Modbus-RTU protocol of Solax Power three phase inverter

X3-MIC(6K~10K)

Version 1.1
2019-01-03

History list：

Data	Name	detail	Protocol Version	ARM version	other
2017-09-20	zhangxiangping	Draft	V1.0	V1.0	
2019-01-03	zhangxiangping	Add Select Language	V1.01	V1.01	
2020-6-9	Lintianyu	Add safety	V1.02	V1.26	
2021-4-20	zhangxiangping	Add Lease Mode	V1.03	V1.31	
2021-6-18	zhangxiangping	Add Spanish Language	V1.04	V1.32	
2021-9-26	zhangxiangping	Add set Ageing Mode	V1.05	V1.34	

1. RS485 Parameter:

Parameter	Value
Baud rate	9600bps
Data bit	8
Parity	None
Stop bit	1
RS485 bus	A(Data+); B(Data-)

2. Communication timing:

Timing parameter	Value
The least interval time between two instructions	1 Sec
Character-gap time out(silent time between 2 package)	>100ms
Response timeout	1 Sec

3. Read holding register

Function Code	Register	Name	R/W	Detail	Unit	Type	Len
0x03	0x00-0x2FF	Reserved	NA	System Reserved	NA	NA	NA
	0x300-0x306	SeriesNumber	R	14 Chars,MSB=SN[14]	14Chars	Uint16	7
	0x307-0x30D	Factory	R	14 Chars,MSB=FactoryName[13]	14Chars	Uint16	7
	0x30E-0x314	ModuleName	R	14 Chars,MSB=ModuleName[13]	14Chars	Uint16	7
	0x315-0x317	FirmwareVersion	R	6 Chars,MSB=Firmware[5]	6Chars	Uint16	3
	0x318	RTC-Second	R	RTC-Second	/	Uint16	1
	0x319	RTC-Minute	R	RTC-Minute	/	Uint16	1
	0x31A	RTC-Hour	R	RTC-Hour	/	Uint16	1
	0x31B	RTC-Day	R	RTC-Day	/	Uint16	1
	0x31C	RTC-Month	R	RTC-Month	/	Uint16	1
	0x31D	RTC-Year	R	RTC-Year	/	Uint16	1
	0x31E	PowerFactorP1	R	Power factor setting point1	1	Uint16	1
	0x31F	PowerFactorP2	R	Power factor setting point2	0.01	Uint16	1

	0x320	PowerFactorP3	R	Power factor setting point3	0.01	Uint16	1
	0x321	PowerFactorP4	R	Power factor setting point4	0.01	Uint16	1
	0x322	PowerFactorP5	R	Power factor setting point5	0.01	Uint16	1
	0x323	PowerFactorP6	R	Power factor setting point6	0.01	Uint16	1
	0x324	VpvStart	R	Pv start voltage	0.1V	Uint16	1
	0x325	Tstart	R	Connection time	1S	Uint16	1
	0x326	VacMinProtect	R	Lower limits of grid voltage	0.1V	Uint16	1
	0x327	VacMaxProtect	R	Upper limits of grid voltage	0.1V	Uint16	1
	0x328	FacMinProtect	R	Lower limits of grid frequency	0.01Hz	Uint16	1
	0x329	FacMaxProtect	R	Upper limits of grid frequency	0.01Hz	Uint16	1
	0x32A	Saftey	R	Saftey type	/	Uint16	1
	0x32B	PvConnectionMode	R	Pv connection mode	/	Uint16	1
	0x32C	Grid10MinAvgProtect	R	Grid voltage limits of 10min average	0.1v	Uint16	1
	0x32D	VacMinSlowProtect	R	Lower limits of grid voltage(slow)	0.1V	Uint16	1
	0x32E	VacMaxSlowProtect	R	Upper limits of grid voltage(slow)	0.1V	Uint16	1
	0x32F	FacMinSlowProtect	R	Lower limits of grid frequency(slow)	0.01Hz	Uint16	1
	0x330	FacMaxSlowProtect	R	Upper limits of grid frequency(slow)	0.01Hz	Uint16	1
	0x331	DCILimits	R	Limits of DCI	1mA	Uint16	1
	0x332	PowerLimitsPercent	R	Percent of power limits	1%	Uint16	1
	0x333	FixedQPower	R	Fix Q Power	Var	Uint16	1
	0x334	QurangeV1	R	Q(u) Mode range Low	1%	Uint16	1
	0x335	QurangeV4	R	Q(u) Mode range High	1%	Uint16	1
	0x336	QuVupRate	R	Q(u) Mode Voltage rate high	0.01	Uint16	1
	0x337	QuVlowRate	R	Q(u) Mode Voltage rate low	0.01	Uint16	1
	0x338	P(U)ModeEnable	R	P(u) Mode Select(Enable or Disable)	NA	Uint16	1
	0x339	SetWgra	R	Wgra	0.01%	Uint16	1
	0x33A	SetV2	R	V2	0.1V	Uint16	1
	0x33B	SetV3	R	V3	0.1V	Uint16	1
	0x33C	SetV4	R	V4	0.1V	Uint16	1

