

APL SEM 3P V2

Three-phase Keypad Energy Meter

Technical Manual

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Foreword

General Safety Rules

APL SEM 3P V2 Three-phase Keypad Prepayment Energy Meter owns advantages of simple measurement, simple installation and simple operation. But to avoid personal injury and other damages related to the meter, it is suggested that this manual should be carefully read, which is better for usage before being installed, detected, operated and used.

While the designing and producing of APL SEM 3P V2 Three-phase Keypad Energy Meter, its solidity and reliability and users' safety and convenience have been already fully considered. Thus, common faulty operations can be endured. If the meter is reasonably and safely installed and used according to the guideline, its lifespan will be extended. This product could only be used within its provisions; AplombTech BD Ltd. has no responsibility for the damage and personal injury caused by faulty operations, operation and the usage beyond the specific range.

Safety Information

In each chapter of this manual, different letter symbols and graphic symbols which are adopted to express the danger according to different levels of danger will be explained. Please pay attention!



Caution!

This sign is to remind of possible danger, which will possibly cause some severe hurt and damage to people and the equipment.



Attention!

This sign is to remind of possible unexpected situation, which might result in personal injury, equipment damage and data error.



Safety Rules

Pay attention to this product's rated voltage and maximum current.

Pay attention to this product's measured load capacity.

Correct and reliable installation and connection.

Pay attention to effective cross-sectional area of wire connection.

Do not touch bare wire or use bare wire to connect.

Please don't use this product in explosive environment.

Keep the product's surface clean.

Pay attention to meter's seal management.

Don't immerse the meter in water and any chemical substance and don't use any chemical substance to clean the meter.

Displays are all examples in this manual, which may have some difference from the real data in meters.

Since it is life-threatening to touch live components, the power must be cut off before installation and replacement.

Please obey local safety rules; Installation and replacing of meter only could be done by qualified person with specified technology.

When installing meter, pay attention to meter's safety; Appearance damaged or fell downed meters are not allowed to install.

Washing the meter by water is not allowed.

The Meter Standard applies to production and test in Meter Electronics, not the standard for client test or acceptance. Only IEC standards apply to the client inspection and acceptance.



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1. Use Instruction

1.1 Overview

1.1.1 Construction Profile



Figure 1.1.1: APL SEM 3P V2 Three-phase Keypad Prepayment Energy Meter

1.1.2 Major Application

APL SEM 3P V2 Three-phase Keypad Prepayment Energy Meter takes digital medium as information exchange media. It is an active electric energy meter in which users load in pre-purchased energy, and it takes energy as its billing. The meter includes measurement unit, real-time clock unit, infrared communication, load switch, GPRS communication module and other auxiliary equipment.

1.1.3 Main Functions

When energy balance is 0, the meter can send out power off signal to control load for auto switching off, and it shall auto restore the power supply after the new purchased energy is loaded.

Record events of open terminal cover trip, open face cover trip, overload trip, power off, reverse tampering, phase off, relay off, time synchronization, power purchase, meter reset, demand reset, event reset and data alteration tampering, etc. (*see 4.14 Event Recording Function*)

1.1.4 Additional Functions

Active energy multi-tariff metering.

Demand calculating.

Auto detection.

Realize users' load detecting and controlling.

Detect grid parameters including real-time power, voltage, current and power factor.

Enable to display by pressing buttons after power outage.

1.1.5 Major Features

Prepaid mode- it is a power consumption mode by paying first and using electricity later.

APL SEM 3P V2 Three-phase Keypad Prepayment Energy Meter takes amount as its electricity billing. In conditions of prepaid mode, electricity consumer purchases amount at first and the meter subtracts the remaining credit amount equivalent to the consumption. When remaining amount is 0 or the overdraft energy allowed by both parties, it will send out power off signal to control load switch automatically cut off.

APL SEM 3P V2 Three-phase Keypad Prepayment Energy Meter adopts CTS algorithm, which has a set of security management system with a high-level security and is completely compatible with the CTS management system deployed in Bangladesh.

1.1.6 Normative References

IEC62052-11 Electricity metering equipment (A.C)-General requirements tests and test conditions- Part 11: Metering equipment.

IEC62053-21 Electricity metering equipment (A.C)-Particular Requirements-Part 21: Static meters for active energy (classes 1 and 2).

IEC62055-31 Electricity metering -Payment Systems-Part 31: Particular requirements Static payment meters for active energy (class 1 and 2)

IEC 62056-21 Electricity metering – Data exchange for meter reading, tariff and load control –Part 21: Direct local data exchange

IEC 62056-42 Electricity metering – Data exchange for meter reading, tariff and load control – Part 42: Physical layer services and procedures for connection oriented asynchronous data exchange

IEC 62056-46 Electricity metering – Data exchange for meter reading, tariff and load control – Part 46 – Data link layer using HDLC-protocol

IEC 62056-53 Electricity metering – Data exchange for meter reading, tariff and load control – Part 53: COSEM Application layer

IEC 62056-61 Electricity metering - Data exchange for meter reading, tariff and load control - Part 61: Object identification system

IEC 62056-62 Electricity metering - Data exchange for meter reading, tariff and load control –Part 62: Interface classes

2. Technical Parameters

2.1. Operating Voltage

Rated voltage U_n	3×230/400 V
Operating voltage range	60% U_n ~ 130% U_n
The meter can work normally within the operating voltage range.	
Limited range of operating voltage	0 U_n ~ 190% U_n

Within this limited operating voltage range, the meter will show no damage. It can guarantee metering during normal display, but cannot ensure the metering accuracy class.

Meanwhile, the load control equipment cannot operate. After the operating voltage returns to normal, the meter can work normally and the accuracy class will remain unchanged.

2.2. Current Parameters

I_{max}	100 A
Starting current (0.4% I_b)	40 mA
Metering current range	40 mA ~ 100 A
Common current specification	10(100) A

2.3. Frequency Parameters

Rated frequency f_n	50 Hz
Frequency application range	47.5 Hz ~ 52.5 Hz

2.4. Self- power Consumption of Meter

Power consumption of voltage circuit	≤2 W 6 VA
Power consumption of current circuit	≤2.5 VA

2.5. Active Metering Accuracy

The accuracy of active energy measurement of APL SEM 3P V2 conforms to IEC62053-21 Class 1.0.

Table 1: Error limit in percentage for active class 1

Load value	Power factor	Error limit in percentage	Meter standard
		IEC62053-21	
$0.05I_b \leq I < 0.10 I_b$	1	±1.5	±0.7
$0.10I_b \leq I \leq I_{max}$	1	±1.0	±0.5
$0.1I_b \leq I < 0.2I_b$	0.5L	±1.5	±0.7
	0.8C	±1.5	±0.7
$0.2I_b \leq I \leq I_{max}$	0.5L	±1.0	±0.5
	0.8C	±1.0	±0.5

2.6. Display Mode

The meter displays numeric data.

Display mode	LCD display of wide-temperature range
Character digits for data item display	8 digits including 6 integers and 2 decimals
Character digits for data ID display	3 digits

2.7. Pulse Constant

Active pulse constant	400 imp/kWh
Reactive pulse constant	400 imp/kvarh

2.8. Active Check Output

The meter is equipped with special pulse indicator for testing active energy (LED is on the nameplate of meter). In order to ensure the accuracy of active measuring test, according to different current test points, pulse quantity collected from test should be incremented with the increase of current, and reasonably select pulses between the numbers 1~8.

