 1.7]	3	2-22	significan	trst high and then low, the most the bit of the first byte is the sign of the specific algorithm.	
7	Y-axis inclination	[-1.7, 1.7]	3	2-22	Unit: G, fi	irst high and then low, the most t bit of the first byte is the sign ote 3 for the specific algorithm.	
8	Z-axis inclination	[-1.7, 1.7]	3	2-22	Unit: G, first high and then low, the most significant bit of the first byte is the sign bit. See Note 3 for the specific algorithm.		
9	Inclination state		1		All zeros are normal. See Table 5-10 for specific definitions.		
10	X-axis gyro temperature	[-128, 128]	2	2-8	significan	t bit of the first byte is the sign of the 4 for the specific algorithm.	
11	Y-axis gyro temperature	[-128, 128]	2	2-8	Unit: °C, from high to low, the most significant bit of the first byte is the sign bit. See Note 4 for the specific algorithm.		
Tracing 12 Trace	Temperature of Z-axis gyroscope	[-128, 128]	2	2-8	significan	t bit of the first byte is the sign ote 4 for the specific algorithm.	

	12	Cyma Thammanatan				A 11 gama a	are normal. See Table 5-10 for		
	13	Gyro Thermometer Status		1			specific definitions.		
CAD	14						c, from high to low, the most		
		X-axis tilt	[-128, 128]	2	2-8	significant	bit of the first byte is the sign		
		temperature				bit. See No	ote 4 for the specific algorithm.		
	15	Y-axis tilt				Unit: ℃	r, from high to low, the most		
		temperature	[-128, 128]	2	2-8	significant	bit of the first byte is the sign		
		temperature				bit. See No	ote 4 for the specific algorithm.		
	16	Z-axis tilt				Unit: ℃	c, from high to low, the most		
		temperature	[-128, 128]	2	2-8	significant	significant bit of the first byte is the sign		
		_					ote 4 for the specific algorithm.		
	17	Dip Thermometer		1			are normal. See Table 5-10 for		
		Status					specific definitions.		
	18	Frame counter	[0, 255]	1	1	0-	255 continuous count		
	19						rst high and then low, the most		
		Delay		2			bit of the first byte is the sign		
						bit. See No	ete 5 for the specific algorithm.		
	20	CRC32		4		CRC32 verification, see instruction 6			
		Table 5-9 Data	Frame Format of	F'Gvro + A	Add Table	+ Inclinatio	n + Temperature'		
	Seri	Tuole 3 y Duta	Traine Tormat of	- Gyro + 1	rad rabic	memiatio	n · Temperature		
	al	_				Remark			
	num	Parameter name	Valid range	Byte	Scale				
	ber								
	1	Frame header	0xA7	1			Packet header		
	2		0xA7	3	2 ⁻¹⁴	Unit: (/s	Packet header s, from high to low, the most		
		X-axis angular	[-400, 400]	3	_	significant	s, from high to low, the most bit of the first byte is the sign		
	2				2 ⁻¹⁴ 2 ⁻¹²	significant	s, from high to low, the most bit of the first byte is the sign to 1 for the specific algorithm.		
		X-axis angular	[-400, 400]	3	_	significant bit. See No Unit: (/s	to, from high to low, the most bit of the first byte is the sign on the 1 for the specific algorithm.		
	2	X-axis angular velocity	[-400, 400] [-2000, 2000]	3	2-12	significant bit. See No Unit: (/s	s, from high to low, the most bit of the first byte is the sign to 1 for the specific algorithm.		
	2	X-axis angular velocity Y-axis angular velocity	[-400, 400] [-2000, 2000] [-400, 400]	3 3 3	2^{-12} 2^{-14}	significant bit. See No Unit: (/s significant bit. See No	e, from high to low, the most bit of the first byte is the sign one of the first byte is the sign		
	3	X-axis angular velocity Y-axis angular velocity Z-axis angular	[-400, 400] [-2000, 2000] [-400, 400] [-2000, 2000] [-400, 400]	3 3 3 3	2^{-12} 2^{-14} 2^{-12} 2^{-14}	significant bit. See No Unit: (/s significant bit. See No Unit: (/s	s, from high to low, the most bit of the first byte is the sign on the 1 for the specific algorithm. If the specific algorithm is the sign of the first byte is the sign of the 1 for the specific algorithm. If the specific algorithm is the sign of the first byte is the sign of the first byte is the sign of the first byte is the sign of the specific algorithm.		
	3	X-axis angular velocity Y-axis angular velocity	[-400, 400] [-2000, 2000] [-400, 400] [-2000, 2000]	3 3 3	2^{-12} 2^{-14} 2^{-12}	significant bit. See No Unit: (/s significant bit. See No Unit: (/s significant bit. See No	s, from high to low, the most bit of the first byte is the sign on the 1 for the specific algorithm. It is, from high to low, the most bit of the first byte is the sign on the 1 for the specific algorithm. It is, from high to low, the most bit of the first byte is the sign of the 1 for the specific algorithm.		
