IMU-M8 Series Intelligent Measuring Unit

Communication Protocol

0609FM0001

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Annex IMU-M8 Communication Protocol

A.1 Modbus_RTU data format

IMU-M8 data format comply with GB/T 19582.

A.1.1 Description of the data format

BIN-binary,WORD- word,DW- double words,VW- multi words.

The actual value is register value multiply by coefficient, the null default coefficient is 1.

"R" means data is readable only; "W" means data is writable only; "R / W" means data is readable and writable.

Table 1.1

Description	Format	Coefficient	Unit	Access Rule	Address	Note
Fault code	WORD	—		R	0x0005~0006	bit0:OverVoltageA
						bit1:OverVoltageB
						bit2:OverVoltageC
						bit3:UnderVoltageA
						bit4:UnderVoltageB
						bit5:UnderVoltageC
						bit6:OverFrequency
						bit7:UnderFrequency
						bit8:Iunbalance
						bit9:Uunbalance
						bit10:LossFhaseA
						bit11:LossFhaseB
						bit12:LossFhaseC
						bit13:OverUaTHD
						bit14:OverUbTHD
						bit15:OverUcTHD
						bit16:OverIaTHD
						bit17:OverIbTHD
						bit18:OverIcTHD
						bit18:ReservePower
						bit20:PhaseSequence
						bit21:LowPFt
						bit22:OverTmpIa
						bit23:OverTmpIb

						bit24:OverTmpIc bit25:OverTmpIn
A phase voltage	WORD	0.01	V	R	0x0007	
B phase voltage	WORD	0.01	V	R	0x0008	
C phase voltage	WORD	0.01	V	R	0x0009	
UAB voltage	WORD	0.01	V	R	0x000A	
UBC voltage	WORD	0.01	V	R	0x000B	
UCA voltage	WORD	0.01	V	R	0x000C	
A phase current	DW	0.001	A	R	0x000D~000E	
B phase current	DW	0.001	A	R	0x000F~0010	
C phase current	DW	0.001	A	R	0x0011~0012	
N phase current(In)	DW	0.001	A	R	0x0013~0014	
Ig	DW	0.001	A	R	0x0015~0016	
frequency	WORD	0.01	Hz	R	0x0018	
voltage Unbalance	DW	0.01	%	R	0x0019~001A	
current Unbalance	DW	0.01	%	R	0x001B~001C	
Maximum value of 3 phase current	DW	0.001	A	R	0x001D~0x001E	
Internal temperature	WORD	0.1	℃	R	0x001F	
A phase temperature	WORD	0.1	℃	R	0x0020	
B phase temperature	WORD	0.1	℃	R	0x0021	
C phase temperature	WORD	0.1	℃	R	0x0022	
N phase temperature	WORD	0.1	℃	R	0x0023	
Power						
Total Active power	DW	0.0001	kW	R	0x0030~0x0031	
A phase Active power	DW	0.0001	kW	R	0x0032~0x0033	
B phase Active power	DW	0.0001	kW	R	0x0034~0x0035	
C phase Active power	DW	0.0001	kW	R	0x0036~0x0037	
Total Reactive power	DW	0.0001	kvar	R	0x0038~0x0039	
A phase Reactive power	DW	0.0001	kVar	R	0x003A~0x003B	
B phase Reactive power	DW	0.0001	kVar	R	0x003C~0x003D	
C phase Reactive power	DW	0.0001	kVar	R	0x003E~0x003F	
Total Apparent power	DW	0.0001	kVA	R	0x0040~0x0041	

