Energy Management System Based on GPRS Meter/Acquisition Terminal

-DT (S) SD178-GPRS Multi-function Meter

-DF6202-GPRS Energy Management Terminal

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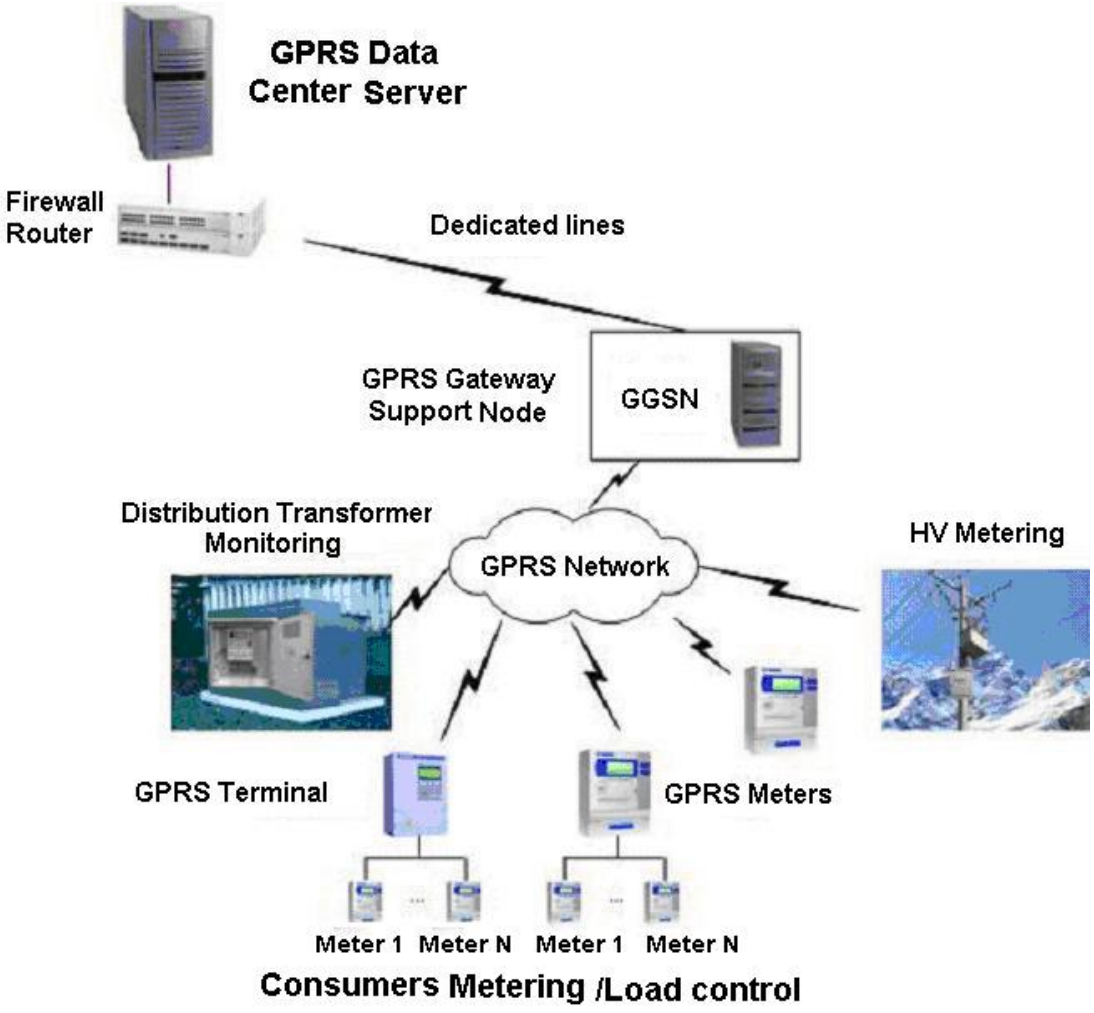
Section I: GPRS Network Composition

1 System

1.1 General

The GPRS system consists of the master system, GPRS acquisition terminal (or GPRS METER), and static meter. The large consumers of static meters are recommended to use GPRS acquisition terminals to acquire, store, and transmit data; large consumers that do not use static meters are advised to directly employ GPRS meters.

