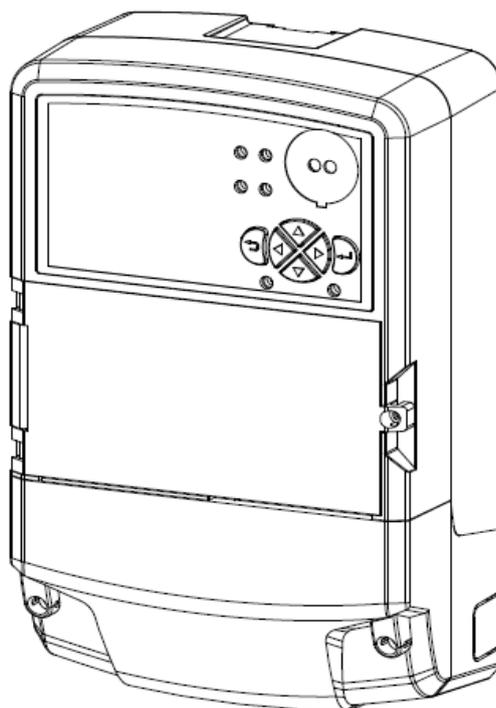


USER MANUAL

Data Concentrator



Model: SX5D1-AEOT-14



Ningbo Sanxing Electric Co., Ltd.

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1. Overview

- This document applies for SX5D1-AEOT-14 concentrator.
- This document provides readers with the configuration and usage of SX5D1-AEOT-14 concentrator.
- This document explains to technicians how to configure, debug, operate and maintain SX5D1-AEOT-14 concentrator.

2. Product Description

- Please read every chapter carefully before using the product.
- Make sure that only professional technicians with operating electrical equipment experience can operate the equipment.
- This product adopts advanced 32 bits ARM9 hardware platform, uses stable embedded Linux operating system as the core, owns mature GPRS communication technology and Power Line Communication technology(optional features), employs the modular structure design and combines with Sanxing Electric's advanced SMT technology, electric meter's design and several years' experience, it's a technology-advanced, stable and reliable embedded product.
- Basic functions: energy measuring, meter reading and data storage, data processing and controlling. Concentrator is also an equipment that connects with master station. This product mainly applies to the automatic data acquisition in low voltage electric power system and automatic meter reading in electric power marketing system.

3. Safety Information

- Read and understand related chapters, qualified enough to operate the equipment, obey the safety rules and follow the instructions thoroughly.
- Special attention: the equipment can be operated when power is disconnected only, anyone that uses the equipment should take responsibility to protect other people and objects.

4. Technical Specifications

CPU	ARM9
Storage Capacity	256MB\512MB
Memory	64MB
Max. Operating Freq. (MHz):	300 MHz
Protocol	DLMS/COSEM

SX5D1-AEOT-14 data concentrator user manual

Voltage range	3 × 133V\230V;3 × 230/400 V
Voltage variation range	0.8Un ~ 1.2Un
Reference Current	1(6)A;1.5(6)A;1(10)A
Active Energy Const	10000imp/kWh
Reactive Energy Const	10000imp/kvarh
Active Accuracy Class	0.5
Reactive Accuracy Class	2
Rated Frequency	50Hz
Operating Temperature	-25°C~+55°C
Storage Temperature	-25°C~+55°C
RTC accuracy	≤0.5s/per day
Self-consumption in stand-by mode (W)	≤8W
Maximum self-consumption during PLC and 4G communication (W)	≤10W
Immunity to surge pulses	6kV
Impulse withstand voltage 1.2/50μS	6kV
Environmental operating requirement	Humidity up to 95 %
Lifetime of operation	6 years
Protection against penetration of dust and water	IP51
material of concentrator casing, cover and terminal cover	heat and fire resistant material (according to EN50470-1)
Overall Dimension	289mm * 180mm * 95mm

Table 1 Technical Specifications

5. Construction and Features

5.1. Overall and Dimension

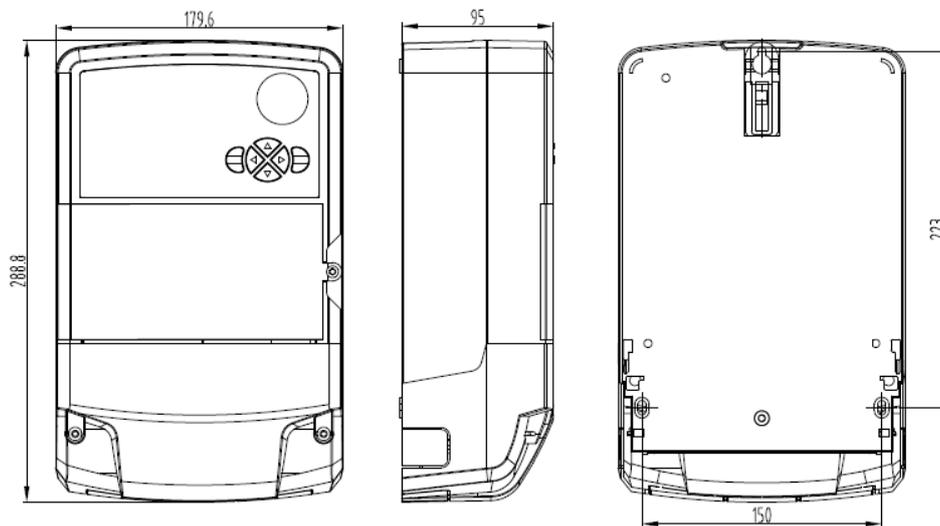


Figure 1 Overall and Dimension

This product is wall-mounted. It can be installed into the distribution box. The size is 289mm x 180mm x 95mm.