Tracing	3	X-axis angular velocity Y-axis angular velocity Z-axis angular	[-400, 400] [-2000, 2000] [-400, 400] [-2000, 2000] [-400, 400]	3 3 3 3	2^{-12} 2^{-14} 2^{-12} 2^{-14}	significant bit. See No Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a	s, from high to low, the most bit of the first byte is the sign on the 1 for the specific algorithm. If the specific algorithm is the sign of the first byte is the sign of the 1 for the specific algorithm. If the specific algorithm is the sign of the first byte is the sign of the first byte is the sign of the first byte is the sign of the specific algorithm.		
Tracing Trace	3	X-axis angular velocity Y-axis angular velocity Z-axis angular velocity Gyroscope status	[-400, 400] [-2000, 2000] [-400, 400] [-2000, 2000] [-400, 400]	3 3 3 3	2^{-12} 2^{-14} 2^{-12} 2^{-14}	significant bit. See No Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a	e, from high to low, the most bit of the first byte is the sign on the last of the specific algorithm. In the last of the specific algorithm. In the last of the first byte is the sign of the last of the specific algorithm. In the last of the first byte is the sign of the last of the first byte is the sign of the last of the specific algorithm. In the last of the specific algorithm. In the last of the specific algorithm. In the last of the specific algorithm.		
	3 4	X-axis angular velocity Y-axis angular velocity Z-axis angular velocity	[-400, 400] [-2000, 2000] [-400, 400] [-2000, 2000] [-400, 400] [-2000, 2000]	3 3 3 3 3	2 ⁻¹² 2 ⁻¹⁴ 2 ⁻¹² 2 ⁻¹⁴ 2 ⁻¹²	significant bit. See No Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a	e, from high to low, the most bit of the first byte is the sign on the 1 for the specific algorithm. In the specific algorithm.		
Trace	3 4	X-axis angular velocity Y-axis angular velocity Z-axis angular velocity Gyroscope status	[-400, 400] [-2000, 2000] [-400, 400] [-2000, 2000] [-400, 400] [-2000, 2000] [-10, 10]	3 3 3 3	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	significant bit. See No Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a	s, from high to low, the most bit of the first byte is the sign on the 1 for the specific algorithm. If the specific algorithm is the sign of the first byte is the sign of the 1 for the specific algorithm. If the specific algorithm is the sign of the first byte is the sign of the first byte is the sign of the specific algorithm. If the specific algorithm is the specific algorithm is the specific algorithm. If the specific algorithm is the specific algorithm is the specific definitions. If the specific definitions is the sign of the specific definitions.		
	3 4	X-axis angular velocity Y-axis angular velocity Z-axis angular velocity Gyroscope status	[-400, 400] [-2000, 2000] [-400, 400] [-2000, 2000] [-400, 400] [-2000, 2000] [-10, 10]	3 3 3 3	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	significant bit. See No Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a	s, from high to low, the most bit of the first byte is the sign on the 1 for the specific algorithm. If the specific algorithm is the sign of the first byte is the sign of the 1 for the specific algorithm. If the specific algorithm is the sign of the first byte is the sign of the first byte is the sign of the specific algorithm. If the specific algorithm is the specific algorithm is the specific algorithm. If the specific algorithm is the specific algorithm is the specific definitions. If the specific definitions is the sign of the specific definitions.		
Trace	3 4	X-axis angular velocity Y-axis angular velocity Z-axis angular velocity Gyroscope status	[-400, 400] [-2000, 2000] [-400, 400] [-2000, 2000] [-400, 400] [-2000, 2000] [-10, 10]	3 3 3 3 1	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	significant bit. See No Unit: (/s significant bit. See No Unit: (/s significant bit. See No All zeros a Unit: G, fir significant	s, from high to low, the most bit of the first byte is the sign on the 1 for the specific algorithm. If the specific algorithm is the sign of the first byte is the sign of the 1 for the specific algorithm. If the specific algorithm is the sign of the first byte is the sign of the first byte is the sign of the specific algorithm. If the specific algorithm is the specific algorithm is the specific algorithm. If the specific algorithm is the specific algorithm is the specific definitions. If the specific definitions is the sign of the specific definitions.		