A phase Apparent power	DW	0.0001	kVA	R	0x0042~0x0043	
B phase Apparent power	DW	0.0001	kVA	R	0x0044~0x0045	
C phase Apparent power	DW	0.0001	kVA	R	0x0046~0x0047	
Total power factor	WORD	0.001	—	R	0x0048	
A phase power factor	WORD	0.001	—	R	0x0049	
B phase power factor	WORD	0.001	—	R	0x004A	
C phase power factor	WORD	0.001	—	R	0x004B	
Harmonics						
A phase voltage THD	WORD	0.01	%	R	0x0050	
B phase voltage THD	WORD	0.01	%	R	0x0052	
C phase voltage THD	WORD	0.01	%	R	0x0054	
A phase current THD	WORD	0.01	%	R	0x0056	
B phase current THD	WORD	0.01	%	R	0x0058	
C phase current THD	WORD	0.01	%	R	0x005A	
Energy						
A phase Forward Active Energy	DW	0.001	kWh	R	0x0110~0x0111	
B phase Forward Active Energy	DW	0.001	kWh	R	0x0112~0x0113	
C phase Forward Active Energy	DW	0.001	kWh	R	0x0114~0x0115	
Total Forward Active Energy	DW	0.001	kWh	R	0x0116~0x0117	
A phase Reverse Active Energy	DW	0.001	kWh	R	0x0118~0x0119	
B phase Reverse Active Energy	DW	0.001	kWh	R	0x011A~0x011B	
C phase Reverse Active Energy	DW	0.001	kWh	R	0x011C~0x011D	
Total Reverse Active Energy	DW	0.001	kWh	R	0x011E~0x011F	
A phase Active Energy	DW	0.001	kVarh	R	0x0120~0x0121	
B phase Active Energy	DW	0.001	kVarh	R	0x0122~0x0123	
C phase Active Energy	DW	0.001	kVarh	R	0x0124~0x0125	

Total Active Energy	DW	0.001	kVarh	R	0x0126~0x0127	
A phase I Quadrant Reactive Energy	DW	0.001	kVarh	R	0x0128~0x0129	
A phase II Quadrant Reactive Energy	DW	0.001	kVarh	R	0x012A~0x012B	
A phase III Quadrant Reactive Energy	DW	0.001	kVarh	R	0x012C~0x012D	
A phase IV Quadrant Reactive Energy	DW	0.001	kVarh	R	0x012E~0x012F	
B phase I Quadrant Reactive Energy	DW	0.001	kVarh	R	0x0130~0x0131	
B phase II Quadrant Reactive Energy	DW	0.001	kVarh	R	0x0132~0x0133	
B phase III Quadrant Reactive Energy	DW	0.001	kVarh	R	0x0134~0x0135	
B phase IV Quadrant Reactive Energy	DW	0.001	kVarh	R	0x0136~0x0137	
C phase I Quadrant Reactive Energy	DW	0.001	kVarh	R	0x0138~0x0139	
C phase II Quadrant Reactive Energy	DW	0.001	kVarh	R	0x013A~0x013B	
C phase III Quadrant Reactive Energy	DW	0.001	kVarh	R	0x013C~0x013D	
C phase IV Quadrant Reactive Energy	DW	0.001	kVarh	R	0x013E~0x013F	
Total I Quadrant Reactive Energy	DW	0.001	kVAh	R	0x0140~0x0141	
Total II Quadrant Reactive Energy	DW	0.001	kVAh	R	0x0142~0x0143	
Total III Quadrant Reactive Energy	DW	0.001	kVAh	R	0x0144~0x0145	
Total IV Quadrant Reactive Energy	DW	0.001	kVAh	R	0x0146~0x0147	
A phase Reactive Energy	DW	0.001	kWh	R	0x0148~0x0149	
B phase Reactive Energy	DW	0.001	kWh	R	0x014A~0x014B	