Example:

QUERY Field Name	 Example (Hex)
Slave Address Function Starting Address Hi Starting Address Lo No. of Points Hi No. of Roints Lo Error Check (LRC or CRC)	11 03 00 6B 00 03 —

RESPONSE	
Field Name	Example (Hex)
Slave Address	11
Function	03
Byte Count	06
Data Hi (Register 40108)	02
Data Lo(Register 40108)	2B
Data Hi(Register 40109)	00
Data Lo(Register 40109)	00
Data Hi(Register 40110)	00
Data Lo(Register 40110)	64
Error Check (LRC or CRC)	—

4. Read input register

Function Code	Register	Name	R/W	Detail	Unit	Type	Length
0x04	0x00-0x3FF	Reserved	NA	System Reserved	NA	NA	NA
	0x400	Vdc1	R	Pv1 input voltage	0.1V	Uint16	1
	0x401	Vdc2	R	Pv2 input voltage	0.1V	Uint16	1
	0x402	Idc1	R	Pv1 input current	0.1A	Uint16	1
	0x403	Idc2	R	Pv2 input current	0.1A	Uint16	1
	0x404	VacR	R	R phase grid voltage	0.1V	Uint16	1
	0x405	VacS	R	S phase grid voltage	0.1V	Uint16	1
	0x406	VacT	R	T phase grid voltage	0.1V	Uint16	1
	0x407	FacR	R	R phase grid frequency	0.01Hz	Uint16	1
	0x408	FacS	R	S phase grid frequency	0.01Hz	Uint16	1
	0x409	FacT	R	T phase grid frequency	0.01Hz	Uint16	1
	0x40A	IacR	R	R phase output current	0.1A	Uint16	1
	0x40B	IacS	R	S phase output current	0.1A	Uint16	1
	0x40C	IacT	R	T phase output current	0.1A	Uint16	1
	0x40D	Temperature1	R	Temperature	1℃	Uint16	1
	0x40E	Pac	R	Output power	1W	Uint16	1
	0x40F	RunMode	R	Inverter status	/	Uint16	1
	0x410	PacR	R	R phase output power	1W	Uint16	1
	0x411	PacS	R	S phase output power	1W	Uint16	1
	0x412	PacT	R	T phase output power	1W	Uint16	1
	0x413	Pdc	R	Total power of dc1 and dc2	1W	Uint16	1
	0x414	Pdc1	R	Power of Dc1	1W	Uint16	1
	0x415	Pdc2	R	Power of Dc2	1W	Uint16	1
	0x416	GridVoltFaultValueR	R	Fault value of R phase voltage	0.1V	Uint16	1
	0x417	GridVoltFaultValueS	R	Fault value of S phase voltage	0.1V	Uint16	1
	0x418	GridVoltFaultValueT	R	Fault value of T phase voltage	0.1V	Uint16	1