There are 3 mounting holes on the back of the meter housing. The upper mounting screw is available for fully installed PLC data concentrator and the 2 bottom screws(5*20mm) are under the sealable terminal cover.

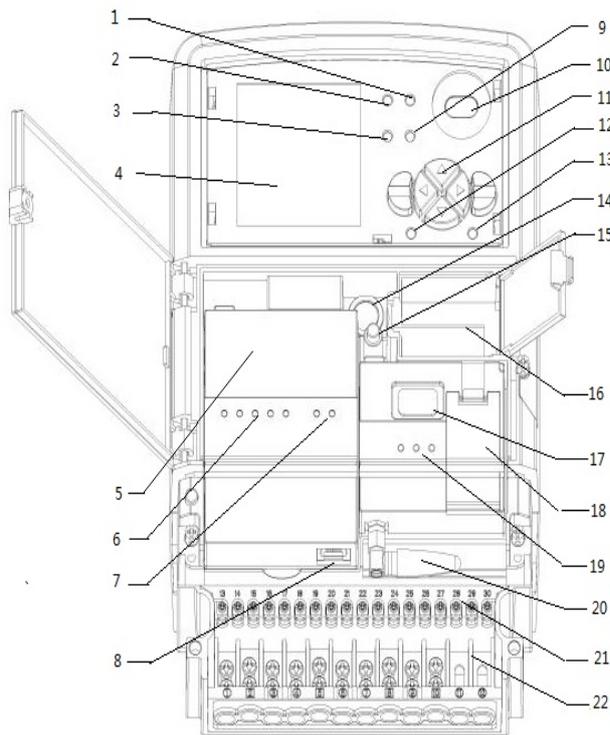


Figure 2 components

5.2. Components and Connections

1. Signal Strength Led
2. Running Led
3. Alarm Led I
4. LCD(optional)
5. PLC Module
6. PLC Status Led
7. Ethernet Status Led
8. Ethernet Interface
9. Alarm Led II
10. Optical Port(not used)
11. Buttons
12. Active Pulse Led
13. Reactive Pulse Led
- 14.RS232 Debug(optional)
15. Reserved Key (optional)
16. Battery Box

17. *USB Port(not used)*
18. SIM Card Slot
19. GPRS Status Led
20. Antenna
21. Aux Port(Energy Pulse,RS485 Port, etc.)
22. Terminal

Both PLC and GPRS are designed and implemented as a single component. We can replace module instead of removing the concentrator.

All the connections are situated under the terminal cover. Utility seals in the fixing screws of the terminal cover prevent unauthorized access to the phase connections. It is prevented to touch the PLC data concentrator terminals which is with sealable cord while sealing the covers. Connection wire can be both copper and aluminum wires, the cross-section of terminal is 2.5~6mm², terminal screw type is PH(PZ).

5.3. Down-Link Modules

Concentrator could be equipped with a down-link module, the type of down-link module could

be HPLC.

5.3.1. HPLC Module

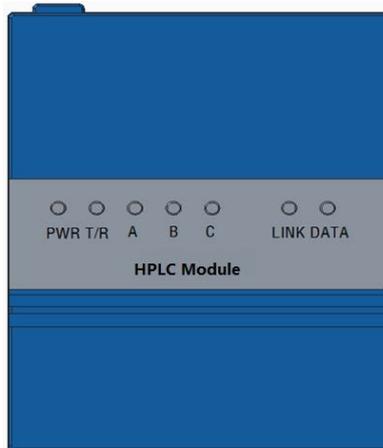


Figure 3 HPLC Module

Down-Link module status description as following:

Indicator light	State	Description
PWR	ON	Normal operation
T/R	ON/blinking at a variable frequency	Receiving or transmitting PLC data
A	OFF/blinking	Reserved, default off
B	OFF/blinking	Reserved, default off
C	OFF/blinking	Reserved, default off
LINK	ON/blinking	Ethernet cable connected
DATA	ON/blinking at a variable frequency	Receiving or transmitting data

Table 2 indicators of Down-Link Module

5.4. Up-Link Module

5.4.1. 4G Module

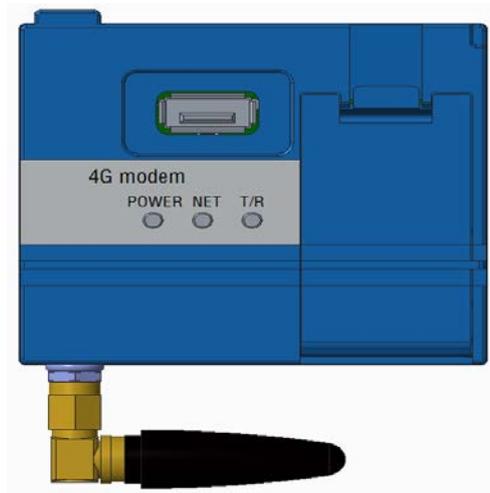


Figure 4 4G module

Panel	LED	explanation
GPRS panel	Power light	Module power up.
	Internet light	GRPS connection
	Transmission light	GPRS data transmit and receive

Table 3 Indicators of Uplink modules

Cellular network coverage strength indication:

Use **Signal Strength Led** Flicker frequency to indication the signal strength:

CSQ [0~15] Frequency is 5Hz

CSQ [16~24] Frequency is 0.5Hz

CSQ [24~31] Frequency is 0.25Hz

Note: blink 3 times every second.

