Solax Power Single Phase External Communication Protocol V1.7

X1 Series

History list：

Data	Name	detail	Version	other
2015-09-23	Weir	Draft	V1.0	
2016-09-18	zhangxiangping	Add set Australia Safety Parameters	V1.1	
2017-03-27	zhangxiangping	Add Italy safety Parameters	V1.2	
2019-05-16	lintianyu	Add EarthDetect & SafetyMode Parameters	V1.3	
2020-04-15	lintianyu	Add Setting Language	V1.4	
2020-05-11	lintianyu	add read inverter config	V1.5	
2020-6-9	lintianyu	Modif safety	V1.6	
2020-6-18	lintianyu	Modif	V1.7	

1. RS485 Parameter:

Parameter	Value
Speed	9600bps
Data bit	8
Parity	None
Stop bit	1
RS485 bus	2 wries A,B /4-wries T+, T-, R+, R-

Communication timing:

Timing parameter	Value
Delay before Inverter begins to send response	0~0.5 Sec
Inter-character delay	0~0.2 Sec
The least interval time between two instructions	0.5 Sec
Time out for Inverter communication	10 Min

2.Packet Format

Header	Source Address	Destination Address	Control Code	Function Code	Data length
2 Bytes (0x AA 55)	2 Bytes (0xXX 00)	2 Bytes (0x00 XX)	1 Byte	1 Byte	1 Byte (N)

Data0	Data1	Data2	Data3	…	Data(N-1)	Checksum
1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes

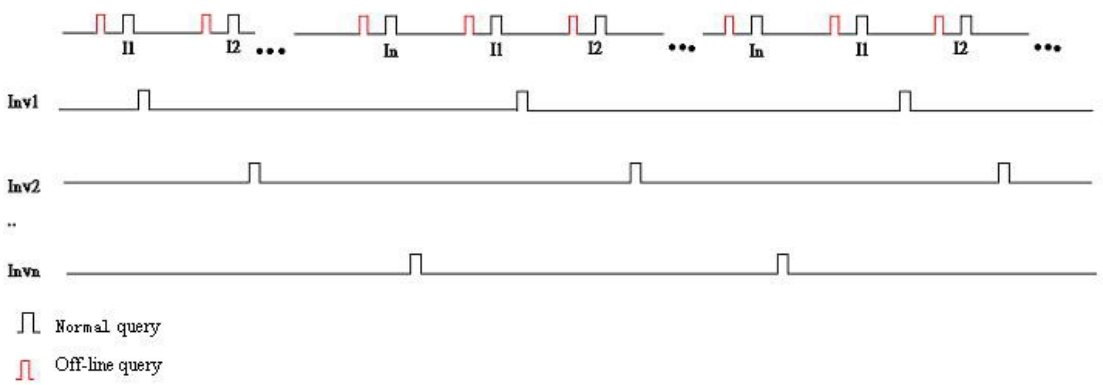
3.Description

	Description
Header (0xAA 0x55):	the header of each packet .
Source Address	designate the sender address . (it is XX00 for AP, or it is 00XX for Inverter)
Destination Address	designate the receiver address. (it is XX00 for AP, or it is 00XX for Inverter)
Control Code	there are 4 kinds: 1. Register(0x10) 2. Read(0x11) 3. Write(0x12) 4. Execute(0x13)

Function Code	
Data length	designate the data length. (If there is not the data column, the data length is 0)
Data0,1,2..	Data column
Checksum	Header + Source Address + Destination Address + Control Code +Function Code + Data length +Data0 + .. +Data (N-1)

4.Packet Communication Method

- It is necessary to get address from AP for each Inverter and the register address is unique for each Inverter.
- The communication method is as follows: AP is master and Inverter is slave, that is, firstly AP sends out the instruction to each Inverter and Inverter executes the operation when receiving its own instruction. Inverter can't actively send the instruction.
- The packet must include the sender and receiver address when AP sends query or control instruction to each Inverter. These instructions will be seen by all on-line Inverters. But the Inverter can only do when the instruction is suitable to its own address and the packet should include the sender and receiver address when Inverter responds to the instruction in the same way.
- AP routine query using the periodic query method (according to address ranking) is as follows:



- It will firstly be sent when AP needs to write the data or allocate address while the routine query will be postponed.
- If AP can't receive the correct response to the sent command in 0.5Sec, AP will send the instruction again after 0.5Sec(the least interval between instructions). When it can't also receive the response for 3 times, AP will cancel the register and no longer send the instruction to the address.