C phase Reactive Energy	DW	0.001	kWh	R	0x014C~0x014D	
Total Reactive Energy1	DW	0.001	kWh	R	0x014E~0x014F	
A phase Reactive Energy	DW	0.001	kWh	R	0x0150~0x0151	
B phase Reactive Energy	DW	0.001	kWh	R	0x0152~0x0153	
C phase Reactive Energy	DW	0.001	kWh	R	0x0154~0x0155	
Total Reactive Energy2	DW	0.001	kWh	R	0x0156~0x0157	
A phase Apparent Energy	DW	0.001	kVarh	R	0x0158~0x0159	
B phase Apparent Energy	DW	0.001	kVarh	R	0x015A~0x015B	
C phase Apparent Energy	DW	0.001	kVarh	R	0x015C~0x015D	
Total Apparent Energy	DW	0.001	kVarh	R	0x015E~0x015F	
RTC Settings						
Read/Write Year and Month	WORD	—		R/W	0x0800	Year and Month
Read/Write Day and Hour	WORD	—		R/W	0x0801	Day and Hour
Read/Write minute and seconds	WORD	—		R/W	0x0802	minute and seconds
Serial Port						
ModBus Address	WORD	—		R/W	0x0803	1-250; 0 is broadcast address
Port Baud rate	WORD	—		R/W	0x0804	1200bps(0x0000)
						2400bps(0x0001)
						4800bps(0x0002)
						9600bps(0x0003)
						19200bps(0x0004)
Check bit	WORD	—		R/W	0x0805	
						0-No check
						1-even parity check
Event Settings Set enable(0:close)(1:alarm)(2:trip)						
						Default value

Set over voltage(Enable)	WORD	—	—	R/W	0xA000	0
Set over voltage(threshold)	WORD	1	V	R/W	0xA001	(TT)276V(0x0114) (IT)480V(0x01E0)
Set over voltage(reset value)	WORD	1	V	R/W	0xA002	(TT)253V(0x00FD) (IT)440V(0x01B8)
Set over voltage(start time)	WORD	1	S	R/W	0xA003	3S(0x0003)
Set over voltage(reset time)	WORD	1	S	R/W	0xA004	3S(0x0003)
Set under voltage(Enable)	WORD	—	—	R/W	0xA005	0
Set under voltage(threshold)	WORD	1	V	R/W	0xA006	(TT)161V(0x00A1) (IT)320V(0x0140)
Set under voltage(reset value)	WORD	1	V	R/W	0xA007	(TT)184V(0x00B8) (IT)360V(0x0168)
Set under voltage(start time)	WORD	1	S	R/W	0xA008	3S(0x0003)
Set under voltage(reset time)	WORD	1	S	R/W	0xA009	3S(0x0003)
Set over frequency(Enable)	WORD	—	—	R/W	0xA00A	0
Set over frequency(threshold)	WORD	1	Hz	R/W	0xA00B	52Hz(0x0034)
Set over frequency(reset value)	WORD	1	Hz	R/W	0xA00C	50Hz(0x0032)
Set over frequency(start time)	WORD	1	S	R/W	0xA00D	30S(0x001E)
Set over frequency(reset time)	WORD	1	S	R/W	0xA00E	30S(0x001E)
Set under frequency(Enable)	WORD	—	—	R/W	0xA00F	0
Set under frequency(threshold)	WORD	1	Hz	R/W	0xA010	48Hz(0x0030)
Set under frequency(reset value)	WORD	1	Hz	R/W	0xA011	50Hz(0x0032)

Set under frequency(start time)	WORD	1	S	R/W	0xA012	30S(0x001E)
Set under frequency(reset time)	WORD	1	S	R/W	0xA013	30S(0x001E)
Set current Unbalance(Enable)	WORD	—	—	R/W	0xA014	0
Set current Unbalance(threshold)	WORD	1	%	R/W	0xA015	20%(0x0014)
Set current Unbalance(reset value)	WORD	1	%	R/W	0xA016	5%(0x0005)
Set current Unbalance(start time)	WORD	1	S	R/W	0xA017	30S(0x001E)
Set current Unbalance(reset time)	WORD	1	S	R/W	0xA018	30S(0x001E)
Set voltage Unbalance(Enable)	WORD	—	—	R/W	0xA019	0
Set voltage Unbalance(threshold)	WORD	1	%	R/W	0xA01A	20%(0x0014)
Set voltage Unbalance(reset value)	WORD	1	%	R/W	0xA01B	10%(0x000A)
Set voltage Unbalance(start time)	WORD	1	S	R/W	0xA01C	30S(0x001E)
Set voltage Unbalance(reset time)	WORD	1	S	R/W	0xA01D	30S(0x001E)
Set loss phase (Enable)	WORD	—	—	R/W	0xA01E	0
Set loss phase (threshold)	WORD	1	V	R/W	0xA01F	50V(0x0032)
Set loss phase(reset value)	WORD	1	V	R/W	0xA020	100V(0x0064)
Set loss phase (start time)	WORD	1	S	R/W	0xA021	30S(0x001E)
Set loss phase(reset time)	WORD	1	S	R/W	0xA022	30S(0x001E)
Set voltage THD over limit(Enable)	WORD	—	—	R/W	0xA023	0