5.5. Wiring Diagrams

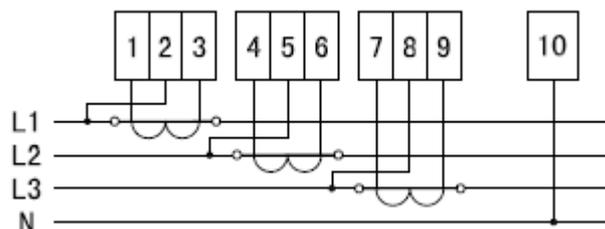


Figure 5 Wiring Diagrams with balance meter

Connect Ua, Ub, Uc and Un at the same time in power grid connection.

6. Conditions and Requirements

6.1. General Requirement

- a) Installation site must be in non-hazardous locations where the temperature is between -25°C and 55°C.
- b) Installation site can't be exposed to sunlight directly.
- c) Concentrator should be installed in electric meter box.
- d) Installation site must be the place without any harmful and corrosive gases and without any dust.

6.2. SIM Card Requirement

- a) SIM card must suitable in GPRS communication and enable related operator service.
- b) SIM card's password inquiry service must be disable.

6.3. Antenna

If connects external antenna, please refer to the frame structure in clause 5.2 and connect antenna with related port.

6.4. Security Annotation in Communication Module

Because of the application of GPRS in communication, radio may suffer from radio-frequency interference, any usage of radio apparatus must obey related rules.

If equipped with medical apparatus such as heart pacemaker, it may be dangerous in getting close to this equipment, please ask related medical apparatus manufacturer to make sure whether it is safe while doing so.

6.5. Installation Procedures

To ensure proper operation of the data concentrator, follow the procedures below when install a DCU:

- a) Remove the terminal cover.
 - b) Screw the upper screw into the wall. Leave enough space between the screw head and the wall for the suspension hanger around the keyhole. (The recommend height is about 1.8 meters)
 - c) Hang the concentrator on the upper screw using the keyhole in the back of the concentrator.
 - d) Insert the remaining two screws (under the terminal cover) to hold the concentrator securely.
 - e) Connect the concentrator according to the wiring diagram on the inner side of terminal cover.
 - f) Install the GPRS module into the concentrator. Connect the external antenna outside.
 - g) Install PLC module into the concentrator. Caution: insert the module into slot carefully and correctly.
 - h) Power up.
-

i) Check LED.

Check the LEDs on the DCU main panel. Please refer to chapter 5.2.

Check the LEDs on the HPLC module. Please refer to chapter 5.3.

Check the LEDs on the GPRS module. Please refer to chapter 5.4.

j) Assemble and seal the terminal cover.

7. Application and Operation

7.1. Interconnection

- a) The data concentrator and Down-link modems work with DLMS/COSEM (IEC 62056) data protocol.

7.2. Communication

- a) PLC communication chipset is fully integrated inside the PLC data concentrator (no additional converters, connectors, wires etc.)
- b) Standard connection is used for the local connection (data exchange and parameterization) to the PLC data concentrator: RJ45 with Ethernet
- c) Local Ethernet communication interface input-output for WAN communication module connection (e.g. Ethernet network or auxiliary cellular modem)
- d) Local Ethernet communication interface supports communication using Ethernet network (10/100 Mbit/s Auto MDI-X Ethernet interface with DHCP support)
- e) PLC data concentrator in WAN operates using IPv4
- f) For predefined different mobile networks. Purchaser predefined APN profiles shall be used. When SIM card is changed to different mobile network operator the new SIM is recognized in the device. New APN profiles can be selected automatically.

7.2.1. HPLC modem

PLC data concentrator uses an UART port to communication with the HPLC module. If a HPLC module is installed in the DCU, the meter archives must be configured into the DCU from HES, then DCU sends archives to HPLC module, the HPLC module will establish a PLC network with meters equipped HPLC module.

-when use PLC communication, without extra wiring

-after re-connections and switching operations in the power grid, the DCU will send meter archives to HPLC module installed in the DCU, this HPLC module will establish the network with meters automatically.

7.2.2. GPRS/3G/4G modem

- a) Operating temperature: -25°C~55°C
 - b) Environmental operating requirement: Humidity up to 95 %
 - c) The modem device casing is made of fire retardant insulation material
 - d) Modem power supply is provided from the PLC data concentrator
 - e) Modem comes with an external antenna with magnetic base and cable length $\geq 1,5\text{m}$
 - f) SMA Female 50 Ohm antenna connector with center pin for external antenna connection
-

- g) Modem has Power indication and data exchange indication, indications are permanently visible when the PLC data concentrator is installed together with modem
- h) Cellular signal strength indication (on meter or modem): ≥ 3 levels
- i) Cellular signal strength indication renewal interval: < 1 min
- j) It is possible monitor the mobile network area signal strength remotely (via HES) and locally (using web GUI)
- k) It is possible to change all modem settings and upgrade modem firmware remotely (via HES) and locally (using web GUI)
- l) It is possible to remotely (using HES) and locally (using local applications) set the modem automatic restart frequency and time
- m) The modem shall automatically register in the cellular network after power or mobile network coverage restoration or restart
- n) Operating frequencies in mobile networks :
 - 2G (GPRS/EDGE) 900MHz and 1800 MHz
 - 3G HSPA/UMTS 900MHz and 2100 MHz
 - 4G LTE 800 MHz and 1800 MHz