The architecture of the system is as follows:



1.2 GPRS network

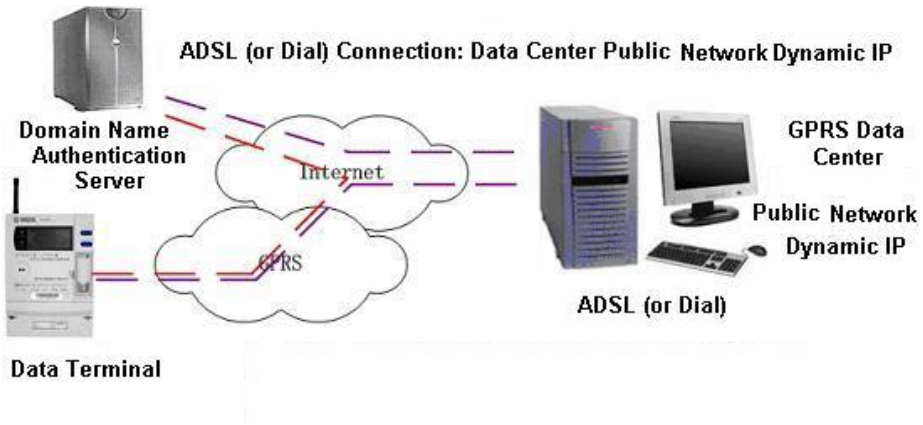
The GPRS wireless communication network is composed of three parts: end user data terminal (GPRS communication terminal), data transmission channel (GPRS network),

and GPRS data center. As far as electrical consumers are concerned, the system GPRS data acquisition network can be in the following manners:

A. Public dynamic IP

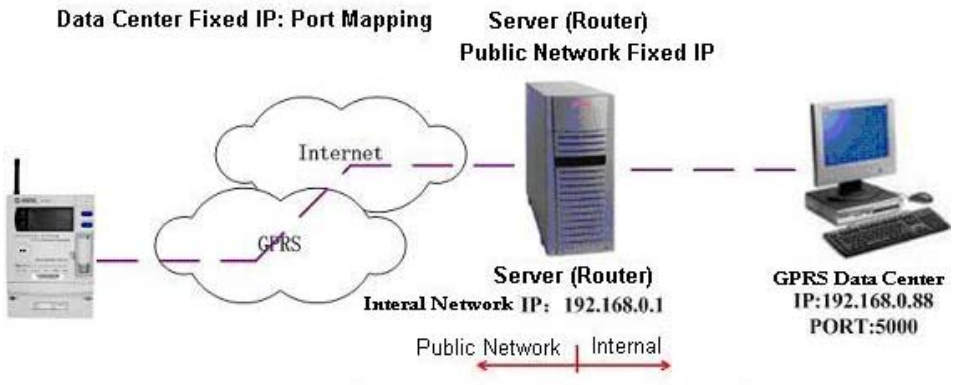
The GPRS communication data server applies for public dynamic IP via connecting to INTERNET by ADSL or dialing from the domain name certification server, communicating with terminals via the public network IP across Internet, GPRS network, whose configuration is simple.

This kind of network is applicable to the system with few terminals at its early stage, and data reporting without being polled. Coming down data quality will be slightly compromised because of communications across networks.



B. Public network fixed IP

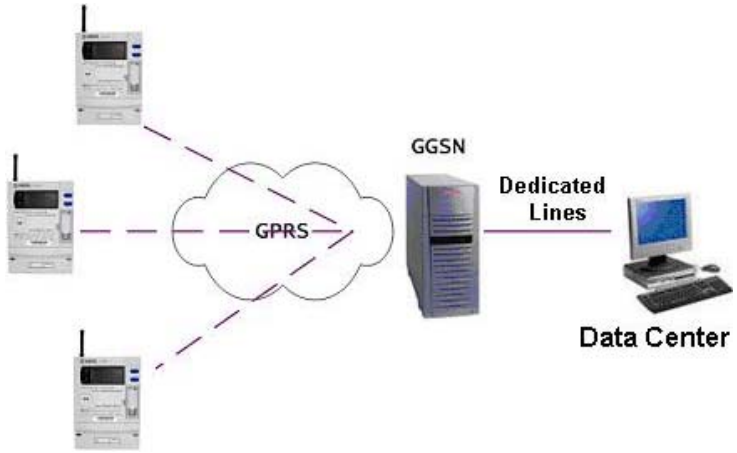
Via the Internet server NAT port mapping of the public network IP, data channels are established between the data terminal and data center. This kind of network is applicable to the system with few terminals at its early stage, and data reporting without being polled. Coming down data quality will be slightly compromised because of communications across networks.