5.Control Code :0x10 'register'

Control	Function code	Vector	Description
0x10	0x00	AP →Inverter	Off-line
0x10	0x80	Inverter→AP	register request
0x10	0x01	AP →Inverter	send register address
0x10	0x81	Inverter→AP	address confirm
0x10	0x02	AP →Inverter	remove register
0x10	0x82	Inverter→AP	remove confirm
0x10	0x03	AP →Inverter	re-connect removed
0x10	0x04	AP →Inverter	Re-register

Off-line query Example:

- AP queries whether there is a new Inverter added (Control Code:0x10 Function Code 0x00)

Header	Source Address	Destination Address	Control Code	Function Code	Data length	Checksum
2 Bytes (0xAA 0x55)	2 Bytes (0xXX 0x00	2 Bytes (0x00 0xXX)	1 Byte (0x10)	1 Byte (0x00)	1 Byte (0x00)	2 Bytes

- The off-line Inverter reply register request(Control Code:0x10, Function Code 0x80)

Header	Source Address	Destination Address	Control Code	Function Code	Data length	Data0
2 Bytes (0xAA 0x55)	2 Bytes (0x00 0x00)	2 Bytes (0xXX 0x00)	1 Byte (0x10)	1 Byte (0x80)	1Byte (0x0E)	1 Byte

Data1	Data2	Data3	…	Data13	Checksum
1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes

Description: Data0 to Data13 is Inverter serial number

- AP allocates address for Inverter (Control Code:0x10 Function Code 0x01)

Header	Source Address	Destination Address	Control Code	Function Code	Data length	Data0
2 Bytes (0xAA 0x55)	2 Bytes (0x00 0x00)	2 Bytes (0xXX 0x00)	1 Byte (0x10)	1 Byte (0x01)	1Byte (0x0B)	1 Byte

Data1	Data2	Data3	…	Data13	Data14	Checksum
1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1Byte (register Address)	2 Bytes

Description: the rules of AP allocating address， Data0 to Data13 is Inverter serial number

- AP should record every allocated address of Inverter that has been registered and set up a

map for allocated address.

- □ AP will allocate a proper address to Inverter according to records of the map of allocated address.

- ■ Inverter reply address confirm (Control Code:0x10 Function Code 0x81)

Header	Source Address	Destination Address	Control Code	Function Code	Data length	Data0	Checksum
2 Bytes (0xAA 0x55)	2 Bytes (0x00 0xXX)	2 Bytes (0xXX 0x00)	1Byte (0x10)	1 Byte (0x81)	1Byte (0x01)	1Byte ACK(0x06)	2 Bytes

Description: The state of Inverter will be changed from ‘not registration ‘state to ‘registration’ state after Inverter has finished the register program, then it will not respond to the ‘off-line query’ from AP.

6. Control Code :0x11 'Read'

Control code	Function code	Vector	Description
0x11	0x02	AP →Inverter	query normal info
0x11	0x82	Inverter→AP	Response for query
0x11	0x03	AP →Inverter	Read ID info
0x11	0x83	Inverter→AP	Response for ID info
0x11	0x04	AP →Inverter	read config
0x11	0x84	Inverter→AP	Response for config

Header	Source Address	Destination Address	Control Code	Function Code	Data length	Checksum
2 Bytes (0xAA 0x55)	2 Bytes (0xXX 0x00	2 Bytes (0x00 0xXX)	1 Byte (0x11)	1 Byte (0x02)	1 Byte (0x00)	2 Bytes

The data response for normal query from inverter:

The following is the data part of the response package.