iskette		1				1	Ι		
			[-50, 5		_	2 ⁻¹⁷	bit. See N	ote 2 for the specific algorithm.	
CAD			[-80, 8			2 ⁻¹⁶			
	7		[-10, 1	0]		2 ⁻¹⁹	Unit: G. f	irst high and then low, the most	
		Y-axis acceleration	[-30, 3	0]	3	2-18		at bit of the first byte is the sign	
		T axis acceleration	[-50, 5	0]		2-17		ote 2 for the specific algorithm.	
			[-80, 8	0]		2^{-16}	511. See 14	ote 2 for the specific argorithms.	
	8		[-10, 1	0]		2-19	H. G. (* .1.1 1.1 1.1	
			[-30, 3	0]]	2-18		Unit: G, first high and then low, the most	
		Z-axis acceleration	[-50, 5	0]	3	2-17		at bit of the first byte is the sign	
			[-80, 8	80]		2-16	bit. See Note 2 for the specific algorithm		
	9	Add table status	s —		1		All zeros	are normal. See Table 5-10 for specific definitions.	
	10						Unit: G, f	irst high and then low, the most	
		X-axis inclination	on [-1.7, 1	.7]	3	2-22	significar	at bit of the first byte is the sign	
				_			bit. See Note 3 for the specific algorithm.		
	11							irst high and then low, the most	
		Y-axis inclinatio	on [-1.7, 1	.7]	3	2-22		at bit of the first byte is the sign	
				-				ote 3 for the specific algorithm.	
	12			1.7]		2-22		irst high and then low, the most	
		Z-axis inclinatio	on [-1.7, 1		3			at bit of the first byte is the sign	
						_		ote 3 for the specific algorithm.	
	13	Inclination state			1		All zeros are normal. See Table 5-10 for		
		The mation state			•			specific definitions.	
	14	X-axis gyro					Unit: °C, from high to low, the most		
		temperature	[-128, 1	28]	2	2-8	significant bit of the first byte is the sign		
		temperature					bit. See N	ote 4 for the specific algorithm.	
	15	Y-axis gyro					Unit: °	C, from high to low, the most	
		temperature	[-128, 1	128]	2	2-8	significant bit of the first byte is the sign		
		temperature					bit. See Note 4 for the specific algorithm.		
	16	Temperature of 2	7				Unit: °	C, from high to low, the most	
		axis gyroscope	[-128, 1	28]	2	2-8	significar	at bit of the first byte is the sign	
		axis gyroscope					bit. See N	ote 4 for the specific algorithm.	
	17	Gyro Thermomet	ter		1		All zeros	are normal. See Table 5-10 for	
		Status			1			specific definitions.	
racing	18	X-axis plus surfa	ce				Unit: °	C, from high to low, the most	
		temperature	[-128, 1	28]	2	2-8	significar	at bit of the first byte is the sign	
race		temperature					bit. See N	ote 4 for the specific algorithm.	
base map									
e map				-	BS-IC	21-1yx-	D6EC	EX2.900.012SM	
				-	<i>_</i>	21 1 y A		1.7.2.700.012.0101	
	Change		Signature,			f 24 No. 20	\ D		