2.9. Serial Communication Interface

Interface 1:

Type	Baud	Serial bi-direction communication interface
Rate		2400 bps
Application		Data reading and related data item configuration
Pattern		Non-modulated IR communication

Interface 2:

Type	Baud	Serial bi-direction communication interface
Rate		9600 bps
Application		Data reading and related data item configuration
Pattern		485 communications

Interface 3:

Type	Baud	Serial bi-direction communication interface
Rate		9600 bps
Application		MCU and GPRS module communication interface
Pattern		GPRS Communication

2.10. Meter Electromagnetic Compatibility

No.	Item		Requirements of IEC62052-11	Meter Standard
1	Electrostatic Discharge Immunity	Contact Discharge	8 kV	10 kV
		Air Discharge	15 kV	18 kV
2	HF Electromagnetic Field Immunity		80 MHz-2 GHz	80 MHz-2 GHz
			30 V/m	30 V/m
3	Fast Transient Burst		4 kV/100 kHz	4.3 kV/100 kHz

4	Radio Interference Test		Equipment of CISPR 22 Class B	Equipment of CISPR 22 Class B
5	Immunity to conducted disturbances induced by radio-frequency fields		150 kHz—80 MHz 10 V	150 kHz—80 MHz 10 V
6	Surge Immunity		4 kV	4.3 kV

Table 1: EMC

2.11. Insulation Test

No.	Item		Requirements of IEC62052-11	Meter Standard
1	Impulse Voltage	Insulation Class II	6 kV	6.5 kV
2	AC Voltage	Between current circuit and the earth (insulation class II)	4 kV (5 mA)	4.1 kV (5 mA)
		Between auxiliary terminals	2 kV (5 mA)	2.5 kV (5 mA)

Table 3: Insulation test

2.12. Application Environment

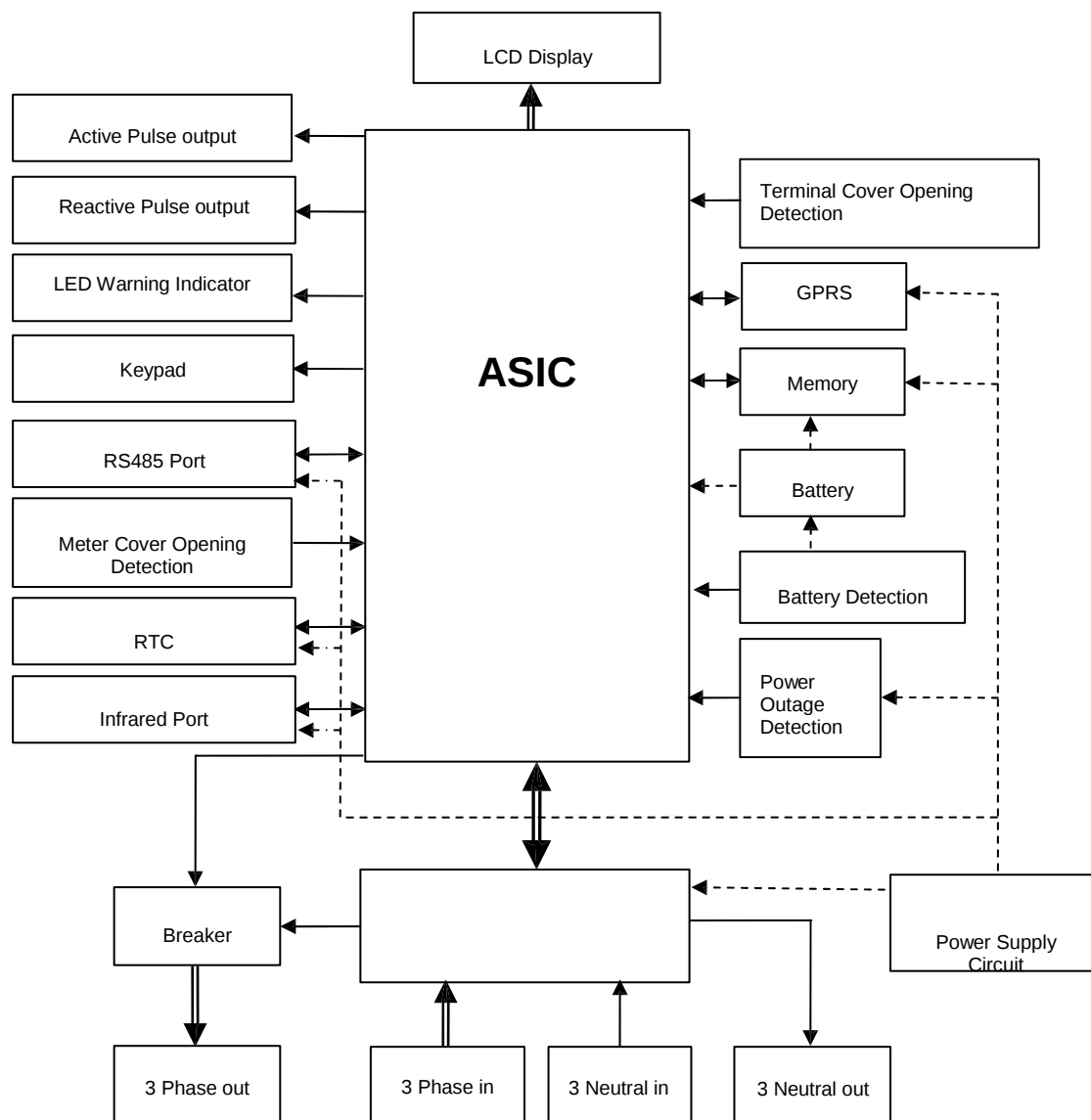
No.	Item		Requirements of IEC 62052-11	Meter Standard
1	Temperature	Operating temperature range	-25 °C~55 °C	-25 °C~70 °C
		Limited range of operation	-40 °C~70 °C	-40 °C~70 °C
		Limit range for storage and transport	-40 °C~70 °C	-40°C~80°C
2	Humidity	Annual mean	≤75%	≤75%
		For 30 days, these days being spread in natural manner over one year	≤95%	≤95%
		Occasionally on other days	≤85%	≤85%

Table 4: Application environment

2.13. Operating Principle Diagram

This meter circuit, centralized with SOC single chip (with internal measurement module, real time clock and temperature testing compensation circuit etc.), consists of main control circuit module, memory circuit module composed of memory chip, power supply circuit module, cover open detection module, GPRS communication module, LCD display and audio reminding user information display module as well as IR emission and IR receiving circuit module etc.

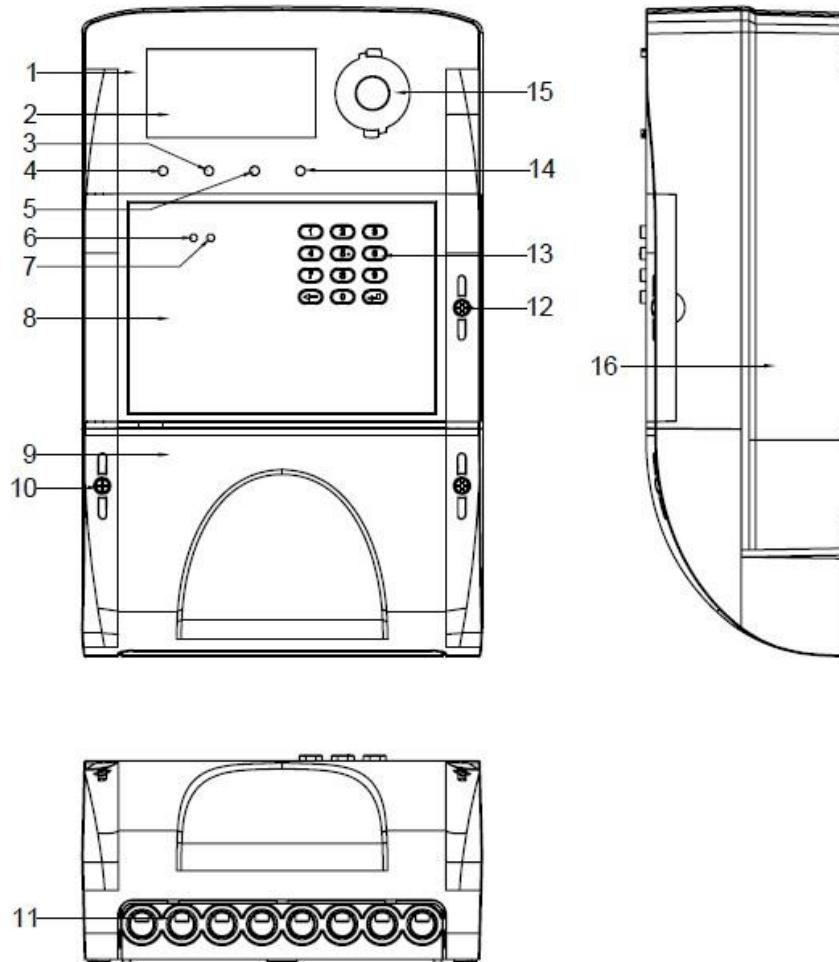
The current sampling uses measurement method of current transformer, while voltage sampling uses dividing resistance network. The meter adjustment is completed via software.