Header	Source Address	Destination Address	Control Code	Function Code	Data length
2 Bytes (0x AA 55)	2 Bytes (0xXX 00)	2 Bytes (0x00 XX)	1 Byte (0x11)	1 Byte (0x82)	1 Byte (N)

Data0	Data1	Data2	Data3	…	Data(N-1)	Checksum
1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes

Data	Unit	Description	Length
Temperature	1℃	Temperature	2Byte
E-today	0.1KWH	Yield today	2Byte
Vpv1	0.1V	PV1 voltage	2Byte
Vpv2	0.1V	PV2 voltage	2Byte
Ipv1	0.1A	PV1 current	2Byte
Ipv2	0.1A	PV2 current	2Byte
Iac	0.1A	Current output	2Byte
Vac	0.1V	Grid voltage	2Byte
Frequency	0.01Hz	Grid frequency	2Byte
power	1W	Power output	2Byte
Not use	-	Not use	2Byte
E-total	0.1kwh	Yield total	4Byte
T-total	1hour	Runtime total	4Byte
Mode	-	Inverter mode	2Byte
GridVoltFault	0.1V	Grid voltage fault value	2Byte
GridFreqFalut	0.01Hz	Grid frequency fault value	2Byte
DCIFault	1mA	DC injection fault value	2Byte
TemperatureFault	-	Temperature fault value	2Byte
PV1Fault	0.1V	Pv1 voltage fault value	2Byte
PV2Fault	0.1V	PV2 voltage fault value	2Byte
GFCFault	1mA	GFC fault value	2Byte
ErrMessage	-	Error Message	4Byte

When sending the MSB will be firstly transmitted as a packet of word format.

The detail of “Run Mode”:

Value	Mode
0	Wait Mode
1	Check Mode
2	Normal Mode
3	Fault Mode
4	Permanent Fault Mode
5	Update Mode
6	SelfTest Mode

The detail of “ErrMessage”:

//BYTE0

```
Uint16 TzProtectFault:1;//0
Uint16 MainsLostFault:1;//1
Uint16 GridVoltFault:1;//2
```

```
Uint16 GridFreqFault:1;//3
Uint16 PLLLostFault:1;//4
Uint16 BusVoltFault:1;//5
Uint16 BIT06:1;//6
Uint16 OciFault:1;//7    OciFault;
//BYTE1
Uint16  Dci_OCP_Fault:1;//8
Uint16 ResidualCurrentFault:1;//9
Uint16 PvVoltFault:1;//10
Uint16 Ac10Mins_Voltage_Fault:1;//11
Uint16 IsolationFault:1;//12
Uint16 TemperatureOverFault:1;//13
Uint16 FanFault:1;//14
Uint16 bit15:1;//15
//BYTE2
Uint16 SpiCommsFault:1;//16
Uint16 SciCommsFault:1;//17
Uint16 BIT18:1;//18
Uint16 InputConfigFault:1;//19
Uint16 EepromFault:1;//20
Uint16 RelayFault:1;//21
Uint16 SampleConsistenceFault:1;//22
Uint16 ResidualCurrent_DeviceFault:1;//23
//BYTE3
Uint16 BIT24:1;//24
Uint16 BIT25:1;//25
Uint16 BIT26:1;//26
Uint16 BIT27:1;//27
Uint16 BIT28:1;//28
Uint16 DCI_DeviceFault:1;//29
Uint16 OtherDeviceFault:1;//30
Uint16 BIT31:1;//31
```

The data response for ID info query from inverter:

arrary	detail
Data9	1: single phase
Data10~data15	Rated power,(ascii char)
Data16~data20	Firmware ver (ascii char)
Data21~data34	Module name(ascii char)
Data35~data48	Factory name(ascii char)
Data49~data62	SerialNumber(ascii char)
Data63~data66	Rated bus voltage(ascii char)

The data response for inverter Config:

Item	Data	Unit	Length
1	wVpvStart[9.10]	0.1V	2Byte
2	wTimeStart[11.12]	1S	2Byte
3	wVacMinProtect[13.14]	0.1V	2Byte
4	wVacMaxProtect[15.16]	0.1V	2Byte
5	wFacMinProtect[17.18]	0.01Hz	2Byte
6	wFacMaxProtect[19.20]	0.01Hz	2Byte
7	wDciLimits[21.22]	1mA	2Byte
8	wGrid10MinAvgProtect[23,24]	0.1V	2Byte
9	wVacMinSlowProtect[25.26]	0.1V	2Byte
10	wVacMaxSlowProtect[27.28]	0.1V	2Byte
11	wFacMinSlowProtect[29.30]	0.01Hz	2Byte
12	wFacMaxSlowProtect[31.32]	0.01Hz	2Byte
13	wSafety[33.34]		2Byte
14	wPowerfactor_mode[35]	NA	1Byte
	wPowerfactor_data[36]	NA	1Byte
15	wUpperLimit[37]	NA	1Byte
	wLowerLimit[38]	NA	1Byte
16	wPowerLow[39]	NA	1Byte
	wPowerUp[40]	NA	1Byte
17	Qpower_set[41.42]	NA	2Byte
18	WFreqSetPoint[43.44]	0.01Hz	2Byte
19	WFreqDroopRate[45.46]	NA	2Byte
20	QuVupRate[47.48]	NA	2Byte
21	QuVlowRate[49.50]	NA	2Byte

22	WPowerLimitsPercent[51.52]	NA	2Byte
23	WWgra[53.54]	0.01%	2Byte
24	wWv2[55.56]	0.1V	2Byte
25	wWv3[57.58]	0.1v	2Byte
26	wWv4[59.60]	0.1v	2Byte
27	wQurangeV1[61.62]	1%	2Byte
28	wQurangeV4[63.64]	1%	2Byte
29	BVoltPowerLimtit[65.66]	NA	2Byte
30	WPowerManagerEnable[67.68]	NA	2Byte
31	WGlobalSeachMPPTStrartFlg[69.70]	NA	2Byte
32	WFrqProtectRestrictive[71.72]	NA	2Byte
33	WQuDelayTimer[73.74]	s	2Byte
34	WFreqActivePowerDelayTimer[75.76]	ms	2Byte

7. Control Code :0x12 'Write

Control code	Function code	Vector	Description
0x12	0x0x	AP →Inverter	Write
0x12	0x8x	Inverter→AP	Return ACK

Header	Source Address	Destination Address	Control Code	Function Code	Data length	Data MSB	Data LSB	Checksum
2 Bytes (0xAA 0x55)	2 Bytes (0xXX 0x00	2 Bytes (0x00 0xXX)	1 Byte (0x12)	1 Byte (0x0x)	1 Byte (0x02)	1Byte	1Byte	2 Byte

The following is the data part of the response package.

Header	Source Address	Destination Address	Control Code	Function Code	Data length
2 Bytes (0x AA 55)	2 Bytes (0xXX 00)	2 Bytes (0x00 XX)	1 Byte (0x12)	1 Byte (0x8x)	1 Byte

Data	Checksum
ACK(0x06) NACK(0x15)	2 Bytes

Function Code	-	-	-
0x00	0.1v	PV start volt	2Byte
0x01	1s	Reconnect time	2Byte
0x04	0.1v	GridVoltLow	2Byte
0x05	0.1v	GridVoltHigh	2Byte
0x06	0.01Hz	GridFreqLow	2Byte
0x07	0.01Hz	GridFreqHigh	2Byte
0x08	0.1v	10min avg volt high	2Byte
0x09	1mA	DCI limits	2Byte
0x0A	0.1v	GridVoltLowSlow	2Byte
0x0B	0.1v	GridVoltHighSlow	2Byte
0x0C	0.01Hz	GridFreqLowSlow	4Byte
0x0D	0.01Hz	GridFreqHighSlow	4Byte
0x0E	NA	wPvStringCommType	2Byte
0x0F	NA	MSB:wPfSettingPoint1_Mode LSB:wPfSettingPoint2_PF	2Byte
0x10	NA	MSB:wPfSettingPoint3_PFUP LSB:wPfSettingPoint4_PFLOW	2Byte
0x11	NA	MSB:wPfSettingPoint5_PLOW LSB:wPfSettingPoint6_PUP	2Byte
0x12	1%	wAcPowerLimit	2Byte
0x13	0.01Hz	fFreqPoint	2Byte