Diskette								
CAD		19	Y-axis plus surface temperature	[-128, 128]	2	2-8	significant	, from high to low, the most bit of the first byte is the sign te 4 for the specific algorithm.
		20	Z-axis plus surface temperature	[-128, 128]	2	2-8	Unit: °C	, from high to low, the most bit of the first byte is the sign te 4 for the specific algorithm.
		21	Add thermometer status		1		All zeros a	are normal. See Table 5-10 for specific definitions.
		22	X-axis tilt temperature	[-128, 128]	2	2-8	significant	, from high to low, the most bit of the first byte is the sign te 4 for the specific algorithm.
		23	Y-axis tilt temperature	[-128, 128]	2	2-8	significant	, from high to low, the most bit of the first byte is the sign te 4 for the specific algorithm.
		24	Z-axis tilt temperature	[-128, 128]	2	2-8	significant	, from high to low, the most bit of the first byte is the sign te 4 for the specific algorithm.
		25	Dip Thermometer Status		1			are normal. See Table 5-10 for specific definitions.
		26	Frame counter	[0, 255]	1	1	0-	255 continuous count
		27	Delay		2		significant	rst high and then low, the most bit of the first byte is the sign te 5 for the specific algorithm.
		28	CRC32		4		CRC32 v	verification, see instruction 6
			Explain			4D 216	1D 28	
			lata bit format; Among AR_1 Outpach axis of the gy	outting the high roscope;	eight bi	ts of the t	hree bytes	$\frac{1}{1} + AR_3$ See Figure 5-1 for the angular velocity
Tracing	_	of ea	lata bit format; Among AR_1 Outpach axis of the gy	outting the high croscope; coutting the mid	eight bi	ts of the t	hree bytes	
Trace		of ea	lata bit format; Among AR_1 Outpach axis of the gy AR_2 Outpacity of each axis of	outting the high roscope; putting the mid of the gyroscope outs the lower eight	eight bi dle eigl e;	ts of the the	hree bytes The three	for the angular velocity
		of ea	data bit format; Among AR_1 Outpach axis of the gy AR_2 Outpacity of each axis of AR_3 Outpace.	putting the high roscope; putting the mid of the gyroscope outs the lower eigen.	eight birdle eighte;	ts of the the	hree bytes The three ree bytes f	for the angular velocity bytes for the angular