Meter Working Principle Diagram

3. Physical Design

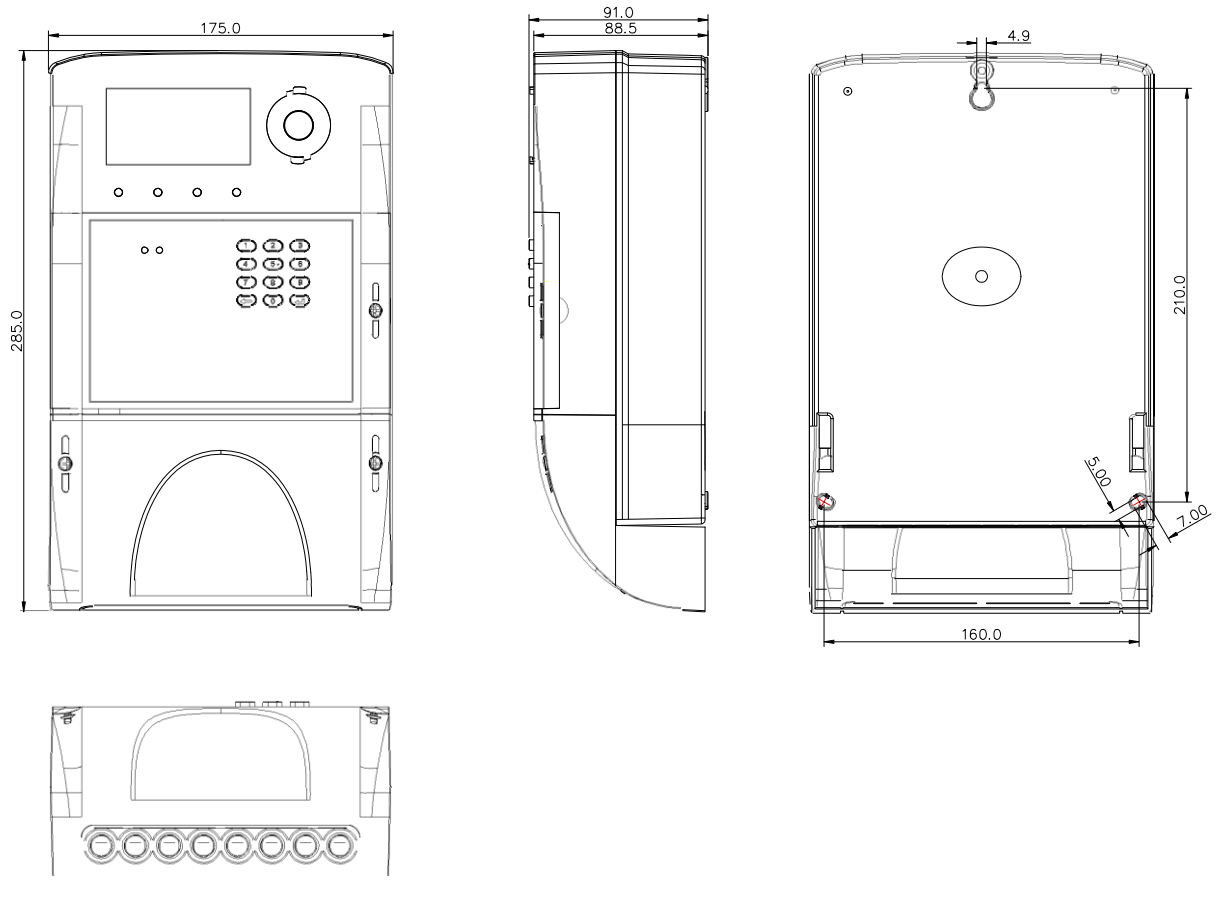
3.1.Construction Diagram



1	Face cover	7	GPRS module receiving LED	13	Keyboard
2	LCD display	8	Flip cover	14	Low energy alert LED
3	Active pulse LED	9	Terminal cover	15	IR communication port
4	Reactive pulse LED	10	Sealing screw for terminal cover	16	Base
5	Alert LED	11	Terminal block		
6	GPRS module sending LED	12	Flip cover sealing screw		

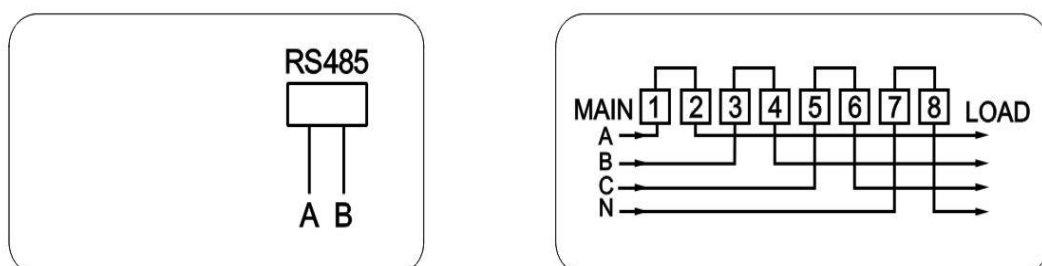
3.2.Dimension Diagram

Outline dimension: 285 mm ×175 mm ×88.5 mm



3.3. Wiring Diagram

All movable terminals of the meter locate in the connection terminal cover with secured screws fitted with user seal to prevent from operations such as unauthorized connection or other settings, etc.



3.4. Protective Class

The test is carried out with the energy meter manufactured by AplombTech BD Ltd. in accordance with IEC60529-4.

3.5. Resistance to Heat and Fire

Resistance to heat and fire class: **V0** (all the casing made out of heat-resistant and fire-retardant material)

4. Functions

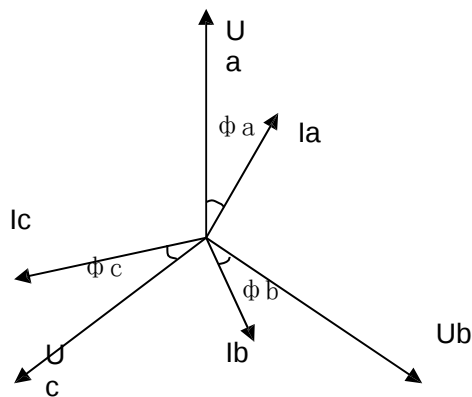
4.1. Metering Function

APL SEM 3P V2 Three-phase Keypad Prepayment Energy Meter can measure reverse power in the same way of measuring forward power and the energy can be accumulated in total active energy and active energy of each billing month. It can measure total active power and store the data and calculate the credit balance, then store the data; meanwhile have them indicated by LED. The meter measures real-time power by pulse constant and pulse interval.

4.2. Active Energy Metering

Active energy unit: kWh, reactive energy unit: kvarh.