Modem operating modes:

2G. Modem constantly running in GPRS/EDGE mobile network

3G. Modem constantly running in HSPA/UMTS mobile network

4G. Modem constantly running in LTE mobile network

Auto. Depending on best network coverage

- o) Modem switches between the operating modes (2G, 3G and 4G) automatically based on the best network coverage
- p) The modem supports automatic TCP Client and TCP Server mode operation
- q) Modem GPRS parameter "Multislot Class": ≥ 9
- r) Modem GPRS parameter "Uplink time slots": ≥ 2
- s) Data transfer rate 2G: 100 kbit/s
- t) Data transfer rate 3G: 400 kbit/s
- u) Possibility to disable (built-in cellular modem) or disconnect (auxiliary cellular modem) the cellular modem
- v) If the product is provided with Heartbeat functionality, it is possible to disable it remotely (via HES) and locally (using Local Software). If this functionality is disabled common solution must be compliant with Technical requirements

Modem must have built-in watchdog functionality with possibility to remotely (using a HES) and locally (using local applications)configure and disable it.

7.3. Functions

- a) It supports multiple simultaneous communication sessions (WAN data session doesn't stop or hamper PLC data sessions and PLC data sessions doesn't stop or hamper WAN communication).
 - b) All stored but previously unread data in the meters' memory shall be read automatically by the PLC concentrator. The data includes:
 - Energy profile and demand profile for last 20 days (the period shall be configurable);
 - Billing profile for last 13 months;
 - Complete event logbook
 - c) PLC data concentrator shall regularly (with configurable interval) check whether the meter is reachable (communication channel is working properly) and check for new events. In case of new events the PLC data concentrator shall automatically retrieve them and forward to HES according to their priority
 - d) In three phase network data device may use all three phases for communications purposes.
 - e) It's possible to remotely and locally perform PLC data device parameterization (by using HES) or locally (by using web GUI).
 - f) It's possible to remotely (by using HES) or locally (by using web GUI) update PLC data concentrator firmware.
 - g) Automatic PLC data device clock synchronization with HES: No less than 1x per day.
 - h) PLC data concentrator automatically maintains clock synchronization for all connected meters (UTC time shall be used for time synchronization).
 - i) PLC data concentrator maintains its own event logbook with Purchaser definable types of events. The event list contains at least (not exhaustive list):
 - terminal cover and mechanism cover removal and refitting with time and date stamp;
 - last parameterization and firmware update with time and date stamp;
 - Power down and power up with time and date stamp;
 - Reboot of the operating system
 - To current technical specification fully compliant PLC data concentrator reserve memory size.: $\geq 50\%$ from total memory size
-

- j) PLC data concentrator stores historical meter data at least for 3 months.
- k) Ethernet interface is available for cellular network modem connection (if the modem is auxiliary connected).
- l) Access to the PLC data concentrator is role based with different access rights. At the moment of installation there must be:
 - Administrator account for technical personnel with device configuration rights;
 - Administrator account for full HES functionality rights.
- m) PLC data concentrator uses internal system clock to generate date and time stamps for audit records.

7.4. Alarm

Alarm works by buzzer. Concentrator power on will trigger a ring for 300ms, TCP connecting to master station will trigger a buzz for 500ms, and it will buzz for 500ms 2times after receiving respond from master station.

7.5. Events

Concentrator will record and log the event and the occurrence time as the following events occur: software starting, parameter upgrading, firmware upgrading.

7.6. Software

For local and remote PLC data concentrator parameter and setting change the WEB GUI shall be used in the following languages: EN.

Provide documented default device settings and shall ensure possibility to change them with a template

7.7. Web Interface

7.7.1. Connection with concentrator by LAN

Connecting with concentrator by Ethernet cable, the web interface will be available with maintenance IP and interface. The default IP for the concentrator is “192.168.100.100”, so you should make your computer’s IP In the same network segment with IP of concentrator. For example, you could change IP of your computer to “192.153.1.101”, then change the subnet

mask to “255.255.255.0” and enter “https://192.168.100.100” on the browser, if all goes well, user can access to the website of concentrator.