C. VPN (Virtual Private Network)

The VPN (Virtual Private Network) is built among data acquisition terminals, the GPRS bases, the GPRS control room, and the power company, and all data are encrypted against data from illegal intrusion or modification. It features on line high speed, quite little investment, and charges can be collected in terms of capacity. GPRS data transmission capacity is large and various energy data and abnormal alarms can be transmitted without being polled.

One GPRS communication data server is added, the enterprise is connected to the router of the GSM/GPRS provider that provides users with public or private IP address. The advantages are that data security is high, stable with little transmission delay, terminal online percentage is high, and maintenance is easy, and this is suitable to the system GPRS with quite many terminals.



1.3 GPRS data center

The GPRS communication data server establishes the GPRS data center, data communication is carried out between the data center and GPRS terminal, communication linking is initiated via GPRS terminals, linking is realized by configuring heartbeat via the GPRS terminal.

The data center is responsible for maintaining on line GPRS terminal list, GPRS load control, terminal data transmission without being polled; the GPRS data center manages acquisition tasks via the task manager, supporting unasked data retrieval from the GPRS terminal.

The test proves that data transmission quality of the network is good and reliable. Considering redundancy and efficiency, the system utilizes the UDP to perform data communication.

On condition that the GPRS network is operating normally, generally, transmission of data packets succeeds more than 99.9%.

As for frequent and real time data transmission, the heartbeat interval shall be configured as per demands of network quality and applications.

Section II: DTSD178-GPRS multi-function meter

1. General

The DTSD178-GPRS multi-function meter integrates electrical measuring, monitoring and GPRS communication as a whole, with high accuracy, catering for demands of HV/LV remote measurements and supervisory control of distribution transformers.

2. Typical application

- . HV remote measuring systems
- . LV remote measuring systems
- Supervisory control systems of distribution transformers
- Large consumer AMR and load control systems

3. Features

- Built in advanced GPRS module, fulfilling quick and safe data connection, always on line;
- Powerful configuration, local/remote parameterization, supporting local/remote software on line upgrade;
- Humidity, mould and corrosion proof PCB;
- Patented lightning proof switching power supply;
- Dual super capacitor and lithium battery backup power ensuring reliability of alarming at time of power outage.

4. Functions

Time of Use

- . bi-directional active energy;
- Forward & backward or four quadrant reactive energy;
- Maximum demand and its occurrence time;
- Up to 9 tariff rates, 12 seasons, 10 daily groups of rate periods, and 12 rate periods;

Supervisory

- Phase to neutral (Phase to phase) voltages and currents;
- Three phase active powers and reactive powers;
- Power factors, phase angles;
- External digital temperature sensor (optional);
- 4 digital inputs.

Recording & statistics

- Historical data;
- Missing potential, phase disconnection, over voltage, and current unbalance events;
- Voltage tolerance; power factor tolerance; recording of maximum & minimum voltages and power factors.
- Operation records of programming, energy and demand clearance, and password modification

Tamper supervision & alarming

- Missing potential, phase disconnection;
- Current missing, CT ratio exceeding;
- Phase sequence reversal;
- Power factor abnormity;
- Malfunction;
- 4 states of change;
- Power outage; lithium battery assuring energy meters and terminals running for 24 hours at time of power outage, supervising status of device operation.
- Programming, energy and demand clearance, and password modification

Remote control (optional)

Two relay contact outputs, used as load control or prepayment performance mechanism based on the master station

5. Technical specifications

Item	Specifications
Reference standard	GB/T17883-1999, GB/T17882-1999, DL/T614-1997, DL/T645-1997
Range of voltage	0.5 ~ 1.4 rated voltage
Current inputs	Max 200%In. (In=5A,Imax=10A) nominal full scale input.
Reference frequency	50Hz±5%
Accuracy class	0.5s for active power; 2.0 for reactive power
Status inputs	4 nos, internal power

Temperature input	1 digital sensor
Load control output	2 relays
Clock	≤0.5s/d (Reference temperature)
Service life for clock battery	≥10 years
Reading at time of power outage	External lithium battery, running up to 24 hours without power
Communication	GPRS, CSD, SMS
Operating temperature	-25 ~ +55^{0}C (-40^{0}C ~ +70^{0}C low temperature resistant, optional)
MTBF	≥5×10^4 h
Dimensions	248×175×70mm