The metering phasor diagram in right connection as:



Active power expressed as: $P = P_1 + P_2 + P_3 = U_a I_a \cos \phi_a + U_b I_b \cos \phi_b + U_c I_c \cos \phi_c$

Reactive power expressed as: $Q = Q_1 + Q_2 + Q_3 = U_a I_a \sin \phi_a + U_b I_b \sin \phi_b + U_c I_c \sin \phi_c$

Active energy expressed as: $E_p = \int P dt = \int (U_a I_a \cos \phi_a + U_b I_b \cos \phi_b + U_c I_c \cos \phi_c) dt$

Reactive energy expressed as: $E_q = \int Q dt = \int (U_a I_a \sin \phi_a + U_b I_b \sin \phi_b + U_c I_c \sin \phi_c) dt$

4.3. Active Direction Definition

The APL SEM 3P V2 Meter, developed by AplombTech BD Ltd., uses the conception of forward power and reverse power from the customers' point of view.

Customers' forward power = power received from the grid.

Customers' reverse power = power sent to the grid.

4.4. Active Max Demand (MD) Calculation

Active maximum demand unit is kW.

Active MD calculation method is slide calculation method.

MD calculation cycle is 15 min.

MD slide window time is 1 min.

4.5. Load Control Function

The meter can be programmed to set load control threshold.

When the meter detects current power of one phase is higher than Sanctioned load, overload alert will be triggered. Alert LED will blink in red. If alert duration reaches specified 30 secs, the meter will cut off user load, alert LED will keep lighting in red. The meter relay will auto close after 120 sec or input "0" "0" and press Enter key on UIU to

close relay. If overload trip times >3 within 30 min, the meter relay will auto close after 30 min or input "0" "0" and press Enter key to close relay.

When load threshold is 0, this function will be disabled.

4.6. Pre-alarming Consumption Function

The meter can be programmed to set pre-alarming threshold.

If the energy balance is lower than pre-alert threshold, the alert indicator will blink in red.

When energy balance is lower than pre-alarming threshold (which can be queried via UIU), pre-alarming function will be triggered. Low energy alert LED indicator shall blink.

When energy balance is deducted to 0, the relay will trip and alert LED indicator shall keep lighting in red.

When pre-alarming threshold value is 0, the function will be disabled.

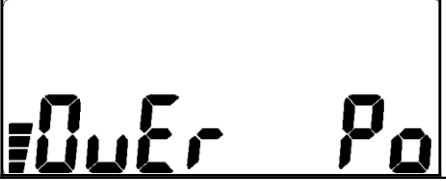
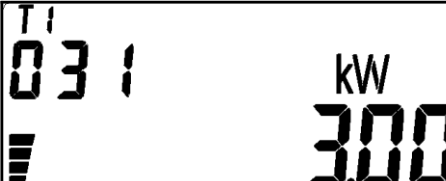
4.7. Reverse Consumption Function

When the meter detects reverse consumption in Phase A, B and C, alert LED indicator shall blink in red and reverse tag "←" corresponding with Phase A, B and C shall keep lighting.

Reverse consumption measured as forward.

4.8. LCD Data Display

Item	Introduction
	Power purchase token is correct and accepted and "accept" is displayed.
	Power purchase token is wrong and rejected and "reject" is displayed.
	When "old" is displayed, it means token is expired.
	When "used" is displayed, it means the token is a used one.

	Overload consumption—When consumption load is over the load threshold specified, “over po” will be displayed and the power will be cut off within specified time.
	Input “0” “1” and press Enter key, the consumed energy 100.00 kWh and the corresponding code 001 are displayed.
	Input “0” “2” and press Enter key, max. demand 2.00 kW in current month and the corresponding code 002 are displayed.
	Input “0” “7” and press Enter key, the energy balance 200.00 Tk and energy balance code 007 are displayed.
	Input “3” “1” and press Enter key, the real-time power 1.00 kW and display code 031 are displayed.
	Input “1” “5” “6” and press Enter key, current electricity price 1.0000 Tk and display code 156 are displayed.

4.9.IR Communication Function

The meter equips with non-modulated IR optical communication interface and 485 interfaces. By HHU with serial communication port, the meter can realize time synchronization and meter data items reading and other functions.

4.9.1 Time Synchronization

The meter can carry out time synchronization via communication interface.

4.9.2 Read Meter Data Item

Via communication interface, it is available to read data items in meter, including current consumption data, energy balance, meter clock, previous 12 months consumption data, all kinds of meter data items and log data.

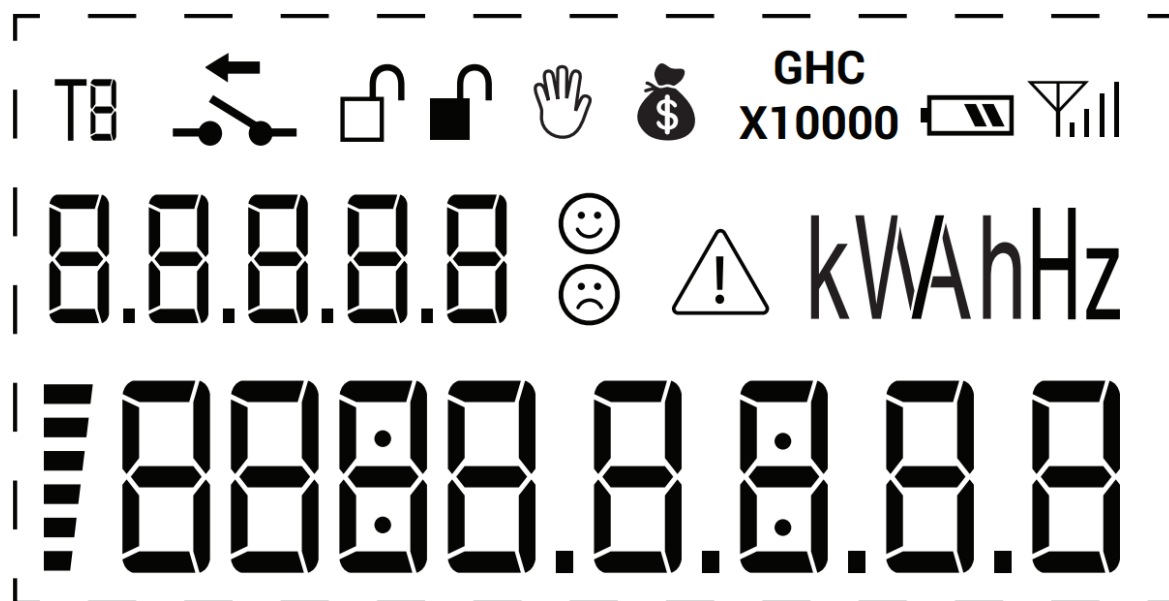
4.10. Prompts

ACCEPT:	TOKEN accepted
REJECT:	TOKEN rejected
OLD:	TOKEN expired
USED:	TOKEN used
OK:	Operation succeeded
Err_01:	Error in manufacturer code
Err_02:	Key expiration error
Err_03:	DDTK error
Err_04:	Overflow Error
Err_05:	Key type Error
Err_06:	Data format Error
Err_07:	Token type error
Err_08:	Appointed function Error
NULL:	Reserved

4.11. Data Item Display Function

4.11.1 LCD Display Instruction

Firstly, initialize LCD after power on, LCD fully displays and automatically enters the set display mode of power information after 4 seconds. LCD in full screen is as follows



1	Credit level indication	2	Display code area	3	Tariff display area
4	Phase A tag	5	Phase A current reversed	6	Battery tag
7	Phase B tag	8	Phase B current reversed	9	Relay state tag
10	Phase C tag	11	Open cover alert	12	Phase C current reversed
13	Power factor tag	14	Magnetic detection alert	15	Quadrant tag
16	Smile face, sad face	17	Unit display area	18	Data display area

Data indication: 6 digits of integer and 2 digits of decimal. The unit of power is kWh, the unit of active power is kW.

Display code: With 3 digits code to indicate respective data item (please see 4.11.3 Meter Data Item Code).