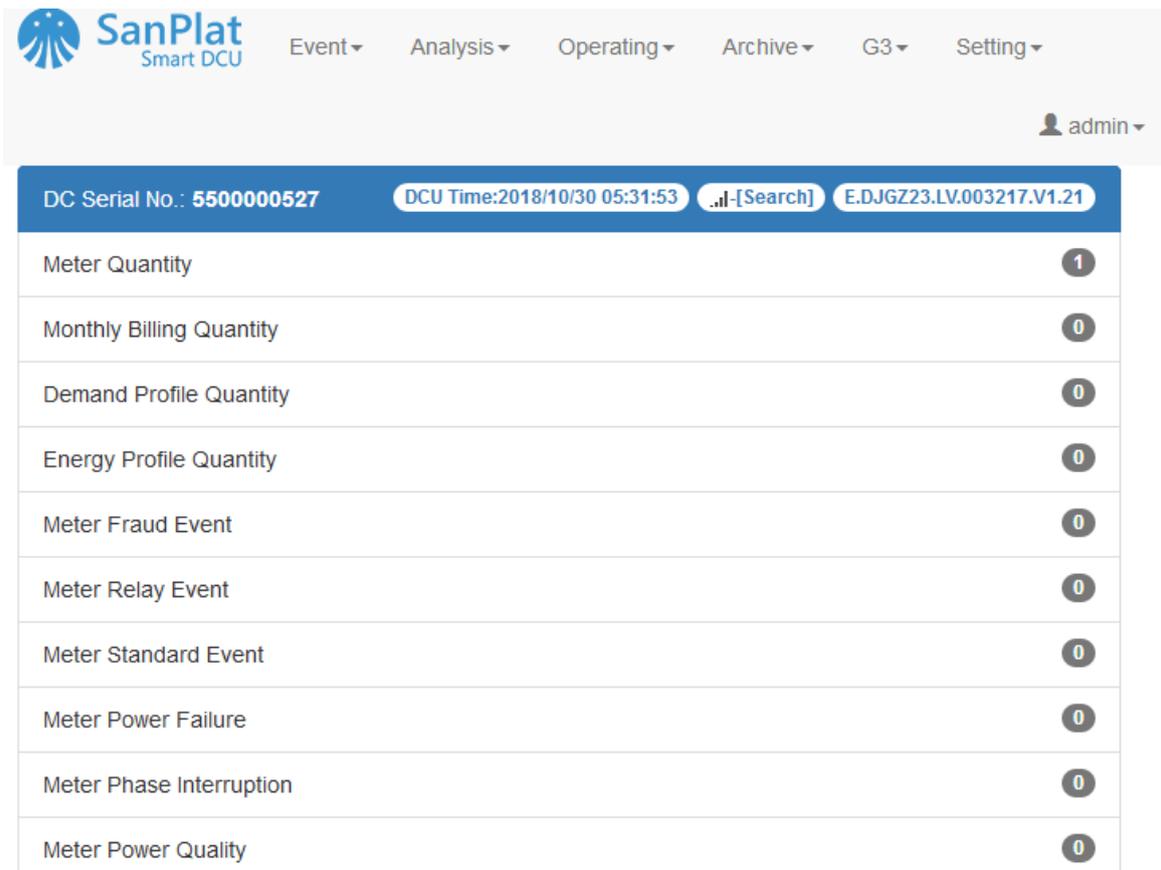
Recommended web browser :

① IE 10 (window 7)

② Firefox

③ Chrome

- In all HTTPS connections only TLS protocol is used (not less than version 1.1.) with certificates from Purchaser PKI (public key infrastructure) solution.
 - Manage metering part of the PLC data concentrator by using Web-GUI ensuring the functionality equivalent to the Local Software for meters
 - Read data from connected meters with a separate manual command by using Web-GUI
- Possible to define a blacklist for devices that are not allowed to communicate in the designated network;
- Web interface homepage



The screenshot shows the SanPlat Smart DCU homepage. At the top left is the SanPlat logo. To its right is a navigation menu with items: Event, Analysis, Operating, Archive, G3, and Setting. In the top right corner, there is a user profile icon labeled 'admin'. Below the navigation is a blue header bar containing: 'DC Serial No.: 5500000527', 'DCU Time:2018/10/30 05:31:53', a search icon and '[Search]', and 'E.DJGZ23.LV.003217.V1.21'. Below this is a table with 11 rows, each representing a data item and its count.

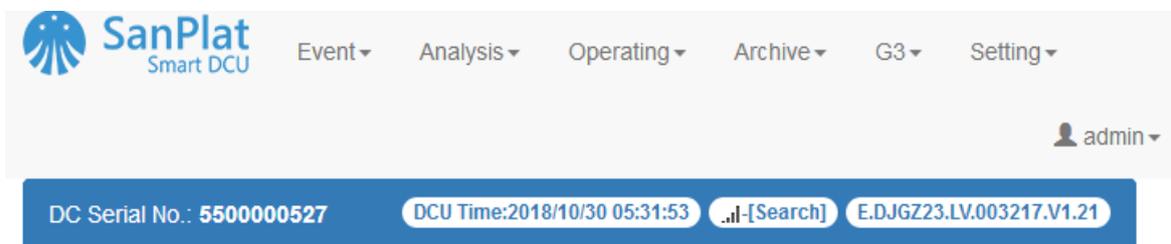
Item	Count
Meter Quantity	1
Monthly Billing Quantity	0
Demand Profile Quantity	0
Energy Profile Quantity	0
Meter Fraud Event	0
Meter Relay Event	0
Meter Standard Event	0
Meter Power Failure	0
Meter Phase Interruption	0
Meter Power Quality	0

Figure 6 Homepage

As above figure, the homepage will display the corresponding concentrator's number on the upper left and the software version number on the upper right.

There are also the records of every data item, such as profile1, profile2 and so on, it is worth noting that records of monthly billing will be showed on the homepage per month, others will be showed per day.

7.7.2. Function of web interface



This screenshot is identical to Figure 6, showing the SanPlat Smart DCU web interface with the same navigation menu, user profile, header bar, and data table.

Figure 7 web interface

7.7.2.1. Archive

Meter +

All All MeterNo Search

#	ID	MeterNo	Status	MAC	Channel	MeterType	Phase	Credit	Task	Prepaid	Wiring	Password	Action
1	1	0011539465	Enable	-1	reading_module	1	1	1	single_phase	255	0	***	
2	2	0011539435	Enable	-1	reading_module	1	1	1	single_phase	255	0	***	
3	3	0011539468	Enable	-1	reading_module	1	1	1	single_phase	255	0	***	
4	4	0011539415	Enable	-1	reading_module	1	1	1	single_phase	255	0	***	
5	5	0011539470	Enable	-1	reading_module	1	1	1	single_phase	255	0	***	
6	6	0051920070	Enable	-1	reading_module	1	1	1	single_phase	255	0	***	
7	7	0051920115	Enable	-1	reading_module	1	1	1	single_phase	255	0	***	
8	8	20170713005	Enable	-1	reading_module	1	1	1	single_phase	255	0	***	

Figure 8 Archive

This branch mainly displays all meters belong to the concentrator, “MeterNo” indicates the corresponding meter serial number.