	1										
Diskette	1	1		ı	I	I					
CAD		Bit 23	Bit 22 Bit 21 Bit : 28 27 2	AR ₁ 20 Bit 19 Bit 18 Bit 17 Bit 16 E 25 24 23 22	AR2 AR2 Bit 15 Bit 14 Bit 13 Bit 12 Bit 11 Bit 10 Bit 9 Bit 8 Bit 7 Bit 6 21 20 21 22 23 24 26 26 27 28	AR ₃ Bit 5 Bit 4 Bit 3 Bit 2 Bit 1 Bit 0 2º 2'10 2'11 2'12 2'13 2'14					
				Figure 5-1 Conve	rting the Gyro Angular Velocity Outp	out to [°/s]					
		I	f the angu	ılar velocity ranş	ge of the gyro is configured as ± 2	2000 °/s, the scale factor					
		is 2 ¹² ;									
		2) Acceler	ation speed outp	out [G] = $\frac{AR_1 \cdot 2^{16} + AR_2 \cdot 2^8 + AR_3}{2^X}$;						
			Amon	gAR ₁ Outputs tl	ne upper eight bits of the three	e bytes for the angular					
		velocity of each axis of the accelerometer;									
		AR_2 Outputs the middle eight bits of the three bytes for the angular									
		velocity of each axis of the accelerometer;									
				AR ₃ Outputs th	ne lower eight bits of the three	e bytes for the angular					
		velocity of each axis of the accelerometer.									
		X is the tabulated scale index, and $10g$, $30g$, $50g$, and $80g$ are tabulated for $X = 19$,									
		18, 17, and 16.									
		3) Tilt speed output [G] = $\frac{AR_1 \cdot 2^{16} + AR_2 \cdot 2^8 + AR_3}{2^{22}}$;									
			Amon	gAR_1 Outputs tl	ne upper eight bits of the three	e bytes for the angular					
		velocity per axis of the tilt angle;									
				AR_2 The middl	e eight bit of that three bytes ar	e output for the angular					
		veloci	ty of each	n axis of the tilt	angle;						
				AR_3 The lower	eight bits of the three bytes are	e output for the angular					
		veloci	ty of eacl	n axis of the tilt	angle.						
		4) Temperature output $[^{\circ}C] = \frac{T_1 \cdot 2^8 + T_2}{2^8}$? See Figure 5-2 for data bit format.									
		A	Among T_1	Outputs the upp	er eight bits of the two bytes for	each axis temperature;					
			T_2	Outputs the low	er eight bits of the two bytes for	each axis temperature.					
				← T ₁	T ₂						
Tracing				Bit 15 Bit 14 Bit 13 Bit 12 Bit 27 26 25 24	t11 Bit 10 Bit 9 Bit 8 Bit 7 Bit 6 Bit 5 Bit 4 Bit 3 Bit 2 23 22 21 20 21 20 21 22 23 24 25 26						
	-			Figure 5-2	Converting Temperature Output to [C1					
Trace		5) Delay ti	ime output [us]		~ 1					
ld base map	1		•								
Base map					BS-IC21-1yx-D6EC	EX2.900.012SM					
		- CI			Page of 24 No. 22 Page						
	Mark	Change	order	Signature,	r age 01 24 No. 22 Page						

Diskette	
	Where, T ₁ is the upper eight bits of the two bytes of the delay time output;
CAD	T ₂ outputs the lower eight bits of the two bytes for the delay time.
	6) CRC check method
	CRC checks all bytes from the data frame header to the check bit, using the
	standard CRC-32 polynomial:
	$x^{32} + x^{26} + x^{23} + x^{22} + x^{16} + x^{12} + x^{11} + x^{10} + x^8 + x^7 + x^5 + x^4 + x^2 + x + 1$ seed = 0xFFFFFFF

See Appendix B for a list of table and table lookup function codes generated from this polynomial.

5.4 Self-check function and real-time output function of working status

The product has the functions of self-checking and real-time output of working status. The data frame contains a byte indicating the status, and the real-time output of product working status information begins after the power-on start is completed. The status bits are defined in Table 5-10.

Table 5-10 Product Status Bit Definitions

Bit	Definition
7	0 = normal, 1 = system-wide abnormal
6	0 = normal, 1 = starting
5	0 = normal, 1 = abnormal external environment
4	0 = normal, 1 = three axes out of service condition
3	0 = normal, 1 = error in three-axis output
2	0 = OK, $1 = Z$ axis out of use condition or error
1	0 = OK, 1 = Y axis out of use condition or error
0	0 = OK, $1 = X$ axis out of use condition or error

6 Functional testing

Tracing

Trace

6.1 Test equipment and instrumentation required

The equipment and instruments required in the test include: DC regulated power supply, computer, turntable, test tooling and test cable.

Old base map						
Base map					BS-IC21-1yx-D6EC	EX2.900.012SM
	Mark	Change	order	Signature,	Page of 24 No. 23 Page	

Diskette

CAD

6.2 Functional testing

The product is in a static state, and the DC regulated power supply is used to supply power to the product. The power supply requirements meet the requirements of 1.2.2. The specific connection mode of the product is shown in Figure 6-1. Data is received according to the communication protocol, and the angular velocity output of the product is received and displayed by the upper computer receiving software.