4.11.2 Meter Data Display

Display content includes consumption data, configuration data, and history data and so on.

For data item length over 8 digits (e.g. date & time and meter No. etc.), the meter will display in split screens.

For credit balance, the data item can be used to indicate the specific value; meanwhile bar can be displayed on LCD screen.

credit balance in meter < 10TK, no bar displays;

10TK ≤ credit balance < 100 TK, the first bar displays;

100 TK ≤ credit balance < 1000 TK, the first 2 bars display;

1000 TK ≤ credit balance < 10000 TK, the first 3 bars display;

10000 TK ≤ credit balance < 100000 TK, the first 4 bars display;

100000 TK ≤ credit balance < 1000000TK, the first 5 bars display;

1000000 TK < credit balance, all 6 bars display.

4.11.3 Meter Data Item Code Table

Display No. is 3-digit.

Display No.	Data Item Name	Display No.	Data Item Name
01	Accumulative active consumption	02	Max. demand of current month
03	Max. demand occurrence time in current month	04	Accumulative consumed amount
05	TOKEN sequence No.	06	Accumulative purchased amount
07	Remaining amount	08	Overdraft amount
09	kWh of current month	10	Key Number
11	Last recharging time	12	Alert threshold
13	Maximum load threshold	14	Demand of last month
15	Overdraft threshold	16	Delay time to overload trip
17	Data transfer day	18	Frozen monthly kWh of the last 1 st time
19	Frozen monthly kWh of the last 2 nd time	20	Frozen monthly kWh of the last 3 rd time
21	Frozen monthly kWh of the last 4 th time	22	Frozen monthly kWh of the last 5 th time
23	Frozen monthly kWh of the last 6 th time	24	Frozen monthly kWh of the last 7 th time
25	Frozen monthly kWh of the last 8 th time	26	Frozen monthly kWh of the last 9 th time
27	Frozen monthly kWh of the last 10 th time	28	Frozen monthly kWh of the last 11 th time
29	Frozen monthly kWh of the last 12 th time	30	Consumed amount of current month
31	Real-time power	32	Demand calculating method
33	Demand calculating cycle	34	Slide window time
35	Key reversion No.	36	Tariff index
37	Reserved	38	Overdraft consumption tag
39	Frequency	40	Terminal cover-open counts
41	Last terminal cover-open time	42	Last 2 nd terminal cover-open time
43	Last 3 rd terminal cover-open time	44	Last 4 th terminal cover-open time

45	Last 5 th terminal cover-open time	46	Overload trip counts
47	Last overload trip	48	Last 2 nd overload trip
49	Last 3 rd overload trip	50	Last 4 th overload trip
51	Last 5 th overload trip	52	Power off counts
53	Last power off time	54	Last 2 nd power off time
55	Last 3 rd power off time	56	Last 4 th power off time
57	Last 5 th power off time	58	Reverse event counts
59	Last reverse occurrence time	60	Last 2 nd reverse occurrence time
61	Last 3 rd reverse occurrence time	62	Last 4 th reverse occurrence time
63	Last 5 th reverse occurrence time	64	Hoarding credit limit
65	Meter ID	66	Active pulse constant
67	Reserved	68	Meter hardware version No.
69	Meter software version No.	70	SGC
71	Working mode (0 user mode/1 factory mode)	72	Current time
73	Current date	74	Reserved
75	Charging Mode (0-postpaid; 1-prepaid)	76	Last recharge token
77	Last 2 nd recharge token	78	Last 3 rd recharge token
79	Last 4 th recharge token	80	Last 5 th recharge token
81	Last 1 st recharge Tk amount	82	Last 2 nd recharge Tk amount
83	Last 3 rd recharge Tk amount	84	Last 4 th recharge Tk amount
85	Last 5 th recharge Tk amount	86	Real time voltage
87	Reserved	88	Reserved
89	L circuit current	90	N circuit current
91	Reserved	92	Operating mode (0-Operational mode 1-Non-operational mode)

93	Single-tariff rate (after activation)	94	Single-tariff rate (before activation)
95	Single-tariff rate activate parameters	96	Reserved
97	Return TOKEN	98	Recharge counts
99	Current tariff rate	100	Current electricity price
101	Current step tariff rate	102	Current kW
103	Power factor	104	Reserved
105	Reserved	106	Reserved
107	Load parameter activation time	108	Load parameter1
109	Load parameter2	110	Over voltage counts
111	Last over voltage occurrence time	112	Last 2 nd over voltage occurrence time
113	Last 3 rd over voltage occurrence time	114	Last 4 th over voltage occurrence time
115	Last 5 th over voltage occurrence time	116	Under voltage counts
117	Last under voltage occurrence time	118	Last 2 nd under voltage occurrence time
119	Last 3 rd under voltage occurrence time	120	Last 4 th under voltage occurrence time
121	Last 5 th under voltage occurrence time	122	Switch on counts
123	Last switch on time	124	Last 2 nd switch on time
125	Last 3 rd switch on time	126	Last 4 th switch on time
127	Last 5 th switch on time	128	Open meter cover counts
129	Last open meter cover time	130	Last 2 nd open meter cover time
131	Last 3 rd open meter cover time	132	Last 4 th open meter cover time
133	Last 5 th open meter cover time	134	Current unbalanced counts
135	Last current unbalanced time	136	Last 2 nd current unbalanced time
137	Last 3 rd current unbalanced time	138	Last 4 th current unbalanced time
139	Last 5 th current unbalanced time	140	Magnetic field influence counts
141	Last magnetic field influence time	142	Last 2 nd magnetic field influence time

143	Last 3 rd magnetic field influence time	144	Last 4 th magnetic field influence time
145	Last 5 th magnetic field influence time	146	Time synchronization counts
147	Las time synchronization time	148	Las 2 nd time synchronization time
149	Las 3 rd time synchronization time	150	Las 4 th time synchronization time
151	Las 5 th time synchronization time	152	Relay off counts
153	Last relay off time	154	Last 2 nd relay off time
155	Last 3 rd relay off time	156	Last 4 th relay off time
157	Last 5 th relay off time	158	Relay off reason
159	Step 1 energy	160	Step 2 energy
161	Step 3 energy	162	Step 4 energy
163	Step 5 energy	164	Step 6 energy
165	Step 7 energy	166	Step 8 energy
167	Date of Activate the backup step energy schedule	168	Step tariff rate1
169	Step tariff rate 2	170	Step tariff rate 3
171	Step tariff rate 4	172	Step tariff rate 5
173	Step tariff rate 6	174	Step tariff rate 7
175	Step tariff rate 8	176	Date of Activate the backup step tariff schedule
177	Token refused number	178	Token accepted counts
179	Reserved	180	Public Holiday1
181	Public Holiday2	182	Public Holiday3
183	Public Holiday4	184	Public Holiday5
185	Public Holiday6	186	Public Holiday7
187	Public Holiday8	188	Public Holiday9
189	Public Holiday10	190	Public Holiday11

191	Public Holiday12	192	Public Holiday13
193	Public Holiday14	194	Public Holiday15
195	Public Holiday16	196	Public Holiday17
197	Public Holiday18	198	Public Holiday19
199	Public Holiday20	200	Public Holiday21
201	Public Holiday22	202	Public Holiday23
203	Public Holiday24	204	Public Holiday25
205	Public Holiday26	206	Public Holiday27
207	Public Holiday28	208	Public Holiday29
209	Public Holiday30	210	Public Holiday31
211	Public Holiday32	212	Friendly Mode
213	Over current counts	214	Last over current time
215	Last 2 nd over current time	216	Last 3 rd over current time
217	Last 4 th over current time	218	Last 5 th over current time

Table 0-2: Data Item Code

Display items when the meter is exiting from factory:

S/N	Display No.	Data Item Name
1	001	Accumulative active consumption
2	007	The remaining amount
3	100	Current Tariff Rate
4	013	Load threshold value