Status indicates the meter’s status, two options below, “Enable” and “Disable”, “Enable” make meter work, “Disable” is on the contrary.

“Task” is the task for the meter, which means that reading meter’s data according to the task.

See details about task in chapter 11.

Channel indicates the communication mode of meter.

Settings → Channel

Figure 9 channel setting

Channel

All All Name Search

#	ID	Name	Protocol	Task	Status	ReadTimeout	WriteTimeout	CommType	Description	Action
1	1	485_1	485_test_fis	empty_task	Enable	2	3	4		
2	2	tcp_server	dims_up_server	empty_task	Enable	3	5	9		
3	3	tcp_client	dims_up	upload_task	Enable	3	5	5		
4	4	reading_module	mip	sync_time	Enable	3	2	2		
5	5	485_2	485_test_fis_ch2	empty_task	Disable	2	3	7		
6	6	485_3	485_test_fis_ch3	empty_task	Disable	2	3	8		
7	7	tcp_server_gui	dims_up_server_gui	empty_task	Enable	3	5	10		
8	8	tcp_server_im	dims_up_server_im	empty_task	Enable	3	5	11		

Figure 10 channel setting

As figure 19 shows, there are 6 values. “Name” is the channel’s name. “Protocol” is the protocol which this channel obeys. “Task” is the channel’s task. “Commtype” means

communication type. As figure 19 shows, the number "4" is for reading_module, "2" is for "tcp_server", "3" is for "tcp_client".

7.7.2.2. Setting

#	ID	Key	Value	Description	Action
1	1	up.device	gprs	ethernet	
2	2	ppp.apn	le2vsk	APN for SIM card	

Figure 11 channel setting

Below this branch, there are seven options, in order, System, Task, Task Item, Channel, Channel Attribution, Protocol, and Protocol Attribution.

System: There are four keywords in this option, "Key" is the specific function. "Value" is the function corresponding value. "Description" is the explanation of this function. You can modify these keywords by the last function "Action".

As figure 20 shows, user could observe that there are some parameters. "Key" is the one of system's name, for example, if the "Key" is "up.device", that means we can change the connect mode with master station, and the second parameter is value, we can see the value is "gprs" there, that means the concentrator connect with master station through gprs. The "Description" is the explanation for the value.

Settings → System → type "ftp" into "key" field → Search

#	ID	Key	Value	Description	Action
1	9	ftp.ip		FTP address for upgrade	
2	10	ftp.port	0	FTP port	
3	11	ftp.username		FTP account	
4	12	ftp.password		FTP password	

Figure 12 channel setting

As figure 21 shows, the four keywords indicate the username and password of the ftp site

interface between concentrator and master station, the ftp is used as remote upgrading and uploading the concentrator's log. And user should make sure that the all values are correct, otherwise, some features may not work.

GPRS Configuration

Settings → System → type “ppp” int “key” field → Search

1	1	up.device	gprs	ethernet	 
2	2	ppp.apn	le2vsk	APN for SIM card	 
3	3	ppp.username		account for apn	 
4	4	ppp.password		password for apn	 
5	5	ppp.sms			 
6	6	ppp.pin		PIN code	 
7	7	ppp.access.number		access.number	 

Figure 13 GPRS setting

As the figure 22, the three keywords is GPRS APN configuration, please configure parameters according to the requirement of the SIM card supplier.

Communication: We configure the four communication modes, namely, port communication, TCP server, TCP client, reading mode, where we can change the protocol type in these four modes where we can change the protocol type in these four mode into what we need.

the top bar Settings → Channel

At left side of the top, in drop-down bar we can choose the protocol. At the middle, in the drop-down bar we can select the task. The input field at the right side can be entered the appropriate name. After selecting, then press search to filter.

Channel									
		All	All	Name	Search				
#	ID	Name	Protocol	Task	Status	ReadTimeout	WriteTimeout	Comm Type	
1	1	485_1	485_test_fis	empty_task	Enable	2	3	4	
2	2	tcp_server	dlms_up_server	empty_task	Enable	3	5	9	
3	3	tcp_client	dlms_up	upload_task	Enable	3	5	5	
4	4	reading_module	mip	sync_time	Enable	3	2	2	
5	5	485_2	485_test_fis_ch2	empty_task	Disable	2	3	7	
6	6	485_3	485_test_fis_ch3	empty_task	Disable	2	3	8	
7	7	tcp_server_gui	dlms_up_server_gui	empty_task	Enable	3	5	10	
8	8	tcp_server_im	dlms_up_server_im	empty_task	Enable	3	5	11	

Figure 14 channel setting

Communication Properties: This field is for setting the specific keywords and values for the four communication modes under the communication field. The following figure shows an example.

Settings → Channel Attribution → Select tcp_client in drop-down bar at the top → Search

tcp_client	ip.1	121.40.80.159	 
tcp_client	port.1	5034	 
tcp_client	ip.2	185.65.163.96	 
tcp_client	port.2	9998	 
tcp_client	ip.size	1	 
tcp_client	connect.timeout	5	 

Figure 15 channel setting

The figure includes the TCP client communication mode configuration master IP, port number, IP number and the connection timeout. If the value of “ip.size” equals “1”, then only ip1 is effective, while ip2 is not available.