Set voltage THD over limit(threshold)	WORD	1	%	R/W	0xA024	15%(0x000F)
Set voltage THD over limit(reset value)	WORD	1	%	R/W	0xA025	5%(0x0005)
Set voltage THD over limit(start time)	WORD	1	S	R/W	0xA026	30S(0x001E)
Set voltage THD over limit(reset time)	WORD	1	S	R/W	0xA027	30S(0x001E)
Set current THD over limit(Enable)	WORD	—	—	R/W	0xA028	0
Set current THD over limit(threshold)	WORD	1	%	R/W	0xA029	15%(0x000F)
Set current THD over limit(reset value)	WORD	1	%	R/W	0xA02A	5%(0x0005)
Set current THD over limit(start time)	WORD	1	S	R/W	0xA02B	30S(0x001E)
Set current THD over limit(reset time)	WORD	1	S	R/W	0xA02C	30S(0x001E)
Set power reverse (Enable)	WORD	—	—	R/W	0xA02D	0
Set power reverse (threshold)	WORD		W	R/W	0xA02E	—(0.5A)
Set power reverse (reset value)	WORD		W	R/W	0xA02F	—(0A)
Set power reverse (start time)	WORD	1	S	R/W	0xA030	30S(0x001E)
Set power reverse (reset time)	WORD	1	S	R/W	0xA031	30S(0x001E)
Set wrong phase sequence(Enable)	WORD	—	—	R/W	0xA032	0
Set wrong phase sequence(threshold)	WORD	—	—	R/W	0xA033	1
Set wrong phase sequence(reset value)	WORD	—	—	R/W	0xA034	0
Set wrong phase sequence(start time)	WORD	1	S	R/W	0xA035	30S(0x001E)

Set wrong phase sequence(reset time)	WORD	1	S	R/W	0xA036	30S(0x001E)
Set power factor under limit(Enable)	WORD	1	—	R/W	0xA037	0
Set power factor under limit(start)	WORD	0.001	—	R/W	0xA038	800(power factor0.8) (0x0320)
Set power factor under limit(stop)	WORD	0.001	—	R/W	0xA039	950(power factor0.95) (0x03B6)
Set power factor under limit(start time)	WORD	1	S	R/W	0xA03A	30S(0x001E)
Set power factor under limit(reset time)	WORD	1	S	R/W	0xA03B	30S(0x001E)
Set over temperature(Enable)	WORD	—	—	R/W	0xA03C	0
Set over temperature (threshold)	WORD	1	℃	R/W	0xA03D	100℃(0x0064)
Set over temperature(reset value)	WORD	1	℃	R/W	0xA03E	80℃(0x0050)
Set over temperature(start time)	WORD	1	S	R/W	0xA03F	30S(0x001E)
Set over temperature (reset time)	WORD	1	S	R/W	0xA040	30S(0x001E)
Instantly freeze address	WORD	—	—	W	0x5000	0xAA55
Reset (include data of energy,event and freeze)	WORD	—	—	W	0x5001	0xAA55
Restore factory protection settings	WORD	—	—	W	0x5002	0xAA55
Bluetooth Switch	WORD	—	—	W	0x5003	0:Close 1:Open
Hardware Version	WORD	—	—	R	0x0848	
sofeware Version	WORD	—	—	R	0x084A	

Mac Address	WORD	—	—	R	0x084B~ 0x0850	6bytes(Read)