Display items after meter mode switching:

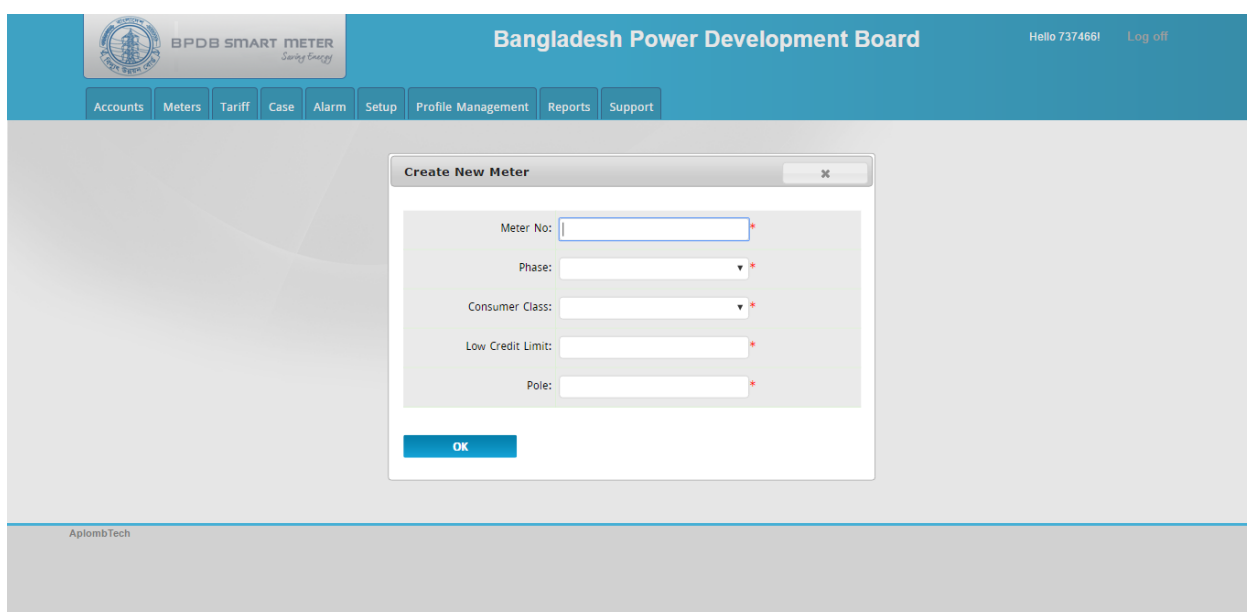
S/N	Display No.	Data Item Name
1	001	Accumulative active consumption

2	013	Load threshold value
---	-----	----------------------

4.12 Account creation and Prepayment Function

4.12.1 Account Opening

The site to be logged in is www.bpdb-smartmeter.gov.bd



The screenshot displays the BPDB Smart Meter web application interface. The header includes the BPDB logo, the text 'BPDB SMART METER Saving Energy', and the 'Bangladesh Power Development Board' name. A navigation menu contains links for Accounts, Meters, Tariff, Case, Alarm, Setup, Profile Management, Reports, and Support. The user is logged in as 'Hello 7374661' with a 'Log off' option. The main content area features a 'Create New Meter' modal form with the following fields: 'Meter No:' (text input), 'Phase:' (dropdown menu), 'Consumer Class:' (dropdown menu), 'Low Credit Limit:' (text input), and 'Pole:' (text input). Each field has a red asterisk indicating it is required. An 'OK' button is located at the bottom of the form. The footer of the page shows 'AplombTech'.

Figure 4.12.1: Create New Meter

After providing Admin credentials, Admin will be able to add New Meter through “Meters > Create New Meter”. A window will appear to enter the Meter Number, Phase, Consumer Class, Low Credit Warning Limit and Pole. On pole field, user has to type the first three letters of the pole name which is created earlier.

The screenshot displays the 'Meter data' page in the BPDB Smart Meter system. The header includes the BPDB logo, 'BPDB SMART METER' text, and the 'Bangladesh Power Development Board' title. A navigation bar contains links for Accounts, Meters, Tariff, Case, Alarm, Setup, Profile Management, Reports, and Support. The main content area shows details for 'MeterNo-54161005472, Class-E, Phase-1, Load Limit - 3.2'. A table lists various meter parameters:

Actions	
Meter No:	54161005472
Old Meter No:	
Consumer Class:	E (Commercial)
Phase:	1
Total Usage (Kwh):	0.00
Remaining Credit:	100
Total Due:	221
Sanction Load (KW):	4.00
Load Limit:	3.2 (80.00 % of Sanction Load)
Peak Hour Limit Percentage:	50.00
Off Peak Hour Limit Percentage:	75.00
Emergency Credit Limit:	50.00
Maximum Credit Limit:	5000.00
Low Credit Warning Limit:	30.00
Monthly Likely Consumption	0.00

Figure 4.12.2: Meter data

After successful entry of meter info, a meter detail page will appear. Every meter should be associated with one consumer. In the software, consumer's details should be inputted along with the previously created meter no. which will be assigned to the consumer

The screenshot displays the 'Add Account' form in the BPDB Smart Meter system. The header is identical to Figure 4.12.2. The 'Add Account' form is a modal window with the following fields:

- Name:
- National Id:
- Mobile No:
- Email:
- Old Meter No:
- Meter:

An 'OK' button is located at the bottom of the form. The footer of the page reads 'AplombTech'.

Figure 4.12.3: Add Account

Bangladesh Power Development Board

Accounts Meters Tariff Case Alarm Setup Profile Management Reports Support

31010010101001000036 X

Actions

Consumer No: 31010010101001000036

Name: Test Account

National Id: 10002000300

Meter: [11122232100, Class-C, Phase- 3, Load Limit - 0](#)

Mobile No: +8801414141414

Email: 111222333@yopmail.com

Status:

Personal Detail:

Service Address:

EDIT

AplombTech

Figure 4.12.4: Dashboard

There are three ways of payment in smart meter. One is direct cash at UVCC office. Other is Mobile Operator Bills pay method and other is via Card/internet banking.

Bangladesh Power Development Board

Accounts Meters Tariff Case Alarm Setup Profile Management Reports Support

Payment Slip X

[Print](#)

Bangladesh Power Development Board

Payment Slip

Payment Date: 4/19/2017 4:02:03 PM

Name:	Test E class meter
Address:	Holding#641, Bashundhara Dhaka
Meter No:	54161005472
Token No:	47285674029700075077

Amount:	300.00
Service Charge:	10.00
Sanctioned Demand Charge:	100.00
Pfc Charge:	0.00
VAT:	15.00
Recharge Amount:	175.00 BDT

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Figure 4.12.5: Payment Slip

D display: The meter will display 11-digit ID in two screens.

4.12.2 Purchase Power

When the energy balance in meter is insufficient, the customer can visit the power vending office to purchase electricity. At vending office, a 20-digit serial number (TOKEN) will be produced based on user information and purchase amount.

Power purchase method:

- Visit the local power vending office.
- Provide your meter ID to the operator.
- Inform the operator the amount you want to buy and pay the bill.
- Obtain a 20-digits token printed on your receipt.

4.13. Indicator Status

Meter indicator state:

Pulse indicator: red, blinks during power consumption.

Alert indicator: in alert event, blinks in red; in event of relay trips, keeps lighting in red.

Lower energy indicator: when energy balance is lower than low credit alert threshold, the indicator will blink in red, otherwise, it keeps lighting in green.

4.14. Event Recording Function

4.14.1 Trip Enabled Event Recording Function

Set the enabled status of each trip event by setting trip enabled status word. If the enable status of one event is set as 0, it means when the event is occurring, the meter will not have any trip activity. If the enable status of one event is set as 1, it means when the event is occurred, the meter will have trip activity.