Protocol: We have a number of protocols. According to the different meters and modules, we select different types of protocol.

top bar Settings → Protocol

15	15	mip	ToMeter	for meter	
16	16	dlms_up_server_gui	ToHeadEnd	DLMS in server model(WEB-GUI)	
17	17	dlms_up_server_im	ToHeadEnd	DLMS in server model(Balance-Meter)	

Figure 16 Protocol setting

Protocol properties: This column develops the appropriate keywords and values for the five sections of the protocol. Take “*dlms_down*” as an example.

Settings→Protocol Attribution→select dlms_down at the top drop-down bar→Search

Protocol Attribution +

All

#	ID	Protocol	Key	Value	Description	Action
1	1	dlms_down	max.bytes	80	max bytes per packet	
2	2	dlms_down	send.retry	3	max retry after fail reading	
3	3	dlms_down	send.timeout	10	reading timeout	
4	4	dlms_down	send.silent	2	silent window after success	
5	5	dlms_up	max.bytes	1024	max bytes per packet	
6	6	dlms_up	send.retry	3	max retry	

Figure 17 Protocol setting

Protocol	Key words	Description
dlms_down	max.bytes	Maximum number of bytes per packet
dlms_down	send.retry	Read maximum number of retries after a failure
dlms_down	send.timeout	Read the time-out
dlms_down	send.silent	Close the window after success

Table 4 LinkDown Protocol setting

Protocol	Key words	Description
dlms_up	server.mode	Service mode. If 1, then use the concentrator as a server; if 0, then use the server as a client

Table 5 Link-Up Protocol setting

7.7.2.3. Reading

Operating →MeterReading

Meter Reading						
#	MeterNo	<input checked="" type="radio"/> Datetime	<input type="radio"/> RelayStatus	<input type="radio"/> ActivePowerImport	State	Operation
1	0096810255				Offline	<input type="button" value="Reading"/>

Figure 18 Meter Reading

User could read the meter’s real-time data and switch off/on the meter. Click “*Reading*” to gets the meter’s real-time data.

7.7.3. Task

In this option, you can create a new task and configure task mode and status, for example, empty task, single-phase, three-phase.

7.7.3.1. Task group

Task +					
<input type="text" value="Name"/>		<input type="text" value="Search"/>			
#	ID	Name	Status	Action	
1	1	empty_task	Disable		
2	2	upload_task	Enable		
3	3	down_device_task	Enable		
4	4	single_phase	Enable		
5	5	three_phase	Enable		
6	6	sync_time	Enable		

Figure 19 Task setting

As the figure 28, the Task name have been configured, at the right place it’s the corresponding status(Enable/Disable),user can create a new task by clicking the ‘+’ at the upper right, modify the status by clicking the ‘pen’ icon, and delete tasks by clicking the ‘Trash can’ icon.

User should pay attention to that “*empty_task*” could not be deleted, otherwise, the concentrator may run abnormally.

7.7.3.2. Task item

It shows the detail information of the corresponding task, the sub task items of related tasks can

be configured with the following attributions.

Settings→Task Item→choose your own task(single_phase as example) →Search

#	ID	Name	Task	Interval	Offset	MaxRecall	Status	Priority	Type	Cron	Action
1	16	path discovery	single_phase	0	0	0	Enable	4	G3 Path Discovery	0 */4 * * *	
2	17	monthbilling	single_phase	259200	0	34819200	Enable	1	Monthly Billing	0 */1 1-5 * *	
3	18	monthbilling	single_phase	2332800	0	34819200	Enable	3	Monthly Billing	0 */4 6-31 * *	
4	19	energy profile	single_phase	120	0	864000	Enable	2	Energy profile	0 */4 * * *	
5	20	demand profile	single_phase	120	0	864000	Disable	4	Demand profile	0 */4 * * *	
6	21	fraud event	single_phase	300	0	34819200	Enable	3	Fraud Event	0 10 * * *	
7	22	relay event	single_phase	300	0	34819200	Enable	3	Relay Event	0 10 * * *	
8	23	standard event	single_phase	300	0	34819200	Enable	3	Standard Event	0 10 * * *	
9	24	power failure event	single_phase	300	0	34819200	Enable	3	Power Failure Event	0 10 * * *	
10	25	phase interruption event	single_phase	300	0	34819200	Enable	3	Phase Interruption Event	0 10 * * *	
11	26	power quality event	single_phase	300	0	34819200	Enable	3	Power Quality Event	0 10 * * *	
12	27	meter clock	single phase	0	0	0	Disable	4	Meter Clock	0 10 */2 * *	

Figure 20 Task Item Setting

Interval	Save Interval
Offset	Time offset
Max Recall	Max period of time for last data
Status	Status (enable/disable)
Type	Task type
Cron (Please see appendix for details)	Meter data freeze time
Priority	(1~5) 1 - the highest 5 - the lowest

Figure 21 task item parameters

7.7.3.3. Meter with task

The screenshot shows a web interface for managing meters. At the top, there are filters for 'All', 'All', and 'MeterNo' with a search button. Below is a table with columns: #, ID, MeterNo, Status, MAC, Channel, MeterType, Phase, Credit, Task, Prepaid, Wiring, Password, and Action. The first row shows a meter with ID 1, MeterNo 0011539465, Status Enable, MAC -1, Channel reading_module, MeterType 1, Phase 1, Credit 1, Task single_phase, Prepaid 255, Wiring 0, Password ***, and an Action icon. The second row shows a meter with ID 3, MeterNo 160800000076, Status Enable, MAC 2, Channel 485_1, MeterType 1, Phase 1, Credit 1, Task 1phase_task, Prepaid 1, Wiring 1, Password ***, and an Action icon. The 'Task' column in the second row is highlighted with a red box.