A.1.2 Format of Read file

Address	Function code	Length	type	File number	Log number	Reserve	CRC
0x03	0x14	0x07	0x06	0x0001	0x0001	0x0000	crcH crcL

Send format：03 14 07 06 00 01 00 01 00 00 34 EE

Address:03

Function code:0x14

Length:0x07(fixed)

Type:0x06(fixed)

File number:please refer table below for file number description

Record number：sequence(1-10)

Reserve:00 00

CRC:34 EE

Table 1.2

File number	Event type
0	Clear Event
1	Power loss Event
2	A phase overvoltage Event
3	B phase overvoltage Event
4	C phase overvoltage Event
5	A phase undervoltage Event
6	B phase undervoltage Event
7	C phase undervoltage Event
8	Over frequency Event
9	Under frequency Event
10	current Unbalance Event
11	voltage Unbalance Event
12	Loss A phase Event
13	Loss B phase Event
14	Loss C phase Event
15	A phase current THD over threshold Event

16	B phase current THD over threshold Event
17	B phase current THD over threshold Event
18	A phase voltage THD over threshold Event
19	B phase voltage THD over threshold Event
20	C phase voltage THD over threshold Event
21	Power Reverse Event
22	Wrong phase sequence Event
23	Power factor under threshold Event
24	A phase Over temperature Event
25	B phase Over temperature Event
26	C phase Over temperature Event
27	N phase Over temperature Event

Format of electrical data

Table 1.3

Serial No.	Items	Content	Byte length	Coefficient	Unit
1	Fixed	03 14 E2 E0 06	5byte		
6	Event number	0A 00 00 00	4byte		
10	Event occurrence time	Year Month Day Hour Minute Second	6byte		
16	A phase voltage		WORD	0.01	V
18	B phase voltage		WORD	0.01	V
20	C phase voltage		WORD	0.01	V
22	A phase current		DW	0.001	A
26	B phase current		DW	0.001	A
30	C phase current		DW	0.001	A
34	Total active power		DW	0.0001	kW
38	A phase active power		DW	0.0001	kW
42	B phase active power		DW	0.0001	kW
46	C phase active power		DW	0.0001	kW
50	Total reactive power		DW	0.0001	kvar

54	A phase reactive power		DW	0.0001	kVar
58	B phase reactive power		DW	0.0001	kVar
62	C phase reactive power		DW	0.0001	kVar
66	Total apparent power		DW	0.0001	kVA
70	A phase apparent power		DW	0.0001	kVA
74	B phase apparent power		DW	0.0001	kVA
78	C phase apparent power		DW	0.0001	kVA
82	Total power factor		WORD	0.001	-
84	A phase power factor		WORD	0.001	-
86	B phase power factor		WORD	0.001	-
88	C phase power factor		WORD	0.001	-
90	Three phase forward active energy		DW	0.001	kWh
94	Three phase reverse active energy		DW	0.001	kWh
98	A phase forward active energy		DW	0.001	kWh
102	A phase reverse active energy		DW	0.001	kWh
106	B phase forward active energy		DW	0.001	kWh
110	B phase reverse active energy		DW	0.001	kWh
114	C phase forward active energy		DW	0.001	kWh

118	C phase reverse active energy		DW	0.001	kWh
122	Event end time	Year Month Day Hour Minute Second	6byte		
128	Three phase forward active energy		DW	0.001	kWh
132	Three phase reverse active energy		DW	0.001	kWh
136	A phase forward active energy		DW	0.001	kWh
140	A phase reverse active energy		DW	0.001	kWh
144	B phase forward active energy		DW	0.001	kWh
148	B phase reverse active energy		DW	0.001	kWh
152	C phase forward active energy		DW	0.001	kWh
156	C phase reverse active energy		DW	0.001	kWh
158	CRCH CRCL		DW	-	-

A.1.3 Read freeze data format

Table 1.4

File No.	Event type
28	Day freeze (sequence no. 1-365)
29	Month freeze(sequence no. 1-12)
30	Instant freeze(sequence no. 1-3)