Open terminal cover trip event

When meter terminal cover is open for certain seconds, it will send out power off signal to have load switch auto cut off. In addition, the meter will add 1 to total count of open terminal cover times. Total open terminal cover trip times and last 10 open terminal cover event time can be recorded. At the trip, the relay will not get closed even if put terminal cover in place, unless the dedicated token is input by Utility to restore power supply after the terminal cover is closed. Open terminal cover event can also be detected by the meter even if during power outage.

Open face cover trip event

When meter face cover is open for certain seconds, it will send out power off signal to have load switch cut off automatically. In addition, the meter will add 1 to total count of open face cover times. Total open face cover trip times and last 10 open face cover event time can be recorded. At the trip, the relay will not get closed even if put face cover in place, unless the dedicated token is input by Utility to restore power supply after the face cover is closed. Open face cover event can also be detected by the meter even if during power outage.

Overload trip event

When meter overload alert duration passes the specified time, it will send out power off signal to control load switch auto cut off power supply. In addition, the meter will add 1 to count of overload trip times. Total overload consumption times and starting time and

ending time of last 10 overload events can be recorded. Besides, phase A, B and C will independently record overload event.

Reverse trip event

When meter one phase is under reverse consumption and lasts for certain seconds, the meter will record it as the starting of reverse event. When the direction of current returns to forward from reverse and lasts for 5 secs, it is the end of event. When power is reversed, LCD will display reverse tag “←” and alert LED indicator will blink in red. Total reverse consumption times and starting time and ending time of the last 10 power reverse events will be recorded. Besides, phase A, B and C will independently record reverse event.

Flow reverse trip event

When direction of total power is reversed and lasts for certain seconds, the flow reverse event is occurred. Total flow reverse times and starting time and ending time of the last 10 flow reverse events will be recorded. When direction of total power returns to forward, flow reverse event ends.

Magnetic field tampering trip event

When there is magnetic field nearby the meter, it will detect as the occurrence of magnetic induction signal. If it keeps for certain seconds, the meter will determine as a magnetic field tampering event. Total magnetic field tampering times and starting time and ending time of the latest 10 magnetic field tampering events will be recorded.

Current serious unbalanced trip event

When the ration between difference of one phase max current and other phase min. current and the average current is higher than set value for certain seconds, the current unbalanced event is occurred. Total current unbalanced event times and starting time and ending time of the latest 10 current unbalanced events will be recorded.

Under voltage trip event of internal battery

When meter internal battery voltage is lower than one set value for certain seconds, the internal battery under voltage event is occurred. Total under voltage event times and starting time and ending time of the latest 10 events will be recorded.

Current reverse sequence trip event

When the meter detects the order of three-phase current over neutral phase is A, B, C, if it doesn't follow this order for certain sec, it will be determined as current phase reversed event. Total current reverse sequence events and starting time and ending time of the latest 10 events will be recorded.

Voltage reverse sequence trip event

When the meter detects the order of three-phase voltage over neutral phase is A, B, C, if it doesn't follow this order for certain sec, it will be determined as voltage phase reversed event. Total voltage reverse sequence events and starting time and ending time of the latest 10 events will be recorded.

Frequency over limit event

When the meter detects grid, frequency is over the set value for certain sec, it will be decided as frequency over limit event. The meter records total frequency over limit events and stating time and ending time of latest 10 frequencies over limit events.

4.14.2 General Events Recording Function

Switch off event

When there is switch off event, the meter will add 1 total count of switch off times. Total switch off times and time of last 10 switch off event will be recorded.

Switch on event

When there is switch on event, the meter will add 1 total count of switch on times. Total switch on times and time of last 10 switches on events will be recorded.

Time synchronization event

When the meter time is synchronized, the meter will add 1 to total count of time synchronization times. Total time synchronization times and time of last 10 time synchronization events will be recorded.

Power purchase event

The meter can record total 60 valid power purchased Token, purchase energy quantity.

Power off event

When the meter is powered off, it will add 1 to total count of power off times. Total power off times and time of last 10 powers off events will be recorded.

Phase off event

In case the meter detects some phase, voltage failure requirement is met and that situation continues for certain time, it will be determined as the occurrence of phase off event. The meter will add 1 to the No. of phase off times. Besides, the meter will display the failure phase, if phase A, it will display L1; if phase B, display L2, while phase C, display L3. Total phase off times and last 10 phases off time can be recorded. In addition, phase A, B and C can independently record phase off event.

Reverse overload event

When the power of meter one phase is reversed and overloaded for certain seconds, the meter will add 1 to total count of reverse overload times. The meter can record starting time and ending time of the latest 10 overload events.

Over voltage event

When meter one phase voltage is over the set value and this state keeps for more than certain seconds, the meter will add 1 to total count of over voltage times. The starting time and ending time of the latest 10 over voltage events will be recorded. Besides, phase A, B, and C can independently record overvoltage event.

Under voltage event

When meter one phase voltage is lower than the set value and this state keeps for more than certain seconds, the meter will add 1 to total count of under voltage times. The starting time and ending time of the latest 10 under voltage events will be recorded. Besides, phase A, B, and C can independently record under voltage event.

Voltage loss event

When the meter detects one phase voltage meets voltage loss requirements and this state lasts for the specified certain seconds, the meter will add 1 to total count of voltage loss times. The starting time and ending time of the latest 10 voltage loss events will be recorded. Besides, phase A, B, and C can independently record voltage loss event.

Current loss event

When the meter detects one phase current meets current loss requirements and this state lasts for the specified certain seconds, the meter will add 1 to total count of current loss times. The starting time and ending time of the latest 10 current loss events will be recorded. Besides, phase A, B, and C can independently record current loss event.

Over current event

When meter current is over the set value and this state keeps for certain seconds, the meter will add 1 to total count of over current events. The starting time and ending time of the latest 10 over current events will be recorded. Besides, phase A, B, and C can independently record over current event.

Total power factor over lower limit event

When total power factor of the meter is under the specified value and this state keeps for certain second, the meter will add 1 to total count of power factor over lower limit events. The starting time and ending time of the latest 10 total power factor over lower limit events will be recorded.

4.15 Monthly Frozen Recording Function

The monthly frozen time is specified as 0 o'clock of the first day of each month.

Freeze the last 12 months' total active energy and total active consumption credit

4.16 Daily Frozen Recording Function

The daily frozen time is specified as 0:00 of each day.

Freeze the last 31 days' forward active energy, total active consumption credit

4.17 Update on Firmware

Remotely or locally update the energy meter via 485 or PLC communication interface. The meter can normally display when issuing update patch. After successfully and completely receiving it, the meter will enter update status and "update" will be displayed on LCD.

The meter will auto execute the new program after updating. While during the complete remote update status, please make sure the meter is powered up.

4.18 Remote Prepayment Function

The meter's remote prepayment function (issue Token) will be realized via GPRS communication module.

4.19 Operating Mode Function

The ex-factory meter is at non-operational mode where the relay will not get tripped even if opening terminal cover. The meter can be switched into operational mode by inputting TOKEN: 0028 8230 3762 8593 2100 on UIU (or the meter will auto switch to operational mode by continuously powered up for 1 h). Under the operational mode, the meter will get tripped if opening the terminal cover. In addition, input “9” “2” and press Enter key to query status word. (0 stands for operational mode, 1 for non-operational mode).

4.20 Multi-tariff Function

Up to 8 tariffs are supported by three-phase electronic energy meter (the tariff parameters can be set via communication ports, 8 daily meter parameters). The meter is set as single tariff by default when ex-factory.

4.21 Step Electricity Price

The meter supports 8 step electricity prices (the parameters of step energy and electricity price can be set via communication port). The step electricity price is set under disabled state by default when ex-factory.

4.22 Parameter Settings via TOKEN

Set hoarding limitation, overdraft limitation and load control parameters.

Set tariff electricity price and activate parameters.