#	ID	MeterNo	Status	MAC	Channel	MeterType	Phase	Credit	Task	Prepaid	Wiring	Password	Action
1	1	0011539465	Enable	-1	reading_module	1	1	1	single_phase	255	0	***	 
1	3	160800000076	Enable	2	485_1	1	1	1	1phase_task	1	1	***	 

Figure 22 Meter with task

User may choose the task while creating a new meter file. As the figure 31 shows, the “task” is for “1phase_task”, when the concentrator configured the task items of “1phase_task” and made the task status enable, then the meter would execute the task according to the “1phase_task”.

8. Security

- a) There are no undocumented interfaces or ports on the PLC data concentrator device
- b) All manufacturing interfaces are destroyed or disabled in firmware

In case of Purchaser definable number of unsuccessful authentication attempts local communication interface is blocked for 24h period

Possible to remotely (using HES) unlock the local communication interface

PLC data concentrator can restore to default configuration and factory settings by 3 actions or more.

PLC data concentrator does not have specific proprietary connectors, factory protocols, undocumented accounts and “backdoors”

PLC data concentrator provides protection for security materials exchange (cryptographic keys, configuration parameters of devices, certificates etc.) by using Public/Private keys encryption method with 4096-bit RSA key.

Storage of any cryptographic keys, security parameters, passwords and data are protected from unauthorized access and modification.

System security and data privacy protection methods (use HTTPS and HLS) ensure security of systems data (confidentiality, integrity and availability).

User access to data and System configuration parameters take place only when access has been authorized.

For access PLC network, PLC data concentrator uses MAC Layer security mechanism with 128-bit PSK (Pre-Shared Key). Devices are pre-configured with Purchaser defined PSK, DCU can change it remotely.

9. Maintenance and troubleshooting

9.1. Maintenance

9.1.1. Concentrator software update

Update software of the concentrator from the master station through the GPRS. Make sure that the concentrator can be connected to the correct master by the configured address before updating. The buzzer will be heard if updating successfully.

PLC data concentrators and modems (PLC and GPRS) ensure secure firmware update/upgrade procedure which includes verification of firmware integrity and authenticity.

9.2. Troubleshooting

9.2.1. The power-on concentrator does not work

Appearance: The power lamp does not light.

Caused by: Circuit connection failed.

Solution: Check the circuit connections.

9.2.2. Can't communicate the meter by use RS485

Appearance: The HES has failed to acquire the data.

Caused by: Meter RS485 interface A, B terminal disconnected, disorder or short circuit.

Solution: Check the voltage between RS485 A and B interface, the normal voltage range is 2.0V ~ 5.0V. If the measured voltage is negative, it may be A, B interface connection is wrong. If the measured voltage is 0, it may be the interface is disconnected or shorted.

9.2.3. PLC module is invalid

Appearance: The master has failed to acquire the data.

Caused by: Concentrator and meter are not in the same area.

Solution: Ensure that the concentrator and meter are in the same area.

9.2.4. Failed to connect to the master

Appearance: The master has failed to acquire the data.

Caused by 1: GPRS signal is weak or no signal.

Solution: Insert the SIM card correctly. User can extend antenna to enhance the signal.

Caused by 2: The GRPS module is not properly networked.

Solution: Check if the GPRS module is plugged in.

Caused by 3: GPRS service have been activated by ISP or the SIM card account is closed.

Solution: Contact the operator.

Caused by 4: Concentrator communication parameter error.

Solution: Correctly set the concentrator parameters.

10. Transport and Storage

The product packaging cannot withstand the strong impact of transport, it need appropriate packaging.

The product shall be stored in a stack of not more than 5 cartons and in a clean and neat environment with original packaging. The absence of corrosive gases should be guaranteed.

11. Annex

The product contains the host body, PLC module, GPRS module, external antenna, terminal cover, screws. Please confirm the complete components after opening the package.

12. Appendix

Corn Explanation:

||||+—minute

|||+—hour

||+—day of month

|+—month

+—day of week

Minute (0-59),

Hour (0-23),

Day of the month (1-31),

Month of the year (1-12),

Day of the week (0-6 with 0=Sunday).

Symbol '*' - wild-card to indicate all possible values. For example, * in the field "Month" means every month, * in the field Day-of-Week means every day of the week.

Symbol '/' is used to indicate incremental component, for example 10/5 in the field Minutes means "every 5 minutes" starting from the 10th minute. To put it in other words it is equivalent to 10,15,20,25,30,35,40,45,50,55.

Examples of Cron expressions

6:00 am every day.

0 6 * * *

Every two hours

0 */2 * * *

Every two hours range from 11:00 pm to 8:00 am, 8:00 am

0 23-7/2, 8 * * *

The 4th of every month and 11 am from Monday to Wednesday of every week.

0 11 4 * 1-3

4 am on January 1st

0 4 1 1 *

***This document is for reference, the delivered products will be adjusted according to customer requirements**