	0x419	GridFreqFaultValueR	R	Fault value of R phase frequency	0.01Hz	Uint16	1
	0x41A	GridFreqFaultValueS	R	Fault value of S phase frequency	0.01Hz	Uint16	1
	0x41B	GridFreqFaultValueT	R	Fault value of T phase frequency	0.01Hz	Uint16	1
	0x41C	DciFaultValueR	R	Fault value of R phase DCI	1mA	Uint16	1
	0x41D	DciFaultValueS	R	Fault value of S phase DCI	1mA	Uint16	1
	0x41E	DciFaultValueT	R	Fault value of T phase DCI	1mA	Uint16	1
	0x41F	Pv1VoltFaultValue	R	Fault value of PV1 voltage	0.1V	Uint16	1
	0x420	Pv2VoltFaultValue	R	Fault value of PV2 voltage	0.1V	Uint16	1
	0x421	TemperatureFalutValue	R	Fault value of temperature	1℃	Uint16	1
	0x422	GfciFaultvalue	R	Fault value of gfci	1mA	Uint16	1
	0x423	YieldTotal.LSB	R	LSB of yield total	0.001Kwh	Uint16	1
	0x424	YieldTotal.MSB	R	MSB of yield total	0.001Kwh	Uint16	1
	0x425	YieldToday.LSB	R	LSB of yield today	0.001Kwh	Uint16	1
	0x426	YieldToday.MSB	R	MSB of yield today	0.001Kwh	Uint16	1
	0x427	Inverter_FaultMessage.Word0	R	Word0 of fault message(LSB)	/	Uint16	1
	0x428	Inverter_FaultMessage.Word1	R	Word1 of fault message	/	Uint16	1
	0x429	Reserved	R	Word2 of fault message	/	Uint16	1
	0x42A	Reserved	R	Word3 of fault message(MSB)	/	Uint16	1
	0x42B	Reserved	R	Pv String Current of 1-1 port	0.1A	Uint16	1
	0x42C	Reserved	R	Pv String Current of 1-2 port	0.1A	Uint16	1
	0x42D	Reserved	R	Pv String Current of 1-3 port	0.1A	Uint16	1
	0x42E	Reserved	R	Pv String Current of 1-4 port	0.1A	Uint16	1
	0x42F	Reserved	R	Pv String Current of 2-1 port	0.1A	Uint16	1
	0x430	Reserved	R	Pv String Current of 2-2 port	0.1A	Uint16	1
	0x431	Reserved	R	Pv String Current of 2-3 port	0.1A	Uint16	1
	0x432	Reserved	R	Pv String Current of 2-4 port	0.1A	Uint16	1
	0x433	Manager_WarningMessage.Word	R	Word of warning message	/	Uint16	1
	0x434	Manager_FaultMessage.Word	R	Word of Manager Fault message	/	Uint16	1

Example:

QUERY

Field Name	Example (Hex)
Slave Address	11
Function	04
Starting Address Hi	00
Starting Address Lo	08
No. of Points Hi	00
No. of Roints Lo	01
Error Check (LRC or CRC)	—

RESPONSE	
Field Name	Example (Hex)
Slave Address	11
Function	04
Byte Count	02
Data Hi(Register 30009)	00
Data Lo(Register 30009)	0A
Error Check (LRC or CRC)	—

The detail of "Run Mode":

Value	Mode
0	Wait Mode
1	Check Mode
2	Normal Mode
3	Fault Mode
4	Permanent Fault Mode

The detail of "Inverter_FaultMessage":

BIT31	Reserved	
BIT30	Other_DeviceFault	
BIT29	DCI_DeviceFault	
BIT28	Reserved	
BIT27	Reserved	
BIT26	Reserved	
BIT25	Reserved	
BIT24	Reserved	
BIT23	ResidualCurrent_DeviceFault	
BIT22	SampleConsistenceFault	
BIT21	RelayFault	
BIT20	EepromFault	
BIT19	InputConfigFault	
BIT18	Reserved	
BIT17	SciCommsFault	
BIT16	SpiCommsFault	
BIT15	Reserved	
BIT14	FanFault	
BIT13	TemperatureOverFault	
BIT12	IsolationFault	
BIT11	Ac10Mins_Voltage_Fault	
BIT10	PvVoltFault	
BIT09	ResidualCurrentFault	

BIT08	Dci_OCP_Fault	
BIT07	Inv_OCP_Fault	
BIT06	Reserved	
BIT05	BusVoltFault	
BIT04	PLLLostFault	
BIT03	GridFreqFault	
BIT02	GridVoltFault	
BIT01	MainsLostFault	
BIT00	TzProtectFault	

The detail of "Manager_FaultMessage":

BIT15	Reserved	
BIT14	Reserved	
BIT13	Reserved	
BIT12	Reserved	
BIT11	Reserved	
BIT10	Reserved	
BIT09	Reserved	
BIT08	Reserved	
BIT07	Reserved	
BIT06	Reserved	
BIT05	Reserved	
BIT04	Meter_Error	
BIT03	ArmDspCommsError	
BIT02	E2promError	
BIT01	Reserved	
BIT00	Reserved	