Set time of use electricity price and activate parameters

Set single-tariff electricity price and activate parameters.

Set friendly interval parameters.

Set friendly period parameter;

Set meter mode and realize mode switch.

Test meter items via TOKEN.

Obtain credit or reset return TOKEN data.

5. Meter Installation Instruction

5.1 Cautions on Operation

The installation and commission operator of energy meter must be technically qualified as below:

Trained with relevant technical training.

Be familiar with and comply with safety regulations, strictly comply with specific regulation of safety.

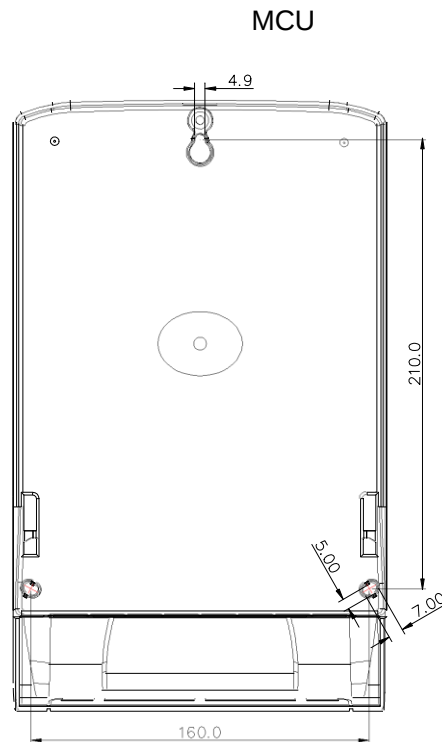
Please see if the required materials and tools are all prepared before starting operation (see 6.2 “Tools and Materials required”).

5.2 Tools and Materials Required

The following tools and materials are necessary for installing the meter:

The energy meter preset correctly (already opened an account) and sealed well.
Customers' information chart of energy meter.
Screws to fix energy meter.
Seal and seal tools provided by the Utility.
Slotted screwdriver and cross screwdriver which are used to secure screw.
Drilling tools (if it is needed) and multi-meter.

5.3 Installation Dimension Figure



5.4 Cautions on Installation

Before wiring, please carefully check the connection diagram on meter case and confirm the phase line, and neutral line (ground wire) consistent with connection diagram. It is better to use copper wire and copper contact to connect to meter.

If the cable is old, operator shall cut the end of cable to ensure the new exposed wire end is about 15 mm long to be used to connect; if cable diameter is between 3 mm and 6.5 mm, directly connect to inside of terminal and make sure it secured; if cable diameter is less than 3 mm, then it is necessary to use a suitable size copper or aluminum bushing to clamp cable end so as to avoid loose contact of connection resulting in terminal burnout.

During wire-connection, firstly loosen each screw on each terminal, then insert In-phase line into end of connection aperture and the in-neutral line into end of connection aperture, fully tighten screws of terminals. Similarly insert Out-phase line into end of connection aperture. Tighten screws of terminals fully and make them secured.

Power on energy meter to test the working condition, if energy meter works normally, record readings of meter. Otherwise, please carefully test condition of installation and connection and working voltage.

Be gentle with the energy meter so as to avoid dropping and collision during whole installation processes.

When installing energy meter, please be careful with operation and power usage safety so as to avoid accident.

6. Transport and Storage

The product shall be transported and stored according to the related rules. No intense impact to the product is allowable during transportation and unpacking.

The product shall be stored in a clean place where the ventilation is good, the ambient temperature is -25 °C~70 °C, and the relative humidity is not more than 75%, and make sure no corrosive gas or harmful material present and the natural ventilation is good.

The product shall be stored on shelf in a warehouse and the stacking height shall not be more than 10 layers.

7. Warranty

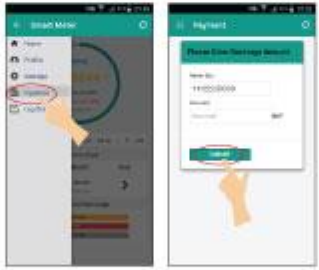
The manufacturer warrants its products against defective parts and workmanship and will repair or (at its option) replace, free of charge, any meter which is or may become defective under proper operation with all seals in good condition within the warranty period specified in contract from date of sales.

8. Troubleshooting

The meter features self-test. If the following information is found on the LCD, or the self-test information displayed on LCD is abnormal (e.g. character missing or character incomplete etc.), contact the manufacturer for advice.

FAULT	Solution
When LCD is under full-screen displaying, some characters are not full or clear, or the energy indication flashes but the LCD has no displaying.	The LCD is not qualified. Ask the manufacturer or agent to replace the LCD.
No display on LCD and no flashing of the energy pulse indicator.	1. Check whether wire-connection is correct. 2. Check whether voltage is in operation range.
LCD is normal, impulse indicator doesn't flash when power consumption	1. Check if the connection is correct. 2. Power consumption is less than 0.4% Ib.

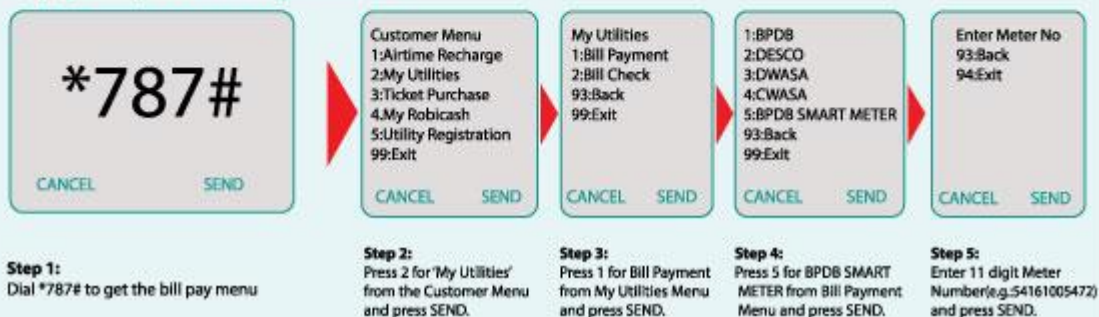
Smart Meter User Manual:

Bangladesh Power Development Board  User Guide SMART METER <i>Saving Energy</i>	- Enter consumer number and password. Dashboard will come after login. - Day wise electricity usage tab will be opened. 	- Tap on the usage to get hour wise chart - Tap on any hour bar to see the hourly consumption 
- In the same way view the Month & Year wise consumption - Tap on Upper Right refresh button to update Dashboard 	- Tapping on the upper left, menu bar will expand Menu section. - Menu expanded view 	- Tap on Menu bar >> Profile - Profile page will appear with User name, address, Meter info and Personal info. 
- Tap on Menu bar >> Settings - Set billing warning and alarm to get SMS & email on balance limit exceeding 	- Tap on Menu bar >> Payment - Enter amount to recharge and tap on SUBMIT. 	- Select payment method, enter payment info and complete the payment. - Verify card details and payment info and tap on 'Confirm Payment' 
- Successful message will appear after completing the payment. - To logout: Menu bar >> Logout 	Short Code for Smart Meter keypad - Remaining balance: Press 07 >> Press Red button - Consumed amount of current month: Press 30 >> Press Red button - Sanction Load: Press 18 >> Press Red button - Consumed kWh of current month: Press 09 >> Press Red button - Last Recharging amount: Press 81 >> Press Red button - Last Recharging time: Press 11 >> Press Red button - Emergency Credit amount: Press 15 >> Press Red button - Current Electricity Price (Single phase): Press 100 >> Press Red button - Current Electricity Price (Three phase): Press 97 >> Press Red button - Meter Number: Press 63 >> Press Red button - Smart Meter web address: http://www.bpdb-smartmeter.com/	 Available on the App Store GET IT ON Google play  Download Smart Meter App 

> Self-Registration process for Robicash Wallet



> Bill payment process for Registered User



> Smart Meter USSD menu