Send data format:

03 14 07 06 00 1e 00 01 00 00 a1 2c

Receive data format:

Table 1.5

Serial No.	Items	Content	Byte length	Coefficient	Unit
1	Fixed	03 14 E2 E0 06	5byte		

6	Number of freeze items	0A 00 00 00	4byte		
10	A phase forward active energy		DW	0.001	kWh
14	B phase forward active energy		DW	0.001	kWh
18	C phase forward active energy		DW	0.001	kWh
22	total forward active energy		DW	0.001	kWh
26	A phase reverse active energy		DW	0.001	kWh
30	B phase reverse active energy		DW	0.001	kWh
34	C phase reverse active energy		DW	0.001	kWh
38	total reverse active energy		DW	0.001	kWh
42	Quadrant I reactive total energy		DW	0.001	kVarh
46	Quadrant II reactive total energy		DW	0.001	kVarh
50	Quadrant III reactive total energy		DW	0.001	kVarh
54	Quadrant IV reactive total energy		DW	0.001	kVarh
58	A phase voltage		WORD	0.01	V
60	B phase voltage		WORD	0.01	V
62	C phase voltage		WORD	0.01	V
64	A phase current		DW	0.001	A
68	B phase current		DW	0.001	A
72	C phase current		DW	0.001	A
76	N phase current(In)		DW	0.001	A
80	Frequency		WORD	0.01	Hz
82	Total active power		DW	0.0001	kW
86	A phase active power		DW	0.0001	kW
90	B phase active power		DW	0.0001	kW
94	C phase active power		DW	0.0001	kW

98	Total reactive power		DW	0.0001	kvar
102	A phase reactive power		DW	0.0001	kvar
106	B phase reactive power		DW	0.0001	kvar
110	C phase reactive power		DW	0.0001	kvar
114	total power factor		WORD	0.001	-
116	A phase power factor		WORD	0.001	-
118	B phase power factor		WORD	0.001	-
120	C phase power factor		WORD	0.001	-
122	Year Month Day Hour Minute Second		6byte		-
128	CRCH CRCL		DW		-

Appendix. Event trigger condition and default value

No.	Event type	Trigger conditions		Default value
1	Over voltage	Any phase(ABC) is higher than: Duration is over:	(IT)1.05~1.25Ue,1.2Ue(default) 2~5S,3S(default)Ue=400V (TT)1.05~1.25Un,1.2Un(default) 2~5S,3S(default)Un=230V	
2	Under voltage	Any phase(ABC) is higher than: Duration is over:	(IT)0.3~0.9Ue,0.7Ue(default) 2~5S,3S(default)Ue=400V (TT)0.3~0.9Un,0.7Un(default) 2~5S,3S(default)Un=230V	
3	Over frequency	Any phase(ABC) is higher than: Duration is over:	45Hz~65Hz,52Hz(default) 2~5S,3S(default)	
4	Under frequency	Any phase(ABC) is higher than: Duration is over:	45Hz~65Hz,48Hz(default) 2~5S,3S(default)	
5	PF pass lower limit	Any phase(ABC) is higher than: Duration is over:	0.5~0.95,0.8(default) 2~60S,30S(default)	
6	Current unbalance	Any phase(ABC) is higher than: Duration is over:	5%~60%, 20%(default) 2~60S,3S(default)	
7	Phase loss	Any phase(ABC) is higher than: Duration is over:	50V~100V,50V(default) 2~60S,30S(default)	
8	Wrong phase sequence	Any phase(ABC) is higher than: Duration is over:	2%~30%,10%(default) 2~60S,3S(default)。	
9	Power reverse	Any phase(ABC) is higher than: Duration is over:	0.5A, 2~60S,30S(default)。	

10	Temperature	Any phase(ABC) is higher than: Duration is over:	80~120℃,100℃(default) 2~60S,30S(default)	
11	THD over upper limit	Any phase(ABC) is higher than: Duration is over:	5%~20%,5%(default) 2~60S,30S(default)	