5. Calc CheckSum

```
Uint16 sGetCrc16(Uint8 *pData, Uint16 wDataLenth)
{
    static const Uint16 wCRCTable[] = {
    0X0000, 0XC0C1, 0XC181, 0X0140, 0XC301, 0X03C0, 0X0280, 0XC241,
    0XC601, 0X06C0, 0X0780, 0XC741, 0X0500, 0XC5C1, 0XC481, 0X0440,
    0XCC01, 0X0CC0, 0X0D80, 0XCD41, 0X0F00, 0XCFC1, 0XCE81, 0X0E40,
    0X0A00, 0XCAC1, 0XCB81, 0X0B40, 0XC901, 0X09C0, 0X0880, 0XC841,
    0XD801, 0X18C0, 0X1980, 0XD941, 0X1B00, 0XDBC1, 0XDA81, 0X1A40,
    0X1E00, 0XDEC1, 0XDF81, 0X1F40, 0XDD01, 0X1DC0, 0X1C80, 0XDC41,
    0X1400, 0XD4C1, 0XD581, 0X1540, 0XD701, 0X17C0, 0X1680, 0XD641,
    0XD201, 0X12C0, 0X1380, 0XD341, 0X1100, 0XD1C1, 0XD081, 0X1040,
    0XF001, 0X30C0, 0X3180, 0XF141, 0X3300, 0XF3C1, 0XF281, 0X3240,
```

```
    0X3600, 0XF6C1, 0XF781, 0X3740, 0XF501, 0X35C0, 0X3480, 0XF441,
    0X3C00, 0XFCC1, 0XFD81, 0X3D40, 0XFF01, 0X3FC0, 0X3E80, 0XFE41,
    0XFA01, 0X3AC0, 0X3B80, 0XFB41, 0X3900, 0XF9C1, 0XF881, 0X3840,
    0X2800, 0XE8C1, 0XE981, 0X2940, 0XEB01, 0X2BC0, 0X2A80, 0XEA41,
    0XEE01, 0X2EC0, 0X2F80, 0XEF41, 0X2D00, 0XEDC1, 0XEC81, 0X2C40,
    0XE401, 0X24C0, 0X2580, 0XE541, 0X2700, 0XE7C1, 0XE681, 0X2640,
    0X2200, 0XE2C1, 0XE381, 0X2340, 0XE101, 0X21C0, 0X2080, 0XE041,
    0XA001, 0X60C0, 0X6180, 0XA141, 0X6300, 0XA3C1, 0XA281, 0X6240,
    0X6600, 0XA6C1, 0XA781, 0X6740, 0XA501, 0X65C0, 0X6480, 0XA441,
    0X6C00, 0XACC1, 0XAD81, 0X6D40, 0XAF01, 0X6FC0, 0X6E80, 0XAE41,
    0XAA01, 0X6AC0, 0X6B80, 0XAB41, 0X6900, 0XA9C1, 0XA881, 0X6840,
    0X7800, 0XB8C1, 0XB981, 0X7940, 0XBB01, 0X7BC0, 0X7A80, 0XBA41,
    0XBE01, 0X7EC0, 0X7F80, 0XBF41, 0X7D00, 0XBDC1, 0XBC81, 0X7C40,
    0XB401, 0X74C0, 0X7580, 0XB541, 0X7700, 0XB7C1, 0XB681, 0X7640,
    0X7200, 0XB2C1, 0XB381, 0X7340, 0XB101, 0X71C0, 0X7080, 0XB041,
    0X5000, 0X90C1, 0X9181, 0X5140, 0X9301, 0X53C0, 0X5280, 0X9241,
    0X9601, 0X56C0, 0X5780, 0X9741, 0X5500, 0X95C1, 0X9481, 0X5440,
    0X9C01, 0X5CC0, 0X5D80, 0X9D41, 0X5F00, 0X9FC1, 0X9E81, 0X5E40,
    0X5A00, 0X9AC1, 0X9B81, 0X5B40, 0X9901, 0X59C0, 0X5880, 0X9841,
    0X8801, 0X48C0, 0X4980, 0X8941, 0X4B00, 0X8BC1, 0X8A81, 0X4A40,
    0X4E00, 0X8EC1, 0X8F81, 0X4F40, 0X8D01, 0X4DC0, 0X4C80, 0X8C41,
    0X4400, 0X84C1, 0X8581, 0X4540, 0X8701, 0X47C0, 0X4680, 0X8641,
    0X8201, 0X42C0, 0X4380, 0X8341, 0X4100, 0X81C1, 0X8081, 0X4040 };

    Uint8 nTemp;
    Uint16 wCRCWord = 0xFFFF;

    while(wDataLenth --)
    {
        nTemp = *pData++ ^ wCRCWord;
        wCRCWord >>= 8;
        wCRCWord  ^= wCRCTable[nTemp];
    }
    return wCRCWord;

} // End: CRC16
```