Rotate the gyroscope assembly in the positive direction around X, Y and Z respectively (input by the turntable if conditions permit, and rotate by hand if no conditions permit), and the angular velocity output of the corresponding axis can be monitored as the positive angular velocity. Rotate the product reversely around X, Y and Z respectively, and the angular velocity output of the corresponding axis can be monitored to be a negative angular velocity. It indicates that the angular velocity output polarity of the product is correct. The three angular rate values at the output of the product shall be in the vicinity of 0 deg/s under stationary conditions.

The acceleration output of the corresponding axis can be monitored to be 1G when X, Y and Z are respectively in the forward direction. Under static conditions, the acceleration at the output of two axes of the product is about 0 G, and the acceleration at the output of the third axis is about 1 G.

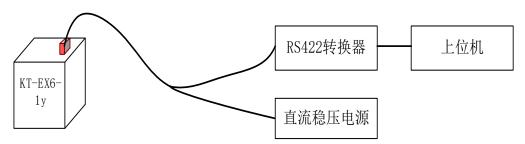


Fig. 6-1 Schematic diagram of IMU test connection

7 Use and maintenance requirements

Before use, the installation position of the system must be checked to ensure correct installation. Carefully check the connection of each signal line to ensure that the connection is correct.

Before power-on, check the cable network contact and power supply value, and the

Tracing

Trace

Old base map

	P						
Base	map					BS-IC21-1yx-D6EC	EX2.900.012SM
		Mark	Change	order	Signature,	Page of 24 No. 24 Page	

	1	10000	r aunnler ne	Jaritzy choll not	he reversed			
CAD	-			olarity shall not			11	1 . 1
CAD	-				unding of the sys			
					ision instruments			
								a temperature of
					my of not more	tnan /3%,	and free of	f acid, alkali and
		COITO	sive gases.					
		App	endix A l	Packing List				
		App			able of BS-IC21-1y	yx-D6EC Iner	tial Measuro	ement Unit
				oduct Matching T		yx-D6EC Iner Quantity	tial Measure Unit	ement Unit Remark
			Pro	oduct Matching T	able of BS-IC21-1y	<u> </u>		
Tracing			Pro ial number	oduct Matching T	able of BS-IC21-1y ame D6EC Products	Quantity	Unit	
Tracing			Proint ial number	oduct Matching T N BS-IC21-1yx-I	able of BS-IC21-1y ame D6EC Products ate	Quantity 1	Unit Taiwan	
Tracing Trace			Profial number 1 2	Doduct Matching T N BS-IC21-1yx-D Product certific Instructions for	able of BS-IC21-1y ame D6EC Products ate	Quantity 1	Unit Taiwan Share	
Trace			Proisial number 1 2 3	Deduct Matching T N BS-IC21-1yx-I Product certific	able of BS-IC21-1y ame D6EC Products ate	Quantity 1 1 1	Unit Taiwan Share Share	
			Proisial number 1 2 3	Doduct Matching T N BS-IC21-1yx-D Product certific Instructions for	able of BS-IC21-1y ame D6EC Products ate	Quantity 1 1 1	Unit Taiwan Share Share	
Trace d base map			Proisial number 1 2 3	Doduct Matching T N BS-IC21-1yx-D Product certific Instructions for	able of BS-IC21-1y ame D6EC Products ate use	Quantity 1 1 1 1	Unit Taiwan Share Share Share	Remark
Trace			Proisial number 1 2 3	Doduct Matching T N BS-IC21-1yx-D Product certific Instructions for	able of BS-IC21-1y ame D6EC Products ate use	Quantity 1 1 1	Unit Taiwan Share Share Share	

Diskette						
		5	Product packing box	1	A	
CAD						
	Ap	pendix B	CRC Lookup Table	e and Lookup Fur	ection	
Tracing	Lo	okup table	e for B1 CRC32			
	stati	ic Uint32 crc	_table[256]={			
i i	0x0	0000000, 0x0	04c11db7, 0x09823b6e, 0x0			
Trace	0x1		2608edb8, 0x22c9f00f, 0x2f3 84fbdbd,0x4c11db70, 0x48d			
Trace	0x3		22	, on 10,00010, on		
Trace	0x3		, , , , , , , , , , , , , , , , , , , 			
d base map	0x3·					
	0x3		BS	-IC21-1yx-D6EC	I	EX2.900.012SM