0x14	2~12	fFreqDroop	2Byte
0x15	1%	wQuVrateUp	2Byte
0x16	1%	wQuVrateLow	2Byte
0x17	1Var	wQsetTemp	2Byte
0x18	0.01%	Wgra	2Byte
0x19	0.1v	Wv2	2Byte
0x1a	0.1v	Wv3	2Byte
0x1b	0.1v	Wv4	2Byte
0x1c	NA	wSetQurangeV1	2Byte
0x1d	NA	wSetQurangeV4	2Byte
0x1e	0.1v	wSetVoltPowerLimtit	2Byte
0x1f	0.1v	wPowerManagerEnable	2Byte
0x20	NA	wGlobalSeachMPPTStrartFlg	2Byte
0x21	NA	wFrqProtectRestrictive	2Byte
0x22	1s	wQuDelayTimer	2Byte
0x23	1ms	wFreqActivePowerDelayTimer	2Byte
0x24	NA	wEarthDetect	2Byte
0x25	NA	saftymode	2Byte

8. Control Code :0x13 'Execute

Control code	Function code	Vector	Description
0x13	0x0x	AP →Inverter	Execute
0x13	0x8x	Inverter→AP	Return ACK

Header	Source Address	Destination Address	Control Code	Function Code	Data length	Data MSB	Data LSB	Checksum
2 Bytes (0xAA 0x55)	2 Bytes (0xXX 0x00	2 Bytes (0x00 0xXX)	1 Byte (0x13)	1 Byte (0x0x)	1 Byte (0x02)	1Byte	1Byte	2 Byte

The following is the data part of the response package.

Header	Source Address	Destination Address	Control Code	Function Code	Data length
2 Bytes (0x AA 55)	2 Bytes (0xXX 00)	2 Bytes (0x00 XX)	1 Byte (0x13)	1 Byte (0x8x)	1 Byte

Data	Checksum
ACK(0x06) NACK(0x15)	2 Bytes

Function Code	-	-	Length
0x00		Clean history	0
0x01	0.1A	PV current calibration	4byte
0x02	0.1v	Grid Volt calibration	2byte
0x03	0.1A	Grid current calibration	2byte
0x07		safty	2byte
0x0C	0.1V	PV volt calibration	2Byte
0x0D	0.1w	Power calibration	2byte
0x0F		SN	14byte
0x10		Module name	14byte
0x11		Factory name	14byte
0x14		reserved	6byte
0x15		Default EEPROM	2byte
0x16		Set Language 0:English 1: German 2: Polish 3: French 4: Portuguese Default:English	2bytes

Safty:

VDE0126	0
VDE4105	1
AS4777	2
G98	3
C10_11	4
TOR	5
EN50438_NL	6
Denmark2019_W	7
CEB	8
Cyprus2019	9
cNRS097_2_1	10
VDE0126_Greece	11
UTE_C15_712_Fr	12
IEC61727	13
G99	14
CQC	15
VDE0126_Greece_is	16
C15_712_Fr_island_50	17
C15_712_Fr_island_60	18
Guyana	19
MEA_Thailand	20
PEA_Thailand	21
cNewZealand	22
cIreland	23
cCE10_21	24
cRD1699	25
EN50438_Sweden	26
EN50549_PL	27
Czech PPDS	28
EN50438_Norway	29
EN50438_Portug	30
cCQC_WideRange	31
BRAZIL	32
EN50438_CEZ	33
IEC_Chile	34
Sri_Lanka	35
BRAZIL_240	36
EN50549-SK	37
EN50549_EU	38
G98/NI	39
Denmark2019_E	40

校验和计算：

CheckSum:

```
void sFillCheckSum(Uint8 bLen)
{
    Uint8 i;
    Uint16 wChkSum;

    wChkSum = 0;
    for(i = 0; i <= (bLen + 8); i++)
    {
       wChkSum = wChkSum + bExternTxPackage[i];
    }
    bExternTxPackage[(bLen + 9)] = (Uint8)(wChkSum / 256);
    bExternTxPackage[(bLen + 10)] = (Uint8)(wChkSum % 256);
}
```