6. Options

- Low temperature alternative: up to -40^{0}C
- Lithium battery unit (assuring energy meters and terminals running for 24 hours at time of power outage)
- Digital temperature sensor supervising distribution transformer oil temperature

Section III: DF6202-GPRS energy management terminal

1. General

The DTSD178-GPRS multi-function meter integrates electrical measuring, monitoring and GPRS communication as a whole, with high accuracy, catering for demands of HV/LV remote measurements and supervisory control of distribution transformers. The DF6202-GPRS energy management terminal – wireless digital communication unit is specially designed for remote HV/LV measuring, large consumer meter reading, and load control systems based on digital GPRS communication, which uses the state of the art industrial wireless communication GPRS module, realizing speedy, reliable and safe data connection. The unit is mainly utilized to collect, store energy data from static meters and supervise peripheral devices, transmitting data to the master station via the GPRS network, providing decision-making references for electric power companies.

2. Typical application

- HV remote measuring systems
- LV remote measuring systems
- Large consumer AMR systems
- Load control systems

3. Features

- Built in advanced GPRS module, fulfilling quick and safe data connection, always on line;
- Powerful configuration, local/remote parameterization, supporting local/remote software on line upgrade;
- Humidity, mould and corrosion proof PCB;
- Patented lightning proof switching power supply;
- Dual super capacitor and lithium battery backup power ensuring reliability of alarming at time of power outage.

4. Functions

Data Acquisition

- Electric energy data;
- Instantaneous data;
- Demand data;
- Missing potential, phase disconnection, over voltage, and current unbalance events;
- Voltage tolerance; power factor tolerance; recording of maximum & minimum voltages and power factors.

Data storage

- Electric energy, Instantaneous, and Demand data, abnormal records, and tolerance data;
- Data memory optional;
- Data storage type configurable;
- Data storage period settable.

Supervisory

- External digital temperature sensor (optional);
- 4 digital inputs

Tamper proof & alarming

- Abnormal operation alarming of static meters (missing potential, phase disconnection, current missing, CT ratio exceeding, phase sequence reversal, power factor abnormity, malfunction, Programming, energy and demand clearance, and password modification)
- 4 states of change;
- Power outage alarm

Remote control (optional)

Two relay contact outputs, used as load control or prepayment performance mechanism based on the master station

5. Technical specifications

Item	Specifications
Voltage inputs	50V ~ 420V AC (The power supply of the meter shall be from all three phases. If one or two phases are disconnected (primary side), the meter shall still function satisfactorily within the accuracy limit on condition that voltage input(s) are within the specified range.)
State inputs	4 nos, internal power
Temperature input	1 digital sensor
Load control outputs	2 relay outputs (optional)
RS485 interface	1 port, capable of being connected to 1 ~ 6 multi-function meters or multi-rate metes
Reading at time of power outage	External lithium battery, running up to 24 hours without power
Communication	GPRS, CSD, SMS
Data storage	Memory capacity, type, and period selectable.
Operating temperature	-25 ~ +55^{0}C (-40^{0}C ~ +70^{0}C low temperature resistant, optional)
MTBF	≥5×10^4 h
Dimensions	248x175x70mm

6. Options

- Low temperature alternative: up to -40^{0}C
- Lithium battery unit (assuring energy meters and terminals running for 24 hours at time of power outage)
- Digital temperature sensor supervising distribution transformer oil temperature

Appendix: Project Reference List for DF6202 & GPRS Meters

Project Reference List for DF6202 & GPRS Meters

Sl. No.	Name of Purchaser	Type of Material	Date of Supply
1.	No. 1 Oil Extraction Factory, Daqing Oilfield Company Limited	Meter: 140 Nos	March 2004
2.	Chifeng Power Supply Company, Inner Mongolia, China	Meter: 4 Nos	May 2004
3.	Karamay Power Supply Company, Sinkiang, China	Meter: 14 Nos	Oct 2004
4.	Liaohe Oil Field	18 GPRS Meters	At hand
5.	Yichun Power Supply Company, Jiangxi	18 GPRS Meters	At hand
6.	Penglai Power Supply Company, Shandong	DF6202: 1 no.	Trial running.
7.	Fuding Power Supply Large Consumer AMR System, Fujian	GPRS Meter: 1 no.	Trial running.