Diskette 0x5bd4b01b, 0x569796c2, 0x52568b75, 0x6a1936c8, 0x6ed82b7f, 0x639b0da6, 0x675a1011, 0x791d4014, 0x7ddc5da3, 0x709f7b7a, 0x745e66cd,0x9823b6e0, 0x9ce2ab57, 0x91a18d8e, CAD 0x95609039, 0x8b27c03c, 0x8fe6dd8b, 0x82a5fb52, 0x8664e6e5, 0xbe2b5b58, 0xbaea46ef, 0xb7a96036, 0xb3687d81, 0xad2f2d84, 0xa9ee3033, 0xa4ad16ea, 0xa06c0b5d,0xd4326d90, 0xd0f37027, 0xddb056fe, 0xd9714b49, 0xc7361b4c, 0xc3f706fb, 0xceb42022, 0xca753d95, 0xf23a8028, 0xf6fb9d9f, 0xfbb8bb46, 0xff79a6f1, 0xe13ef6f4, 0xe5ffeb43, 0xe8bccd9a, 0xec7dd02d,0x34867077, 0x30476dc0, 0x3d044b19, 0x39c556ae, 0x278206ab, 0x23431b1c, 0x2e003dc5, 0x2ac12072, 0x128e9dcf, 0x164f8078, 0x1b0ca6a1, 0x1fcdbb16, 0x018aeb13, 0x054bf6a4, 0x0808d07d, 0x0cc9cdca, 0x7897ab07, 0x7c56b6b0, 0x71159069, 0x75d48dde, 0x6b93dddb, 0x6f52c06c, 0x6211e6b5, 0x66d0fb02, 0x5e9f46bf, 0x5a5e5b08, 0x571d7dd1, 0x53dc6066, 0x4d9b3063, 0x495a2dd4, 0x44190b0d, 0x40d816ba,0xaca5c697, 0xa864db20, 0xa527fdf9, 0xa1e6e04e, 0xbfa1b04b, 0xbb60adfc, 0xb6238b25, 0xb2e29692, 0x8aad2b2f, 0x8e6c3698, 0x832f1041, 0x87ee0df6, 0x99a95df3, 0x9d684044, 0x902b669d, 0x94ea7b2a, 0xe0b41de7, 0xe4750050, 0xe9362689, 0xedf73b3e, 0xf3b06b3b, 0xf771768c, 0xfa325055, 0xfef34de2, 0xc6bcf05f, 0xc27dede8, 0xcf3ecb31, 0xcbffd686, 0xd5b88683, 0xd1799b34, 0xdc3abded, 0xd8fba05a,0x690ce0ee, 0x6dcdfd59, 0x608edb80, 0x644fc637, 0x7a089632, 0x7ec98b85, 0x738aad5c, 0x774bb0eb, 0x4f040d56, 0x4bc510e1, 0x46863638, 0x42472b8f, 0x5c007b8a, 0x58c1663d, 0x558240e4, 0x51435d53,0x251d3b9e, 0x21dc2629, 0x2c9f00f0, 0x285e1d47, 0x36194d42, 0x32d850f5, 0x3f9b762c, 0x3b5a6b9b, 0x0315d626, 0x07d4cb91, 0x05a6b9b, 0x05a6bb, 0x05a60x0a97ed48, 0x0e56f0ff, 0x1011a0fa, 0x14d0bd4d, 0x19939b94, 0x1d528623, 0xf12f560e, 0xf5ee4bb9, 0xf8ad6d60, 0xfc6c70d7, 0xe22b20d2, 0xe6ea3d65, 0xeba91bbc, 0xef68060b, 0xd727bbb6, 0xd3e6a601, 0xdea580d8, 0xda649d6f, 0xc423cd6a, 0xc0e2d0dd, 0xcda1f604, 0xc960ebb3,0xbd3e8d7e, 0xb9ff90c9, 0xb4bcb610, 0xb07daba7, 0xae3afba2, 0xaafbe615, 0xa7b8c0cc, 0xa379dd7b, 0x9b3660c6, 0x9ff77d71, 0x92b45ba8, 0x9675461f, 0x8832161a, 0x8cf30bad, 0x81b02d74, 0x857130c3,0x5d8a9099, 0x594b8d2e, 0x5408abf7, 0x50c9b640, 0x4e8ee645, 0x4a4ffbf2, 0x470cdd2b, 0x43cdc09c, 0x7b827d21, 0x7f436096, 0x7200464f, 0x76c15bf8, 0x68860bfd, 0x6c47164a, 0x61043093, 0x65c52d24,0x119b4be9, 0x155a565e, 0x18197087, 0x1cd86d30, 0x029f3d35, 0x065e2082, 0x0b1d065b, 0x0fdc1bec, 0x3793a651, 0x3352bbe6, 0x3e119d3f, 0x3ad08088, 0x2497d08d, 0x2056cd3a, 0x2d15ebe3, 0x29d4f654, 0xc5a92679, 0xc1683bce, 0xcc2b1d17, 0xc8ea00a0, 0xd6ad50a5, 0xd26c4d12, 0xdf2f6bcb, 0xdbee767c, 0xe3a1cbc1, 0xe760d676, 0xea23f0af, 0xeee2ed18, 0xf0a5bd1d, 0xf464a0aa, 0xf9278673, 0xfde69bc4,0x89b8fd09, 0x8d79e0be, 0x803ac667, 0x84fbdbd0, 0x9abc8bd5, 0x9e7d9662, 0x933eb0bb, 0x97ffad0c, 0xafb010b1, 0xab710d06, 0xa6322bdf, 0xa2f33668, 0xbcb4666d, 0xb8757bda, 0xb5365d03, 0xb1f740b4 **}**; B2 Table lookup function void CRC32(Uint16 *pch,int len) Tracing Uint32 reg = 0xFFFFFFF; //initial value Trace int i; Old base map Base map EX2.900.012SM BS-IC21-1yx-D6EC

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Mark

Change

order

Signature,

```
Diskette
                              int Res=0; Remainder of//4
     CAD
                              if((len%4)!=0)
                                   Res=4-len%4; //Need to supplement the number of 0 for calculating crc32
                              }
                             for( i = 0; i < len; i++)
                                   reg = (reg << 8) \land crc table[(((reg >> 24) \& 0xFF) \land pch[i])];
                              }
                              for(i = 0; i < Res; I + +)//Extra 0 needs to be asked to participate in CRC
                                   reg = (reg << 8) \land crc table[(((reg >> 24) \& 0xFF) \land 0x00)];
                              }
                              crc_{data}[0] = (reg >> 24) \& 0xFF;
                              crc_{data}[1] = (reg >> 16) \& 0xFF;
                              crc_{data}[2] = (reg >> 8) \& 0xFF;
                              crc data[3] = reg & 0xFF;
                              return;
                         }
                         The CRC \_ data [0] to the CRC \_ data [3] is the calculated CRC32 value.
                         Appendix C Product Naming Rules
                               The product type spectrum is designed according to the standardization
  Tracing
                         requirements, and the specific product type spectrum naming rules are as follows:
  Trace
Old base map
Base
                                                                BS-IC21-1yx-D6EC
          map
                                                                                                    EX2.900.012SM
                                                                   Page of 24 No. 28 Page
               Mark
                      Change
                                   order
                                            Signature,
```

Diskette	BS - Blitz Sen	BS-IC21-	D6EC: Digital 6 axis Encapsulated Connected through connector ccelerometer meters -10 g H-30 g		
		IC21 - Series —	y - Gyroscope parameters 1 - +-400 deg/s, standard accuracy 1A - +-400 deg/s, higher accuracy		
Tracing					
d base map			RS-IC21-	1vx-D6FC	EX2.900.012SM
Mark	Change order	Signature,	BS-IC21-1yx-D6EC Page of 24 No. 29 Page		EAZ.900.0125W